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13 Jul 1995

Mr. Tom Lanphar
California Environmental Protection Agency
Department of Toxic Substances Control
Region 2
700 Heinz Avenue, Suite 200
Berkeley, CA 94710-2737

Subj: RESPONSE TO COMMENTS FROM THE DEPARTMENT OF TOXIC SUBSTANCES CONTROL AND THE DEPARTMENT OF HEALTH SERVICES ON THE DRAFT FINAL RADIATION SURVEY FIELD SAMPLING PLAN, NAVAL AIR STATION, ALAMEDA, CA

Dear Mr. Lanphar,

Enclosed is the Navy's response to your comments on the Draft Final Remedial Investigation/Feasibility Study Radiation Survey Field Sampling Plan. Your comments requested an approval letter by the Radiological Affairs Support Office (RASO). This letter is included as the last 2 pages of the Attachments to the enclosure. RASO's comments from this letter have been satisfactorily addressed in the Sampling Plan.

If no additional comments are received by August 4, 1995, the Navy plans to submit the Final Radiation Survey Field Sampling Plan and proceed with field work to implement this Work Plan.

If you have any questions regarding this matter, please feel free to contact Mr. George Kikugawa, Code 1831.2, at (415) 244-2549 or Fax (415) 244-2654.

Sincerely,

Original signed by:

CAMILLE GARIBALDI
Lead RPM NAS Alameda
By direction of
the Commanding Officer

Encl: Navy's response to CAL-EPA, DTSC, comments on the Draft Final Remedial/Feasibility Study Radiation Survey Field Sampling Plan

Copies to:
California Regional Water Quality Control Board (Attn: James Nusrala)
US Environmental Protection Agency (Attn: James Ricks)

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NAS Alameda (Attn: LCDR. Mike Petouhoff)
NAS Alameda (Attn: Sherri Withrow)
Radiological Affairs Support Office (Attn: Lino Fragoso)
Mare Island Naval Shipyard (Attn: Richard Wolf)
PRC Environmental Management, Inc. (Attn: Duane Balch/Susan Willoughby/Ken Kasper)

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NAVY RESPONSE TO COMMENTS FROM CALIFORNIA DEPARTMENT OF HEALTH SERVICES

DRAFT FINAL RI/FS RADIATION SURVEY FIELD SAMPLING PLAN ADDENDUM NAVAL AIR STATION (NAS) ALAMEDA

The Department of Health Services (DHS) of the California Environmental Protection Agency made review comments on the field sampling plan addendum for the radiation survey at the site 1 and site 2 landfills, Naval Air Station (NAS) Alameda, California. The field sampling plan addendum is part of the remedial investigation/feasibility study (RI/FS) at the sites. The DHS comments, in a letter dated January 25, 1995, were provided to Engineering Field Activity West (EFA WEST), Naval Facilities Engineering Command. This document presents the Navy's response to the DHS comments on the addendum.

GENERAL COMMENTS:

Comment 1: **It was agreed to obtain the review and concurrence of the Radiological Affairs Support Office (RASO) for all documents containing discussions for the remediation of radioactive material at BRAC facilities involving the Department of the Navy, e.g., NASA. The record of the review with concurrence is to consist of a cover letter from RASO within the submitted document stipulating their concurrence. Honoring this request would relieve the EMB of the responsibility as the primary reviewer for Navy documents. This previously agreed to review protocol would require normal "peer review" and concurrence by the cognizant Navy organization and would not allow the bypassing of this process. The comprehensive approach that RASO follows in this regard is contained in encl (1). Further, the State of California is not the primary regulatory authority for past practices involving the occupational uses of radioactive materials for the Department of Defense (DoD).**

Response:

The technical review of the work plan by the Navy's Radiological Affairs Support Office (RASO) was performed as agreed to by DHS and the Navy. Comments received by EFA WEST from RASO are attached to this response to comments. Due to a misunderstanding, RASO's approval sheet was not attached with the copy of the report forwarded to the California Department of Toxic Substances Control (DTSC), the agency that transmitted DHS's comments to EFA WEST.

Enclosure (1)

Comment 2: **A second area of concern that was believed to have been resolved by the verbal agreement was the acknowledgement that the DHS does regulate licensed and nonlicensed (e.g. naturally occurring radioactive material) quantities of radioactive material utilized by other than federal entities. As a result of the BRAC process the existing California regulations are Applicable or Relevant and Appropriate Requirements (ARARs) for radioactive material remediation at federal facilities. These regulations (California Code of Regulations, Title 17, Subchapter 4 Radiation) require that a Specific License and/or Authorization (Permit), be applied for, or submitted for review and subsequent concurrence by the DHS prior to commencing work involving sources of radioactivity. The practice of accepting the latter documentation from authorities other than the DHS, i.e., other state licensing authorities, the Nuclear Regulatory Commission, or the cognizant military authority (RASO for the Navy), is appropriate as part of the process known as "reciprocity."**

Response:

PRC Environmental Management, Inc. (PRC) is in the process of obtaining an amendment to its current state license to possess various types of radiological material. On February 17, 1995, Mr. Ken Kasper, a health physicist with PRC spoke at length about licensing with Mr. Gary Butner, chief of DHS's Radiologic Health Branch (RHB). After the discussion and after reviewing the documents involved, both Mr. Butner and Mr. Kasper determined that California state regulations do not require PRC to hold a specific license to perform radiological surveys at federal facilities. However, PRC has evaluated the impact of obtaining a license and has determined that specific state licensing may be potentially beneficial to the work it does for the Navy. In light of the RHB position that PRC is not specifically required to have a license for radiation survey work at NAS Alameda, we do not anticipate that survey work will be delayed while awaiting a modification to our current license.

SPECIFIC COMMENTS:

Comment 1: **Section 1.1, Page 1: Does the reference to man-made sources of radioactive material refer to licensed material?**

Response:

The work plan does not refer to "man-made" radioactive sources but instead refers to anthropogenic sources of radioactivity. These anthropogenic sources include instrument dials and gauge faces that were coated with radioluminescent paints containing radium-226 (^{226}Ra) and possibly strontium-90 (^{90}Sr). Devices containing radium-226 were excluded from the Atomic Energy Act of 1954 since it is a naturally occurring radioactive material. Some of the strontium radioluminescent devices were purchased prior to 1954; these devices would have also been exempt from licensing requirements. Non-exempt quantities of strontium-90 purchased after 1954 fell under appropriate licensing requirements.

The term "anthropogenic" radioactivity also refers to sources of radioactivity from fallout, including ^{137}Cs and ^{90}Sr, due to nuclear weapons testing. This anthropogenic material does not require a license if it is found to be in a form consistent with nuclear weapons fallout. The U.S. Nuclear Regulatory Commission (NRC) does issue licenses for certain quantities of ^{90}Sr as a byproduct material. As a radioluminescent, ^{226}Ra is an enhanced natural radionuclide and is not regulated by the NRC.

Comment 2: **Section 1.2, Page 2: Briefly document and discuss the occupational/operational history of the use of naturally occurring radioactive material (NORM) at NASA. What documentation was reviewed to determine that NASA was not a radium rework facility, or a storage facility and transshipper of NORM?**

Response:

The Navy understands naturally occurring radioactive material (NORM) to be material that is purely naturally occurring and not enhanced. Most natural background radiation sources occur in soils. The soils found in the San Francisco Bay Area include arkosic sands, clays, and silts. The predominant source of NORM in these soils is the arkosic sand fraction. These sands contain feldspars, a source of gamma-emitting potassium-40 and other components of granitic rock. Granitic rock contains small amounts of uranium isotopes that decay into other radioisotopes, including ^{226}Ra. Fill material at sites 1 and 2 consists predominantly of dredge spoils. No known history of the use of soils that contained elevated amounts of NORM as fill material exists.

A radium rework facility was located at NAS Alameda. The Navy has three levels of maintenance: field, intermediate, and depot. A rework facility performs depot level maintenance on equipment. This level of maintenance includes major repair and rebuilding. Radioluminescent devices were repaired and repainted at NAS Alameda.

Radioactive wastes were shipped to a Navy supply center for disposal by an approved, licensed contractor. Prior to 1970, radium-containing materials may have been disposed of in sites 1 and 2. Based on RASO review of documents, stored in RASO files in Yorktown, Virginia, past history and operations have included waste disposal activities within sites 1 and 2 without specific reference to radioactive materials. These document review activities have been summarized by RASO and were submitted to EFA WEST prior to completion of the work plan.

Comment 3: **Section 1.2.1, Pages 3-5: How is it known that the aquifer beneath NASA is not contaminated? What is the potential volume of NORM at site 1? What is the possibility that mixed/compound waste may occur at sites 1 and 2? Define and discuss the term "low-level radiological material" that is part of the waste known to have been buried at site 1.**

Response:

The groundwater around sites 1 and 2 has been sampled quarterly since mid-1994. This sampling process has not led to the detection of any contaminants above what can be attributed to background. More information concerning the aquifer will be collected during future RI/FS work.

The amount of ^{226}Ra and ^{90}Sr in the form of radioluminescent equipment and deck markers that may be in the landfill has not been determined, and no documentation exists to support such a determination. Therefore, the potential volume of radioactive material at sites 1 and 2 has not yet been estimated.

Mixed waste may occur at sites 1 and 2 if radioactive materials are located in the fill there, since chemical contamination has already been detected at these sites (PRC/Montgomery Watson 1993 and E&E 1983). Data collected at a landfill at Hunters Point Annex (HPA), San Francisco, similar to the two landfills at NAS

Alameda, can be instructive. Investigations at HPA revealed that ^{226}Ra remains closely bound to radioluminescent devices and to soil that immediately surrounds them. When a point source is removed from the soil, virtually all of the activity associated with it is also removed (PRC 1992). Consequently, removing point sources decreases the possibility for mixed waste.

Radioluminescent devices that may be expected to have been buried in sites 1 and 2 at NAS Alameda will likely be of approximately the same type and activity as those identified in the HPA landfill. Radium-containing components at the HPA landfill were found to be typically associated with corroded iron- and copper-containing materials. Many of the radium-containing components that have been found in the landfill at HPA are no longer recognizable. Some of the radioactive sources, however, were recognizable as intact dials or illuminator buttons.

"Low-level radiological material" should have been written as "low-level radioactive waste" and refers to radioluminescent dials, deck markers, and other instrumentation and electronic parts containing ^{226}Ra that may be found in the landfill. Low-level radioactive waste is defined in 10 Code of Federal Regulations (CFR) 61.

Comment 4: **Section 1.3, Page 7: The discussion within the first paragraph of this section indicates that RASO provided some guidance in the determination that NORM would be the primary source of radioactivity at sites 1 and 2. What was the documentation reviewed and data that was interpreted that allowed this determination to be made? It is suggested that you request RASO to provide a probable inventory of equipment and devices containing NORM that may be of concern at sites 1 and 2.**

The fourth paragraph infers that the decay daughters from radium could be detected at a soil depth of one foot. Using the field detection equipment specified in this document can you detect 1 Uci of radium at a soil depth of 11" that has a moisture content of ~15% and has not been disturbed? Would you use the detection mode specified for Sr-90 discussed in Appendix A (HV2 PHA)?

Response:

The first referenced paragraph does not discuss NORM as the primary source of radioactivity at sites 1 and 2. Radioluminescent equipment that might be found in the landfill sites 1 and 2 at NAS Alameda does not fall under this classification. Documentation reviewed by RASO does not discuss NORM.

Lieutenant Commander Joe Hosszu of RASO stated that most radium-containing materials that were used by the Navy ranged in activity from approximately 0.15 microcuries (μCi) to 20 μCi. Much of the material contained less than 1 μCi of ^{226}Ra. Large objects such as ship compasses might have contained multiple sources of ^{226}Ra that totaled up to 20 μCi per device. It is difficult to estimate the number or type of objects that may have been disposed of in the landfill at NAS Alameda because detailed landfill disposal records were not kept and the material of concern was not tracked. Based on historical data, the most likely radioactive materials that would have been disposed of at NAS Alameda would have been radium and strontium-containing dials and gauges used in Naval and Marine Corps aircraft.

To verify that the proposed field detection methodology is sensitive enough to detect buried point sources of ^{226}Ra, we are considering performing a field test that will generate appropriate empirical data. The radiation detection mode of the scaler will be set to the gross mode. This mode offers the greatest sensitivity to all gamma energies of interest.

Comment 5: **Section 2.0, Pages 8-10: What "qualified" laboratory is to be involved with the 15% soil confirmation analyses? The DHS Sanitation and Radiation Laboratory requests the opportunity to discuss split sample analysis and possible QA/QC protocol.**

Provide a discussion of the details for the measurement protocol involved in the determination of the data points listed in the matrix titled Radiation Measurements and Analysis to be Performed.

If the MDA for radium $\leq$ 0.5 pci/gm for lab analysis, then what is the action level proposed for remediation of radium contaminated soil? What are the MDA and remediation action levels for Sr-90? What is the anticipated, or actual, background concentration for radium at NASA? For the monitoring personnel in the field obtaining the direct radiation data within the 12 acres each for sites 1 and 2, what would trigger

their "flagging" of a data point? Are hard copies of these field measurements to be maintained and available for independent review?

Response:

The laboratory performing soil confirmation analyses is TMA Norcal of Richmond, California. This laboratory is National Voluntary Laboratory Accreditation Program (NVLAP) certified and is certified and licensed by the State of California to perform radiological analyses.

Representatives of DHS may observe instrument readings and measure radioactivity with their instrumentation during all phases of field operations. DHS personnel that wish to make a site visit need to make prior arrangements with the Base Environmental Coordinator (510-263-3733) to receive gate clearance and access to the site. Split soil samples will be retained from sites 1 and 2, in the event of an anomalous reading, for all samples provided to TMA Norcal. DHS may review information pertaining to quality control procedures followed by TMA and PRC.

Gamma exposure rate measurements will be collected as described in the work plan. Gamma exposure rate measurements will be made 1 meter above ground surface at each survey location using a Ludlum Measurements Model 19, microRoentgen (μR) gamma exposure rate meter. The meter will be held at a distance of approximately 1 meter from the ground surface until the reading stabilizes and that reading will be recorded.

A Ludlum Measurements Model 44-10, 2-inch by 2-inch sodium iodide crystal gamma detector coupled to a Ludlum Measurements Model 2221 rate meter/scaler will be used, during the gross gamma count rate survey, to measure gross gamma count rates over open areas and to identify areas that may contain many point sources of gamma-emitting materials. The instrument's response to a source of ^{137}Cs that produces a one millirem per hour gamma radiation field is approximately 900,000 counts per minute (cpm).

The gamma count rate survey, as described in the work plan, will be used as a method to initially identify areas that may require further investigation for radiation. As described in the work plan, facility-wide background gamma count rates will be measured at 30 uncontaminated background areas. Using the 2-inch by 2-inch sodium iodide (NaI) gamma detector, standard statistical methods will be used to help clarify survey results. When a normal distribution can be assumed, parametric statistics are used to estimate the sample population using the mean (), the standard deviation (σ), and the variance (σ^2). These descriptive statistics are dependant upon the number (n) of measurements.

Areas within sites 1 and 2 that exhibit elevated gamma count rates exceeding three standard deviations of the facility-wide mean background count rate will be surveyed using in situ gamma spectroscopy and soil sampling and analysis.

In situ, or in-place, field gamma spectroscopy will measure gamma-emitting radioisotopes in soil. In situ gamma spectroscopy provides *qualitative and semi-quantitative* identification of gamma-emitting radioisotopes in undisturbed soils in a field setting without having to collect soil samples for analysis. In situ gamma spectroscopy will be employed in areas that are identified, during the gross gamma count rate survey, as exhibiting gross gamma count rates that are 3 sigma above established background.

The *in situ* operational procedures follow the EG&G M-1 software users manual (EG&G 1993). Spectral count times for this in situ method are approximately 30 minutes depending on the soil activity and detector efficiency. The resulting spectra will be evaluated to determine the identity of gamma-emitting radioisotopes that contribute to the total gamma activity.

Laboratory procedures will follow PRC's Standard Operating Guideline for gamma spectroscopic analysis of soil (PRC 1994a) and will be performed using EG&G GammaVision spectroscopy software.

Remediation is not currently proposed for sites 1 and 2. Currently, soil cleanup standards are based on risk assessments. DHS has a guidance on cleanup of radioactivity on closing military bases for unrestricted public use of property (DHS 1994). The guidance provides a 5 Pci/g soil cleanup goal for ^{226}Ra. As detailed in the guidance document, this level specifically does not apply to ^{226}Ra contamination from radioluminescent point sources. Currently there are no remediation action levels for either ^{226}Ra or ^{90}Sr. DHS conducts site-specific radiological risk assessments to determine clean up levels. To that end, either EPA RAGS Part B (EPA 1991), PRESTO (EPA 1987), or the Department of Energy RESRAD (Yu 1993) risk assessment modeling need to be consulted. The laboratory MDA for ^{90}Sr will be less than or equal to 0.1 Pci/g.

The expected background level of ^{226}Ra is approximately 0.5 Pci/g for soils at NAS Alameda, based on soils derived from the local geological feature of the region, called the Franciscan Complex, and soils found generally in the San Francisco Bay Area.

Data collected from each location can only be evaluated after the background data has been statistically analyzed. When the count rate at a particular location is compared to the facility-wide background count rate and found to be greater than three standard deviations of the expected background count rate, the location is "flagged." In-situ gamma spectroscopic data will then be collected at such locations. Field data will be recorded in hard-cover bound logbooks, and a copy of this data will be available for review.

Comment 6: **Section 2.1, Page 10: What criteria was used to determine the "undeveloped land on base" as likely sites for background measurements?**

Response:
This determination was made based on aerial photographs, information currently available from RASO on the various sites at NAS Alameda, and from discussions with Navy personnel at NAS Alameda. These areas are relatively undisturbed by construction activities and have no known radiation operation history. Undeveloped land on base was determined to be representative of site background, since much of the land at NAS Alameda is composed of fill materials that are not native specifically to the site.

Comment 7: **Section 2.2, Page 13: What are the qualification and training requirements for the field technical staff? How will the one meter above the ground surface be determined for field survey measurements?**

Response:
All field staff who perform work at CLEAN sites are OSHA 40-hour health and safety trained. In addition, field staff receive radiation worker training and supplemental radiation worker training, as specified by the Ionizing Radiation Protection Program (IRPP) Manual. All radiological issues surrounding the implementation of the Field Sampling Plan will be managed by PRC's Radiation Protection Manager, Ken Kasper. Mr. Kasper has over 15 years experience in radiation safety and environmental restoration. He is a Registered Radiation Protection Technologist and a Certified Health Physicist. At all times during the handling of actual or potential radioactive material, Mr. Kasper or a Radiation Safety Officer (RSO) designated by Mr. Kasper, will be present.

Gamma spectroscopic field measurements will be performed using a tripod which will be adjusted, using a tape measure, so that the detector is 1 meter above the ground surface. For other instruments, 1 meter will be approximated by holding the detector around waist level.

Comment 8: **Section 2.2.1, Page 13: Appendix A provides the technical evidence for the effectiveness of a SPA 3 placed 15" above the ground surface in detecting Sr-90 in a deck marker buried up to 12" in soil. The explanation on page 13 indicates that a Ludlum Model 19 will be used to measure gamma at one meter. Is the sensitivity and efficiency of the Model 19 for the radiations being emitted by Sr-90 and Ra-226 greater than that of the PRM-5N with SPA 3?**

Response:

The 2-inch by 2-inch NaI gamma detector will be used to obtain gamma count rates at specific locations. These measurements will be compared to facility-wide background gamma count rates.

An additional measurement will be taken for *health and safety* screening purposes using a Ludlum Model 19 gamma exposure rate meter. This meter provides an exposure rate measurement in microRoentgen per hour (μR/hr). Deck markers that contain ^{90}Sr produce secondary photons at approximately 300 thousand electron volts (kev). Because the Model 19 uses a 1-inch by 1-inch NaI crystal, its response to gamma energies will be less than the Ludlum Model 44-10 (SPA 3 equivalent), which uses a 2-inch by 2-inch NaI crystal.

Comment 9: **Section 2.2.2, Page 14: What are the specifics of the documentation obtained and reviewed by the contractor from the Navy (RASO) or NASA (Environmental Health and Safety Office) regarding the radiation safety program at this base and in particular sites 1 and 2?**

Response:

PRC has received and reviewed the Radiological Affairs Support Program (RASP) Manual (U.S. Navy 1991). Specific radiation safety program information concerning NAS Alameda and specifically sites 1 and 2 do not exist. PRCs work at NAS Alameda will be conducted under the guidance of the IRPP and an addendum containing site-specific health and safety information.

Comment 10: **Section 2.2.3.2, Page 17: What is the protocol for the drying of soil samples? What were the results of the review and concurrence of the field laboratory gamma spectroscopic analysis procedure by RASO? If this step has not been achieved it is requested that this review and concurrence be obtained.**

Response:

Laboratory sample drying procedures will follow PRC's Standard Operating Guideline for oven monitoring and soil sample drying (PRC 1994b). Field laboratory gamma spectroscopic analysis procedures were reviewed and approved for use at EFA WEST, Hunters Point Annex, by Navy RASO representatives, LCDR Lino Fragoso and Mr. Troy Blanton, in September 1994.

Comment 11: **Section 2.3, Page 19: What instrumentation is to be used to determine specific surface areas emitting gamma radiation when the detector will be at a height of one meter?**

Response:

Being cylindrical, the NaI detector's angular response characteristics at 1 meter above the ground allow it to respond to emissions within an approximate radius of 10 meters from the detector's location. This translates to a surface area of 314 square meters (m^2) that will be covered within a single measurement. This theory behind the assumption is detailed by Beck, De Campo, and Gogolak (1972) and by Miller and Shebell (1993).

Comment 12: **Section 2.4, Page 19: Who within the Navy and the State of California has reviewed and concurred with the Navy CLEAN Ionizing Radiation Protection Program, referred to as PRC 1993a, and the Navy CLEAN Health and Safety Program, referred to as PRC 1993b?**

Response:

PRC's CLEAN IRPP and CLEAN Health and Safety Program, June 25, 1993, were submitted to EFA WEST in late April 1993 (PRC 1993a and 1993b). The Navy had no comments on these two documents. It was not submitted to DHS for review.

Comment 13: **Section 3.1.1, Page 20: Why was not the California Code of Regulations, Title 17, Subchapter 4. Radiation and the Guidance for Cleanup of Radioactivity on Closing Military Bases ... cited as Applicable or Relevant and Appropriate Regulations (ARARs)?**

Response:

The reference will be added to the list (DHS 1994). However, it is to be noted that present work to be performed does not include any remedial action; hence the need for cleanup ARARs is limited.

Comment 14: **Section 3.1.2, Page 20: If the expected radiation field is to be mixed and consist mainly of Ra-226 and Sr-90, what energy range are you calibrating your instruments to for optimum detection in the field?**

Response:

All gamma count rate measurements will be made using a Ludlum Measurements model 44-10, 2-inch by 2-inch NaI gamma detector coupled to a Ludlum Measurements model 2221 rate meter/scaler. The rate meter/scaler will operate in the gross mode; the threshold will be set at 100 kev and the upper energy sensitivity at approximately 3,500 kev. The instrument high voltage/response plateau will be adjusted for maximum response using a source of ^{226}Ra.

Comment 15: **Section 3.1.3, Page 21: When is personnel dosimetry required and what will it measure? The sixth bulleted action item in this section is not clear. How can work continue in a 2.0 Mr/hr area if the action required is to stay outside this area? Does this mean personnel are to go to an area > 2.0 Mr/hr and work? What is the likelihood of a $\geq$ 10 Mr/hr field for the sites being investigated at NASA? How have radon levels been excluded as a health hazard to personnel? Are radon breath samples required of personnel?**

Response:

Thermoluminescent dosimeters (TLD) will be worn by personnel at all times during field work. The TLDs record personnel whole body exposure to X-rays, gamma, and beta radiation. Once every three months the TLDs are returned to the laboratory for reading and reporting.

There was an error in the sixth bulleted item in Section 3.1.3 (Page 22); the text should read as follows:

Action: notify the site-specific ORPO; map the 2.0 Mr/hr contour; stay outside of the 2.0 Mr/hr contour; continue radiation monitoring with a radiation survey meter.

It is highly unlikely that gamma exposure rates will exceed expected background levels of 9 to 14 μR/hr.

Based on radon flux rate measurement results that PRC obtained at HPA during a 1991 investigation, radon gas emissions from point sources of ^{226}Ra in open land areas do not increase the concentration of radon in the worker's breathing zone (PRC 1992).

The radon flux rate observed for soils and uranium mine tailings varies as a function of several factors. One of these factors is the ^{226}Ra content of the material being tested. The radon-222 (^{222}Rn) flux rate of typical soils is approximately 0.45 $Pci \cdot m^{-2} \cdot sec^{-1}$ as presented by the National Council on Radiation Protection and Measurement (1988).

The National Emission Standard (40 CFR 61) for ^{222}Rn flux from uranium mill tailings and phospho-gypsum operations is 20 $Pci \cdot m^{-2} \cdot sec^{-1}$ (EPA 1978). The amount of soil compaction affects the amount of ^{222}Rn that can be released from the soil. Because hard-packed soils tend to have less transmissivity to gasses, radon flux rates tend to be lower at these locations. Atmospheric pressure changes also affect radon flux rates. Low pressure systems associated with storms tend to increase ^{222}Rn release from soils. Additionally, decreased soil moisture also tends to increase release of ^{222}Rn from soils.

During the radiation survey at HPA, the radon flux rates were usually representative of those found in ordinary soil. Background radon flux rates ranged from 0.01 to 1.12 $Pci \cdot m^{-2} \cdot sec^{-1}$. With one exception out of 460 canisters placed, significantly elevated radon flux rates were only observed when charcoal canisters were placed directly on the soil, on top of recognizable gamma radiation anomalies. Numerous radon flux canisters were placed within a few feet of recognizable ^{226}Ra point sources. These measurements indicated that radon flux rates were normal in all areas except when a canister was placed at the surface within 1 foot or so of a recognizable point source. Therefore, based on this data, radon breath samples will not be required for personnel during this investigation.

Comment 16: **Section 4.0, Page 22: Who within the Navy and the DHS has reviewed and concurred to PRC's Clean Quality Assurance Management Plan?**

Response:

PRC's CLEAN Quality Assurance Management Program (PRC 1990) was reviewed and approved by EFA WEST. It was not submitted for DHS review.

Comment 17: **Appendix A: According to page 7 of this document, the likely source strength for the Sr-90 deck markers to be found at NASA is 1 Uci. What was the source strength of the deck marker used in the RASO test? If they are not the same, where did the 1 Uci value come from? The RASO test results for the PRM-5N with SPA-3 state that the best operational mode is HV2 PHA, yet in all instances the HV2 GROSS mode gave CPMs of at least 4 times greater and in two instances 5 times greater CPMs than the former; explain this. What would be the operational mode if the isotope of interest were radium?**

Response:

The discussion of source activity refers to the average activity of ^{226}Ra point sources. The source activity of ^{90}Sr used in the deck markers was probably less than one millicurie, based on potential radioactive sources used by the Navy provided in the response to comment 4. Even though the exact activity is unknown, the deck marker used in the RASO test is similar to what may be found at sites 1 and 2 and is expected to produce a similar response.

The reason that RASO stated that the "best" operational mode for detecting 300 kev bremsstrahlung rays was in the HV 2 PHA mode was that this mode offers the greatest *sensitivity* to those energies.
The gross mode will be used during the survey for both ^{226}Ra and ^{90}Sr point source contamination.

Comment 18: **Appendix B, Pages 139-145: The type and format of Appendix B is noticeably different from that of the rest of the subject document. It appears to be technically germane to this review process. Has RASO and the DHS reviewed and concurred to the larger document that this appendix is excerpted form?**

Response:

RASO has reviewed this document and has provided no additional comment. See response to comment 12. This document was not submitted for DHS review.

Comment 19: **Appendix B, Section 17.2.1: The titles for the last two bulleted references are incomplete; provide them.**

Response:

The title for both references is the Navy CLEAN Ionizing Radiation Protection Program manual.

Comment 20: **Appendix B, Section 17.2.1.1: What is the anticipated inventory for sampling equipment? Where are the attachments referred to in this appendix?**

Response:

Please refer to Section 17.2.1.1 in Appendix B for the required sampling equipment. Additional sampling equipment includes stainless steel trowels and stainless steel bowls. Attachments are in the Navy CLEAN IRPP, and they are enclosed with this response to comments.

Comment 21: **Appendix B, Section 17.2.1.2: How are the sampling point coordinates determined? Why aren't the characteristics of the terrain/topography to be documented? What is the methodology for the sample identification numbers? Is it location specific? Provide examples of the latter. What are the field screening requirements for soil samples?**

Response:

Sampling coordinates will be referenced to gamma count rate measurement locations and to background locations using global positioning system (GPS) coordinates. The topography is generally flat land. The photogrammetric spot heights and elevation contours are provided on Figures 2 and 3 in the field work plan.

Field samples will be collected and identified by facility, as soil samples, at what site they were collected, and the sequence number. This information will be placed on the sample jar. The sample data and the sample location from which it was collected will be entered on the field sample collection form, IRPP Attachment 29. Sample locations will be given an alphanumeric designator, identifying the location of the grid coordinate, which will be graphically presented on a map in the final report. For example, soil sample 3 collected from site 2 at NAS Alameda, will be designated and labeled as NASA-2-S03.

Soil samples will be screened in the field using an exposure rate meter. A Geiger-Mueller beta-gamma detector and an alpha scintillation detector will be used to assess contamination swipe samples of containers for radioactive contamination. Before submission for analysis, the samples will not have an exposure rate greater than 0.5 Mr/hr; they will also not have removable contamination on the surface of the sample container that exceeds 1,000 dpm/swipe beta-gamma or 20 dpm/swipe alpha.

Comment 22: **Appendix B, Section 17.2.1.3: How is the transfer of field samples to "shippers" documented? Are signatures required at all steps for sample transfers? What is the soil volume or weight when sample containers are filled? What are the heat restrictions for the sample containers? If rocks and debris may remain in a sample because they represent typical soil configuration, what effect will varying geologic matrices and differing sample geometries and the differential uptake of isotopes by plants have on the data? What is the training given to PRC's technical staff that would allow them to make a visual observation discriminating out an acceptable soil sample?**

Response:

The transfer of samples is documented in the chain of custody block on the Field Sample Collection Form. All transfers are documented by signature. Sample containers will be stored at room temperature.

The volume of samples is approximately 1,000 milliliters (ml), and samples will be homogenized and dried. A dried soil sample will be placed into a preweighed 500-milliliter sample jar. The net weight of this sample is usually between 500 and 900 grams when analyzed using gamma spectroscopy.

All rocks and debris that are greater than one-quarter inch in diameter will be removed from the soil at the time of sampling. All health physics personnel have been instructed in proper radiological soil collection techniques as detailed in the Navy CLEAN IRPP, section 17.0, as provided in Appendix B of the document.

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ATTACHMENTS

PRC

ATTACHMENT 29

FIELD SAMPLE COLLECTION FORM

Page ____ of ____

SITE ACTIVITY SAMPLES

Site No. ______________ Site Name ______________ Activity Support (Job) No. ______________ Sampler(s) ______________

Sample I.D. No. / Sample Grid Point	Sample Type (1)	Sample Time	Date of Sample	Preservative	Purpose (2)	Depth cm [ ] ft [ ]	Analysis Required	Remarks

SAMPLE TYPE (1)		PURPOSE (2)	
SS	Surface Soil	RC	Rad Character
BS	Bias Soil	VR	Verification
PS	Profile Soil	QC	Quality Control
SD	Sediment Silt	HS	Hot Spot
OR	Other	RS	Resample
VE	Vegetation	BG	Background
GW	Ground Water	RT	Routine
SW	Surface Water	SP	Special

This package conforms to the conditions and limitations specified in 49 CFR 173.421 for excepted radioactive material, limited quantity, not otherwise specified (n. o. s.) UN 2910

CHAIN OF CUSTODY

REASON	RELNQ BY	REC'D BY	DATE	TIME

Recorded By ______

Date/Time ______

No. of Samples in the box [ ]

Total No. of Samples in this shipment [ ]

Total No. of Boxes in this [ ]

SHIPPER:

SHIP TO:

ATTACHMENT 30

CUSTODY SEAL

PRC Environmental Management, Inc.	____________________ Date
CUSTODY SEAL	____________________ Signature

DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND DETACHMENT
RADIOLOGICAL AFFAIRS SUPPORT OFFICE (RASO)
NWS P.O. DRAWER 260
YORKTOWN, VA 23691-0260

IN REPLY REFER TO

5100/62474
RCN: 941972-09
Ser: 02/02A/ 00811
26 SEP 1994

From: Officer in Charge, Naval Sea Systems Command Detachment, Radiological Affairs Support Office (RASO)
To: Commander, Western Division, Naval Facilities Engineering Command (ATTN: George Kikugawa)

Subj: DRAFT RADIATION SURVEY FIELD SAMPLING PLAN, NAS ALAMEDA

Ref: (a) Telefax of WESTNAVFACENGCOM memo (G. Kikugawa) of 26 Aug 94 received 26 Aug 94

1. As requested in reference (a), a review of the draft Radiation Survey Field Sampling Plan for the landfills at Naval Air Station, Alameda has been conducted. The field sampling plan is acceptable contingent upon the following modifications:

a. Page 9. The field surface radiation survey indicates that a maximum of 12 soil samples from anomalous areas will be collected. The selection of 12 soil samples should be justified as actual conditions may necessitate more than 12 samples.

b. Page 14. Delete the sentence "Additionally, exposure rate measurements are used to determine conformance with Department of Transportation radioactive material shipping regulations under 49 CFR." Department of Transportation regulations are for packages in commercial transport and are not relevant to exposure rates in a landfill.

c. Page 14. Second sentence in section 2.2.2 must be modified so it does not give the impression that bremsstrahlung rays are emitted by ^{226}Ra and its daughter products.

d. Page 16. Amplify the statement "Radiochemical analysis of soils for nongamma-emitting radioisotopes may be required if the field survey indicates they may be present." As written, it is not clear how the field survey will indicate the presence of nongamma-emitting radioisotopes.

Subj: DRAFT RADIATION SURVEY FIELD SAMPLING PLAN, NAS ALAMEDA

2. NAVSEADET RASO point of contact is LCDR L. L. Fragoso, DSN 953-4692, commercial (804) 887-4692.

R. W. LOWMAN
By direction

Copy to:
CNO (N45)
NAVSEASYSCOM (07R)