Message (Digitally Signed)

From: Brooks, George P CIV [george.brooks@navy.mil]
Sent: 5/18/2017 8:33:17 PM
To: LEE, LILY [LEE.LILY@EPA.GOV]
Subject: RE: fact check re background for rad
Attachments: smime.p7s

Thanks!

-----Original Message-----
From: LEE, LILY [mailto:LEE.LILY@EPA.GOV]
Sent: Thursday, May 18, 2017 1:21 PM
To: Robinson, Derek J CIV NAVFAC HQ, BRAC PMO; Brooks, George P CIV
Subject: [Non-DoD Source] FW: fact check re background for rad

Dear Pat, Derek, and Danielle,

It was good to talk with you recently about reference background for rad at Hunters Point. Below and attached are some excerpts I sent before from Navy documents about this topic.

-----Original Message-----
From: Robinson, Derek J CIV NAVFAC HQ, BRAC PMO [mailto:derek.j.robinson1@navy.mil]
Sent: Wednesday, June 22, 2016 9:42 AM
To: LEE, LILY <LEE.LILY@EPA.GOV>
Cc: Janda, Danielle L CIV <danielle.janda@navy.mil>; Howard, Leslie A CTR NAVFAC HQ, BRAC PMO <leslie.howard@navy.mil>
Subject: RE: fact check re background

Lily,

I slightly updated your text response below. It has also been reviewed by RASO. The changes were made to point out that multiple backgrounds can be set for any one area and can be very limited in size (e.g., a layer of material below a small concrete slab -or- materials used to repair a street).

Derek

-----Original Message-----
From: LEE, LILY [mailto:LEE.LILY@EPA.GOV]
Sent: Tuesday, June 21, 2016 1:25 PM
To: Robinson, Derek J CIV NAVFAC HQ, BRAC PMO
Cc: Janda, Danielle L CIV; Howard, Leslie A CTR NAVFAC HQ, BRAC PMO
Subject: [Non-DoD Source] fact check re background

Dear Derek,

Thank you for agreeing to help answer questions. I have received the question below, and I have drafted a response based on what I've found in official documents, and referring to the Navy for more details. I appreciate you're checking if I have made any factual errors in representing the official documentation.

Question:

Hi Lily,

The Hunters Point documents we have been reviewing indicate a remediation level for radium-226 of 1 pCi/g above background, not to exceed 2 pCi/g, "per agreement with EPA." Could you send me documentation of that EPA agreement and its basis, and any risk assessment that was performed at the time of the risk associated with that level of radium? Also, I am having trouble locating the value being employed for radium background-could you let me know what value is being used and where I can find the source for it?

Below is a draft answer regarding background:

Dear Dr. Hirsch,

Regarding background levels, they vary from location to location, depending on what type of materials are under investigation. Many different fill materials were brought to construct Hunters Point. Additionally, multiple construction events have imported materials that have different background levels. Background is determined based on samples collected at reference areas. These are documented in the Radiological Removal Action Completion Reports (Rad RACRs) and the Survey Unit Project Report Abstracts (SUPRAs) for different sections of the site. You can find many of these documents in EnvirStor, the Navy's website, EPA's website, or information depositories at the San Francisco Public Library. Below are excerpts of some of the documents for illustrative purposes. For more details, please contact:

Derek J. Robinson, PE
BRAC Environmental Coordinator
Navy BRAC PMO West
33000 Nixie Way
Bldg 50
San Diego CA 92147
Desk Phone: 619-524-6026
derek.j.robinson1@navy.mil

Thanks!

- Lily

Excerpts:

2005 Basewide Radiological Workplan:

For example, here's the link to the 27 MB 1st section of the Parcel UC-3 Removal Action Completion Report (RACR):
http://www.envirostor.dtsc.ca.gov/regulators/deliverable_documents/3814468204/Hunters%20Point_Final%20Radiological%20Removal%20Action%20Completion%20Report%201of3_03.16.2012.pdf
<http://www.envirostor.dtsc.ca.gov/regulators/deliverable_documents/3814468204/Hunters%20Point_Final%20Radiological%20Removal%20Action%20Completion%20Report%201of3_03.16.2012.pdf>

Here is an excerpt from this report that discusses the background for Radon-226 for Parcel UC-3, p. 3-7 of its Rad RACR.

3.3 REFERENCE AREA

Reference area samples for the sanitary sewer and storm drain removal project were obtained in April 2006 in an area of the Building 813 parking lot in Parcel D-2. Building 813 was identified in the HRA as being impacted, but the parking lot area was not identified as being impacted, and is considered of like material to that encountered in the soils in survey units. Eighteen samples were collected systematically from this area for reference area purposes. All 18 samples were analyzed at the on-site laboratory by gamma spectroscopy. Ten percent of samples (two samples total) were also analyzed for 90Sr at the on-site laboratory. The reference area samples provided a basis for net activity concentration. Background activity for 226Ra was determined to be 0.485 pCi/g, placing the release criterion at 1.485 pCi/g of 226Ra.

Similarly For Parcel G:

The investigation level for gamma radiation surveys was established at the reference area mean plus 3-sigma, where sigma is the standard deviation of the gamma readings in the reference or background area. Background activity for Ra-226 was determined to be 0.485 pCi/g, establishing the release limit at 1.485 pCi/g. The mean activity in the background reference area was established at 0.001 pCi/g for Pu-239 and 0.020 pCi/g for U-235. The other ROCs were assumed to have a mean reference area activity of zero.

Appendix A begins on p. 28 of this document:

http://www.envirostor.dtsc.ca.gov/regulators/deliverable_documents/7709416031/Parcel%20G%20Radiological%20Removal%20Action%20Completion%20Report%20Part%203_Hunters%20Point_12.02.2011.pdf

Parcel D-1, p. 7-44

The investigation level for gamma radiation surveys was established at the reference area mean plus 3-sigma, where sigma is the standard deviation of the gamma readings in the reference or background area. Background activity for Ra-226 was determined to be 0.485 pCi/g, establishing the release limit at 1.485 pCi/g. The mean activity in the background reference area was established at 0.001 pCi/g for Pu-239 and 0.020 pCi/g for U-235. The other ROCs were assumed to have a mean reference area activity of zero.

Final Survey Unit Project Reports Abstract, Rev. 3

Sanitary Sewer and Storm Drain Removal Project

Hunters Point Shipyard

DCN: EMAC-8823-0003-0100.R3

CTO No. 0003

July 7, 2011

This is referenced for Parcel G

1.1 PURPOSE

This Survey Unit Project Reports (SUPRs) Abstract was prepared to document work conducted under the final Base-wide Storm Drain and Sanitary Sewer Removal Work Plan (TtEC 2006) and final Base-wide Storm Drain and Sanitary Sewer Removal Work Plan - Revision 4 (TtEC 2010) (Work Plan) at Hunters Point Shipyard (HPS), San Francisco, California. This Abstract summarizes the scope, approach, and radiological surveys used during removal of the sanitary sewer and storm drains located within HPS prior to December 31, 2010. This Abstract will be applicable to all associated SUPRs and data sets prepared for regulatory review unless otherwise noted.

The previous version of this document (revision 2 to the final) was prepared under Contract No. N68711-98-D-5713, Contract Task Order (CTO) No. 0072. This document (revision 3 to the final) was prepared under Contract No. N62473-08-D-8823, CTO No. 0003.

The laboratory results for this SUPRA did not include Th-232

SUPRA Parcel C:

Final Survey Unit Project Reports Abstract for Parcel C

SS/SD Removal Containing NORM Conducted After March 1, 2013

Hunters Point Naval Shipyard

DCN: RMAC-0809-0012-0052

CTO No. 0012

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Geological and radiological analysis of soil types in Parcel C of HPNS indicate that large quantities of NORM fill material were used to construct road base, as well as surround conduit lines. This NORM fill material is characterized by a sandy brown physical characteristic, as well as a radium-226 (226Ra) and thorium-232 (232Th) concentration in excess of 1 pCi/g, with an approximate one to one ratio in activity concentrations. A further description of the NORM fill material is contained in Appendix A, "Geological Analysis of Elevated Concentrations of Naturally Occurring Radioactive Material in Hunters Point Naval Shipyard Parcel C Fill Material". Because this type of material naturally contains elevated concentrations of Ra-226 and Th-232 as compared to materials in the previous reference area used for SUPRs, an appropriate reference area within Parcel C is necessary to prevent the unnecessary disposal of NORM fill material as Low Level Radioactive Waste (LLRW).

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The investigation level for gamma surveys was established as the reference area mean + 3 σ where σ is the standard deviation of the gamma readings in the reference area, or the standard deviation of the gamma readings in the specific survey unit as recommended in Section 5.5.2.6 Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) (NUREG-1575; DoD et al. 2000), with prior approval from RASO. Note that in the case of excavated survey units surveyed on a Radiological Screening Yard (RSY) pad, a maximum of 18 investigative (or biased) soil samples were collected.

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3.3 REFERENCE AREA

Reference area samples for the sanitary sewer and storm drain removal project were obtained in December 2013 in an unimpacted area to the southeast of Lockwood Avenue adjacent to Parcel C. Eighteen samples were collected systematically from this area for reference area purposes. All 18 samples were analyzed at the DoD ELAP accredited laboratory by gamma spectroscopy.

The reference area samples provided a basis for net activity concentration.

Background activity for 226Ra, based on the mean of the greater of the reported activity or minimum detectable activity (MDA), measured by a minimum of a 21-day in-growth of the 609.31 keV gamma energy peak for bismuth-214 (214Bi), was determined to be 1.057 pCi/g. This places the release criterion at 2.057 pCi/g of 226Ra for final definitive data, as well as radiological

remediation decisions based on application of a shortened in-growth period in conjunction with a correlated 214Bi in-growth factor. Note that this value is used in each SUPR for background subtraction of 226Ra for dose and risk modeling.

The reference area gamma spectroscopy results from the DoD ELAP accredited are provided in Attachment 2. A summary of the results is provided in Table 3-3.

3.4 ADDITIONAL REFERENCE AREA RADIOANALYTICAL DATA

Seven of the reference area soil samples were selected at random and analyzed for actinium-228 (Ac-228), lead-212 (Pb-212), thorium-234 (Th-234), lead-214 (Pb-214) and bismuth-214 (Bi-214) using gamma spectroscopy analysis at the onsite DoD ELAP accredited laboratory for an extended count time of eight hours to minimize activity concentration uncertainties. These same samples were also analyzed at the TestAmerica St. Louis DoD ELAP accredited laboratory using alpha spectroscopy for thorium-232 (Th-232), thorium-228 (Th-228), uranium-238 (U-238) uranium 233/234 (U-233/234) and thorium-230 (Th-230). This data was used to establish that the Th-232 natural decay series (Th-232 to Ac-228 to Th-228 to Pb-212 to Bi-212) and the U-238 natural decay series (U-238 to Th-234 to U-234 to Th-230 to Pb-214 and Bi-214) were in secular equilibrium (i.e., the activity concentrations for each radionuclide in the decay chain are essentially equivalent taking into account uncertainties of the analytical methods), and, therefore, the comparatively elevated activity concentrations of Ra-226 and Th-232 can logically be deduced to be from naturally occurring radioactive materials in the material, as opposed to radiological contamination as the result of HPNS operations within the past 100 years. The approximate 1:1 ratio of Th-232 to Ra-226 was also demonstrated. The alpha spectroscopy and gamma spectroscopy extended count time results are contained in Attachment 2. Furthermore, the radiological concentration of naturally occurring radioactive materials from the reference area samples are similar to those from a sample from the Colma Formation exposed in the cliffs at Fort Funston (Sample 04-FUNST-003), indicating that this material may have been imported for use as fill. Additional discussions concerning the geological similarities between the Colma Formation

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and the NORM fill material are contained in Appendix A. A summary of the results organized by the Th-232 and U-238 decay chains are provided in Tables 3-4 and 3-5, respectively.

As a further measure, the soil samples were also analyzed by alpha spectroscopy at the TestAmerica St. Louis DoD ELAP accredited laboratory for plutonium-239 (Pu-239) to ensure potential contamination due to nuclear weapons testing, as Cs-137 concentrations as determined by gamma spectroscopy did not indicate fission fragments above background concentration. All results indicated activities less than the method detection limit. The alpha spectroscopy results are contained in Attachment 2. A summary of the results is provided in Table 3-6.

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Lily Lee

Cleanup Project Manager

Superfund Division

U.S. Environmental Protection Agency, Region 9

75 Hawthorne St. (SFD-8-3)

San Francisco, CA 94105

Tel: 415-947-4187, Fax: 415-947-3518

www.epa.gov/region9/superfund