



DEPARTMENT OF THE AIR FORCE
PACIFIC AIR FORCES

24 Feb 2013

MEMORANDUM FOR 18 WG/CC

FROM: 18 MDG/CC

SUBJECT: Soil Sampling Results and Health Risk Assessment of Bob Hope Primary School (BHPS) and Amelia Earhart Intermediate School (AEIS) Recreational Area.

1. Executive Summary: On 1 Feb 2014, the Bioenvironmental Engineering Flight of the 18th Medical Group (MDG) collected 12 composite soil samples from the on-base student activity areas behind BHPS and AEIS (see map at Attachment 1). Sampling was conducted in response to community concerns related to materials found at an off-base excavation site in Okinawa City. Samples were analyzed at three independent labs located in the continental United States. The results from the labs confirmed that the soil behind BHPS and AEIS is fully compliant with environmental quality standards and does not pose a health risk to staff and students. This comprehensive assessment provides sufficient data supporting that the recreational areas behind BHPS and AEIS are safe for human activities and occupancy and concludes that no further evaluation or surveys are needed.

2. Background: From Jun 2013 to Jan 2014, the Okinawa Defense Bureau (ODB) excavated 83 drums from a soccer field adjacent to the recreational area located behind BHPS and AEIS. To date, ODB has sampled and analyzed the residue from 22 drums as well as stagnant water and soil from the soccer field. Analysis of the residue identified various levels of dioxins, petroleum oils, herbicides and polychlorinated biphenyls (PCBs). ODB continued their evaluation by collecting and analyzing samples from strategic locations around the soccer field and concluded that no results were above the Japanese soil standards. ODB is currently awaiting results from the remaining 61 drums that were most recently excavated from the site.

3. Evaluating Exposure Routes: In an effort to better understand any potential health risks to the Kadena AB community, medical and civil engineering experts reviewed the results from ODB's soccer field site assessment, and discussed the results with the Okinawa Prefectural Government (OPG) Environmental Prevention Division. All soil sample results are well below Japanese Environmental Governing Standards, and based on OPG and Kadena AB field studies, it is reasonable to conclude that the site contaminants are restricted to within the immediate area where the drums were unearthed. Key findings of the field studies are:

- Drums were buried in a dense layer of clay which would drastically reduce the spread of potential contaminants through the environment.
- Physical barriers that separate the excavation site from the recreational field behind BHPS and AEIS prevent migration of materials between the excavation site and Kadena AB. The excavation site sits approximately 13-feet above the surface of the on-base recreational field at a distance of 75 yards from the Kadena AB perimeter fence. Between the 13-foot retaining wall and the perimeter fence is a concrete drainage ditch that directs rain runoff away from the schools' property.
- ODB's worksite hygiene practices are conducive to controlling the spread of potential contaminants from the area where the drums were excavated. Heavy equipment was used to remove the top layer of soil from the vicinity of the drums. Once the top layer of soil was removed, all drums were removed by hand in order to maintain the integrity of the drums and control the migration of potential contaminants.

Considering these physical factors in conjunction with ODB's worksite hygiene practices, it was determined that the exposure to the recreational area is unlikely.

4. Precautionary Sampling & Testing: In order to further assure parents and staff that the recreational area is safe, 18 WG/CC directed a series of in-house environmental soil and air samples on 31 Dec 2013. The results from these surveys revealed that substances were below background levels and posed no exposure concerns. This also supports the conclusion that the probability of an exposure pathway from the site to the recreational area was unlikely.

Due to continued community concerns, additional soil analysis through a third-party U.S. laboratory was directed by the 18 WG/CC on 23 Jan 2014. This report, outlined below, provides the following components: analytical results, comparison of results to applicable Government of Japan soil concentration standards, background levels found on Kadena AB, exposure route(s) assessment, and health risk assessment with recommendations.

5. Methodology: The Bioenvironmental Engineering Flight (18th Medical Group), with assistance from Detachment 3, United States Air Force School of Aerospace Medicine (USAFSAM), developed a soil sampling plan with the intent to further characterize any route of exposure from the excavation site to the student activity area and to assess the current health risk to students and school staff that play and work in this area. The plan was coordinated with other subject matter experts at USAFSAM, Wright-Patterson AFB, and is based on sampling principles established in the Department of Defense Environmental Field Sampling Handbook (Revision 1.0) (Apr 2013), Army Technical Guide 317 *Collection of Environmental Sampling Data Related to Environmental Health Site Assessments for Military Deployments* (Feb 2009) and the Agency for Toxic Substances and Disease Registry (ATSDR) Public Health Assessment Guidance Manual.

Soil sampling was conducted in the recreational area and the low lying area between the perimeter fence and school grounds, where water is likely to drain away from the school (see Attachment 1 for sample site locations). Using a stratified random selection process, 12 sample site locations (SSL) were selected in the area of concern. Background sampling sites were selected at the Stearley Heights Elementary School (SHES) student activity area and in the field east of Building 125 (Boy Scout Hut), for a total of 16 SSLs. Soil samples were collected from the surface (0 to 6 inches in depth below the vegetation layer) in order to characterize the soil the students are in contact with while playing in the recreational areas. Four samples were collected at each of these 16 SSLs and used to create a composite sample to be submitted to a third party U.S. certified lab (Bureau Veritas North America Inc.) for analysis. Over 60 different substances were quantified. Substances selected for analysis were based on previous sampling ODB had accomplished on the drums and surrounding soil at the excavation site. The types of substances include metals, heat resistant oils (PCBs), fuel constituents, selected herbicides, dioxins, and malathion. The Government of Japan soil concentration standards set by the 2003 Soil Contamination Countermeasures Law were used for guidance. These standards are established to protect human health by eliminating exposures via direct contact (ingestion/inhalation of soil) and indirect contact via ground water and agriculture contamination.

6. Results: Bureau Veritas North America Inc. contracted three U.S. commercial laboratories to accomplish the sample analysis: Cape Fear Analytical, LLC for dioxin analysis; RTI Laboratories, Inc. for malathion analysis; and GEL Laboratories, LLC for metals, fluoride, PCBs, fuel constituents, and selected herbicides. All samples were received at the contract labs by 6 Feb 14 and analysis was accomplished by 12 Feb 14. The report from the lab found as Attachment 2 was finalized and received on 21 Feb 2014. Table 1 summarizes the results found in the lab report.

Chemicals of concern related to the Okinawa City soccer field were evaluated. **All samples collected were below standards and offer no indication that contamination migrated from the excavation site to the student activity areas (see Table 1 below).** The dioxin of most concern, 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD), was not detected in any of the samples. Seventeen other forms of dioxin were analyzed and the total soil dioxin levels ranged from 6.14 to 15.6 picograms-Toxic Equivalents/gram [pg-TEQ/g]. All dioxin samples collected near AEIS and BHPS were below the environmental standard (1000 pg-TEQ/g) and below levels found at the excavation site (58 pg-TEQ/g). Herbicides and pesticides (trichlorophenoxyacetic acid {2,4,5-T}, dichlorophenoxyacetic acid {2,4-D}, and malathion) were not detected in any sample. PCBs were detected at 5 of the 16 sample sites ranging from 0.0018 to 0.0485 mg/kg, well below the environmental standard of 0.5 mg/kg. Additional groups of chemicals evaluated (metals, oil constituents, fluoride) were below environmental quality standards.


Table 1: SOIL SAMPLE RESULTS FROM AEIS & BHPS STUDENT ACTIVITY AREA

Chemical Analyzed	Avg. Lvl (Max Lvl) mg/kg soil	Background Range mg/kg soil	Applicable Soil Std mg/kg soil	Health Risk Concern?
Arsenic	19.31 (24.4)	11.4 – 20.3	150	No
Boron	5.97 (20.9)	2.92 – 6.86	4000	No
Cadmium	0.277 (0.39)	0.204 - 0.545	150	No
Chromium (total)	24.8 (39.6)	21.4 – 47.6	250 (as Chromium VI)	No
Lead	16.095 (21.3)	13.2 – 22.2	150	No
Selenium	0.217 (1.47)	Not Detected	150	No
Mercury	0.0518 (0.322)	0.0139 – 0.0498	15	No
Fluoride	1.251 (2.03)	0.896 – 2.09	4000	No
PCB: Aroclor-1016	Not Detected	Not Detected	0.5 (Total PCB)	No
PCB: Aroclor-1221	Not Detected	Not Detected		No
PCB: Aroclor-1232	Not Detected	Not Detected		No
PCB: Aroclor-1242	Not Detected	Not Detected		No
PCB: Aroclor-1248	Not Detected	Not Detected		No
PCB: Aroclor-1254	0.00183 (0.0159)	0.0485		No
PCB: Aroclor-1260	0.00605 (0.00899)	0.00519 – 0.0143		No
Gasoline Grade Organics	Not Detected	Not Detected	-	No
2,4 D	Not Detected	Not Detected	-	No
2,4,5T	Not Detected	Not Detected	-	No
Malathion	Not Detected	Not Detected	-	No
Total Dioxin (pg-TEQ/g)	7.8 (15.6)	6 – 7.1	1000	No

Some of the substances in this report do not have a corresponding Government of Japan soil concentration standard because they are not considered to be high risk environmental contaminants IAW 2003 Soil Contamination Countermeasures Law.

7. Conclusion: All soil analyzed from the student activity area and the background locations were below environmental quality standards established by the Government of Japan Ministry of the Environment. These results conclusively characterize and confirm that no contaminants have migrated from the excavation site to Kadena AB and that the recreational area does not pose a health concern to the staff and students in the area. No further surveillance is required.

8. If you have any questions regarding this report, please contact my POC, Maj Isaiah Manigault, 18 MDG, Bioenvironmental Engineering Flight Commander at DSN 634-4752 or email, isaiah.manigault@us.af.mil.

A handwritten signature in black ink, appearing to read "F. W. Allara, Jr.", written in a cursive style.

FRANK W. ALLARA, JR., Colonel, USAF, DC
Commander, 18th Medical Group

2 Attachments:

1. Field Map
2. Bureau Veritas North America Inc. Lab report