MACTEC

March 4, 2005

MACTEC Project Number 4400-04-1025

Mr. Scott Smale
Brownfields/State Response
Bureau of Corrective Actions
Nevada Division of Environmental Protection
333 W. Nye Lane, Room 138
Carson City, Nevada 89706

Former Police Department Firing Range
City of Henderson
Brownfields Project
390 Athens Avenue
Henderson, Nevada

Dear Mr. Smale:

This report presents the results of site characterization activities completed by MACTEC Engineering and Consulting, Inc. (MACTEC) at the former City of Henderson Police Department firing range at 390 Athens Avenue, Henderson, Nevada. The work described herein was performed under the Nevada Division of Environmental Protection (NDEP) Brownfields Nevada's Land Recycling Program.

1.0 INTRODUCTION

The purpose of this investigation was to evaluate the nature and extent of total lead in soil in excess of the U.S Environmental Protection Agency (EPA) Region 9 preliminary remediation goal (PRG) for industrial sites resulting from the site's usage as a small arms firing range for the City of Henderson police department.

Sources of contamination at the site include lead and lesser amounts of alloy metals from weathering/oxidation/abrasion of bullets, shotgun shot, and related ammunition components at the impact berms, range floor, and metals residue from muzzle discharge at the firing positions. Lead is present at the site in the greatest quantity and likely at the greatest concentrations relative to the other associated metals, and was therefore used to determine areas of potential concern. In October 2004, after planning documents for the project were completed, the EPA Region 9 PRG of 750 milligrams per kilogram (mg/kg) for total lead in soil at industrial sites was modified to 800 mg/kg (EPA, 2004). This revised PRG has been incorporated into the project as the level above which remedial actions are recommended.

Currently, this site is not being used, is secured, and assess is controlled; therefore exposure pathways to humans are minimal. There are no visible ecological receptors at the site; therefore, no impacts are expected.

MACTEC Engineering and Consulting, Inc.
6280 South Valley View Blvd., Suite #722 • Las Vegas, NV 89118
702-251-5449 • Fax: 702-251-3148
www.mactec.com

2.0 BACKGROUND

The Subject Site is located at 390 Athens Avenue, Henderson, Nevada. It is an approximate 3.2-acre parcel of land located within a 99.5-acre parcel owned by the City of Henderson. The site is located in South one-half (S 1/2) of the Southwest Quarter (SW 1/4) of Section 36, Township 21 South, Range 62 East at Latitude 36°00'27"N, Longitude 114°57'56"W. The Cark County Assessor's Parcel Number (APN) is 161-36-801-001. The site is shown on Plate 1.

The site occupies 3.2 acres in a public/semipublic zoned area. It is bordered on the north by City of Henderson Wastewater Treatment Plant property, on the west by City of Henderson property, on the south by City of Henderson vacant property, separated from the site by Athens Avenue, and on the east by City of Henderson Humane Society facility. The area of investigation comprised a portion of the property approximately 125 feet by 325 feet bounded by berms on north, east, and west, and the firing line on the south (Plate 2).

On-site structures consist of a building previously used as range office, classroom, and target materials storage facility. An open-air steel roof-covered firing line platform also exists on the site, along with a concrete masonry wall, roughly dividing the range floor in half. A second wall is present approximately 60 feet west of the east berm (Plate 2), separating a former SWAT training area (containing a bus) from the rest of the range.

In the site vicinity, groundwater flow is toward the Las Vegas Wash, located north and east of the subject site. First encountered groundwater is found in the Muddy Creek Formation, which consists of interbedded fine-grained lakebed depositional sediments. In the site vicinity, the depth to groundwater is approximately 15 feet below ground surface.

2.1 Site History

The site was acquired by the City of Henderson in 1976 and used by the Police Department as a small-arms firing range for police officer training. As described in the *Sampling and Analysis Plan for City of Henderson Former Police Department Firing Range* (SAP) dated July 27, 2004, the range was used for the purpose of qualifying and training City of Henderson police officers on hand guns (.22 to .45 caliber), shotguns (slug, bird shot, and .00 buck shot) and rifles (.223 caliber). The primary impact (north) berm and the western lateral berm were established in January 1976, with the eastern lateral berm being constructed sometime between 1984 and 1990, when the existing north and west berms were slightly realigned and their height raised.

The small arms range was oriented so that firing was towards the north, into an east-west oriented berm. Brass cartridge cases were reportedly picked up after each target practice event was completed; however, numerous small arms cartridge cases remain on the range floor. The range was used until 2000, when it was closed down as a safety precaution due to encroachment from expansion of the City of Henderson wastewater treatment operations and establishment of the City of Henderson's Bird Viewing Preserve.

After the closure of the range, the City of Henderson Police Department identified the former range as a site for future K-9 and SWAT training operations. In March 2004, the City of Henderson submitted an

application to the State of Nevada Division of Environmental Protection Brownfields Funding Application program. This application was accepted and the site became a NDEP Brownfields project, which was awarded to MACTEC in June 2004.

3.0 SITE INVESTIGATIONS

The objectives of the site investigation performed by MACTEC were to further evaluate the extent of lead impacted soil within the north berm, confirm previous findings (*Converse, 2003*) along the west berm, and evaluate potential presence of lead contamination on the east berm. The following sections summarize the previous investigation performed by Converse Consultants in 2002 and the investigation completed by MACTEC in 2004.

3.1 Previous Site Study – 2002: Converse Consultants

In December 2002, the City of Henderson hired Converse Consultants of Las Vegas Nevada to conduct limited soil sampling to determine if the berm material could be used in the construction of a road through the area. The results of the investigation are presented in *Characterization of Firing Range Berm for Lead, Former Henderson Police Department Shooting Berm, Henderson, Nevada* (*Converse, 2003*). Between December 2002 and June 6, 2003, a total of 39 soil samples were collected from the north (east-west aligned) and west (north-south aligned) berms. The soil samples were collected to determine the presence and extent of lead contaminated soil in the berms, and where concentrations exceeded the EPA Region 9 Preliminary Remediation Goal (PRG) of 750 mg/kg for lead at industrial sites. Samples were analyzed for total lead, using EPA 6010B. Ten of the thirty-nine soil samples exceeded the industrial site PRG for lead of 750 milligrams per kilogram (mg/kg). All samples containing lead above the PRG were collected from the north berm. Based on total lead soil sampling results, four samples were subsequently analyzed for toxicity characteristics leaching procedure (TCLP), using EPA 1311/6010B; two of the samples exceeded the lead TCLP limit of 5 parts per million (ppm). The characterization report concluded that 1) soil from the west berm could be moved and redistributed on-site or disposed of off-site as non-hazardous waste, and 2) further investigation was needed at that portion of the north berm to be removed as part of planned road construction. Subsequent to the Converse investigation, the road alignment was changed, and the City of Henderson has since expressed interest in using the soil for other City of Henderson Projects.

3.2 Site Investigation – 2004: MACTEC

Prior to the investigation of the site, MACTEC attended a scoping meeting on April 27, 2004, at the site, and at the City of Henderson City Hall later the same day, to discuss project elements and investigation approach. Representatives from NDEP, USEPA Region 9, City of Henderson, and MACTEC attended. The investigation activities identified for the project included the literature review/interview and field investigation tasks described below.

3.2.1 Literature Review and Interviews

MACTEC performed a Historic Subject Site Land Use Research (focusing on the berm only) to gain a better understanding of the construction and subsequent use of the site. This was done by reviewing aerial photographs and interviewing the former Henderson Police Department's Fire Range Master. A description of this historic subject site land use research and details of the investigation approach for the berm area is presented in *Sampling and Analysis Plan for City of Henderson Former Police Department Firing Range, Brownsfields Project, 390 Athens Avenue, Henderson, Nevada* (SAP; MACTEC, 2004).

3.2.2 Field Investigations

This section summarizes the field investigation performed at the site which included Range Floor Vacuuming (Section 3.2.2.1), North Berm Trenching and Sampling (Section 3.2.2.2), East and West Berm Confirmation Sampling (Section 3.2.2.3), and a description of field variances implemented during the work (Section 3.2.2.4).

3.2.2.1 Range Floor Vacuuming

MACTEC coordinated vacuuming of the firing range floor (Plate 2) on July 28 and 29, 2004 to remove brass cartridge cases, rubber projectiles, and other range-related material from the range floor prior to trenching and sampling activities along the berm. The objective was to remove the surface debris to allow for mobility of equipment without spreading range-related material into the subsurface, possibly making it more difficult to remove later. During the subsequent berm trenching activities (conducted in October 2004), additional brass cartridge cases were found partially exposed in the range floor. It appeared that concealed material became exposed due to surface erosion during rainfall events that occurred after the range floor had been vacuumed and prior to the berm trenching activities.

3.2.2.2 North Berm Trenching and Sampling

On October 11 and 12, 2004, the north berm was investigated by excavating three trenches (T1, T2, and T3; Plate 2) with a backhoe, and collecting soil samples from the trench walls. A fourth trench, T4 (Plate 2), was excavated for visual inspection and comparison to the other berm characteristics. Samples were collected from the berm at 0, 5, 10, 18, and 25 feet above the range floor and at depths of 0, 1, 2, 3, and 4 feet below the berm impact surface. At the intersection of the toe of the berm impact surface and the range floor, no samples were collected at 4 feet because the excavation was significantly below the level of the range floor and was not expected to contain lead contamination at levels of concern. A total of 72 soil samples were collected from the berm trenches, with splits of eight of the samples submitted for duplicate analyses.

In each trench, a thin (one inch average) bullet layer was observed at a depth of approximately 2 feet and a layer of organic debris and shotgun wadding was present at approximately 3 feet beneath the surface, indicating former berm impact surfaces (Plates 3, 4, and 5). In general, the heaviest concentrations of spent ammunition on the surface and in the subsurface were observed at trench T2, located near the middle of the berm (Plate 2).

3.2.2.3 East and West Berm Confirmation Sampling

The east and west berms were investigated by confirmation sampling (no trenching) at six locations per berm for a total of twelve (12) surface soil samples. Samples were collected from an interval from the surface to six inches bgs. Samples were located, collected, packaged, and shipped to the laboratory in accordance with approved procedures outlined in the SAP (*MACTEC, 2004*).

3.2.2.4 Field Variances

The SAP (*MACTEC, 2004*), specified sample collection locations in the north berm along the berm face at 1, 3, 6, 9, and 12 feet above the range floor at depths of 0, 1, 2, 3, and 4 feet below the berm surface. The actual sampling locations were field modified, based upon visible bullet evidence from the toe to the top of the berm face. Samples were collected along the berm face at 0, 5, 10, 18, and 25 feet above the range floor at depths of 0, 1, 2, 3, and 4 feet below exposed berm face surface.

Near the toe of the berm face and the range floor, no samples were collected at 4 feet below the exposed berm face surface because the excavation was significantly below the level of the range floor and was not expected to contain lead contamination at levels of concern.

Because of the greater vertical extent of spent ammunition seen on the north berm, an additional three surface samples were collected from the east and west berms (a total of six per berm) to provide more comprehensive coverage along the length and height of each lateral berm.

3.2.2.5 Chemical Analysis

All soil samples were analyzed by Del Mar Analytical of Las Vegas, Nevada, for total lead analyses using EPA Test Method 6010B. Upon receipt of the lead analytical results, fifteen trench samples (with varying concentrations of lead) were selected for additional analyses of antimony, arsenic, and copper, by EPA Test Method 6010B, to assess their potential presence in soil relative to their respective PRG values. These metals were selected because they are common alloys in small arms ammunition. Details of the samples collected and analyses performed are presented in Table 1. A complete laboratory report is provided as Appendix A.

3.3 Results - Chemical Analysis

The results of soil chemical analysis are presented in Table 2 and summarized below. Lead detections in soil exceeding the EPA Region 9 PRG of 800 mg/kg for industrial soil were reported by the laboratory at concentrations up to 19,000 mg/kg. In Trench 1 (Plate 3), elevated lead levels up to 8,500 mg/kg were reported for samples collected from distances of up to 10 feet upslope and up to a depth of 2 feet below berm face. In Trench 2 (Plate 4), elevated lead levels up to 19,000 mg/kg were reported for samples collected from distances of up to 18 feet upslope and up to a depth of 3 feet below berm face. In Trench 3 (Plate 5), the sample collected at the surface at the interception of the berm face and range floor contained lead at a concentration of 1,000 mg/kg.

None of the soil samples collected from east and west berm contained lead concentrations exceeding the PRG.

The results of soil chemical analysis for arsenic showed that all samples analyzed contained arsenic at levels exceeding the EPA Region 9 PRG of 1.6 mg/kg for industrial soil (*EPA, 2004*). Except for one sample containing arsenic at 43 mg/kg, concentrations ranged from 4.6 mg/kg to 11 mg/kg. Except for the single detection at 43 mg/kg, all concentrations of arsenic were within a single order of magnitude, while lead levels in the same samples varied by as much as three orders of magnitude. Therefore, a clear relation of elevated lead concentrations with elevated arsenic concentrations was not apparent based on review of the data. During a team meeting on December 7, 2004, these levels were discussed and it was acknowledged that the concentrations seen at the site did not differ significantly from local background conditions, and did not warrant further evaluation.

None of the detected concentrations of antimony or copper exceeded their EPA Region 9 PRGs for industrial soil of 410 mg/kg and 41,000 mg/kg, respectively.

3.4 Data Validation

Data review and validation for project samples was performed by DataVal, Inc (Data Val), a sub-contracted data validation company located in San Rafael, California. DataVal performed EPA Region 9 Tier 1A data review on all sample results reported from the laboratory. In addition to the Level Tier 1A review, DataVal, Inc. performed EPA Region 9 Tier 2 level review on approximately 10 percent of the sample results from each matrix. Data review and validation was conducted in accordance with the EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (*EPA, July 2002*). All data were reviewed for compliance with analytical holding times, initial and continuing calibration requirements, and acceptable spike recovery and absence of contamination in laboratory quality control samples. A review of all field duplicate sample results was also conducted. EPA Tier 2 validation included a review of the raw data to assess accurate compound identification and quantitation. The findings of the data validation performed on the project samples indicate that the data required no qualification, and are valid and useable as reported by the laboratory. A copy of the data validation report is provided as Appendix B

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

The investigation completed by MACTEC at the former Henderson Police Department firing range confirmed Converse's findings that the north berm contains lead in soil at concentrations exceeding the EPA Region 9 PRG for industrial sites. The investigation also showed that the highest concentrations of lead in soil in the north berm are located in the area primarily between the wall in the center of the range to the wall located near the eastern berm. Lead concentrations in surface and subsurface soil exceeding the industrial PRG are generally coincident with greater accumulations of spent ammunition on the surface and with thicker subsurface layers of spent ammunition representing former berm impact surfaces. Visible evidence of bullet accumulation is generally present from the toe of the berm to approximately 15 to 20 feet up slope.

The results of the investigation of soil in the west berm showed that lead concentrations did not exceed the PRG, which is consistent with Converse's findings. Results of MACTEC's investigation of the east berm also showed that lead concentrations in soil did not exceed the PRG.

Although detected levels of arsenic in all north berm samples exceeded the EPA Region 9 PRG of 1.6 mg/kg for industrial soil, it was acknowledged by the project team that the concentrations seen at the site did not differ significantly from local background conditions, and did not warrant further evaluation.

4.2 Recommendations

Based on the results of the investigation presented in this report, it is recommended that portions of the face of the north berm where lead levels in soil exceed the EPA Region 9 industrial PRG of 800 mg/kg for industrial soil be remediated prior to establishing the intended land use. Based on the results of this same study, no remediation is recommended for the west and east berms because analytical results from soil samples collected from those berms did not indicate lead concentrations that exceeded the PRG. A Work Plan describing the recommended approach for soil remediation is provided as Appendix C.

It is also recommended that the range floor be characterized to evaluate potential soil contamination from lead particulate resulting from muzzle discharge from various weapons used at the site. A SAP addendum, provided as Appendix D, describes the procedures to be implemented for the proposed range characterization activities and post-remediation soil confirmation sampling.

5.0 References

Converse Consultants (Converse), 2003. *Characterization of Firing Range Berm for Lead, Former Henderson Police Department Shooting Berm, Henderson, Nevada.* June.

MACTEC Engineering and Consulting (MACTEC), 2004. *Sampling and Analysis Plan for City of Henderson Former Police Department Firing Range, Brownfields Project, 390 Athens Avenue, Henderson, Nevada.* July.

U.S. Environmental Protection Agency (EPA), 2004. *Region 9 PRGs 2004 Table.* October. At: http://www.epa.gov/region09/waste/sfund/prg/files/04prgtable.pdf

MACTEC appreciates the opportunity to provide environmental consulting services for NDEP, Bureau of Corrective Actions. If you should have any questions, please call either of the undersigned at (702) 251-5449 or (707) 793-3887, respectively.

Sincerely,

MACTEC Engineering and Consulting, Inc.

Daniel C. Burns, PG, CEM[1]
Environmental Manager Certification Number 1692
Expiration Date: 10/07/05

Bruce Wilcer, RG
Principal Geologist

DCB/BW/mlb:FINAL report-Brownflds

In accordance with Nevada Administrative Code 459.97285,

[1]*I, Daniel C. Burns, hereby certify that I am responsible for the services described in this document and for the preparation of this document. The services described in this document have been provided in a manner consistent with the current standards of the profession and to the best of my knowledge comply with all applicable federal, state, and local statutes, regulations, and ordinances.*

Attachments: Table 1: Summary of Soil Analytical Program
Table 2: Soil Analytical Results

Plate 1: Site Location Map
Plate 2: Trench and Sample Locations and Lead Concentrations in Surface Soil
Plate 3: T1 Trench Log
Plate 4: T2 Trench Log
Plate 5: T3 Trench Log

Appendix A: Laboratory Analytical Data (CD)
Appendix B: Data Validation Report
Appendix C: Work Plan for Lead Impacted Soil Removal, Transportation, and Disposal
Appendix D: Sampling and Analysis Plan (SAP) Addendum

cc: Addressee by mail

Ms. Brenda L. Pohlmann, CEM, Environmental Programs Division Manager,
City Attorney's Office, City of Henderson, PO Box 95050, Henderson, NV 89009-5050

MACTEC Project File 4400-05-1025

TABLES

Table 1
Summary of Soil Analytical Program
Former Police Department Firing Range
City of Henderson, Nevada

Site Sample ID	Lab Sample ID	Date Sampled	Analyse/Method	Sample Type
T2-0-25	PNJ0336-01	11-Oct-04	Total Lead (6010B)	Soil
T2-0-18	PNJ0336-02	11-Oct-04	Total Antimony, Arsenic, Copper and Lead (6010B)	Soil
T2-0-10	PNJ0336-03	11-Oct-04	Total Lead (6010B)	Soil
T2-0-5	PNJ0336-04	11-Oct-04	Total Lead (6010B)	Soil
T2-0-0	PNJ0336-05	11-Oct-04	Total Lead (6010B)	Soil
T2-4-25	PNJ0336-06	11-Oct-04	Total Lead (6010B)	Soil
T2-3-25	PNJ0336-07	11-Oct-04	Total Lead (6010B)	Soil
T2-2-25	PNJ0336-08	11-Oct-04	Total Antimony, Arsenic, Copper and Lead (6010B)	Soil
T2-1-25	PNJ0336-09	11-Oct-04	Total Lead (6010B)	Soil
T2-4-18	PNJ0336-10	11-Oct-04	Total Lead (6010B)	Soil (1)
T2-4-19	PNJ0336-11	11-Oct-04	Total Lead (6010B)	FD (1)
T2-3-18	PNJ0336-12	11-Oct-04	Total Lead (6010B)	Soil
T2-2-18	PNJ0336-13	11-Oct-04	Total Lead (6010B)	Soil
T2-1-18	PNJ0336-14	11-Oct-04	Total Lead (6010B)	Soil
T2-4-10	PNJ0336-15	11-Oct-04	Total Antimony, Arsenic, Copper and Lead (6010B)	Soil
T2-3-10	PNJ0336-16	11-Oct-04	Total Lead (6010B)	Soil
T2-2-10	PNJ0336-17	11-Oct-04	Total Antimony, Arsenic, Copper and Lead (6010B)	Soil (2)
T2-2-11	PNJ0336-18	11-Oct-04	Total Lead (6010B)	FD (2)
T2-1-10	PNJ0336-19	11-Oct-04	Total Lead (6010B)	Soil
T2-4-5	PNJ0336-20	11-Oct-04	Total Lead (6010B)	Soil
T2-3-5	PNJ0336-21	11-Oct-04	Total Lead (6010B)	Soil
T2-2-5	PNJ0336-22	11-Oct-04	Total Antimony, Arsenic, Copper and Lead (6010B)	Soil
T2-1-5	PNJ0336-23	11-Oct-04	Total Lead (6010B)	Soil
T2-3-0	PNJ0336-24	11-Oct-04	Total Lead (6010B)	Soil
T2-2-0	PNJ0336-25	11-Oct-04	Total Lead (6010B)	Soil
T2-1-0	PNJ0336-26	11-Oct-04	Total Lead (6010B)	Soil
Rinsate-10/11/04	PNJ0336-27	11-Oct-04	Total Lead (6010B)	EB
T1-4-25	PNJ0336-28	12-Oct-04	Total Lead (6010B)	Soil
T1-3-25	PNJ0336-29	12-Oct-04	Total Lead (6010B)	Soil
T1-2-25	PNJ0336-30	12-Oct-04	Total Lead (6010B)	Soil (3)
T1-2-24	PNJ0336-31	12-Oct-04	Total Lead (6010B)	FD (3)
T1-1-25	PNJ0336-32	12-Oct-04	Total Lead (6010B)	Soil
T1-4-18	PNJ0336-33	12-Oct-04	Total Antimony, Arsenic, Copper and Lead (6010B)	Soil
T1-3-18	PNJ0336-34	12-Oct-04	Total Lead (6010B)	Soil
T1-2-18	PNJ0336-35	12-Oct-04	Total Lead (6010B)	Soil
T1-1-18	PNJ0336-36	12-Oct-04	Total Lead (6010B)	Soil
T1-4-10	PNJ0336-37	12-Oct-04	Total Lead (6010B)	Soil
T1-3-10	PNJ0336-38	12-Oct-04	Total Lead (6010B)	Soil
T1-2-10	PNJ0336-39	12-Oct-04	Total Lead (6010B)	Soil
T1-1-10	PNJ0336-40	12-Oct-04	Total Antimony, Arsenic, Copper and Lead (6010B)	Soil
T1-3-5	PNJ0336-41	12-Oct-04	Total Lead (6010B)	Soil
T1-2-5	PNJ0336-42	12-Oct-04	Total Antimony, Arsenic, Copper and Lead (6010B)	Soil
T1-1-5	PNJ0336-43	12-Oct-04	Total Lead (6010B)	Soil
T1-3-0	PNJ0336-44	12-Oct-04	Total Lead (6010B)	Soil
T1-2-0	PNJ0336-45	12-Oct-04	Total Lead (6010B)	Soil
T1-1-0	PNJ0336-46	12-Oct-04	Total Antimony, Arsenic, Copper and Lead (6010B)	Soil
T1-0-25	PNJ0336-47	12-Oct-04	Total Antimony, Arsenic, Copper and Lead (6010B)	Soil
T1-0-18	PNJ0336-48	12-Oct-04	Total Lead (6010B)	Soil
T1-0-11	PNJ0336-49	12-Oct-04	Total Lead (6010B)	Soil (4)
T1-0-10	PNJ0336-50	12-Oct-04	Total Lead (6010B)	FD (4)
T1-0-5	PNJ0336-51	12-Oct-04	Total Lead (6010B)	Soil
T1-0-0	PNJ0336-52	12-Oct-04	Total Lead (6010B)	Soil
T3-4-25	PNJ0336-53	12-Oct-04	Total Antimony, Arsenic, Copper and Lead (6010B)	Soil
T3-3-25	PNJ0336-54	12-Oct-04	Total Lead (6010B)	Soil
T3-2-25	PNJ0336-55	12-Oct-04	Total Lead (6010B)	Soil
T3-1-25	PNJ0336-56	12-Oct-04	Total Lead (6010B)	Soil
T3-4-18	PNJ0336-57	12-Oct-04	Total Antimony, Arsenic, Copper and Lead (6010B)	Soil (5)
T3-4-19	PNJ0336-58	12-Oct-04	Total Lead (6010B)	FD (5)
T3-3-18	PNJ0336-59	12-Oct-04	Total Lead (6010B)	Soil
T3-2-18	PNJ0336-60	12-Oct-04	Total Lead (6010B)	Soil
T3-1-18	PNJ0336-61	12-Oct-04	Total Lead (6010B)	Soil
T3-4-10	PNJ0336-62	12-Oct-04	Total Lead (6010B)	Soil

Table 1
Summary of Soil Analytical Program
Former Police Department Firing Range
City of Henderson, Nevada

Site Sample ID	Lab Sample ID	Date Sampled	Analyse/Method	Sample Type
T3-3-10	PNJ0336-63	12-Oct-04	Total Antimony, Arsenic, Copper and Lead (6010B)	Soil
T3-2-10	PNJ0336-64	12-Oct-04	Total Lead (6010B)	Soil
T3-1-10	PNJ0336-65	12-Oct-04	Total Lead (6010B)	Soil (6)
T3-1-9	PNJ0336-66	12-Oct-04	Total Lead (6010B)	FD (6)
T3-4-5	PNJ0336-67	12-Oct-04	Total Lead (6010B)	Soil
T3-3-5	PNJ0336-68	12-Oct-04	Total Lead (6010B)	Soil
T3-2-5	PNJ0336-69	12-Oct-04	Total Lead (6010B)	Soil
T3-1-5	PNJ0336-70	12-Oct-04	Total Lead (6010B)	Soil (7)
T3-1-4	PNJ0336-71	12-Oct-04	Total Lead (6010B)	FD (7)
T3-3-0	PNJ0336-72	12-Oct-04	Total Lead (6010B)	Soil
T3-2-0	PNJ0336-73	12-Oct-04	Total Lead (6010B)	Soil
T3-1-0	PNJ0336-74	12-Oct-04	Total Lead (6010B)	Soil
T3-25-0	PNJ0336-75	12-Oct-04	Total Lead (6010B)	Soil
T3-18-0	PNJ0336-76	12-Oct-04	Total Lead (6010B)	Soil
T3-10-0	PNJ0336-77	12-Oct-04	Total Antimony, Arsenic, Copper and Lead (6010B)	Soil
T3-5-0	PNJ0336-78	12-Oct-04	Total Lead (6010B)	Soil (8)
T3-6-0	PNJ0336-79	12-Oct-04	Total Lead (6010B)	FD (8)
T3-0-0	PNJ0336-80	12-Oct-04	Total Antimony, Arsenic, Copper and Lead (6010B)	Soil
East Berm 1-0	PNJ0336-81	12-Oct-04	Total Lead (6010B)	Soil
East Berm 2-0	PNJ0336-82	12-Oct-04	Total Lead (6010B)	Soil
East Berm 3-0	PNJ0336-83	12-Oct-04	Total Lead (6010B)	Soil
East Berm 4-0	PNJ0336-84	12-Oct-04	Total Lead (6010B)	Soil
East Berm 5-0	PNJ0336-85	12-Oct-04	Total Lead (6010B)	Soil
East Berm 6-0	PNJ0336-86	12-Oct-04	Total Lead (6010B)	Soil
West Berm 1-0	PNJ0336-87	12-Oct-04	Total Lead (6010B)	Soil
West Berm 2-0	PNJ0336-88	12-Oct-04	Total Lead (6010B)	Soil
West Berm 3-0	PNJ0336-89	12-Oct-04	Total Lead (6010B)	Soil
West Berm 4-0	PNJ0336-90	12-Oct-04	Total Lead (6010B)	Soil (9)
West Berm 5-0	PNJ0336-91	12-Oct-04	Total Lead (6010B)	Soil
West Berm 6-0	PNJ0336-92	12-Oct-04	Total Lead (6010B)	Soil
West Berm 7-0	PNJ0336-93	12-Oct-04	Total Lead (6010B)	FD (9)
Rinsate-10/12/04	**PNJ0336-94**	**12-Oct-04**	**Total Lead (6010B)**	**EB**

*: Modified from: DataVal, Inc., 2004. *DATA VALIDATION SUMMARY REPORT FOR THE CITY OF HENDERSON FORMER POLICE DEPARTMENT SMALL ARMS FIRING RANGE SITE, HENDERSON, NV.*Table 1.

FD: Field duplicate of previous numbered sample, (1), (2), etc.

EB: Equipment Blank

BOLD: Bold typeface indicates samples/analyses that received full (Level IV) data validation

Table 2 - Soil Analytical Results
Former Police Department Firing Range
City of Henderson, Nevada

Trench No.	Antimony (mg/kg)	Arsenic (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	RL	Method
East Berm 1-0				40	2.0	EPA 6010B
East Berm 2-0				57	2.0	EPA 6010B
East Berm 3-0				210	2.0	EPA 6010B
East Berm 4-0				8.1	2.0	EPA 6010B
East Berm 5-0				30	2.0	EPA 6010B
East Berm 6-0				11	2.0	EPA 6010B
T1-0-0				7900	80.0	EPA 6010B
T1-0-05				5100	40.0	EPA 6010B
T1-0-10				3600	8.0	EPA 6010B
T1-0-11				2800	8.0	EPA 6010B
T1-0-18				260	2.0	EPA 6010B
T1-0-25	38				10.0	EPA 6010B
T1-0-25		5.5			2.0	EPA 6010B
T1-0-25			23		2.0	EPA 6010B
T1-0-25				620	2.0	EPA 6010B
T1-1-0	160				10.0	EPA 6010B
T1-1-0		43			2.0	EPA 6010B
T1-1-0			77		2.0	EPA 6010B
T1-1-0				8500	20.0	EPA 6010B
T1-1-05				2100	4.0	EPA 6010B
T1-1-10	26				10.0	EPA 6010B
T1-1-10		9.7			2.0	EPA 6010B
T1-1-10			51		2.0	EPA 6010B
T1-1-10				5500	20.0	EPA 6010B
T1-1-18				640	2.0	EPA 6010B
T1-1-25				7.5	2.0	EPA 6010B
T1-2-0				5900	20.0	EPA 6010B
T1-2-05	ND				10.0	EPA 6010B
T1-2-05		5.5			2.0	EPA 6010B
T1-2-05			17		2.0	EPA 6010B
T1-2-05				460	2.0	EPA 6010B
T1-2-10				68	2.0	EPA 6010B
T1-2-18				8.1	2.0	EPA 6010B
T1-2-24				7	2.0	EPA 6010B
T1-2-25				7.2	2.0	EPA 6010B
T1-3-0				58	2.0	EPA 6010B
T1-3-05				18	2.0	EPA 6010B
T1-3-10				26	2.0	EPA 6010B
T1-3-18				480	2.0	EPA 6010B
T1-3-25				8.6	2.0	EPA 6010B
T1-4-10				140	2.0	EPA 6010B
T1-4-18	ND				10.0	EPA 6010B
T1-4-18		5.2			2.0	EPA 6010B
T1-4-18			14		2.0	EPA 6010B
T1-4-18				14	2.0	EPA 6010B
T1-4-25				28	2.0	EPA 6010B
T2-0-18	25				10.0	EPA 6010B

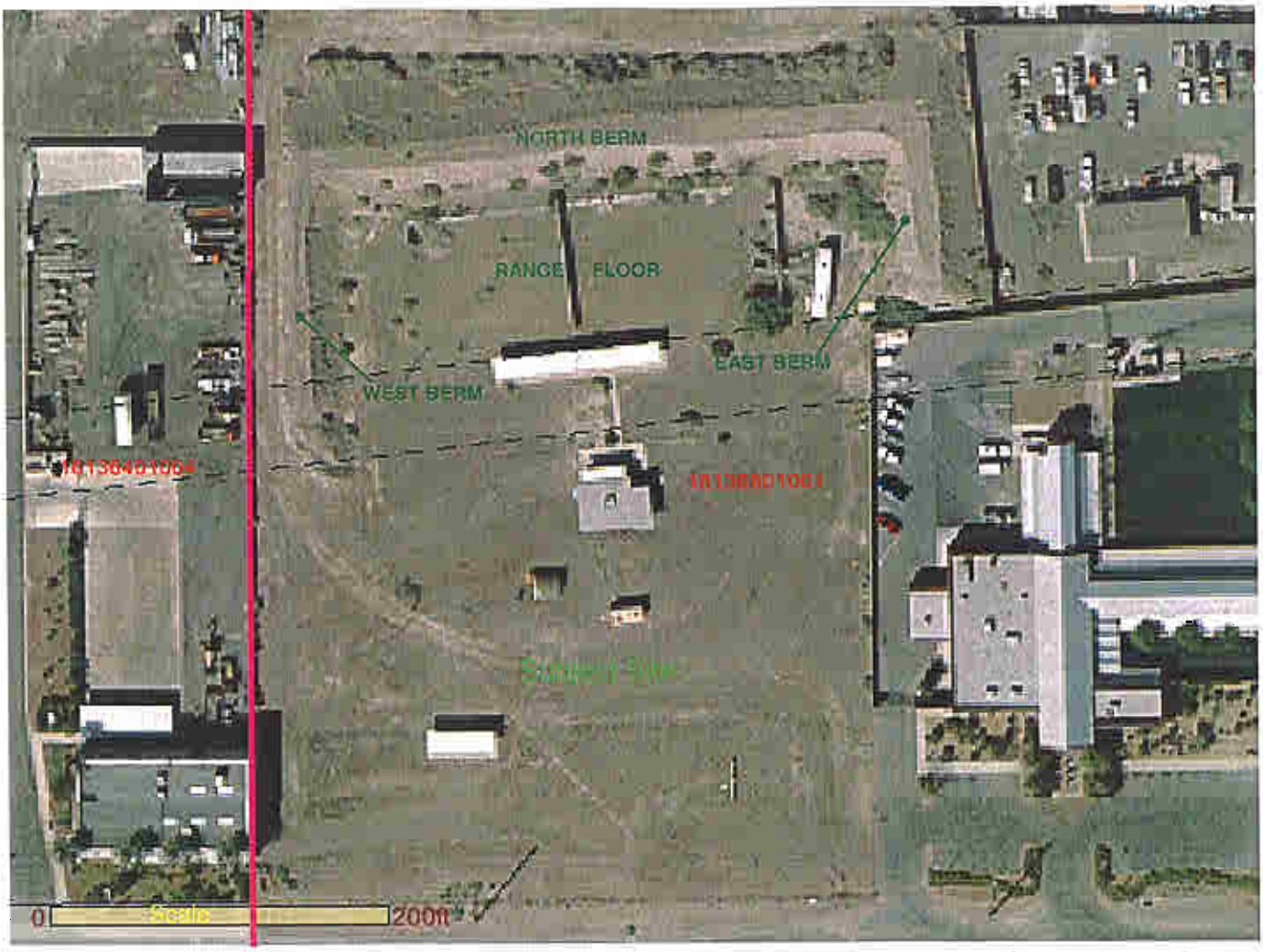
Table 2 - Soil Analytical Results
Former Police Department Firing Range
City of Henderson, Nevada

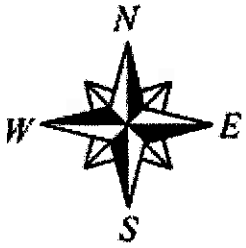
Trench No.	Antimony (mg/kg)	Arsenic (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	RL	Method
T2-0-18		2			2.0	EPA 6010B
T2-0-18			110		2.0	EPA 6010B
T2-0-18				19000	100.0	EPA 6010B
T2-0-25				31	2.0	EPA 6010B
T2-1-0				150	2.0	EPA 6010B
T2-1-05				2700	8.0	EPA 6010B
T2-1-10				91	2.0	EPA 6010B
T2-1-18				130	2.0	EPA 6010B
T2-1-25				15	2.0	EPA 6010B
T2-2-0				1300	4.0	EPA 6010B
T2-2-05	38				10.0	EPA 6010B
T2-2-05		7.6			2.0	EPA 6010B
T2-2-05			110		2.0	EPA 6010B
T2-2-05				1200	2.0	EPA 6010B
T2-2-10	71				20.0	EPA 6010B
T2-2-10		11			4.0	EPA 6010B
T2-2-10			1900		4.0	EPA 6010B
T2-2-10				4200	10.0	EPA 6010B
T2-2-11				5100	10.0	EPA 6010B
T2-2-18				5000	10.0	EPA 6010B
T2-2-25	ND				10.0	EPA 6010B
T2-2-25		6			2.0	EPA 6010B
T2-2-25			28		2.0	EPA 6010B
T2-2-25				480	2.0	EPA 6010B
T2-3-0				51	2.0	EPA 6010B
T2-3-05				1800	4.0	EPA 6010B
T2-3-10				1700	10.0	EPA 6010B
T2-3-18				3700	10.0	EPA 6010B
T2-3-25				33	2.0	EPA 6010B
T2-4-05				52	2.0	EPA 6010B
T2-4-10	ND				10.0	EPA 6010B
T2-4-10		4.6			2.0	EPA 6010B
T2-4-10			16		2.0	EPA 6010B
T2-4-10				20	2.0	EPA 6010B
T2-4-18				40	2.0	EPA 6010B
T2-4-19				38	2.0	EPA 6010B
T3-0-0	ND				10.0	EPA 6010B
T3-0-0		6.8			2.0	EPA 6010B
T3-0-0			20		2.0	EPA 6010B
T3-0-0				1000	2.0	EPA 6010B
T3-1-0				7.3	2.0	EPA 6010B
T3-10-0	74				10.0	EPA 6010B
T3-10-0		9.4			2.0	EPA 6010B
T3-10-0			65		2.0	EPA 6010B
T3-10-0				420	2.0	EPA 6010B
T3-1-04				120	2.0	EPA 6010B
T3-1-05				110	2.0	EPA 6010B

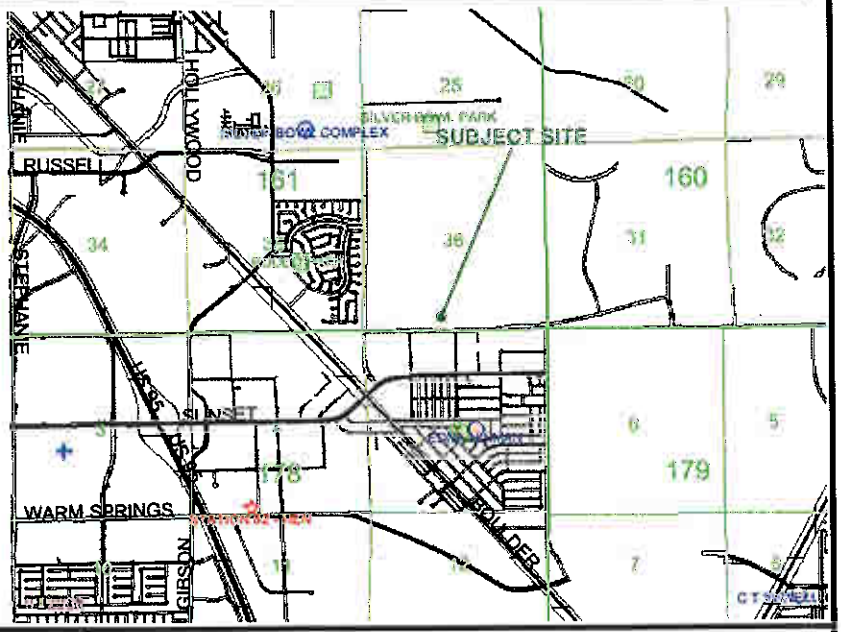
Table 2 - Soil Analytical Results
Former Police Department Firing Range
City of Henderson, Nevada

Trench No.	Antimony (mg/kg)	Arsenic (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	RL	Method
T3-1-09				33	2.0	EPA 6010B
T3-1-10				15	2.0	EPA 6010B
T3-1-18				9.7	2.0	EPA 6010B
T3-1-25				7.5	2.0	EPA 6010B
T3-18-0				16	2.0	EPA 6010B
T3-2-0				10	2.0	EPA 6010B
T3-2-05				76	2.0	EPA 6010B
T3-2-10				62	2.0	EPA 6010B
T3-2-18				8.9	2.0	EPA 6010B
T3-2-25				11	2.0	EPA 6010B
T3-25-0				14	2.0	EPA 6010B
T3-3-0				96	2.0	EPA 6010B
T3-3-05				8.3	2.0	EPA 6010B
T3-3-10	ND				10.0	EPA 6010B
T3-3-10		5.2			2.0	EPA 6010B
T3-3-10			14		2.0	EPA 6010B
T3-3-10				7	2.0	EPA 6010B
T3-3-18				100	2.0	EPA 6010B
T3-3-25				13	2.0	EPA 6010B
T3-4-05				28	2.0	EPA 6010B
T3-4-10				7.4	2.0	EPA 6010B
T3-4-18	ND				10.0	EPA 6010B
T3-4-18		7.2			2.0	EPA 6010B
T3-4-18			24		2.0	EPA 6010B
T3-4-18				150	2.0	EPA 6010B
T3-4-19				200	2.0	EPA 6010B
T3-4-25	ND				10.0	EPA 6010B
T3-4-25		9.4			2.0	EPA 6010B
T3-4-25			21		2.0	EPA 6010B
T3-4-25				90	2.0	EPA 6010B
T3-5-0				150	2.0	EPA 6010B
T3-6-0				56	2.0	EPA 6010B
West Berm 1-0				18	2.0	EPA 6010B
West Berm 2-0				12	2.0	EPA 6010B
West Berm 3-0				13	2.0	EPA 6010B
West Berm 4-0				15	2.0	EPA 6010B
West Berm 5-0				7.7	2.0	EPA 6010B
West Berm 6-0				16	2.0	EPA 6010B
West Berm 7-0				10	2.0	EPA 6010B

PLATES







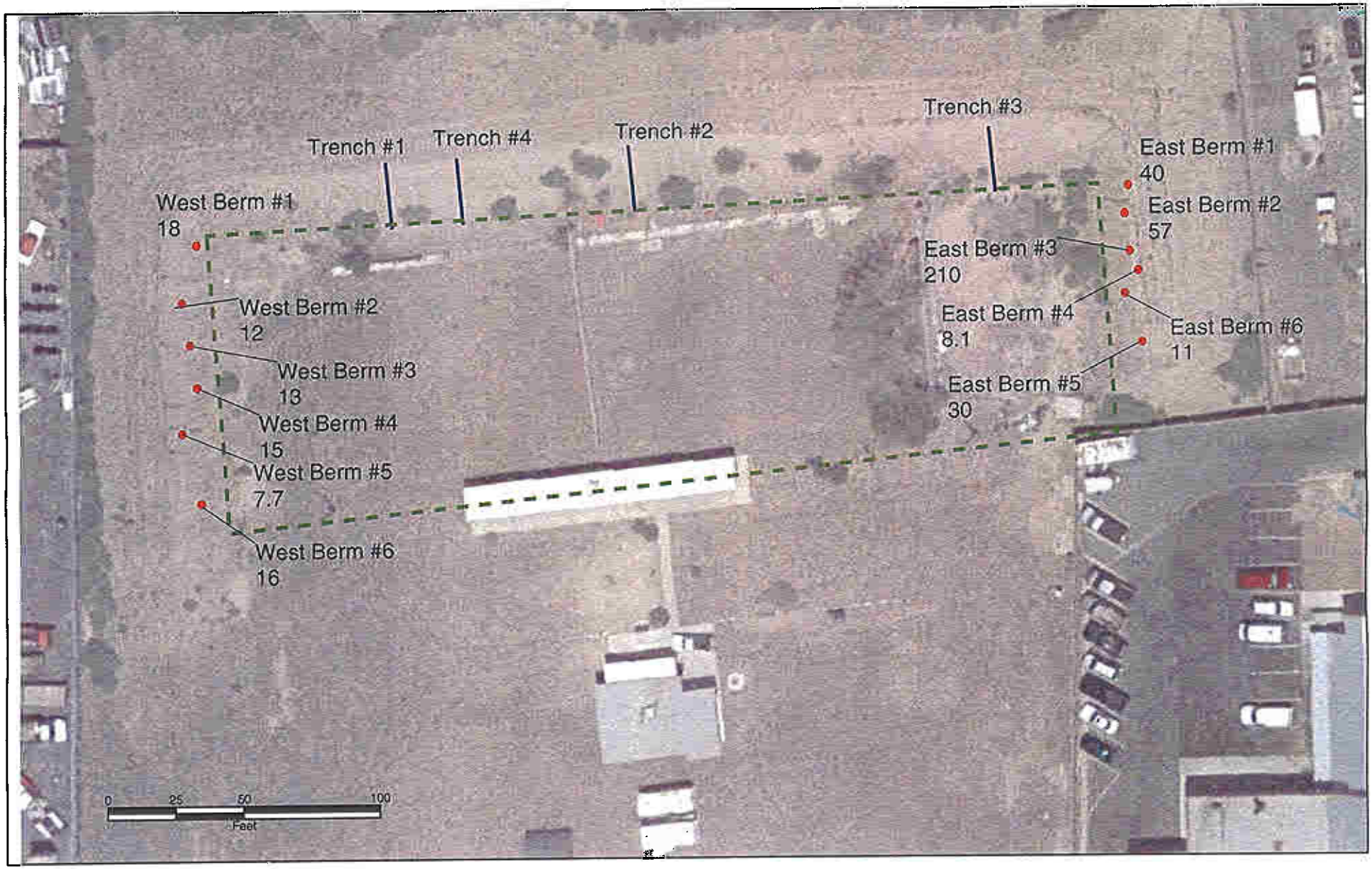
Source:
Southern Nevada GIS
OpenWeb Info Mapper
Aerial Photography
Fall 2003

MACTEC

SITE LOCATION MAP
FORMER POLICE DEPARTMENT FIRING RANGE
CITY OF HENDERSON
HENDERSON, NEVADA

Project:
4400-04-1025.05

Plate 1



Henderson2.mxd - 2/24/2005

EXPLANATION

- SAMPLE POINT AND LEAD CONCENTRATION (mg/kg)
- TRENCH
- APPROXIMATE EXTENT OF RANGE FLOOR

MACTEC

Trench and Sample Locations and Lead Concentrations in Surface Soil

City of Henderson Former Police Firing Range
Henderson, Nevada

PLATE
2

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
TJH	4400041025 05		2/2005	

APPENDIX A

LABORATORY ANALYTICAL DATA (CD)

APPENDIX B

DATA VALIDATION REPORT

TO: Daniel Burns, Mactec E&C, Inc. March 2, 2005

FROM: Donna Breaux, DataVal, Inc. Project No. 4400041025.04

REVISED REPORT

DATA VALIDATION SUMMARY REPORT FOR THE CITY OF HENDERSON FORMER POLICE DEPARTMENT SMALL ARMS FIRING RANGE SITE, HENDERSON, NV

LABORATORY: Del Mar Analytical, Las Vegas, NV

SAMPLING DATES: October 11 and 12, 2004

Data validation of the attached laboratory data package was performed according to the project-specific guidelines. These guidelines were outlined in the Sampling and Analysis Plan (SAP) for The City of Henderson Former Police Department Firing Range, September 2004; and the U. S. Environmental Protection Agency (EPA) Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, July 2002.

Following USEPA Region 9 Tier 1A and Tier 2 criteria, the data were reviewed for holding times, blanks, initial and continuing calibration verification (ICV/CCV) standards, laboratory control samples (LCS), matrix spikes (MS), matrix spike duplicates (MSD), ICP interference check standards, ICP serial dilutions, compound identification and quantitation, and field duplicate samples.

The following paragraphs highlight the essential findings of the data validation effort:

I. **Total Antimony, Arsenic, Copper and Lead (6010B)**
Overall, the data are usable as reported. Qualification was not required.

A. Reporting Limits
The laboratory reporting limits for antimony, arsenic, copper and lead in soil matrix samples met the project required reporting limits, with the following exception:

1. The laboratory reporting limit for antimony did not meet the project required reporting limit listed in the SAP. The laboratory reporting limit was 10 mg/kg for antimony. The project required reporting limit for antimony was 5.0 mg/kg.

B. Holding Times
Technical holding time criteria were met for all project samples.

C. Blanks
Target analytes were not observed in any laboratory method blanks associated with the project samples. Target analytes were not observed in the two equipment blanks associated with the project samples.

D. Initial and Continuing Calibrations
All initial and continuing calibration standards associated with the project samples met QC acceptance criteria.

E. Matrix Spike/Matrix Spike Duplicate
All QC criteria were met for the matrix spikes and matrix spike duplicates associated with the project samples, with the following exceptions:

1. The percent recoveries for lead were outside the 75%-125% project acceptance criteria in QC samples T2-0-0 MS/MSD. The amount of lead present in the parent sample was greater than four times the amount spiked, and qualification was not required.
2. The percent recoveries for lead were outside the 75%-125% project acceptance criteria in QC samples T2-1-5 MS/MSD. The amount of lead present in the parent sample was greater than four times the amount spiked, and qualification was not required.
3. The percent recoveries for lead were outside the 75%-125% project acceptance criteria in QC samples T1-2-5 MS/MSD. The amount of lead present in the parent sample was greater than four times the amount spiked, and qualification was not required.
4. The percent recoveries for antimony were outside the 75%-125% project acceptance criteria in QC samples INJ1710-02 MS/MSD. The parent sample was associated with a site unrelated to the project site, and qualification was not required.

F. Laboratory Control Samples
All QC criteria were met for the laboratory control samples associated with the project samples.

G. ICP Interference Check Standards
ICP interference check standards were not analyzed with the project samples.

H. ICP Serial Dilution
ICP serial dilutions were not analyzed with the project samples.

I. Compound Identification and Quantitation
Samples T2-0-25, T2-0-18, T2-0-10, T2-0-5, T2-0-0, T2-4-25, T2-3-25, T2-2-25, T2-1-25, T2-4-18 and Rinsate-10/12/04 in laboratory sample delivery group PNJ0336 received full (EPA Region 9 Tier 2) data validation. The results for lead in these samples were re-calculated and verified to be correct as reported by the laboratory.

FIELD DUPLICATE SAMPLES

Field duplicate precision was evaluated by calculating the relative percent difference (RPD) between detected results in the original sample and its associated duplicate. The control limit used for field duplicates was a relative percent difference less than or equal to 50 percent, or the absolute difference of the two results must be less than the twice the reporting limit for those analytes that were at or near the detection limit. Nine samples were collected in duplicate for this sampling event.

Project Sample Primary ID	Lab Sample ID	Project Sample Duplicate ID	Lab Sample ID
T2-4-18	PNJ0336-10	T2-4-19	PNJ0336-11
T2-2-10	PNJ0336-17	T2-2-11	PNJ0336-18
T1-2-25	PNJ0336-30	T1-2-24	PNJ0336-31
T1-0-11	PNJ0336-49	T1-0-10	PNJ0336-50
T3-4-18	PNJ0336-57	T3-4-19	PNJ0336-58
T3-1-10	PNJ0336-65	T3-1-9	PNJ0336-66
T3-1-5	PNJ0336-70	T3-1-4	PNJ0336-71
T3-5-0	PNJ0336-78	T3-6-0	PNJ0336-79
West Berm 4-0	PNJ0336-90	West Berm 7-0	PNJ0336-93

The attached Table 2 summarizes the field duplicate sample results. The detected results of the original sample and the associated duplicate sample were compared and the calculated RPDs reported. All RPDs met the 50 percent precision control limit requirement, with the following exceptions:

1. In field duplicates T3-1-10 and T3-1-9, the RPD between the detected results failed the 50% acceptance criteria for lead at 75%.
2. In field duplicates T3-5-0 and T3-6-0, the RPD between the detected results failed the 50% acceptance criteria for lead at 91%.

The analysis of field duplicate samples is a measure of both field and analytical precision. The imprecision in the results in the field duplicate pairs listed above may be due to the sample matrix, sample non-homogeneity, sampling or laboratory technique, or method defects. Since the effect on the quality of the data is not known, data is not qualified for field duplicate failure.

SUMMARY

The attached Table 1 lists the project samples and analyses included in the data validation effort. This table also designates which samples received full (EPA Region 9 Tier 2) data validation. Qualification was not required for any of the project samples included in the data package.

USABILITY

The quality control criteria were reviewed, and other than those discussed above, all criteria were met and the data are considered acceptable. Based upon the cursory and full data validation, all results are considered valid and usable for all purposes. The absence of rejected or qualified data indicates high usability.

APPENDIX C

WORK PLAN FOR LEAD IMPACTED SOIL REMOVAL, TRANSPORTATION, AND DISPOSAL

WORK PLAN FOR

LEAD IMPACTED SOIL REMOVAL, TRANSPORTATION AND DISPOSAL

City of Henderson Former Police Department Firing Range
390 Athens Avenue
Henderson, Nevada
NDEP Brownfields Project

MACTEC Project Number 4400-04-1025

Introduction

The Subject Site is located at 390 Athens Avenue, Henderson, Nevada, and was acquired by the City of Henderson in 1976 and used by the Police Department as a small-arms firing range for Police Officer training. Between 1999 and 2000, use of the firing range was discontinued due to budgetary issues. Between December 2002 and June 2003, a limited number of soil samples were collected at the Site to assess potential impacts on soil from metals associated with firing and training activities (*Converse, June 2003*). The results indicated (1) that material in the West Berm contained lead concentrations in soil below the U.S. Environmental Protection Agency (USEPA) Region IX's Industrial Preliminary Remediation Goal (PRG) for lead of 750 milligrams per kilogram (mg/kg), and (2) material in the North Berm contained lead concentrations in soil that exceeded the PRG. Therefore, additional assessment and remediation activities were determined to be necessary along the North Berm to make the site useable for other purposes. The City of Henderson Police Department plans to redevelop the site and install facilities for future K-9 and SWAT Training operations. In March 2004, the City of Henderson submitted an application to the State of Nevada Division of Environmental Protection (NDEP) Brownfields Funding Application. This application was accepted and the site became a NDEP Brownfields project, which was awarded to MACTEC.

As the result of a scoping meeting held on April 27, 2004 at both the Subject Property and the City of Henderson City Hall (attended by NDEP, USEPA Region IX, City of Henderson, and MACTEC representatives), MACTEC performed the following activities:

1. Conducted a historic subject site land use research (focusing on the berm only),
2. Vacuumed range-related material (e.g., brass cartridge cases) from the firing range floor, and

3. Submitted a sampling and analyses plan (SAP) for trenching of the North Berm, soil sampling within the trenches, and confirmation soil sampling (no trenching) of the East and West Berms.

The Historic Subject Site Land Use Research was conducted prior to the SAP submittal (July 27, 2004) and the implementation of the Range Floor Vacuuming activities (July 28 and 29, 2004). In September 2004, MACTEC received approval from USEPA to implement the SAP. Implementation of the SAP occurred in October 2004. Based upon the results of the October 2004 activities, MACTEC estimates that approximately 600 cubic yards of lead impacted material along the North Berm will require remediation. Results of the October 2004 activities are summarized herein. In addition, although vacuumed, the Range Floor has not been characterized to evaluate potential impacts from lead in soil. A modification to the SAP (Appendix B) has been prepared for implementing range floor characterization and confirmation soil sampling within the area from which the approximately 600 cubic yards of lead impacted material is to be removed.

Site Characterization

On October 11 and 12, 2004, MACTEC implemented a SAP, dated July 2004 that was submitted by MACTEC and approved by USEPA under the NDEP Brownfields program. Using a backhoe, the North Berm was investigated by trenching and collecting soil samples at three locations. A fourth trench was opened for visual inspection only. A total of 72 soil samples were collected from the berm trenches, with an additional 8 samples collected for duplicate analyses. Samples were submitted for total lead (EPA 6010B) analyses. Upon receipt of the lead analyses, fifteen samples (with varying concentrations of lead levels) were selected for antimony, arsenic and copper analyses. These metals were selected because they are also common alloys in small arms ammunition.

Total lead concentrations in the samples collected from the berm trenches were reported by the laboratory at concentrations up to 19,000 mg/kg. In each trench, a thin (one inch average) bullet layer was typically observed at approximately 2 feet beneath the berm face, indicating the presence of a prior berm face that had been previously graded over. Organic debris with shotgun wadding was also observed at approximately 3 feet beneath the berm face. In Trench 1, elevated lead levels were reported for samples collected a distance of 10 feet up slope and a depth of 2 feet below the berm face. In Trench 2, elevated lead levels were reported for samples collected a

distance of 18 feet up slope and a depth of 3 feet below the berm face. In Trench 3, elevated lead levels were reported only in the surface sample collected at the berm face and range floor intercept.

The term 'elevated' as used above is defined as concentrations of total lead in soil reported by the analytical analyses (presented in the SAP) as exceeding the 2003 USEPA Region IX Preliminary Remediation Goal (PRG) for residential soils of 750 mg/kg. It should be noted that while the SAP indicated a lead in soil PRG of 750 mg/kg decision criteria, a new PRG for lead was established by USEPA in October of 2004 of 800 mg/kg. This new PRG value is used for the remedial decision criteria described herein. If the previous 750 mg/kg lead in soil PRG value were used, it is not anticipated that it would make a difference in the scope of the Site remediation or decision process.

The East and West Berms were investigated by confirmation sampling (no trenching) at six locations per berm for a total of twelve (12) surface soil samples. The scope of the original sampling was modified to increase the number of samples per berm from three to six surface soil samples. No total lead samples exceeded the PRG in surface samples collected from the East and West Berms.

Evaluation of Remedial Approaches

Based Brownfields Program requirements, excavation and offsite disposal were considered as the only viable approach. To minimize hazardous material classification and disposal costs, processes were evaluated that might allow for the identification and segregation of material that could be treated as other than hazardous. The following decision points were identified:

1. Selectively excavating layers of material that appear to contain bullets and shot and separating that material from soil without particulate lead that may pass a TCLP analysis,
2. Characterizing bulk excavated material using TCLP,
3. Sieving out material likely to be "clean" (i.e., rock and gravel) and disposing of the remaining material (with bullets and shot) as hazardous,
4. Performing a screening process with subsequent pneumatic separation of the metallic lead fraction and characterizing the resulting processed material through TCLP.

Various selective excavation and sieving techniques were considered, and for the estimated volume of material to be processed, these techniques do not appear to be viable cost savings approaches. Pre-treating all excavated material also does not appear to be viable as sieving and

bench-scale testing would be required. The collection of bulk material samples containing bullets and shot for analyses by TCLP to evaluate the material's acceptance at the APEX industrial facility was considered. However one of the TCLP preparation processes the laboratory is required to perform is passing the material through a 10mm sieve. The bullet and shot fragments would be too large to pass through the 10mm sieve. This was identified as a concern to APEX as not being representative of the excavated material and therefore was rejected.

Therefore, based upon the estimated 600 cubic yard volume of material exceeding the 800 mg/kg lead limit, as well as the time and budget constraints, the remedial action approach for the Site was selected as disposal at the US Ecology facility, located in Beatty, Nevada.

Soil Excavation and Storage

As shown on Plate C-1, along and within the North Berm, elevated levels of lead are estimated to be located along the center portion of the berm roughly from the West berm location eastward to approximately 25 feet west of the East berm (a total distance of approximately 300 feet). Within this lateral distance, the elevated levels of lead extend vertically up the berm face between 10 and 18 feet, and a depth of between 3 and 4 feet beneath the berm face, which comprises an approximate volume of 600 cubic yards of material requiring mitigation. This material will be removed as follows:

- Remove by excavation the area designated by the MACTEC representative based upon previously described field investigations.
- Place excavated material on plastic 6 mil HDPE (or equivalent) sheeting. This material will be temporarily stockpiled outside of the Range Floor footprint, but within the confines of the site boundary (Plate C-1). The location will be selected to allow access to the Site, but maintain a logical loading sequence to minimize downtime during loading of material for transport to the disposal facility.
- As practical, care will be taken to avoid spillage of material onto the Range Floor.
- Perform dust mitigation to comply with Clark County Air Quality Regulations by spraying water as needed from a water truck. A MIE Dust Meter will be used to monitor dust levels during excavation and soil handling to determine the need for dust mitigation and/or triggering personnel level of protection upgrades/downgrades as appropriate.

Once the berm excavation has been completed and range floor cleared of spillage, soil confirmation samples will be collected from the North Berm and a grid pattern will be laid out on the Range Floor for sample collection as detailed in Appendix D (the "*Sampling and Analysis Plan Addendum, Range Floor Characterization and Remedial Action Plan for City of Henderson Former Police Department Firing Range Brownfields Project 390 Athens Avenue Henderson, Nevada,*".

In general, for the Range Floor, samples will be collected at depth intervals of 0.5 and 1 foot below the existing Range Floor surface using a five-point composite sampling method. Samples will be collected within 25 foot by 25 foot area grids located between the lateral extent of the range's firing table and within 50 foot by 50 foot area grids located outside the lateral extent of the Range's Firing Table (Appendix D, Plate D-1).

For the North Berm, soil confirmation samples will be collected at horizontal distances of 25-foot spacing along the portion of the North Berm where impacted material was removed to confirm all soil containing lead above the PRG has been removed. If confirmation sampling indicates lead remains above the PRG at a given sampling location, additional material will need to be excavated. Before any additional material is excavated, the extent of excavation will be discussed with NDEP. Confirmation sampling of the North Berm will be performed at vertical distances of 0, 5, 10, 15, and 20 feet up the berm face, depending on excavation limits. These intervals are designed to correspond approximately with the sampling intervals used in the SAP.

Once confirmation sampling analytical results for lead in soil are obtained, if any sampling locations contain lead in soil that exceed the PRG (a total lead concentration of 800 mg/kg), additional material will need to be excavated. Before any additional material is excavated, the extent of excavation will be discussed with NDEP. The excavated material will be placed with the other stockpiled material on plastic sheeting.

Soil Loading, Transport and Disposal

Initially, two truck loads of excavated material will be loaded for transport to the permitted landfill facility US Ecology, located in Beatty, Nevada. The material from these two initial loads will be analyzed over a period of two days by US Ecology to verify an appropriate pre-treatment stabilization method (determined by their profiling procedures and landfill permit requirements). An additional 2 days may be required by US Ecology to verify the soil stabilization method

before they accept further material from the Site. Once the stabilization method for the Site materials is verified by US Ecology, the remainder of the stockpiled soil will be loaded at a rate of 10 to 15 loads per day and transported to US Ecology's facility for stabilization and disposal.

Hauling will be accomplished by an appropriately licensed transporter. The transporter shall be responsible for the following tasks:

- Complete the transporter section of the manifest;
- Obtain weigh tickets and provide to the MACTEC representative;
- Manage stockpiled material during loading, transportation, and any emergency situations during transport to US Ecology's facility in Beatty, Nevada in accordance with licensing requirements.

Henderson-c1.mxd - 3/2/2005

EXPLANATION

- Excavate to 1' bgs
- Excavate to 3' bgs
- Excavate to 4' bgs
- Trench
- Approximate Extent of Range Floor

MACTEC

Extent of Soil Remediation

City of Henderson Former Police Firing Range
Henderson, Nevada

PLATE

C1

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
TJH	4400041025 05	DCB BSW	3/2005	

APPENDIX D

SAMPLING AND ANALYSIS PLAN ADDENDUM
RANGE FLOOR CHARACTERIZATION AND
REMEDIAL ACTION PLAN SOIL CONFIRMATION SAMPLING

Sampling and Analysis Plan Addendum
Range Floor Characterization and
Remedial Action Plan Soil Confirmation Sampling

City of Henderson Former Police Department Firing Range
Brownfields Project
390 Athens Avenue
Henderson, Nevada

MACTEC Engineering and Consulting, Inc.
6280 S. Valley View Blvd., Suite 722
Las Vegas, Nevada 89118

3/04/2005
Date

MACTEC	Project Manager	Daniel C. Burns, PG, CEM
MACTEC	QA Manager	Bruce Wilcer, RG

For EPA use:

Approved by EPA Project Manager: Date:

Expedited Review? ☐ Yes ☐ No

Received by QA Office: Date:

Reviewed by: Date:

Approved: Date:

Region 9 Quality Assurance Manager

1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) addendum presents additional information and describes procedures pertinent to the site investigation and remediation sampling and analysis subsequent to the completion of the approved SAP, dated July 27, 2004. Only sections of the original SAP that are modified are provided herein. A brief summary of the original SAP introduction is provided here for continuity.

The Subject Site, located at 390 Athens Avenue, Henderson, Nevada, was acquired by the City of Henderson in 1976 and used by the Police Department as a small-arms firing range for Police Officer training. In approximately 1999/2000, use of the firing range was discontinued due to encroachment issues. The City of Henderson Police Department would like to use the site for K-9 and SWAT Training operations (facilities that they currently do not have). In March 2004, the City of Henderson submitted an application to the State of Nevada Division of Environmental Protection Brownfields Funding Application. This application was accepted and the site became a NDEP Brownfields project, which was awarded to MACTEC in June 2004.

As the result of a scoping meeting held on April 27, 2004 at both the Subject Property and the City of Henderson City Hall (attended by NDEP, U.S. Environmental Protection Agency (USEPA) Region IX, City of Henderson, and MACTEC representatives), MACTEC conducted a historic subject site land use research (focusing on the berm only), vacuumed range-related material (e.g., brass cartridge cases) from the firing range floor, and submitted a sampling and analyses plan (SAP) for trenching of the north berm and soil sample collection, and confirmation soil sampling (no trenching) of east and west berms.

The Historic Subject Site Land Use Research was conducted prior to the SAP submittal (July 27, 2004) and the implementation of the Range Floor Vacuuming activities (July 28 and 29, 2004). In September 2004, MACTEC received approval from USEPA to implement the SAP, which occurred in October 2004. Based upon the results of October 2004 activities, approximately 600 cubic yards of lead impacted material along the north berm will require remediation. Results of the October 2004 activities are summarized in Section 2. In addition, the range floor has not been characterized to evaluate potential soil impacts from previous use.

The sections presented herein are *modifications* to the July 27, 2004 SAP approved by EPA. The purpose of the modifications is to address the following two activities that remain before the site can be considered completed as a successful NDEP Brownfields program site. All other Sections remain the same.

- Characterization of the firing range floor
- Confirmation sampling of that portion of the north berm left in place after the approximate 600 cubic yards of lead impacted material along the north berm has been remediated.

1.5 Statement of the Specific Problem

The site has lead impacted soils, resulting from the site's usage as a small arms training firing range for the City of Henderson police department. The intended future use of the property is as a police department K-9 and SWAT training facility.

In June 2004, the site was accepted into the Nevada Brownfields Program. In July 2004, MACTEC coordinated vacuuming of the firing range floor to remove brass shells, rubber projectiles, and other range-related material from the range floor prior to trenching and sampling activities along the berm. The objective was to allow for mobility of equipment without spreading range floor related material into the subsurface, possibly making it more difficult to remove later. During the subsequent berm trenching activities (conducted in October 2004), brass shells were found partially exposed in the range floor. These are suspected of being unearthed as a result of rainfall events that occurred after Range Floor had been vacuumed and prior to the berm trenching activities.

Implementation of the July 2004 SAP consisted of two tasks: 1) Trenching of the North Berm and soil sample collection; and 2) Confirmation soil sampling (no trenching) of East and West Berms. The overall objective was to further evaluate the lead impacted soil along the north berm and to confirm Converse's findings along the west berm. MACTEC's investigation confirmed Converse's findings along the west berm. Remedial activities for a portion of the north berm along with range floor characterization will be required prior to re-development.

MACTEC evaluated possible remedial alternatives for the lead impacted soil along the north berm of the Subject site. As well as approaches to complete the characterization of the firing range floor. The decision points that were considered are outlined below and the approach was based upon the following understanding MACTEC has from project meetings between MACTEC and NDEP.

- The City of Henderson Police Department desires to use the site for SWAT and K-9 training. However, since no formal plan has been established towards that objective, the final condition of the property must support an unrestricted industrial use scenario.
- To support an unrestricted industrial use scenario, soil exceeding the industrial PRG for lead of 800 mg/kg must be removed from the site.
- Projects funded by the Brownfields Program have time and budget constraints.
- The range floor soil must be characterized to evaluate the nature and extent of potential lead contamination at levels exceeding the industrial PRG for lead of 800 mg/kg.

The remedial action approach for this site was selected as disposal at the US Ecology facility, located in Beatty, Nevada. The Work Plan for Impacted Soil Removal is attached as Appendix C.

2.3 Previous Investigations/Regulatory Involvement

On October 11 and 12, 2004, MACTEC implemented a SAP, dated July 2004 that was submitted by MACTEC and approved by USEPA under the NDEP Brownfields program. Using a backhoe, the North Berm was investigated by trenching and collecting soil samples at three locations. These are shown on Figure 1. A fourth trench was opened for visually inspection only. A total of 72 soil samples were collected from the berm trenches, with being an additional 8 samples collected for duplicate analyses. Samples were submitted for total lead (EPA 6010B) analyses. Upon receipt of the lead analyses, fifteen samples (with varying concentrations of lead levels) were selected for antimony, arsenic and copper analyses. These metals were selected, because they are also common alloys in small arms ammunition.

Within the SAP, the sample collection locations were identified as along the berm face at 1, 3, 6, 9, and 12 feet above the range floor at depths of 0, 1, 2, 3, and 4 feet below exposed berm face surface. The actual sampling locations were field modified, based upon visible bullet evidence along the berm face. Samples were collected along the berm face at 0, 5, 10, 18, and 25 feet above the range floor at depths of 0, 1, 2, 3, and 4 feet below exposed berm face surface. Near the toe of the berm face and the range floor, no samples were collected at 4 feet below exposed berm face surface.

Elevated total lead was reported by the laboratory at concentrations up to 19,000 mg/kg. In each Trench, a thin (one inch average) bullet layer was observed generally at approximately 2 feet beneath the berm face, indicating a prior berm face. Organic debris with shotgun wadding was also noted at approximately 3 feet beneath the berm face.
In Trench 1, elevated lead levels were reported for samples collected a distance of 10 feet up slope and a depth of 2 feet below berm face. In Trench 2, elevated lead levels were reported for samples collected a distance of 18 feet up slope and a depth of 3 feet below berm face. In Trench 3, elevated lead levels were reported only at the surface sample collected at the berm face and range floor intercept.

Along and within the north berm, elevated levels of lead are estimated to be located along the center portion of the berm roughly from the West berm location eastward to approximately 25 feet west of the East berm (a total distance of approximately 300 feet). Within this lateral distance, the elevated levels of lead extend vertically up the berm face between 10 and 18 feet, and a depth of between 3 and 4 feet beneath the berm face, which comprises an approximate volume of 600 cubic yards of material requiring mitigation. The term elevated, as used in the preceding sentences is defined as concentrations of total lead in soil reported by the analytical analyses (presented in the SAP) as exceeding the 2003 USEPA Region IX Preliminary Remediation Goal (PRG) for residential soils of 750 mg/kg. It should be noted that while the SAP indicated a lead in soil PRG of 750 mg/kg decision criteria, a new PRG for lead was established in October of 2004 as 800 mg/kg. This new PRG value is used for the remedial decision criteria described herein. If the previous 750 mg/kg lead in soil PRG value were used, it does not appear it would change the decision matrix.

The East and West Berms were investigated by confirmation sampling (no trenching) at six

locations per berm for a total of twelve (12) surface soil samples. This amount was a modification from the originally planned three locations per berm for a total of six surface soil samples. No total lead samples exceeded the PRG.

3.0 PROJECT DATA QUALITY OBJECTIVES

3.1 Project Task and Problem Definition

The purpose of the additional environmental investigation is to characterize the firing range floor and verity that the soil remaining in the north berm, following remediation, in below the Industrial PRG for lead of 800 mg/kg.

3.2 Data Quality Objectives (DQOs)

The following Section discusses the revised Data Quality Objectives (DQOs) for this project.

State the Problem

The impact of former use of a firing range on the firing range floor at the site and verification that soil remaining does not exceed PRG, needs to be further evaluated. Further characterization involves addressing the following data gaps:

Data Gap 1) Previous investigations indicate that past use of the firing range has resulted in concentrations of lead above the action level (the industrial soil PRG of 800 mg/kg) in soil comprising the north berm. The extent of soil containing lead at concentrations exceeding the industrial PRG needs to be further characterized along the Range Floor prior to removal of impacted soil within the north berm.

Data Gap 2) During removal of approximately 600 cubic yards of lead impacted within the north berm, the potential to leave impacted soil exists. Confirmation sampling of the soils left in place (within the footprint of the north berm removal) needs to be conducted.

Identify the Decisions

The following are questions the study will attempt to resolve:

- What is the distribution of lead concentrations in soil along Range Floor?
- What is the extent of lead in soil along the Range Floor above industrial

PRGs?

- After removal of north berm soils that exceed the industrial PRG for lead in soil, are there soils remaining within the removal footprint that exceed the industrial PRG for lead in soil?

Identify Inputs to the Decisions

The following is information that will be used to resolve the decision statement:

- Additional chemical data from analysis of soil samples collected during proposed investigative of Range Floor and confirmation sampling of north berm materials left after removal of impacted material.
- EPA Region IX industrial soil PRGs for lead of 800 mg/kg.

Define the Study Boundaries

The following describes where and when the data will be collected.

Range Floor

- Five point composite sampling within 25 feet by 25 feet area grids located between the lateral extent of the Range's Firing Table
- Five point composite sampling within 50 feet by 50 feet area grids located outside the lateral extent of the Range's Firing Table.
- Samples collected at depth intervals of surface and 1 foot below the Range Floor.

North Berm

- Sample at horizontal distances of 25 foot spacing along the portion of the north berm where impacted material is removed (estimated to be 13 locations). The purpose being to minimize additional removal to no more than a 50 foot section, if necessary.
- Sample at vertical distances of 0, 5, 10, 15, and 20 feet up the berm face to approximately correspond to sampling intervals conducted during the SAP.

Temporal Boundaries

It is anticipated that the data will be collected in one sampling event. The north berm impacted material will be removed and stockpiled in an area located east of the on site building (Appendix C, Plate C-1), and then the firing range floor and the berm confirmation sampling will occur.

Develop Decision Rules

The following are decision rules that have been developed to guide the investigation:

1) ***Extent of Range Floor metals contamination***

- If a range floor grid composite sample shows a total lead concentration in excess of the Industrial PRG for lead, material within that firing range floor grid will require removal to 1 foot minimum, and confirmation sampling will be required within that grid.

- If a range floor grid composite sample shows a total lead concentration beneath the Industrial PRG for lead, the location will be considered to be adequately characterized and no further action required within that grid.

2) ***Confirmation sampling of north berm soil removal***

- If a surface sample shows a total lead concentration in excess of the Industrial PRG for lead, additional removal of an additional 1 foot minimum will be required.

- If a surface sample shows a total lead concentration beneath the Industrial PRG for lead, the location will be considered to be adequately characterized and no further action required.

There may be additional investigation required if, during implementation of this SAP, additional characterization of the site is indicated. If this occurs, an addendum will be made to this plan to document these findings and provide procedures to be followed.

Optimize the Design

The following describes the investigation program designed to address identified data gaps.

Range Floor

The range floor will be laid out into sixteen 25 foot by 25 foot grids and ten 50 foot by foot grids, and five point composite sampling will be conducted (Plate D-1) to evaluate the extent of lead-impacted soil (Data Gap 1).

It is anticipated that 52 primary samples and 6 duplicate samples will be collected. All samples analyzed for lead by EPA Test Method 6010.

North Berm

Surface soil samples will be collected along the portion of the north berm from which elevated lead impacted soil is removed (Plate D-1) to show that material left is beneath the industrial PRG for lead (Data Gap 2).

It is anticipated that up to 54 primary samples and 6 duplicate samples will be collected. Samples will be analyzed for lead by EPA Test Method 6010.

4.0 SAMPLING RATIONALE

The following sections address the sampling protocol for the program. If problems are encountered and additional characterization of the site is indicated, an addendum will be made to this plan which documents these findings and provides a design and procedures for additional site characterization.

4.1 Soil Sampling

Range Floor and sample collection

Range Floor will be divided into grids, with five point composite sampling conducted within each grid. Within the 100 by 100 firing range floor area immediately front of the range firing table, the area will be divided into 25 foot by 25 foot grids (16 grids). The remaining range floor will be divided into 50 foot by 50 foot grids (10 grids). Within each grid, samples will be collected from surface and from 1 foot beneath surface, for a total of 52 composite samples. Additional samples include those to meet data quality objectives: duplicates (6 samples), matrix spike/matrix spike duplicates (3 sample), and sampling equipment rinseate blanks (1 per day). We anticipate each soil sample being analyzed for total lead in accordance with EPA Test Method 6010B.

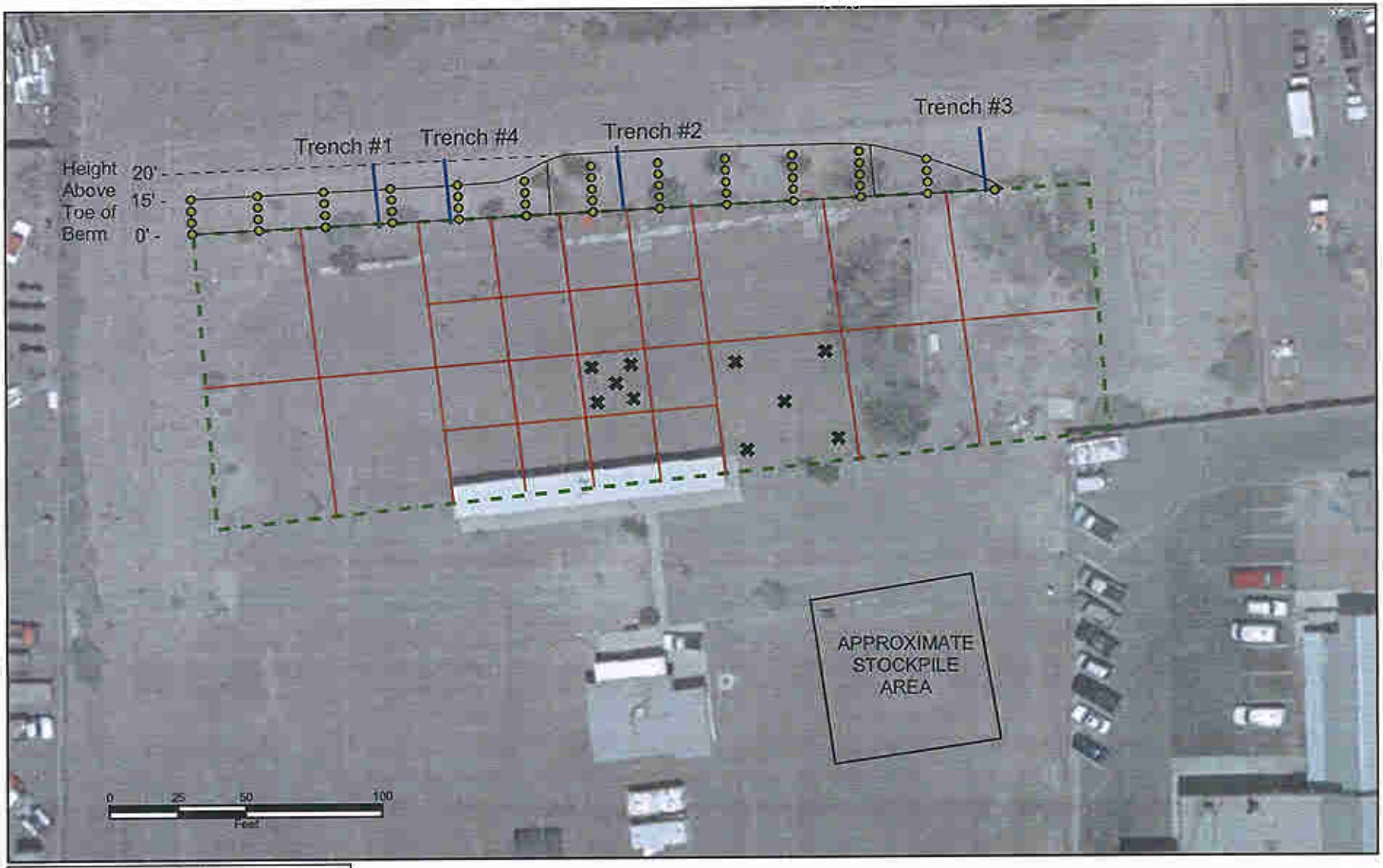
Confirmation sampling of North Berm material left within area of removal

Confirmation sampling of the material left in place within the North Berm footprint from which elevated lead impacted soil will be removed will consist of collecting 54 samples along a 25 foot spaced horizontal interval and at vertical distances of 0, 5, 10, 15, and 20 feet up the berm face, depending on excavation limits. The horizontal distances are meant to minimize the amount of additional material that may require removal. The vertical distances are meant to approximately correspond to sampling intervals conducted during the SAP. Additional samples include those to meet Data Quality Objectives: duplicates (6 samples), matrix spike/matrix spike duplicates (3 sample), and sampling equipment rinseate blanks (1 per day). Each soil sample will be analyzed for total lead in accordance with EPA Test Method 6010.

5.0 REQUEST FOR ANALYSES

5.1 Analyses Narrative

Up to 52 composite soil samples from the surface and at a depth of 1 foot beneath the firing range floor at 26 grid locations along the Range Floor, and up to 54 surface soil samples from the North Berm will be collected and analyzed for total lead by EPA Test Method 6010B. In addition to the primary investigative field samples, quality control samples will also be collected from the two sample areas. Duplicate soil samples will be collected at a rate of 10% of the total number of field samples collected from each area (minimum 1 sample). Sufficient sample volume will be provided for laboratory matrix spike/matrix spike duplicate (MS/MSD) analysis on a minimum of 5% of the total field samples collected from each area and will be designated for MS/MSD analysis on the chain of custody (minimum 1 sample). Because soil sampling equipment will be re-used and decontaminated between sampling locations, sampling equipment rinseate blanks will be collected at a rate of one sample per day from each area. Sample locations, and subsequent QC sample locations will be determined in the field based on accessibility, visible signs of potential contamination (e.g., bullet accumulations, rusty/oxidized soils).



Henderson-c1.mxd - 3/2/2005

EXPLANATION

- Confirmation Sample
- Range Floor Sample (Typical)
- Grid Boundary
- Trench
- Approximate Extent of Range Floor

MACTEC

Range Floor and Confirmation Sampling Patterns

City of Henderson Former Police Firing Range
Henderson, Nevada

PLATE

D1

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
TJH	4400041025 05		3/2005	