CORRECTIVE MEASURES COMPLETION REPORT ADDENDUM

Aerojet Chino Hills Facility

Chino Hills, California

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amec

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Aerojet Chino Hills Facility
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Project No. 7897

I certify that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to evaluate the information submitted. I certify that the information contained in or accompanying this submittal is true, accurate, and complete. As to those identified portion(s) of this submittal for which I cannot personally verify the accuracy, I certify that this submittal and all attachments were prepared in accordance with procedures designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those directly responsible for gathering the information, or the immediate supervisor of such person(s), the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

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ACRONYMS AND ABBREVIATIONS

1,3,5-TNB	1,3,5-trinitrobenzene
2,4-DNT	2,4-dinitrotoluene
2-NT	2-nitrotoluene
2,4,6-TNT	2,4,6-trinitrotoluene
4-A-2,6-DNT	4-amino-2,6-dinitrotoluene
ABS	dermal absorption fraction
ACM	asbestos containing material
AOC	area of concern
API	armor piercing incendiary
Ba	barium
Cal/EPA	California Environmental Protection Agency
Cd	cadmium
CDC	controlled detonation chamber
CDFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
City	City of Chino Hills
CLP	U.S. EPA Contract Laboratory Program
CM	corrective measure
consent agreement	Corrective Action Administrative Agreement of Consent
CMCR	Corrective Measures Completion Report
CMCRA	Corrective Measures Completion Report Addendum
CMW	Corrective Measures Workplan
Co	cobalt
Cr	chromium
CS	o-chlorobenzylidene malononitrile or “tear gas”
Cw	chemical concentration
dataRAM	Data RAM pDR 1000
HERD	Human and Ecological Risk Division, DTSC
DNB	di-n-butyl phthalate
DU	depleted uranium
DTSC	California Department of Toxic Substances Control
GPS	global positioning satellite
HEI	high explosive incendiary
Hg	mercury
HMX	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine or cyclotetramethylene-tetranitramine
LAP	load, assembly, and pack
LBP	lead based paint
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
MEC	munitions and explosives of concern
metals	Title 22, Chapter 11, Article 3 required metals
MB	method blank
Mg	magnesium

mg/kg/day	milligrams per kilograms per day
mg/kg	milligrams per kilogram
mg/l	milligrams per liter
mg/m^3	milligrams per cubic meter
MHJ	J.A. Jones Environmental Services, McLaren-Hart/Jones Division
Mo	molybdenum
MS	matrix spike
MSD	matrix spike duplicate
µm	micrometer
µg/kg	micrograms per kilogram
µg/l	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter
NA	not applicable
ND	non-detect
OB/OD	open burn/open detonation
OCDD	1,2,3,4,6,7,8,9-octachlorodibenzo-p-dioxin
OEHHA	Cal/EPA Office of Environmental Health Hazard Assessment
PCB	polychlorinated biphenyl
PEA	Preliminary Endangerment Assessment
pg/g	picograms per gram or parts per trillion
PM_{10}	particulate matter with a diameter of 10 micrometers or less
PPE	personal protective equipment
QA	quality assurance
Qal	recent alluvium
QC	quality control
R&D	research and development
RAGS	U.S. EPA Risk Assessment Guidance for Superfund
RCRA	Resource Conservation and Recovery Act
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine or cyclotrimethylene-trinitramine
RFI	RCRA Facility Investigation
RPD	relative percent difference
RWQCB	Regional Water Quality Control Board
Sb	antimony
SCAQMD	South Coast Air Quality Management District
SVOCs	semi-volatile organic compounds
SWMU	solid waste management unit
TCLP	toxic characteristic leaching procedure
TEQ	toxic equivalent quotient
TP	target practice
Tps	Soquel member of the Puente Formation
TPH	total petroleum hydrocarbons
U.S. EPA	U.S. Environmental Protection Agency
UST	underground storage tank
UXO	unexploded ordnance
VOCs	volatile organic compounds
Yd^3	cubic yard

EXECUTIVE SUMMARY

AMEC Geomatrix, Inc. (AMEC Geomatrix) has prepared this Resource Conservation and Recovery Act (RCRA) Corrective Measures Completion Report Addendum (CMCRA) on behalf of Aerojet-General Corporation (Aerojet) to present results of the implementation of the additional corrective measures (CMs) and building assessments (BAs) conducted at Aerojet's Chino Hills Facility (facility or site). Geomatrix conducted RCRA Facility Investigation (RFI) and implemented CMs at the facility under the oversight of the California Department of Toxic Substances Control (DTSC). A total of 16 solid waste management units (SWMUs) and 13 areas of concern (AOCs) were identified at the facility. Other areas were added as the study extended beyond the designated SWMUs and AOCs to provide a thorough and complete facility-wide investigation.

Of the 29 SWMUs/AOCs identified at the facility and evaluated during the RFI, 19 were assigned "no further action" status (McLaren/Hart, 1999a, b). The remaining 10 areas required CMs. The Corrective Measures Workplan (CMW) (McLaren/Hart, 1999c) identified the following CMs to remediate and/or control releases of hazardous wastes or their constituents at the facility:

1. CM No. 1 – Ordnance Removal, Segregation, and Handling
2. CM No. 2 – Removal and Landfill Disposal of Impacted Soil
3. CM No. 3 – CS (tear gas) Removal, Segregation, and Handling

DTSC conducted an initial study and determined that the proposed CMs would not have a significant effect on the environment (DTSC, 1999a). Thus, it adopted a negative declaration (no negative impact recognized) for the project and approved the CMW with conditions on October 17, 2000 (DTSC, 1999a, 2000, 2001).

Corrective measures implementation following the DTSC-approved CMW began in 2001. The results of the initial implementation of CMs were described in the draft Corrective Measures Completion Report (CMCR). The draft CMCR was revised pursuant to DTSC comments on the report (DTSC, 2005a, b, d), and subsequently approved by DTSC (DTSC, 2008c). Based on the results presented in the CMCR (Geomatrix, 2006a), Geomatrix recommended "no further action" status for most of the areas of the site subject to CMs. However, several areas of the facility identified in the CMCR required additional CMs, including ordnance screening (CM

No. 1), removal of impacted soil (CM No. 2), or additional assessment of subsurface soil conditions.

Nine areas were identified for further investigation to support ongoing CMs and site assessment activities and eight buildings/structures were identified for additional BA activities (ENSR, 2001b, Geomatrix, 2006a). Recommendations for additional studies were also provided by DTSC based on review of facility documents (DTSC, 2005c, 2006a, b). A summary of the remaining CM/BA activities is provided in the following table:

SWMU/ AOC	Area Name	Corrective Measures			Building Assessment		Recommendation
		CM 1	CM 2	Sample	Demo	Sample	
SWMU 2	Former Landfill	X	X	X			Remove former landfill materials; screen for MEC; assess and remove perchlorate containing soil.
AOC 5	Test Range 16	X		X			Screen for MEC; assess area subject to post November, 2001 demilitarization activities.
AOC 8	Former Building 010		X	X	X	X	Sample building materials; demo structure/foundation; define extent of RDX-impacted soil and remove from site.
AOC 10	Metal Forming Area			X			Former stockpile area; assess soil for perchlorate.
AOC 13	Area 10			X			Former test area; assess soil for cadmium.
None	Area 1D			X			Former scrap yard; assess soil conditions.
None	Building 534 area			X			Possible former burn oven location; assess soil for dioxins.
None	Stockpile s in 1C			X			Assess stockpiles for perchlorate.
None	concrete block area			X			Perchlorate-containing blocks had been stockpiled in area; assess area for perchlorate.
None	Bldg 003				X	X	Demo building/foundation; remove pipe with possible lead azide; remove septic tank.
None	Bldg 006				X	X	Complete characterization; demo building/foundation.
None	Bldg 016				X	X	Demo building; confirm presence of UST(if found, assess and remove).
None	Bldgs 22-25, 29-32					X	Former storage bunkers; assess soil and building conditions.
None	Bldg 036		X		X	X	Remove nitroglycerine-impacted soil; remove septic tank.
None	Bldg 037				X	X	Remove septic tank.
None	Bldg 551W					X	Structure removed; assess soil for explosive compounds.

Several key work plans were prepared to complete CM/BAs and document environmental conditions in the above-listed areas (Geomatrix, 2006b, c, d, e, f, 2007). DTSC reviewed and approved these work plans (DTSC, 2006a, b).

This Corrective Measures Completion Report Addendum (CMCRA) addresses the implementation of the remaining CM/BA activities. CMCRA results are described below.

Corrective Measures Implementation

Material screening measures were applied to SWMU No. 2 (former Landfill) and AOC No. 5 (Test Range 16) where construction debris and munitions and explosives of concern (MEC), respectively, were suspected (Geomatrix, 2006a). Suspect MEC and debris-containing soil were excavated and transported to the screening plant located in Area 10 and operated by URS Corporation (URS), where it was processed (screened) to remove MEC and objects within specification of 0.5 inch in the smallest dimension. The ferrous metal materials were removed by a powerful magnet. Nonferrous materials were removed by URS's unexploded ordnance (UXO) technicians.

A total of 1,120 yd^3 of soil were processed to remove MEC, metal fragments, and debris. A total of 147 suspect MEC items were removed during screening of soil from Test Range 16. No MEC items were found in the materials processed from the former landfill. Quality control (QC) procedures were followed to verify compliance with specifications in the CMW (McLaren/Hart, 1999c) and CMCR (Geomatrix, 2006a). All QC processes and audits of the finished product pile demonstrated that MEC and MEC-related materials were removed from the processed soil. CH2M Hill Demil International, Inc. used their proprietary Controlled Detonation Chamber (CDC) for destruction of MEC. The CDC is an enclosed system equipped with a vacuum system and off-gas filtration plant that suppresses detonation noises and emissions.

Impacted soil was removed from the following areas:

- SWMU No. 2 - An estimated 360 yd^3 of material that was screened for MEC was transported to Waste Management's Kettleman City facility, a Class I facility.
- SWMU No. 2 - An estimated 80 yd^3 of perchlorate-containing soil was transported to Waste Management's Kettleman City facility, a Class I facility.

- AOC No. 8 - An estimated 850 yd^3 of RDX-impacted soil was removed from beneath former Building 010 and transported to Waste Management's McKittrick Waste Treatment Site, a Class II facility, as nonhazardous solid waste.

- Building 036 outflow area – An estimated 8 yd^3 of nitroglycerine-impacted soil was removed from the outflow area. A portion of the non-hazardous material was bulked with other materials and transported to Waste Management's Kettleman City facility, a Class I facility. The remainder of the material was transported to Waste Management's McKittrick Waste Treatment Site, a Class II facility.

Each truck was inspected for loose materials and to confirm integrity of tarps before leaving the site. Display ads were placed in local newspapers notifying the public of transportation activities. An integrated ambient air monitoring program was implemented during the excavation of RDX-impacted soil in the former Building 010 area following applicable South Coast Air Quality Management District (SCAQMD) Fugitive Dust Rule 403 (Rule 403) protocols. Results of particulate sampling and integrated samples for explosive compounds demonstrate that excavation of RDX-impacted soil from the former Building 010 area did not result in airborne emissions that could be carried off site (RES, 2007).

Confirmation sampling in the above areas demonstrated that the impacted materials have been removed from the site. Likewise, CM assessments completed in other areas of the facility demonstrated that the CMs were completed and no additional assessment activities are necessary.

Building Assessment Activities

Based on the initial building assessment activities conducted in 1998 (ENSR, 2001b), Buildings 006, 010, and 037 septic required remedial measures to address areas of known impact. BA activities were also recommended in Buildings 003 and 016, and the septic tanks outside Building 003 and 036 to address areas of possible impact. To support completion of CM/BA activities and address environmental concerns associated with the above listed buildings and structures, additional building characterizations were performed. Subsequently, Buildings 003, 006, 010 and 016 and their concrete slabs, and septic tanks from Buildings 003, 036, and 037 were demolished. Demolition of Building 016 exposed a former underground storage tank (UST).

URS was retained to complete building demolition activities. They obtained appropriate demolition and excavation permits from the City of Chino Hills (city) and UST removal permits from the County of San Bernardino and fire district (county). Asbestos and "universal

wastes" were previously removed from the buildings (ENSR, 2001a), and lead-based paint (LBP) areas were stabilized before demolition. URS used approved engineering control and work practices to control dust. Aurora Industrial Hygienists (Aurora) of Long Beach, California conducted LBP stabilization monitoring. In addition, a drain line beneath Building 003 that may have contained lead azide was "stabilized" with a neutralization solution before the line was cut into sections for offsite management by incineration.

Demolition was accomplished under city and county permits using standard construction equipment (URS, 2007). A water truck was used during all phases of demolition to control airborne debris and dust. Dust monitoring demonstrated that airborne dust did not leave the site. The buildings/structures were dismantled into piles for eventual recycling and disposal (URS, 2007). Most of the building materials, include the UST and its backfill slurry, were transported to the Waste Management's McKittrick Waste Treatment Site, a Class II facility, as nonhazardous solid waste. Some of the inert concrete debris was sent to local recycling facilities. Concrete waste and sediment from the Building 037 septic tank was shipped to Waste Management's Kettleman Hills facility, a Class I facility.

Risk Assessment

Throughout the RFI and CM process, several risk evaluations or screening assessments (Meredith/Boli, 1993; McLaren/Hart, 1999a, b; Geomatrix, 2003, 2006a) were completed to determine the potential health risk posed by chemicals detected in samples collected from the facility. All of these evaluations were reviewed and approved by DTSC. The risk evaluation presented herein followed the DTSC's Preliminary Endangerment Assessment (PEA) Guidance Manual (DTSC, 1999b) using exposure assumptions published by DTSC (1999) and U.S. EPA (1989, 1991, 1997, 2004a, b), and toxicity criteria published by OEHHA (2004, 2007) or U.S. EPA (2007).

To determine if concentrations of metals from the various SWMUs/AOCs and other areas of interest exceeded site background levels, sample results were compared to bedrock background sample results using the Wilcoxon Rank Sum Test. Concentrations of barium, chromium, and cobalt occur in some areas of the site at concentrations statistically higher than background levels. These metals, and other chemicals detected in soil samples (e.g. perchlorate, dioxins, and explosive compounds RDX and HMX), were subject to risk evaluation following the procedures described above. Risk evaluations demonstrated that residual levels of these

chemicals do not pose a risk to human health under the conditions evaluated. Thus, no additional CMs or BAs are necessary in the areas described in this CMCRA.

Data Review

Quality assurance and quality control (QA/QC) procedures were implemented in accordance with the DTSC-approved RFI QA plan (McLaren/Hart, 1999a, b; Geomatrix, 2006a). Analytical data packages provided by the contract laboratories were reviewed to determine whether data are acceptable to meet the intended use(s) following established U.S. EPA guidelines (U.S. EPA 1999 and 2002) and best professional judgment. Generally, the quality assurance data met the U.S. EPA acceptance criteria. In a few instances where QA/QC results deviated from the ideal ranges, data qualifiers were used as necessary.

The results of data review demonstrate that data collected as part of the CMCRA are of sufficient quality to support the conclusions presented herein.

Summary and Conclusion

CM/BA activities were implemented to protect human health and the environment from the chemical releases at the facility. As discussed in this CMCRA, the CM/BAs have been successful and the results of the post-remedial confirmation sampling, as well as the results of the sampling performed in the areas investigated, have confirmed that the residual chemicals do not pose a threat to human health.

With the completion of these CM/BAs, the chemicals of interest/materials found at the impacted areas, with the exception of ordnance, effectively have been removed. Monitoring of subsurface water conditions in two areas of the facility will continue and is reported in a separate document. Geomatrix has recommended “no further action” status for soils in the SWMUs/AOCs, buildings, and other areas of potential concern identified at the facility. Therefore, Aerojet requests termination of the corrective action processes that have been implemented in the areas described in this CMCRA document.

CORRECTIVE MEASURES COMPLETION REPORT ADDENDUM
Aerojet Chino Hills Facility
Chino Hills, California

1.0 INTRODUCTION

AMEC Geomatrix, Inc. (AMEC Geomatrix) has prepared this Resource Conservation and Recovery Act (RCRA) Corrective Measures Completion Report Addendum (CMCRA) on behalf of Aerojet-General Corporation (Aerojet) to present a description of the methods and procedures used and the results of the completion of the additional corrective measures (CMs) performed at Aerojet's Chino Hills Facility (facility *or* site). The Corrective Measures Completion Report (CMCR) dated February 21, 2006, described the results of CMs implemented at the site between 2000 and 2003. This CMCR was revised and finalized per comments from the California Department of Toxic Substances Control (DTSC). The DTSC approved the CMCR by letter dated September 18, 2008 (DTSC, 2008c). Pursuant to DTSC request and as noted in the CMCR (Geomatrix, 2006a), remaining CMs and Building Assessment (BA) activities were implemented. This CMCRA summarizes results of these continued efforts and provides recommendations for "no further action" status.

A draft CMCRA dated November 2, 2007 was provided to DTSC for review. The DTSC provided comments by a letter dated March 17, 2008 (DTSC, 2008a) and draft memorandum from the Human and Ecological Risk Division (HERD) provided to Aerojet on June 10, 2008 (DTSC, 2008b). On August 21, 2008, AMEC Geomatrix provided responses to DTSC comments (AMEC Geomatrix, 2008). Subsequently, this CMCRA was revised and finalized accordingly per request from the DTSC (DTSC, 2008c).

The facility has been undergoing a RCRA Facility Investigation (RFI) and closure under DTSC oversight since 1994. The RFI was conducted under a Corrective Action Administrative Agreement on Consent (consent agreement) signed by representatives of Aerojet and DTSC on November 10, 1994. The consent agreement was issued pursuant to the authority vested in the DTSC by Section 25187 of the California Health and Safety Code. Authority to implement the state program in lieu of RCRA guidelines was granted by the United States Environmental Protection Agency (U.S. EPA) pursuant to 42 U.S.C. Section 6926.

This CMCRA addresses the implementation of remaining CM/BA activities at the facility and supplemental requests for additional studies/activities by DTSC. It does not address ongoing ordnance clearance activities, with the exception of those specifically related to CMs (results of ordnance clearance activities are presented in separate reports). A total of 16 solid waste management units (SWMUs) and 13 areas of concern (AOCs) were identified at the facility. Eleven of the 29 SWMUs/AOCs addressed in the RFI were identified in the original consent agreement. Others were added through the RFI process as additional information was obtained. BA activities were added as the study extended beyond the designated SWMUs and AOCs to provide a thorough and complete facility-wide investigation.

1.1 STATEMENT OF PURPOSE

Although the BA was not conducted as part of the RFI, the BA sampling activities were conducted in accordance with the RFI guidelines and requirements of the consent agreement. In entering into a consent agreement, the four mutual objectives of the DTSC and Aerojet were to:

1. perform interim measures, as deemed necessary, to address documented releases of hazardous waste or materials to the environment;
2. perform an RFI on the SWMUs/AOCs identified at the facility;
3. perform a Corrective Measures Study on the identified SWMUs/AOCs to develop and evaluate CMs necessary to prevent, mitigate, and/or remediate any releases of hazardous wastes or constituents from the facility; and
4. implement the selected CMs approved by the DTSC.

With regard to these objectives, during the performance of these studies, no hazardous waste or materials were found that warranted the performance of interim measures as defined in mutual objective 1. However, several SWMUs/AOCs were identified that required CMs. With DTSC authorization, evaluation of various measures to prevent, mitigate, and/or remediate any release of hazardous wastes or constituents were combined into a single document entitled Revised Corrective Measures Work Plan, or CMW (McLaren/Hart, 1999c). Results of implementing the selected CMs were described in the CMCR (Geomatrix, 2006s). This report discusses implementation of the remaining remedial measures. Thus mutual objectives 2, 3, and 4 above have been met.

1.2 KEY WORK PLANS

Subsequent to approval of the CMCR (Geomatrix, 2006a), several key work plans were prepared to complete CM/BAs and document environmental conditions at several other areas of the facility identified by DTSC. These key work plans are as follows:

- *Work Plan for Additional Corrective Measures and Building Assessment Activities, Aerojet Chino Hills Facility,* dated March 23, 2006 (Geomatrix, 2006b).
- *Response to DTSC Comments on Approval of Work Plan for Additional Corrective Measures and Building Assessment Activities, Aerojet Chino Hills Facility,* dated May 12, 2006 (Geomatrix, 2006c).
- *Notification of Continuation of Ordnance Screening Activities, Aerojet Chino Hills Facility,* dated May 25, 2006 (Geomatrix, 2006d).
- *Screen Plant Configuration,* e-mail dated June 19, 2006.
- *Addendum to Work Plan for Additional Corrective Measures and Building Assessment Activities, Aerojet Chino Hills Facility,* dated August 22, 2006 (Geomatrix, 2006e).
- *Response to DTSC Comments on Addendum to Work Plan for Additional Corrective Measures and Building Assessment Activities, Aerojet Chino Hills Facility,* dated September 14, 2006 (Geomatrix, 2006f).
- *Backfill of Former Building 010 Excavation of RDX-Impacted Soil, Former Aerojet Chino Hills Facility,* dated May 17, 2007 (Geomatrix, 2007).

All of the above-listed work plans were provided to and approved by DTSC (DTSC, 2006a, b, 2007).

1.3 CORRECTIVE MEASURES WORK PLAN APPROVAL AND PUBLIC NOTICE

Of the 29 SWMUs/AOCs evaluated through the RFI process, 6 SWMUs and 4 AOCs were determined to require CMs. The remaining 19 SWMUs/AOCs did not require any CMs. The CMW (McLaren/Hart, 1999c) identified the following CMs to remediate and/or control releases of hazardous wastes or their constituents at the facility:

- CM No. 1 – Ordnance Removal, Segregation, and Handling
- CM No. 2 – Removal and Landfill Disposal of Impacted Soil
- CM No. 3 – CS (tear gas) Removal, Segregation, and Handling

The RFI and CM approval process have been subject to requirements of the California Environmental Quality Act (CEQA) for public participation. DTSC conducted an initial study and determined that the proposed CMs would not have a significant effect on the environment. Thus it adopted a negative declaration for the project (DTSC, 1999a). DTSC provided public notice of the RFI summary reports (McLaren/Hart, 1999a, b) and CMW (McLaren/Hart, 1999c) in the spring of 1999. Upon DTSC's response to public comments, the CMW was approved with conditions on October 17, 2000 (DTSC, 2000), and clarifications of approval (DTSC, 2001).

Pursuant to DTSC approval of the CMW (DTSC, 2000), public notification of remedial activities was provided in local newspapers, including notice of times when transportation of wastes would take place. Display ads were placed in the Inland Valley Daily Bulletin and Chino Hills Champion newspapers in May 2007, October 2006, and May 2006.

1.4 SUBSURFACE WATER MONITORING AND EVALUATION

Results of the RFI studies (McLaren/Hart, 1999a, 1999b) demonstrated that historic operations in SWMUs No. 7 and 15 (Redwater Pond and Upper A-12 Test Area, respectively) resulted in impacts to subsurface water beneath these areas. CM No. 2 activities were implemented in each area to remove the sources of chemical impact. RDX-impacted soil was excavated from the Redwater Pond, and perchlorate-impacted soil was excavated from the Upper A-12 Test Area. Subsequently, monitoring wells were installed in each area.

Additional subsurface water studies at SWMUs No. 7 and 15 are being addressed through a separate investigation.

1.5 GOALS AND OBJECTIVES OF CORRECTIVE MEASURES

Corrective measures described in the CMW (McLaren/Hart, 1999c) were implemented for the SWMUs/AOCs identified as requiring cleanup/remediation. The objectives of the CMs were to achieve the following goals:

- Remediate and/or control the source(s) of releases to reduce or eliminate, to the extent practical, further releases of hazardous wastes that might pose a threat to human health and the environment.
- Comply with remedial action objectives (cleanup standards).
- Protect human health and the environment.

- Comply with applicable federal, state, and local regulations for management of wastes.

1.6 ORGANIZATION OF CMCRA

This report includes the following sections.

Executive Summary
1.0 Introduction
2.0 Background
3.0 Corrective Measures and Building Assessment Summary
4.0 Additional Corrective Measures and Sampling
5.0 Building Assessment (and Demolition)
6.0 Risk Assessment
7.0 Data Quality Review and Performance System Audits
8.0 Completeness of CM/BA Work
9.0 References

Additional supporting information is presented in appendices to this CMCRA.

2.0 BACKGROUND

The Aerojet property is located at 3100 Woodview Road (also known as the end of Woodview Road) in the City of Chino Hills, San Bernardino County, California (Figure 1). It originally occupied approximately 400 acres, covering parts of Sections 5, 6, and 32 of Township 2S, Range 8W, San Bernardino Baseline and Meridian. Figure 2 is a map of the original 400-acre Aerojet property and surrounding areas. In addition to the original 400 acres of Aerojet-owned property (shown as property boundary on Figure 2), an additional 400 acres of surrounding properties have been leased by Aerojet. The leased land has been used primarily for separation between the operational areas and the surrounding areas. Part of these leased properties included the McDermont property, encompassing approximately 162 acres. Aerojet purchased the McDermont property in January 2007.

2.1 FACILITY STATUS AND OPERATION HISTORY

The facility has been owned and operated by Aerojet since operations began in 1954. Before 1954, the undeveloped area was used for cattle grazing. The facility began operations as a small ordnance-testing facility. During the 1970s, operations primarily involved the testing of explosives, propellants, and small quantities of proprietary organic chemicals. After 1974, operations primarily involved research, development, assembly, and testing of high-explosive

incendiary (HEI) projectiles, armor-piercing incendiary (API) projectiles composed in part of depleted uranium (DU), target practice (TP) rounds, and fuzes. Ammunition assembled at the facility primarily consisted of three types of projectiles:

- HEIs composed predominantly of RDX-type explosives;
- APIs composed, in part, of depleted uranium; and
- TPs composed of inert metals such as steel and tungsten.

Test-firing of a representative number of rounds was conducted per government requirements to confirm the quality of the ammunition. Several test areas were constructed at the facility where ordnance was fired and tested to verify compliance with manufacturer and performance specifications. Typically, HEIs and TPs were fired into a "backstop" (a steel plate approximately 4 inches thick) for complete destruction. TPs and APIs were fired into target areas that typically consisted of concrete and steel boxes filled with sand to "catch" the projectiles. API target boxes were emptied periodically and the sand taken to the "DU reclamation area," where DU fragments were routinely separated and removed.

Testing of DU munitions occurred from 1974 to 1995. Facility operations ceased in November 1995.

2.2 FACILITY IDENTIFICATION

1. **Facility Name:** Aerojet Chino Hills Facility
2. **Contact Person:** Scott Goulart, Aerojet Director of Environmental Restoration (Project Coordinator)
3. **Facility Address:** 3100 Woodview Road, Chino Hills, CA 91709 (also addressed as 16771 Woodview and as End of Woodview Road, Chino Hills, CA 91709)
4. **Mailing Address:** P.O. Box 13222, Sacramento, CA 95813-6000
5. **Phone Number:** (916) 355-5454 (Mr. Goulart); (714) 528-7281 (facility)
6. **Other Facility Names:** GenCorp Aerojet, Chino Hills Facility; Aerojet-General Corporation Chino Hills Facility
7. **U.S. EPA Identification Number:** CAD981457302
8. **CalSites Database Number:** Not Assigned

9. **Assessor's Parcel Number and Maps:** Parcel Nos. 1033-031-01100, 04-000, and 03-000

10. **Township, Range, Section, and Meridian:** Township 2S, Range 8W, Sections 5, 6, and 32, San Bernardino Baseline and Meridian

11. **Land Use Zoning:** Agricultural/Ranch and Rural Residential

3.0 CORRECTIVE MEASURES AND BUILDING ASSESSMENT SUMMARY

The RCRA Facility Investigation and corrective measures were undertaken to achieve final closure of 16 SWMUs and 13 AOCs identified at the facility (Figure 2), and eventually, clean closure of the entire facility. Building assessments were undertaken to provide a thorough facility-wide investigation beyond the designated SWMUs and AOCs.

3.1 APPROVED CORRECTIVE MEASURES

The following CMs were selected to remediate/handle the specific waste materials from the facility that were described in the CMW (McLaren/Hart, 1999c) and approved by DTSC.

1. CM No. 1 — Ordnance Removal, Segregation, and Handling. Included excavation and automated screening to remove explosive-containing fragments, other ordnance-related materials, or construction debris from soil; detonation of explosive-containing materials; recycling of scrap metal; and performance monitoring to confirm removal of ordnance/munitions and explosives of concern (MEC).

2. CM No. 2 — Removal and Landfill Disposal of Impacted Soil. Included excavation and off-site landfill disposal of chemical-impacted soil exceeding cleanup levels; and performance monitoring to verify compliance with cleanup levels.

3. CM No. 3 — CS Removal, Segregation, and Handling. Included excavation and screening to remove CS canisters and filters from soil; off-site landfill disposal of CS canisters and filters; and performance monitoring to confirm removal of CS.

A detailed description of initial implementation of CM Nos. 1, 2, and 3 was provided in the CMCR (Geomatrix, 2006a) and is summarized below.

3.1.1 Summary of CM No. 1 Activities

During the initial phase of the CMs, implemented from January 2001 to June 2003, CM No. 1 occurred in specific areas where high numbers of ordnance, explosive-containing fragments, and/or debris had been identified. The suspect soil was excavated from these areas, transported

to and stockpiled in Test Range 1C (location of the former screening plant), followed by confirmation sweeps of the excavated areas.

Stockpiled soil in Test Range 1C was screened or processed to remove ordnance/MEC and debris. Automated screening was performed using a customized screening plant that was designed to meet the specific objectives of ordnance screening and site conditions. Powerful magnets were positioned along the screening plant, and professional staff attended the picking stands for visual inspection and manual removal of ordnance/MEC items. An extensive quality control program was initiated and maintained as part of performance monitoring of ordnance screening operations. Results of the performance monitoring quality control (QC) program indicated that project goals were achieved and ordnance/MEC was removed from the processed soil (Geomatrix, 2006a). The processed soil remains in two stockpiles located in the Test Range 1C area.

A total of 84,950 tons of soil was processed and approximately 72,000 MEC items were recovered from the screening plant (Geomatrix, 2006a). Many of these recovered items were inert and did not require demilitarization (detonation). The recovered items that contained explosive materials and required demilitarization were detonated in Test Range 16, per CMW work scope (McLaren/Hart, 1999c).

As noted in the CMCR (Geomatrix, 2006a), two areas remained where CM No. 1 ordnance removal, segregation, and handling may be required. These areas included:

- SWMU No. 2 – Former Landfill: Removal of inert, former landfill materials beneath the access roads.
- AOC No. 5 – Test Range 16: Upon completion of demilitarization activities, removal and destruction of residual ordnance.

Sections 4.1 and 4.2 described the completion of CM No. 1 activities in SWMU No. 2 and AOC No. 5.

3.1.2 Summary of CM No. 2 Activities

CM No. 2 was applied to the specific areas where impacted soil had been identified at the facility. Excavation and off-site disposal of impacted soil followed procedures described in the CMW (McLaren/Hart, 1999c). Chemical-impacted soil detected at concentrations exceeding cleanup criteria were removed from the following areas:

- SWMU No. 1 – Burn Area "A" (or Area 9): 8.07 tons of dioxin-impacted soil;
- SWMU No. 2 – landfill: 3.17 tons of lead-impacted soil and 13.2 tons of metals-impacted soil;
- SWMU No. 7 – Redwater Pond: 6,871 tons of RDX-impacted soil;
- SWMU No. 8 – HEI Pond: 536 tons of RDX-impacted soil;
- AOC No. 5 – Test Range 16: 400 tons of RDX-impacted soil;
- AOC No. 7 – Test Range 7D: 15 yd^3 of RDX-impacted soil; and
- AOC No. 9 – Test Area 7B: 1 yd^3 of RDX-impacted soil.

Confirmation sample results demonstrated that impacted soil was removed from the above-listed areas and that the levels of residual chemicals in soil did not pose a threat to human health (Geomatrix, 2006a).

Per the request of DTSC, additional confirmation soil sampling was conducted in SWMU No. 2 (former landfill) at the conclusion of CM activities. Some perchlorate-impacted soil was identified and subsequently removed from the facility. In addition, the CMCR recommended demolition of former Building 010 (AOC No. 8) and removal of RDX-impacted soil beneath the building as described in the building assessment report (ENSR, 2001b).

Sections 4.1 and 4.3 describe the completion of CM No. 2 activities in SWMU No. 2 and AOC No. 8.

3.1.3 Summary of CM No. 3 Activities

CS, or "tear gas" (ortho-chlorobenzylidene malonitile), was previously identified in the following areas:

- SWMU No. 2 – former Landfill: CS-containing building ventilation filters and canisters.
- SWMU No. 9 – Burn Area B: canisters containing CS.

CS-containing filters and canisters were removed from SWMUs No. 2 and 9 following procedures described in the CMW (McLaren/Hart, 1999c). The results of CS removal,

segregation, and handling activities were described in the CMCR (Geomatrix, 2006a) and no other activities associated with the CM No. 3 remain at the facility.

3.2 ADDITIONAL CORRECTIVE MEASURES AND SAMPLING

Nine areas were identified for further investigation to support ongoing corrective measures and site assessment activities. Recommendations for additional studies were described in the CMCR (Geomatrix, 2006a) and/or by DTSC based on its review of the CMCR and other facility documents (DTSC, 2006a, b). Additional sampling as part of the CM work plans (Geomatrix, 2006b, e) was proposed for the nine areas described in Section 4.0 of this report.

3.3 ADDITIONAL BUILDING ASSESSMENT

The initial building assessment activities were performed following the McLaren/Hart document titled Workplan for Assembly Building Assessment, Aerojet-General Corporation, Chino Hills facility, dated April 29, 1998 (McLaren/Hart, 1998). Results of the building assessment activities were summarized in the ENSR report titled Results of Building Assessment, Aerojet Chino Hills facility, dated draft July 2, 1999, finalized October 18, 2001 (ENSR, 2001b). Buildings 006, 010, and 037 septic required remedial measures (ENSR, 2001b). Recommended remedial measures included:

- Building 006: Remove explosives-impacted concrete flooring in the northwest corner of the building.
- Building 010: Remove RDX-impacted soil and concrete.
- Building 037 (septic tank only): Remove nitroglycerine and SVOC-impacted materials in the septic tank.

These BA remedial measures were identified in the 2001 ENSR Building Assessment report and the draft CMCR. DTSC reviewed these reports and provided comments (DTSC, 2005a, c, d). Geomatrix provided responses to the DTSC comments (Geomatrix, 2005) and revised the CMCR (Geomatrix, 2006a). Subsequently, Geomatrix prepared work plans and provided supporting information to complete the BA activities (see Section 1.2). DTSC approved the work plans (DTSC, 2006a, b), and the 2001 ENSR Building Assessment report and CMCR (DTSC, 2008c).

Recommendations for additional BA studies were provided by DTSC based on its review of the 2001 ENSR Building Assessment report and CMCR (DTSC, 2005a, b) and other facility

documents (DTSC, 2005c, 2006a, b). Specific comments from DTSC regarding BA activities, in addition to those listed above, are summarized as follows:

- Perform remedial measures at Building 010, including the building floor, the underlying soil, and the area around the building; conduct wipe sampling per recommendations presented in the 2001 ENSR Building Assessment report.
- Collect additional soil samples from all explosives storage bunkers (Buildings 022 to 032) and analyze for metals, explosive compounds, and perchlorate.
- Conduct sampling of Building 510.
- Sample the filter assembly area at Building 551 and analyze for explosive compounds.

To access the building floors and subsurface sample locations, and to complete the BA activities, Buildings 003, 006, 010 and 016 were demolished. In addition, three septic tanks and an UST were removed. Geomatrix retained URS Corporation (URS) to conduct building demolition activities. Additional BA activities were conducted in the following locations:

- Building 003
- Building 006 Complex
- Building 010
- Building 016
- Buildings 022 through 025 and 029 through 032
- Building 036
- Building 037 Septic Tank
- Building 551

Section 5.0 describes the completion of BA activities.

3.4 ANALYTICAL LABORATORIES

Several analytical laboratories were identified and approved through the RFI to conduct analysis of soil and water samples for the various constituents of interest or of concern at the facility. TestAmerica Analytical Testing Corporation (TestAmerica), formerly known as

Sequoia Analytical, conducted the initial sample analyses. Subsequently, Calscience Environmental Laboratories, Inc. (Calscience) completed the sample analyses. TestAmerica and Calscience are State of California certified (state-certified) commercial laboratories. TestAmerica is located at 819 Striker Avenue, Suite 8, Sacramento, CA 95834, and Calscience is located at 7440 Lincoln Way, Garden Grove, CA 92841-1427. They conducted most of the U.S. EPA-approved analyses described below:

- explosive compounds using U.S. EPA Method 8330.
- Title 22, Chapter 11, Article 3 required metals (metals) using U.S. EPA Method 6010B/7000.
- perchlorate using U.S. EPA Method 314.0M.
- nitroglycerine using U.S. EPA Method 8332.
- volatile organic compounds (VOCs) using U.S. EPA Method 8260B.
- semi-volatile organic compounds (SVOCs) using U.S. EPA Method 8270C.
- total petroleum hydrocarbons (TPH) using U.S. EPA Method 8015B (M).

TestAmerica (Sequoia) analytical data sheets are included as Appendix A. Calscience laboratory analytical data sheets are included as Appendix B.

Alta Analytical Laboratory, Inc. (Alta) is a state-certified commercial laboratory located at 5070 Robert J. Mathews Parkway, El Dorado Hills, CA 95762. It conducted analysis for dioxins using EPA Method 8290. Alta laboratory analytical data sheets are included as Appendix C.

Severn Trent Laboratories, Inc. (STL) is a State-certified commercial laboratory located at 880 Riverside Parkway, West Sacramento, California 95605. They conducted analysis for explosive compounds in wipe samples using U.S. EPA Method 8330. STL analytical data sheets are included as Appendix D.

4.0 ADDITIONAL CORRECTIVE MEASURES AND SAMPLING

As noted in Section 3.2, nine areas at the facility were identified for further investigation to support ongoing corrective measures and site assessment activities. Recommendations for additional studies were described in the CMCR (Geomatrix, 2006a) and/or by DTSC based on

its review of the CMCR and other facility documents (DTSC, 2006a, b). Additional sampling as part of the CM/BA work plans (Geomatrix, 2006b, e) was proposed for the nine areas listed below:

- SWMU No. 2 – Landfill (Area 6)
- AOC No. 5 – Test Range 16
- AOC No. 8 – Former Building 010
- AOC No. 10 – Metal Forming Area
- AOC No. 13 – Area 10 or Three-Tier Test Area
- Area 1D
- Building 534 Area
- soil stockpiles in Test Range 1C
- concrete block stockpile area

Summaries of the CMs and sampling results implemented at the areas identified above are presented below.

4.1 SWMU NO. 2 – FORMER LANDFILL

SWMU No. 2 – Former Landfill (also known as Area 6) had served as an on-site landfill and was suspected to contain various hardware, building demolition materials, and other debris (McLaren/Hart, 1999c). CM No. 1 was implemented in the former landfill for the removal, segregation, and handling of soil potentially containing ordnance; CM No. 2 for the removal and off-site disposal of soil impacted by lead and other metals; and CM No. 3 for the removal, segregation, and handling of CS canisters and filters (McLaren/Hart, 1999c; Geomatrix, 2006a). In March and April, 2001, approximately 20,000 tons of materials were removed from the former landfill during the implementation of CMs (Geomatrix, 2006a). Figure 3 shows the limits of the 2001 excavation in the former landfill area.

As noted in Section 3.1.1, CM No. 1 activities were not completed in the former landfill and Test Range 16 (also known as Area 16) before submission of the CMCR (Geomatrix, 2006a). Suspect landfill materials remained in two small portions of the former landfill area, the central and eastern areas of the access road, because removing those areas would have destroyed the

access road. To facilitate completion of CM No.1, Geomatrix contracted URS to remove, segregate, and manage any MEC items from the suspect soils in Test Range 16 and the former landfill areas. URS had just completed MEC removal activities in the former open burn/open detonation (OB/OD) unit of the site following a DTSC-approved work plan. The screening plant was located on an asphalt pad near Area 10 (see Figure 2). Geomatrix provided a letter to DTSC dated May 25, 2006, notifying it of continuation of ordnance screening activities using the URS plant. Per DTSC request, a schematic of the screening plant configuration was provided to DTSC on June 16, 2006. Subsequently, DTSC reviewed the schematic and provided approval to proceed on July 22, 2006.

The report on former landfill MEC removal activities (URS, 2007a) is included as Appendix E. CM activities in the former landfill described below were conducted pursuant to the revised permit from the California Department of Fish and Game (CDFG). The permit is included as Appendix F.

4.1.1 Former Landfill MEC Screening Activities

As part of the CMCRA activities, URS excavated the two suspect areas in the former landfill on June 28, 2006. Approximately 400 yd^3 of soil were excavated and transported to Area 10 to be screened. Figure 3 shows the limits of 2006 excavations in the former landfill area. Natural sandstone and siltstone bedrock was exposed in the excavation areas. Outcrops in the landfill area include the Soquel member (Tps) of the Puente Formations (Geomatrix, 2006a).

Automated screening was performed by URS using a customized screening plant that was designed to meet the specific objectives of ordnance screening and facility conditions. The objectives were to remove MEC and MEC-related materials from the soil, to properly manage any recovered MEC items, and to recycle the inert metal fragments. This was accomplished by processing (screening) the suspect soils through the screening plant to remove objects within specification of 0.5 inch in the smallest dimension.

The screening plant comprised of various components, including:

- a hydraulic-operated hopper/feeder with discharge conveyor;
- a double-decked, vibrating screen equipment with top 1-inch opening screen and bottom 7/16-inch opening screen that segregated soil into three separate streams comprising various particle sizes, including:

- Oversize materials larger than 1 inch directed into bin.
- 1-inch to 7/16-inch materials directed onto picking conveyor.
- Finished product soil passing through 7/16-inch screen mesh directed onto discharge conveyor.

- industrial electro-magnetic device (magnet) positioned above the picking conveyor exiting the double-decked, vibrating screen;
- a picking conveyor for visual inspection to manually remove nonferrous materials; materials from the picking conveyor empty into a clod-reducing device;
- a clod-reducing device equipped with free-spinning hammers rotating at 1,600 revolutions per minute used to break down clods into smaller-size materials; and
- a generator capable of supplying the electrical power required to operate the screening plant.

A flow diagram showing the operation of the screening plant is presented in Figure 4. As indicated in the figure, the screening plant was set up in the "closed loop" configuration. Only the finished product (MEC-free) material that passed through the 7/16-inch mesh screen was allowed to exit the plant.

As described in detail in the URS report included in Appendix E, soil processing and clod-size reduction were accomplished to facilitate removal of MEC items. The ferrous metal materials were removed by a powerful magnet. Nonferrous materials were removed by URS's unexploded ordnance (UXO) technicians. To find and remove the nonferrous items, the materials within the screening plant passed through several cycles while not introducing any new materials. After several revolutions, the plant was shut down and nonferrous items were removed by hand. No ferrous or nonferrous MEC items were found during the landfill screening operation.

Oversize materials ejected from the double-decked vibrating screen were continuously reintroduced into the screening plant through the feeder/hopper. Large rocks and pieces of inert debris that could not be broken down were removed. Each item was inspected by URS's UXO technicians with the hand-held Schonstedt magnetometer for metallic objects before being allowed to leave the area. Oversize inert debris was stockpiled in a location across the road from Area 10.

4.1.1.1 Performance Monitoring

A quality control program was initiated and maintained as part of ordnance screening operations. The QC measures described in the CMW (McLaren/Hart, 1999c), CMCR (Geomatrix, 2006a), and May 25, 2006 notification letter (Geomatrix, 2006d), that were implemented during screening plant operations, include the following:

- monitoring of the screening operations by Geomatrix and URS staff;
- monitoring of picking belt, magnet, and process stream by URS's UXO technicians for serviceability and component integrity;
- introducing of "seeded" test items to the plant processing throughput stream to verify compliance with specifications;
- URS personnel inspecting the discharge pile for ordnance by hand sifting to confirm that the plant was removing all items outside specifications;
- UXO technicians performing hand sifting and geophysical investigation of the discharge pile several times each day using a hand-held screen (7/16-inch-diameter screen); and
- documenting any QC failures and implementing corrective action immediately.

Seed items were introduced daily to the screening plant by the URS UXO technicians. The inert seed test items included 30, 25, and 20-mm projectiles; M505 fuzes; and aluminum slugs from a 30-mm projectile. These test seeds included the smallest and most common MEC items expected to be encountered at the facility. The URS UXO technicians also conducted daily audits of the finished product pile. All QC activities were documented on the URS QA/QC checklists and processed screened soils reports included as addendum to the URS report (URS, 2007a). The URS report is included as Appendix E.

All of the seeds introduced to the screening plant were recovered. All audits of the finished product pile demonstrated that no metals equal to or greater than 0.5 inch in the smallest dimension remained in the processed soil. Thus performance monitoring demonstrated that project objectives were met and MEC and MEC-related materials were removed from the processed soil.

4.1.1.2 Former Landfill Screening Results

Ordnance screening activities occurred on June 27, 28, and 29, 2006. They ended on July 3, 2006, with the cleanup of loose materials around the plant location. A total of 400 yd^3 of

material were processed from the former landfill area to remove MEC, metal fragments, and debris. No MEC items were found in the materials processed from the former landfill.

Processed soil from the former landfill areas, which was never allowed to co-mingle with material from Test Range 16 (see Section 4.2), was transported to separate locations in the Test Range 1C area. This soil was subsequently removed and transported off site for landfill disposal (see Section 4.1.2.1). The screening plant was disassembled and removed from the site. Subsequently, the area around the former screening plant location was checked and cleared by URS's UXO technicians for possible residual ordnance.

4.1.2 Former Landfill Soil Sampling and Removal

Corrective measures were implemented in SWMU No. 2, the former landfill, in 2001 for the removal and off-site disposal of soil impacted by lead and other metals (Geomatrix, 2006a). Confirmation samples collected after excavation and removal activities demonstrated that impacted materials were removed. Residual levels of perchlorate were detected in soil and water samples, but concentrations were below established cleanup criteria (Geomatrix, 2006a). DTSC recommended additional soil sampling of the former landfill area.

4.1.2.1 Processed Soil Sample Results and Offsite Disposal

DTSC recommended sampling of the former landfill material left in place under the access road (Geomatrix, 2006b). To address this recommendation, Geomatrix oversaw the excavation and screening of these remaining former landfill materials (see Section 4.1.1). Upon completion of CM No. 1 activities, the processed MEC-free soil was transported to an area in Test Range 1C. Four composite-type soil samples were collected from the processed soil on June 6, 2006, and analyzed for explosive compounds, perchlorate, and metals. Geomatrix measured and established four roughly equal-dimension grids and collected confirmation samples from each grid (C-SW02-S-20-stp through C-SW02-S-23-stp). Five sample aliquots were collected from each grid at depths of approximately 1 foot and homogenized to form a single composite-type sample. A random number−generating spreadsheet was used to select sample locations within each grid to provide unbiased measure of chemical concentrations (Geomatrix, 2006c). The soil sample analytical results are summarized in Table 1. Analytical results were reported as follows:

- The explosive compounds RDX and HMX were detected in two of the four samples at maximum concentrations of 1.1 and 0.3 mg/kg, respectively.

- Perchlorate was detected in all four samples at concentrations ranging from 0.31 to 2.3 mg/kg.
- Metals barium, chromium, cobalt, and copper were detected at concentrations above background levels (see Section 6.1).

The concentrations of explosive compounds, perchlorate, and metals detected in confirmation soil samples from the former landfill materials subject to MEC screening did not exceed concentrations reported in the CMCR risk assessment (Geomatrix, 2006a). Nonetheless, the material was removed from the site. An estimated 360 yd^3 of material were excavated and removed from the facility on October 9 and 10, 2006. This material was transported to Waste Management's Kettleman City facility. Geomatrix representatives inspected each truck for loose materials and confirmed the integrity of the tarps. Truck inspection logs are included as Appendix G. Drivers were shown, and directed to follow, the approved transportation route to and from the facility. The oversize inert debris that was removed by the screening plant, approximately 40 yd^3, remains on site (see Section 4.1.1).

4.1.2.2 Additional Landfill Soil Sample Results and Off-site Disposal

As noted in the CMCR (Geomatrix, 2006a), following the removal of landfill materials in 2001, seven confirmation soil and two subsurface water samples were collected in May 2001 and May 2002, respectively, from the landfill excavation area and analyzed for perchlorate. Low levels of perchlorate were detected in two soil samples (C-SW02-07 and C-SW02-08) and one subsurface water sample (WG-A6-02) located and collected from the central portion of the former landfill area. This was the area of the former landfill where four large concrete blocks were found and removed (see Section 4.9). The concrete blocks may have been part of a rocket motor test stand that may have been used in the SWMU No. 15 – Upper A-12 Test Area (Geomatrix, 2006a). Based on these sample results, the former landfill appeared to be a source of perchlorate detected in surface water. Risk assessment calculations demonstrated that the concentrations of perchlorate reported in soil from the former landfill area, subsurface water sample results, and surface water sample results from nearby Soquel Canyon Creek did not pose a threat to human health under the conditions evaluated (Geomatrix, 2006a). Figure 5 shows the May 2001 and 2002 soil and subsurface water sample locations and perchlorate results.

To address DTSC's request to evaluate the extent of residual perchlorate in soil at the landfill, additional soil samples were collected from the areas around the May 2001 sample locations

where perchlorate was detected (see Figure 5). The soil samples were collected in May 2006 from three locations (C-SW02-S-17, -18, and -19) at depths of 0.5, 5, and 9 to 10 feet around the two May 2001 sample locations C-SW02-07 and C-SW02-08 that had detectable perchlorate concentrations (0.56 and 0.33 mg/kg, respectively). Perchlorate was detected in six of the nine soil samples at concentrations ranging from 0.01 to 0.15 mg/kg (see Figure 5).

Based on these detections of perchlorate, additional step-out soil sampling was conducted in October and December 2006 to define the lateral extent of perchlorate in soils at the former landfill area. Most portions of the former landfill area consist of exposed bedrock. Soil samples were collected at these step-out locations with direct-push probes at depths of 0.5, 5, and 10 feet, or to refusal or subsurface water. Most of the direct-push probes stopped at shallower depths because of refusal in bedrock. Thus, hollow-stem-auger equipment was used in January 2007 to collect deeper bedrock samples and define the vertical extent of perchlorate in soils and bedrock at the former landfill area. All sample locations were marked with wooden stakes. Sample locations were surveyed and recorded on a hand-held global positioning satellite (GPS) instrument.

A total of 30 step-out borings were advanced in the former landfill area. An additional 6 deeper borings (C-SW02-S-50, -52, -53, -54, -55, and -56) were advanced with hollow-stem auger. Soil boring logs from select locations are included as Appendix H. As noted in the boring logs, subsurface water was encountered in four borings at depths of 13 to 21 feet. Perchlorate was detected in soil samples at concentrations ranging from 0.01 to 1.4 mg/kg. Soil sample analytical results are summarized in Table 2. The sample locations and range of perchlorate results in shallow, intermediate, and deeper samples are shown on Figures 6, 7, 8, and 9, respectively. Figures 10a through 10c provide a cross-sectional approximation of surface topography and subsurface conditions in the former landfill area. The lithologic units exposed in the landfill area include Soquel member sandstone and siltstone (Tps) and recent alluvium (Qal). Geologic cross-sectional locations are shown on Figure 5.

The risk assessment calculations summarized in the CMCR demonstrate that the concentrations of residual perchlorate detected in the soil from the former landfill area do not pose a threat to human health (Geomatrix, 2006a). Nonetheless, DTSC expressed concern where higher levels of perchlorate (1.0 mg/kg or higher) may continue to impact surface water in the nearby Soquel Canyon Creek. Perchlorate was detected in sample locations S-31 at 0.5 foot, S-32 at 5 feet, and S-41 at 0.5 foot at concentrations of 1.4, 1.0, and 1.1 mg/kg, respectively, as shown on

Figures 6 and 7. Thus, Geomatrix proposed excavation and removal of soil around these locations. DTSC representatives Wendy Arano and Christine Brown visited the site on May 8 and 9, 2007, respectively, and verbally approved the excavation plan. The wooden stakes identifying these locations were located in the field and the area demarked for excavation (see Figure 11). Approximately 80 yd^3 of material were removed from the three excavation areas on May 29, 2007, and confirmation samples were collected under the oversight of DTSC representative Sara Michael. This material was transported to Waste Management's Kettleman City facility. Geomatrix representatives inspected each truck for loose materials and confirmed the integrity of the tarps. Truck inspection logs are included as Appendix G. Truck drivers were shown, and directed to follow, the approved transportation route to and from the facility.

Confirmation samples results detected perchlorate in the S-31, S-32, and S-41 excavations at concentrations of 0.14, 0.16, and 0.55 mg/kg, respectively. Thus, the higher concentrations of residual perchlorate were removed. The disturbed areas were recontoured and erosion control established pursuant to CDFG permit. The analytical results from the excavation confirmation samples are summarized in Table 3. The areas of excavation and sample results are shown on Figure 11.

Risk assessment calculations demonstrate that the highest concentration of residual perchlorate detected in the soil from the former landfill area (0.69 mg/kg) does not pose a threat to human health (see Section 6.2.1.1). Based on the results of CM activities and confirmation sampling in SWMU No. 2 – Former Landfill, Geomatrix recommends "no further action" status for this area.

4.2 AOC NO. 5 – TEST RANGE 16

AOC No. 5 – Test Range 16 was operated from 1974 through 1995 to test 25- and 30-mm HEIs and APIs (McLaren/Hart, 1999c). The area was also used for demilitarization activities. Recovered MEC items were detonated as part of demilitarization activities (Geomatrix, 2006a).

In September 2001, approximately 3,000 tons of shallow material were excavated from Test Range 16 and processed through the screening plant in Test Range 1C to remove MEC (Geomatrix, 2006a). An additional 500 tons of RDX-impacted soil was excavated in October 2001 from the deeper, eastern end of Test Range 16 where demilitarization activities were conducted. Figure 12 shows the limits of the 2001 shallow and deep excavations in the Test Range 16 area. The deeper excavated RDX-impacted material was processed through the

screening plant in Test Range 1C to remove MEC before it was released for off-site disposal in November 2001. Subsequently, the deeper excavation was backfilled with borrow material from the shallow surface area around Test Range 16 and the area reused for demilitarization of MEC items. Because the area was reused for demilitarization of MEC items beginning in November 2001, Test Range 16 closure could not be completed (Geomatrix, 2006a).

With Aerojet's decision to use the blast chamber for future demilitarization operations (see Section 4.2.1), AOC No. 5 – Test Range 16 closure could be completed. Geomatrix contracted with URS to complete CM No.1 and remove, segregate, and manage any MEC items from the suspect soils in Test Range 16.

4.2.1 Test Range 16 Soil Sampling and MEC Screening Activities

To assess whether demilitarization activities conducted after 2001 resulted in new impacts to soil in the eastern portion of Test Range 16, two grab-type samples (C-AC05-S-03-N-0.5 and C-AC05-S-04-S-0.5) were collected on May 10, 2006 at a depth of 0.5 foot from backfill material subject to these demilitarization activities (see Figure 12). Duplicate sample SW10-05 was also collected from sample location C-AC05-S-03-N-0.5. These soil samples were analyzed for explosive compounds and metals. Analytical results were reported as follows:

- RDX was detected in sample SW10-05 at a concentration of 0.68 mg/kg.
- HMX was detected in sample C-AC05-S-03-N-0.5 and duplicate sample SW10-05 at concentrations of 1.0 and 0.86 mg/kg, respectively.
- Metals barium and cobalt were detected at maximum concentrations of 110 and 7.3 mg/kg, respectively, which is above background levels (see Section 6.1) but not at levels that pose a threat to human health (see Section 6.2.1.3).

Calculations of the cumulative effect of the explosive compounds and the metals barium and cobalt detected in Test Range 16 backfill soil demonstrate that they do not pose a threat to human health (see Section 6.2.1.3). The AOC No. 5 – Test Range 16 soil sample analytical results are summarized in Table 4.

Upon receipt of sampling results that demonstrated that the soil from the deeper, eastern portion of Test Range 16 where demilitarization occurred after 2001 was not impacted with chemicals at concentrations posing a risk to human health (see Sections 6.2.1.3), the suspect MEC-containing backfill material was excavated on June 27 and 28, 2006. Approximately 720 yd^3 of soil was excavated from the deep eastern portion of Test Range 16. Figure 12 shows the

limits of excavation. Approximately 6 inches to 1 foot of surficial material was removed from the bottom floor area of the test area, while excavation in the deep eastern portion of the area where demilitarization occurred continued to an approximate depth of 4 feet (see Figure 12). Natural sandstone and siltstone bedrock were exposed in the excavation area. The excavated soil was transported to Area 10 to be screened. Soil screening was conducted following the procedures described in Sections 4.1.1 and 4.1.1.1.

Ordnance screening activities occurred on June 27, 28, and 29, 2006. They ended on July 3, 2006, with the cleanup of loose materials around the plant location. A total of 147 suspect MEC items were removed from the Test Range 16 materials during screening activities. The recovered suspect MEC included:

- M505 fuzes — 48 items,
- 27/27.5-mm projectiles — 4 items,
- 25-mm projectiles — 23 items,
- 20-mm projectiles — 67 items, and
- miscellaneous items — 5 items.

Processed soil from the Test Range 16, which was never allowed to co-mingle with material from the former landfill, was transported to separate locations in the Test Range 1C area.

Since Test Range 16 is no longer being used for demilitarization of recovered MEC items, URS subcontracted the treatment of recovered MEC items to CH2M Hill Demil International, Inc., to use their proprietary Controlled Detonation Chamber (CDC) for destruction of MEC recovered from the Test Range 16 processed soil. The CDC is an enclosed system equipped with a vacuum system and off-gas filtration plant that suppresses detonation noises and emissions.

The report on Test Range 16 MEC removal activities (URS, 2007a) is included as Appendix E.

4.2.2 Test Range 16 Bedrock Sampling

As noted in the CMCR (Geomatrix, 2006a) and Section 4.2, the excavation of RDX-impacted soil was performed in the eastern, deeper portion of Test Range 16 in October 2001 to a depth of approximately 4 feet below ground surface where in-place bedrock material was exposed. A

fault trace, which was visible on the exposed sidewall on the northeast side of Test Range 16, extended through the middle of the excavation, dividing it into two approximate halves (north and south). Two confirmation composite-type soil samples (C-AC05-S-01-N and C-AC05-S-02-S) and a duplicate sample (C-MHJ-S-16N) were collected on October 10, 2001, from the exposed bedrock beneath the RDX-impacted soil excavation area, and analyzed for explosive compounds and metals. Analytical results were reported as follows:

- No explosive compounds were detected.
- Cadmium, molybdenum, and selenium were detected in sample C-AC05-S-01-N and duplicate sample C-MHJ-S-16N at concentrations significantly higher than background levels.
- Arsenic, cadmium, chromium, molybdenum, selenium, and vanadium were detected in sample C-AC05-S-02-S at concentrations significantly higher than background levels.

As noted above, several metals were detected in the bedrock samples at concentrations significantly higher than background levels. It was unclear, however, whether the results reflected impact caused by historic testing/demilitarization activities, or if they reflected geochemical conditions related to mineralization along a localized fault (Geomatrix, 2006a).

To assess the potential health effect of the elevated metal results, two additional bedrock samples (C-AC05-S-03-N-4 and C-AC05-S-03-S-4) were collected from the exposed bedrock at the bottom of the deep excavation on May 10, 2006, and analyzed for metals. These results, and results from the October 10, 2001 sampling event, were compared to new background metals results (see Section 6.1). Only two metals, barium and chromium, were detected at concentrations above background levels. Calculations of the cumulative effect of the barium and chromium concentrations in Test Range 16 bedrock samples demonstrate that they do not pose a threat to human health (see Section 6.2.1.2). The Test Range 16 bedrock sample analytical results are summarized in Table 5. Sample location and analytical results for barium and chromium are shown on Figure 13.

Per DTSC's request (Geomatrix, 2006b), two sidewall samples, C-AC05-S-05-0.5 and C-AC05-S-06-0.5, were collected on May 11, 2006, from each side of the exposed fault in Test Range 16 and analyzed for metals (see Figure 13). No metals were detected at concentrations significantly exceeding background levels. The Test Range 16 sidewall sample analytical results are summarized in Table 6.

Based on the results of CM activities and confirmation sampling in AOC No. 5 – Test Range 16, Geomatrix recommends "no further action" status for this area.

4.3 AOC NO. 8 – FORMER BUILDING 010

AOC No. 8 – Building 010 was used predominantly for melt/pour of explosives (Cyclotol) into BLU-49 munitions, as well as for the combined effects munitions. Cyclotol was also stored inside and around the building (McLaren/Hart, 1999a). Shallow-depth soil samples were collected from areas around the building in December 1995 and analyzed for explosive compounds, SVOCs, and metals. These December 1995 soil sample locations and analytical results are shown on Figure 14. Based on the analytical and field results, characterization of the area around former Building 010 was deemed complete, and AOC No. 8 – Building 010 was recommended for "no further action" status in the RFI (McLaren/Hart, 1999a).

During Building 010 assessment activities (ENSR, 2001b), concrete and soil samples were collected from the interior of the building in November 1998 and analyzed for explosive compounds. These November 1998 soil sample locations and analytical results are shown on Figure 14. The explosive compounds RDX and HMX were detected in two of the four soil samples (soil sample 010-007-01-S-0.5 from Room 007 and sample 010-010-02-S-0.5 from Room 010) at maximum concentrations of 1.2 and 4.5 mg/kg, respectively. Additional characterization of Building 010 was recommended to determine the extent of impact and the need for remedial measures (ENSR, 2001b). Because of the higher levels of RDX detected in the soil, AOC No. 8 – Building 010 could not be considered for "no further action" status as recommended in the RFI (McLaren/Hart, 1999a). Additional characterization of Building 010 was recommended in the CMCR (Geomatrix, 2006a). DTSC recommended that remedial measures be performed as part of the CMs for Building 010 (Geomatrix, 2006b). However, to complete these remedial activities, Building 010 would need to be demolished (see Section 5.3).

4.3.1 Defining Vertical and Lateral Extent of RDX-Impacted Soil

To assess the vertical and lateral extent of explosives-impacted soil in the former Building 010 area, five borings were advanced with direct push probes on May 10, 2006 in areas around sample location 010-010-02-S-0.5 collected in November 1998 where RDX was detected at a concentration of 4.5 mg/kg (see Figure 14). Soil samples were proposed to be collected at depths of 0.5, 5, and 10 feet (or refusal), but the direct-push probe could not be advanced

deeper than 4.5 feet because of refusal in bedrock. Nine samples were collected and analyzed for explosive compounds in 2006. Analytical results were reported as follows:

- RDX was detected in five of the nine samples at concentrations ranging from 0.62 to 4.7 mg/kg.
- HMX was detected in two samples at concentrations of 1.1 and 2.3 mg/kg.
- 1,3,5-TNB was detected in one sample at a concentration of 3.7 mg/kg.

The 2006 soil samples locations and analytical results in and around former Building 010 are shown on Figure 14 along with soil sample results from the 1995 and 1998 sampling activities. Note that sample 010-011-01-S was actually collected from Room 009, not Room 011 as the sample description suggests.

To complete the vertical and lateral assessment of RDX-impacted soil at Building 010, the building and underlying foundation were demolished and removed from the facility as described in Section 5.3. Subsequently, a hollow-stem auger was used to collect additional soil samples. Soil samples collected from five borings on November 14, 2006, at depths of 0.5, 2.5, and 5 feet were analyzed for explosive compounds. Elevated concentrations of RDX were detected in 5-foot depth samples at locations 010-010-02 and 010-011-02. On January 30, 2007, three deeper borings (SB-1, -2, and -3) were advanced around locations 010-010-02 and 010-011-02 and analyzed for explosive compounds. Soil samples from the 15- and 20-foot depths defined the vertical extent of RDX impact. Two additional step-out borings SB-4 and SB-5 completed the lateral definition of RDX impact. The direct push and hollow stem auger soil boring locations (and 1995/1998 sample locations and results) are shown on Figure 15.

Former Building 010 soil sample analytical results from the 1995, 1998, 2006, and 2007 sampling activities, and the direct push and hollow stem auger borings, are summarized in Table 7. The soil sample location, analytical results, and limits of RDX-impacted soil are shown on Figure 15. Note that the sample locations and former building dimensions shown on Figure 15 are to scale, whereas sample locations shown of Figure 14 were not to scale.

4.3.2 Former Building 010 Excavation and Backfill

Geomatrix contracted URS to excavate the impacted soil and backfill the excavation. URS implemented the work according to City of Chino Hills (city) excavation permit requirements (URS, 2007b). Former Building 010 CM activities began on June 12, 2007. Excavated soils

were initially stockpiled in areas of known impact to prevent cross-contamination of non-impacted soil. As this area was removed, excavated impacted soil was placed on top of plastic sheeting (Visqueen). Dust suppression was accomplished using a water truck.

Off hauling of RDX-impacted soil first occurred on June 12, 2007. Trucks were staged adjacent to the stockpile area for loading (via front loader) one at a time. Visqueen was placed in the "truck loading area" next to the stockpile of impacted materials to prevent spilled materials from entering clean portions of the facility, and to prevent trucks from tracking material out of the area. Subsequently, trucks were driven to the "inspection area" located in front of Building 006, where they were covered with a tarp and a final brushing was conducted. The inspection area was also covered with Visqueen. Geomatrix representatives inspected each truck for loose materials and confirmed the integrity of the tarps. Truck drivers were shown, and directed to follow, the approved transportation route to and from the facility. Truck inspection logs are included as Appendix G.

Upon results of final confirmation sampling (see Section 4.3.3), former Building 010 excavation activities ended and backfill operations began June 29, 2007. An estimated 850 yd^3 of RDX-impacted soil were removed from AOC No. 8 and transported to Waste Management's McKittrick Waste Treatment Site, a Class II facility, as nonhazardous solid waste. Excavation depths in the deepest portion of the former Building 010 area ranged from 20 to 25 feet below original grade. Depths in the eastern portion sloped from 15 to 5 feet below original grade. A 3-foot-deep section was also removed from the northern corner of the excavation area. As noted on Figure 16, the limits of excavation included all sample locations shown on Figure 15 where explosive compounds were detected. No water accumulated in the bottom of the excavation. Backfill operations were completed on July 3, 2007.

Clean borrow material from the slope west of former Building 010 (and a smaller amount from the eastern slope) was used for backfill (Geomatrix, 2007 and DTSC, 2007). Loose material/soil and vegetation were removed from the slope exposing competent bedrock. This material remains along the sides of the former building location. The exposed bedrock was used as backfill material. Backfill was placed at minimum compaction of 90 percent per city permit requirements. Signet Testing Labs provided compaction testing, results of which were included as Attachment 4 in the building demolition report (URS, 2007b). Sandbags were placed along the former asphalt road for erosion control purposes.

A complete description of Building 010 demolition activities is provided in Section 5.3 and in the building demolition report (URS, 2007b).

4.3.3 RDX Immunoassay and Confirmation Sample Results

RDX immunoassay tests were conducted in the field to facilitate excavation activities. A total of 13 samples were collected. Based on these results, additional material was removed from the southwestern slope. Once field screening results indicated that impacted materials were removed, confirmation composite-type samples were collected. Immunoassay test results are summarized in Table 8. Approximately 750 yd^3 of material was removed based on these results.

The excavation was subdivided into seven confirmation sampling grids shown on Figure 17. A total of nine confirmation composite-type samples were collected from these grids during the excavation of the former Building 010 area and analyzed for explosive compounds. Results of the initial sampling conducted on June 12, 13, and 14, 2007, indicated that two areas, the northeastern slope (sample N3) and the southern portion of the deep excavation (sample 20B2) required additional removal. Approximately 100 yd^3 of additional material was removed from these areas and from bench material generated for equipment to access the deeper portion of the excavation. Two additional soil samples (and a duplicate sample) were collected on June 25, 2007, and results were below cleanup criteria (see Section 6.2.1.4). Thus, a total of seven confirmation samples were collected and analyzed for explosive compounds and results demonstrated that impacted soil had been removed from the former Building 010 area below cleanup criteria (see Section 6.2.1.4). Former Building 010 excavation confirmation sample results are summarized in Table 9. The soil sample location and excavation confirmation analytical results are shown on Figure 17. As shown on Figure 17, the deepest portions of the excavation included grids 20B1 and 20B2 where excavation continued to depths of 20 and 25 feet, respectively.

Confirmation samples were collected following procedures described in the CMW (McLaren/Hart, 1999a), except that in most cases only four aliquot samples were collected per sample grid instead of five as proposed in the CMW. This was done because of site constraints, limited access to the relatively small excavation area, and collection of samples using an excavator bucket. Sample 20B1, which was collected by excavator from the deepest portion of the site at the limits of excavation equipment, was a single sample collected from the center of the grid.

4.3.4 Integrated Ambient Air Monitoring Program

An integrated ambient air monitoring program similar to the 2001 Redwater Pond excavation (Geomatrix, 2006a) was implemented by RES during the excavation of RDX-impacted soil in the former Building 010 area. Soil remediation activities may release particulate matter, including particulate matter less than 10 microns in diameter (PM_{10}), which is the fraction of particulate matter that disperses readily in air currents and is respirable. The air monitoring program was implemented by RES following applicable South Coast Air Quality Management District (SCAQMD) Fugitive Dust Rule 403 (Rule 403) protocols. This program consisted of collecting PM_{10} particulates and 16-hour integrated samples for explosive compound analyses. The air monitoring program was conducted during the initial former Building 010 area excavation activities on June 12 and 13, 2007. RES's integrated ambient air monitoring program report (RES, 2007) is included as Appendix I.

A total of six PM_{10} particulate samples were collected. An exceedence of the Rule 403 protocol occurs if the differential based on subtracting the upwind PM_{10} concentration from the downwind PM_{10} concentration is greater than 50 micrograms per cubic meter ($\mu g/m^3$). None of the average differentials exceeded the Rule 403 criteria of 50 $\mu g/m^3$ (RES, 2007). In addition, three integrated samples were collected and submitted to Paragon Analytics (Paragon) for explosive compound analysis. No explosive compounds were detected in any of the samples. Thus, results of the integrated ambient air monitoring program demonstrate that excavation of RDX-impacted soil from the former Building 010 area did not result in airborne emissions that could be carried off site. Results of RES's integrated ambient air monitoring program and Paragon analytical results are included as Appendix I and J, respectively.

Based on the results of CM activities and confirmation sampling in AOC No. 8 – former Building 010, Geomatrix recommends "no further action" status for this area.

4.4 AOC No. 10 – Metal Forming Area

AOC No. 10 – Metal Forming Area was recommended for "no further action" status in the RFI (McLaren/Hart, 1999a). During the implementation of CMs in 2001, soil excavated from the landfill (SWMU No. 2) containing perchlorate at concentrations below the cleanup level was temporarily stockpiled in the Metal Forming Area before being transported to Test Range 1C for ordnance screening (Geomatrix, 2006a). To assess whether this stockpile activity impacted underlying soil in the Metal Forming Area, four post-use confirmation composite-type soil samples were collected on May 15, 2002 from the area and analyzed for explosive compounds

and perchlorate. No explosive compounds were detected. Perchlorate was detected in three of the four samples at concentrations ranging from 0.042 mg/kg to 0.08 mg/kg. These levels did not pose a risk to human health (Geomatrix, 2006a).

DTSC recommended additional confirmation sampling to further evaluate the perchlorate results from the Metal Forming Area (Geomatrix, 2006b). To address the DTSC recommendation, Geomatrix measured and established four roughly equal-dimension grids in the former Metal Forming Area and collected an additional confirmation sample from each grid (C-AC10-S-05-EXC through C-AC10-S-08-EXC [and duplicate SW10-01]) at depths of 0.5 foot. Five sample aliquots were collected from each grid on May 8, 2006 and homogenized to form a single composite-type sample. A random number–generating spreadsheet was used to select sample locations within each grid to provide unbiased measure of chemical concentrations (see Section 7.2.1). Perchlorate was not detected in any of the samples.

The AOC No. 10 – Metal Forming Area soil sample analytical results are summarized in Table 10. The 2002 and 2006 soil sample location and analytical results are shown on Figure 18. Based on sampling results in AOC No. 10 – Metal Forming Area, Geomatrix recommends "no further action" status for this area.

4.5 AOC NO. 13 – AREA 10 (OR THREE-TIER TEST AREA)

AOC No. 13 or Area 10, also known as the "Three-Tier Test Area," was evaluated as part of the RFI and assigned a "no further action" status (McLaren/Hart, 1999a). During the implementation of CMs, grab-type soil samples were collected in 1996 and 1998 from each of the three tiers and analyzed for metals and/or volatile organic compounds (VOCs) because historical operations may have included storage of drums containing mercury fulminate and/or acetone. No VOC analytes were detected. Metal results, except for cadmium and zinc, were within background levels. Cadmium and zinc were detected in a soil sample from the middle tier at levels exceeding background, but not at concentrations that posed a threat to human health (Geomatrix, 2006a). Geomatrix thus recommended assigning AOC No. 13 "no further action" status.

DTSC required sampling in AOC No. 13 for cadmium (Geomatrix, 2006b). To address the requirement, a total of four additional grab soil samples (C-AC13-S-10-0.5 through C-AC13-S-13-0.5) were collected on May 11, 2006 from a depth of 0.5 foot and analyzed for cadmium. Cadmium was not detected in any of the samples.

The AOC No. 13 – Area 10 soil sample analytical results are summarized in Table 11. The 1996, 1998, and 2006 soil sample location and analytical results for cadmium are shown on Figure 19. Based on sampling results in AOC No. 13 – Area 10, Geomatrix recommends "no further action" status for this area.

4.6 AREA 1D

Area 1D was not included in the RFI or in the CMs. It was identified on a historical facility map as a "scrap yard." Area 1D measures approximately 50 by 40 feet, and is bounded on three sides by moderately sloping canyon walls. Soil containing metal debris was removed from Area 1D during facility ordnance sweeps and transported to Test Range 1C, where it was processed through the screening plant. The excavation area was subsequently swept for ordnance (none was found). No evidence of former structures, testing operations/debris, or possible release of chemical/testing material was observed during reconnaissance of the area. DTSC inquired into the activities that were performed in Area 1D, but no additional information has become available to Geomatrix to document historical activities conducted in Area 1D other than its documented former use as a scrap yard (Geomatrix, 2006b).

To assess Area 1D conditions, Geomatrix collected two grab-type soil samples at a depth of 0.5 and 3 feet (A1D-01-0.5 and A1D-01-3). The soil samples were analyzed for explosive compounds, perchlorate, and metals. Analytic results were reported as follows:

- No explosive compounds were detected.
- Perchlorate was not detected.
- Metal results were within background levels.

The Area 1D soil sample analytical results are summarized in Table 12. The soil sample location and analytical results are shown on Figure 20. Based on sampling results in Area 1D, Geomatrix recommends assigning "no further action" status to this area.

4.7 BUILDING 534 AREA

Building 534 was not included in the RFI. Reportedly, a burn oven was located immediately west of Building 534. Although no visible evidence or historical photographs/documents have been located identifying this feature, two grab-type soil samples were collected during RFI activities in 1998 from a depth of 0.5 foot in the area west of Building 534 and analyzed for explosive compounds, CS, SVOCs, and chemical agents. None of these chemicals were

detected. Based on the sample results, Geomatrix recommended that a “no further action” status be assigned to Building 534 (Geomatrix, 2006a).

Due to the possible presence of a burn oven near Building 534, DTSC recommended that one soil sample be collected and analyzed for dioxins (Geomatrix, 2006b). In response to the DTSC recommendation, Geomatrix collected a grab-type soil sample at a depth of 0.5 foot (Bldg 534-03-0.5) from the estimated location of the former burn oven for analysis of dioxins on May 12, 2006. A duplicate sample SW10-09 was also submitted for dioxins analysis. The toxic equivalent quotient (TEQ) analytical result was 0.411 pg/g (duplicate sample result was 0.435 pg/g). These concentrations do not pose a risk to human health (see Section 6.2.1.5).

The Building 534 area soil sample analytical results are summarized in Table 13. The 1998 and 2006 soil sample locations and analytical results are shown on Figure 21. Based on sample results, Geomatrix recommends “no further action” status in the Building 534 area.

4.8 SOIL STOCKPILES LOCATED IN TEST RANGE 1C

Suspect ordnance-containing soil excavated from various areas of the facility during remedial activities was stockpiled in Test Range 1C. Subsequently, the stockpiles were screened during the implementation of CMs and ordnance materials were removed (Geomatrix, 2006a). Following the screening and removal of MEC items, the processed “clean” soil was stockpiled along the western side of Test Range 1C away from the area designated as AOC No. 6 – Test Range 1C. Oversize material (oversize discharge pile No. 1) was stockpiled in the northern portion of Test Range 1C. The current locations of the processed “clean” soil and oversize discharge pile No. 1 stockpiles are shown on Figure 22. Following the implementation of remaining CMs, Geomatrix recommended that a “no further action” status be assigned to the processed soil stockpiles within the Test Range 1C (Geomatrix, 2006a).

DTSC requested the collection of confirmation samples from the processed soil stockpiled in Test Range 1C area for perchlorate analysis in order to evaluate stockpiled soil conditions as part of the overall perchlorate fate and transport evaluation at the facility (Geomatrix, 2006b). As noted in the CMCR (Geomatrix, 2006a), low concentrations of perchlorate were detected in the soil that had been removed from the landfill and transported to Test Range 1C for processing during the implementation of CMs in 2001. The perchlorate concentrations detected in soil samples collected from landfill materials were below the cleanup level (Geomatrix, 2006a).

To address DTSC's request, six composite-type soil samples (C-AC06-S-01-STP through C-AC06-S-06-STP) were collected from the stockpile of processed soil located west of AOC No. 6 – Test Range 1C (Figure 22). Two additional composite-type soil samples C-AC06-S-07-STP and C-AC06-S-08-STP) were collected from the stockpile of oversize material (Figure 22). Geomatrix measured and established roughly equal-dimension grids in the soil stockpiles and collected a confirmation sample from each grid. Five sample aliquots were collected from each grid and homogenized to form a single composite-type sample. A random number–generating spreadsheet was used to select sample locations and depths (within 5 feet) from each grid to provide unbiased measure of chemical concentrations (Geomatrix, 2006c). Analytical results were reported as follows:

- Perchlorate was detected in four of the six samples collected from the processed material stockpile at concentrations ranging from 0.01 to 0.10 mg/kg.
- Perchlorate was detected in one of the two samples collected from the oversize material stockpile (sample C-AC06-08-STP) at a concentration of 0.06 mg/kg.

Risk assessment calculations demonstrate that the concentrations of perchlorate detected in the soil stockpiles located in Test Range 1C do not pose a threat to human health (see Section 6.2.1.5). Soil stockpile sample analytical results are summarized in Table 14. The soil sample location and analytical results are shown on Figure 22. Based on sampling results, Geomatrix recommends "no further action" status to the soil stockpiles located in Test Range 1C.

4.9 CONCRETE BLOCK STAGING AREA

Several large (dimensions between 6 × 6 × 4 feet and 5 × 4 × 3 feet), steel-rebar-reinforced blocks of concrete were found in the central portion of SWMU No. 2 – Former Landfill in 2001 during the implementation of CMs (Geomatrix, 2006a). As noted in Section 4.1.2.2, the concrete blocks were removed from the landfill area and stockpiled on a concrete pad near the location of former Building 011 (see Figure 2). These blocks may have been part of a rocket motor test stand used in the SWMU No. 15 – Upper A-12 Test Area (Geomatrix, 2006a). Perchlorate was detected at a concentration of 0.48 mg/kg in a concrete chip sample collected from the blocks on May 24, 2002 (Geomatrix, 2006a).

DTSC recommended hauling the concrete blocks off site as soon as practical, and sampling the underlying soil for perchlorate (Geomatrix, 2006b). The concrete blocks were broken up and placed into covered, roll-off type bins. Two bins were removed on June 12, 2006 and a third (final) bin was removed on July 10, 2006. The bins were transported to Waste Management's

Kettleman City facility, a Class I facility. Subsequent to removal of the blocks, soil sample CB-STPL-01 was collected at a depth of 0.5 foot at the location of a crack between the cement concrete pad and the adjacent asphaltic concrete pavement (Figure 23). This soil sample was collected to evaluate if precipitation contacting the concrete blocks had drained from the concrete pad and affected soil. Perchlorate was detected at a concentration of 0.32 mg/kg in the soil sample. Risk assessment calculations demonstrate that this concentration of perchlorate does not pose a threat to human health (see Section 6.2.1.5).

Additional sampling was conducted to evaluate the vertical extent of perchlorate detected in shallow soil (0.5 foot) at the location of CB-STPL-01. Two additional soil samples at this same location were collected at depths of 5 and 10 feet using direct-push probes. In addition, four step-out soil sampling locations (CB-STPL-02 through CB-STPL-05) were located around CB-STPL-01 and at the edge of the asphaltic concrete pavement and sampled to evaluate the potential that precipitation that contacted the concrete blocks had run off the asphalt and impacted adjacent areas. Soil samples were collected with direct-push probes at depths of 0.5, 5, and 10 feet, and all samples were analyzed for perchlorate. Perchlorate was not detected in any of these additional samples.

In addition to the soil samples, a concrete core sample was collected in 2006 from the area where the concrete blocks had been located. The concrete chip sample was analyzed for perchlorate. Perchlorate was not detected in the sample.

The soil and concrete core sample analytical results are summarized in Table 15. The soil and concrete core sample locations and analytical results are shown on Figure 23. Based on these results, Geomatrix recommends assigning “no further action” status to the concrete block staging area.

5.0 BUILDING ASSESSMENT (AND DEMOLITION)

The initial building assessment activities were performed in1998 following the McLaren/Hart document titled Workplan for Assembly Building Assessment, Aerojet-General Corporation, Chino Hills facility and dated April 29, 1998 (McLaren/Hart, 1998). Results of the 1998 building assessment activities were summarized in the ENSR report titled Results of Building Assessment, Aerojet Chino Hills facility, and dated draft July 2, 1999, finalized October 18, 2001 (ENSR, 2001b). Results of the 1998 building assessment activities demonstrated that

Buildings 006, 010, and 037 septic required remedial measures (ENSR, 2001b). The recommended remedial measures included:

- Building 006: Remove explosives-impacted concrete flooring in the northwest corner of the building.
- Building 010: Remove building to access RDX-impacted soil.
- Building 037 (septic tank only): Remove nitroglycerine and SVOC-impacted materials in the septic tank.

As noted in Section 3.3, these remedial measures were identified in the 2001 ENSR Building Assessment report and the CMCR. Recommendations for additional studies were provided by DTSC based on their review of the CMCR (DTSC, 2005a, b) and other facility documents (DTSC, 2005c, 2006a, b). Subsequently, Geomatrix prepared work plans and provide supporting information to complete these activities (see Section 1.2). Specific comments from DTSC regarding BA activities are summarized as follows:

- Perform remedial measures at Building 010, including the building floor, the underlying soil, and the area around the building; conduct wipe sampling per recommendations presented in the 2001 ENSR Building Assessment report.
- Collect additional soil samples from all explosives storage bunkers (Buildings 022 to 032) and analyze for metals, explosive compounds, and perchlorate.
- Conduct sampling of Building 510.
- Sample the filter assembly area at Building 551 and analyze for explosive compounds.

To address the above listed recommendations and comments, additional BA activities were conducted in the following locations:

- Building 003
- Building 006 Complex
- Building 010
- Building 016
- Buildings 022 through 025 and 029 through 032

- Building 036
- Building 037 Septic Tank
- Building 551

To complete some of the BA activities, Buildings 003, 006, 010 and 016 were demolished. In addition, three septic tanks and an UST were removed. Geomatrix prepared specifications for abatement and demolition of the above-listed buildings and structures and provided demolition oversight on behalf of Aerojet. Geomatrix subcontracted to URS, a California state-licensed contractor, for the scope of work. Before demolition work, URS obtained all applicable federal, state, and local permits to complete the work. Copies of the applicable permits are located as attachment 3 to the URS report (URS, 2007b, included as Appendix K).

The following subsections describe the completion of BA and building demolition activities.

5.1 FORMER BUILDING 003

Former Building 003 was a former research and development (R&D) building used to test chemical agents, CS, and explosive compounds. Figure 24 shows the Building 003 room configuration and sample locations and analytical results. Chemical agents and CS were evaluated in the chemical test chamber formerly located in Room 001 and the hot laboratory in Room 002. Explosive compounds were tested in Rooms 017, 019, and 020. Building 003 was identified with AOC No. 11 and evaluated as part of the RFI. No chemicals were detected in soil samples at concentrations exceeding cleanup criteria, and thus AOC No. 11 was assigned a "no further action" status as part of the RFI.

Explosives compounds were known or suspected to be present within the pipe located beneath Rooms 017, 019, and 020 in former Building 003. A sink trap shown on Figure 24 was tagged by former Aerojet representative(s) as containing lead azide, a sensitive explosive compound. This pipe emptied into the septic tank located south of Building 003 (see Figure 24). To assess the potential presence of explosive compounds (included lead azide) in the subsurface drain pipe in Rooms 017, 019, and 020, Building 003 and its foundation were demolished so that the suspect pipe could be exposed and removed.

5.1.1 Building Demolition

Building 003 demolition activities included a hazardous materials survey, lead-based paint stabilization, and structure removal. Lead azide stabilization and septic tank removal are described in Sections 5.1.2 and 5.1.3, respectively.

5.1.1.1 Hazardous Materials Survey

An asbestos and lead-based paint (LBP) survey was conducted in the facility buildings by Camco Group Inc. (Camco) in 1995 (Camco, 1995). In 1998, asbestos containing materials (ACMs) identified in the Camco report were removed from the building (ENSR, 2001a). LBP was identified in several of the buildings, including Building 003.

Hazardous building materials such as "universal waste" (e.g. light ballasts, fluorescent tubes/bulbs, capacitors, transformers, air conditioners, mercury switches, etc.) had previously been removed from non-operating buildings at the facility during facility shut down. As part of the work scope, URS conducted pre-demolition surveys in Buildings 003, 006, 010, and 016 in search of other potential hazardous materials.

Some containers of materials and non-PCB containing ballasts were located in Building 003 and removed prior to demolition and transported to the Clean Harbors facility in Wilmington, California.

5.1.1.2 Lead Based Paint Stabilization

Lead-based paint was identified by Camco in Building 003 (Camco, 1995). To supplement this initial LBP survey, KR Environmental Services Inc. (KR) of Huntington Beach, California conducted an additional LBP survey in Building 003 prior to demolition. A copy of the KR report is included as Appendix L. LBP locations in Building 003 included:

- Portions of Rooms 007, 017, and 019.
- Building posts, support beams, ladder, door frames, door jams.

URS stabilized damaged LBP in the above listed areas prior to demolition activities. They used approved engineering controls and work practices to control dust. These practices included use of wet methods to remove damaged paint, encapsulation of stabilized areas, and proper decontamination methods for work and equipment exiting the work area (URS, 2007b).

A 55-gallon drum containing LBP materials was removed from the site and transported to Clean Harbors facility in Wilmington, California.

Geomatrix contracted Aurora Industrial Hygienists (Aurora) of Long Beach, California to perform site monitoring during LBP stabilization efforts. Upwind and downwind area samples, and dust-wipe samples, were collected and analyzed for lead (Aurora, 2006). Lead was not detected in any of the samples. A copy of the Aurora report is included as Appendix M.

5.1.1.3 Structure Demolition

Structural demolition activities included demolition of Building 003 and removal of the concrete slab. All utilities were previously disconnected from this structure, with the exception of a water line to Building 003. Demolition was accomplished under city demolition permit using a combination of track mounted excavator equipped with grapple, concrete breaker and bucket attachments; track loader; water truck; and bobcat loaders (URS, 2007b). A water truck was used during all phases of demolition to control airborne debris and dust.

The building was dismantled in such a way as to segregate the soft debris (i.e. wood, wallboard, roofing materials) and hard debris (i.e. concrete, block and metal) into piles for disposal (URS, 2007b). Both the soft and hard building material debris from Building 003 was transported to the Waste Management's McKittrick Waste Treatment Site, a Class II facility, as nonhazardous solid waste.

5.1.1.4 Dust Monitoring

Dust monitoring was performed during this project to demonstrate the effectiveness of dust suppressant activities during the building demolition, and truck loading and transportation activities. Three DataRAM pDR 1000 (dataRAM) monitors by Thermo Electron Corporation were used to measure particulate matter less than 10 micrometer (µm) in diameter (PM_{10}). The dataRAM is capable of measuring concentrations ranging from 0.001 to 400 milligram per cubic meter (mg/m^3) of particle sizes ranging from 0.1 to 10 µm. The dataRAMs were set up to record time weighted average concentrations at 60 second intervals. All dataRAMs were calibrated every morning by zeroing with particle-free air.

Two of the three dataRAMs were set up at the perimeter fence line, station 1 and station 2, in the downwind direction of the on-site activities. The third dataRAM, station 3, was set up at locations upwind from the on going on-site activity. Station 3 was relocated as the ongoing

demolition activity shifted from building to building. The PM_{10} concentrations were recorded daily during on-site activities from November 8 through November 17. Stations 1 and 2 were operated continuously prior to any on-site activities and after the end of the activities. Station 3 operated continuously for the most part, except temporarily during times it was relocated to various upwind locations.

Average daily PM_{10} results for station 1 and station 2 were derived by subtracting the average daily PM_{10} results from background station 3 from stations 1 and 2 PM_{10} results. None of the average differential PM_{10} results exceeded the SCAQMD Rule 403 criteria of 50 $\mu m/m^3$. Dust monitoring data and a table (Table 1) showing the summary of PM_{10} concentrations from all stations are included as Appendix N.

5.1.2 Explosive Compounds in Building 003 Piping and Removal

As indicated above, the piping beneath Rooms 017, 019, and 020 potentially contained a sensitive explosive compound, lead azide. Because no analytical method is known to test materials directly for lead azide and determine if it was present in the pipe, the pipe was managed as though it contained lead azide and as a potentially explosive hazardous material. Prior to the demolition of Building 003, the drain line that ran from the former laboratory to the septic tank was “stabilized” because of the possible presence of lead azide. This was accomplished by plugging the end of the pipe that drained into the septic tank and filling the affected length (approximately 60 feet of drain line) with neutralization solution of sodium hydroxide and water. This solution was allowed to sit for about 16 hours before demolition began.

Upon completion of Building 003 structure demolition (see Section 5.1.1.3), the drain line was cut into sections and placed into 55 gallon drums, surrounded by water. The drain line was profiled and transported to the Clean Harbors facility in Colfax, Louisiana for disposal by incineration.

Upon removal of the below-ground pipe, four soil samples (C-003-PIPE-01-S, -02-S, -03-S, and -04-S) were collected on November 11, 2006 near the joints and junctions of the former pipe. The soil samples were analyzed for explosive compounds and lead. Analytical results were reported as follows:

- No explosive compounds were detected in the samples.

- Lead was detected in all four samples at concentrations ranging from 2.30 to 3.97 mg/kg. These levels are representative of background concentrations.

Former Building 003 pipe removal confirmation soil sample results are summarized on Table 16. Soil sample locations and confirmation results are shown on Figure 25. Based on these results, no additional activities are necessary in the former Building 003 pipe area.

5.1.3 Former Building 003 Septic Tank Sampling and Demolition

Upon completion of the Building 003 demolition activities, it was determined that the former pipe emptied into an adjacent concrete septic tank located south of former Building 003. The1995 sample results in the septic tank leach field did not detect any chemicals at concentrations exceeding cleanup criteria (see Figure 24). To determine if historic operations in former Building 003 resulted in impact to septic tank materials, a water sample was collected from the interior of the tank in 2006.

Water sample 003 was collected on November 8, 2006 and analyzed for metals and explosive compounds. Metal results, including lead, were within normal levels and no explosive compounds were detected. Septic tank samples results are summarized on Table 17. Thus, the septic was emptied by vacuum truck, pressure washed, and the contents transported offsite as normal septic wastes.

The septic tank was removed using a combination of an excavator mounted with bucket, concrete breaker attachment and water truck for dust control. The septic tank was removed and broken into less than 2 foot minus pieces. The materials were loaded into trucks for offsite transportation. The concrete debris was transported to the Waste Management's McKittrick Waste Treatment Site, a Class II facility, as nonhazardous solid waste.

Upon removal of the former Building 003 septic tank, confirmation soil sample 003-Septic-B was collected on June 15, 2007 from beneath the former tank location and analyzed for metals, SVOCs, explosive compounds, and nitroglycerine. No SVOCs, explosive compounds, or nitroglycerine were detected in the soil sample. Barium was detected in the soil sample at a concentration of 126 mg/kg that exceeds background levels (see Section 6.1), but not at a level that poses a threat to human health (see Section 6.2.2.5). Thus, no other activities were required and the septic tank excavation area was backfilled with native soil from the site.

The Former Building 003 septic tank excavation confirmation sample results are summarized on Table 18 and shown on Figure 25. Based on the results of BA activities and confirmation sampling in former Building 003 area, Geomatrix recommends “no further action” status for this area.

5.2 BUILDING 006 COMPLEX

The Building 006 Complex included Buildings 006, 510, 507, and 005 (see Figure 2). Building 006 was used primarily in melt/pour operations, but also as an explosive pressing facility and pyrotechnics laboratory. Washdown water from Building 006 was drained along a concrete-lined trough and emptied into an unlined outflow area. Sampling of the Buildings 006 complex and outflow area was conducted as part of the 1998 building assessment activities (ENSR, 2001b). Based on these earlier activities, additional BA activities were recommended in Buildings 006 and 510, and the Building 006 trough.

5.2.1 Building 006 Assessment and Demolition

During the 1998 building assessment activities, a concrete core sample collected from Building 006, Room 001 (sample 006-001-01-C) in November 1998 was analyzed for explosive compounds (Figure 26). The explosive compounds HMX, RDX, 2,4,6-trinitrotoluene (2,4,6-TNT), and 4-amino-2,6-dinitrotoluene (4-A-2,6-DNT) were detected at concentrations of 1.64, 3.82, 0.535, and 0.873 mg/kg, respectively (ENSR, 2001b). The soil sample 006-001-01-S-0.5 (and a duplicate sample) collected at the same time from beneath the core location was non-detect for explosive compounds (Figure 27).

Additional BA sampling in Building 006 occurred in 2006 to assess the extent of impact of explosive compounds to the concrete floor, and to confirm that underlying soils had not been impacted. Two concrete core samples were collected on May 9, 2006 from locations 006-001-02-C and 006-001-03-C around location 006-001-01-C collected on November 13, 1998 as shown on Figure 26. In addition, soil samples 006-001-02-S and 006-001-03-S were collected on May 11, 2006 from the underlying soil as shown on Figure 27. The concrete chip and soil samples were analyzed for explosive compounds. No explosive compounds were detected. The soil and concrete chip sample results from Building 006 are summarized on Table 19. The sample locations and confirmation results are shown on Figures 26 and 27. Based on these results, no additional activities are necessary in Building 006.

Building 006 was demolished so that the portion of impacted concrete flooring around sample location 006-001-01-C could be removed from the site. Figure 26 shows the limits of impacted concrete. This material (and non-crushable demolition material) was transported to the Waste Management's McKittrick Waste Treatment Site, a Class II facility, as nonhazardous solid waste. Crushable, non-impacted debris and rubble were recycled at the Dan Copp's Corona, California facility and at All American Concrete in Irwindale, California (URS, 2007b). The materials were transported to these places depending on daily availability and access to each recycling facility.

5.2.2 Building 006 Trough

Soil samples were collected from beneath a concrete-lined trough exiting Building 006 and from the outflow area south of the building in November 1998 (Figure 27). Explosive compounds were detected in soil sample 006-Trough-01-S-0.5 at the location closest to Building 006. The explosive compounds HMX, RDX, and 1,3,5-TNB were detected in this sample at concentrations of 0.569 mg/kg, 1.14 mg/kg, and 1.13 mg/kg, respectively (Figure 27). These levels were below cleanup criteria (ENSR, 2001b).

Additional sampling in the trough was completed per DTSC request to confirm that underlying soils had not been impacted. Two soil samples were collected on May 10, 2006 from locations 006-Trough-01-S-03 and 006-Trough-04-S-0.5 as shown on Figure 27. The soil samples were analyzed for explosive compounds. However, sample 006-Trough-04-S-0.5 was lost by the laboratory. DTSC was onsite during this sampling event and collected a split sample from this location. The analytical results were provided by DTSC's contract laboratory. Analytical results were reported as follows:

- No explosive compounds were detected in sample 006-Trough-01-S-03.
- RDX and HMX were detected in sample 006-Trough-04-S-0.5 at concentrations of 0.90 and 0.54 mg/kg, respectively.

The soil sample results from May 2006 are summarized on Table 19. The sample locations and confirmation results are shown on Figure 27. Based on these results which are less than the November 1998 reported concentrations of RDX and HMX, no additional activities are necessary in the Building 006 trough area (see Section 6.2.2.1).

5.2.3 Building 510

Building 510 was historically used as a pressing and loading area. Because Building 510 was being used to store recovered ordnance items, proposed building assessment activities were not implemented. Now that ordnance is no longer stored in Building 510, BA activities were implemented.

Three soil samples were collected on May 11, 2006 from inside and around Building 510 and analyzed for explosive compounds. Soil sample 510-001-01-S-0.5 was collected from Room 001 beneath the concrete flooring. Soil sample 510-002-01-S-0.5 was collected outside the building near the former roller machine behind Room 002, and sample 510-004-01-S-0.5 was collected near a drain pipe exiting Room 004 (see Figure 27). No explosive compounds were detected in any of the soil samples collected from the Building 510 area.

Building 510 soil sample results are summarized on Table 19. The sample locations and analytical results are shown on Figure 27. Based on the BA results, no additional activities are necessary in the Building 510 area.

5.3 FORMER BUILDING 010

As noted in Section 4.3, additional characterization of Building 010 was recommended in the CMCR (Geomatrix, 2006a). DTSC recommended that remedial measures be performed as part of the CMs for Building 010 (Geomatrix, 2006b). However, to complete these activities, Building 010 needed to be demolished. Wipe and concrete core samples were collected as part of the BA activities to evaluate building debris disposal requirements.

5.3.1 Wipe Sampling

Wipe samples were collected on May 9, 2006 following the protocols described in the CM/BA Work Plan (Geomatrix, 2006b). Wipe samples 010-010-05-W and 010-010-06-W were collected from the two air conditioner intake vents in Room 010 (see Figure 28). In addition, wipe samples 010-007-04-W and 010-007-05-W were collected from the walls in Rooms 007 and samples 010-010-07-W and 010-010-08-W were collected from the walls in Rooms 010. A total of six wipe samples were collected and analyzed for explosive compounds. Analytical results were reported as follows:

- No explosive compounds were detected in wipe samples from building walls.

- HMX was detected in the two air conditioner intake vents in Room 010 at concentrations of 1.7 and 4.5 mg/kg, respectively.

Building 010 wipe sample results are summarized on Table 20. The sample locations and analytical results are shown on Figure 28. HMX levels detected in the wipe samples do not pose a risk to human health (see Section 6.2.2.2). Based on these results, no additional wipe sample activities are necessary in Building 010.

5.3.2 Concrete Sampling

To assess the extent of explosives-impacted concrete, five additional concrete core samples were collected on May 9, 2006 from the Building 010 concrete floor. The concrete chip samples were analyzed for explosive compounds. No explosive compounds were detected in any of the samples collected from the Building 010.

Building 010 concrete core sample results are summarized on Table 21. The sample locations and confirmation results are shown on Figure 29. Based on these results, no additional concrete sample activities are necessary in Building 010.

5.3.3 Structure Demolition

Structural demolition activities included demolition of Building 010 and the concrete slab. All utilities were previously disconnected from this structure and no hazardous materials waste (e.g. ACM, LBP, universal waste) were identified during the pre-demolition survey of the building. Demolition was completed under city demolition permit using a combination of track mounted excavator equipped with grapple, concrete breaker and bucket attachments; track loader; water truck; and bobcat loaders (URS, 2007b). A water truck was used during all phases of demolition to control airborne debris and dust.

The building was dismantled in such a manner as to segregate the soft debris (i.e. wood, wallboard, roofing materials) and hard debris (i.e. concrete, block and metal) into piles for eventual recycling and disposal (URS, 2007b). Both the soft and hard building material debris from Building 010, including the air conditioner vents, were transported to the Waste Management's McKittrick Waste Treatment Site, a Class II facility, as nonhazardous solid waste. The concrete/asphalt pad outside of Building 010 was recycled at the Dan Copp's Corona, California facility and at All American Concrete in Irwindale, California (URS, 2007b). Based on the results of BA activities and confirmation sampling in former Building 010, Geomatrix recommends "no further action" status for this area.

5.4 BUILDING 016

Building 016 was the former x-ray room and gage laboratory. Prior to construction of the two-story, western addition to Building 016, a UST was reported to have been located in the area. The construction of the western addition may have covered the UST. Building 016 was identified for demolition to confirm the presence or absence of an UST located beneath the western portion of the building.

5.4.1 Structure Demolition

Structural demolition activities included demolition of Building 016 and the concrete slab. All utilities were previously disconnected from this structure. Some LBP was identified on a door and hand rail (Camco, 1995). No other hazardous materials (e.g. ACM, LBP, universal waste) were identified during the pre-demolition survey. Demolition was accomplished under city demolition permit using a combination of track mounted excavator equipped with grapple, concrete breaker and bucket attachments; track loader; water truck; and bobcat loaders (URS, 2007b). A water truck was used during all phases of demolition to control airborne debris and dust.

The building was dismantled in such a manner as to segregate the soft debris (i.e. wood, wallboard, roofing materials) and hard debris (i.e. concrete, block and metal) into piles for eventual recycling and disposal (URS, 2007b). Soft building materials were transported to Waste Management's McKittrick Waste Treatment Site, a Class II facility, as nonhazardous solid waste. Concrete debris was recycled at the Dan Copp's Corona, California facility and at All American Concrete in Irwindale, California (URS, 2007b). A footing beneath the north side of Building 016 extending approximately 8 feet below original grade was left in place.

During the demolition of Building 016, a transite pipe was located. Transite pipe may contain some non-friable asbestos materials. The pipe was placed inside a 55-gallon drum and transported offsite to the Clean Harbors Wilmington, California facility.

5.4.2 UST Assessment and Removal

Upon completion of Building 016 demolition activities, an approximate 15,000 gallon UST was discovered under Building 016. The UST appeared to have been abandoned in-place. The top of the UST was cut off and the tank was backfilled with sand slurry. The approximate 20-foot diameter UST appeared to have been an older, riveted aboveground storage tank.

To characterize the contents of the UST, sample 016-UST-01-S was collected on December 14, 2006 with direct-push probe from the slurry at the bottom of the tank. The slurry sample was analyzed for the following:

- metals
- explosive compounds
- SVOCs
- VOCs
- TPH as gasoline

No explosive compounds, SVOCs, VOCs, or TPH were detected in the slurry sample. Metal results were within normal background ranges. The sample results are summarized on Table 22.

A San Bernardino Fire Department inspector, Mr. Jackson Crutsinger, observed the UST before it was removed. The UST was removed under San Bernardino Fire Department permit utilizing an excavator equipped with a grapple bucket and a water truck for dust control (URS, 2007b). The UST and sand slurry contents of the tank were transported to the Waste Management's McKittrick Waste Treatment Site, a Class II facility, as nonhazardous solid waste.

Per the inspector's request, two soil samples 016-UST-01 and 016-UST-02 were collected on June 14, 2007 from the soil beneath the former UST after it was removed and analyzed for the above listed chemicals (TPH was analyzed for gasoline, diesel and motor oil). Analytical results were reported as follows:

- No explosive compounds, SVOCs, or VOCs were detected in the soil samples.
- TPH as motor oil was detected in sample 016-UST-2 at a concentration of 46 mg/kg.
- TPH as diesel was detected in sample 016-UST-01 at a concentration of 5.7 mg/kg.
- Metal concentrations were within normal background levels expected for barium (see Section 6.1). Barium was detected in 016-UST-02 at a concentration of 202 mg/kg (barium was detected in 016-UST-01 at a concentration of 68.2 mg/kg) but not at a level that poses a threat to human health (see Section 6.2.2.5).

Building 016 UST sample results are summarized on Table 22. The sample locations and confirmation results are shown on Figure 30. Upon receipt of confirmation samples demonstrating the removal of the UST was complete, the approximate 8-foot deep UST excavation was backfilled and the disturbed area recontoured. The San Bernardino Fire Department provided UST closure documentation (URS, 2007b). Based on these results, no additional sampling activities are necessary in the former Building 016 or UST areas.

5.5 BUILDINGS 022 THROUGH 025 AND 029 THROUGH 032

Figure 31 shows the locations of Buildings 022 through 025 and 029 through 032. These buildings were storage bunkers historically used to store packaged bulk explosives and/or assembled ordnance. Since these items were stored in original packaging and opened/sealed elsewhere, it was unlikely that these buildings or subsurface soils were impacted by storage operations. Currently, some of the buildings are periodically used to store recovered ordnance items. The active storage bunkers, those previously under permit for storing recovered ordnance items and donor explosives that may be reactivated in the future, include Buildings 022, 023, 024, and 025. The inactive bunkers include Buildings 029, 030, 031, and 032.

During the 1998 building assessment activities, a single soil sample was collected in November 1998 from the entryway to explosive storage Building 022 and analyzed for explosive compounds. No explosive compounds were detected, and based on the building assessment activities and the sample results, a “no further action” status was recommended for Buildings 022 through 032 (ENSR, 2001b).

DTSC recommended collection of additional samples from the storage bunkers (DTSC, 2005b). To address DTSC’s recommendation, concrete core and soil samples were collected from the bunkers in 2006. In addition, Figure 31 shows two concrete pads identified as A-1 and B-1 that may have been used as temporary storage magazines during facility operations. Because temporary storage magazines would have been fully enclosed with steel bottoms resting on the concrete pad, only soil samples were collected from the front of both the A-1 and B-1 pads.

A total of 16 soil samples (including three duplicates) were collected on May 10, 2006 and October 26 and 27, 2006 from the bunkers and concrete pads and analyzed for explosive compounds and perchlorate. Ten of the soil samples were also analyzed for metals. Figure 31 shows the soil sample locations. Analytical results were reported as follows:

- No explosive compounds were detected in any of the soil samples.
- Perchlorate was detected in soil sample 025-01-S-0.5 at a concentration of 0.01 mg/kg.
- Metals barium, chromium, and cobalt were detected at concentrations above background levels (see Section 6.1) but not at levels that pose a threat to human health (see Section 6.2.2.3).

A total of 9 concrete samples (including one duplicate) were collected on May 9, 2006 and October 27, 2006 from the active and inactive storage bunkers and analyzed for explosive compounds and perchlorate. Figure 32 shows the concrete core sample locations. Analytical results were reported as follows:

- RDX was detected in sample SW10-04, a duplicate of sample 032-01-C, at a concentration of 0.7 mg/kg.
- Perchlorate was detected in samples 025-01-C and SW10-04, a duplicate of sample 032-01-C, at a concentration of 0.04 and 0.01 mg/kg, respectively.

The storage bunker soil and concrete core sample analytical results are summarized on Tables 23 and 24, respectively. The sample locations and analytical results are shown on Figures 31 and 32. Calculations of the cumulative effect of explosive compounds, perchlorate, and metals above background levels detected in the bunker samples demonstrate that they do not pose a risk to human health (see Section 6.2.2.3).

5.6 BUILDING 036

Building 036 was a load, assembly, and pack (LAP) building used for 30mm projectile operations. Large quantities of propellant were stored in Building 036. Nitroglycerine is a component of propellant. Spilled propellant and room washdown water reportedly emptied into the subsurface drain located outside the west side of the building (see Figure 33). The outflow of the drain emptied into a gully south of the building. As part of the 1998 building assessment activities, a video inspection of the accessible drains and drainpipes west of Building 036 was completed (ENSR, 2001b). No cracks or areas of water accumulation were observed in the video. In November 1998, four soil samples were collected at locations adjacent to the drain and at depths below the subsurface pipe area. The soil samples were analyzed for nitroglycerine and PETN. None of these chemicals was detected. Figure 33 shows the 1998 soil sample locations and analytical results in the Building 036 area.

Based on the 1998 building assessment activities, ENSR recommended assigning a "no further action" status to Building 036 (ENSR, 2001b). However, a septic tank located east of Building 036 warranted sampling once the concrete rubble covering its location was removed. DTSC also recommended additional assessment of the Building 036 subsurface drain outflow that emptied into an unlined gully south of the building.

5.6.1 Building 036 Outflow

To address DTSC's recommendation for additional assessment in the gully south of the Building 036 where the below-ground drain emptied, soil samples 036-Drain-04-S and duplicate sample SW10-02 were collected on May 9, 2006. These samples were collected from a depth of 1 foot beneath the drain pipe outflow (Figure 33) and analyzed for explosive compounds and nitroglycerine. Analytical results were reported as follows:

- No explosive compounds were detected.
- Nitroglycerine was detected in sample 036-Drain-04-S at a concentration of 14 mg/kg and in the duplicate sample SW10-02 at a concentration of 100 mg/kg.

To define the extent of nitroglycerine impact, two additional soil samples were collected on October 26, 2006 from former sample location 036-Drain-04-S at depths of 5 and 10 feet. Two step out borings 036-Drain-05-S and 036-Drain-06-S were also located further along the gully and soil samples collected at depths of 1, 5, and 10 feet. All eight soil samples and one duplicate sample were analyzed for nitroglycerine. Nitroglycerine was not detected in any of the samples. Building 036 outflow soil sample results are summarized on Table 25. The sample locations and analytical results are shown on Figure 33.

Approximately 8 cubic yards of nitroglycerine-impacted soil was excavated from the Building 036 outflow area shown on Figure 33. A portion of the non-hazardous material was bulked with other materials and transported to Waste Management's Kettleman City facility, a Class I facility. The remainder of the material was transported to the Waste Management's McKittrick Waste Treatment Site, a Class II facility. Subsequently, a composite-type confirmation sample 036-Outflow was collected on June 15, 2007 from the excavation bottom and analyzed for nitroglycerine. Nitroglycerine was not detected in this sample. Thus, the disturbed area was backfilled with native soil from the site and no additional activities are required in the Building 036 outflow area.

5.6.2 Building 036 Septic Tank Evaluation and Removal

A concrete septic tank located on the east side of Building 036 was identified for sampling during the 1998 building assessment activities (McLaren/Hart, 1998; ENSR, 2001b) but at the time it was covered by concrete rubble and could not be sampled. The Building 036 septic tank was evaluated and removed during this investigation.

URS used an excavator to remove the rubble and expose the septic tank. Water remained in the tank. Thus, water sample 036 was collected on November 8, 2006 from the interior of the septic tank and analyzed for the following:

- explosive compounds
- nitroglycerine
- SVOCs
- metals

The septic tank water samples results are summarized on Table 17. No explosive compounds or nitroglycerine were detected in the water sample. Metal results were consistent with septic waste. One SVOC analyte, 1,4-dichlorobenzene, was detected at a concentration of 73 µg/L. This compound is commonly used in toilet deodorizer blocks and thus was not considered a chemical of concern. The septic tank was emptied by vacuum truck, pressure washed, and the contents transported offsite as normal septic wastes.

The septic tank was removed using a combination of an excavator mounted with bucket, concrete breaker attachment and water truck for dust control. The septic tank was removed and broken into 2 foot minus pieces. Materials were loaded into trucks for offsite transportation. The concrete debris was transported to the Waste Management's McKittrick Waste Treatment Site, a Class II facility, as nonhazardous solid waste. The inlet and outlet sewer lines that serviced the septic tank were capped with concrete per city demolition permit requirements (URS, 2007b). They were inspected by a city inspector for conformity to the permit stipulations (URS, 2007b).

Upon removal of the former Building 036 septic tank, composite-type soil sample 036-Septic-B was collected on June 15, 2007 from beneath the former tank location and analyzed for the above listed chemicals. The results of confirmation samples taken from the septic tank

excavation are summarized on Table 18. Metal results were within normal background levels and no SVOCs, explosive compounds, or nitroglycerine were detected in the soil sample. Thus, the area was backfilled and no other activities are required. Based on the results of BA activities and confirmation sampling in Building 036, Geomatrix recommends "no further action" status for this area.

5.7 BUILDING 037 SEPTIC TANK

Building 037 was a LAP building used for 25mm operations. During the 1998 building assessment activities, a sample was collected in November 1998 from the interior of the septic tank south of Building 037 and analyzed for metals, explosive compounds, nitroglycerine, and SVOCs. Lead and zinc were detected at concentrations significantly higher than mean background levels, lead at 82.8 mg/kg and zinc at 378 mg/kg. The explosive compound 2,4-DNT and nitroglycerine were detected at concentrations of 0.316 mg/kg and 36.7 mg/kg, respectively. Further, the SVOC analyte di-n-butyl phthalate (DNB) was detected at a concentration of 12.9 mg/kg. Analytical results and risk calculations demonstrated that residual levels of nitroglycerine and DNB in the septic tank area of Building 037 required remedial measures (ENSR, 2001b).

To characterize the septic tank contents for disposal, water sample 037 was collected on November 11, 2006 from the interior of the septic tank and analyzed for the following:

- explosive compounds
- nitroglycerine
- SVOCs
- Metals

The septic tank water sample results are summarized on Table 17. No explosive compounds, nitroglycerine, or SVOCs were detected in the water sample. Metal results were within normal concentrations. Thus, the water was removed by a vacuum truck and the contents transported offsite as normal septic wastes. Care was taken to not disturb the septic tank sediments. Bentonite chips were subsequently added to the tank contents to soak up any free-standing water.

The concrete septic tank was removed using a combination of an excavator mounted with bucket, concrete breaker attachment and water truck for dust control. The concrete was broken into less than 2 foot pieces. Materials were loaded into trucks for offsite transportation. The septic tank and its solid contents were transported offsite to Waste Management's Kettleman City facility, a Class I facility. The inlet and outlet sewer lines that serviced the septic tank at Buildings 037 were capped with concrete per city demolition permit requirements (URS, 2007b). They were inspected by a city inspector for conformity to the permit stipulations (URS, 2007b).

Upon removal of the septic tank, composite-type soil sample 037-Septic-B was collected on June 15, 2007 from beneath the former tank location and analyzed for the above listed chemicals. The results of the confirmation samples taken from the Building 037 septic tank excavation are summarized on Table 18. No SVOCs, explosive compounds, or nitroglycerine was detected in the soil sample. Metal concentrations were within normal background levels except for cobalt. Cobalt was detected in sample 037-Septic-B at a concentration of 7.61 mg/kg, which exceeded background levels (see Section 6.1), but not at a level that poses a threat to human health (see Section 6.2.2.5). The sample location and analytical results are shown on Figure 34.

On June 15, 2007, deionized water was poured into the bathroom sink located in Room 006 of Building 037 and water sample 037-Outflow was collected from the exposed pipe outflow which emptied into the former septic tank. The water sample was analyzed for the same chemicals listed above. Analytical results were reported as follows (Table 17):

- Low concentrations of barium, copper, nickel, and zinc were detected.
- Nitroglycerine was not detected.
- SVOC compound benzoic acid was detected at a concentration of 77 µg/L.
- Explosive compounds HMX and 3-nitrotoluene were detected at concentrations of 1.5 and 6.5 µg/L, respectively.

Because the concentrations of benzoic acid, 3(m)-nitrotoluene, and HMX are several orders of magnitude below the U.S. EPA's preliminary remediation goals for tap water (120, 150,000, and 1,800 µg/L, respectively) and the septic lines would never be used to supply drinking water, these chemicals were not considered to pose a risk to human health. Subsequently, the outflow pipe was capped pursuant to city demolition permit requirements and the excavation

was backfilled with native soil (URS, 2007b). No other activities are required in the Building 037 septic area. Based on the results of BA activities and confirmation sampling in the Building 037 septic tank, Geomatrix recommends "no further action" status for this area.

5.8 FORMER BUILDING 551W FILTER HOUSE

Building 551 is part of the Building 020 Complex. Washdown waters from Building 551 emptied into the filter house in Building 551W before draining into the HEI Pond. The filter house was used to capture solid particles that may have been present in the washdown waters. Soil samples collected during the 1998 building assessment activities from areas inside and around Buildings 551 and 551W, including the trough system between the two buildings, were analyzed for explosive compounds (ENSR, 2001b). The explosive compound HMX was detected in sample 551W-Filt-01-S-0.5 at a concentration of 0.566 mg/kg. The risk assessment calculation of the level of HMX detected in the soil sample demonstrated that remedial measures were not necessary, and Building 020 Complex was recommended for "no further action" status (ENSR, 2001b). Figure 35 shows the November 1998 sample locations and analytical results around former Building 551W.

DTSC recommended additional BA activities beneath former Building 551W (DTSC, 2005b). The filter assembly was removed during the excavation of Redwater Pond (Geomatrix, 2006a), but the outline of the structure is still visible. Soil sample 551W-Filt-02-S was collected on May 9, 2006 from the soil underlying the former location of the filter assembly and analyzed for explosive compounds. RDX was detected in the sample at a concentration of 2.6 mg/kg. This level, however, does not pose a risk to human health (see Section 6.2.2.4).

Table 26 summarizes the sample results in former Building 551W. Figure 35 shows the 1998 and 2006 soil sample locations and analytical results. No other activities are required in the former Building 551W filter house area. Based on the results of BA activities and confirmation sampling in the former Building 551W filter house area, Geomatrix recommends "no further action" status for this area.

6.0 RISK ASSESSMENT

Performance monitoring measures were implemented to verify the completion of corrective measures and BA activities. These measures included, among others presented earlier in this report, documentation of CM/BA activities and post-CM assessment of residual chemicals (risk

assessment). Revised risk evaluations of post-CM/BA residual chemical concentrations are presented below.

6.1 BACKGROUND METALS CONCENTRATIONS

During RFI activities, soil samples were collected from unimpacted (background) locations in and around the facility and used to establish background metal concentrations (McLaren/Hart, 1999a). A review of background soil sample data reported in the RFI revealed that all background samples collected in 1995 for metals analyses were from unimpacted sediment; none were from unimpacted bedrock material (Geomatrix, 2006a). There is a potential that elevated metal concentrations found in samples collected from bedrock and reported in the CMCR (Geomatrix, 2006a) may represent natural background levels. Thus, Geomatrix recommended additional background sampling for metals in unimpacted bedrock material.

To address DTSC inquiries regarding background metal concentrations and to satisfy its own recommendation (Geomatrix, 2006a), Geomatrix collected six samples (BG-01-05 through BG-01-10 [and duplicate sample SW10-08]) from a depth of 0.5 foot in bedrock located in unimpacted areas of the facility. Each sample, collected from visually identifiable and structured bedrock, was analyzed for metals. Background bedrock sample locations are shown on Figure 36. Soil sample analytical results are summarized in Table 27.

To determine if concentrations of metals from the various SWMUs/AOCs and other areas of interest may be within levels found in the bedrock background samples, the SWMU/AOC sample results were compared to the bedrock background sample results using the Wilcoxon Rank Sum Test according to the procedures described in the RFI Report (McLaren/Hart, 1999a) and CMCR (Geomatrix, 2006a). The results of the Wilcoxon Rank Sum Tests are provided in Appendix Q. As presented in Appendix Q, concentrations of barium, chromium, cobalt, and copper occur in some areas at concentrations statistically higher than background (copper was only detected at a concentration statistically higher than background from former landfill materials that were removed from the facility as described in Section 4.1.2.1). Sample results from areas where one or two samples were collected and analyzed for metals were compared directly to background results. Sample results which were higher than background levels were also subject to risk evaluation. Risk evaluations including metals detected at levels exceeding background are provided below in Section 6.2.

6.2 REVISED RISK EVALUATION

Throughout the RFI and CM process, several risk evaluations or screening assessments (Meredith/Boli, 1993; McLaren/Hart, 1999a, b; Geomatrix, 2003, 2006a) were completed to determine the potential health risk posed by chemicals detected in soil and water samples collected from the facility. All of these evaluations were reviewed and approved by DTSC. Through these previous assessments, cleanup levels were calculated and, where chemicals were detected at levels exceeding cleanup criteria, corrective measures were implemented. As described in the CMW (McLaren/Hart, 1999c) and per DTSC approval of the CMW (DTSC, 2000) and CMCR (Geomatrix, 2006a), a screening assessment of post-CM or residual levels of chemicals detected in soil at the facility is presented in this report. As noted in Section 1.4, a screening assessment of residual chemicals detected in surface and subsurface water are presented in a separate report.

The RFI/CM screening assessments follow the DTSC's Preliminary Endangerment Assessment (PEA) Guidance Manual (DTSC, 1999b). In conducting the PEA screening evaluation, the land use is assumed to be residential. Potential routes of exposure for residents to non-volatile organic chemicals in soil include incidental ingestion, dermal contact, and inhalation of airborne particulates. The risk evaluations used exposure assumptions published by DTSC (1999) and U.S. EPA (1989, 1991, 1997, 2004a, b), and toxicity criteria published by OEHHA (2004, 2007) or U.S. EPA (2007).

As noted above, the PEA screening evaluations (McLaren/Hart, 1999a, b; Geomatrix, 2003, 2006a) assess potential routes of exposure for residents to non-volatile organic chemicals in soil that include incidental ingestion, dermal contact, and inhalation of airborne particulates. To evaluate the dermal contact route, the exposure assessment predicts how much of a chemical substance an individual may come into contact with and how much of that chemical substance is absorbed across the skin. The amount of absorption across the skin is represented by a chemical-specific dermal absorption fraction (ABS). Regulatory agencies including the California Environmental Protection Agency (Cal/EPA) and the U.S. EPA have provided default ABS values for various classes of chemicals. For example, in the PEA Guidance Manual, DTSC recommends a default ABS of 0.1 for most organic chemicals (DTSC, 1999b). U.S. EPA recommends the same value for SVOCs (U.S. EPA, 2004a). In previously conducted screening assessments, this default value was used for RDX, HMX, and 1,3,5-TNB in PEA risk/hazard calculations and in the calculation of a site-specific RDX cleanup goal for soil at the facility. U.S. EPA has since published chemical-specific ABS values for a number of

explosive compounds, including RDX, HMX, and 1,3,5-TNB, in a supplement to Risk Assessment Guidance for Superfund (RAGS) Part E (U.S. EPA, 2004b). These chemical-specific ABS values supersede any previous "values presented in the original version of Part E (U.S. EPA, 2004b)." The updated ABS values for RDX, HMX, and 1,3,5-TNB are 0.015, 0.006, and 0.019, respectively, and have been used to evaluate dermal exposure in the revised risk evaluation.

6.2.1 Risk Evaluation of Chemicals Detected in CM Samples

As described in previous sections of this report, several chemicals were detected in CM confirmation soil and bedrock samples. Further, several metals were detected at concentrations exceeding background levels. These chemicals and locations where detected are summarized in the following table:

Analytes	Highest Soil Concentration (Area)	Other Locations
Metals (exceeding background)		
Barium (Ba)	180 mg/kg (AOC 5-Area 16 bedrock)	110 mg/kg (AOC 5-Area 16 screened)
Chromium (Cr)	24.2 mg/kg (AOC 5-Area 16 bedrock)	
Cobalt (Co)	7.3 mg/kg (AOC 5-Area 16 screened)	
Explosive Compounds		
RDX	1.4 mg/kg (AOC 8-former Building 010)	0.68 mg/kg (AOC 5-Area 16 screened)
HMX	1.0 mg/kg (AOC 5-Area 16 screened)	0.51 mg/kg (AOC 8-former Building 010)
1,3,5-TNB	3.1 mg/kg (AOC 8-former Building 010)	None
Miscellaneous		
Perchlorate	0.69 mg/kg (SWMU 2-former landfill)	0.32 mg/kg (concrete block area) 0.1 mg/kg (stockpiles in Test Range 1C)
Dioxins	0.435 pg/g TEQ (Bldg 534)	None

Below we present our evaluation of potential threat to human health posed by residual levels of metals, explosive compounds, perchlorate, and dioxins for each SWMU/AOC and other areas of interest. In general, a risk estimation greater than 10^{-6} (1E-6) or a hazard index greater than 1 indicate the presence of contaminants at levels that may pose a threat to human health (DTSC, 1999b).

6.2.1.1 SWMU No. 2 - Former Landfill Area

Perchlorate was detected in CM samples from landfill area (see Section 4.1.2.2). No cancer risk was estimated because perchlorate is not carcinogenic. The hazard index estimated for exposure to this chemical, using the highest concentration detected, is summarized below:

Area	Chemicals (concentration in mg/kg)	Cumulative Cancer Risk	Hazard Index
SWMU No. 2 (former Landfill)	Perchlorate (0.69)	NA	0.05

NA – Not applicable

The hazard index calculations demonstrate that levels of perchlorate in the former landfill area do not pose a threat to human health. Risk assessment calculations are included as Appendix R.

6.2.1.2 AOC No. 5 - Test Range 16 (Bedrock)

Concentrations of metals statistically higher than background were detected in soil samples collected from bedrock material in Test Range 16. No cancer risk was estimated because barium and chromium are not carcinogenic. The hazard index estimated for exposure to these metals, using the highest concentrations detected, is summarized below:

Area	Chemicals (concentrations in mg/kg)	Cumulative Cancer Risk	Hazard Index
AOC No. 5 (bedrock in Test Range 16)	Ba (180), Cr (24.2)	NA	0.08

NA – Not Applicable

The hazard index calculations demonstrate that levels of metals above background in bedrock from Test Range 16 do not pose a threat to human health. Risk assessment calculations are included as Appendix R.

6.2.1.3 AOC No. 5 - Test Range 16 (Materials Subject to MEC Screening)

Explosive compounds RDX and HMX were detected in soil samples collected from Test Range 16 materials subject to MEC screening (see Section 4.2.2). In addition, barium and cobalt were detected in these samples at concentrations above background. The cumulative cancer risk and hazard index estimated for exposure to these chemicals, using the highest concentrations detected, is summarized below:

Area	Chemicals (concentration in mg/kg)	Cumulative Cancer Risk	Hazard Index
AOC No. 5 (Test Range 16)	RDX (0.68), HMX (1.0), Ba (110), Co (7.3)	7E-07	0.1

Cumulative cancer risk and hazard index calculations demonstrate that residual levels of these chemicals in the processed materials do not pose a threat to human health. Risk assessment calculations are included as Appendix R.

6.2.1.4 AOC No. 8 - Former Building 010

Explosive compounds RDX, HMX, and 1,3,5-TNB were detected in excavation confirmation samples from the former Building 010 area. The cumulative cancer risk and hazard index estimated for exposure to explosive compounds in soil from the former Building 010 area, using the highest concentrations detected and the new chemical-specific ABS values (see Section 6.2), are summarized below:

Area	Chemicals (concentration in mg/kg)	Cumulative Cancer Risk	Hazard Index
AOC No. 8 (former Building 010)	RDX (1.4), HMX (0.51), 1,3,5-TNB (3.1)	3E-07	0.01

Cumulative cancer risk and hazard index calculations demonstrate that residual levels of explosive compounds in the former Building 010 area do not pose a threat to human health. Risk assessment calculations are included as Appendix R.

6.2.1.5 Other Miscellaneous Areas

Dioxins and perchlorate were detected in soil samples collected from other miscellaneous areas of concern. Specifically, dioxins were detected in one soil sample collected from the approximate location of a former burn oven near Building 534, and perchlorate was detected the concrete block area and stockpiles in Test Range 1C. The total cancer risk and hazard index estimated for exposure to these chemicals in these areas, using the highest concentrations detected, is summarized below:

Area	Chemicals (mg/kg, unless otherwise noted)	Cumulative Cancer Risk	Hazard Index
Building 534	Dioxin TEQ (0.435 pg/g)	1E-07	NA
Concrete block area	Perchlorate (0.32)	NA	0.02
Stockpiles in Test Range 1C	Perchlorate (0.1)	NA	0.01

NA – Not applicable

Applicable cumulative cancer risk and hazard index calculations demonstrate that residual levels of dioxins and perchlorate in these areas do not pose a threat to human health. Risk assessment calculations are included as Appendix R.

6.2.2 Risk Evaluation of Chemicals Detected in BA Samples

As described in previous sections of this report, several chemicals were detected in BA samples. Further, several metals were detected at concentrations exceeding background levels. These chemicals and locations where detected are summarized in the following table:

Analytes	Highest Concentration (Area)	Other Locations
Metals (exceeding background)		
Barium (Ba)	202 mg/kg (UST excavation)	164 mg/kg (storage bunkers) 126 mg/kg (003 septic excavation)
Chromium (Cr)	18 mg/kg (storage bunkers)	
Cobalt (Co)	13 mg/kg (storage bunkers)	7.61 mg/kg (037 septic excavation)
Explosive Compounds		
RDX	2.6 mg/kg (Bldg 551W)	0.90 mg/kg (Bldg 006 trough) 0.70 mg/kg (storage bunkers - concrete)
HMX	4.5 mg/kg (Bldg 010 wipe)	0.54 mg/kg (Bldg 006 trough)
Miscellaneous		
Perchlorate	0.04 mg/kg (storage bunkers - concrete)	0.01 mg/kg (storage bunkers - soil)

The potential threat to human health posed by residual chemicals in building material (e.g. concrete and debris) was also evaluated using the PEA (DTSC, 1999b) to determine how demolition materials should be handled (offsite disposal or recycling). The assumption of actual human exposure from ingestion of concrete and metal is unlikely and overly conservative.

6.2.2.1 Former Building 006 Trough

Explosive compounds RDX and HMX were detected in a soil sample collected from the trough south of former Building 006. The cumulative cancer risk and hazard index estimated using the highest concentration detected is summarized below:

Area	Chemicals (concentration in mg/kg)	Cumulative Cancer Risk	Hazard Index
Building 0006 trough	RDX (0.90), HMX (0.54)	2E-07	0.005

Cumulative cancer risk and hazard index calculations demonstrate that residual levels of explosive compounds in the former Building 006 area do not pose a threat to human health. Risk assessment calculations are included as Appendix R.

6.2.2.2 Former Building 010 Demolition Materials

The explosive compound HMX was detected in wipe samples from the former Building 010 area. The cumulative cancer risk and hazard index estimated using the highest concentration detected is summarized below:

Area	Chemicals (concentration in mg/kg)	Cumulative Cancer Risk	Hazard Index
Building 010 Wipe	HMX (4.5)	NA	0.001

As noted earlier, building materials were evaluated using the PEA to determine how demolition materials should be handled (offsite disposal or recycling). The assumption of actual human exposure from ingestion of metal is unlikely. These materials were removed from the site for disposal. Risk assessment calculations are included as Appendix R.

6.2.2.3 Storage Bunkers

Concentrations of metals statistically higher than background were detected in soil samples collected from storage bunkers. In addition, perchlorate was detected in 1 of the 16 soil samples from the storage bunkers. RDX and perchlorate were detected in concrete samples. The cumulative cancer risk and hazard index estimated for exposure to these chemicals, using the highest concentrations detected, is summarized below:

Area	Chemicals (concentrations in mg/kg)	Cumulative Cancer Risk	Hazard Index
Storage Bunkers - soil	Ba (164), Cr (18), Co (13), perchlorate (0.01)	9E-07	0.15
Storage Bunkers – concrete	RDX (0.7), perchlorate (0.04)	1E-07	0.01

Cumulative cancer risk and hazard index calculations demonstrate that levels of chemicals from soil beneath the storage bunkers and concrete do not pose a threat to human health. The bunker building materials were evaluated using the PEA to determine how future demolition materials should be handled (offsite disposal or recycling). Risk assessment calculations are included as Appendix R.

6.2.2.4 Former Building 551W

Explosive compound RDX was detected in a soil sample collected from Former Building 551W. The cumulative cancer risk and hazard index estimated for exposure to this compound is summarized below:

Area	Chemicals (concentration in mg/kg)	Cumulative Cancer Risk	Hazard Index
Building 551W	RDX (2.6)	5E-07	0.01

Cumulative cancer risk and hazard index calculations demonstrate that residual levels of RDX in Building 551W do not pose a threat to human health. Risk assessment calculations are included as Appendix R.

6.2.2.5 Septic Tank and UST Excavation

Two metals (barium and cobalt) were detected in the septic tank and UST excavation confirmation samples at concentrations above background. The cumulative cancer risk and hazard index estimated for exposure to these chemicals, using the highest concentrations detected, is summarized below:

Excavation Area	Chemicals (concentration in mg/kg)	Cumulative Cancer Risk	Hazard Index
003 Septic	Ba (126)	NA	0.05
037 Septic	Co (7.6)	6E-07	0.05
UST	Ba (202)	NA	0.09

NA – Not Applicable

Applicable cumulative cancer risk and hazard index calculations demonstrate that residual levels of these chemicals in the septic tank and UST excavations do not pose a threat to human health. Risk assessment calculations are included as Appendix R.

7.0 DATA QUALITY REVIEW AND PERFORMANCE SYSTEM AUDITS

Throughout the sampling program for the RFI and CM/BAs, quality assurance and quality control (QA/QC) procedures were followed to demonstrate the proper collection of environmental samples and laboratory measurements of chemical concentrations. Field quality control samples were collected and laboratory quality control measures were used to validate field activities, collection methodologies and analytical measurements, and to identify possible discrepancies within the data set. The QA/QC procedures were implemented in accordance with the DTSC-approved RFI QA plan (McLaren/Hart, 1999a, b; Geomatrix, 2006a).

This section includes the results of the data validation and usability review, and completeness assessment. Based on review of sampling protocols, procedures, and results, conclusions were drawn regarding the validity of the CM and BA data presented in this report. Analytical results of samples that met the QA/QC criteria were considered to be in compliance. Anomalous QA/QC sample results and data qualifiers are discussed below.

7.1 DATA QUALITY REVIEW

Analytical data packages provided by the contract laboratories were reviewed to determine whether data were acceptable to meet the intended use(s) following established U.S. EPA guidelines (U.S. EPA 1999 and 2002) and best professional judgment. Laboratory data generated during the investigation were reported by the following:

- TestAmerica/Sequoia (included as Appendix A),
- Calscience (included as Appendix B), and

- Alta (included as Appendix C).

All three are state-certified commercial laboratories. Analytical results were provided in Level II data packages (data packages included all information except for raw data, worksheets, chromatograms, and injection logs). The data packages were reviewed for completeness, summary/RCRA forms, temperatures, holding times, and QA/QC parameters. The data packages were complete, included appropriate narrative/RCRA forms, were appropriately chilled during transportation, and were analyzed within established holding times. Some exceptions were identified in the following:

- TestAmerica data package S605199 equipment blank sample EB2 was analyzed two days past the holding time and concrete samples were extracted for explosive compound analysis two days past the holding times, and thus these sample results were qualified as estimated and "UJ" flagged (see Tables 19, 21, 24, and 34).

- TestAmerica data package S605259 equipment blank samples EB3, EB4, and EB6 were analyzed two days past the holding time, and thus these sample results were qualified as estimated and "UJ" flagged (see Tables 33 and 34).

- Calscience data packages 06-10-1536 and 07-06-1071 reported receiving samples at 0.5°C and 1.3°C, respectively, less than the ideal temperature range of 4 ± 2°C. Sample results are not expected to be affected by this slightly lower temperature and therefore are not qualified.

- Calscience data package 06-11-0878 reported receiving samples at 15.2°C, greater than the ideal temperature range of 4 ± 2°C. The samples were received at the laboratory approximately 2 to 2½ hours after being collected and thus, there was not enough time for the temperature in the cooler to have come to equilibrium and chilled to the ideal temperature range. The sample was not exposed to higher temperatures than its ambient condition and therefore, the sample results were not affected by this temperature and are not qualified.

The field and laboratory QA/QC samples utilized during CM and BA sampling are described below. Data evaluation forms are included as Appendix S.

7.1.1 Field Quality Control Samples

Field quality control samples included:

- field duplicate samples

- equipment blanks

- decontamination water sample
- trip blank

Field QA/QC sample types, results, and evaluations are outlined in the following sections. The total number of field QC samples collected during the CMCRA is summarized on Table 28.

7.1.1.1 Field Duplicate Samples

The collection of field duplicate samples provides for the evaluation of sampling and analytical precision by comparing analytical results for two identical or nearly identical samples. Field duplicates were submitted to the laboratories as "double blind" samples (i.e., the laboratory did not know if any sample was a duplicate). Variations between the original sample and the field duplicate sample result greater than 50 percent relative percent difference (RPD) was considered imprecise. The field duplicate RPD is not calculated if the primary and duplicate results are not greater than five times the reporting limit. In cases where the results are not greater than five times the reporting limit, the difference between the samples should be less than the value of the reporting limit.

CM Field Duplicate Results

A total of 18 field duplicate soil samples (consisting of 118 analytes) were collected and analyzed during the implementation of CMs (Table 28). The original sample and field duplicate sample analytical results and RPD are summarized in Tables 29 and 30, respectively. Field duplicate sample variations greater than 50 percent were noted in 4 of the samples as follows:

- In Sequoia data package S605258, the RPD for mercury was 155 percent for sample BG-10-05 and duplicate sample SW10-08. Thus the mercury results in these samples were qualified as estimated and "J" flagged.
- In Calscience data package 07-06-1852, the RPD for 1,3,5-TNB was 53 percent for sample N3A and duplicate sample SW10A. Thus the 1,3,5-TNB results in these samples were qualified as estimated and "J" flagged.
- In Calscience data package 07-01-1701, the RPD was not calculated for HMX and RDX in sample SB-3-10 and duplicate sample SW10-1 because results in one sample were below reporting limits. Results were greater than five times the reporting limit, and thus the HMX and RDX results in these samples were qualified as estimated and "J" flagged.

- In Calscience data package 07-01-1623, the RPD for perchlorate was 78 percent for sample C-SW02-S-53-5 and duplicate sample SW10-01. Thus the perchlorate results in these samples were qualified as estimated and "J" flagged.

No other analytes were detected in the CM field duplicate samples outside on the control limits.

BA Field Duplicate Results

A total of 15 field duplicate soil samples (consisting of 138 analytes) were collected and analyzed during the implementation of BAs (Table 28). The original sample and field duplicate sample analytical results and RPD are summarized in Tables 31 and 32, respectively. Field duplicate sample variations greater than 50 percent were noted in one sample as follows:

- In TestAmerica data package S605199, the RPD for nitroglycerin was 151% for sample 036-DRAIN-04-S and duplicate sample SW10-02. Thus, the nitroglycerine results in these samples were qualified as estimated and "J" flagged.

No other analytes were detected in the BA field duplicate samples outside the control limits.

7.1.1.2 Equipment Blanks

Equipment blanks provided a check on possible contamination from non-disposable sampling instruments used to collect and transfer samples from the point of collection into sample containers. Equipment blank samples were composed of analytically certified organic-free water (HPLC-grade water) provided by the laboratories (see Section 7.1.1.3). After sampling equipment was decontaminated, equipment blank samples were collected by pouring this water over the sampling equipment and collecting the water in the appropriate sample container(s).

CM Equipment Blank Results

A total of 13 equipment blanks (consisting of 97 analytes) were collected and analyzed during the CMs (Table 28). Sample results are summarized on Table 33. Six analytes were identified in the CM equipment blanks as follows:

- Chromium, copper, nickel and zinc were detected in TestAmerica data package S605259 equipment blank EB4 at a concentrations of 0.06, 0.02, 0.02, and 0.02 mg/L, respectively. These metals were detected in the associated samples at concentrations that were at least 10 times greater than the blank contamination, and therefore, sample results were not qualified.

- RDX and tetryl were detected in equipment blank SW-2 at concentrations of 1.7 and 1.2 µg/L, respectively. Tetryl was not detected in the associated samples and RDX

was detected at concentrations significantly greater than the blank detection. Thus associated sample results were not qualified.

No other analytes were detected in the CM equipment blank samples and none of the data was qualified.

BA Equipment Blank Results

A total of 10 equipment blanks (consisting of 94 analytes) were collected and analyzed during the BAs (Table 28). Sample results are summarized on Table 34. One analyte was identified in BA equipment blanks as follows:

- Zinc was detected in Calscience data package 06-10-1669 equipment blank EB1 at a concentration of 0.05 mg/L. Zinc was detected in the associated samples at concentrations that were at least 10 times greater than the blank contamination, and therefore, sample results were not qualified.

No other analytes were detected in the BA equipment blank samples and none of the data was qualified.

7.1.1.3 Decon Water Samples

The contract laboratory provided approximately 60 gallons of the HPLC-grade water for use in equipment decontamination. This water was used throughout the CM/BA sampling activities. A sample of the water identified as RB-1 was collected on May 10, 2006, and analyzed for metals and SVOCs. No analytes were detected in these samples.

7.1.1.4 Trip Blank

Trip blanks were collected to evaluate the potential cross-contamination of VOC samples during transport. One trip blank was submitted with each sample cooler which contained samples being analyzed for VOCs using EPA Method 8260B. Trip blanks were prepared by the analytical laboratory using analytically-certified organic-free water (HPLC-grade water) and shipped with the sample containers for delivery to the project. Detection of VOCs was considered a possible indication that cross-contamination occurred during transport or analysis.

One trip blank was analyzed during this investigation. A trip blank was collected during the BA activities and was included in Calscience data package 07-06-1071. No VOCs were detected in the trip blank sample.

7.1.2 Laboratory Quality Control Samples

Four types of laboratory QC samples were used to account for variability and sources of contamination in various stages of the analytical process. Laboratory QC samples included:

- method blanks,
- matrix spike/matrix spike duplicates (MS/MSD),
- laboratory control samples/laboratory control sample duplicates, and
- surrogates.

Laboratory QC/QC samples were prepared, analyzed, and evaluated per EPA SW-846 requirements and the DTSC-approved RFI quality assurance plan (McLaren/Hart, 1999a, b; Geomatrix, 2006a). The types, frequency, and numbers of the CM/BA laboratory quality control samples analyzed during this investigation are summarized in Table 35.

7.1.2.1 Method Blanks

Method blanks are samples of analytically certified organic-free (HPLC-grade) water for organic parameters and deionized-distilled water for inorganic parameters that were analyzed by the laboratory to demonstrate that the analytical process did not introduce chemicals of concern and cross-contaminate field samples. Method blank samples were run in accordance with the guidelines established in SW-846 for each analysis at the designated frequency. Detection of analytes in method blanks above reporting limits was considered to be a possible indication of laboratory cross-contamination.

The number and types of method blanks are summarized on Table 35.

CM Method Blank Results

A total of 32 method blanks (consisting of 243 analytes) were collected and analyzed during the CMs (Table 35). Five analytes were detected in the method blank samples as reported on Table 36 and summarized below:

- Zinc was detected in Sequoia data package S605258 method blank at a concentration of 0.38 mg/L. Zinc was detected in the associated samples at concentrations that were at least 10 times greater than the blank contamination, and therefore, sample results were not qualified.

- Vanadium was detected in Calscience data package 06-07-0235 method blank at a concentration of 0.285 mg/kg. Vanadium was detected in the associated samples at concentrations that were at least 5 times greater than the blank contamination, and therefore, sample results were not qualified.

- OCDD, OCDF, and 1,2,3,4,6,7,8-HpCDF were detected in Alta data package OMB001 method blank at a concentration of 0.178, 0.278, and 0.14 pg/g. These chemicals were detected in the associated samples at concentrations that were at least 5 times greater than the blank contamination, and therefore, sample results were not qualified.

No other analytes were detected in the method blank samples. None of the CM data were qualified because of method blank results.

BA Method Blank Results

A total of 30 method blanks (consisting of 633 analytes) were collected and analyzed during the BAs (Table 35). One analyte was detected in the method blank samples as reported on Table 37 and summarized below:

- Zinc was detected in Calscience data package 06-10-1669 equipment blank EB1 at a concentration of 0.05 mg/L. Zinc was detected in the associated samples at concentrations that were at least 10 times greater than the blank contamination, and therefore, sample results were not qualified.

No other analytes were detected in the method blank samples. None of the BA data were qualified because of method blank results.

7.1.2.2 Matrix Spike/Matrix Spike Duplicate Samples

Matrix spike and matrix spike duplicate (MS/MSD) samples are used to determine whether the sample matrix (i.e., soil or water) interfered with the sample extraction or analytical process. MS samples were prepared in the laboratory by adding a known amount of an analyte into the sample matrix (spiking) and measuring how much was recovered during sample analysis. The MSD consists of a second aliquot of the same sample matrix spiked separately. The results of the spike analyses are expressed as a percent recovery of the added chemical, and the results of the duplicate are expressed as relative percent difference from the original sample. The RPD is used to evaluate the precision (consistency) of a particular analysis. MS/MSD samples were analyzed in accordance with the guidelines established in SW-846 for each analysis at the designated frequency.

The number and types of MS/MSD samples are summarized on Table 35.

CM Matrix Spike and Matrix Spike Duplicate Results

A total of 32 MS samples (226 analytes) and 32 MSD samples (226 analytes) were analyzed during the CMs (Table 35). The results of CM MS/MSD samples outside of control limits are listed on Table 36 and summarized as follows:

- The mercury MS/MSD associated with TestAmerica package S605259, batch 6050376 were reported at 67 and 65 percent, respectively, less than the control limit of 75 to 125 percent. The detected mercury results in the associated samples (A1D-01-0.5, A1D-01-3, and C-AC05-S-06-0.5) were qualified as estimated and "J" flagged, and the non-detect mercury result (C-AC05-S-05-0.5) was flagged as "UJ."

- The metals MS/MSD associated with Sequoia package S605258, batch 6050232 were low for all analytes. The detected analytes in the associated samples were "J" flagged and the non-detect analytes were qualified as "UJ."

- The metals MS/MSD associated with TestAmerica package S605259, batch 6050256 were low for all analytes, with exception of antimony. The detected analytes in the associated samples were "J" flagged and the non-detect analytes were qualified as "UJ." Antimony was recovered in the MS/MSD at 22 and 25 percent, respectively. Antimony was not detected in the associated samples, and thus results were rejected and flagged with an "R."

- The antimony in Calscience package 06-07-0235, batch 060707L06 was recovered in the MS/MSD at 27 and 28 percent, respectively. Antimony was not detected in the associated samples, and thus results were rejected and flagged with an "R." The MSD recovery for lead was 176 percent, greater than the control limits of 75 to 125 percent. Thus the lead results in the associated samples were qualified as estimated and "J" flagged.

- The perchlorate MS/MSD associated with Calscience package 06-10-1456, batch 061028L03 was reported at 126 and 128 percent, respectively, greater than the control limit of 80 to 125 percent. The spiked sample had a high concentration of perchlorate and required a dilution. The associated LCS/LCSD was within the control limits. The perchlorate result in the associated sample C-SW02-S-31-0.5 was qualified as estimated and "J" flagged.

- The perchlorate MS/MSD associated with Calscience package 06-12-0955, batch 061220L02 was reported at 339 and 340 percent, respectively, greater than the control limit of 80 to 125 percent. The associated samples did not have detection of perchlorate, and thus the results were not qualified.

- The perchlorate MS/MSD associated with Calscience package 06-12-0955, batch 061220L01 was reported at 131 and 131 percent, respectively, greater than the control limit of 80 to 125 percent. The associated LCS/LCSD was within the control limits, and thus the results in the associated samples were not qualified.

- The tetryl in Calscience package 06-07-0235, batch 060707L06 was recovered in the MS/MSD at 174 percent, greater than the control limits. The associated LCS/LCSD was within the control limits, and thus the results were not qualified.

A total of 67 MS/MSD sample results were outside of control limits, of which 61 were qualified (see Table 36). The results of the remaining MS/MSD samples from CMs were within the control limits.

BA Matrix Spike and Matrix Spike Duplicate Results

A total of 27 MS samples (435 analytes) and 27 MSD samples (435 analytes) were analyzed during the BAs (Table 35). The results of BA MS/MSD samples outside of control limits are listed on Table 37 and summarized as follows:

- The mercury MS/MSD associated with TestAmerica package S605259, batch 6050376 were reported at 67 and 65 percent, respectively, less than the control limit of 75 to 125 percent. The detected mercury results in the associated sample (032-01-S-0.5) were qualified as estimated and "J" flagged, and the non-detect mercury results (024-01-S-0.5 and 025-01-S-0.5) were flagged as "UJ".

- The antimony, selenium, and thallium MS/MSD associated with Calscience package 06-10-1669, batch 061030L07 were less than control limits. These chemicals were not detected in the associated samples and therefore, the antimony, selenium, and thallium results were qualified as estimated and "UJ" flagged. Barium MS/MSD results do not apply because the sample exceeded the spike concentration by a factor of four and thus, sample results were not qualified.

- The antimony MS/MSD associated in Calscience package 06-12-0954 were less than control limits. This compound was not detected in the associated samples and therefore, the antimony results were qualified as estimated and flagged as "UJ." Thallium MS recovery was reported at 73 percent, less than the control limit of 75 to 125 percent. The associated MSD, the MS/MSD RPD, and the LCS/LCSD were within the control limits and thus, the results were not qualified. Barium MS/MSD results do not apply because the sample exceeded the spike concentration by a factor of four and thus, the sample results were not qualified.

- The zinc MS/MSD associated with Calscience package 07-06-1199, batch 070619S14 was within control limits, but the RPD of 12 percent exceeded the control limits of 0 to 8 percent. The associated LCS/LCSD was within the control

limits. The zinc result in the associated water sample 037-outflow was qualified as estimated and "J" flagged.

- The 2,4,6-TNT, RDX, and tetryl MS/MSD associated with TestAmerica package S605199, batch NPE3346 were less than the control limits. The 4-amino-2,6-DNT results were greater than the control limits. The data qualified earlier and flagged "J" or "UJ" for exceeding hold times. No other data qualifies were added.

- The tetryl, 1,3,5-TNB, and 2,4,6-TNT MS/MSD associated with Calscience package 06-07-1536, batch 061102S08 were less than the control limits. The MS/MSD, however, was performed with a sample not associated with the site. The LCS/LCSD were within the control limits and thus, sample results were not qualified.

- The tetryl, 1,3,5-TNB, and 2,4,6-TNT MS/MSD associated with Calscience package 06-07-1536, batch 061102S08 were less than the control limits. The MS/MSD was preformed using a concrete matrix. The associated LCS/LCSD were within the control limits and thus, the sample results were not qualified.

- The recovery of TPH as motor oil in the MSD associated with Calscience package 07-06-1071, batch 070619B02 was reported at 133 percent, greater than the control limit of 64 to 130 percent. The associated MS, the MS/MSD RPD, and the LCS/LCSD were within the control limits and thus, the sample results were not qualified.

- The nitroglycerine MS/MSD associated with TestAmerica package S605199, batch 6E23011 was greater than the control limits. The concentration of the spiked sample was greater than five times the spike added and thus, the sample results were not qualified because of MS/MDS results (sample results were qualified earlier because of high RPD between the original sample and duplicate sample).

A total of 62 MS/MSD sample results were outside of control limits, of which 18 were qualified (see Table 37). The results of the remaining MS/MSD samples from BAs were within the control limits.

7.1.2.3 Laboratory Control Samples/Laboratory Control Sample Duplicates

Laboratory controls samples (LCS), also referred to as blank spikes, are prepared by the laboratory by adding a known amount of a pure analyte into analytically certified, organic-free (HPLC-grade) water (spiking) and measuring how much of the injected chemical was recovered during the analysis. The laboratory control sample duplicate (LCSD) consists of a second aliquot of the same sample spiked separately. The LCS/LCSD is carried along with the samples through the entire sampling preparation and analysis sequence. The results of the LCS/LCSD analyses, expressed as percent recovery of the added (spiked) chemical, were used

to provide information on the accuracy of the analytical method and on the laboratory's performance. LCS/LCSD samples were analyzed in accordance with the guidelines established in SW-846 for each analysis at the designated frequency.

CM LCS/LCSD Results

A total of 32 LCS samples (243 analytes) and 26 LCSD samples (178 analytes) were analyzed during the CMs (Table 35). The results of CM LCS/LCSD samples outside of control limits are listed on Table 36 and summarized as follows:

- The RPD between the LCS and LCSD results for 1,3,5-TNB and 2,4,6-TNT associated with Calscience package 07-06-0976 were reported at 21 and 22 percent, respectively, slightly higher than the upper control limit of 20 percent. The results of the LCS and LCSD were within control limits and thus, sample results were not qualified.

None of the CM data were qualified because of LCS/LCSD results.

BA LCS/LCSD Results

A total of 30 LCS samples (633 analytes) and 212 LCSD samples (364 analytes) were analyzed during the BAs (Table 35). None of the LCS/LCSD for the BA samples were outside of control limits (see Table 37).

7.1.2.4 Surrogate Spikes

Surrogate spikes are chemicals with properties similar to analytes of interest that are added to the sample prior to extraction and analysis. The amount of the surrogate spike added was known, and comparison with the quantity reported in the analysis indicated the accuracy of the extraction method and the analytical instrument in measuring the surrogate chemicals and, therefore, the analytes of interest. The methodology for calculating percent recovery was similar to that for the MS and MSD samples. Surrogate spike results beyond control limits are a possible indication of inaccurate analytical measurements.

All but two of the surrogate recoveries were within control limits. Both occurred in TestAmerica package S605259.

CM Surrogate Spike Results

The surrogate recovery in an LCS sample analyzed for explosive compounds of 120 percent associated with batch 6053636 was greater than the control limit of 70 to 118 percent.

However, the other LCS recoveries were all within the control limits, and thus the results were not qualified.

BA Surrogate Spike Results

The surrogate was not recovered in sample EB7 analyzed for explosive compounds. The sample results were qualified as estimated and "UJ" flagged (see Table 34).

7.2 PERFORMANCE SYSTEM AUDITS EVALUATION

To assure that quality control measures were properly implemented, systems audits were performed on field activities and laboratory data.

7.2.1 Field Documentation Audits

Field documentation quality control checks were made by the sampling team leader(s) and/or Project Manager. The team leader(s) made sure that the proper documentation was maintained daily and that the chain-of-custody forms agreed with the field log entries. Field logs were reviewed for consistency, completeness, and accuracy. The team leader(s) initialed the last page of each day's entry as an indication that the field documentation audit was undertaken.

Copies of field notes, including the random number generating spreadsheet used to select composite sample locations, are included as Appendix O. Photographs documenting key CM activities are included as Appendix P.

7.2.2 Laboratory Report Documentation Audit

The data quality review procedures discussed in Section 7.1 included the review of the analysis of equipment blanks, sets of field duplicate samples, sets of MS/MSD samples, and laboratory quality control samples. These reviews were generally performed consistent with the U.S. EPA Contract Laboratory Program (CLP) National Functional Guidelines for Organic Data Review (U.S. EPA, 1999) and Inorganic Data Review (U.S. EPA, 2002). Generally, the quality assurance data met the U.S. EPA acceptance criteria. In a few instances that were described above, QA/QC results deviated from the ideal ranges of the CLP guidelines. However, in those instances, the data were also evaluated in terms of the magnitude of the deviation and the overall results and data qualifiers were used where necessary.

Data validation forms are included as Appendix S.

Field and laboratory quality control samples were evaluated for completeness. Completeness is a measure of the amount of valid data (unqualified) obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. For this investigation, completeness was calculated by the following equation:

Completeness = (number of valid measurements) / (number of measurements) × 100

The field and laboratory completeness objective for this project was greater than 90 percent.

The completeness evaluation of the individual field quality control sampling plan included the following results:

- CM field duplicate samples — 113 of 118, or 96 percent
- CM equipment blanks — 92 of 98, or 94 percent
- BA field duplicate samples — 137 of 138, or 99 percent
- BA equipment blanks — 93 of 94, or 99 percent
- BA trip blanks — 66 of 66, or 100 percent

The overall completeness for CM/BA field quality control samples was 501 valid (unqualified) measurements of 514 total measurements, for a completeness of 97 percent.

The completeness evaluation of the CM laboratory quality control samples included the following results:

- CM method blanks — 238 of 243, or 98 percent
- CM MS/MSD — 391 of 452, or 87 percent
- CM LCS/LCSD — 421 of 421, or 100 percent
- CM surrogate spikes — 96 of 97, or 99 percent

The completeness evaluation of the BA laboratory quality control samples included the following results:

- BA method blanks — 632 of 933, or 99 percent
- BA MS/MSD — 852 of 870, or 98 percent

- BA LCS/LCSD — 997 of 997, or 100 percent
- BA surrogate spikes — 152 of 153, or 99 percent

The overall completeness for CM/BA laboratory quality control samples was 3,779 valid measurements (within laboratory control limits) of 3,866 total measurements, for a completeness of 98 percent.

The data qualifiers described in Sections 7.1 were added to the CM and BA results. No other quality assurance data were identified as outside laboratory acceptance criteria. Overall, the results of the quality control measures performed on field activities and laboratory data indicated that the results of this report are of sufficient quality to support the conclusions presented herein.

8.0 COMPLETENESS OF CM/BA WORK

A total of 16 SWMUs and 13 AOCs were identified at the facility and evaluated during the RFI (McLaren/Hart, 1999a, b). Nineteen of these areas were assigned "no further action" status. The remaining 10 areas required corrective measures (McLaren/Hart, 1999c). Other areas of the facility were also investigated per DTSC requests. The results of the initial implementation of CMs were described in the CMCR (Geomatrix, 2006a) that was reviewed and approved by DTSC.

Nine areas were identified for further investigation to support ongoing CMs and site assessment activities. In addition, eight buildings/structures were identified for additional BA activities. Recommendations for additional studies were described in the CMCR (Geomatrix, 2006a) and/or request by DTSC based on its review of the CMCR and other facility documents (DTSC, 2006a, b). The following subsections describe implementation of CM/BAs in the remaining areas. A "no further action" status is recommended for each area.

8.1 CM CONCLUSIONS AND RECOMMENDATIONS

Additional sampling was proposed in the CM/BA work plans (Geomatrix, 2006b, e) for the nine areas listed below:

- SWMU No. 2 – Landfill (Area 6)
- AOC No. 5 – Test Range 16

- AOC No. 8 – Former Building 010
- AOC No. 10 – Metal Forming Area
- AOC No. 13 – Area 10 (or Three-Tier Test Area)
- Area 1D
- Building 534 Area
- soil stockpiles in Test Range 1C
- concrete block stockpile area

Below is a summary of the significant sampling and corrective measures that occurred in these remaining areas and final recommendations for each area.

8.1.1 SWMU No. 2 – Former Landfill or Area 6

Beginning in 2001, CM Nos. 1, 2, and 3 were implemented in SWMU No. 2, the former landfill (Area 6). The CMs were implemented following the DTSC-approved work plan. Confirmation sample results/risk assessments indicated that residual concentrations of chemicals did not pose a threat to human health. However, in two small areas of the former landfill, fill materials remained in place to protect the access road.

In 2006/2007, the remaining CMs were completed in the former landfill area. The two small portions of former landfill materials that remained beneath the access road were excavated and CM No. 1 was completed. The screened, MEC-free soil was removed for off-site disposal. Soil borings/surface sample locations were placed in the area of the former landfill to define the vertical and lateral extent of residual perchlorate. Three small areas where perchlorate was detected at slightly elevated concentrations were excavated and soil was removed for off-site disposal. The residual levels of perchlorate detected in soil, bedrock, and subsurface water samples collected from the former landfill area do not pose a risk to human health.

All necessary CMs have been completed and no additional CMs are required in SWMU No. 2, the former landfill. Thus, Geomatrix recommends that a “no further action” status be assigned to this area.

8.1.2 AOC No. 5 – Test Range 16

Beginning in 2001, CM Nos. 1 and 2 were implemented in Test Range 16 (Geomatrix, 2006a). MEC-containing materials were excavated and processed through the screening plant, and RDX-impacted soil was removed from the site. Subsequently, a portion of Test Range 16 was used for ordnance demilitarization activities. Thus, the CMs could not be completed in Test Range 16 at that time (Geomatrix, 2006a).

Because of Aerojet's decision to use the CDC for demilitarization, Test Range 16 closure activities were completed. The area where demilitarization activities occurred after 2001 was excavated and CM No. 1 completed in 2006/2007. Calculations of the cumulative health effect of the residual chemicals detected in soil and bedrock samples collected from the Test Range 16 area demonstrated that these residual levels of chemicals do not pose a threat to human health.

All necessary CMs have been completed and no additional CMs are required in AOC No. 5, Test Range 16. Thus, Geomatrix recommends that a "no further action" status be assigned to this area.

8.1.3 AOC No. 8 – Former Building 010

During the 1998 building assessment studies, RDX-impacted soil was detected beneath a portion of Building 010. Additional characterization of Building 010 was recommended in the CMCR (Geomatrix, 2006a) and DTSC recommended that remedial measures be performed as part of the CMs for Building 010 (Geomatrix, 2006b). To access the soil beneath the building, Building 010 was demolished in 2006 and the resultant debris/rubble was removed for off-site disposal.

In 2006/2007, soil borings were advanced in the area to define the vertical and lateral extent of RDX-impacted material beneath former Building 010. The RDX-impacted soil was subsequently excavated and removed for off-site disposal. Post-excavation soil samples were collected and analyzed for explosive compounds. The residual levels of explosive compounds detected in these soil samples did not pose a risk to human health. Thus, the excavation was backfilled with clean borrow material from the site.

All necessary CMs have been completed and no additional CMs are required in AOC No. 8, former Building 010. Geomatrix recommends that a “no further action” status be assigned to this area.

8.1.4 AOC No. 10 – Metal Forming Area

During implementation of the CMs in 2001, perchlorate-containing soil excavated from the former landfill was temporarily stockpiled in the Metal Forming Area before being transported to Test Range 1C for ordnance screening (Geomatrix, 2006a). Four post-use soil samples were collected from the stockpile area and analyzed for explosive compounds and perchlorate. No explosive compounds were detected. Perchlorate was detected in three of the four samples, but not at levels that posed a risk to human health. Thus, Geomatrix recommended that a “no further action” status be assigned to AOC No. 10.

Before adopting a “no further action” status, DTSC requested additional assessment of perchlorate levels in the Metal Forming Area. In 2006, Geomatrix measured and established four roughly equal-dimension grids in the former Metal Forming Area and collected additional confirmation soil samples from each grid for perchlorate analysis. Perchlorate was not detected in any of the soil samples.

No CMs are required in AOC No. 10, Metal Forming Area. Geomatrix recommends that a “no further action” status be assigned to this area.

8.1.5 AOC No. 13 –Area 10 (or Three-Tier Test Area)

Cadmium was detected in a soil sample collected in 1998 from AOC No. 13, Area 10 at a concentration exceeding background levels, but not at a concentration that posed a threat to human health. Thus, Geomatrix recommended that a “no further action” status be assigned to AOC No. 13, Test Area 10 (Geomatrix, 2006a). Before adopting a “no further action” status, DTSC requested additional assessment of cadmium levels in the area. In 2006, four additional soil samples were collected in the Area 10 and analyzed for cadmium. Cadmium was not detected in any of the soil sample.

No CMs are required in AOC No. 13, Area 10. Geomatrix recommends that a “no further action” status be assigned to this area.

8.1.6 Area 1D

Area 1D, identified on historical facility maps as a scrap yard, was not addressed during the initial RFI studies. Thus, DTSC requested that soil samples be collected from the area. In 2006, soil samples were collected from Area 1D and analyzed for explosive compounds, perchlorate, and metals. No explosive compounds or perchlorate were detected in the soil samples, and metal results were within the background levels.

No CMs are required in Area 1D. Geomatrix recommends that a “no further action” status be assigned to this area.

8.1.7 Building 534 Area

A burn oven was reportedly located immediately west of Building 534. Soil samples were collected in 1998 from the approximate location of the former burn oven and analyzed for explosive compounds, CS, SVOCs, and chemical agents. None of these chemicals were detected in the soil samples. Thus, Geomatrix recommended that a “no further action” status be assigned to Building 534 (Geomatrix, 2006a). Before adopting a “no further action” status, DTSC requested assessment of dioxin levels. In 2006, soil samples were collected from the estimated location of the former burn oven and analyzed for dioxins. The TEQ concentrations detected in these samples did not pose a risk to human health.

No CMs are required in the Building 534 area. Geomatrix recommends that a “no further action” status be assigned to this area.

8.1.8 Soil Stockpiles Located in Test Range 1C

In 2001, processed soil resulting from implementation of CM No. 1 in various areas was stockpiled in two portions of Test Range 1C. Low concentrations of perchlorate were detected in the soil that had been removed from the landfill and processed during the implementation of CM No. 1. DTSC requested that confirmation samples be collected from the processed soil stockpiles in and around Test Range 1C for perchlorate analysis. In 2006, Geomatrix measured and established eight grids over the two stockpiles of processed soil, and collected soil samples for perchlorate analysis. Perchlorate was detected in five of the eight samples. Risk assessment calculations demonstrate that the concentrations of perchlorate detected in the soil samples do not pose a threat to human health.

No CMs are required in the Test Range 1C area. Geomatrix recommends that a "no further action" status be assigned to this area.

8.1.9 Concrete Block Stockpile Area

Several large blocks of steel-rebar-reinforced concrete were found in the central portion of the former landfill during the implementation of CMs in 2001 and were transported to a concrete pad area near the location of former Building 011. Perchlorate was detected in a concrete chip sample at a concentration of 0.48 mg/kg. DTSC recommended hauling the concrete blocks off site as soon as practicable, and sampling the underlying soil for perchlorate (Geomatrix, 2006b). Thus, the concrete blocks were removed from the site in 2006 and underlying soil was sampled for perchlorate.

Perchlorate was detected in one soil sample collected at a depth of 0.5 feet from the concrete block stockpile area. Additional deeper and step out samples were collected to assess the lateral and vertical extend of the perchlorate impact. Perchlorate was not detected in any of the deeper samples from this location, or in any of the four step-out borings advanced around the concrete block stockpile area. Likewise, perchlorate was not detected in the concrete core sample collected from the concrete pad where the concrete blocks were stockpiled. Risk assessment calculations demonstrate that the concentration of perchlorate detected in the soil sample did not pose a threat to human health.

All necessary CMs have been completed and no additional CMs are required in the concrete block stockpile area. Geomatrix recommends that a "no further action" status be assigned to this area.

8.2 BA CONCLUSIONS AND RECOMMENDATIONS

Additional BA sampling as part of the CM/BA work plans (Geomatrix, 2006b, e) was proposed for the nine areas listed below:

- Building 003
- Building 006 Complex
- Building 010 (see Section 8.1.3)
- Building 016

- Buildings 022 through 025 and 029 through 032
- Building 036
- Building 037 Septic Tank
- Building 551

Below is a summary of the significant activities that occurred in these remaining areas and final recommendations for each area. Conclusions and recommendations for former Building 010 were summarized in Section 8.1.3.

8.2.1 Former Building 003

A sink trap in Room 017 of former Building 003 was tagged by former Aerojet representative(s) as containing lead azide. This pipe was connected to a septic tank located south of Building 003. In 2006, Building 003 and its foundation were demolished and transported offsite for disposal so that the pipe could be exposed and removed.

A stabilization solution was poured into pipe to neutralize any potential residual lead azide in the pipe prior to removal activities. Upon removal of the pipe for off-site disposal, four soil samples were collected from the excavation area and analyzed for explosive compounds and lead. No explosive compounds were detected, and lead concentrations were within normal background levels. The liquid and solids in the septic tank were removed for off-site disposal. The septic tank was then excavated and removed for off-site disposal. No SVOCs, explosive compounds, or nitroglycerine was detected in the septic tank excavation confirmation soil sample. Risk assessment calculations demonstrate that the concentration of barium (only metal detected at a concentration above background levels) detected in the excavation bottom sample did not pose a threat to human health. Thus, the septic tank excavation was backfilled with native materials borrowed from a nearby area.

The necessary CMs and BAs have been completed and no additional activities are required in the former Building 003 area. Geomatrix recommends that a “no further action” status be assigned to this area.

8.2.2 Building 006 Complex

As part of these BA activities, the assessment of the Building 006 Complex and outflow area was completed in 2006. Concrete core and soil samples were collected from the Building 006

area and analyzed for explosive compounds. No explosive compounds were detected. Thus, Building 006 was demolished in 2006 and the debris transported offsite. Two soil samples were collected from beneath the trough exiting Building 006 and analyzed for explosives compounds. RDX and HMX were detected in one of the soil samples, but not at levels that posed a threat to human health.

The necessary CMs and BAs have been completed and no additional activities are required in the former Building 006 area. Geomatrix recommends that a “no further action” status be assigned to this area.

8.2.3 Former Building 016

An UST was reported to have been located beneath Building 016. Thus, in 2006, Building 016 and its foundation were demolished and transported offsite for disposal. The UST was in fact located beneath the building. Its top had been cut off and the UST backfilled with sand slurry. A soil sample was collected from the sand slurry and analyzed for explosive compounds, SVOCs, VOCs, TPH, and metals. No chemicals of concern were detected in the soil sample, and metal results were within normal background ranges. The UST and sand slurry were excavated in 2007 and removed for off-site disposal pursuant to County permit. Post-removal confirmation soil samples collected from the UST excavation, per county inspector’s request, did not detect any chemicals at concentrations that posed a threat to human health. Thus, the UST excavation was backfilled with native materials borrowed from a nearby area. UST closure documentation was provided by the county (URS, 2007b).

The necessary CMs and BAs have been completed and no additional activities are required in the former Building 016 area. Geomatrix recommends that a “no further action” status be assigned to this area.

8.2.4 Buildings 022 through 025 and 029 through 032

Buildings 022 through 025 and 029 through 032 were historically used as storage bunkers. In 2006, soil samples were collected from beneath the storage bunkers and analyzed for explosive compounds, perchlorate, and metals. Perchlorate was detected in one soil sample collected from Building 025. Metals barium, chromium, and cobalt were detected at concentrations above background levels, but not at levels that posed a threat to human health. Concrete core samples were also collected from the floors inside each storage bunker and analyzed for explosive compounds and perchlorate. RDX was detected in one sample from Building 032 and

perchlorate was detected in samples from Buildings 025 and 032. The levels of RDX and perchlorate do not pose a threat to human health.

No additional BAs are required in the Buildings 022 through 025 and 029 through 032 storage bunkers. Geomatrix recommends that a “no further action” status be assigned to these structures.

8.2.5 Building 036

Spilled propellant and room washdown water emptied into the subsurface drain located outside the west side of the Building 036. This drain emptied into a gully south of the building. In 2006, a soil sample was collected from the Building 036 outflow area and analyzed for explosive compounds and nitroglycerine. No explosive compounds were detected. Elevated concentrations of nitroglycerine were detected. Additional soil samples were collected from the area along the gully and analyzed for nitroglycerine; all results were non-detect. Nitroglycerine-impacted soil was excavated and removed for off-site disposal in 2007. Analytical results from the excavation confirmation soil samples were non-detect. Thus, the disturbed area was backfilled with native materials borrowed from a nearby area.

In 2007, the septic tank located east of Building 036 was excavated for off-site disposal. No SVOCs, explosive compounds, or nitroglycerine was detected in the excavation confirmation soil samples, and metal results were within normal background levels. Thus, the septic tank excavation was backfilled with native materials borrowed from a nearby area.

The necessary CMs and BAs have been completed and no additional activities are required in the Building 036 area. Geomatrix recommends that a “no further action” status be assigned to this area.

8.2.6 Building 037 Septic

In 1998, nitroglycerine and DNB were detected in a sample collected from the septic tank south of Building 037 at concentrations requiring remedial measures. Thus, in 2007 the septic tank and its solid contents were excavated and transported offsite. An excavation confirmation soil sample was collected and analyzed for metals, explosive compounds, nitroglycerine, and SVOCs. No explosive compounds, nitroglycerine, or SVOCs were detected in the sample. Metal results were within normal levels except for cobalt, but it was not detected at a level that

posed a threat to human health. Thus, the septic tank excavation was backfilled with native materials borrowed from a nearby area.

The necessary CMs and BAs have been completed and no additional activities are required in the Building 037 area. Geomatrix recommends that a "no further action" status be assigned to this area.

8.2.7 Former Building 551W

Washdown waters from Building 551 emptied into the filter house in former Building 551W before draining into the HEI Pond. Soil samples collected in 1998 from areas inside and around Building 551 and 551W, including the trough system between the two buildings, were analyzed for explosive compounds. Risk assessment calculations of the levels of explosive compounds detected in the soil samples demonstrated that remedial measures were not necessary, and the area was recommended for "no further action" status. DTSC recommended additional BA activities beneath former Building 551W. In 2006, a soil sample was collected from the former location of the filter assembly and analyzed for explosive compounds. RDX was detected in the sample, but not at a level that posed a threat to human health.

No additional BAs are required in the former Building 551W area. Geomatrix recommends that a "no further action" status be assigned to this area.

8.3 COMPLETENESS SUMMARY AND TERMINATION OF CORRECTIVE ACTION

Corrective measures described in the CMW (McLaren/Hart, 1999c) were implemented for the ten (10) SWMUs/AOCs at the facility identified as requiring cleanup/remediation. Corrective measures were implemented to protect human health and the environment from waste releases at the facility. The objectives of the CM/BAs were to achieve the following goals:

- Remediate and/or control the source(s) of releases to reduce or eliminate, to the extent practical, further releases of wastes or their constituents that may pose a threat to human health and the environment.
- Comply with remedial action objectives (cleanup standards).
- Protect human health and the environment.
- Comply with applicable federal, state, and local regulations for management of wastes.

As discussed in this report, implementation of the CM/BAs have been successful and have achieved the above-listed goals. Further, other suspect areas of the facility were investigated and determined not to pose a threat to human health. With the completion of CM/BAs described in the DTSC-approved CMCR (Geomatrix, 2006a) and in this CMCRA, Geomatrix recommends "no further action" status for soils in the SWMUs/AOCs, buildings, and other areas of potential concern identified at the facility.

Additional monitoring of subsurface water conditions will occur at two SWMUs. These areas and chemicals of concern include:

- SWMU No. 7 – former Redwater Pond: Subsurface water impacted by the explosive compound RDX, and to a lesser degree with HMX.
- SWMU No. 15 – Upper A12 Test Area: Subsurface water impacted by perchlorate, and to a lesser degree with uranium.

As noted in the CMCR (Geomatrix, 2006a), chemical impacts to subsurface waters beneath the former Redwater Pond and Upper A-12 Test Area are expected to decrease with time because source area soils have been removed from these areas. The additional subsurface water monitoring work in these areas will be addressed in a separate report.

With the completion of CM/BAs, the chemicals of interest/materials found at the facility, with the exception of ordnance, have been removed. Risk assessments have demonstrated that residual levels of chemicals do not pose a risk to human health. Therefore, Aerojet requests that DTSC terminate corrective action for the areas described in this CMCRA document.

9.0 REFERENCES

AMEC Geomatrix, 2008, Response to DTSC Comments on Review of "Draft Corrective Measures Completion Report Addendum, Aerojet Chino Hills, Chino Hills, California", August 21.

Aurora Industrial Hygiene (Aurora), 2006, Lead Paint Stabilization at Aerojet, 3100 Woodview Road, Chino Hills, California, December 8.

CAMCO Group, Inc., 1995, Asbestos & Lead Survey, Aerojet, Chino Hills Facility, October 30.

Department of Toxic Substances Control (DTSC), 1999a, Proposed Negative Declaration: Aerojet Ordnance — Chino Hills Facility, April 9.

DTSC, 1999b, Preliminary Endangerment Assessment Guidance Manual, California Environmental Protection Agency, Sacramento, California.

DTSC, 2000, Approval of Corrective Measures for Aerojet Ordnance — Chino Hills Facility, End of Woodview Road, Chino Hills, California, October 17.

DTSC, 2001, Clarification of Conditions of Approval for Corrective Measures, Aerojet Chino Hills Facility, January 4.

DTSC, 2005a, Review of Corrective Measures Completion Report and Building Assessment Report, Aerojet Chino Hills Facility, End of Woodview Road, Chino Hills, California (EPA ID NO. CAD981457302), October 13.

DTSC, 2005b, Review of Revised Risk Evaluation, Draft Corrective Measures Completion Report, Aerojet Chino Hills Facility, Chino Hills, California, Memorandum from David L. Berry to Christine Brown, November 10.

DTSC, 2005c, Review of Results of Building Assessment at the Aerojet Chino Hills Facility, Chino Hills, California, Memorandum from David L. Berry to Christine Brown, November 10.

DTSC, 2005d, Review of Corrective Measures Completion Report, Building Assessment Report and Section 4/Appendix C of the Revised Work Plan for Surface and Subsurface Water Quality Investigation, Aerojet Chino Hills Facility, End of Woodview Road, Chino Hills, California (EPA ID NO. CAD981457302), December 1.

DTSC, 2006a, Approval of Workplan for Additional Corrective Measures and Building Assessment Activities, Aerojet Chino Hills Facility, End of Woodview Road, Chino Hills, California (EPA ID NO. CAD981457302), April 18.

DTSC, 2006b, Comments on "Addendum to Work Plan for Additional Corrective Measures and Building Assessment Activities, Aerojet Chino Hills Facility, Chino Hills, California," August 25.

DTSC, 2007, e-mail from Christine Brown RE: Approval of Proposal for Backfilling of Building 010 Excavation, June 27.

DTSC, 2008a, Review of Corrective Measures Completion Report Addendum, Aerojet Chino Hills, End of Woodview Road, Chino Hills, California EPA ID No. (CAD981457302), March 17.

DTSC, 2008b, Draft, Review of Revised Draft Corrective Measures Completion Report Addendum and Report on 2007 Surface and Subsurface Water Quality Studies, Aerojet Chino Hills Facility, Chino Hills, California, draft Memorandum from David L. Berry to Christine Brown, sent to Aerojet June 10.

DTSC, 2008c, Approval of Corrective Measures Completion Report and Portions of Building Assessment Report, Aerojet Chino Hills, End of Woodview Road, Chino Hills, California EPA ID No. (CAD981457302), September 18.

ENSR, 2001a, Asbestos Abatement Oversight Report, Aerojet Chino Hills Facility, Chino Hills, California: draft July 7, 1999, finalized October 17.

ENSR, 2001b, Results of Building Assessment, Aerojet Chino Hills Facility, Chino Hills, California: draft July 2, 1999, finalized October 18.

Geomatrix Consultants, Inc. (Geomatrix), 2003, Revised Preliminary Endangerment Assessment for Uranium Chemical Toxicity, Aerojet Chino Hills Facility, March 31.

Geomatrix, 2005, Response to DTSC Comments on Review of Corrective Measures Completion Report and Building Assessment Report, Aerojet Chino Hills Facility, Chino Hills, California, December 27.

Geomatrix, 2006a, Corrective Measures Completion Report, Aerojet Chino Hills Facility, Chino Hills, California, February 21.

Geomatrix, 2006b, Work Plan for Additional Corrective Measures and Building Assessment Activities, Aerojet Chino Hills Facility, Chino Hills, California, March 23.

Geomatrix, 2006c, Response to DTSC Comments on Approval of Work Plan for Additional Corrective Measures and Building Assessment Activities, Aerojet Chino Hills Facility, Chino Hills, California, May 12.

Geomatrix 2006d, Notification of Continuation of Ordnance Screening Activities, Aerojet Chino Hills Facility, Chino Hills, California, May 25.

Geomatrix, 2006e, Addendum to Work Plan for Additional Corrective Measures and Building Assessment Activities, Aerojet Chino Hills Facility, Chino Hills, California, August 22.

Geomatrix, 2006f, Response to DTSC Comments on Addendum to Work Plan for Additional Corrective Measures and Building Assessment Activities, Aerojet Chino Hills Facility, Chino Hills, California, September 14.

Geomatrix, 2007, Backfill of Former Building 010 Excavation of RDX-impacted Soil, Former Aerojet Chino Hills Facility, May 17.

KR Environmental Services, Inc. (KR), 2006, Lead Paint Survey in Accordance with HUD Chapter 7, Building #003 – Aerojet Facility, Chino Hills, May 16.

McLaren/Hart, 1998, Workplan for Assembly Building Assessment, Aerojet – General Corporation, Chino Hills Facility, April 29.

McLaren/Hart, 1999a, Revised RCRA Facility Investigation Report at the Aerojet Chino Hills Facility, January 20.

McLaren/Hart, 1999b, RCRA Facility Investigation Addendum Report at the Aerojet Chino Hills Facility: Volumes 1 and 2, February 10.

McLaren/Hart, 1999c, Revised Corrective Measures Workplan at the Aerojet Chino Hills Facility, February 11.

Meredith/Boli, 1993, Screening Level Risk Assessment and Proposed Soil Cleanup Levels for the OB/OD Area, Aerojet Ordnance Facility, Chino Hills, California, Meredith/Boli & Associates.

Office of Environmental Health Hazard Assessment (OEHHA), 2004, Public Health Goals for Chemicals in Drinking Water, Perchlorate: California Environmental Protection Agency, March.

OEHHA, 2005, Responses to Recent Comments on the Perchlorate PHG, California Environmental Protection Agency, April.

OEHHA, 2007, OEHHA Toxicity Criteria Database, California Environmental Protection Agency, on-line database.

RES Environmental, Inc., 2007, Integrated Ambient Air Monitoring Program Report, Former Building 010 Area, Aerojet Chino Hills Facility, August 16.

URS Corporation (URS), 2007a, Aerojet Chino Hills Facility Area 16 and Former Landfill Munitions and Explosives of Concern Removal Project, Final Report, June 4.

URS, 2007b, Aerojet Chino Hills Facility Building Demolition and Environmental Remediation Post Closure report, November 2007.

U.S. Environmental Protection Agency (U.S. EPA), 1989, Risk Assessment Guidance for Superfund (RAGS) — Volume I, Human Health Evaluation Manual (Part A, Baseline Risk Assessment): United States Environmental Protection Agency, December.

U.S. EPA, 1991, Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors, Office of Emergency and Remedial Response, Washington, D.C.

U.S. EPA, 1997, Exposure Factors Handbook, National Center for Environmental Assessment, Office of Research and Development, Washington, D.C., August.

U.S. EPA, 1999, Contract Laboratory Program National Functional Guidelines for Organic Data Review (OSWER 9240.1-05A-P PB99-963506, EPA 540/R-99-008, October, 1999).

U.S. EPA, 2002, Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (OSWER 9240.1-35 EPA 540-R-01-008, July, 2002).

U.S. EPA, 2004a, Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessments), Interim, Office of Emergency and Remedial Response, Washington D.C., July, EPA/540/R-99/005.

U.S. EPA, 2004b, Table 1. Additional and Current Dermal Absorption Fraction Values for Soil (ABSd) (Supplementing Exhibit 3-4 of Part E, last update: September 2004): http://www.epa.gov/oswer/riskassessment/ragse/.

U.S. EPA, 2007, Integrated Risk Information System (IRIS) on-line database, 2007.

TABLE 1
SWMU No. 2 (FORMER LANDFILL)
SCREENED SOIL CONFIRMATION SAMPLE ANALYTICAL RESULTS
Aerojet Chino Hills Facility

Concentrations reporting in milligrams per kilogram (mg/kg)

Analyte	Sample Designation and Date			
	C-SW02-S-20-stp 7/6/2006	C-SW02-S-21-stp 7/6/2006	C-SW02-S-22-stp 7/6/2006	C-SW02-S-23-stp 7/6/2006
Metals (U.S. EPA Methods 6010B/7000)				
Antimony	<0.75 [1] R [2]	<0.75 R	<0.75 R	<0.75 R
Arsenic	2.6	2.4	2.5	2.3
Barium	129	125	120	131
Beryllium	0.29	0.27	0.27	0.28
Cadmium	1.4	1.1	1.0	1.1
Chromium	15	13	11	13
Cobalt	8.0	7.5	7.4	7.6
Copper	18	15	15	15
Lead	29 J [3]	28 J	35 J	26 J
Mercury	<0.08	<0.08	<0.08	<0.08
Molybdenum	1.9	1.3	1.2	2.1
Nickel	21	20	20	19
Selenium	<0.75	<0.75	<0.75	<0.75
Silver	<0.25	<0.25	<0.25	<0.25
Thallium	<0.75	<0.75	<0.75	<0.75
Vanadium	31	27	22	28
Zinc	48	42	43	45
Explosive Compounds (U.S. EPA Method 8330)				
RDX	1.1	0.22	<0.20	<0.20
HMX	0.30	0.23	<0.20	<0.20
Perchlorate (U.S. EPA Method 314.0M)				
	2.3	0.32	0.41	0.31

1. <0.75 = Less than laboratory reporting limit.
2. R = Antimony results "R" flagged due to low MS/MSD recoveries.
3. J = Lead results qualified as estimated due to high MS/MSD recoveries.

Laboratory analytical data results reported to two significant figures, where appropriate.

TABLE 2
SWMU No. 2 (FORMER LANDFILL)
SOIL SAMPLE ANALYTICAL RESULTS*
Aerojet Chino Hills Facility

Concentrations reported in milligrams per kilogram (mg/kg)

Sample Designation	Sample Date	Sample Depth (feet)	Perchlorate U.S. EPA Method 314.0M
C-SW02-S-04	5/1/2001	0.5	ND [1]
C-SW02-S-05	5/1/2001	0.5	ND
C-SW02-S-06	5/1/2001	0.5	ND
C-SW02-S-07	5/1/2001	0.5	0.56
	10/25/2006	5	0.04
		8.5	ND
C-SW02-S-08	5/1/2001	0.5	0.33
C-SW02-S-09	5/1/2001	0.5	ND (ND)
C-SW02-S-10	5/1/2001	0.5	ND
C-SW02-S-17	5/10/2006	0.5	ND
		5	0.02 (0.01)[2]
		10	0.10
C-SW02-S-18	5/10/2006	0.5	ND
		5	0.01
		10	0.04
C-SW02-S-19	5/10/2006	0.5	ND
		5	0.15
		9	0.02
C-SW02-S-24	10/25/2006	0.5	0.29 (0.26)
		5	0.06
		9.5	ND
C-SW02-S-25	10/25/2006	0.5	0.06
		5	0.18
		10	ND
C-SW02-S-26	10/25/2006	0.5	0.40
		5	0.11
		10	ND
C-SW02-S-27	10/25/2006	0.5	ND (ND)
		5	0.05
		10	ND
C-SW02-S-28	10/25/2006	0.5	ND
		5	ND
		10	0.09
C-SW02-S-29	10/25/2006	0.5	ND
		5	0.06
		8	ND
C-SW02-S-30	10/25/2006	0.5	0.05 (0.05)
		4.5	0.08
C-SW02-S-31	10/25/2006	0.5	1.4 J [3]
		5	ND
		8	ND
C-SW02-S-32	10/26/2006	0.5	0.10
		5	1.0

TABLE 2
SWMU No. 2 (FORMER LANDFILL)
SOIL SAMPLE ANALYTICAL RESULTS*
Aerojet Chino Hills Facility

Concentrations reported in milligrams per kilogram (mg/kg)

Sample Designation	Sample Date	Sample Depth (feet)	Perchlorate U.S. EPA Method 314.0M
		10	0.69
C-SW02-S-33	10/26/2006	0.5	ND
C-SW02-S-34	12/14/2006	0.5	ND
		3	ND
C-SW02-S-35	12/14/2006	0.5	ND
		2.5	ND
C-SW02-S-36	12/14/2006	0.5	ND
		5	ND
		10	ND
C-SW02-S-37	12/14/2006	0.5	ND
		5	ND
		10	ND
C-SW02-S-38	12/14/2006	0.5	ND
		5	ND
		10	ND
C-SW02-S-39	12/13/2006	0.5	0.36
		5	ND
		10	0.12
		14.5	ND
C-SW02-S-40	12/13/2006	0.5	0.14
		5	ND (ND)
		7.5	ND
C-SW02-S-41	12/13/2006	0.5	1.1
		5	0.47
		10	ND
C-SW02-S-42	12/13/2006	0.5	ND
		5	ND
C-SW02-S-43	12/13/2006	0.5	ND
		5	ND
		10	ND
C-SW02-S-44	12/13/2006	0.5	ND
		5	ND
		10	0.06
C-SW02-S-45	12/13/2006	0.5	ND
		5	ND
		10	0.06
C-SW02-S-46	12/14/2006	0.5	ND
		5	ND
		10	ND
C-SW02-S-47	12/14/2006	0.5	ND (ND)
		5	ND
		10	ND
C-SW02-S-48	12/14/2006	0.5	ND (ND)
		5	ND

TABLE 2
SWMU No. 2 (FORMER LANDFILL)
SOIL SAMPLE ANALYTICAL RESULTS*
Aerojet Chino Hills Facility

Concentrations reported in milligrams per kilogram (mg/kg)

Sample Designation	Sample Date	Sample Depth (feet)	Perchlorate U.S. EPA Method 314.0M
		10	ND
C-SW02-S-49	12/13/2006	0.5	ND
		5	ND
		10	ND
C-SW02-S-50	1/29/2007	0.5	ND (ND)
		5	ND
		10	ND
C-SW02-S-51	1/29/2007	0.5	0.09
C-SW02-S-52	1/29/2007	15	0.08
		20	ND
C-SW02-S-53	1/29/2007	5	0.08 J (0.18 J)
		10	ND
		15	ND
		20	ND
C-SW02-S-54	1/29/2007	10	0.06
		15	ND
		20	ND
C-SW02-S-55	1/29/2007	0.5	ND
		5	ND
		10	ND
C-SW02-S-56	1/29/2007	0.5	0.04
		5	ND
		10	ND

Notes:

* Results rounded to two significant figures, where appropriate.

1. ND = Not detected above laboratory reporting limit of 0.04 mg/kg (reporting limit for samples collected 5/10/06 was 0.01 mg/kg).

2. (0.01) = Duplicate sample results.

3. J = Data qualified as estimated.

TABLE 3
SWMU No. 2 (FORMER LANDFILL)
EXCAVATION CONFIRMATION SAMPLE ANALYTICAL RESULTS
Aerojet Chino Hills Facility

Concentrations reporting in milligrams per kilogram (mg/kg)

Analyte	Sample Designation and Date		
	S-31-SS-3.0 5/29/2007	S-32-SS-7.0 5/29/2007	S-41-SS-3.0 5/29/2007
Perchlorate (U.S. EPA Method 314.0M)			
	0.14	0.16	0.55

TABLE 4

AOC No. 5 (Test Range 16) SCREENED SOIL CONFIRMATION SAMPLE ANALYTICAL RESULTS

Aerojet Chino Hills Facility

Concentrations reported in milligrams per kilogram (mg/kg)

Analyte	Data Qualifier [1]	Sample Designation and Date (soil excavated and screened)		
		C-AC05-S-03-N-0.5 5/10/2006	SW10-05[2] 5/10/2006	C-AC05-S-04-S-0.5 5/10/2006
Metals (U.S. EPA Methods 6010B/7000)				
Antimony	R	<2.5[3]	<2.5	<2.5
Arsenic	J	5.7	6.9	5.4
Barium	J	110	110	110
Beryllium	UJ	<0.25	<0.25	<0.25
Cadmium	J	2.6	2.0	2.1
Chromium	J	9.4	9.8	11
Cobalt	J	7.0	6.8	7.3
Copper	J	9.5	13	32
Lead	UJ/J	<5.0	6.1	7.6
Mercury		0.032	0.029	0.037
Molybdenum	J	6.3	6.9	6.9
Nickel	J	22	21	21
Selenium	UJ	<5.0	<5.0	<5.0
Silver	UJ	<1.0	<1.0	<1.0
Thallium	UJ	<5.0	<5.0	<5.0
Vanadium	J	17	16	20
Zinc	J	43	50	54
Explosive Compounds (U.S. EPA Method 8330)				
RDX		<0.50	0.68	<0.50
HMX		1.0	0.86	<0.50

1. Data qualified as "UJ", "J", or "R" because of low MS/MSD recoveries.
2. Duplicate of sample C-AC05-S-03-N-0.5.
3. <2.5 = Less than laboratory reporting limit.

Laboratory analytical data results reported to two significant figures, where appropriate.

TABLE 5

AOC No. 5 (Test Range 16) BEDROCK CONFIRMATION SAMPLE ANALYTICAL RESULTS

Aerojet Chino Hills Facility

Concentrations reported in milligrams per kilogram (mg/kg)

Analyte	Data Qualifier [1]	Sample Designation and Date (bedrock confirmation samples)	
		C-AC05-S-03-N-4 5/10/2006	C-AC05-S-04-S-4 5/10/2006
Metals (U.S. EPA Methods 6010B/7000)			
Antimony	R	<2.5 [2]	<2.5
Arsenic	UJ	<5.0	<5.0
Barium	J	67	180
Beryllium	UJ	<0.25	<0.25
Cadmium	J	2.4	0.46
Chromium	J	11	12
Cobalt	J	6.3	5.4
Copper	UJ/J	9.5	<0.25
Lead	UJ	<5.0	<5.0
Mercury		<0.02	<0.02
Molybdenum	J	4.3	4.4
Nickel	J	19	13
Selenium	UJ	<5.0	<5.0
Silver	UJ	<1.0	<1.0
Thallium	UJ	<5.0	<5.0
Vanadium	J	18	14
Zinc	J	39	36

1. Data qualified as "UJ", "J", or "R" because of low MS/MSD recoveries.
2. <2.5 = Less than laboratory reporting limit.

Laboratory analytical data results reported to two significant figures, where appropriate.

TABLE 6

AOC No. 5 (Test Range 16) SIDEWALL SAMPLE ANALYTICAL RESULTS

Aerojet Chino Hills Facility

Concentrations reported in milligrams per kilogram (mg/kg)

Analyte	Data Qualifier [1]	Sample Designation and Date (sidewall samples)	
		C-AC05-S-05-0.5 5/11/2006	C-AC05-S-06-0.5 5/11/2006
Metals (U.S. EPA Methods 6010B/7000)			
Antimony	R	<2.5 [2]	<2.5
Arsenic	UJ/J	5.5	<5.0
Barium	J	41	44
Beryllium	UJ	<0.25	<0.25
Cadmium	J	0.68	0.60
Chromium	J	3.6	5.4
Cobalt	J	7.5	6.2
Copper	J	0.91	3.2
Lead	UJ	<5.0	<5.0
Mercury	UJ/J	<0.02	0.029
Molybdenum	J	1.2	1.2
Nickel	J	18	13
Selenium	UJ	<5.0	<5.0
Silver	UJ	<1.0	<1.0
Thallium	UJ	<5.0	<5.0
Vanadium	J	6.0	9.8
Zinc	J	31	30

1. Data qualified as "UJ", "J", or "R" because of low MS/MSD recoveries.
2. <2.5 = Less than laboratory reporting limit.

Laboratory analytical data results reported to two significant figures, where appropriate.

TABLE 7
AOC No. 8 (FORMER BUILDING 010)
SOIL SAMPLE ANALYTICAL RESULTS
FOR EXPLOSIVE COMPOUNDS
Aerojet Chino Hills Facility

Concentration reported in milligrams per kilogram (mg/kg)

Sample Designation	Sample Date	Sample Depth (feet)	Explosive Compounds using U.S. EPA Method 8330						
			RDX	HMX	1,3,5-TNB	2-Amino-4,6-DNT	2,4-DNT	2,4,6-TNT	Nitrobenzene
Soil Sample Analytical Results - 1995 and 1998									
AC-08-01	12/18/1995	2.5	ND	ND	ND	ND	ND	ND	ND
AC-08-02	12/18/1995	0.5	ND	ND	ND	ND	ND	ND	ND
AC-08-03	12/18/1995	0.5	ND	ND	ND	ND	ND	ND	ND
AC-08-04	12/18/1995	0.5	2.7	1.3	ND	ND	ND	ND	ND
		2.5	ND	ND	ND	ND	ND	ND	ND
		5	ND	ND	ND	ND	ND	ND	ND
AC-08-07	12/18/1995	0.5	ND	ND	ND	ND	ND	ND	ND
010-007-01	11/9/1998	0.5	1.2	0.51	ND	ND	ND	ND	ND
010-010-01	11/9/1998	0.5	ND	ND	ND	ND	ND	ND	ND
010-010-02	11/9/1998	0.5	4.5	1.3	ND	ND	ND	ND	ND
010-014-01	11/9/1998	0.5	ND	ND	ND	ND	ND	ND	ND
Soil Sample Analytical Results - 2006									
010-007-02	5/10/2006	0.5	ND	ND	3.7	ND	ND	ND	ND
010-007-03	5/10/2006	0.5	0.86	ND	ND	ND	ND	ND	ND
		5	ND	ND	ND	ND	ND	ND	ND
010-010-03	5/10/2006	0.5	2.1	ND	ND	ND	ND	ND	ND
		3	2.1	1.1	ND	ND	ND	ND	ND
010-010-04	5/10/2006	0.5	0.62	ND	ND	ND	ND	ND	ND
		4.5	ND	ND	ND	ND	ND	ND	ND
010-011-01	5/10/2006	0.5	ND	ND	ND	ND	ND	ND	ND
		3.5	4.7	2.3	ND	ND	ND	ND	ND
Direct Push Probe Soil Sample Analytical Results - 2006									
010-001-01	11/14/2006	0.5	ND	ND	ND	ND	ND	ND	ND
		2.5	ND	ND	ND	ND	ND	ND	ND
		5	ND	1.3	ND	ND	ND	ND	ND
010-002-01	11/14/2006	0.5	0.46 (0.44)	0.48 (0.45)	ND (ND)	ND (ND)	ND (ND)	ND (ND)	ND (ND)
		2.5	0.54	0.63	3.0	ND	ND	ND	ND
		5	1.2	0.66	1.2	ND	ND	ND	ND
010-010-02	11/14/2006	2.5	2.2	1.9	6.1	0.22	ND	ND	ND
		5	5.3	2.8	5.7	0.44	0.32	ND	ND
010-011-01	11/14/2006	5	3.5	2.3	8.0	0.67	0.25	ND	ND
010-011-02	11/14/2006	0.5	39	7.9	ND	ND	ND	0.33	ND
		2.5	14	ND	ND	0.26	ND	ND	0.25
		5	6.3	0.52	ND	ND	ND	ND	ND
Hollow Stem Auger Boring Soil Sample Analytical Results - 2007									
SB-1	1/30/2007	10	7.8	ND	ND	ND	ND	ND	ND
		15	4.9	1.4	5.4	0.34	0.28	ND	ND
		20	ND	ND	ND	ND	ND	ND	ND
SB-2	1/30/2007	10	5.9	0.28	ND	ND	ND	ND	ND
		15	3.6	ND	ND	ND	ND	ND	ND
		20	0.41	ND	ND	ND	ND	ND	ND
SB-3	1/30/2007	10	ND UJ (3.5J)	ND UJ (1.1J)	ND (ND)	ND (ND)	ND (ND)	ND (ND)	ND (ND)
		15	ND	ND	ND	ND	ND	ND	ND
SB-4	1/30/2007	0.5	ND	ND	ND	ND	ND	ND	ND
		2.5	ND	ND	ND	ND	ND	ND	ND
		5	ND	ND	ND	ND	ND	ND	ND
SB-5	1/30/2007	0.5	1.4	1.1	ND	ND	ND	ND	ND
		2.5	1.8	0.79	ND	ND	ND	ND	ND
		5	2.7	ND	ND	ND	ND	ND	ND

Notes:
ND = Not detected above laboratory reporting limit of 0.2 to 0.5 mg/kg.
1,3,5-TNB = 1,3,5-trinitrobenzene.
(0.44) = Duplicate sample result for analyte indicated.
2,4-DNT = 2,4-dinitrotoluene.
2,4,6-TNT = 2,4,6-trinitrotolune.
J, UJ = Data qualified as estimated.

TABLE 8
AOC No. 8 (FORMER BUILDING 010)
RDX IMMUNOASSAY AND U.S. EPA METHOD 8330 SAMPLE RESULT COMPARISON
Aerojet Chino Hills Facility

Sample Location *	Sample Depth	Date	Immunoassay Result (mg/kg)	Confirmation Sample ID	RDX Confirmation Results (mg/kg)	Remark
Northeastern part of excavation	6	6/12/2007	0.5 -1.5	N3	2.7	East side wall of the initial excavation. Area re-excavated.
	6	6/12/2007	0.5 -1.5	N3	2.7	North side wall of the initial excavation. Area re-excavated.
Re-excavation of Northeastern part of Excavation	2 to 8 feet	6/25/2007	ND	N3A	0.61	Northern portion of excavation after removal of additional soil. Composite of 5 locations (two deeper depth samples collected with excavator bucket).
Northwest corner of excavation	3	6/12/2007	ND	NW2	ND	Northwest corner of the excavation. Composite of 4 locations.
West side wall (the northern portion of the 20-ft excavation)	6	6/12/2007	0.5 -1.5	WX	1.4	West side wall of the initial 20-ft excavation in the northern part. Collected from the excavator bucket. The sample was composite with the sample collected on 06/13 from the west side wall.
West side wall of the southern portion of the 20-ft excavation	10	6/13/2007	1.5 - 2.5	NA area re-excavated	--	West side wall of the southern half of 20-ft excavation. Collected from the excavator bucket. Re excavated westward approximately 2 feet.
West side wall (the southern portion of the 20-ft excavation)	10	6/13/2007	1.5 - 2.5	WX	1.4	West side wall of the southern half of 20-ft excavation. Re-sampling due to immunoassay result in initial test. Collected from the excavator bucket. The sample was composite with the sample collected on 06/12 from the west side wall (the northern part) of the 20-ft excavation.
Bottom of the 20-ft excavation in the northern portion	20	6/13/2007	0.5 -1.5	20B1	0.69	Northern half of 20-ft excavation. Collected from the excavator bucket.
Bottom of the 20-ft excavation in the southern portion	20	6/13/2007	0.5 -1.5	20B2	7.9	Southern half of 20-ft excavation. Collected from the excavator bucket. Area re-excavated.
Re-excavation of southern portion of bottom 25-ft excavation	25	6/25/2007	ND	20B2A	0.62	25-ft excavation. Composite of 4 samples collected from the excavator bucket.
East side	10	6/13/2007	ND	NA	NA	East wall of the 20-ft excavation. Collected from the excavator bucket.
South side wall	10	6/13/2007	0.5 -1.5	NA	NA	South side wall of the 20-ft excavation. Collected from the excavator bucket.
Center of the slope, southeast of the 20-ft excavation	8	6/14/2007	ND	Notch-center	ND	Composite from 4 locations within the area.
South side wall of slope, southeast of the 20-ft excavation	6	6/14/2007	ND	Notch-sidewall	0.39	Composite from 4 locations within the area.

* Sample locations described as if the deep excavation was orientated in a north-south direction.
NA = Not applicable.
ND = Not detected.

TABLE 9
AOC No. 8 (FORMER BUILDING 010)
EXCAVATION CONFIRMATION SAMPLE ANALYTICAL RESULTS
Aerojet Chino Hills Facility

Concentration reported in milligrams per kilogram (mg/kg)

Sample Designation	Sample Date	Explosive Compounds using U.S. EPA Method 8330		
		RDX	HMX	1,3,5-TNB
NW2	6/13/2007	ND	0.22	3.1
N3	6/12/2007	2.7	ND	ND
N3A	6/25/2007	0.61 (0.94)	0.25 (0.40)	1.1 J (1.9 J)
20B1	6/13/2007	0.69	ND	ND
20B2	6/13/2007	7.9	0.28	ND
20B2A	6/25/2007	0.62	ND	ND
WX	6/13/2007	1.4	0.51	ND
Notch-Center	6/14/2007	ND	ND	ND
Notch-Sidewall	6/14/2007	0.39	ND	ND

Notes:
ND = Not detected above laboratory reporting limit of 0.20 mg/kg.
1,3,5-TNB = 1,3,5-trinitrobenzene.
(0.94) = Duplicate sample result for analyte indicated.
N3 and 20B2 Shaded sample results near or above cleanup criteria. Additional soil removed and area resampled (see results N3A and 20B2A).
J = Data qualified as "J" or estimated (original and duplicate RPD = 53%).

TABLE 10
AOC No. 10 (METAL FORMING AREA)
COMPOSITE SOIL SAMPLE ANALYTICAL RESULTS
Aerojet Chino Hills Facility

Concentration reported in milligrams per kilogram (mg/kg)

Sample Designation	Sample Date	Perchlorate U.S. EPA Method 314.0M
C-AC10-S-05-EXC	5/8/2006	ND [1] (ND) [2]
C-AC10-S-06-EXC	5/8/2006	ND
C-AC10-S-07-EXC	5/8/2006	ND
C-AC10-S-08-EXC	5/8/2006	ND

Notes:
1. ND = Not detected above laboratory reporting limit of 0.01 mg/kg.
2. (ND) = Duplicate sample location SW10-01 and analytical results.

TABLE 11
AOC No. 13 (Area 10 or Three-Tier Test Area)
SOIL SAMPLE ANALYTICAL RESULTS FOR CADMIUM
Aerojet Chino Hills Facility

Concentration reported in milligrams per kilogram (mg/kg)

Sample Designation	Sample Date	Cadmium U.S. EPA Method 6010B
C-AC13-S-10-0.5	5/11/2006	ND [1] UJ [2]
C-AC13-S-11-0.5	5/11/2006	ND UJ
C-AC13-S-12-0.5	5/11/2006	ND UJ
C-AC13-S-13-0.5	5/11/2006	ND UJ

Notes:
1. ND = Not detected above laboratory reporting limit of 1.0 mg/kg.
2. UJ = Data qualified as estimated due to low MS/MSD recovery.

TABLE 12
AREA 1D SOIL SAMPLE ANALYTICAL RESULTS
Aerojet Chino Hills Facility

Concentrations reported in milligrams per kilogram (mg/kg)

Analyte	Sample Designation and Date	
	A1D-01-0.5 5/11/2006	A1D-01-3 5/11/2006
Metals (U.S. EPA Methods 6010B/7000)		
Antimony	<2.5 [1]	<2.5
Arsenic	<5.0	<5.0
Barium	69	120
Beryllium	<0.25	<0.25
Cadmium	0.50	<0.25
Chromium	4.5	6.2
Cobalt	6.0	6.7
Copper	2.8	5.3
Lead	<5.0	6.2
Mercury	0.039 J [2]	0.042 J
Molybdenum	<1.0	<1.0
Nickel	12	8.4
Selenium	<5.0	<5.0
Silver	<1.0	<1.0
Thallium	<5.0	<5.0
Vanadium	7.0	8.2
Zinc	24	31
Explosive Compounds (U.S. EPA Method 8330)		
	<0.5	<0.5
Perchlorate (U.S. EPA Method 314.0M)		
	<0.01	<0.01

1. <2.5 = Less than laboratory reporting limit.
2. J = Results qualified as "J" or estimated due to low MS/MSD recovery.

Laboratory analytical data results reported to two significant figures, where appropriate.

TABLE 13
BUILDING 534 AREA
SOIL SAMPLE ANALYTICAL RESULTS
Aerojet Chino Hills Facility

Dioxins (U.S. EPA Method 8290)	Units	Sample Designation and Date	
		Bldg 534-03-0.5 5/12/2006	SW10-09[1] 5/12/2006
2,3,7,8-TCDD	pg/g	<0.0209	<0.0196
1,2,3,7,8-PeCDD	pg/g	0.115 J	0.110 J
1,2,3,4,7,8-HxCDD	pg/g	0.153 J	<0.140
1,2,3,6,7,8-HxCDD	pg/g	0.343 J	0.415 J
1,2,3,7,8,9-HxCDD	pg/g	0.260 J	0.266 J
1,2,3,4,6,7,8-HpCDD	pg/g	7.26	8.25
OCDD	pg/g	67.7 B	79.9 B
2,3,7,8-TCDF	pg/g	0.109 J	0.0903 J
1,2,3,7,8-PeCDF	pg/g	<0.0869	0.0681 J
2,3,4,7,8-PeCDF	pg/g	0.129 J	0.141 J
1,2,3,4,7,8-HxCDF	pg/g	0.161 J	0.139 J
1,2,3,6,7,8-HxCDF	pg/g	0.152 J	0.142 J
2,3,4,6,7,8-HxCDF	pg/g	0.127 J	0.139 J
1,2,3,7,8,9-HxCDF	pg/g	<0.0243	0.0635 J
1,2,3,4,6,7,8-HpCDF	pg/g	1.35 J,B	1.35 J,B
1,2,3,4,7,8,9-HpCDF	pg/g	0.145 J	0.129 J
OCDF	pg/g	3.59 J,B	3.31 J,B
TEQ [2]	**pg/g**	**0.411**	**0.435**

1. Sample SW-10-09 is a duplicate of Bldg 534-03-0.5.
2. Toxic equivalent quotient (TEQ) for dioxins.

Data Qualifiers:
< = Not detected above laboratory reporting limits.
J = The amount detected is below the Lower Calibration Limit of the instrument.
B = This compound was also detected in the method blank.

TABLE 14
SOIL STOCKPILES LOCATED IN TEST RANGE 1C
SOIL SAMPLE ANALYTICAL RESULTS FOR PERCHLORATE
Aerojet Chino Hills Facility

Concentration reported in milligrams per kilogram (mg/kg)

Sample Designation	Sample Date	Perchlorate U.S. EPA Method 314.0M
C-AC06-S-01-STP	5/11/2006	0.02
C-AC06-S-02-STP	5/11/2006	ND
C-AC06-S-03-STP	5/8/2006	0.07
C-AC06-S-04-STP	5/8/2006	0.01
C-AC06-S-05-STP	5/8/2006	ND
C-AC06-S-06-STP	5/8/2006	0.10
C-AC06-S-07-STP	5/11/2006	ND
C-AC06-S-08-STP	5/11/2006	0.06

Notes:
ND = Not detected above laboratory reporting limit of 0.01 mg/kg.

TABLE 15
CONCRETE BLOCK AREA
SOIL AND CONCRETE SAMPLE ANALYTICAL RESULTS
Aerojet Chino Hills Facility

Concentration reported in milligrams per kilogram (mg/kg)

Soil Sample Designation	Sample Date	Sample Depth (feet)	Perchlorate U.S. EPA Method 314.0M
CB-STPL-01	5/9/2006	0.5	0.32
CB-STPL-01-5	10/26/2006	5.0	ND [1]
CB-STPL-01-10	10/26/2006	10	ND
CB-STPL-02-0.5	10/26/2006	0.5	ND
CB-STPL-02-S-5	10/26/2006	5.0	ND
CB-STPL-02-S-10	10/26/2006	10	ND
CB-STPL-03-0.5	10/26/2006	0.5	ND
C-SW10-05[2]	10/26/2006	0.5	ND
CB-STPL-03-5	10/26/2006	5.0	ND
CB-STPL-03-10	10/26/2006	10	ND
CB-STPL-04-0.5	10/26/2006	0.5	ND
CB-STPL-04-5	10/26/2006	5.0	ND
CB-STPL-04-10	10/26/2006	10	ND
CB-STPL-05-0.5	10/26/2006	0.5	ND
CB-STPL-05-5	10/26/2006	5	ND
CB-STPL-05-10	10/26/2006	10	ND

Concrete Core Sample Designation			
CS-STPL-01-C	10/27/2006	NA [3]	ND

Notes:

1. ND = Not detected above laboratory reporting limit of 0.04 mg/kg.
2. Duplicate of sample CB-STPL-03-0.5.
3. NA = Not applicable.

TABLE 16

FORMER BUILDING 003 PIPE REMOVAL CONFIRMATION SOIL SAMPLE ANALYTICAL RESULTS

Aerojet Chino Hills Facility

Concentrations reported in milligrams per kilogram (mg/kg)

Analyte	Sample Designation and Date			
	C-003-PIPE-04-S 11/20/2006	C-003-PIPE-03-S 11/20/2006	C-003-PIPE-02-S 11/20/2006	C-003-PIPE-01-S 11/20/2006
Lead (U.S. EPA Method 6010B)				
	3.30	2.30	2.85	3.97
Explosive Compounds (U.S. EPA Method 8330)				
	ND[1]	ND	ND	ND

Notes

1. ND = Not detected above laboratory reporting limit of 0.2 mg/kg.

TABLE 17

SEPTIC TANK WATER SAMPLE ANALYTICAL RESULTS

Aerojet Chino Hills Facility

Concentrations reported in micrograms per liter (ug/L)

Analyte	Sample Designation and Date			
	003 11/8/2006	036 11/8/2006	037 11/8/2006	037-Outflow 6/15/2007
Metals (U.S. EPA Methods 6010B/7000)				
Antimony	<15 [1]	<15	<15	<15
Arsenic	18	18	21	<10
Barium	285	43	28	20
Beryllium	<1.0	<1.0	<1.0	<1.0
Cadmium	<5.0	<5.0	<5.0	<5.0
Chromium	<5.0	<5.0	<5.0	<5.0
Cobalt	<5.0	<5.0	<5.0	<5.0
Copper	<5.0	<5.0	<5.0	<5.0
Lead	11	<10	<10	<10
Mercury	0.9	<0.5	<0.5	<0.5
Molybdenum	25	20	8.4	<5.0
Nickel	<5.0	<5.0	<5.0	28
Selenium	<15	16	<15	<15
Silver	<5.0	<5	<5.0	<5.0
Thallium	<15	<15	<15	<15
Vanadium	<5.0	<5.0	<5.0	<5.0
Zinc	76	22	<10	770 J [2]
Semi Volatile Organic Compounds (U.S. EPA Method 8270C)				
1,4-Dichlorobenzene	-- [3]	73	<10	--
Benzoic Acid	--	--	--	77
Explosive Compounds (U.S. EPA Method 8330)				
HMX	<2.0	<2.0	<2.0	1.5
3-Nitrotoluene	<2.0	<2.0	<2.0	6.5
Nitroglycerin (U.S. EPA Method 8332)				
	--	<1000	<1000	<50

Notes

1. <15 = Less than laboratory reporting limit.
2. J = Zinc results qualified as estimated due to RPD exceeding laboratory control limits
3. -- = Sample not analyzed for the analyte.

Laboratory analytical data results reported to two significant figures, where appropriate.

TABLE 18

SEPTIC TANK EXCAVATION CONFIRMATION SOIL SAMPLE ANALYTICAL RESULTS

Aerojet Chino Hills Facility

Concentrations reported in milligrams per kilogram (mg/kg)

Analyte	Sample Designation and Date		
	003-Septic-B 6/15/2007	036-Septic-B 6/15/2007	037-Septic-B 6/15/2007
Metals (U.S. EPA Methods 6010B/7000)			
Antimony	<0.75 [1]	<0.75	<0.75
Arsenic	2.4	2.5	2.7
Barium	126	115	106
Beryllium	<0.25	<0.25	<0.25
Cadmium	0.6	<0.5	<0.5
Chromium	8.6	9.3	9.5
Cobalt	6.0	6.0	7.6
Copper	14	7.6	11
Lead	3.0	4.2	2.6
Mercury	<0.0835	<0.0835	<0.0835
Molybdenum	1.4	<0.25	<0.25
Nickel	17	15	16
Selenium	<0.75	<0.75	<0.75
Silver	<0.25	<0.25	<0.25
Thallium	<0.75	<0.75	<0.75
Vanadium	23	23	23
Zinc	35	27	40
Semi Volatile Organic Compounds (U.S. EPA Method 8270C)			
	ND [2]	ND	ND
Explosive Compounds (U.S. EPA Method 8330)			
	<0.2	<0.2	<0.2
Nitroglycerin (U.S. EPA Method 8332)			
	<5.0	<5.0	<5.0

Notes
1. <0.75 = Less than laboratory reporting limit.
2. ND = Not detected above variable laboratory reporting limits.

Laboratory analytical data results reported to two significant figures, where appropriate.

TABLE 19
BUILDING 006 COMPLEX
SOIL AND CONCRETE SAMPLE ANALYTICAL RESULTS
Aerojet Chino Hills Facility

Concentration reported in milligrams per kilogram (mg/kg)

Sample Designation	Sample Date	Sample Matrix	Explosive Compounds U.S. EPA Method 8330
510-001-01-S-0.5	5/11/2006	Soil	ND
510-002-01-S-0.5	5/11/2006	Soil	ND
510-004-01-S-0.5	5/11/2006	Soil	ND
006-001-02-S-0.5	5/11/2006	Soil	ND
006-001-03-S-0.5	5/11/2006	Soil	ND (ND) [1]
006-TROUGH-01-S-03	5/10/2006	Soil	ND
006-TROUGH-04-S-0.5 [2]	5/10/2006	Soil	RDX = 0.90 HMX = 0.54
006-001-02-C	5/9/2006	Concrete	ND UJ
006-001-03-C	5/9/2006	Concrete	ND (ND) [3] UJ

Notes:
ND = Not detected above laboratory reporting limit of 0.5 mg/kg.
UJ = Not detected; qualified as estimated.
1. Duplicate sample location SW10-07.
2. Primary sample 006-TROUGH-04-S-0.5 lost by laboratory. Results of split sample collected by DTSC and analyzed through their contract laboratory are reported.
3. Duplicate sample location SW10-03.

TABLE 20
FORMER BUILDING 010
WIPE SAMPLE ANALYTICAL RESULTS
Aerojet Chino Hills Facility

Concentration reported in micrograms per wipe (µg/wipe)

Sample Designation	Sample Date	Area	HMX U.S. EPA Method 8330
010-010-05-W	5/9/2006	Vent	1.7
010-010-06-W	5/9/2006	Vent	4.5
010-010-07-W	5/9/2006	Wall	ND
010-010-08-W	5/9/2006	Wall	ND
010-007-04-W	5/9/2006	Wall	ND
010-007-05-W	5/9/2006	Wall	ND

Notes:
ND = Not detected above laboratory reporting limit of 0.4 µg/wipe.

TABLE 21
FORMER BUILDING 010
CONCRETE CORE SAMPLE ANALYTICAL RESULTS
Aerojet Chino Hills Facility

Concentration reported in milligrams per kilogram (mg/kg)

Sample Designation	Sample Date	Explosive Compounds U.S. EPA Method 8330
010-007-02-C	5/9/2006	ND UJ
010-007-03-C	5/9/2006	ND UJ
010-010-03-C	5/9/2006	ND UJ
010-010-04-C	5/9/2006	ND UJ
010-011-01-C	5/9/2006	ND UJ

Notes:
ND UJ = Not detected above laboratory reporting limit of 0.5 mg/kg; qualified as estimated.

TABLE 22
FORMER BUILDING 016
UNDERGROUND STORAGE TANK SAMPLE ANALYTICAL RESULTS

Aerojet Chino Hills Facility

Concentrations reported in milligrams per kilogram (mg/kg)

Analyte	Sample Designation and Date		
	016-UST-01 6/14/2007	016-UST-02 6/14/2007	016-UST-01-S 12/14/2006
Metals (U.S. EPA Method 6010B/7471A)			
Antimony	<0.75 [1]	<0.75	<0.75 UJ [2]
Arsenic	3.7	4.1	0.9
Barium	68	202	138
Beryllium	<0.25	<0.25	0.3
Cadmium	0.5	1.6	<0.5
Chromium	8.3	13	9.8
Cobalt	6.7	4.1	9.1
Copper	12	12	10
Lead	3.1	1.8	1.7
Mercury	<0.08	<0.08	<0.08
Molybdenum	0.8	1.2	<0.25
Nickel	14	14	6.6
Selenium	<0.75	<0.75	<0.75
Silver	<0.25	<0.25	<0.25
Thallium	<0.75	<0.75	3.5
Vanadium	21	30	29
Zinc	35	58	41
TPH (U.S. EPA Method 8015B (M))			
Motor Oil	<25	46	-- [3]
Diesel	5.7	<5.0	--
Gasoline	<0.48	<0.5	<0.5
Semi Volatile Organic Compounds (U.S. EPA Method 8270C)			
	ND [4]	ND	ND
Explosive Compounds (U.S. EPA Method 8330)			
	<0.2	<0.2	<0.2
Volatile Organic Compounds (U.S. EPA Method 8260B)			
	ND	ND	ND

Notes
1. <0.75 = Less than laboratory reporting limit.
2. UJ = Data qualified as estimated due to low MS/MSD recoveries.
3. -- = Sample not analyzed for the analyte.
4. ND = Not detected above variable reporting limits.

Laboratory analytical data results reported to two significant figures, where appropriate.

TABLE 23
BUILDINGS 022 TO 025, 029 TO 032, AND A-1, B-1 SOIL SAMPLE ANALYTICAL RESULTS
Aerojet Chino Hills Facility

Concentrations reporting in milligrams per kilogram (mg/kg)

Analyte	Sample Designation and Date															
	022-01-S-0.5 10/27/2006	C-SW10-07[1] 10/27/2006	023-01-S-0.5 10/27/2006	024-01-S-0.5 5/10/2006	025-01-S-0.5 5/10/2006	025-02-S-0.5 10/27/2006	029-01-S-0.5 5/10/2006	SW10-06 [2] 5/10/2006	030-01-S-0.5 5/10/2006	031-01-S-0.5 5/10/2006	032-01-S-0.5 5/10/2006	A1-01-S-0.5 10/26/2006	A1-01-S-2 10/26/2006	B1-01-S-0.5 10/26/2006	C-SW10-04[3] 10/26/2006	B1-01-S-2 10/26/2006
Metals (EPA Methods 6010B/7000)																
Antimony	<0.75 UJ	<0.75 UJ	<0.75 UJ	<2.5	2.6	--	<2.5	<2.5	<2.5	3.1	2.8	--	--	--	--	--
Arsenic	7.8	7.9	7.1	<5.0	5.1	--	<5.0	<5.0	7.2	5.8	<5.0	--	--	--	--	--
Barium	164	135	149	67	100	--	120	160	77	110	82	--	--	--	--	--
Beryllium	0.6	0.5	0.5	<0.25	<0.25	--	<0.25	0.3	<0.25	<0.25	<0.25	--	--	--	--	--
Cadmium	4.2	2.9	2.4	2.9	1.6	--	1.1	1.1	1.5	0.5	2.4	--	--	--	--	--
Chromium	15	13	18	11	12	--	9.2	11	14	16	9.8	--	--	--	--	--
Cobalt	12	10	13	6.5	10	--	11	11	8.3	8.8	6.5	--	--	--	--	--
Copper	29	26	24	8.2	7.8	--	10	11	12	9.3	5.1	--	--	--	--	--
Lead	4.2	3.7	4.0	<5.0	5.0	--	6.8	8.5	5.9	6.8	<5.0	--	--	--	--	--
Mercury	<0.08	<0.08	<0.08	<0.02 UJ	<0.02 UJ	--	0.04	0.04	0.03	<0.02	0.03 J	--	--	--	--	--
Molybdenum	5.8	5.1	4.6	5.6	3.4	--	4.1	5.0	8.5	2.6	11	--	--	--	--	--
Nickel	38	38	33	16	13	--	16	18	25	19	21	--	--	--	--	--
Selenium	<0.75 UJ	<0.75 UJ	<0.75 UJ	<5.0	<5.0	--	<5.0	<5.0	<5.0	<5.0	<5.0	--	--	--	--	--
Silver	<0.25	<0.25	<0.25	<1.0	<1.0	--	<1.0	<1.0	<1.0	<1.0	<1.0	--	--	--	--	--
Thallium	<0.75 UJ	<0.75 UJ	<0.75 UJ	<5.0	<5.0	--	<5.0	<5.0	<5.0	<5.0	<5.0	--	--	--	--	--
Vanadium	33	27	47	25	19	--	13	15	28	27	24	--	--	--	--	--
Zinc	71	68	64	36	38	--	41	48	60	47	40	--	--	--	--	--
Explosive Compounds (EPA Method 8330)																
	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Perchlorate (EPA Method 314.0)																
	ND	ND	ND	ND	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:
ND = Not detected above laboratory reporting limits (<0.2 to 0.5 mg/kg for explosive compounds and <0.01 to 0.04 mg/kg for perchlorate).
UJ and J = Results qualified as estimated due to low MS/MSD recoveries.
<2.5 = Less than laboratory reporting limit.
-- = Not analyzed.
1. Duplicate of sample 022-01-S-0.5
2. Duplicate of sample 029-01-S-0.5.
3. Duplicate of sample B1-01-S-0.5.

Laboratory analytical data results reported to two significant figures, where appropriate.

TABLE 24
BUILDINGS 022 TO 025 AND 029 TO 032
CONCRETE CORE SAMPLE ANALYTICAL RESULTS
Aerojet Chino Hills Facility

Concentrations reporting in milligrams per kilogram (mg/kg)

Analyte	Sample Designation and Date								
	022-01-C 10/27/2006	023-01-C 10/27/2006	024-01-C 5/9/2006	025-01-C 5/9/2006	029-01-C 5/9/2006	030-01-C 5/9/2006	031-01-C 5/9/2006	032-01-C 5/9/2006	SW10-04 [1] 5/9/2006
Explosive Compounds (EPA Method 8330)									
RDX	ND [2]	ND	ND UJ [3]	ND UJ	ND UJ	ND UJ	ND UJ	ND UJ	0.70 J
Perchlorate (EPA Method 314.0)									
	ND	ND	ND	0.04	ND	ND	ND	ND	0.01

Notes:
1. Duplicate of sample 032-01-C.
2. ND = Not detected above laboratory reporting limits (<0.2 to 0.5 mg/kg for explosive compounds and <0.01 to 0.04 mg/kg for perchlorate).
3. UJ and J = Results qualified as estimated.

Laboratory analytical data results reported to two significant figures, where appropriate.

TABLE 25
BUILDING 036 OUTFLOW
SOIL SAMPLE ANALYTICAL RESULTS
Aerojet Chino Hills Facility

Concentration reported in milligrams per kilogram (mg/kg)

Sample Designation	Sample Date	Sample Depth (feet)	Nitroglycerine [1] U.S. EPA Method 8332	Explosive Compounds U.S. EPA Method 8330
036-DRAIN-04-S	5/9/2006	1.0	14 (100) [2] J [3]	ND (ND) [2]
036-DRAIN-04-S-5	10/26/2006	5.0	ND (ND)[4]	--
036-DRAIN-04-S-10	10/26/2006	10.0	ND	--
036-DRAIN-05-S-1	10/26/2006	1.0	ND	--
036-DRAIN-05-S-5	10/26/2006	5.0	ND	--
036-DRAIN-05-S-10	10/26/2006	10.0	ND	--
036-DRAIN-06-S-1	10/26/2006	1.0	ND	--
036-DRAIN-06-S-5	10/26/2006	5.0	ND	--
036-DRAIN-06-S-10	10/26/2006	10.0	ND	--
036-OUTFLOW	6/15/2007	Excavation Bottom	ND	--

Notes:
ND = Not detected above laboratory reporting limits (<0.5 mg/kg for explosive compounds and <2.7 to 3.0 mg/kg for nitroglycerine).
-- = Not analyzed.
1. Trinitroglycerine and nitroglycerine same compound.
2. (100) = Duplicate sample location SW10-02 and analytical results.
3. J = Results qualified as estimated.
4. (ND) = Duplicate sample location SW10-06 and analytical results.

TABLE 26
FORMER BUILDING 551W FILTER HOUSE
SOIL SAMPLE ANALYTICAL RESULTS
Aerojet Chino Hills Facility

Concentration reported in milligrams per kilogram (mg/kg)

Sample Designation	Sample Date	Sample Depth (feet)	RDX U.S. EPA Method 8330
551W-Filt-02-S	5/9/2006	0.5	2.6

TABLE 27
BEDROCK BACKGROUND METALS SAMPLE ANALYTICAL RESULTS
Aerojet Chino Hills Facility

Concentrations reported in milligrams per kilogram (mg/kg)

Analyte	Data Qualifier [1]	Sample Designation and Date Sampled						
		BG-01-05 5/12/2006	SW10-08[2] 5/12/2006	BG-01-06 5/12/2006	BG-01-07 5/12/2006	BG-01-08 5/12/2006	BG-01-09 5/12/2006	BG-01-10 5/12/2006
Metals (U.S. EPA Methods 6010B/7000)								
Antimony	UJ	<2.5[3]	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Arsenic	UJ/J	5.1	<5.0 [4]	6.7	<5.0	8.1	7.3	<5.0
Barium	J	73	86	120	74	100	50	98
Beryllium	UJ	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Cadmium	J	0.3	0.3	1.2	4.9	2.5	3.6	<0.25
Chromium	J	6.2	6.7	17	5.9	9.5	10	6.6
Cobalt	J	6.1	6.9	6.3	3.7	6.3	5.9	7.1
Copper	J	7.5	9.4	20	4.6	12	12	5.6
Lead	UJ/J	5.3	6.0	<5	<5	<5	<5	5.1
Mercury [4]		0.053 J	0.42 J	0.047	<0.02	0.042	0.068	<0.02
Molybdenum	J	1.5	1.7	7.3	6.5	6.0	5.7	<1.0
Nickel	J	13	14	29	28	27	32	12
Selenium	UJ	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Silver	UJ	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Thallium	UJ	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Vanadium	J	10	11	39	27	26	17	9.4
Zinc	J	31	34	76	50	39	49	31

1. Data qualified as "UJ" or "J" due to low MS/MSD recoveries.
2. Duplicate of sample BG-01-05.
3. <2.5 = Less than laboratory reporting limit.
4. Mercury results qualified as "J" where indicated due to high RPD% between original and duplicate sample results.

Laboratory analytical data results reported to two significant figures, where appropriate.

TABLE 28

TOTAL NUMBER OF FIELD QA/QC SAMPLES

Aerojet Chino Hills Facility

CM SAMPLES

Analysis Group	Analytical Method	Field Duplicates	Equipment Blanks
Metals	U.S. EPA 6010B/7000	2	2
Explosive compounds	U.S. EPA 8330	4	4
Perchlorate	U.S. EPA 314.0M	11	7
Dioxins	U.S. EPA 8290	1	0
TOTALS		**18**	**13**

BA SAMPLES

Analysis Group	Analytical Method	Field Duplicates	Equipment Blanks
Metals	U.S. EPA 6010B/7000	2	2
Explosive compounds	U.S. EPA 8330	7	4
Perchlorate	U.S. EPA 314.0M	4	2
Nitroglycerine	U.S. EPA 8332	2	2
TOTALS		**15**	**10**

TABLE 29

RESULTS FOR CM SOIL FIELD DUPLICATE SAMPLES
Aerojet Chino Hills Facility

Analyte	Units	Blind Sample Designation (Sample Location)																							
		C-AC10-S-05-EXC (SW10-01)			C-AC05-S-03-N-0.5 (SW10-05)			C-SW02-S-17-5 (SW10-06)			BG-01-05 (SW10-08)			Bldg 534-03-0.5 (SW10-09)			C-SW02-S-24-0.5 (C-SW10-01)			C-SW02-S-27-0.5 (C-SW10-02)			C-SW02-S-30-0.5 (C-SW10-03)		
		5/8/2006	5/8/2006	RPD [1]	5/10/2006	5/10/2006	RPD	5/10/2006	5/10/2006	RPD	5/12/2006	5/12/2006	RPD	5/13/2006	5/13/2006	RPD	10/25/2006	10/25/2006	RPD	10/25/2006	10/25/2006	RPD	10/25/2006	10/25/2006	RPD
Metals (U.S. EPA Methods 6010B/7000)																									
Antimony	mg/kg [2]	-- [3]	--		<2.5 [4]	<2.5	NC [5]	--	--		<2.5	<2.5	NC	--	--		--	--		--	--		--	--	
Arsenic	mg/kg	--	--		5.7	6.9	19	--	--		5.1	<5.0	NC	--	--		--	--		--	--		--	--	
Barium	mg/kg	--	--		110	110	0	--	--		73	86	16	--	--		--	--		--	--		--	--	
Beryllium	mg/kg	--	--		<0.25	<0.25	NC	--	--		<0.25	<0.25	NC	--	--		--	--		--	--		--	--	
Cadmium	mg/kg	--	--		2.6	2.0	26	--	--		0.28	0.28	0	--	--		--	--		--	--		--	--	
Chromium	mg/kg	--	--		9.4	9.8	4	--	--		6.2	6.7	8	--	--		--	--		--	--		--	--	
Cobalt	mg/kg	--	--		7.0	6.8	3	--	--		6.1	6.9	12	--	--		--	--		--	--		--	--	
Copper	mg/kg	--	--		9.5	13	31	--	--		7.5	9.4	22	--	--		--	--		--	--		--	--	
Lead	mg/kg	--	--		<5.0	6.1	NC	--	--		5.3	6.0	12	--	--		--	--		--	--		--	--	
Mercury	mg/kg	--	--		0.032	0.029	10	--	--		0.053	0.42	155	--	--		--	--		--	--		--	--	
Molybdenum	mg/kg	--	--		6.3	6.9	9	--	--		1.5	1.7	13	--	--		--	--		--	--		--	--	
Nickel	mg/kg	--	--		22	21	5	--	--		13	14	7	--	--		--	--		--	--		--	--	
Selenium	mg/kg	--	--		<5.0	<5.0	NC	--	--		<5.0	<5.0	NC	--	--		--	--		--	--		--	--	
Silver	mg/kg	--	--		<1.0	<1.0	NC	--	--		<1.0	<1.0	NC	--	--		--	--		--	--		--	--	
Thallium	mg/kg	--	--		<5.0	<5.0	NC	--	--		<5.0	<5.0	NC	--	--		--	--		--	--		--	--	
Vanadium	mg/kg	--	--		17	16	6	--	--		10	11	10	--	--		--	--		--	--		--	--	
Zinc	mg/kg	--	--		43	50	15	--	--		31	34	9	--	--		--	--		--	--		--	--	
Dioxins (U.S. EPA Method 8290)																									
	µg/g [6]	--	--		--	--		--	--		--	--		0.41	0.44	6	--	--		--	--		--	--	
Explosive Compounds (U.S. EPA Method 8330)																									
HMX	mg/kg	--	--		1.0	0.86	15	--	--		--	--		--	--		--	--		--	--		--	--	
RDX	mg/kg	--	--		<0.49	0.68	NC	--	--		--	--		--	--		--	--		--	--		--	--	
1,3,5- Trinitrobenzene	mg/kg				ND [7]	ND	0	--	--		--	--		--	--		--	--		--	--		--	--	
Perchlorate (U.S. EPA Method 314.0M)																									
	mg/kg	ND	ND	0	--	--		0.02	0.01	50	--	--		--	--		0.29	0.26	11	ND	ND	0	0.05	0.05	10

1. RPD = relative percent difference.
2. mg/kg = milligrams per kilogram.
3. -- = sample not analyzed for analytes indicated.
4. <2.5 = less than laboratory reporting limit.
5. NC = not calculated.
6. µg/g = micrograms per gram.
7. ND = not detected above reporting limits.

Shaded sample results are considered outliers

TABLE 29

RESULTS FOR CM SOIL FIELD DUPLICATE SAMPLES
Aerojet Chino Hills Facility

Analyte	Units	Blind Sample Designation (Sample Location)																										
		CB-STPL-03-0.5 (C-SW10-05)			010-002-01-S-0.5 (SW10-01)			C-SW02-S-40-5 (SW10-01)			C-SW02-S-48-0.5 (C-SW10-02)			C-SW02-S-47-0.5 (C-SW10-03)			C-SW02-S-50-0.5 (SW10-2)			C-SW02-S-53-5 (SW10-1)			SB-3-10 (SW10-1)			N3A (SW10A)		
		10/26/2006	10/26/2006	RPD	11/14/2006	11/14/2006	RPD	12/13/2006	12/13/2006	RPD	12/14/2006	12/14/2006	RPD	12/14/2006	12/14/2006	RPD	1/29/2007	1/29/2007	RPD	1/29/2007	1/29/2007	RPD [2]	1/30/2007	1/30/2007	RPD	6/25/2007	6/25/2007	RPD
Metals (U.S. EPA Methods 6010B/7000)																												
Antimony	mg/kg [2]	--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--	
Arsenic	mg/kg	--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--	
Barium	mg/kg	--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--	
Beryllium	mg/kg	--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--	
Cadmium	mg/kg	--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--	
Chromium	mg/kg	--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--	
Cobalt	mg/kg	--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--	
Copper	mg/kg	--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--	
Lead	mg/kg	--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--	
Mercury	mg/kg	--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--	
Molybdenum	mg/kg	--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--	
Nickel	mg/kg	--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--	
Selenium	mg/kg	--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--	
Silver	mg/kg	--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--	
Thallium	mg/kg	--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--	
Vanadium	mg/kg	--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--	
Zinc	mg/kg	--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--	
Dioxins (U.S. EPA Method 8290)																												
	µg/g [6]	--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--		--	--	
Explosive Compounds (U.S. EPA Method 8330)																												
HMX	mg/kg	--	--		0.48	0.45	6	--	--		--	--		--	--		--	--		--	--		<0.2	1.1	NC	0.25	0.40	46
RDX	mg/kg	--	--		0.46	0.44	4	--	--		--	--		--	--		--	--		--	--		<0.2	3.5	NC	0.61	0.94	43
1,3,5- Trinitrobenzene	mg/kg	--	--		ND	ND	0	--	--		--	--		--	--		--	--		--	--		ND	ND	0	1.1	1.9	53
Perchlorate (U.S. EPA Method 314.0M)																												
	mg/kg	ND	ND	0	--	--		ND	ND	0	ND	ND	0	ND	ND	0	ND	ND	0	0.08	0.18	78	--	--		--	--	

1. RPD = relative percent difference.
2. mg/kg = milligrams per kilogram.
3. -- = sample not analyzed for analytes indicated.
4. <2.5 = less than laboratory reporting limit.
5. NC = not calculated.
6. µg/g = micrograms per gram.
7. ND = not detected above reporting limits.

Shaded sample results are considered outliers

TABLE 30
COMPARISON OF CM SOIL SAMPLE AND FIELD DUPLICATE SAMPLE RESULTS
Aerojet Chino Hills Facility

Concentrations reported in milligrams per kilogram (mg/kg)

Analysis	Sample ID	Duplicate Sample ID	Total Analytes Within 50%	Total Analytes Exceed 50%	RPD[1] >50%	Analytes that Exceed 50% Criteria	Sample Result	Duplicate Sample Result
Metals (U.S. EPA Method 6010B/7000)								
	C-AC05-S-03-N-0.5	SW10-05	17	0				
	BG-01-05	SW10-08	16	1	155	Mercury	0.053	0.42
	Total		***33***	***1***				
Dioxins (U.S. EPA Method 8290)								
	Bldg 534-03-0.5	SW10-09	17	0				
	Total		***17***	***0***				
Explosive Compounds (U.S EPA Method 8330)								
	N3A	SW10A	13	1	53	1,3,5- Trinitrobenzene	1.1	1.9
	SB-3-10	SW10-1	12	2	high [2] high	HMX RDX	<0.20 [3] <0.20	1.1 3.5
	010-002-01-S-0.5	SW10-01	14	0				
	C-AC05-S-03-N-0.5	SW10-05	14	0				
	Total		***53***	***3***				
Perchlorate (U.S. EPA Method 314.0M)								
	C-AC10-S-05-EXC	SW10-01	1	0				
	CB-STPL-03-0.5	C-SW10-05	1	0				
	C-SW02-S-17-5	SW10-06	1	0				
	C-SW02-S-24-0.5	C-SW10-01	1	0				
	C-SW02-S-27-0.5	C-SW10-02	1	0				
	C-SW02-S-30-0.5	C-SW10-03	1	0				
	C-SW02-S-40-5	SW10-01	1	0				
	C-SW02-S-47-0.5	C-SW10-03	1	0				
	C-SW02-S-48-0.5	C-SW10-02	1	0				
	C-SW02-S-50-0.5	SW10-2	1	0				
	C-SW02-S-53-5	SW10-1	0	1	78	perchlorate	0.078	0.178
	Total		***10***	***1***				

1. RPD = relative percent difference.
2. RPD not calculated if results are not greater than five times the reporting limit. The difference between the samples exceeds five times value of the reporting limit.
3. <0.20 = not detected above reporting limit.

TABLE 31
RESULTS FOR BA SOIL FIELD DUPLICATE SAMPLES
Aerojet Chino Hills Facility

Analyte	Units	Blind Sample Designation (Sample Location)																							
		022-01-S-0.5 (C-SW10-07)			029-01-S-0.5 (SW10-06)			B-01-S-0.5 (C-SW10-04)			032-01-C (SW10-04)			036-DRAIN-04-S (SW10-02)			036-DRAIN-04-S-5 (SW10-06)			006-001-03-S-0.5 (SW10-07)			006-001-03-C (SW10-03)		
		10/27/2006	10/27/2006	RPD% [1]	5/10/2006	5/10/2006	RPD%	10/26/2006	10/26/2006	RPD%	5/9/2006	5/9/2006	RPD%	5/9/2006	5/9/2006	RPD%	10/26/2006	10/26/2006	RPD%	5/11/2006	5/11/2006	RPD%	5/9/2006	5/9/2006	RPD%
Metals (U.S. EPA Methods 6010B/7000)																									
Antimony	mg/kg [2]	<0.75 [3]	<0.75	NC [4]	<2.5	<2.5	NC	-- [5]	--		--	--		--	--		--	--		--	--		--	--	
Arsenic	mg/kg	7.8	7.9	0	<5.0	<5.0	NC	--	--		--	--		--	--		--	--		--	--		--	--	
Barium	mg/kg	164	135	19	120	160	29	--	--		--	--		--	--		--	--		--	--		--	--	
Beryllium	mg/kg	0.6	0.5	14	<0.25	0.34	NC	--	--		--	--		--	--		--	--		--	--		--	--	
Cadmium	mg/kg	4.2	2.9	38	1.1	1.1	0	--	--		--	--		--	--		--	--		--	--		--	--	
Chromium	mg/kg	15	13	14	9.2	11	18	--	--		--	--		--	--		--	--		--	--		--	--	
Cobalt	mg/kg	12	10	16	11	11	0	--	--		--	--		--	--		--	--		--	--		--	--	
Copper	mg/kg	29	26	14	10	11	10	--	--		--	--		--	--		--	--		--	--		--	--	
Lead	mg/kg	4.2	3.7	13	6.8	8.5	22	--	--		--	--		--	--		--	--		--	--		--	--	
Mercury	mg/kg	<0.08	<0.08	NC	0.04	0.04	0	--	--		--	--		--	--		--	--		--	--		--	--	
Molybdenum	mg/kg	5.8	5.1	12	4.1	5.0	20	--	--		--	--		--	--		--	--		--	--		--	--	
Nickel	mg/kg	38	38	1	16	18	12	--	--		--	--		--	--		--	--		--	--		--	--	
Selenium	mg/kg	<0.75	<0.75	NC	<5.0	<5.0	NC	--	--		--	--		--	--		--	--		--	--		--	--	
Silver	mg/kg	<0.25	<0.25	NC	<1.0	<1.0	NC	--	--		--	--		--	--		--	--		--	--		--	--	
Thallium	mg/kg	<0.75	<0.75	NC	<5.0	<5.0	NC	--	--		--	--		--	--		--	--		--	--		--	--	
Vanadium	mg/kg	33	27	21	13	15	14	--	--		--	--		--	--		--	--		--	--		--	--	
Zinc	mg/kg	71	68	4	41	48	16	--	--		--	--		--	--		--	--		--	--		--	--	
Nitroglycerine (U.S. EPA Method 8332)																									
	mg/kg	--	--		--	--		--	--		--	--		14	100	151	ND [6]	ND	0	--	--		--	--	
Explosive Compounds (U.S. EPA Method 8330)																									
HMX	mg/kg	ND	ND	0	ND	ND	0	ND	ND	0	ND	ND	NC	ND	ND	0	--	--		ND	ND	0	ND	ND	0
RDX	mg/kg	ND	ND	0	ND	ND	0	ND	ND	0	ND	0.70	NC	ND	ND	0	--	--		ND	ND	0	ND	ND	0
Perchlorate (U.S. EPA Method 314.0M)																									
	mg/kg	ND	ND	0	ND	ND	0	ND	ND	0	ND	0.01	NC	--	--		--	--		--	--		--	--	

1. RPD = relative percent difference.
2. mg/kg = milligrams per kilogram.
3. <0.75 = less than laboratory reporting limit.
4. NC = not calculated.
5. -- = sample not analyzed for analytes indicated.
6. ND = not detected above laboratory reporting limits.

Shaded sample results are considered outliers

TABLE 32
COMPARISON OF BA SOIL SAMPLE AND FIELD DUPLICATE SAMPLE RESULTS
Aerojet Chino Hills Facility

Concentrations reported in milligrams per kilogram (mg/kg)

Analysis	Sample ID	Duplicate Sample ID	Total Analytes Within 50%	Total Analytes Exceed 50%	RPD[1] >50%	Analytes that Exceed 50% Criteria	Sample Result	Duplicate Sample Result
Metals (U.S. EPA Method 6010B/7000)								
	022-01-S-0.5	C-SW10-07	17	0				
	029-01-S-0.5	SW10-06	17	0				
	Total		***34***	***0***				
Nitroglycerine (U.S. EPA Method 8332)								
	036-DRAIN-04-S	SW10-02	0	1	151	nitroglycerine	14	100
	036-DRAIN-04-S-0.5	SW10-06	1	0				
	Total		***1***	***1***				
Explosive Compounds (U.S. EPA Method 8330)								
	022-01-S-0.5	C-SW10-07	14	0				
	029-01-S-0.5	SW10-06	14	0				
	B-01-S-0.5	C-SW10-04	14	0				
	032-01-C	SW10-04	14	0				
	036-DRAIN-04-S	SW10-02	14	0				
	006-001-03-S-0.5	SW10-07	14	0				
	006-001-03-C	SW10-03	14	0				
	Total		***98***	***0***				
Perchlorate (U.S. EPA Method 314.0M)								
	022-01-S-0.5	C-SW10-07	1	0				
	029-01-S-0.5	SW10-06	1	0				
	B-01-S-0.5	C-SW10-04	1	0				
	032-01-C	SW10-04	1	0				
	Total		***4***	***0***				

1. RPD = relative percent difference.

TABLE 33
RESULTS FOR CM EQUIPMENT BLANKS
Aerojet Chino Hills Facility

Analyte	Units	Sample Designation (Sample Location)					
		EB-1 (C-AC10-S-0.5-EXC) 05/8/2006	EB3 (010-007-03-S-0.5) 05/10/2006	EB4 (C-AC05-S-03-N-0.5) 05/10/2006	ER5 (C-SW02-S-17-5) 05/10/2006	EB8 (BG-01-05) 05/12/2006	EB-1 (C-SW02-S-24-0.5) 10/25/2006
Metals (U.S. EPA Method 6010B/7470A)							
Chromium	mg/l [1]	-- [2]	--	0.06	--	ND [3]	--
Copper	mg/l	--	--	0.02	--	ND	--
Nickel	mg/l	--	--	0.02	--	ND	--
Zinc	mg/l	--	--	0.02	--	ND	--
Perchlorate (U.S. EPA Method 314.0M)							
	mg/l	ND	--	--	ND	--	ND
Explosive Compounds (U.S. EPA Method 8330)							
RDX	µg/l [4]	--	ND (UJ) [5]	ND (UJ)	--	--	--
Tetryl	µg/l	--	ND (UJ)	ND (UJ)	--	--	--

1. mg/l = milligrams per liter.
2. -- = sample not analyzed for analytes indicated.
3. ND = not detected above reporting limits.
4. µg/l = micrograms per liter.
5. UJ = results qualified as estimated.

Shaded sample results are considered outliers.

TABLE 33
RESULTS FOR CM EQUIPMENT BLANKS
Aerojet Chino Hills Facility

Analyte	Units	Sample Designation (Sample Location)					
		EB-1 (CB-STPL-03-5) 10/26/2006	EB-01 (C-SW02-S-40-7.5) 12/13/2006	EB-02 (C-SW02-S-38-0.5) 12/14/2006	EB1 (C-SW02-S-52-15) 01/29/2007	EB-1 (SB-3-10) 01/30/2007	SW-2 (SW10A) 06/25/2007
Metals (U.S. EPA Method 6010B/7470A)							
Chromium	mg/l [1]	--	--	--	--	--	--
Copper	mg/l	--	--	--	--	--	--
Nickel	mg/l	--	--	--	--	--	--
Zinc	mg/l	--	--	--	--	--	--
Perchlorate (U.S. EPA Method 314.0M)							
	mg/l	ND	ND	ND	ND	--	--
Explosive Compounds (U.S. EPA Method 8330)							
RDX	µg/l [4]	--	--	--	--	ND	1.7
Tetryl	µg/l	--	--	--	--	ND	1.2

1. mg/l = milligrams per liter.
2. -- = sample not analyzed for analytes indicated.
3. ND = not detected above reporting limits.
4. µg/l = micrograms per liter.
5. UJ = results qualified as estimated.

Shaded sample results are considered outliers.

TABLE 34
RESULTS FOR BA EQUIPMENT BLANKS
Aerojet Chino Hills Facility

Analyte	Units	Sample Designation (Sample Location)					
		EB-2 (036-Drain-04-S) 5/9/2006	EB6 (029-01-S-0.5) 05/10/2006	EB7 (006-001-03-S-0.5) 05/11/2006	EB-1 (022-01-S-0.5) 10/27/2006	EB-1 (B1-01-S-2) 10/26/2006	EB-01 (036-Drain-04-S-5) 10/26/2006
Metals (U.S. EPA Method 6010B/7470A)							
Zinc	mg/l[1]	-- [2]	ND [3]	--	0.05	--	--
Nitroglycerine (U.S. EPA Method 8332)							
	mg/l	ND (UJ) [4]	--	--	--	--	ND
Perchlorate (U.S. EPA Method 314.0M)							
	mg/l	--	ND		ND	--	--
Explosive Compounds (U.S. EPA Method 8330)							
	µg/l [5]	--	ND (UJ)	ND (UJ)	ND	ND	--

1. mg/l = milligrams per liter.
2. -- = sample not analyzed for analytes indicated.
3. ND = not detected above reporting limits.
4. UJ = results qualified as estimated.
5. µg/l = micrograms per liter.

Shaded sample results are considered outliers.

TABLE 35

TOTAL NUMBER OF LABORATORY QA/QC SAMPLES
Aerojet Chino Hills Facility

CM LABORATORY QA/QC SAMPLES

Analysis Group	Analytical Method	Method Blank	Matrix Spike/ Spike Duplicate		Lab Control Samples	
			MS[1]	MSD[2]	LCS[3]	LCSD[4]
Metals	U.S. EPA 6010B/7000	4	4	4	4	3
Explosives	U.S. EPA 8330	10	10	10	10	8
Perchlorate	U.S. EPA 314.0M	18	18	18	18	15
Dioxins and furans	U.S. EPA 8290	1	0	0	1	0
TOTALS		**33**	**32**	**32**	**33**	**26**

BA LABORATORY QA/QC SAMPLES

Analysis Group	Analytical Method	Method Blank	Matrix Spike/ Spike Duplicate		Lab Control Samples	
			MS[1]	MSD[2]	LCS[3]	LCSD[4]
Mercury	U.S. EPA 7470A	1	1	1	1	5
Lead	U.S. EPA 6010B	1	1	1	1	0
Metals	U.S. EPA 6010B/7000	5	5	5	5	0
Explosives	U.S. EPA 8330	9	9	9	9	6
SVOCs	U.S. EPA 8270C	3	3	3	3	1
VOCs	U.S. EPA 8260B	3	0	0	3	3
TPH	U.S. EPA 8015M	4	4	4	4	4
Perchlorate	U.S. EPA 314.0M	4	4	4	4	2
Nitroglycerine	U.S. EPA 8332	1	1	1	1	0
TOTALS		**31**	**28**	**28**	**31**	**21**

1. MS = matrix spike.
2. MSD = matrix spike duplicate.
3. LCS = laboratory control sample.
4. LCSD = laboratory control sample duplicate.

TABLE 36
LABORATORY QA/QC SUMMARY FOR CM SOIL SAMPLES

Aerojet Chino Hills Facility

Work Order Number	QC Batch Number	Analysis	MB	MS	MSD	LCS	LCSD	Sample Exceedence	Total Assoc. Samples	Associated Samples
S605258	6050353	Hg	1	1	1	1	1		7	BG-01-05, SW10-08, BG-01-06, BG-01-07, BG-01-08, BG-01-09, BG-01-10
S605259	6050353	Hg	1	1	1	1	0	0	5	C-AC05-S-03-N-0.5, SW10-05, C-AC05-S-03-N-4, C-AC05 S-04-S-0.5, C-AC05-S-04-S-4
S605259	6050376	Hg	1	1	1	1	1	MS/MSD	4	A1D-01-0.5, A1D-01-3, C-AC05-S-05-0.5, C-AC05-S-06-0.5
06-07-0235	060707L02	Hg	1	1	1	1	1	0	4	C-SW02-S-20-stp, C-SW02-S-21-stp, C-SW02-S-22-stp, C-SW02-S-23-stp
TOTAL for Mercury			**4**	**4**	**4**	**4**	**3**	**4**	**20**	
S605258	6050232	Metals (excluding Hg)	2	1	1	1	1	MB (Zn) MS (As, Be, Cd, Pb, Zn, Sb, Cr, Cu, Mo, Ni, V, Co, Ag, Se, Th) MSD (As, Ba, Be, Cd, Pb, Zn, Sb, Cr, Cu, Mo, Ni, V, Co, Ag, Se, Th)	7	BG-01-05, SW10-08, BG-01-06, BG-01-07, BG-01-08, BG-01-09, BG-01-10
S605259	6050256	Metals (excluding Hg)	1	1	1	1	0	MS (As, Ba, Be, Cd, Pb, Zn, Sb, Cr, Cu, Mo, Ni, V, Co, Ag, Se, Th) MSD (As, Be, Cd, Pb, Zn, Sb, Cr, Cu, Mo, Ni, V, Co, Ag, Se, Th)	9	C-AC05-S-03-N-0.5, SW10-05, C-AC05-S-03-N-4, C-AC05 S-04-S-0.5, C-AC05-S-04-S-4, A1D-01-0.5, A1D-01-3, C-AC05-S-05-0.5, C-AC05-S-06-0.5
		Cd						MS/MSD	4	C-AC13-S-10-0.5, C-AC13-S-12-0.5, C-AC13-S-13-0.5, C-AC13-S-11-0.5
06-07-0235	060707L06	Metals (excluding Hg)	1	1	1	1	1	MB (V), MS (Sb), MSD (Sb, Pb)	4	C-SW02-S-20-stp, C-SW02-S-21-stp, C-SW02-S-22-stp, C-SW02-S-23-stp
TOTAL for Metals			**4**	**3**	**3**	**3**	**2**	**24**	**24**	
S605259	6053794	Explosives	1	1	1	1	0	0	12	010-010-04-S-0.5, 010-010-04-S-4.5, 010-011-01-S-0.5, 010-011-01-S-3.5, 010-007-02-S-0.5, 010-007-03-S-0.5, 010-007-03-S-5, 010-010-03-S-0.5, 010-010-03-S-3, C-AC05-S-03-N-0.5, SW10-05, C-AC05-S-04-S-0.5
S605259	6053797	Explosives	1	1	1	1	0	0	2	A1D-01-0.5, A1D-01-3
06-07-0235	060707L06	Explosives	1	1	1	1	1	MS/MSD (tetryl) data not qualified	4	C-SW02-S-20-stp, C-SW02-S-21-stp, C-SW02-S-22-stp, C-SW02-S-23-stp

TABLE 36
LABORATORY QA/QC SUMMARY FOR CM SOIL SAMPLES

Work Order Number	QC Batch Number	Analysis	MB	MS	MSD	LCS	LCSD	Sample Exceedence	Total Assoc. Samples	Associated Samples
06-11-0878	061114L02	Explosives	1	1	1	1	1	0	13	010-011-01-S-5.0, 010-001-01-S-0.5, 010-001-01-S-2.5, 010-001-01-S-5.0, 010-002-01-S-2.5, 010-002-01-S-5.0, 010-002-01-S-0.5, 010-010-02-S-2.5, 010-010-02-S-5.0, 010-011-02-S-0.5, 010-011-02-S-2.5, 010-011-02-S-5.0, SW10-01
07-01-1701	070131L08	Explosives	1	1	1	1	1	0	11	SB-5-0.5, SB-5-2.5, SB-5-5, SB-4-0.5, SB-4-2.5, SB-4-5, SB-3-10, SW-10-1, SB-3-15, SB-1-10, SB-1-15
07-01-1701	070131S08	Explosives	1	1	1	1	1	0	2	SB-2-10, SB-2-15
07-01-1701	070131L05	Explosives	1	1	1	1	1	0	2	SB-1-20, SB-2-20
07-06-1071	070615L18	Explosives	1	1	1	1	1	0	2	Notch-sidewall, Notch-center
07-06-0976	070614L11	Explosives	1	1	1	1	1	LCS/LCSD RDP (1,3,5-TNB; 2,4,6-TNT) data not qualified	5	N3, NW2, 20B1, 20B2, WX
07-06-1852	070626L12	Explosives	1	1	1	1	1	0	3	N3A, SW10-A, 20B2A
TOTAL for Explosives			**10**	**10**	**10**	**10**	**8**	**0**	**56**	
S605199	6E17029	Perchlorate	1	1	1	1	0	0	10	C-AC10-S-05-EXC, SW10-01, C-AC10-S-06-EXC, C-AC10-S-07-EXC, C-AC10-S-08-EXC, C-AC10-S-03-STP, C-AC10-S-04-STP,C-AC10-S-05-STP,C-AC10-S-06-STP, CB-STPL-01
S605259	6E31029	Perchlorate	1	1	1	1	0		8	C-SW02-S-19-0.5, C-SW02-S-19-5, C-SW02-S-19-9, C-SW02-S-18-0.5, C-SW02-S-18-5, C-SW02-S-18-10, C-SW02-S-17-0.5, C-SW02-S-17-5
S605259	6E31044	Perchlorate	1	1	1	1	0		7	C-SW02-S-17-10, AID-01-0.5, AID-01-3, C-AC06-S-01-STP, C-AC06-S-02-STP, C-AC06-S-07-STP, C-AC06-S-08-STP
06-07-0235	060707L06	Perchlorate	1	1	1	1	1	0	4	C-SW02-S-20-stp, C-SW02-S-21-stp, C-SW02-S-22-stp, C-SW02-S-23-stp
06-10-1456	061028L01	Perchlorate	1	1	1	1	1	0	19	C-SW02-S-26-0.5, C-SW02-S-26-5, C-SW02-S-26-10, C-SW02-S-25-0.5,C-SW02-S-25-5, C-SW02-S-25-10, C-SW02-S-24-0.5, SW10-01, C-SW02-S-24-5, C-SW02-S-24-9.5, C-SW02-S-07-5, C-SW02-S-07-8.5, C-SW02-S-29-0.5, C-SW02-S-29-5, C-SW02-S-29-8, C-SW02-S-28-0.5, C-SW02-S-28-5, C-SW02-S-28-10, C-SW02-S-27-0.5
06-10-1456	061028L02	Perchlorate	1	1	1	1	1	0	8	C-SW10-02, C-SW02-S-27-5, C-SW02-S-27-10, C-SW02-S-30-0.5, C-SW10-03, C-SW02-S-30-4.5, C-SW02-S-31-5, C-SW02-S-31-8
06-10-1456	061028L03	Perchlorate	1	1	1	1	1	MS/MSD	1	C-SW02-S-31-0.5

TABLE 36
LABORATORY QA/QC SUMMARY FOR CM SOIL SAMPLES

Work Order Number	QC Batch Number	Analysis	MB	MS	MSD	LCS	LCSD	Sample Exceedence	Total Assoc. Samples	Associated Samples
06-10-1536	061101L01	Perchlorate	1	1	1	1	1	0	14	C-SW02-S-32-0.5, C-SW02-S-33-0.5, C-SW02-S-32-5, C-SW02-S-32-10, CB-STPL-03-0.5, C-SW10-05, CB-STPL-03-5, CB-STPL-03-10, CB-STPL-04-0.5, CB-STPL-04-5, CB-STPL-04-10, CB-STPL-01-5, CB-STPL-01-10, CB-STPL-02-0.5
06-10-1536	061101L02	Perchlorate	1	1	1	1	1	0	4	CB-STPL-02-S-5, CB-STPL-02-S-10, CB-STPL-05-5, CB-STPL-05-10
06-10-1669	061102L03	Perchlorate	1	1	1	1	1	0	1	CS-STPL-01-C
06-12-0864	061216L02	Perchlorate	1	1	1	1	1	0	20	C-SW02-S-40-0.5, C-SW02-S-40-5, SW10-01, C-SW02-S-40-7.5, C-SW02-S-39-0.5, C-SW02-S-39-5, C-SW02-S-39-10, C-SW02-S-41-0.5, C-SW02-S-41-5, C-SW02-S-41-10, C-SW02-S-42-0.5, C-SW02-S-42-5, C-SW02-S-43-0.5, C-SW02-S-43-5, C-SW02-S-43-10, C-SW02-S-49-0.5, C-SW02-S-49-5, C-SW02-S-49-10, C-SW02-S-44-0.5, C-SW02-S-44-5
06-12-0864	061216L01	Perchlorate	1	1	1	1	1	0	4	C-SW02-S-44-10. C-SW02-S-45-0.5, C-SW02-S-45-5, C-SW02-S-45-10
06-12-0955	061220L01	Perchlorate	1	1	1	1	1	MS/MSD data not qualified	20	C-SW02-S-48-0.5, SW10-02, C-SW02-S-48-5, C-SW02-S-48-10, C-SW02-S-47-0.5, SW10-03, C-SW02-S-47-5, C-SW02-S-47-10, C-SW02-S-46-0.5, C-SW02-S-46-5, C-SW02-S-46-10, C-SW02-S-34-0.5, C-SW02-S-38-0.5, C-SW02-S-38-5, C-SW02-S-38-10, C-SW02-S-37-0.5, C-SW02-S-37-5, C-SW02-S-37-10, C-SW02-S-36-0.5, C-SW02-S-36-5
06-12-0955	061220L04	Perchlorate	1	1	1	1	1	0	2	C-SW02-S-34-3, C-SW02-S-35-2.5
06-12-0955	061220L02	Perchlorate	1	1	1	1	1	MS/MSD data not qualified	2	C-SW02-S-36-10, C-SW02-S-35-0.5
07-01-1623	070202L01	Perchlorate	1	1	1	1	1	0	20	C-SW02-S-50-0.5, SW10-2, C-SW02-S-50-5, C-SW02-S-50 10, C-SW02-S-51-0.5, C-SW02-S-52-15, C-SW02-S-53-5, SW10-1, C-SW02-S-53-10, C-SW02-S-53-15, C-SW02-S-53-20, C-SW02-S-54-10, C-SW02-S-54-15, C-SW02-S-54-20, C-SW02-S-55-0.5, C-SW02-S-55-5, C-SW02-S-55-10, C-SW02-S-56-0.5, C-SW02-S-56-5, C-SW02-S-56-10
07-01-1623	Archive	Perchlorate	1	1	1	1	1	0	1	C-SW02-S-52-20
07-05-1969	070529L02	Perchlorate	1	1	1	1	1	0	3	S-32-SS-7.0, S-41-SS-3.0, S-31-SS-3.0
TOTAL for Perchlorate			**18**	**18**	**18**	**18**	**15**	**1**	**148**	

TABLE 36
LABORATORY QA/QC SUMMARY FOR CM SOIL SAMPLES

Work Order Number	QC Batch Number	Analysis	MB	MS	MSD	LCS	LCSD	Sample Exceedence	Total Assoc. Samples	Associated Samples
0-MB001	8020	dioxins/furans	1	0	0	1	0	MB (OCDD, 1,2,3,4,6,7,8-HpCDF, OCDF) data not qualified	2	Bldg 534-03-0.5, SW10-09
TOTAL Dioxins and Furans			**1**	**0**	**0**	**1**	**0**	**0**	**2**	
Total Lab QA/QC Samples:			***37***	***35***	***35***	***36***	***28***	***29***	***250***	

QA/QC: Quality Assurance/Quality Control
MB: Method Blank
MS: Matrix Spike
MSD: Matrix Spike Duplicate
LCS: Laboratory Control Sample
LCSD: Laboratory Control Sample Duplicate

2,4,6-TNT: 2,4,6-trinitrotoluene
1,3,5-TNB: 1,3,5-trinitrobenzene

N/A: Not Available

Ag: Silver
As: Arsenic
Ba: Barium
Be: Beryllium
Cd: Cadmium
Co: Cobalt

Cr: Chromium
Cu: Copper
Hg: Mercury
Mg: Magnesium
Mo: Molybdenum
Ni: Nickel

Pb: Lead
Sb: Antimony
Se: Selenium
Th: Thallium
V: Vanadium
Zn: Zinc

TABLE 37
LABORATORY QA/QC SUMMARY FOR BA SOIL SAMPLES

Aerojet Chino Hills Facility

Work Order Number	QC Batch Number	Analysis	MB	MS	MSD	LCS	LCSD	Sample Exceedence	Total Assoc. Samples	Associated Samples
S605259	6050353	Hg	1	1	1	1	0	0	4	029-01-S-0.5, SW10-06, 030-01-S-0.5, 031-01-S-0.5
S605259	6050376	Hg	1	1	1	1	1	MS/MSD	3	032-01-S-0.5, 025-01-S-0.5, 024-01-S-0.5
06-10-1669	061030L04	Hg	1	1	1	1	1	0	3	023-01-S-0.5, 022-01-S-0.5, C-SW10-07
06-12-0954	061215L01	Hg	1	1	1	1	1	0	1	016-UST-01-S
07-06-1071	070618L01	Hg	1	1	1	1	1	0	2	016-UST-1, 016-UST-2
07-06-1199	070618L03	Hg	1	1	1	1	1	0	3	003-Septic-B, 037-Septic-B, 036-Septic-B
TOTAL for Mercury			**6**	**6**	**6**	**6**	**5**	**3**	**16**	
06-11-1249	061120L07	Lead	1	1	1	1	0	0	4	C-003-PIPE-04-S, C-003-PIPE-03-S, C-003-PIPE-02-S, C-003-PIPE-01-S
TOTAL for Lead			**1**	**1**	**1**	**1**	**0**	**0**	**4**	
S605259	6050256	Metals (excluding Hg)	1	1	1	1	0	MS/MSD data not qualified	7	030-01-S-0.5, 031-01-S-0.5, 029-01-S-0.5, SW10-06, 032-01-S-0.5, 025-01-S-0.5, 024-01-S-0.5
06-10-1669	061030L07	Metals (excluding Hg)	1	1	1	1	0	MS/MSD (Sb, Ba, Se, Th) Ba not qualified	3	023-01-S-0.5, 022-01-S-0.5, C-SW10-07
06-12-0954	061215L06	Metals (excluding Hg)	1	1	1	1	0	MS/MSD (Sb, Ba) MS (Th) Ba and Th not qualified	1	016-UST-01-S
07-06-1071	070618L05	Metals (excluding Hg)	1	1	1	1	0	0	2	016-UST-1, 016-UST-2
07-06-1199	070618L05	Metals (excluding Hg)	1	1	1	1	0	0	3	003-Septic-B, 037-Septic-B, 036-Septic-B
TOTAL for Metals			**5**	**5**	**5**	**5**	**0**	**4**	**16**	
NPE3346	6054977	Explosives	1	1	1	1	0	MS/MSD (Tetryl; 4-Amino-2,6-dinitrotoluene; 2,4,6-TNT; RDX)	18	010-011-01-C, 010-010-04-C, 010-010-03-C, 010-007-02-C, 010-007-03-C, 006-001-02-C, 006-001-03-C, SW10-03, 029-01-C, 030-01-C, 031-01-C, 032-01-C, SW10-04, 025-01-C, 024-01-C
S605259	6053794	Explosives	1	1	1	1	0	0	8	006-TROUGH-01-S-03, 029-01-S-0.5, SW10-06, 030-01-S-0.5, 031-01-S-0.5, 032-01-S-0.5, 025-01-S-0.5, 024-01-S-0.5
S605259	6053797	Explosives	1	1	1	1	0	0	6	510-002-01-S-0.5, 510-004-01-S-0.5, 510-001-01-S-0.5, 006-001-02-S-0.5, 006-001-03-S-0.5, SW10-07
06-10-1536	061102S08	Explosives	1	1	1	1	1	MS/MSD (Tetryl; 1,3,5-TNB; 2,4,6-TNT) data not qualified	5	B1-01-S-0.5, C-SW10-04, A1-01-S-0.5, A1-01-S-2, B1-01-S-2

TABLE 37
LABORATORY QA/QC SUMMARY FOR BA SOIL SAMPLES

Work Order Number	QC Batch Number	Analysis	MB	MS	MSD	LCS	LCSD	Sample Exceedence	Total Assoc. Samples	Associated Samples
06-10-1669	061102S08	Explosives	1	1	1	1	1	MS/MSD (Tetryl; 1,3,5-TNB; 2,4,6-TNT) data not qualified	6	025-02-S-0.5, 023-01-C, 023-01-S-0.5, 022-01-C, 022-01-S-0.5, C-SW10-07,
06-11-1249	061201L07	Explosives	1	1	1	1	1	0	4	C-003-PIPE-04-S, C-003-PIPE-03-S, C-003-PIPE-02-S, C-003-PIPE-01-S
06-12-0954	061221L06	Explosives	1	1	1	1	1	0	1	016-UST-01-S
07-06-1071	070615L18	Explosives	1	1	1	1	1	0	4	016-UST-1, 016-UST-2, North-sidewall, Notch-center
07-06-1199	070621L14	Explosives	1	1	1	1	1	0	3	003-Septic-B, 037-Septic-B, 036-Septic-B
TOTAL for Explosives			**9**	**9**	**9**	**9**	**6**	**18**	**55**	
06-12-0954	061215L04	SVOCs	1	1	1	1	1	0	1	016-UST-01-S
07-06-1071	070614L12	SVOCs	1	1	1	1	0	0	2	016-UST-1, 016-UST-2
07-06-1199	070616L01	SVOCs	1	1	1	1	0	0	3	003-Septic-B, 037-Septic-B, 036-Septic-B
TOTAL for SVOCs			**3**	**3**	**3**	**3**	**1**	**0**	**6**	
06-12-0954	061215L01	VOCs	1	0	0	1	1	0	1	016-UST-01-S
07-06-1071	070620L01	VOCs	1	0	0	1	1	0	1	016-UST-1
07-06-1071	070618L03	VOCs	1	0	0	1	1	0	1	016-UST-2
TOTAL VOCs			**3**	**0**	**0**	**3**	**3**	**0**	**3**	
07-06-1071	070619B02	TPH as Motor Oil	1	1	1	1	1	MSD (TPH as Motor Oil) data not qualified	2	016-UST-1, 016-UST-2
TOTAL TPH as Motor Oil			**1**	**1**	**1**	**1**	**1**	**0**	**2**	
07-06-1071	070619B01	TPH as Diesel	1	1	1	1	1	0	2	016-UST-1, 016-UST-2
TOTAL TPH as Diesel			**1**	**1**	**1**	**1**	**1**	**0**	**2**	
06-12-0954	061215B01	TPH as Gasoline	1	1	1	1	1	0	1	016-UST-01-S
07-06-1071	070616B02	TPH as Gasoline	1	1	1	1	1	0	2	016-UST-1, 016-UST-2
TOTAL TPH as Gasoline			**2**	**2**	**2**	**2**	**2**	**0**	**3**	
S605199	6E31029	Perchlorate	1	1	1	1	0	0	7	029-01-C, 030-01-C, 031-01-C, 032-01-C, SW10-04, 025-01-C, 024-01-C
S605259	6E31044	Perchlorate	1	1	1	1	0	0	7	029-01-S-0.5, SW10-06, 030-01-S-0.5, 031-01-S-0.5, 032-01-S-0.5, 025-01-S-0.5, 024-01-S-0.5
06-10-1536	061101L02	Perchlorate	1	1	1	1	1	0	5	B1-01-S-0.5, C-SW10-04, A1-01-S-0.5, A1-01-S-2, B1-01-S-2
06-10-1669	061102L03	Perchlorate	1	1	1	1	1	0	6	025-02-S-0.5, 023-01-C, 023-01-S-0.5, 022-01-C, 022-01-S-0.5, C-SW10-07
TOTAL Perchlorate			**4**	**4**	**4**	**4**	**2**	**0**	**25**	

TABLE 37
LABORATORY QA/QC SUMMARY FOR BA SOIL SAMPLES

Work Order Number	QC Batch Number	Analysis	MB	MS	MSD	LCS	LCSD	Sample Exceedence	Total Assoc. Samples	Associated Samples
S605199	6E23011	Nitroglycerin	1	1	1	1	0	MS/MSD (Nitroglycerin) data not qualified because of MS/MSD	2	036-DRAIN-04-S, SW10-02
TOTAL Nitroglycerin			**1**	**1**	**1**	**1**	**0**	**0**	**2**	
Total Lab QA/QC Samples:			***36***	***33***	***33***	***36***	***21***	***25***	***134***	

QA/QC: Quality Assurance/Quality Control
MB: Method Blank
MS: Matrix Spike
MSD: Matrix Spike Duplicate
LCS: Laboratory Control Sample
LCSD: Laboratory Control Sample Duplicate

2,4,6-TNT: 2,4,6-trinitrotoluene
1,3,5-TNB: 1,3,5-trinitrobenzene

N/A: Not Available

Ag: Silver
As: Arsenic
Ba: Barium
Be: Beryllium
Cd: Cadmium
Co: Cobalt

Cr: Chromium
Cu: Copper
Hg: Mercury
Mg: Magnesium
Mo: Molybdenum
Ni: Nickel

Pb: Lead
Sb: Antimony
Se: Selenium
Th: Thallium
V: Vanadium
Zn: Zinc