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Mr. David Cobrain
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive, Building One
Santa Fe, New Mexico 87505

NMED
Hazardous Waste Bureau

RE: Alternative Background Levels for Arsenic at the Fort Wingate Depot Activity (FWDA)

Dear Mr. Cobrain:

Attached please find a draft evaluation and proposal for an alternative approach for evaluating arsenic at the FWDA. The approach uses FWDA-specific data along with U.S. Geological Survey (USGS) data for McKinley County and follows a tiered approach.

If you or any of your staff have questions, please contact me at (801) 451-2864 or via email at paigewalton@msn.com.

Thank you,

Paige Walton
AQS Senior Scientist and Program Manager

Enclosure

cc: Joel Workman, AQS (electronic)

Establishing Background Levels for Arsenic at the Fort Wingate Depot Activity McKinley County, New Mexico

Investigations and correction actions for Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) at the Fort Wingate Depot Activity (FWDA) are conducted under a Resource Conservation and Recovery Act (RCRA) part B permit issued by the State of New Mexico's Environment Department (NMED). A key component of these RCRA investigations is to identify inorganic constituents (e.g., metals) of potential concern (COPCs) in soil to assess those metals which may be present within naturally occurring concentrations or those metals which may be present due to past activities. This assessment is dependent on establishing the concentrations of naturally occurring inorganics in soils and conducting site attribution analyses.

An initial Background Study was performed for the U.S. Army Corps of Engineers (USACE) by Shaw Environmental Inc. (Shaw). This study was completed in 2010, as documented in a report entitled Soil Background Study and Data Evaluation Report of Fort Wingate Depot Activity (Shaw, 2010). The 2010 Background Study included collecting and analyzing surface and 13 subsurface soil samples from soil borings to determine background concentrations of the 14 23-element Target Analyte List (TAL) metals in soil at the FWDA based on ecological zones. The arsenic levels determined in the initial Background Study were used for subsequent comparison to site investigation data. However, problems arose as arsenic values from hundreds of samples from SWMUs and AOCs where arsenic was not expected to be present due to historic activities exceeded the background value (95% upper tolerance level, UTL) established in the 2010 Soil Background Study (following the site attribution methodologies in the NMED Soil Screening Guidance). As there did not appear to be sources for arsenic in the investigation areas, the Army concluded that the arsenic concentrations determined in the 2010 report were not representative of arsenic at the FWDA and were underestimating natural arsenic variability and concentrations.

In order to better define arsenic (and antimony) concentrations in soil, a Phase 2 Soil Background Report at Fort Wingate Depot Activity (FWDA) was undertaken. The results of the Phase 2 Background Report refined the background levels of arsenic. However, FWDA is still having issues with arsenic levels being slightly above background levels for given ecological zones or soil units. In addition, problems have been noted with clean fill from off-site locations not meeting established background concentrations.

The arsenic concentrations in soil may be explained through: 1) natural variation in soils and geology, 2) transport of soils from higher elevations to lower areas through natural weathering and erosion processes, 3) off-site soils being brought in and used as fill, and 4) mixing of soils (surface and subsurface) through construction activities. However, it is also likely that arsenic could be a site contaminant where there are possible historical uses of arsenic such as: 1) heavy use of herbicides and pesticides, 2) buried or stockpiled wood (preservative), 3) lead batteries (Bleiwas, 2000), 4) discarded or destroyed munitions, and 5) as a byproduct from the burning of diesel fuel (or other dunnage).

It is agreed that in cases where site concentrations of arsenic are greater than previously established background values, and there are no possible sources of arsenic, a more flexible approach is required for assessing arsenic in FWDA soils.

Table 1 presents the arsenic results of soil background investigations for the Fort Wingate Army Depot (USACE, 2013).

Dataset	Number of Samples	Minimum (mg/kg)	Maximum (mg/kg)	Mean (mg/kg)	95% UTL (mg/kg)
Full dataset 2009	112	0.2	11.2	1.1	3.7
Full dataset 2012	100	0.8	14	2.3	4.3
Combined 2009 and 2012	212	0.2	14	1.7	3.9

1. mg/kg = milligrams per kilogram.
2. Values taken from Table 4-1 of USACE (2013).
3. USACE (2013) states that the value of 14 mg/kg in the 2012 dataset may be an outlier.

The following data are taken from the United States Geological Survey (USGS) geochemical database found at <http://mrddata.usgs.gov/pluto/soil/>. Data are grouped by county in the state of New Mexico. The samples were collected from surface and/or subsurface soil.

County	Number of Results in Database	Minimum (ppm)	Maximum (ppm)
Catron	2	1.5	4.1
Chaves	2	11	11
Cibola	60	2.2	36
Curry	1	5.5	5.5
De Baca	1	8.9	8.9
Dona Ana	17	4.3	11
Eddy	128	2.6	13
Grant	44	4.6	17
Guadalupe	1	2	2
Harding	4	4.9	7.5
Hidalgo	145	10	14
Lea	3	3.1	4.4
Lincoln	1	2	2
Luna	10	<0.1	<10 (2.78)
McKinley	4	5.6	11
Otero	2	3.9	4.3
Quay	1	3	3
Rio Arriba	8	3.1	11
Roosevelt	1	2.5	2.5

San Juan	149	1	40
San Miguel	1	6.2	6.2
Sandoval	2	6	9.9
Torrance	1	4.33	4.33
Union	4	4.5	7.6
Valencia	2	8.4	13

1. ppm = parts per million
2. Value in parenthesis is the maximum detected concentration.
3. Results with very high detection limits were not included in this summary table (data with detection limits 100 ppm or greater).

While there were only four quantifiable detections of arsenic in McKinley County by the USGS, the results are comparable to the data from the 2010 and 2013 FWDA background reports. The range of arsenic concentrations from the USGS report for McKinley County are 5.6 to 11 ppm (mg/kg) while the range of data for the FWDA are 0.2 to 11.2 mg/kg (the datum of 14 mg/kg is likely an outlier). The minimum detected concentration (5.6 mg/kg) for the USGS data is slightly greater than the UTL derived using FWDA data (depending on the datasets, between 3.7 to 4.3 mg/kg).

In lieu of a traditional site attribution analysis that follows the methodology in the NMED Soil Screening Guidance (NMED, 2012), the following approach will be applied to assessing arsenic in soils at the FWDA. A new background reference value of 5.6 mg/kg has been determined based on evaluation of FWDA and McKinley County data. This new background reference value allows for natural variability of arsenic in soil as well as accounts for fill material from another part of the county being brought in and used at the depot. **Note that this approach is only appropriate if arsenic is not suspected to be site-related for a specific SWMU/AOC and no source(s) for arsenic have been identified through review of site history. If arsenic is suspected to be site related and/or there are possible sources of arsenic, then the traditional site attribution analysis that follows the methodology outlined in the NMED (2012) Soil Screening Guidance and site specific background data presented in USACE (2013) must be applied.**

Step 1. Compare the site (SWMU/AOC) maximum arsenic concentration to the new background reference for arsenic (5.6 mg/kg). If the maximum detected concentration of arsenic from site soil is below 5.6 mg/kg, then no additional action is required and the arsenic may be considered background. If the site maximum is greater than 5.6 mg/kg, proceed to Step 2.

Is Site Max < Background (5.6 mg/kg)? If yes, stop.

Step 2. Compare the range of site (SWMU/AOC) data to the range of background data (0.2 to 11.2 mg/kg). If the site range falls within the background range of arsenic, then no additional action is required and the arsenic may be considered background. If the site range is inconsistent with the background range, then additional investigation and/or correct action may be required.

References

Bleiwas, Donald I., 2000. *Arsenic and Old Waste*. Interagency Working Group of the President's Council of Environmental Quality. February. <http://minerals.usgs.gov/minerals/mflow/d00-0195/>

New Mexico Environment Department (NMED), 2012. *Risk Assessment Guidance for Site Investigations and Remediation*. <http://www.nmenv.state.nm.us/HWB/guidance.html>

Shaw, 2012. *Final Soil Background Study Report, Solid Waste Management Unit 80, Sewage Treatment Plant Sludge Waste Pile (White Sands Missile Range [WSMR]-30), Solid Waste Management Units 12, 14, 16, 17, 21, and 22, Main Post Sites (WSMR-60, WSMR-33, WSMR-79, WSMR-73, WSMR-31, and WSMR-32), and Solid Waste Management Unit 140, Former LC-37 Paint Dump (WSMR-84)*. August.

USACE, 2013. *Final Phase II Soil Background Report*. Fort Wingate Depot Activity, McKinley County, New Mexico. February.

U.S. Geological Survey, 2001. *Geochemistry of soils in the US from the PLUTO database*: U.S. Geological Survey, Reston, VA. <http://mrdata.usgs.gov/pluto/soil/>.