AIR MONITORING SUMMARY REPORT
Removal and Final Status Survey of Historic Avenue "N" Wood Stave Pipe Former Naval Station Treasure Island San Francisco, California

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Acronyms and Abbreviations

^{226}Ra	radium-226
APP/SSHP	*Accident Prevention Plan/Site Safety and Health Plan, Removal and Final Status Survey of Wood Stave Storm Line at Former Naval Station Treasure Island, San Francisco, California*
CB&I	CB&I Federal Services LLC
PDR	personal data-logging real-time aerosol monitor
Work Plan	*Final Work Plan, Removal and Final Status Survey of Historic Avenue "N" Wood Stave Pipe, Former Naval Station Treasure Island, San Francisco, California*

1.0 Introduction

CB&I Federal Services LLC (CB&I) provided environmental remediation services to the U.S. Department of the Navy under the Environmental Multiple Award Contract, Contract No. N62473-12-D-2005, Contract Task Order 0012. As part of this task, CB&I performed air monitoring at Former Naval Station Treasure Island in accordance with the following:

- *Final Work Plan, Removal and Final Status Survey of Historic Avenue "N" Wood Stave Pipe, Former Naval Station Treasure Island, San Francisco, California* (Work Plan; CB&I, 2015a)
- Environmental Protection Plan (Appendix B of the Work Plan)
- *Accident Prevention Plan/Site Safety and Health Plan, Removal and Final Status Survey of Wood Stave Storm Line at Former Naval Station Treasure Island, San Francisco, California* (APP/SSHP; CB&I 2015b)
- *Sitewide Radiation Protection Plan, Naval Station Treasure Island, San Francisco, California* (CB&I, 2014)

The Work Plan (CB&I, 2015a) describes best management practices and procedures that were implemented to minimize dust generation during work activities. Dust monitoring was conducted to ensure that these procedures were effective, and to verify that the working environment met occupational health and safety standards and that the workers are safe. The APP/SSHP (CB&I, 2015b) outlined the requirements regarding prevention of exposure of construction crews to dust and potential airborne chemicals of concern from the work area. Further, the APP/SSHP also established the conservative project action levels for dust at the work area boundary to protect the public.

Radiological air sampling methods and procedures were detailed in the *Sitewide Radiation Protection Plan, Naval Station Treasure Island, San Francisco, California* (CB&I, 2014) and applicable Treasure Island Work Instructions. For this project, monitoring for radium-226 (^{226}Ra) was conducted upwind and downwind during earthmoving activities associated with potentially radiologically-impacted soil. Air filters were counted on site for gross alpha and beta levels following a decay period and were compared with occupational and public air concentration limits for ^{226}Ra published in 10 Code of Federal Regulations Part 20.

This summary report describes the following:

- Where and how dust monitoring is conducted
- Where and how air monitoring samples are collected

- What test methods are used to analyze air monitoring samples
- How dust and air monitoring data are evaluated

This summary report also presents the dust and air monitoring test results and compares the results with the established action levels included in the Work Plan (CB&I, 2015a) and APP/SSHP (CB&I, 2015b).

2.0 Monitoring Site Locations

During earthmoving activities, multiple personal data-logging real-time aerosol monitor (PDR) stations were set up site wide to monitor real-time airborne dust concentrations. The purpose of the PDR stations was to act as a first line of defense in protecting the crewmembers' health, and ultimately public health, during field activities. By visually verifying the non-existence of dust during fieldwork activities and having the visual verification confirmed by the PDR data, the probability of exposure to potential contaminants of concern was reduced to almost zero. Dust levels were monitored at, and immediately adjacent to, the excavation sites where the greatest dust volumes in air would be. The objective of this dust monitoring approach is to demonstrate that dust levels at the worst-case locations and public areas outside the worst-case locations will meet action levels.

The two general locations for dust monitoring are shown on Figure 1. PDRs were setup in one or more of the general locations governed by the specific work activities performed in a given day. Typically, one PDR each would serve to monitor the upwind (background), downwind, and worker area conditions. The project health and safety officer made a determination on the specific PDR monitoring locations based on the day's planned activities to ensure sufficient data are collected.

The action level adapted for dust monitoring (Table 1) are conservative action levels based on the California Division of Occupational Safety and Health permissible exposure limit of 10 milligrams per cubic meter for total dust particulate (California Occupational Safety and Health, 2015).

Radiological air samplers were positioned adjacent to excavation work activities for radiologically-impacted soil, and were co-located with PDRs. One upwind and one downwind low volume sampler were used. Specific radiological air monitoring locations are detailed in the radiological survey documentation for the sample count.

3.0 Analytical Methods

The PDR is a high sensitivity photometric monitor whose light-scattering sensing configuration has been optimized for the measurement of the respirable fraction of airborne dust, smoke, fumes, and mists. PDRs were used to evaluate real-time monitoring of airborne dust concentrations, to see if there was a need for additional dust control or personal protection, and to determine the response action in emergency situations.

Real-time monitoring for dust was performed in the work areas with the highest potential for generating airborne dust, such as clearing, excavation, loading and unloading trucks, and stockpiling. A PDR was used to monitor for dust in each work area on operating equipment and on the downwind boundary of the work areas.

Each sample was collected upon completion of work activities at the end of the day. Sample collection may not have occurred due to equipment malfunction and/or inclement weather such as rain.

Radiological air monitoring was also being conducted upwind and downwind on days of earthmoving activities for soil that was potentially radiologically impacted. If clean soil was handled, radiological air monitoring was not conducted. Radiological samples were collected with an LV-1 low volume air sampler and are run during the entire excavation time in a given day. The sample was then counted on a Ludlum Model 3030 and analyzed for gross alpha activity. The calculated airborne concentration in microcuries was then compared to the derived air concentration for ^{226}Ra. The threshold for radiological air monitoring samples was considered to be 10 percent of the derived air concentration.

4.0 Analysis of Dust and Air Monitoring Data

Table 1 shows the dust monitoring action levels that were implemented on a real-time basis. PDR data were collected and reviewed each day by the Site Safety and Health Officer during earth moving activities.

Table 1
Dust Monitoring Project Action Levels

Method	Monitoring Location	Monitoring Frequency [a]	Action Level [b]	Action
Visual Dust Observation	All Areas	Ongoing	Any Visible Airborne Dust	Apply water or other suppression method.
PDR	Job Site Perimeter	Continuously	<10.0 mg/m^3 >10.0 mg/m^3	Continue work. Increase dust control and re-evaluate. Stop work if levels do not decrease.

Notes:

Only the Site Safety and Health Officer is authorized to downgrade levels of personal protective equipment.

[a] Frequency of air monitoring may be adjusted by the project Certified Industrial Hygienist after sufficient characterization of site contaminants has been completed, tasks have been modified, or site controls have proven effective.

[b] Action levels represent airborne particulate concentrations in excess of background particulate concentrations.

<	*less than*
>	*greater than*
mg/m^3	*milligram per cubic meter*

Analytical results from air monitoring samples were compared with the project screening criteria (threshold limit values) listed in Table 2. If site activities caused exceedances of the project screening criteria, additional dust control measures would have been considered and implemented. This was not the case for any site activities.

Table 2
Air Monitoring Project Screening Criteria

Analyte	Project Screening Criteria (Threshold Limit Value)	Basis
Radiological (^{226}Ra)	10% of DAC	Occupational and public air concentration limits for ^{226}Ra published in 10 Code of Federal Regulations Part 20

Notes:

%	*percent*
DAC	*derived air concentration*

5.0 Air Monitoring Results

Dust monitoring data conducted during the monitoring period using PDR were below the Table 1 project action levels. In addition, radiological data from air samples were below the contaminant-specific project screening criteria in Table 2.

Weather information (including ambient pressure and temperature data) and high volume air monitoring sample results are presented in Appendix A. PDR summary results are presented in Appendix B. Radiological air monitoring results are presented in Appendix C.

6.0 References

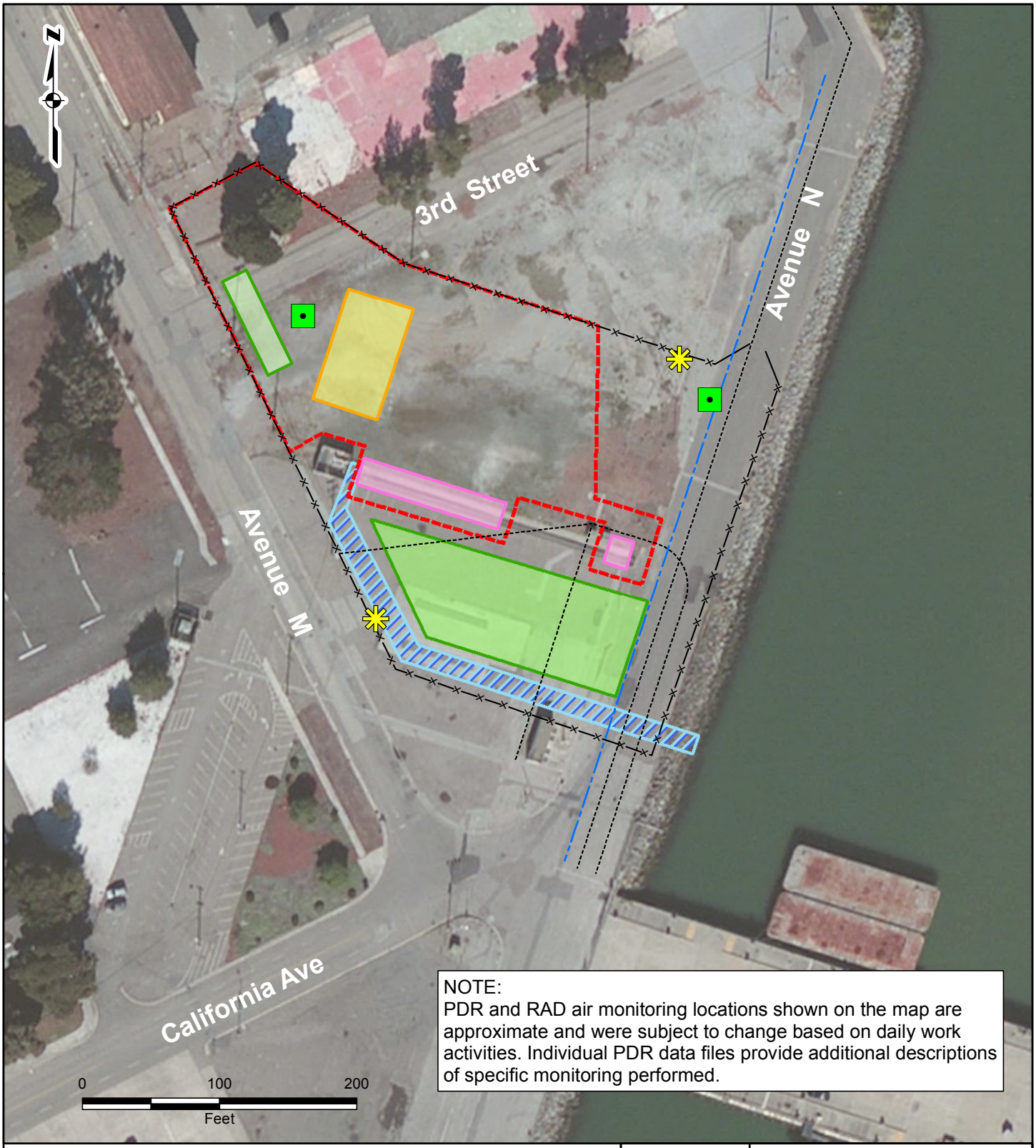
California Occupational Safety and Health, 2015, Permissible Exposure Limits for Chemical Contaminants <https://www.dir.ca.gov/title8/5155table_ac1.html>.

CB&I, 2014, *Sitewide Radiation Protection Plan, Naval Station Treasure Island, San Francisco, California.*

CB&I, 2015a, *Final Work Plan, Removal and Final Status Survey of Historic Avenue "N" Wood Stave Pipe, Former Naval Station Treasure Island, San Francisco, California*, June.

CB&I, 2015b, *Accident Prevention Plan/Site Safety and Health Plan, Removal and Final Status Survey of Wood Stave Storm Line at Former Naval Station Treasure Island, San Francisco, California*.

Figure



U.S. DEPARTMENT OF THE NAVY
BRAC PMO WEST
SAN DIEGO, CALIFORNIA

FIGURE 1
AIR MONITORING LOCATIONS

WOOD STAVE STORM LINE REMOVAL AND FSS
NAVAL STATION TREASURE ISLAND

C:\GIS\Treasure_Island\GIS_Documents\Project_Maps\CTO12EMAC_WoodStave\TI_CTO12_109_WoodStave_PDR.mxd 6/9/2016

Appendix A
Ambient Pressure and Temperature Monitoring Results

Ambient Pressure and Temperature Monitoring Results

Sample Date	Ambient Pressure (in Hg)	Ambient Temperature (°C)
1/4/2016	29.79	9.72
1/5/2016	29.70	10.28
1/6/2016	29.74	9.22
1/7/2016	30.00	10.28
1/8/2016	30.14	9.61
1/11/2016	30.33	11.22
1/12/2016	30.23	11.28
1/13/2016	30.16	13.61
1/14/2016	30.21	9.78
1/15/2016	30.15	12.39
1/18/2016	30.17	13.11
1/19/2016	30.01	14.61
1/20/2016	30.29	11.11
1/21/2016	30.17	13.61
1/22/2016	30.03	13.72
1/25/2016	30.29	12.28
1/26/2016	30.39	9.50
1/27/2016	30.36	12.72
1/28/2016	30.28	12.11
1/29/2016	30.16	14.72
2/1/2016	30.24	9.89
2/2/2016	30.27	9.28
2/3/2016	30.40	8.89
2/4/2016	30.47	11.39
2/5/2016	30.44	11.78
2/8/2016	30.25	15.28
2/9/2016	30.22	16.22
2/10/2016	30.29	14.78
2/11/2016	30.17	14.61
2/12/2016	30.24	13.89
4/25/2016	30.03	15.11
4/26/2016	30.07	13.78
4/27/2016	29.95	12.78
4/28/2016	29.93	14.61
4/29/2016	30.04	14.28
5/2/2016	30.07	14.28
5/3/2016	30.01	14.11
5/4/2016	29.92	14.22
5/5/2016	29.87	14.50
5/6/2016	29.88	12.11
5/9/2016	29.99	13.28

Ambient Pressure and Temperature Monitoring Results

Sample Date	Ambient Pressure (in Hg)	Ambient Temperature (°C)
5/10/2016	30.01	13.61
5/11/2016	30.08	12.78
5/12/2016	30.07	12.61
5/13/2016	30.03	14.11
5/16/2016	29.99	15.72
5/17/2016	29.93	18.72
5/18/2016	29.99	15.28
5/19/2016	29.88	15.78
5/20/2016	29.83	12.78
5/23/2016	29.97	13.61
5/24/2016	30.00	13.22
5/25/2016	30.15	13.11
5/26/2016	30.09	14.50
5/27/2016	29.96	15.78

Notes:

°C - degrees Celsius
in Hg - inches of mercury

Ambient pressure and temperature data were gathered from the wunderground weather website (www.wunderground.com) from stations surrounding the project site in San Francisco and/or Oakland at approximately 1200.

No on site work between 2/12 and 4/25/2016

Appendix B
PDR Air Monitoring Results

PDR Air Monitoring Results

PDR Unit	Date	Maximum (mg/m^3)	Average (mg/m^3)	Exceeding Action Level? (Yes/No)
1	01/25/16	0.017	0.001	No
2	01/25/16	0.022	0.000	No
3	01/25/16	0.040	0.000	No
1	01/26/16	0.084	0.001	No
2	01/26/16	0.105	1.000	No
3	01/26/16	0.026	0.000	No
1	01/27/16	0.197	0.002	No
2	01/27/16	0.181	0.003	No
3	01/27/16	0.779	0.005	No
1	01/28/16	0.043	0.000	No
2	01/28/16	0.056	0.001	No
3	01/28/16	0.100	0.003	No
1	01/29/16	0.000	0.000	No
2	01/29/16	0.000	0.000	No
3	01/29/16	0.003	0.000	No
1	02/01/16	0.008	0.000	No
2	02/01/16	0.071	0.001	No
3	02/01/16	0.249	0.010	No
1	02/03/16	0.008	0.000	No
2	02/03/16	0.001	0.000	No
3	02/03/16	0.556	0.007	No
1	02/04/16	0.017	0.000	No
2	02/04/16	0.012	0.000	No
3	02/04/16	0.007	0.001	No
1	02/05/16	0.016	0.002	No
2	02/05/16	0.217	0.001	No
3	02/05/16	0.101	0.005	No
1	02/09/16	0.038	0.017	No
2	02/09/16	0.004	0.000	No
3	02/09/16	0.026	0.002	No
1	02/11/16	0.013	0.002	No
2	02/11/16	0.050	0.006	No
3	02/11/16	0.017	0.003	No
1	04/25/16	0.229	0.002	No
2	04/25/16	0.952	0.011	No
3	04/25/16	0.738	0.093	No
1	04/26/16	0.060	0.000	No
2	04/26/16	0.105	0.002	No
3	04/26/16	1.312	0.048	No
1	04/28/16	0.511	0.027	No
2	04/28/16	0.032	0.004	No
3	04/28/16	0.431	0.017	No
1	04/29/16	0.014	0.000	No
2	04/29/16	0.027	0.001	No

PDR Air Monitoring Results

PDR Unit	Date	Maximum (mg/m^3)	Average (mg/m^3)	Exceeding Action Level? (Yes/No)
3	04/29/16	0.194	0.004	No
1	05/03/16	0.782	0.004	No
2	05/03/16	1.014	0.016	No
3	05/03/16	2.848	0.080	No
1	05/04/16	0.212	0.001	No
2	05/04/16	0.232	0.006	No
3	05/04/16	0.711	0.009	No
1	05/05/16	0.044	0.001	No
2	05/05/16	0.115	0.003	No
3	05/05/16	0.142	0.020	No
1	05/09/16	0.074	0.069	No
2	05/09/16	0.494	0.026	No
3	05/09/16	0.001	0.000	No
1	05/10/16	0.017	0.000	No
2	05/10/16	0.256	0.005	No
3	05/10/16	0.589	0.006	No
1	05/25/16	0.401	0.001	No
2	05/25/16	0.753	0.008	No
1	05/26/16	0.030	0.003	No
2	05/26/16	2.116	0.060	No

Notes

mg/m^3 - miligrams per cubic meter

Action level at the work site perimeter for the dust monitor is a sustained measurement of 10.0 mg/m3 for five minutes. Data are reviewed on a daily basis and measurements exceeding the action level will prompt additional dust controls. Data is only collected on days when work is active in that location.

Appendix C
Radiological Air Monitoring Results

RAD Air Monitoring Results

Sample Date	Sample Location	Sampling Period (hours)	MDC (µCi/ml)	MDC Exceedance? (Yes/No)
4-Jan-16	upwind	2.5	1.16E-12	No
4-Jan-16	downwind	2.5	1.16E-12	No
8-Jan-16	upwind	5.5	5.82E-13	No
8-Jan-16	downwind	5.5	5.82E-13	No
11-Jan-16	upwind	2.5	1.16E-12	No
11-Jan-16	downwind	2.5	1.16E-12	No
12-Jan-16	upwind	5.8	5.57E-13	No
12-Jan-16	downwind	5.8	5.57E-13	No
14-Jan-16	upwind	5.8	5.04E-13	No
14-Jan-16	downwind	5.8	5.04E-13	No
15-Jan-16	upwind	6.0	5.34E-13	No
15-Jan-16	downwind	6.0	5.34E-13	No
18-Jan-16	upwind	2.0	1.60E-12	No
18-Jan-16	downwind	2.0	1.60E-12	No
20-Jan-16	upwind	6.0	4.83E-12	No
20-Jan-16	downwind	6.0	4.83E-12	No
21-Jan-16	upwind	6.0	5.34E-12	No
21-Jan-16	downwind	6.0	5.34E-12	No
25-Jan-16	upwind	6.3	5.06E-13	No
25-Jan-16	downwind	6.3	5.06E-13	No
26-Jan-16	upwind	5.5	5.82E-13	No
26-Jan-16	downwind	5.5	5.82E-13	No
27-Jan-16	upwind	6.5	4.46E-13	No
27-Jan-16	downwind	6.7	4.35E-13	No
28-Jan-16	upwind	6.3	5.06E-13	No
28-Jan-16	downwind	6.3	5.06E-13	No
1-Feb-16	upwind	7.1	4.52E-13	No
1-Feb-16	downwind	7.1	4.52E-13	No
2-Feb-16	upwind	1.7	1.74E-12	No
2-Feb-16	downwind	1.7	1.74E-12	No
3-Feb-16	upwind	4.8	6.63E-13	No
3-Feb-16	downwind	4.8	6.63E-13	No
4-Feb-16	upwind	5.8	5.49E-13	No
4-Feb-16	downwind	5.8	5.49E-13	No
5-Feb-16	upwind	4.2	6.96E-13	No
5-Feb-16	downwind	4.0	7.25E-13	No
9-Feb-16	upwind	6.0	4.83E-13	No

RAD Air Monitoring Results

Sample Date	Sample Location	Sampling Period (hours)	MDC (µCi/ml)	MDC Exceedance? (Yes/No)
9-Feb-16	downwind	6.2	4.70E-13	No
11-Feb-16	upwind	6.8	4.30E-13	No
11-Feb-16	downwind	6.9	4.19E-13	No

Notes:

MDC - minimum detectable concentration

µCi/ml - micro Curie per mililiter

Approximate sample locations are shown on Figure 1.

RAD sample only collected when interfacing with buffer or contaminated soil.

The threshold value for RAD Samples is 10% of the DAC (for Ra-226, DAC is 3E-10 µCi/ml). Typical MDC is about 4E-13.