Decommissioning Plan Addendum

Tulsa Facility
Tulsa, Oklahoma

Volume 1 of 2

Kaiser Aluminum & Chemical Corporation
Baton Rouge, Louisiana

Project Nos. 5427K and 5427M
May 2002
Revised May 2003

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APPENDIX A

ACCEPTANCE REVIEW CHECKLIST

In the following checklist, all items are applicable to Kaiser Phase 2 DP except those marked with NA (NOT APPLICABLE)

May 2002 Decommissioning Plan Addendum
(Revised May 2003)

ACCEPTANCE REVIEW CHECKLIST

LICENSEE NAME: Kaiser Aluminum
LICENSE NUMBER: STB-472 (terminated) **DOCKET NUMBER:** 040-2377
FACILITY: 7311 East 41st Street, Tulsa, OK
DECOMMISSIONING PLAN DATED/VERSION: Phase 2 DP Addendum

Staff will review the decommissioning plan without assessing the technical accuracy or completeness of the information contained therein. The adequacy of this information will be assessed during the detailed technical review.

In most cases, licensees will not be required to submit all of the information in this checklist. Rather, the staff should use this checklist a basis for developing a site specific checklist for the individual facility. Staff should use the checklist first during the initial meetings with licensees to discuss the scope and content of the decommissioning plan for each site. The staff, in conjunction with the licensee, should determine what information should be submitted for the site, based on the uses of radioactive material at the site, the extent and types of radioactive material contamination, the manner in which the licensee intends to decommissioning the facility and other factors affecting the potential for increased risk to the public or workers from the decommissioning operations. This information should be documented by modifying the acceptance review checklist. Copies of the modified checklist should be provided to the licensee and maintained by the Project Manager. When the decommissioning plan is submitted the Project Manager should use the modified checklist to perform the acceptance review.

Staff will review the decommissioning plan table of contents and the individual decommissioning plan chapters or sections to ensure that the licensee or responsible party has included this information in the decommissioning plan. In addition, the staff may use the guidance regarding formatting and suggested length of individual as a guide in determining if the level of detail of the information appears to be adequate for the staff to perform a detailed technical review. Staff should recognize that failure to supply an item included in the checklist does not necessarily constitute grounds for rejecting the decommissioning plan. Rather, the staff should determine if the licensee can supply the information in a timely manner and if so communicate the additional information needs to the licensee in a deficiency letter. Only in those cases where a detailed technical review cannot begin without the required information should the DP be rejected. For example, if the licensee is requesting restricted release and has not obtained the appropriate input from community interests who could be affected by the decommissioning, the decommissioning plan should be rejected during the acceptance review. Questions regarding whether to reject a decommissioning plan based on the results of the acceptance review should be forwarded to the Decommissioning Branch, Division of Waste Management.

EXECUTIVE SUMMARY

1.0 & 3.1 the name and address of the licensee or owner of the site;
1.0 & 3.1 the location and address of the site;
-- a brief description of the site and immediate environs;
1.0 & 2.2 a summary of the licensed activities that occurred at the site
1.0 & 4.0 the nature and extent of contamination at the site;
1.0 the decommissioning objective proposed by the licensee (i.e., restricted or unrestricted use);
1.0 the DCGLs for the site, the corresponding doses from these DCGLs and the method that was use to determine the DCGLs;
7.2 a summary of the ALARA evaluations performed to support the decommissioning;
-- if the licensee or responsible party requests license termination under restricted conditions, the restrictions the licensee intends to use to limit doses as required in 10 CFR Part 20.1403 or 20.1404 and a summary of institutional controls, financial assurance.
-- if the licensee requests license termination under restricted conditions or using alternate criteria a summary of the public participation activities undertaken by the licensee to comply with 10 CFR Part 20.1403(d) or 20.1404(a)(4);
1.0 the proposed initiation and completion dates of decommissioning;
-- any post-remediation activities (such as groundwater monitoring) that the licensee proposes to undertake prior to requesting license termination; and
NA a statement that the licensee is requesting that its license be amended to incorporate the decommissioning plan

FACILITY OPERATING HISTORY

LICENSE NUMBER/STATUS/ AUTHORIZED ACTIVITIES

2.1 & 2.2 the radionuclides and maximum activities of radionuclides authorized and used under the former license;
2.1 & 2.2 the chemical forms of the radionuclides authorized and used under the former license;
NA a detailed description of how the radionuclides are currently being used at the site;
2.2 the location(s) of use and storage of the various radionuclides authorized under former licenses; and
NA a scale drawing or map of the site and environs showing the current locations of radionuclide use at the site;
NA a list of amendments to the license since the last license renewal.

LICENSE HISTORY

2.2 the radionuclides and maximum activities of radionuclides authorized and used under all previous licenses;
2.2 the chemical forms of the radionuclides authorized and used under all previous licenses;

See notes at end of checklist.

2.1	a detailed description of how the radionuclides were used at the site;
2.2 & 4.1	the location(s) of use and storage of the various radionuclides authorized under all previous licenses
Figure 3A-3	a scale drawing or map of the site, facilities and environs showing previous locations of radionuclide use at the site

PREVIOUS DECOMMISSIONING ACTIVITIES

2.4	a list or summary of areas at the site that were remediated in the past,
2.4	a summary of the types, forms, activities and concentrations of radionuclides that were present in previously remediated areas;
1.0 & 4.0	the activities that caused the areas to become contaminated;
2.4	the procedures used to remediate the areas and the disposition of radioactive material generated during the remediation;
2.4	a summary of the results of the final radiological evaluation of the previously remediated area
Figure 2-4*	a scale drawing or map of the site, facilities and environs showing the locations of previous remedial activity

SPILLS *(Kaiser will provide a summary statement)*

2.5	a summary of areas at the site where spills (or uncontrolled releases) of radioactive material occurred in the past;
2.5	the types, forms, activities and concentrations of radionuclides involved in the spill or uncontrolled release, and;
2.5	a scale drawing or map of the site, facilities and environs showing the locations of spills

PRIOR ON-SITE BURIALS

2.6	a summary of areas at the site where radioactive material has been buried in the past;
2.6	the types, forms, activities and concentrations of waste and radionuclides in the former burial, and;
Figure 2-1*	a scale drawing or map of the site, facilities and environs showing the locations of former burials.

FACILITY DESCRIPTION

SITE LOCATION AND DESCRIPTION

3.1	the size of the site in acres or square meters;
3.1	the State and county in which the site is located;
--	the names and distances to nearby communities, towns and cities;
3.1	a description of the contours and features of the site;
3.1	the elevation of the site;

See notes at end of checklist.

3.3 a description of property surrounding the site; including the location of all off-site wells used by nearby communities or individuals;
3.7 the location of the site relative to prominent features such as rivers and lakes.
Figure 3A-2 a map that shows the detailed topography of the site using a contour interval
3.3 the location of the nearest residences and all significant facilities or activities near the site
3.1 a description of the facilities (buildings, parking lots, fixed equipment, etc.) at the site

POPULATION DISTRIBUTION

3.2 a summary of the current population in and around the site, by compass vectors
3.2 a summary of the projected population in and around the site by compass vectors
3.2 a list of minority populations by compass vectors
3.2 *demographic data by census block group to identify minority or low-income populations*

CURRENT/FUTURE LAND USE

3.3 a description of the current land uses in and around the site;
3.3 a summary of anticipated land uses.

METROLOGY AND CLIMATOLOGY

3.4 a description of the general climate of the region
3.4 seasonal and annual frequencies of severe weather phenomena
-- weather-related radionuclide transmission parameters
-- routine weather-related site deterioration parameters
-- extreme weather-related site deterioration parameters
3.4 a description of the local (site) meteorology
3.5 the National Ambient Air Quality Standards Category of the area in which the facility is located and, if the facility is not in a Category 1 zone, the closest and first downwind Category 1 Zone.

GEOLOGY AND SEISMOLOGY

3.6.1 a detailed description of the geologic characteristics of the site and the region around the site
3.6.2 a discussion of the tectonic history of the region, regional geomorphology, physiography, stratigraphy, and geochronology
Figure 3-5* a regional tectonic map showing the site location and its proximity to tectonic structures
3.6.1 a description of the structural geology of the region and its relationship to the site geologic structure
-- a description of any crustal tilting, subsidence, karst terrain, landsliding, and erosion.
3.6.1 a description of the surface and subsurface geologic characteristics of the site and its vicinity
3.6.1 a description of the geomorphology of the site

See notes at end of checklist.

3.6.2	a description of the location, attitude, and geometry of all known or inferred faults in the site and vicinity
3.6.2	a discussion of the nature and rates of deformation
--	a description of any man-made geologic features such as mines or quarries.
3.6.3	a description of the seismicity of the site and region
3.6.3	a complete list of all historical earthquakes that have a magnitude of 3 or more or a modified Mercalli intensity of IV or more within 200 miles of the site.

SURFACE WATER HYDROLOGY

3.7	a description of site drainage and surrounding watershed fluvial features
--	water resource data including maps, hydrographs, and stream records from other
Figure 3A-2	agencies (e.g., U.S. Geological Survey and U.S. Army Corps of Engineers). topographic maps of the site that show natural drainages and man-made features
3.7	a description of the surface water bodies at the site and surrounding areas
3.7	a description of existing and proposed water control structures and diversions (both upstream and downstream that may influence the site).
--	flow-duration data that indicate minimum, maximum, and average historical observations
Figure 3A-2	for surface water bodies in the site areas maps of the site and adjacent drainage areas identifying features such as drainage areas, surface gradients, and areas of flooding.
--	an inventory of all existing and planned surface water users, whose intakes could be
Figure 3.6*	adversely affected by migration of radionuclides from the site topographic and/or aerial photographs that delineate the 100-year floodplain at the site
8.2.2*	a description of any man-made changes to the surface water hydrologic system that may influence the potential for flooding at the site

GROUNDWATER HYDROLOGY

3.8	a description of the saturated zone
3.8	descriptions of monitoring wells
3.8	physical parameters
3.8.1	a description of groundwater flow directions and velocities
3.8	a description of the unsaturated zone
3.8	information on all monitor stations including location and depth
3.8	a description of physical parameters
3.8	a description of the numerical analyses techniques used to characterize the unsaturated and saturated zones
3.8	the distribution coefficients of the radionuclides of interest at the site.

NATURAL RESOURCES

3.9	a description of the natural resources occurring at or near the site
3.9	a description of potable, agricultural, or industrial ground or surface waters

See notes at end of checklist.

3.9	a description of economic, marginally economic, or subeconomic known or identified natural resources as defined in U.S. Geological Survey Circular 831.
3.9	mineral, fuel, and hydrocarbon resources near and surrounding the site which, if exploited, would effect the licensee' or responsible party's dose estimates

ECOLOGY/ENDANGERED SPECIES

3.10	a list of commercially or recreationally important invertebrate species known to occur within 5 km of the site
3.10	a list of all commercially important floral species known to occur within 5 km of the site
3.10	a list of commercially or recreationally important vertebrate animals known to occur within 5 km of the site.
3.10	estimates of the relative abundance of both commercially and recreationally important game and nongame vertebrates
3.10.1	a list of all endangered species at or within 5 km of the site

RADIOLOGICAL STATUS OF FACILITY

CONTAMINATED STRUCTURES

4.1	a list or description of all structures at the facility where licensed activities occurred that
4.1 &	contain residual radioactive material in excess of site background levels;
Table 4-1	a summary of the structures and locations at the facility that the licensee or responsible party has concluded have not been impacted by licensed operations and the rationale
4.1 &	for the conclusion;
Table 4-1	a list or description of each room or work area within each of these structures;
4.1.1&App. B-1	a summary of the background levels used during scoping or characterization surveys;
4.1.1&Tbl. 4-1	a summary of the locations of contamination in each room or work area
4.1.1&Tbl. 4-2	a summary of the radionuclides present at each location, the maximum and average radionulide activities in dpm/100cm^2, and, if multiple radionuclides are present, the radionuclide ratios;
4.1	the mode of contamination for each surface (i.e., whether the radioactive material is present only on the surface of the material or if it has penetrated the material);
--	the maximum and average radiation levels in mrem/hr in each room or work area; and
Figures 4A-1 through 4A-7	a scale drawing or map of the rooms or work areas showing the locations of radionuclide material contamination.

CONTAMINATED SYSTEMS AND EQUIPMENT

4.2	a list or description and the location of all systems or equipment at the facility that contain residual radioactive material in excess of site background levels;
NA	a summary of the radionuclides present in each systems or on the equipment at each location, the maximum and average radionulide activities in dpm/100cm^2, and, if multiple radionuclides are present, the radionuclide ratios;

See notes at end of checklist.

NA the maximum and average radiation levels in mrem/hr at the surface of each piece of equipment;

NA a summary of the background levels used during scoping or characterization surveys; and,

NA a scale drawing or map of the rooms or work areas showing the locations of the contaminated systems or equipment;

SURFACE SOIL CONTAMINATION *(Discussion of surface and subsurface soil Contamination will be combined in one section)*

Table 4-13 & 4.3 a list or description of all locations at the facility where surface soil contains residual

Table 4-3 & radioactive material in excess of site background levels;

4.3 a summary of the background levels used during scoping or characterization surveys

4.3.1 through 4.3.9 a summary of the radionuclides present at each location, the maximum, average, and variability of radionuclide activities in pCi/gm, and, if multiple radionuclides are present, the radionuclide ratios;

-- the maximum and average radiation levels in mrem/hr at each location; and

Figures 4A-9 through 4A-17 a scale drawing or map of the site showing the locations of radionuclide material contamination in surface soil;

SUBSURFACE SOIL CONTAMINATION

Table 4-13 & 4.3 a list or description of all locations at the facility where subsurface soil contains residual

Table 4-3 & radioactive material in excess of site background levels;

4.3 a summary of the background levels used during scoping or characterization surveys

4.3.1 through 4.3.9 a summary of the radionuclides present at each location, the maximum, average, and variability of radionulide activities in pCi/gm, and, if multiple radionuclides are present, the radionuclide ratios;

Table 4-13 the depth of the subsurface soil contamination at each location; and

Figures 4A-9 through 4A-17 a scale drawing or map of the site showing the locations of subsurface soil contamination.

SURFACE WATER

4.4 a list or description of all surface water bodies at the facility that contain residual radioactive material in excess of site background levels;

4.4 a summary of the background levels used during scoping or characterization surveys

4.4 a summary of the radionuclides present in each surface water body and the maximum and average radionuclide activities in pCi/l.

GROUNDWATER

4.5 a summary of the aquifer(s) at the facility that contain residual radioactive material in excess of site background levels;

4.5 a summary of the background levels used during scoping or characterization surveys

See notes at end of checklist.

4.5 a summary of the radionuclides present in each aquifer and the maximum and average radionulide activities in pCi/l

DOSE MODELING

UNRESTRICTED RELEASE USING SCREENING CRITERIA

Unrestricted release using screening criteria for building surface residual radioactivity

NA the general conceptual model (for both the source term and the building environment) of the site; and,

NA a summary of the screening method (i.e., running DandD or using the look-up tables) used in the decommissioning plan.

Unrestricted release using screening criteria for surface soil residual radioactivity

(Kaiser will make a statement indicating that site specific information will be used)

5.1 justification on the appropriateness of using the screening approach (for both the source term and the environment) at the site; and,

5.1 a summary of the screening method (i.e., running DandD or using the look-up tables) used in the decommissioning plan.

UNRESTRICTED RELEASE USING SITE-SPECIFIC INFORMATION

5.2.1 source term information including nuclides of interest, configuration of the source, areal variability of the source, etc.

5.2.2 description of the exposure scenario including a description of the critical group.

5.2.1 & 5.2.2 description of the conceptual model of the site including the source term, physical features important to modeling the transport pathways, and the critical group.

5.1 & 5.2.2.1 identification/description of the mathematical model used (e.g., hand calculations, DandD Screen v1.0, RESRAD v5.81, etc.).

Appendix D* description of the parameters used in the analysis.

5.2.5 discussion about the effect of uncertainty on the results.

Appendices B, C, D, & E* input and output files or printouts, if a computer program was used.

RESTRICTED RELEASE USING SITE-SPECIFIC INFORMATION

(This section is applicable if Kaiser decides to a restricted release scenario)

-- source term information including nuclides of interest, configuration of the source, areal variability of the source, and chemical forms;

-- a description of the exposure scenarios including a description of the critical group for each scenario;

-- a description of the conceptual model(s) of the site that includes the source term, physical features important to modeling the transport pathways, and the critical group for each scenario;

See notes at end of checklist.

-- identification/description of the mathematical model(s) used (e.g., hand calculations, RESRAD v5.81, etc.);
-- a summary of parameters used in the analysis;
-- a discussion about the effect of uncertainty on the results; and
-- input and output files or printouts, if a computer program was used.

RELEASE INVOLVING ALTERNATE CRITERIA

NA source term information including nuclides of interest, configuration of the source, areal variability of the source, and chemical forms;
NA a description of the exposure scenarios including a description of the critical group for each scenario;
NA a description of the conceptual model(s) of the site that includes the source term, physical features important to modeling the transport pathways, and the critical group for each scenario;
NA identification/description of the mathematical model(s) used (e.g., hand calculations, RESRAD v5.81, etc.);
NA a summary of parameters used in the analysis;
NA a discussion about the effect of uncertainty on the results; and
NA input and output files or printouts, if a computer program was used.

ALTERNATIVES CONSIDERED AND RATIONALE FOR CHOSEN ALTERNATIVE

ALTERNATIVES CONSIDERED

Figure 8A-2 &
8.2.6 a description of the facility if the alternative is employed;
5.1 a summary of the health effects to adjacent communities if the alternative is employed;
6.1 a summary of the impacts on community resources such as land use and property values;
5.0 a summary of the impacts on the geology, hydrology, air quality and ecology in and around the site;
6.1 a description of impacts to minority or low-income populations within a 0.6 mile radius of the center of the facility (urban location) or within a 4 mile radius of the center of the facility (rural location);
NA if appropriate, an assessment of the potential for criticality;
8.0 a summary of the irreversible and irretrievable commitment of resources.
6.0 an analysis of the proposed alternative and other alternatives as required by 10 CFR 51.45(c);
** a list of the permits, licenses, approvals, and other entitlements and the discussion of the status of compliance with these requirements required in 10 CFR 51.45(d)

RATIONALE FOR CHOSEN ALTERNATIVE

6.1 a description of why the licensee selected the preferred alternative described in the decommissioning plan

See notes at end of checklist.

-- if the licensee has not selected the environmentally preferable alternative, an explanation of why this alternative was not selected.

ALARA ANALYSIS

7.1 a description of how the licensee or responsible party will achieve a decommissioning goal below the dose limit;
7.1 a quantitative cost benefit analysis;
7.1 a description of how costs were estimated; and,
7.2 a demonstration that the doses to the average member of the critical group are ALARA

PLANNED DECOMMISSIONING ACTIVITIES

CONTAMINATED STRUCTURES

NA a summary of the remediation tasks planned for each room or area in the contaminated structure in the order in which they will occur;
NA a description of the remediation techniques that will be employed in each room or area of the contaminated structure;
NA a summary of the radiation protection methods and control procedures that will be employed in each room or area;
NA a summary of the procedures already authorized under the existing license and those for which approval is being requested in the decommissioning plan;
NA a commitment to conduct decommissioning activities in accordance with written, approved procedures;
NA a summary of any unique safety or remediation issues associated with remediating the room or area; and,
NA for Part 70 licensees, a summary of how the licensee will ensure that the risks addressed in the facility's Integrated Safety Analysis will be addressed during decommissioning.

CONTAMINATED SYSTEMS AND EQUIPMENT

NA a summary of the remediation tasks planned for each system in the order in which they will occur including which activities will be conducted by licensee staff and which will be performed by a contractor;
NA a description of the techniques that will be employed to remediate each system in the facility or site;
NA a description of the radiation protection methods and control procedures that will be employed while remediating each system;
NA a summary of the equipment will be removed or decontaminated and how the decontamination will be accomplished;
NA a summary of the procedures already authorized under the existing license and those for which approval is being requested in the decommissioning plan;

See notes at end of checklist.

NA a commitment to conduct decommissioning activities in accordance with written, approved procedures;

NA a summary of any unique safety or remediation issues associated with remediating any system or piece of equipment; and,

NA for Part 70 licensees, a summary of how the licensee will ensure that the risks addressed in the facility's Integrated Safety Analysis will be addressed during decommissioning.

SOIL

8.2 a summary of the removal/remediation tasks planned for surface and subsurface soil at the site in the order in which they will occur including which activities will be conducted by licensee staff and which will be performed by a contractor;

8.2.1 a description of the techniques that will be employed to remove or remediate surface and subsurface soil at the site;

8.2.1 a description of the radiation protection methods and control procedures that will be employed during soil removal/remediation;

8.3 a summary of the procedures already authorized under the existing license and those for which approval is being requested in the decommissioning plan;

8.3 a commitment to conduct decommissioning activities in accordance with written, approved procedures;

8.3 a summary of any unique safety or removal/remediation issues associated with remediating the soil; and,

NA for Part 70 licensees, a summary of how the licensee will ensure that the risks addressed in the facility's Integrated Safety Analysis will be addressed during decommissioning.

SURFACE AND GROUNDWATER

NA a summary of the remediation tasks planned for ground and surface water in the order in which they will occur, including which activities will be conducted by licensee staff and which will be performed by a contractor;

NA a description the remediation techniques that will be employed to remediate the ground or surface water;

NA a description of the radiation protection methods and control procedures that will be employed during ground or surface water remediation

NA a summary of the procedures already authorized under the existing license and those for which approval is being requested in the decommissioning plan

NA a commitment to conduct decommissioning activities in accordance with written, approved procedures; and,

NA a summary of any unique safety or remediation issues associated with remediating the ground or surface water.

SCHEDULES

Figure 8-8* a Gantt or PERT chart detailing the proposed remediation tasks in the order in which they will occur

See notes at end of checklist.

8.5 a statement acknowledging that the dates in the schedule are contingent on NRC approval of the decommissioning plan;

8.5 a statement acknowledging that circumstances can change during decommissioning, and, if the licensee determines that the decommissioning cannot be completed as outlined in the schedule, the licensee or responsible party will provide an updated schedule to NRC; and,

8.5 If the decommissioning is not expected to be completed within the timeframes outlined in NRC regulations, a request for alternative schedule for completing the decommissioning

PROJECT MANAGEMENT AND ORGANIZATION

DECOMMISSIONING MANAGEMENT ORGANIZATION

9.1 a description of the decommissioning organization

9.1 a description of the responsibilities of each of these decommissioning project units;

9.1 description of the reporting hierarchy within the decommissioning project management organization

9.1 a description of the responsibility and authority of each unit to ensure that decommissioning activities are conducted in a safe manner and in accordance with approved written procedures

DECOMMISSIONING TASK MANAGEMENT

9.2 a description of the manner in which the decommissioning tasks are managed

9.2 a description of how individual decommissioning tasks are evaluated and how the SWPs are developed for each task;

9.2 a description of how the SWPs are reviewed and approved by the decommissioning project management organization;

9.2 a description of how SWPs are managed throughout the decommissioning project

9.2 a description of how individuals performing the decommissioning tasks are informed of the procedures in the SWP

DECOMMISSIONING MANAGEMENT POSITIONS AND QUALIFICATIONS

9.2 & 9.3 a description of the duties and responsibilities of each management position in the decommissioning organization and the reporting responsibility of the position;

9.2 & 9.3 a description of the duties and responsibilities of each chemical, radiological, physical and occupational safety-related position in the decommissioning organization and the reporting responsibility of the position;

9.2 & 9.3 a description of the duties and responsibilities of each engineering, quality assurance, and waste management position in the decommissioning organization and the reporting responsibility of the position

9.3 the minimum qualifications for each of the positions describe above

-- a description of all decommissioning and safety committees, provided Kaiser decides to pursue a restricted release scenario

See notes at end of checklist.

Radiation Safety Officer

9.3 a description of the health physics and radiation safety education and experience required for individuals acting as the licensee's or responsible party's RSO
9.1 a description of the responsibilities and duties of the RSO; and
9.1 a description of the specific authority of the RSO to implement and manage the licensee's or responsible party' radiation protection program

TRAINING

9.4 a description of the radiation safety training that the licensee will provide to each employee
9.4 a description of any daily worker "jobside" or "tailgate" training that will be provided at the beginning of each workday or job task to familiarize workers with job-specific procedures or safety requirements
9.4 a description of the documentation that will be maintained to demonstrate that training commitments are being met.

CONTRACTOR SUPPORT

8.2 a summary of decommissioning tasks that will be performed by contractors
9.1 a description of the management interfaces that will be in place between the licensee or responsible party's management and on-site supervisors and contractor management and on-site supervisors;
9.1 a description of the oversight responsibilities and authority that the licensee or responsible party will exercise over contractor personnel;
9.3 & 9.4 a description of the training that will be provided to contractor personnel by the licensee or responsible party and the training that will be provided by the contractor
9.5 a commitment that the contractor will comply with all radiation safety and license requirements at the facility.

HEALTH AND SAFETY PROGRAM DURING DECOMMISSIONING

RADIATION SAFETY CONTROLS AND MONITORING FOR WORKERS

Air Sampling Program

10.1 a description which demonstrates that the air sampling program is representative of the workers breathing zones
10.1 a description of the criteria which demonstrates that air samplers with appropriate sensitivities will be used; and that samples will be collected at appropriate frequencies
10.1 a description of the conditions under which air monitors will be used
10.1.1 a description of the criteria used to determine the frequency of calibration of the flow meters on the air samplers
10.1.1 a description of the action levels for air sampling results

See notes at end of checklist.

10.1.1 a description of how minimum detectable activities [MDA] for each specific radionuclide that may be collected in air samples are determined

Respiratory Protection Program

10.1.2 a description of the process controls, engineering controls or procedures to control concentrations of radioactive materials in air;
10.1.2 a description of the evaluation which will be performed when it is not practical to apply engineering controls or procedures
10.1.2 a description of the considerations used which demonstrates respiratory protection equipment is appropriate for a specific task based on the guidance on assigned protection factors;
10.1.2 a description of the medical screening and fit testing required before workers will use any respirator that is assigned a protection factor;
10.1.2 a description of the written procedures maintained to address all the elements of the respiratory protection program;
10.1.2 a description of the use, maintenance, and storage of respiratory protection devices
10.1.2 a description of the respiratory equipment users training program;
10.1.2 a description of the considerations made when selecting respiratory protection equipment

Internal Exposure Determination

10.1.3 a description of the monitoring to be performed to determine worker exposure
10.1.3 a description of how worker intakes are determined using measurements of quantities of radionuclides excreted from, or retained in the human body
10.1 a description of how worker intakes are determined by measurements of the concentrations of airborne radioactive materials in the workplace.
10.1.5 a description of how worker intakes, for an adult, a minor, and a declared pregnant woman are determined using any combination of the measurements above as may be necessary
10.1 a description of how worker intakes are converted into committed effective dose equivalent

External Exposure Determination

10.1.4 a description of the individual-monitoring devices which will be provided to workers
-- a description of the type, range, sensitivity, and accuracy of each individual-monitoring device;
10.1.4 a description of the use of extremity and whole body monitors when the external radiation field is non-uniform
-- a description of when audible-alarm dosimeters and pocket dosimeters will be provided
10.1 a description of how external dose from airborne radioactive material is determined
10.1.4 a description of the procedure to insure that surveys necessary to supplement personnel monitoring are performed

See notes at end of checklist.

10.1 a description of the action levels for worker's external exposure, and the technical bases and actions to be taken when they are exceeded.

Summation of Internal and External Exposures

10.1.5 a description of how the internal and external monitoring results are used to calculate TODE and TEDE doses to occupational workers;

-- a description of how internal doses to the embryo/fetus, which is based on the intake of an occupationally-exposed, declared, pregnant woman will be determined;

-- a description of the monitoring of the intake of a declared, pregnant woman if determined to be necessary;

10.1.8 a description of the program for the preparation, retention and reporting of records for occupational radiation exposures;

Contamination Control Program

10.1.6 a description of the written procedures to control access to, and stay time in, contaminated areas by workers if they are needed

10.1.6 a description of surveys to supplement personnel monitoring for workers during routine operations, maintenance, clean-up activities, and special operations;

14.2 a description of the surveys which will be performed to determine the baseline of background radiation levels and radioactivity from natural sources for areas where decommissioning activities will take place;

pendix G* a description in matrix or tabular form which describes contamination action limits (that is, actions taken to either decontaminate a person, place or area, or restrict access, or modify the type or frequency of radiological monitoring)

Appendix G* a description (included in the matrix or table mentioned above) of proposed radiological contamination guidelines for specifying and modifying the frequency for each type of survey used to assess the reduction of total contamination

-- a description of the procedures used to test sealed sources, and to insure that sealed sources are leaked tested at appropriate intervals

Instrumentation Program

10.1.7 a description of the instruments to be used to support the health and safety program

10.1.7 a description of instrumentation storage, calibration and maintenance facilities for instruments used in field surveys

10.1.1 a description of the method used to estimate the MDC or MDA (at the 95% confidence level) for each type of radiation to be detected;

10.1.7 a description of the instrument calibration and quality assurance procedures;

-- a description of the methods used to estimate uncertainty bounds for each type of instrumental measurement;

10.1.7 a description of air sampling calibration procedures or a statement that the instruments will be calibrated by a qualified service provider.

See notes at end of checklist.

Nuclear Criticality Safety

NA a description of how the NCS functions, including management responsibilities and technical qualifications of safety personnel, shall be maintained when needed throughout the decommissioning process;

NA a description of how an awareness of procedures and other items relied on for safety shall be maintained throughout decommissioning among all personnel with access to systems that may contain fissionable material in sufficient amounts for criticality;

NA a summary of the review of NCSA's or the ISA indicating either that the process needs no new safety procedures or requirements, or that new requirements or analysis have been performed; and

NA a summary of any generic NCS requirements to be applied to general decommissioning, decontamination, or dismantlement operations, including those dealing with systems that may unexpectedly contain fissionable material.

Health Physics Audits, Inspections and Record-Keeping Program.

10.1.9 a general description of the annual program review conducted by management

10.1.9 a description of the records to be maintained of the annual program review and management audits

10.1.9 a description of the types and frequencies of surveys and audits to be performed by the RSO and RSO staff

10.1.9 a description of the process used in evaluating and dealing with violations of NRC requirements or license commitments identified during audits

10.1.9 a description of the records maintained of RSO audits

ENVIRONMENTAL MONITORING AND CONTROL PROGRAM

ENVIRONMENTAL ALARA EVALUATION PROGRAM

11.1 a description of ALARA goals for effluent control;

11.1 a description of the procedures, engineering controls, and process controls to maintain doses ALARA

11.1 a description of the ALARA reviews and reports to management.

EFFLUENT MONITORING PROGRAM

11.1 a demonstration that background and baseline concentrations of radionuclides in environmental media have been established through appropriate sampling and analysis;

11.1 a description of the known or expected concentrations of radionuclides in effluents;

11.1 a description of the physical and chemical characteristics of radionuclides in effluents;

11.2 a summary or diagram of all effluent discharge locations;

11.2 a demonstration that samples will be representative of actual releases;

11.2 a summary of the sample collection and analysis procedures

See notes at end of checklist.

11.2 a summary of the sample collection frequencies;
11.2 a description of the environmental monitoring recording and reporting procedures; and
11.2 a description of the quality assurance program to be established and implemented for the effluent monitoring program

EFFLUENT CONTROL PROGRAM

11.3 a description of the controls that will be used to minimize releases of radioactive material to the environment;
11.3 a summary of the action levels and description of the actions to be taken should a limit be exceeded;
11.3 a description of the leak detection systems for ponds, lagoons, and tanks;
11.3 a description of the procedures to ensure that releases to sewer systems are controlled and maintained to meet the requirements of 10 CFR 20.2003, and
11.1 a summary of the estimates of doses to the public from effluents and a description of the method used to estimate public dose.

RADIOACTIVE WASTE MANAGEMENT PROGRAM

SOLID RADWASTE

12.1 a summary of the types of solid radwaste that are expected to be generated during decommissioning operations
12.1.1 a summary of the estimated volume, in cubic feet, of each solid radwaste type summarized under bullet 1 above;
12.1 a summary of the radionuclides (including the estimated activity of each radionuclide) in each estimated solid radwaste type summarized under bullet 1 above;
12.1 & 12.3.1 a summary of the volumes of Class A, B, C and Greater-than-Class-C solid radwaste that will be generated by decommissioning operations;
12.1.3 a description of how and where each of the solid radwaste summarized under bullet 1 above, will be stored on-site prior to shipment for disposal;
12.1.3 & 12.3.2 a description of how the each of the solid radwastes summarized under bullet 1 above, will be treated and packaged to meet disposal site acceptance criteria prior to shipment for disposal;
12.1.3 & 12.3.2 if appropriate, how the licensee or responsible party intends to manage volumetrically contaminated material;
12.3.2 a description of how the licensee or responsible party will prevent contaminated soil, or other loose solid radwaste, from being re-disbursed after exhumation and collection; and
12.1.3 the name and location of the disposal facility that the licensee intends to use for each solid radwaste type summarized under bullet 1 above

LIQUID RADWASTE

12.2 a summary of the types of liquid radwaste that are expected to be generated during decommissioning operations

See notes at end of checklist.

12.2 a summary of the estimated volume, in liters, of each liquid radwaste type summarized under bullet 1 above;

12.2 a summary of the radionuclides (including the estimated activity of each radionuclide) in each liquid radwaste type summarized under bullet 1 above;

12.2 a summary of the estimated volumes of Class A, B, C and Greater-than-Class-C liquid radwaste that will be generated by decommissioning operations;

12.2 a description of how and where each of the liquid radwastes summarized under bullet 1 above, will be stored on-site prior to shipment for disposal;

12.2 a description of how the each of the liquid radwastes summarized under bullet 1 above, will be treated and packaged to meet disposal site acceptance criteria prior to shipment for disposal;

12.2 the name and location of the disposal facility that the licensee intends to use for each liquid radwaste type summarized under bullet 1 above

MIXED WASTE

12.4 a summary of the types of solid and liquid mixed waste that are expected to be generated during decommissioning operations;

12.4 a summary of the estimated volumes, in cubic feet of each solid mixed waste type summarized under bullet 1 above and in liters for each liquid mixed waste;

12.4 a summary of the radionuclides (including the estimated activity of each radionuclide) in each type of mixed waste type summarized under bullet 1 above;

12.4 a summary of the estimated volumes of Class A, B, C and Greater-than-Class-C mixed waste that will be generated by decommissioning operations;

12.4 a description of how and where each of the mixed wastes summarized under bullet 1 above, will be stored on-site prior to shipment for disposal;

12.4 a description of how the each of the mixed wastes summarized under bullet 1 above, will be treated and packaged to meet disposal site acceptance criteria prior to shipment for disposal;

12.4 the name and location of the disposal facility that the licensee intends to use for each mixed waste type summarized under bullet 1 above;

12.4 a discussion of the requirements of all other regulatory agencies having jurisdiction over the mixed waste; and,

12.4 a demonstration the that the licensee possess the appropriate EPA or State permits to generate, store and/or treat the mixed wastes;

QUALITY ASSURANCE PROGRAM

ORGANIZATION

13.1 a description of the QA program management organization,

13.1 a description of the duties responsibilities of each unit within the organization and how delegation of responsibilities is managed within the decommissioning program

13.2 a description of how work performance is evaluated;

See notes at end of checklist.

13.1 a description of the authority of each unit within the QA program
Figure 9-1* an organization chart of the QA program organization

QUALITY ASSURANCE PROGRAM

13.2 a commitment that activities affecting the quality of site decommissioning will be subject to the applicable controls of the QA program and activities covered by the QA program are identified on program defining documents;
13.1 a brief summary of the company's corporate QA policies;
13.2 a description of provisions to ensure that technical and quality assurance procedures required to implement the QA program are consistent with regulatory, licensing, and QA program requirements and are properly documented and controlled;
13.2 a description of the management reviews, including the documentation of concurrence in these quality-affecting procedures;
13.2 a description of the quality-affecting procedural controls of the principal contractors
-- a description of how NRC will be notified of changes (a) for review and acceptance in the accepted description of the QA program as presented or referenced in the DP before implementation and (b) in organizational elements within 30 days after the announcement of the changes
13.7 a description is provided of how management regularly assesses the scope, status, adequacy, and compliance of the QA program;
13.7 & 9.4 a description of the instruction provided to personnel responsible for performing activities affecting quality
9.4 a description of the training and qualifications of personnel verifying activities
9.4 for formal training and qualification programs, documentation includes the objectives and content of the program, attendees, and date of attendance;
13.7 a description of the self-assessment program to confirm that activities affecting quality comply with the QA program;
13.1 a commitment that persons performing self-assessment activities are not to have direct responsibilities in the area they are assessing;
13.7 a description of the organizational responsibilities for ensuring that activities affecting quality are (a) prescribed by documented instructions, procedures, and drawings; and, (b) accomplished through implementation of these documents; and,
13.7 a description of the procedures to ensure that instructions, procedures, and drawings include quantitative acceptance criteria and qualitative acceptance criteria for determining that important activities have been satisfactorily performed.

DOCUMENT CONTROL

13.4 a summary of the types of QA documents that are included in the program
13.4 a description of how the licensee or responsible party develops, issues, revises and retires QA documents

See notes at end of checklist.

CONTROL OF MEASURING AND TEST EQUIPMENT

13.5 a summary of the test and measurement equipment used in the program
13.5 description of how and at what frequency the equipment will be calibrated;
13.5 a description of the daily calibration checks that will be performed on each piece of test or measurement equipment;
13.5 a description of the documentation that will be maintained to demonstrate that only properly calibrated and maintained equipment was used during the decommissioning

CORRECTIVE ACTION

13.6 a description of the corrective action procedures for the facility, including a description of how the corrective action is determined to be adequate;
13.6 a description of the documentation maintained for each corrective action and any followup activities by the QA organization after the corrective action is implemented;

QUALITY ASSURANCE RECORDS

13.7 a description of the manner in which the QA records will be managed
13.7 a description of the responsibilities of the QA organization
13.7 a description of the QA records storage facility.

AUDITS AND SURVEILLANCES

13.8 a description of the audit program
13.8 a description of the records and documentation generated during the audits and the manner in which the documents are managed
13.8 a description of all followup activities associated with audits or surveillances
13.8 a description of the trending/tracking that will be performed on the results of audits and surveillances

FACILITY RADIATION SURVEYS

RELEASE CRITERIA

14.1 a summary table or list of the $DCGL_W$ for each radionuclide and impacted media of concern;
14.1 if Class 1 survey units are present, a summary table or list of area factors that will be used for determining a $DCGL_{EMC}$ for each radionuclide and media of concern;
14.1 if Class 1 survey units are present, the $DCGL_{EMCs}$ for each radionuclide and medium of concern;
14.1 if multiple radionuclides are present, the appropriate $DCGL_W$ for the survey method to be used.

See notes at end of checklist.

CHARACTERIZATION SURVEYS

4.0 & 14.2	a description and justification of the survey measurements for impacted media
4.0 & 14.2	description of the field instruments and methods that were used for measuring concentrations and the sensitivities of those instruments and methods;
4.0 & 14.2	a description of the laboratory instruments and methods that were used for measuring concentrations and the sensitivities of those instruments and methods;
4.0 & 14.2	the survey results including tables or charts of the concentrations of residual radioactivity measured;
4.0 & 14.2	maps or drawings of the site, area, or building showing areas classified as non-impacted or impacted
4.0 & 14.2	justification for considering areas to be non-impacted;
4.0 & 14.2	a discussion of why the licensee considers the characterization survey to be adequate to demonstrate that it is unlikely that significant quantities of residual radioactivity have gone undetected;
4.0 & 14.2	for areas and surfaces that are inaccessible or not readily accessible, a discussion of how they were surveyed or why they did not need to be surveyed;
4.0 & 14.2	for sites, areas, or buildings with multiple radionuclides, a discussion justifying the ratios of radionuclides that will be assumed in the final status survey or an indication that no fixed ratio exists and each radionuclide will be measured separately.

REMEDIAL ACTION SUPPORT SURVEYS

14.3	a description of field screening methods and instrumentation;
14.3	a demonstration that field screening should be capable of detecting residual radioactivity at the DCGL;

FINAL STATUS SURVEY DESIGN

14.4	a brief overview describing the final status survey design.
14.4	a description and map or drawing of impacted areas of the site, area, or building classified by residual radioactivity levels (Class 1, Class 2, or Class 3) and divided into survey units with an explanation of the basis for division into survey units.
14.4	a description of the background reference areas and materials, if they will be used, and a justification for their selection.
14.4	a summary of the statistical tests that will be used to evaluate the survey results,
14.4	a description of scanning instruments, methods, calibration, operational checks, coverage, and sensitivity for each media and radionuclide.
14.4	for in-situ sample measurements made by field instruments, a description of the instruments, calibration, operational checks, sensitivity, and sampling methods with a
14.4	demonstration that the instruments and methods have adequate sensitivity.
14.4	a description of the analytical instruments for measuring samples in the laboratory, calibration, sensitivity, and methods with a demonstration that the instruments and methods have adequate sensitivity;

See notes at end of checklist.

14.4 a description of how the samples to be analyzed in the laboratory will be collected, controlled, and handled;

14.4 a description of the final status survey investigation levels and how they were determined

14.4 a summary of any significant additional residual radioactivity that was not accounted for during site characterization;

14.4 a summary of direct measurement results and/or soil concentration levels in units that are comparable to the DCGL and if data is used to estimate or update the survey unit;

14.4 a summary of the direct measurements or sample data used to both evaluate the success of remediation and to estimate the survey unit variance.

FINAL STATUS SURVEY REPORT

14.5 an overview of the results of the final status survey.

14.5 a discussion of any changes that were made in the final status survey from what was proposed in the Decommissioning Plan or other prior submittals.

14.5 a description of the method by which the number of samples was determined for each survey unit;

14.5 a summary of the values used to determine the numbers of sample and a justification for these values;

14.5 the survey results for each survey unit include:

- 14.5 the number of samples taken for the survey unit;
- 14.5 a map or drawing of the survey unit showing the reference system and random start systematic sample locations for Class 1 and 2 survey units and random locations shown for Class 3 survey units and reference areas;
- 14.5 the measured sample concentrations;
- 14.5 the statistical evaluation of the measured concentrations;
- 14.5 judgmental and miscellaneous sample data sets reported separately from the those samples collected for performing the statistical evaluation;
- 14.5 a discussion of anomalous data including any areas of elevated direct radiation detected during scanning that exceeded the investigation level or measurement locations in excess of $DCGL_w$.
- 14.5 a statement that a given survey unit satisfied the $DCGL_w$ and the elevated measurement comparison if any sample points exceeded the $DCGL_w$.

14.5 a description of any changes in initial survey unit assumptions relative to the extent of residual radioactivity

14.5 if a survey unit fails, a description of the investigation conducted to ascertain the reason for the failure and a discussion of the impact that the failure has on the conclusion that the facility is ready for final radiological surveys; and

14.5 if a survey unit fails, a discussion of the impact that the reason for the failure has on other survey unit information.

See notes at end of checklist.

FINANCIAL ASSURANCE

COST ESTIMATE

Table 15-1 a cost estimate that appears to be based on documented and reasonable assumptions;

CERTIFICATION STATEMENT

NA the certification statement is based on the licensed possession limits and the applicable quantities specified in 10 CFR 30.35, 40.36, or 70.25

NA licensee is eligible to use a certification of financial assurance and, if eligible, that the certification amount is appropriate.

FINANCIAL MECHANISM

(Kaiser will prepare and submit financial cost estimates for remediation alternatives considered)

NA the financial assurance mechanism supplied by the licensee or responsible party consists of one or more of the following instruments:

___ trust fund;
___ escrow account;
___ government fund;
___ certificate of deposit;
___ deposit of government securities;
___ surety bond;
___ letter of credit;
___ line of credit;
___ insurance policy;
___ parent company guarantee;
___ self guarantee;
___ external sinking fund;
___ statement of intent; or
___ by special arrangements with a government entity assuming custody or ownership of the site

NA the financial assurance mechanism is an originally signed duplicate.

NA the wording of the financial assurance mechanism is identical to the recommended wording provided in Appendix F,

NA for a licensee regulated under 10 CFR Part 72, a means is identified in the decommissioning plan for adjusting the financial assurance funding level over any storage and surveillance period;

NA the amount of financial assurance coverage provided by the licensee for site control and maintenance is at least as great as that calculated using the formula provided in this SRP

See notes at end of checklist.

RESTRICTED USE/ALTERNATE CRITERIA

(This section not required unless Kaiser proposes a restricted release scenario)

RESTRICTED USE

ELIGIBILITY DEMONSTRATION

__ a demonstration that the benefits of dose reduction are less than the cost of doses, injuries and fatalities; or
__ a demonstration that the proposed residual radioactivity levels at the site are ALARA

INSTITUTIONAL CONTROLS

__ a description of the legally enforceable institutional control(s) and an explanation of how the institutional control is a legally enforceable mechanism;
__ a description of any detriments associated with the maintenance of the institutional control(s);
__ a description of the restrictions on present and future landowners;
__ a description of the entities enforcing, and their authority to enforce, the institutional control(s);
__ a discussion of the durability of the institutional control(s);
__ a description of the activities that the entity with the authority to enforce the institutional controls may undertake to enforce the institutional control(s)
__ the manner in which the entity with the authority to enforce the institutional control(s) will be replaced if that entity is no longer willing or able to enforce the institutional control(s) (this may not be needed for Federal or State entities);
__ a description of the duration of the institutional control(s), the basis for the duration, the conditions that will end the institutional control(s) and the activities that will be undertaken to end the institutional control(s);
__ a description of the plans for corrective actions that may be undertaken in the event the institutional control(s) fail; and
__ a description of the records pertaining to the institutional controls, how and where will they will be maintained, and how the public will have access to the records.

SITE MAINTENANCE & FINANCIAL ASSURANCE

__ a demonstration that an appropriately qualified entity has been provided to control and maintain the site;
__ a description of the site maintenance and control program and the basis for concluding that the program is adequate to control and maintain the site;
__ a description of the arrangement or contract with the entity charged with carrying out the actions necessary to maintain control at the site;
__ a demonstration that the contract or arrangement will remain in effect for as long as feasible, and include provisions for renewing or replacing the contract;
__ a description of the manner in which independent oversight of the entity charged with maintaining the site will be conducted and what entity will conduct the oversight;

See notes at end of checklist.

__ a demonstration that the entity providing the oversight has the authority to replace the entity charged with maintaining the site;
__ a description of the authority granted to the third party to perform, or have performed, any necessary maintenance activities;
__ unless the entity is a government entity, a demonstration that the third party is not the entity holding the financial assurance mechanism;
__ a demonstration that sufficient records evidencing to official actions and financial payments made by the third party are open to public inspection;
__ a description of the periodic site inspections that will be performed by the third party, including the frequency of the inspections.
__ a copy of the financial assurance mechanism provided by the licensee or responsible party; and,
__ a demonstration that the amount of financial assurance provided is sufficient to allow an independent third party to carry out any necessary control and maintenance activities[2].

OBTAINING PUBLIC ADVICE

__ a description of how individuals and institutions that may be affected by the decommissioning were identified and informed of the opportunity to provide advice to the licensee or responsible party;
__ a description of the manner in which the licensee obtained advice from these individuals or institutions;
__ a description of how the licensee provided for participation by a broad cross-section of community interests in obtaining the advice;
__ a description of how the licensee provided for a comprehensive, collective discussion on the issues by the participants represented;
__ a copy of the publicly available summary of the results of discussions, including individual viewpoints of the participants on the issues and the extent of agreement and disagreement among the participants;
__ a description of how this summary has been made available to the public;
__ a description of how the licensee evaluated the advice, and the rationale for incorporating, or not incorporating, the advice from affected members of the community into the decommissioning plan.

DOSE MODELING AND ALARA DEMONSTRATION

__ a summary of the dose to the average member of the critical group when radionuclide levels are at the DCGL with institutional controls in place, as well as the estimated doses if they are no longer in place;
__ a summary of the evaluation performed pursuant to Section 7 of this SRP demonstrating that these doses are ALARA;
__ if the estimated dose to the average member of the critical group could exceed 100 mrem/yr (but would be less than 500 mrem/yr) when the radionuclide levels are at the DCGL, a demonstration that the criteria in 10 CFR 20.1403(e) have been met

See notes at end of checklist.

ALTERNATE CRITERIA

__ a summary of the dose in TEDE(s) to the average member of the critical group when the radionuclide levels are at the DCGL (considering all man-made sources other than medical);
__ a summary of the evaluation performed pursuant to Section 7 of this SRP demonstrating that these doses are ALARA;
__ an analysis of all possible sources of exposure to radiation at the site and a discussion of why it is unlikely that the doses from all man-made sources, other than medical, will be more than 1 mSv/yr (100 mrem/yr);
__ a description of the legally enforceable institutional control(s) and an explanation of how the institutional control is a legally enforceable mechanism;
__ a description of any detriments associated with the maintenance of the institutional control(s);
__ a description of the restrictions on present and future landowners;
__ a description of the entities enforcing and their authority to enforce the institutional control(s);
__ a discussion of the durability of the institutional control(s);
__ a description of the activities that the party with the authority to enforce the institutional controls will undertake to enforce the institutional control(s)
__ a description of the manner in which the entity with the authority to enforce the institutional control(s) will be replaced if that entity is no longer willing or able to enforce the institutional control(s)
__ a description of the duration of the institutional control(s), the basis for the duration, the conditions that will end the institutional control(s) and the activities that will be undertaken to end the institutional control(s);
__ a description of the corrective actions that will be undertaken in the event the institutional control(s) fail; and
__ a description of the records pertaining to the institutional controls, how and where they will be maintained, and how the public will have access to the records.
__ a description of how individuals and institutions that may be affected by the decommissioning were identified and informed of the opportunity to provide advice to the licensee or responsible party;
__ a description of the manner in which the licensee obtained advice from affected individuals or institutions;
__ a description of how the licensee provided for participation by a broad cross-section of community interests in obtaining the advice;
__ a description of how the licensee provided for a comprehensive, collective discussion on the issues by the participants represented;
__ a copy of the publicly available summary of the results of discussions, including individual viewpoints of the participants on the issues and the extent of agreement and disagreement among the participants;
__ a description of how this summary has been made available to the public; and,

See notes at end checklist.

__ a description of how the licensee evaluated advice from individuals and institutions that could be affected by the decommissioning and the manner in which the advice was addressed.

Notes: * = Refer to the June 2001 Decommissioning Plan for the Tulsa facility.
** = Item referenced in various sections throughout the Decommissioning Plan. (Kaiser will obtain necessary permits based on final design considerations.)

Table of Contents

1.0 Executive Summary

This Decommissioning Plan Addendum (DPA) was prepared by Earth Sciences Consultants, Inc. (Earth Sciences) on behalf of Kaiser Aluminum & Chemical Corporation (Kaiser) to present a description of the planned remediation activities for the former Kaiser Aluminum Specialty Products facility located in Tulsa, Oklahoma. This document has been prepared as an addendum to Earth Sciences' June 2001 (Revised May 2003) Decommissioning Plan for the Tulsa facility, which addressed the remediation of the affected portions of the 14-acre "pond parcel" at the facility. The DPA focuses on an approximate 3.5-acre land area of the facility known as the former "operational 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. 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.

The Kaiser plant in Tulsa, Oklahoma was built by the Standard Magnesium Corporation (SMC) in the early to mid-1950s to manufacture magnesium products. Kaiser purchased the facility in 1964. SMC received a source materials license (C-4012) from the Atomic Energy Commission (AEC) in March 1958 to receive possession and title to magnesium-thorium alloy (a thorium metal) with up to 4 percent thorium content for processing. Historical operations at the facility included the smelting of scrap magnesium alloy for the production of anodes. Scrap magnesium-thorium alloy was smelted, along with other magnesium materials, to recover the magnesium. Thorium alloy material comprised a small fraction of the total magnesium refined on site. Licensed operations involving the recovery of magnesium-thorium alloy began in 1958 and continued through 1970. Magnesium refining operations continued at the facility until approximately 1985. Aluminum replaced magnesium in smelting and anode manufacture, and the plant continued operating until the 1997-1998 time frame.

The scrap magnesium alloy refining process consisted of placing the material into large melting pots, heating the material until molten, and then siphoning off the pure magnesium. Impurities from the mixture, including thorium, separated from the magnesium. This residue material was removed, allowed to cool, and crushed. The crushed material was returned to the heating pots for a second recovery process. Once refined, the metallic dross residue material was crushed and disposed on site.

The June 2001 (Revised May 2003) Decommissioning Plan identified the potential for radioactive material beneath several currently paved areas and building floor surfaces of the former operational area, based upon an interpretation of historical data and/or observations made during the Adjacent Land Remediation Project (ALRP). As a result, a limited Additional Site Characterization Activities (ASCA) effort was conducted in the former operational area during mid-2001. The objective of the ASCA was to determine if thorium-bearing dross/radioactive material was present beneath these areas of concern. Soil quality data obtained during the ASCA indicated the presence of residual radioactive material beneath several concrete-paved surfaces and structures at relatively shallow depths. The presence of this material beneath the structures and concrete paving is most likely the result of historical grading activities.

A Historical Site Assessment (HSA) was performed during late 2001 for the 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. Presently, none of the original buildings in which magnesium-thorium alloy processing occurred exist on site. With the exception of the Flux Building, there are no buildings in the former operational area of the facility classified as impacted in the HSA. The Flux Building was initially classified as an impacted structure due to past and current uses of the building to house and process soil core and surface samples. Land areas initially classified as impacted included the land areas beneath the Maintenance Building, the Crusher Building, the Crusher Addition Building, the North Extrusion Building, the Warehouse Building, and the former Smelter Building, as well as concrete paved areas completed post-1958.

The results of the HSA (Appendix A of this DPA) 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 in Chapter 4.0 of the DPA.

Based on the results of the survey effort, select land areas of the former operational area were identified for remediation. These areas include the following:

- A portion of the land area beneath the Warehouse Building (Characterization Survey Unit 7);
- A portion of the land area beneath the Crusher Building (Characterization Survey Unit 9);
- The land area beneath a "built-up" dock area located immediately west of the Crusher Building (Characterization Survey Unit 5);
- The land area beneath a built-up dock area located immediately west of the Maintenance Building (Characterization Survey Unit 3);
- A portion of the land area beneath a paved concrete surface situated northwest of the Maintenance Building, northeast of the North Extrusion Building, and south of the Union Pacific Railroad right-of-way (Characterization Survey Unit 2);
- A portion of the land area along a concrete retaining wall situated at the southeastern corner of the Maintenance Building (Survey Unit 5);
- A portion of the land area beneath a paved concrete surface situated to the north of the Warehouse Building (Characterization Survey Units 5 and 6); and
- A portion of the land area beneath a paved concrete surface situated north of 41st Street and the current Crusher Building, south of the Union Pacific Railroad right-of-way, and west of the areas remediated during the ALRP (Survey Unit 8).

The purpose of the June 2001 Decommissioning Plan (Revised May 2003) and this DPA is to decommission the facility safely and meet the Nuclear Regulatory Commission's (NRC) requirements for unrestricted use: residual radioactivity distinguishable from background will not result in a total effective dose equivalent (TEDE) to an average member of a critical group that exceeds 25 millirems per year (mrem/yr). Additionally, implementation of the June 2001 Decommissioning Plan (Revised May 2003) and this DPA will reduce residual radioactivity to levels that are as low as reasonable achievable (ALARA).

The decommissioning alternative chosen for implementation closely mirrors that presented in the June 2001 Decommissioning Plan (Revised May 2003). The planned remediation for the former operational

area requires excavating material with a net thorium-232 (Th-232) activity concentration greater than the established Derived Concentration Guideline Level ($DCGL_w$) of 3.0 picocuries per gram (pCi/g), based on a dose limit criterion of 25 mrem/yr. The excavated material will be transported to the pond parcel. Material with Th-232 activity concentrations greater than 31.1 pCi/g will be segregated and disposed off site as either exempt or nonexempt material at a permitted facility. Material with activity concentrations less than 31.1 pCi/g Th-232 will be placed in the pond parcel excavation as backfill.

Kaiser anticipates completing select predecommissioning activities prior to undertaking the remediation project described in this DPA. The most significant predecommissioning activity relates to the likely demolition of several nonimpacted site structures to facilitate excavation of affected material beneath floor slabs.

During remediation, select land areas of the former operational area will be excavated to depths up to 8 feet and an average depth estimated at 2 feet. Once the former operational area is remediated to acceptable levels, it will be cleared through a MARSSIM-directed final status survey. Most likely, this will be conducted in stages where certain survey units will be cleared and backfilled as excavation occurs in other areas.

Approximately 60,000 cubic feet (ft^3) of clean off-site soil will be used to backfill the excavations in the former operational area. The site will be graded and vegetated to minimize soil erosion and promote positive drainage.

Upon approval of the June 2001 Decommissioning Plan (Revised May 2003) and this DPA by the NRC, Kaiser will undertake preparation of designs and specifications. Subsequently, a construction contractor will be selected. Kaiser may choose to develop performance specifications and require the contractor to develop design details. Alternatively, Kaiser may opt to develop detailed designs/specifications. In either case, preconstruction activities for both the June 2001 Decommissioning Plan (Revised May 2003) and this DPA are expected to take approximately 9 months.

Construction activities will probably not be conducted during the months of December through February. Therefore, remediation is anticipated to begin in March following completion of the design/contractor selection tasks and extend over a period of approximately 3 years. A detailed schedule will be prepared subsequent to NRC approval of the June 2001 Decommissioning Plan (Revised May 2003) and this DPA. This schedule will be updated as circumstances dictate.

Kaiser is seeking approval of this DPA to authorize the activities described herein and NRC concurrence that, if this plan is implemented as described, will result in the property being suitable for unrestricted use. However, this remediation plan is premised on current knowledge of site conditions, regulatory guidance, and disposal market factors. If unforeseen circumstances result in significant changes in the economics or feasibility of implementation of the proposed remedial action, Kaiser may find it necessary to consider other alternatives.

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2.0 Facility Operating History

This 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 3A-3). 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.

An HSA was performed during late 2001 for the former operational area of the 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. A copy of the HSA is provided in Appendix A of this DPA. Appropriate sections of the HSA and/or June 2001 Decommissioning Plan (Revised May 2003) for the Tulsa facility are either referenced or summarized below.

2.1 Licensing Number/Status/Authorized Activities

Refer to Section 2.1 of the June 2001 Decommissioning Plan (Revised May 2003) for the Tulsa facility.

2.2 License History

Historical operations at the facility included the smelting of scrap magnesium alloy for the production of anodes. Scrap magnesium-thorium alloy was smelted, along with other magnesium materials, to recover the magnesium. Thorium alloy material comprised a small fraction of the total magnesium refined on site. Licensed operations involving the recovery of magnesium-thorium alloy began in 1958 and continued through 1970. Magnesium refining operations continued at the facility until approximately 1985. Aluminum replaced magnesium in smelting and anode manufacture, and the plant continued operating until the 1997-1998 timeframe.

The scrap magnesium alloy refining process consisted of placing the material into large melting pots, heating the material until molten, and then siphoning off the pure magnesium. Impurities from the mixture, including thorium, separated from the magnesium. This residue material was removed, allowed to

cool, and crushed. The crushed material was returned to the heating pots for a second recovery process. Once refined, the metallic dross residue material was crushed and disposed on site.

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. There appears to be no records indicating the actual quantity of material that was on site at any give time. A thorium percentage by weight of approximately 4 would equal approximately 4,400 pCi/g. One biased sample of a unique dross material (wrapped in plastic) taken in the area of the original Smelter Building during radiological characterization survey activities in February 2002 contained a Th-232 concentration of 6,429 pCi/g. This elevated concentration is most likely the result of the magnesium recovery process, which removed magnesium mass from the scrap feed material. The removal of magnesium during the process would have decreased the mass of the material, thereby increasing the concentration of Th-232 in the dross residue. Consequently, Th-232 concentrations in dross could have been increased above the 4 percent by weight limit for the scrap feed material. However, thorium alloy material only comprised a small fraction of the total magnesium refined, and records indicate that thorium-bearing materials were generally only a small fraction (5 percent) of each production batch; consequently, it is not surprising that most samples were found to have concentrations well below 4 percent by weight. As indicated in Table A-2, 95 percent of the material on site has a concentration of Th-232 between 3.1 and 120 pCi/g.

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 resulting in a thoriated metallic "dross" residue material. 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 in a second magnesium recovery step and/or prior to disposal. Waste dross was conveyed to disposal ponds (Retention and Reserve ponds) north of the manufacturing complex. 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. From about 1977 until plant shutdown, the Crusher Building was utilized for smelting aluminum. Instrument surveys indicate the absence of radioactive contamination.

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 noncontact cooling water used in plant operations. Sections 3.1 and 4.2 of this DPA present 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 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.

Additional information regarding the license history of the facility is provided in Section 2.2 of the June 2001 Decommissioning Plan (Revised May 2003).

2.3 Site Development and Utilization

Refer to Section 2.3 of the June 2001 Decommissioning Plan (Revised May 2003) for the Tulsa facility.

2.4 Previous Predecommissioning and Decommissioning Activities

As mentioned in Section 2.2, the Smelter Building was demolished in October 2000. During the period of August 28 through August 31, 2000, a radiological survey of the building was performed in preparation of deconstruction activities. The building was constructed mostly of concrete floors and concrete block walls. The roof of the structure was constructed of tin sheeting. Exposure rate surveys of the building did not indicate μR/hr levels greater than 4 μR/hr above background. Structural surveys of the building did not indicate the presence of residual radiological contamination greater than the limits specified in the following table:

	Derived α/min per 100 cm^2
Average	298
Maximum	903
Removable	65

The derived limits that are in the above table were calculated by multiplying the accepted release limits for the Kaiser facility by 1.29 to account for the beta particles emitted by the more abundant Th-230 beta emitting progeny. An instrument efficiency of 16 percent was taken into account when determining the 1.29 multiple. Building materials from deconstruction activities were placed within the buildings'

footprint and covered with soil. No radiological survey data were available for the other structures known to have been used to process thorium-bearing materials.

As discussed in the June 2001 Decommissioning Plan (Revised May 2003), 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).

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 postremediation 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. Further details concerning the ALRP project are contained in the FSSR for the Tulsa facility.

2.5 Spills

Refer to Section 2.5 of the June 2001 Decommissioning Plan (Revised May 2003) for the Tulsa facility.

2.6 Prior On-Site Burials

The June 2001 Decommissioning Plan identified the potential for radioactive material beneath several currently paved areas and building floor surfaces of the former operational area, based upon an

interpretation of historical data and/or observations made during the ALRP. As a result, a limited ASCA effort was conducted in the former operational area during mid-2001. The objective of the ASCA was to determine if thorium-bearing dross/radioactive material was present beneath these areas of concern. Soil quality data obtained during the ASCA indicated the presence of residual radioactive material beneath several concrete-paved surfaces and structures at relatively shallow depths. The presence of this material beneath the structures and concrete paving is most likely the result of historical grading activities.

The results of the HSA conducted in late 2001 were used to design a characterization survey effort for the impacted land areas of the former operational area. The recommended radiological characterization survey effort was described in a work plan prepared by Earth Sciences (December 2001). The primary objectives of the characterization survey 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 characterization survey effort was completed during the months of January and February 2002. Results of the survey activities are presented in Chapter 4.0 of this DPA. Information regarding the on-site disposal of metallic dross residue material at the facility's pond parcel is provided in Section 2.6 of the June 2001 Decommissioning Plan (Revised May 2003). Based on the HSA as documented in Appendix A, it appears that early disposal of licensed materials in the Reserve Pond was performed under the guidance of 10 Code of Federal Regulations (CFR) Part 20.304. These materials will be excavated, segregated, and processed during the planned decommissioning activities. Records do not indicate that licensed material was handled under the provisions of either 10 CFR Part 20.302 or NUREG 1101.

References

1. Earth Sciences, February 2002, Final Status Survey Report, Adjacent Land Area, Tulsa, Oklahoma Facility, Kaiser Aluminum & Chemical Corporation, Baton Rouge, Louisiana.

2. Earth Sciences, December 2001, Historical Site Assessment, Operational Area, Former Kaiser Aluminum Specialty Products Facility, Tulsa, Oklahoma, Kaiser Aluminum & Chemical Corporation, Baton Rouge, Louisiana.

3. Earth Sciences, December 2001, Work Plan, Characterization Survey of the Operational Area, Former Kaiser Aluminum Specialty Products Facility, Tulsa, Oklahoma, Kaiser Aluminum & Chemical Corporation, Baton Rouge, Louisiana.

4. Earth Sciences, October 2001, Additional Site Characterization Activities, Former Kaiser Aluminum Specialty Products Facility, Tulsa, Oklahoma, Kaiser Aluminum & Chemical Corporation, Baton Rouge, Louisiana.

5. Earth Sciences, June 2001, Revised May 2003, Decommissioning Plan, Tulsa Facility, Tulsa, Oklahoma, Kaiser Aluminum & Chemical Corporation, Baton Rouge, Louisiana.

6. NUREG/CR-1575, August 2000, MARSSIM, Rev. 1.

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Figures

3.0 Facility Description

A description of the former Kaiser Aluminum Specialty Products facility was provided in the June 2001 Decommissioning Plan (Revised May 2003). Appropriate sections of the June 2001 Decommissioning Plan (Revised May 2003) are referenced or summarized below. Supplemental information relative to the former operational area of the facility is provided in the following sections, where appropriate.

3.1 Site Location and Description

The former Kaiser Aluminum Specialty Products facility is located at 7311 East 41st Street in Tulsa, Oklahoma (Figure 3A-1). It is situated in Tulsa County, Oklahoma, about 5 miles southeast of the downtown center of the City of Tulsa. The site initially occupied approximately 23 acres of land on both sides of 41st Street. Currently, a 3-acre parcel south of 41st Street contains an active aluminum extrusion and fabrication facility. North of East 41st Street are several parcels of land previously devoted to refining, processing, and waste disposal functions (Figure 3A-2). This acreage is split by the Union Pacific Railroad right-of-way. An approximate 3.5-acre parcel south of the railroad (known as the former operational area) houses an active office building and several inactive industrial structures (Figure 3A-3). An approximate 14.0-acre land area (known as the pond parcel) located north of the railroad contains a Retention Pond, former Freshwater Pond area, a former Reserve Pond area, and the Flux Building area.

Extensive site characterization activities have been conducted since 1994 within the 14.0-acre land area of the facility known as the pond parcel. These characterization activities have indicated the presence of residual radioactive material within a 10-acre portion of the pond parcel. The radioactive material identified within this portion of land is a thorium-bearing dross containing the isotopes Th-232, thorium-230 (Th-230), and thorium-228 (Th-228). The affected portion of the parcel contains the Retention Pond, the former Reserve Pond area, and the Flux Building area. The unaffected portion of the pond parcel contains a former Freshwater Pond area. A plan was prepared to address the decommissioning of the pond parcel land area. The decommissioning plan was submitted in June 2001 to the NRC and subsequently revised in May 2003.

This DPA focuses on the former operational area of the facility, which was not fully addressed in the June 2001 Decommissioning Plan (Revised May 2003). The former operational area of facility, with the exception of the Flux Building, is bounded to the north by the Union Pacific Railroad, to the south by 41st Street, to the east by a small parcel of Kaiser property, and to the west by the Smalley Equipment property. The railroad right-of-way, 41st Street right-of-way, and small parcel of Kaiser property located to

the east of the former operational area were addressed during the ALRP. The former operational area currently houses several structures including the North Extrusion, Office, Maintenance, Warehouse, Crusher, and Crusher Addition buildings. The Flux Building is located to the northeast of the triangular parcel. The land areas of the former operational area consist mainly of land beneath concrete pavement.

As shown in Figure 3A-4, sanitary sewer lines, subsurface piping, and culverts exist within the former operational area of 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 noncontact cooling water used in plant operations. Figure 3A-4 of the 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. Storm water drainage systems and subsurface piping located within the pond parcel are addressed in Chapter 3.0 of the June 2001 Decommissioning Plan (Revised May 2003). These features are also shown in Figure 3A-4.

3.2 Population Distribution

Refer to Section 3.2 of the June 2001 Decommissioning Plan (Revised May 2003) for the Tulsa facility.

3.3 Current/Future Land Use

Refer to Section 3.3 of the June 2001 Decommissioning Plan (Revised May 2003) for the Tulsa facility.

3.4 Meteorology and Climatology

Refer to Section 3.4 of the June 2001 Decommissioning Plan (Revised May 2003) for the Tulsa facility.

3.4.1 Wind

Refer to Section 3.4.1 of the June 2001 Decommissioning Plan (Revised May 2003) for the Tulsa facility.

3.4.2 Temperature

Refer to Section 3.4.2 of the June 2001 Decommissioning Plan (Revised May 2003) for the Tulsa facility.

3.4.3 Precipitation

Refer to Section 3.4.3 of the June 2001 Decommissioning Plan (Revised May 2003) for the Tulsa facility.

3.4.4 Relative Humidity

Refer to Section 3.4.4 of the June 2001 Decommissioning Plan (Revised May 2003) for the Tulsa facility.

3.4.5 Evapotranspiration

Refer to Section 3.4.5 of the June 2001 Decommissioning Plan (Revised May 2003) for the Tulsa facility.

3.5 National Ambient Air Quality Standards Category

Refer to Section 3.5 of the June 2001 Decommissioning Plan (Revised May 2003) for the Tulsa facility.

3.6 Geology and Seismology

3.6.1 Geology

Refer to Section 3.6.1 of the June 2001 Decommissioning Plan (Revised May 2003) for the Tulsa facility.

3.6.2 Regional Geologic Structures and Tectonics

Refer to Section 3.6.2 of the June 2001 Decommissioning Plan (Revised May 2003) for the Tulsa facility.

3.6.3 Seismology

Refer to Section 3.6.3 of the June 2001 Decommissioning Plan (Revised May 2003) for the Tulsa facility.

3.7 Surface Water Hydrology

Refer to Section 3.7 of the June 2001 Decommissioning Plan (Revised May 2003) for the Tulsa facility.

3.7.1 Flood Plan Data

Refer to Section 3.7.1 of the June 2001 Decommissioning Plan (Revised May 2003) for the Tulsa facility.

3.8 Groundwater Hydrology

Refer to Section 3.8 of the June 2001 Decommissioning Plan (Revised May 2003) for the Tulsa facility.

3.8.1 Groundwater Flow Data

Refer to Section 3.8.1 of the June 2001 Decommissioning Plan (Revised May 2003) for the Tulsa facility.

3.8.1.1 Shallow Overburden/Dross Material

Refer to Section 3.8.1.1 of the June 2001 Decommissioning Plan (Revised May 2003) for the Tulsa facility.

3.8.1.2 Deep Overburden

Refer to Section 3.8.1.2 of the June 2001 Decommissioning Plan (Revised May 2003) for the Tulsa facility.

3.9 Natural Resources

Refer to Section 3.9 of the June 2001 Decommissioning Plan (Revised May 2003) for the Tulsa facility.

3.10 Ecology/Endangered Species

Refer to Section 3.10 of the June 2001 Decommissioning Plan (Revised May 2003) for the Tulsa facility.

3.10.1 Relative Abundance

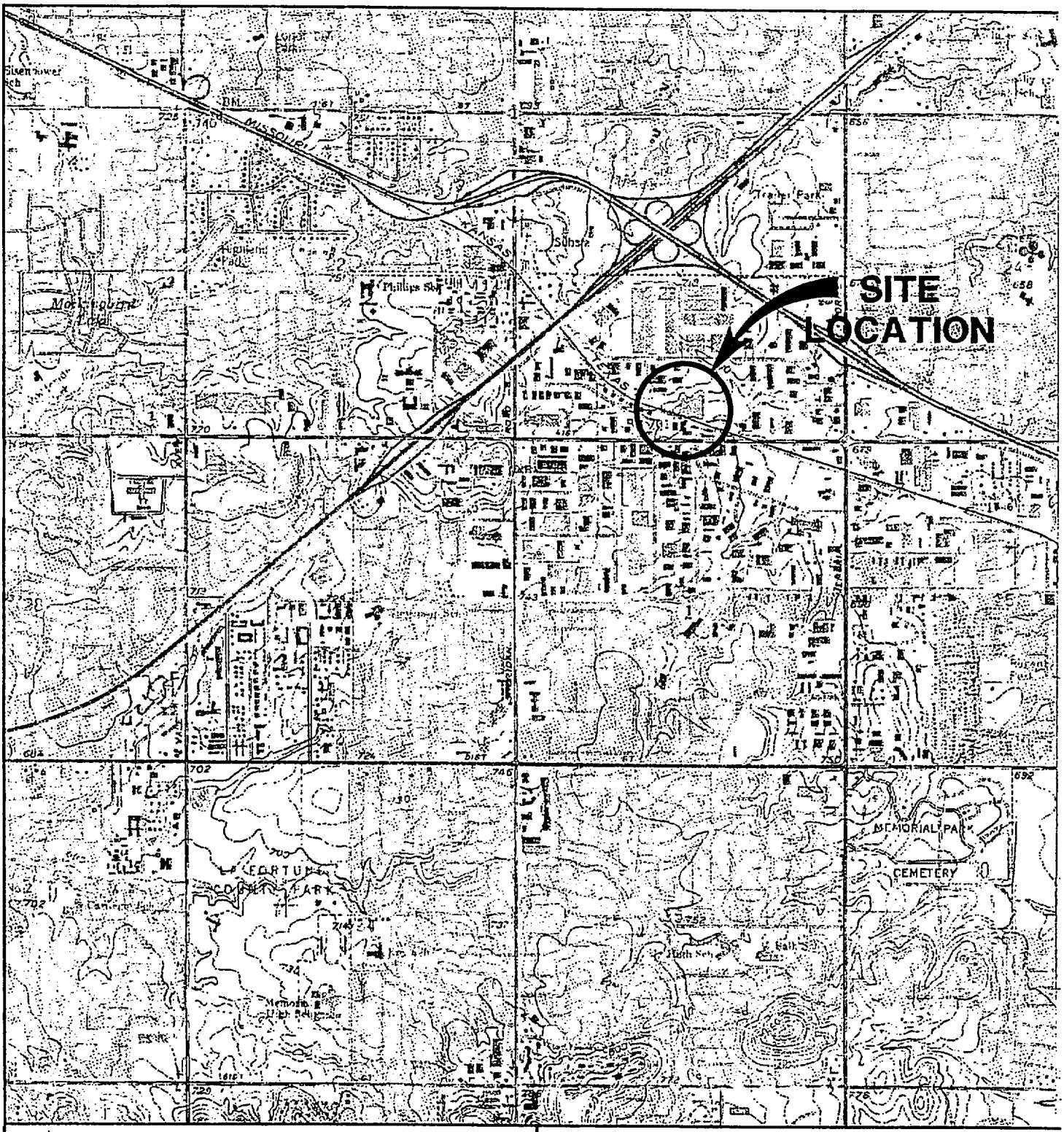
Refer to Section 3.10.1 of the June 2001 Decommissioning Plan (Revised May 2003) for the Tulsa facility.

References

1. Earth Sciences, December 2001, Historical Site Assessment, Operational Area, Former Kaiser Aluminum Specialty Products Facility, Tulsa, Oklahoma, Kaiser Aluminum & Chemical Corporation, Baton Rouge, Louisiana.

2. Earth Sciences, June 2001, Revised May 2003, Decommissioning Plan, Tulsa Facility, Tulsa, Oklahoma, Kaiser Aluminum & Chemical Corporation, Baton Rouge, Louisiana.

Figures



SCALE – FEET

0 2000

N

SITE LOCATION:
7311 EAST 41st STREET
TULSA, OKLAHOMA

REFERENCE
USGS 7.5-MIN TOPOGRAPHIC QUADRANGLE
JENKS, OKLAHOMA
DATED 1952, PHOTOREVISED 1982

FIGURE 3A–1
SITE LOCATION MAP
FORMER KAISER ALUMINUM SPECIALTY PRODUCTS FACILITY
TULSA, OKLAHOMA

PREPARED FOR
KAISER ALUMINUM & CHEMICAL CORPORATION
BATON ROUGE, LOUISIANA

APPROVED	RFD 3/02
CHECKED	CRB 3/02
DRAWN	GJA 10/1/01
DRAWING NUMBER	5427039

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FIGURE 3A-3

"FORMER OPERATIONAL AREA FORMER KAISER ALUMINUM SPECIALTY PRODUCTS FACILITY TULSA, OKLAHOMA"

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FIGURE 3A-4

"SUBSURFACE PIPING AND SEWER LINE LOCATION MAP FORMER KAISER ALUMINUM SPECIALTY PRODUCTS FACILITY TULSA, OKLAHOMA"

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4.0 Radiological Status of Facility

A description of the radiological status for the Tulsa facility relative to the pond parcel is presented in Chapter 4.0 of the June 2001 (Revised May 2003) Decommissioning Plan. This DPA chapter focuses on the radiological status of the approximate 3.5-acre land area of the facility known as the former operational 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.

The former operational area of the facility currently houses six 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.

The June 2001 Decommissioning Plan identified the potential for radioactive material beneath several currently paved areas and building floor surfaces of the former operational area, based upon an interpretation of historical data and/or observations made during the ALRP. As a result, a limited ASCA effort was conducted in the former operational area during mid-2001. The objective of the ASCA was to determine if thorium-bearing dross/radioactive material was present beneath these areas of concern. The characterization approach that was utilized for the ASCA combined a review of aerial photographs stereo pairs for changes in site topography and building structures, the advancement and analytical testing of soil cores, and the excavation and evaluation of test trenches. Soil quality data obtained during the ASCA indicated the presence of residual radioactive material beneath several concrete-paved surfaces and structures at relatively shallow depths. The presence of this material beneath the concrete paving and structures is most likely the result of historical grading and construction infilling activities. The presence of this material beneath the concrete paving and structures within the former "operational area" is most likely the result of historical grading and construction in-filling activities. Consequently, the soil contamination distribution within the former "operational area" may be unlike the distribution elsewhere on the site, and future survey design will need to be adjusted appropriately. Detailed information collected as a result of the ASCA is presented in Earth Sciences' October 2001 Technical Report (see Reference 5). Analytical results for the ASCA conducted in the former operational areas are included in Section 4.3 of this DPA.

As previously discussed, an 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 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 objective of the extended scoping survey of the six structures located in the former operational area was to verify their initial classification of "nonimpacted" during the HSA. No final status survey activities are planned for these six structures. An overview of the available record/documentation of past building demolition is presented in the HSA. No other records exist. 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 below. Supporting documentation is provided in Appendices A and B.

4.1 Contaminated Structures

Presently, none of the original buildings in which magnesium-thorium alloy processing occurred exist on site. 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 that indicated no detectable contamination within the building (refer to Section 2.4 of this DPA). 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.

With the exception of the Flux Building, there were no buildings in the former operational area of the facility classified as impacted in the HSA. The Flux Building was initially classified as an impacted structure due to past and current uses of the building to house and process soil core and surface samples.

4.1.1 Radiological Contamination within Structures

Upon completion of decommissioning activities at the site, the Flux Building will be addressed as a Class 1 survey unit. The remaining six site structures were surveyed as one Class 3 survey unit for the purpose of verifying their initial classification of nonimpacted during the HSA. The Class 3 survey unit was subdivided into 13 subunits consisting of floor surfaces of the structures. The minimum number of sample points (N) and the scan Minimum Detectable Concentration (MDC) required were calculated using the guidance provided in MARSSIM. The minimum number of sample points per survey unit, based on alpha and beta errors of 0.05 (95 percent confidence level) was 18.

From the radionuclide-specific values and the activity ratios of the radionuclides established for the site, a Gross Activity DCGL (GA-DCGL) was calculated using the formula Number 4-4 provided in MARSSIM. The calculated GA-DCGL value is 21.5 disintegrations per minute (dpm)/100 square centimeters (cm^2) for average total surface contamination and 2.15 dpm/100 cm^2 for removable contamination. Refer to the calculation brief contained in Appendix D of this DPA for a derivation of these GA-DCGL values.

Since the calculated scan MDC (425 dpm/100 cm^2) exceeded the GA-DCGL value (21.5 dpm/100 cm^2), the minimum number of samples (N) was increased to 200, in accordance with MARSSIM. The scan MDC was based on the detection of alpha particles emitted from the established site radionuclide mix.

The total floor surface area for the Class 3 survey unit is 6,805 m^2. Based on the fraction of this total area represented by each subunit, the minimum number of sample points that were required per survey subunit was determined (see Table 4-1). Accordingly, the triangular grid spacing pattern (L) for the calculated number of sample points was determined based on MARSSIM guidance.

Extended scoping survey activities performed include scans and fixed-count time measurements of the structural surfaces with the appropriate instrumentation, as well as the collection and analysis of removable contamination (smear) samples for each survey subunit. Ambient background radiological conditions were established for each survey subunit surveyed and each time (at least daily) that a survey was performed (by instrument). A background count time of 60 minutes was used to ensure that the background count rate was statistically significant. Background values were also established for structural

materials that were encountered during survey activities. These background values were established on like materials that were known to be nonimpacted. Appendix B-1 contains the ambient background values established for each survey subunit during survey activities as well as background values established for structural surface materials encountered during survey activities.

A description of each structure and survey subunit is provided below. An overview of the extended scoping survey strategy and a summary of results are also provided in the following sections by survey subunit.

4.1.1.1 North Extrusion Building

The North Extrusion Building was not at any time part of the magnesium refining process. The building served as a storage facility for purified magnesium billets and an anode extrusion facility. A layout of the North Extrusion Building is presented in Figure 4A-1. Building dimensions and construction material types are also shown in this figure. The North Extrusion Building consists of the following levels:

- First Floor of Original Building – Approximately 605 m^2 of floor area
- Loft Area – Approximately 160 m^2 of floor area located above the first-floor level office area of the original building
- Basement of Building Addition – Approximately 945 m^2 of floor area
- First Floor of Building Addition – Approximately 1,325 m^2 of floor area

The total floor area for this building, inclusive of first floor and loft area of the original building, the basement level of the addition, and the first floor level of the addition, is approximately 3,035 m^2.

4.1.1.1.1 Survey Subunit 1 - North Extrusion Building, First Floor of Original Structure

Survey Subunit 1 consists of floor surface for the first-floor level of the North Extrusion Building (Figure 4A-1). The surface area of this survey subunit is approximately 605 m^2.

Specific extended scoping survey activities conducted for this subunit included the following:

- Layout of 18 triangular grid systematic sample points.
- Performance of gross alpha activity scan surveys of the floor surfaces within a 1-m^2 grid area for each triangular grid sample point and adjacent (1 m in width) to the two garage doors located on the south wall of the subunit.
- Performance of a gross alpha static-count measurement at each sample point.
- Collection of a smear sample (representing a surface area of 100 cm^2) at each static-count measurement sample point location for removable alpha activity determination.

Results of these specific extended scoping survey activities are as follows:

- Gross alpha activity scan surveys did not indicate the presence of elevated direct radiation above the calculated MDC of 425 dpm/100 cm^2.
- None of the gross alpha static-count measurements for total surface activity were identified at activity levels above the GA-DCGL value of 21.5 dpm/100 cm^2. The maximum static-count measurement was 21.4 dpm/100 cm^2 and the median measurement value of the data set was 11.7 dpm/100 cm^2.
- None of the gross alpha smear sample determinations for removable surface activity were identified at activity levels above the GA-DCGL value of 2.15 dpm/100 cm^2. The maximum removable activity level was 0.61 dpm/100 cm^2 and the median value of the data set was 0.07 dpm/100 cm^2.

A statistical analysis summary of the total surface and removable surface gross alpha activity levels by survey subunit is presented in Table 4-2. A tabular summary of the extended scoping survey data for this subunit is provided in Appendix B-2, Table B-2-1, analytical data reports are provided in Appendix B-3, and quality assurance/quality control (QA/QC) materials are provided in Appendix B-4.

4.1.1.1.2 Survey Subunit 2 - North Extrusion Building, Loft Area

Survey Subunit 2 consists of the floor surface for the loft area of the North Extrusion Building (Figure 4A-1). The surface area of this survey subunit is approximately 160 m^2.

Specific extended scoping survey activities conducted for this subunit included the following:

- Layout of four triangular grid systematic sample points.

- Performance of gross alpha activity scan surveys of the floor surfaces within a 1-m^2 grid area for each triangular grid sample point and the top of the loft stairway (1 m in width).
- Performance of a gross alpha static-count measurement at each sample point.
- Collection of a smear sample (representing a surface area of 100 cm^2) at each static-count measurement sample point location for removable alpha activity determination.

Results of these specific extended scoping survey activities are as follows:

- Gross alpha activity scan surveys did not indicate the presence of elevated direct radiation above the calculated MDC of 425 dpm/100cm^2.
- None of the gross alpha static-count measurements for total surface activity were identified at activity levels above the GA-DCGL value of 21.5 dpm/100 cm^2. The maximum static-count measurement was 17.6 dpm/100 cm^2 and the median measurement value of the data set was 16.4 dpm/100 cm^2.
- None of the gross alpha smear sample determinations for removable surface activity were identified at activity levels above the GA-DCGL value of 2.15 dpm/100 cm^2. The maximum removable activity level was 0.61 dpm/100 cm^2 and the median value of the data set was 0.07 dpm/100 cm^2.

A statistical analysis summary of the total surface and removable surface gross alpha activity levels by survey subunit is presented in Table 4-2. A tabular summary of the extended scoping survey data for this subunit is provided in Appendix B-2, Table B-2-2, analytical data reports are provided in Appendix B-3, and QA/QC materials are provided in Appendix B-4.

4.1.1.1.3 Survey Subunit 3 - North Extrusion Building, Basement Level of Addition

Survey Subunit 3 consists of the floor surface of the North Extrusion Building basement level addition (Figure 4A-1). The surface area of this survey subunit is approximately 945 m^2.

Specific extended scoping survey activities conducted for this subunit included the following:

- Layout of 28 triangular grid systematic sample points.
- Performance of gross alpha activity scan surveys of the floor surfaces within a 1-m^2 grid area for each triangular grid sample point and adjacent (1 m in width) to the garage door located on the east wall of the subunit.
- Performance of a gross alpha static-count measurement at each sample point.

- Collection of a smear sample (representing a surface area of 100 cm^2) at each static-count measurement sample point location for removable alpha activity determination.

Results of these specific extended scoping survey activities are as follows:

- Gross alpha activity scan surveys did not indicate the presence of elevated direct radiation above the calculated MDC of 425 dpm/100 cm^2.
- None of the gross alpha static-count measurements for total surface activity were identified at activity levels above the GA-DCGL value of 21.5 dpm/100 cm^2. The maximum static-count measurement was 20.0 dpm/100 cm^2 and the median value of the data set was 17.5 dpm/100 cm^2.
- None of the gross alpha smear sample determinations for removable surface activity were identified at activity levels above the GA-DCGL value of 2.15 dpm/100 cm^2. The maximum removable activity level was 1.70 dpm/100 cm^2 and the median value of the data set was 0.34 dpm/100 cm^2.

A statistical analysis summary of the total surface and removable surface gross alpha activity levels by survey subunit is presented in Table 4-2. A tabular summary of the extended scoping survey data for this subunit is provided in Appendix B-2, Table B-2-3, analytical data reports are provided in Appendix B-3, and QA/QC materials are provided in Appendix B-4.

4.1.1.1.4 Survey Subunit 4 - North Extrusion Building, First Floor of Addition

Survey Subunit 4 consists of the floor surface of the North Extrusion Building first floor addition (Figure 4A-1). The surface area of this survey subunit is approximately 1,325 m^2.

Specific extended scoping survey activities conducted for this subunit included the following:

- Layout of 39 triangular grid systematic sample points.
- Performance of gross alpha activity scan surveys of the floor surfaces within a 1-m^2 grid area for each triangular grid sample point and adjacent (1 m in width) to the garage doors located on the north, east, and south walls of the subunit.
- Performance of a gross alpha static-count measurement at each sample point.
- Collection of a smear sample (representing a surface area of 100 cm^2) at each static-count measurement sample point location for removable alpha activity determination.

Results of these specific extended scoping survey activities are as follows:

- Gross alpha activity scan surveys did not indicate the presence of elevated direct radiation above the calculated MDC of 425 dpm/100 cm^2.
- None of the gross alpha static-count measurements for total surface activity were identified at activity levels above the GA-DCGL value of 21.5 dpm/100 cm^2. The maximum static-count measurement was 20.0 dpm/100 cm^2 and the median value of the data set was 17.0 dpm/100 cm^2.
- None of the gross alpha smear sample determinations for removable surface activity were identified at activity levels above the GA-DCGL value of 2.15 dpm/100 cm^2. The maximum removable activity level was 0.89 dpm/100cm^2 and the median value of the data set was 0.07 dpm/100 cm^2.

A statistical analysis summary of the total surface and removable surface gross alpha activity levels by survey subunit is presented in Table 4-2. A tabular summary of the extended scoping survey data for this subunit is provided in Appendix B-2, Table B-2-4, analytical data reports are provided in Appendix B-3, and QA/QC materials are provided in Appendix B-4.

4.1.1.2 Maintenance Building

Although currently referred to as the Maintenance Building, this structure's original function was for the manufacturing of underground anodes. Maintenance activities for the plant were moved to this area around 1985. Neither of these activities required the handling or storage of radioactive materials. A layout of the Maintenance Building is presented in Figure 4A-2. Building dimensions and construction material types are also shown in this figure. The Maintenance Building consists of the following single-story areas:

- Main Building – Approximately 760 m^2 of floor area
- Building Addition – Approximately 35 m^2 of floor area

The total floor area for the main building and the building addition is approximately 795 m^2.

4.1.1.2.1 Survey Subunit 5 - Maintenance Building, Main Structure

Survey Subunit 5 consists of the floor surface of the Maintenance Building (Figure 4A-2). The surface area of this survey subunit is approximately 760 m^2.

Specific extended scoping survey activities conducted for this subunit included the following:

- Layout of 23 triangular grid systematic sample points.
- Performance of gross alpha activity scan surveys of the floor surfaces within a 1-m^2 grid area for each triangular grid sample point and adjacent (1 m in width) to the garage doors located on the north, east, and west walls of the subunit.
- Performance of a gross alpha static-count measurement at each sample point.
- Collection of a smear sample (representing a surface area of 100 cm^2) at each static-count measurement sample point location for removable alpha activity determination.

Results of these specific extended scoping survey activities are as follows:

- Gross alpha activity scan surveys did not indicate the presence of elevated direct radiation above the calculated MDC of 425 dpm/100 cm^2.
- None of the gross alpha static-count measurements for total surface activity were identified at activity levels above the GA-DCGL value of 21.5 dpm/100 cm^2. The maximum static-count measurement was 21.3 dpm/100 cm^2 and the median value of the data set was 6.8 dpm/100 cm^2.
- None of the gross alpha smear sample determinations for removable surface activity were identified at activity levels above the GA-DCGL value of 2.15 dpm/100 cm^2. The maximum removable activity level was 0.61 dpm/100 cm^2 and the median value of the data set was 0.07 dpm/100 cm^2.

A statistical analysis summary of the total surface and removable surface gross alpha activity levels by survey subunit is presented in Table 4-2. A tabular summary of the extended scoping survey data for this subunit is provided in Appendix B-2, Table B-2-5, analytical data reports are provided in Appendix B-3, and QA/QC materials are provided in Appendix B-4.

4.1.1.2.2 Survey Subunit 6 - Maintenance Building, Scale House Addition

Survey Subunit 6 consists of the floor surface for the Maintenance Building, Scale House Addition (Figure 4A-2). The surface area of this survey subunit is approximately 35 m^2.

Specific extended scoping survey activities conducted for this subunit included the following:

- Layout of three sample points.
- Performance of gross alpha activity scan surveys of the floor surfaces within a 1-m^2 grid area for each triangular grid sample point and adjacent (1 m in width) to the main doors for this subunit.
- Performance of a gross alpha static-count measurement at each sample point.
- Collection of a smear sample (representing a surface area of 100 cm^2) at each static-count measurement sample point location for removable alpha activity determination.

Results of these specific extended scoping survey activities are as follows:

- Gross alpha activity scan surveys did not indicate the presence of elevated direct radiation above the calculated MDC of 425 dpm/100 cm^2.
- None of the gross alpha static-count measurements for total surface activity were identified at activity levels above the GA-DCGL value of 21.5 dpm/100 cm^2. The maximum static-count measurement was 12.0 dpm/100 cm^2 and the median value of the data set was 7.3 dpm/100 cm^2.
- None of the gross alpha smear sample determinations for removable surface activity were identified at activity levels above the GA-DCGL value of 2.15 dpm/100 cm^2. The maximum removable activity level was 0.61 dpm/100 cm^2 and the median value of the data set was 0.34 dpm/100 cm^2.

A statistical analysis summary of the total surface and removable surface gross alpha activity levels by survey subunit is presented in Table 4-2. A tabular summary of the extended scoping survey data for this subunit is provided in Appendix B-2, Table B-2-6, analytical data reports are provided in Appendix B-3, and QA/QC materials are provided in Appendix B-4.

4.1.1.3 Office Building

The Office Building is an original facility structure separate from the operational buildings. Available records indicate that this building has been utilized for administrative purposes exclusively. A layout of the Office Building is presented in Figures 4A-3 and 4A-4. Building dimensions and construction material types are also shown in these figures. The Office Building consists of the following levels:

- First Floor – Approximately 310 m^2 of floor area
- Second Floor – Approximately 310 m^2 of floor area

The total floor area for this building is approximately 620 m^2.

4.1.1.3.1 Survey Subunit 7 - Office Building, First Floor

Survey Subunit 7 consists of the floor surface for the first floor of the Office Building (Figure 4A-3). The surface area of this survey subunit is approximately 310 m^2.

Specific extended scoping survey activities conducted for this subunit included the following:

- Layout of nine triangular grid systematic sample points.
- Performance of gross alpha activity scan surveys of the floor surfaces within a 1-m^2 grid area for each triangular grid sample point.
- Performance of a gross alpha static-count measurement at each sample point.
- Collection of a smear sample (representing a surface area of 100 cm^2) at each static-count measurement sample point location for removable alpha activity determination.

Results of these extended scoping survey activities are as follows:

- Gross alpha activity scan surveys did not indicate the presence of elevated direct radiation calculated above the MDC of 425 dpm/100 cm^2.
- None of the gross alpha static-count measurements for total surface activity were identified at activity levels above the GA-DCGL value of 21.5 dpm/100 cm^2. The maximum static-count measurement was 10.2 dpm/100 cm^2 and the median value of the data set was 3.7 dpm/100 cm^2.
- None of the gross alpha smear sample determinations for removable surface activity were identified at activity levels above the GA-DCGL value of 2.15 dpm/100 cm^2. The maximum removable activity level was 0.34 dpm/100 cm^2 and the median value of the data set was -0.20 dpm/100 cm^2.

A statistical analysis summary of the total surface and removable surface gross alpha activity levels by survey subunit is presented in Table 4-2. A tabular summary of the extended scoping survey data for this subunit is provided in Appendix B-2, Table B-2-7, analytical data reports are provided in Appendix B-3, and QA/QC materials are provided in Appendix B-4.

4.1.1.3.2 Survey Subunit 8 - Office Building, Second Floor

Survey Subunit 8 consists of the floor surface for the second floor of the Office Building (Figure 4A-4). The surface area of this survey subunit is approximately 310 m^2.

Specific extended scoping survey activities conducted for this subunit included the following:

- Layout of nine triangular grid systematic sample points.
- Performance of gross alpha activity scan surveys of the floor surfaces within a 1-m^2 grid area for each triangular grid sample point.
- Performance of a gross alpha static-count measurement at each sample point.
- Collection of a smear sample (representing a surface area of 100 cm^2) at each static-count measurement sample point location for removable alpha activity determination.

Results of these specific extended scoping survey activities are as follows:

- Gross alpha activity scan surveys did not indicate the presence of elevated direct radiation above the calculated DCGL of 425 dpm/100 cm^2.
- None of the gross alpha static-count measurements for total surface activity were identified at activity levels above the GA-DCGL value of 21.5 dpm/100 cm^2. The maximum static-count measurement was 9.4 dpm/100 cm^2 and the median value of the data set was -0.9 dpm/100 cm^2.
- None of the gross alpha smear sample determinations for removable surface activity were identified at activity levels above the GA-DCGL value of 2.15 dpm/100 cm^2. The maximum removable activity level was 0.34 dpm/100 cm^2 and the median value of the data set was 0.07 dpm/100 cm^2.

A statistical analysis summary of the total surface and removable surface gross alpha activity levels by survey subunit is presented in Table 4-2. A tabular summary of the extended scoping survey data for this subunit is provided in Appendix B-2, Table B-2-8, analytical data reports are provided in Appendix B-3, and QA/QC materials are provided in Appendix B-4.

4.1.1.4 Warehouse Building

The Warehouse Building has been renovated several times including a major renovation between 1958 and 1964. Available information indicates that this building has served as a storage facility for finished products. A layout of the Warehouse Building is presented in Figure 4A-5. Building dimensions and construction material types are also shown in this figure. The Warehouse Building consists of a single-story structure divided into three main sections:

- Western Section – Approximately 695 m^2 of floor area
- Central Section – Approximately 405 m^2 of floor area
- Eastern Section – Approximately 215 m^2 of floor area

The total floor area of the three main building sections is approximately 1,315 m^2.

4.1.1.4.1 Survey Subunit 9 - Warehouse Building, Western Section

Survey Subunit 9 consists of the floor surface for the Warehouse Building, Western Section (Figure 4A-5). The surface area of this survey subunit is approximately 695 m^2.

Specific extended scoping survey activities conducted for this subunit included the following:

- Layout of 20 triangular grid systematic sample points.
- Performance of gross alpha activity scan surveys of the floor surfaces within a 1-m^2 grid area for each triangular grid sample point and adjacent (1 m in width) to the garage doors located on the north and east walls of the subunit.
- Performance of a gross alpha static-count measurement at each sample point.
- Collection of a smear sample (representing a surface area of 100 cm^2) at each static-count measurement sample point location for removable alpha activity determination.

Results of these specific extended scoping survey activities are as follows:

- Gross alpha activity scan surveys did not indicate the presence of elevated direct radiation above the calculated MDC of 425 dpm/100 cm^2.
- None of the gross alpha static-count measurements for total surface activity were identified at activity levels above the GA-DCGL value of 21.5 dpm/100 cm^2. The maximum static-count measurement was 20.5 dpm/100 cm^2 and the median value of the data set was 8.6 dpm/100 cm^2.
- None of the gross alpha smear sample determinations for removable surface activity were identified at activity levels above the GA-DCGL value of 2.15 dpm/100 cm^2. The maximum removable activity level was 0.89 dpm/100 cm^2 and the median value of the data set was 0.07 dpm/100 cm^2.

A statistical analysis summary of the total surface and removable surface gross alpha activity levels by survey subunit is presented in Table 4-2. A tabular summary of the extended scoping survey data for this

subunit is provided in Appendix B-2, Table B-2-9, analytical data reports are provided in Appendix B-3, and QA/QC materials are provided in Appendix B-4.

4.1.1.4.2 Survey Subunit 10 - Warehouse Building, Central Section

Survey Subunit 10 consists of the floor surface for the Warehouse Building, Central Section (Figure 4A-5). The surface area of this survey subunit is approximately 405 m^2.

Specific extended scoping survey activities conducted for this subunit included the following:

- Layout of 12 triangular grid systematic sample points.
- Performance of gross alpha activity scan surveys of the floor surfaces within a 1-m^2 grid area for each triangular grid sample point and adjacent (1 m in width) to the garage doors located on the north, east, and west walls of the subunit.
- Performance of a gross alpha static-count measurement at each sample point.
- Collection of a smear sample (representing a surface area of 100 cm^2) at each static-count measurement sample point location for removable alpha activity determination.

Results of these specific extended scoping survey activities are as follows:

- Gross alpha activity scan surveys did not indicate the presence of elevated direct radiation above the calculated MDC of 425 dpm/100 cm^2.
- None of the gross alpha static-count measurements for total surface activity were identified at activity levels above the GA-DCGL value of 21.5 dpm/100 cm^2. The maximum static-count measurement was 9.3 dpm/100 cm^2 and the median value of the data set was 4.0 dpm/100 cm^2.
- None of the gross alpha smear sample determinations for removable surface activity were identified at activity levels above the GA-DCGL value of 2.15 dpm/100 cm^2. The maximum removable activity level was 0.34 dpm/100 cm^2 and the median value of the data set was -0.20 dpm/100 cm^2.

A statistical analysis summary of the total surface and removable surface gross alpha activity levels by survey subunit is presented in Table 4-2. A tabular summary of the extended scoping survey data for this subunit is provided in Appendix B-2, Table B-2-10, analytical data reports are provided in Appendix B-3, and QA/QC materials are provided in Appendix B-4.

4.1.1.4.3 Survey Subunit 11 - Warehouse Building, Eastern Section

Survey Subunit 11 consists of the floor surface for the Warehouse Building, Eastern Section (Figure 4A-5). The surface area of this survey subunit is approximately 215 m^2.

Specific extended scoping survey activities conducted for this subunit included the following:

- Layout of six triangular grid systematic sample points.
- Performance of gross alpha activity scan surveys of the floor surfaces within a 1-m^2 grid area for each triangular grid sample point and adjacent (1 m in width) to the garage doors located on the east and west walls of the subunit.
- Performance of a gross alpha static-count measurement at each sample point.
- Collection of a smear sample (representing a surface area of 100 cm^2) at each static-count measurement sample point location for removable alpha activity determination.

Results of these specific extended scoping survey activities are as follows:

- Gross alpha activity scan surveys did not indicate the presence of elevated direct radiation above the calculated MDC of 425 dpm/100 cm^2.
- None of the gross alpha static-count measurements for total surface activity were identified at activity levels above the GA-DCGL value of 21.5 dpm/100 cm^2. The maximum static-count measurement was 20.0 dpm/100 cm^2 and the median value of the data set was 7.2 dpm/100 cm^2.
- None of the gross alpha smear sample determinations for removable surface activity were identified at activity levels above the GA-DCGL value of 2.15 dpm/100 cm^2. The maximum removable activity level was 0.34 dpm/100 cm^2 and the median value of the data set was 0.21 dpm/100 cm^2.

A statistical analysis summary of the total surface and removable surface gross alpha activity levels by survey subunit is presented in Table 4-2. A tabular summary of the extended scoping survey data for this subunit is provided in Appendix B-2, Table B-2-11, analytical data reports are provided in Appendix B-3, and QA/QC materials are provided in Appendix B-4.

4.1.1.5 Crusher Building (Survey Subunit 12)

Available information collected on the Crusher Building indicates that the building was rebuilt after thorium-magnesium alloy processing had ceased at the facility to accommodate the processing of aluminum.

A layout of the Crusher Building is presented in Figure 4A-6. Building dimensions and construction material types are also shown in this figure. The Crusher Building consists of a single-story structure with a main floor area of approximately 500 m^2. This building also contains two aluminum furnaces, a casting pit area, a two-tier stair well, and an exterior concrete pad.

Specific extended scoping survey activities conducted for this subunit included the following:

- Layout of 15 triangular grid systematic sample points.
- Performance of gross alpha activity scan surveys of the floor surfaces within a 1-m^2 grid area for each triangular grid sample point and adjacent (1 m in width) to the doorways located along the southern and western walls of the subunit.
- Performance of a gross alpha static-count measurement at each sample point.
- Collection of a smear sample (representing a surface area of 100 cm^2) at each static-count measurement sample point location for removable alpha activity determination.

Results of these specific extended scoping survey activities are as follows:

- Gross alpha activity scan surveys did not indicate the presence of elevated direct radiation above the calculated MDC of 425 dpm/100 cm^2.
- None of the gross alpha static-count measurements for total surface activity were identified at activity levels above the GA-DCGL value of 21.5 dpm/100 cm^2. The maximum static-count measurement was 17.9 dpm/100 cm^2 and the median value of the data set was 4.0 dpm/100 cm^2.
- None of the gross alpha smear sample determinations for removable surface activity were identified at activity levels above the GA-DCGL value of 2.15 dpm/100 cm^2. The maximum removable activity level was 0.89 dpm/100 cm^2 and the median value of the data set was 0.07 dpm/100 cm^2.

A statistical analysis summary of the total surface and removable surface gross alpha activity levels by survey subunit is presented in Table 4-2. A tabular summary of the extended scoping survey data for this subunit is provided in Appendix B-2, Table B-2-12, analytical data reports are provided in Appendix B-3, and QA/QC materials are provided in Appendix B-4.

4.1.1.6 Crusher Addition Building (Survey Subunit 13)

Available information collected on the Crusher Addition Building indicates that the building was rebuilt after thorium-magnesium alloy processing had ceased at the facility to accommodate the processing of aluminum. A layout of the Crusher Addition Building is presented in Figure 4A-7. Building dimensions and construction material types are also shown in this figure. The Crusher Addition Building consists of a single-story structure with a main floor area of approximately 540 m^2. This building also contains a casting pit, an aluminum tilting furnace, an aluminum smelter, and a preheat furnace.

Specific extended scoping survey activities conducted for this subunit included the following:

- Layout of 16 triangular grid systematic sample points.
- Performance of gross alpha activity scan surveys of the floor surfaces within a 1-m^2 grid area for each triangular grid sample point and adjacent (1 m in width) to the doorways located on the north, south, and west walls of the subunit.
- Performance of a gross alpha static-count measurement at each sample point.
- Collection of a smear sample (representing a surface area of 100 cm^2) at each static-count measurement sample point location for removable alpha activity determination.

Results of these specific extended scoping survey activities are as follows:

- Gross alpha activity scan surveys did not indicate the presence of elevated direct radiation above the calculated MDC of 425 dpm/100 cm^2.
- None of the gross alpha static-count measurements for total surface activity were identified at activity levels above the GA-DCGL value of 21.5 dpm/100 cm^2. The maximum static-count measurement was 21.4 dpm/100 cm^2 and the median value of the data set was 13.7 dpm/100 cm^2.
- None of the gross alpha smear sample determinations for removable surface activity were identified at activity levels above the GA-DCGL value of 2.15 dpm/100 m^2. The maximum removable activity level was 0.61 dpm/100 cm^2 and the median value of the data set was 0.07 dpm/100 cm^2.

A statistical analysis summary of the total surface and removable surface gross alpha activity levels by survey subunit is presented in Table 4-2. A tabular summary of the extended scoping survey data for this subunit is provided in Appendix B-2, Table B-2-13, analytical data reports are provided in Appendix B-3, and QA/QC materials are provided in Appendix B-4.

4.2 Contaminated Systems and Equipment

Smelting of magnesium-thorium alloy was discontinued prior to 1971. Subsequently, nonthoriated magnesium and then aluminum were smelted at the plant. Instrument scans indicated that no contaminated equipment exists at the facility.

As discussed in Chapter 3.0 of this DPA, a limited amount of subsurface piping and associated culverts exist within the former operational area of the facility (Figure 3A-4). 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. These systems are not expected to contain radiological contamination.

Information gathered during an HSA performed during late 2001 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 noncontact cooling water used in plant operations. These systems are not expected to contain radiological contamination. Their radiological status will be confirmed when they are encountered during remediation activities to determine the proper disposition.

4.3 Surface and Subsurface Soil Contamination

Land areas initially classified as impacted included the land areas beneath the Maintenance Building, the Crusher Building, the Crusher Addition Building, the North Extrusion Building, the Warehouse Building, and the former Smelter Building, as well as concrete-paved areas completed post-1958. These areas of concern were delineated into nine survey units for characterization purposes (Figure 4A-8).

Characterization survey activities performed for each survey unit (with the exception of Survey Unit 6) included gamma scan walk over surveys, surface and subsurface soil sampling, and sample field gamma scanning and laboratory analysis. Ambient background radiological conditions were established for each survey unit grid area prior to performing a gamma scan walk over survey. Ambient background radiological conditions were also established, prior to the scanning of soil core samples on site. A background count time of 1 minute was used in both cases to ensure that the background count rate was statistically significant. Table 4-3 contains the ambient background values established for each survey unit grid area.

Ambient background values established for the scanning of soil core samples are listed in Tables 4-4 through 4-12.

A background activity concentration for soils has been established for the site based on Th-232 analytical results. Background values for Th-232 ranged from 0.99 to 1.24 pCi/g, with an overall average of 1.1 pCi/g. A description of each land area survey unit is provided below. An overview of the characterization survey activities and results is also provided in the following sections by survey unit.

4.3.1 Survey Unit 1

Survey Unit 1 encompasses the land area beneath the North Extrusion Building Addition (Figure 4A-8). This area of concern was classified as a Class 1 Survey Unit due to its potential for containing residual radioactive material based on history (timeframe of construction). The surface area of this survey unit is approximately 1,450 m^2.

Specific characterization survey activities conducted for the survey unit included the following:

- Performance of a 100-percent gamma scan survey on a 10-m grid spacing interval.
- Layout of nine triangular grid systematic sample points (SU1-B1 through SU1-B9).
- Collection of soil core samples at each triangular grid sample point.
- Survey of soil core samples for gamma activity and sampling for laboratory analysis (Th-232 activity concentrations).

Results of characterization survey activities for this survey unit are as follows:

- Gamma activity scan surveys did not indicate the presence of elevated direct radiation.
- Net Th-232 activity concentrations for the six soil core samples obtained from the basement section of the North Extrusion Building addition were identified at 0.0 pCi/g.
- Net Th-232 activity concentrations for two of the three soil core samples obtained from the first floor section of the North Extrusion Building addition were identified at 0.0 pCi/g. The third soil core sample (Boring B9, 2 feet to 3 feet) exhibited a net Th-232 activity concentration of 3.93 pCi/g. Net gamma counts for the soil core samples obtained from Boring B9 indicated that thorium contamination is limited to a depth of approximately 4 feet at this location. The approximate surface area of the elevated measurement is 100 m^2. The $DCLG_{EMC}$ value for an area of 100 m^2 is 5.4 pCi/g Th-232 (Table 14-5 of the June 2001 [Revised May 2003] Decommissioning Plan).

A summary of the gamma scan survey results (gross and net maximum, minimum, and average values) for this survey unit is presented in Table 4-3. The results of the soil core scans (net gamma counts) for Survey Unit 1 are summarized in Table 4-4. Th-232 analytical results for select soil core samples are summarized in Table 4-13 and presented in Figure 4A-9. Analytical data reports are contained in Appendix C-1. QA/QC records are contained in Appendix C-2.

4.3.2 Survey Unit 2

Survey Unit 2 consists of the land area beneath a paved concrete surface situated northwest of the Maintenance Building, northeast of the North Extrusion Building, and south of the Union Pacific Railroad right-of-way (Figure 4A-8). This area of concern was classified as a Class 1 Survey Unit due to the presence of residual radioactive material (above the DCGL) as identified during the ASCA. The surface area of this survey unit is approximately 450 m^2.

Specific characterization survey activities conducted for each survey unit included the following:

- Performance of a 100-percent gamma scan survey on a 10-m grid spacing interval.
- Layout of nine triangular grid systematic sample points (SU2-B1 through SU2-B9).
- Collection of soil core samples at each triangular grid sample point.
- Survey of soil core samples for gamma activity and sampling for laboratory analysis (Th-232 activity concentrations).
- Excavation of an exploratory test trench (T-SU2-1) in the western half of the survey unit. Materials encountered during trenching were visually inspected and scanned for the presence of radioactive material.

Results of characterization survey activities for this survey unit are as follows:

- Gamma activity scan surveys indicated the presence of elevated direct radiation in the western half of the survey unit.
- Net Th-232 activity concentrations for the nine triangular grid soil core samples were identified at 0.0 to 0.57 pCi/g.
- A surface soil sample (ASCA-25, 0 foot to 0.5 foot) collected during the ASCA exhibited a net Th-232 activity concentration of 7.37 pCi/g. This sample was collected from the western half of the survey unit.

- Exploratory test trenching revealed the presence of pockets of thorium-bearing dross throughout the western half of the survey unit. Scan data acquired during test trench activities revealed isolated pockets of residual radioactive materials. Scan data ranged from 6,000 cpm net to 12,000 cpm net in the test trench area. The average scan result of the excavation was approximately 10,000 cpm net. Background for the area was measured at 10,000 to 11,000 cpm. The depth of the thorium contamination appears to be limited to approximately 6 feet in this area. The approximate surface area of the radiological contamination is 2,214 ft^2. No samples were acquired for this test trench.

A summary of the gamma scan survey results (gross and net maximum, minimum, and average values) for this survey unit is presented in Table 4-3. The results of the soil core scans (net gamma counts) for Survey Unit 2 are summarized in Table 4-5. Th-232 analytical results for select soil core samples are summarized in Table 4-13 and presented in Figure 4A-10. Analytical data reports are contained in Appendix C-1. QA/QC records are contained in Appendix C-2.

4.3.3 Survey Unit 3

Survey Unit 3 consists of the land area beneath a paved concrete surface situated north of the Office Building, east of the North Extrusion Building, south of Survey Unit 2, and west of the Maintenance Building (Figure 4A-8). This area of concern was classified as a Class 1 Survey Unit due to the presence of residual radioactive material (above the DCGL), as identified during the ASCA. The surface area of this survey unit is approximately 1,750 m^2.

Specific characterization survey activities conducted for the survey unit included the following:

- Performance of a 100-percent gamma scan survey on a 10-m grid spacing interval.
- Layout of nine triangular grid systematic sample points (SU3-B1 through SU3-B9).
- Collection of soil core samples at each triangular grid sample point.
- Collection of soil core samples at three points of elevated surface activity (SU3-A1, SU3-A2, and SU3-C1).
- Survey of soil core samples for gamma activity and sampling for laboratory analysis (Th-232 activity concentrations).
- Excavation of an exploratory test trench (T-SU3-1) in the built-up concrete-surfaced ramp area located immediately west of the Maintenance Building. Materials encountered during trenching were visually inspected and scanned for the presence of radioactive material.

Results of characterization survey activities for this survey unit are as follows:

- Gamma activity scan surveys indicated the presence of elevated direct radiation in three small areas of the survey unit.
- Net Th-232 activity concentrations for the nine triangular grid soil core samples and the three points of elevated surface activity were identified at 0.0 to 0.41 pCi/g.
- A surface soil sample (ASCA-24A, 0 foot to 2 feet) collected during the ASCA exhibited a net Th-232 activity concentration of 8.47 pCi/g. This sample was collected from the built-up concrete-surfaced ramp located immediately west of the Maintenance Building.
- Exploratory test trenching revealed the presence of thorium-bearing dross in the built-up ramp area located immediately west of the maintenance building. Scan data acquired during test trench activities revealed large areas of residual radioactive materials. Scan data ranged from 20,000 cpm net to 250,000 cpm net in the test trench area. The average scan result for this excavation was approximately 50,000 cpm net. Background for the excavation was measured at 9,000 to 10,000 cpm. The depth of the thorium-contamination appears to be limited to approximately 4 feet in this area. The approximate surface area of the radiological contamination is 800 ft^2.
- A biased soil sample (highest scan cpm) collected from the test trench revealed a Th-232 activity concentration of 143.9 pCi/g net.

A summary of the gamma scan survey results (gross and net maximum, minimum, and average values) for this survey unit is presented in Table 4-3. The results of the soil core scans (net gamma counts) for Survey Unit 3 are summarized in Table 4-6. Th-232 analytical results for select soil core samples are summarized in Table 4-13 and presented in Figure 4A-11. Analytical data reports are contained in Appendix C-1. QA/QC records are contained in Appendix C-2.

4.3.4 Survey Unit 4

Survey Unit 4 encompasses the land area beneath the Maintenance Building, Scale House Addition (Figure 4A-8). This area of concern was classified as a Class 1 Survey Unit due to its potential for containing residual radioactive material based on history (timeframe of construction). The surface area of this survey unit is approximately 850 m^2.

Specific characterization survey activities conducted for each survey unit included the following:

- Performance of a 100-percent gamma scan survey on a 10-m grid spacing interval.
- Layout of nine triangular grid systematic sample points (SU4-B1 through SU4-B9).

- Collection of soil core samples at each triangular grid sample point.
- Survey of soil core samples for gamma activity and sampling for laboratory analysis (Th-232 activity concentrations).

Results of characterization survey activities for this survey unit are as follows:

- Gamma activity scan surveys did not indicate the presence of elevated direct radiation.
- Net Th-232 activity concentrations for the nine triangular grid soil core samples obtained during this characterization event were identified at 0.0 pCi/g.

A summary of the gamma scan survey results (gross and net maximum, minimum, and average values) for this survey unit is presented in Table 4-3. The results of the soil core scans (net gamma counts) for Survey Unit 4 are summarized in Table 4-7. Th-232 analytical results for select soil core samples are summarized in Table 4-13 and presented in Figure 4A-12. Analytical data reports are contained in Appendix C-1. QA/QC records are contained in Appendix C-2.

4.3.5 Survey Unit 5

Survey Unit 5 consists of the land area beneath a paved concrete surface situated north of the Warehouse Building, east of the Maintenance Building, south of the Union Pacific Railroad right-of-way, and west of the current Crusher Building (Figure 4A-8). This area of concern was classified as a Class 1 Survey Unit due to its potential for containing residual radioactive material based on operational history (the area of the original Smelter Building). The surface area of this survey unit is approximately 1,850 m^2.

Specific characterization survey activities conducted for the survey unit included the following:

- Performance of a 100-percent gamma scan survey on a 10-m grid spacing interval.
- Layout of nine triangular grid systematic sample points (SU5-B1 through SU5-B9).
- Collection of soil core samples at each triangular grid sample point.
- Collection of soil core samples at four points of elevated surface activity (SU5-A2, SU5-D2, SU5-G1, and SU5-I1).
- Survey of soil core samples for gamma activity and sampling for laboratory analysis (Th-232 activity concentrations).

- Excavation of an exploratory test trench (T-SU5-1) along the backfilled side of a concrete retaining wall situated at the southeastern corner of the Maintenance Building. Materials encountered during trenching were visually inspected and scanned for the presence of radioactive material.

Results of characterization survey activities for this survey unit are as follows:

- Gamma activity scan surveys indicated the presence of elevated direct radiation in the easternmost section of the survey unit.

- Net Th-232 activity concentrations for the nine triangular grid soil core samples and two biased soil core samples (Borings D2 and G1) obtained during this characterization event were identified at 0.0 to 0.01 pCi/g.

- Two biased soil core samples (Boring A2, 1 foot to 2 feet and Boring I1, 3 feet to 4 feet) collected during this characterization event exhibited net Th-232 activity concentrations of 73.3 and 80.7 pCi/g. Net gamma counts for the soil core samples obtained from Boring A2 indicated that thorium contamination is limited to a depth of approximately 2 feet at this location. Net gamma counts for the soil core samples obtained from Boring I1 indicated that thorium contamination is limited to a depth of approximately 4 feet at this location.

- Exploratory test trenching revealed the presence of thorium-bearing dross along the back-filled side of the concrete retaining wall situated at the southeastern corner of the Maintenance Building. Scan data acquired during test trench activities revealed large areas of residual radioactive materials. Scan data ranged from 30,000 cpm net to 1,000,000 cpm net in the test trench area. The average scan result of this excavation was approximately 40,000 cpm net. Background for the excavation was measured at 10,000 to 11,000 cpm. The depth of the thorium contamination appears to be limited to approximately 4 feet in this area. The approximate surface area of the radiological contamination is 496 ft^2. One small elevated area (1,000,000 cpm) of a unique dross material (wrapped in plastic) was identified in this excavation. Sampling of this isolated pocket of dross material removed the majority of the material at this location.

- A biased soil sample (highest scan cpm area) revealed a Th-232 activity contamination of 6,428.9 pCi/g net.

A summary of the gamma scan survey results (gross and net maximum, minimum, and average values) for this survey unit is presented in Table 4-3. The results of the soil core scans (net gamma counts) for Survey Unit 5 are summarized in Table 4-8. Th-232 analytical results for select soil core samples are summarized in Table 4-13 and presented in Figure 4A-13. Analytical data reports are contained in Appendix C-1. QA/QC records are contained in Appendix C-2.

4.3.6 Survey Unit 6

Survey Unit 6 encompasses the land area beneath the floor area of the former Smelter Building No. 5 (Figure 4A-8). The Smelter Building was demolished in October 2000, following completion of survey activities that indicated no contamination within the building. Approximately 2 to 10 feet of clean fill was then placed over the former building's concrete slab floor for site grading purposes. This area of concern was classified as a Class 1 Survey Unit due to its potential for containing residual radioactive material based on history (timeframe of construction). The surface area of this survey unit is approximately 650 m^2.

A separate sampling strategy was developed for the land area beneath the former Smelter Building No. 5. The sampling strategy for this survey unit was designed based on its current surface topographical condition and the configuration of the former Smelter Building. Based on the former building's configuration, two areas within the survey unit exist with a maximum potential for containing residual radioactive material. These include the area at ground level to the east (immediately adjacent to areas remediated during the ALRP) and the exterior area immediately abutting the lower walls of the western and southern portions of the former structure. Prior to initiating any surveys or sampling in this survey unit, an approximate 10-m-by-10-m area in the northeasternmost corner of the former building's foot print was cleared of cover to the concrete floor slab. Once cleared of cover, the following specific characterization survey activities were conducted:

- Performance of a 100-percent gamma scan survey of the cleared 10-m-by-10-m area.
- Layout of four systematic sample points in the cleared area (SU6-B6 through SU6-B9) and five sample points along the perimeter of the former structure's foundation (SU6-B1 through SU6-B5).
- Collection of soil core samples at each sample point.
- Survey of soil core samples for gamma activity and sampling for laboratory analysis (Th-232 activity concentrations).

Net Th-232 activity concentrations for eight of the nine soil core samples were identified at 0.0 to 1.88 pCi/g. The soil core sample collected from Boring B3, 7 feet to 8 feet, exhibited a net Th-232 activity concentration of 20.7 pCi/g. Net gamma counts for the soil core samples obtained from Boring B3 indicated that thorium contamination is limited to a depth of approximately 8 feet at this location.

A summary of the gamma scan survey results (gross and net maximum, minimum, and average values) for this survey unit is presented in Table 4-3. The results of the soil core scans (net gamma counts) for Survey Unit 6 are summarized in Table 4-9. Th-232 analytical results for select soil core samples are summarized in Table 4-13 and presented in Figure 4A-14. Analytical data reports are contained in Appendix C-1. QA/QC records are contained in Appendix C-2.

4.3.7 Survey Unit 7

Survey Unit 7 encompasses the land area beneath the Warehouse Building (Figure 4A-8). This area of concern was classified as a Class 1 Survey Unit due to the presence of residual radioactive material (above the DCGL) as identified during the ASCA. The surface area of this survey unit is approximately 1,500 m^2.

Specific characterization survey activities conducted for the survey unit included the following:

- Performance of a 100-percent gamma scan survey on a 10-m grid spacing interval.
- Layout of nine triangular grid systematic sample points (SU7-B1 through SU7-B9).
- Collection of soil core samples at each triangular grid sample point.
- Collection of soil core samples at five points of elevated surface activity (SU7-C1, SU7-D2, SU7-F2, SU7-H1, and SU7-H2).
- Survey of soil core samples for gamma activity and sampling for laboratory analysis (Th-232 activity concentrations).

Results of characterization survey activities for this survey unit are as follows:

- Gross gamma activity scan surveys indicated the presence of elevated direct radiation in six areas of the survey unit (concentrated to the central and northeastern corner).
- Net Th-232 activity concentrations for eight of the nine triangular grid soil core samples and two biased soil core samples (Borings D2 and H1) obtained during this characterization event were identified at 0.0 to 2.69 pCi/g. The soil core sample collected from Boring B3, 0 foot to 1 foot, exhibited a net Th-232 activity concentration of 64.4 pCi/g. Net gamma counts for the soil core samples obtained from Boring B3 indicated that Th-contamination is limited to a depth of approximately 2 feet at this location. The final location for Boring B3 was biased based on the results of the gamma activity scan survey.
- Three biased soil core samples (Boring C1, 0 foot to 1 foot, Boring F2, 5 feet to 6 feet, and Boring H2, 0 foot to 1 foot) collected exhibited net Th-232 activity concentrations ranging

from 13.2 to 56.8 pCi/g. Net gamma counts for the soil core samples obtained from Borings C1 and H2 indicated that thorium contamination is limited to a depth of approximately 2 feet at these locations. Net gamma counts for the soil core samples obtained from Boring F2 indicated that thorium contamination is limited to a depth of approximately 6 feet at this location.

- One soil sample (ASCA-22, 0 foot to 2 feet) collected from this survey unit during the ASCA also exhibited a net Th-232 activity concentration in excess of 3.0 pCi/g (the DCGL).

A summary of the gamma scan survey results (gross and net maximum, minimum, and average values) for this survey unit is presented in Table 4-3. The results of the soil core scans (net gamma counts) for Survey Unit 7 are summarized in Table 4-10. Th-232 analytical results for select soil core samples are summarized in Table 4-13 and presented in Figure 4A-15. Analytical data reports are contained in Appendix C-1. QA/QC records are contained in Appendix C-2.

4.3.8 Survey Unit 8

Survey Unit 8 consists of the land area beneath a paved concrete surface situated north of 41st Street and the current Crusher Building, east of Survey Unit 5, south of the Union Pacific Railroad right-of-way, and west of areas remedeated during the ALRP (Figure 4A-8). This area of concern was classified as a Class 1 survey unit due to the presence of residual radioactive material (above the DCGL) as identified during the ASCA. The surface area of this survey unit is approximately 1,350 m^2.

Specific characterization survey activities conducted for the survey unit included the following:

- Performance of a 100-percent gamma scan survey on a 10-m grid spacing interval.
- Layout of nine triangular grid systematic sample points (SU8-B1 through SU8-B9).
- Collection of soil core samples at each triangular grid sample point.
- Collection of soil core samples at three points of elevated surface activity (SU8-F1, SU8-F2, and SU8-F3).
- Survey of soil core samples for gamma activity and sampling for laboratory analysis (Th-232 activity concentrations).

Results of characterization survey activities for this survey unit are as follows:

- Gamma activity scan surveys indicated the presence of elevated direct radiation in the northeastern section of the survey unit.

- Net Th-232 activity concentrations for seven of the nine triangular grid soil core samples were identified at 0.0 to 1.81 pCi/g. The soil core sample collected from Boring B3, 1 foot to 2 feet, exhibited a net Th-232 activity concentration of 21.6 pCi/g. Net gamma counts for the soil core samples obtained from Boring B3 indicated that thorium contamination is limited to a depth of approximately 2 feet at this location. The soil core sample collected from Boring B5, 1 foot to 2 feet, exhibited a net Th-232 activity concentration of 41.5 pCi/g. Net gamma counts for the soil core samples obtained from Boring B5 indicated that thorium contamination is limited to a depth of approximately 2 feet at this location.

- Three biased soil core samples (Boring F1, 0 foot to 1 foot, Boring F2, 0 foot to 1 foot, and Boring F3, 0 foot to 1 foot) collected during this characterization event exhibited net Th-232 activity concentrations ranging from 10.8 to 131.9 pCi/g. Net gamma counts for the soil core samples obtained from these borings indicated that thorium contamination is limited to a depth of approximately 2 feet at these locations.

- Three soil samples (ASCA-14, 0 foot to 1 foot, ASCA-15, 1 foot to 2 feet, and ASCA-19, 4 feet to 5 feet) collected from this survey unit during the ASCA also exhibited net Th-232 activity concentration in excess of 3.0 pCi/g (the DCGL).

A summary of the gamma scan survey results (gross and net maximum, minimum, and average values) for this survey unit is presented in Table 4-3. The results of the soil core scans (net gamma counts) for Survey Unit 8 are summarized in Table 4-11. Th-232 analytical results for select soil core samples are summarized in Table 4-13 and presented in Figure 4A-16. Analytical data reports are contained in Appendix C-1. QA/QC records are contained in Appendix C-2.

4.3.9 Survey Unit 9

Survey Unit 9 includes the land area beneath the current Crusher and Crusher Addition buildings (Figure 4A-8). This area of concern was classified as a Class 1 Survey Unit due to the presence of residual radioactive material (above the DCGL), as identified during the ASCA effort. The surface area of this survey unit is approximately 1,200 m^2.

Specific characterization survey activities conducted for the survey unit included the following:

- Performance of a 100-percent gamma scan survey on a 10-m grid spacing interval.

- Layout of nine triangular grid systematic sample points (SU9-B1 through SU9-B9).

- Collection of soil core samples at each triangular grid sample points.

- Survey of soil core samples for gamma activity and sampling for laboratory analysis (Th-232 activity concentrations).

Results of characterization survey activities for this survey unit are as follows:

- Gamma activity scan surveys did not indicate the presence of elevated direct radiation.
- Net Th-232 activity concentrations for seven of the nine triangular grid soil core samples obtained during this characterization event were identified at 0.0 to 1.07 pCi/g. The soil core sample collected from Boring B3, 1 foot to 2 feet exhibited a net Th-232 activity concentration of 30.9 pCi/g. Net gamma counts for the soil core samples obtained from Boring B3 indicated that thorium contamination is limited to a depth of approximately 2 feet at this location. The soil core sample collected from Boring B5, 1 foot to 2 feet, exhibited a net Th-232 activity concentration of 48.7 pCi/g. Net gamma counts for the soil core samples obtained from Boring B5 indicated that thorium contamination is limited to a depth of approximately 2 feet at this location. The final location for Boring B5 was biased based on the results of the gamma activity scan survey.
- One soil sample (ASCA-23, 1 foot to 2 feet) collected from this survey unit during the ASCA also exhibited a net Th-232 activity concentration in excess of 3.0 pCi/g (the DCGL).

A summary of the gamma scan survey results (gross and net maximum, minimum, and average values) for this survey unit is presented in Table 4-3. The results of the soil core scans (net gamma counts) for Survey Unit 9 are summarized in Table 4-12. Th-232 analytical results for select soil core samples are summarized in Table 4-13 and presented in Figure 4A-17. Analytical data reports are contained in Appendix C-1. QA/QC records are contained in Appendix C-2.

4.4 Surface Water

Refer to Section 4.4 of the June 2001 (Revised May 2003) Decommissioning Plan for the Tulsa facility.

4.5 Groundwater

Refer to Section 4.5 of the June 2001 (Revised May 2003) Decommissioning Plan for the Tulsa facility.

References

(1) Earth Sciences, June 2001, Revised May 2003, Decommissioning Plan, Tulsa Facility, Tulsa, Oklahoma, Kaiser Aluminum & Chemical Corporation, Baton Rouge, Louisiana.

(2) Earth Sciences, October 2001, Additional Site Characterization Activities, Former Kaiser Aluminum Specialty Products Facility, Tulsa, Oklahoma, Kaiser Aluminum & Chemical Corporation, Baton Rouge, Louisiana.

(3) Earth Sciences, December 2001, Historical Site Assessment, Operational Area, Former Kaiser Aluminum Specialty Products Facility, Tulsa, Oklahoma, Kaiser Aluminum & Chemical Corporation, Baton Rouge, Louisiana.

(4) Earth Sciences, December 2001, Work Plan, Characterization Survey of the Operational Area, Former Kaiser Aluminum Specialty Products Facility, Tulsa, Oklahoma, Kaiser Aluminum & Chemical Corporation, Baton Rouge, Louisiana.

(5) Earth Sciences, February 2002, Final Status Survey Report, Adjacent Land Area, Tulsa, Oklahoma Facility, Kaiser Aluminum & Chemical Corporation, Baton Rouge, Louisiana.

(6) Earth Sciences, March 2002, Work Plan Addendum, Test Trench Activities, Characterization Survey of the Operational Area, Former Kaiser Aluminum Specialty Products Facility, Tulsa, Oklahoma, Kaiser Aluminum & Chemical Corporation, Baton Rouge, Louisiana.

(7) NUREG/CR-1575, August 2000, MARSSIM, Rev. 1.

Tables

Table 4-1
Minimum Number of Sample Points per Survey Subunit
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Survey Subunit Number	Survey Subunit Description	Floor Area (m^2)	Fraction of Area	Sample Points per Subunit (N)[1]	L[2] (m)
1	North Extrusion Building, First Floor of Original Structure	605	0.088	18	6.2
2	North Extrusion Building, Loft Area	160	0.022	4	6.2
3	North Extrusion Building, Basement Level of Addition	945	0.140	28	6.2
4	North Extrusion Building, First Floor of Addition	1,325	0.197	39	6.2
5	Maintenance Building, Main Structure	760	0.113	23	6.2
6	Maintenance Building, Scale House Addition	35	0.005	1	6.2
7	Office Building, First Floor	310	0.046	9	6.2
8	Office Building, Second Floor	310	0.046	9	6.2
9	Warehouse Building, Western Section	695	0.099	20	6.2
10	Warehouse Building, Central Section	405	0.060	12	6.2
11	Warehouse Building, Eastern Section	215	0.032	6	6.2
12	Crusher Building	500	0.074	15	6.2
13	Crusher Addition Building	540	0.078	16	6.2
	Total Class 3 Survey Unit Area:	*6,805*		*200*	

Notes:
[1]N represents the minimum number of sample points required per survey subunit. The calculated minimum number of sample points for the survey unit was 200.
[2]L represents the calculated triangular grid spacing interval.

Table 4-2
Statistical Analysis Summary
Gross Alpha Activity (dpm/100 cm^2)
Extended Scoping Survey of Structures
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Total Surface Activity Levels

	Survey Subunit												
Statistics	SS1	SS2	SS3	SS4	SS5	SS6	SS7	SS8	SS9	SS10	SS11	SS12	SS13
Average	10.2	14.0	16.8	16.3	7.3	6.7	4.0	-0.9	8.7	4.2	10.6	5.4	13.0
Standard Deviation	8.1	5.7	1.6	2.8	7.2	5.6	4.1	5.8	6.6	2.8	6.6	8.2	5.6
Minimum	-2.3	5.5	15.0	11.0	-8.1	0.8	-3.1	-9.4	-4.6	-0.5	5.4	-5.8	3.1
Maximum	21.4	17.6	20.0	20.0	21.3	12.0	10.2	9.4	20.5	9.3	20.0	17.9	21.4
Median	11.7	16.4	17.5	17.0	6.8	7.3	3.7	-0.9	8.6	4.0	7.2	4.0	13.7
GA-DCGL	*21.5*	*21.5*	*21.5*	*21.5*	*21.5*	*21.5*	*21.5*	*21.5*	*21.5*	*21.5*	*21.5*	*21.5*	*21.5*

Removable Surface Activity Levels

	Survey Subunit												
Statistics	SS1	SS2	SS3	SS4	SS5	SS6	SS7	SS8	SS9	SS10	SS11	SS12	SS13
Average	0.06	0.14	0.42	0.20	0.08	0.34	-0.08	0.04	0.12	-0.02	0.12	0.16	0.05
Standard Deviation	0.27	0.34	0.51	0.31	0.28	0.27	0.20	0.21	0.32	0.24	0.27	0.32	0.27
Minimum	-0.20	-0.20	-0.21	-0.20	-0.20	0.07	-0.20	-0.20	-0.20	-0.20	-0.20	-0.20	-0.20
Maximum	0.61	0.61	1.70	0.89	0.61	0.61	0.34	0.34	0.89	0.34	0.34	0.89	0.61
Median	0.07	0.07	0.34	0.07	0.07	0.34	-0.20	0.07	0.07	-0.20	0.21	0.07	0.07
GA-DCGL	*2.15*	*2.15*	*2.15*	*2.15*	*2.15*	*2.15*	*2.15*	*2.15*	*2.15*	*2.15*	*2.15*	*2.15*	*2.15*

Note:
Supporting information presented in Appendix B-2.

Table 4-3
Gamma Scan Survey Results
Characterization Survey of Land Areas
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Survey Area	Instrument Serial Number	Detector Serial Number	Bkg. Count Rate (cpm)	Scan of the Area (gross cpm)			Scan of the Area (net cpm)		
				Maximum	Minimum	Average	Maximum	Minimum	Average
Survey Unit 1									
SU1-A1	102034	105942	6967	9200	5700	6900	2233	-1267	-67
SU1-A2	102034	105942	6568	8100	5700	6800	1532	-868	232
SU1-A3	102034	105942	8353	9400	7000	8700	1047	-1353	347
SU1-A4	102034	105942	8203	9200	6600	7500	997	-1603	-703
SU1-B1	86312	181297	6613	7300	6000	6500	687	-613	-113
SU1-B2	86312	181297	7708	9200	6800	8300	1492	-908	592
SU1-B3	86312	181297	7758	9200	6400	7900	1442	-1358	142
SU1-B4	86312	181297	7604	9400	6500	8400	1796	-1104	796
SU1-C1	86312	181297	6425	9100	5100	7200	2675	-1325	775
SU1-C2	102034	105942	6197	7100	5500	6200	903	-697	3
SU1-C3	86312	181297	7544	9000	6700	7900	1456	-844	356
SU1-C4	102034	105942	8084	9300	6400	8200	1216	-1684	116
Survey Unit 2									
SU2-A	102034	105942	9700	62000	8000	20000	52300	-1700	10300
SU2-B	102034	105942	9815	50000	8000	15000	40185	-1815	5185
SU2-C	102034	105942	8317	15000	7000	8500	6683	-1317	183
SU2-D	102034	105942	8455	12500	8000	9500	4045	-455	1045
SU2-E	102034	105942	8729	13000	7000	10000	4271	-1729	1271
Survey Unit 3									
SU3-A1/A-1	86312	181297	8239	11500	6200	8400	3261	-2039	161
SU3-A2	86312	181297	7906	12400	6800	7900	4494	-1106	-6
SU3-A3	97799	533	8256	11056	6900	9100	2800	-1356	844
SU3-A4/A5	86312	181297	7862	9300	6200	8100	1438	-1662	238
SU3-B1/B-1	86312	181297	8028	10400	6400	7100	2372	-1628	-928
SU3-B2	97799	533	8215	10200	7000	8500	1985	-1215	285
SU3-B3	97799	533	8116	34463	6500	8800	26347	-1616	684
SU3-B4	86312	181297	7791	10500	5800	7700	2709	-1991	-91
SU3-C1/C-1	102034	105942	8071	12000	7000	8100	3929	-1071	29
SU3-C2	97799	533	8329	9900	6500	8600	1571	-1829	271
SU3-C3	97799	533	8391	15500	7100	9000	7109	-1291	609
SU3-C4	86312	181297	8185	9400	6300	7800	1215	-1885	-385
SU3-D-1	97799	533	8314	9900	7200	8700	1586	-1114	386
SU3-D1/D2	97799	533	8547	9800	7400	8800	1253	-1147	253
SU3-E1	97799	533	8417	9600	6400	8500	1183	-2017	83
SU3-F1	86312	181297	7427	9000	6000	8200	1573	-1427	773
SU3-F-1	86312	181297	9520	10700	6400	7300	1180	-3120	-2220

Table 4-3
Gamma Scan Survey Results
Characterization Survey of Land Areas
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Survey Area	Instrument Serial Number	Detector Serial Number	Bkg. Count Rate (cpm)	Scan of the Area (gross cpm)			Scan of the Area (net cpm)		
				Maximum	Minimum	Average	Maximum	Minimum	Average
Survey Unit 4									
SU4-A1	86312	181297	7265	10600	5100	7000	3335	-2165	-265
SU4-A2	86312	181297	6506	7400	5500	6300	894	-1006	-206
SU4-B1	86312	181297	6430	7900	5200	6500	1470	-1230	70
SU4-B2	86312	181297	6054	8000	5800	7000	1946	-254	946
SU4-C1	102034	105942	7011	8200	5500	7300	1189	-1511	289
SU4-C2	102034	105942	5970	8300	5200	6800	2330	-770	830
SU4-D1	102034	105942	11547	12200	5900	8500	653	-5647	-3047
SU4-D2	102034	105942	6095	9100	5800	6300	3005	-295	205
Survey Unit 5									
SU5-A1/A-1	97799	533	8523	11500	7900	9100	2977	-623	577
SU5-A2	86312	181297	8077	10300	6900	10000	2223	-1177	1923
SU5-A3	97799	533	9645	11900	8900	10000	2255	-745	355
SU5-B1	102034	105942	8127	10000	7900	8400	1873	-227	273
SU5-B-1	102034	105942	9731	10000	9500	9800	269	-231	69
SU5-B2	86312	181297	8961	10700	800	10100	1739	-8161	1139
SU5-B3	97799	533	9763	11800	8600	9800	2037	-1163	37
SU5-C1	102034	105942	10198	11000	9700	10300	802	-498	102
SU5-C-1	97799	533	9816	10200	8100	9600	384	-1716	-216
SU5-C2	86312	181297	9640	11000	9400	10300	1360	-240	660
SU5-D1	97799	533	10673	13700	8900	9800	3027	-1773	-873
SU5-D-1	86312	181297	8522	10200	6400	8300	1678	-2122	-222
SU5-D2	86312	181297	9439	14400	8300	9900	4961	-1139	461
SU5-E1	102034	105942	9813	10500	9000	10000	687	-813	187
SU5-E-1	86312	181297	10141	10500	8400	9200	359	-1741	-941
SU5-F-1	86312	181297	9478	11300	7900	8800	1822	-1578	-678
SU5-G-1	102034	105942	10402	14500	10000	125000	114598	-402	4098
SU5-H-1	86312	181297	11001	12300	9900	10400	1299	-1101	-601
SU5-I-1	102034	105942	11321	22000	10000	12600	114679	-1321	10679

Table 4-3
Gamma Scan Survey Results
Characterization Survey of Land Areas
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Survey Area	Instrument Serial Number	Detector Serial Number	Bkg. Count Rate (cpm)	Scan of the Area (gross cpm)			Scan of the Area (net cpm)		
				Maximum	Minimum	Average	Maximum	Minimum	Average
Survey Unit 6									
SU6	102034	105942	15166	13000	15400	14700	-2166	234	-466
Survey Unit 7									
SU7-A1	86312	181297	6988	8700	6900	7800	1712	-88	812
SU7-A2	86312	181297	6859	7800	6000	7600	941	-859	741
SU7-B1	86312	181297	7008	8800	6300	7500	1792	-708	492
SU7-B2	102034	105942	7823	9200	6900	7900	1377	-923	77
SU7-C1	86312	181297	7346	9400	7100	8900	2054	-246	1554
SU7-C2	102034	105942	7562	9800	6300	8800	2238	-1262	1238
SU7-D1	86312	181297	7948	8600	5600	8300	652	-2348	352
SU7-D2	102034	105942	8547	15300	6800	9200	6753	-1747	653
SU7-E1	86312	181297	7824	9300	6900	8700	1476	-924	876
SU7-E2	102034	105942	8669	29300	6900	9400	20631	-1769	731
SU7-F1	86312	181297	7203	9300	6800	7900	2097	-403	697
SU7-F2	102034	105942	8103	36000	6200	9800	27897	-1903	1697
SU7-G1	86312	181297	7835	9100	5700	7800	1265	-2135	-35
SU7-G2	102034	105942	9807	12300	5700	10800	2493	-4107	993
SU7-H1	86312	181297	7559	8500	6300	7800	941	-1259	241
SU7-H2	102034	105942	9133	18400	6900	10500	9267	-2233	1367
Survey Unit 8									
SU8-A1	102034	105942	15997	17000	15500	16300	1003	-497	303
SU8-B1	102034	105942	16847	175000	16000	16850	158153	-847	3
SU8-C1/C-1	86312	181297	13274	14900	9900	11600	1626	-3374	-1674
SU8-D1/D-1	102034	105942	16448	17000	15000	16300	552	-1448	-148
SU8-E-1/E1	86312	181297	12391	15800	9100	12300	3409	-3291	-91
SU8-F-1/F1	86312	181297	13757	17900	11200	14100	4143	-2557	343
SU8-F-2	86312	181297	11879	25200	8700	11400	13321	-3179	-479
SU8-F-3	102034	105942	12999	13500	12000	13000	501	-999	1
SU8-G-2/G-1	86312	181297	12051	15000	10000	12700	2949	-2051	649
SU8-G-3	102034	105942	13725	14200	13500	13700	475	-225	-25
SU8-H-2/H-1	86312	181297	12522	16800	10700	12500	4278	-1822	-22
SU8-H-3	102034	105942	13314	21000	10000	15000	7686	-3314	1686
SU8-I-2	102034	105942	16512	30000	14900	22000	13488	-1612	5488
SU8-I-3	86312	181297	10146	25500	10100	15200	15354	-46	5054
SU8-J-2	102034	105942	14260	15000	11000	14500	740	-3260	240

Table 4-3
Gamma Scan Survey Results
Characterization Survey of Land Areas
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Survey Area	Instrument Serial Number	Detector Serial Number	Bkg. Count Rate (cpm)	Scan of the Area (gross cpm)			Scan of the Area (net cpm)		
				Maximum	Minimum	Average	Maximum	Minimum	Average
Survey Unit 9									
SU9-A1	102034	105942	8879	9700	8300	9200	821	-579	321
SU9-A2	102034	105942	8953	10300	8900	9400	1347	-53	447
SU9-B1	86312	181297	8844	10500	8200	9600	1656	-644	756
SU9-B2	86312	181297	9572	10200	7600	9600	628	-1972	28
SU9-B3	86312	181297	8357	20300	7100	8300	11943	-1257	-57
SU9-C1	102034	105942	9233	10100	7300	9400	867	-1933	167
SU9-C2	102034	105942	9018	11800	5900	10400	2782	-3118	1382
SU9-C3	86312	181297	8322	10800	5900	8900	2478	-2422	578
SU9-D1	86312	181297	9341	11100	7900	9500	1759	-1441	159
SU9-D2	86312	181297	9185	11100	5600	9800	1915	-3585	615
SU9-A3	86312	181297	9835	11800	7500	10700	1965	-2335	865

Note:
2,500 cpm above background was the field limit used to designate areas of possible subsurface contamination.

Table 4-4

Survey Unit 1 - Land Area Beneath the North Extrusion Building

Soil Core Scans, Net Gamma Count

(cpm)

Depth (ft)	Sample Point B1	Sample Point B2	Sample Point B3	Sample Point B4	Sample Point B5	Sample Point B6	Sample Point B7	Sample Point B8	Sample Point B9
(0-1)	**628**	318	-82	-82	118	318	318	118	218
(1-2)	618	118	-182	118	318	218	418	318	-182
(2-3)	218	118	118	18	218	**618**	318	118	**618**
(3-4)	318	-82	318	**418**	**438**	118	18	**318**	418
(4-5)	518	118	18	118	318	218	-282		218
(5-6)	118	118	118		418	-182	118		118
(6-7)	-82	218	318			-282	18		
(7-8)	218	**418**	518			518	**518**		
(8-9)			-82						
(9-10)			**618**						
(10-11)			318						

Notes:
Background was determined to be 4,382 cpm using soil known to be nonimpacted.
Bold numbers represent the segment of the sample that was sent to the laboratory for analytical analysis.
Instrumentation used for core scans was Ludlum 2221 (SN 117370) with Ludlum 44-10 detector (SN 0551).

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Table 4-5

Survey Unit 2 - Land Area North of the Maintenance Building and the North Extrusion Building

Soil Core Scans, Net Gamma Count

(cpm)

Depth (ft)	Sample Point B1	Sample Point B2	Sample Point B3	Sample Point B4	Sample Point B5	Sample Point B6	Sample Point B7	Sample Point B8	Sample Point B9
(0-1)	**541**	-159	141	141	541	**341**	-59	341	241
(1-2)	141	**141**	-59	**241**	341	-59	-259	**421**	341
(2-3)	41	141	**541**	41	-459	341	**441**	351	-359
(3-4)	141	-259	-59	-459	441	41	141	141	41
(4-5)	541	-159	-59		-359	-59			421
(5-6)	141	41	341		341	241			-59
(6-7)	241		141		**641**	141			**424**
(7-8)	141		441		241	341			41
(8-9)	-59								-359
(9-10)	41								-4559
(10-11)	-459								-4559

Notes:
Background was determined to be 4,382 cpm using soil known to be nonimpacted.
Bold numbers represent the segment of the sample that was sent to the laboratory for analytical analysis.
Instrumentation used for core scans was Ludlum 2221 (SN 117370) with Ludlum 44-10 detector (SN 0551).

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Table 4-6

Survey Unit 3 - Land Area North of the Office Building and South, Southwest of the Maintenance Building

Soil Core Scans, Net Gamma Count

(cpm)

Depth (ft)	Sample Point B1	Sample Point B2	Sample Point B3	Sample Point B4	Sample Point B5	Sample Point B6	Sample Point B7	Sample Point B8	Sample Point B9	Sample Point A1	Sample Point A2	Sample Point C1
(0-1)	-559	231	-59	41	141	41	-159	**641**	**341**	341	-159	241
(1-2)	141	-159	141	**541**	**541**	41	**341**	41		-259	241	301
(2-3)	**441**	41	241		41	**241**	-159	141		441	271	231
(3-4)	141	**441**	**291**		41	141		211		**701**	**641**	141
(4-5)		141	141		241			641		-559		41
(5-6)		341	-359		141			41		671		**641**
(6-7)		341	-459							241		-159
(7-8)		-59								341		

Notes:
Background was determined to be 4,382 cpm using soil known to be nonimpacted.
Bold numbers represent the segment of the sample that was sent to the laboratory for analytical analysis.
Instrumentation used for core scans was Ludlum 2221 (SN 117370) with Ludlum 44-10 detector (SN 0551).

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Table 4-7
Survey Unit 4 - Land Area Beneath the Maintenance Building
Soil Core Scans, Net Gamma Count
(cpm)

Depth (ft)	Sample Point B1	Sample Point B2	Sample Point B3	Sample Point B4	Sample Point B5	Sample Point B6	Sample Point B7	Sample Point B8	Sample Point B9
(0-1)	-159	141	-159	-159	**651**	-59	41	**341**	-259
(1-2)	361	121	**141**	41	-159	241	171	-59	-59
(2-3)	**401**	**341**		**341**	-559	**321**	-159	-259	41
(3-4)	-35	141		41	-59		**341**	41	**141**

Notes:
Background was determined to be 4,382 cpm using soil known to be nonimpacted.
Bold numbers represent the segment of the sample that was sent to the laboratory for analytical analysis.
Instrumentation used for core scans was Ludlum 2221 (SN 117370) with Ludlum 44-10 detector (SN 0551).

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Table 4-8
Survey Unit 5 - Land Area North of the Warehouse Building
Soil Core Scans, Net Gamma Count
(cpm)

Depth (ft)	Sample Point B1	Sample Point B2	Sample Point B3	Sample Point B4	Sample Point B5	Sample Point B6	Sample Point B7	Sample Point B8	Sample Point B9	Sample Point A2	Sample Point D2	Sample Point G1	Sample Point I1
(0-1)	-459	-159	-159	261	371	211	-59	**781**	-59	3221	141	**741**	41
(1-2)	**161**	**501**	41	311	-159	421	41	-89	561	**5661**	**272**	241	321
(2-3)	11	141	211	-159	-159	-159	241	-59	191	601		-159	1441
(3-4)		-39	**941**	141	**461**	241	141	191	441	341		241	**3941**
(4-5)		311	341	**421**	141	241	**741**	141	**591**	141		-159	741
(5-6)		341	441	411	241	241	641			671		511	41
(6-7)		481	-59	-359	461	141	641			941		341	
(7-8)		141	378	-359	41	241	141			341			
(8-9)		-59		141		41				341			
(9-10)		241		141		241				141			
(10-11)		441				-159				-109			
(11-12)						441							

Notes:
Background was determined to be 4,382 cpm using soil known to be nonimpacted.
Bold numbers represent the segment of the sample that was sent to the laboratory for analytical analysis.
Instrumentation used for core scans was Ludlum 2221 (SN 117370) with Ludlum 44-10 detector (SN 0551).

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Table 4-9

Survey Unit 6 - Land Area Around the Footprint of the Former Smelter Building

Soil Core Scans, Net Gamma Count

(cpm)

Depth (ft)	Sample Point B1	Sample Point B2	Sample Point B3	Sample Point B4	Sample Point B5	Sample Point B6	Sample Point B7	Sample Point B8	Sample point B9
(0-1)	174	274	424	324	-26	-226	344	694	44
(1-2)	604	-126	374	194	634	134	474	274	264
(2-3)	674	344	74	**434**	734	-26	374	434	**574**
(3-4)	344	**964**	174		174	**344**	**524**	**744**	
(4-5)	174	474	534		**1064**				
(5-6)	-126	174	264		574				
(6-7)	474	574	514						
(7-8)	174	274	**2354**						
(8-9)	-26	674	754						
(9-10)	174	574	724						
(10-11)	774	174	674						
(11-12)	74		224						
(12-13)	324		464						
(13-14)	174		804						
(14-15)	274								

Notes:
Background was determined to be 4,382 cpm using soil known to be nonimpacted.
Bold numbers represent the segment of the sample that was sent to the laboratory for analytical analysis.
Instrumentation used for core scans was Ludlum 2221 (SN 117370) with Ludlum 44-10 detector (SN 0551).

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Table 4-10

Survey Unit 7 - Land Area Beneath the Warehouse Building

Soil Core Scans, Net Gamma Count

(cpm)

Depth (ft)	Sample Point B1	Sample Point B2	Sample Point B3	Sample Point B4	Sample Point B5	Sample Point B6	Sample Point B7	Sample Point B8	Sample Point B9	Sample Point C1	Sample Point D2	Sample Point F2	Sample Point H1	Sample Point H2
(0-1)	-126	594	**4874**	344	24	374	174	-126	174	**1974**	74	374	74	1974
(1-2)	274	374	844	234	**544**	274	-26	334	**734**	574	474	434	**854**	
(2-3)	44	474	164	374	374	-26	-126	544	574	464	274	364	374	
(3-4)	224	274	-26	624		**414**	474	174	364	374	174	274	-126	
(4-5)	404	274	474	644		74		174	524	574	**734**	174	374	
(5-6)	504	634	674	**674**		174		464	274	774	374	**774**	274	
(6-7)	674	474	974	-26				-226	274	874	374	-26	174	
(7-8)	-226	254		424				844	474	574			174	
(8-9)	274	424		-156						374				
(9-10)	274	74		314						-26				
(10-11)	694	374												
(11-12)	224													
(12-13)	-146													

Notes:
Background was determined to be 4,382 cpm using soil known to be nonimpacted.
Bold numbers represent the segment of the sample that was sent to the laboratory for analytical analysis.
Instrumentation used for core scans was Ludlum 2221 (SN 117370) with Ludlum 44-10 detector (SN 0551).

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Table 4-11

Survey Unit 8 - Land Area North and East of the Crusher Building

Soil Core Scans, Net Gamma Count

(cpm)

Depth (ft)	Sample Point B1	Sample Point B2	Sample Point B3	Sample Point B4	Sample Point B5	Sample Point B6	Sample Point B7	Sample Point B8	Sample Point B9	Sample Point F1	Sample Point F2	Sample Point F3
(0-1)	374	344	1144	374	874	624	174	174	174	**16124**	**1734**	**1564**
(1-2)	274	374	**2204**	374	**2174**	374	274	274	274	2624	374	374
(2-3)	**434**	74	424	354	474	614	**864**	394	74	274	274	474
(3-4)	274	424	274	-26	274	474	74	174	374	2574	594	374
(4-5)	374	594	664	**504**	274	174	474	74	**674**	974	654	-226
(5-6)		**694**	744	94	374	604	374	274	174	74	374	274
(6-7)		174	174	74	174	**1104**	474	174		374		474
(7-8)		374						**554**				374
(8-9)												574
(9-10)												74
(10-11)												274

Notes:
Background was determined to be 4,382 cpm using soil known to be nonimpacted.
Bold numbers represent the segment of the sample that was sent to the laboratory for analytical analysis.
Instrumentation used for core scans was Ludlum 2221 (SN 117370) with Ludlum 44-10 detector (SN 0551).

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Table 4-12
Survey Unit 9 - Land Area Beneath the Crusher and Crusher Addition Buildings
Soil Core Scans, Net Gamma Count
(cpm)

Depth (ft)	Sample Point B1	Sample Point B2	Sample Point B3	Sample Point B4	Sample Point B5	Sample Point B6	Sample Point B7	Sample Point B8	Sample Point B9
(0-1)	**174**	274	374	**274**	2174	514	374	374	474
(1-2)	-326	474	**2374**	184	**2614**	**734**	174	274	-226
(2-3)		474	764		1134	224	374	174	74
(3-4)		784	374		274	474	364	464	**504**
(4-5)		694	694			274	-226	74	274
(5-6)		74	-426			354	-26	74	494
(6-7)		**894**				174	**504**	**624**	374
(7-8)		574				174	474	574	
(8-9)		-126					334	374	
(9-10)		774						274	
(10-11)		174						614	

Notes:
Background was determined to be 4,382 cpm using soil known to be nonimpacted.
Bold numbers represent the segment of the sample that was sent to the laboratory for analytical analysis.
Instrumentation used for core scans was Ludlum 2221 (SN 117370) with Ludlum 44-10 detector (SN 0551).

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Table 4-13
Th-232 Analytical Results for Soil Core Samples
Characterization Survey of Land Areas
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Sample Location	Sample Depth (ft)	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)
SU1 - Land Area Beneath the North Extrusion Building					
1	0-1	5.67E-01	0.00E+00	3.30E-02	1.03E-01
2	7-8	2.23E-01	0.00E+00	2.60E-02	7.20E-02
3	9-10	7.83E-01	0.00E+00	8.20E-02	2.80E-01
4	3-4	1.06E+00	0.00E+00	8.20E-02	2.60E-01
5	3-4	1.03E+00	0.00E+00	1.02E-01	2.91E-01
6	2-3	2.10E-01	0.00E+00	1.80E-02	2.40E-02
7	7-8	1.03E+00	0.00E+00	4.10E-02	1.76E-01
8	3-4	8.15E-01	0.00E+00	1.02E-01	3.53E-01
9	2-3	5.03E+00	3.93E+00	3.32E-01	7.56E-01
Average		1.19E+00	4.37E-01		
Std. Deviation		1.47E+00	1.31E+00		
Min		2.10E-01	0.00E+00		
Max		5.03E+00	3.93E+00		
Median		8.15E-01	0.00E+00		
SU2 - Land Area North of the Maintenance Building and the North Extrusion Building					
1	0-1	1.67E+00	5.70E-01	2.29E-01	5.16E-01
2	1-2	9.92E-01	0.00E+00	7.80E-02	3.19E-01
3	2-3	8.79E-01	0.00E+00	1.21E-01	5.84E-01
4	1-2	1.30E+00	2.00E-01	2.35E-01	2.94E-01
5	6-7	7.79E-01	0.00E+00	1.21E-01	5.06E-01
6	0-1	9.95E-01	0.00E+00	1.12E-01	4.23E-01
7	2-3	7.01E-01	0.00E+00	1.00E-01	4.64E-01
8	1-2	8.56E-01	0.00E+00	1.61E-01	5.17E-01
9	6-7	9.24E-01	0.00E+00	9.70E-02	4.39E-01
*25	0-1	8.47E+00	7.37E+00	3.84E-01	7.45E-01
Average		1.76E+00	8.14E-01		
Std. Deviation		2.38E+00	2.31E+00		
Min		7.01E-01	0.00E+00		
Max		8.47E+00	7.37E+00		
Median		9.58E-01	0.00E+00		
SU3 - Land Area East of the North Extrusion Building and North of the Office Building Area					
1	2-3	8.89E-01	0.00E+00	1.87E-01	5.37E-01
2	3-4	9.08E-01	0.00E+00	1.49E-01	5.10E-01
3	3-4	1.25E+00	1.50E-01	1.96E-01	5.59E-01
4	1-2	1.27E+00	1.70E-01	1.56E-01	4.17E-01
5	1-2	8.22E-01	0.00E+00	1.04E-01	3.53E-01
6	2-3	9.12E-01	0.00E+00	1.44E-01	5.58E-01
7	1-2	8.10E-01	0.00E+00	1.19E-01	3.50E-01
8	0-1	8.93E-01	0.00E+00	1.35E-01	3.53E-01
9	0-1	1.51E+00	4.10E-01	1.04E-01	2.93E-01

Table 4-13
Th-232 Analytical Results for Soil Core Samples
Characterization Survey of Land Areas
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Sample Location	Sample Depth (ft)	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)
A1	3-4	9.20E-01	0.00E+00	1.36E-01	3.75E-01
A2	3-4	7.37E-01	0.00E+00	9.70E-02	4.34E-01
C1	5-6	7.36E-01	0.00E+00	1.15E-01	3.88E-01
*24	0-2	9.57E+00	8.47E+00	1.67E+00	1.30E+00
Average		1.63E+00	4.03E-01		
Std. Deviation		2.40E+00	2.34E+00		
Min		7.36E-01	0.00E+00		
Max		9.57E+00	8.47E+00		
Median		9.08E-01	0.00E+00		
SU4 - Land Area Beneath the Maintenance Building					
1	2-3	8.47E-01	0.00E+00	1.38E-01	4.74E-01
2	2-3	7.18E-01	0.00E+00	9.00E-02	3.00E-01
3	1-2	8.43E-01	0.00E+00	1.20E-01	4.86E-01
4	2-3	7.85E-01	0.00E+00	1.15E-01	5.09E-01
5	0-1	5.46E-01	0.00E+00	5.30E-02	2.16E-01
6	2-3	8.20E-01	0.00E+00	8.30E-02	3.88E-01
7	3-4	9.21E-01	0.00E+00	8.10E-02	4.92E-01
8	0-1	1.03E+00	0.00E+00	1.82E-01	5.76E-01
9	3-4	8.56E-01	0.00E+00	1.41E-01	5.25E-01
Average		8.18E-01	0.00E+00		
Std. Deviation		1.34E-01	0.00E+00		
Min		5.46E-01	0.00E+00		
Max		1.03E+00	0.00E+00		
Median		8.43E-01	0.00E+00		
SU5 - Land Area North of the Warehouse Building					
1	1-2	BDL	0.00E+00	BDL	5.13E-01
2	1-2	8.95E-01	0.00E+00	1.03E-01	5.65E-01
3	3-4	8.40E-01	0.00E+00	1.15E-01	5.55E-01
4	4-5	6.20E-01	0.00E+00	1.22E-01	4.68E-01
5	3-4	1.03E+00	0.00E+00	7.50E-02	4.41E-01
6	11-12	7.54E-01	0.00E+00	1.01E-01	5.23E-01
7	4-5	7.63E-01	0.00E+00	1.42E-01	3.80E-01
8	0-1	BDL	0.00E+00	BDL	4.50E-01
9	4-5	1.11E+00	1.00E-02	1.46E-01	3.41E-01
A2	1-2	7.44E+01	7.33E+01	1.51E+00	2.21E+00
D2	1-2	BDL	0.00E+00	BDL	4.56E-01
G1	0-1	7.20E-01	0.00E+00	1.30E-01	5.34E-01
I1	3-4	8.11E+01	8.00E+01	1.46E+00	1.50E+00
Average		1.62E+01	1.53E+01		
Std. Deviation		3.25E+01	3.24E+01		
Min		6.20E-01	0.00E+00		
Max		8.11E+01	8.00E+01		
Median		8.68E-01	0.00E+00		

Table 4-13
Th-232 Analytical Results for Soil Core Samples
Characterization Survey of Land Areas
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Sample Location	Sample Depth (ft)	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)
SU6 - Land Area Around the Footprint of the Former Smelter Building					
1	10-11	1.01E+00	0.00E+00	1.27E-01	5.40E-01
2	3-4	1.25E+00	1.50E-01	1.22E-01	4.60E-01
3	7-8	2.18E+01	2.07E+01	6.39E-01	1.14E+00
4	2-3	2.98E+00	1.88E+00	2.03E-01	5.07E-01
5	4-5	8.30E-01	0.00E+00	9.90E-02	2.87E-01
6	3-4	9.49E-01	0.00E+00	7.70E-02	4.93E-01
7	3-4	8.10E-01	0.00E+00	1.73E-01	4.80E-01
8	3-4	7.73E-01	0.00E+00	1.05E-01	4.95E-01
9	2-3	1.55E+00	4.50E-01	1.10E-01	4.75E-01
Average		3.55E+00	2.58E+00		
Std. Deviation		6.88E+00	6.82E+00		
Min		7.73E-01	0.00E+00		
Max		2.18E+01	2.07E+01		
Median		1.01E+00	0.00E+00		
SU7 - Land Area Beneath the Warehouse Building					
1	10-11	7.96E-01	0.00E+00	9.90E-02	4.22E-01
2	5-6	7.87E-01	0.00E+00	1.20E-01	4.30E-01
3	0-1	6.55E+01	6.44E+01	1.45E+00	1.84E+00
4	5-6	1.19E+00	9.00E-02	1.46E-01	5.61E-01
5	1-2	3.79E+00	2.69E+00	2.39E-01	7.32E-01
6	3-4	7.58E-01	0.00E+00	1.22E-01	3.62E-01
7	3-4	ND	0.00E+00	ND	4.15E-01
8	7-8	8.98E-01	0.00E+00	1.24E-01	3.96E-01
9	1-2	1.02E+00	0.00E+00	2.17E-01	6.86E-01
C1	0-1	1.92E+01	1.81E+01	5.09E-01	1.09E+00
D2	4-5	8.27E-01	0.00E+00	1.21E-01	5.09E-01
F2	5-6	5.79E+01	5.68E+01	1.21E+00	1.50E+00
H1	1-2	7.40E-01	0.00E+00	1.19E-01	3.72E-01
H2	0-1	1.43E+01	1.32E+01	5.00E-01	8.67E-01
*22	0-2	6.11E+00	5.01E+00	2.55E-01	3.34E-01
Average		1.24E+01	1.14E+01		
Std. Deviation		2.17E+01	2.16E+01		
Min		7.40E-01	0.00E+00		
Max		6.55E+01	6.44E+01		
Median		1.11E+00	4.50E-02		
SU8 - Land Area North and East of the Crusher Building					
1	2-3	1.00E+00	0.00E+00	1.35E-01	5.39E-01
2	5-6	7.70E-01	0.00E+00	1.06E-01	4.48E-01
3	1-2	2.27E+01	2.16E+01	6.67E-01	1.17E+00
4	4-5	BDL	0.00E+00	BDL	4.83E-01
5	1-2	4.26E+01	4.15E+01	8.85E-01	7.92E-01
6	6-7	1.28E+00	1.80E-01	1.73E-01	5.96E-01
7	2-3	2.91E+00	1.81E+00	1.95E-01	4.48E-01
8	7-8	8.82E-01	0.00E+00	1.13E-01	3.82E-01

Table 4-13
Th-232 Analytical Results for Soil Core Samples
Characterization Survey of Land Areas
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Sample Location	Sample Depth (ft)	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)
9	4-5	1.03E+00	0.00E+00	1.19E-01	3.97E-01
F1	0-1	1.33E+02	1.32E+02	2.61E+00	3.02E+00
F2	0-1	1.64E+01	1.53E+01	4.51E-01	6.10E-01
F3	0-1	1.19E+01	1.08E+01	4.91E-01	6.51E-01
*13	1-2	8.63E-01	0.00E+00	1.11E-01	2.56E-01
*14	0-1	6.26E+00	5.16E+00	2.56E-01	4.60E-01
*15	1-2	1.11E+01	1.00E+01	4.83E-01	6.05E-01
*17	2-3	6.74E-01	0.00E+00	1.11E-01	2.70E-01
*18	0-1	1.33E+00	2.30E-01	8.60E-02	2.01E-01
*19	4-5	5.63E+00	4.53E+00	2.46E-01	5.29E-01
Average		1.45E+01	1.35E+01		
Std. Deviation		3.15E+01	3.14E+01		
Min		1.28E-01	0.00E+00		
Max		1.33E+02	1.32E+02		
Median		2.12E+00	1.02E+00		
SU9 - Land Area Beneath the Crusher and the Crusher Addition Buildings					
1	0-1	5.25E-01	0.00E+00	1.11E-01	4.41E-01
2	6-7	2.17E+00	1.07E+00	1.98E-01	4.28E-01
3	1-2	3.20E+01	3.09E+01	6.49E-01	5.84E-01
4	0-1	1.32E+00	2.20E-01	1.59E-01	5.00E-01
5	1-2	4.98E+01	4.87E+01	1.22E+00	1.33E+00
6	1-2	1.00E+00	0.00E+00	1.41E-01	5.15E-01
7	6-7	7.90E-01	0.00E+00	1.19E-01	4.23E-01
8	6-7	5.42E-01	0.00E+00	9.20E-02	4.89E-01
9	3-4	7.24E-01	0.00E+00	9.80E-02	4.61E-01
*16	4-5	6.59E-01	0.00E+00	6.80E-02	2.82E-01
*20	0-2	2.83E-01	0.00E+00	8.50E-02	3.52E-01
*21	0-2	2.69E+00	1.59E+00	1.22E-01	3.98E-01
*23	1-2	4.57E+01	4.46E+01	8.51E-01	7.11E-01
Average		1.06E+01	9.78E+00		
Std. Deviation		1.86E+01	1.84E+01		
Min		2.83E-01	0.00E+00		
Max		4.98E+01	4.87E+01		
Median		1.00E+00	0.00E+00		

Notes:

1. Background established for the site is 1.1 pCi/g Th-232.
2. Sample locations which are denoted with an (*) are samples that were collected during the Additional Site Characterization Activities dated November 2001.

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Table 4-14
Thorium Concentrations of QA/QC Soil Samples
Characterization Survey of Land Areas
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Sample Location	Sample Depth (ft)	Analytical Results Gross Conc. Th-232 (pCi/g)	Net Conc. Th-232 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)
Background Soil Samples (1)					
Bkg - 001	0-1	7.44E-01	N/A	9.10E-02	2.95E-01
Bkg - 002	1-2	8.97E-01	N/A	1.54E-01	4.70E-01
Bkg - 003	2-3	1.24E+00	N/A	1.34E-01	5.10E-01
Average		9.60E-01			
Std. Deviation		2.54E-01			
Min		7.44E-01			
Max		1.24E+00			
Median		8.97E-01			
Spike Soil Samples (2)					
RTP - 001	0-1	5.72E+01	5.61E+01	1.11E+00	9.23E-01
RTP - 002	0-1	5.98E+01	5.87E+01	1.38E+00	1.67E+00
RTP - 003	0-1	5.92E+01	5.81E+01	1.32E+00	1.13E+00
Average		5.87E+01	5.76E+01		
Std. Deviation		1.36E+00	1.36E+00		
Min		5.72E+01	5.61E+01		
Max		5.98E+01	5.87E+01		
Median		5.92E+01	5.81E+01		
Duplicate Soil Samples (3)					
(Original #1) PD - 004	0-1	5.46E+01	5.35E+01	1.47E+00	1.06E+00
(Duplicate #1) RTP - 001	0-1	5.72E+01	5.61E+01	1.11E+00	9.23E-01
(Original #2) PD - 005	0-1	5.92E+01	5.81E+01	1.66E+00	1.14E+00
(Duplicate #2) RTP - 002	0-1	5.98E+01	5.87E+01	1.38E+00	1.67E+00
(Original #3) PD - 006	0-1	5.49E+01	5.38E+01	1.49E+00	1.53E+00
(Duplicate #3) RTP - 003	0-1	5.92E+01	5.81E+01	1.32E+00	1.13E+00
Average		5.75E+01	5.64E+01		
Std. Deviation		2.29E+00	2.29E+00		
Min		5.46E+01	5.35E+01		
Max		5.98E+01	5.87E+01		
Median		5.82E+01	5.71E+01		
Composite Soil Sample Th-232 (4)					
Com - 001	N/A	8.03E+00	6.93E+00	3.68E-01	9.43E-01

Table 4-14
Thorium Concentrations of QA/QC Soil Samples
Characterization Survey of Land Areas
Former Kaiser Aluminum Specialty Products Facility
Tulsa, Oklahoma

Composite Soil Sample Th-230 (4)					
Sample Location	Sample Depth (ft)	Analytical Results Gross Conc. Th-230 (pCi/g)	Net Conc. Th-230 (pCi/g)	Uncert. (+/- pCi/g)	Detection Limit (pCi/g)
Com - 001	N/A	3.67E+01	3.32E+01	1.33E+00	5.18E-01

Notes:

1. Background soil samples were collected from a core sample collected from the nonimpacted land area in front of the Office Building Area.
2. Spike samples were collected from the impacted Retention Pond Area.
3. The spike samples that were submitted for analysis were samples that were previously submitted under the Adjacent Land Remediation Plan.
4. The composite sample that was submitted for analysis was comprised of a teaspoon of soil from all of the core samples that were submitted for analysis under this project.

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