KAISER ALUMINUM
CORPORATE ENVIRONMENTAL

June 6, 2002
Project No. 5427K-12

40-2377

U.S. Nuclear Regulatory Commission
Washington, DC 20555
Attn: Document Control Desk

Response to Comments
Kaiser Phase II Decommissioning Plan
Tulsa, Oklahoma Facility
Kaiser Aluminum & Chemical Corporation

Dear Sir or Madam:

Kaiser Aluminum & Chemical Corporation (Kaiser) has prepared this letter in response to the written comments provided during our April 25, 2002 meeting at Nuclear Regulatory Commission (NRC) headquarters regarding the June 2001 Decommissioning Plan (DP) submittal for the Tulsa, Oklahoma facility. This letter has been formatted to present both NRC's comments followed immediately by Kaiser's response. Typically, the response provides a stand-alone answer. When this is not appropriate, proper reference is made to the DP text, tables, and drawings as well as current NRC regulatory guidelines, etc., to facilitate your review of the response.

1.0 Section 1.0 - Executive Summary

Comment:

Update as needed in response to comments noted below.

Response: The Executive Summary of the June 2001 DP will be revised accordingly based on the following comment-responses.

2.0 Section 2.0 - Facility Operating History

Response: In late 1993, representatives of Kaiser reviewed the Tulsa site files and the corporate files for records related to the magnesium/thorium recovery operations. No records were found. Kaiser was provided with a copy of the NRC files regarding Standard Magnesium and Kaiser Magnesium. The NRC files were used to aid the answering several of the following inquirers regarding licensed materials and activities.

Comment:

(a) Provide information on maximum radioactive material and inventories authorized and estimates of inventory used under prior licenses as Mg-Th scrap, shredded scrap, and dross.

NMSS/ Public

9141 INTERLINE AVENUE, SUITE 1A, BATON ROUGE, LA 70809-1957

Response: Initially the license limit was 20,000 pounds of Mg-Th alloy. This was increased to 30,000 in approximately 1963. There appears to be no records indicating the actual quantity of material that was on site at any given time.

Comment:

(b) Current characterization does not capture the expected range of Th-232 contamination given that the license once authorized Mg-Th alloys with Th as high as 4% by weight.

Response: The quantity of material Standard Magnesium Corporation (SMC) and later Kaiser were authorized to possess at one time was amended from time to time, but generally was limited to 30,000 pounds of magnesium-thorium alloy containing no more than 4 percent thorium. This thorium percentage would equal approximately 4,400 picocuries per gram (pCi/g) by weight. However, it should be noted that thorium alloy material only comprised a small fraction of the total magnesium refined on site. Section 2.2 of the June 2001 DP will be updated appropriately to address this topic.

Comment:

(c) Provide descriptions of the types of licensed material expected or known to be present in debris piles.

Response: Section 2.3 of the June 2001 DP will be updated to present information obtained during the Additional Site Characterization Activities (ASCA) effort conducted during mid-2001. The ASCA included a hazardous waste determination for the thorium-bearing dross material to be excavated during remediation and an assessment of an area of the site historically identified as a debris pile. Results of the Toxicity Characteristic Leaching Procedure (TCLP) testing of 10 samples of thorium-bearing dross collected from test pit excavations during the characterization indicated that the material is nonhazardous. As for the former debris pile area, seven exploratory test trench excavations were advanced at biased locations based on aerial photograph interpretations and field observations. Five of the seven test trench excavations revealed the presence of a significant amount of debris material (concrete, scrap steel, rebar, wood, plastic, wires, cables, and rubber belts) intermixed with soil and licensed material (dross). Exposure rate readings acquired during the test trenching ranged from 11 μR/hr to 160 μR/hr.

Comment:

(d) Describe the chemical forms of material authorized and used under prior licenses.

Response: The initial and all subsequent licenses listed the material as "thorium magnesium alloy." The chemical form of the material was a thorium metal.

Comment:

(e) Include a summary description of areas and/or facilities (Smelter and Crusher Buildings) previously surveyed and released, or decontaminated and released, including types of material and radionuclide contamination levels.

Response: Structures known to have been used to process thorium-bearing materials included the Smelter Building, the Crusher Building, and the Slag Storage Building. The smelting of magnesium alloy for purification occurred in the Smelter Building. The Smelter Building was demolished in October 2000,

following completion of survey activities which indicated no detectable contamination within the building. Operations conducted within the Crusher Building included the crushing of the dross/slag residue material from the smelting operations. The Crusher Building was razed and rebuilt in the early 1970s to accommodate aluminum smelting operations at the facility. The current structure identified as the Crusher Building was not used to process thoriated material. The Slag Storage Building, constructed circa 1964, was used for the storage of dross/slag residue materials prior to the second magnesium recovery step. The building was removed in 1977. Section 2.2 of the June 2001 DP will be updated appropriately to address this topic.

Section 2.4 of the May 2002 Decommissioning Plan Addendum (DPA) provides a summary description of previous pre-decommissioning and decommissioning activities performed at the Tulsa facility including the radiological survey and deconstruction of the Smelter Building and the adjacent land remediation project. Section 4.1 of the May 2002 DPA also provides details on previous radiological survey activities of existing site structures. The June 2001 DP will be updated appropriately to cross reference these topics.

Comment:

(f) Provide a discussion addressing the presence and radiological characteristics of any remaining subsurface piping, pumping station, culverts, and sanitary or industrial sewers (see Sect. 3 topics).

Response: Available information does not indicate the use of subsurface piping systems or the sanitary sewer for the conveyance of radioactive material. The pumping station structure identified near the retention pond was used to convey non-contact cooling water used in plant operations. Sections 3.1 and 4.2 of the May 2002 DPA presents information on the limited amount of sanitary sewer lines, subsurface piping, and culverts which exists within the former operational area of the Tulsa facility. Figure 3A-4 of the May 2002 DPA shows a layout of the subsurface piping and the sanitary sewer for the Tulsa facility. As shown in that figure, several sections of storm drain/subsurface water piping and plant process piping (associated with the pumping station) were encountered and removed during the Adjacent Land Remediation Project (ALRP). Section 2.2 of the June 2001 DP will be updated appropriately to cross reference this topic.

Comment:

(g) Incorporate the information of building facilities and/or grounds described as the "Operational Area," located south of the Union Pacific Railroad, and identify all areas slated to be surveyed "during the additional characterization event(s)" - See update presented in "Kaiser Work Plan - Characterization of the Operational Area (Dec. 2001) and "Additional Site Characterization Activities" (Nov. 2001).

Response: The May 2002 DPA was prepared and submitted to specifically address the approximate 3.5-acre land area of the Tulsa facility known as the Former Operation Area. The former "operational area" of the facility is defined as the triangular parcel of land north of 41st Street and south of the Union Pacific Railroad right-of-way in which plant processes and operations occurred (Figure 2). The former operational area currently houses several structures including the North Extrusion, Office, Maintenance, Warehouse, Crusher, and Crusher Addition buildings. The Flux Building, located to the northeast of the triangular parcel, is also included as part of the former operational area. The "land areas" of the former operational area consist mainly of land beneath concrete pavement.

A Historical Site Assessment (HSA) was performed during late 2001 for the former operational area of the former Kaiser Aluminum Specialty Products facility. The HSA was conducted as the first step toward decommissioning the former operational area at the facility. The objective of the HSA was to compile as much historical information as possible for the facility and, using the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) guidelines, categorize the land areas and structures of the former operational area of the facility as either impacted or nonimpacted.

The results of the HSA were used to design radiological survey efforts for the structures and land areas of the former operational area. The recommended radiological extended scoping (nonimpacted structures) and characterization (impacted land areas) survey efforts were described in a work plan prepared by Earth Sciences Consultants, Inc. (Earth Sciences) (December 2001). The primary objectives of the extended scoping survey of the six structures was to verify their initial classification of "nonimpacted" during the HSA. The primary objectives of the characterization survey of the "impacted" land areas were to determine the nature and extent of residual radioactive materials within the former operational area and collect sufficient data to support evaluation of remedial alternatives and technologies for the impacted land areas of the former operational area. The radiological survey efforts were completed during the months of January and February 2002. Results of the radiological survey efforts are presented Section 4.1 of the May 2002 DPA. Section 2.0 of the June 2001 DP will be updated appropriately to cross reference this topic.

Comment:

(h) Address whether radioactive materials were ever disposed or buried of onsite under the requirements of 10 CFR Parts 20.302 and 20.304, or provisions of NUREG-1101.

Response: Based upon available site information, it appears that early disposal of licensed materials in the Reserve Pond performed under the guidance of 10 Code of Federal Regulations (CFR) Part 20.304. Records do not indicate that licensed material was handled under the provisions of either 10 CFR Part 20.302 or NUREG 1101. Section 2.6 of the June 2001 DP will be updated appropriately to address this topic.

Comment:

(i) Provide the full reference for the cited ratios of Th-230-to-Th-232 of 3.5-to-1. Add the basis as an attachment to the DP for the sake of technical completeness.

Response: Section 2.2 of the June 2001 DP will be updated to provide the full reference for the cited Th-230-to-Th-232 ratio of 3.5-to-1. Supporting technical documentation for the radionuclide ratios will be provided as an Appendix to the June 2001 DP.

Comment:

(j) Update the discussion on the Phase I FSS Report since it has been finalized by Kaiser and approved by the NRC.

Response: Kaiser completed the adjacent land remediation project during late 2000 through mid-2001. Kaiser prepared and submitted to the NRC an ALRP, which was approved on April 4, 2000. Kaiser conducted adjacent land remediation activities and subsequent final status surveys from October 2, 2000 through May 30, 2001. Contamination of the adjacent properties was found to occur at the ground level

to depths of up to 15 feet with contamination levels ranging from less than minimum detectable activity to approximately 365 pCi/g Th-232. More than 91 percent of the samples obtained during characterization activities for the ALRP contained less than 10 pCi/g Th-232 and 95 percent of the samples contained less than 20 pCi/g Th-232. Contaminated materials that were encountered during the remediation process consisted mostly of soil and soil-like materials. In addition to the soil and soil-like materials, impacted piping, drainage channels, and culverts were encountered during the ALRP project (Section 3, Figure 3A-4 of the May 2002 DPA).

Remediation was performed in the adjacent land areas to achieve unrestricted release. Field surveys were performed to guide remediation activities that, in this case, primarily involved excavating affected soil (and piping, culverts, etc.) and moving it onto Kaiser's property. A final status survey was performed following completion of remediation/excavation in each discrete affected survey grid to demonstrate that radiological conditions satisfy criteria for unrestricted release. Following successful remediation, excavations were backfilled.

A Final Status Survey Report (FSSR) was prepared and submitted to the NRC. Calculations indicated that the total residual Th-232 activity above the average background in soil post remediation for the adjacent land area is approximately 3.27×10^{10} pCi. In a letter dated March 7, 2002, the NRC provided Kaiser with a determination that the remediated adjacent properties met the criteria for unrestricted release. Section 2.4 of the June 2001 DP will be updated appropriately to address this topic.

3.0 Section 3.0 - Facility Description

Comment:

The following topics need to be addressed and updated:

(a) Discussions addressing the presence any remaining subsurface piping, pumping station, culverts, and sanitary or industrial sewers are not followed through completion in this section.

Response: As discussed in Section 3.1 of the May 2002 DPA, a limited amount of sanitary sewer lines, subsurface piping, and culverts exist at the facility. On-site sanitary sewer lines associated with rest rooms and employee shower facilities located within nonimpacted structures (Office, Maintenance, and Warehouse buildings) discharge to the main sanitary line traversing easterly along East 41st Street. A surface water storm drain and associated culvert are located near the northeastern corner of the North Extrusion Building. Subsurface piping associated with a storm drain and an air compressor cooling unit originates from the Warehouse Building and surface discharges at a location immediately north of the former operational area. Subsurface piping associated with drains originating from the Crusher Building surface discharge at locations immediately north of the building.

The pumping station structure identified near the retention pond was used to convey non-contact cooling water used in plant operations. Figure 3A-4 of the May 2002 DPA shows a layout of the subsurface piping and the sanitary sewer for the Tulsa facility. As shown in that figure, several sections of storm drain/subsurface water piping and plant process piping (associated with the pumping station) were encountered and removed during the ALRP. Section 3.1 of the June 2001 DP will be updated appropriately to cross reference this topic.

Comment:

(b) Some elements not reviewed by FDS - Comments pending from EA.

Response: Acknowledged.

4.0 Section 4.0 - Radiological Status of Facility

Comment:

(a) This section does not present any radiological information and details as is specified in Modules 4.1 to 4.4 of the SRP - NUREG-1727.

Response: Sections 4.1 through 4.3 of the May 2002 DPA present the radiological information specified in Modules 4.1 to 4.4 of the SRP (NUREG-1727) relative to existing site structures, site systems and equipment, and impacted land areas within the former operational area of the Tulsa facility. The June 2001 DP will be updated appropriately to cross reference these topics.

Section 4.3 of the June 2001 DP provided an overview of the concentration estimates and affected material volume estimates for the Retention Pond and Reserve Pond Area based from kriging calculations, using characterization data generated by Advanced Recovery Systems (ARS)/Nuclear Fuel Services, Inc. in 1994. Appendix A, Figures A-1 through A-4 present total thorium activity concentration (pCi/g) distributions by depth interval (0 to 2 feet, 2 to 4 feet, 5 to 10 feet, and 10 to 15 feet) over the Retention Pond and Reserve Pond Area.

Section 4.3 of the June 2001 DP will be updated to include a more detailed summary of the ARS field characterization of the Retention Pond and Reserve Pond Area. This summary will be similar to the following:

In October of 1994, an extensive characterization of the Retention and Reserve Pond Area was performed in accordance with the Radiological Site Characterization Plan provided to the NRC by Kaiser (September 28, 1994). The purpose of the investigation was to characterize soils and sludges containing thorium with respect to criteria used by the NRC for release of sites for unrestricted use, set forth in the NRC Branch Technical Position, Disposal or On-Site Storage of Residual Thorium or Uranium From Past Operations (1981).

Two hundred and fifty samples were systematically collected from 90 borehole locations (Figure -). Samples were collected in 500-ml Marinelli containers, weighed to the nearest 0.1 g, and counted for 10 minutes with a shielded 2-inch-by-2-inch NaI (Tl) scintillator detector. The instrument was a Bicron LabTech Dual Channel Analyzer.

Approximately 600, 200-ml subsamples were taken from the 250 field samples. Subsamples were analyzed using a density compensating gamma spectroscopy system (Nuclear Fuel Systems, Inc.) for U-234, U-235, U-238, and Th-232. Referred to as the At Line Solution Assay System (ALSAS), it provided density corrected pCi/g values. A correlation coefficient (r) of 0.990 relating the total counts of the field 2-inch-by-2-inch NaI (Tl) detector field count to the analytical results (pCi/g) of the same sample was completed. Linear regression was used to determine an equation to calculate pCi/g values from counts. The results of the survey were total thorium (Th-232 + Th-228) pCi/g values ranging from below the minimum detectable activity of 1 pCi/g to 425.6 pCi/g. Appendix A,

Figures A-1 through A-4 present total thorium activity concentration (pCi/g) distributions by depth interval (0 to 2 feet, 2 to 4 feet, 5 to 10 feet, and 10 to 15 feet) over the Retention Pond and Reserve Pond Area. Sampling locations with respective total thorium concentrations for the particular depth interval are also presented in these figures. Two background soil samples were collected to the west and upgradient of the Retention and Reserve Pond Area and analyzed by gamma spectroscopy. These two samples exhibited Total Thorium concentrations of 1.5 and 4.3 pCi/g.

Alpha spectroscopy was performed on 11 of the samples and confirmed the previously established ratio of Th-232 to Th-230 in dross of between 1:2.4 and 1:3.4. The 11 samples were selected from 60 sample results that fell in the 1 to 50 pCi/g total thorium range. The 11 samples represented 3 of the 4 main areas surveyed including the retention pond, the reserve pond, and the land area between the railroad and the retention pond. Two of the 11 samples represented background. The ratios calculated from these data ranged from 1:0.62 to 1:3.15.

Comment:

(b) Incorporate the information of building facilities and/or grounds described as the "Operational Area," located south of the Union Pacific Railroad, and identify all areas slated to be surveyed "during the additional characterization event(s)" - See update presented in "Kaiser Work Plan - Characterization of the Operational Area" (Dec. 2001) and "Additional Site Characterization Activities" (Nov. 2001).

Response: The May 2002 DPA was prepared and submitted to specifically address the approximate 3.5-acre land area of the Tulsa facility known as the Former Operation Area. The former "operational area" of the facility is defined as the triangular parcel of land north of 41st Street and south of the Union Pacific Railroad right-of-way in which plant processes and operations occurred (Figure 2). The former operational area currently houses several structures including the North Extrusion, Office, Maintenance, Warehouse, Crusher, and Crusher Addition buildings. The Flux Building, located to the northeast of the triangular parcel, is also included as part of the former operational area. The "land areas" of the former operational area consist mainly of land beneath concrete pavement.

A HSA was performed during late 2001 for the former operational area of the former Kaiser Aluminum Specialty Products facility. The HSA was conducted as the first step toward decommissioning the former operational area at the facility. The objective of the HSA was to compile as much historical information as possible for the facility and, using the MARSSIM guidelines, categorize the land areas and structures of the former operational area of the facility as either impacted or nonimpacted.

The results of the HSA were used to design radiological survey efforts for the structures and land areas of the former operational area. The recommended radiological extended scoping (nonimpacted structures) and characterization (impacted land areas) survey efforts were described in a work plan prepared by Earth Sciences (December 2001). The primary objectives of the extended scoping survey of the six structures was to verify their initial classification of "nonimpacted" during the HSA. The primary objectives of the characterization survey of the "impacted" land areas were to determine the nature and extent of residual radioactive materials within the former operational area and collect sufficient data to support evaluation of remedial alternatives and technologies for the impacted land areas of the former operational area. The radiological survey efforts were completed during the months of January and February 2002. Results of the radiological survey efforts are presented Section 4.1 of the May 2002 DPA. Section 4.0 of the June 2001 DP will be updated appropriately to cross reference these topics.

Comment:

(c) Discussions addressing the presence any of remaining subsurface piping, pumping station, culverts, and sanitary or industrial sewers are not followed through completion in this section.

Response: Available information does not indicate the use of subsurface piping systems or the sanitary sewer for the conveyance of radioactive material. The pumping station structure identified near the retention pond was used to convey non-contact cooling water used in plant operations. Sections 3.1 and 4.2 of the May 2002 DPA presents information on the limited amount of sanitary sewer lines, subsurface piping, and culverts which exists within the former operational area of the Tulsa facility. Figure 3A-4 of the May 2002 DPA shows a layout of the subsurface piping and the sanitary sewer for the Tulsa facility. As shown in that figure, several sections of storm drain/subsurface water piping and plant process piping (associated with the pumping station) were encountered and removed during the ALRP. The June 2001 DP will be updated appropriately to cross reference this topic.

Comment:

(d) Summary description of areas and/or facilities (Smelter and Crusher Buildings) previously surveyed and released, or decontaminated and released, including types of material and radionuclide contamination levels.

Response: Section 2.4 of the May 2002 DPA provides a summary description of previous pre-decommissioning and decommissioning activities performed at the Tulsa facility including the radiological survey and deconstruction of the Smelter Building and the adjacent land remediation project. Section 4.1 of the May 2002 DPA also provides details on previous radiological survey activities of existing site structures. The June 2001 DP will be updated appropriately to cross reference these topics.

Comment:

(e) Surface and groundwater sample results are not qualified as to the type of filters (pore size) that were used during all sampling events.

Response: Water samples collected as part of the routine groundwater and surface water monitoring program are field filtered using dedicated disposable 0.45-micron membrane filters. This filter pore size was documented in Section 4.2 of the November 2001 Groundwater Quality Report for the Tulsa facility and will be further detailed in future groundwater reports. Sections 4.4 and 4.5 of the June 2001 DP will be revised to include further detail as to this type of filter (pore size) used to field filter groundwater and surface water samples.

Comment:

(f) Surface and groundwater sample results are not qualified as to whether samples were preserved via acidification (e.g., pH<2 using nitric acid). A review of field and lab pH data given in the Aug. 2000 Ground Water (GW) Quality report indicates that water samples were basic at the time of lab analysis, ranging from a pH of 6.84 to 10.3. Similar observations were noted in the Nov. 2001 GW Quality Report with a pH ranging from 6.45 to 10.1. These pH results imply that water samples were not acidified and, consequently, some of the radioactive contaminants present in water were irretrievably lost to internal surfaces of sample collection bottles and not analyzed. Accordingly, the GW results are of questionable quality and usefulness.

Response: As discussed above, filtered samples (groundwater and surface water) are field filtered using dedicated 0.45-micron filters during sample collection. Samples for laboratory analysis are placed in laboratory-supplied clean containers, properly labeled, and packaged in shuttles for shipment to the analytical laboratory. Samples are chilled from the time of collection until their arrival at the analytical laboratory. Sample shipments to the analytical laboratory occur daily (same day collection and delivery).

Water samples collected as part of the routine groundwater and surface water monitoring program are analyzed by Outreach Laboratory (Outreach) of Broken Arrow, Oklahoma. Upon receipt of the samples, Outreach transfers aliquots of the samples to appropriate analysis-based containers. Samples designated for metals and thorium and radium isotopic analysis are immediately acidified with nitric acid to a pH of 2.0 or less. Following preservation, samples for thorium and radium isotopic analysis are held for 16 hours prior to analysis.

The laboratory pH data provided in the August 2000 and November 2001 Groundwater Quality Reports represent the pH of the groundwater as sampled and not the pH of the preserved groundwater samples. Samples collected for general chemistry parameters such as pH, conductivity, and alkalinity are not preserved by chemical addition prior to analysis.

In conclusion, groundwater and surface water samples collected from March 2000 through December 2001 were field filtered and preserved accordingly based on analytical parameter, and therefore, reflect actual groundwater conditions at the site. Sections 4.4 and 4.5 of the June 2001 DP will be revised to include further detail as to the preservation of surface water and groundwater samples designated for metals and thorium and radium isotopic analysis.

Comment:

(g) A review of the Surface and Ground Water Work Plans and Sampling Procedures (see App. A of either the Aug. 2000 or Nov. 2001 GW Quality Report) indicates different instructions on sample field preparations; thereby, complicating the evaluation and comparison of laboratory results for SW and GW samples.

Response: Preparations of groundwater and surface water samples (i.e., sample filtration and preservation) are performed in a similar manner. Both sets of samples are field filtered through 0.45-micron filter membranes during sample collection and preserved accordingly based on analytical parameter. The Work Plan for Groundwater and Surface Water Monitoring and the procedures for groundwater and surface water sampling have been revised to more clearly reflect these sample preparation practices.

Comment:

(h) The Work Plan included in the GW Quality Report and completed chain-of-custody forms do not specify acidification. Note that it is routine practice to acidify water samples for the analysis of U, Th, and Ra[1]

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[1]See NUREG/CR-5849; Standard Methods for the Examination of Water and Wastewater; EPA 40 CFR Part 136; or ASTM 6517-00 - Standard Guide for Field Preservation of Ground Water Samples.

Response: Refer to Kaiser's responses to Section 4.0 Comments f and g. Chain-of-Custody forms prepared during future monitoring events will include information regarding sample preservation status (i.e., preserved or unpreserved) and/or laboratory preservation requirements.

Comment:

(i) A review of App. A of either the Aug. 2000 or Nov. 2001 GW Quality Report indicates that several Field Water Quality Sampling Forms and Analysis Data Sheets are incompletely filled out or missing. In addtion [sic], the following items were noted to be missing: results for gross alpha activity analyses could not be found in the included lab reports; and several of the lab reports are missing their case narrative cover sheets and/or chain-of-custody forms.

Response: Future groundwater quality report submittals will include properly completed field documentation (Field Water Quality Sampling and Analysis Data Sheets and Chain-of-Custody Forms). The standard practice of the analytical laboratory is to only provide a case narrative for an analytical report if there is an oddity in the analysis, a problem, or an amendment to the data.

The analytical parameters for the routine groundwater and surface water monitoring programs are divided into a set of field-measured parameters (water temperature, turbidity, pH, conductivity, and dissolved oxygen) and a set of laboratory-measured parameters (select metals, select inorganics, select field parameters, and select radiological constituents). The radiological constituents consists of isotopic throrium (Th-228, Th-230, and Th-232) and isotopic radium (Ra-226 and Ra-228). Gross alpha activity analysis is not performed as part of the routine monitoring program.

As discussed in Section 4.2 (Page 8) of the November 2001 Groundwater Quality Report, groundwater quality data collected during the quarterly monitoring events are compared to Maximum Contaminant Levels (MCL) based on U.S. Environmental Protection Agency (USEPA) primary and secondary drinking water standards. However, it is noted that the site groundwater is not likely to ever be a drinking water source. Specific MCLs do not exist for Th-228, Th-230, and Th-232. However, Th is an alpha emitter and would, therefore, fall under 40 CFR 141.15 regarding "Maximum Contaminant Levels for Radium-226, Radium-228, and Gross Alpha Particle Radioactivity in Community Water Systems." Specifically, the MCL for gross alpha particle activity (including Ra-226 but excluding radon and uranium) is 15 pCi/l. Therefore, in evaluating if the gross alpha particle activity MCL is exceeded, the combined totals for Ra-226, Th-228, Th-230, and Th-232 are considered for each water sample.

Comment:

(j) Provide the basis for not including sampling locations and results for background surface and well water samples.

Response: Water samples collected as part of the routine groundwater and surface water monitoring program do include background locations for the Deep Overburden and Shallow Bedrock water-bearing units. Background monitoring wells are generally placed hydraulically upgradient of the pollution source, in this case dross source materials. Hydraulically upgradient (background) locations for the Tulsa facility include Wells P-1, P-2, and MWD-2 for the Deep Overburden water bearing unit, Well ST-2 for the Shallow Bedrock water bearing unit, and the surface water feature known as the Fresh Water Pond.

5.0 Section 5.0 - Dose Modeling Evaluations

Comment:

(a) Not reviewed by FDS - Comments pending from EPAB.

Response: Acknowledged.

6.0 Section 6.0 Alternatives Considered and Rational for Alternative

Comment:

(a) Not reviewed by FDS - Comments pending from EPAB.

Response: Acknowledged.

7.0 Section 7.0 - ALARA Analysis

Comment:

(a) The conclusion of the ALARA analysis hinges, in part, on the dose derived for the assumed radiological conditions of the site after remediation. The dose reflects cleaning up certain portions of the site to 3.0 pCi/g for Th-232 and 10.2 pCi/g for Th-230 and leaving some material at an equivalent Th-232 concentration of 31.1 pCi/g, assuming that this type of material meets the exemption for source material of Part 40.13(a). The results and conclusions of the ALARA analysis depend on whether (i) the dose model scenarios and parameters are acceptable to EPAB, and (ii) the application of Part 40.13(a) provisions as D&D criteria are acceptable in the context of the LTR.

Response: Acknowledged.

Comment:

(b) Other questions at this time include: what is the basis for the estimated population density of 4.0E-03 per m^2 (value not given in Sect. 3 nor 5)? whether the incremental cost of $414 per cubic yard includes all or some of the fixed costs. The cost benefit analysis is calculated using a modified equation from App. D of the SRP - NUREG-1727.

Response: Recently available Year 2000 census block data indicates that the population density for a 16 square kilometer area surrounding the site is 0.00366 person per square meter. Sections 3.2 and 7.1.1 of the June 2001 DP will be updated to include the appropriate reference for the derivation of this population density. Utilizing this population density, the benefit from averted dose for the remedial action (B_{AD}) was recalculated to be $2,515.

The cost estimate for the planned action presented in Chapter 15.0 of the June 2001 DP was also revised based on NRC comments. The revised cost is $17,868,356 (used in the benefit calculation) and does not include mobilization, demobilization, and a contingency. The base unit cost of an incremental removal of 1 cy beyond the planned action was calculated by dividing the total excavation volume into this total project cost. This base unit cost of $404 was compared to the B_{AD} in the As Low As Reasonably Achievable (ALARA) analysis. This cost represents approximately 16 percent of the above estimated

B_{AD}. Removal of approximately 6.2 cy of material will equal the monetary value of the B_{AD} associated with achieving a zero dose. Obviously, much greater quantities of material removal would be required in order to reduce the dose to zero. Moreover, the removal of the 6.2 cy of material would result in a trivial dose-reduction—nowhere near zero dose. Therefore, the cost of removal of material beyond the planned action exceeds the benefit and the planned action is ALARA.

8.0 Section 8.0 - Planned Decommissioned Activities

Comment:

(a) The discussion addressing the presence and radiological characteristics of any remaining subsurface piping, pumping station, culverts, and sanitary or industrial sewers (see Sect. 3 topics) is incomplete.

Response: As discussed in Sections 3.1 and 8.2 of the May 2002 DPA a limited amount of subsurface piping and culverts exist at the facility. These systems are not expected to contain radiological contamination. Sections 2.2, 3.1, and 8.0 of the June 2001 DP will be updated appropriately to address this topic.

Comment:

(b) Incorporate the information of building facilities and/or grounds described as the "Operational Area," located south of the Union Pacific Railroad, and identify all areas slated to be surveyed "during the additional characterization event(s)" - See update presented in "Kaiser Work Plan - Characterization of the Operational Area (Dec. 2001) and "Additional Site Characterization Activities" (Nov. 2001).

Response: The May 2002 DPA was prepared and submitted to specifically address the approximate 3.5-acre land area of the Tulsa facility known as the Former Operation Area. Section 8.0 of the June 2001 DP will be updated appropriately to cross reference this topic.

Comment:

(c) Regarding contamination control, the text does not describe specific measures for isolating and controlling access to survey units that have been surveyed and found to meet the release criteria. Describe the administrative process that will be used to periodically inspect and monitor such areas and identify investigation flags that will be used to de-list and re-survey areas previously meeting the release criteria, given that work will be conducted around these areas in multiple fronts.

Response: Controlling the spread of radioactive contamination within and out of impacted areas is critical to minimize radiation doses to workers and the public. Site-specific radiation surveys will be routinely performed to characterize the distribution of radioactive materials on-site. Contamination control activities will include, but may not be limited to the following:

- Engineering Controls
  - Excavation will proceed in an orderly fashion. Stockpiling and segregation will occur in the Processing Area (freshwater pond area) located to the immediate west of the Retention Pond.

  - Once remediated areas are cleared through a MARSSIM-directed final status survey, they will be separated from affected areas by physical barriers such as temporary fencing.

- Administrative Controls

  - Temporary fencing or other physical barriers that are used to separate work areas will be clearly posted with signs indicating a "Clean Zone" or other appropriate information for effective contamination control.

- Radiological Survey Controls

  - Upon completion of remediation activities at the facility a 100 percent gamma scan of the entire facility will be conducted to ensure that there was no radiological contamination to any previously cleared areas.

Section 8.3 of the June 2001 DP will be updated appropriately to address this topic.

Comment:

(d) Confirm that the radiological conditions of the areas used to stockpile contaminated materials will be confirmed before and after the installation of berms, ditches, and geo-membrane liner.

Response: Section 8.2.2 of the June 2001 DP will be updated to include the performance of 100 percent gamma scan surveys to document the radiological conditions of the Processing Area prior to and subsequent to use for the stockpiling and processing of excavated materials.

Comment:

(e) Provide summary descriptions of the types of decontamination methods that will be used for equipment, tools, vehicles, and materials released for unrestricted use.

Response: Section 8.3 of the June 2001 DP will be updated to indicate that the primary method for decontamination and release of equipment and vehicles is a thorough washing (mechanical brushing/ scraping, high pressure cleaning or steam cleaning, etc.) and surveying before such equipment or a vehicle leaves a controlled area. The implementation of similar procedures during the adjacent land project did not reveal any fixed contamination of equipment or vehicles.

Comment:

(f) Provide a summary addressing any unique safety or remediation issues associated with any stages of remediation activities, e.g., requiring the use of enhanced protective measures for personnel and the environment, use of local HEPA exhaust ventilation systems, measures used to load trucks and gondola cars with soils and debris while controlling fugitive dust emissions, and measures to avoid spills when collecting and processing surface and ground water, and while moving and segregating contaminated soils and debris.

Response: As stated in Section 8.3, there are no unique safety or remediation issues associated with remediation activities planned for the facility. Chapters 10.0 and 11.0 of June 2001 DP provide details on

the H&S air monitoring and environmental air monitoring programs respectively, which will be implemented during remediation activities at the facility. Details regarding specific enhanced protective measures will be developed as needed during the design and implementation phase. Input from the potential qualified contractors will be encouraged. In any case, Kaiser is committed to maintain exposures ALARA during all operations involving the management of radioactive materials.

Comment:

(g) Provide a conceptual description of the water handling equipment and outline the process that will be used to collect, process, analyze, evaluate results against discharge limits or permits, and discharge points for surface and ground water collected during remediation activities. Identify all NRC applicable discharge limits to which water discharges will be evaluated against - see comment 12.d as well.

Response: Section 8.2.3.4 of the June 2001 DP will be updated to indicate that water management may include the utilization of pumps and large storage tanks for the handling of waters infiltrating the excavation areas during remediation activities. Liquids that are encountered will be released for unrestricted use if analyzed and verified to meet the appropriate 10 CFR 20, Appendix B, limit as well as any state or local regulations and/or permit requirements. Specific water control measures and requirements are presented in Chapters 11.0 and 12.0 of the DP.

Comment:

(h) Material segregation will involve soils, dry-active waste, debris, and other types of solid wastes. As written, the text is silent on the use of different survey and sampling methods, survey instrumentation and laboratory support (on and offsite), QA/QC measures, and application of release criteria for material and waste governed by NRC FC83-23, disposal options of 10 CFR Part 20.2002, waste disposal at Envirocare *vs* WCS facilities, and NRC policy on clearance.

Response: Section 8.2.4 of the June 2001 DP will be revised to include a statement referring to Chapter 12.0 and 14.0 of this DP for specific information regarding survey and sampling criteria for material segregation as well as disposal criteria where applicable.

9.0 Section 9.0 - Project Management and Organization

Comment:

(a) The section implies that the remediation organization is capable of performing all required remediation activities. However, the section needs to clearly identify who will be responsible for ensuring that all DP objectives and commitments are made in meeting the cleanup criteria, given that all major functions will be performed by contractors. In order to assess Kaiser's project management functions and oversight of multiple contractors, discuss the respective responsibilities of Kaiser and contractor(s) in the remediation process leading to the design and planning of final status surveys, conduct of final status surveys, and evaluation of results and data quality assessment in demonstrating that the site, once remediated, meets the release criteria.

Response: Kaiser's management team (Project Manager, Health Physics Advisor/Radiation Safety Officer [RSO], and Site Administrator) collectively will ensure that the guidance provided by the contractors in the remediation process (including the design and planning of final status surveys, conduct

of final status surveys, and evaluation of results and data quality assessment) is conducted in accordance with the commitments and objectives of the DP.

The Kaiser Project Manager has overall responsibility for planning and management of the decommissioning activities. The Project Manager must possess a BA/BS degree and have a minimum of 10 years of management experience, including 5 years of health, safety, and environmental management experience.

In addition to the responsibilities outlined in Section 9.1.2 of the June 2001 DP, Kaiser's Site Administrator will possess a minimum of a BS in Science or Engineering and have 2 years of management experience, or equivalent experience.

Section 9.1 and 9.3 of the June 2001 DP will updated accordingly to address these topics.

Comment:

(b) Confirm that the Health Physics Advisor/Radiation Safety Officer (RSO) will be assigned to the site for the duration of the project. As presented, the section implies that the RSO will be a contractor and not necessarily located onsite. If the RSO will not be onsite on a daily basis, then identify an Assistant RSO who will be onsite and assume day-to-day responsibilities. There is a need to identify all of the major functions of the RSO. Confirm that the RSO qualification will be commensurate with that specified in the SRP - see NUREG-1727, Module 9.3.1.

Response: The RSO selected by Kaiser will be qualified to oversee the radiation protection program for the duration of the project. The RSO will be responsible for the radiological health and safety of all license activities involving radioactive materials. In addition, the RSO will review the implementation and documentation of all work activities involving radioactive materials, including surveying, dosimetry, compliance issues, instrumentation, audits, data interpretation, training, wastes, shipping and receiving, decommissioning, decontamination, and emergency response. The RSO will possess a minimum M.S. degree in health physics or related field and have a minimum of 5 years experience in environmental restoration.

An Assistant RSO (the Lead HP Technician or other designee) will be appointed for day-to-day responsibilities, when the RSO is not to be scheduled to be on-site. The RSO will be qualified by training and experience for the types and quantities of radionuclides that will be encountered during decommissioning operations. In addition, the RSO will have "stop-work" authority for all activities involving radioactive material at the site.

Section 9.1.3 of the June 2001 DP will updated accordingly to address these topics.

Comment:

(c) The discussion on task management does not address how remediation activities will be managed via the use of radiation work permits (RWP) or safety work permits (SWP) and how ALARA considerations will be considered on how such activities will be planned, approved, and conducted.

Response: Section 9.2 of the June 2001 DP will be updated to include the use of Safety Work Permits (SWP). This discussion will be similar to the following: Remediation activities will be managed with the use of SWP. Written procedures will include a blanket approval system for routine remediation activities.

In the event of unique activities or conditions, the safety requirements will evaluated and a collective decision will be made. Remediation operations will be controlled to assure that the residual radioactivity is ALARA.

Comment:

(d) A review of the Organization Chart reveals an inconsistent approach in assigning lines of responsibilities. For example, the Quality Control Supervisor answer to the Contract Project Manager and not the Quality Assurance Coordinator. Similarly, Health Physics Technicians answer to the Quality Control Supervisor rather than the Site Supervisor and/or Health & Safety Officer, depending on whether they are supporting remediation activities or radiation protection functions. The Org. Chart should note that the RSO positions may be assigned to a contractor. Finally, the Org. Chart does not identify the role and functions of a Radiation Safety Committee.

Response: The Decommissioning Management Organization chart (Figure 9-1) will be updated to show a more consistent approach in responsibilities. The position of the RSO may be either filled by a Kaiser employee or by a contractor at Kaiser's direction. The Lead Health Physics Technician/Assistant RSO (Contractor) and Health Physics Technician (Contractor) now answer to the Project Manager (Contractor). As discussed during our April 25, 2002 meeting, Kaiser has elected to: (1) have an independent Quality Assurance (QA) coordinator (consultant); (2) have a contractor Quality Control (QC) supervisor answering to the contractor Project Manager; and (3) not have a Radiation Safety Committee for this project. Based on the extensive characterization of the site, the anticipated level of radiological risk is not high (i.e., total annual exposure to site personnel will be well below 10 percent of applicable limits). However, as mentioned in the response to Comment a. above, Kaiser's management team (Project Manager, Health Physics Advisor/RSO, and Site Administrator) collectively will ensure that the guidance provided by the contractors in the remediation process is conducted in accordance with the commitments and objectives of the DP.

Comment:

(e) The list of subjects covered by the Contractor Work Plan needs to include site security, radioactive waste and material management, material and equipment monitoring and release, effluent monitoring and sampling, personnel monitoring, sample analysis (on and offsite lab support), ALARA review and approval, personnel training in recognition that some tasks may be complex, development of RWPs or SWPs for new tasks, radioactive waste and material packaging according to DOT regulations, and compliance with the waste acceptance criteria of disposal sites.

Response: The Contractor Work Plan listing included in Section 9.2.4 of the June 2001 DP will be updated to include the above list of subjects.

Comment:

(f) The training needs to focus on the objectives of the DP in addition to the topics normally required for radiation workers and general employee orientation. Specify the required training frequency for personnel involved in remediation activities. Also, note that the training needs to meet the requirements of 10 CFR Part 19, in addition to Part 20. Confirm that all training records will be maintained over the course and completion of all remediation activities.

Response: Section 9.4 of the June 2001 DP will be updated to include a statement that training focused on the objectives of the DP will be required. Section 9.4.4 will also be updated to include a description of annual training and refresher training, as needed, to comply with both 10 CFR 19 and 10 CFR 20. In addition, a statement that training records will be maintained over the course and completion of all remediation activities will be included in Section 9.4.4.

Comment:

(g) Identify the role of an offsite analytical laboratory in supporting sample analysis (remediation support, worker monitoring, effluent monitoring, and sampling associated with final status surveys) and whom within Kaiser's management staff will be responsible for that oversight and coordination role.

Response: With the exception of radiation badge service, laboratory analytical services are expected to be provided by Outreach of Broken Arrow, Oklahoma. Sampling will be conducted by the Lead Health Physics Technician (Contractor). Coordination will be handled by the Kaiser Site Administrator. Section 9.5 of the June 2001 DP will be updated accordingly to address this topic.

Comment:

(h) Specify that records of past radiation exposures will be obtained for employees that will be designated as radiation workers.

Response: Section 9.4.4 of the June 2001 DP will be updated to reflect the following statement. Records of past radiation exposures will be obtained for employees that will be designated as radiation workers.

10.0 Section 10.0 - H& S Plan

Response: Chapter 10.0 of the June 2001 DP provides the general framework for H&S policies and practices to be followed during decommissioning activities at the Kaiser Tulsa site. It is the intent of Kaiser to use the Radiological Control Program Plan that was approved for the ALRP with the necessary revisions. In addition, contractors engaged to perform work related to site remediation will be required to prepare and submit H&S plans of their own that will be specific to activities and services they are to provide.

Comment:

(a) This section does not present the information and details specified in Modules 10.1 and 10.3 of the SRP - NUREG-1727. This section fails to fully address NRC requirements of 10 CFR Part 20 and guidance given in Division 8 Regulatory Guides and NUREG-1400.

Response: Section 10.1.1, Air Sampling Program, of the June 2001 DP will be amended to include the following additional information:

- Airborne radioactivity surveys will be performed for radioactive material in the particulate form. Sampling equipment and setting ranges include but are not limited to the following:
  - Low volume (Lo-Vol) particulate samplers (normally set in the range of 80-120 Lpm).

- High volume (Hi-Vol) particulate samplers (normally set in the range of 20 – 60 cfm).

- Lapel samples (normally taken at 4 cubic feet per hour [CFH]). If possible, a minimum volume of 6.35 E+06 ml should be obtained. However, if this sample volume cannot be obtained then the sample should be taken for the duration of the work evolution.

- Air Sampling will be conducted outside site boundaries to evaluate offsite releases.

- Routine air sampling will be performed as an ongoing periodic surveillance of general site radiological conditions. The purpose of these surveys is to detect changes in radiological conditions and demonstrate that appropriate postings/controls are in place.

  - The schedule of routine air samples will be periodically reviewed/modified to reflect and changes in the scope of operations.

  - Routine general area samples will normally be taken at the site boundaries using low volume air samplers.

- Job specific air sampling will be performed in specific work areas to determine the extent of the radiological airborne hazards, establish radiological protective measures/controls, and control personnel exposure. These air samples will include, as appropriate, evaluations of pre-job conditions, job coverage evolutions, or other work-related functions.

  - Job specific air samples will generally consist of high volume particulate samples and, when practical, lapel air samples.

- Air sampling equipment will be calibrated in accordance with ANSI N13.1-1999 within 6 months of the start date of the project and every 6 months thereafter. The analysis of the air samples will be performed with equipment capable of a minimum detectable activity equal to a fraction of the appropriate Part 20, Appendix B limit. The analysis equipment will be calibrated in accordance with ANSI N42.17A-1989 guidance.

- If personal exposure to more than 40 DAC hours in 1 day is suspected, the RSO will evaluate the possibility of an uptake. Evaluation will include, but not be limited to nasal smears to determine exposures due to an uptake of thorium.

- For reasons stated in Section 10.1 it is unlikely that airborne thorium concentration will exceed 0.1 DAC and is not expected to ever reach 1 DAC. Nevertheless, if airborne thorium concentrations are greater than 1 DAC and a person must work there, respiratory protective equipment will be issued and used in accordance with 10 CFR 20.1702. However, in the event that respiratory equipment is required to perform remediation activities at the Kaiser facility work will stop until the appropriate engineering controls are in place to minimize airborne radioactive material.

Comment:

(b) Regarding the control of airborne radioactivity, the approach proposing to use engineered controls when dust becomes "visible" is totally unacceptable and contrary to all NRC requirements of 10 CFR Part 20 and guidance given in Division 8 Regulatory Guides.

Response: Section 10.1.2, Respiratory Protection Program, of the June 2001 DP will be amended to include the following additional information:

- The sentence containing the use of dust controls when dust becomes visible will be removed and replaced with the following:

  - **For reasons stated in Section 10.1, it is unlikely that airborne thorium concentrations will exceed 0.1 DAC and are not expected to reach 1 DAC. Nevertheless, in areas where dusts are easily generated, where environmental conditions are dry, or where material handling could attribute to the concentration of radioactive materials in the air, engineering controls such as misting and or filtering may be implemented as required by 10 CFR 20.1702.**

- In an instance where engineering controls are not practical (i.e., excessive watering of material prior to loading for transportation which may cause free liquids during shipping or handling) an evaluation will be performed to demonstrate that utilization of respiratory controls (air filters) will maintain ALARA. However, no such instance is expected to occur during decommissioning activities at the facility.

- As stated in Section 10.1.2 of the June 2001 DP, respiratory protection, medical screening, and fit testing is not specified under this H&S Plan. Based on previous site activities, the physical make-up of the material, and analytical results from previous air sampling respiratory protection equipment will not be required during remediation activities. However, if analysis of air sampling results during remediation activities indicate that respiratory protection is required the following steps will be taken prior to any further remediation activities in the suspect area.

  - Remediation activities in the suspect area will be halted and the area posted with the appropriate signage and temporary fencing.

  - The H&SS will evaluate the suspect area and document sampling results.

  - The H&SS will notify the PM and the SA.

  - A determination of corrective actions if needed will be determined by the H&SS.

  - If respiratory protection is deemed to be necessary, this H&S Plan will be revised with the appropriate procedures required by the guidance provided in Regulatory Positions C5, C3, C4, C5.2, and C6 of Regulatory Guide DG-8022.

  - All documentation, correspondence, and sample analysis will be maintained as part of the Kaiser project files.

  - The NRC will be notified of changes to the H&S Plan.

- Section 10.1.3, Internal Exposure Determination, of the June 2001 DP will be updated to indicate that the action levels for bioassays will be in accordance with Regulatory Guide 8.9. Worker intake of radioactive materials may also be measured by converting the

airborne concentrations to intake as outlined in Regulatory Guide 8.34. The measuring of airborne concentrations will be in accordance with Section 10.1.1 of this H&S Plan.

- Section 10.1.4, External Exposure Determination, of the June 2001 DP will be updated to indicate that the type of dosimeter to be utilized during site activities is the Landauer Luxel Radiation badge or equivalent.

- Section 10.1.5, Summation of Internal and External Exposures, of the June 2001 DP will be updated to indicate that TEDE will be calculated as presented in Regulatory Guide 8.34 and applied to any DPW to obtain the "dose equivalent" to the embryo/fetus as outlined in Regulatory Guide 8.36.

- Section 10.1.7 of the June 2001 DP will be updated to include gamma exposure rate meters and radiation badges.

Comment:

(c) The section refers to position of the H&S Officer, which is not defined in Sect. 9.0 - Project Management and Organization.

Response: Section 10.1.6 will be reviewed to change all mentions of H&S Officer to H&S Supervisor.

11.0 Section 11.0 - Environmental Monitoring and Control Program

Comment:

(a) This section does not present the information and details specified in Modules 11.1 to 11.3 of the SRP - NUREG-1727. Moreover, this section, by referencing Sect. 10.0 for the proposed approach in addressing air monitoring, fails to fully address NRC requirements of 10 CFR Part 20 and guidance given in Division 4 Regulatory Guides.

Response:

Section 11.1 Environmental ALARA Evaluation Program

Every reasonable effort will be made to limit radiation exposures and releases of radioactive materials in effluents in unrestricted areas as ALARA. The environmental monitoring and control program will include management of surface water and groundwater encountered in excavations as well as monitoring for airborne particulates. Periodic sampling (frequency and method of sampling described in Section 11.2) will be conducted to verify that concentrations in the water and air are below the values listed in 10 CFR 20 Appendix B, Table 2 (limits for effluent concentrations for air and water) and Table 3 (limits for releases to sewers). In addition, prior to the release of water to the sanitary sewer system, water samples must meet the criteria set forth in the following table provided by the City of Tulsa as part of Ordinance 19991.

Maximum Allowable Discharge Concentrations

Pollutant	Limitation	Pollutant	Limitation
Arsenic (Total)	1.0 mg/l	Nickel (Total)	3.25 mg/l
Cadmium (Total)	0.60 mg/l	Zinc (Total)	5.0 mg/l
Chromium (Total)	4.0 mg/l	Cyanide (Total)	2.25 mg/l
Copper (Total)	2.0 mg/l	Silver (Total)	1.2 mg/l
Lead (Total)	0.7 mg/l	Oil and Grease	100 mg/l
Mercury (Total)	0.04 mg/l	pH	6.0 to 10.5 std. pH units

Additionally, any discharge must comply with the requirements and limitations set forth in Federal Law 10 CFR Part 20.

A description of engineering controls to maintain doses ALARA will be provided in Section 11.3 of the DP. Water and air sampling results will be evaluated by the RSO. In addition, quarterly summary reports will be prepared evaluating the data of EMP activities and be submitted to the RSO. A post-remedial monitoring report will be completed to document all monitoring activities and results during and subsequent to remediation. Evaluation of air sample results, water sample results and reports by the RSO will be conducted to ensure that the EMP is maintaining its commitment of ALARA. Section 11.1 of the June 2001 DP will be updated accordingly to address these topics.

Section 11.2 Effluent Monitoring Program

Section 11.2 of the June 2001 DP will be updated to include the following topics:

- Background and baseline radionuclide concentrations have been properly established for the site (i.e., Th-232 concentration of 0.146 picocuries per liter of water, and 4.03 x 10^{-15} µCi/ml gross alpha in air).

- During the adjacent land remediation project, waters infiltrating the excavation were collected, temporarily stored for settling, and characterized. No collected waters required off-site processing. The average concentration of Th-232 in the collected waters was 1.2 pCi/l (7.7 pCi/l maximum) which is well below the Part 20 Release to Sewers Average Concentration Standard of 300 pCi/l.

- Physical and chemical characteristics of the site-specific radionuclides in the effluents are as follows:

  - The site-specific radionuclides exist as a thoriated dross material located within impoundments at the facility.

  - The material is generally gray to blue gray in color when found in quantities in the soil.

  - The material is insoluble in water. This has been demonstrated through the filtering of water samples as well as the settling of water removed from excavations.

  - The material does not migrate easily via air. This has been demonstrated through personal and environmental air monitoring during the ALRP.

- Collected Water as a Result of Remediation Activities – Storm water and groundwater collected within an excavation or decontamination area will be contained. Within an excavation, the construction of trenches or berms may be used to isolate storm water and infiltrating groundwater, thereby reducing the potential for contamination of these waters. Collected water will be sampled and analyzed for radiological contamination. If activity concentration levels are below the appropriate 10 CFR 20, Appendix B limit (Table 2 or 3), the water will either be released to surface drainage or the sanitary sewer.

- The frequency of air monitor sampling during remediation will be determined by the RSO. Four monitoring stations will be established to evaluate offsite releases. Samples for laboratory analysis will be collected in accordance with KAI-08 (Air Sampling Procedure). Standard chain-of-custody protocol will be strictly adhered to during all phases of sample collection, transport, and delivery to the laboratory. Minimum detectable concentrations for laboratory analysis will depend on laboratory analysis, instrumentation, and laboratory procedures. MDC concentration will be based on approved release criteria and will be a fraction of the accepted limits. The calculation for computing the MDC values for air samples is contained in Section 10.1.1 of the June 2001 DP.

- Effluent Discharge Locations – Once a representative groundwater and/or surface water sample has been collected and analyzed and satisfies the criteria outlined above in Section 11.1, the collected waters may be released to surface drainage or the sanitary sewer system (per the restrictions set forth by the City of Tulsa). Requirements of the City of Tulsa include that the access point to the sewer system be located within the facility. However, manhole locations are also acceptable with the addition of the proper safety requirements. Specific discharge points for surface water, if necessary, will be identified when design details for surface water control have been completed.

- EMP Reporting – Quarterly reports will be prepared summarizing the air monitoring results and the quarterly groundwater and surface water sampling results. These analytical results will be compared to the baseline sampling results and the required regulatory limits for effluent sampling. In addition, a post-remedial monitoring report will be completed to document all monitoring activities during and after remediation.

- EMP QA/QC Program – A QA/QC Program will be implemented as part of the EMP. The quality of data obtained as a result of the implementation of the EMP will be determined primarily on how well procedures were followed and whether or not the instruments used were functioning properly and adequately calibrated prior to use. To ensure that procedures are followed, personnel making measurements in the field or in the laboratory must review and understand procedures prior to the initiation of field and laboratory work. The following QA Procedures will be used in the performance of the work: KAI-03 (Groundwater Sampling Procedure), KAI-04 (Procedure for Field Measurement of pH, Conductivity, and Dissolved Oxygen), KAI-06 (QA Plan), KAI-07 (Surface Water Sampling Procedure), KAI-08 (Air Sampling Procedure), GEN 21-3 Rev. 3 (Laboratory QA Manual for Outreach Laboratory, Tulsa, Oklahoma).

Section 11.3 Effluent Control Program

Section 11.3 of the June 2001 DP will be updated to include the following topics:

- Existing Sections 11.2.2.4.1 Construction Management for E&S Control and 11.2.3 Protection of Water Quality in Downstream Watercourses will be relocated to Section 11.3, Effluent Control Program. A statement that commonly accepted and well established procedures, engineering controls, and process controls to achieve ALARA goals for effluent minimization will be added.

- A subsection on EMP Action Level will be added with the following discussion: Airborne radioactivity monitoring will be conducted to confirm the effectiveness of radioactive material control practices during work activities. Laboratory results will be compared to the 10 CFR Part 20 Appendix B, Table 1, derived air concentrations limit (DAC), 2×10^{-12} µCi/ml = 1 DAC, for Th-228, Th-230, Th-232 mix. If it is determined that air concentrations exceed 10 percent of the DAC, increased dust control and an evaluation of current engineering controls will occur. See response to comments a and b for Section 10.1.2 of this DP for additional measures and procedures concerning air monitoring.

- A discussion on a secondary containment system for the holding tanks will be added to Section 11.3: Water (groundwater and/or surface water) that infiltrates the excavation areas may be collected and temporarily stored for settling in holding tanks. This system would consist of a liner on top of a sand berm around the holding tanks. Any water that collects (due to rain event or leak from holding tank) in the containment system would be characterized and compared to the criteria outlined in Section 11.1 prior to discharge to the surface drainage or the sanitary sewer system.

- Section 11.3 will include a summary of site procedures: Site procedures will be established to ensure releases to sewer systems are controlled and maintained to meet the requirements of 10 CFR 20.2003. The procedures will address discharge to sewer systems in accordance with the following requirements: the material is water soluble (engineering controls will be maintained to ensure that only the liquid portion of the effluent and soluble materials are released); known or expected discharges meet the effluent limits of 10 CFR 20 Appendix B, Table 3; and the known or expected total quantity of radioactive material released into the sewer system in a year does not exceed 1 Ci of all other radioactive materials combined, as applicable and in accordance with guidance provided by the City of Tulsa in Ordinance 19991.

- Section 11.3 will include a subsection on Estimated Public Dose – Based on recent discharge concentration data obtained during the ALRP, no measurable doses to the public are anticipated. The insoluble thorium was settled out in the holding tank and only water which met the release criteria outlined in Section 11.1 was discharged to the sanitary sewer system.

12.0 Section 12.0 - Radioactive Waste Management

Comment:

(a) The waste characterization does not capture the expected range of Th-232 contamination given that the license once authorized Mg-Th alloys with Th as high as 4% by weight.

Response: The quantity of material SMC and later Kaiser were authorized to possess at one time was amended from time to time, but generally was limited to 30,000 pounds of magnesium-thorium alloy containing no more than 4 percent thorium. This thorium percentage would equal approximately 4,400 pCi/g by weight. However, it should be noted that thorium alloy material only comprised a small fraction of the total magnesium refined on site. Section 12.1 of the June 2001 DP will be updated to address this topic.

Comment:

(b) Material segregation will involve soils, dry-active wastes, debris, and other types of solid wastes. The section is silent on survey and sampling methods, survey instrumentation and laboratory support (on and offsite), QA/QC measures, and application of release criteria for material and waste governed by NRC FC83-23, disposal options of 10 CFR Part 20.2002, waste disposal at Envirocare *vs* WCS facilities, and NRC policy on clearance.

Response: Chapter 12.0 of the June 2001 DP will be updated to cross reference Chapters 8.0 and 14.0 relative to survey and sampling methods, survey instrumentation, laboratory support, QA/QC measures and the application of release criteria.

Comment:

(c) The section needs to identify likely waste disposal facilities that will be used in managing radioactive waste generated during all remediation activities. If is true that an "off-site disposal facility has not yet been selected" (Sect. 12.1.3, p.12-2), then explain the basis for the radioactive waste disposal costs provided in Sect. 15, given that disposal costs are dependent on the chemical and radiological properties of the wastes and transportation costs are dependent on the locations of the disposal sites.

Response: Because of dynamic market conditions, Kaiser is not committing to a waste disposal facility at this time. Kaiser has had discussions with several facilities regarding disposal costs and options for the project. The basis for the costs presented in Chapter 15.0 were the result of these discussions and vendors/supplier costing for previous site activities and/or similarly completed projects.

Comment:

(d) Section 12.2 notes that liquid effluents will be discharged to the sanitary sewer. Under NRC regulations [10 CFR Part 20.2003(a)(1)], only material that is readily soluble or readily dispersible biological material in water can be released in sanitary sewers. Given the nature of the material present at the site (i.e., metallic dross, soils, and other solid residues), it is not clear if liquid wastes containing such materials will meet the NRC criteria for discharges to the sewer. Provide a description of how liquid wastes will be managed, sampled and analyzed, and evaluated against 10 CFR Part 20 before being discharged given the expected properties of liquid effluents.

Response: See Kaiser's response to comments for Section 11.2 of the June 2001 DP. Section 12.2 of the June 2001 DP will be updated to appropriately address this topic.

Comment:

(e) The text fails to provide a characterization of radioactive waste that will be sent for disposal and remain onsite in response to the requirements of 10 CFR Parts 61.55 and 61.56 and a comparative evaluation of waste forms against the waste acceptance criteria of disposal sites expected to be used. Confirm that mixed wastes are not expected given past characterization efforts. However, should mixed waste be identified during remediation activities, confirm that Kaiser will notify the NRC and provide a characterization of such wastes, identify alternate disposal methods to accommodate such wastes, and assess all additional treatment and disposal costs, as needed.

Response: Section 12.3.1 of the June 2001 DP discusses radioactive waste characterization. As presented in Section 12.4 of the May 2002 DPA, based on past characterization efforts, mixed wastes are not expected to be generated during decommissioning operations. If mixed wastes are identified during remediation activities, NRC will be notified. The notification will include a characterization of the mixed wastes, ultimate disposal and/or treatment methods, and costs. A Section 12.4, Mixed Wastes will be incorporated into the June 2001 DP.

Comment:

(f) The discussion on the analytical methods that will be used to characterize waste and material remaining onsite needs to specifically list the analytical methods, which laboratory facilities that will perform such analyses, and confirm that the selected laboratories will be approved by the disposal sites and/or State agencies responsible for the oversight of the disposal facility.

Response: Section 12.3.1 of the June 2001 DP will be updated to state that the profiling of radiological waste for disposal purposes will be completed by a disposal site-approved and/or state-approved laboratory using accepted analytical methods and reporting limits.

13.0 Section 13.0 - QA Program

Comment:

(a) Given the discussion in Sect. 13.1, explain how Kaiser will impartially determine whether there is "an organizational conflict" of interest when one person performs multiple positions in light of the fact that the entire remediation team consists solely of contractors. Provide an Org Chart of the QA Program organization team, how the proposed QA program fits into Kaiser's current corporate QA policy, a commitment from Kaiser Management to support all remediation activities, and discussion as to how and when the NRC will be notified of changes in plans, procedures, and personnel impacting the commitments made in the DP.

Response: Chapter 13.1 of the June 2001 DP will be updated to include an organizational chart of the QA Program team. With regard to "Organizational Conflict", it should be noted that all contractors will report to Kaiser's Project Manager who will have ultimate authority for the project. Although one person may be responsible for more than one aspect of the remediation activities, no one person will be responsible for multiple tasks that would compromise any aspect of this DP. The responsibility of doing multiple tasks will be controlled through the lines of authority as well as management audits. Through

completion of the ALRP and ongoing investment in the DP, Kaiser continues to demonstrate support of remediation of the Tulsa facility, consistent with Corporate policy.

Section 13.1.1, Kaiser QAC will be updated to include the following information:

- Corporate Quality Policy – It is Kaiser's intention to implement its current QA Plan, KAI06, for remediation activities at the Kaiser facility. Aspects of the plan which do not cover current guidance or may be outdated will be revised prior to the onset of remediation activities. It is Kaiser's intention to implement appropriate QA program controls for work related to remediation and final radiological survey activities that may affect the health and safety of the public and personnel at the site, or the quality of the final survey data. The current QA Plan also will be revised to address project personnel responsibilities and activities in support of remediation. The plans and procedures identified in this plan will be selected to control remediation and final radiological survey activities.

- Notification of Changes – The NRC will be notified of changes in plans, procedures, and personnel that would impact the commitments of the DP before implementation of the changes. Editorial changes or personnel reassignments of a nonsubstantive nature would not require NRC notification.

Comment:

(b) A review of the section indicates that it is not clear as to whom within the management team has the ultimate responsibility for ensuring that all DP objectives and regulatory requirements are met during remediation activities. Given that all major functions will be performed by multiple contractors, the section needs to clearly identify who will be responsible for ensuring that all DP objectives and commitments are kept. In order to assess Kaiser's project management functions and oversight of the various contractors, discuss the respective QA responsibilities of Kaiser and its contractors, and how such responsibilities will be integrated into a coherent QA Plan.

Response: Section 13.1, Organization will be update with the following information.

- Kaiser Project Manager – The Project Manager has the overall responsibility for planning and managing remediation activities. The PM is responsible for ensuring that the Kaiser Remediation Project activities meet the established environmental, health and safety, QA requirements, technical performance, budgeting, and scheduling criteria. However, the Kaiser Project Manager will consult with the RSO and Site Administrator. In addition, the Kaiser Project Manager has the authority to make appropriate changes to the QA Plan deemed necessary, as the remediation activities progress.

- Site Administrator – Kaiser's Site Administrator is responsible for overseeing site remediation activities and day-to-day administration of contractor performance to assure that remediation activities are performed safely, in accordance with approved plans, design specifications, and government permits and regulations. Kaiser's Site Administrator has the authority to stop work that may be unsafe or that may violate an approved plan, design specification, government permit or regulation.

Comment:

(c) The section notes that only the "right type, quality, and quantity" of data will be used to determine compliance. This approach fails to address the concept of Data Quality Objectives (DQO) and Data Quality Assessment (DQA), as is embodied in NRC guidance. Accordingly, the section needs to address the DQO and DQA process, identify its elements, and discuss how they will be integrated in all phases of the remediation process. For details in structuring the DQO or DQA process for this site see Sect. 4.9 and 9.0, and App. D and E of MARSSIM.

Response: Chapter 13.0 will be updated to include the following information:

- DQO/DQA - Site surveys will be performed in a manner that ensures results are accurate and sources of uncertainty are identified and controlled. Radiological surveys and sampling will be planned using the Data Quality Objective (DQO) Process. The DQO Process assures that the right type, quantity, and quality of data used in decision making is appropriate for the intended application. An overview of QA and QC activities to be implemented during surveying and sampling are contained in Chapter 14.0. Details of the final status survey QA/QC will be in the Final Status Survey Plan and implementing procedures.

- During the course of remediation activities, a Data Quality Assessment (DQA) will be conducted to verify and validate the survey data and assessment of the quality of the data. Data verification is used to ensure that the requirements stated in the planning documents are implemented as prescribed. Data validation is used to ensure that the results of the data collection activities support the objectives of the survey as documented in Chapter 14.0. The DQA provides the assessment needed to determine that the planning objectives are achieved.

Comment:

(d) The text is silent on the QA/QC functions associated with sample collection and analysis, and laboratory support, for both on and offsite facilities.

Response: Chapter 13.0 will be updated to include the following information regarding sample collection and analysis:

- Procedure - Soil samples will be collected in accordance with written procedures. Sampling tools will be cleaned and monitored, as appropriate, after each use. Samples will be collected in clean/unused sealable containers.

- Documentation – Sample containers will be permanently labeled/marked in the field at the time of collection by the technician collecting the sample. At a minimum, the following information will be recorded on the sample container: sample date/time, sample identification number, sample location, and name of person collecting the sample. Samples which may contain radionuclide levels in excess of 100 times the baseline concentration or which, because of their form, may be a potential laboratory contamination concern will be identified on the outside of the container with a "radioactive material" caution label. Written documentation on sample collection, analysis and audits will be kept as part of the Kaiser project file.

- Chain of Custody – An approved procedure will be used for strict chain of custody to ensure that the integrity of the sample is maintained throughout sampling, transportation, analysis, and archiving.

- Analysis Requirements – For each type of laboratory analysis requested, a specification for the following (at a minimum) will be made: required analysis and/or analytical methodology, the required MDC value for each radionuclide, any result presentation requirements, sample disposition, and turnaround time require to support the project.

- Analytical Laboratory – For all analytical laboratories (vendors) used, at a minimum, the following QA/QC principles will be applied: proper maintenance, storage, and archiving of samples after transfer to laboratory will be practiced; and an approved internal QA program will be in place.

Comment:

(e) The text is silent on the QA/QC functions associated with personnel selection and qualification and training.

Response: Chapter 13.0 will be updated to include the following information regarding personnel selection, qualification, and training:

- Training – Individuals who collect samples and/or operate survey instruments or analytical counting systems will be trained accordingly and such training documented. Training will be commensurate with the education, experience, and proficiency of the individual and the scope, complexity, and nature of the assigned activity.

- Qualification – Individuals who collect samples and/or operate survey instruments or analytical counting systems will be qualified and such qualification documented. Qualification requirements will be commensurate with the scope, complexity, and nature of the assigned activity.

- Documentation – Steps of the process including, but not limited to, training, calibration of the instrumentation, daily checks, surveys, sampling, and results analysis and interpretation will be documented such that the records will stand up to audits. Records will be kept as part of the Kaiser project file.

Comment:

(f) The text is silent on the QA/QC functions associated with the ALARA process and how it will be implemented in plans and procedures associated with radiation exposures to site personnel and public, environmental releases, contamination control, and waste minimization.

Response: Chapter 13.0 will be updated to indicate that plans and procedures associated with radiation exposure will be developed and implemented with the ALARA principle. This includes the Safety Work Permit process.

Comment:

(g) Regarding instrument performance and checks, specify conditions as to what type of corrective actions will be taken, by whom, and time constraints for correcting any deficiencies.

Response: As stated in Section 13.4.2, Source and Instrument Checks, failed source checks will be repeated. Consecutive failure will result in additional testing of the counting system in accordance with the applicable procedure and ultimately removing the counting system from service. Survey data acquired prior to an instrument failing a source check will be reviewed by the Data Manager to determine the validity of the data. This section will be updated to reflect the following:

- The LHPT will notify the Project Manager of an instrument failure and corrective actions that were taken.
- The LHPT will also communicate to the Data Manager any instrument failure and corrective actions that were taken.
- Deficiencies will be corrected in a timely manner.

Comment:

(h) Regarding non-conformance, specify conditions as to what type of corrective actions will be taken, by whom, when will regulatory notification be required, who will determine whether work stoppage is required, and time constraints for correcting all deficiencies.

Response: Section 13.5, Corrective Action will be updated to include the following information:

- The resolution of the non-conformance shall include an evaluation of the validity and acceptability of measurements performed since the last acceptable calibration or source check and the need for repeating original activity or test using calibrated equipment. The calibration system shall provide for recall of equipment for recalibration and confirm that the required recalibration is performed. Out-of-calibration devices shall be tagged or removed from service. The LHPT will notify the Project Manager and the Data Manager of non-conformance items and corrective actions taken.
- Deficiencies will be corrected in a timely manner. Kaiser's Project Manager will notify NRC by telephone in the event that a deficiency cannot be corrected in a timely manner. The telephone notification will be followed by written notification. The decision to stop work will be evaluated on a case-specific basis by the Kaiser Project Manager and/or Site Administrator.

Comment:

(i) Regarding QA records retention, the discussions should be changed from "should" to "will," as in "...data records subject to this plan ***will*** be recorded..." - See similar instances in this and other subsections.

Response: Discussions within Chapter 13.0 will be revised, where appropriate, to replace the word "should" with the word "will."

Comment:

(j) Regarding audits and surveillance activities, the discussions need to note the frequency of audits and surveillance activities and how soon and by whom corrective actions will be taken in changing QA policy and procedures in light of identified deficiencies and non-conformances. As written, the text treats such issues as "recommendations" when they should be addressed as "directives" to correct violations of DP procedures and regulations.

Response: Sections 13.5, Corrective Actions and 13.7, Audits and Surveillance will be updated to refer to the appropriate updated portions of Chapter 13.0. Sections 13.5 and 13.7 also will be updated in include the following information regarding:

- The QAC is responsible for investigating deficiencies and non-conformancies.
- The Project Manager will determine the appropriate directive needed to correct the violation. The directive will be reviewed and implemented by the QAC.
- Documentation will remain part of the Kaiser project file.

References in Section 13.7 to "recommendations" will be revised to state "findings and/or directives" as appropriate. See Kaiser's responses to Section 9.0, Comment h (paragraph two) and Comment 25 for additional information.

14.0 Section 14.0 - Facility Radiation Surveys

Comment:

(a) Subsections addressing basis of proposed DCGLs, exempted and threshold Th-232 concentration criteria, and area factors were not reviewed by FDS - Comments pending from EPAB.

Response: Acknowledged.

Comment:

(b) Update the summary (Sect. 14.2.4) to include a full reference for the areas of the site that were remediated in the 2000-2001 time frame. Confirm that the Th-232-to-Th-230 ratio cited are correct (possible transcription errors?) and include a full reference for the citation. The comment about including a full reference also applies to Th-232-to-Th-230 ratios discussed in Sect. 14.2.2.

Response: The following will be added to the Chapter 14 Reference section:

4. NUREG/CR-1575, August 2000, MARSSIM, Rev. 1
5. Earth Sciences, February 2002, Final Status Survey Report, Adjacent Land Area, Tulsa Oklahoma Facility

6. Kaiser, August 1998, Adjacent Land Remediation Plan for Kaiser Aluminum & Chemical Corporation, Tulsa Oklahoma

Section 14.2.4, Summary will be revised to read as follows:

NUREG-1575 (MARSSIM) defines areas that have no reasonable potential for residual contamination as "non-impacted." These areas have no radiological impact from site operations. Areas with some potential for residual contamination are defined as "impacted." Impacted areas are further divided into Class 1, 2, or 3 areas based on the potential for contamination.

The freshwater pond area is nonimpacted. Results of characterization surveys indicate that the remainder of the pond parcel east of the freshwater pond impoundment is impacted. ~~Several of~~ The land areas ~~(as opposed to structures)~~ have been classified in accordance with MARSSIM based on the existing characterization survey data. The classification is provided in the Final Status Survey Design section below. In addition, part of the adjacent land was impacted and was remediated in 2000-2001. *The adjacent land area was surveyed under NUREG/CR-5849 and the unrestricted release approved by the NRC in 2002. Therefore, the entire area adjacent to the site as delineated by grids in Figure 2-4, is not addressed in this phase of decommissioning.*

In addition to the characterization events detailed in Sections 14.2.1, 14.2.2, and 14.2.3, composite samples of characterization core samples and final status samples were taken during adjacent land remediation surveys. The composite samples were analyzed by alpha spectroscopy to further evaluate the Th-232 to Th-230 activity ratio. The results yielded Th-232 to Th-230 ratios from 1:0.12 to 1:2.95. A summary of soil sample analyses performed to calculate the ratio of Th-232 to Th-230 activity is presented in the table below. A compilation of the analytical data used to calculate the ratio of Th-232 to Th-230 is presented in Appendix X. The established ratio of Th-232 to Th-230 of 1:3.5 will continue to be used during Phase II of the decommissioning of the site because this is the most conservative (protective) approach.

Reference	*Number of Samples*	*Minimum Ratio of Th-232:Th-230*	*Maximum Ratio of Th-232:Th-230*	*Average Ratio of Th-232:Th-230*
ADA 1994	*3*	*1:2.4*	*1:3.4*	*NA*
ARS 1995	*11*	*1:0.6*	*1:3.1*	*1:1.7*
Kaiser 1999	*24*	*1:1.5*	*1:6.4*	*1:3.4*
ES 2002	*14*	*1:0.1*	*1:3.0*	*1:2.1*

Characterization activities concerning water sample analysis have also shown that the contaminated material is not soluble.

Comment:

(c) In Sect. 14.3, revise the text to make it clear that survey instrumentation sensitivities are based on the detection of Th-232 decay products (i.e., Ac-228, Pb-212 and Bi-212) as opposed to "Th-232" alone.

Response: Section 14.3, Remedial Action Support Survey will be revised as follows:

Segregation of impacted soil during remediation may be aided by an automated system equipped with NaI (or equivalent) gamma detectors. Alternatively, HPTs may segregate impacted soil using portable survey instruments equipped with NaI detectors. Both detection methods have the sensitivity to detect Th-232

(surrogate radionuclide) below the most restrictive threshold value of 3 pCi/g above background. *Th-232 is an alpha emitter but is in secular equilibrium with several progeny that emit high-energy photons. Detection of Th-232 is based on the detection of these high-energy photons.* Table 14-6 provides MDC values calculated using the guidance provided in NUREG-1575, MARSSIM, for increasing background values. *The calculation of MDC is based on the detection of high-energy emitting Th-232 progeny.*

Comment:

(d) In addressing the FSS-readiness of a survey unit, the discussion noted on p.14-6 needs to recognize that (i) the development of remedial action surveys must be based on a DQO process that assures that survey data are of sufficient quality to make that determination, and (ii) that sampling and analysis results obtained in support of remediation activities are important elements to be review before reaching such a conclusion.

Response: Since the final status survey protocol presented begins with a 100 percent coverage gamma scan of the survey unit prior to final status sampling, the results of remediation surveys are only used to decide when to begin the final status survey gamma scan. The 100 percent coverage gamma scan survey is used to evaluate the remediation effort by identifying areas of elevated activity prior to final status soil sampling, and is therefore subject to the DQO process. Surveys performed before this are not. However, the scan MDC for remediation support surveys will be calculated based on the DQO selected Type 1 (false positives) and Type 2 (false negatives) errors. When the final status survey is initiated, the scan MDC will be calculated and if detection at the acceptance criteria is not possible the minimum number of samples will be adjusted in accordance with MARSSIM to assure sufficient quality data for final determination. The first paragraph of page 14-6 will be revised as follows:

Remedial action support surveys will be performed while remediation is being conducted and will guide the remedial action in a real-time mode. These surveys will be used to determine when a survey unit is ready for the final status survey. The remedial action surveys will rely principally on direct radiation measurement using gamma-sensitive instrumentation. *Scan MDC will be determined for remediation survey instrumentation using the same protocol as final status surveys.* The determination of a survey unit's readiness for a final status survey will rely on the on-site knowledge of the area (i.e., kriging information and area classification) and the results from the survey instrumentation.

Comment:

(e) The discussion addressing the presence of the spillway structure, and other features not listed here (such as subsurface piping, pumping station, culvert, and sanitary or industrial sewers), is not followed through completion in this section. The discussion needs to elaborate on whether surveys will be conducted to determine if radioactive contamination is present in underlying soils and whether the contamination on such structures is surficially or volumetrically distributed. Moreover, the discussion must note that in planning such surveys, considerations will be given to the removal of residues, liquids, and sediment. In sections of pipes that are not accessible (e.g., within elbows, joints, transitions to different pipe diameters, etc.), access will be provided by drilling or cutting into those sections of the pipe to assess levels of residual of contamination over the full length of buried or embedded piping. The discussion needs to address how instrument radiation detectors will be chosen and calibrated while taking into account surface and detector efficiencies when dealing with widely varying survey conditions, detector-to-surface geometries, and varying condition of the internal surfaces of pipes. Revise the section to address considerations in planning surveys that may rely on different techniques and how the results from different survey methods will be combined and

evaluated in demonstrating compliance with the appropriate DCGLs. Provide the release criteria for surficially contaminated material, and include descriptions of survey methods, instrumentation, calibration, and sensitivities.

Response: The second paragraph of page 14-6 will be revised as follows:

During remediation, excavated material will be characterized into one of the following four categories based on physical description and/or radiological survey:

- Contaminated Soil (or soil-like material) – Soil above the $DCGL_W$ or DCCL value for the processing and retention pond areas respectively.
- Acceptable Backfill Soil (or soil-like material) – Soil containing radioactivity above the $DCGL_W$ but below the DCCL value.
- Suspect Contaminated Soil *(or soil like material)* – Soil which requires additional characterization for the determination of whether it is below the $DCGL_W$ or DCCL value.
- Debris *(Structural Surface Survey Material)* – Non-soil material that is oversized (e.g., concrete fragments, bricks, and construction debris). *Surveys of debris consist of surveys of structural surfaces for total (fixed) and removable contamination in units of disintegrations per minute per one hundred centimeters squared ($dpm/100cm^2$).*

Debris is subdivided into two categories: 1) removable debris that can be easily removed from an excavation and 2) permanent structures such as the concrete spillway contained beneath Characterization Grids 1-4 (ALRP). Removable debris will be segregated from soil to the extent practical by visual inspection. The material will then be surveyed for potential clearance from the site. Clearance surveys will be performed in accordance with American National Standards Institute (ANSI) N13.12-1999, Surface and Volume Radioactivity Standards for Clearance. Based on the results of the clearance survey, the debris will be dispositioned as clean waste for disposal in an appropriate landfill or contaminated waste for disposal at an appropriate low level radioactive waste facility. Permanent structures will be surveyed for unrestricted release in accordance with the guidance provided in the May 2002 DP Addendum for structural surface surveys.

The area containing the Characterization Grids 1-4 (ALRP) is known to contain a concrete spillway. As shown in Figure 4-1, the spillway starts slightly west of Characterization Grid 1 and runs from west to east. The spillway turns north at Characterization Grid 4 and proceeds toward the retention pond. The spillway is considered a permanent structure and will be surveyed as a Class 1 structure. ~~and decontaminated until removable contamination is absent.~~

Additional subsurface structures may be encountered during excavation. The structures will first be categorized as permanent or removable. If the structures are permanent a final status survey of structural surfaces will be performed. Since thorium is highly insoluble it is not anticipated that structures will be volumetrically contaminated. However, subsurface culverts and/or piping may be encountered. Structures with internal surfaces will receive final status surveys of both external and internal surfaces. Consideration will be given to non-accessible surfaces. Residues, sediments and/or liquids encountered will be collected and held for sampling. Based on the results of the sample analysis, the material will be dispositioned accordingly. Gas proportional detectors will be used to survey

structural surfaces when possible. The final and clearance survey protocols for structures are detailed in subsequent parts of Chapter 14.0. Soil and/or soil like material surrounding structures will be segregated in accordance with this plan.

Comment:

(f) Section 14.4.1 states that the objective of the survey is to monitor the effectiveness of the remediation activities and demonstrate that the site meets the release criteria. A review of the subsequent sections indicates that the discussions and proposed approach rely on the MARSSIM survey methodology. It should be noted that the MARSSIM methodology primarily applies to the conduct of final status surveys and that committing to use MARSSIM to monitor the progress of remediation activities may be an onerous self-imposed requirement - Note: see next para. for the conduct of "characterization" surveys. **It is suggested that the survey methodology used to monitor the progress of remediation activities be discussed separately from those used to conduct final status surveys. The discussion needs to only identify survey screening methods, instrumentation, and instrument detection sensitivities; and demonstrate that the survey method and selected instrumentation are adequate in detecting residual activity levels at an appropriate fraction of the DCGL.**

Response: Section 14.4.1, Survey Objective will be revised as follows:

The objective of this survey is to ~~monitor the effectiveness of the remediation effort and ultimately~~ demonstrate that residual radioactivity levels meet the site release criteria.

Comment:

(g) If additional "characterizations" surveys must be conducted over the course of remediation activities, then certain elements of MARSSIM will apply, but these are not discussed here. Again, it is suggested that this discussion be presented separately and address the requirements of SRP Module 14.2 and appropriate references to MARSSIM, namely Chapters 4.8.4, 5.3, and 6.0, and App. E. It can be noted that the requirements to conduct characterization surveys are not as imposing as those for conducting final status surveys.

Response: The following paragraph will be added to the end of Section 14.2.4, Summary:

The characterization of the site is complete. Extensive characterization surveys and sample analysis have been reviewed to provide the initial classification of the site open land areas and structural surfaces. The majority of the land area is impacted and classified as Class 1. The only non-impacted area is the freshwater pond parcel based on site history and the adjacent land based on final status survey results. The only identified subsurface structural surface is the spillway. The spillway is classified as impacted Class 1. All additional subsurface structures discovered during excavation in Class 1 open land areas will be classified as Class 1. Re-classification of any areas would be based on final status survey measurements secured as detailed in the following parts of Chapter 14.0.

Comment:

(h) In reviewing survey design criteria and methodology throughout the balance of Sect. 14, the following shortcomings need to be addressed and/or clarified:

(i) all final status surveys must be conducted on a random start and systematic basis and all survey and sampling points must be tied to a grid benchmarked to an established site reference coordinate system;

Response: Section 14.4.2.2, Discrete Soil Sampling will be revised as follows:

The results of discrete soil sampling will be used to verify that the average soil concentration is less than the appropriate $DCGL_W$ or ADCL values. Regardless of the survey unit classification (Class 1, Class 2, or Class 3), a predetermined minimum number of samples will be collected in each survey unit. A random-start triangular grid pattern will be used. *The random start point will be selected by use of readily available random point generators such as provided by the spreadsheet Excel. Sample points will be located by use of a global positioning system (GPS) or equivalent survey equipment.*

Comment:

(ii) describe the process that will be used in determining the total number of samples to be taken in each survey unit considering the DCGL, LBGR, estimate of the variability of residual radioactivity levels in the survey unit, and Type I and II error decision rates;

Response: The following subsection will be added to Section 14.4.2.1, MARSSIM's WRS Test:

Minimum Number of Samples (N/2)

When using the WRS test, the minimum number of samples (N/2) is the number of samples required in the survey unit and in the reference background area. Hence "N" is the total number of samples required to complete the WRS test. Paramount to determining the minimum number of samples is the determination of the relative shift, delta over sigma (Δ/σ). Delta is equal to the DCGL minus the lower bound gray region (LBGR) value. The LBGR value is arbitrarily set at ½ the DCGL value to start the determination. Sigma is an estimate of the variability in a set of sample analysis results. The sigma used is estimated based on the range of standard deviations of Th-232 activity concentration results of final status samples of the adjacent land remediation final survey (0.42). Since the Th-232 activity concentration of 3.0 pCi/g will be used as the surrogate $DGCL_w$, Δ is equal to 3.0 – 1.5, or 1.5. Delta divided by the sigma of 0.42 results in a relative shift of 3.57 which is rounded to 3.5 for the purpose of determining the required number of samples. The number of samples can be calculated using the following formula or looked up in Table 5.3 of MARSSIM:

$$N = \frac{(Z_{1-\alpha} + Z_{1-\beta})^2}{3(P_r - 0.5)^2}$$

where:

$Z_{1-\alpha}$ = *percentile represented by selected value of* α, *Table 5.2 of MARSSIM*
$Z_{1-\beta}$ = *percentile represented by selected value of* β, *Table 5.2 of MARSSIM*
P_r = *value obtained from Table 5.1 of MARSSIM*

Based on a relative shift of 3.5, the following number of samples are required to meet the DQOs:

Size of Survey Unit	*Class*	*DQOs for α and β*	*Number of Sampling Locations*
$\geq 10\ m^2$ <2,000 m^2	*1*	*0.05, 0.05*	*9*
$\geq 2{,}000\ m^2$ and <10,000 m^2	*2*	*0.05, 0.05*	*9*
$\geq 10{,}000\ m^2$	*3*	*0.05, 0.05*	*9*

The number of samples in the above table includes a factor to increase the number of required samples by 20 percent, as recommended by MARSSIM, to allow for lost or unusable data. The number of required samples may be further increased to increase the power level of the statistical tests.

In addition, the last sentence of Section 14.4.2.5 will be revised as follows:

The DQO selected for β is *0.05*. ~~0.10 or 0.25, depending on the area size.~~

Comment:

(iii) the WRS test is not conducted using "the survey unit net radiological conditions," rather the reference area measurements are added to the DCGL and measurements from the survey unit and reference area adjusted DCGLs are pooled and ranked to derive the sum of the ranks (see MARSSIM Sect. 8.4.2);

Response: Section 14.4.2.1, MARSSIM WRS Test will be revised as follows:

The final status survey will use systematic grid sampling to determine the average radionuclide concentration in a survey unit and gross gamma scans to screen for elevated areas. *At* least *the minimum number of samples (N/2) will be taken in each survey unit.* Since the radionuclides of interest occur naturally in background, ~~the survey unit net radiological conditions will be compared to the specified DCGLs or ADCLs using~~ *the minimum number of samples (N/2) from the reference background area will also be used to complete* the Wilcoxon Rank Sum (WRS) Test.

Comment:

(iv) there is a need to revise the list (p.14-10) of currently impacted areas, survey units, and the classification to include the "operational area," the Freshwater Pond Area, and areas adjacent to the railroad track that will be re-surveyed in Phase II in response to the commitment made in the Phase I FSS Report;

Response: The former operational area is addressed in the May 2002 DP Addendum. The Freshwater Pond Area is non-impacted. The areas adjacent to the railroad tracks were surveyed up to the property line. The element of the former survey that could not be completed was the exposure rate survey due to dross pond shine.

Comment:

(v) add the number of expected survey units for the spillway - see p.14-10;

Response: The tables of Section 14.7 will be revised as follows:

Definitions

Class	Definition	Survey Unit Size
1 Land Areas	Areas known or expected to have radionuclide concentrations above the $DCGL_W$	Up to 2,000 m^2
2 Land Areas	Areas known or expected to have radionuclide concentrations above normal background concentrations but that are not expected to be above the $DCGL_W$	2,000 to 10,000 m^2
3 Land Areas	Areas that are not expected to have radionuclide concentrations detectable above normal background concentrations	No limit
1 Structural Surfaces	*Areas known or expected to have radionuclide concentrations above the $DCGL_W$*	*Up to 100 m^2 of floor area*
2 Structural Surfaces	*Areas known or expected to have radionuclide concentrations above normal background concentrations but that are not expected to be above the $DCGL_W$*	*100 to 1,000 m^2*
3 Structural Surfaces	*Areas that are not expected to have radionuclide concentrations detectable above normal background concentrations*	*No limit*

Initial Area Classifications

Area	Description	Classification
Processing Area	Area currently occupied by a freshwater pond which will be used for processing/stockpiling excavated materials (≈9 survey units).	1
Former Retention Pond Area Bottom	Area formerly occupied by the dross retention pond and reserve pond, postexcavation of dross (≈21 survey units).	1
Former Retention Pond Area	Area formerly occupied by the dross retention pond and reserve pond, backfilled with below-criteria material in 2' survey lifts (≈21 survey units per lift).	1
Spillway/~~Trash Piles~~Other Permanent Structures	~~Areas suspected to contain building materials and or~~ Structures *(such as the spillway)* located where thoriated material is known to exist. *The total area of these structures cannot be determined until uncovered by excavation.*	1

Comment:

(vi) commit to use the unity rule in demonstrating compliance with the site cleanup criteria;

Response: The use of an adjusted DCGL value for Th-232 as a surrogate for all three thorium isotopes is the equivalent of unity. Refer to Section 14.5, Use of a Surrogate Radionuclide and Section 5.2.13, Spatial Distribution and Volume Estimates.

Comment:

(vii) in discussing typical scan MDCs on p.14-12, change the reference from Table 14-1 to 14-6 and confirm that the stated MDCs apply to both NaI survey systems tabulated on p.14-11. In addition, provide scan and fixed MDCs for survey methods used to determine the presence of surface contamination.

Response: Section 14.9 (p. 14-12) will be revised as follows:

...Typical *scan*-MDCs for *survey instruments equipped with 2-inch x 2-inch NaI detectors* are summarized in Table 14-~~1~~ *6* for increasing background count rates.

The radionuclides of concern and/or their progeny emit alpha and/or beta particles that are easily detected using survey instruments equipped with gas proportional detectors and scalers. Scanning for gross alpha or gross beta activity will be used as part of status surveys of structural surface survey units to ensure elevated areas of activity are not missed. In addition, static counts of structural surfaces at predetermined sample points are used to assess total contamination of structural surfaces. The following survey instruments (or equivalents) will be used to scan structural surfaces:

Manufacturer and Meter	***Manufacturer and Detector Model***	***Detector Type***	***Use***
Ludlum 2224	*Ludlum 43-89 Dual Phosphor Alpha/Beta Detector*	*Zinc Sulfide Scintillator*	*Scans and Static Counts for Alpha and Beta Emitting Radionuclides*
Ludlum 2221	*Ludlum 43-68 Gas Proportional*	*Gas Proportional*	*Scans and Static Counts for Alpha and Beta Emitting Radionuclides*

Use of these field instruments or acceptable equivalents are evaluated against the goal of achieving MDCs of less than the $DCGL_{WS}$ for direct measurements and/or scanning measurements. MDCs will be calculated for scanning instruments using the method provided in MARSSIM for calculating MDC that controls both Type I and Type II errors (i.e., elimination of false negatives and false positives) as follows:

Alpha Scan

There are two equations used to determine the alpha scanning DCGL depending on the background level. For a background level of less than 3 cpm, the probability of detecting a single count while passing over the contaminated area is:

$$P(n \geq 1) = 1 - e^{\frac{-GEd}{60v}}$$

where:

P(n ≥ 1) = *probability of observing a single count,*
G = *activity (dpm),*
E = *4π detector efficiency (cpd),*
d = *width of detector in direction of scan (cm), and*
v = *scan speed (cm/s).*

Increase the value of G until the corresponding probability equals the desired confidence level, e.g., 95 percent. For a background level of 3 cpm to about 10 cpm, the probability of detecting two or more counts while passing over the contaminated area is:

$$P(n \geq 2) = 1 - \left(1 + \frac{(GE + B)d}{60v}\right)\left(e^{-\frac{(GE+B)d}{60v}}\right)$$

where:

P(n ≥ 2) = *probability of observing two or more counts,*
G = *activity (dpm),*
E = *4π detector efficiency (cpd),*
B = *background count rate (cpm),*
d = *width of detector in direction of scan (cm), and*
v = *scan speed (cm/s).*

Increase the value of G until the corresponding probability equals the desired confidence level, e.g., 95 percent.

Beta Scan

Beta scanning MDC at a 95 percent confidence level is calculated using the following equation which is a combination of MARSSIM Equations 6-8, 6-9, and 6-10:

$$MDC_{scan} = \frac{d' \sqrt{b_i}\left(\frac{60}{i}\right)}{\sqrt{p} \cdot E_{tot} \cdot \frac{A}{100\,cm^2}}$$

where:

MDC_{scan} = *MDC level in dpm/100 cm²,*

d' = *desired performance variable (usually 1.38 corresponding to alpha and beta errors of 0.05),*
b_i = *background counts during the residence interval,*
i = *residence interval in seconds,*
ρ = *surveyor efficiency (0.5 – 0.75, 0.5 is conservative),*
A = *detector probe physical (active) area in cm^2, and*
E_{tot} = *total detector efficiency for radionuclide emission of*
= $E_i \times E_s$,
where:
E_i = *2π instrument efficiency in counts per disintegration (cpd) and*
E_s = *source (or surface contamination) efficiency.*

Note: Es values can be determined or the default values provided in NUREG-1507 can be used as follows: 0.25 for all alpha energies and beta maximum energies between 0.15 and 0.4 MeV, 0.5 for all beta maximum energies greater than 0.4 MeV.

Alpha or Beta Static Counts

Minimum counting times for static counts of total and removable contamination will be chosen to provide a MDC that is a fraction (25 – 75 percent) of the survey unit-specific acceptance criteria. MARSSIM equations have been modified to convert to units of dpm/100 cm^2. Count times are determined using the following equation. Static counting MDCs at a 95 percent confidence level are calculated using the following equation which is an expansion of NUREG-1507, Equation 6-7 (Strom & Stansbury, 1992):

$$MDC_{static} = \frac{3 + 3.29\sqrt{B_r \cdot t_s \cdot (1 + \frac{t_s}{t_b})}}{t_s \cdot E_{tot} \cdot \frac{A}{100}}$$

where:

MDC_{static} = *minimum detectable concentration level in dpm/100 cm^2,*
B_R = *background count rate in counts per minute,*
t_B = *background count time in minutes,*
t_S = *sample count time in minutes,*
A = *detector probe physical (active) area in cm^2, and*
E_{tot} = *total detector efficiency for radionuclide emission of*
= $E_i \times E_s$,
where:
E_i = *2π instrument efficiency in counts per disintegration (cpd) and*
E_s = *source (or surface contamination) efficiency.*

Note: Es values can be determined or the default values provided in NUREG-1507 can be used as follows: 0.25 for all alpha energies and beta maximum energies between 0.15 and 0.4 MeV, 0.5 for all beta maximum energies greater than 0.4 MeV.

In addition the reference section for Chapter 14 will be revised to include the following reference:

7. *NUREG-1507, December 1997, Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions*

Comment:

(viii) in discussing the use of NaI detectors for the conduct of FSS, state whether such detectors will be shielded or unshielded;

Response: The table in Section 14.9 will be revised as follows:

Manufacturer and Meter	Manufacturer and Detector Model	Detector Type	Use
Eberline E600	Eberline SPA3 2"-x-2" NaI scintillator	Sodium Iodide *(unshielded)*	Scans for Gamma Emitting Radionuclides
~~Bubble Technology Microspec-2~~	~~Bubble Technology Microspec-2~~	~~Sodium Iodide~~	~~Portable Gamma Spectroscopy Quantitative~~
Ludlum 2350-1	Ludlum 44-10 2"-x-2" NaI scintillator	Sodium Iodide *(unshielded)*	Scans for Gamma-Emitting Radionuclides

Comment:

(ix) Sect. 14.11.2 addressing an alternative to the scanning method is confusing as to the method and criteria that will be used. Elaborate as to its equivalency to MARSSIM in detecting elevated residual contamination levels;

Response: The equivalency is in the determination of grid spacing, the details of which will be provided in the final status survey plan and/or implementing procedures.

Comment:

(x) in developing scan survey specifications, confirm that the "Two Stage" scanning method of MARSSIM will be employed - see Sect. 6.7.2 of MARSSIM;

Response: The "two stage" scan methodology is standard for final surveys and the MDC formulas provided in the plan are based on it. The details of implementing a "two stage" scan will be provided in the final status survey plan and/or implementing procedures. Section 14.11.1, Surface Scans will be updated to indicate that the "two stage" scan methodology will be utilized.

Comment:

(xi) define what is meant by "the field of view of the detector" in conducting surveys (Sect. 14.4.2.3) and how it will be determined and applied in ensuring that all areas will be surveyed with adequate overlap;

Response: Standard 2-inch-by-2-inch NaI detectors are cylinders and view a surface slightly larger than the area of the bottom of the cylinder dependent on the distance the detector is held above the surface, the details of which will be provided in the final status survey plan and/or implementing procedures.

Comment:

(xii) describe the considerations and criteria that the Data Manager will use to determine which portions of a survey will need to be surveyed;

Response: Section 14.4.2.3 Scanning will be revised as follows:

One hundred percent coverage means that the entire surface area of the survey unit has been covered by the field of view of the detector. The scanning coverage for Class 2 areas will be adjusted based on the level of confidence supplied by existing data. Whenever less than 100 percent of the survey unit is scanned, the Data Manager will determine the degree of scan coverage and which areas are to be scanned *based on the information available at the time of survey. For example, if the potential for contamination in a section of the survey unit is higher than the rest, i.e., the section that borders a Class 1 survey unit, this section may receive 100 percent coverage, while the remaining section may receive 50 percent systematic coverage. If the survey unit has an equally unlikely potential for contamination, e.g., isolated with no previous history of contamination, a systematic coverage at 25 percent coverage may be appropriate.*

Comment:

(xiii) discuss the features, operating characteristics, and MDCs for the proposed use of the portable gamma spectrometry system (Microspec-2);

Response: See Kaiser's response to Comment (viii).

Comment:

(xiv) if the Microspec-2 system is intended to be as an *in situ* gamma spectroscopy system to demonstrate compliance with the cleanup criteria, provide a technical basis document outlining operating procedure and presenting calibration methods, personnel training, survey methodology against requirements for Class 1, 2 and 3 survey units, and data reduction and interpretation. Note that NUREG-1575 and -1507 do not provide guidance for this type of measurement method, while NUREG-1506 (draft) presents only limited guidance and details;

Response: See Kaiser's response to Comment (xiii) above.

Comment:

(xv) provide the data for all background (reference area) measurements and confirm that they meet the statistical criteria of Sect. 3.4 of App. E to the SRP - NUREG-1575 - include data in an App. to the DP;

Response: The June 2001 DP will be updated to include background data as an Appendix. Statistical analysis and/or additional sampling and analysis will be detailed in the final status survey plan and/or implementing procedures.

Comment:

(xvi) in discussing the use of the triangular grid pattern in collecting samples, indicate which equation will be used and how the location of each sampling points will be defined using the method of Sect. 8 of App. E to the SRP;

Response: Section 14.4.2.2, Discrete Soil Sampling will be revised as follows:

The results of discrete soil sampling will be used to verify that the average soil concentration is less than the appropriate $DCGL_W$ or ADCL values. Regardless of the survey unit classification (Class 1, Class 2, or Class 3), a predetermined minimum number of samples will be collected in each survey unit. A random-start triangular grid pattern will be used *in Class 1 and Class 2 survey units. This sampling pattern is generally the most efficient means of identifying small areas of elevated activity. The distance between the grid nodes (L) will be determined by*

$$L = [A/(0.866 \times n)]^{1/2}$$

where A is the survey unit area to be covered by the grid pattern and n is the number of samples.

Comment:

(xvii) regarding the reclassification of Class 2 and 3 survey units, the entire survey unit must be reclassified and investigated in addition to being remediated whenever survey measurements exceed either the $DCGL_{emc}$ or $DCGL_W$. It is not appropriate to simply carve out an area of elevated activity from a larger Class 2 or Class 3 survey unit into an separate Class 1 survey unit, since the initial basis for evaluating a Class 2 or 3 area is based on specific considerations, i.e., 10 to 100% scan coverage for Class 2 and totally judgmental for Class 3 areas. Accordingly, if a survey were to reveal some contamination in an arbitrarily selected portion, then the entire area should be deemed suspect and re-evaluated as per MARSSIM as to how the original survey unit was classified, the most likely causes of the contamination, and the possibility that other similar areas within the original survey unit having gone undetected. Update the investigational actions to ensure that any portion of a survey unit with residual radioactivity above the criteria will not go undetected and will not be released accidently [sic]. Finally, any downward classification of a survey unit needs to be reviewed and approved by the NRC;

Response: The last paragraph of Section 14.13.2, Data Evaluation and Conversion will be revised as follows:

Both the measurements at discrete locations and the scans will be subject to the EMC. The result of the EMC will be used as a trigger for further investigation. The investigation may involve taking further measurements to determine that the area and level of the elevated residual radioactivity are such that the resulting dose or risk meets the release criterion. The investigation will provide adequate assurance, using the DQO process, that there are no other undiscovered areas of elevated residual radioactivity in the survey unit that might otherwise result in a dose or risk exceeding the release criterion. In some cases, this may lead to reclassifying ~~all or part of~~ a survey unit--unless the results of the investigation indicate that reclassification is not necessary.

Section 14.7.3, Classification Downgrades will be revised as follows:

Any area classification may be downgraded (e.g., from Class 1 to Class 2) by the Data Manager based on the receipt of additional survey or measurement information that justifies the lower classification provided that the approval of the Kaiser RSO *and the NRC* is obtained.

Comment:

(xviii) any changes to an area classification need to be included in the FSS Report for that area and survey unit;

Response: The following bullet will be added to Section 14.14, Final Status Survey Report after the sentence "The survey results for each survey unit including the following":

A discussion of a survey unit re-classification including applicable data.

Comment:

(xix) Sect. 14.9 discusses that static or fixed measurements will be made, but no information is provided describing the survey instrumentation nor measurement sensitivities or MDCs;

Response: See Kaiser's response to Comment (vii) above.

Comment:

(xx) the discussion on laboratory analysis needs to identify which laboratory will be used for samples analysis and commit to a number of alpha spectroscopy analyses to confirm the validity of the current range of Th-230-to-Th-232 ratios over the site;

Response: Section 14.10, Laboratory Analysis will be revised to include the following information:

With the exception of radiation badge service, laboratory analytical services are expected to be provided by Outreach of Broken Arrow, Oklahoma. In the event that Outreach is not available, Kaiser will select another qualified analytical laboratory.

A minimum of five of the quality control samples taken as part of the final status survey will also be analyzed by alpha spectroscopy for Th-232, Th-230, and Th-228. The data will be used to confirm the activity ratio of Th-232 to Th-230 of 1:3.5. The required MDC for the alpha spectroscopy analysis will be 0.5 pCi/g.

Comment:

(xxi) the discussion on surface soil sampling is confusing as to what is meant in by collecting samples in areas that have been remediated to assess areas that have not been remediated;

Response: Section 14.11.3.1, Soil Sampling will be revised as follows:

Surface soil sampling will be conducted *to evaluate the average remaining activity concentration of a survey unit.* ~~in the process area to ensure that the remediation efforts have not contaminated a prior~~

~~unaffected area~~. Surface samples will be collected from the top 15 cm (6 inches) of soil that correspond to the soil mixing or plow depth in several environmental pathway models. Grass, rocks, sticks, and foreign objects will be removed from the soil samples to the degree practical at the time of sampling. If there is reason to believe these materials contain activity, they will be retained as separate samples.

Comment:

(xxii) the discussion on compositing soil samples is not clear as to the procedure and criteria since no information is provided on the number of sample aliquots and maximum volume of soil from which the composite samples will be drawn. Moreover, there is a need to define what is meant by "soils to be potentially used as backfill" and what will be the origin of the backfill and how its radiological properties will be determined;

Response: Composite sampling as described in Section 14.11.3.2, Composite Sampling is not part of the final status survey and therefore this section will be deleted.

Comment:

(xxiii) the outline of the core sampling procedure presented in Sect. 14.11.3.3 needs to address the concern identified above in (xxii), define the depth over which the core sample will be homogenized, justify the penetration depth of 6-inch into the excavation floor, confirm that the core scanning methods will be sensitive enough to detect the DCGL, and address the requirements of Sect. 11.1 of App. E to the SRP - NUREG-1727;

Response: Section 14.11.3.3, Core Sampling will be revised as follows:

Core samples will be collected after backfilling of below-release criteria material is complete. For purposes of a final status survey, the entire backfilled retention pond area will be considered as a unit and divided into survey units based on m^2, *i.e., Class 1 survey units of less than 2000 m^2.* ~~The predetermined number of soil samples will be collected in intervals which encompass the entire backfill layer (prior to placement of clean off-site backfill) plus a minimum of 6 inches of the excavation bottom. Cores that are collected will be analyzed by scanning the entire core with a 2-inch NaI probe (or equivalent) connected to a digital scalar. The coring will be placed in a container and thoroughly mixed to achieve a composite that is representative of the average concentration in that area. A portion of the composite sample of the interval will be submitted for laboratory analysis.~~ *A random start, triangular grid pattern will be used to take the required number of samples (N/2) in each survey unit. The sample will consist of a core sample through the approximate 3-meter layer of placed material and 6-inches of the excavation bottom. The entire core will be scanned using a 2-inch-by-2-inch NaI detector in a low background area sufficient to achieve a scan-MDC of less than 3 pCi/g Th-232. The core will be subdivided as follows: the bottom 6-inches of excavation bottom will be separated, mixed and containerized. The remaining 3-meters will be subdivided into three consecutive 1-meter segments in accordance with Appendix E of the NMSS Decommissioning SRP. Each 1-meter segment will be mixed and containerized. All four segments (one 6-inch and three 1-meter) will be analyzed by gamma spectroscopy for Th-232. The MDC required will be 3 pCi/g.*

In addition the following will be added to the Chapter 14 Reference Section:

8. NMSS Decommissioning Standard Review Plan Appendix E – Rev 0, September 2000, Implementing the MARSSIM Approach for Conducting Final Radiological Survey

Comment:

(xxiv) the approach and method used to survey areas assigned $DCGL_{emc}$ and $ADCL_{emc}$ and will be evaluated once EPAB has commented on the modeling basis and compliance with Subpart E to Part 20. This comment also applies to the discussion addressing the proposed survey methodology to confirm compliance with the criteria;

Response: Acknowledged.

Comments:

(xxv) the discussion on data evaluation (Sect. 14.3) is incomplete as it does not address the QA requirements of Sect. 4.9 and 9.0 of MARSSIM. Moreover, the discussion is silent on the review and use of QA audit reports and whether corrective actions identified in such reports have been implemented and can be tracked in data evaluation; fails to address how QA/QC requirements imposed on laboratory analysis (on and offsite) will be considered as part of this evaluation; and ignores the results of elevated measurement comparison tests and whether the results meet the specified survey unit scan coverage and post-remediation investigational action levels.

(xxvi) the discussion addressing data evaluation and conversion needs to indicate that results will be graphed (e.g., posting and scatter plots, histograms, retrospective power curves, etc.) and that the "MARSSIM" WRS test will be conducted while recognizing its limitations in using MDA or MDC data - see discussions in Sect. 8.4 of MARSSIM. Moreover, the discussion needs to commit to benchmarking the procedure (either manual or computerized) that will be used to conduct the WRS test as part of the QA process, with the results of the benchmark tests being fully documented;

(xxvii) the summary of statistical tests tabulated on p.14-16 needs to be corrected as follows: change "...than $DCGL_w/ADLC_w$ or the difference of..." to "...than $DCGL_w/ADLC_w$ **and** the difference of...";

Response: The review and use of QA audit reports and whether corrective actions identified in such reports have been implemented and can be tracked in data evaluation is beyond the scope of Section 14 of the SRP and of the DP. Note that Section 13 of the DP addresses QA/QC in general. Also, details of graphing the results of surveys will be provided in the final status survey plan and implementing procedures. Section 14.13, "Data Evaluation" is an overview of the review of data generated during the implementation of the final status survey plan and the adequacy of the data as used to support statistical analyses required by the plan. As such Section 14.13 will be revised as follows:

14.13 Data Evaluation

Data will be reviewed by the Data Manager to ensure that the requirements are implemented as prescribed and that the results of the data collection activities support the objectives of the survey, or permit a determination that these objectives should be modified.

14.13.1 Preliminary Data Review

The Data Manager will review QA and QC reports, prepare graphs of the data, and calculate basic statistical quantities to analyze the structure of the data and identify patterns, relationships, or potential anomalies. The survey data shall be reviewed as it is collected. The preliminary data examination includes the following:

- Evaluation of data completeness.
- Verification of instrument calibration.
- Verification of sample identification and traceability back to sampling location.
- Measurement of precision using duplicates, replicates, or split samples.
- Measurement of bias using reference materials or spikes examination of blanks for contamination.
- Assessment of adherence to method specifications and QC limits.
- Evaluation of method performance in the sample matrix.
- Applicability and validation of analytical procedures for site-specific measurements.
- Assessment of external QC measurement results and QA assessments, *including the results of analytical laboratory QA/QC reports related to the analysis of final status survey samples.*

14.13.2 Data Evaluation and Conversion

For comparison of survey data to $DCGL_W$s, ADCLs, or DCCLs, the survey data from field and laboratory measurements will be converted to $DCGL_W$, ADCL, or DCCL units. The Data Manager will ensure data measurements retain traceability to NIST and conversion factors are appropriate for the radiation quantity. The preliminary data reports will be reviewed to ensure adequate measurement sensitivity is being achieved and to resolve any detector sensitivity problems. *Analytical reports will be reviewed for proper MDC values. The results of analytical results will be reported whether the result is above or below the reported MDC value so that the MDC value is not used in the data assessment. Preliminary scan data will also be reviewed against the percent coverage requirement of the survey unit.*

An evaluation will be made to determine that the data are consistent with the underlying assumptions made for survey plan statistical procedures. The basic statistical quantities that will be calculated for the survey unit are the following:

- Mean
- Standard deviation
- Median
- Minimum
- Maximum

The parameter of interest is the mean concentration in the survey unit. The two-sample statistical test (WRS Test) will be used. ~~Thus, the total concentration of the radionuclide is compared to the release criterion.~~ The two-sample WRS Test will evaluate whether the median of the data is above or below the $DCGL_W$ or $ADCL_W$.

Summary of Statistical Tests

Survey Result	Conclusion
Difference between maximum survey unit measurement and minimum reference area measurements is less than $DCGL_W/ADCL_W$	Survey unit meets release criterion
Difference of survey unit average and reference area average is greater than $DCGL_W/ADCL_W$	Survey unit does not meet release criterion
Difference between any survey unit measurement and any reference area measurement greater than $DCGL_W/ADCL_W$ ~~or~~ *and* the difference of survey unit average and reference area average is less than $DCGL_W/ADCL_W$	Conduct WRS Test and elevated measurement comparison

The null hypothesis is assumed to be true unless the WRS test indicates that it should be rejected in favor of the alternative. The result of the hypothesis test determines whether or not the survey unit as a whole is deemed to meet the release criterion. The WRS test will be applied as outlined in the following steps.

1. *Adjusted reference area measurements will be obtained by adding the $DCGL_W$ to each reference area measurement.*

2. *The m adjusted reference area sample measurements and the n sample measurements from the survey unit will be pooled and ranked in order of increasing size from 1 to N, where $N = m + n$.*

3. *If measurements are tied in rank, each of the tied values will be assigned the same average rank of that group of tied measurements.*

4. *The ranks from the reference area will be summed as W_r.*

5. *The value of W_r will be compared with the critical value given in MARSSIM Table I.4 for the appropriate values of m and n at the required Type I error decision rate ($\alpha = 0.05$). If W_r is greater than the critical value, the null hypothesis that the survey unit exceeds the release criterion was rejected.*

Comment:

(xxviii) the discussion on the evaluation of the elevated measurement comparison test does not address (i) the provision of the unity rule in considering the size of the area with elevated levels of radioactivity and determining the area-weighted residual radioactivity levels, and (ii) instances where there may be more than one elevated area in a survey unit - see provisions in App. E to the SRP - NUREG-1727; and

Response: The application of the unity rule (sum of fractions) to the mix of radionuclides is addressed in the dose assessment. The derived value of 3.0 pCi/g Th-232 (as a surrogate) results in compliance with

unity, i.e., contribution from the other radionuclides are added in to show compliance. Based on the Th-232 derived surrogate value of 3.0 pCi/g as compliance with unity, area factors (representing area size) and EMC values in pCi/g (representing area-weighted residual radioactivity levels in terms of Th-232 activity) are presented in Tables 14-3, 14-4, and 14-5. The fourth paragraph of Section 14.13.2 will be revised as follows:

Both the measurements at discrete locations and the scans will be used *to identify elevated areas within a survey unit. Analytical results of soil samples will be used to complete the elevated measurement comparison. If residual radioactivity is found in a localized area of elevated activity - in addition to the residual radioactivity distributed relatively uniformly across the survey unit - the unity rule discussed above will be used to ensure that the release criterion has been met as follows:*

$$\frac{\delta}{DCGL} + \sum_{x+1}^{n} \frac{(\delta_{EMC} - \delta)}{DCGL_{EMC}} \leq 1$$

where:

δ = *is the average concentration of Th-232 over the entire survey unit*
δ_{EMC} = *the average concentration of Th-232 over the elevated area x within the survey unit*
$DCGL$ = *the* $DCGL_w$ *or* $ADCL_w$ *for Th-232*
$DCGL_{EMC}$ = *(area factor for elevated area x) X (DCGL)*
x = *refers to one of the elevated areas within the survey unit*
n = *the total number of elevated areas within the survey unit*

If there is more than one elevated area, a separate term will be included for each area. ~~subject to the EMC.~~ The result of the EMC will be used as a trigger for further investigation. The investigation may involve taking further measurements to determine that the area and level of the elevated residual radioactivity are such that the resulting dose or risk meets the release criterion. The investigation will provide adequate assurance, using the DQO process, that there are no other undiscovered areas of elevated residual radioactivity in the survey unit that might otherwise result in a dose or risk exceeding the release criterion. In some cases, this may lead to reclassifying all or part of a survey unit--unless the results of the investigation indicate that reclassification is not necessary.

Comment:

(xxix) the basis for the investigational levels tabulated on p.14-17 needs to specify which fraction of the DCGL will be used for flagging elevated results in Class 3 areas. Similarly, there is a need to identify the statistical parameter (or its value) that will be used to flag elevated results in Class 1 areas. The discussion on the use of investigational levels focuses on measurements that exceed investigational levels assuming that survey instrumentation fails by displaying high readings only; however, it should be recognized that this is not the only failure mode and that the data should be trended to ensure that all types of instrument failures (e.g., high, low, or induced systematic bias readings) are identified and investigated.

Response: The table will be revised as follows:

Postremediation Survey Investigation Levels

Survey Unit Classification	Flag Direct Measurement or Sample Result When:	Flag Scanning Measurement Result When:
Class 1	>$DCGL_{EMC}$ / $ADCL_{EMC}$ or > $DCGL_W$ / $ADCL_W$ and ~~> statistical parameter based value~~ *the mean of the survey unit is greater than 0.75 of the $DCGL_W$ / $ADCL_W$*	>$DCGL_{EMC}$ or >$ADCL_{EMC}$
Class 2	> $DCGL_W$	> $DCGL_W$ or >MDC
Class 3	> ~~fraction of~~ *0.5 of the* $DCGL_W$ + *background*	> $DCGL_W$ or >MDC

15.0 Section 15.0 - Budgetary Cost Estimates

Comment:

Response: The budgetary cost estimate presented in Section 15.0 of the June 2001 has been updated based on NRC's comments. This revised budgetary cost (including mobilization, demobilization, and a 10 percent contingency) is $19,820,00. Specific revisions to the cost estimate are discussed below.

Comment:

(a) The analytical cost estimate indicates that the related expenses are only associated with sample analysis to confirm that the cleanup criteria are met. However, the discussion and data presented are silent on costs related to support radiation protection activities (dosimetry, air sampling, and bioassays), environmental air sampling and monitoring, liquid waste effluent monitoring, waste characterization to demonstrate compliance with the waste acceptance criteria of disposal sites, and instrumentation calibration and replacement.

Response: The analytical cost estimate has been revised to include samples associated with radiation protection activities (H&S air samples and instrument calibration), QA/QC, environmental air monitoring, liquid waste effluent monitoring, and waste characterization. Section 15.8 of the June 2001 DP will be revised to include the following.

Based on experience, $100 per sample has been included for analytical costs. The analytical cost is based on a turnaround time of 1 week. Due to the size of the excavations, a 1 week turnaround time is expected to be adequate to ensure that the projects momentum is kept without unnecessary expenses on analytical samples. A faster turnaround time may be requested to help minimize water handling and ensure a safe working environment if required. However, this would not have a significant impact on the total overall cost of the project. The approximate number of final status survey samples (1,260) is based on a minimum of nine samples per survey unit per lift (no survey unit is greater than 2,000 m^2). A total of 140 survey units are estimated to verify the sites final radiological status. In addition to analytical sample cost, a cost for liquid radioactive waste testing is included. This cost is based on the

assumption that the not-to-exceed water quantity is 200,000 gallons (20 frack-tanks). It is estimated that 12 grab samples may be required for characterization purposes. Costs obtained for similar analysis during the ALRP equaled $390 per sample.

Additional samples that may be taken with their associated costs are included in the following table:

Additional sample costs				
Type of sample	*Analysis*	*Cost per sample*	*Estimated number of samples*	*Total estimated cost*
Waste Characterization Samples	*TCLP*	*$275.00*	*12*	*$3,300.00*
QA/QC Samples	*Gamma Spec.*	*$90.00*	*130*	*$11,700.00*
QA/QC Samples	*Alpha Spec.*	*$75.00*	*5*	*$375.00*
Environmental Air Samples	*Gross Alpha*	*$25.00*	*48*	*$1,200.00*
H&S Air Samples	*Gross Alpha*	*$25.00*	*48*	*$1,200.00*
Instrument Calibration	*Gamma Detection*	*$60.00*	*30*	*$1,800.00*

Comment:

(b) The unit sample cost of $100 seems adequate to cover only the cost of sample analysis via gamma spectroscopy, but not for alpha spectroscopy. Accordingly, update the section to identify the types of samples that will be analyzed and assign the appropriate cost by type of radio-analytical methods.

Response: See Kaiser's response to Comment a. above.

Comment:

(c) Confirm that the use of R.S. Means cost data based on a 1999 publication are still valid for 2002 and why Kaiser did not use quotes from vendors and suppliers to determine current costs.

Response: Where applicable, the cost estimate has been updated utilizing R.S. Means 2002 costing data. Costs for the following project elements were based on vendors/supplier costing for previous site activities and/or similarly completed projects:

- Soil segregation daily cost
- Backfill material
- Transportation and disposal
- Vegetative and soil cover

Comment:

(d) Balance to be reviewed by FDS.

Response: Acknowledged.

16.0 Appendix E

Comment:

(a) The H&S Plan presents staff function titles that are different than those presented in Section 9.0 - Project Management and Organization. Accordingly, update the Appendix and/or Section 9.0 to make them consistent.

Response: The Environmental Health and Safety Plan provided in Appendix E of the June 2001 DP will be removed from the document.

Comment:

(b) The appendix presents operational H& S concepts that are different than those presented in Section 10.0 - H&S Plan. Accordingly, update the Appendix and/or Section 10.0 to make them consistent.

Response: See Kaiser's response to Comment a. above.

Kaiser Phase 2 DP - Request for Additional Information

Comment:

(1) The DP should reference the Historical Site Assessment that was submitted to the NRC on December 12, 2001.

Response: Chapters 1.0 through 4.0 of the June 2001 DP will be updated to include references to the HSA that was submitted to the NRC on December 12, 2001. A copy of the HSA also was provided as Appendix A of the May 2002 DPA for the Tulsa facility.

Comment:

(2) Section 3.3 does not include the location of off-site wells in the area, or a statement indicating that there are no offsite wells.

Response: An inventory of water wells located within a 1-mile radius of the Tulsa facility was conducted through the Oklahoma Water Resources Board (OWRB). The inventory revealed the presence of one off-site well within a 1 mile area of the site that was being used for other than water quality/soil remediation monitoring purposes. The subject well is located approximately 1 mile to the west/southwest of the Tulsa facility and its identified use was for irrigation. Section 3.3 of the June 2001 DP will be updated appropriately to address this topic.

Comments:

(3) Section 3.2 references the applicable census tracts and block groups within the area but does not provide the demographic data as requested.

(4) Section 3.2 does not include a summary of the projected population in and around the site, as required.

(5) Section 3.2 does not include a list of minority populations by compass vectors, as required.

Response: Section 3.2 of the June 2001 DP will be updated to include the following data concerning minority populations by compass vectors, a summary of projected populations in and around the site, and identification of poverty populations around the site.

County	Direction from Tulsa County	Number of Minorities by Race							
		Total Population	Black or African American	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Hispanic or Latino	Two or more races	Other
Creek	West	67,367	1,724	6,120	179	17	1,283	3,479	423
Okmulgee	South	39,685	4,046	5,099	77	7	772	2,538	244
Osage	West	44,437	4,817	6,410	103	14	940	3,053	279
Rodgers	East	70,641	512	8,533	228	20	1,294	4,522	399
Wagoner	East	57,491	2,158	5,393	296	12	1,437	3,110	490
Washington	North	48,996	1,221	4,214	365	6	1,293	2,974	445

Source: U.S. Census Bureau, Census 2000 Redistricting (Public Law 94-171) Summary File, Matrices PL1 and PL2.

County	Direction from Tulsa County	Current population (yr. 2000)	Projected population (yr. 2025)
Creek	West	67,367	80,840
Okmulgee	South	39,685	47,622
Osage	West	44,437	53,359
Rodgers	East	70,641	84,709
Tulsa	-	563,299	645,928
Wagoner	East	57,491	68,989
Washington	North	48,996	58,795

Source: U.S. Census Bureau, Census 2000 Redistricting (Public Law 94-171) Summary File, Matrices PL1 and PL2.

County	Direction from Tulsa County	Estimate of People of All Ages in Poverty (yr. 1998) (%)
National	-	12.7
Oklahoma	-	16.1
Creek	West	13.7
Okmulgee	South	21.8
Osage	West	15.9
Rodgers	East	8.8
Tulsa	-	12.9
Wagoner	East	11.8
Washington	North	12.2

Estimates model 1998 income reported in the March 1999 Current Population Survey

Comment:

(6) Section 3.6.3 does not include a description of the location, attitude, and geometry of all faults in the site and vicinity.

Response: Section 3.6.3 of the June 2001 DP will be updated to address this topic. A geologic map also will be provided that illustrates the location of faults in the vicinity of the site.

Comment:

(7) Section 3.7 does not include flow duration data for the surface water bodies in the site area.

Response: The Tulsa facility lies within the intermittent stream portion of the Fulton Creek watershed. Fulton Creek flows north and east approximately 2 miles to Mingo Creek. The nearest location to the Tulsa facility for which stream discharge data are available is the U.S. Geological Survey gauging on Mingo Creek located approximately 8 miles downstream of the facility. Available flow data for this gauging station is summarized in the following table.

Year	Annual mean streamflow, in ft^3/s	Year	Annual mean streamflow, in ft^3/s	Year	Annual mean streamflow, in ft^3/s
1988	78.6	**1992**	84.4	**1995**	100
1989	69.4	**1993**	91.5	**1996**	58.5
1990	84.2	**1994**	115	**1997**	80.1
1991	62.3				

Section 3.7 of the June 2001 DP will be updated to address this topic.

Comment:

(8) Section 3.7 does not include an inventory of all existing and planned surface water users, whose intakes could be affected by migration of radionuclides from the site, or a statement saying that no radionuclides will be released from the site.

Response: As mentioned in the response to Comment 7, the Tulsa facility lies at the headwaters of Fulton Creek, which flows approximately 2 miles to Mingo Creek. The beneficial uses designated by the OWRB for Mingo Creek do not include domestic or municipal drinking water use. According to the OWRB, there are no surface water withdrawls within 9 miles of the Tulsa facility. Section 3.7 of the June 2001 DP will be updated appropriately to address this topic.

Comment:

(9) Tables 4-1 to 4-4 do not include storage coefficients, transmissivities, porosities or intrinsic permeabilities as stated in cross reference.

Response: A series of hydraulic conductivity testing of subsurface unconsolidated materials was completed by A&M Engineering between April 1997 and May 1999. Slug tests were used to measure the hydraulic conductivity of the screened materials in the monitoring wells and piezometers installed at the

site. A summary table of the results of these tests will be provided to update the June 2001 DP. An overview of the hydraulic conductivity tests is as follows:

- Unit 1 Materials (Sands) – Range of 2.12×10^{-5} and 3.32×10^{-3} cm/sec with an average of 1.11×10^{-3} cm/sec.
- Units 2 and 3 Materials (Silty Clays) – Range of 10^{-6} and 10^{-8} cm/sec based on Unified Soil Classification System classifications.
- Unit 4 Materials (Peaty Clay) – Range of 10^{-3} and 10^{-6} cm/sec.
- Unit 5 Materials (Dross) - Range of 3.41×10^{-4} and 3.06×10^{-3} cm/sec with an average of 1.3×10^{-3} cm/sec.
- Weathered Shale - Range of 1.6×10^{-6} and 5.55×10^{-4} cm/sec with an average of 2.11×10^{-4} cm/sec.

The hydraulic conductivity of the Nowata shale bedrock underlying the site also was tested using inflatable packer tests. The results of these tests will also be provided in a summary table. The hydraulic conductivity measured for this material ranged from 1.8×10^{-4} cm/sec for shallow weathered and fractured bedrock to less than 10^{-7} cm/sec for deep competent bedrock.

Section 3.8 of the June 2001 DP will be updated to address this topic.

Comment:

(10) Section 4.1.1 should reference the Historical Site Assessment that was transmitted to NRC on December 12, 2001.

Response: See to Kaiser's Response to Comment No. 1 above.

Comment:

(11) Section 4.1.1 does not provide a summary of the structures and locations at the facility that are not impacted by past licensed operations and the rationale for the conclusion.

Response: See Kaiser's response to Section 4, Comment c. Section 4.1 of the June 2001 DP will be updated appropriately to cross reference this topic to Section 4.1 of the May 2002 DPA.

Comment:

(12) Section 6.0 does not provide a description of the impacts of alternatives to minority or low-income populations within a 0.6 mile radius of the center of the facility.

Response: Section 6.1 of the June 2001 DP will be updated to include the following:

Dose analysis for the resident farmer under the selected alternative demonstrated that unrestricted release dose criteria could be achieved with a maximum total estimated dose of 0.276 mrem/yr. Given the industrialized setting of the area and census block data, no adverse impacts are expected for local

minority or low-income populations. In addition, the implementation of this alternative would relinquish the site with no reasonable possibility of an inadvertent dose to a member of the public.

Section 6.2 of the June 2001 DP will be updated to include the following:

Dose analysis for the resident farmer under the no-action scenario demonstrated that unrestricted release dose criteria could not be achieved with a maximum total estimated dose of 797 mrem/yr. The implementation of the no-action alternative also would increase the possibility of an inadvertent dose to a member of the public.

Comment:

(13) Section 8.2.1 does not provide a summary of the radiation protection methods and control procedures that will be employed during soil removal/remediation.

Response: Section 8.2.1 of the June 2001 DP will be updated to provide appropriate references to a Health and Safety Plan for the remediation project and Chapter 10 (Health and Safety Plan) of the June 2001 DP relative to the radiation protection methods and control procedures that will be implemented during remediation activities.

Comments:

(14) Section 9.3 does not provide the minimum qualifications for each of the management positions in the decommissioning organization.

(15) Section 9.3.3 does not provide the health physics and radiation safety education and experience requirements for the RSO.

(16) Section 9.1.3 does not describe the specific authority of the RSO to implement and manage the radiation protection program.

Response: See Kaiser responses to Section 9.0, Comments a. and b. Section 9.0 will be updated accordingly to present the minimum qualification requirements for the management positions in the decommissioning organization.

Comment:

(17) Section 9.4.3 does not provide a description of the daily worker training that will be provided to familiarize workers with job specific procedures or safety requirements.

Response: Section 9.4.3 of the June 2001 DP will be updated to provide a description of the daily worker training that will be provided to familiarize workers with job specific procedures or safety requirements. Prior to the initiation of daily work activities, the Site Administrator or Contractor Project Manager will hold a "kick-off" meeting to familiarize workers with the day's activities and their associated procedures and safety requirements. Changes to standard procedures as a result of unique project conditions will also be discussed during these "kick off" meetings. Procedure retraining will be provided as necessary prior to implementation.

Comment:

(18) Section 10.1.4 does not provide a description of the use of extremity and whole body monitors when the external radiation field is non-uniform.

Response: Kaiser will update Section 10.1.4 of the June 2001 DP to state that these types of monitors will not be required for this project.

Comment:

(19) Section 10.1.6 does not provide a description of the surveys to supplement personnel monitoring for workers during routine operations, maintenance, clean-up activities, and special operations.

Response: Section 10.1.6 of the June 2001DP will be updated to indicate that gamma exposure rate monitoring and air sample analysis will be used to supplement personnel monitoring for workers during routine operations, maintenance, clean-up activities, and special operations.

Comments:

(20) Section 10.1.8 does not identify the records to be maintained of the annual program review and management audits.

(21) Section 10.1.8 does not provide a description of the process used for evaluating and dealing with violations of NRC requirements identified during audits.

(22) Section 10.1.8 does not identify the records maintained as a result of RSO audits.

Response: Section 10.8.1 of the June 2001 DP will be updated to indicate that records and reports generated as a result of remediation activities and audits will be maintained as part of the Kaiser project file. Section 10.1.8 references Chapter 13.0 (QA Program) for document control, corrective action processes, and audits and surveillance methods.

Comment:

(23) Section 11.1 does not provide a description of the ALARA reviews and reports to be prepared for management.

Response: See Kaiser's response to comments regarding Section 11.1.

Comment:

(24) Section 12.2 does not provide a summary of the estimated volume of liquid radwaste generated from decommissioning activities.

Response: Pre-decommissioning closure of the freshwater pond is expected to lower the groundwater table significantly. Primary groundwater control for the deepest excavations will be accomplished by sheet piling. Secondary control will be pumping. For estimate purposes, it is assumed that not more than 200,000 gallons of water (approximately 20 frac-tanks) will be generated through the collection of waters

infiltrating the excavation areas. Section 12.2 of the June 2001 DP will be updated appropriately to address this topic.

Comment:

(25) Section 13.2 does not provide a description of how work performance is evaluated.

Response: Section 13.2, QA Program of the June 2001 DP will be updated to include the following information:

- Work performance will be evaluated through the lines of responsibility presented in the organizational chart (Figure 9-1). For persons performing more than one task, there may be multiple persons who will be required to evaluate their work performance. Performance evaluations may include but will not be limited to: daily oversight by persons responsible for daily activities at the site, management audits as outlined in Chapter 13.0, and regulatory audits as part of the NRC QA/QC program.

Comment:

(26) Section 13.2 does not provide a description of provisions to ensure that technical and quality assurance procedures are consistent with regulatory, and QA program requirements, and are properly documented and controlled.

Response: Section 13.2, QA Program of the June 2001 DP will be updated to include the following information:

- Prior to the implementation of field activities, written procedures consistent with the approved plan and current guidance will be prepared, reviewed by Kaiser management and submitted to the NRC. Revisions to the written procedures will be documented and kept as part of the Kaiser project file. Written procedures and plans will have the appropriately controlled Kaiser management signatures for review and approval. Health and Safety Plans will be submitted to Kaiser as part of the project file.

Comment:

(27) Section 13.2 does not provide a description of the management reviews, including documentation of concurrence in quality affecting procedures.

Response: Section 13.2, QA Program of the June 2001 DP will be updated to include that audits as outlined in Section 13.7 (Audits and Surveillance) will be documented and kept as part of the Kaiser project file. Additional information on this topic is presented in Kaiser's response to Comment 26 above.

Comment:

(28) Section 13.2 does not provide a description of the quality affecting procedural controls of the principal contractors.

Response: See Kaiser's responses to Section 13, Comments d, e, g, h, 13c, and 26.

Comment:

(29) Section 13.2 does not provide a description of the authority of each unit within the QA program.

Response: Kaiser's Project Manager will have the ultimate authority for the project. Others in the QA program will report as outlined in the June 2001 DP Section 13.1. See Kaiser's response to Section 13, Comment a for additional information.

Comment:

(30) Section 13.7 does not provide a description of the management reviews, including the documentation of concurrence in these quality affecting procedures.

Response: See Kaiser's response to Comment 27 above.

Comment:

(31) Section 13.7 does not provide a description of the quality affecting procedural controls fo [sic] the principal contractors.

Response: See Kaiser's response to Comment 28 above.

Comment:

(32) Section 13 does not provide a description of how NRC will be notified of changes to the QA program as presented or referenced in the DP.

Response: See Kaiser's response to Section 13, Comment a (paragraph two).

Comment:

(33) Section 13.1 does not provide a commitment that persons performing self assessments are not to have direct responsibilities in the areas they are assessing.

Response: See Kaiser's responses to Section 13, Comments a and 25.

Comment:

(34) Section 13.6 does not provide a description of the QA records storage facility.

Response: Section 13.6 of the June 2001 DP will be updated to include that QA records will be stored in a lockable fire proof cabinet at the Tulsa facility. Duplicate records also will be maintained by the contractor Project Manager at an alternate secure location.

Comment:

(35) Section 8.2.1, Page 8-2, last paragraph, states that below-criteria material will be returned to excavation. The DP should describe how the material will be segregated. It should be noted that

homogenization or dilution is not an acceptable means for lowering the average concentration of radionuclides.

Response: Sections 8.2.1 and 8.2.4 of the June 2001 DP will be updated to provide information regarding the potential use of a soil sorting system that will provide accurate segregation of radiologically contaminated soil. One of the systems being considered is a characterization and sorting technology that measures the radioactivity of soil as it passes underneath a detector array on a conveyor belt, and automatically separates the portion exceeding the release criteria. The essential advantage is automation, which affords a much higher degree of precision and accuracy compared with manual systems. Also, the soil to be disposed is analyzed, not just sampled, and the level of radioactivity is documented in both the contaminated and clean streams.

Comment:

(36) Section 8.2.6, states that the quantity of material for off-site disposal is estimated to be 1,200,000 cubic ft. This volume is inconsistent with the estimate presented in Section 5.2.1.4.

Response: Section 5.2.1.4 of the June 2001 DP will be updated to reflect the correct estimated volume of "above-criteria" material that will be shipped to an off-site disposal facility. This volume 1,200,000 cubic feet is consistent with the volume presented in Sections 8.2.6 and 12.3 of the June 2001 DP.

Comment:

(37) Section 8.2.6, A statement should be added to say that Kaiser will notify NRC immediately and submit a revised DP for review and approval if the current DP becomes cost prohibitive.

Response: Section 8.2.6 of the June 2001 DP will be updated to reflect the following statement. Kaiser will notify NRC immediately and submit a revised DP for review and approval if the currently proposed remediation plan becomes cost prohibitive.

Comment:

(38) Section 9.2 should describe the process for development, revision, and control of procedures.

Response: Section 9.2 of the June 2001 DP will be updated to include a description of the process for the development, revision, and control of procedures.

Comment:

(39) Section 9.2 should describe the process of training workers to implementing procedures.

Response: See Kaiser's response to Comment No. 17 above.

Comment:

(40) Sections 9.3.1 thru 9.3.3, do not describe the minimum qualification requirements for the PM, SA, and HPA/RSO.

Response: See Kaiser's responses to Section 9.0, Comments a. and b.

Comment:

(41) Figure 9-1, Organizational chart should be revised to remove the Quality Control Supervisor from the technical work chain of command.

Response: See Kaiser's response to Section 9.0, Comment d.

Comment:

(42) Section 11.1 should provide the criteria for release of effluents.

Response: See Kaiser's response to comments regarding Section 11.1.

Comment:

(43) Section 13.3 should identify the QA records.

Response: Section 13.3, Document Control of the June 2001 DP will be updated to indicate that QA records which will fall within the document control program include the following:

- Kaiser site-specific procedures
- Kaiser site-specific plans
- Contractor site-specific procedures
- Contractor site-specific plans
- Non-conformance reports
- Corrective Action reports
- Audit reports

Comment:

(44) Section 13.3 should describe the process for development, review and approval of QA records.

Response: See Kaiser's response to Comment 26.

Comment:

(45) Section 13.5 needs to be revised as follows: (1) 1st sentence must be revised to state that deficiencies and nonconformances "must" be reported; (2) should identify who is responsible for investigating deficiencies and nonconformances; (3) must indicate that corrective actions will be reviewed and approved by QAC; (4) must indicate that QAC will verify proper implementation of corrective actions.

Response: In addition to information contained in Kaiser's response to Section 13, Comment j, the following will be added to Section 13.5, Corrective Action:

- The first sentence will be revised to state that deficiencies and non-conformances "must" be report....

Comment:

(46) Section 13.6 should include a description of QA records storage facility.

Response: See Kaiser's response to Comment 34.

Comment:

(47) Section 13.6 should state that nonconformance reports, corrective action reports, and audit reports are also quality records.

Response: Section 13.6 of the June 2001 DP will be updated to include non-conformance reports, corrective action reports, and audit reports to the list of quality records.

Comment:

(48) Section 13.7.2 should state that: (1) quality assessments will be performed in accordance with written procedures; (2) assessments will examine the programmatic and technical elements of the QA program; (3) management will conduct a complete program review at lease annually.

Response: Section 13.7.2 of the June 2001 DP will be updated to include the following:

- Quality assessments will be performed in accordance with written procedures.
- Quality assessments will examine the programmatic and technical elements of the QA program.
- Management will conduct a complete program review at least annually.

Comment:

(49) Section 15, Table 15-1, the cost estimate is based on waste estimates that appear to be optimistic.

Response: This comment was verbally discussed and eliminated from the list of comments by NRC during the April 25, 2002 meeting.

Kaiser trusts this submittal addresses the NRC's technical review comments for the June 2001 DP. If you should have any questions concerning this response, please contact me.

Respectfully submitted,

J. W. Vinzant

J. W. (Bill) Vinzant
Manager, Corporate Environmental Affairs

JWV:tls

cc: Mr. John Buckley – U.S. Nuclear Regulatory Commission
Mr. Dwight Chamberland – U.S. Nuclear Regulatory Commission, Region IV
Ms. Pamela Bishop – Oklahoma Department of Environmental Quality
Ms. Kelly Hunter Burch – State of Oklahoma
Dr. Max Scott – ADA Consultants
Mr. Tre Fischer – Houston
Mr. M. David Tourdot – Earth Sciences
Al Gutterman – Morgan, Lewis & Bockius LLP
Mr. Paul Handa – Tulsa
Ms. Roberta Fowlkes – Ann Green Communications
Mr. Scott Van Loo – City of Tulsa

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