SITE INVESTIGATION REPORT
SOIL EVALUATION SERVICES

Former Firing Range
Soil Investigation
2650 Leroy Road
Virginia Beach, VA
GER 120-6539

Prepared for

City of Virginia Beach
Public Works Engineering
Virginia Beach, Virginia

Attention: Mr. Jeff Waller, P.E.

Prepared by

Brian C. Parker, REM, SC

GER Consulting Engineers
GeoEnvironmental Resources, Inc.
Environmental • Groundwater • Hazardous Materials • Geotechnical • Industrial Hygiene

Southern Professional Center I

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September 26, 2014

City of Virginia Beach
2405 Courthouse Drive
Virginia Beach, Virginia 23456

Attention: **Mr. Jeff Waller, P.E.**

Subject: **Soil Investigation Report**
Former Firing Range
2650 Leroy Road
Virginia Beach, Virginia
GER Project #120-6539

EXECUTIVE SUMMARY

Geo**E**nvironmental **R**esources, Inc. (**GER**) performed a limited soil investigation of the former firing range located at 2650 Leroy Road in Virginia Beach, Virginia (Hereinafter referred to as the "subject property"). The purpose of the investigation was to determine the extent to which bullets are present within the center side wall berm of the subject property. Representative soil samples were collected along both sides of the center side wall berm and gravimetrically evaluated for the presence of bullets or shotgun shot.

Laboratory results found that four of the thirty-six composite samples collected contained lead ammunition. Sample 2A collected at depth of 0-6" below land surface (blf) contained a single flattened lead bullet and Sample 11B collected from 6-12" bls contained a single unidentifiable bullet fragment. Sample 12A collected from 0-6" bls contained one piece of buckshot and Sample 12B collected from 6-12" bls contained one lead bullet. These four soil samples that contained a bullet or shot had a percent weight of lead to weight of soil of less than 1%. Lead was not found in the other thirty-two soil samples collected. These results appear consistent with the historic use of the center side wall berm as it did not serve as a backstop berm into which ammunition was being fired directly.

These findings suggest a low probability that the soils which comprise the center side wall berm contain hazardous levels of leachable lead. Testing of the berm will be required to assess whether or not it will need to be managed as hazardous waste pursuant to State solid waste management regulations.

BACKGROUND

It is understood that the City plans to develop the subject property as a training facility for the police department. It is further understood that the proposed construction activities will require leveling a portion of the on-site center side wall berm which partially bisects the subject property and grading the site to facilitate construction of two municipal buildings. It is understood that the backstop berm which borders the southeastern property boundary and the side wall berm which borders the northeastern property boundary will remain undisturbed and serve as a buffer from surrounding land uses. The purpose of this investigation is to conduct a preliminary screening of the center side wall berm soil to

estimate the potential amount of residual metal fragments (lead and copper) remaining in the berm from the previous usage of the site as a firing range, and the potential for soil and groundwater contamination due to leaching from the metal fragments over time. Of particular concern is the presence of lead which is commonly used in .38 caliber police service pistols (9.0 millimeter) and four (6.1 millimeter) to four-ought (9.7 millimeter) shotgun ammunition reported to have been fired at the facility.

Based on the results of the preliminary screening, soil and groundwater sampling and analysis may be required to characterize the subject property specifically relating to possible metals contamination.

PROCEDURE

GER contacted City personnel with previous knowledge or familiarity of the historical operation of the firing range to get a better idea of the history of the range, the types of firearms used, and the potential for metals contamination. **GER** also conducted research to identify and compile information pertaining to the regulatory status and the investigation and cleanup of similar firing ranges that may be applicable to the subject property.

GER inspector Brian Parker made site visits to the former firing range on September 4th, 5th, 6th, and 10th, 2014. Measurements were taken of the center side wall berm in preparation for establishing 12 sample areas within the subject property. Measurements were also taken to better evaluate the number and types of soil characterization samples that may be required in the future to properly manage any contaminated materials found. Please refer to Drawing 1 of 1 for measurements taken and sample locations.

Composite soil samples were collected from each of the 12 sample areas (1 through 12). Soil samples were collected using a hand auger. Composite soil borings were completed to three uniform depth intervals to evaluate the depth of penetration of bullets and shot. Samples were collected from the 0 to 6" interval (Sample Numbers 1A through 12A), 6" to 12" interval (Samples 1B through 12B) and 12" to 24" interval (Sample Numbers 1C through 12C) representing various depths of penetration into the berm (total of 36 composite samples). Five soil samples from each sample area (1 through 12) were composited at each of the three sample depths. Each of the five soil samples collected at the desired depth within each sample area were composited in five gallon buckets. Each of the 36 composite samples were placed in individual one-gallon plastic sample bags. The soil samples were then transported to a geotechnical laboratory for a sieve analysis to separate the soil samples into separate size fractions, identify the types of metal fragments present and determine the weight percent of metal fragments to soil.

The 36 composite soil samples were submitted to Engineering and Testing Consultants, Incorporated (ETC) for testing using chain of custody control. The laboratory staff at ETC oven dried each composite soil sample at a temperature of 105^{o} Celsius. All 36 samples were then individually passed through a Number 4 sieve (4.75 millimeter) to separate all bullets and shotgun shot from the oven dried soil. Metal fragments (lead) from each sample were then weighed and recorded. The oven dried weight of soil only was weighed and recorded. Gravimetric data collected was then used to calculate the percent of lead by weight. Please refer to the enclosed "Laboratory Results" for the measured data for each soil sample collected.

HISTORICAL REVIEW

Interviews completed regarding the history of the former firing range were limited due the facility having been closed for approximately 30 years (circa 1984). Based on the collective knowledge of Christopher Epperson (former City of Virginia Beach employee) and those police officers currently working at the Leroy Road facility, it appears that the subject property was used primarily for .38 caliber (9.0 millimeter) pistol training and qualifications. During the time in which the subject property was in operation, rifles

and shotguns were not being used by City law enforcement personnel. It was however disclosed that personal shotguns may have been carried by certain law enforcement personnel which may have been fired at the subject property. It was offered that if shotguns were used, larger buckshot, four (6.1 millimeter) to four-ought (9.7 millimeter) ammunition was preferred. Larger ammunition with lower muzzle velocities used in both pistols and shotguns were the choice among law enforcement personnel to avoid collateral damage when engaging a target. No other pertinent information about the former range operations was disclosed as part of the historical review.

REGULATORY REVIEW

The United States Environmental Protection Agency (EPA) has prepared guidance on the status of firing ranges, and the management of lead and lead-contaminated materials at both operating and closed firing ranges. The purpose of this document is to summarize the EPA guidance and note some of the potential issues pertaining to the closed firing range. This document is intended to be a brief summary for information purposes and for further discussion, and is not intended to be an in-depth analysis of EPA regulations or potential firing range issues.

1. Historically, bullets and shotgun shot used at firing ranges were composed of lead or contained some amount of lead in their composition.

2. At older firing ranges, spent shot was generally left in place in the soil berms, and overshot could fall on land or in water off of the firing range.

3. With the enactment of the Resource Conservation and Recovery Act (RCRA) in 1976, the Clean Water Act (CWA) in 1972, and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, or Superfund) in 1980, legal actions are increasingly being taken against firing ranges for the cleanup of lead shot and lead-contaminated materials (e.g., soil and groundwater). Please note that under normal operating conditions, firing ranges themselves are not subject to any of these regulatory requirements.

4. Under CERCLA, lead and lead-contaminated materials that fail the Toxicity Characteristic Leaching Procedure (TCLP) test are classified as hazardous waste and must be managed and disposed of using special procedures.

5. It is noted by the EPA that materials are not considered hazardous waste when they are used for their intended purpose. There is also an exclusion from RCRA for materials that are collected and recycled. Therefore, when being used for training, lead bullets and shot are being used for their intended purpose and are not classified as a solid waste. In addition, if the lead bullets and shot are routinely collected and recycled, they are not classified as hazardous waste.

6. The main issue is how lead shot and potentially lead-contaminated material that has been left in place is classified. In order to be subject to CERCLA (Superfund) requirements, any material must first be classified as a solid waste as defined in RCRA. According to the EPA guidance and previous legal decisions, if the lead shot is discarded or abandoned, then the materials are considered " waste" and subject to regulation under RCRA. Because the City firing range has been closed for approximately 30 years, any lead shot or material still present at the site (e.g., in the side wall and backstop berms) could be considered as abandoned, and most likely would be classified as " waste" and subject to regulation under RCRA. Because it would be solid waste, it would also potentially be subject to regulation as hazardous waste under CERCLA.

This is a brief summary of the potential waste generation and management issues at the former firing range. Although it might require some additional clarification, it appears that lead shot and soils containing lead shot are not considered solid waste and therefore not subject to RCRA regulations as

long as the lead shot is being collected, removed, and recycled on a regular basis and the cleaned soil is being reused at the firing range. However, after removal of lead shot, if the soil were to be removed off-site it would be classified as solid waste and it would require testing to determine if it is a solid waste. In the case of the City firing range, because the former firing range has been closed for so long any remaining lead shot would likely be considered to be discarded or abandoned, and therefore classified as solid waste and subject to RCRA requirements, even if they remain in place.

LABORATORY RESULTS

Tables I below, lists the sample locations and results. The laboratory report and drawing showing sample locations are attached.

TABLE I: GRAVIMETRIC SOIL RESULTS

SAMPLE NUMBER	% Pb by Weight	SAMPLE NUMBER	% Pb by Weight
1A	0	7A	0
1B	0	7B	0
1C	0	7C	0
2A	0.1	8A	0
2B	0	8B	0
2C	0	8C	0
3A	0	9A	0
3B	0	9B	0
3C	0	9C	0
4A	0	10A	0
4B	0	10B	0
4C	0	10C	0
5A	0	11A	0
5B	0	11B	<0.1
5C	0	11C	0
6A	0	12A	0.2
6B	0	12B	0.4
6C	0	12C	0

DISCUSSION

Laboratory results found that four of the thirty-six composite samples collected contained lead ammunition. Sample 2A collected at depth of 0-6" below land surface (blf) contained a single flattened lead bullet and Sample 11B collected from 6-12" bls contained a single unidentifiable bullet fragment. Sample 12A collected from 0-6" bls contained one piece of buckshot and Sample 12B collected from 6-12" bls contained one lead bullet. These four soil samples that contained a bullet or shot had a percent weight of lead to weight of soil of less than 1%. Lead was not found in the other thirty-two soil samples collected. These results appear consistent with the historic use of the center side wall berm as it did not serve as a backstop berm into which ammunition was being fired directly.

These findings suggest a low probability that the soils which comprise the center side wall berm contain hazardous levels of leachable lead. Testing of the berm will be required to assess whether or not it will need to be managed as hazardous waste pursuant to State solid waste management regulations.

RECOMMENDATIONS

Based on our soil investigation, the following recommendations are provided for your consideration:

1. Complete Total and TCLP lead testing on samples 2A, 11B, 12A and 12B.
2. Review the development plans for the property and evaluate the need for further site characterization.
3. Discuss options for a possible corrective action plan consistent with State solid waste management regulations.

LIMITATIONS

Geo**E**nvironmental **R**esources, Inc., performed a field visit to subject property on September 4th, 5th, 6th, and 10th, 2014. This report is relevant to the date of our field work and should not be relied upon for later dates.

We appreciate the opportunity to complete this work for the City of Virginia Beach. If there are any questions concerning this report, please contact us.

Sincerely,
Geo**E**nvironmental **R**esources, Inc.

Brian C. Parker, REM, SC
Environmental Services Manager

Attachments: 1. Laboratory Results
2. Sample Location Maps
3. Photographs

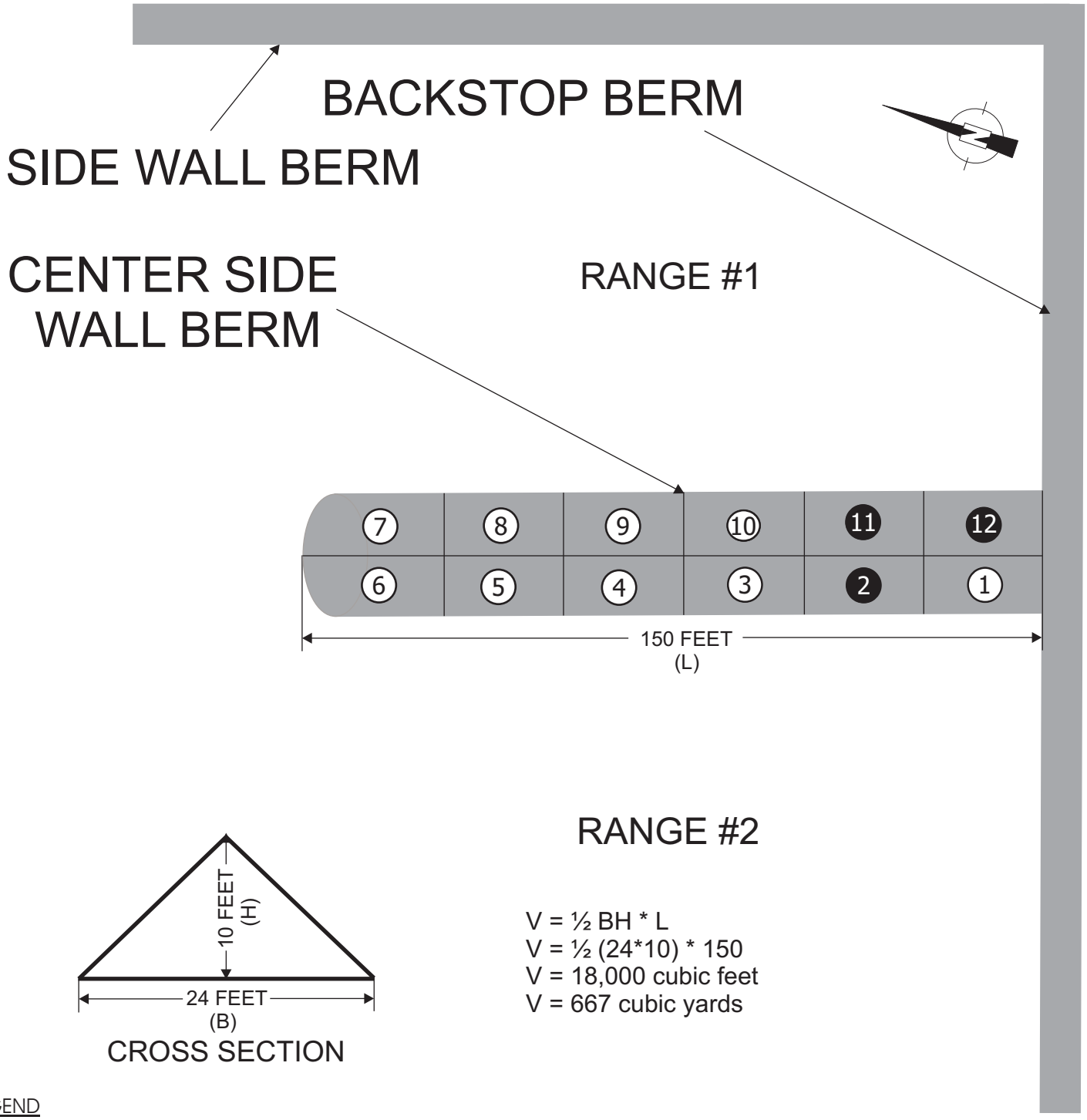
Laboratory Results

LABORATORY DATA SUMMARY

Project: **City Shooting Range Berm Samples**
Lead Percentage By Dry Weight of Soil Testing
Sieve Size Used: No. 4 (4.75 mm)
Number: **5957-110**
Date: **09/23/14**

SAMPLE NUMBER	DEPTH (Inches)	LEAD (Pb) %
1A	≤ 6	0.0
1B	6 to 12	0.0
1C	12 to 24	0.0
2A	≤ 6	0.1
2B	6 to 12	0.0
2C	12 to 24	0.0
3A	≤ 6	0.0
3B	6 to 12	0.0
3C	12 to 24	0.0
4A	≤ 6	0.0
4B	6 to 12	0.0
4C	12 to 24	0.0
5A	≤ 6	0.0
5B	6 to 12	0.0
5C	12 to 24	0.0
6A	≤ 6	0.0
6B	6 to 12	0.0
6C	6 to 12	0.0
7A	≤ 6	0.0
7B	6 to 12	0.0
7C	12 to 24	0.0
8A	≤ 6	0.0
8B	6 to 12	0.0
8C	12 to 24	0.0
9A	≤ 6	0.0
9B	6 to 12	0.0
9C	12 to 24	0.0
10A	≤ 6	0.0
10B	6 to 12	0.0
10C	12 to 24	0.0
11A	≤ 6	0.0
11B	6 to 12	<0.1
11C	12 to 24	0.0
12A	≤ 6	0.2
12B	6 to 12	0.4
12C	12 to 24	0.0

Sample Location Maps



RANGE #2

CROSS SECTION

V = ½ BH * L
V = ½ (24*10) * 150
V = 18,000 cubic feet
V = 667 cubic yards

LEGEND

(#) SOIL SAMPLE LOCATION CONTAINING <1% LEAD

(#) SOIL SAMPLE LOCATION CONTAINING 0% LEAD

NOTE - THE LOCATION FROM WHICH THE SAMPLES WERE OBTAINED SHOULD NOT BE INTERPRETED AS THE ONLY LOCATION WHERE THE MATERIAL EXISTS.

Sample Location Plan

PROJECT:

SOIL INVESTIGATION
FORMER FIRING RANGE
2650 LEROY ROAD
VIRGINIA BEACH, VIRGINIA

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NUMBER: 120-6539

DATE: SEPTEMBER 2014

SCALE: NONE

DRAWING 1 OF 1

Photographs

Photo 1: North facing view of the subject property with measuring tape and orange pin flags visible, detailing the 150' length of the center side wall berm.

Photo 2: Southwest facing view of the subject property with measuring tape and orange pin flags visible, detailing the 150' length of the center side wall berm.

Photographs

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Photo Sheet 1

Photo 3: Southeast facing view of the subject property with measuring tape and orange pin flags visible, detailing the 24' width of the center side wall berm.

Photo 4: East facing view of the subject property with measuring tape on telephone pole visible, detailing the 10' height of the center side wall berm.

Photographs

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Photo Sheet 2

Photo 5: View of composite soil samples collected from the center side wall berm.

Photo 6: View of composite soil samples collected from the center side wall berm.

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Photo Sheet 3