HITACHI

GE Hitachi Nuclear Energy

Scott P. Murray
Manager, Facility Licensing

3901 Castle Hayne Road
P.O. Box 780
Wilmington, NC 28402
USA

T (910) 819-5950
scott.murray@ge.com

M190044

February 26, 2019

Jack D. Parrott, Senior Project Manager
Reactor Decommissioning Branch
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

ATTN: Document Control Desk

Subject: GEH Response to NRC Request for Additional Information

References:
1) NRC License DPR-1, Vallecitos Boiling Water Reactor (VBWR), Docket 50-18
2) NRC License DR-10, ESADA Vallecitos Experimental Superheat Reactor (EVESR), Docket 50-183
3) Letter, D.J. Heckman (GEH) to NRC Document Control Desk, "Unconditional Release of Route 84 Frontage Section of Vallecitos Nuclear Center (VNC) Site, 12/14/18
4) E-mail, J.D. Parrott (NRC) to S.P. Murray (GEH) "VBWR & EVESR Acceptance of Partial Site Release and Request for Additional Information", 2/26/19

Dear Mr. Parrott:

Per your request (Reference 4), attached to this letter is a copy of the Baseline Environmental Consulting soil investigation report.

Please contact me if you have any questions or would like to discuss this matter further.

Sincerely,

Scott P. Murray

Scott P. Murray, Manager
Facility Licensing

Attachment: Baseline Environmental Consulting, Hazardous Materials Soil Investigation, November 2018. SR 84 Expressway Widening and SR 84/I-680 Interchange Improvements Project: GE-Hitachi Parcels 096-0350-001-07 and 096-0350-001-02.

Cc: SPM 19-006

HAZARDOUS MATERIALS SOIL INVESTIGATION

NOVEMBER 2018

SR 84 EXPRESSWAY WIDENING AND SR 84/I-680 INTERCHANGE IMPROVEMENTS PROJECT: GE-HITACHI PARCELS 096-0350-001-07 AND 096-0350-001-02

FOR:
Alameda County
Transportation Commission

18301-00.02592

BASELINE
ENVIRONMENTAL CONSULTING
5900 Hollis Street, Suite D, Emeryville, CA 94608 | P: (510) 420-8686 | www.baseline-env.com

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1. INTRODUCTION

The California Department of Transportation (Caltrans), in cooperation with the Alameda County Transportation Commission (Alameda CTC), is proposing the "SR 84 Expressway Widening and SR 84/I-680 Interchange Improvements Project" (project) to widen and conform State Route (SR) 84 to expressway standards between south of Ruby Hill Drive and the Interstate 680 (I-680) interchange, among other improvements. The project is proposing to acquire a portion of the Vallecitos Nuclear Center property (APNs 096-0350-001-07 and 096-0350-001-02), located at 6705 Vallecitos Road in Sunol, California (**Figure 1**), which is currently owned by GE-Hitachi.

Baseline Environmental Consulting (Baseline), under subcontract to AECOM, has prepared this report documenting the activities and findings of a Hazardous Materials Soils Investigation in support of the proposed partial acquisition of the GE-Hitachi parcels. Most of the property acquisition is located on APN 096-0350-001-07; therefore, this investigation focused on that parcel. Soil testing for radiological materials and Title 22 metals was performed to support the release of the property from the U.S. Nuclear Regulatory Commission's license, in accordance with 10 Code of Federal Regulations (CFR) 50.83. Based on a previous investigation to support the release of property on the north side of the GE-Hitachi facility (**Appendix A**) and coordination with GE-Hitachi staff, a total of 16 surface soil samples were collected within the parcel (APN 096-0350-001-07) at depths between 0 and 6 inches.

2. BACKGROUND

The GE-Hitachi facility has used radioactive materials for nuclear fuel research and the production of radio-isotopes for medical and other uses since about the 1950s (**Appendix A**). While much of the reactor-related activities have ceased, one reactor remains operational. Of the 1,600 acres owned by GE-Hitachi, the proposed project would acquire about 7 acres of the property located on undeveloped grasslands adjacent to SR 84. The nearest facility improvements to the proposed project include four wastewater retention basins in the southwest corner of the parcel, which are connected to a sprinkler irrigation system in a field to the east (**Figure 1**).

In 2015, a radiological survey was conducted on the GE-Hitachi property to the north of the facility to release 610 acres of the property from the U.S. Nuclear Regulatory Commission's license restrictions. Surface soil samples were collected from 11 locations and analyzed for

gross alpha and gross beta activity. The gross alpha and gross beta results were compared to screening levels for background concentrations recommended by the Lawrence Livermore National Laboratory (LLNL) (2008). These screening levels were based on samples collected and analyzed at the LLNL facility located approximately 8 miles northwest of the GE-Hitachi facility. While one of the gross beta results from the GE-Hitachi radiological 2015 survey was above the recommended background screening level, the level was well below results accepted and used to statistically calculate the background levels at the LLNL facility. Therefore, the results were considered consistent with natural background levels characteristic of the area. A gamma spectroscopy was also performed on the three soil samples with the highest alpha and beta activity. The analysis confirmed that no non-naturally occurring isotopes were present in surface soils above background levels (**Appendix A**).

In 2016, an Initial Site Assessment (ISA) was prepared for the project to identify and evaluate the level of risk associated with hazardous materials, hazardous waste, and/or contamination within the project area that could potentially be disturbed during the proposed construction activities. According to the ISA, there have been no documented releases of hazardous materials on the portions of the GE-Hitachi property that would be acquired for the proposed project (**Appendix B**).

3. CONTAMINANTS OF CONCERN

3.1 Radiological Materials

The primary radionuclides of concern are fission products, such as cesium-137, which are produced after a large atomic nucleus undergoes nuclear fission. These fission products then release additional energy in the form of beta particles and gamma radiation. While less likely to be released, heavier radionuclides used in nuclear reactors, such as uranium, release energy in the form of alpha particles and gamma radiation.

Because the area proposed for acquisition is located hydraulically downgradient of the facility where radiological materials are handled, undocumented releases of radiological materials (if any) to the ground surface could potentially migrate to the proposed project area via surface water runoff. Surface water runoff could be generated by rainfall events and/or operation of the facility's wastewater sprinkler irrigation system, which is located in the southwest portion of the facility and immediately upgradient to the north of the proposed project area (**Figure 1**). Alternatively, undocumented releases of radiological materials (if any) to the atmosphere could have resulted in aerial deposition to surface soils around the facility.

3.2 Title 22 Metals

Sanitary sewer water, stormwater, and industrial wastewater from the GE-Hitachi facility are collected in four retention basins located on the southwest portion of the facility, which then discharge to the ground surface through a sprinkler irrigation system to the east of the retention basins (**Figure 1**). Because the proposed project is located hydraulically downgradient of the sprinkler irrigation system, elevated concentrations of metals from the wastewater

discharge (if any) could potentially have migrated to the proposed project area from surface water runoff.

4. FIELD ACTIVITIES

All soil investigation activities were performed in accordance with a scope of work submitted to GE-Hitachi in June 2018 (Baseline, 2018) and a project-specific health and safety plan prepared by Baseline. In July 2018, Baseline collected 16 surface soil samples at depths of between 0 and 6 inches and analyzed them for the contaminants of potential concern: radiological materials and Title 22 metals. Prior to sample collection, Baseline cleared all proposed sampling locations in accordance with Underground Service Alert requirements. As shown in **Figure 2**, soil samples were collected at the following locations:

- Five systematic random locations (S01 through S05) spaced about 1,300 feet apart;
- Four locations (S06 through S09) in apparent low-lying areas where potentially contaminated sediments are more likely to accumulate due to surface water runoff;
- One location (S10) near the entrance to the facility; and
- Six additional locations (S11 through S16) selected by Baseline in the field based on field conditions (i.e., additional low-lying areas and drainage channels observed).

All soil sample locations were surveyed in the field using a portable GPS unit (Trimble GeoExplorer 7X). The soil samples were manually collected in new stainless steel tubes using a slide hammer or a hand auger. Soil samples were labeled and stored in a chilled container immediately following collection. Each sample was labeled with the project name, date and time of sample collection, sampler initial, and unique sample identification. All sampling equipment was decontaminated between sample collections by brushing away any soil adhering to the surface of the equipment.

To help guide the sampling effort and to provide real time health and safety exposure data, surface scans for ambient gamma radiation levels and measurements of gamma radiation levels at the soil sample locations were performed by Baseline using portable instruments provided by GE-Hitachi (Eberline E-120 and PRM-7). The field radiation levels were all within levels considered by GE-Hitachi staff as background for their property (between 5 and 10 microrem per hour for the PRM-7 and 0.01 and 0.08 counts per minute for the E-120). In addition to field gamma measurements, GE-Hitachi provided digital dosimeters (DMC 2000) to measure potential radiation exposure of Baseline staff during sampling. The digital dosimeters did not detect measureable radiation throughout sampling.

5. LABORATORY ANALYSES

The soil samples were submitted to Enthalpy Analytical in Berkeley, California, a certified analytical laboratory for metals analysis. All analyses for radiological materials were

subcontracted by Enthalpy Analytical to GEL Laboratories LLC, in Charleston, South Carolina, a certified analytical laboratory.

The 16 soil samples collected from locations S01 through S16 were analyzed for gross alpha and beta activity by U.S. Environmental Protection Agency (USEPA) Methods 900.0/SW846 9310/SM 7110B Modified. A gamma spectroscopy analysis was then performed by U.S. Department of Energy Methods HASL 300, 4.5.2.3/Ga-01-R on two of the samples with the highest gross beta activity (locations S09 and S10) and one of the samples with the highest alpha activity (location S02). Three of the soil samples collected from locations S01, S06, and S11 that were downgradient and south of the facility's sprinkler irrigation system were also analyzed for Title 22 metals (USEPA Methods 6010B/7471A). Baseline reviewed the laboratory analytical reports to ensure the reliability of the results. Copies of the laboratory analytical reports are included in **Appendix C**.

6. EVALUATION OF RESULTS

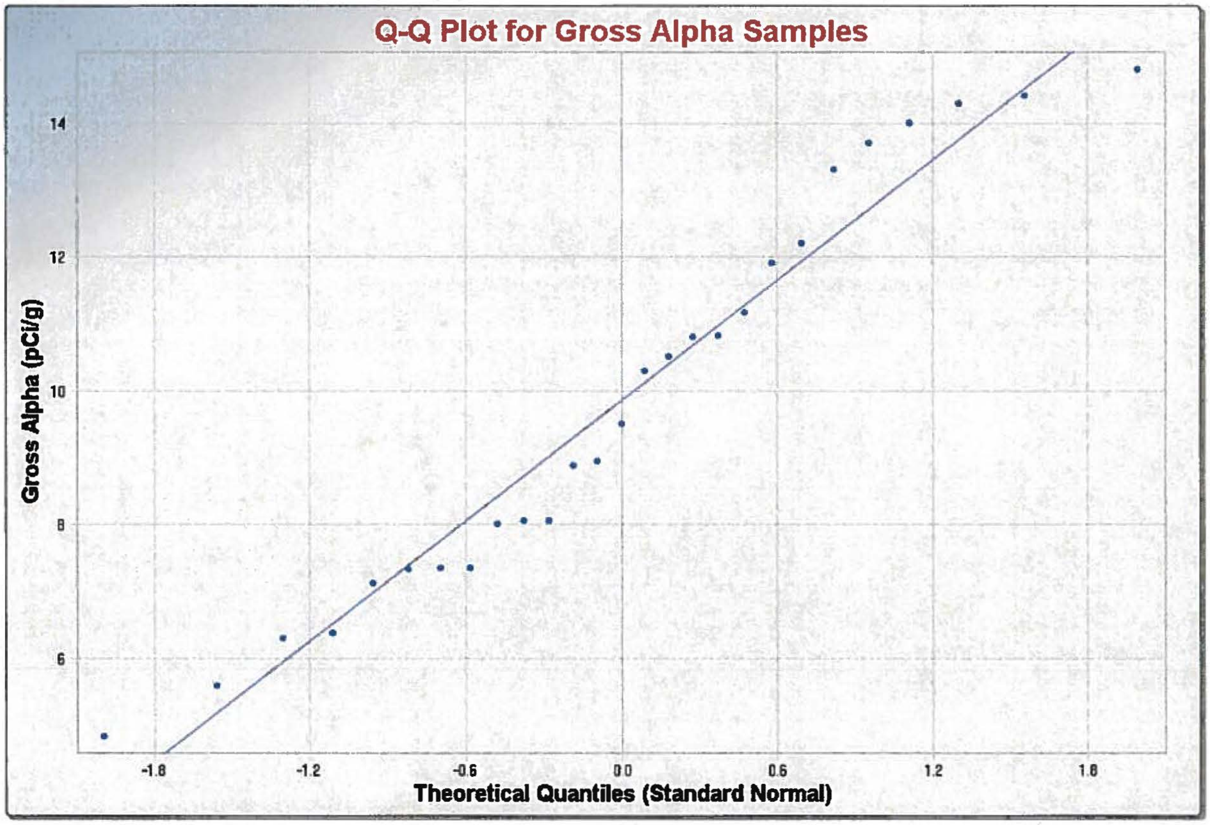
6.1 Radiological Materials

The analytical results from the 16 soil samples (locations S01 through S16) analyzed for gross alpha and gross beta activity are summarized in **Table 1**. These results were combined with the 11 soil samples results from the 2015 radiological survey conducted on the north side of the GE-Hitachi facility (**Appendix A**), which were previously determined to be representative of background radiation levels. The purpose of combining the 27 soils samples was to compare the distribution of results and statistically evaluate if radiation levels in the project area are also representative of background levels.

The distributions of gross alpha and gross beta results from all 27 soil samples were first analyzed on quantile-quantile (Q-Q) plots to visually identify potential data outliers that could represent localized areas of elevated radiation in the project area, also referred to as "hot spots." Any identified hot spot samples were then analyzed by gamma spectroscopy to determine if non-naturally occurring isotopes are present. The one-tailed 95th percentile upper confidence limits (95% UCLs) for the mean gross alpha and gross beta levels were then calculated using the USEPA's ProUCL version 5.1 software and the results were compared to the LLNL's recommend background screening levels. The statistical outputs are included in **Appendix D**.

As shown below, the gross alpha data appears to have a normal distribution and there do not appear to be any data outliers, which indicates that samples collected from the project area are generally consistent with the background gross alpha levels reported during the 2015 radiological survey. Based on a normal distribution, the 95% UCL for the gross alpha levels from the 27 soil samples on the GE-Hitachi property is about 10.8 picocuries per gram (pCi/g), which is below the LLNL's recommended background screening level of 11 pCi/g (LLNL, 2008). To be conservative, a gamma spectroscopy was performed on the soil sample with highest gross alpha level, which was collected from location S02 (**Figure 2**). Based on the gamma results,

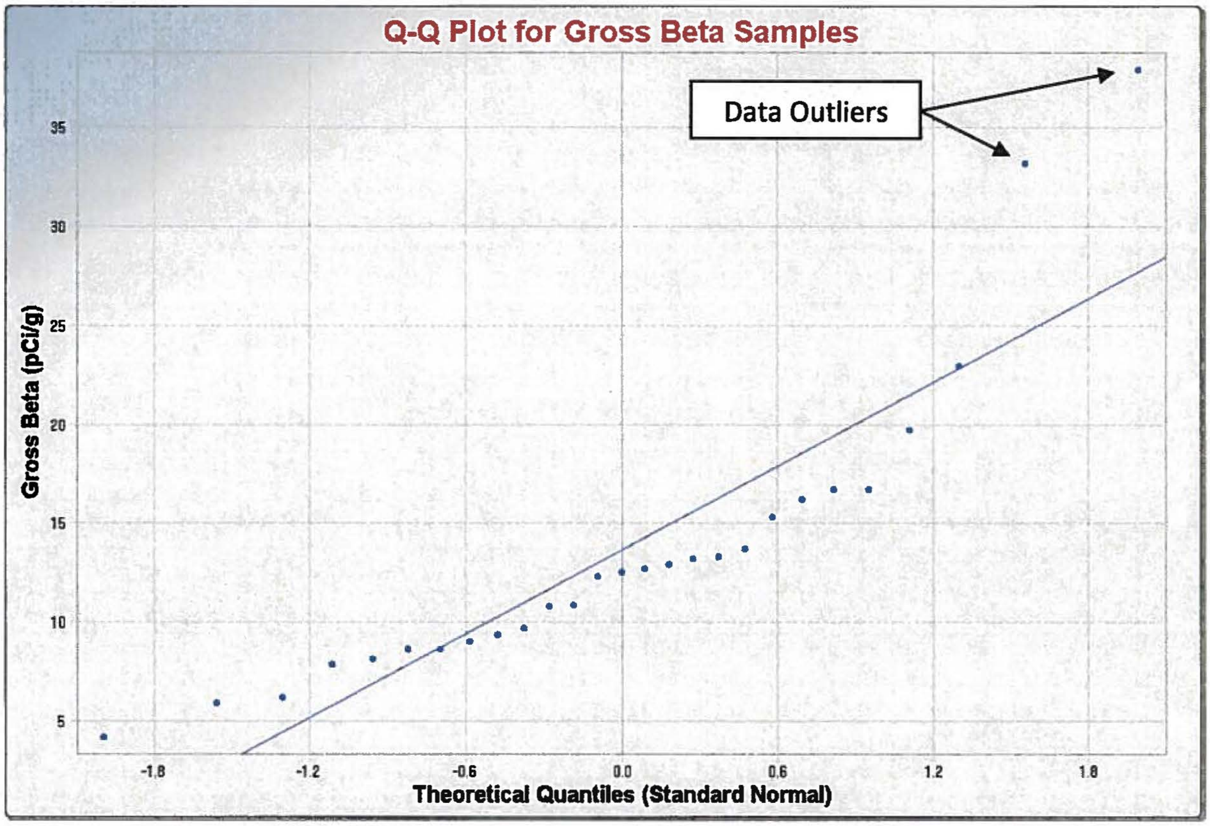
there were no elevated levels of non-naturally occurring isotopes such as cesium-137, which was not detected above the laboratory reporting limit of 0.100 pCi/g (**Table 1**).



As shown below, the gross beta data also appears to have a normal distribution, except for two samples with elevated gross beta levels collected from locations S09 and S10 (**Figure 2**) in the project area that appear to be data outliers. The potential data outliers were confirmed using the Rosner outlier test procedure in ProUCL (**Appendix D**). The gross beta levels reported at locations S09 and S10 were 33.2 and 37.9 pCi/g, respectively. Because these two data outliers are statistically unique relative to the other 25 soil samples collected on the GE-Hitachi property, they are evaluated separately, below. The gross beta levels of the remaining 25 soil samples were evaluated based on their normal distribution of gross beta levels. The 95% UCL for the gross beta levels on the GE-Hitachi property is about 13.4 pCi/g, which is below the LLNL's recommended background screening level of 21 pCi/g (LLNL, 2008).

A gamma spectroscopy was performed on the two soil samples with elevated gross beta levels collected from locations S09 and S10 (**Figure 2**). Based on the gamma results, there were no elevated levels of non-naturally occurring isotopes at sample locations S09 and S10. At sample location S09, cesium-137 was not detected above the laboratory reporting limit of 0.100 pCi/g. At sample location S10, cesium-137 was reported slightly above the laboratory reporting limit at a level of 0.105 pCi/g. This level is well below the National Council of Radiation Protection and Measurements (1999) recommended residential and construction worker screening limits of 5.4 pCi/g and 12.6 pCi/g, respectively (**Table 1**). Because sample locations S09 and S10 were

in drainage swales, the elevated gross beta levels in these areas may be due to the accumulation of sediments affected by background radiation sources (naturally-occurring isotopes and atmospheric fallout).



6.2 Title 22 Metals

The three soil samples analyzed for Title 22 metals from locations S01, S06, and S11 had concentrations of metals reported above the laboratory reporting limits (**Table 2**). All concentrations of metals were reported below the applicable California and federal hazardous waste criteria, as well as the San Francisco Regional Water Quality Control Board (2016) Construction Worker Environmental Screening Levels. Therefore, soils in the project area downgradient from the GE-Hitachi sprinkler irrigation system for wastewater discharges would not be considered a hazardous waste, once excavated, and would not pose a health risk to construction workers.

7. CONCLUSIONS

Based on the analytical results and statistical analyses, gross alpha and gross beta levels reported in soil samples collected from the project area appear to be representative of background levels and no elevated levels of non-naturally occurring isotopes (e.g., cesium-137) were reported. In addition, soil concentrations of Title 22 metals were below the applicable hazardous waste thresholds and construction worker ESLs. Therefore, soils in the project area

do not appear to be affected by radiological materials or metals associated with operation of the GE-Hitachi facility and would not be expected to pose a health risk to construction workers or the environment.

8. LIMITATIONS

This Hazardous Materials Soil Investigation has been conducted for AECOM for the use of AECOM, Alameda CTC, and Caltrans in development of the proposed project. Baseline's objective is to perform our work with care, exercising the customary thoroughness and competence of earth science, environmental, and engineering consulting professionals, in accordance with the standard for professional services for a consulting firm at the time these services were provided. It is important to recognize that even the most comprehensive scope of services may fail to detect environmental conditions and potential liability at a particular site. Therefore, Baseline cannot act as insurers and cannot "certify or underwrite" that a site is free of environmental contamination, and no expressed or implied representation or warranty is included or intended in this report except that the work was performed within the limits prescribed with the customary thoroughness and competence of our profession.

The passage of time, manifestation of latent conditions, or occurrence of future events may require further exploration at the project site, analysis of the data, and re-evaluation of the findings, observations, conclusions, and recommendations expressed in this report. The findings, observations, conclusions, and recommendations expressed by Baseline in this report are limited by the scope of services and should not be considered an opinion concerning the compliance of any past or current owner or operator of the project site with any federal, state, or local law or regulation. No warranty or guarantee, whether expressed or implied is made with respect to the data reported or findings, observations, and conclusions expressed in this report.

9. REFERENCES

Baseline Environmental Consulting (Baseline), 2016. Initial Site Assessment, SR 84 Expressway Widening and SR 84/I-680 Interchange Improvement Project, Alameda County. August 1.

Baseline, 2018. Hazardous Materials Survey Plan, SR-84 Widening and SR-84/I-680 Interchange Improvements Project, GE-Hitachi Parcels: Assessor's Parcel Numbers 096-0350-001-07 and 096-0350-001-02. June 29.

GE Hitachi Nuclear Energy, 2015. Release of North Section of Vallecitos, California Site. April.

Livermore National Laboratory (LLNL), 2008. Background Values of Gross Alpha and Gross Beta in Soil for Lawrence Livermore National Laboratory Lawrence. March.

National Council of Radiation Protection and Measurements (NCRP), 1999. Recommended Screening Limits for Contaminated Surface soil and Review of Factors Relevant to Site-Specific Studies. NCRP Report No. 129. January 29.

San Francisco Bay Regional Water Quality Control Board (Regional Water Board), 2016. Environmental Screening Levels (a Microsoft 2010 Excel file). Table S-1: Soil Direct Exposure Human Health Risk Screening Levels. February.

FIGURES

PROJECT OVERVIEW

Figure 1

Legend

- Proposed Right-of-Way
- Proposed Construction Easement
- Existing Parcel Boundary

700 0 700 ft

SR 84 Expressway Widening and SR 84/I-680 Interchange Improvement Project Alameda County

BASELINE ENVIRONMENTAL CONSULTING

C:\Users\BASELINE\Documents\Projects\18301-00 WMH SR 84&I-680\GIS\QGIS SR 84 Widening.V1.09242018.qgs - 25-09-2018

SOIL SAMPLE LOCATIONS

Figure 2

Legend

- Proposed Right-of-Way
- Proposed Construction Easement
- Existing Parcel Boundary
- Soil Sample Location

100 0 100 ft

SR 84 Expressway Widening and SR 84/I-680 Interchange Improvement Project Alameda County

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SOIL SAMPLE LOCATIONS

Figure 2

Legend

- Proposed Right-of-Way
- Proposed Construction Easement
- Existing Parcel Boundary
- Soil Sample Location

100 0 100 ft

SR 84 Expressway Widening and SR 84/I-680 Interchange Improvement Project Alameda County

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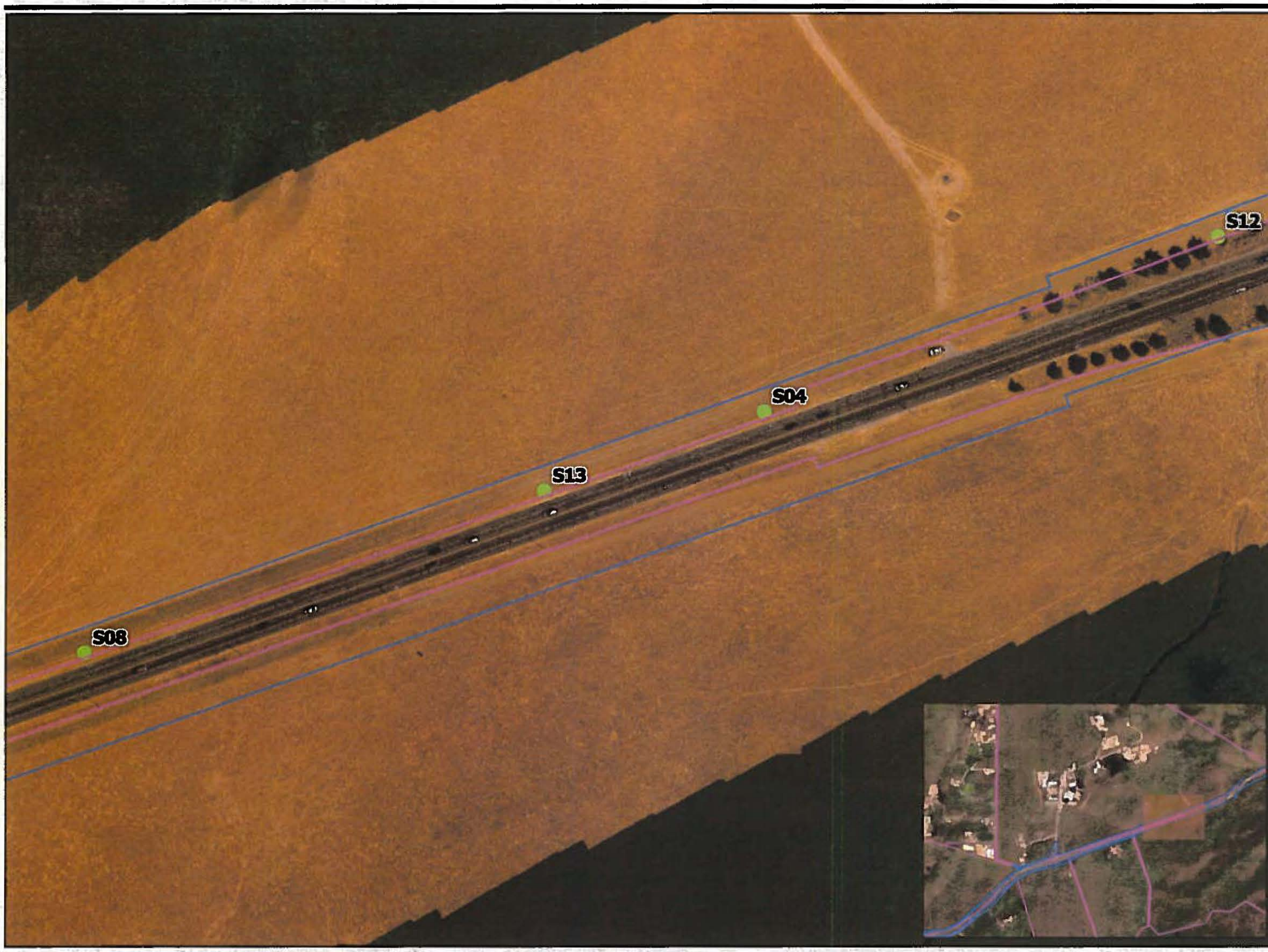
SOIL SAMPLE LOCATIONS

Figure 2



Legend

- Proposed Right-of-Way
- Proposed Construction Easement
- Existing Parcel Boundary
- Soil Sample Location

100 0 100 ft

SR 84 Expressway Widening and SR 84/I-680 Interchange Improvement Project Alameda County

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SOIL SAMPLE LOCATIONS

Figure 2

SR 84 Expressway Widening and SR 84/I-680 Interchange Improvement Project Alameda County

BASELINE ENVIRONMENTAL CONSULTING

TABLES

Table 1: Soil Analytical Results for Radiological Materials (pCi/g)

Sample ID	Date	Gross Alpha	Gross Beta	Cesium-137 [1]
S01;0.0-0.5	7/19/2018	10.5	16.2	--
S02;0.0-0.5	7/19/2018	14.8	12.5	<0.100
S03;0.0-0.5	7/19/2018	10.3	8.60	--
S04;0.0-0.5	7/19/2018	8.00	8.13	--
S05;0.0-0.5	7/19/2018	8.95	13.3	--
S06;0.0-0.5	7/19/2018	7.34	10.8	--
S07;0.0-0.5	7/19/2018	14.3	13.7	--
S08;0.0-0.5	7/19/2018	14.4	16.7	--
S09;0.0-0.5	7/19/2018	8.06	33.2	<0.100
S10;0.0-0.5	7/19/2018	11.9	37.9	0.105
S11;0.0-0.5	7/19/2018	7.12	6.19	--
S12;0.0-0.5	7/19/2018	6.38	9.33	--
S13;0.0-0.5	7/19/2018	9.5	19.7	--
S14;0.0-0.5	7/19/2018	14	12.3	--
S15;0.0-0.5	7/19/2018	12.2	12.9	--
S16;0.0-0.5	7/19/2018	13.3	15.3	--
	95% UCL [2]	10.8	13.4 [3]	--
LLNL Background Screening Limit		11	21	NV
NCRP Residential Screening Limit		NV	NV	5.4
NCRP Construction Worker Screening Limit		NV	NV	12.6

Notes:

Samples were analyzed for gross alpha and beta activity by U.S. Environmental Protection Agency Methods 900.0/SW846 9310/SM 7110B Modified and gamma spectroscopy by U.S. Department of Energy Methods HASL 300, 4.5.2.3/Ga-01-R.

[1] Results for other isotopes included the laboratory analytical report (Appendix B).

[2] Includes samples from 2015 GE-Hitachi Radiological Survey Report (Appendix A).

[3] Excludes two data outliers (samples S09:0.0-0.5 and S10;0.0-0.5).

Abbreviations:

<xx = indicates constituent was not identified at or above the laboratory reporting limit of xx

-- = not analyzed

pCi/g = picocuries per gram

95% UCL = 95th percentile upper confidence limit

LLNL = Lawrence Livermore National Laboratory

NCRP = National Council of Radiation Protection and Measurements

References:

Lawrence Livermore National Laboratory, 2008. Background Values of Gross Alpha and Gross Beta in Soil for Lawrence Livermore National Laboratory Lawrence. March.

National Council of Radiation Protection and Measurements (NCRP), 1999. Recommended Screening Limits for Contaminated Surface soil and Review of Factors Relevant to Site-Specific Studies. NCRP Report No. 129. January 29.

Table 2: Soil Analytical Results for Title 22 Metals (mg/kg)

Sample ID	Sample Date	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium [1]	Cobalt	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
S01;0.0-0.5	7/19/18	<2.0	2.7	220	0.36	<0.26	35	6.6	16	12	0.024	<0.26	34	<2.0	<0.26	<0.52	23	32
S06;0.0-0.5	7/19/18	<1.9	3.0	160	0.26	<0.23	30	12	11	9.3	0.026	<0.23	34	<1.9	<0.23	<0.47	21	41
S11;0.0-0.5	7/19/18	<2.0	4.2	130	0.31	<0.26	48	11	9.5	8.8	<0.018	<0.26	40	<2.0	<0.26	<0.52	27	41
	TTLC (mg/kg)	500	500	10,000	75	100	2,500	8,000	2,500	1,000	20	3,500	2,000	100	500	700	2,400	5,000
	STLC (mg/L)	15	5.0	100	0.75	1.0	560	80	25	5.0	0.2	350	20	1.0	5.0	7.0	24	250
	TCLP Threshold (mg/L)	NV	5.0	100	NV	1.0	5.0	NV	NV	5.0	0.2	NV	NV	1.0	5.0	NV	NV	NV
	Construction Worker ESLs (mg/kg)	140	11 [2]	3,000	42	43	530,000	28	14,000	160	44	1,800	86	1,700	1,800	3.5	470	110,000

Notes:

Samples were analyzed for Title 22 metals in accordance with U.S. Environmental Protection Agency Methods 6010B and 7471A.

Results do not meet the following criteria:

- Concentration ≥ TTLC
- Theoretical soluble concentration (total concentration x 10) ≥ the STLC
- Theoretical soluble concentration (total concentration x 20) ≥ the TCLP
- Concentration ≥ Construction Worker ESLs

[1] Total chromium values are presumed to be representative of chromium-III and not chromium-VI.

[2] In accordance with guidance from Regional Water Board, the upper 99th percentile estimate of the naturally-occurring background arsenic concentrations reported by Duvergé (2011) in the San Francisco Bay Area was substituted for the risk-based ESL.

Abbreviations:

<xx = indicates constituent was not identified at or above the laboratory reporting limit of xx

Title 22 = the 17 inorganic compounds listed under Title 22 of the California Code of Regulations

mg/kg = milligrams per kilogram

mg/L = milligrams per liter

NV = no value

ESL = Environmental Screening Level (Regional Water Board, 2016)

TTLC = Total Threshold Limit Concentration

STLC = Soluble Threshold Limit Concentration

TCLP = Toxicity Characteristic Leaching Procedure

Reference:

San Francisco Bay Regional Water Quality Control Board (Regional Water Board), 2016. Environmental Screening Levels (a Microsoft 2010 Excel file). Table S-1: Soil Direct Exposure Human Health Risk Screening Levels. February.

APPENDICES
(In PDF Format)

A: 2015 GE-Hitachi Radiological Survey Report

B: 2016 Initial Site Assessment

C: Laboratory Analytical Reports

D: ProUCL Statistical Analysis Output Files

APPENDIX A

2015 GE-Hitachi Radiological Survey Report

HITACHI

GEH
3901 Castle Hayne Road
Wilmington, NC 28402

April 2015

Release of North Section of Vallecitos, California Site

Written By: Earl Saito Ph.D.; EHS Manager
Reviewed By: Scott Murray CHP; Facility Licensing

Executive Summary:

Vallecitos Nuclear Center (VNC), located at 6705 Vallecitos Road Sunol, California is an approximately 1600 acre site, of which only approximately 135 acres have ever been used for principal activities. GEH operates VNC as a research and development facility licensed under 10 CFR 50 and 70 as well as a State of California radioactive material license. VNC has never used the northern approximately 610 acres for principal activities and plans to remove reference to this section of the site in order to allow sale to a non-GE controlled entity. The areas identified as Areas C1 and C2 have undergone an environmental assessment including limited sampling to support the sale. GEH has also reviewed site history and operations to determine that Areas C1 and C2 are non-impacted areas and will be released without any limitations or conditions as defined in applicable regulations.

Overview:

The primary purpose of the GE – Hitachi Nuclear Energy Americas LLC (GEH) Vallecitos Nuclear Center (VNC) was to provide research and development and engineering studies of Boiling Water Reactors and their fuel. Over time, much of the reactor related activities have ceased leaving only R-33 Nuclear Test Reactor (NTR) still in operation while DPR-1 Vallecitos Boiling Water Reactor (VBWR), TR-1 GE Test Reactor (GETR), DR-10 Empire State Atomic Development Agency Vallecitos Experimental Superheat Reactor (EVESR) are all in SAFSTOR. The principal activity currently performed on site is the by-product material activities covered under the State of California license CA-0017-01 including sealed source manufacture and research and development.

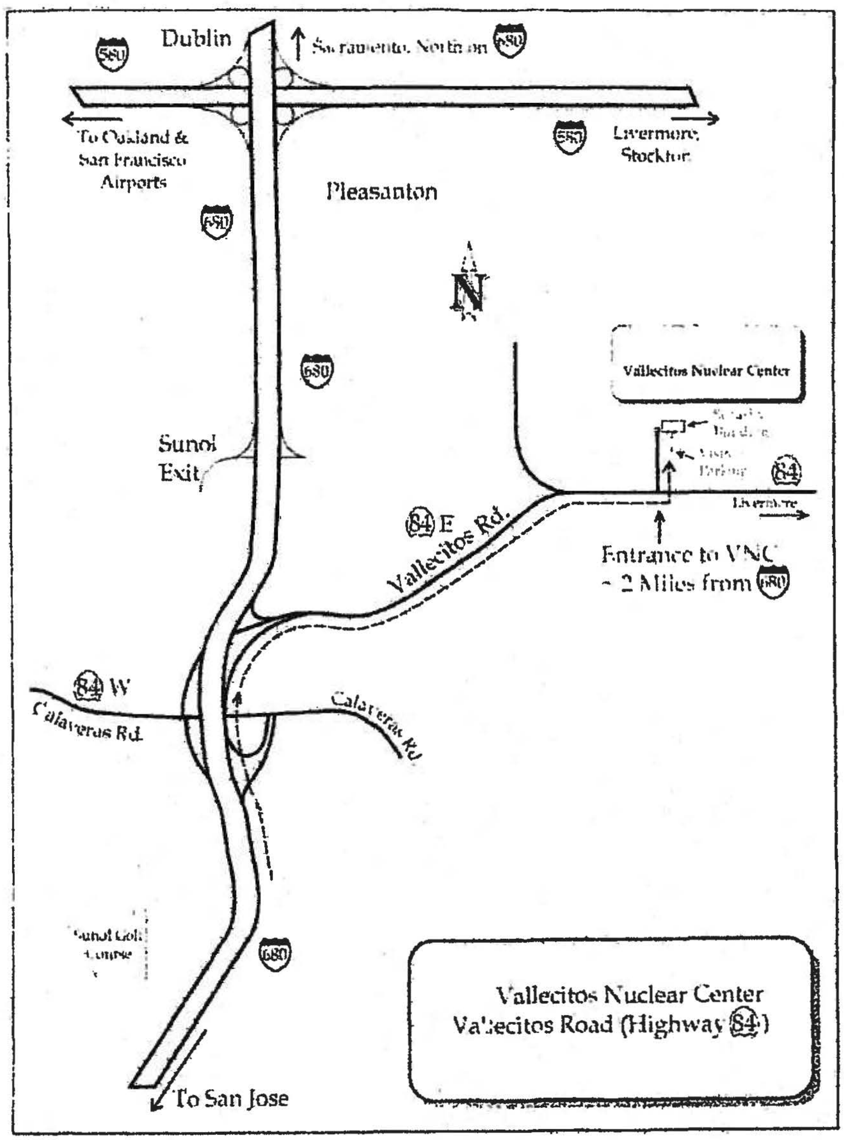
VNC is located near the center of the Pleasanton quadrangle of Alameda County, California. The site is east of San Francisco Bay, approximately 35 air miles east-southeast of San Francisco and 20 air miles north of San Jose. The site is indicated on the area map, Figure 1. The properties surrounding the site are primarily used for agriculture and cattle raising, with some residences, which are mostly to the west of the property. The nearest sizeable towns are Pleasanton located 4.1 miles to the north-northwest and Livermore located 6.2 miles to the northeast.

The site is on the north side of Vallecitos Road (State Route 84), which is a two and four-lane paved highway. A Union Pacific railroad line lies about two miles west of the site. There is light industrial activity within a 10-mile radius of the plant. San Jose (20 miles south), Oakland (30 miles northwest) and San Francisco (35 miles northwest) are major industrial centers.

The property boundary, which has not changed since the original property purchase in 1956, is fenced and posted "No Trespassing". A security gate at the entrance provides access control to the active area of the site.

The site is located in the Livermore Upland physiographic area. The majority of the site is undeveloped with hills ranging in elevation from approximately 400 to 1,200 feet above mean sea level. Approximately 135 acres located in the southwest corner of the property and situated between the 400 and 600-foot topographic contours are developed. The property on which the buildings are located slopes to the southwest and is drained by ditches leading to Vallecitos Creek. This creek discharges to Arroyo de la Laguna near the north end of Sunol Valley, two or three miles southwest of the property.

FIGURE 1
Area Map
(Not to Exact Scale)



Methodology:

Because VBWR was licensed as a power reactor and EVESR has similar possession only license conditions , a 10CFR50.83 release request will be followed. Other licenses have different requirements, but the 50.83 requirements are bounding and should sufficiently demonstrate the adequacy of the release. For the purpose of this report, the requirements from 10CFR50.83 are presented in italics at the beginning of each section. Then a description, encompassing both VBWR and EVESR possession only reactor facilities at VNC, is provided on how that requirement is met.

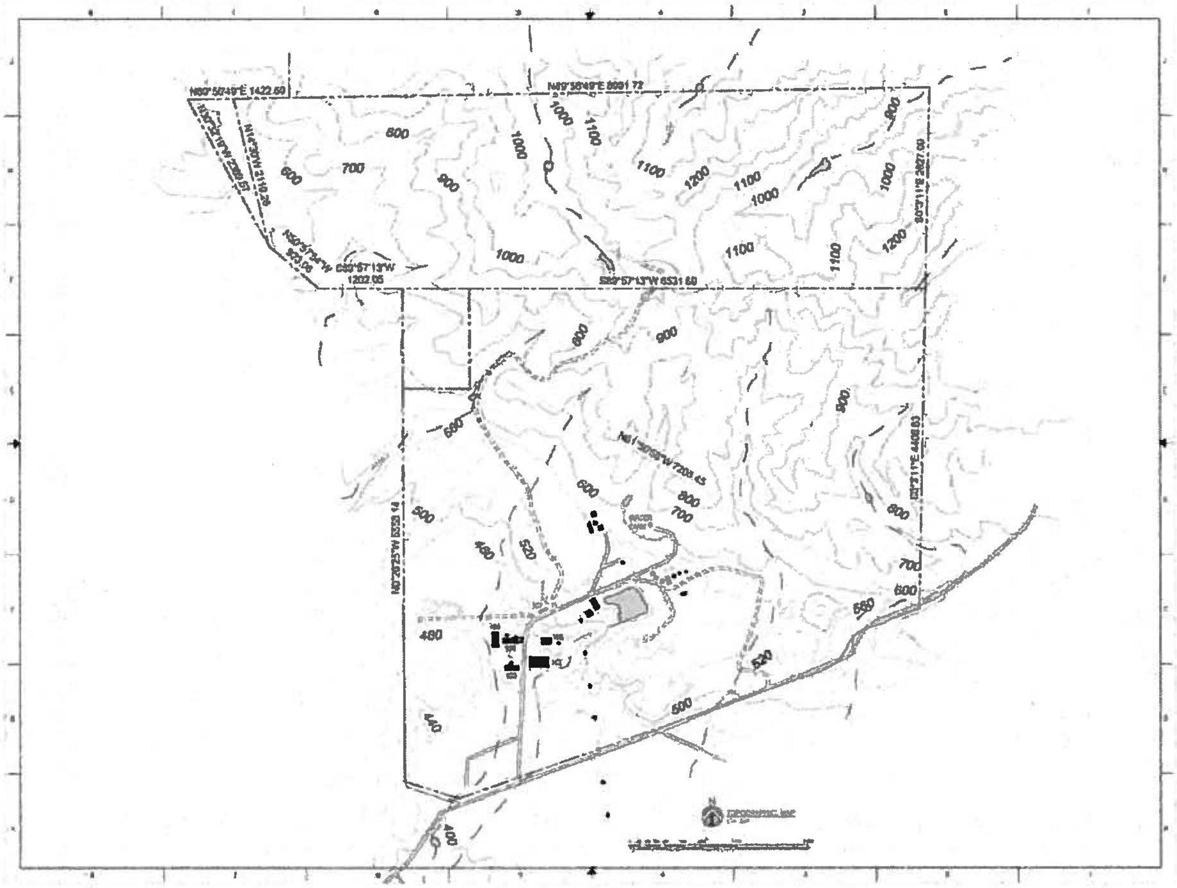
Section 1: (a)(1) Evaluate the effect of releasing the property to ensure that--

(i) The dose to individual members of the public does not exceed the limits and standards of 10 CFR Part 20, Subpart D; The reactors in question have permanently ceased operations and are being maintained in a possession only SAFSTOR status. Direct dose measurements in and around Area C have all been consistent with background (Ref. 4, 5 and 6).

(ii) There is no reduction in the effectiveness of emergency planning or physical security; The areas being released are not part of emergency planning and are not referenced in the plan. Administrative update will be made to the security plan where the current total site area of 1,600 acres is listed. Removing the reference to the number of acres will not reduce the effectiveness of the plan.

(iii) Effluent releases remain within license conditions**;** The reactors in question are being maintained in a possession only SAFSTOR status with limited air emissions and Areas C1 and C2 are uphill from principal site activities so no liquid surface effluents would impact them (Figure 2).

Figure 2: Topographical map of VNC. Note the higher elevation north of the active area of the site.



(iv) The environmental monitoring program and offsite dose calculation manual are revised to account for the changes; The reactors in question are being maintained in a possession only SAFSTOR status. The site monitoring plan has been updated to move samples in Area C to areas of the site that will be retained. In addition, the air monitoring from NTR was confirmed to be sufficient as documented in an associated License Amendment Request for NTR in letter TAC 15-002, from Tom Caine to US NRC dated February 16, 2015 (Ref 3).

(v) The siting criteria of 10 CFR Part 100 continue to be met; The reactors in question are being maintained in a possession only SAFSTOR status. The criteria are being met.

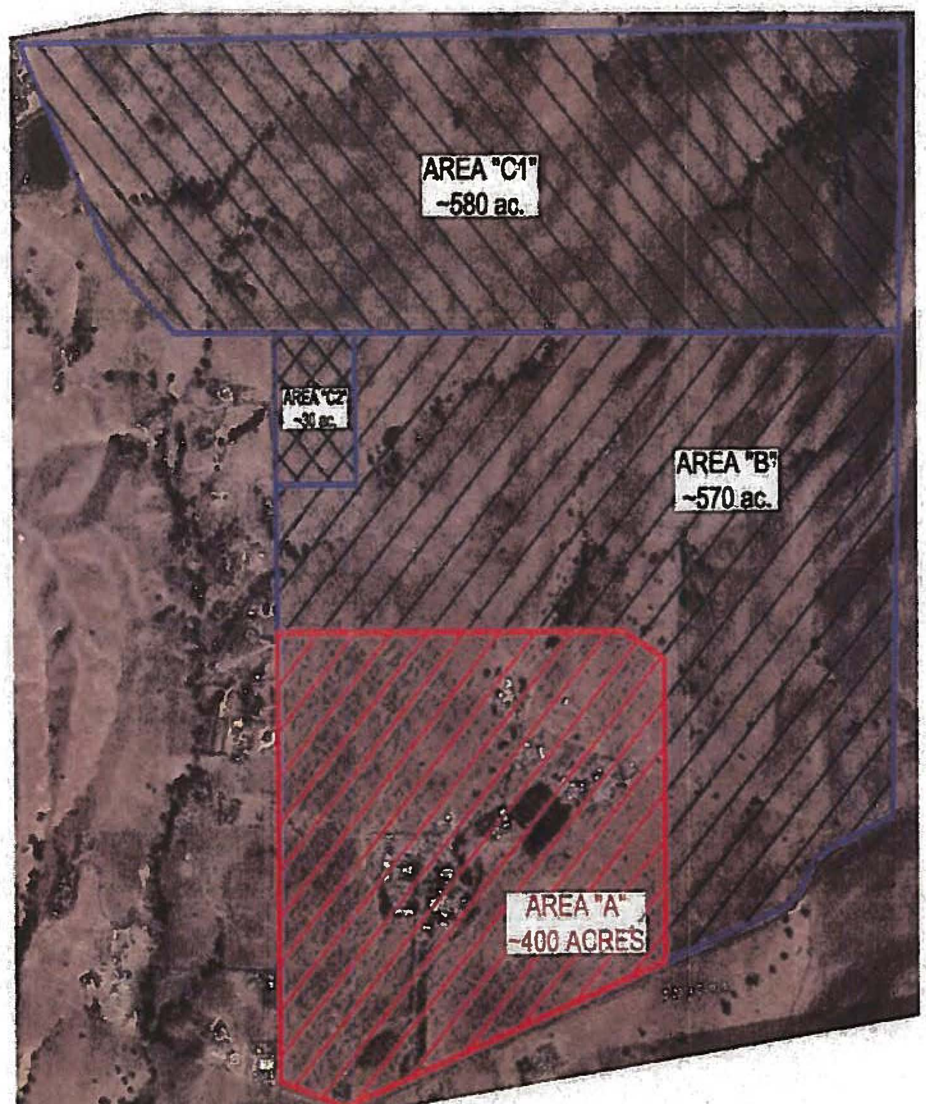
(vi) All other applicable statutory and regulatory requirements continue to be met. Yes.

***Section 2:** (a)(2) Perform a historical site assessment of the part of the facility or site to be released;*

VNC is located near the center of the Pleasanton quadrangle of Alameda County, California. The site is east of San Francisco Bay, approximately 35 air miles east-southeast of San Francisco and 20 air miles north of San Jose. The properties surrounding the site are primarily used for agriculture and cattle raising, with some residences, which are mostly to the west of the property.

GEH has decided to divest approximately 610 acres in an unused portion of the site shown as Area C in Figure 3. Area C is further broken down into two areas C1 and C2. Area C consists generally of undeveloped land and is currently used for cattle grazing. The land has not been used for processing or storage of radioactive material.

Figure 3: Overhead view of VNC Site layout



An Environmental Assessment was conducted by Brown and Caldwell (BC) for Area C (Ref. 1). The results of the assessment were:

Recognized Environmental Conditions

- No adverse or recognized environmental conditions were identified on the Site.
- One recognized environmental condition (GE Vallecitos Nuclear Center) has been identified within one-half mile of the Site.

Environmental Concerns

No environmental concerns were found on the Site.

Historical Recognized Environmental Conditions

No Historical Recognized Environmental Conditions were found on the Site based on the review of aerial photographs and the EDR [Environmental Data Resources] Report.

Consistent with the MARSSIM approach (NUREG-1575 Section 2.2.5) the site has been determined to be non-impacted. The categorization decision is based on four sources of information: visual inspection, historical records review, process knowledge, and the results of sentinel measurements.

1) **Visual Inspection:**

Figure 4: Current Site Boundary to Area C. Fence of golf driving range located north west of property seen on right.

Figure 5: Near C2 toward the Vallecitos operations.

Field observations in the Brown and Caldwell Environmental Site Assessment did not note any indications of industrial materials.

2) Historical Record:

The site history, as documented in Brown and Caldwell's (BC) Environmental Site Assessment of the VNC Site Ref. 1, did not indicate the presence of any radioactive material.

Brown and Caldwell's (BC) Environmental Site Assessment, Section 4.1 Historical Use Information

> *As no historical records were found specific to the Target Property, BC has reviewed the information provided in the EDR Report for the site. Based on information obtained during interviews with site personnel at the Vallecitos Nuclear Center, the Site has been maintained as an open range with cattle grazing since it was purchased by GE-H in the 1950s.*

In addition a review of historical site aerial photographs concluded:

> *No environmental concerns, RECs* [Recognized Environmental Conditions], *or HRECs* [Historic Recognized Environmental Conditions] *were observed in BC's review of historical aerial photographs.*

Further GEH review of site records indicates that activities with licensed material were limited to the approximately 135 acres on the south-west end of the site which is well away from Area C. No documentation was identified that indicate an impact on Area C.

3) Process Knowledge

A survey was taken of current and past site personnel, and there are no known events that occurred in the process area that would have contaminated Area C. The survey included the current and past site managers and the GEH current and past General Managers (who were located in Wilmington, NC).

Name	Title	Approximate Service Years at VNC
Thomas Caine	Site Manager	2004-Present
Timothy Christman	General Manager	2013-Present
Anthony McFadden	Site Manager	2011-2013
Christopher Monetta	GEH EHS Manager and General Manager	1996-2007
Scott Murray	Licensing	1998-present
Louis Quintana	Site Manager	2001-2004
Michael Schrag	Facilities Manager	2004-Present
David Turner	Site Manager and Site EHS Manager	2003-2011
Mark Varno	General Manager	2011-2013

4) Sentinel Measurements

The only potential impact on Areas C1 and C2 from the site would have been due to airborne releases from the reactors or other site facilities. Any impact from the site airborne releases would have been fairly uniformly dispersed across the areas of interest. As part of an environmental assessment, Brown and Caldwell collected soil samples from 11 locations that were analyzed for gross alpha and gross beta activity (See Figure 6). These locations were selected because they were local low points where any contamination would expect to be concentrated. The alpha results had a mean value of 8.6 pCi/g (not including reanalysis) with a maximum result of 17.7 pCi/g (including reanalysis). The beta results had a mean value of 11.1 pCi/g with a maximum result of 23.5 pCi/g. As sentinel results these confirmed the historical record that the area was non-impacted by operations on the site. The results of the soil samples are provided in Table 1.

Figure 6: Gross alpha and beta sample locations.

Table 1: Gross Alpha Beta Results

Sample	Alpha pCi/g	+/-	Beta pCi/g	+/-
C1-1	6.29	3.47	9.04	3.38
C1-2	13.70	4.82	22.96	4.49
C1-3	7.35	3.66	12.67	3.90
C1-4	5.58	2.42	9.68	3.48
C1-5	8.06	3.89	13.17	4.06
C1-6	7.33	3.11	7.87	3.22
C1-7	8.88	3.60	16.67	3.09
C1-8	10.80	3.40	5.89	2.49
C1-9	7.67	2.99	9.29	2.75
C1-9 Replicate	11.16	4.19	10.85	2.86
C2-1	4.83	2.27	4.18	2.75
C2-2	10.82	3.24	8.60	2.18
C1-1 Reanalysis	3.99	4.95	15.74	2.87
C1-2 Reanalysis	11.65	5.11	23.52	4.39
C2-2 Reanalysis	17.65	8.24	12.02	2.67

Figure 7: Rank order of gross alpha results of initial analysis. The highest reading was from sample C1-2.

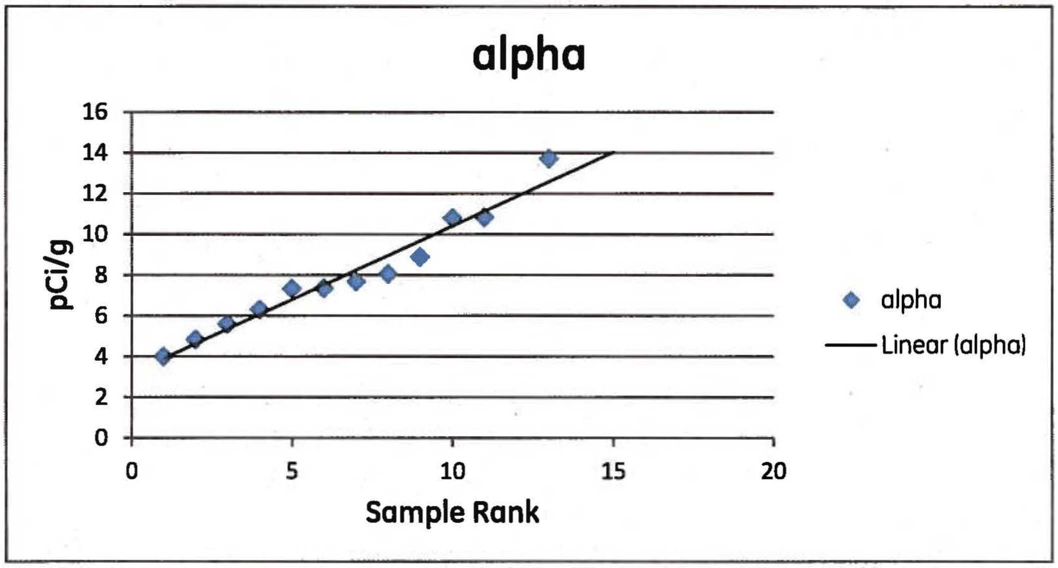
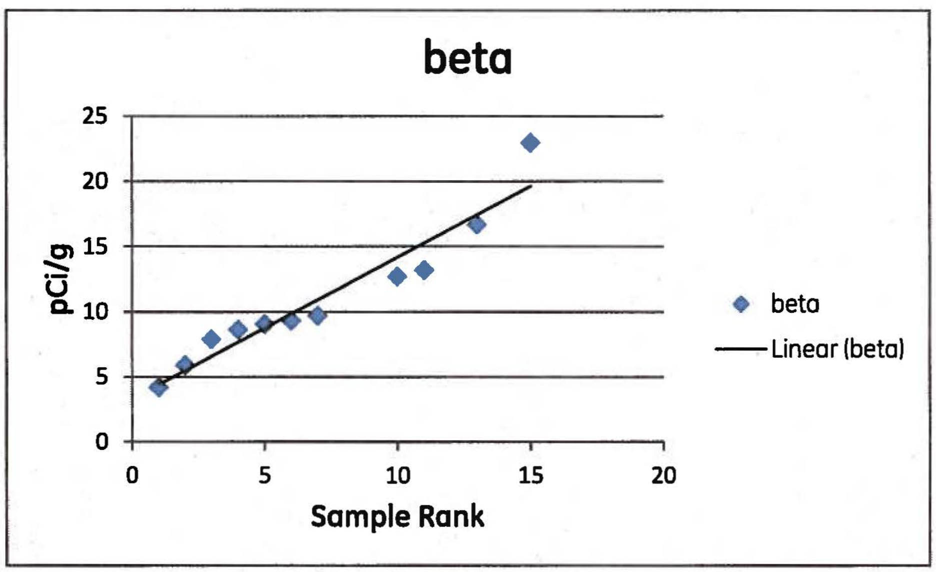


Figure 8: Rank order of gross beta results. Sample C1-2 had the highest result.



For both the alpha and beta cases sample C1-2 appeared to be above the linear result expected for background samples (Figures 7 and 8). In addition, the samples were slightly above the screening levels, of 11 pCi/g for alpha and 21 pCi/g beta, recommended in the Lawrence Livermore National Laboratory (LLNL) background value document (Ref. 2). The LLNL report is a publicly available document that describes the background samples that were collected and analyzed at LLNL. Since LLNL is located near VNC, these results should provide a good data set for general comparisons. While one result was outside of the screening level it was well below results accepted and used to calculate background in the LLNL report indicating consistency with natural background characteristic of the area.

Because the C1-2 results were above screening levels and appeared to be above the rank order line, a gamma spectroscopy analysis was also performed. The gamma results did not indicate increased levels of non-naturally occurring isotopes. In particular, Cs-137 and Co-60, which are the dominant isotopes present at Vallecitos, were not detectable. In addition, gamma scan results for locations C1-1 and C2-2 were also conducted with all results provided in Attachment 1. Results for C1-1 and C2-2 were consistent with C1-2 results in that only naturally occurring isotopes were identified, and in expected concentrations. Therefore, the result of the analysis is that no non-naturally occurring isotopes above background levels have been identified.

Conclusion of MARSSIM type review

None of the 4 reviews indicate that radioactive material was ever used on Areas C1 and C2 and the areas are characterized as non-impacted.

Section 3: (a)(3) Perform surveys adequate to demonstrate compliance with the radiological criteria for unrestricted use specified in 10 CFR 20.1402 for impacted areas. Not applicable. The area being released is a non-impacted area.

Section 4: (b) For release of non-impacted areas, the licensee may submit a written request for NRC approval of the release if a license amendment is not otherwise required. The request submittal must include--

(1) The results of the evaluations performed in accordance with paragraphs (a)(1) and (a)(2) of this section; See Sections 1 and 2.

(2) A description of the part of the facility or site to be released; See Section 2

(3) The schedule for release of the property; The property will be released as soon as approval is received from the NRC. The property is currently being marketed and will transfer as soon as regulatory release is approved and commercial considerations are found to be acceptable.

(4) The results of the evaluations performed in accordance with § 50.59; and Both VBWR and EVESR have permanently ceased operations and are being maintained in a possession only SAFSTOR status. The site acreage is not explicitly used in any of the analyses supporting the licensing basis of either VBWR or EVESR. Results of 10CFR50.59 analysis provided below.

Would the installation, change, test, or experiment:

1. ***Result in more than a minimal increase in the frequency of occurrence of an accident previously evaluated;*** No, the change in site size has no impact on either probability or consequences of any previously evaluated accident.

2. ***Result in more than a minimal increase in the likelihood of occurrence of a malfunction of a structure, system, or component (SSC) important to safety previously evaluated;*** No

3. ***Result in more than a minimal increase in the consequences of an accident previously evaluated;*** No

4. ***Result in more than a minimal increase in the consequences of a malfunction of an SSC important to safety previously evaluated;*** No

5. ***Create a possibility for an accident of a different type than any previously evaluated;*** No, the change in site size does not create the possibility of a new or different kind of accident.

6. ***Create a possibility for a malfunction of an SSC important to safety with a different result than any previously evaluated;*** No

7. ***Result in a limit for a fission product/contamination barrier being exceeded or altered; or:*** No

8. ***Result in a departure from a method of evaluation used in establishing the design bases or in safety analyses.*** No, the change in site size does not result in a departure from a method of evaluation.

(5) A discussion that provides the reasons for concluding that the environmental impacts associated with the licensee's proposed release of the property will be bounded by appropriate previously issued environmental impact statements. The proposed property to be released is an area that has never been used for licensed activity, the current use of the land is cattle grazing. Area C is separated from the active area of the site by hills that preclude surface transport of liquid effluents. Samples taken in the area do not indicate impact from license activities. Because the power reactors are shut down and there is no evidence of historic impact on the area, any previous environmental impact statements should not be impacted by the proposed release of Area C.

Section 5: (c to f) are either not applicable or work to be performed by the NRC.

Section 6: Items of interest from other parts of the regulation

10CFR70.38(g)(4)(v) An updated detailed cost estimate for decommissioning, comparison of that estimate with present funds set aside for decommissioning, and a plan for assuring the availability of adequate funds for completion of decommissioning.

The changes will not impact the decommissioning cost estimate. Because no radioactive material was on land being divested, there is not a significant amount of funding in the current plan for this area.

References:

1) Environmental Site Assessment Assessor's Parcel No. 950-8-2-1 Alameda County, California. March 2, 2015. Brown and Caldwell report 146768
2) Background Values of Gross Alpha and Gross Beta in Soil for Lawrence Livermore National Laboratory, March 2008. LLNL-TR-402360. Gretchen Gallegos.
3) TAC 15-002; Technical Specification Change to Support Potential VNC Site Land Sale; Tom Caine to Document Control Desk, February 16, 2015. Docket No. 50-73 License No. R-33.
4) License Renewal Application for Vallecitos Nuclear Center Reference: NRC License SNM-960, Docket 70-754; September 30, 2009 ML092950541
5) Annual Report, 2013 Effluent Monitoring and Environmental Surveillance Programs, February 28, 2014; ML14073A739
6) Annual Report, 2014 Effluent Monitoring and Environmental Surveillance Programs, February 25, 2015 ML15069A472

Attachment 1

Gamma Spectroscopy Results:

Sample ID	Sample Date	Matrix	EPA Method	Analyses	Results pCi/gram	±	2 sigma Error	MDA
C1-1-1114	12-21-14 (12:45)	Soil						
Analyses completed on:								
	02/02/15		9310	Gross Alpha	3.99	±	4.95	8.30
	02/02/15		9310	Gross Beta	15.74	±	2.87	4.02
	01/23/15		DOE 4.5.2.3	K-40	9.95	±	0.23	0.23
	01/23/15		DOE 4.5.2.3	Co-60	ND		0.01	0.05
	01/23/15		DOE 4.5.2.3	Cs-137	ND		0.01	0.06
	01/23/15		DOE 4.5.2.3	Cs-134	ND		0.01	0.03
	01/23/15		DOE 4.5.2.3	Tl-208	0.24	±	0.03	0.23
	01/23/15		DOE 4.5.2.3	Pb-210	0.17	±	0.01	0.03
	01/23/15		DOE 4.5.2.3	Bi-210	0.13	±	0.01	0.01
	01/23/15		DOE 4.5.2.3	Po-210	0.12	±	0.01	0.02
	01/23/15		DOE 4.5.2.3	Pb-212	0.21	±	0.01	0.01
	01/23/15		DOE 4.5.2.3	Bi-214	0.19	±	0.03	0.08
	01/23/15		DOE 4.5.2.3	Pb-214	0.17	±	0.01	0.04
	01/23/15		DOE 4.5.2.3	Ra-226	0.18	±	0.01	0.04
	01/23/15		DOE 4.5.2.3	Po-214	0.17	±	0.01	0.05
	01/23/15		DOE 4.5.2.3	Th-228	0.37	±	0.02	0.10
	01/23/15		DOE 4.5.2.3	Th-232	0.36	±	0.03	0.06
	01/23/15		DOE 4.5.2.3	Th-234	0.88	±	0.02	0.04
	01/23/15		DOE 4.5.2.3	Pa-234m	0.86	±	0.09	0.19
	01/23/15		DOE 4.5.2.3	Pa-234	0.76	±	0.07	0.12
	01/23/15		DOE 4.5.2.3	Po-216	0.25	±	0.03	0.18
	01/23/15		DOE 4.5.2.3	Po-218	0.22	±	0.02	0.05

Sample ID	Sample Date	Matrix	EPA Method	Analyses	Results pCi/gram	±	2 sigma Error	MDA
C1-2-1114	11-21-14 (13:00)	Soil						
	Analyses completed on:							
	02/23/15		9310	Gross Alpha	11.65	±	5.11	6.99
	02/23/15		9310	Gross Beta	23.52	±	4.39	5.01
	02/23/15		DOE 4.5.2.3	K-40	12.71	±	0.44	0.82
	02/23/15		DOE 4.5.2.3	Co-60	ND		0.01	0.10
	02/23/15		DOE 4.5.2.3	Cs-137	ND		0.01	0.10
	02/23/15		DOE 4.5.2.3	Cs-134	ND		0.01	0.05
	02/23/15		DOE 4.5.2.3	Tl-208	0.93	±	0.08	0.38
	02/23/15		DOE 4.5.2.3	Pb-210	0.29	±	0.02	0.11
	02/23/15		DOE 4.5.2.3	Bi-210	0.01	±	0.01	0.01
	02/23/15		DOE 4.5.2.3	Po-210	0.10	±	0.01	0.01
	02/23/15		DOE 4.5.2.3	Pb-212	0.01	±	0.01	0.01
	02/23/15		DOE 4.5.2.3	Bi-214	0.19	±	0.02	0.06
	02/23/15		DOE 4.5.2.3	Pb-214	0.17	±	0.01	0.10
	02/23/15		DOE 4.5.2.3	Ra-226	0.19	±	0.02	0.07
	02/23/15		DOE 4.5.2.3	Po-214	0.15	±	0.01	0.08
	02/23/15		DOE 4.5.2.3	Th-228	0.34	±	0.02	0.06
	02/23/15		DOE 4.5.2.3	Th-232	0.21	±	0.02	0.13
	02/23/15		DOE 4.5.2.3	Th-234	1.74	±	0.12	0.20
	02/23/15		DOE 4.5.2.3	Pa-234m	1.67	±	0.15	0.35
	02/23/15		DOE 4.5.2.3	Pa-234	0.76	±	0.07	0.12
	02/23/15		DOE 4.5.2.3	Po-216	0.70	±	0.04	0.10
	02/23/15		DOE 4.5.2.3	Po-218	0.17	±	0.01	0.10

Sample ID	Sample Date	Matrix	EPA Method	Analyses	Results pCi/gram	±	2 Sigmaa Error	MDA
C2-2-1114	11-21-14 (09:00)	Soil						
Analyses compelted on:								
	01/26/15		DOE 4.5.2.3	K-40	7.67	±	0.19	0.32
	01/26/15		DOE 4.5.2.3	Co-60	ND		0.01	0.07
	01/26/15		DOE 4.5.2.3	Cs-137	ND		0.01	0.09
	01/26/15		DOE 4.5.2.3	Cs-134	ND		0.01	0.04
	01/26/15		DOE 4.5.2.3	Tl-208	0.23	±	0.03	0.31
	01/26/15		DOE 4.5.2.3	Pb-210	0.11	±	0.01	0.04
	01/26/15		DOE 4.5.2.3	Bi-210	0.21	±	0.01	0.01
	01/26/15		DOE 4.5.2.3	Po-210	0.23	±	0.01	0.07
	01/26/15		DOE 4.5.2.3	Pb-212	0.22	±	0.01	0.06
	01/26/15		DOE 4.5.2.3	Bi-214	0.27	±	0.03	0.12
	01/26/15		DOE 4.5.2.3	Pb-214	0.31	±	0.01	0.06
	01/26/15		DOE 4.5.2.3	Ra-226	0.25	±	0.01	0.02
	01/26/15		DOE 4.5.2.3	Po-214	0.14	±	0.01	0.06
	01/26/15		DOE 4.5.2.3	Th-228	0.17	±	0.01	0.14
	01/26/15		DOE 4.5.2.3	Th-232	0.29	±	0.01	0.04
	01/26/15		DOE 4.5.2.3	Th-234	0.56	±	0.02	0.08
	01/26/15		DOE 4.5.2.3	Pa-234m	0.50	+	0.06	0.26
	01/26/15		DOE 4.5.2.3	Pa-234	0.48	+	0.02	0.06
	01/26/15		DOE 4.5.2.3	Po-216	0.26	±	0.03	0.24
	01/26/15		DOE 4.5.2.3	Po-218	0.23	±	0.01	0.07

APPENDIX B

2016 Initial Site Assessment
(Excerpt for Vallecitos Nuclear Center Records Review)

INITIAL SITE ASSESSMENT

DECEMBER 27, 2016

SR 84 EXPRESSWAY WIDENING AND SR 84/I-680 INTERCHANGE IMPROVEMENTS PROJECT
Alameda County

Prepared for:
Alameda County
Transportation Commission

16205-00.02444

BASELINE ENVIRONMENTAL CONSULTING
5900 Hollis Street, Suite D, Emeryville, CA 94608 | P: (510) 420-8686 | www.baseline-env.com

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Releases from the USTs were identified during the UST removal activities in 1996. In 2014, as a condition for case closure, a land use restriction was recorded for a portion of the site, limiting excavation and prohibiting sensitive land uses.

Although residual contamination is present at the Mission Valley Rock Sunol Plant, this contamination is limited to the vicinity of the former UST location and does not extend off the site (Arcadis 2013). Groundwater flow direction has been measured to the south, southeast, and east (Arcadis 2013), indicating that this site is hydraulically downgradient from the project area. Based on this information, this release would not have the potential to affect the project area.

A Regional Water Quality Control Board (RWQCB) Spills Leaks Investigations and Cleanups (SLIC) database case was opened at an equipment rental business at this site in 2007 when an inspection identified potential contamination near a sump. A subsequent soil investigation did not identify significant contamination, and the SLIC case was closed in 2014.

Site 4 – Chevron Sunol Pipeline – 2793 Calaveras Road (Figure 2B)

A pipeline accident occurred at this site in 2005, approximately one mile south of the project area, which resulted in the release of 25,830 gallons of gasoline. After remediation using a soil vapor extraction system, this site was closed in July 2015. Remediation of this site has been completed, and it is located hydraulically downgradient from the project site, so it would not have the potential to affect the project area.

Site 6 - Walgreens Sunol, 9494 Koopman Road (Figure 2B)

A tractor-trailer truck accident near the Koopman Road undercrossing of I-680 resulted in the release of 150 gallons of diesel. Cleanup occurred soon after the spill and contaminated soil was excavated and disposed of off-site. Although this site remains active in the SLIC database, the relatively small volume of the release and its prompt remediation make it unlikely that contaminants from this site would migrate and affect project area soils or groundwater.

Site 8 - Vallecitos Nuclear Center, 6705 Vallecitos Road (Figures 2C and 2D)

The primary function of this site is nuclear fuel research and the production of radio-isotopes for medical and other uses (DTSC 1997). It is registered as a federal Resources Conservation and Recovery Act (RCRA) large-quantity hazardous waste generator, indicating that it is authorized to generate and dispose of more than 100 kilograms per month of non-acutely hazardous waste, or more than 1 kilogram per month of acutely hazardous waste. The site is also a RCRA-registered waste handler and is listed as generator on numerous hazardous waste manifests.

In 1991, a Preliminary Assessment of the site was performed under the United States Environmental Protection Agency (EPA) Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) program, designed to investigate and remediate suspected hazardous waste sites. No further action was proposed under CERCLA.

In 1997, a RCRA Facility Assessment was performed to identify and evaluate hazardous waste management and other areas of concern at the site (DTSC 1997). Record review for the assessment identified two hazardous materials releases from the site:

- Polychlorinated biphenyls (PCBs) were released at the site in 1993, and affected soils were excavated and disposed of off-site. The oversight agency Alameda County, Division of Environmental Protection, Department of Environmental Health (ACDEH) approved closure of the PCB release case, indicating completion of necessary remediation, on June 24, 1993.

- Diesel was released from a 10,000-gallon above-ground storage tank in 1994. Diesel-contaminated soils were remediated on-site. ACDEH determined that no further action was warranted.

The 1997 assessment concluded that the site discharged wastewater and managed hazardous waste in accordance with permits and other hazardous waste generator requirements. No further action was proposed (DTSC 1997).

Several hazardous waste violation enforcement actions have been recorded at the site, the most recent of which involved late submissions of monitoring reports and exceedances of copper discharge limits during 2000 through 2002. The RCRA enforcement database (CORRACTS) categorized the violations as "minor" and indicated that they had been corrected.

The Vallecitos Nuclear Center appears on the Materials Licensing Tracking System due to the use of radioactive substances at the site. Radioactive substances are regulated by the Nuclear Regulatory Commission (NRC) and the California Department of Public Health, Radiologic Health Branch separately from other hazardous wastes.

The facility is required to monitor discharges to the environment for both standard and radioactive contaminants. Under RWQCB Waste Discharge Requirements (Order R2-2008-0079), the facility is required to monitor temperature, pH, total suspended solids, total dissolved solids, chloride, oil and grease, dissolved oxygen, total chromium, copper, lead, mercury, zinc, and acute toxicity. Under the requirements of Title 10 of the Code of Federal Regulations, Section 20, the radioactivity of air, groundwater, vegetation, and stream bed sediments are regularly monitored. There are 20 monitoring stations along the perimeter of the facility buildings that measure gamma radiation and compare it to "background" stations located near the site perimeters.

The most recent effluent monitoring environmental surveillance report indicated that discharges from the Vallecitos Nuclear Center were within permit requirements for both radioactive and non-radioactive materials and met the goals of the monitoring program, which are to ensure that discharges from the site do not adversely affect areas outside the facility (GE Hitachi 2015).

Three hazardous waste incidents were reported at the Vallecitos Nuclear Center during 2011 and 2012 (Table 1). The incidents involved the release of 1,000 gallons of sewage, 20 gallons of

R22 refrigerant, and 70 gallons of hydraulic oil. The incident reports indicate that cleanup was conducted shortly after reporting, and none of the incidents resulted the opening of a case file by a regulatory oversight agency. These incidents would be unlikely to affect soils and/or groundwater in the project area.

Site 9 - 7900 Vallecitos Road (Figure 2C)

A hazardous materials incident was reported at this site in 2014 regarding a release of water from an irrigation ditch onto an adjoining property. No hazardous materials involvement was noted in the incident record.

Site 10 – Pigeon Pass SR 84 Realignment Project (Figure 2E)

This site was listed in a hazardous materials enforcement action database due to a violation of RWQCB Order R2-2006-0033. The database indicated that the violation was related to the failure to implement required erosion controls, and did not involve hazardous material releases.

6.4 Evaluation of Potential Hazardous Materials Sources from Data Source Review

6.4.1 Aerially-Deposited Lead

Lead alkyl compounds were first added to gasoline in the 1920s. Beginning in 1973, the EPA ordered a gradual phase out of lead from gasoline that significantly reduced the prevalence of leaded gasoline by the mid-1980s. Prior to the 1970s, the EPA estimated that vehicles emitted approximately 75 percent of the lead consumed in leaded gasoline as particulate matter in the exhaust (DTSC 2004). As a result, shallow soils within approximately 30 feet of the edge of pavement in highway corridors have the potential to be contaminated with ADL from historical car emissions prior to the elimination of lead in gasoline (DTSC 2009a).

Based on a review of historical aerial photographs, SR 84 has been present at the project area since at least 1940, and I-680 was constructed in the late 1960s to early 1970s, which was before the full phase-out of lead in gasoline. Therefore, exposed shallow soils at the project area within approximately 30 feet of the edge of pavement along these highways could be contaminated with ADL.

On 1 July 2009, the Department of Toxic Substances Control (DTSC) issued a variance to Caltrans (Caltrans/DTSC ADL Variance) allowing the reuse of some lead-affected soils for construction projects within the Caltrans rights-of-way (DTSC 2009b). The Caltrans/DTSC ADL Variance allows Caltrans to reuse soils containing total lead at concentrations up to 3,397 milligrams per kilogram, or soluble lead at concentrations up to 150 milligrams per liter within the project construction area and the Caltrans right-of-way, subject to certain restrictions and reporting requirements.

APPENDIX C

Laboratory Analytical Reports

ENTHALPY

ANALYTICAL

Enthalpy Analytical

2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

Laboratory Job Number 301639
ANALYTICAL REPORT

Baseline Environmental 5900 Hollis Street Emeryville, CA 94608	Project : 18301-00 Location : SR84 Widening & SR84/I 680 Level : II

Sample ID	Lab ID
S01;0.0-0.5	301639-001
S06;0.0-0.5	301639-002
S11;0.0-0.5	301639-003

This data package has been reviewed for technical correctness and completeness. Release of this data has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature which applies to this PDF file as well as any associated electronic data deliverable files. The results contained in this report meet all requirements of NELAP and pertain only to those samples which were submitted for analysis. This report may be reproduced only in its entirety.

Signature: ______________________ Date: 07/27/2018

Patrick McCarthy
Project Manager
patrick.mccarthy@enthalpy.com
(510) 204-2236 ext 13115

CA ELAP# 2896, NELAP# 4044-001

ENTHALPY ANALYTICAL

CASE NARRATIVE

Laboratory number:	**301639**
Client:	**Baseline Environmental**
Project:	**18301-00**
Location:	**SR84 Widening & SR84/I 680**
Request Date:	**07/20/18**
Samples Received:	**07/20/18**

This data package contains sample and QC results for three soil samples, requested for the above referenced project on 07/20/18. The samples were received cold and intact.

Metals (EPA 6010B and EPA 7471A):
Low recoveries were observed for antimony in the MS/MSD for batch 261623; the parent sample was not a project sample, the BS/BSD were within limits, and the associated RPD was within limits. No other analytical problems were encountered.

BASELINE Environmental Consulting
5900 Hollis Street, Suite D
Emeryville, CA 94608
Tel: (510) 420-8686

CHAIN OF CUSTODY RECORD

LAB LOGIN 301639

Turn-Around-Time Standard TAT
Laboratory Enthalpy
BASELINE Contact Person Patrick Sutton

Project Number: 18301-00
Project Name: SR84 Widening & SR84/I 680
Samplers: (Signature) [signature] / [signature]

Lab No.	Sample ID	Date	Time	Media	Total No.	SS or Brass Liner	16 oz Glass Jar	Other	Ice	HCL	HNO3		TEPH (EPA 8015B)	TPH-g (EPA 8015M)	VOCs (EPA 8260B)	Title 22 Metals (EPA 6010B/7000)	Total Lead (EPA 6010B)		Asbestos (CARB 435)	Remarks/ Composite
	S01;0.0-0.5	7-19-18	8:41	Soil	1	1			X							X				
	S06;0.0-0.5	7-19-18	7:49	Soil	1	1			X							X				
	S11;0.0-0.5	7-19-18	8:23	Soil	1	1			X							X				

Container: Total No., SS or Brass Liner, 16 oz Glass Jar, Other. Preservative: Ice, HCL, HNO3. Analyses: TEPH through Asbestos.

Relinquished by: (Signature)	Received by: (Signature)	Date/Time	Remarks:
[signature]	Pat Gonzalez	7-20-18 8:49	
Relinquished by: (Signature)	Received by: (Signature)	Date/Time	Email contact:
Relinquished by: (Signature)	Received by: (Signature)	Date/Time	Patrick@baseline-env.com

Received at laboratory with intact custody seal: Yes No Na

Sample condition upon arrival at lab : Intact On Ice Cold

Comments:

SAMPLE RECEIPT CHECKLIST

ENTHALPY

Section 1: Login # 301639 Client: Baseline
Date Received: 7-20-18 Project: 18301-00

Section 2: Samples received in a cooler? ☒ Yes, how many? 1 ☐ No (skip Section 3 below)
If no cooler Sample Temp (°C): ____ using IR Gun # ☐ A, or ☐ B
☐ Samples received on ice directly from the field. Cooling process had begun
If in cooler: Date Opened 7-20-18 By (print) tkm (sign) Tkm
Shipping info (if applicable) ____
Are custody seals present? ☒ No, or ☐ Yes. If yes, where? ☐ on cooler, ☐ on samples, ☐ on package
☐ Date: ____ How many ____ ☐ Signature, ☐ Initials, ☐ None
Were custody seals intact upon arrival? ☐ Yes ☐ No ☒ N/A

Section 3: *Important*: Notify PM if temperature exceeds 6°C or arrive frozen.
Packing in cooler: (if other, describe) ____
☐ Bubble Wrap, ☐ Foam blocks, ☐ Bags, ☒ None, ☐ Cloth material, ☐ Cardboard, ☐ Styrofoam, ☐ Paper towels
☐ Samples received on ice directly from the field. Cooling process had begun
Type of ice used: ☒ Wet, ☐ Blue/Gel, ☐ None Temperature blank(s) included? ☐ Yes, ☒ No
Temperature measured using ☐ Thermometer ID: ____, or IR Gun # ☐ A ☒ B
Cooler Temp (°C): #1: 3.5, #2: ____, #3: ____, #4: ____, #5: ____, #6: ____, #7: ____

Section 4:	YES	NO	N/A
Were custody papers dry, filled out properly, and the project identifiable	X		
Were Method 5035 sampling containers present?		X	
If YES, what time were they transferred to freezer? ____			
Did all bottles arrive unbroken/unopened?	X		
Are there any missing / extra samples?		X	
Are samples in the appropriate containers for indicated tests?	X		
Are sample labels present, in good condition and complete?	X		
Does the container count match the COC?	X		
Do the sample labels agree with custody papers?	X		
Was sufficient amount of sample sent for tests requested?	X		
Did you change the hold time in LIMS for unpreserved VOAs?			X
Did you change the hold time in LIMS for preserved terracores?			X
Are bubbles > 6mm absent in VOA samples?			X
Was the client contacted concerning this sample delivery?		X	
If YES, who was called? ____ By ____ Date: ____			

Section 5:	YES	NO	N/A
Are the samples appropriately preserved? (If N/A, skip the rest of section 5)			X
Did you check preservatives for all bottles for each sample?			
Did you document your preservative check?			

pH strip lot# ____, pH strip lot# ____, pH strip lot# ____
Preservative added:
☐ H2SO4 lot# ____ added to samples ____ on/at ____
☐ HCL lot# ____ added to samples ____ on/at ____
☐ HNO3 lot# ____ added to samples ____ on/at ____
☐ NaOH lot# ____ added to samples ____ on/at ____

Section 6:
Explanations/Comments: ____

Date Logged In 7-20-18 By (print) Kp (sign) Kp
Date Labeled 7-20-18 By (print) Kp (sign) Kp

ENTHALPY ANALYTICAL

Detections Summary for 301639

Results for any subcontracted analyses are not included in this summary.

Client : Baseline Environmental
Project : 18301-00
Location : SR84 Widening & SR84/I 680

Client Sample ID : S01;0.0-0.5 Laboratory Sample ID : 301639-001

Analyte	Result	Flags	RL	Units	Basis	IDF	Method	Prep Method
Arsenic	2.7		1.5	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Barium	220		0.26	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Beryllium	0.36		0.10	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Chromium	35		0.26	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Cobalt	6.6		0.26	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Copper	16		0.26	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Lead	12		1.0	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Mercury	0.024		0.016	mg/Kg	As Recd	1.000	EPA 7471A	METHOD
Nickel	34		0.26	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Vanadium	23		0.26	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Zinc	32		1.0	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B

Client Sample ID : S06;0.0-0.5 Laboratory Sample ID : 301639-002

Analyte	Result	Flags	RL	Units	Basis	IDF	Method	Prep Method
Arsenic	3.0		1.4	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Barium	160		0.23	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Beryllium	0.26		0.093	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Chromium	30		0.23	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Cobalt	12		0.23	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Copper	11		0.23	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Lead	9.3		0.93	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Mercury	0.026		0.017	mg/Kg	As Recd	1.000	EPA 7471A	METHOD
Nickel	34		0.23	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Vanadium	21		0.23	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Zinc	41		0.93	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B

ENTHALPY ANALYTICAL

Client Sample ID : S11;0.0-0.5 Laboratory Sample ID : 301639-003

Analyte	Result	Flags	RL	Units	Basis	IDF	Method	Prep Method
Arsenic	4.2		1.5	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Barium	130		0.26	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Beryllium	0.31		0.10	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Chromium	48		0.26	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Cobalt	11		0.26	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Copper	9.5		0.26	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Lead	8.8		1.0	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Nickel	40		0.26	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Vanadium	27		0.26	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B
Zinc	41		1.0	mg/Kg	As Recd	1.000	EPA 6010B	EPA 3050B

ENTHALPY ANALYTICAL

California Title 22 Metals

Lab #:	301639	Project#:	18301-00
Client:	Baseline Environmental	Location:	SR84 Widening & SR84/I 680
Field ID:	S01;0.0-0.5	Basis:	as received
Lab ID:	301639-001	Diln Fac:	1.000
Matrix:	Soil	Sampled:	07/19/18
Units:	mg/Kg	Received:	07/20/18

Analyte	Result	RL	Batch#	Prepared	Analyzed	Prep	Analysis
Antimony	ND	2.0	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Arsenic	2.7	1.5	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Barium	220	0.26	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Beryllium	0.36	0.10	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Cadmium	ND	0.26	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Chromium	35	0.26	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Cobalt	6.6	0.26	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Copper	16	0.26	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Lead	12	1.0	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Mercury	0.024	0.016	261783	07/26/18	07/26/18	METHOD	EPA 7471A
Molybdenum	ND	0.26	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Nickel	34	0.26	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Selenium	ND	2.0	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Silver	ND	0.26	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Thallium	ND	0.52	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Vanadium	23	0.26	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Zinc	32	1.0	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B

ND= Not Detected
RL= Reporting Limit

ENTHALPY ANALYTICAL

California Title 22 Metals

Lab #:	301639	Project#:	18301-00
Client:	Baseline Environmental	Location:	SR84 Widening & SR84/I 680
Field ID:	S06;0.0-0.5	Basis:	as received
Lab ID:	301639-002	Diln Fac:	1.000
Matrix:	Soil	Sampled:	07/19/18
Units:	mg/Kg	Received:	07/20/18

Analyte	Result	RL	Batch#	Prepared	Analyzed	Prep	Analysis
Antimony	ND	1.9	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Arsenic	3.0	1.4	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Barium	160	0.23	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Beryllium	0.26	0.093	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Cadmium	ND	0.23	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Chromium	30	0.23	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Cobalt	12	0.23	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Copper	11	0.23	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Lead	9.3	0.93	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Mercury	0.026	0.017	261783	07/26/18	07/26/18	METHOD	EPA 7471A
Molybdenum	ND	0.23	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Nickel	34	0.23	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Selenium	ND	1.9	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Silver	ND	0.23	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Thallium	ND	0.47	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Vanadium	21	0.23	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Zinc	41	0.93	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B

ND= Not Detected
RL= Reporting Limit

ENTHALPY ANALYTICAL

California Title 22 Metals

Lab #:	301639	Project#:	18301-00
Client:	Baseline Environmental	Location:	SR84 Widening & SR84/I 680
Field ID:	S11;0.0-0.5	Basis:	as received
Lab ID:	301639-003	Diln Fac:	1.000
Matrix:	Soil	Sampled:	07/19/18
Units:	mg/Kg	Received:	07/20/18

Analyte	Result	RL	Batch#	Prepared	Analyzed	Prep	Analysis
Antimony	ND	2.0	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Arsenic	4.2	1.5	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Barium	130	0.26	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Beryllium	0.31	0.10	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Cadmium	ND	0.26	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Chromium	48	0.26	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Cobalt	11	0.26	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Copper	9.5	0.26	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Lead	8.8	1.0	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Mercury	ND	0.018	261783	07/26/18	07/26/18	METHOD	EPA 7471A
Molybdenum	ND	0.26	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Nickel	40	0.26	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Selenium	ND	2.0	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Silver	ND	0.26	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Thallium	ND	0.52	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Vanadium	27	0.26	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B
Zinc	41	1.0	261623	07/20/18	07/23/18	EPA 3050B	EPA 6010B

ND= Not Detected
RL= Reporting Limit

Batch QC Report

California Title 22 Metals

Lab #:	301639	Location:	SR84 Widening & SR84/I 680
Client:	Baseline Environmental	Prep:	EPA 3050B
Project#:	18301-00	Analysis:	EPA 6010B
Type:	BLANK	Diln Fac:	1.000
Lab ID:	QC940312	Batch#:	261623
Matrix:	Soil	Prepared:	07/20/18
Units:	mg/Kg	Analyzed:	07/23/18

Analyte	Result	RL
Antimony	ND	1.9
Arsenic	ND	1.5
Barium	ND	0.24
Beryllium	ND	0.097
Cadmium	ND	0.24
Chromium	ND	0.24
Cobalt	ND	0.24
Copper	ND	0.24
Lead	ND	0.97
Molybdenum	ND	0.24
Nickel	ND	0.24
Selenium	ND	1.9
Silver	ND	0.24
Thallium	ND	0.49
Vanadium	ND	0.24
Zinc	ND	0.97

ND= Not Detected
RL= Reporting Limit

ENTHALPY ANALYTICAL

Batch QC Report

California Title 22 Metals

Lab #:	301639	Location:	SR84 Widening & SR84/I 680
Client:	Baseline Environmental	Prep:	EPA 3050B
Project#:	18301-00	Analysis:	EPA 6010B
Matrix:	Soil	Batch#:	261623
Units:	mg/Kg	Prepared:	07/20/18
Diln Fac:	1.000	Analyzed:	07/23/18

Type: BS Lab ID: QC940313

Analyte	Spiked	Result	%REC	Limits
Antimony	47.62	48.44	102	80-120
Arsenic	47.62	48.45	102	80-120
Barium	47.62	49.30	104	80-120
Beryllium	23.81	24.29	102	80-120
Cadmium	47.62	47.67	100	80-120
Chromium	47.62	49.22	103	80-120
Cobalt	47.62	48.16	101	80-120
Copper	47.62	47.33	99	80-120
Lead	47.62	48.40	102	80-120
Molybdenum	47.62	48.86	103	80-120
Nickel	47.62	48.33	101	80-120
Selenium	47.62	47.93	101	80-120
Silver	4.762	4.649	98	80-120
Thallium	47.62	49.34	104	80-120
Vanadium	47.62	47.82	100	80-120
Zinc	47.62	48.36	102	80-120

Type: BSD Lab ID: QC940314

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Antimony	51.55	52.19	101	80-120	0	20
Arsenic	51.55	52.63	102	80-120	0	20
Barium	51.55	53.50	104	80-120	0	20
Beryllium	25.77	26.19	102	80-120	0	20
Cadmium	51.55	51.79	100	80-120	0	20
Chromium	51.55	53.41	104	80-120	0	20
Cobalt	51.55	52.19	101	80-120	0	20
Copper	51.55	51.31	100	80-120	0	20
Lead	51.55	52.52	102	80-120	0	20
Molybdenum	51.55	53.03	103	80-120	0	20
Nickel	51.55	52.41	102	80-120	0	20
Selenium	51.55	51.73	100	80-120	0	20
Silver	5.155	5.061	98	80-120	1	20
Thallium	51.55	53.57	104	80-120	0	20
Vanadium	51.55	51.84	101	80-120	0	20
Zinc	51.55	52.68	102	80-120	1	20

RPD= Relative Percent Difference

ENTHALPY ANALYTICAL

Batch QC Report

California Title 22 Metals

Lab #:	301639	Location:	SR84 Widening & SR84/I 680
Client:	Baseline Environmental	Prep:	EPA 3050B
Project#:	18301-00	Analysis:	EPA 6010B
Field ID:	ZZZZZZZZZZ	Batch#:	261623
MSS Lab ID:	301631-001	Sampled:	07/19/18
Matrix:	Soil	Received:	07/20/18
Units:	mg/Kg	Prepared:	07/20/18
Basis:	as received	Analyzed:	07/23/18
Diln Fac:	1.000		

Type: MS Lab ID: QC940315

Analyte	MSS Result	Spiked	Result	%REC	Limits
Antimony	0.4451	51.02	12.40	23 *	75-120
Arsenic	4.548	51.02	52.09	93	80-124
Barium	97.76	51.02	145.5	94	75-125
Beryllium	0.4978	25.51	26.93	104	80-120
Cadmium	0.04715	51.02	51.24	100	80-120
Chromium	37.52	51.02	87.18	97	75-125
Cobalt	9.518	51.02	55.89	91	75-120
Copper	19.08	51.02	73.18	106	77-125
Lead	7.327	51.02	54.06	92	75-125
Molybdenum	0.2562	51.02	43.29	84	75-120
Nickel	42.99	51.02	89.08	90	75-125
Selenium	<0.1760	51.02	44.98	88	75-121
Silver	<0.02804	5.102	4.967	97	75-120
Thallium	<0.08404	51.02	45.09	88	75-120
Vanadium	41.21	51.02	91.19	98	75-125
Zinc	42.23	51.02	94.77	103	75-125

Type: MSD Lab ID: QC940316

Analyte	Spiked	Result	%REC	Limits	RPD	Lim
Antimony	55.56	13.73	24 *	75-120	2	20
Arsenic	55.56	56.96	94	80-124	1	20
Barium	55.56	156.0	105	75-125	4	20
Beryllium	27.78	29.62	105	80-120	1	20
Cadmium	55.56	55.73	100	80-120	0	20
Chromium	55.56	91.89	98	75-125	0	20
Cobalt	55.56	60.32	91	75-120	0	20
Copper	55.56	78.83	108	77-125	1	20
Lead	55.56	58.64	92	75-125	1	20
Molybdenum	55.56	47.28	85	75-120	0	20
Nickel	55.56	93.82	91	75-125	0	20
Selenium	55.56	49.72	89	75-121	1	20
Silver	5.556	5.442	98	75-120	1	20
Thallium	55.56	49.67	89	75-120	1	20
Vanadium	55.56	97.43	101	75-125	2	20
Zinc	55.56	100.5	105	75-125	1	20

*= Value outside of QC limits; see narrative
RPD= Relative Percent Difference

ENTHALPY ANALYTICAL

Batch QC Report

California Title 22 Metals

Lab #:	301639	Location:	SR84 Widening & SR84/I 680
Client:	Baseline Environmental	Prep:	METHOD
Project#:	18301-00	Analysis:	EPA 7471A
Analyte:	Mercury	Diln Fac:	1.000
Type:	BLANK	Batch#:	261783
Lab ID:	QC940944	Prepared:	07/26/18
Matrix:	Soil	Analyzed:	07/26/18
Units:	mg/Kg		

Result	RL
ND	0.016

ND= Not Detected
RL= Reporting Limit

ENTHALPY ANALYTICAL

Batch QC Report

California Title 22 Metals

Lab #:	301639	Location:	SR84 Widening & SR84/I 680
Client:	Baseline Environmental	Prep:	METHOD
Project#:	18301-00	Analysis:	EPA 7471A
Analyte:	Mercury	Batch#:	261783
Matrix:	Soil	Prepared:	07/26/18
Units:	mg/Kg	Analyzed:	07/26/18
Diln Fac:	1.000		

Type	Lab ID	Spiked	Result	%REC	Limits	RPD	Lim
BS	QC940945	0.1695	0.1812	107	80-120		
BSD	QC940946	0.1639	0.1688	103	80-120	4	20

RPD= Relative Percent Difference

ENTHALPY ANALYTICAL

Batch QC Report

California Title 22 Metals

Lab #:	301639	Location:	SR84 Widening & SR84/I 680
Client:	Baseline Environmental	Prep:	METHOD
Project#:	18301-00	Analysis:	EPA 7471A
Analyte:	Mercury	Diln Fac:	1.000
Field ID:	ZZZZZZZZZZ	Batch#:	261783
MSS Lab ID:	301537-001	Sampled:	07/11/18
Matrix:	Soil	Received:	07/17/18
Units:	mg/Kg	Prepared:	07/26/18
Basis:	as received	Analyzed:	07/26/18

Type	Lab ID	MSS Result	Spiked	Result	%REC	Limits	RPD	Lim
MS	QC940947	0.01628	0.1724	0.1956	104	80-120		
MSD	QC940948		0.1639	0.1932	108	80-120	3	20

RPD= Relative Percent Difference

ENTHALPY

ANALYTICAL

Enthalpy Analytical

2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

Laboratory Job Number 301640
ANALYTICAL REPORT

Baseline Environmental	Project : 18301-00
5900 Hollis Street	Location : SR84 Widening & SR84/I 680
Emeryville, CA 94608	Level : II

Sample ID	Lab ID
S01;0.0-0.5	301640-001
S02;0.0-0.5	301640-002
S03;0.0-0.5	301640-003
S04;0.0-0.5	301640-004
S05;0.0-0.5	301640-005
S06;0.0-0.5	301640-006
S07;0.0-0.5	301640-007
S08;0.0-0.5	301640-008
S09;0.0-0.5	301640-009
S10;0.0-0.5	301640-010
S11;0.0-0.5	301640-011
S12;0.0-0.5	301640-012
S13;0.0-0.5	301640-013
S14;0.0-0.5	301640-014
S15;0.0-0.5	301640-015
S16;0.0-0.5	301640-016

This data package has been reviewed for technical correctness and completeness. Release of this data has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature which applies to this PDF file as well as any associated electronic data deliverable files. The results contained in this report meet all requirements of NELAP and pertain only to those samples which were submitted for analysis. This report may be reproduced only in its entirety.

Signature: ______________________ Date: 08/10/2018

Patrick McCarthy
Project Manager
patrick.mccarthy@enthalpy.com
(510) 204-2236 ext 13115

CA ELAP# 2896, NELAP# 4044-001

ENTHALPY ANALYTICAL

CASE NARRATIVE

Laboratory number:	**301640**
Client:	**Baseline Environmental**
Project:	**18301-00**
Location:	**SR84 Widening & SR84/I 680**
Request Date:	**07/20/18**
Samples Received:	**07/20/18**

This data package contains sample and QC results for sixteen soil samples, requested for the above referenced project on 07/20/18. The samples were received cold and intact.

This RGROUP holds misc. rad prods:
No analytical problems were encountered.

BASELINE Environmental Consulting

5900 Hollis Street, Suite D
Emeryville, CA 94608
Tel: (510) 420-8686

CHAIN OF CUSTODY RECORD

LAB LOGIN: 301640

Turn-Around-Time: Standard TAT
Laboratory: Enthalpy
BASELINE Contact Person: Patrick Sutton

Project Number: 18301-00
Project Name: SR84 Widening & SR84/I 680
Samplers: (Signature) William K Scott / Reginald Kamuz

Lab No.	Sample ID	Date	Time	Media	Total No.	SS liner	16 oz glass jar	Poly	40 ML VOA	HCL	HNO3	Ice	US EPA 9310	DOE EML HASL 300 4.5.2.3/GA-01-R						Remarks/ Composite
	S01;0.0-0.5	7-19-18	8:41	Soil	1	1							X							
	S02;0.0-0.5		11:15		1	1							X							
	S03;0.0-0.5		10:50		1	1							X							
	S04;0.0-0.5		10:07		1	1							X							
	S05;0.0-0.5		9:41		1	1							X							
	S06;0.0-0.5		7:49		1	1							X							
	S07;0.0-0.5		11:35		1	1							X							
	S08;0.0-0.5		10:27		1	1							X							
	S09;0.0-0.5		9:27		1	1							X							
	S10;0.0-0.5		9:00		1	1							X							
	S11;0.0-0.5		8:23		1	1							X							
	S12;0.0-0.5		9:55		1	1							X							

Relinquished by: (Signature)	Received by: (Signature)	Date/Time	Remarks:
William K Scott	Pat Gonzalez	7-20-18 8:49	
Relinquished by: (Signature)	Received by: (Signature)	Date/Time	Email contact:
			Patrick@baseline-env.com
Relinquished by: (Signature)	Received by: (Signature)	Date/Time	

Received at laboratory with intact custody seal:	Sample condition upon arrival at lab :	Comments:
Yes No Na	Intact On Ice Cold	

BASELINE Environmental Consulting

5900 Hollis Street, Suite D
Emeryville, CA 94608
Tel: (510) 420-8686

CHAIN OF CUSTODY RECORD

LAB LOGIN 301640

Turn-Around-Time Standard TAT
Laboratory Enthalpy
BASELINE Contact Person Patrick Sutton

Project Number: 18301-00
Project Name: SR84 Widening & SR84/I 680
Samplers: (Signature)

Lab No.	Sample ID	Date	Time	Media	Total No.	SS liner	16 oz glass jar	Poly	40 ML VOA	HCL	HNO3	Ice	US EPA 9310	DOE EML HASL 300 4.5.2.3/GA-01-R					Remarks/ Composite
	S13;0.0-0.5	7-19-18	10:16	Soil	1	1							X						
	S14;0.0-0.5		10:38		1	1							X						
	S15;0.0-0.5		11:00		1	1							X						
	S16;0.0-0.5		11:50		1	1							X						

Relinquished by: (Signature)	Received by: (Signature)	Date/Time
	Pat Gonzalez	7-20-18 8:49
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time

Remarks:

Email contact: Patrick@baseline-env.com

Received at laboratory with intact custody seal: Yes No Na

Sample condition upon arrival at lab : Intact On Ice Cold

Comments:

Soil Sample_MASTER Label GE Samples.xlsx - 7/20/2018

SAMPLE RECEIPT CHECKLIST

ENTHALPY

Section 1: Login # 301640 Client: Baseline
Date Received: 7-20-18 Project: 18301-00

Section 2: Samples received in a cooler? ☒ Yes, how many? 1 ☐ No (skip Section 3 below)
If no cooler Sample Temp (°C): ______ using IR Gun # ☐ A, or ☐ B
☐ Samples received on ice directly from the field. Cooling process had begun
If in cooler: Date Opened 7-20-18 By (print) TKU (sign) TKU
Shipping info (if applicable) ______
Are custody seals present? ☒ No, or ☐ Yes. If yes, where? ☐ on cooler, ☐ on samples, ☐ on package
☐ Date: ______ How many ______ ☐ Signature, ☐ Initials, ☐ None
Were custody seals intact upon arrival? ☐ Yes ☐ No ☒ N/A

Section 3: *Important*: Notify PM if temperature exceeds 6°C or arrive frozen.
Packing in cooler: (if other, describe) ______
☐ Bubble Wrap, ☐ Foam blocks, ☐ Bags, ☒ None, ☐ Cloth material, ☐ Cardboard, ☐ Styrofoam, ☐ Paper towels
☐ Samples received on ice directly from the field. Cooling process had begun
Type of ice used: ☒ Wet, ☐ Blue/Gel, ☐ None Temperature blank(s) included? ☐ Yes, ☒ No
Temperature measured using ☐ Thermometer ID: ______, or IR Gun # ☐ A ☒ B
Cooler Temp (°C): #1: 3.5, #2: ____, #3: ____, #4: ____, #5: ____, #6: ____, #7: ____

Section 4:	YES	NO	N/A
Were custody papers dry, filled out properly, and the project identifiable	X		
Were Method 5035 sampling containers present?		X	
If YES, what time were they transferred to freezer? ______			
Did all bottles arrive unbroken/unopened?	X		
Are there any missing / extra samples?		X	
Are samples in the appropriate containers for indicated tests?	X		
Are sample labels present, in good condition and complete?	X		
Does the container count match the COC?	X		
Do the sample labels agree with custody papers?	X		
Was sufficient amount of sample sent for tests requested?	X		
Did you change the hold time in LIMS for unpreserved VOAs?			X
Did you change the hold time in LIMS for preserved terracores?			X
Are bubbles > 6mm absent in VOA samples?			X
Was the client contacted concerning this sample delivery?		X	
If YES, who was called? ______ By ______ Date: ______			

Section 5:	YES	NO	N/A
Are the samples appropriately preserved? (If N/A, skip the rest of section 5)			X
Did you check preservatives for all bottles for each sample?			
Did you document your preservative check?			

pH strip lot# ______, pH strip lot# ______, pH strip lot# ______
Preservative added:
☐ H2SO4 lot# ______ added to samples ______ on/at ______
☐ HCL lot# ______ added to samples ______ on/at ______
☐ HNO3 lot# ______ added to samples ______ on/at ______
☐ NaOH lot# ______ added to samples ______ on/at ______

Section 6:
Explanations/Comments: ______

Date Logged In 7-20-18 **By (print)** KP **(sign)** KP
Date Labeled 7-20-18 **By (print)** KP **(sign)** KP

ENTHALPY ANALYTICAL

Detections Summary for 301640

Results for any subcontracted analyses are not included in this summary.

Client : Baseline Environmental
Project : 18301-00
Location : SR84 Widening & SR84/I 680

Client Sample ID : S01;0.0-0.5 Laboratory Sample ID : 301640-001

No Detections

Client Sample ID : S02;0.0-0.5 Laboratory Sample ID : 301640-002

No Detections

Client Sample ID : S03;0.0-0.5 Laboratory Sample ID : 301640-003

No Detections

Client Sample ID : S04;0.0-0.5 Laboratory Sample ID : 301640-004

No Detections

Client Sample ID : S05;0.0-0.5 Laboratory Sample ID : 301640-005

No Detections

Client Sample ID : S06;0.0-0.5 Laboratory Sample ID : 301640-006

No Detections

Client Sample ID : S07;0.0-0.5 Laboratory Sample ID : 301640-007

No Detections

Client Sample ID : S08;0.0-0.5 Laboratory Sample ID : 301640-008

No Detections

Client Sample ID : S09;0.0-0.5 Laboratory Sample ID : 301640-009

No Detections

ENTHALPY ANALYTICAL

Client Sample ID : S10;0.0-0.5	Laboratory Sample ID : 301640-010

No Detections

Client Sample ID : S11;0.0-0.5	Laboratory Sample ID : 301640-011

No Detections

Client Sample ID : S12;0.0-0.5	Laboratory Sample ID : 301640-012

No Detections

Client Sample ID : S13;0.0-0.5	Laboratory Sample ID : 301640-013

No Detections

Client Sample ID : S14;0.0-0.5	Laboratory Sample ID : 301640-014

No Detections

Client Sample ID : S15;0.0-0.5	Laboratory Sample ID : 301640-015

No Detections

Client Sample ID : S16;0.0-0.5	Laboratory Sample ID : 301640-016

No Detections

Laboratory Job Number 301640

Subcontracted Products

General Engineering Labs

GEL Laboratories LLC

a member of **The GEL Group** INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171
F 843.766.1178

gel.com

August 10, 2018

Mr. Patrick McCarthy
Enthalpy Analytical, LLC
2323 5th Street
Berkeley, California 94710

Re: Project Number:
Work Order: 455294

Dear Mr. McCarthy:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on July 24, 2018. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4485.

Sincerely,

B Luthman
Brielle Luthman for
Valerie Davis
Project Manager

Enclosures

Table of Contents

Case Narrative

Receipt Narrative
for
Enthalpy Analytical, LLC
SDG: 455294

August 10, 2018

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on July 24, 2018 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

Sample Identification: The laboratory received the following samples:

Laboratory ID	Client ID
455294001	S01; 0.0-0.5
455294002	S02; 0.0-0.5
455294003	S03; 0.0-0.5
455294004	S04; 0.0-0.5
455294005	S05; 0.0-0.5
455294006	S06; 0.0-0.5
455294007	S07; 0.0-0.5
455294008	S08; 0.0-0.5
455294009	S09; 0.0-0.5
455294010	S10; 0.0-0.5
455294011	S11; 0.0-0.5
455294012	S12; 0.0-0.5
455294013	S13; 0.0-0.5
455294014	S14; 0.0-0.5
455294015	S15; 0.0-0.5
455294016	S16; 0.0-0.5

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

B Luthman
Brielle Luthman for
Valerie Davis
Project Manager

Chain of Custody and Supporting Documentation

Enthalpy Berkeley

2323 Fifth Street
Berkeley, CA 94710
(510) 486-0900
(510) 486-0532

455294

Project Number: 301640
Site: SR84 Widening & SR84/I 680

Subcontract Laboratory:
General Engineering Labs
2040 Savage Road
Charleston, SC 29407
(843) 556-8171
ATTN: Valerie Davis

Results due: Report Level: II

Please send report to: Patrick McCarthy (patrick.mccarthy@enthalpy.com)
*** Please report using Sample ID rather than Enthalpy (Berkeley) Lab #.

Sample ID	Sampled	Matrix	Analysis	Lab #	Comments
S01;0.0-0.5	07/19 08:41	Soil	GROSS ALPHA/BETA	301640-001	
S02;0.0-0.5	07/19 11:15	Soil	GROSS ALPHA/BETA	301640-002	
S03;0.0-0.5	07/19 10:50	Soil	GROSS ALPHA/BETA	301640-003	
S04;0.0-0.5	07/19 10:07	Soil	GROSS ALPHA/BETA	301640-004	
S05;0.0-0.5	07/19 09:41	Soil	GROSS ALPHA/BETA	301640-005	
S06;0.0-0.5	07/19 07:49	Soil	GROSS ALPHA/BETA	301640-006	
S07;0.0-0.5	07/19 11:35	Soil	GROSS ALPHA/BETA	301640-007	
S08;0.0-0.5	07/19 10:27	Soil	GROSS ALPHA/BETA	301640-008	
S09;0.0-0.5	07/19 09:27	Soil	GROSS ALPHA/BETA	301640-009	
S10;0.0-0.5	07/19 09:00	Soil	GROSS ALPHA/BETA	301640-010	
S11;0.0-0.5	07/19 08:23	Soil	GROSS ALPHA/BETA	301640-011	
S12;0.0-0.5	07/19 09:55	Soil	GROSS ALPHA/BETA	301640-012	
S13;0.0-0.5	07/19 10:16	Soil	GROSS ALPHA/BETA	301640-013	
S14;0.0-0.5	07/19 10:38	Soil	GROSS ALPHA/BETA	301640-014	
S15;0.0-0.5	07/19 11:00	Soil	GROSS ALPHA/BETA	301640-015	
S16;0.0-0.5	07/19 11:50	Soil	GROSS ALPHA/BETA	301640-016	

Notes:	Relinquished By:	Received By:
	[signature] Date/Time: 7-23-18 13:51	[signature] Date/Time: 7/24/18 9:00
	Date/Time:	Date/Time:

Signature on this form constitutes a firm Purchase Order for the services requested above.
Page 1 of 1

GEL Laboratories LLC VD

SAMPLE RECEIPT & REVIEW FORM

Client: CBTL	SDG/AR/COC/Work Order: 455294
Received By: AJA	Date Received: 7/24/18
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground UPS Field Services Courier Other 7727 9693 6293

Suspected Hazard Information	Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
Shipped as a DOT Hazardous?		✓	Hazard Class Shipped: UN#:
COC/Samples marked or classified as radioactive?		✓	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): Ø CPM / mR/Hr Classified as: Rad 1 Rad 2 Rad 3
Is package, COC, and/or Samples marked HAZ?		✓	If yes, select Hazards below, and contact the GEL Safety Group. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other:

	Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		Preservation Method: Wet Ice Ice Packs Dry ice None Other: *all temperatures are recorded in Celsius TEMP: 3°
4	Daily check performed and passed on IR temperature gun?	✓			Temperature Device Serial #: IR2-18 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?		✓		Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	If Yes, Are Encores or Soil Kits present? Yes___ No___ (If yes, take to VOA Freezer) Do VOA vials contain acid preservation? Yes No___ N/A (If unknown, select No) VOA vials free of headspace? Yes No___ N/A Sample ID's and containers affected:
8	Samples received within holding time?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			Sample ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			Sample ID's affected:
11	Number of containers received match number indicated on COC?	✓			Sample ID's affected:
12	Are sample containers identifiable as GEL provided?			✓	
13	COC form is properly signed in relinquished/received sections?	✓			

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials TMC Date 7/25/18 Page 1 of 1

GL-CHL-SR-001 Rev 5

Laboratory Certifications

List of current GEL Certifications as of 10 August 2018

State	Certification
Alaska	17–018
Arkansas	88–0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH–0169
Delaware	SC00012
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330–15–00283, P330–15–00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho Chemistry	SC00012
Idaho Radiochemistry	SC00012
Illinois NELAP	200029
Indiana	C–SC–01
Kansas NELAP	E–10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana NELAP	03046 (AI33904)
Louisiana SDWA	LA180011
Maryland	270
Massachusetts	M–SC012
Michigan	9976
Mississippi	SC00012
Nebraska	NE–OS–26–13
Nevada	SC000122018–1
New Hampshire NELAP	205415
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R–158
Oklahoma	9904
Pennsylvania NELAP	68–00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235–18–13
Utah NELAP	SC000122018–26
Vermont	VT87156
Virginia NELAP	460202
Washington	C780
West Virginia	997404

Radiological Analysis

Case Narrative

Radiochemistry
Technical Case Narrative
Enthalpy Analytical, LLC (CRTL)
SDG #: 455294

Product: **Dry Weight**
Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 23
Preparation Batch: 1785613

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
455294001	S01; 0.0-0.5
455294002	S02; 0.0-0.5
455294003	S03; 0.0-0.5
455294004	S04; 0.0-0.5
455294005	S05; 0.0-0.5
455294006	S06; 0.0-0.5
455294007	S07; 0.0-0.5
455294008	S08; 0.0-0.5
455294009	S09; 0.0-0.5
455294010	S10; 0.0-0.5
455294011	S11; 0.0-0.5
455294012	S12; 0.0-0.5
455294013	S13; 0.0-0.5
455294014	S14; 0.0-0.5
455294015	S15; 0.0-0.5
455294016	S16; 0.0-0.5

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: **GFPC Gross A/B, Solid**
Analytical Method: EPA 900.0/SW846 9310/SM 7110B Modified
Analytical Procedure: GL-RAD-A-001B REV# 19
Analytical Batch: 1790768

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 23
Preparation Batch: 1785613

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
455294001	S01; 0.0-0.5
455294002	S02; 0.0-0.5
455294003	S03; 0.0-0.5
455294004	S04; 0.0-0.5
455294005	S05; 0.0-0.5
455294006	S06; 0.0-0.5
455294007	S07; 0.0-0.5
455294008	S08; 0.0-0.5
455294009	S09; 0.0-0.5
455294010	S10; 0.0-0.5
455294011	S11; 0.0-0.5
455294012	S12; 0.0-0.5
455294013	S13; 0.0-0.5
455294014	S14; 0.0-0.5
455294015	S15; 0.0-0.5
455294016	S16; 0.0-0.5
1204088024	Method Blank (MB)
1204088025	455294001(S01; 0.0-0.5) Sample Duplicate (DUP)
1204088026	455294001(S01; 0.0-0.5) Matrix Spike (MS)
1204088027	455294001(S01; 0.0-0.5) Matrix Spike Duplicate (MSD)
1204088028	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

Duplication Criteria between QC Sample and Duplicate Sample
The Sample and the Duplicate, (See Below), did not meet the relative percent difference requirement; however, they do meet the relative error ratio requirement with the value listed below.

Sample	Analyte	Value
1204088025 (S01; 0.0-0.5DUP)	BETA	RPD 47.2* (0.00%-20.00%) RER 2.45 (0-3)

Technical Information

Sample Re-prep/Re-analysis
Samples were reprepped due to high relative percent difference/relative error ratio. The re-analysis is being reported.

Gross Alpha/Beta Preparation Information
High hygroscopic salt content in evaporated samples can cause the sample mass to fluctuate due to moisture absorption. To minimize this interference, the salts are converted to oxides by heating the sample under a flame until a dull red color is obtained. The conversion to oxides stabilizes the sample weight and ensures that proper alpha/beta efficiencies are assigned for each sample. Volatile radioisotopes of carbon, hydrogen, technetium, polonium and cesium may be lost during sample heating.

Recounts
Sample 455294012 (S12; 0.0-0.5) was recounted to verify sample results. Recount is reported. Samples 1204088025 (S01; 0.0-0.5DUP) and 455294001 (S01; 0.0-0.5) were recounted due to high relative percent difference/relative error ratio. The recounts are reported.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

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Qualifier Definition Report
for

CRTL001 Enthalpy Analytical, LLC

Client SDG: 455294 GEL Work Order: 455294

The Qualifiers in this report are defined as follows:

*	A quality control analyte recovery is outside of specified acceptance criteria
**	Analyte is a Tracer compound
M	Result above MDC and less than RDL
U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: Theresa L Austin **Name:** Theresa Austin

Date: 10 AUG 2018 **Title:** Group Leader

Sample Data Summary

Certificate of Analysis

Report Date: August 10, 2018

Company :	Enthalpy Analytical, LLC
Address :	2323 5th Street
	Berkeley, California 94710
Contact:	Mr. Patrick McCarthy
Project:	Project Number:

Client Sample ID:	S01; 0.0-0.5	Project:	CRTL00117
Sample ID:	455294001	Client ID:	CRTL001
Matrix:	Soil		
Collect Date:	19-JUL-18 08:41		
Receive Date:	24-JUL-18		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Gross A/B, Solid "Dry Weight Corrected"													
Alpha		10.5	+/-4.14	3.77	4.00	pCi/g			JXK3	08/09/18	1612	1790768	1
Beta		16.2	+/-2.93	2.89	10.0	pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	07/27/18	0829	1785613

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 900.0/SW846 9310/SM 7110B Modified	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: August 10, 2018

Company :	Enthalpy Analytical, LLC
Address :	2323 5th Street
	Berkeley, California 94710
Contact:	Mr. Patrick McCarthy
Project:	Project Number:

Client Sample ID:	S02; 0.0-0.5	Project:	CRTL00117
Sample ID:	455294002	Client ID:	CRTL001
Matrix:	Soil		
Collect Date:	19-JUL-18 11:15		
Receive Date:	24-JUL-18		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Gross A/B, Solid "Dry Weight Corrected"													
Alpha		14.8	+/-5.02	3.95	4.00	pCi/g			JXK3	08/09/18	1314	1790768	1
Beta		12.5	+/-2.94	2.86	10.0	pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	07/27/18	0829	1785613

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 900.0/SW846 9310/SM 7110B Modified	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: August 10, 2018

Company :	Enthalpy Analytical, LLC
Address :	2323 5th Street
	Berkeley, California 94710
Contact:	Mr. Patrick McCarthy
Project:	Project Number:

Client Sample ID:	S03; 0.0-0.5	Project:	CRTL00117
Sample ID:	455294003	Client ID:	CRTL001
Matrix:	Soil		
Collect Date:	19-JUL-18 10:50		
Receive Date:	24-JUL-18		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Gross A/B, Solid "Dry Weight Corrected"													
Alpha		10.3	+/-3.81	3.95	4.00	pCi/g			JXK3	08/09/18	1313	1790768	1
Beta	M	8.60	+/-2.12	2.16	10.0	pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	07/27/18	0829	1785613

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 900.0/SW846 9310/SM 7110B Modified	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: August 10, 2018

Company :	Enthalpy Analytical, LLC
Address :	2323 5th Street
	Berkeley, California 94710
Contact:	Mr. Patrick McCarthy
Project:	Project Number:

Client Sample ID:	S04; 0.0-0.5	Project:	CRTL00117
Sample ID:	455294004	Client ID:	CRTL001
Matrix:	Soil		
Collect Date:	19-JUL-18 10:07		
Receive Date:	24-JUL-18		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Gross A/B, Solid "Dry Weight Corrected"													
Alpha		8.00	+/-3.30	3.86	4.00	pCi/g			JXK3	08/09/18	1314	1790768	1
Beta	M	8.13	+/-1.96	2.10	10.0	pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	07/27/18	0829	1785613

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 900.0/SW846 9310/SM 7110B Modified	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: August 10, 2018

Company :	Enthalpy Analytical, LLC
Address :	2323 5th Street
	Berkeley, California 94710
Contact:	Mr. Patrick McCarthy
Project:	Project Number:

Client Sample ID:	S05; 0.0-0.5	Project:	CRTL00117
Sample ID:	455294005	Client ID:	CRTL001
Matrix:	Soil		
Collect Date:	19-JUL-18 09:41		
Receive Date:	24-JUL-18		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Gross A/B, Solid "Dry Weight Corrected"													
Alpha		8.95	+/-3.69	3.88	4.00	pCi/g			JXK3	08/09/18	1313	1790768	1
Beta		13.3	+/-2.75	3.03	10.0	pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	07/27/18	0829	1785613

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 900.0/SW846 9310/SM 7110B Modified	

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: August 10, 2018

Company :	Enthalpy Analytical, LLC
Address :	2323 5th Street
	Berkeley, California 94710
Contact:	Mr. Patrick McCarthy
Project:	Project Number:

Client Sample ID:	S06; 0.0-0.5	Project:	CRTL00117
Sample ID:	455294006	Client ID:	CRTL001
Matrix:	Soil		
Collect Date:	19-JUL-18 07:49		
Receive Date:	24-JUL-18		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Gross A/B, Solid "Dry Weight Corrected"													
Alpha		7.34	+/-3.57	3.98	4.00	pCi/g			JXK3	08/09/18	1313	1790768	1
Beta		10.8	+/-2.94	3.68	10.0	pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	07/27/18	0829	1785613

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 900.0/SW846 9310/SM 7110B Modified	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

Certificate of Analysis

Report Date: August 10, 2018

Company :	Enthalpy Analytical, LLC
Address :	2323 5th Street
	Berkeley, California 94710
Contact:	Mr. Patrick McCarthy
Project:	Project Number:

Client Sample ID:	S07; 0.0-0.5	Project:	CRTL00117
Sample ID:	455294007	Client ID:	CRTL001
Matrix:	Soil		
Collect Date:	19-JUL-18 11:35		
Receive Date:	24-JUL-18		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Gross A/B, Solid "Dry Weight Corrected"													
Alpha		14.3	+/-4.39	3.84	4.00	pCi/g			JXK3	08/09/18	1313	1790768	1
Beta		13.7	+/-2.98	3.42	10.0	pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	07/27/18	0829	1785613

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 900.0/SW846 9310/SM 7110B Modified	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: August 10, 2018

Company :	Enthalpy Analytical, LLC
Address :	2323 5th Street
	Berkeley, California 94710
Contact:	Mr. Patrick McCarthy
Project:	Project Number:

Client Sample ID:	S08; 0.0-0.5	Project:	CRTL00117
Sample ID:	455294008	Client ID:	CRTL001
Matrix:	Soil		
Collect Date:	19-JUL-18 10:27		
Receive Date:	24-JUL-18		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Gross A/B, Solid "Dry Weight Corrected"													
Alpha		14.4	+/-4.62	3.89	4.00	pCi/g			JXK3	08/09/18	1313	1790768	1
Beta		16.7	+/-3.30	3.54	10.0	pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	07/27/18	0829	1785613

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 900.0/SW846 9310/SM 7110B Modified	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: August 10, 2018

Company :	Enthalpy Analytical, LLC
Address :	2323 5th Street
	Berkeley, California 94710
Contact:	Mr. Patrick McCarthy
Project:	Project Number:

Client Sample ID:	S09; 0.0-0.5	Project:	CRTL00117
Sample ID:	455294009	Client ID:	CRTL001
Matrix:	Soil		
Collect Date:	19-JUL-18 09:27		
Receive Date:	24-JUL-18		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Gross A/B, Solid "Dry Weight Corrected"													
Alpha		8.06	+/-3.41	3.85	4.00	pCi/g			JXK3	08/09/18	1314	1790768	1
Beta		33.2	+/-3.51	2.37	10.0	pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	07/27/18	0829	1785613

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 900.0/SW846 9310/SM 7110B Modified	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: August 10, 2018

Company :	Enthalpy Analytical, LLC
Address :	2323 5th Street
	Berkeley, California 94710
Contact:	Mr. Patrick McCarthy
Project:	Project Number:

Client Sample ID:	S10; 0.0-0.5	Project:	CRTL00117
Sample ID:	455294010	Client ID:	CRTL001
Matrix:	Soil		
Collect Date:	19-JUL-18 09:00		
Receive Date:	24-JUL-18		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Gross A/B, Solid "Dry Weight Corrected"													
Alpha		11.9	+/-4.04	3.77	4.00	pCi/g			JXK3	08/09/18	1314	1790768	1
Beta		37.9	+/-3.74	2.22	10.0	pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	07/27/18	0829	1785613

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 900.0/SW846 9310/SM 7110B Modified	

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: August 10, 2018

Company :	Enthalpy Analytical, LLC
Address :	2323 5th Street
	Berkeley, California 94710
Contact:	Mr. Patrick McCarthy
Project:	Project Number:

Client Sample ID:	S11; 0.0-0.5	Project:	CRTL00117
Sample ID:	455294011	Client ID:	CRTL001
Matrix:	Soil		
Collect Date:	19-JUL-18 08:23		
Receive Date:	24-JUL-18		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Gross A/B, Solid "Dry Weight Corrected"													
Alpha		7.12	+/-3.13	3.83	4.00	pCi/g			JXK3	08/09/18	1314	1790768	1
Beta	M	6.19	+/-1.94	2.51	10.0	pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	07/27/18	0829	1785613

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 900.0/SW846 9310/SM 7110B Modified	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: August 10, 2018

Company : Enthalpy Analytical, LLC
Address : 2323 5th Street

Berkeley, California 94710
Contact: Mr. Patrick McCarthy
Project: Project Number:

Client Sample ID:	S12; 0.0-0.5	Project:	CRTL00117
Sample ID:	455294012	Client ID:	CRTL001
Matrix:	Soil		
Collect Date:	19-JUL-18 09:55		
Receive Date:	24-JUL-18		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Gross A/B, Solid "Dry Weight Corrected"													
Alpha		6.38	+/-3.28	3.79	4.00	pCi/g			JXK3	08/10/18	0634	1790768	1
Beta	M	9.33	+/-2.63	3.32	10.0	pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	07/27/18	0829	1785613

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 900.0/SW846 9310/SM 7110B Modified	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: August 10, 2018

Company :	Enthalpy Analytical, LLC
Address :	2323 5th Street
	Berkeley, California 94710
Contact:	Mr. Patrick McCarthy
Project:	Project Number:

Client Sample ID:	S13; 0.0-0.5	Project:	CRTL00117
Sample ID:	455294013	Client ID:	CRTL001
Matrix:	Soil		
Collect Date:	19-JUL-18 10:16		
Receive Date:	24-JUL-18		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Gross A/B, Solid "Dry Weight Corrected"													
Alpha		9.50	+/-3.57	3.97	4.00	pCi/g			JXK3	08/09/18	1314	1790768	1
Beta		19.7	+/-3.14	3.22	10.0	pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	07/27/18	0829	1785613

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 900.0/SW846 9310/SM 7110B Modified	

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: August 10, 2018

Company : Enthalpy Analytical, LLC
Address : 2323 5th Street

Berkeley, California 94710
Contact: Mr. Patrick McCarthy
Project: Project Number:

Client Sample ID:	S14; 0.0-0.5	Project:	CRTL00117
Sample ID:	455294014	Client ID:	CRTL001
Matrix:	Soil		
Collect Date:	19-JUL-18 10:38		
Receive Date:	24-JUL-18		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Gross A/B, Solid "Dry Weight Corrected"													
Alpha		14.0	+/-4.80	3.74	4.00	pCi/g			JXK3	08/09/18	1314	1790768	1
Beta		12.3	+/-2.78	2.62	10.0	pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	07/27/18	0829	1785613

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 900.0/SW846 9310/SM 7110B Modified	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: August 10, 2018

Company :	Enthalpy Analytical, LLC
Address :	2323 5th Street
	Berkeley, California 94710
Contact:	Mr. Patrick McCarthy
Project:	Project Number:

Client Sample ID:	S15; 0.0-0.5	Project:	CRTL00117
Sample ID:	455294015	Client ID:	CRTL001
Matrix:	Soil		
Collect Date:	19-JUL-18 11:00		
Receive Date:	24-JUL-18		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Gross A/B, Solid "Dry Weight Corrected"													
Alpha		12.2	+/-4.54	3.93	4.00	pCi/g			JXK3	08/09/18	1314	1790768	1
Beta		12.9	+/-2.99	3.08	10.0	pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	07/27/18	0829	1785613

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 900.0/SW846 9310/SM 7110B Modified	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: August 10, 2018

Company :	Enthalpy Analytical, LLC
Address :	2323 5th Street
	Berkeley, California 94710
Contact:	Mr. Patrick McCarthy
Project:	Project Number:

Client Sample ID:	S16; 0.0-0.5	Project:	CRTL00117
Sample ID:	455294016	Client ID:	CRTL001
Matrix:	Soil		
Collect Date:	19-JUL-18 11:50		
Receive Date:	24-JUL-18		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gas Flow Proportional Counting													
GFPC Gross A/B, Solid "Dry Weight Corrected"													
Alpha		13.3	+/-4.62	3.89	4.00	pCi/g			JXK3	08/09/18	1314	1790768	1
Beta		15.3	+/-2.83	2.47	10.0	pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	07/27/18	0829	1785613

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 900.0/SW846 9310/SM 7110B Modified	

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Quality Control Summary

GEL LABORATORIES LLC
2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: August 10, 2018

Enthalpy Analytical, LLC
2323 5th Street
Berkeley, California

Contact: **Mr. Patrick McCarthy**

Workorder: **455294**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gas Flow										
Batch 1790768										
QC1204088025 455294001 DUP										
Alpha		10.5		8.28	pCi/g	23.8		(0% - 100%)	JXK3	08/09/18 16:12
	Uncertainty	+/-4.14		+/-3.41						
Beta		16.2		10.0	pCi/g	47.2*		(0%-20%)		
	Uncertainty	+/-2.93		+/-2.97						
QC1204088028 LCS										
Alpha	104			109	pCi/g		105	(75%-125%)		08/09/18 13:13
	Uncertainty			+/-9.98						
Beta	401			427	pCi/g		106	(75%-125%)		
	Uncertainty			+/-14.6						
QC1204088024 MB										
Alpha			U	0.554	pCi/g					08/09/18 13:14
	Uncertainty			+/-1.59						
Beta			U	-0.165	pCi/g					
	Uncertainty			+/-2.30						
QC1204088026 455294001 MS										
Alpha	119	10.5		153	pCi/g		119	(75%-125%)		08/09/18 13:13
	Uncertainty	+/-4.14		+/-17.5						
Beta	461	16.2		483	pCi/g		101	(75%-125%)		
	Uncertainty	+/-2.93		+/-17.8						
QC1204088027 455294001 MSD										
Alpha	116	10.5		132	pCi/g	14.6	105	(0%-20%)		08/09/18 13:13
	Uncertainty	+/-4.14		+/-15.5						
Beta	448	16.2		434	pCi/g	10.6	93.3	(0%-20%)		
	Uncertainty	+/-2.93		+/-15.9						

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

- ** Analyte is a Tracer compound
- < Result is less than value reported
- > Result is greater than value reported

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Workorder: 455294

Page 2 of 2

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

BD	Results are either below the MDC or tracer recovery is low
FA	Failed analysis.
H	Analytical holding time was exceeded
J	Value is estimated
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
M	Result above MDC and less than RDL
N/A	RPD or %Recovery limits do not apply.
N1	See case narrative
ND	Analyte concentration is not detected above the detection limit
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
R	Sample results are rejected
U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
UI	Gamma Spectroscopy--Uncertain identification
UJ	Gamma Spectroscopy--Uncertain identification
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
X	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
h	Preparation or preservation holding time was exceeded

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.
^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.
* Indicates that a Quality Control parameter was not within specifications.
For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

ENTHALPY

ANALYTICAL

Enthalpy Analytical

2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

Laboratory Job Number 302601
ANALYTICAL REPORT

Baseline Environmental	Project : 18301-00
5900 Hollis Street	Location : SR84 Widening & SR84/I 680
Emeryville, CA 94608	Level : II

Sample ID	Lab ID
S02;0.0-0.5	302601-001
S09;0.0-0.5	302601-002
S10;0.0-0.5	302601-003

This data package has been reviewed for technical correctness and completeness. Release of this data has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature which applies to this PDF file as well as any associated electronic data deliverable files. The results contained in this report meet all requirements of NELAP and pertain only to those samples which were submitted for analysis. This report may be reproduced only in its entirety.

Signature: ______________________ Date: 08/23/2018

Patrick McCarthy
Project Manager
patrick.mccarthy@enthalpy.com
(510) 204-2236 ext 13115

CA ELAP# 2896, NELAP# 4044-001

ENTHALPY ANALYTICAL

CASE NARRATIVE

Laboratory number:	**302601**
Client:	**Baseline Environmental**
Project:	**18301-00**
Location:	**SR84 Widening & SR84/I 680**
Request Date:	**08/16/18**
Samples Received:	**07/20/18**

This data package contains sample and QC results for three soil samples, requested for the above referenced project on 08/16/18. The samples were received cold and intact.

Gamma Scan (EMLHASL 300):
General Engineering Labs in Charleston, SC performed the analysis (NELAP certified). Please see the General Engineering Labs case narrative.

MONTROSE

302601
Patrick McCarthy <pmccarthy@montrose-env.com>

Re: 18301-00 - Enthalpy (Berkeley) Data (301640)

Patrick Sutton <patrick@baseline-env.com> Thu, Aug 16, 2018 at 1:45 PM
To: Patrick McCarthy <patrick.mccarthy@enthalpy.com>
Cc: Redgy Ramirez <redgy@baseline-env.com>, William Scott <bill@baseline-env.com>

Sure - we actually have an updated request, so let me start over.

Please perform a gamma scan (DOE EML HASL 300 4.5.2.3 /GA-01-R) of samples S02;0.0-0.5, S09;0.0-0.5, and S10;0.0-0.5. To be consistent with previous investigations performed in this area, please include the list of isotopes shown below. In particular, we want to look at Co-60 and Cs-137. We would also like to request an expedited 5-day turnaround service.

Thanks,
Patrick Sutton

K-40
Co-60
Cs-137
Cs-134
Tl-208
Pb-210
Bi-210
Po-210
Pb-212
Bi-214
Pb-214
Ra-226
Po-214
Th-228
Th-232
Th-234
Pa-234m
Pa-234
Po-216
Po-218

Patrick Sutton
Environmental Engineer

Baseline Environmental Consulting
5900 Hollis Street, Suite D
Emeryville, CA 94608
Main: (510) 420-8686
Direct: (510) 922-0080

ENTHALPY ANALYTICAL

Detections Summary for 302601

Results for any subcontracted analyses are not included in this summary.

Client : Baseline Environmental
Project : 18301-00
Location : SR84 Widening & SR84/I 680

Client Sample ID : S02;0.0-0.5 Laboratory Sample ID : 302601-001

No Detections

Client Sample ID : S09;0.0-0.5 Laboratory Sample ID : 302601-002

No Detections

Client Sample ID : S10;0.0-0.5 Laboratory Sample ID : 302601-003

No Detections

Laboratory Job Number 302601

Subcontracted Products

General Engineering Labs

GEL Laboratories LLC
a member of The GEL Group INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171
F 843.766.1178

gel.com

August 21, 2018

Mr. Patrick McCarthy
Enthalpy Analytical, LLC
2323 5th Street
Berkeley, California 94710

Re: Project Number:
Work Order: 457517

Dear Mr. McCarthy:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on July 24, 2018. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4485.

Sincerely,

B Luthman
Brielle Luthman for
Valerie Davis
Project Manager

Enclosures

Table of Contents

Case Narrative

Receipt Narrative
for
Enthalpy Analytical, LLC
SDG: 457517

August 21, 2018

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary:

Sample receipt: The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on July 24, 2018 for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. There are no additional comments concerning sample receipt.

Sample Identification: The laboratory received the following samples:

Laboratory ID	Client ID
457517001	S09; 0.0-0.5
457517002	S10; 0.0-0.5
457517003	S02; 0.0-0.5

Case Narrative:

Sample analyses were conducted using methodology as outlined in GEL's Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: Radiochemistry.

B Luthman
Brielle Luthman for
Valerie Davis
Project Manager

Chain of Custody and Supporting Documentation

R- 457517

Enthalpy Berkeley

2323 Fifth Street
Berkeley, CA 94710
(510) 486-0900
(510) 486-0532

455294

Project Number: 301640
Site: SR84 Widening & SR84/I 680

Subcontract Laboratory:
General Engineering Labs
2040 Savage Road
Charleston, SC 29407
(843) 556-8171
ATTN: Valerie Davis

Results due: Report Level: II

Please send report to: Patrick McCarthy (patrick.mccarthy@enthalpy.com)
*** Please report using Sample ID rather than Enthalpy (Berkeley) Lab #.

Sample ID	Sampled	Matrix	Analysis	Lab #	Comments
S01;0.0-0.5	07/19 08:41	Soil	GROSS ALPHA/BETA	301640-001	
S02;0.0-0.5	07/19 11:15	Soil	GROSS ALPHA/BETA	301640-002	
S03;0.0-0.5	07/19 10:50	Soil	GROSS ALPHA/BETA	301640-003	
S04;0.0-0.5	07/19 10:07	Soil	GROSS ALPHA/BETA	301640-004	
S05;0.0-0.5	07/19 09:41	Soil	GROSS ALPHA/BETA	301640-005	
S06;0.0-0.5	07/19 07:49	Soil	GROSS ALPHA/BETA	301640-006	
S07;0.0-0.5	07/19 11:35	Soil	GROSS ALPHA/BETA	301640-007	
S08;0.0-0.5	07/19 10:27	Soil	GROSS ALPHA/BETA	301640-008	
S09;0.0-0.5	07/19 09:27	Soil	GROSS ALPHA/BETA	301640-009	
S10;0.0-0.5	07/19 09:00	Soil	GROSS ALPHA/BETA	301640-010	
S11;0.0-0.5	07/19 08:23	Soil	GROSS ALPHA/BETA	301640-011	
S12;0.0-0.5	07/19 09:55	Soil	GROSS ALPHA/BETA	301640-012	
S13;0.0-0.5	07/19 10:16	Soil	GROSS ALPHA/BETA	301640-013	
S14;0.0-0.5	07/19 10:38	Soil	GROSS ALPHA/BETA	301640-014	
S15;0.0-0.5	07/19 11:00	Soil	GROSS ALPHA/BETA	301640-015	
S16;0.0-0.5	07/19 11:50	Soil	GROSS ALPHA/BETA	301640-016	

Notes:	Relinquished By:	Received By:
	Date/Time: 7-23-18 13:51	Date/Time: 7/24/18 9:00
	Date/Time:	Date/Time:

Signature on this form constitutes a firm Purchase Order for the services requested above.
Page 1 of 1

GEL Laboratories LLC VD

SAMPLE RECEIPT & REVIEW FORM

Client: CRTL	SDG/AR/COC/Work Order: 455294
Received By: AJA	Date Received: 7/24/18
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground UPS Field Services Courier Other 7727 9693 6293

Suspected Hazard Information	Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
Shipped as a DOT Hazardous?		✓	Hazard Class Shipped: UN#:
COC/Samples marked or classified as radioactive?		✓	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): Ø CPM / mR/Hr Classified as: Rad 1 Rad 2 Rad 3
Is package, COC, and/or Samples marked HAZ?		✓	If yes, select Hazards below, and contact the GEL Safety Group. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other:

	Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?	✓			
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*		✓		Preservation Method: Wet Ice Ice Packs Dry ice None Other: *all temperatures are recorded in Celsius TEMP: 3°
4	Daily check performed and passed on IR temperature gun?	✓			Temperature Device Serial #: IR2-18 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?	✓			Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?		✓		Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?			✓	If Yes, Are Encores or Soil Kits present? Yes___ No___ (If yes, take to VOA Freezer) Do VOA vials contain acid preservation? Yes No___ N/A (If unknown, select No) VOA vials free of headspace? Yes No___ N/A Sample ID's and containers affected:
8	Samples received within holding time?	✓			ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?	✓			Sample ID's and containers affected:
10	Date & time on COC match date & time on bottles?	✓			Sample ID's affected:
11	Number of containers received match number indicated on COC?	✓			Sample ID's affected:
12	Are sample containers identifiable as GEL provided?			✓	
13	COC form is properly signed in relinquished/received sections?	✓			

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials TMC Date 7/25/18 Page 1 of 1

GL-CHL-SR-001 Rev 5

Subject: Re: Additional Analysis for 301640/ 455294
From: Patrick McCarthy <patrick.mccarthy@enthalpy.com>
Date: 8/16/2018 4:51 PM
To: Valerie Davis <vsd@gel.com>

Hi Valerie,

Here is the updated client request:

Please perform a gamma scan (DOE EML HASL 300 4.5.2.3 /GA-01-R) of samples S02;0.0-0.5, S09;0.0-0.5, and S10;0.0-0.5 (samples 301640-009, 301640-010 and 301640-002).

Please include the list of the following isotopes, of particular importance are Co-60 and Cs- 137. They've also requested an expedited **5-day TAT**. Is that something you can accommodate? Thanks!

K-40
Co-60
Cs-137
Cs-134
Tl-208
Pb-210
Bi-210
Po-210
Pb-212
Bi-214
Pb-214
Ra-226
Po-214
Th-228
Th-232
Th-234
Pa-234m
Pa-234
Po-216
Po-218

ENTHALPY ANALYTICAL

Patrick McCarthy
Project Manager
Enthalpy Analytical LLC
(formerly Curtis & Tompkins, Ltd.)
2323 Fifth St., Berkeley, CA 94710
Office: (510) 486.0900
Direct: (510) 204.2236

www.curtisandtompkins.com

Please note my office hours have changed! I am now available in the lab from 9:30-6 PM.

On Thu, Aug 16, 2018 at 1:16 PM, Valerie Davis <vsd@gel.com> wrote:

Hi Patrick,

Please confirm which gamma isotopes need to be reported.

Thanks,

Valerie

On 8/16/2018 3:48 PM, Patrick McCarthy wrote:

Hi Valerie,

The client has requested additional analysis for spectroscopy analysis (DOE EML HASL 300 4.5.2.3 /GA-01-R) for samples S09;0.0-0.5 (301640-009) and S10;0.0-0.5 (301640-010).

Can you proceed with the analysis?

Thanks!

ENTHALPY ANALYTICAL

Patrick McCarthy
Project Manager
Enthalpy Analytical LLC
(formerly Curtis & Tompkins, Ltd.)
2323 Fifth St., Berkeley, CA 94710
Office: (510) 486.0900
Direct: (510) 204.2236
www.curtisandtompkins.com

Please note my office hours have changed! I am now available in the lab from 9:30-6 PM.

--

Valerie Davis
Project Manager

2040 Savage Road, Charleston, SC 29407 | PO Box 30712, Charleston, SC 29417
Office Direct: 843.769.7391 | Office Main: 843.556.8171 | Fax: 843.766.1178
E-Mail: vsd@gel.com | Website: www.gel.com
Analytical Testing

Laboratory Certifications

List of current GEL Certifications as of 21 August 2018

State	Certification
Alaska	17-018
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
Delaware	SC00012
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho Chemistry	SC00012
Idaho Radiochemistry	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana NELAP	03046 (AI33904)
Louisiana SDWA	LA180011
Maryland	270
Massachusetts	M-SC012
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122018-1
New Hampshire NELAP	205415
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	9904
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-18-13
Utah NELAP	SC000122018-26
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

Radiological Analysis

Case Narrative

Radiochemistry
Technical Case Narrative
Enthalpy Analytical, LLC (CRTL)
SDG #: 457517

Product: **Dry Weight**
Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 23
Preparation Batch: 1793951

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
457517001	S09; 0.0-0.5
457517002	S10; 0.0-0.5

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: **Dry Weight**
Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 23
Preparation Batch: 1794192

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
457517003	S02; 0.0-0.5

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Product: **Gamma Scan**
Analytical Method: DOE HASL 300, 4.5.2.3/Ga-01-R
Analytical Procedure: GL-RAD-A-013 REV# 27

Analytical Batch: 1793965

Preparation Method: Dry Soil Prep
Preparation Procedure: GL-RAD-A-021 REV# 23
Preparation Batches: 1793951 and 1794192

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
457517001	S09; 0.0-0.5
457517002	S10; 0.0-0.5
457517003	S02; 0.0-0.5
1204094972	Method Blank (MB)
1204094973	457517002(S10; 0.0-0.5) Sample Duplicate (DUP)
1204094974	Laboratory Control Sample (LCS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

Duplication Criteria between QC Sample and Duplicate Sample
The Sample and the Duplicate, (See Below), did not meet the relative percent difference requirement; however, they do meet the relative error ratio requirement with the value listed below.

Sample	Analyte	Value
1204094973 (S10; 0.0-0.5DUP)	Bismuth-214	RPD 42.4* (0.00%-20.00%) RER 1.9 (0-3)
	Lead-214	RPD 32.9* (0.00%-20.00%) RER 1.82 (0-3)
	Potassium-40	RPD 21.1* (0.00%-20.00%) RER 1.86 (0-3)
	Radium-226	RPD 42.4* (0.00%-20.00%) RER 1.9 (0-3)

Qualifier Information

Qualifier	Reason	Analyte	Sample	Client Sample
UI	Results are considered a false positive due to high counting uncertainty.	Lead-210	1204094973	S10; 0.0-0.5(457517002DUP)
		Thorium-234	457517002	S10; 0.0-0.5
			1204094972	MB for batch 1793965

			1204094973	S10; 0.0-0.5(457517002DUP)
UI	Results are considered a false positive due to low abundance.	Bismuth-214	457517001	S09; 0.0-0.5
		Radium-226	457517001	S09; 0.0-0.5
UI	Results are considered a false positive due to no valid peak.	Thorium-234	457517001	S09; 0.0-0.5

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

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Qualifier Definition Report
for

CRTL001 Enthalpy Analytical, LLC

Client SDG: 457517 GEL Work Order: 457517

The Qualifiers in this report are defined as follows:

* A quality control analyte recovery is outside of specified acceptance criteria
** Analyte is a Tracer compound
M Result above MDC and less than RDL
U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
UI Gamma Spectroscopy--Uncertain identification

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: Theresa L Austin   **Name: Theresa Austin**

Date: 22 AUG 2018   **Title: Group Leader**

Sample Data Summary

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Certificate of Analysis

Report Date: August 22, 2018

Company :	Enthalpy Analytical, LLC
Address :	2323 5th Street
	Berkeley, California 94710
Contact:	Mr. Patrick McCarthy
Project:	Project Number:

Client Sample ID:	S09; 0.0-0.5	Project:	CRTL00117
Sample ID:	457517001	Client ID:	CRTL001
Matrix:	Soil		
Collect Date:	19-JUL-18 09:27		
Receive Date:	24-JUL-18		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gamma Scan "Dry Weight Corrected"													
Bismuth-214	UI	0.00	+/-0.172	0.239		pCi/g			MXR1	08/20/18	1351	1793965	1
Cesium-134	U	0.0118	+/-0.0355	0.0661		pCi/g							
Cesium-137	U	0.0185	+/-0.0289	0.0613	0.100	pCi/g							
Cobalt-60	U	0.0178	+/-0.0393	0.0864		pCi/g							
Lead-210	U	1.56	+/-3.34	6.61		pCi/g							
Lead-212		0.274	+/-0.0865	0.0809		pCi/g							
Lead-214		0.295	+/-0.123	0.109		pCi/g							
Potassium-40		5.54	+/-1.16	0.557		pCi/g							
Protactinium-234	U	0.105	+/-0.281	0.595		pCi/g							
Protactinium-234m	U	-2.33	+/-4.31	7.83		pCi/g							
Radium-226	UI	0.00	+/-0.172	0.239		pCi/g							
Thallium-208		0.0846	+/-0.0682	0.0578		pCi/g							
Thorium-228		0.274	+/-0.0865	0.0809		pCi/g							
Thorium-232		0.613	+/-0.239	0.225		pCi/g							
Thorium-234	UI	0.00	+/-1.77	1.58		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	08/17/18	0930	1793951

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: August 22, 2018

Company :	Enthalpy Analytical, LLC
Address :	2323 5th Street
	Berkeley, California 94710
Contact:	Mr. Patrick McCarthy
Project:	Project Number:

Client Sample ID:	S10; 0.0-0.5	Project:	CRTL00117
Sample ID:	457517002	Client ID:	CRTL001
Matrix:	Soil		
Collect Date:	19-JUL-18 09:00		
Receive Date:	24-JUL-18		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gamma Scan "Dry Weight Corrected"													
Bismuth-214		0.453	+/-0.109	0.0709		pCi/g			MXR1	08/20/18	1312	1793965	1
Cesium-134	U	0.0325	+/-0.0322	0.0475		pCi/g							
Cesium-137		0.105	+/-0.039	0.0364	0.100	pCi/g							
Cobalt-60	U	0.00333	+/-0.0195	0.0396		pCi/g							
Lead-210	U	-2.93	+/-4.31	7.74		pCi/g							
Lead-212		0.578	+/-0.0759	0.0536		pCi/g							
Lead-214		0.368	+/-0.0989	0.068		pCi/g							
Potassium-40		6.45	+/-0.726	0.294		pCi/g							
Protactinium-234	U	-0.0452	+/-0.165	0.307		pCi/g							
Protactinium-234m	U	2.97	+/-4.00	6.19		pCi/g							
Radium-226		0.453	+/-0.109	0.0709		pCi/g							
Thallium-208		0.194	+/-0.0451	0.0297		pCi/g							
Thorium-228		0.578	+/-0.0759	0.0536		pCi/g							
Thorium-232		0.609	+/-0.150	0.118		pCi/g							
Thorium-234	UI	0.00	+/-2.13	1.75		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXC1	08/17/18	0930	1793951

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: August 22, 2018

Company :	Enthalpy Analytical, LLC
Address :	2323 5th Street
	Berkeley, California 94710
Contact:	Mr. Patrick McCarthy
Project:	Project Number:

Client Sample ID:	S02; 0.0-0.5	Project:	CRTL00117
Sample ID:	457517003	Client ID:	CRTL001
Matrix:	Soil		
Collect Date:	19-JUL-18 11:15		
Receive Date:	24-JUL-18		
Collector:	Client		

Parameter	Qualifier	Result	Uncertainty	MDC	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Rad Gamma Spec Analysis													
Gamma Scan "Dry Weight Corrected"													
Bismuth-214		0.429	+/-0.159	0.110		pCi/g			MXR1	08/20/18	1424	1793965	1
Cesium-134	U	0.0446	+/-0.043	0.089		pCi/g							
Cesium-137	U	0.0656	+/-0.0351	0.0791	0.100	pCi/g							
Cobalt-60	U	0.00332	+/-0.0323	0.066		pCi/g							
Lead-210	U	0.443	+/-1.14	0.836		pCi/g							
Lead-212		0.656	+/-0.0969	0.0779		pCi/g							
Lead-214		0.470	+/-0.149	0.119		pCi/g							
Potassium-40		8.81	+/-1.23	0.554		pCi/g							
Protactinium-234	U	0.181	+/-0.244	0.518		pCi/g							
Protactinium-234m	U	3.08	+/-5.01	9.06		pCi/g							
Radium-226		0.429	+/-0.159	0.110		pCi/g							
Thallium-208		0.171	+/-0.0883	0.0601		pCi/g							
Thorium-228		0.656	+/-0.0969	0.0779		pCi/g							
Thorium-232		0.739	+/-0.217	0.245		pCi/g							
Thorium-234	U	0.346	+/-1.23	0.856		pCi/g							

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
Dry Soil Prep	Dry Soil Prep GL-RAD-A-021	CXB7	08/17/18	1543	1794192

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	DOE HASL 300, 4.5.2.3/Ga-01-R	

Notes:
Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

Quality Control Summary

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Report Date: August 22, 2018

Enthalpy Analytical, LLC
2323 5th Street
Berkeley, California

Contact: **Mr. Patrick McCarthy**

Workorder: **457517**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec										
Batch 1793965										
QC1204094973 457517002 DUP										
Bismuth-214		0.453		0.294	pCi/g	42.4*		(0%-20%)	MXR1	08/20/18 15:49
	Uncertainty	+/-0.109		+/-0.112						
Cesium-134	U	0.0325	U	0.037	pCi/g	N/A		N/A		
	Uncertainty	+/-0.0322		+/-0.0295						
Cesium-137		0.105	M	0.0586	pCi/g	57		(0% - 100%)		
	Uncertainty	+/-0.039		+/-0.041						
Cobalt-60	U	0.00333	U	-0.00244	pCi/g	N/A		N/A		
	Uncertainty	+/-0.0195		+/-0.0282						
Lead-210	U	-2.93	UI	0.00	pCi/g	N/A		N/A		
	Uncertainty	+/-4.31		+/-0.711						
Lead-212		0.578		0.515	pCi/g	11.5		(0%-20%)		
	Uncertainty	+/-0.0759		+/-0.0942						
Lead-214		0.368		0.513	pCi/g	32.9*		(0%-20%)		
	Uncertainty	+/-0.0989		+/-0.107						
Potassium-40		6.45		7.97	pCi/g	21.1*		(0%-20%)		
	Uncertainty	+/-0.726		+/-1.04						
Protactinium-234	U	-0.0452	U	-0.0477	pCi/g	N/A		N/A		
	Uncertainty	+/-0.165		+/-0.163						
Protactinium-234m	U	2.97	U	1.45	pCi/g	N/A		N/A		
	Uncertainty	+/-4.00		+/-3.06						
Radium-226		0.453		0.294	pCi/g	42.4*		(0%-20%)		
	Uncertainty	+/-0.109		+/-0.112						
Thallium-208		0.194		0.160	pCi/g	19		(0%-20%)		
	Uncertainty	+/-0.0451		+/-0.0566						
Thorium-228		0.578		0.515	pCi/g	11.5		(0%-20%)		
	Uncertainty	+/-0.0759		+/-0.0942						
Thorium-232		0.609		0.603	pCi/g	0.957		(0%-20%)		
	Uncertainty	+/-0.150		+/-0.212						

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QC Summary

Workorder: 457517

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec										
Batch 1793965										
Thorium-234	UI	0.00	UI	0.00	pCi/g	N/A		N/A	MXR1	08/20/18 15:49
	Uncertainty	+/-2.13		+/-0.910						
QC1204094974 LCS										
Americium-241	488			579	pCi/g		119	(75%-125%)		08/20/18 17:19
	Uncertainty			+/-14.8						
Bismuth-214			U	-0.559	pCi/g					
	Uncertainty			+/-1.16						
Cesium-134			U	0.249	pCi/g					
	Uncertainty			+/-0.612						
Cesium-137	172			165	pCi/g		96.2	(75%-125%)		
	Uncertainty			+/-3.19						
Cobalt-60	125			123	pCi/g		98	(75%-125%)		
	Uncertainty			+/-3.28						
Lead-210				5160	pCi/g					
	Uncertainty			+/-383						
Lead-212			U	0.442	pCi/g					
	Uncertainty			+/-0.734						
Lead-214			U	-0.581	pCi/g					
	Uncertainty			+/-1.07						
Potassium-40			U	0.780	pCi/g					
	Uncertainty			+/-2.49						
Protactinium-234			U	-0.75	pCi/g					
	Uncertainty			+/-6.52						
Protactinium-234m			U	-25.8	pCi/g					
	Uncertainty			+/-96.6						
Radium-226			U	-0.559	pCi/g					
	Uncertainty			+/-1.16						
Thallium-208			U	0.0885	pCi/g					
	Uncertainty			+/-0.520						
Thorium-228			U	0.442	pCi/g					
	Uncertainty			+/-0.734						

QC Summary

Workorder: **457517**

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec										
Batch 1793965										
Thorium-232			U	-0.317	pCi/g				MXR1	08/20/18 17:19
	Uncertainty			+/-2.73						
Thorium-234			U	-6.83	pCi/g					
	Uncertainty			+/-22.1						
QC1204094972 MB										
Bismuth-214			U	0.00421	pCi/g					08/20/18 15:45
	Uncertainty			+/-0.0563						
Cesium-134			U	0.000157	pCi/g					
	Uncertainty			+/-0.0206						
Cesium-137			U	0.00288	pCi/g					
	Uncertainty			+/-0.0214						
Cobalt-60			U	-0.00948	pCi/g					
	Uncertainty			+/-0.0184						
Lead-210			U	-1.01	pCi/g					
	Uncertainty			+/-6.78						
Lead-212			U	0.0214	pCi/g					
	Uncertainty			+/-0.0525						
Lead-214			U	0.109	pCi/g					
	Uncertainty			+/-0.117						
Potassium-40			U	0.163	pCi/g					
	Uncertainty			+/-0.337						
Protactinium-234			U	0.0593	pCi/g					
	Uncertainty			+/-0.148						
Protactinium-234m			U	3.54	pCi/g					
	Uncertainty			+/-3.32						
Radium-226			U	0.00421	pCi/g					
	Uncertainty			+/-0.0563						
Thallium-208			U	-0.0124	pCi/g					
	Uncertainty			+/-0.0205						
Thorium-228			U	0.0214	pCi/g					
	Uncertainty			+/-0.0525						

QC Summary

Workorder: 457517

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rad Gamma Spec										
Batch 1793965										
Thorium-232			U	-0.000799	pCi/g				MXR1	08/20/18 15:45
	Uncertainty			+/-0.0797						
Thorium-234			UI	0.00	pCi/g					
	Uncertainty			+/-2.99						

Notes:

Counting Uncertainty is calculated at the 95% confidence level (1.96-sigma).

The Qualifiers in this report are defined as follows:

**	Analyte is a Tracer compound
<	Result is less than value reported
>	Result is greater than value reported
BD	Results are either below the MDC or tracer recovery is low
FA	Failed analysis.
H	Analytical holding time was exceeded
J	Value is estimated
K	Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
M	Result above MDC and less than RDL
N/A	RPD or %Recovery limits do not apply.
N1	See case narrative
ND	Analyte concentration is not detected above the detection limit
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
R	Sample results are rejected
U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
UI	Gamma Spectroscopy--Uncertain identification
UJ	Gamma Spectroscopy--Uncertain identification
UL	Not considered detected. The associated number is the reported concentration, which may be inaccurate due to a low bias.
X	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
h	Preparation or preservation holding time was exceeded

QC Summary

Workorder: 457517

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.
^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.
* Indicates that a Quality Control parameter was not within specifications.
For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

QUALITY CONTROL CHECKLIST
FOR REVIEW OF LABORATORY REPORT

Job No.:	**18301-00**	**Site:** SR84 Widening and SR84/I680	
Laboratory:	Enthalpy Analytical	**Laboratory Report No.:**	301639
Report Date:	7/27/2018	**BASELINE Reviewer:**	K. Mertz

	Yes	No	NA
GENERAL QUESTIONS			
(Describe "no" responses below in "comments" section. Contact the laboratory, as required, for further explanation or action on "no" responses; document discussion in comments section.)			
1a. Does the report include a case narrative? *(A case narrative MUST be prepared by the lab for all analytical work requested by BASELINE)*	X		
1b. Are the number of pages for the lab report as indicated on the case narrative/lab transmittal consistent with the number of pages that are included in report?	X		
1c. Does the case narrative indicate which samples were analyzed by a subcontractor and the subcontractor' s name?			X
1d. Does the case narrative summarize subsequent requests not shown on the chain-of-custody (e.g., additional analyses requested, release of "hold" samples)?			X
1e. Does the case narrative explain why requested analyses could not be performed by laboratory (e.g., insufficient sample)?			X
1f. Does the case narrative explain all problems with the QA/QC data as identified in the checklist (as applicable)?	X		
2a. Is the laboratory report format consistent and legible throughout the report?	X		
2b. Are the sample and reported dates shown in the laboratory report correct?	X		
3a. Does the lab report include the original chain-of-custody form?	X		
3b. Were all samples appropriately analyzed as requested on the chain-of-custody form?	X		
4. Was the lab report signed and dated as being reviewed by the laboratory director, QA manager, or other appropriate personnel? (Some lab reports have signature spaces for each page). (This requirement also applies to any analyses subcontracted out by the laboratory)	X		
5a. Are preparation methods, cleanup methods (if applicable), and laboratory methods indicated for all analyses?	X		
5b. If additional analytes were requested as part of the reporting of the data for an analytical method, were these included in the lab report?			X
6. Are the units in the lab report provided for each analysis consistent throughout the report?	X		
7. Are the detection limits (DL) appropriate based on the intended use of the data (e.g., DL below applicable MCLs for water quality issues)?	X		
8a. Are detection limits appropriate based on the analysis performed (i.e., not elevated due to dilution effects)?	X		
8b. If no, is an explanation provided by the laboratory?			X
9a. Were the samples analyzed within the appropriate holding time (generally 2 weeks for volatiles, and up to 6 months for total metals)?	X		
9b. If no, was it flagged in the report?			X
10. If samples were composited prior to analysis, does the lab report indicate which samples were composited for each analysis?			X
11a. Do the chromatograms confirm quantitative laboratory results (petroleum hydrocarbons)?			X
11b. Is a standard chromatogram(s) included in the laboratory report?			X
11c. Do the chromatograms confirm laboratory notes, if present (e.g., sample exhibits lighter hydrocarbon than standard)?			X

Quality Control Checklist - *continued*

Job No.:	**18301-00**	**Site:** SR84 Widening and SR84/I680	
Laboratory:	Enthalpy Analytical	**Laboratory Report No.:**	301639
Report Date:	7/27/2018	**BASELINE Reviewer:**	K. Mertz

	Yes	No	NA
12. Are the results consistent with previous analytical results from the site? *(If no, contact the lab and request review/reanalysis of data, as appropriate.)*			X
13a. REVISED LAB REPORTS ONLY. Is the revised lab report or revised pages to a lab report signed and dated as being reviewed by the laboratory director, QA manager, or other appropriate personnel?			
13b. REVISED LAB REPORTS ONLY. Does the case narrative indicate the date of revision and provide an explanation for the revision?			
13c. REVISED LAB REPORTS ONLY. Does the revised lab report adequately address the problem(s) that triggered the need for a revision?			
13d. REVISED LAB REPORTS ONLY. Are the data included in the revised report the same as the data reported in the original report, except where the report was revised to correct incorrectly reported data?			
QA/QC QUESTIONS			
Field/Laboratory Quality Control - Groundwater Analyses			
14. Are field blanks reported as "ND" (groundwater samples)? *A field blank is a sample of DI water that is prepared in the field using the same collection and handling procedures as the other samples collected, and used to demonstrate that the sampling procedure has not contaminated the sample.*			X
14a. Are rinsate blanks reported as "ND" (soil samples)? *A rinsate blank is a sample of DI water that is prepared in the field by collecting DI rinse water after it has been poured over decontaminated sampling equipment. The rinsate blank is collected to demonstrate that the decontamination procedure has removed all the contaminants from the sampling equipment and that the sampling equipment has not contaminated the sample.*			X
15. Are trip blanks reported as "ND" (groundwater samples/volatile analyses)? *A trip blank is a sample of contaminant free matrix placed in an appropriate container by the lab and transported with the field samples collected. Provides information regarding positive interference introduced during sample transport, storage, preservation, and analysis. The sample is NOT opened in the field.*			X
16. Are duplicate sample results consistent with the original sample (groundwater samples)? *Field duplicates consist of two independent samples collected at the same sampling location during a single sampling event. Used to evaluate precision of the analytical data and sampling technique. (Differences between the duplicate and sample results may also be attributed to environmental variability.)*			X
BATCH QUALITY CONTROL			
Samples are batched together by matrix [soil, water] and analyses requested. A batch generally consists of 20 or fewer samples of the same matrix type, and is prepared using the same reagents, standards, procedures, and time frame as the samples. QC samples are run with each batch to assess performance of the entire measurement process.			
17. Do the sample batch numbers and corresponding laboratory QA/QC batch numbers match?	X		
18a. Are method blanks (MB) for the analytical method(s) below the laboratory reporting limits? *Used to assess lab contamination and prevent false positive results.*	X		
18b. If no, is an explanation provided in the case narrative to validate the data?			X
18c. Are analytes that may be considered laboratory contaminants reported below the laboratory reporting limit? *Common lab contaminants include acetone, methylene chloride, diethylhexyl phthalate, and di-n-octyl phthalate.*			X
18d. If no, was the laboratory contacted to determine whether the reported analyte could be a potential laboratory contaminant and was an explanation included in the case narrative?			X

Quality Control Checklist - *continued*

Job No.:	**18301-00**	**Site:** SR84 Widening and SR84/I680	
Laboratory:	Enthalpy Analytical	**Laboratory Report No.:**	301639
Report Date:	7/27/2018	**BASELINE Reviewer:**	K. Mertz

	Yes	No	NA
19. Are laboratory control samples (LCS) and LCS duplicate (LCSD) [a.k.a., Blank Spike (BS) and BS duplicates (BSD)] within laboratory reporting limits? Limits should be provided on the report. *LCS is a reagent blank spike with a representative selection of target analyte(s) and prepared in the same manner as the samples analyzed. The LCS should be spiked with the same analytes as the matrix spike (below). The LCS is free from interferences from the sample matrix and demonstrates the ability of the lab instruments to recover the target analytes. Accuracy (recovery information) is generally reported as % spike recovery; precision (reproducibility of results) between the LCS and LCSD is generally reported as the relative percent difference (RPD). LCS/LCSD can be run in addition to or in lieu of matrix QC data.*	X		
20a. Are the Matrix QC data (i.e., MS/MSD) within laboratory limits? Limits should be provided on the lab report. *The lab selects a sample from the batch and analyzes a spike and a spike duplicate of that sample. Matrix QC data is used to obtain precision and accuracy information and is reported in the same manner as LCS/LCSD. If the MS/MSD fails, the results may still be considered valid if the MB and either the LCS/LCSD or BS/BSD is within the lab's limits (failure is probably due to matrix interference).*		X	
20b. If no, is the MB and either LCS/LCSD or BS/BSD within lab limits to validate the data?	X		
SAMPLE QUALITY CONTROL			
21a. Are the surrogate spikes reported within the lab's acceptable recovery limits? *A surrogate is a non-target analyte, which is similar in chemical structure to the analyte(s) being analyzed for, and which is not commonly found in environmental samples. A known concentration of the surrogate is spiked into the sample or QA "sample" prior to extraction or sample preparation. Results are usually reported as % recovery of the spike. Failure to meet lab's limits for primary and secondary surrogates results in rebatching and reanalysis of the sample; failure of only the primary or the secondary surrogate may be acceptable under certain circumstances. Failure generally is due to coelution with the sample matrix.*			X
21b. If no, is an explanation given in the case narrative to validate the data?			X

Comments:

Metals (EPA 6010B and EPA 7471A): Low recoveries were observed for antimony in the MS/MSD for batch 261623; the parent sample was not a project sample, the BS/BSD were within limits, and the associated RPD was within limits. No other analytical problems were encountered.

QUALITY CONTROL CHECKLIST
FOR REVIEW OF LABORATORY REPORT

Job No.:	**18301-00**	**Site:** SR84 Widening and SR84/I680	
Laboratory:	Enthalpy Analytical	**Laboratory Report No.:**	301640
Report Date:	7/27/2018	**BASELINE Reviewer:**	K. Mertz

	Yes	No	NA
GENERAL QUESTIONS			
(Describe "no" responses below in "comments" section. Contact the laboratory, as required, for further explanation or action on "no" responses; document discussion in comments section.)			
1a. Does the report include a case narrative? *(A case narrative MUST be prepared by the lab for all analytical work requested by BASELINE)*	X		
1b. Are the number of pages for the lab report as indicated on the case narrative/lab transmittal consistent with the number of pages that are included in report?	X		
1c. Does the case narrative indicate which samples were analyzed by a subcontractor and the subcontractor' s name?	X		
1d. Does the case narrative summarize subsequent requests not shown on the chain-of-custody (e.g., additional analyses requested, release of "hold" samples)?			X
1e. Does the case narrative explain why requested analyses could not be performed by laboratory (e.g., insufficient sample)?			X
1f. Does the case narrative explain all problems with the QA/QC data as identified in the checklist (as applicable)?	X		
2a. Is the laboratory report format consistent and legible throughout the report?	X		
2b. Are the sample and reported dates shown in the laboratory report correct?	X		
3a. Does the lab report include the original chain-of-custody form?	X		
3b. Were all samples appropriately analyzed as requested on the chain-of-custody form?	X		
4. Was the lab report signed and dated as being reviewed by the laboratory director, QA manager, or other appropriate personnel? (Some lab reports have signature spaces for each page). (This requirement also applies to any analyses subcontracted out by the laboratory)	X		
5a. Are preparation methods, cleanup methods (if applicable), and laboratory methods indicated for all analyses?	X		
5b. If additional analytes were requested as part of the reporting of the data for an analytical method, were these included in the lab report?			X
6. Are the units in the lab report provided for each analysis consistent throughout the report?	X		
7. Are the detection limits (DL) appropriate based on the intended use of the data (e.g., DL below applicable MCLs for water quality issues)?	X		
8a. Are detection limits appropriate based on the analysis performed (i.e., not elevated due to dilution effects)?	X		
8b. If no, is an explanation provided by the laboratory?			X
9a. Were the samples analyzed within the appropriate holding time (generally 2 weeks for volatiles, and up to 6 months for total metals)?			X
9b. If no, was it flagged in the report?			X
10. If samples were composited prior to analysis, does the lab report indicate which samples were composited for each analysis?			X
11a. Do the chromatograms confirm quantitative laboratory results (petroleum hydrocarbons)?			X
11b. Is a standard chromatogram(s) included in the laboratory report?			X
11c. Do the chromatograms confirm laboratory notes, if present (e.g., sample exhibits lighter hydrocarbon than standard)?			X

Quality Control Checklist - *continued*

Job No.:	**18301-00**	**Site:** SR84 Widening and SR84/I680	
Laboratory:	Enthalpy Analytical	**Laboratory Report No.:**	301640
Report Date:	7/27/2018	**BASELINE Reviewer:**	K. Mertz

	Yes	**No**	**NA**
12. Are the results consistent with previous analytical results from the site? *(If no, contact the lab and request review/reanalysis of data, as appropriate.)*			X
13a. REVISED LAB REPORTS ONLY. Is the revised lab report or revised pages to a lab report signed and dated as being reviewed by the laboratory director, QA manager, or other appropriate personnel?			
13b. REVISED LAB REPORTS ONLY. Does the case narrative indicate the date of revision and provide an explanation for the revision?			
13c. REVISED LAB REPORTS ONLY. Does the revised lab report adequately address the problem(s) that triggered the need for a revision?			
13d. REVISED LAB REPORTS ONLY. Are the data included in the revised report the same as the data reported in the original report, except where the report was revised to correct incorrectly reported data?			
QA/QC QUESTIONS			
Field/Laboratory Quality Control - Groundwater Analyses			
14. Are field blanks reported as "ND" (groundwater samples)? *A field blank is a sample of DI water that is prepared in the field using the same collection and handling procedures as the other samples collected, and used to demonstrate that the sampling procedure has not contaminated the sample.*			X
14a. Are rinsate blanks reported as "ND" (soil samples)? *A rinsate blank is a sample of DI water that is prepared in the field by collecting DI rinse water after it has been poured over decontaminated sampling equipment. The rinsate blank is collected to demonstrate that the decontamination procedure has removed all the contaminants from the sampling equipment and that the sampling equipment has not contaminated the sample.*			X
15. Are trip blanks reported as "ND" (groundwater samples/volatile analyses)? *A trip blank is a sample of contaminant free matrix placed in an appropriate container by the lab and transported with the field samples collected. Provides information regarding positive interference introduced during sample transport, storage, preservation, and analysis. The sample is NOT opened in the field.*			X
16. Are duplicate sample results consistent with the original sample (groundwater samples)? *Field duplicates consist of two independent samples collected at the same sampling location during a single sampling event. Used to evaluate precision of the analytical data and sampling technique. (Differences between the duplicate and sample results may also be attributed to environmental variability.)*			X
BATCH QUALITY CONTROL			
Samples are batched together by matrix [soil, water] and analyses requested. A batch generally consists of 20 or fewer samples of the same matrix type, and is prepared using the same reagents, standards, procedures, and time frame as the samples. QC samples are run with each batch to assess performance of the entire measurement process.			
17. Do the sample batch numbers and corresponding laboratory QA/QC batch numbers match?	X		
18a. Are method blanks (MB) for the analytical method(s) below the laboratory reporting limits? *Used to assess lab contamination and prevent false positive results.*	X		
18b. If no, is an explanation provided in the case narrative to validate the data?			X
18c. Are analytes that may be considered laboratory contaminants reported below the laboratory reporting limit? *Common lab contaminants include acetone, methylene chloride, diethylhexyl phthalate, and di-n-octyl phthalate.*			X
18d. If no, was the laboratory contacted to determine whether the reported analyte could be a potential laboratory contaminant and was an explanation included in the case narrative?			X

Quality Control Checklist - *continued*

Job No.:	**18301-00**	**Site:** SR84 Widening and SR84/I680			
Laboratory:	Enthalpy Analytical	**Laboratory Report No.:** 301640			
Report Date:	7/27/2018	**BASELINE Reviewer:** K. Mertz			

	Yes	**No**	**NA**
19. Are laboratory control samples (LCS) and LCS duplicate (LCSD) [a.k.a., Blank Spike (BS) and BS duplicates (BSD)] within laboratory reporting limits? Limits should be provided on the report. *LCS is a reagent blank spike with a representative selection of target analyte(s) and prepared in the same manner as the samples analyzed. The LCS should be spiked with the same analytes as the matrix spike (below). The LCS is free from interferences from the sample matrix and demonstrates the ability of the lab instruments to recover the target analytes. Accuracy (recovery information) is generally reported as % spike recovery; precision (reproducibility of results) between the LCS and LCSD is generally reported as the relative percent difference (RPD). LCS/LCSD can be run in addition to or in lieu of matrix QC data.*	X		
20a. Are the Matrix QC data (i.e., MS/MSD) within laboratory limits? Limits should be provided on the lab report. *The lab selects a sample from the batch and analyzes a spike and a spike duplicate of that sample. Matrix QC data is used to obtain precision and accuracy information and is reported in the same manner as LCS/LCSD. If the MS/MSD fails, the results may still be considered valid if the MB and either the LCS/LCSD or BS/BSD is within the lab's limits (failure is probably due to matrix interference).*		X*	
20b. If no, is the MB and either LCS/LCSD or BS/BSD within lab limits to validate the data?			X
SAMPLE QUALITY CONTROL			
21a. Are the surrogate spikes reported within the lab's acceptable recovery limits? *A surrogate is a non-target analyte, which is similar in chemical structure to the analyte(s) being analyzed for, and which is not commonly found in environmental samples. A known concentration of the surrogate is spiked into the sample or QA "sample" prior to extraction or sample preparation. Results are usually reported as % recovery of the spike. Failure to meet lab's limits for primary and secondary surrogates results in rebatching and reanalysis of the sample; failure of only the primary or the secondary surrogate may be acceptable under certain circumstances. Failure generally is due to coelution with the sample matrix.*			X
21b. If no, is an explanation given in the case narrative to validate the data?			X

Comments:

*The Sample and the Duplicate, (See Below), did not meet the relative percent difference requirement; however, they do meet the relative error ratio requirement with the value listed below.

Sample	Analyte	Value
1204088025 (S01; 0.0-0.5DUP)	BETA	RPD 47.2* (0.00%-20.00%) RER 2.45 (0-3)

QUALITY CONTROL CHECKLIST
FOR REVIEW OF LABORATORY REPORT

Job No.:	**18301-00**	**Site:** SR84 Widening and SR84/I680	
Laboratory:	Enthalpy Analytical	**Laboratory Report No.:**	302601
Report Date:	8/23/2018	**BASELINE Reviewer:**	K. Mertz

	Yes	No	NA
GENERAL QUESTIONS			
(Describe "no" responses below in "comments" section. Contact the laboratory, as required, for further explanation or action on "no" responses; document discussion in comments section.)			
1a. Does the report include a case narrative? *(A case narrative MUST be prepared by the lab for all analytical work requested by BASELINE)*	X		
1b. Are the number of pages for the lab report as indicated on the case narrative/lab transmittal consistent with the number of pages that are included in report?	X		
1c. Does the case narrative indicate which samples were analyzed by a subcontractor and the subcontractor's name?	X		
1d. Does the case narrative summarize subsequent requests not shown on the chain-of-custody (e.g., additional analyses requested, release of "hold" samples)?			X
1e. Does the case narrative explain why requested analyses could not be performed by laboratory (e.g., insufficient sample)?			X
1f. Does the case narrative explain all problems with the QA/QC data as identified in the checklist (as applicable)?	X		
2a. Is the laboratory report format consistent and legible throughout the report?	X		
2b. Are the sample and reported dates shown in the laboratory report correct?	X		
3a. Does the lab report include the original chain-of-custody form?	X		
3b. Were all samples appropriately analyzed as requested on the chain-of-custody form?	X		
4. Was the lab report signed and dated as being reviewed by the laboratory director, QA manager, or other appropriate personnel? (Some lab reports have signature spaces for each page). (This requirement also applies to any analyses subcontracted out by the laboratory)	X		
5a. Are preparation methods, cleanup methods (if applicable), and laboratory methods indicated for all analyses?	X		
5b. If additional analytes were requested as part of the reporting of the data for an analytical method, were these included in the lab report?	X		
6. Are the units in the lab report provided for each analysis consistent throughout the report?	X		
7. Are the detection limits (DL) appropriate based on the intended use of the data (e.g., DL below applicable MCLs for water quality issues)?	X		
8a. Are detection limits appropriate based on the analysis performed (i.e., not elevated due to dilution effects)?	X		
8b. If no, is an explanation provided by the laboratory?			X
9a. Were the samples analyzed within the appropriate holding time (generally 2 weeks for volatiles, and up to 6 months for total metals)?			X
9b. If no, was it flagged in the report?			X
10. If samples were composited prior to analysis, does the lab report indicate which samples were composited for each analysis?			X
11a. Do the chromatograms confirm quantitative laboratory results (petroleum hydrocarbons)?			X
11b. Is a standard chromatogram(s) included in the laboratory report?			X
11c. Do the chromatograms confirm laboratory notes, if present (e.g., sample exhibits lighter hydrocarbon than standard)?			X

Job No.:	**18301-00**	**Site:** SR84 Widening and SR84/I680	
Laboratory:	Enthalpy Analytical	**Laboratory Report No.:**	302601
Report Date:	8/23/2018	**BASELINE Reviewer:**	K. Mertz

	Yes	No	NA
12. Are the results consistent with previous analytical results from the site? *(If no, contact the lab and request review/reanalysis of data, as appropriate.)*			X
13a. REVISED LAB REPORTS ONLY. Is the revised lab report or revised pages to a lab report signed and dated as being reviewed by the laboratory director, QA manager, or other appropriate personnel?			
13b. REVISED LAB REPORTS ONLY. Does the case narrative indicate the date of revision and provide an explanation for the revision?			
13c. REVISED LAB REPORTS ONLY. Does the revised lab report adequately address the problem(s) that triggered the need for a revision?			
13d. REVISED LAB REPORTS ONLY. Are the data included in the revised report the same as the data reported in the original report, except where the report was revised to correct incorrectly reported data?			
QA/QC QUESTIONS			
Field/Laboratory Quality Control - Groundwater Analyses			
14. Are field blanks reported as "ND" (groundwater samples)? *A field blank is a sample of DI water that is prepared in the field using the same collection and handling procedures as the other samples collected, and used to demonstrate that the sampling procedure has not contaminated the sample.*			X
14a. Are rinsate blanks reported as "ND" (soil samples)? *A rinsate blank is a sample of DI water that is prepared in the field by collecting DI rinse water after it has been poured over decontaminated sampling equipment. The rinsate blank is collected to demonstrate that the decontamination procedure has removed all the contaminants from the sampling equipment and that the sampling equipment has not contaminated the sample.*			X
15. Are trip blanks reported as "ND" (groundwater samples/volatile analyses)? *A trip blank is a sample of contaminant free matrix placed in an appropriate container by the lab and transported with the field samples collected. Provides information regarding positive interference introduced during sample transport, storage, preservation, and analysis. The sample is NOT opened in the field.*			X
16. Are duplicate sample results consistent with the original sample (groundwater samples)? *Field duplicates consist of two independent samples collected at the same sampling location during a single sampling event. Used to evaluate precision of the analytical data and sampling technique. (Differences between the duplicate and sample results may also be attributed to environmental variability.)*			X
BATCH QUALITY CONTROL			
Samples are batched together by matrix [soil, water] and analyses requested. A batch generally consists of 20 or fewer samples of the same matrix type, and is prepared using the same reagents, standards, procedures, and time frame as the samples. QC samples are run with each batch to assess performance of the entire measurement process.			
17. Do the sample batch numbers and corresponding laboratory QA/QC batch numbers match?	X		
18a. Are method blanks (MB) for the analytical method(s) below the laboratory reporting limits? *Used to assess lab contamination and prevent false positive results.*	X		
18b. If no, is an explanation provided in the case narrative to validate the data?			X
18c. Are analytes that may be considered laboratory contaminants reported below the laboratory reporting limit? *Common lab contaminants include acetone, methylene chloride, diethylhexyl phthalate, and di-n-octyl phthalate.*			X
18d. If no, was the laboratory contacted to determine whether the reported analyte could be a potential laboratory contaminant and was an explanation included in the case narrative?			X

Quality Control Checklist - *continued*

Job No.:	**18301-00**	**Site:** SR84 Widening and SR84/I680	
Laboratory:	Enthalpy Analytical	**Laboratory Report No.:**	302601
Report Date:	8/23/2018	**BASELINE Reviewer:**	K. Mertz

	Yes	**No**	**NA**
19. Are laboratory control samples (LCS) and LCS duplicate (LCSD) [a.k.a., Blank Spike (BS) and BS duplicates (BSD)] within laboratory reporting limits? Limits should be provided on the report. *LCS is a reagent blank spike with a representative selection of target analyte(s) and prepared in the same manner as the samples analyzed. The LCS should be spiked with the same analytes as the matrix spike (below). The LCS is free from interferences from the sample matrix and demonstrates the ability of the lab instruments to recover the target analytes. Accuracy (recovery information) is generally reported as % spike recovery; precision (reproducibility of results) between the LCS and LCSD is generally reported as the relative percent difference (RPD). LCS/LCSD can be run in addition to or in lieu of matrix QC data.*			X
20a. Are the Matrix QC data (i.e., MS/MSD) within laboratory limits? Limits should be provided on the lab report. *The lab selects a sample from the batch and analyzes a spike and a spike duplicate of that sample. Matrix QC data is used to obtain precision and accuracy information and is reported in the same manner as LCS/LCSD. If the MS/MSD fails, the results may still be considered valid if the MB and either the LCS/LCSD or BS/BSD is within the lab's limits (failure is probably due to matrix interference).*		X*	
20b. If no, is the MB and either LCS/LCSD or BS/BSD within lab limits to validate the data?			X
SAMPLE QUALITY CONTROL			
21a. Are the surrogate spikes reported within the lab's acceptable recovery limits? *A surrogate is a non-target analyte, which is similar in chemical structure to the analyte(s) being analyzed for, and which is not commonly found in environmental samples. A known concentration of the surrogate is spiked into the sample or QA "sample" prior to extraction or sample preparation. Results are usually reported as % recovery of the spike. Failure to meet lab's limits for primary and secondary surrogates results in rebatching and reanalysis of the sample; failure of only the primary or the secondary surrogate may be acceptable under certain circumstances. Failure generally is due to coelution with the sample matrix.*			X
21b. If no, is an explanation given in the case narrative to validate the data?			X

Comments:.

Duplication Criteria between QC Sample and Duplicate Sample

The Sample and the Duplicate, (see below), did not meet the relative percent difference requirement; however, they do meet the relative error ratio requirement with the value listed below.

Sample	Analyte	Value
1204094973 (S10; 0.0-0.5DUP)	Bismuth-214	RPD 42.4* (0.00%-20.00%) RER 1.9 (0-3)
	Lead-214	RPD 32.9* (0.00%-20.00%) RER 1.82 (0-3)
	Potassium-40	RPD 21.1* (0.00%-20.00%) RER 1.86 (0-3)
	Radium-226	RPD 42.4* (0.00%-20.00%) RER 1.9 (0-3)

APPENDIX D

ProUCL Statistical Analysis Output Files

UCL Statistics for Uncensored Full Data Sets

User Selected Options			
Date/Time of Computation	ProUCL 5.19/21/2018 1:14:35 PM		
From File	Alpha and Beta Results Input.xls		
Full Precision	OFF		
Confidence Coefficient	95%		
mber of Bootstrap Operations	2000		

Gross Alpha

General Statistics

Total Number of Observations	27	Number of Distinct Observations	26
		Number of Missing Observations	0
Minimum	4.83	Mean	9.846
Maximum	14.8	Median	9.5
SD	2.968	Std. Error of Mean	0.571
Coefficient of Variation	0.301	Skewness	0.196

Normal GOF Test

Shapiro Wilk Test Statistic	0.947	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.923	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.134	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.167	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	10.82	95% Adjusted-CLT UCL (Chen-1995)	10.81
		95% Modified-t UCL (Johnson-1978)	10.82

Gamma GOF Test

A-D Test Statistic	0.365	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.744	etected data appear Gamma Distributed at 5% Significance Lev
K-S Test Statistic	0.113	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.168	etected data appear Gamma Distributed at 5% Significance Lev

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	11.04	k star (bias corrected MLE)	9.837
Theta hat (MLE)	0.892	Theta star (bias corrected MLE)	1.001
nu hat (MLE)	596.1	nu star (bias corrected)	531.2
MLE Mean (bias corrected)	9.846	MLE Sd (bias corrected)	3.139
		Approximate Chi Square Value (0.05)	478.8
Adjusted Level of Significance	0.0401	Adjusted Chi Square Value	475.6

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	10.93	95% Adjusted Gamma UCL (use when n<50)	11

	A	B	C	D	E	F	G	H	I	J	K	L
51	**Lognormal GOF Test**											
52	Shapiro Wilk Test Statistic					0.956	**Shapiro Wilk Lognormal GOF Test**					
53	5% Shapiro Wilk Critical Value					0.923	Data appear Lognormal at 5% Significance Level					
54	Lilliefors Test Statistic					0.0957	**Lilliefors Lognormal GOF Test**					
55	5% Lilliefors Critical Value					0.167	Data appear Lognormal at 5% Significance Level					
56	**Data appear Lognormal at 5% Significance Level**											
57												
58	**Lognormal Statistics**											
59	Minimum of Logged Data					1.575					Mean of logged Data	2.241
60	Maximum of Logged Data					2.695					SD of logged Data	0.314
61												
62	**Assuming Lognormal Distribution**											
63	95% H-UCL					11.06					90% Chebyshev (MVUE) UCL	11.68
64	95% Chebyshev (MVUE) UCL					12.5					97.5% Chebyshev (MVUE) UCL	13.65
65	99% Chebyshev (MVUE) UCL					15.89						
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					10.79					95% Jackknife UCL	10.82
72	95% Standard Bootstrap UCL					10.76					95% Bootstrap-t UCL	10.79
73	95% Hall's Bootstrap UCL					10.78					95% Percentile Bootstrap UCL	10.78
74	95% BCA Bootstrap UCL					10.82						
75	90% Chebyshev(Mean, Sd) UCL					11.56					95% Chebyshev(Mean, Sd) UCL	12.34
76	97.5% Chebyshev(Mean, Sd) UCL					13.41					99% Chebyshev(Mean, Sd) UCL	15.53
77												
78	**Suggested UCL to Use**											
79	95% Student's-t UCL					10.82						
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	Recommendations are based upon data size, data distribution, and skewness.											
83	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
84	owever, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statisticia											
85												

	A–E	F	G–K	L
1	UCL Statistics for Uncensored Full Data Sets			
2				
3	User Selected Options			
4	Date/Time of Computation	ProUCL 5.19/21/2018 3:14:48 PM		
5	From File	Beta Results Input - No Outliers.xls		
6	Full Precision	OFF		
7	Confidence Coefficient	95%		
8	mber of Bootstrap Operations	2000		
9				
10				
11	Gross Beta			
12				
13	General Statistics			
14	Total Number of Observations	25	Number of Distinct Observations	24
15			Number of Missing Observations	0
16	Minimum	4.18	Mean	11.89
17	Maximum	22.96	Median	12.3
18	SD	4.428	Std. Error of Mean	0.886
19	Coefficient of Variation	0.372	Skewness	0.566
20				
21	Normal GOF Test			
22	Shapiro Wilk Test Statistic	0.972	Shapiro Wilk GOF Test	
23	5% Shapiro Wilk Critical Value	0.918	Data appear Normal at 5% Significance Level	
24	Lilliefors Test Statistic	0.101	Lilliefors GOF Test	
25	5% Lilliefors Critical Value	0.173	Data appear Normal at 5% Significance Level	
26	Data appear 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	13.4	95% Adjusted-CLT UCL (Chen-1995)	13.45
31			95% Modified-t UCL (Johnson-1978)	13.42
32				
33	Gamma GOF Test			
34	A-D Test Statistic	0.173	Anderson-Darling Gamma GOF Test	
35	5% A-D Critical Value	0.746	etected data appear Gamma Distributed at 5% Significance Lev	
36	K-S Test Statistic	0.105	Kolmogorov-Smirnov Gamma GOF Test	
37	5% K-S Critical Value	0.175	etected data appear Gamma Distributed at 5% Significance Lev	
38	Detected data appear Gamma Distributed at 5% Significance Level			
39				
40	Gamma Statistics			
41	k hat (MLE)	7.256	k star (bias corrected MLE)	6.412
42	Theta hat (MLE)	1.639	Theta star (bias corrected MLE)	1.854
43	nu hat (MLE)	362.8	nu star (bias corrected)	320.6
44	MLE Mean (bias corrected)	11.89	MLE Sd (bias corrected)	4.695
45			Approximate Chi Square Value (0.05)	280.1
46	Adjusted Level of Significance	0.0395	Adjusted Chi Square Value	277.5
47				
48	Assuming Gamma Distribution			
49	95% Approximate Gamma UCL (use when n>=50))	13.61	95% Adjusted Gamma UCL (use when n<50)	13.73
50				

	A B C D E	F	G H I J K	L
51	**Lognormal GOF Test**			
52	Shapiro Wilk Test Statistic	0.977	**Shapiro Wilk Lognormal GOF Test**	
53	5% Shapiro Wilk Critical Value	0.918	Data appear Lognormal at 5% Significance Level	
54	Lilliefors Test Statistic	0.124	**Lilliefors Lognormal GOF Test**	
55	5% Lilliefors Critical Value	0.173	Data appear Lognormal at 5% Significance Level	
56	**Data appear Lognormal at 5% Significance Level**			
57				
58	**Lognormal Statistics**			
59	Minimum of Logged Data	1.43	Mean of logged Data	2.405
60	Maximum of Logged Data	3.134	SD of logged Data	0.395
61				
62	**Assuming Lognormal Distribution**			
63	95% H-UCL	13.93	90% Chebyshev (MVUE) UCL	14.84
64	95% Chebyshev (MVUE) UCL	16.15	97.5% Chebyshev (MVUE) UCL	17.98
65	99% Chebyshev (MVUE) UCL	21.56		
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	13.35	95% Jackknife UCL	13.4
72	95% Standard Bootstrap UCL	13.37	95% Bootstrap-t UCL	13.51
73	95% Hall's Bootstrap UCL	13.62	95% Percentile Bootstrap UCL	13.38
74	95% BCA Bootstrap UCL	13.49		
75	90% Chebyshev(Mean, Sd) UCL	14.55	95% Chebyshev(Mean, Sd) UCL	15.75
76	97.5% Chebyshev(Mean, Sd) UCL	17.42	99% Chebyshev(Mean, Sd) UCL	20.7
77				
78	**Suggested UCL to Use**			
79	95% Student's-t UCL	13.4		
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	Recommendations are based upon data size, data distribution, and skewness.			
83	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
84	owever, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statisticia			
85				

Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation	ProUCL 5.19/25/2018 11:58:42 AM
From File	Alpha and Beta Results Input.xls
Full Precision	OFF

Rosner's Outlier Test for Gross Beta

Mean	13.64
Standard Deviation	7.642
Number of data	27
Number of suspected outliers	3

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	13.64	7.499	37.9	10	3.235	2.86	3.18
2	12.71	6.024	33.2	9	3.402	2.84	3.16
3	11.89	4.428	22.96	18	2.5	2.82	3.14

For 5% significance level, there are 2 Potential Outliers

Potential outliers are:

37.9, 33.2

For 1% Significance Level, there are 2 Potential Outliers

Potential outliers are:

37.9, 33.2