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FINAL SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE RISK ASSESSMENT REPORT FOR SOLID WASTE MANAGEMENT UNIT (SWMU) 9 AREA B TANK 214 AREA WITH TRANSMITTAL LETTER NAVAL ACTIVITY PUERTO RICO

2/10/2016

MICHAEL BAKER INTERNATIONAL

February 10, 2016

Attn: Mr. Phil Flax
Chief, Resource Conservation and Special Projects Section

Re: Contract N62470-10-D-3000
IDIQ for A/E Services for Multi-Media
Environmental Compliance Engineering Support
Delivery Order (DO) JM01
U.S. Naval Activity Puerto Rico (NAPR)
EPA I.D. No. PR2170027203
Revised Final Screening Level Ecological Risk Assessment and Step 3A of the Baseline Risk Assessment Report – SWMU 9 – Area B, Tank 214 Area

Dear Mr. Flax:

Michael Baker International (Baker), on behalf of the Navy, is pleased to provide you with the Revised Final Screening Level Ecological Risk Assessment and Step 3A of the Baseline Risk Assessment Report – SWMU 9 – Area B, Tank 214 Area and the Final Response to EPA and PREQB comments. Due to the large size of the document and the limited number of editorial revisions, only replacement pages are provided rather than a completely hardcopy document. Directions for inserting the replacement pages into the Final report dated August 17, 2015 also are provided. Included with this submittal is a complete electronic copy provided on CD. If you have questions regarding this submittal, please contact Mr. Stacin Martin at (757) 322-4780.

Regards,

MICHAEL BAKER INTERNATIONAL

John W. Mentz
Activity Coordinator

Attachments
cc: Ms. Debbie Sanders, BRAC PMO SE (letter only)
Mr. Pedro Ruiz, NAPR (electronic copy)
Mr. Stacin Martin, NAVFAC Atlantic (1 CD)
Mr. Doug Pocze US EPA Region II (2 hard copies and 2 CDs)
Mr. Jose Font, US EPA Caribbean Office (1 hard copy and 1 CD)
Mr. Felix Lopez, US F&WS (1 hard copy and 1 CD)
Ms. Gloria Toro Agrait, PREQB (1 hard copy and 1 CD)
Ms. Connie Crossley, Booz Allen Hamilton (1 hard copy and 1 CD)

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NAVY RESPONSE TO EPA AND PREQB COMMENTS ON THE DRAFT SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT SWMU 9 – AREA B, TANK 214 AREA NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO FEBRUARY 10, 2016

This document provides additional Navy responses to PREQB and EPA comments (dated June 23, 2015 and October 13, 2015, respectively) on the Draft Screening Level Ecological Risk Assessment and Step 3a of the Baseline Ecological Risk Assessment, SWMU 9 – Area B, Tank 214 Area, Naval Activity Puerto Rico, Ceiba, Puerto Rico (February 2015), herein referred to as the Draft ERA Report. A timeline for the Draft ERA Report, agency comments, and Navy responses is provided below.

- The Draft ERA Report was submitted by the Navy to EPA and PREQB on February 12, 2015.

- PREQB comments on the Draft ERA Report were provided to the EPA (Mr. Doug Pocze) and Navy (Mr. Stacin Martin) via email from Ms. Lorna M. Rodriquez on April 13, 2015.

- EPA comments on the ERA Report were provided to the Navy (Mr. Stacin Martin) via email from Mr. Doug Pocze on April 29, 2015.

- Navy responses to regulator comments on the Draft ERA Report were provided to the EPA and PREQB on June 2, 2015.

- PREQB comments on the Navy responses dated June 2, 2015 were provided to the EPA (Mr. Doug Pocze) and Navy (Mr. Stacin Martin) via email from Mr. Gloria Toro Agrait on June 23, 2015.

- EPA input on the Navy's June 2, 2015 Response to PREQB Page-Specific Comment 1 was provided to the Navy (Mr. Stacin Martin) via email from Mr. Doug Pocze on July 9, 2015. The EPA did not provide any additional comments on the Navy's June 2, 2015 responses at this time.

- The Navy's Response to Comments and the Final Screening Level Ecological Risk Assessment and Step 3A of the Baseline Risk Assessment for SWMU 9 (Final ERA Report) was submitted on August 18, 2015.

- PREQB approved the Response to Comments and the Final ERA Report on September 18, 2015.

- EPA comments on the Navy's June 2, 2015 responses were provide to the Navy (Mr. Stacin Martin) via email from Ms. Jessica Mollin on October 13, 2015.

- The Navy's response to EPA's October 13, 2015 comments and proposed page revisions for the ERA Report were submitted to EPA and PREQB on January 5, 2016 (this document).

- EPA approved the Response to Comments on January 21, 2016.

- The Navy's Final Response to Comments and the Revised Final ERA Report were submitted on February 10, 2016 (this document).

For reference, the complete set of government comments and Navy responses is provided below and dates corresponding to the above timeline are included in parenthesis after each agency comment and Navy response. EPA's January 21, 2016 comment and the associated Navy response are provided in italics.

EPA COMMENTS

EPA GENERAL COMMENTS

EPA General Comment 1 (April 29, 2015): Overall quality and risk conclusions – The ecological risk assessment is very thorough, with detailed explanations, and proper citations and use of literature and EPA guidance, with the exceptions noted below.

Navy Response to EPA General Comment 1 (June 2, 2015): The EPA comment is noted. Navy Responses to EPA General and Page-Specific Comments are provided below.

EPA General Comment 2 (April 29, 2015): Conclusions and Next Steps - Clarify whether and how the results of the ERA will inform remediation at SWMU 9. Remediation discussions should account for the issues presented below. Information on the use of the ERA results and any related activities should be included at the end of the report.

Navy Response to EPA General Comment 1 (June 2, 2015): Section 11.0 will be renamed (Conclusions and Recommendations) and restructured to include two subsections. The existing text will be presented in Section 11.1 (Conclusions). New text presenting the Navy's recommendations for the Tank 214 Area will be presented in Section 11.2 (Recommendations). The specific text that will be included in Section 11.1 is provided below.

> As discussed in Section 11.1, ecological COCs were identified for surface soil (arsenic, lead, thallium, and zinc), groundwater (lead), and sediment (benzo[a]pyrene, chrysene, pyrene, and lead). Therefore, a CMS is recommended to address potential ecological risks. The CMS will include the development of Corrective Action Objectives (CAOs) protective of ecological receptors, an evaluation of corrective measure options to meet the CAOs and mitigate potential ecological risks, as well as the technical approach for implementation of the recommended corrective measures.

EPA General Comment 3 (April 29, 2015): Risks to Benthic Invertebrates in Sediments – In Section 10.0, page 10-1, and on Tables 10-14 and 11-1, benzo(a)pyrene is eliminated from the list of COCs for sediment because the 95 upper confidence limit (UCL) on the mean concentration for the full sediment dataset (14 detects out of 87 samples) is below the sediment screening value of 88.8 µg/kg. The use of the 95 UCL to evaluate risks to sessile organisms such as benthic invertebrates is justified in the ERA as representing risks to communities rather than to individual organisms. (Note that a similar argument is made for using the 95UCL for evaluating exceedances of soil criteria for soil invertebrates and plants.) The screening value for benzo(a)pyrene is the TEL, which was developed in MacDonald (1994) and defined as the upper limit of minimal effects range (<15 percent probability of effects). As described in MacDonald (1994), the range of concentrations in sediment that could, potentially, be associated with biological effects (i.e., the possible effects range) is delineated by the TEL (lower limit, 88.8 µg/kg) and the PEL (upper limit, 763 µg/kg for benzo(a)pyrene), which indicates a threat of impacts. Within this range of concentrations, adverse biological effects are possible; however, it is difficult to predict the

occurrence, nature, and/or severity of these effects. The data used to derive the TELs and PELs come from a mix of study types including field studies, which include effects on benthic communities. In other words, the TELs/PELs are not derived solely from toxicity tests. Based on their sources of data, exceedance of a TEL for a sediment location could represent community impacts at that location, not just impacts on individuals. As such, the use of 95UCLs for site data to compare with the TELs as a means of representing community-level impacts is questionable. Instead, the individual sample concentrations should be the basis of comparison, which would identify benzo(a)pyrene and possibly chrysene as sediment COCs.

More critically, however, benzo(a)pyrene should be retained as a COC in sediment for the following reasons. During the 2006 excavation to remove lead-contaminated soil from two areas (shown on the map of Figure 4-4), residual soil was discovered to also be contaminated with petroleum hydrocarbons and organic solvents. This petroleum-contaminated soil is immediately upgradient of petroleum-contaminated sediment at sample locations 9SD90, 9SD91, 9SD92, and 9SD94; and groundwater flow direction as shown in Figure 2-4 is from the petroleum-contaminated soil to the petroleum-contaminated sediment locations. Detected concentrations of benzo(a)pyrene at these sediment locations exceeded the TEL of 88.8 µg/kg, at a range from 370 µg/kg to 960 µg/kg, with the highest concentration exceeding the PEL. Two other clusters of two sediment samples each, located just offshore of the tanks, also with detected concentrations of benzo(a)pyrene exceeding the TEL, can be found at samples 9SD20 and 9SD99, and 9SW/SD21 and 9SD72. The concentration of benzo(a)pyrene at 9SD20 (1300 µg/kg) also exceeds the PEL. A similar analysis of potential clusters of screening value exceedance locations should also be performed for chrysene and pyrene. Based on locations and groundwater flow direction, the elevated concentrations of benzo(a)pyrene at these sediment locations appear to be associated with releases from the upland soil areas. Because the locations of screening value exceedances are spatially grouped in clusters, benthic invertebrate communities could be impacted throughout the areas represented by those clusters. Based on this analysis, benzo(a)pyrene, and possibly chrysene and pyrene, should be retained as COCs for sediment at SWMU 9, and modifications to respective tables and text, such as the summary in Section 11.5 Estuarine Wetland Sediment, would need to be considered

MacDonald, D.D. 1994. Approach to the Assessment of Sediment Quality in Florida Waters: Volume 1 - Development and Evaluation of Sediment Quality Assessment Guidelines. Prepared for Florida Department of Environmental Protection, Tallahassee, Fl. November 1994.

Navy Response to EPA General Comment 3 (June 2, 2015): The Navy agrees that an exceedance of a TEL for a given sediment location could represent impacts at that location. However, **t**he intent of the BERA was to evaluate potential risks to the benthic macroinvertebrate community inhabiting the entire wetland study area, not the benthic macroinvertebrate community at specific sample locations. Increasing the representativeness of the exposure estimates to population-level effects using 95 percent UCL of the mean concentrations is consistent with this intent, and is considered appropriate for the Tank 214 Area based on adequate spatial coverage of samples within the wetland, as well as the expectation that members of the benthic macroinvertebrate community are found throughout the study area, rather than concentrated in one particular area. Therefore, the Navy believes that it is appropriate to compare 95 percent UCL of the mean chemical concentrations to screening values in Step 3a of the BERA. It is noted that this approach is consistent with Navy guidance (Parker et al., 2003) and ERAs conducted for the Vieques Restoration Program (CH2M Hill, 2010 and 2013a).

Although refined HQ values for the detected PAHs were low (i.e., less than 1.0 or only slightly elevated above 1.0) and the narcosis target lipid model developed by Di Toro and McGrath (2000) predict low bioavailability, the Navy does agree with EPA's concern regarding the clustering and

co-location of elevated benzo(a)pyrene, chrysene, and pyrene concentrations at several locations downgradient from potential sources. Therefore, the Step 3a risk discussion for PAHs presented in Section 10.1.5 of the Draft ERA Report will be revised to reflect that benzo(a)pyrene, chrysene, and pyrene are identified as ecological COCs for estuarine wetland sediment. The specific text that will be added to the Step 3a risk discussion supporting their identification as ecological COCs is included below.

> "Although the narcosis target lipid model presented within the preceding paragraphs predicts low bioavailability for the detected PAHs identified as ecological COPCs in Step 2 of the ERA, benzo(a)pyrene, chrysene, and pyrene were detected at a relatively high frequency above sediment screening values. Benzo(a)pyrene, was detected in sediment collected at eight locations within the estuarine wetland at concentrations greater than the screening value (1,300J µg/kg at 9SD20, 120J µg/kg at 9SD21, 330 µg/kg at 9SD72, 660J µg/kg at 9SD90, 370J µg/kg at 9SD91, 960J µg/kg at 9SD92, 310J µg/kg at 9SD94, and 180J µg/kg at 9SD99). As evidenced by Figure 4-4, four of these sample locations (9SD90, 9SD91, 9SD92, and 9SD94) were established in close proximity to one another, downgradient from a soil excavation conducted in 2006 as part of an ICM to remove lead-contaminated surface soil. Petroleum-impacted soil was discovered on the floor of this excavation, at a depth of approximately 1.0 foot (Baker, 2014). Each of the detected concentrations at these four sample locations exceeds the sediment screening value (TEL of 88.8 µg/kg [MacDonald, 1994]). The detected concentration in sediment collected at 9SD92 (960J µg/kg) also exceeds the PEL of 763 µg/kg developed by MacDonald (1994). As discussed in Section 5.1.3, the PEL represents the lower limit of the range of sediment concentrations that are usually or always associated with adverse biological effects. Based on the location of 9SD90, 9SD91, 9SD02, and 9SD94 relative to the petroleum-impacted soil discovered during the 2006 ICM, the elevated concentrations are likely associated with site activities at the Tank 214 Area.
>
> Two smaller sample clusters with elevated benzo(a)pyrene concentrations were identified within the estuarine wetland. As evidenced by Figure 4-4, 9SD20 and 9SD99 are located in close proximity to one another. Detected concentrations in sediment collected at these two locations (1,300J µg/kg at 9SD20 and 180J µg/kg at 9SD99) exceed the TEL value. The detected concentration in sediment collected at 9SD20 also exceeds the PEL value. The second cluster is represented by sample locations 9SD21 and 9SD72. Benzo(a)pyrene concentrations in sediment collected at these two locations (120J µg/kg in 9SD21 and 330 µg/kg at 9SD72) exceed the TEL value. Both clusters are located near the shoreline, downgradient from Tank 214.
>
> In addition to benzo(a)pyrene, elevated chrysene and pyrene concentrations also exhibit clustering characteristics within the estuarine wetland. Chrysene was detected in sediment collected at fourteen locations at concentrations greater than the screening value. As evidenced by Figure 4-4, eleven of these sample locations (9SD20, 9SD39, 9SD41, 9SD45, 9SD47, 9SD59, 9SD90, 9SD91, SD92, 9SD94, and 9SD95) form a large cluster downgradient from the petroleum-impacted soil discovered during the 2006 ICM. Chrysene concentrations in sediment collected at these locations range from 110J µg/kg (9SD41 and 9SD47) to 880J µg/kg (9SD92). Each of the detected concentrations exceeds the screening value (TEL of 108 µg/kg [MacDonald, 1994]). The detected concentration in sediment collected at 9SD92 (880J µg/kg) also exceeds the PEL of 846 µg/kg developed by MacDonald (1994). It is noted that the area encompassed by these eleven sample locations includes sample locations with elevated benzo(a)pyrene concentrations (i.e., sample locations 9SD90, 9SD91, 9SD92, and 9SD94).

Chrysene was also detected in sediment collected from a small cluster of two sample locations at concentrations greater than the TEL (1,100J µg/kg in sediment collected at 9SD53 and 650 µg/kg in sediment collected at 9SD72). The detected concentration at 9SD53 also exceeds the PEL. As evidenced by Figure 4-4, 9SD53 and 9SD72 were established near the shoreline, downgradient from Tank 214. It is noted that benzo(a)pyrene was also detected at an elevated concentration in sediment collected at 9SD72 (330 µg/kg).

In the case of pyrene, this PAH was detected in sediment collected at ten locations within the estuarine wetland at concentrations greater than the screening value. As evidenced by Figure 4-4, seven of these sample locations form a cluster downgradient from the petroleum-impacted soil discovered during the 2006 ICM (9SD59, 9SD90, 9SD91, 9SD92, 9SD94, 9SD95, and 9SD99). Pyrene concentrations in sediment collected at these locations range from 140J µg/kg (9SD91) to 870J µg/kg (9SD95). Each of the detected concentrations exceeds the screening value (TEL of 153 µg/kg [MacDonald, 1994]). Many of the sample locations within this cluster also exhibited elevated benzo(a)pyrene and chrysene concentrations.

Pyrene was also detected in sediment collected from a small cluster of two sample locations at concentrations greater than the TEL value (1,400J µg/kg in sediment collected at 9SD53 and 380J µg/kg in sediment collected at 9SD72). The detected concentration at 9SD53 also exceeds the PEL value of 1,398 µg/kg developed by MacDonald (1994). As discussed within the preceding paragraphs, benzo(a)pyrene and/or chrysene were also detected at elevated concentrations in sediment collected at these two sample locations.

Based on the analysis presented within the preceding paragraphs, benzo(a)pyrene, chrysene, and pyrene are identified as ecological COCs for estuarine wetland sediment. For each PAH, elevated concentrations (i.e., concentrations greater than screening values) were detected at locations clustered downgradient from potential sources. In many cases, these elevated concentrations were co-located. The remaining detected PAHs identified as ecological COPCs in Step 2 of the ERA (acenaphthylene, benzo[a]anthracene, benzo[g,h,i]perylene, dibenz[a,h]anthracene, indeno[1,2,3-cd]pyrene, and phenanthrene) do not exhibit clustering characteristics within the estuarine wetland. In fact, acenaphthylene, benzo(g,h,i)perylene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, and phenanthrene were each detected in only a single sediment sample at concentrations greater than their respective screening value, while benzo(a)anthracene was detected in a total of two sediment samples at concentrations greater than the screening value. These six PAHs are not identified as ecological COPCs based on their low frequency of detection above screening values, refined HQ value less than 1.0 (in the case of benzo[a]anthracene, benzo[g,h,i]perylene, indeno[1,2,3-cd]pyrene, and phenanthrene), and low bioavailability predicted by the narcosis target lipid model)."

All associated tables and text (e.g., Table 11-1 and Section 11.0) will also be revised to reflect the identification of benzo(a)pyrene, chrysene, and pyrene as ecological COCs for Tank 214 Area sediment.

References cited in Navy response:

CH2M HILL, Inc. 2013a. Master Ecological Risk Assessment Protocol for Vieques Environmental Restoration Program – Update 1 (Addendum). April 5, 2013.

CH2M HILL, Inc. 2010. Master Standard Operating Procedures, Protocols, and Plans. Environmental Restoration Program. Vieques, Puerto Rico. Final. April 2010.

Di Toro, D.M. and J.A. McGrath. 2000. Technical Basis for Narcotic Chemicals and Polycyclic Aromatic Hydrocarbon Criteria. II. Mixtures and Sediments. Environ. Toxicol. and Chem. 19:1971-1982.

Parker, N., G. McDermott, and D. Neptune. 2003 U.S. Navy Ecological Screening and COPC Refinement for Sediment, Soil, and Surface Water. 18 pp.

EPA technical evaluation of Navy Response (October 13, 2015): Although the response is only partially in agreement with the comment, the revised BERA nonetheless sufficiently addresses the request made in the comment. The statement in the Navy response that the comparison of the 95 upper confidence limit (UCL) on the mean concentration for the full sediment dataset with the sediment screening value of 88.8 µg/kg as based on the TEL is consistent with Navy guidance (Parker 2003) does not appear to be entirely accurate. The Navy guidance does mention the use the 95UCL of a dataset for comparison with screening criteria in the refined screening step of the BERA, but it does not address the specific comparison of a sediment 95UCL with a TEL value, which is the concern expressed in the first part of the comment.

The issue is the whether the screening value (i.e., the TEL) for a sessile organism or community is adequate for comparison with a concentration (i.e., the 95UCL) that reflects a relatively large geographic area, as opposed to a concentration that represents a localized area as determined from a sample at a single location. As the original comment pointed out, the TEL developed in MacDonald (1994) is associated with possible biological effects and could represent community impacts as well as impacts to individuals. Thus, an exceedance of the TEL at a location could indicate potential community impacts in the area that the sample from that location represents. Inclusion of all sample locations within a larger geographic area could dilute the higher concentrations that exceed the TEL at specific locations, which could result in a lack of exceedance of the TEL based on the 95 UCL yet with potential community level impacts at the specific locations where the TEL was exceeded. This issue has been commented on for other SWMUs (SWMU 2) at NAPR.

Navy Response to EPA technical evaluation (January 5, 2016): Based on EPA's acknowledgment that the revised ERA sufficiently addresses the request made in the comment, no additional response to EPA's technical evaluation is provided.

EPA technical evaluation of Navy Response (January 21, 2016): *Based on our review, we find that averaging contaminant data over a reasonable area is acceptable for use at the NAPR sites. Please note, however, there are situations where it would not be appropriate to average the data for ecological purposes (e.g., evaluating a small, sensitive wetland, an endangered species is located within the area, etc.), and the navy should keep this in mind for future submittals.*

Navy Response to EPA technical evaluation (February 9, 2016): *EPA's comment is acknowledged.*

EPA General Comment 4 (April 29, 2015): Values Selected for BAFs, Page 10-2, Section 10.0 Step 3a of the BERA, bottom bullet, and various tables (e.g., Tables 10-3, 10-4, 10-5) – The use of median values for BAFs in the refined Step 3a of the BERA has not been adequately justified. Although the Eco-SSL guidance document (USEPA 2003) uses the median value for BAFs, EPA states that the rationale is to not over-predict tissue concentrations, but the uncertainty with possibly under-predicting them by using median BAFs in risk assessments is not addressed. US EPA (2009)

recommends that average values be used; as such, the 95 UCL on the mean BAF from a data set would be an appropriate value to fully capture the average. Generally, the median values are lower than average values, and the use of either averages or median values may be under-protective when evaluating risks and developing cleanup levels. Because of that concern, some state regulatory agencies (e.g., Washington, Oregon) recommend use of the 75th percentiles for sediment BSAFs. Note that although the 90th percentile is recommended for soil BAFs in the Oak Ridge compilation (Sample et al 1998), it has been recommended that 90th percentile values may be unduly influenced by outliers in the dataset (WDOH 1995). A metric that is designed to prevent under-prediction of risks should be used for the BAFs instead of the median value.

USEPA. 2009. Estimation of Biota Sediment Accumulation Factor (BSAF) from Paired Observations of Chemical Concentrations in Biota and Sediment. EPA/600/R-06/047. February.

Sample, B.E., J.J. Beauchamp, R.A. Efroymson, and G.W. Suter, II. 1998. Development and Validation of Bioaccumulation Models for Small Mammals. ES/ER/TM-219. Oak Ridge National Lab. February 1998.

WDOH. 1995. Development of Sediment Quality Criteria for the Protection of Human Health. Tier I
Report. Washington State Department of Health, Office of Toxic Substances. June 1995.

Navy Response to EPA General Comment 4 (June 2, 2015): BAF values based on central tendency estimates (such as median values) were used in Step 3a of the BERA for those ecological COCs lacking literature-based regression/uptake equations. This approach is considered appropriate and was used to maintain consistency with recently approved ERAs at NAPR (e.g., Final CMS Report for SWMU 59 [Baker, April 2015]) and with ERAs conducted for the Vieques Restoration Program (CH2M Hill, 2010 and 2013).

References cited in Navy response:

CH2M HILL, Inc. 2013a. Master Ecological Risk Assessment Protocol for Vieques Environmental Restoration Program – Update 1 (Addendum). April 5, 2013.

CH2M HILL, Inc. 2010. Master Standard Operating Procedures, Protocols, and Plans. Environmental Restoration Program. Vieques, Puerto Rico. Final. April 2010.

EPA technical evaluation of Navy Response (October 13, 2015): The comment stated that values for BAFs that are designed to not under-estimate uptake should be used in the BERA. The Navy responded that the use of median values is consistent with other BERAs approved by EPA at NAPR, and as such no revision to the BERA was made. However, the BERA and Navy response are not consistent with Navy protocol for performing a BERA (CH2MHILL 2015), which says that BAFs should be based on mean or median values, but emphasis is given to mean values unless the data can be shown to not follow a discernible distribution, then a median value may be appropriate. The SWMU 9 BERA uses median values without showing that the median is more appropriate than a mean. If this is not demonstrated, then a 95 percent upper confidence on the mean would be the best value to use. Thus, the original comment that the use of median values may not be sufficiently protective was not addressed in the response, and the response and the BERA appear to be inconsistent with the Navy protocol.

Navy Response to EPA technical evaluation (January 5, 2016): Text and tables associated with Step 3a of the BERA were revised to reflect the use of 95 percent UCL of mean BAF values when estimating tissue concentrations in prey items for the American robin (terrestrial plants and

invertebrates), mourning dove (terrestrial plants), red-tailed hawk (mammalian omnivores), and brown flower bat (terrestrial plants). Text and tables were also revised to reflect the use of 95 percent UCL of the mean BAF/BSAF values when estimating tissue concentrations in the prey items for the spotted sandpiper (aquatic invertebrates) and green heron (fish). 95 percent UCL of the mean BAF/BSAF values were derived using USEPA ProUCL Version 5.0.00 software [USEPA, 2013b and 2013c]).

It is noted that BAFs/BSAF values derived using uptake equations or regression-based models where not revised to reflect the use of 95 percent UCL of the mean BAF/BSAF values. It is further noted that for a given ecological COPC and prey item, 95 percent UCL of the mean BAFs/BSAFs were used only if the following conditions were met:

- The source document contained a database of individual BAF/BSAF values that allowed for the derivation of a 95 percent UCL of the mean value.

- The database of BAF/BSAF values within the source document contained a sufficient number of data points (ProUCL Version 5.0.00 [USEPA, 2013c] recommends a minimum of eight data points to derive reliable 95 percent UCL of the mean values).

- The 95 percent UCL of the mean concentration derived using ProUCL Version 5.0.00 software did not exceed the maximum BAF value within the database.

If these three conditions were not met, the arithmetic mean or median BAF/BSAF value (as reported by the source document or derived from the source document's BAF/BSAF database for data sets that did not meet the conditions specified by the second and third bullet item above) was used to estimate the prey item tissue concentration. As a measure of conservatism, the highest of the arithmetic mean and median value was used in the derivation.

References cited in Navy response:

USEPA. 2013a. ProUCL Version 5.0.00 User Guide: Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations. EPA/600/R-07/041. September 2013. http://www.epa.gov/osp/hstl/tsc/ProUCL_v5.0_user.pdf.

USEPA. 2013b. ProUCL Version 5.0.00 Technical Guide: Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations. EPA/600/R-07/041. September 2013. http://www.epa.gov/osp/hstl/tsc/ProUCL_v5.0_tech.pdf.

EPA SPECIFIC COMMENTS

EPA Specific Comment 1 (Table 10-4) (April 29, 2010): Under the column "Description" the section number needs correcting.

Navy Response to EPA Specific Comment 1 (June 2, 2015): Reference to Section 7.5.2.2.1 in Table 10-4 under the column "Description" will be revised to Section 6.2.2.1.

EPA Specific Comment 2 (Table 10-4) (April 29, 2010): Under "Source Document" for Lead, the source is Table 7 of Sample (1999), not Table C-1 (which is the correct table for vanadium).

Navy Response to EPA Specific Comment 2 (June 2, 2015): The footnotes in Table 10-4 will be revised to show that the source of the BAF value for lead is Table 7 of Sample et al. (1998).

EPA Specific Comment 3 (Figures 10-1 and 10-2) (April 29, 2010): Units for the soil data should be added to the legends.

Navy Response to EPA Specific Comment 3 (June 2, 2015): The legends for Figures 10-1 and 10-2 will be revised to include the units for the soil data (mg/kg).

PREQB COMMENTS

PREQB GENERAL COMMENTS

PREQB General Comment 1 (April 13, 2015): In general, the risk assessment was thorough and well written. Risks to ecological receptors from various constituents (but primarily lead) detected in soil (both surface and subsurface), groundwater and sediment exist based on the available data and analyses provided in the risk assessment. However, it is unclear what the next step is as recommendations for additional study/testing were not provided. Please provide a discussion concerning the path forward for further evaluating risk at the site or provide appropriate remedial goals for addressing those contaminants presenting potential ecological risk.

Navy Response to PREQB General Comment 1 (June 2, 2015): As discussed in the Navy response to EPA General Comment 2, Section 11.0 will be renamed (Conclusions and Recommendations) and restructured to include two subsections. The existing text will be presented in Section 11.1 (Conclusions). New text presenting the Navy's recommendations for the Tank 214 Area will be presented in Section 11.2 (Recommendations). Specifically, a CMS will be recommended to address potential risks to ecological receptors. The CMS will include the development of Corrective Action Objectives (CAOs) protective of ecological receptors, an evaluation of corrective measure options to meet the CAOs and mitigate potential risks, as well as the technical approach for implementation of the recommended corrective measures.

PREQB General Comment 2 (April 13, 2015): Sediment toxicity testing was previously conducted with Leptocheirus plumulosus as a component of an earlier ecological risk assessment. It is unclear why the risk assessment did not discuss the results of this previous toxicity testing. Please either provide a summary of this previous testing within the risk assessment or indicate why these results are not applicable to the current risk assessment.

Navy Response to PREQB General Comment 2 (June 2, 2015): The *Leptocheirus plumulosus* toxicity tests were conducted on sediment samples collected in 2006. The tests were designed to assist in the establishment of a site-specific corrective action objective for lead. Subsequent investigations conducted at the Tank 214 Area (i.e., 2007 Phase I RFI field investigation and the 2009, 2011, and 2014 Full RFI field investigations) have demonstrated that the spatial extent and range of lead concentrations in estuarine wetland sediment were not adequately defined. These field investigations also showed that sediment quality within the wetland was not adequately characterized. For example, the Phase I and full RFI field investigations referenced above found elevated benzo(a)pyrene, chrysene, and pyrene concentrations at locations not previously sampled during the earlier field investigations. Based on a re-evaluation of the Step 3a risk analysis for PAHs in sediment, these three PAHs are considered ecological COCs for wetland sediment (see EPA General Comment 3 and the Navy response). Given that all COCs were not identified and the spatial extent and range of lead concentrations were not adequately defined prior to sampling activities for toxicity testing, it is the Navy's opinion that the toxicity test data are not applicable to the current ERA (SERA and Step 3a of the BERA).

It is noted that the toxicity data exhibited a poor dose-response relationship with regard to lead concentrations. This poor dose-response relationship may have been due to the presence of unknown contaminants (e.g., PAHs) not included within the study design.

PREQB PAGE-SPECIFIC COMMENTS

PREQB Page-Specific Comment 1 (Page 10-1, Section 10.0) (April 13, 2015): Risks to lower trophic level receptors (i.e., aquatic invertebrates) inhabiting the Los Machos mangrove wetland are evaluated in Step 3A of the baseline ecological risk assessment (BERA) by comparing the 95% UCL of the mean concentration of ecological COPCs with the sediment benchmarks. Although this is one approach to evaluating risk to populations of aquatic invertebrates, as noted in the report, individual benthic organisms would only be exposed to a very localized area - not the entire mangrove wetland. Another more relevant endpoint would be to evaluate the proportion of an area (or percent of samples) that may present a risk to lower trophic level receptors such as aquatic invertebrates. Potential risks to benthic organisms need to consider the extent of sediment within the Los Machos mangrove wetland that exceed the sediment benchmarks as well as available data that reflect site-specific bioavailability (e.g., AVS/SEM results). Please evaluate risk to benthic organisms using this consideration.

Navy Response to PREQB Page-Specific Comment 1 (June 2, 2015): As discussed in the Navy response to EPA General Comment 3, the intent of the BERA was to evaluate potential risks to the benthic macroinvertebrate community inhabiting the entire wetland study area, not the benthic macroinvertebrate community at a specific sample location. As such, Increasing the representativeness of the exposure estimates to population-level effects using 95 percent UCL of the mean concentrations is consistent with this intent, and is considered appropriate for the Tank 214 Area based on adequate spatial coverage of samples within the wetland, as well as the expectation that members of the benthic macroinvertebrate community are found throughout the wetland study area, rather than concentrated in one particular area.

It is noted that the frequency of detected concentrations above sediment screening values was used as a line of evidence in the Step 3a risk discussion for many of the ecological COPCs. For example, barium, cadmium, and chromium where not identified as ecological COCs based, in part, on the low frequency of detected concentrations above sediment screening values.

PREQB technical evaluation of Navy Response (June 23, 2015): The response adequately addresses the comment. However, the percent frequency of samples that exceed sediment benchmarks associated with impacts to benthic organisms needs to also be a consideration for evaluating risk to the benthic community for all COCs. COCs may potentially result in adverse impacts to the benthic community if a high proportion (e.g., 20% or higher) of samples exceed an adverse effect level even if the 95% UCL of the mean is less than the benchmark. Conversely, even if the 95% UCL of the mean exceeds its benthic organism effect level, significant adverse impacts to the benthic community may not result if only a small proportion of samples exceed the effect level. The percent frequency of samples that a COC exceeds its effect level needs to be evaluated in the proposed CMS in addition to the 95% UCL of the mean.

EPA technical evaluation of Navy Response (July 9, 2015): I believe there was and outstanding EQB comment regarding the SWMU 9 - Eco Risk for which EPA was asked to weigh-in. After additional review, EPA does support and share EQB's concerns with regards to the percent frequency of the samples.

Navy Response to PREQB and EPA technical evaluation (August 17, 2015): The Navy concurs with the PREQB and EPA. The proposed CMS for SWMU 9 – Area B, Tank 214 Area will include

an evaluation of the percent frequency of samples that exceed sediment benchmarks when evaluating risks to benthic macroinvertebrates for all COCs.

PREQB Page-Specific Comment 2 (Page 10-4, Section 10.0) (April 13, 2015): Outlier tests were conducted on combined Tank 214 area and background data sets. Please clarify what step(s), if any, were taken if an outlier(s) were identified within either the Tank 214 area data set or background data set.

Navy Response to PREQB Page-Specific Comment 2 (June 2, 2015): Outlier tests were performed on combined Tank 214 Area and background data sets to supplement the exploratory graphical representations (i.e., box plots and probability plots). Specifically, the outlier tests were performed on combined data sets to determine if elevated Tank 214 Area data points suggested by the box and/or probability plots are statistically elevated relative to background concentrations and other detected concentrations at the SWMU. Those site observations indicated to be elevated by graphical representations of the data and found to be statistically elevated by outlier tests relative to background concentrations and other detected concentrations at the SWMU likely represent contamination.

No steps were taken if outliers were identified within the background and/or Tank 214 Area data sets. Specifically, data points identified as statistical outliers by Dixon's outlier test or Rosner's outlier test were not omitted from statistical tests evaluating the mean/median and right-tail of the background and Tank 214 Area data set distributions. This approach is consistent with Navy background guidance (NFESC, 2002, 2003, and 2004).

To clarify the use of outlier tests in Step 3a of the baseline ecological risk assessment and how statistical outliers were treated, the following paragraph will be added to the eighth bullet within Section 10.0:

> "Outlier tests were performed on combined Tank 214 Area and data sets to supplement the graphical representations of the data (i.e., box plots and probability plots). Specifically, the outlier tests were performed on combined data sets to determine if elevated Tank 214 Area data points suggested by the box and/or probability plots are statistically elevated relative to background concentrations and other detected concentrations at the SWMU. Site observations indicated to be elevated by graphical representations of the data and found to be statistically elevated by outlier tests relative to background concentrations and other detected concentrations at the SWMU likely represent contamination. No steps were taken if outliers were identified within the background and/or Tank 214 Area data sets. Specifically, data points identified as statistical outliers by Dixon's outlier test or Rosner's outlier test were not omitted from statistical tests evaluating the mean/median and right-tail of the background and Tank 214 Area data set distributions."

References cited in Navy response:

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Naval Facilities Engineering Service Center (NFESC). 2002. Guidance for Environmental Background Analysis, Volume 1: Soil. NFESC User's Guide UG-2049-ENV.

NFESC. 2003. Guidance for Environmental Background Analysis, Volume II: Sediment. NFESC User's Guide UG-2054-ENV.

(NFESC. 2004. Guidance for Environmental Background Analysis. Volume III: Groundwater. NFESC User's Guide UG-2059-ENV.

PREQB Page-Specific Comment 3 (Page 10-13, Section 10.1.1) (April 13, 2015): The report text for the zinc risk discussion contains a reference to the maximum vanadium concentration detected. Please correct this typographical error to reflect the maximum zinc concentration.

Navy Response to PREQB Page-Specific Comment 3 (June 2, 2015): The reference to the maximum vanadium concentration within the first paragraph, third sentence of the Step 3a risk discussion for zinc in surface soil will be corrected to reflect the maximum zinc concentration.

PREQB Page-Specific Comment 4 (Page 10-22, Section 10.1.3) (April 13, 2015): The report indicates that the maximum detected groundwater concentration of copper (total recoverable concentration) detected at the Tank 214 area represents an outlier. Please indicate whether any outlier was identified for the combined dissolved copper groundwater data sets for the Tank 214 area and background groundwater samples.

Navy Response to PREQB Page-Specific Comment 4 (June 2, 2015): An outlier test was not performed on the combined Tank 214 Area and background data sets for dissolved copper in groundwater. This decision was based on the descriptive statistics presented in Table 10-10 of the Draft ERA Report. As evidenced by the table, the maximum dissolved copper concentration in Tank 214 Area groundwater (6.5J µg/L) is less than the maximum background concentration (496J µg/L) and background threshold value (323 µg/L).

PREQB Page-Specific Comment 5 (10-35, Section 10.1.5) (April 13, 2015): Thallium was not retained as a COC for estuarine sediment based on low frequency of detection and a comparison with the maximum non-detected background sampling result. The rationale for comparing a site-detected constituent with the maximum non-detected background concentration is unclear. If a constituent is not detected in the background data set then background should not be used to as a criterion for deciding whether to include a constituent as a COC or not. Please either provide additional justification for this comparison or base the decision on excluding thallium as an estuarine sediment COC on the remaining criteria.

Navy Response to PREQB Page-Specific Comment 4 (June 2, 2015): The Step 3a risk discussion for thallium will be revised by removing the comparison of detected concentrations in Tank 214 Area sediment to the maximum non-detected background concentration. The decision to exclude thallium as a COC will be based on the remaining criteria (i.e., frequency and magnitude of detected concentrations).

PREQB Page-Specific Comment 6 (Page 10-42, Section 10.1.5) (April 13, 2015): The report discusses AVS/SEM results for 87 sediment samples where this parameter was analyzed. However, Section 3.5 of the risk assessment report lists a total of 92 sediment samples where AVS/SEM was analyzed while Table 3-1 lists 94 AVS/SEM samples. Please clarify or correct these apparent discrepancies.

Navy Response to PREQB Page-Specific Comment 6 (June 2, 2015): The sediment samples listed in Table 3-1 of the Draft ERA Report includes five samples (i.e., 9SD89B, 9SD90B, 9SB91B, 9SB92B, and 9SB93B) and one field duplicate sample (9SD93BD) collected during Step 6 of the BERA. The table indicates that samples 9SD89B, 9SD90B, 9SB91B, 9SB92B, and 9SB93B were analyzed for AVS/SEM. These five samples were also included within the total number of samples identified in Section 3.5 of the Draft ERA Report that were collected during Step 6 of the BERA and analyzed for AVS/SEM (i.e., 25 samples). Their inclusion in Table 3-1 and within the total number of samples identified in Section 3.5 for Step 6 of the BERA represents an error. To correct this error, sediment samples 80SD89B, 80SD90B, 80SB91B, 80SB92B, and 80SB93B), as well as the field duplicate sample collected at 80SB93 (i.e., 80SB93BD) will be removed from Table 3-1.

The total number of sediment samples and field duplicate samples identified within Section 3.5 for Step 6 of the BERA will also be revised from 25 and 3, respectively, to 20 and 2, respectively.

Based on these revisions, Table 3-1 will show that a total of 87 sediments samples, 1 duplicate sample (9SD180D), and 1 MS/MSD sample (9SD180MS/MSD) were collected at the Tank 214 Area and analyzed for AVS/SEM. The number of sediment samples listed within the revised table (87, excluding the field duplicate and MS/MSD sample) will match the number of sediment samples identified within the revised section that were collected at the Tank 214 Area and analyzed for AVS/SEM (11 for the 2000 CMS, 45 for the Step 5 BERA investigation, 20 for the Step 6 BERA investigation, and 11 for the 2011Full RFI). This number will also match the number of sediment samples with AVS/SEM data currently included within Table 10-16 and identified within Section 10.1.5 of the Draft ERA Report. It is noted the AVS and SEM analytical data for sediment sample 9SD180 and its field duplicate (9SD180D) where combined using the procedures presented in Section 6.1 (fifth bullet item) of the Draft ERA Report. The data presented in Table 10-16 for 9SD180 represent the combined data.

PREQB Page-Specific Comment 7 (Table 2-1) (April 13, 2015): The purpose of footnote 4 listed in this table is unclear. The title of Table 2-1 indicates that the birds listed in the table either have been reported or have the potential to occur at NAPR. Footnote 4 appears confusing in that it identifies only two species (piping plover and roseate tern) as having the potential to occur at NAPR while the purpose of the table is to identify and list all avian species that have the potential of be present. Please clarify or remove the 4th footnote from the table.

Navy Response to PREQB Page-Specific Comment 7: The fourth footnote will be removed from Table 2-1 of the Draft ERA Report.

PREQB Page-Specific Comment 8 (Table 5-4) (April 13, 2015): The toxicity reference values presented for polynuclear aromatic hydrocarbons (PAHs) in this table are based on a study conducted in 1963. Peer-reviewed and more recent avian toxicity studies are available in the eco-SSL document (USEPA, 2007) for PAHs (Appendices 5-1 and 5-2). Please use these updated values or provide justification concerning the avian toxicity values used in the risk assessment for PAHs.

Navy Response to PREQB Page-Specific Comment 8 (June 2, 2015): The TRV values listed in Table 5-4 of the Draft ERA Report will be revised to reflect the avian toxicity data contained within Appendix 5.1 and 5.2 of the Eco-SSL document for PAHs (USEPA, 2007). As evidenced by Appendix 5.1 of the Eco-SSL document, the USEPA identified one study from the literature for a single low molecular weight (LMW) PAH (i.e., naphthalene) that meets the minimum requirements for Eco-SSL derivation. For this study, the USEPA derived a NOAEL-based dose of 1,653 mg/kg/day based on northern bobwhite behavior, survival, and growth. This value will be used as the NOAEL-based TRV for naphthalene. A LOAEL-based value is not available from the Eco-SSL document. However, a LOAEL-based TRV of 8,265 mg/kg/day can be estimated by multiplying the NOAEL-based TRV by 5 (Wentsel et al. 1996). This estimated value (8,265 mg/kg/day) will be used as the LOAEL-based TRV for this PAH. These TRVs will also be used as surrogate values for the other LMW PAHs listed in Table 5-4 (i.e., 1-methylnaphthalene, 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, fluoranthene, fluorene, naphthalene, and phenanthrene).

In addition to naphthalene, The USEPA identified one study for a single high molecular weight (HMW) PAH (7,12-dimethylbenz[a]anthracene) that meets the minimum requirements for Eco-SSL derivation (see Appendix 5-2 of the Eco SSL document). For this study, the USEPA derived a NOAEL-based dose of 20 mg/kg/day and a LOAEL-based dose of 2 mg/kg/day based on

European starling biochemical changes, survival, and growth. In addition to these doses, the USEPA derived a second NOAEL-based dose of 60 mg/kg/day for the biochemical endpoint. As evidenced by Table 5-4 of the Draft ERA Report, the NOAEL- and LOAEL-based doses derived by the USEPA for the survival and growth endpoints (20 mg/kg/day and 2 mg/kg/day, respectively) were used as TRV values for 7,12-dimethylbenz(a)anthracene. These TRVs will also be used as surrogate values for the other HMW PAHs listed in Table 5-4 (i.e., benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[g,h,i]perylene, benzo[k]fluoranthene, chrysene, dibenz[a,h]anthracene, indeno[1,2,3-cd]pyrene), and pyrene).

The revised TRVs identified within the preceding paragraphs will be used to recalculate screening level risk estimates for PAHs. Tables 7-6, 7-7, and 7-8, as well as Section 7.6.2, will be revised as necessary to reflect the recalculation of avian risks using the revised TRV values. Those PAHs with screening level HQ values greater than 1.0 for a given receptor-medium combination will be identified as ecological COPCs and subjected to additional evaluation in Step 3a of the BERA using the methodologies presented and discussed in Section 10.0 of the Draft ERA Report.

References cited in Navy response:

USEPA. 2007b. Ecological Soil Screening Levels for Polycyclic Aromatic Hydrocarbons (PAHs) (Interim Final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-78.

REVISED FINAL SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE RISK ASSESSMENT REPORT SWMU 9 – AREA B, TANK 214 AREA

For NAVAL ACTIVITY PUERTO RICO
EPA I.D. No. PR2170027203
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Contract No. N62470-10-D-3000
DO JM01

February 2016

IQC for A/E Services for Multi-Media Environmental Compliance Engineering Support

REVISED FINAL

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE RISK ASSESSMENT REPORT SWMU 9 – AREA B, TANK 214 AREA

NAVAL ACTIVITY PUERTO RICO
EPA I.D. NO. PR2170027203
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February 10, 2016

Prepared for:

DEPARTMENT OF THE NAVY
NAVFAC SOUTHEAST
North Charleston, SC

Under:

Contract No. N62470-10-D-3000
DELIVERY ORDER JM01

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LIST OF ACRONYMS AND ABBREVIATIONS

ADCI	Additional Data Collection Investigation
AET	Apparent Effects Threshold
AUF	Area Use Factor
AUF_j	area use factor for receptor j
ASTM	American Society for Testing and Materials
AVGAS	Aviation Gasoline
AVS	Acid Volatile Sulfide
BAF	Bioaccumulation Factor
Baker	Michael Baker Jr., Inc.
BERA	Baseline Ecological Risk Assessment
BRAC	Base Realignment and Closure
BSAF	Biota-Sediment Accumulation Factors
BTEX	Benzene, Toluene, Ethylene, and Xylene
BTV	Background Threshold Value
BW_j	Body weight of receptor j
CAV	Chronic Aquatic Value
CCC	Continuous Criteria Concentrations
CCME	Canadian Council of Ministers of the Environment
CFR	Code of Federal Regulations
CMS	Corrective Measures Study
CNO	Chief of Naval Operations
COC	Chemical of Concern
COPC	Chemical of Potential Concern
DDT	Dichlorodiphenyltrichloroethane
DI_{xj}	Dietary intake of chemical x by receptor j
DFM	Diesel Fuel Marine
DMMP	Dredged Material Management Program
DO	Delivery Order
DoN	Department of the Navy
DRO	Diesel Range Organics
E2SS3	Estuarine, Intertidal, Scrub-Shrub, Broad-Leaved Evergreen
E2US2	Estuarine, Intertidal, Unconsolidated Shore, Sand
E2US3	Estuarine, Intertidal, Unconsolidated Shore, Mud
E2US4	Estuarine, Intertidal, Unconsolidated Shore, Organic
EC_{50}	Median Effective Concentration
ECOSAR	Ecological Structure Activity Relationships
Eco-SSL	Ecological Soil Screening Level
ECOTOX	Ecotoxicology
EM	Electromagnetic
EqP	Equilibrium Partitioning
ERA	Ecological Risk Assessment
ER-L	Effects Range-Low
ER-M	Effects Range-Median
ESL	Ecological Screening Level

LIST OF ACRONYMS AND ABBREVIATIONS
(continued)

FC_{xi}	maximum concentration of chemical x in food item i
FCV	Final Chronic Value
FIR_j	food ingestion rate for receptor j
f_{oc}	fraction of organic carbon
GLI	Great Lakes Initiative
GMAV	Genus Mean Acute Value
GPR	Ground Penetrating Radar
GRO	Gasoline Range Organics
HI	Hazard Index
HMW	High Molecular Weight
HQ	Hazard Quotient
HSDB	Hazardous Substances Data Bank
ICM	Interim Corrective Measure
JP-5	Jet Propellant-5
K_d	adsorption coefficient
kg	kilogram
kg/day	kilogram per day
K_{oc}	organic carbon partition coefficient
K_{ow}	octanol-water partition coefficient
K_{ww}	biota to soil water partitioning coefficient
L	liter
LC_{50}	Median Lethal Concentration
LEL	Lowest Effect Level
LD_{50}	Median Lethal Dose
LMW	Low Molecular Weight
LOAEC	Lowest Observed Adverse Effect Concentration
LOAEL	Lowest Observed Adverse Effect Level
LOD	Limit of Detection
LOEC	Lowest Observed Effect Concentration
LOEL	Lowest Observable Effect Levels
MATC	Maximum Acceptable Toxicant Concentration
MDL	Method Detection Limit
mg/kg	milligram per kilogram
mg/kg-BW/day	milligram per kilogram Body Weight per day
µg/kg	microgram per kilogram
µg/L	micrograms per liter
µmol/g OC	micromoles per gram organic carbon
MRL	Method Reporting Limit
NAPR	Naval Activity Puerto Rico
NAVFAC	Naval Facilities Engineering Command
NAPR	Naval Activity Puerto Rico

LIST OF ACRONYMS AND ABBREVIATIONS
(continued)

NAVFAC	Naval Facilities Engineering Command
NRWQC	National Recommended Water Quality Criteria
NCP	National Contingency Plan
NFESC	Naval Facility Engineering Service Center
NOAA	National Oceanic and Atmospheric Administration
NOAEC	No Observed Adverse Effect Concentration
NOAEL	No Observed Adverse Effects Level
NOEC	No Observed Effects Concentration
NOEL	No Observed Effects Level
NTU	Nephelometric Turbidity Units
NSRR	Naval Station Roosevelt Roads
OAC	Ohio Administrative Code
OECD	Organization for Economic Co-Operation and Development
OEPA	Ohio Environmental Protection Agency
OMOE	Ontario Ministry of the Environment
OPP	Office of Pesticide Programs
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PDF_i	proportion of diet composed of food item i
PDS	proportion of diet composed of soil/sediment
PEL	Probable Effect Level
PMO	Program Management Office
ppt	parts per thousand
PRDNR	Puerto Rico Department of Natural Resources
PREQB	Puerto Rico Environmental Quality Board
PRWQS	Puerto Rico water Quality Standard
PRWQSR	Puerto Rico Water Quality Regulation
PSQG	Provincial Sediment Quality Guideline
RAGS	Risk Assessment Guidance for Superfund
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SACR	Secondary Acute-to-Chronic Ratio
SAV	Secondary Acute Value
SAR	Structure Activity Relationship
SCV	Secondary Chronic Value
SC_x	maximum concentration of chemical x in soil/sediment
SE	Southeast
SEM	Simultaneously Extracted Metals
SERA	Screening Level Ecological Risk Assessment
SQAG	Sediment Quality Assessment Guideline
SQG	Sediment Quality Guideline
SQUIRT	Screening Quick Reference Table
SVOC	Semi-Volatile Organic Compound
SWMU	Solid Waste Management Unit

LIST OF ACRONYMS AND ABBREVIATIONS
(continued)

TEL	Threshold Effect Level
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
TRV	Toxicity Reference Value
UCL	Upper Confidence Limit
UNEP	United Nations Environmental Program
USACE	U.S. Army Corp of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
UST	Underground Storage Tank
VOC	Volatile Organic Compound

1.0 INTRODUCTION

This document presents a screening level ecological risk assessment (SERA) and Step 3a of the baseline ecological risk assessment (BERA) for Solid Waste Management Unit (SWMU) 9 – Area B, Tank 214 Area (herein referred to as the Tank 214 Area), located at Naval Activity Puerto Rico (NAPR), Ceiba, Puerto Rico (see Figure 1-1 for a regional location map showing the location of NAPR). This report has been prepared by Michael Baker Jr., Inc. (Baker), for the Navy Base Realignment and Closure (BRAC) Program Management Office (PMO) Southeast (SE) office under contract with the Naval Facilities Engineering Command (NAVFAC), SE (Contract Number N62470-10-D-3000, Delivery Order [DO] JM01), and was developed in accordance with the RCRA § 7003 Administrative Order on Consent (U.S. Environmental Protection Agency [USEPA] Docket No. 02-2007-7301 [USEPA, 2007a]).

The SERA and Step 3a of the BERA were performed in accordance with Navy policy for conducting ecological risk assessments (ERAs) (Chief of Naval Operations [CNO], 1999) and Navy guidance for conducting ERAs (available at http://web.ead.anl.gov/ecorisk/), as well as guidance provided by the USEPA (1997). The Navy ERA process (see Figure 1-2) consists of eight steps organized into three tiers and represents a clarification and interpretation of the eight-step ERA process outlined in the USEPA ERA guidance for the Superfund program (USEPA, 1997). Tier 1 of the Navy ERA process represents the SERA:

- Screening level problem formulation and ecological effects evaluation (Step 1)
- Screening level exposure estimate and risk calculation (Step 2)

Under Navy policy (CNO, 1999), if the results of Steps 1 and 2 (Tier 1 SERA) indicate that, based on a set of conservative exposure assumptions, there are chemicals present in environmental media that may present a risk to receptor species/communities (i.e., ecological chemicals of potential concern [COPCs]), as was the case at the Tank 214 Area, the ERA process proceeds to the BERA. According to Superfund guidance (USEPA, 1997), Step 3 represents the problem formulation phase of the BERA. Under Navy policy, the BERA is defined as Tier 2, and the first activity in Tier 2 is Step 3a. In Step 3a, the conservative exposure assumptions applied in Tier 1 are refined and risk estimates are recalculated using the same conceptual site model. The evaluation of risks in Step 3a also may include consideration of available background data and chemical bioavailability. The refinements and methods applied in Step 3a of the BERA for the Tank 214 Area were used to weigh the evidence of potential risk for each ecological COPC identified for each medium and receptor to determine whether the ecological COPCs warrant identification as ecological chemicals of concern (COCs).

1.1 SWMU 9 Description and History

SWMU 9 is comprised of six underground storage tanks (USTs), pipelines, and ancillary facilities. For investigation purposes, the SWMU has been historically divided into three separate areas:

- Area A – Tanks 212 and 213
- Area B – Tanks 214 and 215
- Area C – Tanks 216 and 217

SWMU 9, Areas A and B are located north of Forrestal Drive, along Manila Bay Street (Figure 1-3). Area C is located approximately 4,000 feet southwest of Areas A and B, north of Forrestal Drive along Antietam Road. The USTs were constructed in the 1940s for the storage of aviation gasoline

(AVGAS) for piston-driven airplanes. Most recently, Tanks 212 and 213 (Area A) were used for the storage of diesel fuel and unleaded gasoline. Tanks 214 and 215 (Area B) were changed from AVGAS storage to diesel fuel marine (DFM), while Tank 216 (Area C) was most recently used for the storage of unleaded gasoline. In addition to AVGAS, Tank 217 (Area C) may have been used for the storage of DFM and Jet Propellant-5 (JP-5). All tanks were cleaned and taken out of service in 2005.

Previous reports indicate that at each UST petroleum-based sludge was removed every five years. Sludge material collected during tank cleaning activities prior to 1978 was reportedly disposed of onsite in unlined earthen pits. Since 1978, sludge materials generated during tank cleaning activities have been removed and disposed off-site by a licensed contractor. A geophysical investigation, using a combination of both electromagnetic (EM) terrain conductivity and ground penetrating radar (GPR), conducted during Phase I of the SWMU 9 RFI, as well as test pits excavated during Phases I and II of the SWMU 9 RFI did not identify the presence of the reported sludge disposal pits (Baker, 2000).

A detailed description of the history of NAPR and SWMU 9, previous investigations conducted at the SWMU, and the physical characteristics of the study area (e.g., climate topography, geology, hydrology, and hydrogeology) is provided within Section 2.0 of the Full RFI for SWMU 9 (Baker, 2014). As discussed in Section 1.0, this report only addresses the Tank 214 Area. Potential ecological risks at SWMU 9 – Areas A and C were determined to be acceptable based on the conclusions of the ERA presented in the Final CMS Investigation Report for SWMU 9 (Baker, 2003).

1.2 Organization of Report

This report is organized into 12 sections. Section 1 provides an introduction and a brief history of SWMU 9. Section 2 presents and discusses the environmental setting. Section 3 identifies the analytical data used to evaluate ecological risks at the Tank 214 Area. Sections 4 through 9 present the SERA problem formulation, ecological effects evaluation, exposure estimation, risk calculation, uncertainties associated with the SERA, and SERA decision point and recommendations, respectively. Section 10 presents Step 3a of the BERA. Section 11 presents the conclusions and recommendations, while Section 12 provides reference citations. Supporting material is provided within the appendices.

2.0 ENVIRONMENTAL SETTING

The sections that follow provide a description of the habitats occurring within and contiguous to the Tank 214 Area, as well as the biota that may be present. The description of habitats and biota relies on literature-based information for Puerto Rico and NAPR and is supplemented by site-specific observations recorded during the various field investigations conducted at the SWMU.

2.1 Terrestrial Habitats

The upland habitat bounded by NAPR is classified as subtropical dry forest (Ewel and Witmore, 1973). Similar to other forested areas of Puerto Rico, this region was previously clear-cut in the early part of the century, primarily for pastureland (Geo-Marine, Inc., 1998). After acquisition by the Navy, a secondary growth of thick scrub, dominated by lead tree (*Leucaena* spp.), Christmas tree (*Randia aculeata*), sweet acacia (*Acacia farnesiana*), and Australian corkwood (*Sesbania grandiflora*) grew in the previously grazed sections (Geo-Marine, Inc., 1998). Secondary growth communities (upland coastal forest communities and coastal scrub forest communities) exist today throughout NAPR's undeveloped upland.

The Tank 214 Area is located within a flat upland area surrounded by a coastal scrub forest community (see Figure 2-1). Vegetation within this coastal scrub forest community include Christmas tree, white lead tree (*Leucaena leucocephala*), Portia tree (*Thespesia populnea*), black mampoo (*Guipira fragrans*), cat's claw vine (*Macfadyena unguis-cati*), and guinea grass (*Urochloa maximum*). Prior to the operational closure of NSRR on March 31, 2004, the vegetative community in the immediate vicinity of Tank 214 consisted of maintained grasses of unknown species composition (likely to include *Bothriochloa ischaemum* [yellow bluestem], *Chloris barbata* [swollen fingergrass], and *Digitaria* spp. [crabgrass] based on maintained grasses identified during a habitat characterization conducted at SWMUs 1, 2, and 45 in May 2000 [(Geo-Marine, Inc., 2000)]. Maintained grasses were also observed in 2009. However, grass cutting operations at the SWMU have ceased, and the once maintained areas have been infiltrated by coastal scrub forest vegetation, including white lead tree and guinea grass.

Cobana negra (*Stahlia monosperma*), a federally threatened tree species, is known to occur between the boundary of black mangrove communities and upland coastal forest communities. This species is also known to occur in coastal forests of southeastern Puerto Rico (Little and Wadsworth, 1964). A single individual was encountered at NAPR during recent surveys conducted by Geo-Marine, Inc. (NAVFAC, 2006). This individual is located within a coastal scrub forest community near the Capehart housing area, west of American Circle, approximately 3.2 miles southwest of the Tank 214 Area. No other plant species listed under the provisions of the Endangered Species Act of 1973 are known to occur or have the potential to occur at NAPR (Geo-Marine, Inc., 2000 and NAVFAC, 2006).

2.2 Aquatic Habitats

Approximately 460 acres at NAPR are covered by palustrine habitat, which includes all freshwater wetlands. These wetlands include wet meadows and marshes, dominated by cattails (*Typha* spp.) and grasses (*Panicum* spp. and *Paspalum* spp.), as well as wet coastal scrub forests. The marine environment surrounding NAPR includes mudflats, mangroves, and seagrass beds. The total area of mudflats, mangroves, and seagrass beds in the offshore environment is approximately 161 acres, 2,700 acres, and 1,900 acres, respectively (Geo-Marine, Inc., 1998). Coral reefs are also located in the offshore marine environment (see Figure 2-1). Coral reef types within the waters surrounding NAPR, as well as their associated acreage cover are listed below (Department of Navy [DoN], 2007):

Reef Habitat Type	Area (acres)
Colonized bedrock	266
Linear reef	84
Patch reef (aggregated)	146
Patch reef (individual)	175
Scattered coral-rock	5

Mangroves at NAPR mainly consist of red mangrove (*Rhizophora mangle*), black mangrove (*Avicennia germinans*), and white mangrove (*Laguncularia racemosa*) (Geo-Marine, Inc., 2000 and 2005). Red mangroves tolerate relatively deep water levels, grow in unstable, soft soil, and tolerate a salinity range of 10 to 55 parts per thousand (ppt). They develop large prop roots which usually extend above the water surface. Black and white mangroves generally grow in areas that are not inundated by water. Mangroves at NAPR are natural filters for upland runoff and protect the coastline from storm damage (Lewis, 1986). They also provide habitat for wildlife, fish, and benthic invertebrates. Lewis (1986) reported 112 species of birds that use the NAPR mangroves as habitat for feeding, nesting, and roosting. The red mangrove prop root habitat in Puerto Rico also is used by at least 13 species of fish (including the gray snapper [*Lutijanus griseus*], lane snapper [*Lutijanus synagris*], and gold and black tricolor [*Holocanthus tricolor*]), several crustaceans (including the flat tree oyster [*Isognomon alatus*]), gastropods (including the coffee bean snail [*Melampus coffeus*] and mangrove periwinkle [*Littorina angulifera*]), echinoids (including the long-spined sea urchin [*Diadema antillarum*] and pencil sea urchin [*Eucidaris tribuloides*]), sponges (including the fire sponge [*Tedania ignis*]), ascidians (including the black tunicate [*Acsidia nigra*]), and hydroids (including the feathered hydroid [*Halocordyle disticha*]) (Geo-Marine, Inc., 2005).

The seagrass beds in eastern Puerto Rico are typical of well-developed climax meadows found throughout the tropical Atlantic and Caribbean basin, consisting primarily of a dense continuous coverage of turtle grass (*Thalassia testudinum*) with lesser amounts of manatee grass (*Syringodium filiforme*) and a wide diversity of calcareous algae (Reid et al., 2001). Patchy and sparse beds of mixed species, including shoal grass (*Halodule wrightii*), manatee grass, and paddle grass (*Halophila decipiens*), occur in localized areas affected and maintained by different wave regimes, substrate type, and turbidity than what is normally found in association with the climax turtle grass meadows.

There are no open water marine environments in the immediate vicinity of the Tank 214 Area. The nearest open water marine habitat is the Ensenada Honda (an embayment located approximately 2,800 feet south of the SWMU). As evidenced by Figure 2-1, seagrass beds are prevalent throughout much of the Ensenada Honda. Seagrass meadows within the Ensenada Honda are dominated by a nearly continuous cover of turtle grass with a high abundance of calcareous green algae (*Avranvilla* spp., *Ventricaria ventricosa*, *Caulerpa* spp., *Valonia* spp., and *Udotea* spp.) (Reid et al., 2001). The turtle grass climax meadows of the Ensenada Honda represent grazing areas for the West Indian manatee, a federally endangered species in Puerto Rico (U.S. Fish and Wildlife Service [USFWS], 2014), and the green sea turtle (*Chelonia mydas*), a federally threatened species in Puerto Rico (USFWS, 2014). There are no known transport pathways from the Tank 214 Area to the open water marine environment surrounding NAPR, including the Ensenada Honda.

A map showing the spatial relationship of the Tank 214 Area to wetland habitats is provided as Figure 2-2. The wetlands depicted on Figure 2-2, identified by the Cowardin Wetland Classification System (Cowardin et al., 1979 [see Figure 2-3]), were delineated by Geo-Marine, Inc. in December 1999 from 1993 color infrared and 1998 true color aerial photography. Twenty percent of the wetlands delineated by aerial photography were field checked to verify the accuracy of the delineations. Field verification was based on the 1987 Corps of Engineers wetland delineation manual (U.S. Army Corps

of Engineers [USACE], 1987). As evidenced by Figure 2-2, there are no freshwater wetlands within or contiguous to the Tank 214 Area. However, a significant estuarine wetland feature (Los Machos mangrove forest) borders the Tank 214 Area to the north, east, and west. Based on the Cowardin Wetland Classification System (Cowardin et al., 1979), the specific wetland types found within the Los Machos mangrove forest include the following:

- Estuarine, Intertidal, Scrub-Shrub, Broad-Leaved Evergreen (E2SS3)
- Estuarine, Intertidal, Unconsolidated, Shore, Sand (E2US2)
- Estuarine, Intertidal, Unconsolidated, Shore, Mud (E2US3)
- Estuarine, Intertidal, Unconsolidated Shore, Organic (E2US4)

E2SS3 and E2US3/4 wetlands represent the dominant types (see Figure 2-2). The sediment in these wetland features consist of saturated silt and clay. Black mangroves (*Avicennia germinans*) represent the dominant hydrophyte observed within the E2SS3 wetland features. Saltwort (*Batis maritima*) was also observed within these features closer to the shoreline, where prolonged saturation is not as evident. The E2US3/4 wetland features are generally devoid of vegetation. Vegetation patterns within the Los Machos mangrove are likely influenced by water depths. The depth of standing water generally increases from west to east in the mangrove. As the depth of standing water increases, the persistence of vegetation decreases. For example, at sediment sample location 9SD122 (established within an E2SS3 wetland feature), standing water was noted at approximately 0.5 inches, with a persistent stand of black mangroves. Conversely, at sediment sample location 9SD158 (established within an E2US3/4 wetland feature), standing water was noted at approximately five to six inches, and devoid of vegetation.

Groundwater flow at the Tank 214 Area is radial based on groundwater elevation measurements (Figure 2-4). As such, the Los Machos mangrove forest represents a potential discharge point for Tank 214 Area groundwater.

2.3 Fauna

A description of the fauna occurring in Puerto Rico and the landmass encompassed by NAPR is provided in the sections that follow. The description is supplemented by observations and information from the various field investigations conducted at the Tank 214 Area.

2.3.1 Mammals

A total of 22 terrestrial mammal species are known historically from Puerto Rico; however, all mammals except bats (13 species) have been extirpated (Mac et al., 1998). The specific bat species known to occur on Puerto Rico are listed below. None of the bats found on Puerto Rico are exclusive to the island (Gannon et al., 2005), nor are they listed under provisions of the Endangered Species Act of 1973 (USFWS, 2014).

- Fruit-eating bats: Jamaican fruit bat (*Artibeus jamaicensis*), Antillean fruit bat (*Brachyphylla cavernarum*), and red fig-eating bat (*Stenoderma rufum*)
- Nectivorous bats: brown flower bat (*Erophylla sezekoni*) and greater Antillean long-tounged bat (*Monophyllus redmani*)

- Insectivorous bats: Antillean ghost-faced bat (*Mormoops blainvillii*), Parnell's mustached bat (*Pteronotus parnellii*), sooty mustached bat (*Pteronotus quadridens*), big brown bat (*Eptesicus fuscus*), red bat (*Lasiurus borealis*), velvety free-tailed bat (*Molossus molossus*), and Brazilian free-tailed bat (*Tadarida brasiliensis*)

- Piscivorous bats: Mexican bulldog bat (*Noctilio leporinus*)

As discussed in Section 2.1, vegetation growing within the coastal scrub forest communities at the Tank 214 Area includes white lead tree. The nectar/pollen of this flowering plant is used as a source of food by bats on Puerto Rico (Gannon et al., 2005).

Of the endangered/threatened marine mammals in Puerto Rico, only the West Indian manatee is known to occur in the coastal waters surrounding NAPR (DoN, 2007). Manatee populations in Puerto Rico's coastal waters have been documented during three aerial surveys conducted from 1978 to 1979, 1984 to 1985, and in 1993 (United Nations Environmental Program [UNEP], 1995), a radio tracking study of manatee distribution and abundance (Reid and Kruer, 1998), and a year-long study of manatee distribution and abundance (Woods et al., 1984). Historical manatee sightings at NAPR are summarized on Figure 2-5. The figure (reproduced from DoN, 2007) includes information from most of the studies identified above. As evidenced by Figure 2-5, feeding manatees have been recorded along the entire NAPR coastline. They are most often recorded within Pelican Cove and the Ensenada Honda. Given that the open water marine environment surrounding NAPR does not represent a potential discharge point for Tank 214 Area groundwater or surface run-off, exposure pathways to the West Indian manatee are incomplete.

Several terrestrial mammals have been introduced into Puerto Rico, including the black rat (*Rattus rattus*), Norway rat (*Rattus norvegicus*), and small Indian mongoose (*Herpestes javanicus*). These nonindigenous mammals have been implicated in the decline of native bird and reptile populations (Mac et al., 1998 and USFWS, 1996a).

2.3.2 Birds

A total of 239 bird species are native to Puerto Rico (Raffaele, 1989). This total includes breeding permanent residents and non-breeding migrants. In addition, many nonindigenous bird species have been introduced to Puerto Rico, including the shiny cowbird (*Molothrus bonariensis*) and several parrot species, such as the budgerigar (*Melopsittacus undulates*), orange-fronted parrot (*Aratinga canicularis*), and monk parrot (*Myiopsitta monaqchus*). Of the 239 species native to Puerto Rico, 12 are endemic to the island (Raffaele, 1989).

Numerous native and migratory bird species have been reported at NAPR (Geo-Marine, Inc., 1998). A list of bird species reported at NAPR or having the potential to occur is provided in Table 2-1. The list, compiled from literature-based information pre-dating 1990, includes the great blue heron (*Ardea herodias*), snowy egret (*Egretta thula*), little blue heron (*Florida caerulea*), black-crowned night heron (*Nycticorax nycticorax*), belted kingfisher (*Ceryle alcyon*), spotted sandpiper (*Actitis macularia*), greater yellowlegs (*Tringa melanoleauca*), black-bellied plover (*Squatarola squatarola*), clapper rail (*Rallus longirostris*), Royal tern (*Thalasseus maximus*), sandwich tern (*Thalasseus sandvicensis*), least tern (*Stema albifrons*), yellow warbler (*Dendroica petechia*), palm warbler (*Dendroica palmarum*), prairie warbler (*Dendroica discolar*), magnolia warbler (*Dendrocia magnolia*), mourning dove (*Zenaida macroura*), red-legged thrush (*Mimocichla plumbea*), common nighthawk (*Chordeiles minor*), and red-tailed hawk (*Buteo jamaicensis*). Endemic species reported from NAPR include the Puerto Rican lizard cuckoo (*Saurothera vieilloti*), Puerto Rican flycatcher

(*Myiarchus antillarum*), Puerto Rican woodpecker (*Malanerpes portoricensis*), Puerto Rican emerald (*Chlorostilbon maugaeus*), and yellow-shouldered blackbird (*Agelaius xanthomus*).

The yellow-shouldered blackbird is a federally endangered species. One of the principal reasons for the status of this species is attributed to nest parasitism by the nonindigenous shiny cowbird (USFWS, 1983). Other factors contributing to the status of this species include nest predation by the introduced black rat, Norway rat, and mongoose, as well as habitat modification and destruction (USFWS 1996a). The entire land area of NAPR was declared critical habitat for the yellow-shouldered blackbird in 1976; however, a 1980 agreement with the USFWS exempted certain areas from this categorization (Geo-Marine, Inc., 1998). A study conducted by the Naval Facilities Engineering Service Center (NFESC, 1996) reported that the mangrove forests surrounding NAPR, including the mangroves within the Los Machos mangrove forest adjacent to the Tank 214 Area, should be considered the most important nesting habitat for the yellow-shouldered blackbird. A survey conducted by the Puerto Rico Department of Natural Resources (PRDNR) reported fifteen yellow-shouldered blackbirds (including five juveniles) at NAPR (PRDNR, 2002). At the time of the survey, the birds were using structures at the NAPR airport for resting cover. Although nesting pairs were not observed (the survey was not conducted during the breeding season), the airport structures contained several inactive nests. The inactive nests and juvenile birds indicate that a small breeding population is present at NAPR.

Based on the arboreal feeding behavior of the yellow-shouldered blackbird, the tree and shrub strata within the coastal scrub forest community surrounding the Tank 214 Area represent potential foraging habitat for this species. However, arboreal insectivores, such as the yellow-shouldered blackbird, would not be expected to experience any significant exposures. This line of reasoning is consistent with USEPA's approach to ecological soil screening level (Eco-SSL) development. As discussed in Guidance for Developing Ecological Soil Screening Levels (USEPA, 2005a), aerial and arboreal insectivorous birds were excluded from Eco-SSL development because they are considered inappropriate (i.e., they do not have a clear or indirect exposure pathway link to soil [indirect exposure pathways involve ingestion of prey that have direct contact with soil]).

Other federally listed bird species that have the potential to occur at NAPR are the piping plover (*Charadrius melodus*) and roseate tern (*Sterna dougallii dougallii*) (Geo-Marine, Inc., 1998). The piping plover is a rare, non-breeding winter visitor in Puerto Rico (Raffaele, 1989). This species breeds only in North America in three geographic regions (Atlantic Coast population [threatened], Great Lakes population [endangered], and Northern Great Plains population [threatened]; USFWS, 1996b). No piping plover observations were reported at NAPR during the 1990s or during sea turtle nesting surveys conducted in 2002 and 2004 (Geo-Marine, Inc., 2005). No historic evidence is available to indicate whether the roseate tern (threatened in Puerto Rico) has ever nested at NAPR and no roseate tern observations have been noted in or over coastal waters adjacent to NAPR (DoN, 2007). The nearest active roseate tern colony likely occurs on the eastern end of Vieques, more than 20 miles east of NAPR (DoN, 2007).

Foraging birds were observed within the E2US3/4 wetland units adjacent to the Tank 2014 Area, including egrets, herons, and sandpipers. Birds observed within the coastal scrub forest community included the zenaida dove (*Zenaida aurita*) and mangrove cuckoo (*Coccyzus minor*).

2.3.3 Reptiles and Amphibians

A total of 23 amphibians and 47 reptiles are known from Puerto Rico and the adjacent waters (Mac et al., 1998). Fifteen of the amphibians and 29 of the reptiles are endemic, while four amphibian species and three reptilian species have been introduced (Mac et al. 1998). Puerto Rico's native amphibian

species include 16 species of tiny frogs commonly called coquis. On the coastal lowlands, almost all coqui species are arboreal. The only amphibians listed under provisions of the Endangered Species Act of 1973 are the Puerto Rican crested toad (*Peltophryene lemur*), golden coqui (*Eleutherodactylus jasperi*), and llanero coqui (*Eleutherodactylus juanariveroi*). The Puerto Rican crested toad and golden coqui are listed as threatened, while the llanero coqui is listed as endangered (USFWS, 2014). Distribution of the golden coqui is restricted to areas of dense bromeliad growth. All specimens to date have been collected from a small semicircular area of a 6-mile radius south of Cayey (approximately 30 miles southwest of NAPR), generally at elevations above 700 meters (USFWS, 1984). The llanero coqui is only known to occur within a 614 acre palustrine wetland located at Sabana Seca Ward, Toa Baja (50 FR 60778). This single known location is approximately 36 miles northwest of NAPR. The Puerto Rican crested toad occurs at low elevations (below 200 meters) where there is exposed limestone or porous, well-drained soil offering an abundance of fissures and cavities (USFWS, 1987). A single large population is known to exist from the southwest coast in Guánica Commonwealth Forest, and a small population is believed to survive on the north coast near Quebradillas, Arecibo, Barceloneta, Vega Baja, and Bayamón (USFWS, 1987). It also has been collected on the southeastern coastal plain near Coamo (USFWS, 1987). Given the habitat preferences and locations of known occurrences, these three amphibian species are not expected to occur at NAPR.

Puerto Rico's native reptilian species include 31 lizards, 8 snakes, 1 freshwater turtle, and 5 sea turtles (Mac et al., 1998). Of the five sea turtles, only the green sea turtle, hawksbill sea turtle (*Eretmochelys imbricata*), and loggerhead sea turtle (*Dermochelys coriacea*) nest within Puerto Rico. These three sea turtles, as well as the leatherback sea turtle (*Caretta caretta)* are listed under the provisions of the Endangered Species Act of 1973 (hawksbill sea turtle and leatherback sea turtle are listed as endangered, while the green sea turtle [Caribbean population] and loggerhead sea turtle are listed as threatened) (USFWS, 2014). Aerial surveys of turtles were performed from March 1984 through March 1995 along the Puerto Rican Coast. This information was summarized by Geo-Marine, Inc. (2005) in the Draft NAPR Disposal Environmental Assessment. Cumulative sea turtle sightings and potential turtle nesting sites at NAPR are presented on Figures 2-6 and 2-7 (reproduced from Geo-Marine, Inc., 2005), respectively. Significant turtle observations were made near the mouth of the Ensenada Honda, the northern shore of Pineros Island, Pelican Bay, and the Medio Mundo Passage with the frequency of turtle observations listed as green > hawksbill > loggerhead > leatherback. Based on the life history information for each turtle species (summarized in Baker, 2006a and 2006b) and the availability of preferred feeding habitat (sea grass meadows and coral/hard bottom communities), the green sea turtle, hawksbill sea turtle, and loggerhead sea turtle have the potential to forage within the open water marine environment surrounding NAPR. However, as discussed in Section 2.3.1, the open water marine environment surrounding NAPR does not represent a potential discharge point for Tank 214 Area groundwater or surface run-off. Therefore, exposure pathways to sea turtles are incomplete.

The Puerto Rican boa (*Epicrates inornatus*) is a federally endangered species. Four Puerto Rican boa sightings were reported at NAPR prior to 1999 and an additional four occurrences were reported between 2001 and 2003 (Geo-Marine, Inc., 2005). However, no boas were observed during 211 man-hours of surveys conducted within potential boa habitat in 2004 (Tolson, 2004). The Puerto Rican boa uses a variety of habitats, but is most commonly found in Karst forest habitat (forested limestone hills). Based on the absence of preferred habitat, there is low probability of occurrence of this species at or contiguous to the Tank 214 Area.

2.3.4 Fish and Aquatic Invertebrates

A diverse fish and invertebrate community can be found in the marine environment surrounding NAPR. This can be attributed to the varied habitats that include open water marine and estuarine wetland habitat, mud flats, sea grass beds, and mangrove forests. The fish community is represented by stingrays, herrings, groupers, needlefish, mullets, barracudas, jacks, snappers, grunts, snooks, lizardfishes, parrotfishes, gobies, filefishes, wrasses, damselfishes, and butterflyfish (Geo-Marine, Inc., 1998). The benthic invertebrate community includes sponges, corals, anemones, sea cucumbers, sea stars, urchins, and crabs.

The composition of the aquatic community within the Los Machos mangrove forest has not been surveyed during previous field investigations conducted at SWMU 9 or NAPR. However, fiddler crabs (*Uca* spp.) were prevalent along the shoreline of this estuarine wetland system each field investigation. Numerous fish and crabs (not identified) were also observed within the E2US4 wetland features.

3.0 SOURCES OF AVAILABLE ANALYTICAL DATA

Sampling activities at SWMU 9 (Areas A, B, and C) have been conducted under eight separate investigations:

- Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI): Phase I (April 1996), Phase II (September/October 1997), and Phase III (June 1999) at SWMU 9 Areas A, B, and C
- Corrective Measures Study (CMS) Investigation: December 2000 at SWMU 9 Areas A, B, and C
- Additional Data Collection Field Investigation (ADCI) in Support of the ERA: July 2003 at SWMU 9 Area B
- Steps 5 and 6 of the BERA: August 2005 and January 2006, respectively, at SWMU 9 Area B
- Interim Corrective Measure (ICM): May 2006 at SWMU 9 Area B
- Phase I RFI: March 2007 at SWMU 9 – Area B, Tank 214 Area
- Full RFI: January 2009, January 2011, and January 2014 at SWMU 9 – Area B, Tank 214 Area

Sections 2.3 and 4.0 of the Full RFI (Baker, 2014) provide details regarding each of these investigations. Data for the Tank 214 Area B generated during these investigations are used in this report to evaluate potential risk to ecological receptors. Table 3-1 summarizes the data used in the ERA, while data are provided in Appendix A. It is noted that multiple samples were evaluated for total petroleum hydrocarbon (TPH) diesel range organics (DRO) and TPH gasoline range organics (GRO). These data are not evaluated in the ERA because TPH measures represent chemical mixtures. However, individual chemical constituents contained within TPH are evaluated. As such, TPH DRO and TPH GRO are not included in Table 3-1. It is further noted that the subsurface soil samples listed in Table 3-1 and discussed in Section 3.2 below, as well as the subsurface soil analytical data provided in Appendix A, are limited to samples collected from the 1.0 to 3.0-foot depth interval. Analytical data for subsurface samples collected from deeper depth intervals were not evaluated by the ERA since most soil heterotrophic activity and soil invertebrates occur on the surface or within the oxidized root zone (Suter II, 1995).

3.1 Surface Soil Data

Surface soil data evaluated in the ERA include 63 samples collected during the various field investigations. Three samples were collected from 0.0 to 1.0-foot depth interval during the 1996 RFI investigation and were analyzed for Appendix IX volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), including polynuclear aromatic hydrocarbons (PAHs), and metals. Two samples (and one duplicate) were collected from the 0.0 to 1.0-foot depth interval during the 2000 CMS and were analyzed for PAHs, and Appendix IX metals. Sixteen samples were collected from 0.0 to 0.5-foot depth interval as part of the 2003 ADCI and were analyzed for lead and zinc. Twenty-three samples (and three duplicates) were collected from 0.0 to 1.0-foot depth interval as part of the Phase I RFI for Area B in 2007 and were analyzed for Appendix IX VOCs, SVOCs, including PAHs, and metals. Nine organophosphorous pesticides were reported within the SVOC fraction for

the sixteen 2007 samples. Nineteen samples (and two duplicates) were collected from 0.0 to 1.0-foot depth interval in 2009 as part of the Full RFI and were analyzed for Appendix IX VOCs, PAHs, and metals.

3.2 Subsurface Soil Data

Eight subsurface soil samples (and one duplicate) were collected from the 1.0 to 3.0-foot depth interval during the previous field investigations. Three samples were collected in 2007 as part of the Phase I RFI for Area B and were analyzed for Appendix IX VOCs, SVOCs, including PAHs, and metals. Nine organophosphorous pesticides were reported within the SVOC fraction for the three 2007 samples. Two samples were collected in 2009 as part of the Full RFI field investigation and were analyzed for Appendix IX VOCs and PAHs. Three additional samples (and one duplicate sample) were collected in 2011 as part of the Full RFI field investigation and were analyzed for Appendix IX VOCs.

3.3 Groundwater Data

Groundwater data evaluated in the ERA include 24 samples collected during the various field investigations. In some cases, groundwater from a given well was sampled during multiple field investigations. When this occurred, only data from the most recent sampling event was included with the data evaluated in this ERA. Seven groundwater samples (and one duplicate) were collected as part of the 2007 Phase I RFI field investigation. Each sample was analyzed for Appendix IX VOCs and metals (total fraction). Six of the 2007 groundwater samples were also analyzed for Appendix IX SVOCs, including PAHs, and dissolved metals. Nine organophosphorous pesticides were also reported within the SVOC fraction for the six 2007 samples. Seventeen groundwater samples (and two duplicates) collected as part of the 2011 Full RFI field investigation. These samples were analyzed for Appendix IX VOCs.

3.4 Estuarine Wetland Surface Water Data

Surface water data evaluated in the ERA include fifteen samples collected during the various field investigations. Four samples (and one duplicate) were collected in 1999 as part of the Phase III RFI and were analyzed for Appendix IX VOCs, SVOCs, total and dissolved metals, and sulfide. Eleven samples were collected in 2000 as part of the CMS and were analyzed for benzene, toluene, ethylene, and xylene (BTEX), total and dissolved metals, and sulfide.

3.5 Estuarine Wetland Sediment Data

Sediment data evaluated in the ERA include 180 samples collected during the various field investigations. Four samples were collected in 1999 as part of the Phase III RFI and were analyzed for Appendix IX VOCs, SVOCs, and metals. Eleven samples (and three duplicates) were collected in 2000 as part of the CMS and were analyzed for PAHs, acid volatile sulfide (AVS)/ simultaneously extracted metals (SEM), and metals. Six samples were collected in 2003 as part of the ADCI and were analyzed for lead. Forty-five samples (and three duplicates) were collected in 2005 during Step 5 of the BERA and were analyzed for lead, AVS/SEM, total organic carbon (TOC), moisture, solids, and ammonia. Twenty samples (and two duplicates) were collected in 2006 during Step 6 of the BERA and were analyzed for lead, AVS/SEM, TOC, pH, ammonia, and sulfide. Eleven samples (and one duplicate) were collected in 2007 during the Phase I RFI for the Tank 214 Area and analyzed for Appendix IX VOCs, SVOCs, including PAHs, and metals. Nine organophosphorous pesticides were reported within the SVOC fraction for the eleven 2007 samples. Forty-two samples (and five duplicates) were collected in 2009 for the Full RFI and were analyzed for Appendix IX VOCs, PAHs,

and metals. Nineteen samples (and three duplicates) were collected in 2011 for the Full RFI. Eleven of these were analyzed for lead and AVS/SEM, two were analyzed for PAHs and TOC, and six were analyzed for vanadium. Finally, seventeen sediment samples (and two duplicates) were collected in 2014 for the Full RFI and analyzed for Appendix IX SVOCs.

4.0 SCREENING LEVEL PROBLEM FORMULATION

Problem formulation establishes the goals, scope, and focus of the ERA. The products of the screening level problem formulation are (1) the preliminary conceptual model and (2) the assessment and measurement endpoints. The purpose of the preliminary conceptual model is to describe how ecological receptors may be exposed to chemicals originating from the site. The preliminary conceptual model is developed using information regarding major habitats and ecological receptors, media of concern, and potential contaminant sources in conjunction with an understanding of potential transport pathways, exposure pathways, and exposure routes. The fate, transport, and toxicological properties of the chemicals present at the site are also considered during this process. Assessment and measurement endpoints define the ecological attributes to be protected. They are selected to evaluate those receptors for which complete and potentially significant exposure pathways are likely to exist.

4.1 Preliminary Conceptual Model

Figure 4-1 presents a preliminary conceptual model for the Tank 214 Area. The conceptual model outlines potential sources of contaminants, transport pathways, exposure media, potential exposure routes, and receptor groups. Specific components of the preliminary conceptual model (i.e., source areas, transport pathways, and exposure pathways and routes) are discussed within the sections that follow.

4.1.1 Source Area

The underground storage tanks, pipelines, ancillary facilities, and sludge beds represent historical source areas for the release of AVGAS and DFM at the Tank 214 Area to surface and subsurface soil. Contaminated surface soil represents a potential source for the release of chemicals to subsurface soil, as well as downgradient surface soil, estuarine wetland surface water, and estuarine wetland sediment. Subsurface soil represents a potential source for the release of chemicals to groundwater. In turn, groundwater represents a potential source for the release of chemicals to estuarine wetland surface water and sediment.

4.1.2 Transport Pathways

A transport pathway describes the mechanisms whereby chemicals may be transported from a source of contamination to ecologically relevant media. As depicted on Figure 4-1, potential mechanisms for contaminant transport from potential source areas at the Tank 214 Area are believed to include the following:

- Overland transport of chemicals with surface soil via surface runoff to downgradient surface soil, estuarine wetland surface water, and estuarine wetland sediment.

- Leaching of chemicals from surface soil and/or subsurface soil by infiltrating precipitation and transport with groundwater to estuarine surface water and sediment,

- Uptake by biota from surface soil, subsurface soil, and estuarine wetland sediment and trophic transfer to upper trophic level receptors.

4.1.3 Exposure Pathways and Routes

An exposure pathway links a source of contamination with one or more receptors via exposure to one or more media. Requirements for a complete exposure pathway are listed below.

- A source of contamination must be present
- Release and transport mechanisms must be available to move the contaminants from the source to an exposure point
- An exposure point must exist where ecological receptors could contact affected media
- An exposure route must exist whereby the contaminant can be taken up by ecological receptors

As depicted on Figure 4-1, potentially complete and significant exposure pathways exist at the Tank 214 Area. Exposure pathways and routes applicable to the SWMU are discussed in the paragraphs that follow.

The most common exposure routes are dermal contact, direct uptake, ingestion, and inhalation. Terrestrial plants may be exposed to chemicals present in soil directly through their root surfaces during water and nutrient uptake. Unrooted, floating aquatic plants, rooted submerged aquatic plants, and algae may be exposed to chemicals directly from the water or (for rooted plants) from sediment. Terrestrial invertebrates may be exposed to chemicals in soil through dermal adsorption and ingestion, while aquatic invertebrates and fish may be exposed to chemicals in surface water and sediment through dermal adsorption and ingestion. Much of the toxicological data available for terrestrial invertebrates, aquatic invertebrates, and fish are based upon *in situ* studies that represent both pathways. Therefore, both pathways are typically considered together in SERAs. Invertebrates and fish also represent a link between soil, surface water, and/or sediment and upper trophic level receptors through food web transfer. As such, they are often included as prey items for upper trophic level dietary exposures.

Birds and mammals may be exposed to chemicals through: (1) the inhalation of gaseous chemicals or chemicals adhered to particulate matter; (2) the incidental ingestion of contaminated abiotic media (e.g., soil or sediment) during feeding or cleaning activities; (3) the ingestion of contaminated water; (4) the ingestion of contaminated plant and/or animal tissues for chemicals that have entered food webs; and/or (5) dermal contact with contaminated abiotic media. These exposure routes, where applicable, are depicted on Figure 4-1. Their relative importance depends in part on the chemical being evaluated. For chemicals having the potential to bioaccumulate (e.g., polychlorinated biphenyls [PCBs]), the greatest exposure to wildlife is likely to be from the ingestion of prey. For chemicals having a limited potential to bioaccumulate (e.g., aluminum), the exposure of wildlife to chemicals is likely to be greatest through the direct ingestion of abiotic media, such as surface soil.

Direct ingestion of drinking water is only considered if the salinity of a potential drinking water source is less than 15 ppt, the approximate toxic threshold for wildlife receptors (Humphreys, 1988). Salinity levels estuarine wetland surface water collected at locations adjacent to SWMU 9 – Areas A/B and C during previous investigations (48.9 ppt and 44.6 ppt, respectively; Baker, 2003) indicate that upper trophic level receptors cannot use the Los Machos mangrove forest as a drinking water source. Given that other surface water bodies are not present within or contiguous to the Tank 214 Area, drinking water ingestion was not considered in the risk calculations for upper trophic level receptor dietary exposures.

Certain potential exposure pathways and/or routes depicted on Figure 4-1 are considered insignificant relative to other pathways due to low potential for exposure and low levels of relevant contaminants. For example, dermal exposures are not considered significant relative to ingestion exposures for upper trophic level receptors. This is supported by evidence outlined in Suter II et al. (2000) and USEPA (2003a), including the general fate properties of the majority of compounds detected in soil (e.g., low affinity for dermal uptake), the low potential exposure frequency and duration, and the protection offered by feathers, fur, and scales to avian, mammalian, and reptilian receptors. In addition, literature reviews indicate that dermal exposures to wildlife from classes of chemicals known or suspected to be of concern via dermal adsorption (e.g., VOCs, organophosphorous pesticides, and petroleum compounds) are often overestimated in laboratory studies (where feathers/fur are removed) and do not represent realistic exposure scenarios (USEPA, 2003a). Furthermore, though burrowing reptiles (which would be expected to experience the most significant exposure) may inhabit the upland vegetative units within and immediately contiguous to the Tank 214 Area, chemicals known or suspected to be of concern via dermal adsorption are not known to be associated with historical activities at the site (e.g., organophosphorous pesticides) or were detected at a low frequency and concentration (e.g., VOCs). Moreover, USEPA (2003a) calculated that the contribution of dermal exposures to the total dose received by terrestrial receptors to be 0.5 percent or less and therefore omitted the dermal pathway from consideration during Eco-SSL development. Incidental ingestion of surface soil and/or sediment during feeding and preening activities by upper trophic level receptors, as well as direct contact exposures by lower trophic level receptors (e.g., terrestrial and aquatic invertebrates) are considered significant exposure routes (see Figure 4-1).

Inhalation of gaseous chemicals and chemicals adhered to particulate matter (e.g., soil) also is considered insignificant relative to ingestion pathways. As described above for dermal exposures, this approach is consistent with Suter II et al. (2000) and USEPA (1997 and 2003a), which recognize the relatively small contribution the inhalation pathway contributes to exposure estimates. For example, USEPA (2003a) estimates that the expected contribution to the total dose associated with the inhalation pathway is less than 0.01 percent for particulates and less than 1.0 percent for volatiles. Site conditions further reduce the importance of this exposure route relative to ingestion. The vegetative groundcover at the Tank 214 Area will minimize the suspension of dust and the potential for exposure via inhalation of chemicals adhered to soil particles. Furthermore, inhalation of gaseous chemicals that have volatilized from surface soil is likely to be insignificant given that VOCs were generally detected at low frequencies and/or concentrations during the various field investigations.

4.2 Endpoints and Risk Questions

The conclusion of the screening level problem formulation includes the selection of ecological endpoints, which are based on the preliminary conceptual model. Two types of endpoints, assessment endpoints and measurement endpoints are defined as part of the ERA process, as are risk hypotheses or risk questions (USEPA, 1997 and 1998). An assessment endpoint is an explicit expression of the environmental component or value that is to be protected. A measurement endpoint is a measurable ecological characteristic that is related to the component or value chosen as the assessment endpoint. The considerations for selecting assessment and measurement endpoints are summarized in USEPA (1992 and 1997) and discussed in detail by Suter II (1989, 1990, and 1993). Risk questions ask how the assessment endpoints could be affected by site-related constituents.

Endpoints in the SERA define ecological attributes that are to be protected (assessment endpoints) and a measurable characteristic of those attributes (measurement endpoints) that can be used to gauge the degree of impact that has or may occur. Assessment endpoints most often relate to attributes of biological populations or communities, and are intended to focus the risk assessment on particular components of the ecosystem that could be adversely affected by chemicals attributable to the site

(USEPA, 1997). Assessment endpoints contain an entity (e.g., red-tailed hawk) and an attribute of that entity (e.g., survival rate). Individual assessment endpoints usually encompass a group of species or populations (the receptor) with some common characteristic, such as a specific exposure route or sensitivity to a specific contaminant, with the receptor then used to represent the assessment endpoint in the risk evaluation.

Assessment and measurement endpoints may involve ecological components from any level of biological organization, from individual organisms to the ecosystem itself (USEPA, 1992). Effects on individuals are important for some receptors, such as rare and endangered species; however, population- and community-level effects are typically more relevant to ecosystems. Population- and community-level effects are usually difficult to evaluate directly without long-term and extensive study. However, measurement endpoint evaluations at the individual level, such as an evaluation of the effects of chemical exposure on reproduction, can be used to predict effects on an assessment endpoint at the population or community level. In addition, use of criteria values designed to protect the vast majority (e.g., 95 percent) of the components of a community (e.g., National Recommended Water Quality Criteria [NRWQC] for the protection of aquatic life) can be useful in evaluating potential community- and/or population-level effects.

Table 4-1 summarizes the assessment endpoints, risk questions, and measurement endpoints selected for the SERA. As evidenced by Table 4-1, the assessment endpoints selected for the upland habitat at the Tank 214 Area are based on the survival, growth, and reproduction of lower trophic level terrestrial receptor groups (terrestrial plants and invertebrates), terrestrial reptiles and amphibians, upper trophic level terrestrial birds (herbivores, omnivores, and carnivores), and upper trophic level terrestrial mammals (i.e., nectivorous bats), while assessment endpoints for the estuarine wetland are based on the survival, growth, and reproduction of lower trophic level aquatic receptor groups (aquatic plants, invertebrates, and fish) and upper trophic level birds (piscivores and invertivores). The population traits of interest for each of the assessment endpoints listed in Table 4-1 represent components of a healthy population. Failure or impairment of survival, growth, or reproduction will adversely affect the ability of the population to be healthy and viable and fill its appropriate role in an ecosystem.

4.3 Selection of Receptors

Because of the complexity of natural systems, it is generally not possible to directly assess the potential impacts to all ecological receptors present within an area. Therefore, specific receptor species (e.g., mourning dove) are often selected as surrogates to evaluate potential risks to larger components of the ecological community (e.g., avian herbivores) that are used to represent the assessment endpoints (e.g., survival, growth, and reproduction of avian herbivores). Selection criteria typically include those species that:

- Are known to occur, or are likely to occur, at the site;
- Have a particular ecological, economic, or aesthetic value;
- Are representative of taxonomic groups, life history traits, and/or trophic levels in the habitats present at the site for which complete exposure pathways are likely to exist;
- Can, because of toxicological sensitivity or potential exposure magnitude, be expected to represent potentially sensitive populations at the site; and

- Have sufficient ecotoxicological information available on which to base an evaluation.

Lower trophic level receptor species were evaluated based on those taxonomic groupings (e.g., terrestrial and aquatic plants and invertebrates) for which screening values have been developed. These groupings and screening values are used in most ERAs. As such, specific receptor species of lower trophic level terrestrial and aquatic biota were not chosen because of the limited species-specific information available. These receptors were instead dealt with on a community level via a comparison to media-specific screening values (soil, groundwater, surface water, and sediment screening values).

The upper trophic level receptor species listed below were chosen for dietary exposure modeling to chemicals in Tank 214 Area surface soil, subsurface soil, estuarine wetland surface water, and estuarine wetland sediment based on the criteria listed above, the general guidelines presented in USEPA (1991), the description of habitats and biota presented in Section 2.0, and the assessment endpoints (Table 4-1).

Terrestrial Habitat

- Mourning dove (*Zenaida macroura*) (avian herbivore)
- American robin (*Turdus migratorius*) (avian omnivore)
- Red-tailed hawk (*Buteo jamaicensis*) (avian carnivore)
- Brown flower bat (*Erophylla sezekorni*) (mammalian nectivore)

Aquatic Habitat

- Green heron (*Butorides virescens*) (avian piscivore)
- Spotted sandpiper (*Actitis macularius*) (avian invertivore)

The mourning dove, red-tailed hawk, green heron, and spotted sandpiper are known to occur in Puerto Rico (Raffaele, 1989). These three species have also been reported at NAPR (see Table 2-1). The American robin was selected as a surrogate species to represent birds reported from NAPR with similar feeding habits and dietary preferences (e.g., red-legged thrush). It is noted that the yellow-shouldered blackbird may forage within the terrestrial and estuarine wetland habitats located at and contiguous to the Tank 214 Area. However, as discussed in Section 2.3.2, arboreal insectivores, such as the yellow-shouldered blackbird, would not be expected to experience any significant exposures. Regardless, aspects of the feeding ecology of the American robin and yellow-shouldered blackbird indicate that the American robin can be protectively used as a surrogate receptor:

- The American robin forages on the ground for soft-bodied invertebrates, whereas the yellow-shouldered black bird is an arboreal feeder that forages within the canopy and sub-canopy of trees (USFWS, 1996a). For the SERA, it was assumed that invertebrate prey items consumed by the American robin are earthworms. Because earthworms are in direct contact with soil, they will bioaccumulate soil contaminants at higher concentrations than the arboreal invertebrates consumed by the yellow-shouldered blackbird. Therefore, modeled dietary intakes that include earthworm ingestion will result in a conservative estimate of food web exposures for the yellow-shouldered blackbird.

- The diet of the American robin is assumed to include 10.5 percent soil, whereas soil consumption by the yellow-shouldered blackbird is likely to be negligible based on their arboreal feeding behavior. Modeled dietary intakes that include soil ingestion also will result in a conservative estimate of food web exposures for the yellow-shouldered blackbird.

Although potentially complete and significant exposure pathways exist at the Tank 214 Area for terrestrial ground mammals (i.e., incidental ingestion of soil and ingestion of contaminated plant and/or animal tissues for chemicals that have entered food webs), a terrestrial ground mammal was not selected as an ecological receptor for the following reasons.

- All native terrestrial ground mammals have been extirpated from Puerto Rico (Mac et al., 1998).

- The terrestrial ground mammals represented by potentially complete exposure pathways are limited to nonindigenous, nuisance species (i.e., Norway rat, black rat, and mongoose) that have been implicated in the decline of native reptilian and bird populations (Mac et al., 1998 and USFWS, 1996a).

As discussed in Section 2.3.1, vegetation within the coastal scrub forest communities at the Tank 214 Area includes plants known to be used as a source of food by bats on Puerto Rico (white lead tree). Therefore, a nectivorous bat (i.e., brown flower bat) was selected as an ecological receptor for upland habitat at the Tank 214 Area. This species is common and found throughout Puerto Rico (Gannon et al., 2005). As discussed in Section 2.3.2, the USEPA has excluded aerial and arboreal insectivorous birds from Eco-SSL development because they are considered inappropriate (i.e., they do not have a clear or indirect exposure pathway link to soil [indirect exposure pathways involve ingestion of prey that have direct contact with soil]). For this same reason, the USEPA has also excluded aerial insectivorous mammals (i.e., bats) from Eco-SSL development. As such, an aerial insectivorous bat (i.e., Antillean ghost-faced bat, Parnell's mustached bat, sooty mustached bat, big brown bat, red bat, velvety free-tailed bat, or Brazilian free-tailed bat) was not selected as an ecological receptor. A frugivorous bat (i.e., Jamaican fruit bat, Antillean fruit bat, or red fig-eating bat) was also excluded from evaluation based on the absence of fruit-bearing vegetation known to be used as a source of food on Puerto Rico.

While exposure pathways to terrestrial reptiles and amphibians are likely to be complete, specific reptilian and amphibian species were not selected as receptors in the SERA since the life history and toxicological database concerning the effects of chemicals on herpafauna is severely limited, rendering a quantitative evaluation problematic (USEPA, 2000a and 2005a). It is assumed that reptiles and amphibians potentially present at the SWMU are not exposed to significantly higher concentrations of chemicals and are not more sensitive to chemicals than the other upper trophic level terrestrial receptor species evaluated in the risk assessment. For reptiles, this approach is consistent with USEPA Region III guidance (USEPA, 2014a), which states that "*As a general rule in Region 3, impacts to reptiles do not have to be considered as an assessment endpoint in the screening level ERA. However, the screening ERA would need to state that impacts to reptiles are being assessed qualitatively through the use of surrogate receptors. An exception to this rule is when a threatened or endangered reptile has been identified as a potential receptor on the site. In this situation, it may be appropriate to consider impact on reptiles when identifying assessment endpoints*." It is noted that reptiles and amphibians are poikilotherms (body temperature varies with environmental temperature), while birds and mammals are homeotherms (temperature is regulated, constant, and largely independent of environmental temperatures). Therefore, reptiles and amphibians tend to have much lower metabolic rates and lower caloric intake requirements than birds and mammals. As a consequence, birds and mammals are likely to consume more food than amphibians or reptiles on a

daily dietary intake basis, assuming similar caloric content of the food items. Therefore, potential risks to terrestrial amphibians and reptiles are likely overstated when risk estimates for avian and mammalian dietary intakes are applied to terrestrial herpetofauna.

4.4 Fate and Transport Mechanisms

In the absence of measured values of chemicals within biotic media, the transport and partitioning of constituents into particular environmental compartments, and their ultimate fate in those compartments, can be predicted from key physical-chemical characteristics. The physical-chemical characteristics that are most relevant for exposure modeling in this assessment include water solubility, adsorption to solids, octanol-water partitioning, and degradability. These characteristics are defined below.

The water solubility of a compound influences its partitioning to aqueous media. Highly water-soluble chemicals, such as most VOCs, have a tendency to remain dissolved in the water column rather than partitioning to sediment (Howard, 1991). Compounds with high water solubility also generally exhibit a lower tendency to bioconcentrate in aquatic organisms and a greater likelihood of biodegredation, at least over the short term (Howard, 1991).

Adsorption is a measure of a compound's affinity for binding to solids, such as soil or sediment particles. Adsorption is expressed in terms of partitioning, either as the adsorption coefficient (K_d), a unitless expression of the equilibrium concentration in the solid phase versus the water phase, or the organic carbon partition coefficient (K_{oc}, K_d normalized to the organic carbon content of the solid phase; again unitless) (Howard, 1991). For a given organic chemical, the higher the K_{oc} or K_d, the greater the tendency for that chemical to adhere strongly to soil or sediment particles. K_{oc} values can be measured directly or can be estimated from either water solubility or the octanol-water partition coefficient using one of several available regression equations (Howard, 1991).

Octanol-water partitioning indicates whether a compound is hydrophilic or hydrophobic. The octanol-water partition coefficient (K_{ow}) expresses the relative partitioning of a compound between octanol (lipids) and water. A high affinity for lipids equates to a high K_{ow} and vice versa. K_{ow} has been shown to correlate well with adsorption to soil or sediment particles and the potential to bioaccumulate in the food chain (Howard, 1991). Typically expressed as log K_{ow}, a value of 3.0 or less generally indicates that the chemical will not bioconcentrate to a significant degree (Maki and Duthie, 1978). Log K_{ow} values and K_{oc} values for the organic chemicals that were analyzed for in environmental media collected at the Tank 214 Area (i.e., Appendix IX VOCs, SVOCs, including PAHs, and organophosphorous pesticides) are presented in Table 4-2.

Degradability is an important factor in determining whether there will be significant loss of mass or change in the form of a chemical over time in the environment. The half-life of a compound is typically used to describe losses from either degradation (biological or abiotic) or from transfer from one compartment to another (e.g., volatilization from soil to air). The half-life is the time required for one-half of the mass of a compound to undergo the loss or degradation process.

5.0 SCREENING LEVEL EFFECTS EVALUATION

The purpose of the screening level effects evaluation is the establishment of chemical exposure levels (screening values) that represent conservative thresholds for adverse ecological effects. One set of screening values is typically developed for each of the selected assessment endpoints. For the SERA at the Tank 214 Area, two types of screening values were developed (media-specific screening values and toxicity reference values [TRVs]). Media-specific screening values were developed for soil (surface and subsurface soil), groundwater, estuarine surface water, and estuarine wetland sediment, while TRVs were developed for the evaluation of potential risks to upper trophic level terrestrial receptors (i.e., avian omnivores, avian and mammalian herbivores, and avian carnivores) and aquatic receptors (avian invertivores and avian piscivores) from food web (dietary) exposures (i.e., ingested chemical doses).

5.1 Media-Specific Screening Values for Soil, Groundwater, Surface Water, and Sediment

The sections that follow describe the various criteria and toxicological benchmarks that were used as media-specific screening values for chemicals in soil (surface and subsurface soil), groundwater, estuarine wetland surface water, and estuarine wetland sediment. The media-specific screening values, listed in Tables 5-1 (soil), 5-2 (groundwater and estuarine wetland surface water), and 5-3 (estuarine wetland sediment), represent conservative exposure thresholds above which adverse ecological effects may occur.

5.1.1 Soil Screening Values for Terrestrial Plants and Invertebrates

The toxicological benchmarks selected for use as screening values for chemicals in surface soil (0.0 to 1.0-feet bgs) and subsurface soil (1.0 to 3.0-feet bgs) are summarized in Table 5-1. USEPA Eco-SSLs (documentation is available at http://www.epa.gov/ecotox/ecossl/) for terrestrial plants and invertebrates were preferentially selected as soil screening values. For a given chemical, if an Eco-SSL was available for both receptor groups, the lowest value was selected as the soil screening value.

In the case of chromium and vanadium, insufficient data are available from the literature for derivation of plant- and invertebrate-based Eco-SSLs (USEPA, 2008 and 2005b). However, both Eco-SSL documents list toxicological data from studies eligible for Eco-SSL derivation. The chromium Eco-SSL document cites two studies (Van Gestel et al., 1992 and 1993) that investigated the effect of chromium on earthworm (*Eisenia andrei*) reproduction, while the vanadium Eco-SSL document cites two studies (both reported in Kaplan et al., 1990) that investigated the effect of vanadium on broccoli (*Brassica oleracea*) growth. The chromium studies using earthworms reported Maximum Acceptable Toxicant Concentration (MATC) values of 57 milligrams per kilogram (mg/kg), while the vanadium studies using broccoli reported either a Lowest Observed Adverse Effect Concentration (LOAEC) of 100 mg/kg or a No Observed Adverse Effect Concentration (NOAEC) of 100 mg/kg. For this ERA, the MATC value of 57 mg/kg based on earthworm reproduction was used as the soil screening value for chromium, while the LOAEC value based on broccoli growth (with a safety factor of 5; Wentsel et al., 1996) was used as the soil screening value for vanadium.

The approach used by the USEPA (2007b) to derive Eco-SSLs for PAHs is based on the grouping of individual PAH compounds into two classes based on molecular weight (low molecular weight [LMW] PAHs composed of fewer than four rings and high molecular weight [HMW] PAHs composed of four or more rings). As such, Eco-SSLs for individual PAH compounds are not available for use as soil screening values. However, identical to chromium and vanadium, the Eco-

SSL document for PAHs (USEPA 2007b) lists toxicological data for fluorene, fluoranthene, phenanthrene, and pyrene, which are eligible for derivation of LMW and HMW Eco-SSLs. For a given PAH with eligible toxicological data, the minimum chronic value was used as the soil screening value: 15,000 micrograms per kilogram (µg/kg) for fluoranthene, 8,000 µg/kg for fluorene, 9,000 µg/kg for phenanthrene, and 10,000 µg/kg for pyrene).

For those chemicals lacking terrestrial plant and invertebrate Eco-SSLs or toxicological data eligible for Eco-SSL derivation, the literature-based toxicological benchmarks listed below were selected as soil screening values.

- USEPA Region 5 (2003b) ecological screening levels (ESLs) for soil based on exposures to plants or terrestrial invertebrates
- Toxicological thresholds for earthworms and microorganisms (Efroymson et al., 1997a)
- Toxicological thresholds for plants (Efroymson et al., 1997b)
- Canadian Council of Ministers of the Environment (CCME, 2014) soil quality guidelines for environmental health

For a given chemical, if more than one value was available from the sources listed above, the lowest value was selected as the soil screening value. For those chemicals lacking an Eco-SSL, toxicological data eligible for Eco-SSL derivation, USEPA Region 5 ESLs based on exposures to plants or terrestrial invertebrates, toxicological thresholds from Efroymson et al. (1997a and 1997b), and CCME soil quality guidelines for environmental health, the following values, listed in their order of decreasing preference, were used as soil screening values:

- Toxicity reference values for plants and invertebrates listed in USEPA (1999a)
- Interim Canadian environmental quality assessment criteria for contaminated sites (CCME, 2001)
- Ecological soil screening values compiled by Beyer (1990) and listed in Friday (1998)

Interim Canadian assessment criteria, as well as soil screening values compiled by Beyer (1990) were given the lowest preference since many are based on background concentrations or detection limits, not effect-based concentrations.

5.1.2 Groundwater and Estuarine Wetland Surface Water Screening Values

As discussed in Section 2.2, groundwater flow at the SWMU is radial. As such, groundwater has the potential to discharge to the estuarine wetland system east, north, and west of the Tank 214 Area (i.e., Los Machos mangrove forest).. Because this estuarine wetland system represents a potential discharge point for Tank 214 Area groundwater, the available groundwater data were screened against the marine toxicological thresholds listed in Table 5-2. Analytical data for surface water collected from the estuarine wetland system were also screened against these saltwater values.

Puerto Rico Water Quality Standards (PRWQS) for Class SB coastal and estuarine waters listed within the Puerto Rico Water Quality Standards Regulation (PRWQSR) dated March 31, 2010 (Puerto Rico Environmental Quality Board [PREQB], 2010) were preferentially used as groundwater

and surface water screening values. PRWQS for Class SB coastal and estuarine waters were selected based on the classifications contained within Rule 1302.1 of the PRWQSR. For those chemicals lacking PRWQS for Class SB coastal and estuarine waters, groundwater and surface water screening values were identified from the following saltwater values listed in their order of decreasing preference:

- Chronic saltwater NRWQC (USEPA, 2014b)
- Final Chronic Values (FCVs) for saltwater contained in ECO Update Volume 3, Number 2 (USEPA, 1996)
- USEPA Region 4 chronic screening values for saltwater contained in Ecological Risk Assessment Bulletins – Supplement to Risk Assessment Guidance for Superfund (RAGS) (USEPA, 2001a)
- Minimum chronic toxicity test endpoints (No Observed Effect Concentration [NOEC], No Observed Effect Level [NOEL], and MATC values based on reproduction, growth, or survival) for marine species reported in the ECOTOXicology (ECOTOX) Release 4.0 Database System (USEPA, 2014c) and, in the case of organophosphorous pesticides, the Office of Pesticide Programs (OPP) Pesticide Ecotoxicity database (USEPA, 2014d)
- Chronic Lowest Observable Effect Levels (LOELs) for saltwater contained in National Oceanic and Atmospheric Administration (NOAA) Screening Quick Reference Tables (SQUIRTs) (Buchman, 2008) with a safety factor of 5 (Wentsel et al., 1996)

The order of preference was selected based on their level of protection. For example, NRWQC and FCVs would be expected to offer a greater degree of protection than a single species NOEC, NOEL, MATC, or LOEL since their derivation considers a larger toxicological database. It is noted that the chronic toxicity test endpoints reported in ECOTOX and Pesticide Ecotoxicity databases were given equal preference. If a chronic saltwater value was available from both sources, the minimum value was selected as the screening value.

In the absence of the above-mentioned NRWQC, FCVs, USEPA Region 4 chronic screening values, chronic test endpoints, and chronic LOELs, groundwater and surface water screening values were identified from the acute saltwater values listed below:

- Acute LOELs for saltwater contained in NOAA SQUIRTs (Buchman, 2008)
- Acute toxicity test endpoints (NOEC, NOEL, LOEL, Lowest Observed Effect Concentration [LOEC], median lethal concentration [LC_{50}], and median effective concentration [EC_{50}]) for marine species reported in the ECOTOX Release 4.0 Database System (USEPA, 2014c) and, in the case of organophosphorous pesticides, the OPP Pesticide Ecotoxicity database (USEPA, 2014d)
- LC_{50} values for marine species contained in Superfund Chemical Matrix (USEPA, 2004)

Chronic-based screening values were extrapolated from acute NOEC, NOEL, LOEC, LOEL, LC_{50}, and EC_{50} values as follows:

- A safety factor of 30 was used to convert an acute NOEC or NOEL to a chronic-based screening value (Wentsel et al., 1996)

- A safety factor of 50 was used to convert an acute LOEC or LOEL to a chronic-based screening value (Wentsel et al., 1996)

- A safety factor of 100 was used to convert an EC_{50} or LC_{50} to a chronic-based screening value (Wentsel et al., 1996)

When acute toxicity data were used to extrapolate a chronic screening value, NOECs/NOELs were given preference over LOECs/LOELs, LOECs/LOELs were given preference over LC_{50} and EC_{50} values, and EC_{50} values were given preference over LC_{50} values. When more than one value was available from the literature for a given test endpoint (e.g., NOEC), the minimum value was conservatively used to extrapolate a chronic screening value.

As evidenced by Table 5-2, the screening value selected for mercury is a USEPA saltwater NRWQC (i.e., criteria continuous concentration [CCC]). The saltwater CCC value for this metal is identified as a dissolved concentration (USEPA 2014b). A total recoverable CCC value for mercury was derived for use as a groundwater and surface water screening value in the Step 2 screening level risk calculation by dividing the dissolved CCC value (0.94 micrograms per liter [µg/L]) by 0.85 (saltwater conversion factor for mercury listed in Appendix A of the Aquatic Life Criteria Table [USEPA, 2014b]).

For those chemicals lacking saltwater values, groundwater and surface water screening values were identified from the freshwater values listed below in their order of decreasing preference.

- PRWQS for Class SD surface waters listed in the PRWQSR (PREQB, 2010).

- Chronic freshwater NRWQC (USEPA, 2014b)

- FCVs for freshwater contained in ECO Update Volume 3, Number 2 (USEPA, 1996)

- USEPA Region 4 chronic screening values for freshwater contained in Ecological Risk Assessment Bulletins – Supplement to RAGs (USEPA 2001a) and USEPA Region 5 ESLs (http://www.epa.gov/reg5rcra/ca/ESL.pdf) (USEPA, 2003b)

- Minimum chronic toxicity test endpoints (NOEC, NOEL, and MATC values) for freshwater species reported in the ECOTOX Release 4.0 Database System (USEPA, 2014c) and, in the case of organophosphorous pesticides, the OPP Pesticide Ecotoxicity database (USEPA, 2014d)

- Great Lakes basin Tier II Secondary Chronic Values (SCVs) listed in Version 2.13 of the Great Lakes Initiative Toxicity Data Clearinghouse (available at http://www.epa.gov/gliclearinghouse/) (USEPA, 2013a)

- Chronic LOELs for freshwater contained in NOAA SQUIRTs (Buchman, 2008) with a safety factor of 10 (Wentsel et al., 1996)

Identical to saltwater-based values, the order of preference was selected based on their level of protection. It is noted that USEPA Region 4 and Region 5 screening values were given equal

preference. When a value was available from both sources, the minimum value was selected as the screening value. Chronic toxicity test endpoints reported in the ECOTOX and OPP Pesticide Ecotoxicity databases were also given equal preference. Identical to the USEPA Region 4 and Region 5 screening values, if a chronic freshwater value was available from both sources, the minimum value was selected as the screening value.

In the absence of the above-mentioned freshwater FCVs, freshwater USEPA Region 4 and Region 5 screening values, freshwater chronic test endpoints, Great lakes basin Tier II SCVs, and freshwater chronic LOELs, groundwater and surface water screening values were derived from the acute freshwater values listed below:

- Acute LOELs for freshwater contained in NOAA SQUIRTs (Buchman, 2008)

- Acute toxicity test endpoints (NOEC, NOEL, LOEL, LOEC, LC_{50}, EC_{50} values) for freshwater species contained in the ECOTOX Release 4.0 Database System (USEPA, 2014c) and, in the case of organophosphorous pesticides, the OPP Pesticide Ecotoxicology database (USEPA, 2014d).

- LC_{50} values for freshwater species contained in Superfund Chemical Matrix (USEPA, 2004)

Chronic-based screening values were extrapolated from acute NOEC, NOEL, LOEC, LOEL, LC_{50}, and EC_{50} values using the safety factors from Wentsel et al. (1996) identified above. When acute toxicity data were used to extrapolate a chronic screening value, NOECs/NOELs were given preference over LOECs/LOELs, LOECs/LOELs were given preference over LC_{50} and EC_{50} values, and EC_{50} values were given preference over LC_{50} values. When more than one value was available for a given test endpoint (e.g., NOEC), the minimum value was conservatively used to extrapolate a chronic screening value. In some cases, acute and/or chronic saltwater and freshwater LOELs for chemical classes (e.g., PAHs) were available (Buchman, 2008). For a given chemical, a saltwater LOEL based on a chemical class was used as the groundwater and surface water screening value only if that chemical lacks saltwater and freshwater benchmarks and/or toxicity test endpoints.

5.1.3 Estuarine Wetland Sediment Screening Values

The available sediment analytical data were screened against the marine/estuarine toxicological thresholds listed in Table 5-3. The bulk sediment toxicological benchmarks listed below were preferentially used as sediment screening values:

- Effects-Range Low (ER-L) marine and estuarine sediment quality guidelines (SQGs) (Long and Morgan, 1991 and Long et al., 1995).

- Threshold Effects Level (TEL) marine sediment quality assessment guidelines (SQAGs) (MacDonald, 1994).

- Apparent Effects Threshold (AET) marine SQGs (Buchman, 2008).

A description of ER-L, TEL, and AET values and the methods used in their derivation are provided in the paragraphs that follow.

ER-L marine and estuarine SQGs. Long and Morgan (1991) developed effects-based SQGs using literature-based data from Equilibrium Partitioning (EqP) modeling, spiked-sediment toxicity tests,

and matched sediment chemistry and biological effects measures. For a given chemical, the data were arranged in ascending order of concentration with each data entry assigned an "effects" or "no effects" descriptor, and the 10th percentile and 50th percentile concentrations of the "effects" data were calculated. The 10th and 50th percentiles of the "effects" data represent the ER-L and Effects Range-Median (ER-M), respectively. For a given chemical, the ER-L and the ER-M delineate three concentration ranges. The concentration range below the ER-L value represents a minimal effects range (i.e., the concentration range in which effects would be rarely observed). Concentrations equal to or greater than the ER-L, but less than the ER-M represent a possible effects range within which effects would occasionally occur, while concentrations greater than the ER-M represent a probable-effects range within which effects would frequently occur. The ER-L and ER-M values were recalculated by Long et al. (1995) after omitting a small amount of freshwater data included in the original calculations (Long and Morgan, 1991) and incorporating more recent marine and estuarine data from the literature. With the exception of antimony, ER-Ls based on marine only SQGs from Long et al. (1995) were considered for use as sediment screening values. In the case of antimony, an ER-L value is not available from Long et al. (1995). Therefore, the ER-L value reported by Long and Morgan (1991) was considered as a potential sediment screening value.

TEL marine SQAGs for Florida coastal waters. The updated and revised data set used by Long et al. (1995) also was used by MacDonald (1994) to calculate SQAGs for Florida coastal waters (TELs and Probable Effect Levels [PELs]). Unlike the methodology used by Long et al. (1995) to derive ER-L and ER-M values, the derivation of TELs and PELs took into consideration the "no effects" data set. Specifically, TELs were derived by calculating the geometric mean of the 15th percentile in the "effects" data set and the 50th percentile in the "no effects" data set, while PELs were derived by calculating the geometric mean of the 50th percentile in the "effects" data set and the 85th percentile in the "no effects" data set.

Identical to ER-Ls and ER-Ms, TELs and PELs delineate three concentration ranges for a given chemical. The TEL represents the upper limit of the range of sediment concentrations dominated by "no effects" data. Within this range, concentrations are not considered to represent significant hazards to sediment-associated biota. The PEL represents the lower limit of the range of sediment concentrations that are usually or always associated with adverse biological effects. The range of concentrations that could be associated with biological effects is delineated by the TEL and PEL. Within this range of concentrations, adverse biological effects are possible. Only TELs were considered for use as sediment screening values. It is noted that the TELs reported by MacDonald (1994) have been adopted by the CCME (2014) as Canadian SQGs for the protection of marine aquatic life.

AET marine SQGs. The AET method, developed by Tetra Tech, Inc. (1986), associates chemical concentrations in sediments with adverse biological effects (lethal and sub-lethal toxicity as measured using sediment toxicity tests or changes in benthic macroinvertebrate abundance and community structure as measured by *in situ* biological surveys). For a given chemical and measurement of biological effect (biological indicator), the AET value represents the sediment concentration above which statistically significant biological effects are always observed. The AET values identified as screening values are the minimum AET values from a suite of seven biological indicators (amphipod mortality, oyster larval abnormality, Microtox luminescence, benthic macroinvertebrate abundance, bivalve larvae mortality/abnormality, Echinoderm larvae mortality/abnormality, and juvenile polychaete growth). It is noted that the AET values developed by Buchman (2008) are interim values subject to change.

Minimum, chemical-specific AET values are used by the Washington State Department of Ecology (1995) as sediment management standards for Puget Sound. Minimum AET values also are used by

the USACE (USEPA/USACE, 1998) as "reason to believe" guidance for screening levels for the Dredged Material Management Program (DMMP). The DMMP screening levels are implemented for use in Puget Sound and Grays Harbor/Willapa Bay in the State of Washington. Current Washington State Department of Ecology sediment management standards and USACE DMMP screening levels do not reflect the interim AET values reported by Buchman (2008).

For a given chemical, when more than one toxicological threshold was available from the sources listed above (i.e., Long et al., 1995, MacDonald, 1994, and Buchman, 2008), the minimum value was conservatively selected as the sediment screening value. For those organic chemicals lacking literature-based marine and estuarine toxicological benchmarks, EqP-based screening values were either developed using USEPA methodology (USEPA, 1993a and 1996 [see Appendix B]) or identified from the literature (Di Toro and McGrath, 2000). For a given chemical, when an EqP-based value was derived in accordance with USEPA (1993a and 1996) methodology and a value was also available from Di Toro and McGrath (2000), the minimum value was selected as the sediment screening value. As discussed in Appendix B, EqP-based screening values developed in accordance with USEPA (1993a and 1996) methodology are based, in part, on the fraction of organic carbon (f_{oc}) measured in sediment. For the Step 2 evaluation, a f_{oc} of 0.034 was used in their derivation (minimum value measured in estuarine wetland sediment). This f_{oc} value also was used to adjust the Di Toro and McGrath (2000) EqP-based toxicological benchmarks selected as sediment screening values (published values are based on a default f_{oc} of 0.01).

It is noted that consideration was given to the following freshwater toxicological thresholds for chemicals lacking marine and estuarine bulk sediment values: (1) consensus-based SQGs for freshwater (MacDonald et al., 2000), (2) SQAGs for Florida inland waters (MacDonald et al., 2003), (3) Ontario Ministry of the Environment (OMOE) Lowest Effect Level (LEL) Provincial sediment quality guidelines (PSQGs) (Persaud et al., 1993), and (4) Canadian sediment quality guidelines for the protection of freshwater aquatic life (CCME, 2014). However, no values for chemicals lacking marine and estuarine bulk sediment toxicological thresholds were available from these sources.

5.2 Toxicity Reference Values for Avian and Mammalian Dietary Exposures

TRVs for avian and mammalian dietary exposures to chemicals in surface soil and subsurface soil, and avian dietary exposures to chemicals in estuarine wetland surface water and sediment were compiled from the literature for each receptor species and chemical evaluated for dietary exposures. If available, TRVs identified and used by the USEPA in the derivation of avian and mammalian Eco-SSLs were preferentially used to evaluate risks from ingested dietary doses.

For chemicals lacking an avian/mammalian Eco-SSL, toxicological information from the literature for wildlife species most closely related to the receptor species was used if available. This information was supplemented by laboratory studies of non-wildlife species when necessary. Chronic No Observed Adverse Effects Levels (NOAELs) based on growth or reproduction endpoints were preferentially used as TRVs for upper trophic level receptors. NOAELs represent the highest dose of a chemical at which an effect being measured in a toxicity test does not occur. If several chronic toxicity studies were available from the literature, the most appropriate study was selected for each receptor species based on study design, study methodology, study duration, study endpoint, and test species. When chronic NOAEL values were unavailable, estimates were derived or extrapolated from chronic Lowest Observed Adverse Effects Levels (LOAELs) or median lethal dose (LD_{50}) acute values. LOAELs represent the lowest dose of a chemical at which an effect being measured in a toxicity test occurs, while an LD_{50} represents the dose of a chemical at which half of the organisms being tested die. An uncertainty factor of 5 was used to convert a reported chronic LOAEL to a chronic NOAEL (Wentsel et al., 1996), while an uncertainty factor of 100 was used to convert the

acute LD_{50} to a chronic NOAEL (i.e., the LD_{50} was multiplied by 0.01 to obtain the chronic NOAEL [Wentsel et al., 1996 and USEPA, 1997]).

TRVs for the avian species selected as ecological receptors (i.e., American robin, mourning dove, red-tailed hawk, spotted sandpiper, and green heron), expressed as milligrams of the chemical per kilogram body weight of the receptor per day (mg/kg-BW/day) are provided in Table 5-4. Sample et al. (1996) consider a scaling factor of 1.0 most appropriate for interspecies extrapolation between birds. Therefore, the NOAEL and LOAEL values listed in Table 5-4 were not adjusted to reflect differences in body weights between avian test species and avian receptor species. TRVs for the mammalian species selected as an ecological receptor (i.e., brown flower bat) are provided in Table 5-5. Identical to the avian TRVs, the NOAEL and LOAEL values listed in Table 5-5 were not adjusted to account for differences in body weights between the brown flower bat and mammalian test species (Allard et al., 2011).

Not all chemicals analyzed for in surface soil, subsurface soil, and sediment were evaluated for avian and mammalian dietary exposures. The organic chemicals evaluated for dietary exposures are limited to those listed in Table 4-2 with the potential to bioaccumulate to a significant extent. Bioaccumulative organic chemicals are defined as those with a maximum reported log K_{ow} greater than or equal to 3.0. Rational for using a log K_{ow} of 3.0 to define an organic chemical with the potential to bioaccumulate is included as Appendix C. For conservatism, all inorganic chemicals (i.e., metals) were also evaluated for dietary exposures. The list of chemicals selected for evaluation contains many chemicals that are not identified as "important bioaccumulative compounds" by the USEPA (2000b). It is noted that upper trophic level receptors may be exposed to non-bioaccumulative chemicals in surface soil, subsurface soil, and sediment through incidental ingestion. As such, their exclusion from consideration in the ERA represents an uncertainty that is addressed in Section 8.8.

6.0 SCREENING LEVEL EXPOSURE ESTIMATION

This section presents the analytical data, exposure assumptions, and the exposure models and input parameters that were used to estimate the potential exposure of ecological receptors to chemicals in soil (surface and subsurface soil), groundwater, surface water, and sediment.

6.1 Selection Criteria for Analytical Data

The analytical data used in the SERA (described in Section 3.0 and presented in Appendix A) were reviewed against a set of selection criteria to identify specific data that would be used to estimate potential exposures to ecological receptors. The criteria used to select these analytical data are listed below.

- Data must have been validated by a qualified data validator using acceptable data validation methodology. Rejected ("R") values were not used in the SERA. Unqualified data and data qualified as estimated, "J" or "NJ," were treated as detected, while data qualified as "U" or estimated, "UJ," were treated as non-detected.

- The available soil analytical data were divided into surface soil data (i.e., analytical data for soil samples collected from the 0 to 1.0-foot depth interval) and subsurface soil data (analytical data for soil samples collected from the 1.0 to 3.0-foot depth interval), and evaluated independently from each other. The evaluation of available soil analytical data was limited to these depth ranges since most soil heterotrophic activity and soil invertebrates occur on the surface or within the oxidized root zone (Suter II, 1995).

- For surface water and groundwater, only total (unfiltered) analytical data were used in the Step 2 screening level risk calculation.

- Maximum non-detected concentrations were conservatively used to estimate exposure for non-detected chemicals.

- In some instances, duplicate samples were collected in the field (see Table 3-1). The maximum detected concentration of each chemical (or the maximum non-detected value for chemicals that were not detected) in the original or duplicate sample was used as a conservative estimate of contaminant concentrations at a particular sampling point. In cases where one result was a detection and the other a non-detect, the detected value was used in the assessment. Results from duplicate samples were not evaluated individually. Data provided in Appendix A reflect the combined duplicate samples (i.e., one set of data for each sample point).

6.2 Exposure Estimation

Maximum detected concentrations in soil (surface and subsurface soil), groundwater, estuarine wetland surface water, and estuarine wetland sediment were used to conservatively estimate potential chemical exposures for the ecological receptors selected to represent the assessment endpoints. For conservatism, maximum non-detected concentrations for chemicals that were analyzed for but not detected were also compared to media-specific screening values and (where appropriate) used for food web exposure modeling. This was done to ensure that non-detected concentrations are similar to, or less than, chemical concentrations at which potential adverse effects to ecological receptors may occur. For samples with duplicate analyses, the higher of the two concentrations was used in the

screening (when both values were detects or both values were non-detects). In cases where one result was a detection and the other a non-detect, the detected value was used in the assessment.

6.2.1 Terrestrial and Aquatic Receptor Groups

Maximum measured chemical concentrations in soil, groundwater, estuarine wetland surface water, and estuarine wetland sediment were compared to the media-specific screening values discussed in Section 5.1 and summarized in Tables 5-1 (soil screening values), 5-2 (groundwater and estuarine wetland surface water screening values), and 5-3 (estuarine wetland sediment screening values) to conservatively evaluate the potential for adverse ecological effects to the lower trophic level receptor groups selected as assessment endpoints (i.e., terrestrial plants and invertebrates, aquatic plants and invertebrates, and fish).

6.2.2 Upper Trophic Level Receptors

Exposures for upper trophic level terrestrial receptor species via the food web were determined by estimating chemical-specific concentrations in each dietary component using uptake and food web models. Incidental ingestion of soil and sediment was included when calculating the total level of exposure. As indicated previously, maximum measured soil and sediment concentrations were used in all calculations to provide a conservative assessment. Surface water ingestion was not included in dietary exposure estimates because surface water in the estuarine wetland does not represent a drinking water source (see Section 4.1.3).

For the screening level exposure estimation, tissue concentrations were modeled for terrestrial plants (food item for the mourning dove and brown flower bat), soil invertebrates (food item for the American robin), small mammals (food item for the red-tailed hawk), sediment invertebrates (food item for the spotted sandpiper) and fish (food item for the green heron). The omnivorous Norway rat was selected as the small mammal food item for the red-tailed hawk. A small mammal herbivore and/or insectivore were excluded as potential food items for the red-tailed hawk because they are not part of the Puerto Rican mammalian fauna (see Section 2.3.1).

6.2.2.1 Exposure Point Concentrations

The uptake of chemicals from the abiotic media into terrestrial and aquatic food items is based (where available) on chemical-specific uptake equations (i.e., regressions based on measured soil and tissue concentrations) or conservative (e.g., maximum or 90th percentile) bioaccumulation factors (BAFs) from the literature. Generic models based on Log K_{ow} values (presented in USEPA [2007c]) or default factors of 1.0 were used for chemicals only when uptake equations and/or BAF data were unavailable from the literature. The methodology and models used to derive these estimates are described below.

Terrestrial plants. Tissue concentrations in the aboveground vegetative portion of terrestrial plants were estimated by chemical-specific uptake equations (i.e. regressions developed from measured soil and tissue data) or by multiplying maximum measured soil concentrations by conservative, chemical-specific BAFs (maximum or 90th percentile values) either obtained directly from the literature or derived from literature data sets (see Table 6-1). The chemical-specific BAF values listed in Table 6-1 are based on root uptake from soil and on the ratio between dry-weight soil and dry-weight plant tissue. Literature values based on the ratio between dry-weight soil and wet-weight plant tissue were converted to a dry-weight basis by dividing the wet-weight BAF by the estimated solids content of terrestrial plants (15 percent [0.15]; Sample et al., 1997). Chemical-specific regressions developed by

Bechtel Jacobs (1998) and USEPA (2007c) were given preference over high-end BAF values (i.e., maximum and 90th percentile values) if the regressions were significant ($p < 0.05$).

For bioaccumulative organic chemicals lacking significant regressions and chemical-specific BAFs, soil-to-plant BAFs were estimated from their Log K_{ow} using the rinsed foliage regression equation provided in Figure 5, Panel B of USEPA (2007c):

$$Log\ BAF = (-0.4057)\ (Log\ K_{ow}) + 1.781$$

where:

Log BAF = Log Soil-to-plant BAF (unitless; dry-weight basis)
Log K_{ow} = Log Octanol-water partitioning coefficient (unitless)

The Log K_{ow} values used in this equation are listed in Table 4-2.

Earthworms. Tissue concentrations in soil invertebrates (earthworms) were estimated by chemical-specific uptake equations (i.e. regressions developed from measured soil and tissue data) or by multiplying maximum measured soil concentrations for each chemical by conservative, chemical-specific soil-to-invertebrate BAFs (90th percentile values) obtained directly from the literature or derived from literature data sets (see Table 6-1). The chemical-specific BAF values listed in Table 6-1 are based on the ratio between dry-weight soil and dry-weight earthworm tissue. Literature values based on the ratio between dry-weight soil and wet-weight earthworm tissue were converted to a dry-weight basis by dividing the wet-weight BAF by the estimated solids content of earthworms (16 percent [0.16]; USEPA, 1993b). BAFs based on depurated analyses (soil was purged from the gut of the earthworm prior to analysis) were given preference over undepurated analyses since direct ingestion of surface soil is accounted for separately in the food web model. Chemical-specific regressions developed by Sample et al. (1998a) were given preference over high-end BAF values (i.e., 90th percentile values) if the regressions were significant ($p < 0.05$).

For inorganic chemicals without available chemical-specific uptake equations or high-end BAFs, an earthworm BAF of 1.0 was assumed. For organic chemicals lacking chemical-specific uptake equations or high-end BAFs, earthworm BAF values were estimated using the model presented in Section 3.2.2 and Table 5 of USEPA (2007c). In this model, the soil-to-earthworm BAF value is estimated using the following equation:

$$BAF = K_{ww}/K_d$$

K_{ww} is the biota to soil water partitioning coefficient (liter [L] soil pore water/kilogram [kg] worm tissue - dry weight), while K_d represents the soil to water partitioning coefficient (L soil pore water/kg soil - dry weight). For a given organic chemical, K_{ww} is a function of the K_{ow} value and lipid content of the organism. The following regression equation for K_{ww} (wet weight basis) was derived by Jager (1998) for earthworms based on data for sixty-nine organic chemicals with Log K_{ow} values ranging from 2.0 to 8.0:

$$Log\ K_{ww} = (0.87)(Log\ K_{ow}) - 2.0$$

K_{ww} can be converted to a dry weight basis by dividing the wet weight value by the estimated solids content of earthworms (16 percent [0.16]; USEPA, 1993b). K_d can be estimated by the following equation (USEPA 2007c):

$$K_d = (f_{oc})(K_{oc})$$

In this equation, f_{oc} is the fraction of organic carbon in soil (kg organic carbon/kg soil; assumed to be 0.01 [1.0 percent]) and K_{oc} is the organic carbon partition coefficient. For a given chemical, the Log K_{ow} and K_{oc} value used to estimate K_{ww} and K_d, respectively, are those listed in Table 4-2.

Small mammals. Whole-body tissue concentrations in small mammals (omnivores) were estimated using one of two methodologies. When available, chemical-specific uptake equations (i.e., regressions developed from measured soil and tissue data) or conservative, chemical-specific soil-to-small mammal BAFs (90th percentile values) obtained directly from the literature or derived from literature data sets were used to estimate whole-body tissue concentrations (see Table 6-2). The chemical-specific BAFs listed in Table 6-2 are based on the ratio between dry-weight soil and dry-weight tissue. Literature values based on the ratio between dry-weight soil and wet-weight tissue were converted to a dry-weight basis by dividing the wet-weight BAF by the estimated solids content of small mammals (32 percent [0.32]; USEPA, 1993b). Chemical-specific regressions developed by Sample et al. (1998b) for general small mammals were given preference over high-end BAF values (i.e., 90th percentile values) if the regressions were significant ($p < 0.05$).

For those chemicals lacking chemical-specific uptake equations or literature-based BAF values, an alternate approach was used to estimate whole-body tissue concentrations. Because most chemical exposures for small mammal species is via the diet, it was assumed that the concentration of each chemical in a small mammal's tissues is equal to the chemical concentration in its diet multiplied by a diet to whole-body BAF (wet-weight basis) derived from the literature. For chemicals lacking literature-based diet to whole-body BAF values, a diet to whole-body BAF value of 1.0 was assumed. Resulting tissue concentrations (wet-weight) were converted to dry weight using an estimated solids content of 32 percent (see above). The use of a diet to whole-body BAF of 1.0 is likely to result in a conservative estimate of chemical concentrations for chemicals that are not known to biomagnify in terrestrial food chains (e.g., aluminum). For chemicals that are known to biomagnify, a diet to whole-body BAF value of one will likely result in a realistic estimate of tissue concentrations based on reported literature values. For example, a maximum BAF (wet weight) value of 1.0 was reported by Simmons and McKee (1992) for PCBs based on laboratory studies with white-footed mice. Menzie et al. (1992) reported BAF values (wet-weight) for dichlorodiphenyltrichloroethane (DDT) of 0.3 for voles and 0.2 for short-tailed shrews. Reported BAF (wet-weight) values for dioxin are only slightly above one (1.4) for the deer mouse (USEPA, 1990).

Aquatic Invertebrates. Tissue concentrations in aquatic invertebrates were estimated by multiplying maximum measured sediment concentrations for each chemical by conservative, chemical-specific soil-to-invertebrate BAFs (90th percentile values) obtained directly from the literature or derived from literature-based data sets (see Table 6-3). BAFs based on depurated analyses (sediment was purged from the gut of the organism prior to analysis) were given preference over undepurated analyses since direct ingestion of sediment is accounted for separately within the food web model. The chemical-specific BAFs listed in Table 6-3 are based on the ratio between dry-weight soil and dry-weight tissue. Literature values based on the ratio between dry-weight soil and wet-weight tissue were converted to a dry-weight basis by dividing the wet-weight BAF by the estimated solids content for aquatic invertebrates (21 percent [0.21]; USEPA, 1993b).

For those chemicals lacking literature-based BAF values, BAFs were estimated from the biota-sediment accumulation factors (BSAFs) listed in Table 6-4. The conservative (90th percentile) BSAF values included within Table 6-4 were converted to BAF values (dry weight basis) for use in the food web models using a lipid content of 3.44 percent (mean value for aquatic invertebrate percent lipid data listed in Table 6-5), a percent solids content of 21 percent for aquatic invertebrates (see above), and a sediment organic carbon content of 3.4 percent (minimum organic carbon content measured in estuarine wetland sediment).

For those inorganic chemicals and bioaccumulative organic chemical lacking literature-based BAF and BSAF values, an aquatic invertebrate BAF of 1.0 was assumed.

Fish. Tissue concentrations in fish were estimated by multiplying maximum measured sediment concentrations for each chemical by conservative, chemical-specific sediment-to-fish BAFs (maximum or 95th percentile values) obtained directly from the literature (see Table 6-3). The chemical-specific BAFs listed in Table 6-3 are based on the ratio between dry-weight sediment and dry-weight tissue. Literature values based on the ratio between dry-weight sediment and wet-weight tissue were converted to a dry-weight basis by dividing the wet-weight BAF by the estimated solids content for fish (25 percent [0.25]; USEPA, 1993b).

For those chemicals lacking literature-based values, BAFs were estimated from the available BSAFs listed in Table 6-6. The conservative (90th percentile) BSAF values included within Table 6-6 were converted to BAF values (dry weight basis) for use in the food web models using a lipid content of 5.90 percent (mean value for the fish percent lipid data listed in Table 6-7), a percent solids content of 25 percent (see above), and a sediment organic carbon content of 3.4 percent (minimum organic carbon content measured in estuarine wetland sediment). For those inorganic chemicals and bioaccumulative organic chemicals lacking literature-based BAF and BSAF values, an aquatic invertebrate BAF of 1.0 was assumed.

6.2.2.2 Dietary Intakes

Dietary intakes for each upper trophic level receptor species were calculated using the following formula modified from USEPA (1993b).

$$DI_{xj} = \frac{[[\sum_i[(FIR_j)(FC_{xi})(PDF_i)]] + [(FIR_j)(SC_x)(PDS)]][AUF_j]}{BW_j}$$

where:

DI_{xj}	=	Dietary intake of chemical x by receptor j (mg chemical/kg body weight/day)
FIR_j	=	Food ingestion rate for receptor j (kilograms per day [kg/day]; dry-weight)
FC_{xi}	=	Maximum concentration of chemical x in food item i (mg/kg; dry weight)
PDF_i	=	Proportion of diet composed of food item i (unitless; dry weight basis)
SC_x	=	Maximum concentration of chemical x in soil/sediment (mg/kg; dry weight)
PDS	=	Proportion of diet composed of soil/sediment (unitless; dry weight basis)
BW_j	=	Minimum body weight of receptor j (kg; wet weight basis)
AUF_j	=	Area use factor for receptor j (unitless)

Conservative, receptor-specific exposure parameters (maximum food ingestion rates and minimum body weights) for the American robin, mourning dove, red-tailed hawk, brown flower bat, spotted sandpiper, and green heron are provided in Table 6-8. The food items selected for each receptor species are provided in Table 6-9. Although American robins are omnivores, an exclusive diet of earthworms was assumed for the SERA, allowing for the most conservative exposure estimation. Table 6-8 contains exposure parameters and Table 6-9 contains a dietary composition for the Norway rat (assumed diet of the red-tailed hawk). This assumption is based on likely small mammal prey species present in Puerto Rico (rats). Identification of exposure parameters and food items was necessary when estimating small mammal whole body tissue concentrations for those chemicals that lack a literature-based soil-to-small mammal BAF (i.e., exposure doses were used to estimate tissue

concentrations [see Section 6.2.2.1]). Identical to the American robin, an exclusive diet of earthworms was assumed.

For the SERA, an area use factor (AUF) of 1.0 was assumed (i.e., each receptor is assumed to spend 100 percent of its time on the site). As such, receptor-specific home ranges were not considered in the estimation of dietary intakes.

7.0 SCREENING LEVEL RISK CALCULATION

The screening level risk calculation represents the final step for the SERA. In this step, maximum chemical concentrations in abiotic media or maximum exposure doses for upper trophic level receptor species are compared with the corresponding screening values to derive screening level risk estimates. The outcome of this step is a list of ecological COPCs for each chemical-receptor combination evaluated or a conclusion of negligible risk.

7.1 Selection of Ecological Chemicals of Potential Concern

Ecological COPCs were selected using the hazard quotient (HQ) method. For a given chemical, an HQ was calculated by dividing the maximum chemical concentration in the medium being evaluated by the corresponding medium-specific screening value or, in the case of upper trophic level receptors, by dividing the maximum dietary exposure dose (derived by the equation presented in Section 6.2.2.2) by the corresponding TRV.

The following conservative methodology was used to identify ecological COPCs for lower trophic level receptor exposures to chemicals in soil (surface and subsurface soil), groundwater (assuming discharge to surface water without dilution), surface water, and sediment.

- The maximum detected concentrations in surface soil, subsurface soil, groundwater, surface water, and sediment were used to calculate media-specific HQs. For a given medium, chemicals with HQs greater than 1.0 based on maximum detected concentrations were identified as ecological COPCs.

- For non-detected chemicals, maximum non-detected concentrations were used to calculate media-specific HQ values. For a given medium, non-detected chemicals with HQs greater than 1.0 based on maximum non-detected concentrations were identified as ecological COPCs.

- Detected and non-detected chemicals without media-specific screening values were identified as ecological COPCs.

To select ecological COPCs for upper trophic level dietary exposures, maximum chemical concentrations in soil (surface and subsurface soil) and estuarine wetland sediment were used to estimate dietary doses for each receptor. HQs were calculated with NOAEL-, LOAEL-, and MATC-based TRVs. The MATC is derived by taking the geometric mean of the NOAEL and LOAEL. Calculations with NOAELs provide the most conservative risk estimate, while calculations with LOAELs provide the least conservative risk estimate. Calculations with MATCs provide realistic risk estimates since the MATC represents an estimation of the threshold concentration (i.e., the concentration above which a toxic effect on the test endpoint is produced). For the SERA, chemicals (detected and non-detected) with NOAEL-based HQs greater than 1.0 were identified as ecological COPCs. Identical to the media-specific screening evaluation, detected and non-detected chemicals without literature-based TRVs also were identified as ecological COPCs for upper trophic level receptor exposures.

HQs greater than 1.0 indicate the potential for risk since the chemical concentration or dose (exposure) exceeds the screening value (effect). However, risk estimates are derived using intentionally conservative assumptions (maximum media concentrations, maximum food ingestion rates, and minimum body weights) such that HQs greater than 1.0 do not necessarily indicate that risks are present or impacts are occurring. Rather, they identify chemical-receptor combinations

requiring further evaluation. Following the same reasoning, HQs less than 1.0 indicate that risks are very unlikely, enabling a conclusion of no unacceptable risk to be reached with high confidence.

In most cases, the SERA considered independent effects of chemicals. However, the potential does exist for multiple chemicals in environmental media to interact. Much uncertainty is involved with the interpretation of chemical interactions due to the complexity of potential effects (e.g., synergistic, antagonistic, or additive), and due to varying toxicities of compounds in different species. For these reasons, cumulative effects were not addressed for most chemicals in the SERA. Chemical interactions can be addressed by site-specific studies conducted in Step 6 of the Navy ERA process (i.e., site investigation and data analysis [see Figure 1-1]).

7.2 Screening Level Risk Calculation for Surface Soil, Subsurface Soil, Groundwater, Surface Water, Sediment, and Upper Trophic Level Food Web Exposures

Screening level risk calculations (i.e., HQ calculations) for Tank 214 Area surface soil, subsurface soil, groundwater, estuarine wetland surface water, and estuarine wetland sediment are presented in Tables 7-1, 7-2, 7-3, 7-4, and 7-5, respectively. These calculations apply only to lower trophic level community exposures (i.e., HQ calculations for terrestrial plant and invertebrate exposures to chemicals in surface and subsurface soil, pelagic and benthic biota exposures to chemicals in groundwater discharging to the downgradient estuarine wetland system [i.e., Los Machos mangrove forest], and pelagic and benthic biota exposures to chemicals in estuarine wetland surface water and sediment). Screening level risk estimates for SWMU 9 dietary exposures are presented in Tables 7-6 (surface soil), 7-7 (subsurface soil), and 7-8 (sediment). Ecological COPCs were identified in Step 2 of the SERA using the procedures outlined in Section 7.1.

7.2.1 Screening Level Risk Calculation for Surface Soil

Table 7-1 presents the results of the screening level risk calculation for terrestrial plant and invertebrate exposures to chemicals in Tank 214 Area surface soil. Ten VOCs (2-butanone, 2-hexanone, acetone, carbon disulfide, chloroform, ethylbenzene, methylene chloride, pentachloroethane, styrene, and total xylenes) were detected in surface soil. Based on HQ values less than 1.0, chloroform, ethylbenzene, methylene chloride, pentachloroethane, styrene, and total xylenes are not identified as ecological COPCs. However, 2-butanone, 2-hexanone, acetone, and carbon disulfide are identified as ecological COPCs based on the lack of soil screening values. Although not detected, 1,1,2,2-tetrachloroethane, 1,1,2-trichloroethane, 1,2,3-trichloropropane, bromoform, chloroethane, and dibromomethane are identified as ecological COPCs because maximum non-detected concentrations exceed soil screening values. An additional twenty-four non-detected VOCs are identified as ecological COPCs based on the lack of soil screening values (see Table 7-1).

Di-n-butyl phthalate was detected in a single surface soil sample collected at the Tank 214 Area (40J µg/kg in 9SS03). However, this SVOC is not identified as an ecological COPC based on an HQ value less than 1.0 (HQ = <0.01). Although not detected, fifteen SVOCs are identified as ecological COPCs because maximum non-detected concentrations exceed soil screening values. An additional fifty-seven non-detected SVOCs are identified as ecological COPCs based on the lack of soil screening values.

Twelve PAHs were detected in surface soil (see Table 7-1). Information available from the literature indicates that PAH toxicities in waters, tissues, and sediments are additive or nearly additive (USEPA 2003c). Assuming that PAH toxicities in soils are also additive or nearly additive, the combined toxicological contributions of the PAH mixture in surface soil was considered. The USEPA (2007b) has developed Eco-SSLs for LMW and HMW PAHs (29,000 µg/kg and 18,000 µg/kg, respectively

[soil invertebrate-based values]). LMW PAHs are defined as PAH compounds composed of fewer than four rings, while HMW PAHs are defined as PAH compounds composed of four or more rings (USEPA, 2007b). A total of nine LMW PAH compounds (i.e., 1-methylnaphthalene, 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, fluoranthene, fluorene, naphthalene, and phenanthrene) and nine HMW PAH compounds (i.e., benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[g,h,i]perylene, benzo[k]fluoranthene, dibenz[a,h]anthracene, chrysene, indeno[1,2,3-cd]pyrene, and pyrene) were analyzed for in Tank 214 Area surface soil. The sum of maximum LMW PAH concentrations across the site (2,977 µg/kg; maximum non-detected concentrations used for non-detected LMW PAHs) is less than the LMW PAH Eco-SSL value. The sum of maximum HMW PAH concentrations across the site (7,769 µg/kg; maximum non-detected concentrations used for non-detected HMW PAHs) is also less than the HMW PAH Eco-SSL.

Screening level risk estimates were also derived for individual PAH compounds. As evidenced by Table 7-1, HQ values for all detected and non-detected PAHs are less than 1.0. Based on the comparison of the sum of maximum LMW and HMW PAH concentrations across the site to the invertebrate-based Eco-SSLs, as well as the comparison of maximum concentrations for individual PAH compounds to soil screening values, no PAHs are identified as ecological COPCs for Tank 214 Area surface soil.

No organophosphorous pesticides were detected in surface soil. However, one pesticide (methyl parathion) is identified as an ecological COPC because the maximum non-detected concentration exceeds the soil screening value. An additional eight non-detected organophosphorous pesticides are identified as ecological COPCs based on the lack of soil screening values.

Fifteen metals were detected in surface soil. Of these fifteen metals, arsenic, cobalt, copper, lead, selenium, thallium, vanadium, and zinc are identified as ecological COPCs because maximum detected concentrations exceed soil screening values (i.e., HQs are greater than 1.0). HQ values range from 1.28 for arsenic to 12.00 for vanadium (see Table 7-1). HQ values for the remaining detected metals are less than 1.0.

In summary, arsenic, cobalt, copper, lead, selenium, thallium, vanadium, and zinc were detected and identified as ecological COPCs for Tank 214 Area surface soil because maximum detected concentrations exceed soil screening values. Four detected VOCs (2-butanone, 2-hexanone, acetone, and carbon disulfide) were also identified as ecological COPCs based on the lack of soil screening values. Six non-detected VOCs (1,1,2,2-tetrachloroethane, 1,1,2-trichloroethane, 1,2,3-trichloropropane, bromoform, chloroethane, and dibromomethane), fifteen non-detected SVOCs, and one non-detected pesticide (methyl parathion) were identified as ecological COPCs because maximum non-detected concentrations exceed soil screening values. An additional twenty-four non-detected VOCs, fifty-seven non-detected SVOCs, and eight non-detected pesticides were identified as ecological COPCs based on the lack of soil screening values.

7.2.2 Screening Level Risk Calculation for Subsurface Soil

Table 7-2 presents the results of the screening level risk calculation for plant and invertebrate exposures to chemicals in Tank 214 Area subsurface soil (1.0 to 3.0 foot depth interval). Four VOCs (acetone, carbon disulfide, methylene chloride, and total xylenes) were detected in subsurface soil. Based on HQ values less than 1.0, methylene chloride and total xylenes are not identified as ecological COPCs. However, acetone and carbon disulfide are identified as ecological COPCs based on the lack of soil screening values. Nineteen non-detected VOCs are identified as ecological COPCs because non-detected concentrations exceed soil screening values. An additional twenty-two non-detected VOCs are identified as ecological COPCs based on the lack of soil screening values.

No SVOCs were detected in subsurface soil. However, eight non-detected SVOCs (1,2,4,5-tetrachlorobenzene, 2,3,4,6-tetrachlorophenol, 2,4-dimethylphenol, 2,6-dichlorophenol. 2-chlorophenol, 4,6-dinitro-2-methylphenol, pentachlorobenzene, and pronamide) are identified as ecological COPCs because maximum non-detected concentrations exceed soil screening values. An additional fifty-two non-detected SVOCs are identified as ecological COPCs based on the lack of soil screening values. It is noted that all subsurface soil analytical data for 4-nitroquinoline-1-oxide were rejected during data validation activities. Based on the lack of any usable data with which to evaluate potential risks, this VOC is identified as ecological COPCs for subsurface soil.

Five PAHs (1-methylnaphthalene, 2-methylnaphthalene, benzo[g,h,i]perylene, fluorene, and phenanthrene) were detected in subsurface soil. As discussed in Section 7.2.1, PAH toxicities in soil are assumed to be additive or nearly additive. The USEPA (2007b) has developed Eco-SSLs for LMW and HMW PAHs (29,000 µg/kg and 18,000 µg/kg, respectively [soil invertebrate-based values]). The sum of maximum LMW PAH concentrations in subsurface soil across the site (282 µg/kg; maximum non-detected concentrations used for non-detected LMW PAHs) is less than the LMW PAH Eco-SSL value. The sum of maximum HMW PAH concentrations across the site (153 µg/kg; maximum non-detected concentrations used for non-detected HMW PAHs) is also less than the HMW PAH Eco-SSL. Identical to surface soil, screening level risk estimates were also derived for individual PAH compounds. As evidenced by Table 7-2, HQ values for all detected and non-detected PAHs are less than 1.0. Based on the comparison of the sum of maximum LMW and HMW PAH concentrations to the invertebrate-based Eco-SSLs, as well as the comparison of maximum concentrations for individual PAH compounds to soil screening values, no PAHs are identified as ecological COPCs for subsurface soil.

No organophosphorous pesticides were detected in subsurface soil. However, methyl parathion is identified as an ecological COPC because the maximum non-detected concentration exceeds the soil screening value. Eight additional organophosphorous pesticides are identified as ecological COPCs based on the lack of soil screening values.

Thirteen metals were detected in subsurface soil. Of these thirteen detected metals, cobalt, copper, lead, thallium, and vanadium are identified as ecological COPCs because maximum detected concentrations exceed soil screening values. HQ values range from 1.86 for copper to 10.00 for vanadium (see Table 7-2). HQ values for the remaining detected metals are less than 1.0. Although not detected, selenium is identified as an ecological COPC because the maximum non-detected concentration for this metal exceeds the soil screening value.

In summary, cobalt, copper, lead, thallium, and vanadium were detected and identified as ecological COPCs for Tank 214 Area B subsurface soil because maximum detected concentrations exceed soil screening values. Two detected VOCs (acetone and carbon disulfide) were also detected and identified as ecological COPCs based on the lack of soil screening values. Nineteen non-detected VOCs, eight non-detected SVOCs (1,2,4,5-tetrachlorobenzene, 2,3,4,6-tetrachlorophenol, 2,4-dimethylphenol, 2,4-dichlorophenol. 2-chlorophenol, 4,6-dinitro-2-methylphenol, pentachlorobenzene, and pronamide), one non-detected organophosphorous pesticide (methyl parathion), and one non-detected metal (selenium) were identified as ecological COPCs because maximum non-detected concentrations exceed soil screening values. An additional twenty-two non-detected VOCs, fifty-two non-detected SVOCs, and eight non-detected organophosphorous pesticides were identified as ecological COPCs based on the lack of soil screening values. Finally, 4-nitroquinoline-1-oxide was identified as an ecological COPC for subsurface soil based on the lack of any usable data with which to evaluate potential risks (all subsurface soil analytical data for this SVOC were rejected during data validation activities).

7.2.3 Screening Level Risk Calculation for Groundwater

Table 7-3 presents the results of the screening level risk calculation for Tank 214 Area groundwater. Ten VOCs were detected in groundwater (1,1,2-trichloromethane, acetone, benzene, bromodichloromethane, carbon disulfide, carbon tetrachloride, chlorobenzene, chloroform, ethylbenzene, and methyl acrylonitrile). Of the ten VOCs, benzene and ethylbenzene are identified as ecological COPCs because maximum detected concentrations exceed groundwater screening values (HQs = 3.03 for benzene and 2.79 for ethylbenzene). Methyl acrylonitrile is also identified as an ecological COPC based on the lack of screening value. One non-detected VOC (acrolein) is identified as an ecological COPC because the maximum non-detected concentration exceeds the groundwater screening value (HQ = 21.82). Three additional non-detected VOCs (1,4-dichloro-2-butene, 2-chloro-1,3-butadiene, and chloroethane) are identified as ecological COPCs based on the lack of groundwater screening values.

Six SVOCs were detected in groundwater (1,4-dioxane, 2,4-dichlorophenol, bis[2-chloroethyl]ether, dibenzofuran, o-toluidine, and phenacetin). Of these six SVOCs, 2,4-dichlorophenol (HQ = 1.26) is identified as an ecological COPC because the maximum detected concentration exceeds the groundwater screening value (HQ = 1.26). Phenacetin is also identified as an ecological COPC based on the lack of a screening value. Eight non-detected SVOCs (2-chloronaphthalene, 4-chloro-3-methylphenol, aramite, hexachloro-1,3-butadiene, hexachlorobenzene, hexachlorocyclopentadiene, hexachloroethane, and pentachloronitrobenzene) are identified as ecological COPCs because maximum non-detected concentrations exceed groundwater screening values. An additional seventeen non-detected SVOCs are identified as ecological COPCs based on the lack of screening values. It is noted that all groundwater analytical data for 4-nitrophenol were rejected during data validation activities (six data points). Based on the lack of any usable data with which to evaluate potential risks, this SVOC is also identified as an ecological COPC for groundwater.

Six PAHs were detected in groundwater (1-methylnaphthalene, 2-methylnaphthalene, fluorene, naphthalene, phenanthrene, and pyrene). Of these six detected PAHs, only 2-methylnaphthalene is identified as an ecological COPC because the maximum detected concentration exceeds the groundwater screening value (HQ = 2.67). Two non-detected PAHs (benzo[a]anthracene and benzo[a]pyrene) are also identified as ecological COPCs because maximum non-detected concentrations exceed groundwater screening values.

No organophosphorous pesticides were detected in groundwater. However, six non-detected organophosphorous pesticides (dimethoate, famphur, ethyl parathion, methyl parathion, phorate, and sulfotep) are identified as ecological COPCs because maximum non-detected concentrations exceed groundwater screening values. One additional non-detected organophosphorous pesticide (o,o,o-triethyl phosphorothioate) is identified as an ecological COPC based on the lack of a screening value.

Fourteen metals were detected in the total recoverable fraction of Tank 214 Area groundwater. Of these fourteen metals, cadmium, chromium, cobalt, copper, lead, nickel, vanadium, and zinc are identified as ecological COPCs because maximum detected concentrations exceed groundwater screening values. HQ values range from 1.11 for chromium to 136.73 for copper (see Table 7-3). HQ values for the remaining detected metals are less than 1.0.

In summary, benzene, ethylbenzene, 2,4-dichlorophenol, 2-methylnaphthalene cadmium, chromium, cobalt, copper, lead, nickel, vanadium, and zinc were detected and identified as ecological COPCs for Tank 214 Area groundwater because maximum detected concentrations exceed groundwater screening values. Methyl acrylonitrile and phenacetin were also detected and identified as ecological COPCs based on the lack of groundwater screening values. Although not detected, one VOC

(acrolein), eight non-detected SVOCs (2-chloronaphthalene, 4-chloro-3-methylphenol, hexachloro-1,3-butadiene, hexachlorobenzene, hexachlorocyclopentadiene, hexachloroethane, and pentachloronitrobenzene, and aramite), two non-detected PAHs (benzo[a]anthracene and benzo(a)pyrene), and six non-detected organophosphorous pesticides (dimethoate, famphur, ethyl parathion, methyl parathion, phorate, and sulfotep), were identified as ecological COPCs because maximum non-detected concentrations exceed screening values. An additional three non-detected VOCs, seventeen non-detected SVOCs, and one non-detected organophosphorous pesticide were identified as ecological COPCs based on the lack of groundwater screening values. Finally, 4-nitrophenol was identified as an ecological COPC for groundwater based on the lack of any usable data with which to evaluate potential risks (all groundwater data for this SVOC was rejected during data validation activities).

7.2.4 Screening Level Risk Calculation for Estuarine Wetland Surface Water

Table 7-4 presents the results of the screening level risk calculation for estuarine wetland surface water. One VOC (methylene chloride) was detected in surface water. However, this VOC is not identified as an ecological COPC because the maximum detected concentration is less than the surface water screening value (HQ < 1.0). Although not detected, ethylbenzene is identified as an ecological COPC because the maximum non-detected concentration exceeds the surface water screening value. One additional non-detected VOC (chloroethane) is identified as an ecological COPC based on the lack of a surface water screening value.

No SVOCs were detected in estuarine wetland surface water. However, twenty non-detected SVOCs are identified as ecological COPCs because maximum non-detected concentrations exceed surface water screening values. One additional non-detected SVOC (2,2-oxybis[1-chloropropane]) is also identified as an ecological COPC based on the lack of a screening value.

No PAHs were detected in surface water. However, thirteen PAHs are identified as ecological COPCs because maximum non-detected concentrations exceed surface water screening values.

Fifteen metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, selenium, tin, vanadium, and zinc) were detected within the total recoverable fraction of estuarine wetland surface water. Of these fifteen metals, arsenic, cadmium, chromium, cobalt, copper, lead, nickel, vanadium, and zinc are identified as ecological COPCs because maximum detected concentrations exceed surface water screening values. Maximum HQ values range from 2.35 for thallium to 831 for copper (see Table 7-4). HQ values for the remaining detected metals are less than 1.0. Although not detected, silver and thallium are identified as ecological COPCs because maximum non-detected concentrations exceed surface water screening value.

In summary, arsenic, cadmium, chromium, cobalt, copper, lead, nickel, vanadium, and zinc were detected and identified as ecological COPCs for estuarine wetland surface water because maximum detected concentrations exceeded screening values. One non-detected VOC (ethylbenzene), twenty non-detected SVOCs, and two non-detected metals (silver and thallium) were identified as ecological COPCs because maximum non-detected concentrations exceed surface water screening values. In addition, one non-detected VOC (chloroethane) and one non-detected SVOC (2,2-oxybis[1-chloropropane]) were identified as ecological COPCs based on the lack of surface water screening values.

7.2.5 Screening Level Risk Calculation for Estuarine Wetland Sediment

Table 7-5 presents the results of the screening level risk calculation for estuarine wetland sediment. Seven VOCs were detected in sediment (2-butanone, 2-hexanone, acetone, carbon disulfide, chloromethane, ethylbenzene, and methylene chloride). Of these seven VOCs, acetone and carbon disulfide are identified as an ecological COPCs because maximum detection concentrations exceed sediment screening values (HQs = 23.64 and 43.31, respectively). Twenty-two non-detected VOCs (Table 7-5) are identified as ecological COPCs because maximum non-detected concentrations exceed sediment screening values. An additional three non-detected VOCs (1,4-dichloro-2-butene, 2-chloro-1,3-butadiene, and methyl acrylonitrile) are identified as ecological COPCs based on the lack of sediment screening values.

Four SVOCs (1,4-naphthoquinone, aniline, phenol, and pyridine) were detected in estuarine wetland sediment. Of these four VOCs, 1,4-naphthoquinone is identified as an ecological COPC based on the lack of a sediment screening value. Although not detected, sixty SVOCs are identified as ecological COPCs because maximum non-detected concentrations exceed sediment screening values (see Table 7-5). An additional fifteen non-detected SVOCs are identified as ecological COPCs based on the lack of sediment screening values. It is noted that all sediment analytical data for 4-nitroquinoline-1-oxide were rejected during data validations activities (twenty-eight data points). Based on the lack of any usable data with which to evaluate potential risks, this SVOC is also identified as ecological COPC for sediment.

Seventeen PAHs were detected in estuarine wetland sediment. Of these, acenaphthylene, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene are identified as ecological COPCs because maximum detected concentrations exceed sediment screening values. HQ values range from 1.40 (acenaphthylene) to 14.64 (benzo[a]pyrene). One non-detected PAH (acenaphthene) is also identified as an ecological COPC because the maximum non-detected concentration exceeds the sediment screening value (HQ = 536.51).

No organophosphorous pesticides were detected in estuarine wetland sediment. However, dimethoate, disulfoton, famphur, ethyl parathion, methyl parathion, phorate, sulfotep, and thionazin are identified as ecological COPCs because maximum non-detected concentrations exceed screening values. One additional organophosphorous pesticide (o,o,o-triethyl phosphorothioate) is identified as an ecological COPC due to the lack of screening criteria.

Fifteen metals were detected in estuarine wetland sediment. Of these fifteen metals, barium, cadmium, chromium, cobalt, copper, lead, selenium, tin, and vanadium are identified as ecological COPCs because maximum detected concentrations exceed sediment screening values. Maximum HQs range from 1.13 for barium to 14.24 for lead. Beryllium and thallium are also detected and identified as ecological COPCs based on the lack of sediment screening values. Although not detected, antimony and silver are identified as ecological COPCs because maximum non-detected concentrations for these two metals exceed sediment screening values (HQs = 2.95 and 3.96, respectively).

In summary, acetone, acenaphthylene, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, phenanthrene, pyrene, barium, cadmium, chromium, cobalt, copper, lead, selenium, tin, and vanadium were detected and identified as ecological COPCs for estuarine wetland sediment because maximum detected concentrations exceed sediment screening values. 1,4-Naphthoquinone, beryllium, and thallium were also detected and identified as ecological COPCs based on the lack of sediment screening values. Although not

detected, twenty-two VOCs, sixty SVOCs, one PAH (acenaphthene), eight organophosphorous pesticides, and two metals (antimony and silver) were identified as ecological COPCs because maximum non-detected concentrations exceed sediment screening values. Three non-detected VOCs, fifteen non-detected SVOCs, and one non-detected organophosphorous pesticide were identified as ecological COPCs based on the lack of sediment screening values. Finally, 4-nitroquinoline-1-oxide was identified as an ecological COPC for Tank 214 Area sediment based on the lack of any usable data with which to evaluate potential risks (all sediment analytical data for 4-nitroquinoline-1-oxide were rejected during data validation activities).

7.2.6 Screening Level Risk Calculation for Avian and Mammalian Dietary Exposures

Results of the screening level risk calculation for avian and mammalian dietary exposures to chemicals in Tank 214 Area surface and subsurface soil are presented in Tables 7-6 and 7-7, respectively, while Table 7-8 presents the results of the screening level risk calculation for avian dietary exposures to chemicals in estuarine wetland sediment. A discussion of these results is presented in the subsections that follow.

7.2.6.1 Avian and Mammalian Dietary Exposures: Surface Soil

Results of the screening level risk calculation for avian dietary exposures to chemicals in Tank 214 area surface soil are presented in Table 7-6. Di-n-butyl phthalate, pyrene, cadmium, chromium, copper, lead, mercury, nickel, selenium, thallium, vanadium, and zinc were detected and are identified as ecological COPCs because maximum dietary exposure doses for one or more of the avian receptors exceed NOAEL-based TRVs. The highest HQ values were calculated for the American robin, including an HQ of 34.42 for vanadium, 21.69 for lead, 12.46 for mercury, and 10.96 for chromium. Four detected VOCs (chloroform, ethylbenzene, pentachloroethane, and styrene) and one detected metal (beryllium) are also identified as ecological COPCs based on the lack of avian TRVs. Eight non-detected SVOCs (7,12-dimethylbenz[a]anthracene, bis[2-ethylhexyl]phthalate, di-n-octyl phthalate, dinoseb, hexachlorobenzene, hexachlorobutadiene, pentachloronitrobenzene, and pentachlorophenol) and four non-detected organophosphorous pesticides (disulfoton, ethyl parathion, methyl parathion, and phorate) are identified as ecological COPCs because maximum dietary exposure doses for one or more of the avian receptors, calculated using maximum non-detected concentrations, exceed NOAEL-based TRVs. In addition, five non-detected VOCs, (1,1,1,2-tetrachloroethene, carbon tetrachloride, chlorobenzene, toluene, and trichloroethane), thirty-one non-detected SVOCs, and one non-detected organophosphorous pesticide (sulfotep) are identified as ecological COPCs based on the lack of avian TRVs.

Results of the screening level risk calculation for brown flower bat dietary exposures to chemicals in surface soil also are included within Table 7-6. Pyrene was detected and is identified as an ecological COPC because the maximum brown flower bat dietary exposure dose for this PAH exceeds the NOAEL-based TRV (HQ = 3.44). Pentachloroethane was detected and is also identified as an ecological COPC based on the lack of a mammalian TRV. Although not detected, three SVOCs (1,2,4,5-tetrachlorobenzene, hexachlorophene and penetachlorophenol) and one organophosphorous pesticide (methyl parathion) are identified as ecological COPCs because maximum dietary exposure doses, calculated using maximum non-detected concentrations, exceed NOAEL-based TRVs. In addition, seventeen non-detected SVOCs, and four non-detected organophosphorous pesticides (disulfoton, ethyl parathion, phorate, and sulfotep) are identified as ecological COPCs based on the lack of mammalian TRVs.

7.2.6.2 Avian and Mammalian Dietary Exposures: Subsurface Soil

Results of the screening level risk calculation for avian dietary exposures to chemicals in Tank 214 Area subsurface soil are presented in Table 7-7. Cadmium, chromium, copper, lead, mercury, nickel, thallium, vanadium, and zinc were detected and are identified as ecological COPCs because maximum dietary exposures doses for one or more of the avian receptors exceed NOAEL-based TRVs. The highest HQ values were calculated for the American robin, including an HQ of 26.68 for vanadium, 17.29 for lead, and 9.40 for mercury. Beryllium was also detected and is identified as an ecological COPC based on the lack of an avian TRV. Although not detected, three SVOCs (bis[2-ethylhexyl]phthalate, di-n-butyl phthalate, and hexachlorobenzene), four organophosphorous pesticides (disulfoton, ethyl parathion, methyl parathion, and phorate) and one metal (selenium) are identified as ecological COPCs because maximum dietary exposure doses, calculated using maximum non-detected concentrations, exceed NOAEL-based TRVs for the American robin, mourning dove, and/or red-tailed hawk. In addition, nine non-detected VOCs, twenty-seven non-detected SVOCs, and one non-detected organophosphorous pesticides (sulfotep) are identified as ecological COPCs based on the lack of avian TRVs.

Results of the screening level risk calculation for brown flower bat dietary exposures to chemicals in subsurface soil also are included within Table 7-7. Although not detected, methyl parathion and selenium are identified as ecological COPCs because maximum brown flower bat exposure doses, calculated using maximum non-detected concentrations, exceeds NOAEL-based TRVs. In addition, one non-detected VOC (pentachloroethane), sixteen non-detected SVOCs, and four non-detected organophosphorous pesticides (disulfoton, ethyl parathion, phorate, and sulfotep) are identified as ecological COPCs based on the lack of mammalian TRVs.

7.2.6.3 Avian Dietary Exposures: Estuarine Wetland Sediment

Results of the screening level risk calculation for avian dietary exposures to chemicals in estuarine wetland sediment are presented in Table 7-8. Benzo(b)fluoranthene, benzo(k)fluoranthene, pyrene, chromium, copper, lead, mercury, selenium, thallium, vanadium, and zinc where detected and are identified as ecological COPCs because maximum dietary exposure doses for the spotted sandpiper and/or green heron exceed NOAEL-based TRVs. The highest HQ values were calculated for the spotted sandpiper, including an HQ of 280.75 for vanadium, 82.82 for copper, and 42.27 for lead. Ethylbenzene and beryllium were also detected and are identified as ecological COPCs based on the lack of avian TRVs. Although not detected, four SVOCs (bis[2-ethylhexyl]phthalate, di-n-butyl phthalate, dinoseb, and hexachlorobenzene) and four organophosphorous pesticides (disulfoton, ethyl parathion, methyl parathion, and phorate) are identified as ecological COPCs for avian dietary exposures because maximum exposure doses, calculated using maximum non-detected concentrations, exceed NOAEL-based TRVs for one or both receptors. An additional eight non-detected VOCs, thirty non-detected SVOCs, and one non-detected organophosphorous pesticide (sulfotep) are identified as ecological COPCs based on the lack of avian TRVs.

8.0 UNCERTAINTIES ASSOCIATED WITH THE SERA

The procedures used in this evaluation to assess risks to ecological receptors, as in all such assessments, are subject to uncertainties because of the limitations of the available data and the need to make certain assumptions and extrapolations based on incomplete information. Reliance on results from a risk assessment can be misleading without a consideration of the uncertainties, limitations, and assumptions inherent in the process. The major uncertainties associated with the SERA for the Tank 214 Area are identified and discussed below.

8.1 Analytical Data

- Analytical data for many chemicals were qualified as estimated, "J" because the results fall between the method detection limit (MDL) and method reporting limit (MRL)/Limit of Detection (LOD). Although concentrations that fall between the MDL and MRL/LOD are considered detected and evaluated as such in the SERA, the confidence in the quantified values is low.

- A second source of uncertainty related to the analytical data applies to chemicals with no usable analytical data with which to evaluate potential risk. In subsurface soil and estuarine wetland sediment, all analytical data for 4-nitroquinoline-1-1oxide were rejected. In groundwater, all analytical data for 4-nitrophenol were rejected. Without any usable data, an evaluation of potential risks in Step 2 of the ERA could not be performed. As such, the chemicals identified above were identified as ecological COPCs in Step 2 of the ERA. This may have resulted in an overstatement of the actual number of ecological COPCs if chemicals without usable analytical data are not present in affected media.

8.2 Identification of Ecological COPCs

- Chemicals without available screening values were identified as ecological COPCs even if they were not detected. Non-detected chemicals with maximum concentrations greater than screening values and/or maximum dietary exposure doses greater than NOAEL-based TRVs were also identified as ecological COPCs in the SERA. This approach likely overstates the number of actual COPCs.

- A second source of uncertainty related to the selection of ecological COPCs applies to the use of NOAEL-based TRVs in risk calculations for upper trophic level receptors. The use of NOAEL-based TRVs is extremely conservative since they give no indication as to how much higher a dose must be before adverse effects are observed. This uncertainty does not apply to NOAEL-based avian TRVs obtained from Eco-SSL documents for 7,12-dimethylbenz(a)anthracene, pentachlorophenol, arsenic, cadmium, chromium, cobalt, copper, lead, nickel, selenium, silver, vanadium, and zinc or mammalian TRVs obtained from Eco-SSL documents for pentachlorophenol, HMW PAHs, LMW PAHs, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, nickel, selenium, silver, vanadium, and zinc since these values are based on a compilation of NOAEL and LOAEL values.

- Direct comparison of groundwater concentrations to surface water screening values is considered extremely conservative since dilution upon migration and discharge to surface water, as well as natural attenuation, defined as the reduction in the concentration of a chemical in groundwater over time or distance from the source due to naturally occurring physical, chemical, and biological processes, such as biodegredation, dispersion, dilution, adsorption, and volatilization (American Society for Testing and Materials [ASTM, 2003]),

was not considered. As such, the number of ecological COPCs for groundwater was likely overstated.

8.3 Exposure Point Concentrations

- The maximum measured concentration provides a conservative estimate for immobile biota or those with a limited home range. The most realistic exposure estimates for mobile species with relatively large home ranges and for species populations (even those that are immobile or have limited home ranges) are those based on arithmetic mean concentrations or 95 percent upper confidence limit (UCL) of the mean concentrations in each medium to which these receptors are exposed. This is reflected in the wildlife dietary exposure models contained in the Wildlife Exposure Factors Handbook (USEPA, 1993b), which specify the use of average media concentrations. Given the mobility of the upper trophic level receptor species used in the SERA, the use of maximum chemical concentrations to estimate dietary exposures via food webs is very conservative. For a given medium, this uncertainty was reduced in Step 3a of the BERA by deriving exposure estimates based on 95 percent UCL of the mean concentrations for those ecological COPCs with data sets that have a minimum of eight data points and four detected values (see Section 10.0).

8.4 Media-Specific Screening Values

- Media-specific toxicological thresholds were not available for many of the chemicals evaluated in the SERA. Furthermore, many of the soil screening values used in the comparison to soil analytical data are based on background concentrations or detection limits (e.g., CCME interim Canadian environmental quality assessment criteria (see Section 5.1). Because screening values based on background concentrations or detection limits do not represent effect concentrations, their use in the SERA likely resulted in an overstatement of the actual number of ecological COPCs.

- When a toxicological threshold was available for both terrestrial plants and invertebrates, the minimum value was selected as the screening value. For several chemicals, only a plant or earthworm toxicological threshold was available from the literature. It was assumed in the SERA that the screening values selected for these chemicals are protective of both receptor communities. If a given chemical does not have an available screening value for both terrestrial plants and invertebrates, this approach will result in an underestimation of potential risk if the screening value is not based on the most sensitive receptor community.

- A third source of uncertainty related to media-specific screening values applies to surface water. PRWQS or USEPA NRWQC expressed as total recoverable concentrations were used as surface water screening values for arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, and zinc. Because the filtered fraction more closely approximates the bioavailable fraction of these metals in the water column (USEPA, 1999b and 2002), use of screening values expressed in terms of the total recoverable concentration in the water column likely resulted in an overstatement of the actual number of ecological COPCs. The uncertainty associated with the comparison of total recoverable metal concentrations to PRWQS or NRWQC expressed as total recoverable concentrations was addressed in Step 3a of the BERA by comparing dissolved metals concentrations to screening values expressed as dissolved concentrations. It is further noted that this uncertainty does not apply to filter feeding organisms, which may receive exposure from total metals in surface water.

- A fourth source of uncertainty related to media-specific screening values applies to sediment screening values. The bulk sediment toxicological thresholds used as screening values in the SERA (i.e., AET and TEL values), do not take into consideration site-specific conditions that can influence chemical bioavailability and toxicity. These conditions include TOC and AVS, which can influence the bioavailability of organic chemicals and metals (i.e., cadmium, copper, lead, nickel, silver, and zinc), respectively. As exposure does not necessarily equate to risk, bulk sediment screening values may overstate risks to benthic macroinvertebrates.

- A fifth source of uncertainty related to media-specific screening values also applies to sediment. Measurement endpoints for aquatic plants, invertebrates, and fish included a comparison of chemical concentrations in sediment with sediment screening values. However, as discussed in Section 5.1.3, the literature-based AET and TEL values selected as sediment screening values were developed from data specific to invertebrates. Therefore, they may not be protective of aquatic plants and fish.

8.5 Toxicity Reference Values

- Data on the toxicity of many chemicals to the receptor species were sparse or lacking, requiring the extrapolation of data from other wildlife species or from laboratory studies with non-wildlife species. This is a typical limitation for ERAs because so few wildlife species have been tested directly for most chemicals. The uncertainties associated with toxicity extrapolation were minimized through the selection of the most appropriate test species for which suitable toxicity data were available. The factors that were considered in selecting a test species to represent a receptor species included taxonomic relatedness, trophic level, foraging method, and similarity of diet. Regardless, the use of NOAEL and LOAEL values derived from laboratory studies with non-wildlife species may have resulted in an overstatement or understatement of potential risks if the sensitivities of the receptor and test species differ appreciably.

- A second source of uncertainty related to the derivation of TRVs applies to metals. Most of the toxicological studies on which the avian and mammalian TRVs for metals are based on used forms of the metal (such as salts [see Tables 5-4 and 5-5]) that have high water solubility and high bioavailability to receptors. Since the analytical samples on which site-specific exposure estimates were based measured total metal concentrations, regardless of form, and these highly bioavailable forms are expected to compose only a fraction of the total metal concentration, this is likely to result in an overestimation of potential risks.

- A third source of uncertainty related to the derivation of TRVs applies to mercury. The NOAEL-based mercury TRVs used in the Step 2 screening-level risk calculation for birds and mammals (0.026 mg/kg-BW/day and 0.032 mg/kg-BW/day, respectively) are based on organometallic (methylated) forms (methyl mercury dicyandiamide for birds and methyl mercury chloride for mammals). Avian and mammalian TRVs for inorganic forms of mercury are at least an order of magnitude higher (NOAEL-based avian TRV of 0.45 mg/kg-BW/day and NOAEL-based mammalian TRV of 1.0 mg/kg-BW/day for mercuric chloride [Sample et al., 1996]). The USEPA (2001b) reports that between 0.5 to 5.3 percent of the total mercury in soil and between 0.1 and 1.0 percent of the total mercury in sediment is present as methylmercury. These data indicate that methylmercury represents a fraction of the total mercury in soil and sediment. As such, the use of TRVs based on methylated forms, which assume that 100 percent of the detected mercury is present as methyl mercury, likely resulted in an overestimation of potential risks to avian and mammalian receptors.

8.6 Ecological Receptors

- Although exposure pathways to terrestrial reptiles and amphibians are likely to be complete, assessment endpoints were not selected for these receptor groups. As discussed in the SERA, there is a paucity of data concerning the toxicological effects of chemicals for reptiles and amphibians, rendering a quantitative evaluation problematic (USEPA, 2000a and 2005a). Therefore, for a given ecological COPC, a conclusion of acceptable or unacceptable risk to the other terrestrial receptor species evaluated in the ERA was also applied to terrestrial reptiles and amphibians. It was assumed that terrestrial reptiles and amphibians at the Tank 214 Area are not exposed to significantly higher concentrations of ecological COPCs and are not more sensitive to ecological COPCs than the avian and mammalian receptors evaluated by the ERA. If terrestrial reptiles and amphibians are exposed to significantly higher concentrations of ecological COPCs and/or are more sensitive to ecological COPCs than the avian and mammalian receptors, this approach resulted in an underestimation of potential risks. However, reptiles and amphibians are poikilotherms (body temperature varies with environmental temperature), while birds and mammals are homeotherms (temperature is regulated, constant, and largely independent of environmental temperatures). Therefore, reptiles and amphibians tend to have much lower metabolic rates and lower caloric intake requirements than birds and mammals. As a consequence, birds and mammals are likely to consume more food than reptiles and amphibians on a daily dietary intake basis, assuming similar caloric content of the food items. Therefore, potential risks to terrestrial reptiles and amphibians are likely overstated when risk estimates for avian and mammalian receptors are applied to herpetofauna.

8.7 Exposure Routes

- Although inhalation and/or dermal adsorption represent potential exposure routes for upper trophic level receptors, they were not evaluated in the SERA because they were considered insignificant relative to ingestion exposures (see Section 4.1.3). While this is a reasonable assumption for the terrestrial birds and mammals selected as ecological receptors, the exclusion of inhalation and dermal adsorption represents a source of uncertainty that may have resulted in an underestimation of potential risks.

8.8 Dietary Exposure Modeling

- Chemical concentrations in avian food items (terrestrial plants, terrestrial and aquatic invertebrates, fish, and small mammal omnivores) and mammalian food items (plants) were modeled from measured media concentrations and were not directly measured. The use of generic, literature-derived uptake equations and BAFs introduces some uncertainty into the risk estimates and may have resulted in an overstatement or understatement of potential risks. The values selected and the methodologies employed were intended to provide a reasonable estimate of potential food web exposure concentrations.

- A second source of uncertainty related to the dietary exposure models is the use of default assumptions for exposure parameters such as BAFs. Although chemical-specific uptake equations and BAFs for many chemicals were readily available from the literature and were used in the ERA, the use of a default factor of 1.0 to estimate the concentration of some chemicals in receptor food items is a source of uncertainty. The assumption that the chemical body burden in the prey item is at the same concentration as in soil is conservative for chemicals that are not known not to accumulate to any significant degree. However, if a

chemical does accumulate in receptor prey items, the use of a default factor of 1.0 may have resulted in an underestimation of potential risks to the upper trophic level receptors evaluated by this ERA.

- A third source of uncertainty related to dietary exposure modeling applies to the assumed diet of the red-tailed hawk. In the SERA, it was assumed that the diet of the red-tailed hawk consisted solely of rodents (i.e., Norway rat). However, red-tailed hawks are opportunistic feeders and prey will vary with regional and seasonal availability. In Puerto Rico's El Yunque rainforest, the following food items were delivered to nestlings: rats (black rat and Norway rat), birds (such as the zenaida dove), lizards (*Anolis* spp.), snakes (such as the Puerto Rican racer [*Alsophis portoricensis*]), and coquis (*Eleutherodactylus* spp.) (Global Raptor Information Network, 2010). Santana and Temple (1988) reported the diet of red-tailed hawks in mountain rain and cloud forests of Puerto Rico consisted primarily of birds, reptiles, and amphibians captured from the tree canopy, while the diet of lowland hawks was comprised mostly of mammals. The diet of lowland hawks reported by Santana and Temple (1988) support the diet assumption used in the SERA. However, if red-tailed hawks at NAPR consume a mixed diet of rats, birds, and reptiles, and bioaccumulation of chemicals in birds and reptiles differ from their bioaccumulation in rats, an assumed diet of 100 percent rats may have resulted in an overestimation or underestimation of potential risks.

- A fourth source of uncertainty related to the food web models is the use of unrealistically conservative exposure parameters. The use of maximum food ingestion rates and minimum body weights resulted in a conservative estimate of exposure. In addition, AUFs were assumed to equal one. This is a conservative assumption since a significant percentage of each upper trophic level receptor species' time could be spent foraging off-site in areas not impacted by site-related chemicals or areas where chemical concentrations are expected to be significantly lower. The uncertainty associated with the use of maximum food ingestion rates and minimum body weights in Step 2 of the SERA was reduced in Step 3a of the BERA by using values based on central tendency estimates (see Section 10.0).

- As discussed in Section 5.2, not all chemicals analyzed for in surface soil, subsurface soil, and sediment were evaluated for avian and mammalian dietary exposures. The organic chemicals evaluated for dietary exposures were limited to those listed in Table 4-2 with the potential to bioaccumulate to a significant extent. Bioaccumulative organic chemicals are defined as those with a maximum reported Log K_{ow} value greater than 3.0. Rational for using a Log K_{ow} of 3.0 to define an organic chemical with the potential to bioaccumulate is included within Appendix C. The exclusion of non-bioaccumulative chemicals from dietary exposure modeling represents an uncertainty since ecological receptors may be exposed to non-bioaccumulative chemicals in soil and sediment through incidental ingestion.

  The diet of the American robin and mourning dove includes soil, while the diet of the spotted sandpiper includes sediment (see Table 6-9). Five non-bioaccumulative VOCs (2-butanone, 2-hexanone, acetone, carbon disulfide, and methylene chloride) were detected in Tank 214 Area surface and/or subsurface soil. Six non-bioaccumulative VOCs (2-butanone, 2-hexanone, acetone, carbon disulfide, chloromethane, and methylene chloride) and four non-bioaccumulative SVOCs (1,4-naphthoquinone, aniline, phenol, and pyridine) were also detected in Tank 214 Area sediment. The frequency and range of detected concentrations are provided in Tables 7-1 (surface soil), 7-2 (subsurface soil), and 7-5 (sediment). Avian TRVs for the detected organics are not available from the literature or agency compilations. As such, a comparison of dietary doses from incidental soil and sediment ingestion to avian TRVs could not be conducted. However, given the low magnitude and/or frequency of

detection, it is unlikely that the non-bioaccumulative chemicals excluded from dietary exposure modeling based on Log K_{ow} values would impact avian or mammalian receptor populations at the Tank 214 Area.

8.9 Chemical Mixtures

- The cumulative impacts of ecological COPCs in a given medium cannot be directly addressed by SERAs since they are specifically designed to compare individual chemical concentrations to individual chemical threshold values established by regulatory agencies or the scientific literature. Approaches exist to conservatively sum Step 2 risk estimates (i.e., hazard index [HI] values); however, they can vastly overestimate the potential for risk and have been identified as "*a conservative estimator of risk that may have little ecological relevance*" (Dyer et al., 2000).

  Although cumulative effects may be indirectly examined via detailed literature reviews and toxicity testing of site media, this level of investigation is reserved for a BERA (i.e., Steps 3b through 7 of the Navy ERA process; see Figure 1-2), which has a goal of collecting and interpreting site-specific information. It is important to note that Norwood et al. (2003) performed a review of the impacts of mixtures of inorganic constituents on aquatic biota and found that additive, synergistic, and antagonistic responses were found with equal frequency. This finding indicates that generalizations cannot be made in Step 2.

9.0 SERA DECISION POINT AND RECOMMENDATIONS

The results of the SERA for the Tank 214 Area indicated that, based on a set of conservative exposure assumptions, there are one or more chemicals in surface soil, subsurface soil, groundwater, surface water, and sediment that may present risks to one or more of the receptors species/receptor groups evaluated (see Section 7.2 and Tables 7-1 through 7-8). Under Navy policy, if the results of the Steps 1 and 2 (Tier 1 SERA) indicate that there are chemicals present in environmental media that may present risks to receptor species/receptor groups, the ERA process proceeds to the BERA (i.e., Step 3a). Therefore, further evaluation of each medium in Step 3a of the BERA is warranted (see Section 10.0).

10.0 STEP 3A OF THE BERA

The results of the screening level risk calculation indicated that, based on a set of conservative assumptions, there are one or more chemicals in each medium evaluated that may present risks to ecological receptor groups and/or specific receptor species. As such, the ERA process at the Tank 214 Area proceeded to the BERA. According to Superfund guidance (USEPA, 1997), Step 3 initiates the problem formulation phase of the BERA. Under Navy guidance (CNO, 1999), the BERA is defined as Tier 2, and the first activity under Tier 2 is Step 3a (see Figure 1-2). In Step 3a, the conservative assumptions employed in the SERA (Tier 1) are refined and risk estimates are recalculated using the same conceptual model. Step 3a may also include consideration of background data and chemical bioavailability.

The specific assumptions, parameters, and methods that were modified for the recalculation of media-specific and dietary HQ values are identified below, along with justification for each modification. These refinements and methods were used in Step 3a of the BERA to weigh the evidence of potential risk for each ecological COPC identified for each medium and receptor to determine whether the ecological COPCs warrant identification as ecological COCs.

- Chemicals that were not identified as ecological COPCs because maximum detected concentrations or maximum non-detected concentrations are less then media-specific screening values were not evaluated in Step 3a of the BERA since a conclusion of no unacceptable risk can be made with high confidence. Detected and non-detected chemicals with maximum dietary intakes less than NOAEL-based TRVs were also excluded from further evaluation in Step 3a of the BERA.

- Non-detected chemicals lacking media-specific screening values or, in the case of food web exposures, TRVs were excluded from further evaluation in Step 3a of the BERA. It is not possible to quantitatively address the potential for risk from chemicals that are not detected and that do not have established screening values with which to compare them. Even considerations of the most conservative measurement (the maximum reporting limit) are not informative when no threshold value has been established. Because of these limitations, the approach follows that outlined in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 Code of Federal Regulations [CFR] 300, Appendix A), which does not establish a release when the sample measurement is less than the contract required detection limit as determined by a USEPA certified laboratory. As all samples were analyzed by a certified laboratory, and were validated by an independent third party, the exclusion of non-detected chemicals is considered reasonable and appropriate. Although eliminated from further evaluation, they remain ecological COPCs, but are not considered ecological COCs. It is additionally noted that any site-specific studies, which may be conducted during a BERA, would indirectly evaluate the impacts of non-detected chemicals.

- Risk estimates for ecological COPCs identified in the Step 2 screening level risk calculation were refined in Step 3a of the BERA using 95 percent UCL of the mean chemical concentrations rather than maximum concentrations (Parker et al., 2003). 95 percent UCL of the mean concentrations were calculated using USEPA ProUCL Version 5.0.00 software [USEPA, 2013b and 2013c]). For individual upper trophic-level receptor species, 95 percent UCL of the mean concentrations provide a better estimate of the likely level of chemical exposure because each receptor would be expected to forage in several different areas of the site, and, in many cases, off-site. 95 percent UCL of the mean concentrations are also appropriate for evaluating impacts *to populations* of lower trophic level receptors (e.g., terrestrial and aquatic invertebrates). Because some of these receptors are relatively immobile,

individuals are likely to be impacted by locations of maximum concentrations. However, an evaluation of exposure based on 95 percent UCL of the mean concentrations is more indicative of the level of impact that might be expected at the *population* level. The magnitude of detections above soil screening values was considered when evaluating refined risk estimates based on 95 percent UCL of the mean concentrations (Parker et al., 2003). This consideration ensures that potential effects of "hot spots" are not diluted by calculating 95 percent UCL of the mean concentrations.

It is noted that refined risk estimates using 95 percent UCL of the mean concentrations were derived only for those ecological COPCs with data sets that have a minimum of eight data points and four detected values (USEPA 2013c). Computational outputs from the ProUCL calculations for those ecological COCs that meet this requirement are provided within Appendix D for each medium.

- The diets of the American robin and Norway rat (food item for the red-tailed hawk) were adjusted to reflect their omnivorous feeding behavior. Wheelwright (1986), as cited in USEPA (1993b), reported seasonal dietary compositions for American robins in the western United States. Martin et al. (1951) also reported seasonal dietary compositions for the American robin throughout North America. The highest percentage of invertebrates in the diet of the American robin was reported during the spring: 83.0 percent by Wheelwright (1986) and 78.9 percent by Martin et al. 1951. For conservatism, the contribution that earthworms have to the total diet of the American robin in the BERA was assumed to be 83 percent (highest seasonal contribution reported by Wheelwright (1986) and Martin et al. (1951). Using the relationship presented in Sample and Sutter II (1994), a diet of 83.0 percent earthworms extrapolates to a soil contribution of 8.7 percent to the total diet. The remainder of the diet was assumed to be plants (8.3 percent). The diet of the Norway rat was assumed to be 49.0 percent terrestrial invertebrates, 49.0 percent terrestrial plants, and 2.0 percent soil. The specific diets used in Step 3a of the BERA for each ecological receptor are summarized in Table 10-1.

- Central tendency estimates (e.g., mean, median, midpoint) for body weight and food ingestion rate (see Table 10-2) were used to develop exposure estimates for upper trophic level receptors rather than the minimum body weights and maximum food ingestion rates used in the SERA. The use of central tendency estimates is more relevant because they represent the characteristics of a greater proportion of the individuals in the population. The evaluation of food web exposures still assumed an AUF of 1.0.

- The chemical-specific uptake equations used in the SERA to estimate tissue concentrations in terrestrial plants and invertebrates were also used in Step 3a of the BERA. However, soil concentrations used in the estimation were 95 percent UCL of mean values (in place of maximum concentrations) for those ecological COPCs with data sets that meet the criteria specified within the third bullet item above (minimum of eight data points and four detected values). The uptake equations used for small mammals (general uptake equations for all small mammals developed by Sample et al. [1998b]) were replaced by uptake equations developed specifically for small mammal omnivores. Identical to uptake equations for terrestrial plants and invertebrates, 95 percent UCL of the mean concentrations were used to estimate small mammal tissue concentrations for those ecological COPCs with data sets having a minimum of eight data points and four detected values. When chemical-specific BAFs were used to estimate prey item tissue concentrations, BAFs based on central tendency estimates (e.g., 95 percent UCL of the mean, arithmetic mean, median) were used in place of maximum or high-end (e.g., 90th percentile) values. The chemical-specific uptake equations and BAFs that were used in Step 3a for those chemicals identified as ecological COPCs for American robin,

mourning dove, and/or brown flower bat dietary exposures are summarized in Tables 10-3 (plant and earthworm uptake equations/BAFs), while chemical-specific uptake equations and BAFs that were used in Step 3a for those chemicals identified as ecological COPCs for red-tailed hawk dietary exposures are summarized in Table 10-4 (small mammal omnivore uptake equations/BAFs.

It is noted that when BAFs based on central tendency estimates were used to estimate prey item tissue concentrations, 95 percent UCL of the mean BAF values were given preference. For a given COPC, 95 percent UCL of the mean BAF values were derived using USEPA ProUCL Version 5.0.00 software [USEPA, 2013b and 2013c; see Appendix D]) if the following conditions were met:

- The source document contained a database of individual BAF values that allowed for the derivation of a 95 percent UCL of the mean value.

- The database of BAF values within the source document contained a sufficient number of data points (ProUCL Version 5.0.00 [USEPA, 2013c] recommends a minimum of eight data points to derive reliable 95 percent UCL of the mean values).

- The 95 percent UCL of the mean concentration did not exceed the maximum BAF value within the database.

If these three conditions were not met, the arithmetic mean or median BAF value (as reported by the source document or derived from the source document's BAF database for data sets that did not meet the conditions specified by the second and third bullet item above) was used to estimate the prey item tissue concentration. As a measure of conservatism, the highest of the arithmetic mean and median value was used in the derivation.

Identical to terrestrial plants, terrestrial invertebrates, and small mammals, when chemical-specific BAFs were used to estimate tissue concentrations in aquatic invertebrates and fish, BAFs based on central tendency estimates (e.g., 95 percent UCL of the mean, arithmetic mean, median) were used in place of maximum or high-end (e.g., 90th percentile) values (see Table 10-5). For those ecological COPCs lacking chemical-specific sediment-to-invertebrate and/or sediment-to-fish BAF values, BAFs were estimated from 95 percent UCL of the mean, arithmetic mean, or median BSAF values derived from the data sets listed in Tables 6-4 (aquatic invertebrate BSAFs) and 6-6 (fish BSAFs). BSAF values were converted to BAFs (dry weight basis) for use in the food web models using the lipid content and percent solids content of aquatic invertebrates and fish (see Section 6.2.2.1) and a sediment organic carbon content of 0.034 percent (minimum f_{oc} measured in estuarine wetland sediment). The conditions listed above for terrestrial plants, earthworms, and small mammals were also applied to the selection of BAF/BSAF values for aquatic invertebrates and fish.

It is noted that a BAF of 1.0 was still used to estimate terrestrial and aquatic prey item tissue concentrations for those inorganic chemicals and bioaccumulative organic chemicals lacking BAF and BSAF values.

- For detected ecological COPCs in surface and subsurface soil that lack screening values (i.e., 2-butanone, 2-hexanone, acetone, carbon disulfide, and methylene chloride), the USEPA (2012a and 2012b) Ecological Structure Activity Relationships (ECOSAR) Class Program (MS-Windows Version 1.11; available at http://www.epa.gov/opptintr/newchems/tools/21ecosar.htm) was used to estimate their toxicity

based on structural similarities to chemicals for which toxicity data are available (i.e., structure activity relationships [SARs]).

- For inorganic ecological COPCs (i.e., metals) in surface soil, estuarine wetland surface water, and estuarine wetland sediment, consideration was given to available background data. This was accomplished by statistically comparing site-specific media concentrations to background concentrations in accordance with USEPA (2013c) and Navy guidance (NFESC, 2002 and 2003) using USEPA Version 5.0.00 software (USEPA, 2013b). Statistical comparisons included descriptive summaries of each data set (e.g., maximum, arithmetic mean, and 95 percent UCL of the mean concentrations), hypothesis testing on the mean/median of the distributions (i.e., two sample t-test, Welch-Satterthwaite t-test, Wilcoxon-Mann-Whitney test, and/or Gehan test), and right tail of the distributions (i.e., quantile test and slippage test). The significance level (i.e., the probability criteria for rejecting the null hypothesis that the Tank 214 Area and background data sets were sampled from the same population) was set at 0.05 for all statistical tests (NFESC, 2002 and 2003). The background data used in Step 3a of the BERA for statistical comparisons to Tank 214 Area surface soil, estuarine wetland surface water, and estuarine wetland sediment were the basewide background data sets presented in the Revised Final II Summary Report for Environmental Background Concentrations of Inorganic Compounds (Baker, 2010). Background Threshold Values (BTVs) are from the Technical Memorandum – Background Threshold Value Evaluation and Recommendations for Naval Activity Puerto Rico (CH2M HILL, 2013).

  Analytical data for the inorganic chemicals identified as ecological COPCs for subsurface soil and groundwater were also statistically compared to the basewide background data sets presented in the Revised Final II Summary Report for Environmental Background Concentrations of Inorganic Compounds (Baker, 2010). However, based on the limited size of the Tank 214 Area subsurface soil and groundwater data sets for inorganic analytes (n = 3 and n = 7, respectively), statistical evaluations were limited to a descriptive comparison (USEPA [2013c] recommends a minimum of eight data points from both the site and background population to use hypothesis testing). It is noted that the NAPR background document cited above includes three unique data sets for basewide background subsurface soil (i.e., data sets for soil classified as (1) clay; (2) fine sand/silt; and (3) weathered bedrock). Based on soil characteristics at the Tank 214 Area, the background subsurface soil data set used in the descriptive comparison was the data set for subsurface soil classified as “clay”.

  In addition to the statistical comparisons described above, graphical representations of the Tank 214 Area and background data sets (i.e., box plots and/or probability plots) were prepared. Box plots and probability plots can be useful for the identification of elevated data points. For example, in the case of probability plots, data points that are near a straight line and form a continuous distribution are likely to represent natural conditions, whereas data points that are not near the line or do not fit a continuous distribution (i.e., outliers) may represent contamination (NFESC, 2002, 2003, and 2004). It is noted that for data sets with non-detected values, box plots and probability plots were prepared without non-detected values (i.e., non-detected values were omitted from the data sets). For the purpose of the identification of elevated data points on the right side of the distribution, this is an acceptable approach (USEPA 2013c).

  Outlier tests (Dixon’s outlier test or Rosner’s outlier test) were also conducted on combined Tank 214 Area and background data sets using USEPA ProUCL Version 5.0.00 software Dixon’s outlier test was used for those combined data sets with less than twenty-five data points, while Rosner’s outlier test was used for those combined data sets with a minimum of

twenty-five data points (USEPA, 2013c). Because Dixon's outlier test cannot directly identify all outliers present in a data set, multiple outliers (if present) were identified one at a time iteratively after removing outliers identified in previous iterations. Identical to the graphical representations, outlier tests were conducted on the combined data sets without non-detected values.

Outlier tests were performed on combined Tank 214 Area and data sets to supplement the graphical representations of the data (i.e., box plots and probability plots). Specifically, the outlier tests were performed on combined data sets to determine if elevated Tank 214 Area data points suggested by the box and/or probability plots are statistically elevated relative to background concentrations and other detected concentrations at the SWMU. Site observations indicated to be elevated by graphical representations of the data and found to be statistically elevated by outlier tests relative to background concentrations and other detected concentrations at the SWMU likely represent contamination. No steps were taken if outliers were identified within the background and/or Tank 214 Area data sets. Specifically, data points identified as statistical outliers by Dixon's outlier test or Rosner's outlier test were not omitted from statistical tests evaluating the mean/median and right-tail of the background and Tank 214 Area data set distributions.

- As exposure does not necessarily equate to risk, consideration was given to site-specific factors that can affect the bioavailability of chemicals in groundwater, surface water, and sediment to aquatic receptor groups.

  Literature sources indicate that the filtered fraction of metals more closely approximates the bioavailable fraction in the water column (USEPA, 1999b and 2002). One reason is that a primary mechanism for water column toxicity is adsorption at the gill surface, which requires metals to be in the dissolved form. Therefore, a comparison of dissolved ecological COPC concentrations in estuarine wetland surface water to screening values expressed in terms of the dissolved metal in the water column is more appropriate.

  Arsenic, cadmium, chromium, cobalt, copper, lead, nickel, vanadium, and zinc were identified as ecological COPCs in Step 2 of the ERA for estuarine wetland surface water because maximum detected total recoverable concentrations exceed surface water screening values expressed as total recoverable concentrations. As evidenced by Table 5-2, total recoverable PRWQS for Class SB coastal and estuarine surface waters were used as surface water screening values for arsenic, cadmium, chromium, copper, lead, nickel, and zinc in the SERA. PRWQS expressed as dissolved concentrations are not available from the PRWQSR (PREQB, 2010). Therefore, the NRWQC listed below, expressed in terms of the dissolved metal in the water column, were used as dissolved screening values for these seven metals.

  - Arsenic: 36 µg/L
  - Cadmium: 8.8 µg/L
  - Chromium: 50 µg/L
  - Copper: 3.1 µg/L
  - Lead: 8.1 µg/L
  - Nickel: 8.2 µg/L
  - Zinc: 81 µg/L

  Screening values expressed as a dissolved concentration or total recoverable-to-dissolved conversion factors are not available for cobalt and vanadium. The total recoverable screening

values listed in Table 5-2 for these two metals were conservatively used to screen the dissolved analytical data.

For sediment, consideration was given to the concentration of AVS. AVS is a reactive pool of solid-phase sulfide that represents an important partitioning phase controlling the bioavailability and toxicity of cadmium, copper, lead, nickel, silver, and zinc to sediment-associated biota (Ankley et al, 1996 and Berry et al., 1999). Cadmium, copper, lead, nickel, silver, and zinc, collectively termed SEM, represent those metals that form a more stable complex with sulfide than does iron. The model states that if the SEM concentration is less than the concentration of AVS, toxicity will not be observed. That is, if the SEM-to-AVS ratio is less than 1.0 or the SEM-to-AVS difference is less than zero (i.e., negative value), sufficient AVS is available to bind all the SEM, and sediment-associated biota will not be exposed to toxic concentrations of these metals in the sediment pore water. For a given sample, the total SEM molar concentration was derived by summing individual SEM metal concentrations using the following formula:

$$[SEM]_{Total} = [SEM]_{Cd} + [SEM]_{Cu} + [SEM]_{Pb} + [SEM]_{Ni} + [SEM]_{Zn} + (0.5)[SEM]_{Ag}$$

One-half the molar concentration of silver was added into the SEM totals because this metal is largely in a monovalent state. If an individual SEM metal was not detected in a sediment sample, the total SEM molar concentration for that sample was derived using the non-detected result. If the AVS concentration for a given sediment sample was a non-detected result, the SEM-to-AVS ratio for that sample was derived using the non-detected AVS result. Rejected data were not included in the AVS/SEM calculations.

For organic chemicals, TOC represents the primary sediment characteristic affecting bioavailability (USEPA 1993a, Di Toro and McGrath, 2000, and Fuchsman, 2003). As discussed in Section 8.4, the bulk sediment toxicological thresholds used as screening values in Step 2 of the SERA (i.e., AET and TEL values) do not take into consideration the effect that TOC has on the bioavailability of organic chemicals. This was addressed in Step 3a of the BERA by comparing ecological COPC concentrations to EqP-based screening values derived using USEPA (1993a and 1996) methodology or developed by Di Toro and McGrath (2000).

10.1 Refined Risk Evaluation

Detected chemicals with maximum concentrations and/or maximum exposure doses greater than screening values, as well as detected chemicals lacking screening values were identified as ecological COPCs in Step 2 of the SERA. Non-detected chemicals with maximum concentrations and/or maximum exposure doses greater than screening values, as well as non-detected chemicals lacking screening values also were identified as ecological COPCs in the Step 2 risk calculations. Only those detected and non-detected chemicals with maximum concentrations and/or maximum exposure doses greater than screening values, and those detected chemicals lacking screening values are addressed in Step 3a of the BERA. Although non-detected chemicals lacking screening values were eliminated from further evaluation, they remain ecological COPCs, but are not considered ecological COCs.

10.1.1 Refined Risk Evaluation for Surface Soil

Section 7.2.1 presented the results of the Step 2 screening level risk calculation for Tank 214 Area surface soil. Screening level risk estimates (i.e., HQ values) were also provided in Table 7-1. Arsenic, cobalt, copper, lead, selenium, thallium, vanadium, and zinc were identified as ecological COPCs in Step 2 of the SERA because maximum detected concentrations exceed soil screening values. Four

detected VOCs (2-butanone, 2-hexanone, acetone, and carbon disulfide) were also identified as ecological COPCs based on the lack of soil screening values. Six non-detected VOCs (1,1,2,2-tetrachloroethane, 1,1,2-trichloroethane, 1,2,3-trichloropropane, bromoform, chloroethane, and dibromomethane), fifteen non-detected SVOCs (1,2,4,5-tetraclorobenzene, 2,3,4,6-tetrachlorophenol, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 2,4-dichlorophenol, 2,4-dimethylphenol, 2,6-dichlorophenol, 3,4-methylphenool, 4,6-dinitro-2-methylphenol, 2-chlorophenol, 2-methylphenol, 4-nitrophenol, pentachlorobenzene, pentachlorophenol, and pronamide), and one non-detected organophosphorous pesticide (methyl parathion) were identified as ecological COPCs because maximum non-detected concentrations exceed soil screening values.

The refined risk calculation for surface soil is presented in Table 10-6. As discussed in Section 10.0, risk estimates for surface soil were re-calculated using 95 percent UCL of the mean concentrations for those ecological COPCs with data sets that have a minimum of eight data points and four detected values (acetone, arsenic, cobalt, copper, lead, selenium, thallium, vanadium, and zinc). The refined risk evaluation for Tank 214 Area surface soil is presented and discussed within the paragraphs that follow.

As discussed above, six non-detected VOCs (1,1,2,2-tetrachloroethane, 1,1,2-trichloroethane, 1,2,3-trichloropropane, bromoform, chloroethane, and dibromomethane)), fifteen non-detected SVOCs (1,2,4,5-tetraclorobenzene, 2,3,4,6-tetrachlorophenol, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 2,4-dichlorophenol, 2,4-dimethylphenol, 2,6-dichlorophenol, 3,4-methylphenool, 4,6-dinitro-2-methylphenol, 2-chlorophenol, 2-methylphenol, 4-nitrophenol, pentachlorobenzene, pentachlorophenol, and pronamide), and one non-detected pesticide (methyl parathion) were identified as ecological COPCs in Step 2 of the ERA because maximum non-detected concentrations exceed soil screening values. With the exception of 4-nitrophenol, 2,4-dimethylphenol, pentachlorophenol, pronamide, and methyl parathion, the soil screening values used in the screening level risk calculation for the organic chemicals identified above are based on background concentrations or detection limits (CCME, 2001). Because these screening values are not based on toxicological data (background concentrations and detection limits do not represent threshold effect concentrations), there is uncertainty in their identification as ecological COPCs.

A search of the literature did not identify any studies that investigated the effects of 1,1,2,2-tetrachloroethane, 1,1,2-trichloroethane, 1,2,3-trichloropropane, bromoform, chloroethane, dibromomethane, 1,2,4,5-tetraclorobenzene, 2,3,4,6-tetrachlorophenol, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 2,4-dichlorophenol, 2,6-dichlorophenol, 3,4-methylphenool, 4,6-dinitro-2-methylphenol, 2-chlorophenol, 2-methylphenol, and pentachlorobenzene in soil on terrestrial plants and invertebrates. However, the USEPA (2012a and 2012b) ECOSAR Class Program (Version 1.11) indicates that in solution, these organic chemicals are relatively non-toxic to earthworms. ECOSAR estimates the toxicity of chemicals lacking data based on their structural similarity to chemicals for which toxicity data are available (i.e., SARs). The SARs analysis predicts 14-day earthworm LC_{50} values ranging from 30.1 mg/L for 2,3,4,6-tetrachlorophenol to 462 mg/L for bromoform. Although solution exposures cannot be used to predict effects from soil exposures, LC_{50} values estimated using SARs analysis illustrate the low toxicity of these chemicals to earthworms. The lack of detections in surface soil, as well as subsurface soil and groundwater (see Appendix A) also indicates that these chemicals are not likely to be associated with historical activities at the Tank 214 Area (storage of AVGAS and DFM in underground tanks). Based on their low predicted toxicity in solution to earthworms and the lack of detections in abiotic media collected at the SWMU (i.e., surface soil, subsurface soil, and groundwater), 1,1,2,2-tetrachloroethane, 1,1,2-trichloroethane, 1,2,3-trichloropropane, bromoform, chloroethane, dibromomethane, 1,2,4,5-tetraclorobenzene, 2,3,4,6-tetrachlorophenol, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 2,4-dichlorophenol, 2,6-dichlorophenol, 3,4-methylphenool, 4,6-dinitro-2-methylphenol, 2-chlorophenol, 2-methylphenol, and

pentachlorobenzene are not identified as ecological COCs for surface soil, and no additional evaluation is recommended.

The soil screening values used for 4-nitrophenol, 2,4-dimethylphenol, pentachlorophenol, pronamide, and methyl parathion are based on toxicological data to plants or soil invertebrates. In the case of 4-nitrophenol, the soil screening value represents a toxicological threshold for earthworms (Efroymson et al., 1997a), while soil screening values for 2,4-dimethylphenol, pentachlorophenol, pronamide, and methyl parathion are plant-based values (Eco-SSL or USEPA Region 5 ESLs). Non-detected concentrations for 4-nitrophenol range from 220 µg/kg to 14,000 µg/kg. Four of twenty-six (4/26) non-detected concentrations exceed the soil screening value of 7,000 µg/kg. Use of the maximum non-detected concentration gives a Step 2 risk estimate of 2.0 (see Table 7-1). In addition to surface soil, 4-nitrophenol was not detected in subsurface soil collected at the Tank 214 Area, indicating that this SVOC is not likely to be associated with historical activities at the site (storage of AVGAS and DFM in underground tanks). It is noted that all groundwater data for 4-nitrophenol were rejected during data validation activities (see Section 10.1.3). Based on a lack of detections in surface soil and subsurface soil, as well as the relatively low HQ value calculated using the maximum non-detected concentration, 4-nitrophenol is not identified as an ecological COC for surface soil, and no additional evaluation is recommended.

Non-detected concentrations for pentachlorophenol range from 87 µg/kg to 5,600 µg/kg. Only the maximum value exceeds the soil screening value of 5,000 µg/kg. The Step 2 screening level risk estimate, calculated using the maximum non-detected concentration, is 1.12. In addition to surface soil, pentachlorophenol was not detected in subsurface soil or groundwater collected at the Tank 214 Area, indicating that this SVOC is not likely to be associated with historical activities at the site (storage of AVGAS and DFM in underground tanks). Based on a lack of detections in surface soil, subsurface soil, and groundwater, as well as the low HQ value calculated using the maximum non-detected concentration, pentachlorophenol is not identified as an ecological COC for surface soil, and no additional evaluation is recommended.

Non-detected concentrations for 2,4-dimethylphenol range from 37 µg/kg to 2,400 µg/kg, while non-detected concentrations for pronamide range from 66 µg/kg to 4,300 µg/kg. All non-detected concentrations for each SVOC exceed their respective soil screening value (10 µg/kg for 2,4-dimethylphenol and 13.6 µg/kg for pronamide [USEPA Region 5 ESLs]). In addition to surface soil, 2,4-dimethylphenol and pronamide were not detected in subsurface soil or groundwater collected at the Tank 214 Area. The lack of detections in surface soil, subsurface soil, and groundwater, as well as industrial uses for 2,4-dimethylphenol (manufacture of pharmaceuticals, plastics, insecticides, fungicides, and dyestuffs; Hazardous Substances Data Bank [HSDB], 2014]) and pronamide (systemic herbicide used for the selective control of annual and perennial grasses and broad-leaved weeds in food and feed crops [HSDB, 2014]), indicate that these two SVOCs are not likely to be associated with historical activities at the site (storage of AVGAS and DFM in underground tanks). Based on these considerations, 2,4-dimethylphenol and pronamide are not identified as ecological COPCs for surface soil, and no additional evaluation is recommended.

Non-detected concentrations for methyl parathion range from 49 µg/kg to 3,200 µg/kg. All non-detected concentrations exceed the soil screening value of 0.344 µg/kg (USEPA Region 5 ESL). In addition to surface soil, organophosphorous pesticides, including methyl parathion, were not detected in subsurface soil or groundwater collected at the site (see Appendix A). Given the historical activities conducted at the SWMU (storage of AVGAS and DFM in two underground tanks), as well as the lack of detections in abiotic media at the Tank 214 Area, methyl parathion is not identified as an ecological COC for surface soil, and no additional evaluation is recommended.

2-Butanone, 2-hexanone, acetone, and carbon disulfide were detected and identified as ecological COPCs in Step 2 of the ERA based on the lack of soil screening values. Acetone was detected in thirty-seven of forty-two (37/42) surface soil samples at concentrations ranging from 6.3J µg/kg (9SB38-00) to 850 µg/kg (9SB50-00). A search of the literature did not identify any studies that investigated the effects of acetone in soil on terrestrial plants and invertebrates. However, Gorsuch et al. (1990), as cited in Organization for Economic Co-operation and Development (OECD, 1999), investigated the effect of acetone on emergence and growth of radish (*Raphanus sativus*), lettuce (*Lactuca sativa*), and rye grass (*Lolium perenne*) in solution. The 7-day NOEC for each species was 100 mg/L. Although solution exposure studies cannot be used to predict effects from soil exposures, the results of the study conducted by Gorsuch et al. (1990) illustrate the low toxicity of acetone to terrestrial plants. The USEPA (2012a and 2012b) ECOSAR Class Program (Version 1.11) also indicates that acetone is relatively non-toxic to earthworms. The SARs analysis predicts a 14-day earthworm LC_{50} of 172 mg/L. Again, although solution exposures cannot be used to predict effects from soil exposures, the LC_{50} value estimated using SARs analysis illustrates the low toxicity of acetone to earthworms. Based on the low toxicity in solution to terrestrial plants and low predicted toxicity in solution to earthworms, acetone is not identified as an ecological COC for surface soil, and no additional evaluation is recommended.

2-Butanone was detected in four of forty-five (4/45) surface soil samples at concentrations ranging from 8.6J µg/kg (9SB01-00) to 61J µg/kg (9SB00-00), 2-hexanone was detected in three of forty-five (3/45) surface soil samples at a concentrations ranging from 6.2J µg/kg (9SB47-00) to 27J µg/kg (9SB20-00), while carbon disulfide was detected in two of forty-five (2/45) surface soil samples at concentrations of 6.7J µg/kg (59SB05-00) and 15J µg/kg (9SB01-00). Identical to acetone, the USEPA (2012a and 2012b) ECOSAR Class Program (Version 1.00a) indicates that in solution, 2-butanone, 2-hexanone, and carbon disulfide are relatively non-toxic to earthworms. Specifically, the SARs analysis predicts 14-day earthworm LC_{50} values of 190 mg/kg for 2-butanone, 209 mg/kg for 2-hexanone, and 134 mg/kg for carbon disulfide. Based on their low magnitude and/or frequency of detection, as well as their low predicted toxicity in solution to earthworms, 2-butanone, 2-hexanone, and carbon disulfide are not identified as ecological COCs for surface soil, and no additional evaluation is recommended.

Arsenic, cobalt, copper, lead, selenium, thallium, vanadium, and zinc were identified as ecological COPCs in the Step 2 screening level risk calculation because maximum detected concentrations exceed soil screening values. To further evaluate the potential significance of risks presented by these metals, risk estimates were re-calculated using 95 percent UCL of the mean concentrations (Table 10-6). It is acknowledged that terrestrial plants are immobile and many terrestrial invertebrates are relatively immobile; therefore, individuals are likely to be impacted by locations of maximum concentrations. However, as discussed in Section 10.0, evaluation of the 95 percent UCL of the mean exposure case is more indicative of the level of impact that might be expected at the population level. In addition to the re-calculation of risk estimates using 95% UCL of the mean concentrations, the surface soil data were statistically compared to the NAPR basewide background surface soil data set contained within the Revised Final II Summary Report for Environmental Background Concentrations of Inorganic Compounds (Baker, 2010) in accordance with USEPA (2013c) and Navy (NFESC, 2002) guidance. Supporting statistics for the Tank 214 Area and background data sets are provided in Appendix E. Finally, the refined risk evaluation also took into consideration the magnitude and spatial distribution of arsenic, cobalt, copper, lead, selenium, thallium, vanadium, and zinc detections above soil screening values and/or background concentrations.

Arsenic

Arsenic was detected in thirty-seven of forty-seven (37/47) surface soil samples at concentrations ranging from 0.74J mg/kg (9SB16-00) to 23 mg/kg (9SS07). Of the thirty-seven detections, only the

maximum detected concentration exceeds the soil screening value of 18 mg/kg (23 mg/kg in 9SS07). The Step 2 screening level risk estimate (HQ = 1.28; see Table 7-1), derived using the maximum detected concentration, indicates that arsenic may be presenting unacceptable risk to terrestrial plants and invertebrates. However, the refined risk estimate (HQ = 0.15; see Table 10-6), derived using the 95 percent UCL of the mean concentration (2.71 mg/kg), indicates acceptable risk to terrestrial plant and invertebrate populations.

As evidenced by the descriptive statistics presented in Table 10-7 for Tank 214 Area and background surface soil data sets, maximum, arithmetic mean, and 95 percent UCL of the mean arsenic concentrations in Tank 214 Area surface soil (23 mg/kg, 1.77 mg/kg, and 2.71 mg/kg, respectively) exceed maximum, arithmetic mean, and 95 percent UCL of the mean background concentrations (2.5J mg/kg, 1.32 mg/kg, and 1.49 mg/kg, respectively). However, the statistical tests evaluating the median and right-tail of the data set distributions (Gehan test, quantile test, and slippage test) concluded that arsenic concentrations in Tank 214 Area surface soil are not elevated relative to background concentrations.

The side-by-side probability plots depicting detected arsenic concentrations in Tank 214 Area and background surface soil show a single data point within the SWMU data set that is elevated relative to background concentrations, as well as other detected concentrations at the site. This data point, corresponding to the maximum detected concentration (23 mg/kg in 9SS07), is identified as a potential outlier within the combined Tank 214 Area and background data set by Rosner's outlier test.

Although the statistical tests evaluating the median and right-tail of the data set distributions concluded that arsenic concentrations in Tank 214 Area surface soil are not elevated relative to background concentrations, the side-by-side probability plots clearly show that the maximum detected concentration in Tank 214 Area surface soil is elevated relative to background concentrations, as well as other detected concentrations at the site. This data point is also identified as a potential outlier within the combined Tank 214 Area and background data set, indicating that 9SS07 may represent a localized area of arsenic contamination. For these reasons, arsenic is identified as an ecological COPC for surface soil. It is noted that the arsenic concentration detected in surface soil at 9SS07 is co-located with an elevated zinc concentration (520J mg/kg).

Cobalt

Cobalt was detected in each surface soil sample that was analyzed for this metal (44/44) at concentrations ranging from 5.5J mg/kg (9SB02-00) to 57 mg/kg (9SB51-00). Thirty-eight of the detected concentrations exceed the soil screening value of 13 mg/kg. The Step 2 screening level risk estimate (HQ = 4.38; see Table 7-1), derived using the maximum detected concentration, indicates that cobalt may be presenting unacceptable risk to terrestrial plants and invertebrates. The refined risk estimate (HQ = 1.83; see Table 10-6), derived using the 95 percent UCL of the mean concentration (23.8 mg/kg), also indicates that cobalt may be presenting unacceptable risk to terrestrial plant and invertebrate populations.

The descriptive statistics presented in Table 10-7 for the Tank 214 Area and background surface soil data sets show that cobalt concentrations at the site are similar to background concentrations. Specifically, the maximum detected concentration in Tank 214 Area surface soil (57 mg/kg) is only slightly elevated above the maximum background concentration (50.2 mg/kg), while arithmetic mean and 95 percent UCL of the mean concentrations (21.5 mg/kg and 23.8 mg/kg, respectively) are slightly less than arithmetic mean and 95 percent UCL of the mean background concentrations (22.8 and 27.5 mg/kg, respectively). The statistical tests evaluating the median and right-tail of the data set

distributions (Wilcoxon-Mann-Whitney test, quantile test, and slippage test) also concluded that cobalt concentrations in Tank 214 Area surface soil are not elevated relative to background concentrations.

Based on the low magnitude and frequency of detected concentrations greater than the maximum background concentration, as well as the descriptive and distributional statistics summarized in Table 10-7, cobalt is not identified as an ecological COC for surface soil, and no additional evaluation of this metal is recommended.

Copper

Copper was detected in each surface soil sample that was analyzed for this metal (44/44) at concentrations ranging from 51 mg/kg (9SB49-00) to 170 mg/kg (9SB23-00). Thirty-four of the detected concentrations exceed the soil screening value of 70 mg/kg. The Step 2 screening level risk estimate (HQ = 2.43; see Table 7-1), derived using the maximum detected concentration, indicates that copper may be presenting unacceptable risk to terrestrial plants and invertebrates. The refined risk estimate (HQ = 1.36; see Table 10-6), derived using the 95 percent UCL of the mean concentration (95.4 mg/kg), also indicates that copper may be presenting unacceptable risk to terrestrial plant and invertebrate populations.

The descriptive statistics presented in Table 10-7 indicate that copper concentrations in Tank 214 Area surface soil are not elevated relative to background concentrations. Although the arithmetic mean copper concentration for the site data set (89.9 mg/kg) exceeds the arithmetic mean background concentration (77.1 mg/kg), the maximum and 95 percent UCL of the mean copper concentrations for the Tank 214 Area data set (170 mg/kg and 95.4 mg/kg, respectively) are less than maximum and 95 percent UCL of the mean background concentrations (180 mg/kg and 96.3 mg/kg, respectively). The maximum concentration is also less than the background threshold value of 192 mg/kg. In addition, the statistical tests evaluating the mean and right-tail of the data set distributions (Welch-Satterthwaite test, quantile test, and slippage test) also concluded that copper concentrations in Tank 214 Area surface soil are not elevated relative to background concentrations. Furthermore, Rosner's outlier test did not identify any data points within the combined Tank 214 Area and background data set as potential outliers.

Based on the low magnitude of the refined risk estimate above 1.0, the descriptive and distributional statistics presented in Table 10-7, as well as Rosner's outlier test, copper is not identified as an ecological COC for surface soil, and no additional evaluation of this metal is recommended.

Lead

Lead was detected in each surface soil sample that was analyzed for this metal (62/62) at concentrations ranging from 1.6 mg/kg (9SB50-00) to 1,000J mg/kg (9SB11-00). Fourteen of the detected concentrations exceed the soil screening value of 120 mg/kg. The Step 2 screening level risk estimate (HQ = 8.33; see Table 7-1), derived using the maximum detected concentration, indicates that lead may be presenting unacceptable risk to terrestrial plants and invertebrates. The refined risk estimate (HQ = 1.33; see Table 10-6), derived using the 95 percent UCL of the mean concentration (159.6 mg/kg), also indicates that lead may be presenting unacceptable risk to terrestrial plant and invertebrate populations.

The descriptive statistics presented in Table 10-7 show that lead concentrations in Tank 214 Area surface soil are elevated relative to background concentrations. Maximum, arithmetic mean, and 95 percent UCL of the mean lead concentrations for the Tank 214 Area data set (1,000J mg/kg, 118 mg/kg, and 160 mg/kg, respectively) exceed maximum, arithmetic mean, and 95 percent UCL of the mean background concentrations (21J mg/kg, 8.68 mg/kg, and 12.8 mg/kg, respectively). The maximum

detected concentration also exceeds the background threshold value of 34.2 mg/kg. In addition, statistical tests evaluating the median and right-tail of the data set distributions (Welch-Satterthwaite test, quantile test, and slippage test) concluded that lead concentrations in Tank 214 Area surface soil are elevated relative to background concentrations. The side-by-side probability plots depicting detected lead concentrations in Tank 214 Area and background surface soil support the descriptive and distributional statistics. As evidenced by the plots, a large number of data points within the Tank 214 Area data set are elevated relative to background concentrations, as well as other detected concentrations at the site.

Based on the frequency and magnitude of detected concentrations greater than the soil screening value and maximum background concentration, the refined risk estimate, which indicates unacceptable risk to terrestrial plant and invertebrate populations, the descriptive and distributional statistics presented in Table 10-7, and the side-by-side probability plots, lead is identified as an ecological COC for Tank 214 Area surface soil. The spatial extent of detected lead concentrations greater than the soil screening value is depicted on Figure 10-1.

Selenium

Selenium was detected in nineteen of forty-seven (19/47) surface soil samples at concentrations ranging from 0.19J mg/kg (9SB54-00) to 1.4 mg/kg (9SB37-00). Ten of the detected concentrations exceed the soil screening value of 0.52 mg/kg. The Step 2 screening level risk estimate (HQ = 2.69; see Table 7-1), derived using the maximum concentration, indicates that selenium may be presenting unacceptable risk to terrestrial plants and invertebrates. The refined risk estimate (HQ = 1.19; see Table 10-6), derived using the 95 percent UCL of the mean concentration (0.62 mg/kg), also indicates that selenium may be presenting unacceptable risk to terrestrial plant and invertebrate populations.

The descriptive statistics presented in Table 10-7 indicate that selenium concentrations in Tank 214 Area surface soil are not elevated relative to background concentrations. Specifically, maximum and 95% UCL of the mean selenium concentrations in Tank 214 Area surface soil (1.4 mg/kg and 0.62 mg/kg, respectively) are slightly elevated above maximum and 95 percent UCL of the mean background concentrations (1.2J mg/kg and 0.57 mg/kg, respectively), while the arithmetic mean concentration (0.05 mg/kg) is slightly less than the arithmetic mean background concentration (0.10 mg/kg). It is noted that of the nineteen detections in site surface soil, only the maximum detected concentration exceeds the maximum background concentration. A statistical evaluation of the mean/median of the data set distributions could not be performed due to the low frequency of detection within the SWMU and background data sets (40.4 percent and 25 percent, respectively). In addition, statistical tests evaluating the right-tail of the data set distributions could not be performed because non-detected results in both data sets exceed maximum detected concentrations (see Table 10-7). However, Dixon's outlier test did not identify any data points within the combined Tank 214 Area and background data set as potential outliers.

Based on the low magnitude of the refined risk estimate above 1.0, the low frequency and magnitude of detected concentrations above the maximum background concentration, the descriptive statistics presented in Table 10-7, and Dixon's outlier test, selenium is not identified as an ecological COC for surface soil, and no additional evaluation of this metal is recommended.

Thallium

Thallium was detected in fourteen of forty-four (14/44) surface soil samples at concentrations ranging from 2.3J mg/kg (9SB01-00) to 4.6J mg/kg (9SB10-00). Each of the detected concentrations exceeds the soil screening value of 1.0 mg/kg. The Step 2 screening level risk estimate (HQ = 4.60; see Table

7-1), derived using the maximum detected concentration, indicates that thallium may be presenting unacceptable risk to terrestrial plants and invertebrates. The refined risk estimate (HQ = 1.91; Table 10-6), derived using the 95 percent UCL of the mean concentration (1.91 mg/kg), also indicates that thallium may be presenting unacceptable risk to terrestrial plant and invertebrate populations.

Thallium was detected in a single background surface soil sample at 0.1 mg/kg. Each of the detected concentrations in Tank 214 Area surface soil is over an order of magnitude greater than the single background detection. A statistical evaluation of the mean/median of the data set distributions could not be performed due to the low frequency of detection within the SWMU and background data sets (31.8 percent and 5 percent, respectively). In addition, statistical tests evaluating the right-tail of the data set distributions could not be performed because non-detected results in the background data set exceed maximum detected concentrations (see Table 10-7).

Based on the refined risk estimate, which indicates unacceptable risk to terrestrial plant and invertebrate populations, as well as the frequency and magnitude of detected concentrations greater than the single detected background concentration, thallium is identified as an ecological COC for Tank 214 Area surface soil. The spatial extent of detected thallium concentrations greater than the soil screening value is depicted on Figure 10-2.

Vanadium

Vanadium was detected in each surface soil sample that was analyzed for this metal (44/44) at concentrations ranging from 120 mg/kg (9SB08-00) to 240 mg/kg (9SB51-00). Each of the detected concentrations exceeds the soil screening value of 20 mg/kg. The Step 2 screening level risk estimate (HQ = 12.00; see Table 7-1), derived using the maximum detected concentration, indicates that vanadium may be presenting unacceptable risk to terrestrial plants and invertebrates. The refined risk estimate (HQ = 8.93; see Table 10-6), derived using the 95 percent UCL of the mean concentration (179 mg/kg), also indicates that vanadium may be presenting unacceptable risk to terrestrial plant and invertebrate populations.

As evidenced by Table 10-7, maximum, arithmetic mean, and 95 percent UCL of the mean vanadium concentrations in Tank 214 Area surface soil (240 mg/kg, 172 mg/kg, and 179 mg/kg, respectively) are slightly elevated above maximum, arithmetic mean, and 95 percent UCL of the mean background concentrations (230 mg/kg, 142 mg/kg, and 166 mg/kg, respectively). However, the maximum detected concentration at the site is less than the background threshold value of 286 mg/kg. Statistical tests evaluating the mean and right-tail of the data set distributions (Welch-Satterthwaite test, quantile test, and slippage test) were contradictory. The Welch-Satterthwaite test concluded that vanadium concentrations in Tank 214 Area surface soil are elevated relative to background concentrations, while the quantile test and slippage test did not detect a significant difference.

The side-by-side probability plots depicting detected vanadium concentrations in Tank 214 Area and background surface soil show that data points at the lower end of the range of the Tank 214 data set are elevated relative to background concentrations. However, detected concentrations occupying the right-tail of each data set are comparable. A probability plot depicting vanadium concentrations in a combined Tank 214 Area and background data set also shows that individual data points, including data points at the upper end of the range, fall along a straight line and form a continuous distribution. Data points that exhibit these characteristics are likely to represent natural conditions (NFESC, 2002, 2003, and 2004). It is noted that no data points within the combined data set are identified as potential outliers by Rosner's outlier test.

Based on the low magnitude of the maximum detected concentration above the maximum background concentration, the side-by-side probability plot, as well as the probability plot depicting detected vanadium concentrations in the combined data set, and Rosner's outlier test, vanadium is not identified as an ecological COC for Tank 214 Area surface soil

Zinc

Zinc was detected in each surface soil sample that was analyzed for this metal (60/60) at concentrations ranging from 32J mg/kg (9SB00-00) to 520J mg/kg (9SS07). Two of the detected concentrations exceeded the soil screening value of 120 mg/kg (130 mg/kg in 9SS20 and 520J mg/kg in 9SS07). The Step 2 screening level risk estimate (HQ = 4.33; see Table 7-1), derived using the maximum detected concentration, indicates that zinc may be presenting unacceptable risk to terrestrial plants and invertebrates. However, the refined risk estimate (HQ = 0.64; see Table 10-6), derived using the 95 percent UCL of the mean concentration (76.8 mg/kg), indicates acceptable risk to terrestrial plant and invertebrate populations.

The descriptive statistics presented in Table 10-7 show that maximum, arithmetic mean, and 95 percent UCL of the mean zinc concentrations in Tank 214 Area surface soil (520J mg/kg, 62.1 mg/kg, and 76.8 mg/kg, respectively) exceed maximum, arithmetic mean, and 95 percent UCL of the mean background concentrations (120E mg/kg, 52.5 mg/kg, and 65.7 mg/kg, respectively). However, the statistical tests evaluating the median and right-tail of the data set distributions (Wilcoxon-Mann-Whitney test and quantile test) concluded that zinc concentrations in Tank 214 Area surface soil are not elevated relative to background concentrations.

The side-by-side probability plots depicting detected zinc concentrations in Tank 214 Area and background surface soil show a single data point within the site data set that is elevated relative to background concentrations, as well as other detected concentrations at the SWMU. This data point, corresponding to the maximum detected concentrations (520J mg/kg in 9SS07), is identified as a potential outlier within the combined Tank 214 Area and background data set by Rosner's outlier test.

Although the statistical tests evaluating the median and right-tail of the data set distributions concluded that zinc concentrations in Tank 214 Area surface soil are not elevated relative to background concentrations, the side-by-side probability plots clearly show that the maximum detected concentration is elevated relative to background concentrations and other detected concentrations at the site. This data point is also identified as a potential outlier within the combined Tank 214 Area and background data set, indicating that 9SS07 may represent a localized area of zinc contamination. For these reasons, zinc is identified as an ecological COPC for surface soil. It is noted that the zinc concentration detected in surface soil at 9SS07 is co-located with an elevated arsenic concentration (23 mg/kg).

In summary, arsenic, lead, thallium, and zinc were detected and are identified as ecological COCs for Tank 214 Area surface soil. Note that the identified risk from arsenic and zinc is from a localized area around 9SS07. Although 2-butanone, 2-hexanone, acetone, carbon disulfide, cobalt, copper, selenium, and vanadium were detected in surface soil and identified as ecological COPCs in Step 2 of the ERA, they are not identified as ecological COCs based on the discussion presented within the preceding paragraphs, and no additional evaluation is recommended. No additional evaluation is also recommended for the non-detected chemicals identified as ecological COPCs in Step 2 of the ERA, including those with maximum non-detected concentrations greater than soil screening values.

10.1.2 Refined Risk Evaluation for Subsurface Soil

Section 7.2.2 presented the results of the Step 2 screening level risk calculation for Tank 214 Area subsurface soil. Screening level risk estimates were also provided in Table 7-2. Cobalt, copper, lead, thallium, and vanadium were detected in subsurface soil and identified as ecological COPCs in Step 2 of the ERA because maximum detected concentrations exceed soil screening values. Two detected VOCs (acetone and carbon disulfide) were also identified as ecological COPCs based on the lack of soil screening values. Nineteen non-detected VOCs, eight non-detected SVOCs (1,2,4,5-tetrachlorobenzene, 2,3,4,6-tetrachlorophenol, 2,4-dimethylphenol, 2,4-dichlorophenol. 2-chlorophenol, 4,6-dinitro-2-methylphenol, pentachlorobenzene, and pronamide), one non-detected organophosphorous pesticide (methyl parathion), and one non-detected metal (selenium) were identified as ecological COPCs because maximum non-detected concentrations exceed soil screening values. Finally, 4-nitroquinoline-1-oxide was identified as an ecological COPC based on the lack of any usable data with which to evaluate potential risks (all subsurface soil data were rejected during data validation activities).

As discussed in Section 10.0, risk estimates for cobalt, copper, lead, thallium, and vanadium could not be re-calculated using 95 percent UCL of the mean concentrations due to the small size of the subsurface soil data set for inorganics (n = 3). The refined risk evaluation for Tank 214 Area subsurface soil is presented and discussed within the paragraphs that follow.

All subsurface soil analytical data for 4-nitroquinoline-1-oxide were rejected during data validation activities. Based on the lack of any usable analytical data with which to evaluate potential risks, this organic chemical was identified as an ecological COPC in Step 2 of the ERA. 4-Nitroquinoline was not detected in surface soil collected at the Tank 214 Area. However, non-detected concentrations reported for this SVOC were elevated, ranging from 1,700UJ µg/kg to 19,000UJ µg/kg. Although there are no usable data, its use as a research chemical [HSDB, 2014]) indicates that 4-nitroquinoline-1-oxide is not likely to be present in Tank 214 Area subsurface soil. For this reason, 4-nitroquinoline-1-oxide is not identified as an ecological COC for subsurface soil, and no additional evaluation of this SVOC is recommended.

Nineteen non-detected VOCs, eight non-detected SVOCs (1,2,4,5-tetrachlorobenzene, 2,3,4,6-tetrachlorophenol, 2,4-dimethylphenol, 2,4-dichlorophenol. 2-chlorophenol, 4,6-dinitro-2-methylphenol, pentachlorobenzene, and pronamide), one non-detected organophosphorous pesticide (methyl parathion), were identified as ecological COPCs for subsurface soil because maximum non-detected concentrations exceed soil screening values. With the exception of 2,4-dimethylphenol, pronamide, and methyl parathion, the soil screening values used for these non-detected organic chemicals in the Step 2 screening level risk calculation are based on background concentrations or detection limits (CCME, 2001). Because the screening values are not based on toxicological data (background concentrations and detection limits do not represent threshold effect concentrations), there is uncertainty in their identification as ecological COPCs. If the same lines of evidence used in Section 10.1.1 for the non-detected organic chemicals identified as ecological COPCs for surface soil (i.e., low predicted toxicity in solution to earthworms using SAR and lack of detections in abiotic media collected at the SWMU) are also applied to the non-detected organic chemicals identified as ecological COPCs for subsurface soil, they do not warrant identification as ecological COCs.

Although not detected, selenium was identified as an ecological COPC in Step 2 of the ERA because the maximum non-detected concentration for this metal exceeds the soil screening value. As evidenced by Table 10-8, the maximum non-detected concentration (1.6 mg/kg) is less than the maximum background concentration (3.8 mg/kg), as well as the background threshold value (2.57 mg/kg). These data indicate that selenium is not likely to be present in Tank 214 Area subsurface soil at concentrations

greater than background levels. Based on the comparison of the maximum non-detected concentration to the maximum detected background concentration and background threshold value, selenium is not identified as an ecological COC for subsurface soil, and no additional evaluation of this metal is recommended.

Two detected VOCs (acetone and carbon disulfide) were identified as ecological COPCs for subsurface soil in Step 2 of the ERA based on the lack of soil screening values. Acetone was detected in four of five (4/5) subsurface soil samples at concentrations ranging from 4.7J µg/kg (9SB03-01) to 77J µg/kg (9SB63-01), while carbon disulfide was detected in one of eight (1/8) subsurface soil samples at 18J µg/kg (9SB00-01). These two VOCs were also detected and identified as ecological COPCs for Tank 214 area surface soil based on the lack of soil screening values. If the lines of evidence used in Section 10.1.1 for surface soil are applied to subsurface soil (i.e., measured toxicity in solution to plants [in the case of acetone] and predicted toxicity in solution to earthworms using SARs [in the case of acetone and carbon disulfide], these two VOCs do not warrant identification as ecological COCs for subsurface soil.

Cobalt, copper, lead, thallium, and vanadium were identified as ecological COPCs in Step 2 of the ERA because maximum detected concentrations exceed soil screening values (see Table 7-2). To determine if these metals are site-related, the SWMU data were compared to the basewide background subsurface soil data set classified as "clay" contained within the Revised Final II Summary Report for Environmental Background Concentrations of Inorganic Chemicals (Baker, 2010) in accordance with USEPA (2013c) and Navy (NFESC, 2002) guidance. However, based on their low sample size (n = 3 for each metal), the statistical evaluation was limited to a descriptive comparison. The small size of the Tank 214 area subsurface soil data set for these five metals also prevented a refinement of risk estimates using 95 percent UCL of the mean concentrations.

Cobalt

Cobalt was detected in each subsurface soil sample that was analyzed for this metal (3/3) at concentrations ranging from 3.9J mg/kg (9SB00-01) to 32J mg/kg (9SB03-01). Two of the detected concentrations exceed the soil screening value of 13 mg/kg. The Step 2 screening level risk estimate (HQ = 2.46; see Table 7-2), derived using the maximum detected concentration, indicates that this metal may be presenting unacceptable risk to terrestrial plants and invertebrates.

The descriptive statistics presented in Table 10-8 for the Tank 214 Area and background subsurface soil data sets show that cobalt concentrations in subsurface soil at the site are not elevated relative to background concentrations. Although the arithmetic mean concentration in Tank 214 Area subsurface soil (18.6 mg/kg) exceeds the background arithmetic mean concentration (9.2 mg/kg), the maximum detected concentration (32J mg/kg) is less than the maximum background concentration and background threshold value (33.8 mg/kg and 49.8 mg/kg, respectively). These data indicate that cobalt is not presenting risks to terrestrial plants and invertebrate at the site above what would be expected under background conditions. Based on the descriptive statistics presented in Table 10-8, cobalt is not identified as an ecological COC for subsurface soil, and no additional evaluation of this metal is recommended.

Copper

Copper was detected in each subsurface soil sample that was analyzed for this metal (3/3) at concentrations ranging from 93J mg/kg (9SB06-01) to 130J mg/kg (9SB00-01). Each of the detected concentrations exceeds the soil screening value of 70 mg/kg. The Step 2 screening level risk estimate

(HQ = 1.86; see Table 7-2), derived using the maximum detected concentration, indicates that copper may be presenting unacceptable risk to terrestrial plants and invertebrates.

The descriptive statistics presented in Table 10-8 show that copper concentrations in Tank 214 Area subsurface soil are not elevated relative to background concentrations. Although the arithmetic mean concentration in subsurface soil at the site (111 mg/kg) is slightly elevated above the arithmetic mean background concentration (105 mg/kg), the maximum detected concentration (130J mg/kg) is less than the maximum background concentration and background threshold value (260J mg/kg and 280 mg/kg, respectively). Identical to cobalt, these data indicate that copper concentrations in Tank 214 Area subsurface soil are not presenting risks to terrestrial plants and invertebrates above what would be expected under background conditions. Based on the relatively low magnitude of the Step 2 screening level risk estimate above 1.0 (HQ = 1.86), as well as the descriptive statistics presented in Table 10-8, copper is not identified as an ecological COC for subsurface soil, and no additional evaluation of this metal is recommended.

Lead

Lead was detected in each subsurface soil sample that was analyzed for this metal (3/3) at concentrations ranging from 3.7J mg/kg (9SB00-01) to 790J mg/kg (9SB03-01). The maximum detected concentration exceeds the soil screening value of 120 mg/kg. The Step 2 screening level risk estimate (HQ = 6.58; see Table 7-2), derived using the maximum concentration, indicates that this metal may be presenting unacceptable risk to terrestrial plants and invertebrates.

The descriptive statistics presented in Table 10-8 indicate that lead concentrations in Tank 214 Area subsurface soil are elevated relative to background levels. Specifically, maximum and arithmetic mean lead concentrations in subsurface soil at the site (790J mg/kg and 273 mg/kg, respectively) exceed maximum and arithmetic mean background concentrations (6.6 mg/kg and 3.08 mg/kg, respectively). The maximum detected concentration also exceeds the background threshold value (6.97 mg/kg). Based on the Step 2 screening level risk estimate (HQ = 6.58) and the descriptive statistics presented in Table 10-8, lead is identified as an ecological COC for subsurface soil. It is noted that lead was also identified as an ecological COC for Tank 214 Area surface soil (see Section 10.1.1).

Thallium

Thallium was detected in one of three (1/3) subsurface soil samples at a concentration of 4.6J mg/kg (9SB03-01). The detected concentration exceeds the soil screening value of 1.00 mg/kg. The Step 2 screening level risk estimate (HQ = 4.60; see Table 7-2), derived using the maximum detected concentration, indicates that this metal may be presenting unacceptable risk to terrestrial plants and invertebrates.

The descriptive statistics presented in Table 10-8 show that thallium concentrations in Tank 214 Area subsurface soil are elevated relative to background concentrations. Specifically, maximum and arithmetic mean thallium concentrations at the site (4.6J mg/kg and 4.67 mg/kg, respectively) exceed maximum and arithmetic mean background concentrations (0.29J mg/kg and 0.58 mg/kg, respectively). The maximum detected concentration in Tank 214 Area subsurface soil also exceeds the background threshold value (0.27 mg/kg). Based on the Step 2 screening-level risk estimate (HQ = 4.60), which indicates unacceptable risk to terrestrial plants and invertebrates, and the descriptive statistics presented in Table 10-8, thallium is identified as an ecological COC for subsurface soil. It is noted that thallium was also identified as an ecological COC in Tank 214 Area surface soil (see Section 10.1.1).

Vanadium

Vanadium was detected in each subsurface soil sample that was analyzed for this metal (3/3) at concentrations ranging from 170J mg/kg (9SB06-01) to 200J mg/kg (9SB01-01). Each of the detected concentrations exceeds the soil screening value of 20 mg/kg. The Step 2 screening level risk estimate (HQ = 10.00; Table 7-2), derived using the maximum detected concentration, indicates that this metal may be presenting unacceptable risk to terrestrial plants and invertebrates.

The descriptive statistics presented in Table 10-8 show that vanadium concentrations in Tank 214 Area subsurface soil are not elevated relative to background concentrations. As evidenced by the table, maximum and arithmetic mean vanadium concentrations in subsurface soil at the site (200J mg/kg and 187 mg/kg, respectively) are less than maximum and arithmetic mean background concentrations (410 mg/kg and 209 mg/kg, respectively). The maximum detected concentration in Tank 214 Area subsurface soil is also less than the background threshold value (482 mg/kg). Based on the descriptive statistics presented in Table 10-8, vanadium is not identified as an ecological COC for subsurface soil, and no additional evaluation of this metal is recommended.

In summary, lead and thallium were detected and identified as ecological COCs for Tank 214 Area subsurface soil. Although acetone, carbon disulfide, cobalt, copper, and vanadium were detected and identified as ecological COPCs in Step 2 of the ERA, they are not identified as ecological COCs based on the discussion presented in the preceding paragraphs, and no additional evaluation is recommended. No additional evaluation is also recommended for the non-detected chemicals identified as ecological COPCs in Step 2 of the SERA, including those with maximum non-detected concentrations greater than soil screening values. Finally, no additional evaluation is recommended for the SVOC lacking usable data (4-nitroquinoline-1-oxide).

10.1.3 Refined Risk Evaluation for Groundwater

Section 7.2.3 presented the results of the Step 2 screening level risk calculation for groundwater. Screening level risk estimates were also provided in Table 7-3. Benzene, ethylbenzene, 2,4-dichlorophenol, 2-methylnaphthalene, cadmium, chromium, cobalt, copper, lead, nickel, vanadium, and zinc were detected and identified as ecological COPCs because maximum detected concentrations exceed groundwater screening values. Methyl acrylonitrile and phenacetin were also detected and identified as ecological COPCs based on the lack of groundwater screening values. One non-detected VOC (acrolein), eight non-detected SVOCs (2-chloronaphthalene, 4-chloro-3-methylphenol, hexachloro-1,3-butadiene, hexachlorobenzene, hexachlorocyclopentadiene, hexachloroethane, aramite, and pentachloronitrobenzene), two non-detected PAHs (benzo[a]anthracene and benzo[a]pyrene), and six non-detected organophosphorous pesticides (dimethoate, famphur, methyl parathion, parathion, phorate, and sulfotepp), were identified as ecological COPCs because maximum non-detected concentrations exceed screening values. Finally, one SVOC (4-nitrophenol) was identified as an ecological COPC based on the lack of any usable data with which to evaluate potential risks (all analytical data were rejected during data validation activities).

The refined risk calculation for groundwater is presented in Table 10-9. As discussed in Section 10.0, risk estimates for groundwater were re-calculated using 95 percent UCL of the mean concentrations for those ecological COPCs with data sets that have a minimum of eight data points and four detected values (benzene and ethylbenzene). The refined risk evaluation for groundwater is presented and discussed within the paragraphs that follow.

All groundwater analytical data for 4-nitrophenol were rejected during data validation activities. 4-Nitrophenol was not detected in surface or subsurface, indicating that this SVOC is not likely to be

present in Tank 214 Area groundwater. Industrial uses (manufacture of pharmaceuticals, fungicides, insecticides, and dyes, as well as a substrate for analysis of UDP-glucuronyl transferase [HSDB, 2014]) also indicate that this SVOC is not likely to be associated with historical activities at the site (storage of AVGAS and DFM in underground tanks). Based on these considerations, 4-nitrophenol is not identified as an ecological COC for groundwater, and no additional evaluation of this SVOC is recommended.

One non-detected VOC (acrolein), eight non-detected SVOCs (2-chloronaphthalene, 4-chloro-3-methylphenol, aramite, hexachloro-1,3-butadiene, hexachlorobenzene, hexachloroethane hexachlorocyclopentadiene, and pentachloronitrobenzene), two non-detected PAHs (benzo[a]anthracene and benzo[a]pyrene), and six non-detected organophosphorous pesticides (dimethoate, famphur, ethyl parathion, methyl parathion, phorate, and sulfotepp), were identified as ecological COPCs in Step 2 of the ERA because maximum non-detected concentrations exceed screening values. With the exception of benzo(a)anthracene and benzo(a)pyrene, none of these organic chemicals were detected in surface soil or subsurface soil collected at the Tank 214 Area (see Appendix A). The absence of detected concentrations in surface and subsurface soil indicates that these organic chemicals are not likely to be site-related, nor are they likely to be present in groundwater.

Benzo(a)anthracene was detected in one of forty-seven (1/47) surface soil samples, while benzo(a)pyrene was detected in five of forty-seven (5/47) surface soil samples. Neither PAH was detected in subsurface soil collected at the Tank 214 Area. The screening value used in the Step 2 screening level risk calculation for benzo(a)anthracene represents a SCV, presented in Suter II and Tsao (1996) and selected by the USEPA Region 5 as an ESL. A more recent Tier II value (chronic aquatic value [CAV]), derived in accordance with Great Lakes Initiative (GLI) methodology is available from USEPA (2013a). This Tier II CAV (4.7 µg/L), derived by the Ohio Environmental Protection Agency (OEPA), is greater than the maximum non-detected concentration reported for benzo(a)anthracene (0.71UJ µg/L). Based on this comparison, benzo(a)anthracene is not identified as an ecological COC for groundwater.

In the case of benz(a)pyrene, the screening value used in the Step 2 screening level risk calculation (0.0102 µg/L) was extrapolated from an acute toxicity value (96-hr LC_{50} for *Palaemonetes pugio* [daggerblade grass shrimp]) with a safety factor of 100; see Table 5-2). A Tier II CAV, derived by the OEPA in accordance GLI methodology, is available from USEPA (2011b). However, identical to the screening value listed in Table 5-2, this OEPA chronic Tier II CAV (0.06 µg/L) is less than the maximum non-detected concentration (0.82 µg/L). Regardless, benzo(a)pyrene is not identified as an ecological COC for Tank 214 Area groundwater. This determination is based, in part, on the conservative procedure used in the derivation of OEPA Tier II CAVs (see Chapter 3745-1-35 of the Ohio Administrative Code [OAC]). No chronic toxicity data were available for the derivation of the benzo(a)pyrene Tier II CAV. Therefore, the OEPA derived the Tier II CAVs from available acute toxicity data (LC_{50} and/or EC_{50} values). Acute values were available for three species (*Daphnia magna* (cladoceran], *Daphnia pulex* [cladoceran], and *Chironomus thummi* [midge]). A secondary acute value (SAV) was estimated by dividing the minimum genus mean acute value (GMAV) by a factor of thirteen. A Tier II CAV was then estimated by dividing the SAV by a factor of 18 (an assumed secondary acute-to-chronic ratio [SACR]). It is noted that the high log K_{ow} value for benzo(a)pyrene (6.11; see Table 4-2) indicates that this PAH has a high affinity for adsorption to soil particles and is not likely to be present in groundwater.

Methyl acrylonitrile and phenacetin were detected in groundwater and identified as ecological COPCs in Step 2 of the ERA based on the lack of screening values. Methyl acrylonitrile was detected in three of twenty-one (3/21) groundwater samples at concentrations ranging from 1.8J µg/L to 130 µg/L, while phenacetin was detected in three of six (3/6) groundwater samples at concentrations ranging from 2.6J

µg/L to 5.6J µg/L. Although studies investigating the effects of methyl acrylonitrile and phenacetin on aquatic organisms were not identified in the literature, chronic-based toxicity values for aquatic organisms predicted by the USEPA (2012a and 2012b) ECOSAR Class Program (Version 1.11) indicates that detections in groundwater are not likely to impact aquatic receptor populations residing in the estuarine wetland system downgradient from the Tank 214 Area. In the case of methyl acrylonitrile, the SARs analysis predicts chronic values of 256 µg/L for fish, 475 µg/L for daphnids, and 640 µg/L for green algae. These predicted values exceed the maximum detected concentration in groundwater. In the case of phenacetin, the SARs analysis predicts chronic values of 130 µg/L for fish, 2,203 µg/L for green algae, and 5,318 µg/L daphnids. Identical to methyl acrylonitrile, predicted chronic values for phenacetin exceed the maximum detected concentration. Based on these comparisons, methyl acrylonitrile and phenacetin are not identified as ecological COCs for groundwater, and no additional evaluation of these two SVOCs is recommended.

Benzene, ethylbenzene, 2,4-dichlorophenol, 2-methylnaphthalene were detected and identified as ecological COPCs because maximum detected concentrations exceed groundwater screening values. Benzene was detected in seven of twenty-three (7/23) groundwater samples at concentrations ranging from 0.09J µg/L (9GW44-11) to 330J µg/L (9GW25). Two of the detected concentrations (330J mg/L in 9GW25 and 220 mg/L in 9GW52-11) exceed the groundwater screening value of 109 µg/L. The Step 2 screening level risk estimate (HQ = 3.03; see Table 7-3), derived using the maximum detected concentration, indicates that benzene may be presenting unacceptable risk to plants, invertebrates, and/or fish within the downgradient estuarine wetland system. The refined risk estimate (HQ = 1.09; see Table 10-9), derived using the 95 percent UCL of the mean concentration (119 µg/L), also indicates that benzene may be presenting unacceptable risk to plant, invertebrate, and/or fish populations. Benzene was not detected iin surface water or sediment collected from the downgradient estuarine wetland system (see Appendix A), and all non-detected concentrations in surface water and sediment are less than screening values. Based on the low magnitude of the refined risk estimate and the lack of any indication that this VOC is migrating with groundwater to estuarine wetland surface water and sediment with groundwater at ecologically important concentrations, benzene is not identified as an ecological COC.

Ethylbenzene was detected in five of twenty-two (5/22) groundwater samples at concentrations ranging from 0.21J µg/L (9GW41-11) to 12J µg/L (9GW56-11). Only the maximum detected concentration exceeds the groundwater screening value of 4.30 µg/L. The Step 2 screening level risk estimate (HQ = 2.79; see Table 7-3), derived using the maximum detected concentration, indicates that ethylbenzene may be presenting unacceptable risk to plants, invertebrates, and fish that may be exposed to undiluted groundwater discharging to the downgradient estuarine wetland system. However, the refined risk estimate (HQ = 0.45; see Table 10-10), derived using the 95 percent UCL of the mean concentration (1.93 µg/L), does not indicate any unacceptable risk. Ethylbenzene was detected in one of fifty-seven [1/57] sediment samples at a low, estimated concentration (3.6J µg/kg). This single detection is less than the sediment screening value of 4.0 µg/kg. This VOC was not detected in estuarine wetland surface water (see Appendix A). The low frequency and magnitude of the single, estimated detection in sediment, as well as the lack of detections in surface water indicates that ethylbenzene is not migrating with groundwater to the estuarine wetland system at ecologically important concentrations. Based on the refined risk estimate, as well as the lack of any indication that this VOC is migrating with groundwater to estuarine wetland surface water and sediment at ecologically important concentrations, ethylbenzene is not identified as an ecological COC.

2,4-Dichlorophenol was detected in one of six (1/6) groundwater samples (2.1J µg/L in 9GW01). This single detection exceeds the groundwater screening value of 1.67 µg/L. The Step 2 screening level risk estimate (HQ = 2.79; see Table 7-3), derived using the maximum detected concentration, indicates that

2,4-dichlorophenol may be presenting unacceptable risk to plants, invertebrates, and fish that may be exposed to undiluted groundwater discharging to the downgradient estuarine wetland system. A refined risk estimate could not be calculated due to the low sample size and frequency of detection. This VOC was not detected in surface water or sediment collected from the downgradient estuarine wetland system (see Appendix A). Based on the low magnitude of the single detected concentration above the screening value, as well as the lack of any indication that this VOC is migrating with groundwater to estuarine wetland surface water and sediment at ecologically important concentrations, 2,4-dichlorophenol is not identified as an ecological COC.

2-Methylnaphthalene was detected in three of six (3/6) groundwater samples at concentrations ranging from 0.84 µg/L (9GW25) to 16 µg/L (9GW13). Only the maximum detected concentration exceeds the groundwater screening value of 6.00 µg/L. The Step 2 screening level risk estimate (HQ = 2.67; see Table 7-3), derived using the maximum detected concentration, indicates that 2-methylnaphthalene may be presenting unacceptable risk to plants, invertebrates, and fish that may be exposed to undiluted groundwater discharging to the downgradient estuarine wetland system. Identical to 2,4-dichlorophenol, a refined risk estimate could not be calculated due to the low sample size and frequency of detection. 2-Methylnaphthalene was detected in one of eighty-seven [1/87] sediment samples at a low, estimated concentration (6.8J µg/kg). This single detection is less than the sediment screening value of 20.2 µg/kg. This PAH was not detected in estuarine wetland surface water (see Appendix A). The low frequency and magnitude of the single detected concentration in sediment, as well as the lack of detections in surface water indicates that 2-methylnaphthalene is not migrating with groundwater to the estuarine wetland system at ecologically important concentrations. For this reason, 2-methylnaphalene is not identified as an ecological COC for Tank 214 Area groundwater.

Total recoverable cadmium, chromium, cobalt, copper, lead, nickel, vanadium, and zinc were detected and identified as ecological COPCs in Step 2 of the SERA because maximum detected concentrations exceed groundwater screening values. To determine if these metals are site-related, the Tank 214 Area total recoverable and dissolved analytical data were statistically compared to the background groundwater data presented and contained within the Revised Final II Summary Report for Environmental Background Concentrations of Inorganic Compounds (Baker, 2010). However, due to the low number of data points within the Tank 214 Area inorganic data sets (n = 7 for each metal), statistical evaluations were limited to the descriptive comparisons presented in Table 10-10 (USEPA [2013c] recommends a minimum of eight data points from both the site and background populations to use hypothesis testing). It is noted that for certain ecological COPCs, visual representations of the Tank 214 Area and backgorund data sets (e.g., probability plots) were prepared and/or outlier tests were performed to supplement the descritpitve statistics. Any supporting statistics are provided in Appendix F. It is further noted that the small number of inorganic data points within the Tank 214 Area data set also prevented the calculation of refined risk estimates for inorganic ecological COPCs using 95 percent UCL of the mean concentrations.

Cadmium, Chromium, Cobalt, Nickel, and Zinc

As evidenced by the descriptive statistics presented in Table 10-10, total recoverable cadmium, chromium, cobalt, nickel, and zinc concentrations in Tank 214 Area groundwater are not elevated relative to background concentrations. For each metal, maximum and arithmetic mean concentrations in groundwater at the site are less than maximum and arithmetic mean background concentrations. Maximum concentrations for these five metals are also less than their corresponding background threshold value. The descriptive statistics presented in Table 10-10 also show that dissolved cadmium, chromium, cobalt, nickel, and zinc concentrations in Tank 214 Area groundwater are not elevated relative to background concentrations. In summary, the total recoverable and dissolved data summarized in Table 10-10 indicate that cadmium, chromium, cobalt, nickel, and zinc are not migrating

with Tank 214 Area groundwater to the estuarine wetland system at concentrations greater than what would be expected under background conditions. For this reason, cadmium, chromium, cobalt, nickel, and zinc (total recoverable and dissolved fractions) are not identified as ecological COCs, and no additional evaluation of these metals is recommended.

Copper

Total recoverable copper was detected in seven of seven [7/7] groundwater samples at concentrations ranging from 8.9J µg/L (9GW16) to 510 µg/L (9GW00). Each of the detected concentrations exceeds the total recoverable screening value of 3.73 µg/L. The Step 2 screening level risk estimate (maximum HQ = 137; see Table 7-3), indicates that total recoverable copper may be presenting unacceptable risk to plants, invertebrates, and fish that may be exposed to undiluted groundwater discharging to the downgradient estuarine wetland system.

The descriptive statistics presented in Table 10-10 show that maximum and arithmetic mean copper concentrations within the total recoverable fraction of Tank 214 Area groundwater (510 µg/L and 157 µg/L, respectively) exceed maximum and arithmetic mean background concentrations (352 µg/L and 114 µg/L, respectively). The maximum total recoverable concentration in Tank 214 Area groundwater also exceeds the total recoverable background threshold value of 413 µg/L. The side-by-side probability plots depicting detected total recoverable copper concentrations in Tank 214 Area and background groundwater support the descriptive statistics. As evidenced by the plots, two data points within the SWMU data set (510 µg/L in 9GW00 and 410 µg/L in 9GW25) are elevated relative to background concentrations, as well as other detected concentrations at the site. It is noted that the maximum detected concentration is identified as a potential outlier within the combined Tank 214 Area and background data set by Rosner's outlier test.

Dissolved copper was detected in four of six [4/6] groundwater samples at concentrations ranging from 3.2J µg/L (9GW16) to 6.5J µg/L (9GW00). Each of the detected concentrations exceeds the dissolved screening value of 3.1 µg/L. However, as evidenced by Table 10-10, maximum and arithmetic mean concentrations within the dissolved fraction of Tank 214 Area groundwater (6.5J µg/L and 3.70 µg/L, respectively) are less than maximum and arithmetic mean background concentrations (496J µg/l and 53.3 µg/L, respectively). The maximum dissolved copper concentration in Tank 214 Area groundwater is also less than the background threshold value (323 µg/L).

In summary, total recoverable copper concentrations In Tank 214 Area groundwater are elevated relative to total recoverable background concentrations and the total recoverable screening value. However, copper was not detected in Tank 214 Area surface soil or subsurface soil at concentrations elevated relative to background concentrations (see Tables 10-7 and 10-8, respectively), indicating that elevated total recoverable concentrations in Tank 214 Area groundwater may not site-related. Furthermore, concentrations within the dissolved fraction of Tank 214 Area groundwater are less than background concentrations. These data indicate that the mobile forms of copper are not migrating to the downgradient estuarine wetland at concentrations greater than what would be expected under background conditions. Based on the descriptive statistics presented in Table 10-10, which indicate that dissolved concentrations are not elevated relative to background concentrations, copper is not identified as an ecological COC for Tank 214 Area groundwater. It is noted that the groundwater transport pathway was further evaluated through the collection of estuarine wetland surface water and sediment. As the estuarine wetland represents the exposure point for chemicals in Tank 214 Area groundwater, the refined risk evaluation for these two media (see Sections 10.1.4 and 10.1.5) will indicate if copper is potentially migrating with groundwater to the estuarine wetland at ecologically important concentrations.

Lead

Total recoverable lead was detected in four of seven (4/7) groundwater samples at concentrations ranging from 6.1J µg/L (9GW17) to 93 µg/L (9GW25). Three of the detected concentrations exceed the total recoverable screening value of 8.52 µg/L (8.7J µg/L in 9GW13, 27 µg/L in 9GW00, and 93 µg/L in 9GW25). The Step 2 screening level risk estimate (maximum HQ = 10.92; see Table 7-3), indicates that total recoverable lead may be presenting unacceptable risk to plants, invertebrates, and fish that may be exposed to undiluted groundwater discharging to the downgradient estuarine wetland system. The descriptive statistics presented in Table 10-10 show that maximum and arithmetic mean lead concentrations within the total recoverable fraction of Tank 214 Area groundwater (93 µg/L and 20.6 µg/L, respectively) exceed maximum and arithmetic mean background concentrations (32.5J µg/L and 7.68 µg/L, respectively). The side-by-side probability plots depicting detected total recoverable lead concentrations in Tank 214 area and background groundwater show a single data point within the Tank 214 Area data set (maximum detected concentration) that is elevated relative to background concentrations, as well as other detected concentrations at the site. This concentration is also identified as a potential outlier within the combined Tank 214 Area and background data set by Rosner's outlier test.

Dissolved lead was detected in four of six [4/6] groundwater samples at 2.8J µg/L (9GW17) and 9 µg/L (9GW25). The maximum detected concentration exceeds the dissolved screening value of 8.1 µg/L. As evidenced by Table 10-10, maximum and arithmetic mean concentrations within the dissolved fraction of Tank 214 Area groundwater (9 µg/L and 3.43 µg/L, respectively) exceed maximum and arithmetic mean background concentrations (1.6J µg/L and 1.12 µg/L, respectively). Both detected concentrations in Tank 214 Area groundwater also exceed the background threshold value (1.58 µg/L).

The descriptive statistics presented in Table 10-10 show that total recoverable and dissolved lead concentrations in Tank 214 Area groundwater are elevated relative to screening values and background concentrations. This metal was identified as an ecological COC for surface soil and subsurface soil, indicating that elevated groundwater concentrations may be site-related. Based on the descriptive statistics presented in Table 10-10 and the likelihood that detected concentrations are site-related, lead is identified as an ecological COC for Tank 214 Area groundwater. It is noted that the refined risk evaluation for surface water and sediment (see Sections 10.1.4 and 10.1.5, respectively) will indicate if lead is potentially migrating with groundwater to the estuarine wetland at ecologically important concentrations.

Vanadium

Vanadium was detected within the total recoverable fraction of each groundwater sample at concentrations ranging from 45J µg/L (9GW17) to 630J µg/L (9GW00). Each of the detected concentrations exceeds the screening value of 12 µg/L. The Step 2 screening level risk estimate (maximum HQ = 52.5; see Table 7-3), indicates that total recoverable vanadium may be presenting unacceptable risk to plants, invertebrates, and fish that may be exposed to undiluted groundwater discharging to the downgradient estuarine wetland system. The descriptive statistics presented in Table 10-10 show that maximum and arithmetic mean vanadium concentrations within the total recoverable fraction of Tank 214 Area groundwater (630J µg/L and 200 µg/L, respectively) exceed maximum and arithmetic mean background concentrations (549 µg/L and 161 µg/L, respectively). The side-by-side probability plots depicting detected total recoverable copper concentrations in Tank 214 Area and background groundwater show two data points within the Tank 214 area data set (460J µg/L in 9GW25 and 630J µg/L in 9GW00) that are elevated relative to other detected concentrations at the site. However, neither data point is identified as a potential outlier within the combined Tank 214 Area and background data set.

Vanadium was detected within the dissolved fraction of each groundwater sample at concentrations ranging from 13 µg/L (9GW06) to 61J µg/L (9GW01). Each of the detected concentrations exceeds the total recoverable screening value (a toxicological threshold expressed as a dissolved concentration is not available from the literature or agency sources). However, as evidenced by Table 10-10, maximum and arithmetic mean concentrations within the dissolved fraction of Tank 214 Area groundwater (61J µg/L and 36.6 µg/L, respectively) are less than maximum and arithmetic mean background concentrations (265 µg/l and 39.1 µg/L, respectively). The maximum dissolved copper concentration is also less than the background threshold value (72.9 µg/L).

The descriptive statistics presented in Table 10-10 indicate that total recoverable vanadium concentrations in Tank 214 Area groundwater are elevated relative to background concentrations. However, concentrations within the dissolved fraction of Tank 214 Area groundwater are less than background concentrations. These data indicate that the mobile forms of vanadium are not migrating to the downgradient estuarine wetland at concentrations greater than what would be expected under background conditions. Based on the descriptive statistics presented in Table 10-10, which indicate that dissolved concentrations are not elevated relative to background concentrations, vanadium is not identified as an ecological COC for Tank 214 Area groundwater. It is noted that the groundwater transport pathway was further evaluated through the collection of estuarine wetland surface water and sediment. As the estuarine wetland represents the exposure point for chemicals in Tank 214 Area groundwater, the refined risk evaluation for these media (see Sections 10.1.4 and 10.1.5) will indicate if vanadium is potentially migrating with groundwater to the estuarine wetland at ecologically important concentrations.

In summary, lead was detected identified as an ecological COC for Tank 214 Area groundwater. Although Benzene, ethylbenzene, methyl scrylonitrile, phenacetin, 2,4-dichlorophenol, 2-methylnaphthalene, cadmium, chromium, cobalt, copper, lead, nickel, vanadium, and zinc were detected and identified as ecological COPCs in Step 2 of the ERA, they are not identified as ecological COCs based on the discussion presented in the preceding paragraphs, and no additional evaluation is recommended. No additional evaluation is also recommended for the non-detected chemicals identified as ecological COPCs in Step 2 of the ERA, including those with maximum non-detected concentrations greater than groundwater screening values. Finally, no additional evaluation is recommended for the SVOC lacking usable data (4-nitrophenol).

10.1.4 Refined Risk Evaluation for Estuarine Wetland Surface Water

Section 7.2.4 presented the results of the Step 2 screening level risk calculation for Tank 214 Area surface water. Screening level risk estimates also were provided in Table 7-4. Arsenic, cadmium, chromium, cobalt, copper, lead, nickel, vanadium, and zinc were detected and identified as ecological COPCs because maximum detected concentrations exceed screening values. One non-detected VOC (ethylbenzene), twenry-one non-detected SVOCs, and two non-detected metals (silver and thallium) were identified as ecological COPCs because maximum non-detected concentrations exceed screening values. The spatial extent of detected ecological COPC concentrations greater than surface water screening values is depicted on Figure 10-4.

The refined risk calculation for surface water is presented in Table 10-11. As discussed in Section 10.0, risk estimates for surface water were re-calculated using 95 percent UCL of the mean concentrations for those ecological COPCs with data sets having a minimum of eight data points and four detected values (arsenic, cadmium, chromium, cobalt, copper, lead, nickel, vanadium, and zinc). The refined risk evaluation for surface water is presented and discussed within the paragraphs that follow.

One non-detected VOC (ethylbenzene) and twenty non-detected SVOCs (1,2,4-trichlorobenzene, 2,4-dichlorophenol, 2,4-dinitrophenol, 2-chloronaphthalene, 2-nitroaniline, 3,3'-dichlorobenzidine, 3-nitroaniline, 4,6-dinitro-2-methylphenol, 4-bromophenyl-phenylether, 4-chloro-3-methylphenol, 4-chloroaniline, 4-chlorophenyl-phenylether, benzidine, di-n-butylphthalate, diphenylamine, hexachloro-1,3-butadiene, hexachlorobenzene, hexachlorocyclopentadiene, hexachloroethane, and pentachlorophenol) were identified as ecological COPCs in Step 2 of the ERA because maximum non-detected concentrations exceed surface water screening values. In the case of ethylbenzene, the maximum non-detected concentration (5U µg/L) is only slightly elevated above the screening value (4.30 µg/L). Based on the low magnitude of the maximum non-detected concentration above the surface water screening value (HQ = 1.16), ethylbenzene is not identified as an ecological COC for Tank 214 Area surface water.
Of the twenty non-detected SVOCs identified as ecological COPCs for surface water because maximum non-detected concentrations exceed screening values, only 2,4-dichlorophenol and di-n-butylphthalate were detected in surface soil, subsurface soil, and/or groundwater collected at the Tank 214 Area (see Appendix A). The lack of detections in abiotic media at the Tank 214 Area for the remaining non-detected organic chemicals indicate that they are not likely to be associated with historical activities at the Tank 214 Area (storage of AVGAS and DFM in underground tanks). The physical properties of many of these SVOCs also indicate that they are not likely to be dissolved within the water column at ecologically important concentrations. Specifically, log K_{ow} and K_{oc} values for many of the COPCs (see Table 4-2) imply that they have a high affinity for adsorption to sediment particles. Based on these considerations, 1,2,4-trichlorobenzene, 2,4-dinitrophenol, 2-chloronaphthalene, 2-nitroaniline, 3,3'-dichlorobenzidine, 3-nitroaniline, 4,6-dinitro-2-methylphenol, 4-bromophenyl-phenylether, 4-chloro-3-methylphenol, 4-chloroaniline, 4-chlorophenyl-phenylether, benzidine, diphenylamine, hexachloro-1,3-butadiene, hexachlorobenzene, hexachlorocyclopentadiene, hexachloroethane, and pentachlorophenol are not identified as ecological COCs for Tank 214 Area surface water, and no additional evaluation is recommended.

As indicated in the preceding paragraph, 2,4-dichlorophenol and di-n-butylphthalate were detected in abiotic media collected at the Tank 214 Area. Di-n-butyl phthalate was detected in one of twenty-six (1/26) surface soil samples (40J µg/kg in 9SS03), while 2,4-dichlorophenol was detected at a low, estimated concentration in one of six (1/6) groundwater samples (2.1J µg/L in 8GW01). Based on their low frequency and magnitude of detection in abiotic media collected at the Tank 214 Area, these two SVOCs are not likely to be present in surface water at ecologically important concentrations. In the case of di-n-octyl phthalate, this SVOC has high K_{ow} and K_{oc} values (see Table 4-2), indicating a high affinity for adsorption to sediment particles (not likely to be dissolved within the water column). Based on these considerations, 2,4-dichlorophenol and di-n-butyl phthalate are not identified as ecological COCs for Tank 214 Area surface water.

Thirteen non-detected PAHs (1-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[g,h,i]perylene, benzo[k]fluoranthene, dibenz[a,h]anthracene, indeno[1,2,3-cd]pyrene, phenanthrene, and pyrene) were identified as ecological COPCs because maximum non-detected concentrations exceed surface water screening values. Many of these PAHs were detected in abiotic media collected at the Tank 214 Area (surface soil, subsurface soil, and/or groundwater). With the exception of benzo(a)anthracene, benzo(a)pyrene, and pyrene, the magnitude of the Step 2 risk estimates (i.e., HQ values) above 1.0 was low (see Table 7-4). The high K_{ow} and K_{oc} values for the non-detected PAHs also indicate that they have a high affinity for adsorption to sediment particles. As such, they are not likely to be dissolved within the water column. For these reasons, the non-detected PAHs identified above are not identified as ecological COCs for surface water.

Silver and thallium were identified as ecological COPCs because maximum non-detected concentrations within the total recoverable fraction of surface water (10U µg/L and 50U µg/L, respectively) exceed screening values (HQs = 4.46 for silver and 2.35 for thallium). Silver was not detected within the dissolved fraction of estuarine wetland surface water. However, non-detected concentrations within this bioavailable fraction (all reported at 10U µg/L) are elevated relative to the USEPA NRWQC expressed as a dissolved concentration (1.9 µg/L [USEPA, 2014b]). Silver was detected in seven of forty-seven (7/47) surface soil samples at low, estimated concentrations ranging from 0.04J µg/kg to 0.13J µg/kg. Although silver was not detected in background surface soil, sixteen non-detected background concentrations exceed the maximum detected concentration in Tank 214 Area surface soil. In addition to surface soil, silver was detected at a low, estimated concentration within the total recoverable fraction of a single groundwater sample (1.2J µg/L). This single groundwater detection is less than the maximum total recoverable background concentration (30.1 µg/L [Baker, 2010]). Silver was not detected in Tank 214 Area subsurface soil. The Tank 214 Area surface soil, subsurface soil, and groundwater data indicate that silver is not likely migrating to estuarine wetland surface water at concentrations greater than what would be expected under background conditions.

In the case of thallium, only one of eleven (1/11) non-detected total recoverable concentrations (50U µg/L in 9SW18) exceeds the total recoverable screening value of 21.3 µg/L. Identical to silver, this metal was not detected within the dissolved fraction of estuarine wetland surface water. Non-detected results within the dissolved fraction (all reported at 10U µg/L) are less than the total recoverable screening value (a dissolved screening value is not available from the literature or agency compilations). As there is no indication that this metal is likely to be present within the bioavailable fraction of estuarine wetland surface water at ecologically important concentrations, thallium is not identified as an ecological COC.

Arsenic, cadmium, chromium, cobalt, copper, lead, nickel, vanadium, and zinc were detected within the total recoverable fraction of surface water and identified as ecological COPCs because maximum detected concentrations exceed screening values expressed as total recoverable concentrations. Risk estimates for these nine metals were re-calculated using 95 percent UCL of the mean concentrations for those ecological COPCs with data sets having a minimum of eight data points and four detected values. To determine if these metals are site-related, the Tank 214 Area data (total recoverable) were also compared to the background total recoverable estuarine wetland surface water data set presented and contained within the Revised Final II Summary Report for Environmental Background Concentrations of Inorganic Compounds (Baker, 2010) in accordance with Navy guidance (NFESC, 2004). Supporting statistics for the Tank 214 Area and background data sets are provided in Appendix G.

Arsenic

Total recoverable arsenic was detected in seven of fifteen (7/15) surface water samples at concentrations ranging from 3.7J µg/L (9SW16) to 110 µg/L (9SW18). Only the maximum detected concentration exceeds the surface water screening value (36 µg/L). The Step 2 screening level risk estimate (HQ = 3.06; see Table 7-4), derived using the maximum detected total recoverable concentration, indicates that arsenic may be presenting unacceptable risk to plants, invertebrates, and fish residing within the estuarine wetland. The revised risk estimate (HQ = 1.47; see Table 10-11), derived using the 95 percent UCL of the mean total recoverable concentration (52.9 µg/L), also indicates that arsenic may be presenting unacceptable risk to these aquatic receptor groups.

The descriptive statistics presented in Table 10-12 show that total recoverable arsenic concentrations in Tank 214 Area surface water are elevated relative to background concentrations. Specifically, maximum, arithmetic mean, and 95 percent UCL of the mean arsenic concentrations in Tank 214 Area

surface water (110 µg/L. 22.9 µg/L, and 52.9 µg/L, respectively) exceed maximum, arithmetic mean, and 95 percent UCL of the mean background concentrations (6.1J µg/L, 4.71 µg/L, and 7.70 µg/L, respectively). A statistical test evaluating the mean/median of the data set distributions could not be performed due to the low number of detected concentrations within the site data set (46.7 percent). In addition, statistical tests evaluating the right-tail of the data set distributions (i.e., quantile test and slippage test) could not be performed because non-detected concentrations in the background data set exceed maximum detected concentrations (see Table 10-12).

As discussed in Section 10.0, the filtered fraction of metals more closely approximates the bioavailable fraction of metals in the water column (USEPA, 1999b and 2002). Therefore, a comparison of the maximum detected concentration within the dissolved fraction of Tank 214 Area surface water to a screening value expressed in terms of the dissolved metal in the water column is more appropriate. Dissolved arsenic was detected in three of eleven (3/11) surface water samples at concentrations ranging from 3.2J µg/L (9SW18) to 4.3J µg/L (9SW23). Although the maximum detected concentration within the dissolved fraction is slightly elevated above the maximum background concentration (3.8J µg/L; see Table 10-13), this detection is less than the USEPA NRWQC expressed as a dissolved concentration (36 µg/L). Based on the comparison of the maximum detected concentrations within the dissolved fraction of Tank 214 Area surface water to the dissolved USEPA NRWQC, arsenic is not identified as an ecological COC. It is noted that the elevated total recoverable arsenic concentration in surface water sample 9SW18 (110 µg/L) may be explained by the high turbidity measured in the field for this sample (94.6 nephelometric turbidity units [NTU.]; Baker, 2003). The elevated turbidity likely resulted from the disturbance, suspension and collection of sediment particles during sampling activities (9SW18 is located within an E2SS3 wetland feature where shallow water is prevalent).

Cadmium

Total recoverable cadmium was detected in seven of fifteen (7/15) surface water samples at concentrations ranging from 0.7J µg/L (9SW02) to 38 µg/L (9SW18). Two detected concentrations (9.3 µg/L in 9SW17 and 38 µg/L in 9SW18) exceed the total recoverable screening value of 8.85 µg/L. The Step 2 screening level risk estimate (maximum HQ = 4.29; see Table 7-4), indicates that cadmium may be presenting unacceptable risk to plants, invertebrates, and fish residing within the estuarine wetland. The revised risk estimate (HQ = 1.85; see Table 10-12), derived using the 95 percent UCL of the mean total recoverable concentration (16.4 µg/L), also indicates that cadmium may be presenting unacceptable risk to these aquatic receptor groups. Descriptive statistics, as well as statistical evaluations on the mean/median and right-tail of the data set distributions were impaired by the lack of detections within the background data set (see Table 10-12).

Cadmium was not detected within the dissolved fraction of Tank 214 Area surface water. The maximum non-detected concentration (5.0U µg/L) is less than the USEPA NRWQC expressed as a dissolved concentration (8.8 µg/L). As the filtered fraction of metals more closely approximates their bioavailable fraction in the water column (USEPA, 1999b and 2002), cadmium is not identified as an ecological COC surface water. It is noted that elevated total recoverable cadmium concentrations in surface water samples 9SW17 and 9SW18 (9.3 µg/L and 38 µg/L, respectively) may be explained by the high turbidity measured in the field for these two samples (97 NTU for 9SW17 and 94.6 for 9SW18 [Baker, 2003]). Total recoverable cadmium was not detected in the three remaining surface water samples with co-located turbidity data (9SW14, 9SW16, and 9SW19). The turbidity measured in these three samples ranged from 4.5 NTU (9SW14 and 9SW16) to 32.8 NTU (9SW19).

Chromium

Total recoverable chromium was detected in twelve of fifteen (12/15) Tank 214 Area surface water samples at concentrations ranging from 4.3J µg/L (9SW20) to 540 µg/L (9SW18). Two of the detected concentrations (190 µg/L in 9SW17 and 540 µg/L in 9SW18) exceed the total recoverable screening value of 50.4 µg/L. The Step 2 screening level risk estimate (HQ = 10.71; see Table 7-4), derived using the maximum detected total recoverable concentration, indicates that chromium may be presenting unacceptable risk to plants, invertebrates, and fish residing within the estuarine wetland. The revised risk estimate (HQ = 4.27; see Table 10-11), derived using the 95 percent UCL of the mean total recoverable concentration (215 µg/L), also indicates that chromium may be presenting unacceptable risk to these aquatic receptor groups.

The descriptive statistics presented in Table 10-12 show that total recoverable chromium concentrations in Tank 214 Area surface water are elevated relative to background concentrations. Specifically, maximum, arithmetic mean, and 95 percent UCL of the mean arsenic concentrations in Tank 214 Area surface water (540 µg/L. 55.6 µg/L, and 215 µg/L, respectively) exceed maximum, arithmetic mean, and 95 percent UCL of the mean background concentrations (5J µg/L, 3.30 µg/L, and 4.06 µg/L, respectively). The statistical test evaluating the median of the data set distributions (Gehan test) also concluded that total recoverable chromium concentrations in Tank 214 Area surface water are elevated relative to background concentrations. It is noted that statistical tests evaluating the right-tail of the data set distributions could not be performed due to elevated non-detected results within the site and background data sets (see Table 10-12)

Dissolved chromium was detected in three of eleven (3/11) surface water samples at concentrations ranging from 1.9J µg/kg (9SW16) to 4.3J µg/L (9SW17). Although the maximum detected concentration within the dissolved fraction is slightly elevated above the maximum background concentration (2.2J µg/L; see Table 10-13), this detection is less than the USEPA NRWQC expressed as a dissolved concentration (50 µg/L). As the filtered fraction of metals more closely approximates their bioavailable fraction in the water column (USEPA, 1999b and 2002), chromium is not identified as an ecological COC for Tank 214 Area surface water. It is noted that elevated total recoverable chromium concentrations in surface water samples 9SW17 and 9SW18 (190 µg/L and 540 µg/L, respectively) may be explained by the high turbidity measured in the field for these two samples (97 NTU for 9SW17 and 94.6 for 9SW18 [Baker, 2003]). Total recoverable chromium concentrations in the three remaining surface water samples with co-located turbidity data (8.1J µg/L in 9SW14, 4.7J µg/L in 9SW16, and 5.8J µg/L in 9SW19) are less than the total recoverable screening value. The turbidity measured in these three samples ranged from 4.5 NTU (9SW14 and 9SW16) to 32.8 NTU (9SW19).

Cobalt

Total recoverable cobalt was detected in eleven of fifteen (11/15) surface water samples at concentrations ranging from 0.96J µg/L (9SW02) to 220 µg/L (9SW18). Two of the detected concentrations (110 µg/L in 9SW17 and 220 µg/L in 9SW18) exceed the total recoverable screening value of 45 µg/L. The Step 2 screening level risk estimate (HQ = 4.89; see Table 7-4), derived using the maximum detected total recoverable concentration, indicates that cobalt may be presenting unacceptable risk to plants, invertebrates, and fish residing within the estuarine wetland. The revised risk estimate (HQ = 2.09; see Table 10-11), derived using the 95 percent UCL of the mean total recoverable concentration (94.2 µg/L), also indicates that cobalt may be presenting unacceptable risk to these aquatic receptor groups.

The descriptive statistics presented in Table 10-12 show that total recoverable cobalt concentrations in Tank 214 Area surface water are elevated relative to background concentrations. Specifically, maximum, arithmetic mean, and 95 percent UCL of the mean arsenic concentrations in Tank 214 Area surface water (220 µg/L, 26.6 µg/L, and 94.2 µg/L, respectively) exceed maximum, arithmetic mean, and 95 percent UCL of the mean background concentrations (7.1J µg/L, 3.96 µg/L, and 6.89 µg/L, respectively). The statistical test evaluating the median of the data set distributions (Gehan test) also concluded that total recoverable cobalt concentrations in Tank 214 Area surface water are elevated relative to background concentrations. It is noted that statistical tests evaluating the right-tail of the data set distributions could not be performed due to elevated non-detected results within the site and background data sets (see Table 10-12)

Dissolved cobalt was detected in a single surface water sample (7.1J µg/L in 9SW17). Although the single detected concentration within the dissolved fraction is slightly elevated above the maximum background concentration 3J µg/L; see Table 10-13), this detection is less than the total recoverable screening value of 45 µg/L (a dissolved screening value is not available from the literature or agency compilations). As the filtered fraction of metals more closely approximates their bioavailable fraction in the water column (USEPA, 1999b and 2002), cobalt is not identified as an ecological COC for Tank 214 Area surface water. It is noted that elevated total recoverable cobalt concentrations in surface water samples 9SW17 and 9SW18 (110 µg/L and 220 µg/L, respectively) may be explained by the high turbidity measured in the field for these two samples (97 NTU for 9SW17 and 94.6 for 9SW18 [Baker, 2003]). Total recoverable cobalt concentrations in the three remaining surface water samples with co-located turbidity data (3J µg/L in 9SW14, 1.5J µg/L in 9SW16, and 2J µg/L in 9SW19) are less than the total recoverable screening value. The turbidity measured in these three samples ranged from 4.5 NTU (9SW14 and 9SW16) to 32.8 NTU (9SW19).

Copper

Total recoverable copper was detected in thirteen of fifteen (13/15) surface water samples at concentrations ranging from 8.1J µg/L (9SW15) to 3,100 µg/L (9SW18). Each of the detected concentrations exceeds the total recoverable screening value of 3.73 µg/L. The Step 2 screening level risk estimate (HQ = 831.10; see Table 7-4), derived using the maximum detected total recoverable concentration, indicates that copper may be presenting unacceptable risk to plants, invertebrates, and fish residing within the estuarine wetland. The revised risk estimate (HQ = 677.75; see Table 10-11), derived using the 95 percent UCL of the mean total recoverable concentration (2,528 µg/L), also indicates that copper may be presenting unacceptable risk to these aquatic receptor groups.

The descriptive statistics presented in Table 10-12 show that total recoverable copper concentrations in Tank 214 Area surface water are elevated relative to background concentrations. Specifically, maximum, arithmetic mean, and 95 percent UCL of the mean arsenic concentrations in Tank 214 Area surface water (3,100 µg/L, 339 µg/L, and 2,528 µg/L, respectively) exceed maximum, arithmetic mean, and 95 percent UCL of the mean background concentrations (19J µg/L, 10.3 µg/L, and 14.1 µg/L, respectively). The statistical test evaluating the median and right-tail of the data set distributions (Gehan test and quantile test) also concluded that total recoverable copper concentrations in Tank 214 Area surface water are elevated relative to background concentrations (see Table 10-12).

Dissolved copper was detected in ten of eleven (10/11) Tank 214 Area surface water samples at concentrations ranging from 1.4J µg/L (9SW15) to 3.6J µg/L (9SW22). Two of the detected concentrations (3.5J µg/L in 9SW23 and 3.6J µg/L in 9SW22) are slightly elevated above the maximum background concentration (2.9J µg/L; see Table 10-13) and USEPA NRWQC expressed as a dissolved concentration (3.1 µg/L). However, the 95 percent UCL of the mean dissolved copper concentration in estuarine wetland surface water (2.78 µg/L) is less than the dissolved USEPA NRWQC, indicating

acceptable risk to aquatic receptor group populations. As discussed in Sections 10.1.1 and 10.1.2, copper concentrations in Tank 214 Area surface and subsurface soil are not elevated relative to background concentrations. The descriptive statistics presented in Table 10-10 also show that copper concentrations within the mobile fraction of groundwater (i.e., dissolved fraction) are not elevated relative to background concentrations. As such, there is no indication that dissolved copper concentrations in surface water samples 9SW22 and 9SW23 can be attributed to migration from the Tank 214 Area.

In summary, based on the low magnitude of the maximum dissolved copper concentration above the maximum background concentration and dissolved USEPA NRWQC, comparison of the 95 percent UCL of the mean dissolved copper concentration to the dissolved USEPA NRWQC, and the lack of any indication that copper is migrating from the Tank 214 Area at concentrations greater than what would be expected under background conditions, copper is not identified as an ecological COC for Tank 214 Area surface water. It is noted that elevated total recoverable copper concentrations in surface water samples 9SW17 and 9SW18 (1,500 µg/L and 3,100 µg/L, respectively) may be explained by the high turbidity measured in the field for these two samples (97 NTU for 9SW17 and 94.6 for 9SW18 [Baker, 2003]). Total recoverable copper concentrations in the three remaining surface water samples with co-located turbidity data (65 µg/L in 9SW14, 20J µg/L in 9SW16, and 24 µg/L in 9SW19) are approximately two orders of magnitude less than the two extreme concentrations. The turbidity measured in these three samples ranged from 4.5 NTU (9SW14 and 9SW16) to 32.8 NTU (9SW19).

Lead

Total recoverable lead was detected in eleven of fifteen (11/15) surface water samples at concentrations ranging from 1.7J µg/L (9SW16) to 1,100 µg/L (9SW18). Each of the detected concentrations exceeds the total recoverable screening value of 8.53 µg/L. Three of the detected concentrations (29 µg/L in 9SW19, 84 µg/L in 9SW17, and 1,100 µg/L in 9SW18) exceed the total recoverable screening value of 8.52 µg/L. The Step 2 screening level risk estimate (HQ = 129.11; see Table 7-4), derived using the maximum detected total recoverable concentration, indicates that lead may be presenting unacceptable risk to plants, invertebrates, and fish residing within the estuarine wetland. The revised risk estimate (HQ = 94.85; see Table 10-11), derived using the 95 percent UCL of the mean total recoverable concentration (808 µg/L), also indicates that lead may be presenting unacceptable risk to these aquatic receptor groups.

The descriptive statistics presented in Table 10-12 show that total recoverable lead concentrations in Tank 214 Area surface water are elevated relative to background concentrations. Specifically, maximum, arithmetic mean, and 95 percent UCL of the mean arsenic concentrations in Tank 214 Area surface water (1,100 µg/L, 83.8 µg/L, and 808 µg/L, respectively) exceed maximum, arithmetic mean, and 95 percent UCL of the mean background concentrations (2.5J µg/L, 3.18 µg/L, and 5.00 µg/L, respectively). The statistical test evaluating the median of the data set distributions (Gehan test) also concluded that total recoverable lead concentrations in Tank 214 Area surface water are elevated relative to background concentrations (see Table 10-12). It is noted that statistical tests evaluating the right-tail of the data set distributions could not be performed due to elevated non-detected results within the site and background data sets.

Dissolved lead was not detected within the dissolved fraction of Tank 214 Area surface water. The maximum non-detected concentration (5U µg/L) is less than the USEPA NRWQC expressed as a dissolved concentration (8.1 µg/L). Based on this comparison, lead is not identified as an ecological COC for estuarine wetland surface water. It is noted that elevated total recoverable lead concentrations in surface water samples 9SW17, 9SW18, and 9SW19 (84 µg/L, 1,100 µg/L, and 29 µg/L, respectively) may be explained by the high turbidity measured in the field for these three samples (97 NTU for

9SW17, 94.6 NTU for 9SW18, and 32.8 NTU for 9SW19 [Baker, 2003]). Total recoverable lead concentrations in the two remaining surface water samples with co-located turbidity data (2.3J µg/L in 9SW14 and 1.7J µg/L in 9SW16) are less than the total recoverable screening value. The turbidity measured in both samples was 4.5 NTU.

Nickel

Total recoverable nickel was detected in seven of fifteen (7/15) surface water samples at concentrations ranging from 4.4J µg/L (9SW04) to 200 µg/L (9SW18). Three of the detected concentrations (10.1 µg/L in 9SW01, 77 µg/L in 9SW17, and 200 µg/L in 9SW180) exceed the total recoverable screening value of 8.28 µg/L. The Step 2 screening level risk estimate (HQ = 24.15; see Table 7-4), derived using the maximum detected total recoverable concentration, indicates that nickel may be presenting unacceptable risk to plants, invertebrates, and fish residing within the estuarine wetland. The revised risk estimate (HQ = 11.46; see Table 10-11), derived using the 95 percent UCL of the mean total recoverable concentration (94.9 µg/L), also indicates that nickel may be presenting unacceptable risk to these aquatic receptor groups.

The descriptive statistics presented in Table 10-12 show that total recoverable nickel concentrations in Tank 214 Area surface water are elevated relative to background concentrations. Specifically, maximum, arithmetic mean, and 95 percent UCL of the mean nickel concentrations in Tank 214 Area surface water (200 µg/L, 39.4 µg/L, and 94.9 µg/L, respectively) exceed maximum, arithmetic mean, and 95 percent UCL of the mean background concentrations (2.6J µg/L, 20.9 µg/L, and 40 µg/L, respectively). A statistical test evaluating the mean/median of the data set distributions could not be performed due to the low number of detected concentrations within the background set (45 percent). In addition, statistical tests evaluating the right-tail of the distributions (i.e., quantile test and slippage test) could not be performed because non-detected concentrations in the background data set exceed maximum detected concentrations (see Table 10-12).

Dissolved nickel was not detected within the dissolved fraction of Tank 214 Area surface water. However, the maximum non-detected concentration (40U µg/L) exceeds the USEPA NRWQC expressed as a dissolved concentration (8.2 µg/L). However, as discussed in Sections 10.1.1, 10.1.2, and 10.1.3 and shown in Tables 10-7, 10-8, and 10-10, nickel concentrations in Tank 214 Area surface soil, subsurface soil, and groundwater are not elevated relative to background concentrations. As such, there is no indication that nickel is migrating from the Tank 214 Area to the estuarine wetland at concentrations greater than what would be expected under background conditions. Based on this consideration, nickel is not identified as an ecological COC. It is noted that elevated total recoverable nickel concentrations in surface water samples 9SW17 and 9SW18 (77 µg/L and 200 µg/L, respectively) may be explained by the high turbidity measured in the field for these two samples (97 NTU for 9SW17 and 94.6 NTU for 9SW18 [Baker, 2003]). Total recoverable nickel was not detected in the three remaining surface water samples with co-located turbidity data (9SW14, 9SW16, and 9SW19). The turbidity measured in these three samples ranged from 4.5 NTU (9SW14 and 9SW16) to 32.8 NTU (9SW19).

Vanadium

Total recoverable vanadium was detected in fourteen of fifteen (14/15) surface water samples at concentrations ranging from 23J µg/L (9SW20) to 4,700 µg/L (9SW18). Each of the detected concentrations exceeds the total recoverable screening value of 12 µg/L. The Step 2 screening level risk estimate (HQ = 391.67; see Table 7-4), derived using the maximum detected total recoverable concentration, indicates that vanadium may be presenting unacceptable risk to plants, invertebrates, and fish residing within the estuarine wetland. The revised risk estimate (HQ = 305.83; see Table 10-

11), derived using the 95 percent UCL of the mean total recoverable concentration (3,670 µg/L), also indicates that nickel may be presenting unacceptable risk to these aquatic receptor groups.

The descriptive statistics presented in Table 10-12 show that total recoverable vanadium concentrations in Tank 214 Area surface water are elevated relative to background concentrations. Specifically, maximum, arithmetic mean, and 95 percent UCL of the mean nickel concentrations in Tank 214 Area surface water (4,700 µg/L, 481 µg/L, and 3,670 µg/L, respectively) exceed maximum, arithmetic mean, and 95 percent UCL of the mean background concentrations (25 µg/L, 28.4 µg/L, and 43.9 µg/L, respectively). The statistical tests evaluating the median and right-tail of the data set distributions (Gehan test and quantile test) also concluded that total recoverable vanadium concentrations in Tank 214 Area surface water are elevated relative to background concentrations (see Table 10-12).

Dissolved vanadium was not detected within the dissolved fraction of Tank 214 Area surface water. However, the maximum non-detected concentration (50U µg/L) exceeds the total recoverable screening value of 12 µg/L (a dissolved screening value is not available from the literature or agency compilations). As discussed in Sections 10.1.1 and 10.1.2, vanadium concentrations in Tank 214 Area surface and subsurface soil are not elevated relative to background concentrations. The descriptive statistics presented in Table 10-10 also show that vanadium concentrations within the mobile fraction of groundwater (i.e., dissolved fraction) are not elevated relative to background concentrations. As such, there is no indication that vanadium is migrating to estuarine wetland surface water at concentrations greater than what would be expected under background conditions. Based on this consideration, vanadium is not identified as an ecological COC for surface water.

It is noted that elevated total recoverable vanadium concentrations in surface water samples 9SW17 and 9SW18 (1,700 µg/L and 4,700 µg/L, respectively) may be explained by the high turbidity measured in the field for these two samples (97 NTU for 9SW17 and 94.6 NTU for 9SW18 [Baker, 2003]). Total recoverable vanadium concentrations in the three remaining surface water samples with co-located turbidity data (66 µg/L in 9SW14, 25J µg/L in 9SW16, and 35J µg/L in 9SW19) are over an order of magnitude less than the two extreme concentrations. The turbidity measured in these three samples ranged from 4.5 NTU (9SW14 and 9SW16) to 32.8 NTU (9SW19).

Zinc

Total recoverable zinc was detected in fourteen of fifteen (14/15) surface water samples at concentrations of 6.3J µg/L (9SW02) to 1,300 µg/L (9SW18). Two pf the detected concentrations (480 µg/L in 9SW17 and 1,300 µg/L in 9SW18) exceed the total recoverable screening value of 85.6 µg/L. The Step 2 screening level risk estimate (HQ = 15.19; see Table 7-4), derived using the maximum detected total recoverable concentration, indicates that zinc may be presenting unacceptable risk to plants, invertebrates, and fish residing within the estuarine wetland. The revised risk estimate (HQ = 6.10; see Table 10-11), derived using the 95 percent UCL of the mean total recoverable concentration (522 µg/L), also indicates that zinc may be presenting unacceptable risk to these aquatic receptor groups.

The descriptive statistics presented in Table 10-12 show that total recoverable zinc concentrations in Tank 214 Area surface water are elevated relative to background concentrations. Specifically, maximum, arithmetic mean, and 95 percent UCL of the mean nickel concentrations in Tank 214 Area surface water (1,300 µg/L, 135 µg/L, and 522 µg/L, respectively) exceed maximum, arithmetic mean, and 95 percent UCL of the mean background concentrations (30 µg/L, 17.2 µg/L, and 23.9 µg/L, respectively). The statistical tests evaluating the median and right-tail of the data set distributions were contradictory. The Wilcoxon-Mann-Whitney test concluded that zinc concentrations in estuarine wetland surface water are not elevated relative to background concentrations, while the statistical tests

evaluating the right-tail of the data set distributions (quantile test and slippage test) concluded that zinc concentrations at the site are elevated relative to background concentrations (see Table 10-12). It is noted that ranking tests, such as the Wilcoxon-Mann-Whitney test, cannot detect the magnitude of site concentrations above background concentrations. This deficiency likely resulted in an erroneous conclusion that estuarine wetland surface water concentrations are not elevated relative to background concentrations

Dissolved zinc was detected in two of eleven surface water samples (10J µg/L in 9SW16 and 17J µg/L in 9SW13). Both detections are less than the maximum background concentration (21 µg/L; see Table 10-13) and the USEPA NRWQC expressed as a dissolved concentration (81 µg/L). Based on this comparison, zinc is not identified as an ecological COC for surface water. It is noted that elevated total recoverable zinc concentrations in surface water samples 9SW17 and 9SW18 9SW19 (480 µg/L and 1,300 µg/L, respectively) may be explained by the high turbidity measured in the field for these two samples (97 NTU for 9SW17 and 94.6 NTU for 9SW18 [Baker, 2003]). Total recoverable zinc concentrations in the three remaining surface water samples with co-located turbidity data (23 µg/L in 9SW14, 12J µg/L in 9SW16, and 13J µg/L in 9SW19) are less than the total recoverable screening value. The turbidity measured in these three samples ranged from 4.5 NTU (9SW14 and 9SW16) to 32.8 NTU (9SW19).

In summary, no chemicals were identified as an ecological COC for Tank 214 Area surface water. Although arsenic, cadmium, chromium, cobalt, copper, lead, nickel, vanadium, and zinc were detected within the total recoverable fraction of surface water and identified as ecological COPCs in Step 2 of the SERA, no additional evaluation is recommended based on the discussion presented in the preceding paragraphs. No additional evaluation is also recommended for the non-detected chemicals identified as ecological COPCs in Step 2 of the ERA, including those with maximum non-detected concentrations greater than surface water screening values.

10.1.5 Refined Risk Evaluation for Estuarine Wetland Sediment

Section 7.2.5 presented the results of the Step 2 screening level risk calculation for Tank 214 Area sediment. Screening level risk estimates were also provided in Table 7-5. Acetone, carbon disulfide, acenaphthylene, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, phenanthrene, pyrene, barium, cadmium, chromium, cobalt, copper, lead, selenium, tin, and vanadium were detected and identified as ecological COPCs because maximum detected concentrations exceed sediment screening values. 1,4- Naphthoquinone, beryllium, and thallium were also detected and identified as ecological COPCs based on the lack of sediment screening values. Although not detected, twenty-two VOCs, sixty SVOCs, one PAH (acenaphthene), eight organophosphorous pesticides, and two metals (antimony and silver) were identified as ecological COPCs because maximum non-detected concentrations exceed sediment screening values. Finally, 4-nitroquinoline-1-oxide was identified as an ecological COC based on the lack of any usable data (all sediment analytical data for this SVOC were rejected during data validation activities).

The refined risk calculation for Tank 214 Area sediment is presented in Table 10-14. Risk estimates were re-calculated using 95 percent UCL of the mean concentrations for those ecological COPCs with data sets having a minimum of eight data points and four detected values (acetone, carbon disulfide, chrysene, benzo[a]anthracene, benzo[a]pyrene, benzo[g,h,i]perylene, chrysene, indeno[1,2,3-cd]pyrene, phenanthrene, pyrene, barium, cadmium, cobalt, copper, lead, selenium, tin, and vanadium). Additional refinements applied in Step 3a of the ERA for sediment are identified and discussed within Section 10.0.

4-Nitroquinoline-1-oxide was identified as an ecological COPC in Step 2 of the ERA because all sediment analytical data for this SVOC were rejected during data validation activities. However, for the reasons discussed in Section 10.1.2 (i.e., industrial uses), this organic chemical is not likely to be associated with historical site activities (storage of AVGAS and DFM in underground tanks), and therefore is not likely to be present in abiotic media at the site. For this reason, 4-nitroquinoline-1-oxide is not identified as an ecological COC for sediment, and no additional evaluation is recommended.

Twenty-two VOCs were identified as ecological COPCs in Step 2 of the ERA because maximum non-detected concentrations exceed sediment screening values. With the exception of xylenes (total), these VOCs were not detected in Tank 214 Area surface soil, subsurface soil, or groundwater (see Appendix A). The absence of detected concentrations in surface soil, subsurface soil, and groundwater for the remaining twenty-one non-detected VOCs indicates that these organic chemicals are not likely to be site-related, nor are they likely to be present in sediment. As such, they are not identified as ecological COCs, and no additional evaluation is recommended.

Xylenes (total) were detected in three of forty-five surface soil samples (9.6J µg/kg in 9SB20-00, 15J µg/kg in 9SB16-00, and 680J µg/kg in 9SB19-00), as well as one of eight subsurface soil samples (2.5 µg/kg in 9SB51-01). This VOC was not detected in Tank 214 Area groundwater. With the exception of the detected concentration in suface soil collected at 9SB19, the magnitude of the detected concentrations is low. An examination of the analytical data for surface soil sampling locations established topographically downgradient from 9SB19, including 9SB03, 9SB04, 9SB06, 9SB10, 9SB11, 9SB12, 9SB13, and 9SB15, shows that xylenes are not migrating with surface run-off toward the estuarine wetland. As evidenced by the analytical data in Appendix A, xylenes were not detected in the downgradient surface soil samples. This can be attributed to the densely vegetated coastal scrub forest community at and contiguous to the Tank 214 Area. Based on the low frequency of detection in abiotic media at the Tank 214 Area, as well as the lack of any indication that this VOC is migrating with surface run-off or groundwater to the estuarine wetland, xylenes are not identified as an ecological COC, and no additional evaluation is recommended.

Sixty-four SVOCs were identified as ecological COPCs in Step 2 of the ERA because maximum non-detected concentrations exceed sediment screening values. With the exception of 2,4-dichlorophenol, bis(2-chloroethyl)ether, dibenzofuran, di-n-butyl phthalate, and o-toluidine, these SVOCs were not detected in Tank 214 Area surface soil, subsurface soil, or groundwater (see Appendix A). The absence of detected concentrations in surface soil, subsurface soil, and groundwater for the remaining fifty-nine non-detected SVOCs indicates that these organic chemicals are not likely to be site-related, nor are they likely to be present in sediment. For this reason, they are not identified as ecological COCs, and no additional evaluation is recommended.

2,4-Dichlorophnol, bis(2-chloroethyl)ether, dibenzofuran, and o-toluidine were each detected in a single groundwater sample at low, estimated concentrations (2,4-dichlorophenol was detected in 9GW02 at 2.1J µg/L, bis(2-chloroethyl)ether and dibenzofuran were detected in 9GW25 at 1.1J µg/L and 7.9J µg/L, respectively, and o-toluidine was detected in 9GW06 at 2J µg/L), while di-n-butyl-phthalate was detected in one of twenty-six (1/26) surface soil samples (40J µg/kg in 9SS03). Based on their low frequency and magnitude of detection in abiotic media in abiotic media collected at the Tank 214 Area, it is unlikely that these five SVOCs are migrating to estuarine wetland sediment at ecologically important concentrations. As such, they are not identified as ecological COC for sediment, and no additional evaluation is recommended.

Eight non-detected organophosphorous pesticides (dimethoate, disulfoton, famphur, ethyl parathion, methyl parathion, phorate, sulfotep, and thionazin) were identified as ecological COPCs in Step 2 of

the ERA because maximum non-detected concentrations exceed sediment screening values. None of these organophosphorous pesticides were detected in Tank 214 Area surface soil, subsurface soil, or groundwater (see Appendix A). The absence of detected concentrations in abiotic media at the site indicates that these chemicals are not likely to be site-related, nor are they likely to be present in estuarine wetland sediment. For this reason, they are not identified as ecological COCs, and no additional evaluation is recommended.

Antimony and silver were identified as ecological COPCs for sediment because maximum non-detected concentrations exceed sediment screening values (HQs = 2.95 for antimony and 3.96 for silver). In the case of antimony, this metal was not detected in Tank 214 Area surface soil, subsurface soil, or groundwater (see Appendix A). The absence of detected concentrations in upgradient abiotic media indicates that antimony is not likely to be site-related, nor is it likely to be present in sediment at ecologically important concentrations. Based on the relatively low Step 2 screening level risk estimate (2.95), as well as the lack of detections in surface soil, subsurface soil, and groundwater, antimony is not identified as an ecological COC for Tank 214 Area sediment, and no additional evaluation of this metal is recommended.

Silver was detected in seven of forty-seven (7/47) surface soil samples at low, estimated concentrations ranging from 0.04J mg/kg to 0.13J mg/kg. This metal was also detected within the total recoverable fraction of one groundwater sample (1.2J µg/L). Silver was not detected in Tank 214 Area subsurface soil, nor was this metal detected within the dissolved fraction of Tank 214 Area groundwater. The maximum detected concentration in total recoverable groundwater (0.13J µg/L) is less than the maximum background concentration (30.1 µg/L [Baker, 2010]), indicating that silver is not likely to be migrating with groundwater to the estuarine wetland at concentrations greater than what would be expected under background conditions. Silver was not detected in background surface soil. However, sixteen non-detected background concentrations exceed the maximum detected concentration in Tank 214 Area surface soil. In addition, non-detected concentrations in estuarine wetland sediment greater than the screening value were reported for eleven samples collected during the 2000 CMS field investigation, Non-detected silver concentrations for the fifty-three sediment samples collected during the 2007 Phase I RFI and 2009 Full RFI field investigations were less than the sediment screening value. The recent data suggest that silver is not present in sediment at ecologically important concentrations. Based on the discussion presented above, silver is not identified as an ecological COC for sediment, and no additional evaluation of this metal is recommended.

Beryllium and thallium were detected in sediment and identified as ecological COPCs in Step 2 of the ERA based on the lack of sediment screening values. Beryllium was detected in fifty-one of sixty-eight (51/68) sediment samples at concentrations ranging from 0.12J mg/kg (9SD03) to 0.37J mg/kg (9SDBKG01), while thallium was detected in just four of sixty-eight (4/68) sediment samples (6.3J mg/kg in 9SDUVF-20, 0.34J mg/kg in 9SD104, 0.27J mg/kg in 9SD95, and 0.34J mg/kg in 9SD102). The descriptive statistics presented in Table 10-15 indicate that beryllium concentrations in estuarine wetland sediment are comparable to background levels. Specifically, maximum and 95 percent UCL of the mean concentrations (0.37J mg/kg and 0.25 mg/kg, respectively) are slightly elevated above maximum and 95 percent UCL of the mean background concentrations (0.28 mg/kg and 0.20 mg/kg, respectively), while the arithmetic mean concentration (0.25 mg/kg) is slightly less than the arithmetic mean background concentration (0.28 mg/kg). The statistical test evaluating the median of the data set distributions concluded that beryllium concentrations in sediment are elevated relative to background concentrations. The side-by-side probability plots depicting detected beryllium concentrations in estuarine wetland and background sediment support the conclusion of the Gehan test. It is noted that no detected concentrations within the combined data set are identified as a potential outlier by Rosner's outlier test. A probability plot depicting beryllium concentrations in a combined data set also shows that individual data points, including data points at the upper end of the range, fall along a strainght line

and form a continuous distribution. Data points that exhibit these characteristics are likely to represent natural conditions (NFESC, 2002, 2003, and 2004). Based on the descriptive statistics presented in Table 10-15, the probability plot depicting beryllium concentrations in the combined data set, and Rosner's outlier test, beryllium is not identified as an ecological COC for Tank 214 Area sediment, and no additional evaluation of this metal is recommended.

As discussed within the preceding paragraph, thallium was detected at a low frequency in Tank 214 Area sediment (4/68). This metal was not detected in background sediment. Based on the low frequency of the detection in sediment, thallium is not identified as an ecological COC for estuarine wetland sediment.

Acetone was detected in forty-five of fifty-four (45/54) sediment samples at concentrations ranging from 10J µg/kg (9SDBKG01) to 1,900J µg/kg (9SD100). The Step 2 screening level risk estimate (HQ = 23.63; see Table 7-5) indicates that this VOC may be presenting unacceptable risk to plants, invertebrates and fish residing within the estuarine wetland. The refined risk estimate (5.42; see Table 10-14), derived using the 95 percent UCL of the mean concentration (436 µg/kg), also indicates that acetone may be presenting unacceptable risk to aquatic receptor group populations. The sediment screening value used for acetone in the Step 2 screening level risk calculation and Step 3a refined risk calculation is an EqP-based value derived in accordance with the procedures presented in Appendix B. As discussed in Appendix B, the EqP approach derives a sediment benchmark by setting the dissolved chemical concentration in pore water equal to the surface water benchmark and calculates a corresponding particle-sorbed chemical concentration. This approach is appropriate for highly sorptive chemicals (e.g., PAHs), but it produces overly conservative sediment quality benchmarks for VOCs (Fuchsman, 2003). To further evaluate the significance of acetone detections in sediment, an alternative screening value was identified from the literature. Di Toro and McGrath (2000) developed a narcosis target lipid model that provides a method to evaluate the impact TOC has on the bioavailability of organic chemicals. Based on this model and an assumed TOC of one percent, Di Toro and McGrath (2000) report a SQG of 2,265 µg/kg. The maximum detected acetone concentration in sediment (1,900J µg/kg) is less than the Di Toro and McGrath (2000) SQG. Furthermore, given that the minimum TOC concentration measured in sediment was 34,000 mg/kg (i.e., 3.4 percent), the Di Toro and McGrath (2000) target lipid model would predict even lower potential for bioavailability when site-specific TOC is considered (i.e., SQG of 7,701 µg/kg for acetone based on 3.4 percent TOC). Based on the comparison of maximum concentrations to the SQG value developed by Di Toro and McGrath (2000), acetone is not identified as an ecological COC for sediment, and no additional evaluation of this VOC is recommended.

Carbon disulfide was detected in thirty of fifty-seven (30/57) sediment samples at concentrations ranging from 2.4J µg/kg (9SD91) to 480J µg/kg (9SD59). The Step 2 screening level risk estimate (HQ = 43.31; see Table 7-5), calculated using the maximum detected concentration, indicates that this VOC may be presenting unacceptable risk to plants, invertebrates, and fish residing within the estuarine wetland. The refined risk estimate (HQ = 4.61; see Table 7-14), derived using the 95 percent UCL of the mean concentration (51.17 µg/kg), also indicates that carbon disulfide may be presenting unacceptable risk to aquatic receptor group populations. Identical to acetone, the sediment screening value used for carbon disulfide in the Step 2 screening level risk calculation and Step 3a refined risk calculation is an EqP-based value derived in accordance with the procedures presented in Appendix B. As discussed in the preceding paragraph, the EqP approach is appropriate for highly sorptive chemicals (e.g., PAHs), but it produces overly conservative sediment quality benchmarks for VOCs (Fuchsman, 2003). Regardless, uses for carbon disulfide (manufacture of carbon tetrachloride, sodium sulfite, mineral flotation agents, xanthates, mercaptans, and thioureas; solvent for fats, lipids, resins, rubers, sulfer monochloride, and white phosphorous [HSDB, 2014]), indicate that detections in sediment are not likely to be associated with historical activities at the SWMU (storage of AVGAS and DFM in

underground tanks). It is noted that this VOC occurs naturally in the environment from bacterial sulfate reduction and biodegradation of organic material (USEPA, 1994 and Reddy and Delaune, 2008), Soils, tidally influenced marine sediments and salt marshes within coastal regions, and other areas of high biological productivity tend to be the largest biogenic sources (Environment Canada and Health Canada, 2000, Reddy and Delaune, 2008, and HSDB, 2014). As such, biogenic sources are likely responsible for carbon disulfide detections in estuarine wetland sediment.

Nine PAHs (acenaphthylene, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene) were identified as ecological COPCs because maximum detected concentrations exceed sediment screening values. For those PAHs with data sets having a minimum of eight data points and four detected values (benzo[a]anthracene, benzo[a]pyrene, benzo[g,h,i]perylene, chrysene, indeno[1,2,3-cd]pyrene, phenanthrene, and pyrene], risk estimates were re-calculated using 95 percent UCL of the mean concentrations. As evidenced by Table 10-14, refined risk estimates for benzo(a)anthracene, benzo(g,h,i)perylene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene are less than 1.0 (HQs = 0.14, 0.15, 0.14, 0.21, and 0.95, respectively), indicating acceptable risk to aquatic receptor group populations, while HQ values for benzo(a)pyrene and chrysene are only slightly elevated above 1.0 (HQs = 1.07 and 1.29, respectively). A refined risk estimate for acenaphthylene and dibenz(a,h)anthracene were not derived due to their low frequency of detection in sediment (1/87 for each PAH).

The screening values used in the Step 2 screening level risk calculation and Step 3a refined risk calculation for PAHs were literature-based, bulk sediment screening values (i.e., TEL or AET values; see Table 5-3). These bulk sediment screening values do not take into consideration site-specific factors that can influence bioavailability. For nonionic, organic chemicals such as PAHs, the primary factor affecting bioavailability is TOC (USEPA 1993b, Di Toro and McGrath, 2000, and Fuchsman, 2003). Di Toro and McGrath (2000) developed a narcosis target lipid model that provides a method to evaluate the impact TOC has on the bioavailability of organic chemicals. Based on this model and an assumed organic carbon content of one percent, Di Toro and McGrath (2000) report SQGs of 7,656 µg/kg for acenaphthylene, 14,222 µg/kg for benzo(a)anthracene, 16,324 µg/kg for benzo(a)pyrene, 18,515 µg/kg for benzo(g,h,i)perylene, 14,268 µg/kg for chrysene, 18,983 µg/kg for dibenz(a,h)anthracene, 18,874 µg/kg for indeno(1,2,3-cd)pyrene, 10,086 µg/kg for phenanthrene, and 11,792 µg/kg for pyrene. Becasue maximum detected concentrations for each of the PAHs are less than the Di Toro and McGrath (2000) SQGs, it is unlikely that detections above bulk sediment screening values are ecologically relevant. Given that the minimum TOC concentration measured in sediment was 34,000 mg/kg (i.e., 3.4 percent), the narcosis target lipid model would predict even lower potential for bioavailability when site-specific TOC is considered. As evidenced by the embedded table below, maximum detected concentrations for each of the mentioned PAHs are less than SQGs based on the Di Toro and McGrath (2000) target lipid model and the minimum TOC concentration measured in Tank 214 Area sediment.

Chemical	**Maximum Concentration (µg/kg)**	**Sediment Quality Guideline (µg/kg)**	**Hazard Quotient**
Acenaphthylene	8.2J	26,029	<0.01
Benzo(a)anthracene	110J	48,356	<0.01
Benzo(a)pyrene	1,300J	55,503	0.02
Benzo(g,h,i)perylene	1,300J	62,950	0.02
Chrysene	1,100J	48,512	0.02
Dibenz(a,h)anthracene	11J	64,544	<0.01
Indeno(1,2,3)cd-pyrene	1,100J	64,172	0.02

Chemical	Maximum Concentration (µg/kg)	Sediment Quality Guideline (µg/kg)	Hazard Quotient
Phenanthrene	360J	34,293	0.01
Pyrene	1,400J	40,092	0.03

Because PAH toxicities in sediments are additive or nearly additive (USEPA 2003c), a comparison of the maximum total PAH concentration in sediment to a total PAH SQG is appropriate. In addition to individual PAH SQGs, Di Toro and McGrath (2000) used the narcosis target lipid model to developed a total PAH SQG based on one percent organic carbon (5.69 micromoles per gram organic carbon [µmol/g OC] or 10,443 µg/kg [represents an average of acenaphthene, anthracene, fluoranthene, phenanthrene, and pyrene]). The sum of maximum PAH concentrations across the SWMU (10,626 µg/kg; maximum non-detected concentrations used for non-detected PAHs) is slightly elevated above the total PAH SQG based on one percent organic carbon, but is less than the total PAH SQG adjusted to reflect the minimum TOC concentration measured in Tank 214 Area sediment (33,506 µg/kg).

Although the narcosis target lipid model presented within the preceding paragraphs predicts low bioavailability for the detected PAHs identified as ecological COPCs in Step 2 of the ERA, benzo(a)pyrene, chrysene, and pyrene were detected at a relatively high frequency above sediment screening values. Benzo(a)pyrene, was detected in sediment collected at eight locations within the estuarine wetland at concentrations greater than the screening value (1,300J µg/kg at 9SD20, 120J µg/kg at 9SD21, 330 µg/kg at 9SD72, 660J µg/kg at 9SD90, 370J µg/kg at 9SD91, 960J µg/kg at 9SD92, 310J µg/kg at 9SD94, and 180J µg/kg at 9SD99). As evidenced by Figure 4-4, four of these sample locations (9SD90, 9SD91, 9SD92, and 9SD94) were established in close proximity to one another, downgradient from a soil excavation conducted in 2006 as part of an ICM to remove lead-contaminated surface soil. Petroleum-impacted soil was discovered on the floor of this excavation, at a depth of approximately 1.0 foot (Baker, 2014). Each of the detected concentrations at these four sample locations exceeds the sediment screening value (TEL of 88.8 µg/kg [MacDonald, 1994]). The detected concentration in sediment collected at 9SD92 (960J µg/kg) also exceeds the PEL of 763 µg/kg developed by MacDonald (1994). As discussed in Section 5.1.3, the PEL represents the lower limit of the range of sediment concentrations that are usually or always associated with adverse biological effects. Based on the location of 9SD90, 9SD91, 9SD02, and 9SD94 relative to the petroleum-impacted soil discovered during the 2006 ICM, the elevated concentrations are likely associated with site activities at the Tank 214 Area.

Two smaller sample clusters with elevated bemzo(a)pyrene concentrations were identified within the estuarine wetland. As evidenced by Figure 4-4, 9SD20 and 9SD99 are located in close proximity to one another. Detected concentrations in sediment collected at these two locations (1,300J µg/kg at 9SD20 and 180J µg/kg at 9SD99) exceed the TEL value. The detected concentration in sediment collected at 9SD20 also exceeds the PEL value. The second cluster is represented by sample locations 9SD21 and 9SD72. Benzo(a)pyrene concentrations in sediment collected at these two locations (120J µg/kg in 9SD21 and 330 µg/kg at 9SD72) exceed the TEL value. Both clusters are located near the shoreline, downgradient from Tank 214.

In addition to benzo(a)pyrene, elevated chrysene and pyrene concentrations also exhibit clustering characteristics within the estuarine wetland. Chrysene was detected in sediment collected at fourteen locations at concentrations greater than the screening value. As evidenced by Figure 4-4, eleven of these sample locations (9SD20, 9SD39, 9SD41, 9SD45, 9SD47, 9SD59, 9SD90, 9SD91, (SD92, 9SD94, and 9SD95) form a large cluster downgradient from the petroleum-impacted soil discovered during the 2006 ICM. Chrysene concentrations in sediment collected at these locations range from 110J µg/kg (9SD41 and 9SD47) to 880J µg/kg (9SD92). Each of the detected concentrations exceeds

the screening value (TEL of 108 µg/kg [MacDonald, 1994]). The detected concentration in sediment collected at 9SD92 (880J µg/kg) also exceeds the PEL of 846 µg/kg developed by MacDonald (1994). It is noted that the area encompassed by these eleven sample locations includes sample locations with elevated benzo(a)pyrene concentrations (i.e., sample locations 9SD90, 9SD91, 9SD92, and 9SD94).

Chrysene was also detected in sediment collected from a small cluster of two sample locations at concentrations greater than the TEL (1,100J µg/kg in sediment collected at 9SD53 and 650 µg/kg in sediment collected at 9SD72). The detected concentration at 9SD53 also exceeds the PEL. As evidenced by Figure 4-4, 9SD53 and 9SD72 were established near the shoreline, downgradient from Tank 214. It is noted that benzo(a)pyrene was also detected at an elevated concentration in sediment collected at 9SD72 (330 µg/kg).

In the case of pyrene, this PAH was detected in sediment collected at ten locations within the estuarine wetland at concentrations greater than the screening value. As evidenced by Figure 4-4, seven of these sample locations form a cluster downgradient from the petroleum-impacted soil discovered during the 2006 ICM (9SD59, 9SD90, 9SD91, 9SD92, 9SD94, 9SD95, and 9SD99). Pyrene concentrations in sediment collected at these locations range from 140J µg/kg (9SD91) to 870J µg/kg (9SD95). Each of the detected concentrations exceeds the screening value (TEL of 153 µg/kg [MacDonald, 1994]). Many of the sample locations within this cluster also exhibited elevated benzo(a)pyrene and chrysene concentrations.

Pyrene was also detected in sediment collected from a small cluster of two sample locations at concentrations greater than the TEL value (1,400J µg/kg in sediment collected at 9SD53 and 380J µg/kg in sediment collected at 9SD72). The detected concentration at 9SD53 also exceeds the PEL value of 1,398 µg/kg developed by MacDonald (1994). As discussed within the preceding paragraphs, benzo(a)pyrene and/or chrysene were also detected at elevated concentrations in sediment collected at these two sample locations.

Based on the analysis presented within the preceding paragraphs, benzo(a)pyrene, chrysene, and pyrene are identified as ecological COCs for estuarine wetland sediment. For each PAH, elevated concentrations (i.e., concentrations greater than sediment screening values) were detected at locations clustered downgradient from potential sources. In many cases, elevated concentrations were co-located. The remaining detected PAHs identified as ecological COPCs in Step 2 of the ERA (acenaphthylene, benzo[a]anthracene, benzo[g,h,i]perylene, dibenz[a,h]anthracene, indeno[1,2,3-cd]pyrene, and phenanthrene) do not exhibit clustering characteristics within the estuarine wetland. In fact, acenaphthylene, benzo(g,h,i)perylene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, and phenanthrene were each detected in only a single sediment sample at concentrations greater than their respective screening value, while benzo(a)anthracene was detected in a total of two sediment samples at concentrations greater than the screening value. These six PAHs are not identified as ecological COPCs based on their low frequency of detection above screening values, refined HQ value less than 1.0 (in the case of benzo[a]anthracene, benzo[g,h,i]perylene, indeno[1,2,3-cd]pyrene, and phenanthrene), and low bioavailability predicted by the narcosis target lipid model).

In addition to the detected PAHs discussed within the preceding paragraphs, acenaphthene was identified as an ecological COPC because the maximum non-detected concentration (3,600U µg/kg in 9SD04) exceeds the sediment screening value. Identical to the detected PAHs identified as ecological COPCs, the screening value used for acenaphthene in Step 2 of the ERA was a bulk sediment screening value (TEL). As discussed, bulk sediment screening values do not take into consideration site-specific factors (i.e., TOC) that can influence the bioavailability and toxicity of PAHs. Based on the Di Toro and McGrath (2000) target lipid model and an assumed organic carbon content of one percent, an EqP-based SQG of 7,656 ug/kg is derived for acenaphthylene. Given that the maximum non-detected

concentration is less than the SQG, it is unlikely that this PAH is present in sediment at ecologically important concentrations.

Barium, cadmium, chromium, cobalt, copper, lead, selenium, tin, and vanadium were identified as ecological COPCs in Step 2 of the SERA because maximum detected concentrations exceed sediment screening values. To further evaluate the potential significance of risks presented by these nine metals, risk estimates (i.e., HQ values) were re-calculated using 95 percent UCL of the mean concentrations (Table 10-14). In addition to the re-calculation of risk estimates using 95% UCL of the mean concentrations, the Tank 214 Area sediment data were statistically compared to the NAPR basewide background estuarine wetland sediment data set contained within the Revised Final II Summary Report for Environmental Background Concentrations of Inorganic Compounds (Baker, 2010). Statistical evaluations were conducted in accordance with USEPA (2013c) and Navy guidance (NFESC, 2003) using USEPA Version 5.0.00 software (USEPA, 2013b). Supporting statistics for the Tank 214 Area and background data sets are provided in Appendix H. The refined risk evaluation also took into consideration the magnitude and spatial distribution of arsenic, cobalt, copper, lead, selenium, thallium, vanadium, and zinc detections above sediment screening values and/or background concentrations. Finally, in the case of cadmium, copper, and lead, consideration was given to SEM-to-AVS ratios in sediment. A summary of the AVS and SEM analytical data is presented in Table 10-16.

Barium

Barium was detected in sixty-seven of sixty-eight (67/68) sediment samples at concentrations ranging from 12 mg/kg (9SD18. 9SD20, and 9SD22) to 54 mg/kg (9SD44). Two of the detected concentrations exceed the sediment screening value of 48.0 mg/kg (maximum detected concentration and detected concentration in 9SDUVF-20 [51 mg/kg]). The Step 2 screening level risk estimate (HQ = 1.13; see Table 7-5), derived using the maximum detected concentration, indicates that this metal may be presenting unacceptable risk to aquatic receptor groups within the estuarine wetland. However, the refined risk estimate (HQ = 0.55; see Table 10-14), calculated using the 95 percent UCL of the mean concentration (26.3 mg/kg), indicates that barium is not presenting unacceptable risk to aquatic receptor group populations.

The descriptive statistics presented in Table 10-15 show that maximum, arithmetic mean, and 95 percent UCL of the mean barium concentrations in Tank 214 Area sediment (54 mg/kg, 21.4 mg/kg, and 26.3 mg/kg, respectively) exceed maximum, arithmetic mean, and 95 percent UCL of the mean background concentrations (30 mg/kg, 13.6 mg/kg, and 15.9 mg/kg, respectively). The statistical tests evaluating the median and right-tail of the data set distributions (Wilxoxon-Mann-Whitney test and quantile test) were contradictory. The Wilcoxon-Mann-Whitney test concluded that barium concentrations in Tank 214 Area sediment are elevated relative to background concentrations, while the quantile test did not detect a significant difference. The side-by-side probability plots depicting detected barium concentrations in site and background sediment support the conclusion of the Wilcoxon-Mann-Whitney test. As evidenced by the plots, there are six data points within the site data set at the upper end of the range that are elevated relative to background concentrations and other detected concentrations at the SWMU. These six data points are also identified as potential outliers within the combined data set by Rosner's outlier test.

Although the statistical test evaluating the median of the data set distributions concluded that barium concentrations in estuarine wetland sediment are elevated relative to background concentrations, and the side-by-side probability plots show data points within the site data set at the upper end of the range that are elevated relative to background concentrations, barium is not identified as an ecological COC. This decision is based on the low frequency and magnitude of detected cocnentrations above the

sediment screening value, as well as the refined risk estimate (HQ = 0.55), which indicates that barium concentrations are not presenting unacceptable risk to aquatic receptor group populations.

Cadmium

Cadmium was detected in nine of sixty-eight (9/68) sediment samples at concentrations ranging from 0.068J mg/kg (9SD85) to 0.95J mg/kg (9SDUVF-20). Only the maximum detected concentration exceeds the sediment screening value of 0.7 mg/kg. The Step 2 screening level risk estimate (HQ = 1.41; see Table 7-5), derived using the maximum detected concentration, indicates that this metal may be presenting unacceptable risk to plants, invertebrates and fish residing within the estuarine wetland. However, the refined risk estimate (HQ = 0.17; see Table 10-14), derived using the 95 percent UCL of the mean concentration (0.12 mg/kg), indicates that cadmium is not presenting unacceptable risk to aquatic receptor group populations.

The descriptive statistics presented in Table 10-15 show that cadmium concentrations in Tank 214 Area sediment are not elevated relative to background concentrations. Specifically, the maximum detected concentration in Tank 214 Area sediment (0.95J mg/kg) is equal to the maximum background concentrations, while arithmetic mean and 95 percent UCL of the mean concentrations (0.31 mg/kg and 0.12 mg/kg, respectively) are less than arithmetic mean and background concentrations (1.07 mg/kg and 0.54 mg/kg, respectively). Statistical tests evaluating the mean/median of the data set distributions could not be performed due to the low frequency of detection within the Tank 214 Area and background data sets (31.8 percent and 13.2 percent, respectively). In addition, statistical tests evaluating the right-tail of the data set distributions could not be performed because non-detected results in each data set exceed maximum detected concentrations (NFESC, 2003).

The AVS and SEM analytical data for Tank 214 Area sediment are summarized in Table 10-16. As evidenced by the table, SEM-to-AVS ratios for sediment collected at 82 of 87 locations are less than 1.0, indicating that benthic invertebrates throughout much of the wetland are not being exposed to toxic concentrations of cadmium in sediment pore water. SEM-to-AVS ratios in the five remaining sediment samples exceed 1.0 (1.01 in 9SD23, 1.21 in 9SD41, 1.69 in 9SD49, 1.33 in 9SD109, and 2.79 in 9SD179). However, as evidenced by Table 10-16, cadmium was not detected in the SEM fraction of 9SD41, 9SD49, 9SD109, and 9SD179, while the cadmium concentration in the SEM fraction of 9SD23 (0.0002J µmole/gram) is less than the AVS concentration (0.35 µmole/gram). These data indicate that cadmium is not responsible for the elevated SEM-to-AVS ratios at 9SD23, 9SD41, 9SD49, 9SD109, and 9SD179.

In summary, based on the low frequency and magnitude of detected concentration above the sediment screening value, the refined risk estimate, which indicates acceptable risk to aquatic receptor group populations, the descriptive statistics presented in Table 10-15, as well as the SEM and AVS analytical data and SEM-to-AVS ratios presented in Table 10-16, cadmium is not identified as an ecological COC for sediment, and no further evaluation of this metal is recommended.

Chromium

Chromium was detected in each sediment sample (68/68) at concentrations ranging from 10 mg/kg (9SD19) to 58J mg/kg (9SD95). Only the maximum detected concentration exceeds the sediment screening value of 52.3 mg/kg. The Step 2 screening level risk estimate (HQ = 1.11; see Table 7-5), derived using the maximum detected concentration, indicates that this metal may be presenting unacceptable risk to plants, fish, and aquatic invertebrates residing within the estuarine wetland. However, the refined risk estimate (HQ = 0.48; see Table 10-14), calculated using the 95 percent UCL

of the mean concentration (25.3 mg/kg), indicates that barium is not presenting unacceptable risk to aquatic receptor group populations.

The descriptive statistics presented in Table 10-15 show that chromium concentrations in Tank 214 Area sediment are not elevated relative to background concentrations. Although the maximum chromium concentration in site sediment (58J mg/kg) is slightly elevated above the maximum background concentration (54 mg/kg), arithmetic mean and 95 percent UCL of the mean concentrations (23.9 mg/kg and 25.3 mg/kg, respectively) are less than arithmetic mean and 95 percent UCL of the mean background concentrations (26.1 mg/kg and 30.7 mg/kg, respectively). The statistical tests evaluating the median and right-tail of the data set distributions (Wilcoxon-Mann-Whitney test and quantile test) also concluded that chromium concentrations in Tank 214 Area sediment are not elevated relative to background concentrations.

In summary, based on the low frequency and magnitude of detected concentrations above the sediment screening value, the refined risk estimate (HQ = 0.48; see Table 10-14), which indicates acceptable risk to aquatic receptor group populations, and the descriptive and distributional statistics summarized in Table 10-15, chromium is not identified as an ecological COC for sediment, and no additional evaluation of this metal is recommended.

Cobalt

Cobalt was detected in each sediment sample (68/68) at concentrations ranging from 4.4J mg/kg (9SD99) to 16J mg/kg (9SD47). Seven of the detected concentrations exceed the sediment screening value of 10.0 mg/kg. The Step 2 screening level risk estimate (HQ = 1.60; see Table 7-5), derived using the maximum detected concentration, indicates that this metal may be presenting unacceptable risk to plants, invertebrates, and fish residing within the estuarine wetland. However, the refined risk estimate (HQ = 0.83; see Table 10-14), calculated using the 95 percent UCL of the mean concentration (8.35 mg/kg), indicates that chromium is not presenting unacceptable risk to aquatic receptor group populations.

As evidenced by the descriptive statistics presented in Table 10-15, cobalt concentrations in Tank 214 Area sediment are not elevated relative to background concentrations. Specifically, maximum, arithmetic mean, and 95 percent UCL of the mean concentrations in site sediment (16J mg/kg, 7.90 mg/kg, and 8.35 mg/kg, respectively) are less than maximum, arithmetic mean, and 95 percent UCL of the mean background concentrations (27 mg/kg, 8.44 mg/kg, and 11.5 mg/kg, respectively). The statistical tests evaluating the median and right-tail of the data set distributions (Wilcoxon-Mann-Whitney test, and quantile test) were contradictory. The Wilcoxon-Mann-Whitney test concluded that cobalt concentrations in estuarine wetland sediment are elevated relative to background concentrations, while the quantile test did not detect a significant difference. The side-by-side probability plot supports the conclusion of the quantile test. As evidenced by the plot, cobalt concentrations in background sediment at the upper end of the range exceed concentrations in Tank 214 Area sediment.

Based on the low magnitude of the maximum detected concentration above the sediment screening value (HQ = 1.60), the refined risk estimate (HQ = 0.84), which indicates acceptable risk to aquatic receptor group populations), the descriptive and distributional statistics presented in Table 10-15, as well as the side-by-side probability plot, cobalt is not identified as an ecological COC for Tank 214 Area sediment, and no further evaluation of this metal is recommended.

Copper

Copper was detected in each sediment sample (sixty-eight of sixty-eight [68/68] at concentrations ranging from 52J mg/kg (9SD19) to 140J mg/kg (9SDBKG01 and 9SD39). Each of the detected concentrations exceeds the sediment screening value of 18.7 mg/kg. The Step 2 screening level risk estimate (HQ = 7.49; see Table 7-5), derived using the maximum detected concentration, indicates that this metal may be presenting unacceptable risk to aquatic receptor groups. The Step 3a refined risk estimate (HQ = 4.80; see Table 10-14) also indicates that copper may be presenting unacceptable risk to aquatic receptor group populations.

As evidenced by Table 10-15, the maximum detected copper concentration in Tank 214 Area sediment (140J mg/kg) is equal to the maximum background concentration. However, arithmetic mean and 95 percent UCL of the mean concentrations (85.9 mg/kg and 89.8 mg/kg, respectively) exceed arithmetic mean and 95 percent UCL of the mean background concentrations (61.8 mg/kg and 74.8 mg/kg, respectively). The statistical tests evaluating the median and right-tail of the data set distributions (Wilxoxon-Mann-Whitney test and quantile test) were contradictory. The Wilcoxon-Mann-Whitney test concluded that copper concentrations in Tank 214 Area sediment are elevated relative to background concentrations, while the quantile test did not detect a significant difference. The side-by-side probability plots depicting detected copper concentrations in Tank 214 Area sediment and background sediment show that copper concentrations at the site are generally elevated above background concentrations. This is also shown by the side-by-side box plots. However, no data points within the combined Tank 214 Area and background data set are identified as potential outliers by Rosner's outlier test.

The SEM and AVS analytical data (see Table 10-16) show that SEM-to-AVS ratios for sediment collected at 82 of 87 sediment samples are less than 1.0, indicating that benthic invertebrates throughout much of the wetland are not being exposed to toxic concentrations of copper in sediment pore water. Of the five sediment samples have SEM-to-AVS ratios greater than 1.0 (1.01 in 9SD23, 1.21 in 9SD41, 1.69 in 9SD49, 1.33 in 9SD109, and 2.79 in 9SD179), only 9SD179 has a SEM copper concentration (0.23 µmole/gram) that exceeds the AVS concentration (0.18UJ µmole/gram).

Based on the descriptive statistics presented in Table 10-15, which show that copper was not detected at a concentration greater than the maximum background concentration, as well as the AVS and SEM analytical data presented in Table 10-16, which show that copper was detected within the SEM fraction of only one sediment sample at a concentration greater than the AVS concentration, this metal is not identified as an ecological COC, and no further evaluation is recommended.

Lead

Lead was detected in each sediment sample (150/150) at concentrations ranging from 3.2 mg/kg (9SD14) to 430J mg/kg (9SD49B). Sixty-four of the detected concentrations exceed the sediment screening value of 30.2 mg/kg. The Step 2 screening level risk estimate (HQ = 14.24; see Table 7-5), derived using the maximum detected concentration, indicates that this metal may be presenting unacceptable risk to aquatic receptor groups. The Step 3a refined risk estimate (HQ = 2.70; see Table 10-14), derived using the 95 percent UCL of the mean concentration (81.6 mg/kg) also indicates that lead may be presenting unacceptable risk to aquatic receptor group populations

The descriptive statistics summarized in Table 10-15 show that lead concentrations in Tank 214 Area sediment exceed background concentrations. Specifically, maximum, arithmetic mean, and 95 percent UCL of the mean lead concentrations in site sediment (430J mg/kg, 55.5 mg/kg, and 81.6 mg/kg, respectively), exceed maximum, arithmetic mean, and 95 percent UCL of the mean background

concentrations (38 mg/kg, 8.73 mg/kg, and 13.0 mg/kg, respectively). Statistical tests evaluating the median and right-tail of the data set distributions also concluded that lead concentrations in Tank 214 Area sediment are elevated relative to background concentrations. The side-by-side box and probability plots depicting detected lead concentrations in Tank 214 Area and background sediment support the descriptive and distributional statistics. As evidenced by the plots, there are a large number of data points within the Tank 214 Area data set at the upper end of the range that are elevated relative to background concentrations and other detected concentrations at the site.

As previously discussed, the SEM and AVS analytical data (see Table 10-16) show that SEM-to-AVS ratios for sediment collected at 82 of 87 sediment samples are less than 1.0, indicating that benthic invertebrates throughout much of the wetland are not being exposed to toxic concentrations of lead in sediment pore water. Of the five sediment samples with SEM-to-AVS ratios greater than 1.0 (1.01 in 9SD23, 1.21 in 9SD41, 1.69 in 9SD49, 1.33 in 9SD109, and 2.79 in 9SD179), lead was the primary contributor to the total SEM concentration in 9SD41 and 9SD49,

Based on the magnitude of the maximum detected concentration above the sediment screening value, the refined risk estimate, which indicates unacceptable risk to aquatic receptor group populations, the descriptive and distributional statistics presented in Table 10-15, as well as the side-by-side box and probability plots, lead is identified as an ecological COC for Tank 214 sediment, and additional evaluation of this metal is recommended.

Selenium

Selenium was detected twenty-nine of sixty-eight (29/68) sediment samples at concentrations ranging from 0.48J mg/kg (9SD84) to 1.5J mg/kg (9SD16). Six of the detected concentrations (1.1J mg/kg in 9SD94 and 9SD105, 1.2J mg/kg in 9SD39, 9SD86, and 9SD103, and 1.5J mg/kg in 9SD16) exceed the sediment screening value of 1.0 mg/kg. The Step 2 screening level risk estimate (HQ = 1.50; see Table 7-5), derived using the maximum detected concentration, indicates that this metal may be presenting unacceptable risk to plants, invertebrates, and fish residing within the estuarine wetland. However, the Step 3a refined risk estimate (HQ = 0.86; see Table 10-14), derived using the 95 percent UCL of the mean concentration (0.86 mg/kg), indicates acceptable risk to aquatic receptor group populations.

As evidenced by the descriptive statistics presented in Table 10-15, selenium concentrations in Tank 214 Area sediment are consistent with background levels. Although the arithmetic mean and 95 percent UCL of the mean selenium concentration in Tank 214 Area sediment (1.24 mg/kg and 0.86 mg/kg) are slightly elevated above arithmetic mean and 95 percent UCL of the mean background concentrations (0.74 mg/kg and 0.85 mg/kg), the maximum concentration (1.5J mg/kg) is less than the maximum background concentration (2J mg/kg). A statistical test evaluating the mean/median of the data set distributions was not performed dur to the large number of non-detected values within the Tank 214 Area data set (57.4 percent). In addition, statistical tests evaluating the right-tail of the data set distributions (i.e., quantile test and slippage test) could not performed because non-detected concentrations within each data set exceed maximum detected concentrations (see Table 10-15).

Based on the low magnitude of the maximum detected concentration above the sediment screening value, the refined risk estimate, which indicates that selenium concentrations are not presenting unacceptable risk to aquatic receptor group populations within the estuarine wetland sediment, as well as the descriptive statistics present in Table 10-15, selenium is not identified as an ecological COC for Tank 214 Area sediment, and no additional evaluation of this metal is recommended.

Tin

Tin was detected in five of sixty-eight (5/68) sediment samples at concentrations ranging from 3.6J mg/kg (9SD03) to 9.2J mg/kg (9SD95). Each of the five detections exceeds the sediment screening value (3.4 mg/kg). The Step 2 screening level risk estimate (HQ = 2.71; see Table 7-5), derived using the maximum detected concentration, indicates that this metal may be presenting unacceptable risk to plants, invertebrates, and fish residing within the estuarine wetland. The refined risk estimate (1.35; see Table 10-14), derived using the 95 percent UCL of the mean concentration (4.61 mg/kg), also indicates that tin may be presenting unacceptable risk to aquatic receptor group populations.

As evidenced by the descriptive statistics presented in Table 10-15, tin concentrations in Tank 214 Area sediment are not elevated relative to background concentrations. Although the arithmetic mean concentration in Tank 214 Area sediment (9.97 mg/kg) exceeds the arithmetic mean background concentration (6.91 mg/kg), maximum and 95 percent UCL of the mean concentrations (9.2J mg/kg and 4.61 mg/kg, respectively) are less than maximum and arithmetic mean background concentrations (10J mg/kg and 6.91 mg/kg, respectively). A statistical test evaluating the mean/median of the data set distributions could not be performed due to the large number of non-detected concentrations within the Tank 214 Area data set (92.6 percent). In addition, statistical tests evaluating the right-tail of the data set distributions (i.e., quantile test and slippage test) could not performed because non-detected concentrations within each data set exceed maximum detected concentrations (see Table 10-15).

Based on the descriptive statistics presented in Table 10-15, tin is not identified as an ecological COC for Tank 214 Area sediment, and no additional evaluation of this metal is recommended.

Vanadium

Vanadium was detected in each of the seventy-four sediment samples analyzed for this metal at concentrations ranging from 80J mg/kg (9SD79) to 270J mg/kg (9SDBKG01). Each of the detected concentrations exceeds the sediment screening value of 57.0 mg/kg. The Step 2 screening level risk estimate (HQ = 4.74; see Table 7-5), derived using the maximum detected concentration, indicates that vanadium may be presenting unacceptable risk to aquatic receptor groups. The Step 3a refined risk estimate (HQ = 2.81; see Table 10-14), derived using the 95 percent UCL of the mean concentration (160 mg/kg) also indicates that vanadium may be presenting unacceptable risk to aquatic receptor group populations.

The descriptive statistics presented in Table 10-15 show that vanadium concentrations in Tank 214 Area sediment are elevated relative to background concentrations. Specifically, maximum, arithmetic mean, and 95 percent UCL of the mean vanadium concentrations in Tank 214 Area (270J mg/kg, 153 mg/kg, and 160 mg/kg, respectively) exceed maximum, arithmetic mean, and 95 percent UCL of the mean background concentrations (230 mg/kg, 111 mg/kg, and 134 mg/kg, respectively). The statistical tests evaluating the median and right-tail of the data set distributions (Wilxoxon-Mann-Whitney test and quantile test) were contradictory. The Wilcoxon-Mann-Whitney test concluded that vanadium concentrations in Tank 214 Area sediment are elevated relative to background concentrations, while the quantile test did not detect a significant difference between the two data sets.

The side-by-side box and probability plot depicting detected vanadium concentrations in Tank 214 Area and background sediment show that data points within the Tank 214 Area data set are elevated relative to background cocnetrations. However, no detected concentrations within the combined Tank 214 rea and background data set are identified as a potential outlier by Rosner's outlier test. A probability plot depicting vanadium concentrations in a combined Tank 214 Area and background data set also shows that individual data points, including data points at the upper end of the range, fall along

a strainght line and form a continuous distribution. Data points that exhibit these characteristics are likely to represent natural conditions (NFESC, 2002, 2003, and 2004).

Based on the low frequency and magnitude of detected concentrations above the maximum background concentration, the probability plot depicting detected concentrations in the combined data set, as well as the lack of potential outliers within the combined data set, vanadium is not identified as an ecological COC for Tank 214 Area sediment, and no further evaluation of this metal is recommended.

In summary, benzo(a)pyrene, chrysene, pyrene, and lead was detected and identified as an ecological COC for Tank 214 Area sediment. Although Acetone, carbon disulfide, acenaphthylene, benzo(a)anthracene, benzo(g,h,i)perylene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, phenanthrene, barium, cadmium, chromium, cobalt, copper, selenium, tin, and vanadium were detected and identified as ecological COPCs in Step 2 of the ERA, no additional evaluation is recommended based on the discussion presented in the preceding paragraphs. No additional evaluation is also recommended for the non-detected chemicals identified as ecological COPCs in Step 2 of the ERA, including those with maximum non-detected concentrations greater than sediment screening values.

10.1.6 Refined Risk Evaluation for Avian and Mammalian Dietary Exposures

Tables 7-6 and 7-7 presents the results of the Step 2 screening level risk calculation for avian and mammalian dietary to chemicals in surface soil and subsurface soil, respectively, while Table 7-8 presents the results of the Step 2 screening level risk calculation for avian dietary exposures to chemicals in sediment. HQ values for the refined risk calculations are summarized in Tables 10-17 (surface soil), 10-18 (subsurface soil), and 10-19 (sediment). A discussion of the refined risk evaluation is presented and discussed within the subsections that follow.

10.1.6.1 Avian and Mammalian Dietary Exposures: Surface Soil

Section 7.2.6.1 presented the results of the Step 2 screening level risk calculation for avian (American robin, mourning dove, and red-tailed hawk) and mammalian (brown flower bat) dietary exposures to chemicals in Tank 214 Area surface soil. Screening level risk estimates were provided in Table 7-6. The results of the refined dietary exposure risk calculations for Tank 214 Area surface soil (i.e., NOAEL-, MATC-, and LOAEL-based HQ values) are presented in Table 10-17 and discussed below. As discussed in Section 10.0, 95 percent UCL of the mean surface soil concentrations were used in the refined HQ calculations for those ecological COPCs with data sets that have a minimum of eight data points and four detected values (pyrene, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, thallium, vanadium, and zinc). Refinements to the dietary exposure calculations also included the use of mean body weights, mean food ingestion rates, and BAFs based on, or modeled from, central tendency estimates (see Section 10.0).

Avian Dietary Exposures

Ten detected metals (cadmium, chromium, copper, lead, mercury, nickel, selenium, thallium, vanadium, and zinc), one detected SVOC (di-n-butyl phthalate), and one detected PAH (pyrene) were identified as ecological COPCs for avian dietary exposures in Step 2 of the ERA because maximum American robin, mourning dove, and/or red-tailed hawk dietary exposure doses exceed NOAEL-based TRVs (i.e., maximum HQs exceed 1.0). Four detected VOCs (pentachloroethane, chloroform, ethylbenzene, and styrene) and one detected metal (beryllium) were also identified as ecological COPCs based on the lack of avian TRVs. In addition to these detected chemicals, eight non-detected SVOCs (7,12-dimethylbenz[a]anthracene, bis[2-ethylhexyl]phthalate, di-n-octyl phthalate, dinoseb, hexachlorobenzene, hexachlorobutadiene, pentachloronitrobenzene, and pentachlorophenol) and four

non-detected pesticides (disulfoton, ethyl parathion, methyl parathion, and phorate) were identified as ecological COPCs because maximum dietary doses for one or more of the avian receptors, calculated using maximum non-detected concentrations, exceed NOAEL-based TRVs.

As discussed in the preceding paragraph, eight non-detected SVOCs (7,12-dimethylbenz[a]anthracene, bis[2-ethylhexyl]phthalate, di-n-octyl phthalate, dinoseb, hexachlorobenzene, hexachlorobutadiene, pentachloronitrobenzene, and pentachlorophenol) and four non-detected pesticides (disulfoton, ethyl parathion, methyl parathion, and phorate) were identified as ecological COPCs in Step 2 of the ERA because maximum dietary doses for one or more of the avian receptors, calculated using maximum non-detected concentrations, exceed NOAEL-based TRVs. With the exception of 7.12-dimethylbenz(a)anthracene, refined risk estimates for these ecological COPCs also exceed NOAEL-based TRVs for one or more of the avian receptors (see Table 10-17). In addition to surface soil, none of these chemicals were detected in subsurface soil and groundwater (see Appendix A). The lack of detections in surface soil, subsurface soil, and groundwater indicates that they are not likely to be associated with historical activities at the Tank 214 Area (storage of AVGAS and DFM in underground tanks). As such, 7,12-dimethylbenz(a)anthracene, bis(2-ethylhexyl)phthalate, di-n-octyl phthalate, dinoseb, hexachlorobenzene, hexachlorobutadiene, pentachloronitrobenzene, pentachlorophenol, disulfoton, ethyl parathion, methyl parathion, and phorate are not identified as ecological COCs for Tank 214 Area surface soil, and no additional evaluation is recommended.

Pentachloroethane, chloroform, ethylbenzene, and styrene were detected in surface soil and identified as ecological COPCs for avian dietary exposures in Step 2 of the ERA based on the lack of avian TRVs. Pentachloroethane, chloroform, and styrene were each detected in one of forty-five (1/45) surface soil samples (pentachloroethane was detected in 9SB18-00 at 5.2J µg/kg, chloroform was detected in 9SB12-00 at 2.1J µg/kg, and styrene was detected in 9SB19-00 at 2.2J µg/kg), while ethylbenzene was detected in four of forty-five (4/45) surface soil samples at concentrations ranging from 3.5J mg/kg (9SB20-00) to 220J mg/kg (9SB19-00). These four VOCs are not identified as important bioaccumulative chemicals by the USEPA (2000b) and, therefore, have low potential to bioaccumulate in terrestrial food items (terrestrial plants, invertebrates, and small mammals). Based on their low frequency and magnitude of detection and/or their low potential to bioaccumulate in terrestrial food items, pentachloroethane, chloroform, ethylbenzene, and styrene are not identified as ecological COCs for avian dietary exposures to chemicals in Tank 214 Area surface soil, and no additional evaluation is recommended.

In addition to pentachloroethane, chloroform, ethylbenzene, and styrene, beryllium was detected and identified as an ecological COPC based on the lack of avian TRVs. Beryllium was detected in each of the surface soil samples analyzed for this metal (44/44) at concentrations ranging from 0.11J mg/kg (9SB06-00) to 0.47 mg/kg (9SB39-00). The descriptive statistics presented in Table 10-7 show that beryllium concentrations in Tank 214 Area surface soil are not elevated relative to background concentrations. Specifically, maximum arithmetic mean, and 95 percent UCL of the mean concentrations in Tank 214 area surface soil (0.47 mg/kg, 0.21 mg/kg, and 0.24 mg/kg, respectively) are less than maximum, arithmetic mean, and 95 percent UCL of the mean background concentrations (0.58 mg/kg, 0.29 mg/kg, and 0.27 mg/kg, respectively). The statistical tests evaluating the median and right-tail of the data set distributions (Gehan test and slippage test) also concluded that beryllium concentrations in Tank 214 Area surface soil are not elevated relative to background concentrations. Based on the descriptive and distributional statistics summarized in Table 10-7, beryllium is not identified as an ecological COC for avian dietary exposures to chemicals in Tank 214 Area surface soil, and no additional evaluation of this metal is recommended.

Pyrene was detected and identified as an ecological COPC because the maximum American robin dietary exposure dose exceeds the NOAEL-based TRV (HQ = 1.32). However, as evidenced by Table

10-17, the refined American robin dietary exposure dose for this PAH is less than the NOAEL-based TRV (HQ = 0.63), indicating acceptable risk to avian omnivore populations. Basd on the low magnitude of the maximum exposure dose above the NOAEL-based TRV, as well as the refined NOAEL-based HQ value, pyrene is not identified as an ecological COC for avian omnivore dietary exposures to chemicals in Tank 214 Area surface soil, and no additional evaluation of this PAH is recommended.

Cadmium, chromium, copper, mercury, nickel, selenium, thallium, and zinc were detected in surface soil and identified as ecological COPCs because maximum American robin dietary exposure doses exceed NOAEL-based TRVs. In addition, lead and vanadium were identified as ecological COPCs because maximum dietary exposure doses for each avian receptor exceed NOAEL-based TRVs. As evidenced by Table 10-17, refined American robin dietary exposure doses for cadmium, chromium, copper, nickel, selenium, thallium, and zinc are less than NOAEL-, MATC-, and LOAEL-based TRVs, indicating acceptable risk to avian omnivore populations. The descriptive and/or distributional statistics presented in Table 10-7 also show that chromium, copper, nickel, and selenium concentrations in Tank 214 Area surface soil are not elevated relative to background concentrations. Based on refined NOAEL-, MATC-, and LOAEL-based HQ values less than 1.0, as well as the descriptive and/or distributional statistics presented in Table 10-7, cadmium, chromium, copper, nickel, selenium, thallium, and zinc are not identified as ecological COCs for avian omnivore dietary exposures to chemicals in Tank 214 Area surface soil, and no additional evaluation of these seven metals is recommended.

The refined NOAEL-based HQ value for mercury exceeds 1.0 for the American robin (HQ = 1.17), indicating unacceptable risk to avian omnivore populations. However, refined MATC- and LOAEL-based HQ values are less than 1.0 (HQs = 0.67 and 0.39, respectively). The descriptive statistics presented in Table 10-7 show that maximum, arithmetic mean, and 95 percent UCL of mean mercury concentrations in Tank 214 Area surface soil (0.065J mg/kg, 0.03 mg/kg, and 0.03 mg/kg, respectively) are less than maximum, arithmetic mean, and 95 percent UCL of the mean background concentrations (0.12J mg/kg, 0.05 mg/kg, and 0.06 mg/kg, respectively). The statistical tests evaluating the median and right-tail of the data set distributions (Gehan test, quantile test, and slippage test) also concluded that mercury concentrations in Tank 214 Area surface soil are not elevated relative to background concentrations. Based on the low magnitude of the NOAEL-based HQ value above 1.0, MATC- and LOAEL-based HQ values less than 1.0, as well as the descriptive and distributional statistics summarized in Table 10-7, mercury is not identified as an ecological COC for avian omnivore dietary exposures to chemicals in Tank 214 Area surface soil, and no additional evaluation of this metal is recommended.

Refined NOAEL-, MATC-, and LOAEL-based HQ values for vanadium are less than 1.0 for the red-tailed hawk (see Table 10-17), indicating no unacceptable risk to avian carnivore populations. However, NOAEL-based HQs for this metal exceed 1.0 for the American robin (HQ = 8.36) and mourning dove (HQ = 4.15). The refined MATC- and LOAEL-based HQ values for each receptor also exceeds 1.0. The statistical evaluations presented and discussed in Section 10.1.1 (e.g., descriptive comparisons, statistical tests evaluating the right-tail of the data set distributions, and probability plots), indicate that vanadium concetrations in Tank 214 Area surface soil are not elevated relative to background concentrations. Based on refined HQ values for the red-tailed hawk, as well as the statistical evaluations presented and discussed in Setion 10.1.1, vanadium is not identified as an ecological COC for avian dietary exposures to chemicals in Tank 214 Area surface soil, and no additional evaluation of this metal is recommended.

Identical to vanadium, refined NOAEL-, MATC-, and LOAEL-based HQ values for lead are less than 1.0 for the red-tailed hawk, indicating no unacceptable risk to avian carnivore populations. However,

refined NOAEL-based HQs exceed 1.0 for the American robin and mourning dove (HQs = 1.61 and 1.07, respectively), indicating unacceptable risk to avian omnivore and herbivore populations. As evidenced by Table 10-17, the refined MATC-based HQ value for the American robin also exceeds 1.0 (HQ = 1.14). As discussed in Section 10.1.1, lead concentrations in Tank 214 Area surface soil are elevated relative to background concentrations. Based on the refined NOAEL-based HQ values, which indicate unacceptable risk to the American robin and mourning dove, as well as the statistical evaluations presented and discussed in Section 10.1.1, lead is identified as an ecological COC for avian omnivore and herbivore dietary exposures to chemicals in Tank 214 Area surface soil.

In summary, lead is identified as an ecological COC for avian omnivore and herbivore dietary exposures to chemicals in Tank 214 Area surface soil. Although chloroform, ethylbenzene, pentachloroethane, styrene, pyrene, beryllium, cadmium, chromium, copper, mercury, nickel, selenium, thallium, vanadium, and zinc were detected and identified as ecological COPCs in Step 2 of the ERA, these chemicals are not identified as ecological COCs for the reasons discussed in the preceding paragraphs, and no additional evaluation is recommended. No additional evaluation is also recommended for the non-detected chemicals identified as ecological COPCs in Step 2 of the SERA, including 7,12-dimethylbenz(a)anthracene, bis(2-ethylhexyl)phthalate, di-n-octyl phthalate, dinoseb, hexachlorobenzene, hexachlorobutadiene, pentachloronitrobenzene, pentachlorophenol, disulfoton, methyl parathion, parathion, and phorate.

Mammalian Dietary Exposures

Pyrene was detected and identified as an ecological COPC in Step 2 of the ERA because the maximum brown flower bat exposure dose exceeds the NOAEL-based mammalian TRV. Pentachloroethane was also detected and identified as an ecological COPC for brown flower bat dietary exposures based on the lack of a mammalian TRV. Although not-detected, three SVOCs (1,2,4,5-tetrachlorobenzene, hexachlorophene, and pentachlorophenol) and one organophosphorous pesticide (methyl parathion) were identified as ecolocial COPCs because maximum brown flower bat dietary exposure doses, calculated using maximum non-detected concentrations, exceed NOAEL-based TRVs.

As discussed in the preceding paragraph, 1,2,4,5-tetrachlorobenzene, hexachlorophene, pentachlorophenol, and methyl parathion were not detected but identified as ecological COPCs in Step 2 of the ERA because maximum brown flower bat dietary exposure doses exceed NOAEL-based TRVs. As evidenced by Table 10-17, refined brown flower bat dietary exposure doses for 1,2,4,5-tetrachlorobenzene, hexachlorophene, pentachlorophenol, and methyl parathion also exceed NOAEL-based TRVs (HQs = 6.86, 1.12, 1.06, and 7.22, respectively). In addition to surface soil, these four organics were not detected in Tank 214 Area subsurface soil and groundwater (see Appendix A). The lack of detections in surface soil, subsurface soil, and groundwater indicates that these organic chemicals are not likely to be associated within historical activities at the the Tank 214 Area (storage of AVGAS and DFM in underground tanks). For the reasons discussed above, 1,2,4,5-tetrachlorobenzene, hexachlorophene, pentachlorophenol, and methyl parathion are not identified as ecological COCs for Tanks 214 Area surface soil.

Pentachloroethane was detected and identified as an ecological COPC for brown flower bat dietary exposures in Step 2 of the ERA based on the lack of mammalian TRVs. Pentachloroethane was detected in one of forty-five (1/45) surface soil samples at a low, estimated concentration (5.2J µg/kg in 9SB18-00). This VOC is not identified as an important bioaccumulative chemical by the USEPA (2000b) and, therefore, has low potential to bioaccumulate in terrestrial food items (terrestrial plants). Based on the low frequency and magnitude of detection, as well as the low potential to bioaccumulate in terrestrial food items, pentachloroethane is not identified as an ecological COC for brown flower bat

dietary exposures to chemicals in Tank 214 Area surface soil, and no additional evaluation of this VOC is recommended.

Pyrene was detected in surface soil and identified as an ecological COPC for brown flower bat dietary exposures because the maximum exposure dose exceeds the NOAEL-based mammalian TRV (HQ = 3.44). As evidenced by Table 10-17, the refined brown flower bat dietary exposure dose for pyrene also exceeds the NOAEL-based TRV (HQ = 1.38). However, MATC- and LOAEL-based TRVs are less than 1.0 (HQs = 0.62 and 0.28, respectively). Based on the low magnitude of the NOAEL-based HQ value above 1.0, as well as MATC, and LOAEL-based HQ values less than 1.0, pyrene is not identified as an ecological COC for brown flower bat dietary exposures to chemicals in Tank 214 area surface soil, and no additional evaluation of this PAH is recommended.

In summary, no chemicals were identified as ecological COCs for brown flower bat dietary exposures to chemicals in Tank 214 Area surface soil. Although detected and identified as ecological COPCs in Step 2 of the SERA, pyrene and pentachloroethane are not identified as ecological COCs for the reasons discussed in the preceding paragraphs. No additional evaluation is also recommended for the non-detected chemicals identified as ecological COPCs in Step 2 of the SERA, including 1,2,4,5-tetrachlorobenzene, hexachlorophene, pentachlorophenol, and methyl parathion.

10.1.6.2 Avian and Mammalian Dietary Exposures: Subsurface Soil

Section 7.2.6.2 presented the results of the Step 2 screening level risk calculation for avian (American robin, mourning dove, and red-tailed hawk) and mammalian (brown flower bat) dietary exposures to chemicals in Tank 214 Area subsurface soil. Screening level risk estimates were provided in Table 7-7. The results of the refined dietary exposure risk calculations for subsurface soil (i.e., NOAEL-, MATC-, and LOAEL-based HQ values) are presented in Table 10-18 and discussed in the paragraphs that follow. Refinements to the dietary exposure calculations included the use of mean body weights, mean food ingestion rates, and BAFs based on, or modeled from, central tendency estimates. As discussed in Section 10.0, 95 percent UCL of the mean concentrations could not be calculated due to the small size of the subsurface soil data set. Therefore, refined risk estimates were calculated using maximum detected concentrations.

Avian Dietary Exposures

Nine detected metals (cadmium, chromium, copper, lead, mercury, nickel, thallium, vanadium, and zinc) were identified as ecological COPCs in Step 2 of the ERA because maximum dietary exposure doses for one or more of the avian receptors exceed NOAEL-based TRVs (i.e., maximum HQs exceed 1.0). One additional detected metal (beryllium) was identified as an ecological COPC based on the lack of avian TRVs. Three non-detected SVOCs (bis[2-ethylhexyl]phthalate, di-n-butyl phthalate, and hexachlorobenzene), four non-detected pesticides (disulfoton, ethyl parathion, methyl parathion, and phorate) and one non-detected metal (selenium) were identified as ecological COPCs because maximum dietary doses, calculated using maximum non-detected concentrations, exceed NOAEL-based TRVs for the American robin, mourning dove, and/or red-tailed hawk

Bis(2-ethylhexyl)phthalate and selenium were identified as ecological COPCs in Step 2 of the ERA because maximum American robin dietary exposure doses exceed the NOAEL-based TRV. As evidenced by Table 10-18, refined American robin dietary exposure doses for bis(2-ethylhexyl)phthalate and selenium are less than NOAEL-based avian TRVs (HQs = 0.84 and 0.59, respectively) In the case of selenium, Table 10-8 shows that the maximum non-detected concentration (1.6U mg/kg) is less than the maximum detected background concentration and background threshold value (3.8J mg/kg and 2.57 mg/kg, respectively). Based on these considerations, bis(2-

ethylhexyl)phthalate and selenium are not identified as an ecological COCs for avian dietary exposures. Although refined HQ values for di-n-butyl phthalate, hexachlorobenzene, disulfoton, ethyl parathion, methyl parathion, and phorate exceed NOAEL-based TRVs for the American robin, mourning dove, and/or red-tailed hawk, these non-detected chemicals are also not identified as ecological COCs. This decision is based on the lack of detections in abiotic media collected at the Tank 214 Area, including surface soil and groundwater (see Appendix A), which indicates that these organic chemicals are not likely to be associated within historical activities at the site (storage of AVGAS and DFM in underground tanks).

Beryllium was detected in subsurface soil and identified as an ecological COPC for avian dietary exposures based on the lack of avian TRVs. Beryllium was detected in each subsurface soil sample analyzed for this metal (3/3) at concentrations ranging from 0.15J mg/kg (9SB06-01) to 0.28J mg/kg (9SB03-01). This chemical is not identified as an important bioaccumulative chemical by the USEPA (2000b); and, therefore, has a low potential to bioaccumulate in terrestrial avian food items (terrestrial plants, invertebrates, and small mammals). The descriptive statistics presented in Table 10-8 also indicate that Tank 214 Area subsurface concentrations are not elevated relative to background. Specifically, maximum and arithmetic mean beryllium concentrations in Tank 214 Area subsurface soil (0.28J mg/kg and 0.21 mg/kg, respectively) are less than maximum and arithmetic mean background concentrations (0.7 mg/kg and 0.26 mg/kg, respectively). The maximum concentration in Tank 214 Area subsurface soil is also less than the background threshold value of 0.672 mg/kg. For the reasons discussed above, beryllium is not identified as an ecological COC for avian dietary exposures to chemicals in Tank 214 Area subsurface soil, and no additional evaluation or this metal is recommended.

Cadmium, chromium, copper, lead, mercury, nickel, thallium, vanadium, and zinc were detected in subsurface soil and identified as ecological COPCs for avian dietary exposures because maximum exposure doses for one or more of the avian receptors exceed NOAEL-based screening values. Refined dietary exposure doses for cadmium, copper, nickel, and zinc are less than NOAEL-, MATC-, and LOAEL-based TRVs established for each of the avian receptors (see Table 10-18), indicating acceptable risk to avian herbivore, omnivore, and carnivore populations. The descriptive statistics presented in Table 10-8 for copper, nickel, and zinc also show that the concentrations of these metals in Tank 214 Area subsurface soil are not elevated relative to background concentrations. Based on refined NOAEL-, MATC,- and LOAEL-based HQ values less than 1.0 and/or the descriptive statistics presented in Table 10-8, cadmium, copper, nickel, and zinc are not identified as ecological COCs for avian dietary exposures to chemicals in Tank 214 Area subsurface soil, and no additional evaluation of these four metals is recommended.

The refined NOAEL-based HQ value for chromium exceeds 1.0 for the American robin (HQ = 1.78), indicating unacceptable risk to avian omnivore populations. However, MATC and LOAEL-based HQ values are less than 1.0 (HQs = 0.73 and 0.30, respectively). The descriptive statistics presented in Table 10-8 show that maximum and arithmetic mean chromium concentrations in Tank 214 Area subsurface soil (19 mg/kg and 10.1 mg/kg, respectively) are less than maximum and arithmetic mean background concentrations (148J mg/kg and 37.3 mg/kg, respectively). The maximum detected concentration in Tank 214 Area subsurface soil is also less than the BTV of 167 mg/kg. Based on the low magnitude of the NOAEL-based HQ value above 1.0, MATC- and LOAEL-based HQ values less than 1.0, and the descriptive statistics presented in Table 10-18, chromium is not identified as an ecological COC for avian omnivore dietary exposures to chemicals in Tank 214 Area subsurface soil, and no additional evaluation of this metal is recommended.

Refined NOAEL- and MATC-based HQ values for mercury exceeds 1.0 for the American robin (HQs = 1.96 and 1.13, resepctively), indicating unacceptable risk to avian omnivore populations. The descriptive statistics presented in Table 10-8 show that maximum and arithmetic mean mercury

concentrations in Tank 214 Area subsurface soil (0.049 mg/kg and 0.03 mg/kg, respectively) are less than maximum and arithmetic mean background concentrations (0.17J mg/kg and 0.04 mg/kg, respectively). The maximum detected concentration in Tank 214 Area subsurface soil is also less than the BTV of 0.119 mg/kg. Based on the low magnitude of NOAEL- and MATC-based HQ values above 1.0 and the descriptive statistics presented in Table 10-18, mercury is not identified as an ecological COC for avian omnivore dietary exposures to chemicals in Tank 214 Area subsurface soil, and no additional evaluation of this metal is recommended.

Refined NOAEL-, MATC-, and LOAEL-based HQ values for vanadium are less than 1.0 for the red-tailed hawk (see Table 10-18), indicating no unacceptable risk to avian carnivore populations. However, NOAEL-based HQs for this metal exceed 1.0 for the American robin and mourning dove (HQs = 9.37 and 4.65, respectively). The refined MATC- and LOAEL-based HQ values for each receptor also exceeds 1.0. The descriptive statistics presented in Table 10-8 show that maximum and arithmetic mean vanadium concentrations in Tank 214 Area subsurface soil (200J mg/kg and 187 mg/kg, respectively) are less than maximum and arithmetic mean background concentrations (410 mg/kg and 209 mg/kg, respectively). Based on refined HQ values for the red-tailed hawk, as well as the descriptive statistics presented in Table 10-8, vanadium is not identified as an ecological COC for avian dietary exposures to chemicals in subsurface soil, and no additional evaluation of this metal is recommended.

The refined American robin dietary exposure dose for thallium exceeds the NOAEL-based TRV (HQ = 1.59). However, the refined exposure dose is less than MATC- and LOAEL-based TRVS (HQs = 0.71 and 0.32, respectively). The descriptive statistics presented in Table 10-8 show that the single detected concentration in Tank 214 Area surface soil (4.6J mg/kg) exceeds the maximum detected background concentration and background threshold value (0.29J mg/kg and 0.27 mg/kg, respectively). Although the refined NOAEL-based HQ value is only slightly elevated above 1.0, thallium is identified as an ecological COC for avian omnivore dietary exposures to chemicals in Tank 214 Area subsurface soil. This decision is base, in part, on the small size of the subsurface soil data set, as well as the magnitude of the maximum detected concentration above background concentrations.

Refined American robin, mourning dove, and red-tailed hawk dietary exposure does for lead exceed NOAEL-based TRVs (HQs = 7.28, 4.35, and 3.34, respectively. In addition, refined American robin and mourning dove dietary exposure doses exceed MATC- and LOAEL-based TRVs, while the refined red-tailed hawk dietary exposure dose exceeds the MATC-based TRV (see Table 10-18). The descriptive statistics presented in Table 10-8 show that maximum and arithmetic mean lead concentrations in Tank 214 Area subsurface soil (790J mg/kg and 273 mg/kg, respectively) are elevated relative to maximum and arithmetic mean background concentrations (6.6 mg/kg and 3.08 mg/kg, respectively). Based on refined American robin, mourning dove, and red-tailed hawk NOAEL-, MATC-, and/or LOAEL-based HQ values greater than 1.0 and the descriptive statistics presented in Table 10-8, lead is identified as an ecological COPC for avian herbivore, omnivore, and carnivore dietary exposures to chemicals in Tank 214 Area subsurface soil.

In summary, lead and thallium are identified as ecological COCs for avian dietary exposures to chemicals in Tank 214 Area subsurface soil. Although beryllium, cadmium, chromium, copper, mercury, nickel, selenium, vanadium, and zinc were detected and identified as ecological COPCs in Step 2 of the ERA, these nine metals are not identified as ecological COCs for the reasons discussed in the preceding paragraphs, and no additional evaluation is recommended. No additional evaluation is also recommended for the non-detected chemicals identified as ecological COPCs in Step 2 of the ERA, including bis(2-ethylhexyl)phthalate, di-n-butyl phthalate, hexachlorobenzene, disulfoton, ethyl parathion, methyl parathion, phorate, and selenium.

Mammalian Dietary Exposures

Although not detected, methyl parathion and selenium were identified as ecological COPCs in Step 2 of the ERA for brown flower bat dietary exposures because maximum exposure doses, derived using maximum non-detected concentrations, exceed mammalian TRVs. As evidenced by Table 10-18, the refined HQ value for selenium is less than 1.0, indicating acceptable risk to flying mammalian herbivore populations (HQ = 0.84). In addition, Table 10-8 shows that the maximum non-detected selenium concentration (1.6U mg/kg) is less than the maximum detected background concentration and background threshold value (3.8J mg/kg and 2.57 mg/kg, respectively). Based on a refined HQ value less than 1.0 and the descriptive statistics presented in Table 10-8, selenium is not identified as an ecological COC for brown flower bat dietary exposures to chemicals in Tank 214 Area subsurface soil. In the case of methyl parathion, the refined HQ value for this organophosphorous pesticide exceeds 1.0 (HQ = 2.03). Methyl parathion (as well as other organophosphorous pesticides) was not detected in abiotic media collected at the Tank 214 Area. The lack of detections in subsurface soil, as well as surface soil and groundwater indicates that methyl parathion is not likely to be associated within historical activities at the the Tank 214 Area (storage of AVGAS and DFM in underground tanks), and is not identified as an ecological COC for brown flower bat dietary exposures.

In summary, no additional evaluation is recommended for the non-detected chemicals identified as ecological COPCs in Step 2 of the SERA (i.e., selenium and methyl parathion) for the reasons discussed in the preceding paragraph.

10.1.6.3 Avian Dietary Exposures: Sediment

Section 7.2.6.3 presented the results of the Step 2 screening level risk calculation for avian (spotted sandpiper and green heron) dietary exposures to chemicals in sediment. Screening level risk estimates were also provided in Table 7-8. Based on the comparison of maximum exposure doses to NOAEL-based TRVs, three detected PAHs (benzo[b]fluoranthene, benzo[k]fluoranthene, and pyrene) and eight detected metals (chromium, copper, lead, mercury, selenium, thallium, vanadium, and zinc) were identified as ecological COPCs in Step 2 of the ERA because maximum green heron and spotted sandpiper dietary exposure doses exceed NOAEL-based TRVs (i.e., maximum HQs exceed 1.0). Ethylbenzene and beryllium were also detected and identified as ecological COPCs based on the lack of avian TRVs. Although not detected, four SVOCs (bis[2-ethylhexyl]phthalate, di-n-butyl phthalate, dinoseb, and hexachlorobenzene) and four organophosphorous pesticides (disulfoton, ethyl parathion, methyl parathion, and phorate) were identified as ecological COPCs for avian dietary exposures because maximum exposure doses, calculated using maximum non-detected concentrations, exceed NOAEL-based TRVs for both receptors.

The results of the refined dietary exposure risk calculations for sediment (i.e., NOAEL-, MATC-, and LOAEL-based HQ values) are presented in Table 10-19 and discussed in the paragraphs that follow. As discussed in Section 10.0, refinements to the dietary exposure calculations included the use of 95 percent UCL of the mean concentrations for ecological COPCs with data sets that have a minimum of eight data points and four detected values (benzo[b]fluoranthene, benzo[k]fluoranthene, pyrene, beryllium, chromium, copper, lead, mercury, selenium, thallium, vanadium, and zinc), as well as mean body weights, mean food ingestion rates, and BAFs based on, or modeled from, central tendency estimates.

As discussed above, four SVOCs (bis[2-ethylhexyl]phthalate, di-n-butyl phthalate, dinoseb, and hexachlorobenzene) and four organophosphorous pesticides (disulfoton, ethyl parathion, methyl parathion, and phorate) were identified as ecological COPCs for avian dietary exposures to chemicals in sediment because green heron and spotted sandpiper dietary exposure doses, calculated using the

maximum non-detected concentrations, exceed NOAEL-based TRVs. As evidenced by Table 10-19, the refined NOAEL-based HQ values for these eight organic chemicals also exceed 1.0. Bis(2-ethylhexyl)phthalate, dinoseb, heaxachlorobenzene, disulfoton, ethyl parathion, methyl parathion, and phorate were not detected in abiotic media collected at the SWMU (surface soil, subsurface soil, and groundwater), while di-n-butyl phthalate was detected in a single surface soil sample at a low, estimated concentration (40J ug/kg in 9SS03). Based on the lack of detections or low frequency and magnitude of detections in abiotic media, these organic chemicals are not likely to be associated with historical activities at the the Tank 214 Area (storage of AVGAS and DFM in underground tanks), nor are they likely to be present in estuarine wetland sediment at ecologically important concentrations. Based on these considerations, bis(2-ethylhexyl)phthalate, di-n-butyl phthalate, dinoseb, hexachlorobenzene, disulfoton, ethyl parathion, methyl parathion, and phorate are not identified as ecological COPCs for avian dietary exposures to chemicals in estuarine wetland sediment, and no additional evaluation is recommended.

Ethylbenzene and beryllium were detected and identified as ecological COPCs for green heron and spotted sandpiper dietary exposures in Step 2 of the ERA based on the lack of avian TRVs. Ethylbenzene was detected in one of fifty-seven (1/57) sediment samples at a low, estimated concentration (3.6J ug/kg in 9SD78), while beryllium was detected in fifty-one of sixty-eight (51/68) sediment samples at concentrations ranging from 0.12J µg/kg (9SD03) to 0.37J µg/kg (9SDBKG01). Neither ethylbenzene nor beryllium are identified as an important bioaccumulative chemical by the USEPA (2000b) and, therefore, have low potential to bioaccumulate in aquatic food items (aquatic invertebrates and fish). In the case of beryllium, the descriptive statistics presented in Table 10-15 show that beryllium concentrations in estuarine wetland sediment are not elevated relative to background concentrations. Although maximum and and 95 percent UCL of the mean concentrations in estuarine wetland sediment (0.37J mg/kg and 0.24 mg/kg, respectively) are slightly elevated above maximum and 95 percent UCL of the mean background concentrations (0.31 mg/kg and 0.20 mg/kg, respectively), no detections were reported in estuarine wetland sediment at concentrations greater than the background threshold value of 0.439 mg/kg. Based on the low likelihood that beryllium and ethylbenzene are bioaccumulating in aquatic food items, the low magnitude and frequency of detection in estuarine wetland sediment (in the case of ethylbenzene), and the descriptive statistics present in Table 10-15 (in the case of beryllium), these two analytes are not identified as ecological COCs for avian dietary exposures, and no additional evaluation is recommended.

Benzo(b)fluoranthene, benzo(k)fluoranthene, and pyrene were detected and identified as ecological COPCs in Step 2 of the SERA because maximum spotted sandpiper dietary exposure doses exceed NOEAL-based TRVs (HQs = 2.23, 3.54, and 1.02, respectively; see Table 7-8). As evidenced by Table 10-19, refined dietary exposure doses for these three PAHs are less than NOAEL-based TRVs, indicating acceptable risk to avian invertivore populations. Based on refined HQ values less than 1.0, benzo(b)fluoranthene, benzo(k)fluoranthene, and pyrene are not identified as ecological COCs for avian invertivore dietary exposures to chemicals in estuarine wetland sediment, and no additional evaluation is recommended.

Chromium, copper, lead, mercury, selenium, thallium, vanadium, and zinc were detected and identified as ecological COPCs in Step 2 of the SERA because maximum spotted sandpiper and/or green heron dietary exposure doses exceed NOAEL-based TRVs. As evidenced by Table 10-19, refined dietary exposure doses for chromium, selenium, and zinc are less than NOAEL-, MATC-, and LOAEL-based TRVs, indicating acceptable risk to avian invertivore and piscivore populations. The descriptive and distributional statistics presented in Table 10-15 also show that chromium, selenium, and zinc concentrations in estuarine wetland sediment are not elevated relative to background concentrations. Based on refined HQ values less than 1.0 and the descriptive and distributional statistics presented in Table 10-15, chromium, selenium, and zinc are not identified as ecological COCs for avian dietary

exposures to chemicals in estuarine wetland sediment, and no additional evaluation of these three metals is recommended.

Copper was identified as an ecological COPC in Step 2 of the ERA because the maximum dietary exposure dose for the spotted sandpiper and green heron exceeds the NOAEL-based TRV. As evidenced by Table 10-19, the refined dietary exposure dose for the green heron is less than the NOAEL-, MATC-, and LOAEL-based TRV. However, the refined dietary exposure dose for the spotted sandpiper exceeds the NOAEL-based TRV (HQ = 11.55), as well as MATC- and LOAEL-based based TRVs (HQs = 6.68 and 3.87, respectively. The descriptive statistis presented in Table 10-15 show that the maximum detected concentration in estuarine wetland sediment (140J mg/kg) is equal to the maximum background concentration. This maximum detection is only slightly elevated above the background threshold value of 136 mg/kg. Based on the lack of detections above the maximum background concentration, as well as the low magnitude of the maximum detected concentration above the background threshold value, copper is not identified as an ecological COC for avian invertivore dietary exposures to chemicals in estuarine wetland sediment.

Lead was identified as an ecological COPC in Step 2 of the ERA because maximum spotted sandpiper and green heron exposure doses exceed the NOAEL-based avian TRV. The refined NOAEL- and, MATC-based HQ values for the green heron and the refined NOAEL-, MATC-, and LOAEL-based TRVs for the spotted sandpiper also exceed 1.0 (see Table 10-19). As discussed in Section 10.1.5, lead concentrations in estuarine wetland sediment are elevated relative to background concentrations. Based on refined NOAEL-, MATC-, and/or LOAEL-based HQ values greater than 1.0 for the spotted sandpiper and green heron, as well as the descriptive and distributional statistics discussed in Section 10.1.5 and summarized in Table 10-15, lead is identified as an ecological COPC for avian invertivore and avian piscivore dietary espoures to chemicals in estuarine wetland sediment.

Identical to lead, mercury was identified as an ecological COPC in Step 2 of the ERA because maximum spotted sandpiper and green heron dietary exposure doses exceed the NOAEL-based avian TRV. As evidenced by Table 10-19, refined NOAEL-, MATC-, and LOAEL-based HQ values for spotted sandpiper dietary exposures are less than 1.0. The refined NOAEL-based HQ for green heron dietary exposures exceeds 1.0 (HQ = 1.20), while refined MATC- and LOAEL-based HQs for this receptor are less than 1.0. The descriptive and distributional statistics discussed in Section 10.1.5 and summarized in Table 10-15 show that mercury concentrations in estuarine wetland sediment are not elevated relative to background concentrations. Based on refined NOAEL-, MATC-, and LOAEL-based HQ values less than 1.0 for the spotted sandpiper, the low magnitude of the refined NOAEL-based HQ value for the green heron above 1.0, and the descriptive and distributional statistics presented in Table 10-15, mercury is not identified as an ecological COPC for avian invertivore and piscivore dietary espoures to chemicals in estuarine wetland sediment.

As evidenced by Table 10-19, the refined spotted sandpiper dietary exposure dose for thallium exceeds NOAEL- and MATC-based TRVs. The refined green heron dietary exposure dose also exceeds the NOAEL-based TRV. LOAEL-based HQs for each receptor were less than 1.0. As discussed in Section 10.1.5, thallium was detected at a low frequency in Tank 214 Area sediment (4/68). Although not detected in background sediment, three of the four detected concentrations in Tank 214 Area sediment (0.34J mg/kg in 9SD104, 0.27J mg/kg in 9SD95, and 0.34J mg/kg in 9SD102) are less than the maximum non-detected background concentration (3.8U mg/kg). Based on the low frequency of the detection in sediment and the low magnitude and frequency of detected concentrations above the maximum non-detected background concentration, thallium is not identified as an ecological COC for estuarine wetland sediment. It is noted that thallium is not identified as an important bioaccumulative chemical (USEPA, 2000b). Therefore, it is unlikely that this metal is bioaccumulating in aquatic prey items (invertebrates and fish) at ecologically important concentrations.

Refined spotted sandpiper and green heron dietary exposure doses for vanadium exceed NOAEL-, MATC-, and LOAEL-based TRVs. However, as discussed in Section 10.1.5, vanadium concentrations in Tank 214 Area sediment are not indicative of a release. Therefore, vanadium is not identified as an ecological COC for avian dietary exposures to chemicals in estuarine wetland sediment.

In summary, lead was detected and identified as ecological COCs for avian invertivore dietary exposures to chemicals sediment. Although detected and identified as ecological COPCs in Step 2 of the ERA, ethylbenzene, benzo(b)fluoranthene, benzo(k)fluoranthene, pyrene, beryllium, chromium, copper, mercury, selenium, thallium, vanadium, and zinc are not identified as ecological COCs, and additional evaluation is not recommended for the reasons detailed in the preceding paragraphs. No additional evaluation also is recommended for the non-detected chemicals identified as ecological COPCs in Step 2 of the ERA including bis(2-ethylhexyl)phthalate, di-n-butyl phthalate, dinoseb, hexachlorobenzene), disulfoton, ethyl parathion, methyl parathion, and phorate.

10.2 Uncertainties Associated With Step 3a of the BERA

Many of the uncertainties identified in Section 8.0 for the SERA (i.e. Steps 1 and 2 of the Navy ERA process) also apply to the refined risk calculation and evaluation (i.e. Step 3a of the Navy ERA process). Those uncertainties specific to the refined risk calculation for the Tank 214 Area are listed below.

- Due to the small sample size of the Tank 214 Area subsurface soil and groundwater inorganic data sets (n = 3 and n = 6, respectively), risk estimated for the inorganic ecological COPCs in these two media were not refined using 95 percent UCL of the mean concentrations. The result is a more conservative risk evaluation that may overstate risks to ecological receptor populations at the Tank 214 Area.

- For inorganic ecological COPCs in surface soil, subsurface soil, groundwater, estuarine wetland surface water, and estuarine wetland sediment, consideration was given to available background data. However, due to the small sample size of the Tank 214 Area subsurface soil and groundwater inorganic data sets (n = 3 and n = 6, respectively), the statistical evaluations performed on the Tank 214 Area and background data sets for these media were limited to a descriptive comparison.

- Non-detected chemicals lacking media-specific and/or avian and mammalian TRVs were not evaluated by the refined risk evaluation, nor were they identified as ecological COCs. This approach may have resulted in an understatement of the actual number of ecological COCs if any of the non-detected chemicals lacking screening values and/or TRVs are present at ecologically significant concentrations.

- Assumed sediment-to-fish BAFs of 1.0 were used in the Step 2 screening level risk calculation for chromium and copper. These assumed sediment-to-fish BAFs were replaced in the Step 3a risk calculation by mean BAF values (0.038 for chromium and 0.10 for copper) reported by Krantzberg and Boyd (1992). Use of these BAF values in the green heron dietary exposure model resulted in NOAEL-based HQ values of 0.04 for chromium and 0.27 for copper (see Table 7-19). The study area used by Krantzberg and Boyd (1992) to derive the BAF values had extremely high iron concentrations present in the sediment due to metal smelting, which may have affected metal bioavailability via co-precipitation of metals with iron hydroxide. As such, the BAF values used in Step 3a may have resulted in an understatement of potential risks to the green heron.

To determine the impact that the Krantzberg and Boyd (1992) BAF values had on estimated green heron dietary intakes, risk estimates for chromium and copper were derived using assumed BAF values of 1.0. The NOAEL-based HQ values (1.17 for chromium and 2.72 for copper) are elevated relative to NOAEL-based risk estimates derived using the Krantzberg and Boyd (1992) BAF values (0.04 for chromium and 0.27 for copper). It is noted that a literature search identified a compilation of sediment-to-fish BAF values reported by PTI Environmental Services in their report titled Bioaccumulation Factor Approach Analysis for Metals and Polar Organic Compounds (PTI Environmental Services, 1995). The compilation included a single sediment-to-fish BAF value for chromium, which is based on a laboratory study using yellow perch (*Perca flavescens*). This BAF value (0.043) is very comparable to the BAF value used in the refined risk calculation (0.038).

11.0 CONCLUSIONS AND RECOMMENDATIONS

11.1 Conclusions

Table 11-1 presents a summary of the ecological COPCs identified in Step 2 of the SERA, as well as the ecological COCs identified in Step 3a of the BERA for terrestrial and aquatic receptor group exposures to chemiclas in surface soil, subsurface soil, groundwater, estuarine wetland surface water and estuarine wetland sediment. Ecological COPCs and COCs for avian and mammalian dietary exposures to chemicals in surface soil, subsurface soil, and estuarine wetland sediment are listed in Table 11-2 A discussion of the ecological COCs identified in Tables 11-1 and 11-2 are provided within Sections 11.1 through 11.5 below.

11.1.1 Surface Soil

Based on the refined media-specific risk evaluation presented in Section 10.1.1, arsenic, lead, thallium, and zinc were identified as ecological COCs for terrestrial plant and invertebrate direct contact exposures to chemicals in Tank 214 Area surface soil. Screening level and refined risk estimates (i.e., Step 2 and Step 3a HQ values) for each metal exceed 1.0 (see Tables 7-1 and 10-6, respectively). The descriptive and/or distributional statistics presented in Table 10-7 also show that arsenic, lead, thallium, and zinc concentrations in Tank 214 Area surface soil are elevated relative to background concentrations. Note that the identified risk from arsenic and zinc is from a localized area around 9SS07.

Lead was identified as an ecological COC for avian herbivore and avian omnivore dietary exposures to chemicals in Tank 214 Area surface soil (see Section 10.1.6.1). Mourning dove and American robin dietary exposure doses derived using maximum and 95 percent UCL of the mean lead concentrations, respectively, exceed NOAEL-based TRVs (i.e., HQs > 1.0; see Tables 7-6 and 10-17, respectively). As evidenced by Table 10-17 the refined American robin exposure dose also exceeds the MATC-based TRV. As discussed in the preceding paragraph, lead concentrations in Tank 214 Area surface soil are also elevated relative to background concentrations. No chemicals were identified as ecological COCs for mammalian dietary exposures (see Section 10.1.6.1).

11.1.2 Subsurface Soil

Based on the refined risk evaluation presented in Section 10.1.2, lead and thallium were identified as ecological COCs for terrestrial plant and invertebrate direct contact exposures to chemicals in Tank 214 Area subsurface soil. Screening level and refined risk estimates (i.e., HQ values) for both metals exceed 1.0 (Tables 7-2 and 10-9, respectively). The descriptive statistics presented in Table 10-8 also show that lead and thallium concentrations in Tank 214 Area surface soil are elevated relative to background concentrations.

Lead was identified as an ecological COC for avian herbivore, omnivore and carnivore dietary exposures in Tank 214 Area subsurface soil (see Section 10.1.6.2). Thallium was also identified as an ecological COC for avian omnivore dietary exposures. American robin, mourning dove, and red-tailed hawk dietary exposure dose for lead exceeded the NOAEL-based TRVs (HQs = 7.28, 4.35, and 1.09, respectively). As evidenced by Table 10-18, the refined American robin and mourning dove dietary exposure doses exceed MATC- and LOAEL-based TRVs. As discussed in the preceding paragraph, lead concentrations in Tank 214 Area subsurface soil are also elevated relative to background concentrations. American robin dietary exposure dose for thallium exceeds the NOAEL-based TRV (HQ=1.59); however, the refined dose is less than MATC- and LOEL-based TRVs. Although the refined NOAEL-based HQ value is only slightly elevated above 1.0, thallium is identified as an ecological COC for avian omnivore dietary exposures to chemicals in Tank 214 Area subsurface soil

based, in part, on the small size of the subsurface soil data set, as well as the magnitude of a single maximum detected concentration (4.6 J mg/kg at 9SB03) above the mximum background concentration (0.29 J mg/kg). No chemicals were identified as ecological COCs for mammalian dietary exposures (see Section 10.1.6.2).

11.1.3 Groundwater

Based on the refined risk evaluation presented in Section 10.1.3, lead was identified as an ecological COC for Tank 214 Area groundwater. Maximum concentrations (total and dissolved fractions) exceed groundwater screening values (i.e., HQs > 1.0; see Tables 7-3 and 10-10). The descriptive and distributional statistics presented in Tables 10-9 and 10-11 indicate that lead concentrations in SWMU 9 groundwater are elevated relative to background concentrations. Although lead is identified as an ecological COC in groundwater, it should be noted that lead was not identified as an ecological COC in surface water based on the discussions presented in Section 10.1.4.

11.1.4 Estuarine Wetland Surface Water

Based on the refined risk evaluation presented in Section 10.1.4, no chemicals were identified as ecological COCs for aquatic receptor group direct contact exposures to chemicals in Tank 214 surface water. No further evaluation is recommended.

11.1.5 Estuarine Wetland Sediment

Based on the refined risk evaluation presented in Section 10.1.5, benzo(a)pyrene, chrysene, pyrene, and lead were detected and identified as ecological COCs for aquatic receptor group direct contact exposures to Tank 214 Area sediment. The Step 3a refined risk estimate for lead (i.e., HQ values) exceeds 1.0 (see Tables 10-14). The descriptive and distributional statictics presented in Table 10-15 also show that lead concentrations in the Tank 214 Area sediment are elevated relative to background concentrations. In the case of benzo(a)pyrene, chrysene, and pyrene, elevated concentrations were detected at locations clustered downgradient from potential sources. In many cases, elevated concentrations were co-located.

Lead was identified as an ecological COC for avian invertivore dietary exposures to chemicals in Tank 214 Area estuarine wetland sediment (See Section 10.1.6.3). The refined NOAEL-, MATC-, and LOAEL-based HQ values for the green heron are less than 1.0, while refined NOAEL-, MATC-, and LOAEL-based TRVs for the spotted sandpiper exceed 1.0 (2.46, 1.74, and 1.23, respectively). As discussed in the preceding paragraph, lead concentrations in estuarine wetland sediment are elevated relative to background concentrations.

11.2 Recommendations

As discussed in Section 11.1, ecological COC were identified for surface soil (arsenic, lead, thallium, and zinc), groundwater (lead), and sediment (benzo[a]pyrene, chrysene, pyrene, and lead). Therefore, a CMS is recommended to address potential risks. The CMS will include the development of Corrective Action Objectives (CAOs) protective of ecological receptors, an evaluation of corrective measure options to meet the CAOs and mitigate potential ecological risks, as well as the technical approach for implementation of the recommended corrective measures.

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TABLES

TABLE 2-1

LIST OF BIRDS REPORTED FROM OR HAVING THE POTENTIAL TO OCCUR AT NAVAL ACTIVITY PUERTO RICO SWMU 9 – AREA B, TANK 214 AREA SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Common Name [1]		
Pied-billed grebe	Red-billed tropicbird	Brown pelican
Brown booby	Magnificent frigatebird	Great blue heron
Louisiana heron	Snowy egret	Great egret
Striated heron	Little blue heron	Cattle egret
Least bittern	Yellow-crowned night heron	Black-crowned night heron
White-cheeked pintail	Blue-winged teal	American widgeon
Red-tailed hawk	Osprey	Merlin
Clapper rail	American coot	Caribbean coot
Common gallinule	Piping plover [3]	Semipalmated plover
Black-bellied plover	Wilson's plover	Killdeer
Ruddy turnstone	Black-necked stilt	Whimbrel
Spotted sandpiper	Semipalmated sandpiper	Short-billed dowitcher
Greater yellowlegs	Lesser yellowlegs	Willet
Stilt sandpiper	Pectoral sandpiper	Laughing gull
Royal tern	Sandwich tern	Bridled tern
Least tern	Brown noddy	White-winged dove
Zenaida dove	White-crowned pigeon	Mourning dove
Red-necked pigeon	Common ground dove	Bridled quail dove
Ruddy quail dove	Caribbean parakeet	Smooth-billed ani
Yellow-billed cuckoo	Mangrove cuckoo	Short-eared owl
Chuck-will's-widow	Common nighthawk	Antillean crested hummingbird
Green-throated carib	Antillean mango	Belted kingfisher

TABLE 2-1

LIST OF BIRDS REPORTED FROM OR HAVING THE POTENTIAL TO OCCUR AT NAVAL ACTIVITY PUERTO RICO SWMU 9 – AREA B, TANK 214 AREA SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICLA RISK ASSESSMENT NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Common Name [1]		
Gray kingbird	Loggerhead kingbird	Stolid flycatcher
Caribbean elaenia	Purple martin	Cave swallow
Barn swallow	Northern mockingbird	Pearly-eyed thrasher
Red-legged thrush	Black-whiskered vireo	American redstart
Parula warbler	Prairie warbler	Yellow warbler
Magnolia warbler	Cape May warbler	Black-throated blue warbler
Adelaide's warbler	Palm warbler	Black and white warbler
Ovenbird	Northern water thrush	Bananaquit
Striped-headed tanager	Shiny cowbird	Black-cowled oriole
Greater Antillean grackle	Yellow-shouldered blackbird [2]	Hooded manakin
Yellow-faced grassquit	Black-faced grassquit	Least sandpiper
Western sandpiper	Puerto Rican woodpecker	Rock dove
Puerto Rican emerald	Puerto Rican flycatcher	Pin-tailed whydah
Spice finch	Ruddy duck	Peregrine falcon
Marbled godwit	Puerto Rican lizard cuckoo	Prothonotary warbler
Green-winged teal	Orange-cheeked waxbill	Roseate tern [3]
Least grebe	West Indian whistling duck	Puerto Rican screech owl
Puerto Rican tody	Green heron	

Notes:

[1] List of birds taken from Integrated Natural Resource Management Plan for U.S. Naval Station Roosevelt Roads: Plan Years 1998-2007 (Geo-Marine, Inc., 1998).
[2] Federally-designated endangered species.
[3] Federally-designated threatened species.

TABLE 3-1

SUMMARY OF ANALYTICAL DATA EVALUATED IN THE ECOLOGICAL RISK ASSESSMENT
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

						Analysis															
Media	**Investigation**	**Site ID**	**Sample ID**	**Sample Depth (ft bgs)**	**Sample Date**	**App IX VOCs**	**BTEX**	**SVOCs**	**Low Level PAHs**	**Lead**	**Vanadium**	**Zinc**	**AVS/SEM**	**TOC**	**App IX Metals (Total)**	**App IX Metals (Dissolved)**	**pH**	**Moisture**	**Solids**	**Ammonia**	**Sulfide**	**Comment**
Surface Soil	RFI - Phase I	9SS03	9SS03	0.0 - 1.0	3/20/1996	X		X	X						X							
		9SS04	9SS04	0.0 - 1.0	3/20/1996	X		X	X						X							
		9MW03	9MW03-00	0.0 - 1.0	3/20/1996	X		X	X						X							
	CMS	9SS07	9SS07	0.0 - 1.0	12/16/2000				X						X							
			9SS07D	0.0 - 1.0	12/16/2000				X						X							Duplicate [(1)]
		9SS08	9SS08	0.0 - 1.0	12/16/2000				X						X							
	ADCI	9SS10	9SS10	0.0 - 0.5	7/14/2003					X		X										
		9SS11	9SS11	0.0 - 0.5	7/14/2003					X		X										
		9SS12	9SS12	0.0 - 0.5	7/14/2003					X		X										
		9SS13	9SS13	0.0 - 0.5	7/14/2003					X		X										
		9SS14	9SS14	0.0 - 0.5	7/14/2003					X		X										
		9SS15	9SS15	0.0 - 0.5	7/14/2003					X		X										
		9SS16	9SS16	0.0 - 0.5	7/14/2003					X		X										
		9SS17	9SS17	0.0 - 0.5	7/14/2003					X		X										
		9SS18	9SS18	0.0 - 0.5	7/14/2003					X		X										
		9SS19	9SS19	0.0 - 0.5	7/14/2003					X		X										
		9SS20	9SS20	0.0 - 0.5	7/14/2003					X		X										
		9SS21	9SS21	0.0 - 0.5	7/14/2003					X		X										
		9SS23	9SS23	0.0 - 0.5	7/14/2003					X		X										
		9SS24	9SS24	0.0 - 0.5	7/14/2003					X		X										
		9SS25	9SS25	0.0 - 0.5	7/14/2003					X		X										
		9SS28	9SS28	0.0 - 0.5	7/14/2003					X		X										
	Phase I RFI for Area B	9SB00	9SB00-00	0.0 - 1.0	3/12/2007	X		X	X						X							
		9SB01	9SB01-00	0.0 - 1.0	3/12/2007	X		X	X						X							
			9SB01-00D	0.0 - 1.0	3/12/2007	X		X	X						X							Duplicate [(1)]
		9SB02	9SB02-00	0.0 - 1.0	3/12/2007	X		X	X						X							
		9SB03	9SB03-00	0.0 - 1.0	3/12/2007	X		X	X						X							
		9SB04	9SB04-00	0.0 - 1.0	3/12/2007	X		X	X						X							
		9SB05	9SB05-00	0.0 - 1.0	3/13/2007	X		X	X						X							
		9SB06	9SB06-00	0.0 - 1.0	3/13/2007	X		X	X						X							
		9SB07	9SB07-00	0.0 - 1.0	3/13/2007	X		X	X						X							
		9SB08	9SB08-00	0.0 - 1.0	3/13/2007	X		X	X						X							
		9SB09	9SB09-00	0.0 - 1.0	3/13/2007	X		X	X						X							
		9SB10	9SB10-00	0.0 - 1.0	3/13/2007	X		X	X						X							
		9SB11	9SB11-00	0.0 - 1.0	3/13/2007	X		X	X						X							
		9SB12	9SB12-00	0.0 - 1.0	3/13/2007	X		X	X						X							
		9SB13	9SB13-00	0.0 - 1.0	3/14/2007	X		X	X						X							
		9SB14	9SB14-00	0.0 - 1.0	3/14/2007	X		X	X						X							

TABLE 3-1

SUMMARY OF ANALYTICAL DATA EVALUATED IN THE ECOLOGICAL RISK ASSESSMENT
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

						Analysis															
Media	**Investigation**	**Site ID**	**Sample ID**	**Sample Depth (ft bgs)**	**Sample Date**	**App IX VOCs**	**BTEX**	**SVOCs**	**Low Level PAHs**	**Lead**	**Vanadium**	**Zinc**	**AVS/SEM**	**TOC**	**App IX Metals (Total)**	**App IX Metals (Dissolved)**	**pH**	**Moisture**	**Solids**	**Ammonia**	**Sulfide**	**Comment**
Surface Soil	Phase I RFI for Area B	9SB15	9SB15-00	0.0 - 1.0	3/14/2007	X		X	X						X							
		9SB16	9SB16-00	0.0 - 1.0	3/14/2007	X		X	X						X							
			9SB16-00D	0.0 - 1.0	3/14/2007	X		X	X						X							Duplicate (1)
		9SB17	9SB17-00	0.0 - 1.0	3/14/2007	X		X	X						X							
		9SB18	9SB18-00	0.0 - 1.0	3/14/2007	X		X	X						X							
		9SB19	9SB19-00	0.0 - 1.0	3/14/2007	X		X	X						X							
		9SB20	9SB20-00	0.0 - 1.0	3/15/2007	X		X	X						X							
		9SB23	9SB23-00	0.0 - 1.0	3/15/2007	X		X	X						X							
		9SB29	9SB29-00	0.0 - 1.0	3/19/2007	X		X	X						X							
			9SB29-00D	0.0 - 1.0	3/19/2007	X		X	X						X							Duplicate (1)
	Full RFI	9SB36	9SB36-00	0.0 - 1.0	1/20/2009	X			X						X							
			9SB36-00D	0.0 - 1.0	1/20/2009	X			X						X							Duplicate (1)
			9SB36-00MS/MSD	0.0 - 1.0	1/20/2009	X			X						X							Matrix Spike/Matrix Spike Duplicate
		9SB37	9SB37-00	0.0 - 1.0	1/18/2009	X			X						X							
		9SB38	9SB38-00	0.0 - 1.0	1/20/2009	X			X						X							
		9SB39	9SB39-00	0.0 - 1.0	1/18/2009	X			X						X							
		9SB40	9SB40-00	0.0 - 1.0	1/18/2009	X			X						X							
		9SB41	9SB41-00	0.0 - 1.0	1/18/2009	X			X						X							
		9SB42	9SB42-00	0.0 - 1.0	1/17/2009	X			X						X							
		9SB43	9SB43-00	0.0 - 1.0	1/18/2009	X			X						X							
		9SB44	9SB44-00	0.0 - 1.0	1/17/2009	X			X						X							
		9SB45	9SB45-00	0.0 - 1.0	1/18/2009	X			X						X							
		9SB46	9SB46-00	0.0 - 1.0	1/18/2009	X			X						X							
			9SB46-00D	0.0 - 1.0	1/18/2009	X			X						X							Duplicate (1)
		9SB47	9SB47-00	0.0 - 1.0	1/19/2009	X			X						X							
		9SB48	9SB48-00	0.0 - 1.0	1/20/2009	X			X						X							
		9SB49	9SB49-00	0.0 - 1.0	1/21/2009	X			X						X							
		9SB50	9SB50-00	0.0 - 1.0	1/20/2009	X			X						X							
		9SB51	9SB51-00	0.0 - 1.0	1/20/2009	X			X						X							
		9SB52	9SB52-00	0.0 - 1.0	1/17/2009	X			X						X							
		9SB53	9SB53-00	0.0 - 1.0	1/19/2009	X			X						X							
		9SB54	9SB54-00	0.0 - 1.0	1/16/2009	X			X						X							
Subsurface Soil	Phase I RFI for Area B	9SB00	9SB00-01	1.0 - 3.0	3/12/2007	X		X	X						X							
		9SB03	9SB03-01	1.0 - 3.0	3/12/2007	X		X	X						X							
		9SB06	9SB06-01	1.0 - 3.0	3/13/2007	X		X	X						X							
	Full RFI	9SB48	9SB48-01	1.0 - 3.0	1/20/2009	X			X													
		9SB51	9SB51-01	1.0 - 3.0	1/20/2009	X			X													
		9SB57	9SB57-01	1.0 - 3.0	1/11/2011	X																

TABLE 3-1

SUMMARY OF ANALYTICAL DATA EVALUATED IN THE ECOLOGICAL RISK ASSESSMENT
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

						Analysis																
Media	**Investigation**	**Site ID**	**Sample ID**	**Sample Depth (ft bgs)**	**Sample Date**	**App IX VOCs**	**BTEX**	**SVOCs**	**Low Level PAHs**	**Lead**	**Vanadium**	**Zinc**	**AVS/SEM**	**TOC**	**App IX Metals (Total)**	**App IX Metals (Dissolved)**	**pH**	**Moisture**	**Solids**	**Ammonia**	**Sulfide**	**Comment**
Subsurface Soil	**Full RFI**	9SB59	9SB59-01	1.0 - 3.0	1/11/2011	X																
		9SB63	9SB63-01	1.0 - 3.0	1/11/2011	X																
			9SB63-01D	1.0 - 3.0	1/11/2011	X																Duplicate [(1)]
			9SB63-01MS/MSD	1.0 - 3.0	1/11/2011	X																Matrix Spike/Matrix Spike Duplicate
Sediment	**RFI - Phase III**	9SW/SD01	9SD01	0.0 - 0.5	6/29/1999	X		X							X							
		9SW/SD02	9SD02	0.0 - 0.5	6/29/1999	X		X							X							
		9SW/SD03	9SD03	0.0 - 0.5	6/29/1999	X		X							X							
		9SW/SD04	9SD04	0.0 - 0.5	6/29/1999	X		X							X							
	CMS	9SW/SD13	9SD13	0.0 - 0.5	12/17/2000				X				X		X							
			9SD13D	0.0 - 0.5	12/17/2000				X						X							Duplicate [(1)]
		9SW/SD14	9SD14	0.0 - 0.5	12/17/2000				X				X		X							
		9SW/SD15	9SD15	0.0 - 0.5	12/17/2000				X				X		X							
		9SW/SD16	9SD16	0.0 - 0.5	12/17/2000				X				X		X							
		9SW/SD17	9SD17	0.0 - 0.5	12/17/2000				X				X		X							
		9SW/SD18	9SD18	0.0 - 0.5	12/17/2000				X				X		X							
			9SD18D	0.0 - 0.5	12/17/2000				X						X							Duplicate [(1)]
		9SW/SD19	9SD19	0.0 - 0.5	12/17/2000				X				X		X							
		9SW/SD20	9SD20	0.0 - 0.5	12/17/2000				X				X		X							
		9SW/SD21	9SD21	0.0 - 0.5	12/17/2000				X				X		X							
		9SW/SD22	9SD22	0.0 - 0.5	12/17/2000				X				X		X							
			9SD22D	0.0 - 0.5	12/17/2000				X						X							Duplicate [(1)]
		9SW/SD23	9SD23	0.0 - 0.5	12/17/2000				X				X		X							
	ADCI	9SD29	9SD29	0.0 - 0.5	7/15/2003					X												
		9SD30	9SD30	0.0 - 0.5	7/15/2003					X												
		9SD31	9SD31	0.0 - 0.5	7/15/2003					X												
		9SD32	9SD32	0.0 - 0.5	7/15/2003					X												
		9SD33	9SD33	0.0 - 0.5	7/15/2003					X												
		9SD34	9SD34	0.0 - 0.5	7/15/2003					X												
	Step 5 and 6 of the BERA	9SD35	9SD35	0.0 - 0.5	8/6/2005					X			X	X				X	X	X		
		9SD36	9SD36	0.0 - 0.5	8/6/2005					X			X	X				X	X	X		
		9SD37	9SD37	0.0 - 0.5	8/6/2005					X			X	X				X	X	X		
		9SD38	9SD38	0.0 - 0.5	8/6/2005					X			X	X				X	X	X		
		9SD39	9SD39	0.0 - 0.5	8/6/2005					X			X	X				X	X	X		
		9SD40	9SD40	0.0 - 0.5	8/6/2005					X			X	X				X	X	X		
		9SD41	9SD41	0.0 - 0.5	8/6/2005					X			X	X				X	X	X		
		9SD42	9SD42	0.0 - 0.5	8/6/2005					X			X	X				X	X	X		
		9SD43	9SD43	0.0 - 0.5	8/6/2005					X			X	X				X	X	X		

TABLE 3-1

SUMMARY OF ANALYTICAL DATA EVALUATED IN THE ECOLOGICAL RISK ASSESSMENT
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

						Analysis																
Media	**Investigation**	**Site ID**	**Sample ID**	**Sample Depth (ft bgs)**	**Sample Date**	**App IX VOCs**	**BTEX**	**SVOCs**	**Low Level PAHs**	**Lead**	**Vanadium**	**Zinc**	**AVS/SEM**	**TOC**	**App IX Metals (Total)**	**App IX Metals (Dissolved)**	**pH**	**Moisture**	**Solids**	**Ammonia**	**Sulfide**	**Comment**
Sediment	Step 5 and 6 of the BERA	9SD44	9SD44	0.0 - 0.5	8/6/2005					X			X	X				X	X	X		
			9SD44D	0.0 - 0.5	8/6/2005					X								X	X			Duplicate (1)
		9SD45	9SD45	0.0 - 0.5	8/6/2005					X			X	X				X	X	X		
		9SD46	9SD46	0.0 - 0.5	8/6/2005					X			X	X				X	X	X		
		9SD47	9SD47	0.0 - 0.5	8/6/2005					X			X	X				X	X	X		
		9SD48	9SD48	0.0 - 0.5	8/6/2005					X			X	X				X	X	X		
		9SD49	9SD49	0.0 - 0.5	8/6/2005					X			X	X				X	X	X		
		9SD50	9SD50	0.0 - 0.5	8/6/2005					X			X	X				X	X	X		
		9SD51	9SD51	0.0 - 0.5	8/6/2005					X			X	X				X	X	X		
		9SD52	9SD52	0.0 - 0.5	8/6/2005					X			X	X				X	X	X		
		9SD53	9SD53	0.0 - 0.5	8/6/2005					X			X	X				X	X	X		
		9SD54	9SD54	0.0 - 0.5	8/6/2005					X			X	X				X	X	X		
			9SD54D	0.0 - 0.5	8/6/2005					X								X	X			Duplicate (1)
		9SD55	9SD55	0.0 - 0.5	8/7/2005					X			X	X				X	X	X		
		9SD56	9SD56	0.0 - 0.5	8/7/2005					X			X	X				X	X	X		
		9SD57	9SD57	0.0 - 0.5	8/7/2005					X			X	X				X	X	X		
		9SD58	9SD58	0.0 - 0.5	8/7/2005					X			X	X				X	X	X		
		9SD59	9SD59	0.0 - 0.5	8/7/2005					X			X	X				X	X	X		
		9SD60	9SD60	0.0 - 0.5	8/7/2005					X			X	X				X	X	X		
		9SD61	9SD61	0.0 - 0.5	8/7/2005					X			X	X				X	X	X		
		9SD62	9SD62	0.0 - 0.5	8/7/2005					X			X	X				X	X	X		
		9SD63	9SD63	0.0 - 0.5	8/7/2005					X			X	X				X	X	X		
		9SD64	9SD64	0.0 - 0.5	8/7/2005					X			X	X				X	X	X		
			9SD64D	0.0 - 0.5	8/7/2005					X								X	X			Duplicate (1)
		9SD65	9SD65	0.0 - 0.5	8/7/2005					X			X	X				X	X	X		
		9SD66	9SD66	0.0 - 0.5	8/7/2005					X			X	X				X	X	X		
		9SD67	9SD67	0.0 - 0.5	8/7/2005					X			X	X				X	X	X		
		9SD68	9SD68	0.0 - 0.5	8/7/2005					X			X	X				X	X	X		
		9SD69	9SD69	0.0 - 0.5	8/7/2005					X			X	X				X	X	X		
		9SD70	9SD70	0.0 - 0.5	8/7/2005					X			X	X				X	X	X		
		9SD71	9SD71	0.0 - 0.5	8/7/2005					X			X	X				X	X	X		
		9SD72	9SD72	0.0 - 0.5	8/7/2005					X			X	X				X	X	X		
		9SD73	9SD73	0.0 - 0.5	8/7/2005					X			X	X				X	X	X		
		9SD74	9SD74	0.0 - 0.5	8/7/2005					X			X	X				X	X	X		
		9SD75	9SD75	0.0 - 0.5	8/7/2005					X			X	X				X	X	X		
		9SD76	9SD76	0.0 - 0.5	8/7/2005					X			X	X				X	X	X		
		9SD77	9SD77	0.0 - 0.5	8/7/2005					X			X	X				X	X	X		
		9SD78	9SD78	0.0 - 0.5	8/7/2005					X			X	X				X	X	X		

TABLE 3-1

SUMMARY OF ANALYTICAL DATA EVALUATED IN THE ECOLOGICAL RISK ASSESSMENT
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

						Analysis															
Media	**Investigation**	**Site ID**	**Sample ID**	**Sample Depth (ft bgs)**	**Sample Date**	**App IX VOCs**	**BTEX**	**SVOCs**	**Low Level PAHs**	**Lead**	**Vanadium**	**Zinc**	**AVS/SEM**	**TOC**	**App IX Metals (Total)**	**App IX Metals (Dissolved)**	**pH**	**Moisture**	**Solids**	**Ammonia**	**Sulfide**	**Comment**
Sediment	Step 5 and 6 of the BERA	9SD79	9SD79	0.0 - 0.5	8/7/2005					X			X	X				X	X	X		
		9SD19	9SD19B	0.0 - 0.5	1/22/2006					X			X	X			X			X	X	
		9SD30	9SD30B	0.0 - 0.5	1/22/2006					X			X	X			X			X	X	
		9SD36	9SD36B	0.0 - 0.5	1/22/2006					X			X	X			X			X	X	
		9SD41	9SD41B	0.0 - 0.5	1/22/2006					X			X	X			X			X	X	
		9SD43	9SD43B	0.0 - 0.5	1/22/2006					X			X	X			X			X	X	
		9SD44	9SD44B	0.0 - 0.5	1/22/2006					X			X	X			X			X	X	
		9SD46	9SD46B	0.0 - 0.5	1/22/2006					X			X	X			X			X	X	
		9SD47	9SD47B	0.0 - 0.5	1/22/2006					X			X	X			X			X	X	
		9SD48	9SD48B	0.0 - 0.5	1/22/2006					X			X	X			X			X	X	
		9SD49	9SD49B	0.0 - 0.5	1/22/2006					X			X	X			X			X	X	
			9SD49BD	0.0 - 0.5	1/22/2006					X												Duplicate (1)
		9SD50	9SD50B	0.0 - 0.5	1/22/2006					X			X	X			X			X	X	
		9SD51	9SD51B	0.0 - 0.5	1/22/2006					X			X	X			X			X	X	
		9SD52	9SD52B	0.0 - 0.5	1/22/2006					X			X	X			X			X	X	
		9SD53	9SD53B	0.0 - 0.5	1/22/2006					X			X	X			X			X	X	
		9SD56	9SD56B	0.0 - 0.5	1/22/2006					X			X	X			X			X	X	
		9SD57	9SD57B	0.0 - 0.5	1/22/2006					X			X	X			X			X	X	
		9SD60	9SD60B	0.0 - 0.5	1/22/2006					X			X	X			X			X	X	
		9SD63	9SD63B	0.0 - 0.5	1/22/2006					X			X	X			X			X	X	
		9SD75	9SD75B	0.0 - 0.5	1/22/2006					X			X	X			X			X	X	
		9SD76	9SD76B	0.0 - 0.5	1/22/2006					X			X	X			X			X	X	
			9SD76BD	0.0 - 0.5	1/22/2006					X												Duplicate (1)
	Phase I RFI for Area B	9SD19	9SD19	0.0 - 0.5	3/17/2007	X		X	X						X							
		9SD30	9SD30	0.0 - 0.5	3/17/2007	X		X	X						X							
		9SD44	9SD44	0.0 - 0.5	3/17/2007	X		X	X						X							
		9SD48	9SD48	0.0 - 0.5	3/17/2007	X		X	X						X							
		9SD49	9SD49	0.0 - 0.5	3/17/2007	X		X	X						X							
		9SD50	9SD50	0.0 - 0.5	3/17/2007	X		X	X						X							
			9SD50D	0.0 - 0.5	3/17/2007	X		X	X						X							Duplicate (1)
		9SD52	9SD52	0.0 - 0.5	3/17/2007	X		X	X						X							
		9SDUVF-18	9SDUVF-18	0.0 - 0.5	3/17/2007	X		X	X						X							
		9SDUVF-20	9SDUVF-20	0.0 - 0.5	3/17/2007	X		X	X						X							
		9SD53	9SD53	0.0 - 0.5	3/17/2007	X		X	X						X							
		9SDBKG01	9SDBKG02	0.0 - 0.5	3/19/2007	X		X	X						X							
	Full RFI	9SD39	9SD39	0.0 - 0.5	1/17/2009	X			X						X							
			9SD39D	0.0 - 0.5	1/17/2009	X			X						X							Duplicate (1)
			9SD39MS/MSD	0.0 - 0.5	1/17/2009	X			X						X							Matrix Spike/Matrix Spike Duplicate

TABLE 3-1

SUMMARY OF ANALYTICAL DATA EVALUATED IN THE ECOLOGICAL RISK ASSESSMENT
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

						Analysis															
Media	**Investigation**	**Site ID**	**Sample ID**	**Sample Depth (ft bgs)**	**Sample Date**	**App IX VOCs**	**BTEX**	**SVOCs**	**Low Level PAHs**	**Lead**	**Vanadium**	**Zinc**	**AVS/SEM**	**TOC**	**App IX Metals (Total)**	**App IX Metals (Dissolved)**	**pH**	**Moisture**	**Solids**	**Ammonia**	**Sulfide**	**Comment**
Sediment	Full RFI	9SD41	9SD41	0.0 - 0.5	1/17/2009	X			X						X							
		9SD45	9SD45	0.0 - 0.5	1/17/2009	X			X						X							
		9SD47	9SD47	0.0 - 0.5	1/17/2009	X			X						X							
		9SD54	9SD54	0.0 - 0.5	1/18/2009	X			X						X							
		9SD59	9SD59	0.0 - 0.5	1/20/2009	X			X						X							
		9SD70	9SD70	0.0 - 0.5	1/21/2009	X			X						X							
		9SD71	9SD71	0.0 - 0.5	1/21/2009	X			X						X							
		9SD72	9SD72	0.0 - 0.5	1/21/2009	X			X						X							
		9SD75	9SD75	0.0 - 0.5	1/21/2009	X			X						X							
		9SD77	9SD77	0.0 - 0.5	1/21/2009	X			X						X							
			9SD77D	0.0 - 0.5	1/21/2009	X			X						X							Duplicate (1)
		9SD78	9SD78	0.0 - 0.5	1/21/2009	X			X						X							
		9SD79	9SD79	0.0 - 0.5	1/21/2009	X			X						X							
		9SD80	9SD80	0.0 - 0.5	1/16/2009	X			X						X							
		9SD81	9SD81	0.0 - 0.5	1/16/2009	X			X						X							
		9SD82	9SD82	0.0 - 0.5	1/16/2009	X			X						X							
		9SD83	9SD83	0.0 - 0.5	1/17/2009	X			X						X							
		9SD84	9SD84	0.0 - 0.5	1/16/2009	X			X						X							
		9SD85	9SD85	0.0 - 0.5	1/16/2009	X			X						X							
		9SD86	9SD86	0.0 - 0.5	1/16/2009	X			X						X							
		9SD87	9SD87	0.0 - 0.5	1/17/2009	X			X						X							
			9SD87D	0.0 - 0.5	1/17/2009	X			X						X							Duplicate (1)
			9SD87MS/MSD	0.0 - 0.5	1/17/2009	X			X						X							Matrix Spike/Matrix Spike Duplicate
		9SD88	9SD88	0.0 - 0.5	1/17/2009	X			X						X							
		9SD89	9SD89	0.0 - 0.5	1/17/2009	X			X						X							
		9SD90	9SD90	0.0 - 0.5	1/17/2009	X			X						X							
		9SD91	9SD91	0.0 - 0.5	1/18/2009	X			X						X							
		9SD92	9SD92	0.0 - 0.5	1/17/2009	X			X						X							
		9SD93	9SD93	0.0 - 0.5	1/18/2009	X			X						X							
		9SD94	9SD94	0.0 - 0.5	1/18/2009	X			X						X							
		9SD95	9SD95	0.0 - 0.5	1/20/2009	X			X						X							
		9SD96	9SD96	0.0 - 0.5	1/18/2009	X			X						X							
		9SD97	9SD97	0.0 - 0.5	1/20/2009	X			X						X							
		9SD98	9SD98	0.0 - 0.5	1/20/2009	X			X						X							
		9SD99	9SD99	0.0 - 0.5	1/20/2009	X			X						X							
		9SD100	9SD100	0.0 - 0.5	1/20/2009	X			X						X							
		9SD101	9SD101	0.0 - 0.5	1/20/2009	X			X						X							
		9SD102	9SD102	0.0 - 0.5	1/20/2009	X			X						X							

TABLE 3-1

SUMMARY OF ANALYTICAL DATA EVALUATED IN THE ECOLOGICAL RISK ASSESSMENT
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

						Analysis															
Media	**Investigation**	**Site ID**	**Sample ID**	**Sample Depth (ft bgs)**	**Sample Date**	**App IX VOCs**	**BTEX**	**SVOCs**	**Low Level PAHs**	**Lead**	**Vanadium**	**Zinc**	**AVS/SEM**	**TOC**	**App IX Metals (Total)**	**App IX Metals (Dissolved)**	**pH**	**Moisture**	**Solids**	**Ammonia**	**Sulfide**	**Comment**
Sediment	Full RFI	9SD103	9SD103	0.0 - 0.5	1/20/2009	X			X						X							
			9SD103D	0.0 - 0.5	1/20/2009	X			X						X							Duplicate [(1)]
		9SD104	9SD104	0.0 - 0.5	1/20/2009	X			X						X							
		9SD105	9SD105	0.0 - 0.5	1/21/2009	X			X						X							
		9SD106	9SD106	0.0 - 0.5	1/21/2009	X			X						X							
		9SD107	9SD107	0.0 - 0.5	1/21/2009	X			X						X							
			9SD107D	0.0 - 0.5	1/21/2009	X			X						X							Duplicate [(1)]
			9SD107MS/MSD	0.0 - 0.5	1/21/2009	X			X						X							Matrix Spike/Matrix Spike Duplicate
		9SD108	9SD108	0.0 - 0.5	1/21/2009	X			X						X							
		9SD109	9SD109	0.0 - 0.5	1/11/2011					X			X									
		9SD110	9SD110	0.0 - 0.5	1/11/2011					X			X									
		9SD111	9SD111	0.0 - 0.5	1/11/2011					X			X									
		9SD112	9SD112	0.0 - 0.5	1/11/2011					X			X									
		9SD124	9SD124	0.0 - 0.5	1/6/2011				X					X								
		9SD125	9SD125	0.0 - 0.5	1/6/2011				X					X								
			9SD125D	0.0 - 0.5	1/6/2011				X													Duplicate [(1)]
			9SD125MS/MSD	0.0 - 0.5	1/6/2011				X													Matrix Spike/Matrix Spike Duplicate
		9SD129	9SD129	0.0 - 0.5	1/6/2011						X											
		9SD130	9SD130	0.0 - 0.5	1/6/2011						X											
		9SD131	9SD131	0.0 - 0.5	1/6/2011						X											
			9SD131D	0.0 - 0.5	1/6/2011						X											Duplicate [(1)]
			9SD131MS/MSD	0.0 - 0.5	1/6/2011						X											Matrix Spike/Matrix Spike Duplicate
		9SD136	9SD136	0.0 - 0.5	1/6/2011						X											
		9SD137	9SD137	0.0 - 0.5	1/6/2011						X											
		9SD138	9SD138	0.0 - 0.5	1/6/2011						X											
		9SD177	9SD177	0.0 - 0.5	1/11/2011					X			X									
		9SD178	9SD178	0.0 - 0.5	1/11/2011					X			X									
		9SD179	9SD179	0.0 - 0.5	1/11/2011					X			X									
		9SD180	9SD180	0.0 - 0.5	1/11/2011					X			X									
			9SD180D	0.0 - 0.5	1/11/2011					X			X									Duplicate [(1)]
			9SD180MS/MSD	0.0 - 0.5	1/11/2011					X			X									Matrix Spike/Matrix Spike Duplicate
		9SD181	9SD181	0.0 - 0.5	1/11/2011					X			X									
		9SD182	9SD182	0.0 - 0.5	1/11/2011					X			X									
		9SD183	9SD183	0.0 - 0.5	1/11/2011					X			X									

TABLE 3-1

SUMMARY OF ANALYTICAL DATA EVALUATED IN THE ECOLOGICAL RISK ASSESSMENT
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

						Analysis															
Media	**Investigation**	**Site ID**	**Sample ID**	**Sample Depth (ft bgs)**	**Sample Date**	**App IX VOCs**	**BTEX**	**SVOCs**	**Low Level PAHs**	**Lead**	**Vanadium**	**Zinc**	**AVS/SEM**	**TOC**	**App IX Metals (Total)**	**App IX Metals (Dissolved)**	**pH**	**Moisture**	**Solids**	**Ammonia**	**Sulfide**	**Comment**
Surface Water	**RFI - Phase III**	9SW/SD01	9SW01	0.0 - 0.5	6/29/1999	X		X							X	X					X	
		9SW/SD02	9SW02	0.0 - 0.5	6/29/1999	X		X							X	X					X	
		9SW/SD03	9SW03	0.0 - 0.5	6/29/1999	X		X							X	X					X	
		9SW/SD04	9SW04	0.0 - 0.5	6/29/1999	X		X							X	X					X	
	CMS	9SW/SD13	9SD13	0.0 - 0.5	12/17/2000		X								X	X					X	
		9SW/SD14	9SD14	0.0 - 0.5	12/17/2000		X								X	X					X	
		9SW/SD15	9SD15	0.0 - 0.5	12/17/2000		X								X	X					X	
		9SW/SD16	9SD16	0.0 - 0.5	12/17/2000		X								X	X					X	
		9SW/SD17	9SD17	0.0 - 0.5	12/17/2000		X								X	X					X	
		9SW/SD18	9SD18	0.0 - 0.5	12/17/2000		X								X	X					X	
		9SW/SD19	9SD19	0.0 - 0.5	12/17/2000		X								X	X					X	
		9SW/SD20	9SD20	0.0 - 0.5	12/17/2000		X								X	X					X	
		9SW/SD21	9SD21	0.0 - 0.5	12/17/2000		X								X	X					X	
		9SW/SD22	9SD22	0.0 - 0.5	12/17/2000		X								X	X					X	
		9SW/SD23	9SD23	0.0 - 0.5	12/17/2000		X								X	X					X	
Groundwater	**Phase I RFI for Area B**	9GW00	9GW00	NA	3/16/2007	X									X							
		9GW01	9GW01	NA	3/16/2007	X		X	X						X	X						
		9GW06	9GW06	NA	3/16/2007	X		X	X						X	X						
		9GW13	9GW13	NA	3/16/2007	X		X	X						X	X						
			9GW13D	NA	3/16/2007	X		X	X						X	X						Duplicate [(1)]
		9GW16	9GW16	NA	3/16/2007	X		X	X						X	X						
		9GW17	9GW17	NA	3/16/2007	X		X	X						X	X						
		9GW25	9GW25	NA	3/17/2007	X		X	X						X	X						
	Full RFI	13SB05	13GW05-11	NA	1/8/2011	X																
			13GW05-11D	NA	1/8/2011	X																Duplicate [(1)]
			13GW05-11MS/MSD	NA	1/8/2011	X																Matrix Spike/Matrix Spike Duplicate
		9SB09	9GW09-11	NA	1/12/2011	X																Permanent well
		9SB37	9GW37-11	NA	1/11/2011	X																Temporary well
		9SB39	9GW39-11	NA	1/9/2011	X																Temporary well
		9SB40	9GW40-11	NA	1/10/2011	X																Temporary well
		9SB41	9GW41-11	NA	1/10/2011	X																Permanent well
		9SB42	9GW42-11	NA	1/8/2011	X																Temporary well
		9SB44	9GW44-11	NA	1/9/2011	X																Permanent well
		9SB47	9GW47-11	NA	1/10/2011	X																Permanent well
		9SB48	9GW48-11	NA	1/11/2011	X																Temporary well

TABLE 3-1

SUMMARY OF ANALYTICAL DATA EVALUATED IN THE ECOLOGICAL RISK ASSESSMENT
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

						Analysis																
Media	**Investigation**	**Site ID**	**Sample ID**	**Sample Depth (ft bgs)**	**Sample Date**	**App IX VOCs**	**BTEX**	**SVOCs**	**Low Level PAHs**	**Lead**	**Vanadium**	**Zinc**	**AVS/SEM**	**TOC**	**App IX Metals (Total)**	**App IX Metals (Dissolved)**	**pH**	**Moisture**	**Solids**	**Ammonia**	**Sulfide**	**Comment**
Groundwater	**Full RFI**	9SB52	9GW52-11	NA	1/9/2011	X																Permanent well
		9SB53	9GW53-11	NA	1/9/2011	X																Permanent well
		9SB54	9GW54-11	NA	1/8/2011	X																Permanent well
		9SB56	9GW56-11	NA	1/13/2011	X																Permanent well
		9SB57	9GW57-11	NA	1/13/2011	X																Permanent well
		9SB58	9GW58-11	NA	1/13/2011	X																Permanent well
		9SB59	9GW59-11	NA	1/13/2011	X																Permanent well
			9GW59-11D	NA	01/13/11	X																Duplicate [1]

Notes:

ADCI - Additional Data Collection Investigation
App IX - Appendix IX
AVS/SEM - Acid Volatile Sulfide/Simulatneously Extracted Metals
BERA - Baseline Ecological Risk Assessment
BTEX - Benzene, Toluene, Ethylbenzene, Xylene
CMS - Corrective Measures Study
ft bgs - feet below ground surface.
NA - Not Applicable.
PAHs - Polynuclear Aromatic Hydrocarbons
RFI - RCRA Facility Investigation
SVOCs - Semivolatile Organic Compounds
TOC - Total Organic Carbon
VOCs - Volatile Organic Compounds

[1] Results from duplicate samples were not evaluated individually. Refer to Section 6.1.

TABLE 4-1

PRELIMINARY ASSESSMENT ENDPOINTS, RISK QUESTIONS, AND MEASUREMENT ENDPOINTS
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Assessment Endpoints	Risk Questions	Measurement Endpoints
Terrestrial Habitat: Survival, growth, and reproduction of terrestrial soil invertebrate communities.	Are site-related chemical concentrations in surface and subsurface soil sufficient to adversely affect terrestrial soil invertebrate communities?	Comparison of maximum chemical concentrations in surface and subsurface soil with soil screening values.
Survival, growth, and reproduction of terrestrial plant communities.	Are site-related chemical concentrations in surface and subsurface soil sufficient to adversely affect terrestrial plant communities?	Comparison of maximum chemical concentrations in surface and subsurface soil with soil screening values.
Survival, growth, and reproduction of flying mammalian herbivores (i.e., bats).	Are site-related chemical concentrations in surface and subsurface soil sufficient to cause adverse effects (on growth, survival, or reproduction) to flying mammal species (i.e., bats) that may consume terrestrial plants from the site?	Comparison of chronic No Observed Adverse Effect Level (NOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on maximum chemical concentrations in surface and subsurface soil.
Survival, growth, and reproduction of terrestrial avian herbivores.	Are site-related chemical concentrations in surface and subsurface soil sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume terrestrial plants from the site?	Comparison of chronic No Observed Adverse Effect Level (NOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on maximum chemical concentrations in surface and subsurface soil.
Survival, growth, and reproduction of terrestrial avian omnivores.	Are site-related chemical concentrations in surface and subsurface soil sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume terrestrial plants and soil invertebrates from the site?	Comparison of chronic No Observed Adverse Effect Level (NOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on maximum chemical concentrations in surface and subsurface soil.
Survival, growth, and reproduction of terrestrial avian carnivores.	Are site-related chemical concentrations in surface and subsurface soil sufficient to cause adverse effects (on growth, survival, or reproduction) to avian species that may consume small mammals from the site?	Comparison of chronic No Observed Adverse Effect Level (NOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on maximum chemical concentrations in surface and subsurface soil.
Survival, growth, and reproduction of terrestrial reptile communities.	Are site-related chemical concentrations in surface and subsurface soil sufficient to cause adverse effects (on growth, survival, or reproduction) to terrestrial reptiles?	Qualitative examination of exposures and risks to ecological receptors occupying similar trophic levels.

TABLE 4-1

PRELIMINARY ASSESSMENT ENDPOINTS, RISK QUESTIONS, AND MEASUREMENT ENDPOINTS
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Assessment Endpoints	Risk Questions	Measurement Endpoints
Terestrial Habitat (continued): Survival, growth, and reproduction of terrestrial amphibian communities.	Are site-related chemical concentrations in surface and subsurface soil sufficient to cause adverse effects (on growth, survival, or reproduction) to terrestrial amphibians?	Qualitative examination of exposures and risks to ecological receptors occupying similar trophic levels.
Aquatic Habitat: Survival, growth, and reproduction of aquatic invertebrate communities.	Are site-related chemical concentrations in estiuarine wetland surface water and sediment sufficient to adversely affect aquatic invertebrate communities?	Comparison of maximum chemical concentrations in surface water and sediment with surface water and sediment screening values.
Survival, growth, and reproduction of aquatic plant communities.	Are site-related chemical concentrations in estuarine wetland surface water and sediment sufficient to adversely affect aquatic plant communities?	Comparison of maximum chemical concentrations in surface water and sediment with surface water and sediment screening values.
Survival, growth, and reproduction of fish communities.	Are site-related chemical concentrations in estuarine wetland surface water and sediment sufficient to adversely affect fish communities?	Comparison of maximum chemical concentrations in surface water and sediment with surface water and sediment screening values.
Survival, growth, and reproduction of avian invertivores	Are site-related chemical concentrations in estuarine wetland sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to aquatic amphibians?	Comparison of chronic No Observed Adverse Effect Level (NOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on maximum chemical concentrations in sediment.
Survival, growth, and reproduction of avian piscivores	Are site-related chemical concentrations in estuarein wetland sediment sufficient to cause adverse effects (on growth, survival, or reproduction) to avian piscivore species that may consume fish from the site?	Comparison of chronic No Observed Adverse Effect Level (NOAEL) values for survival, growth, and/or reproductive effects with modeled dietary exposure doses based on maximum chemical concentrations in sediment.

TABLE 4-2

Log K_{ow} AND K_{oc} VALUES FOR ORGANIC CHEMICALS
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Log K_{ow} Range	Recommended Log K_{ow}	Reference	K_{oc} (L/Kg)	Reference	Bioaccumulative Chemical [(1)]
Volatile Organics:						
1,1,1,2-Tetrachloroethane	2.63 to 3.03	2.63	USEPA 1995	86.03	USEPA 2014	Yes
1,1,1-Trichloroethane	2.47 to 2.51	2.48	USEPA 1995	43.89	USEPA 2014	No
1,1,2,2-Tetrachloroethane	2.31 to 2.64	2.39	USEPA 1995	94.94	USEPA 2014	No
1,1,2-Trichloroethane	2.03 to 2.07	2.05	USEPA 1995	60.7	USEPA 2014	No
1,1-Dichloroethane	1.78 to 1.85	1.79	USEPA 1995	31.82	USEPA 2014	No
1,1-Dichloroethene	2.13 to 2.37	2.13	USEPA 1995	31.82	USEPA 2014	No
1,2,3-Trichloropropane	1.98 to 2.63	2.25	USEPA 1995	115.8	USEPA 2014	No
1,2-Dibromo-3-chloropropane	2.26 to 2.41	2.34	USEPA 1995	115.8	USEPA 2014	No
1,2-Dichloroethane	1.4 to 1.48	1.47	USEPA 1995	39.6	USEPA 2014	No
1,2-Dichloropropane	1.94 to 1.99	1.97	USEPA 1995	60.7	USEPA 2014	No
2-Butanone (MEK)	0.28 to 0.69	0.28	USEPA 1995	4.51	USEPA 2014	No
2-Chloro-1,3-butadiene	2.03 to 2.13	2.08	USEPA 1995	60.7	USEPA 2014	No
2-Hexanone	---	1.38	USEPA 2012	14.98	USEPA 2014	No
3-Chloro-1-propene (Allyl chloride)	---	1.93	USEPA 2012	39.6	USEPA 2014	No
4-Methyl-2-pentanone (MIBK)	---	1.31	USEPA 2012	12.6	USEPA 2014	No
Acetone	-0.21 to -0.24	-0.24	USEPA 1995	2.364	USEPA 2014	No
Acetonitrile	-0.34 to -0.39	-0.34	USEPA 1995	4.67	USEPA 2014	No
Acrolein	-0.01 to 0.90	-0.01	USEPA 1995	1.0	USEPA 2014	No
Acrylonitrile	-0.92 to 1.20	0.25	USEPA 1995	8.511	USEPA 2014	No
Benzene	1.83 to 2.50	2.13	USEPA 1995	145.8	USEPA 2014	No
Bromoform	2.30 to 2.38	2.35	USEPA 1995	31.82	USEPA 2014	No
Bromomethane	---	1.19	USEPA 2012	13.22	USEPA 2014	No
Carbon disulfide	1.84 to 2.16	2.00	USEPA 1995	21.73	USEPA 2014	No
Carbon tetrachloride	2.03 to 3.10	2.73	USEPA 1995	43.89	USEPA 2014	Yes
Chlorobenzene	2.56 to 3.79	2.86	USEPA 1995	233.9	USEPA 2014	Yes
Clorodibromomethane	2.13 to 2.24	2.17	USEPA 1995	31.82	USEPA 2014	No
Chloroethane	---	1.43	USEPA 2012	21.73	USEPA 2014	No
Chloroform	1.81 to 3.04	1.92	USEPA 1995	31.82	USEPA 2014	Yes
Chloromethane (Ethyl chloride)	---	0.91	USEPA 2012	13.22	USEPA 2014	No
cis-1,2-Dichloroethene	1.77 to 2.10	1.86	USEPA 1995	39.6	USEPA 2014	No
cis-1,3-Dichloropropene	2.03 to 2.06	2.03	USEPA 2012	66.07	USEPA 2012	No

TABLE 4-2

Log K_{ow} AND K_{oc} VALUES FOR ORGANIC CHEMICALS
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Log K_{ow} Range	Recommended Log K_{ow}	Reference	K_{oc} (L/Kg)	Reference	Bioaccumulative Chemical [1]
Volatile Organics:						
Dibromomethane	---	1.70	USEPA 2012	21.73	USEPA 2014	No
Dichlorobromomethane	1.88 to 2.14	2.10	USEPA 1995	31.82	USEPA 2014	No
Dichlorodifluoromethane	2.0 to 2.37	2.16	USEPA 1995	43.89	USEPA 2014	No
Ethylbenzene	3.07 to 3.57	3.14	USEPA 1995	446.1	USEPA 2014	Yes
Ethylene dibromide	---	1.96	USEPA 2012	39.6	USEPA 2014	No
Ethyl methacrylate	1.59 to 1.65	1.59	USEPA 2012	16.66	USEPA 2014	No
Iodomethane	---	1.51	USEPA 2012	13.22	USEPA 2012	No
Isobutyl alcohol	0.65 to 0.76	0.75	USEPA 1995	2.919	USEPA 2014	No
Methacrylonitrile	0.54 to 0.70	0.54	USEPA 1995	13.05	USEPA 2014	No
Methylene chloride	1.22 to 1.40	1.25	USEPA 1995	21.73	USEPA 2014	No
Methyl methacrylate	1.11 to 1.38	1.38	USEPA 1995	9.14	USEPA 2014	No
Pentachloroethane	---	3.22	USEPA 2012	136.2	USEPA 2014	Yes
Propionitrile	---	0.16	USEPA 2012	8.511	USEPA 2012	No
Styrene	2.76 to 3.16	2.94	USEPA 1995	446.1	USEPA 2014	Yes
Tetrachloroethene	2.53 to 2.98	2.67	USEPA 1995	94.94	USEPA 2014	No
Toluene	2.21 to 3.13	2.75	USEPA 1995	233.9	USEPA 2014	Yes
trans-1,2-Dichloroethene	1.77 to 2.10	2.07	USEPA 1995	39.6	USEPA 2014	No
trans-1,3-Dichloropropene	2.03 to 2.06	2.03	USEPA 2012	66.07	USEPA 2012	No
trans-1,4-Dichloro-2-butene	---	2.60	USEPA 2012	131.5	USEPA 2014	No
Trichloroethene	2.42 to 3.14	2.71	USEPA 1995	60.7	USEPA 2014	Yes
Trichlorofluoromethane	2.44 to 2.58	2.53	USEPA 1995	43.89	USEPA 2014	No
Vinyl acetate	0.21 to 0.83	0.73	USEPA 1995	5.583	USEPA 2014	No
Vinyl chloride	1.23 to 1.52	1.50	USEPA 1995	21.73	USEPA 2014	No
o-Xylene	2.77 to 3.54	3.13	USEPA 1995	382.9	USEPA 2014	Yes
m-Xylene	3.11 to 3.68	3.20	USEPA 1995	375.3	USEPA 2014	Yes
p-Xylene	3.13 to 3.65	3.17	USEPA 1995	375.3	USEPA 2014	Yes
m,p-Xylene [2]	---	3.17	---	375.3	---	Yes
Xylenes (total)	---	3.16	USEPA 2012	382.9	USEPA 2014	Yes
Semivolatile Organics:						
1,2,4,5-Tetrachlorobenzene	4.51 to 4.83	4.64	USEPA 1995	2,220	USEPA 2014	Yes
1,2,4-Trichlorobenzene	3.89 to 4.23	4.01	USEPA 1995	1,356	USEPA 2014	Yes
1,3,5-Trinitrobenzene	1.18 to 1.37	1.18	USEPA 1995	1,683	USEPA 2014	No

TABLE 4-2

Log K_{ow} AND K_{oc} VALUES FOR ORGANIC CHEMICALS
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Log K_{ow} Range	Recommended Log K_{ow}	Reference	K_{oc} (L/Kg)	Reference	Bioaccumulative Chemical [1]
Semivolatile Organics:						
1,1-Biphenyl	---	4.01	USEPA 2012	5,129	USEPA 2014	Yes
1,2-Dichlorobenzene	3.20 to 3.61	3.43	USEPA 1995	382.9	USEPA 2014	Yes
1,3-Dichlorobenzene	---	3.53	USEPA 2012	380.2	USEPA 2012	Yes
1,3-Dinitrobenzene	1.49 to 1.63	1.50	USEPA 1995	351.6	USEPA 2014	No
1,4,-Dichlorobenzene	3.26 to 3.78	3.42	USEPA 1995	375.3	USEPA 2014	Yes
1,4-Dioxane	---	-0.27	USEPA 2012	2.633	USEPA 2014	No
1,4-Naphthoquinone	---	1.71	USEPA 2012	454.4	USEPA 2014	No
1-Naphthylamine	2.09 to 2.48	2.24	USEPA 1995	3,236	USEPA 2012	No
2,3,4,6-Tetrachlorophenol	---	4.45	USEPA 2012	2,964	USEPA 2014	Yes
2,4,5-Trichlorophenol	---	3.72	USEPA 2012	1,777	USEPA 2014	Yes
2,4,6-Trichlorophenol	3.29 to 4.05	3.70	USEPA 1995	1,777	USEPA 2014	Yes
2,2'-Oxybis(1-chloropropane)	---	2.48	USEPA 2012	82.92	USEPA 2014	No
2,4-Dichlorophenol	2.80 to 3.30	3.08	USEPA 1995	491.8	USEPA 2014	Yes
2,4-Dimethylphenol	1.99 to 2.49	2.36	USEPA 1995	491.8	USEPA 2014	No
2,4-Dinitrophenol	1.40 to 1.79	1.55	USEPA 1995	460.8	USEPA 2014	No
2,4-Dinitrotoluene	1.98 to 2.05	2.01	USEPA 1995	575.6	USEPA 2014	No
2,6-Dichlorophenol	---	2.75	USEPA 2012	501.9	USEPA 2012	No
2,6-Dinitrotoluene	1.72 to 2.03	1.87	USEPA 1995	587.4	USEPA 2014	No
2-Acetylaminofluorene	---	3.12	USEPA 2012	2,206	USEPA 2014	Yes
2-Chloronaphthalene	---	3.90	USEPA 2012	2,478	USEPA 2014	Yes
2-Chlorophenol	0.83 to 2.32	2.15	USEPA 1995	306.5	USEPA 2014	No
2-Methylphenol (o-Cresol)	1.90 to 2.04	1.99	USEPA 1995	306.5	USEPA 2014	No
2-Naphthylamine	2.09 to 2.42	2.28	USEPA 1995	2,478	USEPA 2014	No
2-Nitroaniline	---	1.85	USEPA 2012	111.3	USEPA 2014	No
2-Nitrophenol	---	1.79	USEPA 2012	501.9	USEPA 2012	No
2-Picoline	---	1.11	USEPA 2012	115.1	USEPA 2012	No
2-Toluidine (o-Toluidine)	---	1.32	USEPA 2012	115	USEPA 2012	No
3,3'-Dichlorobenzidine	3.51 to 3.95	3.51	USEPA 1995	3,190	USEPA 2014	Yes
3,3'-Dimethylbenzidine	2.34 to 3.01	2.68	USEPA 1995	3,190	USEPA 2014	Yes
3,4-Methylphenol (m,p-Cresol) [3]	---	1.95	---	300.4	---	No
3-Methylcholanthrene	6.42 to 6.76	6.42	USEPA 1995	961,600	USEPA 2014	Yes

TABLE 4-2

Log K_{ow} AND K_{oc} VALUES FOR ORGANIC CHEMICALS
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Log K_{ow} Range	Recommended Log K_{ow}	Reference	K_{oc} (L/Kg)	Reference	Bioaccumulative Chemical [1]
Semivolatile Organics:						
3-Methylphenol (m-Cresol)	1.92 to 2.05	1.97	USEPA 1995	300.4	USEPA 2014	No
3-Nitroaniline	---	1.37	USEPA 2012	53.7	USEPA 2012	No
4,6-Dinitro-2-methylphenol	---	2.13	USEPA 2012	754.4	USEPA 2014	No
4-Aminobiphenyl	---	2.86	USEPA 2012	2,471	USEPA 2014	No
4-Bromophenyl phenyl ether	4.89 to 5.24	5.00	USEPA 1995	3,077	USEPA 2012	Yes
4-Chloro-3-methylphenol	---	3.10	USEPA 2012	491.8	USEPA 2014	Yes
4-Chloroaniline (p-Chloroaniline)	1.57 to 2.02	1.85	USEPA 1995	112.7	USEPA 2014	No
4-Chlorophenyl phenyl ether	4.08 to 5.09	4.95	USEPA 1995	3,077	USEPA 2012	Yes
4-Methylphenol (p-Cresol)	1.38 to 2.04	1.95	USEPA 1995	300.4	USEPA 2014	No
4-Nitroaniline	---	1.39	USEPA 2012	109.1	USEPA 2014	No
4-Nitrophenol	---	1.91	USEPA 2012	234.4	USEPA 2012	No
4-Nitroquinoline-N-oxide	---	1.09	USEPA 2012	4007.0	USEPA 2012	No
7,12-Dimethylbenz(a)anthracene	5.98 to 6.66	6.62	USEPA 1995	493,600	USEPA 2014	Yes
Acetophenone	1.55 to 1.72	1.64	USEPA 1995	51.85	USEPA 2014	No
a,a-Dimethylphenethylamine	---	1.90	USEPA 2012	1,082	USEPA 2012	No
Aniline	0.78 to 1.24	0.98	USEPA 1995	70.23	USEPA 2014	No
Aramite, total	---	4.82	USEPA 2012	5,550	USEPA 2014	Yes
Benzidine	1.34 to 1.70	1.66	USEPA 1995	1,190	USEPA 2014	No
Benzoic Acid	1.33 to 2.18	1.86	USEPA 1995	16.55	USEPA 2014	No
Benzyl alcohol	0.87 to 1.22	1.11	USEPA 1995	21.46	USEPA 2014	No
bis(2-Chloroethoxy)methane	---	1.30	USEPA 2012	14.38	USEPA 2014	No
bis(2-Chloroethyl)ether	1.0 to 1.29	1.21	USEPA 1995	32.21	USEPA 2014	No
bis(2-Ethylhexyl)phthalate	4.20 to 8.61	7.30	USEPA 1995	119,600	USEPA 2014	Yes
Butyl benzyl phthalate	3.57 to 5.02	4.84	USEPA 1995	7,155	USEPA 2014	Yes
Carbazole	3.01 to 3.76	3.59	USEPA 1995	2,512	USEPA 2012	Yes
Chlorobenzilate	---	4.74	USEPA 2012	1,539	USEPA 2014	Yes
Diallate (total)	3.79 to 4.99	4.49	USEPA 1995	644.3	USEPA 2014	Yes
cis-Diallate [4]	---	4.49	USEPA 2012	644.3	USEPA 2012	Yes
Dibenzofuran	---	4.12	USEPA 2012	8,128	USEPA 2012	Yes
Diethyl phthalate	1.40 to 3.00	2.50	USEPA 1995	104.9	USEPA 2014	Yes
Dimethyl phthalate	1.34 to 1.90	1.57	USEPA 1995	39.81	USEPA 2012	No

TABLE 4-2

Log K_{ow} AND K_{oc} VALUES FOR ORGANIC CHEMICALS
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Log K_{ow} Range	Recommended Log K_{ow}	Reference	K_{oc} (L/Kg)	Reference	Bioaccumulative Chemical [(1)]
Semivolatile Organics:						
Di-n-butyl phthalate	3.74 to 4.79	4.61	USEPA 1995	1,157	USEPA 2014	Yes
Di-n-octyl phthalate	8.03 to 9.49	8.06	USEPA 1995	140,800	USEPA 2014	Yes
Dinoseb	---	3.56	USEPA 2012	4,294	USEPA 2014	Yes
Diphenylamine	2.37 to 3.72	3.48	USEPA 1995	825.8	USEPA 2014	Yes
Ethyl methanesulfonate	0.01 to 0.05	0.05	USEPA 1995	7.894	USEPA 2012	No
Hexachlorobenzene	5.00 to 7.42	5.89	USEPA 1995	6,165	USEPA 2014	Yes
Hexachlorobutadiene	4.74 to 5.16	4.81	USEPA 1995	845.2	USEPA 2014	Yes
Hexachlorocyclopentadiene	5.04 to 5.51	5.39	USEPA 1995	1,404	USEPA 2014	Yes
Hexachloroethane	3.82 to 4.14	4.00	USEPA 1995	196.8	USEPA 2014	Yes
Hexachlorophene	7.08 to 7.60	7.54	USEPA 1995	668,600	USEPA 2014	Yes
Hexachloropropene	---	4.38	USEPA 2012	406.4	USEPA 2012	Yes
Isophorone	1.67 to 1.90	1.70	USEPA 1995	65.15	USEPA 2014	No
Isosafrole	---	3.37	USEPA 2012	207.2	USEPA 2012	Yes
Methapyrilene	---	2.87	USEPA 2012	1,858	USEPA 2012	No
Methyl methanesulfonate	---	-0.66	USEPA 2012	4.332	USEPA 2014	No
N-Nitro-o-toluidine	---	1.87	USEPA 2012	178.6	USEPA 2012	No
n-Nitrosodiethylamine	0.29 to 0.56	0.48	USEPA 1995	82.92	USEPA 2014	No
n-Nitrosodimethylamine	-0.77 to -0.48	-0.57	USEPA 1995	22.79	USEPA 2014	No
n-Nitroso-di-n-butylamine	2.41 to 2.45	2.41	USEPA 1995	914.6	USEPA 2014	No
n-Nitroso-di-n-propylamine	1.31 to 1.45	1.40	USEPA 1995	275.4	USEPA 2014	No
n-Nitrosodiphenylamine	3.13 to 3.45	3.16	USEPA 1995	2,632	USEPA 2014	Yes
n-Nitrosomethylethylamine	-0.24 to 1.35	-0.12	USEPA 1995	43.47	USEPA 2014	No
n-Nitrosomorpholine	---	-0.44	USEPA 2012	22.51	USEPA 2014	No
n-Nitrosopiperidine	0.25 to 0.63	0.63	USEPA 1995	167.5	USEPA 2014	No
n-Nitrosopyrrolidine	-0.29 to -0.19	-0.19	USEPA 1995	91.91	USEPA 2014	No
Nitrobenzene	---	1.85	USEPA 2012	226.4	USEPA 2014	No
p-Dimethylamino azobenzene	---	4.58	USEPA 2012	2,028	USEPA 2014	Yes
Pentachlorobenzene	4.88 to 6.12	5.26	USEPA 1995	3,708	USEPA 2014	Yes
Pentachloronitrobenzene	4.18 to 4.64	4.64	USEPA 1995	5,996	USEPA 2014	Yes
Pentachlorophenol	3.29 to 5.24	5.09	USEPA 1995	4,959	USEPA 2014	Yes
Phenacetin	---	1.58	USEPA 2012	40.99	USEPA 2014	No

TABLE 4-2

Log K_{ow} AND K_{oc} VALUES FOR ORGANIC CHEMICALS
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Log K_{ow} Range	Recommended Log K_{ow}	Reference	K_{oc} (L/Kg)	Reference	Bioaccumulative Chemical [1]
Semivolatile Organics:						
Phenol	0.79 to 1.55	1.48	USEPA 1995	187.2	USEPA 2014	No
p-Phenylenediamine	---	-0.30	USEPA 2012	33.83	USEPA 2014	No
Pronamide	3.26 to 3.86	3.51	USEPA 1995	404.9	USEPA 2014	Yes
Pyridine	0.62 to 1.28	0.67	USEPA 1995	71.72	USEPA 2014	No
Safrole, total	2.66 to 2.88	2.66	USEPA 1995	207.2	USEPA 2014	No
trans-Diallate [4]	---	4.49	---	644.3	---	Yes
PAHs:						
1-Methylnaphthalene	---	3.87	USEPA 2012	2,528	USEPA 2014	Yes
2-Methylnaphthalene	---	3.86	USEPA 2012	2,478	USEPA 2014	Yes
Acenaphthene	3.77 to 4.49	3.92	USEPA 1995	5,027	USEPA 2014	Yes
Acenaphthylene	---	3.94	USEPA 2012	5,623	USEPA 2012	Yes
Anthracene	3.45 to 4.80	4.55	USEPA 1995	16,360	USEPA 2014	Yes
Benzo(a)anthracene	4.00 to 5.79	5.70	USEPA 1995	176,900	USEPA 2014	Yes
Benzo(a)pyrene	5.98 to 6.42	6.11	USEPA 1995	587,400	USEPA 2014	Yes
Benzo(b)fluoranthene	5.79 to 6.40	6.20	USEPA 1995	599,400	USEPA 2014	Yes
Benzo(g,h,i)perylene	6.63 to 7.05	6.70	USEPA 1995	1,951,000	USEPA 2012	Yes
Benzo(k)fluoranthene	6.12 to 6.27	6.20	USEPA 1995	587,400	USEPA 2014	Yes
Chrysene	5.41 to 5.79	5.70	USEPA 1995	180,500	USEPA 2014	Yes
Dibenzo(a,h)anthracene	6.50 to 6.88	6.69	USEPA 1995	1,912,000	USEPA 2014	Yes
Fluoranthene	4.31 to 5.39	5.12	USEPA 1995	55,450	USEPA 2014	Yes
Fluorene	4.04 to 4.40	4.21	USEPA 1995	9,160	USEPA 2014	Yes
Indeno(1,2,3-cd)pyrene	6.58 to 6.72	6.65	USEPA 1995	3,470,000	USEPA 2014	Yes
Naphthalene	3.01 to 4.70	3.36	USEPA 1995	1,544	USEPA 2014	Yes
Phenanthrene	4.28 to 4.57	4.55	USEPA 1995	22,387	USEPA 2012	Yes
Pyrene	4.76 to 5.52	5.11	USEPA 1995	54,340	USEPA 2014	Yes
Organophosphorous Pesticides:						
Dimethoate	0.50 to 0.79	0.69	USEPA 1995	12.77	USEPA 2014	No
Disulfoton	3.84 to 4.10	3.98	USEPA 1995	837.9	USEPA 2014	Yes
Famphur	---	2.23	USEPA 2012	189.2	USEPA 2012	No
Methyl Parathion	1.91 to 3.32	2.90	USEPA 1995	729.3	USEPA 2014	Yes
o,o,o-Triethyl Phosphorothioate	---	2.64	USEPA 2012	138.4	USEPA 2012	No

TABLE 4-2

Log K_{ow} AND K_{oc} VALUES FOR ORGANIC CHEMICALS
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Log K_{ow} Range	Recommended Log K_{ow}	Reference	K_{oc} (L/Kg)	Reference	Bioaccumulative Chemical [(1)]
Organophosphorous Pesticides:						
Parathion (ethyl parathion)	2.15 to 3.93	3.83	USEPA 1995	2,422	USEPA 2014	Yes
Phorate	2.92 to 4.26	3.81	USEPA 1995	459.8	USEPA 2014	Yes
Sulfotepp	---	3.99	USEPA 2012	265.6	USEPA 2012	Yes
Thionazin	---	1.86	USEPA 2012	395	USEPA 2012	No

Notes:

K_{oc} = Organic Carbon Partition Coefficient
K_{ow} = Octanol-Water Partition Coefficient
L/kg = liter per kilogram
PAH = Polynuclear Aromatic Hydrocarbon
PCB = Polychlorinated Biphenyl
USEPA = United States Environmental Protection Agency

(1) An organic chemical is considered a bioaccumulative chemical if its Log K_{ow} value is greater than or equal to 3.0. When a range of K_{ow} values was reported, the upper value within the range was conservatively used to identify bioaccumulative chemicals.
(2) Log K_{ow} and K_{oc} values for p-xylene used as surrogates.
(3) Log K_{ow} and K_{oc} values for 4-methylphenol used as surrogates.
(4) Log K_{ow} and K_{oc} values for total diallate used as surrogates.

Table References:

U.S. Environmental Protection Agency (USEPA). 2014. Regional Screening Levels for Chemical Contaminants at Superfund Sites. November 2014. http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm

USEPA. 2012. Estimation Programs Interface Suite™ for Microsoft® Windows, Version 4.11. Office of Pollution Prevention and Toxics, Washington, D.C. http://www.epa.gov/oppt/exposure/pubs/episuite.htm

USEPA. 1995. Internal Report on Summary of Measured, Calculated and Recommended Log K_{ow} Values. Environmental Research Laboratory, Athens, GA. April 10, 1995.

TABLE 5-1

SOIL SCREENING VALUES FOR PLANTS AND INVERTEBRATES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Soil Screening Value	Reference	Comment
Volatile Organics (µg/kg):			
1,1,1,2-Tetrachloroethane	100	CCME 2001	Interim environmental quality criterion for agricultural soil
1,1,1-Trichloroethane	100	CCME 2001	Interim environmental quality criterion for agricultural soil
1,1,2,2-Tetrachloroethane	100	CCME 2001	Interim environmental quality criterion for agricultural soil
1,1,2-Trichloroethane	100	CCME 2001	Interim environmental quality criterion for agricultural soil
1,1-Dichloroethane	100	CCME 2001	Interim environmental quality criterion for agricultural soil
1,1-Dichloroethene	100	CCME 2001	Interim environmental quality criterion for agricultural soil
1,2,3-Trichloropropane	100	CCME 2001	Interim environmental quality criterion for agricultural soil
1,2-Dibromo-3-chloropropane	NA	---	---
1,2-Dichloroethane	100	CCME 2001	Interim environmental quality criterion for agricultural soil
1,2-Dichloroethene (total)	100	CCME 2001	Interim environmental quality criterion for agricultural soil
1,2-Dichloropropane	700,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
2-Butanone (MEK)	NA	---	---
2-Chloro-1,3-butadiene	NA	---	---
2-Hexanone	NA	---	---
3-Chloro-1-propene (allyl chloride)	NA	---	---
4-Methyl-2-pentanone (MIBK)	NA	---	---
Acetone	NA	---	---
Acetonitrile	NA	---	---
Acrolein	NA	---	---
Acrylonitrile	1,000,000	Efroymson et al. 1997a	Toxicological threshold for soil microorganisms and microbial processes
Benzene	25,000	CCME 2014	Environmental health surface soil quality guideline based on agricultural land uses
Bromoform	100	CCME 2001	Interim environmental quality criterion for agricultural soil
Bromomethane	NA	---	---
Carbon disulfide	NA	---	---
Carbon tetrachloride	1,000,000	Efroymson et al. 1997a	Toxicological threshold for soil microorganisms and microbial processes
Chlorobenzene	40,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
Chlorodibromomethane	NA	---	---
Chloroethane	100	CCME 2001	Interim environmental quality criterion for agricultural soil
Chloroform	100	CCME 2001	Interim environmental quality criterion for agricultural soil
Chloromethane	NA	---	---
cis-1,2-Dichloroethene	100	CCME 2001	Interim environmental quality criterion for agricultural soil
cis-1,3-Dichloropropene	100	CCME 2001	Interim environmental quality criterion for agricultural soil
Dibromomethane	100	CCME 2001	Interim environmental quality criterion for agricultural soil
Dichlorobromomethane (Bromodichloromethane)	NA	---	---
Dichlorodifluoromethane	NA	---	---

TABLE 5-1

SOIL SCREENING VALUES FOR PLANTS AND INVERTEBRATES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Soil Screening Value	Reference	Comment
Volatile Organics (µg/kg):			
Ethylbenzene	55,000	CCME 2014	Environmental health surface soil quality guideline based on agricultural land uses
Ethylene dibromide (1,2-Dibromoethane)	300	CCME 2001	Interim environmental quality criterion for agricultural soil
Ethyl methacrylate	NA	---	---
Iodomethane	NA	---	---
Isobutyl alcohol	NA	---	---
Methacrylonitrile	NA	---	---
Methylene chloride	100	CCME 2001	Interim environmental quality criterion for agricultural soil
Methyl methacrylate	NA	---	---
Pentachloroethane	100	CCME 2001	Interim environmental quality criterion for agricultural soil
Propionitrile	NA	---	---
Styrene	300,000	Efroymson et al. 1997b	Toxicological threshold for plants
Tetrachloroethene	100	CCME 2001	Interim environmental quality criterion for agricultural soil
Toluene	75,000	CCME 2014	Environmental health surface soil quality guideline based on agricultural land uses
trans-1,2-Dichloroethene	100	CCME 2001	Interim environmental quality criterion for agricultural soil (see CCME 2001)
trans-1,3-Dichloropropene	100	CCME 2001	Interim environmental quality criterion for agricultural soil
trans-1,4-Dichloro-2-butene	1,000,000	Efroymson et al. 1997a	Toxicological threshold for soil microorganisms and microbial processes
Trichloroethene	100	CCME 2001	Interim environmental quality criterion for agricultural soil
Trichlorofluoromethane	NA	---	---
Vinyl acetate	NA	---	---
Vinyl chloride	NA	---	---
o-Xylene	1,000	---	Value for total xylenes used as a surrogate
m,p-Xylene	1,000	---	Value for total xylenes used as a surrogate
Xylenes, total	1,000	USEPA 2003	Region 5 ecological screening level based on exposures to plants
Semivolatile Organics (µg/kg):			
1,1-Biphenyl	60,000	Efroymson et al. 1997b	Toxicological threshold for plants
1,2,4,5-Tetrachlorobenzene	50.0	CCME 2001	Interim environmental quality criterion for agricultural soil
1,2,4-Trichlorobenzene	20,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
1,2-Dichlorobenzene	100	CCME 2001	Interim environmental quality criterion for agricultural soil
1,3,5-Trinitrobenzene	40,000	---	Value for nitrobenzene used as a surrogate
1,3-Dichlorobenzene	100	CCME 2001	Interim environmental quality criterion for agricultural soil
1,3-Dinitrobenzene	40,000	---	Value for nitrobenzene used as a surrogate
1,4-Dichlorobenzene	20,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
1,4-Dioxane	NA	---	---
1,4-Naphthoquinone	NA	---	---
1,4-Phenylenediamine	NA	---	---

TABLE 5-1

SOIL SCREENING VALUES FOR PLANTS AND INVERTEBRATES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Soil Screening Value	Reference	Comment
Semivolatile Organics (µg/kg):			
1-Naphthylamine	NA	---	---
2,2'-Oxybis(1-chloropropane)	NA	---	---
2,3,4,6-Tetrachlorophenol	50	CCME 2001	Interim environmental quality criterion for agricultural soil
2,4,5-Trichlorophenol	4,000	Efroymson et al. 1997b	Toxicological threshold for plants
2,4,6-Trichlorophenol	10,000	Efroymson et al., 1997a	Toxicological threshold for earthworms
2,4-Dichlorophenol	50	CCME 2014	Interim environmental quality criterion for agricultural soil
2,4-Dimethylphenol	10	USEPA 2003	Region 5 ecological screening level based on exposures to plants
2,4-Dinitrophenol	20,000	Efroymson et al. 1997b	Toxicological threshold for plants
2,4-Dinitrotoluene	NA	---	---
2,6-Dichlorophenol	50	CCME 2001	Interim environmental quality criterion for agricultural soil
2,6-Dinitrotoluene	NA	---	---
2-Acetylaminofluorene	NA	---	---
2-Chloronaphthalene	NA	---	---
2-Chlorophenol	50	CCME 2001	Interim environmental quality criterion for agricultural soil
2-Methylphenol	100	CCME 2001	Interim environmental quality criterion for agricultural soil
2-Naphthylamine	NA	---	---
2-Nitroaniline	NA	---	---
2-Nitrophenol	7,000	---	Value for 4-nitrophenol used as a surrogate
2-Picoline	NA	---	---
2-Toluidine	NA	---	---
3,4-Methylphenol	100	CCME 2001	Interim environmental quality criterion for agricultural soil
3,3'-Dichlorobenzidine	NA	---	---
3,3'-Dimethylbenzidine	NA	---	---
3-Methylcholanthrene	NA	---	---
3-Methylphenol	100	CCME 2001	Interim environmental quality criterion for agricultural soil
3-Nitroaniline	NA	---	---
4,6-Dinitro-2-methylphenol	100	CCME 2001	Interim environmental quality criterion for agricultural soil
4-Aminobiphenyl	NA	---	---
4-Bromophenyl phenyl ether	NA	---	---
4-Chloro-3-methylphenol	NA	---	---
4-Chloroaniline	NA	---	---
4-Chlorophenyl phenyl ether	NA	---	---
4-Methylphenol	100	CCME 2001	Interim environmental quality criterion for agricultural soil
4-Nitroaniline	NA	---	---
4-Nitrophenol	7,000	Efroymson et al. 1997a	Toxicological threshold for earthworms

TABLE 5-1

SOIL SCREENING VALUES FOR PLANTS AND INVERTEBRATES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Soil Screening Value	Reference	Comment
Semivolatile Organics (µg/kg):			
4-Nitroquinoline-1-oxide	NA	---	---
7,12-Dimethylbenz(a)anthracene	NA	---	---
A,A-Dimethylphenethylamine	NA	---	---
Acetophenone	NA	---	---
Aniline	NA	---	---
Aramite, total	NA	---	---
Benzyl alcohol	NA	---	---
bis(2-Chloroethoxy)methane	NA	---	---
bis(2-Chloroethyl)ether	NA	---	---
bis(2-Ethylhexyl)phthalate	30,000	CCME 2001	Interim environmental quality criterion for agricultural soil
Butyl benzyl phthalate	30,000	CCME 2001	Interim environmental quality criterion for agricultural soil
Chlorobenzilate	NA	---	---
cis-Diallate	NA	---	---
Diallate (total)	NA	---	---
Dibenzofuran	NA	---	---
Diethyl phthalate	100,000	Efroymson et al. 1997b	Toxicological threshold for plants
Dimethyl phthalate	200,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
Di-n-butyl phthalate	200,000	Efroymson et al. 1997b	Toxicological threshold for plants
Di-n-octyl phthalate	30,000	CCME 2001	Interim environmental quality criterion for agricultural soil
Dinoseb	NA	---	---
Ethyl methanesulfonate	NA	---	---
Hexachlorobenzene	1,000,000	Efroymson et al. 1997a	Toxicological threshold for soil microorganisms and microbial processes
Hexachlorobutadiene	NA	---	---
Hexachlorocyclopentadiene	10,000	Efroymson et al. 1997b	Toxicological threshold for plants
Hexachloroethane	NA	---	---
Hexachlorophene	NA	---	---
Hexachlorophene	NA	---	---
Hexachloropropene	NA	---	---
Hexachloropropene	NA	---	---
Isophorone	NA	---	---
Isosafrole	NA	---	---
Methapyrilene	NA	---	---
Methyl methanesulfonate	NA	---	---
N-Nitro-o-toluidine	NA	---	---
N-Nitrosodiethylamine	20,000	---	Value for n-Nitrosdiphenylamine used as a surrogate

TABLE 5-1

SOIL SCREENING VALUES FOR PLANTS AND INVERTEBRATES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Soil Screening Value	Reference	Comment
Semivolatile Organics (µg/kg):			
N-Nitrosodimethylamine	20,000	---	Value for n-Nitrosdiphenylamine used as a surrogate
N-Nitroso-di-n-butylamine	20,000	---	Value for n-Nitrosdiphenylamine used as a surrogate
N-Nitroso-di-n-propylamine	20,000	---	Value for n-Nitrosdiphenylamine used as a surrogate
N-Nitrosodiphenylamine	20,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
N-Nitrosomethylethylamine	20,000	---	Value for n-Nitrosdiphenylamine used as a surrogate
Nitrobenzene	40,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
N-Nitrosomorpholine	NA	---	---
N-Nitrosopiperidine	NA	---	---
N-Nitrosopyrrolidine	NA	---	---
p-Dimethylamino azobenzene	NA	---	---
Pentachlorobenzene	50	CCME 2001	Interim environmental quality criterion for agricultural soil
Pentachloronitrobenzene	NA	---	---
Pentachlorophenol	5,000	USEPA 2007a	Ecological soil screening level for plants
Phenacetin	NA	---	---
Phenol	30,000	Efroymson et al. 1997a	Toxicological threshold for earthworms
p-Phenylenediamine (1,4-phenylenediamine)	NA	---	---
Pronamide	13.6	USEPA 2003	Region 5 ecological screening level based on exposures to plants
Pyridine	NA	---	---
Safrole, total	NA	---	---
trans-Diallate	NA	---	---
PAHs (µg/kg):			
1-Methylnaphthalene	2,500	---	Value for anthracene used as a surrogate (value represents the minimum available screening value for other low molecular weight PAHs)
2-Methylnaphthalene	2,500	---	Value for anthracene used as a surrogate (value represents the minimum available screening value for other low molecular weight PAHs)
Acenaphthene	20,000	Efroymson et al. 1997b	Toxicological threshold for plants
Acenaphthylene	2,500	---	Value for anthracene used as a surrogate (value represents the minimum available screening value for other low molecular weight PAHs)
Anthracene	2,500	CCME 2014	Environmental health surface soil quality guideline based on agricultural land uses
Benzo(a)anthracene	10,000	---	Value for pyrene used as a surrogate (value represents the minimum available screening value for other high molecular weight PAHs)
Benzo(a)pyrene	20,000	CCME 2014	Environmental health surface soil quality guideline based on agricultural land uses
Benzo(b)fluoranthene	10,000	---	Value for pyrene used as a surrogate (value represents the minimum available screening value for other high molecular weight PAHs)

TABLE 5-1

SOIL SCREENING VALUES FOR PLANTS AND INVERTEBRATES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Soil Screening Value	Reference	Comment
PAHs (µg/kg):			
Benzo(g,h,i)perylene	10,000	---	Value for pyrene used as a surrogate (value represents the minimum available screening value for other high molecular weight PAHs)
Benzo(k)fluoranthene	10,000	---	Value for pyrene used as a surrogate (value represents the minimum available screening value for other high molecular weight PAHs)
Chrysene	10,000	---	Value for pyrene used as a surrogate (value represents the minimum available screening value for other high molecular weight PAHs)
Dibenzo(a,h)anthracene	10,000	---	Value for pyrene used as a surrogate (value represents the minimum available screening value for other high molecular weight PAHs)
Fluoranthene	15,000	USEPA 2007b	Minimum chronic value eligible for Eco-SSL derivation (valued based on *Enchytraeus crypticus* [potworm] reproduction)
Fluorene	8,000	USEPA 2007b	Minimum chronic value eligible for Eco-SSL derivation (value based on *Folsomia fimetaria* [springtail] reproduction)
Indeno(1,2,3-cd)pyrene	10,000	---	Value for pyrene used as a surrogate (value represents the minimum available screening value for other high molecular weight PAHs)
Naphthalene	2,500	---	Value for anthracene used as a surrogate (value represents the minimum available screening value for other low molecular weight PAHs)
Phenanthrene	9,000	USEPA 2007b	Minimum chronic value eligible for Eco-SSL derivation (value based on *Folsomia fimetaria* [springtail] reproduction)
Pyrene	10,000	USEPA 2007b	Minimum chronic value eligible for Eco-SSL derivation (value based on *Folsomia fimetaria* [springtail] reproduction)
Low molecular weight PAHs (2)	29,000	USEPA 2007b	Ecological soil screening level for soil invertebrates
High molecular weight PAHs (3)	18,000	USEPA 2007b	Ecological soil screening level for soil invertebrates
Organophosphorous Pesticides (µg/kg):			
Dimethoate	NA	---	---
Disulfoton	NA	---	---
Famphur	NA	---	---
Methyl Parathion	0.344	USEPA 2003	Region 5 ecological screening level based on exposure to soil invertebrates
o,o,o-Triethyl Phosphorothioate	NA	---	---
Parathion (ethyl parathion)	NA	---	---
Phorate	NA	---	---
Sulfotepp	NA	---	---
Thionazin	NA	---	---

TABLE 5-1

SOIL SCREENING VALUES FOR PLANTS AND INVERTEBRATES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Soil Screening Value	Reference	Comment
Metals (mg/kg):			
Antimony	78.0	USEPA 2005a	Ecological soil screening level for soil invertebrates
Arsenic	18.0	USEPA 2005b	Ecological soil screening level for plants
Barium	330	USEPA 2005c	Ecological soil screening level for soil invertebrates
Beryllium	40.0	USEPA 2005d	Ecological soil screening level for soil invertebrates
Cadmium	32.0	USEPA 2005e	Ecological soil screening level for plants
Chromium, total	57.0	USEPA 2008	Reproduction-based MATC for *Eisenia andrei* (earthworm)
Cobalt	13.0	USEPA 2005f	Ecological soil screening level for plants
Copper	70.0	USEPA 2007c	Ecological soil screening level for plants
Lead	120	USEPA 2005g	Ecological soil screening level for plants
Mercury	0.10	Efroymson et al. 1997a	Toxicological threshold for earthworms
Nickel	38.0	USEPA 2007d	Ecological soil screening level for plants
Selenium	0.52	USEPA 2007e	Ecological soil screening level for plants
Silver	560	USEPA 2006	Ecological soil screening level for plants
Thallium	1.00	Efroymson et al. 1997b	Toxicological threshold for plants
Tin	50.0	Efroymson et al. 1997b	Toxicological threshold for plants
Vanadium	20.0	USEPA 2005h	Growth-based LOAEC for *Brassica oleracea* (broccoli) with a safety factor of 5
Zinc	120	USEPA 2007f	Ecological soil screening level for soil invertebrates

Notes:

NA = Not Available
CCME = Canadian Council of Ministers of the Environment
USEPA = U.S. Environmental Protection Agency
MATC = Maximum Acceptable Toxicant Concentration
LOAEC = Lowest Observed Adverse Effect Concentration
PAH = Polynuclear Aromatic Hydrocarbon
µg/kg = microgram per kilogram
mg/kg = milligram per kilogram

(1) Low molecular weight PAHs are defined by the USEPA (2007b) as PAH compounds composed of fewer than four rings. The low molecular weight PAH compounds analyzed for in Tank 214 Area soil were 1-methylnaphthalene, 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, fluoranthene, fluorene, naphthalene, and phenanthrene.

(2) High molecular weight PAHs are defined by the USEPA (2007b) as PAH compounds composed of four or more rings. The high molecular weight PAH compounds analyzed for in Tank 214 Area soil were benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, and pyrene.

TABLE 5-1

SOIL SCREENING VALUES FOR PLANTS AND INVERTEBRATES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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USEPA. 2007c. Ecological Soil Screening Levels for Copper (Interim Final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-68.

USEAP. 2007d. Ecological Soil Screening Levels for Nickel (Interim Final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-76.

USEAP. 2007e. Ecological Soil Screening Levels for Selenium (Interim Final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-72.

USEPA. 2007f. Ecological Soil Screening Levels for Zinc (Interim Final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-73.

USEPA. 2006. Ecological Soil Screening Levels for Silver (Interim Final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWEER Directive 9285.7-77.

USEPA. 2005a. Ecological Soil Screening Levels for Antimony (Interim Final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-61.

USEPA. 2005b. Ecological Soil Screening Levels for Arsenic (Interim Final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-62.

USEPA. 2005c. Ecological Soil Screening Levels for Barium (Interim Final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-63.

USEPA. 2005d. Ecological Soil Screening Levels for Beryllium (Interim Final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-64.

TABLE 5-1

SOIL SCREENING VALUES FOR PLANTS AND INVERTEBRATES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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USEPA. 2005g. Ecological Soil Screening Levels for Lead (Interim Final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-70.

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TABLE 5-2

GROUNDWATER AND SURFACE WATER SCREENING VALUES
SWMU 9 – AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Surface Water Screening Value [1]	Reference	Comment [2]
Volatile Organics (µg/L):			
1,1,1,2-Tetrachloroethane	85.0 [3]	USEPA 2013	Ohio Environmental Protection Agency Great Lakes Basin Tier II chronic criterion
1,1,1-Trichloroethane	312	USEPA 2001	USEPA Region 4 chronic screening value
1,1,2,2-Tetrachloroethane	90.2	USEPA 2001	USEPA Region 4 chronic screening value
1,1,2-Trichloroethane	340	USEPA 2014a	Minimum acute value (48-hr LC_{50} for *Pleuronectes platessa* [sand dab]) with a safety factor of 100
1,1-Dichloroethane	47.0 [3]	USEPA 2003	USEPA Region 5 ecological screening level
1,1-Dichloroethene	2,240	USEPA 2001	USEPA Region 4 chronic screening value
1,2,3-Trichloropropane	274 [3]	USEPA 2014a	Minimum acute value (96-hr LC_{50} for *Pimephales promelas* [fathead minnow]) with a safety factor of 100
1,2-Dibromo-3-chloropropane	100	USEPA 2014a	Minimum acute value (48-hr EC_{50} for *Mercenaria mercenaria* [hard clam]) with a safety factor of 100
1,2-Dichloroethane	1,130	USEPA 2001	USEPA Region 4 chronic screening value
1,2-Dichloropropane	2,400	USEPA 2001	USEPA Region 4 chronic screening value
2-Butanone (MEK)	13,333	USEPA 2014a	Minimum acute value (96-hour NOEC for *Cyprinodon variegatus* [sheepshead minnow]) with a safety factor of 30
2-Chloro-1,3-butadiene	NA	---	---
2-Hexanone	99.0 [3]	USEPA 2003	USEPA Region 5 ecological screening level
3-Chloro-1-propene	3.40 [3]	USEPA 2014a	Minimum acute value (48-hr LC_{50} for *Xenopus laevis* [clawed toad]) with a safety factor of 100
4-Methyl-2-pentanone (MIBK)	170 [3]	USEPA 2003	USEPA Region 5 ecological screening level
Acetone	1,000	USEPA 2014a	Minimum acute value (96-hr LC_{50} for *Lumbriculus variegatus* [Oligochaete]) with a safety factor of 100
Acetonitrile	12,000 [3]	USEPA 2003	USEPA Region 5 ecological screening level
Acrolein	0.55	USEPA 2003	USEPA Region 4 chronic screening value
Acrylonitrile	58.1	USEPA 2014a	Minimum acute value (96-hr $LC_{50\ for}$ *Americamysis bahia* [opossum shrimp]) with a safety factor of 100
Benzene	109	USEPA 2001	USEPA Region 4 chronic screening value
Bromoform	640	USEPA 2001	USEPA Region 4 chronic screening value
Bromomethane	120	USEPA 2014a	Minimum acute value (96-hr LC_{50} for *Menidia beryllina* [inland silverside]) with a safety factor of 100
Carbon disulfide	15.0 [3]	USEPA 2003	USEPA Region 5 ecological screening level
Carbon tetrachloride	1,500	USEPA 2001	USEPA Region 4 chronic screening value
Chlorobenzene	105	USEPA 2001	USEPA Region 4 chronic screening value
Chlorodibromomethane	320 [3]	USEPA 2013	Ohio Environmental Protection Agency Great Lakes Basin Tier II chronic criterion
Chloroethane	NA	---	---
Chloroform	815	USEPA 2001	USEPA Region 4 chronic screening value
Chloromethane	2,700	USEPA 2014a	Minimum acute value (96-hr LC_{50} for *Menidia beryllina* [inland silverside]) with a safety factor of 100
cis-1,2-Dichloroethene	4,480	Buchman 2008	Acute LOEL (summation of all isomers) with a safety factor of 50
cis-1,3-Dichloropropene	7.90	USEPA 2001	USEPA Region 4 chronic screening value (cis and trans)
Dibromomethane	1,280	Buchman 2008	Chronic LOEL for chemical class with a safety factor of 5
Dichlorobromomethane	340 [3]	USEPA 2013	Ohio Environmental Protection Agency Great Lakes Basin Tier II chronic criterion
Dichlorodifluoromethane	1,280	---	Value for trichlorofluoromethane used as a surrogate
Ethylbenzene	4.30	USEPA 2001	USEPA Region 4 chronic screening value
Ethylene dibromide	48.0	USEPA 2014a	Minimum acute value (48-hr LC_{50} for *Cyprinodon variegatus* [sheepshead minnow]) with a safety factor of 100
Ethyl methacrylate	18,000 [3]	USEPA 2014a	Minimum chronic value (21-day NOEC for *Daphnia magna* [cladoceron] based on reproduction [progeny counts])
Iodomethane	20.7 [3]	USEPA 2014a	Minimum acute value (96-hr NOEC for *Oncorhynchus mykiss* [rainbow trout]) with a safety factor of 30

TABLE 5-2

GROUNDWATER AND SURFACE WATER SCREENING VALUES
SWMU 9 – AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Surface Water Screening Value [1]	Reference	Comment [2]
Volatile Organics (µg/L):			
Isobutyl alcohol	10,000	USEPA 2014a	Minimum acute value (96-hr LC_{50} for *Alburnus alburnus* [bleak]) with a safety factor of 100
Methacrylonitrile	NA	---	---
Methylene chloride	2,560	USEPA 2001	USEPA Region 4 chronic screening value
Methyl methacrylate	2,800 [3]	USEPA 2003	USEPA Region 5 ecological screening level
Pentachloroethane	56.2	Buchman 2008	Chronic LOEL with a safety factor of 5
Propionitrile	15,200 [3]	USEPA 2014a	Minimum acute value (96-hr LC_{50} for *Pimephales promelas* [fathead minnow]) with a safety factor of 100
Styrene	170	USEPA 2014a	Minimum acute value (96-hr NOEC for *Cyprinodon variegatus* [sheepshead minnow]) with a safety factor of 30
Tetrachloroethene	45.0	USEPA 2001	USEPA Region 4 chronic screening value
Toluene	37.0	USEPA 2001	USEPA Region 4 chronic screening value
trans-1,2-dichloroethene	4,480	Buchman 2008	Acute LOEL (summation of all isomers) with a safety factor of 50
trans-1,3-Dichloropropene	7.90	USEPA 2001	USEPA Region 4 chronic screening value (cis and trans)
trans-1,4-Dichloro-2-butene	NA	---	---
Trichloroethene	40.0	Buchman 2008	Acute LOEL with a safety factor of 50
Trichlorofluoromethane	1,280	Buchman 2008	Chronic LOEL for chemical class with a safety factor of 5
Vinyl acetate	140 [3]	USEPA 2014a	Minimum acute value (48-hr LC_{50} for *Pimephales promelas* [fathead minnow]) with a safety factor of 100
Vinyl chloride	930 [3]	USEPA 2003	USEPA Region 5 ecological screening level
o-Xylene	74.0	---	Value for total xylenes used as a surrogate.
m-Xylene	74.0	---	Value for total xylenes used as a surrogate.
p-Xylene	74.0	---	Value for total xylenes used as a surrogate.
m,p-Xylene	74.0	---	Value for total xylenes used as a surrogate.
Xylenes, total	74.0	USEPA 2014a	Minimum acute value (96-hr LC_{50} for *Palaemonetes pugio* [daggerblade grass shrimp]) with a safety factor of 100
Semivolatile Organics (µg/L):			
1,2,4,5-Tetrachlorobenzene	10.0	USEPA 2014a	Minimum acute value (96-hr NOEC for *Cyprinodon variegatus* [sheepshead minnow]) with a safety factor of 30
1,2,4-Trichlorobenzene	4.50	USEPA 2001	USEPA Region 4 chronic screening value
1,3,5-Trinitrobenzene	80.0 [3]	USEPA 2014a	Minimum chronic value (71-day NOEC for *Oncorhynchus mykiss* [rainbow trout] based on reproduction)
1,1-Biphenyl	230 [3]	USEPA 2014a	Minimum chronic value (21-day MATC for *Daphnia magna* [cladoceron] based on reproduction)
1,2-Dichlorobenzene	19.7	USEPA 2001	USEPA Region 4 chronic screening value
1,3-Dichlorobenzene	28.5	USEPA 2001	USEPA Region 4 chronic screening value
1,3-Dinitrobenzene	22.0 [3]	USEPA 2003	USEPA Region 5 ecological screening level
1,4-Dichlorobenzene	19.9	USEPA 2001	USEPA Region 4 chronic screening value
1,4-Dioxane	67,000	USEPA 2014a	Minimum acute value (96-hr LC_{50} for *Menidia beryllina* [inland silverside]) with a safety factor of 100
1,4-Naphthoquinone	NA	---	---
1-Naphthylamine	70.0 [3]	USEPA 2014a	Minimum acute value (48-hour LC_{50} for *Oryzias latipes* [medaka high eyes]) with a safety factor of 100
2,3,4,6-Tetrachlorophenol	8.80	Buchman 2008	Acute LOEL with a safety factor of 50
2,4,5-Trichlorophenol	11.0	Buchman 2008	Proposed Criteria Continuous Concentration
2,4,6-Trichlorophenol	12.1	USEPA 2014a	Minimum acute value (96-hr LC_{50} for *Palaemonetes pugio* [daggerblade grass shrimp]) with a safety factor of 100
2,2'-Oxybis(1-chloropropane)	NA	---	---
2,4-Dichlorophenol	1.67	USEPA 2014a	Minimum acute value (96-hr NOEC for *Allorchestes compressa* [scud]) with a safety factor of 30
2,4-Dimethylphenol	131	USEPA 2014a	Minimum chronic value (28-day NOEC for *Menidia beryllina* [inland silverside] based on survival)

TABLE 5-2

GROUNDWATER AND SURFACE WATER SCREENING VALUES
SWMU 9 – AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Surface Water Screening Value (1)	Reference	Comment (2)
Semivolatile Organics (µg/L):			
2,4-Dinitrophenol	48.5	USEPA 2001	USEPA Region 4 chronic screening value
2,4-Dinitrotoluene	44.0 (3)	USEPA 2003	USEPA Region 5 ecological screening level
2,6-Dichlorophenol	54.0	USEPA 2014a	Minimum acute value (96-hr LC_{50} for *Platichthys flesus* [european flounder]) with a safety factor of 100
2,6-Dinitrotoluene	81.0 (3)	USEPA 2003	USEPA Region 5 ecological screening level
2-Acetylaminofluorene	20.0 (3)	USEPA 2014a	Minimum acute value (96-hr LOEC for *Xenopus laevis* [clawed toad]) with a safety factor of 50
2-Chloronaphthalene	0.15	Buchman 2008	Acute LOEL for chemical class with a safety factor of 50
2-Chlorophenol	18.0	USEPA 2014a	Minimum acute value (96-hr LC_{50} for *Crangon septemspinosa* [bay shrimp]) with a safety factor of 100
2-Methylphenol	102	USEPA 2014a	Minimum acute value (96-hr LC_{50} for *Elasmopus pectinicrus* [scud]) with a safety factor of 100
2-Naphthylamine	NA	---	---
2-Nitroaniline	48.9 (3)	USEPA 2014a	Minumum acute value (48-hr EC_{50} for *daphnia magna* [cladoceron]) with a safety factor of 100
2-Nitrophenol	10,000	USEPA 2014a	Minimum chronic value (28-day MATC for *Cyprinodon variegatus* [sheepshead minnow] based on egg hatchability)
2-Picoline	8,979 (3)	USEPA 2014a	Minimum acute value (96-hr LC_{50} for *Pimephales promelas* [fathead minnow]) with a safety factor of 100
2-Toluidine	5.20 (3)	USEPA 2014a	Minimum acute value (48-hr LC_{50} for *Daphnia magna* [cladoceron]) with a safety factor of 100
3,4-Methyphenol	33.6	---	Value for 4-methylphenol used as a surrogate
3,3'-Dichlorobenzidine	4.50 (3)	USEPA 2003	USEPA Region 5 ecological screening level
3,3'-Dimethylbenzidine	160 (3)	USEPA 2014a	Minimum chronic value (21-day NOEC for *Daphnia magna* [cladoceron] based on behavior [equilibrium])
3-Methylcholanthrene	NA	---	---
3-Nitroaniline	9.80 (3)	USEPA 2014a	Minimum acute value (48-hr EC_{50} for *Daphnia magna* [cladoceron]) with a safety factor of 100
3-Methylphenol	62.0(3)	USEPA 2003	USEPA Region 5 ecological screening level
4,6-Dinitro-2-methylphenol	23.0 (3)	USEPA 2003	USEPA Region 5 ecological screening level
4-Aminobiphenyl	NA	---	---
4-Bromophenyl phenyl ether	1.50 (3)	USEPA 2003	USEPA Region 5 ecological screening level
4-Chloro-3-methylphenol	0.30 (3)	USEPA 2003	USEPA Region 5 ecological screening level
4-Chloroaniline	10.0 (3)	USEPA 2014a	Minimum chronic value (21-day NOEC for *Daphnia magna* [cladoceron]) based on reproduction)
4-Chlorophenyl phenyl ether	7.30 (3)	USEPA 2014a	Minimum acute value (96-hr LC_{50} for *Salvelinus fontinalis* [brook trout]) with a safety factor of 100
4-Methylphenol	33.6	USEPA 2014a	Minimum acute value (96-hr LC_{50} for Oncorhynchus goruscha [pink salmon]) with a safety factor of 100
4-Nitroaniline	170 (3)	USEPA 2014a	Minimum acute value (48-hr EC_{50} for *Daphnia magna* [cladoceron]) with a safety factor of 100
4-Nitrophenol	71.7	USEPA 2001	USEPA Region 4 chronic screening value
4-Nitroquinoline-1-oxide	NA	---	---
7,12-Dimethylbenz(a)anthracene	6.00	Buchman 2008	Acute LOEL for chemical class with a safety factor of 50 (value for high molecular weight PAHs)
Acetophenone	1,550 (3)	USEPA 2014a	Minimum acute value (96-hr LC_{50} for *Pimephales promelas* [fathead minnow]) with a safety factor of 100
A,A-Dimethyl phenethylamine	NA	---	---
Aniline	294	USEPA 2014a	Minimum acute value (96-hr LC_{50} for *Crangon septemspinosa* [sand shrimp]) with a safety factor of 100
Aramite, total	3.09 (3)	USEPA 2003	USEPA Region 5 ecological screening level
Benzidine	44.7	USEPA 2014a	Minimum acute value (96-hr LC_{50} for *Americamysis bahia* [opossum shrimp]) with a safety factor of 30
Benzoic acid	3,333 (3)	USEPA 2014a	Minimum acute value (48-hr NOEL for *Daphnia magna* [cladoceron]) with a safety factor of 30

TABLE 5-2

GROUNDWATER AND SURFACE WATER SCREENING VALUES
SWMU 9 – AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Surface Water Screening Value [1]	Reference	Comment [2]
Semivolatile Organics (µg/L):			
Benzyl alcohol	150	USEPA 2014a	Minimum acute value (96-hr LC_{50} for *Menidia beryllina* [inland silverside]) with a safety factor of 100
bis(2-Chloroethoxy)methane	1,840 [3]	USEPA 2014a	Minimum acute value (96-hr LC_{50} for *Pimephales promelas* [fathead minnow]) with a safety factor of 100
bis(2-Chloroethyl)ether	2,380 [3]	USEPA 2001	USEPA Region 4 chronic screeing value
bis(2-Ethylhexyl)phthalate	360	Buchman 2008	Proposed Criteria Continuous Concentration
Butyl benzyl phthalate	29.4	USEPA 2001	USEPA Region 4 chronic screening value
Carbazole	9.30 [3]	USEPA 2014a	Minimum acute value (96-hr LC_{50} for *Pimephales promelas* [fathead minnow]) with a safety factor of 100
cis-Diallate	82.0 [3]	---	Value for diallate used as a surrogate
Diallate (total)	82.0 [3]	USEPA 2014a	Minimum acute value (48-hr LC_{50} for *Rasbora heteromorpha* [harlequinfish]) with a safety factor of 100
Dibenzofuran	33.3	USEPA 2014a	Minimum acute value (96-hr NOEC for *Cyprinodon variegatus* [sheepshead minnow]) with a safety factor of 30
Diethyl phthalate	75.9	USEPA 2001	USEPA Region 4 chronic screening value
Dimethyl phthalate	580	USEPA 2001	USEPA Region 4 chronic screening value
Di-n-butyl phthalate	3.40	USEPA 2001	USEPA Region 4 chronic screening value (lowest reported plant value)
Di-n-octyl phthalate	1,150	USEPA 2014a	Minimum acute value (96-hr NOEC for *Americamysis bahia* [opossum shrimp]) with a safety factor of 30
Dinoseb	1.70	USEPA 2014a	Minimum acute value (96-hr LC_{50} for *Americamysis bahia* [opossum shrimp]) with a safety factor of 100
Diphenylamine	3.10	USEPA 2007	Minimum acute value (48-hr EC_{50} for *Daphnia magna* [cladoceron]) with a safety factor of 100
Ethyl methanesulfonate	40.0 [3]	USEPA 2014a	Minimum acute value (96-hr LC_{50} for *Clarias batrachus* [walking catfish]) with a safety factor of 100
Hexachlorobenzene	0.077	USEPA 2014a	Minimum acute value (48-hr NOEC [NR-ZERO] for *Penaeus duorarum* [northern pink shrimp]) with a safety factor of 30
Hexachlorobutadiene	0.32	USEPA 2001	USEPA Region 4 chronic screening value
Hexachlorocyclopentadiene	0.07	USEPA 2001	USEPA Region 4 chronic screening value
Hexachloroethane	9.40	USEPA 2001	USEPA Region 4 chronic screening value
Hexachlorophene	8.80 [3]	USEPA 2014a	Minimum chronic value (34-day NOEC for *Pimephales promelas* [fathead minnow] based on survival and growth)
Hexachloropropene	NA	---	---
Isophorone	129	USEPA 2001	USEPA Region 4 chronic screening value
Isosafrole	NA	---	---
Methapyrilene	NA	---	---
Methyl methanesulfonate	NA	---	---
Nitrobenzene	66.8	USEPA 2001	USEPA Region 4 chronic screening value
N-Nitro-o-toluidine	220 [3]	USEPA 2014a	Minimum acute value (48-hr EC_{50} for *Daphnia magna* [cladoceron] based on immobilization) with a safety factor of 100
N-Nitrosodiethylamine	768 [3]	USEPA 2003	USEPA Region 5 ecological screening level
N-Nitrosodimethylamine	25.0 [3]	---	Value for N-nitrosodiphenylamine used as a surrogate
N-Nitroso-di-n-butylamine	25.0 [3]	---	Value for N-nitrosodiphenylamine used as a surrogate
N-Nitroso-di-n-propylamine	25.0 [3]	---	Value for N-nitrosodiphenylamine used as a surrogate
N-Nitrosodiphenylamine	25.0 [3]	USEPA 2013	Indiana Department of Environmental Management Great Lakes Basin Tier II chronic criterion
N-Nitrosomethylethylamine	25.0 [3]	---	Value for N-nitrosodiphenylamine used as a surrogate
N-Nitrosomorpholine	NA	---	---
N-Nitrosopiperidine	NA	---	---
N-Nitrosopyrrolidine	NA	---	---
p-Dimethylamino azobenzene	NA	---	---

TABLE 5-2

GROUNDWATER AND SURFACE WATER SCREENING VALUES
SWMU 9 – AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Surface Water Screening Value [1]	Reference	Comment [2]
Semivolatile Organics (µg/L):			
Pentachlorobenzene	129	USEPA 2001	USEPA Region 4 chronic screening value
Pentachloronitrobenzene	0.12	USEPA 2014a	Minimum acute value (96-hr LC_{50} for *Americamysis bahia* [opossum shrimp]) with a safety factor of 100
Pentachlorophenol	7.90	PREQB 2010	Puerto Rico Water Quality Standard for Class SB coastal and estuarine waters
Phenacetin	NA	---	---
Phenol	58.0	USEPA 2001	USEPA Region 4 chronic screening value
p-Phenylene diamine	200 [3]	USEPA 2014a	Minimum acute value (48-hr LC_{50} for *Oryzias latires* [medika, high-eyes]) with a safety factor of 100
Pronamide	35.0	USEPA 2014a	Minimum acute value (96-hr EC_{50} for *Crassostrea virginica* [Virginia oyster]) with a safety factor of 100
Pyridine	500	USEPA 2014a	Minimum acute value (96-hr LC_{50} for *Crangon septemspinosa* [sand shrimp]) with a safety factor of 100
Safrole	NA	---	---
trans-Diallate	82.0 [3]	---	Value for diallate used as a surrogate
PAHs (µg/L):			
1-Methylnaphthalene	19.0	USEPA 2014a	Minimum acute value (96-hr NOEC for *Metacarcinus magister* [dungeness crab]) with a safety factor of 100
2-Methylnaphthalene	6.00	USEPA 2014a	Minimum acute value (96-hr LC_{50} for *Penaeus aztecus* [brown shrimp]) with a safety factor of 100
Acenaphthene	9.70	USEPA 2001	USEPA Region 4 chronic screening value
Acenaphthylene	6.00	Buchman 2008	Acute LOEL for chemical class with a safety factor of 50 (value for low molecular weight PAHs)
Anthracene	5.35	USEPA 2014a	Minimum acute value (48-hr LC_{50} for *Americamysis bahia* [opossum shrimp]) with a safety factor of 100
Benzo(a)anthracene	0.025 [3]	USEPA 2003	USEPA Region 5 ecological screening level
Benzo(a)pyrene	0.0102	USEPA 2014a	Minimum acute value (96-hr LC_{50} for *Palaemonetes pugio* [daggerblade grass shrimp]) with a safety factor of 100
Benzo(b)fluoranthene	6.00	Buchman 2008	Acute LOEL for chemical class with a safety factor of 50 (value for high molecular weight PAHs)
Benzo(g,h,i)perylene	6.00	Buchman 2008	Acute LOEL for chemical class with a safety factor of 50 (value for high molecular weight PAHs)
Benzo(k)fluoranthene	6.00	Buchman 2008	Acute LOEL for chemical class with a safety factor of 50 (value for high molecular weight PAHs)
Chrysene	10.0	USEPA 2004	Acute value (LC_{50}) with a safety factor of 100
Dibenzo(a,h)anthracene	6.00	Buchman 2008	Acute LOEL for chemical class with a safety factor of 50 (value for high molecular weight PAHs)
Fluoranthene	11.0	USEPA 1996	Final Chronic Value
Fluorene	10.0	USEPA 2014a	Minimum acute value (96-hr LC_{50} for *Nereis arenaceodentata* [polychaete]) with a safety factor of 100
Indeno(1,2,3-cd)pyrene	6.00	Buchman 2008	Acute LOEL for chemical class with a safety factor of 50 (value for high molecular weight PAHs)
Naphthalene	23.5	USEPA 2001	USEPA Region 4 chronic screening value
Phenanthrene	8.30	USEPA 1996	Final Chronic Value
Pyrene	0.248	USEPA 2014a	Minimum acute value (48-hr LC_{50} for *Americamysis bahia* [opossum shrimp]) with a safety factor of 100
Organophosphorous Pesticides (µg/L):			
Dimethoate	0.15	USEPA 2014b	Minimum acute value (96-hr LC_{50} for *Americamysis bahia* [opossum shrimp]) with a safety factor of 100
Disulfoton	2.35	USEPA 2014a	Minimum chronic value (32-day NOEC for *Americamysis bahia* [opossum shrimp] based on growth)
Parathion (Ethyl parathion)	0.67	USEPA 2014a	Minimum chronic value (28-day NOEC for *Cyprinodon variegatus* [sheepshead minnnow] based on growth)
Famphur	0.16 [3]	USEPA 2014a	Minimum acute value (24-hr LC_{50} for *Culex pipiens* [common house mosquito] with a safety factor of 100
Methyl parathion	0.11	USEPA 2014a	Minimum chronic value (24-day NOEC for *Americamysis bahia* [opossum shrimp] based on growth)
o,o,o-Triethylphosphorothioate	NA	---	---
Phorate	0.09	USEPA 2014a	Minimum chronic value (28-day NOEC for *Americamysis bahia* [opossum shrimp] based on survival)
Sulfotep (Tetraethyldithiopyrophosphate)	0.0023 [3]	USEPA 2014a	Minimum acute value (48-hr LC_{50} for *Daphnia magna* [cladoceron] with a safety factor of 100)
Thionazin	0.90 [3]	USEPA 2014a	Minimum acute value (48-hr LC_{50} for *Rasbora heteromorpha* [harlequinfish] with a safety factor of 100)

TABLE 5-2

GROUNDWATER AND SURFACE WATER SCREENING VALUES
SWMU 9 – AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Surface Water Screening Value [1]	Reference	Comment [2]
Total Recoverable Metals (µg/L):			
Antimony	500	Buchman 2008	Proposed Criteria Continuous Concentration
Arsenic	36.0	PREQB 2010	Total recoverable Puerto Rico Water Quality Standard for Class SB coastal and estuarine waters
Barium	16,667	USEPA 2014a	Minimum acute value (96-hr NOEC for *Cyprinodon variegatus* [sheepshead minnow]) with a safety factor of 30
Beryllium	167	USEPA 2014a	Minimum acute value (96-hr NOEC [NR-ZERO] for *Fundulus heteroclitus* [mummichog]) with a safety factor of 30
Cadmium	8.85	PREQB 2010	Total recoverable Puerto Rico Water Quality Standard for Class SB coastal and estuarine waters
Chromium, total	50.4 [4]	PREQB 2010	Total recoverable Puerto Rico Water Quality Standard for Class SB coastal and estuarine waters
Cobalt	45.0	USEPA 2014a	Minimum acute value (96-hr LC_{50} for *Nitocra spinipes* [Harpacticoid copepod]) with a safety factor of 100
Copper	3.73	PREQB 2010	Total recoverable Puerto Rico Water Quality Standard for Class SB coastal and estuarine waters
Lead	8.52	PREQB 2010	Total recoverable Puerto Rico Water Quality Standard for Class SB coastal and estuarine waters
Mercury	1.11	USEPA 2014b	Total recoverable Criteria Continuous Concentration
Nickel	8.28	PREQB 2010	Total recoverable Puerto Rico Water Quality Standard for Class SB coastal and estuarine waters
Selenium	71.1	PREQB 2010	Total recoverable Puerto Rico Water Quality Standard for Class SB coastal and estuarine waters
Silver	2.24	PREQB 2010	Total recoverable Puerto Rico Water Quality Standard for Class SB coastal and estuarine waters
Thallium	21.3	USEPA 2001	USEPA Region 4 chronic screening value
Tin	180 [3]	USEPA 2003	USEPA Region 5 ecological screening level
Vanadium	12.0 [3]	USEPA 2003	USEPA Region 5 ecological screening level
Zinc	85.6	PREQB 2010	Total recoverable Puerto Rico Water Quality Standard for Class SB coastal and estuarine waters

Notes:

EC_{50} = Median Effective Concentration
LC_{50} = Median Lethal Concentration
LOEL = Lowest Observed Effect Level
MATC = Maximum Acceptable Toxicant Concentration
µg/L = microgram per liter
NA = Not Available
NOEC = No Observed Effect Concentration
NR-ZERO = 0 percent mortality, or 100 percent survival of test organisms
PAH = Polynuclear Aromatic Hydrocarbon
PREQB = Puerto Rico Environmental Quality Board
USEPA = U.S. Environmental Protection Agency

[1] The values shown are marine/estuarine screening values unless otherwise noted. Estuarine/marine surface water screening values were preferentially used as groundwater screening values since groundwater flow at the Tank 214 Area is toward an estuarine wetland system (Los Machos mangrove forest).
[2] The safety factors applied to acute endpoints (i.e., LC_{50}, EC_{50}, NOEC, and LOEL values) and chronic endpoints (i.e., LOELs) are those recommended by Wentsel et al. (1996).
[3] The chemical lacks a marine/estuarine surface water screening value/toxicity value. The value shown is a freshwater screening value/toxicity value.
[4] The value shown is for hexavalent chromium.

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GROUNDWATER AND SURFACE WATER SCREENING VALUES
SWMU 9 – AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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TABLE 5-3

MARINE/ESTUARINE SEDIMENT SCREENING VALUES
SWMU 9 – AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Sediment Screening Value [1]	Reference	Comment [2][3]
Volatile Organics (µg/kg):			
1,1,1,2-Tetrachloroethane [4]	249	USEPA 1993 and 1996	EqP-based screening value
1,1,1-Trichloroethane	466	USEPA 1993 and 1996	EqP-based screening value
1,1,2,2-Tetrachloroethane	291	USEPA 1993 and 1996	EqP-based screening value
1,1,2-Trichloroethane	702	USEPA 1993 and 1996	EqP-based screening value
1,1-Dichloroethane [4]	50.8	USEPA 1993 and 1996	EqP-based screening value
1,1-Dichloroethene	2,423	USEPA 1993 and 1996	EqP-based screening value
1,2,3-Trichloropropane [4]	1,079	USEPA 1993 and 1996	EqP-based screening value
1,2-Dibromo-3-chloropropane	394	USEPA 1993 and 1996	EqP-based screening value
1,2-Dichloroethane	1,521	USEPA 1993 and 1996	EqP-based screening value
1,2-Dichloropropane	4,953	USEPA 1993 and 1996	EqP-based screening value
2-Butanone (MEK)	2,044	USEPA 1993 and 1996	EqP-based screening value
2-Chloro-1,3-butadiene	NA	---	---
2-Hexanone [4]	50.4	USEPA 1993 and 1996	EqP-based screening value
3-Chloro-1-propene [4]	4.58	USEPA 1993 and 1996	EqP-based screening value
4-Methyl-2-pentanone (MIBK) [4]	72.8	USEPA 1993 and 1996	EqP-based screening value
Acetone	80.4	USEPA 1993 and 1996	EqP-based screening value
Acetonitrile	1,905	USEPA 1993 and 1996	EqP-based screening value
Acrolein	0.019	USEPA 1993 and 1996	EqP-based screening value
Acrylonitrile [4]	16.8	USEPA 1993 and 1996	EqP-based screening value
Benzene	540	USEPA 1993 and 1996	EqP-based screening value
Bromoform	692	USEPA 1993 and 1996	EqP-based screening value
Bromomethane	53.9	USEPA 1993 and 1996	EqP-based screening value
Carbon disulfide [4]	11.1	USEPA 1993 and 1996	EqP-based screening value
Carbon tetrachloride	2,238	USEPA 1993 and 1996	EqP-based screening value
Chlorobenzene	835	USEPA 1993 and 1996	EqP-based screening value
Chlorodibromomethane [4]	346	USEPA 1993 and 1996	EqP-based screening value
Chloroethane	9,828	Di Toro and McGrath 2000	EqP-based toxicological threshold
Chloroform	882	USEPA 1993 and 1996	EqP-based screening value
Chloromethane	1,214	USEPA 1993 and 1996	EqP-based screening value
cis-1,2-Dichloroethene	6,032		
cis-1,3-Dichloropropene	17.7	USEPA 1993 and 1996	EqP-based screening value
Dibromomethane	946	USEPA 1993 and 1996	EqP-based screening value
Dichlorobromomethane [4]	368	USEPA 1993 and 1996	EqP-based screening value
Dichlorodifluoromethane	1,910	USEPA 1993 and 1996	EqP-based screening value
Ethylbenzene	4.00	Buchman 2008	Minimum Apparent Effects Threshold (Echinoderm larvae and larvalmax)
Ethylene dibromide	64.6	USEPA 1993 and 1996	EqP-based screening value

TABLE 5-3

MARINE/ESTUARINE SEDIMENT SCREENING VALUES
SWMU 9 – AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Sediment Screening Value [1]	Reference	Comment [2][3]
Volatile Organics (µg/kg):			
Ethyl methacrylate [4]	10,196	USEPA 1993 and 1996	EqP-based screening value
Iodomethane [4]	9.30	USEPA 1993 and 1996	EqP-based screening value
Isobutyl alcohol	992	USEPA 1993 and 1996	EqP-based screening value
Methacrylonitrile	NA	---	---
Methylene chloride	1,891	USEPA 1993 and 1996	EqP-based screening value
Methyl methacrylate [4]	870	USEPA 1993 and 1996	EqP-based screening value
Pentachloroethane	260	USEPA 1993 and 1996	EqP-based screening value
Propionitrile [4]	4,398	USEPA 1993 and 1996	EqP-based screening value
Styrene	2,578	USEPA 1993 and 1996	EqP-based screening value
Tetrachloroethene	57.0	Buchman 2008	Minimum Apparent Effects Threshold (infaunal community impacts)
Toluene	294	USEPA 1993 and 1996	EqP-based screening value
trans-1,2-dichloroethene	6,032	USEPA 1993 and 1996	EqP-based screening value
trans-1,3-Dichloropropene	17.7	USEPA 1993 and 1996	EqP-based screening value
trans-1,4-Dichloro-2-butene	NA	---	---
Trichloroethene	82.6	USEPA 1993 and 1996	EqP-based screening value
Trichlorofluoromethane	1,910	USEPA 1993 and 1996	EqP-based screening value
Vinyl acetate [4]	26.6	USEPA 1993 and 1996	EqP-based screening value
Vinyl chloride [4]	687	USEPA 1993 and 1996	EqP-based screening value
o-Xylene	4.00	---	Value for total xylenes used as a surrogate
m-Xylene	4.00	---	Value for total xylenes used as a surrogate
p-Xylene	4.00	---	Value for total xylenes used as a surrogate
m,p-Xylene	4.00	---	Value for total xylenes used as a surrogate
Xylenes, total	4.00	Buchman 2008	Minimum Apparent Effects Threshold for total xylenes (bivalve)
Semivolatile Organics (µg/kg):			
1,2,4,5-Tetrachlorobenzene	755	USEPA 1993 and 1996	EqP-based screening value
1,2,4-Trichlorobenzene	4.80	Buchman 2008	Minimum Apparent Effects Threshold (Echinoderm larvae)
1,3,5-Trinitrobenzene [4]	4,578	USEPA 1993 and 1996	EqP-based screening value
1,1-Biphenyl [4]	40,109	USEPA 1993 and 1996	EqP-based screening value
1,2-Dichlorobenzene	13.0	Buchman 2008	Minimum Apparent Effects Threshold (Neanthes bioassays)
1,3-Dichlorobenzene	368	USEPA 1993 and 1996	EqP-based screening value
1,3-Dinitrobenzene [4]	263	USEPA 1993 and 1996	EqP-based screening value
1,4-Dichlorobenzene	110	Buchman 2008	Minimum Apparent Effects Threshold (infaunal community impacts and Microtox)
1,4-Dioxane	5,998	USEPA 1993 and 1996	EqP-based screening value
1,4-Naphthoquinone	NA	---	---
1-Naphthylamine [4]	7,702	USEPA 1993 and 1996	EqP-based screening value
2,3,4,6-Tetrachlorophenol	887	USEPA 1993 and 1996	EqP-based screening value

TABLE 5-3

MARINE/ESTUARINE SEDIMENT SCREENING VALUES
SWMU 9 – AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Sediment Screening Value [1]	Reference	Comment [2][3]
Semivolatile Organics (µg/kg):			
2,4,5-Trichlorophenol	3.00	Buchman 2008	Minimum Apparent Effects Threshold (infaunal community impacts)
2,4,6-Trichlorophenol	6.00	Buchman 2008	Minimum Apparent Effects Threshold (infaunal community impacts)
2,2'-Oxybis(1-chloropropane)	NA	---	---
2,4-Dichlorophenol	0.2083	Buchman 2008	Minimum Apparent Effects Threshold (basis of value not specified)
2,4-Dimethylphenol	18.0	Buchman 2008	Minimum Apparent Effects Threshold (Neanthes bioassays)
2,4-Dinitrophenol	760	USEPA 1993 and 1996	EqP-based screening value
2,4-Dinitrotoluene [4]	861	USEPA 1993 and 1996	EqP-based screening value
2,6-Dichlorophenol	921	USEPA 1993 and 1996	EqP-based screening value
2,6-Dinitrotoluene [4]	1,618	USEPA 1993 and 1996	EqP-based screening value
2-Acetylaminofluorene [4]	1,500	USEPA 1993 and 1996	EqP-based screening value
2-Chloronaphthalene	12.6	USEPA 1993 and 1996	EqP-based screening value
2-Chlorophenol	0.333	Buchman 2008	Minimum Apparent Effects Threshold (basis of value not specified)
2-Methylphenol (o-cresol)	8.00	Buchman 2008	Minimum Apparent Effects Threshold (bivalve)
2-Naphthylamine	NA	---	---
2-Nitroaniline [4]	185.0	USEPA 1993 and 1996	EqP-based screening value
2-Nitrophenol	170,646	USEPA 1993 and 1996	EqP-based screening value
2-Picoline [4]	35,138	USEPA 1993 and 1996	EqP-based screening value
2-Toluidine [4]	20.3	USEPA 1993 and 1996	EqP-based screening value
3,3'-Dichlorobenzidine [4]	488	USEPA 1993 and 1996	EqP-based screening value
3,3'-Dimethylbenzidine [4]	17,354	USEPA 1993 and 1996	EqP-based screening value
3,4-Methylphenol	100	---	Value for 4-methylphenol used as a surrogate
3-Methylcholanthrene	NA	---	---
3-Methylphenol	100	---	Value for 4-methylphenol used as a surrogate
3-Nitroaniline [4]	17.9	USEPA 1993 and 1996	EqP-based screening value
4,6-Dinitro-2-methylphenol [4]	590	USEPA 1993 and 1996	EqP-based screening value
4-Aminobiphenyl	NA	---	---
4-Bromophenyl phenyl ether [4]	1,061	Di Toro and McGrath 2000	EqP-based toxicological threshold
4-Chloro-3-methylphenol [4]	5.02	USEPA 1993 and 1996	EqP-based screening value
4-Chloroaniline [4]	38.3	USEPA 1993 and 1996	EqP-based screening value
4-Chlorophenyl phenyl ether	975	Di Toro and McGrath 2000	EqP-based toxicological threshold
4-Methylphenol (p-cresol)	100	Buchman 2008	Minimum Apparent Effects Threshold (bivalve)
4-Nitroaniline [4]	631	USEPA 1993 and 1996	EqP-based screening value
4-Nitrophenol	571	USEPA 1993 and 1996	EqP-based screening value
4-Nitroquinoline-1-oxide	NA	---	---
7,12-Dimethylbenz(a)anthracene	100,694	USEPA 1993 and 1996	EqP-based screening value

TABLE 5-3

MARINE/ESTUARINE SEDIMENT SCREENING VALUES
SWMU 9 – AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Sediment Screening Value [1]	Reference	Comment [2][3]
Semivolatile Organics (µg/kg):			
Acetophenone	2,732	USEPA 1993 and 1996	EqP-based screening value
A,A-Dimethylphenethylamine	NA	---	---
Aniline	702	USEPA 1993 and 1996	EqP-based screening value
Aramite, total	583	USEPA 1993 and 1996	EqP-based screening value
Benzidine	1,809	USEPA 1993 and 1996	
Benzoic acid [4]	1,875	USEPA 1993 and 1996	EqP-based screening value
Benzyl alcohol	52.0	Buchman 2008	Minimum Apparent Effects Threshold (bivalve)
bis(2-Chloroethoxy)methane [4]	900	USEPA 1993 and 1996	EqP-based screening value
bis(2-Chloroethyl)ether [4]	2,606	USEPA 1993 and 1996	EqP-based screening value
bis(2-Ethylhexyl)phthalate	180	MacDonald et al. 2003	Threshold Effect Concentration
Butyl benzyl phthalate	63.0	Buchman 2008	Minimum Apparent Effects Threshold (Microtox)
Carbazole [4]	794	USEPA 1993 and 1996	EqP-based screening value
Diallate, total [4]	1,796	USEPA 1993 and 1996	EqP-based screening value
cis-Diallate [4]	1,796	USEPA 1993 and 1996	EqP-based screening value
Dibenzofuran	110	Buchman 2008	Minimum Apparent Effects Threshold (Echinoderm larvae)
Diethyl phthalate	630 [5]	MacDonald et al. 2003	Threshold Effect Concentration
Dimethyl phthalate	6.00	Buchman 2008	Minimum Apparent Effects Threshold (bivalve)
Di-n-butyl phthalate	58.0	Buchman 2008	Minimum Apparent Effects Threshold (bivalve and larvalmax)
Di-n-octyl phthalate	61.0	Buchman 2008	Minimum Apparent Effects Threshold (bivalve and larvalmax)
Dinoseb	248	USEPA 1993 and 1996	EqP-based screening value
Diphenylamine [4]	87.0	USEPA 1993 and 1996	EqP-based screening value
Ethyl methanesulfonate [4]	10.7	USEPA 1993 and 1996	EqP-based screening value
Hexachlorobenzene	6.00	Buchman 2008	Minimum Apparent Effects Threshold (bivalve)
Hexachlorobutadiene	1.30	Buchman 2008	Minimum Apparent Effects Threshold (Echinoderm larvae)
Hexachlorocyclopentadiene	3.34	USEPA 1993 and 1996	EqP-based screening value
Hexachloroethane	73.0	Buchman 2008	Minimum Apparent Effects Threshold (bivalve and larvalmax)
Hexachlorophene [4]	200,045	USEPA 1993 and 1996	EqP-based screening value
Hexachloropropene	NA	---	---
Isophorone	286	USEPA 1993 and 1996	EqP-based screening value
Isosafrole	NA	---	---
Methapyrilene	NA	---	---
Methyl methanesulfonate	NA	---	---
N-Nitro-o-toluidine [4]	1,336	USEPA 1993 and 1996	EqP-based screening value
N-Nitrosodiethylamine [4]	2,165	USEPA 1993 and 1996	EqP-based screening value
N-Nitrosodimethylamine [4]	19.4	USEPA 1993 and 1996	EqP-based screening value

TABLE 5-3

MARINE/ESTUARINE SEDIMENT SCREENING VALUES
SWMU 9 – AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Sediment Screening Value [1]	Reference	Comment [2][3]
Semivolatile Organics (µg/kg):			
N-Nitroso-di-n-butylamine [4]	777	USEPA 1993 and 1996	EqP-based screening value
N-Nitroso-di-n-propylamine [4]	234	USEPA 1993 and 1996	EqP-based screening value
N-Nitrosodiphenylamine [4]	28.0	Buchman 2008	Minimum Apparent Effects Threshold (infaunal community impacts)
N-Nitrosomethylethylamine [4]	36.9	USEPA 1993 and 1996	EqP-based screening value
N-Nitrosomorpholine	NA	---	---
N-Nitrosopiperidine	NA	---	---
N-Nitrosopyrrolidine	NA	---	---
Nitrobenzene	21.0	Buchman 2008	Minimum Apparent Effects Threshold (Neanthes bioassays)
p-Dimethylamino azobenzene	NA	---	---
Pentachlorobenzene	16,263	USEPA 1993 and 1996	EqP-based screening value
Pentachloronitrobenzene	24.5	USEPA 1993 and 1996	EqP-based screening value
Pentachlorophenol	17.0	Buchman 2008	Minimum Apparent Effects Threshold (bivalve)
Phenacetin	NA	---	---
Phenol	130	Buchman 2008	Minimum Apparent Effects Threshold (Echinoderm larvae)
p-Phenylenediamine [4]	230	USEPA 1993 and 1996	EqP-based screening value
Pronamide	482	USEPA 1993 and 1996	EqP-based screening value
Pyridine [4]	1,219	USEPA 1993 and 1996	EqP-based screening value
Safrole, total	NA	---	---
trans-Diallate [4]	1,796	USEPA 1993 and 1996	EqP-based screening value
PAHs (µg/kg):			
1-Methylnaphthalene	20.2	---	Value for 2-methylnaphthalene used as a surrogate
2-Methylnaphthalene	20.2	MacDonald 1994	Threshold Effect Level
Acenaphthene	6.71	MacDonald 1994	Threshold Effect Level
Acenaphthylene	5.87	MacDonald 1994	Threshold Effect Level
Anthracene	46.9	MacDonald 1994	Threshold Effect Level
Benzo(a)anthracene	74.8	MacDonald 1994	Threshold Effect Level
Benzo(a)pyrene	88.8	MacDonald 1994	Threshold Effect Level
Benzo(b)fluoranthene	1,800	Buchman 2008	Minimum Apparent Effects Threshold (Echinoderm larvae and infaunal commuity impacts)
Benzo(g,h,i)perylene	670	Buchman 2008	Minimum Apparent Effects Threshold (Echinoderm larvae)
Benzo(k)fluoranthene	1,800	Buchman 2008	Minimum Apparent Effects Threshold (Echinoderm larvae and infaunal commuity impacts)
Chrysene	108	MacDonald 1994	Threshold Effect Level
Dibenzo(a,h)anthracene	6.22	MacDonald 1994	Threshold Effect Level
Fluoranthene	113	MacDonald 1994	Threshold Effect Level
Fluorene	21.2	MacDonald 1994	Threshold Effect Level
Indeno(1,2,3-cd)pyrene	600	Buchman 2008	Minimum Apparent Effects Threshold (Microtox)
Naphthalene	34.6	MacDonald 1994	Threshold Effect Level

TABLE 5-3

MARINE/ESTUARINE SEDIMENT SCREENING VALUES
SWMU 9 – AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Sediment Screening Value [1]	Reference	Comment [2][3]
PAHs (µg/kg):			
Phenanthrene	86.7	MacDonald 1994	Threshold Effect Level
Pyrene	153	MacDonald 1994	Threshold Effect Level
Organophosphorous Pesticides (µg/kg):			
Dimethoate	0.065	USEPA 1993 and 1996	EqP-based screening value
Disulfoton	66.9	USEPA 1993 and 1996	EqP-based screening value
Parathion (Ethyl parathion)	4.31	USEPA 1993 and 1996	EqP-based screening value
Famphur [4]	3.97	USEPA 1993 and 1996	EqP-based screening value
Methyl parathion	0.52	USEPA 1993 and 1996	EqP-based screening value
o,o,o-Triethylphosphorothioate	NA	---	---
Phorate	1.41	USEPA 1993 and 1996	EqP-based screening value
Sulfotep (Tetraethyldithiopyrophosphate)	0.021	USEPA 1993 and 1996	EqP-based screening value
Thionazin	12.1	USEPA 1993 and 1996	---
Metals (mg/kg):			
Antimony	2.00	Long and Morgan 1991	Effects Range-Low
Arsenic	7.24	MacDonald 1994	Threshold Effect Level
Barium	48.0	Buchman 2008	Minimum Apparent Effects Threshold (amphipod)
Beryllium	NA	---	---
Cadmium	0.676	MacDonald 1994	Threshold Effect Level
Chromium, total	52.3	MacDonald 1994	Threshold Effect Level
Cobalt	10.0	Buchman 2008	Minimum Apparent Effects Threshold (Neanthes bioassays)
Copper	18.7	MacDonald 1994	Threshold Effect Level
Lead	30.2	MacDonald 1994	Threshold Effect Level
Mercury	0.13	MacDonald 1994	Threshold Effect Level
Nickel	15.9	MacDonald 1994	Threshold Effect Level
Selenium	1.00	Buchman 2008	Minimum Apparent Effects Threshold (amphipod)
Silver	0.733	MacDonald 1994	Threshold Effect Level
Thallium	NA	---	---
Tin [4]	3.40	Buchman 2008	Minimum Apparent Effects Threshold (Neanthes bioassays)
Vanadium [4]	57.0	Buchman 2008	Minimum Apparent Effects Threshold (Neanthes bioassays)
Zinc	124	MacDonald 1994	Threshold Effect Level

TABLE 5-3

MARINE/ESTUARINE SEDIMENT SCREENING VALUES
SWMU 9 – AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Notes:

EqP = Equilibrium partitioning
µg/kg = microgram per kilogram
mg/kg = milligram per kilogram
NA = Not Available
PAH = Polynuclear Aromatic Hydrocarbon
USEPA = U.S. Environmental Protection Agency

(1) The values shown are marine/estuarine screening values unless otherwise noted.
(2) EqP-based sediment screening values calculated using USEPA (1993 and 1996) methodology: $SV_{sed} = (K_{oc})(f_{oc})(SV_{sw})$ where K_{oc} is the organic carbon partition coefficient (L/kg), f_{oc} is the fraction of organic carbon (unitless), and SV_{sw} is the surface water screening value (ug/L). Sediment screening values are based on a f_{oc} of 0.034 (minimum measured value in Tank 214 Area sediment). Eqp-based screening values.
(3) EqP-based sediment screening values from Di Toro and McGrath (2000) are based on a f_{oc} of 0.034 (minimum measured value in Tank 214 Area sediment).
(4) The EqP-based sediment screening value was derived using a fresh surface water screeing value (the chemical lacks a marine surface water screening value).

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TABLE 5-4

TOXICITY REFERENCE VALUES FOR BIRDS
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	Test Material	NOAEL (mg/kg/d)	MATC [1] (mg/kg/d)	LOAEL (mg/kg/d)	Source Document [2]	Comments
Volatile Organics:											
1,1,1,2-Tetrachloroethane	---	---	---	---	---	---	NA	NA	NA	---	---
Carbon tetrachloride	---	---	---	---	---	---	NA	NA	NA	---	---
Chlorobenzene	---	---	---	---	---	---	NA	NA	NA	---	---
Chloroform	---	---	---	---	---	---	NA	NA	NA	---	---
Ethylbenzene	---	---	---	---	---	---	NA	NA	NA	---	---
Pentachloroethane	---	---	---	---	---	---	NA	NA	NA	---	---
Styrene	---	---	---	---	---	---	NA	NA	NA	---	---
Toluene	---	---	---	---	---	---	NA	NA	NA	---	---
Trichloroethene	---	---	---	---	---	---	NA	NA	NA	---	---
Xylene, m/p-	---	---	---	---	---	---	40.5 [3]	90.7	203 [4]	---	Value for total xylenes used as a surrogate
Xylene, o-	---	---	---	---	---	---	40.5 [3]	90.7	203 [4]	---	Value for total xylenes used as a surrogate
Xylenes, total	Quail	0.191	Unknown	Oral in diet	Mortality	---	40.5 [3]	90.7	203 [4]	Hill and Camardese 1986	---
Semivolatile Organics:											
1,2,4,5-Tetrachlorobenzene	---	---	---	---	---	---	NA	NA	NA	---	---
1,2,4-Trichlorobenzene	---	---	---	---	---	---	NA	NA	NA	---	---
1,1-Biphenyl	---	---	---	---	---	---	NA	NA	NA	---	---
1,2-Dichlorobenzene	---	---	---	---	---	---	16.08	35.96	80.4	---	Values for 1,4-dichlorobenzene used as surrogates
1,3-Dichlorobenzene	---	---	---	---	---	---	16.08	35.96	80.4	---	Values for 1,4-dichlorobenzene used as surrogates
1,4-Dichlorobenzene	Northern bobwhite	0.157	14 days	Oral (gavage)	Mortality	Not Applicable	16.08 [3]	35.96	80.4 [4]	USEPA 2014 [13]	---
2,3,4,6-Tetrachlorophenol	---	---	---	---	---	---	NA	NA	NA	---	---
2,4,5-Trichlorophenol	---	---	---	---	---	---	NA	NA	NA	---	---
2,4,6-Trichlorophenol	---	---	---	---	---	---	NA	NA	NA	---	---
2,4-Dichlorophenol	---	---	---	---	---	---	NA	NA	NA	---	---
2-Acetylaminofluorene	---	---	---	---	---	---	NA	NA	NA	---	---
2-Chloronaphthalene	---	---	---	---	---	---	NA	NA	NA	---	---
3,3'-Dichlorobenzidine	---	---	---	---	---	---	NA	NA	NA	---	---
3,3-Dimethylbenzidine	---	---	---	---	---	---	NA	NA	NA	---	---
3-Methylcholanthrene	---	---	---	---	---	---	NA	NA	NA	---	---
4-Bromophenyl phenyl ether	---	---	---	---	---	---	NA	NA	NA	---	---
4-Chloro-3-methylphenol	---	---	---	---	---	---	NA	NA	NA	---	---
4-Chlorophenyl phenyl ether	---	---	---	---	---	---	NA	NA	NA	---	---
7-12-Dimethylbenz(a)anthracene	European starling	0.055	5 days	Oral (gavage)	Growth	---	2.00	6.32	20.0	USEPA 2007a [13]	---
Aramite, total	---	---	---	---	---	---	NA	NA	NA	---	---
bis(2-Ethylhexyl) phthalate	Ringed dove	0.155	4 weeks	Oral in diet	Reproduction	Not Applicable	1.11	2.48	5.55 [4]	Sample et al. 1996 [13]	---
Butyl benzyl phthalate	---	---	---	---	---	---	NA	NA	NA	---	---
Diallate	---	---	---	---	---	---	NA	NA	NA	---	---
Carbazole	---	---	---	---	---	---	NA	NA	NA	---	---
Chlorobenzilate	Bobwhite quail	Unknown	14 days	Oral (gavage)	Mortality	Not Applicable	6.07 [3]	13.57	30.35	USEPA 2014 [13]	---
cis-Diallate	---	---	---	---	---	---	NA	NA	NA	---	---
trans-Diallate	---	---	---	---	---	---	NA	NA	NA	---	---
Dibenzofuran	---	---	---	---	---	---	NA	NA	NA	---	---
Diethyl phthalate	---	---	---	---	---	---	NA	NA	NA	---	---
Di-n-butyl phthalate	Ringed dove	0.155	4 weeks	Oral in diet	Reproduction	Not Applicable	0.222 [5]	0.50	1.11	Sample et al. 1996 [13]	---
Di-n-octyl phthalate	Ring-necked pheasant	1.00	5 days	Oral	Mortality	Not Applicable	50 [3]	112	250 [4]	USEPA 2007b [13]	---
Dinoseb	Mallard duck	Unknown	14 days	Oral (gavage)	Mortality	Not Applicable	0.095 [3]	0.212	0.475 [4]	USEPA 2014 [13]	---
Diphenylamine	---	---	---	---	---	---	NA	NA	NA	---	---
Hexachlorobenzene	Japanese quail	0.15	90 days	Oral	Reproduction	Not Applicable	0.11	0.25	0.57	Coulston and Kolbye 1994	---

TABLE 5-4

TOXICITY REFERENCE VALUES FOR BIRDS
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	Test Material	NOAEL (mg/kg/d)	MATC [1] (mg/kg/d)	LOAEL (mg/kg/d)	Source Document [2]	Comments
Semivolatile Organics:											
Hexachlorobutadiene	Japanese quail	0.15	90days	Oral	Reproduction	Not Applicable	3.39 [4]	7.59	17.0	Coulston and Kolbye 1994	---
Hexachlorocyclopentadiene	---	---	---	---	---	---	NA	NA	NA	---	---
Hexachloroethane	---	---	---	---	---	---	NA	NA	NA	---	---
Hexachlorophene	---	---	---	---	---	---	NA	NA	NA	---	---
Hexachloropropene	---	---	---	---	---	---	NA	NA	NA	---	---
Isosafrole	---	---	---	---	---	---	NA	NA	NA	---	---
N-Nitrosodiphenylamine	---	---	---	---	---	---	NA	NA	NA	---	---
p-Dimethylamino azobenzene	---	---	---	---	---	---	NA	NA	NA	---	---
Pentachlorobenzene	---	---	---	---	---	---	NA	NA	NA	---	---
Pentachloronitrobenzene	Chicken	1.50	35 weeks	Oral in diet	Reproduction	Not Applicable	7.07	22.4	70.7	Sample et al. 1996 [13]	---
Pentachlorophenol	Chicken	0.66	1 week	Oral in diet	Growth	Pentachlorophenol (purified)	6.73 [6]	21.3	67.3	USEPA 2007c [13]	---
Pronamide	---	---	---	---	---	---	NA	NA	NA	---	---
PAHs:											
1-Methylnaphthalene	---	---	---	---	---	---	1,653	3,696	8,265	---	Values for naphthalene used as surrogates
2-Methylnaphthalene	---	---	---	---	---	---	1,653	3,696	8,265	---	Values for naphthalene used as surrogates
Acenaphthene	---	---	---	---	---	---	1,653	3,696	8,265	---	Values for naphthalene used as surrogates
Acenaphthylene	---	---	---	---	---	---	1,653	3,696	8,265	---	Values for naphthalene used as surrogates
Anthracene	---	---	---	---	---	---	1,653	3,696	8,265	---	Values for naphthalene used as surrogates
Benzo(a)anthracene	---	---	---	---	---	---	2.00	6.32	20.0	---	Values for 7,12-dimethylbenz(a)anthracene used as surrogates
Benzo(a)pyrene	---	---	---	---	---	---	2.00	6.32	20.0	---	Values for 7,12-dimethylbenz(a)anthracene used as surrogates
Benzo(b)fluoranthene	---	---	---	---	---	---	2.00	6.32	20.0	---	Values for 7,12-dimethylbenz(a)anthracene used as surrogates
Benzo(g,h,i)perylene	---	---	---	---	---	---	2.00	6.32	20.0	---	Values for 7,12-dimethylbenz(a)anthracene used as surrogates
Benzo(k)fluoranthene	---	---	---	---	---	---	2.00	6.32	20.0	---	Values for 7,12-dimethylbenz(a)anthracene used as surrogates
Chrysene	---	---	---	---	---	---	2.00	6.32	20.0	---	Values for 7,12-dimethylbenz(a)anthracene used as surrogates
Dibenz(a,h)anthracene	---	---	---	---	---	---	2.00	6.32	20.0	---	Values for 7,12-dimethylbenz(a)anthracene used as surrogates
Fluoranthene	---	---	---	---	---	---	1,653	3,696	8,265	---	Values for naphthalene used as surrogates
Fluorene	---	---	---	---	---	---	1,653	3,696	8,265	---	Values for naphthalene used as surrogates
Indeno(1,2,3-cd)pyrene	---	---	---	---	---	---	2.00	6.32	20.0	---	Values for 7,12-dimethylbenz(a)anthracene used as surrogates
Naphthalene	Northern bobwhite	0.055	5 days	oral (gavage)	Growth	Not Applicable	1,653	3,696	8,265 [4]	USEPA 2007a [13]	---
Phenanthrene	---	---	---	---	---	---	1,653	3,696	8,265	---	Values for naphthalene used as surrogates
Pyrene	---	---	---	---	---	---	2.00	6.32	20.0	---	Values for 7,12-dimethylbenz(a)anthracene used as surrogates
Organophosphorous Pesticides:											
Disulfoton	Mallard duck	---	14 days	oral (gavage)	Mortality	---	0.0654 [3]	0.146	0.327 [4]	USEPA 2014 [13]	---
Methyl Parathion	American kestral	---	14 days	oral (gavage)	Mortality	---	0.0308 [3]	0.069	0.154 [4]	USEPA 2014 [13]	---
Parathion	Fulvous whistling duck	---	14 days	oral (gavage)	Mortality	---	0.00125 [3]	0.00280	0.00625 [4]	USEPA 2004	---
Phorate	Mallard Duck	---	14 days	oral (gavage)	Mortality	---	0.0062 [3]	0.014	0.031 [4]	USEPA 2014 [13]	---
Sulfotepp	--	--	--	--	--	---	NA	NA	NA	---	---
Metals:											
Antimony	Northern bobwhite	0.19	6 weeks	Oral	Unknown	Unknown	4,740	14,989	47,400	Opresko et al. 1993	---
Arsenic	Chicken	1.6	19 days	Oral in diet	Growth	Arsenic oxide	2.24 [6]	3.18	4.51 [7]	USEPA 2005a [13]	---
Barium	One-day old chicks	0.121	4 weeks	Oral in diet	Mortality	Barium hydroxide	20.8	29.5	41.7	Sample et al. 1996 [13]	---
Beryllium	---	---	---	---	---	---	NA	NA	NA	---	---
Cadmium	Multiple species	Various	Various	Oral in diet/water	Reproduction/growth	Cadmium, cadmium sulfate, and cadmium chloride	1.47 [8]	3.06	6.36 [9]	USEPA 2005b	---

TABLE 5-4

TOXICITY REFERENCE VALUES FOR BIRDS
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	Test Material	NOAEL (mg/kg/d)	MATC [1] (mg/kg/d)	LOAEL (mg/kg/d)	Source Document [2]	Comments
Metals:											
Chromium, total	Multiple species	Various	Various	Oral in diet	Reproduction/growth	Sodium and potassium dichromate	2.66 [8][10]	6.44	15.6 [9]	USEPA 2008	---
Cobalt	Multiple species	Various	Various	Oral in diet	Growth	Cobalt, cobalt chloride, and cobalt carbonate	7.61 [8]	11.8	18.3 [9]	USEPA 2005c	---
Copper	Chicken	1.52	84 days	Oral in diet	Reproduction	Copper	4.05 [11]	7.00	12.1	USEPA 2007d [13]	---
Lead	Chicken	1.81	4 weeks	Oral in diet	Reproduction	Lead acetate	1.63 [11]	2.31	3.26	USEPA 2005d [13]	---
Mercury	Mallard duck	1.00	3 generations	Oral in diet	Reproduction	Methyl mercury dicyandiamide	0.026	0.045	0.078	USEPA 1997a [13]	---
Nickel	Multiple species	Various	Various	Oral in diet	Reproduction/growth	Nickel acetate, chloride, and sulfate	6.71 [8]	11.2	18.6 [9]	USEPA 2007e	---
Selenium	Chicken	0.328	2 weeks	Oral in diet	Mortality	Sodium selenite	0.29 [11]	0.410	0.579	USEPA 2007f [13]	---
Silver	Turkey	0.662	5 weeks	Oral in diet	Growth	Silver acetate	2.02 [12]	6.39	20.2	USEPA 2006	---
Thallium	European starling	Unknown	acute	Oral	Survival	Unknown	0.35 [3]	0.78	1.75 [4]	USEPA 1999 [13]	---
Tin	Japanese quail	0.15	6 weeks	Oral in diet	Reproduction	bis(Tributyltin)-oxide	6.80	11	16.9	Sample et al. 1996 [13]	---
Vanadium	Chicken	1.042	5 weeks	Oral in diet	Growth	Sodium metavanadate	0.344 [11]	0.486	0.688	USEPA 2005e [13]	---
Zinc	Multiple species	Various	Various	Oral in diet	Reproduction/growth	Zinc carbonate, oxide, and sulfate	66.1 [8]	106	171 [9]	USEPA 2007g	---

Notes:

kg - kilogram
LOAEL - Lowest Observed Adverse Effect Level
MATC - Maximum Acceptable Toxicant Concentration
mg/kg/d - milligram per kilogram-body weight per day
NA - Not Available
NOAEL - No Observed Adverse Effect Level
PAH - Polynuclear Aromatic Hydrocarbon
USEPA - U.S. Environmental Protection Agency

(1) MATC values were derived by calculating the geometric mean of the NOAEL and LOAEL values (values were calculated by Baker Environmental, Inc.).

(2) Source documents for NOAEL and LOAEL values represent primary data sources (as reported by original authors) unless otherwise noted.

(3) The chronic NOAEL value was estimated by applying a safety factor of 100 to a LD_{50} value (Wentsel et al., 1996 and USEPA, 1997b).

(4) A chronic LOAEL value was not available from the study used as the source of the chronic NOAEL value. Therefore, a chronic LOAEL value was estimated by applying a safety factor of 5 to the chronic NOAEL value (Wentsel et al., 1996).

(5) A chronic NOAEL value was not available from the study used as the source of the chronic LOAEL value. Therefore, the chronic NOAEL value shown was estimated by applying a safety factor of 5 to the chronic LOAEL value (Wentsel et al., 1996).

(6) The NOAEL value represents the lowest value of all reproduction, growth, and survival-based NOAEL values listed in the cited ecological soil screening levels document that meet the required data evaluation score. The value was used by the USEPA to derive the avian ecological soil screening level. It is noted that a geometric mean of NOAEL values for growth and reproduction could not be calculated by the USEPA because insufficient NOAEL values meeting the minimum required data evaluation score were identified from the literature.

(7) A LOAEL value was not available from the study chosen by the USEPA as the source of the NOAEL value selected as the ecological soil screening level. Therefore, the LOAEL value represents a geometric mean of all reproduction- and growth-based LOAEL values listed within the cited ecological soil screening level document that meet the minimum required data evaluation score (value was calculated by Michael Baker Jr., Inc.).

(8) The NOAEL value represents the geometric mean of all reproduction and growth-based NOAEL values listed within the cited ecological soil screening level document that meet the minimum required data evaluation score. Because this value is lower than the lowest bounded LOAEL for reproduction, growth, or survival, it was selected by the USEPA as the toxicity reference value for avian ecological soil screening level development.

(9) The NOAEL value selected by the USEPA as the ecological soil screening level represents a geometric mean of all reproduction and growth-based NOAEL values that meet the minimum required data evaluation score. Therefore, the LOAEL value shown represents a geometric mean of all reproduction and growth-based LOAEL values listed within the cited ecological soil screening level document that meet the minimum required data evaluation score (value was calculated by Michael Baker Jr., Inc.).

(10) The NOAEL value shown is for trivalent chromium.

(11) The NOAEL value shown represents the highest bounded NOAEL below the lowest bounded LOAEL for reproduction, growth, or survival listed within the cited ecological soil screening levels that meet the minimum required data evaluation score. The value was used by the USEPA as the toxicity reference value for avian ecological soil screening value development. It is noted that a geometric mean of available NOAEL values for growth and reproduction was not used as the toxicity reference value by the USEPA for ecological soil screening value development since the geometric mean is higher than the lowest bounded LOAEL for reproduction, growth, and survival.

(12) The NOAEL is equal to the lowest value of all reproduction- and growth-based LOAELs listed in the cited ecological soil screening levels document that meet the minimum required data evaluation score divided by ten. The value was used by the USEPA to derive the avian ecological soil screening level. It is noted that a geometric mean of NOAEL values for growth and reproduction could not be calculated by the USEPA based on the lack of NOAEL values for reproduction and growth.

(13) The data reference represents a secondary data source.

TABLE 5-4

TOXICITY REFERENCE VALUES FOR BIRDS
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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USEPA. 2005c. Ecological Soil Screening Levels for Cobalt (Interim Final). Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-67

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TABLE 5-5

TOXICITY REFERENCE VALUES FOR MAMMALS
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	Test Material	NOAEL (mg/kg/d)	MATC [1] (mg/kg/d)	LOAEL (mg/kg/d)	Source Document [2]
Volatile Organics:										
1,1,1,2-Tetrachloroethane	Rat	0.35	103 weeks	Oral (gavage)	Kidney toxicity	Not Applicable	17.86 [5]	39.94	89.3	USEPA 2014 [19]
Carbon tetrachloride	Rat	0.35	2 years	Oral in diet	Reproduction	Not Applicable	16	35.8	80 [3]	Sample et al. 1996 [19]
Chlorobenzene	Dog	12.7	13 weeks	Oral	Liver toxicity	Not Applicable	27.25	38.5	54.5	USEPA 2014 [19]
Chloroform	Rat	0.35	13 weeks	Oral (intubation)	Liver toxicity	Not Applicable	15 [4]	24.8	41 [4]	Sample et al. 1996 [19]
Ethylbenzene	Rat	0.35	182 days	Oral (gavage)	Liver/kidney toxicity	Not Applicable	136	236	408	USEPA 2014 [19]
Pentachloroethane	---	---	---	---	---	---	NA	NA	NA	---
Styrene	Rat	0.35	90 days	Oral in water	Reproduction	Not Applicable	35	78.3	175 [3]	Beliles et al. 1985
Toluene	Mouse	0.03	Days 6-12 of gestation	Oral (gavage)	Reproduction	Not Applicable	52 [5]	116	260	Sample et al. 1996 [19]
Trichloroethene	Mouse	0.03	6 weeks	Oral (gavage)	hepatotoxicity	Not Applicable	0.7	2.21	7	Sample et al. 1996 [19]
Xylene, m/p-	---	---	---	---	---	---	2.06 [6]	2.31 [6]	2.58 [6]	---
Xylene, o-	---	---	---	---	---	---	2.06 [6]	2.31 [6]	2.58 [6]	---
Xylenes, total	Mouse	0.03	Days 6-15 of gestation	Oral (gavage)	Reproduction	Not Applicable	2.06	2.31	2.58	Sample et al. 1996 [19]
Semi-Volatile Organics:										
1,2,4,5-Tetrachlorobenzene	Rat	0.35	28 days	Oral in diet	Kidney toxicity	Not Applicable	0.034 [4]	0.108	0.34 [4]	USEPA 2014 [19]
1,2,4-Trichlorobenzene	Rat	0.35	3 generations	Oral in water	Reproduction	Not Applicable	53	80	106	Coulston and Kolbye 1994
1,1-Biphenyl	Rat	0.35	2 years	Oral in diet	Kidney toxicity	Not Applicable	42.7	73.9	128	USEPA 2014 [19]
1,2-Dichlorobenzene	Rat	0.35	chronic	Oral (gavage)	Liver/kidney toxicity	Not Applicable	171 [5]	383	857	Coulston and Kolbye 1994
1,3-Dichlorobenzene	---	0.35	---	---	---	---	171 [7]	383 [7]	857 [7]	---
1,4-Dichlorobenzene	Rat	0.35	Days 6-15 of gestation	Oral (gavage)	Reproduction (fetal development)	Not Applicable	250	354.0	500	Coulston and Kolbye 1994
2,3,4,6-Tetrachlorophenol	---	---	---	---	---	---	NA	NA	NA	---
2,4,5-Trichlorophenol	Rat	0.35	98 days	Oral in diet	Liver/kidney toxicity	Not Applicable	160 [5]	358	800	McCollister et al. 1961
2,4,6-Trichlorophenol	---	---	---	---	---	---	160 [8]	358 [8]	800 [8]	---
2,4-Dichlorophenol	Rat	0.35	103 weeks	Oral in diet	Reproduction	Not Applicable	88 [5]	198	440	NTP 1989
2-Acetylaminofluorene	---	---	---	---	---	---	NA	NA	NA	---
2-Chloronaphthalene	Mouse	0.03	13 weeks	Oral (gavage)	Liver/gall bladder weights	Not Applicable	25 [4]	38.7	60 [4]	USEPA 2014 [19]
3,3'-Dichlorobenzidine	---	---	---	---	---	---	NA	NA	NA	---
3,3-Dimethylbenzidine	---	---	---	---	---	---	NA	NA	NA	---
3-Methylcholanthrene	---	---	---	---	---	---	NA	NA	NA	---
4-Bromophenyl phenyl ether	---	---	---	---	---	---	NA	NA	NA	---
4-Chloro-3-methylphenol	---	---	---	---	---	---	NA	NA	NA	---
4-Chlorophenyl phenyl ether	---	---	---	---	---	---	NA	NA	NA	---
7-12-Dimethylbenz(a)anthracene	---	---	---	---	---	---	NA	NA	NA	---
Aramite, total	---	---	---	---	---	---	NA	NA	NA	---
bis(2-Ethylhexyl) phthalate	Mouse	0.03	105 days	Oral in diet	Reproduction	Not Applicable	18.3	57.9	183.3	Sample et al. 1996 [19]
Butyl benzyl phthalate	Rat	0.35	2 years	Oral in diet	Liver toxicity	Not Applicable	480 [5]	1,073	2,400	NTP 1997
Carbazole	Mouse	0.03	19 to 29 days	Oral in diet	Reproduction	---	133	421	1,330	ATSDR 1995
Chlorobenzilate	Rabbit	Not reported	Days 7-19 of gestation	Oral (intubation)	Maternal food consumption and body weight	Technical grade	5.0	10.0	20.0	USEPA 2014 [23]

TABLE 5-5

TOXICITY REFERENCE VALUES FOR MAMMALS
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	Test Material	NOAEL (mg/kg/d)	MATC [1] (mg/kg/d)	LOAEL (mg/kg/d)	Source Document [2]
Semi-Volatile Organics:										
Diallate	---	---	---	---	---	---	NA	NA	NA	---
cis-Diallate	---	---	---	---	---	---	NA	NA	NA	---
trans-Diallate	---	---	---	---	---	---	NA	NA	NA	---
Dibenzofuran	---	---	---	---	---	---	NA	NA	NA	---
Diethyl phthalate	Mouse	0.03	105 days	Oral in diet	Reproduction	Not Applicable	4,583	10,248	22,915 [3]	Sample et al. 1996 [19]
Di-n-butyl phthalate	Mouse	0.03	105 days	Oral in diet	Reproduction (litter size and offspring mortality)	Not Applicable	550	1,004	1,833	Sample et al. 1996 [19]
Di-n-octyl phthalate	Mouse	0.03	105 days	Oral in diet	Reproduction	Not Applicable	55 [9]	174	550 [9]	Sample et al. 1996 [19]
Dinoseb	---	---	---	---	---	---	NA	NA	NA	---
Diphenylamine	---	---	---	---	---	---	NA	NA	NA	---
Hexachlorobenzene	Rat	0.35	4 generations	Oral	Reproduction (decreased fertility)	Not Applicable	8	11.3	16	ATSDR 2002 [19]
Hexachlorobutadiene	Rat	0.35	90 days +	Oral	Reproduction	Not Applicable	4.0 [5]	8.9	20	IPCS 1994 [19]
Hexachlorocyclopentadiene	Rat	0.35	Days 6-15 of gestation	Oral	Reproduction	Not Applicable	10	17.3	30	USEPA 1984 [19]
Hexachloroethane	Rat	0.35	16 weeks	Oral in diet	Kidney toxicity	Not Applicable	0.1 [4]	0.39	1.5 [4]	USEPA 2014 [19]
Hexachlorophene	Rat	0.35	Not reported	Oral	Mortality	Not Applicable	5.6 [10]	13	28 [3]	USEPA 1999 [19]
Hexachloropropene	---	---	---	---	---	---	NA	NA	NA	---
Isosafrole	---	---	---	---	---	---	NA	NA	NA	---
N-Nitrosodiphenylamine	Rat	0.35	8 to 11 weeks	Oral in diet	Systemic toxicity	Not Applicable	300 [5]	671	1,500	ATSDR 1993 [19]
p-Dimethylamino azobenzene	---	---	---	---	---	---	NA	NA	NA	---
Pentachlorobenzene	Rat	0.35	180 days	Oral	Not reported	Not Applicable	7.25	16.21	36.25 [3]	USEPA 1999 [19]
Pentachloronitrobenzene	Dog	Not reported	2 years	Oral in diet	Liver toxicity	Not Applicable	0.75	1.84	4.5	USEPA 2014 [19]
Pentachlorophenol	Various	Various	Various	Oral in diet or gavage	Reproduction/growth	Pentachlorophenol (purified, technical, or purity not specified)	8.42 [11]	13.81	22.65 [12]	USEPA 2007a
Pronamide	Dog	Not reported	2 years	Oral in diet	Organ weights and histopathologic changes	Not Applicable	7.5	16.8	37.5 [3]	USEPA 2014 [19]
PAHs:										
1-Methylnaphthalene	Norway rat	0.247	6 weeks	Oral in diet	Growth (body weight)	1-Naphthaleneacetic acid	65.6 [13]	147	328	USEPA 2007b [19]
2-Methylnaphthalene	Norway rat	0.247	6 weeks	Oral in diet	Growth (body weight)	1-Naphthaleneacetic acid	65.6 [13]	147	328	USEPA 2007b [19]
Acenaphthene	Norway rat	0.247	6 weeks	Oral in diet	Growth (body weight)	1-Naphthaleneacetic acid	65.6 [13]	147	328	USEPA 2007b [19]
Acenaphthylene	Norway rat	0.247	6 weeks	Oral in diet	Growth (body weight)	1-Naphthaleneacetic acid	65.6 [13]	147	328	USEPA 2007b [19]
Anthracene	Norway rat	0.247	6 weeks	Oral in diet	Growth (body weight)	1-Naphthaleneacetic acid	65.6 [13]	147	328	USEPA 2007b [19]
Benzo(a)anthracene	House mouse	0.038	65 weeks	Oral in diet	Mortality	Benzo(a)pyrene	0.615 [13]	1.36	3.01	USEPA 2007b [19]
Benzo(a)pyrene	House mouse	0.038	65 weeks	Oral in diet	Mortality	Benzo(a)pyrene	0.615 [13]	1.36	3.01	USEPA 2007b [19]
Benzo(b)fluoranthene	House mouse	0.038	65 weeks	Oral in diet	Mortality	Benzo(a)pyrene	0.615 [13]	1.36	3.01	USEPA 2007b [19]
Benzo(g,h,i)perylene	House mouse	0.038	65 weeks	Oral in diet	Mortality	Benzo(a)pyrene	0.615 [13]	1.36	3.01	USEPA 2007b [19]
Benzo(k)fluoranthene	House mouse	0.038	65 weeks	Oral in diet	Mortality	Benzo(a)pyrene	0.615 [13]	1.36	3.01	USEPA 2007b [19]
Chrysene	House mouse	0.038	65 weeks	Oral in diet	Mortality	Benzo(a)pyrene	0.615 [13]	1.36	3.01	USEPA 2007b [19]
Dibenz(a,h)anthracene	House mouse	0.038	65 weeks	Oral in diet	Mortality	Benzo(a)pyrene	0.615 [13]	1.36	3.01	USEPA 2007b [19]

TABLE 5-5

TOXICITY REFERENCE VALUES FOR MAMMALS
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	Test Material	NOAEL (mg/kg/d)	MATC [1] (mg/kg/d)	LOAEL (mg/kg/d)	Source Document [2]
PAHs:										
Fluoranthene	Norway rat	0.247	6 weeks	Oral in diet	Growth (body weight)	1-Naphthaleneacetic acid	65.6 [13]	147	328	USEPA 2007b [19]
Fluorene	Norway rat	0.247	6 weeks	Oral in diet	Growth (body weight)	1-Naphthaleneacetic acid	65.6 [13]	147	328	USEPA 2007b [19]
Indeno(1,2,3-cd)pyrene	House mouse	0.038	65 weeks	Oral in diet	Mortality	Benzo(a)pyrene	0.615 [13]	1.36	3.01	USEPA 2007b [19]
Naphthalene	Norway rat	0.247	6 weeks	Oral in diet	Growth (body weight)	1-Naphthaleneacetic acid	65.6 [13]	147	328	USEPA 2007b [19]
Phenanthrene	Norway rat	0.247	6 weeks	Oral in diet	Growth (body weight)	1-Naphthaleneacetic acid	65.6 [13]	147	328	USEPA 2007b [19]
Pyrene	House mouse	0.038	65 weeks	Oral in diet	Mortality	Benzo(a)pyrene	0.615 [13]	1.36	3.01	USEPA 2007b [19]
Organophosphorous Pesticides:										
Disulfoton	---	---	---	---	---	---	NA	NA	NA	---
Methyl Parathion	Rat	0.35	2 years	Oral in diet	Hematological changes	Not applicable	0.025	0.079	0.25	USEPA 2014 [19]
Parathion	---	---	---	---	---	---	NA	NA	NA	---
Phorate	---	---	---	---	---	---	NA	NA	NA	---
Sulfotepp	---	---	---	---	---	---	NA	NA	NA	---
Metals:										
Antimony	Norway rat	0.33	31 days	Oral in water	Reproduction (progeny weight)	Antimony trichloride	0.059 [13]	0.19	0.59	USEPA 2005a [19]
Arsenic	Dog	10.1	8 weeks	Oral in diet	Growth (body weight)	Sodium arsenite	1.04 [13]	1.31	1.66	USEPA 2005b [19]
Barium	House mouse/Norway rat	Various	Various	Oral in diet/water or gavage	Reproduction/Growth	Barium acetate, barium chloride, and barium chloride dihydrate	51.8 [11]	65.5	82.7 [12]	USEPA 2005c
Beryllium	Norway rat	0.486	4 years	Oral in diet	Mortality (life span)	Beryllium sulfate	0.532 [14]	0.549	0.567 [15]	USEPA 2005d [19]
Cadmium	Norway rat	0.43	57 days	Oral in water	Growth (body weight)	Cadmium acetate	0.77 [13]	2.43	7.7	USEPA 2005e [19]
Chromium, total	Various	Various	Various	Oral in diet/water	Reproduction/growth	Various	2.4 [16][17]	11.85	58.53 [12]	USEPA 2005f
Cobalt	Various	Various	Various	Oral in diet/water or gavage	Reproduction/growth	Various	7.33 [11]	11.77	18.9 [12]	USEPA 2005g
Copper	Pig	100	4 weeks	Oral in diet	Growth (body weight)	Copper sulfate pentahydrate	5.6 [13]	7.23	9.34	USEPA 2007c [19]
Lead	Noway rat	0.3	7 weeks	Oral in water	Growth (body weight)	Lead acetate	4.7 [13]	6.47	8.90	USEPA 2005h [19]
Mercury	Rat	0.35	3 generations	Oral in diet	Reproduction (pup viability)	Methyl mercury chloride	0.032	0.072	0.16	Sample et al. 1996 [19]
Nickel	House mouse	0.025	35 days	Oral	Reproduction (sperm cell counts)	Nickelous chloride	1.7 [13]	2.40	3.40	USEPA 2007d [19]
Selenium	Pig	17.800	37 days	Oral in diet	Growth (body weight)	Sodium selenite	0.143 [13]	0.175	0.215	USEPA 2007e [19]
Silver	Pig	8.86	40 days	Oral in diet	Growth (body weight)	Silver acetate	6.02 [18]	19.04	60.2	USEPA 2006 [19]
Thallium	Rat	0.365	60 days	Oral in water	Reproduction (male testicular function)	Tallium sufate	0.0074	0.023	0.074	Sample et al. 1996 [19]
Tin	Mouse	0.03	Days 6-15 of gestation	Oral (intubation)	Reproduction (fetal weight and survival)	bis(Tributyltin) oxide	23.4	28.6	35.0	Sample et al. 1996 [19]
Vanadium	House mouse	0.0471	12 days	Oral (gavage)	Reproduction (offspring development)	Sodium orthovanadate	4.16 [13]	5.88	8.31	USEPA 2005i [19]
Zinc	Various	Various	Various	Oral in diet or gavage	Reproduction/growth	Various	75.4 [11]	26.96	82.3 [12]	USEPA 2007f

TABLE 5-5

TOXICITY REFERENCE VALUES FOR MAMMALS
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Notes:

ATSDR - Agency for Toxic Substances and Disease Registry
IPCS - International Programme on Chemical Safety
kg - kilogram
LOAEL - Lowest Observed Adverse Effect Level
MATC - Maximum Acceptable Toxicant Concentration
mg/kg/d - milligram per kilogram-body weight per day
NA - Not Available
NOAEL - No Observed Adverse Effect Level
NTP - National Toxicology Program
PAH - Polynuclear Aromatic Hydrocarbon
USEPA - U.S. Environmental Protection Agency

(1) MATC values were derived by calculating the geometric mean of the NOAEL and LOAEL values (values were calculated by Baker Environmental, Inc.).
(2) Source documents for NOAEL and LOAEL values represent primary data sources (as reported by original authors) unless otherwise noted.
(3) A chronic LOAEL value was not available from the study used as the source of the chronic NOAEL value. Therefore, a chronic LOAEL value was estimated by applying a safety factor of 5 to the chronic NOAEL value (Wentsel et al., 1996).
(4) A chronic value was not available from the literature or government compilations. Therefore, the chronic value shown was estimated by applying a safety factor of 10 to a reported subchronic value (Wentsel et al., 1996).
(5) A chronic NOAEL value was not available from the study used as the source of the chronic LOAEL value. Therefore, the chronic NOAEL value shown was estimated by applying a safety factor of 5 to the chronic LOAEL value (Wentsel et al., 1996).
(6) Value for total xylene used as a surrogate.
(7) Value for 1,2-dichlorobenzene used as a surrogate.
(8) Value for 2,4,5-trichlorophenol used as a surrogate
(9) Value for di-n-hexylphthalate reported in Sample et al. (1996) used as a surrogate (value based on a 105-day reproductive study using mice).
(10) The chronic NOAEL value was estimated by applying a safety factor of 100 to a LD_{50} value (Wentsel et al., 1996 and USEPA, 1997).
(11) The NOAEL value represents the geometric mean of all reproduction and growth-based NOAEL values listed within the cited ecological soil screening level document that meet the minimum required data evaluation score. Because this value is lower than the lowest bounded LOAEL for reproduction, growth, or survival, it was selected by the USEPA as the toxicity reference value for mammalian ecological soil screening level development.
(12) The NOAEL value selected by the USEPA as the ecological soil screening level represents a geometric mean of all reproduction and growth-based NOAEL values that meet the minimum required data evaluation score. Therefore, the LOAEL value shown represents a geometric mean of all reproduction and growth-based LOAEL values listed within the cited ecological soil screening level document that meet the minimum required data evaluation score (value was calculated by Michael Baker Jr., Inc.).
(13) The NOAEL value shown represents the highest bounded NOAEL below the lowest bounded LOAEL for reproduction, growth, or survival listed within the cited ecological soil screening levels that meet the minimum required data evaluation score. The value was was used by the USEPA as the toxicity reference value for mammalian ecological soil screening value development. It is noted that a geometric mean of available NOAEL values for growth and reproduction was not used as the toxicity reference value by the USEPA for ecological soil screening value development since the geometric mean is higher than the lowest bounded LOAEL for reproduction, growth, and survival.
(14) The NOAEL value represents the lowest value of all reproduction, growth, and survival-based NOAEL values listed in the cited ecological soil screening levels document that meet the required data evaluation score. The value was used by the USEPA to derive the mammalian ecological soil screening level. It is noted that a geometric mean of NOAEL values for growth and reproduction could not be calculated by the USEPA because insufficient NOAEL values meeting the minimum required data evaluation score were identified from the literature.
(15) A LOAEL value was not available from the study chosen by the USEPA as the source of the NOAEL value selected as the ecological soil screening level. Therefore, the LOAEL value represents a geometric mean of all reproduction- and growth-based LOAEL values listed within the cited ecological soil screening level document that meet the minimum required data evaluation score (value was calculated by Michael Baker Jr., Inc.).
(16) The NOAEL value represents the geometric mean of all reproduction and growth-based NOAEL values listed within the cited ecological soil screening level document that meet the minimum required data evaluation score. It is noted that there were no bounded LOAEL values for reproduction, growth, or mortality for comparison.
(17) The NOAEL value shown is for trivalent chromium.
(18) The NOAEL is equal to the lowest value of all reproduction- and growth-based LOAELs listed in the cited ecological soil screening levels document that meet the minimum required data evaluation score divided by ten. The value was used by the USEPA to derive the mammalina ecological soil screening level. It is noted that a geometric mean of NOAEL values for growth and reproduction could not be calculated by the USEPA based on the lack of NOAEL values for reproduction and growth.
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TABLE 5-5

TOXICITY REFERENCE VALUES FOR MAMMALS
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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TABLE 5-5

TOXICITY REFERENCE VALUES FOR MAMMALS
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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TABLE 6-1

SOIL TO PLANT AND SOIL TO EARTHWORM BIOACCUMULATION FACTORS AND BIOACCUMULATION UPTAKE EQUATIONS USED TO ESTIMATE CHEMICAL CONCENTRATIONS IN TERRESTRIAL PLANT AND INVERTEBRATE TISSUE: STEP 2 SCREENING LEVEL RISK CALCULATION
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Soil-to-Plant BAF (dry weight) or Uptake Equation (dry weight)			Soil-to-Invertebrate BAF (dry weight) or Uptake Equation (dry weight)		
	BAF Value/Uptake Equation	Source Document	Description	BAF Value/Uptake Equation	Source Document	Description
Volatile Organics:						
1,1,1,2-Tetrachloroethane	5.176	USEPA 2007	Regression-based BAF (1)	14.104	USEPA 2007	Modeled BAF (10)
Carbon tetrachloride	4.715	USEPA 2007	Regression-based BAF (1)	33.776	USEPA 2007	Modeled BAF (10)
Chlorobenzene	4.175	USEPA 2007	Regression-based BAF (1)	8.223	USEPA 2007	Modeled BAF (10)
Chloroform	10.047	USEPA 2007	Regression-based BAF (1)	9.196	USEPA 2007	Modeled BAF (10)
Ethylbenzene	3.214	USEPA 2007	Regression-based BAF (1)	7.555	USEPA 2007	Modeled BAF (10)
Pentachloroethane	2.983	USEPA 2007	Regression-based BAF (1)	29.047	USEPA 2007	Modeled BAF (10)
Styrene	3.875	USEPA 2007	Regression-based BAF (1)	5.061	USEPA 2007	Modeled BAF (10)
Toluene	4.627	USEPA 2007	Regression-based BAF (1)	6.597	USEPA 2007	Modeled BAF (10)
Trichloroethene	4.803	USEPA 2007	Regression-based BAF (1)	23.463	USEPA 2007	Modeled BAF (10)
m-Xylene	3.039	USEPA 2007	Regression-based BAF (1)	10.127	USEPA 2007	Modeled BAF (10)
o-Xylene	3.245	USEPA 2007	Regression-based BAF (1)	8.628	USEPA 2007	Modeled BAF (10)
p-xylene	3.126	USEPA 2007	Regression-based BAF (1)	9.537	USEPA 2007	Modeled BAF (10)
m,p-Xylene	3.126	USEPA 2007	Regression-based BAF (1)	9.537	USEPA 2007	Modeled BAF (10)
Xylenes (total)	3.155	USEPA 2007	Regression-based BAF (1)	9.162	USEPA 2007	Modeled BAF (10)
Semivolatile Organics:						
1,1-Biphenyl	1.426	USEPA 2007	Regression-based BAF (1)	3.754	USEPA 2007	Modeled BAF (10)
1,2,4,5-Tetrachlorobenzene	0.792	USEPA 2007	Regression-based BAF (1)	30.643	USEPA 2007	Modeled BAF (10)
1,2,4-Trichlorobenzene	1.426	USEPA 2007	Regression-based BAF (1)	14.201	USEPA 2007	Modeled BAF (10)
1,2-Dichlorobenzene	2.452	USEPA 2007	Regression-based BAF (1)	15.736	USEPA 2007	Modeled BAF (10)
1,3-Dichlorobenzene	2.233	USEPA 2007	Regression-based BAF (1)	19.363	USEPA 2007	Modeled BAF (10)
1,4,-Dichlorobenzene	2.475	USEPA 2007	Regression-based BAF (1)	15.736	USEPA 2007	Modeled BAF (10)
2,3,4,6-Tetrachlorophenol	0.945	USEPA 2007	Regression-based BAF (1)	15.686	USEPA 2007	Modeled BAF (10)
2,4,5-Trichlorophenol	1.870	USEPA 2007	Regression-based BAF (1)	6.062	USEPA 2007	Modeled BAF (10)
2,4,6-Trichlorophenol	1.905	USEPA 2007	Regression-based BAF (1)	5.824	USEPA 2007	Modeled BAF (10)
2,4-Dichlorophenol	3.400	USEPA 2007	Regression-based BAF (1)	6.077	USEPA 2007	Modeled BAF (10)
2-Acetylaminofluorene	3.275	USEPA 2007	Regression-based BAF (1)	1.468	USEPA 2007	Modeled BAF (10)
2-Chloronaphthalene	1.580	USEPA 2007	Regression-based BAF (1)	6.234	USEPA 2007	Modeled BAF (10)
3,3'-Dichlorobenzidine	2.275	USEPA 2007	Regression-based BAF (1)	2.217	USEPA 2007	Modeled BAF (10)
3,3'-Dimethylbenzidine	4.940	USEPA 2007	Regression-based BAF (1)	0.420	USEPA 2007	Modeled BAF (10)
3-Methylcholanthrene	0.150	USEPA 2007	Regression-based BAF (1)	2.502	USEPA 2007	Modeled BAF (10)
4-Bromophenyl phenyl ether	0.566	USEPA 2007	Regression-based BAF (1)	45.473	USEPA 2007	Modeled BAF (10)
4-Chloro-3-methylphenol	3.337	USEPA 2007	Regression-based BAF (1)	6.325	USEPA 2007	Modeled BAF (10)
4-Chlorophenyl phenyl ether	0.593	USEPA 2007	Regression-based BAF (1)	41.139	USEPA 2007	Modeled BAF (10)
7,12-Dimethylbenz(a)anthracene	0.125	USEPA 2007	Regression-based BAF (1)	7.276	USEPA 2007	Modeled BAF (10)
Aramite, total	0.669	USEPA 2007	Regression-based BAF (1)	17.579	USEPA 2007	Modeled BAF (10)

TABLE 6-1

SOIL TO PLANT AND SOIL TO EARTHWORM BIOACCUMULATION FACTORS AND BIOACCUMULATION UPTAKE EQUATIONS USED TO ESTIMATE CHEMICAL CONCENTRATIONS IN TERRESTRIAL PLANT AND INVERTEBRATE TISSUE: STEP 2 SCREENING LEVEL RISK CALCULATION
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	Soil-to-Plant BAF (dry weight) or Uptake Equation (dry weight)			Soil-to-Invertebrate BAF (dry weight) or Uptake Equation (dry weight)		
Chemical	**BAF Value/Uptake Equation**	**Source Document**	**Description**	**BAF Value/Uptake Equation**	**Source Document**	**Description**
Semivolatile Organics:						
Bis(2-ethylhexyl)phthalate	0.066	USEPA 2007	Regression-based BAF (1)	117.260	USEPA 2007	Modeled BAF (10)
Butyl benzyl phthalate	0.657	USEPA 2007	Regression-based BAF (1)	14.193	USEPA 2007	Modeled BAF (10)
Carbazole	2.111	USEPA 2007	Regression-based BAF (1)	3.305	USEPA 2007	Modeled BAF (10)
Chlorobenzilate	0.721	USEPA 2007	Regression-based BAF (1)	54.006	USEPA 2007	Modeled BAF (10)
cis-Diallate	0.911	USEPA 2007	Regression-based BAF (1)	78.179	USEPA 2007	Modeled BAF (10)
Diallate	0.911	USEPA 2007	Regression-based BAF (1)	78.179	USEPA 2007	Modeled BAF (10)
Dibenzofuran	1.287	USEPA 2007	Regression-based BAF (1)	2.953	USEPA 2007	Modeled BAF (10)
Diethyl phthalate	5.845	USEPA 2007	Regression-based BAF (1)	8.915	USEPA 2007	Modeled BAF (10)
Di-n-butyl phthalate	0.814	USEPA 2007	Regression-based BAF (1)	55.366	USEPA 2007	Modeled BAF (10)
Di-n-octyl phthalate	0.032	USEPA 2007	Regression-based BAF (1)	456.538	USEPA 2007	Modeled BAF (10)
Dinoseb	2.171	USEPA 2007	Regression-based BAF (1)	1.821	USEPA 2007	Modeled BAF (10)
Diphenylamine	2.340	USEPA 2007	Regression-based BAF (1)	8.036	USEPA 2007	Modeled BAF (10)
Hexachlorobenzene	0.246	USEPA 2007	Regression-based BAF (1)	134.973	USEPA 2007	Modeled BAF (10)
Hexachlorobutadiene	0.675	USEPA 2007	Regression-based BAF (1)	113.141	USEPA 2007	Modeled BAF (10)
Hexachlorocyclopentadiene	0.393	USEPA 2007	Regression-based BAF (1)	217.677	USEPA 2007	Modeled BAF (10)
Hexachloroethane	1.439	USEPA 2007	Regression-based BAF (1)	95.908	USEPA 2007	Modeled BAF (10)
Hexachlorophene	0.053	USEPA 2007	Regression-based BAF (1)	33.925	USEPA 2007	Modeled BAF (10)
Hexachloropropene	1.009	USEPA 2007	Regression-based BAF (1)	99.432	USEPA 2007	Modeled BAF (10)
Isosafrole	2.593	USEPA 2007	Regression-based BAF (1)	25.786	USEPA 2007	Modeled BAF (10)
n-Nitrosodiphenylamine	3.155	USEPA 2007	Regression-based BAF (1)	1.333	USEPA 2007	Modeled BAF (10)
p-Dimethylamino azobenzene	0.837	USEPA 2007	Regression-based BAF (1)	29.745	USEPA 2007	Modeled BAF (10)
Pentachlorobenzene	0.444	USEPA 2007	Regression-based BAF (1)	63.524	USEPA 2007	Modeled BAF (10)
Pentachloronitrobenzene	0.792	USEPA 2007	Regression-based BAF (1)	11.345	USEPA 2007	Modeled BAF (10)
Pentachlorophenol	46.02	USEPA 2007	Maximum BAF (2)	88.12	USEPA 2007	90th percentile BAF (11)
Pronamide	2.275	USEPA 2007	Regression-based BAF (1)	17.468	USEPA 2007	Modeled BAF (10)
trans-Diallate	0.911	USEPA 2007	Regression-based BAF (1)	78.179	USEPA 2007	Modeled BAF (10)
PAHs:						
1-Methylnaphthalene	1.625	USEPA 2007	Regression-based BAF (1)	5.754	USEPA 2007	Modeled BAF (10)
2-Methylnaphthalene	1.641	USEPA 2007	Regression-based BAF (1)	5.754	USEPA 2007	Modeled BAF (10)
Acenaphthene	$In(C_p) = -0.8556[ln(Cs)] - 5.562$	USEPA 2007	Uptake equation (3)	3.199	USEPA 2007	Modeled BAF (10)
Acenaphthylene	$In(C_p) = 0.791[ln[C_s]) - 1.144$	USEPA 2007	Uptake equation (3)	2.977	USEPA 2007	Modeled BAF (10)
Anthracene	$ln(C_p) = 0.7784[ln(C_s)] - 0.9887$	USEPA 2007	Uptake equation (3)	3.472	USEPA 2007	Modeled BAF (10)
Benzo(a)anthracene	$In(C_p) = 0.5944[In(C_s)] - 2.7078$	USEPA 2007	Uptake equation (3)	3.215	USEPA 2007	Modeled BAF (10)
Benzo(a)pyrene	$ln(C_p) = 0.975[ln(C_s)] - 2.0615$	USEPA 2007	Uptake equation (3)	2.201	USEPA 2007	Modeled BAF (10)
Benzo(b)fluoranthene	0.48	USEPA 2007	Maximum BAF (4)	2.583	USEPA 2007	Modeled BAF (10)

TABLE 6-1

SOIL TO PLANT AND SOIL TO EARTHWORM BIOACCUMULATION FACTORS AND BIOACCUMULATION UPTAKE EQUATIONS USED TO ESTIMATE CHEMICAL CONCENTRATIONS IN TERRESTRIAL PLANT AND INVERTEBRATE TISSUE: STEP 2 SCREENING LEVEL RISK CALCULATION
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SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Soil-to-Plant BAF (dry weight) or Uptake Equation (dry weight)			Soil-to-Invertebrate BAF (dry weight) or Uptake Equation (dry weight)		
	BAF Value/Uptake Equation	Source Document	Description	BAF Value/Uptake Equation	Source Document	Description
PAHs:						
Benzo(g,h,i)perylene	$\ln(C_p) = 1.1829[\ln(C_s)] - 0.9313$	USEPA 2007	Uptake equation (3)	2.161	USEPA 2007	Modeled BAF (10)
Benzo(k)fluoranthene	$\ln(C_p) = 0.8595[\ln(C_s)] - 2.1579$	USEPA 2007	Uptake equation (3)	2.636	USEPA 2007	Modeled BAF (10)
Chrysene	$\ln(C_p) = 0.5944[\ln(C_s)] - 2.7078$	USEPA 2007	Uptake equation (3)	3.151	USEPA 2007	Modeled BAF (10)
Dibenzo(a,h)anthracene	0.23	USEPA 2007	Maximum BAF (4)	2.161	USEPA 2007	Modeled BAF (10)
Fluoranthene	6.00	USEPA 2007	Maximum BAF (4)	3.209	USEPA 2007	Modeled BAF (10)
Fluorene	$\ln(C_p) = -0.8556[\ln[C_s]) - 5.562$	USEPA 2007	Uptake equation (3)	3.138	USEPA 2007	Modeled BAF (10)
Indeno(1,2,3-cd)pyrene	0.15	USEPA 2007	Maximum BAF (4)	1.099	USEPA 2007	Modeled BAF (10)
Naphthalene	48.0	USEPA 2007	Maximum BAF (4)	3.392	USEPA 2007	Modeled BAF (10)
Phenanthrene	$\ln(C_p) = 0.6203[\ln(C_s)] - 0.1665$	USEPA 2007	Uptake equation (3)	2.537	USEPA 2007	Modeled BAF (10)
Pyrene	3.70	USEPA 2007	Maximum BAF (4)	3.210	USEPA 2007	Modeled BAF (10)
Organophosphorous Pesticides:						
Disulfoton	1.467	USEPA 2007	Regression-based BAF (1)	21.642	USEPA 2007	Modeled BAF (10)
Methyl Parathion	4.022	USEPA 2007	Regression-based BAF (1)	2.857	USEPA 2007	Modeled BAF (10)
Parathion (ethyl parathion)	1.687	USEPA 2007	Regression-based BAF (1)	5.544	USEPA 2007	Modeled BAF (10)
Phorate	1.719	USEPA 2007	Regression-based BAF (1)	28.055	USEPA 2007	Modeled BAF (10)
Sulfotepp	1.453	USEPA 2007	Regression-based BAF (1)	69.655	USEPA 2007	Modeled BAF (10)
Metals:						
Antimony	$\ln(C_p) = 0.938[\ln(C_s)] - 3.233$	USEPA 2007	Uptake equation (5)	1.00	USEPA 2007	Assumed BAF
Arsenic	$\ln(C_p) = 0.564[\ln[C_s]) - 1.992$	Bechtel Jacobs 1998	Uptake equation (6)	$\ln(C_e) = 0.706[\ln(C_s)] - 1.421$	USEPA 2007	Uptake equation (15)
Barium	0.447	Bechtel Jacobs 1998	90th percentile BAF (7)	0.16	Sample et al. 1998	90th percentile BAF (16)
Beryllium	$\ln(C_p) = 0.7345[\ln[C_s]) - 0.5361$	USEPA 2007	Uptake equation (8)	1.182	Sample et al. 1998	90th percentile BAF (16)
Cadmium	$\ln(C_p) = 0.546[\ln(C_s)] - 0.475$	USEPA 2007	Uptake equation (9)	$\ln(C_e) = 0.795[\ln(C_s)] + 2.114$	USEPA 2007	Uptake equation (15)
Chromium, total	0.0839	Bechtel Jacobs 1998	90th percentile BAF (7)	3.162	Sample et al. 1998	90th percentile BAF (17)
Cobalt	0.0248	Bechtel Jacobs 1998	90th percentile BAF (7)	0.291	Sample et al. 1998	90th percentileBAF (16)
Copper	$\ln(C_p) = 0.394[\ln(C_s)] + 0.668$	USEPA 2007	Uptake equation (9)	$\ln(C_e) = 0.264[\ln(C_s)] + 1.675$	Sample et al. 1998	Uptake equation (14)
Lead	$\ln(C_p) = 0.561[\ln(C_s)] - 1.328$	USEPA 2007	Uptake equation (9)	$\ln(C_e) = 0.807[\ln(C_s)] - 2.18$	USEPA 2007	Uptake equation (15)
Mercury	$\ln(C_p) = 0.544[\ln[C_s]) - 0.996$	Bechtel Jacobs 1998	Uptake equation (6)	20.63	Sample et al. 1998	90th percentile BAF (17)
Nickel	$\ln(C_p) = 0.748[\ln(C_s)] - 2.224$	USEPA 2007	Uptake equation (9)	4.73	Sample et al. 1998	90th percentile BAF (17)
Selenium	$\ln(C_p) = 1.104[\ln(C_s)] - 0.678$	USEPA 2007	Uptake equation (9)	$\ln(C_e) = 0.733[\ln(C_s)] - 0.075$	USEPA 2007	Uptake equation (15)
Silver	0.0367	Bechtel Jacobs 1998	90th percentile BAF (7)	15.338	Sample et al. 1998	90th percentile BAF (16)
Thallium	0.004	Baes et al. 1984	Geometric mean BAF	1.00	---	Assumed BAF
Tin	0.03	Baes et al. 1984	Geometric mean BAF	1.00	---	Assumed BAF
Vanadium	0.0097	Bechtel Jacobs 1998	90th percentile BAF (7)	0.088	Sample et al. 1998	90th percentile BAF (16)
Zinc	$\ln(C_p) = 0.554[\ln(C_s)] + 1.575$	USEPA 2007	Uptake equation (9)	$\ln(C_e) = 0.328[\ln(C_s)] + 4.449$	USEPA 2007	Uptake equation (15)

TABLE 6-1

SOIL TO PLANT AND SOIL TO EARTHWORM BIOACCUMULATION FACTORS AND BIOACCUMULATION UPTAKE EQUATIONS USED TO ESTIMATE CHEMICAL CONCENTRATIONS IN TERRESTRIAL PLANT AND INVERTEBRATE TISSUE: STEP 2 SCREENING LEVEL RISK CALCULATION
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Notes:

BAF = Bioaccumulation Factor (unitless)
C_e = Concentration in earthworm tissue (mg/kg - dry weight)
C_p = Concentration in plant tissue (mg/kg - dry weight)
C_s = Maximum concentration in soil (mg/kg - dry weight)

ln = natural logarithm
PAH = Polynuclear Aromatic Hydrocarbon
USEPA = U.S. Environmental Protection Agency

(1) BAF value was estimated using an inter-chemical regression equation for non-ionic organics based on rinsed plant foliage BAF data: $\log BAF = -0.4057(\log K_{ow}) + 1.781$, where BAF is the bioaccumulation factor and K_{ow} is the octanol-water partition coefficient (see Figure 5, Panel B in USEPA, 2007). The K_{ow} value used in the estimation of the BAF value is listed in Table 4-2.

(2) Maximum BAF value listed in Appendix F, Table F-1 of USEPA (2007).

(3) The concentration in plant tissue was estimated using a chemical-specific bioaccumulation uptake equation (i.e., regression equation) based on rinsed plant foliage BAF data (see Appendix C in USEPA, 2007).

(4) Maximum BAF value for rinsed plant foliage data listed in Appendix C of USEPA (2007).

(5) The concentration in plant tissue was estimated using a chemical-specific bioaccumulation uptake equation (i.e., regression equation; see Table 4a of USEPA[2007]) derived from measured BAF data (see Appendix A, Table A-1 of USEPA, 2007).

(6) The concentration in plant tissue was estimated using a chemical-specific bioaccumulation uptake equation (i.e., regression equation) listed in Table 7 of Bechtel Jacobs (1998).

(7) 90th percentile BAF value listed in Appendix D, Table D-1 of Bechtel Jacobs (1998).

(8) The concentration in plant tissue was estimated using a chemical-specific bioaccumulation uptake equation (i.e., regression equation; see Table 4a of USEPA, 2007) derived from measured BAF data (see Appendix A, Table A-2 of USEPA, 2007).

(9) The concentration in plant tissue was estimated using a chemical-specific bioaccumulation uptake equation (i.e., regression equation) developed by Bechtel Jacobs (1998) and cited in Table 4a of USEPA (2007).

(10) BAF value was estimated using the relationship $BAF = K_{ww}/K_d$ where K_{ww} is the biota to soil pore water partition coefficient (L soil pore water/kg ww tissue; converted to L soil pore water/kg dw tissue by assuming 16 percent soilds [USEPA, 1993] and dividing by 0.16) and K_d is the soil to pore water partition coefficient (L soil pore water/kg dw soil) (relationship developed by Jager, 1998 and cited in USEPA, 2007). Chemical-specific values for K_{ww} and K_d were derived using the following relationships:

$\log(K_{ww}) = 0.87(\log K_{ow}) - 2.0$ where K_{ow} is the octanol-water partition coefficient (K_{ow} value listed in Table 4-2)
$K_d = (f_{oc})(K_{oc})$ where f_{oc} is the fraction of organic carbon in soil (assumed to be 0.01 [one percent]) and K_{oc} is the organic carbon partition coefficient (K_{oc} value listed in Table 4-2)

(11) 90th percentile BAF calculated from individual BAF values listed in Appendix F-2 of USEPA (2007).

(12) The concentration in earthworm tissue was estimated using a chemical-specific bioaccumulation uptake equation (i.e., regression equation; see Table 4b of USEPA, 2007) derived using measured BAF data (see Appendix D, Table D-1 of USEPA, 2007).

(13) Maximum BAF value listed in Appendix F, Table F-1 of USEPA (2007).

(14) The concentration in earthworm tissue was estimated using a chemical-specific bioaccumulation uptake equation (i.e., regression equation) listed in Table 12 of Sample et al. (1998).

(15) The concentration in earthworm tissue was estimated using a chemical-specific bioaccumulation uptake equation (i.e., regression equation) developed by Sample et al. (1998 and 1999) and cited in Table 4a of USEPA (2007).

(16) 90th percentile BAF listed in Appendix C, Table C.1 of Sample et al. (1998).

(17) 90th percentile BAF value listed in Table 11 of Sample et al. (1998).

TABLE 6-1

SOIL TO PLANT AND SOIL TO EARTHWORM BIOACCUMULATION FACTORS AND BIOACCUMULATION UPTAKE EQUATIONS USED TO ESTIMATE CHEMICAL CONCENTRATIONS IN TERRESTRIAL PLANT AND INVERTEBRATE TISSUE: STEP 2 SCREENING LEVEL RISK CALCULATION
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NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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TABLE 6-2

SOIL BIOACCUMULATION FACTORS AND BIOACCUMULATION UPTAKE EQUATIONS USED TO ESTIMATE CHEMICAL CONCENTRATIONS IN SMALL MAMMAL TISSUE: STEP 2 SCREENING LEVEL RISK CALCULATION
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NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Soil-Small Mammal BAF (dry weight)		
	BAF Value/Uptake Equation	Source Document	Description
Volatile Organics:			
1,1,1,2-Tetrachloroethane	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Carbon tetrachloride	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Chlorobenzene	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Chloroform	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Ethylbenzene	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Pentachloroethane	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Styrene	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Toluene	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Trichloroethene	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Xylenes, o-	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Xylenes, m/p-	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Xylenes, total	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Semivolatile Organics:			
1,2,4,5-Tetrachlorobenzene	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
1,2,4-Trichlorobenzene	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
1,2-Dichlorobenzene	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
1,3-Dichlorobenzene	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
1,4,-Dichlorobenzene	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
2,3,4,6-Tetrachlorophenol	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
2,4,5-Trichlorophenol	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
2,4,6-Trichlorophenol	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
2,4-Dichlorophenol	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
2-Acetylaminofluorene	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
2-Chloronaphthalene	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
3,3'-Dichlorobenzidine	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
3,3'-Dimethylbenzidine	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
3-Methylcholanthrene	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
4-Bromophenyl phenyl ether	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)

TABLE 6-2

SOIL BIOACCUMULATION FACTORS AND BIOACCUMULATION UPTAKE EQUATIONS USED TO ESTIMATE CHEMICAL CONCENTRATIONS IN SMALL MAMMAL TISSUE: STEP 2 SCREENING LEVEL RISK CALCULATION
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Chemical	Soil-Small Mammal BAF (dry weight)		
	BAF Value/Uptake Equation	Source Document	Description
Semivolatile Organics:			
4-Chloro-3-methylphenol	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
4-Chlorophenyl phenyl ether	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
7,12-Dimethylbenz(a)anthracene	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Aramite, total	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Bis(2-ethylhexyl)phthalate	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Butyl benzyl phthalate	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Carbazole	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Chlorobenzilate	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 7.5.2.2.1
Diallate, cis-	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Diallate, trans-	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Diallate	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Dibenzofuran	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Diethyl phthalate	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Di-n-butyl phthalate	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Di-n-octyl phthalate	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Dinoseb	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Diphenyamine	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Hexachlorobenzene	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Hexachlorobutadiene	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Hexachlorocyclopentadiene	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Hexachloroethane	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Hexachlorophene	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Hexachloropropene	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Isosafrole	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
n-Nitrosodiphenylamine	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
p-Dimethylamino azobenzene	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Pentachlorobenzene	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Pentachloronitrobenzene	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)

TABLE 6-2

SOIL BIOACCUMULATION FACTORS AND BIOACCUMULATION UPTAKE EQUATIONS USED TO ESTIMATE CHEMICAL CONCENTRATIONS IN SMALL MAMMAL TISSUE: STEP 2 SCREENING LEVEL RISK CALCULATION
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Chemical	Soil-Small Mammal BAF (dry weight)		
	BAF Value/Uptake Equation	Source Document	Description
Semivolatile Organics:			
Pentachlorophenol	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Pronamide	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
PAHs:			
1-Methylnaphthalene	0.000	---	BAF value for other PAH compounds used as a surrogate
2-Methylnaphthalene	0.000	---	BAF value for other PAH compounds used as a surrogate
Acenaphthene	0.000	USEPA 2007	Bioaccumulation is assumed to be negligible
Acenaphthylene	0.000	USEPA 2007	Bioaccumulation is assumed to be negligible
Anthracene	0.000	USEPA 2007	Bioaccumulation is assumed to be negligible
Benzo(a)anthracene	0.000	USEPA 2007	Bioaccumulation is assumed to be negligible
Benzo(a)pyrene	0.000	USEPA 2007	Bioaccumulation is assumed to be negligible
Benzo(b)fluoranthene	0.000	USEPA 2007	Bioaccumulation is assumed to be negligible
Benzo(g,h,i)perylene	0.000	USEPA 2007	Bioaccumulation is assumed to be negligible
Benzo(k)fluoranthene	0.000	USEPA 2007	Bioaccumulation is assumed to be negligible
Chrysene	0.000	USEPA 2007	Bioaccumulation is assumed to be negligible
Dibenzo(a,h)anthracene	0.000	USEPA 2007	Bioaccumulation is assumed to be negligible
Fluoranthene	0.000	USEPA 2007	Bioaccumulation is assumed to be negligible
Fluorene	0.000	USEPA 2007	Bioaccumulation is assumed to be negligible
Indeno(1,2,3-cd)pyrene	0.000	USEPA 2007	Bioaccumulation is assumed to be negligible
Naphthalene	0.000	USEPA 2007	Bioaccumulation is assumed to be negligible
Phenanthrene	0.000	USEPA 2007	Bioaccumulation is assumed to be negligible
Pyrene	0.000	USEPA 2007	Bioaccumulation is assumed to be negligible
Organophosphorous Pesticides:			
Disulfoton	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Methyl parathion	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Parathion	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Phorate	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Sulfotepp	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)

TABLE 6-2

SOIL BIOACCUMULATION FACTORS AND BIOACCUMULATION UPTAKE EQUATIONS USED TO ESTIMATE CHEMICAL CONCENTRATIONS IN SMALL MAMMAL TISSUE: STEP 2 SCREENING LEVEL RISK CALCULATION
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Chemical	Soil-Small Mammal BAF (dry weight)		
	BAF Value/Uptake Equation	Source Document	Description
Metals:			
Antimony	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Arsenic	$\ln(C_m) = 0.8188[\ln(C_s)] - 4.8471$	USEPA 2007	Regression-based uptake equation for all small mammals (2)
Barium	0.1121	Sample et al. 1998	90th percentile BAF for all small mammals (3)
Beryllium	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Cadmium	$\ln(C_m) = 0.4865[\mathrm{In}(C_s)] - 0.4306$	Sample et al. 1998	Regression-based uptake equation for all small mammals (4)
Chromium, total	$\ln(C_m) = 0.7338[\ln(C_s)] - 1.4599$	USEPA 2007	Regression-based uptake equation for all small mammals (2)
Cobalt	$\ln(C_m) = 1.3070[\ln(C_s)] - 4.4669$	USEPA 2007	Regression-based uptake equation for all small mammals (2)
Copper	$\ln(C_m) = 0.1444[\ln(C_s)] + 0.2042$	USEPA 2007	Regression-based uptake equation for all small mammals (2)
Lead	$\ln(C_m) = 0.4422[\ln(C_s)] + 0.0761$	USEPA 2007	Regression-based uptake equation for all small mammals (2)
Mercury	0.192	Sample et al. 1998	90th percentile BAF for all small mammals (5)
Nickel	$\ln(C_m) = 0.4658[\ln(C_s)] - 0.2462$	USEPA 2007	Regression-based uptake equation for all small mammals (2)
Selenium	$\ln(C_m) = 0.3764[\ln(C_s)] - 0.4158$	USEPA 2007	Regression-based uptake equation for all small mammals (2)
Silver	0.5013	Sample et al. 1998	90th percentile BAF for all small mammals (3)
Thallium	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Tin	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 (1)
Vanadium	0.0179	Sample et al. 1998	90th percentile BAF for all small mammals (3)
Zinc	$\ln(C_m) = 0.0738[\ln(C_s)] + 4.4713$	Sample et al. 1998	Regression-based uptake equation for all small mammals (4)

Notes:

BAF = Bioaccumulation Factor
BAF_d = diet-to-small mammal bioaccumulation factor (wet weight)
C_m = Concentration in small mammal tissue (mg/kg - dry weight)
C_s = Maximum concentration in soil (mg/kg - dry weight)
DI = Small mammal dietary intake (mg/kg-BW/day)
PAH = Polynuclear Aromatic Hydrocarbon
USEPA = U.S. Environmental Protection Agency

TABLE 6-2

SOIL BIOACCUMULATION FACTORS AND BIOACCUMULATION UPTAKE EQUATIONS USED TO ESTIMATE CHEMICAL CONCENTRATIONS IN SMALL MAMMAL TISSUE: STEP 2 SCREENING LEVEL RISK CALCULATION
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Notes (continued):

(1) Most chemical exposure for small mammals is via the diet. Therefore, it is assumed that the concentration of the chemical in small mammal tissue is equal to the chemical concentration in its diet multiplied by a diet to whole-body BAF (BAF_d - wet weight basis). In the absence of literature-based diet to whole-body BAF, a value of 1.0 was assumed. The resulting tissue concentration was converted to a dry weight basis using an estimated solids content for small mammals of 0.32 (USEPA, 1993). Additional explanation is provided in Section 6.2.2.1.

(2) The concentration in small mammal tissue was estimated using a chemical-specific bioaccumulation uptake equation for all small mammals (i.e., regression equation) developed by Sample et al. (1998) and cited in Table 4a of USEPA (2007).

(3) 90th percentile BAF value for all small mammals listed in Appendix C, Table C-1 of Sample et al. (1998).

(4) The concentration in small mammal tissue was estimated using a chemical-specific bioaccumulation uptake equation for all small mammals (i.e., regression equation) listed in Table 8 of Sample et al. (1998).

(5) 90th percentile BAF value for all small mammals listed in Table 7 of Sample et al. (1998).

Table References:

Sample, B.E., J.J. Beauchamp, R.A. Efroymson, and G.W. Suter II. 1998. Development and Validation of Bioaccumulation Models for Small Mammals. Oak Ridge National Laboratory, Environmental Restoration Division, ORNL Environmental Restoration Program. ES/ER/TM-219.

U.S. Environmental Protection Agency (USEPA). 2007. Attachemnt 4-1 of Guidance for Developing Ecological Soil Screening Levels (Eco-SSLs): Exposure Factors and Bioaccumulation Models for Derivation of Wildlife Eco-SSLs. Office of Solid Waste and Emergency Response, Washington, D.C. OSWER Directive 9285.7-55.

TABLE 6-3

SEDIMENT TO INVERTEBRATE AND SEDIMENT TO FISH BIOACCUMULATION FACTORS AND BIOACCUMULATION UPTAKE EQUATIONS USED TO ESTIMATE CHEMICAL CONCENTRATIONS IN AQUATIC INVERTEBRATE AND FISH TISSUE: STEP 2 SCREENING LEVEL RISK CALCULATION
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	Sediment-to-Invertebrate BAF (dry weight)			Sediment-to-Fish BAF (dry weight)		
Chemical	**BAF**	**Source Document**	**Description**	**BAF**	**Source Document**	**Description**
Volatile Organics:						
1,1,1,2-Tetrachloroethane	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Carbon tetrachloride	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Chlorobenzene	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Chloroform	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Ethylbenzene	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Pentachloroethane	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Styrene	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Toluene	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Trichloroethene	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Xylenes, o-	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Xylenes, m/p-	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Xylene, total	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Semivolatile Organics:						
1,1-Biphenyl	5.417	---	BAF derived from 90th percentile BSAF value (1.1244; see Table 6-4) (1)	0.448	---	BAF derived from 90th percentile BSAF value (0.0646; see Table 6-6) (5)
1,2,4,5-Tetrachlorobenzene	1.00	---	Assumed BAF	1.00	---	Assumed BAF
1,2,4-Trichlorobenzene	1.00	---	Assumed BAF	1.216	---	BAF derived from 90th percentile BSAF value (0.1752; see Table 6-6) (5)
1,2-Dichlorobenzene	1.00	---	Assumed BAF	0.777	---	BAF derived from single BSAF value (0.1119; see Table 6-6) (5)
1,3-Dichlorobenzene	1.00	---	Assumed BAF	0.140	---	BAF derived from single BSAF value (0.0202; see Table 6-6) (5)
1,4,-Dichlorobenzene	1.00	---	Assumed BAF	0.094	---	BAF derived from single BSAF value (0.0136; see Table 6-6) (5)
2,3,4,6-Tetrachlorophenol	1.00	---	Assumed BAF	1.00	---	Assumed BAF
2,4,5-Trichlorophenol	1.00	---	Assumed BAF	1.00	---	Assumed BAF
2,4,6-Trichlorophenol	1.00	---	Assumed BAF	1.00	---	Assumed BAF
2,4-Dichlorophenol	1.00	---	Assumed BAF	1.00	---	Assumed BAF
2-Acetylaminofluorene	1.00	---	Assumed BAF	1.00	---	Assumed BAF
2-Chloronaphthalene	1.00	---	Assumed BAF	1.00	---	Assumed BAF
3,3'-Dichlorobenzidine	1.00	---	Assumed BAF	1.00	---	Assumed BAF
3,3'-Dimethylbenzidine	1.00	---	Assumed BAF	1.00	---	Assumed BAF
3-Methylcholanthrene	1.00	---	Assumed BAF	1.00	---	Assumed BAF
4-Bromophenyl phenyl ether	1.00	---	Assumed BAF	1.00	---	Assumed BAF
4-Chloro-3-methylphenol	1.00	---	Assumed BAF	1.00	---	Assumed BAF
4-Chlorophenyl phenyl ether	1.00	---	Assumed BAF	1.00	---	Assumed BAF
7,12-Dimethylbenz(a)anthracene	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Aramite, total	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Bis(2-ethylhexyl)phthalate	61.988	---	BAF derived from 90th percentile BSAF value (12.8661; see Table 6-4) (1)	21.420	---	BAF derived from 90th percentile BSAF value (3.0859; see Table 6-6) (1)
Butyl benzyl phthalate	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Carbazole	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Diallate, total	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Dibenzofuran	1.00	---	Assumed BAF	0.248	---	BAF derived from 90th percentile BSAF value (0.0357; see Table 6-6) (1)
Diethyl phthalate	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Di-n-butyl phthalate	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Di-n-octyl phthalate	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Dinoseb	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Diphenylamine	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Hexachlorobenzene	35.392	---	BAF derived from 90th percentile BSAF value (7.3460; see Table 6-4) (1)	0.625	---	BAF derived from 90th percentile BSAF value (0.0900; see Table 6-6) (1)

TABLE 6-3

SEDIMENT TO INVERTEBRATE AND SEDIMENT TO FISH BIOACCUMULATION FACTORS AND BIOACCUMULATION UPTAKE EQUATIONS USED TO ESTIMATE CHEMICAL CONCENTRATIONS IN AQUATIC INVERTEBRATE AND FISH TISSUE: STEP 2 SCREENING LEVEL RISK CALCULATION
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	Sediment-to-Invertebrate BAF (dry weight)			Sediment-to-Fish BAF (dry weight)		
Chemical	**BAF**	**Source Document**	**Description**	**BAF**	**Source Document**	**Description**
Semivolatile Organics:						
Hexachlorobutadiene	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Hexachlorocyclopentadiene	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Hexachloroethane	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Hexachlorophene	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Hexachloropropene	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Isosafrole	1.00	---	Assumed BAF	1.00	---	Assumed BAF
n-Nitrosodiphenylamine	1.00	---	Assumed BAF	1.00	---	Assumed BAF
p-Dimethylamino azobenzene	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Pentachlorobenzene	1.00	---	Assumed BAF	0.278	---	BAF derived from single BSAF value (0.0400; see Table 6-6) (5)
Pentachloronitrobenzene	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Pentachlorophenol	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Pronamide	1.00	---	Assumed BAF	1.00	---	Assumed BAF
PAHs:						
1-Methylnaphalene	4.601	---	BAF derived from 90th percentile BSAF value (0.9549; see Table 6-4) (5)	1.00	---	Assumed BAF
2-Methylnaphthalene	24.154	---	BAF derived from 90th percentile BSAF value (5.0133; see Table 6-4) (1)	1.265	---	BAF derived from 90th percentile BSAF value (0.1823; see Table 6-6) (5)
Acenaphthene	3.771	---	BAF derived from 90th percentile BSAF value (0.7827; see Table 6-4) (1)	0.297	---	BAF derived from 90th percentile BSAF value (0.0428; see Table 6-6) (5)
Acenaphthylene	4.837	---	BAF derived from 90th percentile BSAF value (1.0039; see Table 6-4) (1)	0.185	---	BAF derived from 90th percentile BSAF value (0.0266; see Table 6-6) (5)
Anthracene	2.162	---	BAF derived from 90th percentile BSAF value (0.4487; see Table 6-4) (1)	0.091	---	BAF derived from 90th percentile BSAF value (0.0131; see Table 6-6) (5)
Benzo(a)anthracene	5.147	---	BAF derived from 90th percentile BSAF value (1.0682; see Table 6-4) (1)	0.215	---	BAF derived from 90th percentile BSAF value (0.0310; see Table 6-6) (5)
Benzo(a)pyrene	2.411	---	BAF derived from 90th percentile BSAF value (0.5004; see Table 6-4) (1)	0.025	---	BAF derived from 90th percentile BSAF value (0.0035; see Table 6-6) (5)
Benzo(b)fluoranthene	17.910	---	BAF derived from 90th percentile BSAF value (3.7174; see Table 6-4) (1)	0.027	---	BAF derived from 90th percentile BSAF value (0.0040; see Table 6-6) (5)
Benzo(g,h,i)perylene	2.003	---	BAF derived from 90th percentile BSAF value (0.4157; see Table 6-4) (1)	0.394	---	BAF derived from 90th percentile BSAF value (0.0567; see Table 6-6) (5)
Benzo(k)fluoranthene	29.274	---	BAF derived from 90th percentile BSAF value (6.0761; see Table 6-4) (1)	0.025	---	BAF derived from 90th percentile BSAF value (0.0036; see Table 6-6) (5)
Chrysene	4.373	---	BAF derived from 90th percentile BSAF value (0.9076; see Table 6-4) (1)	0.155	---	BAF derived from 90th percentile BSAF value (0.0223; see Table 6-6) (5)
Dibenzo(a,h)anthracene	0.904	---	BAF derived from 90th percentile BSAF value (0.1877; see Table 6-4) (1)	0.025	---	BAF derived from 90th percentile BSAF value (0.0036; see Table 6-6) (5)
Fluoranthene	3.807	---	BAF derived from 90th percentile BSAF value (0.7902; see Table 6-4) (1)	0.067	---	BAF derived from 90th percentile BSAF value (0.0096; see Table 6-6) (5)
Fluorene	5.469	---	BAF derived from 90th percentile BSAF value (1.1352; see Table 6-4) (1)	0.863	---	BAF derived from 90th percentile BSAF value (0.1244; see Table 6-6) (5)
Indeno(1,2,3-cd)pyrene	4.025	---	BAF derived from 90th percentile BSAF value (0.8354; see Table 6-4) (1)	0.277	---	BAF derived from 90th percentile BSAF value (0.0400; see Table 6-6) (5)
Naphthalene	6.370	---	BAF derived from 90th percentile BSAF value (1.3221; see Table 6-4) (1)	1.747	---	BAF derived from 90th percentile BSAF value (0.2517; see Table 6-6) (5)
Phenanthrene	6.516	---	BAF derived from 90th percentile BSAF value (1.3525; see Table 6-4) (1)	0.433	---	BAF derived from 90th percentile BSAF value (0.0625; see Table 6-6) (5)
Pyrene	4.846	---	BAF derived from 90th percentile BSAF value (1.0059; see Table 6-4) (1)	0.321	---	BAF derived from 90th percentile BSAF value (0.0462; see Table 6-6) (5)
Organophosphorous Pesticides:						
Disulfoton	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Methyl parathion	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Parathion	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Phorate	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Sulfotepp	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Metals:						
Antimony	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Arsenic	0.690	Bechtel Jacobs 1998	90th percentile BAF (3)	1.00	---	Assumed BAF
Barium	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Beryllium	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Cadmium	3.073	Bechtel Jacobs 1998	90th percentile BAF (2)	2.0	PTI Environmental Services 1995	95th Percentile BAF (6)
Chromium, total	0.468	Bechtel Jacobs 1998	90th percentile BAF (3)	1.00	---	Assumed BAF

TABLE 6-3

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NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Sediment-to-Invertebrate BAF (dry weight)			Sediment-to-Fish BAF (dry weight)		
	BAF	Source Document	Description	BAF	Source Document	Description
Metals:						
Cobalt	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Copper	7.957	Bechtel Jacobs 1998	90th percentile BAF (2)	1.00	---	Assumed BAF
Lead	0.326	Bechtel Jacobs 1998	90th percentile BAF (2)	0.39	PTI Environmental Services 1995	95th Percentile BAF (6)
Mercury	2.868	Bechtel Jacobs 1998	90th percentile BAF (3)	4.58	Cope et al. 1990	Maximum BAF
Nickel	0.214	Bechtel Jacobs 1998	90th percentile BAF (2)	1.00	---	Assumed BAF
Selenium	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Silver	0.18	Hirsch 1998	Mean BAF (4)	1.00	---	Assumed BAF
Thallium	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Tin	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Vanadium	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Zinc	4.759	Bechtel Jacobs 1998	90th percentile BAF (2)	4.82	PTI Environmental Services 1995	95th Percentile BAF (6)

Notes:

BAF = Bioaccumulation Factor
BSAF = Biota-Sediment Accumulation Factor
PAH = Polynuclear Aromatic Hydrocarbon

(1) 90th percentile BSAF value (wet weight) listed in Table 6-4 was converted to a BAF value (dry weight) using an invertebrate lipid content of 3.44 percent, invertebrate solids content of 21 percent (USEPA, 1993), and a sediment organic carbon content of 3.4 percent (minimum value).
(2) 90th percentile BAF value listed in Table 2 of Bechtel Jacobs (1998) for depurated organisms.
(3) 90th percentile BAF value listed in Table 2 of Bechtel Jacobs (1998) for depurated and non-depurated organisms. A combined depurated/non-depurated data set was used due to the low number of data points within the depurated data set.
(4) Mean BAF value for depurated oligochates (*Lumbriculus variegatus*).
(5) 90th percentile/single BSAF value (wet weight) listed in Table 6-6 was converted to a BAF value (dry weight) using a fish lipid content of 5.9 percent, fish solids content of 25 percent (USEPA, 1993), and sediment organic carbon content of 3.4 percent (minimum value).
(6) 95th percentile BAF for values listed in Table 1 of PTI Environmental Services (1995).

Table References:

Bechtel Jacobs. 1998. Biota Sediment Accumulation Factors for Invertebrates: Review and Recommendations for Oak Ridge Reservation. Prepared for U.S. Department of Energy. BJC/OR-112. August 1998.

Cope, W.G., J.G. Wiener, and R.G. Rada. 1990. Mercury Accumulation in Yellow Perch in Wisconsin Seepage Lakes: Relation to Lake Characteristics. Environ. Toxicol. Chem. 9:931-940.

Hirsch, M.P. 1998. Bioaccumulation of Silver from Laboratory-Spiked Sediments in the Oligochaete (*Lumbriculus Variegatus*). Environ. Toxicol. Chem. 17:605-609.

PTI Environmental Services. 1995. Bioaccumulation Factor Approach Analysis for Metals and Polar Organic Compounds. Prepared for Washington Departmetn of Ecology, Central Program, Environmental Review and Sediment Section, Olympia, Washington. October 1995. CAOU-03-03.

U.S. Environmental Protection Agency (USEPA). 1993. Wildlife Exposure Factors Handbook. Office of Research and Development, Washington, D.C. EPA/600/R-93/187a.

TABLE 6-4

LITERATURE-BASED BIOTA-SEDIMENT ACCUMULATION FACTORS USED TO DERIVE SEDIMENT-TO-INVERTEBRATE BIOACCUMULATION FACTORS
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A
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NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Organism	BSAF (wet weight)	Reference
PAHs:			
1-Methylnaphthalene	False Quahog (*Pitar morrhuana*)	1.7856	USEPA 2010
		0.7336	USEPA 2010
	Northern Quahog (*Mercenaria mercenaria*)	0.9943	USEPA 2010
	Blue muscle (*Mytilus edulis*)	0.3838	USEPA 2010
		0.5206	USEPA 2010
		0.6403	USEPA 2010
		0.0538	USEPA 2010
		0.0718	USEPA 2010
		0.1187	USEPA 2010
		0.3254	USEPA 2010
		0.2926	USEPA 2010
		0.1656	USEPA 2010
		0.1176	USEPA 2010
		0.0017	USEPA 2010
		0.8959	USEPA 2010
	1-Methylnaphthalene Statistics: 90th Percentile BSAF (wet weight)	0.9549	
	Median BSAF (wet weight)	0.3254	
2-Methylnaphthalene	Fiddler Crab (*Uca* sp.)	9.0575	USEPA 2010
		9.1329	USEPA 2010
	False Quahog (*Pitar morrhuana*)	0.9692	USEPA 2010
		0.7676	USEPA 2010
	Northern Quahog (*Mercenaria mercenaria*)	0.8919	USEPA 2010
	Blue Mussel (*Mytilus edulis*)	0.5199	USEPA 2010
		0.7835	USEPA 2010
		0.0540	USEPA 2010
		0.1326	USEPA 2010
		0.6825	USEPA 2010
		0.1655	USEPA 2010
		0.5478	USEPA 2010
		0.1687	USEPA 2010
		0.0037	USEPA 2010
		0.9443	USEPA 2010
		0.0507	USEPA 2010
	2-Methylnaphthalene Statistics: 90th Percentile BSAF (wet weight)	5.0133	
	Median BSAF (wet weight)	0.6152	
Acenaphthene	False Quahog (*Pitar morrhuana*)	0.6578	USEPA 2010
		1.4306	USEPA 2010
		0.4541	USEPA 2010
		1.311	USEPA 2010
		0.6007	USEPA 2010
		0.0452	USEPA 2010
		0.1203	USEPA 2010
		0.0705	USEPA 2010

TABLE 6-4

LITERATURE-BASED BIOTA-SEDIMENT ACCUMULATION FACTORS USED TO DERIVE SEDIMENT-TO-INVERTEBRATE BIOACCUMULATION FACTORS
SWMU 9 - AREA B, TANK 214 AREA
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Chemical	Organism	BSAF (wet weight)	Reference
PAHs:			
Acenaphthene (continued)	Northern Quahog (*Mercenaria mercenaria*)	1.4262	USEPA 2010
		0.0523	USEPA 2010
		0.0331	USEPA 2010
		0.115	USEPA 2010
		0.1192	USEPA 2010
		0.042	USEPA 2010
		0.0695	USEPA 2010
		0.0238	USEPA 2010
		0.0518	USEPA 2010
		0.084	USEPA 2010
		0.0154	USEPA 2010
		0.0364	USEPA 2010
		0.0098	USEPA 2010
		0.0042	USEPA 2010
		0.0513	USEPA 2010
	Blue Mussel (*Mytilus edulis*)	0.866	USEPA 2010
		1.3867	USEPA 2010
		0.0245	USEPA 2010
		0.0754	USEPA 2010
		0.1437	USEPA 2010
		0.1675	USEPA 2010
		0.0977	USEPA 2010
		0.2931	USEPA 2010
		0.0524	USEPA 2010
		0.0049	USEPA 2010
		0.0008	USEPA 2010
		0.0109	USEPA 2010
		0.0005	USEPA 2010
		0.0033	USEPA 2010
		0.0102	USEPA 2010
		0.5173	USEPA 2010
		0.003	USACE 2010
		0.005	USACE 2010
	Bent-Nosed Clam (*Macoma nasuta*)	0.016	USACE 2010
		0.012	USACE 2010
	Unidentified Crayfish	0.0014	USEPA 2010
		0.0442	USEPA 2010
	Acenaphthene Statistics: 90th Percentile BSAF (wet weight)	0.7827	
	Median BSAF (wet weight)	0.0518	
Acenaphthylene	False Quahog (*Pitar morrhuana*)	0.1195	USEPA 2010
		0.1657	USEPA 2010
		4.2120	USEPA 2010
		0.3363	USEPA 2010
		0.1275	USEPA 2010
		5.0744	USEPA 2010
		0.0293	USEPA 2010
		0.0225	USEPA 2010
		0.0218	USEPA 2010

TABLE 6-4

LITERATURE-BASED BIOTA-SEDIMENT ACCUMULATION FACTORS USED TO DERIVE SEDIMENT-TO-INVERTEBRATE BIOACCUMULATION FACTORS
SWMU 9 - AREA B, TANK 214 AREA
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Chemical	Organism	BSAF (wet weight)	Reference
PAHs:			
Acenaphthylene (continued)	Northern Quahog (*Mercenaria mercenaria*)	0.0313	USEPA 2010
		0.0391	USEPA 2010
		0.1045	USEPA 2010
		0.2220	USEPA 2010
		2.2102	USEPA 2010
		0.8416	USEPA 2010
		0.2804	USEPA 2010
		0.4541	USEPA 2010
		0.5247	USEPA 2010
		0.4864	USEPA 2010
		0.2824	USEPA 2010
		0.0466	USEPA 2010
		0.0411	USEPA 2010
		0.0558	USEPA 2010
		0.0630	USEPA 2010
		0.0369	USEPA 2010
		0.0692	USEPA 2010
		0.0214	USEPA 2010
	Blue Mussel (*Mytilus edulis*)	0.4579	USEPA 2010
		0.2655	USEPA 2010
		0.2270	USEPA 2010
		0.3440	USEPA 2010
		0.1325	USEPA 2010
		0.0565	USEPA 2010
		0.1921	USEPA 2010
		1.2027	USEPA 2010
		0.9036	USEPA 2010
		4.8701	USEPA 2010
		0.1262	USEPA 2010
		0.2503	USEPA 2010
		0.1306	USEPA 2010
		1.0469	USEPA 2010
		0.0195	USEPA 2010
		0.0017	USEPA 2010
		0.0018	USEPA 2010
		0.0012	USEPA 2010
		0.0061	USEPA 2010
		0.2016	USEPA 2010
		0.0010	USEPA 2010
		0.0058	USEPA 2010
		0.0650	USACE 2010
		0.1090	USACE 2010
	Unidentified Crayfish	0.0149	USEPA 2010
		0.0375	USEPA 2010
		0.0085	USEPA 2010
	Acenaphthylene Statistics: 90th Percentile BSAF (wet weight)	1.0039	
	Median BSAF (wet weight)	0.1229	

TABLE 6-4

LITERATURE-BASED BIOTA-SEDIMENT ACCUMULATION FACTORS USED TO DERIVE SEDIMENT-TO-INVERTEBRATE BIOACCUMULATION FACTORS
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A
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NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Organism	BSAF (wet weight)	Reference
PAHs:			
Anthracene	False Quahog (*Pitar morrhuana*)	0.2660	USEPA 2010
		1.0333	USEPA 2010
		0.2760	USEPA 2010
		0.1431	USEPA 2010
		0.0872	USEPA 2010
		0.6731	USEPA 2010
		0.3419	USEPA 2010
		0.2064	USEPA 2010
		0.1080	USEPA 2010
		0.2254	USEPA 2010
		0.1706	USEPA 2010
		0.5304	USEPA 2010
		0.0472	USEPA 2010
		0.0383	USEPA 2010
		0.0177	USEPA 2010
	Northern Quahog (*Mercenaria mercenaria*)	0.3669	USEPA 2010
		0.1215	USEPA 2010
		0.0590	USEPA 2010
		0.1199	USEPA 2010
		0.1914	USEPA 2010
		0.1641	USEPA 2010
		0.1068	USEPA 2010
		0.1420	USEPA 2010
		0.0776	USEPA 2010
		0.0495	USEPA 2010
		0.0068	USEPA 2010
		0.0575	USEPA 2010
		0.0206	USEPA 2010
		0.0178	USEPA 2010
		0.1260	USEPA 2010
		0.0132	USEPA 2010
		0.0078	USEPA 2010
		0.0282	USEPA 2010
		0.0367	USEPA 2010
	Blue Mussel (*Mytilus edulis*)	0.2516	USEPA 2010
		1.9053	USEPA 2010
		0.1195	USEPA 2010
		0.0348	USEPA 2010
		0.1005	USEPA 2010
		0.2459	USEPA 2010
		0.2491	USEPA 2010
		0.2744	USEPA 2010
		0.3097	USEPA 2010
		1.4894	USEPA 2010
		0.0353	USEPA 2010
		0.0976	USEPA 2010
		0.0914	USEPA 2010
		0.0012	USEPA 2010
		0.2030	USEPA 2010

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Chemical	Organism	BSAF (wet weight)	Reference
PAHs:			
Anthracene (continued)	Blue Mussel (*Mytilus edulis*) (continued)	0.2265	USEPA 2010
		0.0089	USEPA 2010
		0.0006	USEPA 2010
		0.0011	USEPA 2010
		0.0003	USEPA 2010
		0.0020	USEPA 2010
		0.0066	USEPA 2010
		0.2131	USEPA 2010
		0.0060	USACE 2010
		0.0160	USACE 2010
	Bent-Nosed Clam (*Macoma nasuta*)	0.0500	USACE 2010
		0.0440	USACE 2010
	Unidentified Crayfish	0.0026	USEPA 2010
		0.0140	USEPA 2010
		0.0387	USEPA 2010
	Brackish Water Clam (*Rangia cuneata*)	4.4895	USEPA 2010
	Fiddler Crab (*Uca* sp.)	1.5155	USEPA 2010
	Anthracene Statistics: 90th Percentile BSAF (wet weight)	0.4487	
	Median BSAF (wet weight)	0.0991	
Benzo(a)anthracene	False Quahog (*Pitar morrhuana*)	0.3950	USEPA 2010
		1.9526	USEPA 2010
		0.4332	USEPA 2010
		0.7700	USEPA 2010
		0.3152	USEPA 2010
		1.1428	USEPA 2010
		0.6938	USEPA 2010
		0.6447	USEPA 2010
		0.2370	USEPA 2010
		0.3740	USEPA 2010
		0.0115	USEPA 2010
		0.0386	USEPA 2010
		0.0300	USEPA 2010
		0.0308	USEPA 2010
		0.0108	USEPA 2010
	Northern Quahog (*Mercenaria mercenaria*)	1.7028	USEPA 2010
		0.0992	USEPA 2010
		0.0160	USEPA 2010
		0.1860	USEPA 2010
		0.0588	USEPA 2010
		0.0549	USEPA 2010
		0.0234	USEPA 2010
		0.0336	USEPA 2010
		0.0217	USEPA 2010
		0.0314	USEPA 2010
		0.0076	USEPA 2010
		0.0325	USEPA 2010

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LITERATURE-BASED BIOTA-SEDIMENT ACCUMULATION FACTORS USED TO DERIVE SEDIMENT-TO-INVERTEBRATE BIOACCUMULATION FACTORS
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Chemical	Organism	BSAF (wet weight)	Reference
PAHs:			
Benzo(a)anthracene (continued)	Northern Quahog (*Mercenaria mercenaria*) (continued)	0.0044	USEPA 2010
		0.0197	USEPA 2010
		0.0365	USEPA 2010
		0.0061	USEPA 2010
		0.0056	USEPA 2010
		0.0386	USEPA 2010
		0.0087	USEPA 2010
	Blue Mussel (*Mytilus edulis*)	0.3752	USEPA 2010
		1.3486	USEPA 2010
		0.0887	USEPA 2010
		0.0252	USEPA 2010
		0.0633	USEPA 2010
		0.5590	USEPA 2010
		0.2063	USEPA 2010
		0.1802	USEPA 2010
		0.0288	USEPA 2010
		0.3608	USEPA 2010
		0.5301	USEPA 2010
		0.0811	USEPA 2010
		0.1268	USEPA 2010
		0.0739	USEPA 2010
		0.0100	USACE 2010
		0.0640	USACE 2010
		0.1750	USACE 2010
		0.2104	USEPA 2010
		0.2002	USEPA 2010
		0.0008	USEPA 2010
		0.0001	USEPA 2010
		0.0006	USEPA 2010
		0.0001	USEPA 2010
		0.0008	USEPA 2010
		0.0036	USEPA 2010
		0.1169	USEPA 2010
	Fiddler Crab (*Uca* sp.)	3.1768	USEPA 2010
		0.4532	USEPA 2010
		5.0716	USEPA 2010
	Unidentified Crayfish	0.0009	USEPA 2010
		0.0020	USEPA 2010
		0.0115	USEPA 2010
	Brackish Water Clam (*Rangia cuneata*)	11.7785	USEPA 2010
		1.3275	USEPA 2010
	Bent-Nosed Clam (*Macoma nasuta*)	0.1028	USEPA 2010
		0.0280	USACE 2010
		0.0260	USACE 2010
		0.0700	USACE 2010
		0.0740	USACE 2010
	Benzo(a)anthracene Statistics: 90th Percentile BSAF (wet weight)	1.0682	
	Median BSAF (wet weight)	0.0640	

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Chemical	Organism	BSAF (wet weight)	Reference
PAHs:			
Benzo(a)pyrene	False Quahog (*Pitar morrhuana*)	0.1313	USEPA 2010
		0.9764	USEPA 2010
		0.1467	USEPA 2010
		0.2808	USEPA 2010
		0.1327	USEPA 2010
		0.3552	USEPA 2010
		0.0621	USEPA 2010
		0.1503	USEPA 2010
		0.1455	USEPA 2010
		0.0930	USEPA 2010
		0.1736	USEPA 2010
		0.0167	USEPA 2010
		0.0163	USEPA 2010
		0.0068	USEPA 2010
	Northern Quahog (*Mercenaria mercenaria*)	0.5035	USEPA 2010
		0.2230	USEPA 2010
		0.0101	USEPA 2010
		0.0422	USEPA 2010
		0.0298	USEPA 2010
		0.0254	USEPA 2010
		0.0204	USEPA 2010
		0.0298	USEPA 2010
		0.0236	USEPA 2010
		0.0159	USEPA 2010
		0.0052	USEPA 2010
		0.0168	USEPA 2010
		0.0030	USEPA 2010
		0.0072	USEPA 2010
		0.0251	USEPA 2010
		0.0074	USEPA 2010
		0.0027	USEPA 2010
		0.0053	USEPA 2010
		0.0244	USEPA 2010
		0.0284	USEPA 2010
	Blue Mussel (*Mytilus edulis*)	0.0400	USACE 2010
		0.0970	USACE 2010
		0.1237	USEPA 2010
		0.0255	USEPA 2010
		0.0047	USEPA 2010
		0.0224	USEPA 2010
		0.3513	USEPA 2010
		0.0453	USEPA 2010
		0.0662	USEPA 2010
		0.0741	USEPA 2010
		0.2383	USEPA 2010
		0.0084	USEPA 2010
		0.0315	USEPA 2010
		0.0191	USEPA 2010
		0.0433	USEPA 2010

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Chemical	Organism	BSAF (wet weight)	Reference
PAHs:			
Benzo(a)pyrene (continued)	Blue Mussel (*Mytilus edulis)* (continued)	0.0313	USEPA 2010
		0.0028	USEPA 2010
		0.0006	USEPA 2010
		0.0002	USEPA 2010
		0.0004	USEPA 2010
		0.0002	USEPA 2010
		0.0009	USEPA 2010
		0.0017	USEPA 2010
		0.0491	USEPA 2010
	Bent-Nosed Clam (*Macoma nasuta*)	0.0150	USEPA 2010
		0.0210	USEPA 2010
		0.0280	USEPA 2010
		0.0320	USEPA 2010
	Brackish Water Clam (*Rangia cuneata*)	9.5120	USEPA 2010
		1.2660	USEPA 2010
	Ribbed Mussel (*Geukensia demissa*)	0.0195	USEPA 2010
	Eastern Oyster (*Crassostrea virginica*)	0.1051	USEPA 2010
	Amphipod (*Diporeia* spp.)	0.0500	USACE 2010
		0.0300	USACE 2010
		0.0400	USACE 2010
		0.0100	USACE 2010
		0.2200	USACE 2010
		0.0600	USACE 2010
		0.4000	USACE 2010
	Oligochaete (*Lumbriculus variegatus*)	1.0000	USACE 2010
		0.5000	USACE 2010
		1.3400	USACE 2010
	Unidentified Crayfish	0.0084	USEPA 2010
	Fiddler Crab (*Uca* sp.)	3.5792	USEPA 2010
		0.4317	USEPA 2010
		4.7011	USEPA 2010
	Benzo(a)pyrene Statistics: 90th Percentile BSAF (wet weight)	0.5004	
	Median BSAF (wet weight)	0.0314	
Benzo(b)fluoranthene	Brackish Water Clam (*Rangia cuneata*)	8.0329	USEPA 2010
		1.0508	USEPA 2010
	Fiddler Crab (*Uca* sp.)	1.8679	USEPA 2010
		0.3598	USEPA 2010
		0.3136	USEPA 2010
	Unidentified Crayfish	0.0014	USEPA 2010
		0.0017	USEPA 2010
		0.0105	USEPA 2010
	Benzo(b)fluoranthene Statistics: 90th Percentile BSAF (wet weight)	3.7174	
	Median BSAF (wet weight)	0.3367	

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Chemical	Organism	BSAF (wet weight)	Reference
PAHs:			
Benzo(g,h,i)perylene	False Quahog (*Pitar morrhuana*)	0.0991	USEPA 2010
		0.1087	USEPA 2010
		0.4162	USEPA 2010
		0.1043	USEPA 2010
		0.1634	USEPA 2010
		0.1296	USEPA 2010
		0.1397	USEPA 2010
		0.1354	USEPA 2010
		0.0193	USEPA 2010
		0.0169	USEPA 2010
	Northern Quahog (*Mercenaria mercenaria*)	0.1136	USEPA 2010
		0.0303	USEPA 2010
		0.0373	USEPA 2010
		0.0669	USEPA 2010
		0.0086	USEPA 2010
		0.0135	USEPA 2010
		0.0054	USEPA 2010
		0.0526	USEPA 2010
		0.0610	USEPA 2010
	Northern Quahog (*Mercenaria mercenaria*) (continued)	0.0062	USEPA 2010
		0.0160	USEPA 2010
		0.0048	USEPA 2010
		0.0622	USEPA 2010
		0.0595	USEPA 2010
		0.0174	USEPA 2010
		0.0060	USEPA 2010
		0.0428	USEPA 2010
	Blue Mussel (*Mytilus edulis*)	0.0508	USEPA 2010
		0.4110	USEPA 2010
		0.0335	USEPA 2010
		0.2042	USEPA 2010
		0.0321	USEPA 2010
		0.1170	USEPA 2010
		0.6140	USEPA 2010
		0.0331	USEPA 2010
		0.0518	USEPA 2010
		0.0452	USEPA 2010
		0.0677	USEPA 2010
		0.0830	USEPA 2010
		0.0008	USEPA 2010
		0.0039	USEPA 2010
		0.0001	USEPA 2010
		0.0008	USEPA 2010
		0.0002	USEPA 2010
		0.0013	USEPA 2010
		0.0036	USEPA 2010
		0.0698	USEPA 2010

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Chemical	Organism	BSAF (wet weight)	Reference
PAHs:			
Benzo(g,h,i)perylene (continued)	Blue Mussel (Mytilus edulis) (continued)	0.0120	USACE 2010
		0.0170	USACE 2010
		0.0360	USEPA 2010
	Bent-Nosed Clam (*Macoma nasuta*)	0.0220	USACE 2010
		0.0350	USACE 2010
		0.0110	USACE 2010
		0.0130	USACE 2010
	Brackish Water Clam (*Rangia cuneata*)	16.7574	USEPA 2010
		3.7523	USEPA 2010
	Fiddler Crab (*Uca* sp.)	6.1502	USEPA 2010
		1.2775	USEPA 2010
		6.2611	USEPA 2010
	Unidentified Crayfish	0.0031	USEPA 2010
		0.0035	USEPA 2010
		0.0155	USEPA 2010
	Benzo(g,h,i)perylene Statistics: 90th Percentile BSAF (wet weight)	0.4157	
	Median BSAF (wet weight)	0.0367	
Benzo(k)fluoranthene	Brackish Water Clam (*Rangia cuneata*)	11.0245	USEPA 2010
		1.1277	USEPA 2010
	Unidentified Crayfish	0.0023	USEPA 2010
		0.0029	USEPA 2010
		0.0148	USEPA 2010
	Fiddler Crab (Uca sp.)	0.3851	USEPA 2010
	Benzo(k)fluoranthene Statistics: 90th Percentile BSAF (wet weight)	6.0761	
	Median BSAF (wet weight)	0.2000	
Chrysene	False Quahog (*Pitar morrhuana*)	0.1651	USEPA 2010
		0.7712	USEPA 2010
		0.2586	USEPA 2010
		0.4849	USEPA 2010
		0.2009	USEPA 2010
		0.5775	USEPA 2010
		0.4125	USEPA 2010
		0.2299	USEPA 2010
		0.1392	USEPA 2010
		0.3818	USEPA 2010
		0.1705	USEPA 2010
	Northern Quahog (*Mercenaria mercenaria*)	0.5615	USEPA 2010
		0.0832	USEPA 2010
		0.0305	USEPA 2010
		0.2276	USEPA 2010
		0.1447	USEPA 2010
		0.1179	USEPA 2010
		0.0853	USEPA 2010
		0.0985	USEPA 2010
		0.0712	USEPA 2010

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Chemical	Organism	BSAF (wet weight)	Reference
PAHs:			
Chrysene (continued)	Blue Mussel (*Mytilus edulis*)	0.2475	USEPA 2010
		1.3264	USEPA 2010
		0.0916	USEPA 2010
		0.0158	USEPA 2010
	Blue Mussel (*Mytilus edulis*) (continued)	0.0613	USEPA 2010
		0.2944	USEPA 2010
		0.1960	USEPA 2010
		0.1743	USEPA 2010
		0.4230	USEPA 2010
		0.3013	USEPA 2010
		0.0245	USEPA 2010
		0.1426	USEPA 2010
		0.1050	USEPA 2010
		0.4085	USEPA 2010
		0.1720	USEPA 2010
		0.0100	USACE 2010
		0.0190	USACE 2010
		0.0840	USACE 2010
		0.1960	USACE 2010
	Bent-Nosed Clam (*Macoma nasuta*)	0.0507	USEPA 2010
		0.0250	USACE 2010
		0.0380	USACE 2010
		0.0730	USACE 2010
		0.0790	USACE 2010
	Brackish Water Clam (*Rangia cuneata*)	7.3039	USEPA 2010
		0.9933	USEPA 2010
	Fiddler Crab (*Uca* sp.)	1.6313	USEPA 2010
		0.3397	USEPA 2010
		3.4030	USEPA 2010
		0.9076	USEPA 2010
	Unidentified Crayfish	0.0071	USEPA 2010
	Chrysene Statistics: 90th Percentile BSAF (wet weight)	0.9076	
	Median BSAF (wet weight)	0.1720	
Dibenz(a,h)anthracene	False Quahog (*Pitar morrhuana*)	0.0459	USEPA 2010
		0.0175	USEPA 2010
	Northern Quahog (*Mercenaria mercenaria*)	0.0291	USEPA 2010
		0.0961	USEPA 2010
		0.0518	USEPA 2010
		0.0073	USEPA 2010
		0.0181	USEPA 2010
		0.0084	USEPA 2010
		0.0096	USEPA 2010
		0.0026	USEPA 2010
		0.0403	USEPA 2010
	Blue Mussel (*Mytilus edulis*)	0.1372	USEPA 2010
		0.2254	USEPA 2010

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Chemical	Organism	BSAF (wet weight)	Reference
PAHs:			
Dibenz(a,h)anthracene (continued)	Blue Mussel *(Mytilus edulis)* (continued)	0.1625	USEPA 2010
		0.6260	USEPA 2010
		0.0236	USEPA 2010
		0.0340	USEPA 2010
		0.0359	USEPA 2010
		0.0627	USEPA 2010
		0.0579	USEPA 2010
		0.0002	USEPA 2010
		0.0003	USEPA 2010
		0.00004	USEPA 2010
		0.0335	USEPA 2010
		0.0003	USEPA 2010
		0.0016	USEPA 2010
	Fiddler Crab (*Uca* sp.)	14.2575	USEPA 2010
	Dibenz(a,h)anthracene Statistics: 90th Percentile BSAF (wet weight)	0.1877	
	Median BSAF (wet weight)	0.0335	
Fluoranthene	False Quahog (*Pitar morrhuana*)	0.3050	USEPA 2010
		2.4013	USEPA 2010
		0.5225	USEPA 2010
		0.5669	USEPA 2010
		0.1455	USEPA 2010
		0.8004	USEPA 2010
		0.3072	USEPA 2010
		0.6089	USEPA 2010
		0.3462	USEPA 2010
		0.3186	USEPA 2010
		0.0441	USEPA 2010
		0.1877	USEPA 2010
		0.0421	USEPA 2010
		0.0472	USEPA 2010
		0.0342	USEPA 2010
	Northern Quahog (*Mercenaria mercenaria*)	1.9672	USEPA 2010
		0.0925	USEPA 2010
		0.0570	USEPA 2010
		0.2326	USEPA 2010
		0.2878	USEPA 2010
		0.1482	USEPA 2010
		0.0709	USEPA 2010
		0.1046	USEPA 2010
		0.0602	USEPA 2010
		0.0846	USEPA 2010
		0.0163	USEPA 2010
		0.0714	USEPA 2010
		0.0199	USEPA 2010
		0.0332	USEPA 2010
		0.0730	USEPA 2010
		0.6760	USEPA 2010

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Chemical	Organism	BSAF (wet weight)	Reference
PAHs:			
Fluoranthene (continued)	Northern Quahog (Mercenaria mercenaria) (continued)	0.0178	USEPA 2010
		0.0719	USEPA 2010
		0.0132	USEPA 2010
		0.0365	USEPA 2010
	Blue Mussel (*Mytilus edulis*)	0.6400	USEPA 2010
		1.7373	USEPA 2010
		0.1978	USEPA 2010
		0.0323	USEPA 2010
		0.0842	USEPA 2010
		0.5312	USEPA 2010
		0.7834	USEPA 2010
		0.3955	USEPA 2010
		0.7712	USEPA 2010
		1.3857	USEPA 2010
		0.0825	USEPA 2010
		0.2052	USEPA 2010
		0.1899	USEPA 2010
		0.4089	USEPA 2010
		0.4969	USEPA 2010
		0.0012	USEPA 2010
		0.0005	USEPA 2010
		0.0012	USEPA 2010
		0.0004	USEPA 2010
		0.0019	USEPA 2010
		0.0085	USEPA 2010
		0.0116	USEPA 2010
		0.2727	USEPA 2010
		0.0320	USACE 2010
		0.1020	USACE 2010
	Bent-Nosed Clam (*Macoma nasuta*)	0.0230	USACE 2010
		0.0410	USACE 2010
		0.0930	USACE 2010
		0.0950	USACE 2010
		0.0090	USACE 2010
		0.2077	USEPA 2010
		0.1252	USEPA 2010
		0.1408	USEPA 2010
	Brackish Water Clam (*Rangia cuneata*)	4.5359	USEPA 2010
		0.6175	USEPA 2010
	Unidentified Crayfish	0.0014	USEPA 2010
		0.0029	USEPA 2010
		0.0095	USEPA 2010
		0.0888	USEPA 2010
	Fiddler Crab (*Uca* sp.)	2.4521	USEPA 2010
		0.2095	USEPA 2010
		2.7526	USEPA 2010
	Fluoranthene Statistics: 90th Percentile BSAF (wet weight)	0.7902	
	Median BSAF (wet weight)	0.1020	

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Chemical	Organism	BSAF (wet weight)	Reference
PAHs:			
Fluorene	False Quahog (*Pitar morrhuana*)	0.3233	USEPA 2010
		2.3704	USEPA 2010
		0.5678	USEPA 2010
		1.4454	USEPA 2010
		0.0715	USEPA 2010
		0.8249	USEPA 2010
		0.4195	USEPA 2010
		10.7313	USEPA 2010
		0.3695	USEPA 2010
		0.0496	USEPA 2010
		0.0485	USEPA 2010
	Northern Quahog (*Mercenaria mercenaria*)	1.4886	USEPA 2010
		0.6820	USEPA 2010
		0.3457	USEPA 2010
		0.1157	USEPA 2010
	Northern Quahog (*Mercenaria mercenaria*) (continued)	0.1215	USEPA 2010
		0.1755	USEPA 2010
		0.2241	USEPA 2010
		0.2650	USEPA 2010
		0.3997	USEPA 2010
		0.0526	USEPA 2010
		0.0512	USEPA 2010
		0.0070	USEPA 2010
		0.0921	USEPA 2010
		0.0204	USEPA 2010
		0.0212	USEPA 2010
		0.0115	USEPA 2010
		0.0070	USEPA 2010
		0.0532	USEPA 2010
		0.0478	USEPA 2010
	Blue Mussel (*Mytilus edulis*)	0.2654	USEPA 2010
		2.3978	USEPA 2010
		0.1805	USEPA 2010
		0.1791	USEPA 2010
		0.2563	USEPA 2010
		0.1724	USEPA 2010
		0.3697	USEPA 2010
		0.5901	USEPA 2010
		0.6499	USEPA 2010
		7.1530	USEPA 2010
		0.0410	USEPA 2010
		0.1461	USEPA 2010
		0.1660	USEPA 2010
		0.3361	USEPA 2010
		0.2292	USEPA 2010
		0.0023	USEPA 2010
		0.0019	USEPA 2010
		0.0045	USEPA 2010
		0.0005	USEPA 2010

TABLE 6-4

LITERATURE-BASED BIOTA-SEDIMENT ACCUMULATION FACTORS USED TO DERIVE SEDIMENT-TO-INVERTEBRATE BIOACCUMULATION FACTORS
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Chemical	Organism	BSAF (wet weight)	Reference
PAHs:			
Fluorene (continued)	Blue Mussel (Mytilus edulis) (continued)	0.0048	USEPA 2010
		0.0275	USEPA 2010
		0.0123	USEPA 2010
		0.4877	USEPA 2010
	Unidentified Crayfish	0.0014	USEPA 2010
		0.0360	USEPA 2010
		0.0547	USEPA 2010
	Fluorene Statistics: 90th Percentile BSAF (wet weight)	1.1352	
	Median BSAF (wet weight)	0.1692	
Indeno(1,2,3-cd)pyrene	False Quahog (*Pitar morrhuana*)	0.0731	USEPA 2010
		0.0889	USEPA 2010
		0.0877	USEPA 2010
		0.1276	USEPA 2010
		0.1102	USEPA 2010
		0.1028	USEPA 2010
		0.0327	USEPA 2010
		0.0202	USEPA 2010
		0.0166	USEPA 2010
	Northern Quahog (*Mercenaria mercenaria*)	0.0220	USEPA 2010
		0.0322	USEPA 2010
		0.0407	USEPA 2010
		0.0278	USEPA 2010
		0.0344	USEPA 2010
		0.0354	USEPA 2010
		0.0373	USEPA 2010
		0.0118	USEPA 2010
		0.0123	USEPA 2010
		0.0059	USEPA 2010
		0.0114	USEPA 2010
		0.0023	USEPA 2010
		0.0354	USEPA 2010
	Blue Mussel (*Mytilus edulis*)	0.0839	USEPA 2010
		0.3942	USEPA 2010
		0.0219	USEPA 2010
		0.1608	USEPA 2010
		0.0303	USEPA 2010
		0.1129	USEPA 2010
		0.6638	USEPA 2010
		0.0178	USEPA 2010
		0.0430	USEPA 2010
		0.0314	USEPA 2010
		0.0548	USEPA 2010
		0.0604	USEPA 2010
		0.0018	USEPA 2010
		0.0005	USEPA 2010
		0.0001	USEPA 2010
		0.0007	USEPA 2010
		0.0001	USEPA 2010

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Chemical	Organism	BSAF (wet weight)	Reference
PAHs:			
Indeno(1,2,3-cd)pyrene (continued)	Blue Mussel (*Mytilus edulis*) (continued)	0.0007	USEPA 2010
		0.0026	USEPA 2010
		0.0670	USEPA 2010
		0.8390	USACE 2010
		0.8270	USACE 2010
		0.0110	USACE 2010
		0.0260	USACE 2010
	Bent-Nosed Clam (*Macoma nasuta*)	0.0210	USACE 2010
		0.0250	USACE 2010
		0.0070	USACE 2010
	Brackish Water Clam (*Rangia cuneata*)	19.5522	USEPA 2010
		4.0446	USEPA 2010
	Fiddler Crab (*Uca* sp.)	11.4025	USEPA 2010
		1.3748	USEPA 2010
		9.0442	USEPA 2010
	Indeno(1,2,3-cd)pyrene Statistics: 90th Percentile BSAF (wet weight)	0.8354	
	Median BSAF (wet weight)	0.0336	
Naphthalene	False Quahog (*Pitar morrhuana*)	0.7531	USEPA 2010
		0.5388	USEPA 2010
	Northern Quahog (*Mercenaria mercenaria*)	0.4400	USEPA 2010
		1.3412	USEPA 2010
		0.4154	USEPA 2010
		0.2182	USEPA 2010
		1.3221	USEPA 2010
	Blue Mussel (*Mytilus edulis*)	1.5619	USEPA 2010
		3.1543	USEPA 2010
		0.1713	USEPA 2010
		0.7555	USEPA 2010
		1.2388	USEPA 2010
		0.0369	USEPA 2010
		0.0949	USEPA 2010
		0.0805	USEPA 2010
		0.2660	USEPA 2010
		0.2862	USEPA 2010
		0.1906	USEPA 2010
		0.0046	USEPA 2010
		0.0046	USEPA 2010
		0.0900	USACE 2010
		0.1210	USACE 2010
		0.0790	USACE 2010
		0.0710	USACE 2010
	Bent-Nosed Clam (*Macoma nasuta*)	1.0600	USACE 2010
		0.4750	USACE 2010
		0.0440	USACE 2010
		0.0350	USACE 2010

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Chemical	Organism	BSAF (wet weight)	Reference
PAHs:			
Naphthalene (continued)	Unidentified Crayfish	0.0519	USEPA 2010
		0.0004	USEPA 2010
		0.0112	USEPA 2010
	Naphthalene Statistics: 90th Percentile BSAF (wet weight)	1.3221	
	Median BSAF (wet weight)	0.1906	
Phenanthrene	False Quahog (*Pitar morrhuana*)	0.2753	USEPA 2010
		1.9196	USEPA 2010
		0.3340	USEPA 2010
		0.6550	USEPA 2010
		0.1054	USEPA 2010
		0.3081	USEPA 2010
		0.2284	USEPA 2010
		0.1500	USEPA 2010
		0.1540	USEPA 2010
		0.1646	USEPA 2010
		0.3543	USEPA 2010
		0.2201	USEPA 2010
		0.0413	USEPA 2010
		0.0525	USEPA 2010
		0.0202	USEPA 2010
	Northern Quahog (*Mercenaria mercenaria*)	1.5031	USEPA 2010
		0.2465	USEPA 2010
		0.0572	USEPA 2010
		0.0419	USEPA 2010
		0.1137	USEPA 2010
		0.1174	USEPA 2010
		0.1191	USEPA 2010
		0.0401	USEPA 2010
		0.0718	USEPA 2010
		0.0308	USEPA 2010
		0.0409	USEPA 2010
		0.0044	USEPA 2010
	Northern Quahog (*Mercenaria mercenaria*) (continued)	0.0501	USEPA 2010
		0.0098	USEPA 2010
		0.0158	USEPA 2010
		0.0930	USEPA 2010
		0.0082	USEPA 2010
		0.0042	USEPA 2010
		0.0290	USEPA 2010
	Blue Mussel (*Mytilus edulis*)	0.2205	USEPA 2010
		1.3525	USEPA 2010
		0.1336	USEPA 2010
		0.0466	USEPA 2010
		0.0734	USEPA 2010
		0.1991	USEPA 2010
		0.4570	USEPA 2010
		0.3817	USEPA 2010
		0.6770	USEPA 2010

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Chemical	Organism	BSAF (wet weight)	Reference
PAHs:			
Phenanthrene (continued)	Blue Mussel *(Mytilus edulis)* (continued)	1.6889	USEPA 2010
		0.0405	USEPA 2010
		0.0907	USEPA 2010
		0.1265	USEPA 2010
		0.2125	USEPA 2010
		0.1642	USEPA 2010
		0.0006	USEPA 2010
		0.0002	USEPA 2010
		0.0007	USEPA 2010
		0.0002	USEPA 2010
		0.0006	USEPA 2010
		0.0054	USEPA 2010
		0.2242	USEPA 2010
		0.0058	USEPA 2010
		0.0070	USACE 2010
		0.0180	USACE 2010
	Bent-Nosed Clam (*Macoma nasuta*)	0.1140	USACE 2010
		0.0600	USACE 2010
		0.0470	USACE 2010
		0.0440	USACE 2010
	Brackish Water Clam (*Rangia cuneata*)	8.8610	USEPA 2010
		1.6997	USEPA 2010
	Fiddler Crab (*Uca* sp.)	3.4472	USEPA 2010
		0.5813	USEPA 2010
		3.9180	USEPA 2010
	Unidentified Crayfish	0.0010	USEPA 2010
		0.0062	USEPA 2010
		0.0239	USEPA 2010
	Phenanthrene Statistics: 90th Percentile BSAF (wet weight)	1.3525	
	Median BSAF (wet weight)	0.0930	
Pyrene	False Quahog (*Pitar morrhuana*)	0.2678	USEPA 2010
		2.1318	USEPA 2010
		0.3483	USEPA 2010
		0.4560	USEPA 2010
		0.1308	USEPA 2010
		0.6378	USEPA 2010
		0.2157	USEPA 2010
		0.0366	USEPA 2010
		0.0356	USEPA 2010
		0.0234	USEPA 2010
		0.3766	USEPA 2010
		0.3173	USEPA 2010
		0.2377	USEPA 2010
		0.2763	USEPA 2010
		0.2747	USEPA 2010
	Northern Quahog (*Mercenaria mercenaria*)	1.6478	USEPA 2010
		0.2613	USEPA 2010
		0.1493	USEPA 2010

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LITERATURE-BASED BIOTA-SEDIMENT ACCUMULATION FACTORS USED TO DERIVE SEDIMENT-TO-INVERTEBRATE BIOACCUMULATION FACTORS
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Chemical	Organism	BSAF (wet weight)	Reference
PAHs:			
Pyrene (continued)	Northern Quahog *(Mercenaria mercenaria)* (continued)	0.0628	USEPA 2010
		0.0903	USEPA 2010
		0.0517	USEPA 2010
		0.0607	USEPA 2010
		0.0140	USEPA 2010
		0.0480	USEPA 2010
		0.0200	USEPA 2010
		0.0301	USEPA 2010
		0.0624	USEPA 2010
		0.0162	USEPA 2010
		0.0110	USEPA 2010
		0.0555	USEPA 2010
		0.4934	USEPA 2010
		0.0310	USEPA 2010
		0.0935	USEPA 2010
		0.0603	USEPA 2010
		0.1758	USEPA 2010
	Blue Mussel (*Mytilus edulis*)	1.4573	USEPA 2010
		0.1150	USEPA 2010
		0.0163	USEPA 2010
		0.0646	USEPA 2010
		0.3914	USEPA 2010
		0.2275	USEPA 2010
		0.1992	USEPA 2010
		0.4155	USEPA 2010
		0.6368	USEPA 2010
		0.0606	USEPA 2010
		0.1156	USEPA 2010
		0.0816	USEPA 2010
		0.1549	USEPA 2010
		0.1978	USEPA 2010
		0.3675	USEPA 2010
		0.0012	USEPA 2010
		0.0004	USEPA 2010
		0.0010	USEPA 2010
		0.0004	USEPA 2010
		0.0017	USEPA 2010
		0.0105	USEPA 2010
		0.2093	USEPA 2010
		0.0068	USEPA 2010
		0.0120	USACE 2010
		0.0280	USACE 2010
		0.0300	USACE 2010
		0.1310	USACE 2010
	Bent-Nosed Clam (*Macoma nasuta*)	0.2304	USEPA 2010
		0.2362	USEPA 2010
		0.1935	USEPA 2010
		0.0220	USACE 2010

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LITERATURE-BASED BIOTA-SEDIMENT ACCUMULATION FACTORS USED TO DERIVE SEDIMENT-TO-INVERTEBRATE BIOACCUMULATION FACTORS
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Chemical	Organism	BSAF (wet weight)	Reference
PAHs:			
Pyrene (continued)	Bent-Nosed Clam (*Macoma nasuta*) (continued)	0.0420	USACE 2010
		0.0890	USACE 2010
		0.0960	USACE 2010
	Brackish Water Clam (*Rangia cuneata*)	3.3315	USEPA 2010
		0.3575	USEPA 2010
	Amphipod (*Diporeia* spp.)	0.2200	USACE 2010
		0.2700	USACE 2010
		0.3700	USACE 2010
		0.1600	USACE 2010
	Amphipod (*Diporeia* spp.) (continued)	1.5700	USACE 2010
		0.4100	USACE 2010
		1.6200	USACE 2010
	Unidentified Crayfish	0.0026	USEPA 2010
		0.0089	USEPA 2010
	Oligochaete (*Lumbriculus variegatus*)	0.5200	USACE 2010
		0.2900	USACE 2010
		0.7400	USACE 2010
		0.2900	USACE 2010
		1.3400	USACE 2010
		0.6600	USACE 2010
		2.0300	USACE 2010
	Fiddler Crab (*Uca* sp.)	0.1214	USEPA 2010
		2.4118	USEPA 2010
		1.0059	USEPA 2010
		0.4353	USEPA 2010
	Unidentified Penaeid Shrimp	0.0012	USEPA 2010
	Pyrene Statistics: 90th Percentile BSAF (wet weight)	1.0059	
	Median BSAF (wet weight)	0.1575	
Semivolatile Organics:			
1,1-Biphenyl	False Quahog (*Pitar morrhuana*)	1.3216	USEPA 2010
		1.8343	USEPA 2010
		0.0493	USEPA 2010
	Northern Quahog (*Mercenaria mercenaria*)	0.1294	USEPA 2010
		0.4500	USEPA 2010
		0.9911	USEPA 2010
		0.4154	USEPA 2010
		0.4100	USEPA 2010
		0.1248	USEPA 2010
		0.5068	USEPA 2010
		0.0386	USEPA 2010
		0.0215	USEPA 2010
		0.0664	USEPA 2010
		0.1684	USEPA 2010
		0.0342	USEPA 2010
		0.0624	USEPA 2010
		0.0755	USEPA 2010

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LITERATURE-BASED BIOTA-SEDIMENT ACCUMULATION FACTORS USED TO DERIVE SEDIMENT-TO-INVERTEBRATE BIOACCUMULATION FACTORS
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Chemical	Organism	BSAF (wet weight)	Reference
Semivolatile Organics:			
1,1-Biphenyl (continued)	Blue Mussel (*Mytilus edulis*)	0.5940	USEPA 2010
		0.4844	USEPA 2010
		1.1577	USEPA 2010
		1.3683	USEPA 2010
		0.0785	USEPA 2010
		0.0829	USEPA 2010
		0.0671	USEPA 2010
		0.4675	USEPA 2010
		0.5811	USEPA 2010
		0.1685	USEPA 2010
	Blue Mussel *(Mytilus edulis)* (continued)	0.0104	USEPA 2010
		0.0278	USEPA 2010
		0.0057	USEPA 2010
		0.4804	USEPA 2010
		0.0086	USEPA 2010
		0.0161	USEPA 2010
	1,1-Biphenyl Statistics: 90th Percentile BSAF (wet weight)	1.1244	
	Median BSAF (wet weight)	0.1294	
Hexachlorobenzene	Blue Mussel (*Mytilus edulis*)	0.7313	USEPA 2010
		0.3029	USEPA 2010
		0.0800	USEPA 2010
		0.1837	USEPA 2010
		0.1154	USEPA 2010
		3.3973	USEPA 2010
		1.3486	USEPA 2010
	Bent-Nosed Clam (*Macoma nasuta)*	1.9700	USACE 2010
	Northern Quahog (Mercenaria mercenaria)	0.7369	USEPA 2010
		9.1426	USEPA 2010
		4.6511	USEPA 2010
		0.9457	USEPA 2010
	False Quahog (Pitar morrhuana)	12.2301	USEPA 2010
		0.3128	USEPA 2010
	Mediterranean Mussel (*Mytilus galloprovincialis*)	0.6410	USACE 2010
	Hexachlorobenzene Statistics: 90th Percentile BSAF (wet weight)	7.3460	
	Median BSAF (wet weight)	0.7369	
Bis(2-ethylexyl)phthalate	Unidentified Crayfish	0.8100	USEPA 2010
		13.9641	USEPA 2010
		8.4739	USEPA 2010
	Bis (2-ethylhexyl)phthalate Statistics: 90th Percentile BSAF (wet weight)	12.8661	
	Median BSAF (wet weight)	8.4739	

TABLE 6-5

PERCENT LIPID CONTENT OF AQUATIC INVERTEBRATES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A
OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Organism [(1)]	**Percent Lipid (wet weight)** [(2)]	**Reference**
Amphipod (*Diporeia* spp.)	7.73 [(3)]	USACE 2010
Amphipod (*Hyalella azteca*)	1.265 [(3)]	USACE 2010
Crayfish (*Orconectes* spp.)	0.86	USACE 2010
Crayfish (*Procambarus* spp.)	2.985 [(3)]	USACE 2010
Mysid shrimp (*Antarctomysis ohlinii*)	3.2	USACE 2010
Copepod (*Calanoides acutus*)	10.6	USACE 2010
Asian paddle crab (*Charybdis japonica*)	1.9	USACE 2010
Burrowing crab (*Chasmagnathus granulata*)	4.118 [(3)]	USACE 2010
Amphipod (*Corophium colo*)	0.54 [(3)]	USACE 2010
Amphipod (*Corophium volutator*)	0.81 [(3)]	USACE 2010
Amphipod (*Cyphocaris richardii*)	6.6	USACE 2010
Krill (*Euphausia superba*)	5.675	USACE 2010
Amphipod (*Eurythenes gryllus*)	13.8	USACE 2010

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PERCENT LIPID CONTENT OF AQUATIC INVERTEBRATES
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SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A
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NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Organism [(1)]	**Percent Lipid (wet weight)** [(2)]	**Reference**
Amphipod (*Eusirus propaperdentatus*)	5.1	USACE 2010
Amphipod (*Leptocheirus plumulosus*)	1.21	USACE 2010
Indian brown shrimp (*Metapenaeus affinis*)	1.637 [(3)]	USACE 2010
Greasy-back shrimp (*Metapenaeus ensis*)	1.755 [(3)]	USACE 2010
Copepod (*Metridia gerlachei*)	5.0	USACE 2010
Mantis shrimp (*Oratosquilla oratoria*)	2.22 [(3)]	USACE 2010
Daggerblade grass shrimp (*Palaemonetes pugio*)	1.7	USACE 2010
Amphipod (*Parandania boecki*)	4.6	USACE 2010
Arrow worm (*Pseudosagitta gazellae*)	4.1	USACE 2010
Copepod (*Rhincalanus gigas*)	1.9	USACE 2010
Chinese marsh crab (*Sesarma denaani*)	3.87 [(3)]	USACE 2010
Krill (*Thysanoessa macrura*)	4.1	USACE 2010
Asian clam (*Corbicula fluminea*)	2.11 [(3)]	USACE 2010

TABLE 6-5

PERCENT LIPID CONTENT OF AQUATIC INVERTEBRATES
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SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A
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Organism [(1)]	**Percent Lipid (wet weight)** [(2)]	**Reference**
Asian clam (*Corbicula manilensis*)	1.504	USACE 2010
Asian clam (*Corbicula* spp.)	1.25	USACE 2010
Zebra mussel (*Dreissena polymorpha*)	2.37 [(3)]	USACE 2010
Clam (*Dreissena* spp.)	1.22	USACE 2010
Fatmucket (*Lampsilis siliquoidea*)	0.249 [(3)]	USACE 2010
Eastern oyster (*Crassostrea virginica*)	0.618 [(3)]	USACE 2010
Japanese cockle (*Fulvia mutica*)	0.5	USACE 2010
Bent nosed clam (*Macoma nasuta*)	1.663 [(3)]	USACE 2010
Hard clam (*Mercenaria* spp.)	0.88	USACE 2010
Blue muscle (*Mytilus edulis*)	3.634 [(3)]	USACE 2010
Asian clam (*Potamocorbula amurensis*)	0.40 [(3)]	USACE 2010
Razor clam (*Sinonovacula constricta*)	1.75 [(3)]	USACE 2010
Japanese littleneck clam (*Venerupis philippinarum*)	0.80 [(3)]	USACE 2010

TABLE 6-5

PERCENT LIPID CONTENT OF AQUATIC INVERTEBRATES
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SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A
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NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Organism [1]	**Percent Lipid (wet weight)** [2]	**Reference**
Oligochaete (*Limnodrilus hoffmeisteri*)	13.0	USACE 2010
Oligochaete (*Lumbriculus variegatus*)	0.951 [3]	USACE 2010
Polychaete (*Abarenicola pacifica*)	20.9	USACE 2010
Milky ribbon worm (*Cerebratulus lacteus*)	3.696	USACE 2010
Polychaete (*Leitoscoloplos fragilis*)	1.52 [3]	USACE 2010
Polychaete (*Marenzelleria viridis*)	1.39 [3]	USACE 2010
Polychaete (*Nephtys* spp.)	2.86	USACE 2010
Polychaete (*Nereis diversicolor*)	1.29 [3]	USACE 2010

Notes:

USACE - U.S. Army Corps of Engineers

[1] The organisms listed include freshwater and marine species.
[2] Arithmetic average of the listed percent lipid data was used to convert biota-sediment accumulation factors to bioaccumulation factors (arithmetic average = 3.44 percent).
[3] The value shown represents an average of two or more percent lipid values.

Table References:

United States Army Corps of Engineers (USACE). 2010. BSAF Database. USACE Engineer Research and Development Center. http://el.erdc.usace.army.mil/bsaf/bsaf.html.

TABLE 6-6

LITERATURE-BASED BIOTA-SEDIMENT ACCUMULATION FACTORS USED TO DERIVE SEDIMENT-TO-FISH BIOACCUMULATION FACTORS
SWMU 9 - AREA B, TANK 214 AREA
SERA AND STEP 3A OF THE BERA REPORT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Organism	BSAF (wet weight)	Reference	90th Percentile BSAF (wet weight)	Median BSAF (wet weight)
PAHs:					
2-Methylnaphthalene	American eel (*Anguilla rostrata*)	0.0284	USEPA 2010	0.1823	0.0788
		0.0109	USEPA 2010		
		0.0518	USEPA 2010		
	White sucker (*Catostomus commersoni*)	0.0721	USEPA 2010		
		0.0832	USEPA 2010		
		0.0703	USEPA 2010		
		0.0743	USEPA 2010		
		0.0267	USEPA 2010		
		0.1031	USEPA 2010		
		0.1190	USEPA 2010		
		0.0895	USEPA 2010		
	Killifish (*Fundulus* sp.)	0.9717	USEPA 2010		
		0.1935	USEPA 2010		
	Largemouth bass (*Micropterus salmoides*)	0.1561	USEPA 2010		
Acenaphthene	American eel (*Anguilla rostrata*)	0.0293	USEPA 2010	0.0428	0.0351
		0.0048	USEPA 2010		
		0.0145	USEPA 2010		
	White sucker (*Catostomus commersoni*)	0.0365	USEPA 2010		
		0.0428	USEPA 2010		
		0.0417	USEPA 2010		
		0.0602	USEPA 2010		
		0.0089	USEPA 2010		
		0.0306	USEPA 2010		
		0.0401	USEPA 2010		
		0.0351	USEPA 2010		
Acenaphthylene	American eel (*Anguilla rostrata*)	0.0037	USEPA 2010	0.0266	0.0138
		0.0024	USEPA 2010		
		0.0003	USEPA 2010		
	White sucker (*Catostomus commersoni*)	0.0150	USEPA 2010		
		0.0149	USEPA 2010		
		0.0136	USEPA 2010		
		0.0138	USEPA 2010		
		0.0085	USEPA 2010		
		0.0266	USEPA 2010		
		0.0287	USEPA 2010		
		0.0244	USEPA 2010		

TABLE 6-6

LITERATURE-BASED BIOTA-SEDIMENT ACCUMULATION FACTORS USED TO DERIVE SEDIMENT-TO-FISH BIOACCUMULATION FACTORS
SWMU 9 - AREA B, TANK 214 AREA
SERA AND STEP 3A OF THE BERA REPORT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Organism	BSAF (wet weight)	Reference	90th Percentile BSAF (wet weight)	Median BSAF (wet weight)
PAHs:					
Anthracene	American eel (*Anguilla rostrata*)	0.0031	USEPA 2010	0.0131	0.0084
		0.0008	USEPA 2010		
		0.0002	USEPA 2010		
	White sucker (*Catostomus commersoni*)	0.0119	USEPA 2010		
		0.0106	USEPA 2010		
		0.0099	USEPA 2010		
		0.0105	USEPA 2010		
		0.0032	USEPA 2010		
		0.0139	USEPA 2010		
		0.0109	USEPA 2010		
		0.0148	USEPA 2010		
	Largemouth bass (*Micropterus salmoides*)	0.0072	USEPA 2010		
		0.0062	USEPA 2010		
	Mummichog (*Fundulus heteroclitus*)	0.0084	USEPA 2010		
	Cunner (*Tautogolabrus adspersus*)	0.0061	USEPA 2010		
Benzo(a)anthracene	White sucker (*Catostomus commersoni*)	0.0021	USEPA 2010	0.0310	0.0024
		0.0040	USEPA 2010		
		0.0029	USEPA 2010		
		0.0026	USEPA 2010		
		0.0003	USEPA 2010		
		0.0014	USEPA 2010		
		0.0009	USEPA 2010		
	Killifish (*Fundulus* sp.)	0.0941	USEPA 2010		
Benzo(a)pyrene	White sucker (*Catostomus commersoni*)	0.0018	USEPA 2010	0.00353	0.0021
		0.0023	USEPA 2010		
		0.0040	USEPA 2010		
		0.0002	USEPA 2010		
Benzo(b)fluoranthene	White sucker (*Catostomus commersoni*)	0.0043	USEPA 2010	0.00395	0.0025
		0.0034	USEPA 2010		
		0.0019	USEPA 2010		
		0.0025	USEPA 2010		
		0.0002	USEPA 2010		

TABLE 6-6

LITERATURE-BASED BIOTA-SEDIMENT ACCUMULATION FACTORS USED TO DERIVE SEDIMENT-TO-FISH BIOACCUMULATION FACTORS
SWMU 9 - AREA B, TANK 214 AREA
SERA AND STEP 3A OF THE BERA REPORT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Organism	BSAF (wet weight)	Reference	90th Percentile BSAF (wet weight)	Median BSAF (wet weight)
PAHs:					
Benzo(g,h,i)perylene	White sucker (*Catostomus commersoni*)	0.0040	USEPA 2010	0.0567	0.0040
		0.0012	USEPA 2010		
		0.0699	USEPA 2010		
Benzo(k)fluoranthene	White sucker (*Catostomus commersoni*)	0.0018	USEPA 2010	0.0036	0.0024
		0.0024	USEPA 2010		
		0.0030	USEPA 2010		
		0.0041	USEPA 2010		
		0.0002	USEPA 2010		
Chrysene	White sucker (*Catostomus commersoni*)	0.0046	USEPA 2010	0.0223	0.0027
		0.0029	USEPA 2010		
		0.0024	USEPA 2010		
		0.0034	USEPA 2010		
		0.0003	USEPA 2010		
		0.0010	USEPA 2010		
		0.0017	USEPA 2010		
		0.0636	USEPA 2010		
Dibenzo(a,h)anthracene	White sucker (*Catostomus commersoni*)	0.0022	USEPA 2010	0.0036	0.0022
		0.0014	USEPA 2010		
		0.0027	USEPA 2010		
		0.0043	USEPA 2010		
		0.0003	USEPA 2010		
Fluoranthene	American eel (*Anguilla rostrata*)	0.0011	USEPA 2010	0.0096	0.0029
		0.0003	USEPA 2010		
		0.0001	USEPA 2010		
	White sucker (*Catostomus commersoni*)	0.0045	USEPA 2010		
		0.0048	USEPA 2010		
		0.0065	USEPA 2010		
		0.0040	USEPA 2010		
		0.0007	USEPA 2010		
		0.0027	USEPA 2010		
		0.0035	USEPA 2010		
		0.0026	USEPA 2010		
	Cunner (*Tautogolabrus adspersus*)	0.0117	USEPA 2010		
		0.0029	USEPA 2010		
		0.0001	USEPA 2010		
	Killifish (*Fundulus* sp.)	0.0383	USEPA 2010		

TABLE 6-6

LITERATURE-BASED BIOTA-SEDIMENT ACCUMULATION FACTORS USED TO DERIVE SEDIMENT-TO-FISH BIOACCUMULATION FACTORS
SWMU 9 - AREA B, TANK 214 AREA
SERA AND STEP 3A OF THE BERA REPORT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Organism	BSAF (wet weight)	Reference	90th Percentile BSAF (wet weight)	Median BSAF (wet weight)
PAHs:					
Indeno(1,2,3-cd)pyrene	White sucker (*Catostomus commersoni*)	0.0043	USEPA 2010	0.0400	0.0025
		0.0020	USEPA 2010		
		0.0013	USEPA 2010		
		0.0029	USEPA 2010		
		0.0002	USEPA 2010		
	Killifish (*Fundulus* sp.)	0.0756	USEPA 2010		
Fluorene	American eel (*Anguilla rostrata*)	0.0063	USEPA 2010	0.1244	0.0237
		0.0016	USEPA 2010		
		0.0006	USEPA 2010		
		0.0039	USEPA 2010		
	White sucker (*Catostomus commersoni*)	0.0415	USEPA 2010		
		0.0238	USEPA 2010		
		0.0236	USEPA 2010		
		0.0225	USEPA 2010		
		0.0081	USEPA 2010		
		0.0324	USEPA 2010		
		0.0280	USEPA 2010		
		0.0280	USEPA 2010		
	Largemouth bass (*Micropterus salmoides*)	0.0302	USEPA 2010		
		0.0189	USEPA 2010		
	Mummichog (*Fundulus heteroclitus*)	0.5256	USEPA 2010		
	Cunner (*Tautogolabrus adspersus*)	0.2073	USEPA 2010		

TABLE 6-6

LITERATURE-BASED BIOTA-SEDIMENT ACCUMULATION FACTORS USED TO DERIVE SEDIMENT-TO-FISH BIOACCUMULATION FACTORS
SWMU 9 - AREA B, TANK 214 AREA
SERA AND STEP 3A OF THE BERA REPORT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Organism	BSAF (wet weight)	Reference	90th Percentile BSAF (wet weight)	Median BSAF (wet weight)
PAHs:					
Naphthalene	American eel (*Anguilla rostrata*)	0.0265	USEPA 2010	0.2517	0.0408
		0.0123	USEPA 2010		
	White sucker (*Catostomus commersoni*)	0.0408	USEPA 2010		
		0.0430	USEPA 2010		
		0.0428	USEPA 2010		
		0.0387	USEPA 2010		
		0.0170	USEPA 2010		
	Killifish (*Fundulus* sp.)	0.8125	USEPA 2010		
		0.1575	USEPA 2010		
		0.0366	USEPA 2010		
	White perch (*Morone americana*)	0.2517	USEPA 2010		
Pyrene	White sucker (*Catostomus commersoni*)	0.0022	USEPA 2010	0.0462	0.0034
		0.0027	USEPA 2010		
		0.0041	USEPA 2010		
		0.0026	USEPA 2010		
		0.0003	USEPA 2010		
	Mummichog (*Fundulus heteroclitus*)	0.0387	USEPA 2010		
	Cunner (*Tautogolabrus adspersus*)	0.0122	USEPA 2010		
	Killifish (*Fundulus* sp.)	0.0638	USEPA 2010		

TABLE 6-6

LITERATURE-BASED BIOTA-SEDIMENT ACCUMULATION FACTORS USED TO DERIVE SEDIMENT-TO-FISH BIOACCUMULATION FACTORS
SWMU 9 - AREA B, TANK 214 AREA
SERA AND STEP 3A OF THE BERA REPORT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Organism	BSAF (wet weight)	Reference	90th Percentile BSAF (wet weight)	Median BSAF (wet weight)
PAHs:					
Phenanthrene	American eel (*Anguilla rostrata*)	0.0027	USEPA 2010	0.0625	0.0083
		0.0006	USEPA 2010		
		0.0002	USEPA 2010		
	White sucker (*Catostomus commersoni*)	0.0055	USEPA 2010		
		0.0109	USEPA 2010		
		0.0068	USEPA 2010		
		0.0072	USEPA 2010		
		0.0016	USEPA 2010		
		0.0083	USEPA 2010		
		0.0099	USEPA 2010		
		0.0085	USEPA 2010		
	Killifish (*Fundulus* sp.)	0.1128	USEPA 2010		
		0.1611	USEPA 2010		
	Cunner (*Tautogolabrus adspersus*)	0.0289	USEPA 2010		
		0.0135	USEPA 2010		
	Largemouth bass (*Micropterus salmoides*)	0.0064	USEPA 2010		
	Mummichog (*Fundulus heteroclitus*)	0.0184	USEPA 2010		
Semivolatile Organics:					
1,1-Biphenyl	White sucker (*Catostomus commersoni*)	0.0138	USEPA 2010	0.06459	0.0384
		0.0642	USEPA 2010		
		0.0681	USEPA 2010		
		0.0582	USEPA 2010		
		0.0337	USEPA 2010		
		0.0357	USEPA 2010		
		0.0347	USEPA 2010		
		0.0410	USEPA 2010		
	Largmouth Bass (*Micropterus salmoides*)	0.0519	USEPA 2010		
	Anerican eel (*Anguilla rostrata*)	0.0106	USEPA 2010		
1,2,4-Trichlorobenzene	Killifish (*Fundulus* sp.)	0.0770	USEPA 2010	0.1752	0.1315
		0.1861	USEPA 2010		

TABLE 6-6

LITERATURE-BASED BIOTA-SEDIMENT ACCUMULATION FACTORS USED TO DERIVE SEDIMENT-TO-FISH BIOACCUMULATION FACTORS
SWMU 9 - AREA B, TANK 214 AREA
SERA AND STEP 3A OF THE BERA REPORT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Organism	BSAF (wet weight)	Reference	90th Percentile BSAF (wet weight)	Median BSAF (wet weight)
Semivolatile Organics:					
1,2-Dichlorobenzene	killifish (*Fundulus* sp.)	0.1119	USEPA 2010	Not Applicable	Not Applicable
1,3-Dichlorobenzene	killifish (*Fundulus* sp.)	0.0202	USEPA 2010	Not Applicable	Not Applicable
1,4-Dichlorobenzene	killifish (*Fundulus* sp.)	0.0136	USEPA 2010	Not Applicable	Not Applicable
Dibenzofuran	American eel (*Anguilla rostrata*)	0.0021	USEPA 2010	0.0357	0.0317
		0.0067	USEPA 2010		
	White sucker (*Catostomus commersoni*)	0.0093	USEPA 2010		
		0.0320	USEPA 2010		
		0.0359	USEPA 2010		
		0.0333	USEPA 2010		
		0.0305	USEPA 2010		
		0.0327	USEPA 2010		
		0.0338	USEPA 2010		
		0.0496	USEPA 2010		
	Largemouth bass (*Micropterus salmoides*)	0.0138	USEPA 2010		
		0.0315	USEPA 2010		
Bis(2-ethylhexyl)phthalate	Killifish (*Fundulus* sp.)	2.8785	USEPA 2010	3.0859	1.1577
		3.2242	USEPA 2010		
		1.1577	USEPA 2010		
	Largescale sucker (*Catostomus macrocheilus*)	0.2988	USEPA 2010		
		0.1175	USEPA 2010		
Hexachlorobenzene	Not reported	0.0900	USEPA 2004	Not Applicable	Not Applicable
Pentachlorobenzene	Not reported	0.0400	USEPA 2004	Not Applicable	Not Applicable

Notes:

BSAF - Biota-Sediment Accumulation Facto
PAH - Polynuclear Aromatic Hydrocarbon
USEPA - U.S. Environmental Protection Agency

Table References:

U.S. Environmental Protection Agency (USEPA). 2010. Biota-Sediment Accumulation Factor (BSAF) Database.http://www.epa.gov/med/Prods_Pubs/bsaf.htm.

USEPA. 2004. The Incidence and Severity of Sediment Contamination in Surface Waters of the United States. National Sediment Quality Survey: Second Editio
EPA-823-R-04-007. November, 2004.

TABLE 6-7

PERCENT LIPID CONTENT OF FISH
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND
STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Organism [1]	Percent Lipid (wet weight) [2]	Reference
Bridgelip sucker (*Catostomus columbianus*)	12.22	USACE 2010
White sucker (*Catostomus commersoni*)	5.995	USACE 2010
Largescale sucker (*Catostomus macrocheilus*)	6.95	USACE 2010
Speckled sanddab (*Citharichthys stigmaeus*)	1.682 [3]	USACE 2010
Paiute sculpin (*Cottus beldingii*)	2.6	USACE 2010
Sculpin (*Cottus* spp.)	5.35	USACE 2010
Common carp (*Cyprinus carpio*)	6.314	USACE 2010
Channel catfish (*Ictalurus punctatus*)	3.3	USACE 2010
Flathead mullet (*Mugil cephalus*)	0.46	USACE 2010
Round goby (*Neogobius melanstomus*)	2.825 [3]	USACE 2010
Silver perch (*Bairdiella chrysoura*)	3.7	USACE 2010
Popeye lampfish (*Bolinichthys longipes*)	4.4	USACE 2010
Dogtooth lampfish (*Ceratoscopelus townsendi*)	8.6 [3]	USACE 2010
California headlightfish (*Diaphus theta*)	7.8 [3]	USACE 2010
Lanternfish (*Electrona antarctica*)	18.9	USACE 2010
Lanternfish (*Electrona carlsbergi*)	11.2	USACE 2010

TABLE 6-7

PERCENT LIPID CONTENT OF FISH
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND
STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Organism [1]	Percent Lipid (wet weight) [2]	Reference
Eastern mosquitofish (*Gambusia holbrooki*)	4.367	USACE 2010
Slendertail lanternfish (*Gonichthys tenuiculus*)	2.6	USACE 2010
Thickhead lanternfish (*Hygophum atratum*)	1.8	USACE 2010
Sunbeam lampfish (*Lampadena urophaos*)	8.9 [3]	USACE 2010
Northern lampfish (*Lampanyctus ingens*)	1.2	USACE 2010
Slimtail lampfish (*Lampanyctus parvicauda*)	12.3	USACE 2010
Pinpoint lanternfish (*Lampanyctus regalis*)	1.7	USACE 2010
Broadfin lampfish (*Lampanyctus ritteri*)	8.85 [3]	USACE 2010
Smallmouth bass (*Micropterus dolomieu*)	1.9	USACE 2010
Lanternfish (*Nannobrachium idostigma*)	5.8	USACE 2010
Patchwork lampfish (*Notoscopelus resplendens*)	5.6	USACE 2010
Columbia River redband trout (*Oncorhynchus mykiss gairdnerii*)	4.203 [3]	USACE 2010
Antarctic silverfish (*Pleuragramma antarcticum*)	4.3	USACE 2010
Japanese ricefish (*Oryzias latipes*)	4.765 [3]	USACE 2010
Rainbow smelt (*Osmerus mordax*)	7.0 [3]	USACE 2010
Fathead minnow (*Pimephales promelas*)	2.05 [3]	USACE 2010

TABLE 6-7

PERCENT LIPID CONTENT OF FISH
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND
STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Organism [(1)]	**Percent Lipid (wet weight)** [(2)]	**Reference**
Guppy (*Poecilia reticulata*)	9.7	USACE 2010
Bluefish (*Pomatomus saltatrix*)	1.8 [(3)]	USACE 2010
Lanternfish (*Protomyctophum bolini*)	8.5	USACE 2010
California flashlightfish (*Protomyctophum crockeri*)	5.2	USACE 2010
Brown trout (*Salmo trutta*)	4.8	USACE 2010
Deepwater lanternfish (*Taaningichthys bathyphilus*)	3.8	USACE 2010
Blue lanternfish (*Tarletonbeania crenularis*)	2.6	USACE 2010
Lake trout (*Salvelinus namaycush*)	13.60 [(3)]	USACE 2010
Pacific blackchin (*Scopelengys tristis*)	3.8	USACE 2010
California lanternfish (*Symbolophorus californiensis*)	5.76 [(3)]	USACE 2010
Mexican lampfish (*Triphoturus mexicanus*)	11.7 [(3)]	USACE 2010
Atlantic herring (*Clupea harengus*)	8.75	USACE 2010

Notes:

USACE - U.S. Army Corp of Engineers

(1) The organisms listed include freshwater and marine species.

(2) Arithmetic average of the listed percent lipid data was used to convert biota-sediment accumulation factors to bioaccumulation factors (arithmetic average - 5.90 percent).

(3) The value shown represents an average of two or more percent lipid values.

Table References:

U.S. Army Corps of Engineers (USACE). 2010. BSAF Database. USACE Engineer Research and Development Center. http://el.erdc.usace.army.mil/bsaf/bsaf.html.

TABLE 6-8

EXPOSURE PARAMETERS FOR UPPER TROPHIC LEVEL RECEPTORS: STEP 2 SCREENING LEVEL RISK CALCULATION
SWMU 9 – AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Receptor	Habitat	Body Weight (kg)		Food Ingestion Rate (kg/day - dry)		Area Use Factor
		Value	Reference	Value	Reference	
Birds:						
American robin	Terrestrial	0.056 (1)	Dunning 2008	0.01503	Allometric equation from Nagy (2001) for insectivorous birds(8): $[0.540((BW*1000)^{0.705})]/1000$	1.00
Mourning dove	Terrestrial	0.115 (2)	Dunning 2008	0.01723	Allometric equation from Nagy (2001) for all birds(8): $[0.638((BW*1000)^{0.685})]/1000$	1.00
Red-tailed hawk	Terrestrial	0.923 (3)	Dunning 2008	0.09679	Allometric equation from Nagy (2001) for carnivorous birds(8): $[0.849((BW*1000)^{0.663})]/1000$	1.00
Green heron	Aquatic	0.138 (4)	Dunning 2008	0.02567	Allometric equation from Nagy (2001) for all birds(8): $[0.638((BW*1000)^{0.685})]/1000$	1.00
Spotted sandpiper	Aquatic	0.0294 (5)	Dunning 2008	0.01052	Allometric equation from Nagy (2001) for all birds(8): $[0.638((BW*1000)^{0.685})]/1000$	1.00

TABLE 6-8

EXPOSURE PARAMETERS FOR UPPER TROPHIC LEVEL RECEPTORS: STEP 2 SCREENING LEVEL RISK CALCULATION
SWMU 9 – AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Receptor	Habitat	Body Weight (kg)		Food Ingestion Rate (kg/day - dry)		Area Use Factor
		Value	Reference	Value	Reference	
Mammals:						
Brown flower bat	Terrestrial	0.016 [6]	Gannon et al. 2005	0.00277	Allometric equation from Nagy (2001) for bats[9]: $[0.365((BW*1000)^{0.671})]/1000$	1.00
Norway rat (prey item for red-tailed hawk)	Terrestrial	0.200 [7]	Jackson 1992	0.04075	Allometric equation from Nagy (2001) for rodents[10]: $[0.332((BW*1000)^{0.774})]/1000$	1.00

Notes:

BW = Body Weight
kg = kilogram
kg/day - dry = kilogram per day - dry weight basis
L/day = liter per day
USEPA = United States Environmental Protection Agency

(1) Minimum body weight for males and females from the western United States (n = 255).
(2) Minimum mean body weight for females in Illinois (n = 95)
(3) Minimum mean body weight for males from the western United States (n = 26)
(4) Minimum body weight for males and femals in the Caribbean (n = 70)
(5) Minimum body weight for unknown gender in Pennsylvania (n = 56)
(6) Minimum body weight for males and females in Puerto Rico (n = 20)
(7) Minimum body weight within the range of reported values (sex and location not specified).
(8) Food ingestion rates for avian receptors were calculated using maximum body weights: 0.123 kg for the mourning dove, 0.112 kg for the American robin, 1.266 kg for the red-tailed hawk, 0.220 kg for the green heron, and 0.0598 kg for the spotted sandpiper (Dunning, 2008).

TABLE 6-8

EXPOSURE PARAMETERS FOR UPPER TROPHIC LEVEL RECEPTORS: STEP 2 SCREENING LEVEL RISK CALCULATION
SWMU 9 – AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Notes (continued):

(9) Food ingestion rate for the brown flower bat was calculated using a maximum body weight of 0.0205 kg (Gannon et al., 2005).

(10) Food ingestion rate for the Norway rat was calculated using the maximum body weight within the range of reported values: 0.500 kg (Jackson, 1992).

Table References:

Dunning, J.B., Jr. (ed.). 2008. CRC Handbook of Avian Body Masses, Second Edition. CRC Press, Boca Raton, FL. 655 pp.

Gannon, M.R., A. Kurta, A. Rodriguez-Durán, and M.R. Willig. 2005. Bats of Puerto Rico: An Island Focus and a Caribbean Perspective. Texas Tech University Press, Lubbock, TX. 239 pp.

Jackson, W.B. 1992. Norway Rat and Allies. Chapter 54 *In* Chapman, J.A. and G.A. Feldhamer (eds.), Wild Mammals of North America: Biology, Management, and Economics. The John Hopkins University Press, Baltimore, MD. pp. 1077-1088.

Nagy, K. A. 2001. Food Requirements of Wild Animals: Predictive Equations for Free-Living Mammals, Reptiles, and Birds. Nutr. Abstr. Rev. Series B. 71:21R-31R.

TABLE 6-9

DIETARY COMPOSITION FOR AVIAN AND MAMMALAIN UPPER TROPHIC LEVEL RECEPTORS: STEP 2 SCREENING LEVEL RISK CALCULATION
SWMU 9 – AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Receptor	Dietary Composition (percent)						Soil/Sediment Ingestion (percent)	
	Terrestrial Plants	Soil Invertebrates	Small Mammals	Aquatic Invertebrates	Fish	Reference	Value	Reference
Birds:								
American robin	0	89.5	0	0	0	Assumed [1]	10.5 [4]	Sample and Suter II 1994
Mourning dove	95.0	0	0	0	0	Tomlinson et al. 1994	5.0	Assumed
Red-tailed hawk	0	0	100	0	0	USEPA 1993; Sample and Suter II 1994	0	Sample and Suter II 1994
Green heron	0	0	0	0	100	Assumed [2]	0	Sample et al. 1997
Spotted sandpiper	0	0	0	81.9	0	USEPA 1993	18.1	Beyer et al. 1994
Mammals:								
Brown flower bat	100	0	0	0	0	Gannon et al. 2005	0 [5]	Assumed
Norway rat (prey item for red-tailed hawk)	0	98.0	0	0	0	Assumed [3]	2.0	Assumed

Notes:

USEPA = U.S. Environmental Protection Agency

(1) Although the American robin is omnivorous (USEPA, 1993, Sample et al., 1997, Wheelwright et al., 1986, and Martin et al., 1951), an exclusive diet of terrestrial invertebrates (i.e., earthworms) is assumed for the screening level risk calculation.

(2) Although the green heron consumes aquatic invertebrates and fish (Sample et al., 1997), an exclusive diet of fish is assumed for the screening level risk calculation.

(3) Although the Norway rat is omnivorous (Jackson, 1992), an exclusive diet of terrestrial invertebrates (i.e., earthworms) is assumed for the screening level risk calculation.

(4) The percentage of soil in the diet of the American robin was estimated using the relationship presented in Sample and Sutter II (1994). An exclusive diet of earthworms extrapolates to a soil contribution of 10.5 percent to the total diet.

(5) Soil ingestion is considered negligible based on the arboreal feeding behavior of nectivorous bats.

Table References:

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TABLE 6-9

DIETARY COMPOSITION FOR AVIAN AND MAMMALAIN UPPER TROPHIC LEVEL RECEPTORS: STEP 2 SCREENING LEVEL RISK CALCULATION
SWMU 9 – AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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TABLE 7-1

FREQUENCY AND RANGE OF SURFACE SOIL DATA (MAXIMUM CONCENTRATIONS) COMPARED TO SOIL SCREENING VALUES FOR TERRESTRIAL PLANTS AND INVERTEBRATES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte	Contaminant Frequency/Range				Soil Screening Value (SSV)	Reference (2)	Maximum HQ (3)	Ecological COPC?	Comments
	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	Value used in Step 2 Screen (1)					
Volatile Organics (µg/kg)									
1,1,1,2-Tetrachloroethane	0/45	ND	0.57U - 61U	61	100	CCME 2001	0.61	No	HQ < 1.0
1,1,1-Trichloroethane	0/45	ND	0.52U - 56U	56	100	CCME2001	0.56	No	HQ < 1.0
1,1,2,2-Tetrachloroethane	0/45	ND	0.88UJ - 130U	130	100	CCME2001	1.30	Yes	HQ > 1.0
1,1,2-Trichloroethane	0/45	ND	1.1U - 110U	110	100	CCME 2001	1.10	Yes	HQ > 1.0
1,1-Dichloroethane	0/45	ND	0.45U - 48U	48	100	CCME 2001	0.48	No	HQ < 1.0
1,1-Dichloroethene	0/45	ND	0.48U - 52U	52	100	CCME 2001	0.52	No	HQ < 1.0
1,2,3-Trichloropropane	0/45	ND	1.3U - 130U	130	100	CCME 2001	1.30	Yes	HQ > 1.0
1,2-Dibromo-3-chloropropane (DBCP)	0/45	ND	2.5U - 270U	270	NE	---	NA	Yes	No SSV
1,2-Dibromoethane (EDB)	0/45	ND	1.2UJ - 140U	140	300	CCME 2001	0.47	No	HQ < 1.0
1,2-Dichloroethane	0/45	ND	0.89U - 96U	96	100	CCME 2001	0.96	No	HQ < 1.0
1,2-Dichloroethene (total)	0/3	ND	5U - 6U	6	100	CCME 2001	0.06	No	HQ < 1.0
1,2-Dichloroethene (trans)	0/42	ND	0.87U - 93U	93	100	CCME 2001	0.93	No	HQ < 1.0
1,2-Dichloropropane	0/45	ND	0.98U - 110U	110	700,000	Efroymson et al. 1997a	<0.01	No	HQ < 1.0
1,3-Dichloropropene (cis)	0/45	ND	0.78U - 83U	83	100	CCME 2001	0.83	No	HQ < 1.0
1,3-Dichloropropene (trans)	0/45	ND	0.78U - 83U	83	100	CCME 2001	0.83	No	HQ < 1.0
1,4-Dichloro-2-butene (trans)	0/45	ND	2.8U - 300U	300	1,000,000	Efroymson et al. 1997a	<0.01	No	HQ < 1.0
2-Butanone (MEK)	4/45	8.6J - 61J	2.8UJ - 260U	61	NE	---	NA	Yes	No SSV
2-Chloro-1,3-butadiene (Chloroprene)	0/45	ND	0.51U - 120U	120	NE	---	NA	Yes	No SSV
2-Hexanone (MBK)	3/45	6.2J - 27J	1.9U - 200U	27	NE	---	NA	Yes	No SSV
3-Chloropropene (Allyl Chloride)	0/45	ND	1.1UJ - 140U	140	NE	---	NA	Yes	No SSV
4-Methyl-2-pentanone (MIBK)	0/45	ND	2.6U - 280U	280	NE	---	NA	Yes	No SSV
Acetone	37/42	6.3J - 850	2.8UJ - 11UJ	850	NE	---	NA	Yes	No SSV
Acetonitrile	0/37	ND	25UJ - 120U	120	NE	---	NA	Yes	No SSV
Acrolein	0/45	ND	9.7UJ - 1,800UJ	1,800	NE	---	NA	Yes	No SSV
Acrylonitrile	0/45	ND	14UJ - 2,200UJ	2,200	1,000,000	Efroymson et al. 1997a	<0.01	No	HQ < 1.0
Benzene	0/45	ND	0.71U - 76U	76	25,000	CCME 2014	<0.01	No	HQ < 1.0
Bromodichloromethane	0/45	ND	0.74UJ - 79UJ	79	NE	---	NA	Yes	No SSV
Bromoform	0/45	ND	0.98U - 110U	110	100	CCME 2001	1.10	Yes	HQ > 1.0
Bromomethane	0/45	ND	1.1UJ - 150UJ	150	NE	---	NA	Yes	No SSV
Carbon Disulfide	2/45	6.7J - 15J	0.88UJ - 110U	15	NE	---	NA	Yes	No SSV
Carbon Tetrachloride	0/45	ND	0.78UJ - 96U	96	1,000,000	Efroymson et al. 1997a	<0.01	No	HQ < 1.0
Chlorobenzene	0/45	ND	0.61UJ - 70U	70	40,000	Efroymson et al. 1997a	<0.01	No	HQ < 1.0
Chloroethane	0/45	ND	1.1U - 110U	110	100	CCME 2001	1.10	Yes	HQ > 1.0
Chloroform	1/45	2.1J - 2.1J	0.45U - 48U	2.1	100	CCME 2001	0.02	No	HQ < 1.0
Chloromethane	0/45	ND	0.62UJ - 68U	68	NE	---	NA	Yes	No SSV
Dibromochloromethane	0/45	ND	0.45U - 48U	48	NE	---	NA	Yes	No SSV
Dibromomethane	0/45	ND	1.1U - 110U	110	100	CCME 2001	1.10	Yes	HQ > 1.0
Ethyl Methacrylate	0/45	ND	0.68UJ - 210U	210	NE	---	NA	Yes	No SSV
Ethylbenzene	4/45	3.5J - 220J	0.67U - 63U	220	55,000	CCME 2014	<0.01	No	HQ < 1.0
Freon 11 (Trichlorofluoromethane)	0/45	ND	1.2UJ - 140U	140	NE	---	NA	Yes	No SSV
Freon-12 (Dichlorodifluoromethane)	0/45	ND	0.8U - 85U	85	NE	---	NA	Yes	No SSV

TABLE 7-1

FREQUENCY AND RANGE OF SURFACE SOIL DATA (MAXIMUM CONCENTRATIONS) COMPARED TO SOIL SCREENING VALUES FOR TERRESTRIAL PLANTS AND INVERTEBRATES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	Contaminant Frequency/Range								
Analyte	**Frequency of Detection**	**Range of Positive Detections**	**Range of Non-Detects**	**Value used in Step 2 Screen (1)**	**Soil Screening Value (SSV)**	**Reference (2)**	**Maximum HQ (3)**	**Ecological COPC?**	**Comments**
Volatile Organics (µg/kg)									
Isobutyl Alcohol	0/30	ND	66U - 280UJ	280	NE	---	NA	Yes	No SSV
Methyl Acrylonitrile	0/45	ND	14UJ - 2300U	2,300	NE	---	NA	Yes	No SSV
Methyl Iodide	0/45	ND	0.88UJ - 96UJ	96	NE	---	NA	Yes	No SSV
Methyl Methacrylate	0/42	ND	1.5UJ - 350U	350	NE	---	NA	Yes	No SSV
Methylene Chloride	3/45	2.4J - 4.3J	0.96U - 96UJ	4.3	100	CCME 2001	0.04	No	HQ < 1.0
Pentachloroethane	1/45	5.2J - 5.2J	2UJ - 210UJ	5.2	100	CCME 2001	0.05	No	HQ < 1.0
Propionitrile (Ethyl Cyanide)	0/44	ND	19UJ - 2,000UJ	2,000	NE	---	NA	Yes	No SSV
Styrene (Ethenylbenzene)	1/45	2.2J - 2.2J	0.59U - 63U	2.2	300,000	CCME 2001	<0.01	No	HQ < 1.0
Tetrachloroethene (PCE)	0/45	ND	0.65U - 70U	70	100	CCME 2001	0.70	No	HQ < 1.0
Toluene	0/45	ND	0.71U - 76U	76	75,000	CCME 2014	<0.01	No	HQ < 1.0
Trichloroethene (TCE)	0/45	ND	0.89U - 96U	96	100	CCME 2001	0.96	No	HQ < 1.0
Vinyl Acetate	0/45	ND	1.3U - 140U	140	NE	---	NA	Yes	No SSV
Vinyl Chloride	0/45	ND	0.52U - 56U	56	NE	---	NA	Yes	No SSV
Xylenes, total	3/45	9.6J - 680J	1.8UJ - 220U	680	1000	USEPA 2003	0.68	No	HQ < 1.0
Semivolatile Organics (µg/kg)									
1,1'-Biphenyl	0/23	ND	30U - 2,000U	2,000	60,000	Efroymson et al. 1997b	0.03	No	HQ < 1.0
1,2,4,5-Tetrachlorobenzene	0/24	ND	33U - 2,100U	2,100	50.0	CCME 2001	42.00	Yes	HQ > 1.0
1,2,4-Trichlorobenzene	0/26	ND	22U - 1,400U	1,400	20,000	Efroymson et al. 1997a	0.07	No	HQ < 1.0
1,2-Dichlorobenzene (o-)	0/26	ND	24U - 1,600U	1,600	100	CCME 2001	16.00	Yes	HQ > 1.0
1,2-Diphenylhydrazine	0/3	ND	350U - 380U	380	NE	---	NA	Yes	No SSV
1,3,5-Trinitrobenzene (TNB)	0/26	ND	86UJ - 5,600U	5,600	40,000	---	0.14	No	HQ < 1.0
1,3-Dichlorobenzene (m-)	0/26	ND	27U - 1,800U	1,800	100	CCME 2001	18.00	Yes	HQ > 1.0
1,3-Dinitrobenzene (m-)	0/26	ND	52U - 3,400U	3,400	40,000	---	0.09	No	HQ < 1.0
1,4-Dichlorobenzene (p-)	0/26	ND	23U - 1,500U	1,500	20,000	Efroymson et al. 1997a	0.08	No	HQ < 1.0
1,4-Dioxane (p-)	0/26	ND	69U - 4,500U	4,500	NE	---	NA	Yes	No SSV
1,4-Naphthoquinone	0/26	ND	41U - 2,700U	2,700	NE	---	NA	Yes	No SSV
1,4-Phenylenediamine	0/26	ND	700U - 120,000U	120,000	NE	---	NA	Yes	No SSV
1-Naphthylamine	0/26	ND	86U - 5,600U	5,600	NE	---	NA	Yes	No SSV
2,2'-Oxybis[1-chloropropane]	0/26	ND	37U - 2,400U	2,400	NE	---	NA	Yes	No SSV
2,3,4,6-Tetrachlorophenol	0/26	ND	47U - 3,100U	3,100	50	CCME 2001	62.00	Yes	HQ > 1.0
2,4,5-Trichlorophenol	0/26	ND	34U - 2,200U	2,200	4,000	Efroymson et al. 1997b	0.55	No	HQ < 1.0
2,4,6-Trichlorophenol	0/26	ND	21U - 1,400U	1,400	10,000	Efroymson et al. 1997a	0.14	No	HQ < 1.0
2,4-Dichlorophenol	0/26	ND	24U - 1,600U	1,600	50	CCME 2001	32.00	Yes	HQ > 1.0
2,4-Dimethylphenol	0/26	ND	37U - 2,400U	2,400	10	USEPA 2003	240.00	Yes	HQ > 1.0
2,4-Dinitrophenol	0/25	ND	180U - 12,000U	12,000	20,000	Efroymson et al. 1997b	0.60	No	HQ < 1.0
2,4-Dinitrotoluene (DNT)	0/26	ND	20U - 1,300U	1,300	NE	---	NA	Yes	No SSV
2,6-Dichlorophenol	0/26	ND	56U - 3,600U	3,600	50	CCME 2001	72.00	Yes	HQ > 1.0
2,6-Dinitrotoluene (DNT)	0/26	ND	35U - 2,200U	2,200	NE	---	NA	Yes	No SSV
2-Acetylaminofluorene	0/26	ND	40U - 2,600U	2,600	NE	---	NA	Yes	No SSV
2-Chloronaphthalene	0/26	ND	25U - 1,600U	1,600	NE	---	NA	Yes	No SSV
2-Chlorophenol	0/26	ND	28U - 1,800U	1,800	50	CCME 2001	36.00	Yes	HQ > 1.0

TABLE 7-1

FREQUENCY AND RANGE OF SURFACE SOIL DATA (MAXIMUM CONCENTRATIONS) COMPARED TO SOIL SCREENING VALUES FOR TERRESTRIAL PLANTS AND INVERTEBRATES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	Contaminant Frequency/Range								
Analyte	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	Value used in Step 2 Screen (1)	Soil Screening Value (SSV)	Reference (2)	Maximum HQ (3)	Ecological COPC?	Comments
Semivolatile Organics (µg/kg)									
2-Methyl-5-nitroaniline	0/26	ND	34U - 2,200U	2,200	NE	---	NA	Yes	No SSV
2-Methylphenol (o-Cresol)	0/26	ND	31U - 2,000U	2,000	100	CCME 2001	20.00	Yes	HQ > 1.0
2-Naphthylamine	0/26	ND	86U - 5,600U	5,600	NE	---	NA	Yes	No SSV
2-Nitroaniline	0/26	ND	24U - 1,900U	1,900	NE	---	NA	Yes	No SSV
2-Nitrophenol	0/26	ND	21U - 1,400U	1,400	7,000	---	0.20	No	HQ < 1.0
2-Picoline	0/26	ND	86U - 5,600U	5,600	NE	---	NA	Yes	No SSV
3,3'-Dichlorobenzidine	0/26	ND	31U - 2,000U	2,000	NE	---	NA	Yes	No SSV
3,3'-Dimethylbenzidine	0/26	ND	440U - 29,000U	29,000	NE	---	NA	Yes	No SSV
3,4-Methylphenol (m,p-Cresol)	0/26	ND	30U - 2,000U	2,000	100	CCME 2001	20.00	Yes	HQ > 1.0
3-Methylcholanthrene	0/26	ND	27U - 1,800U	1,800	NE	---	NA	Yes	No SSV
3-Nitroaniline	0/26	ND	35U - 2,200U	2,200	NE	---	NA	Yes	No SSV
4,6-Dinitro-2-methylphenol	0/26	ND	210U - 14,000U	14,000	100	CCME 2001	140.00	Yes	HQ > 1.0
4-Aminobiphenyl	0/26	ND	57U - 3,700U	3,700	NE	---	NA	Yes	No SSV
4-Bromophenyl-phenylether	0/26	ND	33U - 2,100U	2,100	NE	---	NA	Yes	No SSV
4-Chloro-3-methylphenol	0/26	ND	36U - 2,300U	2,300	NE	---	NA	Yes	No SSV
4-Chloroaniline	0/26	ND	27U - 1,800U	1,800	NE	---	NA	Yes	No SSV
4-Chlorophenyl-phenylether	0/26	ND	20U - 1,300U	1,300	NE	---	NA	Yes	No SSV
4-Dimethylaminoazobenzene (p-)	0/26	ND	40U - 2,600U	2,600	NE	---	NA	Yes	No SSV
4-Nitroaniline	0/26	ND	18U - 1,900U	1,900	NE	---	NA	Yes	No SSV
4-Nitrophenol	0/26	ND	220UJ - 14,000UJ	14,000	7,000	Efroymson et al. 1997a	2.00	Yes	HQ > 1.0
4-Nitroquinoline-1-oxide	0/2	ND	190U - 1,900UJ	1,900	NE	---	NA	Yes	No SSV
7,12-Dimethylbenz(a)anthracene	0/26	ND	33U - 2,100U	2,100	NE	---	NA	Yes	No SSV
a,a-Dimethylphenethylamine	0/26	ND	510UJ - 33,000UJ	33,000	NE	---	NA	Yes	No SSV
Acetophenone	0/29	ND	18U - 1,500U	1,500	NE	---	NA	Yes	No SSV
Aniline	0/26	ND	22U - 1,900U	1,900	NE	---	NA	Yes	No SSV
Aramite	0/25	ND	63UJ - 4,100UJ	4,100	NE	---	NA	Yes	No SSV
Benzidine	0/3	ND	3,500UJ - 3,800UJ	3,800	NE	---	NA	Yes	No SSV
Benzoic Acid	0/3	ND	1,700UJ - 1,900UJ	1,900	NE	---	NA	Yes	No SSV
Benzyl Alcohol	0/26	ND	40U - 2,600U	2,600	NE	---	NA	Yes	No SSV
Bis(2-chloroethoxy)methane	0/26	ND	25U - 1,600U	1,600	NE	---	NA	Yes	No SSV
Bis(2-chloroethyl)ether	0/26	ND	29U - 1,900U	1,900	NE	---	NA	Yes	No SSV
Bis(2-ethylhexyl) Phthalate (BEHP)	0/26	ND	40U - 2,600U	2,600	30,000	CCME 2001	0.09	No	HQ < 1.0
Butyl Benzyl Phthalate	0/26	ND	28U - 1,800U	1,800	30,000	CCME 2001	0.06	No	HQ < 1.0
Carbazole	0/3	ND	350U - 380U	380	NE	---	NA	Yes	No SSV
Diallate (total)	0/26	ND	59U - 3,800U	3,800	NE	---	NA	Yes	No SSV
Dibenzofuran	0/26	ND	20U - 1,300U	1,300	NE	---	NA	Yes	No SSV
Diethyl Phthalate (DEP)	0/26	ND	23U - 1,500U	1,500	100,000	Efroymson et al. 1997b	0.02	No	HQ < 1.0
Dimethyl Phthalate	0/26	ND	20U - 1,300U	1,300	200,000	Efroymson et al. 1997a	<0.01	No	HQ < 1.0
Di-n-butyl Phthalate (DBP)	1/26	40J - 40J	29U - 1,900U	40	200,000	Efroymson et al. 1997b	<0.01	No	HQ < 1.0
Di-n-octyl Phthalate	0/26	ND	33U - 2,100U	2,100	30,000	CCME 2001	0.07	No	HQ < 1.0
Dinoseb	0/26	ND	87U - 5,600U	5,600	NE	---	NA	Yes	No SSV

TABLE 7-1

FREQUENCY AND RANGE OF SURFACE SOIL DATA (MAXIMUM CONCENTRATIONS) COMPARED TO SOIL SCREENING VALUES FOR TERRESTRIAL PLANTS AND INVERTEBRATES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	Contaminant Frequency/Range								
Analyte	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	Value used in Step 2 Screen (1)	Soil Screening Value (SSV)	Reference (2)	Maximum HQ (3)	Ecological COPC?	Comments
Semivolatile Organics (µg/kg)									
Diphenylamine	0/3	ND	350U - 380U	380	NE	---	NA	Yes	No SSV
Chlorobenzilate	0/3	ND	350U - 380U	380	NE	---	NA	Yes	No SSV
Ethyl Methane Sulfonate (EMS)	0/26	ND	69U - 4,500U	4,500	NE	---	NA	Yes	No SSV
Hexachloro-1,3-butadiene	0/26	ND	21U - 1,400U	1,400	NE	---	NA	Yes	No SSV
Hexachlorobenzene	0/26	ND	27U - 1,800U	1,800	1,000,000	Efroymson et al. 1997a	<0.01	No	HQ < 1.0
Hexachlorocyclopentadiene	0/26	ND	87U - 5,600U	5,600	10,000	Efroymson et al. 1997b	0.56	No	HQ < 1.0
Hexachloroethane	0/26	ND	21U - 1,400U	1,400	NE	---	NA	Yes	No SSV
Hexachlorophene	0/20	ND	13,000U - 850,000UJ	850,000	NE	---	NA	Yes	No SSV
Hexachloropropene	0/26	ND	47U - 3,100U	3,100	NE	---	NA	Yes	No SSV
Isosafrole	0/26	ND	67U - 4,400U	4,400	NE	---	NA	Yes	No SSV
Methapyrilene	0/26	ND	44U - 2,900U	2,900	NE	---	NA	Yes	No SSV
Nitrobenzene	0/26	ND	37U - 2,400U	2,400	40,000	Efroymson et al. 1997a	0.06	No	HQ < 1.0
n-Nitrosodiethylamine	0/26	ND	46U - 3,000U	3,000	20,000	---	0.15	No	HQ < 1.0
n-Nitrosodimethylamine (NDMA)	0/26	ND	62U - 4,000U	4,000	20,000	Efroymson et al. 1997a	0.20	No	HQ < 1.0
n-Nitroso-di-n-butylamine	0/26	ND	55U - 3,500U	3,500	20,000	---	0.18	No	HQ < 1.0
n-Nitrosodi-n-propylamine	0/26	ND	29U - 1,900U	1,900	20,000	---	0.10	No	HQ < 1.0
n-Nitrosodiphenylamine	0/26	ND	62U - 4,000U	4,000	20,000	Efroymson et al. 1997a	0.20	No	HQ < 1.0
n-Nitrosomethylethylamine	0/26	ND	55U - 3,500U	3,500	20,000	---	0.18	No	HQ < 1.0
n-Nitrosomorpholine	0/26	ND	69U - 4,500U	4,500	NE	---	NA	Yes	No SSV
n-Nitrosopiperidine	0/26	ND	75U - 4,800U	4,800	NE	---	NA	Yes	No SSV
n-Nitrosopyrrolidine	0/26	ND	47U - 3,100U	3,100	NE	---	NA	Yes	No SSV
o-Toluidine	0/25	ND	59U - 3,800U	3,800	NE	---	NA	Yes	No SSV
Pentachlorobenzene	0/26	ND	67U - 4,400U	4,400	50	CCME 2001	88.00	Yes	HQ > 1.0
Pentachloronitrobenzene	0/25	ND	59U - 3,800U	3,800	NE	---	NA	Yes	No SSV
Pentachlorophenol	0/26	ND	87U - 5,600U	5,600	5,000	USEPA 2007a	1.12	Yes	HQ > 1.0
Phenacetin	0/26	ND	54U - 3,500U	3,500	NE	---	NA	Yes	No SSV
Phenol	0/26	ND	31U - 2,000U	2,000	30,000	Efroymson et al. 1997a	0.07	No	HQ < 1.0
Pronamide	0/26	ND	66U - 4,300U	4,300	13.6	USEPA 2003	316.18	Yes	HQ > 1.0
Pyridine	0/26	ND	31U - 2,000U	2,000	NE	---	NA	Yes	No SSV
Safrole	0/26	ND	56U - 3,600U	3,600	NE	---	NA	Yes	No SSV
PAHs (µg/kg)									
1-Methylnaphthalene	1/44	1.3J - 1.3J	1.2U - 600U	1.3	2,500	---	<0.01	No	HQ < 1.0
2-Methylnaphthalene	2/47	1.3J - 2.1J	1U - 530U	2.1	2,500	---	<0.01	No	HQ < 1.0
Acenaphthene	0/47	ND	1.1U - 540U	540	20,000	---	0.03	No	HQ < 1.0
Acenaphthylene	0/47	ND	1U - 530U	530	2,500	---	0.21	No	HQ < 1.0
Anthracene	0/45	ND	1.1U - 540U	540	2,500	CCME 2014	0.22	No	HQ < 1.0
Benzo(a)anthracene	1/47	5.7J - 5.7J	1.1U - 540U	5.7	10,000	---	<0.01	No	HQ < 1.0
Benzo(a)pyrene (BaP)	5/47	4.5J - 430J	0.88U - 450U	430	20,000	CCME 2014	0.02	No	HQ < 1.0
Benzo(b)fluoranthene	2/47	6.3J - 460J	1.2U - 600U	460	10,000	---	0.05	No	HQ < 1.0
Benzo(g,h,i)perylene	12/47	27J - 760J	1.1U - 380U	760	10,000	---	0.08	No	HQ < 1.0
Benzo(k)fluoranthene	2/47	3.2J - 330J	0.9U - 460U	330	10,000	---	0.03	No	HQ < 1.0

TABLE 7-1

FREQUENCY AND RANGE OF SURFACE SOIL DATA (MAXIMUM CONCENTRATIONS) COMPARED TO SOIL SCREENING VALUES FOR TERRESTRIAL PLANTS AND INVERTEBRATES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte	Contaminant Frequency/Range				Soil Screening Value (SSV)	Reference (2)	Maximum HQ (3)	Ecological COPC?	Comments
	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	Value used in Step 2 Screen (1)					
PAHs (µg/kg)									
Chrysene	4/47	5.3J - 2,000J	0.99U - 380U	2,000	10,000	---	0.20	No	HQ < 1.0
Dibenz(a,h)anthracene	0/47	ND	0.63U - 760U	760	10,000	---	0.08	No	HQ < 1.0
Fluoranthene	1/47	0.95J - 0.95J	0.42U - 600U	0.95	15,000	USEPA 2007b	<0.01	No	HQ < 1.0
Fluorene	0/47	ND	1.3U - 650U	650	8,000	USEPA 2007b	0.08	No	HQ < 1.0
Indeno(1,2,3-cd)pyrene	1/47	3J - 3J	1.7U - 870U	3	10,000	---	<0.01	No	HQ < 1.0
Naphthalene	2/47	1.3J - 2.2J	1.3U - 650U	2.2	2,500	---	<0.01	No	HQ < 1.0
Phenanthrene	0/47	ND	1.4U - 710U	710	9,000	USEPA 2007b	0.08	No	HQ < 1.0
Pyrene	5/47	6.8J - 3,300J	1.3U - 380U	3,300	10,000	USEPA 2007b	0.33	No	HQ < 1.0
Low Molecular Weight PAHs (4)	NA	NA	NA	2,976	29,000	USEPA 2007b	0.10	No	HQ < 1.0
High Molecular Weight PAHs (5)	NA	NA	NA	8,049	18,000	USEPA 2007b	0.45	No	HQ < 1.0
Organophosphorous Pesticides (µg/kg)									
Dimethoate	0/23	ND	47U - 3,100U	3,100	NE	---	NA	Yes	No SSV
Disulfoton	0/23	ND	58U - 3,700U	3,700	NE	---	NA	Yes	No SSV
Famphur	0/23	ND	100UJ - 6,700U	6,700	NE	---	NA	Yes	No SSV
Methyl Parathion	0/23	ND	49U - 3,200U	3,200	0.344	USEPA 2003	9302.33	Yes	HQ > 1.0
o,o,o-Triethyl Phosphorothioate	0/23	ND	76U - 4,900U	4,900	NE	---	NA	Yes	No SSV
Parathion	0/23	ND	58U - 3,700U	3,700	NE	---	NA	Yes	No SSV
Phorate	0/23	ND	72U - 4,700U	4,700	NE	---	NA	Yes	No SSV
Sulfotep	0/23	ND	58U - 3,700U	3,700	NE	---	NA	Yes	No SSV
Thionazin	0/23	ND	44U - 2,900U	2,900	NE	---	NA	Yes	No SSV
Inorganics (mg/kg)									
Antimony	0/44	ND	0.086U - 2.7UJ	2.7	78.0	USEPA 2005a	0.03	No	HQ < 1.0
Arsenic	37/47	0.74J - 23	0.44U - 0.84U	23	18.0	USEPA 2005b	1.28	Yes	HQ > 1.0
Barium	47/47	22J - 180	NA	180	330	USEPA 2005c	0.55	No	HQ < 1.0
Beryllium	44/44	0.11J - 0.47	NA	0.47	40.0	USEPA 2005d	0.01	No	HQ < 1.0
Cadmium	36/47	0.048J - 1.8	0.04U - 0.37U	1.8	32.0	USEPA 2005e	0.06	No	HQ < 1.0
Chromium	47/47	2.5J - 37J	NA	37	57.0	USEPA 2008	0.65	No	HQ < 1.0
Cobalt	44/44	5.5J - 57	NA	57	13.0	USEPA 2005f	4.38	Yes	HQ > 1.0
Copper	42/42	51 - 170	NA	170	70.0	USEPA 2007c	2.43	Yes	HQ > 1.0
Lead	62/62	1.6 - 1,000J	NA	1000	120	USEPA 2005g	8.33	Yes	HQ > 1.0
Mercury	39/47	0.0046J - 0.065J	0.0044U - 0.06U	0.065	0.10	Efroymson et al. 1997a	0.65	No	HQ < 1.0
Nickel	44/44	4J - 9.1J	NA	9.1	38.0	USEPA 2007d	0.24	No	HQ < 1.0
Selenium	19/47	0.19J - 1.4	0.46U - 1.5U	1.4	0.52	USEPA 2007e	2.69	Yes	HQ > 1.0
Silver	7/47	0.04J - 0.13J	0.03U - 1.3U	0.13	560	USEPA 2006	<0.01	No	HQ < 1.0
Thallium	14/44	2.3J - 4.6J	0.12U - 7.4UJ	4.6	1.00	Efroymson et al. 1997b	4.60	Yes	HQ > 1.0
Tin	0/44	ND	3.8U - 8UJ	8	50.0	Efroymson et al. 1997b	0.16	No	HQ < 1.0
Vanadium	44/44	120 - 240	NA	240	20.0	USEPA 2005h	12.00	Yes	HQ > 1.0
Zinc	60/60	32J - 520J	NA	520	120	USEPA 2007f	4.33	Yes	HQ > 1.0

TABLE 7-1

FREQUENCY AND RANGE OF SURFACE SOIL DATA (MAXIMUM CONCENTRATIONS) COMPARED TO SOIL SCREENING VALUES FOR TERRESTRIAL PLANTS AND INVERTEBRATES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Notes:

CCME = Canadian Council of Ministries of the Environment
COPC = Chemical of Potential Concern
HQ = Hazard Quotient
J = Estimated value
µg/kg = microgram per kilogram
mg/kg = milligram per kilogram
NA = Not Applicable
ND = Not Detected
NE = Not Established
PAH = Polynuclear Aromatic Hydrocarbon
SSV = Soil Screening Value
U = Not detected
UJ = Not detected, estimated value
USEPA = U.S. Environmental Protection Agency

(1) The value listed represents the maximum detected concentration (or maximum non-detected concentrations for analytes that were not detected).

(2) See Table 5-1 for reference citations.

(3) For a given chemical, the hazard quotient (HQ) is the maximum detected concentration (or maximum non-detected concentration for analytes that were not detected) divided by the soil screening value.

(4) Low molecular weight PAHs are defined by the USEPA (2007b) as PAH compounds composed of fewer than four rings. The low molecular weight PAH compounds analyzed for in Tank 214 Area surface soil were 1-methylnaphthalene, 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, fluoranthene, fluorene, naphthalene, and phenanthrene. The value was calculated by summing maximum detected concentrations in site surface soil for each PAH. Maximum non-detected concentrations were used for those LMW PAHs that were not detected.

(5) High molecular weight PAHs are defined by the USEPA (2007b) as PAH compounds composed of four or more rings. The high molecular weight PAH compounds analyzed for in Tank 214 Area surface soil were benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, and pyrene. The value was calculated by summing maximum detected concentrations in site surface soil for each PAH. Maximum non-detected concentrations were used for those HMW PAHs that were not detected.

TABLE 7-2

FREQUENCY AND RANGE OF SUBSURFACE SOIL DATA (MAXIMUM CONCENTRATIONS) COMPARED TO SOIL SCREENING VALUES FOR TERRESTRIAL PLANTS AND INVERTEBRATES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte [1]	Contaminant Frequency/Range				Soil Screening Value (SSV)	Reference [3]	Maximum HQ [4]	Ecological COPC?	Comments
	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	Value used in Step 2 Screen [2]					
Volatile Organics (µg/kg)									
1,1,1,2-Tetrachloroethane	0/8	ND	0.69U - 160U	160	100	CCME 2001	1.60	Yes	HQ > 1.0
1,1,1-Trichloroethane	0/8	ND	0.62U - 150U	150	100	CCME2001	1.50	Yes	HQ > 1.0
1,1,2,2-Tetrachloroethane	0/8	ND	0.9UJ - 360U	360	100	CCME2001	3.60	Yes	HQ > 1.0
1,1,2-Trichloroethane	0/8	ND	1.1UJ - 310UJ	310	100	CCME 2001	3.10	Yes	HQ > 1.0
1,1-Dichloroethane	0/8	ND	0.54U - 130U	130	100	CCME 2001	1.30	Yes	HQ > 1.0
1,1-Dichloroethene	0/8	ND	0.58U - 140U	140	100	CCME 2001	1.40	Yes	HQ > 1.0
1,2,3-Trichloropropane	0/8	ND	1.5U - 360U	360	100	CCME 2001	3.60	Yes	HQ > 1.0
1,2-Dibromo-3-chloropropane (DBCP)	0/8	ND	3U - 710U	710	NE	---	NA	Yes	No SSV
1,2-Dibromoethane (EDB)	0/8	ND	1.3UJ - 380UJ	380	300	CCME 2001	1.27	Yes	HQ > 1.0
1,2-Dichloroethane	0/8	ND	1.1U - 250U	250	100	CCME 2001	2.50	Yes	HQ > 1.0
1,2-Dichloroethene (trans)	0/8	ND	0.99UJ - 250U	250	100	CCME 2001	2.50	Yes	HQ > 1.0
1,2-Dichloropropane	0/8	ND	1.2U - 280U	280	700,000	Efroymson et al. 1997a	<0.01	No	HQ < 1.0
1,3-Dichloropropene (cis)	0/8	ND	0.82UJ - 220UJ	220	100	CCME 2001	2.20	Yes	HQ > 1.0
1,3-Dichloropropene (trans)	0/8	ND	0.93U - 220UJ	220	100	CCME 2001	2.20	Yes	HQ > 1.0
1,4-Dichloro-2-butene (trans)	0/8	ND	3.3U - 790UJ	790	1,000,000	Efroymson et al. 1997a	<0.01	No	HQ < 1.0
2-Butanone (MEK)	0/8	ND	2.9U - 690UJ	690	NE	---	NA	Yes	No SSV
2-Chloro-1,3-butadiene (Chloroprene)	0/8	ND	0.61UJ - 150U	150	NE	---	NA	Yes	No SSV
2-Hexanone (MBK)	0/8	ND	2.3U - 530UJ	530	NE	---	NA	Yes	No SSV
3-Chloropropene (Allyl Chloride)	0/8	ND	1.1UJ - 380U	380	NE	---	NA	Yes	No SSV
4-Methyl-2-pentanone (MIBK)	0/8	ND	3.1U - 740UJ	740	NE	---	NA	Yes	No SSV
Acetone	4/5	4.7J - 77J	4.7U - 4.7U	77.0	NE	---	NA	Yes	No SSV
Acetonitrile	0/8	ND	5.8U - 11,000UJ	11,000	NE	---	NA	Yes	No SSV
Acrolein	0/5	ND	9.9UJ - 4,800U	4,800	NE	---	NA	Yes	No SSV
Acrylonitrile	0/5	ND	14UJ - 5,900U	5,900	1,000,000	Efroymson et al. 1997a	<0.01	No	HQ < 1.0
Benzene	0/8	ND	0.78UJ - 200U	200	25,000	CCME 2014	<0.01	No	HQ < 1.0
Bromodichloromethane	0/8	ND	0.89U - 210UJ	210	NE	---	NA	Yes	No SSV
Bromoform	0/8	ND	1.2U - 280U	280	100	CCME 2001	2.80	Yes	HQ > 1.0
Bromomethane	0/8	ND	1.2UJ - 410UJ	410	NE	---	NA	Yes	No SSV
Carbon Disulfide	1/8	18J - 18J	0.9UJ - 310U	18.0	NE	---	NA	Yes	No SSV
Carbon Tetrachloride	0/8	ND	0.8UJ - 250U	250	1,000,000	Efroymson et al. 1997a	<0.01	No	HQ < 1.0
Chlorobenzene	0/8	ND	0.62UJ - 190U	190	40,000	Efroymson et al. 1997a	<0.01	No	HQ < 1.0
Chloroethane	0/8	ND	1.3U - 310U	310	100	CCME 2001	3.10	Yes	HQ > 1.0
Chloroform	0/8	ND	0.54U - 130U	130	100	CCME 2001	1.30	Yes	HQ > 1.0
Chloromethane	0/8	ND	0.63UJ - 180UJ	180	NE	---	NA	Yes	No SSV
Dibromochloromethane	0/8	ND	0.54U - 130UJ	130	NE	---	NA	Yes	No SSV
Dibromomethane	0/8	ND	1.2UJ - 310U	310	100	CCME 2001	3.10	Yes	HQ > 1.0
Ethyl Methacrylate	0/8	ND	0.69UJ - 560U	560	NE	---	NA	Yes	No SSV
Ethylbenzene	0/8	ND	0.79UJ - 190U	190	55,000	CCME 2014	<0.01	No	HQ < 1.0
Freon 11 (Trichlorofluoromethane)	0/8	ND	1.3UJ - 380U	380	NE	---	NA	Yes	No SSV
Freon-12 (Dichlorodifluoromethane)	0/8	ND	0.95U - 230UJ	230	NE	---	NA	Yes	No SSV
Isobutyl Alcohol	0/4	ND	74U - 250UJ	250	NE	---	NA	Yes	No SSV

TABLE 7-2

FREQUENCY AND RANGE OF SUBSURFACE SOIL DATA (MAXIMUM CONCENTRATIONS) COMPARED TO SOIL SCREENING VALUES FOR TERRESTRIAL PLANTS AND INVERTEBRATES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte [1]	Contaminant Frequency/Range				Soil Screening Value (SSV)	Reference [3]	Maximum HQ [4]	Ecological COPC?	Comments
	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	Value used in Step 2 Screen [2]					
Volatile Organics (µg/kg)									
Methyl Acrylonitrile	0/8	ND	14UJ - 6,100U	6,100	NE	---	NA	Yes	No SSV
Methyl Iodide	0/8	ND	0.9UJ - 250UJ	250	NE	---	NA	Yes	No SSV
Methyl Methacrylate	0/5	ND	1.5UJ - 940UJ	940	NE	---	NA	Yes	No SSV
Methylene Chloride	1/8	1.5J - 1.5J	1.4UJ - 250U	1.5	100	CCME 2001	0.02	No	HQ < 1.0
Pentachloroethane	0/8	ND	2.4U - 560UJ	560	100	CCME 2001	5.60	Yes	HQ > 1.0
Propionitrile (Ethyl Cyanide)	0/5	ND	21UJ - 5,300U	5,300	NE	---	NA	Yes	No SSV
Styrene (Ethenylbenzene)	0/8	ND	0.71U - 170U	170	300,000	CCME 2001	<0.01	No	HQ < 1.0
Tetrachloroethene (PCE)	0/8	ND	0.78U - 190U	190	100	CCME 2001	1.90	Yes	HQ > 1.0
Toluene	0/8	ND	0.85U - 200U	200	75,000	CCME 2014	<0.01	No	HQ < 1.0
Trichloroethene (TCE)	0/8	ND	1.1U - 250U	250	100	CCME 2001	2.50	Yes	HQ > 1.0
Vinyl Acetate	0/8	ND	1.6U - 380U	380	NE	---	NA	Yes	No SSV
Vinyl Chloride	0/8	ND	0.62U - 150U	150	NE	---	NA	Yes	No SSV
Xylene, m/p-	0/3	ND	12U - 16U	16.0	1,000	---	0.02	No	HQ < 1.0
Xylene, o-	0/3	ND	5.8U - 8.1U	8.1	1,000	---	<0.01	No	HQ < 1.0
Xylenes, total	1/8	2.5 - 2.5	1.8UJ - 590U	2.5	1,000	USEPA 2003	<0.01	No	HQ < 1.0
Semivolatile Organics (µg/kg)									
1,1'-Biphenyl	0/3	ND	31U - 56U	56	60,000	Efroymson et al. 1997b	<0.01	No	HQ < 1.0
1,2,4,5-Tetrachlorobenzene	0/3	ND	34U - 60U	60	50.0	CCME 2001	1.20	Yes	HQ > 1.0
1,2,4-Trichlorobenzene	0/3	ND	23U - 40U	40	20,000	Efroymson et al. 1997a	<0.01	No	HQ < 1.0
1,2-Dichlorobenzene (o-)	0/3	ND	25U - 44U	44	100	CCME 2001	0.44	No	HQ < 1.0
1,3,5-Trinitrobenzene (TNB)	0/3	ND	89U - 160U	160	40,000	---	<0.01	No	HQ < 1.0
1,3-Dichlorobenzene (m-)	0/3	ND	28U - 50U	50	100	CCME 2001	0.50	No	HQ < 1.0
1,3-Dinitrobenzene (m-)	0/3	ND	54U - 96U	96	40,000	---	<0.01	No	HQ < 1.0
1,4-Dichlorobenzene (p-)	0/3	ND	24U - 42U	42	20,000	Efroymson et al. 1997a	<0.01	No	HQ < 1.0
1,4-Dioxane (p-)	0/3	ND	72U - 130U	130	NE	---	NA	Yes	No SSV
1,4-Naphthoquinone	0/3	ND	42U - 75U	75	NE	---	NA	Yes	No SSV
1,4-Phenylenediamine	0/3	ND	1,800U - 3,300U	3,300	NE	---	NA	Yes	No SSV
1-Naphthylamine	0/3	ND	89U - 160U	160	NE	---	NA	Yes	No SSV
2,2'-Oxybis[1-chloropropane]	0/3	ND	38U - 67U	67	NE	---	NA	Yes	No SSV
2,3,4,6-Tetrachlorophenol	0/3	ND	49U - 87U	87	50.0	CCME 2001	1.74	Yes	HQ > 1.0
2,4,5-Trichlorophenol	0/3	ND	35U - 62U	62	4,000	Efroymson et al. 1997b	0.02	No	HQ < 1.0
2,4,6-Trichlorophenol	0/3	ND	22U - 38U	38	10,000	Efroymson et al. 1997a	<0.01	No	HQ < 1.0
2,4-Dichlorophenol	0/3	ND	25U - 44U	44	50.0	CCME 2001	0.88	No	HQ < 1.0
2,4-Dimethylphenol	0/3	ND	38U - 67U	67	10.0	USEPA 2003	6.70	Yes	HQ > 1.0
2,4-Dinitrophenol	0/3	ND	180U - 330U	330	20,000	Efroymson et al. 1997b	0.02	No	HQ < 1.0
2,4-Dinitrotoluene (DNT)	0/3	ND	21U - 37U	37	NE	---	NA	Yes	No SSV
2,6-Dichlorophenol	0/3	ND	57U - 100U	100	50.0	CCME 2001	2.00	Yes	HQ > 1.0
2,6-Dinitrotoluene (DNT)	0/3	ND	36U - 64U	64	NE	---	NA	Yes	No SSV
2-Acetylaminofluorene	0/3	ND	41U - 73U	73	NE	---	NA	Yes	No SSV
2-Chloronaphthalene	0/3	ND	26U - 46U	46	NE	---	NA	Yes	No SSV
2-Chlorophenol	0/3	ND	29U - 52U	52	50.0	CCME 2001	1.04	Yes	HQ > 1.0

TABLE 7-2

FREQUENCY AND RANGE OF SUBSURFACE SOIL DATA (MAXIMUM CONCENTRATIONS) COMPARED TO SOIL SCREENING VALUES FOR TERRESTRIAL PLANTS AND INVERTEBRATES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte [1]	Contaminant Frequency/Range				Soil Screening Value (SSV)	Reference [3]	Maximum HQ [4]	Ecological COPC?	Comments
	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	Value used in Step 2 Screen [2]					
Semivolatile Organics (µg/kg)									
2-Methyl-5-nitroaniline	0/3	ND	35U - 62U	62	NE	---	NA	Yes	No SSV
2-Methylphenol (o-Cresol)	0/3	ND	33U - 58U	58	100	CCME 2001	0.58	No	HQ < 1.0
2-Naphthylamine	0/3	ND	89U - 160U	160	NE	---	NA	Yes	No SSV
2-Nitroaniline	0/3	ND	25U - 44U	44	NE	---	NA	Yes	No SSV
2-Nitrophenol	0/3	ND	22U - 38U	38	7,000	---	<0.01	No	HQ < 1.0
2-Picoline	0/3	ND	89U - 160U	160	NE	---	NA	Yes	No SSV
3,3'-Dichlorobenzidine	0/3	ND	33U - 58U	58	NE	---	NA	Yes	No SSV
3,3'-Dimethylbenzidine	0/3	ND	460U - 810U	810	NE	---	NA	Yes	No SSV
3,4-Methylphenol (m,p-Cresol)	0/3	ND	31U - 56U	56	100	CCME 2001	0.56	No	HQ < 1.0
3-Methylcholanthrene	0/3	ND	28U - 50U	50	NE	---	NA	Yes	No SSV
3-Nitroaniline	0/3	ND	36U - 64U	64	NE	---	NA	Yes	No SSV
4,6-Dinitro-2-methylphenol	0/3	ND	220U - 380U	380	100	CCME 2001	3.80	Yes	HQ > 1.0
4-Aminobiphenyl	0/3	ND	59U - 100U	100	NE	---	NA	Yes	No SSV
4-Bromophenyl-phenylether	0/3	ND	34U - 60U	60	NE	---	NA	Yes	No SSV
4-Chloro-3-methylphenol	0/3	ND	37U - 65U	65	NE	---	NA	Yes	No SSV
4-Chloroaniline	0/3	ND	28U - 50U	50	NE	---	NA	Yes	No SSV
4-Chlorophenyl-phenylether	0/3	ND	21U - 37U	37	NE	---	NA	Yes	No SSV
4-Dimethylaminoazobenzene (p-)	0/3	ND	41U - 73U	73	NE	---	NA	Yes	No SSV
4-Nitroaniline	0/3	ND	18U - 33U	33	NE	---	NA	Yes	No SSV
4-Nitrophenol	0/3	ND	230UJ - 400UJ	400	7,000	Efroymson et al. 1997a	0.06	No	HQ < 1.0
7,12-Dimethylbenz(a)anthracene	0/3	ND	34U - 60U	60	NE	---	NA	Yes	No SSV
a,a-Dimethylphenethylamine	0/3	ND	530UJ - 940UJ	940	NE	---	NA	Yes	No SSV
Acetophenone	0/3	ND	24U - 42U	42	NE	---	NA	Yes	No SSV
Aniline	0/3	ND	23U - 40U	40	NE	---	NA	Yes	No SSV
Aramite	0/3	ND	65UJ - 120UJ	120	NE	---	NA	Yes	No SSV
Benzyl Alcohol	0/3	ND	41U - 73U	73	NE	---	NA	Yes	No SSV
Bis(2-chloroethoxy)methane	0/3	ND	26U - 46U	46	NE	---	NA	Yes	No SSV
Bis(2-chloroethyl)ether	0/3	ND	30U - 54U	54	NE	---	NA	Yes	No SSV
Bis(2-ethylhexyl) Phthalate (BEHP)	0/3	ND	41U - 73U	73	30,000	CCME 2001	<0.01	No	HQ < 1.0
Butyl Benzyl Phthalate	0/3	ND	29U - 52U	52	30,000	CCME 2001	<0.01	No	HQ < 1.0
Diallate (total)	0/3	ND	61U - 110U	110	NE	---	NA	Yes	No SSV
Dibenzofuran	0/3	ND	21U - 37U	37	NE	---	NA	Yes	No SSV
Diethyl Phthalate (DEP)	0/3	ND	24U - 42U	42	100,000	Efroymson et al. 1997b	<0.01	No	HQ < 1.0
Dimethyl Phthalate	0/3	ND	21U - 37U	37	200,000	Efroymson et al. 1997a	<0.01	No	HQ < 1.0
Di-n-butyl Phthalate (DBP)	0/3	ND	30U - 54U	54	200,000	Efroymson et al. 1997b	<0.01	No	HQ < 1.0
Di-n-octyl Phthalate	0/3	ND	34U - 60U	60	30,000	CCME 2001	<0.01	No	HQ < 1.0
Dinoseb	0/3	ND	90U - 160U	160	NE	---	NA	Yes	No SSV
Ethyl Methane Sulfonate (EMS)	0/3	ND	72U - 130U	130	NE	---	NA	Yes	No SSV
Hexachloro-1,3-butadiene	0/3	ND	22U - 38U	38	NE	---	NA	Yes	No SSV
Hexachlorobenzene	0/3	ND	28U - 50U	50	1,000,000	Efroymson et al. 1997a	<0.01	No	HQ < 1.0
Hexachlorocyclopentadiene	0/3	ND	90U - 160U	160	10,000	Efroymson et al. 1997b	0.02	No	HQ < 1.0

TABLE 7-2

FREQUENCY AND RANGE OF SUBSURFACE SOIL DATA (MAXIMUM CONCENTRATIONS) COMPARED TO SOIL SCREENING VALUES FOR TERRESTRIAL PLANTS AND INVERTEBRATES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte [1]	Contaminant Frequency/Range				Soil Screening Value (SSV)	Reference [3]	Maximum HQ [4]	Ecological COPC?	Comments
	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	Value used in Step 2 Screen [2]					
Semivolatile Organics (µg/kg)									
Hexachloroethane	0/3	ND	22U - 38U	38	NE	---	NA	Yes	No SSV
Hexachlorophene	0/3	ND	14,000UJ - 24,000UJ	24000	NE	---	NA	Yes	No SSV
Hexachloropropene	0/3	ND	49U - 87U	87	NE	---	NA	Yes	No SSV
Isophorone	0/3	ND	24U - 42U	42	NE	---	NA	Yes	No SSV
Isosafrole	0/3	ND	69U - 120U	120	NE	---	NA	Yes	No SSV
Methapyrilene	0/3	ND	46U - 81U	81	NE	---	NA	Yes	No SSV
Methyl Methane Sulfonate	0/3	ND	60U - 110U	110	NE	---	NA	Yes	No SSV
Nitrobenzene	0/3	ND	38U - 67U	67	40,000	Efroymson et al. 1997a	<0.01	No	HQ < 1.0
n-Nitrosodiethylamine	0/3	ND	48U - 85U	85	20,000	---	<0.01	No	HQ < 1.0
n-Nitrosodimethylamine (NDMA)	0/3	ND	64U - 110U	110	20,000	Efroymson et al. 1997a	<0.01	No	HQ < 1.0
n-Nitroso-di-n-butylamine	0/3	ND	56U - 100U	100	20,000	---	<0.01	No	HQ < 1.0
n-Nitrosodi-n-propylamine	0/3	ND	30U - 54U	54	20,000	---	<0.01	No	HQ < 1.0
n-Nitrosodiphenylamine	0/3	ND	64U - 110U	110	20,000	Efroymson et al. 1997a	<0.01	No	HQ < 1.0
n-Nitrosomethylethylamine	0/3	ND	56U - 100U	100	20,000	---	<0.01	No	HQ < 1.0
n-Nitrosomorpholine	0/3	ND	72U - 130U	130	NE	---	NA	Yes	No SSV
n-Nitrosopiperidine	0/3	ND	77U - 140U	140	NE	---	NA	Yes	No SSV
n-Nitrosopyrrolidine	0/3	ND	49U - 87U	87	NE	---	NA	Yes	No SSV
o-Toluidine	0/3	ND	61U - 110U	110	NE	---	NA	Yes	No SSV
Pentachlorobenzene	0/3	ND	69U - 120U	120	50.0	CCME 2001	2.40	Yes	HQ > 1.0
Pentachloronitrobenzene	0/3	ND	61U - 110U	110	NE	---	NA	Yes	No SSV
Pentachlorophenol	0/3	ND	90U - 160U	160	5,000	USEPA 2007a	0.03	No	HQ < 1.0
Phenacetin	0/3	ND	55U - 98U	98	NE	---	NA	Yes	No SSV
Phenol	0/3	ND	33U - 58U	58	30,000	Efroymson et al. 1997a	<0.01	No	HQ < 1.0
Pronamide	0/3	ND	68U - 120U	120	13.6	USEPA 2003	8.82	Yes	HQ > 1.0
Pyridine	0/3	ND	33U - 58U	58	NE	---	NA	Yes	No SSV
Safrole	0/3	ND	57U - 100U	100	NE	---	NA	Yes	No SSV
PAHs (µg/kg)									
1-Methylnaphthalene	1/5	160 - 160	1.2U - 12U	160	2,500	---	0.06	No	HQ < 1.0
2-Methylnaphthalene	1/5	15 - 15	1.1U - 11U	15	2,500	---	<0.01	No	HQ < 1.0
Acenaphthene	0/5	ND	1.1U - 11U	11	20,000	Efroymson et al. 1997b	<0.01	No	HQ < 1.0
Acenaphthylene	0/5	ND	1.1U - 11U	11	2,500	---	<0.01	No	HQ < 1.0
Anthracene	0/5	ND	1.1U - 11U	11	2,500	CCME 2014	<0.01	No	HQ < 1.0
Benzo(a)anthracene	0/5	ND	1.1U - 11U	11	10,000	---	<0.01	No	HQ < 1.0
Benzo(a)pyrene (BaP)	0/5	ND	0.9U - 9.3U	9	20,000	CCME 2014	<0.01	No	HQ < 1.0
Benzo(b)fluoranthene	0/5	ND	1.2U - 12U	12	10,000	---	<0.01	No	HQ < 1.0
Benzo(g,h,i)perylene	1/5	54J - 54J	1.1U - 2.5U	54	10,000	---	<0.01	No	HQ < 1.0
Benzo(k)fluoranthene	0/5	ND	0.92U - 9.5U	9.5	10,000	---	<0.01	No	HQ < 1.0
Chrysene	0/5	ND	1U - 10U	10	10,000	---	<0.01	No	HQ < 1.0
Dibenz(a,h)anthracene	0/5	ND	0.8U - 16U	16	10,000	---	<0.01	No	HQ < 1.0
Fluoranthene	0/5	ND	0.54U - 12U	12	15,000	USEPA 2007b	<0.01	No	HQ < 1.0
Fluorene	1/5	19 - 19	1.3U - 13U	19	8,000	USEPA 2007b	<0.01	No	HQ < 1.0

TABLE 7-2

FREQUENCY AND RANGE OF SUBSURFACE SOIL DATA (MAXIMUM CONCENTRATIONS) COMPARED TO SOIL SCREENING VALUES FOR TERRESTRIAL PLANTS AND INVERTEBRATES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte [1]	Contaminant Frequency/Range				Soil Screening Value (SSV)	Reference [3]	Maximum HQ [4]	Ecological COPC?	Comments
	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	Value used in Step 2 Screen [2]					
PAHs (µg/kg)									
Indeno(1,2,3-cd)pyrene	0/5	ND	1.7U - 18U	18	10,000	---	<0.01	No	HQ < 1.0
Naphthalene	0/5	ND	1.3U - 13U	13	2,500	---	<0.01	No	HQ < 1.0
Phenanthrene	1/5	30 - 30	1.4U - 15U	30	9,000	USEPA 2007b	<0.01	No	HQ < 1.0
Pyrene	0/5	ND	1.3U - 13U	13	10,000	USEPA 2007b	<0.01	No	HQ < 1.0
Low Molecular Weight PAHs [5]	NA	NA	NA	282	29,000	USEPA 2007b	<0.01	No	HQ < 1.0
High Molecular Weight PAHs [6]	NA	NA	NA	153	18,000	USEPA 2007b	<0.01	No	HQ < 1.0
Organophosphorous Pesticides (µg/kg)									
Dimethoate	0/3	ND	49U - 87U	87	NE	---	NA	Yes	No SSV
Disulfoton	0/3	ND	60U - 110U	110	NE	---	NA	Yes	No SSV
Famphur	0/3	ND	110U - 190U	190	NE	---	NA	Yes	No SSV
Methyl Parathion	0/3	ND	51U - 90U	90	0.34	USEPA 2003	261.63	Yes	HQ > 1.0
o,o,o-Triethyl Phosphorothioate	0/3	ND	78U - 140U	140	NE	---	NA	Yes	No SSV
Parathion	0/3	ND	60U - 110U	110	NE	---	NA	Yes	No SSV
Phorate	0/3	ND	75U - 130U	130	NE	---	NA	Yes	No SSV
Sulfotep	0/3	ND	60U - 110U	110	NE	---	NA	Yes	No SSV
Thionazin	0/3	ND	46U - 81U	81	NE	---	NA	Yes	No SSV
Inorganics (mg/kg)									
Antimony	0/3	ND	0.48UJ - 0.82UJ	0.82	78.0	USEPA 2005a	0.01	No	HQ < 1.0
Arsenic	2/3	0.77J - 1.8J	1.2U - 1.2U	1.8	18.0	USEPA 2005b	0.10	No	HQ < 1.0
Barium	3/3	17 - 64	NA	64	330	USEPA 2005c	0.19	No	HQ < 1.0
Beryllium	3/3	0.15J - 0.28J	NA	0.28	40.0	USEPA 2005d	<0.01	No	HQ < 1.0
Cadmium	2/3	0.54J - 0.73J	0.4U - 0.4U	0.73	32.0	USEPA 2005e	0.02	No	HQ < 1.0
Chromium	3/3	4.2 - 19	NA	19	57.0	USEPA 2008	0.33	No	HQ < 1.0
Cobalt	3/3	3.9J - 32J	NA	32	13.0	USEPA 2005f	2.46	Yes	HQ > 1.0
Copper	3/3	93J - 130J	NA	130	70.0	USEPA 2007c	1.86	Yes	HQ > 1.0
Lead	3/3	3.7J - 790J	NA	790	120	USEPA 2005g	6.58	Yes	HQ > 1.0
Mercury	2/3	0.034 - 0.049	0.0081U - 0.0081U	0.049	0.10	Efroymson et al. 1997a	0.49	No	HQ < 1.0
Nickel	3/3	5J - 9.1	NA	9.1	38.0	USEPA 2007d	0.24	No	HQ < 1.0
Selenium	0/3	ND	0.96U - 1.6U	1.6	0.52	USEPA 2007e	3.08	Yes	HQ > 1.0
Silver	0/3	ND	0.11U - 0.18U	0.18	560	USEPA 2006	<0.01	No	HQ < 1.0
Thallium	1/3	4.6J - 4.6J	2.4UJ - 7UJ	4.6	1.00	Efroymson et al. 1997b	4.60	Yes	HQ > 1.0
Tin	0/3	ND	4.3U - 7.3U	7.3	50.0	Efroymson et al. 1997b	0.15	No	HQ < 1.0
Vanadium	3/3	170J - 200J	NA	200	20.0	USEPA 2005h	10.00	Yes	HQ > 1.0
Zinc	3/3	32J - 71J	NA	71	120	USEPA 2007f	0.59	No	HQ < 1.0

TABLE 7-2

FREQUENCY AND RANGE OF SUBSURFACE SOIL DATA (MAXIMUM CONCENTRATIONS) COMPARED TO SOIL SCREENING VALUES FOR TERRESTRIAL PLANTS AND INVERTEBRATES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Notes:

CCME = Canadian Council of Ministries of the Environment
COPC = Chemical of Potential Concern
HQ = Hazard Quotient
J = Estimated value
µg/kg = microgram per kilogram
mg/kg = milligram per kilogram
NA = Not Applicable
ND = Not Detected
NE = Not Established
PAH = Polynuclear Aromatic Hydrocarbon
SSV = Soil Screening Value
U = Not detected
UJ = Not detected, estimated value
USEPA = U.S. Environmental Protection Agency

(1) All subsurface soil analytical data for 4-nitroquinoline-1-oxide were rejected during data validation activities (see Appendix A). Although 4-nitroquinoline-1-oxide is not listed, this SVOC is identified as an ecological COPC based on the lack of any useable analytical data.

(2) The value listed represents the maximum detected concentration (or maximum non-detected concentrations for analytes that were not detected).

(3) See Table 5-1 for reference citations.

(4) For a given chemical, the hazard quotient (HQ) is the maximum detected concentration (or maximum non-detected concentration for analytes that were not detected) divided by the soil screening value.

(5) Low molecular weight PAHs are defined by the USEPA (2007b) as PAH compounds composed of fewer than four rings. The low molecular weight PAH compounds analyzed for in Tank 214 Area subsurface soil were 1-methylnaphthalene, 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, fluoranthene, fluorene, naphthalene, and phenanthrene. The value was calculated by summing maximum detected concentrations in site subsurface soil for each PAH. Maximum non-detected concentrations were used for those LMW PAHs that were not detected.

(6) High molecular weight PAHs are defined by the USEPA (2007b) as PAH compounds composed of four or more rings. The high molecular weight PAH compounds analyzed for in Tank 214 Area subsurface soil were benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, and pyrene. The value was calculated by summing maximum detected concentrations in subsurface soil for each PAH. Maximum non-detected concentrations were used for those HMW PAHs that were not detected.

TABLE 7-3

FREQUENCY AND RANGE OF GROUNDWATER DATA (MAXIMUM CONCENTRATIONS) COMPARED TO GROUNDWATER SCREENING VALUES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte [1]	Contaminant Frequency/Range				Groundwater Screening Value (GWSV)	Reference [3]	Maximum HQ [4]	Ecological COPC?	Comments
	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	Value used in Step 2 Screen [2]					
Volatile Organics (µg/L)									
1,1,1,2-Tetrachloroethane	0/21	ND	0.45U - 0.5U	0.50	85.0	USEPA 2013	<0.01	No	HQ < 1.0
1,1,1-Trichloroethane	0/21	ND	0.5U - 0.75U	0.75	312	USEPA 2001	<0.01	No	HQ < 1.0
1,1,2,2-Tetrachloroethane	0/21	ND	0.5U - 0.92U	0.92	90.2	USEPA 2001	0.01	No	HQ < 1.0
1,1,2-Trichloroethane	1/21	14 - 14	0.5U - 1.3U	14.0	340	USEPA 2014a	0.04	No	HQ < 1.0
1,1-Dichloroethane	0/21	ND	0.5U - 0.8U	0.80	47.0	USEPA 2003	0.02	No	HQ < 1.0
1,1-Dichloroethene	0/21	ND	0.5U - 0.73U	0.73	2,240	USEPA 2001	<0.01	No	HQ < 1.0
1,2,3-Trichloropropane	0/21	ND	0.37U - 0.5U	0.50	274	USEPA 2014a	<0.01	No	HQ < 1.0
1,2-Dibromo-3-chloropropane (DBCP)	0/21	ND	0.4U - 0.5U	0.50	100	USEPA 2014a	<0.01	No	HQ < 1.0
1,2-Dibromoethane (EDB)	0/21	ND	0.5U - 0.93U	0.93	48.0	USEPA 2014a	0.02	No	HQ < 1.0
1,2-Dichloroethane	0/21	ND	0.5U - 0.7U	0.70	1,130	USEPA 2001	<0.01	No	HQ < 1.0
1,2-Dichloroethene (trans)	0/21	ND	0.5U - 0.53U	0.53	4,480	Buchman 2008	<0.01	No	HQ < 1.0
1,2-Dichloropropane	0/21	ND	0.5U - 0.56U	0.56	2,400	USEPA 2001	<0.01	No	HQ < 1.0
1,3-Dichloropropene (cis)	0/21	ND	0.35U - 0.5U	0.50	7.90	USEPA 2001	0.06	No	HQ < 1.0
1,3-Dichloropropene (trans)	0/21	ND	0.21U - 0.5U	0.50	7.90	USEPA 2001	0.06	No	HQ < 1.0
1,4-Dichloro-2-butene (trans)	0/21	ND	0.42U - 2U	2.0	NE	---	NA	Yes	No GWSV
2-Butanone (MEK)	0/15	ND	0.39U - 2.5U	2.5	13,333	USEPA 2014a	<0.01	No	HQ < 1.0
2-Chloro-1,3-butadiene (Chloroprene)	0/21	ND	0.5U - 0.91U	0.91	NE	---	NA	Yes	No GWSV
2-Hexanone (MBK)	0/21	ND	0.26U - 2.5U	2.5	99.0	USEPA 2003	0.03	No	HQ < 1.0
3-Chloropropene (Allyl Chloride)	0/21	ND	0.4U - 0.5U	0.50	3.40	USEPA 2014a	0.15	No	HQ < 1.0
4-Methyl-2-pentanone (MIBK)	0/21	ND	0.96UJ - 2.5U	2.5	170	USEPA 2003	0.01	No	HQ < 1.0
Acetone	4/11	7.2J - 36J	7.3U - 29U	36.0	1,000	USEPA 2014a	0.04	No	HQ < 1.0
Acetonitrile	0/21	ND	0.23U - 0.5U	0.50	12,000	USEPA 2003	<0.01	No	HQ < 1.0
Acrolein	0/7	ND	12U - 12U	12.0	0.55	USEPA 2001	21.82	Yes	HQ > 1.0
Acrylonitrile	0/7	ND	3.2U - 3.2U	3.2	58.1	USEPA 2014a	0.06	No	HQ < 1.0
Benzene	7/23	0.09J - 330J	0.5U - 0.54U	330	109	USEPA 2001	3.03	Yes	HQ > 1.0
Bromodichloromethane	1/21	0.095J - 0.095J	0.34U - 0.5U	0.095	340	USEPA 2013	<0.01	No	HQ < 1.0
Bromoform	0/21	ND	0.42U - 0.5U	0.50	640	USEPA 2001	<0.01	No	HQ < 1.0
Bromomethane	0/21	ND	0.36U - 0.5U	0.50	120	USEPA 2014a	<0.01	No	HQ < 1.0
Carbon Disulfide	4/21	0.037J - 0.85J	0.5U - 0.93UJ	0.85	15.0	USEPA 2003	0.06	No	HQ < 1.0
Carbon Tetrachloride	1/21	3.6J - 3.6J	0.5U - 0.72U	3.6	1,500	USEPA 2001	<0.01	No	HQ < 1.0
Chlorobenzene	3/22	0.29J - 3.2	0.5U - 0.75U	3.2	105	USEPA 2001	0.03	No	HQ < 1.0
Chloroethane	0/21	ND	0.5U - 0.89UJ	0.89	NE	---	NA	Yes	No GWSV
Chloroform	3/21	0.043J - 1.3	0.5U - 0.52U	1.3	815	USEPA 2001	<0.01	No	HQ < 1.0
Chloromethane	0/21	ND	0.5U - 0.53U	0.53	2,700	USEPA 2014a	<0.01	No	HQ < 1.0
Dibromochloromethane	0/21	ND	0.41U - 0.5U	0.50	320	USEPA 2013	<0.01	No	HQ < 1.0
Dibromomethane	0/21	ND	0.5U - 0.65U	0.65	1,280	Buchman 2008	<0.01	No	HQ < 1.0
Ethyl Methacrylate	0/21	ND	0.8U - 5U	5.0	18,000	USEPA 2014a	<0.01	No	HQ < 1.0
Ethylbenzene	5/22	0.21J - 12J	0.28U - 0.5U	12.0	4.30	USEPA 2001	2.79	Yes	HQ > 1.0
Freon 11 (Trichlorofluoromethane)	0/21	ND	0.5U - 0.79U	0.79	1,280	Buchman 2008	<0.01	No	HQ < 1.0
Freon-12 (Dichlorodifluoromethane)	0/21	ND	0.33U - 0.5U	0.50	1,280	---	<0.01	No	HQ < 1.0
Isobutyl Alcohol	0/7	ND	0.36U - 0.36U	0.36	10,000	USEPA 2014a	<0.01	No	HQ < 1.0

TABLE 7-3

FREQUENCY AND RANGE OF GROUNDWATER DATA (MAXIMUM CONCENTRATIONS) COMPARED TO GROUNDWATER SCREENING VALUES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte [1]	Contaminant Frequency/Range				Groundwater Screening Value (SWSV)	Reference [3]	Maximum HQ [4]	Ecological COPC?	Comments
	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	Value used in Step 2 Screen [2]					
Volatile Organics (µg/L)									
Methyl Acrylonitrile	3/21	1.8J - 130	0.62U - 5U	130	NE	---	NA	Yes	No GWSV
Methyl Iodide	0/21	ND	0.41U - 0.5U	0.50	20.7	USEPA 2014a	0.02	No	HQ < 1.0
Methyl Methacrylate	0/14	ND	5U - 5U	5.0	2,800	USEPA 2003	<0.01	No	HQ < 1.0
Methylene Chloride	0/21	ND	0.33U - 0.5U	0.50	2,560	USEPA 2001	<0.01	No	HQ < 1.0
Pentachloroethane	0/21	ND	0.5U - 9.1U	9.1	56.2	Buchman 2008	0.16	No	HQ < 1.0
Propionitrile (Ethyl Cyanide)	0/7	ND	0.44U - 0.44U	0.44	15,200	USEPA 2014a	<0.01	No	HQ < 1.0
Styrene (Ethenylbenzene)	0/21	ND	0.36U - 0.5U	0.50	170	USEPA 2014a	<0.01	No	HQ < 1.0
Tetrachloroethene (PCE)	0/21	ND	0.5U - 1U	1.0	45.0	USEPA 2001	0.02	No	HQ < 1.0
Toluene	0/21	ND	0.5U - 10U	10.0	37.0	USEPA 2001	0.27	No	HQ < 1.0
Trichloroethene (TCE)	0/21	ND	0.5U - 0.62U	0.62	40.0	Buchman 2008	0.02	No	HQ < 1.0
Vinyl Acetate	0/21	ND	0.71U - 1U	1.0	140	USEPA 2014a	<0.01	No	HQ < 1.0
Vinyl Chloride	0/21	ND	0.5U - 0.96UJ	0.96	930	USEPA 2003	<0.01	No	HQ < 1.0
Xylene, m/p-	0/14	ND	1U - 1U	1.0	74.0	---	0.01	No	HQ < 1.0
Xylene, o-	0/14	ND	0.5U - 0.5U	0.50	74.0	---	<0.01	No	HQ < 1.0
Xylenes, total	0/21	ND	0.44U - 0.5U	0.50	74.0	USEPA 2014a	<0.01	No	HQ < 1.0
Semivolatile Organics (µg/L)									
1,1'-Biphenyl	0/6	ND	0.64U - 0.67U	0.67	230	USEPA 2014a	<0.01	No	HQ < 1.0
1,2,4,5-Tetrachlorobenzene	0/6	ND	1.1U - 1.2U	1.2	10.0	USEPA 2014a	0.12	No	HQ < 1.0
1,2,4-Trichlorobenzene	0/6	ND	0.51U - 0.53U	0.53	4.50	USEPA 2001	0.12	No	HQ < 1.0
1,2-Dichlorobenzene (o-)	0/6	ND	0.94U - 0.98U	0.98	19.7	USEPA 2001	0.05	No	HQ < 1.0
1,3,5-Trinitrobenzene (TNB)	0/6	ND	0.58U - 0.61U	0.61	80.0	USEPA 2014a	<0.01	No	HQ < 1.0
1,3-Dichlorobenzene (m-)	0/6	ND	0.52U - 0.54U	0.54	28.5	USEPA 2001	0.02	No	HQ < 1.0
1,3-Dinitrobenzene (m-)	0/6	ND	0.64U - 0.67U	0.67	22.0	USEPA 2003	0.03	No	HQ < 1.0
1,4-Dichlorobenzene (p-)	0/6	ND	0.49U - 0.51U	0.51	19.9	USEPA 2001	0.03	No	HQ < 1.0
1,4-Dioxane (p-)	1/6	4.3J - 4.3J	2.2U - 2.3U	4.3	67,000	USEPA 2014a	<0.01	No	HQ < 1.0
1,4-Naphthoquinone	0/6	ND	1.1U - 1.2U	1.2	NE	---	NA	Yes	No GWSV
1,4-Phenylenediamine	0/6	ND	0.68U - 0.71U	0.71	200	USEPA 2014a	<0.01	No	HQ < 1.0
1-Naphthylamine	0/6	ND	0.44U - 0.46U	0.46	70.0	USEPA 2014a	<0.01	No	HQ < 1.0
2,2'-Oxybis[1-chloropropane]	0/6	ND	0.93U - 0.97U	0.97	NE	---	NA	Yes	No GWSV
2,3,4,6-Tetrachlorophenol	0/6	ND	0.59U - 0.62U	0.62	8.80	Buchman 2008	0.07	No	HQ < 1.0
2,4,5-Trichlorophenol	0/6	ND	0.66U - 0.69U	0.69	11.0	Buchman 2008	0.06	No	HQ < 1.0
2,4,6-Trichlorophenol	0/6	ND	0.62U - 0.65U	0.65	12.1	USEPA 2014a	0.05	No	HQ < 1.0
2,4-Dichlorophenol	1/6	2.1J - 2.1J	0.94U - 0.97U	2.1	1.67	USEPA 2014a	1.26	Yes	HQ > 1.0
2,4-Dimethylphenol	0/6	ND	4.7U - 4.9U	4.9	131	USEPA 2014a	0.04	No	HQ < 1.0
2,4-Dinitrophenol	0/6	ND	0.53U - 0.55U	0.55	48.5	USEPA 2001	0.01	No	HQ < 1.0
2,4-Dinitrotoluene (DNT)	0/6	ND	0.65U - 0.68U	0.68	44.0	USEPA 2003	0.02	No	HQ < 1.0
2,6-Dichlorophenol	0/6	ND	0.54U - 0.56U	0.56	54.0	USEPA 2014a	0.01	No	HQ < 1.0
2,6-Dinitrotoluene (DNT)	0/6	ND	1.3U - 1.4U	1.4	81.0	USEPA 2003	0.02	No	HQ < 1.0
2-Acetylaminofluorene	0/6	ND	0.68U - 0.71U	0.71	20.0	USEPA 2014a	0.04	No	HQ < 1.0
2-Chloronaphthalene	0/6	ND	0.66U - 0.69U	0.69	0.15	Buchman 2008	4.60	Yes	HQ > 1.0
2-Chlorophenol	0/6	ND	0.58U - 0.61U	0.61	53.0	USEPA 2014a	0.01	No	HQ < 1.0

TABLE 7-3

FREQUENCY AND RANGE OF GROUNDWATER DATA (MAXIMUM CONCENTRATIONS) COMPARED TO GROUNDWATER SCREENING VALUES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte [1]	Contaminant Frequency/Range				Groundwater Screening Value (SWSV)	Reference [3]	Maximum HQ [4]	Ecological COPC?	Comments
	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	Value used in Step 2 Screen [2]					
Semivolatile Organics (µg/L)									
2-Methyl-5-nitroaniline	0/6	ND	0.94U - 0.98U	0.98	220	USEPA 2014a	<0.01	No	HQ < 1.0
2-Methylphenol (o-Cresol)	0/6	ND	0.6U - 0.63U	0.63	102	USEPA 2014a	<0.01	No	HQ < 1.0
2-Naphthylamine	0/6	ND	0.65U - 0.68U	0.68	NE	---	NA	Yes	No GWSV
2-Nitroaniline	0/6	ND	0.69U - 0.72U	0.72	48.9	USEPA 2014a	0.01	No	HQ < 1.0
2-Nitrophenol	0/6	ND	0.82UJ - 0.85U	0.85	10,000	USEPA 2014a	<0.01	No	HQ < 1.0
2-Picoline	0/6	ND	0.55U - 0.57U	0.57	8,979	USEPA 2014a	<0.01	No	HQ < 1.0
3,3'-Dichlorobenzidine	0/6	ND	2.4U - 2.5U	2.5	4.50	USEPA 2003	0.56	No	HQ < 1.0
3,3'-Dimethylbenzidine	0/6	ND	1.3U - 1.4U	1.4	160	USEPA 2014a	<0.01	No	HQ < 1.0
3,4-Methylphenol (m,p-Cresol)	0/6	ND	0.94U - 0.98U	0.98	33.6	---	0.03	No	HQ < 1.0
3-Methylcholanthrene	0/6	ND	0.65U - 0.68U	0.68	NE	---	NA	Yes	No GWSV
3-Nitroaniline	0/6	ND	0.94U - 0.98U	0.98	9.80	USEPA 2014a	0.10	No	HQ < 1.0
4,6-Dinitro-2-methylphenol	0/6	ND	0.64U - 0.67U	0.67	23.0	USEPA 2003	0.03	No	HQ < 1.0
4-Aminobiphenyl	0/6	ND	0.8U - 0.83U	0.83	NE	---	NA	Yes	No GWSV
4-Bromophenyl-phenylether	0/6	ND	0.52U - 0.54U	0.54	1.50	USEPA 2003	0.36	No	HQ < 1.0
4-Chloro-3-methylphenol	0/6	ND	0.49U - 0.51U	0.51	0.30	USEPA 2003	1.70	Yes	HQ > 1.0
4-Chloroaniline	0/6	ND	0.53U - 0.55U	0.55	10.0	USEPA 2014a	0.06	No	HQ < 1.0
4-Chlorophenyl-phenylether	0/6	ND	0.8U - 0.83U	0.83	7.30	USEPA 2014a	0.11	No	HQ < 1.0
4-Dimethylaminoazobenzene (p-)	0/6	ND	0.56U - 0.58U	0.58	NE	---	NA	Yes	No GWSV
4-Nitroaniline	0/6	ND	3.2U - 3.3U	3.3	170	USEPA 2014a	0.02	No	HQ < 1.0
4-Nitroquinoline-1-oxide	0/6	ND	1.2U - 1.3U	1.3	NE	---	NA	Yes	No GWSV
7,12-Dimethylbenz(a)anthracene	0/6	ND	0.78U - 0.81U	0.81	6.00	Buchman 2008	0.14	No	HQ < 1.0
a,a-Dimethylphenethylamine	0/6	ND	0.61U - 0.64U	0.64	NE	---	NA	Yes	No GWSV
Acetophenone	0/6	ND	9.4U - 9.8U	9.8	1,550	USEPA 2014a	<0.01	No	HQ < 1.0
Aniline	0/6	ND	1.6U - 1.7U	1.7	294	USEPA 2014a	<0.01	No	HQ < 1.0
Aramite	0/6	ND	0.75U - 7.3U	7.3	3.09	USEPA 2003	2.36	Yes	HQ > 1.0
Benzyl Alcohol	0/6	ND	0.74U - 0.76U	0.76	150	USEPA 2014a	<0.01	No	HQ < 1.0
Bis(2-chloroethoxy)methane	0/6	ND	0.68U - 0.71U	0.71	1,840	USEPA 2014a	<0.01	No	HQ < 1.0
Bis(2-chloroethyl)ether	1/6	1.1J - 1.1J	0.92U - 0.96U	1.1	2,380	USEPA 2001	<0.01	No	HQ < 1.0
Bis(2-ethylhexyl) Phthalate (BEHP)	0/6	ND	1.5U - 1.6U	1.6	360	Buchman 2008	<0.01	No	HQ < 1.0
Butyl Benzyl Phthalate	0/6	ND	0.77U - 0.8U	0.80	29.4	USEPA 2001	0.03	No	HQ < 1.0
Diallate (total)	0/6	ND	0.65U - 0.68U	0.68	82.0	USEPA 2014a	<0.01	No	HQ < 1.0
Dibenzofuran	1/6	7.9J - 7.9J	0.77U - 0.8U	7.9	33.3	USEPA 2014a	0.24	No	HQ < 1.0
Diethyl Phthalate (DEP)	0/6	ND	1.1U - 1.2U	1.2	75.9	USEPA 2001	0.02	No	HQ < 1.0
Dimethyl Phthalate	0/6	ND	2.4U - 2.5U	2.5	580	USEPA 2001	<0.01	No	HQ < 1.0
Di-n-butyl Phthalate (DBP)	0/6	ND	0.56U - 0.58U	0.58	3.40	USEPA 2001	0.17	No	HQ < 1.0
Di-n-octyl Phthalate	0/6	ND	0.85U - 0.88U	0.88	1,150	USEPA 2014a	<0.01	No	HQ < 1.0
Dinoseb	0/6	ND	0.75U - 0.78U	0.78	1.70	USEPA 2014a	0.46	No	HQ < 1.0
Ethyl Methane Sulfonate (EMS)	0/6	ND	1U - 1.1U	1.1	40.0	USEPA 2014a	0.03	No	HQ < 1.0
Hexachloro-1,3-butadiene	0/6	ND	4.7U - 4.9U	4.9	0.32	USEPA 2001	15.31	Yes	HQ > 1.0
Hexachlorobenzene	0/6	ND	0.94U - 0.98U	0.98	0.077	USEPA 2014a	12.73	Yes	HQ > 1.0
Hexachlorocyclopentadiene	0/6	ND	0.94U - 0.98U	0.98	0.07	USEPA 2001	14.00	Yes	HQ > 1.0

TABLE 7-3

FREQUENCY AND RANGE OF GROUNDWATER DATA (MAXIMUM CONCENTRATIONS) COMPARED TO GROUNDWATER SCREENING VALUES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte [1]	Contaminant Frequency/Range				Groundwater Screening Value (SWSV)	Reference [3]	Maximum HQ [4]	Ecological COPC?	Comments
	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	Value used in Step 2 Screen [2]					
Semivolatile Organics (µg/L)									
Hexachloroethane	0/5	ND	44U - 46UJ	46.0	9.40	USEPA 2001	4.89	Yes	HQ > 1.0
Hexachlorophene	0/6	ND	1.1UJ - 1.2UJ	1.2	8.80	USEPA 2014a	0.14	No	HQ < 1.0
Hexachloropropene	0/6	ND	0.63U - 0.66U	0.66	NE	---	NA	Yes	No GWSV
Isophorone	0/6	ND	0.91U - 0.94U	0.94	129	USEPA 2001	<0.01	No	HQ < 1.0
Isosafrole	0/6	ND	1.8UJ - 1.9U	1.9	NE	---	NA	Yes	No GWSV
Methapyrilene	0/6	ND	0.8UJ - 0.83UJ	0.83	NE	---	NA	Yes	No GWSV
Methyl Methane Sulfonate	0/6	ND	0.88U - 0.91U	0.91	NE	---	NA	Yes	No GWSV
Nitrobenzene	0/6	ND	0.74U - 0.76U	0.76	66.8	USEPA 2001	0.01	No	HQ < 1.0
n-Nitrosodiethylamine	0/6	ND	1U - 1.1U	1.1	768	USEPA 2003	<0.01	No	HQ < 1.0
n-Nitrosodimethylamine (NDMA)	0/6	ND	0.75U - 0.78U	0.78	25.0	USEPA 2011	0.03	No	HQ < 1.0
n-Nitroso-di-n-butylamine	0/6	ND	0.77U - 0.8U	0.80	25.0	---	0.03	No	HQ < 1.0
n-Nitrosodi-n-propylamine	0/6	ND	2.5U - 2.5U	2.5	25.0	---	0.10	No	HQ < 1.0
n-Nitrosodiphenylamine	0/6	ND	0.75U - 0.78U	0.78	25.0	USEPA 2011	0.03	No	HQ < 1.0
n-Nitrosomethylethylamine	0/6	ND	1U - 1.1U	1.1	25.0	---	0.04	No	HQ < 1.0
n-Nitrosomorpholine	0/6	ND	1.1U - 1.2U	1.2	NE	---	NA	Yes	No GWSV
n-Nitrosopiperidine	0/6	ND	0.54U - 0.56U	0.56	NE	---	NA	Yes	No GWSV
n-Nitrosopyrrolidine	0/6	ND	1.1U - 1.2U	1.2	NE	---	NA	Yes	No GWSV
o-Toluidine	1/6	2J - 2J	0.62U - 1.8U	2.0	5.20	USEPA 2014a	0.38	No	HQ < 1.0
Pentachlorobenzene	0/6	ND	1.1U - 1.2U	1.2	129	USEPA 2001	<0.01	No	HQ < 1.0
Pentachloronitrobenzene	0/6	ND	2.4U - 2.5U	2.5	0.12	USEPA 2014a	20.83	Yes	HQ > 1.0
Pentachlorophenol	0/6	ND	0.77U - 0.8U	0.80	7.90	USEPA 2009	0.10	No	HQ < 1.0
Phenacetin	3/6	2.6J - 5.6J	0.93U - 0.97U	5.6	NE	---	NA	Yes	No GWSV
Phenol	0/6	ND	35U - 36U	36.0	58.0	USEPA 2001	0.62	No	HQ < 1.0
Pronamide	0/6	ND	1.2U - 1.3U	1.3	35.0	USEPA 2014a	0.04	No	HQ < 1.0
Pyridine	0/6	ND	0.76U - 0.79U	0.79	500	USEPA 2014a	<0.01	No	HQ < 1.0
Safrole	0/6	ND	0.93U - 0.97U	0.97	NE	---	NA	Yes	No GWSV
PAHs (µg/L)									
1-Methylnaphthalene	3/6	0.46 - 12	0.011U - 0.56U	12.0	19.0	USEPA 2014a	0.63	No	HQ < 1.0
2-Methylnaphthalene	3/6	0.84 - 16	0.0072U - 0.38U	16.0	6.00	USEPA 2014a	2.67	Yes	HQ > 1.0
Acenaphthene	0/6	ND	0.015U - 0.82U	0.82	9.70	USEPA 2001	0.08	No	HQ < 1.0
Acenaphthylene	0/6	ND	0.008U - 0.42U	0.42	6.00	Buchman 2008	0.07	No	HQ < 1.0
Anthracene	0/6	ND	0.011U - 0.56U	0.56	5.35	USEPA 2014a	0.10	No	HQ < 1.0
Benzo(a)anthracene	0/6	ND	0.013U - 0.71U	0.71	0.025	USEPA 2003	28.40	Yes	HQ > 1.0
Benzo(a)pyrene (BaP)	0/6	ND	0.015U - 0.82U	0.82	0.0102	USEPA 2014a	80.39	Yes	HQ > 1.0
Benzo(b)fluoranthene	0/6	ND	0.039U - 2.1U	2.1	6.00	Buchman 2008	0.35	No	HQ < 1.0
Benzo(g,h,i)perylene	0/6	ND	0.022U - 1.2U	1.2	6.00	Buchman 2008	0.20	No	HQ < 1.0
Benzo(k)fluoranthene	0/6	ND	0.035U - 1.8U	1.8	6.00	Buchman 2008	0.30	No	HQ < 1.0
Chrysene	0/6	ND	0.014U - 0.77U	0.77	10.0	USEPA 2004	0.08	No	HQ < 1.0
Dibenz(a,h)anthracene	0/6	ND	0.023U - 1.2U	1.2	6.00	Buchman 2008	0.20	No	HQ < 1.0
Fluoranthene	0/6	ND	0.0082U - 0.43U	0.43	11.0	USEPA 1996	0.04	No	HQ < 1.0
Fluorene	3/6	0.059J - 0.22J	0.012U - 0.61U	0.22	10.0	USEPA 2014a	0.02	No	HQ < 1.0

TABLE 7-3

FREQUENCY AND RANGE OF GROUNDWATER DATA (MAXIMUM CONCENTRATIONS) COMPARED TO GROUNDWATER SCREENING VALUES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte [1]	Contaminant Frequency/Range				Groundwater Screening Value (SWSV)	Reference [3]	Maximum HQ [4]	Ecological COPC?	Comments
	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	Value used in Step 2 Screen [2]					
PAHs (µg/L)									
Indeno(1,2,3-cd)pyrene	0/6	ND	0.032U - 1.7U	1.7	6.00	Buchman 2008	0.28	No	HQ < 1.0
Naphthalene	3/6	0.91 - 16	0.0091U - 0.48U	16.0	23.5	USEPA 2001	0.68	No	HQ < 1.0
Phenanthrene	2/6	0.029J - 0.32J	0.0082U - 0.43U	0.32	8.30	USEPA 1996	0.04	No	HQ < 1.0
Pyrene	1/6	0.032J - 0.032J	0.0083U - 0.44U	0.032	0.248	USEPA 2014a	0.13	No	HQ < 1.0
Organophosphorous Pesticides (µg/kg)									
Dimethoate	0/6	ND	0.6U - 0.63U	0.63	0.15	USEPA 2014b	4.20	Yes	HQ > 1.0
Disulfoton	0/6	ND	0.84U - 0.87U	0.87	2.35	USEPA 2014a	0.37	No	HQ < 1.0
Famphur	0/6	ND	0.66U - 0.69U	0.69	0.16	USEPA 2014a	4.31	Yes	HQ > 1.0
Methyl Parathion	0/6	ND	0.78U - 0.81U	0.81	0.11	USEPA 2014a	7.36	Yes	HQ > 1.0
o,o,o-Triethyl Phosphorothioate	0/6	ND	0.74U - 0.76U	0.76	NE	---	NA	Yes	No GWSV
Parathion	0/6	ND	0.74U - 0.76U	0.76	0.67	USEPA 2014a	1.13	Yes	HQ > 1.0
Phorate	0/6	ND	2.1U - 2.2U	2.2	0.09	USEPA 2014a	24.44	Yes	HQ > 1.0
Sulfotep	0/6	ND	0.66U - 0.69U	0.69	0.0023	USEPA 2014a	300.00	Yes	HQ > 1.0
Thionazin	0/6	ND	0.63U - 0.66U	0.66	0.9	USEPA 2014a	0.73	No	HQ < 1.0
Total Metals (µg/L)									
Antimony	0/7	ND	5.1U - 5.1U	5.1	500	Buchman 2008	0.01	No	HQ < 1.0
Arsenic	2/7	13J - 20	5.2U - 5.2U	20.0	36.0	PREQB 2010	0.56	No	HQ < 1.0
Barium	7/7	78 - 370	NA	370	16,667	USEPA 2014a	0.02	No	HQ < 1.0
Beryllium	3/7	0.19J - 0.83J	0.14U - 0.14U	0.83	167	USEPA 2014a	<0.01	No	HQ < 1.0
Cadmium	4/7	1.3J - 13	1U - 1U	13.0	8.85	PREQB 2010	1.47	Yes	HQ > 1.0
Chromium	2/7	54 - 56	1.1U - 5.2U	56.0	50.4	PREQB 2010	1.11	Yes	HQ > 1.0
Cobalt	7/7	2.7J - 91J	NA	91.0	45.0	USEPA 2014a	2.02	Yes	HQ > 1.0
Copper	7/7	8.9J - 510	NA	510	3.73	PREQB 2010	136.73	Yes	HQ > 1.0
Lead	4/7	6.1J - 93	3.5U - 3.5U	93.0	8.52	PREQB 2010	10.92	Yes	HQ > 1.0
Mercury	1/7	0.57J - 0.57J	0.08UJ - 0.08UJ	0.57	1.11	USEPA 2009	0.51	No	HQ < 1.0
Nickel	7/7	2.2J - 31J	NA	31.0	8.28	PREQB 2010	3.74	Yes	HQ > 1.0
Selenium	0/7	ND	5.4U - 6.1U	6.1	71.1	PREQB 2010	0.09	No	HQ < 1.0
Silver	1/7	1.2J - 1.2J	1U - 1U	1.2	2.24	PREQB 2010	0.54	No	HQ < 1.0
Thallium	0/7	ND	11UJ - 11UJ	11.0	21.3	USEPA 2001	0.52	No	HQ < 1.0
Tin	1/7	7.1J - 7.1J	6.3U - 6.3U	7.1	180	USEPA 2003	0.04	No	HQ < 1.0
Vanadium	7/7	45J - 630J	NA	630	12.0	USEPA 2003	52.50	Yes	HQ > 1.0
Zinc	2/7	130 - 160	9.7U - 17U	160	85.6	PREQB 2010	1.87	Yes	HQ > 1.0

TABLE 7-3

FREQUENCY AND RANGE OF GROUNDWATER DATA (MAXIMUM CONCENTRATIONS) COMPARED TO GROUNDWATER SCREENING VALUES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Notes:

COPC = Chemical of Potential Concern
GWSV = Groundwater Screening Value
HQ = Hazard Quotient
J = Estimated value

µg/L = microgram per liter
NA = Not Applicable
ND = Not Detected
NE = Not Established

PAH = Polynuclear Aromatic Hydrocarbon
PREQB = Puerto Rico Environmental Quality Board
U = Not detected
UJ = Not detected, estimated value
USEPA = U.S. Environmental Protection Agency

(1) All goundwater analytical data for 4-nitrophenol was rejected druing data validation activities (see Appendix A). Althought 4-nitrophenol is not listed below, this SVOC is identified as an ecological COPC based on the lack of any usable analytical data.

(2) The value listed represents the maximum detected concentration (or maximum non-detected concentrations for analytes that were not detected).

(3) See Table 5-2 for reference citations.

(4) For a given chemical, the hazard quotient (HQ) is the maximum detected concentration (or maximum non-detected concentration for analytes that were not detected) divided by the groundwater screening value.

TABLE 7-4

FREQUENCY AND RANGE OF SURFACE WATER DATA (MAXIMUM CONCENTRATIONS) COMPARED TO MARINE SURFACE WATER SCREENING VALUES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte	Contaminant Frequency/Range				Surface Water Screening Value (SWSV)	Reference [2]	Maximum HQ [3]	Ecological COPC?	Comments
	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	Value used in Step 2 Screen [1]					
Volatile Organics (µg/L)									
1,1,1-Trichloroethane	0/4	ND	5U - 5U	5.0	312	USEPA 2001	0.02	No	HQ < 1.0
1,1,2,2-Tetrachloroethane	0/4	ND	5U - 5U	5.0	90.2	USEPA 2001	0.06	No	HQ < 1.0
1,1,2-Trichloroethane	0/4	ND	5U - 5U	5.0	340	USEPA 2014a	0.01	No	HQ < 1.0
1,1-Dichloroethane	0/4	ND	5U - 5U	5.0	47.0	USEPA 2003	0.11	No	HQ < 1.0
1,1-Dichloroethene	0/4	ND	5U - 5U	5.0	2,240	USEPA 2001	<0.01	No	HQ < 1.0
1,2-Dichloroethane	0/4	ND	5U - 5U	5.0	1,130	USEPA 2001	<0.01	No	HQ < 1.0
1,2-Dichloroethene (cis)	0/4	ND	5U - 5U	5.0	4,480	Buchman 2008	<0.01	No	HQ < 1.0
1,2-Dichloroethene (trans)	0/4	ND	5U - 5U	5.0	4,480	Buchman 2008	<0.01	No	HQ < 1.0
1,2-Dichloropropane	0/4	ND	5U - 5U	5.0	2,400	USEPA 2001	<0.01	No	HQ < 1.0
1,3-Dichloropropene (cis)	0/4	ND	5U - 5U	5.0	7.90	USEPA 2001	0.63	No	HQ < 1.0
1,3-Dichloropropene (trans)	0/4	ND	5U - 5U	5.0	7.90	USEPA 2001	0.63	No	HQ < 1.0
2-Butanone (MEK)	0/4	ND	25U - 25U	25.0	13,333	USEPA 2014a	<0.01	No	HQ < 1.0
2-Hexanone (MBK)	0/4	ND	25U - 25U	25.0	99.0	USEPA 2003	0.25	No	HQ < 1.0
4-Methyl-2-pentanone (MIBK)	0/4	ND	25U - 25U	25.0	170	USEPA 2003	0.15	No	HQ < 1.0
Acetone	0/4	ND	50U - 50U	50.0	1,000	USEPA 2014a	0.05	No	HQ < 1.0
Benzene	0/15	ND	5U - 5U	5.0	109	USEPA 2001	0.05	No	HQ < 1.0
Bromodichloromethane	0/4	ND	5U - 5U	5.0	340	USEPA 2013	0.01	No	HQ < 1.0
Bromoform	0/4	ND	5U - 5U	5.0	640	USEPA 2001	<0.01	No	HQ < 1.0
Bromomethane	0/4	ND	10U - 10U	10.0	120	USEPA 2014a	0.08	No	HQ < 1.0
Carbon Disulfide	0/4	ND	5U - 5U	5.0	15.0	USEPA 2003	0.33	No	HQ < 1.0
Carbon Tetrachloride	0/4	ND	5U - 5U	5.0	1,500	USEPA 2001	<0.01	No	HQ < 1.0
Chlorobenzene	0/4	ND	5U - 5U	5.0	105	USEPA 2001	0.05	No	HQ < 1.0
Chloroethane	0/4	ND	10U - 10U	10.0	NE	---	NA	Yes	No SWSV
Chloroform	0/4	ND	5U - 5U	5.0	815	USEPA 2001	<0.01	No	HQ < 1.0
Chloromethane	0/4	ND	10U - 10U	10.0	2,700	USEPA 2014a	<0.01	No	HQ < 1.0
Dibromochloromethane	0/4	ND	5U - 5U	5.0	320	USEPA 2013	0.02	No	HQ < 1.0
Ethylbenzene	0/15	ND	5U - 5U	5.0	4.30	USEPA 2001	1.16	Yes	HQ > 1.0
Methylene Chloride	1/4	2.7J - 2.7J	5U - 5U	2.7	2,560	USEPA 2001	<0.01	No	HQ < 1.0
Styrene (Ethenylbenzene)	0/4	ND	5U - 5U	5.0	170	USEPA 2014a	0.03	No	HQ < 1.0
Tetrachloroethene (PCE)	0/4	ND	5U - 5U	5.0	45.0	USEPA 2001	0.11	No	HQ < 1.0
Toluene	0/15	ND	5U - 5U	5.0	37.0	USEPA 2001	0.14	No	HQ < 1.0
Trichloroethene (TCE)	0/4	ND	5U - 5U	5.0	40.0	Buchman 2008	0.13	No	HQ < 1.0
Vinyl Chloride	0/4	ND	10U - 10U	10.0	930	USEPA 2003	0.01	No	HQ < 1.0
Xylenes, total	0/15	ND	10U - 10U	10.0	74.0	USEPA 2014a	0.14	No	HQ < 1.0
Semivolatile Organics (µg/L)									
1,2,4-Trichlorobenzene	0/4	ND	10U - 10U	10.0	4.50	USEPA 2001	2.22	Yes	HQ > 1.0
1,2-Dichlorobenzene (o-)	0/4	ND	10U - 10U	10.0	19.7	USEPA 2001	0.51	No	HQ < 1.0
1,3-Dichlorobenzene (m-)	0/4	ND	10U - 10U	10.0	28.5	USEPA 2001	0.35	No	HQ < 1.0
1,4-Dichlorobenzene (p-)	0/4	ND	10U - 10U	10.0	19.9	USEPA 2001	0.50	No	HQ < 1.0
2,2'-Oxybis[1-chloropropane]	0/4	ND	10U - 10U	10.0	NE	---	NA	Yes	No SWSV
2,4,5-Trichlorophenol	0/4	ND	10U - 10U	10.0	11.0	Buchman 2008	0.91	No	HQ < 1.0

TABLE 7-4

FREQUENCY AND RANGE OF SURFACE WATER DATA (MAXIMUM CONCENTRATIONS) COMPARED TO MARINE SURFACE WATER SCREENING VALUES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte	Contaminant Frequency/Range				Surface Water Screening Value (SWSV)	Reference [2]	Maximum HQ [3]	Ecological COPC?	Comments
	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	Value used in Step 2 Screen [1]					
Semivolatile Organics (µg/L)									
2,4,6-Trichlorophenol	0/4	ND	10U - 10U	10.0	12.1	USEPA 2014a	0.83	No	HQ < 1.0
2,4-Dichlorophenol	0/4	ND	10U - 10U	10.0	1.67	USEPA 2014a	5.99	Yes	HQ > 1.0
2,4-Dimethylphenol	0/4	ND	10U - 10U	10.0	131	USEPA 2014a	0.08	No	HQ < 1.0
2,4-Dinitrophenol	0/4	ND	50U - 50U	50.0	48.5	USEPA 2001	1.03	Yes	HQ > 1.0
2,4-Dinitrotoluene (DNT)	0/4	ND	10U - 10U	10.0	44.0	USEPA 2003	0.23	No	HQ < 1.0
2,6-Dinitrotoluene (DNT)	0/4	ND	10U - 10U	10.0	81.0	USEPA 2003	0.12	No	HQ < 1.0
2-Chloronaphthalene	0/4	ND	10U - 10U	10.0	0.15	Buchman 2008	66.67	Yes	HQ > 1.0
2-Chlorophenol	0/4	ND	10U - 10U	10.0	53.0	USEPA 2014a	0.19	No	HQ < 1.0
2-Methylphenol (o-Cresol)	0/4	ND	10U - 10U	10.0	102	USEPA 2014a	0.10	No	HQ < 1.0
2-Nitroaniline	0/4	ND	50U - 50U	50.0	48.9	USEPA 2014a	1.02	Yes	HQ > 1.0
2-Nitrophenol	0/4	ND	10U - 10U	10.0	10,000	USEPA 2014a	<0.01	No	HQ < 1.0
3,3'-Dichlorobenzidine	0/4	ND	20U - 20U	20.0	4.50	USEPA 2003	4.44	Yes	HQ > 1.0
3,4-Methylphenol (m,p-Cresol)	0/4	ND	10U - 10U	10.0	33.6	---	0.30	No	HQ < 1.0
3-Nitroaniline	0/4	ND	50U - 50U	50.0	9.80	USEPA 2014a	5.10	Yes	HQ > 1.0
4,6-Dinitro-2-methylphenol	0/4	ND	50U - 50U	50.0	23.0	USEPA 2003	2.17	Yes	HQ > 1.0
4-Bromophenyl-phenylether	0/4	ND	10U - 10U	10.0	1.50	USEPA 2003	6.67	Yes	HQ > 1.0
4-Chloro-3-methylphenol	0/4	ND	10U - 10U	10.0	0.30	USEPA 2003	33.33	Yes	HQ > 1.0
4-Chloroaniline	0/4	ND	20U - 20U	20.0	10.0	USEPA 2014a	2.00	Yes	HQ > 1.0
4-Chlorophenyl-phenylether	0/4	ND	10U - 10U	10.0	7.30	USEPA 2014a	1.37	Yes	HQ > 1.0
4-Nitroaniline	0/4	ND	50U - 50U	50.0	170	USEPA 2014a	0.29	No	HQ < 1.0
4-Nitrophenol	0/4	ND	50U - 50U	50.0	71.7	USEPA 2001	0.70	No	HQ < 1.0
Benzidine	0/4	ND	80U - 80U	80.0	44.7	USEPA 2014a	1.79	Yes	HQ > 1.0
Benzoic Acid	0/4	ND	50U - 50U	50.0	3,333	USEPA 2014a	0.02	No	HQ < 1.0
Benzyl Alcohol	0/4	ND	10U - 10U	10.0	150	USEPA 2014a	0.07	No	HQ < 1.0
Bis(2-chloroethoxy)methane	0/4	ND	10U - 10U	10.0	1,840	USEPA 2014a	<0.01	No	HQ < 1.0
Bis(2-chloroethyl)ether	0/4	ND	10U - 10U	10.0	2,380	USEPA 2001	<0.01	No	HQ < 1.0
Bis(2-ethylhexyl) Phthalate (BEHP)	0/4	ND	10U - 10U	10.0	360	Buchman 2008	0.03	No	HQ < 1.0
Butyl Benzyl Phthalate	0/4	ND	10U - 10U	10.0	29.4	USEPA 2001	0.34	No	HQ < 1.0
Dibenzofuran	0/4	ND	10U - 10U	10.0	33.3	USEPA 2014a	0.30	No	HQ < 1.0
Diethyl Phthalate (DEP)	0/4	ND	10U - 10U	10.0	75.9	USEPA 2001	0.13	No	HQ < 1.0
Dimethyl Phthalate	0/4	ND	10U - 10U	10.0	580	USEPA 2001	0.02	No	HQ < 1.0
Di-n-butyl Phthalate (DBP)	0/4	ND	10U - 10U	10.0	3.40	USEPA 2001	2.94	Yes	HQ > 1.0
Dimethyl Phthalate	0/4	ND	10U - 10U	10.0	580	USEPA 2001	0.02	No	HQ < 1.0
Di-n-butyl Phthalate (DBP)	0/4	ND	10U - 10U	10.0	3.40	USEPA 2001	2.94	Yes	HQ > 1.0
Di-n-octyl Phthalate	0/4	ND	10U - 10U	10.0	1,150	USEPA 2014a	<0.01	No	HQ < 1.0
Diphenylamine	0/4	ND	10U - 10U	10.0	3.10	USEPA 2014a	3.23	Yes	HQ > 1.0
Hexachloro-1,3-butadiene	0/4	ND	10U - 10U	10.0	0.32	USEPA 2001	31.25	Yes	HQ > 1.0
Hexachlorobenzene	0/4	ND	10U - 10U	10.0	0.077	USEPA 2014a	129.87	Yes	HQ > 1.0
Hexachlorocyclopentadiene	0/4	ND	10U - 10U	10.0	0.07	USEPA 2001	142.86	Yes	HQ > 1.0
Hexachloroethane	0/4	ND	10U - 10U	10.0	9.40	USEPA 2001	1.06	Yes	HQ > 1.0
Isophorone	0/4	ND	10U - 10U	10.0	129	USEPA 2001	0.08	No	HQ < 1.0

TABLE 7-4

FREQUENCY AND RANGE OF SURFACE WATER DATA (MAXIMUM CONCENTRATIONS) COMPARED TO MARINE SURFACE WATER SCREENING VALUES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte	Contaminant Frequency/Range				Surface Water Screening Value (SWSV)	Reference (2)	Maximum HQ (3)	Ecological COPC?	Comments
	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	Value used in Step 2 Screen (1)					
Semivolatile Organics (µg/L)									
Nitrobenzene	0/4	ND	10U - 10U	10.0	66.8	USEPA 2001	0.15	No	HQ < 1.0
n-Nitrosodimethylamine (NDMA)	0/4	ND	10U - 10U	10.0	25.0	USEPA 2011	0.40	No	HQ < 1.0
n-Nitrosodi-n-propylamine	0/4	ND	10U - 10U	10.0	25.0	---	0.40	No	HQ < 1.0
Pentachlorophenol	0/4	ND	50U - 50U	50.0	7.90	USEPA 2009	6.33	Yes	HQ > 1.0
Phenol	0/4	ND	10U - 10U	10.0	58.0	USEPA 2001	0.17	No	HQ < 1.0
PAHs (µg/L)									
2-Methylnaphthalene	0/4	ND	10U - 10U	10.0	6.00	USEPA 2014a	1.67	Yes	HQ > 1.0
Acenaphthene	0/4	ND	10U - 10U	10.0	9.70	USEPA 2001	1.03	Yes	HQ > 1.0
Acenaphthylene	0/4	ND	10U - 10U	10.0	6.00	Buchman 2008	1.67	Yes	HQ > 1.0
Anthracene	0/4	ND	10U - 10U	10.0	5.35	USEPA 2014a	1.87	Yes	HQ > 1.0
Benzo(a)anthracene	0/4	ND	10U - 10U	10.0	0.025	USEPA 2003	400.00	Yes	HQ > 1.0
Benzo(a)pyrene (BaP)	0/4	ND	10U - 10U	10.0	0.0102	USEPA 2014a	980.39	Yes	HQ > 1.0
Benzo(b)fluoranthene	0/4	ND	10U - 10U	10.0	6.00	Buchman 2008	1.67	Yes	HQ > 1.0
Benzo(g,h,i)perylene	0/4	ND	10U - 10U	10.0	6.00	Buchman 2008	1.67	Yes	HQ > 1.0
Benzo(k)fluoranthene	0/4	ND	10U - 10U	10.0	6.00	Buchman 2008	1.67	Yes	HQ > 1.0
Chrysene	0/4	ND	10U - 10U	10.0	10.0	USEPA 2004	1.00	No	HQ = 1.0
Dibenz(a,h)anthracene	0/4	ND	10U - 10U	10.0	6.00	Buchman 2008	1.67	Yes	HQ > 1.0
Fluoranthene	0/4	ND	10U - 10U	10.0	11.0	USEPA 1996	0.91	No	HQ < 1.0
Fluorene	0/4	ND	10U - 10U	10.0	10.0	USEPA 2014a	1.00	No	HQ = 1.0
Indeno(1,2,3-cd)pyrene	0/4	ND	10U - 10U	10.0	6.00	Buchman 2008	1.67	Yes	HQ > 1.0
Naphthalene	0/4	ND	10U - 10U	10.0	23.5	USEPA 2001	0.43	No	HQ < 1.0
Phenanthrene	0/4	ND	10U - 10U	10.0	8.30	USEPA 1996	1.20	Yes	HQ > 1.0
Pyrene	0/4	ND	10U - 10U	10.0	0.248	USEPA 2014a	40.32	Yes	HQ > 1.0
Total Metals (µg/L)									
Antimony	3/15	6.5J - 16.5	2.7U - 20U	16.5	500	Buchman 2008	0.03	No	HQ < 1.0
Arsenic	7/15	3.7J - 110	10U - 10U	110	36.0	PREQB 2010	3.06	Yes	HQ > 1.0
Barium	15/15	25 - 450	NA	450	16,667	USEPA 2014a	0.03	No	HQ < 1.0
Beryllium	4/15	0.12J - 6.6	0.1U - 4U	6.6	167	USEPA 2014a	0.04	No	HQ < 1.0
Cadmium	7/15	0.7J - 38	2.5U - 5U	38.0	8.85	PREQB 2010	4.29	Yes	HQ > 1.0
Chromium	12/15	4.3J - 540	2.7U - 10U	540	50.4	PREQB 2010	10.71	Yes	HQ > 1.0
Cobalt	11/15	0.96J - 220	10U - 10U	220	45.0	USEPA 2014a	4.89	Yes	HQ > 1.0
Copper	13/15	8.1J - 3,100	25.6U - 41.4U	3,100	3.73	PREQB 2010	831.10	Yes	HQ > 1.0
Lead	11/15	1.7J - 1,100	4.5UJ - 5U	1,100	8.52	PREQB 2010	129.11	Yes	HQ > 1.0
Mercury	5/15	0.08J - 0.78	0.1U - 0.2U	0.78	1.11	USEPA 2009	0.70	No	HQ < 1.0
Nickel	7/15	4.4J - 200	2.7U - 40U	200	8.28	PREQB 2010	24.15	Yes	HQ > 1.0
Selenium	4/15	5J - 26	10U - 17UJ	26.0	71.1	PREQB 2010	0.37	No	HQ < 1.0
Silver	0/15	ND	0.6U - 10U	10.0	2.24	PREQB 2010	4.46	Yes	HQ > 1.0
Thallium	0/11	ND	10U - 50U	50.0	21.3	USEPA 2001	2.35	Yes	HQ > 1.0
Tin	6/15	2.7J - 25J	50U - 50U	25.0	180	USEPA 2003	0.14	No	HQ < 1.0
Vanadium	14/15	23J - 4,700	50U - 50U	4,700	12.0	USEPA 2003	391.67	Yes	HQ > 1.0
Zinc	14/15	6.3J - 1,300	20U - 20U	1,300	85.6	PREQB 2010	15.19	Yes	HQ > 1.0

TABLE 7-4

FREQUENCY AND RANGE OF SURFACE WATER DATA (MAXIMUM CONCENTRATIONS) COMPARED TO MARINE SURFACE WATER SCREENING VALUES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Notes:

COPC = Chemical of Potential Concern
HQ = Hazard Quotient
J = Estimated value
µg/L - microgram per liter
NA = Not Applicable
ND = Not Detected
NE = Not Established
PREQB = Puerto Rico Environmental Quality Board
SWSV = Surface Water Screening Value
U = Not detected
UJ = Not detected, estimated value
USEPA = U.S. Environmental Protection Agency

(1) The value listed represents the maximum detected concentration (or maximum non-detected concentrations for analytes that were not detected).

(2) See Table 5-2 for reference citations.

(3) For a given chemical, the hazard quotient (HQ) is the maximum detected concentration (or maximum non-detected concentration for analytes that were not detected) divided by the surface water screening value.

TABLE 7-5

FREQUENCY AND RANGE OF SEDIMENT DATA (MAXIMUM CONCENTRATIONS) COMPARED TO MARINE SEDIMENT SCREENING VALUES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte [1]	Contaminant Frequency/Range				Sediment Screening Value (SDSV)	Reference [3]	Maximum HQ [4]	Ecological COPC?	Comments
	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	Value used in Step 2 Screen [2]					
Volatile Organics (µg/kg)									
1,1,1,2-Tetrachloroethane	0/53	ND	0.79UJ - 160UJ	160	249	USEPA 1993 and 1996	0.64	No	HQ < 1.0
1,1,1-Trichloroethane	0/57	ND	0.72UJ - 140UJ	140	466	USEPA 1993 and 1996	0.30	No	HQ < 1.0
1,1,2,2-Tetrachloroethane	0/57	ND	1.7UJ - 350UJ	350	291	USEPA 1993 and 1996	1.20	Yes	HQ > 1.0
1,1,2-Trichloroethane	0/57	ND	1.5UJ - 300UJ	300	702	USEPA 1993 and 1996	0.43	No	HQ < 1.0
1,1-Dichloroethane	0/57	ND	0.62UJ - 120UJ	120	50.8	USEPA 1993 and 1996	2.36	Yes	HQ > 1.0
1,1-Dichloroethene	0/57	ND	0.67UJ - 130UJ	130	2,423	USEPA 1993 and 1996	0.05	No	HQ < 1.0
1,2,3-Trichloropropane	0/53	ND	1.7UJ - 350UJ	350	1,079	USEPA 1993 and 1996	0.32	No	HQ < 1.0
1,2-Dibromo-3-chloropropane (DBCP)	0/53	ND	3.5UJ - 690UJ	690	394	USEPA 1993 and 1996	1.75	Yes	HQ > 1.0
1,2-Dibromoethane (Ethylene Dibromide)	0/53	ND	1.8UJ - 370UJ	370	64.6	USEPA 1993 and 1996	5.73	Yes	HQ > 1.0
1,2-Dichloroethane	0/57	ND	1.2UJ - 250UJ	250	1,521	USEPA 1993 and 1996	0.16	No	HQ < 1.0
1,2-Dichloroethene (cis)	0/4	ND	10U - 15U	15.0	6,032	USEPA 1993 and 1996	<0.01	No	HQ < 1.0
1,2-Dichloroethene (trans)	0/57	ND	1.2UJ - 240UJ	240	6,032	USEPA 1993 and 1996	0.04	No	HQ < 1.0
1,2-Dichloropropane	0/57	ND	1.4UJ - 270UJ	270	4,953	USEPA 1993 and 1996	0.05	No	HQ < 1.0
1,3-Dichloropropene (cis)	0/57	ND	1.1UJ - 210UJ	210	17.7	USEPA 1993 and 1996	11.86	Yes	HQ > 1.0
1,3-Dichloropropene (trans)	0/57	ND	1.1UJ - 210UJ	210	17.7	USEPA 1993 and 1996	11.86	Yes	HQ > 1.0
1,4-Dichloro-2-butene (trans)	0/53	ND	3.8UJ - 760UJ	760	NE	---	NA	Yes	No SDSV
2-Butanone (MEK)	23/57	16J - 1,500J	6.1UJ - 670UJ	1500	2,044	USEPA 1993 and 1996	0.73	No	HQ < 1.0
2-Chloro-1,3-butadiene (Chloroprene)	0/53	ND	0.7UJ - 140UJ	140	NE	---	NA	Yes	No SDSV
2-Hexanone (MBK)	1/57	14J - 14J	2.6UJ - 520UJ	14.0	50.4	USEPA 1993 and 1996	0.28	No	HQ < 1.0
3-Chloropropene (Allyl Chloride)	0/53	ND	1.8UJ - 370UJ	370	4.58	USEPA 1993 and 1996	80.83	Yes	HQ > 1.0
4-Methyl-2-pentanone (MIBK)	0/57	ND	3.6UJ - 720UJ	720	72.8	USEPA 1993 and 1996	9.89	Yes	HQ > 1.0
Acetone	45/54	10J - 1,900J	5.4UJ - 280UJ	1,900	80.4	USEPA 1993 and 1996	23.64	Yes	HQ > 1.0
Acetonitrile	0/48	ND	50UJ - 11,000UJ	11,000	1,905	USEPA 1993 and 1996	5.77	Yes	HQ > 1.0
Acrolein	0/53	ND	20UJ - 4,700UJ	4,700	0.019	USEPA 1993 and 1996	251,336.90	Yes	HQ > 1.0
Acrylonitrile	0/53	ND	28UJ - 5,700UJ	5,700	16.8	USEPA 1993 and 1996	339.03	Yes	HQ > 1.0
Benzene	0/57	ND	0.97UJ - 190UJ	190	540	USEPA 1993 and 1996	0.35	No	HQ < 1.0
Bromodichloromethane	0/57	ND	1UJ - 200UJ	200	368	USEPA 1993 and 1996	0.54	No	HQ < 1.0
Bromoform	0/57	ND	1.4UJ - 270UJ	270	692	USEPA 1993 and 1996	0.39	No	HQ < 1.0
Bromomethane	0/57	ND	2UJ - 390UJ	390	53.9	USEPA 1993 and 1996	7.23	Yes	HQ > 1.0
Carbon Disulfide	30/57	2.4J - 480J	1.5UJ - 90UJ	480	11.1	USEPA 1993 and 1996	43.31	Yes	HQ > 1.0
Carbon Tetrachloride	0/57	ND	1.2UJ - 250UJ	250	2,238	USEPA 1993 and 1996	0.11	No	HQ < 1.0
Chlorobenzene	0/57	ND	0.9UJ - 180UJ	180	835	USEPA 1993 and 1996	0.22	No	HQ < 1.0
Chloroethane	0/57	ND	1.5UJ - 300UJ	300	9,828	Di Toro and McGrath 2000	0.03	No	HQ < 1.0
Chloroform	0/57	ND	0.62UJ - 120UJ	120	882	USEPA 1993 and 1996	0.14	No	HQ < 1.0
Chloromethane	3/57	2.5J - 5.3J	0.88UJ - 180UJ	5.3	1,214	USEPA 1993 and 1996	<0.01	No	HQ < 1.0
Dibromochloromethane	0/57	ND	0.62UJ - 120UJ	120	346	USEPA 1993 and 1996	0.35	No	HQ < 1.0
Dibromomethane	0/53	ND	1.5UJ - 300UJ	300	946	USEPA 1993 and 1996	0.32	No	HQ < 1.0
Ethyl Methacrylate	0/53	ND	1.4UJ - 540UJ	540	10,196	USEPA 1993 and 1996	0.05	No	HQ < 1.0
Ethylbenzene	1/57	3.6J - 3.6J	0.92UJ - 180UJ	3.6	4.00	Buchman 2008	0.90	No	HQ < 1.0
Freon 11 (Trichlorofluoromethane)	0/53	ND	1.8UJ - 370UJ	370	1,910	USEPA 1993 and 1996	0.19	No	HQ < 1.0
Freon-12 (Dichlorodifluoromethane)	0/53	ND	1.1UJ - 220UJ	220	1,910	USEPA 1993 and 1996	0.12	No	HQ < 1.0

TABLE 7-5

FREQUENCY AND RANGE OF SEDIMENT DATA (MAXIMUM CONCENTRATIONS) COMPARED TO MARINE SEDIMENT SCREENING VALUES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte [1]	Contaminant Frequency/Range				Sediment Screening Value (SDSV)	Reference [3]	Maximum HQ [4]	Ecological COPC?	Comments
	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	Value used in Step 2 Screen [2]					
Volatile Organics (µg/kg)									
Isobutyl Alcohol	0/41	ND	85UJ - 12,000UJ	12,000	992	USEPA 1993 and 1996	12.09	Yes	HQ > 1.0
Methylacrylonitrile	0/53	ND	29UJ - 5,900UJ	5,900	NE	---	NA	Yes	No SDSV
Methyl Iodide (Iodomethane)	0/53	ND	1.2UJ - 250UJ	250	9.30	USEPA 1993 and 1996	26.88	Yes	HQ > 1.0
Methyl Methacrylate	0/53	ND	3UJ - 910UJ	910	870	USEPA 1993 and 1996	1.05	Yes	HQ > 1.0
Methylene Chloride	4/57	2.1J - 7.9J	1.2UJ - 250UJ	7.9	1,891	USEPA 1993 and 1996	<0.01	No	HQ < 1.0
Pentachloroethane	0/53	ND	2.7UJ - 540UJ	540	260	USEPA 1993 and 1996	2.07	Yes	HQ > 1.0
Propionitrile (Ethyl Cyanide)	0/53	ND	26UJ - 5,200UJ	5,200	4,398	USEPA 1993 and 1996	1.18	Yes	HQ > 1.0
Styrene (Ethenylbenzene)	0/57	ND	0.81UJ - 160UJ	160	2,578	USEPA 1993 and 1996	0.06	No	HQ < 1.0
Tetrachloroethene (PCE)	0/57	ND	0.9UJ - 180UJ	180	57.0	Buchman 2008	3.16	Yes	HQ > 1.0
Toluene	0/57	ND	0.97UJ - 320UJ	320	294	USEPA 1993 and 1996	1.09	Yes	HQ > 1.0
Trichloroethene (TCE)	0/57	ND	1.2UJ - 250UJ	250	82.6	USEPA 1993 and 1996	3.03	Yes	HQ > 1.0
Vinyl Acetate	0/53	ND	1.8UJ - 370UJ	370	26.6	USEPA 1993 and 1996	13.92	Yes	HQ > 1.0
Vinyl Chloride	0/57	ND	0.72UJ - 140UJ	140	687	USEPA 1993 and 1996	0.20	No	HQ < 1.0
Xylenes, total	0/57	ND	2.8UJ - 570UJ	570	4.00	Buchman 2008	142.50	Yes	HQ > 1.0
Semivolatile Organics (µg/kg)									
1,1'-Biphenyl	0/11	ND	52U - 640UJ	640	40,109	USEPA 1993 and 1996	0.02	No	HQ < 1.0
1,2,4,5-Tetrachlorobenzene	0/28	ND	6.3U - 680UJ	680	755	USEPA 1993 and 1996	0.90	No	HQ < 1.0
1,2,4-Trichlorobenzene	0/32	ND	8.7U - 3,600U	3,600	4.80	Buchman 2008	750.00	Yes	HQ > 1.0
1,2-Dichlorobenzene (o-)	0/32	ND	13U - 3,600U	3,600	13.0	Buchman 2008	276.92	Yes	HQ > 1.0
1,3,5-Trinitrobenzene (TNB)	0/28	ND	32U - 1,800UJ	1,800	4,578	USEPA 1993 and 1996	0.39	No	HQ < 1.0
1,3-Dichlorobenzene (m-)	0/32	ND	11U - 3,600U	3,600	368	USEPA 1993 and 1996	9.77	Yes	HQ > 1.0
1,3-Dinitrobenzene (m-)	0/28	ND	32U - 1,100UJ	1,100	263	USEPA 1993 and 1996	4.18	Yes	HQ > 1.0
1,4-Dichlorobenzene (p-)	0/32	ND	9.9U - 3,600U	3,600	110	Buchman 2008	32.73	Yes	HQ > 1.0
1,4-Dioxane (p-)	0/28	ND	13U - 1,500UJ	1,500	5,998	USEPA 1993 and 1996	0.25	No	HQ < 1.0
1,4-Naphthoquinone	15/28	20J - 500J	6.3UJ - 860UJ	500	NE	---	NA	Yes	No SDSV
1,4-Phenylenediamine	0/28	ND	1600UJ - 37,000UJ	37,000	230	USEPA 1993 and 1996	160.84	Yes	HQ > 1.0
1-Naphthylamine	0/28	ND	32U - 1,800UJ	1,800	7,702	USEPA 1993 and 1996	0.23	No	HQ < 1.0
2,2'-Oxybis[1-chloropropane]	0/32	ND	14U - 3,600U	3,600	NE	---	NA	Yes	No SDSV
2,3,4,6-Tetrachlorophenol	0/28	ND	6.3U - 990UJ	990	887	USEPA 1993 and 1996	1.12	Yes	HQ > 1.0
2,4,5-Trichlorophenol	0/32	ND	14U - 3,600U	3,600	3.00	Buchman 2008	1,200.00	Yes	HQ > 1.0
2,4,6-Trichlorophenol	0/32	ND	15U - 3,600U	3,600	6.00	Buchman 2008	600.00	Yes	HQ > 1.0
2,4-Dichlorophenol	0/32	ND	14U - 3,600U	3,600	0.2083	Buchman 2008	17,282.77	Yes	HQ > 1.0
2,4-Dimethylphenol	0/32	ND	14U - 3,600U	3,600	18.0	Buchman 2008	200.00	Yes	HQ > 1.0
2,4-Dinitrophenol	0/31	ND	80U - 18,000U	18,000	760	USEPA 1993 and 1996	23.69	Yes	HQ > 1.0
2,4-Dinitrotoluene (DNT)	0/32	ND	14U - 3,600U	3,600	861	USEPA 1993 and 1996	4.18	Yes	HQ > 1.0
2,6-Dichlorophenol	0/28	ND	6.3U - 1,200UJ	1,200	921	USEPA 1993 and 1996	1.30	Yes	HQ > 1.0
2,6-Dinitrotoluene (DNT)	0/32	ND	15U - 3,600U	3,600	1,618	USEPA 1993 and 1996	2.23	Yes	HQ > 1.0
2-Acetylaminofluorene	0/28	ND	63U - 1,400UJ	1,400	1,500	USEPA 1993 and 1996	0.93	No	HQ < 1.0
2-Chloronaphthalene	0/32	ND	11U - 3,600U	3,600	12.6	USEPA 1993 and 1996	284.86	Yes	HQ > 1.0
2-Chlorophenol	0/32	ND	10U - 3,600U	3,600	0.333	Buchman 2008	10,810.81	Yes	HQ > 1.0
2-Methyl-5-nitroaniline	0/28	ND	32U - 720UJ	720	1,336	USEPA 1993 and 1996	0.54	No	HQ < 1.0

TABLE 7-5

FREQUENCY AND RANGE OF SEDIMENT DATA (MAXIMUM CONCENTRATIONS) COMPARED TO MARINE SEDIMENT SCREENING VALUES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte [1]	Contaminant Frequency/Range				Sediment Screening Value (SDSV)	Reference [3]	Maximum HQ [4]	Ecological COPC?	Comments
	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	Value used in Step 2 Screen [2]					
Semivolatile Organics (µg/kg)									
2-Methylphenol (o-Cresol)	0/32	ND	12U - 3,600U	3,600	8.00	Buchman 2008	450.00	Yes	HQ > 1.0
2-Naphthylamine	0/28	ND	32U - 1,800UJ	1,800	NE	---	NA	Yes	No SDSV
2-Nitroaniline	0/32	ND	13U - 18,000U	18,000	185	USEPA 1993 and 1996	97.27	Yes	HQ > 1.0
2-Nitrophenol	0/32	ND	11U - 3,600U	3,600	170,646	USEPA 1993 and 1996	0.02	No	HQ < 1.0
2-Picoline	0/28	ND	6.3U - 1,800UJ	1,800	35,138	USEPA 1993 and 1996	0.05	No	HQ < 1.0
3,4-Methylphenol	0/32	ND	14U - 3,600UJ	3,600	100	Buchman 2008	3.60	Yes	HQ > 1.0
3,3'-Dichlorobenzidine	0/31	ND	32U - 7,200U	7,200	488	USEPA 1993 and 1996	14.75	Yes	HQ > 1.0
3,3'-Dimethylbenzidine	0/28	ND	130UJ - 9,300UJ	9,300	17,354	USEPA 1993 and 1996	0.54	No	HQ < 1.0
3-Methylcholanthrene	0/28	ND	46U - 1,400UJ	1,400	NE	---	NA	Yes	No SDSV
3-Nitroaniline	0/31	ND	13U - 18,000U	18,000	17.9	USEPA 1993 and 1996	1,005.99	Yes	HQ > 1.0
4,6-Dinitro-2-methylphenol	0/32	ND	32U - 18,000U	18,000	590	USEPA 1993 and 1996	30.51	Yes	HQ > 1.0
4-Aminobiphenyl	0/28	ND	32UJ - 1,200UJ	1,200	NE	---	NA	Yes	No SDSV
4-Bromophenyl-phenylether	0/32	ND	13U - 3,600U	3,600	1,061	Di Toro and McGrath 2000	3.39	Yes	HQ > 1.0
4-Chloro-3-methylphenol	0/32	ND	13U - 3,600U	3,600	5.02	USEPA 1993 and 1996	717.65	Yes	HQ > 1.0
4-Chloroaniline	0/31	ND	9.9U - 7,200U	7,200	38.3	USEPA 1993 and 1996	187.90	Yes	HQ > 1.0
4-Chlorophenyl-phenylether	0/32	ND	12U - 3,600U	3,600	975	Di Toro and McGrath 2000	3.69	Yes	HQ > 1.0
4-Dimethylaminoazobenzene (p-)	0/28	ND	32U - 840UJ	840	NE	---	NA	Yes	No SDSV
4-Nitroaniline	0/31	ND	30U - 18,000U	18,000	631	USEPA 1993 and 1996	28.54	Yes	HQ > 1.0
4-Nitrophenol	0/32	ND	140U - 18,000U	18,000	571	USEPA 1993 and 1996	31.52	Yes	HQ > 1.0
7,12-Dimethylbenz(a)anthracene	0/28	ND	32U - 720UJ	720	100,694	USEPA 1993 and 1996	<0.01	No	HQ < 1.0
a,a-Dimethylphenethylamine	0/28	ND	630U - 14,000UJ	14,000	NE	---	NA	Yes	No SDSV
Acetophenone	0/28	ND	13U - 480UJ	480	2,732	USEPA 1993 and 1996	0.18	No	HQ < 1.0
Aniline	1/27	110J - 110J	16U - 460UJ	110	702	USEPA 1993 and 1996	0.16	No	HQ < 1.0
Aramite	0/28	ND	9.1U - 1,300UJ	1,300	583	USEPA 1993 and 1996	2.23	Yes	HQ > 1.0
Benzidine	0/4	ND	6700U - 29,000U	29,000	1,809	USEPA 1993 and 1996	16.03	Yes	HQ > 1.0
Benzoic Acid	0/4	ND	4200U - 18,000U	18,000	1,875	USEPA 1993 and 1996	9.60	Yes	HQ > 1.0
Benzyl Alcohol	0/32	ND	12U - 3,600U	3,600	52.0	Buchman 2008	69.23	Yes	HQ > 1.0
Bis(2-chloroethoxy)methane	0/32	ND	12U - 3,600U	3,600	900	USEPA 1993 and 1996	4.00	Yes	HQ > 1.0
Bis(2-chloroethyl)ether	0/32	ND	12U - 3,600U	3,600	2,606	USEPA 1993 and 1996	1.38	Yes	HQ > 1.0
Bis(2-ethylhexyl) Phthalate (BEHP)	0/32	ND	11U - 3,600U	3,600	180	MacDonald 1994	20.00	Yes	HQ > 1.0
Butyl Benzyl Phthalate	0/32	ND	13U - 3,600U	3,600	63.0	Buchman 2008	57.14	Yes	HQ > 1.0
Diallate (total)	0/28	ND	11U - 1,200UJ	1,200	1,796	USEPA 1993 and 1996	0.67	No	HQ < 1.0
Dibenzofuran	0/32	ND	13U - 3,600U	3,600	110	Buchman 2008	32.73	Yes	HQ > 1.0
Diethyl Phthalate (DEP)	0/32	ND	14U - 3,600U	3,600	630	MacDonald et al. 2003	5.71	Yes	HQ > 1.0
Dimethyl Phthalate	0/32	ND	14U - 3,600U	3,600	6.00	Buchman 2008	600.00	Yes	HQ > 1.0
Di-n-butyl Phthalate (DBP)	0/32	ND	32U - 3,600U	3,600	58.0	Buchman 2008	62.07	Yes	HQ > 1.0
Di-n-octyl Phthalate	0/32	ND	13U - 3,600U	3,600	61.0	Buchman 2008	59.02	Yes	HQ > 1.0
Dinoseb	0/28	ND	13U - 1,800UJ	1,800	248	USEPA 1993 and 1996	7.25	Yes	HQ > 1.0
Diphenylamine	0/4	ND	820U - 3,600U	3,600	87.0	USEPA 1993 and 1996	41.38	Yes	HQ > 1.0
Ethyl methanesulfonate (EMS)	0/28	ND	15U - 1,500UJ	1,500	10.7	USEPA 1993 and 1996	139.72	Yes	HQ > 1.0
Hexachloro-1,3-butadiene	0/32	ND	13U - 3,600U	3,600	1.30	Buchman 2008	2,769.23	Yes	HQ > 1.0

TABLE 7-5

FREQUENCY AND RANGE OF SEDIMENT DATA (MAXIMUM CONCENTRATIONS) COMPARED TO MARINE SEDIMENT SCREENING VALUES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte [1]	Contaminant Frequency/Range				Sediment Screening Value (SDSV)	Reference [3]	Maximum HQ [4]	Ecological COPC?	Comments
	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	Value used in Step 2 Screen [2]					
Semivolatile Organics (µg/kg)									
Hexachlorobenzene	0/43	ND	14U - 3,600U	3,600	6.00	Buchman 2008	600.00	Yes	HQ > 1.0
Hexachlorocyclopentadiene	0/31	ND	7U - 3,600U	3,600	3.34	USEPA 1993 and 1996	1,077.35	Yes	HQ > 1.0
Hexachloroethane	0/32	ND	11U - 3,600U	3,600	73.0	Buchman 2008	49.32	Yes	HQ > 1.0
Hexachlorophene	0/12	ND	5,900UJ - 100,000UJ	100,000	200,045	USEPA 1993 and 1996	0.50	No	HQ < 1.0
Hexachloropropene	0/28	ND	10U - 990UJ	990	NE	---	NA	Yes	No SDSV
Isophorone	0/32	ND	13U - 3,600U	3,600	286	USEPA 1993 and 1996	12.60	Yes	HQ > 1.0
Isosafrole	0/28	ND	6.3U - 1,400UJ	1,400	NE	---	NA	Yes	No SDSV
Methapyrilene	0/28	ND	75UJ - 2,900UJ	2,900	NE	---	NA	Yes	No SDSV
Methyl Methane Sulfonate	0/28	ND	7.2U - 1,200UJ	1,200	NE	---	NA	Yes	No SDSV
Nitrobenzene	0/32	ND	13U - 3,600U	3,600	21.0	Buchman 2008	171.43	Yes	HQ > 1.0
n-Nitrosodiethylamine	0/28	ND	6.3U - 970UJ	970	2,165	USEPA 1993 and 1996	0.45	No	HQ < 1.0
n-Nitrosodimethylamine (NDMA)	0/32	ND	36UJ - 3,600U	3,600	19.4	USEPA 1993 and 1996	185.84	Yes	HQ > 1.0
n-Nitroso-di-n-butylamine	0/28	ND	32U - 1,100UJ	1,100	777	USEPA 1993 and 1996	1.41	Yes	HQ > 1.0
n-Nitrosodi-n-propylamine	0/32	ND	14U - 3600U	3,600	234	USEPA 1993 and 1996	15.38	Yes	HQ > 1.0
n-Nitrosodiphenylamine	0/28	ND	12U - 510UJ	510	28.0	Buchman 2008	18.21	Yes	HQ > 1.0
n-Nitrosomethylethylamine	0/28	ND	6.3U - 1,100UJ	1,100	36.9	USEPA 1993 and 1996	29.77	Yes	HQ > 1.0
n-Nitrosomorpholine	0/28	ND	8.5U - 1,500UJ	1,500	NE	---	NA	Yes	No SDSV
n-Nitrosopiperidine	0/28	ND	6.5U - 1,600UJ	1,600	NE	---	NA	Yes	No SDSV
n-Nitrosopyrrolidine	0/28	ND	6.8U - 990UJ	990	NE	---	NA	Yes	No SDSV
o-Toluidine (2-Toluidine)	0/28	ND	6.3U - 1,200UJ	1,200	20.3	USEPA 1993 and 1996	59.02	Yes	HQ > 1.0
Pentachlorobenzene	0/28	ND	6.3U - 1,400UJ	1,400	16,263	USEPA 1993 and 1996	0.09	No	HQ < 1.0
Pentachloronitrobenzene	0/28	ND	32U - 1,200UJ	1,200	24.5	USEPA 1993 and 1996	49.05	Yes	HQ > 1.0
Pentachlorophenol	0/32	ND	32U - 18,000U	18,000	17.0	Buchman 2008	1,058.82	Yes	HQ > 1.0
Phenacetin	0/28	ND	32U - 1,100UJ	1,100	NE	---	NA	Yes	No SDSV
Phenol	1/32	21J - 21J	12U - 3,600U	21.0	130	Buchman 2008	0.16	No	HQ < 1.0
Pronamide	0/28	ND	8U - 1,400UJ	1,400	482	USEPA 1993 and 1996	2.91	Yes	HQ > 1.0
Pyridine	1/28	190J - 190J	38UJ - 850UJ	190	1,219	USEPA 1993 and 1996	0.16	No	HQ < 1.0
Safrole	0/28	ND	6.3U - 1,200UJ	1,200	NE	---	NA	Yes	No SDSV
PAHs (µg/kg)									
1-Methylnaphthalene	1/66	3.6J - 3.6J	2.7UJ - 1,800U	3.6	20.2	--	0.18	No	HQ < 1.0
2-Methylnaphthalene	1/87	6.8J - 6.8J	2.4UJ - 3,600U	6.8	20.2	MacDonald 1994	0.34	No	HQ < 1.0
Acenaphthene	0/87	ND	2.5UJ - 3,600U	3,600	6.71	MacDonald 1994	536.51	Yes	HQ > 1.0
Acenaphthylene	1/87	8.2J - 8.2J	2.4UJ - 3,600U	8.2	5.87	MacDonald 1994	1.40	Yes	HQ > 1.0
Anthracene	6/87	5.5J - 22J	2.5UJ - 3,600U	22.0	46.9	MacDonald 1994	0.47	No	HQ < 1.0
Benzo(a)anthracene	6/87	9.4J - 110J	2.5UJ - 3,600U	110	74.8	MacDonald 1994	1.47	Yes	HQ > 1.0
Benzo(a)pyrene (BaP)	14/87	4.1J - 1,300J	2.1UJ - 3,600U	1,300	88.8	MacDonald 1994	14.64	Yes	HQ > 1.0
Benzo(b)fluoranthene	6/87	9.1J - 840J	2.7UJ - 3,600U	840	1,800	Buchman 2008	0.47	No	HQ < 1.0
Benzo(g,h,i)perylene	7/87	10J - 1,300J	2.5UJ - 3,600U	1,300	670	Buchman 2008	1.94	Yes	HQ > 1.0
Benzo(k)fluoranthene	6/87	3.1J - 820J	2.1UJ - 3,600U	820	1,800	Buchman 2008	0.46	No	HQ < 1.0
Chrysene	26/87	6.5J - 1,100J	2.3UJ - 3,600U	1,100	108	MacDonald 1994	10.19	Yes	HQ > 1.0
Dibenz(a,h)anthracene	1/87	11J - 11J	1.2UJ - 3,600U	11.0	6.22	MacDonald 1994	1.77	Yes	HQ > 1.0

TABLE 7-5

FREQUENCY AND RANGE OF SEDIMENT DATA (MAXIMUM CONCENTRATIONS) COMPARED TO MARINE SEDIMENT SCREENING VALUES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte [1]	Contaminant Frequency/Range				Sediment Screening Value (SDSV)	Reference [3]	Maximum HQ [4]	Ecological COPC?	Comments
	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	Value used in Step 2 Screen [2]					
PAHs (µg/kg)									
Fluoranthene	6/76	1.7J - 44J	0.87UJ - 3,600U	44.0	113	MacDonald 1994	0.39	No	HQ < 1.0
Fluorene	1/87	2.7J - 2.7J	3UJ - 3,600U	2.7	21.2	MacDonald 1994	0.13	No	HQ < 1.0
Indeno(1,2,3-cd)pyrene	5/87	17J - 1,100J	4UJ - 3,600U	1,100	600	Buchman 2008	1.83	Yes	HQ > 1.0
Naphthalene	1/87	27J - 27J	3UJ - 3,600U	27.0	34.6	MacDonald 1994	0.78	No	HQ < 1.0
Phenanthrene	6/87	3.9J - 360J	3.2UJ - 3,600U	360	86.7	MacDonald 1994	4.15	Yes	HQ > 1.0
Pyrene	30/87	7.1J - 1,400J	3UJ - 3,600U	1,400	153	MacDonald 1994	9.15	Yes	HQ > 1.0
Organophosphorous Pesticides (µg/kg)									
Dimethoate	0/11	ND	80U - 990UJ	990	0.065	USEPA 1993 and 1996	15,230.77	Yes	HQ > 1.0
Disulfoton	0/11	ND	98U - 1,200UJ	1,200	66.9	USEPA 1993 and 1996	17.92	Yes	HQ > 1.0
Famphur	0/11	ND	170U - 2,200UJ	2,200	3.97	USEPA 1993 and 1996	554.52	Yes	HQ > 1.0
Methyl Parathion	0/11	ND	84U - 1,000UJ	1,000	0.52	USEPA 1993 and 1996	1,931.93	Yes	HQ > 1.0
o,o,o-Triethyl Phosphorothioate	0/11	ND	130U - 1,600UJ	1,600	NE	USEPA 1993 and 1996	NA	Yes	No SDSV
Parathion	0/11	ND	98U - 1,200UJ	1,200	4.31	USEPA 1993 and 1996	278.42	Yes	HQ > 1.0
Phorate	0/11	ND	120U - 1,500UJ	1,500	1.41	USEPA 1993 and 1996	1,066.11	Yes	HQ > 1.0
Sulfotep	0/11	ND	98U - 1,200UJ	1,200	0.021	USEPA 1993 and 1996	57,775.86	Yes	HQ > 1.0
Thionazin	0/11	ND	75U - 930UJ	930	12.1	USEPA 1993 and 1996	76.94	Yes	HQ > 1.0
Inorganics (mg/kg)									
Antimony	0/64	ND	0.14UJ - 5.9UJ	5.9	2.00	Long and Morgan 1991	2.95	Yes	HQ > 1.0
Arsenic	57/68	1J - 6.6J	1.1U - 2U	6.6	7.24	MacDonald 1994	0.91	No	HQ < 1.0
Barium	67/68	12 - 54	14UJ - 14UJ	54.0	48.0	Buchman 2008	1.13	Yes	HQ > 1.0
Beryllium	51/68	0.12J - 0.37J	0.15UJ - 1.2U	0.37	NE	---	NA	Yes	No SDSV
Cadmium	9/68	0.068J - 0.95J	0.059UJ - 1.5U	0.95	0.7	MacDonald 1994	1.41	Yes	HQ > 1.0
Chromium	68/68	10 - 58J	NA	58.0	52.3	MacDonald 1994	1.11	Yes	HQ > 1.0
Cobalt	68/68	4.4J - 16J	NA	16.0	10.0	Buchman 2008	1.60	Yes	HQ > 1.0
Copper	68/68	52J - 140J	NA	140	18.7	MacDonald 1994	7.49	Yes	HQ > 1.0
Lead	150/150	3.20 - 430J	NA	430	30.2	MacDonald 1994	14.24	Yes	HQ > 1.0
Mercury	67/67	0.039J - 0.12J	NA	0.12	0.13	MacDonald 1994	0.92	No	HQ < 1.0
Nickel	68/68	4.8J - 13J	NA	13.0	15.9	MacDonald 1994	0.82	No	HQ < 1.0
Selenium	29/68	0.48J - 1.5J	0.6UJ - 2.9U	1.5	1.00	Buchman 2008	1.50	Yes	HQ > 1.0
Silver	0/68	ND	0.039UJ - 2.9U	2.9	0.73	MacDonald 1994	3.96	Yes	HQ > 1.0
Thallium	4/68	0.23J - 6.3J	0.24UJ - 3UJ	6.3	NE	---	NA	Yes	No SDSV
Tin	5/68	3.6J - 9.2J	6.4U - 18UJ	9.2	3.40	Buchman 2008	2.71	Yes	HQ > 1.0
Vanadium	74/74	80J - 270J	NA	270	57.0	Buchman 2008	4.74	Yes	HQ > 1.0
Zinc	68/68	35J - 76J	NA	76.0	124.0	MacDonald 1994	0.61	No	HQ < 1.0

Notes:

USEPA = U.S. Environmental Protection Agency
COPC = Chemical of Potential Concern
SDSV = Sediment Screening Value
HQ = Hazard Quotient

µg/kg = microgram per kilogram
mg/kg = milligram per kilogram
ND = Not Detected
NA = Not Applicable

NE = Not Established
J = Estimated value
U = Not detected
UJ = Not detected, estimated value

TABLE 7-5

FREQUENCY AND RANGE OF SEDIMENT DATA (MAXIMUM CONCENTRATIONS) COMPARED TO MARINE SEDIMENT SCREENING VALUES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Notes (continued):

(1) All sediment analytical data for 4-nitroquinoline-1-oxide were rejected during data validation activities (see Appendix A). Although 4-nitroquinoline-1-oxide is not listed below, this SVOC is identified as an ecological COPC based on the lack of any useable analytical data.

(2) The value listed represents the maximum detected concentration (or maximum non-detected concentrations for analytes that were not detected).

(3) See Table 5-3 for reference citations.

(4) For a given chemical, the Hazard Quotient (HQ) is the maximum detected concentration (or maximum non-detected concentration for analytes that were not detected) divided by the sediment screening value.

TABLE 7-6

HAZARD QUOTIENT VALUES FOR AVIAN AND MAMMALIAN DIETARY EXPOSURES TO CHEMICALS IN SURFACE SOIL
SOIL: STEP 2 SCREENING LEVEL RISK ESTIMATE
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Brown flower bat			American robin			Mourning dove			Red-tailed hawk		
	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC
Volatile Organics:												
1,1,1,2-Tetrachloroethane	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	0.11	0.01	0.04	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes, total	0.18	0.14	0.16	0.04	<0.01	0.02	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
Semivolatile Organics:												
1,1'-Biphenyl	0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	8.47	0.85	2.68	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	<0.01	<0.01	<0.01	0.38	0.08	0.17	0.04	<0.01	0.02	0.10	0.02	0.05
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	0.52	0.10	0.23	0.04	<0.01	0.02	0.14	0.03	0.06
1,4-Dichlorobenzene	<0.01	<0.01	<0.01	0.36	0.07	0.16	0.03	<0.01	0.02	0.10	0.02	0.04
2,3,4,6-Tetrachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Acetylaminofluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	0.02	<0.01	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dimethylbenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylcholanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromopheny phenyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl phenyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7,12-Dimethylbenz(a)anthracene	NA	NA	NA	1.87	0.19	0.59	0.03	<0.01	<0.01	0.50	0.05	0.16
Aramite, total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	<0.01	<0.01	<0.01	66.06	13.21	29.54	0.04	<0.01	0.02	17.98	3.60	8.04
Butyl benzyl phthalate	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzilate	<0.01	<0.01	<0.01	0.81	0.16	0.36	<0.01	<0.01	<0.01	0.22	0.04	0.10
Diallate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 7-6

HAZARD QUOTIENT VALUES FOR AVIAN AND MAMMALIAN DIETARY EXPOSURES TO CHEMICALS IN SURFACE SOIL
SOIL: STEP 2 SCREENING LEVEL RISK ESTIMATE
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Brown flower bat			American robin			Mourning dove			Red-tailed hawk		
	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC
Semivolatile Organics:												
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl phthalate	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl phthalate	<0.01	<0.01	<0.01	2.40	0.48	1.07	0.02	<0.01	<0.01	0.65	0.13	0.29
Di-n-octyl phthalate	<0.01	<0.01	<0.01	4.61	0.92	2.06	<0.01	<0.01	<0.01	1.25	0.25	0.56
Dinoseb	NA	NA	NA	27.45	5.49	12.28	18.66	3.73	8.35	7.10	1.42	3.18
Diphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	<0.01	<0.01	<0.01	531.17	102.51	233.34	0.70	0.13	0.31	144.54	27.89	63.50
Hexachlorobutadiene	0.04	<0.01	0.02	11.24	2.24	5.02	0.04	<0.01	0.02	3.06	0.61	1.37
Hexachlorocyclopentadiene	0.04	0.01	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	0.35	0.23	0.28	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorophene	1.39	0.28	0.62	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isosafrole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
p-Dimethylamino azobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorobenzene	0.05	<0.01	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloronitrobenzene	0.69	0.12	0.28	1.48	0.15	0.47	0.06	<0.01	0.02	0.40	0.04	0.13
Pentachlorophenol	5.30	1.97	3.23	17.64	1.76	5.58	5.46	0.55	1.73	4.80	0.48	1.52
Pronamide	0.23	0.05	0.10	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs:												
1-Methylnaphthalene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2-Methylnaphthalene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	0.02	<0.01	<0.01	0.12	0.01	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	0.06	0.01	0.03	0.15	0.01	0.05	0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	0.08	0.02	0.04	0.21	0.02	0.07	0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	0.01	<0.01	<0.01	0.11	0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	0.03	<0.01	0.01	0.79	0.08	0.25	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	0.05	0.01	0.02	0.21	0.02	0.07	0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Naphthalene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

TABLE 7-6

HAZARD QUOTIENT VALUES FOR AVIAN AND MAMMALIAN DIETARY EXPOSURES TO CHEMICALS IN SURFACE SOIL
SOIL: STEP 2 SCREENING LEVEL RISK ESTIMATE
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Brown flower bat			American robin			Mourning dove			Red-tailed hawk		
	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC
PAHs:												
Phenanthrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene	3.44	0.70	1.55	1.32	0.13	0.42	0.88	0.09	0.28	<0.01	<0.01	<0.01
Organophosphorous Pesticides:												
Disulfoton	NA	NA	NA	295.79	59.16	132.28	12.24	2.45	5.47	80.19	16.04	35.86
Ethyl parathion	NA	NA	NA	4,026.43	805.29	1,800.67	733.22	146.64	327.90	1,077.71	215.54	481.96
Methyl parathion	89.13	8.91	28.19	74.26	14.85	33.21	60.28	12.06	26.96	19.56	3.91	8.75
Phorate	NA	NA	NA	5,131.65	1,026.33	2,294.94	191.21	38.24	85.51	1,392.64	278.53	622.81
Sulfotep	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals:												
Antimony	0.29	0.03	0.09	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic	0.13	0.08	0.11	0.53	0.26	0.37	0.13	0.06	0.09	<0.01	<0.01	<0.01
Barium	0.27	0.17	0.21	0.58	0.29	0.41	0.62	0.31	0.43	<0.01	<0.01	<0.01
Beryllium	0.11	0.10	0.11	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	0.19	0.02	0.06	2.19	0.51	1.06	0.09	0.02	0.04	0.06	0.01	0.03
Chromium, total	0.22	<0.01	0.05	10.96	1.87	4.53	0.27	0.05	0.11	0.13	0.02	0.05
Cobalt	0.03	0.01	0.02	0.73	0.31	0.47	0.08	0.03	0.05	0.03	0.01	0.02
Copper	0.46	0.27	0.35	2.41	0.81	1.40	0.83	0.28	0.48	0.42	0.14	0.24
Lead	0.47	0.25	0.34	21.69	10.84	15.34	5.71	2.86	4.04	1.47	0.74	1.04
Mercury	0.45	0.09	0.20	12.46	4.15	7.20	0.48	0.16	0.27	0.05	0.02	0.03
Nickel	0.06	0.03	0.04	1.58	0.57	0.95	0.02	<0.01	0.01	0.03	0.01	0.02
Selenium	0.89	0.59	0.73	1.12	0.56	0.79	0.40	0.20	0.28	0.27	0.14	0.19
Silver	<0.01	<0.01	<0.01	0.24	0.02	0.08	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thallium	0.43	0.04	0.14	3.53	0.71	1.58	0.11	0.02	0.05	0.88	0.18	0.39
Tin	<0.01	<0.01	<0.01	0.32	0.13	0.20	0.01	<0.01	<0.01	0.08	0.03	0.05
Vanadium	0.10	0.05	0.07	34.42	17.21	24.34	6.19	3.10	4.38	1.31	0.65	0.93
Zinc	0.33	0.31	0.32	2.64	1.02	1.64	0.37	0.14	0.23	0.22	0.09	0.14

Notes:

Shaded cells indicate a hazard quotient value greater than 1.0

LOAEL = Lowest Observed Adverse Effect Level
MATC = Maximum Acceptable Toxicant Concentration
NA = Toxicity reference value not available (hazard quotient value could not be calculated)
NOAEL = No Observed Adverse Effect Level

TABLE 7-7

HAZARD QUOTIENT VALUES FOR AVIAN AND MAMMALIAN DIETARY EXPOSURES TO CHEMICALS IN SUBSURFACE SOIL: STEP 2 SCREENING LEVEL RISK CALCULATION
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Brown flower bat			American robin			Mourning dove			Red-tailed hawk		
	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC
Volatile Organics:												
1,1,1,2-Tetrachloroethane	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	0.02	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	0.30	0.03	0.09	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylene, m/p-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Xylene, o-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Xylenes, total	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Semivolatile Organics:												
1,1'-Biphenyl	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	0.24	0.02	0.08	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,4-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2,3,4,6-Tetrachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Acetylaminofluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dimethylbenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylcholanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromopheny phenyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl phenyl ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7,12-Dimethylbenz(a)anthracene	NA	NA	NA	0.05	<0.01	0.02	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
Aramite, total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	<0.01	<0.01	<0.01	1.85	0.37	0.83	<0.01	<0.01	<0.01	0.50	0.10	0.23
Butyl benzyl phthalate	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diallate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 7-7

HAZARD QUOTIENT VALUES FOR AVIAN AND MAMMALIAN DIETARY EXPOSURES TO CHEMICALS IN SUBSURFACE SOIL: STEP 2 SCREENING LEVEL RISK CALCULATION
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Brown flower bat			American robin			Mourning dove			Red-tailed hawk		
	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC
Semivolatile Organics:												
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl phthalate	<0.01	<0.01	<0.01	3.24	0.65	1.45	0.03	<0.01	0.01	0.88	0.18	0.39
Di-n-octyl phthalate	<0.01	<0.01	<0.01	0.13	0.03	0.06	<0.01	<0.01	<0.01	0.04	<0.01	0.02
Dinoseb	NA	NA	NA	0.78	0.16	0.35	0.53	0.11	0.24	0.20	0.04	0.09
Hexachlorobenzene	<0.01	<0.01	<0.01	14.75	2.85	6.48	0.02	<0.01	<0.01	4.02	0.77	1.76
Hexachlorobutadiene	<0.01	<0.01	<0.01	0.31	0.06	0.14	<0.01	<0.01	<0.01	0.08	0.02	0.04
Hexachloroethane	0.09	<0.01	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorophene	0.04	<0.01	0.02	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isosafrole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
p-Dimethylamino azobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorobenzene	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloronitrobenzene	0.02	<0.01	<0.01	0.04	<0.01	0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01
Pronamide	<0.01	<0.01	<0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs:												
1-Methylnaphthalene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2-Methylnaphthalene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Naphthalene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Organophosphorous Pesticides:												
Disulfoton	NA	NA	NA	8.79	1.76	3.93	0.36	0.07	0.16	2.38	0.48	1.07
Methyl parathion	2.51	0.25	0.79	2.09	0.42	0.93	1.70	0.34	0.76	0.55	0.11	0.25
Ethyl parathion	NA	NA	NA	119.70	23.94	53.53	21.80	4.36	9.75	32.04	6.41	14.33

TABLE 7-7

HAZARD QUOTIENT VALUES FOR AVIAN AND MAMMALIAN DIETARY EXPOSURES TO CHEMICALS IN SUBSURFACE SOIL: STEP 2 SCREENING LEVEL RISK CALCULATION
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Brown flower bat			American robin			Mourning dove			Red-tailed hawk		
	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC
Organophosphorous Pesticides:												
Phorate	NA	NA	NA	141.94	28.39	63.48	5.29	1.06	2.37	38.52	7.70	17.23
Sulfotep	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals:												
Antimony	0.10	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic	0.03	0.02	0.03	0.06	0.03	0.04	0.02	<0.01	0.01	<0.01	<0.01	<0.01
Barium	0.10	0.06	0.08	0.21	0.10	0.14	0.22	0.11	0.15	<0.01	<0.01	<0.01
Beryllium	0.07	0.07	0.07	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	0.12	0.01	0.04	1.07	0.25	0.51	0.05	0.01	0.03	0.04	<0.01	0.02
Chromium, total	0.11	<0.01	0.02	5.63	0.96	2.32	0.14	0.02	0.06	0.08	0.01	0.03
Cobalt	0.02	<0.01	0.01	0.41	0.17	0.27	0.05	0.02	0.03	0.01	<0.01	<0.01
Copper	0.41	0.25	0.32	2.05	0.69	1.19	0.71	0.24	0.41	0.40	0.13	0.23
Lead	0.41	0.22	0.30	17.29	8.65	12.23	4.61	2.30	3.26	1.33	0.66	0.94
Mercury	0.39	0.08	0.17	9.40	3.13	5.42	0.41	0.14	0.23	0.04	0.01	0.02
Nickel	0.06	0.03	0.04	1.58	0.57	0.95	0.02	<0.01	0.01	0.03	0.01	0.02
Selenium	1.03	0.69	0.84	1.24	0.62	0.88	0.46	0.23	0.33	0.28	0.14	0.20
Silver	<0.01	<0.01	<0.01	0.33	0.03	0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thallium	0.43	0.04	0.14	3.53	0.71	1.58	0.11	0.02	0.05	0.88	0.18	0.39
Tin	<0.01	<0.01	<0.01	0.29	0.12	0.18	0.01	<0.01	<0.01	0.07	0.03	0.05
Vanadium	0.08	0.04	0.06	28.68	14.34	20.28	5.16	2.58	3.65	1.09	0.55	0.77
Zinc	0.11	0.10	0.11	1.29	0.50	0.80	0.11	0.04	0.07	0.19	0.07	0.12

Notes:

Shaded cells indicate a hazard quotient value greater than 1.0

LOAEL = Lowest Observed Adverse Effect Level
MATC = Maximum Acceptable Toxicant Concentration
NA = Toxicity reference value not available (hazard quotient value could not be calculated)
NOAEL = No Observed Adverse Effect Level

TABLE 7-8

HAZARD QUOTIENT VALUES FOR AVIAN DIETARY EXPOSURES TO CHEMICALS IN SEDIMENT: STEP 2
SCREENING LEVEL RISK CALCULATION
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Spotted sandpiper			Green heron		
	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC
Volatile Organics:						
1,1,1,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA
Pentachloroethane	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA
Styrene	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA
Trichloroethene	NA	NA	NA	NA	NA	NA
Xylenes, total	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Semivolatile Organics:						
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	0.08	0.02	0.04	0.03	<0.01	0.01
1,3-Dichlorobenzene	0.08	0.02	0.04	<0.01	<0.01	<0.01
1,4-Dichlorobenzene	0.08	0.02	0.04	<0.01	<0.01	<0.01
2,3,4,6-Tetrachlorophenol	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA
2-Acetylaminofluorene	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA
3,3'-Dimethylbenzidine	NA	NA	NA	NA	NA	NA
3-Methylcholanthrene	NA	NA	NA	NA	NA	NA
4-Bromopheny phenyl ether	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA
4-Chlorophenyl phenyl ether	NA	NA	NA	NA	NA	NA
7,12-Dimethylbenz(a)anthracene	0.13	0.01	0.04	0.07	<0.01	0.02
Aramite, total	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	59.11	11.82	26.43	12.92	2.58	5.78
Butyl benzyl phthalate	NA	NA	NA	NA	NA	NA
Diallate (total)	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA
Diethyl phthalate	NA	NA	NA	NA	NA	NA

TABLE 7-8

HAZARD QUOTIENT VALUES FOR AVIAN DIETARY EXPOSURES TO CHEMICALS IN SEDIMENT: STEP 2
SCREENING LEVEL RISK CALCULATION
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Spotted sandpiper			Green heron		
	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC
Semivolatile Organics:						
Di-n-butyl phthalate	5.80	1.16	2.59	3.02	0.60	1.35
Di-n-octyl phthalate	0.03	<0.01	0.01	0.01	<0.01	<0.01
Dinoseb	6.78	1.36	3.03	3.52	0.70	1.58
Diphenylamine	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	341.45	65.89	150.00	3.80	0.73	1.67
Hexachlorobutadiene	0.38	0.08	0.17	0.20	0.04	0.09
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA
Hexachlorophene	NA	NA	NA	NA	NA	NA
Hexachloropropene	NA	NA	NA	NA	NA	NA
Isosafrole	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA
p-Dimethylamino azobenzene	NA	NA	NA	NA	NA	NA
Pentachlorobenzene	NA	NA	NA	NA	NA	NA
Pentachloronitrobenzene	0.06	<0.01	0.02	0.03	<0.01	<0.01
Pentachlorophenol	0.96	0.10	0.30	0.50	0.05	0.16
Pronamide	NA	NA	NA	NA	NA	NA
PAHs:						
1-Methylnaphthalene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2-Methylnaphthalene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene	0.09	<0.01	0.03	<0.01	<0.01	<0.01
Benzo(a)pyrene	0.50	0.05	0.16	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	2.23	0.22	0.71	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	0.42	0.04	0.13	0.05	<0.01	0.02
Benzo(k)fluoranthene	3.54	0.35	1.12	<0.01	<0.01	<0.01
Chrysene	0.74	0.07	0.23	0.02	<0.01	<0.01
Dibenz(a,h)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene	0.68	0.07	0.22	0.03	<0.01	<0.01
Naphthalene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene	1.04	0.10	0.33	0.04	<0.01	0.01

TABLE 7-8

HAZARD QUOTIENT VALUES FOR AVIAN DIETARY EXPOSURES TO CHEMICALS IN SEDIMENT: STEP 2
SCREENING LEVEL RISK CALCULATION
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Spotted sandpiper			Green heron		
	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC
Organophosphorous Pesticides:						
Disulfoton	6.56	1.31	2.94	3.41	0.68	1.53
Ethyl parathion	343.39	68.68	153.57	178.56	35.71	79.85
Methyl parathion	11.61	2.32	5.19	6.04	1.21	2.70
Phorate	86.54	17.31	38.70	45.00	9.00	20.12
Sulfotep	NA	NA	NA	NA	NA	NA
Metals:						
Antimony	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Arsenic	0.79	0.39	0.55	0.55	0.27	0.39
Barium	0.93	0.46	0.66	0.48	0.24	0.34
Beryllium	NA	NA	NA	NA	NA	NA
Cadmium	0.62	0.14	0.30	0.24	0.06	0.12
Chromium, total	4.40	0.75	1.82	4.06	0.69	1.67
Cobalt	0.75	0.31	0.48	0.39	0.16	0.25
Copper	82.82	27.72	47.91	6.43	2.15	3.72
Lead	42.27	21.14	29.89	19.14	9.57	13.53
Mercury	4.18	1.39	2.41	3.93	1.31	2.27
Nickel	0.25	0.09	0.15	0.36	0.13	0.22
Selenium	1.85	0.93	1.31	0.96	0.48	0.68
Silver	0.17	0.02	0.05	0.27	0.03	0.08
Thallium	6.44	1.29	2.88	3.35	0.67	1.50
Tin	0.48	0.19	0.31	0.25	0.10	0.16
Vanadium	280.75	140.37	198.52	145.98	72.99	103.23
Zinc	1.68	0.65	1.04	1.03	0.40	0.64

Notes:

Shaded cells indicate a hazard quotient value greater than 1.0

LOAEL = Lowest Observed Adverse Effect Level
MATC = Maximum Acceptable Toxicant Concentration
NA = Toxicity reference value not available (hazard quotient value could not be calculated)
NOAEL = No Observed Adverse Effect Level

TABLE 10-1

DIETARY COMPOSITION FOR UPPER TROPHIC LEVEL RECEPTORS: STEP 3A RISK CALCULATION
SWMU 9 – AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Receptor	Dietary Composition (percent)						Soil/Sediment Ingestion (percent)	
	Terrestrial Plants	Soil Invertebrates	Small Mammals	Aquatic Invertebrates	Fish	Reference	Value	Reference
Birds:								
American robin	8.3	83.0 (1)	0	0	0	Wheelwright et al. 1986	8.7 (2)	Sample and Suter II 1994
Mourning dove	95.0	0	0	0	0	Tomlinson et al. 1994	5.0	Assumed
Red-tailed hawk	0	0	100	0	0	USEPA 1993; Sample and Suter II 1994	0	Sample and Suter II 1994
Green heron	0	0	0	0.0	100.0	Assumed (3)	0	Sample et al. 1997
Spotted sandpiper	0	0	0	81.9	0	USEPA 1993	18.1	Beyer et al. 1994
Mammals:								
Brown flower bat	100	0	0	0	0	Gannon et al. 2005	0 (4)	Assumed
Norway rat (prey item for red-tailed hawk)	49.0	49.0	0	0	0	Assumed	2.0	Assumed

Notes:

USEPA - U.S. Environmental Protection Agency

(1) The value shown represents the highest seasonal percentage of invertebrates in the diet of the American robin as reported by Wheelwright et al. (1986).

(2) The percentage of soil in the diet of the American robin was estimated using the relationship presented in Sample and Sutter II (1994). A diet of 83 percent earthworms extrapolates to a soil contribution of 8.7 percent to the total diet.

(3) Although the green heron consumes aquatic invertebrates and fish (Sample et al., 1997), an exclusive diet of fish is assumed for the Step 3a risk calculation.

(4) Soil ingestion is considered negligible based on the arboreal feeding behavior of nectivorous bats.

Table References:

Beyer, N., E. Connor, and S. Gerould. 1994. Estimates of Soil Ingestion by Wildlife. Patuxent Wildlife Research Center, Lauren, MD.

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TABLE 10-1

DIETARY COMPOSITION FOR UPPER TROPHIC LEVEL RECEPTORS: STEP 3A RISK CALCULATION
SWMU 9 – AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Table References (continued):

Sample, B.E. and G.W. Suter II. 1994. Estimating Exposure of Terrestrial Wildlife to Contaminants. Environmental Restoration Division, ORNL Environmental Restoration Program. ES/ER/TM-125.

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Wheelwright, N. T. 1986. The Diet of American Robins: An Analysis of U.S. Biological Survey Records. Auk. 103: 710-725.

TABLE 10-2

EXPOSURE PARAMETERS FOR UPPER TROPHIC LEVEL RECEPTORS: STEP 3A RISK CALCULATION
SWMU 9 – AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Receptor	Habitat	Body Weight (kg)		Food Ingestion Rate (kg/day - dry)		Area Use Factor
		Value	Reference	Value	Reference	
Birds:						
American robin	Terrestrial	0.0785 (1)	Dunning 2008	0.01033	Allometric equation from Nagy (2001) for omnivorous birds (8): $[0.67((BW*1000)^{0.627})]/1000$	1.00
Mourning dove	Terrestrial	0.1190 (2)	Dunning 2008	0.01685	Allometric equation from Nagy (2001) for all birds (8): $[0.638((BW*1000)^{0.685})]/1000$	1.00
Red-tailed hawk	Terrestrial	1.0945 (3)	Dunning 2008	0.08788	Allometric equation from Nagy (2001) for carnivorous birds (8): $[0.849((BW*1000)^{0.663})]/1000$	1.00
Green heron	Aquatic	0.1870 (4)	Dunning 2008	0.02296	Allometric equation from Nagy (2001) for all birds(8): $[0.638((BW*1000)^{0.685})]/1000$	1.00
Spotted sandpiper	Aquatic	0.0404 (5)	Dunning 1993	0.00804	Allometric equation from Nagy (2001) for all birds(8): $[0.638((BW*1000)^{0.685})]/1000$	1.00
Mammals:						
Brown flower bat	Terrestrial	0.0183 (6)	Gannon et al. 2005	0.00257	Allometric equation from Nagy (2001) for bats (9): $[0.365((BW*1000)^{0.671})]/1000$	1.00
Norway rat (prey item for red-tailed hawk)	Terrestrial	0.350 (7)	Jackson 1992	0.03092	Allometric equation from Nagy (2001) for rodents (10): $[0.332((BW*1000)^{0.774})]/1000$	1.00

TABLE 10-2

EXPOSURE PARAMETERS FOR UPPER TROPHIC LEVEL RECEPTORS: STEP 3A RISK CALCULATION
SWMU 9 – AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Notes:

BW = Body Weight
kg = kilogram
kg/day - dry = kilogram per day - dry weight basis
L/day = liter per day
USEPA = U.S. Environmental Protection Agency

(1) Mean body weight for males and females from the western United States (n = 255).
(2) Mean mean body weight for males and females in Illinois (n = 235).
(3) Mean body weight for males and females from the western United States (n = 50).
(4) Mean body weight for males and femals in the Caribbean (n = 70)
(5) Mean body weight for unknown gender in Pennsylvania (n = 56)
(6) Mean body weight for males and females in Puerto Rico (n = 20).
(7) The body weight shown represents the midpoint within the range of reported values (gender and location not specified).
(8) Food ingestion rates for avian receptors were calculated using mean body weights: 0.119 kg for the mourning dove, 0.0785 kg for the American robin, 1.0945 kg for the red-tailed hawk, 0.187 kg for the green heron, and 0.0404 kg for the spotted sandpiper (Dunning, 2008).
(9) Food ingestion rate for the brown flower bat was calculated using a mean body weight of 0.0183 kg (Gannon et al., 2005).
(10) Food ingestion rate for the Norway rat was calculated using the midpoint within the range of reported values: 0.350 kg (Jackson, 1992).

Table References:

Dunning, J.B., Jr. (ed.). 2008. CRC Handbook of Avian Body Masses, Second Edition. CRC Press, Boca Raton, FL. 655 pp.

Gannon, M.R., A. Kurta, A. Rodriguez-Durán, and M.R. Willig. 2005. Bats of Puerto Rico: An Island Focus and a Caribbean Perspective. Texas Tech University Press, Lubbock, TX. 239 pp.

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TABLE 10-3

SOIL TO PLANT AND SOIL TO EARTHWORM BIOACCUMULATION FACTORS AND BIOACCUMULATION UPTAKE EQUATIONS USED TO ESTIMATE CHEMICAL CONCENTRATIONS IN TERRESTRIAL PLANT AND INVERTEBRATE TISSUE: STEP 3A RISK CALCULATION
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	Soil-Plant BAF (dry weight) or Uptake Equation (dry weight)			Soil-Invertebrate BAF (dry weight) or Uptake Equation (dry weight)		
Chemical	**BAF Value/Uptake Equation**	**Source Document**	**Description**	**BAF Value/Uptake Equation**	**Source Document**	**Description**
Volatile Organics:						
Chloroform	10.047	USEPA 2007	Regression-based BAF (1)	9.196	USEPA 2007	Modeled BAF (8)
Ethylbenzene	3.214	USEPA 2007	Regression-based BAF (1)	7.555	USEPA 2007	Modeled BAF (8)
Pentachloroethane	2.983	USEPA 2007	Regression-based BAF (1)	29.047	USEPA 2007	Modeled BAF (8)
Styrene	3.875	USEPA 2007	Regression-based BAF (1)	5.061	USEPA 2007	Modeled BAF (8)
Semivolatile Organics:						
1,2,4,5-Tetrachlorobenzene	0.792	USEPA 2007	Regression-based BAF (1)	0.50	Beyer 1996	Mean BAF
7,12-Dimethylbenz(a)anthracene	0.125	USEPA 2007	Regression-based BAF (1)	7.276	USEPA 2007	Modeled BAF (8)
Bis(2-ethylhexyl)phthalate	0.066	USEPA 2007	Regression-based BAF (1)	117.260	USEPA 2007	Modeled BAF (8)
Di-n-butyl phthalate	0.814	USEPA 2007	Regression-based BAF (1)	55.366	USEPA 2007	Modeled BAF (8)
Di-n-octyl phthalate	0.032	USEPA 2007	Regression-based BAF (1)	456.538	USEPA 2007	Modeled BAF (8)
Dinoseb	2.171	USEPA 2007	Regression-based BAF (1)	1.821	USEPA 2007	Modeled BAF (8)
Hexachlorobenzene	0.246	USEPA 2007	Regression-based BAF (1)	134.973	USEPA 2008	Modeled BAF (8)
Hexachlorobutadiene	0.675	USEPA 2007	Regression-based BAF (1)	113.141	USEPA 2007	Modeled BAF (8)
Hexachlorophene	0.053	USEPA 2007	Regression-based BAF (1)	33.925	USEPA 2007	Modeled BAF (8)
Pentachloronitrobenzene	0.792	USEPA 2007	Regression-based BAF (1)	11.345	USEPA 2007	Modeled BAF (8)
Pentachlorophenol	11.38	USEPA 2007	Arithmetic mean BAF (2)	57.55	USEPA 2007	95% UCL BAF(9)
PAHs:						
Pyrene	1.83	USEPA 2007	95% UCL BAF (3)	3.210	USEPA 2007	Modeled BAF (8)
Organophosphorous Pesticides:						
Disulfoton	1.467	USEPA 2007	Regression-based BAF (1)	21.642	USEPA 2007	Modeled BAF (8)
Methyl Parathion	4.022	USEPA 2007	Regression-based BAF (1)	2.857	USEPA 2007	Modeled BAF (8)
Parathion (ethyl parathion)	1.687	USEPA 2007	Regression-based BAF (1)	5.544	USEPA 2007	Modeled BAF (8)
Phorate	1.719	USEPA 2007	Regression-based BAF (1)	28.055	USEPA 2007	Modeled BAF (8)
Metals:						
Beryllium	$\ln(C_p) = 0.7345[\ln(C_s)] - 0.5361$	USEPA 2007	Uptake equation (4)	0.250	Sample et al. 1998	Arithmetic mean BAF (10)
Cadmium	$\ln(C_p) = 0.546[\ln(C_s)] - 0.475$	USEPA 2007	Uptake equation (5)	$\ln(C_e) = 0.795[\ln(C_s)] + 2.114$	USEPA 2007	Uptake equation (11)
Chromium, total	0.136	Bechtel Jacobs 1998	95% UCL BAF (6)	2.157	Sample et al. 1998	95% UCL BAF (12)
Copper	$\ln(C_p) = 0.394[\ln(C_s)] + 0.668$	USEPA 2007	Uptake equation (5)	$\ln(C_e) = 0.264[\ln(C_s)] + 1.675$	Sample et al. 1998	Uptake equation (13)
Lead	$\ln(C_p) = 0.561[\ln(C_s)] - 1.328$	USEPA 2007	Uptake equation (5)	$\ln(C_e) = 0.807[\ln(C_s)] - 2.18$	USEPA 2007	Uptake equation (11)
Mercury	$\ln(C_p) = 0.544[\ln[C_s]) - 0.996$	Bechtel Jacobs 1998	Uptake equation (7)	9.247	Sample et al. 1998	95% UCL BAF (12)
Nickel	$\ln(C_p) = 0.748[\ln(C_s)] - 2.224$	USEPA 2007	Uptake equation (5)	2.483	Sample et al. 1998	95% UCL BAF (12)
Selenium	$\ln(C_p) = 1.104[\ln(C_s)] - 0.678$	USEPA 2007	Uptake equation (5)	$\ln(C_e) = 0.733[\ln(C_s)] - 0.075$	USEPA 2007	Uptake equation (11)
Thallium	0.004	Baes et al. 1984	Geometric mean	1.00	---	Assumed BAF
Vanadium	0.00684	Bechtel Jacobs 1998	95% UCL BAF (6)	0.042	USEPA 2007	Median BAF (14)
Zinc	$\ln(C_p) = 0.554[\ln(C_s)] + 1.575$	USEPA 2007	Uptake equation (5)	$\ln(C_e) = 0.328[\ln(C_s)] + 4.449$	USEPA 2007	Uptake equation (11)

TABLE 10-3

SOIL TO PLANT AND SOIL TO EARTHWORM BIOACCUMULATION FACTORS AND BIOACCUMULATION UPTAKE EQUATIONS USED TO ESTIMATE CHEMICAL CONCENTRATIONS IN TERRESTRIAL PLANT AND INVERTEBRATE TISSUE: STEP 3A RISK CALCULATION SWMU 9 - AREA B, TANK 214 AREA SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Notes:

BAF = Bioaccumulation Factor (unitless)
UCL = Upper Confidence Limit (95 percent upper confidence limit of the mean)
C_e = Concentration in earthworm tissue (mg/kg - dry weight)
C_p = Concentration in plant tissue (mg/kg - dry weight)
C_s = 95 percent UCL of the mean concentration in soil (mg/kg - dry weight) - for a given chemical, the 95 percent UCL of the mean concentration was used if there were at least eight data points with a minimum of four detected values (if these conditions were not met, the maximum concentration was used)
ln = natural logarithm
PAH = Polynuclear Aromatic Hydrocarbon
USEPA = U.S. Environmental Protection Agency

(1) BAF value was estimated using an inter-chemical regression equation for non-ionic organics based on rinsed plant foliage BAF data: $\log BAF = -0.4057(\log K_{ow}) + 1.781$, where BAF is the bioaccumulation factor and K_{ow} is the octanol-water partition coefficient (see Figure 5, Panel B in USEPA, 2007). The K_{ow} value used in the estimation of the BAF value is listed in Table 4-2.

(2) Mean value from data set listed in Appendix F, Table F-1 of USEPA (2007).

(3) 95 percent UCL of the mean value derived from data set for rinsed plant foliage BAF data listed in Appendix C of USEPA (2007).

(4) The concentration in plant tissue was estimated using a chemical-specific bioaccumulation uptake equation (i.e., regression equation; see Table 4a of USEPA, 2007) derived from measured BAF data (see Appendix A, Table A-2 of USEPA, 2007).

(5) The concentration in plant tissue was estimated using a chemical-specific bioaccumulation uptake equation (i.e., regression equation; see Table 4a of USEPA[2007]) developed by Bechtel Jacobs (1998) and cited in Table 4a of USEPA (2007).

(6) 95 percent UCL of the mean value from BAF database contained in Appendix A of Bechtel Jacobs (1998).

(7) The concentration in plant tissue was estimated using a chemical-specific bioaccumulation uptake equation (i.e., regression equation) listed in Table 7 of Bechtel Jacobs (1998).

(8) BAF value was estimated using the relationship $BAF = K_{ww}/K_d$ where K_{ww} is the biota to soil pore water partition coefficient (L soil pore water/kg ww tissue; converted to L soil pore water/kg dw tissue by assuming 16 percent soilds [USEPA, 1993] and dividing by 0.16) and K_d is the soil to pore water partition coefficient (L soil pore water/kg dw soil) (relationship developed by Jager, 1998 and cited in USEPA, 2007). Chemical-specific values for K_{ww} and K_d were derived using the following relationships:

$\log(K_{ww}) = 0.87(\log K_{ow}) - 2.0$ where K_{ow} is the ocantol-water partition coefficient (K_{ow} value listed in Table 4-2)
$K_d = (f_{oc})(K_{oc})$ where f_{oc} is the fraction of organic carbon in soil (assumed to be 0.01 [one percent]) and K_{oc} is the organic carbon patition coefficient (K_{oc} value listed in Table 4-2)

(9) 95 percent UCL of the mean value derived from data set listed in Appendix F, Table F-2 of USEPA (2007).

(10) Arithmetic mean BAF value listed in Appendix C, Table C-1 of Sample et al. (1998).

(11) The concentration in earthworm tissue was estimated using a chemical-specific bioaccumulation uptake equation (i.e., regression equation) developed by Sample et al. (1998 and 1999) and cited in Table 4a of USEPA (2007).

(12) 95 percent UCL of the mean value from BAF database contained in Appendix B of Sample et al. (1998).

(13) The concentration in earthworm tissue was estimated using a chemical-specific bioaccumulation uptake equation (i.e., regression equation) listed in Table 12 of Sample et al. (1998).

(14) Median BAF value listed in Table 11 of Sample et al. (1998).

TABLE 10-3

SOIL TO PLANT AND SOIL TO EARTHWORM BIOACCUMULATION FACTORS AND BIOACCUMULATION UPTAKE EQUATIONS USED TO ESTIMATE CHEMICAL CONCENTRATIONS IN TERRESTRIAL PLANT AND INVERTEBRATE TISSUE: STEP 3A RISK CALCULATION SWMU 9 - AREA B, TANK 214 AREA SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Table References:

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USEPA. 1993. Wildlife Exposure Factors Handbook. Office of Research and Development, Washington, D.C. EPA/600/R-93/187a.

TABLE 10-4

SOIL BIOACCUMULATION FACTORS AND BIOACCUMULATION UPTAKE EQUATIONS USED TO ESTIMATE CHEMICAL CONCENTRATIONS IN SMALL MAMMAL TISSUE: STEP 3A RISK CALCULATION
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical [1]	Soil-Small Mammal BAF (dry weight) or Uptake Equation (dry weight)		
	BAF Value/Uptake Equation	Source Document	Description
Volatile Organics:			
Chloroform	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 [2]
Ethylbenzene	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 [2]
Pentachloroethane	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 [2]
Styrene	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 [2]
Semi-Volatile Organics:			
Bis(2-ethylhexyl)phthalate	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 [2]
Di-n-octyl phthalate	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 [2]
Dinoseb	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 [2]
Hexachlorobenzene	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 [2]
Hexachlorobutadiene	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 [2]
Organophosphorous Pesticides:			
Disulfoton	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 [2]
Methyl Parathion	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 [2]
Parathion	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 [2]
Phorate	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 [2]
Metals:			
Beryllium	$C_m = [(BAF_d)(DI)]/0.32$	---	See Section 6.2.2.1 [2]
Lead	0.203	Sample et al. 1998	95% UCL of the mean BAF for omnivores [3]
Vanadium	0.01037	Sample et al. 1998	Median BAF for omnivores [3]

Notes:

BAF = Bioaccumulation Factor
BAF_d = diet-to-small mammal bioaccumulation factor (wet weight)
C_m = Concentration in small mammal tissue (mg/kg - dry weight)
COPC = Chemical of Potential Concern
UCL = Uppr Confidence Limit
DI = Small mammal dietary intake (mg/kg-BW/day)
USEPA = U.S. Environmental Protection Agency

TABLE 10-4

SOIL BIOACCUMULATION FACTORS AND BIOACCUMULATION UPTAKE EQUATIONS USED TO ESTIMATE CHEMICAL CONCENTRATIONS IN SMALL MAMMAL TISSUE: STEP 3A RISK CALCULATION
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Notes (continued):

(1) The chemicals listed are those detected in surface and/or subsurface soil and identified as ecological COPCs in the Step 2 screening level risk calculation for the red-tailed hawk. Non-detected chemicals identified as ecological COPCs because maximum exposure doses exceed toxicity reference values also are listed.

(2) Most chemical exposure for small mammals is via the diet. Therefore, it is assumed that the concentration of the chemical in the tissue of small mammals is equal to the chemical concentration in its diet multiplied by a diet-to-whole body BAF (BAF_d - wet weight basis). In the absence of literature-based diet-to whole-body BAF, a value of 1.0 was assumed. The resulting tissue concentration was converted to a dry weight basis using an estimated solids content for small mammals of 0.32 (USEPA, 1993). Additional explanation if provided in Section 6.2.2.1.

(3) 95 percent UCL of the mean value from BAF database contained in Appendix B of Sample et al. (1998).

(4) Median BAF value for omnivores listed in Appendix C, Table C-1 of Sample et al. (1998).

Table References:

Sample, B.E., J.J. Beauchamp, R.A. Efroymson, and G.W. Suter II. 1998. Development and Validation of Bioaccumulation Models for Small Mammals. Oak Ridge National Laboratory, Environmental Restoration Division, ORNL Environmental Restoration Program. ES/ER/TM-219.

U.S. Environmental Protection Agency (USEPA). 1993. Wildlife Exposure Factors Handbook. Office of Research and Development, Washington, D.C. EPA/600/R-93/187a.2007.

TABLE 10-5

SEDIMENT TO INVERTEBRATE AND SEDIMENT TO FISH BIOACCUMULATION FACTORS USED TO ESTIMATE CHEMICAL CONCENTRATIONS IN AQUATIC INVERTEBRATE AND FISH TISSUE: STEP 3A REFINED RISK CALCULATION
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

	Sediment-Invertebrate BAF (dry weight)			Sediment-Fish BAF (dry weight)		
Chemical	**Value**	**Source Document**	**Description**	**Value**	**Source Document**	**Description**
Volatile Organics:						
Ethylbenzene	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Semi-Volatile Organics:						
Bis(2-ethylhexyl)phthalate	40.8266	---	BAF derived from median BSAF value (8.4739; see Table 6-4) (1)	10.657	---	BAF derived from arithmetic mean BSAF value (1.5353; see data in Table 6-6) (6)
Di-n-butyl phthalate	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Dinoseb	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Hexachlorobenzene	25.8193	---	BAF derived from 95% UCL BSAF value (5.359; see data in Table 6-4) (2)	0.625	---	BAF derived from single BSAF value (0.0900; see Table 6-6) (7)
PAHs:						
Benzo(b)fluoranthene	7.009	---	BAF derived from arithmetic mean BSAF value (1.4548; see data in Table 6-4) (3)	0.017	---	BAF derived from median BSAF value (0.0025; see Table 6-6) (8)
Benzo(k)fluoranthene	10.083	---	BAF derived from arithmetic mean BSAF value (2.0928; see data in Table 6-4) (2)	0.017	---	BAF derived from median BSAF value (0.0024; see Table 6-6) (8)
Pyrene	2.255	---	BAF derived from 95% UCL BSAF value (0.468; see data in Table 6-4) (2)	0.110	---	BAF derived from arithmetic mean BSAF value (0.0158; see data in Table 6-6) (6)
Organophosphorous Pesticides:						
Disulfoton	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Methyl parathion	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Parathion	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Metals:						
Chromium, total	0.179	Bechtel Jacobs 1998	Arithmetic mean BAF (4)	0.038	Krantzberg and Boyd 1992	Arithmetic mean BAF
Copper	2.976	Bechtel Jacobs 1998	Arithmetic Mean BAF (5)	0.10	Krantzberg and Boyd 1992	Arithmetic mean BAF
Lead	0.276	Bechtel Jacobs 1998	Arithmetic Mean BAF (5)	0.265	PTI Environmental Services 1995	95 percent UCL of the mean BAF (8)
Mercury	1.422	Bechtel Jacobs 1998	Arithmetic Mean BAF (4)	3.25	Cope et al. 1990	Arithmetic mean BAF
Selenium	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Thallium	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Vanadium	1.00	---	Assumed BAF	1.00	---	Assumed BAF
Zinc	1.952	Bechtel Jacobs 1998	Arithmetic Mean BAF (5)	4.513	PTI Environmental Services 1995	95 percent UCL of the mean BAF (8)

Notes:

BAF = Bioaccumulation Factor
BSAF = Biota-Sediment Accumulation Factor
UCL = Upper Confidence Limit (95 percent upper confidence limit of the mean)

(1) Median BSAF value (wet weight) listed in Table 6-4 was converted to a BAF value (dry weight) using an invertebrate percent lipid content of 3.44 percent, invertebrate percent solids content of 21 percent, and a percent organic carbon content of 0.034 (minimum value).
(2) 95 percent UCL of the mean BSAF value (wet weight) derived from the data listed in Table 6-4 was converted to a BAF value (dry weight) using an invertebrate percent lipid content of 3.44 percent, invertebrate percent solids content of 21 percent, and a percent organic carbon content of 0.034 (minimum value).
(3) Arithmetic mean BSAF value (wet weight) derived from the data listed in Table 6-4 was converted to a BAF value (dry weight) using an invertebrate percent lipid content of 3.44 percent, invertebrate percent solids content of 21 percent, and a percent organic carbon content of 0.034 (minimum value).
(4) Mean BAF value listed in Table 2 of Bechtel Jacobs (1998) for depurated and non-depurated organisms. A combined depurated/non-depurated data set was used due to the low number of data points within the depurated data set.
(5) Mean BAF value listed in Table 2 of Bechtel Jacobs (1998) for depurated organisms.
(6) Arithmetic mean BSAF value (wet weight) derived from data listed in Table 6-6 was converted to a BAF value (dry weight) using a fish percent lipid content of 5.9 percent, fish percent solids content of 25 percent, and a percent organic carbon content of 0.034 (minimum value).
(7) Single BSAF value (wet weight) listed in Table 6-6 was converted to a BAF value (dry weight) using a fish percent lipid content of 5.9 percent, fish percent solids content of 25 percent, and a percent organic carbon content of 0.034 (minimum value).
(8) Median BSAF value (wet weight) listed in Table 6-6 was converted to a BAF value (dry weight) using a fish percent lipid content of 5.9 percent, fish percent solids content of 25 percent, and a percent organic carbon content of 0.034 (minimum value).
(9) 95 percent UCL of the mean BAF for values listed in Table 1 of PTI Environmental Services (1995).

TABLE 10-5

SEDIMENT TO INVERTEBRATE AND SEDIMENT TO FISH BIOACCUMULATION FACTORS USED TO ESTIMATE CHEMICAL CONCENTRATIONS IN AQUATIC INVERTEBRATE AND FISH TISSUE: STEP 3A REFINED RISK CALCULATION
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Table References:

Bechtel Jacobs. 1998b. Biota Sediment Accumulation Factors for Invertebrates: Review and Recommendations for Oak Ridge Reservation. Prepared for U.S. Department of Energy. BJC/OR-112. August 1998.

Cope, W.G., J.G. Wiener, and R.G. Rada. 1990. Mercury Accumulation in Yellow Perch in Wisconsin Seepage Lakes: Relation to Lake Characteristics. Environ. Toxicol. Chem. 9:931-940.

Krantzberg, G. and D. Boyd. 1992. The Biological Significance of Contaminants in Sediment from Hamilton Harbor, Lake Ontario. Environ. Toxicol. Chem. 11:1527-1540.

PTI Environmental Services. 1995. Bioaccumulation Factor Approach Analysis for Metals and Polar Organic Compounds. Prepared for Washington Departmetn of Ecology, Central Program, Environmental Review and Sediment Section, Olympia, Washington. October 1995. CAOU-03-03.

TABLE 10-6

FREQUENCY AND RANGE OF SURFACE SOIL DATA (95 PERCENT UCL OF THE MEAN CONCENTRATIONS) COMPARED TO SOIL SCREENING VALUES FOR TERRESTRIAL PLANTS AND INVERTEBRATES: STEP 3A RISK CALCULATION
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte [1]	Contaminant Frequency/Range					Soil Screening Value (SSV)	Reference [4]	95% UCL of the Mean HQ [5]	Comments
	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	95% UCL of the Mean [2]	Value used in Step 3a Screen [3]				
Volatile Organics (µg/kg)									
2-Butanone (MEK)	4/45	8.6J - 61J	2.8UJ - 260U	8.048	8.048	NE	---	NA	No SSV
Acetone	37/42	6.3J - 850	2.8UJ - 11UJ	151.6	151.6	NE	---	NA	No SSV
Metals (mg/kg)									
Arsenic	37/47	0.74J - 23	0.44U - 0.84U	2.709	2.709	18.0	USEPA 2005b	0.15	HQ < 1.0
Cobalt	44/44	5.5J - 57	NA	23.82	23.82	13.0	USEPA 2005f	1.83	HQ > 1.0
Copper	42/42	51 - 170	NA	95.42	95.42	70.0	USEPA 2007c	1.36	HQ > 1.0
Lead	62/62	1.6 - 1,000J	NA	159.6	159.6	120	USEPA 2005g	1.33	HQ > 1.0
Selenium	19/47	0.19J - 1.4	0.46U - 1.5U	0.62	0.62	0.52	USEPA 2007e	1.19	HQ > 1.0
Thallium	14/44	2.3J - 4.6J	0.12U - 7.4UJ	1.912	1.912	1.00	Efroymson et al. 1997b	1.91	HQ > 1.0
Vanadium	44/44	120 - 240	NA	178.5	178.5	20.0	USEPA 2005h	8.93	HQ > 1.0
Zinc	60/60	32J - 520J	NA	76.8	76.8	120	USEPA 2007f	0.64	HQ < 1.0

Notes:

HQ = Hazard Quotient
J = Estimated value
mg/kg - milligram per kilogram
NA = Not Applicable
NE = Not Established
SSV = Soil Screening Value
U = Not detected
UCL = Upper Confiedence Limit
UJ = Not detected, estimated value
USEPA = U.S. Environmental Protection Agency

(1) The analytes shown are those that were detected in surface soil (minimum of eight data points with at least four detected values) and identified as ecological chemicals of potential concern in Step 2 of the screening level risk calculation because maximum detected concentrations exceed soil screening values.
(2) 95% Upper Conficence Limit of the mean concentrations were calculated using USEPA ProUCL Version 5.0.00 software (USEPA, 2013a and 2013b; see Appendix E)
(3) Risk estimates were re-calculated in Step 3a using 95% UCL of the mean concentrations.
(4) See Table 3-1 for reference citations.
(5) The 95% UCL of the mean HQ is the 95% UCL of the mean concentration divided by the soil screening value.

Table References:

U.S. Environmental Protection Agency (USEPA). 2013a. ProUCLVersion 5.0.00. September 2013. http://www.epa.gov/osp/hstl/tsc/software.htm.

USEPA. 2013b. ProUCL Version 5.0.00 Technical Guide. Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations. Office of Research and Development. EPA/600/R-07/041. http://www.epa.gov/osp/hstl/tsc/software.htm.

TABLE 10-7

SUMMARY OF DESCRIPTIVE AND DISTRIBUTIONAL STATISTICS FOR INORGANIC ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN IN SURFACE SOIL
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Ecological COPC	Population (1)	Descriptive Statistics (2)							Test for Normality (6)	Test for Homogeneity of Variance (7)	Distributional Statistics		
		Frequency of Detection	Range of Detections	Range of Non-Detections	Mean (3)	SE	95% UCL (4)	BTV (5)			Mean/Median of the Distribution (8)	Right Tail of the Distribution	
												Quantile Test (9)	Slippage Test
Arsenic	Tank 214 Area	37/47	0.74J - 23	0.44U - 0.84U	1.77	0.47	2.71	---	Test not performed (10)	Test not performed (11)	Gehan Test (13) Not elevated at α = 0.05 G(0.379) < z(1.645)	Not elevated at α = 0.05	Not elevated at α = 0.05
	NAPR Background	14/20	0.21J - 2.5J	0.69UJ - 1.8U	1.32	0.15	1.49	2.75	Test not performed (10)				
Beryllium	Tank 214 Area	44/44	0.11J - 0.47	NA	0.21	0.01	0.24	---	Not normal at α = 0.05	Test not performed (11)	Gehan Test (13) Not elevated at α = 0.05 G(-2.176) < z(1.645)	Test not performed (17)	Not elevated at α = 0.05
	NAPR Background	16/18	0.085B - 0.58	0.04U - 0.1U	0.29	0.03	0.27	0.676	Test not performed (10)				
Cadmium	Tank 214 Area	36/47	0.048J - 1.8	0.04U - 0.37U	0.43	0.05	0.51	---	Test not performed (10)	Test not performed (11)	Test not performed (14)	Test not performed (17)	Test not performed (18)
	NAPR Background	7/20	0.18J - 0.92J	0.059U - 1.2U	0.37	0.07	0.33	0.765	Test not performed (10)				
Chromium	Tank 214 Area	47/47	2.5J - 37	NA	8.19	0.81	9.41	---	Not normal at α = 0.05	Test not performed (12)	Wilcoxon-Mann-Whitney Test (15) Not elevated at α = 0.05 (p = 1.0)	Not elevated at α = 0.05	Not elevated at α = 0.05
	NAPR Background	20/20	5.9J - 47	NA	25.69	2.73	30.42	55	Normal at α = 0.05				
Cobalt	Tank 214 Area	44/44	5.5J - 57	NA	21.52	1.34	23.82	---	Not normal at α = 0.05	Test not performed (12)	Wilcoxon-Mann-Whitney Test (15) Not elevated at α = 0.05 (p = 0.568)	Not elevated at α = 0.05	Not elevated at α = 0.05
	NAPR Background	19/19	9.5 - 50.2J	NA	22.84	2.68	27.50	52.3	Normal at α = 0.05				
Copper	Tank 214 Area	42/42	51 - 170	NA	89.86	3.31	95.42	---	Normal at α = 0.05	Variances are not equal at α = 0.05	Welch-Satterthwaite Test (16) Not elevated at α = 0.05 (p = 0.140)	Not elevated at α = 0.05	Not elevated at α = 0.05
	NAPR Background	18/18	13N - 180	NA	77.11	11.01	96.27	192	Normal at α = 0.05				
Lead	Tank 214 Area	62/62	1.6 - 1,000J	NA	117.60	24.20	159.60	---	Not normal at α = 0.05	Test not performed (12)	Wilcoxon-Mann-Whitney Test (15) Elevated at α = 0.05 (p = <0.01)	Elevated at α = 0.05	Test not performed (19)
	NAPR Background	18/18	2J - 21J	NA	8.68	1.62	12.81	34.2	Not normal at α = 0.05				
Mercury	Tank 214 Area	39/47	0.0046J - 0.065J	0.0044U - 0.06U	0.03	0.01	0.03	---	Test not performed (10)	Test not performed (11)	Gehan Test (13) Not elevated at α = 0.05 G(-3.885) < z(1.645)	Not elevated at α = 0.05	Not elevated at α = 0.05
	NAPR Background	17/20	0.012B - 0.12J	0.02U - 0.04U	0.05	0.01	0.06	0.131	Test not performed (10)				
Nickel	Tank 214 Area	44/44	4J - 9.1	NA	5.77	0.21	6.13	---	Not normal at α = 0.05	Test not performed (12)	Wilcoxon-Mann-Whitney Test (15) Not elevated at α = 0.05 (P = 1.0)	Not elevated at α = 0.05	Not elevated at α = 0.05
	NAPR Background	19/19	3.4B - 19	NA	10.54	1.20	12.62	28	Normal at α = 0.05				
Selenium	Tank 214 Area	19/47	0.19J - 1.4	0.46U - 1.5U	0.82	0.05	0.62	---	Test not performed (10)	Test not performed (11)	Test not performed (14)	Test not performed (17)	Test not performed (18)
	NAPR Background	5/20	0.45J - 1.2J	0.13UJ - 2.1UJ	0.84	0.10	0.57	1.07	Test not performed (10)				

TABLE 10-7

SUMMARY OF DESCRIPTIVE AND DISTRIBUTIONAL STATISTICS FOR INORGANIC ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN IN SURFACE SOIL
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Ecological COPC	Population [1]	Descriptive Statistics [2]							Test for Normality [6]	Test for Homogeneity of Variance [7]	Distributional Statistics		
											Mean/Median of the Distribution [8]	Right Tail of the Distribution	
		Frequency of Detection	Range of Detections	Range of Non-Detections	Mean [3]	SE	95% UCL [4]	UTL [5]				Quantile Test [9]	Slippage Test
Thallium	Tank 214 Area	14/44	2.3J - 4.6J	0.03U - 1.3U	2.50	0.38	1.91	---	Test not performed [10]	Test not performed [11]	Test not performed [14]	Test not performed [17]	Test not performed [18]
	NAPR Background	1/19	0.1J - 0.1J	0.08U - 1.2U	0.37	0.09	NE	NE	Test not performed [10]				
Vanadium	Tank 214 Area	44/44	120 - 240	NA	172.05	3.81	178.50	---	Normal at α = 0.05	Variances are not equal at α = 0.05	Welch-Satterthwaite Test [16] Elevated at α = 0.05 (p = 0.023)	Not elevated at α = 0.05	Not elevated at α = 0.05
	NAPR Background	18/18	35 - 230	NA	141.57	13.85	165.70	286	Normal at α = 0.05				
Zinc	Tank 214 Area	60/60	32J - 520J	NA	62.07	8.10	76.80	---	Not normal at α = 0.05	Test not performed [12]	Wilcoxon-Mann-Whitney Test [15] Not elevated at α = 0.05 (p = 0.177)	Not elevated at α = 0.05	Test not performed [19]
	NAPR Background	18/18	6.2E - 120E	NA	52.48	7.62	65.73	132	Normal at α = 0.05				

Notes:

95% UCL = 95 percent Upper Confidence Limit of the Mean
B = The reported concentration is less than the reporting limit but greater than method detection limit
BTV = Background Threshold Value
COPC = Chemical of Potential Concern
E = The reported concentrations is estimated due to the presence of matrix interferences
J = Estimated value
N = Spiked sample recovery not within control limits
NA = Not applicable
ND = Not detected
NE = Not established (insufficient number of detected concentrations)
SE = Standard error
U = Not detected
UJ = Not detected, estimated value

(1) Basewide background surface soil data taken from Revised Final II Summary Report for Environmental Background Concentrations of Inorganic Compounds, Naval Activity Puerto Rico, Ceiba, Puerto Rico. (Baker, 2010). Duplicate samples were combined prior to all statistical evaluations.
(2) Units in milligram per kilogram (mg/kg).
(3) Arithmetic mean calculated using non-detected data without manipulation.
(4) 95% Upper Confidence Limit of the mean concentrations were calculated using USEPA ProUCL Version 5.0.00 software (USEPA, 2013a). 95 percent upper confidence limit of the mean cocnentrations were derived for those data sets that have a minimum of eight data points and four detected values (USEPA, 2013b).
(5) Background threshold values for surface soil taken from Background Threshold Value Evaluation and Recommendations for Naval Activity Puerto Rico (CH2M Hill, 2013).
(6) Normality verified by the Shapiro-Wilk test (NFESC, 2002 and USEPA, 2013b).
(7) Homogeneity of variance verified by F test (NFESC, 2002 and USEPA, 2013b).
(8) Parametric tests were used if: (a) the site and background dataset do not contain non-detected values; and (b) both data sets are normally distributed. Non-parametric tests were used if: (a) the site and/or background data sets contain non-detected resuts; or (b) if both data sets are not normally distributed (USEPA, 2013b). Parametric and non-parametirc tests evaluating the mean/median of the data set distributions were conducted using USEPA ProUCL Version 5.0.00 software (USEPA, 2013a).
(9) Quantile test was conducted using USEPA ProUCL Version 4.1.01 software (USEPA, 2011).
(10) Test for normality was not performed because the data set contains non-detected results (USEPA, 2013b).
(11) Test for homogeneity of variance was not performed due to the presence of non-detected results within the site and/or background dataset (USEPA, 2013b).
(12) Test for homogeneity of variance was not performed because the site and/or background data set is not normallly distributed (USEPA, 2013b).
(14) Gehan test was used because the SWMU and/or background data sets contain different non-detected values (USEPA, 2013b).
(14) A statistical test evaluating the mean or median of the data set distributions was not performed because there is greater than 50 percent non-detected results within the SWMU and/or background data set (NFEC, 1998).
(15) The Wilcoxon-mann-Whitney test was used because the SWMU and/or background data set does not follow a normal distribution (USEPA, 2013b).
(16) Welch-Satterthwaite test was used because the SWMU and background data set distributions do not have equal variances (USEPA, 2013b).
(17) The quantile test was not performed because non-detected results within the SWMU and/or background data set are greater than the smallest of the "r" largest detected results in the combined data set (USEPA, 2010).
(18) The slippage test was not performed because the largest detected value for the background data set is less than the largest non-detected value (NFESC, 2002).
(19) The slippage test was not performed because the size of the SWMU data set is greater than 50 (critical value table does not provide values beyond n = 50).

TABLE 10-7

SUMMARY OF DESCRIPTIVE AND DISTRIBUTIONAL STATISTICS FOR INORGANIC ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN IN SURFACE SOIL
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Table References:

Baker Environmental, Inc. (Baker). 2010. Revised Final II Summary Report for Environmental Background Concentrations of Inorganic Compounds, Naval Activity Puerto Rico, Ceiba, Puerto Rico. July 30, 2010.

CH2M Hill. 2013. Background Threshold Value Evaluation and Recommendations for Naval Activity Puerto Rico. December 6, 2013.

Naval Facilities Engineering Command (NFEC). 1998. Procedural Guidance for Statistically Analyzing Environmental Background Data. September 1998.

Naval Facilities Engineering Service Center (NFESC). 2002. Guidance for Environmental Background Analysis. Volume I: Soil. NFESC User's Guide UG-209-ENV. April 2002.

U.S. Environmental Protection Agency (USEPA). 2013a. ProUCLVersion 5.0.00. September 2013. http://www.epa.gov/osp/hstl/tsc/software.htm.

USEPA. 2013b. ProUCL Version 5.0.00 Technical Guide. Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations. Office of Research and Development. EPA/600/R-07/041. http://www.epa.gov/osp/hstl/tsc/software.htm.

USEPA. 2011. ProUCLVersion 4.1.01. August 2011. http://www.epa.gov/osp/hstl/tsc/software.htm.

USEPA. 2010. ProUCL Version 4.1.00 Technical Guide (Draft). Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations. Office of Research and Development. EPA/600/R-07/041. http://www.epa.gov/osp/hstl/tsc/software.htm.

TABLE 10-8

SUMMARY OF DESCRIPTIVE STATISTICS FOR INORGANIC ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN IN SUBSURFACE SOIL
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Ecological COPC	Tank 214 Area Frequency/Range [1]				Background Frequency/Range [1][2]				
	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean [3]	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean [3]	Background Threshold Value [4]
Beryllium	3/3	0.15J - 0.28J	NA	0.21	18/18	0.052B - 0.7	NA	0.26	0.672
Cadmium	2/3	0.54J - 0.73J	0.4U - 0.4U	0.56	6/20	0.099J - 0.48	0.061U - 0.66U	0.37	0.603
Chromium	3/3	4.2 - 19	NA	10.07	18/18	3.9 - 148J	NA	37.31	167
Cobalt	3/3	3.9J - 32J	NA	18.63	17/18	0.83B - 33.8	1.2U - 1.2U	9.15	49.8
Copper	3/3	93J - 130J	NA	111.00	17/17	18 - 260J	NA	104.97	280
Lead	3/3	3.7J - 790J	NA	272.90	19/19	0.27J - 6.6	NA	3.08	6.97
Mercury	2/3	0.034 - 0.049	0.0081U - 0.0081U	0.03	7/20	0.013B - 0.17J	0.0051UJ - 0.06U	0.04	0.119
Nickel	3/3	5J - 9.1	NA	6.63	18/18	1.1J - 35.6	NA	7.89	34.1
Selenium	0/3	ND	0.96U - 1.6U	1.18	6/20	0.22J - 3.8J	0.15UJ - 1.3U	0.90	2.57
Silver	0/3	ND	0.11U - 0.18U	0.13	1/20	0.16B - 0.16B	0.063U - 1.3U	0.50	NE
Thallium	1/3	4.6J - 4.6J	2.4UJ - 7UJ	4.67	2/19	0.21J - 0.29J	0.11UJ - 2.4U	0.58	0.27
Vanadium	3/3	170J - 200J	NA	186.67	19/19	25 - 410	NA	208.57	482
Zinc	3/3	32J - 71J	NA	50.00	18/19	3.9 - 98J	27U - 27U	38.06	111

Notes:

COPC = Chemical of Potential Concern
B = The reported concentration is less than the reporting limit but greater than method detection limit
NE = Not established (insufficient number of detected concentrations)
NA = Not Applicable
ND = Not Detected
J = Estimated value
U = Not detected
UJ = Not detected, estimated value

[1] Units in milligram per kilogram (mg/kg).

[2] Basewide background subsurface soil data (clay data set) taken from Revised Final II Summary Report for Environmental Background Concentrations of Inorganic Compounds, Naval Activity Puerto Rico, Ceiba, Puerto Rico. (Baker, 2010). Duplicate samples were combined prior to derivation of arithmetic mean values.

[3] Arithmetic mean calculated using non-detected data without manipulation.

[4] Background threshold values for subsurface soil taken from Background Threshold Value Evaluation and Recommendations for Naval Activity Puerto Rico (CH2M Hill, 2013).

Table References:

Baker Environmental, Inc. (Baker). 2010. Revised Final II Summary Report for Environmental Background Concentrations of Inorganic Compounds, Naval Activity Puerto Rico, Ceiba, Puerto Rico. July 30, 2010.

CH2M Hill. 2013. Background Threshold Value Evaluation and Recommendations for Naval Activity Puerto Rico. December 6, 2013.

TABLE 10-9

FREQUENCY AND RANGE OF GROUNDWATER DATA (95 PERCENT UCL OF THE MEAN CONCENTRATIONS) COMPARED TO GROUNDWATER SCREENING VALUES: STEP 3A RISK CALCULATION
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte [1]	Contaminant Frequency/Range					Groundwater Screening Value (GWSV)	Reference [4]	95% UCL of the Mean HQ [5]	Comments
	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	95% UCL of the Mean [2]	Value used in Step 3a Screen [3]				
Volatile Organics (µg/kg)									
Benzene	7/23	0.09J - 330J	0.5U - 0.54U	118.7	118.7	109	USEPA 2001	1.09	HQ > 1.0
Ethylbenzene	5/22	0.21J - 12J	0.28U - 0.5U	1.925	1.925	4.30	USEPA 2001	0.45	HQ < 1.0

Notes:

GWSV = Groundwater Screening Value
HQ = Hazard Quotient
J = Estimated value
µg/kg - microgram per kilogram
U = Not detected
UCL = Upper Confiedence Limit
USEPA = U.S. Environmental Protection Agency

(1) The analytes shown are those that were detected in the total recoverable fraction of groundwater (minimum of eight data points with at least four detected values) and identified as ecological chemicals of potential concern in Step 2 of the screening level risk calculation because maximum detected concentrations exceed groundwater screening values.
(2) 95% Upper Conficence Limit of the mean concentrations were calculated using USEPA ProUCL Version 5.0.00 software (USEPA, 2013a and 2013b; see Appendix E)
(3) Risk estimates were re-calculated in Step 3a using 95% UCL of the mean concentrations.
(4) See Table 3-2 for reference citations.
(5) The 95% UCL of the mean HQ is the 95% UCL of the mean concentration divided by the groundwater screening value.

Table References:

U.S. Environmental Protection Agency (USEPA). 2013a. ProUCLVersion 5.0.00. September 2013. http://www.epa.gov/osp/hstl/tsc/software.htm.

USEPA. 2013b. ProUCL Version 5.0.00 Technical Guide. Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations. Office of Research and Development. EPA/600/R-07/041. http://www.epa.gov/osp/hstl/tsc/software.htm.

TABLE 10-10

SUMMARY OF DESCRIPTIVE STATISTICS FOR INORGANIC ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN IN GROUNDWATER
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Ecological COPC	Tank 214 Area Frequency/Range [1]				Background Frequency/Range [1][2]				
	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean [3]	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean [3]	Background Threshold Value [4]
Total Recoverable:									
Cadmium	4/7	1.3J - 13	1U - 1U	3.44	6/13	5.4J - 53.1	0.3U - 2.9U	9.47	46.7
Chromium	2/7	54 - 56	1.1U - 5.2U	17.57	9/12	1.2J - 182	0.7U - 8.5U	55.24	263
Cobalt	7/7	2.7J - 91J	NA	26.80	10/12	11.1J - 778	0.7U - 2.8U	152.07	778
Copper	7/7	8.9J - 510	NA	156.70	11/12	85 - 352	0.5U - 0.5U	114.43	413
Lead	4/7	6.1J - 93	3.5U - 3.5U	20.56	7/11	2.5J - 32.5J	0.9UJ - 1.5U	7.68	96.9
Nickel	7/7	2.2J - 31J	NA	10.20	10/12	12.6J - 86.9	0.8U - 6.7U	40.63	128
Vanadium	7/7	45J - 630J	NA	199.71	11/12	1.7J - 549	8.5U - 8.5U	161.21	696
Zinc	2/7	130 - 160	9.7U - 17U	51.53	11/12	3.1J - 695	24.9U - 24.9U	174.67	1,540
Dissolved:									
Cadmium	1/6	4.3J - 4.3J	1U - 1U	1.55	4/13	1.7J - 36	0.3U - 2.9U	7.98	40.2
Chromium	1/6	1.6J - 1.6J	0.83U - 2.3U	1.20	4/13	3.2J - 8J	0.7U - 8.5U	3.42	4.86
Cobalt	6/6	5.8J - 29	NA	12.90	8/12	0.93J - 591	0.7U - 3.9U	108.90	1,300
Copper	4/6	3.2J - 6.5J	1.7U - 1.7U	3.70	5/12	3.3 - 496J	0.5U - 7.5U	53.29	323
Lead	2/6	2.8J - 9	2.2U - 2.2U	3.43	2/11	0.9J - 1.6	0.9UJ - 1.5U	1.12	1.58
Nickel	6/6	2J - 3.6J	NA	2.78	7/12	0.91J - 80.1J	0.6U - 11.1U	26.08	103
Vanadium	5/5	13 - 61J	NA	36.60	6/12	8.1 - 265	0.8U - 8.5U	39.08	72.9
Zinc	0/6	ND	7.9U - 14U	10.12	10/11	1.6J - 492	2.4U - 2.4U	78.50	421

Notes:

B = The reported concentration is less than the reporting limit but greater than method detection limit
COPC = Chemical of Potential Concern
J = Estimated value
NA = Not Applicable
ND = Not Detected
NE = Not established (insufficient number of detected concentrations)
U = Not detected
UJ = Not detected, estimated value

[1] Units in microgram per liter (µg/L).

[2] Basewide groundwater data taken from Revised Final II Summary Report for Environmental Background Concentrations of Inorganic Compounds, Naval Activity Puerto Rico, Ceiba, Puerto Rico. (Baker, 2010). Duplicate samples were combined prior to derivation of arithmetic mean values.

[3] Arithmetic mean calculated using non-detected data without manipulation.

[4] Background threshold values for groundwater taken from Background Threshold Value Evaluation and Recommendations for Naval Activity Puerto Rico (CH2M Hill, 2013).

Table References:

Baker Environmental, Inc. (Baker). 2010. Revised Final II Summary Report for Environmental Background Concentrations of Inorganic Compounds, Naval Activity Puerto Rico, Ceiba, Puerto Rico. July 30, 2010.

CH2M Hill. 2013. Background Threshold Value Evaluation and Recommendations for Naval Activity Puerto Rico. December 6, 2013.

TABLE 10-11

FREQUENCY AND RANGE OF SURFACE WATER DATA (95 PERCENT UCL OF THE MEAN CONCENTRATIONS) COMPARED TO SURFACE WATER SCREENING VALUES: STEP 3A RISK CALCULATION
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte [1]	Contaminant Frequency/Range					Surface Water Screening Value (SWSV)	Reference [4]	95% UCL of the mean HQ [5]	Comments
	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	95% UCL of the Mean [2]	Value used in Step 3a Screen [3]				
Total Metals (µg/L)									
Arsenic	7/15	3.7J - 110	10U - 10U	52.93	52.93	36.0	PREQB 2010	1.47	HQ > 1.0
Cadmium	7/15	0.7J - 38	2.5U - 5U	16.38	16.38	8.85	PREQB 2010	1.85	HQ > 1.0
Chromium	12/15	4.3J - 540	2.7U - 10U	215.4	215.4	50.4	PREQB 2010	4.27	HQ > 1.0
Cobalt	11/15	0.96J - 220	10U - 10U	94.15	94.15	45.0	USEPA 2007a	2.09	HQ > 1.0
Copper	13/15	8.1J - 3,100	25.6U - 41.4U	2,528	2,528	3.73	PREQB 2010	677.75	HQ > 1.0
Lead	11/15	1.7J - 1,100	4.5UJ - 5U	808.1	808.1	8.52	PREQB 2010	94.85	HQ > 1.0
Nickel	7/15	4.4J - 200	2.7U - 40U	94.93	94.93	8.28	PREQB 2010	11.46	HQ > 1.0
Vanadium	14/15	23J - 4,700	50U - 50U	3,670	3,670	12.0	USEPA 2003	305.83	HQ > 1.0
Zinc	14/15	6.3J - 1,300	20U - 20U	521.9	521.9	85.6	PREQB 2010	6.10	HQ > 1.0

Notes:

HQ = Hazard Quotient
J = Estimated value
µg/L = microgram per liter
PRQEB = Puerto Rico Environmental Quality Board
SWSV = Surface Water Value
U = Not detected
UCL = Upper Confiedence Limit
USEPA = U.S. Environmental Protection Agency

(1) The analytes shown are those that were detected within the total recoverable fraction of surface water (minimum of eight data points with at least four detected values) and identified as ecological chemicals of potential concern in Step 2 of the screening level risk calculation because maximum detected concentrations exceed surface water screening values.
(2) 95% Upper Conficence Limit of the mean concentrations were calculated using USEPA ProUCL Version 5.0.00 software (USEPA, 2013a and 2013b; see Appendix E)
(3) Risk estimates were re-calculated in Step 3a using 95% UCL of the mean concentrations.
(4) See Table 3-2 for reference citations.
(5) The 95% UCL of the mean HQ is the 95% UCL of the mean concentration divided by the surface water screening value.

Table References:

U.S. Environmental Protection Agency (USEPA). 2013a. ProUCLVersion 5.0.00. September 2013. http://www.epa.gov/osp/hstl/tsc/software.htm.

USEPA. 2013b. ProUCL Version 5.0.00 Technical Guide. Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations. Office of Research and Development. EPA/600/R-07/041. http://www.epa.gov/osp/hstl/tsc/software.htm.

TABLE 10-12

SUMMARY OF DESCRIPTIVE AND DISTRIBUTIONAL STATISTICS FOR INORGANIC ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN IN SURFACE WATER: TOTAL RECOVERABLE FRACTION
SWMU 9 – AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Ecological COPC	Population (1)	Descriptive Statistics (2)							Test for Normality (6)	Test for Homogeneity of Variance (7)	Distributional Statistics		
		Frequency of Detection	Range of Detections	Range of Non-Detections	Mean (3)	SE	95% UCL (4)	BTV (5)			Mean/Median of the Distribution (8)	Right Tail of the Distribution	
												Quantile Test (9)	Slippage Test
Arsenic	Tank 214 Area	7/15	3.7J - 110	10U - 10U	22.93	6.88	52.93	--	Test not performed (10)	Test not performed (11)	Test not performed (12)	Test not performed (16)	Test not performed (17)
	NAPR Background	15/19	1.8J - 6.1J	10U - 10U	4.71	0.69	7.696	6.69	Test not performed (10)				
Cadmium	Tank 214 Area	7/15	0.7J - 38	2.5U - 5U	6.12	2.35	16.38	--	Test not performed (10)	Test not performed (11)	Test not performed (12)	Test not performed (16)	Test not performed (18)
	NAPR Background	0/20	ND	0.5U - 5U	3.65	0.32	NE	NE	Test not performed (10)				
Chromium	Tank 214 Area	12/15	4.3J - 540	2.7U - 10U	55.56	36.68	215.4	--	Test not performed (10)	Test not performed (11)	Gehan Test (13) Elevated at α = 0.05 G(3.875) > z(1.645)	Test not performed (16)	Test not performed (17)
	NAPR Background	18/19	1.4J - 5J	10U - 10U	3.30	0.44	4.059	5.64	Test not performed (10)				
Cobalt	Tank 214 Area	11/15	0.96J - 220	10U - 10U	26.64	15.49	94.15	--	Test not performed (10)	Test not performed (11)	Gehan Test (14) Not elevated at α = 0.05 G(1.389) < z(1.645)	Test not performed (16)	Test not performed (17)
	NAPR Background	17/20	1.5J - 7.1J	10U - 10U	3.96	0.67	6.886	6.44	Test not performed (10)				
Copper	Tank 214 Area	13/15	8.1J - 3,100	25.6U - 41.4U	339.07	219.95	2,528	--	Test not performed (10)	Test not performed (11)	Gehan Test (13) Elevated at α = 0.05 G(4.107) < z(1.645)	Elevated at α = 0.05	Test not performed (17)
	NAPR Background	19/20	2.7J - 19	42.3U - 42.3U	10.26	1.98	14.1	21.6	Test not performed (10)				
Lead	Tank 214 Area	11/15	1.7J - 1,100	4.5UJ - 5U	83.79	72.79	808.1	--	Test not performed (10)	Test not performed (11)	Gehan Test (13) Elevated at α = 0.05 G(3.517) > z(1.645)	Test not performed (16)	Test not performed (17)
	NAPR Background	10/20	0.74J - 2.5J	4.5UJ - 5U	3.18	0.42	4.997	2.76	Test not performed (10)				
Nickel	Tank 214 Area	7/15	4.4J - 200	2.7U - 40U	39.44	12.73	94.93	--	Test not performed (10)	Test not performed (11)	Test not performed (12)	Test not performed (16)	Test not performed (17)
	NAPR Background	9/20	1.2J - 2.6J	1.4U - 40U	20.87	4.39	40.0	2.82	Test not performed (10)				
Vanadium	Tank 214 Area	14/15	23J - 4,700	50U - 50U	481.39	320.50	3,670	--	Test not performed (10)	Test not performed (11)	Gehan Test (14) Elevated at α = 0.05 G(4.563) > z(1.645)	Elevated at α = 0.05	Test not performed (17)
	NAPR Background	13/19	13 - 25	50U - 50U	28.42	3.56	43.94	32.7	Test not performed (10)				
Zinc	Tank 214 Area	14/15	6.3J - 1,300	20U - 20U	135.41	88.67	521.90	--	Test not performed (10)	Test not performed (11)	Wilcoxon-Mann-Whitney Test (15) Not elevated at α = 0.05 (p =0.088)	Elevated at α = 0.05	Elevated at α = 0.05
	NAPR Background	15/20	6J - 30	20U - 20U	17.18	1.54	23.9	30.6	Test not performed (10)				

Notes:

95% UCL = 95 percent Upper Confidence Limit of the Mean
BTV = Background Threshold Value
COPC = Ecological Chemical of Potetnial Concern

J = Estimated value
ND = Not detected
NE = Not established (insufficient number of detected concentrations)

SE = Standard Error
U = Not detected
UJ = Not detected, estimated value

TABLE 10-12

SUMMARY OF DESCRIPTIVE AND DISTRIBUTIONAL STATISTICS FOR INORGANIC ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN IN SURFACE WATER: TOTAL RECOVERABLE FRACTION
SWMU 9 – AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Notes (continued):

(1) Background estuarine wetland surface water data taken from Revised Final II Summary Report for Environmental Background Concentrations of Inorganic Compounds, Naval Activity Puerto Rico, Ceiba, Puerto Rico. (Baker, 2010). Duplicate samples were combined prior to all statistical evaluations.

(2) Units in microgram per liter (µg/L).

(3) Arithmetic mean calculated using non-detected data without manipulation.

(4) 95% Upper Conficence Limit of the mean concentrations were calculated using USEPA ProUCL Version 5.0.00 software (USEPA, 2013a). 95 percent upper confidence limit of the mean cocnentrations were derived for those data sets that have a minimum of eight data points and four detected values (USEPA, 2013b).

(5) Background threshold values for estuarine wetland surface water taken from Background Threshold Value Evaluation and Recommendations for Naval Activity Puerto Rico (CH2M Hill, 2013).

(6) Normality verified by the Shapiro-Wilk test (NFESC, 2002, 2003, and 2004 and USEPA, 2013b).

(7) Homogeneity of variance verified by F test (NFESC, 2002, 2003, and 2004 and USEPA, 2013b).

(8) Parametric tests were used if: (a) the site and background dataset do not contain non-detected values; and (b) both data sets are normally distributed. Non-parametric tests were used if: (a) the site and/or background data sets contain non-detected resuts; or (b) if both data sets are not normally distributed (USEPA, 2013b). Parametric and non-parametirc tests evaluating the mean/median of the data set distributions were conducted using USEPA ProUCL Version 5.0.00 software (USEPA, 2013a).

(9) Quantile test was conducted using USEPA ProUCL Version 4.1.01 software (USEPA, 2011).

(10) Test for normality was not performed because the data set contains non-detected results (USEPA, 2013b).

(11) Test for homogeneity of variance was not performed due to the presence of non-detected results within the site and/or background dataset (USEPA, 2013b).

(12) A statistical test evaluating the mean or median of the data set distributions was not performed because there is greater than 50 percent non-detected results within the SWMU and/or background data set (NFEC, 1998).

(13) Gehan test was used because the SWMU and/or background data sets contain different non-detected values (USEPA, 2013b).

(14) Although all detected values within the SWMU and background data sets are identical and the number of non-detected values in each data set are less than 40 percent, the Wilcoxon-Mann-Whitney test could not be used becasue the the non-detected value exceeds all detected values within the background data set. Under this scenario, ProUCL Version 5.0.00 will not perform the Wilcoxon-Mann-Whitney test becasue all detected values within the background data set are treated as non-detected values (USEPA, 2013c). As such, the Gehan test was used to statistically compare the SWMU and background data sets.

(15) The Wilcoxon-Mann-Whitney test was used because the SWMU and background data sets contain less than 40 percent non-detected results and all non-detected values are identical (USEPA, 2013b).

(16) The quantile test was not performed because non-detected results within the SWMU and/or background data set are greater than the smallest of the "r" largest detected results in the combined data set (USEPA, 2010).

(17) The slippage test was not performed because the largest detected result for the background data set is less than the largest non-detected result (NFESC, 2002, 2003, and 2004).

(18) The slippage test was not performed because there are no detected results in the backgorund data set (NFESC, 2003).

Table References:

Baker Environmental, Inc. (Baker). 2010. Revised Final II Summary Report for Environmental Background Concentrations of Inorganic Compounds, Naval Activity Puerto Rico, Ceiba, Puerto Rico. July 30, 2010.

CH2M Hill. 2013. Background Threshold Value Evaluation and Recommendations for Naval Activity Puerto Rico. December 6, 2013.

Naval Facilities Engineering Service Center (NFESC). 2004. Guidance for Environmental Background Analysis. Volume III: Groundwater. NFESC User's Guide UG-2059-ENV. April 2004.

NFESC. 2003. Guidance for Environmental Background Analysis. Volume II: Sediment. NFESC User's Guide UG-2054-ENV. April 2003.

NFESC. 2002. Guidance for Environmental Background Analysis. Volume I: Soil. NFESC User's Guide UG-209-ENV. April 2002.

U.S Environmental Protection Agency (USEPA). 2013a. ProUCLVersion 5.0.00. September 2013. http://www.epa.gov/osp/hstl/tsc/software.htm.

USEPA. 2013b. ProUCL Version 5.0.00 Technical Guide. Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations. Office of Research and Development. EPA/600/R-07/041. http://www.epa.gov/osp/hstl/tsc/software.htm.

USEPA. 2013b. ProUCL Version 5.0.00 User Guide. Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations. Office of Research and Development. EPA/600/R-07/041. http://www.epa.gov/osp/hstl/tsc/software.htm.

USEPA. 2011. ProUCLVersion 4.1.01. August 2011. http://www.epa.gov/osp/hstl/tsc/software.htm.

USEPA. 2010. ProUCL Version 4.1.00 Technical Guide (Draft). Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations. Office of Research and Development. EPA/600/R-07/041. http://www.epa.gov/osp/hstl/tsc/software.htm.

TABLE 10-13

SUMMARY OF DESCRIPTIVE STATISTICS FOR INORGANIC ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN IN SURFACE WATER: DISSOLVED FRACTION
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Ecological COPC	Tank 214 Area Frequency/Range [1]				Background Frequency/Range [1][2]				
	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean [3]	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean [3]	Background Threshold Value [4]
Dissolved:									
Arsenic	3/11	3.2J - 4.3J	10U - 10U	8.25	10/19	1.7J - 3.8J	10U - 10U	5.94	3.75
Cadmium	0/11	ND	5U - 5U	5.00	0/19	ND	2.5U - 5U	3.82	NE
Chromium	3/11	1.9J - 4.3J	10U - 10U	8.01	3/19	0.95J - 2.2J	5U - 10U	6.60	3.21
Cobalt	1/11	7.1J	10U - 10U	9.74	12/18	1.5J - 3J	10U - 10U	4.60	2.86
Copper	10/11	1.4J - 3.6J	20U	3.95	15/18	1.1J - 2.9J	20U	5.06	11
Lead	0/11	ND	5U - 5U	5.00	5/19	0.11J - 0.2J	1.5U - 1.5U	2.98	0.215
Nickel	0/11	ND	40U - 40U	40.00	9/19	0.53J - 0.91J	40U - 40U	21.38	1.01
Vanadium	0/11	ND	50U - 50U	50.00	9/19	5.4 - 15	20U - 20U	30.76	15.9
Zinc	2/11	10J - 17J	20U - 20U	18.82	14/19	7.6J - 21	20U - 20U	18.01	27.5

Notes:

COPC = Chemical of Potential Concern
J = Estimated value
ND = Not Detected
NE = Not established (insufficient number of detected concentrations)
U = Not detected

[1] Units in microgram per liter (µg/L).

[2] Basewide background estuarine wetland surface water data taken from Revised Final II Summary Report for Environmental Background Concentrations of Inorganic Compounds, Naval Activity Puerto Rico, Ceiba, Puerto Rico (Baker, 2010). Prior to compilation of frequency and range data and calculation of arithmetic mean values, duplicate samples were combined with original samples in accordance with the procedures presented in Section 6.1 for Tank 214 Area data.

[3] Arithmetic mean calculated using non-detected data without manipulation.

[4] Background threshold values for estuarine wetland surface water taken from Background Threshold Value Evaluation and Recommendations for Naval Activity Puerto Rico (CH2M Hill, 2013).

Table References:

Baker Environmental, Inc. (Baker). 2010. Revised Final II Summary Report for Environmental Background Concentrations of Inorganic Compounds, Naval Activity Puerto Rico, Ceiba, Puerto Rico. July 30, 2010.

CH2M Hill. 2013. Background Threshold Value Evaluation and Recommendations for Naval Activity Puerto Rico. December 6, 2013.

TABLE 10-14

FREQUENCY AND RANGE OF SEDIMENT DATA (95 PERCENT UCL OF THE MEAN CONCENTRATIONS) COMPARED TO SEDIMENT SCREENING VALUES: STEP 3A RISK CALCULATION
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Analyte [1]	Contaminant Frequency/Range					Sediment Screening Value (SDSV)	Reference [4]	95% UCL of the Mean HQ [5]	Comments
	Frequency of Detection	Range of Positive Detections	Range of Non-Detects	95% UCL of the Mean [2]	Value used in Step 3a Screen [3]				
Volatiles (µg/kg)									
Acetone	45/54	10J - 1900J	5.4UJ - 280UJ	435.5	435.5	80.4	USEPA 1993 and 1996	5.42	HQ > 1.0
Carbon Disulfide	30/57	2.4J - 480J	1.5UJ - 90UJ	51.17	51.17	11.1	USEPA 1993 and 1996	4.61	HQ > 1.0
PAHs (µg/kg)									
Benzo(a)anthracene	6/87	9.4J - 110J	2.5UJ - 3,600U	10.53	10.53	74.8	MacDonald 1994	0.14	HQ < 1.0
Benzo(a)pyrene (BaP)	14/87	4.1J - 1,300J	2.1UJ - 3,600U	94.86	94.86	88.8	MacDonald 1994	1.07	HQ > 1.0
Benzo(g,h,i)perylene	7/87	10J - 1,300J	2.5UJ - 3,600U	99.81	99.81	670.0	Buchman 2008	0.15	HQ < 1.0
Chrysene	26/87	6.5J - 1,100J	2.3UJ - 3,600U	138.8	138.8	108.0	MacDonald 1994	1.29	HQ > 1.0
Indeno(1,2,3-cd)pyrene	5/87	17J - 1,100J	4UJ - 3,600U	86.59	86.59	600.0	Buchman 2008	0.14	HQ < 1.0
Phenanthrene	6/87	3.9J - 360J	3.2UJ - 3,600U	18.59	18.59	86.7	MacDonald 1994	0.21	HQ < 1.0
Pyrene	30/87	7.1J - 1,400J	3UJ - 3,600U	144.8	144.8	153.0	MacDonald 1994	0.95	HQ < 1.0
Metals (mg/kg)									
Barium	67/68	12 - 54	14UJ - 14UJ	26.26	26.26	48.0	Buchman 2008	0.55	1.13
Cadmium	9/68	0.068J - 0.95J	0.059UJ - 1.5U	0.115	0.115	0.7	MacDonald 1994	0.17	1.41
Chromium	68/68	10 - 58J	NA	25.31	25.31	52.3	MacDonald 1994	0.48	1.11
Cobalt	68/68	4.4J - 16J	NA	8.345	8.345	10.0	Buchman 2008	0.83	1.60
Copper	68/68	52J - 140J	NA	89.79	89.79	18.7	MacDonald 1994	4.80	7.49
Lead	150/150	3.2 - 430J	NA	81.6	81.6	30.2	MacDonald 1994	2.70	14.24
Selenium	29/68	0.48J - 1.5J	0.6UJ - 2.9U	0.863	0.863	1.0	Buchman 2008	0.86	1.50
Tin	5/68	3.6J - 9.2J	6.4U - 18UJ	4.606	4.606	3.4	Buchman 2008	1.35	2.71
Vanadium	74/74	80J - 270J	NA	160.40	160.40	57.0	Buchman 2008	2.81	4.74

Notes:

HQ = Hazard Quotient
J = Estimated value
µg/kg - microgram per kilogram
mg/kg - milligram per kilogram
NA = Not Applicable
PAH = Polynuclear Aromatic Hydrocarbon
SDSV = Sediment Screening Value
U = Not detected
UCL = Upper Confiedence Limit
UJ = Not detected, estimated value
USEPA = U.S. Environmental Protection Agency

(1) The analytes shown are those that were detected in sediment (minimum of eight data points with at least four detected values) and identified as ecological chemicals of potential concern in Step 2 of the screening level risk calculation because maximum detected concentrations exceed sediment screening values.

(2) 95% Upper Conficence Limit of the mean concentrations were calculated using USEPA ProUCL Version 5.0.00 software (USEPA, 2013a and 2013b; see Appendix E)

(3) Risk estimates were re-calculated in Step 3a using 95% UCL of the mean concentrations.

(4) See Table 3-3 for reference citations.

(5) The 95% UCL of the mean HQ is the 95% UCL of the mean concentration divided by the sediment screening value.

Table References:

U.S. Environmental Protection Agency (USEPA). 2013a. ProUCLVersion 5.0.00. September 2013. http://www.epa.gov/osp/hstl/tsc/software.htm.

USEPA. 2013b. ProUCL Version 5.0.00 Technical Guide. Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations. Office of Research and Development. EPA/600/R-07/041. http://www.epa.gov/osp/hstl/tsc/software.htm.

TABLE 10-15

SUMMARY OF DESCRIPTIVE AND DISTRIBUTIONAL STATISTICS FOR INORGANIC ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN IN SEDIMENT
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Ecological COPC	Population (1)	Descriptive Statistics (2)							Test for Normality (6)	Test for Homogeneity of Variance (7)	Distributional Statistics		
		Frequency of Detection	Range of Detections	Range of Non-Detections	Mean (3)	SE	95% UCL (4)	BTV (5)			Mean/Median of the Distribution (8)	Right Tail of the Distribution	
												Quantile Test (9)	Slippage Test
Barium	Tank 214 Area	67/68	12 - 54	14UJ - 14UJ	21.40	1.12	26.26	--	Test not performed (10)	Test not performed (11)	Wilcoxon-Mann-Whitney Test (13) Elevated at α = 0.05 (P = <0.01)	Not elevated at α = 0.05	Test not performed (19)
	NAPR Background	21/21	4.6 - 30	NA	13.59	1.32	15.94	28	Not normal at α = 0.05				
Beryllium	Tank 214 Area	51/68	0.12J - 0.37J	0.15UJ - 1.2U	0.25	0.02	0.24	--	Test not performed (10)	Test not performed (11)	Gehan Test (14) Elevated at α = 0.05 G(1.851) > z(1.645)	Test not performed (18)	Test not performed (20)
	NAPR Background	20/22	0.047J - 0.31	1.3U - 1.5U	0.28	0.08	0.20	0.439	Test not performed (10)				
Cadmium	Tank 214 Area	9/68	0.068J - 0.95J	0.059U - 1.5U	0.31	0.05	0.12	---	Test not performed (10)	Test not performed (11)	Test not performed (15)	Test not performed (18)	Test not performed (20)
	NAPR Background	7/22	0.1J - 0.95J	0.12U - 2.4U	1.07	0.15	0.54	0.966	Test not performed (10)				
Chromium	Tank 214 Area	68/68	10 - 58J	NA	23.85	0.88	25.31	--	Not normal at α = 0.05	Test not performed (12)	Wilcoxon-Mann-Whitney Test (16) Not elevated at α = 0.05 (p = 0.556)	Not elevated at α = 0.05	Test not performed (19)
	NAPR Background	22/22	11J - 54	NA	26.10	2.67	30.70	62.9	Normal at α = 0.05				
Cobalt	Tank 214 Area	68/68	4.4J - 16J	NA	7.90	0.27	8.35	--	Not normal at α = 0.05	Test not performed (12)	Wilcoxon-Mann-Whitney Test (16) Elevated at α = 0.05 (p = 0.0365)	Not elevated at α = 0.05	Test not performed (19)
	NAPR Background	21/21	2.2J - 27	NA	8.44	1.51	11.50	27.6	Not normal at α = 0.05				
Copper	Tank 214 Area	68/68	52J - 140J	NA	85.85	2.35	89.79	--	Not normal at α = 0.05	Test not performed (12)	Wilcoxon_Mann-Whitney Test (16) Elevated at α = 0.05 (p = <0.01)	Not elevated at α = 0.05	Test not performed (19)
	NAPR Background	22/22	11 - 140	NA	61.75	7.57	74.77	136	Normal at α = 0.05				
Lead	Tank 214 Area	150/150	3.2 - 430J	NA	55.49	5.99	81.60	--	Not normal at α = 0.05	Test not performed (12)	Wilcoxon_Mann_Whitney Test (16) Elevated at α = 0.05 (p = <0.01)	Elevated at α = 0.05	Test not performed (19)
	NAPR Background	21/21	1.2 - 38	NA	8.73	1.97	13.00	35.6	Not normal at α = 0.05				
Mercury	Tank 214 Area	67/67	0.039J - 0.12J	NA	0.07	0.01	0.08	---	Normal at α = 0.05	Variances are not equal at α = 0.05	Welch-Satterthwaite Test (17) Not elevated at α = 0.05 (p = 0.527)	Not elevated at α = 0.05	Test not performed (19)
	NAPR Background	22/22	0.015J - 0.21	NA	0.08	0.01	0.09	0.194	Normal at α = 0.05				
Selenium	Tank 214 Area	29/68	0.48J - 1.5J	0.6UJ - 2.9U	1.24	0.07	0.86	--	Test not performed (10)	Test not performed (11)	Gehan Test (14) Not Elevated at α = 0.05 G(1.29) < z(1.645)	Test not performed (18)	Test not performed (20)
	NAPR Background	19/21	0.21J - 2J	0.75U - 2.1U	0.74	0.10	0.85	1.92	Test not performed (10)				
Thallium	Tank 214 Area	4/68	0.23J - 6.3J	0.24UJ - 3UJ	1.04	0.14	0.50	--	Test not performed (10)	Test not performed (11)	Test not performed (15)	Test not performed (18)	Test not performed (21)
	NAPR Background	0/22	ND	0.14U - 3.8UJ	0.83	0.17	NE	NE	Test not performed (10)				

TABLE 10-15

SUMMARY OF DESCRIPTIVE AND DISTRIBUTIONAL STATISTICS FOR INORGANIC ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN IN SEDIMENT
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Ecological COPC	Population (1)	Descriptive Statistics (2)							Test for Normality (6)	Test for Homogeneity of Variance (7)	Distributional Statistics		
		Frequency of Detection	Range of Detections	Range of Non-Detections	Mean (3)	SE	95% UCL (4)	BTV (5)			Mean/Median of the Distribution (8)	Right Tail of the Distribution	
												Quantile Test (9)	Slippage Test
Tin	Tank 214 Area	5/68	3.6J - 9.2J	6.4U - 18UJ	9.97	0.34	4.61	--	Test not performed (10)	Test not performed (11)	Test not performed (15)	Test not performed (18)	Test not performed (20)
	NAPR Background	16/22	2.3J - 10J	0.59U - 19U	6.91	0.99	6.16	11.8	Test not performed (10)				
Vanadium	Tank 214 Area	74/74	80J - 270J	NA	152.88	4.46	160.40	--	Not normal at α = 0.05	Test not performed (12)	Wilcoxon-Mann-Whitney Test (16) Elevated at α = 0.05 (p = <0.01)	Not elevated at α = 0.05	Test not performed (19)
	NAPR Background	22/22	23 - 230	NA	110.77	13.24	133.60	240	Normal at α = 0.05				
Zinc	SWMU 9	68/68	35 - 76J	NA	52.37	1.14	54.26	--	Normal at α = 0.05	Test not performed (11)	Wilcoxon-Mann-Whitney Test (13) Not elevated at α = 0.05 (p = 0.0621)	Not elevated at α = 0.05	Test not performed (19)
	NAPR Background	21/22	13 - 92.8	NA	44.54	5.80	54.17	131	Test not performed (10)				

Notes:

95% UCL = 95 percent Upper Confidence Limit of the Mean
BTV = Background Threshold Value
COPC = Ecological Chemical of Potetnial Concern
J = Estimated value
NA = Not applicable
NE = Not established (insufficient number of detected concentrations)
ND = Not detected
SE = Standard Error
U = Not detected
UJ = Not detected, estimated value

(1) Basewide background estuarine wetland sediment data taken from Revised Final II Summary Report for Environmental Background Concentrations of Inorganic Compounds, Naval Activity Puerto Rico, Ceiba, Puerto Rico. (Baker, 2010). Duplicate samples were combined prior to all statistical evaluations.
(2) Units in milligram per kilogram (mg/kg).
(3) Arithmetic mean calculated using non-detected data without manipulation.
(4) 95% Upper Conficence Limit of the mean concentrations were calculated using USEPA ProUCL Version 5.0.00 software (USEPA, 2013a). 95 percent upper confidence limit of the mean cocnentrations were derived for those data sets that have a minimum of eight data points and four detected values (USEPA, 2013b).
(5) Background threshold values for estuarine wetland sediment taken from Background Threshold Value Evaluation and Recommendations for Naval Activity Puerto Rico (CH2M Hill, 2013).
(6) Normality verified by the Shapiro-Wilk test (NFESC, 2002 and USEPA, 2013b).
(7) Homogeneity of variance verified by F test (NFESC, 2002 and USEPA, 2013b).
(8) Parametric tests were used if: (a) the site and background dataset do not contain non-detected values; and (b) both data sets are normally distributed. Non-parametric tests were used if: (a) the site and/or background data sets contain non-detected resuts; or (b) if both data sets are not normally distributed (USEPA, 2013b). Parametric and non-parametirc tests evaluating the mean/median of the data set distributions were conducted using USEPA ProUCL Version 5.0.00 software (USEPA, 2013a).
(9) Quantile test was conducted using USEPA ProUCL Version 4.1.01 software (USEPA, 2011).
(10) Test for normality was not performed because the data set contains non-detected results (USEPA, 2013b).
(11) Test for homogeneity of variance was not performed due to the presence of non-detected results within the site and/or background dataset (USEPA, 2013b).
(12) Test for homogeneity of variance was not performed because the site and/or background data set is not normallly distributed (USEPA, 2013b).
(13) The Wilcoxon-Mann-Whitney test was used because the SWMU and background data sets contain less than 40 percent non-detected results and all non-detected values are identical (USEPA, 2013b).
(14) Gehan test was used because the SWMU and/or background data sets contain different non-detected values (USEPA, 2013b).
(15) A statistical test evaluating the mean or median of the data set distributions was not performed because there is greater than 50 percent non-detected results within the SWMU and/or background data set (NFEC, 1998).
(16) The Wilcoxon-Mann-Whitney test was used because the SWMU and/or background data set does not follow a normal distribution (USEPA, 2013b).
(17) Welch-Satterthwaite test was used because the SWMU and background data set distributions do not have equal variances (USEPA, 2013b).
(18) The quantile test was not performed because non-detected results within the SWMU and/or background data set are greater than the smallest of the "r" largest detected results in the combined data set (USEPA, 2010).
(19) The slippage test was not performed because the size of the SWMU data set is greater than 50 (critical value table does not provide values beyond n = 50).
(20) The slippage test was not performed because the largest detected value for the background data set is less than the largest non-detected value (NFESC, 2003). The size of the SWMU data set is also greater than 50 (critical value table does not provide values beyond n = 50).
(21) The slippage test was not performed because there are no detected results in the backgorund data set (NFESC, 2003). The size of the SWMU data set is also greater than 50 (critical value table does not provide values beyond n = 50).

Table References:

TABLE 10-15

SUMMARY OF DESCRIPTIVE AND DISTRIBUTIONAL STATISTICS FOR INORGANIC ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN IN SEDIMENT
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

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TABLE 10-16

ACID VOLATILE SULFIDE AND SIMULTANEOUSLY EXTRACTED METALS DATA FOR SEDIMENT
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SW/SD13	9SW/SD14	9SW/SD15	9SW/SD16	9SW/SD17	9SW/SD18	9SW/SD19	9SW/SD20
Sample ID	9SD13	9SD14	9SD15	9SD16	9SD17	9SD18	9SD19	9SD20
Sample Date	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
AVS (µmole/g)	37.43	1.15	1.43	0.44 J	0.69 U	19.34	2.03	13.10
SEM (µmole/g)								
Cadmium	0.0002 J	0.0012 U	0.0013 U	0.0013 U	0.0001 J	0.0003 J	0.0003 J	0.0002 J
Copper	0.1448 J	0.0551 J	0.0315 J	0.0393 J	0.1888 J	0.0740 J	0.2203 J	0.0488 J
Lead	0.0087	0.0058	0.0097	0.0043	0.0169	0.0676	0.8687	0.1110
Nickel	0.0077 J	0.0073 J	0.0065 J	0.0027 J	0.0083 J	0.0063 J	0.0070 J	0.0043 J
Silver								
Zinc	0.1101 J	0.0658 J	0.0826 J	0.0413 J	0.0612 J	0.0734 J	0.1071 J	0.1040 J
Total SEM (µmole/g) [(1)(2)]	0.27	0.14	0.13	0.09	0.28	0.22	1.20	0.27
SEM-to-AVS Ratio [(3)]	0.007	0.117	0.092	0.204	0.401	0.011	0.594	0.020

TABLE 10-16

ACID VOLATILE SULFIDE AND SIMULTANEOUSLY EXTRACTED METALS DATA FOR SEDIMENT
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SW/SD21	9SW/SD22	9SW/SD23	9SD35	9SD36	9SD37	9SD38	9SD39
Sample ID	9SD21	9SD22	9SD23	9SD35	9SD36	9SD37	9SD38	9SD39
Sample Date	12/17/2000	12/17/2000	12/17/2000	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
AVS (µmole/g)	1.37	9.98	0.34 J	14.35 J	1.43 J	15.91 J	16.53 J	17.47 J
SEM (µmole/g)								
Cadmium	0.0002 J	0.0002 J	0.0002 J	0.0014 UJ	0.0013 UJ	0.0016 UJ	0.0015 UJ	0.0015 UJ
Copper	0.0393 J	0.1731 J	0.2203 J	0.0102 R	0.0028 J	0.0113 R	0.0109 R	0.0104 R
Lead	0.0579	0.0217	0.0261	0.0270 J	0.0401 J	0.0314 J	0.0280 J	0.0531 J
Nickel	0.0034 J	0.0055 J	0.0153 J	0.0044 J	0.0041 J	0.0024 J	0.0024 J	0.0034 J
Silver								
Zinc	0.0703 J	0.0856 J	0.0856 J	0.0872 J	0.0856 J	0.0719 J	0.0811 J	0.1239 J
Total SEM (µmole/g) [(1)(2)]	0.17	0.29	0.35	0.12	0.13	0.11	0.11	0.18
SEM-to-AVS Ratio [(3)]	0.125	0.029	1.013	0.008	0.093	0.007	0.007	0.010

TABLE 10-16

ACID VOLATILE SULFIDE AND SIMULTANEOUSLY EXTRACTED METALS DATA FOR SEDIMENT
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SD40	9SD41	9SD42	9SD43	9SD44	9SD45	9SD46	9SD47
Sample ID	9SD40	9SD41	9SD42	9SD43	9SD44	9SD45	9SD46	9SD47
Sample Date	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
AVS (µmole/g)	10.61 J	0.17 UJ	0.22 J	49.91 J	1.22 J	13.10 J	40.55 J	21.21 J
SEM (µmole/g)								
Cadmium	0.0016 UJ	0.0013 UJ	0.0016 UJ	0.0017 UJ	0.0014 UJ	0.0017 UJ	0.0017 UJ	0.0019 UJ
Copper	0.0112 R	0.0055 J	0.0112 R	0.0120 R	0.0551 J	0.0118 R	0.0120 R	0.0127 R
Lead	0.0820 J	0.0724 J	0.0627 J	0.0820 J	0.4199 J	0.0410 J	0.0676 J	0.0579 J
Nickel	0.0048 J	0.0037 J	0.0043 J	0.0049 J	0.0029 J	0.0037 J	0.0039 J	0.0029 J
Silver								
Zinc	0.1529 J	0.1178 J	0.1116 J	0.1330 J	0.0719 J	0.1514 J	0.0811 J	0.1162 J
Total SEM (µmole/g) [(1)(2)]	0.24	0.20	0.18	0.22	0.55	0.20	0.15	0.18
SEM-to-AVS Ratio [(3)]	0.023	1.214	0.825	0.004	0.453	0.015	0.004	0.008

TABLE 10-16

ACID VOLATILE SULFIDE AND SIMULTANEOUSLY EXTRACTED METALS DATA FOR SEDIMENT
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SD48	9SD49	9SD50	9SD51	9SD52	9SD53	9SD54	9SD55
Sample ID	9SD48	9SD49	9SD50	9SD51	9SD52	9SD53	9SD54	9SD55
Sample Date	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/7/2005
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
AVS (µmole/g)	34.31 J	0.44 J	12.79 J	34.31 J	59.26 J	43.67 J	14.66 J	43.67 J
SEM (µmole/g)								
Cadmium	0.0016 UJ	0.0011 UJ	0.0025 J	0.0016 UJ	0.0017 UJ	0.0018 UJ	0.0016 UJ	0.0018 UJ
Copper	0.0113 R	0.0472 J	0.0039 J	0.0110 R	0.0120 R	0.0129 R	0.0011 J	0.0126 R
Lead	0.1303 J	0.5792 J	0.3668 J	0.1014 J	0.1303 J	0.1641 J	0.0531 J	0.0367 J
Nickel	0.0044 J	0.0060 J	0.0077 J	0.0055 J	0.0046 J	0.0034 J	0.0024 J	0.0026 J
Silver								
Zinc	0.1346 J	0.1040 J	0.2600 J	0.1315 J	0.1438 J	0.1132 J	0.0749 J	0.0505 J
Total SEM (µmole/g) [(1)(2)]	0.27	0.74	0.64	0.24	0.28	0.28	0.13	0.09
SEM-to-AVS Ratio [(3)]	0.008	1.689	0.050	0.007	0.005	0.006	0.009	0.002

TABLE 10-16

ACID VOLATILE SULFIDE AND SIMULTANEOUSLY EXTRACTED METALS DATA FOR SEDIMENT
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SD56	9SD57	9SD58	9SD59	9SD60	9SD61	9SD62	9SD63
Sample ID	9SD56	9SD57	9SD58	9SD59	9SD60	9SD61	9SD62	9SD63
Sample Date	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
AVS (µmole/g)	30.57 J	43.67 J	15.60 J	40.55 J	65.50 J	19.96 J	46.79 J	106.05 J
SEM (µmole/g)								
Cadmium	0.0015 UJ	0.0017 UJ	0.0018 UJ	0.0019 UJ	0.0016 J	0.0018 UJ	0.0016 UJ	0.0024 UJ
Copper	0.0105 R	0.0121 R	0.0126 R	0.0131 R	0.0205 R	0.0129 R	0.0110 R	0.0173 R
Lead	0.1737 J	0.1062 J	0.0627 J	0.0280 J	0.2365 J	0.0299 J	0.1014 J	0.0483 J
Nickel	0.0027 J	0.0032 J	0.0031 J	0.0046 J	0.0070 J	0.0273 UJ	0.0044 J	0.0066 J
Silver								
Zinc	0.0688 J	0.1025 J	0.0765 J	0.0948 J	0.2141 J	0.0566 J	0.1040 J	0.1407 J
Total SEM (µmole/g) [(1)(2)]	0.25	0.21	0.14	0.13	0.46	0.12	0.21	0.20
SEM-to-AVS Ratio [(3)]	0.008	0.005	0.009	0.003	0.007	0.006	0.005	0.002

TABLE 10-16

ACID VOLATILE SULFIDE AND SIMULTANEOUSLY EXTRACTED METALS DATA FOR SEDIMENT
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SD64	9SD65	9SD66	9SD67	9SD68	9SD69	9SD70	9SD71
Sample ID	9SD64	9SD65	9SD66	9SD67	9SD68	9SD69	9SD70	9SD71
Sample Date	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
AVS (µmole/g)	14.97 J	77.98 J	37.43 J	34.31 J	59.26 J	8.42 J	11.54 J	6.86 J
SEM (µmole/g)								
Cadmium	0.0010 J	0.0021 UJ	0.0021 UJ	0.0022 UJ	0.0021 UJ	0.0015 UJ	0.0022 UJ	0.0016 UJ
Copper	0.0016 J	0.0151 R	0.0151 R	0.0014 J	0.0151 R	0.0105 R	0.0156 R	0.0112 R
Lead	0.0430 J	0.0304 J	0.0304 J	0.0280 J	0.0159 J	0.0101 J	0.0111 J	0.0188 J
Nickel	0.0053 J	0.0032 J	0.0026 J	0.0048 J	0.0026 J	0.0016 J	0.0341 UJ	0.0027 J
Silver								
Zinc	0.1178 J	0.1101 J	0.0551 J	0.0887 J	0.0612 J	0.0352 J	0.0765 J	0.0443 J
Total SEM (µmole/g) [(1)(2)]	0.17	0.15	0.09	0.13	0.08	0.05	0.12	0.07
SEM-to-AVS Ratio [(3)]	0.011	0.002	0.002	0.004	0.001	0.006	0.011	0.010

TABLE 10-16

ACID VOLATILE SULFIDE AND SIMULTANEOUSLY EXTRACTED METALS DATA FOR SEDIMENT
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SD72	9SD73	9SD74	9SD75	9SD76	9SD77	9SD78	9SD79
Sample ID	9SD72	9SD73	9SD74	9SD75	9SD76	9SD77	9SD78	9SD79
Sample Date	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
AVS (µmole/g)	8.11 J	17.78 J	8.42 J	27.45 J	1.65 J	62.38 J	37.43 J	77.98 J
SEM (µmole/g)								
Cadmium	0.0019 UJ	0.0017 UJ	0.0016 UJ	0.0018 UJ	0.0017 UJ	0.0016 UJ	0.0016 UJ	0.0021 UJ
Copper	0.0033 J	0.0030 J	0.0028 J	0.0030 J	0.0030 J	0.0025 J	0.0024 J	0.0035 J
Lead	0.0077 J	0.0140 J	0.0087 J	0.0082 J	0.0077 J	0.0111 J	0.0140 J	0.0217 J
Nickel	0.0024 J	0.0036 J	0.0026 J	0.0029 J	0.0026 J	0.0039 J	0.0044 J	0.0055 J
Silver								
Zinc	0.0413 J	0.0627 J	0.0367 J	0.0581 J	0.0398 J	0.0780 J	0.0749 J	0.0979 J
Total SEM (µmole/g) [(1)(2)]	0.06	0.08	0.05	0.07	0.05	0.10	0.10	0.13
SEM-to-AVS Ratio [(3)]	0.007	0.005	0.006	0.003	0.033	0.002	0.003	0.002

TABLE 10-16

ACID VOLATILE SULFIDE AND SIMULTANEOUSLY EXTRACTED METALS DATA FOR SEDIMENT
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SD19B	9SD30B	9SD36B	9SD41B	9SD43B	9SD44B	9SD46B	9SD47B
Sample ID	9SD19B	9SD30B	9SD36B	9SD41B	9SD43B	9SD44B	9SD46B	9SD47B
Sample Date	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
AVS (µmole/g)	16.84 J	21.52 J	23.71 J	7.49 J	43.67 J	20.59 J	6.86 J	15.91 J
SEM (µmole/g)								
Cadmium	0.0009 J	0.0009 J	0.0011 J	0.0009 J	0.0009 J	0.0008 J	0.0015 UJ	0.0017 UJ
Copper	0.0173 J	0.0124 R	0.0127 R	0.1133 J	0.0173 J	0.1574 J	0.0582 J	0.0598 J
Lead	0.4247 J	0.2606 J	0.0772 J	0.1931 J	0.1882 J	0.7239 J	0.2751 J	0.2124 J
Nickel	0.0061 J	0.0063 J	0.0055 J	0.0070 J	0.0085 J	0.0065 J	0.0066 J	0.0075 J
Silver	0.0040 R	0.0037 R	0.0039 R	0.0035 R	0.0034 R	0.0037 R	0.0032 R	0.0036 R
Zinc	0.1330 J	0.1529 J	0.1682 J	0.1835 J	0.1682 J	0.1529 J	0.1208 J	0.1285 J
Total SEM (µmole/g) [(1)(2)]	0.58	0.42	0.25	0.50	0.38	1.04	0.46	0.41
SEM-to-AVS Ratio [(3)]	0.035	0.020	0.011	0.066	0.009	0.051	0.067	0.026

TABLE 10-16

ACID VOLATILE SULFIDE AND SIMULTANEOUSLY EXTRACTED METALS DATA FOR SEDIMENT
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SD48B	9SD49B	9SD50B	9SD51B	9SD52B	9SD53B	9SD56B	9SD57B
Sample ID	9SD48B	9SD49B	9SD50B	9SD51B	9SD52B	9SD53B	9SD56B	9SD57B
Sample Date	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
AVS (µmole/g)	7.49 J	14.66 J	40.55 J	12.79 J	77.98 J	15.28 J	15.28 J	93.57 J
SEM (µmole/g)								
Cadmium	0.0015 UJ	0.0008 J	0.0021 J	0.0017 UJ	0.0016 J	0.0020 UJ	0.0018 UJ	0.0014 J
Copper	0.0393 J	0.0960 J	0.0157 J	0.0346 J	0.0157 R	0.1102 J	0.0189 J	0.0173 J
Lead	0.4826 J	1.1583 J	0.5792 J	0.2027 J	0.4054 J	0.3620 J	0.4199 J	0.1882 J
Nickel	0.0080 J	0.0170 J	0.0073 J	0.0092 J	0.0066 J	0.0061 J	0.0061 J	0.0097 J
Silver	0.0033 R	0.0028 R	0.0044 R	0.0036 R	0.0047 R	0.0042 R	0.0037 R	0.0052 R
Zinc	0.1835 J	0.1988 J	0.2906 J	0.1330 J	0.1988 J	0.1361 J	0.1682 J	0.2141 J
Total SEM (µmole/g) [(1)(2)]	0.72	1.47	0.89	0.38	0.61	0.62	0.61	0.43
SEM-to-AVS Ratio [(3)]	0.096	0.100	0.022	0.030	0.008	0.040	0.040	0.005

TABLE 10-16

ACID VOLATILE SULFIDE AND SIMULTANEOUSLY EXTRACTED METALS DATA FOR SEDIMENT
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SD60B	9SD63B	9SD75B	9SD76B	9SD109	9SD110	9SD111	9SD112
Sample ID	9SD60B	9SD63B	9SD75B	9SD76B	9SD109	9SD110	9SD111	9SD112
Sample Date	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/11/2011	1/11/2011	1/11/2011	1/11/2011
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
AVS (µmole/g)	65.50 J	65.50 J	40.55 J	34.31 J	0.52 J	2.90 J	0.99 J	5.20 J
SEM (µmole/g)								
Cadmium	0.0016 J	0.0018 J	0.0022 UJ	0.0023 UJ	0.0011 UJ	0.0010 UJ	0.0010 UJ	0.0011 UJ
Copper	0.0189 J	0.0157 R	0.0205 J	0.0362 J	0.4800 J	0.6420 J	0.4390 J	0.3930 J
Lead	0.2317 J	0.1014 J	0.0227 J	0.0294 J	0.0226 J	0.0305 J	0.0355 J	0.0190 J
Nickel	0.0097 J	0.0109 J	0.0068 J	0.0095 J	0.0170 UJ	0.0160 J	0.0180 J	0.0170 UJ
Silver	0.0052 R	0.0050 R	0.0048 R	0.0049 R	0.0024 UJ	0.0021 UJ	0.0021 UJ	0.0023 UJ
Zinc	0.2294 J	0.2141 J	0.1392 J	0.1392 J	0.1680 J	0.1960 J	0.2210 J	0.1690 J
Total SEM (µmole/g) [(1)(2)]	0.49	0.33	0.19	0.22	0.69	0.89	0.72	0.60
SEM-to-AVS Ratio [(3)]	0.007	0.005	0.005	0.006	1.327	0.306	0.723	0.115

TABLE 10-16

ACID VOLATILE SULFIDE AND SIMULTANEOUSLY EXTRACTED METALS DATA FOR SEDIMENT
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SD177	9SD178	9SD179	9SD180	9SD181	9SD182	9SD183
Sample ID	9SD177	9SD178	9SD179	9SD180	9SD181	9SD182	9SD183
Sample Date	1/11/2011	1/11/2011	1/11/2011	1/11/2011	1/11/2011	1/11/2011	1/11/2011
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
AVS (µmole/g)	0.96 J	1.36 J	0.18 UJ	2.60 J	2.70 J	9.40 J	1.70 J
SEM (µmole/g)							
Cadmium	0.0010 UJ	0.0010 UJ	0.0009 UJ	0.0011 UJ	0.0008 UJ	0.0015 UJ	0.0011 UJ
Copper	0.3210 J	0.2170 J	0.2310 J	0.2700 J	0.1820 J	0.2260 J	0.3260 J
Lead	0.0251 J	0.0152 J	0.0171 J	0.0155 J	0.0124 J	0.0281 J	0.0238 J
Nickel	0.0150 J	0.0160 J	0.0150 J	0.0180 J	0.0120 UJ	0.0230 UJ	0.0160 UJ
Silver	0.0021 UJ	0.0021 UJ	0.0018 UJ	0.0023 UJ	0.0017 UJ	0.0031 UJ	0.0022 UJ
Zinc	0.2260 J	0.2500 J	0.2380 J	0.2590 J	0.1660 J	0.3600 J	0.2110 J
Total SEM (µmole/g) [(1)(2)]	0.59	0.50	0.50	0.56	0.37	0.64	0.58
SEM-to-AVS Ratio [(3)]	0.614	0.368	2.794	0.217	0.139	0.068	0.341

Notes:

AVS - Acid Volatile Sulfide
ft bgs - feet below ground surface
J - Detected (estimated value)
µmole/g - micromole per gram
R - Data rejected by data validator. These data were not used in calculations.
SEM - Simultaneously Extracted Metals
UJ - Not Detected (estimated value)

(1) The total SEM concentration was derived using the following formula: $[SEM]_{total} = [SEM]_{Cd} + [SEM]_{Cu} + [SEM]_{Pb} + [SEM]_{Ni} + [SEM]_{Zn} + (0.5)[SEM]_{Ag}$ (one-half the molar concentration of silver was added into the SEM totals due to silver being largely in a monovalent state)

(2) If a given sediment sample had non-detected results for individual SEM metals, the non-detected results were used in the derivation of the total SEM molar concentration without manipulation.

(3) If a given sediment sample had a non-detected result for AVS, the non-detected result was used (without manipulation) in the derivation of the SEM-to-AVS ratio.

Shading indicates an SEM-to-AVS ration greater than 1.0, indicating potential bioavailability of metals at this location.

TABLE 10-17

HAZARD QUOTIENT VALUES FOR AVIAN AND MAMMALIAN DIETARY EXPOSURES TO CHEMICALS IN SURFACE SOIL: STEP 3A RISK CALCULATION
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Brown flower bat			American robin			Mourning dove			Red-tailed hawk		
	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC
Volatile Organic:												
Pentachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	---	---	---	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	---	---	---	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	---	---	---	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semi-Volatile Organics:												
1,2,4,5-Tetrachlorobenzene	6.86	0.69	2.17	NA	NA	NA	NA	NA	NA	NA	NA	NA
7,12-Dimethylbenz(a)anthracene	NA	NA	NA	0.85	0.08	0.27	---	---	---	---	---	---
bis(2-Ethylhexyl)phthalate	---	---	---	30.03	6.01	13.43	---	---	---	2.99	0.60	1.34
Di-n-butyl phthalate	---	---	---	1.09	0.22	0.49	---	---	---	---	---	---
Di-n-octyl phthalate	---	---	---	2.10	0.42	0.94	---	---	---	0.21	0.04	0.09
Dinoseb	NA	NA	NA	13.80	2.76	6.17	17.63	3.53	7.89	2.58	0.52	1.15
Hexachlorobenzene	---	---	---	241.50	46.60	106.09	---	---	---	24.04	4.64	10.56
Hexachlorobutadiene	---	---	---	5.11	1.02	2.28	---	---	---	0.51	0.10	0.23
Hexachlorophene	1.12	0.22	0.50	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloronitrobenzene	---	---	---	0.68	0.07	0.21	---	---	---	---	---	---
Pentachlorophenol	1.06	0.39	0.65	5.34	0.53	1.69	1.28	0.13	0.40	0.62	0.06	0.20
PAHs:												
Pyrene	1.38	0.28	0.62	0.63	0.06	0.20	---	---	---	---	---	---
Organophosphorous Pesticides:												
Disulfoton	NA	NA	NA	135.30	27.06	60.51	11.56	2.31	5.17	14.23	2.85	6.36
Ethyl parathion	NA	NA	NA	1,880.97	376.19	841.19	692.70	138.54	309.79	233.80	46.76	104.56
Methyl parathion	7.22	72.21	22.84	38.18	7.64	17.08	56.95	11.39	25.47	7.81	1.56	3.49
Phorate	NA	NA	NA	2,346.10	469.22	1049.21	180.65	36.13	80.79	245.50	49.10	109.79
Metals:												
Beryllium	---	---	---	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	---	---	---	0.37	0.08	0.18	---	---	---	---	---	---
Chromium, total	---	---	---	0.88	0.15	0.36	---	---	---	---	---	---
Copper	---	---	---	0.78	0.26	0.45	---	---	---	---	---	---
Lead	---	---	---	1.61	0.80	1.14	1.07	0.53	0.76	0.68	0.07	0.21
Mercury	---	---	---	1.17	0.39	0.67	---	---	---	---	---	---
Nickel	---	---	---	0.26	0.09	0.16	---	---	---	---	---	---
Selenium	---	---	---	0.28	0.14	0.20	---	---	---	---	---	---
Thallium	---	---	---	0.66	0.13	0.29	---	---	---	---	---	---
Vanadium	---	---	---	8.36	4.18	5.91	4.15	2.08	2.94	0.43	0.22	0.31
Zinc	---	---	---	0.61	0.24	0.38	---	---	---	---	---	---

TABLE 10-17

HAZARD QUOTIENT VALUES FOR AVIAN AND MAMMALIAN DIETARY EXPOSURES TO CHEMICALS IN SURFACE SOIL: STEP 3A RISK CALCULATION
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Notes:

Shaded cells indicate a hazard quotient value greater than 1.0

--- = Chemical was not identified as an ecological chemical of potential concern for this receptor in the Step 2 screening level risk calculation
LOAEL = Lowest Observed Adverse Effect Level
MATC = Maximum Acceptable Toxicant Concentration
NA = Toxicity Reference Value not available (hazard quotient value could not be calculated)
NOAEL = No Observed Adverse Effect Level

TABLE 10-18

HAZARD QUOTIENT VALUES FOR AVIAN AND MAMMALIAN DIETARY EXPOSURES TO CHEMICALS IN SUBSURFACE SOIL: STEP 3A RISK CALCULATION
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Brown flower bat			American robin			Mourning dove			Red-tailed hawk		
	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC
Semi-Volatile Organics:												
bis(2-Ethylhexyl)phthalate	---	---	---	0.84	0.17	0.38	---	---	---	---	---	---
Di-n-butyl phthalate	---	---	---	1.48	0.30	0.66	---	---	---	---	---	---
Hexachlorobenzene	---	---	---	6.71	1.29	2.95	---	---	---	0.67	0.13	0.29
Organophosphorous Pesticides:												
Disulfoton	NA	NA	NA	4.02	0.80	1.80	---	---	---	0.42	0.08	0.19
Ethyl parathion	NA	NA	NA	55.92	11.18	25.01	20.59	4.12	9.21	6.95	1.39	3.11
Methyl parathion	2.03	0.20	0.64	1.07	0.21	0.48	1.60	0.32	0.72	---	---	---
Phorate	NA	NA	NA	64.89	12.98	29.02	5.00	1.00	2.23	6.79	1.36	3.04
Metals:												
Beryllium	---	---	---	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	---	---	---	0.49	0.11	0.23	---	---	---	---	---	---
Chromium, total	---	---	---	1.78	0.30	0.73	---	---	---	---	---	---
Copper	---	---	---	0.92	0.31	0.53	---	---	---	---	---	---
Lead	---	---	---	7.28	3.64	5.14	4.35	2.18	3.08	3.34	0.33	1.06
Mercury	---	---	---	1.96	0.65	1.13	---	---	---	---	---	---
Nickel	---	---	---	0.38	0.14	0.23	---	---	---	---	---	---
Selenium	0.84	0.56	0.68	0.59	0.29	0.42	---	---	---	---	---	---
Thallium	---	---	---	1.59	0.32	0.71	---	---	---	---	---	---
Vanadium	---	---	---	9.37	4.68	6.62	4.65	2.33	3.29	0.48	0.24	0.34
Zinc	---	---	---	0.59	0.23	0.37	---	---	---	---	---	---

Notes:

Shaded cells indicate a hazard quotient value greater than 1.0

--- = Chemical was not identified as an ecological chemical of potential concern for this receptor in the Step 2 screening level risk calculation
LOAEL = Lowest Observed Adverse Effect Level
MATC = Maximum Acceptable Toxicant Concentration
NA = Toxicity Reference Value not available (hazard quotient value could not be calculated)
NOAEL = No Observed Adverse Effect Level

TABLE 10-19

REFINED HAZARD QUOTIENT VALUES FOR AVIAN DIETARY EXPOSURES TO CHEMICALS IN SEDIMENT: STEP 3A RISK CALCULATION
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemical	Spotted sandpiper			Green heron		
	NOAEL	LOAEL	MATC	NOAEL	LOAEL	MATC
Volatile Organics:						
Ethylbenzene	NA	NA	NA	NA	NA	NA
Semi-Volatile Organics:						
bis(2-Ethylhexyl)phthalate	21.70	4.34	9.70	4.24	0.85	1.90
Di-n-butyl phthalate	3.23	0.65	1.44	1.99	0.40	0.89
Dinoseb	3.77	0.75	1.69	2.33	0.47	1.04
Hexachlorobenzene	138.88	26.80	61.01	2.51	0.48	1.10
PAHs:						
Benzo(b)fluoranthene	0.04	<0.01	0.01	---	---	---
Benzo(k)fluoranthene	0.05	<0.01	0.02	---	---	---
Pyrene	0.03	<0.01	<0.01	---	---	---
Organophosphorous Pesticides:						
Disulfoton	3.65	0.73	1.63	2.25	0.45	1.01
Ethyl parathion	191.02	38.20	85.43	117.89	23.58	52.72
Methyl parathion	6.46	1.29	2.89	3.99	0.80	1.78
Phorate	48.14	9.63	21.53	29.71	5.94	13.29
Metals:						
Beryllium	NA	NA	NA	NA	NA	NA
Chromium, total	0.62	0.11	0.26	0.04	<0.01	0.02
Copper	11.55	3.87	6.68	0.27	0.09	0.16
Lead	4.05	2.03	2.87	1.63	0.81	1.15
Mercury	0.81	0.27	0.47	1.20	0.40	0.69
Selenium	0.59	0.30	0.42	---	---	---
Thallium	3.58	0.72	1.60	2.21	0.44	0.99
Vanadium	92.78	46.39	65.61	57.26	28.63	40.49
Zinc	0.29	0.11	0.18	0.45	0.18	0.28

Notes:

Shaded cells indicate a hazard quotient value greater than 1.0

--- = Chemical was not identified as an ecological chemical of potential concern for this receptor in the Step 2 screening level risk calculation
LOAEL = Lowest Observed Adverse Effect Level
MATC = Maximum Acceptable Toxicant Concentration
NA = Toxicity Reference Value not available (hazard quotient value could not be calculated)
NOAEL = No Observed Adverse Effect Level

TABLE 11-1
SUMMARY OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN AND ECOLOGICAL CHEMICALS OF CONCERN
FOR LOWER TROPHIC LEVEL RECEPTOR GROUP DIRECT CONTACT EXPOSURES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemcials	Surface Soil	Subsurface Soil	Groundwater	Surface Water	Sediment
Ecological Chemicals of Concern [1]	Arsenic Lead Thallium Zinc	Lead Thallium	Lead	None	Lead Benzo(a)pyrene Chrysene Pyrene
Ecological Chemicals of Potential Concern [2]	2-Butanone 2-Hexanone Acetone Carbon disulfide Arsenic Cobalt Copper Lead Selenium Thallium Vanadium Zinc 30 non-detected VOCs 4 VOCs with no usable data 72 non-detected SVOCs 9 non-detected OP pesticides	Acetone Carbon disulfide Cobalt Copper Lead Thallium Vanadium 41 non-detected VOCs 60 non-detected SVOCs 1 SVOC with no usable data 9 non-detected OP pesticides 1 non-detected metal	Benzene Ethylbenzene Methyl acrylonitrile 2,4-Dichlorophenol Phenacetin 2-Methylnaphthalene Cadmium Chromium Cobalt Copper Lead Nickel Vanadium Zinc 4 non-detected VOCs 25 non-detected SVOCs 1 SVOC with no usable data 2 non-detected PAHs 7 non-detected OP pesticides	Arsenic Cadmium Chromium Cobalt Copper Lead Nickel Vanadium Zinc 2 Non-deteted VOCs 21 non-detected SVOCs 13 non-detected PAHs 2 non-detected metals	Acetone Carbon disulfide 1,4-Naphthoquinone Acenaphthylene Benzo(a)anthracene Benzo(g,h,i)perylene Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene Phenanthrene Barium Cadmium Chromium Cobalt Copper Lead Selenium Tin Vanadium 25 non-detected VOCs 75 non-detected SVOCs 1 SVOC with no usable data One non-detected PAH 9 non-detected OP pesticides 2 non-detected metals

Notes:

SVOC = Semi-Volatile Organic Compound
VOC = Volatile Organic Compound
PAH = Polynuclear Aromatic Hydrocarbon
OP = Organophosphorous

[1] Ecological chemcials of potential concern (COPCs) were identified based on the evaluations presented in Sections 7.2.1, 7.2.2, 7.2.3, 7.2.4, and 7.2.5.
[2] Ecological chemcials of concern (COCs) were identified based on the evaluations presented in Sections 10.1.1, 10.1.2, 10.1.3, 10.1.4, and 10.1.5.

TABLE 11-2

SUMMARY OF ECOLOGICAL CHEMICALS OF POTENTIAL CONCERN AND ECOLOGICAL CHEMICALS OF CONCERN FOR AVIAN AND MAMMALIAN DIETARY EXPOSURES
SWMU 9 - AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELIINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Chemcials	Surface Soil		Subsurface Soil		Sediment
	Avian Dietary Exposures	Mammalian Dietary Exposures	Avian Dietary Exposures	Mammalian Dietary Exposures	Avian Dietary Exposures
Ecological Chemicals of Concern [1]	Lead	None	Lead Thallium	None	Lead
Ecological Chemicals of Potential Concern [2]	Chloroform Ethylbenzene Pentachloroethane Styrene Di-n-butyl phthalate Pyrene Beryllium Cadmium Chromium Copper Lead Mercury Nickel Selenium Thallium Vanadium Zinc 5 non-detected VOCs 39 non-detected SVOCs 5 non-detected OP pesticides 1 non-detected metal	Pentachloroethane Pyrene 20 non-detected SVOCs 5 non-detected OP pesticides	Beryllium Cadmium Chromium Copper Lead Mercury Nickel Thallium Vanadium Zinc 9 non-detected VOCs 30 non-detected SVOCs 5 non-detected OP pesticides 1 non-detected metal	1 non-detected VOCs 16 non-detected SVOCs 5 non-detected OP pesticides 1 non-detected metal	Ethylbenzene Benzo(b)fluroanthene Benzo(k)fluoranthene Pyrene Beryllium Chromium Copper lead Mercury Selenium Thallium Vanadium Zinc 8 non-detected VOCs 34 non-detected SVOCs 5 non-detected OP pesticides

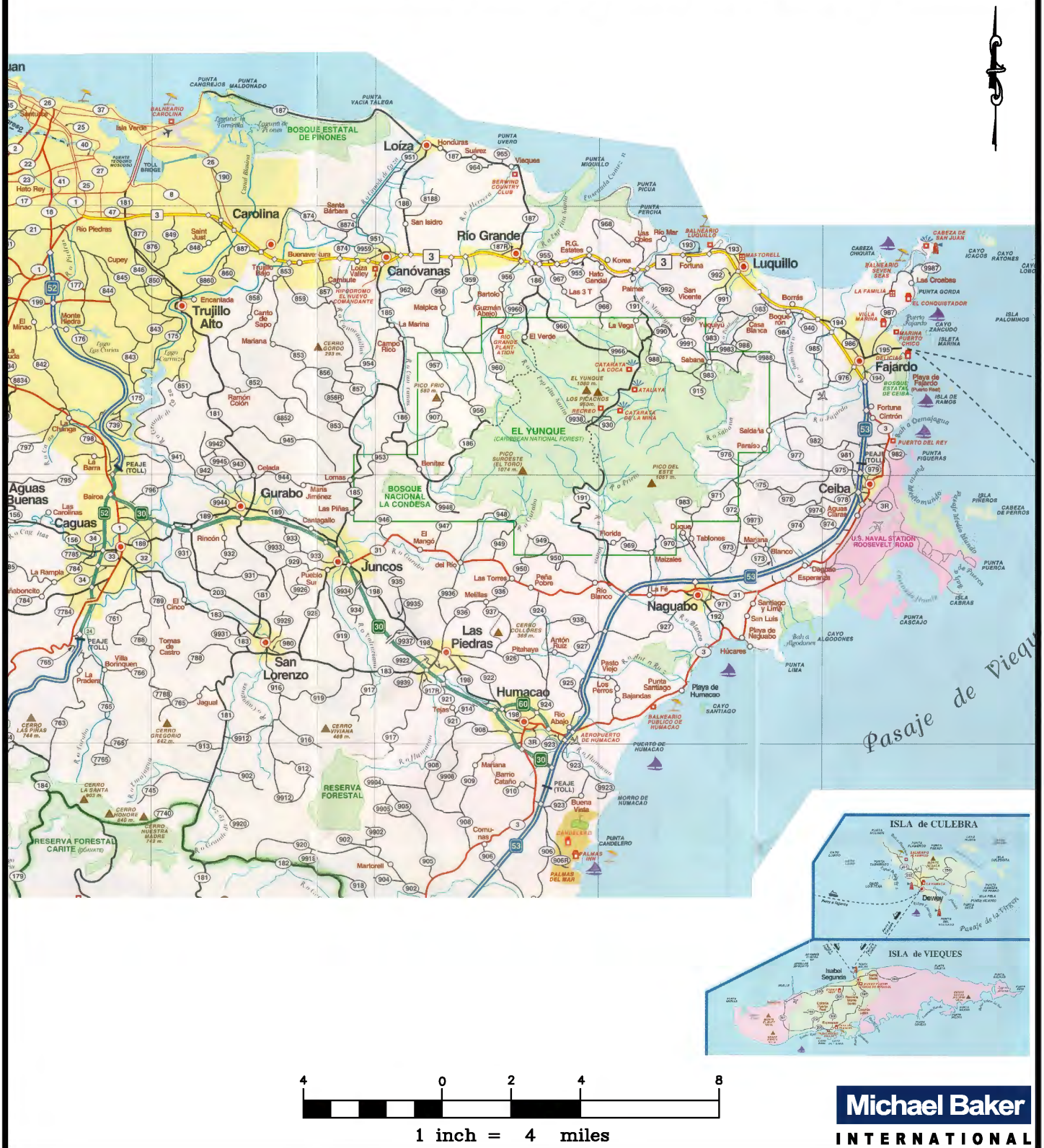
Notes:

SVOC = Semi-Volatile Organic Compound
VOC = Volatile Organic Compound
PAH = Polynuclear Aromatic Hydrocarbon
OP = Organophosphorous

[1] Ecological chemcials of potential concern (COPCs) were identified based on the evaluations presented in Sections 7.2.6.1, 7.2.6.2, and 7.2.6.3.
[2] Ecological chemcials of concern (COCs) were identified based on the evaluations presented in Sections 10.1.6.1, 10.1.6.2, and 10.1.6.3.

FIGURES

K:_SOUTHNAVFAC\119197 JM01\SWMU 9 - Area B, Tank 214 Area\SERA and Step 3a of the BERA Report\cad\119197_9-214_01.dwg



4 0 2 4 8

1 inch = 4 miles

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FIGURE 1-1
REGIONAL LOCATION MAP
SWMU 9 - AREA B, TANK 214 AREA
SERA AND STEP 3A OF THE BERA REPORT

SOURCE: METRODATA, INC., 1999.

NAVAL ACTIVITY PUERTO RICO

K:_SOUTHNAVFAC\119197 JM01\SWMU 9 – Area B, Tank 214 Area\SERA and Step 3a of the BERA Report\cad\119197_9-214_02.dwg

LEGEND

– SWMUs

– AREA TO WHICH THIS REPORT PERTAINS

AOC D – AOCs

IMAGE SOURCE: USGS 2006

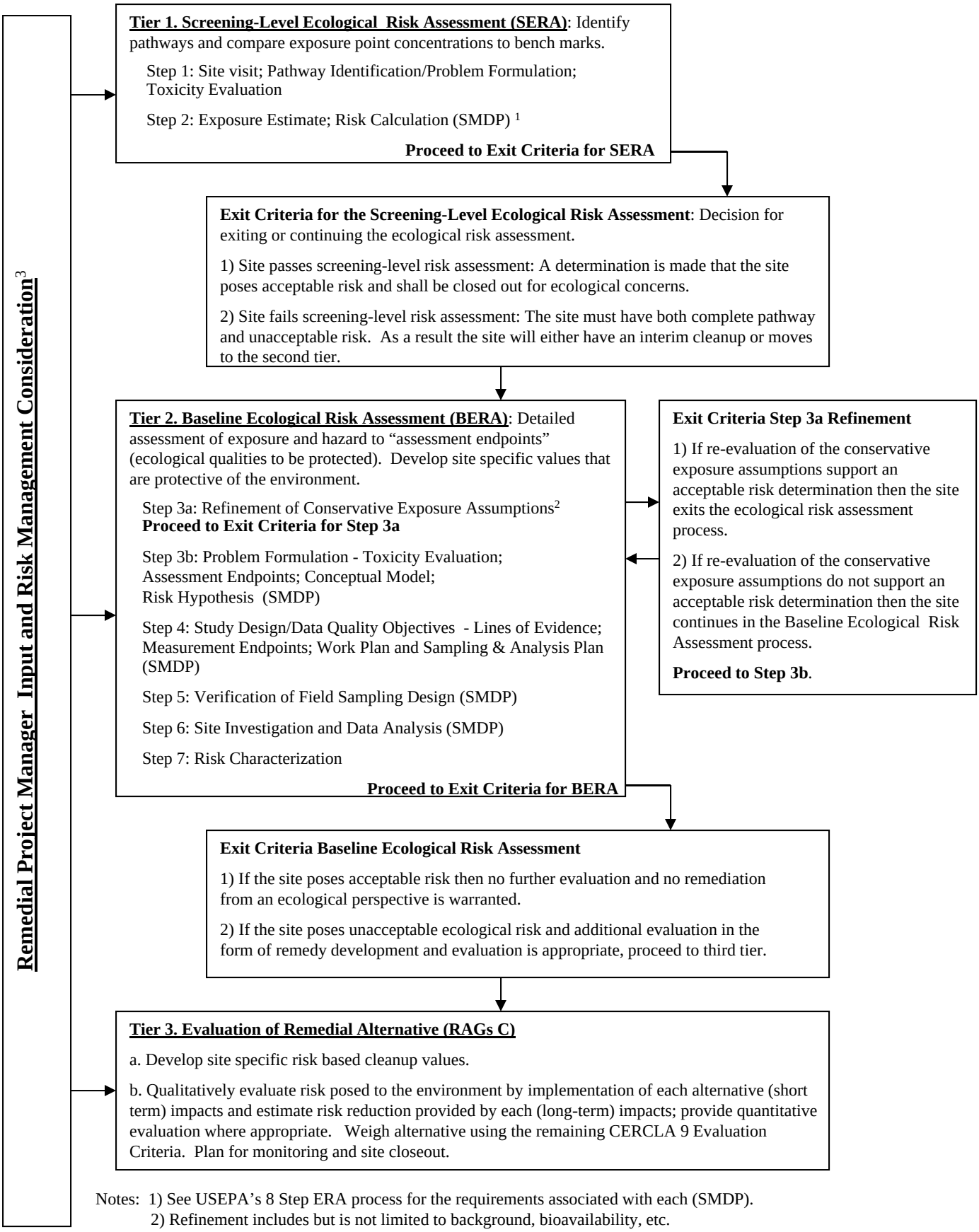
3000 0 1500 3000

1 inch = 3000 ft.

FIGURE 1–2
SWMU/AOC LOCATION MAP
SWMU 9 – AREA B, TANK 214 AREA
SERA AND STEP 3A OF THE BERA REPORT

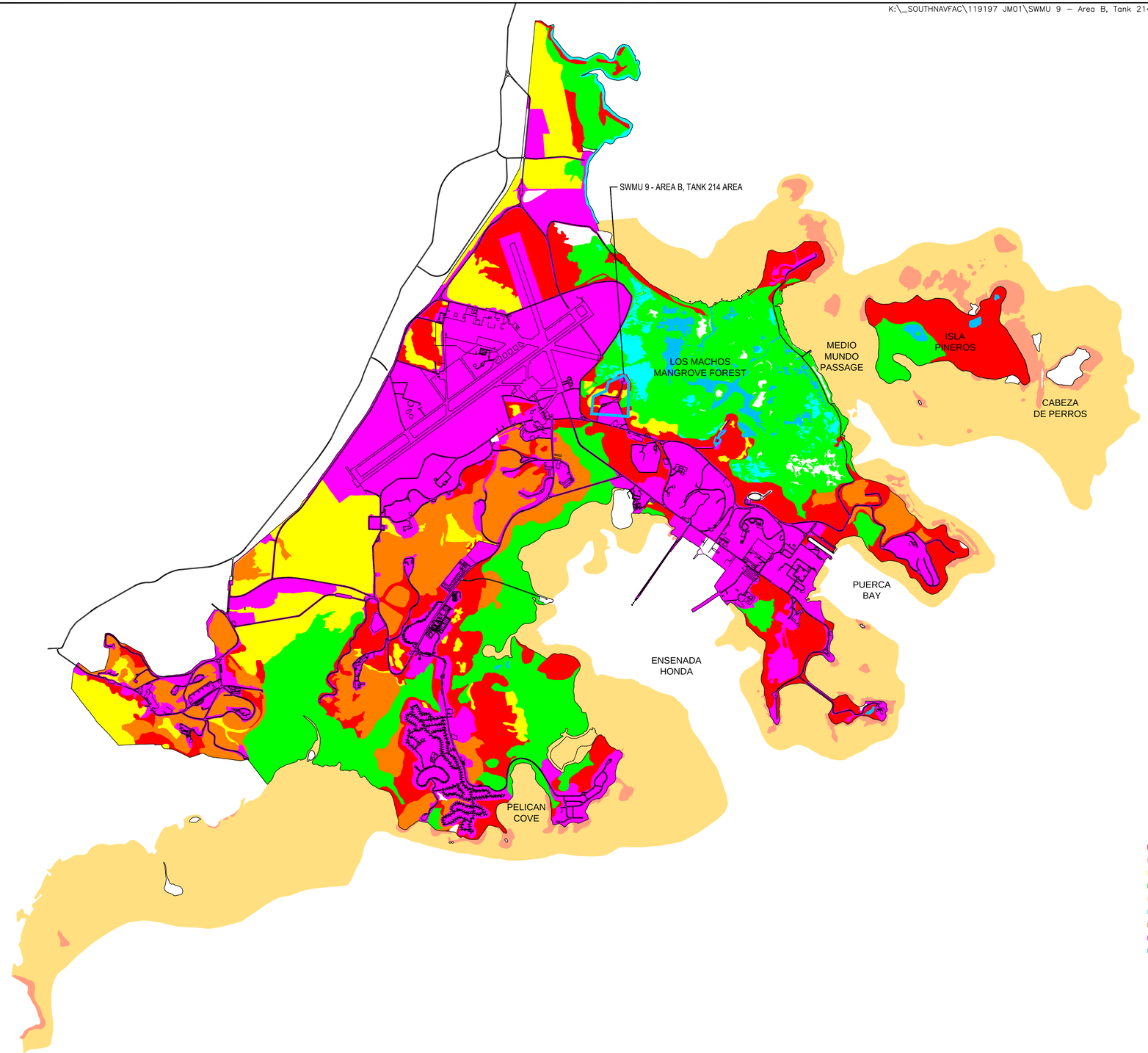
NAVAL ACTIVITY PUERTO RICO

Figure 1-3
Navy Ecological Risk Assessment Tiered Approach



Notes: 1) See USEPA's 8 Step ERA process for the requirements associated with each (SMDP).
2) Refinement includes but is not limited to background, bioavailability, etc.
3) Risk management is incorporated throughout the tiered approach.

K:_SOUTHNAVFAC\119197 JM01\SWMU 9 – Area B, Tank 214 Area\SERA and Step 3a of the BERA Report\cad\119197_9-214_04.dwg



SOURCE: GEO-MARINE, INC.

REVISIONS		NORTH					
	DRAWN /RR REVIEWED RA S.O.# 119197 CADD# 119197_9-214-04			SWMU 9 - AREA B, TANK 214 AREA NAVAL ACTIVITY PUERTO RICO MICHAEL BAKER INTERNATIONAL Moon Township, Pennsylvania	Michael Baker INTERNATIONAL	TERRESTRIAL AND AQUATIC HABITAT OCCURRING AT NAVAL ACTIVITY PUERTO RICO SWMU 9 - AREA B, TANK 214 AREA SERA AND STEP 3A OF THE BERA REPORT SCALE 1" = 2000' DATE FEBRUARY 2015	FIGURE 2-1

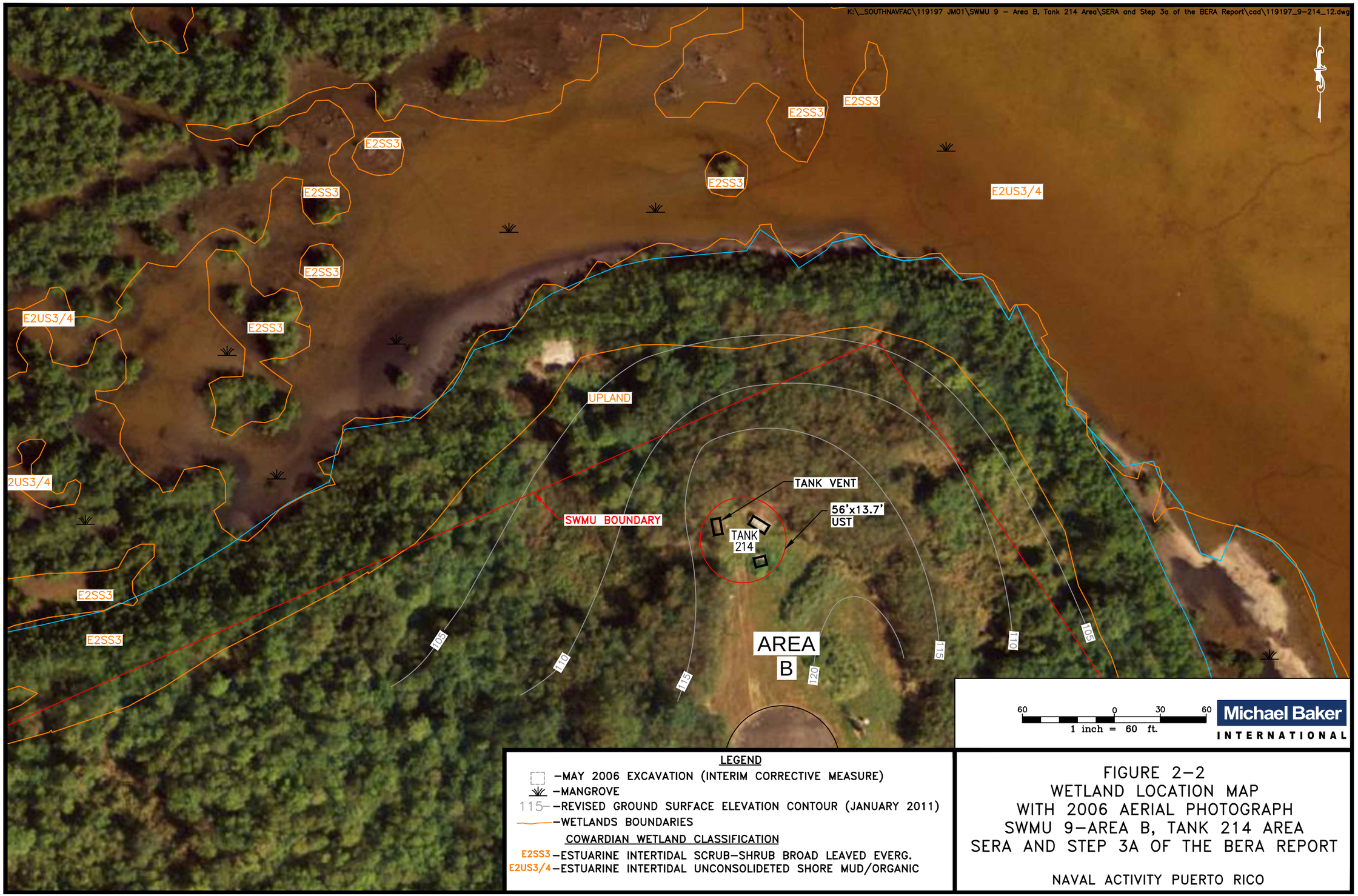


FIGURE 2–2
WETLAND LOCATION MAP
WITH 2006 AERIAL PHOTOGRAPH
SWMU 9–AREA B, TANK 214 AREA
SERA AND STEP 3A OF THE BERA REPORT

NAVAL ACTIVITY PUERTO RICO

M - MARINE

SYSTEM	M - MARINE								
SUBSYSTEM	1 - SUBTIDAL					2 - INTERTIDAL			
CLASS	RB - Rock Bottom	UB - Unconsolidated Bottom	AB - Aquatic Bed	RF - Reef	OW - Open Water (unknown bottom)	AB - Aquatic Bed	RF - Reef	RS - Rocky Shore	US - Unconsolidated Shore
Subclass	1 Bedrock 2 Rubble	1 Cobble - Gravel 2 Sand 3 Mud 4 Organic	1 Algal 3 Rooted Vasc 5 Unknown	1 Coral 3 Worm		1 Algal 3 Rooted Vasc 5 Unknown	1 Coral 3 Worm	1 Bedrock 2 Rubble	1 Cobble - Gravel 2 Sand 3 Mud 4 Organic

E - ESTUARINE

SYSTEM	E - ESTUARINE										
SUBSYSTEM	1 - SUBTIDAL				2 - INTERTIDAL						
CLASS	RB - Rock Bottom	UB - Unconsolidated Bottom	AB - Aquatic Bed	RF - Reef	OW - Open Water (unknown bottom)	AB - Aquatic Bed	RF - Reef	SB - Streambed	RS - Rocky Shore	US - Unconsolidated Shore	EM - Emergent	SS - Scrub-Shrub	FO - Forested
Subclass	1 Bedrock 2 Rubble	1 Cobble - Gravel 2 Sand 3 Mud 4 Organic	1 Algal 3 Rooted Vasc 4 Floating Vasc 5 *Unknown Submerg.* 6 *Unknown Surface*	2 Mollusk 3 Worm		1 Algal 3 Rooted Vasc 4 Floating Vasc 5 *Unknown Submerg.* 6 *Unknown Surface*	2 Mollusk 3 Worm	1 Cobble - Gravel 2 Sand 3 Mud 4 Organic	1 Bedrock 2 Rubble	1 Cobble - Gravel 2 Sand 3 Mud 4 Organic 5 Dead	1 Persistent 2 Nonpersistent	1 Broad-leaved Decid. 2 Needle-leaved Decid. 3 Broad-leaved Everg. 4 Needle-leaved Everg. 5 Dead 6 *Deciduous* 7 *Evergreen*	1 Broad-leaved Decid. 2 Needle-leaved Decid. 3 Broad-leaved Everg. 4 Needle-leaved Everg. 5 Dead 6 *Deciduous* 7 *Evergreen*

R - RIVERINE

SYSTEM	R - RIVERINE							
SUBSYSTEM	1 - TIDAL	2 - LOWER PERENNIAL		3 - UPPER PERENNIAL		4 INTERMITTENT		5 - UNKNOWN PERENNIAL
CLASS	RB - Rock	UB - Unconsolidated Bottom	SB - Streambed	AB - Aquatic Bed	RS - Rocky Shore	US - Unconsolidated Shore	OW - Open Water (unknown bottom)	**EM - Emergent
Subclass	1 Bedrock 2 Rubble	1 Cobble - Gravel 2 Sand 3 Mud 4 Organic	1 Bedrock 2 Rubble 3 Cobble - Gravel 4 Sand 5 Mud 6 Organic 7 Vegetated	1 Algal 2 Aquatic Moss 3 Rooted Vasc 4 Floating Vasc 5 *Unknown Submerg.* 6 *Unknown Surface*	1 Bedrock 2 Rubble	1 Cobble - Gravel 2 Sand 3 Mud 4 Organic		2 Nonpersistent

L - LACUSTRINE

SYSTEM	L - LACUSTRINE										
SUBSYSTEM	1 - LIMNETIC				2 - LITTORAL						
CLASS	RB - Rock Bottom	UB - Unconsolidated Bottom	AB - Aquatic Bed	OW - Open Water (unknown bottom)	RB - Rock Bottom	RS - Rocky Shore	UB - Unconsolidated Bottom	AB - Aquatic Bed	US - Unconsolidated Shore	EM - Emergent	OW - Open Water (unknown bottom)
Subclass	1 Bedrock 2 Rubble	1 Cobble - Gravel 2 Sand 3 Mud 4 Organic	1 Algal 2 Aquatic Moss 3 Rooted Vasc 4 Floating Vasc 5 *Unknown Submerg.* 6 *Unknown Surface*		1 Bedrock 2 Rubble	1 Bedrock 2 Rubble	1 Cobble - Gravel 2 Sand 3 Mud 4 Organic	1 Algal 2 Aquatic Moss 3 Rooted Vasc 4 Floating Vasc 5 *Unknown Submerg.* 6 *Unknown Surface*	1 Cobble - Gravel 2 Sand 3 Mud 4 Organic 5 Vegetated	2 Nonpersistent	

P - PALUSTRINE

SYSTEM	P - PALUSTRINE								
CLASS	RB - Rock Bottom	UB - Unconsolidated Bottom	AB - Aquatic Bed	US - Unconsolidated Shore	ML - Moss-Lichen	EM - Emergent	SS - Scrub-Shrub	FO - Forested	OW - Open Water (unknown bottom)
Subclass	1 Bedrock 2 Rubble	1 Cobble - Gravel 2 Sand 3 Mud 4 Organic	1 Algal 2 Aquatic Moss 3 Rooted Vasc 4 Floating Vasc 5 *Unknown Submerg.* 6 *Unknown Surface*	1 Cobble - Gravel 2 Sand 3 Mud 4 Organic 5 Vegetated	1 Moss 2 Lichen	1 Persistent 2 Nonpersistent	1 Broad-leaved Decid. 2 Needle-leaved Decid. 3 Broad-leaved Everg. 4 Needle-leaved Everg. 5 Dead 6 *Deciduous* 7 *Evergreen*	1 Broad-leaved Decid. 2 Needle-leaved Decid. 3 Broad-leaved Everg. 4 Needle-leaved Everg. 5 Dead 6 *Deciduous* 7 *Evergreen*	

MODIFIERS

WATER REGIME

Non-Tidal

- A Temp. Flooded
- B Saturated
- C Seasonally Flooded
- D Seasonally Flooded/ Well Drained
- E Seasonally Flooded/ Saturated
- F Semipermanently Flooded
- G intermittently Exposed
- H Permanently Flooded
- J Intermittently Flooded
- K Artificially Flooded
- W Intermittently Flooded/ Temporary
- Y Saturated/Semipermanent/ Seasonal
- Z Intermittently Exposed/ Permanent
- U Unknown

Tidal

- K Artificially Flooded
- L Subtidal
- M Irregularly Flooded
- N Regularly Flooded
- P Irregularly Flooded
- *S Temporary-Tidal
- *R Seasonal-Tidal
- *T Semipermanent- Tidal
- *V Permanent-Tidal
- U Unknown

* These water regimes are only used in tidally influenced, freshwater systems.

WATER CHEMISTRY

Coastal Halinity

- 1 Hyperhaline
- 2 Euhaline
- 3 Mixohaline
- 4 Polyhaline
- 5 Mesohaline
- 6 Oligohaline
- 0 Fresh

Inland Salinity

- 7 Hypersaline
- 8 Eusaline
- 9 Mixosaline
- 0 Fresh

pH (fresh water)

- a Acid
- t circumneutral
- i Alkaline

SOIL

- g Organic
- n Mineral

SPECIAL

- b Beaver
- d partially drained/ditched
- f Farmed
- h Diked/Impounded
- r Artificial Substrate
- s Spoil
- x Excavated

SOURCE: UNITED STATES, FISH AND WILDLIFE SERVICE. CLASSIFICATION OF WETLANDS AND DEEPWATER HABITATS OF THE UNITED STATES, 1985

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FIGURE 2-3
THE COWARDIN WETLAND CLASSIFICATION SYSTEM
SWMU 9 - AREA B, TANK 214 AREA
SERA AND STEP 3A OF THE BERA REPORT
NAVAL ACTIVITY PUERTO RICO

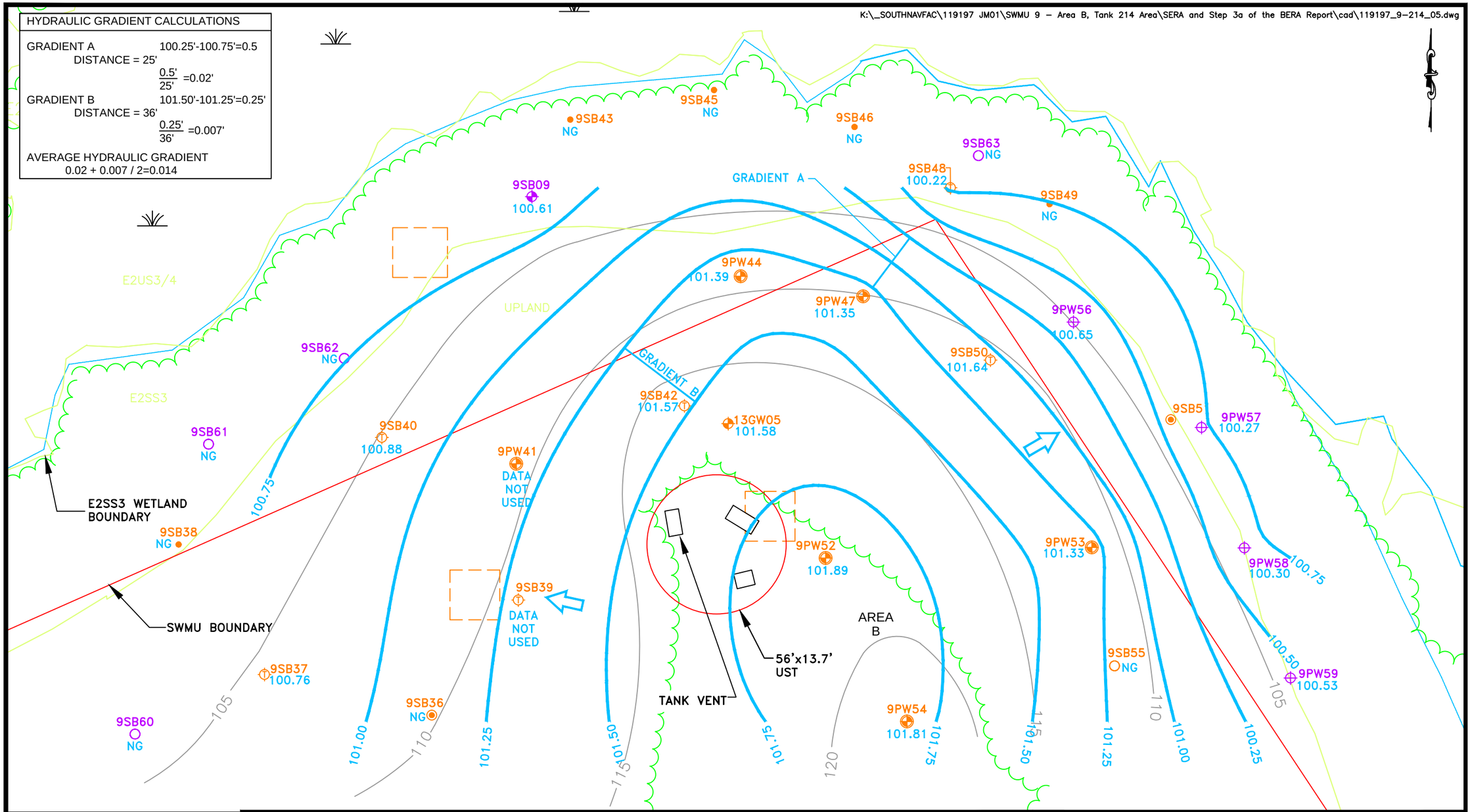
K:_SOUTHNAVFAC\119197 JM01\SWMU 9 – Area B, Tank 214 Area\SERA and Step 3a of the BERA Report\cad\119197_9-214_05.dwg

HYDRAULIC GRADIENT CALCULATIONS

GRADIENT A 100.25'-100.75'=0.5
DISTANCE = 25'
$\frac{0.5'}{25'}$ =0.02'

GRADIENT B 101.50'-101.25'=0.25'
DISTANCE = 36'
$\frac{0.25'}{36'}$ =0.007'

AVERAGE HYDRAULIC GRADIENT
0.02 + 0.007 / 2=0.014



40 0 20 40
1 inch = 40 ft.

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LEGEND

- SUBSURFACE SOIL SAMPLE (JAN 2011 RFI)
- SUBSURFACE SOIL AND GROUNDWATER SAMPLE (JAN 2011 RFI)
- GROUNDWATER SAMPLE (JAN 2011 RFI)
- SURFACE SOIL SAMPLE (JAN 2009 RFI)
- SUBSURFACE SOIL SAMPLE (JAN 2009 RFI)
- SURFACE AND SUBSURFACE SOIL SAMPLE (JAN 2009 RFI)
- SURFACE, SUBSURFACE SOIL AND GROUNDWATER SAMPLE (JAN 2009 RFI)
- SURFACE, SUBSURFACE SOIL AND GROUNDWATER SAMPLE (TEMPORARY WELL) (JAN 2009 RFI)
- GROUNDWATER SAMPLE (JAN 2009 RFI)

E2SS3 – ESTUARINE INTERTIDAL SCRUB-SHRUB BROD-LEAVED EVERGREEN
– MAY 2006 EXCAVATION (INTERIM CORRECTIVE MEASURE)
– MANGROVE
– TREES
115 – REVISED GROUND SURFACE ELEVATION CONTOUR (JANUARY 2011)
– GROUNDWATER CONTOUR
100.04 – GROUNDWATER ELEVATION (FT, MSL)
NG – NOT GAUGED
– GROUNDWATER FLOW DIRECTION

FIGURE 2-4
GROUNDWATER CONTOUR MAP
JANUARY 2011
SWMU 9 – AREA B, TANK 214 AREA
SERA AND STEP 3A OF THE BERA REPORT

NAVAL ACTIVITY PUERTO RICO

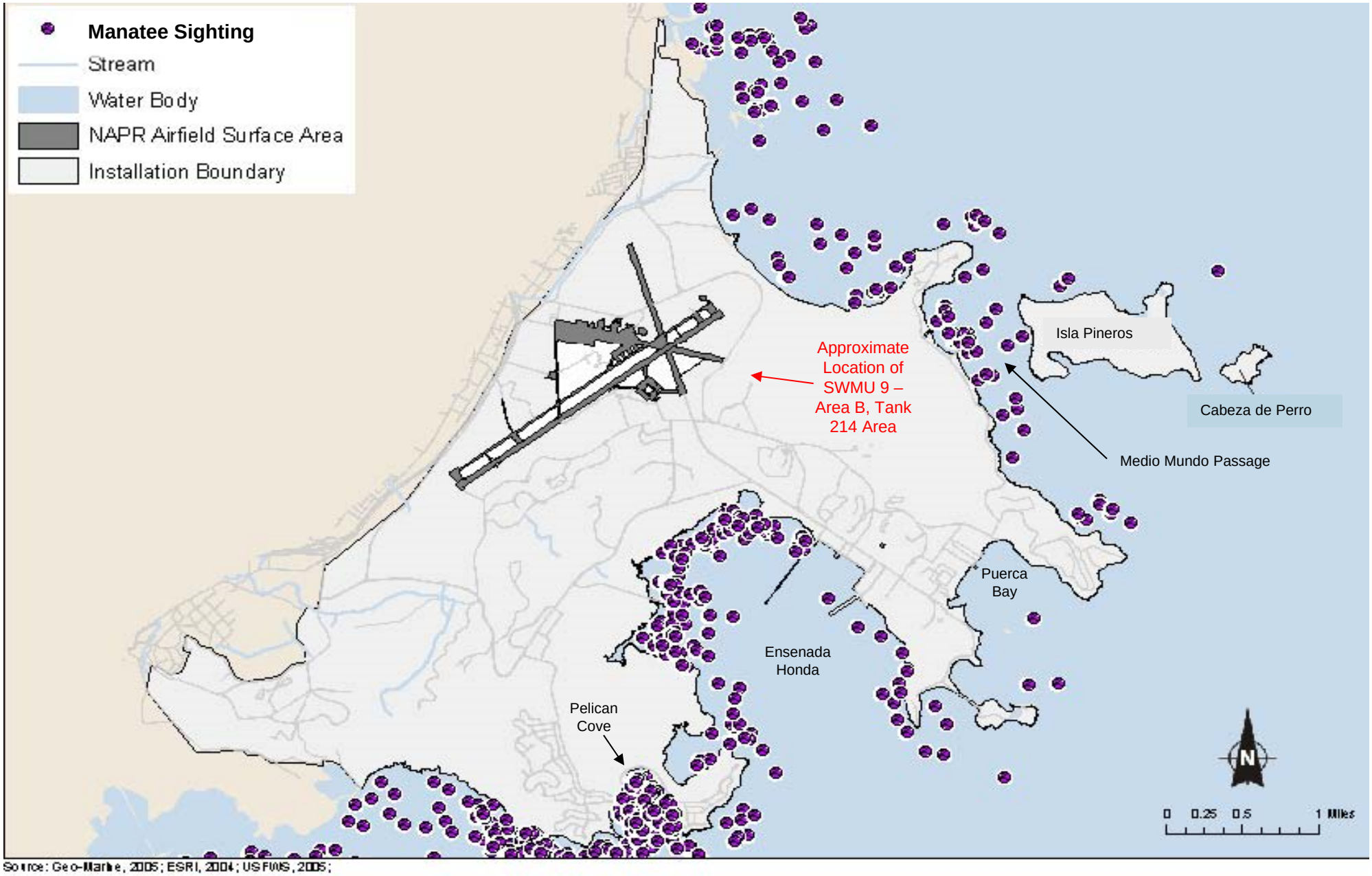
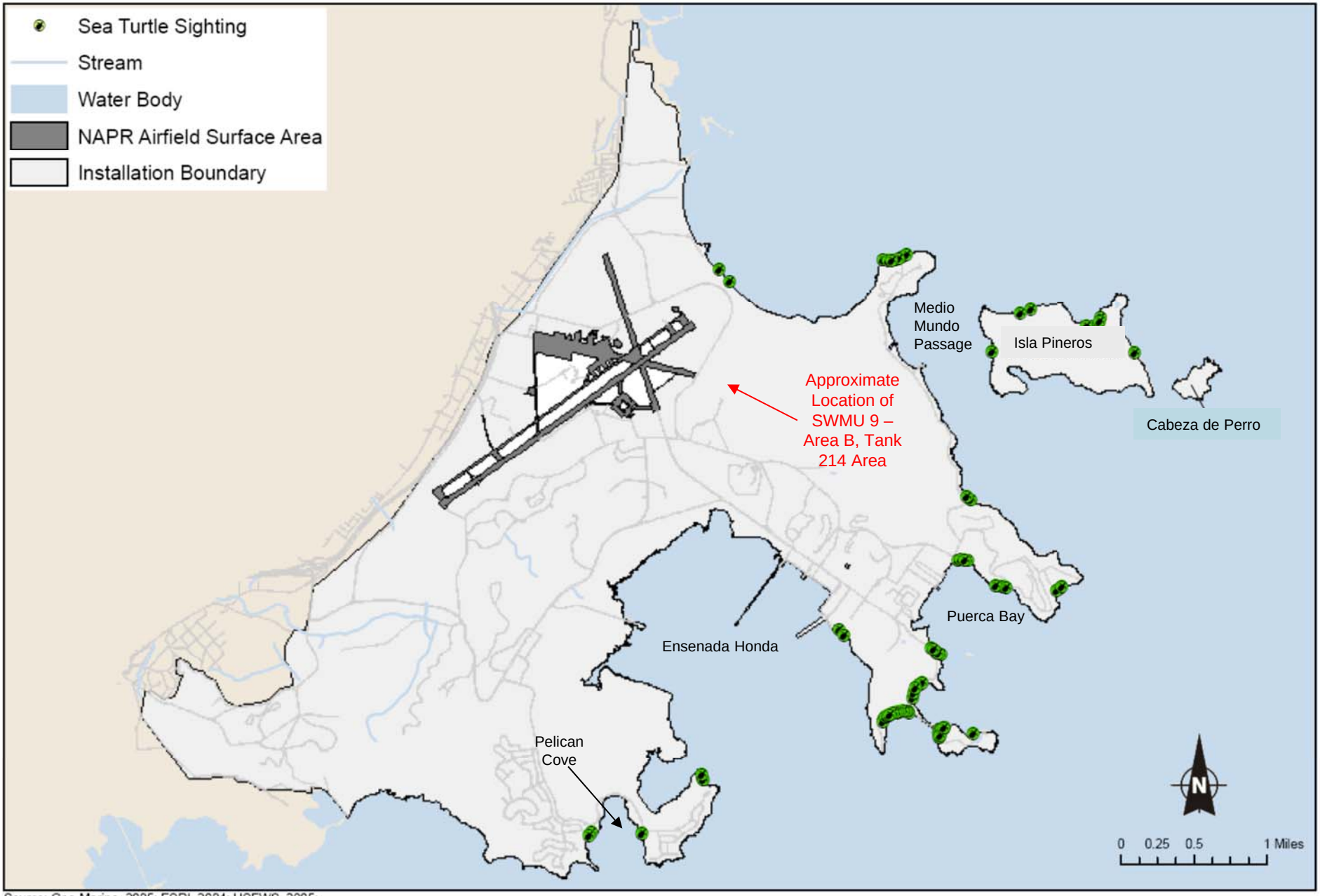


Figure from: Department of the Navy (DoN). 2007. *Environmental Assessment for the Disposal of Naval Activity Puerto Rico (formerly Naval Station Roosevelt Roads).* April 2007.

FIGURE 2-5
HISTORICAL MANATEE SIGHTINGS IN EASTERN PUERTO RICO
SWMU 9 – AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

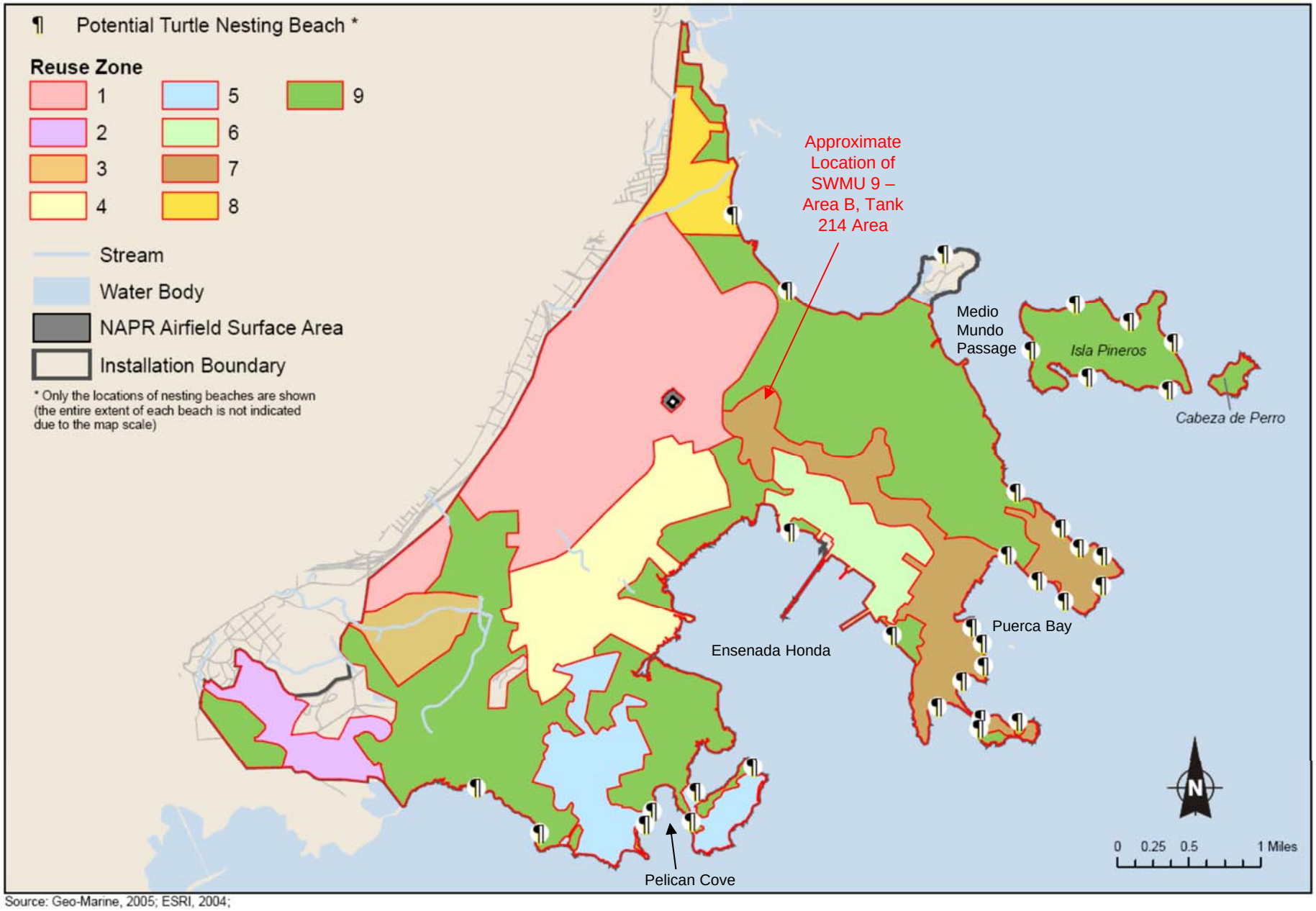


Source: Geo-Marine, 2005; ESRI, 2004; USFWS, 2005;

Cumulative sea turtle sightings from March 1984 through March 1995 obtained from weekly aerial surveys of the Former Naval Station Roosevelt Roads.

Figure from: Department of the Navy (DoN). 2007. *Environmental Assessment for the Disposal of Naval Activity Puerto Rico (formerly Naval Station Roosevelt Roads).* April 2007.

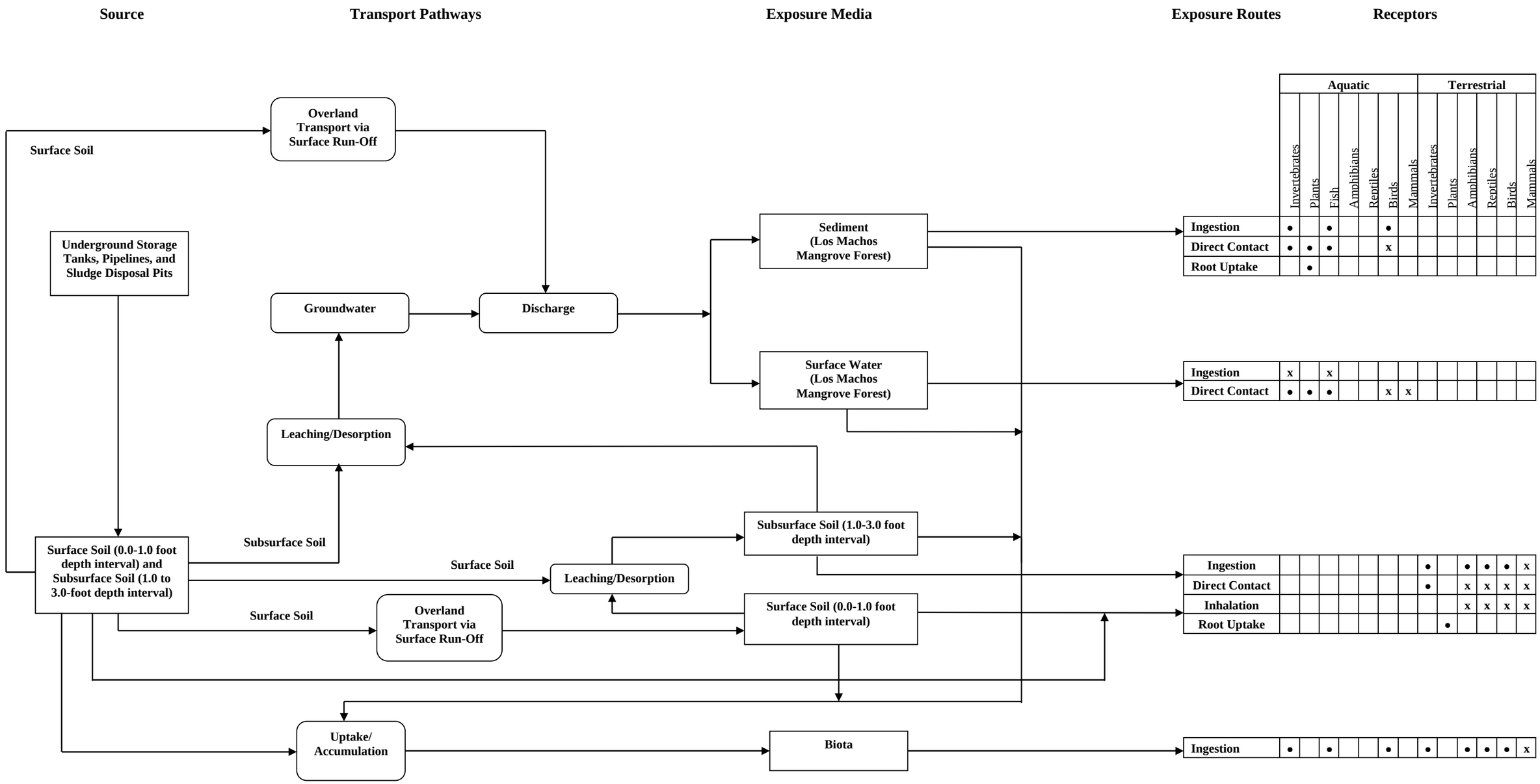
FIGURE 2-6
SEA TURTLE SIGHTINGS AT NAVAL ACTIVITY PUERTO RICO
SWMU 9 – AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO



Source: Geo-Marine, 2005; ESRI, 2004;

Figure from: Department of Navy (DoN). 2007. *Environmental Assessment for the Disposal of Naval Activity Puerto Rico (formerly Naval Station Roosevelt Roads).* April 2007

FIGURE 2-7
POTENTIAL TURTLE NESTING SITES
SWMU 9 – AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

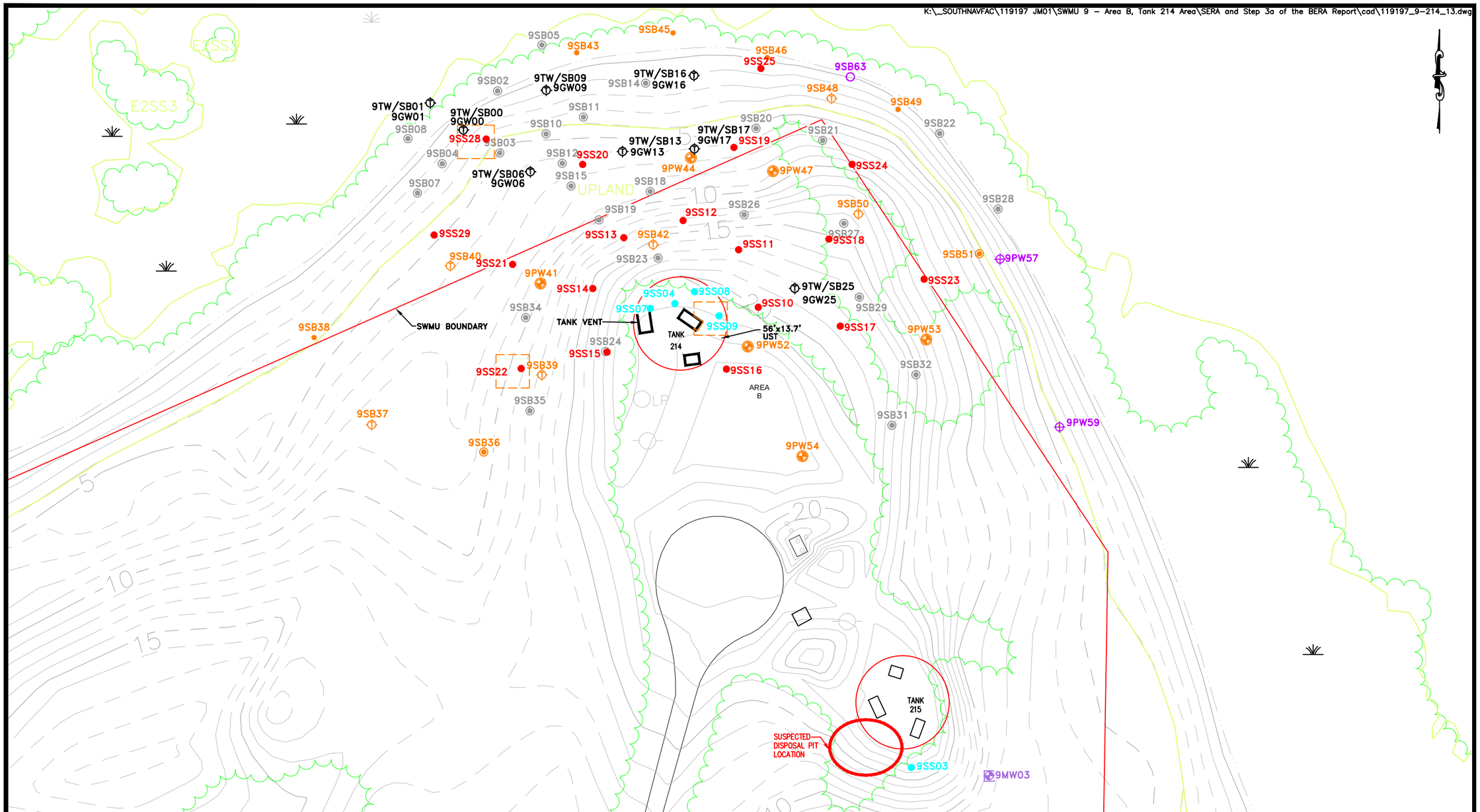


Potentially complete and significant pathway (evaluated)

FIGURE 4-1
PRELIMINARY CONCEPTUAL MODEL FOR ECOLOGICAL RECEPTORS
SWMU 9 – AREA B, TANK 214 AREA
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT AND STEP 3A OF THE BASELINE ECOLOGICAL RISK ASSESSMENT
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

● - Receptor/pathway was qualitatively or quantitatively evaluated
x - Receptor/pathway was not be evaluated

K:_SOUTHNAVFAC\119197 JM01\SWMU 9 - Area B, Tank 214 Area\SERA and Step 3a of the BERA Report\cad\119197_9-214_13.dwg



60 0 30 60

1 inch = 60 ft.

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NOTE:
TOPOGRAPHIC CONTOURS HAVE NOT BEEN FIELD VERIFIED AND MAY NOT BE ACCURATE.

LEGEND

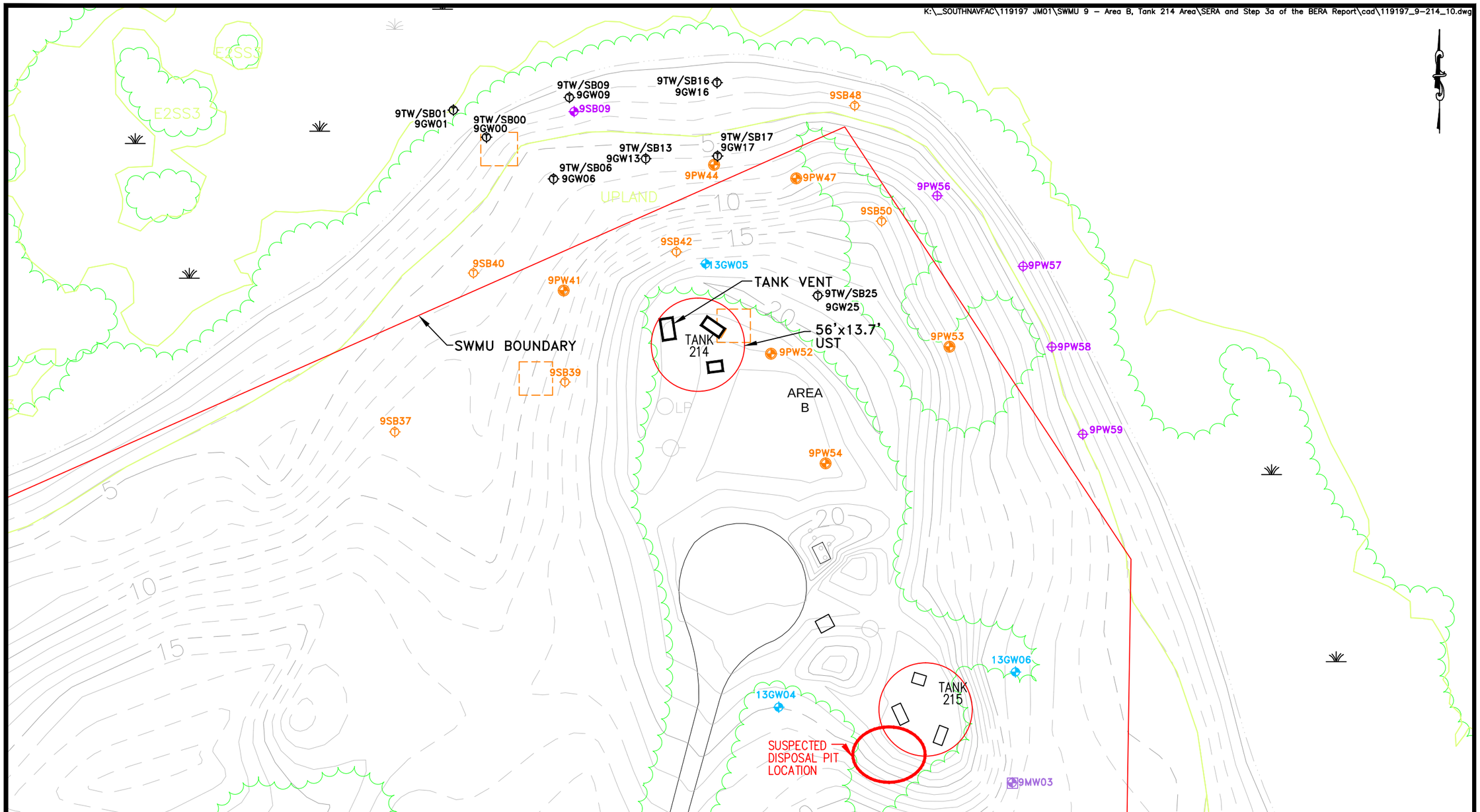
- SUBSURFACE SOIL AND GROUNDWATER SAMPLE (JAN 2011 RFI)
- SUBSURFACE SOIL SAMPLE (JAN 2011 RFI)
- SURFACE SOIL SAMPLE (JAN 2009 RFI)
- SURFACE AND SUBSURFACE SOIL SAMPLE (JAN 2009 RFI)
- SURFACE, SUBSURFACE SOIL AND GROUNDWATER SAMPLE (JAN 2009 RFI)
- SURFACE, SUBSURFACE SOIL AND GROUNDWATER SAMPLE (TEMPORARY WELL) (JAN 2009 RFI)
- SURFACE AND SUBSURFACE SOIL SAMPLE (2008 RFI WORK PLAN)
- SURFACE, SUBSURFACE SOIL AND GROUNDWATER SAMPLE (TEMPORARY WELL) (PHASE I RFI 2007)
- SURFACE SOIL SAMPLE (ADDITIONAL DATA COLLECTION-2003)
- SURFACE SOIL SAMPLE LOCATION (PHASE I RFI AND CMS INV.-1996/2000)
- MONITOR WELL LOCATION (PHASE I 1996)
- E2SS3 - WETLAND IDENTIFICATION
- MAY 2006 EXCAVATION (INTERIM CORRECTIVE MEASURE)
- MANGROVE
- TREES
- GROUND SURFACE ELEVATION CONTOUR

SOURCE:
WETLAND: GEO-MARINE, INC., SEPTEMBER 6, 2000.
CONTOUR: AERO-DYNAMICS, CORP. FEBRUARY 1998

FIGURE 4-2
SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION MAP
SWMU 9-AREA B, TANK 214 AREA
SERA AND STEP 3A OF THE BERA REPORT

NAVAL ACTIVITY PUERTO RICO

K:_SOUTHNAVFAC\119197 JM01\SWMU 9 - Area B, Tank 214 Area\SERA and Step 3a of the BERA Report\cad\119197_9-214_10.dwg



60 0 30 60

1 inch = 60 ft.

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INTERNATIONAL

NOTE:
TOPOGRAPHIC CONTOURS HAVE NOT BEEN FIELD VERIFIED AND MAY NOT BE ACCURATE.

LEGEND

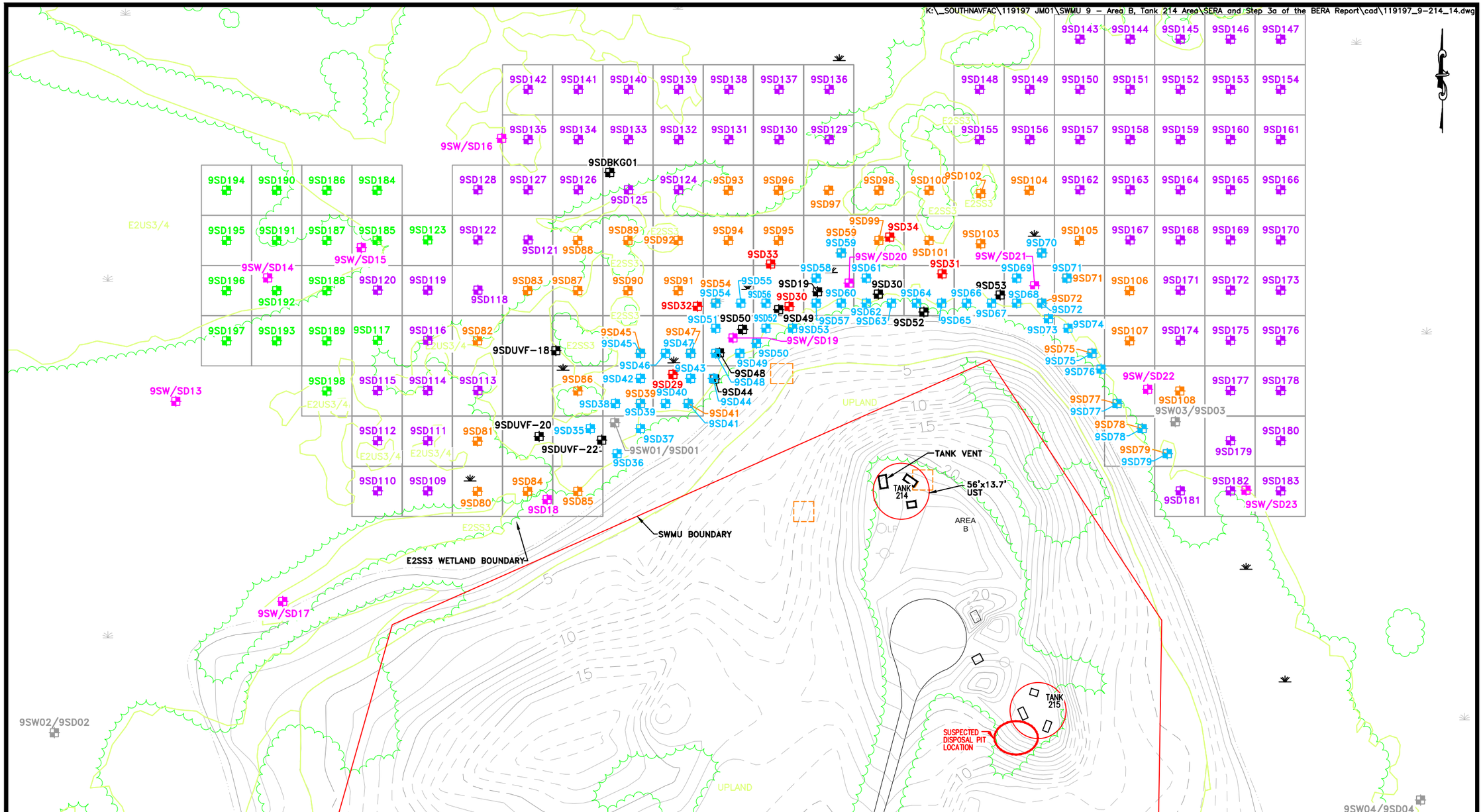
- SUBSURFACE SOIL AND GROUNDWATER SAMPLE (JAN 2011 RFI)
- GROUNDWATER SAMPLE (JAN 2011 RFI)
- SURFACE, SUBSURFACE SOIL AND GROUNDWATER SAMPLE (JAN 2009 RFI)
- GROUNDWATER SAMPLE (JAN 2009 RFI)
- SURFACE, SUBSURFACE SOIL AND GROUNDWATER SAMPLE (TEMPORARY WELL) (JAN 2009 RFI)
- SURFACE, SUBSURFACE SOIL AND GROUNDWATER SAMPLE (TEMPORARY WELL) (PHASE I RFI 2007)
- MONITOR WELL LOCATION (PHASE I 1996)
- EXISTING MONITORING WELL

E2SS3 - WETLAND IDENTIFICATION
- MAY 2006 EXCAVATION (INTERIM CORRECTIVE MEASURE)
- MANGROVE
- TREES
- GROUND SURFACE ELEVATION CONTOUR

SOURCE:
WETLAND: GEO-MARINE, INC., SEPTEMBER 6, 2000.
CONTOUR: AERO-DYNAMICS, CORP. FEBRUARY 1998

FIGURE 4-3
GROUNDWATER SAMPLE LOCATION MAP
SWMU 9-AREA B, TANK 214 AREA
SERA AND STEP 3A OF THE BERA REPORT

NAVAL ACTIVITY PUERTO RICO



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NOTE:
TOPOGRAPHIC CONTOURS HAVE NOT BEEN FIELD VERIFIED AND MAY NOT BE ACCURATE.

LEGEND

- SEDIMENT SAMPLE (1999 PHASE III RFI)
- SEDIMENT SAMPLE (2000 CMS)
- SEDIMENT SAMPLE LOCATION (ADDITIONAL DATA COLLECTION-2003)
- SEDIMENT SAMPLE LOCATION (STEP 3B AND 4 DRAFT 2005)
- SEDIMENT SAMPLE (PHASE I RFI-2007)
- SEDIMENT SAMPLE (JAN 2009 RFI)
- SEDIMENT SAMPLE (JAN 2011 RFI)
- SEDIMENT SAMPLE (JAN 2014 ADDITIONAL SAMPLING)

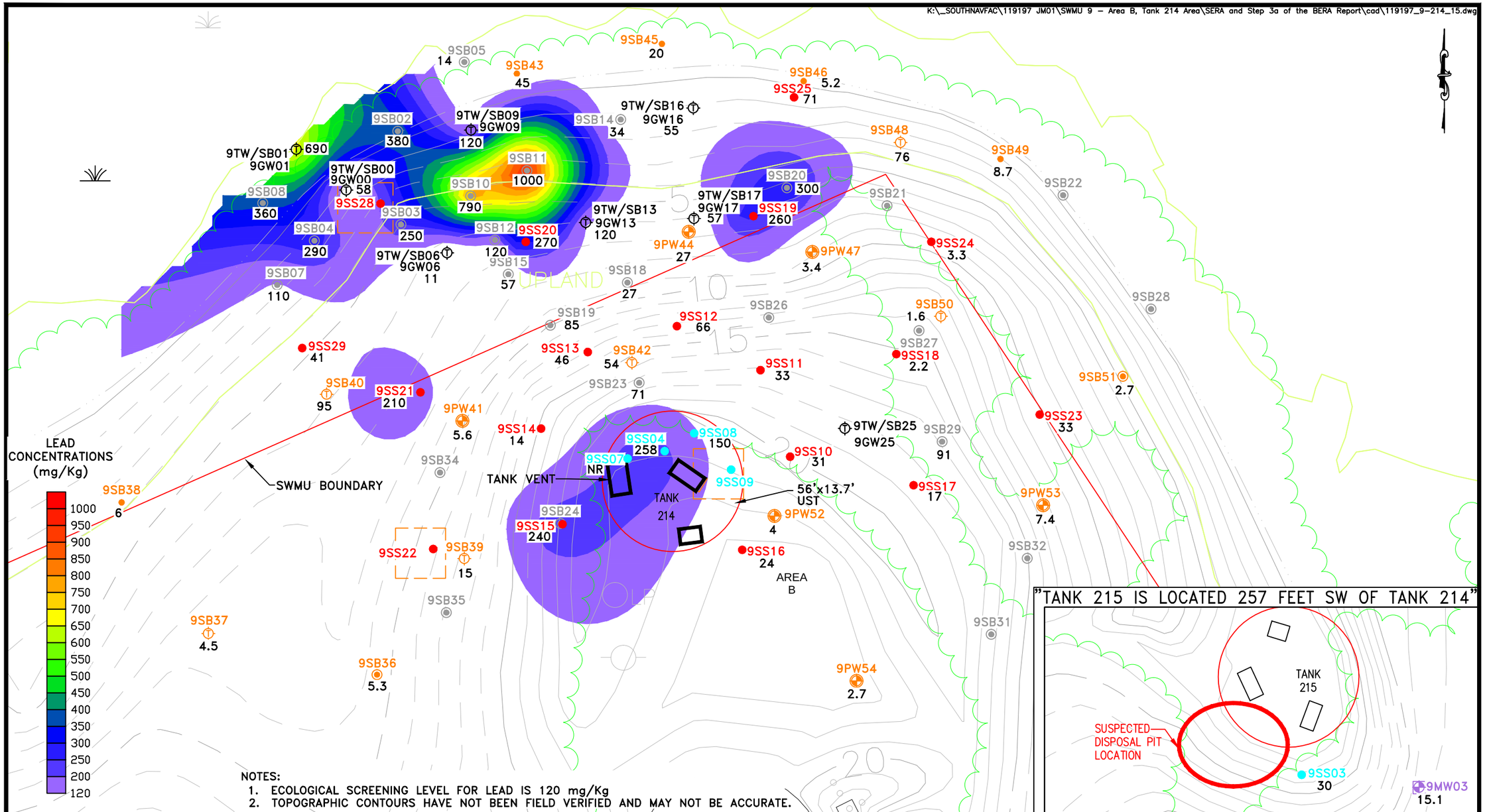
E2SS3 - WETLAND IDENTIFICATION
- MAY 2006 EXCAVATION (INTERIM CORRECTIVE MEASURE)
- MANGROVE
- TREES
- GROUND SURFACE ELEVATION CONTOUR

SOURCE:
WETLAND: GEO-MARINE, INC., SEPTEMBER 6, 2000.
CONTOUR: AERO-DYNAMICS, CORP. FEBRUARY 1998

FIGURE 4-4
SURFACE WATER AND SEDIMENT SAMPLE LOCATION MAP
SWMU 9-AREA B, TANK 214 AREA
SERA AND STEP 3A OF THE BERA REPORT

NAVAL ACTIVITY PUERTO RICO

K:_SOUTHNAVFAC\119197 JM01\SWMU 9 – Area B, Tank 214 Area\SERA and Step 3a of the BERA Report\cad\119197_9-214_15.dwg



NOTES:
1. ECOLOGICAL SCREENING LEVEL FOR LEAD IS 120 mg/Kg
2. TOPOGRAPHIC CONTOURS HAVE NOT BEEN FIELD VERIFIED AND MAY NOT BE ACCURATE.

40 0 20 40
1 inch = 40 ft.

Michael Baker
INTERNATIONAL

NOTE:
TOPOGRAPHIC CONTOURS HAVE NOT BEEN FIELD VERIFIED AND MAY NOT BE ACCURATE.

LEGEND

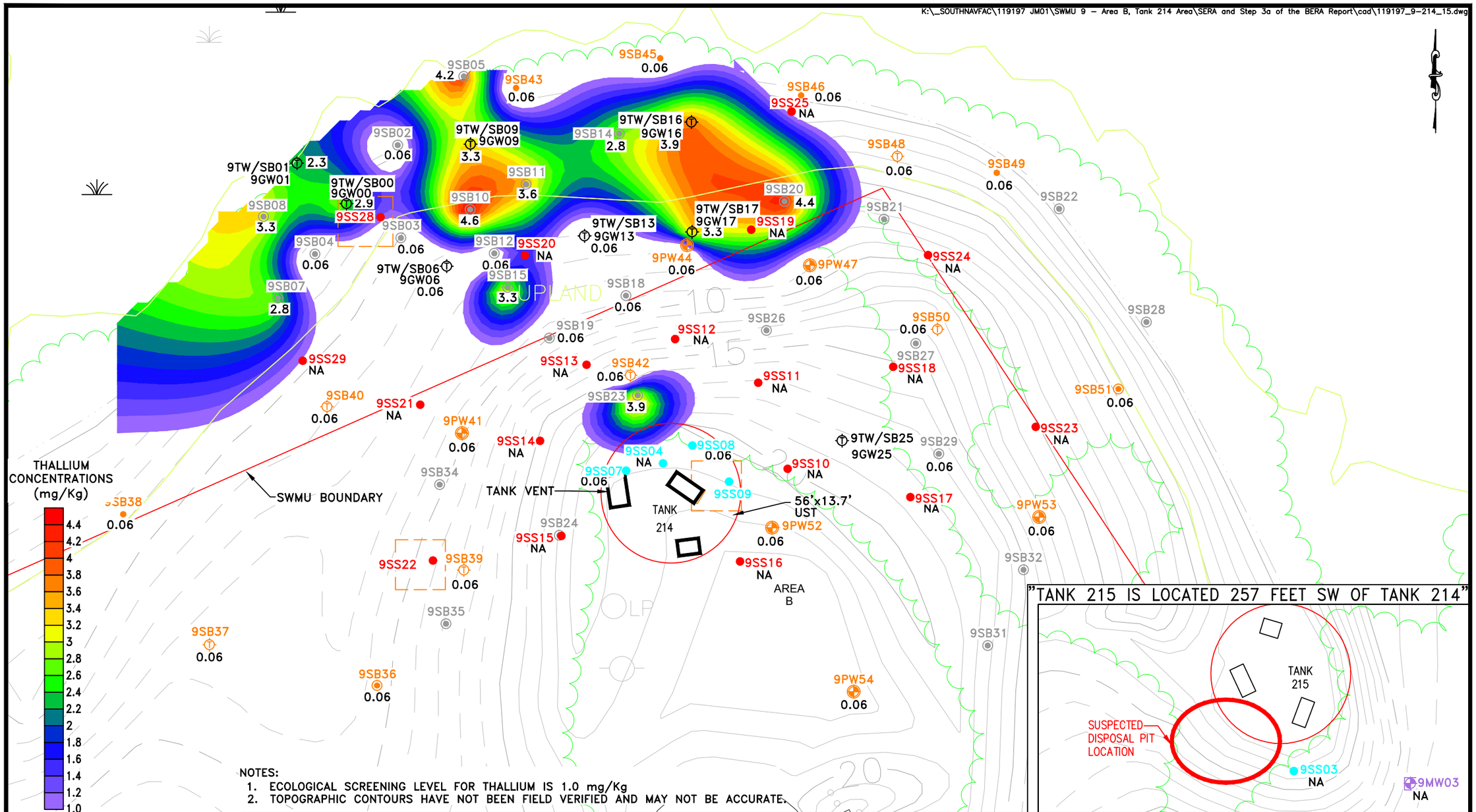
- SURFACE SOIL SAMPLE (JAN 2009 RFI)
- SURFACE AND SUBSURFACE SOIL SAMPLE (JAN 2009 RFI)
- SURFACE, SUBSURFACE SOIL AND GROUNDWATER SAMPLE (JAN 2009 RFI)
- SURFACE, SUBSURFACE SOIL AND GROUNDWATER SAMPLE (TEMPORARY WELL) (JAN 2009 RFI)
- SURFACE AND SUBSURFACE SOIL SAMPLE (2008 RFI WORK PLAN)
- SURFACE, SUBSURFACE SOIL AND GROUNDWATER SAMPLE (TEMPORARY WELL) (PHASE I RFI 2007)
- SURFACE SOIL SAMPLE (ADDITIONAL DATA COLLECTION–2003)
- SURFACE SOIL SAMPLE LOCATION (PHASE I RFI AND CMS INV.–1996/2000)
- MONITOR WELL LOCATION (PHASE I 1996)

5.3 – LEAD CONCENTRATIONS (mg/Kg)
E2SS3 – WETLAND IDENTIFICATION
– MAY 2006 EXCAVATION (INTERIM CORRECTIVE MEASURE)
– MANGROVE
– TREES
– GROUND SURFACE ELEVATION CONTOUR

SOURCE:
WETLAND: GEO–MARINE, INC., SEPTEMBER 6, 2000.
CONTOUR: AERO–DYNAMICS, CORP. FEBRUARY 1998

FIGURE 10–1
EXTENT OF LEAD GREATER THAN THE ECOLOGICAL SCREENING LEVEL IN SURFACE SOIL
SWMU 9–AREA B, TANK 214 AREA
SERA AND STEP 3A OF THE BERA REPORT
NAVAL ACTIVITY PUERTO RICO

K:_SOUTHNAVFAC\119197 JM01\SWMU 9 – Area B, Tank 214 Area\SERA and Step 3a of the BERA Report\cad\119197_9-214_15.dwg



NOTES:
1. ECOLOGICAL SCREENING LEVEL FOR THALLIUM IS 1.0 mg/Kg
2. TOPOGRAPHIC CONTOURS HAVE NOT BEEN FIELD VERIFIED AND MAY NOT BE ACCURATE.

40 0 20 40
1 inch = 40 ft.

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LEGEND

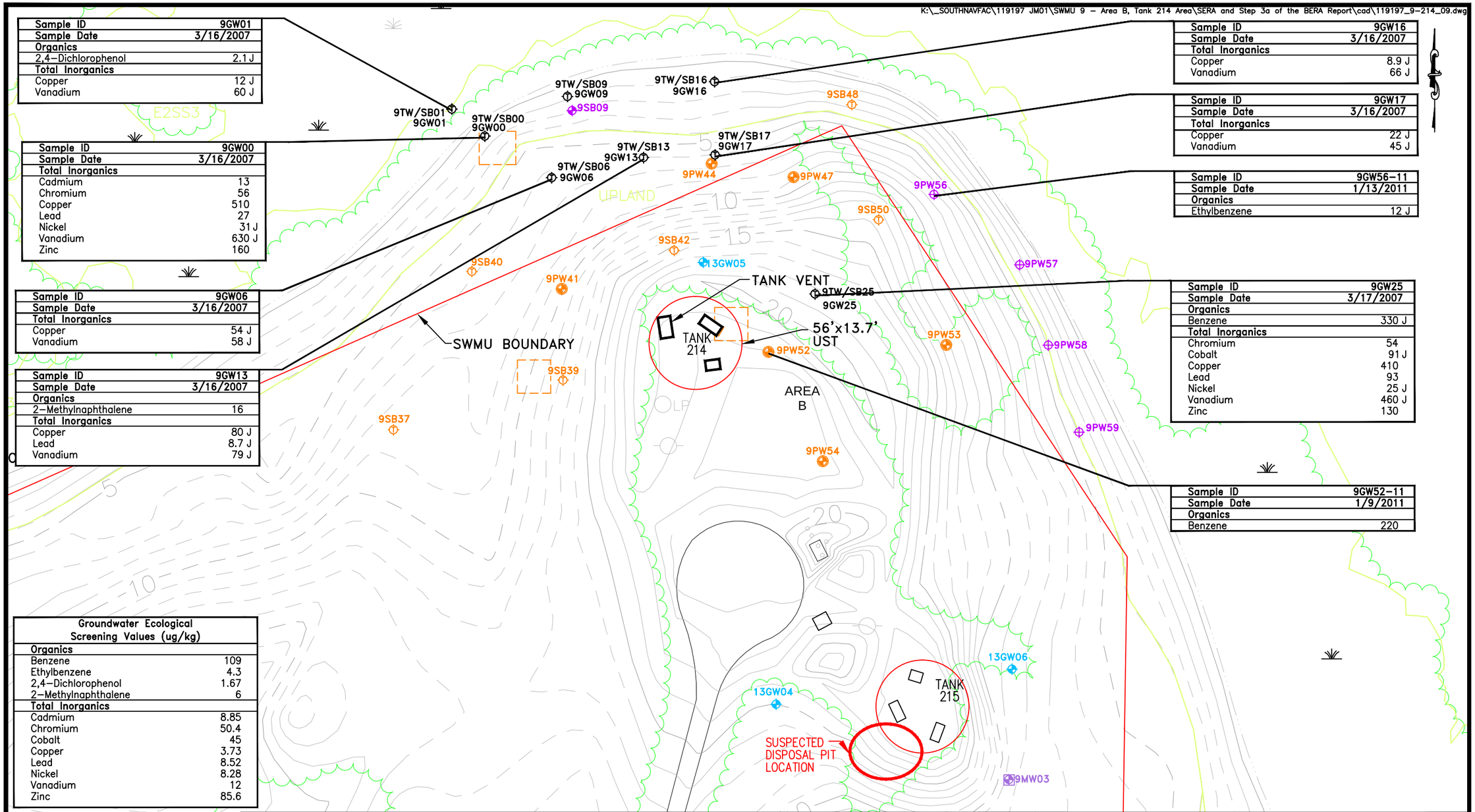
- SURFACE SOIL SAMPLE (JAN 2009 RFI)
- SURFACE AND SUBSURFACE SOIL SAMPLE (JAN 2009 RFI)
- SURFACE, SUBSURFACE SOIL AND GROUNDWATER SAMPLE (JAN 2009 RFI)
- SURFACE, SUBSURFACE SOIL AND GROUNDWATER SAMPLE (TEMPORARY WELL) (JAN 2009 RFI)
- SURFACE AND SUBSURFACE SOIL SAMPLE (2008 RFI WORK PLAN)
- SURFACE, SUBSURFACE SOIL AND GROUNDWATER SAMPLE (TEMPORARY WELL) (PHASE I RFI 2007)
- SURFACE SOIL SAMPLE (ADDITIONAL DATA COLLECTION–2003)
- SURFACE SOIL SAMPLE LOCATION (PHASE I RFI AND CMS INV.–1996/2000)
- MONITOR WELL LOCATION (PHASE I 1996)

0.06 – THALLIUM CONCENTRATIONS (mg/Kg)
E2SS3 – WETLAND IDENTIFICATION
– MAY 2006 EXCAVATION (INTERIM CORRECTIVE MEASURE)
– MANGROVE
– TREES
– GROUND SURFACE ELEVATION CONTOUR

SOURCE:
WETLAND: GEO–MARINE, INC., SEPTEMBER 6, 2000.
CONTOUR: AERO–DYNAMICS, CORP. FEBRUARY 1998

FIGURE 10–2
EXTENT OF THALLIUM GREATER THAN THE ECOLOGICAL SCREENING LEVEL IN SURFACE SOIL
SWMU 9–AREA B, TANK 214 AREA
SERA AND STEP 3A OF THE BERA REPORT
NAVAL ACTIVITY PUERTO RICO

K:_SOUTHNAVFAC\119197 JM01\SWMU 9 – Area B, Tank 214 Area\SERA and Step 3a of the BERA Report\cad\119197_9-214_09.dwg



Sample ID	9GW01
Sample Date	3/16/2007
Organics	
2,4–Dichlorophenol	2.1 J
Total Inorganics	
Copper	12 J
Vanadium	60 J

Sample ID	9GW00
Sample Date	3/16/2007
Total Inorganics	
Cadmium	13
Chromium	56
Copper	510
Lead	27
Nickel	31 J
Vanadium	630 J
Zinc	160

Sample ID	9GW06
Sample Date	3/16/2007
Total Inorganics	
Copper	54 J
Vanadium	58 J

Sample ID	9GW13
Sample Date	3/16/2007
Organics	
2–Methylnaphthalene	16
Total Inorganics	
Copper	80 J
Lead	8.7 J
Vanadium	79 J

Sample ID	9GW16
Sample Date	3/16/2007
Total Inorganics	
Copper	8.9 J
Vanadium	66 J

Sample ID	9GW17
Sample Date	3/16/2007
Total Inorganics	
Copper	22 J
Vanadium	45 J

Sample ID	9GW56–11
Sample Date	1/13/2011
Organics	
Ethylbenzene	12 J

Sample ID	9GW25
Sample Date	3/17/2007
Organics	
Benzene	330 J
Total Inorganics	
Chromium	54
Cobalt	91 J
Copper	410
Lead	93
Nickel	25 J
Vanadium	460 J
Zinc	130

Sample ID	9GW52–11
Sample Date	1/9/2011
Organics	
Benzene	220

Groundwater Ecological Screening Values (ug/kg)	
Organics	
Benzene	109
Ethylbenzene	4.3
2,4–Dichlorophenol	1.67
2–Methylnaphthalene	6
Total Inorganics	
Cadmium	8.85
Chromium	50.4
Cobalt	45
Copper	3.73
Lead	8.52
Nickel	8.28
Vanadium	12
Zinc	85.6

60 0 30 60
1 inch = 60 ft.

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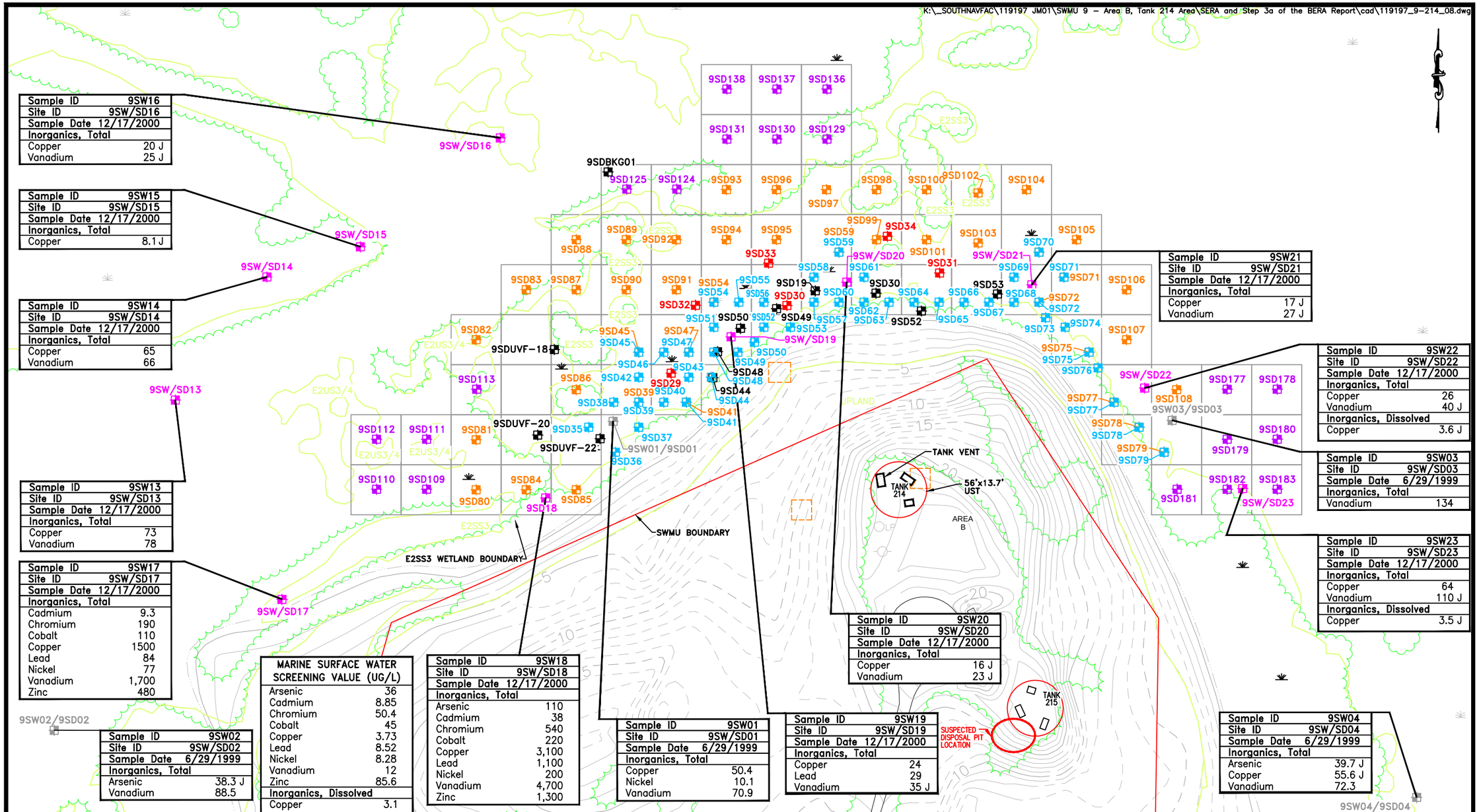
NOTE:
TOPOGRAPHIC CONTOURS HAVE NOT BEEN FIELD VERIFIED AND MAY NOT BE ACCURATE.

LEGEND

- SUBSURFACE SOIL AND GROUNDWATER SAMPLE (JAN 2011 RFI)
- GROUNDWATER SAMPLE (JAN 2011 RFI)
- SURFACE, SUBSURFACE SOIL AND GROUNDWATER SAMPLE (JAN 2009 RFI)
- GROUNDWATER SAMPLE (JAN 2009 RFI)
- SURFACE, SUBSURFACE SOIL AND GROUNDWATER SAMPLE (TEMPORARY WELL) (JAN 2009 RFI)
- SURFACE, SUBSURFACE SOIL AND GROUNDWATER SAMPLE (TEMPORARY WELL) (PHASE I RFI 2007)
- MONITOR WELL LOCATION (PHASE I 1996)
- EXISTING MONITORING WELL
- E2SS3 – WETLAND IDENTIFICATION
- MAY 2006 EXCAVATION (INTERIM CORRECTIVE MEASURE)
- MANGROVE
- TREES
- GROUND SURFACE ELEVATION CONTOUR

SOURCE:
WETLAND: GEO–MARINE, INC., SEPTEMBER 6, 2000.
CONTOUR: AERO–DYNAMICS, CORP. FEBRUARY 1998

FIGURE 10–3
DETECTED CONCENTRATIONS IN GROUNDWATER EXCEEDING GROUNDWATER SCREENING VALUES
SWMU 9–AREA B, TANK 214 AREA
SERA AND STEP 3A OF THE BERA REPORT
NAVAL ACTIVITY PUERTO RICO



Sample ID	9SW16
Site ID	9SW/SD16
Sample Date	12/17/2000
Inorganics, Total	
Copper	20 J
Vanadium	25 J

Sample ID	9SW15
Site ID	9SW/SD15
Sample Date	12/17/2000
Inorganics, Total	
Copper	8.1 J

Sample ID	9SW14
Site ID	9SW/SD14
Sample Date	12/17/2000
Inorganics, Total	
Copper	65
Vanadium	66

Sample ID	9SW13
Site ID	9SW/SD13
Sample Date	12/17/2000
Inorganics, Total	
Copper	73
Vanadium	78

Sample ID	9SW17
Site ID	9SW/SD17
Sample Date	12/17/2000
Inorganics, Total	
Cadmium	9.3
Chromium	190
Cobalt	110
Copper	1500
Lead	84
Nickel	77
Vanadium	1,700
Zinc	480

Sample ID	9SW02
Site ID	9SW/SD02
Sample Date	6/29/1999
Inorganics, Total	
Arsenic	38.3 J
Vanadium	88.5

MARINE SURFACE WATER SCREENING VALUE (UG/L)	
Arsenic	36
Cadmium	8.85
Chromium	50.4
Cobalt	45
Copper	3.73
Lead	8.52
Nickel	8.28
Vanadium	12
Zinc	85.6
Inorganics, Dissolved	
Copper	3.1

Sample ID	9SW18
Site ID	9SW/SD18
Sample Date	12/17/2000
Inorganics, Total	
Arsenic	110
Cadmium	38
Chromium	540
Cobalt	220
Copper	3,100
Lead	1,100
Nickel	200
Vanadium	4,700
Zinc	1,300

Sample ID	9SW01
Site ID	9SW/SD01
Sample Date	6/29/1999
Inorganics, Total	
Copper	50.4
Nickel	10.1
Vanadium	70.9

Sample ID	9SW19
Site ID	9SW/SD19
Sample Date	12/17/2000
Inorganics, Total	
Copper	24
Lead	29
Vanadium	35 J

Sample ID	9SW20
Site ID	9SW/SD20
Sample Date	12/17/2000
Inorganics, Total	
Copper	16 J
Vanadium	23 J

Sample ID	9SW21
Site ID	9SW/SD21
Sample Date	12/17/2000
Inorganics, Total	
Copper	17 J
Vanadium	27 J

Sample ID	9SW22
Site ID	9SW/SD22
Sample Date	12/17/2000
Inorganics, Total	
Copper	26
Vanadium	40 J
Inorganics, Dissolved	
Copper	3.6 J

Sample ID	9SW03
Site ID	9SW/SD03
Sample Date	6/29/1999
Inorganics, Total	
Vanadium	134

Sample ID	9SW23
Site ID	9SW/SD23
Sample Date	12/17/2000
Inorganics, Total	
Copper	64
Vanadium	110 J
Inorganics, Dissolved	
Copper	3.5 J

Sample ID	9SW04
Site ID	9SW/SD04
Sample Date	6/29/1999
Inorganics, Total	
Arsenic	39.7 J
Copper	55.6 J
Vanadium	72.3

100 0 50 100

1 inch = 100 ft.

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NOTE:
TOPOGRAPHIC CONTOURS HAVE NOT BEEN FIELD VERIFIED AND MAY NOT BE ACCURATE.

LEGEND

- SEDIMENT SAMPLE (1999 PHASE III RFI)
- SEDIMENT SAMPLE (2000 CMS)
- SEDIMENT SAMPLE LOCATION (ADDITIONAL DATA COLLECTION–2003)
- SEDIMENT SAMPLE LOCATION (STEP 3B AND 4 DRAFT 2005)
- SEDIMENT SAMPLE (PHASE I RFI–2007)
- SEDIMENT SAMPLE (JAN 2009 RFI)
- SEDIMENT SAMPLE (JAN 2011 RFI)
- E2SS3 – WETLAND IDENTIFICATION
- MAY 2006 EXCAVATION (INTERIM CORRECTIVE MEASURE)
- MANGROVE
- TREES
- GROUND SURFACE ELEVATION CONTOUR

SOURCE:
WETLAND: GEO–MARINE, INC., SEPTEMBER 6, 2000.
CONTOUR: AERO–DYNAMICS, CORP. FEBRUARY 1998

FIGURE 10–4
DETECTED CONCENTRATIONS IN SURFACE WATER EXCEEDING SURFACE WATER SCREENING VALUES
SWMU 9–AREA B, TANK 214 AREA
SERA AND STEP 3A OF THE BERA REPORT
NAVAL ACTIVITY PUERTO RICO

APPENDICES

APPENDIX A

Data Used in the Ecological Risk Assessment

APPENDIX A

SUMMARY OF ANALYTICAL RESULTS - SURFACE SOIL
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SS03	9SS04	9MW03	9SS07	9SS08	9SS10	9SS11	9SS12	9SS13	9SS14	9SS15
Sample ID	9SS03	9SS04	9MW03-00	9SS07	9SS08	9SS10	9SS11	9SS12	9SS13	9SS14	9SS15
Sample Date	3/20/1996	3/20/1996	3/20/1996	12/16/2000	12/16/2000	7/14/2003	7/14/2003	7/14/2003	7/14/2003	7/14/2003	7/14/2003
Sample Depth (ft bgs)	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
Volatile Organics (µg/kg)											
1,1,1,2-Tetrachloroethane	12 U	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	6 U	6 U	5 U	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	6 U	6 U	5 U	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	6 U	6 U	5 U	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	6 U	6 U	5 U	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	6 U	6 U	5 U	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	12 U	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane (DBCP)	23 U	22 U	21 U	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (EDB)	23 U	22 U	21 U	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	6 U	6 U	5 UJ	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (total)	6 U	6 U	5 U	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	6 U	6 U	5 U	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichloropropene (cis)	6 U	6 U	5 U	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichloropropene (trans)	6 U	6 U	5 U	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichloro-2-butene (trans)	23 U	22 U	21 U	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	12 UJ	11 UJ	11 U	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloro-1,3-butadiene (Chloroprene)	120 U	110 U	110 U	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone (MBK)	12 UJ	11 UJ	11 U	NA	NA	NA	NA	NA	NA	NA	NA
3-Chloropropene (Allyl Chloride)	23 U	22 U	21 U	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	12 UJ	11 UJ	11 U	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	22 J	11 UJ	14 J	NA	NA	NA	NA	NA	NA	NA	NA
Acetonitrile	120 U	110 U	110 U	NA	NA	NA	NA	NA	NA	NA	NA
Acrolein	580 UJ	550 UJ	530 U	NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	120 U	110 U	110 U	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	6 U	6 U	5 U	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	6 U	6 U	5 U	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	6 U	6 U	5 U	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	12 U	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Disulfide	6 U	6 U	5 U	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Tetrachloride	6 U	6 U	5 UJ	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	6 U	6 U	5 U	NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane	12 U	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	6 U	6 U	5 U	NA	NA	NA	NA	NA	NA	NA	NA
Chloromethane	12 U	11 U	11 UJ	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	6 U	6 U	5 U	NA	NA	NA	NA	NA	NA	NA	NA

APPENDIX A

SUMMARY OF ANALYTICAL RESULTS - SURFACE SOIL
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SS03	9SS04	9MW03	9SS07	9SS08	9SS10	9SS11	9SS12	9SS13	9SS14	9SS15
Sample ID	9SS03	9SS04	9MW03-00	9SS07	9SS08	9SS10	9SS11	9SS12	9SS13	9SS14	9SS15
Sample Date	3/20/1996	3/20/1996	3/20/1996	12/16/2000	12/16/2000	7/14/2003	7/14/2003	7/14/2003	7/14/2003	7/14/2003	7/14/2003
Sample Depth (ft bgs)	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
Volatile Organics (µg/kg) (continued)											
Dibromomethane	12 U	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methacrylate	23 U	22 U	21 U	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	6 U	6 U	5 U	NA	NA	NA	NA	NA	NA	NA	NA
Freon 11 (Trichlorofluoromethane)	12 UJ	11 UJ	11 U	NA	NA	NA	NA	NA	NA	NA	NA
Freon-12 (Dichlorodifluoromethane)	23 UJ	22 UJ	21 UJ	NA	NA	NA	NA	NA	NA	NA	NA
Isobutyl Alcohol	2300 R	2200 R	2100 R	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Acrylonitrile	23 U	22 U	21 U	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Iodide	12 U	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Methacrylate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	6 U	6 U	5 UJ	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloroethane	23 U	22 U	21 U	NA	NA	NA	NA	NA	NA	NA	NA
Propionitrile (Ethyl Cyanide)	58 UJ	55 UJ	53 R	NA	NA	NA	NA	NA	NA	NA	NA
Styrene (Ethenylbenzene)	6 U	6 U	5 U	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene (PCE)	6 U	6 U	5 U	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	6 U	6 U	5 U	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene (TCE)	6 U	6 U	5 U	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Acetate	12 U	11 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Chloride	12 U	11 U	11 UJ	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes, total	6 U	6 U	5 U	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organics (µg/kg)											
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	380 R	360 U	350 R	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Diphenylhydrazine	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trinitrobenzene (TNB)	3800 UJ	3600 U	3500 U	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene (m-)	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene (m-)	760 U	730 U	700 U	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene (p-)	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane (p-)	760 U	730 U	700 U	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Naphthoquinone	1900 UJ	1800 UJ	1700 UJ	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Phenylenediamine	760 UJ	730 UJ	700 U	NA	NA	NA	NA	NA	NA	NA	NA
1-Naphthylamine	760 U	730 U	700 U	NA	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis[1-chloropropane]	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	380 U	360 UJ	350 U	NA	NA	NA	NA	NA	NA	NA	NA

APPENDIX A

SUMMARY OF ANALYTICAL RESULTS - SURFACE SOIL
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SS03	9SS04	9MW03	9SS07	9SS08	9SS10	9SS11	9SS12	9SS13	9SS14	9SS15
Sample ID	9SS03	9SS04	9MW03-00	9SS07	9SS08	9SS10	9SS11	9SS12	9SS13	9SS14	9SS15
Sample Date	3/20/1996	3/20/1996	3/20/1996	12/16/2000	12/16/2000	7/14/2003	7/14/2003	7/14/2003	7/14/2003	7/14/2003	7/14/2003
Sample Depth (ft bgs)	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
Semivolatile Organics (µg/kg) (continued)											
2,4,5-Trichlorophenol	1900 U	1800 U	1700 U	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	1900 UJ	1800 UJ	1700 U	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene (DNT)	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dichlorophenol	380 U	360 U	350 UJ	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene (DNT)	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
2-Acetylaminofluorene	760 U	730 U	700 U	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
2-Methyl-5-nitroaniline	760 UJ	730 U	700 U	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol (o-Cresol)	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
2-Naphthylamine	960 U	910 UJ	870 U	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	1900 U	1800 U	1700 U	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
2-Picoline	380 U	360 UJ	350 U	NA	NA	NA	NA	NA	NA	NA	NA
3 & 4 Methylphenol	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	760 U	730 U	700 U	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dimethylbenzidine	1900 U	1800 U	1700 U	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylcholanthrene	380 U	360 UJ	350 U	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	1900 U	1800 U	1700 U	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	1900 UJ	1800 U	1700 U	NA	NA	NA	NA	NA	NA	NA	NA
4-Aminobiphenyl	760 U	730 U	700 U	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	380 U	360 U	350 UJ	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	760 U	730 U	700 U	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	760 U	730 U	700 U	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
4-Dimethylaminoazobenzene (p-)	760 UJ	730 U	700 U	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	1900 U	1800 U	1700 U	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	1900 U	1800 U	1700 U	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroquinoline-1-oxide	1900 UJ	1800 R	1700 R	NA	NA	NA	NA	NA	NA	NA	NA
7,12-Dimethylbenz(a)anthracene	760 U	730 UJ	700 U	NA	NA	NA	NA	NA	NA	NA	NA
a,a-Dimethylphenethylamine	1900 U	1800 UJ	1700 UJ	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	380 U	360 U	350 U	18 U	44 U	NA	NA	NA	NA	NA	NA
Aniline	1900 U	1800 UJ	1700 U	NA	NA	NA	NA	NA	NA	NA	NA

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SS03	9SS04	9MW03	9SS07	9SS08	9SS10	9SS11	9SS12	9SS13	9SS14	9SS15
Sample ID	9SS03	9SS04	9MW03-00	9SS07	9SS08	9SS10	9SS11	9SS12	9SS13	9SS14	9SS15
Sample Date	3/20/1996	3/20/1996	3/20/1996	12/16/2000	12/16/2000	7/14/2003	7/14/2003	7/14/2003	7/14/2003	7/14/2003	7/14/2003
Sample Depth (ft bgs)	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
Semivolatile Organics (µg/kg) (continued)											
Aramite	760 R	730 UJ	700 U	NA	NA	NA	NA	NA	NA	NA	NA
Benzidine	3800 UJ	3600 UJ	3500 UJ	NA	NA	NA	NA	NA	NA	NA	NA
Benzoic Acid	1900 UJ	1800 U	1700 UJ	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	380 UJ	360 U	350 UJ	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethyl)ether	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) Phthalate (BEHP)	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
Butyl Benzyl Phthalate	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
Diallate (total)	380 UJ	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl Phthalate (DEP)	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl Phthalate	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl Phthalate (DBP)	40 J	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octyl Phthalate	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
Dinoseb	760 U	730 UJ	700 U	NA	NA	NA	NA	NA	NA	NA	NA
Diphenylamine	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl 4,4'-Dichlorobenzilate (Chlorobenzilate)	382 U	362 U	352 U	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methane Sulfonate (EMS)	383 U	363 U	353 U	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloro-1,3-butadiene	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorophene	3800 R	3600 R	3500 R	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloropropene	1900 U	1800 U	1700 U	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
Isosafrole	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
Methapyrilene	960 UJ	910 UJ	870 UJ	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Methane Sulfonate	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Parathion	381 U	361 U	351 U	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiethylamine	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodimethylamine (NDMA)	380 UJ	360 UJ	350 U	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-butylamine	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodi-n-propylamine	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SS03	9SS04	9MW03	9SS07	9SS08	9SS10	9SS11	9SS12	9SS13	9SS14	9SS15
Sample ID	9SS03	9SS04	9MW03-00	9SS07	9SS08	9SS10	9SS11	9SS12	9SS13	9SS14	9SS15
Sample Date	3/20/1996	3/20/1996	3/20/1996	12/16/2000	12/16/2000	7/14/2003	7/14/2003	7/14/2003	7/14/2003	7/14/2003	7/14/2003
Sample Depth (ft bgs)	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
Semivolatile Organics (µg/kg) (continued)											
n-Nitrosomethylethylamine	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosomorpholine	760 U	730 U	700 U	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopiperidine	380 UJ	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopyrrolidine	1900 U	1800 U	1700 U	NA	NA	NA	NA	NA	NA	NA	NA
o-Toluidine	380 U	360 R	350 U	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorobenzene	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloronitrobenzene	380 U	360 U	350 R	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	1900 U	1800 U	1700 U	NA	NA	NA	NA	NA	NA	NA	NA
Phenacetin	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
Pronamide	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
Pyridine	760 U	730 U	700 UJ	NA	NA	NA	NA	NA	NA	NA	NA
Safrole	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (µg/kg)											
1-Methylnaphthalene	NA	NA	NA	18 U	44 UJ	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	380 UJ	360 U	350 UJ	18 U	44 U	NA	NA	NA	NA	NA	NA
Acenaphthene	380 U	360 U	350 U	18 U	44 U	NA	NA	NA	NA	NA	NA
Acenaphthylene	380 U	360 U	350 U	18 U	44 U	NA	NA	NA	NA	NA	NA
Anthracene	380 U	360 U	350 U	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	380 U	360 U	350 U	18 U	44 U	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene (BaP)	380 U	360 U	350 U	18 U	44 UJ	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	380 U	360 U	350 U	18 U	44 UJ	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	380 U	360 U	350 U	18 U	44 UJ	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	380 U	360 U	350 U	18 U	44 UJ	NA	NA	NA	NA	NA	NA
Chrysene	380 U	360 U	350 U	18 U	44 U	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	380 U	360 U	350 U	18 U	44 UJ	NA	NA	NA	NA	NA	NA
Fluoranthene	380 U	360 U	350 U	18 U	44 U	NA	NA	NA	NA	NA	NA
Fluorene	380 U	360 U	350 U	18 U	44 U	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	380 U	360 U	350 U	18 U	44 UJ	NA	NA	NA	NA	NA	NA
Naphthalene	380 U	360 U	350 U	18 U	44 U	NA	NA	NA	NA	NA	NA
Phenanthrene	380 U	360 U	350 U	18 U	44 U	NA	NA	NA	NA	NA	NA
Pyrene	380 U	360 U	350 U	18 U	44 U	NA	NA	NA	NA	NA	NA

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SS03	9SS04	9MW03	9SS07	9SS08	9SS10	9SS11	9SS12	9SS13	9SS14	9SS15
Sample ID	9SS03	9SS04	9MW03-00	9SS07	9SS08	9SS10	9SS11	9SS12	9SS13	9SS14	9SS15
Sample Date	3/20/1996	3/20/1996	3/20/1996	12/16/2000	12/16/2000	7/14/2003	7/14/2003	7/14/2003	7/14/2003	7/14/2003	7/14/2003
Sample Depth (ft bgs)	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
Organophosphorous Pesticides (µg/kg)											
Dimethoate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Disulfoton	381 U	361 U	351 U	NA	NA	NA	NA	NA	NA	NA	NA
Famphur	384 U	364 U	354 U	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Parathion	381 U	361 U	351 U	NA	NA	NA	NA	NA	NA	NA	NA
o,o,o-Triethyl Phosphorothioate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phorate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfotepp	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thionazin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals (mg/kg)											
Antimony	NA	NA	NA	2.7 UJ	2.4 UJ	NA	NA	NA	NA	NA	NA
Arsenic	2	1.7 J	1.3	23	2.4	NA	NA	NA	NA	NA	NA
Barium	115	84.7	56.5	150	93	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	0.32 J	0.26 J	NA	NA	NA	NA	NA	NA
Cadmium	0.2 U	0.22 U	0.42	1.8	0.63	NA	NA	NA	NA	NA	NA
Chromium	9.3 J	9.5 J	13.2 J	37 J	23 J	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	28	23	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	410 R	110 R	NA	NA	NA	NA	NA	NA
Lead	30	258	15.1	140 R	150 J	31	33	66	46	14	240
Mercury	0.04 U	0.06 U	0.05 U	0.017 J	0.019 J	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	7.7	6.4	NA	NA	NA	NA	NA	NA
Selenium	1.1 J	0.88 UJ	0.62 J	1.3 U	0.57 J	NA	NA	NA	NA	NA	NA
Silver	0.28 U	0.3 U	0.26 U	1.3 U	1.2 U	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	1.3 U	1.2 U	NA	NA	NA	NA	NA	NA
Tin	NA	NA	NA	6.7 U	5.9 U	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	160	120	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	520 J	96 J	50 J	61 J	45 J	50 J	52 J	70 J

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SS16	9SS17	9SS18	9SS19	9SS20	9SS21	9SS23	9SS24	9SS25	9SS29	9SB00
Sample ID	9SS16	9SS17	9SS18	9SS19	9SS20	9SS21	9SS23	9SS24	9SS25	9SS29	9SB00-00
Sample Date	7/14/2003	7/14/2003	7/14/2003	7/14/2003	7/14/2003	7/14/2003	7/15/2003	7/15/2003	7/15/2003	7/14/2003	3/12/2007
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 1.0
Volatile Organics (µg/kg)											
1,1,1,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 UJ
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.75 UJ
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.88 UJ
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.1 UJ
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.88 UJ
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.97 UJ
1,2,3-Trichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.4 UJ
1,2-Dibromo-3-chloropropane (DBCP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4 UJ
1,2-Dibromoethane (EDB)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 UJ
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.1 UJ
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.97 UJ
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.1 UJ
1,3-Dichloropropene (cis)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.8 UJ
1,3-Dichloropropene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.97 UJ
1,4-Dichloro-2-butene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.5 UJ
2-Butanone (MEK)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	61 J
2-Chloro-1,3-butadiene (Chloroprene)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.73 UJ
2-Hexanone (MBK)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.8 UJ
3-Chloropropene (Allyl Chloride)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.1 UJ
4-Methyl-2-pentanone (MIBK)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.1 UJ
Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 J
Acetonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25 UJ
Acrolein	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	9.7 UJ
Acrylonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	14 UJ
Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.76 UJ
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.88 UJ
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.9 UJ
Bromomethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.1 UJ
Carbon Disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.88 UJ
Carbon Tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.78 UJ
Chlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.61 UJ
Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.3 UJ
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.77 UJ
Chloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.62 UJ
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.97 UJ

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SS16	9SS17	9SS18	9SS19	9SS20	9SS21	9SS23	9SS24	9SS25	9SS29	9SB00
Sample ID	9SS16	9SS17	9SS18	9SS19	9SS20	9SS21	9SS23	9SS24	9SS25	9SS29	9SB00-00
Sample Date	7/14/2003	7/14/2003	7/14/2003	7/14/2003	7/14/2003	7/14/2003	7/15/2003	7/15/2003	7/15/2003	7/14/2003	3/12/2007
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 1.0
Volatile Organics (µg/kg) (continued)											
Dibromomethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.1 UJ
Ethyl Methacrylate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.68 UJ
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.77 UJ
Freon 11 (Trichlorofluoromethane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 UJ
Freon-12 (Dichlorodifluoromethane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.2 UJ
Isobutyl Alcohol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	110 UJ
Methyl Acrylonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	14 UJ
Methyl Iodide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.88 UJ
Methyl Methacrylate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.5 UJ
Methylene Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.4 UJ
Pentachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4 UJ
Propionitrile (Ethyl Cyanide)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20 UJ
Styrene (Ethenylbenzene)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.75 UJ
Tetrachloroethene (PCE)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.88 UJ
Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.88 UJ
Trichloroethene (TCE)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.1 UJ
Vinyl Acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.7 UJ
Vinyl Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.81 UJ
Xylenes, total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.8 UJ
Semivolatile Organics (µg/kg)											
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	34 U
1,2,4,5-Tetrachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	37 U
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25 U
1,2-Dichlorobenzene (o-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	27 U
1,2-Diphenylhydrazine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trinitrobenzene (TNB)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	97 U
1,3-Dichlorobenzene (m-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	31 U
1,3-Dinitrobenzene (m-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	59 U
1,4-Dichlorobenzene (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	26 U
1,4-Dioxane (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	78 U
1,4-Naphthoquinone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	46 U
1,4-Phenylenediamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2000 U
1-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	97 U
2,2'-Oxybis[1-chloropropane]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	41 U
2,3,4,6-Tetrachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	53 U

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SUMMARY OF ANALYTICAL RESULTS - SURFACE SOIL
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SS16	9SS17	9SS18	9SS19	9SS20	9SS21	9SS23	9SS24	9SS25	9SS29	9SB00
Sample ID	9SS16	9SS17	9SS18	9SS19	9SS20	9SS21	9SS23	9SS24	9SS25	9SS29	9SB00-00
Sample Date	7/14/2003	7/14/2003	7/14/2003	7/14/2003	7/14/2003	7/14/2003	7/15/2003	7/15/2003	7/15/2003	7/14/2003	3/12/2007
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 1.0
Semivolatile Organics (µg/kg) (continued)											
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	38 U
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	24 U
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	27 U
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	41 U
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	200 U
2,4-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	22 U
2,6-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	62 U
2,6-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	39 U
2-Acetylaminofluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	45 U
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	28 U
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	32 U
2-Methyl-5-nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	38 U
2-Methylphenol (o-Cresol)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 U
2-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	97 U
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	27 U
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	24 U
2-Picoline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	97 U
3 & 4 Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	34 U
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 U
3,3'-Dimethylbenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	490 U
3-Methylcholanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	31 U
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	39 U
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	240 U
4-Aminobiphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	64 U
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	37 U
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	40 U
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	31 U
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	22 U
4-Dimethylaminoazobenzene (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	45 U
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20 U
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	250 UJ
4-Nitroquinoline-1-oxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	200 R
7,12-Dimethylbenz(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	37 U
a,a-Dimethylphenethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	580 UJ
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	26 U
Aniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25 U

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SUMMARY OF ANALYTICAL RESULTS - SURFACE SOIL
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SS16	9SS17	9SS18	9SS19	9SS20	9SS21	9SS23	9SS24	9SS25	9SS29	9SB00
Sample ID	9SS16	9SS17	9SS18	9SS19	9SS20	9SS21	9SS23	9SS24	9SS25	9SS29	9SB00-00
Sample Date	7/14/2003	7/14/2003	7/14/2003	7/14/2003	7/14/2003	7/14/2003	7/15/2003	7/15/2003	7/15/2003	7/14/2003	3/12/2007
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 1.0
Semivolatile Organics (µg/kg) (continued)											
Aramite	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	71 UJ
Benzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzoic Acid	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	45 U
Bis(2-chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	28 U
Bis(2-chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	33 U
Bis(2-ethylhexyl) Phthalate (BEHP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	45 U
Butyl Benzyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	32 U
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diallate (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	66 U
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	22 U
Diethyl Phthalate (DEP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	26 U
Dimethyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	22 U
Di-n-butyl Phthalate (DBP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	33 U
Di-n-octyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	37 U
Dinoseb	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	98 U
Diphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl 4,4'-Dichlorobenzilate (Chlorobenzilate)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methane Sulfonate (EMS)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	78 U
Hexachloro-1,3-butadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	24 U
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	31 U
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	98 U
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	24 U
Hexachlorophene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	15000 UJ
Hexachloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	53 U
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	26 U
Isosafrole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	75 U
Methapyrilene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	49 U
Methyl Methane Sulfonate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	65 U
Methyl Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	55 U
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	41 U
n-Nitrosodiethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	52 U
n-Nitrosodimethylamine (NDMA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	70 U
n-Nitroso-di-n-butylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	61 U
n-Nitrosodi-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	33 U
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	27 U

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SS16	9SS17	9SS18	9SS19	9SS20	9SS21	9SS23	9SS24	9SS25	9SS29	9SB00
Sample ID	9SS16	9SS17	9SS18	9SS19	9SS20	9SS21	9SS23	9SS24	9SS25	9SS29	9SB00-00
Sample Date	7/14/2003	7/14/2003	7/14/2003	7/14/2003	7/14/2003	7/14/2003	7/15/2003	7/15/2003	7/15/2003	7/14/2003	3/12/2007
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 1.0
Semivolatile Organics (µg/kg) (continued)											
n-Nitrosomethylethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	61 U
n-Nitrosomorpholine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	78 U
n-Nitrosopiperidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	84 U
n-Nitrosopyrrolidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	53 U
o-Toluidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	66 U
Pentachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	75 U
Pentachloronitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	66 U
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	98 U
Phenacetin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	60 U
Phenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 U
Pronamide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	74 U
Pyridine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	35 U
Safrole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	62 U
PAHs (µg/kg)											
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.3 U
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.1 U
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U
Benzo(a)pyrene (BaP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.98 U
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.3 U
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 U
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.1 U
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.7 U
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.3 U
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.4 U
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.9 U
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.4 U
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.5 U
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.4 U

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
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Site ID	9SS16	9SS17	9SS18	9SS19	9SS20	9SS21	9SS23	9SS24	9SS25	9SS29	9SB00
Sample ID	9SS16	9SS17	9SS18	9SS19	9SS20	9SS21	9SS23	9SS24	9SS25	9SS29	9SB00-00
Sample Date	7/14/2003	7/14/2003	7/14/2003	7/14/2003	7/14/2003	7/14/2003	7/15/2003	7/15/2003	7/15/2003	7/14/2003	3/12/2007
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 1.0
Organophosphorous Pesticides (µg/kg)											
Dimethoate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	53 U
Disulfoton	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	65 U
Famphur	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	120 U
Methyl Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	55 U
o,o,o-Triethyl Phosphorothioate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	85 U
Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	65 U
Phorate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	81 U
Sulfotepp	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	65 U
Thionazin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	49 U
Metals (mg/kg)											
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.48 UJ
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.71 U
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	36
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.12 J
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.43 J
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	16 J
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	83 J
Lead	24	17	2.2	260	270	210	33	3.3	71	41	58 J
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0044 U
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.3
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.96 U
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.11 U
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.9 J
Tin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.2 U
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	140 J
Zinc	86 J	53	35	54	130	47	68	51	49	54	32 J

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SB01	9SB02	9SB03	9SB04	9SB05	9SB06	9SB07	9SB08	9SB09	9SB10	9SB11
Sample ID	9SB01-00	9SB02-00	9SB03-00	9SB04-00	9SB05-00	9SB06-00	9SB07-00	9SB08-00	9SB09-00	9SB10-00	9SB11-00
Sample Date	3/12/2007	3/12/2007	3/12/2007	3/12/2007	3/13/2007	3/13/2007	3/13/2007	3/13/2007	3/13/2007	3/13/2007	3/13/2007
Sample Depth (ft bgs)	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0
Volatile Organics (µg/kg)											
1,1,1,2-Tetrachloroethane	2 UJ	2.8 UJ	2.5 UJ	1.3 UJ	3 UJ	1.3 UJ	1.8 UJ	1.5 UJ	1.8 UJ	1.6 UJ	1.7 UJ
1,1,1-Trichloroethane	1.2 UJ	1.7 UJ	1.5 UJ	0.8 UJ	1.8 UJ	0.8 UJ	1.1 UJ	0.93 UJ	1.1 UJ	0.98 UJ	1 UJ
1,1,2,2-Tetrachloroethane	1.4 UJ	2 UJ	1.8 UJ	0.94 UJ	2.1 UJ	0.95 UJ	1.3 UJ	1.1 UJ	1.3 UJ	1.2 UJ	1.2 UJ
1,1,2-Trichloroethane	1.7 UJ	2.4 UJ	2.1 UJ	1.1 UJ	2.6 UJ	1.1 UJ	1.5 UJ	1.3 UJ	1.5 UJ	1.4 UJ	1.5 UJ
1,1-Dichloroethane	1.4 UJ	2 UJ	1.8 UJ	0.94 UJ	2.1 UJ	0.95 UJ	1.3 UJ	1.1 UJ	1.3 UJ	1.2 UJ	1.2 UJ
1,1-Dichloroethene	1.6 UJ	2.2 UJ	2 UJ	1 UJ	2.4 UJ	1 UJ	1.4 UJ	1.2 UJ	1.4 UJ	1.3 UJ	1.3 UJ
1,2,3-Trichloropropane	3.8 UJ	5.4 UJ	4.8 UJ	2.5 UJ	5.8 UJ	2.6 UJ	3.4 UJ	3 UJ	3.5 UJ	3.1 UJ	3.3 UJ
1,2-Dibromo-3-chloropropane (DBCP)	6.5 UJ	9.2 UJ	8.2 UJ	4.3 UJ	9.9 UJ	4.4 UJ	5.8 UJ	5 UJ	5.9 UJ	5.3 UJ	5.6 UJ
1,2-Dibromoethane (EDB)	2 UJ	2.8 UJ	2.5 UJ	1.3 UJ	3 UJ	1.3 UJ	1.8 UJ	1.5 UJ	1.8 UJ	1.6 UJ	1.7 UJ
1,2-Dichloroethane	1.7 UJ	2.4 UJ	2.1 UJ	1.1 UJ	2.6 UJ	1.1 UJ	1.5 UJ	1.3 UJ	1.5 UJ	1.4 UJ	1.5 UJ
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (trans)	1.6 UJ	2.2 UJ	2 UJ	1 UJ	2.4 UJ	1 UJ	1.4 UJ	1.2 UJ	1.4 UJ	1.3 UJ	1.3 UJ
1,2-Dichloropropane	1.9 UJ	2.6 UJ	2.3 UJ	1.2 UJ	2.8 UJ	1.2 UJ	1.6 UJ	1.4 UJ	1.7 UJ	1.5 UJ	1.6 UJ
1,3-Dichloropropene (cis)	1.3 UJ	1.8 UJ	1.6 UJ	0.86 UJ	2 UJ	0.86 UJ	1.2 UJ	1 UJ	1.2 UJ	1 UJ	1.1 UJ
1,3-Dichloropropene (trans)	1.6 UJ	2.2 UJ	2 UJ	1 UJ	2.4 UJ	1 UJ	1.4 UJ	1.2 UJ	1.4 UJ	1.3 UJ	1.3 UJ
1,4-Dichloro-2-butene (trans)	5.7 UJ	8 UJ	7.1 UJ	3.8 UJ	8.6 UJ	3.8 UJ	5.1 UJ	4.4 UJ	5.1 UJ	4.6 UJ	4.8 UJ
2-Butanone (MEK)	8.6 J	8 UJ	7.1 UJ	3.8 UJ	65 UJ	3.8 UJ	5.1 UJ	4.4 UJ	5.1 UJ	4.6 UJ	4.8 UJ
2-Chloro-1,3-butadiene (Chloroprene)	1.2 UJ	1.7 UJ	1.5 UJ	0.78 UJ	1.8 UJ	0.79 UJ	1.1 UJ	0.91 UJ	1.1 UJ	0.96 UJ	1 UJ
2-Hexanone (MBK)	7.7 UJ	11 UJ	9.6 UJ	5.1 UJ	12 UJ	5.1 UJ	6.8 UJ	5.9 UJ	6.9 UJ	6.2 UJ	6.5 UJ
3-Chloropropene (Allyl Chloride)	1.7 UJ	2.4 UJ	2.1 UJ	1.1 UJ	2.6 UJ	1.1 UJ	1.5 UJ	1.3 UJ	1.5 UJ	1.4 UJ	1.5 UJ
4-Methyl-2-pentanone (MIBK)	8.3 UJ	12 UJ	10 UJ	5.5 UJ	12 UJ	5.5 UJ	7.4 UJ	6.4 UJ	7.5 UJ	6.7 UJ	7 UJ
Acetone	26 J	6 UJ	18 J	2.8 UJ	120 J	8.7 J	12 J	3.3 UJ	17 J	8.6 J	25 J
Acetonitrile	40 UJ	56 UJ	50 UJ	26 UJ	60 UJ	26 UJ	36 UJ	31 UJ	36 UJ	32 UJ	34 UJ
Acrolein	16 UJ	22 UJ	20 UJ	10 UJ	24 UJ	10 UJ	14 UJ	12 UJ	14 UJ	13 UJ	13 UJ
Acrylonitrile	22 UJ	31 UJ	28 UJ	15 UJ	34 UJ	15 UJ	20 UJ	17 UJ	20 UJ	18 UJ	19 UJ
Benzene	1.2 UJ	1.7 UJ	1.5 UJ	0.81 UJ	1.8 UJ	0.81 UJ	1.1 UJ	0.94 UJ	1.1 UJ	0.99 UJ	1 UJ
Bromodichloromethane	1.4 UJ	2 UJ	1.8 UJ	0.94 UJ	2.1 UJ	0.95 UJ	1.3 UJ	1.1 UJ	1.3 UJ	1.2 UJ	1.2 UJ
Bromoform	3.1 UJ	4.4 UJ	3.9 UJ	2.1 UJ	4.7 UJ	2.1 UJ	2.8 UJ	2.4 UJ	2.8 UJ	2.5 UJ	2.7 UJ
Bromomethane	1.9 UJ	2.6 UJ	2.3 UJ	1.2 UJ	2.8 UJ	1.2 UJ	1.6 UJ	1.4 UJ	1.7 UJ	1.5 UJ	1.6 UJ
Carbon Disulfide	15 J	2 UJ	1.8 UJ	0.94 UJ	6.7 J	0.95 UJ	1.3 UJ	1.1 UJ	1.3 UJ	1.2 UJ	1.2 UJ
Carbon Tetrachloride	1.3 UJ	1.8 UJ	1.6 UJ	0.84 UJ	1.9 UJ	0.84 UJ	1.1 UJ	0.98 UJ	1.1 UJ	1 UJ	1.1 UJ
Chlorobenzene	0.98 UJ	1.4 UJ	1.2 UJ	0.65 UJ	1.5 UJ	0.65 UJ	0.88 UJ	0.76 UJ	0.89 UJ	0.79 UJ	0.84 UJ
Chloroethane	2.1 UJ	3 UJ	2.7 UJ	1.4 UJ	3.2 UJ	1.4 UJ	1.9 UJ	1.6 UJ	1.9 UJ	1.7 UJ	1.8 UJ
Chloroform	1.3 UJ	1.8 UJ	1.6 UJ	0.83 UJ	1.9 UJ	0.83 UJ	1.1 UJ	0.97 UJ	1.1 UJ	1 UJ	1.1 UJ
Chloromethane	1 UJ	1.4 UJ	1.2 UJ	0.66 UJ	1.5 UJ	0.66 UJ	0.89 UJ	0.77 UJ	0.9 UJ	0.81 UJ	0.85 UJ
Dibromochloromethane	1.6 UJ	2.2 UJ	2 UJ	1 UJ	2.4 UJ	1 UJ	1.4 UJ	1.2 UJ	1.4 UJ	1.3 UJ	1.3 UJ

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SUMMARY OF ANALYTICAL RESULTS - SURFACE SOIL
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SB01	9SB02	9SB03	9SB04	9SB05	9SB06	9SB07	9SB08	9SB09	9SB10	9SB11
Sample ID	9SB01-00	9SB02-00	9SB03-00	9SB04-00	9SB05-00	9SB06-00	9SB07-00	9SB08-00	9SB09-00	9SB10-00	9SB11-00
Sample Date	3/12/2007	3/12/2007	3/12/2007	3/12/2007	3/13/2007	3/13/2007	3/13/2007	3/13/2007	3/13/2007	3/13/2007	3/13/2007
Sample Depth (ft bgs)	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0
Volatile Organics (µg/kg) (continued)											
Dibromomethane	1.9 UJ	2.6 UJ	2.3 UJ	1.2 UJ	2.8 UJ	1.2 UJ	1.6 UJ	1.4 UJ	1.7 UJ	1.5 UJ	1.6 UJ
Ethyl Methacrylate	1.1 UJ	1.5 UJ	1.4 UJ	0.73 UJ	1.7 UJ	0.73 UJ	0.98 UJ	0.84 UJ	0.99 UJ	0.89 UJ	0.93 UJ
Ethylbenzene	1.2 UJ	1.7 UJ	1.5 UJ	0.82 UJ	1.9 UJ	0.82 UJ	1.1 UJ	0.95 UJ	1.1 UJ	1 UJ	1.1 UJ
Freon 11 (Trichlorofluoromethane)	2 UJ	2.8 UJ	2.5 UJ	1.3 UJ	3 UJ	1.3 UJ	1.8 UJ	1.5 UJ	1.8 UJ	1.6 UJ	1.7 UJ
Freon-12 (Dichlorodifluoromethane)	3.6 UJ	5 UJ	4.4 UJ	2.4 UJ	5.4 UJ	2.4 UJ	3.2 UJ	2.7 UJ	3.2 UJ	2.9 UJ	3 UJ
Isobutyl Alcohol	190 UJ	260 UJ	230 UJ	120 UJ	280 UJ	120 UJ	160 UJ	140 UJ	170 UJ	150 UJ	160 UJ
Methyl Acrylonitrile	23 UJ	32 UJ	28 UJ	15 UJ	34 UJ	15 UJ	20 UJ	18 UJ	21 UJ	18 UJ	19 UJ
Methyl Iodide	1.4 UJ	2 UJ	1.8 UJ	0.94 UJ	2.1 UJ	0.95 UJ	1.3 UJ	1.1 UJ	1.3 UJ	1.2 UJ	1.2 UJ
Methyl Methacrylate	2.4 UJ	3.3 UJ	2.9 UJ	1.6 UJ	3.6 UJ	1.6 UJ	2.1 UJ	1.8 UJ	2.1 UJ	1.9 UJ	2 UJ
Methylene Chloride	2.3 UJ	3.2 UJ	2.8 UJ	1.5 UJ	3.4 UJ	1.5 UJ	2 UJ	1.8 UJ	2.1 UJ	1.8 UJ	1.9 UJ
Pentachloroethane	6.5 UJ	9.2 UJ	8.2 UJ	4.3 UJ	9.9 UJ	4.4 UJ	5.8 UJ	5 UJ	5.9 UJ	5.3 UJ	5.6 UJ
Propionitrile (Ethyl Cyanide)	33 UJ	46 UJ	41 UJ	22 UJ	49 UJ	22 UJ	29 UJ	25 UJ	30 UJ	26 UJ	28 UJ
Styrene (Ethenylbenzene)	1.2 UJ	1.7 UJ	1.5 UJ	0.8 UJ	1.8 UJ	0.8 UJ	1.1 UJ	0.93 UJ	1.1 UJ	0.98 UJ	1 UJ
Tetrachloroethene (PCE)	1.4 UJ	2 UJ	1.8 UJ	0.94 UJ	2.1 UJ	0.95 UJ	1.3 UJ	1.1 UJ	1.3 UJ	1.2 UJ	1.2 UJ
Toluene	1.4 UJ	2 UJ	1.8 UJ	0.94 UJ	2.1 UJ	0.95 UJ	1.3 UJ	1.3 UJ	1.3 UJ	1.6 UJ	1.2 UJ
Trichloroethene (TCE)	1.7 UJ	2.4 UJ	2.1 UJ	1.1 UJ	2.6 UJ	1.1 UJ	1.5 UJ	1.3 UJ	1.5 UJ	1.4 UJ	1.5 UJ
Vinyl Acetate	2.7 UJ	3.8 UJ	3.4 UJ	1.8 UJ	4.1 UJ	1.8 UJ	2.4 UJ	2.1 UJ	2.4 UJ	2.2 UJ	2.3 UJ
Vinyl Chloride	1.3 UJ	1.8 UJ	1.6 UJ	0.87 UJ	2 UJ	0.87 UJ	1.2 UJ	1 UJ	1.2 UJ	1.1 UJ	1.1 UJ
Xylenes, total	2.8 UJ	4 UJ	3.6 UJ	1.9 UJ	4.3 UJ	1.9 UJ	2.5 UJ	2.2 UJ	2.6 UJ	2.3 UJ	2.4 UJ
Semivolatile Organics (µg/kg)											
1,1'-Biphenyl	2000 U	1000 U	310 U	170 U	1200 UJ	32 U	40 U	190 U	360 U	320 U	1600 U
1,2,4,5-Tetrachlorobenzene	2100 U	1100 U	330 U	180 U	1300 UJ	34 U	43 U	210 U	380 U	340 U	1700 U
1,2,4-Trichlorobenzene	1400 U	760 U	220 U	120 U	900 UJ	23 U	29 U	140 U	260 U	230 U	1100 U
1,2-Dichlorobenzene (o-)	1600 U	830 U	240 U	140 U	990 UJ	25 U	32 U	150 U	280 U	250 U	1300 U
1,2-Diphenylhydrazine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trinitrobenzene (TNB)	5600 U	3000 U	870 U	490 U	3500 UJ	90 U	110 U	550 U	1000 U	910 U	4500 U
1,3-Dichlorobenzene (m-)	1800 U	940 U	280 U	150 U	1100 UJ	29 U	36 U	170 U	320 U	290 U	1400 U
1,3-Dinitrobenzene (m-)	3400 U	1800 U	530 U	300 U	2100 UJ	55 U	70 U	330 U	620 U	550 U	2700 U
1,4-Dichlorobenzene (p-)	1500 U	790 U	230 U	130 U	940 UJ	24 U	31 U	150 U	270 U	240 U	1200 U
1,4-Dioxane (p-)	4500 U	2400 U	700 U	390 U	2800 UJ	72 U	92 U	440 U	810 U	730 U	3600 U
1,4-Naphthoquinone	2700 U	1400 U	410 U	230 U	1700 UJ	43 U	54 U	260 U	480 U	430 U	2100 U
1,4-Phenylenediamine	120000 U	61000 U	18000 U	10000 U	73000 UJ	1900 U	2400 U	11000 U	21000 U	19000 U	92000 U
1-Naphthylamine	5600 U	3000 U	870 U	490 U	3500 UJ	90 U	110 U	550 U	1000 U	910 U	4500 U
2,2'-Oxybis[1-chloropropane]	2400 U	1300 U	370 U	210 U	1500 UJ	38 U	49 U	230 U	430 U	390 U	1900 U
2,3,4,6-Tetrachlorophenol	3100 U	1600 U	480 U	270 U	1900 UJ	49 U	63 U	300 U	550 U	500 U	2400 U

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SUMMARY OF ANALYTICAL RESULTS - SURFACE SOIL
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SB01	9SB02	9SB03	9SB04	9SB05	9SB06	9SB07	9SB08	9SB09	9SB10	9SB11
Sample ID	9SB01-00	9SB02-00	9SB03-00	9SB04-00	9SB05-00	9SB06-00	9SB07-00	9SB08-00	9SB09-00	9SB10-00	9SB11-00
Sample Date	3/12/2007	3/12/2007	3/12/2007	3/12/2007	3/13/2007	3/13/2007	3/13/2007	3/13/2007	3/13/2007	3/13/2007	3/13/2007
Sample Depth (ft bgs)	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0
Semivolatile Organics (µg/kg) (continued)											
2,4,5-Trichlorophenol	2200 U	1200 U	340 U	190 U	1400 UJ	35 U	45 U	210 U	390 U	350 U	1700 U
2,4,6-Trichlorophenol	1400 U	720 U	210 U	120 U	860 UJ	22 U	28 U	130 U	250 U	220 U	1100 U
2,4-Dichlorophenol	1600 U	830 U	240 U	140 U	990 UJ	25 U	32 U	150 U	280 U	250 U	1300 U
2,4-Dimethylphenol	2400 U	1300 U	370 U	210 U	1500 UJ	38 U	49 U	230 U	430 U	390 U	1900 U
2,4-Dinitrophenol	12000 U	6100 U	1800 U	1000 U	7300 UJ	190 U	240 U	1100 U	2100 U	1900 U	9200 U
2,4-Dinitrotoluene (DNT)	1300 U	690 U	200 U	110 U	810 UJ	21 U	26 U	130 U	230 U	210 U	1000 U
2,6-Dichlorophenol	3600 U	1900 U	560 U	310 U	2300 UJ	58 U	74 U	350 U	650 U	590 U	2900 U
2,6-Dinitrotoluene (DNT)	2200 U	1200 U	350 U	200 U	1400 UJ	36 U	46 U	220 U	410 U	360 U	1800 U
2-Acetylaminofluorene	2600 U	1400 U	400 U	230 U	1600 UJ	42 U	53 U	250 U	470 U	420 U	2100 U
2-Chloronaphthalene	1600 U	870 U	260 U	140 U	1000 UJ	26 U	33 U	160 U	300 U	270 U	1300 U
2-Chlorophenol	1800 U	980 U	290 U	160 U	1200 UJ	30 U	38 U	180 U	330 U	300 U	1500 U
2-Methyl-5-nitroaniline	2200 U	1200 U	340 U	190 U	1400 UJ	35 U	45 U	210 U	390 U	350 U	1700 U
2-Methylphenol (o-Cresol)	2000 U	1100 U	320 U	180 U	1300 UJ	33 U	42 U	200 U	370 U	330 U	1600 U
2-Naphthylamine	5600 U	3000 U	870 U	490 U	3500 UJ	90 U	110 U	550 U	1000 U	910 U	4500 U
2-Nitroaniline	1600 U	830 U	240 U	140 U	990 UJ	25 U	32 U	150 U	280 U	250 U	1300 U
2-Nitrophenol	1400 U	720 U	210 U	120 U	860 UJ	22 U	28 U	130 U	250 U	220 U	1100 U
2-Picoline	5600 U	3000 U	870 U	490 U	3500 UJ	90 U	110 U	550 U	1000 U	910 U	4500 U
3 & 4 Methylphenol	2000 U	1000 U	310 U	170 U	1200 UJ	32 U	40 U	190 U	360 U	320 U	1600 U
3,3'-Dichlorobenzidine	2000 U	1100 U	320 U	180 U	1300 UJ	33 U	42 U	200 U	370 U	330 U	1600 U
3,3'-Dimethylbenzidine	29000 U	15000 U	4500 U	2500 U	18000 UJ	460 U	580 U	2800 U	5200 U	4600 U	23000 U
3-Methylcholanthrene	1800 U	940 U	280 U	150 U	1100 UJ	29 U	36 U	170 U	320 U	290 U	1400 U
3-Nitroaniline	2200 U	1200 U	350 U	200 U	1400 UJ	36 U	46 U	220 U	410 U	360 U	1800 U
4,6-Dinitro-2-methylphenol	14000 U	7200 U	2100 U	1200 U	8600 UJ	220 U	280 U	1300 U	2500 U	2200 U	11000 U
4-Aminobiphenyl	3700 U	2000 U	570 U	320 U	2300 UJ	59 U	75 U	360 U	670 U	600 U	2900 U
4-Bromophenyl-phenylether	2100 U	1100 U	330 U	180 U	1300 UJ	34 U	43 U	210 U	380 U	340 U	1700 U
4-Chloro-3-methylphenol	2300 U	1200 U	360 U	200 U	1500 UJ	37 U	47 U	230 U	420 U	380 U	1800 U
4-Chloroaniline	1800 U	940 U	280 U	150 U	1100 UJ	29 U	36 U	170 U	320 U	290 U	1400 U
4-Chlorophenyl-phenylether	1300 U	690 U	200 U	110 U	810 UJ	21 U	26 U	130 U	230 U	210 U	1000 U
4-Dimethylaminoazobenzene (p-)	2600 U	1400 U	400 U	230 U	1600 UJ	42 U	53 U	250 U	470 U	420 U	2100 U
4-Nitroaniline	1200 U	610 U	180 U	100 U	730 UJ	19 U	24 U	110 U	210 U	190 U	920 U
4-Nitrophenol	14000 UJ	7600 UJ	2200 UJ	1200 UJ	9000 UJ	230 UJ	290 U	1400 UJ	2600 UJ	2300 UJ	11000 U
4-Nitroquinoline-1-oxide	11000 R	6000 R	1800 R	990 R	7100 R	180 R	230 R	1100 R	2000 R	1800 R	9000 R
7,12-Dimethylbenz(a)anthracene	2100 U	1100 U	330 U	180 U	1300 UJ	34 U	43 U	210 U	380 U	340 U	1700 U
a,a-Dimethylphenethylamine	33000 UJ	18000 UJ	5200 UJ	2900 UJ	21000 UJ	540 UJ	680 UJ	3300 UJ	6000 UJ	5400 UJ	27000 UJ
Acetophenone	1500 U	790 U	230 U	130 U	940 UJ	24 U	31 U	150 U	270 U	240 U	1200 U
Aniline	1400 U	760 U	220 U	120 U	900 UJ	23 U	29 U	140 U	260 U	230 U	1100 U

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SB01	9SB02	9SB03	9SB04	9SB05	9SB06	9SB07	9SB08	9SB09	9SB10	9SB11
Sample ID	9SB01-00	9SB02-00	9SB03-00	9SB04-00	9SB05-00	9SB06-00	9SB07-00	9SB08-00	9SB09-00	9SB10-00	9SB11-00
Sample Date	3/12/2007	3/12/2007	3/12/2007	3/12/2007	3/13/2007	3/13/2007	3/13/2007	3/13/2007	3/13/2007	3/13/2007	3/13/2007
Sample Depth (ft bgs)	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0
Semivolatile Organics (µg/kg) (continued)											
Aramite	4100 UJ	2200 UJ	640 UJ	360 UJ	2600 UJ	66 UJ	84 UJ	400 UJ	740 UJ	660 UJ	3300 UJ
Benzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzoic Acid	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	2600 U	1400 U	400 U	230 U	1600 UJ	42 U	53 U	250 U	470 U	420 U	2100 U
Bis(2-chloroethoxy)methane	1600 U	870 U	260 U	140 U	1000 UJ	26 U	33 U	160 U	300 U	270 U	1300 U
Bis(2-chloroethyl)ether	1900 U	1000 U	300 U	170 U	1200 UJ	31 U	39 U	190 U	340 U	310 U	1500 U
Bis(2-ethylhexyl) Phthalate (BEHP)	2600 U	1400 U	400 U	230 U	1600 UJ	42 U	53 U	250 U	470 U	420 U	2100 U
Butyl Benzyl Phthalate	1800 U	980 U	290 U	160 U	1200 UJ	30 U	38 U	180 U	330 U	300 U	1500 U
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diallate (total)	3800 U	2000 U	600 U	330 U	2400 UJ	61 U	78 U	370 U	690 U	620 U	3000 U
Dibenzofuran	1300 U	690 U	200 U	110 U	810 UJ	21 U	26 U	130 U	230 U	210 U	1000 U
Diethyl Phthalate (DEP)	1500 U	790 U	230 U	130 U	940 UJ	24 U	31 U	150 U	270 U	240 U	1200 U
Dimethyl Phthalate	1300 U	690 U	200 U	110 U	810 UJ	21 U	26 U	130 U	230 U	210 U	1000 U
Di-n-butyl Phthalate (DBP)	1900 U	1000 U	300 U	170 U	1200 UJ	31 U	39 U	190 U	340 U	310 U	1500 U
Di-n-octyl Phthalate	2100 U	1100 U	330 U	180 U	1300 UJ	34 U	43 U	210 U	380 U	340 U	1700 U
Dinoseb	5600 U	3000 U	880 U	490 U	3600 UJ	91 U	120 U	550 U	1000 U	920 U	4500 U
Diphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl 4,4'-Dichlorobenzilate (Chlorobenzilate)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methane Sulfonate (EMS)	4500 U	2400 U	700 U	390 U	2800 UJ	72 U	92 U	440 U	810 U	730 U	3600 U
Hexachloro-1,3-butadiene	1400 U	720 U	210 U	120 U	860 UJ	22 U	28 U	130 U	250 U	220 U	1100 U
Hexachlorobenzene	1800 U	940 U	280 U	150 U	1100 UJ	29 U	36 U	170 U	320 U	290 U	1400 U
Hexachlorocyclopentadiene	5600 U	3000 U	880 U	490 U	3600 UJ	91 U	120 U	550 U	1000 U	920 U	4500 U
Hexachloroethane	1400 U	720 U	210 U	120 U	860 UJ	22 U	28 U	130 U	250 U	220 U	1100 U
Hexachlorophene	850000 UJ	450000 UJ	130000 UJ	74000 UJ	540000 UJ	14000 UJ	17000 U	83000 UJ	150000 UJ	140000 UJ	680000 U
Hexachloropropene	3100 U	1600 U	480 U	270 U	1900 UJ	49 U	63 U	300 U	550 U	500 U	2400 U
Isophorone	1500 U	790 U	230 U	130 U	940 UJ	24 U	31 U	150 U	270 U	240 U	1200 U
Isosafrole	4400 U	2300 U	680 U	380 U	2700 UJ	70 U	89 U	430 U	790 U	710 U	3500 U
Methapyrilene	2900 U	1500 U	450 U	250 U	1800 UJ	46 U	58 U	280 U	520 U	460 U	2300 U
Methyl Methane Sulfonate	3700 U	2000 U	580 U	330 U	2400 UJ	60 U	77 R	370 U	680 U	610 U	3000 R
Methyl Parathion	3200 U	1700 U	500 U	280 U	2000 UJ	52 U	65 U	310 U	580 U	520 U	2600 U
Nitrobenzene	2400 U	1300 U	370 U	210 U	1500 UJ	38 U	49 U	230 U	430 U	390 U	1900 U
n-Nitrosodiethylamine	3000 U	1600 U	470 U	260 U	1900 UJ	48 U	61 U	290 U	540 U	490 U	2400 U
n-Nitrosodimethylamine (NDMA)	4000 U	2100 U	630 U	350 U	2500 UJ	65 U	82 U	390 U	730 U	650 U	3200 U
n-Nitroso-di-n-butylamine	3500 U	1900 U	550 U	310 U	2200 UJ	57 U	72 U	350 U	640 U	570 U	2800 U
n-Nitrosodi-n-propylamine	1900 U	1000 U	300 U	170 U	1200 UJ	31 U	39 U	190 U	340 U	310 U	1500 U
n-Nitrosodiphenylamine	1600 U	830 U	240 U	140 U	990 UJ	25 U	32 U	150 U	280 U	250 U	1300 U

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SB01	9SB02	9SB03	9SB04	9SB05	9SB06	9SB07	9SB08	9SB09	9SB10	9SB11
Sample ID	9SB01-00	9SB02-00	9SB03-00	9SB04-00	9SB05-00	9SB06-00	9SB07-00	9SB08-00	9SB09-00	9SB10-00	9SB11-00
Sample Date	3/12/2007	3/12/2007	3/12/2007	3/12/2007	3/13/2007	3/13/2007	3/13/2007	3/13/2007	3/13/2007	3/13/2007	3/13/2007
Sample Depth (ft bgs)	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0
Semivolatile Organics (µg/kg) (continued)											
n-Nitrosomethylethylamine	3500 U	1900 U	550 U	310 U	2200 UJ	57 U	72 U	350 U	640 U	570 U	2800 U
n-Nitrosomorpholine	4500 U	2400 U	700 U	390 U	2800 UJ	72 U	92 U	440 U	810 U	730 U	3600 U
n-Nitrosopiperidine	4800 U	2600 U	750 U	420 U	3000 UJ	78 U	99 U	470 U	870 U	780 U	3900 U
n-Nitrosopyrrolidine	3100 U	1600 U	480 U	270 U	1900 UJ	49 U	63 U	300 U	550 U	500 U	2400 U
o-Toluidine	3800 U	2000 U	600 U	330 U	2400 UJ	61 U	78 U	370 U	690 U	620 U	3000 U
Pentachlorobenzene	4400 U	2300 U	680 U	380 U	2700 UJ	70 U	89 U	430 U	790 U	710 U	3500 U
Pentachloronitrobenzene	3800 U	2000 U	600 U	330 U	2400 UJ	61 U	78 U	370 U	690 U	620 U	3000 U
Pentachlorophenol	5600 U	3000 U	880 U	490 U	3600 UJ	91 U	120 U	550 U	1000 U	920 U	4500 U
Phenacetin	3500 U	1800 U	540 U	300 U	2200 UJ	56 U	71 U	340 U	630 U	560 U	2800 U
Phenol	2000 U	1100 U	320 U	180 U	1300 UJ	33 U	42 U	200 U	370 U	330 U	1600 U
Pronamide	4300 U	2300 U	670 U	370 U	2700 UJ	69 U	88 U	420 U	780 U	700 U	3400 U
Pyridine	2000 U	1100 U	320 U	180 U	1300 UJ	33 U	42 U	200 U	370 U	330 U	1600 U
Safrole	3600 U	1900 U	560 U	310 U	2300 UJ	58 U	74 U	350 U	650 U	590 U	2900 U
PAHs (µg/kg)											
1-Methylnaphthalene	600 U	400 U	58 U	13 U	120 UJ	1.2 U	1.5 U	15 U	68 U	120 U	120 U
2-Methylnaphthalene	530 U	350 U	51 U	11 U	100 UJ	1.1 U	1.3 U	13 U	60 U	110 U	110 U
Acenaphthene	540 U	360 U	53 U	12 U	110 UJ	1.1 U	1.4 U	13 U	62 U	110 U	110 U
Acenaphthylene	530 U	350 U	52 U	12 U	100 UJ	1.1 U	1.4 U	13 U	60 U	110 U	110 U
Anthracene	540 U	360 U	53 U	12 U	110 UJ	1.1 U	1.4 U	13 U	62 U	110 U	110 U
Benzo(a)anthracene	540 U	360 U	53 U	12 U	110 UJ	1.1 U	1.4 U	13 U	62 U	110 U	110 U
Benzo(a)pyrene (BaP)	450 U	430 J	44 U	12 J	150 J	0.91 U	1.2 U	14 J	51 U	92 U	90 U
Benzo(b)fluoranthene	600 U	460 J	58 U	13 U	140 UJ	1.2 U	1.5 U	15 U	68 U	120 U	120 U
Benzo(g,h,i)perylene	720 J	760 J	79 J	12 U	230 UJ	1.1 U	1.4 U	34 J	210 J	280 J	510 J
Benzo(k)fluoranthene	460 U	330 J	45 U	10 U	97 UJ	0.93 U	1.2 U	11 U	52 U	94 U	93 U
Chrysene	1800 J	2000 J	49 U	11 U	100 UJ	1 U	1.3 U	17 J	57 U	100 U	100 U
Dibenz(a,h)anthracene	760 U	510 U	74 U	17 U	150 UJ	1.5 U	1.9 U	19 U	86 U	150 U	150 U
Fluoranthene	600 U	400 U	58 U	13 U	120 UJ	1.2 U	1.5 U	15 U	68 U	120 U	120 U
Fluorene	650 U	430 U	64 U	14 U	130 UJ	1.3 U	1.7 U	16 U	74 U	130 U	130 U
Indeno(1,2,3-cd)pyrene	870 U	580 U	85 U	19 U	170 UJ	1.8 U	2.2 U	21 U	99 U	180 U	170 U
Naphthalene	650 U	430 U	64 U	14 U	130 UJ	1.3 U	1.7 U	16 U	74 U	130 U	130 U
Phenanthrene	710 U	470 U	69 U	15 U	140 UJ	1.4 U	1.8 U	17 U	80 U	140 U	140 U
Pyrene	3300 J	1400 J	64 U	14 U	580 J	1.3 U	1.7 U	16 U	74 U	130 U	130 U

APPENDIX A

SUMMARY OF ANALYTICAL RESULTS - SURFACE SOIL
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SB01	9SB02	9SB03	9SB04	9SB05	9SB06	9SB07	9SB08	9SB09	9SB10	9SB11
Sample ID	9SB01-00	9SB02-00	9SB03-00	9SB04-00	9SB05-00	9SB06-00	9SB07-00	9SB08-00	9SB09-00	9SB10-00	9SB11-00
Sample Date	3/12/2007	3/12/2007	3/12/2007	3/12/2007	3/13/2007	3/13/2007	3/13/2007	3/13/2007	3/13/2007	3/13/2007	3/13/2007
Sample Depth (ft bgs)	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0
Organophosphorous Pesticides (µg/kg)											
Dimethoate	3100 U	1600 U	480 U	270 U	1900 UJ	49 U	63 U	300 U	550 U	500 U	2400 U
Disulfoton	3700 U	2000 U	580 U	330 U	2400 UJ	60 U	77 U	370 U	680 U	610 U	3000 U
Famphur	6700 U	3500 U	1000 U	580 U	4200 UJ	110 U	140 UJ	650 U	1200 U	1100 U	5300 UJ
Methyl Parathion	3200 U	1700 U	500 U	280 U	2000 UJ	52 U	65 U	310 U	580 U	520 U	2600 U
o,o,o-Triethyl Phosphorothioate	4900 U	2600 U	770 U	430 U	3100 UJ	79 U	100 U	480 U	890 U	800 U	3900 U
Parathion	3700 U	2000 U	580 U	330 U	2400 UJ	60 U	77 U	370 U	680 U	610 U	3000 U
Phorate	4700 U	2500 U	730 U	410 U	3000 UJ	76 U	96 U	460 U	850 U	760 U	3800 U
Sulfotepp	3700 U	2000 U	580 U	330 U	2400 UJ	60 U	77 U	370 U	680 U	610 U	3000 U
Thionazin	2900 U	1500 U	450 U	250 U	1800 UJ	46 U	58 U	280 U	520 U	460 U	2300 U
Metals (mg/kg)											
Antimony	0.56 UJ	0.77 UJ	0.45 UJ	0.51 UJ	0.45 UJ	0.45 UJ	0.57 UJ	0.54 UJ	0.5 UJ	0.48 UJ	0.47 UJ
Arsenic	1.4 J	2 J	1.1 J	0.96 J	1.3 J	0.66 U	0.84 U	1.8 J	0.75 U	1.8 J	0.8 J
Barium	45	22	62	44	49	34	38	29	26	64	51
Beryllium	0.18 J	0.16 J	0.13 J	0.15 J	0.18 J	0.11 J	0.22 J	0.14 J	0.16 J	0.28 J	0.16 J
Cadmium	0.43 J	0.37 U	0.81	0.64 J	0.54 J	0.42 J	0.33 J	0.43 J	0.44 J	0.73 J	0.58 J
Chromium	7.5	11	9.8	6.5	4.2	3.9	11	7.3	6.7	7	4.9
Cobalt	10 J	5.5 J	25 J	23 J	22 J	14 J	12 J	20 J	13 J	32 J	21 J
Copper	73 J	76 J	89 J	110 J	92 J	58 J	95 J	68 J	100 J	110 J	84 J
Lead	690 J	380 J	250 J	290 J	14 J	11 J	110 J	360 J	120 J	790 J	1000 J
Mercury	0.028	0.056	0.021	0.018 U	0.0091 U	0.014 U	0.041	0.02 U	0.032	0.034	0.032
Nickel	6.8	6.9	6.2	6.2	4.4	4	5.1	5.1	5.8	9.1	6.4
Selenium	1.1 U	1.5 U	0.9 U	1 U	0.9 U	0.89 U	1.1 U	1.1 U	1 U	0.96 U	0.94 U
Silver	0.12 U	0.17 U	0.12 J	0.11 U	0.098 U	0.13 J	0.12 U	0.12 U	0.11 U	0.11 U	0.1 U
Thallium	2.3 J	2.2 UJ	6.5 UJ	7.4 UJ	4.2 J	6.4 UJ	2.8 J	3.3 J	3.3 J	4.6 J	3.6 J
Tin	5 U	6.8 U	4 U	4.5 U	4 U	4 U	5 U	4.8 U	4.5 U	4.3 U	4.2 U
Vanadium	160 J	160 J	200 J	170 J	170 J	140 J	160 J	150 J	170 J	190 J	180 J
Zinc	94 J	38 J	42 J	48 J	37 J	35 J	42 J	61 J	47 J	71 J	83 J

APPENDIX A

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SB12	9SB13	9SB14	9SB15	9SB16	9SB17	9SB18	9SB19	9SB20	9SB23	9SB29
Sample ID	9SB12-00	9SB13-00	9SB14-00	9SB15-00	9SB16-00	9SB17-00	9SB18-00	9SB19-00	9SB20-00	9SB23-00	9SB29-00
Sample Date	3/13/2007	3/14/2007	3/14/2007	3/14/2007	3/14/2007	3/14/2007	3/14/2007	3/14/2007	3/15/2007	3/15/2007	3/19/2007
Sample Depth (ft bgs)	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0
Volatile Organics (µg/kg)											
1,1,1,2-Tetrachloroethane	2 UJ	1.6 UJ	1.5 UJ	1.9 UJ	1.7 UJ	1.5 UJ	1.6 UJ	1.7 UJ	1.9 UJ	1.8 UJ	1.5 UJ
1,1,1-Trichloroethane	1.2 UJ	0.95 UJ	0.91 UJ	1.2 UJ	1.1 UJ	0.93 UJ	0.96 UJ	1 UJ	1.2 UJ	1.1 UJ	0.91 UJ
1,1,2,2-Tetrachloroethane	1.4 UJ	1.1 UJ	1.1 UJ	1.4 UJ	1.2 UJ	1.1 UJ	1.1 UJ	1.2 UJ	1.4 UJ	1.3 UJ	1.1 UJ
1,1,2-Trichloroethane	1.7 UJ	1.3 UJ	1.3 UJ	1.6 UJ	1.5 UJ	1.3 UJ	1.4 UJ	1.4 UJ	1.7 UJ	1.5 UJ	1.3 UJ
1,1-Dichloroethane	1.4 UJ	1.1 UJ	1.1 UJ	1.4 UJ	1.2 UJ	1.1 UJ	1.1 UJ	1.2 UJ	1.4 UJ	1.3 UJ	1.1 UJ
1,1-Dichloroethene	1.5 UJ	1.2 UJ	1.2 UJ	1.5 UJ	1.4 UJ	1.2 UJ	1.2 UJ	1.3 UJ	1.5 UJ	1.4 UJ	1.2 UJ
1,2,3-Trichloropropane	3.8 UJ	3 UJ	2.9 UJ	3.7 UJ	3.3 UJ	3 UJ	3.1 UJ	3.2 UJ	3.7 UJ	3.4 UJ	2.9 UJ
1,2-Dibromo-3-chloropropane (DBCP)	6.4 UJ	5.1 UJ	4.9 UJ	6.3 UJ	5.7 UJ	5 UJ	5.2 UJ	5.5 UJ	6.4 UJ	5.8 UJ	4.9 UJ
1,2-Dibromoethane (EDB)	2 UJ	1.6 UJ	1.5 UJ	1.9 UJ	1.7 UJ	1.5 UJ	1.6 UJ	1.7 UJ	1.9 UJ	1.8 UJ	1.5 UJ
1,2-Dichloroethane	1.7 UJ	1.3 UJ	1.3 UJ	1.6 UJ	1.5 UJ	1.3 UJ	1.4 UJ	1.4 UJ	1.7 UJ	1.5 UJ	1.3 UJ
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (trans)	1.5 UJ	1.2 UJ	1.2 UJ	1.5 UJ	1.4 UJ	1.2 UJ	1.2 UJ	1.3 UJ	1.5 UJ	1.4 UJ	1.2 UJ
1,2-Dichloropropane	1.8 UJ	1.5 UJ	1.4 UJ	1.8 UJ	1.6 UJ	1.4 UJ	1.5 UJ	1.5 UJ	1.8 UJ	1.6 UJ	1.4 UJ
1,3-Dichloropropene (cis)	1.3 UJ	1 UJ	0.98 UJ	1.2 UJ	1.1 UJ	1 UJ	1 UJ	1.1 UJ	1.3 UJ	1.1 UJ	0.98 UJ
1,3-Dichloropropene (trans)	1.5 UJ	1.2 UJ	1.2 UJ	1.5 UJ	1.4 UJ	1.2 UJ	1.2 UJ	1.3 UJ	1.5 UJ	1.4 UJ	1.2 UJ
1,4-Dichloro-2-butene (trans)	5.6 UJ	4.5 UJ	4.3 UJ	5.4 UJ	5 UJ	4.4 UJ	4.5 UJ	4.8 UJ	5.5 UJ	5 UJ	4.3 UJ
2-Butanone (MEK)	5.6 UJ	4.5 UJ	4.3 UJ	5.4 UJ	5 UJ	19 J	20 J	4.8 UJ	5.5 UJ	5 UJ	4.3 UJ
2-Chloro-1,3-butadiene (Chloroprene)	1.2 UJ	0.93 UJ	0.89 UJ	1.1 UJ	1 UJ	0.91 UJ	0.94 UJ	0.99 UJ	1.1 UJ	1 UJ	0.89 UJ
2-Hexanone (MBK)	7.5 UJ	18 J	5.8 UJ	7.4 UJ	6.7 UJ	5.9 UJ	6.1 UJ	6.4 UJ	27 J	6.8 UJ	5.8 UJ
3-Chloropropene (Allyl Chloride)	1.7 UJ	1.3 UJ	1.3 UJ	1.6 UJ	1.5 UJ	1.3 UJ	1.4 UJ	1.4 UJ	1.7 UJ	1.5 UJ	1.3 UJ
4-Methyl-2-pentanone (MIBK)	8.1 UJ	6.5 UJ	6.2 UJ	7.9 UJ	7.2 UJ	6.4 UJ	6.6 UJ	6.9 UJ	8 UJ	7.3 UJ	6.2 UJ
Acetone	17 J	21 J	7.7 J	24 J	7.6 J	230 J	230 J	32 J	49 J	18 J	3.2 UJ
Acetonitrile	39 UJ	31 UJ	30 UJ	38 UJ	35 UJ	31 UJ	32 UJ	33 UJ	39 UJ	35 UJ	30 UJ
Acrolein	15 UJ	12 UJ	12 UJ	15 UJ	14 UJ	12 UJ	12 UJ	13 UJ	15 UJ	14 UJ	12 UJ
Acrylonitrile	22 UJ	18 UJ	17 UJ	21 UJ	19 UJ	17 UJ	18 UJ	19 UJ	22 UJ	20 UJ	17 UJ
Benzene	1.2 UJ	0.96 UJ	0.92 UJ	1.2 UJ	1.1 UJ	0.94 UJ	0.97 UJ	1 UJ	1.2 UJ	1.1 UJ	0.92 UJ
Bromodichloromethane	1.4 UJ	1.1 UJ	1.1 UJ	1.4 UJ	1.2 UJ	1.1 UJ	1.1 UJ	1.2 UJ	1.4 UJ	1.3 UJ	1.1 UJ
Bromoform	3.1 UJ	2.5 UJ	2.4 UJ	3 UJ	2.7 UJ	2.4 UJ	2.5 UJ	2.6 UJ	3 UJ	2.8 UJ	2.4 UJ
Bromomethane	1.8 UJ	1.5 UJ	1.4 UJ	1.8 UJ	1.6 UJ	1.4 UJ	1.5 UJ	1.5 UJ	1.8 UJ	1.6 UJ	1.4 UJ
Carbon Disulfide	1.4 UJ	1.1 UJ	1.1 UJ	1.4 UJ	1.2 UJ	1.1 UJ	1.1 UJ	1.2 UJ	1.4 UJ	1.3 UJ	1.1 UJ
Carbon Tetrachloride	1.2 UJ	0.99 UJ	0.96 UJ	1.2 UJ	1.1 UJ	0.98 UJ	1 UJ	1.1 UJ	1.2 UJ	1.1 UJ	0.96 UJ
Chlorobenzene	0.96 UJ	0.77 UJ	0.74 UJ	0.94 UJ	0.85 UJ	0.76 UJ	0.78 UJ	0.82 UJ	0.95 UJ	0.87 UJ	0.74 UJ
Chloroethane	2.1 UJ	1.7 UJ	1.6 UJ	2 UJ	1.9 UJ	1.6 UJ	1.7 UJ	1.8 UJ	2.1 UJ	1.9 UJ	1.6 UJ
Chloroform	2.1 J	0.98 UJ	0.95 UJ	1.2 UJ	1.1 UJ	0.96 UJ	0.99 UJ	1 UJ	1.2 UJ	1.1 UJ	0.95 UJ
Chloromethane	0.98 UJ	0.78 UJ	0.75 UJ	0.95 UJ	0.87 UJ	0.77 UJ	0.79 UJ	0.83 UJ	0.97 UJ	0.88 UJ	0.75 UJ
Dibromochloromethane	1.5 UJ	1.2 UJ	1.2 UJ	1.5 UJ	1.4 UJ	1.2 UJ	1.2 UJ	1.3 UJ	1.5 UJ	1.4 UJ	1.2 UJ

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Site ID	9SB12	9SB13	9SB14	9SB15	9SB16	9SB17	9SB18	9SB19	9SB20	9SB23	9SB29
Sample ID	9SB12-00	9SB13-00	9SB14-00	9SB15-00	9SB16-00	9SB17-00	9SB18-00	9SB19-00	9SB20-00	9SB23-00	9SB29-00
Sample Date	3/13/2007	3/14/2007	3/14/2007	3/14/2007	3/14/2007	3/14/2007	3/14/2007	3/14/2007	3/15/2007	3/15/2007	3/19/2007
Sample Depth (ft bgs)	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0
Volatile Organics (µg/kg) (continued)											
Dibromomethane	1.8 UJ	1.5 UJ	1.4 UJ	1.8 UJ	1.6 UJ	1.4 UJ	1.5 UJ	1.5 UJ	1.8 UJ	1.6 UJ	1.4 UJ
Ethyl Methacrylate	1.1 UJ	0.86 UJ	0.83 UJ	1 UJ	0.95 UJ	0.84 UJ	0.87 UJ	0.92 UJ	1.1 UJ	0.97 UJ	0.83 UJ
Ethylbenzene	1.2 UJ	0.97 UJ	0.93 UJ	1.2 UJ	5.9 J	0.95 UJ	0.98 UJ	220 J	3.5 J	1.1 UJ	0.93 UJ
Freon 11 (Trichlorofluoromethane)	2 UJ	1.6 UJ	1.5 UJ	1.9 UJ	1.7 UJ	1.5 UJ	1.6 UJ	1.7 UJ	1.9 UJ	1.8 UJ	1.5 UJ
Freon-12 (Dichlorodifluoromethane)	3.5 UJ	2.8 UJ	2.7 UJ	3.4 UJ	3.1 UJ	2.7 UJ	2.8 UJ	3 UJ	3.5 UJ	3.1 UJ	2.7 UJ
Isobutyl Alcohol	180 UJ	150 UJ	140 UJ	180 UJ	160 UJ	140 UJ	150 UJ	150 UJ	180 UJ	160 UJ	140 UJ
Methyl Acrylonitrile	22 UJ	18 UJ	17 UJ	22 UJ	20 UJ	18 UJ	18 UJ	19 UJ	22 UJ	20 UJ	17 UJ
Methyl Iodide	1.4 UJ	1.1 UJ	1.1 UJ	1.4 UJ	1.2 UJ	1.1 UJ	1.1 UJ	1.2 UJ	1.4 UJ	1.3 UJ	1.1 UJ
Methyl Methacrylate	2.3 UJ	1.9 UJ	1.8 UJ	2.3 UJ	2.1 UJ	1.8 UJ	1.9 UJ	2 UJ	2.3 UJ	2.1 UJ	1.8 UJ
Methylene Chloride	2.2 UJ	1.8 UJ	1.7 UJ	2.2 UJ	2 UJ	1.8 UJ	1.8 UJ	1.9 UJ	2.2 UJ	2 UJ	1.7 UJ
Pentachloroethane	6.4 UJ	5.1 UJ	4.9 UJ	6.3 UJ	5.7 UJ	5 UJ	5.2 J	5.5 UJ	6.4 UJ	5.8 UJ	4.9 UJ
Propionitrile (Ethyl Cyanide)	32 UJ	26 UJ	25 UJ	31 UJ	28 UJ	25 UJ	26 UJ	27 UJ	32 UJ	29 UJ	25 UJ
Styrene (Ethenylbenzene)	1.2 UJ	0.95 UJ	0.91 UJ	1.2 UJ	1.1 UJ	0.93 UJ	0.96 UJ	2.2 J	1.2 UJ	1.1 UJ	0.91 UJ
Tetrachloroethene (PCE)	1.4 UJ	1.1 UJ	1.1 UJ	1.4 UJ	1.2 UJ	1.1 UJ	1.1 UJ	1.2 UJ	1.4 UJ	1.3 UJ	1.1 UJ
Toluene	1.4 UJ	1.1 UJ	1.1 UJ	1.4 UJ	1.2 UJ	1.1 U	2.3 U	1.2 UJ	1.4 UJ	1.3 UJ	1.1 UJ
Trichloroethene (TCE)	1.7 UJ	1.3 UJ	1.3 UJ	1.6 UJ	1.5 UJ	1.3 UJ	1.4 UJ	1.4 UJ	1.7 UJ	1.5 UJ	1.3 UJ
Vinyl Acetate	2.7 UJ	2.1 UJ	2 UJ	2.6 UJ	2.4 UJ	2.1 UJ	2.1 UJ	2.3 UJ	2.6 UJ	2.4 UJ	2 UJ
Vinyl Chloride	1.3 UJ	1 UJ	0.99 UJ	1.3 UJ	1.1 UJ	1 UJ	1 UJ	1.1 UJ	1.3 UJ	1.2 UJ	0.99 UJ
Xylenes, total	2.8 UJ	2.2 UJ	2.1 UJ	2.7 UJ	15 J	2.2 UJ	2.3 UJ	680 J	9.6 J	2.5 UJ	2.1 UJ
Semivolatile Organics (µg/kg)											
1,1'-Biphenyl	32 U	34 U	30 U	32 U	34 U	31 U	31 U	31 U	33 U	31 U	32 U
1,2,4,5-Tetrachlorobenzene	35 U	36 U	33 U	35 U	36 U	33 U	33 U	33 U	35 U	33 U	35 U
1,2,4-Trichlorobenzene	23 U	24 U	22 U	23 U	25 U	22 U	22 U	22 U	24 U	23 U	23 U
1,2-Dichlorobenzene (o-)	26 U	27 U	24 U	26 U	27 U	25 U	24 U	25 U	26 U	25 U	26 U
1,2-Diphenylhydrazine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trinitrobenzene (TNB)	91 UJ	95 U	86 UJ	91 U	96 U	88 UJ	87 UJ	88 UJ	93 UJ	88 U	92 U
1,3-Dichlorobenzene (m-)	29 U	30 U	27 U	29 U	31 U	28 U	28 U	28 U	29 U	28 U	29 U
1,3-Dinitrobenzene (m-)	56 U	58 U	52 U	56 U	59 U	53 U	53 U	54 U	57 U	54 U	56 U
1,4-Dichlorobenzene (p-)	24 U	26 U	23 U	24 U	26 U	24 U	23 U	24 U	25 U	24 U	25 U
1,4-Dioxane (p-)	73 U	77 U	69 U	73 U	78 U	71 U	70 U	71 U	75 U	71 U	74 U
1,4-Naphthoquinone	43 U	45 U	41 U	43 U	46 U	42 U	41 U	42 U	44 U	42 U	44 U
1,4-Phenylenediamine	1900 U	2000 U	1800 U	1900 U	2000 U	1800 U	1800 U	1800 U	1900 U	1800 U	1900 U
1-Naphthylamine	91 U	95 U	86 U	91 U	96 U	88 U	87 U	88 U	93 U	88 U	92 U
2,2'-Oxybis[1-chloropropane]	39 U	41 U	37 U	39 U	41 U	37 U	37 U	37 U	40 U	38 U	39 U
2,3,4,6-Tetrachlorophenol	50 U	52 U	47 U	50 U	53 U	48 U	48 U	48 U	51 U	49 U	50 U

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Site ID	9SB12	9SB13	9SB14	9SB15	9SB16	9SB17	9SB18	9SB19	9SB20	9SB23	9SB29
Sample ID	9SB12-00	9SB13-00	9SB14-00	9SB15-00	9SB16-00	9SB17-00	9SB18-00	9SB19-00	9SB20-00	9SB23-00	9SB29-00
Sample Date	3/13/2007	3/14/2007	3/14/2007	3/14/2007	3/14/2007	3/14/2007	3/14/2007	3/14/2007	3/15/2007	3/15/2007	3/19/2007
Sample Depth (ft bgs)	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0
Semivolatile Organics (µg/kg) (continued)											
2,4,5-Trichlorophenol	36 U	37 U	34 U	36 U	38 U	34 U	34 U	34 U	36 U	35 U	36 U
2,4,6-Trichlorophenol	22 U	23 U	21 U	22 U	24 U	21 U	21 U	21 U	23 U	22 U	22 U
2,4-Dichlorophenol	26 U	27 U	24 U	26 U	27 U	25 U	24 U	25 U	26 U	25 U	26 U
2,4-Dimethylphenol	39 U	41 U	37 U	39 U	41 U	37 U	37 U	37 U	40 U	38 U	39 U
2,4-Dinitrophenol	190 U	200 U	180 U	190 U	200 U	180 U	180 U	180 U	190 R	180 U	190 U
2,4-Dinitrotoluene (DNT)	21 U	22 U	20 U	21 U	22 U	20 U	20 U	20 U	22 U	20 U	21 U
2,6-Dichlorophenol	59 U	62 U	56 U	59 U	62 U	57 U	56 U	57 U	60 U	57 U	59 U
2,6-Dinitrotoluene (DNT)	37 U	38 U	35 U	37 U	39 U	35 U	35 U	35 U	37 U	36 U	37 U
2-Acetylaminofluorene	42 U	44 U	40 U	42 U	45 U	41 U	40 U	41 U	43 U	41 U	42 U
2-Chloronaphthalene	27 U	28 U	25 U	27 U	28 U	26 U	25 U	26 U	27 U	26 U	27 U
2-Chlorophenol	30 U	31 U	28 U	30 U	32 U	29 U	29 U	29 U	31 U	29 U	30 U
2-Methyl-5-nitroaniline	36 U	37 U	34 U	36 U	38 U	34 U	34 U	34 U	36 U	35 U	36 U
2-Methylphenol (o-Cresol)	33 U	35 U	31 U	33 U	35 U	32 U	32 U	32 U	34 U	32 U	34 U
2-Naphthylamine	91 U	95 U	86 U	91 U	96 U	88 U	87 U	88 U	93 U	88 U	92 U
2-Nitroaniline	26 U	27 U	24 U	26 U	27 U	25 U	24 U	25 U	26 U	25 U	26 U
2-Nitrophenol	22 U	23 U	21 U	22 U	24 U	21 U	21 U	21 U	23 U	22 U	22 U
2-Picoline	91 U	95 U	86 U	91 U	96 U	88 U	87 U	88 U	93 U	88 U	92 U
3 & 4 Methylphenol	32 U	34 U	30 U	32 U	34 U	31 U	31 U	31 U	33 U	31 U	32 U
3,3'-Dichlorobenzidine	33 U	35 U	31 U	33 U	35 U	32 U	32 U	32 U	34 U	32 U	34 U
3,3'-Dimethylbenzidine	470 U	490 U	440 U	470 U	490 U	450 U	450 U	450 U	480 U	450 U	470 U
3-Methylcholanthrene	29 U	30 U	27 U	29 U	31 U	28 U	28 U	28 U	29 U	28 U	29 U
3-Nitroaniline	37 U	38 U	35 U	37 U	39 U	35 U	35 U	35 U	37 U	36 U	37 U
4,6-Dinitro-2-methylphenol	220 U	230 UJ	210 U	220 U	240 UJ	210 U	210 U	210 U	230 U	220 U	220 U
4-Aminobiphenyl	60 U	63 U	57 U	60 U	63 U	58 U	57 U	58 U	61 U	58 U	60 U
4-Bromophenyl-phenylether	35 U	36 U	33 U	35 U	36 U	33 U	33 U	33 U	35 U	33 U	35 U
4-Chloro-3-methylphenol	38 U	39 U	36 U	38 U	40 U	36 U	36 U	36 U	39 U	37 U	38 U
4-Chloroaniline	29 U	30 U	27 U	29 U	31 U	28 U	28 U	28 U	29 U	28 U	29 U
4-Chlorophenyl-phenylether	21 U	22 U	20 U	21 U	22 U	20 U	20 U	20 U	22 U	20 U	21 U
4-Dimethylaminoazobenzene (p-)	42 U	44 U	40 U	42 U	45 U	41 U	40 U	41 U	43 U	41 U	42 U
4-Nitroaniline	19 U	20 U	18 U	19 U	20 U	18 U	18 U	18 U	19 U	18 U	19 U
4-Nitrophenol	230 U	240 UJ	220 UJ	230 U	250 UJ	220 U	220 U	220 UJ	240 U	230 U	230 U
4-Nitroquinoline-1-oxide	180 R	190 R	170 R	180 R	200 R	180 R	180 R	180 R	190 U	180 R	190 R
7,12-Dimethylbenz(a)anthracene	35 U	36 U	33 U	35 U	36 U	33 U	33 U	33 U	35 U	33 U	35 U
a,a-Dimethylphenethylamine	550 U	570 U	510 UJ	550 UJ	580 U	520 U	520 U	520 UJ	550 U	530 UJ	550 UJ
Acetophenone	24 U	26 U	23 U	24 U	26 U	24 U	23 U	24 U	25 U	24 U	25 U
Aniline	23 U	24 U	22 U	23 U	25 U	22 U	22 U	22 U	24 U	23 U	23 U

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SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SB12	9SB13	9SB14	9SB15	9SB16	9SB17	9SB18	9SB19	9SB20	9SB23	9SB29
Sample ID	9SB12-00	9SB13-00	9SB14-00	9SB15-00	9SB16-00	9SB17-00	9SB18-00	9SB19-00	9SB20-00	9SB23-00	9SB29-00
Sample Date	3/13/2007	3/14/2007	3/14/2007	3/14/2007	3/14/2007	3/14/2007	3/14/2007	3/14/2007	3/15/2007	3/15/2007	3/19/2007
Sample Depth (ft bgs)	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0
Semivolatile Organics (µg/kg) (continued)											
Aramite	67 U	70 U	63 UJ	67 UJ	71 U	64 U	64 U	64 UJ	68 U	65 U	67 UJ
Benzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzoic Acid	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	42 U	44 U	40 U	42 U	45 U	41 U	40 U	41 U	43 U	41 U	42 U
Bis(2-chloroethoxy)methane	27 U	28 U	25 U	27 U	28 U	26 U	25 U	26 U	27 U	26 U	27 U
Bis(2-chloroethyl)ether	31 U	33 U	29 U	31 U	33 U	30 U	30 U	30 U	32 U	30 U	31 U
Bis(2-ethylhexyl) Phthalate (BEHP)	42 U	72 U	40 U	42 U	45 U	41 U	40 U	41 U	43 U	41 U	42 U
Butyl Benzyl Phthalate	30 U	31 U	28 U	30 U	32 U	29 U	29 U	29 U	31 U	29 U	30 U
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diallate (total)	62 U	65 U	59 U	62 U	66 U	60 U	59 U	60 U	63 U	60 U	63 U
Dibenzofuran	21 U	22 U	20 U	21 U	22 U	20 U	20 U	20 U	22 U	20 U	21 U
Diethyl Phthalate (DEP)	24 U	26 U	23 U	24 U	26 U	24 U	23 U	24 U	25 U	24 U	25 U
Dimethyl Phthalate	21 U	22 U	20 U	21 U	22 U	20 U	20 U	20 U	22 U	20 U	21 U
Di-n-butyl Phthalate (DBP)	31 U	33 U	29 U	31 U	33 U	30 U	30 U	30 U	32 U	30 U	31 U
Di-n-octyl Phthalate	35 U	36 U	33 U	35 U	36 U	33 U	33 U	33 U	35 U	33 U	35 U
Dinoseb	92 U	96 U	87 U	92 U	98 U	89 U	88 U	89 U	94 U	90 U	93 U
Diphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl 4,4'-Dichlorobenzilate (Chlorobenzilate)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methane Sulfonate (EMS)	73 U	77 U	69 U	73 U	78 U	71 U	70 U	71 U	75 U	71 U	74 U
Hexachloro-1,3-butadiene	22 U	23 U	21 U	22 U	24 U	21 U	21 U	21 U	23 U	22 U	22 U
Hexachlorobenzene	29 U	30 U	27 U	29 U	31 U	28 U	28 U	28 U	29 U	28 U	29 U
Hexachlorocyclopentadiene	92 U	96 U	87 U	92 U	98 U	89 U	88 U	89 U	94 U	90 U	93 U
Hexachloroethane	22 U	23 U	21 U	22 U	24 U	21 U	21 U	21 U	23 U	22 U	22 U
Hexachlorophene	14000 U	15000 R	13000 U	14000 UJ	14000 U	13000 U	13000 U	13000 U	14000 U	13000 R	14000 R
Hexachloropropene	50 U	52 U	47 U	50 U	53 U	48 U	48 U	48 U	51 U	49 U	50 U
Isophorone	24 U	26 U	23 U	24 U	26 U	24 U	23 U	24 U	25 U	24 U	25 U
Isosafrole	71 U	74 U	67 U	71 U	75 U	68 U	68 U	69 U	72 U	69 U	72 U
Methapyrilene	47 U	49 U	44 U	47 U	49 U	45 U	45 U	45 U	48 U	45 UJ	47 U
Methyl Methane Sulfonate	61 U	64 U	58 R	61 U	65 U	59 U	58 U	59 R	62 U	59 UJ	61 U
Methyl Parathion	52 U	55 U	49 U	52 U	55 U	50 U	50 U	50 U	53 U	51 U	53 U
Nitrobenzene	39 U	41 U	37 U	39 U	41 U	37 U	37 U	37 U	40 U	38 U	39 U
n-Nitrosodiethylamine	49 U	51 U	46 U	49 U	52 U	47 U	47 U	47 U	50 U	47 U	49 U
n-Nitrosodimethylamine (NDMA)	66 U	69 U	62 U	66 U	69 U	63 U	63 U	63 U	67 U	64 U	66 U
n-Nitroso-di-n-butylamine	58 U	60 U	55 U	58 U	61 U	56 U	55 U	56 U	59 U	56 U	58 U
n-Nitrosodi-n-propylamine	31 U	33 U	29 U	31 U	33 U	30 U	30 U	30 U	32 U	30 U	31 U
n-Nitrosodiphenylamine	26 U	27 U	24 U	26 U	27 U	25 U	24 U	25 U	26 U	25 U	26 U

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SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SB12	9SB13	9SB14	9SB15	9SB16	9SB17	9SB18	9SB19	9SB20	9SB23	9SB29
Sample ID	9SB12-00	9SB13-00	9SB14-00	9SB15-00	9SB16-00	9SB17-00	9SB18-00	9SB19-00	9SB20-00	9SB23-00	9SB29-00
Sample Date	3/13/2007	3/14/2007	3/14/2007	3/14/2007	3/14/2007	3/14/2007	3/14/2007	3/14/2007	3/15/2007	3/15/2007	3/19/2007
Sample Depth (ft bgs)	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0
Semivolatile Organics (µg/kg) (continued)											
n-Nitrosomethylethylamine	58 U	60 U	55 U	58 U	61 U	56 U	55 U	56 U	59 U	56 U	58 U
n-Nitrosomorpholine	73 U	77 U	69 U	73 U	78 U	71 U	70 U	71 U	75 U	71 U	74 U
n-Nitrosopiperidine	79 U	82 U	75 U	79 U	83 U	76 U	75 U	76 U	80 U	77 U	79 U
n-Nitrosopyrrolidine	50 U	52 U	47 U	50 U	53 U	48 U	48 U	48 U	51 U	49 U	50 U
o-Toluidine	62 U	65 U	59 U	62 U	66 U	60 U	59 U	60 U	63 U	60 U	63 U
Pentachlorobenzene	71 U	74 U	67 U	71 U	75 U	68 U	68 U	69 U	72 U	69 U	72 U
Pentachloronitrobenzene	62 U	65 U	59 U	62 U	66 U	60 U	59 U	60 U	63 U	60 U	63 U
Pentachlorophenol	92 U	96 U	87 U	92 U	98 U	89 U	88 U	89 U	94 U	90 U	93 U
Phenacetin	57 U	59 U	54 U	57 U	60 U	55 U	54 U	55 U	58 U	55 U	57 U
Phenol	33 U	35 U	31 U	33 U	35 U	32 U	32 U	32 U	34 U	32 U	34 U
Pronamide	70 U	73 U	66 U	70 U	74 U	67 U	67 U	67 U	71 U	68 U	70 U
Pyridine	33 U	35 U	31 U	33 U	35 U	32 U	32 U	32 U	34 U	32 U	34 U
Safrole	59 U	62 U	56 U	59 U	62 U	57 U	56 U	57 U	60 U	57 U	59 U
PAHs (µg/kg)											
1-Methylnaphthalene	1.2 U	13 U	12 U	12 U	13 U	1.2 U	1.2 U	12 U	1.3 J	1.2 U	1.2 U
2-Methylnaphthalene	1.1 U	11 U	10 U	11 U	11 U	1.3 J	1 U	10 U	2.1 J	1 U	1.1 U
Acenaphthene	1.1 U	12 U	11 U	11 U	12 U	1.1 U	1.1 U	11 U	1.1 U	1.1 U	1.1 U
Acenaphthylene	1.1 U	11 U	10 U	11 U	12 U	1.1 U	1 U	10 U	1.1 U	1.1 U	1.1 U
Anthracene	1.1 U	12 U	11 U	11 U	12 U	1.1 U	1.1 U	11 U	1.1 U	1.1 U	1.1 U
Benzo(a)anthracene	1.1 U	12 U	11 U	11 U	12 U	1.1 U	1.1 U	11 U	5.7 J	1.1 U	1.1 U
Benzo(a)pyrene (BaP)	0.93 U	9.6 U	8.7 U	9.2 U	9.8 U	0.89 U	0.88 U	8.9 U	4.5 J	0.9 U	0.92 U
Benzo(b)fluoranthene	1.2 U	13 U	12 U	12 U	13 U	1.2 U	1.2 U	12 U	6.3 J	1.2 U	1.2 U
Benzo(g,h,i)perylene	1.1 U	45 J	27 J	11 U	12 U	1.1 U	1.1 U	130	1.1 U	1.1 U	1.1 U
Benzo(k)fluoranthene	0.95 U	9.8 U	8.9 U	9.5 U	10 U	0.91 U	0.9 U	9.1 U	3.2 J	0.92 U	0.95 U
Chrysene	1 U	11 U	9.8 U	10 U	11 U	1 U	0.99 U	10 U	5.3 J	1 U	1 U
Dibenz(a,h)anthracene	1.6 U	16 U	15 U	16 U	17 U	1.5 U	1.5 U	15 U	1.6 U	1.5 U	1.6 U
Fluoranthene	1.2 U	13 U	12 U	12 U	13 U	1.2 U	1.2 U	12 U	5 U	1.2 U	1.2 U
Fluorene	1.3 U	14 U	13 U	13 U	14 U	1.3 U	1.3 U	13 U	1.4 U	1.3 U	1.3 U
Indeno(1,2,3-cd)pyrene	1.8 U	19 U	17 U	18 U	19 U	1.7 U	1.7 U	17 U	3 J	1.7 U	1.8 U
Naphthalene	1.3 U	14 U	13 U	13 U	14 U	1.3 J	1.3 U	13 U	2.2 J	1.3 U	1.3 U
Phenanthrene	1.4 U	15 U	14 U	14 U	15 U	1.4 U	1.4 U	14 U	1.5 U	1.4 U	1.4 U
Pyrene	1.3 U	14 U	13 U	13 U	14 U	1.3 U	1.3 U	13 U	6.8 J	1.3 U	1.3 U

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NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SB12	9SB13	9SB14	9SB15	9SB16	9SB17	9SB18	9SB19	9SB20	9SB23	9SB29
Sample ID	9SB12-00	9SB13-00	9SB14-00	9SB15-00	9SB16-00	9SB17-00	9SB18-00	9SB19-00	9SB20-00	9SB23-00	9SB29-00
Sample Date	3/13/2007	3/14/2007	3/14/2007	3/14/2007	3/14/2007	3/14/2007	3/14/2007	3/14/2007	3/15/2007	3/15/2007	3/19/2007
Sample Depth (ft bgs)	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0
Organophosphorous Pesticides (µg/kg)											
Dimethoate	50 U	52 U	47 U	50 U	53 U	48 U	48 U	48 U	51 U	49 U	50 U
Disulfoton	61 U	64 U	58 U	61 U	65 U	59 U	58 U	59 U	62 U	59 U	61 U
Famphur	110 U	110 UJ	100 UJ	110 U	120 UJ	100 U	100 U	100 UJ	110 U	110 U	110 U
Methyl Parathion	52 U	55 U	49 U	52 U	55 U	50 U	50 U	50 U	53 U	51 U	53 U
o,o,o-Triethyl Phosphorothioate	80 U	84 U	76 U	80 U	85 U	77 U	76 U	77 U	82 U	78 U	80 U
Parathion	61 U	64 UJ	58 U	61 U	65 UJ	59 U	58 U	59 U	62 U	59 U	61 U
Phorate	77 U	80 U	72 U	77 U	81 U	74 U	73 U	74 U	78 U	74 U	77 U
Sulfotepp	61 U	64 U	58 U	61 U	65 U	59 U	58 U	59 U	62 U	59 U	61 U
Thionazin	47 U	49 U	44 U	47 U	49 U	45 U	45 U	45 U	48 U	45 U	47 U
Metals (mg/kg)											
Antimony	0.48 UJ	0.48 UJ	0.45 UJ	0.46 UJ	0.51 UJ	0.46 UJ	0.43 UJ	0.46 UJ	0.49 UJ	0.44 U	0.48 UJ
Arsenic	1.4 J	1.4 J	0.67 U	0.69 U	0.74 J	0.69 U	0.95 J	0.83 J	1.3 J	1.4 J	0.72 UJ
Barium	45	45	23	51	36	51	58	79	55	83	65
Beryllium	0.12 J	0.12 J	0.15 J	0.14 J	0.2 J	0.14 J	0.16 J	0.17 J	0.22 J	0.28 J	0.17 J
Cadmium	0.9	0.9	0.67 J	0.96	0.66 J	0.96	0.65 J	0.71 J	0.75 J	1.1	0.56 J
Chromium	4.5	4.5	5.2	4.3	5.2	4.3	4.6	4.4	6.8	9	5.9
Cobalt	21 J	21 J	16 J	21 J	19 J	21 J	22 J	22 J	24 J	25	20
Copper	96 J	96 J	77 J	97 J	90 J	97 J	71 J	100 J	83 J	170	110 J
Lead	120 J	120 J	34 J	57 J	55 J	57 J	27 J	85 J	300 J	71	91
Mercury	0.029	0.029	0.014 J	0.035	0.02 J	0.035	0.03	0.017 J	0.057	0.029	0.024 J
Nickel	5.2	5.2	4.2	4.9	4.3	4.9	4.6	6.1	6.3	7.2	4.7
Selenium	0.97 U	0.97 U	0.9 U	0.92 U	1 U	0.92 U	0.86 U	0.91 U	0.98 U	0.88 U	0.97 U
Silver	0.11 U	0.11 U	0.099 U	0.11 J	0.11 U	0.11 J	0.095 U	0.1 U	0.11 U	0.13 J	0.12 J
Thallium	7 UJ	7 UJ	2.8 J	3.3 J	3.9 J	3.3 J	6.2 UJ	6.6 UJ	4.4 J	3.9	7 UJ
Tin	4.3 U	4.3 U	4 U	4.1 U	4.5 U	4.1 U	3.8 U	4 U	4.4 U	3.9 U	4.3 U
Vanadium	170 J	170 J	160 J	160 J	170 J	160 J	160 J	180 J	170 J	150	170
Zinc	56	56	34 J	53 J	37 J	53 J	38 J	42 J	54 J	78	42 J

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SB36	9SB37	9SB38	9SB39	9SB40	9SB41	9SB42	9SB43	9SB44
Sample ID	9SB36-00	9SB37-00	9SB38-00	9SB39-00	9SB40-00	9SB41-00	9SB42-00	9SB43-00	9SB44-00
Sample Date	1/20/2009	1/18/2009	1/20/2009	1/18/2009	1/18/2009	1/19/2009	1/17/2009	1/18/2009	1/17/2009
Sample Depth (ft bgs)	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0
Volatile Organics (µg/kg)									
1,1,1,2-Tetrachloroethane	0.72 U	0.7 U	0.69 U	0.66 U	54 U	0.57 U	0.71 U	61 U	0.64 U
1,1,1-Trichloroethane	0.65 U	0.63 U	0.62 U	0.6 U	49 U	0.52 U	0.64 U	56 U	0.58 U
1,1,2,2-Tetrachloroethane	1.6 U	1.5 U	1.5 U	1.4 U	120 U	1.3 U	1.5 U	130 U	1.4 U
1,1,2-Trichloroethane	1.4 UJ	1.3 U	1.3 U	1.2 U	100 U	1.1 U	1.3 U	110 U	1.2 U
1,1-Dichloroethane	0.56 U	0.54 U	0.54 U	0.51 U	42 U	0.45 U	0.55 U	48 U	0.5 U
1,1-Dichloroethene	0.61 U	0.59 U	0.58 U	0.56 U	46 U	0.48 U	0.6 U	52 U	0.54 U
1,2,3-Trichloropropane	1.6 U	1.5 U	1.5 U	1.4 U	120 U	1.3 U	1.5 U	130 U	1.4 U
1,2-Dibromo-3-chloropropane (DBCP)	3.2 U	3 U	3 U	2.9 U	240 U	2.5 U	3.1 U	270 U	2.8 U
1,2-Dibromoethane (EDB)	1.7 UJ	1.6 U	1.6 U	1.5 U	130 U	1.3 U	1.7 U	140 U	1.5 U
1,2-Dichloroethane	1.1 U	1.1 U	1.1 U	1 U	84 U	0.89 U	1.1 UJ	96 U	1 UJ
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (trans)	1.1 U	1.1 U	1 U	1 U	82 U	0.87 U	1.1 U	93 U	0.98 U
1,2-Dichloropropane	1.2 U	1.2 U	1.2 U	1.1 U	93 U	0.98 U	1.2 U	110 U	1.1 U
1,3-Dichloropropene (cis)	0.98 UJ	0.95 U	0.93 U	0.9 U	73 U	0.78 U	0.96 U	83 U	0.88 U
1,3-Dichloropropene (trans)	0.98 UJ	0.95 U	0.93 U	0.9 U	73 U	0.78 U	0.96 U	83 U	0.88 U
1,4-Dichloro-2-butene (trans)	3.5 UJ	3.4 U	3.3 U	3.2 U	260 U	2.8 U	3.4 U	300 U	3.1 UJ
2-Butanone (MEK)	3 UJ	2.9 UJ	2.9 U	2.8 UJ	230 U	3.6 U	5.8 U	260 U	4.4 U
2-Chloro-1,3-butadiene (Chloroprene)	0.64 U	0.62 U	0.61 UJ	0.59 U	48 U	0.51 U	0.63 UJ	55 U	0.57 U
2-Hexanone (MBK)	2.4 UJ	2.3 U	2.3 U	2.2 U	180 U	1.9 U	2.3 U	200 U	2.1 U
3-Chloropropene (Allyl Chloride)	1.7 U	1.6 U	1.6 U	1.5 U	130 U	1.3 U	1.7 U	140 U	1.5 U
4-Methyl-2-pentanone (MIBK)	3.3 UJ	3.2 U	3.1 U	3 U	240 U	2.6 U	3.2 UJ	280 U	2.9 UJ
Acetone	13 J	8.5 J	6.3 J	7.6 J	370 R	26 J	33 J	420 R	12 J
Acetonitrile	51 UJ	49 UJ	48 U	46 UJ	3800 R	40 R	50 UJ	4300 R	45 U
Acrolein	21 U	21 U	20 U	20 U	1600 UJ	17 UJ	21 U	1800 UJ	19 U
Acrylonitrile	26 U	25 U	25 UJ	24 U	1900 UJ	21 UJ	25 UJ	2200 UJ	23 UJ
Benzene	0.89 U	0.86 U	0.85 U	0.81 U	67 U	0.71 U	0.87 U	76 U	0.8 U
Bromodichloromethane	0.93 UJ	0.9 U	0.89 U	0.85 U	70 UJ	0.74 UJ	0.92 U	79 UJ	0.84 U
Bromoform	1.2 U	1.2 U	1.2 U	1.1 U	93 U	0.98 U	1.2 U	110 U	1.1 UJ
Bromomethane	1.8 UJ	1.7 UJ	1.7 U	1.6 UJ	140 UJ	1.4 UJ	1.8 UJ	150 UJ	1.6 UJ
Carbon Disulfide	1.4 U	1.3 U	1.3 U	1.2 U	100 U	1.1 U	1.3 U	110 U	1.2 U
Carbon Tetrachloride	1.1 U	1.1 U	1.1 U	1 U	84 U	0.89 U	1.1 U	96 U	1 U
Chlorobenzene	0.82 U	0.79 U	0.78 U	0.75 U	62 U	0.65 U	0.81 U	70 U	0.74 U
Chloroethane	1.4 U	1.3 U	1.3 U	1.2 U	100 U	1.1 U	1.3 U	110 U	1.2 UJ
Chloroform	0.56 U	0.54 U	0.54 U	0.51 U	42 U	0.45 U	0.55 U	48 U	0.5 U
Chloromethane	0.8 UJ	0.77 U	0.76 U	0.73 U	60 U	0.64 U	0.78 U	68 U	0.72 U
Dibromochloromethane	0.56 UJ	0.54 U	0.54 U	0.51 U	42 U	0.45 U	0.55 U	48 U	0.5 U

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SB36	9SB37	9SB38	9SB39	9SB40	9SB41	9SB42	9SB43	9SB44
Sample ID	9SB36-00	9SB37-00	9SB38-00	9SB39-00	9SB40-00	9SB41-00	9SB42-00	9SB43-00	9SB44-00
Sample Date	1/20/2009	1/18/2009	1/20/2009	1/18/2009	1/18/2009	1/19/2009	1/17/2009	1/18/2009	1/17/2009
Sample Depth (ft bgs)	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0
Volatile Organics (µg/kg) (continued)									
Dibromomethane	1.4 U	1.3 U	1.3 U	1.2 U	100 U	1.1 U	1.3 U	110 U	1.2 U
Ethyl Methacrylate	2.5 U	2.4 U	2.4 U	2.3 U	190 U	2 U	2.4 U	210 U	2.2 U
Ethylbenzene	0.84 U	0.82 U	0.8 U	0.77 U	63 U	0.67 U	0.83 U	150 J	0.76 U
Freon 11 (Trichlorofluoromethane)	1.7 U	1.6 U	1.6 U	1.5 U	130 U	1.3 U	1.7 UJ	140 U	1.5 UJ
Freon-12 (Dichlorodifluoromethane)	1 UJ	0.97 UJ	0.95 U	0.92 UJ	75 U	0.8 U	0.98 U	85 U	0.9 U
Isobutyl Alcohol	66 U	75 R	74 U	71 R	5800 R	62 R	76 R	6600 R	70 U
Methyl Acrylonitrile	27 U	26 U	26 U	25 U	2000 U	21 U	26 UJ	2300 U	24 U
Methyl Iodide	1.1 UJ	1.1 U	1.1 U	1 U	84 UJ	0.89 UJ	1.1 U	96 UJ	1 U
Methyl Methacrylate	4.2 UJ	4 U	4 U	3.8 U	310 U	3.3 U	4.1 U	350 U	3.7 U
Methylene Chloride	1.1 U	1.1 U	3.2 J	1 U	84 UJ	2.4 J	1.1 U	96 UJ	1 U
Pentachloroethane	2.5 UJ	2.4 UJ	2.4 UJ	2.3 UJ	190 UJ	2 UJ	2.4 U	210 UJ	2.2 U
Propionitrile (Ethyl Cyanide)	24 U	23 U	23 UJ	22 U	1800 UJ	19 UJ	23 UJ	2000 UJ	21 U
Styrene (Ethenylbenzene)	0.74 U	0.72 U	0.71 U	0.68 U	56 U	0.59 U	0.73 U	63 U	0.66 U
Tetrachloroethene (PCE)	0.82 U	0.79 U	0.78 U	0.75 U	62 U	0.65 U	0.81 UJ	70 U	0.74 UJ
Toluene	0.89 U	0.86 U	0.85 U	0.81 U	67 U	0.71 U	0.87 U	76 U	0.8 U
Trichloroethene (TCE)	1.1 U	1.1 U	1.1 U	1 U	84 U	0.89 U	1.1 U	96 U	1 U
Vinyl Acetate	1.7 U	1.6 U	1.6 U	1.5 U	130 U	1.3 U	1.7 U	140 U	1.5 U
Vinyl Chloride	0.65 U	0.63 U	0.62 U	0.6 U	49 U	0.52 U	0.64 U	56 U	0.58 U
Xylenes, total	2.6 U	2.5 U	2.5 U	2.4 U	190 U	2.1 U	2.5 U	220 U	2.3 U
Semivolatile Organics (µg/kg)									
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Diphenylhydrazine	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trinitrobenzene (TNB)	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene (m-)	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene (m-)	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Naphthoquinone	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Phenylenediamine	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis[1-chloropropane]	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA

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NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SB36	9SB37	9SB38	9SB39	9SB40	9SB41	9SB42	9SB43	9SB44
Sample ID	9SB36-00	9SB37-00	9SB38-00	9SB39-00	9SB40-00	9SB41-00	9SB42-00	9SB43-00	9SB44-00
Sample Date	1/20/2009	1/18/2009	1/20/2009	1/18/2009	1/18/2009	1/19/2009	1/17/2009	1/18/2009	1/17/2009
Sample Depth (ft bgs)	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0
Semivolatile Organics (µg/kg) (continued)									
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Acetylaminofluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methyl-5-nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol (o-Cresol)	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Picoline	NA	NA	NA	NA	NA	NA	NA	NA	NA
3 & 4 Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dimethylbenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylcholanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Aminobiphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Dimethylaminoazobenzene (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroquinoline-1-oxide	NA	NA	NA	NA	NA	NA	NA	NA	NA
7,12-Dimethylbenz(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
a,a-Dimethylphenethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aniline	NA	NA	NA	NA	NA	NA	NA	NA	NA

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NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SB36	9SB37	9SB38	9SB39	9SB40	9SB41	9SB42	9SB43	9SB44
Sample ID	9SB36-00	9SB37-00	9SB38-00	9SB39-00	9SB40-00	9SB41-00	9SB42-00	9SB43-00	9SB44-00
Sample Date	1/20/2009	1/18/2009	1/20/2009	1/18/2009	1/18/2009	1/19/2009	1/17/2009	1/18/2009	1/17/2009
Sample Depth (ft bgs)	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0
Semivolatile Organics (µg/kg) (continued)									
Aramite	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzoic Acid	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) Phthalate (BEHP)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl Benzyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diallate (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl Phthalate (DEP)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl Phthalate (DBP)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dinoseb	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl 4,4'-Dichlorobenzilate (Chlorobenzilate)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methane Sulfonate (EMS)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloro-1,3-butadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorophene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isosafrole	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methapyrilene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Methane Sulfonate	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodimethylamine (NDMA)	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-butylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodi-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Site ID	9SB36	9SB37	9SB38	9SB39	9SB40	9SB41	9SB42	9SB43	9SB44
Sample ID	9SB36-00	9SB37-00	9SB38-00	9SB39-00	9SB40-00	9SB41-00	9SB42-00	9SB43-00	9SB44-00
Sample Date	1/20/2009	1/18/2009	1/20/2009	1/18/2009	1/18/2009	1/19/2009	1/17/2009	1/18/2009	1/17/2009
Sample Depth (ft bgs)	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0
Semivolatile Organics (µg/kg) (continued)									
n-Nitrosomethylethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosomorpholine	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopiperidine	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopyrrolidine	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Toluidine	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloronitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenacetin	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pronamide	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyridine	NA	NA	NA	NA	NA	NA	NA	NA	NA
Safrole	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (µg/kg)									
1-Methylnaphthalene	2 U	2.2 U	2.3 U	2 U	1.9 U	1.9 U	1.9 U	23 U	2 U
2-Methylnaphthalene	2 U	2.2 U	2.3 U	2 U	1.9 U	1.9 U	1.9 U	23 U	2 U
Acenaphthene	2 U	2.2 U	2.3 U	2 U	1.9 U	1.9 U	1.9 U	23 U	2 U
Acenaphthylene	2 U	2.2 U	2.3 U	2 U	1.9 U	1.9 U	1.9 U	23 U	2 U
Anthracene	2 U	2.2 U	2.3 U	2 U	1.9 U	1.9 U	1.9 U	23 U	2 U
Benzo(a)anthracene	2 U	2.2 U	2.3 U	2 U	1.9 U	1.9 U	1.9 U	23 U	2 U
Benzo(a)pyrene (BaP)	2 U	2.2 U	2.3 U	2 U	1.9 U	1.9 U	1.9 U	23 U	2 U
Benzo(b)fluoranthene	2 U	2.2 U	2.3 U	2 U	1.9 U	1.9 U	1.9 U	23 U	2 U
Benzo(g,h,i)perylene	2 U	2.2 U	2.3 U	2 U	1.9 U	1.9 U	1.9 U	150	2 U
Benzo(k)fluoranthene	2 U	2.2 U	2.3 U	2 U	1.9 U	1.9 U	1.9 U	23 U	2 U
Chrysene	2 U	2.2 U	2.3 U	2 U	1.9 U	1.9 U	1.9 U	23 U	2 U
Dibenz(a,h)anthracene	0.68 U	0.73 U	0.76 U	0.68 U	0.65 U	0.63 U	0.64 U	7.6 U	0.68 U
Fluoranthene	0.45 U	0.49 U	0.5 U	0.45 U	0.43 U	0.42 U	0.43 U	5.1 U	0.45 U
Fluorene	2 U	2.2 U	2.3 U	2 U	1.9 U	1.9 U	1.9 U	23 U	2 U
Indeno(1,2,3-cd)pyrene	3.9 U	4.2 U	4.4 U	3.9 U	3.8 U	3.6 U	3.7 U	44 U	3.9 U
Naphthalene	2 U	2.2 U	2.3 U	2 U	1.9 U	1.9 U	1.9 U	23 U	2 U
Phenanthrene	2 U	2.2 U	2.3 U	2 U	1.9 U	1.9 U	1.9 U	23 U	2 U
Pyrene	2 U	2.2 U	2.3 U	2 U	1.9 U	1.9 U	1.9 U	23 U	2 U

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SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SB36	9SB37	9SB38	9SB39	9SB40	9SB41	9SB42	9SB43	9SB44
Sample ID	9SB36-00	9SB37-00	9SB38-00	9SB39-00	9SB40-00	9SB41-00	9SB42-00	9SB43-00	9SB44-00
Sample Date	1/20/2009	1/18/2009	1/20/2009	1/18/2009	1/18/2009	1/19/2009	1/17/2009	1/18/2009	1/17/2009
Sample Depth (ft bgs)	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0
Organophosphorous Pesticides (µg/kg)									
Dimethoate	NA	NA	NA	NA	NA	NA	NA	NA	NA
Disulfoton	NA	NA	NA	NA	NA	NA	NA	NA	NA
Famphur	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA
o,o,o-Triethyl Phosphorothioate	NA	NA	NA	NA	NA	NA	NA	NA	NA
Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phorate	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfotepp	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thionazin	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals (mg/kg)									
Antimony	0.27 U	0.19 U	0.15 U	0.1 U	0.13 U	0.086 U	0.18 UJ	0.096 U	0.34 UJ
Arsenic	2.1	2	2.2	1.6	1.5	0.44 U	2.2	1.3	1.3
Barium	70	54 J	160	87 J	59 J	48 J	100	57 J	72
Beryllium	0.32	0.38	0.34	0.47	0.2	0.12	0.3	0.15	0.18
Cadmium	0.16	0.057 U	0.12	0.064 U	0.18	0.1	0.23	0.043 U	0.11
Chromium	13 J	11 J	7.6	2.5 J	7.4 J	3.7 J	11	5.3 J	6.7
Cobalt	43 J	22 J	34	22 J	23 J	17 J	28	25 J	19
Copper	110	110 J	70	70 J	100 J	75 J	120	120 J	86
Lead	5.3	4.5 J	6	15 J	95 J	5.6 J	54	45 J	27
Mercury	0.046	0.05	0.03	0.019 J	0.0082 J	0.0046 J	0.027	0.021 J	0.017 J
Nickel	9.1 J	6.1 J	4.7	4.8 J	6.8 J	4.3 J	8.5	7 J	6.1
Selenium	1.2	1.4	0.84	0.37 J	0.35 J	0.3 J	0.62	0.31 J	0.28 J
Silver	0.091 U	0.065 U	0.047 U	0.03 U	0.06 U	0.075 U	0.059 U	0.077 U	0.082 U
Thallium	0.13 U	0.14 U	0.14 U	0.13 U	0.12 U	0.12 U	0.13 U	0.15 U	0.12 U
Tin	4.3 U	4.6 U	4.6 U	4.2 U	4.1 U	4 U	4.4 U	5.1 U	4 U
Vanadium	190	220 J	200	160 J	170 J	140 J	180	200 J	170
Zinc	50	48 J	51	77 J	51 J	47 J	65 J	47 J	45 J

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SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SB45	9SB46	9SB47	9SB48	9SB49	9SB50	9SB51	9SB52	9SB53	9SB54
Sample ID	9SB45-00	9SB46-00	9SB47-00	9SB48-00	9SB49-00	9SB50-00	9SB51-00	9SB52-00	9SB53-00	9SB54-00
Sample Date	1/18/2009	1/18/2009	1/19/2009	1/20/2009	1/21/2009	1/20/2009	1/20/2009	1/17/2009	1/19/2009	1/16/2009
Sample Depth (ft bgs)	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0
Volatile Organics (µg/kg)										
1,1,1,2-Tetrachloroethane	1.4 UJ	1.1 U	0.94 U	1.1 U	0.73 U	0.77 U	0.8 U	0.62 U	0.71 UJ	0.81 U
1,1,1-Trichloroethane	1.2 UJ	0.99 U	0.86 U	0.98 U	0.66 U	0.7 U	0.72 U	0.56 U	0.64 U	0.74 U
1,1,2,2-Tetrachloroethane	3 UJ	2.4 U	2.1 U	2.4 U	1.6 U	1.7 U	1.7 U	1.3 U	1.6 U	1.8 U
1,1,2-Trichloroethane	2.6 UJ	2 U	1.8 U	2 U	1.4 U	1.4 U	1.5 U	1.2 U	1.3 U	1.5 U
1,1-Dichloroethane	1.1 UJ	0.85 U	0.74 U	0.85 U	0.57 U	0.6 U	0.62 U	0.48 U	0.56 U	0.64 U
1,1-Dichloroethene	1.2 UJ	0.92 U	0.8 U	0.92 U	0.62 U	0.65 U	0.67 U	0.52 U	0.6 U	0.69 U
1,2,3-Trichloropropane	3 UJ	2.4 U	2.1 U	2.4 U	1.6 U	1.7 U	1.7 U	1.3 U	1.6 U	1.8 U
1,2-Dibromo-3-chloropropane (DBCP)	6 UJ	4.8 U	4.1 U	4.7 U	3.2 UJ	3.4 U	3.5 U	2.7 U	3.1 U	3.6 U
1,2-Dibromoethane (EDB)	3.2 UJ	2.6 U	2.2 U	2.5 U	1.7 U	1.8 U	1.9 U	1.4 U	1.7 U	1.9 U
1,2-Dichloroethane	2.1 UJ	1.7 U	1.5 U	1.7 U	1.1 U	1.2 U	1.2 U	0.96 UJ	1.1 U	1.3 UJ
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (trans)	2.1 UJ	1.7 U	1.4 U	1.6 U	1.1 U	1.2 U	1.2 U	0.93 U	1.1 U	1.2 U
1,2-Dichloropropane	2.4 UJ	1.9 U	1.6 U	1.9 U	1.3 U	1.3 U	1.4 U	1.1 U	1.2 U	1.4 U
1,3-Dichloropropene (cis)	1.9 UJ	1.5 U	1.3 U	1.5 U	0.99 U	1 U	1.1 U	0.84 U	0.97 U	1.1 U
1,3-Dichloropropene (trans)	1.9 UJ	1.5 U	1.3 U	1.5 U	0.99 U	1 U	1.1 U	0.84 U	0.97 U	1.1 U
1,4-Dichloro-2-butene (trans)	6.7 UJ	5.3 U	4.6 U	5.3 U	3.5 U	3.7 U	3.9 U	3 UJ	3.4 U	3.9 U
2-Butanone (MEK)	22 UJ	16 UJ	4 UJ	4.6 U	3.1 U	35 U	3.4 U	3.5 U	15 U	12 U
2-Chloro-1,3-butadiene (Chloroprene)	1.2 UJ	0.97 U	0.84 U	0.97 UJ	0.65 U	0.69 UJ	0.71 UJ	0.55 U	0.63 U	0.72 UJ
2-Hexanone (MBK)	4.5 UJ	3.6 U	6.2 J	3.6 U	2.4 U	2.5 U	2.6 U	2 U	2.3 U	2.7 U
3-Chloropropene (Allyl Chloride)	3.2 UJ	2.6 U	2.2 U	2.5 U	1.7 U	1.8 U	1.9 U	1.4 U	1.7 U	1.9 U
4-Methyl-2-pentanone (MIBK)	6.2 UJ	4.9 U	4.3 U	4.9 U	3.3 U	3.5 U	3.6 U	2.8 UJ	3.2 U	3.7 UJ
Acetone	89 J	100 J	130 J	7.7 J	20 R	850	98	12 J	120 J	50 J
Acetonitrile	97 R	77 R	66 R	76 U	51 R	54 U	56 U	43 U	50 R	57 UJ
Acrolein	41 UJ	32 U	28 U	32 U	22 UJ	23 U	24 U	18 U	21 UJ	24 U
Acrylonitrile	49 UJ	39 U	34 U	39 UJ	26 UJ	28 UJ	29 UJ	22 UJ	26 UJ	29 UJ
Benzene	1.7 UJ	1.3 U	1.2 U	1.3 U	0.9 U	0.95 U	0.98 U	0.76 U	0.88 U	1 U
Bromodichloromethane	1.8 UJ	1.4 U	1.2 U	1.4 U	0.95 U	1 U	1 U	0.8 U	0.92 UJ	1.1 U
Bromoform	2.4 UJ	1.9 U	1.6 U	1.9 U	1.3 UJ	1.3 U	1.4 U	1.1 UJ	1.2 U	1.4 U
Bromomethane	3.4 UJ	2.7 UJ	2.4 UJ	2.7 U	1.8 UJ	1.9 U	2 U	1.5 UJ	1.8 UJ	2 UJ
Carbon Disulfide	2.6 UJ	2 U	1.8 U	2 U	1.4 U	1.4 U	1.5 U	1.2 U	1.3 U	1.5 U
Carbon Tetrachloride	2.1 UJ	1.7 U	1.5 U	1.7 U	1.1 U	1.2 U	1.2 U	0.96 U	1.1 U	1.3 U
Chlorobenzene	1.6 UJ	1.2 U	1.1 U	1.2 U	0.83 U	0.88 U	0.91 U	0.7 U	0.81 U	0.93 U
Chloroethane	2.6 UJ	2 U	1.8 U	2 U	1.4 UJ	1.4 U	1.5 U	1.2 UJ	1.3 U	1.5 U
Chloroform	1.1 UJ	0.85 U	0.74 U	0.85 U	0.57 U	0.6 U	0.62 U	0.48 U	0.56 U	0.64 U
Chloromethane	1.5 UJ	1.2 U	1 U	1.2 U	0.81 U	0.85 U	0.88 U	0.68 U	0.79 U	0.9 U
Dibromochloromethane	1.1 UJ	0.85 U	0.74 U	0.85 U	0.57 UJ	0.6 U	0.62 U	0.48 U	0.56 U	0.64 U

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SUMMARY OF ANALYTICAL RESULTS - SURFACE SOIL
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SB45	9SB46	9SB47	9SB48	9SB49	9SB50	9SB51	9SB52	9SB53	9SB54
Sample ID	9SB45-00	9SB46-00	9SB47-00	9SB48-00	9SB49-00	9SB50-00	9SB51-00	9SB52-00	9SB53-00	9SB54-00
Sample Date	1/18/2009	1/18/2009	1/19/2009	1/20/2009	1/21/2009	1/20/2009	1/20/2009	1/17/2009	1/19/2009	1/16/2009
Sample Depth (ft bgs)	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0
Volatile Organics (µg/kg) (continued)										
Dibromomethane	2.6 UJ	2 U	1.8 U	2 U	1.4 U	1.4 U	1.5 U	1.2 U	1.3 U	1.5 U
Ethyl Methacrylate	4.7 UJ	3.7 U	3.2 U	3.7 U	2.5 U	2.6 U	2.7 U	2.1 U	2.4 U	2.8 U
Ethylbenzene	1.6 UJ	1.3 U	1.1 U	1.3 U	0.85 U	0.9 U	0.93 U	0.72 U	0.83 U	0.95 U
Freon 11 (Trichlorofluoromethane)	3.2 UJ	2.6 U	2.2 U	2.5 U	1.7 U	1.8 U	1.9 U	1.4 UJ	1.7 U	1.9 UJ
Freon-12 (Dichlorodifluoromethane)	1.9 UJ	1.5 UJ	1.3 UJ	1.5 U	1 UJ	1.1 U	1.1 U	0.86 U	0.99 U	1.1 U
Isobutyl Alcohol	150 R	120 R	100 R	120 U	79 R	83 U	86 U	66 U	77 R	88 R
Methyl Acrylonitrile	51 UJ	41 U	35 U	41 U	27 U	29 U	30 U	23 U	27 U	30 UJ
Methyl Iodide	2.1 UJ	1.7 U	1.5 U	1.7 U	1.1 UJ	1.2 U	1.2 U	0.96 U	1.1 UJ	1.3 U
Methyl Methacrylate	7.9 UJ	6.3 U	5.5 U	6.3 U	4.2 U	4.4 U	4.6 U	3.6 U	4.1 U	4.7 U
Methylene Chloride	2.1 UJ	4.3 J	1.5 UJ	1.7 U	1.1 UJ	1.2 U	1.2 U	0.96 U	1.1 UJ	1.3 U
Pentachloroethane	4.7 UJ	3.7 UJ	3.2 UJ	3.7 UJ	2.5 UJ	2.6 UJ	2.7 UJ	2.1 U	2.4 UJ	2.8 U
Propionitrile (Ethyl Cyanide)	45 UJ	36 UJ	31 UJ	36 UJ	24 UJ	25 UJ	26 UJ	20 U	23 UJ	27 UJ
Styrene (Ethenylbenzene)	1.4 UJ	1.1 U	0.97 U	1.1 U	0.75 U	0.79 U	0.82 U	0.64 U	0.73 U	0.84 U
Tetrachloroethene (PCE)	1.6 UJ	1.2 U	1.1 U	1.2 U	0.83 U	0.88 U	0.91 U	0.7 UJ	0.81 U	0.93 UJ
Toluene	1.7 UJ	1.3 U	1.2 U	1.3 U	0.9 U	0.95 U	0.98 U	0.76 U	0.88 U	1 U
Trichloroethene (TCE)	2.1 UJ	1.7 U	1.5 U	1.7 U	1.1 U	1.2 U	1.2 U	0.96 U	1.1 U	1.3 U
Vinyl Acetate	3.2 UJ	2.6 U	2.2 U	2.5 U	1.7 U	1.8 U	1.9 U	1.4 U	1.7 U	1.9 U
Vinyl Chloride	1.2 UJ	0.99 U	0.86 U	0.98 U	0.66 U	0.7 U	0.72 U	0.56 U	0.64 U	0.74 U
Xylenes, total	4.9 UJ	3.9 U	3.4 U	3.9 U	2.6 U	2.8 U	2.9 U	2.2 U	2.6 U	2.9 U
Semivolatile Organics (µg/kg)										
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Diphenylhydrazine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trinitrobenzene (TNB)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene (m-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene (m-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Naphthoquinone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Phenylenediamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis[1-chloropropane]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SWMU 9 - AREA B TANK 214 AREA
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NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SB45	9SB46	9SB47	9SB48	9SB49	9SB50	9SB51	9SB52	9SB53	9SB54
Sample ID	9SB45-00	9SB46-00	9SB47-00	9SB48-00	9SB49-00	9SB50-00	9SB51-00	9SB52-00	9SB53-00	9SB54-00
Sample Date	1/18/2009	1/18/2009	1/19/2009	1/20/2009	1/21/2009	1/20/2009	1/20/2009	1/17/2009	1/19/2009	1/16/2009
Sample Depth (ft bgs)	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0
Semivolatile Organics (µg/kg) (continued)										
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Acetylaminofluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methyl-5-nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol (o-Cresol)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Picoline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3 & 4 Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dimethylbenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylcholanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Aminobiphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Dimethylaminoazobenzene (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroquinoline-1-oxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7,12-Dimethylbenz(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
a,a-Dimethylphenethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SB45	9SB46	9SB47	9SB48	9SB49	9SB50	9SB51	9SB52	9SB53	9SB54
Sample ID	9SB45-00	9SB46-00	9SB47-00	9SB48-00	9SB49-00	9SB50-00	9SB51-00	9SB52-00	9SB53-00	9SB54-00
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Sample Depth (ft bgs)	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0
Semivolatile Organics (µg/kg) (continued)										
Aramite	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzoic Acid	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) Phthalate (BEHP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl Benzyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diallate (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl Phthalate (DEP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl Phthalate (DBP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dinoseb	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl 4,4'-Dichlorobenzilate (Chlorobenzilate)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methane Sulfonate (EMS)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloro-1,3-butadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorophene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isosafrole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methapyrilene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Methane Sulfonate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodimethylamine (NDMA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-butylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodi-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Site ID	9SB45	9SB46	9SB47	9SB48	9SB49	9SB50	9SB51	9SB52	9SB53	9SB54
Sample ID	9SB45-00	9SB46-00	9SB47-00	9SB48-00	9SB49-00	9SB50-00	9SB51-00	9SB52-00	9SB53-00	9SB54-00
Sample Date	1/18/2009	1/18/2009	1/19/2009	1/20/2009	1/21/2009	1/20/2009	1/20/2009	1/17/2009	1/19/2009	1/16/2009
Sample Depth (ft bgs)	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0
Semivolatile Organics (µg/kg) (continued)										
n-Nitrosomethylethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosomorpholine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopiperidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopyrrolidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Toluidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloronitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenacetin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pronamide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyridine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Safrole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (µg/kg)										
1-Methylnaphthalene	37 UJ	3.3 U	2.1 U	2.4 U	2.4 U	2 U	2.2 U	1.9 U	2 U	2.7 U
2-Methylnaphthalene	37 UJ	3.3 U	2.1 U	2.4 U	2.4 U	2 U	2.2 U	1.9 U	2 U	2.7 U
Acenaphthene	37 UJ	3.3 U	2.1 U	2.4 U	2.4 U	2 U	2.2 U	1.9 U	2 U	2.7 U
Acenaphthylene	37 UJ	3.3 U	2.1 U	2.4 U	2.4 U	2 U	2.2 U	1.9 U	2 U	2.7 U
Anthracene	37 UJ	3.3 U	2.1 U	2.4 U	2.4 U	2 U	2.2 U	1.9 U	2 U	2.7 U
Benzo(a)anthracene	37 UJ	3.3 U	2.1 U	2.4 U	2.4 U	2 U	2.2 U	1.9 U	2 U	2.7 U
Benzo(a)pyrene (BaP)	37 UJ	3.3 U	2.1 U	2.4 U	2.4 U	2 U	2.2 U	1.9 U	2 U	2.7 U
Benzo(b)fluoranthene	37 UJ	3.3 U	2.1 U	2.4 U	2.4 U	2 U	2.2 U	1.9 U	2 U	2.7 U
Benzo(g,h,i)perylene	96 J	3.3 U	2.1 U	2.4 U	2.4 U	2 U	2.2 U	1.9 U	2 U	2.7 U
Benzo(k)fluoranthene	37 UJ	3.3 U	2.1 U	2.4 U	2.4 U	2 U	2.2 U	1.9 U	2 U	2.7 U
Chrysene	37 UJ	3.3 U	2.1 U	2.4 U	2.4 U	2 U	2.2 U	1.9 U	2 U	2.7 U
Dibenz(a,h)anthracene	12 UJ	1.1 U	0.69 U	0.79 U	0.82 U	0.68 U	0.72 U	0.65 U	0.67 U	0.91 U
Fluoranthene	8.3 UJ	0.74 U	0.46 U	0.53 U	0.54 U	0.46 U	0.48 U	0.95 J	0.45 U	0.6 U
Fluorene	37 UJ	3.3 U	2.1 U	2.4 U	2.4 U	2 U	2.2 U	1.9 U	2 U	2.7 U
Indeno(1,2,3-cd)pyrene	72 UJ	6.5 U	4 U	4.6 U	4.7 U	4 U	4.2 U	3.8 U	3.9 U	5.2 U
Naphthalene	37 UJ	3.3 U	2.1 U	2.4 U	2.4 U	2 U	2.2 U	1.9 U	2 U	2.7 U
Phenanthrene	37 UJ	3.3 U	2.1 U	2.4 U	2.4 U	2 U	2.2 U	1.9 U	2 U	2.7 U
Pyrene	140 J	3.3 U	2.1 U	2.4 U	2.4 U	2 U	2.2 U	1.9 U	2 U	2.7 U

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SUMMARY OF ANALYTICAL RESULTS - SURFACE SOIL
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SB45	9SB46	9SB47	9SB48	9SB49	9SB50	9SB51	9SB52	9SB53	9SB54
Sample ID	9SB45-00	9SB46-00	9SB47-00	9SB48-00	9SB49-00	9SB50-00	9SB51-00	9SB52-00	9SB53-00	9SB54-00
Sample Date	1/18/2009	1/18/2009	1/19/2009	1/20/2009	1/21/2009	1/20/2009	1/20/2009	1/17/2009	1/19/2009	1/16/2009
Sample Depth (ft bgs)	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0	0.0-1.0
Organophosphorous Pesticides (µg/kg)										
Dimethoate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Disulfoton	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Famphur	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o,o,o-Triethyl Phosphorothioate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phorate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfotepp	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thionazin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals (mg/kg)										
Antimony	0.15 UJ	0.13 U	0.24 U	0.14 U	0.12 UJ	0.099 U	0.17 U	0.38 UJ	0.16 U	0.23 UJ
Arsenic	1.9 J	1.6	0.84	1.2	1.1 J	0.47 U	1.9	1	1.6	1.6
Barium	22 J	61 J	61 J	57	44 J	52	41	69	180	41
Beryllium	0.23 J	0.32	0.2	0.3	0.28	0.13	0.45	0.13	0.32	0.14
Cadmium	0.07 UJ	0.07 U	0.048 J	0.095 U	0.052 J	0.04 U	0.1 U	0.11	0.11	0.066 J
Chromium	16 J	8.3 J	4.8 J	9.4	7.9	4.2	11	8.2	6.4	6
Cobalt	7.3 J	8.2 J	20 J	25	15	14	57	18	27	26
Copper	72 J	70 J	73 J	88	51	68	120	83	94	69
Lead	20 J	5.2 J	3.4 J	76	8.7	1.6	2.7	4	7.4	2.7
Mercury	0.065 J	0.04	0.033	0.033	0.029	0.027	0.022 J	0.01 J	0.011 J	0.0098 J
Nickel	7.3 J	4 J	4.4 J	5.6	4.9	4.3	7.9	5.9	4.4	5.6
Selenium	0.8 J	0.51 J	0.46 J	0.49 U	0.46 U	0.49 U	0.86	0.23 J	1.2	0.19 J
Silver	0.051 UJ	0.052 U	0.04 J	0.054 U	0.048 U	0.039 U	0.042 U	0.058 U	0.043 U	0.061 U
Thallium	0.24 UJ	0.22 U	0.13 U	0.15 U	0.15 U	0.13 U	0.15 U	0.12 U	0.12 U	0.16 U
Tin	8 UJ	7.2 U	4.3 U	5 U	4.9 U	4.5 U	5 U	4.2 U	3.9 U	5.4 U
Vanadium	160 J	200 J	180 J	230	200	150	240	130	210	150
Zinc	46 J	41 J	40 J	48	41 J	48	92	44	51	48

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SUMMARY OF ANALYTICAL RESULTS - SURFACE SOIL
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Notes/Qualifiers:

BERA - Baseline Ecological Risk Assessment
ft bgs - feet below ground surface
J - Estimated: The analyte was positively identified; the quantitation is an estimation.
µg/kg - microgram per kilogram
mg/kg - milligram per kilogram
NA - Not Analzyed
PAHs - Polynuclear Aromatic Hydrocarbons
R - Rejected data; data is not usable.
SERA - Screening Level Ecological Risk Assessment
U - Non detected
UJ - Reported quantitation limit is qualified as estimated.

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SUMMARY OF ANALYTICAL RESULTS - SUBSURFACE SOIL
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SB00	9SB03-01	9SB06-01	9SB48	9SB51	9SB57	9SB59	9SB63
Sample ID	9SB00-01	9SB03-01	9SB06-01	9SB48-01	9SB51-01	9SB57-01	9SB59-01	9SB63-01
Sample Date	3/12/2007	3/12/2007	3/13/2007	1/20/2009	1/20/2009	1/11/2011	1/11/2011	1/11/2011
Sample Depth (ft bgs)	1.0 - 3.0	1.0 - 3.0	1.0 - 3.0	1.0-3.0	1.0-3.0	1.0 - 3.0	1.0 - 3.0	1.0 - 3.0
Volatile Organics (µg/kg)								
1,1,1,2-Tetrachloroethane	2.6 UJ	1.4 UJ	1.3 UJ	160 U	0.69 U	6.8 UJ	5.8 U	8.1 U
1,1,1-Trichloroethane	1.6 UJ	0.86 UJ	0.77 UJ	150 U	0.62 U	6.8 UJ	5.8 U	8.1 U
1,1,2,2-Tetrachloroethane	1.9 UJ	1 UJ	0.9 UJ	360 U	1.5 U	6.8 UJ	5.8 U	8.1 U
1,1,2-Trichloroethane	2.3 UJ	1.2 UJ	1.1 UJ	310 UJ	1.3 U	6.8 UJ	5.8 U	8.1 U
1,1-Dichloroethane	1.9 UJ	1 UJ	0.9 UJ	130 U	0.54 U	6.8 UJ	5.8 U	8.1 U
1,1-Dichloroethene	2.1 UJ	1.1 UJ	0.99 UJ	140 U	0.58 U	6.8 UJ	5.8 U	8.1 U
1,2,3-Trichloropropane	5.1 UJ	2.7 UJ	2.4 UJ	360 U	1.5 U	6.8 UJ	5.8 U	8.1 U
1,2-Dibromo-3-chloropropane (DBCP)	8.7 UJ	4.6 UJ	4.2 UJ	710 U	3 U	6.8 UJ	5.8 U	8.1 U
1,2-Dibromoethane (EDB)	2.6 UJ	1.4 UJ	1.3 UJ	380 UJ	1.6 U	6.8 UJ	5.8 U	8.1 U
1,2-Dichloroethane	2.3 UJ	1.2 UJ	1.1 UJ	250 U	1.1 U	6.8 UJ	5.8 U	8.1 U
1,2-Dichloroethene (trans)	2.1 UJ	1.1 UJ	0.99 UJ	250 U	1 U	6.8 UJ	5.8 U	8.1 U
1,2-Dichloropropane	2.5 UJ	1.3 UJ	1.2 UJ	280 U	1.2 U	6.8 UJ	5.8 U	8.1 U
1,3-Dichloropropene (cis)	1.7 UJ	0.92 UJ	0.82 UJ	220 UJ	0.93 U	6.8 UJ	5.8 U	8.1 U
1,3-Dichloropropene (trans)	2.1 UJ	1.1 UJ	0.99 UJ	220 UJ	0.93 U	6.8 UJ	5.8 U	8.1 U
1,4-Dichloro-2-butene (trans)	7.5 UJ	4 UJ	3.6 UJ	790 UJ	3.3 U	27 UJ	23 U	33 U
2-Butanone (MEK)	7.5 UJ	4 UJ	3.6 UJ	690 UJ	2.9 U	17 UJ	14 U	20 U
2-Chloro-1,3-butadiene (Chloroprene)	1.6 UJ	0.84 UJ	0.75 UJ	150 U	0.61 UJ	6.8 UJ	5.8 U	8.1 U
2-Hexanone (MBK)	10 UJ	5.4 UJ	4.9 UJ	530 UJ	2.3 U	17 UJ	14 U	20 U
3-Chloropropene (Allyl Chloride)	2.3 UJ	1.2 UJ	1.1 UJ	380 U	1.6 U	6.8 UJ	5.8 U	8.1 U
4-Methyl-2-pentanone (MIBK)	11 UJ	5.8 UJ	5.2 UJ	740 UJ	3.1 U	17 UJ	14 U	20 U
Acetone	20 J	4.7 J	4.9 J	1400 R	4.7 U	17 R	14 R	77 J
Acetonitrile	53 UJ	28 UJ	25 UJ	11000 UJ	48 U	6.8 UJ	5.8 U	8.1 U
Acrolein	21 UJ	11 UJ	9.9 UJ	4800 U	20 U	68 R	58 R	81 R
Acrylonitrile	30 UJ	16 UJ	14 UJ	5900 U	25 U	68 R	58 R	81 R
Benzene	1.6 UJ	0.87 UJ	0.78 UJ	200 U	0.85 U	6.8 UJ	5.8 U	8.1 U
Bromodichloromethane	1.9 UJ	1 UJ	0.9 UJ	210 UJ	0.89 U	6.8 UJ	5.8 U	8.1 U
Bromoform	4.2 UJ	2.2 UJ	2 UJ	280 U	1.2 U	6.8 UJ	5.8 U	8.1 U
Bromomethane	2.5 UJ	1.3 UJ	1.2 UJ	410 UJ	1.7 U	6.8 UJ	5.8 U	8.1 U
Carbon Disulfide	18 J	1 UJ	0.9 UJ	310 U	1.3 U	6.8 UJ	5.8 U	8.1 U
Carbon Tetrachloride	1.7 UJ	0.9 UJ	0.8 UJ	250 U	1.1 U	6.8 UJ	5.8 U	8.1 U
Chlorobenzene	1.3 UJ	0.7 UJ	0.62 UJ	190 U	0.78 U	6.8 UJ	5.8 U	8.1 U
Chloroethane	2.8 UJ	1.5 UJ	1.4 UJ	310 U	1.3 U	6.8 UJ	5.8 U	8.1 U
Chloroform	1.7 UJ	0.89 UJ	0.79 UJ	130 U	0.54 U	6.8 UJ	5.8 U	8.1 U
Chloromethane	1.3 UJ	0.71 UJ	0.63 UJ	180 UJ	0.76 U	6.8 UJ	5.8 U	8.1 U

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SB00	9SB03-01	9SB06-01	9SB48	9SB51	9SB57	9SB59	9SB63
Sample ID	9SB00-01	9SB03-01	9SB06-01	9SB48-01	9SB51-01	9SB57-01	9SB59-01	9SB63-01
Sample Date	3/12/2007	3/12/2007	3/13/2007	1/20/2009	1/20/2009	1/11/2011	1/11/2011	1/11/2011
Sample Depth (ft bgs)	1.0 - 3.0	1.0 - 3.0	1.0 - 3.0	1.0-3.0	1.0-3.0	1.0 - 3.0	1.0 - 3.0	1.0 - 3.0
Volatile Organics (µg/kg) (continued)								
Dibromochloromethane	2.1 UJ	1.1 UJ	0.99 UJ	130 UJ	0.54 U	6.8 UJ	5.8 U	8.1 U
Dibromomethane	2.5 UJ	1.3 UJ	1.2 UJ	310 U	1.3 U	6.8 UJ	5.8 U	8.1 U
Ethyl Methacrylate	1.5 UJ	0.78 UJ	0.69 UJ	560 U	2.4 U	68 UJ	58 U	81 U
Ethylbenzene	1.6 UJ	0.88 UJ	0.79 UJ	190 U	0.8 U	6.8 UJ	5.8 U	8.1 U
Freon 11 (Trichlorofluoromethane)	2.6 UJ	1.4 UJ	1.3 UJ	380 U	1.6 U	6.8 UJ	5.8 U	8.1 U
Freon-12 (Dichlorodifluoromethane)	4.7 UJ	2.5 UJ	2.3 UJ	230 UJ	0.95 U	6.8 UJ	5.8 U	8.1 U
Isobutyl Alcohol	250 UJ	130 UJ	120 UJ	18000 R	74 U	340 R	290 R	410 R
Methyl Acrylonitrile	30 UJ	16 UJ	14 UJ	6100 U	26 U	68 UJ	58 U	81 U
Methyl Iodide	1.9 UJ	1 UJ	0.9 UJ	250 UJ	1.1 U	6.8 UJ	5.8 U	8.1 U
Methyl Methacrylate	3.1 UJ	1.7 UJ	1.5 UJ	940 UJ	4 U	68 R	58 R	81 R
Methylene Chloride	3 UJ	1.6 UJ	1.4 UJ	250 U	1.5 J	6.8 UJ	5.8 U	8.1 U
Pentachloroethane	8.7 UJ	4.6 UJ	4.2 UJ	560 UJ	2.4 U	6.8 UJ	5.8 U	8.1 U
Propionitrile (Ethyl Cyanide)	43 UJ	23 UJ	21 UJ	5300 U	23 U	340 R	290 R	410 R
Styrene (Ethenylbenzene)	1.6 UJ	0.86 UJ	0.77 UJ	170 U	0.71 U	6.8 UJ	5.8 U	8.1 U
Tetrachloroethene (PCE)	1.9 UJ	1 UJ	0.9 UJ	190 U	0.78 U	6.8 UJ	5.8 U	8.1 U
Toluene	1.9 UJ	1 UJ	0.9 UJ	200 U	0.85 U	6.8 UJ	5.8 U	8.1 U
Trichloroethene (TCE)	2.3 UJ	1.2 UJ	1.1 UJ	250 U	1.1 U	6.8 UJ	5.8 U	8.1 U
Vinyl Acetate	3.6 UJ	1.9 UJ	1.7 UJ	380 U	1.6 U	6.8 UJ	5.8 U	8.1 U
Vinyl Chloride	1.7 UJ	0.93 UJ	0.83 UJ	150 U	0.62 U	6.8 UJ	5.8 U	8.1 U
Xylene, m/p-	NA	NA	NA	NA	NA	14 UJ	12 U	16 U
Xylene, o-	NA	NA	NA	NA	NA	6.8 UJ	5.8 U	8.1 U
Xylenes, total	3.8 UJ	2 UJ	1.8 UJ	590 U	2.5	6.8 UJ	5.8 U	8.1 U
Semivolatile Organics (µg/kg)								
1,1'-Biphenyl	56 U	31 U	32 U	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	60 U	34 U	35 U	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	40 U	23 U	23 U	NA	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	44 U	25 U	26 U	NA	NA	NA	NA	NA
1,3,5-Trinitrobenzene (TNB)	160 U	89 U	91 U	NA	NA	NA	NA	NA
1,3-Dichlorobenzene (m-)	50 U	28 U	29 U	NA	NA	NA	NA	NA
1,3-Dinitrobenzene (m-)	96 U	54 U	56 U	NA	NA	NA	NA	NA
1,4-Dichlorobenzene (p-)	42 U	24 U	25 U	NA	NA	NA	NA	NA
1,4-Dioxane (p-)	130 U	72 U	74 U	NA	NA	NA	NA	NA
1,4-Naphthoquinone	75 U	42 U	43 U	NA	NA	NA	NA	NA

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SUMMARY OF ANALYTICAL RESULTS - SUBSURFACE SOIL
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SB00	9SB03-01	9SB06-01	9SB48	9SB51	9SB57	9SB59	9SB63
Sample ID	9SB00-01	9SB03-01	9SB06-01	9SB48-01	9SB51-01	9SB57-01	9SB59-01	9SB63-01
Sample Date	3/12/2007	3/12/2007	3/13/2007	1/20/2009	1/20/2009	1/11/2011	1/11/2011	1/11/2011
Sample Depth (ft bgs)	1.0 - 3.0	1.0 - 3.0	1.0 - 3.0	1.0-3.0	1.0-3.0	1.0 - 3.0	1.0 - 3.0	1.0 - 3.0
Semivolatile Organics (µg/kg) (continued)								
1,4-Phenylenediamine	3300 U	1800 U	1900 U	NA	NA	NA	NA	NA
1-Naphthylamine	160 U	89 U	91 U	NA	NA	NA	NA	NA
2,2'-Oxybis[1-chloropropane]	67 U	38 U	39 U	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	87 U	49 U	50 U	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	62 U	35 U	36 U	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	38 U	22 U	22 U	NA	NA	NA	NA	NA
2,4-Dichlorophenol	44 U	25 U	26 U	NA	NA	NA	NA	NA
2,4-Dimethylphenol	67 U	38 U	39 U	NA	NA	NA	NA	NA
2,4-Dinitrophenol	330 U	180 U	190 U	NA	NA	NA	NA	NA
2,4-Dinitrotoluene (DNT)	37 U	21 U	21 U	NA	NA	NA	NA	NA
2,6-Dichlorophenol	100 U	57 U	59 U	NA	NA	NA	NA	NA
2,6-Dinitrotoluene (DNT)	64 U	36 U	37 U	NA	NA	NA	NA	NA
2-Acetylaminofluorene	73 U	41 U	42 U	NA	NA	NA	NA	NA
2-Chloronaphthalene	46 U	26 U	27 U	NA	NA	NA	NA	NA
2-Chlorophenol	52 U	29 U	30 U	NA	NA	NA	NA	NA
2-Methyl-5-nitroaniline	62 U	35 U	36 U	NA	NA	NA	NA	NA
2-Methylphenol (o-Cresol)	58 U	33 U	33 U	NA	NA	NA	NA	NA
2-Naphthylamine	160 U	89 U	91 U	NA	NA	NA	NA	NA
2-Nitroaniline	44 U	25 U	26 U	NA	NA	NA	NA	NA
2-Nitrophenol	38 U	22 U	22 U	NA	NA	NA	NA	NA
2-Picoline	160 U	89 U	91 U	NA	NA	NA	NA	NA
3 & 4 Methylphenol	56 U	31 U	32 U	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	58 U	33 U	33 U	NA	NA	NA	NA	NA
3,3'-Dimethylbenzidine	810 U	460 U	470 U	NA	NA	NA	NA	NA
3-Methylcholanthrene	50 U	28 U	29 U	NA	NA	NA	NA	NA
3-Nitroaniline	64 U	36 U	37 U	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	380 U	220 U	220 U	NA	NA	NA	NA	NA
4-Aminobiphenyl	100 U	59 U	60 U	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	60 U	34 U	35 U	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	65 U	37 U	38 U	NA	NA	NA	NA	NA
4-Chloroaniline	50 U	28 U	29 U	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	37 U	21 U	21 U	NA	NA	NA	NA	NA
4-Dimethylaminoazobenzene (p-)	73 U	41 U	42 U	NA	NA	NA	NA	NA
4-Nitroaniline	33 U	18 U	19 U	NA	NA	NA	NA	NA

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SB00	9SB03-01	9SB06-01	9SB48	9SB51	9SB57	9SB59	9SB63
Sample ID	9SB00-01	9SB03-01	9SB06-01	9SB48-01	9SB51-01	9SB57-01	9SB59-01	9SB63-01
Sample Date	3/12/2007	3/12/2007	3/13/2007	1/20/2009	1/20/2009	1/11/2011	1/11/2011	1/11/2011
Sample Depth (ft bgs)	1.0 - 3.0	1.0 - 3.0	1.0 - 3.0	1.0-3.0	1.0-3.0	1.0 - 3.0	1.0 - 3.0	1.0 - 3.0
Semivolatile Organics (µg/kg) (continued)								
4-Nitrophenol	400 UJ	230 UJ	230 UJ	NA	NA	NA	NA	NA
4-Nitroquinoline-1-oxide	320 R	180 R	180 R	NA	NA	NA	NA	NA
7,12-Dimethylbenz(a)anthracene	60 U	34 U	35 U	NA	NA	NA	NA	NA
a,a-Dimethylphenethylamine	940 UJ	530 UJ	550 UJ	NA	NA	NA	NA	NA
Acetophenone	42 U	24 U	25 U	NA	NA	NA	NA	NA
Aniline	40 U	23 U	23 U	NA	NA	NA	NA	NA
Aramite	120 UJ	65 UJ	67 UJ	NA	NA	NA	NA	NA
Benzyl Alcohol	73 U	41 U	42 U	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	46 U	26 U	27 U	NA	NA	NA	NA	NA
Bis(2-chloroethyl)ether	54 U	30 U	31 U	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) Phthalate (BEHP)	73 U	41 U	42 U	NA	NA	NA	NA	NA
Butyl Benzyl Phthalate	52 U	29 U	30 U	NA	NA	NA	NA	NA
Diallate (total)	110 U	61 U	62 U	NA	NA	NA	NA	NA
Dibenzofuran	37 U	21 U	21 U	NA	NA	NA	NA	NA
Diethyl Phthalate (DEP)	42 U	24 U	25 U	NA	NA	NA	NA	NA
Dimethyl Phthalate	37 U	21 U	21 U	NA	NA	NA	NA	NA
Di-n-butyl Phthalate (DBP)	54 U	30 U	31 U	NA	NA	NA	NA	NA
Di-n-octyl Phthalate	60 U	34 U	35 U	NA	NA	NA	NA	NA
Dinoseb	160 U	90 U	92 U	NA	NA	NA	NA	NA
Ethyl Methane Sulfonate (EMS)	130 U	72 U	74 U	NA	NA	NA	NA	NA
Hexachloro-1,3-butadiene	38 U	22 U	22 U	NA	NA	NA	NA	NA
Hexachlorobenzene	50 U	28 U	29 U	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	160 U	90 U	92 U	NA	NA	NA	NA	NA
Hexachloroethane	38 U	22 U	22 U	NA	NA	NA	NA	NA
Hexachlorophene	24000 UJ	14000 UJ	14000 UJ	NA	NA	NA	NA	NA
Hexachloropropene	87 U	49 U	50 U	NA	NA	NA	NA	NA
Isophorone	42 U	24 U	25 U	NA	NA	NA	NA	NA
Isosafrole	120 U	69 U	71 U	NA	NA	NA	NA	NA
Methapyrilene	81 U	46 U	47 U	NA	NA	NA	NA	NA
Methyl Methane Sulfonate	110 U	60 U	61 U	NA	NA	NA	NA	NA
Nitrobenzene	67 U	38 U	39 U	NA	NA	NA	NA	NA
n-Nitrosodiethylamine	85 U	48 U	49 U	NA	NA	NA	NA	NA
n-Nitrosodimethylamine (NDMA)	110 U	64 U	66 U	NA	NA	NA	NA	NA
n-Nitroso-di-n-butylamine	100 U	56 U	58 U	NA	NA	NA	NA	NA

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SB00	9SB03-01	9SB06-01	9SB48	9SB51	9SB57	9SB59	9SB63
Sample ID	9SB00-01	9SB03-01	9SB06-01	9SB48-01	9SB51-01	9SB57-01	9SB59-01	9SB63-01
Sample Date	3/12/2007	3/12/2007	3/13/2007	1/20/2009	1/20/2009	1/11/2011	1/11/2011	1/11/2011
Sample Depth (ft bgs)	1.0 - 3.0	1.0 - 3.0	1.0 - 3.0	1.0-3.0	1.0-3.0	1.0 - 3.0	1.0 - 3.0	1.0 - 3.0
Semivolatile Organics (µg/kg) (continued)								
n-Nitrosodi-n-propylamine	54 U	30 U	31 U	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	44 U	25 U	26 U	NA	NA	NA	NA	NA
n-Nitrosomethylethylamine	100 U	56 U	58 U	NA	NA	NA	NA	NA
n-Nitrosomorpholine	130 U	72 U	74 U	NA	NA	NA	NA	NA
n-Nitrosopiperidine	140 U	77 U	79 U	NA	NA	NA	NA	NA
n-Nitrosopyrrolidine	87 U	49 U	50 U	NA	NA	NA	NA	NA
o-Toluidine	110 U	61 U	62 U	NA	NA	NA	NA	NA
Pentachlorobenzene	120 U	69 U	71 U	NA	NA	NA	NA	NA
Pentachloronitrobenzene	110 U	61 U	62 U	NA	NA	NA	NA	NA
Pentachlorophenol	160 U	90 U	92 U	NA	NA	NA	NA	NA
Phenacetin	98 U	55 U	57 U	NA	NA	NA	NA	NA
Phenol	58 U	33 U	33 U	NA	NA	NA	NA	NA
Pronamide	120 U	68 U	70 U	NA	NA	NA	NA	NA
Pyridine	58 U	33 U	33 U	NA	NA	NA	NA	NA
Safrole	100 U	57 U	59 U	NA	NA	NA	NA	NA
PAHs (µg/kg)								
1-Methylnaphthalene	160	1.2 U	12 U	2.5 U	2.4 U	NA	NA	NA
2-Methylnaphthalene	15	1.1 U	11 U	2.5 U	2.4 U	NA	NA	NA
Acenaphthene	1.9 U	1.1 U	11 U	2.5 U	2.4 U	NA	NA	NA
Acenaphthylene	1.9 U	1.1 U	11 U	2.5 U	2.4 U	NA	NA	NA
Anthracene	1.9 U	1.1 U	11 U	2.5 U	2.4 U	NA	NA	NA
Benzo(a)anthracene	1.9 U	1.1 U	11 U	2.5 U	2.4 U	NA	NA	NA
Benzo(a)pyrene (BaP)	1.6 U	0.9 U	9.3 U	2.5 U	2.4 U	NA	NA	NA
Benzo(b)fluoranthene	2.1 U	1.2 U	12 U	2.5 U	2.4 U	NA	NA	NA
Benzo(g,h,i)perylene	1.9 U	1.1 U	54 J	2.5 U	2.4 U	NA	NA	NA
Benzo(k)fluoranthene	1.6 U	0.92 U	9.5 U	2.5 U	2.4 U	NA	NA	NA
Chrysene	1.8 U	1 U	10 U	2.5 U	2.4 U	NA	NA	NA
Dibenz(a,h)anthracene	2.7 U	1.5 U	16 U	0.85 U	0.8 U	NA	NA	NA
Fluoranthene	2.1 U	1.2 U	12 U	0.57 U	0.54 U	NA	NA	NA
Fluorene	19	1.3 U	13 U	2.5 U	2.4 U	NA	NA	NA
Indeno(1,2,3-cd)pyrene	3.1 U	1.7 U	18 U	4.9 U	4.7 U	NA	NA	NA
Naphthalene	2.3 U	1.3 U	13 U	2.5 U	2.4 U	NA	NA	NA

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SB00	9SB03-01	9SB06-01	9SB48	9SB51	9SB57	9SB59	9SB63
Sample ID	9SB00-01	9SB03-01	9SB06-01	9SB48-01	9SB51-01	9SB57-01	9SB59-01	9SB63-01
Sample Date	3/12/2007	3/12/2007	3/13/2007	1/20/2009	1/20/2009	1/11/2011	1/11/2011	1/11/2011
Sample Depth (ft bgs)	1.0 - 3.0	1.0 - 3.0	1.0 - 3.0	1.0-3.0	1.0-3.0	1.0 - 3.0	1.0 - 3.0	1.0 - 3.0
PAHs (µg/kg) (continued)								
Phenanthrene	30	1.4 U	15 U	2.5 U	2.4 U	NA	NA	NA
Pyrene	2.3 U	1.3 U	13 U	2.5 U	2.4 U	NA	NA	NA
Organophosphorous Pesticides (µg/kg)								
Dimethoate	87 U	49 U	50 U	NA	NA	NA	NA	NA
Disulfoton	110 U	60 U	61 U	NA	NA	NA	NA	NA
Famphur	190 U	110 U	110 U	NA	NA	NA	NA	NA
Methyl Parathion	90 U	51 U	52 U	NA	NA	NA	NA	NA
o,o,o-Triethyl Phosphorothioate	140 U	78 U	80 U	NA	NA	NA	NA	NA
Parathion	110 U	60 U	61 U	NA	NA	NA	NA	NA
Phorate	130 U	75 U	77 U	NA	NA	NA	NA	NA
Sulfotepp	110 U	60 U	61 U	NA	NA	NA	NA	NA
Thionazin	81 U	46 U	47 U	NA	NA	NA	NA	NA
Metals (mg/kg)								
Antimony	0.82 UJ	0.48 UJ	0.48 UJ	NA	NA	NA	NA	NA
Arsenic	1.2 U	1.8 J	0.77 J	NA	NA	NA	NA	NA
Barium	17	64	51	NA	NA	NA	NA	NA
Beryllium	0.21 J	0.28 J	0.15 J	NA	NA	NA	NA	NA
Cadmium	0.4 U	0.73 J	0.54 J	NA	NA	NA	NA	NA
Chromium	19	7	4.2	NA	NA	NA	NA	NA
Cobalt	3.9 J	32 J	20 J	NA	NA	NA	NA	NA
Copper	130 J	110 J	93 J	NA	NA	NA	NA	NA
Lead	3.7 J	790 J	25 J	NA	NA	NA	NA	NA
Mercury	0.049	0.034	0.0081 U	NA	NA	NA	NA	NA
Nickel	5 J	9.1	5.8	NA	NA	NA	NA	NA
Selenium	1.6 U	0.96 U	0.97 U	NA	NA	NA	NA	NA
Silver	0.18 U	0.11 U	0.11 U	NA	NA	NA	NA	NA
Thallium	2.4 UJ	4.6 J	7 UJ	NA	NA	NA	NA	NA
Tin	7.3 U	4.3 U	4.3 U	NA	NA	NA	NA	NA
Vanadium	200 J	190 J	170 J	NA	NA	NA	NA	NA
Zinc	32 J	71 J	47 J	NA	NA	NA	NA	NA

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SUMMARY OF ANALYTICAL RESULTS - SUBSURFACE SOIL
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Notes/Qualifiers:

BERA - Baseline Ecological Risk Assessment
ft bgs - feet below ground surface
J - Estimated: The analyte was positively identified; the quantitation is an estimation.
µg/kg - microgram per kilogram
mg/kg - milligram per kilogram
NA - Not Analyzed
PAHs - Polynuclear Aromatic Hydrocarbons
R - Rejected data; data is not usable.
SERA - Screening Level Ecological Risk Assessment
U - Non detected.
UJ - Reported quantitation limit is qualified as estimated.

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SUMMARY OF ANALYTICAL RESULTS - GROUNDWATER
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ATIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9GW00	9GW01	9GW06	9GW13	9GW16	9GW17	9GW25	13GW05	9TW/SB09	9SB37	9SB39	9SB40
Sample ID	9GW00	9GW01	9GW06	9GW13	9GW16	9GW17	9GW25	13GW05-11	9GW09-11	9GW37-11	9GW39-11	9GW40-11
Sample Date	3/16/2007	3/16/2007	3/16/2007	3/16/2007	3/16/2007	3/16/2007	3/17/2007	1/8/2011	1/12/2011	1/11/2011	1/9/2011	1/10/2011
Volatile Organics (µg/L)												
1,1,1,2-Tetrachloroethane	0.45 U	0.45 U	0.45 U	0.45 U	0.45 U	0.45 U	0.45 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
1,1,1-Trichloroethane	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	0.92 U	0.92 U	0.92 U	0.92 U	0.92 U	0.92 U	0.92 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloroethane	1.3 U	14	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethene	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.73 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
1,2,3-Trichloropropane	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dibromo-3-chloropropane (DBCP)	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dibromoethane (EDB)	0.93 U	0.93 U	0.93 U	0.93 U	0.93 U	0.93 U	0.93 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethene (trans)	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloropropane	0.56 U	0.56 U	0.56 U	0.56 U	0.56 U	0.56 U	0.56 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
1,3-Dichloropropene (cis)	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.35 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
1,3-Dichloropropene (trans)	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
1,4-Dichloro-2-butene (trans)	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U	2 R	2 U	2 U	2 U	2 U
2-Butanone (MEK)	0.39 U	0.39 U	0.39 U	0.39 U	0.39 U	0.39 U	0.39 U	2.5 R	2.5 U	2.5 U	2.5 R	2.5 U
2-Chloro-1,3-butadiene (Chloroprene)	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
2-Hexanone (MBK)	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	2.5 R	2.5 U	2.5 U	2.5 U	2.5 U
3-Chloropropene (Allyl Chloride)	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
4-Methyl-2-pentanone (MIBK)	0.96 UJ	0.96 UJ	0.96 UJ	0.96 UJ	0.96 UJ	0.96 UJ	0.96 UJ	2.5 R	2.5 U	2.5 U	2.5 U	2.5 U
Acetone	29 U	13 U	13 U	11 U	7.3 U	7.3 U	7.3 U	7.2 J	2.7 R	2.5 R	36 J	2.5 R
Acetonitrile	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Acrolein	12 U	12 U	12 U	12 U	12 U	12 U	12 U	5 R	5 R	5 R	5 R	5 R
Acrylonitrile	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	5 R	5 R	5 R	5 R	5 R
Benzene	0.54 U	0.54 U	0.54 U	20	0.54 U	24	330 J	4.2 J	0.5 U	0.5 U	0.5 U	0.5 U
Bromodichloromethane	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Bromoform	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Bromomethane	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	0.93 UJ	0.93 UJ	0.93 UJ	0.93 UJ	0.93 UJ	0.93 UJ	0.93 UJ	0.5 R	0.11 J	0.5 U	0.5 U	0.5 U
Carbon Tetrachloride	3.6 J	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Chlorobenzene	0.75 U	3.2	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Chloroethane	0.89 UJ	0.89 UJ	0.89 UJ	0.89 UJ	0.89 UJ	0.89 UJ	0.89 UJ	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Chloroform	0.52 U	0.52 U	0.52 U	0.52 U	0.52 U	0.52 U	0.52 U	0.5 R	0.043 J	0.5 U	0.052 J	0.5 U
Chloromethane	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Dibromochloromethane	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Dibromomethane	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Ethyl Methacrylate	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	5 R	5 U	5 U	5 U	5 U
Ethylbenzene	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Freon 11 (Trichlorofluoromethane)	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Freon-12 (Dichlorodifluoromethane)	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Isobutyl Alcohol	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	25 R	25 R	25 R	25 R	25 R

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ATIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9GW00	9GW01	9GW06	9GW13	9GW16	9GW17	9GW25	13GW05	9TW/SB09	9SB37	9SB39	9SB40
Sample ID	9GW00	9GW01	9GW06	9GW13	9GW16	9GW17	9GW25	13GW05-11	9GW09-11	9GW37-11	9GW39-11	9GW40-11
Sample Date	3/16/2007	3/16/2007	3/16/2007	3/16/2007	3/16/2007	3/16/2007	3/17/2007	1/8/2011	1/12/2011	1/11/2011	1/9/2011	1/10/2011
Volatile Organics (µg/L) (continued)												
Methyl Acrylonitrile	0.62 U	0.62 U	0.62 U	130	0.62 U	89	1.8 J	5 R	5 U	5 U	5 U	5 U
Methyl Iodide	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Methyl Methacrylate	13 R	13 R	13 R	13 R	13 R	13 R	13 R	5 R	5 U	5 U	5 U	5 U
Methylene Chloride	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Pentachloroethane	9.1 U	9.1 U	9.1 U	9.1 U	9.1 U	9.1 U	9.1 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Propionitrile (Ethyl Cyanide)	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	25 R	25 R	25 R	25 R	25 R
Styrene (Ethenylbenzene)	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Tetrachloroethene (PCE)	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Toluene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethene (TCE)	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Vinyl Acetate	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	1 R	1 U	1 U	1 U	1 U
Vinyl Chloride	0.96 UJ	0.96 UJ	0.96 UJ	0.96 UJ	0.96 UJ	0.96 UJ	0.96 UJ	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Xylene, m/p-	NA	NA	NA	NA	NA	NA	NA	1 R	1 U	1 U	1 U	1 U
Xylene, o-	NA	NA	NA	NA	NA	NA	NA	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Xylenes, total	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.44 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Semivolatile Organics (µg/L) (continued)												
1,1'-Biphenyl	NA	0.67 U	0.66 U	0.64 U	0.64 U	0.65 U	0.65 U	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	NA	1.2 U	1.2 U	1.1 U	1.1 U	1.2 U	1.2 U	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	0.53 U	0.52 U	0.51 U	0.51 U	0.52 U	0.52 U	NA	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	NA	0.98 U	0.97 U	0.94 U	0.94 U	0.96 U	0.96 U	NA	NA	NA	NA	NA
1,3,5-Trinitrobenzene (TNB)	NA	0.61 U	0.6 U	0.58 U	0.58 U	0.6 U	0.6 U	NA	NA	NA	NA	NA
1,3-Dichlorobenzene (m-)	NA	0.54 U	0.53 U	0.52 U	0.52 U	0.53 U	0.53 U	NA	NA	NA	NA	NA
1,3-Dinitrobenzene (m-)	NA	0.67 U	0.66 U	0.64 U	0.64 U	0.65 U	0.65 U	NA	NA	NA	NA	NA
1,4-Dichlorobenzene (p-)	NA	0.51 U	0.5 U	0.49 U	0.49 U	0.5 U	0.5 U	NA	NA	NA	NA	NA
1,4-Dioxane (p-)	NA	2.3 U	2.2 U	4.3 J	2.2 U	2.2 U	2.2 U	NA	NA	NA	NA	NA
1,4-Naphthoquinone	NA	1.2 U	1.2 U	1.1 U	1.1 U	1.2 U	1.2 U	NA	NA	NA	NA	NA
1,4-Phenylenediamine	NA	0.71 U	0.7 U	0.68 U	0.68 U	0.69 U	0.69 U	NA	NA	NA	NA	NA
1-Naphthylamine	NA	0.46 U	0.46 U	0.44 U	0.44 U	0.45 U	0.45 U	NA	NA	NA	NA	NA
2,2'-Oxybis[1-chloropropane]	NA	0.97 U	0.96 U	0.93 U	0.93 U	0.95 U	0.95 U	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	NA	0.62 U	0.61 U	0.59 U	0.59 U	0.61 U	0.61 U	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	0.69 U	0.68 U	0.66 U	0.66 U	0.67 U	0.67 U	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	0.65 U	0.64 U	0.62 U	0.62 U	0.63 U	0.63 U	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	2.1 J	0.97 U	0.94 U	0.94 U	0.96 U	0.96 U	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	4.9 UJ	4.9 U	4.7 U	4.7 U	4.8 U	4.8 U	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	0.55 U	0.54 U	0.53 U	0.53 U	0.54 U	0.54 U	NA	NA	NA	NA	NA
2,4-Dinitrotoluene (DNT)	NA	0.68 U	0.67 U	0.65 U	0.65 U	0.66 U	0.66 U	NA	NA	NA	NA	NA
2,6-Dichlorophenol	NA	0.56 U	0.55 U	0.54 U	0.54 U	0.55 U	0.55 U	NA	NA	NA	NA	NA
2,6-Dinitrotoluene (DNT)	NA	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	NA	NA	NA	NA	NA
2-Acetylaminofluorene	NA	0.71 U	0.7 U	0.68 U	0.68 U	0.69 U	0.69 U	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	0.69 U	0.68 U	0.66 U	0.66 U	0.67 U	0.67 U	NA	NA	NA	NA	NA

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ATIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9GW00	9GW01	9GW06	9GW13	9GW16	9GW17	9GW25	13GW05	9TW/SB09	9SB37	9SB39	9SB40
Sample ID	9GW00	9GW01	9GW06	9GW13	9GW16	9GW17	9GW25	13GW05-11	9GW09-11	9GW37-11	9GW39-11	9GW40-11
Sample Date	3/16/2007	3/16/2007	3/16/2007	3/16/2007	3/16/2007	3/16/2007	3/17/2007	1/8/2011	1/12/2011	1/11/2011	1/9/2011	1/10/2011
Semivolatile Organics (µg/L) (continued)												
2-Chlorophenol	NA	0.61 U	0.6 U	0.58 U	0.58 U	0.6 U	0.6 U	NA	NA	NA	NA	NA
2-Methyl-5-nitroaniline	NA	0.98 U	0.97 U	0.94 U	0.94 U	0.96 U	0.96 U	NA	NA	NA	NA	NA
2-Methylphenol (o-Cresol)	NA	0.63 U	0.62 U	0.6 U	0.6 U	0.62 U	0.62 U	NA	NA	NA	NA	NA
2-Naphthylamine	NA	0.68 U	0.67 U	0.65 U	0.65 U	0.66 U	0.66 U	NA	NA	NA	NA	NA
2-Nitroaniline	NA	0.72 U	0.71 U	0.69 U	0.69 U	0.7 U	0.7 U	NA	NA	NA	NA	NA
2-Nitrophenol	NA	0.85 U	0.84 UJ	0.82 U	0.82 UJ	0.84 UJ	0.84 UJ	NA	NA	NA	NA	NA
2-Picoline	NA	0.57 U	0.56 U	0.55 U	0.55 U	0.56 U	0.56 U	NA	NA	NA	NA	NA
3 & 4 Methylphenol	NA	0.98 U	0.97 U	0.94 U	0.94 U	0.96 U	0.96 U	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	2.5 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	NA	NA	NA	NA	NA
3,3'-Dimethylbenzidine	NA	1.4 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	NA	NA	NA	NA	NA
3-Methylcholanthrene	NA	0.68 U	0.67 U	0.65 U	0.65 U	0.66 U	0.66 U	NA	NA	NA	NA	NA
3-Nitroaniline	NA	0.98 U	0.97 U	0.94 U	0.94 U	0.96 U	0.96 U	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	0.67 U	0.66 U	0.64 U	0.64 U	0.65 U	0.65 U	NA	NA	NA	NA	NA
4-Aminobiphenyl	NA	0.83 U	0.83 U	0.8 U	0.8 U	0.82 U	0.82 U	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	NA	0.54 U	0.53 U	0.52 U	0.52 U	0.53 U	0.53 U	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	0.51 U	0.5 U	0.49 U	0.49 U	0.5 U	0.5 U	NA	NA	NA	NA	NA
4-Chloroaniline	NA	0.55 U	0.54 U	0.53 U	0.53 U	0.54 U	0.54 U	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	0.83 U	0.83 U	0.8 U	0.8 U	0.82 U	0.82 U	NA	NA	NA	NA	NA
4-Dimethylaminoazobenzene (p-)	NA	0.58 U	0.57 U	0.56 U	0.56 U	0.57 U	0.57 U	NA	NA	NA	NA	NA
4-Nitroaniline	NA	3.3 U	3.3 U	3.2 U	3.2 U	3.3 U	3.3 U	NA	NA	NA	NA	NA
4-Nitrophenol	NA	4.9 R	4.9 R	4.7 R	4.7 R	4.8 R	4.8 R	NA	NA	NA	NA	NA
4-Nitroquinoline-1-oxide	NA	1.3 U	1.3 U	1.2 U	1.2 U	1.3 U	1.3 U	NA	NA	NA	NA	NA
7,12-Dimethylbenz(a)anthracene	NA	0.81 U	0.81 U	0.78 U	0.78 U	0.8 U	0.8 U	NA	NA	NA	NA	NA
a,a-Dimethylphenethylamine	NA	0.64 U	0.63 U	0.61 U	0.61 U	0.63 U	0.63 U	NA	NA	NA	NA	NA
Acetophenone	NA	9.8 U	9.7 U	9.4 U	9.4 U	9.6 U	9.6 U	NA	NA	NA	NA	NA
Aniline	NA	1.7 U	1.7 U	1.6 U	1.6 U	1.6 U	1.6 U	NA	NA	NA	NA	NA
Aramite	NA	0.78 U	0.78 U	0.75 U	0.75 U	0.77 U	7.3 U	NA	NA	NA	NA	NA
Benzyl Alcohol	NA	0.76 U	0.76 U	0.74 U	0.74 U	0.75 U	0.75 U	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	NA	0.71 U	0.7 U	0.68 U	0.68 U	0.69 U	0.69 U	NA	NA	NA	NA	NA
Bis(2-chloroethyl)ether	NA	0.96 U	0.95 U	0.92 U	0.92 U	0.94 U	1.1 J	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) Phthalate (BEHP)	NA	1.6 U	1.6 U	1.5 U	1.5 U	1.5 U	1.5 U	NA	NA	NA	NA	NA
Butyl Benzyl Phthalate	NA	0.8 U	0.8 U	0.77 U	0.77 U	0.79 U	0.79 U	NA	NA	NA	NA	NA
Diallate (total)	NA	0.68 U	0.67 U	0.65 U	0.65 U	0.66 U	0.66 U	NA	NA	NA	NA	NA
Dibenzofuran	NA	0.8 U	0.8 U	0.77 U	0.77 U	0.79 U	7.9 J	NA	NA	NA	NA	NA
Diethyl Phthalate (DEP)	NA	1.2 U	1.2 U	1.1 U	1.1 U	1.2 U	1.2 U	NA	NA	NA	NA	NA
Dimethyl Phthalate	NA	2.5 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	NA	NA	NA	NA	NA
Di-n-butyl Phthalate (DBP)	NA	0.58 U	0.57 U	0.56 U	0.56 U	0.57 U	0.57 U	NA	NA	NA	NA	NA
Di-n-octyl Phthalate	NA	0.88 U	0.87 U	0.85 U	0.85 U	0.87 U	0.87 U	NA	NA	NA	NA	NA
Dinoseb	NA	0.78 U	0.78 U	0.75 U	0.75 U	0.77 U	0.77 U	NA	NA	NA	NA	NA
Ethyl Methane Sulfonate (EMS)	NA	1.1 U	1.1 U	1 U	1 U	1.1 U	1.1 U	NA	NA	NA	NA	NA
Hexachloro-1,3-butadiene	NA	4.9 U	4.9 U	4.7 U	4.7 U	4.8 U	4.8 U	NA	NA	NA	NA	NA

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Site ID	9GW00	9GW01	9GW06	9GW13	9GW16	9GW17	9GW25	13GW05	9TW/SB09	9SB37	9SB39	9SB40
Sample ID	9GW00	9GW01	9GW06	9GW13	9GW16	9GW17	9GW25	13GW05-11	9GW09-11	9GW37-11	9GW39-11	9GW40-11
Sample Date	3/16/2007	3/16/2007	3/16/2007	3/16/2007	3/16/2007	3/16/2007	3/17/2007	1/8/2011	1/12/2011	1/11/2011	1/9/2011	1/10/2011
Semivolatile Organics (µg/L) (continued)												
Hexachlorobenzene	NA	0.98 U	0.97 U	0.94 U	0.94 U	0.96 U	0.96 U	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	0.98 U	0.97 U	0.94 U	0.94 U	0.96 U	0.96 U	NA	NA	NA	NA	NA
Hexachloroethane	NA	46 R	46 UJ	44 U	44 U	45 U	45 U	NA	NA	NA	NA	NA
Hexachlorophene	NA	1.2 U	1.2 U	1.1 U	1.1 UJ	1.2 UJ	1.2 UJ	NA	NA	NA	NA	NA
Hexachloropropene	NA	0.66 U	0.65 U	0.63 U	0.63 U	0.64 U	0.64 U	NA	NA	NA	NA	NA
Isophorone	NA	0.94 U	0.93 U	0.91 U	0.91 U	0.92 U	0.92 U	NA	NA	NA	NA	NA
Isosafrole	NA	1.9 U	1.8 UJ	1.8 U	1.8 UJ	1.8 UJ	1.8 UJ	NA	NA	NA	NA	NA
Methapyrilene	NA	0.83 UJ	0.83 UJ	0.8 UJ	0.8 UJ	0.82 UJ	0.82 UJ	NA	NA	NA	NA	NA
Methyl Methane Sulfonate	NA	0.91 U	0.9 U	0.88 U	0.88 U	0.89 U	0.89 U	NA	NA	NA	NA	NA
Nitrobenzene	NA	0.76 U	0.76 U	0.74 U	0.74 U	0.75 U	0.75 U	NA	NA	NA	NA	NA
n-Nitrosodiethylamine	NA	1.1 U	1.1 U	1 U	1 U	1.1 U	1.1 U	NA	NA	NA	NA	NA
n-Nitrosodimethylamine (NDMA)	NA	0.78 U	0.78 U	0.75 U	0.75 U	0.77 U	0.77 U	NA	NA	NA	NA	NA
n-Nitroso-di-n-butylamine	NA	0.8 U	0.8 U	0.77 U	0.77 U	0.79 U	0.79 U	NA	NA	NA	NA	NA
n-Nitrosodi-n-propylamine	NA	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	0.61 U	0.6 U	0.58 U	0.58 U	0.6 U	0.6 U	NA	NA	NA	NA	NA
n-Nitrosomethylethylamine	NA	1.1 U	1.1 U	1 U	1 U	1.1 U	1.1 U	NA	NA	NA	NA	NA
n-Nitrosomorpholine	NA	1.2 U	1.2 U	1.1 U	1.1 U	1.2 U	1.2 U	NA	NA	NA	NA	NA
n-Nitrosopiperidine	NA	0.56 U	0.55 U	0.54 U	0.54 U	0.55 U	0.55 U	NA	NA	NA	NA	NA
n-Nitrosopyrrolidine	NA	1.2 U	1.2 U	1.1 U	1.1 U	1.2 U	1.2 U	NA	NA	NA	NA	NA
o-Toluidine	NA	0.65 U	2 J	1.8 U	0.62 U	0.63 U	0.63 U	NA	NA	NA	NA	NA
Pentachlorobenzene	NA	1.2 U	1.2 U	1.1 U	1.1 U	1.2 U	1.2 U	NA	NA	NA	NA	NA
Pentachloronitrobenzene	NA	2.5 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	NA	NA	NA	NA	NA
Pentachlorophenol	NA	0.8 U	0.8 U	0.77 U	0.77 U	0.79 U	0.79 U	NA	NA	NA	NA	NA
Phenacetin	NA	0.97 U	0.96 U	5.6 J	0.93 U	2.6 J	3.1 J	NA	NA	NA	NA	NA
Phenol	NA	36 U	36 U	35 U	35 U	36 U	36 U	NA	NA	NA	NA	NA
Pronamide	NA	1.3 U	1.3 U	1.2 U	1.2 U	1.3 U	1.3 U	NA	NA	NA	NA	NA
Pyridine	NA	0.79 U	0.79 U	0.76 U	0.76 U	0.78 U	0.78 U	NA	NA	NA	NA	NA
Safrole	NA	0.97 U	0.96 U	0.93 U	0.93 U	0.95 U	0.95 U	NA	NA	NA	NA	NA
PAHs (µg/L)												
1-Methylnaphthalene	NA	0.56 U	0.011 U	12	0.011 U	0.87	0.46	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	0.38 U	0.0074 U	16	0.0072 U	1.4	0.84	NA	NA	NA	NA	NA
Acenaphthene	NA	0.82 U	0.016 U	0.015 U	0.015 U	0.015 U	0.016 U	NA	NA	NA	NA	NA
Acenaphthylene	NA	0.42 U	0.0081 U	0.008 U	0.008 U	0.008 U	0.0081 U	NA	NA	NA	NA	NA
Anthracene	NA	0.56 U	0.011 U	0.011 U	0.011 U	0.011 U	0.011 U	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	0.71 U	0.014 U	0.013 U	0.013 U	0.013 U	0.014 U	NA	NA	NA	NA	NA
Benzo(a)pyrene (BaP)	NA	0.82 U	0.016 U	0.015 U	0.015 U	0.015 U	0.016 U	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	2.1 U	0.04 U	0.039 U	0.039 U	0.039 U	0.04 U	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	1.2 U	0.023 U	0.022 U	0.022 U	0.022 U	0.022 U	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	1.8 U	0.035 U	0.035 U	0.035 U	0.035 U	0.035 U	NA	NA	NA	NA	NA
Chrysene	NA	0.77 U	0.015 U	0.014 U	0.014 U	0.014 U	0.015 U	NA	NA	NA	NA	NA

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Site ID	9GW00	9GW01		9GW06		9GW13		9GW16		9GW17		9GW25		13GW05	9TW/SB09	9SB37	9SB39	9SB40
Sample ID	9GW00	9GW01		9GW06		9GW13		9GW16		9GW17		9GW25		13GW05-11	9GW09-11	9GW37-11	9GW39-11	9GW40-11
Sample Date	3/16/2007	3/16/2007		3/16/2007		3/16/2007		3/16/2007		3/16/2007		3/17/2007		1/8/2011	1/12/2011	1/11/2011	1/9/2011	1/10/2011
PAHs (µg/L) (continued)																		
Dibenz(a,h)anthracene	NA	1.2	U	0.024	U	0.023	U	0.023	U	0.023	U	0.023	U	NA	NA	NA	NA	NA
Fluoranthene	NA	0.43	U	0.0083	U	0.0082	U	0.0082	U	0.0082	U	0.0083	U	NA	NA	NA	NA	NA
Fluorene	NA	0.61	U	0.012	U	0.22	J	0.012	U	0.059	J	0.1	J	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	1.7	U	0.032	U	0.032	U	0.032	U	0.032	U	0.032	U	NA	NA	NA	NA	NA
Naphthalene	NA	0.48	U	0.0093	U	16		0.0091	U	1.7		0.91		NA	NA	NA	NA	NA
Phenanthrene	NA	0.43	U	0.0083	U	0.32	J	0.0082	U	0.029	J	0.0083	U	NA	NA	NA	NA	NA
Pyrene	NA	0.44	U	0.0084	U	0.032	J	0.0083	U	0.0083	U	0.0083	U	NA	NA	NA	NA	NA
Organophosphorous Pesticides (µg/L)																		
Dimethoate	NA	0.63	U	0.62	U	0.6	U	0.6	U	0.62	U	0.62	U	NA	NA	NA	NA	NA
Disulfoton	NA	0.87	U	0.86	U	0.84	U	0.84	U	0.86	U	0.86	U	NA	NA	NA	NA	NA
Famphur	NA	0.69	U	0.68	U	0.66	U	0.66	U	0.67	U	0.67	U	NA	NA	NA	NA	NA
Methyl Parathion	NA	0.81	U	0.81	U	0.78	U	0.78	U	0.8	U	0.8	U	NA	NA	NA	NA	NA
o,o,o-Triethyl Phosphorothioate	NA	0.76	U	0.76	U	0.74	U	0.74	U	0.75	U	0.75	U	NA	NA	NA	NA	NA
Parathion	NA	0.76	U	0.76	U	0.74	U	0.74	U	0.75	U	0.75	U	NA	NA	NA	NA	NA
Phorate	NA	2.2	U	2.1	U	2.1	U	2.1	U	2.1	U	2.1	U	NA	NA	NA	NA	NA
Sulfotepp	NA	0.69	U	0.68	U	0.66	U	0.66	U	0.67	U	0.67	U	NA	NA	NA	NA	NA
Thionazin	NA	0.66	U	0.65	U	0.63	U	0.63	U	0.64	U	0.64	U	NA	NA	NA	NA	NA
Dissolved Metals (mg/L)																		
Antimony	NA	4	U	4	U	4	U	4	U	4	U	4	U	NA	NA	NA	NA	NA
Arsenic	NA	25		4.2	U	4.2	U	4.2	U	4.2	U	4.2	U	NA	NA	NA	NA	NA
Barium	NA	370		61		180	J	70		99		19		NA	NA	NA	NA	NA
Beryllium	NA	0.14	J	0.12	U	0.12	U	0.24	J	0.12	U	0.12	U	NA	NA	NA	NA	NA
Cadmium	NA	1	U	1	U	1	U	4.3	J	1	U	1	U	NA	NA	NA	NA	NA
Chromium	NA	2.3	U	0.83	U	0.83	U	0.83	U	0.83	U	1.6	J	NA	NA	NA	NA	NA
Cobalt	NA	5.8	J	29		12		10		11		9.6	J	NA	NA	NA	NA	NA
Copper	NA	3.2	J	5.7	J	1.7	U	3.4	J	1.7	U	6.5	J	NA	NA	NA	NA	NA
Lead	NA	2.2	U	2.2	U	2.2	U	2.2	U	2.8	J	9		NA	NA	NA	NA	NA
Mercury	NA	0.08	UJ	0.08	UJ	0.08	UJ	0.08	UJ	0.08	UJ	0.08	UJ	NA	NA	NA	NA	NA
Nickel	NA	2	J	3.6	J	2.6	J	2.3	J	3.1	J	3.1	J	NA	NA	NA	NA	NA
Selenium	NA	6.2	U	6.2	U	6.2	U	6.2	U	6.2	U	6.2	U	NA	NA	NA	NA	NA
Silver	NA	1	U	1	U	1	U	1	U	1	U	1	U	NA	NA	NA	NA	NA
Thallium	NA	9.8	UJ	9.8	UJ	9.8	UJ	9.8	UJ	9.8	UJ	9.8	UJ	NA	NA	NA	NA	NA
Tin	NA	14	U	14	U	14	U	14	U	14	U	14	U	NA	NA	NA	NA	NA
Vanadium	NA	61	J	13		93	R	55	J	36		18		NA	NA	NA	NA	NA
Zinc	NA	14	U	9.5	U	11	U	9.6	U	7.9	U	8.7	U	NA	NA	NA	NA	NA

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Sample Date	3/16/2007	3/16/2007	3/16/2007	3/16/2007	3/16/2007	3/16/2007	3/17/2007	1/8/2011	1/12/2011	1/11/2011	1/9/2011	1/10/2011
Total Metals (mg/L)												
Antimony	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	NA	NA	NA	NA	NA
Arsenic	13 J	20	5.2 U	5.2 U	5.2 U	5.2 U	5.2 U	NA	NA	NA	NA	NA
Barium	230	370	100	190 J	78	100	130	NA	NA	NA	NA	NA
Beryllium	0.83 J	0.14 U	0.14 U	0.14 U	0.19 J	0.14 U	0.45 J	NA	NA	NA	NA	NA
Cadmium	13	1 U	1.3 J	1 U	4.6 J	1 U	2.2 J	NA	NA	NA	NA	NA
Chromium	56	3.2 U	2.1 U	5.2 U	1.4 U	1.1 U	54	NA	NA	NA	NA	NA
Cobalt	40	2.7 J	29	12	6.3 J	6.6 J	91 J	NA	NA	NA	NA	NA
Copper	510	12 J	54 J	80 J	8.9 J	22 J	410	NA	NA	NA	NA	NA
Lead	27	3.5 U	3.5 U	8.7 J	3.5 U	6.1 J	93	NA	NA	NA	NA	NA
Mercury	0.57 J	0.08 UJ	0.08 UJ	0.08 UJ	0.08 UJ	0.08 UJ	0.08 UJ	NA	NA	NA	NA	NA
Nickel	31 J	2.2 J	4.5 J	3.5 J	2.6 J	2.6 J	25 J	NA	NA	NA	NA	NA
Selenium	6.1 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	NA	NA	NA	NA	NA
Silver	1.2 J	1 U	1 U	1 U	1 U	1 U	1 U	NA	NA	NA	NA	NA
Thallium	11 UJ	11 UJ	11 UJ	11 UJ	11 UJ	11 UJ	11 UJ	NA	NA	NA	NA	NA
Tin	6.3 U	7.1 J	6.3 U	6.3 U	6.3 U	6.3 U	6.3 U	NA	NA	NA	NA	NA
Vanadium	630 J	60 J	58 J	79 J	66 J	45 J	460 J	NA	NA	NA	NA	NA
Zinc	160	9.7 U	17 U	17 U	16 U	11 U	130	NA	NA	NA	NA	NA

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ATIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SB41	9SB42	9SB44	9SB47	9SB48	9SB52	9SB53	9SB54	9SB56	9SB57	9SB58	9SB59
Sample ID	9GW41-11	9GW42-11	9GW44-11	9GW47-11	9GW48-11	9GW52-11	9GW53-11	9GW54-11	9GW56-11	9GW57-11	9GW58-11	9GW59-11
Sample Date	1/10/2011	1/8/2011	1/9/2011	1/10/2011	1/11/2011	1/9/2011	1/9/2011	1/8/2011	1/13/2011	1/13/2011	1/13/2011	1/13/2011
Volatile Organics (µg/L)												
1,1,1,2-Tetrachloroethane	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
1,1,1-Trichloroethane	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloroethane	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethene	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
1,2,3-Trichloropropane	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dibromo-3-chloropropane (DBCP)	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dibromoethane (EDB)	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethene (trans)	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloropropane	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
1,3-Dichloropropene (cis)	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
1,3-Dichloropropene (trans)	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
1,4-Dichloro-2-butene (trans)	2 U	2 R	2 U	2 U	2 U	2 U	2 U	2 R	2 U	2 U	2 U	2 U
2-Butanone (MEK)	2.5 R	2.5 R	2.5 R	2.5 R	2.5 U	2.5 R	2.5 R	2.5 R	2.5 U	2.5 U	2.5 U	2.5 U
2-Chloro-1,3-butadiene (Chloroprene)	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
2-Hexanone (MBK)	2.5 U	2.5 R	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 R	2.5 U	2.5 U	2.5 U	2.5 U
3-Chloropropene (Allyl Chloride)	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
4-Methyl-2-pentanone (MIBK)	2.5 U	2.5 R	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 R	2.5 U	2.5 U	2.5 U	2.5 U
Acetone	2.5 R	2.5 R	2.5 R	2.5 R	5.3 R	7.2 J	2.5 R	2.5 R	13 J	2.9 R	3.6 R	2.5 R
Acetonitrile	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Acrolein	5 R	5 R	5 R	5 R	5 R	5 R	5 R	5 R	5 R	5 R	5 R	5 R
Acrylonitrile	5 R	5 R	5 R	5 R	5 R	5 R	5 R	5 R	5 R	5 R	5 R	5 R
Benzene	0.5 U	31 J	0.09 J	0.5 U	0.5 U	220	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Bromodichloromethane	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.095 J
Bromoform	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Bromomethane	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Carbon Disulfide	0.5 U	0.5 R	0.5 U	0.5 U	0.037 J	0.5 U	0.5 U	0.5 R	0.85 J	0.65	0.5 U	0.5 U
Carbon Tetrachloride	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Chlorobenzene	0.29 J	0.71 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Chloroethane	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Chloroform	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	1.3
Chloromethane	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Dibromochloromethane	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Dibromomethane	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Ethyl Methacrylate	5 U	5 R	5 U	5 U	5 U	5 U	5 U	5 R	5 U	5 U	5 U	5 U
Ethylbenzene	0.21 J	2.1 J	0.5 U	0.5 U	0.5 U	0.5 J	0.67 J	0.5 R	12 J	0.5 U	0.5 U	0.5 U
Freon 11 (Trichlorofluoromethane)	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Freon-12 (Dichlorodifluoromethane)	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Isobutyl Alcohol	25 R	25 R	25 R	25 R	25 R	25 R	25 R	25 R	25 R	25 R	25 R	25 R

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Sample Date	1/10/2011	1/8/2011	1/9/2011	1/10/2011	1/11/2011	1/9/2011	1/9/2011	1/8/2011	1/13/2011	1/13/2011	1/13/2011	1/13/2011
Volatile Organics (µg/L) (continued)												
Methyl Acrylonitrile	5 U	5 R	5 U	5 U	5 U	5 U	5 U	5 R	5 U	5 U	5 U	5 U
Methyl Iodide	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Methyl Methacrylate	5 U	5 R	5 U	5 U	5 U	5 U	5 U	5 R	5 U	5 U	5 U	5 U
Methylene Chloride	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Pentachloroethane	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Propionitrile (Ethyl Cyanide)	25 R	25 R	25 R	25 R	25 R	25 R	25 R	25 R	25 R	25 R	25 R	25 R
Styrene (Ethenylbenzene)	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Tetrachloroethene (PCE)	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Toluene	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethene (TCE)	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Vinyl Acetate	1 U	1 R	1 U	1 U	1 U	1 U	1 U	1 R	1 U	1 U	1 U	1 U
Vinyl Chloride	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Xylene, m/p-	1 U	1 R	1 U	1 U	1 U	1 U	1 U	1 R	1 U	1 U	1 U	1 U
Xylene, o-	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Xylenes, total	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 R	0.5 U	0.5 U	0.5 U	0.5 U
Semivolatile Organics (µg/L) (continued)												
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trinitrobenzene (TNB)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene (m-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene (m-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Naphthoquinone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Phenylenediamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis[1-chloropropane]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Acetylaminofluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Site ID	9SB41	9SB42	9SB44	9SB47	9SB48	9SB52	9SB53	9SB54	9SB56	9SB57	9SB58	9SB59
Sample ID	9GW41-11	9GW42-11	9GW44-11	9GW47-11	9GW48-11	9GW52-11	9GW53-11	9GW54-11	9GW56-11	9GW57-11	9GW58-11	9GW59-11
Sample Date	1/10/2011	1/8/2011	1/9/2011	1/10/2011	1/11/2011	1/9/2011	1/9/2011	1/8/2011	1/13/2011	1/13/2011	1/13/2011	1/13/2011
Semivolatile Organics (µg/L) (continued)												
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methyl-5-nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol (o-Cresol)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Picoline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3 & 4 Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dimethylbenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylcholanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Aminobiphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Dimethylaminoazobenzene (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroquinoline-1-oxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7,12-Dimethylbenz(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
a,a-Dimethylphenethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aramite	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) Phthalate (BEHP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl Benzyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diallate (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl Phthalate (DEP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl Phthalate (DBP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dinoseb	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methane Sulfonate (EMS)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloro-1,3-butadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Semivolatile Organics (µg/L) (continued)												
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorophene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isosafrole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methapyrilene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Methane Sulfonate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodimethylamine (NDMA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-butylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodi-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosomethylethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosomorpholine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopiperidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopyrrolidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Toluidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloronitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenacetin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pronamide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyridine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Safrole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (µg/L)												
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene (BaP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SUMMARY OF ANALYTICAL RESULTS - GROUNDWATER
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ATIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SB41	9SB42	9SB44	9SB47	9SB48	9SB52	9SB53	9SB54	9SB56	9SB57	9SB58	9SB59
Sample ID	9GW41-11	9GW42-11	9GW44-11	9GW47-11	9GW48-11	9GW52-11	9GW53-11	9GW54-11	9GW56-11	9GW57-11	9GW58-11	9GW59-11
Sample Date	1/10/2011	1/8/2011	1/9/2011	1/10/2011	1/11/2011	1/9/2011	1/9/2011	1/8/2011	1/13/2011	1/13/2011	1/13/2011	1/13/2011
PAHs (µg/L) (continued)												
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Organophosphorous Pesticides (µg/L)												
Dimethoate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Disulfoton	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Famphur	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o,o,o-Triethyl Phosphorothioate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phorate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfotepp	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thionazin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (mg/L)												
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SUMMARY OF ANALYTICAL RESULTS - GROUNDWATER
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ATIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SB41	9SB42	9SB44	9SB47	9SB48	9SB52	9SB53	9SB54	9SB56	9SB57	9SB58	9SB59
Sample ID	9GW41-11	9GW42-11	9GW44-11	9GW47-11	9GW48-11	9GW52-11	9GW53-11	9GW54-11	9GW56-11	9GW57-11	9GW58-11	9GW59-11
Sample Date	1/10/2011	1/8/2011	1/9/2011	1/10/2011	1/11/2011	1/9/2011	1/9/2011	1/8/2011	1/13/2011	1/13/2011	1/13/2011	1/13/2011
Total Metals (mg/L)												
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes/Qualifiers:

BERA - Baseline Ecological Risk Assessment
J - Estimated: The analyte was positively identified; the quantitation is an estimation.
µg/L - microgram per liter
mg/L - milligram per liter
PAHs - Polynuclear Aromatic Hydrocarbons
R - Rejected data; data is not usable.
SERA - Screening Level Ecological Risk Assessment
U - Non detected
UJ - Reported quantitation limit is qualified as etimated.

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SUMMARY OF ANALTYICAL RESULTS - SURFACE WATER
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEPH 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SW/SD01	9SW/SD02	9SW/SD03	9SW/SD04	9SW/SD13	9SW/SD14	9SW/SD15	9SW/SD16
Sample ID	9SW01	9SW02	9SW03	9SW04	9SW13	9SW14	9SW15	9SW16
Sample Date	6/29/1999	6/29/1999	6/29/1999	6/29/1999	12/17/2000	12/17/2000	12/17/2000	12/17/2000
Volatile Organics (µg/L)								
1,1,1-Trichloroethane	5 U	5 U	5 U	5 U	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	5 U	5 U	5 U	5 U	NA	NA	NA	NA
1,1,2-Trichloroethane	5 U	5 U	5 U	5 U	NA	NA	NA	NA
1,1-Dichloroethane	5 U	5 U	5 U	5 U	NA	NA	NA	NA
1,1-Dichloroethene	5 U	5 U	5 U	5 U	NA	NA	NA	NA
1,2-Dichloroethane	5 U	5 U	5 U	5 U	NA	NA	NA	NA
1,2-Dichloroethene (cis)	5 U	5 U	5 U	5 U	NA	NA	NA	NA
1,2-Dichloroethene (trans)	5 U	5 U	5 U	5 U	NA	NA	NA	NA
1,2-Dichloropropane	5 U	5 U	5 U	5 U	NA	NA	NA	NA
1,3-Dichloropropene (cis)	5 U	5 U	5 U	5 U	NA	NA	NA	NA
1,3-Dichloropropene (trans)	5 U	5 U	5 U	5 U	NA	NA	NA	NA
2-Butanone (MEK)	25 U	25 U	25 U	25 U	NA	NA	NA	NA
2-Hexanone (MBK)	25 U	25 U	25 U	25 U	NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	25 U	25 U	25 U	25 U	NA	NA	NA	NA
Acetone	50 U	50 U	50 U	50 U	NA	NA	NA	NA
Benzene	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromodichloromethane	5 U	5 U	5 U	5 U	NA	NA	NA	NA
Bromoform	5 U	5 U	5 U	5 U	NA	NA	NA	NA
Bromomethane	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Carbon Disulfide	5 U	5 U	5 U	5 U	NA	NA	NA	NA
Carbon Tetrachloride	5 U	5 U	5 U	5 U	NA	NA	NA	NA
Chlorobenzene	5 U	5 U	5 U	5 U	NA	NA	NA	NA
Chloroethane	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Chloroform	5 U	5 U	5 U	5 U	NA	NA	NA	NA
Chloromethane	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Dibromochloromethane	5 U	5 U	5 U	5 U	NA	NA	NA	NA
Ethylbenzene	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Methylene Chloride	2.7 J	5 U	5 U	5 U	NA	NA	NA	NA
Styrene (Ethenylbenzene)	5 U	5 U	5 U	5 U	NA	NA	NA	NA
Tetrachloroethene (PCE)	5 U	5 U	5 U	5 U	NA	NA	NA	NA
Toluene	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene (TCE)	5 U	5 U	5 U	5 U	NA	NA	NA	NA
Vinyl Chloride	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Xylenes, total	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEPH 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SW/SD01	9SW/SD02	9SW/SD03	9SW/SD04	9SW/SD13	9SW/SD14	9SW/SD15	9SW/SD16
Sample ID	9SW01	9SW02	9SW03	9SW04	9SW13	9SW14	9SW15	9SW16
Sample Date	6/29/1999	6/29/1999	6/29/1999	6/29/1999	12/17/2000	12/17/2000	12/17/2000	12/17/2000
Semivolatile Organics (µg/L)								
1,2,4-Trichlorobenzene	10 U	10 U	10 U	10 U	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	10 U	10 U	10 U	10 U	NA	NA	NA	NA
1,3-Dichlorobenzene (m-)	10 U	10 U	10 U	10 U	NA	NA	NA	NA
1,4-Dichlorobenzene (p-)	10 U	10 U	10 U	10 U	NA	NA	NA	NA
2,2'-Oxybis[1-chloropropane]	10 U	10 U	10 U	10 U	NA	NA	NA	NA
2,4,5-Trichlorophenol	10 U	10 U	10 U	10 U	NA	NA	NA	NA
2,4,6-Trichlorophenol	10 U	10 U	10 U	10 U	NA	NA	NA	NA
2,4-Dichlorophenol	10 U	10 U	10 U	10 U	NA	NA	NA	NA
2,4-Dimethylphenol	10 U	10 U	10 U	10 U	NA	NA	NA	NA
2,4-Dinitrophenol	50 U	50 U	50 U	50 U	NA	NA	NA	NA
2,4-Dinitrotoluene (DNT)	10 U	10 U	10 U	10 U	NA	NA	NA	NA
2,6-Dinitrotoluene (DNT)	10 U	10 U	10 U	10 U	NA	NA	NA	NA
2-Chloronaphthalene	10 U	10 U	10 U	10 U	NA	NA	NA	NA
2-Chlorophenol	10 U	10 U	10 U	10 U	NA	NA	NA	NA
2-Methylphenol (o-Cresol)	10 U	10 U	10 U	10 U	NA	NA	NA	NA
2-Nitroaniline	50 U	50 U	50 U	50 U	NA	NA	NA	NA
2-Nitrophenol	10 U	10 U	10 U	10 U	NA	NA	NA	NA
3 & 4 Methylphenol	10 U	10 U	10 U	10 U	NA	NA	NA	NA
3,3'-Dichlorobenzidine	20 U	20 U	20 U	20 U	NA	NA	NA	NA
3-Nitroaniline	50 U	50 U	50 U	50 U	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	50 U	50 U	50 U	50 U	NA	NA	NA	NA
4-Bromophenyl-phenylether	10 U	10 U	10 U	10 U	NA	NA	NA	NA
4-Chloro-3-methylphenol	10 U	10 U	10 U	10 U	NA	NA	NA	NA
4-Chloroaniline	20 U	20 U	20 U	20 U	NA	NA	NA	NA
4-Chlorophenyl-phenylether	10 U	10 U	10 U	10 U	NA	NA	NA	NA
4-Nitroaniline	50 U	50 U	50 U	50 U	NA	NA	NA	NA
4-Nitrophenol	50 U	50 U	50 U	50 U	NA	NA	NA	NA
Benzidine	80 U	80 U	80 U	80 U	NA	NA	NA	NA
Benzoic Acid	50 U	50 U	50 U	50 U	NA	NA	NA	NA
Benzyl Alcohol	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Bis(2-chloroethyl)ether	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Bis(2-ethylhexyl) Phthalate (BEHP)	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Butyl Benzyl Phthalate	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Dibenzofuran	10 U	10 U	10 U	10 U	NA	NA	NA	NA

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEPH 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SW/SD01	9SW/SD02	9SW/SD03	9SW/SD04	9SW/SD13	9SW/SD14	9SW/SD15	9SW/SD16
Sample ID	9SW01	9SW02	9SW03	9SW04	9SW13	9SW14	9SW15	9SW16
Sample Date	6/29/1999	6/29/1999	6/29/1999	6/29/1999	12/17/2000	12/17/2000	12/17/2000	12/17/2000
Semivolatile Organics (µg/L) (continued)								
Diethyl Phthalate (DEP)	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Dimethyl Phthalate	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Di-n-butyl Phthalate (DBP)	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Di-n-octyl Phthalate	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Diphenylamine	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Hexachloro-1,3-butadiene	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Hexachlorobenzene	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Hexachlorocyclopentadiene	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Hexachloroethane	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Isophorone	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Nitrobenzene	10 U	10 U	10 U	10 U	NA	NA	NA	NA
n-Nitrosodimethylamine (NDMA)	10 U	10 U	10 U	10 U	NA	NA	NA	NA
n-Nitrosodi-n-propylamine	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Pentachlorophenol	50 U	50 U	50 U	50 U	NA	NA	NA	NA
Phenol	10 U	10 U	10 U	10 U	NA	NA	NA	NA
PAHs (µg/L)								
2-Methylnaphthalene	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Acenaphthene	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Acenaphthylene	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Anthracene	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Benzo(a)anthracene	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Benzo(a)pyrene (BaP)	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Benzo(b)fluoranthene	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Benzo(g,h,i)perylene	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Benzo(k)fluoranthene	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Chrysene	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Dibenz(a,h)anthracene	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Fluoranthene	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Fluorene	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Naphthalene	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Phenanthrene	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Pyrene	10 U	10 U	10 U	10 U	NA	NA	NA	NA

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SUMMARY OF ANALTYICAL RESULTS - SURFACE WATER
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEPH 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SW/SD01	9SW/SD02	9SW/SD03	9SW/SD04	9SW/SD13	9SW/SD14	9SW/SD15	9SW/SD16
Sample ID	9SW01	9SW02	9SW03	9SW04	9SW13	9SW14	9SW15	9SW16
Sample Date	6/29/1999	6/29/1999	6/29/1999	6/29/1999	12/17/2000	12/17/2000	12/17/2000	12/17/2000
Metals, Total (µg/L)								
Antimony	16.5	2.7 U	2.7 U	2.7 U	20 U	20 U	20 U	20 U
Arsenic	17.8 J	38.3 J	33.5 J	39.7 J	10 U	10 U	10 U	3.7 J
Barium	54.2	50.5	54.9	61.1	73	59	34	30
Beryllium	0.73	0.1 U	0.1 U	0.12 J	4 U	4 U	4 U	4 U
Cadmium	2.5 U	0.7 J	0.94 J	1.5 J	2.9 J	5 U	5 U	5 U
Chromium	8.5	2.7 U	8 J	7.7 U	13	8.1 J	10 U	4.7 J
Cobalt	4.1	0.96 J	3.6 J	4.4 J	6.2 J	3 J	10 U	1.5 J
Copper	50.4	25.6 U	41.4 U	55.6 J	73	65	8.1 J	20 J
Cyanide	61	10 U	10 U	10 U	NA	NA	NA	NA
Lead	4.5 UJ	4.5 UJ	4.5 UJ	5.4 J	2.4 J	2.3 J	5 U	1.7 J
Mercury	0.1 U	0.1 U	0.1 U	0.1 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	10.1	2.7 U	4.5 J	4.4 J	5.2 J	40 U	40 U	40 U
Selenium	17 U	22.3 J	17 UJ	17 UJ	10 U	10 U	10 U	5 J
Silver	3 U	0.6 U	0.6 U	0.6 U	10 U	10 U	10 U	10 U
Sulfide	10 U	10 U	10 U	10 U	NA	NA	NA	NA
Thallium	180 R	900 R	900 R	900 R	10 U	10 U	10 U	10 U
Tin	9.2	2.7 J	5 J	3.8 J	50 U	50 U	50 U	50 U
Vanadium	70.9	88.5	134	72.3	78	66	50 U	25 J
Zinc	27.4	6.3 J	14.5 J	19.9 J	33	23	20 U	12 J

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEPH 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SW/SD01	9SW/SD02	9SW/SD03	9SW/SD04	9SW/SD13	9SW/SD14	9SW/SD15	9SW/SD16
Sample ID	9SW01	9SW02	9SW03	9SW04	9SW13	9SW14	9SW15	9SW16
Sample Date	6/29/1999	6/29/1999	6/29/1999	6/29/1999	12/17/2000	12/17/2000	12/17/2000	12/17/2000
Metasls, Dissolved (µg/L)								
Antimony	NA	NA	NA	NA	20 U	20 U	20 U	20 U
Arsenic	NA	NA	NA	NA	3.3 J	10 U	10 U	10 U
Barium	NA	NA	NA	NA	56	39	33	28
Beryllium	NA	NA	NA	NA	4 U	4 U	4 U	4 U
Cadmium	NA	NA	NA	NA	5 U	5 U	5 U	5 U
Chromium	NA	NA	NA	NA	10 U	10 U	10 U	1.9 J
Cobalt	NA	NA	NA	NA	10 U	10 U	10 U	10 U
Copper	NA	NA	NA	NA	1.9 J	1.7 J	1.4 J	2.8 J
Lead	NA	NA	NA	NA	5 U	5 U	5 U	5 U
Mercury	NA	NA	NA	NA	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	NA	NA	NA	NA	40 U	40 U	40 U	40 U
Selenium	NA	NA	NA	NA	10 U	10 U	10 U	10 U
Silver	NA	NA	NA	NA	10 U	10 U	10 U	10 U
Thallium	NA	NA	NA	NA	10 U	10 U	10 U	10 U
Tin	NA	NA	NA	NA	50 U	50 U	50 U	50 U
Vanadium	NA	NA	NA	NA	50 U	50 U	50 U	50 U
Zinc	NA	NA	NA	NA	17 J	20 U	20 U	10 J

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SUMMARY OF ANALTYICAL RESULTS - SURFACE WATER
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEPH 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SW/SD17	9SW/SD18	9SW/SD19	9SW/SD20	9SW/SD21	9SW/SD22	9SW/SD23
Sample ID	9SW17	9SW18	9SW19	9SW20	9SW21	9SW22	9SW23
Sample Date	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000
Volatile Organics (µg/L)							
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (cis)	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (trans)	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA
1,3-Dichloropropene (cis)	NA	NA	NA	NA	NA	NA	NA
1,3-Dichloropropene (trans)	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	NA	NA	NA	NA	NA	NA	NA
2-Hexanone (MBK)	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA
Benzene	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA
Bromomethane	NA	NA	NA	NA	NA	NA	NA
Carbon Disulfide	NA	NA	NA	NA	NA	NA	NA
Carbon Tetrachloride	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA	NA
Chloroethane	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA
Chloromethane	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Methylene Chloride	NA	NA	NA	NA	NA	NA	NA
Styrene (Ethenylbenzene)	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene (PCE)	NA	NA	NA	NA	NA	NA	NA
Toluene	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene (TCE)	NA	NA	NA	NA	NA	NA	NA
Vinyl Chloride	NA	NA	NA	NA	NA	NA	NA
Xylenes, total	10 U	10 U	10 U	10 U	10 U	10 U	10 U

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SUMMARY OF ANALTYICAL RESULTS - SURFACE WATER
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEPH 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SW/SD17	9SW/SD18	9SW/SD19	9SW/SD20	9SW/SD21	9SW/SD22	9SW/SD23
Sample ID	9SW17	9SW18	9SW19	9SW20	9SW21	9SW22	9SW23
Sample Date	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000
Semivolatile Organics (µg/L)							
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene (m-)	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene (p-)	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis[1-chloropropane]	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol (o-Cresol)	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA
3 & 4 Methylphenol	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA
Benzidine	NA	NA	NA	NA	NA	NA	NA
Benzoic Acid	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) Phthalate (BEHP)	NA	NA	NA	NA	NA	NA	NA
Butyl Benzyl Phthalate	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA

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SUMMARY OF ANALTYICAL RESULTS - SURFACE WATER
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEPH 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SW/SD17	9SW/SD18	9SW/SD19	9SW/SD20	9SW/SD21	9SW/SD22	9SW/SD23
Sample ID	9SW17	9SW18	9SW19	9SW20	9SW21	9SW22	9SW23
Sample Date	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000
Semivolatile Organics (µg/L) (continued)							
Diethyl Phthalate (DEP)	NA	NA	NA	NA	NA	NA	NA
Dimethyl Phthalate	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl Phthalate (DBP)	NA	NA	NA	NA	NA	NA	NA
Di-n-octyl Phthalate	NA	NA	NA	NA	NA	NA	NA
Diphenylamine	NA	NA	NA	NA	NA	NA	NA
Hexachloro-1,3-butadiene	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodimethylamine (NDMA)	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodi-n-propylamine	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA
PAHs (µg/L)							
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene (BaP)	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA

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SUMMARY OF ANALTYICAL RESULTS - SURFACE WATER
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEPH 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SW/SD17	9SW/SD18	9SW/SD19	9SW/SD20	9SW/SD21	9SW/SD22	9SW/SD23
Sample ID	9SW17	9SW18	9SW19	9SW20	9SW21	9SW22	9SW23
Sample Date	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000
Metals, Total (µg/L)							
Antimony	6.5 J	16 J	20 U	20 U	20 U	20 U	20 U
Arsenic	21	110	10 U	10 U	10 U	10 U	10 U
Barium	290	450	31	27	25	27	32
Beryllium	2.8 J	6.6	4 U	4 U	4 U	4 U	4 U
Cadmium	9.3	38	5 U	5 U	5 U	5 U	0.91 J
Chromium	190	540	5.8 J	4.3 J	4.9 J	5.7 J	20
Cobalt	110	220	2 J	10 U	10 U	10 U	3.8 J
Copper	1500	3100	24	16 J	17 J	26	64
Cyanide	NA	NA	NA	NA	NA	NA	NA
Lead	84	1100	29	3.5 J	2.4 J	2.5 J	5.2
Mercury	0.78	0.22	0.11 J	0.1 J	0.08 J	0.2 U	0.2 U
Nickel	77	200	40 U	40 U	40 U	40 U	7.7 J
Selenium	13	26	10 U	10 U	10 U	10 U	10 U
Silver	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Sulfide	NA	NA	NA	NA	NA	NA	NA
Thallium	10 U	50 U	10 U	10 U	10 U	10 U	10 U
Tin	7.9 J	25 J	50 U	50 U	50 U	50 U	50 U
Vanadium	1700	4700	35 J	23 J	27 J	40 J	110
Zinc	480	1300	13 J	13 J	19 J	13 J	37

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SUMMARY OF ANALTYICAL RESULTS - SURFACE WATER
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEPH 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Site ID	9SW/SD17	9SW/SD18	9SW/SD19	9SW/SD20	9SW/SD21	9SW/SD22	9SW/SD23
Sample ID	9SW17	9SW18	9SW19	9SW20	9SW21	9SW22	9SW23
Sample Date	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000
Metasls, Dissolved (µg/L)							
Antimony	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Arsenic	10 U	3.2 J	10 U	10 U	10 U	10 U	4.3 J
Barium	57	31	25	25	22	21	21
Beryllium	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Cadmium	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chromium	4.3 J	10 U	10 U	10 U	10 U	10 U	1.9 J
Cobalt	7.1 J	10 U	10 U	10 U	10 U	10 U	10 U
Copper	1.7 J	20 U	1.9 J	2.2 J	2.7 J	3.6 J	3.5 J
Lead	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Mercury	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	40 U	40 U	40 U	40 U	40 U	40 U	40 U
Selenium	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Silver	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Thallium	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Tin	50 U	50 U	50 U	50 U	50 U	50 U	50 U
Vanadium	50 U	50 U	50 U	50 U	50 U	50 U	50 U
Zinc	20 U	20 U	20 U	20 U	20 U	20 U	20 U

Notes/Qualifiers:

BERA - Baseline Ecological Risk Assessment
J - Estimated: The analyte was positively identified; the quantitation is an estimation.
µg/L - microgram per liter
NA - Not Analyzed
PAHs - Polynuclear Aromatic Hydrocarbons
R - Rejected data; data is not usable.
SERA - Screening Level Ecological Risk Assessment
U - Non detected
UJ - Reported quantiation limit is qualified as estimated.

APPENDIX A

SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD01	9SD02	9SD03	9SD04	9SD13	9SD14	9SD15	9SD16	9SD17	9SD18	9SD19	9SD20
Site ID	9SW/SD01	9SW/SD02	9SW/SD03	9SW/SD04	9SW/SD13	9SW/SD14	9SW/SD15	9SW/SD16	9SW/SD17	9SW/SD18	9SW/SD19	9SW/SD20
Sample Date	6/29/1999	6/29/1999	6/29/1999	6/29/1999	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
Volatile Organics (µg/kg)												
1,1,1,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	12 U	15 U	10 U	12 U	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	12 U	15 U	10 UJ	12 UJ	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	12 U	15 U	10 U	12 U	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	12 U	15 U	10 U	12 U	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	12 U	15 U	10 U	12 U	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane (DBCP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (EDB)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	12 U	15 U	10 U	12 U	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (cis)	12 U	15 U	10 U	12 U	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (trans)	12 U	15 U	10 U	12 U	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	12 U	15 U	10 U	12 U	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichloropropene (cis)	12 U	15 U	10 U	12 U	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichloropropene (trans)	12 U	15 U	10 U	12 U	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichloro-2-butene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	62 U	74 U	28 J	39 J	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloro-1,3-butadiene (Chloroprene)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone (MBK)	62 U	74 U	52 U	59 U	NA	NA	NA	NA	NA	NA	NA	NA
3-Chloropropene (Allyl Chloride)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	62 U	74 U	52 U	59 U	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	130	130 J	140	200	NA	NA	NA	NA	NA	NA	NA	NA
Acetonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrolein	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	12 U	15 U	10 U	12 U	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	12 U	15 U	10 U	12 U	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	12 U	15 U	10 UJ	12 UJ	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	25 U	29 U	21 U	24 U	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Disulfide	12 U	15 U	5.3 J	8.9 J	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Tetrachloride	12 U	15 U	10 U	12 U	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	12 U	15 U	10 UJ	12 UJ	NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane	25 U	29 U	21 U	24 U	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	12 U	15 U	10 U	12 U	NA	NA	NA	NA	NA	NA	NA	NA
Chloromethane	25 U	29 U	21 U	24 U	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	12 U	15 U	10 U	12 U	NA	NA	NA	NA	NA	NA	NA	NA
Dibromomethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methacrylate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	12 U	15 U	10 UJ	12 UJ	NA	NA	NA	NA	NA	NA	NA	NA
Freon 11 (Trichlorofluoromethane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Freon-12 (Dichlorodifluoromethane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isobutyl Alcohol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Acrylonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD01	9SD02	9SD03	9SD04	9SD13	9SD14	9SD15	9SD16	9SD17	9SD18	9SD19	9SD20
Site ID	9SW/SD01	9SW/SD02	9SW/SD03	9SW/SD04	9SW/SD13	9SW/SD14	9SW/SD15	9SW/SD16	9SW/SD17	9SW/SD18	9SW/SD19	9SW/SD20
Sample Date	6/29/1999	6/29/1999	6/29/1999	6/29/1999	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
Volatile Organics (µg/kg)(continued)												
Methyl Iodide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Methacrylate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	12 U	15 U	10 U	12 U	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Propionitrile (Ethyl Cyanide)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene (Ethenylbenzene)	12 U	15 U	10 UJ	12 UJ	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene (PCE)	12 U	15 U	10 U	12 U	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	12 U	15 U	10 U	12 U	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene (TCE)	12 U	15 U	10 U	12 U	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Chloride	25 U	29 U	21 U	24 U	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes, total	25 U	29 U	21 UJ	24 U	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organics (µg/kg)												
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trinitrobenzene (TNB)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene (m-)	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene (m-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene (p-)	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Naphthoquinone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Phenylenediamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis[1-chloropropane]	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	4200 U	5,000 U	7,100 U	18,000 U	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene (DNT)	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene (DNT)	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
2-Acetylaminofluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
2-Methyl-5-nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol (o-Cresol)	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
2-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	4200 U	5,000 U	7,100 U	18,000 U	NA	NA	NA	NA	NA	NA	NA	NA

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SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD01	9SD02	9SD03	9SD04	9SD13	9SD14	9SD15	9SD16	9SD17	9SD18	9SD19	9SD20
Site ID	9SW/SD01	9SW/SD02	9SW/SD03	9SW/SD04	9SW/SD13	9SW/SD14	9SW/SD15	9SW/SD16	9SW/SD17	9SW/SD18	9SW/SD19	9SW/SD20
Sample Date	6/29/1999	6/29/1999	6/29/1999	6/29/1999	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
Semivolatile Organis (µg/kg)(continued)												
2-Nitrophenol	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
2-Picoline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3 & 4 Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	1600 U	1,900 U	2,800 U	7,200 U	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dimethylbenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylcholanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	4200 U	5,000 U	7,100 U	18,000 U	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	4200 U	5,000 U	7,100 U	18,000 U	NA	NA	NA	NA	NA	NA	NA	NA
4-Aminobiphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	1600 U	1,900 U	2,800 U	7,200 U	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
4-Dimethylaminoazobenzene (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	4200 U	5,000 U	7,100 U	18,000 U	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	4200 U	5,000 U	7,100 U	18,000 U	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroquinoline-1-oxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7,12-Dimethylbenz(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
a,a-Dimethylphenethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aramite	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzidine	6700 U	7,900 U	11,000 U	29,000 U	NA	NA	NA	NA	NA	NA	NA	NA
Benzoic Acid	4200 U	5,000 U	7,100 U	18,000 U	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethyl)ether	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) Phthalate (BEHP)	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
Butyl Benzyl Phthalate	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
Cresol (Mixed Isomers)	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
Diallate (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl Phthalate (DEP)	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl Phthalate	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl Phthalate (DBP)	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octyl Phthalate	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
Dinoseb	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diphenylamine	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methane Sulfonate (EMS)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloro-1,3-butadiene	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	820 U	970 U	1,400 U	3,600 U	39 U	27 U	29 U	28 U	73 U	130 U	1,500 U	1,800 U
Hexachlorocyclopentadiene	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA

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SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD01	9SD02	9SD03	9SD04	9SD13	9SD14	9SD15	9SD16	9SD17	9SD18	9SD19	9SD20
Site ID	9SW/SD01	9SW/SD02	9SW/SD03	9SW/SD04	9SW/SD13	9SW/SD14	9SW/SD15	9SW/SD16	9SW/SD17	9SW/SD18	9SW/SD19	9SW/SD20
Sample Date	6/29/1999	6/29/1999	6/29/1999	6/29/1999	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
Semivolatile Organis (µg/kg)(continued)												
Hexachlorophene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
Isosafrole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methapyrilene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Methane Sulfonate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodimethylamine (NDMA)	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-butylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodi-n-propylamine	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosomethylethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosomorpholine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopiperidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopyrrolidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Toluidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloronitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	4200 U	5,000 U	7,100 U	18,000 U	NA	NA	NA	NA	NA	NA	NA	NA
Phenacetin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
Pronamide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyridine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Safrole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (µg/kg)												
1-Methylnaphthalene	NA	NA	NA	NA	39 U	27 U	29 U	28 U	73 U	130 U	1,500 U	1,800 U
2-Methylnaphthalene	820 U	970 U	1,400 U	3,600 U	39 U	27 U	29 U	28 U	73 U	130 U	1,500 U	1,800 U
Acenaphthene	820 U	970 U	1,400 U	3,600 U	39 U	27 U	29 U	28 U	73 U	130 U	1,500 U	1,800 U
Acenaphthylene	820 U	970 U	1,400 U	3,600 U	39 U	27 U	29 U	28 U	73 U	130 U	1,500 U	1,800 U
Anthracene	820 U	970 U	1,400 U	3,600 U	39 U	27 U	29 U	28 U	73 U	130 U	1,500 U	1,800 U
Benzo(a)anthracene	820 U	970 U	1,400 U	3,600 U	39 U	27 U	29 U	28 U	73 U	130 U	1,500 U	1,800 U
Benzo(a)pyrene (BaP)	820 U	970 U	1,400 U	3,600 U	39 U	27 U	29 U	28 U	73 U	250 U	1,500 U	1,300 J
Benzo(b)fluoranthene	820 U	970 U	1,400 U	3,600 U	39 U	27 U	29 U	28 U	73 U	130 U	1,500 U	840 J
Benzo(g,h,i)perylene	820 U	970 U	1,400 U	3,600 U	39 U	27 U	29 U	28 U	73 U	130 U	1,500 U	1,300 J
Benzo(k)fluoranthene	820 U	970 U	1,400 U	3,600 U	39 U	27 U	29 U	28 U	73 U	130 U	1,500 U	820 J
Chrysene	820 U	970 U	1,400 U	3,600 U	39 U	27 U	29 U	28 U	73 U	130 U	1,500 U	560 J
Dibenz(a,h)anthracene	820 U	970 U	1,400 U	3,600 U	39 U	27 U	29 U	28 U	73 U	130 U	1,500 U	1,800 U
Fluoranthene	820 U	970 U	1,400 U	3,600 U	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	820 U	970 U	1,400 U	3,600 U	39 U	27 U	29 U	28 U	73 U	130 U	1,500 U	1,800 U
Indeno(1,2,3-cd)pyrene	820 U	970 U	1,400 U	3,600 U	39 U	27 U	29 U	28 U	73 U	130 U	1,500 U	1,100 J
Naphthalene	820 U	970 U	1,400 U	3,600 U	39 U	27 U	29 U	28 U	73 U	130 U	1,500 U	1,800 U
PAHs (µg/kg)(continued)												
Phenanthrene	820 U	970 U	1,400 U	3,600 U	39 U	27 U	29 U	28 U	73 U	130 U	1,500 U	360 J
Pyrene	820 U	970 U	1,400 U	3,600 U	39 U	27 U	29 U	28 U	73 U	130 U	1,500 U	1,800 U

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SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD01	9SD02	9SD03	9SD04	9SD13	9SD14	9SD15	9SD16	9SD17	9SD18	9SD19	9SD20
Site ID	9SW/SD01	9SW/SD02	9SW/SD03	9SW/SD04	9SW/SD13	9SW/SD14	9SW/SD15	9SW/SD16	9SW/SD17	9SW/SD18	9SW/SD19	9SW/SD20
Sample Date	6/29/1999	6/29/1999	6/29/1999	6/29/1999	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000	12/17/2000
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
Organophosphorous Pesticide (µg/kg)												
Dimethoate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Disulfoton	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Famphur	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o,o,o-Triethyl Phosphorothioate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phorate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfotepp	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thionazin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals (mg/kg)												
Antimony	0.68 R	0.72 R	0.51 R	0.59 R	5.9 UJ	4 UJ	4 UJ	4.3 UJ	4 UJ	3.8 UJ	4.1 UJ	4.8 UJ
Arsenic	1 J	1.8 J	1.2 J	1.3 J	1.4 J	2 U	1.2 J	2.9	2 U	1.5 J	1.4 J	2.6
Barium	14	14	15	20	26	28	21	22	33	12	19	12
Beryllium	0.15 J	0.29 J	0.12 J	0.16 J	1.2 U	0.22 J	0.2 J	0.14 J	0.24 J	0.21 J	0.15 J	0.14 J
Cadmium	0.13 U	0.13 U	0.14 J	0.12 J	1.5 U	1 U	0.99 U	1.1 U	0.99 U	0.17 J	1 U	1.2 U
Chromium	23	21	28	26	20	19	16	20	16	13	10	17
Cobalt	7.9	6.9	8.3	12	9	6.1	5.8	8.2	9.3	7.8	5.8	8.7
Copper	98 J	63 J	83 J	120 J	85 J	85 J	87 J	120 J	87 J	65 J	52 J	77 J
Lead	5.4 J	12 J	47 J	24 J	4.2	3.2	5.3	3.9	4.6	31	250	69
Mercury	0.085 J	0.078 J	0.084 J	0.1 J	0.093	0.083	0.11	0.1	0.046	0.058	0.058	0.1
Nickel	6.7	6.6 J	7.2 J	9.8	6.8 J	6.5 J	5.9 J	7.3 J	5.4 J	4.8 J	6 J	6.2 J
Selenium	2.1 UJ	2.3 UJ	1.8 UJ	1.8 UJ	2.9 U	2 U	2 U	1.5 J	2 U	1.9 U	2.1 U	2.4 U
Silver	0.15 U	0.16 U	0.11 U	0.13 U	2.9 U	2 U	2 U	2.1 U	2 U	1.9 U	2.1 U	2.4 U
Thallium	0.45 UJ	0.48 UJ	0.38 UJ	0.39 UJ	2.9 U	2 U	2 U	2.1 U	2 U	1.9 U	2.1 U	2.4 U
Tin	4.7	4.3 J	3.6 J	4.3 J	15 U	10 U	9.9 U	11 U	9.9 U	9.6 U	10 U	12 U
Vanadium	160	180	130	180	170	130	140	160	140	130	120	110
Zinc	49 J	64 J	49 J	63 J	63	54	47	52	42	38	39	36
AVS / SEM (µmol/g)												
Cadmium	NA	NA	NA	NA	0.000249 J	0.001245 U	0.001334 U	0.001334 U	0.000142 J	0.000329 J	0.00032 J	0.000196 J
Copper	NA	NA	NA	NA	0.144777 J	0.055078 J	0.031473 J	0.039342 J	0.18884 J	0.073962 J	0.220313 J	0.048784 J
Lead	NA	NA	NA	NA	0.008687	0.005792	0.009653	0.004344	0.016892	0.067568	0.868726	0.111004
Nickel	NA	NA	NA	NA	0.007667 J	0.007326 J	0.006474 J	0.002726 J	0.008348 J	0.006304 J	0.006985 J	0.004259 J
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	0.110109 J	0.065759 J	0.082581 J	0.041291 J	0.061171 J	0.073406 J	0.10705 J	0.103991 J
Total SEM hg	NA	NA	NA	NA	0.27	0.14	0.13	0.09	0.28	0.22	1.20	0.27
Acid Volatile Sulfide	NA	NA	NA	NA	37.42982	1.154086	1.43481	0.436681 J	0.686213 U	19.33874	2.027449	13.10044
Conventionals												
pH (SU)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Percent Moisture (%)	NA	NA	NA	NA	66	50	54	53	54	48	56	62
Percent Solids (%)	NA	NA	NA	NA	34	50	46	47	46	52	44	38
Total Organic Carbon (mg/kg)	NA	NA	NA	NA	110000	64000	88000	75000	35000	35000	48000	79000

APPENDIX A

SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD21	9SD22	9SD23	9SD29	9SD30	9SD31	9SD32	9SD33	9SD34	9SD35	9SD36	9SD37
Site ID	9SW/SD21	9SW/SD22	9SW/SD23	9SD29	9SD30	9SD31	9SD32	9SD33	9SD34	9SD35	9SD36	9SD37
Sample Date	12/17/2000	12/17/2000	12/17/2000	7/15/2003	7/15/2003	7/15/2003	7/15/2003	7/15/2003	7/15/2003	8/6/2005	8/6/2005	8/6/2005
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5			
Volatile Organics (µg/kg)												
1,1,1,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane (DBCP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (EDB)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (cis)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichloropropene (cis)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichloropropene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichloro-2-butene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloro-1,3-butadiene (Chloroprene)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone (MBK)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Chloropropene (Allyl Chloride)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrolein	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromomethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methacrylate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Freon 11 (Trichlorofluoromethane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Freon-12 (Dichlorodifluoromethane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isobutyl Alcohol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Acrylonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD21	9SD22	9SD23	9SD29	9SD30	9SD31	9SD32	9SD33	9SD34	9SD35	9SD36	9SD37
Site ID	9SW/SD21	9SW/SD22	9SW/SD23	9SD29	9SD30	9SD31	9SD32	9SD33	9SD34	9SD35	9SD36	9SD37
Sample Date	12/17/2000	12/17/2000	12/17/2000	7/15/2003	7/15/2003	7/15/2003	7/15/2003	7/15/2003	7/15/2003	8/6/2005	8/6/2005	8/6/2005
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5			
Volatile Organics (µg/kg)(continued)												
Methyl Iodide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Methacrylate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Propionitrile (Ethyl Cyanide)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene (Ethenylbenzene)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene (PCE)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene (TCE)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes, total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organics (µg/kg)												
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trinitrobenzene (TNB)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene (m-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene (m-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Naphthoquinone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Phenylenediamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis[1-chloropropane]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Acetylaminofluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methyl-5-nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol (o-Cresol)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD21	9SD22	9SD23	9SD29	9SD30	9SD31	9SD32	9SD33	9SD34	9SD35	9SD36	9SD37
Site ID	9SW/SD21	9SW/SD22	9SW/SD23	9SD29	9SD30	9SD31	9SD32	9SD33	9SD34	9SD35	9SD36	9SD37
Sample Date	12/17/2000	12/17/2000	12/17/2000	7/15/2003	7/15/2003	7/15/2003	7/15/2003	7/15/2003	7/15/2003	8/6/2005	8/6/2005	8/6/2005
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5			
Semivolatile Organis (µg/kg)(continued)												
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Picoline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3 & 4 Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dimethylbenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylcholanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Aminobiphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Dimethylaminoazobenzene (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroquinoline-1-oxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7,12-Dimethylbenz(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
a,a-Dimethylphenethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aramite	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzoic Acid	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) Phthalate (BEHP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl Benzyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cresol (Mixed Isomers)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diallate (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl Phthalate (DEP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl Phthalate (DBP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dinoseb	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methane Sulfonate (EMS)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloro-1,3-butadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	310 U	88 U	31 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SERA AND STEP 3A OF THE BERA
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Sample ID	9SD21	9SD22	9SD23	9SD29	9SD30	9SD31	9SD32	9SD33	9SD34	9SD35	9SD36	9SD37
Site ID	9SW/SD21	9SW/SD22	9SW/SD23	9SD29	9SD30	9SD31	9SD32	9SD33	9SD34	9SD35	9SD36	9SD37
Sample Date	12/17/2000	12/17/2000	12/17/2000	7/15/2003	7/15/2003	7/15/2003	7/15/2003	7/15/2003	7/15/2003	8/6/2005	8/6/2005	8/6/2005
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5			
Semivolatile Organis (µg/kg)(continued)												
Hexachlorophene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isosafrole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methapyrilene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Methane Sulfonate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodimethylamine (NDMA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-butylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodi-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosomethylethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosomorpholine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopiperidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopyrrolidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Toluidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloronitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenacetin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pronamide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyridine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Safrole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (µg/kg)												
1-Methylnaphthalene	310 U	88 U	31 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	310 U	88 U	31 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	310 U	88 U	31 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	310 U	88 U	31 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	310 U	88 U	31 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	310 U	88 U	31 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene (BaP)	120 J	88 U	31 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	310 U	88 U	31 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	160 J	88 U	31 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	310 U	88 U	31 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	310 U	88 U	31 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	310 U	88 U	31 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	310 U	88 U	31 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	50 J	88 U	31 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	310 U	88 U	31 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (µg/kg)(continued)												
Phenanthrene	71 J	88 U	31 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	310 U	88 U	31 U	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD21	9SD22	9SD23	9SD29	9SD30	9SD31	9SD32	9SD33	9SD34	9SD35	9SD36	9SD37
Site ID	9SW/SD21	9SW/SD22	9SW/SD23	9SD29	9SD30	9SD31	9SD32	9SD33	9SD34	9SD35	9SD36	9SD37
Sample Date	12/17/2000	12/17/2000	12/17/2000	7/15/2003	7/15/2003	7/15/2003	7/15/2003	7/15/2003	7/15/2003	8/6/2005	8/6/2005	8/6/2005
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5			
Organophosphorous Pesticide (µg/kg)												
Dimethoate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Disulfoton	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Famphur	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o,o,o-Triethyl Phosphorothioate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phorate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfotepp	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thionazin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals (mg/kg)												
Antimony	4.7 UJ	5.3 UJ	4.2 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	1.5 J	3.2	1.3 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	15	12	14	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	0.21 J	0.2 J	0.2 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	1.2 U	1.3 U	1.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	21	17	20	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	6	7.9	5	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	67 J	75 J	60 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	23	14	7.2	110	210	26	60	43	13	23 J	23 J	44 J
Mercury	0.091	0.1	0.077	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	6.8 J	5.9 J	5.7 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	2.3 U	0.98 J	2.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	2.3 U	2.6 U	2.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	2.3 U	2.6 U	2.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tin	12 U	13 U	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	150	130	130	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	47	44	42	NA	NA	NA	NA	NA	NA	NA	NA	NA
AVS / SEM (µmol/g)												
Cadmium	0.000151 J	0.000178 J	0.00017 J	NA	NA	NA	NA	NA	NA	0.001 UJ	0.00133 UJ	0.0016 UJ
Copper	0.039342 J	0.173103 J	0.22031 J	NA	NA	NA	NA	NA	NA	0.01 R	0.00283 J	0.01133 R
Lead	0.057915	0.021718	0.02606	NA	NA	NA	NA	NA	NA	0.027 J	0.04006 J	0.03137 J
Nickel	0.003408 J	0.005452 J	0.01533 J	NA	NA	NA	NA	NA	NA	0.004 J	0.00409 J	0.00239 J
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	0.070347 J	0.08564 J	0.08564 J	NA	NA	NA	NA	NA	NA	0.087 J	0.08564 J	0.07188 J
Total SEM hg	0.17	0.29	0.35	NA	NA	NA	NA	NA	NA	0.13	0.13	0.12
Acid Volatile Sulfide	1.372427	9.981285	0.34311 J	NA	NA	NA	NA	NA	NA	14.35 J	1.43481 J	15.9077 J
Conventionals												
pH (SU)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	25	16	28
Sulfide (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Percent Moisture (%)	57	51	57	NA	NA	NA	NA	NA	NA	56	53	60
Percent Solids (%)	43	49	43	NA	NA	NA	NA	NA	NA	44	47	40
Total Organic Carbon (mg/kg)	45000	63000	59000	NA	NA	NA	NA	NA	NA	52000	36000	59000

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SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD38	9SD39	9SD40	9SD41	9SD42	9SD43	9SD44	9SD45	9SD46	9SD47
Site ID	9SD38	9SD39	9SD40	9SD41	9SD42	9SD43	9SD44	9SD45	9SD46	9SD47
Sample Date	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005
Sample Depth (ft bgs)										
Volatile Organics (µg/kg)										
1,1,1,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane (DBCP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (EDB)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (cis)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichloropropene (cis)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichloropropene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichloro-2-butene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloro-1,3-butadiene (Chloroprene)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone (MBK)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Chloropropene (Allyl Chloride)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrolein	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromomethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methacrylate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Freon 11 (Trichlorofluoromethane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Freon-12 (Dichlorodifluoromethane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isobutyl Alcohol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Acrylonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

APPENDIX A

SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD38	9SD39	9SD40	9SD41	9SD42	9SD43	9SD44	9SD45	9SD46	9SD47
Site ID	9SD38	9SD39	9SD40	9SD41	9SD42	9SD43	9SD44	9SD45	9SD46	9SD47
Sample Date	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005
Sample Depth (ft bgs)										
Volatile Organics (µg/kg)(continued)										
Methyl Iodide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Methacrylate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Propionitrile (Ethyl Cyanide)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene (Ethenylbenzene)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene (PCE)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene (TCE)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes, total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organics (µg/kg)										
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trinitrobenzene (TNB)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene (m-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene (m-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Naphthoquinone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Phenylenediamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis[1-chloropropane]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Acetylaminofluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methyl-5-nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol (o-Cresol)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD38	9SD39	9SD40	9SD41	9SD42	9SD43	9SD44	9SD45	9SD46	9SD47
Site ID	9SD38	9SD39	9SD40	9SD41	9SD42	9SD43	9SD44	9SD45	9SD46	9SD47
Sample Date	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005
Sample Depth (ft bgs)										
Semivolatile Organis (µg/kg)(continued)										
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Picoline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3 & 4 Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dimethylbenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylcholanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Aminobiphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Dimethylaminoazobenzene (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroquinoline-1-oxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7,12-Dimethylbenz(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
a,a-Dimethylphenethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aramite	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzoic Acid	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) Phthalate (BEHP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl Benzyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cresol (Mixed Isomers)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diallate (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl Phthalate (DEP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl Phthalate (DBP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dinoseb	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methane Sulfonate (EMS)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloro-1,3-butadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD38	9SD39	9SD40	9SD41	9SD42	9SD43	9SD44	9SD45	9SD46	9SD47
Site ID	9SD38	9SD39	9SD40	9SD41	9SD42	9SD43	9SD44	9SD45	9SD46	9SD47
Sample Date	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005
Sample Depth (ft bgs)										
Semivolatile Organis (µg/kg)(continued)										
Hexachlorophene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isosafrole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methapyrilene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Methane Sulfonate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodimethylamine (NDMA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-butylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodi-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosomethylethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosomorpholine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopiperidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopyrrolidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Toluidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloronitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenacetin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pronamide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyridine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Safrole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (µg/kg)										
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene (BaP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (µg/kg)(continued)										
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD38	9SD39	9SD40	9SD41	9SD42	9SD43	9SD44	9SD45	9SD46	9SD47
Site ID	9SD38	9SD39	9SD40	9SD41	9SD42	9SD43	9SD44	9SD45	9SD46	9SD47
Sample Date	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005
Sample Depth (ft bgs)										
Organophosphorous Pesticide (µg/kg)										
Dimethoate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Disulfoton	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Famphur	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o,o,o-Triethyl Phosphorothioate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phorate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfotepp	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thionazin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals (mg/kg)										
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	56 J	39 J	41 J	72 J	42 J	98 J	130 J	39 J	44 J	84 J
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AVS / SEM (µmol/g)										
Cadmium	0.0015 UJ	0.002 UJ	0.002 UJ	0.001334389 UJ	0.001601267 UJ	0.001690226 UJ	0.001423348 UJ	0.001690226 UJ	0.001690226 UJ	0.001868145 UJ
Copper	0.0109 R	0.01 R	0.011 R	0.005507821 J	0.011173009 R	0.01195984 R	0.055078211 J	0.011802474 R	0.01195984 R	0.012746672 R
Lead	0.028 J	0.053 J	0.082 J	0.072393822 J	0.062741313 J	0.082046332 J	0.41988417 J	0.041023166 J	0.067567568 J	0.057915058 J
Nickel	0.0024 J	0.003 J	0.005 J	0.003748292 J	0.004259423 J	0.00494093 J	0.002896407 J	0.003748292 J	0.003918669 J	0.002896407 J
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	0.0811 J	0.124 J	0.153 J	0.117755008 J	0.111637865 J	0.133047867 J	0.071876434 J	0.151399297 J	0.081052149 J	0.116225723 J
Total SEM hg	0.12	0.19	0.25	0.20	0.19	0.23	0.55	0.21	0.17	0.19
Acid Volatile Sulfide	16.532 J	17.47 J	10.61 J	0.165315034 UJ	0.218340611 J	49.90642545 J	1.21646912 J	13.10043668 J	40.54897068 J	21.21023082 J
Conventionals										
pH (SU)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia (mg/kg)	35	36	33	19	23	35	13	41	39	37
Sulfide (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Percent Moisture (%)	58	56	59	53	59	62	55	62	62	65
Percent Solids (%)	42	44	41	48	41	38	45	38	38	35
Total Organic Carbon (mg/kg)	63000	59000	60000	48000	62000	60000	85000	54000	62000	99000

APPENDIX A

SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD48	9SD49	9SD50	9SD51	9SD52	9SD53	9SD54	9SD55	9SD56	9SD57
Site ID	9SD48	9SD49	9SD50	9SD51	9SD52	9SD53	9SD54	9SD55	9SD56	9SD57
Sample Date	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/7/2005	8/7/2005	8/7/2005
Sample Depth (ft bgs)										
Volatile Organics (µg/kg)										
1,1,1,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane (DBCP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (EDB)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (cis)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichloropropene (cis)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichloropropene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichloro-2-butene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloro-1,3-butadiene (Chloroprene)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone (MBK)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Chloropropene (Allyl Chloride)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrolein	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromomethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methacrylate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Freon 11 (Trichlorofluoromethane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Freon-12 (Dichlorodifluoromethane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isobutyl Alcohol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Acrylonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

APPENDIX A

SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD48	9SD49	9SD50	9SD51	9SD52	9SD53	9SD54	9SD55	9SD56	9SD57
Site ID	9SD48	9SD49	9SD50	9SD51	9SD52	9SD53	9SD54	9SD55	9SD56	9SD57
Sample Date	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/7/2005	8/7/2005	8/7/2005
Sample Depth (ft bgs)										
Volatile Organics (µg/kg)(continued)										
Methyl Iodide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Methacrylate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Propionitrile (Ethyl Cyanide)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene (Ethenylbenzene)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene (PCE)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene (TCE)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes, total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organics (µg/kg)										
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trinitrobenzene (TNB)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene (m-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene (m-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Naphthoquinone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Phenylenediamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis[1-chloropropane]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Acetylaminofluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methyl-5-nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol (o-Cresol)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD48	9SD49	9SD50	9SD51	9SD52	9SD53	9SD54	9SD55	9SD56	9SD57
Site ID	9SD48	9SD49	9SD50	9SD51	9SD52	9SD53	9SD54	9SD55	9SD56	9SD57
Sample Date	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/7/2005	8/7/2005	8/7/2005
Sample Depth (ft bgs)										
Semivolatile Organis (µg/kg)(continued)										
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Picoline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3 & 4 Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dimethylbenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylcholanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Aminobiphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Dimethylaminoazobenzene (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroquinoline-1-oxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7,12-Dimethylbenz(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
a,a-Dimethylphenethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aramite	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzoic Acid	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) Phthalate (BEHP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl Benzyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cresol (Mixed Isomers)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diallate (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl Phthalate (DEP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl Phthalate (DBP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dinoseb	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methane Sulfonate (EMS)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloro-1,3-butadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD48	9SD49	9SD50	9SD51	9SD52	9SD53	9SD54	9SD55	9SD56	9SD57
Site ID	9SD48	9SD49	9SD50	9SD51	9SD52	9SD53	9SD54	9SD55	9SD56	9SD57
Sample Date	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/7/2005	8/7/2005	8/7/2005
Sample Depth (ft bgs)										
Semivolatile Organis (µg/kg)(continued)										
Hexachlorophene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isosafrole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methapyrilene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Methane Sulfonate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodimethylamine (NDMA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-butylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodi-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosomethylethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosomorpholine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopiperidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopyrrolidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Toluidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloronitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenacetin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pronamide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyridine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Safrole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (µg/kg)										
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene (BaP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (µg/kg)(continued)										
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

APPENDIX A

SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD48	9SD49	9SD50	9SD51	9SD52	9SD53	9SD54	9SD55	9SD56	9SD57
Site ID	9SD48	9SD49	9SD50	9SD51	9SD52	9SD53	9SD54	9SD55	9SD56	9SD57
Sample Date	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/6/2005	8/7/2005	8/7/2005	8/7/2005
Sample Depth (ft bgs)										
Organophosphorous Pesticide (µg/kg)										
Dimethoate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Disulfoton	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Famphur	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o,o,o-Triethyl Phosphorothioate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phorate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfotepp	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thionazin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals (mg/kg)										
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	120 J	310 J	310 J	60 J	110 J	180 J	71 J	41 J	110 J	290 J
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AVS / SEM (µmol/g)										
Cadmium	0.001601267 UJ	0.001067511 UJ	0.002490859 J	0.001601267 UJ	0.001690226 UJ	0.002 UJ	0.0016 UJ	0.002 UJ	0.001512308 UJ	0.001690226 UJ
Copper	0.011330375 R	0.047209895 J	0.003934158 J	0.011015642 R	0.01195984 R	0.013 R	0.0011 J	0.013 R	0.010543543 R	0.012117206 R
Lead	0.13030888 J	0.579150579 J	0.366795367 J	0.101351351 J	0.13030888 J	0.164 J	0.0531 J	0.037 J	0.173745174 J	0.106177606 J
Nickel	0.0044298 J	0.005963192 J	0.007666961 J	0.005452061 J	0.004600177 J	0.003 J	0.0024 J	0.003 J	0.002726031 J	0.003237161 J
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	0.134577152 J	0.103991436 J	0.25997859 J	0.131518581 J	0.143752867 J	0.113 J	0.0749 J	0.05 J	0.068817862 J	0.10246215 J
Total SEM hg	0.28	0.74	0.64	0.25	0.29	0.30	0.13	0.10	0.26	0.23
Acid Volatile Sulfide	34.3106675 J	0.436681223 J	12.78852152 J	34.3106675 J	59.26388022 J	43.67 J	14.66 J	43.67 J	30.56768559 J	43.66812227 J
Conventionals										
pH (SU)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia (mg/kg)	24	5.6	12	74	38	23	64	120	58	65
Sulfide (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Percent Moisture (%)	60	39	56	59	63	65	59	64	58	63
Percent Solids (%)	40	61	44	41	38	35	41	36	43	37
Total Organic Carbon (mg/kg)	78000	34000	180000	70000	86000	87000	75000	94000	85000	78000

APPENDIX A

SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD58	9SD59	9SD60	9SD61	9SD62	9SD63	9SD64	9SD65	9SD66
Site ID	9SD58	9SD59	9SD60	9SD61	9SD62	9SD63	9SD64	9SD65	9SD66
Sample Date	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005
Sample Depth (ft bgs)									
Volatile Organics (µg/kg)									
1,1,1,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane (DBCP)	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (EDB)	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (cis)	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichloropropene (cis)	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichloropropene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichloro-2-butene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloro-1,3-butadiene (Chloroprene)	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone (MBK)	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Chloropropene (Allyl Chloride)	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrolein	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromomethane	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methacrylate	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Freon 11 (Trichlorofluoromethane)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Freon-12 (Dichlorodifluoromethane)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isobutyl Alcohol	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Acrylonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA

APPENDIX A

SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD58	9SD59	9SD60	9SD61	9SD62	9SD63	9SD64	9SD65	9SD66
Site ID	9SD58	9SD59	9SD60	9SD61	9SD62	9SD63	9SD64	9SD65	9SD66
Sample Date	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005
Sample Depth (ft bgs)									
Volatile Organics (µg/kg)(continued)									
Methyl Iodide	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Methacrylate	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA
Propionitrile (Ethyl Cyanide)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene (Ethenylbenzene)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene (PCE)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene (TCE)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes, total	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organics (µg/kg)									
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trinitrobenzene (TNB)	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene (m-)	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene (m-)	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Naphthoquinone	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Phenylenediamine	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis[1-chloropropane]	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Acetylaminofluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methyl-5-nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol (o-Cresol)	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD58	9SD59	9SD60	9SD61	9SD62	9SD63	9SD64	9SD65	9SD66
Site ID	9SD58	9SD59	9SD60	9SD61	9SD62	9SD63	9SD64	9SD65	9SD66
Sample Date	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005
Sample Depth (ft bgs)									
Semivolatile Organis (µg/kg)(continued)									
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Picoline	NA	NA	NA	NA	NA	NA	NA	NA	NA
3 & 4 Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dimethylbenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylcholanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Aminobiphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Dimethylaminoazobenzene (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroquinoline-1-oxide	NA	NA	NA	NA	NA	NA	NA	NA	NA
7,12-Dimethylbenz(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
a,a-Dimethylphenethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aniline	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aramite	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzoic Acid	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) Phthalate (BEHP)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl Benzyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cresol (Mixed Isomers)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diallate (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl Phthalate (DEP)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl Phthalate (DBP)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dinoseb	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methane Sulfonate (EMS)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloro-1,3-butadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD58	9SD59	9SD60	9SD61	9SD62	9SD63	9SD64	9SD65	9SD66
Site ID	9SD58	9SD59	9SD60	9SD61	9SD62	9SD63	9SD64	9SD65	9SD66
Sample Date	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005
Sample Depth (ft bgs)									
Semivolatile Organis (µg/kg)(continued)									
Hexachlorophene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isosafrole	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methapyrilene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Methane Sulfonate	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodimethylamine (NDMA)	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-butylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodi-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosomethylethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosomorpholine	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopiperidine	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopyrrolidine	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Toluidine	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloronitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenacetin	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pronamide	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyridine	NA	NA	NA	NA	NA	NA	NA	NA	NA
Safrole	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (µg/kg)									
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene (BaP)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (µg/kg)(continued)									
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA

APPENDIX A

SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD58	9SD59	9SD60	9SD61	9SD62	9SD63	9SD64	9SD65	9SD66
Site ID	9SD58	9SD59	9SD60	9SD61	9SD62	9SD63	9SD64	9SD65	9SD66
Sample Date	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005
Sample Depth (ft bgs)									
Organophosphorous Pesticide (µg/kg)									
Dimethoate	NA	NA	NA	NA	NA	NA	NA	NA	NA
Disulfoton	NA	NA	NA	NA	NA	NA	NA	NA	NA
Famphur	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA
o,o,o-Triethyl Phosphorothioate	NA	NA	NA	NA	NA	NA	NA	NA	NA
Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phorate	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfotepp	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thionazin	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals (mg/kg)									
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	30 J	20 J	79 J	36 J	53 J	27 J	28 J	15 J	26 J
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tin	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA
AVS / SEM (µmol/g)									
Cadmium	0.001779185 UJ	0.001868145 UJ	0.001601267 J	0.001779185 UJ	0.001601267 UJ	0.0024019 UJ	0.000978552 J	0.002135022 UJ	0.002135022 UJ
Copper	0.012589305 R	0.013061404 R	0.020457621 R	0.012904038 R	0.011015642 R	0.017310295 R	0.001557927 J	0.015107166 R	0.015107166 R
Lead	0.062741313 J	0.027992278 J	0.236486486 J	0.02992278 J	0.101351351 J	0.048262548 J	0.042953668 J	0.030405405 J	0.030405405 J
Nickel	0.003066784 J	0.004600177 J	0.006985453 J	0.027260305 UJ	0.0044298 J	0.006644699 J	0.005281684 J	0.003237161 J	0.002555654 J
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	0.076464291 J	0.094815721 J	0.214100015 J	0.056583575 J	0.103991436 J	0.140694296 J	0.117755008 J	0.110108579 J	0.05505429 J
Total SEM hg	0.16	0.14	0.48	0.13	0.22	0.22	0.17	0.16	0.11
Acid Volatile Sulfide	15.59575795 J	40.54897068 J	65.50218341 J	19.96257018 J	46.78727386 J	106.0511541 J	14.97192764 J	77.97878977 J	37.42981909 J
Conventionals									
pH (SU)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia (mg/kg)	61	77	77	53	77	110	51	100	24
Sulfide (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Percent Moisture (%)	64	65	77	65	59	73	67	70	70
Percent Solids (%)	36	35	23	35	41	27	33	30	30
Total Organic Carbon (mg/kg)	72000	65000	97000	63000	81000	99000	160000	92000	100000

APPENDIX A

SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD67	9SD68	9SD69	9SD70	9SD71	9SD72	9SD73	9SD74	9SD75	9SD76
Site ID	9SD67	9SD68	9SD69	9SD70	9SD71	9SD72	9SD73	9SD74	9SD75	9SD76
Sample Date	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005
Sample Depth (ft bgs)										
Volatile Organics (µg/kg)										
1,1,1,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane (DBCP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (EDB)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (cis)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichloropropene (cis)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichloropropene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichloro-2-butene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloro-1,3-butadiene (Chloroprene)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone (MBK)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Chloropropene (Allyl Chloride)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrolein	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromomethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methacrylate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Freon 11 (Trichlorofluoromethane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Freon-12 (Dichlorodifluoromethane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isobutyl Alcohol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Acrylonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

APPENDIX A

SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD67	9SD68	9SD69	9SD70	9SD71	9SD72	9SD73	9SD74	9SD75	9SD76
Site ID	9SD67	9SD68	9SD69	9SD70	9SD71	9SD72	9SD73	9SD74	9SD75	9SD76
Sample Date	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005
Sample Depth (ft bgs)										
Volatile Organics (µg/kg)(continued)										
Methyl Iodide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Methacrylate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Propionitrile (Ethyl Cyanide)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene (Ethenylbenzene)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene (PCE)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene (TCE)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes, total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organics (µg/kg)										
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trinitrobenzene (TNB)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene (m-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene (m-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Naphthoquinone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Phenylenediamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis[1-chloropropane]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Acetylaminofluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methyl-5-nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol (o-Cresol)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD67	9SD68	9SD69	9SD70	9SD71	9SD72	9SD73	9SD74	9SD75	9SD76
Site ID	9SD67	9SD68	9SD69	9SD70	9SD71	9SD72	9SD73	9SD74	9SD75	9SD76
Sample Date	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005
Sample Depth (ft bgs)										
Semivolatile Organis (µg/kg)(continued)										
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Picoline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3 & 4 Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dimethylbenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylcholanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Aminobiphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Dimethylaminoazobenzene (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroquinoline-1-oxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7,12-Dimethylbenz(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
a,a-Dimethylphenethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aramite	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzoic Acid	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) Phthalate (BEHP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl Benzyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cresol (Mixed Isomers)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diallate (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl Phthalate (DEP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl Phthalate (DBP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dinoseb	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methane Sulfonate (EMS)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloro-1,3-butadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD67	9SD68	9SD69	9SD70	9SD71	9SD72	9SD73	9SD74	9SD75	9SD76
Site ID	9SD67	9SD68	9SD69	9SD70	9SD71	9SD72	9SD73	9SD74	9SD75	9SD76
Sample Date	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005
Sample Depth (ft bgs)										
Semivolatile Organis (µg/kg)(continued)										
Hexachlorophene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isosafrole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methapyrilene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Methane Sulfonate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodimethylamine (NDMA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-butylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodi-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosomethylethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosomorpholine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopiperidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopyrrolidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Toluidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloronitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenacetin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pronamide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyridine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Safrole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (µg/kg)										
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene (BaP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (µg/kg)(continued)										
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD67	9SD68	9SD69	9SD70	9SD71	9SD72	9SD73	9SD74	9SD75	9SD76
Site ID	9SD67	9SD68	9SD69	9SD70	9SD71	9SD72	9SD73	9SD74	9SD75	9SD76
Sample Date	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005	8/7/2005
Sample Depth (ft bgs)										
Organophosphorous Pesticide (µg/kg)										
Dimethoate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Disulfoton	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Famphur	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o,o,o-Triethyl Phosphorothioate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phorate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfotepp	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thionazin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals (mg/kg)										
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	13 J	11 J	63 J	17 J	12 J	11 J	6.7 J	9.9 J	12 J	5.7 J
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AVS / SEM (µmol/g)										
Cadmium	0.002223982 UJ	0.002135022 UJ	0.002 UJ	0.002223982 UJ	0.001601267 UJ	0.001868145 UJ	0.002 UJ	0.002 UJ	0.002 UJ	0.002 UJ
Copper	0.001416297 J	0.015107166 R	0.011 R	0.015579265 R	0.011173009 R	0.003304693 J	0.003 J	0.003 J	0.003 J	0.003 J
Lead	0.027992278 J	0.015926641 J	0.01 J	0.011100386 J	0.018822394 J	0.007722008 J	0.014 J	0.009 J	0.008 J	0.008 J
Nickel	0.004770553 J	0.002555654 J	0.002 J	0.034075382 UJ	0.002726031 J	0.002385277 J	0.004 J	0.003 J	0.003 J	0.003 J
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	0.088698578 J	0.061171433 J	0.035 J	0.076464291 J	0.044349289 J	0.041290717 J	0.063 J	0.037 J	0.058 J	0.04 J
Total SEM hg	0.13	0.10	0.06	0.14	0.08	0.06	0.08	0.05	0.07	0.05
Acid Volatile Sulfide	34.3106675 J	59.26388022 J	8.422 J	11.54086089 J	6.8621335 J	8.109794136 J	17.78 J	8.422 J	27.45 J	1.653 J
Conventionals										
pH (SU)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia (mg/kg)	78	87	17	26	17	29	37	39	35	30
Sulfide (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Percent Moisture (%)	71	71	57	71	60	65	62	60	65	62
Percent Solids (%)	29	30	43	29	41	35	38	40	35	38
Total Organic Carbon (mg/kg)	83000	63000	71000	77000	56000	85000	76000	84000	79000	63000

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SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD77	9SD78	9SD79	9SD19B	9SD30B	9SD36B	9SD41B	9SD43B	9SD44B	9SD46B
Site ID	9SD77	9SD78	9SD79	9SD19B	9SD30B	9SD36B	9SD41B	9SD43B	9SD44B	9SD46B
Sample Date	8/7/2005	8/7/2005	8/7/2005	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006
Sample Depth (ft bgs)										
Volatile Organics (µg/kg)										
1,1,1,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane (DBCP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (EDB)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (cis)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichloropropene (cis)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichloropropene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichloro-2-butene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloro-1,3-butadiene (Chloroprene)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone (MBK)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Chloropropene (Allyl Chloride)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrolein	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromomethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methacrylate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Freon 11 (Trichlorofluoromethane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Freon-12 (Dichlorodifluoromethane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isobutyl Alcohol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Acrylonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD77	9SD78	9SD79	9SD19B	9SD30B	9SD36B	9SD41B	9SD43B	9SD44B	9SD46B
Site ID	9SD77	9SD78	9SD79	9SD19B	9SD30B	9SD36B	9SD41B	9SD43B	9SD44B	9SD46B
Sample Date	8/7/2005	8/7/2005	8/7/2005	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006
Sample Depth (ft bgs)										
Volatile Organics (µg/kg)(continued)										
Methyl Iodide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Methacrylate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Propionitrile (Ethyl Cyanide)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene (Ethenylbenzene)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene (PCE)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene (TCE)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes, total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organics (µg/kg)										
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trinitrobenzene (TNB)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene (m-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene (m-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Naphthoquinone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Phenylenediamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis[1-chloropropane]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Acetylaminofluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methyl-5-nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol (o-Cresol)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD77	9SD78	9SD79	9SD19B	9SD30B	9SD36B	9SD41B	9SD43B	9SD44B	9SD46B
Site ID	9SD77	9SD78	9SD79	9SD19B	9SD30B	9SD36B	9SD41B	9SD43B	9SD44B	9SD46B
Sample Date	8/7/2005	8/7/2005	8/7/2005	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006
Sample Depth (ft bgs)										
Semivolatile Organis (µg/kg)(continued)										
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Picoline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3 & 4 Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dimethylbenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylcholanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Aminobiphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Dimethylaminoazobenzene (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroquinoline-1-oxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7,12-Dimethylbenz(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
a,a-Dimethylphenethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aramite	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzoic Acid	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) Phthalate (BEHP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl Benzyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cresol (Mixed Isomers)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diallate (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl Phthalate (DEP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl Phthalate (DBP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dinoseb	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methane Sulfonate (EMS)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloro-1,3-butadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD77	9SD78	9SD79	9SD19B	9SD30B	9SD36B	9SD41B	9SD43B	9SD44B	9SD46B
Site ID	9SD77	9SD78	9SD79	9SD19B	9SD30B	9SD36B	9SD41B	9SD43B	9SD44B	9SD46B
Sample Date	8/7/2005	8/7/2005	8/7/2005	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006
Sample Depth (ft bgs)										
Semivolatile Organis (µg/kg)(continued)										
Hexachlorophene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isosafrole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methapyrilene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Methane Sulfonate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodimethylamine (NDMA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-butylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodi-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosomethylethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosomorpholine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopiperidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopyrrolidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Toluidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloronitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenacetin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pronamide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyridine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Safrole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (µg/kg)										
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene (BaP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (µg/kg)(continued)										
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD77	9SD78	9SD79	9SD19B	9SD30B	9SD36B	9SD41B	9SD43B	9SD44B	9SD46B
Site ID	9SD77	9SD78	9SD79	9SD19B	9SD30B	9SD36B	9SD41B	9SD43B	9SD44B	9SD46B
Sample Date	8/7/2005	8/7/2005	8/7/2005	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006
Sample Depth (ft bgs)										
Organophosphorous Pesticide (µg/kg)										
Dimethoate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Disulfoton	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Famphur	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o,o,o-Triethyl Phosphorothioate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phorate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfotepp	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thionazin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals (mg/kg)										
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	7 J	9.2 J	12 J	96 J	71 J	31 J	64 J	230 J	200 J	120 J
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AVS / SEM (µmol/g)										
Cadmium	0.002 UJ	0.002 UJ	0.0021 UJ	0.000889593 J	0.000871801 J	0.001067511 J	0.000889593 J	0.000889593 J	0.000836217 J	0.001512308 UJ
Copper	0.003 J	0.002 J	0.0035 J	0.017310295 J	0.012431939 R	0.012746672 R	0.113303748 J	0.017310295 J	0.157366317 J	0.058225537 J
Lead	0.011 J	0.014 J	0.0217 J	0.424710425 J	0.260617761 J	0.077220077 J	0.193050193 J	0.188223938 J	0.723938224 J	0.275096525 J
Nickel	0.004 J	0.004 J	0.0055 J	0.006133569 J	0.006303946 J	0.005452061 J	0.006985453 J	0.008518845 J	0.006474322 J	0.006644699 J
Silver	NA	NA	NA	0.003986346 R	0.003708229 R	0.003893641 R	0.003522818 R	0.003430112 R	0.003708229 R	0.0032447 R
Zinc	0.078 J	0.075 J	0.0979 J	0.133047867 J	0.152928582 J	0.168221441 J	0.183514299 J	0.168221441 J	0.152928582 J	0.12081358 J
Total SEM hg	0.10	0.10	0.13	0.58	0.44	0.27	0.50	0.38	1.04	0.46
Acid Volatile Sulfide	62.38 J	37.43 J	77.979 J	16.84341859 J	21.52214598 J	23.70555209 J	7.485963818 J	43.66812227 J	20.5864005 J	6.8621335 J
Conventionals										
pH (SU)	NA	NA	NA	7.72	7.99	7.9	8.1	8.14	7.84	8.12
Ammonia (mg/kg)	56	41	55	25	24	23	5.2	17	4.6	14
Sulfide (mg/kg)	NA	NA	NA	1400	890	700	660	1300	870	120
Percent Moisture (%)	69	61	70	NA	NA	NA	NA	NA	NA	NA
Percent Solids (%)	31	39	30	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon (mg/kg)	79000	69000	110000	140000	120000	49000	49000	58000	70000	50000

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SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD47B	9SD48B	9SD49B	9SD50B	9SD51B	9SD52B	9SD53B	9SD56B	9SD57B	9SD60B	9SD63B	9SD75B
Site ID	9SD47B	9SD48B	9SD49B	9SD50B	9SD51B	9SD52B	9SD53B	9SD56B	9SD57B	9SD60B	9SD63B	9SD75B
Sample Date	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006
Sample Depth (ft bgs)												
Volatile Organics (µg/kg)												
1,1,1,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane (DBCP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (EDB)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (cis)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichloropropene (cis)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichloropropene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichloro-2-butene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloro-1,3-butadiene (Chloroprene)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone (MBK)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Chloropropene (Allyl Chloride)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrolein	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromomethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methacrylate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Freon 11 (Trichlorofluoromethane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Freon-12 (Dichlorodifluoromethane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isobutyl Alcohol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Acrylonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

APPENDIX A

SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD47B	9SD48B	9SD49B	9SD50B	9SD51B	9SD52B	9SD53B	9SD56B	9SD57B	9SD60B	9SD63B	9SD75B
Site ID	9SD47B	9SD48B	9SD49B	9SD50B	9SD51B	9SD52B	9SD53B	9SD56B	9SD57B	9SD60B	9SD63B	9SD75B
Sample Date	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006
Sample Depth (ft bgs)												
Volatile Organics (µg/kg)(continued)												
Methyl Iodide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Methacrylate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Propionitrile (Ethyl Cyanide)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene (Ethenylbenzene)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene (PCE)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene (TCE)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes, total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organics (µg/kg)												
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trinitrobenzene (TNB)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene (m-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene (m-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Naphthoquinone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Phenylenediamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis[1-chloropropane]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Acetylaminofluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methyl-5-nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol (o-Cresol)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD47B	9SD48B	9SD49B	9SD50B	9SD51B	9SD52B	9SD53B	9SD56B	9SD57B	9SD60B	9SD63B	9SD75B
Site ID	9SD47B	9SD48B	9SD49B	9SD50B	9SD51B	9SD52B	9SD53B	9SD56B	9SD57B	9SD60B	9SD63B	9SD75B
Sample Date	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006
Sample Depth (ft bgs)												
Semivolatile Organis (µg/kg)(continued)												
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Picoline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3 & 4 Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dimethylbenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylcholanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Aminobiphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Dimethylaminoazobenzene (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroquinoline-1-oxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7,12-Dimethylbenz(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
a,a-Dimethylphenethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aramite	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzoic Acid	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) Phthalate (BEHP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl Benzyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cresol (Mixed Isomers)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diallate (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl Phthalate (DEP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl Phthalate (DBP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dinoseb	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methane Sulfonate (EMS)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloro-1,3-butadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD47B	9SD48B	9SD49B	9SD50B	9SD51B	9SD52B	9SD53B	9SD56B	9SD57B	9SD60B	9SD63B	9SD75B
Site ID	9SD47B	9SD48B	9SD49B	9SD50B	9SD51B	9SD52B	9SD53B	9SD56B	9SD57B	9SD60B	9SD63B	9SD75B
Sample Date	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006
Sample Depth (ft bgs)												
Semivolatile Organis (µg/kg)(continued)												
Hexachlorophene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isosafrole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methapyrilene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Methane Sulfonate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodimethylamine (NDMA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-butylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodi-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosomethylethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosomorpholine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopiperidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopyrrolidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Toluidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloronitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenacetin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pronamide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyridine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Safrole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (µg/kg)												
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene (BaP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (µg/kg)(continued)												
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD47B	9SD48B	9SD49B	9SD50B	9SD51B	9SD52B	9SD53B	9SD56B	9SD57B	9SD60B	9SD63B	9SD75B
Site ID	9SD47B	9SD48B	9SD49B	9SD50B	9SD51B	9SD52B	9SD53B	9SD56B	9SD57B	9SD60B	9SD63B	9SD75B
Sample Date	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006	1/22/2006
Sample Depth (ft bgs)												
Organophosphorous Pesticide (µg/kg)												
Dimethoate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Disulfoton	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Famphur	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o,o,o-Triethyl Phosphorothioate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phorate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfotepp	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thionazin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals (mg/kg)												
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	91 J	200 J	430 J	180 J	65 J	130 J	130 J	110 J	62 J	79 J	30 J	14 J
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AVS / SEM (µmol/g)												
Cadmium	0.002 UJ	0.002 UJ	0.0008 J	0.002 J	0.002 UJ	0.002 J	0.002 UJ	0.002 UJ	0.001 J	0.002 J	0.0017792 J	0.00222398 UJ
Copper	0.06 J	0.039 J	0.096 J	0.016 J	0.035 J	0.016 R	0.11 J	0.019 J	0.017 J	0.019 J	0.0157366 R	0.02045762 J
Lead	0.212 J	0.483 J	1.1583 J	0.579 J	0.203 J	0.405 J	0.362 J	0.42 J	0.188 J	0.232 J	0.1013514 J	0.0226834 J
Nickel	0.007 J	0.008 J	0.017 J	0.007 J	0.009 J	0.007 J	0.006 J	0.006 J	0.01 J	0.01 J	0.0109041 J	0.00681508 J
Silver	0.004 R	0.003 R	0.0028 R	0.004 R	0.004 R	0.005 R	0.004 R	0.004 R	0.005 R	0.005 R	0.0050061 R	0.0048207 R
Zinc	0.128 J	0.184 J	0.1988 J	0.291 J	0.133 J	0.199 J	0.136 J	0.168 J	0.214 J	0.229 J	0.2141 J	0.13916501 J
Total SEM hg	0.41	0.72	1.47	0.90	0.38	0.63	0.62	0.62	0.43	0.49	0.35	0.19
Acid Volatile Sulfide	15.91 J	7.486 J	14.66 J	40.55 J	12.79 J	77.98 J	15.28 J	15.28 J	93.57 J	65.5 J	65.502183 J	40.5489707 J
Conventionals												
pH (SU)	8.31	8.07	7.9	7.83	8.32	7.87	7.85	8.13	7.88	7.89	7.77	7.96
Ammonia (mg/kg)	20	3.6	4.2	14	14	45	12	14	49	24	46	61
Sulfide (mg/kg)	610	320	520	1800	680	2800	510	450	3100	2700	2900	2100
Percent Moisture (%)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Percent Solids (%)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon (mg/kg)	63000	54000	60000	2E+05	53000	84000	88000	83000	82000	1E+05	110000	79000

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD76B	9SD19	9SD30	9SD44	9SD48	9SD49	9SD50	9SD52	9SDUVF-18	9SDUVF-20
Site ID	9SD76B									
Sample Date	1/22/2006	3/17/2007	3/17/2007	3/17/2007	3/17/2007	3/17/2007	3/17/2007	3/17/2007	3/17/2007	3/17/2007
Sample Depth (ft bgs)										
Volatile Organics (µg/kg)										
1,1,1,2-Tetrachloroethane	NA	2.8 UJ	2.9 UJ	2.7 UJ	2.7 UJ	2.5 UJ	130 UJ	5.4 UJ	2.7 UJ	2.5 UJ
1,1,1-Trichloroethane	NA	1.7 UJ	1.7 UJ	1.6 UJ	1.6 UJ	1.5 UJ	76 UJ	3.3 UJ	1.7 UJ	1.5 UJ
1,1,2,2-Tetrachloroethane	NA	2 UJ	2 UJ	1.9 UJ	1.9 UJ	1.8 UJ	90 UJ	3.9 UJ	2 UJ	1.8 UJ
1,1,2-Trichloroethane	NA	2.4 UJ	2.4 UJ	2.3 UJ	2.3 UJ	2.1 UJ	110 UJ	4.6 UJ	2.4 UJ	2.1 UJ
1,1-Dichloroethane	NA	2 UJ	2 UJ	1.9 UJ	1.9 UJ	1.8 UJ	90 UJ	3.9 UJ	2 UJ	1.8 UJ
1,1-Dichloroethene	NA	2.2 UJ	2.2 UJ	2.1 UJ	2.1 UJ	2 UJ	98 UJ	4.2 UJ	2.2 UJ	2 UJ
1,2,3-Trichloropropane	NA	5.4 UJ	5.5 UJ	5.1 UJ	5.2 UJ	4.8 UJ	240 UJ	10 UJ	5.3 UJ	4.8 UJ
1,2-Dibromo-3-chloropropane (DBCP)	NA	9.2 UJ	9.4 UJ	8.7 UJ	8.8 UJ	8.2 UJ	410 UJ	18 UJ	9 UJ	8.2 UJ
1,2-Dibromoethane (EDB)	NA	2.8 UJ	2.9 UJ	2.7 UJ	2.7 UJ	2.5 UJ	130 UJ	5.4 UJ	2.7 UJ	2.5 UJ
1,2-Dichloroethane	NA	2.4 UJ	2.4 UJ	2.3 UJ	2.3 UJ	2.1 UJ	110 UJ	4.6 UJ	2.4 UJ	2.1 UJ
1,2-Dichloroethene (cis)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (trans)	NA	2.2 UJ	2.2 UJ	2.1 UJ	2.1 UJ	2 UJ	98 UJ	4.2 UJ	2.2 UJ	2 UJ
1,2-Dichloropropane	NA	2.6 UJ	2.7 UJ	2.5 UJ	2.5 UJ	2.3 UJ	120 UJ	5 UJ	2.5 UJ	2.3 UJ
1,3-Dichloropropene (cis)	NA	1.8 UJ	1.9 UJ	1.7 UJ	1.7 UJ	1.6 UJ	81 UJ	3.5 UJ	1.8 UJ	1.6 UJ
1,3-Dichloropropene (trans)	NA	2.2 UJ	2.2 UJ	2.1 UJ	2.1 UJ	2 UJ	98 UJ	4.2 UJ	2.2 UJ	2 UJ
1,4-Dichloro-2-butene (trans)	NA	8 UJ	8.2 UJ	7.6 UJ	7.7 UJ	7.1 UJ	360 UJ	15 UJ	7.8 UJ	7.2 UJ
2-Butanone (MEK)	NA	26 J	24 J	7.6 UJ	7.7 UJ	17 J	360 UJ	47 J	7.8 UJ	7.2 UJ
2-Chloro-1,3-butadiene (Chloroprene)	NA	1.7 UJ	1.7 UJ	1.6 UJ	1.6 UJ	1.5 UJ	74 UJ	3.2 UJ	1.6 UJ	1.5 UJ
2-Hexanone (MBK)	NA	11 UJ	11 UJ	10 UJ	10 UJ	9.6 UJ	480 UJ	21 UJ	11 UJ	9.7 UJ
3-Chloropropene (Allyl Chloride)	NA	2.4 UJ	2.4 UJ	2.3 UJ	2.3 UJ	2.1 UJ	110 UJ	4.6 UJ	2.4 UJ	2.1 UJ
4-Methyl-2-pentanone (MIBK)	NA	12 UJ	12 UJ	11 UJ	11 UJ	10 UJ	520 UJ	22 UJ	11 UJ	10 UJ
Acetone	NA	170 UJ	180 UJ	220 J	160 UJ	98 UJ	270 UJ	280 UJ	11 UJ	5.4 UJ
Acetonitrile	NA	56 UJ	57 UJ	53 UJ	54 UJ	50 UJ	2500 UJ	110 UJ	55 UJ	50 UJ
Acrolein	NA	22 UJ	22 UJ	21 UJ	21 UJ	20 UJ	980 UJ	42 UJ	22 UJ	20 UJ
Acrylonitrile	NA	31 UJ	32 UJ	30 UJ	30 UJ	28 UJ	1400 UJ	61 UJ	31 UJ	28 UJ
Benzene	NA	1.7 UJ	1.8 UJ	1.6 UJ	1.6 UJ	1.5 UJ	77 UJ	3.3 UJ	1.7 UJ	1.5 UJ
Bromodichloromethane	NA	2 UJ	2 UJ	1.9 UJ	1.9 UJ	1.8 UJ	90 UJ	3.9 UJ	2 UJ	1.8 UJ
Bromoform	NA	4.4 UJ	4.5 UJ	4.2 UJ	4.2 UJ	3.9 UJ	200 UJ	8.5 UJ	4.3 UJ	3.9 UJ
Bromomethane	NA	2.6 UJ	2.7 UJ	2.5 UJ	2.5 UJ	2.3 UJ	120 UJ	5 UJ	2.5 UJ	2.3 UJ
Carbon Disulfide	NA	20 J	22 J	3.2 J	22 J	10 J	90 UJ	17 J	2 UJ	1.8 UJ
Carbon Tetrachloride	NA	1.8 UJ	1.8 UJ	1.7 UJ	1.7 UJ	1.6 UJ	80 UJ	3.4 UJ	1.7 UJ	1.6 UJ
Chlorobenzene	NA	1.4 UJ	1.4 UJ	1.3 UJ	1.3 UJ	1.2 UJ	62 UJ	2.7 UJ	1.4 UJ	1.2 UJ
Chloroethane	NA	3 UJ	3.1 UJ	2.8 UJ	2.9 UJ	2.7 UJ	130 UJ	5.8 UJ	2.9 UJ	2.7 UJ
Chloroform	NA	1.8 UJ	1.8 UJ	1.7 U	1.7 UJ	1.6 UJ	79 UJ	3.4 UJ	1.7 UJ	1.6 UJ
Chloromethane	NA	3.6 UJ	1.4 UJ	5.3 J	4.1 J	2.5 J	63 UJ	2.7 UJ	1.4 UJ	1.3 UJ
Dibromochloromethane	NA	2.2 UJ	2.2 UJ	2.1 UJ	2.1 UJ	2 UJ	98 UJ	4.2 UJ	2.2 UJ	2 UJ
Dibromomethane	NA	2.6 UJ	2.7 UJ	2.5 UJ	2.5 UJ	2.3 UJ	120 UJ	5 UJ	2.5 UJ	2.3 UJ
Ethyl Methacrylate	NA	1.5 UJ	1.6 UJ	1.5 UJ	1.5 UJ	1.4 UJ	69 UJ	3 UJ	1.5 UJ	1.4 UJ
Ethylbenzene	NA	1.7 UJ	1.8 UJ	1.7 UJ	1.7 UJ	1.6 UJ	78 UJ	3.4 UJ	1.7 UJ	1.6 UJ
Freon 11 (Trichlorofluoromethane)	NA	2.8 UJ	2.9 UJ	2.7 UJ	2.7 UJ	2.5 UJ	130 UJ	5.4 UJ	2.7 UJ	2.5 UJ
Freon-12 (Dichlorodifluoromethane)	NA	5 UJ	5.1 UJ	4.7 UJ	4.8 UJ	4.5 UJ	220 UJ	9.6 UJ	4.9 UJ	4.5 UJ
Isobutyl Alcohol	NA	260 UJ	270 UJ	250 UJ	250 UJ	230 UJ	12000 UJ	500 UJ	250 UJ	230 UJ
Methyl Acrylonitrile	NA	32 UJ	33 UJ	30 UJ	31 UJ	29 UJ	1400 UJ	62 UJ	31 UJ	29 UJ

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SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD76B	9SD19	9SD30	9SD44	9SD48	9SD49	9SD50	9SD52	9SDUVF-18	9SDUVF-20
Site ID	9SD76B									
Sample Date	1/22/2006	3/17/2007	3/17/2007	3/17/2007	3/17/2007	3/17/2007	3/17/2007	3/17/2007	3/17/2007	3/17/2007
Sample Depth (ft bgs)										
Volatile Organics (µg/kg)(continued)										
Methyl Iodide	NA	2 UJ	2 UJ	1.9 UJ	1.9 UJ	1.8 UJ	90 UJ	3.9 UJ	2 UJ	1.8 UJ
Methyl Methacrylate	NA	3.3 UJ	3.4 UJ	3.1 UJ	3.2 UJ	3 UJ	150 UJ	6.4 UJ	3.3 UJ	3 UJ
Methylene Chloride	NA	3.2 UJ	3.3 UJ	3 UJ	3.1 UJ	2.9 UJ	140 UJ	6.2 UJ	3.1 UJ	2.9 UJ
Pentachloroethane	NA	9.2 UJ	9.4 UJ	8.7 UJ	8.8 UJ	8.2 UJ	410 UJ	18 UJ	9 UJ	8.2 UJ
Propionitrile (Ethyl Cyanide)	NA	46 UJ	47 UJ	44 UJ	44 UJ	41 UJ	2100 UJ	89 UJ	45 UJ	41 UJ
Styrene (Ethenylbenzene)	NA	1.7 UJ	1.7 UJ	1.6 UJ	1.6 UJ	1.5 UJ	76 UJ	3.3 UJ	1.7 UJ	1.5 UJ
Tetrachloroethene (PCE)	NA	2 UJ	2 UJ	1.9 UJ	1.9 UJ	1.8 UJ	90 UJ	3.9 UJ	2 UJ	1.8 UJ
Toluene	NA	2 UJ	2 UJ	1.9 UJ	1.9 UJ	1.8 UJ	320 UJ	3.9 UJ	2 UJ	1.8 UJ
Trichloroethene (TCE)	NA	2.4 UJ	2.4 UJ	2.3 UJ	2.3 UJ	2.1 UJ	110 UJ	4.6 UJ	2.4 UJ	2.1 UJ
Vinyl Acetate	NA	3.8 UJ	3.9 UJ	3.6 UJ	3.6 UJ	3.4 UJ	170 UJ	7.3 UJ	3.7 UJ	3.4 UJ
Vinyl Chloride	NA	1.8 UJ	1.9 UJ	1.7 UJ	1.8 UJ	1.6 UJ	82 UJ	3.5 UJ	1.8 UJ	1.6 UJ
Xylenes, total	NA	4 UJ	4.1 UJ	3.8 UJ	3.8 UJ	3.6 UJ	180 UJ	7.7 UJ	3.9 UJ	3.6 UJ
Semivolatile Organics (µg/kg)										
1,1'-Biphenyl	NA	56 U	60 UJ	52 U	56 U	55 U	58 UJ	67 UJ	57 U	52 U
1,2,4,5-Tetrachlorobenzene	NA	60 U	64 UJ	55 U	60 U	59 U	62 UJ	72 UJ	61 U	55 U
1,2,4-Trichlorobenzene	NA	41 U	44 UJ	37 U	41 U	40 U	42 UJ	49 UJ	41 U	37 U
1,2-Dichlorobenzene (o-)	NA	45 U	48 UJ	41 U	45 U	44 U	46 UJ	53 UJ	45 U	41 U
1,3,5-Trinitrobenzene (TNB)	NA	160 U	170 UJ	150 U	160 U	160 U	170 UJ	190 UJ	160 U	150 U
1,3-Dichlorobenzene (m-)	NA	50 U	54 UJ	46 U	51 U	49 U	52 UJ	60 UJ	51 U	46 U
1,3-Dinitrobenzene (m-)	NA	97 U	100 UJ	89 U	97 U	95 U	100 UJ	120 UJ	98 U	89 U
1,4-Dichlorobenzene (p-)	NA	43 U	46 UJ	39 U	43 U	42 U	44 UJ	51 UJ	43 U	39 U
1,4-Dioxane (p-)	NA	130 U	140 UJ	120 U	130 U	120 U	130 UJ	150 UJ	130 U	120 U
1,4-Naphthoquinone	NA	76 U	81 UJ	69 U	76 U	74 U	78 UJ	90 UJ	76 U	69 U
1,4-Phenylenediamine	NA	3300 U	3500 UJ	3000 U	3300 U	3200 U	3400 UJ	3900 UJ	3300 U	3000 U
1-Naphthylamine	NA	160 U	170 UJ	150 U	160 U	160 U	170 UJ	190 UJ	160 U	150 U
2,2'-Oxybis[1-chloropropane]	NA	68 U	73 UJ	62 U	68 U	66 U	70 UJ	81 UJ	69 U	62 U
2,3,4,6-Tetrachlorophenol	NA	87 U	93 UJ	80 U	87 U	85 U	91 UJ	100 UJ	88 U	80 U
2,4,5-Trichlorophenol	NA	62 U	66 UJ	57 U	62 U	61 U	64 UJ	74 UJ	63 U	57 U
2,4,6-Trichlorophenol	NA	39 U	41 UJ	36 U	39 U	38 U	40 UJ	46 UJ	39 U	36 U
2,4-Dichlorophenol	NA	45 U	48 UJ	41 U	45 U	44 U	46 UJ	53 UJ	45 U	41 U
2,4-Dimethylphenol	NA	68 U	73 UJ	62 U	68 U	66 U	70 UJ	81 UJ	69 U	62 U
2,4-Dinitrophenol	NA	330 UJ	350 UJ	300 UJ	330 U	320 UJ	340 UJ	390 UJ	330 U	300 U
2,4-Dinitrotoluene (DNT)	NA	37 U	39 UJ	34 U	37 U	36 U	38 UJ	44 UJ	37 U	34 U
2,6-Dichlorophenol	NA	100 U	110 UJ	94 U	100 U	100 U	110 UJ	120 UJ	100 U	94 U
2,6-Dinitrotoluene (DNT)	NA	64 U	68 UJ	59 U	64 U	62 U	66 UJ	76 UJ	65 U	59 U
2-Acetylaminofluorene	NA	74 U	79 UJ	68 U	74 U	72 U	76 UJ	88 UJ	74 U	68 U
2-Chloronaphthalene	NA	47 U	50 UJ	43 U	47 U	45 U	48 UJ	55 UJ	47 U	43 U
2-Chlorophenol	NA	52 U	56 UJ	48 U	52 U	51 U	54 UJ	62 UJ	53 U	48 U
2-Methyl-5-nitroaniline	NA	62 U	66 UJ	57 U	62 U	61 U	64 UJ	74 UJ	63 U	57 U
2-Methylphenol (o-Cresol)	NA	58 U	62 UJ	53 U	58 U	57 U	60 UJ	69 UJ	59 U	53 U
2-Naphthylamine	NA	160 U	170 UJ	150 U	160 U	160 U	170 UJ	190 UJ	160 U	150 U
2-Nitroaniline	NA	45 U	48 UJ	41 U	45 U	44 U	46 UJ	53 UJ	45 U	41 U

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SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD76B	9SD19	9SD30	9SD44	9SD48	9SD49	9SD50	9SD52	9SDUVF-18	9SDUVF-20
Site ID	9SD76B									
Sample Date	1/22/2006	3/17/2007	3/17/2007	3/17/2007	3/17/2007	3/17/2007	3/17/2007	3/17/2007	3/17/2007	3/17/2007
Sample Depth (ft bgs)										
Semivolatile Organis (µg/kg)(continued)										
2-Nitrophenol	NA	39 U	41 UJ	36 U	39 U	38 U	40 UJ	46 UJ	39 U	36 U
2-Picoline	NA	160 U	170 UJ	150 U	160 U	160 U	170 UJ	190 UJ	160 UJ	150 UJ
3 & 4 Methylphenol	NA									
3,3'-Dichlorobenzidine	NA	58 U	62 UJ	53 U	58 U	57 U	60 UJ	69 UJ	59 U	53 U
3,3'-Dimethylbenzidine	NA	820 U	870 UJ	750 U	820 U	790 U	850 UJ	970 UJ	820 U	750 U
3-Methylcholanthrene	NA	50 U	54 UJ	46 U	51 U	49 U	52 UJ	60 UJ	51 U	46 U
3-Nitroaniline	NA	64 U	68 UJ	59 U	64 U	62 U	66 UJ	76 UJ	65 U	59 U
4,6-Dinitro-2-methylphenol	NA	390 U	410 UJ	360 U	390 U	380 U	400 UJ	460 UJ	390 U	360 U
4-Aminobiphenyl	NA	100 U	110 UJ	96 U	100 U	100 U	110 UJ	120 UJ	110 U	96 U
4-Bromophenyl-phenylether	NA	60 U	64 UJ	55 U	60 U	59 U	62 UJ	72 UJ	61 U	55 U
4-Chloro-3-methylphenol	NA	66 U	71 UJ	61 U	66 U	64 U	68 UJ	79 UJ	67 U	61 U
4-Chloroaniline	NA	50 U	54 UJ	46 U	51 U	49 U	52 UJ	60 UJ	51 U	46 U
4-Chlorophenyl-phenylether	NA	37 U	39 UJ	34 U	37 U	36 U	38 UJ	44 UJ	37 U	34 U
4-Dimethylaminoazobenzene (p-)	NA	74 U	79 UJ	68 U	74 U	72 U	76 UJ	88 UJ	74 U	68 U
4-Nitroaniline	NA	33 U	35 UJ	30 U	33 U	32 U	34 UJ	39 UJ	33 U	30 U
4-Nitrophenol	NA	410 U	440 UJ	370 U	410 U	400 U	420 UJ	490 UJ	410 U	370 U
4-Nitroquinoline-1-oxide	NA	320 R	340 R	300 R	320 R	310 R	330 R	380 R	330 R	300 R
7,12-Dimethylbenz(a)anthracene	NA	60 U	64 UJ	55 U	60 U	59 U	62 UJ	72 UJ	61 U	55 U
a,a-Dimethylphenethylamine	NA	950 UJ	1000 UJ	870 UJ	950 UJ	930 UJ	990 UJ	1100 UJ	960 U	870 U
Acetophenone	NA	43 U	46 UJ	39 U	43 U	42 U	44 UJ	51 UJ	43 U	39 U
Aniline	NA	41 U	44 UJ	37 U	41 U	40 U	110 J	49 UJ	41 U	37 U
Aramite	NA	120 U	120 UJ	110 U	120 U	110 U	120 UJ	140 UJ	120 U	110 U
Benzidine	NA									
Benzoic Acid	NA									
Benzyl Alcohol	NA	74 U	79 UJ	68 U	74 U	72 U	76 UJ	88 UJ	74 U	68 U
Bis(2-chloroethoxy)methane	NA	47 U	50 UJ	43 U	47 U	45 U	48 UJ	55 UJ	47 U	43 U
Bis(2-chloroethyl)ether	NA	54 U	58 UJ	50 U	54 U	53 U	56 UJ	65 UJ	55 U	50 U
Bis(2-ethylhexyl) Phthalate (BEHP)	NA	74 U	79 UJ	68 U	74 U	72 U	76 UJ	88 UJ	74 U	68 U
Butyl Benzyl Phthalate	NA	52 U	56 UJ	48 U	52 U	51 U	54 UJ	62 UJ	53 U	48 U
Cresol (Mixed Isomers)	NA	56 U	60 UJ	52 U	56 U	55 U	58 UJ	67 UJ	57 U	52 U
Diallate (total)	NA	110 U	120 UJ	100 U	110 U	110 U	110 UJ	130 UJ	110 U	100 U
Dibenzofuran	NA	37 U	39 UJ	34 U	37 U	36 U	38 UJ	44 UJ	37 U	34 U
Diethyl Phthalate (DEP)	NA	43 U	46 UJ	39 U	43 U	42 U	44 UJ	51 UJ	43 U	39 U
Dimethyl Phthalate	NA	37 U	39 UJ	34 U	37 U	36 U	38 UJ	44 UJ	37 U	34 U
Di-n-butyl Phthalate (DBP)	NA	54 U	58 UJ	50 U	54 U	53 U	56 UJ	65 UJ	55 U	50 U
Di-n-octyl Phthalate	NA	60 U	64 UJ	55 U	60 U	59 U	62 UJ	72 UJ	61 U	55 U
Dinoseb	NA	160 U	170 UJ	150 U	160 U	160 U	170 UJ	190 UJ	160 U	150 U
Diphenylamine	NA									
Ethyl Methane Sulfonate (EMS)	NA	130 U	140 UJ	120 U	130 U	120 U	130 UJ	150 UJ	130 U	120 U
Hexachloro-1,3-butadiene	NA	39 U	41 UJ	36 U	39 U	38 U	40 UJ	46 UJ	39 U	36 U
Hexachlorobenzene	NA	50 U	54 UJ	46 U	51 U	49 U	52 UJ	60 UJ	51 U	46 U
Hexachlorocyclopentadiene	NA	160 U	170 UJ	150 U	160 U	160 U	170 UJ	190 UJ	160 U	150 U
Hexachloroethane	NA	39 U	41 UJ	36 U	39 U	38 U	40 UJ	46 UJ	39 U	36 U

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD76B	9SD19	9SD30	9SD44	9SD48	9SD49	9SD50	9SD52	9SDUVF-18	9SDUVF-20
Site ID	9SD76B									
Sample Date	1/22/2006	3/17/2007	3/17/2007	3/17/2007	3/17/2007	3/17/2007	3/17/2007	3/17/2007	3/17/2007	3/17/2007
Sample Depth (ft bgs)										
Semivolatile Organis (µg/kg)(continued)										
Hexachlorophene	NA	24000 R	26000 R	22000 R	24000 R	24000 R	25000 UJ	29000 UJ	25000 U	22000 U
Hexachloropropene	NA	87 U	93 UJ	80 U	87 U	85 U	91 UJ	100 UJ	88 UJ	80 UJ
Isophorone	NA	43 U	46 UJ	39 U	43 U	42 U	44 UJ	51 UJ	43 U	39 U
Isosafrole	NA	120 U	130 UJ	110 U	120 U	120 U	130 UJ	150 UJ	130 U	110 U
Methapyrilene	NA	82 UJ	87 UJ	75 UJ	82 U	79 UJ	85 UJ	97 UJ	82 UJ	75 UJ
Methyl Methane Sulfonate	NA	110 UJ	110 UJ	98 UJ	110 UJ	100 UJ	110 UJ	130 UJ	110 UJ	98 UJ
Nitrobenzene	NA	68 U	73 UJ	62 U	68 U	66 U	70 UJ	81 UJ	69 U	62 U
n-Nitrosodiethylamine	NA	85 U	91 UJ	78 U	86 U	83 U	89 UJ	100 UJ	86 U	78 U
n-Nitrosodimethylamine (NDMA)	NA	110 U	120 UJ	110 U	110 U	110 U	120 UJ	140 UJ	120 U	110 U
n-Nitroso-di-n-butylamine	NA	100 U	110 UJ	93 U	100 U	98 U	100 UJ	120 UJ	100 U	93 U
n-Nitrosodi-n-propylamine	NA	54 U	58 UJ	50 U	54 U	53 U	56 UJ	65 UJ	55 U	50 U
n-Nitrosodiphenylamine	NA	45 U	48 UJ	41 U	45 U	44 U	46 UJ	53 UJ	45 U	41 U
n-Nitrosomethylethylamine	NA	100 U	110 UJ	93 U	100 UJ	98 U	100 UJ	120 UJ	100 U	93 U
n-Nitrosomorpholine	NA	130 U	140 UJ	120 U	130 U	120 U	130 UJ	150 UJ	130 U	120 U
n-Nitrosopiperidine	NA	140 U	150 UJ	130 U	140 U	130 U	140 UJ	160 UJ	140 U	130 U
n-Nitrosopyrrolidine	NA	87 U	93 UJ	80 U	87 U	85 U	91 UJ	100 UJ	88 U	80 U
o-Toluidine	NA	110 U	120 UJ	100 U	110 U	110 U	110 UJ	130 UJ	110 U	100 U
Pentachlorobenzene	NA	120 U	130 UJ	110 U	120 U	120 U	130 UJ	150 UJ	130 U	110 U
Pentachloronitrobenzene	NA	110 U	120 UJ	100 U	110 U	110 U	110 UJ	130 UJ	110 U	100 U
Pentachlorophenol	NA	160 U	170 UJ	150 U	160 U	160 U	170 UJ	190 UJ	160 U	150 U
Phenacetin	NA	99 U	110 UJ	91 U	99 U	97 U	100 UJ	120 UJ	100 U	91 U
Phenol	NA	58 U	62 UJ	53 U	58 U	57 U	60 UJ	69 UJ	59 U	53 U
Pronamide	NA	120 U	130 UJ	110 U	120 U	120 U	130 UJ	150 UJ	120 U	110 U
Pyridine	NA	58 U	62 UJ	53 U	58 U	57 U	190 J	69 UJ	59 U	53 U
Safrole	NA	100 U	110 UJ	94 U	100 U	100 U	110 UJ	120 UJ	100 U	94 U
PAHs (µg/kg)										
1-Methylnaphthalene	NA	21 U	110 UJ	98 U	110 U	100 U	440 UJ	25 UJ	110 U	98 U
2-Methylnaphthalene	NA	19 U	100 UJ	86 U	95 U	91 U	390 UJ	22 UJ	95 U	86 U
Acenaphthene	NA	19 U	100 UJ	89 U	98 U	94 U	400 UJ	23 UJ	98 U	89 U
Acenaphthylene	NA	19 U	100 UJ	87 U	96 U	92 U	390 UJ	23 UJ	96 U	87 U
Anthracene	NA	19 U	100 UJ	89 U	98 U	94 U	400 UJ	23 UJ	98 U	89 U
Benzo(a)anthracene	NA	19 U	100 UJ	89 U	98 U	94 U	400 UJ	23 UJ	98 U	89 U
Benzo(a)pyrene (BaP)	NA	16 U	86 UJ	74 U	81 U	78 U	330 UJ	19 UJ	81 U	74 U
Benzo(b)fluoranthene	NA	21 U	110 UJ	98 U	110 U	100 U	440 UJ	25 UJ	110 U	98 U
Benzo(g,h,i)perylene	NA	19 U	100 UJ	89 U	98 U	94 U	400 UJ	23 UJ	98 U	89 U
Benzo(k)fluoranthene	NA	17 U	88 UJ	75 U	83 U	80 U	340 UJ	20 UJ	83 U	76 U
Chrysene	NA	18 U	97 UJ	83 U	91 U	88 U	370 UJ	21 UJ	91 U	83 U
Dibenz(a,h)anthracene	NA	27 U	150 UJ	120 U	140 U	130 U	560 UJ	32 UJ	140 U	120 U
Fluoranthene	NA	21 U	110 UJ	98 U	110 U	100 U	440 UJ	25 UJ	110 U	98 U
Fluorene	NA	23 U	120 UJ	110 U	120 U	110 U	480 UJ	28 UJ	120 U	110 U
Indeno(1,2,3-cd)pyrene	NA	31 U	170 UJ	140 U	160 U	150 U	640 UJ	37 UJ	160 U	140 U
Naphthalene	NA	23 U	120 UJ	110 U	120 U	110 U	480 UJ	28 UJ	120 U	110 U
PAHs (µg/kg)(continued)										
Phenanthrene	NA	25 U	140 UJ	120 U	130 U	120 U	520 UJ	30 UJ	130 U	120 U
Pyrene	NA	23 U	120 UJ	110 U	120 U	110 U	480 UJ	28 UJ	120 U	110 U

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD76B	9SD19	9SD30	9SD44	9SD48	9SD49	9SD50	9SD52	9SDUVF-18	9SDUVF-20
Site ID	9SD76B									
Sample Date	1/22/2006	3/17/2007	3/17/2007	3/17/2007	3/17/2007	3/17/2007	3/17/2007	3/17/2007	3/17/2007	3/17/2007
Sample Depth (ft bgs)										
Organophosphorous Pesticide (µg/kg)										
Dimethoate	NA	87 U	93 UJ	80 U	87 U	85 U	91 UJ	100 UJ	88 U	80 U
Disulfoton	NA	110 U	110 UJ	98 U	110 U	100 U	110 UJ	130 UJ	110 U	98 U
Famphur	NA	190 U	200 UJ	170 U	190 U	190 U	200 UJ	230 UJ	190 U	170 U
Methyl Parathion	NA	91 U	97 UJ	84 U	91 U	89 U	95 UJ	110 UJ	92 U	84 U
o,o,o-Triethyl Phosphorothioate	NA	140 U	150 UJ	130 U	140 U	140 U	140 UJ	170 UJ	140 U	130 U
Parathion	NA	110 U	110 UJ	98 U	110 U	100 U	110 UJ	130 UJ	110 U	98 U
Phorate	NA	130 U	140 UJ	120 U	130 U	130 U	140 UJ	160 UJ	140 U	120 U
Sulfotepp	NA	110 U	110 UJ	98 U	110 U	100 U	110 UJ	130 UJ	110 U	98 U
Thionazin	NA	82 U	87 UJ	75 U	82 U	79 U	85 UJ	97 UJ	82 U	75 U
Metals (mg/kg)										
Antimony	NA	0.8 UJ	0.84 UJ	0.73 UJ	0.82 UJ	0.82 UJ	0.82 UJ	0.99 UJ	0.8 UJ	0.72 UJ
Arsenic	NA	1.5 J	1.6 J	1.1 U	1.2 U	1.2 U	1.7 J	1.5 UJ	2 J	2.2 J
Barium	NA	14	16 J	54	46	42	21	15 J	44	51
Beryllium	NA	0.22 J	0.2 J	0.31 J	0.27 J	0.3 J	0.25 J	0.2 J	0.36 J	0.31 J
Cadmium	NA	0.39 U	0.41 UJ	0.36 U	0.4 U	0.4 U	0.4 UJ	0.48 UJ	0.39 U	0.95 J
Chromium	NA	25	19 J	27	25	25	28 J	14 J	25	23
Cobalt	NA	6.9 J	6.8 J	6 J	6.1 J	5.9 J	9.8 J	5.8 J	6.7 J	8.6 J
Copper	NA	82 J	73 J	72 J	79 J	67 J	120 J	70 J	83 J	87 J
Lead	14 J	41	29 J	110	150	180	320 J	26 J	18	13
Mercury	NA	0.067 J	0.087 J	0.072 J	0.049 J	0.048 J	0.059 J	0.066 J	0.07 J	0.056 J
Nickel	NA	7.8	7.3 J	7.8	7.9	8.4	9.9 J	6.3 J	8.9	8.4
Selenium	NA	1.6 U	1.7 UJ	1.5 U	1.6 U	1.6 U	1.6 UJ	2 UJ	1.6 U	1.4 U
Silver	NA	0.18 U	0.19 UJ	0.16 U	0.18 U	0.18 U	0.18 UJ	0.22 UJ	0.18 U	0.16 U
Thallium	NA	2.3 UJ	2.4 UJ	2.1 UJ	2.4 UJ	2.4 UJ	2.4 UJ	2.9 UJ	2.3 UJ	6.3 J
Tin	NA	7.1 U	7.5 UJ	6.5 U	7.3 U	7.3 U	7.3 UJ	8.8 UJ	7.1 U	6.4 U
Vanadium	NA	120 J	110 J	170 J	170 J	170 J	220 J	130 J	180 J	230 J
Zinc	NA	47 J	44 J	58 J	58 J	60 J	65 J	42 J	60 J	66 J
AVS / SEM (µmol/g)										
Cadmium	0.0023129 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	0.0361943 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	0.0294402 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	0.0095411 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	0.0049134 R	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	0.139165 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total SEM hg	0.22	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acid Volatile Sulfide	34.310667 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Conventionals										
pH (SU)	8.13	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia (mg/kg)	28	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide (mg/kg)	1600 B	NA	NA	NA	NA	NA	NA	NA	NA	NA
Percent Moisture (%)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Percent Solids (%)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon (mg/kg)	60000	NA	NA	NA	NA	NA	NA	NA	NA	NA

APPENDIX A

SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD53	9SDBKG01	9SD39	9SD41	9SD45	9SD47	9SD54	9SD59	9SD70	9SD71	9SD72	9SD75	9SD77	9SD78
Site ID			9SD39	9SD41	9SD45	9SD47	9SD54	9SD59	9SD70	9SD71	9SD72	9SD75	9SD77	9SD78
Sample Date	3/17/2007	3/19/2007	1/17/2009	1/17/2009	1/17/2009	1/17/2009	1/18/2009	1/20/2009	1/21/2009	1/21/2009	1/21/2009	1/21/2009	1/21/2009	1/21/2009
Sample Depth (ft bgs)			0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
Volatile Organics (µg/kg)														
1,1,1,2-Tetrachloroethane	3.6 UJ	3.2 UJ	1.3 UJ	1.3 UJ	0.8 UJ	0.86 UJ	0.79 UJ	160 UJ	1.4 UJ	1.7 UJ	1.4 UJ	1.8 UJ	1.6 UJ	1.8 UJ
1,1,1-Trichloroethane	2.2 UJ	2 UJ	1.2 UJ	1.2 UJ	0.72 UJ	0.78 UJ	0.72 UJ	140 UJ	1.3 UJ	1.5 UJ	1.3 UJ	1.7 UJ	1.5 UJ	1.6 UJ
1,1,2,2-Tetrachloroethane	2.6 UJ	2.3 UJ	2.9 UJ	2.9 UJ	1.7 UJ	1.9 UJ	1.7 UJ	350 UJ	3.2 UJ	3.7 UJ	3.2 UJ	4 UJ	3.5 UJ	3.9 UJ
1,1,2-Trichloroethane	3.1 UJ	2.8 UJ	2.5 UJ	2.5 UJ	1.5 UJ	1.6 UJ	1.5 UJ	300 UJ	2.7 UJ	3.2 UJ	2.7 UJ	3.5 UJ	3 UJ	3.3 UJ
1,1-Dichloroethane	2.6 UJ	2.3 UJ	1.1 UJ	1 UJ	0.62 UJ	0.67 UJ	0.62 UJ	120 UJ	1.1 UJ	1.3 UJ	1.1 UJ	1.4 UJ	1.3 UJ	1.4 UJ
1,1-Dichloroethene	2.8 UJ	2.5 UJ	1.1 UJ	1.1 UJ	0.67 UJ	0.72 UJ	0.67 UJ	130 UJ	1.2 UJ	1.4 UJ	1.2 UJ	1.6 UJ	1.4 UJ	1.5 UJ
1,2,3-Trichloropropane	6.9 UJ	6.2 UJ	2.9 UJ	2.9 UJ	1.7 UJ	1.9 UJ	1.7 UJ	350 UJ	3.2 UJ	3.7 UJ	3.2 UJ	4 UJ	3.5 UJ	3.9 UJ
1,2-Dibromo-3-chloropropane (DBCP)	12 UJ	11 UJ	5.9 UJ	5.7 UJ	3.5 UJ	3.8 UJ	3.5 UJ	690 UJ	6.3 UJ	7.4 UJ	6.3 UJ	8.1 UJ	7 UJ	7.7 UJ
1,2-Dibromoethane (EDB)	3.6 UJ	3.2 UJ	3.2 UJ	3.1 UJ	1.9 UJ	2 UJ	1.8 UJ	370 UJ	3.4 UJ	3.9 UJ	3.4 UJ	4.3 UJ	3.8 UJ	4.1 UJ
1,2-Dichloroethane	3.1 UJ	2.8 UJ	2.1 UJ	2 UJ	1.2 UJ	1.3 UJ	1.2 UJ	250 UJ	2.3 UJ	2.6 UJ	2.3 UJ	2.9 UJ	2.5 UJ	2.8 UJ
1,2-Dichloroethene (cis)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (trans)	2.8 UJ	2.5 UJ	2 UJ	2 UJ	1.2 UJ	1.3 UJ	1.2 UJ	240 UJ	2.2 UJ	2.5 UJ	2.2 UJ	2.8 UJ	2.4 UJ	2.7 UJ
1,2-Dichloropropane	3.3 UJ	3 UJ	2.3 UJ	2.3 UJ	1.4 UJ	1.5 UJ	1.4 UJ	270 UJ	2.5 UJ	2.9 UJ	2.5 UJ	3.2 UJ	2.8 UJ	3 UJ
1,3-Dichloropropene (cis)	2.3 UJ	2.1 UJ	1.8 UJ	1.8 UJ	1.1 UJ	1.2 UJ	1.1 UJ	210 UJ	2 UJ	2.3 UJ	2 UJ	2.5 UJ	2.2 UJ	2.4 UJ
1,3-Dichloropropene (trans)	2.8 UJ	2.5 UJ	1.8 UJ	1.8 UJ	1.1 UJ	1.2 UJ	1.1 UJ	210 UJ	2 UJ	2.3 UJ	2 UJ	2.5 UJ	2.2 UJ	2.4 UJ
1,4-Dichloro-2-butene (trans)	10 UJ	9.2 UJ	6.5 UJ	6.3 UJ	3.9 UJ	4.2 UJ	3.8 UJ	760 UJ	7 UJ	8.1 UJ	7 UJ	8.9 UJ	7.8 UJ	8.6 UJ
2-Butanone (MEK)	23 J	9.2 UJ	110 J	76 UJ	25 UJ	24 UJ	17 UJ	670 UJ	16 UJ	42 UJ	6.1 UJ	7.8 UJ	29 UJ	1200 J
2-Chloro-1,3-butadiene (Chloroprene)	2.1 UJ	1.9 UJ	1.2 UJ	1.2 UJ	0.71 UJ	0.76 UJ	0.7 UJ	140 UJ	1.3 UJ	1.5 UJ	1.3 UJ	1.6 UJ	1.4 UJ	1.6 UJ
2-Hexanone (MBK)	14 UJ	12 UJ	4.4 UJ	4.3 UJ	2.6 UJ	2.8 UJ	2.6 UJ	520 UJ	4.7 UJ	5.5 UJ	4.7 UJ	6.1 UJ	5.3 UJ	5.8 UJ
3-Chloropropene (Allyl Chloride)	3.1 UJ	2.8 UJ	3.2 UJ	3.1 UJ	1.9 UJ	2 UJ	1.8 UJ	370 UJ	3.4 UJ	3.9 UJ	3.4 UJ	4.3 UJ	3.8 UJ	4.1 UJ
4-Methyl-2-pentanone (MIBK)	15 UJ	13 UJ	6.1 UJ	5.9 UJ	3.6 UJ	3.9 UJ	3.6 UJ	720 UJ	6.5 UJ	7.6 UJ	6.6 UJ	8.4 UJ	7.3 UJ	8 UJ
Acetone	160 UJ	10 J	1300 J	88 J	55 J	58 J	47 J	2100 R	59 J	110 J	39 J	46 J	160 J	5100 R
Acetonitrile	72 UJ	64 UJ	95 UJ	92 UJ	56 UJ	60 UJ	55 UJ	11000 UJ	100 UJ	120 UJ	100 UJ	130 UJ	110 UJ	120 UJ
Acrolein	28 UJ	25 UJ	40 UJ	39 UJ	24 UJ	25 UJ	23 UJ	4700 UJ	43 UJ	50 UJ	43 UJ	55 UJ	48 UJ	53 UJ
Acrylonitrile	40 UJ	36 UJ	48 UJ	47 UJ	29 UJ	31 UJ	28 UJ	5700 UJ	52 UJ	60 UJ	52 UJ	66 UJ	58 UJ	64 UJ
Benzene	2.2 UJ	2 UJ	1.7 UJ	1.6 UJ	0.98 UJ	1.1 UJ	0.97 UJ	190 UJ	1.8 UJ	2.1 UJ	1.8 UJ	2.3 UJ	2 UJ	2.2 UJ
Bromodichloromethane	2.6 UJ	2.3 UJ	1.7 UJ	1.7 UJ	1 UJ	1.1 UJ	1 UJ	200 UJ	1.9 UJ	2.2 UJ	1.9 UJ	2.4 UJ	2.1 UJ	2.3 UJ
Bromoform	5.6 UJ	5 UJ	2.3 UJ	2.3 UJ	1.4 UJ	1.5 UJ	1.4 UJ	270 UJ	2.5 UJ	2.9 UJ	2.5 UJ	3.2 UJ	2.8 UJ	3 UJ
Bromomethane	3.3 UJ	3 UJ	3.4 UJ	3.3 UJ	2 UJ	2.1 UJ	2 UJ	390 UJ	3.6 UJ	4.2 UJ	3.6 UJ	4.6 UJ	4 UJ	4.4 UJ
Carbon Disulfide	24 J	2.3 UJ	4.3 J	2.5 UJ	3.3 J	1.6 UJ	1.5 UJ	480 J	2.7 UJ	3.2 UJ	2.7 UJ	3.5 UJ	3 UJ	3.3 UJ
Carbon Tetrachloride	2.3 UJ	2 UJ	2.1 UJ	2 UJ	1.2 UJ	1.3 UJ	1.2 UJ	250 UJ	2.3 UJ	2.6 UJ	2.3 UJ	2.9 UJ	2.5 UJ	2.8 UJ
Chlorobenzene	1.8 UJ	1.6 UJ	1.5 UJ	1.5 UJ	0.91 UJ	0.98 UJ	0.9 UJ	180 UJ	1.6 UJ	1.9 UJ	1.7 UJ	2.1 UJ	1.8 UJ	2 UJ
Chloroethane	3.8 UJ	3.4 UJ	2.5 UJ	2.5 UJ	1.5 UJ	1.6 UJ	1.5 UJ	300 UJ	2.7 UJ	3.2 UJ	2.7 UJ	3.5 UJ	3 UJ	3.3 UJ
Chloroform	2.3 UJ	2 UJ	1.1 UJ	1 UJ	0.62 UJ	0.67 UJ	0.62 UJ	120 UJ	1.1 UJ	1.3 UJ	1.1 UJ	1.4 UJ	1.3 UJ	1.4 UJ
Chloromethane	1.8 UJ	1.6 UJ	1.5 UJ	1.5 UJ	0.88 UJ	0.95 UJ	0.88 UJ	180 UJ	1.6 UJ	1.9 UJ	1.6 UJ	2 UJ	1.8 UJ	2 UJ
Dibromochloromethane	2.8 UJ	2.5 UJ	1.1 UJ	1 UJ	0.62 UJ	0.67 UJ	0.62 UJ	120 UJ	1.1 UJ	1.3 UJ	1.1 UJ	1.4 UJ	1.3 UJ	1.4 UJ
Dibromomethane	3.3 UJ	3 UJ	2.5 UJ	2.5 UJ	1.5 UJ	1.6 UJ	1.5 UJ	300 UJ	2.7 UJ	3.2 UJ	2.7 UJ	3.5 UJ	3 UJ	3.3 UJ
Ethyl Methacrylate	2 UJ	1.8 UJ	4.6 UJ	4.5 UJ	2.7 UJ	3 UJ	2.7 UJ	540 UJ	5 UJ	5.8 UJ	5 UJ	6.3 UJ	5.5 UJ	6.1 UJ
Ethylbenzene	2.2 UJ	2 UJ	1.6 UJ	1.5 UJ	0.93 UJ	1 UJ	0.92 UJ	180 UJ	1.7 UJ	2 UJ	1.7 UJ	2.2 UJ	1.9 UJ	3.6 J
Freon 11 (Trichlorofluoromethane)	3.6 UJ	3.2 UJ	3.2 UJ	3.1 UJ	1.9 UJ	2 UJ	1.8 UJ	370 UJ	3.4 UJ	3.9 UJ	3.4 UJ	4.3 UJ	3.8 UJ	4.1 UJ
Freon-12 (Dichlorodifluoromethane)	6.4 UJ	5.7 UJ	1.9 UJ	1.8 UJ	1.1 UJ	1.2 UJ	1.1 UJ	220 UJ	2 UJ	2.3 UJ	2 UJ	2.6 UJ	2.2 UJ	2.5 UJ
Isobutyl Alcohol	330 UJ	300 UJ	150 UJ	140 UJ	86 UJ	93 UJ	85 UJ	17000 R	160 UJ	180 UJ	160 UJ	200 UJ	170 UJ	190 UJ
Methyl Acrylonitrile	41 UJ	37 UJ	50 UJ	49 UJ	30 UJ	32 UJ	30 UJ	5900 UJ	54 UJ	63 UJ	54 UJ	69 UJ	60 UJ	66 UJ

APPENDIX A

SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD53	9SDBKG01	9SD39	9SD41	9SD45	9SD47	9SD54	9SD59	9SD70	9SD71	9SD72	9SD75	9SD77	9SD78
Site ID			9SD39	9SD41	9SD45	9SD47	9SD54	9SD59	9SD70	9SD71	9SD72	9SD75	9SD77	9SD78
Sample Date	3/17/2007	3/19/2007	1/17/2009	1/17/2009	1/17/2009	1/17/2009	1/18/2009	1/20/2009	1/21/2009	1/21/2009	1/21/2009	1/21/2009	1/21/2009	1/21/2009
Sample Depth (ft bgs)			0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
Volatile Organics (µg/kg)(continued)														
Methyl Iodide	2.6 UJ	2.3 UJ	2.1 UJ	2 UJ	1.2 UJ	1.3 UJ	1.2 UJ	250 UJ	2.3 UJ	2.6 UJ	2.3 UJ	2.9 UJ	2.5 UJ	2.8 UJ
Methyl Methacrylate	4.3 UJ	3.8 UJ	7.8 UJ	7.6 UJ	4.6 UJ	5 UJ	4.6 UJ	910 UJ	8.4 UJ	9.7 UJ	8.4 UJ	11 UJ	9.3 UJ	10 UJ
Methylene Chloride	4.1 UJ	3.7 UJ	2.1 J	2 UJ	1.2 UJ	1.3 UJ	1.2 UJ	250 UJ	2.3 UJ	2.6 UJ	2.3 UJ	2.9 UJ	2.5 UJ	2.8 UJ
Pentachloroethane	12 UJ	11 UJ	4.6 UJ	4.5 UJ	2.7 UJ	3 UJ	2.7 UJ	540 UJ	5 UJ	5.8 UJ	5 UJ	6.3 UJ	5.5 UJ	6.1 UJ
Propionitrile (Ethyl Cyanide)	59 UJ	53 UJ	44 UJ	43 UJ	26 UJ	28 UJ	26 UJ	5200 UJ	47 UJ	55 UJ	47 UJ	61 UJ	53 UJ	58 UJ
Styrene (Ethenylbenzene)	2.2 UJ	2 UJ	1.4 UJ	1.4 UJ	0.82 UJ	0.89 UJ	0.81 UJ	160 UJ	1.5 UJ	1.7 UJ	1.5 UJ	1.9 UJ	1.7 UJ	1.8 UJ
Tetrachloroethene (PCE)	2.6 UJ	2.3 UJ	1.5 UJ	1.5 UJ	0.91 UJ	0.98 UJ	0.9 UJ	180 UJ	1.6 UJ	1.9 UJ	1.7 UJ	2.1 UJ	1.8 UJ	2 UJ
Toluene	2.6 UJ	2.3 UJ	1.7 UJ	1.6 UJ	0.98 UJ	1.1 UJ	0.97 UJ	190 UJ	1.8 UJ	2.1 UJ	1.8 UJ	2.3 UJ	2 UJ	2.2 UJ
Trichloroethene (TCE)	3.1 UJ	2.8 UJ	2.1 UJ	2 UJ	1.2 UJ	1.3 UJ	1.2 UJ	250 UJ	2.3 UJ	2.6 UJ	2.3 UJ	2.9 UJ	2.5 UJ	2.8 UJ
Vinyl Acetate	4.9 UJ	4.4 UJ	3.2 UJ	3.1 UJ	1.9 UJ	2 UJ	1.8 UJ	370 UJ	3.4 UJ	3.9 UJ	3.4 UJ	4.3 UJ	3.8 UJ	4.1 UJ
Vinyl Chloride	2.4 UJ	2.1 UJ	1.2 UJ	1.2 UJ	0.72 UJ	0.78 UJ	0.72 UJ	140 UJ	1.3 UJ	1.5 UJ	1.3 UJ	1.7 UJ	1.5 UJ	1.6 UJ
Xylenes, total	5.1 UJ	4.6 UJ	4.8 UJ	4.7 UJ	2.9 UJ	3.1 UJ	2.8 UJ	570 UJ	5.2 UJ	6 UJ	5.2 UJ	6.6 UJ	5.8 UJ	6.4 UJ
Semivolatile Organics (µg/kg)														
1,1'-Biphenyl	640 UJ	72 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	680 UJ	77 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	460 UJ	52 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	510 UJ	57 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trinitrobenzene (TNB)	1800 UJ	200 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene (m-)	570 UJ	64 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene (m-)	1100 UJ	120 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene (p-)	480 UJ	54 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane (p-)	1500 UJ	160 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Naphthoquinone	860 UJ	97 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Phenylenediamine	37000 UJ	4200 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Naphthylamine	1800 UJ	200 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis[1-chloropropane]	770 UJ	87 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	990 UJ	110 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	700 UJ	79 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	440 UJ	50 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	510 UJ	57 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	770 UJ	87 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	3700 UJ	420 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene (DNT)	420 UJ	47 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dichlorophenol	1200 UJ	130 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene (DNT)	730 UJ	82 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Acetylaminofluorene	840 UJ	94 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	530 UJ	59 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	590 UJ	67 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methyl-5-nitroaniline	700 UJ	79 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol (o-Cresol)	660 UJ	74 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Naphthylamine	1800 UJ	200 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	510 UJ	57 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

APPENDIX A

SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD53	9SDBKG01	9SD39	9SD41	9SD45	9SD47	9SD54	9SD59	9SD70	9SD71	9SD72	9SD75	9SD77	9SD78
Site ID			9SD39	9SD41	9SD45	9SD47	9SD54	9SD59	9SD70	9SD71	9SD72	9SD75	9SD77	9SD78
Sample Date	3/17/2007	3/19/2007	1/17/2009	1/17/2009	1/17/2009	1/17/2009	1/18/2009	1/20/2009	1/21/2009	1/21/2009	1/21/2009	1/21/2009	1/21/2009	1/21/2009
Sample Depth (ft bgs)			0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
Semivolatile Organis (µg/kg)(continued)														
2-Nitrophenol	440 UJ	50 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Picoline	1800 UJ	200 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3 & 4 Methylphenol			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	660 UJ	74 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dimethylbenzidine	9300 UJ	1000 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylcholanthrene	570 UJ	64 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	730 UJ	82 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	4400 UJ	500 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Aminobiphenyl	1200 UJ	130 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	680 UJ	77 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	750 UJ	84 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	570 UJ	64 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	420 UJ	47 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Dimethylaminoazobenzene (p-)	840 UJ	94 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	370 UJ	42 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	4600 UJ	520 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroquinoline-1-oxide	3700 R	410 R	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7,12-Dimethylbenz(a)anthracene	680 UJ	77 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
a,a-Dimethylphenethylamine	11000 UJ	1200 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	480 UJ	54 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aniline	460 UJ	52 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aramite	1300 UJ	150 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzidine			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzoic Acid			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	840 UJ	94 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	530 UJ	59 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethyl)ether	620 UJ	69 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) Phthalate (BEHP)	840 UJ	94 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl Benzyl Phthalate	590 UJ	67 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cresol (Mixed Isomers)	640 UJ	72 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diallate (total)	1200 UJ	140 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	420 UJ	47 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl Phthalate (DEP)	480 UJ	54 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl Phthalate	420 UJ	47 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl Phthalate (DBP)	620 UJ	69 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octyl Phthalate	680 UJ	77 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dinoseb	1800 UJ	210 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diphenylamine			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methane Sulfonate (EMS)	1500 UJ	160 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloro-1,3-butadiene	440 UJ	50 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	570 UJ	64 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	1800 UJ	210 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	440 UJ	50 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

APPENDIX A

SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD53	9SDBKG01	9SD39	9SD41	9SD45	9SD47	9SD54	9SD59	9SD70	9SD71	9SD72	9SD75	9SD77	9SD78
Site ID			9SD39	9SD41	9SD45	9SD47	9SD54	9SD59	9SD70	9SD71	9SD72	9SD75	9SD77	9SD78
Sample Date	3/17/2007	3/19/2007	1/17/2009	1/17/2009	1/17/2009	1/17/2009	1/18/2009	1/20/2009	1/21/2009	1/21/2009	1/21/2009	1/21/2009	1/21/2009	1/21/2009
Sample Depth (ft bgs)			0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
Semivolatile Organis (µg/kg)(continued)														
Hexachlorophene	280000 R	31000 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloropropene	990 UJ	110 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	480 UJ	54 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isosafrole	1400 UJ	160 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methapyrilene	930 UJ	100 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Methane Sulfonate	1200 UJ	140 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	770 UJ	87 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiethylamine	970 UJ	110 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodimethylamine (NDMA)	1300 UJ	150 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-butylamine	1100 UJ	130 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodi-n-propylamine	620 UJ	69 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	510 UJ	57 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosomethylethylamine	1100 UJ	130 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosomorpholine	1500 UJ	160 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopiperidine	1600 UJ	180 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopyrrolidine	990 UJ	110 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Toluidine	1200 UJ	140 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorobenzene	1400 UJ	160 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloronitrobenzene	1200 UJ	140 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	1800 UJ	210 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenacetin	1100 UJ	130 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	660 UJ	74 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pronamide	1400 UJ	160 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyridine	660 UJ	74 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Safrole	1200 UJ	130 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (µg/kg)														
1-Methylnaphthalene	120 UJ	2.7 UJ	71 UJ	56 UJ	38 UJ	43 UJ	41 UJ	46 UJ	4 U	4 U	36 U	4.9 U	4.1 U	4.4 U
2-Methylnaphthalene	110 UJ	2.4 UJ	71 UJ	56 UJ	38 UJ	43 UJ	41 UJ	46 UJ	4 U	4 U	36 U	4.9 U	4.1 U	4.4 U
Acenaphthene	110 U	2.5 UJ	71 UJ	56 UJ	38 UJ	43 UJ	41 UJ	46 UJ	4 U	4 U	36 U	4.9 U	4.1 U	4.4 U
Acenaphthylene	110 UJ	2.4 UJ	71 UJ	56 UJ	38 UJ	43 UJ	41 UJ	46 UJ	4 U	4 U	36 U	4.9 U	4.1 U	4.4 U
Anthracene	110 UJ	2.5 UJ	71 UJ	56 UJ	38 UJ	43 UJ	41 UJ	46 UJ	4 U	4 U	36 U	4.9 U	4.1 U	4.4 U
Benzo(a)anthracene	110 UJ	2.5 UJ	71 UJ	56 UJ	38 UJ	43 UJ	41 UJ	46 UJ	4 U	4 U	36 U	9.4 J	29	4.4 U
Benzo(a)pyrene (BaP)	92 UJ	2.1 UJ	71 UJ	56 UJ	38 UJ	43 UJ	41 UJ	46 UJ	4 U	4 U	330	11 J	30	4.4 U
Benzo(b)fluoranthene	120 UJ	2.7 UJ	71 UJ	56 UJ	38 UJ	43 UJ	41 UJ	46 UJ	4 U	4 U	140	16 J	51 J	4.4 U
Benzo(g,h,i)perylene	170 J	2.5 UJ	71 UJ	56 UJ	38 UJ	43 UJ	41 UJ	86 J	4 U	4 U	36 U	4.9 U	21	4.4 U
Benzo(k)fluoranthene	94 UJ	2.1 UJ	71 UJ	56 UJ	38 UJ	43 UJ	41 UJ	46 UJ	4 U	4 U	36 U	6.3 J	22	4.4 U
Chrysene	1100 J	2.3 UJ	300 J	110 J	120 J	110 J	71 J	430 J	4 U	4 U	650	14 J	51	4.4 U
Dibenz(a,h)anthracene	150 UJ	3.5 UJ	24 UJ	19 UJ	13 UJ	14 UJ	14 UJ	15 UJ	1.3 U	1.3 U	12 U	1.6 U	1.4 U	1.5 U
Fluoranthene	120 UJ	2.7 UJ	16 UJ	12 UJ	8.4 UJ	9.5 UJ	9.3 UJ	10 UJ	2.4 J	0.89 U	8.1 U	6.2 J	6.9 J	0.98 U
Fluorene	130 UJ	3 UJ	71 UJ	56 UJ	38 UJ	43 UJ	41 UJ	46 UJ	4 U	4 U	36 U	4.9 U	4.1 U	4.4 U
Indeno(1,2,3-cd)pyrene	180 UJ	4 UJ	140 UJ	110 UJ	73 UJ	83 UJ	80 UJ	89 UJ	7.7 U	7.7 U	71 U	9.5 U	26	8.6 U
Naphthalene	130 UJ	3 UJ	71 UJ	56 UJ	38 UJ	43 UJ	41 UJ	46 UJ	4 U	4 U	36 U	4.9 U	4.1 U	4.4 U
PAHs (µg/kg)(continued)														
Phenanthrene	140 UJ	3.2 UJ	71 UJ	56 UJ	38 UJ	43 UJ	41 UJ	46 UJ	4 U	4 U	36 U	4.9 U	4.1 U	4.4 U
Pyrene	1400 J	3 UJ	270	78 J	120 J	68 J	57 J	740 J	4 U	8.8 J	380	8.2 J	17	4.4 U

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SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD53	9SDBKG01	9SD39	9SD41	9SD45	9SD47	9SD54	9SD59	9SD70	9SD71	9SD72	9SD75	9SD77	9SD78
Site ID			9SD39	9SD41	9SD45	9SD47	9SD54	9SD59	9SD70	9SD71	9SD72	9SD75	9SD77	9SD78
Sample Date	3/17/2007	3/19/2007	1/17/2009	1/17/2009	1/17/2009	1/17/2009	1/18/2009	1/20/2009	1/21/2009	1/21/2009	1/21/2009	1/21/2009	1/21/2009	1/21/2009
Sample Depth (ft bgs)			0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
Organophosphorous Pesticide (µg/kg)														
Dimethoate	990 UJ	110 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Disulfoton	1200 UJ	140 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Famphur	2200 UJ	240 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Parathion	1000 UJ	120 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o,o,o-Triethyl Phosphorothioate	1600 UJ	180 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Parathion	1200 UJ	140 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phorate	1500 UJ	170 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfotepp	1200 UJ	140 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thionazin	930 UJ	100 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals (mg/kg)														
Antimony	0.95 UJ	1 UJ	0.68 UJ	0.38 UJ	0.38 UJ	0.59 UJ	0.41 UJ	0.32 UJ	0.19 UJ	0.19 UJ	0.15 UJ	0.24 UJ	0.17 UJ	0.18 UJ
Arsenic	1.4 UJ	1.6 J	4 J	2.5 J	3.8 J	4.2 J	1.9 J	4.1 J	1.4 J	1.6 J	1 J	2.7 J	3.2 J	3 J
Barium	14 J	41 J	23 J	15 J	18 J	16 J	26 J	19 J	22 J	19 J	17 J	14 J	25 J	18 J
Beryllium	0.22 J	0.37 J	0.25 J	0.2 UJ	0.2 UJ	0.25 J	0.27 J	0.23 J	0.27 J	0.24 J	0.27 J	0.25 UJ	0.18 UJ	0.24 UJ
Cadmium	0.46 UJ	0.5 UJ	0.15 J	0.29 J	0.068 UJ	0.072 J	0.076 UJ	0.09 UJ	0.073 UJ	0.071 UJ	0.062 UJ	0.085 UJ	0.072 UJ	0.081 UJ
Chromium	20 J	28 J	37 J	19 J	31 J	24 J	38 J	30 J	28 J	27 J	19 J	21 J	12 J	22 J
Cobalt	6.5 J	8.7 J	15 J	12 J	13 J	16 J	9.5 J	9.7 J	6.7 J	7 J	6 J	7.6 J	5.3 J	8 J
Copper	77 J	140 J	140 J	100 J	120 J	94 J	100 J	120 J	78 J	84 J	78 J	77 J	52 J	76 J
Lead	19 J	10 J	76 J	110 J	76 J	170 J	46 J	27 J	18 J	18 J	14 J	12 J	6.9 J	9.6 J
Mercury	0.072 J	0.06 J	0.33 R	0.074 J	0.039 J	0.074 J	0.053 J	0.06 J	0.055 J	0.077 J	0.058 J	0.066 J	0.064 J	0.053 J
Nickel	8 J	10 J	13 J	8.2 J	11 J	11 J	13 J	11 J	9.3 J	8.8 J	7.3 J	7.8 J	5.2 J	8.6 J
Selenium	1.9 UJ	2 UJ	1.2 J	0.83 J	0.88 J	0.54 J	0.64 J	1.1 UJ	0.82 UJ	0.93 UJ	0.67 UJ	0.87 UJ	0.71 UJ	0.9 UJ
Silver	0.21 UJ	0.23 UJ	0.26 UJ	0.15 UJ	0.095 UJ	0.11 UJ	0.048 UJ	0.076 UJ	0.039 UJ	0.055 UJ	0.05 UJ	0.063 UJ	0.055 UJ	0.091 UJ
Thallium	2.7 UJ	3 UJ	0.46 UJ	0.35 UJ	0.26 UJ	0.28 UJ	0.3 UJ	0.27 UJ	0.28 UJ	0.24 UJ	0.24 UJ	0.31 UJ	0.28 UJ	0.29 UJ
Tin	8.4 UJ	9.1 UJ	15 UJ	12 UJ	8.8 UJ	9.3 UJ	9.9 UJ	9.1 UJ	9.4 UJ	8.1 UJ	8 UJ	10 UJ	9.3 UJ	9.7 UJ
Vanadium	150 J	270 J	240 J	130 J	200 J	180 J	240 J	150 J	170 J	150 J	150 J	130 J	100 J	110 J
Zinc	49 J	74 J	76 J	63 J	56 J	54 J	69 J	58 J	58 J	53 J	52 J	49 J	38 J	48 J
AVS / SEM (µmol/g)														
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total SEM hg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acid Volatile Sulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Conventionals														
pH (SU)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Percent Moisture (%)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Percent Solids (%)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD79	9SD80	9SD81	9SD82	9SD83	9SD84	9SD85	9SD86	9SD87	9SD88	9SD89	9SD90	9SD91	9SD92
Site ID	9SD79	9SD80	9SD81	9SD82	9SD83	9SD84	9SD85	9SD86	9SD87	9SD88	9SD89	9SD90	9SD91	9SD92
Sample Date	1/21/2009	1/16/2009	1/16/2009	1/16/2009	1/17/2009	1/16/2009	1/16/2009	1/16/2009	1/17/2009	1/17/2009	1/17/2009	1/17/2009	1/18/2009	1/17/2009
Sample Depth (ft bgs)	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
Volatile Organics (µg/kg)														
1,1,1,2-Tetrachloroethane	2.6 UJ	1.5 UJ	3 UJ	3.2 UJ	1.4 UJ	1.7 UJ	1.7 UJ	2.2 UJ	1.7 UJ	1.3 UJ	2.5 UJ	1.1 UJ	0.83 UJ	1.2 UJ
1,1,1-Trichloroethane	2.4 UJ	1.3 UJ	2.7 UJ	2.9 UJ	1.2 UJ	1.5 UJ	1.5 UJ	2 UJ	1.5 UJ	1.2 UJ	2.3 UJ	1 UJ	0.75 UJ	1.1 UJ
1,1,2,2-Tetrachloroethane	5.8 UJ	3.2 UJ	6.6 UJ	7 UJ	3 UJ	3.7 UJ	3.7 UJ	4.8 UJ	3.7 UJ	2.9 UJ	5.5 UJ	2.5 UJ	1.8 UJ	2.6 UJ
1,1,2-Trichloroethane	4.9 UJ	2.7 UJ	5.6 UJ	6 UJ	2.5 UJ	3.1 UJ	3.2 UJ	4.1 UJ	3.1 UJ	2.5 UJ	4.7 UJ	2.1 UJ	1.6 UJ	2.2 UJ
1,1-Dichloroethane	2.1 UJ	1.1 UJ	2.4 UJ	2.5 UJ	1.1 UJ	1.3 UJ	1.3 UJ	1.7 UJ	1.3 UJ	1 UJ	2 UJ	0.89 UJ	0.65 UJ	0.93 UJ
1,1-Dichloroethene	2.2 UJ	1.2 UJ	2.5 UJ	2.7 UJ	1.1 UJ	1.4 UJ	1.4 UJ	1.8 UJ	1.4 UJ	1.1 UJ	2.1 UJ	0.96 UJ	0.7 UJ	1 UJ
1,2,3-Trichloropropane	5.8 UJ	3.2 UJ	6.6 UJ	7 UJ	3 UJ	3.7 UJ	3.7 UJ	4.8 UJ	3.7 UJ	2.9 UJ	5.5 UJ	2.5 UJ	1.8 UJ	2.6 UJ
1,2-Dibromo-3-chloropropane (DBCP)	12 UJ	6.4 UJ	13 UJ	14 UJ	5.9 UJ	7.3 UJ	7.5 UJ	9.6 UJ	7.3 UJ	5.7 UJ	11 UJ	5 UJ	3.6 UJ	5.2 UJ
1,2-Dibromoethane (EDB)	6.2 UJ	3.4 UJ	7.1 UJ	7.6 UJ	3.2 UJ	3.9 UJ	4 UJ	5.1 UJ	3.9 UJ	3.1 UJ	5.9 UJ	2.7 UJ	1.9 UJ	2.8 UJ
1,2-Dichloroethane	4.1 UJ	2.3 UJ	4.7 UJ	5 UJ	2.1 UJ	2.6 UJ	2.7 UJ	3.4 UJ	2.6 UJ	2 UJ	3.9 UJ	1.8 UJ	1.3 UJ	1.9 UJ
1,2-Dichloroethene (cis)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (trans)	4 UJ	2.2 UJ	4.6 UJ	4.9 UJ	2.1 UJ	2.5 UJ	2.6 UJ	3.3 UJ	2.5 UJ	2 UJ	3.8 UJ	1.7 UJ	1.3 UJ	1.8 UJ
1,2-Dichloropropane	4.5 UJ	2.5 UJ	5.2 UJ	5.5 UJ	2.3 UJ	2.9 UJ	2.9 UJ	3.8 UJ	2.9 UJ	2.3 UJ	4.3 UJ	2 UJ	1.4 UJ	2 UJ
1,3-Dichloropropene (cis)	3.6 UJ	2 UJ	4.1 UJ	4.4 UJ	1.8 UJ	2.3 UJ	2.3 UJ	3 UJ	2.3 UJ	1.8 UJ	3.4 UJ	1.5 UJ	1.1 UJ	1.6 UJ
1,3-Dichloropropene (trans)	3.6 UJ	2 UJ	4.1 UJ	4.4 UJ	1.8 UJ	2.3 UJ	2.3 UJ	3 UJ	2.3 UJ	1.8 UJ	3.4 UJ	1.5 UJ	1.1 UJ	1.6 UJ
1,4-Dichloro-2-butene (trans)	13 UJ	7.1 UJ	15 UJ	16 UJ	6.6 UJ	8.1 UJ	8.3 UJ	11 UJ	8.1 UJ	6.4 UJ	12 UJ	5.5 UJ	4 UJ	5.8 UJ
2-Butanone (MEK)	1500 J	17 UJ	100 UJ	650 J	280 J	7.1 UJ	7.2 UJ	130 UJ	760 J	150 J	140 UJ	750 J	18 UJ	46 UJ
2-Chloro-1,3-butadiene (Chloroprene)	2.4 UJ	1.3 UJ	2.7 UJ	2.9 UJ	1.2 UJ	1.5 UJ	1.5 UJ	2 UJ	1.5 UJ	1.2 UJ	2.2 UJ	1 UJ	0.74 UJ	1.1 UJ
2-Hexanone (MBK)	8.7 UJ	4.8 UJ	9.9 UJ	11 UJ	4.5 UJ	5.5 UJ	5.6 UJ	7.2 UJ	5.5 UJ	4.3 UJ	8.2 UJ	3.7 UJ	2.7 UJ	3.9 UJ
3-Chloropropene (Allyl Chloride)	6.2 UJ	3.4 UJ	7.1 UJ	7.6 UJ	3.2 UJ	3.9 UJ	4 UJ	5.1 UJ	3.9 UJ	3.1 UJ	5.9 UJ	2.7 UJ	1.9 UJ	2.8 UJ
4-Methyl-2-pentanone (MIBK)	12 UJ	6.6 UJ	14 UJ	15 UJ	6.1 UJ	7.6 UJ	7.7 UJ	9.9 UJ	7.6 UJ	5.9 UJ	11 UJ	5.1 UJ	3.7 UJ	5.4 UJ
Acetone	4300 R	71 J	280 J	890 J	230 J	28 J	19 J	290 J	470 J	200 J	290 J	450 J	52 J	69 J
Acetonitrile	190 UJ	100 UJ	210 UJ	230 UJ	95 UJ	120 UJ	120 UJ	150 UJ	120 UJ	92 UJ	180 UJ	80 UJ	58 UJ	84 UJ
Acrolein	78 UJ	44 UJ	89 UJ	96 UJ	40 UJ	50 UJ	51 UJ	65 UJ	50 UJ	39 UJ	74 UJ	34 UJ	25 UJ	35 UJ
Acrylonitrile	95 UJ	53 UJ	110 UJ	120 UJ	49 UJ	60 UJ	61 UJ	79 UJ	60 UJ	47 UJ	90 UJ	41 UJ	30 UJ	43 UJ
Benzene	3.3 UJ	1.8 UJ	3.7 UJ	4 UJ	1.7 UJ	2.1 UJ	2.1 UJ	2.7 UJ	2.1 UJ	1.6 UJ	3.1 UJ	1.4 UJ	1 UJ	1.5 UJ
Bromodichloromethane	3.4 UJ	1.9 UJ	3.9 UJ	4.2 UJ	1.8 UJ	2.2 UJ	2.2 UJ	2.8 UJ	2.2 UJ	1.7 UJ	3.2 UJ	1.5 UJ	1.1 UJ	1.5 UJ
Bromoform	4.5 UJ	2.5 UJ	5.2 UJ	5.5 UJ	2.3 UJ	2.9 UJ	2.9 UJ	3.8 UJ	2.9 UJ	2.3 UJ	4.3 UJ	2 UJ	1.4 UJ	2 UJ
Bromomethane	6.6 UJ	3.7 UJ	7.5 UJ	8.1 UJ	3.4 UJ	4.2 UJ	4.3 UJ	5.5 UJ	4.2 UJ	3.3 UJ	6.2 UJ	2.8 UJ	2.1 UJ	3 UJ
Carbon Disulfide	4.9 UJ	2.7 UJ	5.6 UJ	6 UJ	5 J	3.1 UJ	3.2 UJ	7.8 J	5.8 J	3.6 J	15 J	2.1 UJ	2.4 J	4.2 J
Carbon Tetrachloride	4.1 UJ	2.3 UJ	4.7 UJ	5 UJ	2.1 UJ	2.6 UJ	2.7 UJ	3.4 UJ	2.6 UJ	2 UJ	3.9 UJ	1.8 UJ	1.3 UJ	1.9 UJ
Chlorobenzene	3 UJ	1.7 UJ	3.4 UJ	3.7 UJ	1.5 UJ	1.9 UJ	1.9 UJ	2.5 UJ	1.9 UJ	1.5 UJ	2.9 UJ	1.3 UJ	0.94 UJ	1.4 UJ
Chloroethane	4.9 UJ	2.7 UJ	5.6 UJ	6 UJ	2.5 UJ	3.1 UJ	3.2 UJ	4.1 UJ	3.1 UJ	2.5 UJ	4.7 UJ	2.1 UJ	1.6 UJ	2.2 UJ
Chloroform	2.1 UJ	1.1 UJ	2.4 UJ	2.5 UJ	1.1 UJ	1.3 UJ	1.3 UJ	1.7 UJ	1.3 UJ	1 UJ	2 UJ	0.89 UJ	0.65 UJ	0.93 UJ
Chloromethane	2.9 UJ	1.6 UJ	3.3 UJ	3.6 UJ	1.5 UJ	1.9 UJ	1.9 UJ	2.4 UJ	1.9 UJ	1.5 UJ	2.8 UJ	1.3 UJ	0.92 UJ	1.3 UJ
Dibromochloromethane	2.1 UJ	1.1 UJ	2.4 UJ	2.5 UJ	1.1 UJ	1.3 UJ	1.3 UJ	1.7 UJ	1.3 UJ	1 UJ	2 UJ	0.89 UJ	0.65 UJ	0.93 UJ
Dibromomethane	4.9 UJ	2.7 UJ	5.6 UJ	6 UJ	2.5 UJ	3.1 UJ	3.2 UJ	4.1 UJ	3.1 UJ	2.5 UJ	4.7 UJ	2.1 UJ	1.6 UJ	2.2 UJ
Ethyl Methacrylate	9.1 UJ	5 UJ	10 UJ	11 UJ	4.7 UJ	5.8 UJ	5.9 UJ	7.5 UJ	5.8 UJ	4.5 UJ	8.6 UJ	3.9 UJ	2.8 UJ	4.1 UJ
Ethylbenzene	3.1 UJ	1.7 UJ	3.5 UJ	3.8 UJ	1.6 UJ	2 UJ	2 UJ	2.6 UJ	2 UJ	1.5 UJ	2.9 UJ	1.3 UJ	0.97 UJ	1.4 UJ
Freon 11 (Trichlorofluoromethane)	6.2 UJ	3.4 UJ	7.1 UJ	7.6 UJ	3.2 UJ	3.9 UJ	4 UJ	5.1 UJ	3.9 UJ	3.1 UJ	5.9 UJ	2.7 UJ	1.9 UJ	2.8 UJ
Freon-12 (Dichlorodifluoromethane)	3.7 UJ	2 UJ	4.2 UJ	4.5 UJ	1.9 UJ	2.3 UJ	2.4 UJ	3 UJ	2.3 UJ	1.8 UJ	3.5 UJ	1.6 UJ	1.1 UJ	1.7 UJ
Isobutyl Alcohol	280 UJ	160 UJ	320 UJ	350 UJ	150 UJ	180 UJ	180 UJ	240 UJ	180 UJ	140 UJ	270 UJ	120 UJ	89 UJ	130 UJ
Methyl Acrylonitrile	99 UJ	55 UJ	110 UJ	120 UJ	51 UJ	63 UJ	64 UJ	82 UJ	63 UJ	49 UJ	94 UJ	43 UJ	31 UJ	45 UJ

APPENDIX A

SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD79	9SD80	9SD81	9SD82	9SD83	9SD84	9SD85	9SD86	9SD87	9SD88	9SD89	9SD90	9SD91	9SD92
Site ID	9SD79	9SD80	9SD81	9SD82	9SD83	9SD84	9SD85	9SD86	9SD87	9SD88	9SD89	9SD90	9SD91	9SD92
Sample Date	1/21/2009	1/16/2009	1/16/2009	1/16/2009	1/17/2009	1/16/2009	1/16/2009	1/16/2009	1/17/2009	1/17/2009	1/17/2009	1/17/2009	1/18/2009	1/17/2009
Sample Depth (ft bgs)	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
Volatile Organics (µg/kg)(continued)														
Methyl Iodide	4.1 UJ	2.3 UJ	4.7 UJ	5 UJ	2.1 UJ	2.6 UJ	2.7 UJ	3.4 UJ	2.6 UJ	2 UJ	3.9 UJ	1.8 UJ	1.3 UJ	1.9 UJ
Methyl Methacrylate	15 UJ	8.5 UJ	17 UJ	19 UJ	7.8 UJ	9.7 UJ	9.8 UJ	13 UJ	9.7 UJ	7.6 UJ	14 UJ	6.6 UJ	4.8 UJ	6.9 UJ
Methylene Chloride	4.1 UJ	2.3 UJ	7.9 J	7.5 J	2.1 UJ	2.6 UJ	2.7 UJ	6 J	2.6 UJ	2 UJ	3.9 UJ	1.8 UJ	1.3 UJ	1.9 UJ
Pentachloroethane	9.1 UJ	5 UJ	10 UJ	11 UJ	4.7 UJ	5.8 UJ	5.9 UJ	7.5 UJ	5.8 UJ	4.5 UJ	8.6 UJ	3.9 UJ	2.8 UJ	4.1 UJ
Propionitrile (Ethyl Cyanide)	87 UJ	48 UJ	99 UJ	110 UJ	45 UJ	55 UJ	56 UJ	72 UJ	55 UJ	43 UJ	82 UJ	37 UJ	27 UJ	39 UJ
Styrene (Ethenylbenzene)	2.7 UJ	1.5 UJ	3.1 UJ	3.3 UJ	1.4 UJ	1.7 UJ	1.8 UJ	2.3 UJ	1.7 UJ	1.4 UJ	2.6 UJ	1.2 UJ	0.85 UJ	1.2 UJ
Tetrachloroethene (PCE)	3 UJ	1.7 UJ	3.4 UJ	3.7 UJ	1.5 UJ	1.9 UJ	1.9 UJ	2.5 UJ	1.9 UJ	1.5 UJ	2.9 UJ	1.3 UJ	0.94 UJ	1.4 UJ
Toluene	3.3 UJ	1.8 UJ	3.7 UJ	4 UJ	1.7 UJ	2.1 UJ	2.1 UJ	2.7 UJ	2.1 UJ	1.6 UJ	3.1 UJ	1.4 UJ	1 UJ	1.5 UJ
Trichloroethene (TCE)	4.1 UJ	2.3 UJ	4.7 UJ	5 UJ	2.1 UJ	2.6 UJ	2.7 UJ	3.4 UJ	2.6 UJ	2 UJ	3.9 UJ	1.8 UJ	1.3 UJ	1.9 UJ
Vinyl Acetate	6.2 UJ	3.4 UJ	7.1 UJ	7.6 UJ	3.2 UJ	3.9 UJ	4 UJ	5.1 UJ	3.9 UJ	3.1 UJ	5.9 UJ	2.7 UJ	1.9 UJ	2.8 UJ
Vinyl Chloride	2.4 UJ	1.3 UJ	2.7 UJ	2.9 UJ	1.2 UJ	1.5 UJ	1.5 UJ	2 UJ	1.5 UJ	1.2 UJ	2.3 UJ	1 UJ	0.75 UJ	1.1 UJ
Xylenes, total	9.5 UJ	5.3 UJ	11 UJ	12 UJ	4.9 UJ	6 UJ	6.1 UJ	7.9 UJ	6 UJ	4.7 UJ	9 UJ	4.1 UJ	3 UJ	4.3 UJ
Semivolatile Organics (µg/kg)														
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trinitrobenzene (TNB)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene (m-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene (m-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Naphthoquinone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Phenylenediamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis[1-chloropropane]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Acetylaminofluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methyl-5-nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol (o-Cresol)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SERA AND STEP 3A OF THE BERA
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Sample ID	9SD79	9SD80	9SD81	9SD82	9SD83	9SD84	9SD85	9SD86	9SD87	9SD88	9SD89	9SD90	9SD91	9SD92
Site ID	9SD79	9SD80	9SD81	9SD82	9SD83	9SD84	9SD85	9SD86	9SD87	9SD88	9SD89	9SD90	9SD91	9SD92
Sample Date	1/21/2009	1/16/2009	1/16/2009	1/16/2009	1/17/2009	1/16/2009	1/16/2009	1/16/2009	1/17/2009	1/17/2009	1/17/2009	1/17/2009	1/18/2009	1/17/2009
Sample Depth (ft bgs)	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
Semivolatile Organis (µg/kg)(continued)														
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Picoline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3 & 4 Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dimethylbenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylcholanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Aminobiphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Dimethylaminoazobenzene (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroquinoline-1-oxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7,12-Dimethylbenz(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
a,a-Dimethylphenethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aramite	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzoic Acid	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) Phthalate (BEHP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl Benzyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cresol (Mixed Isomers)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diallate (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl Phthalate (DEP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl Phthalate (DBP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dinoseb	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methane Sulfonate (EMS)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloro-1,3-butadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD79	9SD80	9SD81	9SD82	9SD83	9SD84	9SD85	9SD86	9SD87	9SD88	9SD89	9SD90	9SD91	9SD92
Site ID	9SD79	9SD80	9SD81	9SD82	9SD83	9SD84	9SD85	9SD86	9SD87	9SD88	9SD89	9SD90	9SD91	9SD92
Sample Date	1/21/2009	1/16/2009	1/16/2009	1/16/2009	1/17/2009	1/16/2009	1/16/2009	1/16/2009	1/17/2009	1/17/2009	1/17/2009	1/17/2009	1/18/2009	1/17/2009
Sample Depth (ft bgs)	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
Semivolatile Organis (µg/kg)(continued)														
Hexachlorophene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isosafrole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methapyrilene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Methane Sulfonate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodimethylamine (NDMA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-butylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodi-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosomethylethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosomorpholine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopiperidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopyrrolidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Toluidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloronitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenacetin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pronamide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyridine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Safrole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (µg/kg)														
1-Methylnaphthalene	6.3 U	3.9 UJ	55 UJ	5.8 UJ	5.7 UJ	4 UJ	4.2 UJ	50 UJ	66 UJ	56 UJ	69 UJ	46 UJ	39 UJ	54 UJ
2-Methylnaphthalene	6.3 U	3.9 UJ	55 UJ	5.8 UJ	5.7 UJ	4 UJ	4.2 UJ	50 UJ	66 UJ	56 UJ	69 UJ	46 UJ	39 UJ	54 UJ
Acenaphthene	6.3 U	3.9 UJ	55 UJ	5.8 UJ	5.7 UJ	4 UJ	4.2 UJ	50 UJ	66 UJ	56 UJ	69 UJ	46 UJ	39 UJ	54 UJ
Acenaphthylene	6.3 U	3.9 UJ	55 UJ	5.8 UJ	5.7 UJ	4 UJ	4.2 UJ	50 UJ	66 UJ	56 UJ	69 UJ	46 UJ	39 UJ	54 UJ
Anthracene	6.3 U	3.9 UJ	55 UJ	5.8 UJ	7.7 J	4 UJ	4.2 UJ	50 UJ	66 UJ	56 UJ	69 UJ	46 UJ	39 UJ	54 UJ
Benzo(a)anthracene	6.3 U	3.9 UJ	55 UJ	5.8 UJ	5.7 UJ	4 UJ	4.2 UJ	50 UJ	66 UJ	56 UJ	69 UJ	81 J	39 UJ	110 J
Benzo(a)pyrene (BaP)	6.3 U	3.9 UJ	55 UJ	5.8 UJ	5.7 UJ	5.8 J	4.2 UJ	50 UJ	66 UJ	56 UJ	69 UJ	660 J	370 J	960 J
Benzo(b)fluoranthene	6.3 U	3.9 UJ	55 UJ	5.8 UJ	5.7 UJ	4 UJ	4.2 UJ	50 UJ	66 UJ	56 UJ	69 UJ	46 UJ	39 UJ	54 UJ
Benzo(g,h,i)perylene	6.3 U	3.9 UJ	160 J	5.8 UJ	5.7 UJ	4 UJ	4.2 UJ	50 UJ	66 UJ	56 UJ	69 UJ	46 UJ	39 UJ	54 UJ
Benzo(k)fluoranthene	6.3 U	3.9 UJ	55 UJ	5.8 UJ	5.7 UJ	4 UJ	4.2 UJ	50 UJ	66 UJ	56 UJ	69 UJ	46 UJ	39 UJ	54 UJ
Chrysene	6.3 U	3.9 UJ	260 J	5.8 UJ	18 J	4 UJ	4.2 UJ	50 UJ	66 UJ	56 UJ	81 J	590 J	230 J	880 J
Dibenz(a,h)anthracene	2.1 U	1.3 UJ	18 UJ	1.9 UJ	1.9 UJ	1.4 UJ	1.4 UJ	17 UJ	22 UJ	19 UJ	23 UJ	16 UJ	13 UJ	18 UJ
Fluoranthene	1.4 U	0.87 UJ	12 UJ	1.3 UJ	1.3 UJ	0.9 UJ	0.93 UJ	11 UJ	15 UJ	12 UJ	15 UJ	10 UJ	8.7 UJ	12 UJ
Fluorene	6.3 U	3.9 UJ	55 UJ	5.8 UJ	5.7 UJ	4 UJ	4.2 UJ	50 UJ	66 UJ	56 UJ	69 UJ	46 UJ	39 UJ	54 UJ
Indeno(1,2,3-cd)pyrene	12 U	7.5 UJ	110 J	11 UJ	11 UJ	7.8 UJ	8.1 UJ	96 UJ	130 UJ	110 UJ	130 UJ	90 UJ	76 UJ	100 UJ
Naphthalene	6.3 U	3.9 UJ	55 UJ	5.8 UJ	5.7 UJ	4 UJ	4.2 UJ	50 UJ	66 UJ	56 UJ	69 UJ	46 UJ	39 UJ	54 UJ
PAHs (µg/kg)(continued)														
Phenanthrene	6.3 U	3.9 UJ	55 UJ	5.8 UJ	5.7 UJ	4 UJ	4.2 UJ	50 UJ	66 UJ	56 UJ	69 UJ	46 UJ	39 UJ	54 UJ
Pyrene	6.3 U	3.9 UJ	89 J	12 J	9.6 J	4 UJ	4.2 UJ	51 J	66 UJ	56 UJ	69 UJ	610 J	140 J	800 J

APPENDIX A

SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD79	9SD80	9SD81	9SD82	9SD83	9SD84	9SD85	9SD86	9SD87	9SD88	9SD89	9SD90	9SD91	9SD92
Site ID	9SD79	9SD80	9SD81	9SD82	9SD83	9SD84	9SD85	9SD86	9SD87	9SD88	9SD89	9SD90	9SD91	9SD92
Sample Date	1/21/2009	1/16/2009	1/16/2009	1/16/2009	1/17/2009	1/16/2009	1/16/2009	1/16/2009	1/17/2009	1/17/2009	1/17/2009	1/17/2009	1/18/2009	1/17/2009
Sample Depth (ft bgs)	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
Organophosphorous Pesticide (µg/kg)														
Dimethoate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Disulfoton	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Famphur	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o,o,o-Triethyl Phosphorothioate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phorate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfotepp	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thionazin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals (mg/kg)														
Antimony	0.53 UJ	0.41 UJ	0.44 UJ	0.41 UJ	0.42 UJ	0.7 UJ	0.42 UJ	0.45 UJ	0.41 UJ	0.32 UJ	0.32 UJ	0.29 UJ	0.49 UJ	0.47 UJ
Arsenic	2.9 J	4.7 J	2.2 J	3 J	6.6 J	2.6 J	2.1 J	2.8 J	2.3 J	1.4 J	1.7 UJ	2.2 J	2.1 J	2.7 J
Barium	15 J	28 J	14 J	21 J	17 J	15 J	32 J	17 J	15 J	14 J	15 J	15 J	19 J	23 J
Beryllium	0.19 UJ	0.27 J	0.16 UJ	0.22 UJ	0.24 J	0.31 J	0.34 UJ	0.21 J	0.19 J	0.15 J	0.21 J	0.19 J	J	0.31 J
Cadmium	0.1 UJ	0.066 UJ	0.096 UJ	0.096 UJ	0.095 UJ	0.069 UJ	0.068 J	0.086 J	0.12 UJ	0.085 UJ	0.11 UJ	0.078 UJ	0.07 UJ	0.091 UJ
Chromium	18 J	21 J	19 J	27 J	41 J	21 J	16 J	25 J	21 J	18 J	19 J	21 J	27 J	30 J
Cobalt	6 J	8.4 J	6.8 J	12 J	7.8 J	9.9 J	6.8 J	9.8 J	7.2 J	6 J	6.9 J	7.3 J	9.4 J	9 J
Copper	63 J	80 J	82 J	110 J	110 J	92 J	68 J	100 J	74 J	73 J	66 J	69 J	87 J	98 J
Lead	8.2 J	26 J	14 J	19 J	14 J	51 J	23 J	24 J	15 J	10 J	13 J	19 J	36 J	27 J
Mercury	0.071 J	0.078 J	0.063 J	0.08 J	0.12 J	0.083 J	0.061 J	0.074 J	0.09 J	0.12 J	0.079 J	0.068 J	0.073 J	0.12 J
Nickel	7.3 J	7.4 J	8.3 J	11 J	8.5 J	7.4 J	5.9 J	9.3 J	7.3 J	6.6 J	7.2 J	8.1 J	9 J	12 J
Selenium	0.9 J	0.7 J	0.92 J	1 J	0.91 J	0.48 J	0.59 J	1.2 J	0.79 J	0.69 J	0.63 J	0.76 J	0.77 J	0.76 J
Silver	0.092 UJ	0.059 UJ	0.1 UJ	0.079 UJ	0.084 UJ	0.16 UJ	0.11 UJ	0.094 UJ	0.074 UJ	0.068 UJ	0.062 UJ	0.054 UJ	0.088 UJ	0.076 UJ
Thallium	0.39 UJ	0.25 UJ	0.37 UJ	0.35 UJ	0.37 UJ	0.27 UJ	0.26 UJ	0.3 UJ	0.46 UJ	0.33 UJ	0.43 UJ	0.3 UJ	0.27 UJ	0.35 UJ
Tin	13 UJ	8.5 UJ	12 UJ	12 UJ	12 UJ	8.9 UJ	8.8 UJ	10 UJ	15 UJ	11 UJ	14 UJ	10 UJ	9 UJ	12 UJ
Vanadium	80 J	190 J	140 J	160 J	140 J	200 J	160 J	170 J	120 J	110 J	93 J	120 J	160 J	200 J
Zinc	44 J	52 J	42 J	65 J	49 J	52 J	43 J	53 J	43 J	38 J	41 J	42 J	50 J	60 J
AVS / SEM (µmol/g)														
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total SEM hg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acid Volatile Sulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Conventionals														
pH (SU)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Percent Moisture (%)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Percent Solids (%)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

APPENDIX A

SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD93	9SD94	9SD95	9SD96	9SD97	9SD98	9SD99	9SD100	9SD101	9SD102	9SD103	9SD104
Site ID	9SD93	9SD94	9SD95	9SD96	9SD97	9SD98	9SD99	9SD100	9SD101	9SD102	9SD103	9SD104
Sample Date	1/18/2009	1/18/2009	1/20/2009	1/18/2009	1/20/2009	1/20/2009	1/20/2009	1/20/2009	1/20/2009	1/20/2009	1/20/2009	1/20/2009
Sample Depth (ft bgs)	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
Volatile Organics (µg/kg)												
1,1,1,2-Tetrachloroethane	1.2 UJ	1.5 UJ	1.8 UJ	0.9 UJ	3.7 UJ	2.9 UJ	2.6 UJ	2.9 UJ	1.5 UJ	1.4 UJ	1.9 UJ	1.9 UJ
1,1,1-Trichloroethane	1.1 UJ	1.4 UJ	1.7 UJ	0.82 UJ	3.4 UJ	2.6 UJ	2.3 UJ	2.7 UJ	1.4 UJ	1.3 UJ	1.7 UJ	1.7 UJ
1,1,2,2-Tetrachloroethane	2.6 UJ	3.4 UJ	4 UJ	2 UJ	8.2 UJ	6.2 UJ	5.6 UJ	6.4 UJ	3.3 UJ	3.2 UJ	4.1 UJ	4.2 UJ
1,1,2-Trichloroethane	2.2 UJ	2.9 UJ	3.5 UJ	1.7 UJ	7 UJ	5.4 UJ	4.8 UJ	5.5 UJ	2.9 UJ	2.7 UJ	3.5 UJ	3.6 UJ
1,1-Dichloroethane	0.92 UJ	1.2 UJ	1.4 UJ	0.71 UJ	2.9 UJ	2.2 UJ	2 UJ	2.3 UJ	1.2 UJ	1.1 UJ	1.5 UJ	1.5 UJ
1,1-Dichloroethene	0.99 UJ	1.3 UJ	1.6 UJ	0.76 UJ	3.2 UJ	2.4 UJ	2.2 UJ	2.5 UJ	1.3 UJ	1.2 UJ	1.6 UJ	1.6 UJ
1,2,3-Trichloropropane	2.6 UJ	3.4 UJ	4 UJ	2 UJ	8.2 UJ	6.2 UJ	5.6 UJ	6.4 UJ	3.3 UJ	3.2 UJ	4.1 UJ	4.2 UJ
1,2-Dibromo-3-chloropropane (DBCP)	5.1 UJ	6.8 UJ	8.1 UJ	4 UJ	16 UJ	12 UJ	11 UJ	13 UJ	6.7 UJ	6.3 UJ	8.2 UJ	8.4 UJ
1,2-Dibromoethane (EDB)	2.7 UJ	3.6 UJ	4.3 UJ	2.1 UJ	8.8 UJ	6.7 UJ	6.1 UJ	6.9 UJ	3.6 UJ	3.4 UJ	4.4 UJ	4.5 UJ
1,2-Dichloroethane	1.8 UJ	2.4 UJ	2.9 UJ	1.4 UJ	5.8 UJ	4.5 UJ	4 UJ	4.6 UJ	2.4 UJ	2.3 UJ	2.9 UJ	3 UJ
1,2-Dichloroethene (cis)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (trans)	1.8 UJ	2.3 UJ	2.8 UJ	1.4 UJ	5.7 UJ	4.3 UJ	3.9 UJ	4.5 UJ	2.3 UJ	2.2 UJ	2.8 UJ	2.9 UJ
1,2-Dichloropropane	2 UJ	2.7 UJ	3.2 UJ	1.6 UJ	6.4 UJ	4.9 UJ	4.4 UJ	5 UJ	2.6 UJ	2.5 UJ	3.2 UJ	3.3 UJ
1,3-Dichloropropene (cis)	1.6 UJ	2.1 UJ	2.5 UJ	1.2 UJ	5.1 UJ	3.9 UJ	3.5 UJ	4 UJ	2.1 UJ	2 UJ	2.6 UJ	2.6 UJ
1,3-Dichloropropene (trans)	1.6 UJ	2.1 UJ	2.5 UJ	1.2 UJ	5.1 UJ	3.9 UJ	3.5 UJ	4 UJ	2.1 UJ	2 UJ	2.6 UJ	2.6 UJ
1,4-Dichloro-2-butene (trans)	5.7 UJ	7.5 UJ	8.9 UJ	4.4 UJ	18 UJ	14 UJ	13 UJ	14 UJ	7.4 UJ	7 UJ	9.1 UJ	9.3 UJ
2-Butanone (MEK)	83 UJ	45 UJ	7.8 UJ	13 UJ	330 J	310 J	330 J	610 J	16 J	25 J	55 J	52 J
2-Chloro-1,3-butadiene (Chloroprene)	1 UJ	1.4 UJ	1.6 UJ	0.8 UJ	3.3 UJ	2.5 UJ	2.3 UJ	2.6 UJ	1.4 UJ	1.3 UJ	1.7 UJ	1.7 UJ
2-Hexanone (MBK)	3.8 UJ	5.1 UJ	6.1 UJ	3 UJ	12 UJ	9.4 UJ	14 J	9.6 UJ	5 UJ	4.8 UJ	6.2 UJ	6.3 UJ
3-Chloropropene (Allyl Chloride)	2.7 UJ	3.6 UJ	4.3 UJ	2.1 UJ	8.8 UJ	6.7 UJ	6.1 UJ	6.9 UJ	3.6 UJ	3.4 UJ	4.4 UJ	4.5 UJ
4-Methyl-2-pentanone (MIBK)	5.3 UJ	7 UJ	8.4 UJ	4.1 UJ	17 UJ	13 UJ	12 UJ	13 UJ	6.9 UJ	6.6 UJ	8.5 UJ	8.7 UJ
Acetone	180 J	95 J	270 J	39 J	480 J	600 J	980 J	1900 J	180 J	140 J	210 J	230 J
Acetonitrile	82 UJ	110 UJ	130 UJ	64 UJ	260 UJ	200 UJ	180 R	210 UJ	110 R	100 R	130 R	130 R
Acrolein	35 UJ	46 UJ	55 UJ	27 UJ	110 UJ	85 UJ	77 UJ	87 UJ	45 UJ	43 UJ	56 UJ	57 UJ
Acrylonitrile	42 UJ	56 UJ	66 UJ	32 UJ	130 UJ	100 UJ	93 UJ	110 UJ	55 UJ	52 UJ	67 UJ	69 UJ
Benzene	1.4 UJ	1.9 UJ	2.3 UJ	1.1 UJ	4.6 UJ	3.5 UJ	3.2 UJ	3.6 UJ	1.9 UJ	1.8 UJ	2.3 UJ	2.4 UJ
Bromodichloromethane	1.5 UJ	2 UJ	2.4 UJ	1.2 UJ	4.9 UJ	3.7 UJ	3.3 UJ	3.8 UJ	2 UJ	1.9 UJ	2.4 UJ	2.5 UJ
Bromoform	2 UJ	2.7 UJ	3.2 UJ	1.6 UJ	6.4 UJ	4.9 UJ	4.4 UJ	5 UJ	2.6 UJ	2.5 UJ	3.2 UJ	3.3 UJ
Bromomethane	2.9 UJ	3.9 UJ	4.6 UJ	2.3 UJ	9.3 UJ	7.1 UJ	6.5 UJ	7.3 UJ	3.8 UJ	3.6 UJ	4.7 UJ	4.8 UJ
Carbon Disulfide	2.2 UJ	7.3 J	10 J	2.6 J	26 J	5.8 J	7.2 J	5.5 UJ	2.9 UJ	4.9 J	22 J	5.7 J
Carbon Tetrachloride	1.8 UJ	2.4 UJ	2.9 UJ	1.4 UJ	5.8 UJ	4.5 UJ	4 UJ	4.6 UJ	2.4 UJ	2.3 UJ	2.9 UJ	3 UJ
Chlorobenzene	1.3 UJ	1.8 UJ	2.1 UJ	1 UJ	4.3 UJ	3.3 UJ	2.9 UJ	3.3 UJ	1.7 UJ	1.7 UJ	2.1 UJ	2.2 UJ
Chloroethane	2.2 UJ	2.9 UJ	3.5 UJ	1.7 UJ	7 UJ	5.4 UJ	4.8 UJ	5.5 UJ	2.9 UJ	2.7 UJ	3.5 UJ	3.6 UJ
Chloroform	0.92 UJ	1.2 UJ	1.4 UJ	0.71 UJ	2.9 UJ	2.2 UJ	2 UJ	2.3 UJ	1.2 UJ	1.1 UJ	1.5 UJ	1.5 UJ
Chloromethane	1.3 UJ	1.7 UJ	2 UJ	1 UJ	4.1 UJ	3.2 UJ	2.9 UJ	3.3 UJ	1.7 UJ	1.6 UJ	2.1 UJ	2.1 UJ
Dibromochloromethane	0.92 UJ	1.2 UJ	1.4 UJ	0.71 UJ	2.9 UJ	2.2 UJ	2 UJ	2.3 UJ	1.2 UJ	1.1 UJ	1.5 UJ	1.5 UJ
Dibromomethane	2.2 UJ	2.9 UJ	3.5 UJ	1.7 UJ	7 UJ	5.4 UJ	4.8 UJ	5.5 UJ	2.9 UJ	2.7 UJ	3.5 UJ	3.6 UJ
Ethyl Methacrylate	4 UJ	5.3 UJ	6.4 UJ	3.1 UJ	13 UJ	9.8 UJ	8.9 UJ	10 UJ	5.2 UJ	5 UJ	6.5 UJ	6.6 UJ
Ethylbenzene	1.4 UJ	1.8 UJ	2.2 UJ	1.1 UJ	4.4 UJ	3.3 UJ	3 UJ	3.4 UJ	1.8 UJ	1.7 UJ	2.2 UJ	2.2 UJ
Freon 11 (Trichlorofluoromethane)	2.7 UJ	3.6 UJ	4.3 UJ	2.1 UJ	8.8 UJ	6.7 UJ	6.1 UJ	6.9 UJ	3.6 UJ	3.4 UJ	4.4 UJ	4.5 UJ
Freon-12 (Dichlorodifluoromethane)	1.6 UJ	2.2 UJ	2.6 UJ	1.3 UJ	5.2 UJ	4 UJ	3.6 UJ	4.1 UJ	2.1 UJ	2 UJ	2.6 UJ	2.7 UJ
Isobutyl Alcohol	130 UJ	170 UJ	200 R	97 UJ	400 R	310 R	280 R	320 R	160 R	160 R	200 R	210 R
Methyl Acrylonitrile	44 UJ	58 UJ	69 UJ	34 UJ	140 UJ	110 UJ	97 UJ	110 UJ	57 UJ	54 UJ	70 UJ	72 UJ

APPENDIX A

SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD93	9SD94	9SD95	9SD96	9SD97	9SD98	9SD99	9SD100	9SD101	9SD102	9SD103	9SD104
Site ID	9SD93	9SD94	9SD95	9SD96	9SD97	9SD98	9SD99	9SD100	9SD101	9SD102	9SD103	9SD104
Sample Date	1/18/2009	1/18/2009	1/20/2009	1/18/2009	1/20/2009	1/20/2009	1/20/2009	1/20/2009	1/20/2009	1/20/2009	1/20/2009	1/20/2009
Sample Depth (ft bgs)	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
Volatile Organics (µg/kg)(continued)												
Methyl Iodide	1.8 UJ	2.4 UJ	2.9 UJ	1.4 UJ	5.8 UJ	4.5 UJ	4 UJ	4.6 UJ	2.4 UJ	2.3 UJ	2.9 UJ	3 UJ
Methyl Methacrylate	6.8 UJ	9 UJ	11 UJ	5.2 UJ	22 UJ	17 UJ	15 UJ	17 UJ	8.8 UJ	8.4 UJ	11 UJ	11 UJ
Methylene Chloride	1.8 UJ	2.4 UJ	2.9 UJ	1.4 UJ	5.8 UJ	4.5 UJ	4 UJ	4.6 UJ	2.4 UJ	2.3 UJ	2.9 UJ	3 UJ
Pentachloroethane	4 UJ	5.3 UJ	6.4 UJ	3.1 UJ	13 UJ	9.8 UJ	8.9 UJ	10 UJ	5.2 UJ	5 UJ	6.5 UJ	6.6 UJ
Propionitrile (Ethyl Cyanide)	38 UJ	51 UJ	61 UJ	30 UJ	120 UJ	94 UJ	85 UJ	96 UJ	50 UJ	48 UJ	62 UJ	63 UJ
Styrene (Ethenylbenzene)	1.2 UJ	1.6 UJ	1.9 UJ	0.93 UJ	3.9 UJ	2.9 UJ	2.7 UJ	3 UJ	1.6 UJ	1.5 UJ	1.9 UJ	2 UJ
Tetrachloroethene (PCE)	1.3 UJ	1.8 UJ	2.1 UJ	1 UJ	4.3 UJ	3.3 UJ	2.9 UJ	3.3 UJ	1.7 UJ	1.7 UJ	2.1 UJ	2.2 UJ
Toluene	1.4 UJ	1.9 UJ	2.3 UJ	1.1 UJ	4.6 UJ	3.5 UJ	3.2 UJ	3.6 UJ	1.9 UJ	1.8 UJ	2.3 UJ	2.4 UJ
Trichloroethene (TCE)	1.8 UJ	2.4 UJ	2.9 UJ	1.4 UJ	5.8 UJ	4.5 UJ	4 UJ	4.6 UJ	2.4 UJ	2.3 UJ	2.9 UJ	3 UJ
Vinyl Acetate	2.7 UJ	3.6 UJ	4.3 UJ	2.1 UJ	8.8 UJ	6.7 UJ	6.1 UJ	6.9 UJ	3.6 UJ	3.4 UJ	4.4 UJ	4.5 UJ
Vinyl Chloride	1.1 UJ	1.4 UJ	1.7 UJ	0.82 UJ	3.4 UJ	2.6 UJ	2.3 UJ	2.7 UJ	1.4 UJ	1.3 UJ	1.7 UJ	1.7 UJ
Xylenes, total	4.2 UJ	5.6 UJ	6.6 UJ	3.2 UJ	13 UJ	10 UJ	9.3 UJ	11 UJ	5.5 UJ	5.2 UJ	6.7 UJ	6.9 UJ
Semivolatile Organics (µg/kg)												
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trinitrobenzene (TNB)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene (m-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene (m-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Naphthoquinone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Phenylenediamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis[1-chloropropane]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Acetylaminofluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methyl-5-nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol (o-Cresol)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD93	9SD94	9SD95	9SD96	9SD97	9SD98	9SD99	9SD100	9SD101	9SD102	9SD103	9SD104
Site ID	9SD93	9SD94	9SD95	9SD96	9SD97	9SD98	9SD99	9SD100	9SD101	9SD102	9SD103	9SD104
Sample Date	1/18/2009	1/18/2009	1/20/2009	1/18/2009	1/20/2009	1/20/2009	1/20/2009	1/20/2009	1/20/2009	1/20/2009	1/20/2009	1/20/2009
Sample Depth (ft bgs)	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
Semivolatile Organis (µg/kg)(continued)												
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Picoline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3 & 4 Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dimethylbenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylcholanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Aminobiphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Dimethylaminoazobenzene (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroquinoline-1-oxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7,12-Dimethylbenz(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
a,a-Dimethylphenethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aramite	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzoic Acid	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) Phthalate (BEHP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl Benzyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cresol (Mixed Isomers)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diallate (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl Phthalate (DEP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl Phthalate (DBP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dinoseb	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methane Sulfonate (EMS)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloro-1,3-butadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD93	9SD94	9SD95	9SD96	9SD97	9SD98	9SD99	9SD100	9SD101	9SD102	9SD103	9SD104
Site ID	9SD93	9SD94	9SD95	9SD96	9SD97	9SD98	9SD99	9SD100	9SD101	9SD102	9SD103	9SD104
Sample Date	1/18/2009	1/18/2009	1/20/2009	1/18/2009	1/20/2009	1/20/2009	1/20/2009	1/20/2009	1/20/2009	1/20/2009	1/20/2009	1/20/2009
Sample Depth (ft bgs)	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
Semivolatile Organis (µg/kg)(continued)												
Hexachlorophene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isosafrole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methapyrilene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Methane Sulfonate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodimethylamine (NDMA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-butylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodi-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosomethylethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosomorpholine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopiperidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopyrrolidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Toluidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloronitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenacetin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pronamide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyridine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Safrole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (µg/kg)												
1-Methylnaphthalene	5.1 UJ	64 UJ	45 UJ	4.9 UJ	8.2 UJ	6.3 UJ	5.7 UJ	6.3 UJ	4 UJ	3.6 UJ	4.4 UJ	46 UJ
2-Methylnaphthalene	5.1 UJ	64 UJ	45 UJ	4.9 UJ	8.2 UJ	6.3 UJ	5.7 UJ	6.3 UJ	4 UJ	3.6 UJ	4.4 UJ	46 UJ
Acenaphthene	5.1 UJ	64 UJ	45 UJ	4.9 UJ	8.2 UJ	6.3 UJ	5.7 UJ	6.3 UJ	4 UJ	3.6 UJ	4.4 UJ	46 UJ
Acenaphthylene	5.1 UJ	64 UJ	45 UJ	4.9 UJ	8.2 UJ	6.3 UJ	5.7 UJ	6.3 UJ	4 UJ	3.6 UJ	4.4 UJ	46 UJ
Anthracene	5.5 J	64 UJ	45 UJ	4.9 UJ	8.2 UJ	6.3 UJ	18 J	7 J	4 UJ	3.6 UJ	4.4 UJ	46 UJ
Benzo(a)anthracene	5.1 UJ	64 UJ	45 UJ	4.9 UJ	8.2 UJ	6.3 UJ	5.7 UJ	6.3 UJ	4 UJ	3.6 UJ	4.4 UJ	46 UJ
Benzo(a)pyrene (BaP)	15 J	310 J	45 UJ	4.9 UJ	8.2 UJ	6.3 UJ	180 J	6.3 UJ	4 UJ	3.6 UJ	4.4 UJ	46 UJ
Benzo(b)fluoranthene	5.1 UJ	64 UJ	45 UJ	4.9 UJ	8.2 UJ	6.3 UJ	5.7 UJ	6.3 UJ	4 UJ	3.6 UJ	4.4 UJ	46 UJ
Benzo(g,h,i)perylene	5.1 UJ	64 UJ	45 UJ	4.9 UJ	8.2 UJ	6.3 UJ	5.7 UJ	6.3 UJ	4 UJ	3.6 UJ	4.4 UJ	46 UJ
Benzo(k)fluoranthene	5.1 UJ	64 UJ	45 UJ	4.9 UJ	8.2 UJ	6.3 UJ	5.7 UJ	6.3 UJ	4 UJ	3.6 UJ	4.4 UJ	46 UJ
Chrysene	5.1 UJ	270 J	700 J	4.9 UJ	8.2 UJ	21 J	5.7 UJ	6.3 UJ	4 UJ	6.5 J	14 J	46 UJ
Dibenz(a,h)anthracene	1.7 UJ	22 UJ	15 UJ	1.6 UJ	2.8 UJ	2.1 UJ	1.9 UJ	2.1 UJ	1.3 UJ	1.2 UJ	1.5 UJ	16 UJ
Fluoranthene	1.2 UJ	14 UJ	10 UJ	1.1 UJ	1.8 UJ	1.4 UJ	1.3 UJ	1.4 UJ	0.89 UJ	1.7 J	0.97 UJ	10 UJ
Fluorene	5.1 UJ	64 UJ	45 UJ	4.9 UJ	8.2 UJ	6.3 UJ	5.7 UJ	6.3 UJ	4 UJ	3.6 UJ	4.4 UJ	46 UJ
Indeno(1,2,3-cd)pyrene	10 UJ	120 UJ	87 UJ	9.5 UJ	16 UJ	12 UJ	11 UJ	12 UJ	7.7 UJ	7 UJ	8.4 UJ	90 UJ
Naphthalene	5.1 UJ	64 UJ	45 UJ	4.9 UJ	8.2 UJ	6.3 UJ	5.7 UJ	6.3 UJ	4 UJ	3.6 UJ	4.4 UJ	46 UJ
PAHs (µg/kg)(continued)												
Phenanthrene	5.1 UJ	64 UJ	45 UJ	4.9 UJ	8.2 UJ	6.3 UJ	5.7 UJ	6.3 UJ	4 UJ	3.6 UJ	4.4 UJ	46 UJ
Pyrene	11 J	230 J	870 J	7.2 J	8.2 UJ	10 J	280 J	6.3 UJ	7.1 J	3.6 UJ	9.5 J	46 UJ

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
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Sample ID	9SD93	9SD94	9SD95	9SD96	9SD97	9SD98	9SD99	9SD100	9SD101	9SD102	9SD103	9SD104
Site ID	9SD93	9SD94	9SD95	9SD96	9SD97	9SD98	9SD99	9SD100	9SD101	9SD102	9SD103	9SD104
Sample Date	1/18/2009	1/18/2009	1/20/2009	1/18/2009	1/20/2009	1/20/2009	1/20/2009	1/20/2009	1/20/2009	1/20/2009	1/20/2009	1/20/2009
Sample Depth (ft bgs)	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5
Organophosphorous Pesticide (µg/kg)												
Dimethoate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Disulfoton	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Famphur	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o,o,o-Triethyl Phosphorothioate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phorate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfotepp	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thionazin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals (mg/kg)												
Antimony	0.35 UJ	0.46 UJ	0.36 UJ	0.29 UJ	0.33 UJ	0.24 UJ	0.24 UJ	0.28 UJ	0.16 UJ	0.14 UJ	0.44 UJ	0.27 UJ
Arsenic	1.9 J	3.9 J	4.2 J	2.3 J	1.7 UJ	2 J	1.3 UJ	1.9 UJ	1.4 J	1.1 J	2.4 J	1.7 J
Barium	21 J	21 J	19 J	27 J	18 J	17 J	22 J	14 UJ	24 J	27 J	22 J	19 J
Beryllium	0.23 J	0.26 J	0.24 J	0.3 J	0.21 UJ	0.17 UJ	0.15 UJ	0.19 UJ	0.31 J	0.29 J	0.33 J	0.3 J
Cadmium	0.08 UJ	0.11 UJ	0.095 UJ	0.087 UJ	0.14 UJ	0.1 UJ	0.1 UJ	0.12 UJ	0.08 UJ	0.059 UJ	0.081 UJ	0.076 UJ
Chromium	29 J	29 J	58 J	30 J	21 J	25 J	17 J	18 J	28 J	29 J	26 J	26 J
Cobalt	8 J	9.3 J	11 J	8.5 J	7.2 J	6.5 J	4.4 J	5.2 J	6.5 J	6.8 J	8.6 J	5.7 J
Copper	89 J	96 J	120 J	98 J	75 J	81 J	60 J	64 J	100 J	79 J	95 J	75 J
Lead	14 J	31 J	43 J	12 J	12 J	11 J	27 J	13 J	24 J	12 J	22 J	9.6 J
Mercury	0.092 J	0.085 J	0.077 J	0.1 J	0.074 J	0.093 J	0.047 J	0.074 J	0.075 J	0.071 J	0.073 J	0.056 J
Nickel	9.6 J	10 J	11 J	9.5 J	8.2 J	8.3 J	8.4 J	6.6 J	9.3 J	10 J	9.8 J	7.8 J
Selenium	0.93 J	1.1 J	1.1 UJ	0.99 J	0.76 UJ	0.82 UJ	0.6 UJ	0.91 UJ	0.92 UJ	0.63 UJ	1.2 J	1.1 UJ
Silver	0.059 UJ	0.081 UJ	0.087 UJ	0.045 UJ	0.073 UJ	0.059 UJ	0.056 UJ	0.06 UJ	0.056 UJ	0.047 UJ	0.087 UJ	0.083 UJ
Thallium	0.31 UJ	0.44 UJ	0.27 J	0.34 UJ	0.54 UJ	0.39 UJ	0.39 UJ	0.45 UJ	0.26 UJ	0.23 J	0.27 UJ	0.34 J
Tin	10 UJ	15 UJ	9.2 J	11 UJ	18 UJ	13 UJ	13 UJ	15 UJ	8.7 UJ	7.6 UJ	9 UJ	9.8 UJ
Vanadium	160 J	170 J	150 J	240 J	96 J	120 J	120 J	96 J	170 J	170 J	160 J	160 J
Zinc	55 J	58 J	58 J	60 J	54 J	47 J	35 J	40 J	60 J	62 J	62 J	51 J
AVS / SEM (µmol/g)												
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total SEM hg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acid Volatile Sulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Conventionals												
pH (SU)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Percent Moisture (%)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Percent Solids (%)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD105	9SD106	9SD107	9SD108	9SD109	9SD110	9SD111	9SD112	9SD124	9SD125
Site ID	9SD105	9SD106	9SD107	9SD108	9SD109	9SD110	9SD111	9SD112	9SD124	9SD125
Sample Date	1/21/2009	1/21/2009	1/21/2009	1/21/2009	1/11/2011	1/11/2011	1/11/2011	1/11/2011	1/6/2011	1/6/2011
Sample Depth (ft bgs)	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
Volatile Organics (µg/kg)										
1,1,1,2-Tetrachloroethane	1.6 UJ	1.5 UJ	2.2 UJ	1.8 UJ	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	1.4 UJ	1.4 UJ	2 UJ	1.6 UJ	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	3.5 UJ	3.4 UJ	4.9 UJ	4 UJ	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	3 UJ	2.9 UJ	4.2 UJ	3.4 UJ	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	1.2 UJ	1.2 UJ	1.8 UJ	1.4 UJ	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	1.3 UJ	1.3 UJ	1.9 UJ	1.5 UJ	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	3.5 UJ	3.4 UJ	4.9 UJ	4 UJ	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane (DBCP)	7 UJ	6.8 UJ	9.8 UJ	7.9 UJ	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (EDB)	3.7 UJ	3.6 UJ	5.3 UJ	4.2 UJ	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	2.5 UJ	2.4 UJ	3.5 UJ	2.8 UJ	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (cis)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (trans)	2.4 UJ	2.3 UJ	3.4 UJ	2.7 UJ	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	2.7 UJ	2.7 UJ	3.9 UJ	3.1 UJ	NA	NA	NA	NA	NA	NA
1,3-Dichloropropene (cis)	2.2 UJ	2.1 UJ	3.1 UJ	2.5 UJ	NA	NA	NA	NA	NA	NA
1,3-Dichloropropene (trans)	2.2 UJ	2.1 UJ	3.1 UJ	2.5 UJ	NA	NA	NA	NA	NA	NA
1,4-Dichloro-2-butene (trans)	7.7 UJ	7.5 UJ	11 UJ	8.8 UJ	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	21 UJ	46 UJ	62 UJ	27 UJ	NA	NA	NA	NA	NA	NA
2-Chloro-1,3-butadiene (Chloroprene)	1.4 UJ	1.4 UJ	2 UJ	1.6 UJ	NA	NA	NA	NA	NA	NA
2-Hexanone (MBK)	5.2 UJ	5.1 UJ	7.4 UJ	5.9 UJ	NA	NA	NA	NA	NA	NA
3-Chloropropene (Allyl Chloride)	3.7 UJ	3.6 UJ	5.3 UJ	4.2 UJ	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	7.2 UJ	7 UJ	10 UJ	8.2 UJ	NA	NA	NA	NA	NA	NA
Acetone	91 J	210 J	200 J	110 J	NA	NA	NA	NA	NA	NA
Acetonitrile	110 UJ	110 UJ	160 UJ	130 UJ	NA	NA	NA	NA	NA	NA
Acrolein	47 UJ	46 UJ	67 UJ	54 UJ	NA	NA	NA	NA	NA	NA
Acrylonitrile	57 UJ	56 UJ	81 UJ	65 UJ	NA	NA	NA	NA	NA	NA
Benzene	2 UJ	1.9 UJ	2.8 UJ	2.2 UJ	NA	NA	NA	NA	NA	NA
Bromodichloromethane	2.1 UJ	2 UJ	2.9 UJ	2.4 UJ	NA	NA	NA	NA	NA	NA
Bromoform	2.7 UJ	2.7 UJ	3.9 UJ	3.1 UJ	NA	NA	NA	NA	NA	NA
Bromomethane	4 UJ	3.9 UJ	5.6 UJ	4.5 UJ	NA	NA	NA	NA	NA	NA
Carbon Disulfide	3.2 J	14 UJ	6.7 UJ	4.1 J	NA	NA	NA	NA	NA	NA
Carbon Tetrachloride	2.5 UJ	2.4 UJ	3.5 UJ	2.8 UJ	NA	NA	NA	NA	NA	NA
Chlorobenzene	1.8 UJ	1.8 UJ	2.6 UJ	2.1 UJ	NA	NA	NA	NA	NA	NA
Chloroethane	3 UJ	2.9 UJ	4.2 UJ	3.4 UJ	NA	NA	NA	NA	NA	NA
Chloroform	1.2 UJ	1.2 UJ	1.8 UJ	1.4 UJ	NA	NA	NA	NA	NA	NA
Chloromethane	1.8 UJ	1.7 UJ	2.5 UJ	2 UJ	NA	NA	NA	NA	NA	NA
Dibromochloromethane	1.2 UJ	1.2 UJ	1.8 UJ	1.4 UJ	NA	NA	NA	NA	NA	NA
Dibromomethane	3 UJ	2.9 UJ	4.2 UJ	3.4 UJ	NA	NA	NA	NA	NA	NA
Ethyl Methacrylate	5.5 UJ	5.3 UJ	7.7 UJ	6.2 UJ	NA	NA	NA	NA	NA	NA
Ethylbenzene	1.9 UJ	1.8 UJ	2.6 UJ	2.1 UJ	NA	NA	NA	NA	NA	NA
Freon 11 (Trichlorofluoromethane)	3.7 UJ	3.6 UJ	5.3 UJ	4.2 UJ	NA	NA	NA	NA	NA	NA
Freon-12 (Dichlorodifluoromethane)	2.2 UJ	2.2 UJ	3.1 UJ	2.5 UJ	NA	NA	NA	NA	NA	NA
Isobutyl Alcohol	170 R	170 R	240 UJ	200 UJ	NA	NA	NA	NA	NA	NA
Methyl Acrylonitrile	60 UJ	58 UJ	84 UJ	68 UJ	NA	NA	NA	NA	NA	NA

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD105	9SD106	9SD107	9SD108	9SD109	9SD110	9SD111	9SD112	9SD124	9SD125
Site ID	9SD105	9SD106	9SD107	9SD108	9SD109	9SD110	9SD111	9SD112	9SD124	9SD125
Sample Date	1/21/2009	1/21/2009	1/21/2009	1/21/2009	1/11/2011	1/11/2011	1/11/2011	1/11/2011	1/6/2011	1/6/2011
Sample Depth (ft bgs)	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
Volatile Organics (µg/kg)(continued)										
Methyl Iodide	2.5 UJ	2.4 UJ	3.5 UJ	2.8 UJ	NA	NA	NA	NA	NA	NA
Methyl Methacrylate	9.2 UJ	9 UJ	13 UJ	10 UJ	NA	NA	NA	NA	NA	NA
Methylene Chloride	2.5 UJ	2.4 UJ	4.1 UJ	2.8 UJ	NA	NA	NA	NA	NA	NA
Pentachloroethane	5.5 UJ	5.3 UJ	7.7 UJ	6.2 UJ	NA	NA	NA	NA	NA	NA
Propionitrile (Ethyl Cyanide)	52 UJ	51 UJ	74 UJ	59 UJ	NA	NA	NA	NA	NA	NA
Styrene (Ethenylbenzene)	1.6 UJ	1.6 UJ	2.3 UJ	1.9 UJ	NA	NA	NA	NA	NA	NA
Tetrachloroethene (PCE)	1.8 UJ	1.8 UJ	2.6 UJ	2.1 UJ	NA	NA	NA	NA	NA	NA
Toluene	2 UJ	1.9 UJ	2.8 UJ	2.2 UJ	NA	NA	NA	NA	NA	NA
Trichloroethene (TCE)	2.5 UJ	2.4 UJ	3.5 UJ	2.8 UJ	NA	NA	NA	NA	NA	NA
Vinyl Acetate	3.7 UJ	3.6 UJ	5.3 UJ	4.2 UJ	NA	NA	NA	NA	NA	NA
Vinyl Chloride	1.4 UJ	1.4 UJ	2 UJ	1.6 UJ	NA	NA	NA	NA	NA	NA
Xylenes, total	5.7 UJ	5.6 UJ	8.1 UJ	6.5 UJ	NA	NA	NA	NA	NA	NA
Semivolatile Organics (µg/kg)										
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trinitrobenzene (TNB)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene (m-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene (m-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Naphthoquinone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Phenylenediamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis[1-chloropropane]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Acetylaminofluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methyl-5-nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol (o-Cresol)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD105	9SD106	9SD107	9SD108	9SD109	9SD110	9SD111	9SD112	9SD124	9SD125
Site ID	9SD105	9SD106	9SD107	9SD108	9SD109	9SD110	9SD111	9SD112	9SD124	9SD125
Sample Date	1/21/2009	1/21/2009	1/21/2009	1/21/2009	1/11/2011	1/11/2011	1/11/2011	1/11/2011	1/6/2011	1/6/2011
Sample Depth (ft bgs)	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
Semivolatile Organis (µg/kg)(continued)										
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Picoline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3 & 4 Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dimethylbenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylcholanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Aminobiphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Dimethylaminoazobenzene (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroquinoline-1-oxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7,12-Dimethylbenz(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
a,a-Dimethylphenethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aramite	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzoic Acid	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) Phthalate (BEHP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl Benzyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cresol (Mixed Isomers)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diallate (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl Phthalate (DEP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl Phthalate (DBP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dinoseb	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methane Sulfonate (EMS)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloro-1,3-butadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SERA AND STEP 3A OF THE BERA
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Sample ID	9SD105	9SD106	9SD107	9SD108	9SD109	9SD110	9SD111	9SD112	9SD124	9SD125
Site ID	9SD105	9SD106	9SD107	9SD108	9SD109	9SD110	9SD111	9SD112	9SD124	9SD125
Sample Date	1/21/2009	1/21/2009	1/21/2009	1/21/2009	1/11/2011	1/11/2011	1/11/2011	1/11/2011	1/6/2011	1/6/2011
Sample Depth (ft bgs)	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
Semivolatile Organis (µg/kg)(continued)										
Hexachlorophene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isosafrole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methapyrilene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Methane Sulfonate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodimethylamine (NDMA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-butylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodi-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosomethylethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosomorpholine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopiperidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopyrrolidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Toluidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloronitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenacetin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pronamide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyridine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Safrole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (µg/kg)										
1-Methylnaphthalene	5 U	37 U	27 U	24 U	NA	NA	NA	NA	3.6 J	31 UJ
2-Methylnaphthalene	5 U	37 U	27 U	24 U	NA	NA	NA	NA	6.8 J	31 UJ
Acenaphthene	5 U	37 U	27 U	24 U	NA	NA	NA	NA	30 UJ	31 UJ
Acenaphthylene	5 U	37 U	27 U	24 U	NA	NA	NA	NA	8.2 J	31 UJ
Anthracene	5 U	37 U	27 U	24 U	NA	NA	NA	NA	13 J	22 J
Benzo(a)anthracene	5 U	37 U	27 U	24 U	NA	NA	NA	NA	30 UJ	9.8 J
Benzo(a)pyrene (BaP)	5 U	37 U	27 U	24 U	NA	NA	NA	NA	30 UJ	4.1 J
Benzo(b)fluoranthene	5 U	37 U	27 U	24 U	NA	NA	NA	NA	30 UJ	9.1 J
Benzo(g,h,i)perylene	5 U	37 U	27 U	24 U	NA	NA	NA	NA	30 UJ	10 J
Benzo(k)fluoranthene	5 U	37 U	27 U	24 U	NA	NA	NA	NA	30 UJ	3.1 J
Chrysene	17 J	37 U	36 J	24 U	NA	NA	NA	NA	26 J	55 J
Dibenz(a,h)anthracene	1.7 U	13 U	9.2 U	7.9 U	NA	NA	NA	NA	30 UJ	11 J
Fluoranthene	1.1 U	8.4 U	6.1 U	5.3 U	NA	NA	NA	NA	30 UJ	8.3 J
Fluorene	5 U	37 U	27 U	24 U	NA	NA	NA	NA	2.7 J	31 UJ
Indeno(1,2,3-cd)pyrene	9.8 U	73 U	53 U	46 U	NA	NA	NA	NA	30 UJ	17 J
Naphthalene	5 U	37 U	27 U	24 U	NA	NA	NA	NA	30 UJ	31 UJ
PAHs (µg/kg)(continued)										
Phenanthrene	5 U	37 U	27 U	24 U	NA	NA	NA	NA	5.7 J	3.9 J
Pyrene	7.2 J	37 U	27 U	24 U	NA	NA	NA	NA	27 J	98 J

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SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD105	9SD106	9SD107	9SD108	9SD109	9SD110	9SD111	9SD112	9SD124	9SD125
Site ID	9SD105	9SD106	9SD107	9SD108	9SD109	9SD110	9SD111	9SD112	9SD124	9SD125
Sample Date	1/21/2009	1/21/2009	1/21/2009	1/21/2009	1/11/2011	1/11/2011	1/11/2011	1/11/2011	1/6/2011	1/6/2011
Sample Depth (ft bgs)	0.0-0.5	0.0-0.5	0.0-0.5	0.0-0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
Organophosphorous Pesticide (µg/kg)										
Dimethoate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Disulfoton	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Famphur	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o,o,o-Triethyl Phosphorothioate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phorate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfotepp	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thionazin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals (mg/kg)										
Antimony	0.37 UJ	0.17 UJ	0.29 UJ	0.19 UJ	NA	NA	NA	NA	NA	NA
Arsenic	2.1 J	1.2 J	2.5 J	2 J	NA	NA	NA	NA	NA	NA
Barium	23 J	19 J	19 J	16 J	NA	NA	NA	NA	NA	NA
Beryllium	0.22 UJ	0.31 J	0.26 UJ	0.22 UJ	NA	NA	NA	NA	NA	NA
Cadmium	0.089 UJ	0.061 UJ	0.088 UJ	0.077 UJ	NA	NA	NA	NA	NA	NA
Chromium	32 J	25 J	25 J	26 J	NA	NA	NA	NA	NA	NA
Cobalt	8.5 J	5.5 J	7.7 J	6.4 J	NA	NA	NA	NA	NA	NA
Copper	99 J	76 J	77 J	89 J	NA	NA	NA	NA	NA	NA
Lead	20 J	8.2 J	14 J	9.1 J	16 J	9.12 J	5.78 J	7.07 J	NA	NA
Mercury	0.078 J	0.05 J	0.073 J	0.053 J	NA	NA	NA	NA	NA	NA
Nickel	11 J	8 J	9.1 J	8.3 J	NA	NA	NA	NA	NA	NA
Selenium	1.1 J	0.73 J	0.91 J	0.96 J	NA	NA	NA	NA	NA	NA
Silver	0.061 UJ	0.056 UJ	0.049 UJ	0.061 UJ	NA	NA	NA	NA	NA	NA
Thallium	0.35 UJ	0.24 UJ	0.34 UJ	0.3 UJ	NA	NA	NA	NA	NA	NA
Tin	12 UJ	7.9 UJ	11 UJ	9.9 UJ	NA	NA	NA	NA	NA	NA
Vanadium	210 J	130 J	150 J	170 J	NA	NA	NA	NA	NA	NA
Zinc	62 J	51 J	57 J	49 J	NA	NA	NA	NA	NA	NA
AVS / SEM (µmol/g)										
Cadmium	NA	NA	NA	NA	0.0011 UJ	0.00099 UJ	0.00099 UJ	0.0011 UJ	NA	NA
Copper	NA	NA	NA	NA	0.48 J	0.642 J	0.439 J	0.393 J	NA	NA
Lead	NA	NA	NA	NA	0.0226 J	0.0305 J	0.0355 J	0.019 J	NA	NA
Nickel	NA	NA	NA	NA	0.017 UJ	0.016 J	0.018 J	0.017 UJ	NA	NA
Silver	NA	NA	NA	NA	0.0024 UJ	0.0021 UJ	0.0021 UJ	0.0023 UJ	NA	NA
Zinc	NA	NA	NA	NA	0.168 J	0.196 J	0.221 J	0.169 J	NA	NA
Total SEM hg	NA	NA	NA	NA	0.69	0.89	0.72	0.60	NA	NA
Acid Volatile Sulfide	NA	NA	NA	NA	0.52 J	2.9 J	0.99 J	5.2 J	NA	NA
Conventionals										
pH (SU)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Percent Moisture (%)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Percent Solids (%)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD129	9SD130	9SD131	9SD136	9SD137	9SD138	9SD177	9SD178	9SD179	9SD180
Site ID	9SD129	9SD130	9SD131	9SD136	9SD137	9SD138	9SD177	9SD178	9SD179	9SD180
Sample Date	1/6/2011	1/6/2011	1/6/2011	1/6/2011	1/6/2011	1/6/2011	1/11/2011	1/11/2011	1/11/2011	1/11/2011
Sample Depth (ft bgs)	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
Volatile Organics (µg/kg)										
1,1,1,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane (DBCP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (EDB)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (cis)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichloropropene (cis)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichloropropene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichloro-2-butene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloro-1,3-butadiene (Chloroprene)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone (MBK)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Chloropropene (Allyl Chloride)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrolein	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromomethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methacrylate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Freon 11 (Trichlorofluoromethane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Freon-12 (Dichlorodifluoromethane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isobutyl Alcohol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Acrylonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD129	9SD130	9SD131	9SD136	9SD137	9SD138	9SD177	9SD178	9SD179	9SD180
Site ID	9SD129	9SD130	9SD131	9SD136	9SD137	9SD138	9SD177	9SD178	9SD179	9SD180
Sample Date	1/6/2011	1/6/2011	1/6/2011	1/6/2011	1/6/2011	1/6/2011	1/11/2011	1/11/2011	1/11/2011	1/11/2011
Sample Depth (ft bgs)	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
Volatile Organics (µg/kg)(continued)										
Methyl Iodide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Methacrylate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Propionitrile (Ethyl Cyanide)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene (Ethenylbenzene)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene (PCE)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene (TCE)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes, total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organics (µg/kg)										
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene (o-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trinitrobenzene (TNB)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene (m-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene (m-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Naphthoquinone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Phenylenediamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis[1-chloropropane]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene (DNT)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Acetylaminofluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methyl-5-nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol (o-Cresol)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Naphthylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD129	9SD130	9SD131	9SD136	9SD137	9SD138	9SD177	9SD178	9SD179	9SD180
Site ID	9SD129	9SD130	9SD131	9SD136	9SD137	9SD138	9SD177	9SD178	9SD179	9SD180
Sample Date	1/6/2011	1/6/2011	1/6/2011	1/6/2011	1/6/2011	1/6/2011	1/11/2011	1/11/2011	1/11/2011	1/11/2011
Sample Depth (ft bgs)	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
Semivolatile Organis (µg/kg)(continued)										
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Picoline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3 & 4 Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dimethylbenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylcholanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Aminobiphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Dimethylaminoazobenzene (p-)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroquinoline-1-oxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7,12-Dimethylbenz(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
a,a-Dimethylphenethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aramite	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzoic Acid	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) Phthalate (BEHP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyl Benzyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cresol (Mixed Isomers)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diallate (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl Phthalate (DEP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl Phthalate (DBP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octyl Phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dinoseb	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methane Sulfonate (EMS)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloro-1,3-butadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD129	9SD130	9SD131	9SD136	9SD137	9SD138	9SD177	9SD178	9SD179	9SD180
Site ID	9SD129	9SD130	9SD131	9SD136	9SD137	9SD138	9SD177	9SD178	9SD179	9SD180
Sample Date	1/6/2011	1/6/2011	1/6/2011	1/6/2011	1/6/2011	1/6/2011	1/11/2011	1/11/2011	1/11/2011	1/11/2011
Sample Depth (ft bgs)	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
Semivolatile Organis (µg/kg)(continued)										
Hexachlorophene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloropropene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isosafrole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methapyrilene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Methane Sulfonate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodimethylamine (NDMA)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-butylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodi-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosomethylethylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosomorpholine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopiperidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosopyrrolidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Toluidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloronitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenacetin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pronamide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyridine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Safrole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (µg/kg)										
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene (BaP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (µg/kg)(continued)										
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD129	9SD130	9SD131	9SD136	9SD137	9SD138	9SD177	9SD178	9SD179	9SD180
Site ID	9SD129	9SD130	9SD131	9SD136	9SD137	9SD138	9SD177	9SD178	9SD179	9SD180
Sample Date	1/6/2011	1/6/2011	1/6/2011	1/6/2011	1/6/2011	1/6/2011	1/11/2011	1/11/2011	1/11/2011	1/11/2011
Sample Depth (ft bgs)	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5	0 - 0.5
Organophosphorous Pesticide (µg/kg)										
Dimethoate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Disulfoton	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Famphur	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o,o,o-Triethyl Phosphorothioate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phorate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfotepp	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thionazin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals (mg/kg)										
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	8.04 J	6.27 J	10.8 J	5.3 J
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	117 J	151 J	101 J	115 J	142 J	142 J	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AVS / SEM (µmol/g)										
Cadmium	NA	NA	NA	NA	NA	NA	0.001 UJ	0.00099 UJ	0.00088 UJ	0.0011 UJ
Copper	NA	NA	NA	NA	NA	NA	0.321 J	0.217 J	0.231 J	0.27 J
Lead	NA	NA	NA	NA	NA	NA	0.0251 J	0.0152 J	0.0171 J	0.0155 J
Nickel	NA	NA	NA	NA	NA	NA	0.015 J	0.016 J	0.015 J	0.018 J
Silver	NA	NA	NA	NA	NA	NA	0.0021 UJ	0.0021 UJ	0.0018 UJ	0.0023 UJ
Zinc	NA	NA	NA	NA	NA	NA	0.226 J	0.25 J	0.238 J	0.259 J
Total SEM hg	NA	NA	NA	NA	NA	NA	0.59	0.50	0.50	0.56
Acid Volatile Sulfide	NA	NA	NA	NA	NA	NA	0.96 J	1.36 J	0.18 UJ	2.6 J
Conventionals										
pH (SU)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Percent Moisture (%)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Percent Solids (%)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD181	9SD182	9SD183	9SD117-14	9SD123-14	9SD184	9SD185	9SD186	9SD187	9SD188	9SD189	9SD190
Site ID	9SD181	9SD182	9SD183	9SD117-14	9SD123-14	9SD184	9SD185	9SD186	9SD187	9SD188	9SD189	9SD190
Sample Date	1/11/2011	1/11/2011	1/11/2011	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014
Sample Depth (ft bgs)	0 - 0.5	0 - 0.5	0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
Volatile Organics (µg/kg)												
1,1,1,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane (DBCP)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (EDB)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (cis)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichloropropene (cis)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichloropropene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichloro-2-butene (trans)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloro-1,3-butadiene (Chloroprene)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone (MBK)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Chloropropene (Allyl Chloride)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrolein	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Disulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromomethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methacrylate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Freon 11 (Trichlorofluoromethane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Freon-12 (Dichlorodifluoromethane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isobutyl Alcohol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Acrylonitrile	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD181	9SD182	9SD183	9SD117-14	9SD123-14	9SD184	9SD185	9SD186	9SD187	9SD188	9SD189	9SD190
Site ID	9SD181	9SD182	9SD183	9SD117-14	9SD123-14	9SD184	9SD185	9SD186	9SD187	9SD188	9SD189	9SD190
Sample Date	1/11/2011	1/11/2011	1/11/2011	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014
Sample Depth (ft bgs)	0 - 0.5	0 - 0.5	0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
Volatile Organics (µg/kg)(continued)												
Methyl Iodide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Methacrylate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Propionitrile (Ethyl Cyanide)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene (Ethenylbenzene)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene (PCE)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene (TCE)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes, total	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organics (µg/kg)												
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	NA	NA	NA	140 UJ	99 UJ	9.6 UJ	15 UJ	21 UJ	8.1 UJ	40 UJ	44 UJ	38 UJ
1,2,4-Trichlorobenzene	NA	NA	NA	200 UJ	140 UJ	13 UJ	21 UJ	29 UJ	11 UJ	55 UJ	62 UJ	53 UJ
1,2-Dichlorobenzene (o-)	NA	NA	NA	280 UJ	200 UJ	19 UJ	30 UJ	42 UJ	16 UJ	79 UJ	89 UJ	75 UJ
1,3,5-Trinitrobenzene (TNB)	NA	NA	NA	720 UJ	510 UJ	49 UJ	76 UJ	110 UJ	42 UJ	200 UJ	230 UJ	190 UJ
1,3-Dichlorobenzene (m-)	NA	NA	NA	240 UJ	170 UJ	16 UJ	25 UJ	36 UJ	14 UJ	67 UJ	75 UJ	64 UJ
1,3-Dinitrobenzene (m-)	NA	NA	NA	720 UJ	510 UJ	49 UJ	76 UJ	110 UJ	42 UJ	200 UJ	230 UJ	190 UJ
1,4-Dichlorobenzene (p-)	NA	NA	NA	220 UJ	160 UJ	15 UJ	23 UJ	33 UJ	13 UJ	63 UJ	70 UJ	59 UJ
1,4-Dioxane (p-)	NA	NA	NA	290 UJ	200 UJ	19 UJ	30 UJ	43 UJ	16 UJ	81 UJ	90 UJ	77 UJ
1,4-Naphthoquinone	NA	NA	NA	500 J	110 J	100 J	100 J	120 J	120 J	40 UJ	180 J	86 J
1,4-Phenylenediamine	NA	NA	NA	35000 UJ	25000 UJ	2400 UJ	3700 UJ	5300 UJ	2000 UJ	10000 UJ	11000 UJ	9500 UJ
1-Naphthylamine	NA	NA	NA	720 UJ	510 UJ	49 UJ	76 UJ	110 UJ	42 UJ	200 UJ	230 UJ	190 UJ
2,2'-Oxybis[1-chloropropane]	NA	NA	NA	310 UJ	220 UJ	21 UJ	32 UJ	46 UJ	18 UJ	87 UJ	97 UJ	82 UJ
2,3,4,6-Tetrachlorophenol	NA	NA	NA	140 UJ	99 UJ	9.6 UJ	15 UJ	21 UJ	8.1 UJ	40 UJ	44 UJ	38 UJ
2,4,5-Trichlorophenol	NA	NA	NA	320 UJ	230 UJ	22 UJ	34 UJ	48 UJ	19 UJ	91 UJ	100 UJ	87 UJ
2,4,6-Trichlorophenol	NA	NA	NA	340 UJ	240 UJ	23 UJ	35 UJ	50 UJ	19 UJ	95 UJ	110 UJ	90 UJ
2,4-Dichlorophenol	NA	NA	NA	310 UJ	220 UJ	21 UJ	32 UJ	46 UJ	18 UJ	87 UJ	97 UJ	82 UJ
2,4-Dimethylphenol	NA	NA	NA	320 UJ	230 UJ	22 UJ	34 UJ	48 UJ	19 UJ	91 UJ	100 UJ	87 UJ
2,4-Dinitrophenol	NA	NA	NA	1800 UJ	1300 UJ	120 UJ	190 UJ	270 UJ	100 R	500 UJ	570 UJ	480 UJ
2,4-Dinitrotoluene (DNT)	NA	NA	NA	320 UJ	230 UJ	22 UJ	34 UJ	48 UJ	18 UJ	90 UJ	100 UJ	86 UJ
2,6-Dichlorophenol	NA	NA	NA	140 UJ	99 UJ	9.6 UJ	15 UJ	21 UJ	8.1 UJ	40 UJ	44 UJ	38 UJ
2,6-Dinitrotoluene (DNT)	NA	NA	NA	340 UJ	240 UJ	23 UJ	35 UJ	50 UJ	19 UJ	95 UJ	110 UJ	90 UJ
2-Acetylaminofluorene	NA	NA	NA	1400 UJ	990 UJ	96 UJ	150 UJ	210 UJ	81 UJ	400 UJ	440 UJ	380 UJ
2-Chloronaphthalene	NA	NA	NA	260 UJ	180 UJ	17 UJ	27 UJ	38 UJ	15 UJ	72 UJ	81 UJ	69 UJ
2-Chlorophenol	NA	NA	NA	230 UJ	160 UJ	15 UJ	24 UJ	34 UJ	13 UJ	64 UJ	71 UJ	61 UJ
2-Methyl-5-nitroaniline	NA	NA	NA	720 UJ	510 UJ	49 UJ	76 UJ	110 UJ	42 UJ	200 UJ	230 UJ	190 UJ
2-Methylphenol (o-Cresol)	NA	NA	NA	270 UJ	190 UJ	18 UJ	28 UJ	40 UJ	16 UJ	76 UJ	85 UJ	72 UJ
2-Naphthylamine	NA	NA	NA	720 UJ	510 UJ	49 UJ	76 UJ	110 UJ	42 UJ	200 UJ	230 UJ	190 UJ
2-Nitroaniline	NA	NA	NA	300 UJ	210 UJ	20 UJ	31 UJ	44 UJ	17 UJ	84 UJ	94 UJ	80 UJ

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD181	9SD182	9SD183	9SD117-14	9SD123-14	9SD184	9SD185	9SD186	9SD187	9SD188	9SD189	9SD190
Site ID	9SD181	9SD182	9SD183	9SD117-14	9SD123-14	9SD184	9SD185	9SD186	9SD187	9SD188	9SD189	9SD190
Sample Date	1/11/2011	1/11/2011	1/11/2011	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014
Sample Depth (ft bgs)	0 - 0.5	0 - 0.5	0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
Semivolatile Organis (µg/kg)(continued)												
2-Nitrophenol	NA	NA	NA	250 UJ	170 UJ	17 UJ	26 UJ	37 UJ	14 UJ	70 UJ	78 UJ	66 UJ
2-Picoline	NA	NA	NA	140 UJ	99 UJ	9.6 UJ	15 UJ	21 UJ	8.1 UJ	40 UJ	44 UJ	38 UJ
3 & 4 Methylphenol	NA	NA	NA	310 UJ	220 UJ	21 UJ	33 UJ	46 UJ	18 UJ	88 UJ	98 UJ	83 UJ
3,3'-Dichlorobenzidine	NA	NA	NA	720 UJ	510 UJ	49 UJ	76 UJ	110 UJ	42 R	200 UJ	230 UJ	190 UJ
3,3'-Dimethylbenzidine	NA	NA	NA	2800 UJ	2000 UJ	190 UJ	300 UJ	420 UJ	160 UJ	790 UJ	890 UJ	750 UJ
3-Methylcholanthrene	NA	NA	NA	1400 UJ	990 UJ	96 UJ	150 UJ	210 UJ	81 UJ	400 UJ	440 UJ	380 UJ
3-Nitroaniline	NA	NA	NA	290 UJ	200 UJ	19 UJ	30 UJ	43 UJ	16 R	81 UJ	90 UJ	77 UJ
4,6-Dinitro-2-methylphenol	NA	NA	NA	720 UJ	510 UJ	49 UJ	76 UJ	110 UJ	42 UJ	200 UJ	230 UJ	190 UJ
4-Aminobiphenyl	NA	NA	NA	720 UJ	510 UJ	49 UJ	76 UJ	110 UJ	42 UJ	200 UJ	230 UJ	190 UJ
4-Bromophenyl-phenylether	NA	NA	NA	290 UJ	210 UJ	20 UJ	31 UJ	44 UJ	17 UJ	83 UJ	93 UJ	79 UJ
4-Chloro-3-methylphenol	NA	NA	NA	300 UJ	210 UJ	20 UJ	31 UJ	44 UJ	17 UJ	84 UJ	94 UJ	80 UJ
4-Chloroaniline	NA	NA	NA	220 UJ	160 UJ	15 UJ	23 UJ	33 UJ	13 R	63 UJ	70 UJ	59 UJ
4-Chlorophenyl-phenylether	NA	NA	NA	270 UJ	190 UJ	19 UJ	29 UJ	41 UJ	16 UJ	77 UJ	86 UJ	73 UJ
4-Dimethylaminoazobenzene (p-)	NA	NA	NA	720 UJ	510 UJ	49 UJ	76 UJ	110 UJ	42 UJ	200 UJ	230 UJ	190 UJ
4-Nitroaniline	NA	NA	NA	720 UJ	510 UJ	49 UJ	76 UJ	110 UJ	42 R	200 UJ	230 UJ	190 UJ
4-Nitrophenol	NA	NA	NA	3100 UJ	2200 UJ	210 UJ	330 UJ	460 UJ	180 UJ	880 UJ	980 UJ	830 UJ
4-Nitroquinoline-1-oxide	NA	NA	NA	1800 R	1300 R	120 R	190 R	270 R	100 R	500 R	570 R	480 R
7,12-Dimethylbenz(a)anthracene	NA	NA	NA	720 UJ	510 UJ	49 UJ	76 UJ	110 UJ	42 UJ	200 UJ	230 UJ	190 UJ
a,a-Dimethylphenethylamine	NA	NA	NA	14000 UJ	9900 UJ	960 UJ	1500 UJ	2100 UJ	810 UJ	4000 UJ	4400 UJ	3800 UJ
Acetophenone	NA	NA	NA	290 UJ	200 UJ	20 UJ	30 UJ	43 UJ	17 UJ	82 UJ	92 UJ	78 UJ
Aniline	NA	NA	NA	350 UJ	250 UJ	24 UJ	37 UJ	52 UJ	20 R	99 UJ	110 UJ	94 UJ
Aramite	NA	NA	NA	200 UJ	140 UJ	14 UJ	21 UJ	30 UJ	12 UJ	58 UJ	65 UJ	55 UJ
Benzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzoic Acid	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	NA	NA	NA	260 UJ	180 UJ	18 UJ	27 UJ	39 UJ	15 UJ	73 UJ	82 UJ	70 UJ
Bis(2-chloroethoxy)methane	NA	NA	NA	280 UJ	200 UJ	19 UJ	29 UJ	41 UJ	16 UJ	78 UJ	88 UJ	74 UJ
Bis(2-chloroethyl)ether	NA	NA	NA	280 UJ	200 UJ	19 UJ	29 UJ	41 UJ	16 UJ	78 UJ	88 UJ	74 UJ
Bis(2-ethylhexyl) Phthalate (BEHP)	NA	NA	NA	260 UJ	180 UJ	17 UJ	27 UJ	38 UJ	15 UJ	72 UJ	81 UJ	69 UJ
Butyl Benzyl Phthalate	NA	NA	NA	290 UJ	200 UJ	19 UJ	30 UJ	43 UJ	16 UJ	81 UJ	90 UJ	77 UJ
Cresol (Mixed Isomers)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diallate (total)	NA	NA	NA	240 UJ	170 UJ	16 UJ	25 UJ	36 UJ	14 UJ	67 UJ	75 UJ	64 UJ
Dibenzofuran	NA	NA	NA	290 UJ	200 UJ	19 UJ	30 UJ	43 UJ	16 UJ	81 UJ	90 UJ	77 UJ
Diethyl Phthalate (DEP)	NA	NA	NA	320 UJ	220 UJ	21 UJ	33 UJ	47 UJ	18 UJ	89 UJ	100 UJ	85 UJ
Dimethyl Phthalate	NA	NA	NA	320 UJ	230 UJ	22 UJ	34 UJ	48 UJ	18 UJ	90 UJ	100 UJ	86 UJ
Di-n-butyl Phthalate (DBP)	NA	NA	NA	720 UJ	510 UJ	49 UJ	76 UJ	110 UJ	42 UJ	200 UJ	230 UJ	190 UJ
Di-n-octyl Phthalate	NA	NA	NA	290 UJ	200 UJ	19 UJ	30 UJ	43 UJ	16 UJ	81 UJ	90 UJ	77 UJ
Dinoseb	NA	NA	NA	290 UJ	200 UJ	19 UJ	30 UJ	43 UJ	16 UJ	81 UJ	90 UJ	77 UJ
Diphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methane Sulfonate (EMS)	NA	NA	NA	330 UJ	230 UJ	23 UJ	35 UJ	50 UJ	19 UJ	94 UJ	110 UJ	89 UJ
Hexachloro-1,3-butadiene	NA	NA	NA	290 UJ	200 UJ	20 UJ	30 UJ	43 UJ	17 UJ	82 UJ	92 UJ	78 UJ
Hexachlorobenzene	NA	NA	NA	320 UJ	230 UJ	22 UJ	34 UJ	48 UJ	19 UJ	91 UJ	100 UJ	87 UJ
Hexachlorocyclopentadiene	NA	NA	NA	160 UJ	110 UJ	11 UJ	17 UJ	23 UJ	9.1 R	44 UJ	50 UJ	42 UJ
Hexachloroethane	NA	NA	NA	250 UJ	170 UJ	17 UJ	26 UJ	37 UJ	14 UJ	70 UJ	78 UJ	66 UJ

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SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD181	9SD182	9SD183	9SD117-14	9SD123-14	9SD184	9SD185	9SD186	9SD187	9SD188	9SD189	9SD190
Site ID	9SD181	9SD182	9SD183	9SD117-14	9SD123-14	9SD184	9SD185	9SD186	9SD187	9SD188	9SD189	9SD190
Sample Date	1/11/2011	1/11/2011	1/11/2011	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014
Sample Depth (ft bgs)	0 - 0.5	0 - 0.5	0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
Semivolatile Organis (µg/kg)(continued)												
Hexachlorophene	NA	NA	NA	100000 UJ	15000 UJ	6900 UJ	11000 R	15000 R	5900 UJ	29000 R	32000 R	27000 R
Hexachloropropene	NA	NA	NA	230 UJ	160 UJ	15 UJ	24 UJ	34 UJ	13 UJ	64 UJ	71 UJ	61 UJ
Isophorone	NA	NA	NA	300 UJ	210 UJ	20 UJ	31 UJ	44 UJ	17 UJ	84 UJ	94 UJ	80 UJ
Isosafrole	NA	NA	NA	140 UJ	99 UJ	9.6 UJ	15 UJ	21 UJ	8.1 UJ	40 UJ	44 UJ	38 UJ
Methapyrilene	NA	NA	NA	2900 UJ	2000 UJ	190 UJ	300 UJ	430 UJ	160 UJ	810 UJ	900 UJ	770 UJ
Methyl Methane Sulfonate	NA	NA	NA	160 UJ	110 UJ	11 UJ	17 UJ	24 UJ	9.4 UJ	46 UJ	51 UJ	43 UJ
Nitrobenzene	NA	NA	NA	280 UJ	200 UJ	19 UJ	30 UJ	42 UJ	16 UJ	79 UJ	89 UJ	75 UJ
n-Nitrosodiethylamine	NA	NA	NA	140 UJ	99 UJ	9.6 UJ	15 UJ	21 UJ	8.1 UJ	40 UJ	44 UJ	38 UJ
n-Nitrosodimethylamine (NDMA)	NA	NA	NA	810 UJ	570 UJ	55 UJ	85 UJ	120 UJ	47 UJ	230 UJ	260 UJ	220 UJ
n-Nitroso-di-n-butylamine	NA	NA	NA	720 UJ	510 UJ	49 UJ	76 UJ	110 UJ	42 UJ	200 UJ	230 UJ	190 UJ
n-Nitrosodi-n-propylamine	NA	NA	NA	320 UJ	230 UJ	22 UJ	34 UJ	48 UJ	18 UJ	90 UJ	100 UJ	86 UJ
n-Nitrosodiphenylamine	NA	NA	NA	260 UJ	180 UJ	18 UJ	27 UJ	39 UJ	15 UJ	73 UJ	82 UJ	70 UJ
n-Nitrosomethylethylamine	NA	NA	NA	140 UJ	99 UJ	9.6 UJ	15 UJ	21 UJ	8.1 UJ	40 UJ	44 UJ	38 UJ
n-Nitrosomorpholine	NA	NA	NA	190 UJ	140 UJ	13 UJ	20 UJ	29 UJ	11 UJ	54 UJ	61 UJ	51 UJ
n-Nitrosopiperidine	NA	NA	NA	140 UJ	100 UJ	9.8 UJ	15 UJ	22 UJ	8.4 UJ	41 UJ	46 UJ	39 UJ
n-Nitrosopyrrolidine	NA	NA	NA	150 UJ	110 UJ	10 UJ	16 UJ	23 UJ	8.9 UJ	43 UJ	49 UJ	41 UJ
o-Toluidine	NA	NA	NA	140 UJ	99 UJ	9.6 UJ	15 UJ	21 UJ	8.1 UJ	40 UJ	44 UJ	38 UJ
Pentachlorobenzene	NA	NA	NA	140 UJ	99 UJ	9.6 UJ	15 UJ	21 UJ	8.1 UJ	40 UJ	44 UJ	38 UJ
Pentachloronitrobenzene	NA	NA	NA	720 UJ	510 UJ	49 UJ	76 UJ	110 UJ	42 UJ	200 UJ	230 UJ	190 UJ
Pentachlorophenol	NA	NA	NA	720 UJ	510 UJ	49 UJ	76 UJ	110 UJ	42 UJ	200 UJ	230 UJ	190 UJ
Phenacetin	NA	NA	NA	720 UJ	510 UJ	49 UJ	76 UJ	110 UJ	42 UJ	200 UJ	230 UJ	190 UJ
Phenol	NA	NA	NA	280 UJ	200 UJ	21 J	29 UJ	41 UJ	16 UJ	78 UJ	88 UJ	74 UJ
Pronamide	NA	NA	NA	180 UJ	130 UJ	12 UJ	19 UJ	27 UJ	10 UJ	50 UJ	57 UJ	48 UJ
Pyridine	NA	NA	NA	850 UJ	600 UJ	58 UJ	89 UJ	130 UJ	49 UJ	240 UJ	270 UJ	230 UJ
Safrole	NA	NA	NA	140 UJ	99 UJ	9.6 UJ	15 UJ	21 UJ	8.1 UJ	40 UJ	44 UJ	38 UJ
PAHs (µg/kg)												
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	140 UJ	99 UJ	9.6 UJ	15 UJ	21 UJ	8.1 UJ	40 UJ	44 UJ	38 UJ
Acenaphthene	NA	NA	NA	140 UJ	99 UJ	9.6 UJ	15 UJ	21 UJ	8.1 UJ	40 UJ	44 UJ	38 UJ
Acenaphthylene	NA	NA	NA	140 UJ	99 UJ	9.6 UJ	15 UJ	21 UJ	8.1 UJ	40 UJ	44 UJ	38 UJ
Anthracene	NA	NA	NA	140 UJ	99 UJ	9.6 UJ	15 UJ	21 UJ	8.1 UJ	40 UJ	44 UJ	38 UJ
Benzo(a)anthracene	NA	NA	NA	140 UJ	99 UJ	9.6 UJ	15 UJ	21 UJ	8.1 UJ	40 UJ	44 UJ	38 UJ
Benzo(a)pyrene (BaP)	NA	NA	NA	140 UJ	99 UJ	9.6 UJ	15 UJ	21 UJ	8.1 UJ	40 UJ	44 UJ	38 UJ
Benzo(b)fluoranthene	NA	NA	NA	140 UJ	99 UJ	9.6 UJ	15 UJ	21 UJ	8.1 UJ	40 UJ	44 UJ	38 UJ
Benzo(g,h,i)perylene	NA	NA	NA	140 UJ	99 UJ	9.6 UJ	15 UJ	21 UJ	8.1 UJ	40 UJ	44 UJ	38 UJ
Benzo(k)fluoranthene	NA	NA	NA	140 UJ	99 UJ	9.6 UJ	15 UJ	21 UJ	8.1 UJ	40 UJ	44 UJ	38 UJ
Chrysene	NA	NA	NA	140 UJ	99 UJ	9.6 UJ	15 UJ	21 UJ	8.1 UJ	40 UJ	44 UJ	38 UJ
Dibenz(a,h)anthracene	NA	NA	NA	290 UJ	200 UJ	19 UJ	30 UJ	43 UJ	16 UJ	81 UJ	90 UJ	77 UJ
Fluoranthene	NA	NA	NA	140 UJ	99 UJ	9.6 UJ	15 UJ	21 UJ	8.1 UJ	40 UJ	44 UJ	38 UJ
Fluorene	NA	NA	NA	140 UJ	99 UJ	9.6 UJ	15 UJ	21 UJ	8.1 UJ	40 UJ	44 UJ	38 UJ
Indeno(1,2,3-cd)pyrene	NA	NA	NA	140 UJ	99 UJ	9.6 UJ	15 UJ	21 UJ	8.1 UJ	40 UJ	44 UJ	38 UJ
Naphthalene	NA	NA	NA	140 UJ	99 UJ	9.6 UJ	15 UJ	21 UJ	8.1 UJ	40 UJ	44 UJ	38 UJ
PAHs (µg/kg)(continued)												
Phenanthrene	NA	NA	NA	290 UJ	200 UJ	19 UJ	30 UJ	43 UJ	16 UJ	81 UJ	90 UJ	77 UJ
Pyrene	NA	NA	NA	140 UJ	99 UJ	9.6 UJ	15 UJ	21 UJ	8.1 UJ	40 UJ	44 UJ	38 UJ

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SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD181	9SD182	9SD183	9SD117-14	9SD123-14	9SD184	9SD185	9SD186	9SD187	9SD188	9SD189	9SD190
Site ID	9SD181	9SD182	9SD183	9SD117-14	9SD123-14	9SD184	9SD185	9SD186	9SD187	9SD188	9SD189	9SD190
Sample Date	1/11/2011	1/11/2011	1/11/2011	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014
Sample Depth (ft bgs)	0 - 0.5	0 - 0.5	0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
Organophosphorous Pesticide (µg/kg)												
Dimethoate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Disulfoton	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Famphur	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o,o,o-Triethyl Phosphorothioate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Parathion	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phorate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfotepp	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thionazin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals (mg/kg)												
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	7.43 J	6.95 J	7.25 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AVS / SEM (µmol/g)												
Cadmium	0.00081 UJ	0.002 UJ	0.0011 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	0.182 J	0.226 J	0.326 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	0.0124 J	0.028 J	0.0238 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	0.012 UJ	0.023 UJ	0.016 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	0.0017 UJ	0.003 UJ	0.0022 UJ	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	0.166 J	0.36 J	0.211 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total SEM hg	0.37	0.64	0.58	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acid Volatile Sulfide	2.7 J	9.4 J	1.7 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Conventionals												
pH (SU)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Percent Moisture (%)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Percent Solids (%)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD191	9SD192	9SD193	9SD194	9SD195	9SD196	9SD197	9SD198
Site ID	9SD191	9SD192	9SD193	9SD194	9SD195	9SD196	9SD197	9SD198
Sample Date	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
Volatile Organics (µg/kg)								
1,1,1,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane (DBCP)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane (EDB)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (cis)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (trans)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichloropropene (cis)	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichloropropene (trans)	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichloro-2-butene (trans)	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloro-1,3-butadiene (Chloroprene)	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone (MBK)	NA	NA	NA	NA	NA	NA	NA	NA
3-Chloropropene (Allyl Chloride)	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA
Acetonitrile	NA	NA	NA	NA	NA	NA	NA	NA
Acrolein	NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Disulfide	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA
Chloromethane	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA
Dibromomethane	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methacrylate	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA
Freon 11 (Trichlorofluoromethane)	NA	NA	NA	NA	NA	NA	NA	NA
Freon-12 (Dichlorodifluoromethane)	NA	NA	NA	NA	NA	NA	NA	NA
Isobutyl Alcohol	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Acrylonitrile	NA	NA	NA	NA	NA	NA	NA	NA

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SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD191	9SD192	9SD193	9SD194	9SD195	9SD196	9SD197	9SD198
Site ID	9SD191	9SD192	9SD193	9SD194	9SD195	9SD196	9SD197	9SD198
Sample Date	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
Volatile Organics (µg/kg)(continued)								
Methyl Iodide	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Methacrylate	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	NA	NA	NA	NA	NA	NA	NA	NA
Pentachloroethane	NA	NA	NA	NA	NA	NA	NA	NA
Propionitrile (Ethyl Cyanide)	NA	NA	NA	NA	NA	NA	NA	NA
Styrene (Ethenylbenzene)	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene (PCE)	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene (TCE)	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Acetate	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Chloride	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes, total	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organics (µg/kg)								
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	17 UJ	14 UJ	17 UJ	7 UJ	13 UJ	6.3 U	15 UJ	8.5 UJ
1,2,4-Trichlorobenzene	24 UJ	19 UJ	24 UJ	9.8 UJ	19 UJ	8.7 U	21 UJ	12 UJ
1,2-Dichlorobenzene (o-)	34 UJ	28 UJ	34 UJ	14 UJ	27 UJ	13 U	30 UJ	17 UJ
1,3,5-Trinitrobenzene (TNB)	87 UJ	71 UJ	88 UJ	36 UJ	69 UJ	32 U	77 UJ	44 UJ
1,3-Dichlorobenzene (m-)	29 UJ	23 UJ	29 UJ	12 UJ	23 UJ	11 U	25 UJ	14 UJ
1,3-Dinitrobenzene (m-)	87 UJ	71 UJ	88 UJ	36 UJ	69 UJ	32 U	77 UJ	44 UJ
1,4-Dichlorobenzene (p-)	27 UJ	22 UJ	27 UJ	11 UJ	21 UJ	9.9 U	23 UJ	13 UJ
1,4-Dioxane (p-)	34 UJ	28 UJ	35 UJ	14 UJ	27 UJ	13 U	30 UJ	17 UJ
1,4-Naphthoquinone	280 J	20 J	120 J	29 J	29 J	6.3 UJ	47 J	56 J
1,4-Phenylenediamine	4300 UJ	3500 UJ	4300 UJ	1800 UJ	3400 UJ	1600 UJ	3700 UJ	2100 UJ
1-Naphthylamine	87 UJ	71 UJ	88 UJ	36 UJ	69 UJ	32 U	77 UJ	44 UJ
2,2'-Oxybis[1-chloropropane]	37 UJ	30 UJ	37 UJ	15 UJ	29 UJ	14 U	32 UJ	19 UJ
2,3,4,6-Tetrachlorophenol	17 UJ	14 UJ	17 UJ	7 UJ	13 UJ	6.3 U	15 UJ	8.5 UJ
2,4,5-Trichlorophenol	39 UJ	32 UJ	40 UJ	16 UJ	31 UJ	14 U	34 UJ	20 UJ
2,4,6-Trichlorophenol	41 UJ	33 UJ	41 UJ	17 UJ	32 UJ	15 U	36 UJ	20 UJ
2,4-Dichlorophenol	37 UJ	30 UJ	37 UJ	15 UJ	29 UJ	14 U	32 UJ	19 UJ
2,4-Dimethylphenol	39 UJ	32 UJ	40 UJ	16 UJ	31 UJ	14 U	34 UJ	20 UJ
2,4-Dinitrophenol	220 UJ	180 UJ	220 UJ	90 UJ	170 UJ	80 U	190 UJ	110 UJ
2,4-Dinitrotoluene (DNT)	39 UJ	31 UJ	39 UJ	16 UJ	30 UJ	14 U	34 UJ	19 UJ
2,6-Dichlorophenol	17 UJ	14 UJ	17 UJ	7 UJ	13 UJ	6.3 U	15 UJ	8.5 UJ
2,6-Dinitrotoluene (DNT)	41 UJ	33 UJ	41 UJ	17 UJ	32 UJ	15 U	36 UJ	20 UJ
2-Acetylaminofluorene	170 UJ	140 UJ	170 UJ	70 UJ	130 UJ	63 U	150 UJ	85 UJ
2-Chloronaphthalene	31 UJ	25 UJ	31 UJ	13 UJ	24 UJ	11 U	27 UJ	16 UJ
2-Chlorophenol	27 UJ	22 UJ	28 UJ	11 UJ	21 UJ	10 U	24 UJ	14 UJ
2-Methyl-5-nitroaniline	87 UJ	71 UJ	88 UJ	36 UJ	69 UJ	32 U	77 UJ	44 UJ
2-Methylphenol (o-Cresol)	32 UJ	26 UJ	33 UJ	13 UJ	26 UJ	12 U	28 UJ	16 UJ
2-Naphthylamine	87 UJ	71 UJ	88 UJ	36 UJ	69 UJ	32 U	77 UJ	44 UJ
2-Nitroaniline	36 UJ	29 UJ	36 UJ	15 UJ	28 UJ	13 U	32 UJ	18 UJ

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SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD191	9SD192	9SD193	9SD194	9SD195	9SD196	9SD197	9SD198
Site ID	9SD191	9SD192	9SD193	9SD194	9SD195	9SD196	9SD197	9SD198
Sample Date	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
Semivolatile Organis (µg/kg)(continued)								
2-Nitrophenol	30 UJ	24 UJ	30 UJ	12 UJ	23 UJ	11 U	26 UJ	15 UJ
2-Picoline	17 UJ	14 UJ	17 UJ	7 UJ	13 UJ	6.3 U	15 UJ	8.5 UJ
3 & 4 Methylphenol	38 UJ	31 UJ	38 UJ	16 UJ	30 UJ	14 U	33 UJ	19 UJ
3,3'-Dichlorobenzidine	87 UJ	71 UJ	88 UJ	36 UJ	69 UJ	32 U	77 UJ	44 UJ
3,3'-Dimethylbenzidine	340 UJ	280 UJ	340 UJ	140 UJ	270 UJ	130 UJ	300 UJ	170 UJ
3-Methylcholanthrene	170 UJ	140 UJ	170 UJ	70 UJ	130 UJ	63 U	150 UJ	85 UJ
3-Nitroaniline	34 UJ	28 UJ	35 UJ	14 UJ	27 UJ	13 U	30 UJ	17 UJ
4,6-Dinitro-2-methylphenol	87 UJ	71 UJ	88 UJ	36 UJ	69 UJ	32 U	77 UJ	44 UJ
4-Aminobiphenyl	87 UJ	71 UJ	88 UJ	36 UJ	69 UJ	32 UJ	77 UJ	44 UJ
4-Bromophenyl-phenylether	35 UJ	29 UJ	36 UJ	15 UJ	28 UJ	13 U	31 UJ	18 UJ
4-Chloro-3-methylphenol	36 UJ	29 UJ	36 UJ	15 UJ	28 UJ	13 U	32 UJ	18 UJ
4-Chloroaniline	27 UJ	22 UJ	27 UJ	11 UJ	21 UJ	9.9 U	23 UJ	13 UJ
4-Chlorophenyl-phenylether	33 UJ	27 UJ	33 UJ	14 UJ	26 UJ	12 U	29 UJ	17 UJ
4-Dimethylaminoazobenzene (p-)	87 UJ	71 UJ	88 UJ	36 UJ	69 UJ	32 U	77 UJ	44 UJ
4-Nitroaniline	87 UJ	71 UJ	88 UJ	36 UJ	69 UJ	32 U	77 UJ	44 UJ
4-Nitrophenol	380 UJ	310 UJ	380 UJ	160 UJ	300 UJ	140 U	330 UJ	190 UJ
4-Nitroquinoline-1-oxide	220 R	180 R	220 R	90 R	170 R	80 R	190 R	110 R
7,12-Dimethylbenz(a)anthracene	87 UJ	71 UJ	88 UJ	36 UJ	69 UJ	32 U	77 UJ	44 UJ
a,a-Dimethylphenethylamine	1700 UJ	1400 UJ	1700 UJ	700 UJ	1300 UJ	630 U	1500 UJ	850 UJ
Acetophenone	35 UJ	28 UJ	35 UJ	15 UJ	28 UJ	13 U	31 UJ	18 UJ
Aniline	42 UJ	34 UJ	43 UJ	17 UJ	33 UJ	16 U	37 UJ	21 UJ
Aramite	25 UJ	20 UJ	25 UJ	10 UJ	19 UJ	9.1 U	22 UJ	12 UJ
Benzidine	NA	NA	NA	NA	NA	NA	NA	NA
Benzoic Acid	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	31 UJ	26 UJ	32 UJ	13 UJ	25 UJ	12 U	28 UJ	16 UJ
Bis(2-chloroethoxy)methane	33 UJ	27 UJ	34 UJ	14 UJ	26 UJ	12 U	29 UJ	17 UJ
Bis(2-chloroethyl)ether	33 UJ	27 UJ	34 UJ	14 UJ	26 UJ	12 U	29 UJ	17 UJ
Bis(2-ethylhexyl) Phthalate (BEHP)	31 UJ	25 UJ	31 UJ	13 UJ	24 UJ	11 U	27 UJ	16 UJ
Butyl Benzyl Phthalate	34 UJ	28 UJ	35 UJ	14 UJ	27 UJ	13 U	30 UJ	17 UJ
Cresol (Mixed Isomers)	NA	NA	NA	NA	NA	NA	NA	NA
Diallate (total)	29 UJ	23 UJ	29 UJ	12 UJ	23 UJ	11 U	25 UJ	14 UJ
Dibenzofuran	34 UJ	28 UJ	35 UJ	14 UJ	27 UJ	13 U	30 UJ	17 UJ
Diethyl Phthalate (DEP)	38 UJ	31 UJ	38 UJ	16 UJ	30 UJ	14 U	33 UJ	19 UJ
Dimethyl Phthalate	39 UJ	31 UJ	39 UJ	16 UJ	30 UJ	14 U	34 UJ	19 UJ
Di-n-butyl Phthalate (DBP)	87 UJ	71 UJ	88 UJ	36 UJ	69 UJ	32 U	77 UJ	44 UJ
Di-n-octyl Phthalate	34 UJ	28 UJ	35 UJ	14 UJ	27 UJ	13 U	30 UJ	17 UJ
Dinoseb	34 UJ	28 UJ	35 UJ	14 UJ	27 UJ	13 U	30 UJ	17 UJ
Diphenylamine	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl Methane Sulfonate (EMS)	40 UJ	33 UJ	41 UJ	17 UJ	32 UJ	15 U	35 UJ	20 UJ
Hexachloro-1,3-butadiene	35 UJ	28 UJ	35 UJ	15 UJ	28 UJ	13 U	31 UJ	18 UJ
Hexachlorobenzene	39 UJ	32 UJ	40 UJ	16 UJ	31 UJ	14 U	34 UJ	20 UJ
Hexachlorocyclopentadiene	19 UJ	15 UJ	19 UJ	7.9 UJ	15 UJ	7 U	17 UJ	9.6 UJ
Hexachloroethane	30 UJ	24 UJ	30 UJ	12 UJ	23 UJ	11 U	26 UJ	15 UJ

APPENDIX A

SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD191	9SD192	9SD193	9SD194	9SD195	9SD196	9SD197	9SD198
Site ID	9SD191	9SD192	9SD193	9SD194	9SD195	9SD196	9SD197	9SD198
Sample Date	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
Semivolatile Organis (µg/kg)(continued)								
Hexachlorophene	12000 UJ	10000 R	12000 R	5100 R	9700 UJ	4600 R	11000 R	6200 UJ
Hexachloropropene	27 UJ	22 UJ	28 UJ	11 UJ	21 UJ	10 U	24 UJ	14 UJ
Isophorone	36 UJ	29 UJ	36 UJ	15 UJ	28 UJ	13 U	32 UJ	18 UJ
Isosafrole	17 UJ	14 UJ	17 UJ	7 UJ	13 UJ	6.3 U	15 UJ	8.5 UJ
Methapyrilene	340 UJ	280 UJ	350 UJ	140 UJ	270 UJ	130 UJ	300 UJ	170 UJ
Methyl Methane Sulfonate	20 UJ	16 UJ	20 UJ	8.1 UJ	15 UJ	7.2 U	17 UJ	9.8 UJ
Nitrobenzene	34 UJ	28 UJ	34 UJ	14 UJ	27 UJ	13 U	30 UJ	17 UJ
n-Nitrosodiethylamine	17 UJ	14 UJ	17 UJ	7 UJ	13 UJ	6.3 U	15 UJ	8.5 UJ
n-Nitrosodimethylamine (NDMA)	98 UJ	79 UJ	99 UJ	41 UJ	77 UJ	36 UJ	86 UJ	49 UJ
n-Nitroso-di-n-butylamine	87 UJ	71 UJ	88 UJ	36 UJ	69 UJ	32 U	77 UJ	44 UJ
n-Nitrosodi-n-propylamine	39 UJ	31 UJ	39 UJ	16 UJ	30 UJ	14 U	34 UJ	19 UJ
n-Nitrosodiphenylamine	31 UJ	26 UJ	32 UJ	13 UJ	25 UJ	12 U	28 UJ	16 UJ
n-Nitrosomethylethylamine	17 UJ	14 UJ	17 UJ	7 UJ	13 UJ	6.3 U	15 UJ	8.5 UJ
n-Nitrosomorpholine	23 UJ	19 UJ	23 UJ	9.6 UJ	18 UJ	8.5 U	20 UJ	12 UJ
n-Nitrosopiperidine	17 UJ	14 UJ	18 UJ	7.3 UJ	14 UJ	6.5 U	15 UJ	8.8 UJ
n-Nitrosopyrrolidine	19 UJ	15 UJ	19 UJ	7.7 UJ	15 UJ	6.8 U	16 UJ	9.3 UJ
o-Toluidine	17 UJ	14 UJ	17 UJ	7 UJ	13 UJ	6.3 U	15 UJ	8.5 UJ
Pentachlorobenzene	17 UJ	14 UJ	17 UJ	7 UJ	13 UJ	6.3 U	15 UJ	8.5 UJ
Pentachloronitrobenzene	87 UJ	71 UJ	88 UJ	36 UJ	69 UJ	32 U	77 UJ	44 UJ
Pentachlorophenol	87 UJ	71 UJ	88 UJ	36 UJ	69 UJ	32 U	77 UJ	44 UJ
Phenacetin	87 UJ	71 UJ	88 UJ	36 UJ	69 UJ	32 U	77 UJ	44 UJ
Phenol	33 UJ	27 UJ	34 UJ	14 UJ	26 UJ	12 U	29 UJ	17 UJ
Pronamide	22 UJ	18 UJ	22 UJ	9 UJ	17 UJ	8 U	19 UJ	11 UJ
Pyridine	100 UJ	84 UJ	100 UJ	43 UJ	81 UJ	38 UJ	90 UJ	52 UJ
Safrole	17 UJ	14 UJ	17 UJ	7 UJ	13 UJ	6.3 U	15 U	8.5 UJ
PAHs (µg/kg)								
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	17 UJ	14 UJ	17 UJ	7 UJ	13 UJ	6.3 U	15 UJ	8.5 UJ
Acenaphthene	17 UJ	14 UJ	17 UJ	7 UJ	13 UJ	6.3 U	15 UJ	8.5 UJ
Acenaphthylene	17 UJ	14 UJ	17 UJ	7 UJ	13 UJ	6.3 U	15 UJ	8.5 UJ
Anthracene	17 UJ	14 UJ	17 UJ	7 UJ	13 UJ	6.3 U	15 UJ	8.5 UJ
Benzo(a)anthracene	17 UJ	14 UJ	17 UJ	7 UJ	21 J	6.3 U	15 UJ	8.5 UJ
Benzo(a)pyrene (BaP)	17 UJ	14 UJ	17 UJ	7 UJ	21 J	6.3 U	15 UJ	8.5 UJ
Benzo(b)fluoranthene	17 UJ	14 UJ	17 UJ	7 UJ	31 J	6.3 U	15 UJ	8.5 UJ
Benzo(g,h,i)perylene	17 UJ	14 UJ	17 UJ	7 UJ	13 UJ	6.3 U	15 UJ	8.5 UJ
Benzo(k)fluoranthene	17 UJ	14 UJ	17 UJ	7 UJ	17 J	6.3 U	9.3 J	8.5 UJ
Chrysene	17 UJ	14 UJ	17 UJ	7 UJ	21 UJ	6.3 U	15 UJ	15 UJ
Dibenz(a,h)anthracene	34 UJ	28 UJ	35 UJ	14 UJ	27 UJ	13 U	30 UJ	17 UJ
Fluoranthene	20 UJ	14 UJ	17 UJ	7.5 UJ	44 J	6.3 U	16 UJ	8.5 UJ
Fluorene	17 UJ	14 UJ	17 UJ	7 UJ	13 UJ	6.3 U	15 UJ	8.5 UJ
Indeno(1,2,3-cd)pyrene	17 UJ	14 UJ	17 UJ	7 UJ	13 UJ	6.3 U	15 UJ	8.5 UJ
Naphthalene	17 UJ	14 UJ	17 UJ	27 J	13 UJ	6.3 U	15 UJ	8.5 UJ
PAHs (µg/kg)(continued)								
Phenanthrene	34 UJ	28 UJ	35 UJ	5.7 J	30 J	4.6 U	15 UJ	17 UJ
Pyrene	23 UJ	14 UJ	17 UJ	7 UJ	45 J	6.3 U	17 UJ	8.5 UJ

APPENDIX A

SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Sample ID	9SD191	9SD192	9SD193	9SD194	9SD195	9SD196	9SD197	9SD198
Site ID	9SD191	9SD192	9SD193	9SD194	9SD195	9SD196	9SD197	9SD198
Sample Date	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014	1/15/2014
Sample Depth (ft bgs)	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
Organophosphorous Pesticide (µg/kg)								
Dimethoate	NA	NA	NA	NA	NA	NA	NA	NA
Disulfoton	NA	NA	NA	NA	NA	NA	NA	NA
Famphur	NA	NA	NA	NA	NA	NA	NA	NA
Methyl Parathion	NA	NA	NA	NA	NA	NA	NA	NA
o,o,o-Triethyl Phosphorothioate	NA	NA	NA	NA	NA	NA	NA	NA
Parathion	NA	NA	NA	NA	NA	NA	NA	NA
Phorate	NA	NA	NA	NA	NA	NA	NA	NA
Sulfotepp	NA	NA	NA	NA	NA	NA	NA	NA
Thionazin	NA	NA	NA	NA	NA	NA	NA	NA
Metals (mg/kg)								
Antimony	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA	NA	NA
Tin	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA
AVS / SEM (µmol/g)								
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA
Total SEM hg	NA	NA	NA	NA	NA	NA	NA	NA
Acid Volatile Sulfide	NA	NA	NA	NA	NA	NA	NA	NA
Conventionals								
pH (SU)	NA	NA	NA	NA	NA	NA	NA	NA
Ammonia (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA
Percent Moisture (%)	NA	NA	NA	NA	NA	NA	NA	NA
Percent Solids (%)	NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon (mg/kg)	NA	NA	NA	NA	NA	NA	NA	NA

APPENDIX A

SUMMARY OF ANALTYICAL RESULTS - SEDIMENT
SWMU 9 - AREA B TANK 214 AREA
SERA AND STEP 3A OF THE BERA
NAVAL ACTIVITY PUERTO RICO, CEIBA, PUERTO RICO

Notes/Qualifiers:

% - percent
AVS - Acid Volatile Sulfide
BERA - Baseline Ecological Risk Assessment
ft bgs - feet below ground surface
J - Estimated: The analyte was positively identified; the quantitation is an estimation.
µg/kg - microgram per kilogram
µmole/g - micromole per gram
mg/kg - milligram per kilogram
NA - Not Analzyed
PAHs - Polynuclear Aromatic Hydrocarbons
R - Rejected data; data is not usable.
SEM - Simultaneously Extracted Metals
SERA - Screening Level Ecological Risk Assessment
SU - Standard Unit
U - Non detected
UJ - Reported quantitation limit is qualified as estimated.

APPENDIX B

Equilibrium Partitioning Method

APPENDIX B

EQUILIBRIUM PARTITIONING APPROACH

The U.S. Environmental Protection Agency (USEPA, 1993) uses the equilibrium partitioning (EqP) approach to develop sediment quality criteria for nonionic organic chemicals. This approach was used in the screening level ecological risk assessment (SERA) for the Tank 214 Area to derive sediment screening values for those organic chemicals lacking literature-based, bulk sediment screening values.

There are three underlying assumptions to the derivation of sediment quality criteria using EqP. First, it is assumed that sediment toxicity correlates with the concentration of the chemical in the sediment pore water and not the bulk sediment concentration (i.e., the pore water concentration represents the bioavailable fraction). Second, partitioning between sediment pore water and bulk sediment is assumed to be dependent on the organic content of the sediment with little dependence upon other chemical or physical properties. Third, the EqP approach assumes that equilibrium has been attained between the sediment pore water concentration and the bulk sediment concentration.

The relationship between the concentration of a nonionic organic chemical in sediment pore water and bulk sediment is described by the partitioning coefficient, K_p (USEPA, 1993):

$$K_p = (C_s)/(C_{pw}) \quad \text{(Equation B-1)}$$

Where C_s is the concentration in bulk sediment and C_{pw} is the concentration in sediment pore water. For a given organic chemical, the partition coefficient can be derived by multiplying the fraction of organic carbon (f_{oc}) present in the sediment by the chemical's organic carbon partition coefficient (K_{oc}) (USEPA, 1993):

$$K_p = (f_{oc})(K_{oc}) \quad \text{(Equation B-2)}$$

Combining Equations B-1 and B-2 yields the following:

$$C_s = (K_{oc})(f_{oc})(C_{PW}) \quad \text{(Equation B-3)}$$

If the organic carbon content of the sediment is known, a site-specific sediment screening value (SDSV) can be calculated for a given organic chemical by setting C_{pw} equivalent to a conservative surface water screening value for that chemical (SWSV):

$$SDSV = (K_{oc})(f_{oc})(SWSV) \quad \text{(Equation B-4)}$$

In this equation, SDSV represents the concentration of the chemical in bulk sediment that, at equilibrium, will result in a sediment pore water concentration equal to the surface water screening value. Sediment concentrations less than SDSV would be protective of sediment-associated biota. The use of surface water screening values (i.e., criteria and toxicological benchmarks) in Equation B-4 assumes that the sensitivities of sediment-associated biota and the species typically tested to derive surface water screening values such as USEPA NAWQC (predominantly water column species) are similar. Furthermore, it assumes that levels of protection afforded by the surface water screening values are appropriate for sediment-associated biota. It is noted that the EqP approach can only be used if the total organic carbon (TOC) content in sediment is greater than 0.2 percent (i.e., 2,000 mg/kg). At TOC concentrations less

than 0.2 percent, other factors (e.g., particle size, sorption to nonorganic mineral fractions) become relatively more important (Jones et al., 1997 and USEPA, 1993).

Although the EqP approach was developed by the USEPA for nonionic organic chemicals (e.g. semi-volatile organic compounds [SVOCs]), this method was used to derive sediment screening values for all organic chemicals lacking bulk sediment screening values, including ionic organic chemicals (e.g., (volatile organic chemicals [VOCs]). Application of the EqP approach to ionic organic chemicals likely overestimates their pore water concentrations since adsorption mechanisms other than hydrophobicity may significantly increase the fraction of the chemical sorbed to sediment particles (Jones et al., 1997). The conservative nature of sediment quality benchmarks derived using EqP is documented in the literature (Fuschman, 2003). Regardless, application of the EqP approach to the development of sediment screening values for ionic chemicals is documented in the literature (USEPA, 1996 and Jones et al., 1997).

Seventy-six estuarine wetland sediment samples collected at the Tank 214 Area were analyzed for total organic carbon (TOC). TOC concentrations in these samples range from 34,000 mg/kg (9SD49) to 180,000 mg/kg (9SD50). The minimum measured TOC concentration (i.e., 34,000 mg/kg [f_{oc} = 0.034]) was used to derive the EqP-based sediment screening values listed in Table 5-3. The K_{oc} and surface water screening values used in the derivation of the EqP-based sediment screening values are those provided in Tables 4-2 and 5-2, respectively. It is noted that EqP-based sediment screening values could not be calculated for those organic chemicals that lack a surface water screening value.

Appendix B References

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U.S. Environmental Protection Agency (USEPA). 1993. Technical Basis for Deriving Sediment Quality Criteria for Nonionic Organic Contaminants for the Protection of Benthic Organisms by Using Equilibrium Partitioning. Office of Water, Washington, D.C. EPA-822-R-93-011.

USEPA. 1996. Ecotox Thresholds. Eco Update, Volume 3, Number 2. Office of Solid Waste and Emergency Response, Washington, D.C. EPA 540/F-95/038.

Jones, D.S., G.W. Suter II., and R.N. Hull. 1997. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Sediment-Associated Biota: 1997 revision. Oak Ridge National Laboratory, Oak Ridge, TN. ES/ER/TM-95/R4.

APPENDIX C

Identification of Bioaccumulative Chemicals

APPENDIX C

IDENTIFICATION OF BIOACCUMULATIVE CHEMICALS

Only those organic chemicals with a log octanol-water partition coefficient (K_{ow}) value greater than or equal to 3.0 was considered a bioaccumulative chemical. Justification for defining bioaccumulative organic chemicals as those with log K_{ow} values greater than or equal to 3.0 is provided below.

- The potential for organic chemicals to accumulate in organisms has been shown to correlate well with the K_{ow}. USEPA (1985), as sited in USEPA/ACOE (1998), recommends that only chemicals for which the log K_{ow} is greater than 3.5 be considered for evaluation of bioaccumulation potential since chemicals with log K_{ow} values less than 3.5 are not likely to bioaccumulate to a significant degree.

- Although organic chemicals with log K_{ow} values in the 2 to 7 range have at least some potential to bioconcentrate (Connell, 1990), significant bioconcentration does not generally occur for chemicals with log K_{ow} values less than 3.0 (Maki and Duthie, 1978) to 5.0 (Gobas and Mackay, 1990). Most work with bioconcentration (uptake from the surrounding medium, such as water) and bioaccumulation (uptake from all exposure routes, including via food) of organic chemicals has concerned chemicals with log K_{ow} values of 3.0 or more (USEPA, 1995a), since organic chemicals with lower log K_{ow} values generally have little potential for significant bioaccumulation.

- The USEPA has developed a number of scoring algorithms to evaluate the relative hazard of chemicals to human or ecological receptors. All of these algorithms have a component that addresses bioaccumulation potential. The evaluation of bioaccumulation potential is generally based on measured or estimated (using log K_{ow} values) BCFs or BAFs, or less commonly using log K_{ow} itself. For example, USEPA (1980) developed a bioaccumulation potential scoring system that considered organics with BCF values of less than 100 (equivalent to a log K_{ow} of approximately 3.0) to have negligible potential to bioaccumulate in aquatic food webs, while organic chemicals with BCFs in the 100 to 1,000 range (equivalent to log K_{ow} values of about 3.0 to 4.3) are considered to have low bioaccumulation potential. The more recent Scoring and Ranking Assessment Model (SCRAM), developed by EPA Region 5 for the Great Lakes, has similar bioaccumulation scoring cut-offs (USEPA, 2000).

- The proposed categorization of persistent, bioaccumulative, and toxic (PBT) chemicals under the Toxic Substances Control Act (TSCA) defines chemicals with a tendency to accumulate in organisms as those with a BCF or BAF of greater than 1,000 (Federal Register 63(192):53417; 10/5/98). Using the equation listed below (USEPA, 1995b), a BCF/BAF of 1,000 equates to a log K_{ow} value of approximately 4.3.

$$Log\ BCF = [(0.79)(log\ K_{ow}) - 0.40] \qquad \text{(Equation C-1)}$$

- The Beta Test Version 1.0 of the EPA Waste Minimization Prioritization Tool (WMPT), used to develop a list of PBTs for the Resource Conservation and Recovery Act (RCRA) program, defined organic chemicals with a low potential to bioaccumulate as those with log K_{ow} values of less than 3.5 and those with a high potential to bioaccumulate as those with log K_{ow} values greater than 5.0 (USEPA, 1998). The 1998 version of the EPA WMPT defines bioaccumulation potential based on BCF or BAF values (rather than on log K_{ow} values directly), with a scoring "fenceline" for organic chemicals with a low

bioaccumulation potential defined as a BCF or BAF of less than 250. Although the tool no longer uses log K_{ow} directly, log K_{ow} values can be used to estimate a BCF or BAF value. Using Equation C-1, a BCF/BAF of 250 equates to a log K_{ow} value of approximately 3.5.

- Garten and Trabalka (1983) have reviewed terrestrial food web data and concluded that only organic chemicals with log K_{ow} values greater than 3.5 have the potential to significantly bioaccumulate from food to birds to mammals.

The information listed above indicates that a log K_{ow} of 3.0 to 3.5 is a reasonable, non-arbitrary parameter value to use in defining an organic chemical with the potential to bioaccumulate. For conservatism, the low end (3.0) of this log K_{ow} range will be used to define a bioaccumulative organic chemical. Table 4-2 lists log K_{ow} values (range and recommended value) for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), including polynuclear aromatic hydrocarbons (PAHs), and organophosphorous pesticides that were analyzed for in abiotic media collected at the Tank 214 Area. Log K_{ow} values were obtained from the USEPA (1995c and 2012). The organic chemicals that will be evaluated in the dietary intake models are those with a log K_{ow} value of greater than or equal to 3.0. For those chemicals with a range of K_{ow} values, the maximum value in the log K_{ow} range will be used for this determination, not the recommended value.

Inorganic chemicals were not quantitatively screened for bioaccumulation potential since log K_{ow} values are not available for these chemicals. Although all Appendix IX metals are retained for evaluation in the upper trophic level food chain models, only mercury and selenium are known to biomagnify in food chains (in organic forms [Suter, 1993]) and only cadmium, copper, and zinc generally have the potential to bioaccumulate significantly. The other metals are retained by default.

Appendix C References

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APPENDIX D

ProUCL Calculations

UCL Statistics for Uncensored Full Data Sets: SWMU 9 Area B and Background Surface Soil
and
UCL Statistics for Data Sets with Non-Detects: SWMU 9 Area B and Background Surface Soil

Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Arsenic: Tank 214 Area Surface Soil

General Statistics

Total Number of Observations	47	Number of Distinct Observations	29
Number of Detects	37	Number of Non-Detects	10
Number of Distinct Detects	21	Number of Distinct Non-Detects	9
Minimum Detect	0.74	Minimum Non-Detect	0.44
Maximum Detect	23	Maximum Non-Detect	0.84
Variance Detects	12.7	Percent Non-Detects	21.28%
Mean Detects	2.068	SD Detects	3.564
Median Detects	1.4	CV Detects	1.723
Skewness Detects	5.938	Kurtosis Detects	35.79
Mean of Logged Detects	0.425	SD of Logged Detects	0.554

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.267	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.936	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.436	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.146	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	1.724	Standard Error of Mean	0.472
SD	3.188	95% KM (BCA) UCL	2.709
95% KM (t) UCL	2.516	95% KM (Percentile Bootstrap) UCL	2.672
95% KM (z) UCL	2.5	95% KM Bootstrap t UCL	4.929
90% KM Chebyshev UCL	3.139	95% KM Chebyshev UCL	3.78
97.5% KM Chebyshev UCL	4.669	99% KM Chebyshev UCL	6.416

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	5.2	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.762	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.315	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.147	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.808	k star (bias corrected MLE)	1.68
Theta hat (MLE)	1.144	Theta star (bias corrected MLE)	1.231
nu hat (MLE)	133.8	nu star (bias corrected)	124.3
MLE Mean (bias corrected)	2.068	MLE Sd (bias corrected)	1.596

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.292	nu hat (KM)	27.49
Approximate Chi Square Value (27.49, α)	16.53	Adjusted Chi Square Value (27.49, β)	16.26
95% Gamma Approximate KM-UCL (use when n>=50)	2.867	95% Gamma Adjusted KM-UCL (use when n<50)	2.915

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	1.63
Maximum	23	Median	1.3
SD	3.266	CV	2.003
k hat (MLE)	0.552	k star (bias corrected MLE)	0.531
Theta hat (MLE)	2.954	Theta star (bias corrected MLE)	3.071
nu hat (MLE)	51.88	nu star (bias corrected)	49.9
MLE Mean (bias corrected)	1.63	MLE Sd (bias corrected)	2.238
		Adjusted Level of Significance (β)	0.0449
Approximate Chi Square Value (49.90, α)	34.68	Adjusted Chi Square Value (49.90, β)	34.28
95% Gamma Approximate UCL (use when n>=50)	2.346	95% Gamma Adjusted UCL (use when n<50)	2.373

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.714	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.936	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.202	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.146	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	1.745	Mean in Log Scale	0.206
SD in Original Scale	3.215	SD in Log Scale	0.65
95% t UCL (assumes normality of ROS data)	2.532	95% Percentile Bootstrap UCL	2.676
95% BCA Bootstrap UCL	3.173	95% Bootstrap t UCL	5.109
95% H-UCL (Log ROS)	1.838		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.699	Mean in Log Scale	0.0966
SD in Original Scale	3.234	SD in Log Scale	0.81
95% t UCL (Assumes normality)	2.491	95% H-Stat UCL	1.975

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (BCA) UCL	2.709

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Arsenic: Background Surface Soil

General Statistics

Total Number of Observations	20	Number of Distinct Observations	18
Number of Detects	14	Number of Non-Detects	6
Number of Distinct Detects	13	Number of Distinct Non-Detects	6
Minimum Detect	0.21	Minimum Non-Detect	0.69
Maximum Detect	2.5	Maximum Non-Detect	1.8
Variance Detects	0.515	Percent Non-Detects	30%
Mean Detects	1.474	SD Detects	0.718
Median Detects	1.5	CV Detects	0.487
Skewness Detects	-0.399	Kurtosis Detects	-0.778
Mean of Logged Detects	0.204	SD of Logged Detects	0.735

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.955	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.874	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.104	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.237	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	1.172	Standard Error of Mean	0.182
SD	0.757	95% KM (BCA) UCL	1.469
95% KM (t) UCL	1.486	95% KM (Percentile Bootstrap) UCL	1.463
95% KM (z) UCL	1.471	95% KM Bootstrap t UCL	1.479
90% KM Chebyshev UCL	1.717	95% KM Chebyshev UCL	1.964
97.5% KM Chebyshev UCL	2.307	99% KM Chebyshev UCL	2.981

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.644	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.743	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.179	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.231	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	2.871	k star (bias corrected MLE)	2.303
Theta hat (MLE)	0.513	Theta star (bias corrected MLE)	0.64
nu hat (MLE)	80.38	nu star (bias corrected)	64.49
MLE Mean (bias corrected)	1.474	MLE Sd (bias corrected)	0.971

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	2.398	nu hat (KM)	95.92
Approximate Chi Square Value (95.92, α)	74.33	Adjusted Chi Square Value (95.92, β)	72.83
95% Gamma Approximate KM-UCL (use when n>=50)	1.512	95% Gamma Adjusted KM-UCL (use when n<50)	1.544

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.21	Mean	1.223
Maximum	2.5	Median	1.15
SD	0.713	CV	0.583
k hat (MLE)	2.712	k star (bias corrected MLE)	2.339
Theta hat (MLE)	0.451	Theta star (bias corrected MLE)	0.523
nu hat (MLE)	108.5	nu star (bias corrected)	93.54
MLE Mean (bias corrected)	1.223	MLE Sd (bias corrected)	0.8
		Adjusted Level of Significance (β)	0.038
Approximate Chi Square Value (93.54, α)	72.24	Adjusted Chi Square Value (93.54, β)	70.76
95% Gamma Approximate UCL (use when n>=50)	1.584	95% Gamma Adjusted UCL (use when n<50)	1.617

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.831	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.874	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.227	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.237	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	1.183	Mean in Log Scale	-0.0656
SD in Original Scale	0.75	SD in Log Scale	0.743
95% t UCL (assumes normality of ROS data)	1.473	95% Percentile Bootstrap UCL	1.449
95% BCA Bootstrap UCL	1.459	95% Bootstrap t UCL	1.506
95% H-UCL (Log ROS)	1.823		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-0.134	95% H-UCL (KM -Log)	1.989
KM SD (logged)	0.843	95% Critical H Value (KM-Log)	2.415
KM Standard Error of Mean (logged)	0.222		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	1.177	Mean in Log Scale	-0.0942
SD in Original Scale	0.762	SD in Log Scale	0.788
95% t UCL (Assumes normality)	1.471	95% H-Stat UCL	1.898

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	1.486	95% KM (Percentile Bootstrap) UCL	1.463

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Beryllium: Tank 214 Area Surface Soil

General Statistics

Total Number of Observations	45	Number of Distinct Observations	20
		Number of Missing Observations	0
Minimum	0.11	Mean	0.213
Maximum	0.47	Median	0.18
SD	0.0906	Std. Error of Mean	0.0135
Coefficient of Variation	0.425	Skewness	1.114

Normal GOF Test

Shapiro Wilk Test Statistic	0.869	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.945	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.18	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.132	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.236	95% Adjusted-CLT UCL (Chen-1995)	0.238
		95% Modified-t UCL (Johnson-1978)	0.236

Gamma GOF Test

A-D Test Statistic	1.237	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.752	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.146	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.132	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	6.528	k star (bias corrected MLE)	6.107
Theta hat (MLE)	0.0326	Theta star (bias corrected MLE)	0.0349
nu hat (MLE)	587.5	nu star (bias corrected)	549.7
MLE Mean (bias corrected)	0.213	MLE Sd (bias corrected)	0.0862
		Approximate Chi Square Value (0.05)	496.3
Adjusted Level of Significance	0.0447	Adjusted Chi Square Value	494.6

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	0.236	95% Adjusted Gamma UCL (use when n<50)	0.237

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.929	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.945	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.125	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.132	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-2.207	Mean of logged Data	-1.624
Maximum of Logged Data	-0.755	SD of logged Data	0.391

Assuming Lognormal Distribution

95% H-UCL	0.237	90% Chebyshev (MVUE) UCL	0.251
95% Chebyshev (MVUE) UCL	0.268	97.5% Chebyshev (MVUE) UCL	0.292
99% Chebyshev (MVUE) UCL	0.339		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	0.235	95% Jackknife UCL	0.236
95% Standard Bootstrap UCL	0.236	95% Bootstrap-t UCL	0.24
95% Hall's Bootstrap UCL	0.238	95% Percentile Bootstrap UCL	0.236
95% BCA Bootstrap UCL	0.237		
90% Chebyshev(Mean, Sd) UCL	0.254	95% Chebyshev(Mean, Sd) UCL	0.272
97.5% Chebyshev(Mean, Sd) UCL	0.298	99% Chebyshev(Mean, Sd) UCL	0.348

Suggested UCL to Use

95% Student's-t UCL	0.236	or 95% Modified-t UCL	0.236

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Beryllium: Background Surface Soil

General Statistics

Total Number of Observations	18	Number of Distinct Observations	15
Number of Detects	7	Number of Non-Detects	11
Number of Distinct Detects	7	Number of Distinct Non-Detects	10
Minimum Detect	0.085	Minimum Non-Detect	0.04
Maximum Detect	0.58	Maximum Non-Detect	0.37
Variance Detects	0.0336	Percent Non-Detects	61.11%
Mean Detects	0.352	SD Detects	0.183
Median Detects	0.36	CV Detects	0.521
Skewness Detects	-0.391	Kurtosis Detects	-1.185
Mean of Logged Detects	-1.217	SD of Logged Detects	0.708

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.948	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.151	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.335	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.191	Standard Error of Mean	0.0477
SD	0.174	95% KM (BCA) UCL	0.275
95% KM (t) UCL	0.274	95% KM (Percentile Bootstrap) UCL	0.267
95% KM (z) UCL	0.27	95% KM Bootstrap t UCL	0.269
90% KM Chebyshev UCL	0.334	95% KM Chebyshev UCL	0.399
97.5% KM Chebyshev UCL	0.489	99% KM Chebyshev UCL	0.666

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.401	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.712	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.226	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.314	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	3.045	k star (bias corrected MLE)	1.835
Theta hat (MLE)	0.116	Theta star (bias corrected MLE)	0.192
nu hat (MLE)	42.62	nu star (bias corrected)	25.69
MLE Mean (bias corrected)	0.352	MLE Sd (bias corrected)	0.26

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	1.207	nu hat (KM)	43.44
Approximate Chi Square Value (43.44, α)	29.33	Adjusted Chi Square Value (43.44, β)	28.22
95% Gamma Approximate KM-UCL (use when n>=50)	0.283	95% Gamma Adjusted KM-UCL (use when n<50)	0.294

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.179
Maximum	0.58	Median	0.0864
SD	0.181	CV	1.013
k hat (MLE)	1.124	k star (bias corrected MLE)	0.974
Theta hat (MLE)	0.159	Theta star (bias corrected MLE)	0.184
nu hat (MLE)	40.47	nu star (bias corrected)	35.05
MLE Mean (bias corrected)	0.179	MLE Sd (bias corrected)	0.182
		Adjusted Level of Significance (β)	0.0357
Approximate Chi Square Value (35.05, α)	22.51	Adjusted Chi Square Value (35.05, β)	21.55
95% Gamma Approximate UCL (use when n>=50)	0.279	95% Gamma Adjusted UCL (use when n<50)	0.291

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.872	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.258	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.335	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.19	Mean in Log Scale	-1.988
SD in Original Scale	0.173	SD in Log Scale	0.793
95% t UCL (assumes normality of ROS data)	0.261	95% Percentile Bootstrap UCL	0.258
95% BCA Bootstrap UCL	0.268	95% Bootstrap t UCL	0.293
95% H-UCL (Log ROS)	0.295		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-2.075	95% H-UCL (KM -Log)	0.339
KM SD (logged)	0.924	95% Critical H Value (KM-Log)	2.529
KM Standard Error of Mean (logged)	0.306		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.213	Mean in Log Scale	-1.848
SD in Original Scale	0.164	SD in Log Scale	0.851
95% t UCL (Assumes normality)	0.28	95% H-Stat UCL	0.373

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.274	95% KM (Percentile Bootstrap) UCL	0.267

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Cadmium: Tank 214 Area Surface Soil

General Statistics

Total Number of Observations	47	Number of Distinct Observations	38
Number of Detects	36	Number of Non-Detects	11
Number of Distinct Detects	29	Number of Distinct Non-Detects	10
Minimum Detect	0.048	Minimum Non-Detect	0.04
Maximum Detect	1.8	Maximum Non-Detect	0.37
Variance Detects	0.139	Percent Non-Detects	23.4%
Mean Detects	0.52	SD Detects	0.373
Median Detects	0.49	CV Detects	0.716
Skewness Detects	1.087	Kurtosis Detects	2.426
Mean of Logged Detects	-0.99	SD of Logged Detects	0.944

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.91	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.935	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.103	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.148	Detected Data appear Normal at 5% Significance Level

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.412	Standard Error of Mean	0.0559
SD	0.377	95% KM (BCA) UCL	0.505
95% KM (t) UCL	0.506	95% KM (Percentile Bootstrap) UCL	0.508
95% KM (z) UCL	0.504	95% KM Bootstrap t UCL	0.518
90% KM Chebyshev UCL	0.579	95% KM Chebyshev UCL	0.655
97.5% KM Chebyshev UCL	0.761	99% KM Chebyshev UCL	0.968

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.895	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.765	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.168	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.149	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.632	k star (bias corrected MLE)	1.514
Theta hat (MLE)	0.319	Theta star (bias corrected MLE)	0.344
nu hat (MLE)	117.5	nu star (bias corrected)	109
MLE Mean (bias corrected)	0.52	MLE Sd (bias corrected)	0.423

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	1.19	nu hat (KM)	111.9
Approximate Chi Square Value (111.90, α)	88.48	Adjusted Chi Square Value (111.90, β)	87.82
95% Gamma Approximate KM-UCL (use when n>=50)	0.521	95% Gamma Adjusted KM-UCL (use when n<50)	0.525

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.409
Maximum	1.8	Median	0.42
SD	0.385	CV	0.941
k hat (MLE)	0.839	k star (bias corrected MLE)	0.8
Theta hat (MLE)	0.487	Theta star (bias corrected MLE)	0.511
nu hat (MLE)	78.89	nu star (bias corrected)	75.19
MLE Mean (bias corrected)	0.409	MLE Sd (bias corrected)	0.457
		Adjusted Level of Significance (β)	0.0449
Approximate Chi Square Value (75.19, α)	56.22	Adjusted Chi Square Value (75.19, β)	55.7
95% Gamma Approximate UCL (use when n>=50)	0.546	95% Gamma Adjusted UCL (use when n<50)	0.552

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.901	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.935	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.218	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.148	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.415	Mean in Log Scale	-1.397
SD in Original Scale	0.378	SD in Log Scale	1.123
95% t UCL (assumes normality of ROS data)	0.507	95% Percentile Bootstrap UCL	0.513
95% BCA Bootstrap UCL	0.512	95% Bootstrap t UCL	0.514
95% H-UCL (Log ROS)	0.699		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.413	Mean in Log Scale	-1.475
SD in Original Scale	0.381	SD in Log Scale	1.255
95% t UCL (Assumes normality)	0.506	95% H-Stat UCL	0.817

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.506	95% KM (Percentile Bootstrap) UCL	0.508

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Cadmium: Background Surface Soil

General Statistics

Total Number of Observations	20	Number of Distinct Observations	16
Number of Detects	7	Number of Non-Detects	13
Number of Distinct Detects	7	Number of Distinct Non-Detects	11
Minimum Detect	0.18	Minimum Non-Detect	0.059
Maximum Detect	0.92	Maximum Non-Detect	1.2
Variance Detects	0.0965	Percent Non-Detects	65%
Mean Detects	0.397	SD Detects	0.311
Median Detects	0.25	CV Detects	0.782
Skewness Detects	1.266	Kurtosis Detects	-0.373
Mean of Logged Detects	-1.146	SD of Logged Detects	0.683

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.722	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.373	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.335	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.221	Standard Error of Mean	0.062
SD	0.234	95% KM (BCA) UCL	0.323
95% KM (t) UCL	0.329	95% KM (Percentile Bootstrap) UCL	0.329
95% KM (z) UCL	0.323	95% KM Bootstrap t UCL	0.407
90% KM Chebyshev UCL	0.407	95% KM Chebyshev UCL	0.492
97.5% KM Chebyshev UCL	0.608	99% KM Chebyshev UCL	0.838

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.9	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.714	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.347	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.315	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	2.395	k star (bias corrected MLE)	1.464
Theta hat (MLE)	0.166	Theta star (bias corrected MLE)	0.271
nu hat (MLE)	33.54	nu star (bias corrected)	20.5
MLE Mean (bias corrected)	0.397	MLE Sd (bias corrected)	0.328

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.895	nu hat (KM)	35.81
Approximate Chi Square Value (35.81, α)	23.11	Adjusted Chi Square Value (35.81, β)	22.31
95% Gamma Approximate KM-UCL (use when n>=50)	0.343	95% Gamma Adjusted KM-UCL (use when n<50)	0.355

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.162
Maximum	0.92	Median	0.0585
SD	0.25	CV	1.545
k hat (MLE)	0.601	k star (bias corrected MLE)	0.544
Theta hat (MLE)	0.27	Theta star (bias corrected MLE)	0.298
nu hat (MLE)	24.02	nu star (bias corrected)	21.75
MLE Mean (bias corrected)	0.162	MLE Sd (bias corrected)	0.22
		Adjusted Level of Significance (β)	0.038
Approximate Chi Square Value (21.75, α)	12.15	Adjusted Chi Square Value (21.75, β)	11.59
95% Gamma Approximate UCL (use when n>=50)	0.29	95% Gamma Adjusted UCL (use when n<50)	0.304

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.786	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.309	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.335	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.21	Mean in Log Scale	-1.872
SD in Original Scale	0.226	SD in Log Scale	0.722
95% t UCL (assumes normality of ROS data)	0.298	95% Percentile Bootstrap UCL	0.296
95% BCA Bootstrap UCL	0.324	95% Bootstrap t UCL	0.505
95% H-UCL (Log ROS)	0.291		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-1.909	95% H-UCL (KM -Log)	0.345
KM SD (logged)	0.856	95% Critical H Value (KM-Log)	2.433
KM Standard Error of Mean (logged)	0.264		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.257	Mean in Log Scale	-1.783
SD in Original Scale	0.249	SD in Log Scale	0.987
95% t UCL (Assumes normality)	0.353	95% H-Stat UCL	0.494

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.329	95% KM (% Bootstrap) UCL	0.329

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Cobalt: Tank 214 Area Surface Soil

General Statistics

Total Number of Observations	44	Number of Distinct Observations	25
		Number of Missing Observations	0
Minimum	5.5	Mean	21.52
Maximum	57	Median	21
SD	8.872	Std. Error of Mean	1.338
Coefficient of Variation	0.412	Skewness	1.557

Normal GOF Test

Shapiro Wilk Test Statistic	0.885	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.944	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.166	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.134	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	23.77	95% Adjusted-CLT UCL (Chen-1995)	24.06
		95% Modified-t UCL (Johnson-1978)	23.82

Gamma GOF Test

A-D Test Statistic	1.071	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.752	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.14	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.134	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	6.259	k star (bias corrected MLE)	5.848
Theta hat (MLE)	3.438	Theta star (bias corrected MLE)	3.68
nu hat (MLE)	550.8	nu star (bias corrected)	514.6
MLE Mean (bias corrected)	21.52	MLE Sd (bias corrected)	8.9
		Approximate Chi Square Value (0.05)	463
Adjusted Level of Significance	0.0445	Adjusted Chi Square Value	461.3

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	23.92	95% Adjusted Gamma UCL (use when n<50)	24.01

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.932	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.944	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.167	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.134	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.705	Mean of logged Data	2.987
Maximum of Logged Data	4.043	SD of logged Data	0.426

Assuming Lognormal Distribution

95% H-UCL	24.49	90% Chebyshev (MVUE) UCL	25.99
95% Chebyshev (MVUE) UCL	27.94	97.5% Chebyshev (MVUE) UCL	30.66
99% Chebyshev (MVUE) UCL	36		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	23.72	95% Jackknife UCL	23.77
95% Standard Bootstrap UCL	23.68	95% Bootstrap-t UCL	24.07
95% Hall's Bootstrap UCL	25.04	95% Percentile Bootstrap UCL	23.8
95% BCA Bootstrap UCL	23.97		
90% Chebyshev(Mean, Sd) UCL	25.54	95% Chebyshev(Mean, Sd) UCL	27.35
97.5% Chebyshev(Mean, Sd) UCL	29.88	99% Chebyshev(Mean, Sd) UCL	34.83

Suggested UCL to Use

95% Student's-t UCL	23.77	or 95% Modified-t UCL	23.82

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Cobalt: Background Surface Soil

General Statistics

Total Number of Observations	19	Number of Distinct Observations	18
		Number of Missing Observations	0
Minimum	9.5	Mean	22.84
Maximum	50.2	Median	21.2
SD	11.7	Std. Error of Mean	2.685
Coefficient of Variation	0.512	Skewness	1.14

Normal GOF Test

Shapiro Wilk Test Statistic	0.875	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.901	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.194	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.203	Data appear Normal at 5% Significance Level

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	27.5	95% Adjusted-CLT UCL (Chen-1995)	28.01
		95% Modified-t UCL (Johnson-1978)	27.61

Gamma GOF Test

A-D Test Statistic	0.456	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.744	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.185	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.199	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	4.554	k star (bias corrected MLE)	3.87
Theta hat (MLE)	5.016	Theta star (bias corrected MLE)	5.903
nu hat (MLE)	173	nu star (bias corrected)	147.1
MLE Mean (bias corrected)	22.84	MLE Sd (bias corrected)	11.61
		Approximate Chi Square Value (0.05)	120
Adjusted Level of Significance	0.0369	Adjusted Chi Square Value	117.9

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	27.99	95% Adjusted Gamma UCL (use when n<50)	28.49

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.954	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.901	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.165	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.203	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.251	Mean of logged Data	3.015
Maximum of Logged Data	3.916	SD of logged Data	0.484

Assuming Lognormal Distribution

95% H-UCL	28.78	90% Chebyshev (MVUE) UCL	30.61
95% Chebyshev (MVUE) UCL	34.16	97.5% Chebyshev (MVUE) UCL	39.09
99% Chebyshev (MVUE) UCL	48.77		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	27.26	95% Jackknife UCL	27.5
95% Standard Bootstrap UCL	27	95% Bootstrap-t UCL	28.79
95% Hall's Bootstrap UCL	29.25	95% Percentile Bootstrap UCL	27.24
95% BCA Bootstrap UCL	27.79		
90% Chebyshev(Mean, Sd) UCL	30.9	95% Chebyshev(Mean, Sd) UCL	34.55
97.5% Chebyshev(Mean, Sd) UCL	39.61	99% Chebyshev(Mean, Sd) UCL	49.56

Suggested UCL to Use

95% Student's-t UCL	27.5

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Chromium: Tanke 214 Area Surface Soil

General Statistics

Total Number of Observations	48	Number of Distinct Observations	38
		Number of Missing Observations	0
Minimum	2.5	Mean	8.194
Maximum	37	Median	6.9
SD	5.643	Std. Error of Mean	0.814
Coefficient of Variation	0.689	Skewness	3.317

Normal GOF Test

Shapiro Wilk Test Statistic	0.695	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.947	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.205	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.128	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	9.56	95% Adjusted-CLT UCL (Chen-1995)	9.95
		95% Modified-t UCL (Johnson-1978)	9.625

Gamma GOF Test

A-D Test Statistic	1.012	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.755	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.119	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.129	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	3.599	k star (bias corrected MLE)	3.388
Theta hat (MLE)	2.276	Theta star (bias corrected MLE)	2.418
nu hat (MLE)	345.6	nu star (bias corrected)	325.3
MLE Mean (bias corrected)	8.194	MLE Sd (bias corrected)	4.451
		Approximate Chi Square Value (0.05)	284.5
Adjusted Level of Significance	0.045	Adjusted Chi Square Value	283.3

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	9.368	95% Adjusted Gamma UCL (use when n<50)	9.407

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.965	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.947	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0896	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.128	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.916	Mean of logged Data	1.958
Maximum of Logged Data	3.611	SD of logged Data	0.509

Assuming Lognormal Distribution

95% H-UCL	9.284	90% Chebyshev (MVUE) UCL	9.906
95% Chebyshev (MVUE) UCL	10.75	97.5% Chebyshev (MVUE) UCL	11.92
99% Chebyshev (MVUE) UCL	14.22		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	9.533	95% Jackknife UCL	9.56
95% Standard Bootstrap UCL	9.512	95% Bootstrap-t UCL	10.43
95% Hall's Bootstrap UCL	16.19	95% Percentile Bootstrap UCL	9.65
95% BCA Bootstrap UCL	9.977		
90% Chebyshev(Mean, Sd) UCL	10.64	95% Chebyshev(Mean, Sd) UCL	11.74
97.5% Chebyshev(Mean, Sd) UCL	13.28	99% Chebyshev(Mean, Sd) UCL	16.3

Suggested UCL to Use

95% Adjusted Gamma UCL	9.407

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Chromium: Background Surface Soil

General Statistics

Total Number of Observations	20	Number of Distinct Observations	18
		Number of Missing Observations	0
Minimum	5.9	Mean	25.69
Maximum	47	Median	29.95
SD	12.22	Std. Error of Mean	2.733
Coefficient of Variation	0.476	Skewness	-0.153

Normal GOF Test

Shapiro Wilk Test Statistic	0.922	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.905	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.185	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.198	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	30.42	95% Adjusted-CLT UCL (Chen-1995)	30.09
		95% Modified-t UCL (Johnson-1978)	30.4

Gamma GOF Test

A-D Test Statistic	1.052	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.746	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.231	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.195	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	3.603	k star (bias corrected MLE)	3.096
Theta hat (MLE)	7.131	Theta star (bias corrected MLE)	8.299
nu hat (MLE)	144.1	nu star (bias corrected)	123.8
MLE Mean (bias corrected)	25.69	MLE Sd (bias corrected)	14.6
		Approximate Chi Square Value (0.05)	99.13
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	97.38

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	32.09	95% Adjusted Gamma UCL (use when n<50)	32.67

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.873	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.905	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.239	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.198	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.775	Mean of logged Data	3.101
Maximum of Logged Data	3.85	SD of logged Data	0.601

Assuming Lognormal Distribution

95% H-UCL	35.66	90% Chebyshev (MVUE) UCL	37.5
95% Chebyshev (MVUE) UCL	42.55	97.5% Chebyshev (MVUE) UCL	49.57
99% Chebyshev (MVUE) UCL	63.35		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	30.19	95% Jackknife UCL	30.42
95% Standard Bootstrap UCL	30.04	95% Bootstrap-t UCL	30.26
95% Hall's Bootstrap UCL	30.03	95% Percentile Bootstrap UCL	29.95
95% BCA Bootstrap UCL	29.84		
90% Chebyshev(Mean, Sd) UCL	33.89	95% Chebyshev(Mean, Sd) UCL	37.6
97.5% Chebyshev(Mean, Sd) UCL	42.76	99% Chebyshev(Mean, Sd) UCL	52.88

Suggested UCL to Use

95% Student's-t UCL	30.42

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Copper: Tank 214 Area Surface Soil

General Statistics

Total Number of Observations	42	Number of Distinct Observations	26
		Number of Missing Observations	0
Minimum	51	Mean	89.86
Maximum	170	Median	88.5
SD	21.43	Std. Error of Mean	3.306
Coefficient of Variation	0.238	Skewness	1.215

Normal GOF Test

Shapiro Wilk Test Statistic	0.884	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.942	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.106	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.137	Data appear Normal at 5% Significance Level

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	95.42	95% Adjusted-CLT UCL (Chen-1995)	95.96
		95% Modified-t UCL (Johnson-1978)	95.52

Gamma GOF Test

A-D Test Statistic	0.419	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.747	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0877	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.136	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	19.58	k star (bias corrected MLE)	18.2
Theta hat (MLE)	4.588	Theta star (bias corrected MLE)	4.937
nu hat (MLE)	1645	nu star (bias corrected)	1529
MLE Mean (bias corrected)	89.86	MLE Sd (bias corrected)	21.06
		Approximate Chi Square Value (0.05)	1439
Adjusted Level of Significance	0.0443	Adjusted Chi Square Value	1436

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	95.46	95% Adjusted Gamma UCL (use when n<50)	95.67

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.931	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.942	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0854	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.137	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	3.932	Mean of logged Data	4.472
Maximum of Logged Data	5.136	SD of logged Data	0.227

Assuming Lognormal Distribution

95% H-UCL	95.56	90% Chebyshev (MVUE) UCL	99.36
95% Chebyshev (MVUE) UCL	103.7	97.5% Chebyshev (MVUE) UCL	109.7
99% Chebyshev (MVUE) UCL	121.5		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	95.3	95% Jackknife UCL	95.42
95% Standard Bootstrap UCL	95.17	95% Bootstrap-t UCL	96.35
95% Hall's Bootstrap UCL	96.87	95% Percentile Bootstrap UCL	95.38
95% BCA Bootstrap UCL	96.07		
90% Chebyshev(Mean, Sd) UCL	99.78	95% Chebyshev(Mean, Sd) UCL	104.3
97.5% Chebyshev(Mean, Sd) UCL	110.5	99% Chebyshev(Mean, Sd) UCL	122.8

Suggested UCL to Use

95% Student's-t UCL	95.42

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Copper: Background Surface Soil

General Statistics

Total Number of Observations	18	Number of Distinct Observations	17
		Number of Missing Observations	0
Minimum	13	Mean	77.11
Maximum	180	Median	66.5
SD	46.73	Std. Error of Mean	11.01
Coefficient of Variation	0.606	Skewness	0.919

Normal GOF Test

Shapiro Wilk Test Statistic	0.922	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.897	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.197	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.209	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	96.27	95% Adjusted-CLT UCL (Chen-1995)	97.77
		95% Modified-t UCL (Johnson-1978)	96.67

Gamma GOF Test

A-D Test Statistic	0.193	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.748	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.12	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.205	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.736	k star (bias corrected MLE)	2.317
Theta hat (MLE)	28.18	Theta star (bias corrected MLE)	33.28
nu hat (MLE)	98.49	nu star (bias corrected)	83.41
MLE Mean (bias corrected)	77.11	MLE Sd (bias corrected)	50.66
		Approximate Chi Square Value (0.05)	63.36
Adjusted Level of Significance	0.0357	Adjusted Chi Square Value	61.69

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	101.5	95% Adjusted Gamma UCL (use when n<50)	104.3

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.958	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.897	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.136	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.209	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.565	Mean of logged Data	4.152
Maximum of Logged Data	5.193	SD of logged Data	0.685

Assuming Lognormal Distribution

95% H-UCL	116.1	90% Chebyshev (MVUE) UCL	119.7
95% Chebyshev (MVUE) UCL	138.1	97.5% Chebyshev (MVUE) UCL	163.6
99% Chebyshev (MVUE) UCL	213.7		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	95.23	95% Jackknife UCL	96.27
95% Standard Bootstrap UCL	94.65	95% Bootstrap-t UCL	100.7
95% Hall's Bootstrap UCL	102.4	95% Percentile Bootstrap UCL	96.12
95% BCA Bootstrap UCL	96.38		
90% Chebyshev(Mean, Sd) UCL	110.2	95% Chebyshev(Mean, Sd) UCL	125.1
97.5% Chebyshev(Mean, Sd) UCL	145.9	99% Chebyshev(Mean, Sd) UCL	186.7

Suggested UCL to Use

95% Student's-t UCL	96.27

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Lead: Tank 214 Area Surface Soil

General Statistics

Total Number of Observations	62	Number of Distinct Observations	54
		Number of Missing Observations	0
Minimum	1.6	Mean	117.6
Maximum	1000	Median	45.5
SD	190.6	Std. Error of Mean	24.2
Coefficient of Variation	1.62	Skewness	2.938

Normal GOF Test

Shapiro Wilk Test Statistic	0.623	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.271	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.113	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	158.1	95% Adjusted-CLT UCL (Chen-1995)	167.1
		95% Modified-t UCL (Johnson-1978)	159.6

Gamma GOF Test

A-D Test Statistic	1.016	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.809	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.104	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.119	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.572	k star (bias corrected MLE)	0.555
Theta hat (MLE)	205.8	Theta star (bias corrected MLE)	212.1
nu hat (MLE)	70.89	nu star (bias corrected)	68.79
MLE Mean (bias corrected)	117.6	MLE Sd (bias corrected)	157.9
		Approximate Chi Square Value (0.05)	50.7
Adjusted Level of Significance	0.0461	Adjusted Chi Square Value	50.33

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	159.6	95% Adjusted Gamma UCL (use when n<50)	160.8

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.965	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0.168	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0717	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.113	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.47	Mean of logged Data	3.679
Maximum of Logged Data	6.908	SD of logged Data	1.619

Assuming Lognormal Distribution

95% H-UCL	254.2	90% Chebyshev (MVUE) UCL	260.3
95% Chebyshev (MVUE) UCL	314.6	97.5% Chebyshev (MVUE) UCL	390.1
99% Chebyshev (MVUE) UCL	538.3		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	157.4	95% Jackknife UCL	158.1
95% Standard Bootstrap UCL	157.7	95% Bootstrap-t UCL	174.5
95% Hall's Bootstrap UCL	172.4	95% Percentile Bootstrap UCL	158.9
95% BCA Bootstrap UCL	168.2		
90% Chebyshev(Mean, Sd) UCL	190.2	95% Chebyshev(Mean, Sd) UCL	223.1
97.5% Chebyshev(Mean, Sd) UCL	268.8	99% Chebyshev(Mean, Sd) UCL	358.4

Suggested UCL to Use

95% Approximate Gamma UCL	159.6

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Lead: Background Surface Soil

General Statistics

Total Number of Observations	18	Number of Distinct Observations	16
		Number of Missing Observations	0
Minimum	2	Mean	8.678
Maximum	21	Median	5.5
SD	6.872	Std. Error of Mean	1.62
Coefficient of Variation	0.792	Skewness	0.755

Normal GOF Test

Shapiro Wilk Test Statistic	0.838	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.897	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.233	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.209	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	11.5	95% Adjusted-CLT UCL (Chen-1995)	11.65
		95% Modified-t UCL (Johnson-1978)	11.54

Gamma GOF Test

A-D Test Statistic	0.766	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.755	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.2	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.207	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.695	k star (bias corrected MLE)	1.449
Theta hat (MLE)	5.12	Theta star (bias corrected MLE)	5.987
nu hat (MLE)	61.01	nu star (bias corrected)	52.18
MLE Mean (bias corrected)	8.678	MLE Sd (bias corrected)	7.208
		Approximate Chi Square Value (0.05)	36.58
Adjusted Level of Significance	0.0357	Adjusted Chi Square Value	35.33

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	12.38	95% Adjusted Gamma UCL (use when n<50)	12.81

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.904	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.897	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.163	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.209	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.693	Mean of logged Data	1.838
Maximum of Logged Data	3.045	SD of logged Data	0.845

Assuming Lognormal Distribution

95% H-UCL	14.74	90% Chebyshev (MVUE) UCL	14.42
95% Chebyshev (MVUE) UCL	16.99	97.5% Chebyshev (MVUE) UCL	20.56
99% Chebyshev (MVUE) UCL	27.56		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	11.34	95% Jackknife UCL	11.5
95% Standard Bootstrap UCL	11.32	95% Bootstrap-t UCL	11.91
95% Hall's Bootstrap UCL	11.36	95% Percentile Bootstrap UCL	11.3
95% BCA Bootstrap UCL	11.47		
90% Chebyshev(Mean, Sd) UCL	13.54	95% Chebyshev(Mean, Sd) UCL	15.74
97.5% Chebyshev(Mean, Sd) UCL	18.79	99% Chebyshev(Mean, Sd) UCL	24.79

Suggested UCL to Use

95% Adjusted Gamma UCL	12.81

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Mercury: Tank 214 Area Surface Soil

General Statistics

Total Number of Observations	48	Number of Distinct Observations	32
Number of Detects	40	Number of Non-Detects	8
Number of Distinct Detects	28	Number of Distinct Non-Detects	8
Minimum Detect	0.0046	Minimum Non-Detect	0.0044
Maximum Detect	0.065	Maximum Non-Detect	0.06
Variance Detects	1.9289E-4	Percent Non-Detects	16.67%
Mean Detects	0.0278	SD Detects	0.0139
Median Detects	0.0285	CV Detects	0.5
Skewness Detects	0.706	Kurtosis Detects	0.488
Mean of Logged Detects	-3.724	SD of Logged Detects	0.575

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.951	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.94	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.126	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.14	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.0254	Standard Error of Mean	0.00213
SD	0.0142	95% KM (BCA) UCL	0.0291
95% KM (t) UCL	0.029	95% KM (Percentile Bootstrap) UCL	0.0291
95% KM (z) UCL	0.0289	95% KM Bootstrap t UCL	0.0294
90% KM Chebyshev UCL	0.0318	95% KM Chebyshev UCL	0.0347
97.5% KM Chebyshev UCL	0.0387	99% KM Chebyshev UCL	0.0466

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.402	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.753	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.123	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.14	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	3.719	k star (bias corrected MLE)	3.457
Theta hat (MLE)	0.00746	Theta star (bias corrected MLE)	0.00803
nu hat (MLE)	297.6	nu star (bias corrected)	276.6
MLE Mean (bias corrected)	0.0278	MLE Sd (bias corrected)	0.0149

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	3.185	nu hat (KM)	305.7
Approximate Chi Square Value (305.74, α)	266.2	Adjusted Chi Square Value (305.74, β)	265.1
95% Gamma Approximate KM-UCL (use when n>=50)	0.0292	95% Gamma Adjusted KM-UCL (use when n<50)	0.0293

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.0046	Mean	0.0256
Maximum	0.065	Median	0.0234
SD	0.0137	CV	0.534
k hat (MLE)	3.499	k star (bias corrected MLE)	3.294
Theta hat (MLE)	0.00733	Theta star (bias corrected MLE)	0.00779
nu hat (MLE)	335.9	nu star (bias corrected)	316.3
MLE Mean (bias corrected)	0.0256	MLE Sd (bias corrected)	0.0141
		Adjusted Level of Significance (β)	0.045
Approximate Chi Square Value (316.27, α)	276.1	Adjusted Chi Square Value (316.27, β)	274.9
95% Gamma Approximate UCL (use when n>=50)	0.0294	95% Gamma Adjusted UCL (use when n<50)	0.0295

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.949	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.94	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.153	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.14	Detected Data Not Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0254	Mean in Log Scale	-3.834
SD in Original Scale	0.0139	SD in Log Scale	0.606
95% t UCL (assumes normality of ROS data)	0.0288	95% Percentile Bootstrap UCL	0.0286
95% BCA Bootstrap UCL	0.0289	95% Bootstrap t UCL	0.0291
95% H-UCL (Log ROS)	0.0309		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-3.864	95% H-UCL (KM -Log)	0.0321
KM SD (logged)	0.672	95% Critical H Value (KM-Log)	2.015
KM Standard Error of Mean (logged)	0.103		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0254	Mean in Log Scale	-3.872
SD in Original Scale	0.0143	SD in Log Scale	0.71
95% t UCL (Assumes normality)	0.0288	95% H-Stat UCL	0.0331

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.029	95% KM (Percentile Bootstrap) UCL	0.0291

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Mercury: Background Surface Soil

General Statistics

Total Number of Observations	20	Number of Distinct Observations	15
Number of Detects	17	Number of Non-Detects	3
Number of Distinct Detects	13	Number of Distinct Non-Detects	2
Minimum Detect	0.012	Minimum Non-Detect	0.02
Maximum Detect	0.12	Maximum Non-Detect	0.04
Variance Detects	7.1349E-4	Percent Non-Detects	15%
Mean Detects	0.0584	SD Detects	0.0267
Median Detects	0.06	CV Detects	0.458
Skewness Detects	0.413	Kurtosis Detects	0.413
Mean of Logged Detects	-2.963	SD of Logged Detects	0.551

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.958	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.892	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.141	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.215	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.0521	Standard Error of Mean	0.00657
SD	0.0284	95% KM (BCA) UCL	0.0624
95% KM (t) UCL	0.0634	95% KM (Percentile Bootstrap) UCL	0.0632
95% KM (z) UCL	0.0629	95% KM Bootstrap t UCL	0.0643
90% KM Chebyshev UCL	0.0718	95% KM Chebyshev UCL	0.0807
97.5% KM Chebyshev UCL	0.0931	99% KM Chebyshev UCL	0.117

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.443	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.742	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.179	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.21	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	4.282	k star (bias corrected MLE)	3.566
Theta hat (MLE)	0.0136	Theta star (bias corrected MLE)	0.0164
nu hat (MLE)	145.6	nu star (bias corrected)	121.2
MLE Mean (bias corrected)	0.0584	MLE Sd (bias corrected)	0.0309

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	3.366	nu hat (KM)	134.6
Approximate Chi Square Value (134.63, α)	108.8	Adjusted Chi Square Value (134.63, β)	107
95% Gamma Approximate KM-UCL (use when n>=50)	0.0644	95% Gamma Adjusted KM-UCL (use when n<50)	0.0655

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.012	Mean	0.0527
Maximum	0.12	Median	0.054
SD	0.0282	CV	0.536
k hat (MLE)	3.2	k star (bias corrected MLE)	2.753
Theta hat (MLE)	0.0165	Theta star (bias corrected MLE)	0.0191
nu hat (MLE)	128	nu star (bias corrected)	110.1
MLE Mean (bias corrected)	0.0527	MLE Sd (bias corrected)	0.0318
		Adjusted Level of Significance (β)	0.038
Approximate Chi Square Value (110.14, α)	86.91	Adjusted Chi Square Value (110.14, β)	85.28
95% Gamma Approximate UCL (use when n>=50)	0.0668	95% Gamma Adjusted UCL (use when n<50)	0.0681

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.913	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.892	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.179	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.215	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0528	Mean in Log Scale	-3.099
SD in Original Scale	0.0281	SD in Log Scale	0.612
95% t UCL (assumes normality of ROS data)	0.0637	95% Percentile Bootstrap UCL	0.0634
95% BCA Bootstrap UCL	0.0626	95% Bootstrap t UCL	0.0649
95% H-UCL (Log ROS)	0.0734		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-3.149	95% H-UCL (KM -Log)	0.0767
KM SD (logged)	0.684	95% Critical H Value (KM-Log)	2.217
KM Standard Error of Mean (logged)	0.16		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.0516	Mean in Log Scale	-3.174
SD in Original Scale	0.0296	SD in Log Scale	0.735
95% t UCL (Assumes normality)	0.063	95% H-Stat UCL	0.0805

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.0634	95% KM (Percentile Bootstrap) UCL	0.0632

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Nickel: Tank 214 Area Surface Soil

General Statistics

Total Number of Observations	44	Number of Distinct Observations	26
		Number of Missing Observations	0
Minimum	4	Mean	5.766
Maximum	9.1	Median	5.6
SD	1.368	Std. Error of Mean	0.206
Coefficient of Variation	0.237	Skewness	0.777

Normal GOF Test

Shapiro Wilk Test Statistic	0.916	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.944	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.138	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.134	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	6.113	95% Adjusted-CLT UCL (Chen-1995)	6.131
		95% Modified-t UCL (Johnson-1978)	6.117

Gamma GOF Test

A-D Test Statistic	0.692	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.748	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.122	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.133	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	19.42	k star (bias corrected MLE)	18.11
Theta hat (MLE)	0.297	Theta star (bias corrected MLE)	0.318
nu hat (MLE)	1709	nu star (bias corrected)	1594
MLE Mean (bias corrected)	5.766	MLE Sd (bias corrected)	1.355
		Approximate Chi Square Value (0.05)	1502
Adjusted Level of Significance	0.0445	Adjusted Chi Square Value	1499

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	6.118	95% Adjusted Gamma UCL (use when n<50)	6.13

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.942	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.944	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.112	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.134	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.386	Mean of logged Data	1.726
Maximum of Logged Data	2.208	SD of logged Data	0.228

Assuming Lognormal Distribution

95% H-UCL	6.12	90% Chebyshev (MVUE) UCL	6.362
95% Chebyshev (MVUE) UCL	6.634	97.5% Chebyshev (MVUE) UCL	7.011
99% Chebyshev (MVUE) UCL	7.752		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	6.105	95% Jackknife UCL	6.113
95% Standard Bootstrap UCL	6.11	95% Bootstrap-t UCL	6.146
95% Hall's Bootstrap UCL	6.133	95% Percentile Bootstrap UCL	6.1
95% BCA Bootstrap UCL	6.118		
90% Chebyshev(Mean, Sd) UCL	6.385	95% Chebyshev(Mean, Sd) UCL	6.665
97.5% Chebyshev(Mean, Sd) UCL	7.054	99% Chebyshev(Mean, Sd) UCL	7.818

Suggested UCL to Use

95% Adjusted Gamma UCL	6.13

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Nickel: Background Surface Soil

General Statistics

Total Number of Observations	19	Number of Distinct Observations	19
		Number of Missing Observations	0
Minimum	3.4	Mean	10.54
Maximum	19	Median	8.6
SD	5.228	Std. Error of Mean	1.199
Coefficient of Variation	0.496	Skewness	0.295

Normal GOF Test

Shapiro Wilk Test Statistic	0.899	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.901	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.184	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.203	Data appear Normal at 5% Significance Level

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	12.62	95% Adjusted-CLT UCL (Chen-1995)	12.6
		95% Modified-t UCL (Johnson-1978)	12.63

Gamma GOF Test

A-D Test Statistic	0.663	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.745	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.163	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.199	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	4.046	k star (bias corrected MLE)	3.442
Theta hat (MLE)	2.605	Theta star (bias corrected MLE)	3.061
nu hat (MLE)	153.7	nu star (bias corrected)	130.8
MLE Mean (bias corrected)	10.54	MLE Sd (bias corrected)	5.68
		Approximate Chi Square Value (0.05)	105.4
Adjusted Level of Significance	0.0369	Adjusted Chi Square Value	103.4

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	13.08	95% Adjusted Gamma UCL (use when n<50)	13.33

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.925	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.901	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.148	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.203	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.224	Mean of logged Data	2.226
Maximum of Logged Data	2.944	SD of logged Data	0.535

Assuming Lognormal Distribution

95% H-UCL	13.84	90% Chebyshev (MVUE) UCL	14.67
95% Chebyshev (MVUE) UCL	16.51	97.5% Chebyshev (MVUE) UCL	19.06
99% Chebyshev (MVUE) UCL	24.08		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	12.51	95% Jackknife UCL	12.62
95% Standard Bootstrap UCL	12.48	95% Bootstrap-t UCL	12.63
95% Hall's Bootstrap UCL	12.44	95% Percentile Bootstrap UCL	12.37
95% BCA Bootstrap UCL	12.64		
90% Chebyshev(Mean, Sd) UCL	14.14	95% Chebyshev(Mean, Sd) UCL	15.77
97.5% Chebyshev(Mean, Sd) UCL	18.03	99% Chebyshev(Mean, Sd) UCL	22.47

Suggested UCL to Use

95% Student's-t UCL 12.62

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Selenium: Tank 214 Area Surface Soil

General Statistics

Total Number of Observations	47	Number of Distinct Observations	30
Number of Detects	19	Number of Non-Detects	28
Number of Distinct Detects	17	Number of Distinct Non-Detects	16
Minimum Detect	0.19	Minimum Non-Detect	0.46
Maximum Detect	1.4	Maximum Non-Detect	1.5
Variance Detects	0.137	Percent Non-Detects	59.57%
Mean Detects	0.643	SD Detects	0.37
Median Detects	0.57	CV Detects	0.576
Skewness Detects	0.681	Kurtosis Detects	-0.686
Mean of Logged Detects	-0.608	SD of Logged Detects	0.604

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.914	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.901	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.156	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.203	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.523	Standard Error of Mean	0.0577
SD	0.298	95% KM (BCA) UCL	0.621
95% KM (t) UCL	0.62	95% KM (Percentile Bootstrap) UCL	0.617
95% KM (z) UCL	0.618	95% KM Bootstrap t UCL	0.635
90% KM Chebyshev UCL	0.696	95% KM Chebyshev UCL	0.775
97.5% KM Chebyshev UCL	0.883	99% KM Chebyshev UCL	1.097

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.325	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.748	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.128	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.2	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	3.181	k star (bias corrected MLE)	2.714
Theta hat (MLE)	0.202	Theta star (bias corrected MLE)	0.237
nu hat (MLE)	120.9	nu star (bias corrected)	103.1
MLE Mean (bias corrected)	0.643	MLE Sd (bias corrected)	0.39

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	3.078	nu hat (KM)	289.3
Approximate Chi Square Value (289.34, α)	250.9	Adjusted Chi Square Value (289.34, β)	249.8
95% Gamma Approximate KM-UCL (use when n>=50)	0.603	95% Gamma Adjusted KM-UCL (use when n<50)	0.606

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.19	Mean	0.517
Maximum	1.4	Median	0.438
SD	0.269	CV	0.521
k hat (MLE)	4.795	k star (bias corrected MLE)	4.503
Theta hat (MLE)	0.108	Theta star (bias corrected MLE)	0.115
nu hat (MLE)	450.7	nu star (bias corrected)	423.3
MLE Mean (bias corrected)	0.517	MLE Sd (bias corrected)	0.244
		Adjusted Level of Significance (β)	0.0449
Approximate Chi Square Value (423.25, α)	376.6	Adjusted Chi Square Value (423.25, β)	375.2
95% Gamma Approximate UCL (use when n>=50)	0.581	95% Gamma Adjusted UCL (use when n<50)	0.583

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.96	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.901	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.108	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.203	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.508	Mean in Log Scale	-0.783
SD in Original Scale	0.268	SD in Log Scale	0.445
95% t UCL (assumes normality of ROS data)	0.574	95% Percentile Bootstrap UCL	0.577
95% BCA Bootstrap UCL	0.587	95% Bootstrap t UCL	0.592
95% H-UCL (Log ROS)	0.57		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-0.795	95% H-UCL (KM -Log)	0.607
KM SD (logged)	0.537	95% Critical H Value (KM-Log)	1.912
KM Standard Error of Mean (logged)	0.115		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.539	Mean in Log Scale	-0.714
SD in Original Scale	0.26	SD in Log Scale	0.435
95% t UCL (Assumes normality)	0.603	95% H-Stat UCL	0.606

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.62	95% KM (Percentile Bootstrap) UCL	0.617

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Selenium: Background Surface Soil

General Statistics

Total Number of Observations	20	Number of Distinct Observations	15
Number of Detects	5	Number of Non-Detects	15
Number of Distinct Detects	5	Number of Distinct Non-Detects	12
Minimum Detect	0.45	Minimum Non-Detect	0.13
Maximum Detect	1.2	Maximum Non-Detect	2.1
Variance Detects	0.13	Percent Non-Detects	75%
Mean Detects	0.76	SD Detects	0.36
Median Detects	0.56	CV Detects	0.474
Skewness Detects	0.599	Kurtosis Detects	-3.01
Mean of Logged Detects	-0.363	SD of Logged Detects	0.466

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.804	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.311	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.396	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.385	Standard Error of Mean	0.0999
SD	0.323	95% KM (BCA) UCL	0.605
95% KM (t) UCL	0.557	95% KM (Percentile Bootstrap) UCL	0.573
95% KM (z) UCL	0.549	95% KM Bootstrap t UCL	0.468
90% KM Chebyshev UCL	0.684	95% KM Chebyshev UCL	0.82
97.5% KM Chebyshev UCL	1.009	99% KM Chebyshev UCL	1.379

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.583	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.68	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.312	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.358	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	5.819	k star (bias corrected MLE)	2.461
Theta hat (MLE)	0.131	Theta star (bias corrected MLE)	0.309
nu hat (MLE)	58.19	nu star (bias corrected)	24.61
MLE Mean (bias corrected)	0.76	MLE Sd (bias corrected)	0.484

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	1.421	nu hat (KM)	56.86
Approximate Chi Square Value (56.86, α)	40.53	Adjusted Chi Square Value (56.86, β)	39.44
95% Gamma Approximate KM-UCL (use when n>=50)	0.54	95% Gamma Adjusted KM-UCL (use when n<50)	0.554

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.0468	Mean	0.353
Maximum	1.2	Median	0.255
SD	0.314	CV	0.889
k hat (MLE)	1.546	k star (bias corrected MLE)	1.347
Theta hat (MLE)	0.228	Theta star (bias corrected MLE)	0.262
nu hat (MLE)	61.82	nu star (bias corrected)	53.88
MLE Mean (bias corrected)	0.353	MLE Sd (bias corrected)	0.304
		Adjusted Level of Significance (β)	0.038
Approximate Chi Square Value (53.88, α)	38.02	Adjusted Chi Square Value (53.88, β)	36.96
95% Gamma Approximate UCL (use when n>=50)	0.5	95% Gamma Adjusted UCL (use when n<50)	0.515

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.828	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.279	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.396	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.425	Mean in Log Scale	-0.984
SD in Original Scale	0.267	SD in Log Scale	0.475
95% t UCL (assumes normality of ROS data)	0.528	95% Percentile Bootstrap UCL	0.522
95% BCA Bootstrap UCL	0.559	95% Bootstrap t UCL	0.657
95% H-UCL (Log ROS)	0.52		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-1.286	95% H-UCL (KM -Log)	0.593
KM SD (logged)	0.806	95% Critical H Value (KM-Log)	2.368
KM Standard Error of Mean (logged)	0.284		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.514	Mean in Log Scale	-0.87
SD in Original Scale	0.304	SD in Log Scale	0.73
95% t UCL (Assumes normality)	0.632	95% H-Stat UCL	0.8

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.557	95% KM (Percentile Bootstrap) UCL	0.573

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Thallium: Tank 214 Area Surface Soil

General Statistics

Total Number of Observations	44	Number of Distinct Observations	25
Number of Detects	14	Number of Non-Detects	30
Number of Distinct Detects	9	Number of Distinct Non-Detects	16
Minimum Detect	2.3	Minimum Non-Detect	0.12
Maximum Detect	4.6	Maximum Non-Detect	7.4
Variance Detects	0.444	Percent Non-Detects	68.18%
Mean Detects	3.471	SD Detects	0.666
Median Detects	3.3	CV Detects	0.192
Skewness Detects	0.111	Kurtosis Detects	-0.662
Mean of Logged Detects	1.227	SD of Logged Detects	0.196

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.965	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.874	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.173	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.237	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	1.423	Standard Error of Mean	0.291
SD	1.682	95% KM (BCA) UCL	1.86
95% KM (t) UCL	1.912	95% KM (Percentile Bootstrap) UCL	1.907
95% KM (z) UCL	1.902	95% KM Bootstrap t UCL	1.957
90% KM Chebyshev UCL	2.296	95% KM Chebyshev UCL	2.692
97.5% KM Chebyshev UCL	3.24	99% KM Chebyshev UCL	4.318

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.274	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.734	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.153	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.228	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	28.65	k star (bias corrected MLE)	22.56
Theta hat (MLE)	0.121	Theta star (bias corrected MLE)	0.154
nu hat (MLE)	802.2	nu star (bias corrected)	631.6
MLE Mean (bias corrected)	3.471	MLE Sd (bias corrected)	0.731

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.716	nu hat (KM)	63
Approximate Chi Square Value (63.00, α)	45.75	Adjusted Chi Square Value (63.00, β)	45.25
95% Gamma Approximate KM-UCL (use when n>=50)	1.96	95% Gamma Adjusted KM-UCL (use when n<50)	1.982

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.873	Mean	2.341
Maximum	4.6	Median	2.26
SD	0.953	CV	0.407
k hat (MLE)	6.297	k star (bias corrected MLE)	5.883
Theta hat (MLE)	0.372	Theta star (bias corrected MLE)	0.398
nu hat (MLE)	554.2	nu star (bias corrected)	517.7
MLE Mean (bias corrected)	2.341	MLE Sd (bias corrected)	0.965
		Adjusted Level of Significance (β)	0.0445
Approximate Chi Square Value (517.72, α)	466	Adjusted Chi Square Value (517.72, β)	464.3
95% Gamma Approximate UCL (use when n>=50)	2.601	95% Gamma Adjusted UCL (use when n<50)	2.61

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.963	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.874	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.147	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.237	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	2.498	Mean in Log Scale	0.868
SD in Original Scale	0.818	SD in Log Scale	0.305
95% t UCL (assumes normality of ROS data)	2.705	95% Percentile Bootstrap UCL	2.7
95% BCA Bootstrap UCL	2.714	95% Bootstrap t UCL	2.726
95% H-UCL (Log ROS)	2.711		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-0.819	95% H-UCL (KM -Log)	3.703
KM SD (logged)	1.636	95% Critical H Value (KM-Log)	3.164
KM Standard Error of Mean (logged)	0.283		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	1.804	Mean in Log Scale	-0.55
SD in Original Scale	1.706	SD in Log Scale	1.894
95% t UCL (Assumes normality)	2.236	95% H-Stat UCL	9.598

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	1.912	95% KM (Percentile Bootstrap) UCL	1.907

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Thallium: Background Surface Soil

General Statistics

Total Number of Observations	19	Number of Distinct Observations	14
Number of Detects	1	Number of Non-Detects	18
Number of Distinct Detects	1	Number of Distinct Non-Detects	13

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
s suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Thallium Bkg was not processed!

Vanadium: Tank 214 Area Surface Soil

General Statistics

Total Number of Observations	44	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	120	Mean	172
Maximum	240	Median	170
SD	25.3	Std. Error of Mean	3.814
Coefficient of Variation	0.147	Skewness	0.635

Normal GOF Test

Shapiro Wilk Test Statistic	0.951	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.944	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.191	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.134	Data Not Normal at 5% Significance Level

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	178.5	95% Adjusted-CLT UCL (Chen-1995)	178.7
		95% Modified-t UCL (Johnson-1978)	178.5

Gamma GOF Test

A-D Test Statistic	0.775	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.747	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.173	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.133	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	48.81	k star (bias corrected MLE)	45.5
Theta hat (MLE)	3.525	Theta star (bias corrected MLE)	3.781
nu hat (MLE)	4295	nu star (bias corrected)	4004
MLE Mean (bias corrected)	172	MLE Sd (bias corrected)	25.51
		Approximate Chi Square Value (0.05)	3858
Adjusted Level of Significance	0.0445	Adjusted Chi Square Value	3853

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	178.6	95% Adjusted Gamma UCL (use when n<50)	178.8

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.969	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.944	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.164	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.134	Data Not Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	4.787	Mean of logged Data	5.137
Maximum of Logged Data	5.481	SD of logged Data	0.144

Assuming Lognormal Distribution

95% H-UCL	178.6	90% Chebyshev (MVUE) UCL	183.3
95% Chebyshev (MVUE) UCL	188.4	97.5% Chebyshev (MVUE) UCL	195.5
99% Chebyshev (MVUE) UCL	209.5		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	178.3	95% Jackknife UCL	178.5
95% Standard Bootstrap UCL	178.3	95% Bootstrap-t UCL	179
95% Hall's Bootstrap UCL	178.7	95% Percentile Bootstrap UCL	178
95% BCA Bootstrap UCL	178.4		
90% Chebyshev(Mean, Sd) UCL	183.5	95% Chebyshev(Mean, Sd) UCL	188.7
97.5% Chebyshev(Mean, Sd) UCL	195.9	99% Chebyshev(Mean, Sd) UCL	210

Suggested UCL to Use

95% Student's-t UCL	178.5

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Vanadium: Background Surface Soil

General Statistics

Total Number of Observations	18	Number of Distinct Observations	17
		Number of Missing Observations	0
Minimum	35	Mean	141.6
Maximum	230	Median	151.5
SD	58.77	Std. Error of Mean	13.85
Coefficient of Variation	0.415	Skewness	-0.0584

Normal GOF Test

Shapiro Wilk Test Statistic	0.95	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.897	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.136	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.209	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	165.7	95% Adjusted-CLT UCL (Chen-1995)	164.1
		95% Modified-t UCL (Johnson-1978)	165.6

Gamma GOF Test

A-D Test Statistic	0.451	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.743	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.166	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.204	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	5.04	k star (bias corrected MLE)	4.237
Theta hat (MLE)	28.09	Theta star (bias corrected MLE)	33.41
nu hat (MLE)	181.4	nu star (bias corrected)	152.5
MLE Mean (bias corrected)	141.6	MLE Sd (bias corrected)	68.78
		Approximate Chi Square Value (0.05)	125
Adjusted Level of Significance	0.0357	Adjusted Chi Square Value	122.6

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	172.8	95% Adjusted Gamma UCL (use when n<50)	176.1

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.906	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.897	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.181	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.209	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	3.555	Mean of logged Data	4.85
Maximum of Logged Data	5.438	SD of logged Data	0.502

Assuming Lognormal Distribution

95% H-UCL	185.4	90% Chebyshev (MVUE) UCL	196.6
95% Chebyshev (MVUE) UCL	220.5	97.5% Chebyshev (MVUE) UCL	253.7
99% Chebyshev (MVUE) UCL	318.9		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	164.4	95% Jackknife UCL	165.7
95% Standard Bootstrap UCL	163.3	95% Bootstrap-t UCL	166.8
95% Hall's Bootstrap UCL	164.8	95% Percentile Bootstrap UCL	164.2
95% BCA Bootstrap UCL	164.2		
90% Chebyshev(Mean, Sd) UCL	183.1	95% Chebyshev(Mean, Sd) UCL	201.9
97.5% Chebyshev(Mean, Sd) UCL	228.1	99% Chebyshev(Mean, Sd) UCL	279.4

Suggested UCL to Use

95% Student's-t UCL	165.7

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Zinc: Tank 214 Area Surface Soil

General Statistics

Total Number of Observations	60	Number of Distinct Observations	34
		Number of Missing Observations	0
Minimum	32	Mean	62.07
Maximum	520	Median	50
SD	62.76	Std. Error of Mean	8.102
Coefficient of Variation	1.011	Skewness	6.823

Normal GOF Test

Shapiro Wilk Test Statistic	0.336	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.316	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.114	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	75.61	95% Adjusted-CLT UCL (Chen-1995)	83.02
		95% Modified-t UCL (Johnson-1978)	76.8

Gamma GOF Test

A-D Test Statistic	6.057	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.755	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.258	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.115	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	3.748	k star (bias corrected MLE)	3.572
Theta hat (MLE)	16.56	Theta star (bias corrected MLE)	17.38
nu hat (MLE)	449.8	nu star (bias corrected)	428.6
MLE Mean (bias corrected)	62.07	MLE Sd (bias corrected)	32.84
		Approximate Chi Square Value (0.05)	381.6
Adjusted Level of Significance	0.046	Adjusted Chi Square Value	380.6

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	69.71	95% Adjusted Gamma UCL (use when n<50)	69.91

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.758	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	6.459E-13	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.217	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.114	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	3.466	Mean of logged Data	3.989
Maximum of Logged Data	6.254	SD of logged Data	0.411

Assuming Lognormal Distribution

95% H-UCL	64.81	90% Chebyshev (MVUE) UCL	68.33
95% Chebyshev (MVUE) UCL	72.71	97.5% Chebyshev (MVUE) UCL	78.79
99% Chebyshev (MVUE) UCL	90.73		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	75.39	95% Jackknife UCL	75.61
95% Standard Bootstrap UCL	75.71	95% Bootstrap-t UCL	104.6
95% Hall's Bootstrap UCL	126.6	95% Percentile Bootstrap UCL	76.73
95% BCA Bootstrap UCL	86.62		
90% Chebyshev(Mean, Sd) UCL	86.37	95% Chebyshev(Mean, Sd) UCL	97.38
97.5% Chebyshev(Mean, Sd) UCL	112.7	99% Chebyshev(Mean, Sd) UCL	142.7

Suggested UCL to Use

95% Student's-t UCL	75.61	or 95% Modified-t UCL	76.8

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Zinc: Background Surface Soil

General Statistics

Total Number of Observations	18	Number of Distinct Observations	18
		Number of Missing Observations	0
Minimum	6.2	Mean	52.48
Maximum	120	Median	47
SD	32.33	Std. Error of Mean	7.621
Coefficient of Variation	0.616	Skewness	0.788

Normal GOF Test

Shapiro Wilk Test Statistic	0.925	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.897	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.16	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.209	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	65.73	95% Adjusted-CLT UCL (Chen-1995)	66.52
		95% Modified-t UCL (Johnson-1978)	65.97

Gamma GOF Test

A-D Test Statistic	0.235	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.75	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.119	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.206	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.439	k star (bias corrected MLE)	2.07
Theta hat (MLE)	21.52	Theta star (bias corrected MLE)	25.36
nu hat (MLE)	87.81	nu star (bias corrected)	74.51
MLE Mean (bias corrected)	52.48	MLE Sd (bias corrected)	36.48
		Approximate Chi Square Value (0.05)	55.63
Adjusted Level of Significance	0.0357	Adjusted Chi Square Value	54.06

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	70.29	95% Adjusted Gamma UCL (use when n<50)	72.32

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.936	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.897	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.165	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.209	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.825	Mean of logged Data	3.742
Maximum of Logged Data	4.787	SD of logged Data	0.751

Assuming Lognormal Distribution

95% H-UCL	85.05	90% Chebyshev (MVUE) UCL	86.05
95% Chebyshev (MVUE) UCL	100.2	97.5% Chebyshev (MVUE) UCL	119.8
99% Chebyshev (MVUE) UCL	158.3		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	65.01	95% Jackknife UCL	65.73
95% Standard Bootstrap UCL	64.57	95% Bootstrap-t UCL	68.43
95% Hall's Bootstrap UCL	67.67	95% Percentile Bootstrap UCL	64.84
95% BCA Bootstrap UCL	65.52		
90% Chebyshev(Mean, Sd) UCL	75.34	95% Chebyshev(Mean, Sd) UCL	85.7
97.5% Chebyshev(Mean, Sd) UCL	100.1	99% Chebyshev(Mean, Sd) UCL	128.3

Suggested UCL to Use

95% Student's-t UCL	65.73

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Acetone - Tank 214 Area Surface Soil

General Statistics

Total Number of Observations	42	Number of Distinct Observations	33
Number of Detects	37	Number of Non-Detects	5
Number of Distinct Detects	28	Number of Distinct Non-Detects	5
Minimum Detect	6.3	Minimum Non-Detect	2.8
Maximum Detect	850	Maximum Non-Detect	11
Variance Detects	20787	Percent Non-Detects	11.9%
Mean Detects	67.05	SD Detects	144.2
Median Detects	21	CV Detects	2.15
Skewness Detects	4.757	Kurtosis Detects	25.4
Mean of Logged Detects	3.308	SD of Logged Detects	1.188

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.433	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.936	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.337	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.146	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	59.48	Standard Error of Mean	21.13
SD	135.1	95% KM (BCA) UCL	100.6
95% KM (t) UCL	95.04	95% KM (Percentile Bootstrap) UCL	98.73
95% KM (z) UCL	94.24	95% KM Bootstrap t UCL	150.7
90% KM Chebyshev UCL	122.9	95% KM Chebyshev UCL	151.6
97.5% KM Chebyshev UCL	191.4	99% KM Chebyshev UCL	269.7

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.715	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.795	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.245	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.151	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.677	k star (bias corrected MLE)	0.64
Theta hat (MLE)	99.07	Theta star (bias corrected MLE)	104.8
nu hat (MLE)	50.08	nu star (bias corrected)	47.35
MLE Mean (bias corrected)	67.05	MLE Sd (bias corrected)	83.81

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.194	nu hat (KM)	16.29
Approximate Chi Square Value (16.29, α)	8.171	Adjusted Chi Square Value (16.29, β)	7.965
95% Gamma Approximate KM-UCL (use when n>=50)	118.6	95% Gamma Adjusted KM-UCL (use when n<50)	121.7

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	59.07
Maximum	850	Median	17.5
SD	136.9	CV	2.317
k hat (MLE)	0.386	k star (bias corrected MLE)	0.375
Theta hat (MLE)	152.9	Theta star (bias corrected MLE)	157.6
nu hat (MLE)	32.46	nu star (bias corrected)	31.47
MLE Mean (bias corrected)	59.07	MLE Sd (bias corrected)	96.5
		Adjusted Level of Significance (β)	0.0443
Approximate Chi Square Value (31.47, α)	19.65	Adjusted Chi Square Value (31.47, β)	19.32
95% Gamma Approximate UCL (use when n>=50)	94.58	95% Gamma Adjusted UCL (use when n<50)	96.22

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.901	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.936	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.165	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.146	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	59.37	Mean in Log Scale	3.016
SD in Original Scale	136.7	SD in Log Scale	1.38
95% t UCL (assumes normality of ROS data)	94.88	95% Percentile Bootstrap UCL	95.83
95% BCA Bootstrap UCL	119.1	95% Bootstrap t UCL	149.8
95% H-UCL (Log ROS)	96.93		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	59.38	Mean in Log Scale	3.012
SD in Original Scale	136.7	SD in Log Scale	1.391
95% t UCL (Assumes normality)	94.89	95% H-Stat UCL	98.82

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	151.6

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

2-Butanone: Tank 214 Area Surface Soil

General Statistics

Total Number of Observations	45	Number of Distinct Observations	35
Number of Detects	4	Number of Non-Detects	41
Number of Distinct Detects	4	Number of Distinct Non-Detects	31
Minimum Detect	8.6	Minimum Non-Detect	2.8
Maximum Detect	61	Maximum Non-Detect	260
Variance Detects	535.8	Percent Non-Detects	91.11%
Mean Detects	27.15	SD Detects	23.15
Median Detects	19.5	CV Detects	0.853
Skewness Detects	1.693	Kurtosis Detects	3.199
Mean of Logged Detects	3.051	SD of Logged Detects	0.805

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.814	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.371	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.443	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	5.195	Standard Error of Mean	1.698
SD	9.481	95% KM (BCA) UCL	N/A
95% KM (t) UCL	8.048	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	7.988	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	10.29	95% KM Chebyshev UCL	12.6
97.5% KM Chebyshev UCL	15.8	99% KM Chebyshev UCL	22.09

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.385	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.66	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.326	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.398	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	2.146	k star (bias corrected MLE)	0.703
Theta hat (MLE)	12.65	Theta star (bias corrected MLE)	38.61
nu hat (MLE)	17.17	nu star (bias corrected)	5.626
MLE Mean (bias corrected)	27.15	MLE Sd (bias corrected)	32.37

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.3	nu hat (KM)	27.02
Approximate Chi Square Value (27.02, α)	16.17	Adjusted Chi Square Value (27.02, β)	15.89
95% Gamma Approximate KM-UCL (use when n>=50)	8.682	95% Gamma Adjusted KM-UCL (use when n<50)	8.835

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	2.422
Maximum	61	Median	0.01
SD	9.876	CV	4.077
k hat (MLE)	0.159	k star (bias corrected MLE)	0.163
Theta hat (MLE)	15.28	Theta star (bias corrected MLE)	14.88
nu hat (MLE)	14.27	nu star (bias corrected)	14.65
MLE Mean (bias corrected)	2.422	MLE Sd (bias corrected)	6.004
		Adjusted Level of Significance (β)	0.0447
Approximate Chi Square Value (14.65, α)	7.018	Adjusted Chi Square Value (14.65, β)	6.843
95% Gamma Approximate UCL (use when n>=50)	5.056	95% Gamma Adjusted UCL (use when n<50)	N/A

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.943	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.277	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.443	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	2.923	Mean in Log Scale	-0.395
SD in Original Scale	9.756	SD in Log Scale	1.235
95% t UCL (assumes normality of ROS data)	5.367	95% Percentile Bootstrap UCL	5.55
95% BCA Bootstrap UCL	7.12	95% Bootstrap t UCL	9.83
95% H-UCL (Log ROS)	2.365		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	1.234	95% H-UCL (KM -Log)	5.123
KM SD (logged)	0.641	95% Critical H Value (KM-Log)	2.018
KM Standard Error of Mean (logged)	0.117		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	11.57	Mean in Log Scale	1.445
SD in Original Scale	26.35	SD in Log Scale	1.151
95% t UCL (Assumes normality)	18.17	95% H-Stat UCL	12.79

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	8.048	95% KM (Percentile Bootstrap) UCL	N/A

Warning: One or more Recommended UCL(s) not available!

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	11/18/2014 1:01:09 PM
From File	TR Groundwater for ProUCL.xls
Full Precision	OFF
Confidence Coefficient	95%
mber of Bootstrap Operations	2000

Benzene - SWMU 9 Area B

General Statistics

Total Number of Observations	23	Number of Distinct Observations	9
Number of Detects	7	Number of Non-Detects	16
Number of Distinct Detects	7	Number of Distinct Non-Detects	2
Minimum Detect	0.09	Minimum Non-Detect	0.5
Maximum Detect	330	Maximum Non-Detect	0.54
Variance Detects	17114	Percent Non-Detects	69.57%
Mean Detects	89.9	SD Detects	130.8
Median Detects	24	CV Detects	1.455
Skewness Detects	1.444	Kurtosis Detects	0.629
Mean of Logged Detects	2.833	SD of Logged Detects	2.747

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.724	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.388	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.335	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	27.42	Standard Error of Mean	17.69
SD	78.56	95% KM (BCA) UCL	60.02
95% KM (t) UCL	57.81	95% KM (Percentile Bootstrap) UCL	56.52
95% KM (z) UCL	56.53	95% KM Bootstrap t UCL	228.5
90% KM Chebyshev UCL	80.51	95% KM Chebyshev UCL	104.5
97.5% KM Chebyshev UCL	137.9	99% KM Chebyshev UCL	203.5

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.294	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.769	letected data appear Gamma Distributed at 5% Significance Leve
K-S Test Statistic	0.221	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.331	letected data appear Gamma Distributed at 5% Significance Leve

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.396	k star (bias corrected MLE)	0.321
Theta hat (MLE)	227.2	Theta star (bias corrected MLE)	279.8
nu hat (MLE)	5.539	nu star (bias corrected)	4.498
MLE Mean (bias corrected)	89.9	MLE Sd (bias corrected)	158.6

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.122	nu hat (KM)	5.605
Approximate Chi Square Value (5.60, α)	1.441	Adjusted Chi Square Value (5.60, β)	1.295
5% Gamma Approximate KM-UCL (use when n>=50)	106.6	95% Gamma Adjusted KM-UCL (use when n<50)	118.7

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	27.37
Maximum	330	Median	0.01
SD	80.35	CV	2.936
k hat (MLE)	0.138	k star (bias corrected MLE)	0.149
Theta hat (MLE)	198.8	Theta star (bias corrected MLE)	184
nu hat (MLE)	6.334	nu star (bias corrected)	6.841
MLE Mean (bias corrected)	27.37	MLE Sd (bias corrected)	70.97
		Adjusted Level of Significance (β)	0.0389
Approximate Chi Square Value (6.84, α)	2.084	Adjusted Chi Square Value (6.84, β)	1.899
95% Gamma Approximate UCL (use when n>=50)	89.85	95% Gamma Adjusted UCL (use when n<50)	98.59

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.898	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.238	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.335	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	27.62	Mean in Log Scale	-1.012
SD in Original Scale	80.26	SD in Log Scale	3.571
95% t UCL (assumes normality of ROS data)	56.36	95% Percentile Bootstrap UCL	58.03
95% BCA Bootstrap UCL	68.08	95% Bootstrap t UCL	262.8
95% H-UCL (Log ROS)	37094		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-0.813	95% H-UCL (KM -Log)	538.9
KM SD (logged)	2.79	95% Critical H Value (KM-Log)	5.398
KM Standard Error of Mean (logged)	0.628		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	27.54	Mean in Log Scale	-0.0889
SD in Original Scale	80.29	SD in Log Scale	2.442
95% t UCL (Assumes normality)	56.28	95% H-Stat UCL	219.3

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	57.81	95% GROS Adjusted Gamma UCL	98.59
95% Adjusted Gamma KM-UCL	118.7		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
owever, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician

Ethylbenzene - SWMU 9 Area B

General Statistics

Total Number of Observations	22	Number of Distinct Observations	6
Number of Detects	5	Number of Non-Detects	17
Number of Distinct Detects	5	Number of Distinct Non-Detects	2
Minimum Detect	0.21	Minimum Non-Detect	0.28
Maximum Detect	12	Maximum Non-Detect	0.5
Variance Detects	25.31	Percent Non-Detects	77.27%
Mean Detects	3.096	SD Detects	5.031
Median Detects	0.67	CV Detects	1.625
Skewness Detects	2.125	Kurtosis Detects	4.562
Mean of Logged Detects	0.115	SD of Logged Detects	1.56

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.668	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.762	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.378	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.396	Detected Data appear Normal at 5% Significance Level

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.866	Standard Error of Mean	0.587
SD	2.463	95% KM (BCA) UCL	2.064
95% KM (t) UCL	1.876	95% KM (Percentile Bootstrap) UCL	1.925
95% KM (z) UCL	1.831	95% KM Bootstrap t UCL	10.99
90% KM Chebyshev UCL	2.627	95% KM Chebyshev UCL	3.424
97.5% KM Chebyshev UCL	4.532	99% KM Chebyshev UCL	6.706

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.465	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.706	etected data appear Gamma Distributed at 5% Significance Leve
K-S Test Statistic	0.29	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.369	etected data appear Gamma Distributed at 5% Significance Leve

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.607	k star (bias corrected MLE)	0.376
Theta hat (MLE)	5.098	Theta star (bias corrected MLE)	8.228
nu hat (MLE)	6.073	nu star (bias corrected)	3.763
MLE Mean (bias corrected)	3.096	MLE Sd (bias corrected)	5.047

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.124	nu hat (KM)	5.441
Approximate Chi Square Value (5.44, α)	1.361	Adjusted Chi Square Value (5.44, β)	1.216
5% Gamma Approximate KM-UCL (use when n>=50)	3.462	95% Gamma Adjusted KM-UCL (use when n<50)	3.873

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.716
Maximum	12	Median	0.01
SD	2.562	CV	3.579
k hat (MLE)	0.233	k star (bias corrected MLE)	0.231
Theta hat (MLE)	3.078	Theta star (bias corrected MLE)	3.097
nu hat (MLE)	10.24	nu star (bias corrected)	10.17
MLE Mean (bias corrected)	0.716	MLE Sd (bias corrected)	1.489
		Adjusted Level of Significance (β)	0.0386
Approximate Chi Square Value (10.17, α)	4.051	Adjusted Chi Square Value (10.17, β)	3.766
95% Gamma Approximate UCL (use when n>=50)	1.798	95% Gamma Adjusted UCL (use when n<50)	1.934

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.946	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.229	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.396	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.845	Mean in Log Scale	-1.652
SD in Original Scale	2.53	SD in Log Scale	1.523
95% t UCL (assumes normality of ROS data)	1.773	95% Percentile Bootstrap UCL	1.883
95% BCA Bootstrap UCL	2.497	95% Bootstrap t UCL	9.352
95% H-UCL (Log ROS)	1.881		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-1.18	95% H-UCL (KM -Log)	0.838
KM SD (logged)	0.967	95% Critical H Value (KM-Log)	2.538
KM Standard Error of Mean (logged)	0.231		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	0.862	Mean in Log Scale	-1.23
SD in Original Scale	2.522	SD in Log Scale	1.042
95% t UCL (Assumes normality)	1.787	95% H-Stat UCL	0.918

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	1.876	95% KM (Percentile Bootstrap) UCL	1.925

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
owever, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician

UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	10/29/2014 10:39:20 AM
From File	TR Surface Water for ProUCL.xls
Full Precision	OFF
Confidence Coefficient	95%
mber of Bootstrap Operations	2000

Arsenic: Tank 214 Area Surface Water

General Statistics

Total Number of Observations	15	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	3.7	Mean	22.93
Maximum	110	Median	10
SD	26.66	Std. Error of Mean	6.883
Coefficient of Variation	1.162	Skewness	2.807

Normal GOF Test

Shapiro Wilk Test Statistic	0.615	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.881	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.286	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.229	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	35.06	95% Adjusted-CLT UCL (Chen-1995)	39.58
		95% Modified-t UCL (Johnson-1978)	35.89

Gamma GOF Test

A-D Test Statistic	1.37	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.755	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.319	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.226	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.438	k star (bias corrected MLE)	1.195
Theta hat (MLE)	15.95	Theta star (bias corrected MLE)	19.2
nu hat (MLE)	43.13	nu star (bias corrected)	35.84
MLE Mean (bias corrected)	22.93	MLE Sd (bias corrected)	20.98
		Approximate Chi Square Value (0.05)	23.14
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	21.89

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	35.52	95% Adjusted Gamma UCL (use when n<50)	37.55

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.864	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.881	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.302	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.229	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.308	Mean of logged Data	2.746
Maximum of Logged Data	4.7	SD of logged Data	0.838

Assuming Lognormal Distribution

95% H-UCL	38.74	90% Chebyshev (MVUE) UCL	36.45
95% Chebyshev (MVUE) UCL	43.22	97.5% Chebyshev (MVUE) UCL	52.62
99% Chebyshev (MVUE) UCL	71.09		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	34.25	95% Jackknife UCL	35.06
95% Standard Bootstrap UCL	33.78	95% Bootstrap-t UCL	50.81
95% Hall's Bootstrap UCL	73.11	95% Percentile Bootstrap UCL	34.5
95% BCA Bootstrap UCL	40.33		
90% Chebyshev(Mean, Sd) UCL	43.58	95% Chebyshev(Mean, Sd) UCL	52.93
97.5% Chebyshev(Mean, Sd) UCL	65.92	99% Chebyshev(Mean, Sd) UCL	91.41

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	52.93

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Arsenic: Background Surface Water

General Statistics

Total Number of Observations	19	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	1.8	Mean	4.705
Maximum	10	Median	3.3
SD	2.991	Std. Error of Mean	0.686
Coefficient of Variation	0.636	Skewness	1.137

Normal GOF Test

Shapiro Wilk Test Statistic	0.768	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.901	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.248	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.203	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	5.895	95% Adjusted-CLT UCL (Chen-1995)	6.025
		95% Modified-t UCL (Johnson-1978)	5.925

Gamma GOF Test

A-D Test Statistic	1.126	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.748	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.218	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.2	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	3.168	k star (bias corrected MLE)	2.703
Theta hat (MLE)	1.485	Theta star (bias corrected MLE)	1.741
nu hat (MLE)	120.4	nu star (bias corrected)	102.7
MLE Mean (bias corrected)	4.705	MLE Sd (bias corrected)	2.862
		Approximate Chi Square Value (0.05)	80.32
Adjusted Level of Significance	0.0369	Adjusted Chi Square Value	78.59

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	6.017	95% Adjusted Gamma UCL (use when n<50)	6.149

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.89	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.901	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.188	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.203	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.588	Mean of logged Data	1.383
Maximum of Logged Data	2.303	SD of logged Data	0.572

Assuming Lognormal Distribution

95% H-UCL	6.215	90% Chebyshev (MVUE) UCL	6.563
95% Chebyshev (MVUE) UCL	7.43	97.5% Chebyshev (MVUE) UCL	8.633
99% Chebyshev (MVUE) UCL	11		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	5.834	95% Jackknife UCL	5.895
95% Standard Bootstrap UCL	5.798	95% Bootstrap-t UCL	6.252
95% Hall's Bootstrap UCL	5.788	95% Percentile Bootstrap UCL	5.821
95% BCA Bootstrap UCL	6.021		
90% Chebyshev(Mean, Sd) UCL	6.764	95% Chebyshev(Mean, Sd) UCL	7.696
97.5% Chebyshev(Mean, Sd) UCL	8.991	99% Chebyshev(Mean, Sd) UCL	11.53

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	7.696

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Cadmium: Tank 214 Area Surface Water

General Statistics

Total Number of Observations	15	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	0.7	Mean	6.117
Maximum	38	Median	5
SD	9.116	Std. Error of Mean	2.354
Coefficient of Variation	1.49	Skewness	3.461

Normal GOF Test

Shapiro Wilk Test Statistic	0.502	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.881	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.415	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.229	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	10.26	95% Adjusted-CLT UCL (Chen-1995)	12.24
		95% Modified-t UCL (Johnson-1978)	10.61

Gamma GOF Test

A-D Test Statistic	1.118	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.762	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.314	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.228	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.055	k star (bias corrected MLE)	0.888
Theta hat (MLE)	5.799	Theta star (bias corrected MLE)	6.886
nu hat (MLE)	31.64	nu star (bias corrected)	26.65
MLE Mean (bias corrected)	6.117	MLE Sd (bias corrected)	6.49
		Approximate Chi Square Value (0.05)	15.88
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	14.86

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	10.26	95% Adjusted Gamma UCL (use when n<50)	10.97

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.897	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.881	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.235	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.229	Data Not Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-0.357	Mean of logged Data	1.267
Maximum of Logged Data	3.638	SD of logged Data	1.019

Assuming Lognormal Distribution

95% H-UCL	12.7	90% Chebyshev (MVUE) UCL	10.6
95% Chebyshev (MVUE) UCL	12.82	97.5% Chebyshev (MVUE) UCL	15.91
99% Chebyshev (MVUE) UCL	21.98		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	9.988	95% Jackknife UCL	10.26
95% Standard Bootstrap UCL	9.862	95% Bootstrap-t UCL	20.14
95% Hall's Bootstrap UCL	27.92	95% Percentile Bootstrap UCL	10.59
95% BCA Bootstrap UCL	12.26		
90% Chebyshev(Mean, Sd) UCL	13.18	95% Chebyshev(Mean, Sd) UCL	16.38
97.5% Chebyshev(Mean, Sd) UCL	20.82	99% Chebyshev(Mean, Sd) UCL	29.54

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	16.38

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Chromium: Tank 214 Area Surface Water

General Statistics

Total Number of Observations	15	Number of Distinct Observations	15
		Number of Missing Observations	0
Minimum	2.7	Mean	55.56
Maximum	540	Median	8
SD	142	Std. Error of Mean	36.68
Coefficient of Variation	2.557	Skewness	3.298

Normal GOF Test

Shapiro Wilk Test Statistic	0.42	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.881	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.466	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.229	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	120.2	95% Adjusted-CLT UCL (Chen-1995)	149.3
		95% Modified-t UCL (Johnson-1978)	125.4

Gamma GOF Test

A-D Test Statistic	2.866	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.81	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.385	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.236	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.418	k star (bias corrected MLE)	0.379
Theta hat (MLE)	132.8	Theta star (bias corrected MLE)	146.5
nu hat (MLE)	12.55	nu star (bias corrected)	11.38
MLE Mean (bias corrected)	55.56	MLE Sd (bias corrected)	90.23
		Approximate Chi Square Value (0.05)	4.818
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	4.304

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	131.2	95% Adjusted Gamma UCL (use when n<50)	146.8

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.739	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.881	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.276	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.229	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.993	Mean of logged Data	2.456
Maximum of Logged Data	6.292	SD of logged Data	1.441

Assuming Lognormal Distribution

95% H-UCL	127.1	90% Chebyshev (MVUE) UCL	66.26
95% Chebyshev (MVUE) UCL	83.05	97.5% Chebyshev (MVUE) UCL	106.4
99% Chebyshev (MVUE) UCL	152.1		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	115.9	95% Jackknife UCL	120.2
95% Standard Bootstrap UCL	112.2	95% Bootstrap-t UCL	1727
95% Hall's Bootstrap UCL	939.5	95% Percentile Bootstrap UCL	116.3
95% BCA Bootstrap UCL	173.6		
90% Chebyshev(Mean, Sd) UCL	165.6	95% Chebyshev(Mean, Sd) UCL	215.4
97.5% Chebyshev(Mean, Sd) UCL	284.6	99% Chebyshev(Mean, Sd) UCL	420.5

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	215.4

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Chromium: Background Surface Water

General Statistics

Total Number of Observations	19	Number of Distinct Observations	16
		Number of Missing Observations	0
Minimum	1.4	Mean	3.3
Maximum	10	Median	2.6
SD	1.908	Std. Error of Mean	0.438
Coefficient of Variation	0.578	Skewness	2.576

Normal GOF Test

Shapiro Wilk Test Statistic	0.731	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.901	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.186	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.203	Data appear Normal at 5% Significance Level

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	4.059	95% Adjusted-CLT UCL (Chen-1995)	4.296
		95% Modified-t UCL (Johnson-1978)	4.102

Gamma GOF Test

A-D Test Statistic	0.695	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.743	etected data appear Gamma Distributed at 5% Significance Lev
K-S Test Statistic	0.159	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.199	etected data appear Gamma Distributed at 5% Significance Lev

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	4.676	k star (bias corrected MLE)	3.972
Theta hat (MLE)	0.706	Theta star (bias corrected MLE)	0.831
nu hat (MLE)	177.7	nu star (bias corrected)	150.9
MLE Mean (bias corrected)	3.3	MLE Sd (bias corrected)	1.656
		Approximate Chi Square Value (0.05)	123.6
Adjusted Level of Significance	0.0369	Adjusted Chi Square Value	121.4

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	4.032	95% Adjusted Gamma UCL (use when n<50)	4.104

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.932	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.901	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.137	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.203	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.336	Mean of logged Data	1.083
Maximum of Logged Data	2.303	SD of logged Data	0.454

Assuming Lognormal Distribution

95% H-UCL	4.04	90% Chebyshev (MVUE) UCL	4.301
95% Chebyshev (MVUE) UCL	4.775	97.5% Chebyshev (MVUE) UCL	5.433
99% Chebyshev (MVUE) UCL	6.725		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	4.02	95% Jackknife UCL	4.059
95% Standard Bootstrap UCL	3.998	95% Bootstrap-t UCL	4.681
95% Hall's Bootstrap UCL	7.302	95% Percentile Bootstrap UCL	4.079
95% BCA Bootstrap UCL	4.347		
90% Chebyshev(Mean, Sd) UCL	4.613	95% Chebyshev(Mean, Sd) UCL	5.208
97.5% Chebyshev(Mean, Sd) UCL	6.033	99% Chebyshev(Mean, Sd) UCL	7.655

Suggested UCL to Use

95% Student's-t UCL	4.059

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Cobalt: Tank 214 Area Surface Water

General Statistics

Total Number of Observations	15	Number of Distinct Observations	12
		Number of Missing Observations	0
Minimum	0.96	Mean	26.64
Maximum	220	Median	4.4
SD	59.99	Std. Error of Mean	15.49
Coefficient of Variation	2.252	Skewness	2.93

Normal GOF Test

Shapiro Wilk Test Statistic	0.468	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.881	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.476	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.229	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	53.92	95% Adjusted-CLT UCL (Chen-1995)	64.63
		95% Modified-t UCL (Johnson-1978)	55.87

Gamma GOF Test

A-D Test Statistic	2.036	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.799	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.394	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.235	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.471	k star (bias corrected MLE)	0.421
Theta hat (MLE)	56.61	Theta star (bias corrected MLE)	63.29
nu hat (MLE)	14.12	nu star (bias corrected)	12.63
MLE Mean (bias corrected)	26.64	MLE Sd (bias corrected)	41.06
		Approximate Chi Square Value (0.05)	5.643
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	5.078

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	59.61	95% Adjusted Gamma UCL (use when n<50)	66.23

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.865	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.881	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.263	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.229	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-0.0408	Mean of logged Data	1.92
Maximum of Logged Data	5.394	SD of logged Data	1.462

Assuming Lognormal Distribution

95% H-UCL	79.15	90% Chebyshev (MVUE) UCL	40.06
95% Chebyshev (MVUE) UCL	50.28	97.5% Chebyshev (MVUE) UCL	64.47
99% Chebyshev (MVUE) UCL	92.33		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	52.11	95% Jackknife UCL	53.92
95% Standard Bootstrap UCL	51.34	95% Bootstrap-t UCL	423.8
95% Hall's Bootstrap UCL	223.9	95% Percentile Bootstrap UCL	55.06
95% BCA Bootstrap UCL	69.5		
90% Chebyshev(Mean, Sd) UCL	73.1	95% Chebyshev(Mean, Sd) UCL	94.15
97.5% Chebyshev(Mean, Sd) UCL	123.4	99% Chebyshev(Mean, Sd) UCL	180.7

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	94.15

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Cobalt: Background Surface Water

General Statistics

Total Number of Observations	20	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	1.5	Mean	3.96
Maximum	10	Median	2.35
SD	3.002	Std. Error of Mean	0.671
Coefficient of Variation	0.758	Skewness	1.334

Normal GOF Test

Shapiro Wilk Test Statistic	0.723	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.905	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.3	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.198	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	5.121	95% Adjusted-CLT UCL (Chen-1995)	5.278
		95% Modified-t UCL (Johnson-1978)	5.154

Gamma GOF Test

A-D Test Statistic	1.824	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.75	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.271	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.196	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.426	k star (bias corrected MLE)	2.096
Theta hat (MLE)	1.632	Theta star (bias corrected MLE)	1.89
nu hat (MLE)	97.05	nu star (bias corrected)	83.82
MLE Mean (bias corrected)	3.96	MLE Sd (bias corrected)	2.736
		Approximate Chi Square Value (0.05)	63.72
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	62.34

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	5.209	95% Adjusted Gamma UCL (use when n<50)	5.325

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.829	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.905	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.246	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.198	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.405	Mean of logged Data	1.156
Maximum of Logged Data	2.303	SD of logged Data	0.641

Assuming Lognormal Distribution

95% H-UCL	5.368	90% Chebyshev (MVUE) UCL	5.61
95% Chebyshev (MVUE) UCL	6.404	97.5% Chebyshev (MVUE) UCL	7.506
99% Chebyshev (MVUE) UCL	9.672		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	5.064	95% Jackknife UCL	5.121
95% Standard Bootstrap UCL	5.051	95% Bootstrap-t UCL	5.512
95% Hall's Bootstrap UCL	4.989	95% Percentile Bootstrap UCL	5.05
95% BCA Bootstrap UCL	5.255		
90% Chebyshev(Mean, Sd) UCL	5.974	95% Chebyshev(Mean, Sd) UCL	6.886
97.5% Chebyshev(Mean, Sd) UCL	8.152	99% Chebyshev(Mean, Sd) UCL	10.64

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	6.886

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Copper: Tank 214 Area Surface Water

General Statistics

Total Number of Observations	15	Number of Distinct Observations	15
		Number of Missing Observations	0
Minimum	8.1	Mean	339.1
Maximum	3100	Median	41.4
SD	851.9	Std. Error of Mean	219.9
Coefficient of Variation	2.512	Skewness	2.966

Normal GOF Test

Shapiro Wilk Test Statistic	0.44	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.881	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.489	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.229	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	726.5	95% Adjusted-CLT UCL (Chen-1995)	880.9
		95% Modified-t UCL (Johnson-1978)	754.5

Gamma GOF Test

A-D Test Statistic	2.684	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.822	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.432	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.238	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.366	k star (bias corrected MLE)	0.337
Theta hat (MLE)	927.1	Theta star (bias corrected MLE)	1006
nu hat (MLE)	10.97	nu star (bias corrected)	10.11
MLE Mean (bias corrected)	339.1	MLE Sd (bias corrected)	584.1
		Approximate Chi Square Value (0.05)	4.011
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	3.55

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	854.7	95% Adjusted Gamma UCL (use when n<50)	965.6

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.785	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.881	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.296	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.229	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.092	Mean of logged Data	4.001
Maximum of Logged Data	8.039	SD of logged Data	1.622

Assuming Lognormal Distribution

95% H-UCL	1075	90% Chebyshev (MVUE) UCL	420.2
95% Chebyshev (MVUE) UCL	532.6	97.5% Chebyshev (MVUE) UCL	688.5
99% Chebyshev (MVUE) UCL	994.9		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	700.9	95% Jackknife UCL	726.5
95% Standard Bootstrap UCL	683.8	95% Bootstrap-t UCL	12792
95% Hall's Bootstrap UCL	4791	95% Percentile Bootstrap UCL	741.6
95% BCA Bootstrap UCL	950.9		
90% Chebyshev(Mean, Sd) UCL	998.9	95% Chebyshev(Mean, Sd) UCL	1298
97.5% Chebyshev(Mean, Sd) UCL	1713	99% Chebyshev(Mean, Sd) UCL	2528

Suggested UCL to Use

99% Chebyshev (Mean, Sd) UCL	2528

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Copper: Background Surface Water

General Statistics

Total Number of Observations	20	Number of Distinct Observations	20
		Number of Missing Observations	0
Minimum	2.5	Mean	10.26
Maximum	42.3	Median	8
SD	8.843	Std. Error of Mean	1.977
Coefficient of Variation	0.862	Skewness	2.701

Normal GOF Test

Shapiro Wilk Test Statistic	0.72	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.905	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.212	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.198	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	13.67	95% Adjusted-CLT UCL (Chen-1995)	14.78
		95% Modified-t UCL (Johnson-1978)	13.87

Gamma GOF Test

A-D Test Statistic	0.402	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.752	etected data appear Gamma Distributed at 5% Significance Lev
K-S Test Statistic	0.123	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.196	etected data appear Gamma Distributed at 5% Significance Lev

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.115	k star (bias corrected MLE)	1.831
Theta hat (MLE)	4.85	Theta star (bias corrected MLE)	5.601
nu hat (MLE)	84.59	nu star (bias corrected)	73.23
MLE Mean (bias corrected)	10.26	MLE Sd (bias corrected)	7.579
		Approximate Chi Square Value (0.05)	54.53
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	53.25

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	13.77	95% Adjusted Gamma UCL (use when n<50)	14.1

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.963	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.905	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.123	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.198	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.916	Mean of logged Data	2.073
Maximum of Logged Data	3.745	SD of logged Data	0.717

Assuming Lognormal Distribution

95% H-UCL	14.9	90% Chebyshev (MVUE) UCL	15.33
95% Chebyshev (MVUE) UCL	17.69	97.5% Chebyshev (MVUE) UCL	20.97
99% Chebyshev (MVUE) UCL	27.4		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	13.51	95% Jackknife UCL	13.67
95% Standard Bootstrap UCL	13.41	95% Bootstrap-t UCL	16.56
95% Hall's Bootstrap UCL	28.18	95% Percentile Bootstrap UCL	13.77
95% BCA Bootstrap UCL	15.36		
90% Chebyshev(Mean, Sd) UCL	16.19	95% Chebyshev(Mean, Sd) UCL	18.87
97.5% Chebyshev(Mean, Sd) UCL	22.6	99% Chebyshev(Mean, Sd) UCL	29.93

Suggested UCL to Use

95% Adjusted Gamma UCL	14.1

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Lead: Tank 214 Area Surface Water

General Statistics

Total Number of Observations	15	Number of Distinct Observations	12
		Number of Missing Observations	0
Minimum	1.7	Mean	83.79
Maximum	1100	Median	4.5
SD	281.9	Std. Error of Mean	72.79
Coefficient of Variation	3.365	Skewness	3.836

Normal GOF Test

Shapiro Wilk Test Statistic	0.324	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.881	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.444	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.229	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	212	95% Adjusted-CLT UCL (Chen-1995)	280.6
		95% Modified-t UCL (Johnson-1978)	224

Gamma GOF Test

A-D Test Statistic	3.244	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.844	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.444	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.241	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.283	k star (bias corrected MLE)	0.271
Theta hat (MLE)	296	Theta star (bias corrected MLE)	309.3
nu hat (MLE)	8.493	nu star (bias corrected)	8.128
MLE Mean (bias corrected)	83.79	MLE Sd (bias corrected)	161
		Approximate Chi Square Value (0.05)	2.809
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	2.438

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	242.4	95% Adjusted Gamma UCL (use when n<50)	279.3

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.707	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.881	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.365	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.229	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.531	Mean of logged Data	1.969
Maximum of Logged Data	7.003	SD of logged Data	1.726

Assuming Lognormal Distribution

95% H-UCL	204.2	90% Chebyshev (MVUE) UCL	65.99
95% Chebyshev (MVUE) UCL	84.1	97.5% Chebyshev (MVUE) UCL	109.2
99% Chebyshev (MVUE) UCL	158.6		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	203.5	95% Jackknife UCL	212
95% Standard Bootstrap UCL	200.1	95% Bootstrap-t UCL	3451
95% Hall's Bootstrap UCL	3252	95% Percentile Bootstrap UCL	228.1
95% BCA Bootstrap UCL	308.7		
90% Chebyshev(Mean, Sd) UCL	302.2	95% Chebyshev(Mean, Sd) UCL	401.1
97.5% Chebyshev(Mean, Sd) UCL	538.4	99% Chebyshev(Mean, Sd) UCL	808.1

Suggested UCL to Use

99% Chebyshev (Mean, Sd) UCL	808.1

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Lead: Background Surface Water

General Statistics

Total Number of Observations	20	Number of Distinct Observations	11
		Number of Missing Observations	0
Minimum	0.74	Mean	3.182
Maximum	5	Median	3.5
SD	1.863	Std. Error of Mean	0.417
Coefficient of Variation	0.586	Skewness	-0.133

Normal GOF Test

Shapiro Wilk Test Statistic	0.758	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.905	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.286	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.198	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	3.902	95% Adjusted-CLT UCL (Chen-1995)	3.853
		95% Modified-t UCL (Johnson-1978)	3.9

Gamma GOF Test

A-D Test Statistic	1.852	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.751	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.283	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.196	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.387	k star (bias corrected MLE)	2.062
Theta hat (MLE)	1.333	Theta star (bias corrected MLE)	1.543
nu hat (MLE)	95.49	nu star (bias corrected)	82.5
MLE Mean (bias corrected)	3.182	MLE Sd (bias corrected)	2.215
		Approximate Chi Square Value (0.05)	62.57
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	61.19

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	4.195	95% Adjusted Gamma UCL (use when n<50)	4.289

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.8	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.905	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.28	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.198	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-0.301	Mean of logged Data	0.934
Maximum of Logged Data	1.609	SD of logged Data	0.74

Assuming Lognormal Distribution

95% H-UCL	4.929	90% Chebyshev (MVUE) UCL	5.042
95% Chebyshev (MVUE) UCL	5.836	97.5% Chebyshev (MVUE) UCL	6.938
99% Chebyshev (MVUE) UCL	9.102		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	3.867	95% Jackknife UCL	3.902
95% Standard Bootstrap UCL	3.871	95% Bootstrap-t UCL	3.889
95% Hall's Bootstrap UCL	3.832	95% Percentile Bootstrap UCL	3.825
95% BCA Bootstrap UCL	3.861		
90% Chebyshev(Mean, Sd) UCL	4.431	95% Chebyshev(Mean, Sd) UCL	4.997
97.5% Chebyshev(Mean, Sd) UCL	5.783	99% Chebyshev(Mean, Sd) UCL	7.326

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	4.997

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. For additional insight the user may want to consult a statistician.

Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Nickel: Tank 214 Area Surface Water

General Statistics

Total Number of Observations	15	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	2.7	Mean	39.44
Maximum	200	Median	40
SD	49.3	Std. Error of Mean	12.73
Coefficient of Variation	1.25	Skewness	2.723

Normal GOF Test

Shapiro Wilk Test Statistic	0.644	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.881	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.362	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.229	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	61.86	95% Adjusted-CLT UCL (Chen-1995)	69.94
		95% Modified-t UCL (Johnson-1978)	63.35

Gamma GOF Test

A-D Test Statistic	0.918	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.768	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.243	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.229	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.906	k star (bias corrected MLE)	0.769
Theta hat (MLE)	43.55	Theta star (bias corrected MLE)	51.29
nu hat (MLE)	27.17	nu star (bias corrected)	23.07
MLE Mean (bias corrected)	39.44	MLE Sd (bias corrected)	44.98
		Approximate Chi Square Value (0.05)	13.14
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	12.23

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	69.23	95% Adjusted Gamma UCL (use when n<50)	74.41

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.887	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.881	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.3	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.229	Data Not Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.993	Mean of logged Data	3.03
Maximum of Logged Data	5.298	SD of logged Data	1.259

Assuming Lognormal Distribution

95% H-UCL	133.1	90% Chebyshev (MVUE) UCL	88
95% Chebyshev (MVUE) UCL	108.8	97.5% Chebyshev (MVUE) UCL	137.7
99% Chebyshev (MVUE) UCL	194.5		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	60.38	95% Jackknife UCL	61.86
95% Standard Bootstrap UCL	59.92	95% Bootstrap-t UCL	83.16
95% Hall's Bootstrap UCL	157	95% Percentile Bootstrap UCL	60.91
95% BCA Bootstrap UCL	73.67		
90% Chebyshev(Mean, Sd) UCL	77.63	95% Chebyshev(Mean, Sd) UCL	94.93
97.5% Chebyshev(Mean, Sd) UCL	118.9	99% Chebyshev(Mean, Sd) UCL	166.1

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	94.93

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Nickel: Background Surface Water

General Statistics

Total Number of Observations	20	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	1.2	Mean	20.87
Maximum	40	Median	21.3
SD	19.63	Std. Error of Mean	4.389
Coefficient of Variation	0.941	Skewness	-8.666E-4

Normal GOF Test

Shapiro Wilk Test Statistic	0.65	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.905	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.335	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.198	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	28.46	95% Adjusted-CLT UCL (Chen-1995)	28.09
		95% Modified-t UCL (Johnson-1978)	28.46

Gamma GOF Test

A-D Test Statistic	3.07	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.788	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.338	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.203	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.655	k star (bias corrected MLE)	0.59
Theta hat (MLE)	31.89	Theta star (bias corrected MLE)	35.39
nu hat (MLE)	26.18	nu star (bias corrected)	23.59
MLE Mean (bias corrected)	20.87	MLE Sd (bias corrected)	27.18
		Approximate Chi Square Value (0.05)	13.54
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	12.93

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	36.37	95% Adjusted Gamma UCL (use when n<50)	38.06

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.702	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.905	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.334	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.198	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.182	Mean of logged Data	2.106
Maximum of Logged Data	3.689	SD of logged Data	1.633

Assuming Lognormal Distribution

95% H-UCL	122.7	90% Chebyshev (MVUE) UCL	63.47
95% Chebyshev (MVUE) UCL	79.86	97.5% Chebyshev (MVUE) UCL	102.6
99% Chebyshev (MVUE) UCL	147.3		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	28.09	95% Jackknife UCL	28.46
95% Standard Bootstrap UCL	27.89	95% Bootstrap-t UCL	29.15
95% Hall's Bootstrap UCL	27.93	95% Percentile Bootstrap UCL	28.46
95% BCA Bootstrap UCL	28.5		
90% Chebyshev(Mean, Sd) UCL	34.04	95% Chebyshev(Mean, Sd) UCL	40
97.5% Chebyshev(Mean, Sd) UCL	48.28	99% Chebyshev(Mean, Sd) UCL	64.54

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	40

Recommended UCL exceeds the maximum observation

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. For additional insight the user may want to consult a statistician.

Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

Vanadium: Tank 214 Area Surface Water

General Statistics

Total Number of Observations	15	Number of Distinct Observations	15
		Number of Missing Observations	0
Minimum	23	Mean	481.3
Maximum	4700	Median	70.9
SD	1241	Std. Error of Mean	320.5
Coefficient of Variation	2.579	Skewness	3.272

Normal GOF Test

Shapiro Wilk Test Statistic	0.421	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.881	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.477	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.229	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	1046	95% Adjusted-CLT UCL (Chen-1995)	1298
		95% Modified-t UCL (Johnson-1978)	1091

Gamma GOF Test

A-D Test Statistic	2.728	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.815	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.412	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.237	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.399	k star (bias corrected MLE)	0.363
Theta hat (MLE)	1208	Theta star (bias corrected MLE)	1325
nu hat (MLE)	11.96	nu star (bias corrected)	10.9
MLE Mean (bias corrected)	481.3	MLE Sd (bias corrected)	798.5
		Approximate Chi Square Value (0.05)	4.511
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	4.017

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	1163	95% Adjusted Gamma UCL (use when n<50)	1306

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.761	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.881	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.268	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.229	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	3.135	Mean of logged Data	4.525
Maximum of Logged Data	8.455	SD of logged Data	1.501

Assuming Lognormal Distribution

95% H-UCL	1213	90% Chebyshev (MVUE) UCL	578.4
95% Chebyshev (MVUE) UCL	727.8	97.5% Chebyshev (MVUE) UCL	935.2
99% Chebyshev (MVUE) UCL	1343		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	1008	95% Jackknife UCL	1046
95% Standard Bootstrap UCL	984.6	95% Bootstrap-t UCL	17183
95% Hall's Bootstrap UCL	5601	95% Percentile Bootstrap UCL	1089
95% BCA Bootstrap UCL	1316		
90% Chebyshev(Mean, Sd) UCL	1443	95% Chebyshev(Mean, Sd) UCL	1878
97.5% Chebyshev(Mean, Sd) UCL	2483	99% Chebyshev(Mean, Sd) UCL	3670

Suggested UCL to Use

99% Chebyshev (Mean, Sd) UCL	3670

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Vanadium: Background Surface Water

General Statistics

Total Number of Observations	19	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	13	Mean	28.42
Maximum	50	Median	22
SD	15.51	Std. Error of Mean	3.559
Coefficient of Variation	0.546	Skewness	0.664

Normal GOF Test

Shapiro Wilk Test Statistic	0.761	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.901	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.271	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.203	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	34.59	95% Adjusted-CLT UCL (Chen-1995)	34.86
		95% Modified-t UCL (Johnson-1978)	34.68

Gamma GOF Test

A-D Test Statistic	1.465	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.746	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.232	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.199	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	3.808	k star (bias corrected MLE)	3.242
Theta hat (MLE)	7.463	Theta star (bias corrected MLE)	8.766
nu hat (MLE)	144.7	nu star (bias corrected)	123.2
MLE Mean (bias corrected)	28.42	MLE Sd (bias corrected)	15.78
		Approximate Chi Square Value (0.05)	98.56
Adjusted Level of Significance	0.0369	Adjusted Chi Square Value	96.64

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	35.52	95% Adjusted Gamma UCL (use when n<50)	36.23

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.836	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.901	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.222	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.203	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.565	Mean of logged Data	3.21
Maximum of Logged Data	3.912	SD of logged Data	0.533

Assuming Lognormal Distribution

95% H-UCL	36.9	90% Chebyshev (MVUE) UCL	39.12
95% Chebyshev (MVUE) UCL	44.01	97.5% Chebyshev (MVUE) UCL	50.79
99% Chebyshev (MVUE) UCL	64.13		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	34.28	95% Jackknife UCL	34.59
95% Standard Bootstrap UCL	34.15	95% Bootstrap-t UCL	35.15
95% Hall's Bootstrap UCL	34.08	95% Percentile Bootstrap UCL	34.05
95% BCA Bootstrap UCL	34.68		
90% Chebyshev(Mean, Sd) UCL	39.1	95% Chebyshev(Mean, Sd) UCL	43.94
97.5% Chebyshev(Mean, Sd) UCL	50.65	99% Chebyshev(Mean, Sd) UCL	63.84

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	43.94

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Zinc: Tank 214 Area Surface Water

General Statistics

Total Number of Observations	15	Number of Distinct Observations	13
		Number of Missing Observations	0
Minimum	6.3	Mean	135.4
Maximum	1300	Median	19.9
SD	343.4	Std. Error of Mean	88.67
Coefficient of Variation	2.536	Skewness	3.255

Normal GOF Test

Shapiro Wilk Test Statistic	0.421	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.881	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.479	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.229	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	291.6	95% Adjusted-CLT UCL (Chen-1995)	360.9
		95% Modified-t UCL (Johnson-1978)	304

Gamma GOF Test

A-D Test Statistic	2.971	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.809	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.429	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.236	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.423	k star (bias corrected MLE)	0.383
Theta hat (MLE)	319.8	Theta star (bias corrected MLE)	353.4
nu hat (MLE)	12.7	nu star (bias corrected)	11.49
MLE Mean (bias corrected)	135.4	MLE Sd (bias corrected)	218.8
		Approximate Chi Square Value (0.05)	4.896
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	4.377

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	317.9	95% Adjusted Gamma UCL (use when n<50)	355.6

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.726	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.881	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.299	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.229	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.841	Mean of logged Data	3.368
Maximum of Logged Data	7.17	SD of logged Data	1.426

Assuming Lognormal Distribution

95% H-UCL	301.4	90% Chebyshev (MVUE) UCL	160.8
95% Chebyshev (MVUE) UCL	201.3	97.5% Chebyshev (MVUE) UCL	257.5
99% Chebyshev (MVUE) UCL	368		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	281.3	95% Jackknife UCL	291.6
95% Standard Bootstrap UCL	274.3	95% Bootstrap-t UCL	5120
95% Hall's Bootstrap UCL	1829	95% Percentile Bootstrap UCL	305.4
95% BCA Bootstrap UCL	392.7		
90% Chebyshev(Mean, Sd) UCL	401.4	95% Chebyshev(Mean, Sd) UCL	521.9
97.5% Chebyshev(Mean, Sd) UCL	689.2	99% Chebyshev(Mean, Sd) UCL	1018

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	521.9

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Zinc: Background Surface Water

General Statistics

Total Number of Observations	20	Number of Distinct Observations	12
		Number of Missing Observations	0
Minimum	6	Mean	17.18
Maximum	30	Median	20
SD	6.901	Std. Error of Mean	1.543
Coefficient of Variation	0.402	Skewness	-0.467

Normal GOF Test

Shapiro Wilk Test Statistic	0.859	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.905	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.304	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.198	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	19.84	95% Adjusted-CLT UCL (Chen-1995)	19.54
		95% Modified-t UCL (Johnson-1978)	19.82

Gamma GOF Test

A-D Test Statistic	1.942	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.745	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.347	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.194	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	4.894	k star (bias corrected MLE)	4.193
Theta hat (MLE)	3.509	Theta star (bias corrected MLE)	4.096
nu hat (MLE)	195.8	nu star (bias corrected)	167.7
MLE Mean (bias corrected)	17.18	MLE Sd (bias corrected)	8.387
		Approximate Chi Square Value (0.05)	138.8
Adjusted Level of Significance	0.038	Adjusted Chi Square Value	136.7

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	20.76	95% Adjusted Gamma UCL (use when n<50)	21.07

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.788	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.905	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.356	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.198	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.792	Mean of logged Data	2.738
Maximum of Logged Data	3.401	SD of logged Data	0.513

Assuming Lognormal Distribution

95% H-UCL	22.39	90% Chebyshev (MVUE) UCL	23.75
95% Chebyshev (MVUE) UCL	26.58	97.5% Chebyshev (MVUE) UCL	30.51
99% Chebyshev (MVUE) UCL	38.23		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	19.71	95% Jackknife UCL	19.84
95% Standard Bootstrap UCL	19.68	95% Bootstrap-t UCL	19.64
95% Hall's Bootstrap UCL	19.56	95% Percentile Bootstrap UCL	19.67
95% BCA Bootstrap UCL	19.59		
90% Chebyshev(Mean, Sd) UCL	21.8	95% Chebyshev(Mean, Sd) UCL	23.9
97.5% Chebyshev(Mean, Sd) UCL	26.81	99% Chebyshev(Mean, Sd) UCL	32.53

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	23.9

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. For additional insight the user may want to consult a statistician.

Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	7/15/2014 11:29:17 AM
From File	SWMU SW DATA SER_a.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Copper: Tank 214 Area Surface Water

General Statistics

Total Number of Observations	11	Number of Distinct Observations	9
Number of Detects	10	Number of Non-Detects	1
Number of Distinct Detects	8	Number of Distinct Non-Detects	1
Minimum Detect	1.4	Minimum Non-Detect	20
Maximum Detect	3.6	Maximum Non-Detect	20
Variance Detects	0.598	Percent Non-Detects	9.091%
Mean Detects	2.34	SD Detects	0.773
Median Detects	2.05	CV Detects	0.331
Skewness Detects	0.654	Kurtosis Detects	-0.934
Mean of Logged Detects	0.803	SD of Logged Detects	0.323

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.899	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.215	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.28	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	2.34	Standard Error of Mean	0.245
SD	0.734	95% KM (BCA) UCL	2.713
95% KM (t) UCL	2.783	95% KM (Percentile Bootstrap) UCL	2.71
95% KM (z) UCL	2.742	95% KM Bootstrap t UCL	2.875
90% KM Chebyshev UCL	3.074	95% KM Chebyshev UCL	3.406
97.5% KM Chebyshev UCL	3.867	99% KM Chebyshev UCL	4.774

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.394	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.725	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.21	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.267	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	10.69	k star (bias corrected MLE)	7.549
Theta hat (MLE)	0.219	Theta star (bias corrected MLE)	0.31
nu hat (MLE)	213.8	nu star (bias corrected)	151
MLE Mean (bias corrected)	2.34	MLE Sd (bias corrected)	0.852

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	10.17	nu hat (KM)	223.7
Approximate Chi Square Value (223.74, α)	190.1	Adjusted Chi Square Value (223.74, β)	185.1
95% Gamma Approximate KM-UCL (use when n>=50)	2.754	95% Gamma Adjusted KM-UCL (use when n<50)	2.829

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	1.4	Mean	2.335
Maximum	3.6	Median	2.2
SD	0.734	CV	0.314
k hat (MLE)	11.74	k star (bias corrected MLE)	8.595
Theta hat (MLE)	0.199	Theta star (bias corrected MLE)	0.272
nu hat (MLE)	258.2	nu star (bias corrected)	189.1
MLE Mean (bias corrected)	2.335	MLE Sd (bias corrected)	0.796
		Adjusted Level of Significance (β)	0.0278
Approximate Chi Square Value (189.10, α)	158.3	Adjusted Chi Square Value (189.10, β)	153.7
95% Gamma Approximate UCL (use when n>=50)	2.789	95% Gamma Adjusted UCL (use when n<50)	2.873

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.934	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.191	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.28	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	2.33	Mean in Log Scale	0.803
SD in Original Scale	0.734	SD in Log Scale	0.306
95% t UCL (assumes normality of ROS data)	2.732	95% Percentile Bootstrap UCL	2.694
95% BCA Bootstrap UCL	2.727	95% Bootstrap t UCL	2.821
95% H-UCL (Log ROS)	2.825		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	0.803	95% H-UCL (KM -Log)	2.825
KM SD (logged)	0.306	95% Critical H Value (KM-Log)	1.955
KM Standard Error of Mean (logged)	0.102		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	3.036	Mean in Log Scale	0.939
SD in Original Scale	2.423	SD in Log Scale	0.546
95% t UCL (Assumes normality)	4.361	95% H-Stat UCL	4.369

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	2.783	95% KM (Percentile Bootstrap) UCL	2.71

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Copper: Background Surface Water

General Statistics

Total Number of Observations	18	Number of Distinct Observations	11
Number of Detects	15	Number of Non-Detects	3
Number of Distinct Detects	10	Number of Distinct Non-Detects	1
Minimum Detect	1.1	Minimum Non-Detect	20
Maximum Detect	2.9	Maximum Non-Detect	20
Variance Detects	0.314	Percent Non-Detects	16.67%
Mean Detects	2.067	SD Detects	0.56
Median Detects	2	CV Detects	0.271
Skewness Detects	-0.083	Kurtosis Detects	-0.935
Mean of Logged Detects	0.688	SD of Logged Detects	0.291

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.957	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.881	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.124	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.229	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	2.067	Standard Error of Mean	0.145
SD	0.541	95% KM (BCA) UCL	2.294
95% KM (t) UCL	2.318	95% KM (Percentile Bootstrap) UCL	2.306
95% KM (z) UCL	2.305	95% KM Bootstrap t UCL	2.321
90% KM Chebyshev UCL	2.501	95% KM Chebyshev UCL	2.697
97.5% KM Chebyshev UCL	2.97	99% KM Chebyshev UCL	3.506

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.308	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.736	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.143	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.221	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	13.51	k star (bias corrected MLE)	10.85
Theta hat (MLE)	0.153	Theta star (bias corrected MLE)	0.19
nu hat (MLE)	405.4	nu star (bias corrected)	325.6
MLE Mean (bias corrected)	2.067	MLE Sd (bias corrected)	0.627

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	14.58	nu hat (KM)	525
Approximate Chi Square Value (524.98, α)	472.8	Adjusted Chi Square Value (524.98, β)	468.1
95% Gamma Approximate KM-UCL (use when n>=50)	2.295	95% Gamma Adjusted KM-UCL (use when n<50)	2.318

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	1.1	Mean	2.063
Maximum	2.9	Median	2.013
SD	0.529	CV	0.256
k hat (MLE)	15.02	k star (bias corrected MLE)	12.55
Theta hat (MLE)	0.137	Theta star (bias corrected MLE)	0.164
nu hat (MLE)	540.8	nu star (bias corrected)	452
MLE Mean (bias corrected)	2.063	MLE Sd (bias corrected)	0.582
		Adjusted Level of Significance (β)	0.0357
Approximate Chi Square Value (451.97, α)	403.7	Adjusted Chi Square Value (451.97, β)	399.3
95% Gamma Approximate UCL (use when n>=50)	2.31	95% Gamma Adjusted UCL (use when n<50)	2.335

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.942	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.881	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.14	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.229	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	2.059	Mean in Log Scale	0.688
SD in Original Scale	0.531	SD in Log Scale	0.274
95% t UCL (assumes normality of ROS data)	2.277	95% Percentile Bootstrap UCL	2.264
95% BCA Bootstrap UCL	2.249	95% Bootstrap t UCL	2.294
95% H-UCL (Log ROS)	2.336		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	0.688	95% H-UCL (KM -Log)	2.347
KM SD (logged)	0.281	95% Critical H Value (KM-Log)	1.839
KM Standard Error of Mean (logged)	0.0751		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	3.389	Mean in Log Scale	0.957
SD in Original Scale	3.084	SD in Log Scale	0.673
95% t UCL (Assumes normality)	4.654	95% H-Stat UCL	4.683

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	2.318	95% KM (Percentile Bootstrap) UCL	2.306

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

UCL Statistics for Uncensored Full Data Sets: SWMU 9 Area B and Background Sediment
and
UCL Statistics for Data Sets with Non-Detects: SWMU 9 Area B and Background Sediment

Barium: Tank 214 Area Sediment

General Statistics

Total Number of Observations	68	Number of Distinct Observations	24
Number of Detects	67	Number of Non-Detects	1
Number of Distinct Detects	24	Number of Distinct Non-Detects	1
Minimum Detect	12	Minimum Non-Detect	14
Maximum Detect	54	Maximum Non-Detect	14
Variance Detects	85.62	Percent Non-Detects	1.471%
Mean Detects	21.51	SD Detects	9.253
Median Detects	19	CV Detects	0.43
Skewness Detects	1.898	Kurtosis Detects	3.457
Mean of Logged Detects	2.999	SD of Logged Detects	0.355

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.779	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	1.465E-13	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.197	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.108	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	21.37	Standard Error of Mean	1.123
SD	9.187	95% KM (BCA) UCL	23.19
95% KM (t) UCL	23.24	95% KM (Percentile Bootstrap) UCL	23.34
95% KM (z) UCL	23.21	95% KM Bootstrap t UCL	23.53
90% KM Chebyshev UCL	24.74	95% KM Chebyshev UCL	26.26
97.5% KM Chebyshev UCL	28.38	99% KM Chebyshev UCL	32.54

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	2.544	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.752	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.148	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.109	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	7.351	k star (bias corrected MLE)	7.031
Theta hat (MLE)	2.926	Theta star (bias corrected MLE)	3.059
nu hat (MLE)	985	nu star (bias corrected)	942.2
MLE Mean (bias corrected)	21.51	MLE Sd (bias corrected)	8.111

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	5.409	nu hat (KM)	735.6
Approximate Chi Square Value (735.64, α)	673.7	Adjusted Chi Square Value (735.64, β)	672.4
5% Gamma Approximate KM-UCL (use when n>=50)	23.33	95% Gamma Adjusted KM-UCL (use when n<50)	23.38

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	7.104	Mean	21.3
Maximum	54	Median	19
SD	9.348	CV	0.439
k hat (MLE)	6.835	k star (bias corrected MLE)	6.543
Theta hat (MLE)	3.116	Theta star (bias corrected MLE)	3.255
nu hat (MLE)	929.6	nu star (bias corrected)	889.9
MLE Mean (bias corrected)	21.3	MLE Sd (bias corrected)	8.325
		Adjusted Level of Significance (β)	0.0465
Approximate Chi Square Value (889.90, α)	821.7	Adjusted Chi Square Value (889.90, β)	820.3
95% Gamma Approximate UCL (use when n>=50)	23.06	95% Gamma Adjusted UCL (use when n<50)	23.1

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.128	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.108	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	21.34	Mean in Log Scale	2.989
SD in Original Scale	9.288	SD in Log Scale	0.362
95% t UCL (assumes normality of ROS data)	23.22	95% Percentile Bootstrap UCL	23.22
95% BCA Bootstrap UCL	23.51	95% Bootstrap t UCL	23.57
95% H-UCL (Log ROS)	22.95		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	21.29	Mean in Log Scale	2.983
SD in Original Scale	9.351	SD in Log Scale	0.374
95% t UCL (Assumes normality)	23.19	95% H-Stat UCL	23

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics
Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	26.26

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician

Barium: Background Sediment

General Statistics

Total Number of Observations	21	Number of Distinct Observations	12
		Number of Missing Observations	0
Minimum	4.6	Mean	13.59
Maximum	30	Median	13
SD	6.07	Std. Error of Mean	1.325
Coefficient of Variation	0.447	Skewness	1.419

Normal GOF Test

Shapiro Wilk Test Statistic	0.835	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.908	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.265	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.193	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	15.87	95% Adjusted-CLT UCL (Chen-1995)	16.2
		95% Modified-t UCL (Johnson-1978)	15.94

Gamma GOF Test

A-D Test Statistic	0.866	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.745	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.209	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.19	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	5.755	k star (bias corrected MLE)	4.965
Theta hat (MLE)	2.361	Theta star (bias corrected MLE)	2.737
nu hat (MLE)	241.7	nu star (bias corrected)	208.5
MLE Mean (bias corrected)	13.59	MLE Sd (bias corrected)	6.097
		Approximate Chi Square Value (0.05)	176.1
Adjusted Level of Significance	0.0383	Adjusted Chi Square Value	173.8

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	16.09	95% Adjusted Gamma UCL (use when n<50)	16.3

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.916	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.908	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.2	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.193	Data Not Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.526	Mean of logged Data	2.52
Maximum of Logged Data	3.401	SD of logged Data	0.44

Assuming Lognormal Distribution

95% H-UCL	16.56	90% Chebyshev (MVUE) UCL	17.65
95% Chebyshev (MVUE) UCL	19.48	97.5% Chebyshev (MVUE) UCL	22.02
99% Chebyshev (MVUE) UCL	27.01		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	15.76	95% Jackknife UCL	15.87
95% Standard Bootstrap UCL	15.7	95% Bootstrap-t UCL	16.72
95% Hall's Bootstrap UCL	21.3	95% Percentile Bootstrap UCL	15.78
95% BCA Bootstrap UCL	16.39		
90% Chebyshev(Mean, Sd) UCL	17.56	95% Chebyshev(Mean, Sd) UCL	19.36
97.5% Chebyshev(Mean, Sd) UCL	21.86	99% Chebyshev(Mean, Sd) UCL	26.76

Suggested UCL to Use

95% Student's-t UCL	15.87	or 95% Modified-t UCL	15.94

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Beryllium: Tank 214 Area Sediment

General Statistics

Total Number of Observations	68	Number of Distinct Observations	23
Number of Detects	51	Number of Non-Detects	17
Number of Distinct Detects	20	Number of Distinct Non-Detects	13
Minimum Detect	0.12	Minimum Non-Detect	0.15
Maximum Detect	0.37	Maximum Non-Detect	1.2
Variance Detects	0.00353	Percent Non-Detects	25%
Mean Detects	0.24	SD Detects	0.0594
Median Detects	0.24	CV Detects	0.247
Skewness Detects	0.0303	Kurtosis Detects	-0.573
Mean of Logged Detects	-1.459	SD of Logged Detects	0.262

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.971	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0.389	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.0782	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.124	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.221	Standard Error of Mean	0.00811
SD	0.0637	95% KM (BCA) UCL	0.234
95% KM (t) UCL	0.235	95% KM (Percentile Bootstrap) UCL	0.235
95% KM (z) UCL	0.235	95% KM Bootstrap t UCL	0.235
90% KM Chebyshev UCL	0.246	95% KM Chebyshev UCL	0.257
97.5% KM Chebyshev UCL	0.272	99% KM Chebyshev UCL	0.302

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.477	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.749	Detected data appear Gamma Distributed at 5% Significance Leve
K-S Test Statistic	0.0834	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.124	Detected data appear Gamma Distributed at 5% Significance Leve

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	15.68	k star (bias corrected MLE)	14.77
Theta hat (MLE)	0.0153	Theta star (bias corrected MLE)	0.0163
nu hat (MLE)	1600	nu star (bias corrected)	1507
MLE Mean (bias corrected)	0.24	MLE Sd (bias corrected)	0.0625

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	12.07	nu hat (KM)	1642
Approximate Chi Square Value (N/A, α)	1549	Adjusted Chi Square Value (N/A, β)	1547
5% Gamma Approximate KM-UCL (use when n>=50)	0.235	95% Gamma Adjusted KM-UCL (use when n<50)	0.235

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.12	Mean	0.223
Maximum	0.37	Median	0.212
SD	0.0606	CV	0.272
k hat (MLE)	13.87	k star (bias corrected MLE)	13.27
Theta hat (MLE)	0.0161	Theta star (bias corrected MLE)	0.0168
nu hat (MLE)	1886	nu star (bias corrected)	1804
MLE Mean (bias corrected)	0.223	MLE Sd (bias corrected)	0.0613
		Adjusted Level of Significance (β)	0.0465
Approximate Chi Square Value (N/A, α)	1706	Adjusted Chi Square Value (N/A, β)	1704
95% Gamma Approximate UCL (use when n>=50)	0.236	95% Gamma Adjusted UCL (use when n<50)	0.236

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.0877	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.124	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.223	Mean in Log Scale	-1.537
SD in Original Scale	0.0606	SD in Log Scale	0.273
95% t UCL (assumes normality of ROS data)	0.235	95% Percentile Bootstrap UCL	0.235
95% BCA Bootstrap UCL	0.236	95% Bootstrap t UCL	0.235
95% H-UCL (Log ROS)	0.236		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-1.551	95% H-UCL (KM -Log)	0.236
KM SD (logged)	0.297	95% Critical H Value (KM-Log)	1.755
KM Standard Error of Mean (logged)	0.0386		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.214	Mean in Log Scale	-1.634
SD in Original Scale	0.0909	SD in Log Scale	0.444
95% t UCL (Assumes normality)	0.232	95% H-Stat UCL	0.238

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.235	95% KM (Percentile Bootstrap) UCL	0.235

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician

Beryllium: Background Sediment

General Statistics

Total Number of Observations	22	Number of Distinct Observations	17
Number of Detects	20	Number of Non-Detects	2
Number of Distinct Detects	15	Number of Distinct Non-Detects	2
Minimum Detect	0.047	Minimum Non-Detect	1.3
Maximum Detect	0.31	Maximum Non-Detect	1.5
Variance Detects	0.00731	Percent Non-Detects	9.091%
Mean Detects	0.167	SD Detects	0.0855
Median Detects	0.155	CV Detects	0.511
Skewness Detects	0.32	Kurtosis Detects	-1.315
Mean of Logged Detects	-1.929	SD of Logged Detects	0.565

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.914	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.17	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.198	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.167	Standard Error of Mean	0.0191
SD	0.0833	95% KM (BCA) UCL	0.2
95% KM (t) UCL	0.2	95% KM (Percentile Bootstrap) UCL	0.199
95% KM (z) UCL	0.199	95% KM Bootstrap t UCL	0.201
90% KM Chebyshev UCL	0.225	95% KM Chebyshev UCL	0.251
97.5% KM Chebyshev UCL	0.287	99% KM Chebyshev UCL	0.358

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.548	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.746	Detected data appear Gamma Distributed at 5% Significance Leve	
K-S Test Statistic	0.171	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.195	Detected data appear Gamma Distributed at 5% Significance Leve	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	3.715	k star (bias corrected MLE)	3.191
Theta hat (MLE)	0.045	Theta star (bias corrected MLE)	0.0524
nu hat (MLE)	148.6	nu star (bias corrected)	127.7
MLE Mean (bias corrected)	0.167	MLE Sd (bias corrected)	0.0936

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	4.03	nu hat (KM)	177.3
Approximate Chi Square Value (177.32, α)	147.5	Adjusted Chi Square Value (177.32, β)	145.5
5% Gamma Approximate KM-UCL (use when n>=50)	0.201	95% Gamma Adjusted KM-UCL (use when n<50)	0.204

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.047	Mean	0.166
Maximum	0.31	Median	0.155
SD	0.0814	CV	0.49
k hat (MLE)	4.065	k star (bias corrected MLE)	3.541
Theta hat (MLE)	0.0409	Theta star (bias corrected MLE)	0.0469
nu hat (MLE)	178.8	nu star (bias corrected)	155.8
MLE Mean (bias corrected)	0.166	MLE Sd (bias corrected)	0.0883
		Adjusted Level of Significance (β)	0.0386
Approximate Chi Square Value (155.79, α)	127.9	Adjusted Chi Square Value (155.79, β)	126.1
95% Gamma Approximate UCL (use when n>=50)	0.202	95% Gamma Adjusted UCL (use when n<50)	0.205

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.932	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.905	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.157	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.198	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.165	Mean in Log Scale	-1.929
SD in Original Scale	0.0816	SD in Log Scale	0.537
95% t UCL (assumes normality of ROS data)	0.195	95% Percentile Bootstrap UCL	0.194
95% BCA Bootstrap UCL	0.196	95% Bootstrap t UCL	0.195
95% H-UCL (Log ROS)	0.213		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-1.929	95% H-UCL (KM -Log)	0.216
KM SD (logged)	0.551	95% Critical H Value (KM-Log)	2.045
KM Standard Error of Mean (logged)	0.126		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.216	Mean in Log Scale	-1.786
SD in Original Scale	0.177	SD in Log Scale	0.709
95% t UCL (Assumes normality)	0.281	95% H-Stat UCL	0.304

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.2	95% KM (Percentile Bootstrap) UCL	0.199

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician

Cadmium: Tank 214 Area Sediment

General Statistics

Total Number of Observations	68	Number of Distinct Observations	46
Number of Detects	8	Number of Non-Detects	60
Number of Distinct Detects	8	Number of Distinct Non-Detects	42
Minimum Detect	0.068	Minimum Non-Detect	0.059
Maximum Detect	0.95	Maximum Non-Detect	1.5
Variance Detects	0.0885	Percent Non-Detects	88.24%
Mean Detects	0.22	SD Detects	0.298
Median Detects	0.13	CV Detects	1.355
Skewness Detects	2.74	Kurtosis Detects	7.624
Mean of Logged Detects	-1.947	SD of Logged Detects	0.839

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.537	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.441	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.313	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.085	Standard Error of Mean	0.0166
SD	0.117	95% KM (BCA) UCL	0.119
95% KM (t) UCL	0.113	95% KM (Percentile Bootstrap) UCL	0.115
95% KM (z) UCL	0.112	95% KM Bootstrap t UCL	0.172
90% KM Chebyshev UCL	0.135	95% KM Chebyshev UCL	0.157
97.5% KM Chebyshev UCL	0.189	99% KM Chebyshev UCL	0.25

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.143	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.731	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.367	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.3	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.301	k star (bias corrected MLE)	0.897
Theta hat (MLE)	0.169	Theta star (bias corrected MLE)	0.245
nu hat (MLE)	20.82	nu star (bias corrected)	14.35
MLE Mean (bias corrected)	0.22	MLE Sd (bias corrected)	0.232

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.527	nu hat (KM)	71.65
Approximate Chi Square Value (71.65, α)	53.16	Adjusted Chi Square Value (71.65, β)	52.82
5% Gamma Approximate KM-UCL (use when n>=50)	0.115	95% Gamma Adjusted KM-UCL (use when n<50)	0.115

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.0346
Maximum	0.95	Median	0.01
SD	0.118	CV	3.4
k hat (MLE)	0.656	k star (bias corrected MLE)	0.637
Theta hat (MLE)	0.0528	Theta star (bias corrected MLE)	0.0544
nu hat (MLE)	89.2	nu star (bias corrected)	86.6
MLE Mean (bias corrected)	0.0346	MLE Sd (bias corrected)	0.0434
		Adjusted Level of Significance (β)	0.0465
Approximate Chi Square Value (86.60, α)	66.15	Adjusted Chi Square Value (86.60, β)	65.76
95% Gamma Approximate UCL (use when n>=50)	0.0454	95% Gamma Adjusted UCL (use when n<50)	0.0456

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.79	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.292	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.313	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.0427	Mean in Log Scale	-3.816
SD in Original Scale	0.116	SD in Log Scale	0.861
95% t UCL (assumes normality of ROS data)	0.0663	95% Percentile Bootstrap UCL	0.069
95% BCA Bootstrap UCL	0.084	95% Bootstrap t UCL	0.13
95% H-UCL (Log ROS)	0.04		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-2.656	95% H-UCL (KM -Log)	0.0847
KM SD (logged)	0.429	95% Critical H Value (KM-Log)	1.824
KM Standard Error of Mean (logged)	0.0667		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.168	Mean in Log Scale	-2.373
SD in Original Scale	0.209	SD in Log Scale	1.025
95% t UCL (Assumes normality)	0.21	95% H-Stat UCL	0.209

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.113	95% KM (% Bootstrap) UCL	0.115

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician

Cadmium: Background Sediment

General Statistics

Total Number of Observations	22	Number of Distinct Observations	18
Number of Detects	7	Number of Non-Detects	15
Number of Distinct Detects	6	Number of Distinct Non-Detects	12
Minimum Detect	0.1	Minimum Non-Detect	0.12
Maximum Detect	0.95	Maximum Non-Detect	2.4
Variance Detects	0.0789	Percent Non-Detects	68.18%
Mean Detects	0.474	SD Detects	0.281
Median Detects	0.39	CV Detects	0.592
Skewness Detects	0.608	Kurtosis Detects	0.165
Mean of Logged Detects	-0.935	SD of Logged Detects	0.726

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.96	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.189	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.335	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.389	Standard Error of Mean	0.0859
SD	0.246	95% KM (BCA) UCL	0.537
95% KM (t) UCL	0.537	95% KM (Percentile Bootstrap) UCL	0.53
95% KM (z) UCL	0.53	95% KM Bootstrap t UCL	0.55
90% KM Chebyshev UCL	0.647	95% KM Chebyshev UCL	0.764
97.5% KM Chebyshev UCL	0.926	99% KM Chebyshev UCL	1.244

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.233	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.713	Detected data appear Gamma Distributed at 5% Significance Leve
K-S Test Statistic	0.197	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.314	Detected data appear Gamma Distributed at 5% Significance Leve

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	2.804	k star (bias corrected MLE)	1.697
Theta hat (MLE)	0.169	Theta star (bias corrected MLE)	0.279
nu hat (MLE)	39.25	nu star (bias corrected)	23.76
MLE Mean (bias corrected)	0.474	MLE Sd (bias corrected)	0.364

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	2.504	nu hat (KM)	110.2
Approximate Chi Square Value (110.20, α)	86.97	Adjusted Chi Square Value (110.20, β)	85.43
5% Gamma Approximate KM-UCL (use when n>=50)	0.493	95% Gamma Adjusted KM-UCL (use when n<50)	0.502

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.1	Mean	0.373
Maximum	0.95	Median	0.337
SD	0.18	CV	0.482
k hat (MLE)	5.058	k star (bias corrected MLE)	4.398
Theta hat (MLE)	0.0738	Theta star (bias corrected MLE)	0.0849
nu hat (MLE)	222.5	nu star (bias corrected)	193.5
MLE Mean (bias corrected)	0.373	MLE Sd (bias corrected)	0.178
		Adjusted Level of Significance (β)	0.0386
Approximate Chi Square Value (193.53, α)	162.3	Adjusted Chi Square Value (193.53, β)	160.2
95% Gamma Approximate UCL (use when n>=50)	0.445	95% Gamma Adjusted UCL (use when n<50)	0.451

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.926	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.803	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.246	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.335	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.351	Mean in Log Scale	-1.157
SD in Original Scale	0.184	SD in Log Scale	0.479
95% t UCL (assumes normality of ROS data)	0.419	95% Percentile Bootstrap UCL	0.415
95% BCA Bootstrap UCL	0.431	95% Bootstrap t UCL	0.454
95% H-UCL (Log ROS)	0.434		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-1.187	95% H-UCL (KM -Log)	0.585
KM SD (logged)	0.75	95% Critical H Value (KM-Log)	2.261
KM Standard Error of Mean (logged)	0.281		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.609	Mean in Log Scale	-0.703
SD in Original Scale	0.336	SD in Log Scale	0.757
95% t UCL (Assumes normality)	0.732	95% H-Stat UCL	0.958

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.537	95% KM (Percentile Bootstrap) UCL	0.53

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician

Chromium: Tank 214 Area Sediment

General Statistics

Total Number of Observations	68	Number of Distinct Observations	25
		Number of Missing Observations	0
Minimum	10	Mean	23.85
Maximum	58	Median	23.5
SD	7.273	Std. Error of Mean	0.882
Coefficient of Variation	0.305	Skewness	1.671

Normal GOF Test

Shapiro Wilk Test Statistic	0.902	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	1.1331E-5	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.111	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.107	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	25.32	95% Adjusted-CLT UCL (Chen-1995)	25.49
		95% Modified-t UCL (Johnson-1978)	25.35

Gamma GOF Test

A-D Test Statistic	0.651	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.75	Detected data appear Gamma Distributed at 5% Significance Leve
K-S Test Statistic	0.0892	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.108	Detected data appear Gamma Distributed at 5% Significance Leve

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	12.27	k star (bias corrected MLE)	11.74
Theta hat (MLE)	1.944	Theta star (bias corrected MLE)	2.032
nu hat (MLE)	1669	nu star (bias corrected)	1597
MLE Mean (bias corrected)	23.85	MLE Sd (bias corrected)	6.962
		Approximate Chi Square Value (0.05)	1505
Adjusted Level of Significance	0.0465	Adjusted Chi Square Value	1503

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	25.31	95% Adjusted Gamma UCL (use when n<50)	25.34

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.98	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0.649	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.106	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.107	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.303	Mean of logged Data	3.131
Maximum of Logged Data	4.06	SD of logged Data	0.288

Assuming Lognormal Distribution

95% H-UCL	25.37	90% Chebyshev (MVUE) UCL	26.38
95% Chebyshev (MVUE) UCL	27.54	97.5% Chebyshev (MVUE) UCL	29.13
99% Chebyshev (MVUE) UCL	32.27		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	25.3	95% Jackknife UCL	25.32
95% Standard Bootstrap UCL	25.27	95% Bootstrap-t UCL	25.64
95% Hall's Bootstrap UCL	25.6	95% Percentile Bootstrap UCL	25.37
95% BCA Bootstrap UCL	25.5		
90% Chebyshev(Mean, Sd) UCL	26.5	95% Chebyshev(Mean, Sd) UCL	27.7
97.5% Chebyshev(Mean, Sd) UCL	29.36	99% Chebyshev(Mean, Sd) UCL	32.63

Suggested UCL to Use

95% Approximate Gamma UCL	25.31

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Chromium: Background Sediment

General Statistics

Total Number of Observations	22	Number of Distinct Observations	18
		Number of Missing Observations	0
Minimum	11	Mean	26.1
Maximum	54	Median	25
SD	12.53	Std. Error of Mean	2.671
Coefficient of Variation	0.48	Skewness	0.884

Normal GOF Test

Shapiro Wilk Test Statistic	0.903	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.911	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.167	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.189	Data appear Normal at 5% Significance Level

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	30.7	95% Adjusted-CLT UCL (Chen-1995)	31.04
		95% Modified-t UCL (Johnson-1978)	30.78

Gamma GOF Test

A-D Test Statistic	0.44	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.746	Detected data appear Gamma Distributed at 5% Significance Leve
K-S Test Statistic	0.13	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.186	Detected data appear Gamma Distributed at 5% Significance Leve

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	4.875	k star (bias corrected MLE)	4.24
Theta hat (MLE)	5.355	Theta star (bias corrected MLE)	6.156
nu hat (MLE)	214.5	nu star (bias corrected)	186.6
MLE Mean (bias corrected)	26.1	MLE Sd (bias corrected)	12.68
		Approximate Chi Square Value (0.05)	156
Adjusted Level of Significance	0.0386	Adjusted Chi Square Value	153.9

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	31.23	95% Adjusted Gamma UCL (use when n<50)	31.65

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.952	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.911	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.117	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.189	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.398	Mean of logged Data	3.156
Maximum of Logged Data	3.989	SD of logged Data	0.471

Assuming Lognormal Distribution

95% H-UCL	32.13	90% Chebyshev (MVUE) UCL	34.23
95% Chebyshev (MVUE) UCL	37.92	97.5% Chebyshev (MVUE) UCL	43.03
99% Chebyshev (MVUE) UCL	53.08		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	30.5	95% Jackknife UCL	30.7
95% Standard Bootstrap UCL	30.4	95% Bootstrap-t UCL	31.66
95% Hall's Bootstrap UCL	31.48	95% Percentile Bootstrap UCL	30.64
95% BCA Bootstrap UCL	31		
90% Chebyshev(Mean, Sd) UCL	34.12	95% Chebyshev(Mean, Sd) UCL	37.75
97.5% Chebyshev(Mean, Sd) UCL	42.78	99% Chebyshev(Mean, Sd) UCL	52.68

Suggested UCL to Use

95% Student's-t UCL 30.7

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Cobalt: Tank 214 Area Sediment

General Statistics

Total Number of Observations	68	Number of Distinct Observations	41
		Number of Missing Observations	0
Minimum	4.4	Mean	7.903
Maximum	16	Median	7.45
SD	2.251	Std. Error of Mean	0.273
Coefficient of Variation	0.285	Skewness	1.437

Normal GOF Test

Shapiro Wilk Test Statistic	0.89	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	1.8052E-6	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.113	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.107	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	8.358	95% Adjusted-CLT UCL (Chen-1995)	8.403
		95% Modified-t UCL (Johnson-1978)	8.366

Gamma GOF Test

A-D Test Statistic	0.918	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.75	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.103	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.108	)etected data appear Gamma Distributed at 5% Significance Leve

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	14.5	k star (bias corrected MLE)	13.87
Theta hat (MLE)	0.545	Theta star (bias corrected MLE)	0.57
nu hat (MLE)	1972	nu star (bias corrected)	1886
MLE Mean (bias corrected)	7.903	MLE Sd (bias corrected)	2.122
		Approximate Chi Square Value (0.05)	1786
Adjusted Level of Significance	0.0465	Adjusted Chi Square Value	1784

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	8.345	95% Adjusted Gamma UCL (use when n<50)	8.355

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.966	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0.171	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0925	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.107	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.482	Mean of logged Data	2.032
Maximum of Logged Data	2.773	SD of logged Data	0.259

Assuming Lognormal Distribution

95% H-UCL	8.34	90% Chebyshev (MVUE) UCL	8.644
95% Chebyshev (MVUE) UCL	8.986	97.5% Chebyshev (MVUE) UCL	9.461
99% Chebyshev (MVUE) UCL	10.39		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	8.352	95% Jackknife UCL	8.358
95% Standard Bootstrap UCL	8.346	95% Bootstrap-t UCL	8.436
95% Hall's Bootstrap UCL	8.434	95% Percentile Bootstrap UCL	8.362
95% BCA Bootstrap UCL	8.41		
90% Chebyshev(Mean, Sd) UCL	8.722	95% Chebyshev(Mean, Sd) UCL	9.093
97.5% Chebyshev(Mean, Sd) UCL	9.607	99% Chebyshev(Mean, Sd) UCL	10.62

Suggested UCL to Use

95% Approximate Gamma UCL	8.345

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Cobalt: Background Sediment

General Statistics

Total Number of Observations	21	Number of Distinct Observations	19
		Number of Missing Observations	0
Minimum	2.2	Mean	8.438
Maximum	27	Median	6.4
SD	6.937	Std. Error of Mean	1.514
Coefficient of Variation	0.822	Skewness	1.63

Normal GOF Test

Shapiro Wilk Test Statistic	0.774	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.908	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.237	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.193	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	11.05	95% Adjusted-CLT UCL (Chen-1995)	11.5
		95% Modified-t UCL (Johnson-1978)	11.14

Gamma GOF Test

A-D Test Statistic	0.861	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.753	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.162	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.192	)etected data appear Gamma Distributed at 5% Significance Leve

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.102	k star (bias corrected MLE)	1.833
Theta hat (MLE)	4.014	Theta star (bias corrected MLE)	4.602
nu hat (MLE)	88.29	nu star (bias corrected)	77.01
MLE Mean (bias corrected)	8.438	MLE Sd (bias corrected)	6.232
		Approximate Chi Square Value (0.05)	57.79
Adjusted Level of Significance	0.0383	Adjusted Chi Square Value	56.51

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	11.24	95% Adjusted Gamma UCL (use when n<50)	11.5

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.941	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.908	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.113	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.193	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.788	Mean of logged Data	1.876
Maximum of Logged Data	3.296	SD of logged Data	0.702

Assuming Lognormal Distribution

95% H-UCL	11.79	90% Chebyshev (MVUE) UCL	12.29
95% Chebyshev (MVUE) UCL	14.12	97.5% Chebyshev (MVUE) UCL	16.67
99% Chebyshev (MVUE) UCL	21.67		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	10.93	95% Jackknife UCL	11.05
95% Standard Bootstrap UCL	10.92	95% Bootstrap-t UCL	12.12
95% Hall's Bootstrap UCL	11.57	95% Percentile Bootstrap UCL	11.03
95% BCA Bootstrap UCL	11.57		
90% Chebyshev(Mean, Sd) UCL	12.98	95% Chebyshev(Mean, Sd) UCL	15.04
97.5% Chebyshev(Mean, Sd) UCL	17.89	99% Chebyshev(Mean, Sd) UCL	23.5

Suggested UCL to Use

95% Adjusted Gamma UCL	11.5

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Copper: Tank 214 Area Sediment

General Statistics

Total Number of Observations	68	Number of Distinct Observations	36
		Number of Missing Observations	0
Minimum	52	Mean	85.85
Maximum	140	Median	82
SD	19.38	Std. Error of Mean	2.35
Coefficient of Variation	0.226	Skewness	0.837

Normal GOF Test

Shapiro Wilk Test Statistic	0.934	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0.00179	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.123	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.107	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	89.77	95% Adjusted-CLT UCL (Chen-1995)	89.97
		95% Modified-t UCL (Johnson-1978)	89.81

Gamma GOF Test

A-D Test Statistic	0.667	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.749	Detected data appear Gamma Distributed at 5% Significance Leve
K-S Test Statistic	0.0939	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.108	Detected data appear Gamma Distributed at 5% Significance Leve

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	21.2	k star (bias corrected MLE)	20.27
Theta hat (MLE)	4.05	Theta star (bias corrected MLE)	4.235
nu hat (MLE)	2883	nu star (bias corrected)	2757
MLE Mean (bias corrected)	85.85	MLE Sd (bias corrected)	19.07
		Approximate Chi Square Value (0.05)	2636
Adjusted Level of Significance	0.0465	Adjusted Chi Square Value	2634

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	89.79	95% Adjusted Gamma UCL (use when n<50)	89.88

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.971	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0.298	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0795	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.107	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	3.951	Mean of logged Data	4.429
Maximum of Logged Data	4.942	SD of logged Data	0.218

Assuming Lognormal Distribution

95% H-UCL	89.87	90% Chebyshev (MVUE) UCL	92.69
95% Chebyshev (MVUE) UCL	95.8	97.5% Chebyshev (MVUE) UCL	100.1
99% Chebyshev (MVUE) UCL	108.6		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	89.72	95% Jackknife UCL	89.77
95% Standard Bootstrap UCL	89.69	95% Bootstrap-t UCL	89.99
95% Hall's Bootstrap UCL	90.04	95% Percentile Bootstrap UCL	89.74
95% BCA Bootstrap UCL	90.34		
90% Chebyshev(Mean, Sd) UCL	92.9	95% Chebyshev(Mean, Sd) UCL	96.09
97.5% Chebyshev(Mean, Sd) UCL	100.5	99% Chebyshev(Mean, Sd) UCL	109.2

Suggested UCL to Use

95% Approximate Gamma UCL	89.79

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Copper: Background Sediment

General Statistics

Total Number of Observations	22	Number of Distinct Observations	20
		Number of Missing Observations	0
Minimum	11	Mean	61.75
Maximum	140	Median	63.7
SD	35.51	Std. Error of Mean	7.572
Coefficient of Variation	0.575	Skewness	0.417

Normal GOF Test

Shapiro Wilk Test Statistic	0.944	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.911	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.114	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.189	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	74.77	95% Adjusted-CLT UCL (Chen-1995)	74.92
		95% Modified-t UCL (Johnson-1978)	74.89

Gamma GOF Test

A-D Test Statistic	0.663	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.753	)etected data appear Gamma Distributed at 5% Significance Leve
K-S Test Statistic	0.174	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.187	)etected data appear Gamma Distributed at 5% Significance Leve

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.5	k star (bias corrected MLE)	2.189
Theta hat (MLE)	24.7	Theta star (bias corrected MLE)	28.2
nu hat (MLE)	110	nu star (bias corrected)	96.33
MLE Mean (bias corrected)	61.75	MLE Sd (bias corrected)	41.73
		Approximate Chi Square Value (0.05)	74.7
Adjusted Level of Significance	0.0386	Adjusted Chi Square Value	73.27

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	79.63	95% Adjusted Gamma UCL (use when n<50)	81.18

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.896	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.911	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.214	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.189	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.398	Mean of logged Data	3.91
Maximum of Logged Data	4.942	SD of logged Data	0.739

Assuming Lognormal Distribution

95% H-UCL	94.25	90% Chebyshev (MVUE) UCL	97.5
95% Chebyshev (MVUE) UCL	112.4	97.5% Chebyshev (MVUE) UCL	133.1
99% Chebyshev (MVUE) UCL	173.8		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	74.2	95% Jackknife UCL	74.77
95% Standard Bootstrap UCL	73.79	95% Bootstrap-t UCL	75.87
95% Hall's Bootstrap UCL	76.41	95% Percentile Bootstrap UCL	73.47
95% BCA Bootstrap UCL	74.02		
90% Chebyshev(Mean, Sd) UCL	84.46	95% Chebyshev(Mean, Sd) UCL	94.75
97.5% Chebyshev(Mean, Sd) UCL	109	99% Chebyshev(Mean, Sd) UCL	137.1

Suggested UCL to Use

95% Student's-t UCL	74.77

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Lead: Tank 214 Area Sediment

General Statistics

Total Number of Observations	150	Number of Distinct Observations	84
		Number of Missing Observations	0
Minimum	3.2	Mean	55.49
Maximum	430	Median	26
SD	73.37	Std. Error of Mean	5.991
Coefficient of Variation	1.322	Skewness	2.479

Normal GOF Test

Shapiro Wilk Test Statistic	0.683	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.238	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0723	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	65.41	95% Adjusted-CLT UCL (Chen-1995)	66.64
		95% Modified-t UCL (Johnson-1978)	65.61

Gamma GOF Test

A-D Test Statistic	4.408	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.789	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.146	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.0791	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.894	k star (bias corrected MLE)	0.881
Theta hat (MLE)	62.06	Theta star (bias corrected MLE)	63.01
nu hat (MLE)	268.3	nu star (bias corrected)	264.2
MLE Mean (bias corrected)	55.49	MLE Sd (bias corrected)	59.13
		Approximate Chi Square Value (0.05)	227.6
Adjusted Level of Significance	0.0484	Adjusted Chi Square Value	227.3

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	64.43	95% Adjusted Gamma UCL (use when n<50)	64.52

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.954	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	3.0777E-4	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.099	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.0723	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.163	Mean of logged Data	3.362
Maximum of Logged Data	6.064	SD of logged Data	1.129

Assuming Lognormal Distribution

95% H-UCL	67.64	90% Chebyshev (MVUE) UCL	73
95% Chebyshev (MVUE) UCL	81.53	97.5% Chebyshev (MVUE) UCL	93.36
99% Chebyshev (MVUE) UCL	116.6		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	65.35	95% Jackknife UCL	65.41
95% Standard Bootstrap UCL	65.12	95% Bootstrap-t UCL	67.67
95% Hall's Bootstrap UCL	66.62	95% Percentile Bootstrap UCL	66.36
95% BCA Bootstrap UCL	66.7		
90% Chebyshev(Mean, Sd) UCL	73.46	95% Chebyshev(Mean, Sd) UCL	81.6
97.5% Chebyshev(Mean, Sd) UCL	92.9	99% Chebyshev(Mean, Sd) UCL	115.1

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	81.6

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Lead: Background Sediment

General Statistics

Total Number of Observations	21	Number of Distinct Observations	19
		Number of Missing Observations	0
Minimum	1.2	Mean	8.729
Maximum	38	Median	4.7
SD	9.032	Std. Error of Mean	1.971
Coefficient of Variation	1.035	Skewness	2.017

Normal GOF Test

Shapiro Wilk Test Statistic	0.764	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.908	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.259	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.193	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	12.13	95% Adjusted-CLT UCL (Chen-1995)	12.9
		95% Modified-t UCL (Johnson-1978)	12.27

Gamma GOF Test

A-D Test Statistic	0.552	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.762	Detected data appear Gamma Distributed at 5% Significance Leve
K-S Test Statistic	0.194	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.194	Data Not Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.313	k star (bias corrected MLE)	1.157
Theta hat (MLE)	6.649	Theta star (bias corrected MLE)	7.544
nu hat (MLE)	55.14	nu star (bias corrected)	48.6
MLE Mean (bias corrected)	8.729	MLE Sd (bias corrected)	8.115
		Approximate Chi Square Value (0.05)	33.59
Adjusted Level of Significance	0.0383	Adjusted Chi Square Value	32.64

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	12.63	95% Adjusted Gamma UCL (use when n<50)	13

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.972	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.908	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.134	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.193	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.182	Mean of logged Data	1.74
Maximum of Logged Data	3.638	SD of logged Data	0.94

Assuming Lognormal Distribution

95% H-UCL	14.92	90% Chebyshev (MVUE) UCL	14.49
95% Chebyshev (MVUE) UCL	17.16	97.5% Chebyshev (MVUE) UCL	20.86
99% Chebyshev (MVUE) UCL	28.12		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	11.97	95% Jackknife UCL	12.13
95% Standard Bootstrap UCL	11.92	95% Bootstrap-t UCL	13.95
95% Hall's Bootstrap UCL	14.85	95% Percentile Bootstrap UCL	12.13
95% BCA Bootstrap UCL	12.97		
90% Chebyshev(Mean, Sd) UCL	14.64	95% Chebyshev(Mean, Sd) UCL	17.32
97.5% Chebyshev(Mean, Sd) UCL	21.04	99% Chebyshev(Mean, Sd) UCL	28.34

Suggested UCL to Use

95% Adjusted Gamma UCL	13

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Mercury: Tank 214 Sediment

General Statistics

Total Number of Observations	67	Number of Distinct Observations	39
		Number of Missing Observations	0
Minimum	0.039	Mean	0.0745
Maximum	0.12	Median	0.074
SD	0.0184	Std. Error of Mean	0.00225
Coefficient of Variation	0.247	Skewness	0.557

Normal GOF Test

Shapiro Wilk Test Statistic	0.957	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0.0535	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.0968	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.108	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	0.0783	95% Adjusted-CLT UCL (Chen-1995)	0.0784
		95% Modified-t UCL (Johnson-1978)	0.0783

Gamma GOF Test

A-D Test Statistic	0.301	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.75	)etected data appear Gamma Distributed at 5% Significance Leve
K-S Test Statistic	0.0657	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.109	)etected data appear Gamma Distributed at 5% Significance Leve

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	16.93	k star (bias corrected MLE)	16.18
Theta hat (MLE)	0.0044	Theta star (bias corrected MLE)	0.0046
nu hat (MLE)	2269	nu star (bias corrected)	2169
MLE Mean (bias corrected)	0.0745	MLE Sd (bias corrected)	0.0185
		Approximate Chi Square Value (0.05)	2062
Adjusted Level of Significance	0.0464	Adjusted Chi Square Value	2059

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	0.0784	95% Adjusted Gamma UCL (use when n<50)	0.0785

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.979	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0.589	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0819	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.108	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-3.244	Mean of logged Data	-2.626
Maximum of Logged Data	-2.12	SD of logged Data	0.247

Assuming Lognormal Distribution

95% H-UCL	0.0786	90% Chebyshev (MVUE) UCL	0.0814
95% Chebyshev (MVUE) UCL	0.0845	97.5% Chebyshev (MVUE) UCL	0.0888
99% Chebyshev (MVUE) UCL	0.0972		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	0.0782	95% Jackknife UCL	0.0783
95% Standard Bootstrap UCL	0.0782	95% Bootstrap-t UCL	0.0786
95% Hall's Bootstrap UCL	0.0783	95% Percentile Bootstrap UCL	0.0783
95% BCA Bootstrap UCL	0.0783		
90% Chebyshev(Mean, Sd) UCL	0.0813	95% Chebyshev(Mean, Sd) UCL	0.0843
97.5% Chebyshev(Mean, Sd) UCL	0.0886	99% Chebyshev(Mean, Sd) UCL	0.0969

Suggested UCL to Use

95% Student's-t UCL	0.0783

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Mercury: Background Sediment

General Statistics

Total Number of Observations	21	Number of Distinct Observations	18
		Number of Missing Observations	0
Minimum	0.015	Mean	0.0753
Maximum	0.21	Median	0.066
SD	0.0501	Std. Error of Mean	0.0109
Coefficient of Variation	0.666	Skewness	0.998

Normal GOF Test

Shapiro Wilk Test Statistic	0.912	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.908	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.122	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.193	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	0.0941	95% Adjusted-CLT UCL (Chen-1995)	0.0958
		95% Modified-t UCL (Johnson-1978)	0.0945

Gamma GOF Test

A-D Test Statistic	0.255	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.752	Detected data appear Gamma Distributed at 5% Significance Leve
K-S Test Statistic	0.123	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.191	Detected data appear Gamma Distributed at 5% Significance Leve

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.351	k star (bias corrected MLE)	2.047
Theta hat (MLE)	0.032	Theta star (bias corrected MLE)	0.0368
nu hat (MLE)	98.73	nu star (bias corrected)	85.96
MLE Mean (bias corrected)	0.0753	MLE Sd (bias corrected)	0.0526
		Approximate Chi Square Value (0.05)	65.59
Adjusted Level of Significance	0.0383	Adjusted Chi Square Value	64.22

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	0.0987	95% Adjusted Gamma UCL (use when n<50)	0.101

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.969	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.908	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.118	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.193	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-4.2	Mean of logged Data	-2.814
Maximum of Logged Data	-1.561	SD of logged Data	0.721

Assuming Lognormal Distribution

95% H-UCL	0.111	90% Chebyshev (MVUE) UCL	0.115
95% Chebyshev (MVUE) UCL	0.133	97.5% Chebyshev (MVUE) UCL	0.157
99% Chebyshev (MVUE) UCL	0.205		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	0.0933	95% Jackknife UCL	0.0941
95% Standard Bootstrap UCL	0.093	95% Bootstrap-t UCL	0.0982
95% Hall's Bootstrap UCL	0.097	95% Percentile Bootstrap UCL	0.0937
95% BCA Bootstrap UCL	0.0962		
90% Chebyshev(Mean, Sd) UCL	0.108	95% Chebyshev(Mean, Sd) UCL	0.123
97.5% Chebyshev(Mean, Sd) UCL	0.144	99% Chebyshev(Mean, Sd) UCL	0.184

Suggested UCL to Use

95% Student's-t UCL 0.0941

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Selenium: Tank 214 Area Sediment

General Statistics

Total Number of Observations	68	Number of Distinct Observations	39
Number of Detects	29	Number of Non-Detects	39
Number of Distinct Detects	24	Number of Distinct Non-Detects	23
Minimum Detect	0.48	Minimum Non-Detect	0.6
Maximum Detect	1.5	Maximum Non-Detect	2.9
Variance Detects	0.0521	Percent Non-Detects	57.35%
Mean Detects	0.882	SD Detects	0.228
Median Detects	0.9	CV Detects	0.259
Skewness Detects	0.559	Kurtosis Detects	0.549
Mean of Logged Detects	-0.157	SD of Logged Detects	0.261

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.973	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.926	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.0964	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.165	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.801	Standard Error of Mean	0.0368
SD	0.226	95% KM (BCA) UCL	0.867
95% KM (t) UCL	0.863	95% KM (Percentile Bootstrap) UCL	0.86
95% KM (z) UCL	0.862	95% KM Bootstrap t UCL	0.866
90% KM Chebyshev UCL	0.912	95% KM Chebyshev UCL	0.962
97.5% KM Chebyshev UCL	1.031	99% KM Chebyshev UCL	1.167

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.163	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.745	)etected data appear Gamma Distributed at 5% Significance Leve	
K-S Test Statistic	0.0818	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.162	)etected data appear Gamma Distributed at 5% Significance Leve	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	15.61	k star (bias corrected MLE)	14.02
Theta hat (MLE)	0.0565	Theta star (bias corrected MLE)	0.063
nu hat (MLE)	905.3	nu star (bias corrected)	813
MLE Mean (bias corrected)	0.882	MLE Sd (bias corrected)	0.236

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	12.57	nu hat (KM)	1709
Approximate Chi Square Value (N/A, α)	1614	Adjusted Chi Square Value (N/A, β)	1612
5% Gamma Approximate KM-UCL (use when n>=50)	0.848	95% Gamma Adjusted KM-UCL (use when n<50)	0.849

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.48	Mean	0.795
Maximum	1.5	Median	0.771
SD	0.193	CV	0.243
k hat (MLE)	18.68	k star (bias corrected MLE)	17.86
Theta hat (MLE)	0.0426	Theta star (bias corrected MLE)	0.0445
nu hat (MLE)	2540	nu star (bias corrected)	2429
MLE Mean (bias corrected)	0.795	MLE Sd (bias corrected)	0.188
		Adjusted Level of Significance (β)	0.0465
Approximate Chi Square Value (N/A, α)	2316	Adjusted Chi Square Value (N/A, β)	2313
95% Gamma Approximate UCL (use when n>=50)	0.834	95% Gamma Adjusted UCL (use when n<50)	0.835

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.988	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.926	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.097	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.165	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.795	Mean in Log Scale	-0.256
SD in Original Scale	0.19	SD in Log Scale	0.226
95% t UCL (assumes normality of ROS data)	0.833	95% Percentile Bootstrap UCL	0.833
95% BCA Bootstrap UCL	0.837	95% Bootstrap t UCL	0.836
95% H-UCL (Log ROS)	0.833		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-0.26	95% H-UCL (KM -Log)	0.85
KM SD (logged)	0.276	95% Critical H Value (KM-Log)	1.746
KM Standard Error of Mean (logged)	0.0466		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.81	Mean in Log Scale	-0.277
SD in Original Scale	0.276	SD in Log Scale	0.385
95% t UCL (Assumes normality)	0.866	95% H-Stat UCL	0.889

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.863	95% KM (Percentile Bootstrap) UCL	0.86

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician

Selenium: Background Sediment

General Statistics

Total Number of Observations	21	Number of Distinct Observations	18
Number of Detects	19	Number of Non-Detects	2
Number of Distinct Detects	16	Number of Distinct Non-Detects	2
Minimum Detect	0.21	Minimum Non-Detect	0.75
Maximum Detect	2	Maximum Non-Detect	1.6
Variance Detects	0.198	Percent Non-Detects	9.524%
Mean Detects	0.697	SD Detects	0.445
Median Detects	0.64	CV Detects	0.638
Skewness Detects	1.582	Kurtosis Detects	2.989
Mean of Logged Detects	-0.529	SD of Logged Detects	0.59

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.857	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.901	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.155	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.203	Detected Data appear Normal at 5% Significance Level

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.682	Standard Error of Mean	0.0964
SD	0.422	95% KM (BCA) UCL	0.858
95% KM (t) UCL	0.849	95% KM (Percentile Bootstrap) UCL	0.843
95% KM (z) UCL	0.841	95% KM Bootstrap t UCL	0.907
90% KM Chebyshev UCL	0.972	95% KM Chebyshev UCL	1.103
97.5% KM Chebyshev UCL	1.284	99% KM Chebyshev UCL	1.642

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.32	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.748	Detected data appear Gamma Distributed at 5% Significance Leve
K-S Test Statistic	0.13	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.2	Detected data appear Gamma Distributed at 5% Significance Leve

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	3.122	k star (bias corrected MLE)	2.664
Theta hat (MLE)	0.223	Theta star (bias corrected MLE)	0.262
nu hat (MLE)	118.6	nu star (bias corrected)	101.2
MLE Mean (bias corrected)	0.697	MLE Sd (bias corrected)	0.427

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	2.611	nu hat (KM)	109.7
Approximate Chi Square Value (109.67, α)	86.5	Adjusted Chi Square Value (109.67, β)	84.92
5% Gamma Approximate KM-UCL (use when n>=50)	0.865	95% Gamma Adjusted KM-UCL (use when n<50)	0.881

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.21	Mean	0.68
Maximum	2	Median	0.581
SD	0.426	CV	0.626
k hat (MLE)	3.346	k star (bias corrected MLE)	2.9
Theta hat (MLE)	0.203	Theta star (bias corrected MLE)	0.235
nu hat (MLE)	140.5	nu star (bias corrected)	121.8
MLE Mean (bias corrected)	0.68	MLE Sd (bias corrected)	0.399
		Adjusted Level of Significance (β)	0.0383
Approximate Chi Square Value (121.80, α)	97.31	Adjusted Chi Square Value (121.80, β)	95.63
95% Gamma Approximate UCL (use when n>=50)	0.851	95% Gamma Adjusted UCL (use when n<50)	0.866

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.976	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.901	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.127	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.203	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.679	Mean in Log Scale	-0.545
SD in Original Scale	0.427	SD in Log Scale	0.563
95% t UCL (assumes normality of ROS data)	0.839	95% Percentile Bootstrap UCL	0.833
95% BCA Bootstrap UCL	0.853	95% Bootstrap t UCL	0.908
95% H-UCL (Log ROS)	0.879		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-0.547	95% H-UCL (KM -Log)	0.882
KM SD (logged)	0.568	95% Critical H Value (KM-Log)	2.052
KM Standard Error of Mean (logged)	0.131		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.687	Mean in Log Scale	-0.536
SD in Original Scale	0.429	SD in Log Scale	0.573
95% t UCL (Assumes normality)	0.848	95% H-Stat UCL	0.897

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.849	95% KM (Percentile Bootstrap) UCL	0.843

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician

Thallium: Tank 214 Area Sediment

General Statistics

Total Number of Observations	68	Number of Distinct Observations	31
Number of Detects	4	Number of Non-Detects	64
Number of Distinct Detects	4	Number of Distinct Non-Detects	29
Minimum Detect	0.23	Minimum Non-Detect	0.24
Maximum Detect	6.3	Maximum Non-Detect	3
Variance Detects	9.062	Percent Non-Detects	94.12%
Mean Detects	1.785	SD Detects	3.01
Median Detects	0.305	CV Detects	1.686
Skewness Detects	1.999	Kurtosis Detects	3.995
Mean of Logged Detects	-0.504	SD of Logged Detects	1.571

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.644	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.434	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.443	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	0.326	Standard Error of Mean	0.102
SD	0.73	95% KM (BCA) UCL	N/A
95% KM (t) UCL	0.497	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	0.495	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	0.633	95% KM Chebyshev UCL	0.772
97.5% KM Chebyshev UCL	0.965	99% KM Chebyshev UCL	1.344

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.811	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.678	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.447	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.409	Detected Data Not Gamma Distributed at 5% Significance Level	

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.574	k star (bias corrected MLE)	0.31
Theta hat (MLE)	3.11	Theta star (bias corrected MLE)	5.755
nu hat (MLE)	4.591	nu star (bias corrected)	2.481
MLE Mean (bias corrected)	1.785	MLE Sd (bias corrected)	3.205

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.2	nu hat (KM)	27.14
Approximate Chi Square Value (27.14, α)	16.26	Adjusted Chi Square Value (27.14, β)	16.08
5% Gamma Approximate KM-UCL (use when n>=50)	0.544	95% Gamma Adjusted KM-UCL (use when n<50)	0.551

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.117
Maximum	6.3	Median	0.01
SD	0.763	CV	6.517
k hat (MLE)	0.314	k star (bias corrected MLE)	0.31
Theta hat (MLE)	0.372	Theta star (bias corrected MLE)	0.377
nu hat (MLE)	42.77	nu star (bias corrected)	42.22
MLE Mean (bias corrected)	0.117	MLE Sd (bias corrected)	0.21
		Adjusted Level of Significance (β)	0.0465
Approximate Chi Square Value (42.22, α)	28.32	Adjusted Chi Square Value (42.22, β)	28.08
95% Gamma Approximate UCL (use when n>=50)	0.175	95% Gamma Adjusted UCL (use when n<50)	N/A

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.722	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.393	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.443	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	0.257	Mean in Log Scale	-1.859
SD in Original Scale	0.748	SD in Log Scale	0.679
95% t UCL (assumes normality of ROS data)	0.408	95% Percentile Bootstrap UCL	0.432
95% BCA Bootstrap UCL	0.531	95% Bootstrap t UCL	1.231
95% H-UCL (Log ROS)	0.232		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	-1.395	95% H-UCL (KM -Log)	0.294
KM SD (logged)	0.404	95% Critical H Value (KM-Log)	1.81
KM Standard Error of Mean (logged)	0.059		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	0.575	Mean in Log Scale	-1.12
SD in Original Scale	0.848	SD in Log Scale	0.985
95% t UCL (Assumes normality)	0.746	95% H-Stat UCL	0.694

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	0.497	95% KM (Percentile Bootstrap) UCL	N/A

Warning: One or more Recommended UCL(s) not available!

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician

Thallium: Background Sediment

General Statistics

Total Number of Observations	22	Number of Missing Observations	0
Number of Distinct Observations	20		
Number of Detects	0	Number of Non-Detects	22
Number of Distinct Detects	0	Number of Distinct Non-Detects	20
Minimum Detect	N/A	Minimum Non-Detect	0.14
Maximum Detect	N/A	Maximum Non-Detect	3.8
Variance Detected	N/A	Percent Non-Detects	100%
Mean Detected	N/A	SD Detected	N/A
Mean of Detected Logged Data	N/A	SD of Detected Logged Data	N/A

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Thallium Bkg was not processed!

Tin: Tank 214 Area Sediment

General Statistics

Total Number of Observations	68	Number of Distinct Observations	33
Number of Detects	4	Number of Non-Detects	64
Number of Distinct Detects	3	Number of Distinct Non-Detects	30
Minimum Detect	3.6	Minimum Non-Detect	6.4
Maximum Detect	4.7	Maximum Non-Detect	18
Variance Detects	0.209	Percent Non-Detects	94.12%
Mean Detects	4.225	SD Detects	0.457
Median Detects	4.3	CV Detects	0.108
Skewness Detects	-0.949	Kurtosis Detects	2.009
Mean of Logged Detects	1.436	SD of Logged Detects	0.112

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.911	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.315	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.443	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	4.225	Standard Error of Mean	0.229
SD	0.396	95% KM (BCA) UCL	N/A
95% KM (t) UCL	4.606	95% KM (Percentile Bootstrap) UCL	N/A
95% KM (z) UCL	4.601	95% KM Bootstrap t UCL	N/A
90% KM Chebyshev UCL	4.911	95% KM Chebyshev UCL	5.222
97.5% KM Chebyshev UCL	5.653	99% KM Chebyshev UCL	6.5

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.409	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.657	)etected data appear Gamma Distributed at 5% Significance Leve	
K-S Test Statistic	0.336	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.394	)etected data appear Gamma Distributed at 5% Significance Leve	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	109.2	k star (bias corrected MLE)	27.46
Theta hat (MLE)	0.0387	Theta star (bias corrected MLE)	0.154
nu hat (MLE)	873.2	nu star (bias corrected)	219.6
MLE Mean (bias corrected)	4.225	MLE Sd (bias corrected)	0.806

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	113.8	nu hat (KM)	15475
Approximate Chi Square Value (N/A, α)	15187	Adjusted Chi Square Value (N/A, β)	15181
5% Gamma Approximate KM-UCL (use when n>=50)	4.305	95% Gamma Adjusted KM-UCL (use when n<50)	4.307

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	3.517	Mean	4.223
Maximum	4.975	Median	4.218
SD	0.328	CV	0.0776
k hat (MLE)	167.5	k star (bias corrected MLE)	160.1
Theta hat (MLE)	0.0252	Theta star (bias corrected MLE)	0.0264
nu hat (MLE)	22777	nu star (bias corrected)	21774
MLE Mean (bias corrected)	4.223	MLE Sd (bias corrected)	0.334
		Adjusted Level of Significance (β)	0.0465
Approximate Chi Square Value (N/A, α)	21432	Adjusted Chi Square Value (N/A, β)	21424
95% Gamma Approximate UCL (use when n>=50)	4.291	95% Gamma Adjusted UCL (use when n<50)	N/A

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.895	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.748	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.329	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.443	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	4.219	Mean in Log Scale	1.436
SD in Original Scale	0.336	SD in Log Scale	0.0798
95% t UCL (assumes normality of ROS data)	4.287	95% Percentile Bootstrap UCL	4.286
95% BCA Bootstrap UCL	4.287	95% Bootstrap t UCL	4.287
95% H-UCL (Log ROS)	N/A		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	1.436	95% H-UCL (KM -Log)	N/A
KM SD (logged)	0.0968	95% Critical H Value (KM-Log)	N/A
KM Standard Error of Mean (logged)	0.0559		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	5.11	Mean in Log Scale	1.605
SD in Original Scale	1.211	SD in Log Scale	0.227
95% t UCL (Assumes normality)	5.354	95% H-Stat UCL	5.359

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	4.606	95% KM (Percentile Bootstrap) UCL	N/A

Warning: One or more Recommended UCL(s) not available!

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician

Tin: Background Sediment

General Statistics

Total Number of Observations	22	Number of Distinct Observations	21
Number of Detects	16	Number of Non-Detects	6
Number of Distinct Detects	16	Number of Distinct Non-Detects	6
Minimum Detect	2.3	Minimum Non-Detect	0.59
Maximum Detect	10	Maximum Non-Detect	19
Variance Detects	6.539	Percent Non-Detects	27.27%
Mean Detects	5.394	SD Detects	2.557
Median Detects	5.1	CV Detects	0.474
Skewness Detects	0.323	Kurtosis Detects	-1.306
Mean of Logged Detects	1.571	SD of Logged Detects	0.505

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.916	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.157	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.222	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	5.049	Standard Error of Mean	0.648
SD	2.624	95% KM (BCA) UCL	6.023
95% KM (t) UCL	6.164	95% KM (Percentile Bootstrap) UCL	6.122
95% KM (z) UCL	6.115	95% KM Bootstrap t UCL	6.189
90% KM Chebyshev UCL	6.994	95% KM Chebyshev UCL	7.874
97.5% KM Chebyshev UCL	9.097	99% KM Chebyshev UCL	11.5

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.532	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.742	Detected data appear Gamma Distributed at 5% Significance Leve	
K-S Test Statistic	0.162	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.216	Detected data appear Gamma Distributed at 5% Significance Leve	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	4.527	k star (bias corrected MLE)	3.72
Theta hat (MLE)	1.191	Theta star (bias corrected MLE)	1.45
nu hat (MLE)	144.9	nu star (bias corrected)	119
MLE Mean (bias corrected)	5.394	MLE Sd (bias corrected)	2.797

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	3.703	nu hat (KM)	162.9
Approximate Chi Square Value (162.94, α)	134.4	Adjusted Chi Square Value (162.94, β)	132.5
5% Gamma Approximate KM-UCL (use when n>=50)	6.12	95% Gamma Adjusted KM-UCL (use when n<50)	6.209

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	1.273	Mean	5.021
Maximum	10	Median	4.628
SD	2.346	CV	0.467
k hat (MLE)	4.516	k star (bias corrected MLE)	3.931
Theta hat (MLE)	1.112	Theta star (bias corrected MLE)	1.277
nu hat (MLE)	198.7	nu star (bias corrected)	172.9
MLE Mean (bias corrected)	5.021	MLE Sd (bias corrected)	2.532
		Adjusted Level of Significance (β)	0.0386
Approximate Chi Square Value (172.95, α)	143.5	Adjusted Chi Square Value (172.95, β)	141.5
95% Gamma Approximate UCL (use when n>=50)	6.05	95% Gamma Adjusted UCL (use when n<50)	6.135

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.915	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.887	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.154	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.222	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	4.97	Mean in Log Scale	1.493
SD in Original Scale	2.342	SD in Log Scale	0.491
95% t UCL (assumes normality of ROS data)	5.829	95% Percentile Bootstrap UCL	5.774
95% BCA Bootstrap UCL	5.856	95% Bootstrap t UCL	5.902
95% H-UCL (Log ROS)	6.214		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	1.436	95% H-UCL (KM -Log)	7.349
KM SD (logged)	0.683	95% Critical H Value (KM-Log)	2.184
KM Standard Error of Mean (logged)	0.171		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	5.416	Mean in Log Scale	1.501
SD in Original Scale	2.695	SD in Log Scale	0.767
95% t UCL (Assumes normality)	6.404	95% H-Stat UCL	8.814

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	6.164	95% KM (Percentile Bootstrap) UCL	6.122

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician

Vanadium: Tank 214 Area Sediment

General Statistics

Total Number of Observations	74	Number of Distinct Observations	24
		Number of Missing Observations	0
Minimum	80	Mean	152.9
Maximum	270	Median	150
SD	38.39	Std. Error of Mean	4.463
Coefficient of Variation	0.251	Skewness	0.754

Normal GOF Test

Shapiro Wilk Test Statistic	0.951	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0.0166	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.125	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.103	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	160.3	95% Adjusted-CLT UCL (Chen-1995)	160.6
		95% Modified-t UCL (Johnson-1978)	160.4

Gamma GOF Test

A-D Test Statistic	0.467	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.75	Detected data appear Gamma Distributed at 5% Significance Leve
K-S Test Statistic	0.0976	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.104	Detected data appear Gamma Distributed at 5% Significance Leve

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	16.79	k star (bias corrected MLE)	16.12
Theta hat (MLE)	9.107	Theta star (bias corrected MLE)	9.486
nu hat (MLE)	2485	nu star (bias corrected)	2385
MLE Mean (bias corrected)	152.9	MLE Sd (bias corrected)	38.08
		Approximate Chi Square Value (0.05)	2273
Adjusted Level of Significance	0.0468	Adjusted Chi Square Value	2271

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	160.4	95% Adjusted Gamma UCL (use when n<50)	160.6

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.982	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0.719	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0876	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.103	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	4.382	Mean of logged Data	5
Maximum of Logged Data	5.598	SD of logged Data	0.247

Assuming Lognormal Distribution

95% H-UCL	160.7	90% Chebyshev (MVUE) UCL	166.2
95% Chebyshev (MVUE) UCL	172.2	97.5% Chebyshev (MVUE) UCL	180.6
99% Chebyshev (MVUE) UCL	197		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	160.2	95% Jackknife UCL	160.3
95% Standard Bootstrap UCL	160	95% Bootstrap-t UCL	160.4
95% Hall's Bootstrap UCL	160.6	95% Percentile Bootstrap UCL	160.4
95% BCA Bootstrap UCL	161		
90% Chebyshev(Mean, Sd) UCL	166.3	95% Chebyshev(Mean, Sd) UCL	172.3
97.5% Chebyshev(Mean, Sd) UCL	180.8	99% Chebyshev(Mean, Sd) UCL	197.3

Suggested UCL to Use

95% Approximate Gamma UCL	160.4

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Vanadium: Background Sediment

General Statistics

Total Number of Observations	22	Number of Distinct Observations	18
		Number of Missing Observations	0
Minimum	23	Mean	110.8
Maximum	230	Median	115
SD	62.09	Std. Error of Mean	13.24
Coefficient of Variation	0.561	Skewness	0.267

Normal GOF Test

Shapiro Wilk Test Statistic	0.949	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.911	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.113	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.189	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	133.6	95% Adjusted-CLT UCL (Chen-1995)	133.4
		95% Modified-t UCL (Johnson-1978)	133.7

Gamma GOF Test

A-D Test Statistic	0.585	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.752	Detected data appear Gamma Distributed at 5% Significance Leve
K-S Test Statistic	0.168	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.187	Detected data appear Gamma Distributed at 5% Significance Leve

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.674	k star (bias corrected MLE)	2.339
Theta hat (MLE)	41.43	Theta star (bias corrected MLE)	47.35
nu hat (MLE)	117.6	nu star (bias corrected)	102.9
MLE Mean (bias corrected)	110.8	MLE Sd (bias corrected)	72.42
		Approximate Chi Square Value (0.05)	80.53
Adjusted Level of Significance	0.0386	Adjusted Chi Square Value	79.05

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	141.6	95% Adjusted Gamma UCL (use when n<50)	144.3

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.904	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.911	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.198	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.189	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	3.135	Mean of logged Data	4.509
Maximum of Logged Data	5.438	SD of logged Data	0.704

Assuming Lognormal Distribution

95% H-UCL	163.3	90% Chebyshev (MVUE) UCL	170.1
95% Chebyshev (MVUE) UCL	195.2	97.5% Chebyshev (MVUE) UCL	230
99% Chebyshev (MVUE) UCL	298.4		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	132.5	95% Jackknife UCL	133.6
95% Standard Bootstrap UCL	132.1	95% Bootstrap-t UCL	135.5
95% Hall's Bootstrap UCL	134	95% Percentile Bootstrap UCL	131.6
95% BCA Bootstrap UCL	132		
90% Chebyshev(Mean, Sd) UCL	150.5	95% Chebyshev(Mean, Sd) UCL	168.5
97.5% Chebyshev(Mean, Sd) UCL	193.4	99% Chebyshev(Mean, Sd) UCL	242.5

Suggested UCL to Use

95% Student's-t UCL 133.6

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Zinc: Tank 214 Area Sediment

General Statistics

Total Number of Observations	68	Number of Distinct Observations	30
		Number of Missing Observations	0
Minimum	35	Mean	52.37
Maximum	76	Median	52
SD	9.366	Std. Error of Mean	1.136
Coefficient of Variation	0.179	Skewness	0.218

Normal GOF Test

Shapiro Wilk Test Statistic	0.97	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0.249	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.0791	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.107	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	54.26	95% Adjusted-CLT UCL (Chen-1995)	54.27
		95% Modified-t UCL (Johnson-1978)	54.27

Gamma GOF Test

A-D Test Statistic	0.419	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.749	)etected data appear Gamma Distributed at 5% Significance Leve
K-S Test Statistic	0.0926	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.108	)etected data appear Gamma Distributed at 5% Significance Leve

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	31.51	k star (bias corrected MLE)	30.13
Theta hat (MLE)	1.662	Theta star (bias corrected MLE)	1.738
nu hat (MLE)	4286	nu star (bias corrected)	4098
MLE Mean (bias corrected)	52.37	MLE Sd (bias corrected)	9.54
		Approximate Chi Square Value (0.05)	3950
Adjusted Level of Significance	0.0465	Adjusted Chi Square Value	3947

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	54.33	95% Adjusted Gamma UCL (use when n<50)	54.37

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.97	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0.246	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0961	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.107	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	3.555	Mean of logged Data	3.942
Maximum of Logged Data	4.331	SD of logged Data	0.181

Assuming Lognormal Distribution

95% H-UCL	54.4	90% Chebyshev (MVUE) UCL	55.85
95% Chebyshev (MVUE) UCL	57.42	97.5% Chebyshev (MVUE) UCL	59.6
99% Chebyshev (MVUE) UCL	63.89		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	54.24	95% Jackknife UCL	54.26
95% Standard Bootstrap UCL	54.27	95% Bootstrap-t UCL	54.3
95% Hall's Bootstrap UCL	54.3	95% Percentile Bootstrap UCL	54.28
95% BCA Bootstrap UCL	54.16		
90% Chebyshev(Mean, Sd) UCL	55.78	95% Chebyshev(Mean, Sd) UCL	57.32
97.5% Chebyshev(Mean, Sd) UCL	59.46	99% Chebyshev(Mean, Sd) UCL	63.67

Suggested UCL to Use

95% Student's-t UCL	54.26

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Zinc: Background Sediment

General Statistics

Total Number of Observations	22	Number of Distinct Observations	19
Number of Detects	21	Number of Non-Detects	1
Number of Distinct Detects	19	Number of Distinct Non-Detects	1
Minimum Detect	13	Minimum Non-Detect	29
Maximum Detect	92.8	Maximum Non-Detect	29
Variance Detects	765.6	Percent Non-Detects	4.545%
Mean Detects	45.28	SD Detects	27.67
Median Detects	43	CV Detects	0.611
Skewness Detects	0.36	Kurtosis Detects	-1.389
Mean of Logged Detects	3.604	SD of Logged Detects	0.69

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.896	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.908	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.191	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.193	Detected Data appear Normal at 5% Significance Level

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	44	Standard Error of Mean	5.906
SD	27.03	95% KM (BCA) UCL	54.6
95% KM (t) UCL	54.17	95% KM (Percentile Bootstrap) UCL	53.18
95% KM (z) UCL	53.72	95% KM Bootstrap t UCL	54.07
90% KM Chebyshev UCL	61.72	95% KM Chebyshev UCL	69.75
97.5% KM Chebyshev UCL	80.89	99% KM Chebyshev UCL	102.8

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.734	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.751	Detected data appear Gamma Distributed at 5% Significance Leve
K-S Test Statistic	0.188	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.191	Detected data appear Gamma Distributed at 5% Significance Leve

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	2.549	k star (bias corrected MLE)	2.217
Theta hat (MLE)	17.76	Theta star (bias corrected MLE)	20.42
nu hat (MLE)	107.1	nu star (bias corrected)	93.1
MLE Mean (bias corrected)	45.28	MLE Sd (bias corrected)	30.41

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	2.651	nu hat (KM)	116.6
Approximate Chi Square Value (116.63, α)	92.7	Adjusted Chi Square Value (116.63, β)	91.1
5% Gamma Approximate KM-UCL (use when n>=50)	55.36	95% Gamma Adjusted KM-UCL (use when n<50)	56.33

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	13	Mean	44.13
Maximum	92.8	Median	40
SD	27.53	CV	0.624
k hat (MLE)	2.528	k star (bias corrected MLE)	2.213
Theta hat (MLE)	17.46	Theta star (bias corrected MLE)	19.94
nu hat (MLE)	111.2	nu star (bias corrected)	97.39
MLE Mean (bias corrected)	44.13	MLE Sd (bias corrected)	29.66
		Adjusted Level of Significance (β)	0.0386
Approximate Chi Square Value (97.39, α)	75.63	Adjusted Chi Square Value (97.39, β)	74.2
95% Gamma Approximate UCL (use when n>=50)	56.83	95% Gamma Adjusted UCL (use when n<50)	57.93

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.904	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.908	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.172	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.193	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	44.1	Mean in Log Scale	3.575
SD in Original Scale	27.56	SD in Log Scale	0.687
95% t UCL (assumes normality of ROS data)	54.21	95% Percentile Bootstrap UCL	53.58
95% BCA Bootstrap UCL	54.53	95% Bootstrap t UCL	54.76
95% H-UCL (Log ROS)	62.75		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	3.569	95% H-UCL (KM -Log)	61.65
KM SD (logged)	0.678	95% Critical H Value (KM-Log)	2.179
KM Standard Error of Mean (logged)	0.148		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	43.88	Mean in Log Scale	3.562
SD in Original Scale	27.79	SD in Log Scale	0.702
95% t UCL (Assumes normality)	54.07	95% H-Stat UCL	63.18

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	54.17	95% KM (Percentile Bootstrap) UCL	53.18

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician

Benzo(a)anthracene - Tank 214 Area Sediment

General Statistics

Total Number of Observations	87	Number of Distinct Observations	67
Number of Detects	6	Number of Non-Detects	81
Number of Distinct Detects	6	Number of Distinct Non-Detects	64
Minimum Detect	9.4	Minimum Non-Detect	2.5
Maximum Detect	110	Maximum Non-Detect	3600
Variance Detects	1769	Percent Non-Detects	93.1%
Mean Detects	43.37	SD Detects	42.06
Median Detects	25	CV Detects	0.97
Skewness Detects	1.041	Kurtosis Detects	-0.742
Mean of Logged Detects	3.338	SD of Logged Detects	1.037

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.824	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.3	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.362	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	6.662	Standard Error of Mean	2.127
SD	15.89	95% KM (BCA) UCL	11.5
95% KM (t) UCL	10.2	95% KM (Percentile Bootstrap) UCL	10.53
95% KM (z) UCL	10.16	95% KM Bootstrap t UCL	10.24
90% KM Chebyshev UCL	13.04	95% KM Chebyshev UCL	15.93
97.5% KM Chebyshev UCL	19.94	99% KM Chebyshev UCL	27.82

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.406	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.711	Detected data appear Gamma Distributed at 5% Significance Leve
K-S Test Statistic	0.217	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.339	Detected data appear Gamma Distributed at 5% Significance Leve

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.3	k star (bias corrected MLE)	0.761
Theta hat (MLE)	33.35	Theta star (bias corrected MLE)	56.96
nu hat (MLE)	15.61	nu star (bias corrected)	9.136
MLE Mean (bias corrected)	43.37	MLE Sd (bias corrected)	49.7

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.176	nu hat (KM)	30.57
Approximate Chi Square Value (30.57, α)	18.94	Adjusted Chi Square Value (30.57, β)	18.79
5% Gamma Approximate KM-UCL (use when n>=50)	10.75	95% Gamma Adjusted KM-UCL (use when n<50)	10.84

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	3
Maximum	110	Median	0.01
SD	15	CV	4.999
k hat (MLE)	0.149	k star (bias corrected MLE)	0.152
Theta hat (MLE)	20.11	Theta star (bias corrected MLE)	19.78
nu hat (MLE)	25.96	nu star (bias corrected)	26.4
MLE Mean (bias corrected)	3	MLE Sd (bias corrected)	7.703
		Adjusted Level of Significance (β)	0.0472
Approximate Chi Square Value (26.40, α)	15.68	Adjusted Chi Square Value (26.40, β)	15.55
95% Gamma Approximate UCL (use when n>=50)	5.049	95% Gamma Adjusted UCL (use when n<50)	5.094

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.902	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.179	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.362	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	3.801	Mean in Log Scale	-0.0387
SD in Original Scale	14.84	SD in Log Scale	1.104
95% t UCL (assumes normality of ROS data)	6.447	95% Percentile Bootstrap UCL	6.573
95% BCA Bootstrap UCL	7.727	95% Bootstrap t UCL	12.94
95% H-UCL (Log ROS)	2.339		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	1.225	95% H-UCL (KM -Log)	5.664
KM SD (logged)	0.811	95% Critical H Value (KM-Log)	2.07
KM Standard Error of Mean (logged)	0.13		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	80.59	Mean in Log Scale	2.796
SD in Original Scale	242.8	SD in Log Scale	1.584
95% t UCL (Assumes normality)	123.9	95% H-Stat UCL	93.82

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	10.2	95% KM (Percentile Bootstrap) UCL	10.53

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician

Benzo(a)pyrene - Tank 214 Area Sediment

General Statistics

Total Number of Observations	87	Number of Distinct Observations	68
Number of Detects	14	Number of Non-Detects	73
Number of Distinct Detects	14	Number of Distinct Non-Detects	59
Minimum Detect	4.1	Minimum Non-Detect	2.1
Maximum Detect	1300	Maximum Non-Detect	3600
Variance Detects	162040	Percent Non-Detects	83.91%
Mean Detects	308.4	SD Detects	402.5
Median Detects	150	CV Detects	1.305
Skewness Detects	1.56	Kurtosis Detects	1.795
Mean of Logged Detects	4.477	SD of Logged Detects	1.971

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.779	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.874	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.225	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.237	Detected Data appear Normal at 5% Significance Level

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	55.3	Standard Error of Mean	22.28
SD	195.7	95% KM (BCA) UCL	96.05
95% KM (t) UCL	92.35	95% KM (Percentile Bootstrap) UCL	94.86
95% KM (z) UCL	91.95	95% KM Bootstrap t UCL	118.9
90% KM Chebyshev UCL	122.1	95% KM Chebyshev UCL	152.4
97.5% KM Chebyshev UCL	194.5	99% KM Chebyshev UCL	277

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.391	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.793	Detected data appear Gamma Distributed at 5% Significance Leve
K-S Test Statistic	0.187	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.242	Detected data appear Gamma Distributed at 5% Significance Leve

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.506	k star (bias corrected MLE)	0.445
Theta hat (MLE)	609.9	Theta star (bias corrected MLE)	693.1
nu hat (MLE)	14.16	nu star (bias corrected)	12.46
MLE Mean (bias corrected)	308.4	MLE Sd (bias corrected)	462.3

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0798	nu hat (KM)	13.89
Approximate Chi Square Value (13.89, α)	6.497	Adjusted Chi Square Value (13.89, β)	6.411
5% Gamma Approximate KM-UCL (use when n>=50)	118.2	95% Gamma Adjusted KM-UCL (use when n<50)	119.8

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	49.63
Maximum	1300	Median	0.01
SD	193.6	CV	3.901
k hat (MLE)	0.113	k star (bias corrected MLE)	0.117
Theta hat (MLE)	437.7	Theta star (bias corrected MLE)	423.7
nu hat (MLE)	19.73	nu star (bias corrected)	20.38
MLE Mean (bias corrected)	49.63	MLE Sd (bias corrected)	145
		Adjusted Level of Significance (β)	0.0472
Approximate Chi Square Value (20.38, α)	11.13	Adjusted Chi Square Value (20.38, β)	11.02
95% Gamma Approximate UCL (use when n>=50)	90.86	95% Gamma Adjusted UCL (use when n<50)	91.81

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.923	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.874	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.167	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.237	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	50.08	Mean in Log Scale	-0.0894
SD in Original Scale	193.5	SD in Log Scale	2.309
95% t UCL (assumes normality of ROS data)	84.57	95% Percentile Bootstrap UCL	86.82
95% BCA Bootstrap UCL	96.74	95% Bootstrap t UCL	119
95% H-UCL (Log ROS)	33.63		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	1.608	95% H-UCL (KM -Log)	30.18
KM SD (logged)	1.61	95% Critical H Value (KM-Log)	2.9
KM Standard Error of Mean (logged)	0.214		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	113.8	Mean in Log Scale	2.997
SD in Original Scale	287	SD in Log Scale	1.748
95% t UCL (Assumes normality)	165	95% H-Stat UCL	164.5

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	92.35	95% KM (Percentile Bootstrap) UCL	94.86

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician

Chrysene - Tank 214 Area Sediment

General Statistics

Total Number of Observations	87	Number of Distinct Observations	68
Number of Detects	26	Number of Non-Detects	61
Number of Distinct Detects	24	Number of Distinct Non-Detects	48
Minimum Detect	6.5	Minimum Non-Detect	2.3
Maximum Detect	1100	Maximum Non-Detect	3600
Variance Detects	93963	Percent Non-Detects	70.11%
Mean Detects	258.5	SD Detects	306.5
Median Detects	110	CV Detects	1.186
Skewness Detects	1.357	Kurtosis Detects	1.023
Mean of Logged Detects	4.67	SD of Logged Detects	1.514

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.797	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.92	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.251	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.174	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	85.81	Standard Error of Mean	23.09
SD	205.5	95% KM (BCA) UCL	130.9
95% KM (t) UCL	124.2	95% KM (Percentile Bootstrap) UCL	125.6
95% KM (z) UCL	123.8	95% KM Bootstrap t UCL	135
90% KM Chebyshev UCL	155.1	95% KM Chebyshev UCL	186.5
97.5% KM Chebyshev UCL	230	99% KM Chebyshev UCL	315.5

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.566	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.791	Detected data appear Gamma Distributed at 5% Significance Leve	
K-S Test Statistic	0.132	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.179	Detected data appear Gamma Distributed at 5% Significance Leve	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.685	k star (bias corrected MLE)	0.632
Theta hat (MLE)	377.2	Theta star (bias corrected MLE)	409.1
nu hat (MLE)	35.64	nu star (bias corrected)	32.86
MLE Mean (bias corrected)	258.5	MLE Sd (bias corrected)	325.2

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.174	nu hat (KM)	30.35
Approximate Chi Square Value (30.35, α)	18.77	Adjusted Chi Square Value (30.35, β)	18.61
5% Gamma Approximate KM-UCL (use when n>=50)	138.8	95% Gamma Adjusted KM-UCL (use when n<50)	139.9

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	77.25
Maximum	1100	Median	0.01
SD	203.7	CV	2.636
k hat (MLE)	0.127	k star (bias corrected MLE)	0.131
Theta hat (MLE)	606.9	Theta star (bias corrected MLE)	591.7
nu hat (MLE)	22.15	nu star (bias corrected)	22.72
MLE Mean (bias corrected)	77.25	MLE Sd (bias corrected)	213.8
		Adjusted Level of Significance (β)	0.0472
Approximate Chi Square Value (22.72, α)	12.88	Adjusted Chi Square Value (22.72, β)	12.75
95% Gamma Approximate UCL (use when n>=50)	136.3	95% Gamma Adjusted UCL (use when n<50)	137.6

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.947	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.92	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.117	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.174	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	79.76	Mean in Log Scale	2.126
SD in Original Scale	202.7	SD in Log Scale	1.958
95% t UCL (assumes normality of ROS data)	115.9	95% Percentile Bootstrap UCL	118.2
95% BCA Bootstrap UCL	127.2	95% Bootstrap t UCL	130.5
95% H-UCL (Log ROS)	115.1		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	2.288	95% H-UCL (KM -Log)	131.5
KM SD (logged)	1.947	95% Critical H Value (KM-Log)	3.312
KM Standard Error of Mean (logged)	0.239		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	139.7	Mean in Log Scale	3.309
SD in Original Scale	288.9	SD in Log Scale	1.851
95% t UCL (Assumes normality)	191.2	95% H-Stat UCL	286.7

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	124.2	95% GROS Approximate Gamma UCL	136.3
95% Approximate Gamma KM-UCL	138.8		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician

Indeno(1,2,3-cd)pyrene - Tank 214 Area Sediment

General Statistics

Total Number of Observations	87	Number of Distinct Observations	63
Number of Detects	5	Number of Non-Detects	82
Number of Distinct Detects	5	Number of Distinct Non-Detects	60
Minimum Detect	17	Minimum Non-Detect	4
Maximum Detect	1100	Maximum Non-Detect	3600
Variance Detects	221501	Percent Non-Detects	94.25%
Mean Detects	260.6	SD Detects	470.6
Median Detects	50	CV Detects	1.806
Skewness Detects	2.204	Kurtosis Detects	4.879
Mean of Logged Detects	4.341	SD of Logged Detects	1.647

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.618	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.762	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.426	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.396	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	20.51	Standard Error of Mean	14.61
SD	119.4	95% KM (BCA) UCL	70.73
95% KM (t) UCL	44.8	95% KM (Percentile Bootstrap) UCL	48.01
95% KM (z) UCL	44.54	95% KM Bootstrap t UCL	118.2
90% KM Chebyshev UCL	64.33	95% KM Chebyshev UCL	84.19
97.5% KM Chebyshev UCL	111.7	99% KM Chebyshev UCL	165.9

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.611	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.71	)etected data appear Gamma Distributed at 5% Significance Leve
K-S Test Statistic	0.323	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.371	)etected data appear Gamma Distributed at 5% Significance Leve

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.517	k star (bias corrected MLE)	0.34
Theta hat (MLE)	503.8	Theta star (bias corrected MLE)	766
nu hat (MLE)	5.172	nu star (bias corrected)	3.402
MLE Mean (bias corrected)	260.6	MLE Sd (bias corrected)	446.8

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0295	nu hat (KM)	5.134
Approximate Chi Square Value (5.13, α)	1.214	Adjusted Chi Square Value (5.13, β)	1.183
5% Gamma Approximate KM-UCL (use when n>=50)	86.69	95% Gamma Adjusted KM-UCL (use when n<50)	88.97

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	14.99
Maximum	1100	Median	0.01
SD	118.4	CV	7.902
k hat (MLE)	0.117	k star (bias corrected MLE)	0.121
Theta hat (MLE)	128	Theta star (bias corrected MLE)	124.2
nu hat (MLE)	20.37	nu star (bias corrected)	21
MLE Mean (bias corrected)	14.99	MLE Sd (bias corrected)	43.14
		Adjusted Level of Significance (β)	0.0472
Approximate Chi Square Value (21.00, α)	11.59	Adjusted Chi Square Value (21.00, β)	11.47
95% Gamma Approximate UCL (use when n>=50)	27.15	95% Gamma Adjusted UCL (use when n<50)	27.43

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.897	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.762	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.214	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.396	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	15.13	Mean in Log Scale	-2.11
SD in Original Scale	118.4	SD in Log Scale	1.986
95% t UCL (assumes normality of ROS data)	36.24	95% Percentile Bootstrap UCL	40.46
95% BCA Bootstrap UCL	66.05	95% Bootstrap t UCL	348
95% H-UCL (Log ROS)	1.792		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	1.645	95% H-UCL (KM -Log)	9.21
KM SD (logged)	0.868	95% Critical H Value (KM-Log)	2.118
KM Standard Error of Mean (logged)	0.126		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	90.44	Mean in Log Scale	3.111
SD in Original Scale	251.1	SD in Log Scale	1.493
95% t UCL (Assumes normality)	135.2	95% H-Stat UCL	106.7

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	44.8	95% GROS Approximate Gamma UCL	27.15
95% Approximate Gamma KM-UCL	86.69		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician

Phenanthrene - Tank 214 Area Sediment

General Statistics

Total Number of Observations	87	Number of Distinct Observations	61
Number of Detects	6	Number of Non-Detects	81
Number of Distinct Detects	5	Number of Distinct Non-Detects	60
Minimum Detect	3.9	Minimum Non-Detect	3.2
Maximum Detect	360	Maximum Non-Detect	3600
Variance Detects	19562	Percent Non-Detects	93.1%
Mean Detects	79.38	SD Detects	139.9
Median Detects	17.85	CV Detects	1.762
Skewness Detects	2.275	Kurtosis Detects	5.271
Mean of Logged Detects	3.065	SD of Logged Detects	1.784

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.636	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.357	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.362	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	9.663	Standard Error of Mean	4.947
SD	40.22	95% KM (BCA) UCL	18.76
95% KM (t) UCL	17.89	95% KM (Percentile Bootstrap) UCL	18.59
95% KM (z) UCL	17.8	95% KM Bootstrap t UCL	42.69
90% KM Chebyshev UCL	24.5	95% KM Chebyshev UCL	31.22
97.5% KM Chebyshev UCL	40.56	99% KM Chebyshev UCL	58.88

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.543	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.738	Detected data appear Gamma Distributed at 5% Significance Leve	
K-S Test Statistic	0.282	**Kolmogrov-Smirnoff GOF**	
5% K-S Critical Value	0.349	Detected data appear Gamma Distributed at 5% Significance Leve	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.487	k star (bias corrected MLE)	0.355
Theta hat (MLE)	162.9	Theta star (bias corrected MLE)	223.8
nu hat (MLE)	5.847	nu star (bias corrected)	4.257
MLE Mean (bias corrected)	79.38	MLE Sd (bias corrected)	133.3

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0577	nu hat (KM)	10.04
Approximate Chi Square Value (10.04, α)	3.967	Adjusted Chi Square Value (10.04, β)	3.903
5% Gamma Approximate KM-UCL (use when n>=50)	24.45	95% Gamma Adjusted KM-UCL (use when n<50)	24.86

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	5.484
Maximum	360	Median	0.01
SD	39.33	CV	7.171
k hat (MLE)	0.135	k star (bias corrected MLE)	0.138
Theta hat (MLE)	40.61	Theta star (bias corrected MLE)	39.73
nu hat (MLE)	23.5	nu star (bias corrected)	24.02
MLE Mean (bias corrected)	5.484	MLE Sd (bias corrected)	14.76
		Adjusted Level of Significance (β)	0.0472
Approximate Chi Square Value (24.02, α)	13.86	Adjusted Chi Square Value (24.02, β)	13.73
95% Gamma Approximate UCL (use when n>=50)	9.502	95% Gamma Adjusted UCL (use when n<50)	9.592

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.89	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.271	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.362	Detected Data appear Lognormal at 5% Significance Level	

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	5.817	Mean in Log Scale	-1.056
SD in Original Scale	39.28	SD in Log Scale	1.466
95% t UCL (assumes normality of ROS data)	12.82	95% Percentile Bootstrap UCL	13.83
95% BCA Bootstrap UCL	22.88	95% Bootstrap t UCL	67.78
95% H-UCL (Log ROS)	1.57		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	1.418	95% H-UCL (KM -Log)	6.251
KM SD (logged)	0.719	95% Critical H Value (KM-Log)	2.022
KM Standard Error of Mean (logged)	0.11		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	76.2	Mean in Log Scale	2.824
SD in Original Scale	228.3	SD in Log Scale	1.586
95% t UCL (Assumes normality)	116.9	95% H-Stat UCL	96.92

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	17.89	95% KM (Percentile Bootstrap) UCL	18.59

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician

Pyrene - Tank 214 Area Sediment

General Statistics

Total Number of Observations	87	Number of Distinct Observations	68
Number of Detects	30	Number of Non-Detects	57
Number of Distinct Detects	29	Number of Distinct Non-Detects	46
Minimum Detect	7.1	Minimum Non-Detect	3
Maximum Detect	1400	Maximum Non-Detect	3600
Variance Detects	113995	Percent Non-Detects	65.52%
Mean Detects	215.4	SD Detects	337.6
Median Detects	62.5	CV Detects	1.568
Skewness Detects	2.138	Kurtosis Detects	4.482
Mean of Logged Detects	4.117	SD of Logged Detects	1.722

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.672	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.927	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.288	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.162	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	84.18	Standard Error of Mean	25.16
SD	224	95% KM (BCA) UCL	128.1
95% KM (t) UCL	126	95% KM (Percentile Bootstrap) UCL	130.5
95% KM (z) UCL	125.6	95% KM Bootstrap t UCL	146.8
90% KM Chebyshev UCL	159.7	95% KM Chebyshev UCL	193.8
97.5% KM Chebyshev UCL	241.3	99% KM Chebyshev UCL	334.5

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.196	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.809	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.149	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.169	)etected data appear Gamma Distributed at 5% Significance Leve

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.505	k star (bias corrected MLE)	0.477
Theta hat (MLE)	426.3	Theta star (bias corrected MLE)	451.6
nu hat (MLE)	30.31	nu star (bias corrected)	28.61
MLE Mean (bias corrected)	215.4	MLE Sd (bias corrected)	311.9

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.141	nu hat (KM)	24.58
Approximate Chi Square Value (24.58, α)	14.29	Adjusted Chi Square Value (24.58, β)	14.15
5% Gamma Approximate KM-UCL (use when n>=50)	144.8	95% Gamma Adjusted KM-UCL (use when n<50)	146.2

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	74.27
Maximum	1400	Median	0.01
SD	221.4	CV	2.982
k hat (MLE)	0.132	k star (bias corrected MLE)	0.136
Theta hat (MLE)	560.6	Theta star (bias corrected MLE)	547.8
nu hat (MLE)	23.05	nu star (bias corrected)	23.59
MLE Mean (bias corrected)	74.27	MLE Sd (bias corrected)	201.7
		Adjusted Level of Significance (β)	0.0472
Approximate Chi Square Value (23.59, α)	13.54	Adjusted Chi Square Value (23.59, β)	13.41
95% Gamma Approximate UCL (use when n>=50)	129.4	95% Gamma Adjusted UCL (use when n<50)	130.7

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.909	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.927	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.162	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.162	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	76.7	Mean in Log Scale	2.058
SD in Original Scale	220.6	SD in Log Scale	1.937
95% t UCL (assumes normality of ROS data)	116	95% Percentile Bootstrap UCL	116.4
95% BCA Bootstrap UCL	129.7	95% Bootstrap t UCL	135.6
95% H-UCL (Log ROS)	101.8		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	2.528	95% H-UCL (KM -Log)	93.22
KM SD (logged)	1.705	95% Critical H Value (KM-Log)	3.013
KM Standard Error of Mean (logged)	0.21		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	148.7	Mean in Log Scale	3.392
SD in Original Scale	312.6	SD in Log Scale	1.802
95% t UCL (Assumes normality)	204.4	95% H-Stat UCL	276.8

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	126	95% GROS Approximate Gamma UCL	129.4
95% Approximate Gamma KM-UCL	144.8		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician

Acetone -Tank 214 Area Sediment

General Statistics

Total Number of Observations	54	Number of Distinct Observations	39
Number of Detects	45	Number of Non-Detects	9
Number of Distinct Detects	35	Number of Distinct Non-Detects	8
Minimum Detect	10	Minimum Non-Detect	5.4
Maximum Detect	1900	Maximum Non-Detect	280
Variance Detects	131074	Percent Non-Detects	16.67%
Mean Detects	267.7	SD Detects	362
Median Detects	160	CV Detects	1.352
Skewness Detects	2.972	Kurtosis Detects	9.972
Mean of Logged Detects	4.997	SD of Logged Detects	1.098

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.637	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.945	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.298	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.132	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	233.3	Standard Error of Mean	46.39
SD	336.5	95% KM (BCA) UCL	310.2
95% KM (t) UCL	311	95% KM (Percentile Bootstrap) UCL	316.7
95% KM (z) UCL	309.6	95% KM Bootstrap t UCL	361.4
90% KM Chebyshev UCL	372.5	95% KM Chebyshev UCL	435.5
97.5% KM Chebyshev UCL	523	99% KM Chebyshev UCL	694.9

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.081	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.778	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.16	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.136	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.976	k star (bias corrected MLE)	0.926
Theta hat (MLE)	274.2	Theta star (bias corrected MLE)	289
nu hat (MLE)	87.87	nu star (bias corrected)	83.35
MLE Mean (bias corrected)	267.7	MLE Sd (bias corrected)	278.2

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.481	nu hat (KM)	51.9
Approximate Chi Square Value (51.90, α)	36.35	Adjusted Chi Square Value (51.90, β)	36
5% Gamma Approximate KM-UCL (use when n>=50)	333.1	95% Gamma Adjusted KM-UCL (use when n<50)	336.4

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	225.8
Maximum	1900	Median	120
SD	343.3	CV	1.52
k hat (MLE)	0.421	k star (bias corrected MLE)	0.41
Theta hat (MLE)	536.7	Theta star (bias corrected MLE)	551.1
nu hat (MLE)	45.44	nu star (bias corrected)	44.25
MLE Mean (bias corrected)	225.8	MLE Sd (bias corrected)	352.8
		Adjusted Level of Significance (β)	0.0456
Approximate Chi Square Value (44.25, α)	29.99	Adjusted Chi Square Value (44.25, β)	29.67
95% Gamma Approximate UCL (use when n>=50)	333.1	95% Gamma Adjusted UCL (use when n<50)	336.7

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.988	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.945	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0923	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.132	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	232	Mean in Log Scale	4.79
SD in Original Scale	339.8	SD in Log Scale	1.15
95% t UCL (assumes normality of ROS data)	309.4	95% Percentile Bootstrap UCL	316.1
95% BCA Bootstrap UCL	335.2	95% Bootstrap t UCL	345.7
95% H-UCL (Log ROS)	346.6		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.752	95% H-UCL (KM -Log)	392.5
KM SD (logged)	1.24	95% Critical H Value (KM-Log)	2.655
KM Standard Error of Mean (logged)	0.178		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	235.4	Mean in Log Scale	4.796
SD in Original Scale	338.3	SD in Log Scale	1.231
95% t UCL (Assumes normality)	312.5	95% H-Stat UCL	403.8

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL 435.5

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician

Carbon Disulfide - Tank 214 Area Sediment

General Statistics

Total Number of Observations	57	Number of Distinct Observations	45
Number of Detects	30	Number of Non-Detects	27
Number of Distinct Detects	25	Number of Distinct Non-Detects	24
Minimum Detect	2.4	Minimum Non-Detect	1.5
Maximum Detect	480	Maximum Non-Detect	90
Variance Detects	7426	Percent Non-Detects	47.37%
Mean Detects	25.42	SD Detects	86.18
Median Detects	6.5	CV Detects	3.39
Skewness Detects	5.413	Kurtosis Detects	29.51
Mean of Logged Detects	2.143	SD of Logged Detects	1.055

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.249	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.927	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.464	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.162	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	14.42	Standard Error of Mean	8.43
SD	62.57	95% KM (BCA) UCL	32.03
95% KM (t) UCL	28.52	95% KM (Percentile Bootstrap) UCL	30.72
95% KM (z) UCL	28.28	95% KM Bootstrap t UCL	115.1
90% KM Chebyshev UCL	39.71	95% KM Chebyshev UCL	51.17
97.5% KM Chebyshev UCL	67.07	99% KM Chebyshev UCL	98.3

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	4.313	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.803	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.289	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.168	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.57	k star (bias corrected MLE)	0.535
Theta hat (MLE)	44.61	Theta star (bias corrected MLE)	47.51
nu hat (MLE)	34.19	nu star (bias corrected)	32.1
MLE Mean (bias corrected)	25.42	MLE Sd (bias corrected)	34.75

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.0531	nu hat (KM)	6.054
Approximate Chi Square Value (6.05, α)	1.668	Adjusted Chi Square Value (6.05, β)	1.609
5% Gamma Approximate KM-UCL (use when n>=50)	52.35	95% Gamma Adjusted KM-UCL (use when n<50)	54.25

Gamma (KM) may not be used when k hat (KM) is < 0.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detected data is small such as < 0.1
For such situations, GROS method tends to yield inflated values of UCLs and BTVs
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	13.38
Maximum	480	Median	2.6
SD	63.32	CV	4.731
k hat (MLE)	0.202	k star (bias corrected MLE)	0.203
Theta hat (MLE)	66.41	Theta star (bias corrected MLE)	66.06
nu hat (MLE)	22.97	nu star (bias corrected)	23.1
MLE Mean (bias corrected)	13.38	MLE Sd (bias corrected)	29.73
		Adjusted Level of Significance (β)	0.0458
Approximate Chi Square Value (23.10, α)	13.16	Adjusted Chi Square Value (23.10, β)	12.97
95% Gamma Approximate UCL (use when n>=50)	23.48	95% Gamma Adjusted UCL (use when n<50)	23.84

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.831	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.927	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.142	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.162	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	13.96	Mean in Log Scale	1.174
SD in Original Scale	63.2	SD in Log Scale	1.32
95% t UCL (assumes normality of ROS data)	27.96	95% Percentile Bootstrap UCL	30.48
95% BCA Bootstrap UCL	39.98	95% Bootstrap t UCL	115.1
95% H-UCL (Log ROS)	12.81		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	1.43	95% H-UCL (KM -Log)	11.17
KM SD (logged)	1.107	95% Critical H Value (KM-Log)	2.497
KM Standard Error of Mean (logged)	0.155		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	15.19	Mean in Log Scale	1.458
SD in Original Scale	63.22	SD in Log Scale	1.21
95% t UCL (Assumes normality)	29.19	95% H-Stat UCL	13.78

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL 51.17

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician

UCL Statistics for Uncensored Full Data Sets: Soil-to-Plant BAFs

User Selected Options	
Date/Time of Computation	11/29/2015 8:19:36 AM
From File	ProUCL Input_ SWMU 9_Plant BAFs.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Pentachlorophenol BAF Values

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	1.0000E-4	Mean	11.38
Maximum	46.02	Median	5.935
SD	14.79	Std. Error of Mean	4.678
Coefficient of Variation	1.299	Skewness	1.797

Normal GOF Test

Shapiro Wilk Test Statistic	0.764	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.295	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.28	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	19.96	95% Adjusted-CLT UCL (Chen-1995)	21.92
		95% Modified-t UCL (Johnson-1978)	20.4

Gamma GOF Test

A-D Test Statistic	0.59	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.809	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.255	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.287	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.325	k star (bias corrected MLE)	0.294
Theta hat (MLE)	35.04	Theta star (bias corrected MLE)	38.71
nu hat (MLE)	6.497	nu star (bias corrected)	5.881
MLE Mean (bias corrected)	11.38	MLE Sd (bias corrected)	20.99
		Approximate Chi Square Value (0.05)	1.579
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	1.225

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	42.38	95% Adjusted Gamma UCL (use when n<50)	54.63

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.745	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.348	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.28	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-9.21	Mean of logged Data	0.337
Maximum of Logged Data	3.829	SD of logged Data	4.132

Assuming Lognormal Distribution

95% H-UCL	1.829E+10	90% Chebyshev (MVUE) UCL	1120
95% Chebyshev (MVUE) UCL	1497	97.5% Chebyshev (MVUE) UCL	2019
99% Chebyshev (MVUE) UCL	3044		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	19.08	95% Jackknife UCL	19.96
95% Standard Bootstrap UCL	18.67	95% Bootstrap-t UCL	34.65
95% Hall's Bootstrap UCL	56.29	95% Percentile Bootstrap UCL	18.94
95% BCA Bootstrap UCL	21.04		
90% Chebyshev(Mean, Sd) UCL	25.42	95% Chebyshev(Mean, Sd) UCL	31.77
97.5% Chebyshev(Mean, Sd) UCL	40.59	99% Chebyshev(Mean, Sd) UCL	57.92

Suggested UCL to Use

95% Adjusted Gamma UCL	54.63

Recommended UCL exceeds the maximum observation

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Pyrene BAF Values

General Statistics

Total Number of Observations	11	Number of Distinct Observations	11
		Number of Missing Observations	0
Minimum	0.013	Mean	1.205
Maximum	3.7	Median	0.72
SD	1.144	Std. Error of Mean	0.345
Coefficient of Variation	0.95	Skewness	1.078

Normal GOF Test

Shapiro Wilk Test Statistic	0.898	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.85	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.209	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.267	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	1.83	95% Adjusted-CLT UCL (Chen-1995)	1.892
		95% Modified-t UCL (Johnson-1978)	1.848

Gamma GOF Test

A-D Test Statistic	0.235	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.761	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.137	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.265	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.788	k star (bias corrected MLE)	0.633
Theta hat (MLE)	1.529	Theta star (bias corrected MLE)	1.902
nu hat (MLE)	17.33	nu star (bias corrected)	13.94
MLE Mean (bias corrected)	1.205	MLE Sd (bias corrected)	1.513
		Approximate Chi Square Value (0.05)	6.527
Adjusted Level of Significance	0.0278	Adjusted Chi Square Value	5.721

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	2.572	95% Adjusted Gamma UCL (use when n<50)	2.934

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.878	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.85	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.194	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.267	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-4.343	Mean of logged Data	-0.569
Maximum of Logged Data	1.308	SD of logged Data	1.702

Assuming Lognormal Distribution

95% H-UCL	26.89	90% Chebyshev (MVUE) UCL	4.987
95% Chebyshev (MVUE) UCL	6.394	97.5% Chebyshev (MVUE) UCL	8.348
99% Chebyshev (MVUE) UCL	12.18		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	1.772	95% Jackknife UCL	1.83
95% Standard Bootstrap UCL	1.739	95% Bootstrap-t UCL	2.073
95% Hall's Bootstrap UCL	2.047	95% Percentile Bootstrap UCL	1.787
95% BCA Bootstrap UCL	1.892		
90% Chebyshev(Mean, Sd) UCL	2.239	95% Chebyshev(Mean, Sd) UCL	2.708
97.5% Chebyshev(Mean, Sd) UCL	3.359	99% Chebyshev(Mean, Sd) UCL	4.637

Suggested UCL to Use

95% Student's-t UCL	1.83

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Chromium BAF Values

General Statistics

Total Number of Observations	28	Number of Distinct Observations	26
		Number of Missing Observations	0
Minimum	0.0212	Mean	0.0653
Maximum	0.48	Median	0.041
SD	0.086	Std. Error of Mean	0.0163
Coefficient of Variation	1.317	Skewness	4.465

Normal GOF Test

Shapiro Wilk Test Statistic	0.453	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.924	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.343	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.167	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.093	95% Adjusted-CLT UCL (Chen-1995)	0.107
		95% Modified-t UCL (Johnson-1978)	0.0953

Gamma GOF Test

A-D Test Statistic	1.774	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.761	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.205	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.168	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.724	k star (bias corrected MLE)	1.563
Theta hat (MLE)	0.0379	Theta star (bias corrected MLE)	0.0418
nu hat (MLE)	96.53	nu star (bias corrected)	87.52
MLE Mean (bias corrected)	0.0653	MLE Sd (bias corrected)	0.0523
		Approximate Chi Square Value (0.05)	66.95
Adjusted Level of Significance	0.0404	Adjusted Chi Square Value	65.84

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	0.0854	95% Adjusted Gamma UCL (use when n<50)	0.0869

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.881	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.924	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.131	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.167	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-3.854	Mean of logged Data	-3.045
Maximum of Logged Data	-0.734	SD of logged Data	0.682

Assuming Lognormal Distribution

95% H-UCL	0.0791	90% Chebyshev (MVUE) UCL	0.0842
95% Chebyshev (MVUE) UCL	0.0954	97.5% Chebyshev (MVUE) UCL	0.111
99% Chebyshev (MVUE) UCL	0.141		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	0.0921	95% Jackknife UCL	0.093
95% Standard Bootstrap UCL	0.0919	95% Bootstrap-t UCL	0.151
95% Hall's Bootstrap UCL	0.205	95% Percentile Bootstrap UCL	0.0963
95% BCA Bootstrap UCL	0.112		
90% Chebyshev(Mean, Sd) UCL	0.114	95% Chebyshev(Mean, Sd) UCL	0.136
97.5% Chebyshev(Mean, Sd) UCL	0.167	99% Chebyshev(Mean, Sd) UCL	0.227

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	0.136

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Vanadium BAF Values

General Statistics

Total Number of Observations	21	Number of Distinct Observations	17
		Number of Missing Observations	0
Minimum	0.00173	Mean	0.00548
Maximum	0.0145	Median	0.00485
SD	0.00308	Std. Error of Mean	6.7215E-4
Coefficient of Variation	0.562	Skewness	1.448

Normal GOF Test

Shapiro Wilk Test Statistic	0.855	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.908	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.211	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.193	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.00664	95% Adjusted-CLT UCL (Chen-1995)	0.00681
		95% Modified-t UCL (Johnson-1978)	0.00667

Gamma GOF Test

A-D Test Statistic	0.658	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.747	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.213	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.19	Data Not Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	3.933	k star (bias corrected MLE)	3.403
Theta hat (MLE)	0.00139	Theta star (bias corrected MLE)	0.00161
nu hat (MLE)	165.2	nu star (bias corrected)	142.9
MLE Mean (bias corrected)	0.00548	MLE Sd (bias corrected)	0.00297
		Approximate Chi Square Value (0.05)	116.3
Adjusted Level of Significance	0.0383	Adjusted Chi Square Value	114.5

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	0.00673	95% Adjusted Gamma UCL (use when n<50)	0.00684

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.956	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.908	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.197	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.193	Data Not Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-6.36	Mean of logged Data	-5.34
Maximum of Logged Data	-4.234	SD of logged Data	0.52

Assuming Lognormal Distribution

95% H-UCL	0.00694	90% Chebyshev (MVUE) UCL	0.00739
95% Chebyshev (MVUE) UCL	0.00826	97.5% Chebyshev (MVUE) UCL	0.00948
99% Chebyshev (MVUE) UCL	0.0119		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	0.00658	95% Jackknife UCL	0.00664
95% Standard Bootstrap UCL	0.00656	95% Bootstrap-t UCL	0.00701
95% Hall's Bootstrap UCL	0.00708	95% Percentile Bootstrap UCL	0.00656
95% BCA Bootstrap UCL	0.00685		
90% Chebyshev(Mean, Sd) UCL	0.00749	95% Chebyshev(Mean, Sd) UCL	0.00841
97.5% Chebyshev(Mean, Sd) UCL	0.00967	99% Chebyshev(Mean, Sd) UCL	0.0122

Suggested UCL to Use

95% Adjusted Gamma UCL	0.00684

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

UCL Statistics for Uncensored Full Data Sets: Soil-to-Invertebrate BAFs

User Selected Options	
Date/Time of Computation	11/29/2015 9:04:16 AM
From File	ProUCL Input_ SWMU 9_Earthworm BAFs.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Pentachlorophenol BAF Values

General Statistics

Total Number of Observations	29	Number of Distinct Observations	29
		Number of Missing Observations	0
Minimum	1.23	Mean	36.4
Maximum	201.9	Median	14.6
SD	47.25	Std. Error of Mean	8.774
Coefficient of Variation	1.298	Skewness	2.118

Normal GOF Test

Shapiro Wilk Test Statistic	0.738	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.926	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.228	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.165	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	51.32	95% Adjusted-CLT UCL (Chen-1995)	54.52
		95% Modified-t UCL (Johnson-1978)	51.9

Gamma GOF Test

A-D Test Statistic	0.564	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.791	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.124	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.17	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.68	k star (bias corrected MLE)	0.633
Theta hat (MLE)	53.52	Theta star (bias corrected MLE)	57.53
nu hat (MLE)	39.45	nu star (bias corrected)	36.7
MLE Mean (bias corrected)	36.4	MLE Sd (bias corrected)	45.76
		Approximate Chi Square Value (0.05)	23.83
Adjusted Level of Significance	0.0407	Adjusted Chi Square Value	23.21

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	56.05	95% Adjusted Gamma UCL (use when n<50)	57.55

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.945	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.926	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.163	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.165	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.207	Mean of logged Data	2.702
Maximum of Logged Data	5.308	SD of logged Data	1.504

Assuming Lognormal Distribution

95% H-UCL	113.3	90% Chebyshev (MVUE) UCL	88.03
95% Chebyshev (MVUE) UCL	108.5	97.5% Chebyshev (MVUE) UCL	136.9
99% Chebyshev (MVUE) UCL	192.7		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	50.83	95% Jackknife UCL	51.32
95% Standard Bootstrap UCL	50.78	95% Bootstrap-t UCL	58.56
95% Hall's Bootstrap UCL	60.94	95% Percentile Bootstrap UCL	50.98
95% BCA Bootstrap UCL	54.53		
90% Chebyshev(Mean, Sd) UCL	62.72	95% Chebyshev(Mean, Sd) UCL	74.64
97.5% Chebyshev(Mean, Sd) UCL	91.19	99% Chebyshev(Mean, Sd) UCL	123.7

Suggested UCL to Use

95% Adjusted Gamma UCL	57.55

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Chromium BAF Values

General Statistics

Total Number of Observations	67	Number of Distinct Observations	62
		Number of Missing Observations	0
Minimum	0.021	Mean	1.099
Maximum	11.42	Median	0.306
SD	1.987	Std. Error of Mean	0.243
Coefficient of Variation	1.807	Skewness	3.296

Normal GOF Test

Shapiro Wilk Test Statistic	0.586	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.294	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.108	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	1.504	95% Adjusted-CLT UCL (Chen-1995)	1.603
		95% Modified-t UCL (Johnson-1978)	1.52

Gamma GOF Test

A-D Test Statistic	2.261	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.815	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.147	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.115	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.513	k star (bias corrected MLE)	0.5
Theta hat (MLE)	2.143	Theta star (bias corrected MLE)	2.199
nu hat (MLE)	68.73	nu star (bias corrected)	66.98
MLE Mean (bias corrected)	1.099	MLE Sd (bias corrected)	1.555
		Approximate Chi Square Value (0.05)	49.15
Adjusted Level of Significance	0.0464	Adjusted Chi Square Value	48.81

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	1.498	95% Adjusted Gamma UCL (use when n<50)	1.508

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.943	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0.00699	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.115	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.108	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-3.863	Mean of logged Data	-1.139
Maximum of Logged Data	2.435	SD of logged Data	1.637

Assuming Lognormal Distribution

95% H-UCL	2.04	90% Chebyshev (MVUE) UCL	2.154
95% Chebyshev (MVUE) UCL	2.6	97.5% Chebyshev (MVUE) UCL	3.219
99% Chebyshev (MVUE) UCL	4.435		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	1.498	95% Jackknife UCL	1.504
95% Standard Bootstrap UCL	1.487	95% Bootstrap-t UCL	1.694
95% Hall's Bootstrap UCL	1.78	95% Percentile Bootstrap UCL	1.499
95% BCA Bootstrap UCL	1.622		
90% Chebyshev(Mean, Sd) UCL	1.827	95% Chebyshev(Mean, Sd) UCL	2.157
97.5% Chebyshev(Mean, Sd) UCL	2.615	99% Chebyshev(Mean, Sd) UCL	3.514

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	2.157

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Mercury BAF Values

General Statistics

Total Number of Observations	30	Number of Distinct Observations	30
		Number of Missing Observations	0
Minimum	0.03	Mean	5.231
Maximum	33	Median	1.693
SD	8.896	Std. Error of Mean	1.624
Coefficient of Variation	1.701	Skewness	2.304

Normal GOF Test

Shapiro Wilk Test Statistic	0.612	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.927	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.303	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.162	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	7.991	95% Adjusted-CLT UCL (Chen-1995)	8.633
		95% Modified-t UCL (Johnson-1978)	8.105

Gamma GOF Test

A-D Test Statistic	0.551	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.823	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.112	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.171	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.437	k star (bias corrected MLE)	0.416
Theta hat (MLE)	11.96	Theta star (bias corrected MLE)	12.58
nu hat (MLE)	26.24	nu star (bias corrected)	24.95
MLE Mean (bias corrected)	5.231	MLE Sd (bias corrected)	8.113
		Approximate Chi Square Value (0.05)	14.57
Adjusted Level of Significance	0.041	Adjusted Chi Square Value	14.11

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	8.956	95% Adjusted Gamma UCL (use when n<50)	9.247

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.955	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.927	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0994	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.162	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-3.507	Mean of logged Data	0.171
Maximum of Logged Data	3.497	SD of logged Data	2.045

Assuming Lognormal Distribution

95% H-UCL	43.91	90% Chebyshev (MVUE) UCL	20.04
95% Chebyshev (MVUE) UCL	25.5	97.5% Chebyshev (MVUE) UCL	33.08
99% Chebyshev (MVUE) UCL	47.97		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	7.903	95% Jackknife UCL	7.991
95% Standard Bootstrap UCL	7.874	95% Bootstrap-t UCL	9.455
95% Hall's Bootstrap UCL	8.241	95% Percentile Bootstrap UCL	7.907
95% BCA Bootstrap UCL	8.728		
90% Chebyshev(Mean, Sd) UCL	10.1	95% Chebyshev(Mean, Sd) UCL	12.31
97.5% Chebyshev(Mean, Sd) UCL	15.37	99% Chebyshev(Mean, Sd) UCL	21.39

Suggested UCL to Use

95% Adjusted Gamma UCL 9.247

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. For additional insight the user may want to consult a statistician.

Nickel BAF Values

General Statistics

Total Number of Observations	31	Number of Distinct Observations	30
		Number of Missing Observations	0
Minimum	0.033	Mean	1.656
Maximum	7.802	Median	1.059
SD	1.85	Std. Error of Mean	0.332
Coefficient of Variation	1.117	Skewness	1.895

Normal GOF Test

Shapiro Wilk Test Statistic	0.777	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.929	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.225	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.159	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	2.22	95% Adjusted-CLT UCL (Chen-1995)	2.323
		95% Modified-t UCL (Johnson-1978)	2.239

Gamma GOF Test

A-D Test Statistic	0.487	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.786	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.113	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.164	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.787	k star (bias corrected MLE)	0.733
Theta hat (MLE)	2.104	Theta star (bias corrected MLE)	2.261
nu hat (MLE)	48.81	nu star (bias corrected)	45.42
MLE Mean (bias corrected)	1.656	MLE Sd (bias corrected)	1.935
		Approximate Chi Square Value (0.05)	30.96
Adjusted Level of Significance	0.0413	Adjusted Chi Square Value	30.3

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	2.43	95% Adjusted Gamma UCL (use when n<50)	2.483

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.899	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.929	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.184	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.159	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-3.411	Mean of logged Data	-0.251
Maximum of Logged Data	2.054	SD of logged Data	1.516

Assuming Lognormal Distribution

95% H-UCL	5.786	90% Chebyshev (MVUE) UCL	4.649
95% Chebyshev (MVUE) UCL	5.722	97.5% Chebyshev (MVUE) UCL	7.21
99% Chebyshev (MVUE) UCL	10.13		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	2.203	95% Jackknife UCL	2.22
95% Standard Bootstrap UCL	2.196	95% Bootstrap-t UCL	2.451
95% Hall's Bootstrap UCL	2.402	95% Percentile Bootstrap UCL	2.237
95% BCA Bootstrap UCL	2.325		
90% Chebyshev(Mean, Sd) UCL	2.653	95% Chebyshev(Mean, Sd) UCL	3.104
97.5% Chebyshev(Mean, Sd) UCL	3.731	99% Chebyshev(Mean, Sd) UCL	4.962

Suggested UCL to Use

95% Adjusted Gamma UCL	2.483

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

UCL Statistics for Uncensored Full Data Sets: Soil-to-Mammal BAFs

User Selected Options	
Date/Time of Computation	11/29/2015 11:10:31 AM
From File	ProUCL Input_ SWMU 9_Mammal BAFs.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Lead BAF Values

General Statistics

Total Number of Observations	60	Number of Distinct Observations	60
		Number of Missing Observations	0
Minimum	0.0035	Mean	0.11
Maximum	0.995	Median	0.0484
SD	0.177	Std. Error of Mean	0.0228
Coefficient of Variation	1.605	Skewness	3.211

Normal GOF Test

Shapiro Wilk Test Statistic	0.61	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.273	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.114	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.148	95% Adjusted-CLT UCL (Chen-1995)	0.158
		95% Modified-t UCL (Johnson-1978)	0.15

Gamma GOF Test

A-D Test Statistic	1.411	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.8	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.126	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.12	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.67	k star (bias corrected MLE)	0.647
Theta hat (MLE)	0.164	Theta star (bias corrected MLE)	0.17
nu hat (MLE)	80.35	nu star (bias corrected)	77.66
MLE Mean (bias corrected)	0.11	MLE Sd (bias corrected)	0.137
		Approximate Chi Square Value (0.05)	58.36
Adjusted Level of Significance	0.046	Adjusted Chi Square Value	57.95

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	0.147	95% Adjusted Gamma UCL (use when n<50)	0.148

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.962	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0.13	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0944	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.114	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-5.655	Mean of logged Data	-3.115
Maximum of Logged Data	-0.00511	SD of logged Data	1.39

Assuming Lognormal Distribution

95% H-UCL	0.203	90% Chebyshev (MVUE) UCL	0.193
95% Chebyshev (MVUE) UCL	0.229	97.5% Chebyshev (MVUE) UCL	0.279
99% Chebyshev (MVUE) UCL	0.378		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	0.148	95% Jackknife UCL	0.148
95% Standard Bootstrap UCL	0.148	95% Bootstrap-t UCL	0.164
95% Hall's Bootstrap UCL	0.173	95% Percentile Bootstrap UCL	0.149
95% BCA Bootstrap UCL	0.162		
90% Chebyshev(Mean, Sd) UCL	0.179	95% Chebyshev(Mean, Sd) UCL	0.21
97.5% Chebyshev(Mean, Sd) UCL	0.253	99% Chebyshev(Mean, Sd) UCL	0.337

Suggested UCL to Use

95% H-UCL	0.203

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

ProUCL computes and outputs H-statistic based UCLs for historical reasons only.
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

UCL Statistics for Uncensored Full Data Sets: Sediment-to-Aquatic Invertebrate BSAFs

User Selected Options	
Date/Time of Computation	11/30/2015 7:43:47 AM
From File	ProUCL Input_ SWMU 9_Aquatic Invertebrate BAFs.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Hexachlorobenzene BSAF Values

General Statistics

Total Number of Observations	15	Number of Distinct Observations	15
		Number of Missing Observations	0
Minimum	0.08	Mean	2.453
Maximum	12.23	Median	0.737
SD	3.63	Std. Error of Mean	0.937
Coefficient of Variation	1.48	Skewness	2.012

Normal GOF Test

Shapiro Wilk Test Statistic	0.684	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.881	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.286	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.229	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	4.103	95% Adjusted-CLT UCL (Chen-1995)	4.514
		95% Modified-t UCL (Johnson-1978)	4.184

Gamma GOF Test

A-D Test Statistic	0.508	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.784	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.18	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.232	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.621	k star (bias corrected MLE)	0.541
Theta hat (MLE)	3.952	Theta star (bias corrected MLE)	4.534
nu hat (MLE)	18.62	nu star (bias corrected)	16.23
MLE Mean (bias corrected)	2.453	MLE Sd (bias corrected)	3.335
		Approximate Chi Square Value (0.05)	8.124
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	7.427

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	4.899	95% Adjusted Gamma UCL (use when n<50)	5.359

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.972	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.881	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0917	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.229	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-2.526	Mean of logged Data	-0.0934
Maximum of Logged Data	2.504	SD of logged Data	1.524

Assuming Lognormal Distribution

95% H-UCL	12.91	90% Chebyshev (MVUE) UCL	5.936
95% Chebyshev (MVUE) UCL	7.481	97.5% Chebyshev (MVUE) UCL	9.624
99% Chebyshev (MVUE) UCL	13.83		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	3.994	95% Jackknife UCL	4.103
95% Standard Bootstrap UCL	3.914	95% Bootstrap-t UCL	6.285
95% Hall's Bootstrap UCL	8.699	95% Percentile Bootstrap UCL	4.135
95% BCA Bootstrap UCL	4.52		
90% Chebyshev(Mean, Sd) UCL	5.264	95% Chebyshev(Mean, Sd) UCL	6.538
97.5% Chebyshev(Mean, Sd) UCL	8.305	99% Chebyshev(Mean, Sd) UCL	11.78

Suggested UCL to Use

95% Adjusted Gamma UCL	5.359

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Benzo(b)fluoranthene BSAF Values

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	0.0014	Mean	1.455
Maximum	8.033	Median	0.337
SD	2.736	Std. Error of Mean	0.967
Coefficient of Variation	1.881	Skewness	2.535

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.0

Normal GOF Test

Shapiro Wilk Test Statistic	0.606	Shapiro Wilk GOF Test
5% Shapiro Wilk Critical Value	0.818	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.315	Lilliefors GOF Test
5% Lilliefors Critical Value	0.313	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	3.288	95% Adjusted-CLT UCL (Chen-1995)	3.973
		95% Modified-t UCL (Johnson-1978)	3.432

Gamma GOF Test

A-D Test Statistic	0.286	Anderson-Darling Gamma GOF Test
5% A-D Critical Value	0.805	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.18	Kolmogrov-Smirnoff Gamma GOF Test
5% K-S Critical Value	0.318	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.28	k star (bias corrected MLE)	0.258
Theta hat (MLE)	5.197	Theta star (bias corrected MLE)	5.632
nu hat (MLE)	4.479	nu star (bias corrected)	4.133
MLE Mean (bias corrected)	1.455	MLE Sd (bias corrected)	2.862
		Approximate Chi Square Value (0.05)	0.775
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	0.479

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	7.759	95% Adjusted Gamma UCL (use when n<50)	12.54

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.9	Shapiro Wilk Lognormal GOF Test
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.239	Lilliefors Lognormal GOF Test
5% Lilliefors Critical Value	0.313	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-6.571	Mean of logged Data	-2.116
Maximum of Logged Data	2.084	SD of logged Data	3.293

Assuming Lognormal Distribution

95% H-UCL	5808397	90% Chebyshev (MVUE) UCL	14.5
95% Chebyshev (MVUE) UCL	19.29	97.5% Chebyshev (MVUE) UCL	25.95
99% Chebyshev (MVUE) UCL	39.02		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	3.046	95% Jackknife UCL	3.288
95% Standard Bootstrap UCL	2.94	95% Bootstrap-t UCL	10.62
95% Hall's Bootstrap UCL	8.698	95% Percentile Bootstrap UCL	3.228
95% BCA Bootstrap UCL	4.097		
90% Chebyshev(Mean, Sd) UCL	4.357	95% Chebyshev(Mean, Sd) UCL	5.672
97.5% Chebyshev(Mean, Sd) UCL	7.497	99% Chebyshev(Mean, Sd) UCL	11.08

Suggested UCL to Use

95% Adjusted Gamma UCL 12.54

Recommended UCL exceeds the maximum observation

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. For additional insight the user may want to consult a statistician.

Pyrene BSAF Values

General Statistics

Total Number of Observations	92	Number of Distinct Observations	89
		Number of Missing Observations	0
Minimum	4.0000E-4	Mean	0.361
Maximum	3.332	Median	0.157
SD	0.589	Std. Error of Mean	0.0614
Coefficient of Variation	1.631	Skewness	2.864

Normal GOF Test

Shapiro Wilk Test Statistic	0.618	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.27	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0924	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.463	95% Adjusted-CLT UCL (Chen-1995)	0.482
		95% Modified-t UCL (Johnson-1978)	0.466

Gamma GOF Test

A-D Test Statistic	0.789	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.817	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0893	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.0985	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.514	k star (bias corrected MLE)	0.504
Theta hat (MLE)	0.703	Theta star (bias corrected MLE)	0.716
nu hat (MLE)	94.5	nu star (bias corrected)	92.75
MLE Mean (bias corrected)	0.361	MLE Sd (bias corrected)	0.508
		Approximate Chi Square Value (0.05)	71.54
Adjusted Level of Significance	0.0474	Adjusted Chi Square Value	71.25

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	0.468	95% Adjusted Gamma UCL (use when n<50)	0.47

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.935	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	1.9352E-4	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.101	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.0924	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-7.824	Mean of logged Data	-2.251
Maximum of Logged Data	1.203	SD of logged Data	1.946

Assuming Lognormal Distribution

95% H-UCL	1.38	90% Chebyshev (MVUE) UCL	1.285
95% Chebyshev (MVUE) UCL	1.567	97.5% Chebyshev (MVUE) UCL	1.959
99% Chebyshev (MVUE) UCL	2.728		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	0.462	95% Jackknife UCL	0.463
95% Standard Bootstrap UCL	0.462	95% Bootstrap-t UCL	0.491
95% Hall's Bootstrap UCL	0.484	95% Percentile Bootstrap UCL	0.467
95% BCA Bootstrap UCL	0.481		
90% Chebyshev(Mean, Sd) UCL	0.545	95% Chebyshev(Mean, Sd) UCL	0.629
97.5% Chebyshev(Mean, Sd) UCL	0.744	99% Chebyshev(Mean, Sd) UCL	0.972

Suggested UCL to Use

95% Approximate Gamma UCL	0.468

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

UCL Statistics for Uncensored Full Data Sets: Sediment-to-Fish BAFs/BSAFs

User Selected Options	
Date/Time of Computation	11/30/2015 8:17:32 AM
From File	ProUCL Input_ SWMU 9_Fish BAFs_BSAFs.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Lead BAF Values

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	0.028	Mean	0.182
Maximum	0.43	Median	0.13
SD	0.134	Std. Error of Mean	0.0448
Coefficient of Variation	0.738	Skewness	0.89

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.0

Normal GOF Test

Shapiro Wilk Test Statistic	0.902	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.231	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.295	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	0.265	95% Adjusted-CLT UCL (Chen-1995)	0.27
		95% Modified-t UCL (Johnson-1978)	0.267

Gamma GOF Test

A-D Test Statistic	0.223	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.73	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.144	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.283	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.954	k star (bias corrected MLE)	1.377
Theta hat (MLE)	0.0931	Theta star (bias corrected MLE)	0.132
nu hat (MLE)	35.18	nu star (bias corrected)	24.79
MLE Mean (bias corrected)	0.182	MLE Sd (bias corrected)	0.155
		Approximate Chi Square Value (0.05)	14.45
Adjusted Level of Significance	0.0231	Adjusted Chi Square Value	12.81

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	0.312	95% Adjusted Gamma UCL (use when n<50)	0.352

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.961	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.133	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.295	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-3.576	Mean of logged Data	-1.981
Maximum of Logged Data	-0.844	SD of logged Data	0.843

Assuming Lognormal Distribution

95% H-UCL	0.467	90% Chebyshev (MVUE) UCL	0.35
95% Chebyshev (MVUE) UCL	0.424	97.5% Chebyshev (MVUE) UCL	0.526
99% Chebyshev (MVUE) UCL	0.727		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	0.256	95% Jackknife UCL	0.265
95% Standard Bootstrap UCL	0.252	95% Bootstrap-t UCL	0.295
95% Hall's Bootstrap UCL	0.26	95% Percentile Bootstrap UCL	0.253
95% BCA Bootstrap UCL	0.259		
90% Chebyshev(Mean, Sd) UCL	0.316	95% Chebyshev(Mean, Sd) UCL	0.377
97.5% Chebyshev(Mean, Sd) UCL	0.461	99% Chebyshev(Mean, Sd) UCL	0.627

Suggested UCL to Use

95% Student's-t UCL	0.265

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. For additional insight the user may want to consult a statistician.

Zinc BAF Values

General Statistics

Total Number of Observations	10	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	0.13	Mean	1.833
Maximum	5	Median	1.25
SD	1.875	Std. Error of Mean	0.593
Coefficient of Variation	1.023	Skewness	0.923

Normal GOF Test

Shapiro Wilk Test Statistic	0.813	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.312	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.28	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	2.92	95% Adjusted-CLT UCL (Chen-1995)	2.993
		95% Modified-t UCL (Johnson-1978)	2.949

Gamma GOF Test

A-D Test Statistic	0.405	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.752	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.178	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.275	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.897	k star (bias corrected MLE)	0.695
Theta hat (MLE)	2.043	Theta star (bias corrected MLE)	2.639
nu hat (MLE)	17.94	nu star (bias corrected)	13.89
MLE Mean (bias corrected)	1.833	MLE Sd (bias corrected)	2.199
		Approximate Chi Square Value (0.05)	6.498
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	5.643

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	3.919	95% Adjusted Gamma UCL (use when n<50)	4.513

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.91	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.167	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.28	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-2.04	Mean of logged Data	-0.0459
Maximum of Logged Data	1.609	SD of logged Data	1.344

Assuming Lognormal Distribution

95% H-UCL	13.22	90% Chebyshev (MVUE) UCL	4.801
95% Chebyshev (MVUE) UCL	6.05	97.5% Chebyshev (MVUE) UCL	7.783
99% Chebyshev (MVUE) UCL	11.19		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	2.808	95% Jackknife UCL	2.92
95% Standard Bootstrap UCL	2.765	95% Bootstrap-t UCL	3.126
95% Hall's Bootstrap UCL	2.721	95% Percentile Bootstrap UCL	2.807
95% BCA Bootstrap UCL	2.923		
90% Chebyshev(Mean, Sd) UCL	3.612	95% Chebyshev(Mean, Sd) UCL	4.418
97.5% Chebyshev(Mean, Sd) UCL	5.536	99% Chebyshev(Mean, Sd) UCL	7.733

Suggested UCL to Use

95% Adjusted Gamma UCL	4.513

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Pyrene BSAF Values

General Statistics

Total Number of Observations	8	Number of Distinct Observations	8
		Number of Missing Observations	0
Minimum	2.5100E-4	Mean	0.0158
Maximum	0.0638	Median	0.00343
SD	0.0231	Std. Error of Mean	0.00818
Coefficient of Variation	1.462	Skewness	1.688

Note: Sample size is small (e.g., <10), if data are collected using ISM approach, you should use guidance provided in ITRC Tech Reg Guide on ISM (ITRC, 2012) to compute statistics of interest. For example, you may want to use Chebyshev UCL to estimate EPC (ITRC, 2012). Chebyshev UCL can be computed using the Nonparametric and All UCL Options of ProUCL 5.0

Normal GOF Test

Shapiro Wilk Test Statistic	0.715	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.319	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.313	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	0.0313	95% Adjusted-CLT UCL (Chen-1995)	0.0345
		95% Modified-t UCL (Johnson-1978)	0.0321

Gamma GOF Test

A-D Test Statistic	0.464	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.759	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.26	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.308	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.556	k star (bias corrected MLE)	0.431
Theta hat (MLE)	0.0285	Theta star (bias corrected MLE)	0.0367
nu hat (MLE)	8.895	nu star (bias corrected)	6.893
MLE Mean (bias corrected)	0.0158	MLE Sd (bias corrected)	0.0241
		Approximate Chi Square Value (0.05)	2.112
Adjusted Level of Significance	0.0195	Adjusted Chi Square Value	1.508

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	0.0517	95% Adjusted Gamma UCL (use when n<50)	0.0723

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.946	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.818	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.189	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.313	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	-8.29	Mean of logged Data	-5.27
Maximum of Logged Data	-2.752	SD of logged Data	1.769

Assuming Lognormal Distribution

95% H-UCL	0.964	90% Chebyshev (MVUE) UCL	0.0492
95% Chebyshev (MVUE) UCL	0.0636	97.5% Chebyshev (MVUE) UCL	0.0837
99% Chebyshev (MVUE) UCL	0.123		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	0.0293	95% Jackknife UCL	0.0313
95% Standard Bootstrap UCL	0.0282	95% Bootstrap-t UCL	0.0924
95% Hall's Bootstrap UCL	0.109	95% Percentile Bootstrap UCL	0.0305
95% BCA Bootstrap UCL	0.0332		
90% Chebyshev(Mean, Sd) UCL	0.0404	95% Chebyshev(Mean, Sd) UCL	0.0515
97.5% Chebyshev(Mean, Sd) UCL	0.0669	99% Chebyshev(Mean, Sd) UCL	0.0972

Suggested UCL to Use

95% Adjusted Gamma UCL	0.0723

Recommended UCL exceeds the maximum observation

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. For additional insight the user may want to consult a statistician.

APPENDIX E

SWMU 9 and Background Statistical Evaluation for Soil

Distribution Tests

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

User Selected Options

Date/Time of Computation	6/5/2014 1:08:33 PM
From File	Surface Soil.xls
Full Precision	OFF
Confidence Coefficient	0.95

Beryllium: Tank 214 Area Surface Soil

Raw Statistics

Number of Valid Observations	45
Number of Distinct Observations	20
Minimum	0.11
Maximum	0.47
Mean of Raw Data	0.213
Standard Deviation of Raw Data	0.0906
Khat	6.528
Theta hat	0.0326
Kstar	6.107
Theta star	0.0349
Mean of Log Transformed Data	-1.624
Standard Deviation of Log Transformed Data	0.391

Normal GOF Test Results

Correlation Coefficient R	0.937
Shapiro Wilk Test Statistic	0.869
Shapiro Wilk Critical (0.05) Value	0.945
Approximate Shapiro Wilk P Value	3.5517E-5
Lilliefors Test Statistic	0.18
Lilliefors Critical (0.05) Value	0.132

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.977
A-D Test Statistic	1.237
A-D Critical (0.05) Value	0.752
K-S Test Statistic	0.146
K-S Critical(0.05) Value	0.132

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.973
Shapiro Wilk Test Statistic	0.929
Shapiro Wilk Critical (0.05) Value	0.945
Approximate Shapiro Wilk P Value	0.0115
Lilliefors Test Statistic	0.125
Lilliefors Critical (0.05) Value	0.132

Data appear Approximate_Lognormal at (0.05) Significance Lev

Chromium: Tank 214 Area Surface Soil

Raw Statistics

Number of Valid Observations	48
Number of Distinct Observations	38
Minimum	2.5
Maximum	37
Mean of Raw Data	8.194
Standard Deviation of Raw Data	5.643
Khat	3.599
Theta hat	2.276
Kstar	3.388
Theta star	2.418
Mean of Log Transformed Data	1.958
Standard Deviation of Log Transformed Data	0.509

Normal GOF Test Results

Correlation Coefficient R	0.814
Shapiro Wilk Test Statistic	0.695
Shapiro Wilk Critical (0.05) Value	0.947
Approximate Shapiro Wilk P Value	4.223E-12
Lilliefors Test Statistic	0.205
Lilliefors Critical (0.05) Value	0.128

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.905
A-D Test Statistic	1.012
A-D Critical (0.05) Value	0.755
K-S Test Statistic	0.119
K-S Critical(0.05) Value	0.129

Data follow Appr. Gamma Distribution at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.978
Shapiro Wilk Test Statistic	0.965
Shapiro Wilk Critical (0.05) Value	0.947
Approximate Shapiro Wilk P Value	0.264
Lilliefors Test Statistic	0.0896
Lilliefors Critical (0.05) Value	0.128

Data appear Lognormal at (0.05) Significance Level

Chromium: Background Surface Soil

Raw Statistics	
Number of Valid Observations	20
Number of Distinct Observations	18
Minimum	5.9
Maximum	47
Mean of Raw Data	25.69
Standard Deviation of Raw Data	12.22
Khat	3.603
Theta hat	7.131
Kstar	3.096
Theta star	8.299
Mean of Log Transformed Data	3.101
Standard Deviation of Log Transformed Data	0.601

Normal GOF Test Results

Correlation Coefficient R	0.966
Shapiro Wilk Test Statistic	0.922
Shapiro Wilk Critical (0.05) Value	0.905
Approximate Shapiro Wilk P Value	0.128
Lilliefors Test Statistic	0.185
Lilliefors Critical (0.05) Value	0.198

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.935
A-D Test Statistic	1.052
A-D Critical (0.05) Value	0.746
K-S Test Statistic	0.231
K-S Critical(0.05) Value	0.195

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.938
Shapiro Wilk Test Statistic	0.873
Shapiro Wilk Critical (0.05) Value	0.905
Approximate Shapiro Wilk P Value	0.0136
Lilliefors Test Statistic	0.239
Lilliefors Critical (0.05) Value	0.198

Data not Lognormal at (0.05) Significance Level

Cobalt: Tank 214 Area Surface Soil

Raw Statistics

Number of Valid Observations	44
Number of Distinct Observations	25
Minimum	5.5
Maximum	57
Mean of Raw Data	21.52
Standard Deviation of Raw Data	8.872
Khat	6.259
Theta hat	3.438
Kstar	5.848
Theta star	3.68
Mean of Log Transformed Data	2.987
Standard Deviation of Log Transformed Data	0.426

Normal GOF Test Results

Correlation Coefficient R	0.928
Shapiro Wilk Test Statistic	0.885
Shapiro Wilk Critical (0.05) Value	0.944
Approximate Shapiro Wilk P Value	1.9124E-4
Lilliefors Test Statistic	0.166
Lilliefors Critical (0.05) Value	0.134

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.955
A-D Test Statistic	1.071
A-D Critical (0.05) Value	0.752
K-S Test Statistic	0.14
K-S Critical(0.05) Value	0.134

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.957
Shapiro Wilk Test Statistic	0.932
Shapiro Wilk Critical (0.05) Value	0.944
Approximate Shapiro Wilk P Value	0.0158
Lilliefors Test Statistic	0.167
Lilliefors Critical (0.05) Value	0.134

Data not Lognormal at (0.05) Significance Level

Cobalt: Background Surface Soil

Raw Statistics	
Number of Valid Observations	19
Number of Distinct Observations	18
Minimum	9.5
Maximum	50.2
Mean of Raw Data	22.84
Standard Deviation of Raw Data	11.7
Khat	4.554
Theta hat	5.016
Kstar	3.87
Theta star	5.903
Mean of Log Transformed Data	3.015
Standard Deviation of Log Transformed Data	0.484

Normal GOF Test Results

Correlation Coefficient R	0.938
Shapiro Wilk Test Statistic	0.875
Shapiro Wilk Critical (0.05) Value	0.901
Approximate Shapiro Wilk P Value	0.0175
Lilliefors Test Statistic	0.194
Lilliefors Critical (0.05) Value	0.203

Data appear Approximate Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.977
A-D Test Statistic	0.456
A-D Critical (0.05) Value	0.744
K-S Test Statistic	0.185
K-S Critical(0.05) Value	0.199

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.982
Shapiro Wilk Test Statistic	0.954
Shapiro Wilk Critical (0.05) Value	0.901
Approximate Shapiro Wilk P Value	0.504
Lilliefors Test Statistic	0.165
Lilliefors Critical (0.05) Value	0.203

Data appear Lognormal at (0.05) Significance Level

Copper: Tank 214 Area Surface Soil

Raw Statistics

Number of Valid Observations	42
Number of Distinct Observations	26
Minimum	51
Maximum	170
Mean of Raw Data	89.86
Standard Deviation of Raw Data	21.43
Khat	19.58
Theta hat	4.588
Kstar	18.2
Theta star	4.937
Mean of Log Transformed Data	4.472
Standard Deviation of Log Transformed Data	0.227

Normal GOF Test Results

Correlation Coefficient R	0.952
Shapiro Wilk Test Statistic	0.884
Shapiro Wilk Critical (0.05) Value	0.942
Approximate Shapiro Wilk P Value	0.011
Lilliefors Test Statistic	0.106
Lilliefors Critical (0.05) Value	0.137

Data appear Approximate Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.97
A-D Test Statistic	0.419
A-D Critical (0.05) Value	0.747
K-S Test Statistic	0.0877
K-S Critical(0.05) Value	0.136

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.983
Shapiro Wilk Test Statistic	0.931
Shapiro Wilk Critical (0.05) Value	0.942
Approximate Shapiro Wilk P Value	0.689
Lilliefors Test Statistic	0.0854
Lilliefors Critical (0.05) Value	0.137

Data appear Approximate_Lognormal at (0.05) Significance Level

Copper: Background Surface Soil

Raw Statistics

Number of Valid Observations	18
Number of Distinct Observations	17
Minimum	13
Maximum	180
Mean of Raw Data	77.11
Standard Deviation of Raw Data	46.73
Khat	2.736
Theta hat	28.18
Kstar	2.317
Theta star	33.28
Mean of Log Transformed Data	4.152
Standard Deviation of Log Transformed Data	0.685

Normal GOF Test Results

Correlation Coefficient R	0.962
Shapiro Wilk Test Statistic	0.922
Shapiro Wilk Critical (0.05) Value	0.897
Approximate Shapiro Wilk P Value	0.15
Lilliefors Test Statistic	0.197
Lilliefors Critical (0.05) Value	0.209

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.988
A-D Test Statistic	0.193
A-D Critical (0.05) Value	0.748
K-S Test Statistic	0.12
K-S Critical(0.05) Value	0.205

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.978
Shapiro Wilk Test Statistic	0.958
Shapiro Wilk Critical (0.05) Value	0.897
Approximate Shapiro Wilk P Value	0.55
Lilliefors Test Statistic	0.136
Lilliefors Critical (0.05) Value	0.209

Data appear Lognormal at (0.05) Significance Level

Lead: Tank 214 Area Surface Soil

Raw Statistics

Number of Valid Observations	62
Number of Distinct Observations	54
Minimum	1.6
Maximum	1000
Mean of Raw Data	117.6
Standard Deviation of Raw Data	190.6
Khat	0.572
Theta hat	205.8
Kstar	0.555
Theta star	212.1
Mean of Log Transformed Data	3.679
Standard Deviation of Log Transformed Data	1.619

Normal GOF Test Results

Correlation Coefficient R	0.779
Approximate Shapiro Wilk Test Statistic	0.623
Approximate Shapiro Wilk P Value	0
Lilliefors Test Statistic	0.271
Lilliefors Critical (0.05) Value	0.113

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.979
A-D Test Statistic	1.016
A-D Critical (0.05) Value	0.809
K-S Test Statistic	0.104
K-S Critical(0.05) Value	0.119

Data follow Appr. Gamma Distribution at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.992
Approximate Shapiro Wilk Test Statistic	0.965
Approximate Shapiro Wilk P Value	0.168
Lilliefors Test Statistic	0.0717
Lilliefors Critical (0.05) Value	0.113

Data appear Lognormal at (0.05) Significance Level

Lead: Background Surface Soil

Raw Statistics	
Number of Valid Observations	18
Number of Distinct Observations	16
Minimum	2
Maximum	21
Mean of Raw Data	8.678
Standard Deviation of Raw Data	6.872
Khat	1.695
Theta hat	5.12
Kstar	1.449
Theta star	5.987
Mean of Log Transformed Data	1.838
Standard Deviation of Log Transformed Data	0.845

Normal GOF Test Results

Correlation Coefficient R	0.926
Shapiro Wilk Test Statistic	0.838
Shapiro Wilk Critical (0.05) Value	0.897
Approximate Shapiro Wilk P Value	0.00573
Lilliefors Test Statistic	0.233
Lilliefors Critical (0.05) Value	0.209

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.953
A-D Test Statistic	0.766
A-D Critical (0.05) Value	0.755
K-S Test Statistic	0.2
K-S Critical(0.05) Value	0.207

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.963
Shapiro Wilk Test Statistic	0.904
Shapiro Wilk Critical (0.05) Value	0.897
Approximate Shapiro Wilk P Value	0.0882
Lilliefors Test Statistic	0.163
Lilliefors Critical (0.05) Value	0.209

Data appear Lognormal at (0.05) Significance Level

Nickel: Tank 214 Area Surface Soil

Raw Statistics

Number of Valid Observations	44
Number of Distinct Observations	26
Minimum	4
Maximum	9.1
Mean of Raw Data	5.766
Standard Deviation of Raw Data	1.368
Khat	19.42
Theta hat	0.297
Kstar	18.11
Theta star	0.318
Mean of Log Transformed Data	1.726
Standard Deviation of Log Transformed Data	0.228

Normal GOF Test Results

Correlation Coefficient R	0.965
Shapiro Wilk Test Statistic	0.916
Shapiro Wilk Critical (0.05) Value	0.944
Approximate Shapiro Wilk P Value	0.00351
Lilliefors Test Statistic	0.138
Lilliefors Critical (0.05) Value	0.134

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.982
A-D Test Statistic	0.692
A-D Critical (0.05) Value	0.748
K-S Test Statistic	0.122
K-S Critical(0.05) Value	0.133

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.981
Shapiro Wilk Test Statistic	0.942
Shapiro Wilk Critical (0.05) Value	0.944
Approximate Shapiro Wilk P Value	0.0411
Lilliefors Test Statistic	0.112
Lilliefors Critical (0.05) Value	0.134

Data appear Approximate_Lognormal at (0.05) Significance Lev

Nickel: Background Surface Soil

Raw Statistics	
Number of Valid Observations	19
Number of Distinct Observations	19
Minimum	3.4
Maximum	19
Mean of Raw Data	10.54
Standard Deviation of Raw Data	5.228
Khat	4.046
Theta hat	2.605
Kstar	3.442
Theta star	3.061
Mean of Log Transformed Data	2.226
Standard Deviation of Log Transformed Data	0.535

Normal GOF Test Results

Correlation Coefficient R	0.958
Shapiro Wilk Test Statistic	0.899
Shapiro Wilk Critical (0.05) Value	0.901
Approximate Shapiro Wilk P Value	0.0558
Lilliefors Test Statistic	0.184
Lilliefors Critical (0.05) Value	0.203

Data appear Approximate Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.952
A-D Test Statistic	0.663
A-D Critical (0.05) Value	0.745
K-S Test Statistic	0.163
K-S Critical(0.05) Value	0.199

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.969
Shapiro Wilk Test Statistic	0.925
Shapiro Wilk Critical (0.05) Value	0.901
Approximate Shapiro Wilk P Value	0.166
Lilliefors Test Statistic	0.148
Lilliefors Critical (0.05) Value	0.203

Data appear Lognormal at (0.05) Significance Level

Vanadium: Tank 214 Area Surface Soil

Raw Statistics

Number of Valid Observations	44
Number of Distinct Observations	13
Minimum	120
Maximum	240
Mean of Raw Data	172
Standard Deviation of Raw Data	25.3
Khat	48.81
Theta hat	3.525
Kstar	45.5
Theta star	3.781
Mean of Log Transformed Data	5.137
Standard Deviation of Log Transformed Data	0.144

Normal GOF Test Results

Correlation Coefficient R	0.974
Shapiro Wilk Test Statistic	0.951
Shapiro Wilk Critical (0.05) Value	0.944
Approximate Shapiro Wilk P Value	0.088
Lilliefors Test Statistic	0.191
Lilliefors Critical (0.05) Value	0.134

Data appear Approximate Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.982
A-D Test Statistic	0.775
A-D Critical (0.05) Value	0.747
K-S Test Statistic	0.173
K-S Critical(0.05) Value	0.133

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.983
Shapiro Wilk Test Statistic	0.969
Shapiro Wilk Critical (0.05) Value	0.944
Approximate Shapiro Wilk P Value	0.399
Lilliefors Test Statistic	0.164
Lilliefors Critical (0.05) Value	0.134

Data appear Approximate_Lognormal at (0.05) Significance Level

Vanadium: Background Surface Soil

Raw Statistics	
Number of Valid Observations	18
Number of Distinct Observations	17
Minimum	35
Maximum	230
Mean of Raw Data	141.6
Standard Deviation of Raw Data	58.77
Khat	5.04
Theta hat	28.09
Kstar	4.237
Theta star	33.41
Mean of Log Transformed Data	4.85
Standard Deviation of Log Transformed Data	0.502

Normal GOF Test Results

Correlation Coefficient R	0.981
Shapiro Wilk Test Statistic	0.95
Shapiro Wilk Critical (0.05) Value	0.897
Approximate Shapiro Wilk P Value	0.478
Lilliefors Test Statistic	0.136
Lilliefors Critical (0.05) Value	0.209

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.956
A-D Test Statistic	0.451
A-D Critical (0.05) Value	0.743
K-S Test Statistic	0.166
K-S Critical(0.05) Value	0.204

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.952
Shapiro Wilk Test Statistic	0.906
Shapiro Wilk Critical (0.05) Value	0.897
Approximate Shapiro Wilk P Value	0.0769
Lilliefors Test Statistic	0.181
Lilliefors Critical (0.05) Value	0.209

Data appear Lognormal at (0.05) Significance Level

Zinc: Tank 214 Surface Soil

Raw Statistics

Number of Valid Observations	60
Number of Distinct Observations	34
Minimum	32
Maximum	520
Mean of Raw Data	62.07
Standard Deviation of Raw Data	62.76
Khat	3.748
Theta hat	16.56
Kstar	3.572
Theta star	17.38
Mean of Log Transformed Data	3.989
Standard Deviation of Log Transformed Data	0.411

Normal GOF Test Results

Correlation Coefficient R	0.536
Approximate Shapiro Wilk Test Statistic	0.336
Approximate Shapiro Wilk P Value	0
Lilliefors Test Statistic	0.316
Lilliefors Critical (0.05) Value	0.114

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.652
A-D Test Statistic	6.057
A-D Critical (0.05) Value	0.755
K-S Test Statistic	0.258
K-S Critical(0.05) Value	0.115

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.849
Approximate Shapiro Wilk Test Statistic	0.758
Approximate Shapiro Wilk P Value	6.459E-13
Lilliefors Test Statistic	0.217
Lilliefors Critical (0.05) Value	0.114

Data not Lognormal at (0.05) Significance Level

Zinc: Background Surface Soil

Raw Statistics	
Number of Valid Observations	18
Number of Distinct Observations	18
Minimum	6.2
Maximum	120
Mean of Raw Data	52.48
Standard Deviation of Raw Data	32.33
Khat	2.439
Theta hat	21.52
Kstar	2.07
Theta star	25.36
Mean of Log Transformed Data	3.742
Standard Deviation of Log Transformed Data	0.751

Normal GOF Test Results

Correlation Coefficient R	0.965
Shapiro Wilk Test Statistic	0.925
Shapiro Wilk Critical (0.05) Value	0.897
Approximate Shapiro Wilk P Value	0.17
Lilliefors Test Statistic	0.16
Lilliefors Critical (0.05) Value	0.209

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.978
A-D Test Statistic	0.235
A-D Critical (0.05) Value	0.75
K-S Test Statistic	0.119
K-S Critical(0.05) Value	0.206

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.965
Shapiro Wilk Test Statistic	0.936
Shapiro Wilk Critical (0.05) Value	0.897
Approximate Shapiro Wilk P Value	0.239
Lilliefors Test Statistic	0.165
Lilliefors Critical (0.05) Value	0.209

Data appear Lognormal at (0.05) Significance Level

Distributional Statistics

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	6/4/2014 10:34:35 AM
From File	Surface Soil.xls
Full Precision	OFF
Confidence Coefficient	95%
Selected Null Hypothesis	Sample 1 Mean/Median <= Sample 2 Mean/Median (Form 1)
Alternative Hypothesis	Sample 1 Mean/Median > Sample 2 Mean/Median

Sample 1 Data: Arsenic - Tank 214 Surface Soil

Sample 2 Data: Arsenic - Background Surface Soil

Raw Statistics

	Sample 1	Sample 2
Number of Valid Data	47	20
Number of Non-Detects	10	6
Number of Detect Data	37	14
Minimum Non-Detect	0.44	0.69
Maximum Non-Detect	0.84	1.8
Percent Non-detects	21.28%	30.00%
Minimum Detect	0.74	0.21
Maximum Detect	23	2.5
Mean of Detects	2.068	1.474
Median of Detects	1.4	1.5
SD of Detects	3.564	0.718

Sample 1 vs Sample 2 Gehan Test

H0: Mean/Median of Sample 1 <= Mean/Median of background

Gehan z Test Value	0.379
Critical z (0.05)	1.645
P-Value	0.352

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Sample 1 <= Sample 2

P-Value >= alpha (0.05)

Quantile Site vs Background Comparison Hypothesis Test for Data Sets with Non-Detects

User Selected Options

From File	C:\Users\jmalinowski\Desktop\SWMU 9\Surface Soil.xls.wst
Full Precision	OFF
Confidence Coefficient	95%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Arsenic - Tank 214 Surface Soil
Background Data: Arsenic - Background Surface Soil

Raw Statistics

	Site	Background
Number of Valid Data	47	20
Number of Non-Detect Data	10	6
Number of Detect Data	37	14
Minimum Non-Detect	0.44	0.69
Maximum Non-Detect	0.84	1.8
Percent Non detects	21.28%	30.00%
Minimum Detected	0.74	0.21
Maximum Detected	23	2.5
Mean of Detected Data	2.068	1.474
Median of Detected Data	1.4	1.5
SD of Detected Data	3.564	0.718

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.043)	8
Approximate K Value (0.043)	8
R Value Adjusted for Ties in Data	9
K Value Adjusted for Ties in Data	9
Number of Site Observations in 'R' Largest	5
Calculated Alpha	0.0482

Conclusion with Alpha = 0.043

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney or Gehan Test

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	8/7/2014 1:26:37 PM
From File	Surface Soil for calcs_stats.xls
Full Precision	OFF
Confidence Coefficient	95%
Selected Null Hypothesis	Sample 1 Mean/Median <= Sample 2 Mean/Median (Form 1)
Alternative Hypothesis	Sample 1 Mean/Median > Sample 2 Mean/Median

Sample 1 Data: Beryllium - Tank 214 Suface Soil

Sample 2 Data: Beryllium - Background Surface Soil

Raw Statistics

	Sample 1	Sample 2
Number of Valid Data	45	18
Number of Non-Detects	0	2
Number of Detect Data	45	16
Minimum Non-Detect	N/A	0.04
Maximum Non-Detect	N/A	0.1
Percent Non-detects	0.00%	11.11%
Minimum Detect	0.11	0.085
Maximum Detect	0.47	0.58
Mean of Detects	0.213	0.315
Median of Detects	0.18	0.325
SD of Detects	0.0906	0.134

Sample 1 vs Sample 2 Gehan Test

H0: Mean/Median of Sample 1 <= Mean/Median of background

Gehan z Test Value	-2.176
Critical z (0.05)	1.645
P-Value	0.985

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Sample 1 <= Sample 2

P-Value >= alpha (0.05)

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

User Selected Options	
Date/Time of Computation	6/5/2014 1:17:40 PM
From File	Surface Soil.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0.000
Selected Null Hypothesis	Sample 1 Mean/Median <= Sample 2 Mean/Median (Form 1)
Alternative Hypothesis	Sample 1 Mean/Median > Sample 2 Mean/Median

Sample 1 Data: Chromium - Tank 214 Surface Soil

Sample 2 Data: Chromium- Background Surface Soil

Raw Statistics

	Sample 1	Sample 2
Number of Valid Observations	48	20
Number of Distinct Observations	38	18
Minimum	2.5	5.9
Maximum	37	47
Mean	8.194	25.69
Median	6.9	29.95
SD	5.643	12.22
SE of Mean	0.814	2.733

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 <= Mean/Median of Sample 2

Sample 1 Rank Sum W-Stat	1257
Standardized WMW U-Stat	-5.379
Mean (U)	480
SD(U) - Adj ties	74.27
Approximate U-Stat Critical Value (0.05)	1.645
P-Value (Adjusted for Ties)	1

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Sample 1 <= Sample 2

P-Value >= alpha (0.05)

Non-parametric Quantile Hypothosis Test for Full Dataset (No NDs)

User Selected Options

From File	C:\Users\jmalinowski\Desktop\SWMU 9\Surface Soil.xls.wst
Full Precision	OFF
Confidence Coefficient	95%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Chromium - Tank 214 Surface Soil
Background Data: Chromium - Background Surface Soil

Raw Statistics

	Site	Background
Number of Valid Observations	48	20
Number of Distinct Observations	38	18
Minimum	2.5	5.9
Maximum	37	47
Mean	8.194	25.69
Median	6.9	29.95
SD	5.643	12.22
SE of Mean	0.814	2.733

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.057)	8
Approximate K Value (0.057)	8
Number of Site Observations in 'R' Largest	1
Calculated Alpha	0.051

Conclusion with Alpha = 0.057

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney Ranked Sum Test

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

User Selected Options	
Date/Time of Computation	6/4/2014 8:58:43 AM
From File	Surface Soil.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0.000
Selected Null Hypothesis	Sample 1 Mean/Median <= Sample 2 Mean/Median (Form 1)
Alternative Hypothesis	Sample 1 Mean/Median > Sample 2 Mean/Median

Sample 1 Data: Cobalt - Tank 214 Surface Soil

Sample 2 Data: Cobalt - Background Surface Soil

Raw Statistics

	Sample 1	Sample 2
Number of Valid Observations	44	19
Number of Distinct Observations	25	18
Minimum	5.5	9.5
Maximum	57	50.2
Mean	21.52	22.84
Median	21	21.2
SD	8.872	11.7
SE of Mean	1.338	2.685

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 <= Mean/Median of Sample 2

Sample 1 Rank Sum W-Stat	1397
Standardized WMW U-Stat	-0.172
Mean (U)	418
SD(U) - Adj ties	66.71
Approximate U-Stat Critical Value (0.05)	1.645
P-Value (Adjusted for Ties)	0.568

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Sample 1 <= Sample 2

P-Value >= alpha (0.05)

Non-parametric Quantile Hypothosis Test for Full Dataset (No NDs)

User Selected Options

From File	C:\Users\jmalinowski\Desktop\SWMU 9\Surface Soil.xls.wst
Full Precision	OFF
Confidence Coefficient	95%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Cobalt - Tank 214 Surface Soil
Background Data: Cobalt - Background Surface Soil

Raw Statistics

	Site	Background
Number of Valid Observations	44	19
Number of Distinct Observations	25	18
Minimum	5.5	9.5
Maximum	57	50.2
Mean	21.52	22.84
Median	21	21.2
SD	8.872	11.7
SE of Mean	1.338	2.685

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.043)	8
Approximate K Value (0.043)	8
Number of Site Observations in 'R' Largest	4
Calculated Alpha	0.0458

Conclusion with Alpha = 0.043

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney Ranked Sum Test

t-Test Sample 1 vs Sample 2 Comparison for Uncensored Full Data Sets without NDs

User Selected Options	
Date/Time of Computation	6/4/2014 8:59:44 AM
From File	Surface Soil.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference (S)	0.000
Selected Null Hypothesis	Sample 1 Mean <= Sample 2 Mean (Form 1)
Alternative Hypothesis	Sample 1 Mean > the Sample 2 Mean

Sample 1 Data: Copper - Tank 214 Surface Soil
Sample 2 Data: Copper - Background Surface Soil

Raw Statistics

	Sample 1	Sample 2
Number of Valid Observations	42	18
Number of Distinct Observations	26	17
Minimum	51	13
Maximum	170	180
Mean	89.86	77.11
Median	88.5	66.5
SD	21.43	46.73
SE of Mean	3.306	11.01

Sample 1 vs Sample 2 Two-Sample t-Test

H0: Mean of Sample 1 - Mean of Sample 2 <= 0

Method	DF	t-Test Value	Critical t (0.05)	P-Value
Pooled (Equal Variance)	58	1.457	1.672	0.075
Welch-Satterthwaite (Unequal V	20.1	1.108	1.725	0.140

Pooled SD 31.056

Conclusion with Alpha = 0.050

Student t (Pooled) Test: Do Not Reject H0, Conclude Sample 1 <= Sample 2

Welch-Satterthwaite Test: Do Not Reject H0, Conclude Sample 1 <= Sample 2

Test of Equality of Variances

Variance of Sample 1	459.1
Variance of Sample 2	2183

Numerator DF	Denominator DF	F-Test Value	P-Value
17	41	4.755	0.000

Conclusion with Alpha = 0.05

Two variances are not equal

Non-parametric Quantile Hypothosis Test for Full Dataset (No NDs)

User Selected Options

From File	C:\Users\jmalinowski\Desktop\SWMU 9\Surface Soil.xls.wst
Full Precision	OFF
Confidence Coefficient	95%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Copper - Tank 214 Surface Soil
Background Data: Copper - Background Surface Soil

Raw Statistics

	Site	Background
Number of Valid Observations	42	18
Number of Distinct Observations	26	17
Minimum	51	13
Maximum	170	180
Mean	89.86	77.11
Median	88.5	66.5
SD	21.43	46.73
SE of Mean	3.306	11.01

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.048)	7
Approximate K Value (0.048)	7
Number of Site Observations in 'R' Largest	4
Calculated Alpha	0.0699

Conclusion with Alpha = 0.048

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney Ranked Sum Test

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

User Selected Options	
Date/Time of Computation	6/4/2014 9:00:30 AM
From File	Surface Soil.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0.000
Selected Null Hypothesis	Sample 1 Mean/Median <= Sample 2 Mean/Median (Form 1)
Alternative Hypothesis	Sample 1 Mean/Median > Sample 2 Mean/Median

Sample 1 Data: Lead - Tank 214 Surface Soil

Sample 2 Data: Lead - Background Surface Soil

Raw Statistics

	Sample 1	Sample 2
Number of Valid Observations	62	18
Number of Distinct Observations	54	16
Minimum	1.6	2
Maximum	1000	21
Mean	117.6	8.678
Median	45.5	5.5
SD	190.6	6.872
SE of Mean	24.2	1.62

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 <= Mean/Median of Sample 2

Sample 1 Rank Sum W-Stat	2878
Standardized WMW U-Stat	4.223
Mean (U)	558
SD(U) - Adj ties	86.79
Approximate U-Stat Critical Value (0.05)	1.645
P-Value (Adjusted for Ties)	1.2051E-5

Conclusion with Alpha = 0.05

Reject H0, Conclude Sample 1 > Sample 2

P-Value < alpha (0.05)

Non-parametric Quantile Hypothosis Test for Full Dataset (No NDs)

User Selected Options

From File	C:\Users\jmalinowski\Desktop\SWMU 9\Surface Soil.xls.wst
Full Precision	OFF
Confidence Coefficient	95%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Lead - Tank 214 Surface Soil
Background Data: Lead - Background Surface Soil

Raw Statistics

	Site	Background
Number of Valid Observations	62	18
Number of Distinct Observations	54	16
Minimum	1.6	2
Maximum	1000	21
Mean	117.6	8.678
Median	45.5	5.5
SD	190.6	6.872
SE of Mean	24.2	1.62

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.046)	10
Approximate K Value (0.046)	10
Number of Site Observations in 'R' Largest	10
Calculated Alpha	0.0653

Conclusion with Alpha = 0.046

Reject H0, Conclude Site Concentration > Background Concentration

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	6/5/2014 1:31:55 PM
From File	Surface Soil.xls
Full Precision	OFF
Confidence Coefficient	95%
Selected Null Hypothesis	Sample 1 Mean/Median <= Sample 2 Mean/Median (Form 1)
Alternative Hypothesis	Sample 1 Mean/Median > Sample 2 Mean/Median

Sample 1 Data: Mercury - Tank 214 Surface Soil

Sample 2 Data: Mercury - Background Surface Soil

Raw Statistics

	Sample 1	Sample 2
Number of Valid Data	48	20
Number of Non-Detects	8	3
Number of Detect Data	40	17
Minimum Non-Detect	0.0044	0.02
Maximum Non-Detect	0.06	0.04
Percent Non-detects	16.67%	15.00%
Minimum Detect	0.0046	0.012
Maximum Detect	0.065	0.12
Mean of Detects	0.0278	0.0584
Median of Detects	0.0285	0.06
SD of Detects	0.0139	0.0267

Sample 1 vs Sample 2 Gehan Test

H0: Mean/Median of Sample 1 <= Mean/Median of background

Gehan z Test Value	-3.885
Critical z (0.05)	1.645
P-Value	1

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Sample 1 <= Sample 2

P-Value >= alpha (0.05)

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

User Selected Options	
Date/Time of Computation	8/5/2014 1:18:25 PM
From File	Surface Soil for calcs.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0.000
Selected Null Hypothesis	Sample 1 Mean/Median <= Sample 2 Mean/Median (Form 1)
Alternative Hypothesis	Sample 1 Mean/Median > Sample 2 Mean/Median

Sample 1 Data: Nickel - Tank 214 Surface Soil

Sample 2 Data: Nickel - Background Surface Soil

Raw Statistics

	Sample 1	Sample 2
Number of Valid Observations	44	19
Number of Distinct Observations	26	19
Minimum	4	3.4
Maximum	9.1	19
Mean	5.766	10.54
Median	5.6	8.6
SD	1.368	5.228
SE of Mean	0.206	1.199

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 <= Mean/Median of Sample 2

Sample 1 Rank Sum W-Stat	1173
Standardized WMW U-Stat	-3.529
Mean (U)	418
SD(U) - Adj ties	66.74
Approximate U-Stat Critical Value (0.05)	1.645
P-Value (Adjusted for Ties)	1

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Sample 1 <= Sample 2

P-Value >= alpha (0.05)

Non-parametric Quantile Hypothosis Test for Full Dataset (No NDs)

User Selected Options

From File	K:_SOUTHNAVFAC\119197 JM01\SWMU 9 -Area B, Tank 214 Area\Draft SERA and Step 3a
Full Precision	OFF
Confidence Coefficient	95%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Nickel - Tank 214 Surface Soil
Background Data: Nickel - Background Surface Soil

Raw Statistics

	Site	Background
Number of Valid Observations	44	19
Number of Distinct Observations	26	19
Minimum	4	3.4
Maximum	9.1	19
Mean	5.766	10.54
Median	5.6	8.6
SD	1.368	5.228
SE of Mean	0.206	1.199

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.043)	8
Approximate K Value (0.043)	8
Number of Site Observations in 'R' Largest	0
Calculated Alpha	0.0458

Conclusion with Alpha = 0.043

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney Ranked Sum Tes

t-Test Sample 1 vs Sample 2 Comparison for Uncensored Full Data Sets without NDs

User Selected Options	
Date/Time of Computation	6/4/2014 9:01:58 AM
From File	Surface Soil.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference (S)	0.000
Selected Null Hypothesis	Sample 1 Mean <= Sample 2 Mean (Form 1)
Alternative Hypothesis	Sample 1 Mean > the Sample 2 Mean

Sample 1 Data: Vanadium - Tank 214 Surface Soil
Sample 2 Data: Vanadium - Background Surface Soil

Raw Statistics

	Sample 1	Sample 2
Number of Valid Observations	44	18
Number of Distinct Observations	13	17
Minimum	120	35
Maximum	240	230
Mean	172	141.6
Median	170	151.5
SD	25.3	58.77
SE of Mean	3.814	13.85

Sample 1 vs Sample 2 Two-Sample t-Test

H0: Mean of Sample 1 - Mean of Sample 2 <= 0

Method	DF	t-Test Value	Critical t (0.05)	P-Value
Pooled (Equal Variance)	60	2.873	1.671	0.003
Welch-Satterthwaite (Unequal Variance)	19.6	2.121	1.725	0.023

Pooled SD 37.911

Conclusion with Alpha = 0.050

Student t (Pooled) Test: Reject H0, Conclude Sample 1 > Sample 2

Welch-Satterthwaite Test: Reject H0, Conclude Sample 1 > Sample 2

Test of Equality of Variances

Variance of Sample 1	639.9
Variance of Sample 2	3454

Numerator DF	Denominator DF	F-Test Value	P-Value
17	43	5.398	0.000

Conclusion with Alpha = 0.05

Two variances are not equal

Non-parametric Quantile Hypothosis Test for Full Dataset (No NDs)

User Selected Options

From File	C:\Users\jmalinowski\Desktop\SWMU 9\Surface Soil.xls.wst
Full Precision	OFF
Confidence Coefficient	95%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Vanadium - Tank 214 Surface Soil
Background Data: Vanadium - Background Surface Soil

Raw Statistics

	Site	Background
Number of Valid Observations	44	18
Number of Distinct Observations	13	17
Minimum	120	35
Maximum	240	230
Mean	172	141.6
Median	170	151.5
SD	25.3	58.77
SE of Mean	3.814	13.85

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.043)	8
Approximate K Value (0.043)	8
R Value Adjusted for Ties in Data	12
K Value Adjusted for Ties in Data	12
Number of Site Observations in 'R' Largest	9
Calculated Alpha	0.0524

Conclusion with Alpha = 0.043

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney Ranked Sum Test

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

User Selected Options	
Date/Time of Computation	6/4/2014 9:04:07 AM
From File	Surface Soil.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0.000
Selected Null Hypothesis	Sample 1 Mean/Median <= Sample 2 Mean/Median (Form 1)
Alternative Hypothesis	Sample 1 Mean/Median > Sample 2 Mean/Median

Sample 1 Data: Zinc - Tank 214 Surface Soil

Sample 2 Data: Zinc - Background Surface Soil

Raw Statistics

	Sample 1	Sample 2
Number of Valid Observations	60	18
Number of Distinct Observations	34	18
Minimum	32	6.2
Maximum	520	120
Mean	62.07	52.48
Median	50	47
SD	62.76	32.33
SE of Mean	8.102	7.621

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 <= Mean/Median of Sample 2

Sample 1 Rank Sum W-Stat	2449
Standardized WMW U-Stat	0.926
Mean (U)	540
SD(U) - Adj ties	84.28
Approximate U-Stat Critical Value (0.05)	1.645
P-Value (Adjusted for Ties)	0.177

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Sample 1 <= Sample 2

P-Value >= alpha (0.05)

Non-parametric Quantile Hypothosis Test for Full Dataset (No NDs)

User Selected Options

From File	C:\Users\jmalinowski\Desktop\SWMU 9\Surface Soil.xls.wst
Full Precision	OFF
Confidence Coefficient	95%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Zinc - Tank 214 Surface Soil
Background Data: Zinc - Background Surface Soil

Raw Statistics

	Site	Background
Number of Valid Observations	60	18
Number of Distinct Observations	34	18
Minimum	32	6.2
Maximum	520	120
Mean	62.07	52.48
Median	50	47
SD	62.76	32.33
SE of Mean	8.102	7.621

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.046)	10
Approximate K Value (0.046)	10
Number of Site Observations in 'R' Largest	7
Calculated Alpha	0.0599

Conclusion with Alpha = 0.046

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney Ranked Sum Tes

Outlier Tests

Outlier Tests for Selected Variables excluding nondetects

User Selected Options

Date/Time of Computation	6/4/2014 10:38:49 AM
From File	Surface Soil.xls
Full Precision	OFF

Rosner's Outlier Test for 2 Outliers in Arsenic - SWMU and Background

Total N	**67**
Number NDs	**16**
Number Detects	**51**
Mean of Detects	**1.905**
SD of Detects	**3.058**
Number of data	**51**
Number of suspected outliers	**2**

s not included in the following:

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	1.905	3.028	23	4	6.967	3.137	3.488
2	1.483	0.527	0.21	47	2.415	3.127	3.478

For 5% Significance Level, there is 1 Potential Outlier

Therefore, Observation 23 is a Potential Statistical Outlier

For 1% Significance Level, there is 1 Potential Outlier

Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation	6/4/2014 9:08:35 AM
From File	Surface Soil.xls
Full Precision	OFF

Rosner's Outlier Test for Copper - SWMU and Background

Mean	**86.03**
Standard Deviation	**31.35**
Number of data	**60**
Number of suspected outliers	**3**

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	86.03	31.09	180	44	3.023	3.2	3.56
2	84.44	29.07	170	22	2.943	3.19	3.55
3	82.97	27	169	45	3.186	3.19	3.55

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

Outlier Tests for Selected Variables excluding nondetects

User Selected Options

Date/Time of Computation	6/11/2014 9:26:16 AM
From File	Surface Soil.xls
Full Precision	OFF

Dixon's Outlier Test for Selenium - SWMU and Background

Total N = 67
Number NDs = 43
Number Detects = 24
10% critical value: 0.367
5% critical value: 0.413
1% critical value: 0.497
Note: NDs excluded from Outlier Test

1. Data Value 1.4 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.179

For 10% significance level, 1.4 is not an outlier.
For 5% significance level, 1.4 is not an outlier.
For 1% significance level, 1.4 is not an outlier.

2. Data Value 0.19 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.089

For 10% significance level, 0.19 is not an outlier.
For 5% significance level, 0.19 is not an outlier.
For 1% significance level, 0.19 is not an outlier.

Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation	6/4/2014 9:14:19 AM
From File	Surface Soil.xls
Full Precision	OFF

Rosner's Outlier Test for Vanadium - SWMU and Background

Mean	**163.2**
Standard Deviation	**40.1**
Number of data	**62**
Number of suspected outliers	**1**

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	163.2	39.78	35	54	3.223	3.212	3.572

For 5% Significance Level, there is 1 Potential Outlier

Potential outliers is: 35

For 1% Significance Level, there is no Potential Outlier

Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation	6/4/2014 9:17:02 AM
From File	Surface Soil.xls
Full Precision	OFF

Rosner's Outlier Test for Zinc - SWMU and Background

Mean	**59.85**
Standard Deviation	**57.14**
Number of data	**78**
Number of suspected outliers	**4**

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	59.85	56.78	520	1	8.104	3.3	3.66
2	53.88	22.05	130	13	3.452	3.29	3.66
3	52.88	20.36	120	62	3.297	3.29	3.65
4	51.98	18.93	108	66	2.959	3.28	3.648

For 5% significance level, there are 3 Potential Outliers

Potential outliers are:

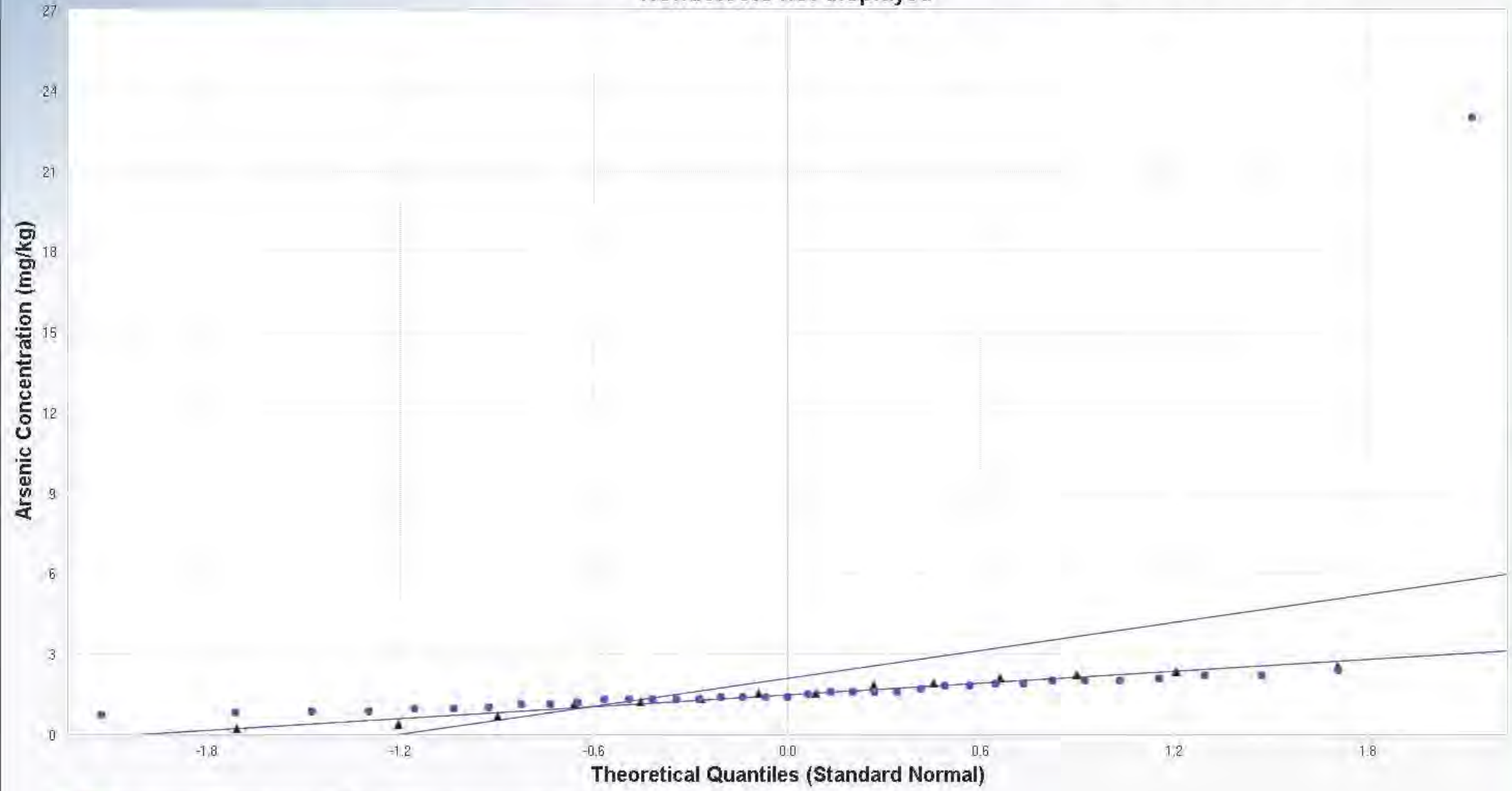
520, 130, 120

For 1% Significance Level, there is 1 Potential Outlier

Potential outliers is: 520

Probability Plots

Side-by-Side Probability Plots Showing Arsenic in SWMU 9 Area B and Background Surface Soil
Nondetects not displayed



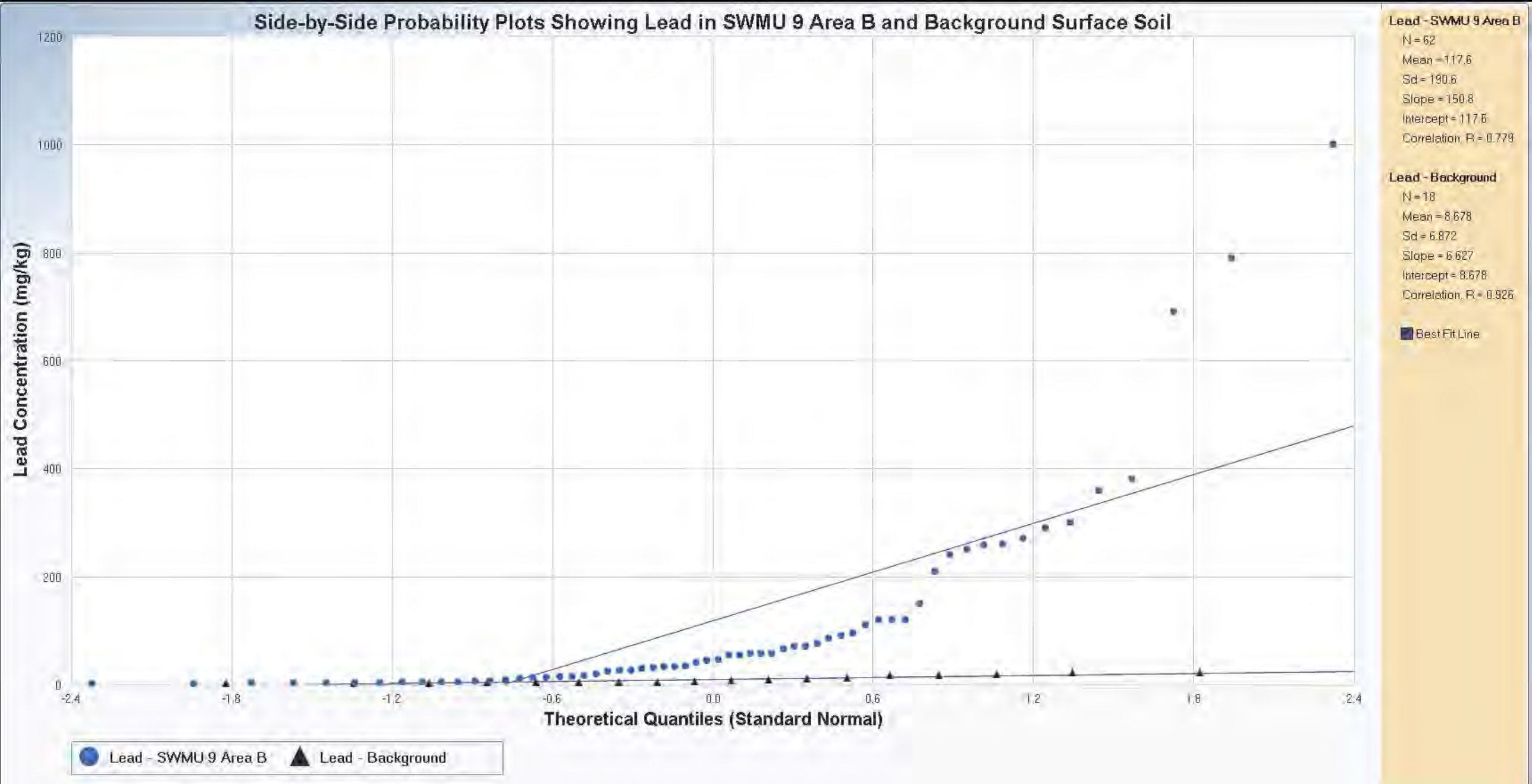
Arsenic - SWMU 9 Area B

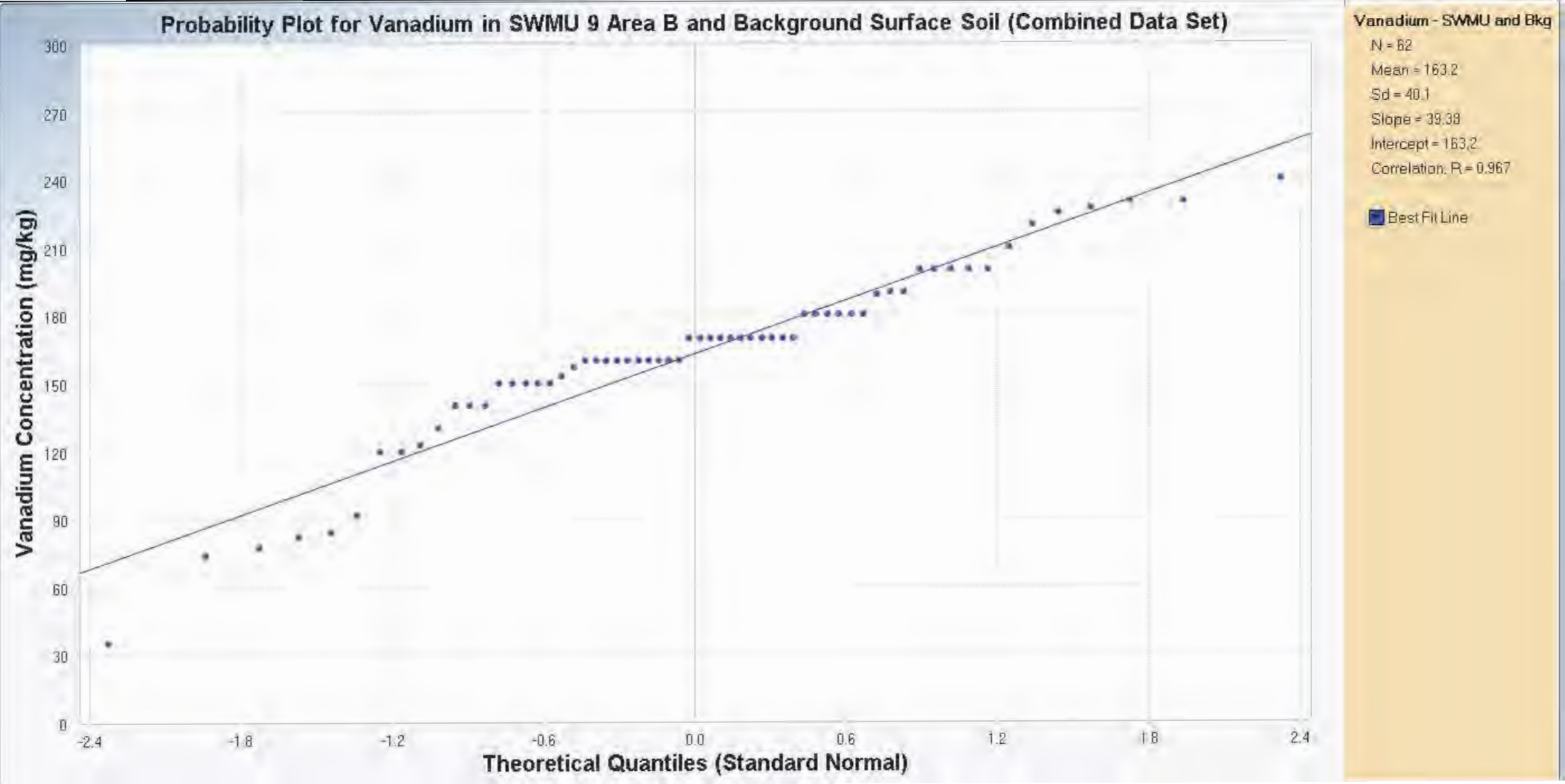
Total Number of Data = 47
Number of Non-Detects = 10
Number of Detects = 37
Detected Mean = 2.068
Detected Sd = 3.564
Slope (displayed data) = 1.744
Intercept (displayed data)= 2.068
Correlation, R = 0.478

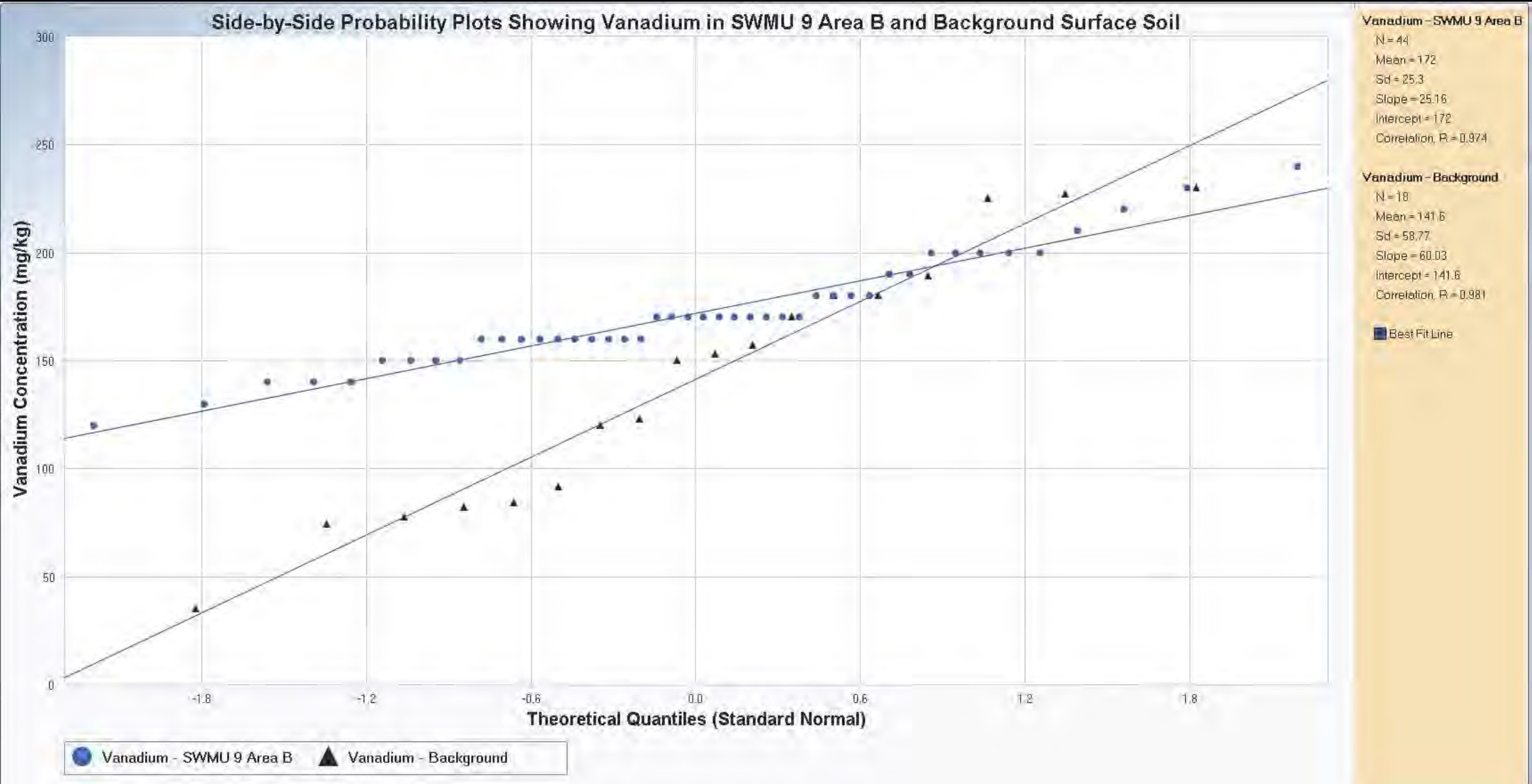
Arsenic - Background

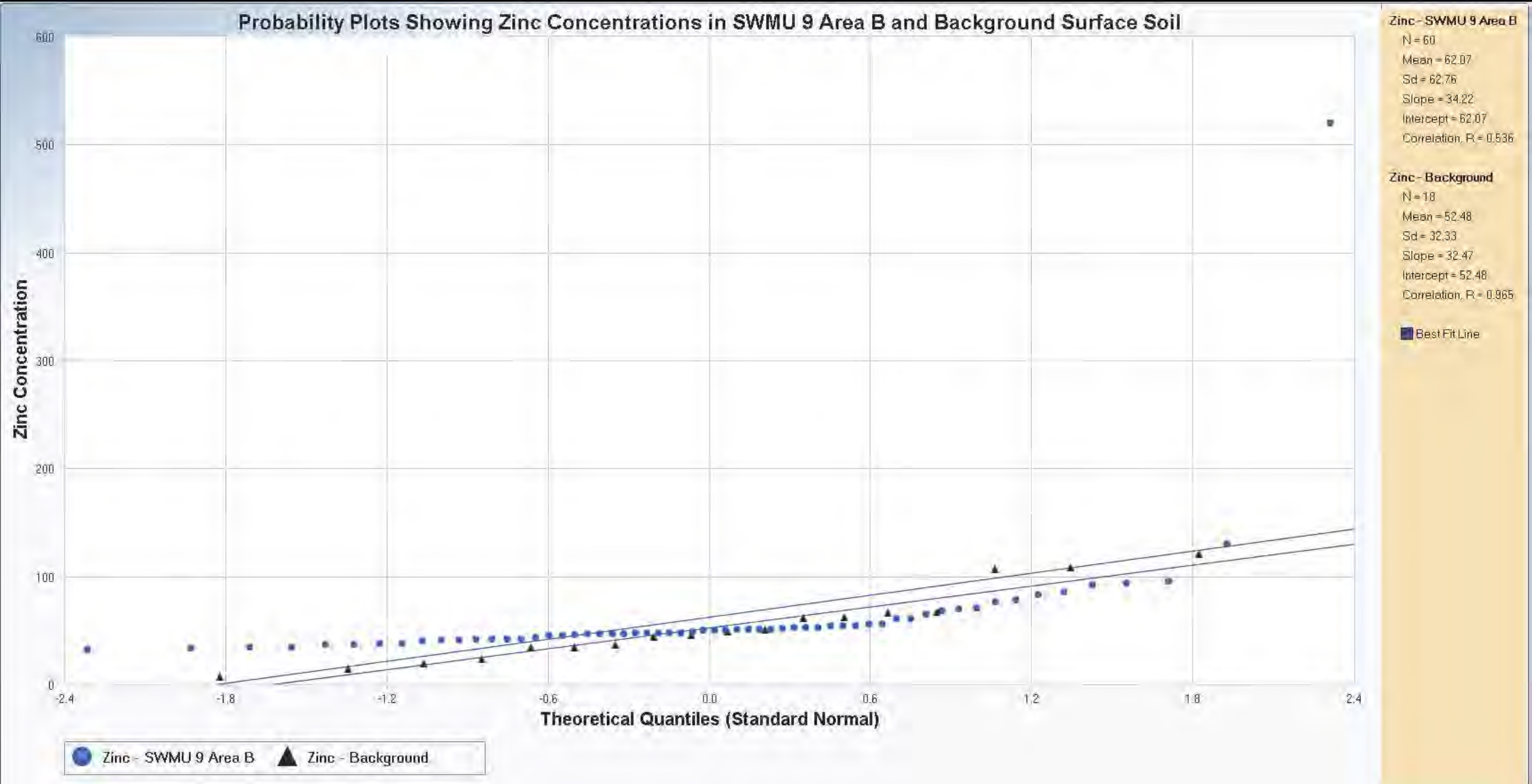
Total Number of Data = 20
Number of Non-Detects = 6
Number of Detects = 14
Detected Mean = 1.474
Detected Sd = 0.718
Slope (displayed data) = 0.741
Intercept (displayed data)= 1.474
Correlation, R = 0.984

Best Fit Line


Side-by-Side Probability Plots Showing Lead in SWMU 9 Area B and Background Surface Soil
Lead Concentration (mg/kg)
1200
1000
800
600
400
200
0
-2.4
-1.8
-1.2
-0.6
0.0
0.6
1.2
1.8
2.4
Theoretical Quantiles (Standard Normal)
Lead - SWMU 9 Area B
Lead - Background
Lead - SWMU 9 Area B
N = 62
Mean = 117.6
Sd = 190.6
Slope = 150.8
Intercept = 117.6
Correlation, R = 0.779
Lead - Background
N = 18
Mean = 8.678
Sd = 6.872
Slope = 6.627
Intercept = 8.678
Correlation, R = 0.926
Best Fit Line


Probability Plot for Vanadium in SWMU 9 Area B and Background Surface Soil (Combined Data Set)
Vanadium Concentration (mg/kg)
300
270
240
210
180
150
120
90
60
30
0
-2.4
-1.8
-1.2
-0.6
0.0
0.6
1.2
1.8
2.4
Theoretical Quantiles (Standard Normal)
Vanadium - SWMU and Bkg
N = 62
Mean = 163.2
Sd = 40.1
Slope = 39.38
Intercept = 163.2
Correlation: R = 0.967
Best Fit Line


Side-by-Side Probability Plots Showing Vanadium in SWMU 9 Area B and Background Surface Soil
Vanadium Concentration (mg/kg)
300
250
200
150
100
50
0
-1.8
-1.2
-0.6
0.0
0.6
1.2
1.8
Theoretical Quantiles (Standard Normal)
Vanadium - SWMU 9 Area B
Vanadium - Background
Vanadium - SWMU 9 Area B
N = 44
Mean = 172
Sd = 25.3
Slope = 25.16
Intercept = 172
Correlation, R = 0.974
Vanadium - Background
N = 18
Mean = 141.6
Sd = 58.77
Slope = 60.03
Intercept = 141.6
Correlation, R = 0.981
Best Fit Line


Probability Plots Showing Zinc Concentrations in SWMU 9 Area B and Background Surface Soil
Zinc Concentration
600
500
400
300
200
100
0
-2.4
-1.8
-1.2
-0.6
0.0
0.6
1.2
1.8
2.4
Theoretical Quantiles (Standard Normal)
Zinc - SWMU 9 Area B
Zinc - Background
Zinc - SWMU 9 Area B
N = 60
Mean = 62.07
Sd = 62.76
Slope = 34.22
Intercept = 62.07
Correlation, R = 0.536
Zinc - Background
N = 18
Mean = 52.48
Sd = 32.33
Slope = 32.47
Intercept = 52.48
Correlation, R = 0.965
Best Fit Line

Michael Baker INTERNATIONAL

Michael Baker Jr., Inc.

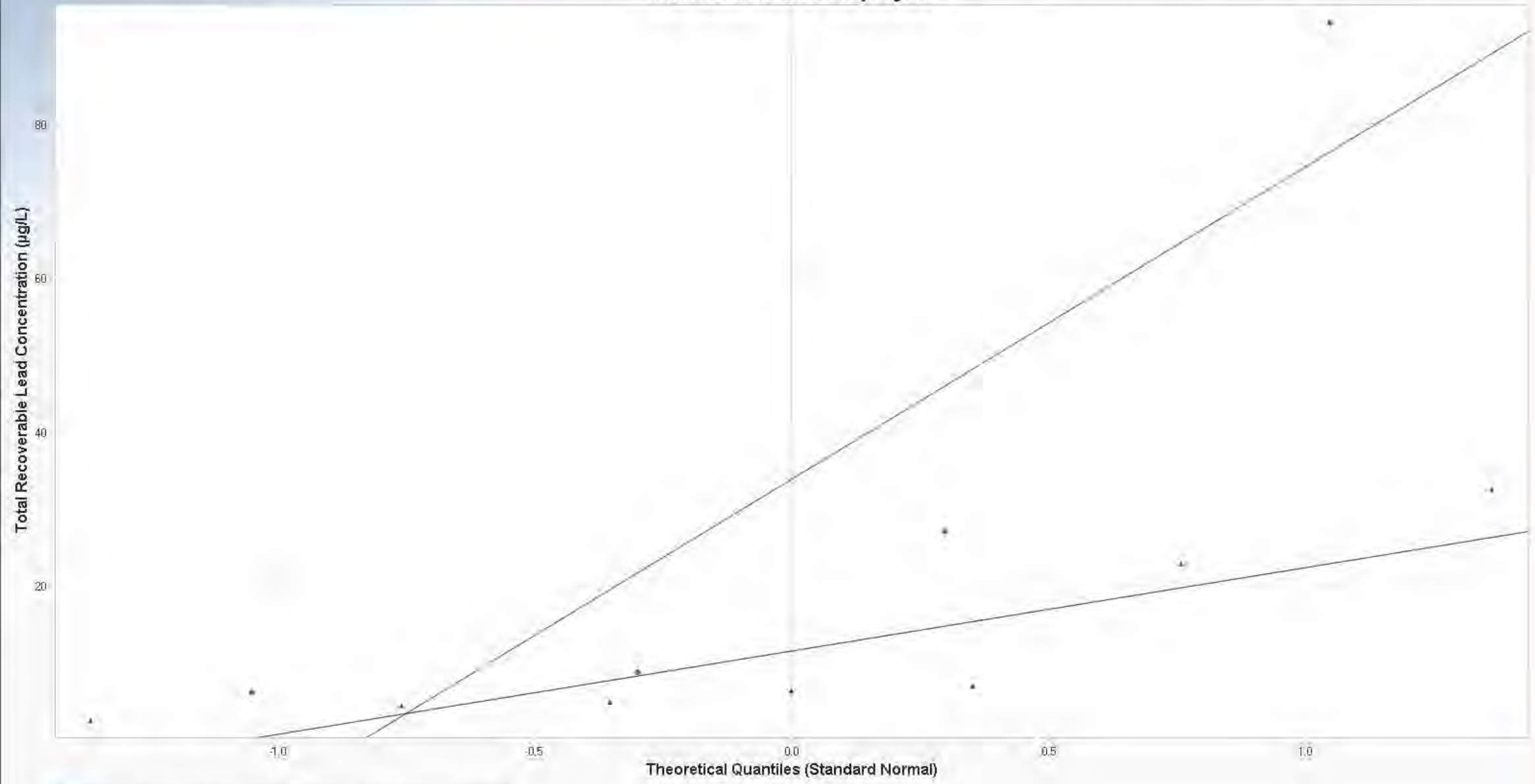
APPENDIX F

SWMU 9 and Background Statistical Evaluation for Groundwater

Probability Plots

Side-by-Side Probability Plots Showing Total Recoverable Lead in SWMU 9 Area B and Background Groundwater

Nondetects not displayed



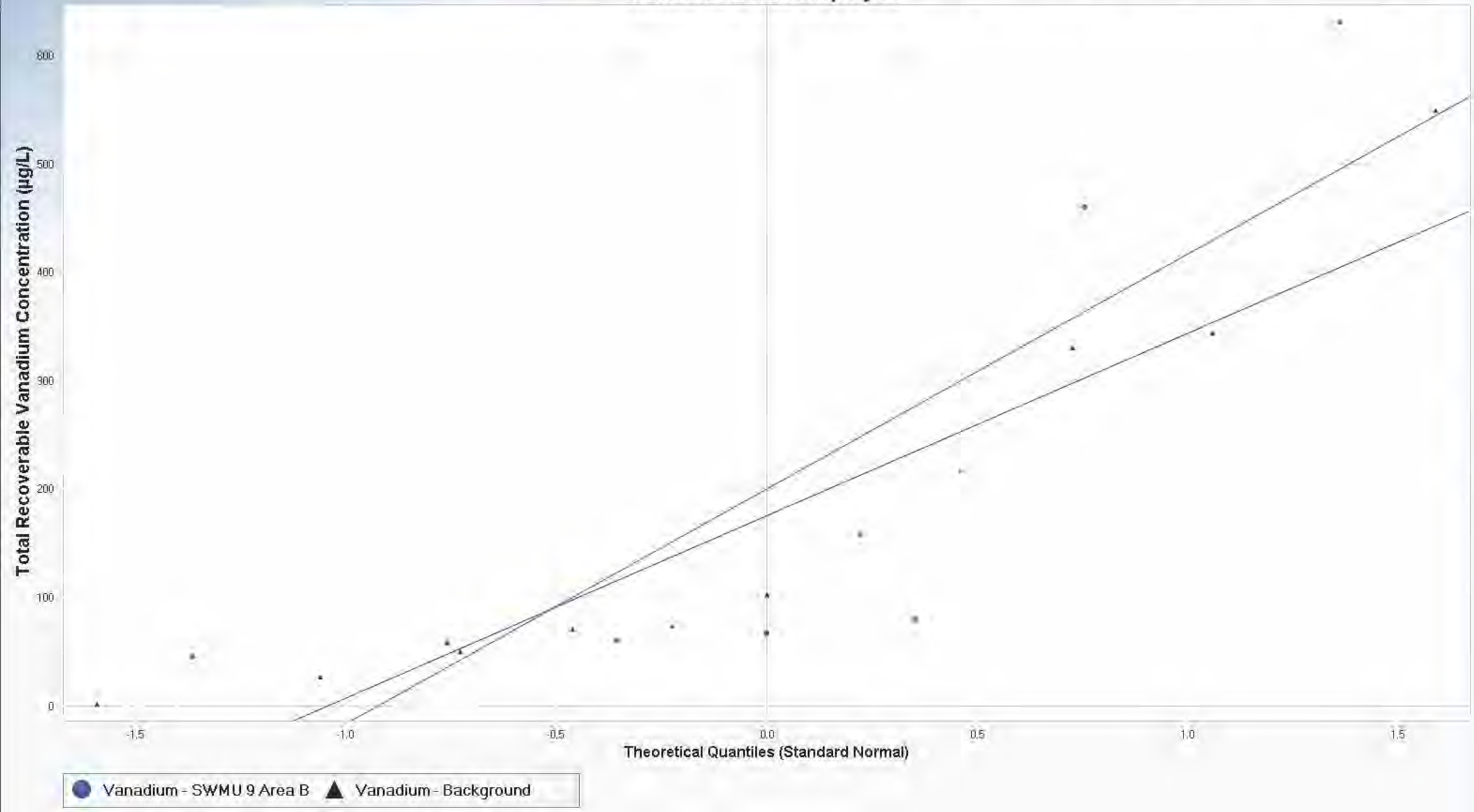
Lead - SWMU 9 Area B
N = 4
Mean = 33.7
Sd = 40.61
Slope = 40.6
Intercept = 38.7
Correlation, R = 0.89

Lead - Background
N = 7
Mean = 11.47
Sd = 11.49
Slope = 10.87
Intercept = 11.47
Correlation, R = 0.874

Best Fit Line

Side-by-Side Probability Plots Showing Total Recoverable Vanadium in SWMU 9 Area B and Background Groundwater

Nondetects not displayed



Vanadium - SWMU 9 Area B
N = 7
Mean = 199.7
Sd = 241.1
Slope = 216.6
Intercept = 199.7
Correlation, R = 0.83

Vanadium - Background
N = 11
Mean = 175.1
Sd = 169.8
Slope = 168.2
Intercept = 175.1
Correlation, R = 0.935

Best Fit Line

Michael Baker
INTERNATIONAL

Michael Baker Jr., Inc.

APPENDIX G

SWMU 9 and Background Statistical Evaluation for Surface Water

Distributional Statistics

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	7/9/2014 1:39:21 PM
From File	SWMU 9 TR SW.xls
Full Precision	OFF
Confidence Coefficient	95%
Selected Null Hypothesis	Sample 1 Mean/Median <= Sample 2 Mean/Median (Form 1)
Alternative Hypothesis	Sample 1 Mean/Median > Sample 2 Mean/Median

Sample 1 Data: Chromium - Tank 214 Surface Water

Sample 2 Data: Chromium - Background Surface Water

Raw Statistics

	Sample 1	Sample 2
Number of Valid Data	15	19
Number of Non-Detects	3	1
Number of Detect Data	12	18
Minimum Non-Detect	2.7	10
Maximum Non-Detect	10	10
Percent Non-detects	20.00%	5.26%
Minimum Detect	4.3	1.4
Maximum Detect	540	5
Mean of Detects	67.75	2.928
Median of Detects	8.05	2.55
SD of Detects	157.7	1.033

Sample 1 vs Sample 2 Gehan Test

H0: Mean/Median of Sample 1 <= Mean/Median of background

Gehan z Test Value	3.875
Critical z (0.05)	1.645
P-Value	5.3308E-5

Conclusion with Alpha = 0.05

Reject H0, Conclude Sample 1 > Sample 2

P-Value < alpha (0.05)

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	7/10/2014 9:12:28 AM
From File	SWMU 9 TR SW.xls
Full Precision	OFF
Confidence Coefficient	95%
Selected Null Hypothesis	Sample 1 Mean/Median <= Sample 2 Mean/Median (Form 1)
Alternative Hypothesis	Sample 1 Mean/Median > Sample 2 Mean/Median

Sample 1 Data: Cobalt - Tank 214 Surface Water

Sample 2 Data: Cobalt - Background Surface Water

Raw Statistics

	Sample 1	Sample 2
Number of Valid Data	15	20
Number of Non-Detects	4	3
Number of Detect Data	11	17
Minimum Non-Detect	10	10
Maximum Non-Detect	10	10
Percent Non-detects	26.67%	15.00%
Minimum Detect	0.96	1.5
Maximum Detect	220	7.1
Mean of Detects	32.69	2.894
Median of Detects	3.8	2.3
SD of Detects	69.9	1.63

Sample 1 vs Sample 2 Gehan Test

H0: Mean/Median of Sample 1 <= Mean/Median of background

Gehan z Test Value	1.389
Critical z (0.05)	1.645
P-Value	0.0824

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Sample 1 <= Sample 2

P-Value >= alpha (0.05)

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	7/10/2014 9:13:54 AM
From File	SWMU 9 TR SW.xls
Full Precision	OFF
Confidence Coefficient	95%
Selected Null Hypothesis	Sample 1 Mean/Median <= Sample 2 Mean/Median (Form 1)
Alternative Hypothesis	Sample 1 Mean/Median > Sample 2 Mean/Median

Sample 1 Data: Copper - Tank 214 Surface Water

Sample 2 Data: Copper - Background Surface Water

Raw Statistics

	Sample 1	Sample 2
Number of Valid Data	15	20
Number of Non-Detects	2	1
Number of Detect Data	13	19
Minimum Non-Detect	25.6	42.3
Maximum Non-Detect	41.4	42.3
Percent Non-detects	13.33%	5.00%
Minimum Detect	8.1	2.5
Maximum Detect	3100	19
Mean of Detects	386.1	8.568
Median of Detects	50.4	7.9
SD of Detects	910.3	4.743

Sample 1 vs Sample 2 Gehan Test

H0: Mean/Median of Sample 1 <= Mean/Median of background

Gehan z Test Value	4.107
Critical z (0.05)	1.645
P-Value	1.9999E-5

Conclusion with Alpha = 0.05

Reject H0, Conclude Sample 1 > Sample 2

P-Value < alpha (0.05)

Quantile Site vs Background Comparison Hypothesis Test for Data Sets with Non-Detects

User Selected Options

From File	PRO_UCL.wst
Full Precision	OFF
Confidence Coefficient	95%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Copper - Tank 214 Surface Water

Background Data: Copper - Background Surface Water

Raw Statistics

	Site	Background
Number of Valid Data	15	20
Number of Non-Detect Data	2	1
Number of Detect Data	13	19
Minimum Non-Detect	25.6	42.3
Maximum Non-Detect	41.4	42.3
Percent Non detects	13.33%	5.00%
Minimum Detected	8.1	2.5
Maximum Detected	3100	19
Mean of Detected Data	386.1	8.568
Median of Detected Data	50.4	7.9
SD of Detected Data	910.3	4.743

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.04)	6
Approximate K Value (0.04)	5
Number of Site Observations in 'R' Largest	6
Calculated Alpha	0.0401

Conclusion with Alpha = 0.04

Reject H0, Conclude Site Concentration > Background Concentration

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	7/10/2014 9:16:53 AM
From File	SWMU 9 TR SW.xls
Full Precision	OFF
Confidence Coefficient	95%
Selected Null Hypothesis	Sample 1 Mean/Median <= Sample 2 Mean/Median (Form 1)
Alternative Hypothesis	Sample 1 Mean/Median > Sample 2 Mean/Median

Sample 1 Data: Lead - Tank 214 Surface Water

Sample 2 Data: Lead - Background Surface Water

Raw Statistics

	Sample 1	Sample 2
Number of Valid Data	15	20
Number of Non-Detects	4	10
Number of Detect Data	11	10
Minimum Non-Detect	4.5	4.5
Maximum Non-Detect	5	5
Percent Non-detects	26.67%	50.00%
Minimum Detect	1.7	0.74
Maximum Detect	1100	2.5
Mean of Detects	112.6	1.413
Median of Detects	3.5	1.2
SD of Detects	328.4	0.593

Sample 1 vs Sample 2 Gehan Test

H0: Mean/Median of Sample 1 <= Mean/Median of background

Gehan z Test Value	3.517
Critical z (0.05)	1.645
P-Value	2.1828E-4

Conclusion with Alpha = 0.05

Reject H0, Conclude Sample 1 > Sample 2

P-Value < alpha (0.05)

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	7/10/2014 10:02:11 AM
From File	SWMU 9 TR SW.xls
Full Precision	OFF
Confidence Coefficient	95%
Selected Null Hypothesis	Sample 1 Mean/Median <= Sample 2 Mean/Median (Form 1)
Alternative Hypothesis	Sample 1 Mean/Median > Sample 2 Mean/Median

Sample 1 Data: Vanadium - Tank 214 Surface Water

Sample 2 Data: Vanadium - Background Surface Water

Raw Statistics

	Sample 1	Sample 2
Number of Valid Data	15	19
Number of Non-Detects	1	6
Number of Detect Data	14	13
Minimum Non-Detect	50	50
Maximum Non-Detect	50	50
Percent Non-detects	6.67%	31.58%
Minimum Detect	23	13
Maximum Detect	4700	25
Mean of Detects	512.1	18.46
Median of Detects	71.6	19
SD of Detects	1282	4.557

Sample 1 vs Sample 2 Gehan Test

H0: Mean/Median of Sample 1 <= Mean/Median of background

Gehan z Test Value	4.563
Critical z (0.05)	1.645
P-Value	2.5181E-6

Conclusion with Alpha = 0.05

Reject H0, Conclude Sample 1 > Sample 2

P-Value < alpha (0.05)

Quantile Site vs Background Comparison Hypothesis Test for Data Sets with Non-Detects

User Selected Options

From File	PRO_UCL.wst
Full Precision	OFF
Confidence Coefficient	95%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Vanadium - Tank 214 Surface Water

Background Data: Vanadium - Background Surface Water

Raw Statistics

	Site	Background
Number of Valid Data	15	19
Number of Non-Detect Data	1	6
Number of Detect Data	14	13
Minimum Non-Detect	50	50
Maximum Non-Detect	50	50
Percent Non detects	6.67%	31.58%
Minimum Detected	23	13
Maximum Detected	4700	25
Mean of Detected Data	512.1	18.46
Median of Detected Data	71.6	19
SD of Detected Data	1282	4.557

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.04)	6
Approximate K Value (0.04)	5
Number of Site Observations in 'R' Largest	6
Calculated Alpha	0.0461

Conclusion with Alpha = 0.04

Reject H0, Conclude Site Concentration > Background Concentration

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	7/10/2014 10:03:57 AM
From File	SWMU 9 TR SW.xls
Full Precision	OFF
Confidence Coefficient	95%
Selected Null Hypothesis	Sample 1 Mean/Median <= Sample 2 Mean/Median (Form 1)
Alternative Hypothesis	Sample 1 Mean/Median > Sample 2 Mean/Median

Sample 1 Data: Zinc - Tank 214 Surface Water

Sample 2 Data: Zinc - Background Surface Water

Raw Statistics

	Sample 1	Sample 2
Number of Valid Data	15	20
Number of Non-Detects	1	5
Number of Detect Data	14	15
Minimum Non-Detect	20	20
Maximum Non-Detect	20	20
Percent Non-detects	6.67%	25.00%
Minimum Detect	6.3	6
Maximum Detect	1300	30
Mean of Detects	143.7	16.23
Median of Detects	19.45	19
SD of Detects	354.8	7.8

WMW test is meant for a Single Detection Limit Case

Use of Gehan or T-W test is suggested when multiple detection limits are present

All observations <= 20 (Max DL) are ranked the same

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 <= Mean/Median of Sample 2

Sample 1 Rank Sum W-Stat	304
WMW U-Stat	184
Mean (U)	150
SD(U) - Adj ties	30
WMW U-Stat Critical Value (0.05)	199
Standardized WMW U-Stat	1.357
Approximate P-Value	0.0875

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Sample 1 <= Sample 2

Quantile Site vs Background Comparison Hypothesis Test for Data Sets with Non-Detects

User Selected Options

From File	PRO_UCL.wst
Full Precision	OFF
Confidence Coefficient	95%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Zinc - Tank 214 Surface Water

Background Data: Zinc - Background Surface Water

Raw Statistics

	Site	Background
Number of Valid Data	15	20
Number of Non-Detect Data	1	5
Number of Detect Data	14	15
Minimum Non-Detect	20	20
Maximum Non-Detect	20	20
Percent Non detects	6.67%	25.00%
Minimum Detected	6.3	6
Maximum Detected	1300	30
Mean of Detected Data	143.7	16.23
Median of Detected Data	19.45	19
SD of Detected Data	354.8	7.8

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.04)	6
Approximate K Value (0.04)	5
Number of Site Observations in 'R' Largest	5
Calculated Alpha	0.0401

Conclusion with Alpha = 0.04

Reject H0, Conclude Site Concentration > Background Concentration

Outlier Tests

Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation	12/9/2014 7:28:46 AM
From File	TR Groundwater for ProUCL_1.xls
Full Precision	OFF

Dixon's Outlier Test for Copper - SWMU and Background

Number of Observations = 19
10% critical value: 0.412
5% critical value: 0.462
1% critical value: 0.547

1. Observation Value 510 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.315

For 10% significance level, 510 is not an outlier.
For 5% significance level, 510 is not an outlier.
For 1% significance level, 510 is not an outlier.

2. Observation Value 0.5 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.024

For 10% significance level, 0.5 is not an outlier.
For 5% significance level, 0.5 is not an outlier.
For 1% significance level, 0.5 is not an outlier.

Outlier Tests for Selected Variables excluding nondetects

User Selected Options

Date/Time of Computation	12/9/2014 9:12:11 AM
From File	TR Groundwater for ProUCL_1.xls
Full Precision	OFF

Dixon's Outlier Test for Lead - SWMU and Background

Total N = 18
Number NDs = 7
Number Detects = 11
10% critical value: 0.517
5% critical value: 0.576
1% critical value: 0.679
Note: NDs excluded from Outlier Test

1. Data Value 93 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.744

For 10% significance level, 93 is an outlier.
For 5% significance level, 93 is an outlier.
For 1% significance level, 93 is an outlier.

2. Data Value 2.5 is a Potential Outlier (Lower Tail)?

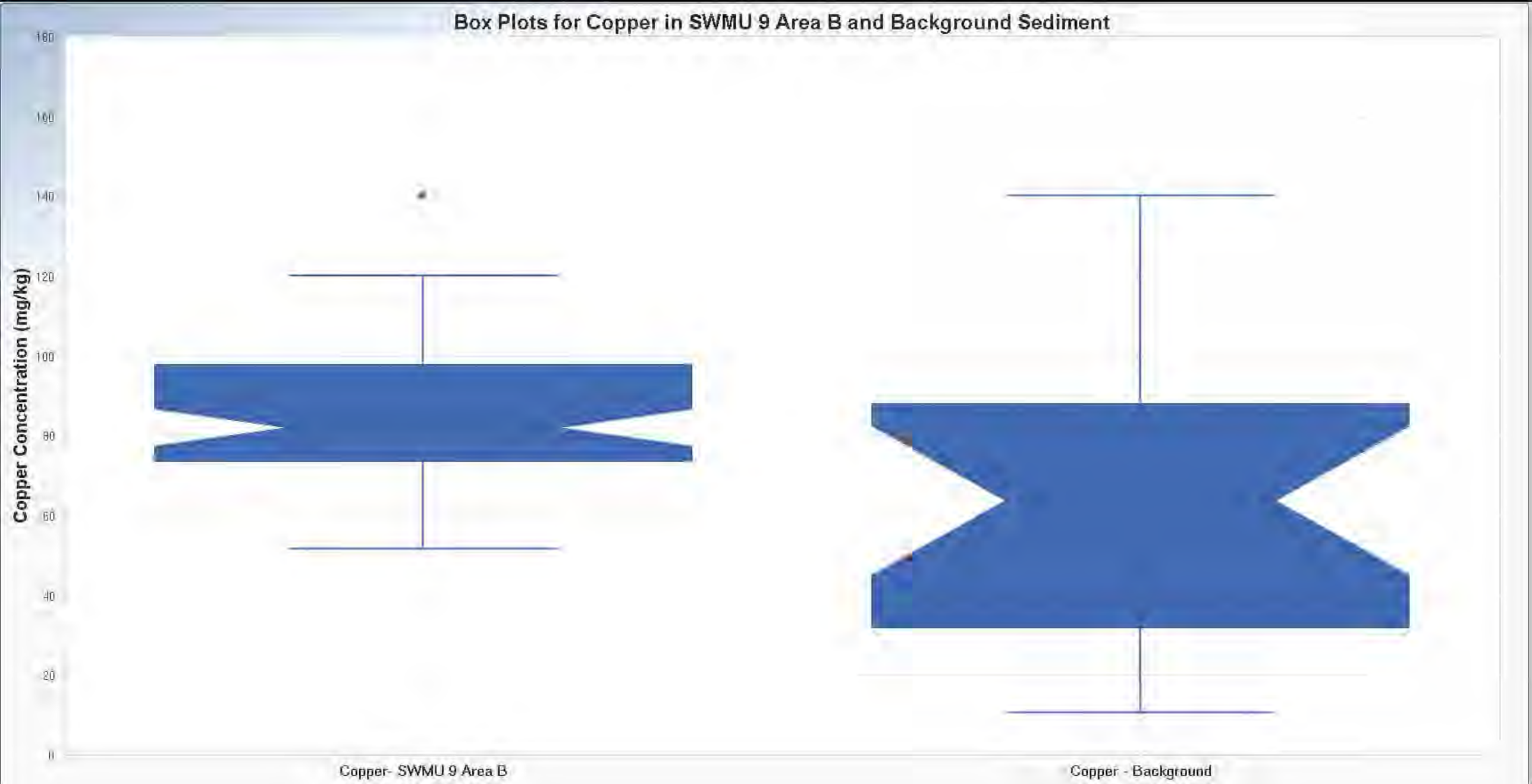
Test Statistic: 0.080

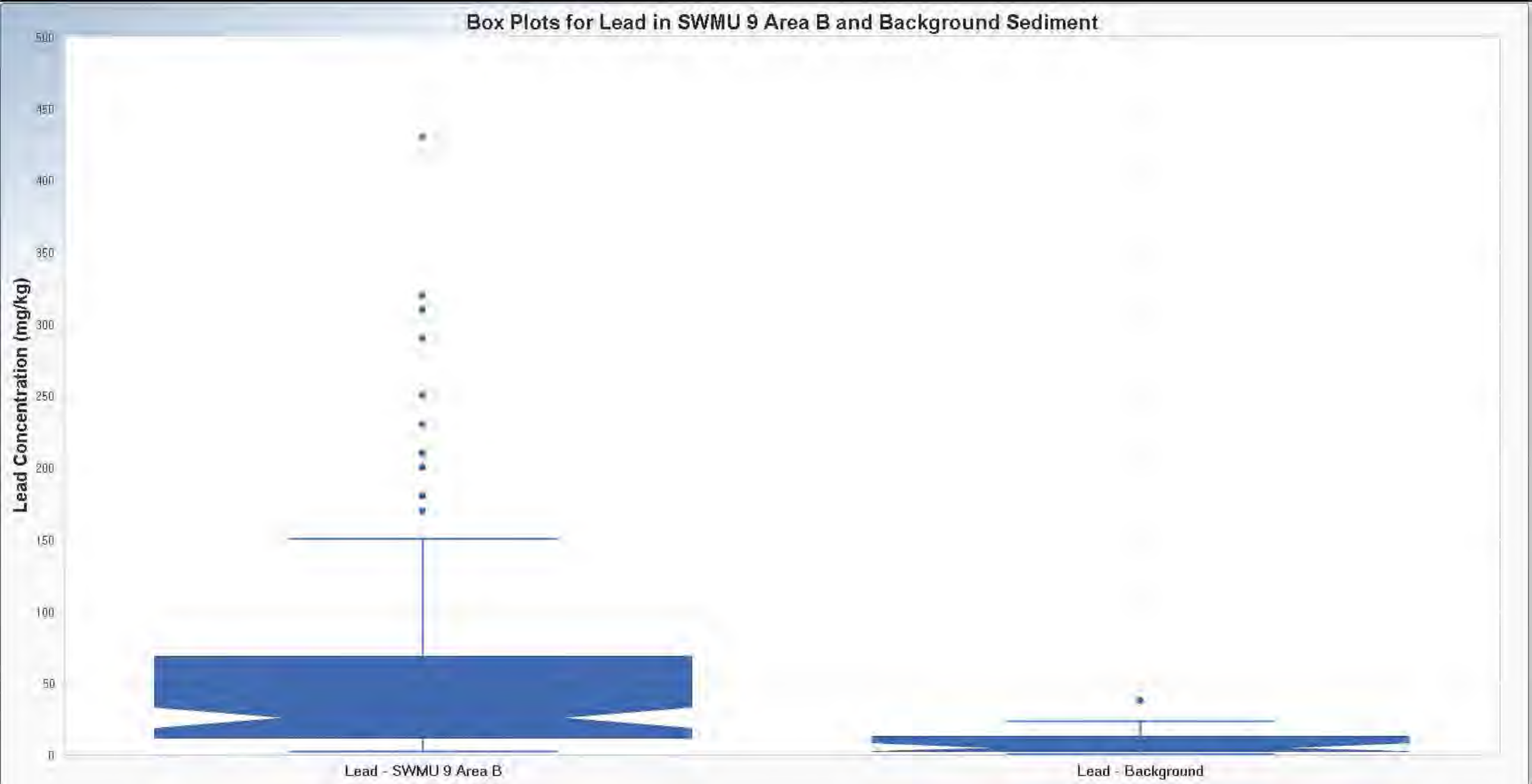
For 10% significance level, 2.5 is not an outlier.
For 5% significance level, 2.5 is not an outlier.
For 1% significance level, 2.5 is not an outlier.

APPENDIX H

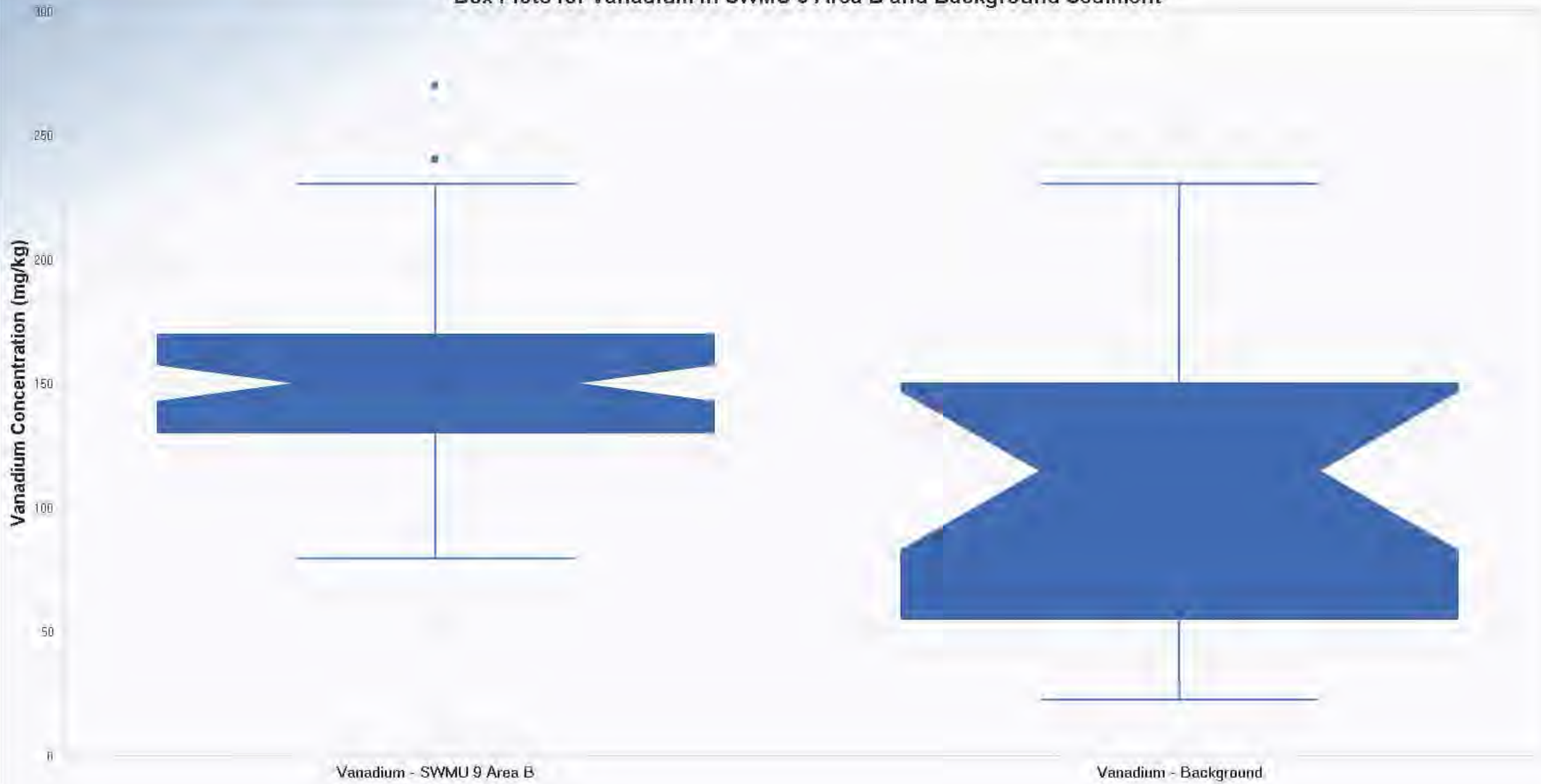
SWMU 9 and Background Statistical Evaluation for Sediment

Box Plots


Box Plots for Copper in SWMU 9 Area B and Background Sediment
Copper Concentration (mg/kg)
160
140
120
100
80
60
40
20
0
Copper- SWMU 9 Area B
Copper - Background


Box Plots for Lead in SWMU 9 Area B and Background Sediment
Lead Concentration (mg/kg)
500
450
400
350
300
250
200
150
100
50
0
Lead - SWMU 9 Area B
Lead - Background

Box Plots for Vanadium in SWMU 9 Area B and Background Sediment



Distribution Tests

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

User Selected Options

Date/Time of Computation	6/9/2014 8:05:23 AM
From File	Sediment.xls
Full Precision	OFF
Confidence Coefficient	0.95

Barium: Background Sediment

Raw Statistics

Number of Valid Observations	21
Number of Distinct Observations	12
Minimum	4.6
Maximum	30
Mean of Raw Data	13.59
Standard Deviation of Raw Data	6.07
Khat	5.755
Theta hat	2.361
Kstar	4.965
Theta star	2.737
Mean of Log Transformed Data	2.52
Standard Deviation of Log Transformed Data	0.44

Normal GOF Test Results

Correlation Coefficient R	0.909
Shapiro Wilk Test Statistic	0.835
Shapiro Wilk Critical (0.05) Value	0.908
Approximate Shapiro Wilk P Value	0.00172
Lilliefors Test Statistic	0.265
Lilliefors Critical (0.05) Value	0.193

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.939
A-D Test Statistic	0.866
A-D Critical (0.05) Value	0.745
K-S Test Statistic	0.209
K-S Critical(0.05) Value	0.19

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.953
Shapiro Wilk Test Statistic	0.916
Shapiro Wilk Critical (0.05) Value	0.908
Approximate Shapiro Wilk P Value	0.0693
Lilliefors Test Statistic	0.2
Lilliefors Critical (0.05) Value	0.193

Data appear Approximate_Lognormal at (0.05) Significance Level

Chromium: Tank 214 Area Sediment

Raw Statistics	
Number of Valid Observations	68
Number of Distinct Observations	25
Minimum	10
Maximum	58
Mean of Raw Data	23.85
Standard Deviation of Raw Data	7.273
Khat	12.27
Theta hat	1.944
Kstar	11.74
Theta star	2.032
Mean of Log Transformed Data	3.131
Standard Deviation of Log Transformed Data	0.288

Normal GOF Test Results

Correlation Coefficient R	0.936
Approximate Shapiro Wilk Test Statistic	0.902
Approximate Shapiro Wilk P Value	1.1331E-5
Lilliefors Test Statistic	0.111
Lilliefors Critical (0.05) Value	0.107

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.96
A-D Test Statistic	0.651
A-D Critical (0.05) Value	0.75
K-S Test Statistic	0.0892
K-S Critical(0.05) Value	0.108

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.982
Approximate Shapiro Wilk Test Statistic	0.98
Approximate Shapiro Wilk P Value	0.649
Lilliefors Test Statistic	0.106
Lilliefors Critical (0.05) Value	0.107

Data appear Lognormal at (0.05) Significance Level

Chromium: Background Sediment

Raw Statistics	
Number of Valid Observations	22
Number of Distinct Observations	18
Minimum	11
Maximum	54
Mean of Raw Data	26.1
Standard Deviation of Raw Data	12.53
Khat	4.875
Theta hat	5.355
Kstar	4.24
Theta star	6.156
Mean of Log Transformed Data	3.156
Standard Deviation of Log Transformed Data	0.471

Normal GOF Test Results

Correlation Coefficient R	0.955
Shapiro Wilk Test Statistic	0.903
Shapiro Wilk Critical (0.05) Value	0.911
Approximate Shapiro Wilk P Value	0.0312
Lilliefors Test Statistic	0.167
Lilliefors Critical (0.05) Value	0.189

Data appear Approximate Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.984
A-D Test Statistic	0.44
A-D Critical (0.05) Value	0.746
K-S Test Statistic	0.13
K-S Critical(0.05) Value	0.186

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.982
Shapiro Wilk Test Statistic	0.952
Shapiro Wilk Critical (0.05) Value	0.911
Approximate Shapiro Wilk P Value	0.341
Lilliefors Test Statistic	0.117
Lilliefors Critical (0.05) Value	0.189

Data appear Lognormal at (0.05) Significance Level

Cobalt: Tank 214 Area Sediment

Raw Statistics

Number of Valid Observations	68
Number of Distinct Observations	41
Minimum	4.4
Maximum	16
Mean of Raw Data	7.903
Standard Deviation of Raw Data	2.251
Khat	14.5
Theta hat	0.545
Kstar	13.87
Theta star	0.57
Mean of Log Transformed Data	2.032
Standard Deviation of Log Transformed Data	0.259

Normal GOF Test Results

Correlation Coefficient R	0.942
Approximate Shapiro Wilk Test Statistic	0.89
Approximate Shapiro Wilk P Value	1.8052E-6
Lilliefors Test Statistic	0.113
Lilliefors Critical (0.05) Value	0.107

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.972
A-D Test Statistic	0.918
A-D Critical (0.05) Value	0.75
K-S Test Statistic	0.103
K-S Critical(0.05) Value	0.108

Data follow Appr. Gamma Distribution at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.985
Approximate Shapiro Wilk Test Statistic	0.966
Approximate Shapiro Wilk P Value	0.171
Lilliefors Test Statistic	0.0925
Lilliefors Critical (0.05) Value	0.107

Data appear Lognormal at (0.05) Significance Level

Cobalt: Background Sediment

Raw Statistics

Number of Valid Observations	21
Number of Distinct Observations	19
Minimum	2.2
Maximum	27
Mean of Raw Data	8.438
Standard Deviation of Raw Data	6.937
Khat	2.102
Theta hat	4.014
Kstar	1.833
Theta star	4.602
Mean of Log Transformed Data	1.876
Standard Deviation of Log Transformed Data	0.702

Normal GOF Test Results

Correlation Coefficient R	0.88
Shapiro Wilk Test Statistic	0.774
Shapiro Wilk Critical (0.05) Value	0.908
Approximate Shapiro Wilk P Value	1.4424E-4
Lilliefors Test Statistic	0.237
Lilliefors Critical (0.05) Value	0.193

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.969
A-D Test Statistic	0.861
A-D Critical (0.05) Value	0.753
K-S Test Statistic	0.162
K-S Critical(0.05) Value	0.192

Data follow Appr. Gamma Distribution at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.974
Shapiro Wilk Test Statistic	0.941
Shapiro Wilk Critical (0.05) Value	0.908
Approximate Shapiro Wilk P Value	0.23
Lilliefors Test Statistic	0.113
Lilliefors Critical (0.05) Value	0.193

Data appear Lognormal at (0.05) Significance Level

Copper: Tank 214 Area Sediment

Raw Statistics	
Number of Valid Observations	68
Number of Distinct Observations	36
Minimum	52
Maximum	140
Mean of Raw Data	85.85
Standard Deviation of Raw Data	19.38
Khat	21.2
Theta hat	4.05
Kstar	20.27
Theta star	4.235
Mean of Log Transformed Data	4.429
Standard Deviation of Log Transformed Data	0.218

Normal GOF Test Results

Correlation Coefficient R	0.971
Approximate Shapiro Wilk Test Statistic	0.934
Approximate Shapiro Wilk P Value	0.00179
Lilliefors Test Statistic	0.123
Lilliefors Critical (0.05) Value	0.107

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.985
A-D Test Statistic	0.667
A-D Critical (0.05) Value	0.749
K-S Test Statistic	0.0939
K-S Critical(0.05) Value	0.108

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.991
Approximate Shapiro Wilk Test Statistic	0.971
Approximate Shapiro Wilk P Value	0.298
Lilliefors Test Statistic	0.0795
Lilliefors Critical (0.05) Value	0.107

Data appear Lognormal at (0.05) Significance Level

Copper: Background Sediment

Raw Statistics

Number of Valid Observations	22
Number of Distinct Observations	20
Minimum	11
Maximum	140
Mean of Raw Data	61.75
Standard Deviation of Raw Data	35.51
Khat	2.5
Theta hat	24.7
Kstar	2.189
Theta star	28.2
Mean of Log Transformed Data	3.91
Standard Deviation of Log Transformed Data	0.739

Normal GOF Test Results

Correlation Coefficient R	0.975
Shapiro Wilk Test Statistic	0.944
Shapiro Wilk Critical (0.05) Value	0.911
Approximate Shapiro Wilk P Value	0.241
Lilliefors Test Statistic	0.114
Lilliefors Critical (0.05) Value	0.189

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.969
A-D Test Statistic	0.663
A-D Critical (0.05) Value	0.753
K-S Test Statistic	0.174
K-S Critical(0.05) Value	0.187

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.951
Shapiro Wilk Test Statistic	0.896
Shapiro Wilk Critical (0.05) Value	0.911
Approximate Shapiro Wilk P Value	0.023
Lilliefors Test Statistic	0.214
Lilliefors Critical (0.05) Value	0.189

Data not Lognormal at (0.05) Significance Level

Lead: Tank 214 Area Sediment

Raw Statistics

Number of Valid Observations	150
Number of Distinct Observations	84
Minimum	3.2
Maximum	430
Mean of Raw Data	55.49
Standard Deviation of Raw Data	73.37
Khat	0.894
Theta hat	62.06
Kstar	0.881
Theta star	63.01
Mean of Log Transformed Data	3.362
Standard Deviation of Log Transformed Data	1.129

Normal GOF Test Results

Correlation Coefficient R	0.822
Approximate Shapiro Wilk Test Statistic	0.683
Approximate Shapiro Wilk P Value	0
Lilliefors Test Statistic	0.238
Lilliefors Critical (0.05) Value	0.0723

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.984
A-D Test Statistic	4.408
A-D Critical (0.05) Value	0.789
K-S Test Statistic	0.146
K-S Critical(0.05) Value	0.0791

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.987
Approximate Shapiro Wilk Test Statistic	0.954
Approximate Shapiro Wilk P Value	3.0777E-4
Lilliefors Test Statistic	0.099
Lilliefors Critical (0.05) Value	0.0723

Data not Lognormal at (0.05) Significance Level

Lead: Background Sediment

Raw Statistics	
Number of Valid Observations	21
Number of Distinct Observations	19
Minimum	1.2
Maximum	38
Mean of Raw Data	8.729
Standard Deviation of Raw Data	9.032
Khat	1.313
Theta hat	6.649
Kstar	1.157
Theta star	7.544
Mean of Log Transformed Data	1.74
Standard Deviation of Log Transformed Data	0.94

Normal GOF Test Results

Correlation Coefficient R	0.869
Shapiro Wilk Test Statistic	0.764
Shapiro Wilk Critical (0.05) Value	0.908
Approximate Shapiro Wilk P Value	9.8796E-5
Lilliefors Test Statistic	0.259
Lilliefors Critical (0.05) Value	0.193

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.984
A-D Test Statistic	0.552
A-D Critical (0.05) Value	0.762
K-S Test Statistic	0.194
K-S Critical(0.05) Value	0.194

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.989
Shapiro Wilk Test Statistic	0.972
Shapiro Wilk Critical (0.05) Value	0.908
Approximate Shapiro Wilk P Value	0.758
Lilliefors Test Statistic	0.134
Lilliefors Critical (0.05) Value	0.193

Data appear Lognormal at (0.05) Significance Level

Mercury: Tank 214 Area Sediment

Raw Statistics	
Number of Valid Observations	67
Number of Distinct Observations	39
Minimum	0.039
Maximum	0.12
Mean of Raw Data	0.0745
Standard Deviation of Raw Data	0.0184
Khat	16.93
Theta hat	0.0044
Kstar	16.18
Theta star	0.0046
Mean of Log Transformed Data	-2.626
Standard Deviation of Log Transformed Data	0.247

Normal GOF Test Results

Correlation Coefficient R	0.985
Approximate Shapiro Wilk Test Statistic	0.957
Approximate Shapiro Wilk P Value	0.0535
Lilliefors Test Statistic	0.0968
Lilliefors Critical (0.05) Value	0.108

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.992
A-D Test Statistic	0.301
A-D Critical (0.05) Value	0.75
K-S Test Statistic	0.0657
K-S Critical(0.05) Value	0.109

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.995
Approximate Shapiro Wilk Test Statistic	0.979
Approximate Shapiro Wilk P Value	0.589
Lilliefors Test Statistic	0.0819
Lilliefors Critical (0.05) Value	0.108

Data appear Lognormal at (0.05) Significance Level

Mercury: Background Sediment

Raw Statistics

Number of Valid Observations	21
Number of Distinct Observations	18
Minimum	0.015
Maximum	0.21
Mean of Raw Data	0.0753
Standard Deviation of Raw Data	0.0501
Khat	2.351
Theta hat	0.032
Kstar	2.047
Theta star	0.0368
Mean of Log Transformed Data	-2.814
Standard Deviation of Log Transformed Data	0.721

Normal GOF Test Results

Correlation Coefficient R	0.955
Shapiro Wilk Test Statistic	0.912
Shapiro Wilk Critical (0.05) Value	0.908
Approximate Shapiro Wilk P Value	0.0575
Lilliefors Test Statistic	0.122
Lilliefors Critical (0.05) Value	0.193

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.988
A-D Test Statistic	0.255
A-D Critical (0.05) Value	0.752
K-S Test Statistic	0.123
K-S Critical(0.05) Value	0.191

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.988
Shapiro Wilk Test Statistic	0.969
Shapiro Wilk Critical (0.05) Value	0.908
Approximate Shapiro Wilk P Value	0.7
Lilliefors Test Statistic	0.118
Lilliefors Critical (0.05) Value	0.193

Data appear Lognormal at (0.05) Significance Level

Vanadium: Tank 214 Area Sediment

Raw Statistics	
Number of Valid Observations	74
Number of Distinct Observations	24
Minimum	80
Maximum	270
Mean of Raw Data	152.9
Standard Deviation of Raw Data	38.39
Khat	16.79
Theta hat	9.107
Kstar	16.12
Theta star	9.486
Mean of Log Transformed Data	5
Standard Deviation of Log Transformed Data	0.247

Normal GOF Test Results

Correlation Coefficient R	0.978
Approximate Shapiro Wilk Test Statistic	0.951
Approximate Shapiro Wilk P Value	0.0166
Lilliefors Test Statistic	0.125
Lilliefors Critical (0.05) Value	0.103

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.991
A-D Test Statistic	0.467
A-D Critical (0.05) Value	0.75
K-S Test Statistic	0.0976
K-S Critical(0.05) Value	0.104

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.994
Approximate Shapiro Wilk Test Statistic	0.982
Approximate Shapiro Wilk P Value	0.719
Lilliefors Test Statistic	0.0876
Lilliefors Critical (0.05) Value	0.103

Data appear Lognormal at (0.05) Significance Level

Vanadium: Background Sediment

Raw Statistics

Number of Valid Observations	22
Number of Distinct Observations	18
Minimum	23
Maximum	230
Mean of Raw Data	110.8
Standard Deviation of Raw Data	62.09
Khat	2.674
Theta hat	41.43
Kstar	2.339
Theta star	47.35
Mean of Log Transformed Data	4.509
Standard Deviation of Log Transformed Data	0.704

Normal GOF Test Results

Correlation Coefficient R	0.981
Shapiro Wilk Test Statistic	0.949
Shapiro Wilk Critical (0.05) Value	0.911
Approximate Shapiro Wilk P Value	0.304
Lilliefors Test Statistic	0.113
Lilliefors Critical (0.05) Value	0.189

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.968
A-D Test Statistic	0.585
A-D Critical (0.05) Value	0.752
K-S Test Statistic	0.168
K-S Critical(0.05) Value	0.187

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.957
Shapiro Wilk Test Statistic	0.904
Shapiro Wilk Critical (0.05) Value	0.911
Approximate Shapiro Wilk P Value	0.033
Lilliefors Test Statistic	0.198
Lilliefors Critical (0.05) Value	0.189

Data not Lognormal at (0.05) Significance Level

Zinc: Tank 214 Area Sediment

Raw Statistics

Number of Valid Observations	68
Number of Distinct Observations	30
Minimum	35
Maximum	76
Mean of Raw Data	52.37
Standard Deviation of Raw Data	9.366
Khat	31.51
Theta hat	1.662
Kstar	30.13
Theta star	1.738
Mean of Log Transformed Data	3.942
Standard Deviation of Log Transformed Data	0.181

Normal GOF Test Results

Correlation Coefficient R	0.992
Approximate Shapiro Wilk Test Statistic	0.97
Approximate Shapiro Wilk P Value	0.249
Lilliefors Test Statistic	0.0791
Lilliefors Critical (0.05) Value	0.107

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.993
A-D Test Statistic	0.419
A-D Critical (0.05) Value	0.749
K-S Test Statistic	0.0926
K-S Critical(0.05) Value	0.108

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.992
Approximate Shapiro Wilk Test Statistic	0.97
Approximate Shapiro Wilk P Value	0.246
Lilliefors Test Statistic	0.0961
Lilliefors Critical (0.05) Value	0.107

Data appear Lognormal at (0.05) Significance Level

Distributional Statistics

Quantile Site vs Background Comparison Hypothesis Test for Data Sets with Non-Detects

User Selected Options

From File	C:\Users\jmalinowski\Desktop\SWMU 9\Sediment.xls.wst
Full Precision	OFF
Confidence Coefficient	95%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Barium - Tank 214 Sediment
Background Data: Barium - Background Sediment

Raw Statistics

	Site	Background
Number of Valid Data	68	21
Number of Non-Detect Data	1	0
Number of Detect Data	67	21
Minimum Non-Detect	14	N/A
Maximum Non-Detect	14	N/A
Percent Non detects	1.47%	0.00%
Minimum Detected	12	4.6
Maximum Detected	54	30
Mean of Detected Data	21.51	13.59
Median of Detected Data	19	13
SD of Detected Data	9.253	6.07

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.052)	11
Approximate K Value (0.052)	11
R Value Adjusted for Ties in Data	12
K Value Adjusted for Ties in Data	12
Number of Site Observations in 'R' Largest	10
Calculated Alpha	0.042

Conclusion with Alpha = 0.052

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney or Gehan Test

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	6/9/2014 8:41:15 AM
From File	Sediment.xls
Full Precision	OFF
Confidence Coefficient	95%
Selected Null Hypothesis	Sample 1 Mean/Median <= Sample 2 Mean/Median (Form 1)
Alternative Hypothesis	Sample 1 Mean/Median > Sample 2 Mean/Median

Sample 1 Data: Barium - Tank 214 Sediment

Sample 2 Data: Barium - Background Sediment

Raw Statistics

	Sample 1	Sample 2
Number of Valid Data	68	21
Number of Non-Detects	1	0
Number of Detect Data	67	21
Minimum Non-Detect	14	N/A
Maximum Non-Detect	14	N/A
Percent Non-detects	1.47%	0.00%
Minimum Detect	12	4.6
Maximum Detect	54	30
Mean of Detects	21.51	13.59
Median of Detects	19	13
SD of Detects	9.253	6.07

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 <= Mean/Median of Sample 2

Sample 1 Rank Sum W-Stat	3479
Standardized WMW U-Stat	4.104
Mean (U)	714
SD(U) - Adj ties	103.3
Approximate U-Stat Critical Value (0.05)	1.645
P-Value (Adjusted for Ties)	2.0263E-5

Conclusion with Alpha = 0.05

Reject H0, Conclude Sample 1 > Sample 2

P-Value < alpha (0.05)

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	6/9/2014 8:50:55 AM
From File	Sediment.xls
Full Precision	OFF
Confidence Coefficient	95%
Selected Null Hypothesis	Sample 1 Mean/Median <= Sample 2 Mean/Median (Form 1)
Alternative Hypothesis	Sample 1 Mean/Median > Sample 2 Mean/Median

Sample 1 Data: Beryllium - Tank 214 Sediment

Sample 2 Data: Beryllium - Background Sediment

Raw Statistics

	Sample 1	Sample 2
Number of Valid Data	68	22
Number of Non-Detects	17	2
Number of Detect Data	51	20
Minimum Non-Detect	0.15	1.3
Maximum Non-Detect	1.2	1.5
Percent Non-detects	25.00%	9.09%
Minimum Detect	0.12	0.047
Maximum Detect	0.37	0.31
Mean of Detects	0.24	0.167
Median of Detects	0.24	0.155
SD of Detects	0.0594	0.0855

Sample 1 vs Sample 2 Gehan Test

H0: Mean/Median of Sample 1 <= Mean/Median of background

Gehan z Test Value	1.851
Critical z (0.05)	1.645
P-Value	0.0321

Conclusion with Alpha = 0.05

Reject H0, Conclude Sample 1 > Sample 2

P-Value < alpha (0.05)

Non-parametric Quantile Hypothosis Test for Full Dataset (No NDs)

User Selected Options

From File	C:\Users\jmalinowski\Desktop\SWMU 9\Sediment.xls.wst
Full Precision	OFF
Confidence Coefficient	95%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Chromium - Tank 214 Sediment
Background Data: Chromium - Background Sediment

Raw Statistics

	Site	Background
Number of Valid Observations	68	22
Number of Distinct Observations	25	18
Minimum	10	11
Maximum	58	54
Mean	23.85	26.1
Median	23.5	25
SD	7.273	12.53
SE of Mean	0.882	2.671

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.052)	11
Approximate K Value (0.052)	11
Number of Site Observations in 'R' Largest	5
Calculated Alpha	0.0368

Conclusion with Alpha = 0.052

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney Ranked Sum Tes

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

User Selected Options	
Date/Time of Computation	8/12/2014 11:38:42 AM
From File	Sediment.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0.000
Selected Null Hypothesis	Sample 1 Mean/Median <= Sample 2 Mean/Median (Form 1)
Alternative Hypothesis	Sample 1 Mean/Median > Sample 2 Mean/Median

Sample 1 Data: Chromium - Tank 214 Sediment

Sample 2 Data: Chromium - Background Sediment

Raw Statistics

	Sample 1	Sample 2
Number of Valid Observations	68	22
Number of Distinct Observations	25	18
Minimum	10	11
Maximum	58	54
Mean	23.85	26.1
Median	23.5	25
SD	7.273	12.53
SE of Mean	0.882	2.671

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 <= Mean/Median of Sample 2

Sample 1 Rank Sum W-Stat	3080
Standardized WMW U-Stat	-0.141
Mean (U)	748
SD(U) - Adj ties	106.3
Approximate U-Stat Critical Value (0.05)	1.645
P-Value (Adjusted for Ties)	0.556

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Sample 1 <= Sample 2

P-Value >= alpha (0.05)

Non-parametric Quantile Hypothosis Test for Full Dataset (No NDs)

User Selected Options

From File	C:\Users\jmalinowski\Desktop\SWMU 9\Sediment.xls.wst
Full Precision	OFF
Confidence Coefficient	95%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Cobalt - Tank 214 Sediment
Background Data: Cobalt - Background Sediment

Raw Statistics

	Site	Background
Number of Valid Observations	68	21
Number of Distinct Observations	41	19
Minimum	4.4	2.2
Maximum	16	27
Mean	7.903	8.438
Median	7.45	6.4
SD	2.251	6.937
SE of Mean	0.273	1.514

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.052)	11
Approximate K Value (0.052)	11
Number of Site Observations in 'R' Largest	7
Calculated Alpha	0.042

Conclusion with Alpha = 0.052

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney Ranked Sum Tes

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

User Selected Options	
Date/Time of Computation	6/9/2014 8:12:57 AM
From File	Sediment.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0.000
Selected Null Hypothesis	Sample 1 Mean/Median <= Sample 2 Mean/Median (Form 1)
Alternative Hypothesis	Sample 1 Mean/Median > Sample 2 Mean/Median

Sample 1 Data: Cobalt - Tank 214 Sediment

Sample 2 Data: Cobalt - Background Sediment

Raw Statistics

	Sample 1	Sample 2
Number of Valid Observations	68	21
Number of Distinct Observations	41	19
Minimum	4.4	2.2
Maximum	16	27
Mean	7.903	8.438
Median	7.45	6.4
SD	2.251	6.937
SE of Mean	0.273	1.514

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 <= Mean/Median of Sample 2

Sample 1 Rank Sum W-Stat	3246
Standardized WMW U-Stat	1.793
Mean (U)	714
SD(U) - Adj ties	103.5
Approximate U-Stat Critical Value (0.05)	1.645
P-Value (Adjusted for Ties)	0.0365

Conclusion with Alpha = 0.05

Reject H0, Conclude Sample 1 > Sample 2

P-Value < alpha (0.05)

Non-parametric Quantile Hypothosis Test for Full Dataset (No NDs)

User Selected Options

From File	C:\Users\jmalinowski\Desktop\SWMU 9\Sediment.xls.wst
Full Precision	OFF
Confidence Coefficient	95%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Copper - Tank 214 Sediment
Background Data: Copper - Background Sediment

Raw Statistics

	Site	Background
Number of Valid Observations	68	22
Number of Distinct Observations	36	20
Minimum	52	11
Maximum	140	140
Mean	85.85	61.75
Median	82	63.7
SD	19.38	35.51
SE of Mean	2.35	7.572

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.052)	11
Approximate K Value (0.052)	11
R Value Adjusted for Ties in Data	12
K Value Adjusted for Ties in Data	12
Number of Site Observations in 'R' Largest	10
Calculated Alpha	0.0368

Conclusion with Alpha = 0.052

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney Ranked Sum Tes

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

User Selected Options	
Date/Time of Computation	6/9/2014 8:18:59 AM
From File	Sediment.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0.000
Selected Null Hypothesis	Sample 1 Mean/Median <= Sample 2 Mean/Median (Form 1)
Alternative Hypothesis	Sample 1 Mean/Median > Sample 2 Mean/Median

Sample 1 Data: Copper - Tank 214 Sediment

Sample 2 Data: Copper - Background Sediment

Raw Statistics

	Sample 1	Sample 2
Number of Valid Observations	68	22
Number of Distinct Observations	36	20
Minimum	52	11
Maximum	140	140
Mean	85.85	61.75
Median	82	63.7
SD	19.38	35.51
SE of Mean	2.35	7.572

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 <= Mean/Median of Sample 2

Sample 1 Rank Sum W-Stat	3446
Standardized WMW U-Stat	3.297
Mean (U)	748
SD(U) - Adj ties	106.5
Approximate U-Stat Critical Value (0.05)	1.645
P-Value (Adjusted for Ties)	4.8890E-4

Conclusion with Alpha = 0.05

Reject H0, Conclude Sample 1 > Sample 2

P-Value < alpha (0.05)

Non-parametric Quantile Hypothosis Test for Full Dataset (No NDs)

User Selected Options

From File	C:\Users\jmalinowski\Desktop\SWMU 9\Sediment.xls.wst
Full Precision	OFF
Confidence Coefficient	95%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Lead - Tank 214 Sediment
Background Data: Lead - Background Sediment

Raw Statistics

	Site	Background
Number of Valid Observations	150	21
Number of Distinct Observations	84	19
Minimum	3.2	1.2
Maximum	430	38
Mean	55.49	8.729
Median	26	4.7
SD	73.37	9.032
SE of Mean	5.991	1.971

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.054)	15
Approximate K Value (0.054)	15
Number of Site Observations in 'R' Largest	15
Calculated Alpha	0

Conclusion with Alpha = 0.054

Reject H0, Conclude Site Concentration > Background Concentration

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

User Selected Options	
Date/Time of Computation	6/9/2014 8:17:43 AM
From File	Sediment.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0.000
Selected Null Hypothesis	Sample 1 Mean/Median <= Sample 2 Mean/Median (Form 1)
Alternative Hypothesis	Sample 1 Mean/Median > Sample 2 Mean/Median

Sample 1 Data: Lead - Tank 214 Sediment

Sample 2 Data: Lead - Background Sediment

Raw Statistics

	Sample 1	Sample 2
Number of Valid Observations	150	21
Number of Distinct Observations	84	19
Minimum	3.2	1.2
Maximum	430	38
Mean	55.49	8.729
Median	26	4.7
SD	73.37	9.032
SE of Mean	5.991	1.971

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 <= Mean/Median of Sample 2

Sample 1 Rank Sum W-Stat	14040
Standardized WMW U-Stat	5.362
Mean (U)	1575
SD(U) - Adj ties	212.4
Approximate U-Stat Critical Value (0.05)	1.645
P-Value (Adjusted for Ties)	4.1258E-8

Conclusion with Alpha = 0.05

Reject H0, Conclude Sample 1 > Sample 2

P-Value < alpha (0.05)

Non-parametric Quantile Hypothosis Test for Full Dataset (No NDs)

User Selected Options

From File	C:\Users\jmalinowski\Desktop\SWMU 9\Sediment.xls.wst
Full Precision	OFF
Confidence Coefficient	95%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Mercury - Tank 214 Sediment
Background Data: Mercury - Background Sediment

Raw Statistics

	Site	Background
Number of Valid Observations	67	21
Number of Distinct Observations	39	18
Minimum	0.039	0.015
Maximum	0.12	0.21
Mean	0.0745	0.0753
Median	0.074	0.066
SD	0.0184	0.0501
SE of Mean	0.00225	0.0109

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.057)	10
Approximate K Value (0.057)	10
Number of Site Observations in 'R' Largest	4
Calculated Alpha	0.0549

Conclusion with Alpha = 0.057

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney Ranked Sum Tes

t-Test Sample 1 vs Sample 2 Comparison for Uncensored Full Data Sets without NDs

User Selected Options	
Date/Time of Computation	6/9/2014 8:20:00 AM
From File	Sediment.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference (S)	0.000
Selected Null Hypothesis	Sample 1 Mean <= Sample 2 Mean (Form 1)
Alternative Hypothesis	Sample 1 Mean > the Sample 2 Mean

Sample 1 Data: Mercury - Tank 214 Sediment
Sample 2 Data: Mercury - Background Sediment

Raw Statistics

	Sample 1	Sample 2
Number of Valid Observations	67	21
Number of Distinct Observations	39	18
Minimum	0.039	0.015
Maximum	0.12	0.21
Mean	0.0745	0.0753
Median	0.074	0.066
SD	0.0184	0.0501
SE of Mean	0.00225	0.0109

Sample 1 vs Sample 2 Two-Sample t-Test

H0: Mean of Sample 1 - Mean of Sample 2 <= 0

Method	DF	t-Test Value	Critical t (0.05)	P-Value
Pooled (Equal Variance)	86	-0.105	1.663	0.542
Welch-Satterthwaite (Unequal V	21.7	-0.068	1.717	0.527

Pooled SD 0.029

Conclusion with Alpha = 0.050

Student t (Pooled) Test: Do Not Reject H0, Conclude Sample 1 <= Sampl

Welch-Satterthwaite Test: Do Not Reject H0, Conclude Sample 1 <= Sam

Test of Equality of Variances

Variance of Sample 1	3.3919E-4
Variance of Sample 2	0.00251

Numerator DF	Denominator DF	F-Test Value	P-Value
20	66	7.402	0.000

Conclusion with Alpha = 0.05

Two variances are not equal

Gehan Sample 1 vs Sample 2 Comparison Hypothesis Test for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	6/9/2014 8:47:51 AM
From File	Sediment.xls
Full Precision	OFF
Confidence Coefficient	95%
Selected Null Hypothesis	Sample 1 Mean/Median <= Sample 2 Mean/Median (Form 1)
Alternative Hypothesis	Sample 1 Mean/Median > Sample 2 Mean/Median

Sample 1 Data: Selenium - Tank 214 Sedimet

Sample 2 Data: Selenium - Background Sediment

Raw Statistics

	Sample 1	Sample 2
Number of Valid Data	68	21
Number of Non-Detects	39	2
Number of Detect Data	29	19
Minimum Non-Detect	0.6	0.75
Maximum Non-Detect	2.9	1.6
Percent Non-detects	57.35%	9.52%
Minimum Detect	0.48	0.21
Maximum Detect	1.5	2
Mean of Detects	0.882	0.697
Median of Detects	0.9	0.64
SD of Detects	0.228	0.445

Sample 1 vs Sample 2 Gehan Test

H0: Mean/Median of Sample 1 <= Mean/Median of background

Gehan z Test Value	1.29
Critical z (0.05)	1.645
P-Value	0.0984

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Sample 1 <= Sample 2

P-Value >= alpha (0.05)

Non-parametric Quantile Hypothosis Test for Full Dataset (No NDs)

User Selected Options

From File	C:\Users\jmalinowski\Desktop\SWMU 9\Sediment.xls.wst
Full Precision	OFF
Confidence Coefficient	95%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Vanadium - Tank 214 Sediment
Background Data: Vanadium - Background Sediment

Raw Statistics

	Site	Background
Number of Valid Observations	74	22
Number of Distinct Observations	24	18
Minimum	80	23
Maximum	270	230
Mean	152.9	110.8
Median	150	115
SD	38.39	62.09
SE of Mean	4.463	13.24

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.048)	12
Approximate K Value (0.048)	12
R Value Adjusted for Ties in Data	13
K Value Adjusted for Ties in Data	13
Number of Site Observations in 'R' Largest	10
Calculated Alpha	0.0351

Conclusion with Alpha = 0.048

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney Ranked Sum Tes

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Uncensor Full Data Sets without NDs

User Selected Options	
Date/Time of Computation	6/9/2014 8:21:02 AM
From File	Sediment.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0.000
Selected Null Hypothesis	Sample 1 Mean/Median <= Sample 2 Mean/Median (Form 1)
Alternative Hypothesis	Sample 1 Mean/Median > Sample 2 Mean/Median

Sample 1 Data: Vanadium - Tank 214 Sediment

Sample 2 Data: Vanadium - Background Sediment

Raw Statistics

	Sample 1	Sample 2
Number of Valid Observations	74	22
Number of Distinct Observations	24	18
Minimum	80	23
Maximum	270	230
Mean	152.9	110.8
Median	150	115
SD	38.39	62.09
SE of Mean	4.463	13.24

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 <= Mean/Median of Sample 2

Sample 1 Rank Sum W-Stat	3947
Standardized WMW U-Stat	3.12
Mean (U)	814
SD(U) - Adj ties	114.4
Approximate U-Stat Critical Value (0.05)	1.645
P-Value (Adjusted for Ties)	9.0341E-4

Conclusion with Alpha = 0.05

Reject H0, Conclude Sample 1 > Sample 2

P-Value < alpha (0.05)

Quantile Site vs Background Comparison Hypothesis Test for Data Sets with Non-Detects

User Selected Options

From File	C:\Users\jmalinowski\Desktop\SWMU 9\Sediment.xls.wst
Full Precision	OFF
Confidence Coefficient	95%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Zinc -Tank 214 Sediment
Background Data: Zinc - Background Sediment

Raw Statistics

	Site	Background
Number of Valid Data	68	22
Number of Non-Detect Data	0	1
Number of Detect Data	68	21
Minimum Non-Detect	N/A	29
Maximum Non-Detect	N/A	29
Percent Non detects	0.00%	4.55%
Minimum Detected	35	13
Maximum Detected	76	92.8
Mean of Detected Data	52.37	45.28
Median of Detected Data	52	43
SD of Detected Data	9.366	27.67

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.052)	11
Approximate K Value (0.052)	11
R Value Adjusted for Ties in Data	12
K Value Adjusted for Ties in Data	12
Number of Site Observations in 'R' Largest	6
Calculated Alpha	0.0368

Conclusion with Alpha = 0.052

Do Not Reject H0, Perform Wilcoxon-Mann-Whitney or Gehan Test

Wilcoxon-Mann-Whitney Sample 1 vs Sample 2 Comparison Test for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	6/9/2014 8:56:35 AM
From File	Sediment.xls
Full Precision	OFF
Confidence Coefficient	95%
Selected Null Hypothesis	Sample 1 Mean/Median <= Sample 2 Mean/Median (Form 1)
Alternative Hypothesis	Sample 1 Mean/Median > Sample 2 Mean/Median

Sample 1 Data: Zinc - Tank 214 Sediment
Sample 2 Data: Zinc - Background Sediment

Raw Statistics

	Sample 1	Sample 2
Number of Valid Data	68	22
Number of Non-Detects	0	1
Number of Detect Data	68	21
Minimum Non-Detect	N/A	29
Maximum Non-Detect	N/A	29
Percent Non-detects	0.00%	4.55%
Minimum Detect	35	13
Maximum Detect	76	92.8
Mean of Detects	52.37	45.28
Median of Detects	52	43
SD of Detects	9.366	27.67

WMW test is meant for a Single Detection Limit Case
Use of Gehan or T-W test is suggested when multiple detection limits are present
All observations <= 29 (Max DL) are ranked the same

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Sample 1 <= Mean/Median of Sample 2

Sample 1 Rank Sum W-Stat	3258
Standardized WMW U-Stat	1.537
Mean (U)	748
SD(U) - Adj ties	106.4
Approximate U-Stat Critical Value (0.05)	1.645
P-Value (Adjusted for Ties)	0.0621

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Sample 1 <= Sample 2
P-Value >= alpha (0.05)

Outlier Tests

Outlier Tests for Selected Variables excluding nondetects

User Selected Options	
Date/Time of Computation	6/9/2014 7:27:16 AM
From File	Sediment.xls
Full Precision	OFF

Rosner's Outlier Test for 2 Outliers in Beryllium - SWMU and Background

Total N	**90**
Number NDs	**19**
Number Detects	**71**
Mean of Detects	**0.22**
SD of Detects	**0.0748**
Number of data	**71**
Number of suspected outliers	**2**

Ds not included in the following:

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	0.22	0.0743	0.047	53	2.324	3.265	3.625
2	0.222	0.0724	0.07	52	2.102	3.255	3.625

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation	6/9/2014 7:34:36 AM
From File	Sediment.xls
Full Precision	OFF

Rosner's Outlier Test for Copper - SWMU and Background

Mean	**79.96**
Standard Deviation	**26.24**
Number of data	**90**
Number of suspected outliers	**4**

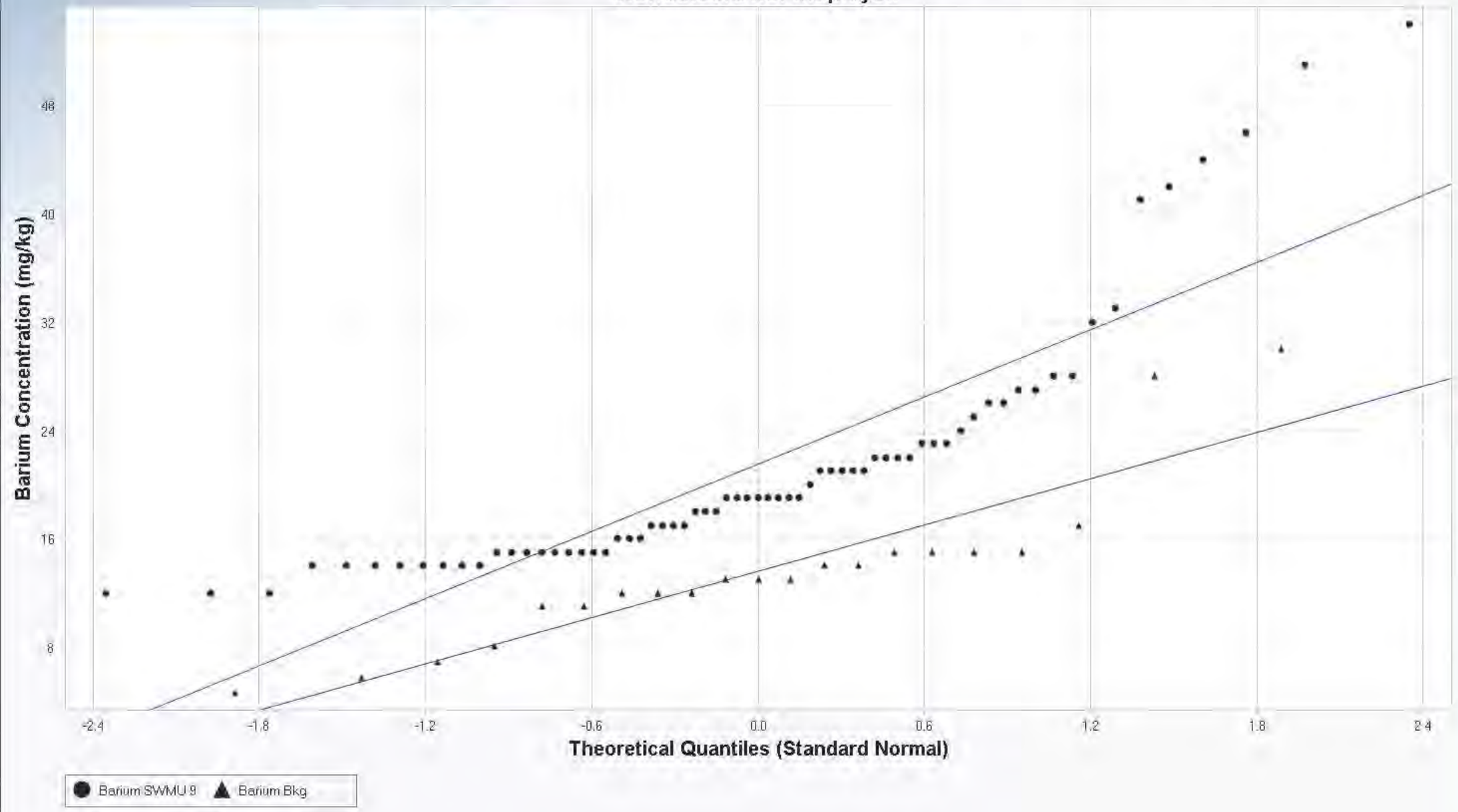
#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	79.96	26.1	11	86	2.642	3.35	3.72
2	80.73	25.34	14	89	2.634	3.34	3.71
3	81.49	24.44	14	90	2.761	3.34	3.71
4	82.27	23.47	20	85	2.653	3.34	3.7

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier

Probability Plots

Probability Plots Showing Barium in SWMU 9 Area B and Background Sediment (Individual Data Sets)
Nondetects not displayed



Barium SWMU 9

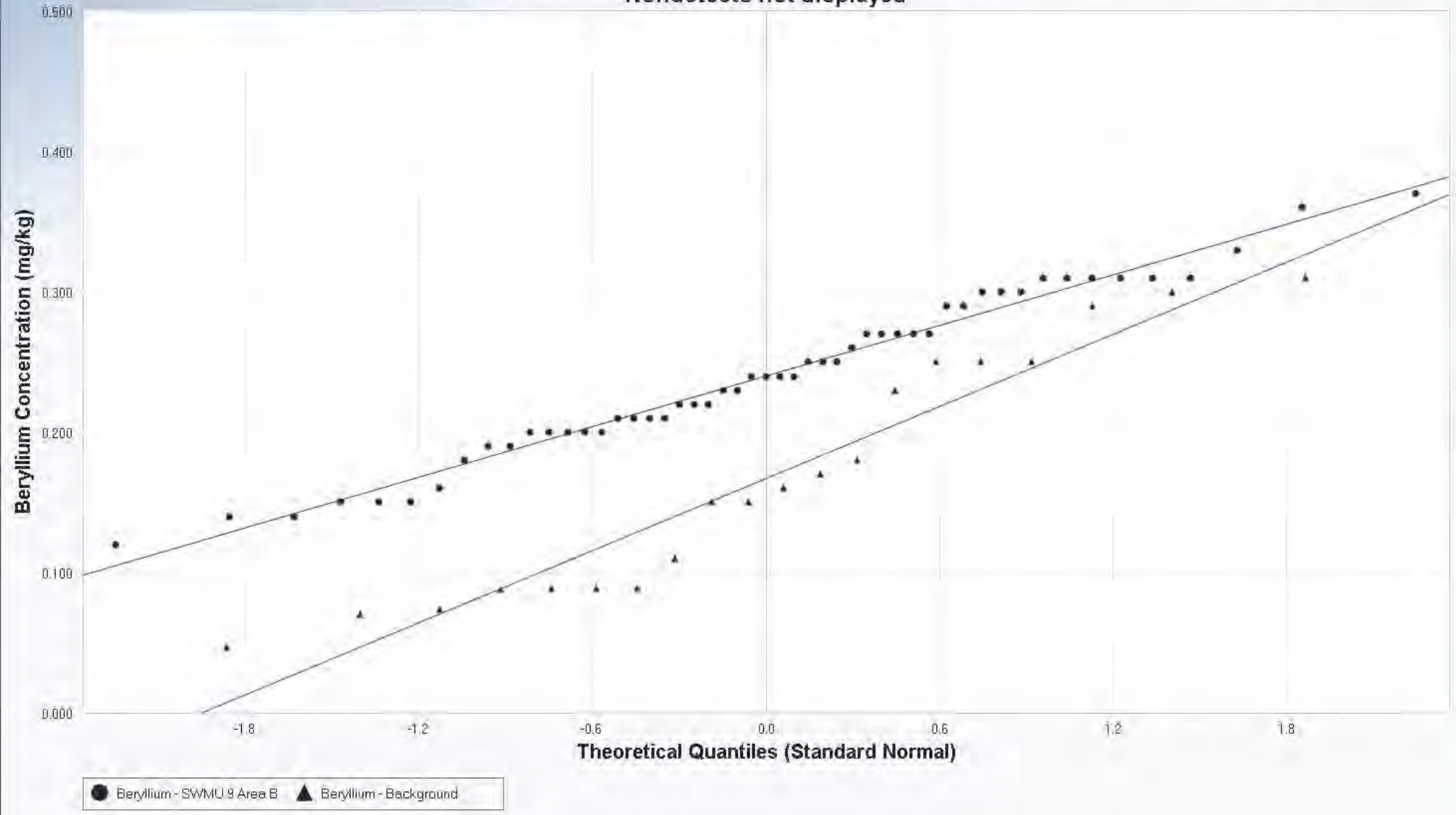
Total Number of Data = 68
Number of Non-Detects = 1
Number of Detects = 67
Detected Mean = 21.51
Detected Sd = 9.253
Slope (displayed data) = 8.296
Intercept (displayed data)= 21.51
Correlation, R = 0.883

Barium Bkg

Total Number of Data = 21
Number of Non-Detects = 0
Number of Detects = 21
Detected Mean = 13.59
Detected Sd = 6.07
Slope (displayed data) = 5.719
Intercept (displayed data)= 13.59
Correlation, R = 0.909

Best Fit Line

Probability Plots Showing Beryllium in SWMU 9 Area B and Background Sediment (Individual Data Sets)
Nondetects not displayed



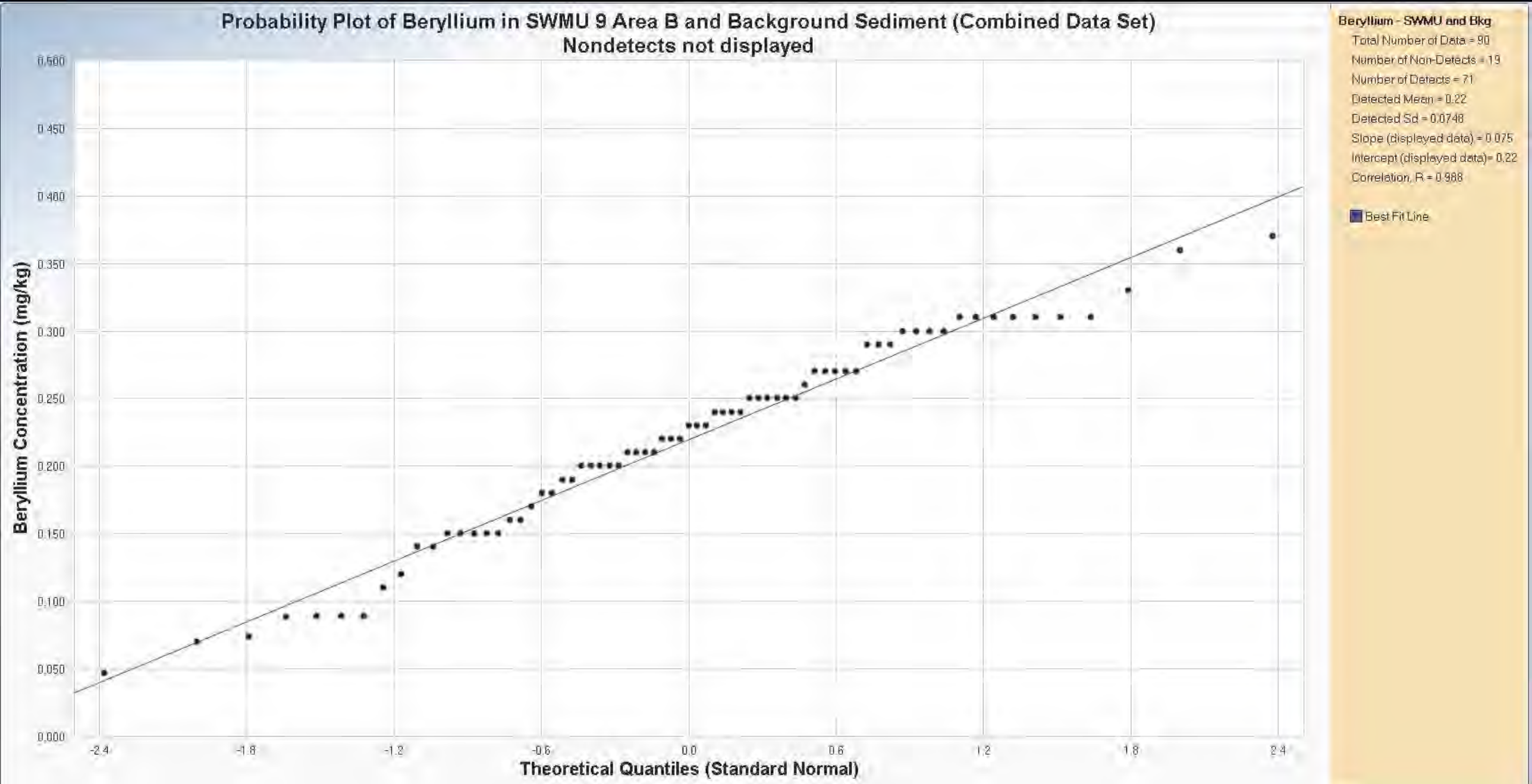
Beryllium - SWMU 9 Area B

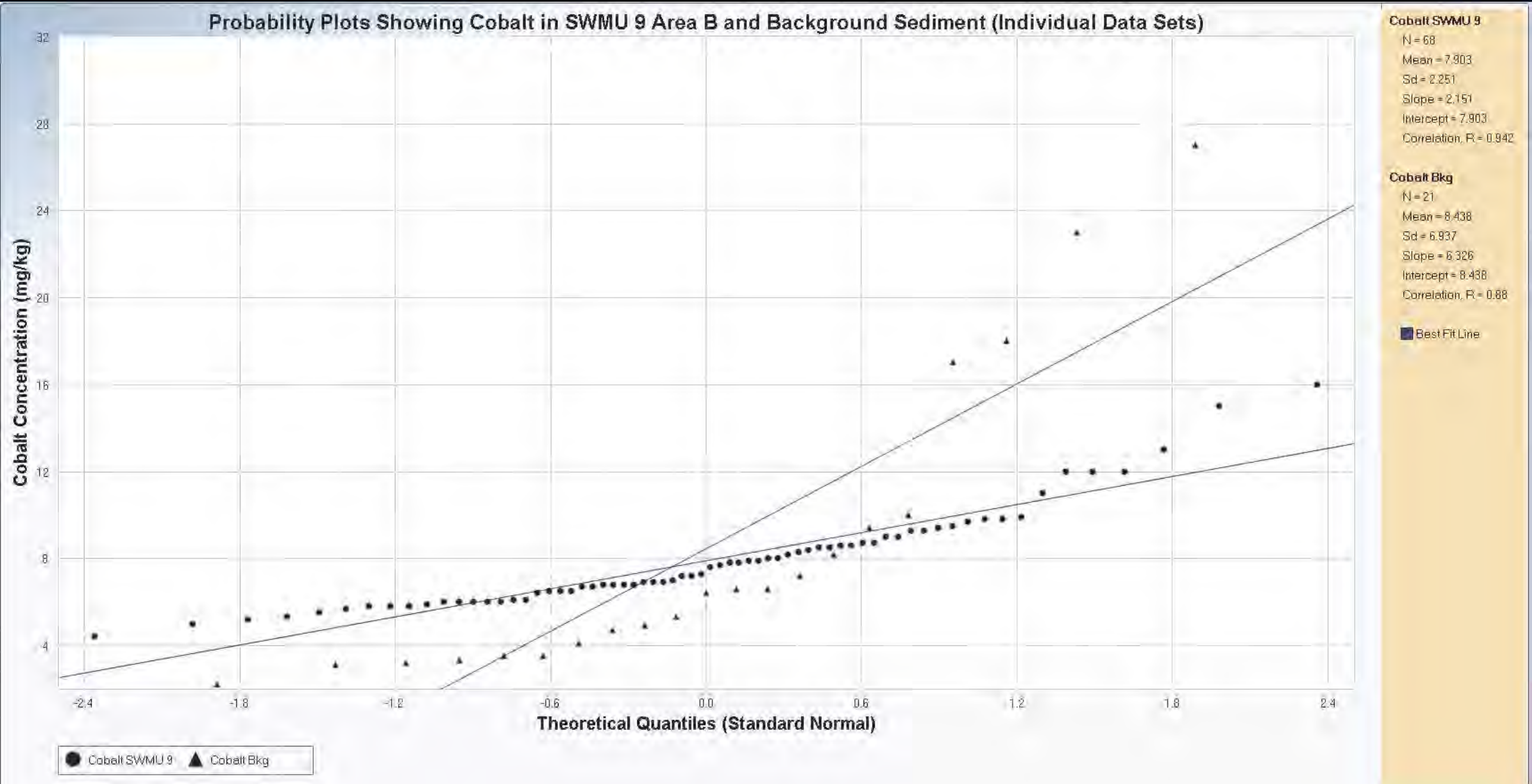
Total Number of Data = 68
Number of Non-Detects = 17
Number of Detects = 51
Detected Mean = 0.24
Detected Sd = 0.0594
Slope (displayed data) = 0.06
Intercept (displayed data)= 0.24
Correlation, R = 0.991

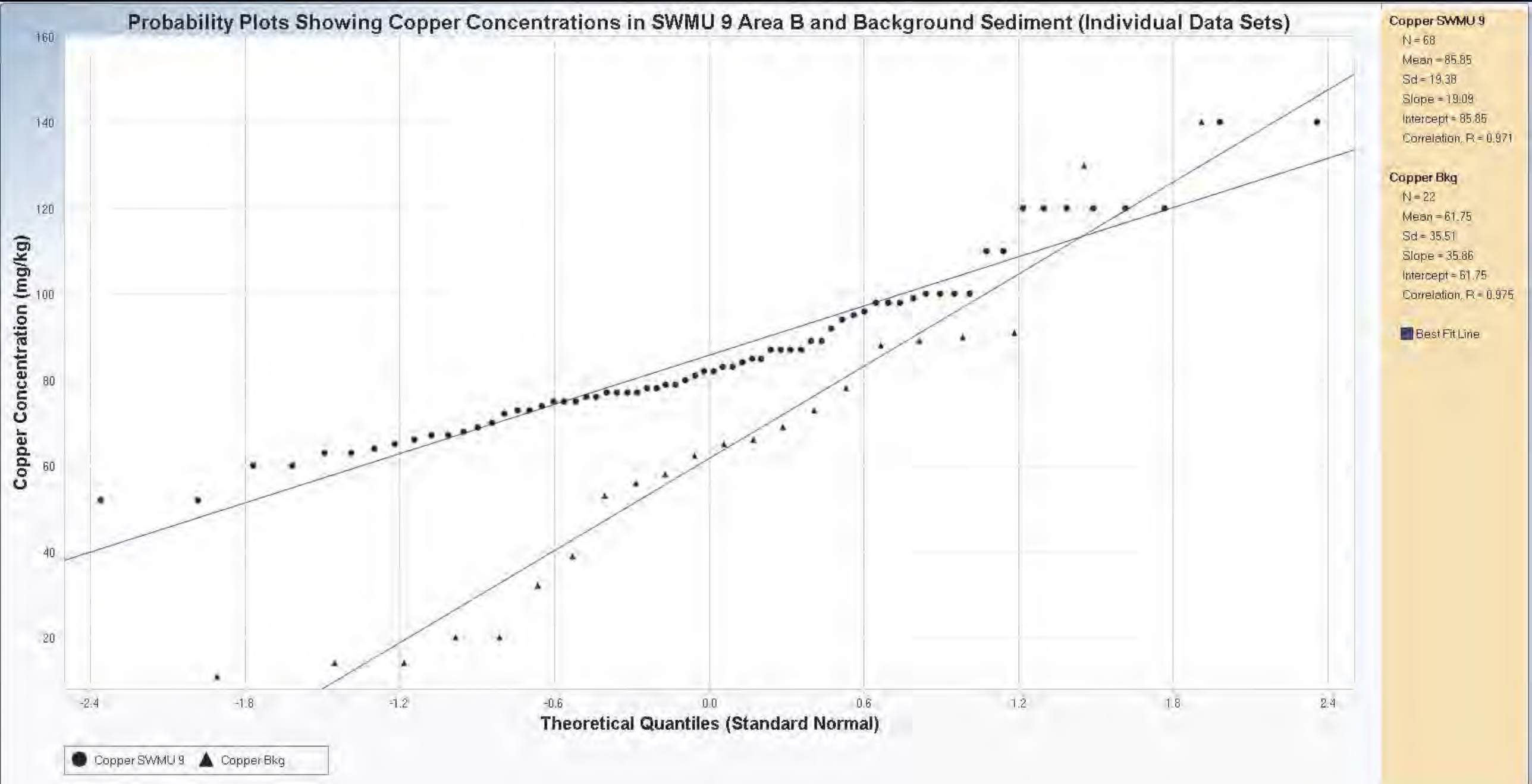
Beryllium - Background

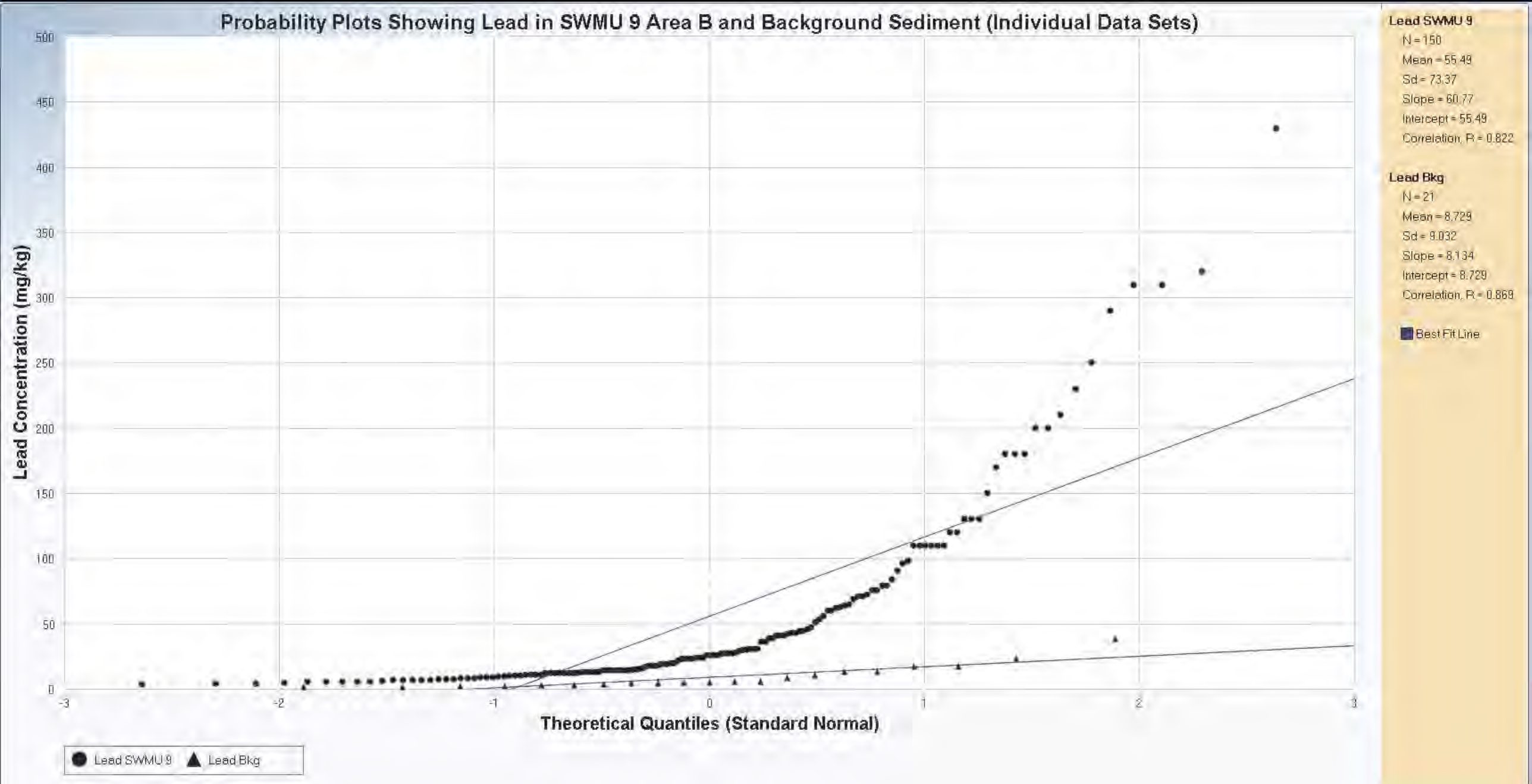
Total Number of Data = 22
Number of Non-Detects = 2
Number of Detects = 20
Detected Mean = 0.167
Detected Sd = 0.0855
Slope (displayed data) = 0.0857
Intercept (displayed data)= 0.167
Correlation, R = 0.965

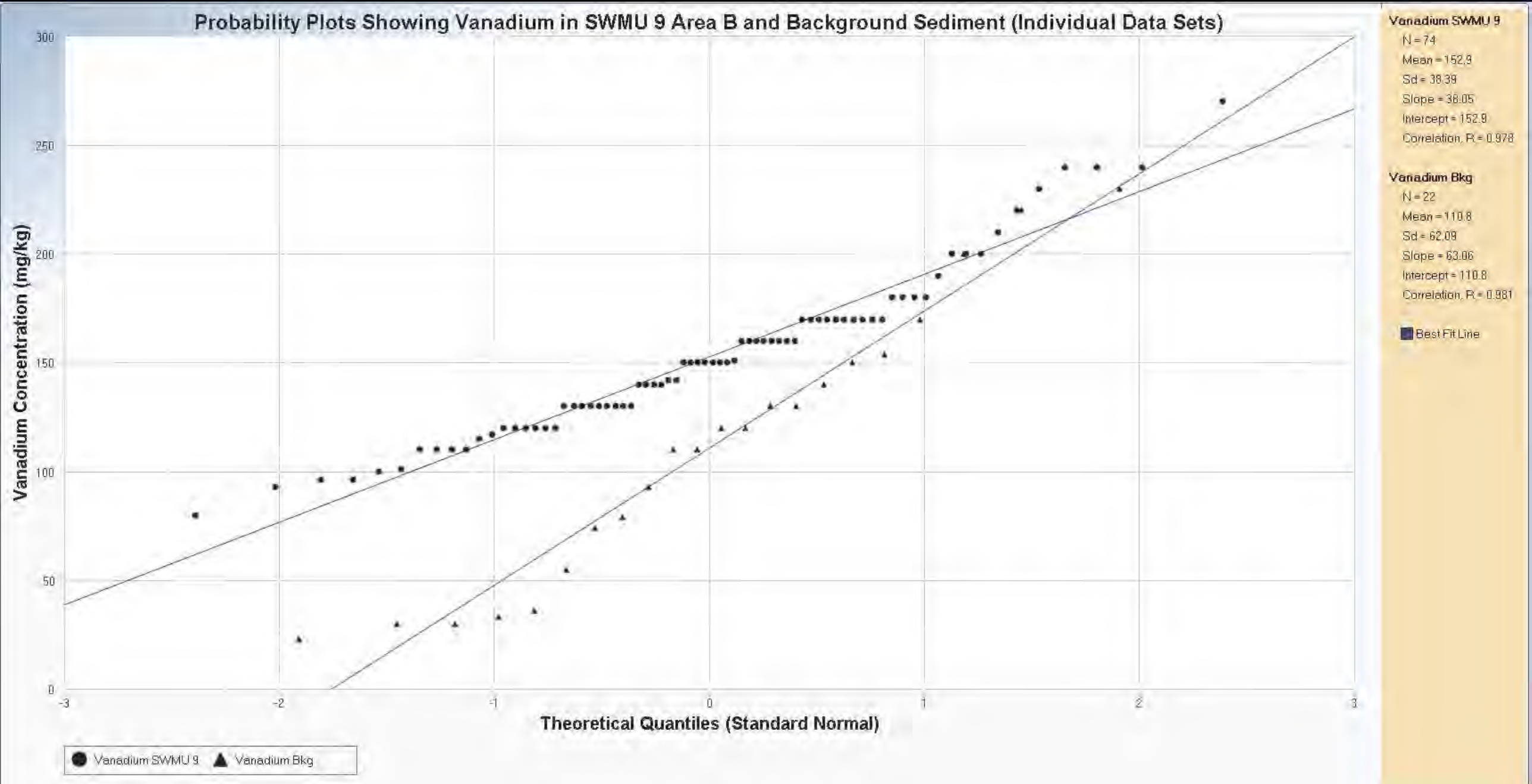
Best Fit Line

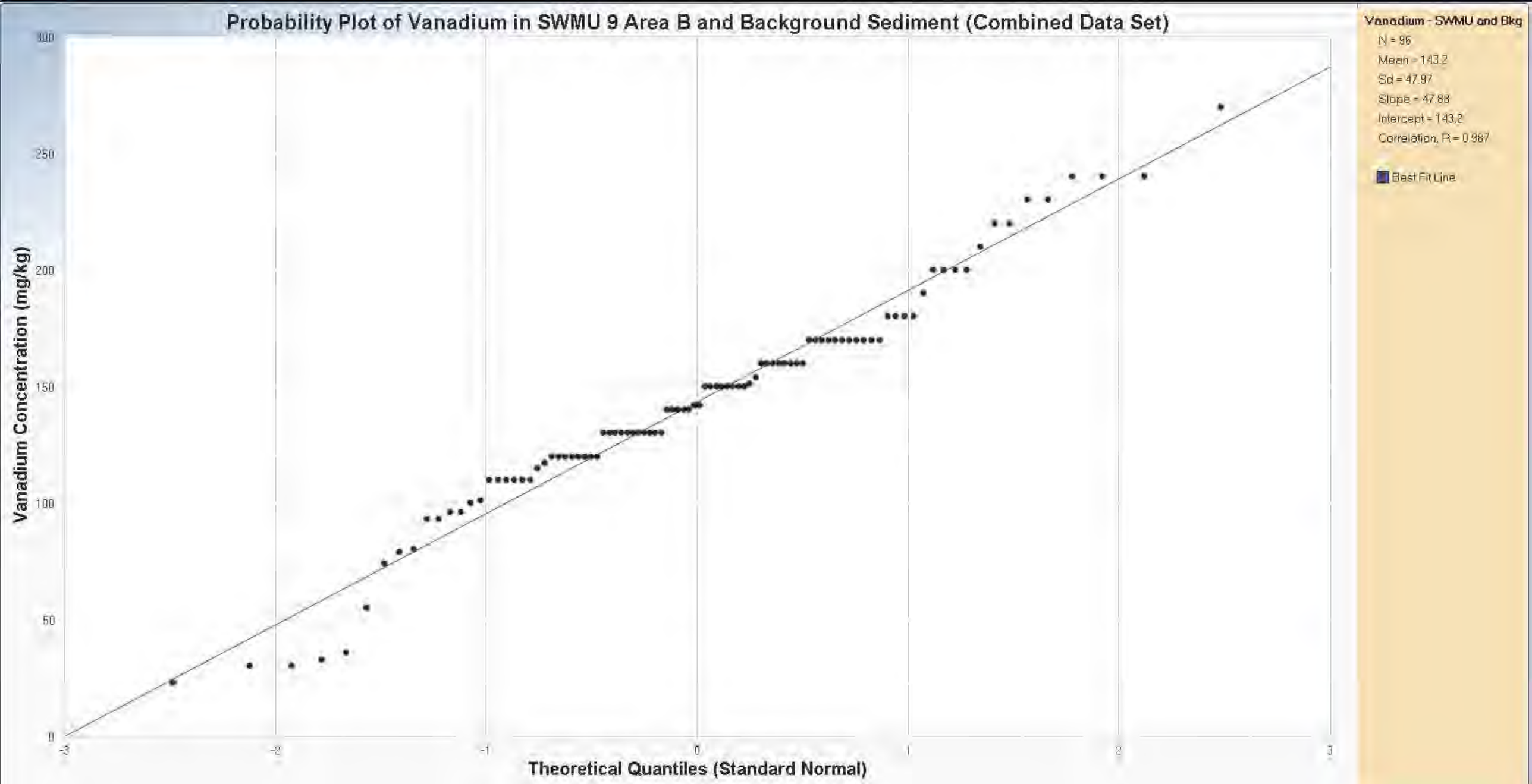

Probability Plot of Beryllium in SWMU 9 Area B and Background Sediment (Combined Data Set)
Nondetects not displayed
Beryllium Concentration (mg/kg)
0.500
0.450
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
-2.4
-1.8
-1.2
-0.6
0.0
0.6
1.2
1.8
2.4
Theoretical Quantiles (Standard Normal)
Beryllium - SWMU and Bkg
Total Number of Data = 90
Number of Non-Detects = 19
Number of Detects = 71
Detected Mean = 0.22
Detected Sd = 0.0748
Slope (displayed data) = 0.075
Intercept (displayed data)= 0.22
Correlation, R = 0.988
Best Fit Line


Probability Plots Showing Cobalt in SWMU 9 Area B and Background Sediment (Individual Data Sets)
Cobalt Concentration (mg/kg)
32
28
24
20
16
12
8
4
-2.4
-1.8
-1.2
-0.6
0.0
0.6
1.2
1.8
2.4
Theoretical Quantiles (Standard Normal)
Cobalt SWMU 9
Cobalt Bkg
Cobalt SWMU 9
N = 68
Mean = 7.903
Sd = 2.251
Slope = 2.151
Intercept = 7.903
Correlation, R = 0.942
Cobalt Bkg
N = 21
Mean = 8.438
Sd = 6.937
Slope = 6.326
Intercept = 8.438
Correlation, R = 0.88
Best Fit Line


Probability Plots Showing Copper Concentrations in SWMU 9 Area B and Background Sediment (Individual Data Sets)
Copper Concentration (mg/kg)
160
140
120
100
80
60
40
20
-2.4
-1.8
-1.2
-0.6
0.0
0.6
1.2
1.8
2.4
Theoretical Quantiles (Standard Normal)
Copper SWMU 9
Copper Bkg
Copper SWMU 9
N = 68
Mean = 85.85
Sd = 19.38
Slope = 19.09
Intercept = 85.85
Correlation, R = 0.971
Copper Bkg
N = 22
Mean = 61.75
Sd = 35.51
Slope = 35.86
Intercept = 61.75
Correlation, R = 0.975
Best Fit Line


Probability Plots Showing Lead in SWMU 9 Area B and Background Sediment (Individual Data Sets)
Lead Concentration (mg/kg)
500
450
400
350
300
250
200
150
100
50
0
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
Lead SWMU 9
Lead Bkg
Lead SWMU 9
N = 150
Mean = 55.49
Sd = 73.37
Slope = 60.77
Intercept = 55.49
Correlation, R = 0.822
Lead Bkg
N = 21
Mean = 8.729
Sd = 9.032
Slope = 8.134
Intercept = 8.729
Correlation, R = 0.869
Best Fit Line


Probability Plots Showing Vanadium in SWMU 9 Area B and Background Sediment (Individual Data Sets)
Vanadium Concentration (mg/kg)
300
250
200
150
100
50
0
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
Vanadium SWMU 9
Vanadium Bkg
Vanadium SWMU 9
N = 74
Mean = 152.9
Sd = 38.39
Slope = 38.05
Intercept = 152.9
Correlation, R = 0.978
Vanadium Bkg
N = 22
Mean = 110.8
Sd = 62.09
Slope = 63.06
Intercept = 110.8
Correlation, R = 0.981
Best Fit Line


Probability Plot of Vanadium in SWMU 9 Area B and Background Sediment (Combined Data Set)
Vanadium - SWMU and Bkg
N = 96
Mean = 143.2
Sd = 47.97
Slope = 47.88
Intercept = 143.2
Correlation, R = 0.987
Best Fit Line
Vanadium Concentration (mg/kg)
Theoretical Quantiles (Standard Normal)
300
250
200
150
100
50
0
-3
-2
-1
0
1
2
3