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June 20, 2008

Joseph Gearo, Director
Environmental Programs Office
US Army Dugway Proving Ground
Dugway, Utah 84022-5000

Subject: Draft Phase II RCRA Facility Investigation (RFI) Report &
Corrective Measures Study (CMS) Workplan
Solid Waste Management Unit (SWMU) 11

Dear Mr. Gearo:

We have completed a review of the above referenced document and comments are enclosed. SWMU 11 is located on the north east side of Granite Mountain and was used for burning of propellant containing beryllium, disposal of propellant residues and disposal of radiological wastes. SWMU 11 includes six disposal trenches. Four trenches were used for burning and disposal of propellant and the other two trenches were used for disposal of radiological waste and possibly for burning of waste.

Soil and waste samples collected from the four propellant related trenches included six surface soil samples, 30 subsurface soil/waste samples and a few waste samples. The propellant trench soils appear to have been adequately investigated and sampled to define the nature and extent of contamination for risk assessment and soil to groundwater modeling, but additional surface soil samples may be needed during the Corrective Measures Implementation (CMI). Although not addressed in the RFI report, a groundwater monitoring well was recently installed immediately downgradient of the propellant trenches. Preliminary groundwater results did not indicate volatile organic (VOC) or perchlorate contamination.

The sample results for the propellant related trenches show the concentrations of arsenic and beryllium in soil and waste exceed the industrial risk use values defined in R315-101, and a removal action is proposed. Dioxin is also present in the subsurface soil samples at concentrations above residential risk use values. The Division concurs with the proposal to remove contamination in the four propellant related trenches, but any issues about the need to manage the waste as mixed waste must be resolved before excavation starts.

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The two trenches containing radiological waste were not sampled for chemical contamination. Because these two trenches have not been characterized and radiation hazards exist, risks related to the radiological trenches are assumed to be unacceptable, and remedial action (removal or geosyntheic clay liner cover) is proposed for these two trenches. The Division generally concurs with this approach, but notes the enclosed comments from TechLaw Inc., about radiation sampling and radiation risk standards. The Division prefers not to make a final decision about remedial action for these two trenches until all requirements of the Nuclear Regulatory Commission (NRC) are clearly addressed and the NRC concurs the site has been adequately characterized and sampled for radiological contamination. The Division also notes the CMS Workplan includes a corrective action objective for satisfying NRC closure requirements. The NRC contact for this site is Janine F. Katanic, PhD at (817) 860-8151.

If you have any questions, please contact David Larsen of my staff at (801) 538-6710.

Sincerely,

Dennis R. Downs, Director
Utah Division of Solid and Hazardous Waste

DRD/dcl/kk

Enclosure

c: Brad Wright, US Army Environmental Center
Myron Bateman, EHS, MPA, Health Officer, Tooele County Health Department
Mark Sydow, US Army Corps of Engineers
Noreen Okubo, US Environmental Protection Agency, Region VIII
Janine Katanic, PhD, Nuclear Regulatory Commission, Region IV
Steve Glaser, TechLaw

Utah Division of Solid and Hazardous Waste Comments
Phase II RCRA Facility Investigation (RFI) Report &
Corrective Measures Study (CMS) Workplan
Solid Waste Management Unit (SWMU) 11

1. Please provide a complete history regarding the sources of radiation. Please also provide a complete review of the licensing and other information referenced on pages 4-17 and 4-20 and rewrite Section 1.2 as needed. In addition, the existence of any classified information related to use and disposal of the waste at this site must be disclosed.

2. It is concluded that none of the chemicals detected in surface soil exceeded background values or EPA preliminary remediation goals (PRGs). Please modify Sections 2.2.3.2, 2.2.3.3 and 2.3 as needed and indicate why it is believed the dioxin samples represent worst case sample locations. If dioxin is produced by burning, could dioxin concentrations be higher in surface soils located outside the trenches? The trenches appear to have been covered with soil after the burns.

3. Please modify Sections 2.2.3.3 and 2.3 and indicate the concentrations of beryllium in TR1-3 exceed the residential and industrial PRGs. The concentrations of beryllium, benzene and chromium also exceed default soil screen levels.

4. Please modify Sections 2.2.3.3 and 2.3 and generally address the vertical extent of contamination. Based on the sample data present in Figure 2.3, it appears beryllium and other chemical concentrations decrease rapidly with depth, but it does not appear the vertical extent of dioxin contamination has been completely defined. It also appears volatile organics have migrated from the waste into the soil. If a removal is the preferred remedial alternative, the Division believes confirmation samples will be needed following excavation of the waste and contaminated soil.

5. The detection of dioxin in EP15 from TR-6 appears to indicate waste was burned. Please modify the document as needed.

6. Was any waste removed from TR-6? Please modify Section 2.1.2.2 as needed. This section should also indicate a soil sample was collected at 9.5 to 10.5 feet in TR6 (base of the trench in native soil).

7. Please modify Section 2.2.3.4 on page 2-42, *Conclusions of the Radiological Survey*, and address the metal tubes. The text on page 2-37 includes the following statement, "and it is suspected that the source may be encased in the white, wax-like material inside the tubes." Can the tubes be removed from the site? See Comment 1 above.

8. Please modify the text and include information about the recently installed groundwater monitoring well. VOCs and perchlorate were not detected in groundwater samples collected by the Division.

9. Please modify corrective action objective (CAO) 2 (page 4-6) as needed following input from the NRC.

10. Please modify the CMS workplan and address the radioactive waste in more detail. Is this classified as mixed waste? Can the waste be removed and disposed?

TECHLAW REVIEW OF DRAFT FINAL PHASE II
RCRA FACILITY INVESTIGATION REPORT SWMU 11 ADDENDUM

General Comments:

1. There is a question of whether sufficient surface soil characterization has been conducted. While six samples are listed as such, four of these samples are from the bottom of trenches. The concern is that during the burning of propellant, beryllium could have been distributed over an area as part of the soot (note that the maximum beryllium concentration of 24,000 mg/kg is greater than that indicated by the historical record. If there were 300 pounds of beryllium out of 50,000 pounds of propellant, that would mean that the starting beryllium concentration was only 6,000 ppm). Please either justify why such samples are not necessary, or collect additional surface soil samples for beryllium.

2. While 25 mrem/year is a release criterion under Nuclear Regulatory Commission (NRC) guidance, in order to comply with UAC R315-101, it is also necessary to demonstrate that releases to soil do not pose a cancer risk in excess of 1×10^{-4}, and that they do not pose significant ecological risks. The RFI should be revised to demonstrate compliance with DSHW as well as NRC regulations. The NRC criterion is acceptable for evaluating wipe sample data.

3. The Phase II RCRA Facility Investigation Report (Report) states that the primary constituents of concern for the radiological survey were reported to be tritium (H-3) and Carbon-14 (C-14) but that these constituents are not expected to persist in the environment. This assertion is not fully justified by statements provided in the Report and are not supported through the collection of representative sampling and analysis for these radioisotopes (see Section F.2.3). As such, it appears that a data gap exists for H-3 and C-14 based on the following insufficiency of information/data:

- It is unclear what matrices the C-14 was contained in as a result of operations at Dugway; therefore information pertaining to the persistence or environmental fate and transport of C-14 can not be evaluated. Section F.2.1 (Radionuclides of Concern) of Appendix F states on page F-4 that C-14 sources may form carbon dioxide (CO2) and be prone to evaporation and dispersion. However, since the C-14 source would presumably be buried, atmospheric or water vapor flux which might affect formation of CO2 would not be assumed to significantly affect the amount of C-14 in buried waste forms. C-14 has a long half life at approximately 5,730 years and therefore without significant dispersion of C-14, sources of this isotope would still persist based on the decay rate.

- H-3 is known to have a shorter half life of around 12.3 years and is most often associated with water vapor. Therefore, it is understood that sources of tritium would largely have decayed and/or evaporated in the dry, arid environment at the Dugway Proving Grounds. However, since it does not appear that data was collected to support the conclusion that tritium is no longer of concern (with the exception of the CONEX container), and process history and/or waste disposal records are not available to confirm the amounts of tritium that may have been buried at the solid Waste Management Unit (SWMU) 11, it still remains questionable as to whether tritium is still present in subsurface locations.

  It should also be noted that tritium may become organically bound in plant and other organic matter. Additionally, while it appears unlikely that tritium may have migrated to groundwater given the long distance to the water table noted for this area, tritium is highly mobile in the environment and it is conceivable that significant sources of tritium could impact groundwater. Also, Section 2.2.4 (Evaluation of Surface Water and Groundwater Analyses) states potential future impacts to groundwater were evaluated based on soil-to-groundwater screening using

results from soil samples collected at SWMU-11; however, samples collected at SWMU-11 were not analyzed for tritium. Therefore, additional justification for excluding tritium analyses should be provided or soil and/or groundwater samples should be collected for the analysis of tritium.

In accordance with requirements to define the nature and extent of contamination, the RFI Report should be revised to provide further justification for excluding analyses of H-3 and C-14. Alternatively, further sampling of one or more soil and groundwater samples in representative areas should be considered to confirm the stated assumptions regarding the absence of H-3 and C-14 at the SWMU 11 area.

Specific Comments:

1. Page 2-2, Line 28. The sentence should say "versus" rather than "verses."

2. Page 2-15, Line 1. It is unclear why groundwater at SWMU 11 is thought to be comparable to that in WW10, given the previous statement that this SWMU is in a zone of local recharge where groundwater is expected to be of higher quality than on the basin floor.

3. Page 2-33, Line 4. No evidence has been given that the surface soil samples were collected from biased worst-case locations, given that they were all collected from areas where no staining, waste, or other evidence of contamination was observed. Please provide the rationale for surface soil samples being from biased worst-case locations, and that the small number of samples could adequately characterize surface soil contamination at this site.

4. Page 2-34, Line 21 states "Other radionuclides of concern based on possible DPG usage were Cobalt-60 (Co-60) and Radium-226 (Ra-226)." However, based on a cursory review of Attachment F-1, Available Dugway Proving Ground Historical Information, it appears NRC issued radioactive material licenses for other radioisotopes, including but not limited to Phosphorus-32 (P-32), Nickel-63 (Ni-63), Americium-241 (Am-241), Cesium-137 (Cs-137), Strontium-90 (Sr-90), and enriched Uranium (enriched U). As such, this statement should be revised to list other radioisotopes known to be used at Dugway, and/or determined to be present based on the radiological survey and analytical data collection.

5. Page 3-31, Line 18. This sentence contains an extra period.

6. Page 3-37, Line 26. The word "slightly" should be deleted. A hazard index of 6 is not "slightly" above 1 any more than a hazard index of 0.17 is slightly less than 1. This comment also applies to Page 3-41, Line 24.

7. Page 3-59, Line 6. This analysis should included uncertainties associated with the exposure parameters and modeling used in the human health risk assessment.

8. Page 3-60, Line 19. The derivation of the toxicity values used for chromium should be shown in this section.

9. Figure 3.1. The conceptual site model should include external radiation.

10. Table 3.3. The toxicity values for cadmium are those that are reached by following the normal toxicity hierarchy, and cadmium should not be footnoted to indicate otherwise. This comment also applies to Tables 3.5, 3.8, and D.11.

11. Table 3.4. This evaluation of soil-to-groundwater impacts effectively examines potential hot spots, where the highest individual constituent concentrations were detected. Also necessary is an evaluation of

whether average constituent concentrations that would be found in multiple burial trenches that are contiguous or nearly contiguous (with a larger area and thus a lower dilution factor) could pose a risk to groundwater.

12. Table 3.7. The indoor air exchange rate of 0.83 per hour is not adequately supported. The ASTM standard presents this as a nominal value for example purposes only, and referencing the standard is not adequate justification for its use.

13. Table 3.9. The total risks for the non-intrusive, non-intrusive remote, and intrusive workers should be presented, summing the results with the indoor air risks. This is necessary because the exposure pathway evaluation indicated outdoor air risks would not be calculated for these receptors, as they would be bounded by the indoor air pathway results.

14. Page D-9, Line 12. While the maximum selenium concentration in mixed soil is less than its background threshold, this metal was detected much more frequently at SWMU 11 than in background (47% versus 7%). Justify why this much higher frequency of detection does not indicate that selenium is a SWMU 11 contaminant. This comment also applies to subsurface soil.

15. Table D.11. It is unclear why an SSL is not calculated for lead. The 400 mg/kg concentration referenced in this table is for protection of children ingesting soil, not for protecting groundwater.

16. Table D.11. The table does not indicate which congener was used for deriving the SSL for the 2,3,7,8-TCDD TEQ. There is a great deal of variability in the parameters of the different dioxins and furans. Use of a single set of fate and transport parameters is acceptable if these are shown to be conservative for the mixture that is present at SWMU 11. This comment also applies to Tables E.ERA.5 and E.ERA.6.

17. Tables E.HRA.8 through E.HRA.10. For the intrusive worker, the exposure frequency should be 125 days per year, the exposure duration should be 0.5 years, and the non-carcinogenic averaging time should 183 days (0.5 years).

18. Table E.HRA.9. Nitroglycerin should be treated as an SVOC for purposes of assigning a dermal absorption factor (DAF). Thus, it should be given a DAF of 0.1.

19. Table E.HRA.10. The particulate emission factor for intrusive work should account for construction-related dust in addition to wind-generated dust.

20. Tables E.ERA.5 and E.ERA.6. The text should explain why surface soil concentrations were used for invertebrates whereas mixed soil concentrations were used for plants.

21. Page F-4, Section F.2.2. As indicated in General Comment 2, the 25 mrem/year NRC limit is not accepted by DSHW as a standard for no further action, or for site management not requiring corrective action. With respect to ecological risks, further elaboration must be provided in this document demonstrating that the screening levels of 10 mGy/day and 1 mGy/day for terrestrial plants and animals meet the same standards as toxicity reference values for chemical constituents, and also show the assumptions used in relating an exposure in mrem/yr to a biologically effective dose.

22. Page F-6, 1st Paragraph. As indicated in General Comment 2, the 25 mrem/year NRC limit is not accepted by DSHW as a standard for no further action, or for site management not requiring corrective action with respect to soil However, in evaluating potential cancer risks, it is not necessary to assume that the SWMU becomes a farm in the future. It will be sufficient to evaluate the same exposure pathways,

plus external radiation, as for chemical constituents. The model RESRAD (developed by Argonne National Laboratory) is a simple way to assess potential human health risks.

23. Page F-7, last paragraph of Section F.2.4. The text states, "After completion of the radiological surveys, TR-4 and additional surveyed land area to the west (including the areas designated as TR-5 and TR-6) were grouped as a single Class 2 survey unit." Since a Class 1 survey unit is defined as an area that has the potential for radioactive contamination based on site operating history or radiological surveys, it is unclear why TR-4, TR-5, and TR-6 were grouped into a single Class 2 survey unit rather than a Class 1 survey unit given that the results of the radiological survey confirmed the presence of radioactivity in TR-5 and TR-6 and signage was present at TR-4 indicating the presence of contaminated material. Further, it is unclear what impact the Class 2 designation had on further investigation (trenching and material sample collection), or what impact this designation will have on future investigations in these areas (presumably greater sample density). Section F.3.4.1 (Summary of Survey Activities) states that the survey grid established for TR-4 was extended and that survey grids F-B3 and F-A3 were further divided into 2 x 2 meter increments; however, no further explanation is provided as to how the entire Class 2 area was surveyed in accordance with MARSSIM guidance. The text should be revised to further justify the chosen Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) class for these areas and to explain what impact this had or will have on radiological data collection at these areas.

24. Page F-11, 1st Full Paragraph. Please provide further description of the soil sampling locations. It is unclear if the "surface" soil samples from the bottom of the trenches are from the bottom of the trenches as they were encountered at the beginning of the RFI investigation, or after trenching was performed as part of the Phase II investigation. Please demonstrate how the sampling would account for migration of the radionuclides and their decay products. What is the potential for erosion and/or dust deposition to have covered over soil to which there was a release of radioactive material? Additionally, radioisotopes with primarily alpha and/or beta emissions may not be detected by surface scans due to the low energy of particles emitted with this type of radiation (such as C-14, Ra-226, H-3, Sr-90). Therefore, it is unclear how samples collected from only the top six inches of soil may be considered representative of subsurface conditions. The concern is whether the investigation was sufficient to identify any releases of radioactive material to subsurface soil.

25. Page F-12, Section F.2.8. The Compliance Approach is designed to meet NRC requirements. An additional background analysis should be performed in the same manner as chemical constituents. For areas where survey measurements show no indication of a release of radioactive constituents and where the sampling methodology and locations are such that any release would be detected, further evaluation is not necessary to comply with UAC R315-101.

26. Page F-13, Line 1. It is stated that 2x2 NaI and FIDLER data were compared to the appropriate background data set. However, the Report does not state whether surface survey data were compared to surface background samples or were compared to background data collected from the surface and subsurface. It appears that survey data were compared to a background data set that averaged surface and subsurface results. The Report should provide justification for such an approach. Alternatively, use of a separate background data set for the surface (0 – 1.75 feet) and subsurface (1.75 – 8 feet) should be considered as it appears there are noticeable and probably statistically significant differences in the two background data sets which most likely should be defined as separate populations. This is primarily due to elevated levels of Cs-137 on surface soils from atmospheric fallout, and the differences in the presence of rock and mineral composition (and therefore radionuclide composition) of different layers of soils. Background data sets may also be determined by the presence of rock outcrops as noted in Section F.3.1 (summary of SWMU-11 Background Area Results) on page F-13. As such, the Report should consider defining background data sets by depth and location and comparing the background populations to the corresponding geographical location of radiological data sets.

27. Page F-17, last sentence of Section F.3.2.3. It is stated that small hotspots do not by themselves constitute a failure of the NRC release criterion and USNRC guidance allows release of a survey unit even if small hotspots are identified. Further, the RFI states "[O]n that basis, trenches TR-1, TR-2, and TR-3 meet the release criteria and are suitable for unrestricted use." However, screening values used in the radiological survey design of this RFI assumed an industrial use setting and therefore used screening values based on the industrial use rather than residential use (see Page F-5). As such, radiological survey instrumentation and the survey design were developed to demonstrate compliance with industrial screening levels, not residential and therefore may not have been sufficient to demonstrate compliance with residential screening levels in accordance with an 'unrestricted release' condition. As such, the Report should either be revised to demonstrate that the survey instrumentation and survey design were such that survey instrumentation MDCs and count times were sufficient to demonstrate compliance with residential screening levels, or the statement on page F-17 regarding conclusions for the Open Trenches should be revised to indicate the NRC release criteria for an industrial setting was achieved. Additionally, according to NRC regulation 10 CFR Section 20.1402, a site must be able to demonstrate that the critical group exposure does not exceed a Total Effective Dose Equivalent (TEDE) of 25 mrem and must be determined to have radioactivity at levels that are as low as reasonably achievable (ALARA). Further, the term 'unrestricted use' implies land use controls are not required and all residential uses are acceptable, which does not appear to be the case for the SWMU-11 area. It does not appear the survey design and analytical data collection were sufficient to quantify all radionuclides (see comment 3) and did not appear to adequately characterize subsurface conditions (see comment 24); therefore, it is unclear how the resulting data demonstrate these principals and support a conclusion of "unrestricted use." Note that this comment is made in regards to compliance with NRC criteria only.

28. Page F-21, 3rd Paragraph. The histograms in Attachment F-10 comparing the survey data without grids F-A3 and F-B3 to background are distinctly right-shifted rather than left-shifted. Additionally the NaI background data do not appear to be normally distributed.

29. Figures F.3.8.b through F.3.12 were omitted from the document.