OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

May 20, 2002

Mr. Thomas G. McLaughlin U.S. Nuclear Regulatory Commission Division of Waste Management 11555 Rockville Pike Mail Stop: T-7F27 Rockville, MD 20852

## SUBJECT: LETTER REPORT—CONFIRMATORY SURVEY OF BUILDINGS 13 AND 14, MOLYCORP, INC., WASHINGTON FACILITY, WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-007a)

Dear Mr. McLaughlin:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) performed confirmatory survey activities at the subject facility on April 15, 2002. Enclosed is the letter report describing the confirmatory survey procedures and results.

Please contact me at (865) 576-0065 or Timothy J. Vitkus at (865) 576-5073 should you have any questions or require additional information.

Sincerely

Wade C. Adams Project Leader/Health Physicist Environmental Survey and Site Assessment Program

WCA:ar

Enclosure

cc: G. Purdy, NRC/NMSS/TWFN 7F27 E. Knox-Davin, NRC/NMSS/TWFN 8A23 C. Gordon, NRC/Region I W. Beck, ORISE/ESSAP T. Vitkus, ORISE/ESSAP E. Abelquist, ORISE/ESSAP D. Condra, ORISE/ESSAP File/812

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## LETTER REPORT CONFIRMATORY SURVEY OF BUILDINGS 13 AND 14 MOLYCORP, INC., WASHINGTON FACILITY WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-007a)

#### INTRODUCTION AND SITE HISTORY

Since the mid 1920s, Molybdenum Corporation of America (Molycorp) operated a plant in Washington, Pennsylvania for the primary production of molybdenum products—the plant also produced ferro alloys such as ferrocolumbium and tungsten. The raw material for this ferrocolumbium operation, columbite ore, contained natural thorium.

In the late 1960s, new federal requirements necessitated that Molycorp obtain a Source Material License (SMB-1393, Docket No. 040-8778) from the Atomic Energy Commission (AEC) for possession and use of materials containing 0.05% or greater by weight, uranium, thorium, or a combination of both. Most of the material that was processed by the corporation for the ferrocolumbium contained 1 to 1.5% thorium. The slag resulting from this production was in a glass/ceramic form containing an average of 1.2% thorium. Operations using thorium-containing ores were discontinued about 1970 (RSI 2001).

Molycorp renewed its Source Material License (SMB-1393) in 1992 and added an amendment incorporating a schedule for decommissioning the site. In November 1992, Molycorp submitted a site characterization plan to the NRC for approval—the scope of the survey plan was limited to buildings and structures on the Molycorp site and did not include the soil.

Currently, there are 21 buildings on the site for which decommissioning activities are being performed. All have been characterized for radiological contamination. As part of the decommissioning activities, process equipment and supporting fixtures were removed, cleaned, and released or disposed of as low-level radioactive waste. Potentially contaminated structural surfaces were stripped of coatings by grit blasting or use of chemical agents. Contaminated surfaces identified by the characterization survey were cleaned or removed. These remediation activities

were performed under the Decommissioning Plan for the Washington, PA Facility which implemented final status survey guidance from draft NUREG/CR-5849 (RSI 1999 and NRC 1992a). Soil areas located underneath and around the buildings have not been addressed and are radioactively contaminated.

Molycorp has submitted the final status survey results for Buildings 13 and 14. Although there were no radiological materials present within these two buildings, as previously mentioned, the soils are contaminated. The top surfaces of the floors were expected to be clean and were classified as unaffected—however, the undersides of the concrete floors that are in contact with the soil will require survey prior to release (RSI 2001).

The NRC's Division of Waste Management has requested that the Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) perform confirmatory survey activities on buildings at the Molycorp, Inc. Washington Facility, in Washington, Pennsylvania for which the licensee and their current decontamination and decommissioning (D&D) contractor, MACTEC, have prepared final status survey reports.

#### SITE DESCRIPTION

The Molycorp, Inc., Washington Site is located in southwestern Pennsylvania on the outskirts of Washington County approximately 56 kilometers (35 miles) southwest of Pittsburgh. The site consists of approximately 8 hectares [ha (20 acres)] which represents the fenced portion of the 24 ha parcel of land owned by Molycorp that lies entirely within Canton Township at 300 Caldwell Avenue, Washington, Pennsylvania (Figure 1). In addition to the land area, there are approximately 21 buildings which remain on the site. The site is bounded by two streets in Canton Township—Caldwell Avenue and Green Street. The site is also transversed by Chartiers Creek that flows south to north through the property. The property is served by the CSX Railroad via two lines that were formerly owned by Tylerdale Connecting Railroad Company and the Baltimore and Ohio Railroad (MACTEC 2002a).

Building 13 is 12 meters (m) long by 8 m wide with an approximately 5 m high metal frame and truss structure with exterior corrugated metal walls and roof panels, and a concrete slab floor. The building runs from east to west and has a large sliding door at the west end that opens into Building 14 (Figure 2). Personnel doors are located on the east, south and west walls.

Building 14 is 31 m long by 16 m wide with an approximately 5 m high metal frame and truss structure with exterior corrugated metal walls and roof panels, and a concrete slab floor. The building runs from east to west and has a large sliding door at the east end that opens into Building 13 (Figure 3). Personnel doors are located along each wall.

### DOCUMENT/DATA REVIEW

ESSAP reviewed the D&D contractor's survey documentation to determine the adequacy and appropriateness of the final status survey radiological instrumentation and procedures (MACTEC 2002a). ESSAP also reviewed the final status survey data for Buildings 13 and 14 prior to visiting the site (MACTEC 2002b).

#### SURVEY PROCEDURES

ESSAP performed confirmatory survey activities for Buildings 13 and 14 at the Molycorp, Washington Facility on April 15, 2002. Survey activities consisted of alpha plus beta and gamma surface scans, alpha and beta surface activity measurements, removable activity measurements, and exposure rate measurements. These activities were conducted in accordance with a site-specific survey plan, submitted to and approved by the U.S. Nuclear Regulatory Commission (NRC) and the ORISE/ESSAP Survey Procedures and Quality Assurance Manuals (ORISE 2002a, 2000 and 2001).

The reference grid system, previously established by MACTEC, was used by ESSAP for referencing measurement and sample locations.

ESSAP confirmatory survey coverage was determined by MACTEC's radiological classification of the building—Buildings 13 and 14 were classified as unaffected. ESSAP conducted alpha plus beta

activity surface scans on up to 50% of the accessible floor surfaces and up to 25% of the lower wall surfaces, and conducted gamma surface scans on up to 100% of the accessible floor surfaces in Buildings 13 and 14. Alpha plus beta surface scans were performed using gas proportional detectors coupled to ratemeter-scalers with audible indicators. Gamma surface scans were performed using NaI scintillation detectors coupled to ratemeters with audible indicators.

Alpha and beta surface activity measurements were performed at ten locations (four on the floor, four on the lower walls, and two on the exterior walls) for Building 13 and fifteen locations (six on the floor, four on the lower walls, two on the upper walls, and three on the exterior walls) for Building 14. ESSAP performed beta-only activity measurements at each measurement location and alpha activity measurements at 21 of the 25 direct measurement locations. Direct measurements were performed using gas proportional detectors coupled to ratemeter-scalers. Smear samples, for determining removable activity levels, were collected from each direct measurement location. Site exposure rates were measured at two locations within Building 13 and five locations within Building 14. Exposure rate measurements were performed at one meter above the surface using a micro-rem meter. Measurement locations are shown on Figures 2 and 3.

#### SAMPLE ANALYSIS AND DATA INTERPRETATION

Samples and survey data were returned to the ORISE/ESSAP laboratory in Oak Ridge, Tennessee for analysis and interpretation. Sample analyses were performed in accordance with the ORISE/ESSAP Laboratory Procedures Manual (ORISE 2002b). Smears were analyzed for gross alpha and gross beta activity using a low-background gas proportional counter. Smear sample results and direct measurement data were reported in units of disintegrations per minute per 100 square centimeters (dpm/100 cm<sup>2</sup>). Exposure rates were reported in units of microroentgens per hour ( $\mu$ R/h).

### FINDINGS AND RESULTS

Alpha plus beta surface scans of the floor and lower walls identified several areas of elevated alpha plus beta activity near the drying oven and in the bottom of a ditch in Building 14. These locations

were marked for further investigation. Gamma surface scans also detected several areas of elevated activity and each were marked for further investigation.

Total and removable surface activity levels for Building 13 are presented in Table 1. Alpha surface activity levels ranged from -16 to 32 dpm/100 cm<sup>2</sup> and beta surface activity levels ranged from -130 to 620 dpm/100 cm<sup>2</sup>. Removable activity levels ranged from 0 to 1 dpm/100 cm<sup>2</sup> for alpha and -4 to 3 dpm/100 cm<sup>2</sup> for beta.

Total and removable surface activity levels for Building 14 are presented in Table 2. Alpha surface activity levels ranged from -8 to 130 dpm/100 cm<sup>2</sup> and beta surface activity levels ranged from -160 to 1,700 dpm/100 cm<sup>2</sup>. Removable activity levels ranged from 0 to 3 dpm/100 cm<sup>2</sup> for alpha and -4 to 8 dpm/100 cm<sup>2</sup> for beta.

Site background exposure rates averaged 10  $\mu$ R/h; Buildings 13 and 14 exposure rates, presented in Table 3, ranged from 6 to 11  $\mu$ R/h.

### **COMPARISON OF RESULTS WITH GUIDELINES**

Survey results were compared with the site's decommissioning criteria. The applicable NRC surface activity guideline levels are (NRC 1987):

#### Natural Thorium

1,000 dpm/100 cm<sup>2</sup>, averaged over a 1 m<sup>2</sup> area 3,000 dpm/100 cm<sup>2</sup>, total, maximum in a 100 cm<sup>2</sup> area 200 dpm/100 cm<sup>2</sup>, removable

#### Natural Uranium

5,000  $\alpha$  dpm/100 cm<sup>2</sup>, averaged over a 1 m<sup>2</sup> area 15,000  $\alpha$  dpm/100 cm<sup>2</sup>, total, maximum in a 100 cm<sup>2</sup> area 1,000  $\alpha$  dpm/100 cm<sup>2</sup>, removable

Thorium is the predominant contaminant and has the more restrictive guideline—therefore, the D&D contractor elected to use the thorium guidelines for the site. Natural thorium emits both alpha and beta radiations, therefore, either alpha or beta activity may be measured for determining the residual activity of the thorium contaminant. As interpreted by the NRC, the average 1,000 dpm/100 cm<sup>2</sup> and maximum 3,000 dpm/100 cm<sup>2</sup> should apply independently to both alpha and beta measurements for surface contamination involving natural thorium (NRC 1992b). ESSAP's experience has shown that beta measurements typically provide a more accurate evaluation of thorium contamination on structure surfaces, due to problems inherent in measuring alpha contamination on rough, porous, and/or dirty surfaces. For the thorium series in secular equilibrium, the activity level providing 1,000 alpha dpm/100 cm<sup>2</sup> would result in about 670 beta dpm/100 cm<sup>2</sup>. Therefore, a beta activity measurement that is greater than 670 dpm/100 cm<sup>2</sup> would exceed the alpha activity guideline for thorium.

Two measurement locations on the floor in Building 14 had total beta activity levels in excess of the average guideline. All other measurements on the floor and the lower, upper and exterior walls met the guidelines.

The NRC guideline for exposure rates at one meter above building surfaces is 5  $\mu$ R/h above background (NRC 1991). The exposure rates in both buildings were within the guideline.

#### SUMMARY

On April 15, 2002, the Environmental Survey and Site Assessment Program of the Oak Ridge Institute for Science and Education performed confirmatory survey activities on Buildings 13 and 14 at the Molycorp, Inc., Washington Facility in Washington, Pennsylvania. Survey activities consisted of alpha plus beta and gamma scans, alpha and beta surface activity measurements, and exposure rate measurements.

Based on the confirmatory survey results, it is ESSAP's opinion that the building's shells met the NRC guidelines—however, the floor had elevated activity above the average guideline levels.

Although the guidelines permit averaging over 1 m<sup>2</sup>, the floor area was classified by MACTEC as unaffected—the ESSAP data indicate that the floor does not reflect "unaffected" conditions and should be re-classified as affected and appropriate classification final status surveys performed. It should also be noted that MACTEC personnel performed 1 m<sup>2</sup> averaging on the walls within Building 13—this activity warrants reclassification of the walls by NUREG/CR-5849 guidance. This report does not address the undersides of the concrete slab floor which will be surveyed by the licensee at a later date.

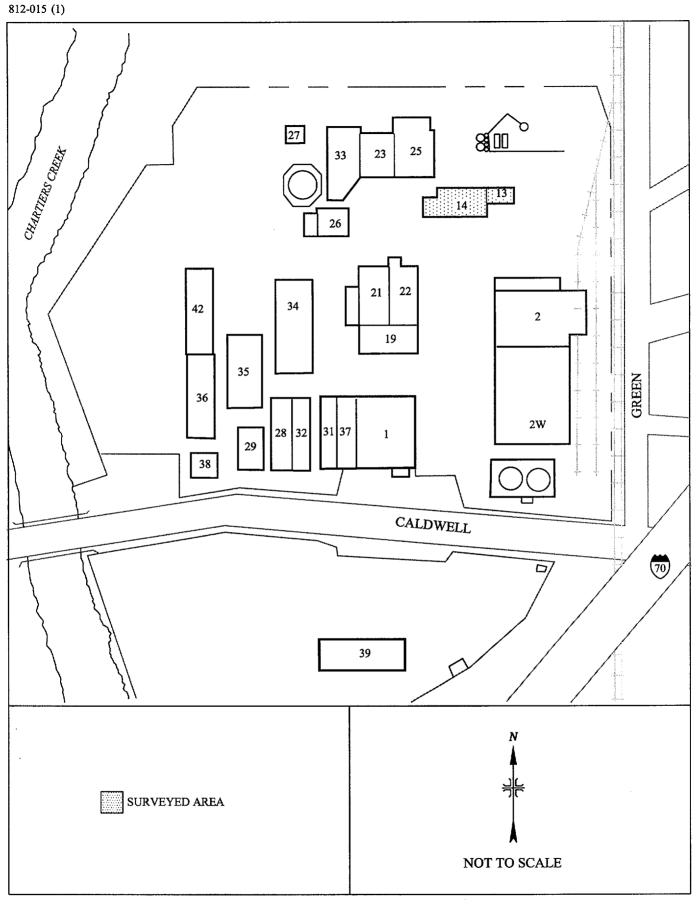
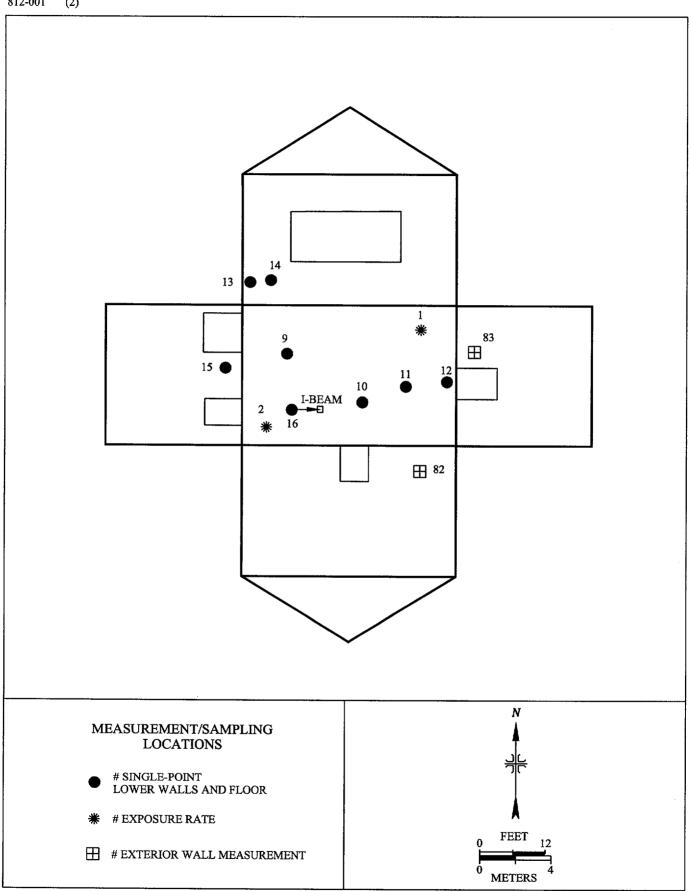


FIGURE 1: Plot Plan of Molycorp, Incorporated, Washington, Pennsylvania

812-001 (2)



Building 13; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations FIGURE 2:

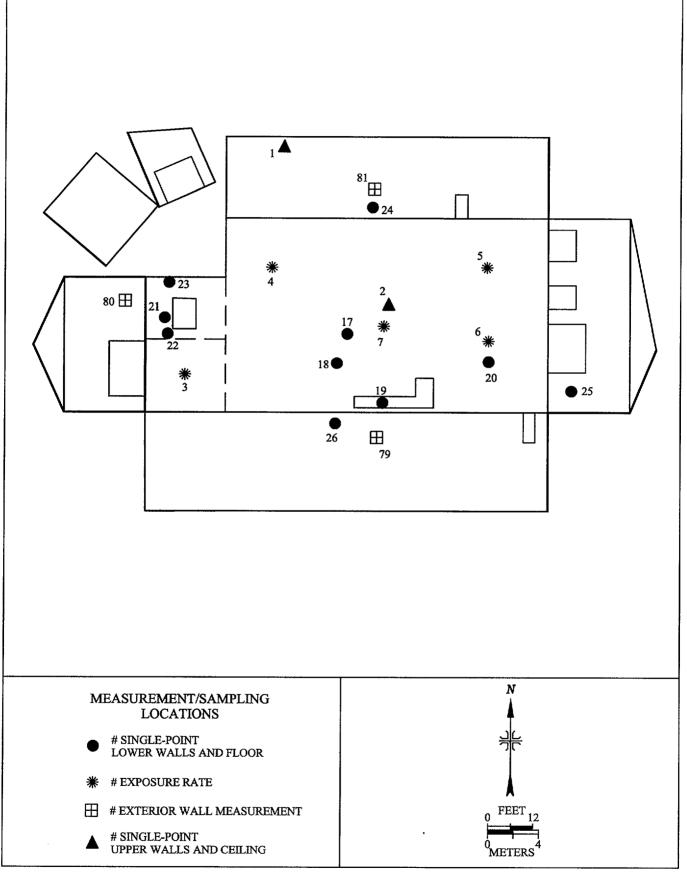


FIGURE 3: Building 14; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

### TABLE 1

# SURFACE ACTIVITY LEVELS **BUILDING 13 MOLYCORP INCORPORATED** WASHINGTON, PENNSYLVANIA

Location <sup>a</sup>	Surface <sup>b</sup>	Total Activity (dpm/100 cm <sup>2</sup> )		Removable Activity (dpm/100 cm <sup>2</sup> )	
		Alpha	Beta	Alpha	Beta
9	F	-16	-11	1	3
10	F	-16	190	0	1
11	F	8	53	0	-1
12	F	0	230	0	-1
13	LW	8	620	1	1
14	LW	32	87	0	-4
15	LW	c	-130	0	-2
16	LW	0	19	0	-4
82	EW	0	-100	0	-1
83	EW		-98	0	2

<sup>a</sup>Refer to Figure 2. <sup>b</sup>F = floor; LW = lower wall; and EW =exterior wall. "Measurement not performed.

## TABLE 2

# SURFACE ACTIVITY LEVELS BUILDING 14 MOLYCORP INCORPORATED WASHINGTON, PENNSYLVANIA

Location <sup>a</sup>	Surface <sup>b</sup>	Total Activity (dpm/100 cm <sup>2</sup> )		Removable Activity (dpm/100 cm <sup>2</sup> )	
		Alpha	Beta	Alpha	Beta
17	F	130	1,700°	0	-4
18	F	56	1,400°	0	8
19	F	100	750°	0	4
20	F	63	530°	1	3
21	F	56	920°	3	2
22	F	24	590°	0	-2
23	LW	16	220	0	-2
24	LW	16	-150	1	-2
25	LW	24	360	0	1
26	LW	-8	30	1	-4
92A	UW	d	150		
93A	UW		260		
79	EW	24	-160	1	8

### **TABLE 2 (continued)**

## SURFACE ACTIVITY LEVELS BUILDING 14 MOLYCORP INCORPORATED WASHINGTON, PENNSYLVANIA

Location <sup>a</sup>	Surface <sup>b</sup>	Total Activity (dpm/100 cm <sup>2</sup> )		Removable Activity (dpm/100 cm <sup>2</sup> )	
		Alpha	Beta	Alpha	Beta
80	EW		220	1	5
81	EW		-60	0	-3

<sup>a</sup>Refer to Figure 3.

 ${}^{b}F =$ floor; LW = lower wall; and EW =exterior wall.

<sup>c</sup>Due to elevated ambient gamma activity from contaminated soil underneath the concrete pad, these measurements were calculated by determining the difference between unshielded and shielded beta activity measurements with Net Count Rates determined as follows: Net Count Rate=(Surface Counts<sub>unstrickled</sub>-Surface Counts<sub>shielded</sub>)-(BKG Counts<sub>shielded</sub>-BKG Counts<sub>shielded</sub>). <sup>d</sup>Measurement not performed.

#### TABLE 3

## EXPOSURE RATES BUILDINGS 13 AND 14 MOLYCORP INCORPORATED WASHINGTON, PENNSYLVANIA

Location <sup>a</sup>	Exposure Rate @ 1m (µR/h)
1	11
2	11
3	10
4	9
5	10
6	6
7	8

<sup>a</sup>Refer to Figures 2 and 3.

### REFERENCES

MACTEC, Inc. (MACTEC). Survey Plan for Determining the Final Status of Buildings at the Molycorp Site, Washington, PA. Grand Junction, Colorado; Revision 0, February 1, 2002a.

MACTEC, Inc. Final Status Survey Report for Buildings 13, 14, 28, and 34 at the Molycorp Site, Washington, PA. Grand Junction, Colorado; Revision 0, March 14, 2002b.

Radiological Services, Inc. (RSI). Molycorp, Inc., Washington, PA Facility Decommissioning Plan, Part 1 Revision. New London, Connecticut; June 30, 1999.

Radiological Services, Inc. Radiological Final Status Survey Report Building 39 and 42 (North End), Molycorp, Inc., Washington, PA. New London, Connecticut; December 2001.

Oak Ridge Institute for Science and Education (ORISE). Survey Procedures Manual for the Environmental Survey and Site Assessment Program. Oak Ridge, Tennessee; September 28, 2000.

Oak Ridge Institute for Science and Education. Quality Assurance Manual for the Environmental Survey and Site Assessment Program. Oak Ridge, Tennessee; June 1, 2001.

Oak Ridge Institute for Science and Education. Confirmatory Survey Plan for Building Surveys at Molycorp, Inc., Washington Facility, Washington, Pennsylvania (Docket No. 040-08778, RFTA No. 02-007a). Oak Ridge, Tennessee; April 12, 2002a.

Oak Ridge Institute for Science and Education. Laboratory Procedures Manual for the Environmental Survey and Site Assessment Program. Oak Ridge, Tennessee; January 25, 2002b.

U.S. Nuclear Regulatory Commission (NRC). Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproducts, Source, or Special Nuclear Material. Washington, DC; August 1987.

U. S. Nuclear Regulatory Commission. Policy and Guideline Directive FC91-2, Standard Review Plan: Evaluating Decommissioning Plans for Licensees Under 10 CFR Parts 30, 40, and 70. Washington, DC; August 1991.

U. S. Nuclear Regulatory Commission. Draft—Manual for Conducting Radiological Surveys in Support of License Termination. NUREG/CR-5849; Washington, DC; June 1992a.

U.S. Nuclear Regulatory Commission. Memorandum from J. Hickey (U.S. Nuclear Regulatory Commission, HQ) to D. Collins (U.S. Nuclear Regulatory Commission, Region II), RE: "Interpretation of Thorium Surface Contamination Limits", February 20, 1992b.

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May 20, 2002

Mr. Thomas G. McLaughlin U.S. Nuclear Regulatory Commission Division of Waste Management 11555 Rockville Pike Mail Stop: T-7F27 Rockville, MD 20852

## SUBJECT: LETTER REPORT—CONFIRMATORY SURVEY OF BUILDING 23, MOLYCORP, INC., WASHINGTON FACILITY, WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-007a)

Dear Mr. McLaughlin:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) performed confirmatory survey activities at the subject facility on April 17 and 18, 2002. Enclosed is the letter report describing the survey procedures and results.

Please contact me at (865) 576-0065 or Timothy J. Vitkus at (865) 576-5073 should you have any questions or require additional information.

Sincerely,

Wade C. Adams Project Leader/Health Physicist Environmental Survey and Site Assessment Program

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## LETTER REPORT CONFIRMATORY SURVEY OF BUILDING 23 MOLYCORP, INC., WASHINGTON FACILITY WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-007a)

### **INTRODUCTION AND SITE HISTORY**

Since the mid 1920s, Molybdenum Corporation of America (Molycorp) operated a plant in Washington, Pennsylvania for the primary production of molybdenum products—the plant also produced ferro alloys such as ferrocolumbium and tungsten. The raw material for this ferrocolumbium operation, columbite ore, contained natural thorium.

In the late 1960s, new federal requirements necessitated that Molycorp obtain a Source Material License (SMB-1393, Docket No. 040-8778) from the Atomic Energy Commission (AEC) for possession and use of materials containing 0.05% or greater by weight, uranium, thorium, or a combination of both. Most of the material that was processed by the corporation for the ferrocolumbium contained 1 to 1.5% thorium. The slag resulting from this production was in a glass/ceramic form containing an average of 1.2% thorium. Operations that using thorium-containing ores were discontinued about 1970 (RSI 2001).

Molycorp renewed its Source Material License (SMB-1393) in 1992 and added an amendment incorporating a schedule for decommissioning the site. In November 1992, Molycorp submitted a site characterization plan to the NRC for approval—the scope of the survey plan was limited to buildings and structures on the Molycorp site and did not include the soil.

Currently, there are 21 buildings on the site for which decommissioning activities are being performed. All have been characterized for radiological contamination. As part of the decommissioning activities, process equipment and supporting fixtures were removed, cleaned, and released or disposed of as low-level radioactive waste. Potentially contaminated structural surfaces were stripped of coatings by grit blasting or use of chemical agents. Contaminated surfaces identified by the characterization survey were cleaned or removed. These remediation activities were performed under the Decommissioning Plan for the Washington, PA Facility which implemented

final status survey guidance from draft NUREG/CR-5849 (RSI 1999 and NRC 1992a). Soil areas located underneath and around the buildings have not been addressed and are radioactively contaminated.

Molycorp submitted the final status survey results for Building 23 directly to ESSAP while on-site. It was determined through site history that radiological materials had been present within this building, therefore Building 23 was classified as affected. The undersides of the concrete floors that are in contact with the soil will also require survey prior to release (RSI 2001).

The NRC's Division of Waste Management has requested that the Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) perform confirmatory survey activities on buildings at the Molycorp, Inc. Washington Facility for which the licensee and their current decontamination and decommissioning (D&D) contractor, MACTEC, have prepared final status survey reports.

#### SITE DESCRIPTION

The Molycorp, Inc., Washington Site is located in southwestern Pennsylvania on the outskirts of Washington County approximately 56 kilometers (35 miles) southwest of Pittsburgh. The site consists of approximately 8 hectares [ha (20 acres)] which represents the fenced portion of the 24 ha parcel of land owned by Molycorp that lies entirely within Canton Township at 300 Caldwell Avenue, Washington, Pennsylvania (Figure 1). In addition to the land area, there are approximately 21 buildings which remain on the site. The site is bounded by two streets in Canton Township—Caldwell Avenue and Green Street. The site is also transversed by Chartiers Creek that flows south to north through the property. The property is served by the CSX Railroad via two lines that were formerly owned by Tylerdale Connecting Railroad Company and the Baltimore and Ohio Railroad (MACTEC 2002a).

Building 23 is approximately 32 meters (m) long by 20 m wide with a 6 m high prefabricated metal structure with a steel frame, corrugated exterior metal walls and roof panels and a reinforced concrete floor. There are separate floor levels. The building runs from north to south and has large

roll top doors on the west side and personnel doors on the north and west sides. The east side opens into west side of Building 25 and the west side opens into the east side of Building 33.

#### **DOCUMENT/DATA REVIEW**

ESSAP reviewed the D&D contractor's survey documentation to determine the adequacy and appropriateness of the final status survey radiological instrumentation and procedures (MACTEC 2002a). ESSAP also reviewed the final status survey data for Building 23 while on-site (MACTEC 2002b).

#### **SURVEY PROCEDURES**

ESSAP performed confirmatory survey activities for Building 23 at the Molycorp, Washington Facility on April 17 and 18, 2002. Survey activities consisted of alpha plus beta surface scans, alpha and beta surface activity measurements and removable activity measurements. These activities were conducted in accordance with a site-specific survey plan, submitted to and approved by the U.S. Nuclear Regulatory Commission (NRC) and the ORISE/ESSAP Survey Procedures and Quality Assurance Manuals (ORISE 2002a, 2000 and 2001).

The reference grid system, previously established by MACTEC, was used by ESSAP for referencing measurement and sample locations.

ESSAP confirmatory survey coverage was determined by MACTEC's radiological classification of the building—Building 23 was classified as affected. ESSAP conducted alpha plus beta activity scans on the lower wall and upper wall surfaces in Building 23—however, due to the number of elevated radiation areas noted by the scans, the scan coverage was limited and documentation of the elevated areas exceeding guidelines was initiated. Alpha plus beta surface scans were performed using gas proportional detectors coupled to ratemeter-scalers with audible indicators.

Alpha and beta surface activity measurements were performed at eleven locations on the lower and upper walls/surfaces. ESSAP performed beta-only activity measurements at each measurement

location and alpha activity measurements at eight of the eleven direct measurement locations. Direct measurements were performed using gas proportional detectors coupled to ratemeter-scalers. Smear samples, for determining removable activity levels, were collected from eight of the direct measurement locations. No measurements were performed on the exterior walls. Measurement locations are shown on Figure 2.

### SAMPLE ANALYSIS AND DATA INTERPRETATION

Samples and survey data were returned to the ORISE/ESSAP laboratory in Oak Ridge, Tennessee for analysis and interpretation. Sample analyses were performed in accordance with the ORISE/ESSAP Laboratory Procedures Manual (ORISE 2002b). Smears were analyzed for gross alpha and gross beta activity using a low-background gas proportional counter. Smear sample results and direct measurement data were reported in units of disintegrations per minute per 100 square centimeters (dpm/100 cm<sup>2</sup>).

#### FINDINGS AND RESULTS

Alpha plus beta surface scans identified several areas of elevated radiation on the metal walls, purlins and I-beams within the building. The horizontal upper surfaces of I-beams and roof supports indicated radiation levels exceeding the maximum guideline at locations 85A through 87A (Figure 2). These locations were marked for further investigation.

Total and removable surface activity levels for Building 23 are presented in Table 1. Alpha surface activity levels ranged from 18 to 370 dpm/100 cm<sup>2</sup> and beta surface activity levels ranged from -200 to 4,700 dpm/100 cm<sup>2</sup>. Removable activity levels ranged from 0 to 1 dpm/100 cm<sup>2</sup> for alpha and -4 to 3 dpm/100 cm<sup>2</sup> for beta.

#### **COMPARISON OF RESULTS WITH GUIDELINES**

Survey results were compared with the site's decommissioning criteria. The applicable NRC surface activity guideline levels are (NRC 1987):

### Natural Thorium

1,000 dpm/100 cm<sup>2</sup>, averaged over a 1 m<sup>2</sup> area 3,000 dpm/100 cm<sup>2</sup>, total, maximum in a 100 cm<sup>2</sup> area 200 dpm/100 cm<sup>2</sup>, removable

Natural Uranium

5,000  $\alpha$  dpm/100 cm<sup>2</sup>, averaged over a 1 m<sup>2</sup> area 15,000  $\alpha$  dpm/100 cm<sup>2</sup>, total, maximum in a 100 cm<sup>2</sup> area 1,000  $\alpha$  dpm/100 cm<sup>2</sup>, removable

Thorium is the predominant contaminant and has the more restrictive guideline—therefore, the D&D contractor elected to use the thorium guidelines for the site. Natural thorium emits both alpha and beta radiations, therefore, either alpha or beta activity may be measured for determining the residual activity of the thorium contaminant. As interpreted by the NRC, the average 1,000 dpm/100 cm<sup>2</sup> and maximum 3,000 dpm/100 cm<sup>2</sup> should apply independently to both alpha and beta measurements for surface contamination involving natural thorium (NRC 1992b). ESSAP's experience has shown that beta measurements typically provide a more accurate evaluation of thorium contamination on structure surfaces, due to problems inherent in measuring alpha contamination on rough, porous, and/or dirty surfaces. For the thorium series in secular equilibrium, the activity level providing 1,000 alpha dpm/100 cm<sup>2</sup> would result in about 670 beta dpm/100 cm<sup>2</sup>. Therefore, a beta activity measurement that is greater than 670 dpm/100 cm<sup>2</sup> would exceed the alpha activity guideline for thorium.

Four of the eleven measurement locations in Building 23 had total beta activity levels in excess of the average guideline while one measurement exceeded the maximum guideline. Taking into account the alpha to beta ratio as discussed previously, two beta measurements would have exceeded the maximum alpha activity level.

#### **SUMMARY**

During the period of April 17 and 18, 2002, the Environmental Survey and Site Assessment Program of the Oak Ridge Institute for Science and Education performed confirmatory survey activities on Building 23 at the Molycorp, Inc. Washington Facility in Washington, Pennsylvania. Survey activities consisted of alpha plus beta scans and alpha and beta surface activity measurements.

Based on the confirmatory survey results, it is ESSAP's opinion that the building's shell and support beams did not meet the NRC guidelines for release for unrestricted use. This report does not address the upper concrete floor surface (per agreement with the NRC and licensee) or the undersides of the concrete slab floor which will be surveyed by the licensee at a later date. Exposure rate measurements were also not performed.

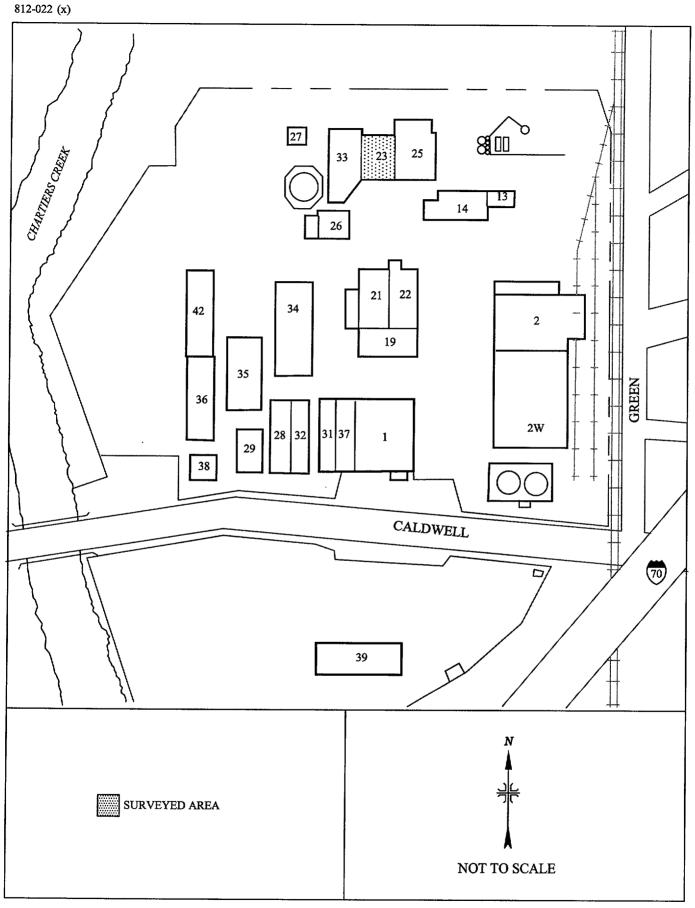


FIGURE 1: Plot Plan of Molycorp, Incorporated, Washington, Pennsylvania

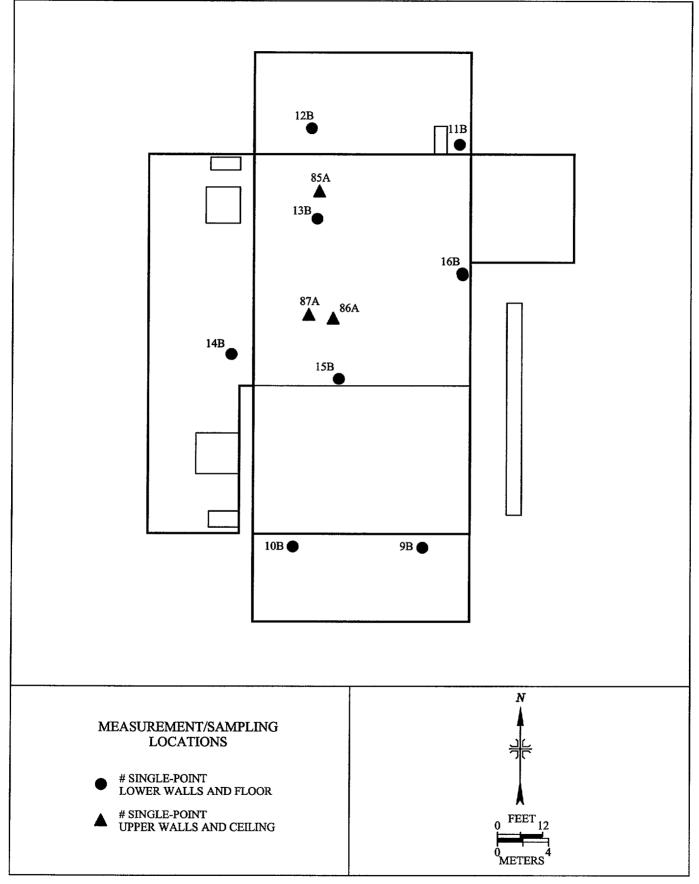


FIGURE 2: Building 23; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

### **TABLE 1**

# SURFACE ACTIVITY LEVELS BUILDING 23 MOLYCORP INCORPORATED WASHINGTON, PENNSYLVANIA

Location <sup>a</sup>	Surface <sup>b</sup>	Total Activity (dpm/100 cm <sup>2</sup> )		Removable Activity (dpm/100 cm <sup>2</sup> )	
		Alpha	Beta	Alpha	Beta
9B	LW	190	-200	0	-2
10B	LW	35	45	0	3
11B	LW	120	1,000°	1	-1
12B	LW	370	640	0	-2
13B	LW	53	-140	1	-2
14B	LW	18	190	0	-3
15B	LW	62	-53	1	-4
16B	LW	250	79	0	-2
85A	UW	<sup>d</sup>	4,700		
86A	UW		2,600		
87A	UW		1,600		

<sup>a</sup>Refer to Figure 2.

 $^{b}LW = lower wall and UW = upper wall.$ 

<sup>c</sup>Due to elevated ambient gamma radiation from contaminated soil and/or adjacent contaminated I-beams, these measurements were calculated by determining the difference between unshielded and shielded beta activity measurements with Net Count Rates determined as follows: Net Count Rate=(Surface Counts<sub>unshielded</sub>-Surface Counts<sub>shielded</sub>)-(BKG Counts<sub>unshielded</sub>-BKG Counts<sub>shielded</sub>). <sup>d</sup>Measurement not performed.

#### REFERENCES

MACTEC, Inc. (MACTEC). Survey Plan for Determining the Final Status of Buildings at the Molycorp Site, Washington, PA. Grand Junction, Colorado; Revision 0, February 1, 2002a.

MACTEC, Inc. Final Status Survey Data Package for Building 23 at the Molycorp Site, Washington, PA. Grand Junction, Colorado; April 17, 2002b.

Radiological Services, Inc. (RSI). Molycorp, Inc., Washington, PA Facility Decommissioning Plan, Part 1 Revision. New London, Connecticut; June 30, 1999.

Radiological Services, Inc. Radiological Final Status Survey Report Building 39 and 42 (North End), Molycorp, Inc., Washington, PA. New London, Connecticut; December 2001.

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Oak Ridge Institute for Science and Education. Confirmatory Survey Plan for Building Surveys at Molycorp, Inc., Washington Facility, Washington, Pennsylvania (Docket No. 040-08778, RFTA No. 02-007a). Oak Ridge, Tennessee; April 12, 2002a.

Oak Ridge Institute for Science and Education. Laboratory Procedures Manual for the Environmental Survey and Site Assessment Program. Oak Ridge, Tennessee; January 25, 2002b.

U.S. Nuclear Regulatory Commission (NRC). Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproducts, Source, or Special Nuclear Material. Washington, DC; August 1987.

U. S. Nuclear Regulatory Commission. Draft—Manual for Conducting Radiological Surveys in Support of License Termination. NUREG/CR-5849; Washington, DC; June 1992a.

U.S. Nuclear Regulatory Commission. Memorandum from J. Hickey (U.S. Nuclear Regulatory Commission, HQ) to D. Collins (U.S. Nuclear Regulatory Commission, Region II), RE: "Interpretation of Thorium Surface Contamination Limits", February 20, 1992b.

OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

May 20, 2002

Mr. Thomas G. McLaughlin U.S. Nuclear Regulatory Commission Division of Waste Management 11555 Rockville Pike Mail Stop: T-7F27 Rockville, MD 20852

## SUBJECT: LETTER REPORT—CONFIRMATORY SURVEY OF BUILDING 25, MOLYCORP, INC., WASHINGTON FACILITY, WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-007a)

Dear Mr. McLaughlin:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) performed confirmatory survey activities at the subject facility on April 17, 2002. Enclosed is the letter report describing the survey procedures and results.

Please contact me at (865) 576-0065 or Timothy J. Vitkus at (865) 576-5073 should you have any questions or require additional information.

Sincerely.

Wade C. Adams Project Leader/Health Physicist Environmental Survey and Site Assessment Program

WCA:ar

Enclosure

cc: G. Purdy, NRC/NMSS/TWFN 7F27
E. Knox-Davin, NRC/NMSS/TWFN 8A23
C. Gordon, NRC/Region I
W. Beck, ORISE/ESSAP

T. Vitkus, ORISE/ESSAP E. Abelquist, ORISE/ESSAP D. Condra, ORISE/ESSAP File/812

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Operated by Oak Ridge Associated Universities for the U.S. Department of Energy



## LETTER REPORT CONFIRMATORY SURVEY OF BUILDING 25 MOLYCORP, INC., WASHINGTON FACILITY WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-007a)

## **INTRODUCTION AND SITE HISTORY**

Since the mid 1920s, Molybdenum Corporation of America (Molycorp) operated a plant in Washington, Pennsylvania for the primary production of molybdenum products—the plant also produced ferro alloys such as ferrocolumbium and tungsten. The raw material for this ferrocolumbium operation, columbite ore, contained natural thorium.

In the late 1960s, new federal requirements necessitated that Molycorp obtain a Source Material License (SMB-1393, Docket No. 040-8778) from the Atomic Energy Commission (AEC) for possession and use of materials containing 0.05% or greater by weight, uranium, thorium, or a combination of both. Most of the material that was processed by the corporation for the ferrocolumbium contained 1 to 1.5% thorium. The slag resulting from this production was in a glass/ceramic form containing an average of 1.2% thorium. Operations that using thorium-containing ores were discontinued about 1970 (RSI 2001).

Molycorp renewed its Source Material License (SMB-1393) in 1992 and added an amendment incorporating a schedule for decommissioning the site. In November 1992, Molycorp submitted a site characterization plan to the NRC for approval—the scope of the survey plan was limited to buildings and structures on the Molycorp site and did not include the soil.

Currently, there are 21 buildings on the site for which decommissioning activities are being performed. All have been characterized for radiological contamination. As part of the decommissioning activities, process equipment and supporting fixtures were removed, cleaned, and released or disposed of as low-level radioactive waste. Potentially contaminated structural surfaces were stripped of coatings by grit blasting or use of chemical agents. Contaminated surfaces identified by the characterization survey were cleaned or removed. These remediation activities were performed under the Decommissioning Plan for the Washington, PA Facility which implemented

final status survey guidance from draft NUREG/CR-5849 (RSI 1999 and NRC 1992a). Soil areas located underneath and around the buildings have not been addressed and are radioactively contaminated.

Molycorp has submitted the final status survey results for Building 25. Although there was no history of radiological materials present within this building, as previously mentioned, the soils are contaminated. The top surfaces of the floors were expected to be clean and were classified as unaffected—however, the undersides of the concrete floors that are in contact with the soil will require survey prior to release (RSI 2001).

The NRC's Division of Waste Management has requested that the Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) perform confirmatory survey activities on buildings at the Molycorp, Inc. Washington Facility for which the licensee and their current decontamination and decommissioning (D&D) contractor, MACTEC, have prepared final status survey reports.

#### SITE DESCRIPTION

The Molycorp, Inc., Washington Site is located in southwestern Pennsylvania on the outskirts of Washington County approximately 56 kilometers (35 miles) southwest of Pittsburgh. The site consists of approximately 8 hectares [ha (20 acres)] which represents the fenced portion of the 24 ha parcel of land owned by Molycorp that lies entirely within Canton Township at 300 Caldwell Avenue, Washington, Pennsylvania (Figure 1). In addition to the land area, there are approximately 21 buildings which remain on the site. The site is bounded by two streets in Canton Township—Caldwell Avenue and Green Street. The site is also transversed by Chartiers Creek that flows south to north through the property. The property is served by the CSX Railroad via two lines that were formerly owned by Tylerdale Connecting Railroad Company and the Baltimore and Ohio Railroad (MACTEC 2002a).

Building 25 is approximately 36 meters (m) long by 20 m wide with a 6 m high prefabricated metal structure with a steel frame, corrugated exterior metal walls and roof panels and a reinforced

concrete floor. The building runs from north to south and has large roll top doors on the south, east and west sides and personnel doors on the north and east sides. The west side opens into the east side of Building 23.

#### **DOCUMENT/DATA REVIEW**

ESSAP reviewed the D&D contractor's survey documentation to determine the adequacy and appropriateness of the final status survey radiological instrumentation and procedures (MACTEC 2002a). The final status survey data for Building 25 was submitted to and reviewed by ESSAP while on-site (MACTEC 2002b).

#### SURVEY PROCEDURES

ESSAP performed confirmatory survey activities for Building 25 at the Molycorp, Washington Facility on April 17, 2002. Survey activities consisted of alpha plus beta surface scans, alpha and beta surface activity measurements and removable activity measurements. These activities were conducted in accordance with a site-specific survey plan, submitted to and approved by the U.S. Nuclear Regulatory Commission (NRC) and the ORISE/ESSAP Survey Procedures and Quality Assurance Manuals (ORISE 2002a, 2000 and 2001).

The reference grid system, previously established by MACTEC, was used by ESSAP for referencing measurement and sample locations.

ESSAP confirmatory survey coverage was determined by MACTEC's radiological classification of the building—Building 25 was classified as unaffected. ESSAP conducted alpha plus beta activity scans on up to 10% of the lower wall and exterior wall surfaces in Building 25. Alpha plus beta surface scans were performed using gas proportional detectors coupled to ratemeter-scalers with audible indicators.

Alpha and beta surface activity measurements were performed at eight locations on the lower walls. ESSAP performed alpha-only and beta-only activity measurements at each of the direct measurement

locations. Direct measurements were performed using gas proportional detectors coupled to ratemeter-scalers. Smear samples, for determining removable activity levels, were collected from each direct measurement location. No measurements were performed on the upper walls, exterior walls, or ceiling. Measurement locations are shown on Figure 2.

#### SAMPLE ANALYSIS AND DATA INTERPRETATION

Samples and survey data were returned to the ORISE/ESSAP laboratory in Oak Ridge, Tennessee for analysis and interpretation. Sample analyses were performed in accordance with the ORISE/ESSAP Laboratory Procedures Manual (ORISE 2002b). Smears were analyzed for gross alpha and gross beta activity using a low-background gas proportional counter. Smear sample results and direct measurement data were reported in units of disintegrations per minute per 100 square centimeters (dpm/100 cm<sup>2</sup>).

#### FINDINGS AND RESULTS

Alpha plus beta surface scans of the lower walls identified two areas of elevated radiation on the purlins and I-beams along the east wall within the building near measurement locations #20B and #21B (Figure 2). These locations were marked for further investigation.

Total and removable surface activity levels for Building 25 are presented in Table 1. Alpha surface activity levels ranged from 26 to 350 dpm/100 cm<sup>2</sup> and beta surface activity levels ranged from -110 to 2,500 dpm/100 cm<sup>2</sup>. Removable activity levels ranged from 0 to 1 dpm/100 cm<sup>2</sup> for alpha and -4 to 5 dpm/100 cm<sup>2</sup> for beta.

#### **COMPARISON OF RESULTS WITH GUIDELINES**

Survey results were compared with the site's decommissioning criteria. The applicable NRC surface activity guideline levels are (NRC 1987):

#### Natural Thorium

1,000 dpm/100 cm<sup>2</sup>, averaged over a 1 m<sup>2</sup> area 3,000 dpm/100 cm<sup>2</sup>, total, maximum in a 100 cm<sup>2</sup> area 200 dpm/100 cm<sup>2</sup>, removable

Natural Uranium

5,000  $\alpha$  dpm/100 cm<sup>2</sup>, averaged over a 1 m<sup>2</sup> area 15,000  $\alpha$  dpm/100 cm<sup>2</sup>, total, maximum in a 100 cm<sup>2</sup> area 1,000  $\alpha$  dpm/100 cm<sup>2</sup>, removable

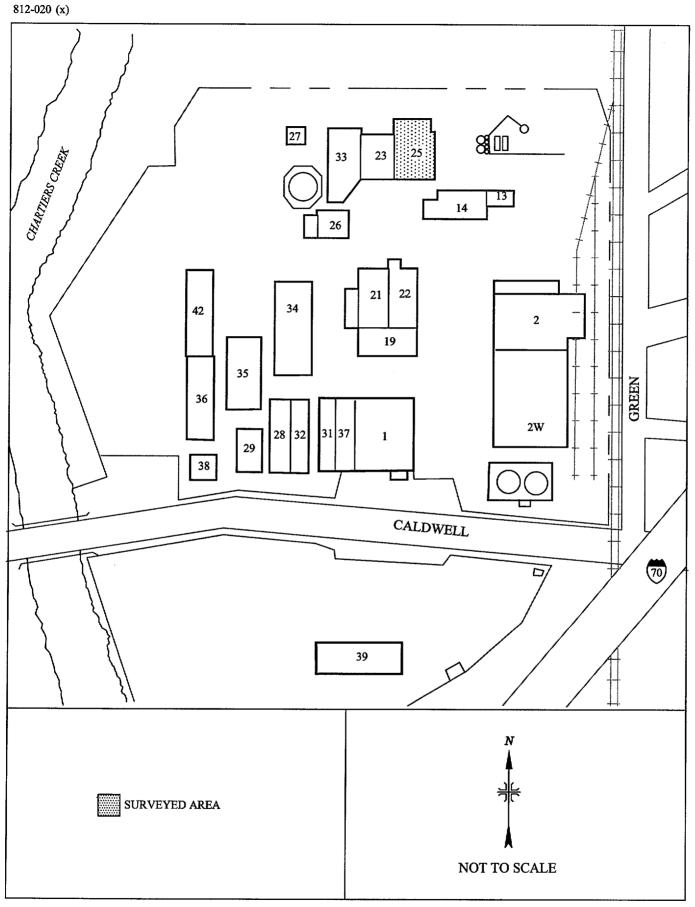
Thorium is the predominant contaminant and has the more restrictive guideline—therefore, the D&D contractor elected to use the thorium guidelines for the site. Natural thorium emits both alpha and beta radiations, therefore, either alpha or beta activity may be measured for determining the residual activity of the thorium contaminant. As interpreted by the NRC, the average 1,000 dpm/100 cm<sup>2</sup> and maximum 3,000 dpm/100 cm<sup>2</sup> should apply independently to both alpha and beta measurements for surface contamination involving natural thorium (NRC 1992b). ESSAP's experience has shown that beta measurements typically provide a more accurate evaluation of thorium contamination on structure surfaces, due to problems inherent in measuring alpha contamination on rough, porous, and/or dirty surfaces. For the thorium series in secular equilibrium, the activity level providing 1,000 alpha dpm/100 cm<sup>2</sup> would result in about 670 beta dpm/100 cm<sup>2</sup>. Therefore, a beta activity measurement that is greater than 670 dpm/100 cm<sup>2</sup> would exceed the alpha activity guideline for thorium.

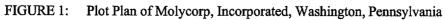
Two of the eight measurement locations on the lower walls in Building 25 had total beta activity levels in excess of the average guideline.

#### SUMMARY

On April 17, 2002, the Environmental Survey and Site Assessment Program of the Oak Ridge Institute for Science and Education performed confirmatory survey activities on Building 25 at the Molycorp, Inc. Washington Facility in Washington, Pennsylvania. Survey activities consisted of alpha plus beta scans and alpha and beta surface activity measurements.

Based on the confirmatory survey results, it is ESSAP's opinion that the building's shell did not meet the NRC guidelines. Although the guidelines permit averaging over  $1 \text{ m}^2$ , the lower walls were classified by MACTEC as unaffected—the ESSAP data indicate that the lower walls do not reflect "unaffected" conditions and should be re-classified as affected and appropriate classification final status surveys performed. This report does not address the upper concrete floor surface (per agreement with the NRC and licensee) or the undersides of the concrete slab floor which will be surveyed by the licensee at a later date. Exposure rate measurements were also not performed.





812-005 (2)

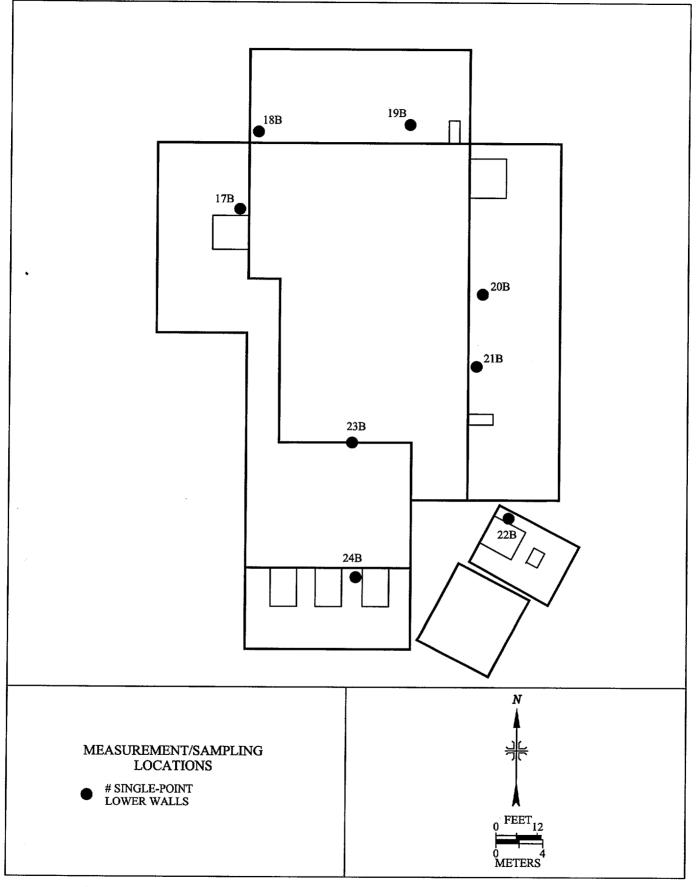


FIGURE 2: Building 25; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

## TABLE 1

# SURFACE ACTIVITY LEVELS BUILDING 25 MOLYCORP INCORPORATED WASHINGTON, PENNSYLVANIA

Location <sup>a</sup>	Surface <sup>b</sup>	Total Activity (dpm/100 cm <sup>2</sup> )		Removable Activity (dpm/100 cm <sup>2</sup> )	
		Alpha	Beta	Alpha	Beta
17B	LW	260	550°	0	-1
18B	LW	79	91°	0	4
19B	LW	26	200	0	5
20B	LW	350	1,700°	1	-2
21B	LW	97	2,500°	0	-3
22B	LW	26	-34	0	-4
23B	LW	71	-110 <sup>c</sup>	0	-2
24B	LW	26	330	0	5

"Refer to Figure 2.

 $^{b}LW = lower wall.$ 

"Due to elevated ambient gamma radiation from contaminated soil and/or adjacent contaminated I-beams, these measurements were calculated by determining the difference between unshielded and shielded beta activity measurements with Net Count Rates determined as follows: Net Count Rate=(Surface Counts<sub>unshielded</sub>-Surface Counts<sub>sthielded</sub>)-(BKG Counts<sub>sthielded</sub>-BKG Counts<sub>sthielded</sub>).

#### REFERENCES

MACTEC, Inc. (MACTEC). Survey Plan for Determining the Final Status of Buildings at the Molycorp Site, Washington, PA. Grand Junction, Colorado; Revision 0, February 1, 2002a.

MACTEC, Inc. Final Status Survey Report for Buildings 25, 29, 32, 33, 35, 36 and the Soil Sample Storage Room (Bldg 19) at the Molycorp Site, Washington, PA. Grand Junction, Colorado; Revision 0, April 15, 2002b.

Radiological Services, Inc. (RSI). Molycorp, Inc., Washington, PA Facility Decommissioning Plan, Part 1 Revision. New London, Connecticut; June 30, 1999.

Radiological Services, Inc. Radiological Final Status Survey Report Building 39 and 42 (North End), Molycorp, Inc., Washington, PA. New London, Connecticut; December 2001.

Oak Ridge Institute for Science and Education (ORISE). Survey Procedures Manual for the Environmental Survey and Site Assessment Program. Oak Ridge, Tennessee; September 28, 2000.

Oak Ridge Institute for Science and Education. Quality Assurance Manual for the Environmental Survey and Site Assessment Program. Oak Ridge, Tennessee; June 1, 2001.

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OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

May 20, 2002

Mr. Thomas G. McLaughlin U.S. Nuclear Regulatory Commission Division of Waste Management 11555 Rockville Pike Mail Stop: T-7F27 Rockville, MD 20852

# SUBJECT: LETTER REPORT—CONFIRMATORY SURVEY OF BUILDING 28, MOLYCORP, INC., WASHINGTON FACILITY, WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-007a)

Dear Mr. McLaughlin:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) performed confirmatory survey activities at the subject facility on April 16 through 18, 2002. Enclosed is the letter report describing the survey procedures and results.

Please contact me at (865) 576-0065 or Timothy J. Vitkus at (865) 576-5073 should you have any questions or require additional information.

Sincerely.

Wade C. Adams Project Leader/Health Physicist Environmental Survey and Site Assessment Program

WCA:ar

Enclosure

cc: G. Purdy, NRC/NMSS/TWFN 7F27
E. Knox-Davin, NRC/NMSS/TWFN 8A23
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Operated by Oak Ridge Associated Universities for the U.S. Department of Energy



# LETTER REPORT CONFIRMATORY SURVEY OF BUILDING 28 MOLYCORP, INC., WASHINGTON FACILITY WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-007a)

## **INTRODUCTION AND SITE HISTORY**

Since the mid 1920s, Molybdenum Corporation of America (Molycorp) operated a plant in Washington, Pennsylvania for the primary production of molybdenum products—the plant also produced ferro alloys such as ferrocolumbium and tungsten. The raw material for this ferrocolumbium operation, columbite ore, contained natural thorium.

In the late 1960s, new federal requirements necessitated that Molycorp obtain a Source Material License (SMB-1393, Docket No. 040-8778) from the Atomic Energy Commission (AEC) for possession and use of materials containing 0.05% or greater by weight, uranium, thorium, or a combination of both. Most of the material that was processed by the corporation for the ferrocolumbium contained 1 to 1.5% thorium. The slag resulting from this production was in a glass/ceramic form containing an average of 1.2% thorium. Operations using thorium-containing ores were discontinued about 1970 (RSI 2001).

Molycorp renewed its Source Material License (SMB-1393) in 1992 and added an amendment incorporating a schedule for decommissioning the site. In November 1992, Molycorp submitted a site characterization plan to the NRC for approval—the scope of the survey plan was limited to buildings and structures on the Molycorp site and did not include the soil.

Currently, there are 21 buildings on the site for which decommissioning activities are being performed. All have been characterized for radiological contamination. As part of the decommissioning activities, process equipment and supporting fixtures were removed, cleaned, and released or disposed of as low-level radioactive waste. Potentially contaminated structural surfaces were stripped of coatings by grit blasting or use of chemical agents. Contaminated surfaces identified by the characterization survey were cleaned or removed. These remediation activities were performed under the Decommissioning Plan for the Washington, PA Facility which implemented

final status survey guidance from draft NUREG/CR-5849 (RSI 1999 and NRC 1992a). Soil areas located underneath and around the buildings have not been addressed and are radioactively contaminated.

Molycorp has submitted the final status survey results for Building 28. Although there was no history of radiological materials present within this building, as previously mentioned, the underlying soils are contaminated. The top surfaces of the floors were expected to be clean and were classified as unaffected—however, the undersides of the concrete floors that are in contact with the soil will require survey prior to release (RSI 2001).

The NRC's Division of Waste Management has requested that the Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) perform confirmatory survey activities on buildings at the Molycorp, Inc. Washington Facility for which the licensee and their current decontamination and decommissioning (D&D) contractor, MACTEC, have prepared final status survey reports.

### SITE DESCRIPTION

The Molycorp, Inc., Washington Site is located in southwestern Pennsylvania on the outskirts of Washington County approximately 56 kilometers (35 miles) southwest of Pittsburgh. The site consists of approximately 8 hectares [ha (20 acres)] which represents the fenced portion of the 24 ha parcel of land owned by Molycorp that lies entirely within Canton Township at 300 Caldwell Avenue, Washington, Pennsylvania (Figure 1). In addition to the land area, there are approximately 21 buildings which remain on the site. The site is bounded by two streets in Canton Township—Caldwell Avenue and Green Street. The site is also transversed by Chartiers Creek that flows south to north through the property. The property is served by the CSX Railroad via two lines that were formerly owned by Tylerdale Connecting Railroad Company and the Baltimore and Ohio Railroad (MACTEC 2002a).

Building 28 is 36 meters (m) long by 9 m wide with a 5 m high prefabricated metal structure with a steel frame, corrugated exterior metal walls and roof panels, and a reinforced concrete floor. The building runs from north to south and has a large roll top door at the north end and a personnel door on the west wall at the south end (Figure 2). The building's east wall adjoins to the west wall of Building 32 (Figure 1).

#### **DOCUMENT/DATA REVIEW**

ESSAP reviewed the D&D contractor's survey documentation to determine the adequacy and appropriateness of the final status survey radiological instrumentation and procedures (MACTEC 2002a). ESSAP also reviewed the final status survey data for Building 28 prior to visiting the site (MACTEC 2002b).

#### SURVEY PROCEDURES

ESSAP performed confirmatory survey activities for Building 28 at the Molycorp, Washington Facility on April 16 through 18, 2002. Survey activities consisted of alpha plus beta and gamma surface scans, alpha and beta surface activity measurements, removable activity measurements, and exposure rate measurements. These activities were conducted in accordance with a site-specific survey plan, submitted to and approved by the U.S. Nuclear Regulatory Commission (NRC) and the ORISE/ESSAP Survey Procedures and Quality Assurance Manuals (ORISE 2002a, 2000 and 2001).

The reference grid system, previously established by MACTEC, was used by ESSAP for referencing measurement and sample locations.

ESSAP confirmatory survey coverage was determined by MACTEC's radiological classification of the building—Building 28 was classified as unaffected. ESSAP conducted alpha plus beta activity scans on up to 50% of the accessible floor surfaces, up to 10% of the lower wall surfaces, and up to 10% of the exterior wall surfaces, and conducted gamma scans over 100% of the accessible floor surfaces in Building 28. After alpha plus beta scans in the affected adjacent Building 32 identified elevated beta radiation on the roof support beams, ESSAP returned to Building 28 and performed

cursory alpha plus beta scans on the roof supports in Building 28. Alpha plus beta surface scans were performed using gas proportional detectors coupled to ratemeter-scalers with audible indicators. Gamma surface scans were performed using NaI scintillation detectors coupled to ratemeters with audible indicators.

As part of the initial unaffected area survey activities, alpha and beta surface activity measurements were performed at five locations on the floor (at one location a  $1 \text{ m}^2$  average was performed), five locations on the lower walls, and at three locations on the exterior walls (Figure 2). After elevated beta radiation was identified on the adjacent Building 32 roof supports, ESSAP performed beta surface activity measurements at four locations on the upper walls and ceilings. Direct measurements were performed using gas proportional detectors coupled to ratemeter-scalers. Smear samples, for determining removable activity levels, were collected from each direct measurement location. Exposure rates, measured at five locations, were performed at one meter above the surface using a micro-rem meter. Measurement locations are shown on Figure 2.

# SAMPLE ANALYSIS AND DATA INTERPRETATION

Samples and survey data were returned to the ORISE/ESSAP laboratory in Oak Ridge, Tennessee for analysis and interpretation. Sample analyses were performed in accordance with the ORISE/ESSAP Laboratory Procedures Manual (ORISE 2002b). Smears were analyzed for gross alpha and gross beta activity using a low-background gas proportional counter. Smear sample results and direct measurement data were reported in units of disintegrations per minute per 100 square centimeters (dpm/100 cm<sup>2</sup>). Exposure rates were reported in units of microroentgens per hour ( $\mu$ R/h).

## FINDINGS AND RESULTS

Alpha plus beta surface scans of the floor and lower walls identified two areas of elevated alpha plus beta radiation on the floor near measurement locations #31 and #32 (Figure 2). Gamma floor surface scans also detected several areas of elevated radiation. These locations were marked for further

investigation. Cursory beta surface scans of the roof supports in Building 28 also identified elevated beta radiation at measurement locations 88A through 91A (Figure 2).

Total and removable surface activity levels for Building 28 are presented in Table 1. Alpha surface activity levels for the floor and lower walls ranged from 0 to 320 dpm/100 cm<sup>2</sup> and beta surface activity levels ranged from -68 to 960 dpm/100 cm<sup>2</sup>. At measurement location #32, elevated beta activity in excess of the average guideline was identified. MACTEC personnel performed additional remedial activities at this location while ESSAP was on-site. ESSAPs post-remediation beta activity measurement at this location was -34 dpm/100 cm<sup>2</sup>. Beta surface activity levels on the roof supports and upper walls ranged from 1,000 to 2,000 dpm/100 cm<sup>2</sup>. Removable activity levels for all measurement locations ranged from 0 to 3 dpm/100 cm<sup>2</sup> for alpha and -4 to 5 dpm/100 cm<sup>2</sup> for beta.

Site background exposure rates averaged 10  $\mu$ R/h; Building 28 exposure rates, presented in Table 2, ranged from 10 to 15  $\mu$ R/h.

### **COMPARISON OF RESULTS WITH GUIDELINES**

Survey results were compared with the site's decommissioning criteria. The applicable NRC surface activity guideline levels are (NRC 1987):

Natural Thorium

1,000 dpm/100 cm<sup>2</sup>, averaged over a 1 m<sup>2</sup> area 3,000 dpm/100 cm<sup>2</sup>, total, maximum in a 100 cm<sup>2</sup> area 200 dpm/100 cm<sup>2</sup>, removable

## Natural Uranium

5,000  $\alpha$  dpm/100 cm<sup>2</sup>, averaged over a 1 m<sup>2</sup> area 15,000  $\alpha$  dpm/100 cm<sup>2</sup>, total, maximum in a 100 cm<sup>2</sup> area 1,000  $\alpha$  dpm/100 cm<sup>2</sup>, removable

Thorium is the predominant contaminant and has the more restrictive guideline—therefore, the D&D contractor elected to use the thorium guidelines for the site. Natural thorium emits both alpha and beta radiations, therefore, either alpha or beta activity may be measured for determining the residual activity of the thorium contaminant. As interpreted by the NRC, the average 1,000 dpm/100 cm<sup>2</sup> and maximum 3,000 dpm/100 cm<sup>2</sup> should apply independently to both alpha and beta measurements for surface contamination involving natural thorium (NRC 1992b). ESSAP's experience has shown that beta measurements typically provide a more accurate evaluation of thorium contamination on structure surfaces, due to problems inherent in measuring alpha contamination on rough, porous, and/or dirty surfaces. For the thorium series in secular equilibrium, the activity level providing 1,000 alpha dpm/100 cm<sup>2</sup> would result in about 670 beta dpm/100 cm<sup>2</sup>. Therefore, a beta activity measurement that is greater than 670 dpm/100 cm<sup>2</sup> would exceed the alpha activity guideline for thorium.

After the remediation of the area around measurement location #32, all confirmatory measurements on the floor, lower walls, and exterior walls were less than the guidelines. However, after elevated beta activity was identified on the roof supports in the adjacent Building 32, cursory survey activities were performed on the roof supports in Building 28. The measurement locations on the roof supports and upper walls were randomly selected and indicated that elevated activity above the average guideline remains on the roof support surfaces of Building 28 within the accumulated dust and dirt. Averaging for 1 m<sup>2</sup> areas was not performed on the roof support beams.

The NRC guideline for exposure rates at one meter above building surfaces is 5  $\mu$ R/h above background (NRC 1991). The exposure rates within Building 28 were within the guideline.

#### SUMMARY

During the period of April 16 through 18, 2002, the Environmental Survey and Site Assessment Program of the Oak Ridge Institute for Science and Education performed confirmatory survey activities on Building 28 at the Molycorp, Inc. Washington Facility in Washington, Pennsylvania. Survey activities consisted of alpha plus beta and gamma scans, alpha and beta surface activity measurements, and exposure rate measurements. Survey results indicated that fixed and removable activity levels and exposure rates were less than the applicable guidelines for the floor, lower wall and exterior wall surfaces. However, the confirmatory survey findings for the roof supports indicate that elevated beta activity above the average guideline remains within the dust/dirt on the horizontal building roof support beams. The review of the final status survey data package indicates that MACTEC did not perform any survey activities on the upper walls and ceiling within Building 28. Based on this, the confirmatory survey data do not support the licensee's conclusion that the radiological conditions of Building 28 satisfy the NRC surface activity guidelines for release to unrestricted use. This report does not address the undersides of the concrete slab floors which will be surveyed by the licensee at a later date.

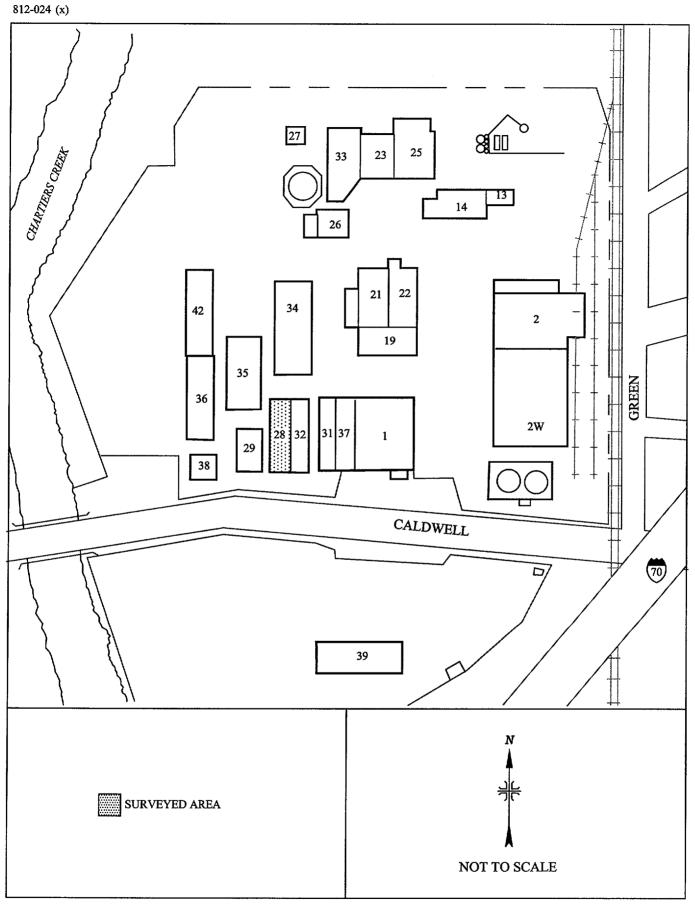


FIGURE 1: Plot Plan of Molycorp, Incorporated, Washington, Pennsylvania



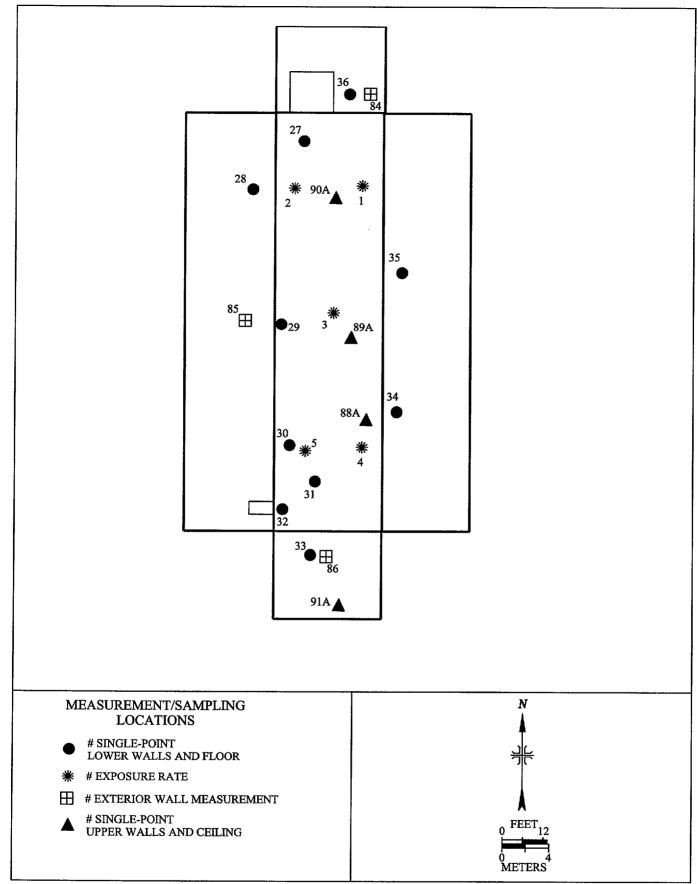


FIGURE 2: Building 28; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

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# TABLE 1

# SURFACE ACTIVITY LEVELS BUILDING 28 MOLYCORP INCORPORATED WASHINGTON, PENNSYLVANIA

Location <sup>a</sup>	Surface <sup>b</sup>	Total Activity (dpm/100 cm <sup>2</sup> )		Removable Activity (dpm/100 cm <sup>2</sup> )	
		Alpha	Beta	Alpha	Beta
27	F	0	-60°	0	-2
28	LW	320	960°	0	-3
29	F	95	610 <sup>c</sup>	0	1
30	F	24	23°	0	2
31	F	16	-68°	0	-1
32	F	<sup>d</sup>	-34°	0	-4
33	LW	48	320	0	-2
34	LW	8	250	1	2
35	LW	0	130	0	2
36	LW	32	310	0	1
88A	UW		1,000		
89A	UW		2,000		
90A	UW		1,800		

# **TABLE 1 (continued)**

# SURFACE ACTIVITY LEVELS BUILDING 28 MOLYCORP INCORPORATED WASHINGTON, PENNSYLVANIA

Location <sup>2</sup>	Surface <sup>b</sup>	Total Activity (dpm/100 cm <sup>2</sup> )		Removable Activity (dpm/100 cm <sup>2</sup> )	
		Alpha	Beta	Alpha	Beta
91A	UW		1,500		
84	EW	32	130	0	3
85	EW		760	3	4
86	EW		160	0	5

<sup>a</sup>Refer to Figure 2.

<sup>b</sup>F = floor; LW = lower wall; UW = upper wall; and EW = exterior wall.

<sup>c</sup>Due to elevated ambient gamma radiation from contaminated soil and/or adjacent contaminated I-beams, these measurements were calculated by determining the difference between unshielded and shielded beta activity measurements with Net Count Rates determined as follows: Net Count Rate=(Surface Counts<sub>unshielded</sub>-Surface Counts<sub>shielded</sub>)- (BKG Counts<sub>shielded</sub>-BKG Counts<sub>shielded</sub>).

## TABLE 2

# EXPOSURE RATES BUILDING 28 MOLYCORP INCORPORATED WASHINGTON, PENNSYLVANIA

Location <sup>a</sup>	Exposure Rate @ 1m (µR/h)		
1	15		
2	10		
3	10		
4	12		
5	12		

<sup>a</sup>Refer to Figure 2.

### REFERENCES

MACTEC, Inc. (MACTEC). Survey Plan for Determining the Final Status of Buildings at the Molycorp Site, Washington, PA. Grand Junction, Colorado; Revision 0, February 1, 2002a.

MACTEC, Inc. Final Status Survey Report for Buildings 13, 14, 28, and 34 at the Molycorp Site, Washington, PA. Grand Junction, Colorado; Revision 0, March 14, 2002b.

Radiological Services, Inc. (RSI). Molycorp, Inc., Washington, PA Facility Decommissioning Plan, Part 1 Revision. New London, Connecticut; June 30, 1999.

Radiological Services, Inc. Radiological Final Status Survey Report Building 39 and 42 (North End), Molycorp, Inc., Washington, PA. New London, Connecticut; December 2001.

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U.S. Nuclear Regulatory Commission (NRC). Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproducts, Source, or Special Nuclear Material. Washington, DC; August 1987.

U. S. Nuclear Regulatory Commission. Policy and Guideline Directive FC91-2, Standard Review Plan: Evaluating Decommissioning Plans for Licensees Under 10 CFR Parts 30, 40, and 70. Washington, DC; August 1991.

U. S. Nuclear Regulatory Commission. Draft—Manual for Conducting Radiological Surveys in Support of License Termination. NUREG/CR-5849; Washington, DC; June 1992a.

U.S. Nuclear Regulatory Commission. Memorandum from J. Hickey (U.S. Nuclear Regulatory Commission, HQ) to D. Collins (U.S. Nuclear Regulatory Commission, Region II), RE: "Interpretation of Thorium Surface Contamination Limits", February 20, 1992b.

OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

May 20, 2002

Mr. Thomas G. McLaughlin U.S. Nuclear Regulatory Commission Division of Waste Management 11555 Rockville Pike Mail Stop: T-7F27 Rockville, MD 20852

# SUBJECT: LETTER REPORT—CONFIRMATORY SURVEY OF BUILDING 29, MOLYCORP, INC., WASHINGTON FACILITY, WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-007a)

Dear Mr. McLaughlin:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) performed confirmatory survey activities at the subject facility on April 17, 2002. Enclosed is the letter report describing the survey procedures and results.

Please contact me at (865) 576-0065 or Timothy J. Vitkus at (865) 576-5073 should you have any questions or require additional information.

Sincerely.

Wade C. Adams Project Leader/Health Physicist Environmental Survey and Site Assessment Program

WCA:ar

Enclosure

cc: G. Purdy, NRC/NMSS/TWFN 7F27 E. Knox-Davin, NRC/NMSS/TWFN 8A23 C. Gordon, NRC/Region I W. Beck, ORISE/ESSAP T. Vitkus, ORISE/ESSAP E. Abelquist, ORISE/ESSAP D. Condra, ORISE/ESSAP File/812

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Operated by Oak Ridge Associated Universities for the U.S. Department of Energy



# LETTER REPORT CONFIRMATORY SURVEY OF BUILDING 29 MOLYCORP, INC., WASHINGTON FACILITY WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-007a)

## **INTRODUCTION AND SITE HISTORY**

Since the mid 1920s, Molybdenum Corporation of America (Molycorp) operated a plant in Washington, Pennsylvania for the primary production of molybdenum products—the plant also produced ferro alloys such as ferrocolumbium and tungsten. The raw material for this ferrocolumbium operation, columbite ore, contained natural thorium.

In the late 1960s, new federal requirements necessitated that Molycorp obtain a Source Material License (SMB-1393, Docket No. 040-8778) from the Atomic Energy Commission (AEC) for possession and use of materials containing 0.05% or greater by weight, uranium, thorium, or a combination of both. Most of the material that was processed by the corporation for the ferrocolumbium contained 1 to 1.5% thorium. The slag resulting from this production was in a glass/ceramic form containing an average of 1.2% thorium. Operations using thorium-containing ores were discontinued about 1970 (RSI 2001).

Molycorp renewed its Source Material License (SMB-1393) in 1992 and added an amendment incorporating a schedule for decommissioning the site. In November 1992, Molycorp submitted a site characterization plan to the NRC for approval—the scope of the survey plan was limited to buildings and structures on the Molycorp site and did not include the soil.

Currently, there are 21 buildings on the site for which decommissioning activities are being performed. All have been characterized for radiological contamination. As part of the decommissioning activities, process equipment and supporting fixtures were removed, cleaned, and released or disposed of as low-level radioactive waste. Potentially contaminated structural surfaces were stripped of coatings by grit blasting or use of chemical agents. Contaminated surfaces identified by the characterization survey were cleaned or removed. These remediation activities were performed under the Decommissioning Plan for the Washington, PA Facility which implemented

final status survey guidance from draft NUREG/CR-5849 (RSI 1999 and NRC 1992a). Soil areas located underneath and around the buildings have not been addressed and are radioactively contaminated.

Molycorp has submitted the final status survey results for Building 29. Although there was no history of radiological materials present within this building, during the final status survey, localized elevated levels of activity were detected in multiple areas on the concrete floor and on several structural support components (purlins) of the building. Molycorp's decontamination and decommissioning (D&D) contractor, MACTEC, determined that the elevated activity was fixed into the concrete and required removal of that portion of the concrete. The radioactivity identified on the purlins was also determined to be fixed contamination. The structural integrity of the building was evaluated and it was determined that the purlins should remain in place until building demolition. Therefore, the building's classification was changed from unaffected to affected and MACTEC personnel performed affected final status survey activities within the building (MACTEC 2002a).

The areas on the purlins, identified as being contaminated, were marked with a bright flourescent paint and recorded as contaminated—they will remain in place until just prior to demolition. MACTEC personnel performed remediation activities on the concrete floor and the final status survey data indicated that the remediation efforts were successful in removing the contamination (MACTEC 2002a).

The NRC's Division of Waste Management has requested that the Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) perform confirmatory survey activities on buildings at the Molycorp, Inc. Washington Facility for which the licensee and their current decontamination and decommissioning (D&D) contractor, MACTEC, have prepared final status survey reports.

#### SITE DESCRIPTION

The Molycorp, Inc., Washington Site is located in southwestern Pennsylvania on the outskirts of Washington County approximately 56 kilometers (35 miles) southwest of Pittsburgh. The site

consists of approximately 8 hectares [ha (20 acres)] which represents the fenced portion of the 24 ha parcel of land owned by Molycorp that lies entirely within Canton Township at 300 Caldwell Avenue, Washington, Pennsylvania (Figure 1). In addition to the land area, there are approximately 21 buildings which remain on the site. The site is bounded by two streets in Canton Township—Caldwell Avenue and Green Street. The site is also transversed by Chartiers Creek that flows south to north through the property. The property is served by the CSX Railroad via two lines that were formerly owned by Tylerdale Connecting Railroad Company and the Baltimore and Ohio Railroad (MACTEC 2002b).

Building 29 is 24 meters (m) long by 16 m wide with a 5 m high prefabricated metal structure with a steel frame, corrugated exterior metal walls and roof panels, and a reinforced concrete floor. The building runs from north to south and has large roll top doors on the north, east and west walls and personnel doors on the east, south, and west walls (Figure 2).

#### **DOCUMENT/DATA REVIEW**

ESSAP reviewed the D&D contractor's survey documentation to determine the adequacy and appropriateness of the final status survey radiological instrumentation and procedures (MACTEC 2002b). The final status survey data for Building 29 was submitted to and reviewed by ESSAP while on-site (MACTEC 2002a).

#### SURVEY PROCEDURES

ESSAP performed confirmatory survey activities for Building 29 at the Molycorp, Washington Facility on April 17, 2002. Survey activities consisted of alpha plus beta and gamma surface scans, alpha and beta surface activity measurements, and removable activity measurements. These activities were conducted in accordance with a site-specific survey plan, submitted to and approved by the U.S. Nuclear Regulatory Commission (NRC) and the ORISE/ESSAP Survey Procedures and Quality Assurance Manuals (ORISE 2002a, 2000 and 2001).

The reference grid system, previously established by MACTEC, was used by ESSAP for referencing measurement and sample locations.

ESSAP confirmatory survey coverage was determined by MACTEC's radiological classification of the building—Building 29 was classified as affected. ESSAP initiated alpha plus beta activity scans on accessible floor surfaces, lower wall surfaces, and exterior wall surfaces, and conducted gamma scans on accessible floor surfaces in Building 29—however, due to the number of elevated radiation areas noted by the scans, the scan coverage was limited and documentation of the elevated areas exceeding guidelines was conducted. Alpha plus beta surface scans were performed using gas proportional detectors coupled to ratemeter-scalers with audible indicators. Gamma surface scans were performed using NaI scintillation detectors coupled to ratemeters with audible indicators.

Alpha and beta surface activity measurements were performed at three locations on the floor and two locations on the lower walls. Direct measurements were performed using gas proportional detectors coupled to ratemeter-scalers. Smear samples, for determining removable activity levels, were collected from each of the direct measurement locations. Measurement locations are shown on Figure 2.

#### SAMPLE ANALYSIS AND DATA INTERPRETATION

Samples and survey data were returned to the ORISE/ESSAP laboratory in Oak Ridge, Tennessee for analysis and interpretation. Sample analyses were performed in accordance with the ORISE/ESSAP Laboratory Procedures Manual (ORISE 2002b). Smears were analyzed for gross alpha and gross beta activity using a low-background gas proportional counter. Smear sample results and direct measurement data were reported in units of disintegrations per minute per 100 square centimeters (dpm/100 cm<sup>2</sup>).

#### FINDINGS AND RESULTS

Alpha plus beta surface scans of the floor and lower walls identified numerous areas of elevated alpha plus beta radiation on the floor and several locations on the lower walls. Gamma surface scans

of the floor also detected several areas of elevated radiation. These locations were marked for further investigation.

Total and removable surface activity levels for Building 29 are presented in Table 1. Alpha surface activity levels ranged from 710 to 2,300 dpm/100 cm<sup>2</sup> and beta surface activity levels ranged from 3,100 to 21,000 dpm/100 cm<sup>2</sup>. Removable activity levels for all measurement locations ranged from 0 to 3 dpm/100 cm<sup>2</sup> for alpha and -4 to 3 dpm/100 cm<sup>2</sup> for beta.

## **COMPARISON OF RESULTS WITH GUIDELINES**

Survey results were compared with the site's decommissioning criteria. The applicable NRC surface activity guideline levels are (NRC 1987):

Natural Thorium

1,000 dpm/100 cm<sup>2</sup>, averaged over a 1 m<sup>2</sup> area 3,000 dpm/100 cm<sup>2</sup>, total, maximum in a 100 cm<sup>2</sup> area 200 dpm/100 cm<sup>2</sup>, removable

Natural Uranium

5,000  $\alpha$  dpm/100 cm<sup>2</sup>, averaged over a 1 m<sup>2</sup> area 15,000  $\alpha$  dpm/100 cm<sup>2</sup>, total, maximum in a 100 cm<sup>2</sup> area 1,000  $\alpha$  dpm/100 cm<sup>2</sup>, removable

Thorium is the predominant contaminant and has the more restrictive guideline—therefore, the D&D contractor elected to use the thorium guidelines for the site. Natural thorium emits both alpha and beta radiations, therefore, either alpha or beta activity may be measured for determining the residual activity of the thorium contaminant. As interpreted by the NRC, the average 1,000 dpm/100 cm<sup>2</sup> and maximum 3,000 dpm/100 cm<sup>2</sup> should apply independently to both alpha and beta measurements for surface contamination involving natural thorium (NRC 1992b). ESSAP's experience has shown that beta measurements typically provide a more accurate evaluation of thorium contamination on structure surfaces, due to problems inherent in measuring alpha contamination on rough, porous,

and/or dirty surfaces. For the thorium series in secular equilibrium, the activity level providing 1,000 alpha dpm/100 cm<sup>2</sup> would result in about 670 beta dpm/100 cm<sup>2</sup>. Therefore, a beta activity measurement that is greater than 670 dpm/100 cm<sup>2</sup> would exceed the alpha activity guideline for thorium.

Each of the five measurement locations in Building 29 had total beta activity levels in excess of the maximum guideline. No measurements were performed on the upper walls and ceiling or exterior walls.

### SUMMARY

On April 17, 2002, the Environmental Survey and Site Assessment Program of the Oak Ridge Institute for Science and Education performed confirmatory survey activities on Building 29 at the Molycorp, Inc. Washington Facility in Washington, Pennsylvania. Survey activities consisted of alpha plus beta and gamma surface scans and alpha and beta surface activity measurements.

The confirmatory survey identified residual contamination and the data therefore does not support the licensee's conclusion that the radiological conditions of Building 29 satisfy the NRC surface activity guidelines for release to unrestricted use. This report does not address the undersides of the concrete slab floors which will be surveyed by the licensee at a later date.

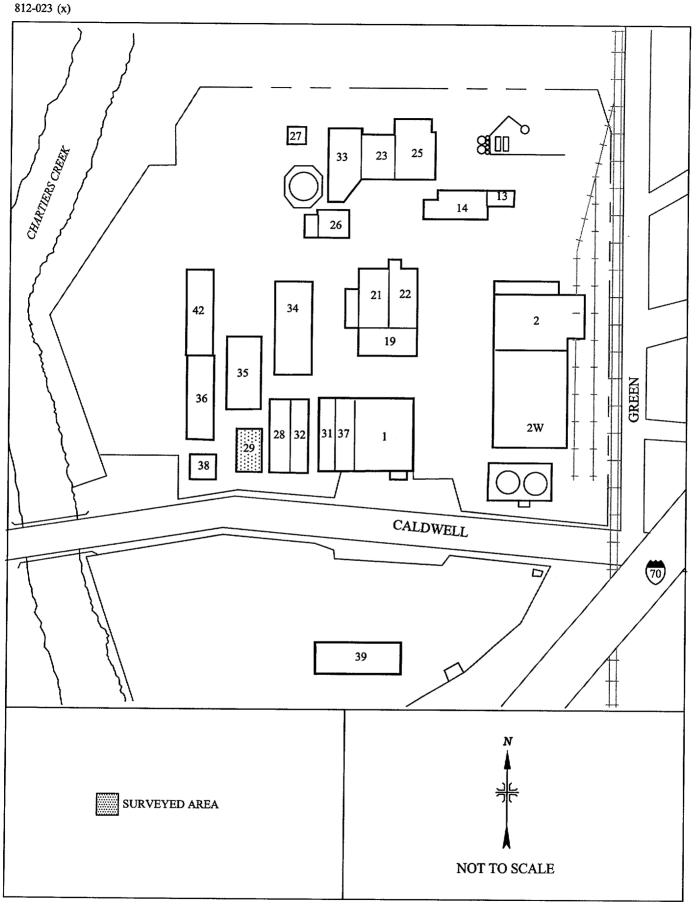


FIGURE 1: Plot Plan of Molycorp, Incorporated, Washington, Pennsylvania

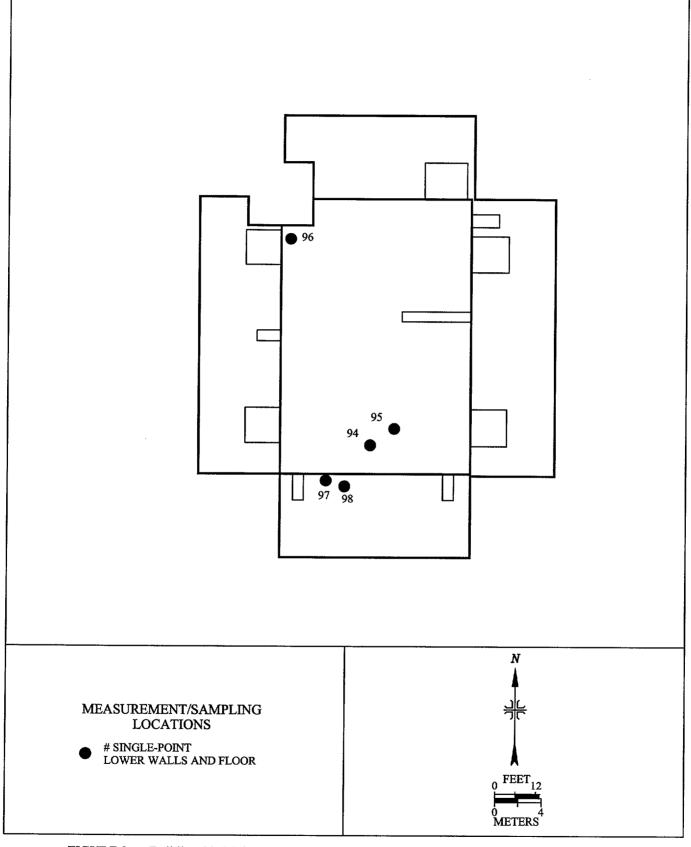


FIGURE 2: Building 29; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

## TABLE 1

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# SURFACE ACTIVITY LEVELS BUILDING 29 MOLYCORP INCORPORATED WASHINGTON, PENNSYLVANIA

Location <sup>a</sup>	Surface <sup>b</sup>	Total Activity (dpm/100 cm <sup>2</sup> )		Removable Activity (dpm/100 cm <sup>2</sup> )	
		Alpha	Beta <sup>c</sup>	Alpha	Beta
94	F	2300	21,000	0	2
95	F	1200	10,000	1	-2
96	F	780	5,000	0	3
97	LW	710	3,100	0	1
98	LW	d	3,600	3	-4

<sup>e</sup>Due to elevated ambient gamma radiation from contaminated soil and/or adjacent contaminated I-beams, these measurements were calculated by determining the difference between unshielded and shielded beta activity measurements with Net Count Rates determined as follows: Net Count Rate=(Surface Counts<sub>unshielded</sub>-Surface Counts<sub>shielded</sub>). (BKG Counts<sub>shielded</sub>).

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<sup>a</sup>Refer to Figure 2.

 ${}^{b}F =$ floor and LW = lower wall.

<sup>d</sup>Measurement not performed.

Molycorp, Inc. Washington Facility - May 20, 2002

### REFERENCES

MACTEC, Inc. (MACTEC). Final Status Survey Report for Buildings 25, 29, 32, 33, 35, 36 and the Soil Sample Storage Room (Bldg 19) at the Molycorp Site, Washington, PA. Grand Junction, Colorado; Revision 0, April 15, 2002a.

MACTEC, Inc. (MACTEC). Survey Plan for Determining the Final Status of Buildings at the Molycorp Site, Washington, PA. Grand Junction, Colorado; Revision 0, February 1, 2002b.

Radiological Services, Inc. (RSI). Molycorp, Inc., Washington, PA Facility Decommissioning Plan, Part 1 Revision. New London, Connecticut; June 30, 1999.

Radiological Services, Inc. Radiological Final Status Survey Report Building 39 and 42 (North End), Molycorp, Inc., Washington, PA. New London, Connecticut; December 2001.

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Oak Ridge Institute for Science and Education. Confirmatory Survey Plan for Building Surveys at Molycorp, Inc., Washington Facility, Washington, Pennsylvania (Docket No. 040-08778, RFTA No. 02-007a). Oak Ridge, Tennessee; April 12, 2002a.

Oak Ridge Institute for Science and Education. Laboratory Procedures Manual for the Environmental Survey and Site Assessment Program. Oak Ridge, Tennessee; January 25, 2002b.

U.S. Nuclear Regulatory Commission (NRC). Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproducts, Source, or Special Nuclear Material. Washington, DC; August 1987.

U. S. Nuclear Regulatory Commission. Draft—Manual for Conducting Radiological Surveys in Support of License Termination. NUREG/CR-5849; Washington, DC; June 1992a.

U.S. Nuclear Regulatory Commission. Memorandum from J. Hickey (U.S. Nuclear Regulatory Commission, HQ) to D. Collins (U.S. Nuclear Regulatory Commission, Region II), RE: "Interpretation of Thorium Surface Contamination Limits", February 20, 1992b.

OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

May 20, 2002

Mr. Thomas G. McLaughlin U.S. Nuclear Regulatory Commission Division of Waste Management 11555 Rockville Pike Mail Stop: T-7F27 Rockville, MD 20852

# SUBJECT: LETTER REPORT—CONFIRMATORY SURVEY OF BUILDING 32, MOLYCORP, INC., WASHINGTON FACILITY, WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-007a)

Dear Mr. McLaughlin:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) performed confirmatory survey activities at the subject facility on April 17, 2002. Enclosed is the letter report describing the survey procedures and results.

Please contact me at (865) 576-0065 or Timothy J. Vitkus at (865) 576-5073 should you have any questions or require additional information.

Sincerely

Wade C. Adams Project Leader/Health Physicist Environmental Survey and Site Assessment Program

WCA:ar

Enclosure

cc: G. Purdy, NRC/NMSS/TWFN 7F27
E. Knox-Davin, NRC/NMSS/TWFN 8A23
C. Gordon, NRC/Region I
W. Beck, ORISE/ESSAP

T. Vitkus, ORISE/ESSAP E. Abelquist, ORISE/ESSAP D. Condra, ORISE/ESSAP File/812

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Operated by Oak Ridge Associated Universities for the U.S. Department of Energy



# LETTER REPORT CONFIRMATORY SURVEY OF BUILDING 32 MOLYCORP, INC., WASHINGTON FACILITY WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-007a)

### **INTRODUCTION AND SITE HISTORY**

Since the mid 1920s, Molybdenum Corporation of America (Molycorp) operated a plant in Washington, Pennsylvania for the primary production of molybdenum products—the plant also produced ferro alloys such as ferrocolumbium and tungsten. The raw material for this ferrocolumbium operation, columbite ore, contained natural thorium.

In the late 1960s, new federal requirements necessitated that Molycorp obtain a Source Material License (SMB-1393, Docket No. 040-8778) from the Atomic Energy Commission (AEC) for possession and use of materials containing 0.05% or greater by weight, uranium, thorium, or a combination of both. Most of the material that was processed by the corporation for the ferrocolumbium contained 1 to 1.5% thorium. The slag resulting from this production was in a glass/ceramic form containing an average of 1.2% thorium. Operations using thorium-containing ores were discontinued about 1970 (RSI 2001).

Molycorp renewed its Source Material License (SMB-1393) in 1992 and added an amendment incorporating a schedule for decommissioning the site. In November 1992, Molycorp submitted a site characterization plan to the NRC for approval—the scope of the survey plan was limited to buildings and structures on the Molycorp site and did not include the soil.

Currently, there are 21 buildings on the site for which decommissioning activities are being performed. All have been characterized for radiological contamination. As part of the decommissioning activities, process equipment and supporting fixtures were removed, cleaned, and released or disposed of as low-level radioactive waste. Potentially contaminated structural surfaces were stripped of coatings by grit blasting or use of chemical agents. Contaminated surfaces identified by the characterization survey were cleaned or removed. These remediation activities were performed under the Decommissioning Plan for the Washington, PA Facility which implemented

final status survey guidance from draft NUREG/CR-5849 (RSI 1999 and NRC 1992a). Soil areas located underneath and around the buildings have not been addressed and are radioactively contaminated.

Molycorp has submitted the final status survey results for Building 32. Although there was no history of radiological materials present within this building, during the final status survey, localized elevated levels of activity were detected in multiple areas on the concrete floor and on several structural support components (purlins) of the building. Molycorp's decontamination and decommissioning (D&D) contractor, MACTEC, determined that the elevated activity was fixed into the concrete and required removal of that portion of the concrete. The radioactivity identified on the purlins was also determined to be fixed contamination. The structural integrity of the building was evaluated and it was determined that the purlins should remain in place until building demolition. Therefore, the building's classification was changed from unaffected to affected and MACTEC personnel performed affected final status survey activities within the building (MACTEC 2002a).

The areas on the purlins, identified as being contaminated, were marked with a bright flourescent paint and recorded as contaminated—they will remain in place until just prior to demolition. MACTEC personnel performed remediation activities on the concrete floor and the final status survey data indicated that the remediation efforts were successful in removing the contamination (MACTEC 2002a).

The NRC's Division of Waste Management has requested that the Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) perform confirmatory survey activities on buildings at the Molycorp, Inc. Washington Facility for which the licensee and their current D&D contractor, MACTEC, have prepared final status survey reports.

#### SITE DESCRIPTION

The Molycorp, Inc., Washington Site is located in southwestern Pennsylvania on the outskirts of Washington County approximately 56 kilometers (35 miles) southwest of Pittsburgh. The site

consists of approximately 8 hectares [ha (20 acres)] which represents the fenced portion of the 24 ha parcel of land owned by Molycorp that lies entirely within Canton Township at 300 Caldwell Avenue, Washington, Pennsylvania (Figure 1). In addition to the land area, there are approximately 21 buildings which remain on the site. The site is bounded by two streets in Canton Township—Caldwell Avenue and Green Street. The site is also transversed by Chartiers Creek that flows south to north through the property. The property is served by the CSX Railroad via two lines that were formerly owned by Tylerdale Connecting Railroad Company and the Baltimore and Ohio Railroad (MACTEC 2002b).

Building 32 is 36 meters (m) long by 9 m wide with a 5 m high prefabricated metal structure with a steel frame, corrugated exterior metal walls and roof panels, and a reinforced concrete floor. The building runs from north to south and has a large roll top door at the north end and a personnel door on the east wall at the south end (Figure 2). The building's west wall adjoins to the east wall of Building 28 (Figure 1).

#### **DOCUMENT/DATA REVIEW**

ESSAP reviewed the D&D contractor's survey documentation to determine the adequacy and appropriateness of the final status survey radiological instrumentation and procedures (MACTEC 2002b). The final status survey data for Building 32 was submitted to and reviewed by ESSAP while on-site (MACTEC 2002a).

#### SURVEY PROCEDURES

ESSAP performed confirmatory survey activities for Building 32 at the Molycorp, Washington Facility on April 17, 2002. Survey activities consisted of alpha plus beta surface scans, alpha and beta surface activity measurements, and removable activity measurements. These activities were conducted in accordance with a site-specific survey plan, submitted to and approved by the U.S. Nuclear Regulatory Commission (NRC) and the ORISE/ESSAP Survey Procedures and Quality Assurance Manuals (ORISE 2002a, 2000 and 2001).

The reference grid system, previously established by MACTEC, was used by ESSAP for referencing measurement and sample locations.

ESSAP confirmatory survey coverage was determined by MACTEC's radiological classification of the building—Building 32 was classified as affected. ESSAP initiated alpha plus beta activity scans on accessible floor surfaces—however, due to the number of elevated radiation areas noted by the scans, the scan coverage of the floor was limited and documentation of the elevated areas exceeding guidelines was conducted. Based on an agreement with the licensee and NRC, it was decided that the floor would be considered a separate survey unit from the building shell; therefore ESSAP continued confirmatory survey activities on the building shell. ESSAP performed alpha plus beta scans were performed using gas proportional detectors coupled to ratemeter-scalers with audible indicators.

Alpha and beta surface activity measurements were performed at three locations on the floor, eleven locations on the lower walls, and four locations on the upper walls and ceilings. Direct measurements were performed using gas proportional detectors coupled to ratemeter-scalers. Smear samples, for determining removable activity levels, were collected from each of the direct measurement locations. Measurement locations are shown on Figure 2.

### SAMPLE ANALYSIS AND DATA INTERPRETATION

Samples and survey data were returned to the ORISE/ESSAP laboratory in Oak Ridge, Tennessee for analysis and interpretation. Sample analyses were performed in accordance with the ORISE/ESSAP Laboratory Procedures Manual (ORISE 2002b). Smears were analyzed for gross alpha and gross beta activity using a low-background gas proportional counter. Smear sample results and direct measurement data were reported in units of disintegrations per minute per 100 square centimeters (dpm/100 cm<sup>2</sup>).

#### FINDINGS AND RESULTS

#### **FLOOR**

Alpha plus beta surface scans of the floor identified three areas of elevated alpha plus beta radiation on the northwest side of the building near measurement locations #31A through 33A (Figure 2).

Total and removable surface activity levels for the Building 32 floor are presented in Table 1. Alpha surface activity levels were 340 dpm/100 cm<sup>2</sup> and beta surface activity levels ranged from 3,200 to 28,000 dpm/100 cm<sup>2</sup>. Removable activity levels ranged from 0 to 1 dpm/100 cm<sup>2</sup> for alpha and -5 to 4 dpm/100 cm<sup>2</sup> for beta.

#### **BUILDING SHELL**

Alpha plus beta surface scans of the lower and upper walls and the ceiling identified areas of elevated alpha plus beta radiation on a purlin and on two roof support beams that had not been marked by MACTEC as contaminated. These areas were marked for further investigation and are indicated on Figure 2 as measurement locations #45A, #47A and #48A.

Total and removable surface activity levels for Building 32 lower walls are presented in Table 1. Alpha surface activity levels ranged from 0 to 200 dpm/100 cm<sup>2</sup> and beta surface activity levels ranged from 170 to 1,500 dpm/100 cm<sup>2</sup>. Removable activity levels were 0 dpm/100 cm<sup>2</sup> for alpha and ranged from -6 to 5 dpm/100 cm<sup>2</sup> for beta.

Total and removable surface activity levels for Building 32 upper walls and ceiling are presented in Table 1. Beta surface activity levels ranged from 530 to 19,000 dpm/100 cm<sup>2</sup>. Removable activity levels were 0 dpm/100 cm<sup>2</sup> for alpha and ranged from -1 to 4 dpm/100 cm<sup>2</sup> for beta.

#### **COMPARISON OF RESULTS WITH GUIDELINES**

Survey results were compared with the site's decommissioning criteria. The applicable NRC surface activity guideline levels are (NRC 1987):

### Natural Thorium

1,000 dpm/100 cm<sup>2</sup>, averaged over a 1 m<sup>2</sup> area 3,000 dpm/100 cm<sup>2</sup>, total, maximum in a 100 cm<sup>2</sup> area 200 dpm/100 cm<sup>2</sup>, removable

Natural Uranium

5,000  $\alpha$  dpm/100 cm<sup>2</sup>, averaged over a 1 m<sup>2</sup> area 15,000  $\alpha$  dpm/100 cm<sup>2</sup>, total, maximum in a 100 cm<sup>2</sup> area 1,000  $\alpha$  dpm/100 cm<sup>2</sup>, removable

Thorium is the predominant contaminant and has the more restrictive guideline—therefore, the D&D contractor elected to use the thorium guidelines for the site. Natural thorium emits both alpha and beta radiations, therefore, either alpha or beta activity may be measured for determining the residual activity of the thorium contaminant. As interpreted by the NRC, the average 1,000 dpm/100 cm<sup>2</sup> and maximum 3,000 dpm/100 cm<sup>2</sup> should apply independently to both alpha and beta measurements for surface contamination involving natural thorium (NRC 1992b). ESSAP's experience has shown that beta measurements typically provide a more accurate evaluation of thorium contamination on structure surfaces, due to problems inherent in measuring alpha contamination on rough, porous, and/or dirty surfaces. For the thorium series in secular equilibrium, the activity level providing 1,000 alpha dpm/100 cm<sup>2</sup> would result in about 670 beta dpm/100 cm<sup>2</sup>. Therefore, a beta activity measurement that is greater than 670 dpm/100 cm<sup>2</sup> would exceed the alpha activity guideline for thorium.

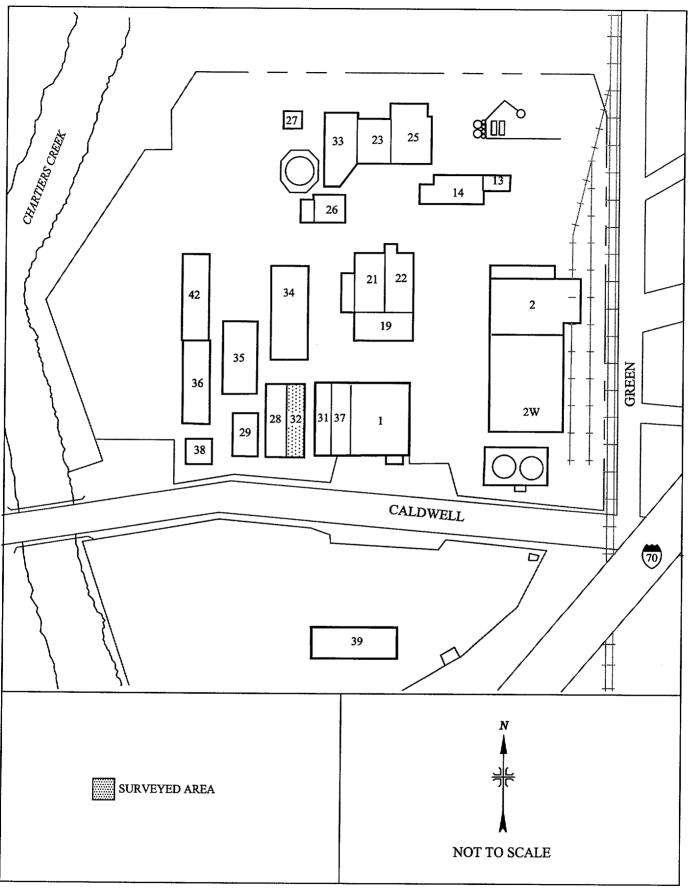
The measurement locations on the floor and on the roof supports (within the accumulated dust and dirt) indicate that elevated activity above the maximum guideline remains within Building 32.

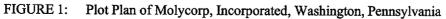
#### **SUMMARY**

On April 17, 2002, the Environmental Survey and Site Assessment Program of the Oak Ridge Institute for Science and Education performed confirmatory survey activities on Building 32 at the Molycorp, Inc. Washington Facility in Washington, Pennsylvania. Survey activities consisted of alpha plus beta and gamma scans and alpha and beta surface activity measurements.

The confirmatory survey identified residual contamination and the data therefore do not support the licensee's conclusion that the radiological conditions of Building 32 satisfy the NRC surface activity guidelines for release to unrestricted use. This report does not address the undersides of the concrete slab floors which will be surveyed by the licensee at a later date.







812-007 (2)

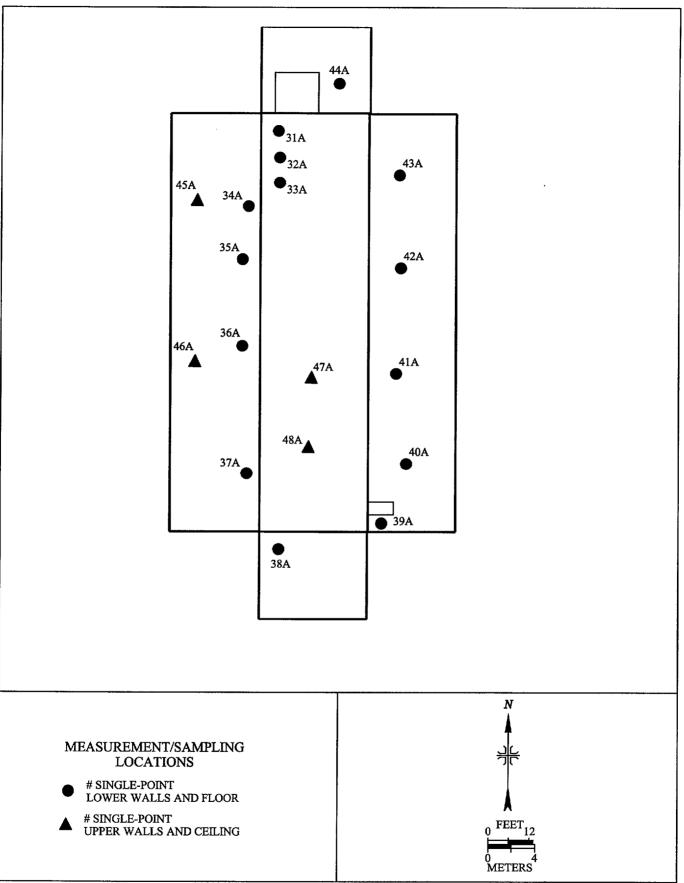


FIGURE 2: Building 32; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

# TABLE 1

# SURFACE ACTIVITY LEVELS BUILDING 32 MOLYCORP INCORPORATED WASHINGTON, PENNSYLVANIA

Location <sup>2</sup>	Surface <sup>b</sup>	Total Activity (dpm/100 cm <sup>2</sup> )		Removable Activity (dpm/100 cm <sup>2</sup> )	
		Alpha	Beta	Alpha	Beta
31A	F	340	3,200	0	-5
32A	F	<sup>c</sup>	5,900	1	4
33A	F		28,000	0	1
34A	LW		340	0	1
35A	LW	0	620	0	-6
36A	LW	56	640	0	1
37A	LW		270	0	-4
38A	LW		170	0	5
39A	LW		910	0	5
40A	LW		510	0	-1
41A	LW	200	760	0	-2
42A	LW		760	0	3
43A	LW	8	1,500	0	1
44A	LW	24	680	0	-3

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Y:/essap/projects/0812/Reports/Building 32.wpd

# TABLE 1 (continued)

# SURFACE ACTIVITY LEVELS BUILDING 32 MOLYCORP INCORPORATED WASHINGTON, PENNSYLVANIA

Location <sup>a</sup>	0. C. h	Total Activity (dpm/100 cm <sup>2</sup> )		Removable Activity (dpm/100 cm <sup>2</sup> )	
	Surface <sup>b</sup>	Alpha	Beta	Alpha	Beta
45A	UW		1,400	0	4
46A	UW		530	0	-1
47A	UW		19,000	0	4
48A	UW		10,000	0	3

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<sup>a</sup>Refer to Figure 2. <sup>b</sup>F = floor; LW = lower wall; and UW = upper wall. <sup>c</sup>Measurement not performed.

## REFERENCES

MACTEC, Inc. (MACTEC). Final Status Survey Report for Buildings 25, 29, 32, 33, 35, 36 and the Soil Sample Storage Room (Bldg 19) at the Molycorp Site, Washington, PA. Grand Junction, Colorado; Revision 0, April 15, 2002a.

MACTEC, Inc. Survey Plan for Determining the Final Status of Buildings at the Molycorp Site, Washington, PA. Grand Junction, Colorado; Revision 0, February 1, 2002b.

Radiological Services, Inc. (RSI). Molycorp, Inc., Washington, PA Facility Decommissioning Plan, Part 1 Revision. New London, Connecticut; June 30, 1999.

Radiological Services, Inc. Radiological Final Status Survey Report Building 39 and 42 (North End), Molycorp, Inc., Washington, PA. New London, Connecticut; December 2001.

Oak Ridge Institute for Science and Education (ORISE). Survey Procedures Manual for the Environmental Survey and Site Assessment Program. Oak Ridge, Tennessee; September 28, 2000.

Oak Ridge Institute for Science and Education. Quality Assurance Manual for the Environmental Survey and Site Assessment Program. Oak Ridge, Tennessee; June 1, 2001.

Oak Ridge Institute for Science and Education. Confirmatory Survey Plan for Building Surveys at Molycorp, Inc., Washington Facility, Washington, Pennsylvania (Docket No. 040-08778, RFTA No. 02-007a). Oak Ridge, Tennessee; April 12, 2002a.

Oak Ridge Institute for Science and Education. Laboratory Procedures Manual for the Environmental Survey and Site Assessment Program. Oak Ridge, Tennessee; January 25, 2002b.

U.S. Nuclear Regulatory Commission (NRC). Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproducts, Source, or Special Nuclear Material. Washington, DC; August 1987.

U. S. Nuclear Regulatory Commission. Draft—Manual for Conducting Radiological Surveys in Support of License Termination. NUREG/CR-5849; Washington, DC; June 1992a.

U.S. Nuclear Regulatory Commission. Memorandum from J. Hickey (U.S. Nuclear Regulatory Commission, HQ) to D. Collins (U.S. Nuclear Regulatory Commission, Region II), RE: "Interpretation of Thorium Surface Contamination Limits", February 20, 1992b.

OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

May 20, 2002

Mr. Thomas G. McLaughlin U.S. Nuclear Regulatory Commission Division of Waste Management 11555 Rockville Pike Mail Stop: T-7F27 Rockville, MD 20852

## SUBJECT: LETTER REPORT—CONFIRMATORY SURVEY OF BUILDING 33, MOLYCORP, INC., WASHINGTON FACILITY, WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-007a)

Dear Mr. McLaughlin:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) performed confirmatory survey activities at the subject facility on April 17 and 18, 2002. Enclosed for the letter report describing the survey procedures and results.

Please contact me at (865) 576-0065 or Timothy J. Vitkus at (865) 576-5073 should you have any questions or require additional information.

Sincerely.

Wade C. Adams Project Leader/Health Physicist Environmental Survey and Site Assessment Program

WCA:ar

Enclosure

cc: G. Purdy, NRC/NMSS/TWFN 7F27 E. Knox-Davin, NRC/NMSS/TWFN 8A23 C. Gordon, NRC/Region I W. Beck, ORISE/ESSAP T. Vitkus, ORISE/ESSAP E. Abelquist, ORISE/ESSAP D. Condra, ORISE/ESSAP File/812

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## LETTER REPORT CONFIRMATORY SURVEY OF BUILDING 33 MOLYCORP, INC., WASHINGTON FACILITY WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-007a)

## **INTRODUCTION AND SITE HISTORY**

Since the mid 1920s, Molybdenum Corporation of America (Molycorp) operated a plant in Washington, Pennsylvania for the primary production of molybdenum products—the plant also produced ferro alloys such as ferrocolumbium and tungsten. The raw material for this ferrocolumbium operation, columbite ore, contained natural thorium.

In the late 1960s, new federal requirements necessitated that Molycorp obtain a Source Material License (SMB-1393, Docket No. 040-8778) from the Atomic Energy Commission (AEC) for possession and use of materials containing 0.05% or greater by weight, uranium, thorium, or a combination of both. Most of the material that was processed by the corporation for the ferrocolumbium contained 1 to 1.5% thorium. The slag resulting from this production was in a glass/ceramic form containing an average of 1.2% thorium. Operations that using thorium-containing ores were discontinued about 1970 (RSI 2001).

Molycorp renewed its Source Material License (SMB-1393) in 1992 and added an amendment incorporating a schedule for decommissioning the site. In November 1992, Molycorp submitted a site characterization plan to the NRC for approval—the scope of the survey plan was limited to buildings and structures on the Molycorp site and did not include the soil.

Currently, there are 21 buildings on the site for which decommissioning activities are being performed. All have been characterized for radiological contamination. As part of the decommissioning activities, process equipment and supporting fixtures were removed, cleaned, and released or disposed of as low-level radioactive waste. Potentially contaminated structural surfaces were stripped of coatings by grit blasting or use of chemical agents. Contaminated surfaces identified by the characterization survey were cleaned or removed. These remediation activities were performed under the Decommissioning Plan for the Washington, PA Facility which implemented

final status survey guidance from draft NUREG/CR-5849 (RSI 1999 and NRC 1992a). Soil areas located underneath and around the buildings have not been addressed and are radioactively contaminated.

Molycorp has submitted the final status survey results for Building 33. Although there was no history of radiological materials present within this building, as previously mentioned, the underlying soils are contaminated. The top surfaces of the floors were expected to be clean and were classified as unaffected—however, the undersides of the concrete floors that are in contact with the soil will require survey prior to release (RSI 2001).

The NRC's Division of Waste Management has requested that the Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) perform confirmatory survey activities on buildings at the Molycorp, Inc. Washington Facility, in Washington, Pennsylvania for which the licensee and their current decontamination and decommissioning (D&D) contractor, MACTEC, have prepared final status survey reports.

## SITE DESCRIPTION

The Molycorp, Inc., Washington Site is located in southwestern Pennsylvania on the outskirts of Washington County approximately 56 kilometers (35 miles) southwest of Pittsburgh. The site consists of approximately 8 hectares [ha (20 acres)] which represents the fenced portion of the 24 ha parcel of land owned by Molycorp that lies entirely within Canton Township at 300 Caldwell Avenue, Washington, Pennsylvania (Figure 1). In addition to the land area, there are approximately 21 buildings which remain on the site. The site is bounded by two streets in Canton Township—Caldwell Avenue and Green Street. The site is also transversed by Chartiers Creek that flows south to north through the property. The property is served by the CSX Railroad via two lines that were formerly owned by Tylerdale Connecting Railroad Company and the Baltimore and Ohio Railroad (MACTEC 2002a).

Building 33 is approximately 36 meters (m) long by 18 m wide with a 5 m high prefabricated metal structure with a steel frame, corrugated exterior metal walls and roof panels and a reinforced

concrete floor. The building runs from north to south and has large roll top doors on the south and east sides and personnel doors on the east side. The east side opens into the west side of Building 23.

### **DOCUMENT/DATA REVIEW**

ESSAP reviewed the D&D contractor's survey documentation to determine the adequacy and appropriateness of the final status survey radiological instrumentation and procedures (MACTEC 2002a). The final status survey data for Building 33 was submitted to and reviewed by ESSAP while on-site (MACTEC 2002b).

#### SURVEY PROCEDURES

ESSAP performed confirmatory survey activities for Building 33 at the Molycorp, Washington Facility on April 17 and 18, 2002. Survey activities consisted of alpha plus beta surface scans, alpha and beta surface activity measurements and removable activity measurements. These activities were conducted in accordance with a site-specific survey plan, submitted to and approved by the U.S. Nuclear Regulatory Commission (NRC) and the ORISE/ESSAP Survey Procedures and Quality Assurance Manuals (ORISE 2002a, 2000 and 2001).

The reference grid system, previously established by MACTEC, was used by ESSAP for referencing measurement and sample locations.

ESSAP confirmatory survey coverage was determined by MACTEC's radiological classification of the building—Building 33 was classified as unaffected. ESSAP conducted alpha plus beta activity scans on up to 25% of the lower wall surfaces, up to 10% of the upper wall surfaces, and up to 10% of the exterior wall surfaces for Building 33. Alpha plus beta surface scans were performed using gas proportional detectors coupled to ratemeter-scalers with audible indicators.

Alpha and beta surface activity measurements were performed at eight locations on the lower walls, six locations on the upper walls, one location on an exhaust fan (at measurement location #51A), and

five locations on the exterior walls. ESSAP performed beta-only activity measurements at each of the direct measurement locations and alpha activity measurements at 40 percent of the direct measurement locations. Direct measurements were performed using gas proportional detectors coupled to ratemeter-scalers. Smear samples, for determining removable activity levels, were collected from each direct measurement location. Measurement locations are shown on Figure 2.

### SAMPLE ANALYSIS AND DATA INTERPRETATION

Samples and survey data were returned to the ORISE/ESSAP laboratory in Oak Ridge, Tennessee for analysis and interpretation. Sample analyses were performed in accordance with the ORISE/ESSAP Laboratory Procedures Manual (ORISE 2002b). Smears were analyzed for gross alpha and gross beta activity using a low-background gas proportional counter. Smear sample results and direct measurement data were reported in units of disintegrations per minute per 100 square centimeters (dpm/100 cm<sup>2</sup>).

#### FINDINGS AND RESULTS

Alpha plus beta surface scans of the lower walls identified two areas of elevated radiation on the purloins along the east wall and at three locations along the north wall. These locations were marked for further investigation.

Total and removable surface activity levels for Building 33 are presented in Table 1. Alpha surface activity levels ranged from 0 to 120 dpm/100 cm<sup>2</sup> and beta surface activity levels ranged from -280 to 730 dpm/100 cm<sup>2</sup>. Removable activity levels ranged from 0 to 5 dpm/100 cm<sup>2</sup> for alpha and -6 to 10 dpm/100 cm<sup>2</sup> for beta.

## **COMPARISON OF RESULTS WITH GUIDELINES**

Survey results were compared with the site's decommissioning criteria. The applicable NRC surface activity guideline levels are (NRC 1987):

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#### Natural Thorium

1,000 dpm/100 cm<sup>2</sup>, averaged over a 1 m<sup>2</sup> area 3,000 dpm/100 cm<sup>2</sup>, total, maximum in a 100 cm<sup>2</sup> area 200 dpm/100 cm<sup>2</sup>, removable

Natural Uranium

5,000  $\alpha$  dpm/100 cm<sup>2</sup>, averaged over a 1 m<sup>2</sup> area 15,000  $\alpha$  dpm/100 cm<sup>2</sup>, total, maximum in a 100 cm<sup>2</sup> area 1,000  $\alpha$  dpm/100 cm<sup>2</sup>, removable

Thorium is the predominant contaminant and has the more restrictive guideline—therefore, the D&D contractor elected to use the thorium guidelines for the site. Natural thorium emits both alpha and beta radiations, therefore, either alpha or beta activity may be measured for determining the residual activity of the thorium contaminant. As interpreted by the NRC, the average 1,000 dpm/100 cm<sup>2</sup> and maximum 3,000 dpm/100 cm<sup>2</sup> should apply independently to both alpha and beta measurements for surface contamination involving natural thorium (NRC 1992b). ESSAP's experience has shown that beta measurements typically provide a more accurate evaluation of thorium contamination on structure surfaces, due to problems inherent in measuring alpha contamination on rough, porous, and/or dirty surfaces. For the thorium series in secular equilibrium, the activity level providing 1,000 alpha dpm/100 cm<sup>2</sup> would result in about 670 beta dpm/100 cm<sup>2</sup>. Therefore, a beta activity measurement that is greater than 670 dpm/100 cm<sup>2</sup> would exceed the alpha activity guideline for thorium.

All measurement locations on the lower, upper, and exterior walls met the guidelines.

#### SUMMARY

During the period of April 17 and 18, 2002, the Environmental Survey and Site Assessment Program of the Oak Ridge Institute for Science and Education performed confirmatory survey activities on

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Building 33 at the Molycorp, Inc. Washington Facility in Washington, Pennsylvania. Survey activities consisted of alpha plus beta scans and alpha and beta surface activity measurements.

Survey results indicated that fixed and removable activity levels were less than the applicable guidelines. ESSAP's survey findings are consistent with the licensee's measurements and support the licensee's conclusion that the radiological conditions of the surveyed areas in Building 33 satisfy the NRC guidelines for release to unrestricted use. This report does not address the undersides of the concrete slab floor which will be surveyed by the licensee at a later date. Exposure rate measurements were also not performed.

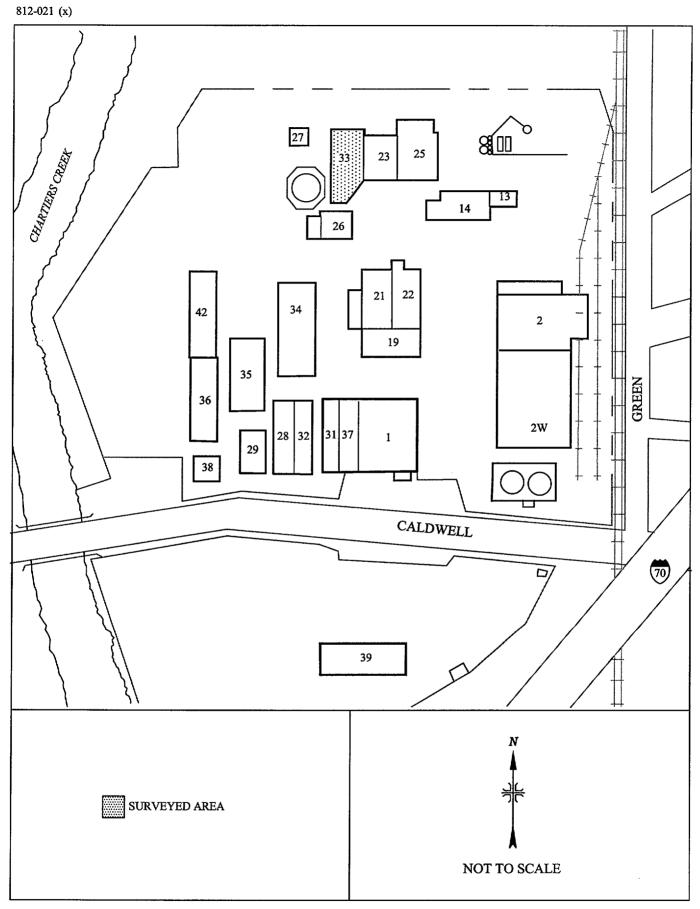


FIGURE 1: Plot Plan of Molycorp, Incorporated, Washington, Pennsylvania

812-008 (2)

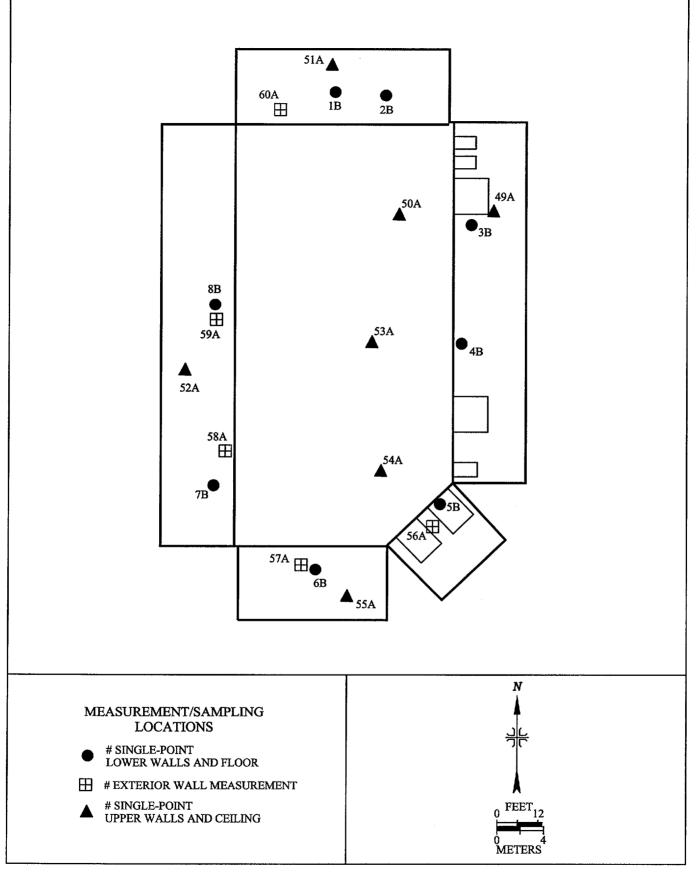


FIGURE 2: Building 33; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

## TABLE 1

# SURFACE ACTIVITY LEVELS BUILDING 33 MOLYCORP INCORPORATED WASHINGTON, PENNSYLVANIA

Location <sup>a</sup>		Total Activity (dpm/100 cm <sup>2</sup> )		Removable Activity (dpm/100 cm <sup>2</sup> )	
	Surface <sup>b</sup>	Alpha	Beta	Alpha	Beta
49A	UW	<sup>c</sup>	590	1	6
50A	UW		250	0	2
51A	Е		730 <sup>d</sup>	0	-1
52A	UW		490	0	6
53A	UW		290	0	10
54A	UW		440	5	3
55A	UW		440	0	1
56A	EW		-230	0	1
57A	EW		150	0	-3
58A	EW		-210	0	4
59A	EW		79	0	2
60A	EW		390	0	1
1B	LW	9	130 <sup>d</sup>	0	-2
2B	LW	44	310 <sup>d</sup>	0	2

## TABLE 1 (continued)

# SURFACE ACTIVITY LEVELS BUILDING 33 MOLYCORP INCORPORATED WASHINGTON, PENNSYLVANIA

Location <sup>a</sup>	Surface <sup>b</sup>	Total Activity (dpm/100 cm <sup>2</sup> )		Removable Activity (dpm/100 cm <sup>2</sup> )	
		Alpha	Beta	Alpha	Beta
3B	LW	44	-76	1	1
4B	LW	120	620	0	-1
5B	LW	9	100	1	1
6B	LW	35	230	0	-1
7B	LW	0	26	1	-6
8B	LW	9	-4	0	-2

\*Refer to Figure 2.

<sup>b</sup>LW = lower wall; UW = upper wall; EW = exterior wall; and E = equipment.

"Measurement not performed.

<sup>d</sup>Due to elevated ambient gamma radiation from contaminated soil and/or adjacent contaminated I-beams, these measurements were calculated by determining the difference between unshielded and shielded beta activity measurements with Net Count Rates determined as follows: Net Count Rate=(Surface Counts<sub>unshielded</sub>-Surface Counts<sub>shielded</sub>)-(BKG Counts<sub>shielded</sub>).

### REFERENCES

MACTEC, Inc. (MACTEC). Survey Plan for Determining the Final Status of Buildings at the Molycorp Site, Washington, PA. Grand Junction, Colorado; Revision 0, February 1, 2002a.

MACTEC, Inc. Final Status Survey Report for Buildings 25, 29, 32, 33, 35, 36 and the Soil Sample Storage Room (Bldg 19) at the Molycorp Site, Washington, PA. Grand Junction, Colorado; Revision 0, April 15, 2002b.

Radiological Services, Inc. (RSI). Molycorp, Inc., Washington, PA Facility Decommissioning Plan, Part 1 Revision. New London, Connecticut; June 30, 1999.

Radiological Services, Inc. Radiological Final Status Survey Report Building 39 and 42 (North End), Molycorp, Inc., Washington, PA. New London, Connecticut; December 2001.

Oak Ridge Institute for Science and Education (ORISE). Survey Procedures Manual for the Environmental Survey and Site Assessment Program. Oak Ridge, Tennessee; September 28, 2000.

Oak Ridge Institute for Science and Education. Quality Assurance Manual for the Environmental Survey and Site Assessment Program. Oak Ridge, Tennessee; June 1, 2001.

Oak Ridge Institute for Science and Education. Confirmatory Survey Plan for Building Surveys at Molycorp, Inc., Washington Facility, Washington, Pennsylvania (Docket No. 040-08778, RFTA No. 02-007a). Oak Ridge, Tennessee; April 12, 2002a.

Oak Ridge Institute for Science and Education. Laboratory Procedures Manual for the Environmental Survey and Site Assessment Program. Oak Ridge, Tennessee; January 25, 2002b.

U.S. Nuclear Regulatory Commission (NRC). Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproducts, Source, or Special Nuclear Material. Washington, DC; August 1987.

U. S. Nuclear Regulatory Commission. Draft—Manual for Conducting Radiological Surveys in Support of License Termination. NUREG/CR-5849; Washington, DC; June 1992a.

U.S. Nuclear Regulatory Commission. Memorandum from J. Hickey (U.S. Nuclear Regulatory Commission, HQ) to D. Collins (U.S. Nuclear Regulatory Commission, Region II), RE: "Interpretation of Thorium Surface Contamination Limits", February 20, 1992b.

OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

May 20, 2002

Mr. Thomas G. McLaughlin U.S. Nuclear Regulatory Commission Division of Waste Management 11555 Rockville Pike Mail Stop: T-7F27 Rockville, MD 20852

## SUBJECT: LETTER REPORT—CONFIRMATORY SURVEY OF BUILDING 34, MOLYCORP, INC., WASHINGTON FACILITY, WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-007a)

Dear Mr. McLaughlin:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) performed confirmatory survey activities at the subject facility on April 16 and 18, 2002. Enclosed is the letter report describing the survey procedures and results.

Please contact me at (865) 576-0065 or Timothy J. Vitkus at (865) 576-5073 should you have any questions or require additional information.

Sincerely.

Wade C. Adams Project Leader/Health Physicist Environmental Survey and Site Assessment Program

WCA:ar

Enclosure

cc: G. Purdy, NRC/NMSS/TWFN 7F27 E. Knox-Davin, NRC/NMSS/TWFN 8A23 C. Gordon, NRC/Region I W. Beck, ORISE/ESSAP T. Vitkus, ORISE/ESSAP E. Abelquist, ORISE/ESSAP D. Condra, ORISE/ESSAP File/812

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## LETTER REPORT CONFIRMATORY SURVEY OF BUILDING 34 MOLYCORP, INC., WASHINGTON FACILITY WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-007a)

### **INTRODUCTION AND SITE HISTORY**

Since the mid 1920s, Molybdenum Corporation of America (Molycorp) operated a plant in Washington, Pennsylvania for the primary production of molybdenum products—the plant also produced ferro alloys such as ferrocolumbium and tungsten. The raw material for this ferrocolumbium operation, columbite ore, contained natural thorium.

In the late 1960s, new federal requirements necessitated that Molycorp obtain a Source Material License (SMB-1393, Docket No. 040-8778) from the Atomic Energy Commission (AEC) for possession and use of materials containing 0.05% or greater by weight, uranium, thorium, or a combination of both. Most of the material that was processed by the corporation for the ferrocolumbium contained 1 to 1.5% thorium. The slag resulting from this production was in a glass/ceramic form containing an average of 1.2% thorium. Operations using thorium-containing ores were discontinued about 1970 (RSI 2001).

Molycorp renewed its Source Material License (SMB-1393) in 1992 and added an amendment incorporating a schedule for decommissioning the site. In November 1992, Molycorp submitted a site characterization plan to the NRC for approval—the scope of the survey plan was limited to buildings and structures on the Molycorp site and did not include the soil.

Currently, there are 21 buildings on the site for which decommissioning activities are being performed. All have been characterized for radiological contamination. As part of the decommissioning activities, process equipment and supporting fixtures were removed, cleaned, and released or disposed of as low-level radioactive waste. Potentially contaminated structural surfaces were stripped of coatings by grit blasting or use of chemical agents. Contaminated surfaces identified by the characterization survey were cleaned or removed. These remediation activities were performed under the Decommissioning Plan for the Washington, PA Facility which implemented

final status survey guidance from draft NUREG/CR-5849 (RSI 1999 and NRC 1992a). Soil areas located underneath and around the buildings have not been addressed and are radioactively contaminated.

Molycorp has submitted the final status survey results for Building 34. Although there was no history of radiological materials present within this building, as previously mentioned, the soils are contaminated. The top surfaces of the floors were expected to be clean and were classified as unaffected—however, the undersides of the concrete floors that are in contact with the soil will require survey prior to release (RSI 2001).

The NRC's Division of Waste Management has requested that the Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) perform confirmatory survey activities on buildings at the Molycorp, Inc. Washington Facility for which the licensee and their current decontamination and decommissioning (D&D) contractor, MACTEC, have prepared final status survey reports.

#### SITE DESCRIPTION

The Molycorp, Inc., Washington Site is located in southwestern Pennsylvania on the outskirts of Washington County approximately 56 kilometer (35 miles) southwest of Pittsburgh. The site consists of approximately 8 hectares [ha (20 acres)] which represents the fenced portion of the 24 ha parcel of land owned by Molycorp that lies entirely within Canton Township at 300 Caldwell Avenue, Washington, Pennsylvania (Figure 1). In addition to the land area, there are approximately 21 buildings which remain on the site. The site is bounded by two streets in Canton Township—Caldwell Avenue and Green Street. The site is also transversed by Chartiers Creek that flows south to north through the property. The property is served by the CSX Railroad via two lines that were formerly owned by Tylerdale Connecting Railroad Company and the Baltimore and Ohio Railroad (MACTEC 2002a).

Building 34, a building which housed equipment used in several types of burns, is approximately 36 meters (m) long by 18 m wide with an approximately 8 m high metal frame and truss structure with

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exterior corrugated metal walls and roof panels, and a concrete slab floor. The building runs from north to south and has large roll top doors on all sides and personnel doors on the north, east and south sides. A dirt/sand burn pit is centered in the building along the west wall (Figure 2).

### **DOCUMENT/DATA REVIEW**

ESSAP reviewed the D&D contractor's survey documentation to determine the adequacy and appropriateness of the final status survey radiological instrumentation and procedures (MACTEC 2002a). ESSAP also reviewed the final status survey data for Building 34, when classified as unaffected, prior to visiting the site (MACTEC 2002b). The revised final status survey data for the lower and upper walls, after the classification change to affected, was also reviewed while on-site. ESSAP was not able to determine if these data included metal I-beams and roof supports.

#### SURVEY PROCEDURES

ESSAP performed confirmatory survey activities for Building 34 at the Molycorp, Washington Facility on April 16 and 18, 2002. Survey activities consisted of alpha plus beta and gamma surface scans, alpha and beta surface activity measurements, and removable activity measurements. These activities were conducted in accordance with a site-specific survey plan, submitted to and approved by the U.S. Nuclear Regulatory Commission (NRC), and the ORISE/ESSAP Survey Procedures and Quality Assurance Manuals (ORISE 2002a, 2000 and 2001).

The reference grid system, previously established by MACTEC, was used by ESSAP for referencing measurement and sample locations.

ESSAP confirmatory survey coverage was determined by MACTEC's radiological classification of the building—Building 34 was originally classified as unaffected. However during the initial survey activities, contamination exceeding the guidelines was found on the floor surface near the wall/burn pit interface. ESSAP personnel discontinued survey activities within the building as it no longer met NUREG/CR-5849 classification guidance for unaffected areas. The building's classification was changed from unaffected to affected and MACTEC personnel performed affected area final status

survey activities on the building's shell—it was decided by MACTEC, with NRC concurrence, that the concrete floor slab final status surveys would be performed at a later date (MACTEC 2002b). After the reclassification of the building, ESSAP conducted alpha plus beta activity scans on up to 50% of the lower wall surfaces, up to 5% of the upper wall and exterior wall surfaces, and up to 5% on the accessible equipment surfaces. Alpha plus beta surface scans were performed using gas proportional detectors coupled to ratemeter-scalers with audible indicators. Gamma surface scans were not performed on the floor surfaces since the floor was excluded from the confirmatory survey activities.

Alpha and beta surface activity measurements were performed at eight locations on the floor prior to (and resulting in) the classification change. After the classification change of the building's floor and walls (the equipment classification was not changed by MACTEC), beta surface activity measurements were performed at four locations on the lower walls, eight locations on the upper walls and ceiling, five locations on the exterior walls and six locations on equipment surfaces. ESSAP performed beta activity measurements at each measurement location and alpha activity measurements at each of the eight floor direct measurement locations. Direct measurements were performed using gas proportional detectors coupled to ratemeter-scalers. Smear samples, for determining removable activity levels, were collected from each direct measurement location. Measurement locations are shown on Figure 2.

#### SAMPLE ANALYSIS AND DATA INTERPRETATION

Samples and survey data were returned to the ORISE/ESSAP laboratory in Oak Ridge, Tennessee for analysis and interpretation. Sample analyses were performed in accordance with the ORISE/ESSAP Laboratory Procedures Manual (ORISE 2002b). Smears were analyzed for gross alpha and gross beta activity using a low-background gas proportional counter. Smear sample results and direct measurement data were reported in units of disintegrations per minute per 100 square centimeters (dpm/100 cm<sup>2</sup>).

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### FINDINGS AND RESULTS

#### FLOOR

Alpha plus beta surface scans of the floor, prior to the classification change, identified an area of elevated alpha plus beta radiation on the west side of the building near measurement locations #40, #41 and #42A (Figure 2).

Total and removable surface activity levels for Building 34 floor are presented in Table 1. Alpha surface activity levels ranged from -16 to 320 dpm/100 cm<sup>2</sup> and beta surface activity levels ranged from -30 to 5,300 dpm/100 cm<sup>2</sup>. Removable activity levels ranged from 0 to 1 dpm/100 cm<sup>2</sup> for alpha and -4 to 7 dpm/100 cm<sup>2</sup> for beta. Due to these findings, the building was reclassified by MACTEC as affected; additional confirmatory surveys were not performed on Building 34 floors while ESSAP was on-site since MACTEC was not able to resurvey the floors under their affected area survey procedures prior to ESSAP personnel leaving the site.

### **BUILDING SHELL**

Alpha plus beta surface scans of the lower, upper and exterior walls and the ceiling, performed after the classification change to affected, identified areas of elevated alpha plus beta radiation on the roof support beams at measurement locations #62A through #68A (Figure 2). These areas were marked for further investigation.

Total and removable surface activity levels for Building 34 walls and ceiling are presented in Table 1. Beta surface activity levels ranged from 63 to 2,100 dpm/100 cm<sup>2</sup>. Removable activity levels ranged from 0 to 1 dpm/100 cm<sup>2</sup> for alpha and -3 to 19 dpm/100 cm<sup>2</sup> for beta.

## EQUIPMENT

Although MACTEC changed the classification of Building 34 to affected, MACTEC did not perform affected area final status survey activities on equipment surfaces. Therefore, ESSAP personnel performed cursory survey activities on the equipment surfaces. Limited alpha plus beta surface scans of the equipment did not identify any areas of elevated alpha plus beta radiation on the surveyed equipment surfaces.

Total and removable surface activity levels for Building 34 equipment surfaces are presented in Table 1. Beta surface activity levels ranged from -41 to 430 dpm/100 cm<sup>2</sup>. Removable activity levels ranged from 0 to 1 dpm/100 cm<sup>2</sup> for alpha and -4 to 8 dpm/100 cm<sup>2</sup> for beta.

## **COMPARISON OF RESULTS WITH GUIDELINES**

Survey results were compared with the site's decommissioning criteria. The applicable NRC surface activity guideline levels are (NRC 1987):

Natural Thorium

1,000 dpm/100 cm<sup>2</sup>, averaged over a 1 m<sup>2</sup> area 3,000 dpm/100 cm<sup>2</sup>, total, maximum in a 100 cm<sup>2</sup> area 200 dpm/100 cm<sup>2</sup>, removable

Natural Uranium

 $5,000 \alpha \text{ dpm}/100 \text{ cm}^2$ , averaged over a 1 m<sup>2</sup> area 15,000  $\alpha \text{ dpm}/100 \text{ cm}^2$ , total, maximum in a 100 cm<sup>2</sup> area 1,000  $\alpha \text{ dpm}/100 \text{ cm}^2$ , removable

Thorium is the predominant contaminant and has the more restrictive guideline—therefore, the D&D contractor elected to use the thorium guidelines for the site. Natural thorium emits both alpha and beta radiations, therefore, either alpha or beta activity may be measured for determining the residual activity of the thorium contaminant. As interpreted by the NRC, the average 1,000 dpm/100 cm<sup>2</sup> and maximum 3,000 dpm/100 cm<sup>2</sup> should apply independently to both alpha and beta measurements for surface contamination involving natural thorium (NRC 1992b). ESSAP's experience has shown that beta measurements typically provide a more accurate evaluation of thorium contamination on structure surfaces, due to problems inherent in measuring alpha contamination on rough, porous,

and/or dirty surfaces. For the thorium series in secular equilibrium, the activity level providing 1,000 alpha dpm/100 cm<sup>2</sup> would result in about 670 beta dpm/100 cm<sup>2</sup>. Therefore, a beta activity measurement that is greater than 670 dpm/100 cm<sup>2</sup> would exceed the alpha activity guideline for thorium.

Measurement locations on the floor along the west wall in the vicinity of the burn pit had total beta activity levels well in excess of the maximum guideline criteria at locations #41 and #42 (Figure 2). The floor does not meet the guidelines.

Measurement locations of the lower and exterior walls satisfy the NRC surface activity guidelines for release to unrestricted use. However, five of the eight measurement locations on the horizontal portions of the roof support beams had total beta activity levels in excess of the average guideline. These locations were picked at random and indicate that elevated activity above the average guideline remains on the roof support surfaces within the accumulated dust and dirt. Averaging for  $1 \text{ m}^2$  areas was not performed on the roof support beams.

### SUMMARY

On April 16 and 18, 2002, the Environmental Survey and Site Assessment Program of the Oak Ridge Institute for Science and Education performed confirmatory survey activities on Building 34 at the Molycorp, Inc. Washington Facility in Washington, Pennsylvania. Survey activities consisted of alpha plus beta scans and alpha and beta surface activity measurements.

Survey results indicated that fixed and removable activity levels for the floor exceeded the applicable guidelines. ESSAP's survey findings for the floor warranted the reclassification of the building according to NUREG/CR-5849 guidance. Due to the findings, MACTEC reclassified the building as affected and performed affected area survey activities on the lower and upper walls and asked ESSAP to perform affected area confirmatory survey activities on the building shell and equipment. ESSAP recommended that affected area final status surveys also be performed on the equipment, but this was not done by MACTEC. It was decided that the floors would receive the affected area final status surveys at a later date. Confirmatory survey findings indicated that elevated beta activity

above the average guideline remains within the dust/dirt on the horizontal building roof support beams—the review of the revised final status survey data package for the lower and upper walls does not indicate if roof support or I-beam surfaces were surveyed. Based on this, the confirmatory survey data do not support the licensee's conclusion that the radiological conditions of the surveyed areas in Building 34 satisfy the NRC surface activity guidelines for release to unrestricted use. This report does not address the undersides of the concrete slab floors which will be surveyed by the licensee at a later date.

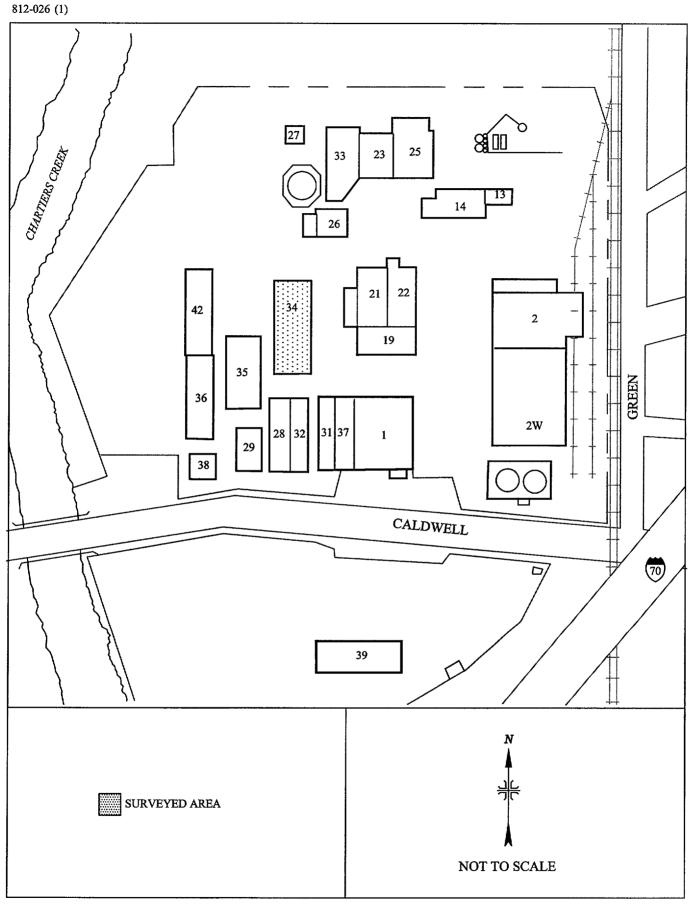


FIGURE 1: Plot Plan of Molycorp, Incorporated, Washington, Pennsylvania



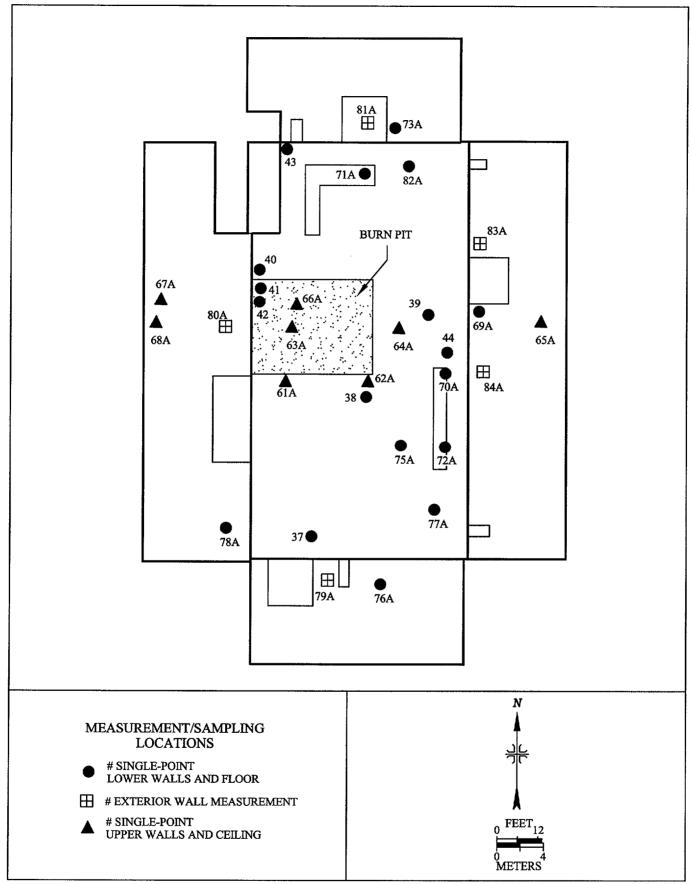


FIGURE 2: Building 34; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

# TABLE 1

# SURFACE ACTIVITY LEVELS BUILDING 34 MOLYCORP INCORPORATED WASHINGTON, PENNSYLVANIA

Location <sup>a</sup>	Constant b	Total Activity (dpm/100 cm <sup>2</sup> )		Removable Activity (dpm/100 cm <sup>2</sup> )	
Location <sup>a</sup>	Surface <sup>b</sup>	Alpha	Beta	Alpha	Beta
37	F	-16	170°	1	-2
38	F	-8	-23°	0	7
39	F	16	-30°	0	3
40	F	240	2,400°	0	-3
41	F	320	4,800 <sup>c</sup>	0	4
42	F	300	5,300°	1	1
43	F	48	8°	0	-4
44	F	24	190°	0	-1
61A	UW	<sup>d</sup>	590	0	2
62A	UW		1,700°		
63A	UW		1,300°		
64A	UW		880°		
65A	UW		1,900°		
66A	UW		2,100		
67A	UW		950		

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Y:/essap/projects/0812/Reports/Building 34.wpd

# TABLE 1 (continued)

# SURFACE ACTIVITY LEVELS BUILDING 34 MOLYCORP INCORPORATED WASHINGTON, PENNSYLVANIA

Location <sup>a</sup>	Same Carach	Total Activity (dpm/100 cm <sup>2</sup> )		Removable Activity (dpm/100 cm <sup>2</sup> )	
	Surface <sup>b</sup>	Alpha	Beta	Alpha	Beta
68A	UW		1,800		
69A	LW		310	1	6
70A	E		79	0	-3
71A	E		430	1	1
72A	E		41	0	1
73A	LW		180	1	-2
75A	Е		310	0	8
76A	LW		95	1	4
77A	E		-41	1	-4
78A	LW		63	1	-2
79A	EW		340	1	19
80A	EW		520	0	2
81A	EW		400	1	-3

## **TABLE 1 (continued)**

# SURFACE ACTIVITY LEVELS BUILDING 34 MOLYCORP INCORPORATED WASHINGTON, PENNSYLVANIA

Location <sup>2</sup>	Groufe ash	Total Activity (dpm/100 cm <sup>2</sup> )		Removable Activity (dpm/100 cm <sup>2</sup> )	
	Surface <sup>b</sup>	Alpha	Beta	Alpha	Beta
82A	E ·		16	0	-1
83A	EW		340	0	-2
84A	EW		420	0	1

\*Refer to Figure 2.

<sup>b</sup>F = floor; LW = lower wall; UW = upper wall; EW = exterior wall; and E = equipment.

<sup>6</sup>Due to elevated ambient gamma radiation from contaminated soils and/or contaminated I-beams, these measurements were calculated by determining the difference between unshielded and shielded beta activity measurements with Net Count Rates determined as follows: Net Count Rate=(Surface Counts<sub>unshielded</sub>-Surface Counts<sub>shielded</sub>)-(BKG Counts<sub>unshielded</sub>-BKG Counts<sub>shielded</sub>). <sup>d</sup>Measurement not performed.

### REFERENCES

MACTEC, Inc. (MACTEC). Survey Plan for Determining the Final Status of Buildings at the Molycorp Site, Washington, PA. Grand Junction, Colorado; Revision 0, February 1, 2002a.

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U.S. Nuclear Regulatory Commission (NRC). Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproducts, Source, or Special Nuclear Material. Washington, DC; August 1987.

U. S. Nuclear Regulatory Commission. Draft—Manual for Conducting Radiological Surveys in Support of License Termination. NUREG/CR-5849; Washington, DC; June 1992a.

U.S. Nuclear Regulatory Commission. Memorandum from J. Hickey (U.S. Nuclear Regulatory Commission, HQ) to D. Collins (U.S. Nuclear Regulatory Commission, Region II), RE: "Interpretation of Thorium Surface Contamination Limits", February 20, 1992b.

OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

May 20, 2002

Mr. Thomas G. McLaughlin U.S. Nuclear Regulatory Commission Division of Waste Management 11555 Rockville Pike Mail Stop: T-7F27 Rockville, MD 20852

## SUBJECT: LETTER REPORT—CONFIRMATORY SURVEY OF BUILDING 35, MOLYCORP, INC., WASHINGTON FACILITY, WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-007a)

Dear Mr. McLaughlin:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) performed confirmatory survey activities at the subject facility on April 16 and 17, 2002. Enclosed is the letter report describing the survey procedures and results.

Please contact me at (865) 576-0065 or Timothy J. Vitkus at (865) 576-5073 should you have any questions or require additional information.

Sincerely.

Wade C. Adams Project Leader/Health Physicist Environmental Survey and Site Assessment Program

WCA:ar

Enclosure

cc: G. Purdy, NRC/NMSS/TWFN 7F27
E. Knox-Davin, NRC/NMSS/TWFN 8A23
C. Gordon, NRC/Region I
W. Beck, ORISE/ESSAP

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## LETTER REPORT CONFIRMATORY SURVEY OF BUILDING 35 MOLYCORP, INC., WASHINGTON FACILITY WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-007a)

## **INTRODUCTION AND SITE HISTORY**

Since the mid 1920s, Molybdenum Corporation of America (Molycorp) operated a plant in Washington, Pennsylvania for the primary production of molybdenum products—the plant also produced ferro alloys such as ferrocolumbium and tungsten. The raw material for this ferrocolumbium operation, columbite ore, contained natural thorium.

In the late 1960s, new federal requirements necessitated that Molycorp obtain a Source Material License (SMB-1393, Docket No. 040-8778) from the Atomic Energy Commission (AEC) for possession and use of materials containing 0.05% or greater by weight, uranium, thorium, or a combination of both. Most of the material that was processed by the corporation for the ferrocolumbium contained 1 to 1.5% thorium. The slag resulting from this production was in a glass/ceramic form containing an average of 1.2% thorium. Operations using thorium-containing ores were discontinued about 1970 (RSI 2001).

Molycorp renewed its Source Material License (SMB-1393) in 1992 and added an amendment incorporating a schedule for decommissioning the site. In November 1992, Molycorp submitted a site characterization plan to the NRC for approval—the scope of the survey plan was limited to buildings and structures on the Molycorp site and did not include the soil.

Currently, there are 21 buildings on the site for which decommissioning activities are being performed. All have been characterized for radiological contamination. As part of the decommissioning activities, process equipment and supporting fixtures were removed, cleaned, and released or disposed of as low-level radioactive waste. Potentially contaminated structural surfaces were stripped of coatings by grit blasting or use of chemical agents. Contaminated surfaces identified by the characterization survey were cleaned or removed. These remediation activities were performed under the Decommissioning Plan for the Washington, PA Facility which implemented

final status survey guidance from draft NUREG/CR-5849 (RSI 1999 and NRC 1992a). Soil areas located underneath and around the buildings have not been addressed and are radioactively contaminated.

Molycorp has submitted the final status survey results for Building 35. Although there was no history of radiological materials present within this building, during the final status survey, localized elevated levels of activity were detected in a four foot by four foot area of the concrete floor at the north end of the building. Molycorp's decontamination and decommissioning (D&D) contractor, MACTEC, determined that the elevated activity was fixed into the concrete and required removal of that portion of the concrete. The building's classification was changed from unaffected to affected and MACTEC personnel performed affected final status survey activities within the building (MACTEC 2002a).

The NRC's Division of Waste Management has requested that the Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) perform confirmatory survey activities on buildings at the Molycorp, Inc. Washington Facility for which the licensee and their current D&D contractor, MACTEC, have prepared final status survey reports.

### SITE DESCRIPTION

The Molycorp, Inc., Washington Site is located in southwestern Pennsylvania on the outskirts of Washington County approximately 56 kilometer (35 miles) southwest of Pittsburgh. The site consists of approximately 8 hectares [ha (20 acres)] which represents the fenced portion of the 24 ha parcel of land owned by Molycorp that lies entirely within Canton Township at 300 Caldwell Avenue, Washington, Pennsylvania (Figure 1). In addition to the land area, there are approximately 21 buildings which remain on the site. The site is bounded by two streets in Canton Township—Caldwell Avenue and Green Street. The site is also transversed by Chartiers Creek that flows south to north through the property. The property is served by the CSX Railroad via two lines that were formerly owned by Tylerdale Connecting Railroad Company and the Baltimore and Ohio Railroad (MACTEC 2002b).

Building 35, a Research and Development Building, is approximately 36 meter (m) long by 18 m wide with an approximately 8 m high metal frame and truss structure with exterior corrugated metal walls and roof panels, and a concrete slab floor. The building runs from north to south and has large roll top and personnel doors on the north, east and west sides.

#### **DOCUMENT/DATA REVIEW**

ESSAP reviewed the D&D contractor's survey documentation to determine the adequacy and appropriateness of the final status survey radiological instrumentation and procedures (MACTEC 2002b). The final status survey data for Building 35 was submitted to and reviewed by ESSAP while on-site (MACTEC 2002a).

#### SURVEY PROCEDURES

ESSAP performed confirmatory survey activities for Building 35 at the Molycorp, Washington Facility on April 16 and 17, 2002. Survey activities consisted of alpha plus beta and gamma surface scans, alpha and beta surface activity measurements, removable activity measurements, and exposure rate measurements. These activities were conducted in accordance with a site-specific survey plan, submitted to and approved by the U.S. Nuclear Regulatory Commission (NRC), and the ORISE/ESSAP Survey Procedures and Quality Assurance Manuals (ORISE 2002a, 2000 and 2001).

The reference grid system, previously established by MACTEC, was used by ESSAP for referencing measurement and sample locations.

ESSAP confirmatory survey coverage was determined by MACTEC's radiological classification of the building—Building 35 was classified as affected. ESSAP conducted alpha plus beta activity scans on up to 100% of the accessible floor surfaces, up to 50% of the lower wall surfaces, and up to 5% of the upper wall and exterior wall surfaces, and conducted gamma scans over 100% of the accessible floor surfaces in Building 35. Alpha plus beta surface scans were performed using gas proportional detectors coupled to ratemeter-scalers with audible indicators. Gamma surface scans were performed using NaI scintillation detectors coupled to ratemeters with audible indicators.

Alpha and beta surface activity measurements were performed at twelve locations on the floor, nine locations on the lower walls, five locations on the upper walls and ceiling, and five locations on the exterior walls. ESSAP performed beta-only activity measurements at each measurement location and alpha activity measurements at 50 percent of the direct measurement locations. Direct measurements were performed using gas proportional detectors coupled to ratemeter-scalers. Smear samples, for determining removable activity levels, were collected from each direct measurement location. Exposure rates, measured at six locations, were performed at one meter above the surface using a micro-rem meter. Measurement locations are shown on Figure 2.

## SAMPLE ANALYSIS AND DATA INTERPRETATION

Samples and survey data were returned to the ORISE/ESSAP laboratory in Oak Ridge, Tennessee for analysis and interpretation. Sample analyses were performed in accordance with the ORISE/ESSAP Laboratory Procedures Manual (ORISE 2002b). Smears were analyzed for gross alpha and gross beta activity using a low-background gas proportional counter. Smear sample results and direct measurement data were reported in units of disintegrations per minute per 100 square centimeters (dpm/100 cm<sup>2</sup>). Exposure rates were reported in units of microroentgens per hour ( $\mu$ R/h).

### **FINDINGS AND RESULTS**

Alpha plus beta surface scans of the floor and lower walls identified an area of elevated alpha plus beta radiation at the north end of the building near measurement locations #99 and #1A (Figure 2). Gamma surface scans of the floor surface also detected the same elevated radiation area in the north end of the building. This location was marked for further investigation. It was determined that the location was due to the presence of elevated gamma radiation in the underlying soil beneath the concrete slab floor at the north end of the building. There had also been some remediation activities performed in this area by MACTEC personnel.

Total and removable surface activity levels for Building 35 are presented in Table 1. Alpha surface activity levels ranged from 0 to 56 dpm/100  $cm^2$  and beta surface activity levels ranged from

-420 to 750 dpm/100 cm<sup>2</sup>. Removable activity levels ranged from 0 to 1 dpm/100 cm<sup>2</sup> for alpha and -5 to 5 dpm/100 cm<sup>2</sup> for beta.

Site background exposure rates averaged 10  $\mu$ R/h; Building 35 exposure rates, presented in Table 2, ranged from 7 to 21  $\mu$ R/h.

### **COMPARISON OF RESULTS WITH GUIDELINES**

Survey results were compared with the site's decommissioning criteria. The applicable NRC surface activity guideline levels are (NRC 1987):

### Natural Thorium

1,000 dpm/100 cm<sup>2</sup>, averaged over a 1 m<sup>2</sup> area 3,000 dpm/100 cm<sup>2</sup>, total, maximum in a 100 cm<sup>2</sup> area 200 dpm/100 cm<sup>2</sup>, removable

Natural Uranium

5,000  $\alpha$  dpm/100 cm<sup>2</sup>, averaged over a 1 m<sup>2</sup> area 15,000  $\alpha$  dpm/100 cm<sup>2</sup>, total, maximum in a 100 cm<sup>2</sup> area 1,000  $\alpha$  dpm/100 cm<sup>2</sup>, removable

Thorium is the predominant contaminant and has the more restrictive guideline—therefore, the D&D contractor elected to use the thorium guidelines for the site. Natural thorium emits both alpha and beta radiations, therefore, either alpha or beta activity may be measured for determining the residual activity of the thorium contaminant. As interpreted by the NRC, the average 1,000 dpm/100 cm<sup>2</sup> and maximum 3,000 dpm/100 cm<sup>2</sup> should apply independently to both alpha and beta measurements for surface contamination involving natural thorium (NRC 1992b). ESSAP's experience has shown that beta measurements typically provide a more accurate evaluation of thorium contamination on structure surfaces, due to problems inherent in measuring alpha contamination on rough, porous, and/or dirty surfaces. For the thorium series in secular equilibrium, the activity level providing 1,000 alpha dpm/100 cm<sup>2</sup> would result in about 670 beta dpm/100 cm<sup>2</sup>. Therefore, a beta activity

measurement that is greater than 670 dpm/100  $cm^2$  would exceed the alpha activity guideline for thorium.

Measurement locations on the floor near the remediated floor opening at the north end of the building had unshielded total beta activity levels well in excess of the average guideline (Figure 2). However, the exposed contaminated soil in the area caused the elevated gamma radiation. Shielded beta measurements indicated that the majority of the activity was the result of gamma radiation from the soil beneath and not beta contamination on the floor surface. Therefore, all the measurements on the floor and lower, upper, and exterior walls met the guidelines.

The NRC guideline for exposure rates at one meter above building surfaces is 5  $\mu$ R/h above background (NRC 1991). With one exception, the exposure rates within Building 35 were within the guideline. The one exception was near the exposed soil surface at the north end of the building at exposure rate location #5 (Figure 2).

#### SUMMARY

During the period of April 16 and 17, 2002, the Environmental Survey and Site Assessment Program of the Oak Ridge Institute for Science and Education performed confirmatory survey activities on Building 35 at the Molycorp, Inc. Washington Facility in Washington, Pennsylvania. Survey activities consisted of alpha plus beta and gamma scans, alpha and beta surface activity measurements, and exposure rate measurements.

Survey results indicated that fixed and removable activity levels were less than the applicable guidelines. ESSAP's survey findings are consistent with the licensee's measurements and support the licensee's conclusion that the radiological conditions of the surveyed areas in Building 35 satisfy the NRC surface activity guidelines for release to unrestricted use. One exposure rate measurement exceeded the guideline, but this was the result of contaminated soil underneath the concrete slab floor and the exposed soil surface at the north end of the building. This report does not address the undersides of the concrete slab floors which will be surveyed by the licensee at a later date.

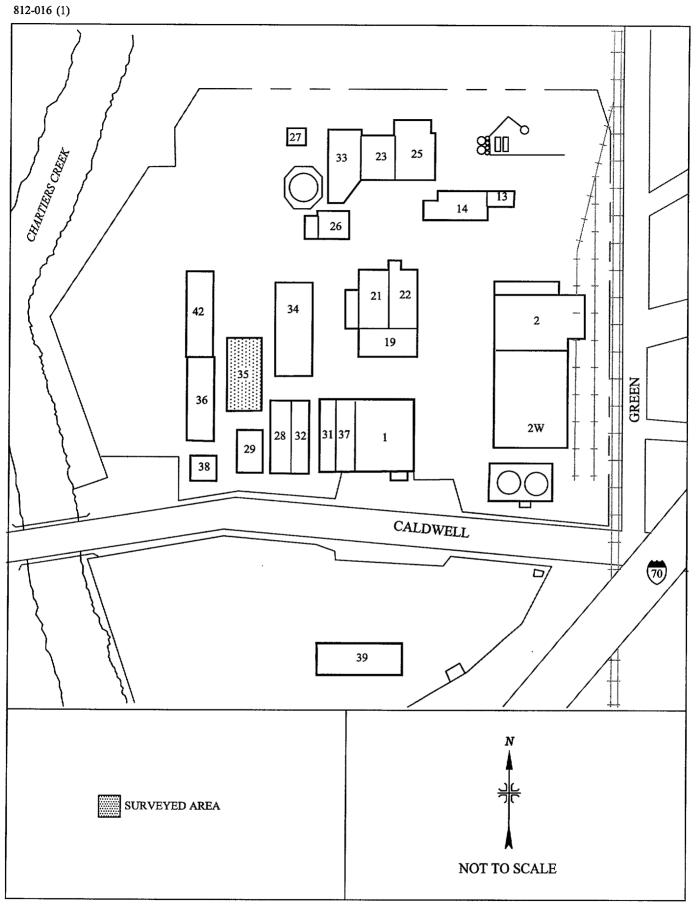
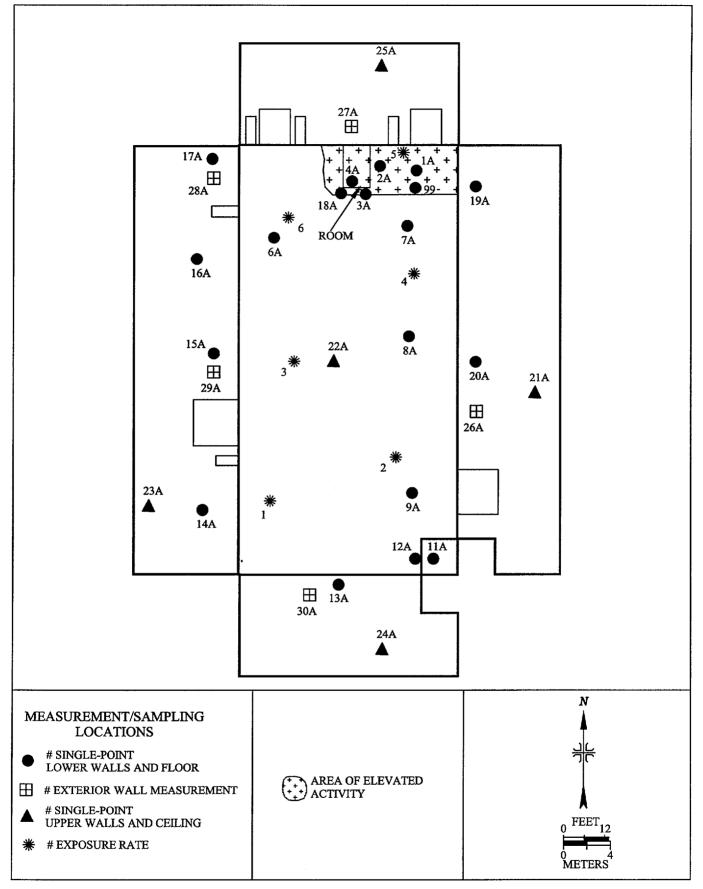
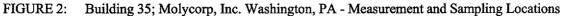


FIGURE 1: Plot Plan of Molycorp, Incorporated, Washington, Pennsylvania







## SURFACE ACTIVITY LEVELS BUILDING 35 MOLYCORP INCORPORATED WASHINGTON, PENNSYLVANIA

I continua	Sec. Sec. 1	Total Activity	/ (dpm/100 cm <sup>2</sup> )	Removable Activ	vity (dpm/100 cm <sup>2</sup> )
Location <sup>a</sup>	Surface <sup>b</sup>	Alpha	Beta	Alpha	Beta
99	F	c	750	0	3
1A	F		180	0	-1
2A	F	16	-130	1	-1
3A	F		15	0	-1
4A	F		240	0	-2
5A	F	24	-30	0	-1
6A	F	32	-26	0	-4
7A	F	8	57	0	-1
8A	F	56	34	0	-1
9A	F	48	-140	1	2
10A	F	24	480	0	3
11A	F	16	-42	0	2
12A	LW	8	87	0	-2
13A	LW	0	-420	0	-1

# TABLE 1 (continued)

## SURFACE ACTIVITY LEVELS BUILDING 35 MOLYCORP INCORPORATED WASHINGTON, PENNSYLVANIA

<b>I</b> (* 2	Surface <sup>b</sup>	Total Activity	(dpm/100 cm <sup>2</sup> )	Removable Activ	ity (dpm/100 cm <sup>2</sup> )
Location <sup>a</sup>	Surface	Alpha	Beta	Alpha	Beta
14A	LW	16	160	0	1
15A	LW		100	0	-5
16A	LW		49	0	-4
17A	LW		-220	0	-3
18A	LW	16	-72	1	-1
19A	LW		94	0	-2
20A	LW		240	0	-2
21A	UW		110	1	-3
22A	UW		290	0	-1
23A	UW		250	1	5
24A	UW		100	1	1
25A	UW		60	0	-1
26A	EW		-76	0	2
27A	EW	8	-360	0	-1

## TABLE 1 (continued)

## SURFACE ACTIVITY LEVELS BUILDING 35 MOLYCORP INCORPORATED WASHINGTON, PENNSYLVANIA

<b>Y</b>	Constant b	Total Activity	(dpm/100 cm <sup>2</sup> )	Removable Activ	ity (dpm/100 cm <sup>2</sup> )
Location <sup>a</sup>	Surface <sup>b</sup>	Alpha	Beta	Alpha	Beta
28A	EW		23	0	-1
29A	EW		-19	0	-3
30A	EW		140	0	-3

<sup>a</sup>Refer to Figure 2.

 ${}^{b}F$  = floor; LW = lower wall; UW = upper wall; and EW = exterior wall. {Measurement not performed.

## EXPOSURE RATES BUILDING 35 MOLYCORP INCORPORATED WASHINGTON, PENNSYLVANIA

Location <sup>a</sup>	Exposure Rate @ 1m (µR/h)
1	7
2	11
3	7
4	8
5	21
6	8

<sup>a</sup>Refer to Figure 2.

#### REFERENCES

MACTEC, Inc. (MACTEC). Final Status Survey Report for Buildings 25, 29, 32, 33, 35, 36 and the Soil Sample Storage Room (Bldg 19) at the Molycorp Site, Washington, PA. Grand Junction, Colorado; Revision 0, April 15, 2002a.

MACTEC, Inc. Survey Plan for Determining the Final Status of Buildings at the Molycorp Site, Washington, PA. Grand Junction, Colorado; Revision 0, February 1, 2002b.

Radiological Services, Inc. (RSI). Molycorp, Inc., Washington, PA Facility Decommissioning Plan, Part 1 Revision. New London, Connecticut; June 30, 1999.

Radiological Services, Inc. Radiological Final Status Survey Report Building 39 and 42 (North End), Molycorp, Inc., Washington, PA. New London, Connecticut; December 2001.

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Oak Ridge Institute for Science and Education. Quality Assurance Manual for the Environmental Survey and Site Assessment Program. Oak Ridge, Tennessee; June 1, 2001.

Oak Ridge Institute for Science and Education. Confirmatory Survey Plan for Building Surveys at Molycorp, Inc., Washington Facility, Washington, Pennsylvania (Docket No. 040-08778, RFTA No. 02-007a). Oak Ridge, Tennessee; April 12, 2002a.

Oak Ridge Institute for Science and Education. Laboratory Procedures Manual for the Environmental Survey and Site Assessment Program. Oak Ridge, Tennessee; January 25, 2002b.

U.S. Nuclear Regulatory Commission (NRC). Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproducts, Source, or Special Nuclear Material. Washington, DC; August 1987.

U. S. Nuclear Regulatory Commission. Policy and Guideline Directive FC91-2, Standard Review Plan: Evaluating Decommissioning Plans for Licensees Under 10 CFR Parts 30, 40, and 70. Washington, DC; August 1991.

U. S. Nuclear Regulatory Commission. Draft—Manual for Conducting Radiological Surveys in Support of License Termination. NUREG/CR-5849; Washington, DC; June 1992a.

U.S. Nuclear Regulatory Commission. Memorandum from J. Hickey (U.S. Nuclear Regulatory Commission, HQ) to D. Collins (U.S. Nuclear Regulatory Commission, Region II), RE: "Interpretation of Thorium Surface Contamination Limits", February 20, 1992b.

OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATIO

May 20, 2002

Mr. Thomas G. McLaughlin U.S. Nuclear Regulatory Commission Division of Waste Management 11555 Rockville Pike Mail Stop: T-7F27 Rockville, MD 20852

### SUBJECT: LETTER REPORT—CONFIRMATORY SURVEY OF BUILDING 36, MOLYCORP, INC., WASHINGTON FACILITY, WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-007a)

Dear Mr. McLaughlin:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) performed confirmatory survey activities at the subject facility on April 16 and 17, 2002. Enclosed is the letter report describing the survey procedures and results.

Please contact me at (865) 576-0065 or Timothy J. Vitkus at (865) 576-5073 should you have any questions or require additional information.

Sincerely

Wade C. Adams Project Leader/Health Physicist Environmental Survey and Site Assessment Program

WCA:ar

Enclosure

cc: G. Purdy, NRC/NMSS/TWFN 7F27 E. Knox-Davin, NRC/NMSS/TWFN 8A23 C. Gordon, NRC/Region I W. Beck, ORISE/ESSAP T. Vitkus, ORISE/ESSAP E. Abelquist, ORISE/ESSAP D. Condra, ORISE/ESSAP File/812

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### LETTER REPORT CONFIRMATORY SURVEY OF BUILDING 36 MOLYCORP, INC., WASHINGTON FACILITY WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-007a)

### **INTRODUCTION AND SITE HISTORY**

Since the mid 1920s, Molybdenum Corporation of America (Molycorp) operated a plant in Washington, Pennsylvania for the primary production of molybdenum products—the plant also produced ferro alloys such as ferrocolumbium and tungsten. The raw material for this ferrocolumbium operation, columbite ore, contained natural thorium.

In the late 1960s, new federal requirements necessitated that Molycorp obtain a Source Material License (SMB-1393, Docket No. 040-8778) from the Atomic Energy Commission (AEC) for possession and use of materials containing 0.05% or greater by weight, uranium, thorium, or a combination of both. Most of the material that was processed by the corporation for the ferrocolumbium contained 1 to 1.5% thorium. The slag resulting from this production was in a glass/ceramic form containing an average of 1.2% thorium. Operations using thorium-containing ores were discontinued about 1970 (RSI 2001).

Molycorp renewed its Source Material License (SMB-1393) in 1992 and added an amendment incorporating a schedule for decommissioning the site. In November 1992, Molycorp submitted a site characterization plan to the NRC for approval—the scope of the survey plan was limited to buildings and structures on the Molycorp site and did not include the soil.

Currently, there are 21 buildings on the site for which decommissioning activities are being performed. All have been characterized for radiological contamination. As part of the decommissioning activities, process equipment and supporting fixtures were removed, cleaned, and released or disposed of as low-level radioactive waste. Potentially contaminated structural surfaces were stripped of coatings by grit blasting or use of chemical agents. Contaminated surfaces identified by the characterization survey were cleaned or removed. These remediation activities were performed under the Decommissioning Plan for the Washington, PA Facility which implemented

final status survey guidance from draft NUREG/CR-5849 (RSI 1999 and NRC 1992a). Soil areas located underneath and around the buildings have not been addressed and are radioactively contaminated.

Molycorp has submitted the final status survey results for Building 36. Although there was no history of radiological materials present within this building, as previously mentioned, the underlying soils are contaminated. The top surfaces of the floors were expected to be clean and were classified as unaffected—however, the undersides of the concrete floors that are in contact with the soil will require survey prior to release (RSI 2001).

The NRC's Division of Waste Management has requested that the Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) perform confirmatory survey activities on buildings at the Molycorp, Inc. Washington Facility for which the licensee and their current decontamination and decommissioning (D&D) contractor, MACTEC, have prepared final status survey reports.

#### SITE DESCRIPTION

The Molycorp, Inc., Washington Site is located in southwestern Pennsylvania on the outskirts of Washington County approximately 56 kilometers (35 miles) southwest of Pittsburgh. The site consists of approximately 8 hectares [ha (20 acres)] which represents the fenced portion of the 24 ha parcel of land owned by Molycorp that lies entirely within Canton Township at 300 Caldwell Avenue, Washington, Pennsylvania (Figure 1). In addition to the land area, there are approximately 21 buildings which remain on the site. The site is bounded by two streets in Canton Township—Caldwell Avenue and Green Street. The site is also transversed by Chartiers Creek that flows south to north through the property. The property is served by the CSX Railroad via two lines that were formerly owned by Tylerdale Connecting Railroad Company and the Baltimore and Ohio Railroad (MACTEC 2002a).

Building 36 is 37 m long by 15 m wide with a 9 m high prefabricated metal structure with a steel frame, corrugated exterior metal walls and roof panels and a reinforced concrete floor. The building

runs from north to south and has large roll top and personnel doors on the north, east and west sides and a personnel door on the south side. The north end opens into the south end of Building 42.

#### **DOCUMENT/DATA REVIEW**

ESSAP reviewed the D&D contractor's survey documentation to determine the adequacy and appropriateness of the final status survey radiological instrumentation and procedures (MACTEC 2002a). The final status survey data for Building 36 was submitted to and reviewed by ESSAP while on-site (MACTEC 2002b).

#### SURVEY PROCEDURES

ESSAP performed confirmatory survey activities for Building 36 at the Molycorp, Washington Facility on April 16 and 17, 2002. Survey activities consisted of alpha plus beta and gamma surface scans, alpha and beta surface activity measurements, removable activity measurements, and exposure rate measurements. These activities were conducted in accordance with a site-specific survey plan, submitted to and approved by the U.S. Nuclear Regulatory Commission (NRC) and the ORISE/ESSAP Survey Procedures and Quality Assurance Manuals (ORISE 2002a, 2000 and 2001).

The reference grid system, previously established by MACTEC, was used by ESSAP for referencing measurement and sample locations.

ESSAP confirmatory survey coverage was determined by MACTEC's radiological classification of the building—Building 36 was classified as unaffected. ESSAP conducted alpha plus beta activity scans on up to 50% of the accessible floor surfaces, up to 10% of the lower wall surfaces, and up to 10% of the exterior wall surfaces, and conducted gamma scans on up to 75% of the accessible floor surfaces in Building 36. Alpha plus beta surface scans were performed using gas proportional detectors coupled to ratemeter-scalers with audible indicators. Gamma surface scans were performed using NaI scintillation detectors coupled to ratemeters with audible indicators.

Alpha and beta surface activity measurements were performed at seven locations on the floor, four locations on the lower walls, two locations on the upper walls, and four locations on the exterior walls. ESSAP performed beta-only activity measurements at each measurement location and alpha activity measurements at 50 percent of the direct measurement locations. Direct measurements were performed using gas proportional detectors coupled to ratemeter-scalers. Smear samples, for determining removable activity levels, were collected from each direct measurement location. Exposure rates, measured at five locations, were performed at one meter above the surface using a micro-rem meter. Measurement locations are shown on Figure 2.

#### SAMPLE ANALYSIS AND DATA INTERPRETATION

Samples and survey data were returned to the ORISE/ESSAP laboratory in Oak Ridge, Tennessee for analysis and interpretation. Sample analyses were performed in accordance with the ORISE/ESSAP Laboratory Procedures Manual (ORISE 2002b). Smears were analyzed for gross alpha and gross beta activity using a low-background gas proportional counter. Smear sample results and direct measurement data were reported in units of disintegrations per minute per 100 square centimeters (dpm/100 cm<sup>2</sup>). Exposure rates were reported in units of microroentgens per hour ( $\mu$ R/h).

#### FINDINGS AND RESULTS

Alpha plus beta and gamma surface scans of the floor and walls did not identify any areas of elevated radiation within the building.

Total and removable surface activity levels for Building 36 are presented in Table 1. Alpha surface activity levels ranged from -8 to 63 dpm/100 cm<sup>2</sup> and beta surface activity levels ranged from -26 to  $1,100 \text{ dpm}/100 \text{ cm}^2$ . Removable activity levels ranged from 0 to 5 dpm/100 cm<sup>2</sup> for alpha and -4 to 8 dpm/100 cm<sup>2</sup> for beta.

Site background exposure rates averaged 10  $\mu$ R/h; Building 36 exposure rates, presented in Table 2, ranged from 7 to 9  $\mu$ R/h.

#### **COMPARISON OF RESULTS WITH GUIDELINES**

Survey results were compared with the site's decommissioning criteria. The applicable NRC surface activity guideline levels are (NRC 1987):

### Natural Thorium

1,000 dpm/100 cm<sup>2</sup>, averaged over a 1 m<sup>2</sup> area 3,000 dpm/100 cm<sup>2</sup>, total, maximum in a 100 cm<sup>2</sup> area 200 dpm/100 cm<sup>2</sup>, removable

Natural Uranium

5,000  $\alpha$  dpm/100 cm<sup>2</sup>, averaged over a 1 m<sup>2</sup> area 15,000  $\alpha$  dpm/100 cm<sup>2</sup>, total, maximum in a 100 cm<sup>2</sup> area 1,000  $\alpha$  dpm/100 cm<sup>2</sup>, removable

Thorium is the predominant contaminant and has the more restrictive guideline—therefore, the D&D contractor elected to use the thorium guidelines for the site. Natural thorium emits both alpha and beta radiations, therefore, either alpha or beta activity may be measured for determining the residual activity of the thorium contaminant. As interpreted by the NRC, the average 1,000 dpm/100 cm<sup>2</sup> and maximum 3,000 dpm/100 cm<sup>2</sup> should apply independently to both alpha and beta measurements for surface contamination involving natural thorium (NRC 1992b). ESSAP's experience has shown that beta measurements typically provide a more accurate evaluation of thorium contamination on structure surfaces, due to problems inherent in measuring alpha contamination on rough, porous, and/or dirty surfaces. For the thorium series in secular equilibrium, the activity level providing 1,000 alpha dpm/100 cm<sup>2</sup> would result in about 670 beta dpm/100 cm<sup>2</sup>. Therefore, a beta activity measurement that is greater than 670 dpm/100 cm<sup>2</sup> would exceed the alpha activity guideline for thorium.

All measurement locations on the floor, lower, upper, and exterior walls met the guidelines. A measurement on the edge of the crane, indicated elevated activity slightly above the average beta activity guideline—however, a cursory beta scan of the vicinity did not indicate any additional

elevated activity within the contiguous  $1 \text{ m}^2$  area. Additional direct measurements to obtain a  $1 \text{ m}^2$  average were not performed.

The NRC guideline for exposure rates at one meter above building surfaces is 5  $\mu$ R/h above background (NRC 1991). All exposure rates within Building 36 were within the guideline.

#### SUMMARY

During the period of April 16 and 17, 2002, the Environmental Survey and Site Assessment Program of the Oak Ridge Institute for Science and Education performed confirmatory survey activities on Building 36 at the Molycorp, Inc. Washington Facility in Washington, Pennsylvania. Survey activities consisted of alpha plus beta and gamma scans, alpha and beta surface activity measurements, and exposure rate measurements.

Survey results indicated that, with one exception, fixed and removable activity levels were less than the applicable guidelines. The one exception was a dirty/greasy location on the overhead crane for which a cursory scan, in the areas immediately adjacent to the measurement location, did not indicate any additional elevated radiation. All exposure rate measurements were within the guideline. ESSAP's survey findings are consistent with the licensee's measurements and support the licensee's conclusion that the radiological conditions of the surveyed areas in Building 36 satisfy the NRC guidelines for release to unrestricted use. This report does not address the undersides of the concrete slab floors which will be surveyed by the licensee at a later date.

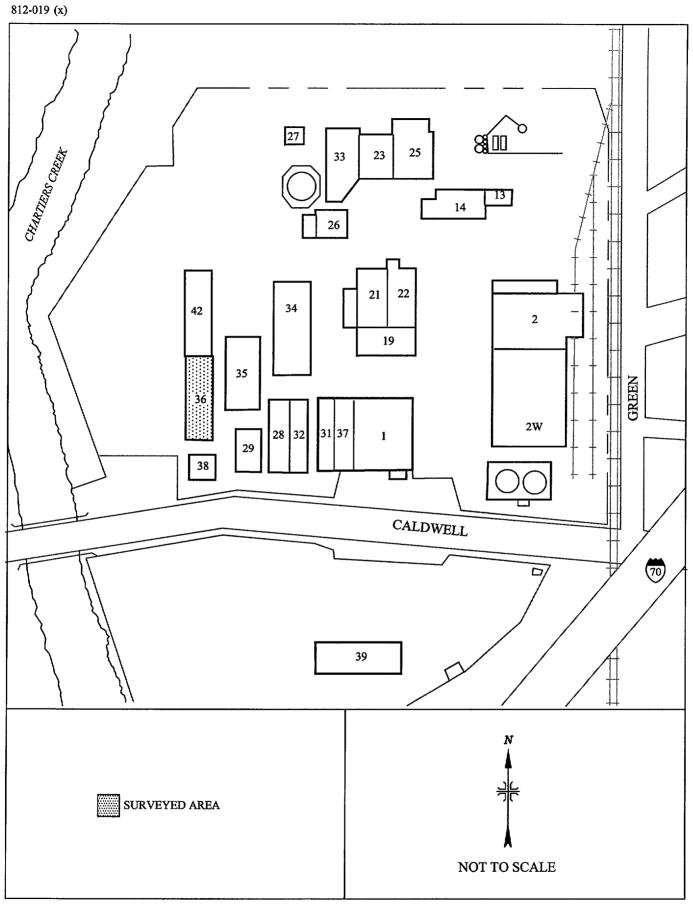


FIGURE 1: Plot Plan of Molycorp, Incorporated, Washington, Pennsylvania



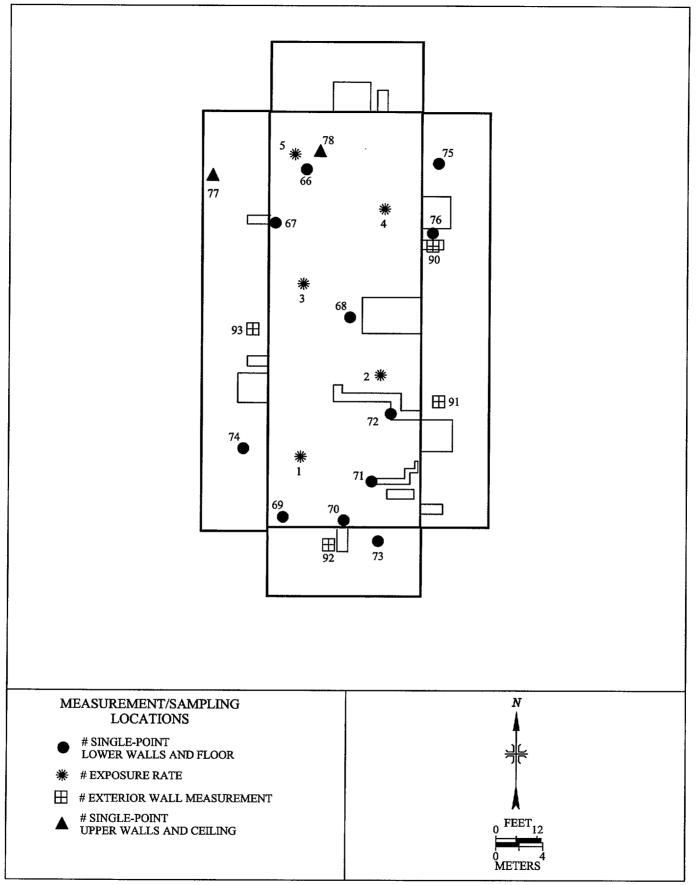


FIGURE 2: Building 36; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

## SURFACE ACTIVITY LEVELS BUILDING 36 MOLYCORP INCORPORATED WASHINGTON, PENNSYLVANIA

	a <b>a</b> b	Total Activity	(dpm/100 cm <sup>2</sup> )	Removable Activ	ity (dpm/100 cm <sup>2</sup> )
Location <sup>2</sup>	Surface <sup>b</sup>	Alpha	Beta	Alpha	Beta
66	F	8	79	1	3
67	F	8	150	1	3
68	F	48	76	0	-4
69	F	-8	-26	0	2
70	F	63	-11	1	-2
71	Pit	56	94	1	4
72	Pit	16	87	0	3
73	LW	c	230	1	8
74	LW		140	0	-2
75	LW	8	100	0	3
76	LW		-15	0	6
77	UW		700	0	5
78	UW		1,100	5	-2
90	EW	0	-15	0	3

## TABLE 1 (continued)

## SURFACE ACTIVITY LEVELS BUILDING 36 MOLYCORP INCORPORATED WASHINGTON, PENNSYLVANIA

<b>T</b> (* a	Sector and	Total Activity	(dpm/100 cm <sup>2</sup> )	Removable Activ	ity (dpm/100 cm²)
Location <sup>a</sup>	Surface <sup>b</sup>	Alpha	Beta	Alpha	Beta
91	EW		53	0	-1
92	EW		220	1	-4
93	EW		98	0	2

10

\*Refer to Figure 2.

Measurement not performed.

 ${}^{b}F =$ floor; LW = lower wall; UW = upper wall; and EW = exterior wall.

Y:/essap/projects/0812/Reports/Building 36.wpd

### EXPOSURE RATES BUILDING 36 MOLYCORP INCORPORATED WASHINGTON, PENNSYLVANIA

Location <sup>a</sup>	Exposure Rate @ 1m (µR/h)
1	9
2	7
3	8
4	7
5	7

<sup>a</sup>Refer to Figure 2.

#### REFERENCES

MACTEC, Inc. (MACTEC). Survey Plan for Determining the Final Status of Buildings at the Molycorp Site, Washington, PA. Grand Junction, Colorado; Revision 0, February 1, 2002a.

MACTEC, Inc. Final Status Survey Report for Buildings 25, 29, 32, 33, 35, 36 and the Soil Sample Storage Room (Bldg 19) at the Molycorp Site, Washington, PA. Grand Junction, Colorado; Revision 0, April 15, 2002b.

Radiological Services, Inc. (RSI). Molycorp, Inc., Washington, PA Facility Decommissioning Plan, Part 1 Revision. New London, Connecticut; June 30, 1999.

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OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

May 20, 2002

Mr. Thomas G. McLaughlin U.S. Nuclear Regulatory Commission Division of Waste Management 11555 Rockville Pike Mail Stop: T-7F27 Rockville, MD 20852

### SUBJECT: LETTER REPORT—CONFIRMATORY SURVEY OF BUILDING 39, MOLYCORP, INC., WASHINGTON FACILITY, WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-007a)

Dear Mr. McLaughlin:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) performed confirmatory survey activities at the subject facility on April 15, 2002. Enclosed is the letter report describing the survey procedures and results.

Please contact me at (865) 576-0065 or Timothy J. Vitkus at (865) 576-5073 should you have any questions or require additional information.

Sincerely.

Wade C. Adams Project Leader/Health Physicist Environmental Survey and Site Assessment Program

WCA:ar

Enclosure

cc: G. Purdy, NRC/NMSS/TWFN 7F27 E. Knox-Davin, NRC/NMSS/TWFN 8A23 C. Gordon, NRC/Region I W. Beck, ORISE/ESSAP T. Vitkus, ORISE/ESSAP E. Abelquist, ORISE/ESSAP D. Condra, ORISE/ESSAP File/812

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### LETTER REPORT CONFIRMATORY SURVEY OF BUILDING 39 MOLYCORP, INC., WASHINGTON FACILITY WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-007a)

### **INTRODUCTION AND SITE HISTORY**

Since the mid 1920s, Molybdenum Corporation of America (Molycorp) operated a plant in Washington, Pennsylvania for the primary production of molybdenum products—the plant also produced ferro alloys such as ferrocolumbium and tungsten. The raw material for this ferrocolumbium operation, columbite ore, contained natural thorium.

In the late 1960s, new federal requirements necessitated that Molycorp obtain a Source Material License (SMB-1393, Docket No. 040-8778) from the Atomic Energy Commission (AEC) for possession and use of materials containing 0.05% or greater by weight, uranium, thorium, or a combination of both. Most of the material that was processed by the corporation for the ferrocolumbium contained 1 to 1.5% thorium. The slag resulting from this production was in a glass/ceramic form containing an average of 1.2% thorium. Operations using thorium-containing ores were discontinued about 1970 (RSI 2001).

Molycorp renewed its Source Material License (SMB-1393) in 1992 and added an amendment incorporating a schedule for decommissioning the site. In November 1992, Molycorp submitted a site characterization plan to the NRC for approval—the scope of the survey plan was limited to buildings and structures on the Molycorp site and did not include the soil.

Currently, there are 21 buildings on the site for which decommissioning activities are being performed. All have been characterized for radiological contamination. As part of the decommissioning activities, process equipment and supporting fixtures were removed, cleaned, and released or disposed of as low-level radioactive waste. Potentially contaminated structural surfaces were stripped of coatings by grit blasting or use of chemical agents. Contaminated surfaces identified by the characterization survey were cleaned or removed. These remediation activities were performed under the Decommissioning Plan for the Washington, PA Facility which implemented

final status survey guidance from draft NUREG/CR-5849 (RSI 1999 and NRC 1992a). Soil areas located underneath and around the buildings have not been addressed and are radioactively contaminated.

Molycorp has submitted the final status survey results for Building 39. Although there was no history of radiological materials present within this building, as previously mentioned, the soils are contaminated. The top surfaces of the floors were expected to be clean and were classified as unaffected—however, the undersides of the concrete floors that are in contact with the soil will require survey prior to release (RSI 2001).

The NRC's Division of Waste Management has requested that the Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) perform confirmatory survey activities on buildings at the Molycorp, Inc. Washington Facility for which the licensee and their previous decontamination and decommissioning (D&D) contractor, Radiological Services, Inc. (RSI), have prepared final status survey reports.

#### SITE DESCRIPTION

The Molycorp, Inc., Washington Site is located in southwestern Pennsylvania on the outskirts of Washington County approximately 56 kilometers (35 miles) southwest of Pittsburgh. The site consists of approximately 8 hectares [ha (20 acres)] which represents the fenced portion of the 24 ha parcel of land owned by Molycorp that lies entirely within Canton Township at 300 Caldwell Avenue, Washington, Pennsylvania (Figure 1). In addition to the land area, there are approximately 21 buildings which remain on the site. The site is bounded by two streets in Canton Township—Caldwell Avenue and Green Street. The site is also transversed by Chartiers Creek that flows south to north through the property. The property is served by the CSX Railroad via two lines that were formerly owned by Tylerdale Connecting Railroad Company and the Baltimore and Ohio Railroad (MACTEC 2002).

Building 39, a Maintenance and Storage Warehouse, is 31 meter (m) long by 12 m wide with an approximately 6 m high wood frame and wood truss structure with exterior corrugated metal walls and roof panels, and a concrete slab floor. The building runs from east to west and has a large sliding door at either end. Personnel doors are located on the east end of the north wall and the north end of the west wall.

#### **DOCUMENT/DATA REVIEW**

ESSAP reviewed the D&D contractor's survey documentation to determine the adequacy and appropriateness of the final status survey radiological instrumentation and procedures (RSI 1999). ESSAP also reviewed the final status survey data for Building 39 prior to visiting the site (RSI 2001).

#### SURVEY PROCEDURES

ESSAP performed confirmatory survey activities for Building 39 at the Molycorp, Washington Facility on April 15, 2002. Survey activities consisted of alpha plus beta and gamma surface scans, alpha and beta surface activity measurements, removable activity measurements, and exposure rate measurements. These activities were conducted in accordance with a site-specific survey plan, submitted to and approved by the U.S. Nuclear Regulatory Commission (NRC), and the ORISE/ESSAP Survey Procedures and Quality Assurance Manuals (ORISE 2002a, 2000 and 2001).

The reference grid system, previously established by RSI, was used by ESSAP for referencing measurement and sample locations.

ESSAP confirmatory survey coverage was determined by RSI's radiological classification of the building—Building 39 was classified as unaffected. ESSAP conducted alpha plus beta activity scans on up to 50% of the accessible floor surfaces, and up to 25% of the lower wall surfaces, and conducted gamma scans over 100% of the accessible floor surfaces in Building 39. Alpha plus beta surface scans were performed using gas proportional detectors coupled to ratemeter-scalers with

audible indicators. Gamma surface scans were performed using NaI scintillation detectors coupled to ratemeters with audible indicators.

Alpha and beta surface activity measurements were performed at four locations on the floor and at three locations on the lower walls. ESSAP performed alpha-only and beta-only activity measurements at each measurement location. Direct measurements were performed using gas proportional detectors coupled to ratemeter-scalers. Smear samples, for determining removable activity levels, were collected from each direct measurement location. Exposure rates, measured at five locations, were performed at one meter above the surface using a micro-rem meter. Measurement locations are shown on Figure 2.

### SAMPLE ANALYSIS AND DATA INTERPRETATION

Samples and survey data were returned to the ORISE/ESSAP laboratory in Oak Ridge, Tennessee for analysis and interpretation. Sample analyses were performed in accordance with the ORISE/ESSAP Laboratory Procedures Manual (ORISE 2002b). Smears were analyzed for gross alpha and gross beta activity using a low-background gas proportional counter. Smear sample results and direct measurement data were reported in units of disintegrations per minute per 100 square centimeters (dpm/100 cm<sup>2</sup>). Exposure rates were reported in units of microroentgens per hour ( $\mu$ R/h).

#### FINDINGS AND RESULTS

Alpha plus beta surface scans of the floor and lower walls identified one area of elevated alpha plus beta radiation near measurement location #1 (Figure 2). This location was marked for further investigation. Gamma surface scans also detected several areas of elevated radiation near the wall/floor interface, but these locations were due to the presence of elevated gamma radiation in the adjacent grounds outside the building.

Total and removable surface activity levels for Building 39 are presented in Table 1. Alpha surface activity levels ranged from 0 to 270 dpm/100 cm<sup>2</sup> and beta surface activity levels ranged from

-130 to 1,900 dpm/100 cm<sup>2</sup>. Removable activity levels ranged from 0 to 3 dpm/100 cm<sup>2</sup> for alpha and -3 to 5 dpm/100 cm<sup>2</sup> for beta.

Site background exposure rates averaged 10  $\mu$ R/h; Building 39 exposure rates, presented in Table 2, ranged from 10 to 15  $\mu$ R/h.

### **COMPARISON OF RESULTS WITH GUIDELINES**

Survey results were compared with the site's decommissioning criteria. The applicable NRC surface activity guideline levels are (NRC 1987):

### Natural Thorium

1,000 dpm/100 cm<sup>2</sup>, averaged over a 1 m<sup>2</sup> area 3,000 dpm/100 cm<sup>2</sup>, total, maximum in a 100 cm<sup>2</sup> area 200 dpm/100 cm<sup>2</sup>, removable

Natural Uranium

 $5,000 \alpha \text{ dpm}/100 \text{ cm}^2$ , averaged over a 1 m<sup>2</sup> area 15,000  $\alpha \text{ dpm}/100 \text{ cm}^2$ , total, maximum in a 100 cm<sup>2</sup> area 1,000  $\alpha \text{ dpm}/100 \text{ cm}^2$ , removable

Thorium is the predominant contaminant and has the more restrictive guideline—therefore, the D&D contractor elected to use the thorium guidelines for the site. Natural thorium emits both alpha and beta radiations, therefore, either alpha or beta activity may be measured for determining the residual activity of the thorium contaminant. As interpreted by the NRC, the average 1,000 dpm/100 cm<sup>2</sup> and maximum 3,000 dpm/100 cm<sup>2</sup> should apply independently to both alpha and beta measurements for surface contamination involving natural thorium (NRC 1992b). ESSAP's experience has shown that beta measurements typically provide a more accurate evaluation of thorium contamination on structure surfaces, due to problems inherent in measuring alpha contamination on rough, porous, and/or dirty surfaces. For the thorium series in secular equilibrium, the activity level providing

1,000 alpha dpm/100 cm<sup>2</sup> would result in about 670 beta dpm/100 cm<sup>2</sup>. Therefore, a beta activity measurement that is greater than 670 dpm/100 cm<sup>2</sup> would exceed the alpha activity guideline for thorium.

Measurement location #2 on the floor in Building 39 had a total beta activity level in excess of the average guideline (Figure 2). All other measurements on the lower walls and floor met the guidelines.

The NRC guideline for exposure rates at one meter above building surfaces is 5  $\mu$ R/h above background (NRC 1991). The exposure rates within Building 39 were within the guideline.

#### SUMMARY

On April 15, 2002, the Environmental Survey and Site Assessment Program of the Oak Ridge Institute for Science and Education performed confirmatory survey activities on Building 39 at the Molycorp, Inc. Washington Facility in Washington, Pennsylvania. Survey activities consisted of alpha plus beta and gamma scans, alpha and beta surface activity measurements, and exposure rate measurements.

Based on the confirmatory survey results, it is ESSAP's opinion that the building's shell satisfies the NRC guidelines—however, elevated activity above the average guideline levels was present on the floor. Although the guidelines permit averaging over 1 m<sup>2</sup>, the floor area was classified by RSI as unaffected—the ESSAP data indicate that the floor does not reflect "unaffected" conditions and should be re-classified as affected and appropriate classification final status surveys performed. This report does not address the undersides of the concrete slab floor which will be surveyed by the licensee at a later date.



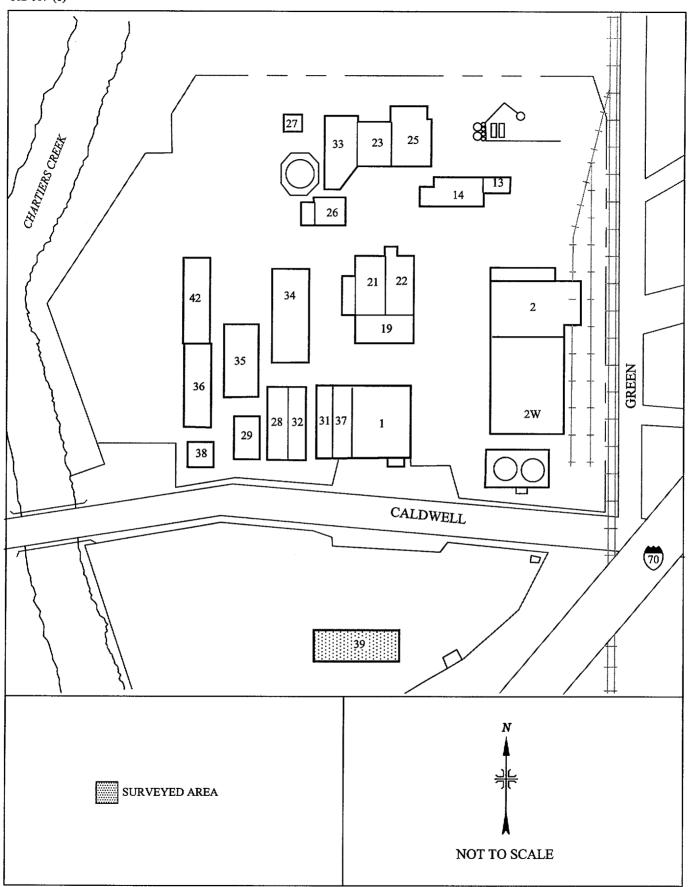


FIGURE 1: Plot Plan of Molycorp, Incorporated, Washington, Pennsylvania

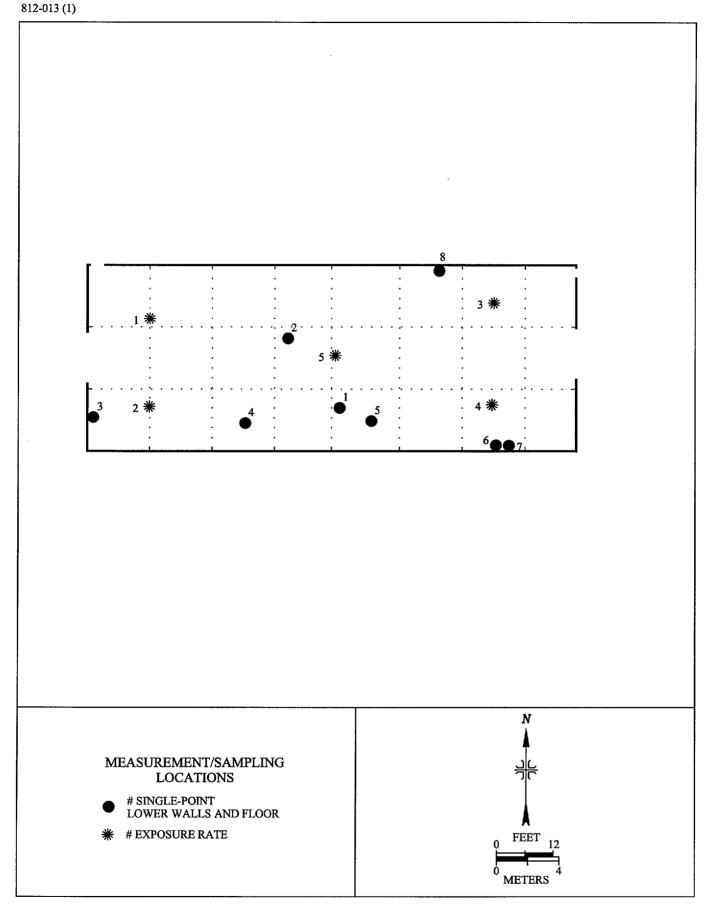


FIGURE 2: Building 39; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

## SURFACE ACTIVITY LEVELS BUILDING 39 MOLYCORP INCORPORATED WASHINGTON, PENNSYLVANIA

T de a		Total Activity	Total Activity (dpm/100 cm <sup>2</sup> )		vity (dpm/100 cm <sup>2</sup> )
Location*	Location <sup>a</sup> Surface <sup>b</sup>	Alpha	Beta <sup>c</sup>	Alpha	Beta
1	F	95	190	0	1
2	F	270	1,900	0	1
3	F	32	-130	0	5
4	F	79	130	0	-3
5	F	48	100	3	-1
6	LW	8	-26	0	-1
7	LW	16	130	0	1
8	LW	0	76	1	-2

<sup>a</sup>Refer to Figure 2.

 ${}^{b}F =$ floor and LW = lower wall.

<sup>c</sup>Due to elevated ambient gamma radiation from contaminated soil and/or adjacent contaminated I-beams, these measurements were calculated by determining the difference between unshielded and shielded beta activity measurements with Net Count Rates determined as follows: Net Count Rate=(Surface Counts<sub>unshielded</sub>-Surface Counts<sub>shielded</sub>)-(BKG Counts<sub>unshielded</sub>-BKG Counts<sub>shielded</sub>).

## EXPOSURE RATES BUILDING 39 MOLYCORP INCORPORATED WASHINGTON, PENNSYLVANIA

Location <sup>a</sup>	Exposure Rate @ 1m (µR/h)
1	10
2	11
3	11
4	11
5	15

<sup>a</sup>Refer to Figure 2.

### REFERENCES

MACTEC, Inc. (MACTEC). Survey Plan for Determining the Final Status of Buildings at the Molycorp Site, Washington, PA. Grand Junction, Colorado; Revision 0, February 1, 2002.

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U.S. Nuclear Regulatory Commission. Memorandum from J. Hickey (U.S. Nuclear Regulatory Commission, HQ) to D. Collins (U.S. Nuclear Regulatory Commission, Region II), RE: "Interpretation of Thorium Surface Contamination Limits", February 20, 1992b.

OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

May 20, 2002

Mr. Thomas G. McLaughlin U.S. Nuclear Regulatory Commission Division of Waste Management 11555 Rockville Pike Mail Stop: T-7F27 Rockville, MD 20852

### SUBJECT: LETTER REPORT—CONFIRMATORY SURVEY OF BUILDING 42, MOLYCORP, INC., WASHINGTON FACILITY, WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-007a)

Dear Mr. McLaughlin:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) performed confirmatory survey activities at the subject facility on April 16 and 17, 2002. Enclosed is the letter report describing the survey procedures and results.

Please contact me at (865) 576-0065 or Timothy J. Vitkus at (865) 576-5073 should you have any questions or require additional information.

Sincerely,

Wade C. Adams Project Leader/Health Physicist Environmental Survey and Site Assessment Program

WCA:ar

Enclosure

cc: G. Purdy, NRC/NMSS/TWFN 7F27
E. Knox-Davin, NRC/NMSS/TWFN 8A23
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### LETTER REPORT CONFIRMATORY SURVEY OF BUILDING 42 MOLYCORP, INC., WASHINGTON FACILITY WASHINGTON, PENNSYLVANIA (DOCKET NO. 040-08778, RFTA NO. 02-007a)

### **INTRODUCTION AND SITE HISTORY**

Since the mid 1920s, Molybdenum Corporation of America (Molycorp) operated a plant in Washington, Pennsylvania for the primary production of molybdenum products—the plant also produced ferro alloys such as ferrocolumbium and tungsten. The raw material for this ferrocolumbium operation, columbite ore, contained natural thorium.

In the late 1960s, new federal requirements necessitated that Molycorp obtain a Source Material License (SMB-1393, Docket No. 040-8778) from the Atomic Energy Commission (AEC) for possession and use of materials containing 0.05% or greater by weight, uranium, thorium, or a combination of both. Most of the material that was processed by the corporation for the ferrocolumbium contained 1 to 1.5% thorium. The slag resulting from this production was in a glass/ceramic form containing an average of 1.2% thorium. Operations using thorium-containing ores were discontinued about 1970 (RSI 2001).

Molycorp renewed its Source Material License (SMB-1393) in 1992 and added an amendment incorporating a schedule for decommissioning the site. In November 1992, Molycorp submitted a site characterization plan to the NRC for approval—the scope of the survey plan was limited to buildings and structures on the Molycorp site and did not include the soil.

Currently, there are 21 buildings on the site for which decommissioning activities are being performed. All have been characterized for radiological contamination. As part of the decommissioning activities, process equipment and supporting fixtures were removed, cleaned, and released or disposed of as low-level radioactive waste. Potentially contaminated structural surfaces were stripped of coatings by grit blasting or use of chemical agents. Contaminated surfaces identified by the characterization survey were cleaned or removed. These remediation activities were performed under the Decommissioning Plan for the Washington, PA Facility which implemented

final status survey guidance from draft NUREG/CR-5849 (RSI 1999 and NRC 1992a). Soil areas located underneath and around the buildings have not been addressed and are radioactively contaminated.

Molycorp has submitted the final status survey results for Building 42. Although there was no history of radiological materials present within this building, as previously mentioned, the soils are contaminated. The top surfaces of the floors were expected to be clean and were classified as unaffected—however, the undersides of the concrete floors that are in contact with the soil will require survey prior to release (RSI 2001).

The NRC's Division of Waste Management has requested that the Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) perform confirmatory survey activities on buildings at the Molycorp, Inc. Washington Facility for which the licensee and their previous decontamination and decommissioning (D&D) contractor, Radiological Services, Inc. (RSI), have prepared final status survey reports.

#### SITE DESCRIPTION

The Molycorp, Inc., Washington Site is located in southwestern Pennsylvania on the outskirts of Washington County approximately 56 kilometers (35 miles) southwest of Pittsburgh. The site consists of approximately 8 hectares [ha (20 acres)] which represents the fenced portion of the 24 ha parcel of land owned by Molycorp that lies entirely within Canton Township at 300 Caldwell Avenue, Washington, Pennsylvania (Figure 1). In addition to the land area, there are approximately 21 buildings which remain on the site. The site is bounded by two streets in Canton Township—Caldwell Avenue and Green Street. The site is also transversed by Chartiers Creek that flows south to north through the property. The property is served by the CSX Railroad via two lines that were formerly owned by Tylerdale Connecting Railroad Company and the Baltimore and Ohio Railroad (MACTEC 2002).

Building 42 (north end), a Storage Warehouse, is 37 meter (m) long by 15 m wide with a 9 m high prefabricated metal structure with a steel frame, corrugated exterior metal walls and roof panels, and a reinforced concrete floor. The south end opens into the north end of Building 36.

#### **DOCUMENT/DATA REVIEW**

ESSAP reviewed the D&D contractor's survey documentation to determine the adequacy and appropriateness of the final status survey radiological instrumentation and procedures (RSI 1999). ESSAP also reviewed the final status survey data for Building 42 prior to visiting the site (RSI 2001).

#### SURVEY PROCEDURES

ESSAP performed confirmatory survey activities for Building 42 at the Molycorp, Washington Facility on April 16 and 17, 2002. Survey activities consisted of alpha plus beta and gamma surface scans, alpha and beta surface activity measurements, removable activity measurements, and exposure rate measurements. These activities were conducted in accordance with a site-specific survey plan, submitted to and approved by the U.S. Nuclear Regulatory Commission (NRC) and the ORISE/ESSAP Survey Procedures and Quality Assurance Manuals (ORISE 2002a, 2000 and 2001).

The reference grid system, previously established by RSI, was used by ESSAP for referencing measurement and sample locations.

ESSAP confirmatory survey coverage was determined by RSI's radiological classification of the building—Building 42 was classified as unaffected. ESSAP conducted alpha plus beta activity scans on up to 50% of the accessible floor surfaces, up to 25% of the lower wall surfaces, and up to 5% of the exterior wall surfaces, and conducted gamma scans over 100% of the accessible floor surfaces in Building 42. Alpha plus beta surface scans were performed using gas proportional detectors coupled to ratemeter-scalers with audible indicators. Gamma surface scans were performed using NaI scintillation detectors coupled to ratemeters with audible indicators.

Alpha and beta surface activity measurements were performed at nine locations on the floor, nine locations on the lower walls, three locations on the upper walls, and at four locations on the exterior walls. ESSAP performed beta-only activity measurements at 25 measurement locations and alpha activity measurements at eleven of the direct measurement locations. Direct measurements were performed using gas proportional detectors coupled to ratemeter-scalers. Smear samples, for determining removable activity levels, were collected from each direct measurement location. Exposure rates, measured at five locations, were performed at one meter above the surface using a micro-rem meter. Measurement locations are shown on Figure 2.

### SAMPLE ANALYSIS AND DATA INTERPRETATION

Samples and survey data were returned to the ORISE/ESSAP laboratory in Oak Ridge, Tennessee for analysis and interpretation. Sample analyses were performed in accordance with the ORISE/ESSAP Laboratory Procedures Manual (ORISE 2002b). Smears were analyzed for gross alpha and gross beta activity using a low-background gas proportional counter. Smear sample results and direct measurement data were reported in units of disintegrations per minute per 100 square centimeters (dpm/100 cm<sup>2</sup>). Exposure rates were reported in units of microroentgens per hour ( $\mu$ R/h).

#### FINDINGS AND RESULTS

Alpha plus beta surface scans of the floor and lower walls identified two areas of elevated alpha plus beta radiation near measurement locations #47 and #48 (Figure 2). These locations were marked for further investigation. Gamma surface scans did not detect any areas of elevated radiation.

Total and removable surface activity levels for Building 42 are presented in Table 1. Alpha surface activity levels ranged from 16 to 780 dpm/100 cm<sup>2</sup> and beta surface activity levels ranged from -49 to 4,100 dpm/100 cm<sup>2</sup>. Removable activity levels ranged from 0 to 1 dpm/100 cm<sup>2</sup> for alpha and -4 to 6 dpm/100 cm<sup>2</sup> for beta.

Site background exposure rates averaged 10  $\mu$ R/h; Building 42 exposure rates, presented in Table 2, ranged from 8 to 10  $\mu$ R/h.

### **COMPARISON OF RESULTS WITH GUIDELINES**

Survey results were compared with the site's decommissioning criteria. The applicable NRC surface activity guideline levels are (NRC 1987):

<u>Natural Thorium</u> 1,000 dpm/100 cm<sup>2</sup>, averaged over a 1 m<sup>2</sup> area 3,000 dpm/100 cm<sup>2</sup>, total, maximum in a 100 cm<sup>2</sup> area 200 dpm/100 cm<sup>2</sup>, removable

Natural Uranium

5,000  $\alpha$  dpm/100 cm<sup>2</sup>, averaged over a 1 m<sup>2</sup> area 15,000  $\alpha$  dpm/100 cm<sup>2</sup>, total, maximum in a 100 cm<sup>2</sup> area 1,000  $\alpha$  dpm/100 cm<sup>2</sup>, removable

Thorium is the predominant contaminant and has the more restrictive guideline—therefore, the D&D contractor elected to use the thorium guidelines for the site. Natural thorium emits both alpha and beta radiations, therefore, either alpha or beta activity may be measured for determining the residual activity of the thorium contaminant. As interpreted by the NRC, the average 1,000 dpm/100 cm<sup>2</sup> and maximum 3,000 dpm/100 cm<sup>2</sup> should apply independently to both alpha and beta measurements for surface contamination involving natural thorium (NRC 1992b). ESSAP's experience has shown that beta measurements typically provide a more accurate evaluation of thorium contamination on structure surfaces, due to problems inherent in measuring alpha contamination on rough, porous, and/or dirty surfaces. For the thorium series in secular equilibrium, the activity level providing 1,000 alpha dpm/100 cm<sup>2</sup> would result in about 670 beta dpm/100 cm<sup>2</sup>. Therefore, a beta activity measurement that is greater than 670 dpm/100 cm<sup>2</sup> would exceed the alpha activity guideline for thorium.

Measurement location #47, performed at a crack on the floor in Building 42, had a total beta activity level in excess of the average guideline (Figure 2). A clean piece of plastic was placed over the crack and left in place for about 15 minutes. Afterwards, a direct measurement on the plastic indicated 1,200 cpm with a background count of 198 cpm. Therefore, it was concluded that the elevated counts on the plastic are likely radon/thoron daughters that emanated through the crack in the floor from the contaminated soil below. All other measurements on the lower, upper, and exterior walls and the floor met the guidelines.

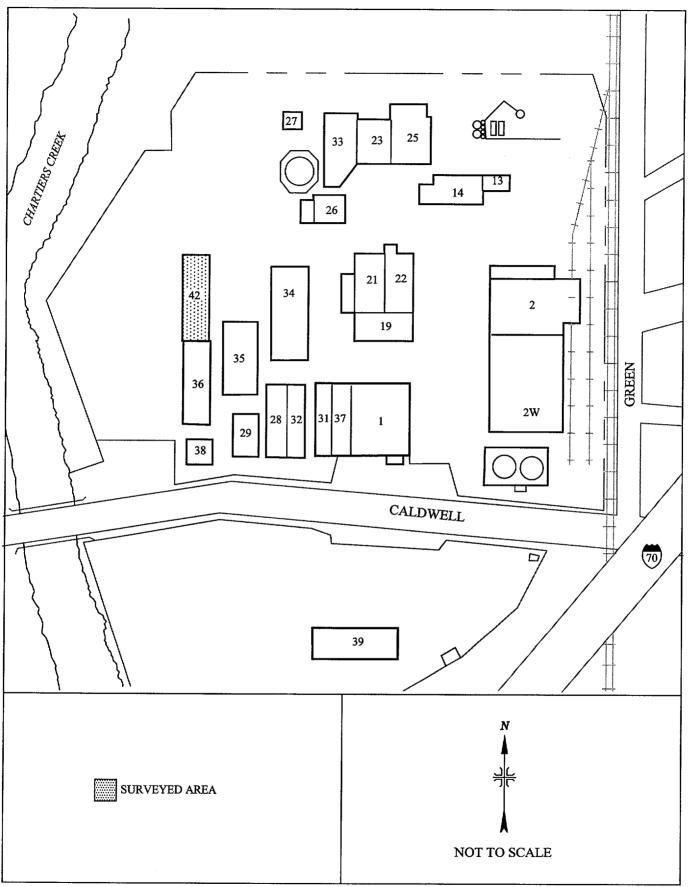
The NRC guideline for exposure rates at one meter above building surfaces is 5  $\mu$ R/h above background (NRC 1991). The exposure rates within Building 42 were within the guideline.

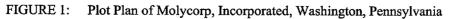
#### SUMMARY

During the period of April 16 and 17, 2002, the Environmental Survey and Site Assessment Program of the Oak Ridge Institute for Science and Education performed confirmatory survey activities on Building 42 at the Molycorp, Inc. Washington Facility in Washington, Pennsylvania. Survey activities consisted of alpha plus beta and gamma scans, alpha and beta surface activity measurements, and exposure rate measurements.

Survey results indicated that fixed and removable activity levels and exposure rates were less than the applicable guidelines. ESSAP's survey findings are consistent with the licensee's measurements and support the licensee's conclusion that the radiological conditions of the surveyed areas in Building 42 satisfy the NRC guidelines for release to unrestricted use. This report does not address the undersides of the concrete slab floor which will be surveyed by the licensee at a later date.









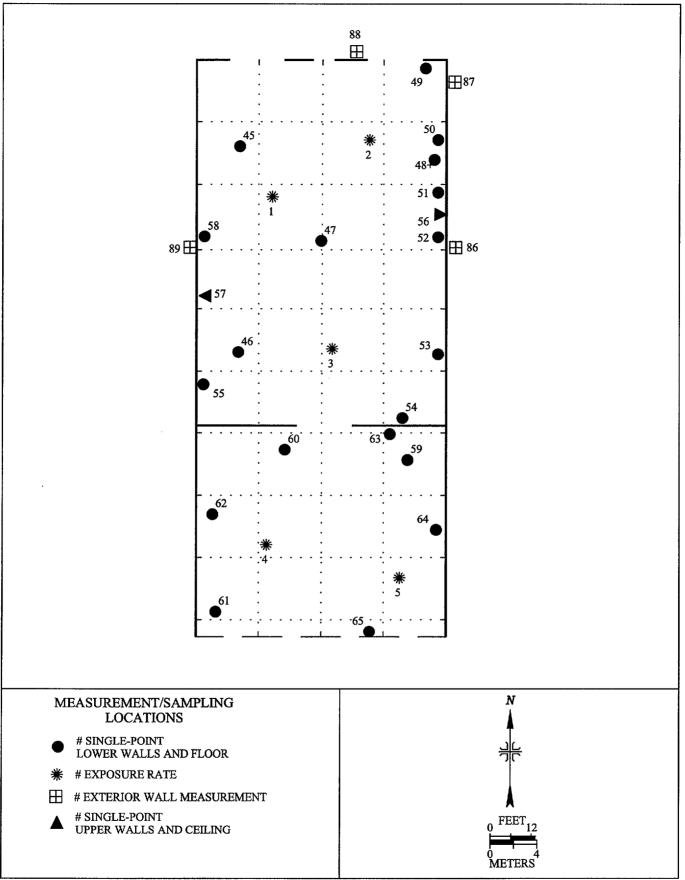


FIGURE 2: Building 42; Molycorp, Inc. Washington, PA - Measurement and Sampling Locations

## SURFACE ACTIVITY LEVELS BUILDING 42 MOLYCORP INCORPORATED WASHINGTON, PENNSYLVANIA

	a c h	Total Activity	(dpm/100 cm <sup>2</sup> )	Removable Activ	ity (dpm/100 cm <sup>2</sup> )
Location <sup>a</sup>	Surface <sup>b</sup>	Alpha	Beta	Alpha	Beta
45	F	48	190°	0	1
46	F	16	-49 <sup>c</sup>	0	1
47	F	780	<b>4,1</b> 00 <sup>c</sup>	0	-4
48	F	250	790°	0	-2
49	LW	56	580	1	-3
50	LW	40	790	0	3
51	LW	<sup>d</sup>	700	1	1
52	LW		820	0	-2
53	LW		700	1	-3
54	LW		490	0	2
55	F		590	1	-2
56	UW		1,000	1	-1
57	UW		790	0	-3
58	UW	0	680	0	-1

### TABLE 1 (continued)

## SURFACE ACTIVITY LEVELS BUILDING 42 MOLYCORP INCORPORATED WASHINGTON, PENNSYLVANIA

	a c b	Total Activity	(dpm/100 cm <sup>2</sup> )	Removable Activ	ity (dpm/100 cm²)
Location <sup>a</sup>	Surface <sup>b</sup>	Alpha	Beta	Alpha	Beta
59	F	71	420	0	-3
60	F	56	280	0	-3
61	F	32	310	0	4
62	F		410	0	1
63	LW		340	0	2
64	LW	56	350	0	-3
65	LW		310	0	1
86	EW		460	0	5
87	EW		440	1	-1
88	EW		220	0	6
89	EW		140	0	-1

\*Refer to Figure 2.

 ${}^{b}F =$ floor; LW = lower wall; UW = upper wall; and EW = exterior wall.

<sup>e</sup>Due to elevated ambient gamma radiation from contaminated soil underneath the concrete pad, these measurements were calculated by determining the difference between unshielded and shielded beta activity measurements Net Count Rates determined as follows: Net Count Rate=(Surface Counts<sub>unshielded</sub>-Surface Counts<sub>shielded</sub>)-(BKG Counts<sub>unshielded</sub>-BKG Counts<sub>shielded</sub>). <sup>d</sup>Measurement not performed.

### EXPOSURE RATES BUILDING 42 MOLYCORP INCORPORATED WASHINGTON, PENNSYLVANIA

Location <sup>a</sup>	Exposure Rate @ 1m (µR/h)
1	8
2	10
3	9
4	9
5	8

<sup>a</sup>Refer to Figure 2.

#### REFERENCES

MACTEC, Inc. (MACTEC), Survey Plan for Determining the Final Status of Buildings at the Molycorp Site, Washington, PA. Grand Junction, Colorado; Revision 0, February 1, 2002.

Radiological Services, Inc. (RSI). Molycorp, Inc., Washington, PA Facility Decommissioning Plan, Part 1 Revision. New London, Connecticut; June 30, 1999.

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