



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION IV  
611 RYAN PLAZA DRIVE, SUITE 400  
ARLINGTON, TEXAS 76011-4005**

December 9, 2005

Mr. J. William Vinzant  
Regional Environmental Manager  
Corporate Environmental Affairs  
Kaiser Aluminum and Chemical Corporation  
9141 Interline Avenue, Suite 1A  
Baton Rouge, Louisiana 70809-1957

**SUBJECT: NRC INSPECTION REPORT 040-02377/05-006**

Dear Mr. Vinzant:

On October 3 - November 1, 2005 an NRC inspection was conducted at the former Kaiser Aluminum Specialty Products facility in Tulsa, Oklahoma. The preliminary inspection findings were discussed with you and members of your staff during the exit briefing conducted on November 1, 2005. Following receipt of remaining laboratory sample and survey scan results on December 5, 2005, the final inspection findings were discussed with the Site Administrator on December 5, 2005. The enclosed report presents the scope and results of that inspection.

The purposes of the inspection were to determine whether decommissioning and remediation activities were being conducted in accordance with the NRC-approved Decommissioning Plan for Phase II Remediation. Within these areas, the inspection consisted of selected examination of procedures, work plans, representative records, and interviews with personnel as they related to safety and compliance with the Commission's rules and regulations. This inspection consisted of confirmatory surveys of survey units in the pond parcel area, and concrete slabs removed from the former Flux Building foundation. The results of the confirmatory surveys are provided in the enclosed inspection report. No deviations from NRC commitments were identified, and no response to this letter is required.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be made available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room). To the extent possible, your response should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the Public without redaction.

Kaiser Aluminum and Chemical Corp. - 2 -

Should you have any questions concerning this inspection, please contact Ms. Beth Schlapper at (817) 860-8169 or the undersigned at (817) 860-8191.

Sincerely,

*/RA/ Leonard D. Wert for*

D. Blair Spitzberg, Ph.D., Chief  
Fuel Cycle and Decommissioning Branch

Docket No.: 040-02377  
License No.: STB-472 (terminated)

Enclosure:  
NRC Inspection Report  
040-02377/05-006

cc w/enclosure:  
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**ENCLOSURE**

U. S. NUCLEAR REGULATORY COMMISSION  
REGION IV

Docket No.: 040-02377

License No.: STB-472 (Terminated in March 1971)

Report No.: 040-02377/05-006

Property Owner: Kaiser Aluminum & Chemical Corporation

Facility: Former Kaiser Aluminum Specialty Products Facility

Location: 7311 East 41<sup>st</sup> Street  
Tulsa, Oklahoma 74145

Inspection Dates: October 3 - 6, 2005  
October 31 - November 1, 2005

Inspectors: Beth Schlapper, Health Physicist  
Fuel Cycle & Decommissioning Branch  
  
Robert J. Evans, PE, CHP, Senior Health Physicist  
Fuel Cycle & Decommissioning Branch

Accompanied By: Leonard D. Wert, Jr., Division Director  
Division of Nuclear Materials Safety

Approved By: D. Blair Spitzberg, Ph.D., Chief  
Fuel Cycle & Decommissioning Branch

Attachments: Supplemental Inspection Information

## **EXECUTIVE SUMMARY**

### Former Kaiser Aluminum Specialty Products Plant NRC Inspection Report 040-02377/05-006

This was an inspection of the Kaiser Aluminum Specialty Products facility, formerly occupied by Standard Magnesium Company. This inspection consisted of confirmatory surveys of survey units in the pond parcel area, including bottom of excavation surveys and coring, and the concrete slabs removed from the former Flux Building foundation and adjacent parking area.

#### Closeout Inspection and Survey

- Independent confirmatory radiological surveys were conducted by the inspectors in four final status survey units. Results of confirmatory surveys were generally consistent with measurements taken by Kaiser. Seventeen soil samples were collected and analyzed for uranium and thorium concentrations. The results for both Kaiser's and NRC's samples were below the NRC-approved wide area derived concentration guideline level (Section 1).
- Confirmatory surveys of the concrete slabs from the former Flux Building foundation and adjacent parking area were performed. The surveys did not identify any areas that exceeded the NRC-approved free release criteria for total average contamination (Section 1).

## Report Details

### Summary of Site Status

Since the previous inspection, Kaiser continued to conduct Phase II decommissioning of the site in accordance with the NRC-approved Decommissioning Plan (DP). Kaiser had completed the remediation of 21 survey units in the pond parcel area and excavated approximately 134,000 tons of contaminated soil and dross. Nine survey units in the Former Operational Area (FOA) have also been completed. As of October 31, 2005, Kaiser has successfully shipped 605 rail gondola cars amounting to more than 59,000 tons of material to an offsite disposal site.

## **1 Closeout Inspection and Survey (83890)**

### 1.1 Scope

The inspectors performed confirmatory surveys to verify if Kaiser was remediating and decontaminating the site to acceptable radiological levels for unrestricted release.

### 1.2 Observations and Findings

#### a. Pond Parcel Area Survey Units FSS-020 & FSS-021 (Bottom Excavation)

Final status survey unit FSS-020 included the soil area beneath the former Flux Building on the south-east side of the pond parcel at the property boundary. FSS-021 was located on the north-central side of the pond parcel area, just west of FSS-017. The survey units were both 2,000 m<sup>2</sup> in size. Included within these survey units were excavated grounds and soil walls. The confirmatory survey consisted of gamma scans of the soil surface and collection of soil samples.

The inspectors performed the gamma radiation level scans of the soil surfaces using a Ludlum Model 18 survey meter (NRC No. 012778, calibration due date of November 10, 2005) with a SPA-3 scintillation probe assembly (NRC No. 20795G). A site background of 10,000 cpm was established. The soil surface survey measurements ranged from 15,000 cpm to 24,000 cpm in these survey units because of the proximity to areas still containing contaminated soil and dross material, or previously backfilled areas with below criterion material (32.2 pCi/g thorium-232). Based on information provided in the draft final status survey report, Kaiser's survey results for FSS-020 ranged from 9,082 cpm to 29,000 cpm with an average survey unit background of 12,843 cpm. Kaiser's survey results for FSS-021 ranged from 15,582 cpm to 28,000 cpm with an average survey unit background of 18,372 cpm.

The inspectors performed a gamma scan of FSS-020 and FSS-021, in part, to identify locations for soil sampling based on any elevated readings detected. Based on the soil scan survey results, seven areas were selected for sampling. Three soil samples were collected from FSS-020 and four soil samples were collected from FSS-021 as shown in the Table 1. The samples were collected and split onsite using in-situ mixing. The seven

soil samples were transferred through chain-of-custody records to Oak Ridge Institute for Science and Education (ORISE) for analysis. The samples were analyzed by gamma spectroscopy for uranium and thorium concentrations. The sample results are listed in Table 1 below:

**Table 1**  
Concentrations of Uranium and Thorium Isotopes  
In Survey Units FSS-020 and FSS-021 Soil Samples

NRC Region IV Sample ID	Survey Unit	Radionuclide Concentrations <sup>a,d</sup> (pCi/g wet weight)						
		U-238	U-235	Total U <sup>b</sup>	Th-230	Th-228	Th-232	Total Th <sup>c</sup>
NRC-05-06-01	FSS-021	0.91±0.65	0.02±0.14	1.84±0.93	3.1±4.4	1.08±0.10	0.99±0.23	2.07±0.25
NRC-05-06-02	FSS-021	1.00±0.83	0.03±0.16	2.0±1.2	-5.7±6.3	1.97±0.19	1.84±0.30	3.81±0.36
NRC-05-06-03	FSS-021	0.95±0.61	-0.04±0.13	1.86±0.87	2.9±5.1	1.09±0.10	1.22±0.18	2.31±0.21
NRC-05-06-14	FSS-020	2.89±0.88	0.12±0.20	5.9±1.3	6.3±7.6	1.89±0.18	2.28±0.30	4.17±0.35
NRC-05-06-15	FSS-020	0.78±0.89	0.07±0.13	1.6±1.3	5.9±7.0	2.01±0.16	1.79±0.28	3.80±0.32
NRC-05-06-16	FSS-020	0.65±0.68	0.08±0.13	1.38±0.97	4.7±6.1	2.83±0.24	3.00±0.32	5.83±0.40
NRC-05-06-17	FSS-020	0.70±0.37	0.11±0.09	1.51±0.53	1.9±3.7	0.90±0.09	0.92±0.16	1.82±0.18

<sup>a</sup> The average MDCs for these radionuclides ranges from 0.13 pCi/g for Th-228 by Pb-212 to 20 pCi/g for Th-230 (Tables 1 & 3)

<sup>b</sup> Total uranium is the sum of (2\*U-238) + U-235

<sup>c</sup> Total Thorium is the sum of Th-228 and Th-232

<sup>d</sup> Uncertainties represent the 95 percent confidence level, based on total propagated uncertainties

The NRC-approved wide area derived concentration guideline level (DCGL<sub>w</sub>) for thorium-232 in soil in the stockpile and processing areas is 3.0 pCi/g with a background of 1.1 pCi/g. All thorium-232 sample results were less than the NRC approved DCGL<sub>w</sub> of 4.1 pCi/g.

As part of the final status survey process, Kaiser collected nine soil samples from each survey unit. The minimum number of samples required to be collected was nine from each survey unit. Kaiser submitted the samples for each survey unit based on the highest field measurements to a state-licensed laboratory for analysis. Kaiser's sample results ranged from 0.475 ± 0.138 to 1.120 ± 0.208 pCi/g for thorium-232 in FSS-020 and 0.663 ± 0.211 to 1.35 ± 0.193 pCi/g for thorium-232 in FSS-021.

During the confirmatory surveys of FSS-020 and FSS-021, Kaiser collected and split seven samples with the NRC. One of seven samples (NRC-05-06-16) was analyzed by Kaiser's contract laboratory. The comparison of the thorium-232 sample result is provided in Table 2 below:

**Table 2**  
 Comparison Of Split Soil Samples by Gamma Spectroscopy  
 In Survey Units FSS-020 and FSS-021  
 Th-232 by Ac-228, including background (1.1 pCi/g)

Sample ID		Survey Unit	NRC Analysis (Wet) pCi/g*	NRC (Wet) % Moisture	Kaiser Analysis (Wet) pCi/g	Kaiser % Moisture
NRC - RIV	Kaiser					
NRC 05-06-16	K-1179	FSS-020	3.00±0.32	18	1.79±0.204	18.8

\*Uncertainties represent the 95 percent confidence level, based on total propagated uncertainties

The sample results for both Kaiser and NRC (post-decontamination) were below the NRC approved  $DCGL_w$  of 4.1 pCi/g thorium-232 with background included.

b. Final Status Survey Units FSSB-007 and FSSB-008 (corings)

The inspectors observed soil core borings in FSSB-007 and FSSB-008 and conducted confirmatory surveys of soil cores. As part of reclamation, Kaiser excavates the contaminated soil, then sorts the soil for off-site disposal or on-site backfill. On-site backfill or below criteria material is used to backfill the soil excavation areas to a specified depth (10 feet from top elevation). Soil core boring is performed to determine the “as-left” site conditions for final site dose modeling. The soil core is a soil sample obtained by boring down vertically through soil resulting in a sample with a cylindrical shape and constant diameter in 1-meter sections.

A soil core scan is performed on each 1-meter section by moving the sodium iodide detector at a rate of no greater than 1-inch per second, keeping the detector close to the soil core. An average count rate is determined for each 1-foot segment of the soil core and recorded. The 1-meter soil core is then placed into a bucket and mixed thoroughly. A soil sample is taken and the remaining composite core sample is archived.

Kaiser performed nine soil core borings in each survey unit, resulting in approximately 45 soil samples from each survey unit. The NRC conducted confirmatory surveys that consisted of soil core scans and composite sampling of 1-meter sections of the cores in each survey unit. The inspectors performed the gamma radiation level scans of the soil cores using a Ludlum Model 18 survey meter with a SPA-3 scintillation probe assembly. A total of 10 soil samples were taken, one at each 1-meter depth, randomly selected in each survey unit. Therefore, a confirmatory soil sample was collected at 0-3 feet, 3-6 feet, 6-9 feet, 9-12 feet and 12-15 feet in each survey unit.

To avoid cross-contamination of the soil core borings, 1-foot of clean off-site backfill is placed on the backfilled survey units prior to coring which also reduces potential occupational exposure and background levels. The background in these survey units was 10,000 cpm. The soil core scan measurements (including background) ranged from 26,000 cpm to 36,000 cpm.

The ten split soil samples were collected after a composite sample of each 1-meter section was prepared. The soil samples were transferred through chain-of-custody records to ORISE for analysis. The sample was analyzed by gamma spectroscopy for uranium and thorium concentrations.

The sample results are listed in Table 3 below:

**Table 3**  
Concentrations of Uranium and Thorium Isotopes  
In Survey Units FSSB-007 and FSSB-008 Soil Samples

NRC Region IV Sample ID	Radionuclide Concentrations <sup>a,d</sup> (pCi/g wet weight)						
	U-238	U-235	Total U <sup>b</sup>	Th-230	Th-228	Th-232	Total Th <sup>c</sup>
NRC-05-06-04	2.4±2.3	0.44±0.44	5.2±3.3	84±26	25.7±2.3	25.1±2.1	50.8±3.1
NRC-05-06-05	0.8±2.3	0.15±0.56	1.8±3.3	93±26	28.6±1.9	28.1±2.4	56.7±3.1
NRC-05-06-06	2.9±2.0	-0.21±0.45	5.6±2.9	130±26	24.1±2.0	25.0±2.1	49.1±2.9
NRC-05-06-07	1.0±1.4	0.37±0.45	2.4±2.0	89±25	29.6±2.3	29.2±2.3	58.8±3.3
NRC-05-06-08	3.4±2.7	-0.15±0.42	6.7±3.8	99±25	28.1±2.5	27.4±2.2	55.5±3.3
NRC-05-06-09	1.1±2.2	0.20±0.48	2.4±3.1	89±26	29.1±2.4	29.3±2.4	58.4±3.4
NRC-05-06-10	1.4±1.7	0.36±0.50	3.2±2.5	99±25	23.9±2.0	24.6±2.0	48.5±2.8
NRC-05-06-11	2.6±2.3	-0.31±0.45	4.9±3.5	89±25	27.6±2.5	26.8±2.2	54.4±3.3
NRC-05-06-12	1.7±1.5	0.34±0.33	3.7±2.1	52±14	15.3±1.4	15.4±1.3	30.7±1.9
NRC-05-06-13	3.1±2.3	0.08±0.44	6.3±3.3	85±22	27.0±1.8	26.8±2.3	53.8±2.9

<sup>a</sup> The average MDCs for these radionuclides ranges from 0.13 pCi/g for Th-228 by Pb-212 to 20 pCi/g for Th-230 (Tables 1 & 3)

<sup>b</sup> Total uranium is the sum of (2\*U-238) + U-235

<sup>c</sup> Total Thorium is the sum of Th-228 and Th-232

<sup>d</sup> Uncertainties represent the 95 percent confidence level, based on total propagated uncertainties

The NRC-approved DCGL<sub>w</sub> for thorium-232 in soil in the backfill is 31.1 pCi/g with a background of 1.1 pCi/g. The sample results were less than the NRC approved DCGL<sub>w</sub> of 32.2 pCi/g.

During the confirmatory surveys of FSSB-007 and FSSB-008, Kaiser collected and split ten samples with the NRC. All of the samples were analyzed by Kaiser’s contract laboratory. The comparison of the thorium-232 sample results and moisture content are provided in Table 4 below:

**Table 4**  
 Comparison Of Split Soil Samples by Gamma Spectroscopy  
 In Survey Units FSSB-007 and FSSB-008  
 Th-232 by Ac-228, including background (1.1 pCi/g)

Sample ID		Survey Unit	Core Depth (ft)	NRC Analysis (Wet) pCi/g*	NRC (Wet) % Moisture	Kaiser Analysis (Wet) pCi/g	Kaiser % Moisture
NRC - RIV	Kaiser						
NRC-05-06-04	K-1066	FSSB-007	3-6	25.1±2.1	19	20.7±1.09	18.6
NRC-05-06-05	K-1072	FSSB-007	9-12	28.1±2.4	20	21.0±1.37	20.4
NRC-05-06-06	K-1081	FSSB-007	6-9	25.0±2.1	18	20.5±1.95	19.2
NRC-05-06-07	K-1094	FSSB-007	0-3	29.2±2.3	15	24.3±1.31	16.2
NRC-05-06-08	K-1108	FSSB-007	12-15	27.4±2.2	18	22.7±1.14	19.2
NRC-05-06-09	K-1115	FSSB-008	0-3	29.3±2.4	18	27.4±1.54	17.5
NRC-05-06-10	K-1122	FSSB-008	6-9	24.6±2.0	20	20.6±1.29	21.6
NRC-05-06-11	K-1139	FSSB-008	12-16	26.8±2.2	21	24.8±1.47	22.3
NRC-05-06-12	K-1141	FSSB-008	3-6	15.4±1.3	15	15.8±1.03	15.5
NRC-05-06-13	K-1158	FSSB-008	9-12	26.8±2.3	18	24.0±1.36	18.6

\*Uncertainties represent the 95 percent confidence level, based on total propagated uncertainties

The sample results indicated that the samples were below the NRC approved DCGL<sub>w</sub> for backfill material of 32.2 pCi/g thorium-232 with background included.

c. Confirmatory Survey of Concrete Slabs

Confirmatory surveys were performed on concrete slabs staged for off-site disposal at a local landfill. The surveys were conducted using two Eberline E600 survey meters (NRC Tag No. 079977, calibration due date: May 31, 2006 and NRC Tag No. 063473, calibration due date: July 20, 2006) each with an Eberline SHP-380AB alpha-beta probe (NRC Tag No. 079976 and NRC Tag No. 072358). The surveys included surface scans for gross alpha and beta radioactivity and 1-minute static measurements. Swipe sampling was not required because Kaiser is releasing the concrete slabs based on the state criteria of indistinguishable from background levels, which is lower than the NRC-approved removable contamination free release criteria of 50 dpm/100cm<sup>2</sup>.

Background measurements were obtained from similar concrete located in an offsite area that was unimpacted by previous plant operations. Background measurements ranged from 82 - 230 dpm/100cm<sup>2</sup> with an average of 157 dpm/100cm<sup>2</sup>.

The DP amendment states that the free release criteria for structures removed from the site is 230 dpm/100 cm<sup>2</sup> total average contamination with 700 dpm/100 cm<sup>2</sup> maximum contamination and 50 dpm/100 cm<sup>2</sup> removable contamination. Kaiser performed free release surveys on approximately 485 concrete slabs prior to this inspection. Approximately 10-percent of those slabs failed the State of Oklahoma criterion of

indistinguishable from background and were sent for offsite disposal at a low-level waste facility. The inspectors performed confirmatory surveys on 97 of the remaining concrete slabs.

Three 1-minute alpha particle counts were obtained from each concrete slab for comparison to the NRC-approved average gross alpha DCGL of 230 dpm/100 cm<sup>2</sup>. The static measurements included both fixed and removable alpha contamination on the surfaces. The gross alpha particle measurements ranged from 10 dpm/100 cm<sup>2</sup> to 226 dpm/100 cm<sup>2</sup>.

In summary, neither Kaiser's nor NRC's concrete sample results exceeded the NRC-approved gross alpha derived concentration guideline level for structures for free release of 230 dpm/100 cm<sup>2</sup> total average contamination with 700 dpm/100 cm<sup>2</sup> maximum contamination.

### 1.3 Conclusion

Independent confirmatory radiological surveys were conducted by the inspectors in four final status survey units. Results of confirmatory surveys were generally consistent with measurements taken by Kaiser. Seventeen soil samples were collected and analyzed for uranium and thorium concentrations. The results for both Kaiser's and NRC's samples were below the NRC-approved DCGL<sub>w</sub>.

Confirmatory surveys of the concrete slabs from the former Flux Building foundation and adjacent parking areas were performed. The surveys did not identify any areas that exceeded the NRC-approved free release criteria for total average contamination.

## 3 **Exit Meeting Summary**

The inspectors reviewed the scope and findings of the inspection during a preliminary exit briefing that was conducted on November 1, 2005, at the conclusion of the onsite inspection. A discussion of the confirmatory survey results and final exit briefing was conducted via telephone with the Site Administrator on December 5, 2005, following receipt of laboratory samples and scan survey data. Kaiser did not identify as proprietary any information provided to, or reviewed by the inspectors.

**ATTACHMENT**

**SUPPLEMENTAL INFORMATION**

**PARTIAL LIST OF PERSONS CONTACTED**

Kaiser Aluminum & Chemical Corp.

Bill Vinzant, Program Manager  
P. Handa, Site Administrator, Kaiser Aluminum & Chemical Corp.  
L. Max Scott, Radiation Safety Officer

Penn E&R

David Weyant, Data Manger  
David Duffey, HP Technician

Civil & Environmental Consultants, Inc.

Andy Lombardo, Final Survey Oversight

ReCon

Jerry Pionesa, QA Manager  
Joel Nowack, HP Technician  
Tyrone Trent, HP Technician

**INSPECTION PROCEDURES USED**

IP 83890      Closeout Inspection and Survey

### ITEMS OPENED, CLOSED AND DISCUSSED

Opened

None

Closed

None

Discussed

None

### LIST OF ACRONYMS USED

CFR	Code of Federal Regulations
cpm	counts per minute
DCGL <sub>w</sub>	wide area derived concentration guideline level
DP	NRC-Approved Decommissioning Plan
FOA	Former Operational Area
FSS	Final Status Survey
GA-DCGL	gross alpha derived concentration guideline level
IP	Inspection Procedure
pCi/g	picocuries per gram
dpm/100 cm <sup>2</sup>	disintegrations per minute per 100 square centimeters
m <sup>2</sup>	square meters
ORISE	Oak Ridge Institute for Science and Education
FSSB	Final Status Survey - Boring