AIRBORNE URANIUM MONITORING
U. S. ARMY POHAKULOA TRAINING AREA
ISLAND OF HAWAII

Summary Report - April 2009

Contract No. W9128A-04-D-0019
Task Order 0040

Prepared for

U. S. Army Corps of Engineers
Honolulu District
Fort Shafter, Hawaii

and

U. S. Army Garrison, Hawaii
Schofield Barracks, Hawaii

Prepared by:

J. W. Morrow, DrPH
Environmental Management Consultant
Honolulu, Hawaii

ACRONYMS AND ABBREVIATIONS

ATSDR	Agency for Toxic Substances and Disease Registry
EPA	U. S. Environmental Protection Agency
ICP-MS	inductively coupled mass spectrometry
IDL	instrument detection limit
lpm	liters per minute
μg	micrograms
$\mu g/m^3$	micrograms per cubic meter
MRL	minimal risk level
N	number of samples
ppm	parts per million
PRL	practical reporting limit
PTA	Pohakuloa Training Area
TSP	total suspended particulate matter
U	uranium
^{238}U	uranium-238 isotope
^{234}U	uranium-234 isotope
^{235}U	uranium-235 isotope
WHO	World Health Organization

INTRODUCTION

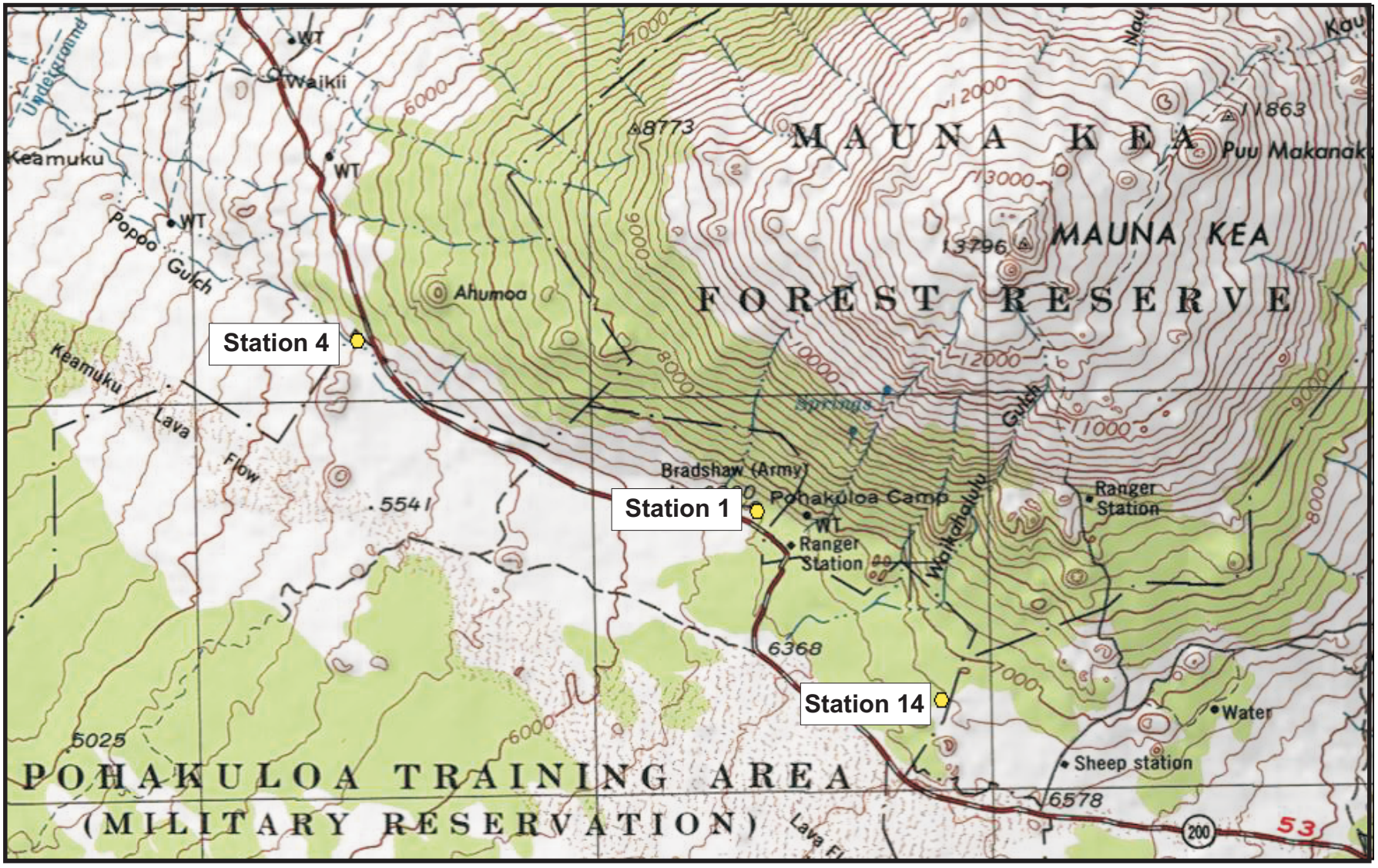
An airborne uranium monitoring project at the U. S. Army's Pohakuloa Training Area (PTA) commenced on 4 February 2009. Portable samplers operating at a nominal 5 liters per minute (lpm) are located at three (3) sites on PTA (Figure 1). The samplers were originally set to collect total suspended particulate matter (TSP) from midnight to midnight on sample days. However, due to the very low uranium content of the TSP samples, the run time was increased to 48 hours on 13 Apr 09 and then to 72 hours on 19 Apr 09 in an effort to raise the collected uranium mass above the practical reporting level (PRL). Since there was no heavy weapons firing activity on PTA ranges in April, EPA's published once-every-six-days schedule was followed with no additional sampling days other than those associated with the 48 and 72-hour runs.

The 47-mm Teflon filters with the collected TSP are sent to laboratories for gravimetric and then uranium analysis. The analysis method for uranium is inductively coupled plasma - mass spectrometry (ICP-MS), a method capable of detecting uranium down to the picogram (10^{-12} gram) level.

Nineteen (19) samples were collected and analyzed during April 2009, and the results are presented herein. This included four (4) co-located duplicate samples which were collected at Sites 1 and 14 during this period; thus, there were actually 15 sample days.

FIGURE 1

MONITORING SITES



RESULTS AND DISCUSSION

The analysis results for each of the three (3) monitoring stations are summarized in Tables 1 and Figures 2 - 4. The figures also indicate the World Health Organization (WHO) and U. S. Agency for Toxic Substances and Disease Registry (ATSDR) guidelines for uranium exposure protection. The WHO guideline is an annual average while the ATSDR guideline is based on chronic exposure (365 days or longer) to highly soluble uranium compounds. It is clear that the uranium concentrations found at PTA in April 2009 are well below both those health guidelines.

TABLE 1

TSP & AIRBORNE URANIUM CONCENTRATIONS
APRIL 2009

Station No.	N	TSP Range ($\mu g/m^3$)	U Range ($\mu g/m^3$)	U Mean ($\mu g/m^3$)	ACTIVITY
1	7	6.1 - 16.3	0.000005 - 0.000018	0.000010	No heavy weapons activity
4	5	7.3 - 12.5	0.000005 - 0.000019	0.000011	No heavy weapons activity
14	7	1.6 - 9.0	0.000005 - 0.000015	0.000009	No heavy weapons activity

As noted in previous reports, the total uranium mass found on each filter was well above, i.e., in this data set 7 to 17 times, the laboratory's instrument detection level (IDL) for the ICP-MS method; however, despite the increased sampling time (72 hours), collected uranium mass remained below the practical reporting level (PRL).

The uranium mass in a few of the 72-hour samples did reach as high as 60 - 76% of the PRL representing a 50% - 90% increase over the previous 24-hour samples which averaged approximately 40% of the PRL. However, that is not the 3-fold increase that might have been expected due to the 3-fold increase in sampling time. This is likely due to the very low concentrations being measured and the uncertainty associated with the analytical method at such low levels.

The fact that the measured uranium values continue to be less than the PRL remains significant from a public health perspective. At a nominal sampler flow rate of 5 lpm, the laboratory's PRL of 0.00025 microgram (µg) corresponds to an airborne uranium concentration of 0.000035 $\mu g/m^3$, a value several orders of magnitude below health effects guidelines. Uranium isotopes ^{234}U and ^{235}U were again undetectable.

The results of co-located duplicate sampling at Stations 1 and 14 are summarized in Table 2 and indicated good agreement given the low concentrations of TSP and uranium being measured.

TABLE 2

CO-LOCATED SAMPLING RESULTS

Date	Station No.	Sampler 1 TSP ($\mu g/^3$)	Sampler 2 TSP ($\mu g/^3$)	Sampler 1 U ($\mu g/^3$)	Sampler 2 U ($\mu g/^3$)
7 Apr 09	1	8.3	7.6	0.000014	0.000013
13 Apr 09	1	6.1	5.2	0.000007	0.000007
7 Apr 09	14	3.0	2.8	0.000015	0.000006
13 Apr 09	14	2.0	1.9	0.000013	0.000008

FIGURE 2

AIRBORNE URANIUM CONCENTRATIONS
STATION 1

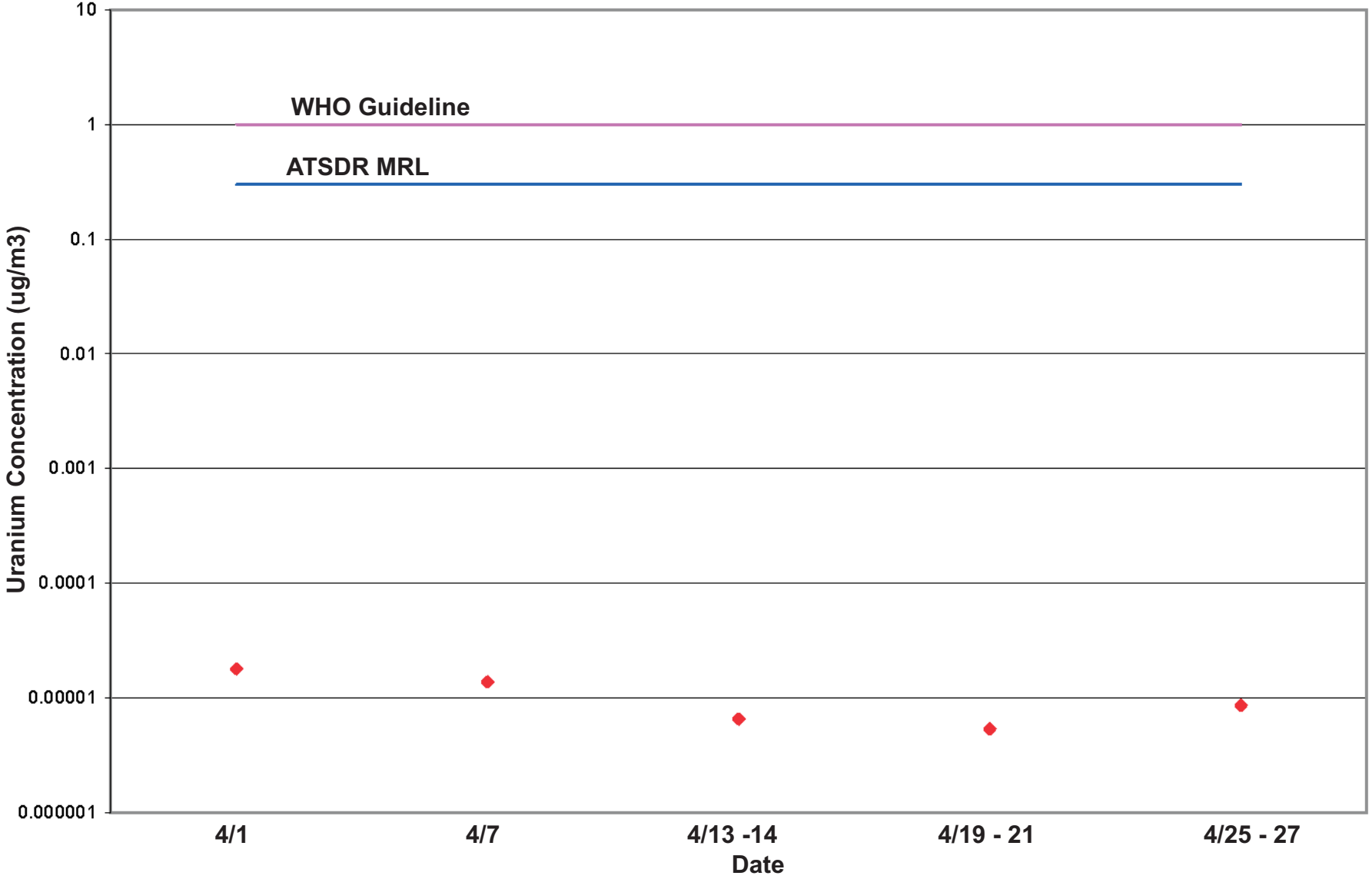


FIGURE 3

AIRBORNE URANIUM CONCENTRATIONS
STATION 4

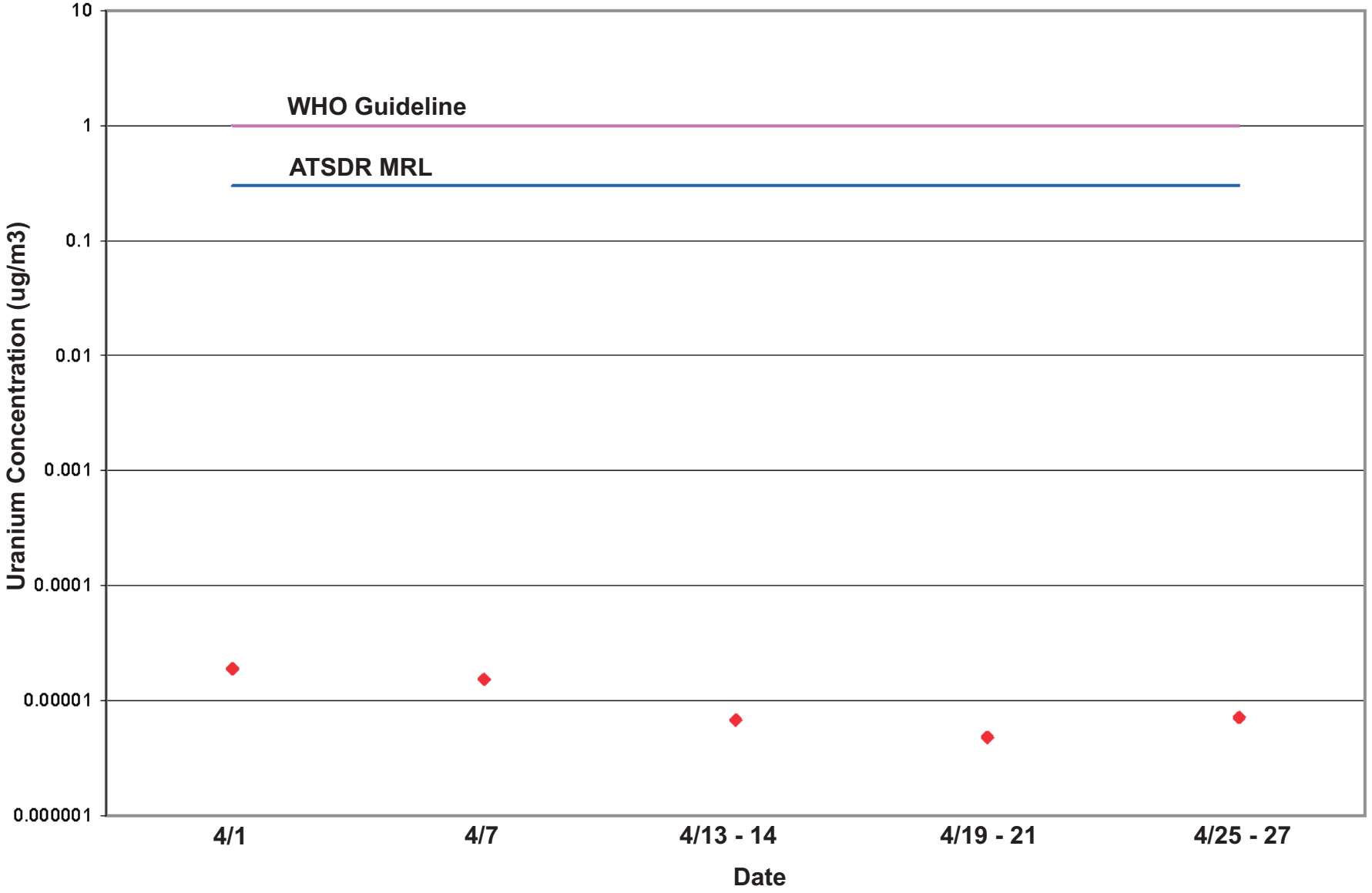


FIGURE 4

AIRBORNE URANIUM CONCENTRATIONS
STATION 14