AERIALLY DEPOSITED LEAD (ADL) INVESTIGATION
TEMESCAL CANYON ROAD OVER TEMESCAL WASH
BRIDGE REPLACEMENT PROJECT
LAKE ELSINORE, CALIFORNIA
BRLS-5074(015)

Prepared for:

CITY OF LAKE ELSINORE
130 South Main Street
Lake Elsinore, California 92530

AGUILAR CONSULTING, INC.
2155 Chicago Avenue, Suite 301
Riverside, California 92507

Prepared by:

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GDC Project No. EN617
March 18, 2016

GROUP DELTA

City of Lake Elsinore
130 South Main Street
Lake Elsinore, CA 92530

March 18, 2016
Project No. EN617

Aguilar Consulting, Inc.
2155 Chicago Avenue, Suite 301
Riverside, California 92507

Attention: Ati Eskandari, PE and Ceazar Aguilar, PE

Subject: Aerially Deposited Lead Investigation
Temescal Canyon Road over Temescal Wash Bridge Replacement Project
Lake Elsinore, California

Dear Ms. Eskandari and Mr. Aguilar:

Group Delta Consultants, Inc. (GDC) is pleased to submit to the City of Lake Elsinore and Aguilar Consulting Inc. this report on the results of an Aerially Deposited Lead (ADL) Investigation for the Temescal Canyon Road over Temescal Wash Bridge Replacement Project. The purpose of the ADL investigation is to evaluate the lead content of unpaved soil along the current Temescal Canyon Road alignment and the proposed intersection at Lake Street to assess the requirements for management of this soil. The ADL investigation included the submission of a Work Plan and approval of the Work Plan by the City of Lake Elsinore and Aguilar Consulting Inc., the collection of soil samples, laboratory analysis, data evaluation, statistical analysis, and preparation of this report.

Should you have any questions regarding this report, please feel free to call us at:
(949) 450-2100.

Sincerely,
GROUP DELTA CONSULTANTS, INC.

Glenn Burks, Ph.D., P.E.
Principal - Director of Environmental Services

Jack Packwood
Associate

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Project Description

This report has been prepared to present the procedures and results of an Aerially Deposited Lead (ADL) investigation performed for the Temescal Canyon Road over Temescal Wash Bridge Replacement Project in Lake Elsinore, California (Project).

The proposed Temescal Canyon Road over Temescal Wash Bridge Replacement Project is located in north Lake Elsinore, California (Figure 1). The existing bridge at the site is a 2-span reinforced concrete structure with 2 abutments and a center bent in Temescal Wash. The approach roadway is a narrow 2-lane asphalt paved roadway with narrow unpaved shoulders. The current bridge will be replaced with a 4-lane structure west of the existing bridge. In addition, approximately 3,300 feet (ft) of Temescal Canyon Road will be reconstructed to follow a modified alignment.

Proposed project construction will involve disturbance of near surface soils along the existing road that have the potential to contain ADL. In general, excavation is proposed to a depth of approximately 1 foot (ft) below ground surface.

1.2 Project Objectives and Scope of Work

The objective of this investigation is to evaluate unpaved soil along the Project alignment for the presence of ADL. ADL is typically present at higher concentrations along unpaved areas adjacent to roads with high traffic due to the historical use of leaded fuels. Soil samples were collected from unpaved areas along the project alignment adjacent to Temescal Canyon Road where future soil disturbance is anticipated.

Results of the ADL tests were incorporated into an ADL statistical analysis and presented in this ADL investigation report. The information obtained from this study will be used to identify health and safety issues due to the potential lead hazard and to determine proper handling and disposal options prior to Project construction.

The ADL testing followed the procedures presented in the "Workplan for Site Investigation Temescal Canyon Road Bridge over Temescal Wash Project, Lake Elsinore, California" dated January 12, 2016. The Work Plan was reviewed and approved by the City of Lake Elsinore and Augilar Consulting Inc.

This work was also performed in accordance with U.S. Environmental Protection Agency SW-846 “Test Methods for Evaluating Solid Waste”.

The authorized scope of work was as follows:

- Preparation of a work plan;
- Field investigation and soil sampling;
- Laboratory analysis of soil samples;
- Review and analysis of laboratory results, and;
- Preparation of this ADL Investigation Report.

2.0 FIELD INVESTIGATION

Section 2.0 outlines the field procedures employed to collect samples and the laboratory analytical methods utilized.

2.1 Utility Clearance

Prior to conducting the investigation, an initial Site reconnaissance was conducted to ensure accessibility and safety of sampling locations. Boring locations were marked with white paint on the shoulder of the roadway and a wooden stake at the proposed sample location. The Underground Service Alert of Southern California was notified of the planned field work more than 48 hours prior to commencement of field activities to confirm the absence of subsurface utilities at the investigation locations.

2.2 Soil Sampling

Soil sampling was performed on February 11, 2016 in unpaved areas within the zone of the future soil disturbance. Sampling locations were positioned along the Project alignment on both sides of Temescal Canyon Road, and at the new proposed intersection of Temescal Canyon Road and Lake Street. ADL sampling locations, or boring locations, are presented in Figure 2.

Soil samples were collected at approximate depths of 0.5 ft and 1.0 ft below ground surface (bgs). These depth intervals are based on the expected depths of soil disturbance.

The field investigation consisted of performing 10 hand-auger borings and collection of 20 primary soil samples. In addition, Group Delta collected 2 field duplicate quality control (QC) soil samples, with one field duplicate collected per 10 primary samples. The amount of soil samples collected during the field investigation exceeded the minimum number of samples required and/or specified by the U.S. Environmental Protection Agency SW-846 “Test Methods for Evaluating Solid Waste” document (≥4 samples).

For borehole naming, GDC named each borehole sequentially from west to east. For sample naming, GDC labeled each sample with the borehole from which it was collected followed by a dash and then the depth the sample was collected from in feet (e.g., ADL-1-0.5, ADL-1-1.0, etc.) Duplicate samples were labeled with the same sample name as the primary sample followed by a dash and then “DUP” (e.g., ADL-1-0.5-DUP).

2.2.1 Field Sampling Equipment

The following equipment was used during the performance of fieldwork:
:

1. One (1) hand-held 3-inch diameter stainless steel auger
2. Twenty-two (22) 8-oz sealed glass jars with Teflon lined lids
3. Personal Protective Equipment (PPE)
4. Three 5-gallon buckets
5. Tap water
6. Deionized water
7. Liquinox
8. Plastic sheeting
9. Box cooler for storage of the collected samples
10. Self-adhesive jar labels and chain-of-custody (COC) sheets

2.2.2 Sampling Procedures

Presented below is the procedure followed in the field:

1. Initiate boring with a hand-held 3-inch diameter stainless steel auger;
2. Advance the boring to the first sampling depth;
3. Transfer the sample from the tube of the hand-auger directly into a sealable 8-oz glass jar;
4. Appropriately label all samples with the boring number, sample depth, and time and date of sample collection using self-adhesive label;
5. Place the samples on ice in a cooler box;
6. Repeat the procedure for the remaining sample depths;
7. Collect two separate samples from 10% of the samples as QC field sample duplicates; both samples undergo the same analyses;
8. Clean and rinse the sampling equipment after each boring is completed by washing with a solution of Liquinox followed by tap water and then deionized water rinses;
9. Decontamination liquids shall be stored, labeled, and disposed of appropriately;
10. Once equipment is cleaned, the equipment is not placed directly on the ground but on top of plastic sheeting or upon clean equipment racks;
11. After decontaminating the field sampling equipment, rinse the equipment with deionized water and collect the rinseate/equipment blank for analysis;
12. Record a summary of the observations and general soil conditions for each boring;
13. Backfill borings with soil cuttings and native soil to meet the existing grade;
14. Fill out chain-of-custody form, and;

15. Transport the samples on ice to a chemical testing laboratory certified by the State Water Resources Control Board (SWRCB) Environmental Laboratory Accreditation Program (ELAP).

3.0 RESULTS OF LABORATORY TESTING

3.1 Laboratory Analysis

Soil samples collected during the investigation were transported to A & R Laboratories (A&R) in Ontario, California for laboratory analyses. A&R is a laboratory certified by the SWRCB ELAP. The results of the laboratory analysis are presented in laboratory analytical reports provided as Appendix A and include copies of the completed COC forms, laboratory analytical results, the quality control sample (field and laboratory) results, and a narrative of any deviations and corrective actions taken.

ADL testing was performed to determine soil handling and disposal options as well as for health and safety/worker protection. A brief description of the analytical process is provided as follows:

- All soil samples were homogenized and analyzed for total lead, using Environmental Protection Agency (EPA) Method 6010B.

- It is standard protocol that all samples containing greater or equal to 50 milligrams per kilogram (mg/kg) total lead be analyzed for soluble lead using the California Waste Extraction Test (WET) (Citric acid extraction/EPA Method 3050A) and 6010B for extractable lead. However, none of the samples analyzed equaled or exceeded 50 mg/kg, and therefore the WET analysis was not performed.

- Samples containing greater than or equal to 1,000 mg/kg of total lead or greater than 5 milligrams per liter (mg/l) of extractable lead using WET (Citric acid) were to be analyzed using the EPA Toxic Characteristic Leaching Procedure (TCLP) using EPA Method 1311 for leachable lead. However, none of the samples analyzed met this criteria, and therefore the TCLP analysis was not performed.

3.2 ADL Analytical Results

The analytical results of this investigation are described in the following subsections. The analytical results for lead analyses are summarized in Table 1 and the sampling locations are shown on Figure 2.

3.2.1 Total Lead

Total lead was detected in each of the 22 samples analyzed. Total lead concentrations ranged from 3.20 mg/kg to 28.20 mg/kg with an average detected concentration of 8.99 mg/kg. None of the samples analyzed contained total lead concentrations that equaled or exceeded the 50 mg/kg criteria requiring the samples to be analyzed for STLC-WET (citric acid).

3.2.2 Soluble Lead STLC (WET-Citrate)

None of the samples collected were analyzed for soluble lead using the California WET method using citric acid due to no detected concentrations of lead at or above 50 mg/kg.

3.2.3 Toxicity Characteristic Leaching Procedure (TCLP)

None of the samples collected underwent supplemental analysis for soluble lead using the TCLP method due to low detected concentrations of lead.

3.3 Data Validation

Group Delta and A&R use Quality Assurance/Quality Control (QA/QC) measures to minimize and control errors associated with field and laboratory methods. Duplicate soil samples were collected at a rate of one duplicate per ten primary soil samples. The results of duplicate soil samples are presented in Table 1.

Field QA/QC measures also consisted of cleaning sampling equipment (i.e., hand auger) between each use with a detergent solution followed by tap and distilled/purified water rinses as necessary. One equipment blank sample was collected per the requirements to collect equipment blank samples at the rate of one per day per sampling device. The equipment blank was analyzed for total lead, the same chemical of concern that the soil samples collected with the specified field equipment were analyzed. Lead was not detected in the equipment blank sample.

Laboratory QA/QC measures include the use of matrix spikes, duplicates, and method blanks, in addition to calculation of percent recovery and relative percentage difference. A review of the laboratory QA/QC results indicates satisfactory data reporting, and the data are of sufficient quality for the purposes of this report.

4.0 STATISTICAL DATA EVALUATION

The following section describes the statistical methods utilized to evaluate the available lead data set for the site. The purpose of the data evaluation is to help determine the Upper Confidence Limits (UCLs) of lead concentrations at each sampling depth to better classify soil for hazardous waste management. This statistical analysis was conducted using the software program ProUCL (version 5.0). ProUCL is recommended by Caltrans as the appropriate statistical software to be used to perform the ADL statistical analyses. The outputs for the ProUCL calculations are presented as Appendices B, C, and D.

For the statistical analyses conducted for the Project, the Site was analyzed as one segment.

4.1 Population Distribution

A histogram generated by ProUCL indicates that the total lead data follows a lognormal distribution. However, a test for population distribution was not necessary in order to apply the appropriate statistical methods when examining the UCLs on the total lead means. The appropriate statistical method is automatically suggested by ProUCL v.5.0 and is dependent on the distribution of the data set analyzed. The recommended statistical methods provided by ProUCL for calculating 95% UCLs are provided herein. A histogram for the data distribution is presented as Appendix B.

Data for total lead concentrations was analyzed by ProUCL to identify outliers in the data set. No outliers were identified that must be removed from the sample results prior to the 95% UCL calculations discussed below. The potential outlier data output is presented in Appendix B.

4.2 95% Upper Confidence Limit Analysis

The upper one-sided 95% UCL of the arithmetic mean is defined as the value that, when calculated repeatedly for randomly drawn subsets of site data, equals or exceeds the true mean 95% of the time. Statistical confidence limits are the classical tool for addressing uncertainties of a distribution mean. The UCLs of the arithmetic mean concentration are used as the mean concentrations because it is not possible to know the true mean due to the essentially infinite number of soil samples that could be collected from a site. The UCLs therefore account for uncertainties due to limited sampling data. The actual Site soil lead concentrations may vary from statistical projections, as results are influenced by the limited number of samples collected within each segment analyzed.

The 95% UCLs of the mean for use on the project are presented as results from the ProUCL analyses. Statistical analyses were completed for the project segments with the following depth interval considerations:

- Surface to 0.5 ft bgs
- 0.5 to 1.0 ft bgs
- Surface to 1.0 ft bgs

The Site was analyzed as one segment. The recommended UCL methods for use on the project are presented as results from the ProUCL analyses. The table below provides data for specified depth intervals for the Project including the results of the 95% UCL analyses, the waste class, and the UCL statistical method utilized per ProUCL. Significant figures vary based upon the ProUCL output. The ProUCL outputs for each UCL analysis are provided in Appendix C.

The 95% UCL analysis conducted utilized laboratory provided data. UCL results are provided in the table below:

TABLE A
Temescal Canyon Road – 95% Upper Confidence Limit

Depth (feet)	Total Lead Mean (mg/kg)	Total Lead UCL (mg/kg)	Waste Class	UCL Used
0.0-0.5	9.78	17.16	Non-Hazardous	95% Adjusted Gamma UCL
0.5-1.0	7.86	17.98	Non-Hazardous	95% Chebyshev UCL
0-1.0	8.82	15.87	Non-Hazardous	95% Chebyshev UCL

All individual and combined depth intervals along Temescal Canyon Road would be classified as non-hazardous waste if disposed off-site.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Under the federal and state hazardous waste classifications, soil can be categorized into specific ADL soil management types. To classify the soil on the Project, Group Delta conducted statistical analyses by evaluating the Site as one segment. Average total lead values were below regulatory levels, and none of the samples analyzed exceeded 50 mg/kg.

Soil from all depth intervals would be classified as non-hazardous waste if disposed offsite. Surplus soil can be disposed of as non-hazardous waste at a Class III landfill or exported for reuse elsewhere in accordance with the destination's waste acceptance policy and local environmental regulations. Excavated soil is not restricted for on-site reuse.

6.0 HEALTH EFFECTS OF LEAD

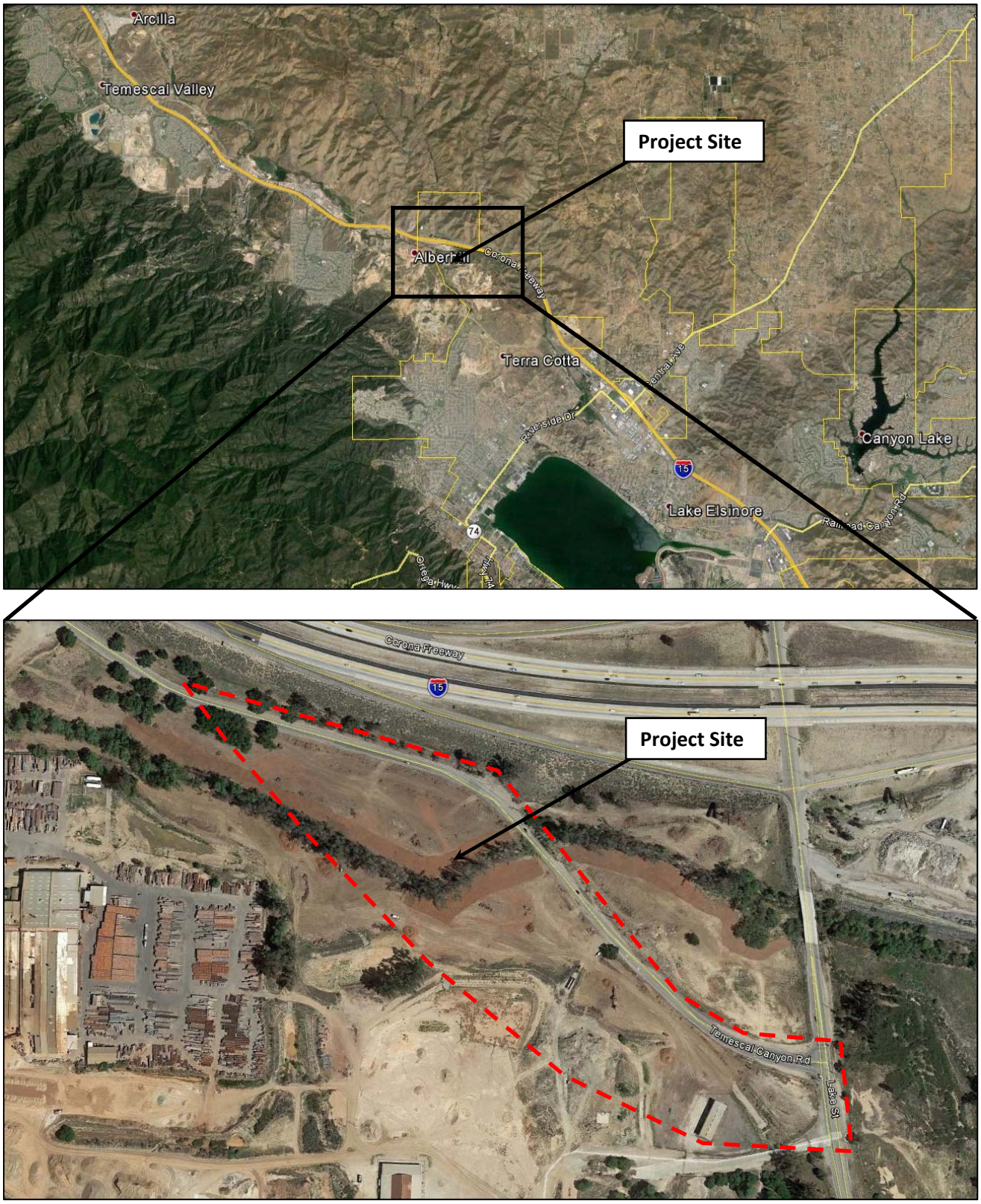
Concentrations of lead in soil represent a potential threat to the health of site workers performing earthwork activities on some highway construction projects. The permissible exposure limit (PEL) for lead is 0.05 milligrams per cubic meter (mg/m3) in air based on an eight-hour time-weighted average (TWA); the Immediately Dangerous to Life and Health (IDLH) exposure limit is 100 mg/m^3 as established by the National Institute of Occupational Safety and Health (NIOSH). Exposure to lead in excess of these occupational exposure limits and the deleterious health effects associated with lead exposure are not expected during construction activities for this Project due to the low concentrations of lead encountered during this investigation.

7.0 REFERENCES

Group Delta Consultants, “Workplan for Site Investigation Temescal Canyon Road Bridge over Temescal Wash Project, Lake Elsinore, California” dated January 12, 2016 prepared for the City of Lake Elsinore and Augilar Consulting Inc.

California Department of Transportation (Caltrans), “Caltrans Aerially Deposited Lead Guidance,” dated June 2007.

Figures



Reference: ***Google Earth***

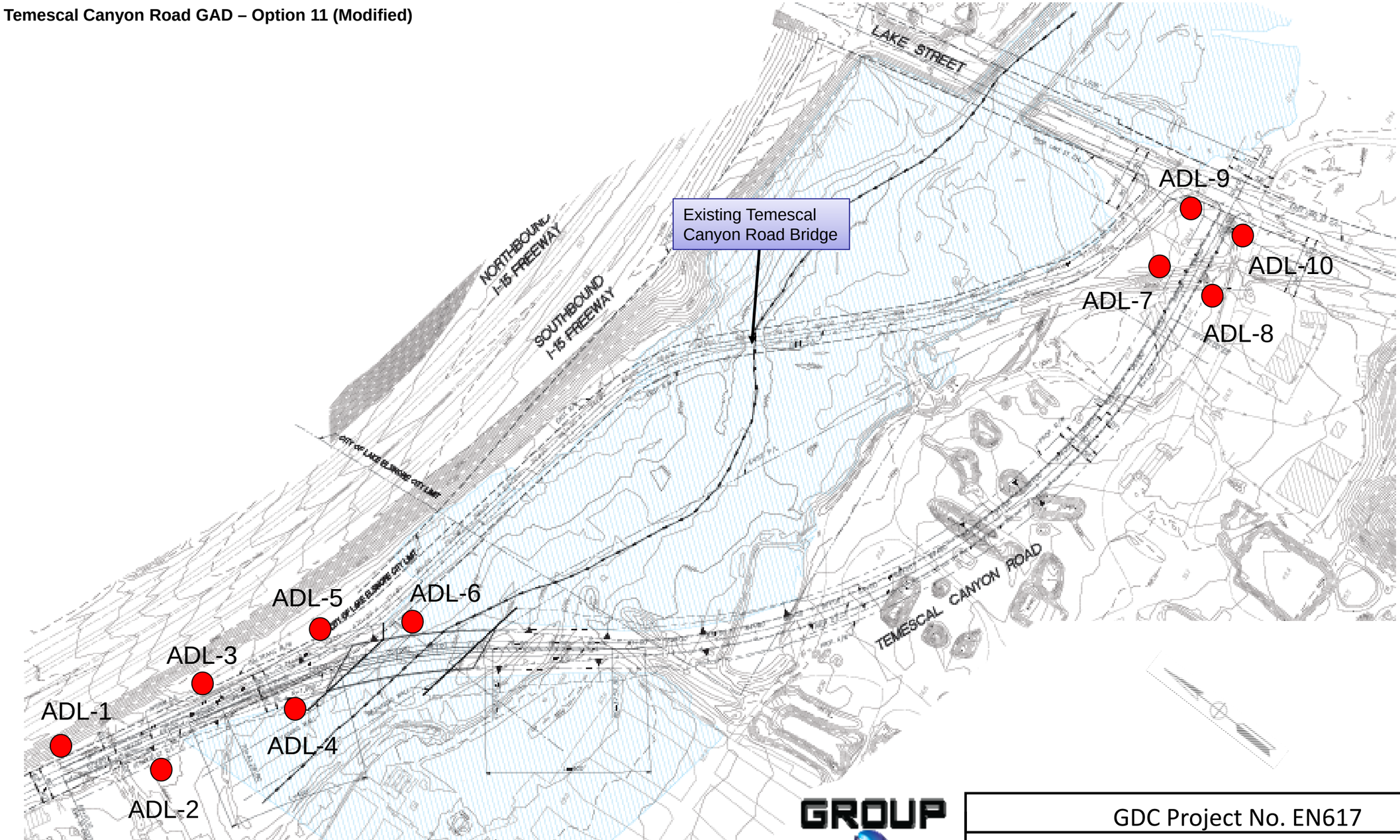
GDC Project No. EN617

Project Location Map

ADL Investigation
Temescal Canyon Road over Temescal Wash
Lake Elsinore, California

Figure 1

Source: Temescal Canyon Road GAD – Option 11 (Modified)



LEGEND

Approximate Soil Sampling Location

GROUP DELTA

GDC Project No. EN617

ADL Sample Location Plan

ADL Investigation
Temescal Canyon Road over Temescal Wash
Lake Elsinore, California

Figure: 2

Tables

Table 1
Summary of ADL Results
Temescal Canyon Road over Temescal Wash Bridge Replacement Project
Lake Elsinore, California

Sample ID	Sample Depth (feet)	Total Lead (mg/kg)	Station Location
ADL-1-0.5	0.5	18.30	67+00
ADL-1-1.5	1.5	4.64	
ADL-2-0.5	0.5	6.21	68+00
ADL-2-1.5	1.5	3.59	
ADL-3-0.5	0.5	7.79	69+00
ADL-3-1.5	1.5	4.86	
ADL-4-0.5	0.5	21.80	70+00
ADL-4-1.5	1.5	28.20	
ADL-5-0.5	0.5	20.30	73+00
ADL-5-0.5-DUP	0.5	15.60	
ADL-5-1.5	1.5	7.90	
ADL-6-0.5	0.5	7.96	74+00
ADL-6-1.5	1.5	8.94	
ADL-7-0.5	0.5	3.31	99+00
ADL-7-1.5	1.5	5.90	
ADL-8-0.5	0.5	3.43	98+00
ADL-8-1.5	1.5	5.68	
ADL-9-0.5	0.5	3.20	100+00
ADL-9-1.5	1.5	4.95	
ADL-10-0.5	0.5	5.49	100+00
ADL-10-0.5-DUP	0.5	5.72	
ADL-10-1.5	1.5	3.92	

mg/kg - milligrams per kilogram
DUP- duplicate sample

Appendix A
Laboratory Analytical Reports

A & R Laboratories

Formerly Microbac Southern California

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CASE NARRATIVE

Authorized Signature Name / Title (print)	Ken Zheng, President
Signature / Date	Ken Zheng, President 02/12/2016 13:21:46
Laboratory Job No. (Certificate of Analysis No.)	1602-00083
Project Name / No.	TEMESCAL CANYON ROAD BRIDGE ADL / PTS EN617
Dates Sampled (from/to)	02/11/16 To 02/11/16
Dates Received (from/to)	02/11/16 To 02/11/16
Dates Reported (from/to)	02/12/16 To 2/12/2016
Chains of Custody Received	Yes

Comments:

Subcontracting

Inorganic Analyses

No analyses sub-contracted

Sample Condition(s)

All samples intact

Positive Results (Organic Compounds)

None

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CERTIFICATE OF ANALYSIS

1602-00083

GROUP DELTA CONSULTANTS, INC.
JACK PACKWOOD
1035 S. MILLIKEN AVENUE
SUITE G
ONTARIO, CA 91761

Project: TEMESCAL CANYON ROAD BRIDGE ADL / PTS

Date Reported	02/12/16
Date Received	02/11/16
Invoice No.	75335
Cust #	G083
Permit Number	
Customer P.O.	EN617

Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
Sample: 001 ADL-7-0.5					Date & Time Sampled:		02/11/16 @ 8:52	
Sample Matrix: Soil								
[Metals]								
Metals Acid Digestion	Complete			EPA 3050B	1		02/12/16	TLB
Lead	3.31		mg/Kg	EPA 6010B	1	0.500	02/12/16	TLB
Sample: 002 ADL-7-1.5					Date & Time Sampled:		02/11/16 @ 9:06	
Sample Matrix: Soil								
[Metals]								
Metals Acid Digestion	Complete			EPA 3050B	1		02/12/16	TLB
Lead	5.90		mg/Kg	EPA 6010B	1	0.500	02/12/16	TLB
Sample: 003 ADL-8-0.5					Date & Time Sampled:		02/11/16 @ 9:11	
Sample Matrix: Soil								
[Metals]								
Metals Acid Digestion	Complete			EPA 3050B	1		02/12/16	TLB
Lead	3.43		mg/Kg	EPA 6010B	1	0.500	02/12/16	TLB
Sample: 004 ADL-8-1.5					Date & Time Sampled:		02/11/16 @ 9:18	
Sample Matrix: Soil								
[Metals]								
Metals Acid Digestion	Complete			EPA 3050B	1		02/12/16	TLB
Lead	5.68		mg/Kg	EPA 6010B	1	0.500	02/12/16	TLB
Sample: 005 ADL-9-0.5					Date & Time Sampled:		02/11/16 @ 9:26	
Sample Matrix: Soil								
[Metals]								
Metals Acid Digestion	Complete			EPA 3050B	1		02/12/16	TLB
Lead	3.20		mg/Kg	EPA 6010B	1	0.500	02/12/16	TLB
Sample: 006 ADL-9-1.5					Date & Time Sampled:		02/11/16 @ 9:35	
Sample Matrix: Soil								
[Metals]								
Metals Acid Digestion	Complete			EPA 3050B	1		02/12/16	TLB
Lead	4.95		mg/Kg	EPA 6010B	1	0.500	02/12/16	TLB

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Cust #	G083
Permit Number	
Customer P.O.	EN617

Project: TEMESCAL CANYON ROAD BRIDGE ADL / PTS

Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
Sample: 007 ADL-10-0.5 Sample Matrix: Soil					Date & Time Sampled:		02/11/16 @ 9:40	
[Metals]								
Metals Acid Digestion	Complete			EPA 3050B	1		02/12/16	TLB
Lead	5.49		mg/Kg	EPA 6010B	1	0.500	02/12/16	TLB
Sample: 008 ADL-10-0.5-DUP Sample Matrix: Soil					Date & Time Sampled:		02/11/16 @ 9:41	
[Metals]								
Metals Acid Digestion	Complete			EPA 3050B	1		02/12/16	TLB
Lead	5.72		mg/Kg	EPA 6010B	1	0.500	02/12/16	TLB
Sample: 009 ADL-10-1.5 Sample Matrix: Soil					Date & Time Sampled:		02/11/16 @ 9:54	
[Metals]								
Metals Acid Digestion	Complete			EPA 3050B	1		02/12/16	TLB
Lead	3.92		mg/Kg	EPA 6010B	1	0.500	02/12/16	TLB
Sample: 010 PTS-2 Sample Matrix: Soil					Date & Time Sampled:		02/11/16 @ 10:30	
[Metals]								
Metals Acid Digestion	Complete			EPA 3050B	1		02/12/16	TLB
Chromium	<0.500		mg/Kg	EPA 6010B	1	0.500	02/12/16	TLB
Lead	1.54		mg/Kg	EPA 6010B	1	0.500	02/12/16	TLB
Sample: 011 PTS-3 Sample Matrix: Soil					Date & Time Sampled:		02/11/16 @ 10:35	
[Metals]								
Metals Acid Digestion	Complete			EPA 3050B	1		02/12/16	TLB
Chromium	0.704		mg/Kg	EPA 6010B	1	0.500	02/12/16	TLB
Lead	2.79		mg/Kg	EPA 6010B	1	0.500	02/12/16	TLB
Sample: 012 ADL-1-0.5 Sample Matrix: Soil					Date & Time Sampled:		02/11/16 @ 11:40	

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1602-00083

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Date Reported	02/12/16
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Invoice No.	75335
Cust #	G083
Permit Number	
Customer P.O.	EN617

Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
Sample: 012 ADL-1-0.5					Date & Time Sampled:		02/11/16 @ 11:40	
Sample Matrix: Soil								
[Metals]								
Metals Acid Digestion	Complete			EPA 3050B	1		02/12/16	TLB
Lead	18.3		mg/Kg	EPA 6010B	1	0.500	02/12/16	TLB
Sample: 013 ADL-1-1.5					Date & Time Sampled:		02/11/16 @ 11:58	
Sample Matrix: Soil								
[Metals]								
Metals Acid Digestion	Complete			EPA 3050B	1		02/12/16	TLB
Lead	4.64		mg/Kg	EPA 6010B	1	0.500	02/12/16	TLB
Sample: 014 ADL-3-0.5					Date & Time Sampled:		02/11/16 @ 12:05	
Sample Matrix: Soil								
[Metals]								
Metals Acid Digestion	Complete			EPA 3050B	1		02/12/16	TLB
Lead	7.79		mg/Kg	EPA 6010B	1	0.500	02/12/16	TLB
Sample: 015 ADL-3-1.5					Date & Time Sampled:		02/11/16 @ 12:10	
Sample Matrix: Soil								
[Metals]								
Metals Acid Digestion	Complete			EPA 3050B	1		02/12/16	TLB
Lead	4.86		mg/Kg	EPA 6010B	1	0.500	02/12/16	TLB
Sample: 016 ADL-5-0.5					Date & Time Sampled:		02/11/16 @ 12:20	
Sample Matrix: Soil								
[Metals]								
Metals Acid Digestion	Complete			EPA 3050B	1		02/12/16	TLB
Lead	20.3		mg/Kg	EPA 6010B	1	0.500	02/12/16	TLB
Sample: 017 ADL-5-0.5-DUP					Date & Time Sampled:		02/11/16 @ 12:21	
Sample Matrix: Soil								
[Metals]								
Metals Acid Digestion	Complete			EPA 3050B	1		02/12/16	TLB
Lead	15.6		mg/Kg	EPA 6010B	1	0.500	02/12/16	TLB

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LA City#	10261
ELAP#'s	2789
	2790
	2122

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CERTIFICATE OF ANALYSIS

1602-00083

GROUP DELTA CONSULTANTS, INC.
JACK PACKWOOD
1035 S. MILLIKEN AVENUE
SUITE G
ONTARIO, CA 91761

Project: TEMESCAL CANYON ROAD BRIDGE ADL / PTS

Date Reported	02/12/16
Date Received	02/11/16
Invoice No.	75335
Cust #	G083
Permit Number	
Customer P.O.	EN617

Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
Sample: 018 ADL-5-1.5					Date & Time Sampled:		02/11/16 @ 12:27	
Sample Matrix: Soil								
[Metals]								
Metals Acid Digestion	Complete			EPA 3050B	1		02/12/16	TLB
Lead	7.90		mg/Kg	EPA 6010B	1	0.500	02/12/16	TLB
Sample: 019 ADL-6-0.5					Date & Time Sampled:		02/11/16 @ 12:32	
Sample Matrix: Soil								
[Metals]								
Metals Acid Digestion	Complete			EPA 3050B	1		02/12/16	TLB
Lead	7.96		mg/Kg	EPA 6010B	1	0.500	02/12/16	TLB
Sample: 020 ADL-6-1.5					Date & Time Sampled:		02/11/16 @ 12:40	
Sample Matrix: Soil								
[Metals]								
Metals Acid Digestion	Complete			EPA 3050B	1		02/12/16	TLB
Lead	8.94		mg/Kg	EPA 6010B	1	0.500	02/12/16	TLB
Sample: 021 ADL-2-0.5					Date & Time Sampled:		02/11/16 @ 12:56	
Sample Matrix: Soil								
[Metals]								
Metals Acid Digestion	Complete			EPA 3050B	1		02/12/16	TLB
Lead	6.21		mg/Kg	EPA 6010B	1	0.500	02/12/16	TLB
Sample: 022 ADL-2-1.5					Date & Time Sampled:		02/11/16 @ 13:06	
Sample Matrix: Soil								
[Metals]								
Metals Acid Digestion	Complete			EPA 3050B	1		02/12/16	TLB
Lead	3.59		mg/Kg	EPA 6010B	1	0.500	02/12/16	TLB
Sample: 023 ADL-4-0.5					Date & Time Sampled:		02/11/16 @ 13:31	
Sample Matrix: Soil								
[Metals]								
Metals Acid Digestion	Complete			EPA 3050B	1		02/12/16	TLB

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CERTIFICATE OF ANALYSIS

1602-00083

GROUP DELTA CONSULTANTS, INC.
JACK PACKWOOD
1035 S. MILLIKEN AVENUE
SUITE G
ONTARIO, CA 91761

Date Reported	02/12/16
Date Received	02/11/16
Invoice No.	75335
Cust #	G083
Permit Number	
Customer P.O.	EN617

Project: TEMESCAL CANYON ROAD BRIDGE ADL / PTS

Analysis	Result	Qual	Units	Method	DF	RL	Date	Tech
Sample: 023 ADL-4-0.5					Date & Time Sampled:		02/11/16 @ 13:31	
Sample Matrix: Soil								
.....continued								
Lead	21.8		mg/Kg	EPA 6010B	1	0.500	02/12/16	TLB
Sample: 024 ADL-4-1.5					Date & Time Sampled:		02/11/16 @ 13:40	
Sample Matrix: Soil								
[Metals]								
Metals Acid Digestion	Complete			EPA 3050B	1		02/12/16	TLB
Lead	28.2		mg/Kg	EPA 6010B	1	0.500	02/12/16	TLB
Sample: 025 PTS-1					Date & Time Sampled:		02/11/16 @ 13:55	
Sample Matrix: Soil								
[Metals]								
Metals Acid Digestion	Complete			EPA 3050B	1		02/12/16	TLB
Chromium	3.67		mg/Kg	EPA 6010B	1	0.500	02/12/16	TLB
Lead	17.7		mg/Kg	EPA 6010B	1	0.500	02/12/16	TLB
Sample: 026 EB-02112016					Date & Time Sampled:		02/11/16 @ 14:38	
Sample Matrix: Aqueous								
[Metals]								
Metals Acid Digestion	Complete			EPA 3010A	1		02/12/16	TLB
Chromium	<0.0100		mg/L	EPA 6010B	1	0.0100	02/12/16	TLB
Lead	<0.0200		mg/L	EPA 6010B	1	0.0200	02/12/16	TLB

Respectfully Submitted: Ken Zheng

Ken Zheng - Lab Director

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QUALIFIERS

B = Detected in the associated Method Blank at a concentration above the routine RL.
B1 = BOD dilution water is over specifications . The reported result may be biased high.
D = Surrogate recoveries are not calculated due to sample dilution.
E = Estimated value; Value exceeds calibration level of instrument.
H = Analyte was prepared and/or analyzed outside of the analytical method holding time
I = Matrix Interference.
J = Analyte concentration detected between RL and MDL.
Q = One or more quality control criteria did not meet specifications. See Comments for further explanation.
S = Customer provided specification limit exceeded.

ABBREVIATIONS

DF = Dilution Factor
RL = Reporting Limit, Adjusted by DF
MDL = Method Detection Limit, Adjusted by DF
Qual = Qualifier
Tech = Technician

As regulatory limits change frequently, A & R Laboratories advises the recipient of this report to confirm such limits with the appropriate federal, state, or local authorities before acting in reliance on the regulatory limits provided.

For any feedback concerning our services, please contact Jenny Jiang, Project Manager at 951.779.0310. You may also contact Ken Zheng, President at office@arlaboratories.com.

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QUALITY CONTROL DATA REPORT

GROUP DELTA CONSULTANTS, INC.
JACK PACKWOOD
1035 S. MILLIKEN AVENUE
SUITE G
ONTARIO, CA 91761

1602-00083

Date Reported	**02/12/2016**
Date Received	**02/11/2016**
Date Sampled	**02/11/2016**
Invoice No.	**75335**
Customer #	**G083**
Customer P.O.	**EN617**

Project: TEMESCAL CANYON ROAD BRIDGE ADL / PTS

Method # EPA 6010B

QC Reference # 53089 Date Analyzed: 2/12/2016 Technician: TLB

Samples 001 002 003 004 005 006 007 008 009 010 011 012 013 014 015 016 017 018 019 020

Results

	LCS %REC	LCS %DUP	LCS %RPD	Control Ranges LCS %REC	Control Ranges LCS %RPD
Chromium	100	102	1.8	75 - 125	0 - 20
Lead	103	103	0.2	75 - 125	0 - 20

QC Reference # 53090 Date Analyzed: 2/12/2016 Technician: TLB

Samples 021 022 023 024 025

Results

	LCS %REC	LCS %DUP	LCS %RPD	Control Ranges LCS %REC	Control Ranges LCS %RPD
Chromium	102	101	1.1	75 - 125	0 - 20
Lead	105	104	0.7	75 - 125	0 - 20

QC Reference # 53091 Date Analyzed: 2/12/2016 Technician: TLB

Samples 026

Results

	LCS %REC	LCS %DUP	LCS %RPD	Control Ranges LCS %REC	Control Ranges LCS %RPD
Chromium	99	96	3.4	75 - 125	0 - 20
Lead	107	105	2.0	75 - 125	0 - 20

No method blank results were above reporting limit

Respectfully Submitted: Ken Zheng

Ken Zheng - President

For any feedback concerning our services, please contact Jenny Jiang, Project Manager at 951.779.0310. You may also contact Ken Zheng, President at office@arlaboratories.com.

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Chain of Custody Record

AR Lab Job # 1602 00083

Project No: EN617	Project Name: Temescal Canyon Road Bridge ADL/PTS
Project Manager: Jack Packwood	Phone: (909) 295-555 Fax: (909) 295-5552
Client Name: Group Delta Consultants (Report and Billing)	Address: 1035 S. Milliken Avenue, Ontario, CA 91761 (Report and Billing)

Please Circle Analyses Requested

Turn-Around Time

- ☐ 24 Hr. RUSH*
- ☐ 48 Hr. RUSH*
- ☐ Normal TAT

*Requires PRIOR approval, additional charges apply

Requested due date: _____

Centrum ID (Lab use only)	Sample ID (As it should appear on report)	Date sampled	Time sampled	Sample matrix	Site location	Containers: # and type	Total Lead (EPA 6010B)	Total Chromium (EPA 6010B)	Remarks/Special Instructions
1	ADL-7-0.5	2/11/16	0852	SS	Temescal Canyon Road Bridge	1; 8oz	X		
2	ADL-7-1.5		0906				X		
3	ADL-8-0.5		0911				X		
4	ADL-8-1.5		0918				X		
5	ADL-9-0.5		09:26				X		
6	ADL-9-1.5		09:35				X		
7	ADL-10-0.5		0940				X		
8	ADL-10-0.5-DUP		0941				X		
9	ADL-10-1.5		0954				X		
10	~~ADL~~ PTS-2		10:30				X	X	

1) Relinquished by: (Sampler's Signature)	Date: 2/11/16	Time: 1444	3) Relinquished by:	Date:	Time:
2) Received by:	Date:	Time:	4) Received by:	Date:	Time:
			5) Relinquished by:	Date:	Time:
The delivery of samples and the signature on this chain of custody form constitutes authorization to perform the analyses specified above under the Terms and Conditions set forth on the back hereof.			6) Received for Laboratory by: Cynthia Rojas AR	Date: 2/11/16	Time: 14:45

To be completed by Laboratory personnel:

Samples chilled? ☒ Yes ☐ No ☐ From Field

Custody seals? ☐ Yes ☒ No

All sample containers intact? ☒ Yes ☐ No

☐ Courier ☐ UPS/Fed Ex ☒ Hand carried

Sample Disposal

- ☐ Client will pick up
- ☐ Return to client
- ☐ Lab disposal

Laboratory Notes:

Sample Locator No.

AR LABORATORIES, Inc.

Chain of Custody Record

AR Lab Job # 1602-00083

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Project No: EN617 | Project Name: Temescal Canyon Road Bridge ADL/PTS

Project Manager: Jack Packwood | Phone: (909) 295-555 | Fax: (909) 295-5552

Client Name: Group Delta Consultants (Report and Billing) | Address: 1035 S. Milliken Avenue, Ontario, CA 91761 (Report and Billing)

Please Circle Analyses Requested

Turn-Around Time

- ☐ 24 Hr. RUSH*
- ☐ 48 Hr. RUSH*
- ☐ Normal TAT

*Requires PRIOR approval, additional charges apply

Requested due date: _____

Centrum ID (Lab use only)	Sample ID (As it should appear on report)	Date sampled	Time sampled	Sample matrix	Site location	Containers: # and type	Total Lead (EPA 6010B)	Total Chromium (EPA 6010B)	Remarks/Special Instructions
11	PTS-3	2/11/16	10:35	SS	Temescal Canyon Road Bridge	1; 8oz	X	X	
12	ADL-1-0.5		11:40				X		
13	ADL-1-1.5		11:58				X		
14	ADL-3-0.5		12:05				X		
15	ADL-3-1.5		12:10				X		
16	ADL-5-0.5		1220				X		
17	ADL-5-0.5-DUP		1221				X		
18	ADL-5-1.5		1227				X		
19	ADL-6-0.5		1232				X		
20	ADL-6-1.5		1240				X		

1) Relinquished by: (Sampler's Signature) — Date: 2/11/16 — Time: 1444

2) Received by: — Date: — Time:

3) Relinquished by: — Date: — Time:

4) Received by: — Date: — Time:

5) Relinquished by: — Date: — Time:

6) Received for Laboratory by: Cynthia Rojas AR — Date: 2/11/16 — Time: 14:45

The delivery of samples and the signature on this chain of custody form constitutes authorization to perform the analyses specified above under the Terms and Conditions set forth on the back hereof.

To be completed by Laboratory personnel:

Samples chilled? ☒ Yes ☐ No ☐ From Field

Custody seals? ☐ Yes ☒ No

All sample containers intact? ☒ Yes ☐ No

☐ Courier ☐ UPS/Fed Ex ☒ Hand carried

Sample Disposal

- ☐ Client will pick up
- ☐ Return to client
- ☐ Lab disposal

Laboratory Notes:

Sample Locator No.

v6.0 1/11 coc-temp-both.xls

White Copy - Original (Accompanies Samples) | Yellow Copy - Centrum Files | Pink Copy - Centrum duplicate | Gold Copy - Client Copy

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Chain of Custody Record

AR Lab Job # 1602-00083

Project No: EN617 | Project Name: Temescal Canyon Road Bridge ADL/PTS

Project Manager: Jack Packwood | Phone: (909) 295-555 | Fax: (909) 295-5552

Client Name: Group Delta Consultants (Report and Billing) | Address: 1035 S. Milliken Avenue, Ontario, CA 91761 (Report and Billing)

Please Circle Analyses Requested

Turn-Around Time

- ☐ 24 Hr. RUSH*
- ☐ 48 Hr. RUSH*
- ☐ Normal TAT

*Requires PRIOR approval, additional charges apply

Requested due date: _____

Centrum ID (Lab use only)	Sample ID (As it should appear on report)	Date sampled	Time sampled	Sample matrix	Site location	Containers: # and type	Total Lead (EPA 6010B)	Total Chromium (EPA 6010B)	Remarks/Special Instructions
21	ADL-2-0.5	2/11/16	1256	SS	Temescal Canyon Road Bridge	1; 8oz	X		
22	ADL-2-1.5	"	1306	"	"	"	X		
23	ADL-4-0.5	"	1331	"	"	"	X		
24	ADL-4-1.5	"	1340	"	"	"	X		
25	PTS-1	"	1355	"	"	"	X	X	
26	EB-02112016	2/11/16	1438	H_2O	"	1;	X	X	

	Date:	Time:
1) Relinquished by: (Sampler's Signature)	2/11/16	1444
2) Received by:		
3) Relinquished by:		
4) Received by:		
5) Relinquished by:		
6) Received for Laboratory by: Cynthia Tejas AR	2/11/16	1745

The delivery of samples and the signature on this chain of custody form constitutes authorization to perform the analyses specified above under the Terms and Conditions set forth on the back hereof.

To be completed by Laboratory personnel:
Samples chilled? ☒ Yes ☐ No ☐ From Field
Custody seals? ☐ Yes ☒ No
All sample containers intact? ☒ Yes ☐ No
☐ Courier ☐ UPS/Fed Ex ☒ Hand carried

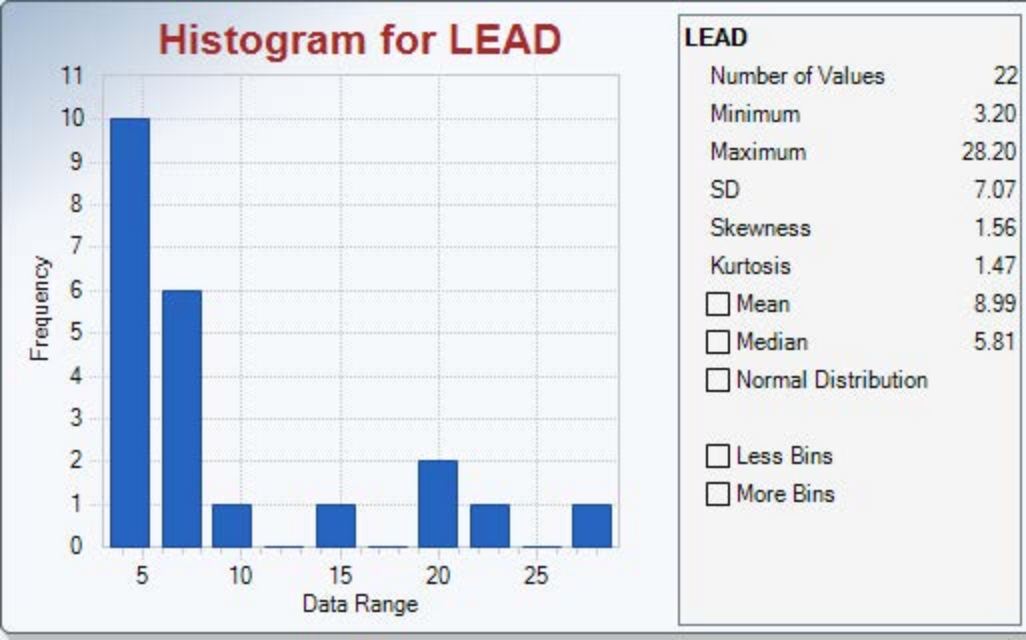
Sample Disposal
- ☐ Client will pick up
- ☐ Return to client
- ☐ Lab disposal

Laboratory Notes:

Sample Locator No.

Appendix B

Data Distribution Histogram and Statistical Summary


Histogram for LEAD
Frequency
Data Range
0
1
2
3
4
5
6
7
8
9
10
11
5
10
15
20
25
LEAD
Number of Values 22
Minimum 3.20
Maximum 28.20
SD 7.07
Skewness 1.56
Kurtosis 1.47
Mean 8.99
Median 5.81
Normal Distribution
Less Bins
More Bins

	A	B	C	D	E	F	G	H	I	J	K	L
1					**Outlier Tests for Selected Uncensored Variables**							
2				**User Selected Options**								
3				Date/Time of Computation	3/9/2016 2:29:25 PM							
4				From File	WorkSheet.xls							
5				Full Precision	OFF							
6												
7												
8	**Dixon's Outlier Test for LEAD**											
9												
10	Number of Observations = 22											
11	10% critical value: 0.382											
12	5% critical value: 0.43											
13	1% critical value: 0.514											
14												
15	**1. Observation Value 28.2 is a Potential Outlier (Upper Tail)?**											
16												
17	Test Statistic: 0.319											
18												
19	For 10% significance level, 28.2 is not an outlier.											
20	For 5% significance level, 28.2 is not an outlier.											
21	For 1% significance level, 28.2 is not an outlier.											
22												
23	**2. Observation Value 3.2 is a Potential Outlier (Lower Tail)?**											
24												
25	Test Statistic: 0.013											
26												
27	For 10% significance level, 3.2 is not an outlier.											
28	For 5% significance level, 3.2 is not an outlier.											
29	For 1% significance level, 3.2 is not an outlier.											
30												

Appendix C
Statistical Analyses of Lead Results

1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation			3/9/2016 2:48:24 PM								
5	From File			WorkSheet.xls								
6	Full Precision			OFF								
7	Confidence Coefficient			95%								
8	Number of Bootstrap Operations			2000								
9												
10												
11	**0.5 ft**											
12												
13	**General Statistics**											
14	Total Number of Observations				10		Number of Distinct Observations					10
15							Number of Missing Observations					0
16	Minimum				3.2		Mean					9.779
17	Maximum				21.8		Median					7
18	SD				7.391		Std. Error of Mean					2.337
19	Coefficient of Variation				0.756		Skewness					0.884
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic				0.799		**Shapiro Wilk GOF Test**					
23	5% Shapiro Wilk Critical Value				0.842		Data Not Normal at 5% Significance Level					
24	Lilliefors Test Statistic				0.297		**Lilliefors GOF Test**					
25	5% Lilliefors Critical Value				0.28		Data Not Normal at 5% Significance Level					
26	**Data Not Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**					
30	95% Student's-t UCL				14.06		95% Adjusted-CLT UCL (Chen-1995)					14.32
31							95% Modified-t UCL (Johnson-1978)					14.17
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic				0.64		**Anderson-Darling Gamma GOF Test**					
35	5% A-D Critical Value				0.735		Detected data appear Gamma Distributed at 5% Significance Level					
36	K-S Test Statistic				0.222		**Kolmogrov-Smirnoff Gamma GOF Test**					
37	5% K-S Critical Value				0.27		Detected data appear Gamma Distributed at 5% Significance Level					
38	**Detected data appear Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)				2.109		k star (bias corrected MLE)					1.543
42	Theta hat (MLE)				4.636		Theta star (bias corrected MLE)					6.337
43	nu hat (MLE)				42.19		nu star (bias corrected)					30.86
44	MLE Mean (bias corrected)				9.779		MLE Sd (bias corrected)					7.872
45							Approximate Chi Square Value (0.05)					19.17
46	Adjusted Level of Significance				0.0267		Adjusted Chi Square Value					17.59
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50)				15.74		95% Adjusted Gamma UCL (use when n<50)					17.16
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic				0.879		**Shapiro Wilk Lognormal GOF Test**					

53	5% Shapiro Wilk Critical Value					0.842	Data appear Lognormal at 5% Significance Level					
54	Lilliefors Test Statistic					0.18	**Lilliefors Lognormal GOF Test**					
55	5% Lilliefors Critical Value					0.28	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59	Minimum of Logged Data					1.163	Mean of logged Data					2.025
60	Maximum of Logged Data					3.082	SD of logged Data					0.75
61												
62	**Assuming Lognormal Distribution**											
63	95% H-UCL					19.34	90% Chebyshev (MVUE) UCL					16.85
64	95% Chebyshev (MVUE) UCL					20.09	97.5% Chebyshev (MVUE) UCL					24.58
65	99% Chebyshev (MVUE) UCL					33.41						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71	95% CLT UCL					13.62	95% Jackknife UCL					14.06
72	95% Standard Bootstrap UCL					13.44	95% Bootstrap-t UCL					15.11
73	95% Hall's Bootstrap UCL					12.85	95% Percentile Bootstrap UCL					13.36
74	95% BCA Bootstrap UCL					14.35						
75	90% Chebyshev(Mean, Sd) UCL					16.79	95% Chebyshev(Mean, Sd) UCL					19.97
76	97.5% Chebyshev(Mean, Sd) UCL					24.38	99% Chebyshev(Mean, Sd) UCL					33.03
77												
78	**Suggested UCL to Use**											
79	95% Adjusted Gamma UCL					17.16						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

1	**UCL Statistics for Uncensored Full Data Sets**											
2												
3	User Selected Options											
4	Date/Time of Computation	3/9/2016 2:50:30 PM										
5	From File	WorkSheet.xls										
6	Full Precision	OFF										
7	Confidence Coefficient	95%										
8	Number of Bootstrap Operations	2000										
9												
10												
11	**1 ft**											
12												
13	**General Statistics**											
14	Total Number of Observations	10			Number of Distinct Observations	10						
15					Number of Missing Observations	0						
16	Minimum	3.59			Mean	7.858						
17	Maximum	28.2			Median	5.315						
18	SD	7.341			Std. Error of Mean	2.322						
19	Coefficient of Variation	0.934			Skewness	2.87						
20												
21	**Normal GOF Test**											
22	Shapiro Wilk Test Statistic	0.57			**Shapiro Wilk GOF Test**							
23	5% Shapiro Wilk Critical Value	0.842			Data Not Normal at 5% Significance Level							
24	Lilliefors Test Statistic	0.341			**Lilliefors GOF Test**							
25	5% Lilliefors Critical Value	0.28			Data Not Normal at 5% Significance Level							
26	**Data Not Normal at 5% Significance Level**											
27												
28	**Assuming Normal Distribution**											
29	**95% Normal UCL**				**95% UCLs (Adjusted for Skewness)**							
30	95% Student's-t UCL	12.11			95% Adjusted-CLT UCL (Chen-1995)	13.93						
31					95% Modified-t UCL (Johnson-1978)	12.46						
32												
33	**Gamma GOF Test**											
34	A-D Test Statistic	1.173			**Anderson-Darling Gamma GOF Test**							
35	5% A-D Critical Value	0.734			Data Not Gamma Distributed at 5% Significance Level							
36	K-S Test Statistic	0.284			**Kolmogrov-Smirnoff Gamma GOF Test**							
37	5% K-S Critical Value	0.269			Data Not Gamma Distributed at 5% Significance Level							
38	**Data Not Gamma Distributed at 5% Significance Level**											
39												
40	**Gamma Statistics**											
41	k hat (MLE)	2.482			k star (bias corrected MLE)	1.804						
42	Theta hat (MLE)	3.165			Theta star (bias corrected MLE)	4.355						
43	nu hat (MLE)	49.65			nu star (bias corrected)	36.09						
44	MLE Mean (bias corrected)	7.858			MLE Sd (bias corrected)	5.85						
45					Approximate Chi Square Value (0.05)	23.34						
46	Adjusted Level of Significance	0.0267			Adjusted Chi Square Value	21.57						
47												
48	**Assuming Gamma Distribution**											
49	95% Approximate Gamma UCL (use when n>=50))	12.15			95% Adjusted Gamma UCL (use when n<50)	13.15						
50												
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic	0.799			**Shapiro Wilk Lognormal GOF Test**							

53	5% Shapiro Wilk Critical Value					0.842	Data Not Lognormal at 5% Significance Level					
54	Lilliefors Test Statistic					0.248	**Lilliefors Lognormal GOF Test**					
55	5% Lilliefors Critical Value					0.28	Data appear Lognormal at 5% Significance Level					
56	**Data appear Approximate Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59	Minimum of Logged Data					1.278	Mean of logged Data					1.847
60	Maximum of Logged Data					3.339	SD of logged Data					0.596
61												
62	**Assuming Lognormal Distribution**											
63	95% H-UCL					12.1	90% Chebyshev (MVUE) UCL					11.72
64	95% Chebyshev (MVUE) UCL					13.66	97.5% Chebyshev (MVUE) UCL					16.36
65	99% Chebyshev (MVUE) UCL					21.67						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71	95% CLT UCL					11.68	95% Jackknife UCL					12.11
72	95% Standard Bootstrap UCL					11.46	95% Bootstrap-t UCL					24.34
73	95% Hall's Bootstrap UCL					25.37	95% Percentile Bootstrap UCL					12.27
74	95% BCA Bootstrap UCL					13.9						
75	90% Chebyshev(Mean, Sd) UCL					14.82	95% Chebyshev(Mean, Sd) UCL					17.98
76	97.5% Chebyshev(Mean, Sd) UCL					22.36	99% Chebyshev(Mean, Sd) UCL					30.96
77												
78	**Suggested UCL to Use**											
79	95% Chebyshev (Mean, Sd) UCL					17.98						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

UCL Statistics for Uncensored Full Data Sets		
User Selected Options		
Date/Time of Computation	3/9/2016 2:36:47 PM	
From File	WorkSheet.xls	
Full Precision	OFF	
Confidence Coefficient	95%	
Number of Bootstrap Operations	2000	

0-1 ft

General Statistics

Total Number of Observations	20	Number of Distinct Observations	20
		Number of Missing Observations	2
Minimum	3.2	Mean	8.819
Maximum	28.2	Median	5.79
SD	7.237	Std. Error of Mean	1.618
Coefficient of Variation	0.821	Skewness	1.661

Normal GOF Test

Shapiro Wilk Test Statistic	0.732	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.905	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.297	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.198	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	11.62	95% Adjusted-CLT UCL (Chen-1995)	12.12
		95% Modified-t UCL (Johnson-1978)	11.72

Gamma GOF Test

A-D Test Statistic	1.342	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.751	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.219	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.196	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.227	k star (bias corrected MLE)	1.926
Theta hat (MLE)	3.96	Theta star (bias corrected MLE)	4.578
nu hat (MLE)	89.07	nu star (bias corrected)	77.05
MLE Mean (bias corrected)	8.819	MLE Sd (bias corrected)	6.354
		Approximate Chi Square Value (0.05)	57.83
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	56.51

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	11.75	95% Adjusted Gamma UCL (use when n<50)	12.02

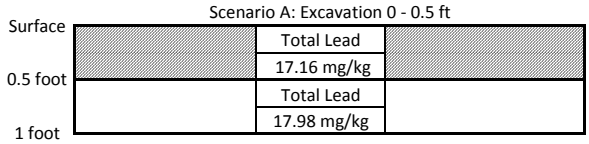
Lognormal GOF Test

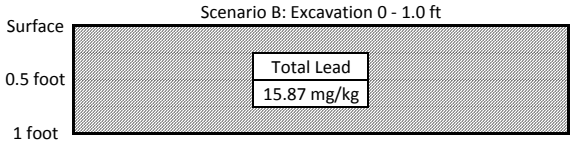
Shapiro Wilk Test Statistic	0.884	**Shapiro Wilk Lognormal GOF Test**

53	5% Shapiro Wilk Critical Value					0.905	Data Not Lognormal at 5% Significance Level					
54	Lilliefors Test Statistic					0.168	**Lilliefors Lognormal GOF Test**					
55	5% Lilliefors Critical Value					0.198	Data appear Lognormal at 5% Significance Level					
56	**Data appear Approximate Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59	Minimum of Logged Data					1.163	Mean of logged Data					1.936
60	Maximum of Logged Data					3.339	SD of logged Data					0.666
61												
62	**Assuming Lognormal Distribution**											
63	95% H-UCL					12.1	90% Chebyshev (MVUE) UCL					12.58
64	95% Chebyshev (MVUE) UCL					14.42	97.5% Chebyshev (MVUE) UCL					16.96
65	99% Chebyshev (MVUE) UCL					21.96						
66												
67	**Nonparametric Distribution Free UCL Statistics**											
68	**Data appear to follow a Discernible Distribution at 5% Significance Level**											
69												
70	**Nonparametric Distribution Free UCLs**											
71	95% CLT UCL					11.48	95% Jackknife UCL					11.62
72	95% Standard Bootstrap UCL					11.37	95% Bootstrap-t UCL					12.93
73	95% Hall's Bootstrap UCL					11.59	95% Percentile Bootstrap UCL					11.5
74	95% BCA Bootstrap UCL					12.24						
75	90% Chebyshev(Mean, Sd) UCL					13.67	95% Chebyshev(Mean, Sd) UCL					15.87
76	97.5% Chebyshev(Mean, Sd) UCL					18.92	99% Chebyshev(Mean, Sd) UCL					24.92
77												
78	**Suggested UCL to Use**											
79	95% Chebyshev (Mean, Sd) UCL					15.87						
80												
81	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
82	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
83	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.											
84	For additional insight the user may want to consult a statistician.											
85												

Appendix D
Block Diagrams

APPENDIX D
BLOCK DIAGRAMS - 95% UCL
Temescal Canyon Road over Temescal Wash Bridge Replacement Project





LEGEND

Excavated Soil Layer