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Responses to Colorado Department of Public Health and Environment Comments on the CDPHE Conservative Screen Letter Report for OU 3

1.0 Introduction

This document provides additional responses to formal comments from the Colorado Department of Public Health and Environment (CDPHE) regarding the CDPHE Conservative Screen Letter Report for Operable Unit No 3 (OU 3), Rocky Flats Environmental Technology Site (the Site) These responses were prepared based on discussions at a meeting involving CDPHE, the U S Environmental Protection Agency (EPA), and the U S Department of Energy (DOE) held April 25, 1995 at the Site At the meeting, formal comments on the CDPHE Conservative Screen for OU 3 submitted by CDPHE were reviewed and additional analysis of the OU 3 data sets was requested by CDPHE Specifically, CDPHE requested that the subsurface soil and subsurface sediment (Standley Lake and Mower Reservoir) data sets be evaluated in the CDPHE Conservative Screen This document describes the additional data analysis steps that were agreed to by CDPHE, EPA, and DOE (see Attachment 1, DOE letter outlining data analysis steps) and the results of the analyses Also, Table 2-1 from the CDPHE Conservative Screen Letter Report was corrected to indicate that all OU 3 data sets resulting from the Resource Conservation and Recovery Act (RCRA) Facility Investigation/Remedial Investigation (RFI/RI) sampling program were evaluated in the CDPHE Conservative Screen (Attachment 2)

2.0 Subsurface Soil

Additional analysis required: Clarify that subsurface soil (trench) data were considered in the CDPHE Conservative Screen; verify that maximum activities for ^{241}Am and $^{239/240}$Pu are in surface soil, and that activities for uranium isotopes are at background levels.

Results:

Clarify that subsurface soil (trench) data were considered in the CDPHE Conservative Screen. Activities of radionuclides in OU 3 subsurface soil were compared to activities in background soil samples using the statistical methodology for OU-to-background comparisons (agreed to by CDPHE, EPA, and DOE) based on site-specific guidance developed by Gilbert (1993) OU 3 RFI/RI subsurface soil data (i e , trench sample results) and background soil data from the Rock Creek area (DOE, 1993) were used for the statistical comparisons

Verify that maximum activities for ^{241}Am and $^{239/240}$Pu are in surface soil. The statistical results indicate that activities of ^{241}Am and $^{239/240}$Pu in OU 3 subsurface soil are significantly different than background by more than one statistical test (Tables 1 and 2) Levels of ^{241}Am and $^{239/240}$Pu in surface soil were also significantly different than background, according to the statistical comparison tests (see Appendix B in <u>Technical Memorandum No. 4, Human Health Risk Assessment Chemicals of Concern Identification, Operable Unit 3</u> [TM 4] [DOE, 1994] for table of statistical results) Based on these results, ^{241}Am and $^{239/240}$Pu are considered potential chemicals of concern (PCOCs) in soil for the CDPHE Conservative Screen Because the maximum values for these two analytes were found in surface soil samples (Table 3), the surface soil data were used to define areas of concern (AOCs) for the CDPHE Conservative Screen Note Maximum activities of ^{241}Am and $^{239/240}$Pu in subsurface soil do not exceed the preliminary remediation goals (PRGs) (maximum ^{241}Am activity = 0 27 picocuries per gram [pCi/g], PRG for ^{241}Am = 2 37 pCi/g, maximum $^{239/240}$Pu activity = 1 59 pCi/g, PRG for $^{239/240}$Pu = 3 43 pCi/g)

Verify that activities for uranium isotopes are at background levels. Four of the five statistical comparison tests indicate that the levels of uranium isotopes in OU 3 subsurface soil are not significantly different than background levels (Tables 1 and 2) Results of one test, the Upper Tolerance Limit (UTL) test (also referred to as the Hot-Measurement test) indicate that the uranium isotopes may be PCOCs However, after further analysis of the levels and spatial distribution of uranium activities in subsurface soil, the uranium isotopes were eliminated as PCOCs This analysis is presented in detail in the following paragraphs

Only four samples in two of the trenches have activities of uranium that exceed UTLs for background soil Trench TR03492, located in the southern parcel of the Jefferson County Remedy Acres, has one UTL exceedance for ^{235}U at a depth of 6 inches The ^{235}U activity for this sample is 0 26 pCi/g and the UTL for ^{235}U is 0 199 pCi/g Trench TR03692, located directly north of the southern parcel of the Jefferson County Remedy Acres and west of Mower Reservoir, has exceedances of the UTLs for $^{233/234}U$ at a depth of 3 inches, ^{235}U at a depth of 96 inches, and ^{238}U at a depth of 3 inches Table 4 summarizes the activities and the UTLs for the uranium isotopes for the four samples where UTLs are exceeded

Figures 1 and 2 show radionuclide activities with depth for the soil trenches TR03492 and TR03692 Activities for ^{241}Am and $^{239/240}Pu$ are greatest at the surface, with activities decreasing with depth to less than 0 01 pCi/g for ^{241}Am and 0 10 pCi/g for $^{239/240}Pu$ at a depth of about 10 centimeters These subsurface soil depth profiles indicate that the presence of ^{241}Am and $^{239/240}Pu$ in OU 3 soil is the result of windblown deposition Activities of the uranium isotopes show a different pattern, with levels of activities of $^{233/234}U$, ^{235}U, and ^{238}U varying over the entire depth of the trench samples at one location The distribution of activities with depth for the uranium isotopes indicates variability associated with background conditions rather than wind-blown contamination from the Site (Note The majority of the uranium data for TR03492 were rejected by the independent data validators These rejected data for TR03492 appear to follow the same pattern as TR03692 so they are included to show the complete depth profile) Based on the analysis of levels and patterns of uranium activities in subsurface soil, $^{233/234}U$, ^{235}U, and ^{238}U were not retained as PCOCs for the CDPHE Conservative Screen These analytes were also eliminated as PCOCs for soil based on analysis of the surface soil data set (see Section 2 3 1 of the CDPHE Letter Report for OU 3, September 23, 1994)

3.0 Subsurface Sediments–Radionuclides

Additional analysis required: Carry the maximum values for ^{241}Am and $^{239/240}$Pu through the CDPHE Conservative Screen for Standley Lake (IHSS 201) and Mower Reservoir (IHSS 202). These values may be in surface or subsurface sediments. Although background comparisons for these two analytes indicate they are not PCOCs for IHSSs 201 and 202, CDPHE requested they be carried through the screen because $^{239/240}$Pu is a site-related contaminant and ^{241}Am is a decay product of plutonium.

Results: Table 5 presents the chemical-specific Risk-Based Concentration (RBC) ratios for ^{241}Am and $^{239/240}$Pu, and Ratio Sums for IHSSs 201 and 202 For ^{241}Am and $^{239/240}$Pu, maximum sediment activities were used to calculate the RBC ratios Maximum values for ^{241}Am and $^{239/240}$Pu in both IHSSs were measured in subsurface sediment samples None of the chemical-specific RBC ratios or RBC Ratio Sums exceed 1

4.0 Subsurface Sediments–Metals

Additional analysis required: Evaluate metal PCOCs for Standley Lake (IHSS 201) and Mower Reservoir (IHSS 202) based on the two steps described below. Only metal analytes with maximum concentrations in subsurface sediments greater than maximum concentrations in surface sediments need to be included in the analysis. Any PCOCs remaining after Steps 1 and 2 will be carried through the remainder of the CDPHE Conservative Screen.

Step 1. Compare the mean and maximum concentrations of metals in OU 3 subsurface sediments, by IHSS, to the upper-bound value (i.e., mean plus two standard deviations) and maximum concentrations of metals in background stream sediments as reported in the Background Geochemical Characterization Report (DOE, 1993). Analytes with OU 3 mean and maximum concentrations greater than upper-bound value and maximum background concentrations, respectively, will be carried through to Step 2. In addition, include any metal analytes identified as chemicals of concern (COCs) for OU 5, with the exception of those associated with the south interceptor ditch (SID), in Step 2.

Step 2. Perform a spatial analysis for each metal analyte identified in Step 1. The spatial analysis will be presented on an 11 x 17 inch map that shows concentrations of metal analytes over the entire Site, including OU 3. Any metals that do not appear to be Site-related will be eliminated as PCOCs.

Results. Based on Steps 1 and 2 described above, all metals were eliminated as PCOCs for Standley Lake (IHSS 201) and Mower Reservoir (IHSS 202) subsurface sediments Step 1 eliminated all metals except arsenic, cadmium, copper, lead, nickel, potassium, and zinc for Standley Lake and potassium for Mower Reservoir These analytes were carried through to Step 2 where they were eliminated through spatial analysis The only metals identified as COCs for OU 5 (i e , copper, mercury, and zinc) were associated with the SID, so these metals were not included in Step 2

Tables 6 and 7 present the data used to perform the subsurface to surface maximum concentration comparisons for IHSSs 201 and 202, respectively The tables also present the background stream sediment data used to perform Step 1

Tables 8 (IHSS 201) and 9 (IHSS 202) summarize the results of the two data analysis steps used to identify PCOCs The first column indicates metals eliminated as PCOCs because they were not detected in any subsurface sediment samples The second column of each table presents metal analytes eliminated as PCOCs in subsurface sediments based on the comparison of maximum concentrations in subsurface and surface sediment samples (i e , maximum concentrations for these analytes were detected in surface sediment samples) Column 3 of each table presents metal analytes eliminated as PCOCs based on the comparison of OU 3 subsurface sediment concentrations to background stream sediment concentrations (i e , OU 3 mean and maximum concentrations were less than background upper-bound mean and maximum values, respectively) Column 4 presents metal analytes eliminated as PCOCs based on the spatial analysis or identification as an essential human nutrient

The following paragraphs describe the data analysis steps for each metal analyte in subsurface sediments for Standley Lake (IHSS 201) and Mower Reservoir (IHSS 202)

Aluminum: Aluminum was not considered a PCOC for Standley Lake (IHSS 201) because the subsurface maximum concentration (20,700 mg/kg) was less than the surface maximum concentration (23,500 mg/kg) Aluminum was eliminated as a PCOC in Mower Reservoir

(IHSS 202) because the subsurface mean (13,400 mg/kg) was less than the upper-bound background value (15,713 mg/kg) and the subsurface maximum value (19,500 mg/kg) was less than the background maximum value (25,200 mg/kg)

Antimony: Antimony was eliminated as a PCOC for Standley Lake (IHSS 201) because the subsurface mean (3 96 mg/kg) was less than the upper-bound background value (8 75 mg/kg) and the subsurface maximum (8 2 mg/kg) was less than the background maximum value (12 4 mg/kg) Antimony was not considered as a PCOC for Mower Reservoir (IHSS 202) because it was not detected in any of the three subsurface sediment samples that were analyzed for antimony

Arsenic: Arsenic was not eliminated as a PCOC for Standley Lake (IHSS 201) by Step 1, it was retained for Step 2 (spatial analysis) Arsenic was eliminated as a PCOC for Mower Reservoir (IHSS 202) because the subsurface maximum (8 9 mg/kg) was less than the surface-maximum concentration (10 4 mg/kg)

Barium: Barium was eliminated as a PCOC for Standley Lake (IHSS 201) because the subsurface mean (177 mg/kg) was less than the upper-bound background value (mean plus two standard deviations, 190 mg/kg) and the subsurface maximum concentration (250 mg/kg) was less than the background maximum concentration (244 mg/kg) Barium was not considered as a PCOC for Mower Reservoir (IHSS 202) because the subsurface maximum concentration (246 mg/kg) was less than the surface maximum concentration (250 mg/kg)

Beryllium: Beryllium was not considered as a PCOC for Standley Lake (IHSS 201) because the subsurface maximum concentration (1 6 mg/kg) was equal to the surface maximum concentration (1 6 mg/kg) Beryllium was not considered as a PCOC for Mower Reservoir (IHSS 202) because the subsurface maximum concentration (1 5 mg/kg) was equal to the surface maximum concentration (1 5 mg/kg)

Cadmium: Cadmium was not eliminated as a PCOC for Standley Lake (IHSS 201) by Step 1, it was retained for Step 2 (spatial analysis) Cadmium was not considered as a PCOC for Mower Reservoir (IHSS 202) because it was not detected in any of the 22 subsurface samples that were analyzed for cadmium

Calcium: Calcium was not considered as a PCOC for Standley Lake (IHSS 201) because the subsurface maximum concentration (10,300 mg/kg) was less than the surface maximum concentration (90,100 mg/kg) Calcium was not considered as a PCOC for Mower Reservoir (IHSS 202) because the subsurface maximum value (29,100 mg/kg) was less than the surface maximum concentration (42,000 mg/kg)

Cesium: Cesium was eliminated as a PCOC for Standley Lake (IHSS 201) because the subsurface mean (19 2 mg/kg) was less than the background mean (69 29 mg/kg) and the subsurface maximum concentration (40 6 mg/kg) was less than the background maximum concentration (157 mg/kg) Cesium was not considered as a PCOC for Mower Reservoir (IHSS 202) because it was not detected in any of the 22 subsurface sediment samples analyzed for cesium

Chromium: Chromium was eliminated as a PCOC for Standley Lake (IHSS 201) because the subsurface mean (19 6 mg/kg) was less than the upper-bound value (mean plus two standard deviations, 22 97 mg/kg) Chromium was not considered as a PCOC for Mower Reservoir (IHSS 202) because the subsurface maximum value (20 6 mg/kg) was less than the surface maximum concentration (22 1 mg/kg)

Cobalt: Cobalt was eliminated as a PCOC for Standley Lake (IHSS 201) because the subsurface mean (10 6 mg/kg) was less than the upper-bound value (mean plus two standard deviations, 11 62 mg/kg) Cobalt was not considered as a PCOC for Mower Reservoir (IHSS 202) because the subsurface maximum value (10 mg/kg) was less than the surface maximum concentration (15 3 mg/kg)

Copper: Copper was not eliminated as a PCOC for Standley Lake (IHSS 201) by Step 1, it was retained for Step 2 (spatial analysis) Copper was eliminated as a PCOC for Mower

Reservoir (IHSS 202) because the subsurface mean (25 5 mg/kg) was less than the upper-bound background value (mean plus two standard deviations, 25 87 mg/kg)

Iron: Iron was eliminated as a PCOC for Standley Lake (IHSS 201) because the subsurface mean (21,900 mg/kg) was approximately equal to the upper-bound value (mean plus two standard deviations, 21,379 mg/kg) and the subsurface maximum concentration (31,400 mg/kg) was equal to the background maximum concentration (31,400 mg/kg) Iron was not considered as a PCOC for Mower Reservoir (IHSS 202) because the subsurface maximum value (23,200 mg/kg) was less than the surface maximum concentration (48,000 mg/kg)

Lead: Lead was not eliminated as a PCOC for Standley Lake (IHSS 201) by Step 1, it was retained for Step 2 (spatial analysis) Lead was eliminated as a PCOC for Mower Reservoir (IHSS 202) because the subsurface mean (28 3 mg/kg) was less than the upper-bound background value (mean plus two standard deviations, 95 6 mg/kg) and the subsurface maximum (50 1 mg/kg) was less than the background maximum concentration (244 mg/kg)

Lithium: Lithium was not considered as a PCOC for Standley Lake (IHSS 201) because the subsurface maximum concentration (17 mg/kg) was equal to the surface maximum concentration (17 1 mg/kg) Lithium was eliminated as a PCOC for Mower Reservoir (IHSS 202) because the subsurface mean (11 9 mg/kg) was less than the upper-bound background value (mean plus two standard deviations, 18 mg/kg) and the subsurface maximum (18 5 mg/kg) was less than the background maximum concentration (20 2 mg/kg)

Magnesium: Magnesium was not considered as a PCOC for Standley Lake (IHSS 201) because the subsurface maximum concentration (5,020 mg/kg) was less than the surface maximum concentration (6,430 mg/kg) Magnesium was not considered as a PCOC for Mower Reservoir (IHSS 202) because the subsurface maximum value (4,940 mg/kg) was less than the surface maximum concentration (5,040 mg/kg)

Manganese: Manganese was not considered a PCOC for Standley Lake (IHSS 201) because the subsurface maximum value (1,880 mg/kg) was less than the surface maximum concentration (2,080 mg/kg) Manganese was not considered as a PCOC for Mower Reservoir (IHSS 202) because the subsurface maximum value (448 mg/kg) was less than the surface maximum concentration (925 mg/kg)

Mercury: Mercury was not considered a PCOC for Standley Lake (IHSS 201) because the subsurface maximum value (0 55 mg/kg) was less than the surface maximum concentration (0 6 mg/kg) Mercury was eliminated as a PCOC for Mower Reservoir (IHSS 202) because the subsurface mean (0 047 mg/kg) was less than the background mean (0 08 mg/kg)

Molybdenum: Molybdenum was eliminated as a PCOC for Standley Lake (IHSS 201) because the subsurface mean (5 68 mg/kg) was less than the upper-bound value (mean plus two standard deviations, 14 93 mg/kg) Molybdenum was not considered as a PCOC for Mower Reservoir (IHSS 202) because it was not detected in any of the 22 subsurface sediment samples analyzed for molybdenum

Nickel: Nickel was not eliminated as a PCOC for Standley Lake (IHSS 201) by Step 1, it was retained for Step 2 (spatial analysis) Nickel was not considered as a PCOC for Mower Reservoir (IHSS 202) because the subsurface maximum value (20 4 mg/kg) was less than the surface maximum concentration (29 2 mg/kg)

Potassium: Potassium was not eliminated as a PCOC for Standley Lake (IHSS 201) by Step 1, it was retained for Step 2 (spatial analysis) Potassium was not eliminated as a PCOC for Mower Reservoir (IHSS 202) by Step 1, it was retained for Step 2 (spatial analysis)

Selenium: Selenium was not considered as a PCOC for Standley Lake (IHSS 201) because the subsurface maximum value (3 2 mg/kg) was less than the surface maximum value (4 5 mg/kg) Selenium was eliminated as a PCOC for Mower Reservoir (IHSS 202) because the mean (1 53 mg/kg) was less than the upper-bound background value (1 54 mg/kg)

Silver: Silver was not considered as a PCOC for Standley Lake (IHSS 201) because the subsurface maximum value (6 8 mg/kg) was less than the surface maximum value (7 7 mg/kg) Silver was not considered as a PCOC for Mower Reservoir (IHSS 202) because the subsurface maximum value (1 7 mg/kg) was less than the surface maximum concentration (1 9 mg/kg)

Sodium: Sodium was not considered as a PCOC for Standley Lake (IHSS 201) because the subsurface maximum concentration (449 mg/kg) was less than the surface maximum concentration (509 mg/kg) Sodium was not considered as a PCOC for Mower Reservoir (IHSS 202) because the subsurface maximum value (441 mg/kg) was less than the surface maximum concentration (1,080 mg/kg)

Strontium: Strontium was not considered as a PCOC for Standley Lake (IHSS 201) because the subsurface maximum concentration (78 4 mg/kg) was less than the surface maximum concentration (423 mg/kg) Strontium was not considered as a PCOC for Mower Reservoir (IHSS 202) because the subsurface maximum value (151 mg/kg) was less than the surface maximum concentration (190 mg/kg)

Thallium: Thallium was not considered as a PCOC for Standley Lake (IHSS 201) and Mower Reservoir (IHSS 202) because it was not detected in any of the 33 subsurface sediment samples in IHSS 201 and the 22 subsurface sediment samples in IHSS 202

Tin: Tin was eliminated as a PCOC for Standley Lake (IHSS 201) because the subsurface mean (4 33 mg/kg) was less than the background mean (7 64 mg/kg) Tin was not considered as a PCOC for Mower Reservoir (IHSS 202) because the subsurface maximum value (49 7 mg/kg) was less than the surface maximum concentration (51 4 mg/kg)

Vanadium: Vanadium was eliminated as a PCOC for Standley Lake (IHSS 201) because the subsurface maximum (46 3 mg/kg) was less than the surface maximum (50 mg/kg) Vanadium was not considered as a PCOC for Mower Reservoir (IHSS 202) because the subsurface maximum value (50 2 mg/kg) was less than the surface maximum concentration (114 mg/kg)

Zinc: Zinc was not eliminated as a PCOC for Standley Lake (IHSS 201) by Step 1, it was retained for Step 2 (spatial analysis) Zinc was not considered as a PCOC for Mower Reservoir (IHSS 202) because the subsurface maximum value (95 7 mg/kg) was less than the surface maximum concentration (193 mg/kg)

Figures 3 through 9 are maps that show site-wide concentrations of metals not eliminated as PCOCs by Step 1 described above (i e , arsenic, cadmium, copper, lead, nickel, potassium, and zinc for Standley Lake and potassium for Mower Reservoir) For core samples in the reservoirs, the maximum value at each location is shown on the maps

For the metal analytes shown on Figures 3 through 9, the majority of the samples collected within the Site boundaries and from OU 3 have concentrations below stream sediment UTLs reported in the Background Geochemical Characterization Report (DOE, 1993) In general, the highest concentrations for these metals tend to be in the deeper areas of Standley Lake Natural limnological phenomena explain the slightly elevated concentrations of metals in the center of the reservoirs The finer particles of sediment tend to have the highest concentrations of organic matter, and thus higher metal concentrations associated with the organic matter (Davis and Kent, 1990) These finer sediment particles in the water column also tend to deposit in the center of the lake where flow velocities can no longer support particle suspension

It is also important to note when assessing levels of metals in OU 3 sediments that Standley Lake receives approximately 90 percent of its water from Clear Creek and the Clear Creek drainage area includes the Central City/Clear Creek mining district Conversely, Mower Reservoir receives approximately 100 percent of its water from the Rocky Flats drainage area (ASI, 1990) Based on these estimates of water sources and sediment source areas, it is expected that higher concentrations of Site-related metals would be found in Mower

Reservoir than in Standley Lake However, results of Step 1 indicate all metal analytes except potassium were found at background levels in the reservoir that receives essentially all of its water from Site-related drainages, Mower Reservoir Based on the site-wide patterns of metals concentrations and the fact that all metals except potassium were found at background levels in Mower Reservoir, these analytes are not associated with releases from the Site and therefore, were eliminated as PCOCs for Standley Lake subsurface sediments

Potassium was not retained as a PCOC for Mower Reservoir because it is an essential human nutrient and therefore, an RBC was not available for potassium Because an RBC was not available, potassium cannot be evaluated as a PCOC in the CDPHE Conservative Screen

References

ASI, 1990 Advanced Sciences, Inc Water-Yield and Water-Quality Study of Other Sources Tributary to Standley Lake and Great Western Reservoir, Rocky Flats Plant, Task 16 of the Zero-Offsite Water-Discharge Study Final Report December 18, 1990

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DOE, 1994 United States Department of Energy Technical Memorandum No 4, Human Health Risk Assessment Chemicals of Concern Identification, Operable Unit 3 September 23, 1994

DOE, 1993 United States Department of Energy Background Geochemical Characterization Report September 30, 1993

Gilbert, 1993 Richard O Gilbert Recommended process for implementation by Rocky Flats Plant (RFP) to compare environmental restoration site analytical results obtained in operable units (OU) to background concentrations July 30, 1993

TABLE 1

TEST RESULTS FOR OU 3 TRENCH SOIL DATA

Analyte	Units	No Samp UTL	Maximum	No Samp SLIP	Slippage P-Value	Quantil P-Value	Gehan P-Value	T-Test P-Value	Statistical PCOC
^{241}Am	pCı/g	7	0 04046	9	0 03894	0 1143	0 93666		Yes
$^{239/240}Pu$	pCı/g	18	0 1	19	0 00929	0 0523	0 99723	0 01716	Yes
$^{233/234}U$	pCı/g	1	1 472	9	0 17783	0 3796	0 90727	0 99646	Yes
^{235}U	pCı/g	2	0 1393	2	0 69288	0 6533	0 51511		Yes
^{238}U	pCı/g	1	1 521	6	0 32341	0 8553	0 99352	0 99907	Yes

Notes UTL = Upper tolerance lımıt
SLIP = Slıppage test
Quantıl = Quantıle test
Gehan = Gehan test

TABLE 2

TEST SUMMARY FOR OU 3 TRENCH SOIL DATA

Analyte	Units	UTL/TEST	Slippage	Quantile	Gehan	T-Test	Statistical PCOC
^{241}Am	pCı/g	Yes	Yes	No	No		Yes
$^{239/240}Pu$	pCı/g	Yes	Yes	No	No	Yes	Yes
$^{233/234}U$	pCı/g	Yes	No	No	No	No	Yes
^{235}U	pCı/g	Yes	No	No	No		Yes
^{238}U	pCı/g	Yes	No	No	No	No	Yes

Table 3
COMPARISON OF RADIONUCLIDE ACTIVITIES IN SOIL DATA SETS (Pci/g)

Analyte	Trench Samples		Rock Creek Surface Soil Samples (Background)			OU 3 Surface Soil Samples		Jeffco Remedy Acres Surface Soil Samples	
	Max	Mean	UTL	Max	Mean	Max	Mean	Max	Mean
^{241}Am	0 27	0 03	0 064	0 04	0 02	0 52	0 035	0 363	0 143
$^{239/240}Pu$	1 59	0 12	0 133	0 10	0 05	2 95	0 158	6 468	1 01
$^{233/234}U$	2 02	1 01	1 86	1 47	1 15	2 14	1 01	NA	NA
^{235}U	0 36	0 05	0 199	0 14	0 05	0 124	0 049	NA	NA
^{238}U	2 15	0 99	2 00	1 52	1 19	2 13	1 04	NA	NA

Notes NA = Not analyzed
UTL = Upper tolerance limit

Table 4
SUBSURFACE SOIL SAMPLES THAT EXCEED BACKGROUND SURFACE SOIL UTLs

Analyte	Location	Depth (Inches)	Activity (pCi/g)	Background UTL (pCi/g)
$^{233/234}U$	TR03692	3	2 02	1 86
^{235}U	TR03492	6	0 26	0 199
^{235}U	TR03692	96	0 36	0 199
^{238}U	TR03692	3	2 15	2 00

Note UTL = Upper Tolerance Limit

TABLE 5

SUBSURFACE SEDIMENTS—IHSSs 201 AND 202

	IHSS 201			IHSS 202		
Analyte	**Maximum Detected Activity (pCi/g)**	**RBC (pCi/g)**	**RBC Ratio**	**Maximum Detected Activity (pCi/g)**	**RBC (pCi/g)**	**RBC Ratio (pCi/g)**
^{241}Am	0 180	2.37	0 08	0 1748	2.37	0 074
$^{239/240}Pu$	0 380	3 43	0 11	1 1120	3 43	0 320
		Ratio Sum—C	0 19		Ratio Sum—C	0 390

Notes   Ratio Sum—C = Ratio sum for carcinogenic analytes

TABLE 6
METAL CONCENTRATIONS IN SEDIMENTS
IHSS 201-MOWER RESERVOIR

ANALYTE	UNITS	OU 3 SUBSURFACE MEAN	OU 3 SUBSURFACE MAX	OU 3 SURFACE MAX	BGCR MEAN	BGCR MEAN+2SD	BGCR MAX
ALUMINIUM	MG/KG	1 51E+04	20700	23500	5887 61	15713 06	25200
ANTIMONY	MG/KG	3 96	ND	6 9	3 29	8 75	12 4
ARSENIC	MG/KG	12 3	36 2	17 7	2 41	7 31	17 3
BARIUM	MG/KG	1 77E+02	250	196	77 91	190 68	244
BERYLLIUM	MG/KG	1 23	1 6	1 6	0 66	4 04	1 3
CADMIUM	MG/KG	3 28	ND	5	0 54	1 26	1 3
CALCIUM	MG/KG	6 42E+03	10300	90100	3658 24	12985 43	17100
CESIUM	MG/KG	1 92E+01	ND		69 29	197 04	157
CHROMIUM	MG/KG	1 96E+01	33 7	21 4	8 13	22 97	29 7
COBALT	MG/KG	1 06E+01	16 7	13 2	5 04	11 62	15
COPPER	MG/KG	1 43E+02	254	183	10 15	25 87	36 7
IRON	MG/KG	2 19E+04	31400	28300	8852 63	21379	31400
LEAD	MG/KG	1 34E+02	328	317	22 02	95 6	244
LITHIUM	MG/KG	1 28E+01	17	17 1	7 48	18	20 2
MAGNESIUM	MG/KG	3 97E+03	5020	6430	1473 77	3978 91	5850
MANGANESE	MG/KG	8 85E+02	1880	2080	227 82	658 77	1280
MERCURY	MG/KG	2 71E-01	0 55	0 6	0 08	0 19	0 05
MOLYBDENUM	MG/KG	5 68	ND	7 7	4 47	14 93	9 6
NICKEL	MG/KG	2 01E+01	28 7	23 7	6 75	17 51	25 6
POTASSIUM	MG/KG	2 98E+03	3790	3630	835 34	2334 19	3770
SELENIUM	MG/KG	8 99E-01	3 2	4 5	0 42	1 54	2 9
SILVER	MG/KG	2 75	6 8	7 7	0 66	1 69	3 4
SODIUM	MG/KG	2 02E+02	449	509	161 47	435 08	637
STRONTIUM	MG/KG	5 79E+01	78 4	423	36 38	156 13	421
THALLIUM	MG/KG	ND	ND		0 3	0 77	0 4
TIN	MG/KG	4 33	11 9	10 4	7 64	19 81	27 1
VANADIUM	MG/KG	3 67E+01	46 3	50	18 33	46 93	73
ZINC	MG/KG	8 07E+02	1660	1120	43 77	104 22	155

Note ND = Not Detected

TABLE 7
METAL CONCENTRATIONS IN SEDIMENTS
IHSS-202-MOWER RESERVOIR

ANALYTE	UNITS	OU 3 SUBSURFACE MEAN	OU 3 SUBSURFACE MAX	OU 3 SURFACE MAX	BGCR MEAN	BGCR MEAN+2SD	BGCR MAX
ALUMINIUM	MG/KG	1 34E+04	19500	18300	5887 61	15713 06	25200
ANTIMONY	MG/KG	ND	ND	17 3	3 29	8 75	12 4
ARSENIC	MG/KG	4 74	8 9	10 4	2 41	7 31	17 3
BARIUM	MG/KG	1 76E+02	246	250	77 91	190 68	244
BERYLLIUM	MG/KG	1 09	1 5	1 5	0 66	4 04	1 3
CADMIUM	MG/KG	ND	ND		0 54	1 26	1 3
CALCIUM	MG/KG	1 01E+04	29100	42000	3658 24	12985 43	17100
CESIUM	MG/KG	ND	ND	69 8	69 29	197 04	157
CHROMIUM	MG/KG	1 53E+01	20 6	22 1	8 13	22 97	29 7
COBALT	MG/KG	8 15E+00	10	15 3	5 04	11 62	15
COPPER	MG/KG	2 55E+01	58	50 1	10 15	25 87	36 7
IRON	MG/KG	1 65E+04	23200	48000	8852 63	21379	31400
LEAD	MG/KG	2 83E+01	50 1	40 8	22 02	95 6	244
LITHIUM	MG/KG	1 19E+01	18 5	13 9	7 48	18	20 2
MAGNESIUM	MG/KG	3 48E+03	4940	5040	1473 77	3978 91	5850
MANGANESE	MG/KG	2 53E+02	448	925	227 82	658 77	1280
MERCURY	MG/KG	4 70E-02	0 12	0 1	0 08	0 19	0 05
MOLYBDENUM	MG/KG	ND	ND		4 47	14 93	9 6
NICKEL	MG/KG	1 55E+01	20 4	29 2	6 75	17 51	25 6
POTASSIUM	MG/KG	2 81E+03	3950	3450	835 34	2334 19	3770
SELENIUM	MG/KG	1 53E+00	6 7	5 7	0 42	1 54	2 9
SILVER	MG/KG	8 74E-01	1 7	1 9	0 66	1 69	3 4
SODIUM	MG/KG	1 97E+02	441	1080	161 47	435 08	637
STRONTIUM	MG/KG	5 97E+01	151	190	36 38	156 13	421
THALLIUM	MG/KG	ND	ND		0 3	0 77	0 4
TIN	MG/KG	1 26E+01	49 7	51 4	7 64	19 81	27 1
VANADIUM	MG/KG	3 74E+01	50 2	114	18 33	46 93	73
ZINC	MG/KG	6 55E+01	95 7	193	43 77	104 22	155

Note ND = Not Detected

TABLE 8

PCOC SELECTION PROCESS RESULTS IHSS 201--STANDLEY LAKE SUBSURFACE SEDIMENTS
(Chemicals are listed below the step by which they were eliminated as PCOCs)

Not Detected in Subsurface Samples	Surface to Subsurface Concentration Comparison	Comparison to BGCR Sediment Data	Spatial Analysis	PCOCs
Thallium	Aluminum	Antimony	Arsenic	None
	Beryllium	Barium	Cadmium	
	Calcium	Cesium	Copper	
	Lithium	Chromium	Lead	
	Magnesium	Cobalt	Nickel	
	Manganese	Iron	Potassium	
	Mercury	Molybdenum	Zinc	
	Selenium	Tin		
	Silver			
	Sodium			
	Strontium			
	Vanadium			

Note BGCR = Background Geochemical Characterization Report (DOE, 1993)

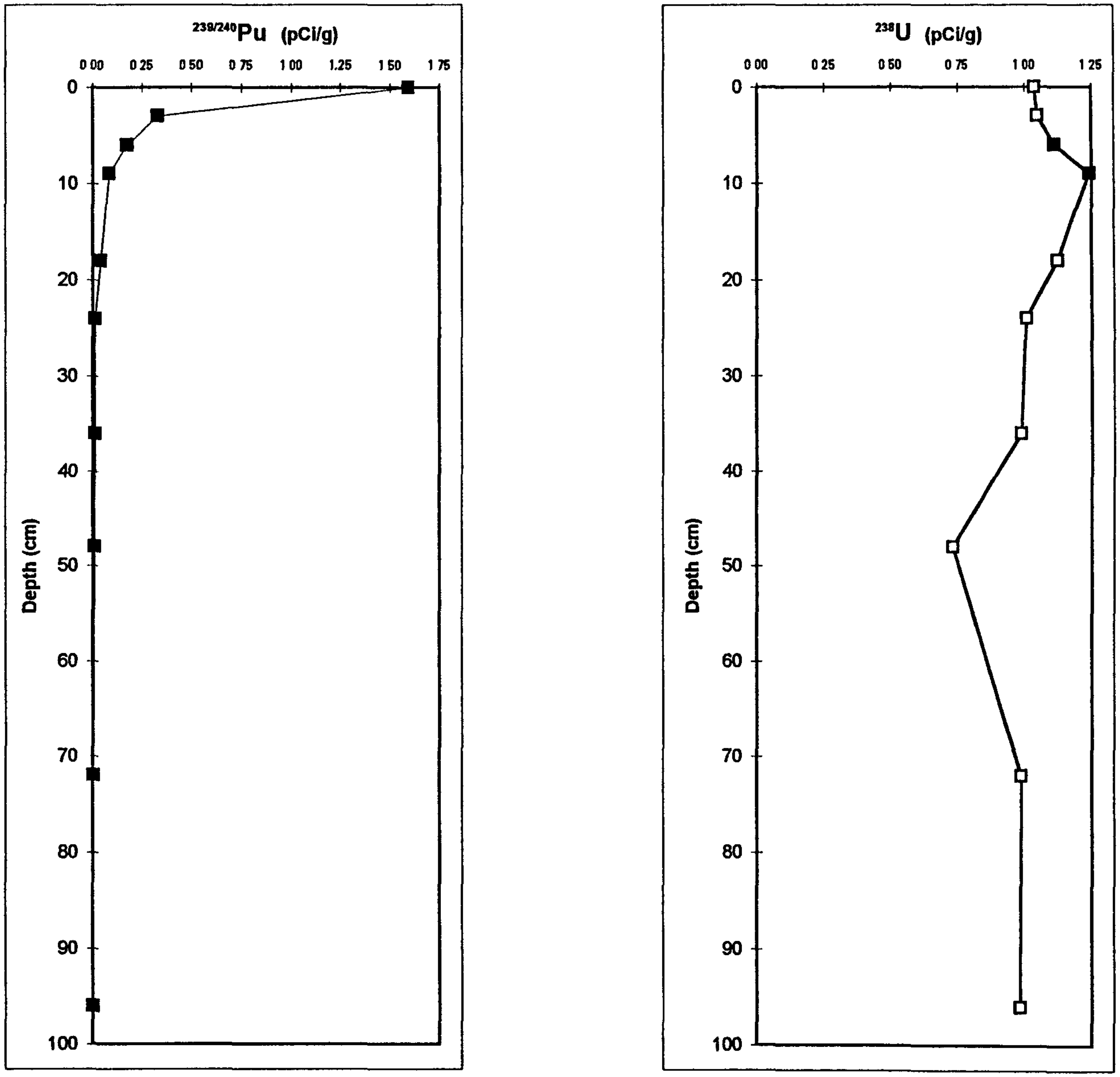
TABLE 9

PCOC SELECTION PROCESS RESULTS
IHSS 202--MOWER RESERVOIR SUBSURFACE SEDIMENTS
(Chemicals are listed below the step by which they were eliminated as PCOCs)

Not Detected in Subsurface Samples	Surface to Subsurface Concentration Comparison	Comparison to BGCR Sediment Data	Essential Human Nutrient	PCOCs
Antimony	Arsenic	Aluminum	Potassium	None
Cadmium	Barium	Copper		
Cesium	Beryllium	Lead		
Molybdenum	Calcium	Lithium		
Thallium	Chromium	Mercury		
	Cobalt	Selenium		
	Iron			
	Magnesium			
	Manganese			
	Nickel			
	Silver			
	Sodium			
	Strontium			
	Tin			
	Vanadium			
	Zinc			

Note BGCR = Background Geochemical Characterization Report (DOE, 1993)

Figure 1 Trench 03492



Rejected values indicated by □

Figure 1 Trench 03492

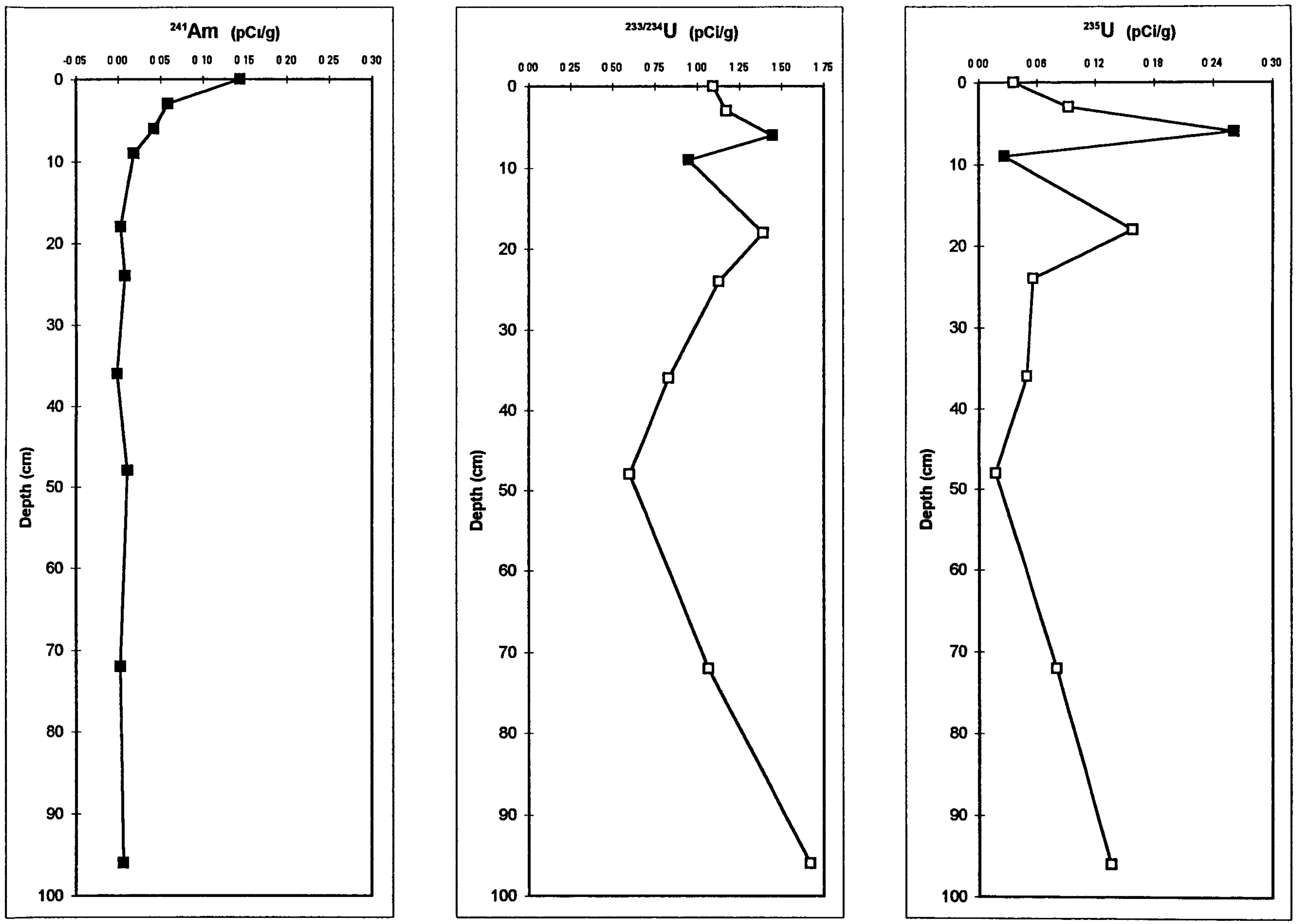


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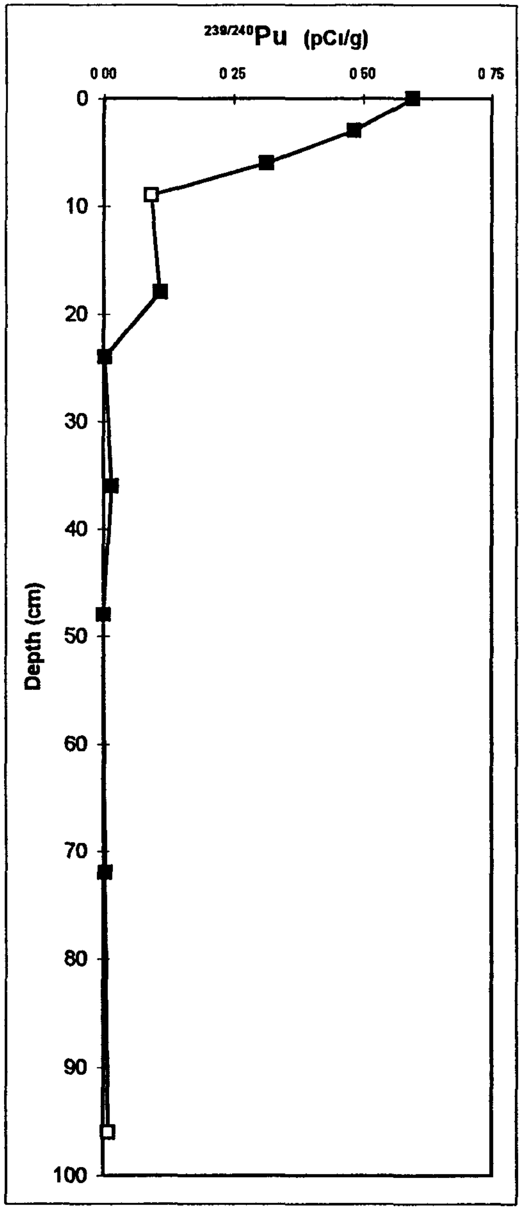
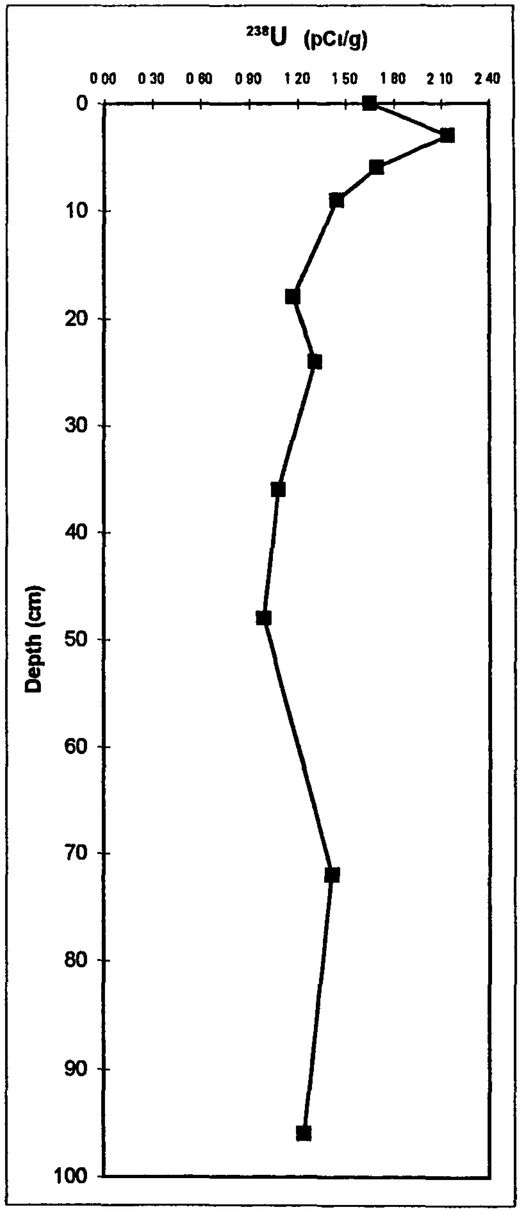
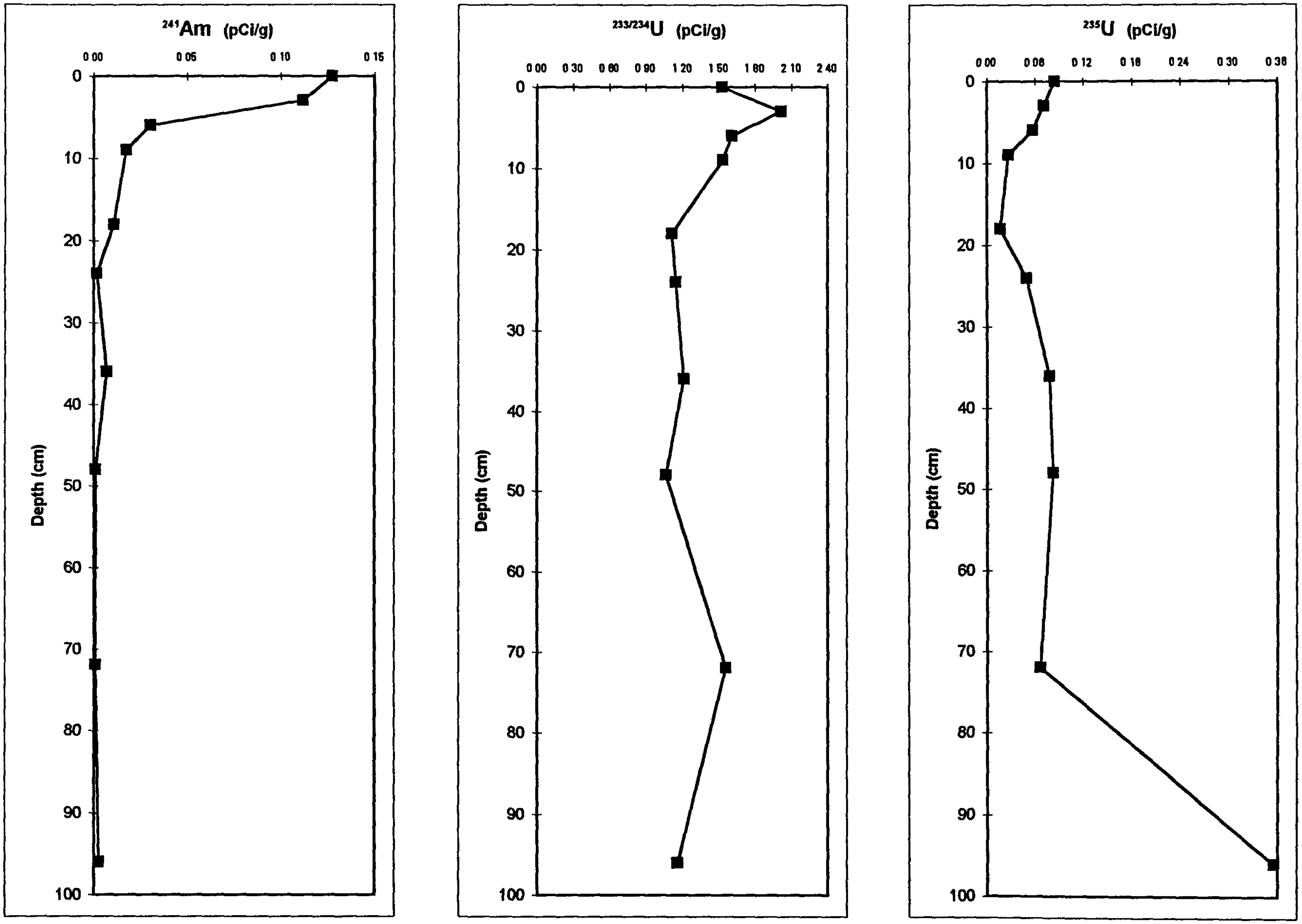
Figure 2 Trench 03692





Rejected values indicated by □

Figure 2   Trench 03692



Rejected values indicated by □

Department of Energy

ROCKY FLATS FIELD OFFICE
PO BOX 928
GOLDEN COLORADO 80402-0928

95-DOE-08367

Mr. Martin Hestmark
U.S Environmental Protection Agency, Region VIII
ATTN Rocky Flats Project Manager, 8HWM-RI
999 18th Street, Suite 500 8WM-C
Denver, Colorado 80202-2405

Mr Joe Schieffelin
Hazardous Waste Facilities Unit Leader
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, Colorado 80222-1530

Gentlemen.

As a result of our April 25, 1995 meeting regarding the Colorado Department of Public Health and Environment (CDPHE) Conservative Screen letter report for Operable Unit (OU) 3, the following approach will be taken to address outstanding issues:

Subsurface Soil (trench data)

The maximum values for Pu and Am are found in surface soils. These values are used when considering all soils in OU-3 It will be clarified that all soil data were considered for use in the CDPHE conservative screen, but that the surface soil values which represent the maximum detected radioactivity were used in the screen, as specified by the CDPHE methodology

Clarification will be presented regarding uranium isotope concentrations in the subsurface trenches Background evaluation and spatial analysis for uranium isotopes will be included to support the discussion on page 2 of the Response to Comments (dated March 13 1995) to show that the uranium levels are at background concentrations.

Subsurface Sediments (239/240 Pu and 241 Am)

The maximum values for 239/240 Pu and 241 Am will be carried through the CDPHE Conservative Screen for Mower Reservoir and Standley Lake. These values may be in the subsurface or surface sediments. These values will be carried through even though the weight-of-evidence evaluation on surface sediments determined that 239/240 Pu and 241 Am were not Potential Contaminants of Concern (PCOCs) Professional judgment will be used to add these elements back into the screen because they are site-related and further analysis provides a higher degree of confidence communicating risk to the public.

Subsurface Sediments (metals)

Since Standley Lake receives almost all of its water and sediment supply from Clear Creek, Standley Lake sediments will be evaluated to determine which associated metals are site-related, if any Data is available from results of the OU-5 conservative screen and values from Mower Reservoir which receives all of its water from the Woman Creek drainage Any Rocky Flats derived contaminants associated with sediments from the Woman Creek drainage would be reflected in the Mower Reservoir sediment profile more strongly than in Standley Lake, due to the relative sediment contributions of Woman Creek to each reservoir

The maximum value for each metal in the reservoir sediments for Mower Reservoir and Standley Lake will be evaluated to determine whether it occurs in the surface or subsurface sediments. If the maximum value for a metal occurs in the surface sediments, the metal will no longer be considered because surface sediments have already been evaluated through the screen. Those metals with maximum values in the subsurface sediments will undergo the following weight-of-evidence evaluation

a. Compare the maximum values to the Background Geochemical Characterization Report (BGCR) data. Any metals whose values exceed the BGCR values will be identified as PCOCs (means and maximums will be compared). Any additional OU-5 metal Contaminants of Concern (COCs) (not including the south interceptor ditch) will also be identified as PCOCs.

b. Conduct a spatial analysis that includes sitewide data for each metal PCOC. This presentation will be an 11x17 inch map similar to the As sitewide map If it can be demonstrated that these metal PCOCs are not site related, they will not be retained as PCOCs

c. Any remaining metal PCOCs will be carried through the remainder of the CDPHE Conservative Screen.

As discussed in the meeting, this approach should resolve the outstanding concerns expressed by CDPHE regarding subsurface media in OU-3. These evaluations will be presented in a letter format which will be submitted for CDPHE review within 2 to 3 weeks, and CDPHE will require 1 week to complete their review Upon satisfactory review, the Department of Energy (DOE) will receive a letter of approval for the OU-3 Conservative Screen Letter Report

DOE believes that the contents of this letter accurately reflect the approach agreed to at the conclusion of the April 25, 1995, meeting with CDPHE and the Environmental Protection Agency If you have any questions, please call Robert H Birk at 966-5921

Sincerely,

Steven W Staten
IAG Project Coordinator
Environmental Restoration

TABLE 2-1

OU 3 DATA SETS EVALUATED IN THE CDPHE CONSERVATIVE SCREEN
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

IHSS	Medium	Description
199	Surface Soil	61 RFI/RI plots average of CDPHE (0 - 0 25") and RFP (0 - 2") sample collection methods, 47 Jefferson County Remedy Acres locations
	Subsurface Soil	11 trenches were sampled at 10 depth intervals down to 96 cm
200	Surface Water	13 sample locations in reservoir and streams/ditches
	Surface Sediment	41 RFI/RI sample locations in reservoir and streams/ditches sampled from 0 to 6", 51 1983/84 sample locations
	Subsurface Sediments	8 sample locations in reservoir sampled at 1" and 2" depth intervals down to approximately 36"
	Groundwater	1 sample location
201	Surface Water	12 sample locations in reservoir and streams/ditches
	Surface Sediment	48 sample locations in reservoir and streams/ditches sampled from 0 to 6", 63 1983/84 sample locations
	Subsurface Sediments	8 sample locations in reservoir sampled at 1" and 2" depth intervals down to approximately 36"
	Groundwater	1 sample location
202	Surface Water	8 sample locations in reservoir and streams/ditches
	Surface Sediment	14 sample locations in reservoir and streams/ditches sampled from 0 to 6"
	Subsurface Sediments	4 sample locations in reservoir sampled at 1" and 2" depth intervals down to approximately 36"

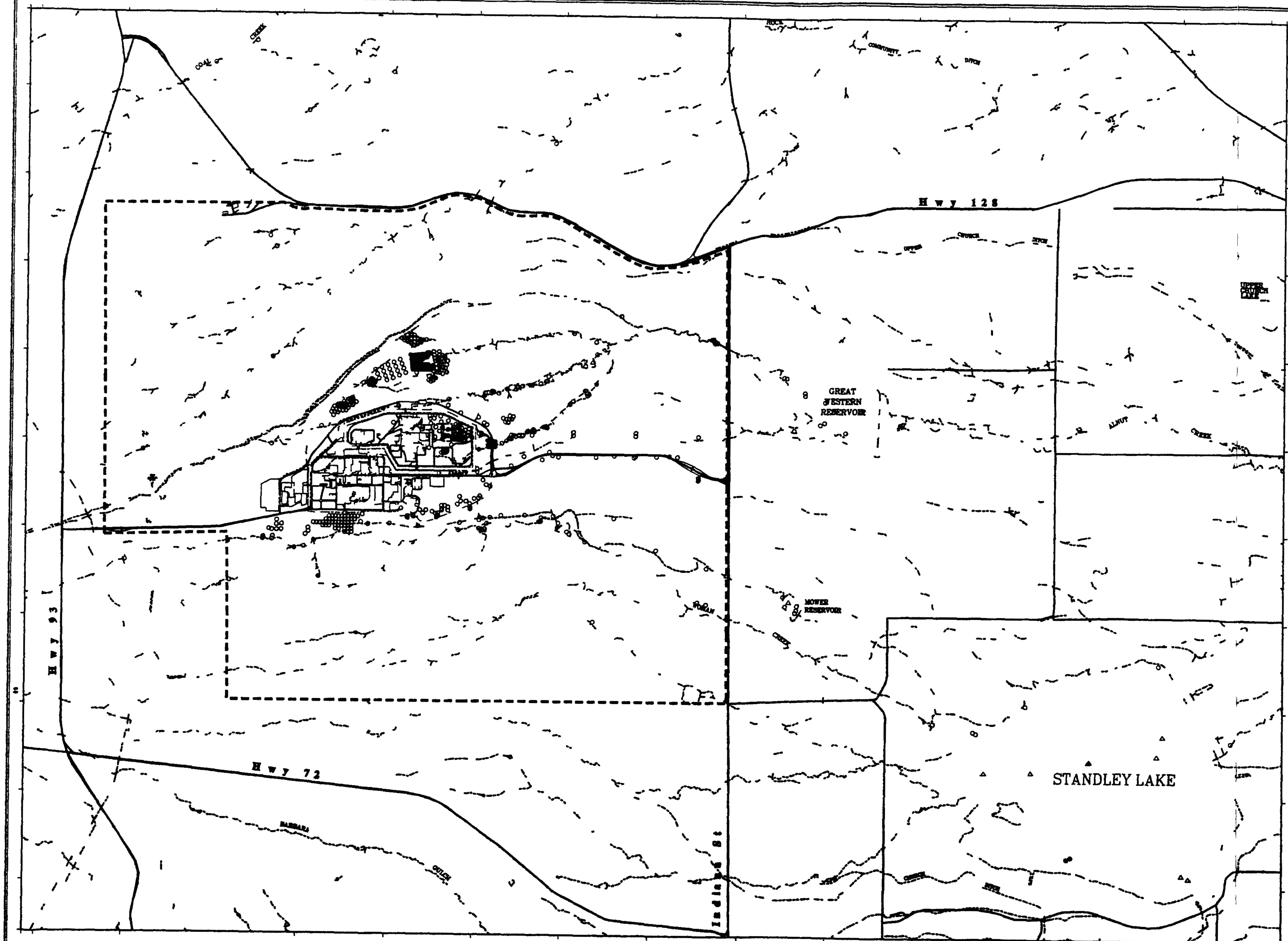


Figure 3
Distribution of Arsenic in Sediments and Soils

Arsenic Concentrations (Mg/Kg)

- ○ 0 9.9 (Sed UTL)
- △ 9.9 13.0 (SS UTL)
- 13.0 68.0 (Seep UTL)
- ▲ > 68.0

Standard Map Features

- Streams, ditches, or other drainage features
- Fences
- Rocky Flats boundary
- Major Roads
- Secondary Roads
- RFETS Roads

DATA SOURCE:
Analytical data comes from RFEDS, using general extraction method.
Buildings, roads, and fences provided by Facilities Engr., EG&G Rocky Flats, Inc. 1991.
Hydrology provided by USGS (date unknown)

U S Department of Energy
Rocky Flats Environmental Technology Site

Prepared by:
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Rocky Flats Environmental Technology Site
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Golden, Colorado 80402-0464

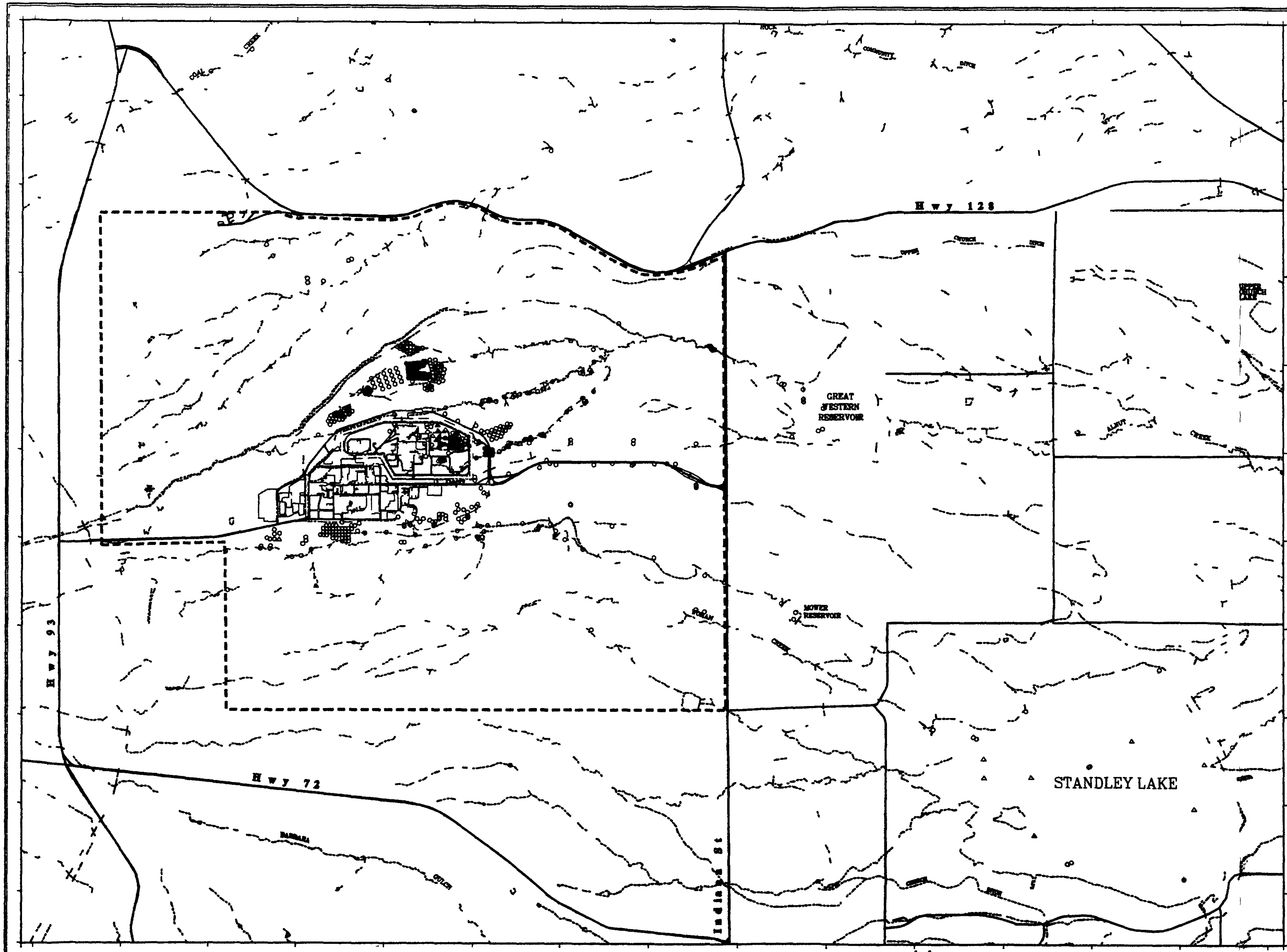
MAP ID ***Draft***

M y 09, 1995

/home/s12890/projects/ou2-3/mark/arsenic.aml

Figure 4

Distribution of Cadmium in Sediments and Soils



Cadmium Concentrations (Mg/Kg)

- ○ 0 2 5 (Sed UTL)
- △ 2 5 4 7 (Seep UTL)
- ● 4.7 4.9 (SS UTL)
- ▲ > 4.9

Standard Map Features

- Streams, ditches, or other drainage features
- Fences
- Rocky Flats boundary
- Major Roads
- Secondary Roads
- RFETS Roads

DATA SOURCE: Analytical data comes from RFEDS using general extraction method. Buildings, roads, and fences provided by Facilities Engr. EG&G Rocky Flats, Inc. 1991. Hydrology provided by USGS (date unknown)

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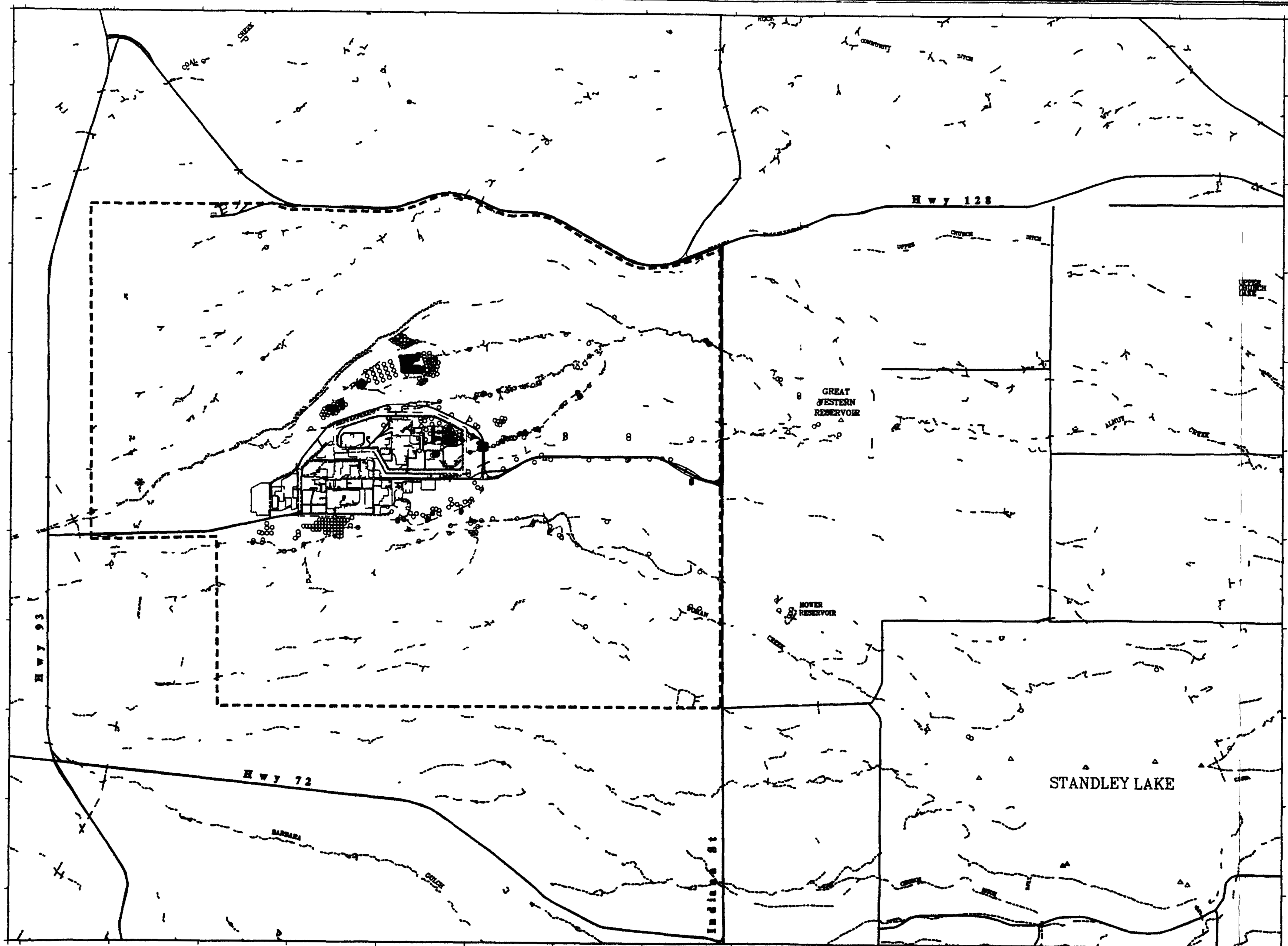

Figure 5
Distribution of Lead in Sediments and Soils

Lead Concentrations (Mg/Kg)

- ○ 0 63 0 (SS UTL)
- △ 63 0 138 0 (Sed UTL)
- ● 138 0 262.0 (Seep UTL)
- ▲ > 262 0

Standard Map Features

- Streams, ditches, or other drainage features
- Fences
- Rocky Flats boundary
- Major Roads
- Secondary Roads
- RFETS Roads

DATA SOURCE: Analytical data comes from RFEDS, using general extraction method. Buildings, roads, and fences provided by Facilities Engr., EG&G Rocky Flats, Inc. 1991. Hydrology provided by USGS (date unknown)

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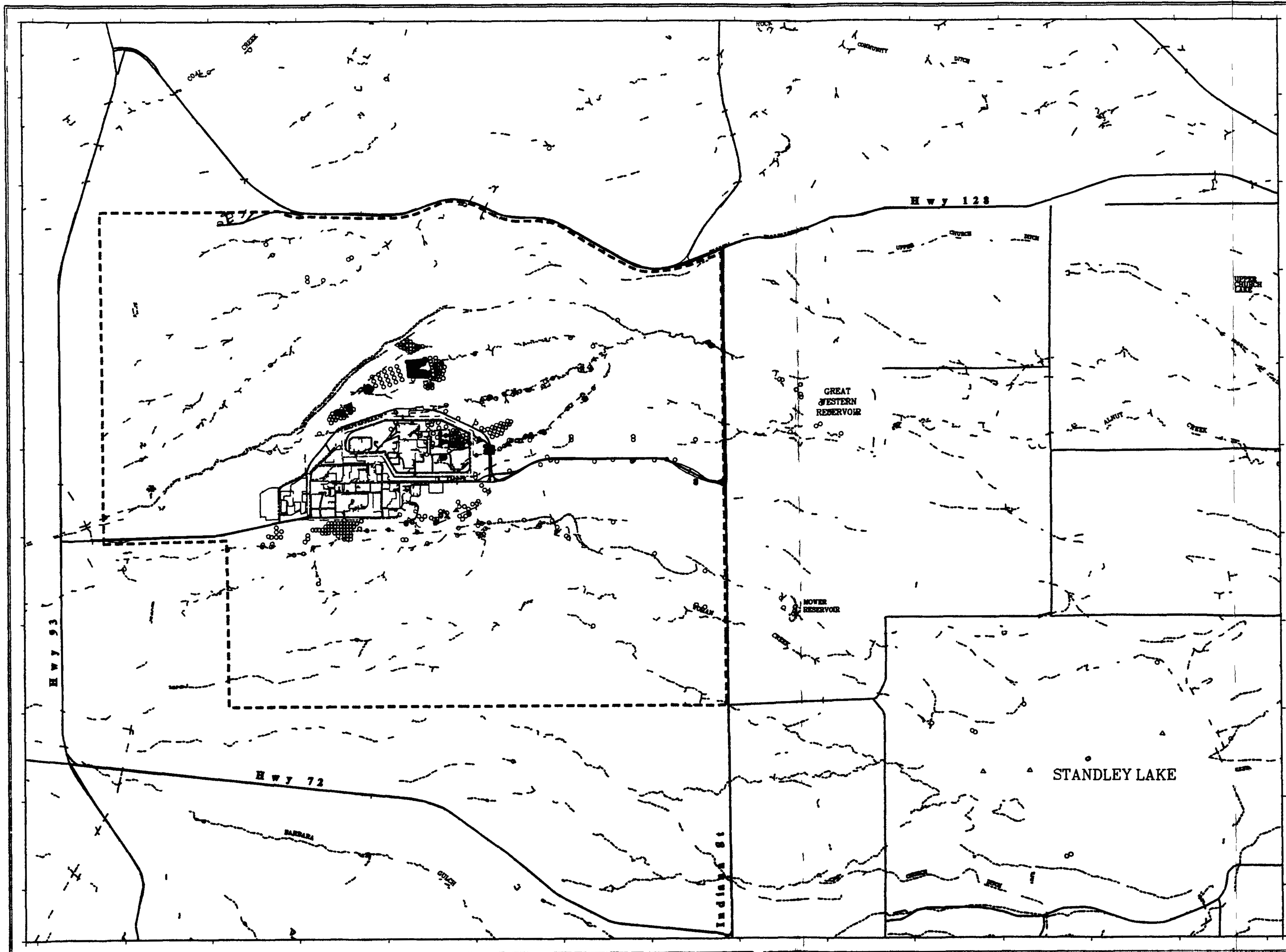

Figure 6

Distribution of Nickel in Sediments and Soils

Nickel Concentrations (Mg/Kg)

- ○ 0 23.0 (Sed UTL)
- △ 23.0 28.0 (SS UTL)
- ● 28.0 36.0 (Seep UTL)
- ▲ > 36.0

Standard Map Features

- Streams, ditches, or other drainage features
- Fences
- Rocky Flats boundary
- Major Roads
- Secondary Roads
- RFETS Roads

DATA SOURCE: Analytical data comes from RFEDS, using general extraction method. Buildings, roads, and fences provided by Facilities Engr. EG&G Rocky Flats, Inc. 1991. Hydrology provided by USGS (date unknown)

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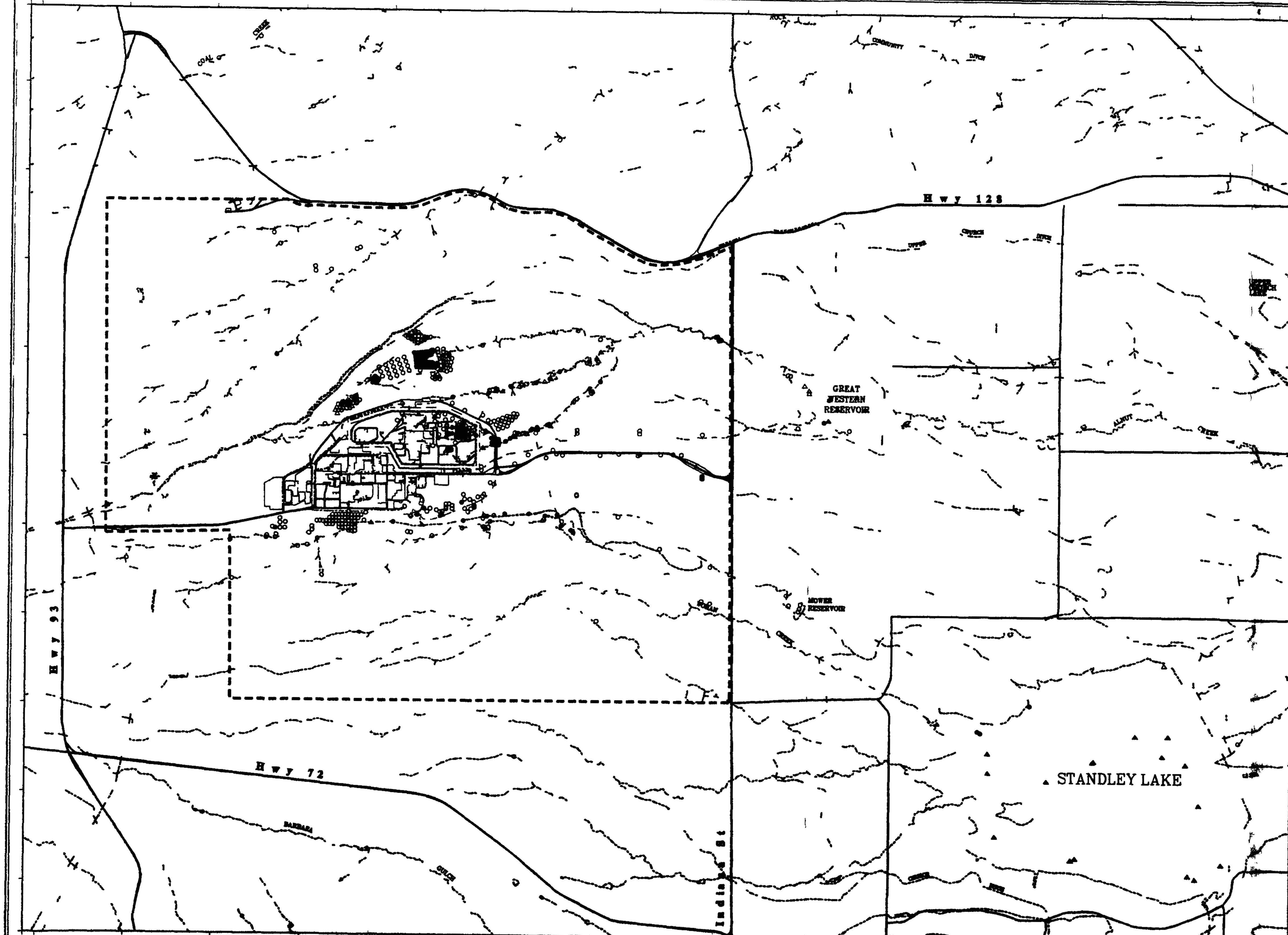

Figure 7
Distribution of Zinc in Sediments and Soils

Zinc Concentrations (Mg/Kg)

- ○ 0 100 0 (SS UTL)
- △ 100 0 148 0 (Seep UTL)
- ● 148 0 308 0 (Sed UTL)
- ▲ > 308 0

Standard Map Features

- Streams, ditches, or other drainage features
- Fences
- Rocky Flats boundary
- Major Roads
- Secondary Roads
- RFETS Roads

DATA SOURCE: Analytical data comes from RFEDS, using general extraction method. Buildings, roads, and fences provided by Facilities Engr., EG&G Rocky Flats, Inc. 1991. Hydrology provided by USGS (date unknown)

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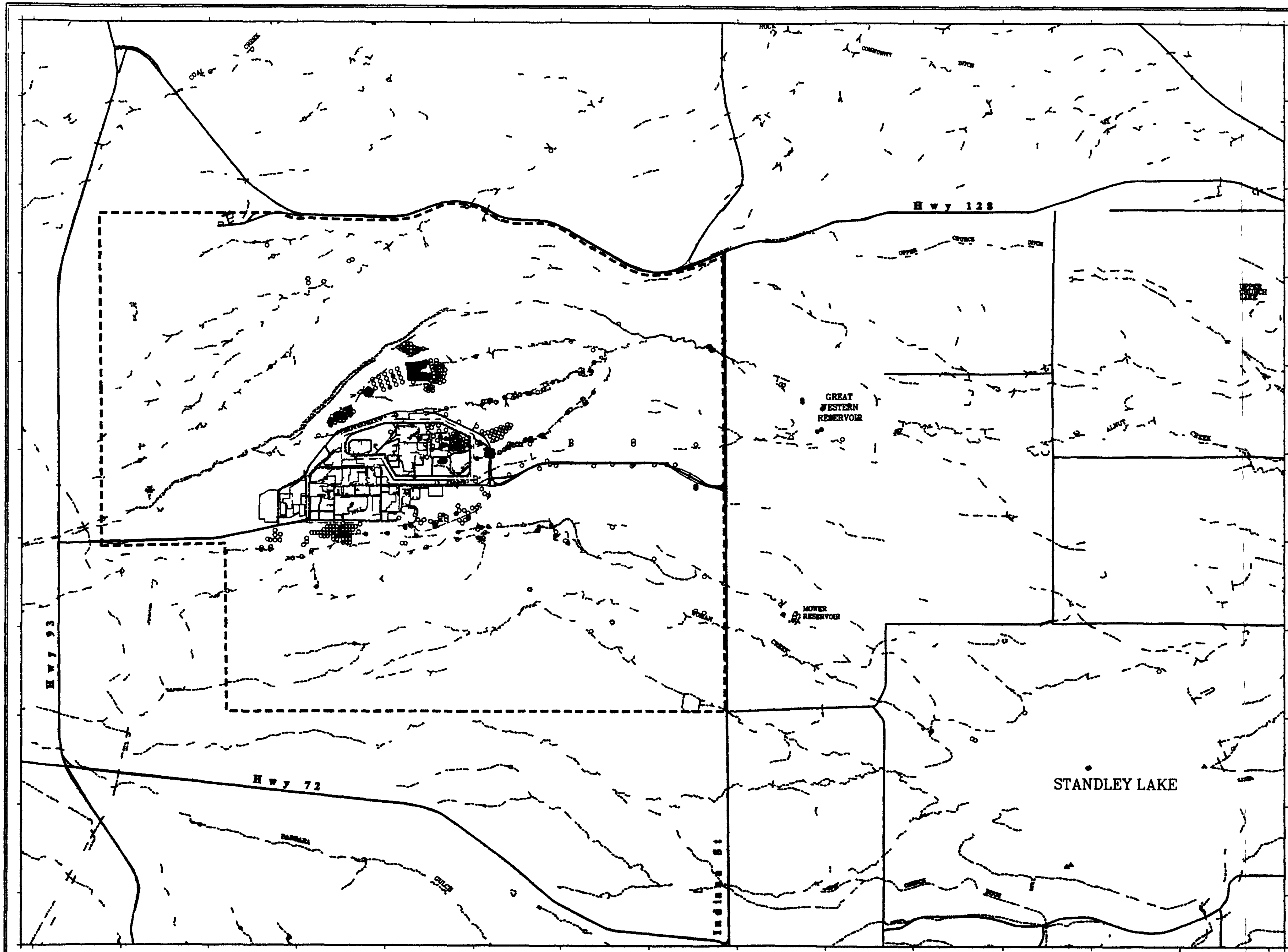

Figure 8

Distribution of Copper in Sediments and Soils

Copper Concentrations (Mg/Kg)

- ○ 0 30 0 (SS UTL)
- △ 30 0 34 0 (Sed UTL)
- ● 34.0 176 0 (Seep UTL)
- ▲ > 176

Standard Map Features

- Streams, ditches, or other drainage features
- Fences
- Rocky Flats boundary
- Major Roads
- Secondary Roads
- RFETS Roads

DATA SOURCE: Analytical data comes from RFEDS, using general extraction method. Buildings, roads, and fences provided by Facilities Engr., EG&G Rocky Flats, Inc. 1991. Hydrology provided by USGS (date unknown)

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

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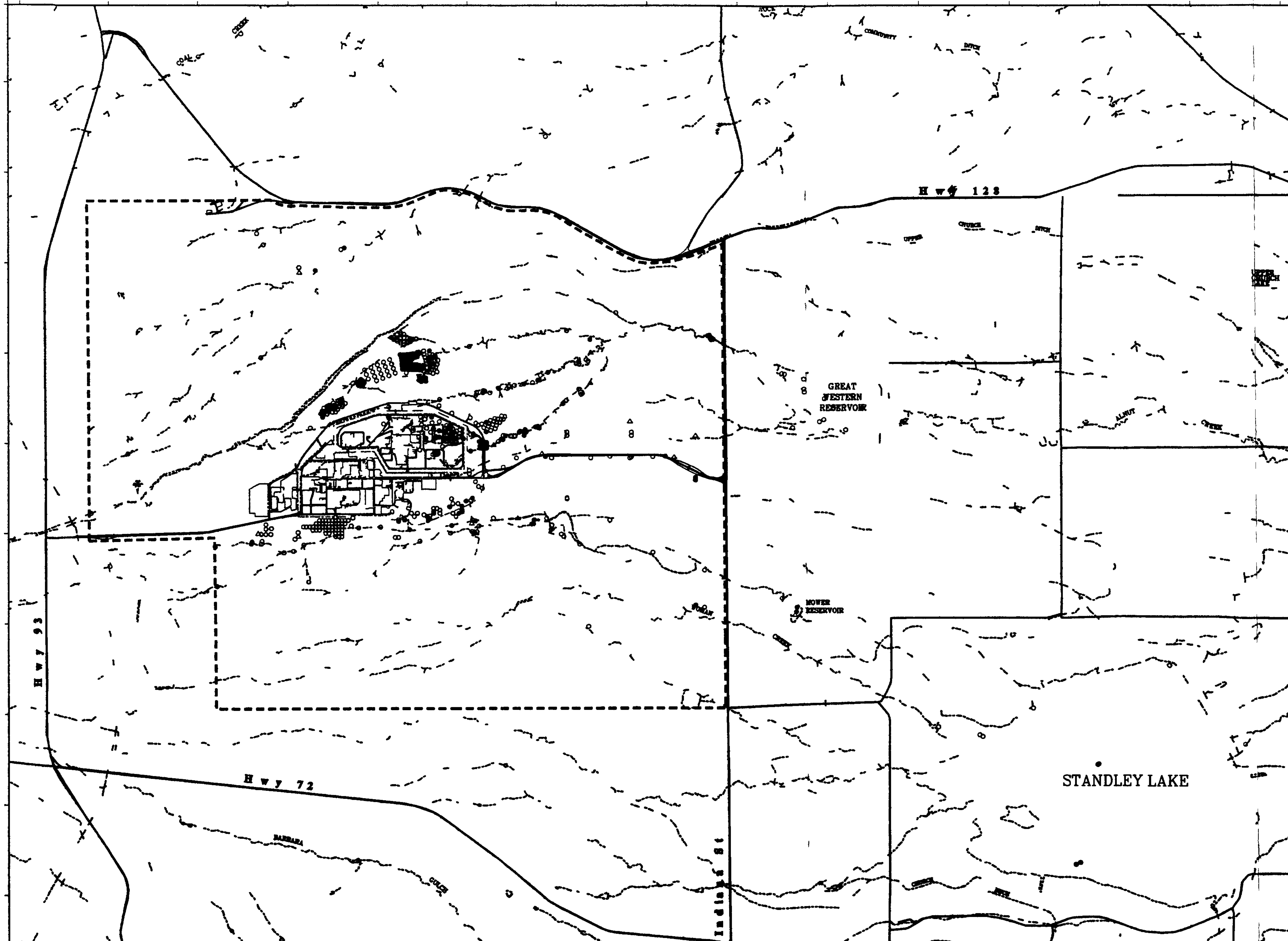

Figure 9
Distribution of Potassium in Sediments and Soils

Potassium Concentrations (Mg/Kg)

- ○ 0 3075 0 (Sed UTL)
- △ 3075 0 3227 0 (Seep UTL)
- ● 3227 0 6191 0 (SS UTL)
- ▲ > 6191 0

Standard Map Features

- Streams, ditches, or other drainage features
- Fences
- Rocky Flats boundary
- Major Roads
- Secondary Roads
- RFETS Roads

DATA SOURCE: Analytical data comes from RFEDS, using general extraction method. Buildings, roads, and fences provided by Facilities Engr., EG&G Rocky Flats, Inc. 1991. Hydrology provided by USGS (date unknown)

State Plane Coordinate Projection
Colorado Central Zone
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