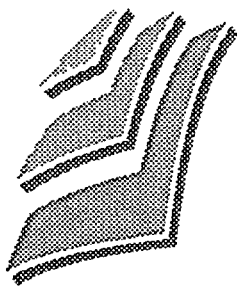


# Final Status Survey Report for Building Footers 21, 22, 34 and 36 and the 2W Ramp Concrete at the Molycorp Site

Washington, PA



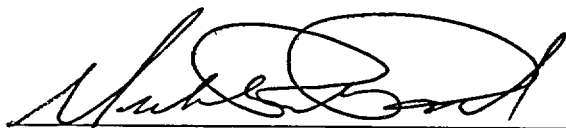
MACTEC, Inc.

Revision - 0  
Dated 10/09/02

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21, 22, 34 and 36 and the 2W Ramp Concrete at  
the Molycorp Site  
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**Reviews:**



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MACTEC Radiological Engineer

10-9-02

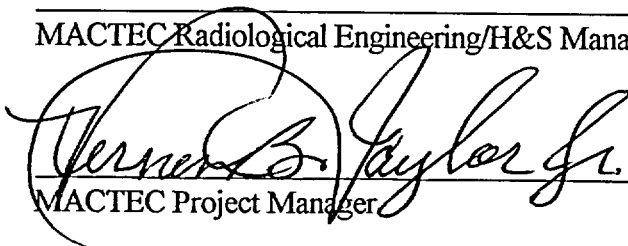
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MACTEC Project Manager

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Date

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## **1.0 BACKGROUND INFORMATION**

Molycorp, Inc.'s (Molycorp) predecessor, the Molybdenum Corporation of America, was formed from the Electric Reduction Company in Washington, Pennsylvania on June 16, 1920. The facility was purchased to manufacture ferroalloys.

Molybdenum manufacturing began in the 1920s. Processing of this material was idled in 1991. Although primarily manufacturing molybdenum products, the plant also produced ferrocolumbium (FeCb, 1964 to 1971), as well as other ferroalloys, e.g., tungsten.

In February 2002, site decommissioning and demolition was initiated for aboveground structures and buildings. Building final status surveys (FSS) were initiated in mid February, building demolition started in May 2002. Initially, each building or area located in a building was a single survey unit that included the foundation and shell/structure. After completing the FSS for the first set of buildings, it was realized that by combining the foundation and structure into a single survey unit, the completion of the NRC independent verification (IV) survey and release from radiological controls was delayed. In order to facilitate and expedite NRC IV surveys and the release of radiological controls, all subsequent building FSS consisted of independent surveys for the building's foundation and the shell/structure.

During subsequent visits by the NRC, IV surveys were performed of the building's shell and structural materials but not the foundations of the buildings.

Building shells/structures were demolished and the construction debris was removed from site or controlled as radioactive material

## **2.0 SITE INFORMATION**

### **2.1 SITE DESCRIPTION**

The Molycorp, Inc. project site (the site) is located in southwestern Pennsylvania on the outskirts of Washington County approximately 35 miles southwest of Pittsburgh. The site is separated from the populated City's urbanized area by the ramps and structures associated with Interstate 70 (I-70). The region is generally comprised of towns located close to transportation corridors surrounded by agricultural lands and open areas

The current work site consists of approximately 8 acres that is located inside a 20 acre fenced portion of the 59-acre parcel owned by Molycorp that lies entirely within Canton Township at 300 Caldwell Avenue, Washington, Pennsylvania, 15301. The fenced area is situated between 1,010 and 1,045 feet above mean sea level with relatively flat topography.

Molycorp's property has frontage along two dedicated public streets in Canton Township – Caldwell Avenue and Weirich Avenue. The site is transversed by Chartiers Creek that flows south to north through the property. The property is served by the CSX operated railroad via two lines that were formerly owned by the Tylerdale Connecting Railroad Company and the Baltimore and Ohio Railroad.

Adjacent property owners can be classified into three major categories on the current use of the land - residential, industrial, and public. The residential property lies to the east of the site on Green Street and to the west along Weirich Avenue. The industrial property is located predominately north of the site and includes property under the ownership of the Findlay Refractories Company and Allegheny Ludlum Corporation. Darr Development Company owns several scattered parcels located to the south and east of the site. Land under public ownership includes the Canton Township Volunteer Fire Company property, the right-of-way for I-70, and other public streets. The Washington Institute of Technology owns a vacant 38-acre parcel adjacent to the southwestern property line

## **2.2 SITE CONDITIONS AT TIME OF FOUNDATION SURVEY**

As part of the past decommissioning activities, building structural materials have been removed and processed, either as clean construction debris or as radiological waste. Clean construction debris has been continually removed from site as building materials and concrete foundations have been cleared from radiological controls by the NRC. Radiological waste has been segregated and stored on-site for final disposal activities. Shipping of radiological waste began in early October, 2002. Radioactive waste shipments will continue through job completion.

## **2.3 GROUNDS**

The Molycorp Washington, PA facility produced a ferrocolumbium alloy from Brazilian ore (pyrochlore) between 1946 and 1970. While the use of pyrochlore was commonplace by that time, this particular ore contained thorium as an accessory metal. The thorium was also in concentrations that required Molycorp to acquire a Source Materials License. This operation resulted in the production of a thorium-bearing slag. A portion of this slag was ball-milled (turned into a granular powder) and used as fill over portions of the site

While significant amounts of this slag have been removed from the site, remaining slag in soil continued to play a significant role in the survey and release of buildings on-site. Building steel walls and concrete floors showed significant readings above "normal" background levels when surveyed by hand-held or portable detectors

Because this elevated background condition exists at the Molycorp site, MACTEC devised instrument detector windows for some of their instruments and used them in areas where thorium slag in soil created a background nuisance during survey activities.

## **2.4 FOUNDATION CLASSIFICATION**

All foundations do not have the same potential for residual contamination and therefore do not require the same level of survey coverage. For purposes of establishing the degree of survey effort required, building foundations have been segregated into affected and unaffected foundations.

- Affected foundation: Foundations that have a potential for surface residual contamination from contact with underlying soils
- Unaffected foundation: Foundations not classified as affected.

TABLE 1 - CLASSIFICATION OF BUILDING FOUNDATION

Foundation Classification <sup>(1)</sup>	Building Number	Radiological Information
U	1	Concrete floor. Underside of slab identified as contaminated above release limits
U	2	Concrete floor. Not yet released by NRC. Building foundation is not located on contaminated fill.
U	2W	Concrete floor. Not yet released by NRC. Building foundation is not located on contaminated fill.
U	2 Train Bay	Concrete floor. Not yet released by NRC. Building foundation is not located on contaminated fill.
U	13	Slab final status surveyed and released by NRC.
U	14	Concrete floor. Not yet released by NRC. Building foundation is not located on contaminated fill.
U	19	Concrete floor. Not yet released by NRC. Building foundation is not located on contaminated fill.
U	21	Slab final status surveyed and released by NRC.
U	22	Concrete floor. Underside of slab identified as contaminated above release limits.
U	23	Slab final status surveyed and released by NRC.
U	25	Slab final status surveyed and released by NRC.
U	26	Concrete floor. Not yet released by NRC. Building foundation is not located on contaminated fill.
A	28	Concrete floor. Not yet released by NRC. Building foundation is located on contaminated fill.
U	29	Concrete floor. Underside of slab identified as contaminated above release limits.
U	31	Concrete floor. Topside of slab identified as contaminated above release limits.
A	32	Concrete floor. Underside of slab identified as contaminated above release limits.
A	33	Slab final status surveyed and released by NRC.
A	34	Concrete floor. Underside of slab identified as contaminated above release limits.
A	35	Slab final status surveyed and released by NRC.

A	36	Slab final status surveyed and released by NRC.
U	37	Concrete floor. Underside of slab identified as contaminated above release limits
A	38	Concrete floor. Not yet released by NRC. Building foundation is located on contaminated fill.
A	39	Concrete floor. Not yet released by NRC. Building foundation is located on contaminated fill.
A	42	Slab final status surveyed and released by NRC.

(1) Building foundation classification is derived from building location, obtained from Molycorp's Material License, Amendment No. 5, SMB-1393.

## 2.5 SURVEY UNITS

Each building foundation was considered an individual survey unit for final status survey purposes. Determination of compliance with the average unrestricted use limits was evaluated on a survey unit basis. Each survey unit must be shown to meet the average surface contamination and exposure rate limits at a 95% confidence.

## 3.0 DECOMMISSIONING ACTIVITIES

Decommissioning activities of the buildings on site were performed as a "first step" to release the site for unrestricted future use. The scope of work during this phase includes D and D of all above surface structures.

### 3.1 OBJECTIVES

The objectives for this phase of D and D activities included.

- Removal of equipment and surplus supplies from buildings
- Characterization of hazards associated with the buildings (performance of effective radiological surveys)
- Remediation or disposal of hazards identified in the characterization process
- Completion of Final Status Survey
- Unrestricted release of buildings
- Demolition of buildings



### 3.2 RESULTS OF PREVIOUS SURVEYS

Numerous radiological studies and surveys have been conducted at the Molycorp Washington, PA site. Since the late 1960s, regulatory requirements and pressure from local agencies have driven surveys and studies of the hazards associated with the production of various ferroalloys. Listed below is a brief history of the previous surveys performed on the Molycorp site:

Applied Health Physics, Inc. was contracted by Molycorp to conduct a series of leaching studies on ferrocolumbium slag during the late 1960s. These studies indicated that radioactive materials were fixed and would not leach into the groundwater in excess of prescribed limits. During this period, Molycorp applied unsuccessfully to the Pennsylvania Department of Health's Industrial Wastes Section and AEC for an onsite burial permit. Ferrocolumbium slag cleanup was concentrated in the early to mid-1970s time frame.

In June 1971, an AEC compliance inspection revealed that thorium-bearing slag had been inadvertently buried onsite in violation of the terms and conditions of their license and AEC regulations. The AEC issued a Notice of Violation and requested Molycorp to take remedial action to excavate these materials and dispose of them in accordance with AEC regulations and guidance documents. Applied Health Physics was contracted to perform a thorough radiological survey of the site and to provide health physics and waste disposal services necessary to comply with AEC's request. Survey measurements indicated exposure levels at 1.2 mR/hr in some areas.

In 1972, thoriated material from the site was disposed of at the West Valley, New York, burial site. The disposal was terminated when New York officials decided that the volume of waste was too large and the contamination level insignificant to use up valuable burial area. Molycorp performed cleanup operations to segregate and stabilize the remaining thoriated material in a capped pile containing about 27,700 cubic yards of slag on the south property. A 1975 Applied Health Physics, Inc. report indicated the average concentration of thorium-232 in the slag pile was 1,250 pCi/g, with exposures within the 0.2 mR/hr Nuclear Regulatory Commission maximum level allowed at the time (AEC was reorganized as the NRC in 1974). This pile was eventually removed and disposed of.

In 1978, one of two molybdenum-roasting furnaces was shut down as part of a consent decree with the Pennsylvania Department of Environmental Resources (PADER) Air Quality Agency due to exceedances of SO<sub>2</sub> standards. All remaining processes continued until 1991.

Oak Ridge Associated Universities, an NRC contractor, conducted a radiological survey of the site in 1985. The survey identified elevated (twice background or greater) levels of thorium in the dikes that separated the surface impoundments, and indicated the potential of subsurface thoriated slags in the western portion of the site.

RSA, Inc. conducted a subsurface survey for Molycorp in 1990 to characterize the thorium contamination across the western portion of the site (i.e., the impoundment area), and the areas immediately to the north, west, and northwest. Thirty-two holes were drilled on the site and radiation measurements were logged at every six inches of depth from the surface down to bedrock, both above and below water table. Radiation levels were also logged in monitoring wells previously drilled on the site. In addition to the subsurface survey, RSA, Inc. conducted a survey of the radiation exposure rates inside the study area. This survey consisted of approximately 400 measurements of the gamma radiation field at a height of one meter above

ground level Findings revealed that, in general, the subsurface concentrations of thorium were above those in the surface soils in almost every hole drilled. A general pattern was that the underground radiation levels decreased to background at a depth of about ten feet. While a majority of the holes exhibited concentrations of greater than 0.01 percent thorium, in only a few holes did the thorium content exceed an average of 0.05 percent at some point below the surface of the ground.

Foster Wheeler Environmental Corporation conducted a site characterization of the Molycorp Washington, PA site in 1994 and published its report titled "Site Characterization Report for License Termination of the Washington, PA Facility, 1995." This three-volume report was conducted to meet the Site Characterization Plan's objectives:

- To determine the extent of the distribution of thoriated residues on the site, in the structures and in the environmental media.
- To determine the rate(s) of migration, if any, of thorium or its daughters through various pathways to man.
- To assess associated non-radiological constituents and determine their effects on the radiological constituents and potential impacts on decommissioning
- To quantify parameters that affect potential human exposure to existing site radiological materials
- To support evaluation of alternative decommissioning actions and detailed planning of a preferred approach for decommissioning, decontamination, and waste disposal.

### **3.3 DECONTAMINATION PROCEDURES**

Building foundations and equipment footings found to contain radioactivity above the release limits were not normally decontaminated. Concrete and foundation materials found to have elevated levels of radioactivity were controlled as radioactive material, are temporarily stored on site, and will ultimately be disposed of as radioactive waste.

## **4.0 FINAL SURVEY PROCEDURES**

The basis of the Molycorp radiological survey design conformed to NUREG/CR 5849, "Manual for Conducting Radiological Surveys in Support of License Termination," RSI's "Decommission Plan for the Washington, PA Facility, Part 1 Revision," and the requirements of Molycorp's "U.S. Nuclear Regulatory Commission Material License, Amendment No. 5, SMB-1393." These references provide adequate information and sampling requirements to ensure a proper survey had been planned and performed. The requirements listed in these references were compiled into a sampling plan (MACTEC's "Concrete Sample and Management Plan") and used as the guidance document for sampling instructions.

#### 4.1 SAMPLING PARAMETERS

Sampling parameters were identified from NUREG/CR 5849, "Manual for Conducting Radiological Surveys in Support of License Termination," RSI's "Decommission Plan for the Washington, PA Facility, Part 1 Revision," and the requirements of Molycorp's "U.S. Nuclear Regulatory Commission Material License, Amendment No. 5, SMB-1393."

Survey results were obtained and used for comparison against the limits for unrestricted release, as defined in the site's NRC License.

Table 2 identifies the release limits of the license.

**TABLE 2 - ACCEPTABLE SURFACE CONTAMINATION LEVELS (DPM/100CM<sup>2</sup>)**

Radionuclide <sup>(1)</sup>	Average	Maximum	Removable
U-nat, U-235, U-238, and associated decay products	5,000 $\alpha$	15,000 $\alpha$	1,000 $\alpha$
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100	300	20
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000	3,000	200
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above	5,000	15,000	1,000

(1) Where surface contamination by both alpha and beta-gamma emitting nuclides exist, the limits established for alpha and beta-gamma emitting nuclides should apply independently.

Even though limited quantities of natural uranium has been identified at the Washington, PA site, and is included as a part of the site's NRC License, the more restrictive limits for release (for surface activity) are for the natural thorium radionuclide, which is the significant radionuclide of concern. Therefore, the limits for release are due to the natural thorium radionuclide, and the limits are 1,000 dpm/100cm<sup>2</sup> average, 3,000 dpm/100cm<sup>2</sup> maximum and 200 dpm/100cm<sup>2</sup> removable.

Because both alpha and beta radiations are a product of the decay of natural thorium (in equilibrium), the limits listed above apply independently to both alpha radiation and beta radiation.

Due to the inherent difficulty of properly quantifying the alpha radiation component during the decay of natural thorium when using a hand-held instrument, a ratio of alpha decays to beta decays was identified and beta radiation was used as a surrogate to quantify the alpha activity. This was not the case for determining removable contamination. The Ludlum 2929 was calibrated and set up for the measurement of both alpha and beta radioactivity.

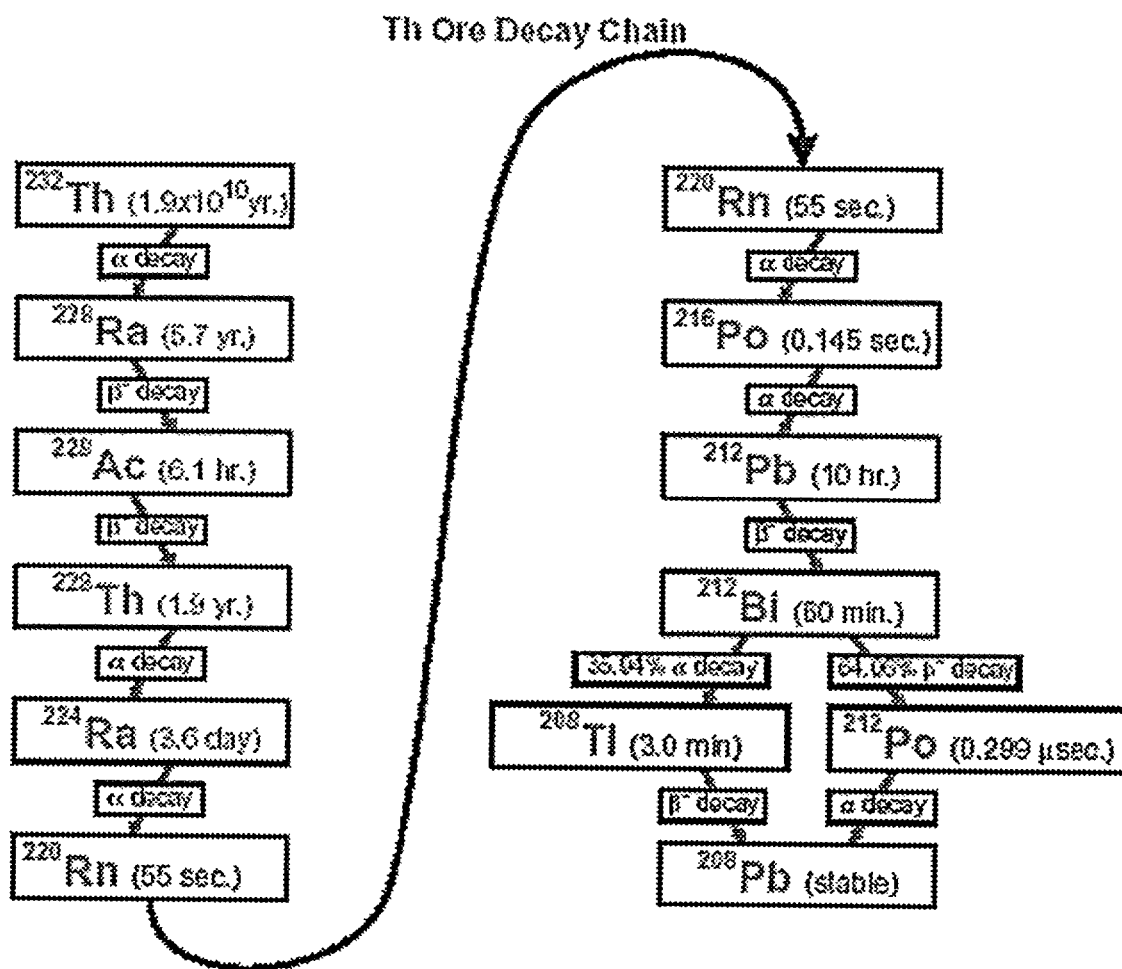
The detectable ratio of alpha to beta is a 2:1 for natural thorium decay. In actuality, the decay of natural thorium produces 6 alphas and 4 betas to reach stable lead. However, one of the betas emitted during the

decay process (from Ra-228) is not detectable (39 keV E-max). The other three betas emitted are detectable and are suitable as a surrogate.

The alpha readings recorded on the various data forms and record sheets were actual instrument readings, obtained from the instrument during the survey, and do not represent this ratio factoring. The use of alpha to beta ratio factoring is incorporated in the data set just prior to statistical analysis and comparison to limit values

Figure 1 is a graphical representation of the decay of natural thorium

FIGURE 1 - NATURAL THORIUM DECAY CHAIN



## 5.0 SURVEY PROCEDURE

### 5.1 GENERAL

Approved SOPs and/or field procedures were followed for activities described in this plan.

### 5.2 SURFACE SCANS

Scanning of surfaces to identify locations of elevated residual surface activity were performed according to Table 3.

**TABLE 3 - SURFACE SCAN SCHEDULE**

<b>Foundation Classification</b>	<b>Survey Location</b>	<b>Surface Scan</b>
All Previously Surveyed Foundation Tops	Top surface of foundation.	5 - 10% cursory beta-gamma scan (at random locations) on top surface of previously surveyed foundations prior to lifting foundation.
Affected Foundations	Underside surface of foundation.	100 % beta-gamma scan of underside of foundation when foundation is lifted.
Unaffected Foundations	Underside surface of foundation.	10 % beta-gamma scan of underside of foundation when foundation is lifted.
Result Requirements		Locations of surface activity exceeding twice background will be marked for further evaluation by direct measurement.

The instruments that were used for scanning are listed in Table 7. For hand-held instrumentation, the detector was kept as close as possible to the surface and moved across the surface at a slow speed. Scan surveys were performed by moving the detector over the surface area at a maximum speed of 1-2 inches per second and a distance of approximately 1/2 inch for beta. If the count rate increased, the rate of movement of the detector was decreased or stopped. If the increase in count rate was real (approximately twice background and not a random variation in the background count rate), a static 60-second measurement was performed over the area to quantify the activity. Audible indicators (headphones or instrument speaker) were used to identify locations having elevated activity levels. All scanning results were noted on standard survey forms and locations of elevated radiation were identified for later investigation.

### 5.3 DIRECT SURFACE MEASUREMENTS

Direct measurements were performed according to Table 4.

**TABLE 4 - DIRECT SURFACE MEASUREMENT SCHEDULE**

<b>Foundation Classification</b>	<b>Survey Location</b>	<b>Direct Measurement</b>
All Previously Surveyed Foundations	Top surface of foundation	Measurements will be performed at each location of elevated activity identified by surface scan measurements.
Affected Foundations	Underside surface of foundation.	Measurements will be performed at a minimum of 30 locations for the entire foundation (survey unit) and sufficient additional locations to provide coverage at a minimum of approximately one location per 20 m <sup>2</sup> of the underside surface of the foundation.
Unaffected Foundations	Underside surface of foundation.	Measurements will be performed at a minimum of 30 locations for the entire foundation (survey unit) and sufficient additional locations to provide coverage at a minimum of approximately one location per 50 m <sup>2</sup> of the underside surface of the foundation.
Result Requirements		If measurement indicates residual activity above guideline limits, the affected area is identified and controlled as radioactive material.

Direct surface measurements were performed at the identified locations using the instruments described in Table 7. Direct surface measurements were conducted by integrating counts over a 1-minute period.

Due to the inherent difficulty of properly quantifying the alpha radiation component of the decay of natural thorium when using a hand-held instrument, a derived ratio of alpha decays to beta decays was used. The detectable ratio of alpha to beta is 2:1 for natural thorium decay. In actuality, the decay of natural thorium produces 6 alphas and 4 betas to reach stable lead. However, one of the betas emitted during the decay process (from Ra-228) is not detectable (39 keV E-max). The other three betas emitted are detectable and are suitable as a surrogate. Beta radiation was used as a surrogate to quantify alpha activity when performing direct measurements.

Alpha readings obtained during the surveying process were recorded on the proper data form(s) and/or record sheet(s) but were not be used to quantify the alpha activity component for direct measurements

Alpha to beta ratio factoring was incorporated in the data set just prior to statistical analysis and comparison to limit values.

#### 5.4 SMEAR SURVEYS

Smear surveys were conducted according to Table 5.

**TABLE 5 - LOOSE SURFACE MEASUREMENT SCHEDULE**

Foundation Classification	Survey Location	Removable Surface Activity
All Previously Surveyed Foundations	Top surface of foundation.	Collected from each location where a direct surface activity measurement is made (alpha and beta analysis).
Affected Foundations	Underside surface of foundation	Collected from each location where a direct surface activity measurement is made (alpha and beta analysis).
Unaffected Foundations	Underside surface of foundation.	Collected from each location where a direct surface activity measurement is made (alpha and beta analysis).

Smear sampling was performed in accordance with applicable procedures. Smears were counted for gross alpha and beta with the appropriate instrument described in Table 7.

#### 5.5 EXPOSURE RATE MEASUREMENTS

Exposure rate measurements were performed according to Table 6.

**TABLE 6 - EXPOSURE RATE MEASUREMENT SCHEDULE**

Foundation Classification	Survey Location	Exposure Rate Measurement
NA	External surface of "clean" concrete waste pile.	Gamma exposure rates measured 1 meter perpendicular to the piled concrete surface at 1 measurement per 50 m <sup>2</sup> of surface area.

Exposure rate measurements were performed at the identified locations using the instruments described in Table 7. Pile exposure rate measurements were not be taken at locations greater than seven feet above ground level.

#### 5.6 BACKGROUND LEVEL DETERMINATION

Background levels were determined for concrete surfaces by taking a minimum of 10 measurements at locations of similar construction, but without a history of radioactive materials use (off-site locations)

## 5.7 DOCUMENTATION

All survey and sampling efforts were documented by sampling personnel. One member of the sampling team was assigned as a document coordinator and was responsible for recording all required information during survey and sampling activities, other than the normal sampling information commonly performed by the individual obtaining the sample. Samples that were sent to an off-site processing facility were transferred from sample collection personnel to the designated counting technician for handling and custody control. This technician was responsible for documentation, sample identification, packaging, and shipping of samples, as required. A standard chain-of-custody record was used to record sample transfers to offsite facilities. Samples were held in the custody of the document coordinator until being shipped to the laboratory.

All survey data was documented on the appropriate radiological survey form, map, and/or data sheet. Information included, but was not limited to:

- Date, time and purpose of the survey
- General and specific location of the survey
- Name and signature of the surveyor
- Instrument model, serial number, and calibration due date
- Survey results for radiological contamination (recorded in dpm/100 cm<sup>2</sup>)

Survey documentation was completed and reviewed in a timely manner. Errors identified during the review process were brought to the Health Physics Technician (HPT) for correction.

## 6.0 INSTRUMENTATION

### 6.1 INSTRUMENT OPERATION AND CALIBRATION

All instruments were operated, maintained, and calibrated according to the manufacturer's recommendations and/or the specifications of ANSI N323-1978.

- Survey instruments were calibrated before initial use, at least semi-annually and following maintenance or repair that could affect calibration. Calibration sources were National Institute of Science and Technology (NIST) traceable.
- Meters need not be calibrated for readings above 1,000 mR/hr.
- Daily functional checks were conducted on each instrument to verify that the equipment is functioning properly.
- When not in use, instruments were stored at a central location and protected from harsh environments
- Records of instrument calibration and daily functional checks are maintained for inspection.



- Calibration stickers which include; sources used to calibrate, correction factors or efficiencies for each scale or decade calibrated, the date calibrated and due date, were attached to each instrument.

## 6.2 MINIMUM DETECTABLE ACTIVITY

The detection sensitivity of a measurement system refers to the statistically determined quantity of radioactive material or radiation that can be measured or detected at a pre-selected confidence level. This sensitivity is a factor of both the instrumentation and the technique or procedure being used. Typically, detection sensitivity has been defined (EPA 1980) as the level above which there is less than a 5% probability that radioactivity will be reported present when it is really absent (Type I error) or reported absent when it is really present (Type II error).

Minimum detectable activity (MDA) is an *a priori* estimate of the minimum activity level which is practically measurable with a specific instrument and sampling and/or measurement technique. The basic equation for determining field instrument MDA (NUREG/CR-5849) is:

FIGURE 1 - BASIC MDA EQUATION

$$MDA = \frac{2.71 + 4.65\sqrt{B_R * t}}{E * \frac{A}{100}}$$

Where:

$B_R$	=	background count rate
$t$	=	background count time (min)
$E$	=	efficiency
$A$	=	area of probe

## 6.3 INSTRUMENT SELECTION

During the final status survey of building foundations at the MolyCorp site, several radiological instruments were used to identify and quantify the radioactivity of building surfaces. The instruments identified in Table 7 are commonly used for measuring surface deposited radioactive levels from thorium series source of radioactivity. These instruments are reliable, readily available, and reasonably easy to use by trained personnel. As necessary, instruments were substituted with an equivalent, or better, instrument. Prior to instrument substitution, the site radiological engineer was notified and approved of the substitution.

TABLE 7 - INSTRUMENTATION GUIDE

Instruments	Probe	Radiation	MDA (dpm/100 cm <sup>2</sup> )	Use
Ludlum, Model 2360	43-89	Alpha	67	Static Surveys
Ludlum, Model 2360	43-89	Beta	520	Static Surveys
Ludlum, Model 2350-1	43-68	Alpha	66	Static Surveys
Ludlum, Model 2350-1	43-68	Beta	319	Static Surveys
Ludlum, Model 2929	43-10-1	Alpha	29	Counter Scaler
Ludlum, Model 2929	43-10-1	Beta	182	Counter Scaler
Ludlum, Model 2350-1	43-68	Alpha	105	Scan Surveys
Ludlum, Model 2350-1	43-68	Beta	625	Scan Surveys
Ludlum, Model 239-1F	43-37	Alpha	64	Floor Monitor
Ludlum, Model 239-1F	43-37	Beta	1186	Floor Monitor
Ludlum, Model 19	Internal	Gamma	NA	Exposure Rates

#### 6.4 INSTRUMENT USE TECHNIQUES

Instruments selected for performing final status surveys were provided by GTS Duratek, Field Engineering and Field Services group, Kingston, TN. Prior to delivery, instrument calibrations and operations were verified by the vendor, and shipped to Washington, PA. Upon arrival, the instruments were inspected and verified operational. Instrument backgrounds were preformed. QC check control limits were established and Chi-squared tests were performed, as necessary.

Prior to daily use, instruments were response checked and compared against their two and three sigma warning and control limit values. For scaler instruments, daily backgrounds were determined and MDCs were calculated in addition to their response checks. After daily use, hand-held instruments were once again source response checked to ensure that the instrument did not fail during the day's work. All instrument "daily checks" data was logged in the appropriate data log record.

Qualified HP technicians were trained on the use of the instruments, and provided access to the instrument's User Manuals. Surveys were performed in accordance with approved radiological survey procedures on site. Survey results were reviewed by the Radiological Engineer for accuracy and completeness.

## 7.0 SURVEY FINDINGS

Detailed data reports (Survey Findings Report) for each survey unit sampled are provided as an appendix to this report. Field data collection forms, survey report forms, instrumentation information (background, QC, MDA, and source response data forms), statistical test results, and comparisons to release limits are all provided as a single package. Each package also contains a summary of the final status survey for that survey unit and includes information on anomalies discovered during the survey process. Where significant differences existed between final status survey results and results of previous surveys for the survey unit, explanations are provided.

Raw survey data was compiled into survey data tables, where appropriate, and presented with calculational results and comparisons.

### 7.1 TECHNIQUES FOR REDUCING/EVALUATING DATA

Survey information was obtained from the instrument's meter face used at the time of the survey. This data was recorded on a Radiological Survey Location Indicator data sheet, in the instrument's units. For scans and static measurements, the units were in counts per minute (cpm). Smear data was recorded after counting, subtracting background, and converted to units of disintegrations per minute per 100 square centimeters (dpm/100cm<sup>2</sup>). Dose rate measurements were recorded in units of micro-Roentgen per hour (uR/hr) and taken directly from the instrument's meter face. Information used in the conversion from cpm to dpm (instrument efficiencies) was recorded on the Radiation Protection Survey Report form. For scans, the highest reading for the given immediate scan area was recorded in cpm.

Where "hot spots" needed to be evaluated, additional readings were taken and the average hot spot activity was calculated in accordance with NUREG/CR-5849, Section 8.5.2 - Elevated Areas of Activity.

### 7.2 STATISTICAL EVALUATION AND COMPARISON TABLES

The statistical methodology used to provide the true representation of the data in relationship to the applicable limits is found in Sections 2.0 and 8.0 of NUREG/CR-5849. Comparison tables and tests used in the analysis are presented as part of each survey unit's Survey Findings Report package, as an appendix to this report.

## 8.0 SUMMARY

Final status survey of the building foundations located at the MolyCorp Washington, PA site were performed in accordance with the requirements listed in NUREG/CR 5849, "Manual for Conducting Radiological Surveys in Support of License Termination," RSI's "Decommission Plan for the Washington, PA Facility, Part 1 Revision," MolyCorp's "U.S. Nuclear Regulatory Commission Material License, Amendment No. 5, SMB-1393," and MACTEC's "Concrete Sample and Management Plan."

According to the findings of the final status surveys performed at the MolyCorp Washington, PA site, all release criteria have been met. Results of the final status survey demonstrate that the residual radioactivity is below the unrestricted use criteria and confirm that the building foundations are suitable for unrestricted use.

## 9.0 REFERENCES

- 1) *Manual for Conducting Radiological Surveys in Support of License Termination*, NUREG/CR-5849, Draft, December 1993.
- 2) *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) Revision 1*, NUREG-1575, Rev. 1, US Nuclear Regulatory Commission, Office of Nuclear Regulatory Research, Washington, DC, August 2000.
- 3) *Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs*, American National Standard, ANSI/ASQC E4-1994.
- 4) *Quality Assurance for Radiological Monitoring Program - Effluent Streams and the Environment*, NRC Regulatory Guide 4.15, 1979.
- 5) *Termination of Operating Licenses for Nuclear Reactors*, Nuclear Regulatory Commission, Regulatory Guide 1.86, 1974.
- 6) *Minimum Detectable Concentrations with Typical Radiation Survey Instruments for Various Contaminants and Field Conditions*, NUREG/CR-1507, Final, 1997.
- 7) *Statistical Methods for Evaluating the Attainment of Cleanup Standards*, Pacific Northwest Laboratory, Richland, WA, December 1992.
- 8) *Radiation Detection and Measurement*, Knoll, 1979.
- 9) *Washing, PA Facility, Decommissioning Plan, Part I Revision*, June 30, 1999, Radiological Services Inc.
- 10) *Radiation Protection Program, Health Physics Procedures*, June 1999, Radiological Services Inc.
- 11) *Site Characterization Report for License Termination of the Washington, PA Facility*, January 1995, Radiological Services Inc
- 12) *U.S. Nuclear Regulatory Commission Materials License*, Molycorp, Inc, SMB-1393, Docket No. 040-08778, Amendment 5.
- 13) *Antech Ltd. - Waltz Mill, Project No. 02-0284W, Analytical Survey Results for Composite Tile Sample at Molycorp, Washington, PA*, May 13, 2002.

## Appendix A

# **Building 21 Footer Data Package**

Molycorp Washington, PA

October, 2002

## **Building 21 Footers Data Package**

This data package contains final status survey information for Building 21, Molycorp, Washington, PA site. The building's footers were surveyed in accordance with the Concrete Sampling and Management Plan.

Field data collection forms, survey report forms, statistical test results, and comparisons to release limits are provided.

## **Summary**

Results from the final status survey of Building 21 footers provides evidence that all release criteria have been met, demonstrates that residual radioactivity is below the unrestricted use criteria, and confirms that the footers of Building 21 are suitable for unrestricted use and release.

DDO-138 Radiation Protection Survey Report				Site Molycorp / Washington, PA											
Section 1: Survey Information															
Date	9-17-02	Time	1630	Location	Bldg #21										
RWP Number	N/A	Purpose of Survey <input type="checkbox"/> RWP <input type="checkbox"/> Routine Survey <input type="checkbox"/> Unconditional Release <input type="checkbox"/> Other			Survey Issue Log Number 02-1011										
Survey Title: FSS Foundations (underside) (Footer)				Page	1 of 3										
<p>1 Minute STATICS TAKEN ON Concrete Foundations</p> <table><thead><tr><th></th><th>BKG</th><th>MDA</th></tr></thead><tbody><tr><td>B -</td><td>144</td><td>253</td></tr><tr><td><math>\alpha</math></td><td>8</td><td>92</td></tr></tbody></table> <p>9 locations on Data Sheet labeled * MARKED in AREA TO be removed to RAD waste pile</p> <p>Model 19 #22526 Due 1-29-03</p>					BKG	MDA	B -	144	253	$\alpha$	8	92	Smear Number	Beta dpm/100cm <sup>2</sup>	Alpha dpm/100cm <sup>2</sup>
					BKG	MDA									
				B -	144	253									
				$\alpha$	8	92									
				1											
				2											
				3											
				4											
				5											
				6											
				7											
				8											
				9											
				10											
				11											
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				14											
				15											
				16											
				17											
				18											
				19											
				20											
				21											
				22											
23															
24															
25															
26															
Bkgd Readings: 8-10 HR/hv															
Legend 00 = mRem/h gamma    00 C = mRem/h gamma contact    ① = Smear Location    ▽ = Air Sample Location    -X-X-X- = Rope, Boundary, or Barrier 00 β = mRem/h beta    00 βC = mRem/h beta contact    -①- = Large Area Wipe    - = Bulk Material Sample															
Section 2: Instrument Used															
Instrument Model/SN	Cal Due Date	Probe Model/SN	Cal Due Date	Detector Eff: β (cpm/dpm) α	MDA B- α    Other B- DKG α										
2929/115563	6-14-03	43-10/12726	6-14-03	.231/.347	134/12    73/.1										
2350-1/126140	1-16-03	43-106/127162	12-14-02	.231/.172	717/72    307/1.7										
Section 3: Review and Approval															
Survey Performed By (Sign) Mark Blanceck			Area Posted and/or Barricaded <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Required		Date and Time 9-17-02 / 1630										
Radiation Safety Officer (Print Name & Sign) Steve Kowalski / Steve Kowalski					Date and Time 9-18-02 / 0845										

## Radiological Survey Results - Survey Location Indicator

Survey # 02-1011

Survey Area Information:

(Footers)  
FSS FOUNDATIONS Bldg 21

Instrument Data	Instrument Model/SN	Cal Due	Probe Model/SN	Cal Due	$\alpha$ Scan MDA	$\beta$ Scan MDA	$\alpha$ Static MDA	$\beta$ Static MDA

Performed By:

Print Name

Signature

Date

Location	$\beta$ Scan (cpm)	$\alpha$ Scan (cpm)	$\beta$ Static (unsh) (cpm)	$\beta$ Static (sh) (cpm)	$\alpha$ Static (cpm)	ER ( $\mu$ rem/hr)	Smears (dpm/100 cm <sup>2</sup> )	
							$\alpha$	$\beta$
* F-21	760	NA	719	413	NA	12	- .3	- 56
* F-21	680		651	360		11	- .3	- 13
* F-21	740		713	310		11	- .3	35
* F-21	790		762	363		10	- .3	35
* F-21	760		720	407		12	- .3	4.3
F-21	600		523	360		11	- .3	13
F-21	540		519	356		11	2.6	48
F-21	620		598	364		12	- .3	- 17
F-21	540		521	391		11	- .3	- 43
* F-21	680		650	320		12	- .3	- 69
* F-21	790		760	407		11	- .3	- 56
F-21	580		550	399		11	2.3	- 4.3
F-21	570		540	368		10	5.5	0
F-21	540		510	349		11	- .3	- 13
* F-21	840		780	401		11	- .3	26
* F-21	960		900	416		1.0	- .3	56
F-21	620	NA	586	411	NA	11	2.6	95
NA								



Sunny H 02-1011

Inst. #2

**Results of Surface Scans**  
**Molycorp - Building 21 Survey Unit**

**Footer Material**

Location	Beta Scan gross cpm	Beta Scan net cpm
F1	490	183
F2	450	143
F3	460	153
F4	590	283
F5	380	73
F6	360	53
F7	630	323
F8	580	273
F9	480	173
F10	460	153
F11	760	453
F12	680	373
F13	740	433
F14	790	483
F15	760	453
F16	600	293
F17	540	233
F18	620	313
F19	540	233
F20	680	373
F21	790	483
F22	580	273
F23	570	263
F24	540	233
F25	840	533
F26	960	653
F27	620	313

All footer material scans performed with Ludlum Model 2350-1 No. 126190  
with 43-106 No. 133871

**Monitor Info:**

Scan MDA Beta - 717 dpm/100cm<sup>2</sup>

Scan background Beta - 307 cpm

Detector Eff. Beta - .231

**Elevated Results of Surface Scans**  
**Molycorp - Building 21 Survey Unit**

**Footer Material**

Location	Beta Scan net cpm
F26	653

## Direct Measurements (Total Activity)

Molycorp - Building 21 Survey Unit

### Footer Material

Location	Unshield Beta cpm	Shield Beta cpm	Gross Beta cpm	Bkgd cpm	Net cpm	Direct Beta (dpm/100cm <sup>2</sup> )	Uncertainty 95% CL	MDA (dpm/100cm <sup>2</sup> )	Direct Alpha <sup>(1)</sup> (dpm/100cm <sup>2</sup> )
F1	471	328	143	144	-1	-4	144	253	-9
F2	416	286	130	144	-14	-61	140	253	-121
F3	427	315	112	144	-32	-139	136	253	-277
F4	575	348	227	144	83	359	163	253	719
F5	349	284	65	144	-79	-342	123	253	-684
F6	348	347	1	144	-143	-619	102	253	-1238
F7	603	373	230	144	86	372	164	253	745
F8	562	353	209	144	65	281	159	253	563
F9	450	334	116	144	-28	-121	137	253	-242
F10	442	323	119	144	-25	-108	138	253	-216
F11	719	412	307	144	163	706	180	253	1411
F12	651	360	291	144	147	636	177	253	1273
F13	713	310	403	144	259	1121	198	253	2242
F14	762	363	399	144	255	1104	198	253	2208
F15	720	407	313	144	169	732	181	253	1463
F16	523	360	163	144	19	79	143	244	158
F17	519	356	163	144	19	79	143	244	158
F18	598	366	232	144	88	367	158	244	733
F19	521	391	130	144	-14	-58	135	244	-117
F20	650	320	330	144	186	775	178	244	1550
F21	760	407	353	144	209	871	182	244	1742
F22	550	399	151	144	7	29	140	244	58
F23	540	368	172	144	28	117	145	244	233
F24	510	349	161	144	17	71	143	244	142
F25	780	401	379	144	235	979	187	244	1958
F26	900	416	484	144	340	1417	205	244	2833
F27	580	411	169	144	25	104	144	244	208

All footer material direct measurements performed with Ludlum Model 2350-1  
No. 126190 with 43-106 No. 133871

Monitor Info:

Direct MDA Beta - 253 dpm/100cm<sup>2</sup>

Concrete background Beta - 144 cpm

Detector Eff. Beta - .231

(1) - A beta to alpha ratio factoring (1:2, beta to alpha) was used to provide a more accurate alpha activity determination.

## Elevated Direct Measurements (Total Activity)

### Molycorp - Building 21 Survey Unit

#### Footer Material

Location	Direct Beta (dpm/100cm <sup>2</sup> )	Direct Alpha (dpm/100cm <sup>2</sup> )
F11		1411
F12		1273
F13	1121	2242
F14	1104	2208
F15		1463
F20		1550
F21		1742
F25		1958
F26	1417	2833

All concrete with elevated direct measurement readings was identified, marked and segregated from clean concrete. Concrete with elevated readings (above release limits) will be controlled until shipped off-site as radiological waste or additional surveys will be performed and the 1 square meter average determined.

# Removable Surface Activity Measurements

## Molycorp - Building 21 Survey Unit

### Footer Material

Location	Removable Beta (dpm/100cm <sup>2</sup> )	Uncertainty 95% CL	MDA	Removable Alpha (dpm/100cm <sup>2</sup> )	Uncertainty 95% CL	MDA
F1	0	9.4	134	-0.3	1.8	12
F2	8.7	15.2	134	-0.3	1.8	12
F3	35	25.9	134	2.6	5.4	12
F4	17	19.2	134	-0.3	1.8	12
F5	-13	17.4	134	-0.3	1.8	12
F6	0	9.4	134	-0.3	1.8	12
F7	-17	19.2	134	2.6	5.4	12
F8	13	17.4	134	-0.3	1.8	12
F9	26	22.8	134	-0.3	1.8	12
F10	4.3	12.6	134	-0.3	1.8	12
F11	-56	31.9	134	-0.3	1.8	12
F12	-13	17.4	134	-0.3	1.8	12
F13	35	25.9	134	-0.3	1.8	12
F14	35	25.9	134	-0.3	1.8	12
F15	43	28.3	134	-0.3	1.8	12
F16	13	17.4	134	-0.3	1.8	12
F17	48	29.8	134	2.6	5.4	12
F18	-17	19.2	134	-0.3	1.8	12
F19	-43	28.3	134	-0.3	1.8	12
F20	-69	35.1	134	-0.3	1.8	12
F21	-56	31.9	134	-0.3	1.8	12
F22	-4.3	12.6	134	-0.3	1.8	12
F23	0	9.4	134	5.5	7.8	12
F24	-13	17.4	134	-0.3	1.8	12
F25	26	22.8	134	-0.3	1.8	12
F26	56	31.9	134	-0.3	1.8	12
F27	95	40.8	134	2.6	5.4	12

Ludlum 2929 No. 115563 with 43-10 No.  
127216 Info:

	Beta	Alpha
Background (cpm)	73	0.1
Bkgd ct. time	60	60
Sample ct. time	1	1
Efficiency	0.231	0.347
MDA	134	12.0

**Elevated Removable Surface Activity Measurements**  
**Molycorp - Building 21 Survey Unit**

**Footer Material**

No elevated removable surface activity was reported above limits.



**Exposure Rate Measurements**  
**Molycorp - Building 21 Survey Unit**

**Footer Material**

Location	Exposure Rate (uR/hr)	Net Exp Rate (uR/hr)
F1	11	2
F2	11	2
F3	9	0
F4	10	1
F5	10	1
F6	11	2
F7	11	2
F8	10	1
F9	10	1
F10	11	2
F11	12	3
F12	11	2
F13	11	2
F14	10	1
F15	12	3
F16	11	2
F17	11	2
F18	12	3
F19	11	2
F20	12	3
F21	11	2
F22	11	2
F23	10	1
F24	11	2
F25	11	2
F26	10	1
F27	11	2

Background dose rate: 8-10 uR/hr with Model 19, No. 22526

# Summary of Building Surface Direct Reading (Total Activity) Results Molycorp - Building 21 Survey Unit

## Footer Material

Beta				Alpha			
n	$\bar{x}$	s	$\mu_{\alpha}$	n	$\bar{x}$	s	$\mu_{\alpha}$
18	23	250.6	125.0	18	45	501.3	250.0
	$t_{1-\alpha}$	1.734					

## Guidelines/Conditions Satisfied?

Beta	Alpha
Yes	Yes

**Summary of Exposure Rate Measurements**  
**Molycorp - Building 21 Survey Unit**

**Footer Material**

n	$\bar{x}$	s	$\mu_\alpha$
27	1.8	0.7	2.1
$t_{1-\alpha}$	1.703		

**Guidelines/Conditions**  
**Satisfied?**

Yes

## Appendix B

# **Building 22 Footer Data Package**

Molycorp Washington, PA

October, 2002

## **Building 22 Footers Data Package**

This data package contains final status survey information for Building 22, Molycorp, Washington, PA site. The building's footers were surveyed in accordance with the Concrete Sampling and Management Plan.

Field data collection forms, survey report forms, statistical test results, and comparisons to release limits are provided.

## **Summary**

Results from the final status survey of Building 22 footers provides evidence that all release criteria have been met, demonstrates that residual radioactivity is below the unrestricted use criteria, and confirms that the footers of Building 22 are suitable for unrestricted use and release.



Survey # 02-1035

on:  
FSS Bldg # 22 (Foundations)

Performed By:	Print Name	Signature	Date
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____

[illegible]

**Results of Surface Scans**  
**Molycorp - Building 22 Survey Unit**

**Footer Material**

Location	Beta Scan gross cpm	Beta Scan net cpm
F1	980	620
F2	960	600
F3	1050	690
F4	740	380
F5	650	290
F6	630	270
F7	790	430
F8	760	400
F9	720	360
F10	690	330
F11	650	290
F12	690	330
F13	630	270
F14	640	280
F15	660	300

All footer scans performed with Ludlum Model 2350-1 No. 126190 with 43-106 No. 133871

Scan MDA Beta - 776 dpm/100cm<sup>2</sup>  
Scan background Beta - 360 cpm  
Detector Eff. Beta - .231



**Elevated Results of Surface Scans**  
**Molycorp - Building 22 Survey Unit**

**Footer Material**

No elevated scan results were reported.

## Direct Measurements (Total Activity)

Molycorp - Building 22 Survey Unit

### Footer Material

Location	Unshield Beta cpm	Shield Beta cpm	Gross Beta cpm	Bkgd cpm	Net cpm	Direct Beta (dpm/100cm <sup>2</sup> )	Uncertainty 95% CL	MDA (dpm/100cm <sup>2</sup> )	Direct Alpha <sup>(1)</sup> (dpm/100cm <sup>2</sup> )
F1	904	604	300	144	156	675	179	253	1351
F2	837	672	165	144	21	91	149	253	182
F3	976	741	235	144	91	394	165	253	788
F4	706	454	252	144	108	468	169	253	935
F5	614	482	132	144	-12	-52	141	253	-104
F6	596	495	101	144	-43	-186	133	253	-372
F7	764	567	197	144	53	229	157	253	459
F8	725	549	176	144	32	139	152	253	277
F9	697	498	199	144	55	238	157	253	476
F10	660	546	114	144	-30	-130	136	253	-260
F11	624	481	143	144	-1	-4	144	253	-9
F12	640	502	138	144	-6	-26	142	253	-52
F13	609	497	112	144	-32	-139	136	253	-277
F14	624	481	143	144	-1	-4	144	253	-9
F15	637	506	131	144	-13	-56	141	253	-113

All footer direct measurements performed with Ludlum Model 2350-1 No.  
126190 with 43-106No. 133871

Direct MDA Beta - 253 dpm/100cm<sup>2</sup>  
Concrete background Beta - 144 cpm  
Detector Eff. Beta - .231

(1) - A beta to alpha ratio factoring (1:2, beta to alpha) was used to provide a more accurate alpha activity determination.

**Elevated Direct Measurements (Total Activity)**  
**Molycorp - Building 22 Survey Unit**

**Footer Material**

Location	Direct Alpha (dpm/100cm <sup>2</sup> )
F1	1351

Concrete pieces with elevated readings have been segregated from clean concrete and moved to a designated RMA. Radiologically clean concrete has been left in the footprint of the building, awaiting release authorization.

**Removable Surface Activity Measurements**  
**Molycorp - Building 22 Survey Unit**

**Footer Material**

Location	Removable Beta (dpm/100cm <sup>2</sup> )	Uncertainty 95% CL	MDA	Removable Alpha (dpm/100cm <sup>2</sup> )	Uncertainty 95% CL	MDA
F1	35	25.9	134	-0.95	3.3	14
F2	30	24.2	134	-0.95	3.3	14
F3	129	47.2	134	-0.95	3.3	14
F4	-69	35.1	134	-0.95	3.3	14
F5	61	33.2	134	-0.95	3.3	14
F6	8.7	15.2	134	1.9	4.6	14
F7	-2.9	11.6	134	-0.95	3.3	14
F8	13	17.4	134	-0.95	3.3	14
F9	-43	28.3	134	-0.95	3.3	14
F10	0	9.3	134	-0.95	3.3	14
F11	8.7	15.2	134	1.9	4.6	14
F12	-48	29.7	134	-0.95	3.3	14
F13	13	17.4	134	-0.95	3.3	14
F14	0	9.3	134	-0.95	3.3	14
F15	13	17.4	134	-0.95	3.3	14

Ludlum 2929 No. 115563 with 43-10 No.  
 127216 Info:

	Beta	Alpha
Background (cpm)	72	0.33
Bkgd ct. time	60	60
Sample ct. time	1	1
Efficiency	0.231	0.347
MDA	134	14.0

**Elevated Removable Surface Activity Measurements**  
**Molycorp - Building 22 Survey Unit**

**Footer Material**

No elevated removable surface activity was reported above limits.

**Exposure Rate Measurements**  
**Molycorp - Building 22 Survey Unit**

**Footer Material**

Location	Exposure Rate (uR/hr)	Net Exp Rate (uR/hr)
F1	12	3
F2	12	3
F3	20	10
F4	10	1
F5	10	1
F6	8	-1
F7	8	-1
F8	7	-2
F9	8	-1
F10	9	0
F11	9	0
F12	9	0
F13	10	1
F14	10	1
F15	9	0

Background dose rate: 8-10 uR/hr with Model 19, No. 22526

# Summary of Building Surface Direct Reading (Total Activity) Results Molycorp - Building 22 Survey Unit

## Footer Material

Beta				Alpha			
n	$\bar{x}$	s	$\mu_{\alpha}$	n	$\bar{x}$	s	$\mu_{\alpha}$
14	69	200.4	162.9	14	137	400.7	325.9
	$t_{1-\alpha}$	1.761					

## Guidelines/Conditions Satisfied?

Beta	Alpha
Yes	Yes



## Summary of Exposure Rate Measurements

### Molycorp - Building 22 Survey Unit

#### Footer Material

n	$\bar{x}$	s	$\mu_\alpha$
15	1.0	2.9	2.3
$t_{1-\alpha}$	1.753		

Guidelines/Conditions  
Satisfied?

Yes

## Appendix C

# **Building 34 Footer Data Package**

Molycorp Washington, PA

October, 2002

## **Building 34 Footers Data Package**

This data package contains final status survey information for Building 34, MolyCorp, Washington, PA site. The building's footers were surveyed in accordance with the Concrete Sampling and Management Plan.

Field data collection forms, survey report forms, statistical test results, and comparisons to release limits are provided.

## **Summary**

Results from the final status survey of Building 34 footers provides evidence that all release criteria have been met, demonstrates that residual radioactivity is below the unrestricted use criteria, and confirms that the footers of Building 34 are suitable for unrestricted use and release.

DDO-138 Radiation Protection Survey Report			Site MolyCorp / Washington PA								
Section 1: Survey Information											
Date	Time	Location	Survey Issue Log Number								
9-18-02	1700	Bldg 34	02-1020								
RWP Number	Purpose of Survey		Page								
NA	<input type="checkbox"/> RWP <input type="checkbox"/> Routine Survey <input type="checkbox"/> Unconditional Release <input type="checkbox"/> Other		1 of 3								
Survey Title:			Smear Number	Beta dpm/100cm <sup>2</sup>	Alpha dpm/100cm <sup>2</sup>						
FSS FOUNDATIONS (Footers) Bldg 34			1								
1) F19, F22, F23, F27, F30 All sent to R.M.A. For RAD waste. F1, F2, F7, F8, F10, F11, To RMA. for shipment.			2								
1 Minute STATISTICS TAKEN on Concrete			3								
			4								
			5								
			6								
			7								
			8								
			9								
			10								
			11								
			12								
			13								
			14								
			15								
			16								
			17								
			18								
			19								
			20								
			21								
			22								
			23								
			24								
			25								
			26								
INST #1 <table border="1"> <thead> <tr> <th>BKG</th> <th>MDA</th> </tr> </thead> <tbody> <tr> <td>144</td> <td>253</td> </tr> <tr> <td>8</td> <td>92</td> </tr> </tbody> </table>			BKG	MDA	144	253	8	92			
BKG	MDA										
144	253										
8	92										
INST #2 < <table border="1"> <thead> <tr> <th>BKG</th> <th>MDA</th> </tr> </thead> <tbody> <tr> <td>144</td> <td>244</td> </tr> <tr> <td>8</td> <td>81</td> </tr> </tbody> </table>			BKG	MDA	144	244	8	81			
BKG	MDA										
144	244										
8	81										
Model 19 #22526 Due 1-29-03											
Bkgd Readings 10-12 Hr/hr											

## Legend

00 = mRem/h gamma    00 C = mRem/h gamma contact    D = Smear Location    ▽ = Air Sample Location    -X-X-X- = Rope, Boundary, or Barrier  
 00 β = mRem/h beta    00 βC = mRem/h beta contact    -D- = Large Area Wipe    = Bulk Material Sample

## Section 2: Instrument Used

Instrument Model/SN	Cal Due Date	Probe Model/SN	Cal Due Date	Detector Eff B (cpm/dpm)	MDA B	Other B	BKG
INST #1 2350-1/126140	1-16-03	43-106/133871	12-14-02	.231/.172	920	141	506
INST #2 2350-1/129414	8-2-03	43-106/128914	2-2-03	.240/.195	765	102	378
2929/115563	6-14-03	43-106/127216	6-14-03	.231/.347	134	13	73

## Section 3: Review and Approval

Survey Performed By (Sign)	Area Posted and/or Barricaded	Date and Time
Mark Blawieck / J. H. Haker	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Required	9-18-02 / 1700
Radiation Safety Officer (Print Name & Sign)		Date and Time
Steve Kowalski / Steve Kowalski		9-23-02 / 1000

### Radiological Survey Results - Survey Location Indicator

Survey # 02-1020

[illegible]

FSS Foundation Bldg #34 (Footers)

Instrument Data	Instrument Model/SN	Cal Due	Probe Model/SN	Cal Due	$\alpha$ Scan MDA	$\beta$ Scan MDA	$\alpha$ Static MDA	$\beta$ Static MDA

Performed By:	Print Name	Signature	Date

[illegible]

**Results of Surface Scans**  
**Molycorp - Building 34 Survey Unit**

**Footer Material**

Location	Beta Scan gross cpm	Beta Scan net cpm	Instrument #
F1	1020	514	1
F2	940	434	1
F3	560	54	1
F4	580	74	1
F5	590	84	1
F6	380	-126	1
F7	860	354	1
F8	980	474	1
F9	710	204	1
F10	820	314	1
F11	940	434	1
F12	700	194	1
F13	620	114	1
F14	780	274	1
F15	760	254	1
F16	575	197	2
F17	370	-8	2
F18	431	53	2
F19	920	542	2
F20	510	132	2
F21	515	137	2
F22	895	517	2
F23	695	317	2
F24	459	81	2
F25	480	102	2
F26	509	131	2
F27	850	472	2
F28	570	192	2
F29	475	97	2
F30	1360	982	2

All footer scans performed with either: # 1 - Ludlum Model 2350-1 No. 126190 with 43-106 No. 133871

Scan MDA Beta - 920 dpm/100cm<sup>2</sup>  
Scan background Beta - 506 cpm  
Detector Eff. Beta - .231

or

# 2 - Ludlum Model 2350-1 No. 129414 with 43-106 No. 128914

Scan MDA Beta - 765 dpm/100cm<sup>2</sup>  
Scan background Beta - 378 cpm  
Detector Eff. Beta - .240

**Elevated Results of Surface Scans**  
**Molycorp - Building 34 Survey Unit**

**Footer Material**

Location	Beta Scan net cpm
F30	982



# Direct Measurements (Total Activity)

Molycorp - Building 34 Survey Unit

## Footer Material

Location	Unshield Beta cpm	Shield Beta cpm	Gross Beta cpm	Bkgd cpm	Net cpm	Direct Beta (dpm/100cm <sup>2</sup> )	Uncertainty 95% CL	MDA (dpm/100cm <sup>2</sup> )	Direct Alpha <sup>(1)</sup> (dpm/100cm <sup>2</sup> )	Instrument #
F1	960	460	500	144	356	1541	215	253	3082	1
F2	890	420	470	144	326	1411	210	253	2823	1
F3	509	311	198	144	54	234	157	253	468	1
F4	507	291	216	144	72	312	161	253	623	1
F5	533	423	110	144	-34	-147	135	253	-294	1
F6	323	211	112	144	-32	-139	136	253	-277	1
F7	803	460	343	144	199	861	187	253	1723	1
F8	915	478	437	144	293	1268	205	253	2537	1
F9	649	498	151	144	7	30	146	253	61	1
F10	790	440	350	144	206	892	189	253	1784	1
F11	893	541	352	144	208	900	189	253	1801	1
F12	667	452	215	144	71	307	161	253	615	1
F13	574	443	131	144	-13	-56	141	253	-113	1
F14	724	475	249	144	105	455	168	253	909	1
F15	722	502	220	144	76	329	162	253	658	1
F16	557	397	160	144	16	67	142	244	133	2
F17	358	279	79	144	-65	-271	122	244	-542	2
F18	402	300	102	144	-42	-175	128	244	-350	2
F19	874	416	458	144	314	1308	200	244	2617	2
F20	491	377	114	144	-30	-125	131	244	-250	2
F21	478	346	132	144	-12	-50	136	244	-100	2
F22	872	369	503	144	359	1496	208	244	2992	2
F23	664	358	306	144	162	675	173	244	1350	2
F24	407	313	94	144	-50	-208	126	244	-417	2
F25	467	384	83	144	-61	-254	123	244	-508	2
F26	485	400	85	144	-59	-246	124	244	-492	2
F27	814	460	354	144	210	875	182	244	1750	2
F28	557	453	104	144	-40	-167	129	244	-333	2
F29	453	346	107	144	-37	-154	129	244	-308	2
F30	1345	597	748	144	604	2517	244	244	5033	2

All footer direct measurements performed with either: # 1 - Ludlum Model  
2350-1 No. 126190 with 43-106 No. 133871

Direct MDA Beta - 253 dpm/100cm<sup>2</sup>  
Concrete background Beta - 144 cpm  
Detector Eff. Beta - .231

or

# 2 - Ludlum Model 2350-1 No. 129414 with 43-106 No. 128914

Direct MDA Beta - 244 dpm/100cm<sup>2</sup>  
Concrete background Beta - 144 cpm  
Detector Eff. Beta - .240

(1) - A beta to alpha ratio factoring (1:2, beta to alpha) was used to provide a more accurate alpha activity determination.

**Elevated Direct Measurements (Total Activity)**  
**Molycorp - Building 34 Survey Unit**

**Footer Material**

Location	Direct Beta (dpm/100cm <sup>2</sup> )	Direct Alpha (dpm/100cm <sup>2</sup> )
F1	1541	3082
F2	1411	2823
F7		1723
F8	1268	2537
F10		1784
F11		1801
F19	1308	2617
F22	1496	2992
F23		1350
F27		1750
F30	2517	5033

Concrete pieces with elevated readings have been segregated from clean concrete and moved to a designated RMA. Radiologically clean concrete has been left in the footprint of the building, awaiting release authorization.

# Removable Surface Activity Measurements

Molycorp - Building 34 Survey Unit

## Footer Material

Location	Removable Beta (dpm/100cm <sup>2</sup> )	Uncertainty 95% CL	MDA	Removable Alpha (dpm/100cm <sup>2</sup> )	Uncertainty 95% CL	MDA
F1	-17	19.2	134	-0.6	2.6	13
F2	26	22.8	134	5.1	7.5	13
F3	-26	22.8	134	-0.6	2.6	13
F4	-22	21.3	134	2.2	4.9	13
F5	-22	21.3	134	2.2	4.9	13
F6	69	35.1	134	16.7	13.6	13
F7	-26	22.8	134	2.2	4.9	13
F8	-35	25.9	134	2.2	4.9	13
F9	-4.3	12.6	134	-0.6	2.6	13
F10	-65	34.2	134	-0.6	2.6	13
F11	-56	31.9	134	5.1	7.5	13
F12	13	17.4	134	2.2	4.9	13
F13	17	19.2	134	-0.6	2.6	13
F14	8.7	15.2	134	2.2	4.9	13
F15	4.3	12.6	134	-0.6	2.6	13
F16	4.3	12.6	134	-0.6	2.6	13
F17	13	17.4	134	2.2	4.9	13
F18	-17	19.2	134	-0.6	2.6	13
F19	13	17.4	134	-0.6	2.6	13
F20	-4.3	12.6	134	-0.6	2.6	13
F21	26	22.8	134	-0.6	2.6	13
F22	-39	27.1	134	2.2	4.9	13
F23	17	19.2	134	-0.6	2.6	13
F24	-48	29.8	134	5.1	7.5	13
F25	8.7	15.2	134	2.2	4.9	13
F26	22	21.3	134	-0.6	2.6	13
F27	26	22.8	134	-0.6	2.6	13
F28	30	24.2	134	-0.6	2.6	13
F29	22	21.3	134	-0.6	2.6	13
F30	22	21.3	134	2.2	4.9	13

Ludlum 2929 No. 115563 with 43-10 No.  
127216 Info:

	Beta	Alpha
Background (cpm)	73	0.22
Bkgd ct. time	60	60
Sample ct. time	1	1
Efficiency	0.231	0.347
MDA	134	13.0

**Elevated Removable Surface Activity Measurements**  
**Molycorp - Building 34 Survey Unit**

**Footer Material**

No elevated removable surface activity was reported above limits.

**Exposure Rate Measurements**  
**Molycorp - Building 34 Survey Unit**

**Footer Material**

Location	Exposure Rate (uR/hr)	Net Exp Rate (uR/hr)
F1	14	3
F2	12	1
F3	12	1
F4	13	2
F5	12	1
F6	14	3
F7	15	4
F8	12	1
F9	12	1
F10	15	4
F11	13	2
F12	12	1
F13	11	0
F14	13	2
F15	14	3
F16	14	3
F17	10	-1
F18	13	2
F19	14	3
F20	12	1
F21	15	4
F22	14	3
F23	13	2
F24	15	4
F25	14	3
F26	12	1
F27	14	3
F28	12	1
F29	13	2
F30	15	4

Background dose rate: 10-12 uR/hr with Model 19, No. 22526

# **Summary of Building Surface Direct Reading (Total Activity) Results** **Molycorp - Building 34 Survey Unit**

## **Footer Material**

Beta				Alpha			
n	$\bar{x}$	s	$\mu_\alpha$	n	$\bar{x}$	s	$\mu_\alpha$
19	-14	229.6	77.5	19	-27	459.2	154.9
		$t_{1-\alpha}$	1.729				

## **Guidelines/Conditions Satisfied?**

<b>Beta</b>	<b>Alpha</b>
Yes	Yes

## Summary of Exposure Rate Measurements

### Molycorp - Building 34 Survey Unit

#### Footer Material

$n$	$\bar{x}$	$s$	$\mu_\alpha$
30	2.1	1.3	2.5
$t_{1-\alpha}$	1.697		

Guidelines/Conditions  
Satisfied?

Yes



## Appendix D

# **Building 36 Footer Data Package**

Molycorp Washington, PA

October, 2002

## **Building 36 Footers Data Package**

This data package contains final status survey information for Building 36, MolyCorp, Washington, PA site. The building's footers were surveyed in accordance with the Concrete Sampling and Management Plan.

Field data collection forms, survey report forms, statistical test results, and comparisons to release limits are provided.

## **Summary**

Results from the final status survey of Building 36 footers provides evidence that all release criteria have been met, demonstrates that residual radioactivity is below the unrestricted use criteria, and confirms that the footers of Building 36 are suitable for unrestricted use and release.

DDO-138 Radiation Protection Survey Report					Site MolyCorp / Washington, PA										
<b>Section 1: Survey Information</b>															
Date <u>9-16-02</u>		Time <u>1600</u>		Location <u>Bldg 36 (Foundation)</u>		Survey Issue Log Number <u>02-1001</u>									
RWP Number <u>N/A</u>		Purpose of Survey: <input type="checkbox"/> RWP <input type="checkbox"/> Routine Survey <input type="checkbox"/> Unconditional Release <input type="checkbox"/> Other.			Page <u>1</u> of <u>2</u>										
Survey Title: <u>FSS Foundation (underside) Footers</u>				Smear Number	Beta dpm/100cm <sup>2</sup>	Alpha dpm/100cm <sup>2</sup>									
<p>1 Minute Static's taken on Foundations</p> <table style="margin: auto;"> <tr> <td></td> <td><u>BKG</u></td> <td><u>MDA</u></td> </tr> <tr> <td>B<sup>-</sup></td> <td>144</td> <td>253</td> </tr> <tr> <td>α</td> <td>8</td> <td>92</td> </tr> </table> <p>Model 19 <sup>6</sup>22526 1-29-03</p> <p>Bkgd Readings: <u>8-10 H/L hr</u></p>					<u>BKG</u>	<u>MDA</u>	B <sup>-</sup>	144	253	α	8	92	1		
					<u>BKG</u>	<u>MDA</u>									
				B <sup>-</sup>	144	253									
				α	8	92									
				2											
				3											
				4											
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				20											
				21											
				22											
				23											
24															
25															
26															
<b>Legend:</b> 00 = mRem/h gamma    00 C = mRem/h gamma contact    ⊙ = Smear Location    ∇ = Air Sample Location    -X-X-X- = Rope, Boundary, or Barrier 00 β = mRem/h beta    00 βC = mRem/h beta contact    -⊙- = Large Area Wipe    □ = Bulk Material Sample															
<b>Section 2: Instrument Used</b>															
Instrument Model/SN	Cal Due Date	Probe Model/SN	Cal Due Date	Detector Eff B (cpm/dpm) <u>α</u>	MDA B <sup>-</sup> <u>α</u>	Other B <sup>-</sup> BKG <u>α</u>									
2929 / 115563	6-14-03	43-10 / 127216	6-14-03	1231 / 1347	134 / 12	71 / .17									
2350-1 / 126150	1-16-03	43-106 / 133871	12-14-02	231 / 1112	732 / 65	320 / 1.4									
		N			N										
		A			A										
<b>Section 3: Review and Approval</b>															
Survey Performed By (Sign) <u>Mark Blomquist</u>			Area Posted and/or Bannetted <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Not Required		Date and Time <u>9-16-02 / 1600</u>										
Radiation Safety Officer (Print Name & Sign) <u>Steve Kowalski / Steve Kowalski</u>					Date and Time <u>9-17-02 / 0945</u>										

## Radiological Survey Results - Survey Location Indicator

Survey # 02-1001

Survey Area Information: FSS Foundations Bldg #36								
Instrument Data	Instrument Model/SN	Cal Due	Probe Model/SN	Cal Due	$\alpha$ Scan MDA	$\beta$ Scan MDA	$\alpha$ Static MDA	$\beta$ Static MDA
Performed By:	Print Name				Signature		Date	
Location	$\beta$ Scan (cpm)	$\alpha$ Scan (cpm)	$\beta$ Static (unsh) (cpm)	$\beta$ Static (sh) (cpm)	$\alpha$ Static (cpm)	ER ( $\mu$ rem/hr)	Smears (dpm/100 cm <sup>2</sup> )	
							$\alpha$	$\beta$
1	470	12	449	415	6	10	-1.5	0
2	480	10	464	353	4	9	-1.5	-39
3	460	8	446	365	2	8	-1.5	69
4	540	14	492	332	8	9	2.4	22
5	480	6	458	369	2	10	-1.5	13
6	460	9	445	360	5	11	-1.5	-56
7	420	6	409	325	2	10	2.4	-30
8	510	5	487	354	3	10	7.9	-39
9	430	6	397	331	4	9	-1.5	39
10	460	5	431	357	3	8	-1.5	91
11	480	9	458	321	7	8	-1.5	-8.7
12	470	11	451	350	8	9	-1.5	-4.3
13	440	6	424	331	4	9	2.4	43
14	420	8	441	347	9	10	-1.5	35
15	450	4	437	321	5	10	-1.5	17
16	400	7	383	300	4	10	2.4	-17
17	410	6	371	326	3	9	-1.5	13
18	480	5	447	294	2	10	-1.5	22
19	460	9	427	318	6	10	2.4	48
20	480	8	440	353	5	11	-1.5	4.3
21	500	6	468	358	1	10	2.4	39
22	490	9	459	344	4	11	-1.5	56
23	390	13	375	300	9	10	-1.5	4.3
24	410	11	385	307	8	9	-1.5	65
25	660	8	604	358	3	10	2.4	-22
26	540	5	500	362	2	11	-1.5	8.7
27	560	6	527	375	4	11	-1.5	43

**Results of Surface Scans**  
**Molycorp - Building 36 Survey Unit**

**Footer Material**

Location	Beta Scan gross cpm	Beta Scan net cpm
F1	470	150
F2	480	160
F3	460	140
F4	540	220
F5	480	160
F6	460	140
F7	420	100
F8	510	190
F9	430	110
F10	460	140
F11	480	160
F12	470	150
F13	440	120
F14	420	100
F15	450	130
F16	400	80
F17	410	90
F18	480	160
F19	460	140
F20	480	160
F21	500	180
F22	490	170
F23	390	70
F24	410	90
F25	660	340
F26	540	220
F27	560	240

All footer scans performed with Ludlum Model 2350-1 No. 126190 with 43-106 No. 133871

**Monitor Info:**

Scan MDA Beta - 732 dpm/100cm<sup>2</sup>

Scan background Beta - 320 cpm

Detector Eff. Beta - .231

**Elevated Results of Surface Scans**  
**Molycorp - Building 36 Survey Unit**

**Footer Material**

No elevated scan results were reported.

# Direct Measurements (Total Activity)

Molycorp - Building 36 Survey Unit

## Footer Material

Location	Unshield Beta cpm	Shield Beta cpm	Gross Beta cpm	Bkgd cpm	Net cpm	Direct Beta (dpm/100cm <sup>2</sup> )	Uncertainty 95% CL	MDA (dpm/100cm <sup>2</sup> )	Direct Alpha <sup>(1)</sup> (dpm/100cm <sup>2</sup> )
F1	449	415	34	144	-110	-476	113	253	-952
F2	464	353	111	144	-33	-143	135	253	-286
F3	446	365	81	144	-63	-273	127	253	-545
F4	492	332	160	144	16	69	148	253	139
F5	458	369	89	144	-55	-238	130	253	-476
F6	445	360	85	144	-59	-255	128	253	-511
F7	409	325	84	144	-60	-260	128	253	-519
F8	487	354	133	144	-11	-48	141	253	-95
F9	397	331	66	144	-78	-338	123	253	-675
F10	431	357	74	144	-70	-303	125	253	-606
F11	458	321	137	144	-7	-30	142	253	-61
F12	451	350	101	144	-43	-186	133	253	-372
F13	424	331	93	144	-51	-221	131	253	-442
F14	441	347	94	144	-50	-216	131	253	-433
F15	437	321	116	144	-28	-121	137	253	-242
F16	383	300	83	144	-61	-264	128	253	-528
F17	371	326	45	144	-99	-429	117	253	-857
F18	447	294	153	144	9	39	146	253	78
F19	427	318	109	144	-35	-152	135	253	-303
F20	440	353	87	144	-57	-247	129	253	-494
F21	468	358	110	144	-34	-147	135	253	-294
F22	459	344	115	144	-29	-126	137	253	-251
F23	375	300	75	144	-69	-299	126	253	-597
F24	385	307	78	144	-66	-286	126	253	-571
F25	604	358	246	144	102	442	168	253	883
F26	500	362	138	144	-6	-26	142	253	-52
F27	527	375	152	144	8	35	146	253	69

All footer direct measurements performed with Ludlum Model 2350-1 No.  
126190 with 43-106No. 133871

Monitor Info:

Direct MDA Beta - 253 dpm/100cm<sup>2</sup>

Concrete background Beta - 144 cpm

Detector Eff. Beta - .231

(1) - A beta to alpha ratio factoring (1:2, beta to alpha) was used to provide a more accurate alpha activity determination.



**Elevated Direct Measurements (Total Activity)**  
**Molycorp - Building 36 Survey Unit**

**Footer Material**

No elevated direct measurements were reported.

**Removable Surface Activity Measurements**  
**Molycorp - Building 36 Survey Unit**

**Footer Material**

Location	Removable Beta (dpm/100cm <sup>2</sup> )	Uncertainty 95% CL	MDA	Removable Alpha (dpm/100cm <sup>2</sup> )	Uncertainty 95% CL	MDA
F1	0	9.2	134	-0.5	2.4	12
F2	-39	27.1	134	-0.5	2.4	12
F3	69	35.1	134	-0.5	2.4	12
F4	22	21.2	134	2.4	5.2	12
F5	13	17.4	134	-0.5	2.4	12
F6	-56	31.9	134	-0.5	2.4	12
F7	-30	24.2	134	2.4	5.2	12
F8	-39	27.1	134	7.9	9.4	12
F9	39	27.1	134	-0.5	2.4	12
F10	91	40.0	134	-0.5	2.4	12
F11	-8.7	15.2	134	-0.5	2.4	12
F12	-4.3	12.5	134	-0.5	2.4	12
F13	43	28.3	134	2.4	5.2	12
F14	35	25.8	134	-0.5	2.4	12
F15	17	19.2	134	-0.5	2.4	12
F16	-17	19.2	134	2.4	5.2	12
F17	13	17.4	134	-0.5	2.4	12
F18	22	21.2	134	-0.5	2.4	12
F19	48	29.7	134	2.4	5.2	12
F20	4.3	12.5	134	-0.5	2.4	12
F21	39	27.1	134	2.4	5.2	12
F22	56	31.9	134	-0.5	2.4	12
F23	4.3	12.5	134	-0.5	2.4	12
F24	65	34.1	134	-0.5	2.4	12
F25	-22	21.2	134	2.4	5.2	12
F26	8.7	15.2	134	-0.5	2.4	12
F27	43	28.3	134	-0.5	2.4	12

Ludlum 2929 No. 115563 with 43-10 No.  
 127216 Info:

	Beta	Alpha
Background (cpm)	71	0.17
Bkgd ct. time	60	60
Sample ct. time	1	1
Efficiency	0.231	0.347
MDA	134	12.0

**Elevated Removable Surface Activity Measurements**  
**Molycorp - Building 36 Survey Unit**

**Footer Material**

No elevated removable surface activity was reported above limits.

**Exposure Rate Measurements**  
**Molycorp - Building 36 Survey Unit**

**Footer Material**

Location	Exposure Rate (uR/hr)	Net Exp Rate (uR/hr)
F1	10	1
F2	9	0
F3	8	-1
F4	9	0
F5	10	1
F6	11	2
F7	10	1
F8	10	1
F9	9	0
F10	8	-1
F11	8	-1
F12	9	0
F13	9	0
F14	10	1
F15	10	1
F16	10	1
F17	9	0
F18	10	1
F19	10	1
F20	11	2
F21	10	1
F22	11	2
F23	10	1
F24	9	0
F25	10	1
F26	11	2
F27	11	2

Background dose rate: 8-10 uR/hr with Model 19, No. 22526

# Summary of Building Surface Direct Reading (Total Activity) Results Molycorp - Building 36 Survey Unit

## Footer Material

Beta				Alpha			
n	$\bar{x}$	s	$\mu_\alpha$	n	$\bar{x}$	s	$\mu_\alpha$
27	-167	182.3	-106.8	27	-333	364.7	-213.7
	$t_{1-\alpha}$	1.703					

## Guidelines/Conditions Satisfied?

Beta	Alpha
Yes	Yes

**Summary of Exposure Rate Measurements**  
**Molycorp - Building 36 Survey Unit**

**Footer Material**

n	$\bar{x}$	s	$\mu_\alpha$
27	0.7	0.9	1.0
$t_{1-\alpha}$	1.703		

**Guidelines/Conditions**  
**Satisfied?**

Yes

## Appendix E

# **2W Concrete Ramp Data Package**

Molycorp Washington, PA

October, 2002

## **2W Concrete Ramp Footers Data Package**

This data package contains final status survey information for the 2W Concrete Ramp, Molycorp, Washington, PA site. The 2W Concrete Ramp was surveyed in accordance with the Concrete Sampling and Management Plan.

Field data collection forms, survey report forms, statistical test results, and comparisons to release limits are provided.

### **Summary**

Results from the final status survey of the 2W Concrete Ramp provides evidence that all release criteria have been met, demonstrates that residual radioactivity is below the unrestricted use criteria, and confirms that the concrete from the 2W Concrete Ramp is suitable for unrestricted use and release.



DDO-138 Radiation Protection Survey Report				Site: Molycorp / Washington, PA										
<b>Section 1: Survey Information</b>														
Date <b>9-11-02</b>		Time <b>1130</b>		Location <b>W2 + Acid Tank Area</b>										
Survey Issue Log Number <b>02-0979</b>														
RWP Number <b>NA</b>		Purpose of Survey: <b>FSS</b> <input type="checkbox"/> RWP <input type="checkbox"/> Routine Survey <input type="checkbox"/> Unconditional Release <input checked="" type="checkbox"/> Other		Page <b>1</b> of <b>2</b>										
Survey Title: <b>Acid tank concrete &amp; Ramp Behind W2</b>				Smear Number	Beta dpm/100cm <sup>2</sup>									
<p>1 minute Statics taken on concrete</p> <table style="margin: auto;"> <tr> <td></td> <td>Bkg</td> <td>MDA</td> </tr> <tr> <td>B-</td> <td>144</td> <td>244</td> </tr> <tr> <td>2</td> <td>8</td> <td>81</td> </tr> </table> <p>Model 19122526 / 1-29-03</p> <p>Bkgd Readings: 8-10 MC/164</p>					Bkg	MDA	B-	144	244	2	8	81	1	
					Bkg	MDA								
				B-	144	244								
				2	8	81								
				2										
				3										
				4										
				5										
				6										
				7										
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				21										
				22										
				23										
24														
25														
26														
<b>Legend:</b> 00 = mRem/h gamma    00 C = mRem/h gamma contact    ① = Smear Location    ▽ = Air Sample Location    -X-X-X- = Rope, Boundary, or Barrier 00 β = mRem/h beta    00 βC = mRem/h beta contact    -①- = Large Area Wipe    ▮ = Bulk Material Sample														
<b>Section 2: Instrument Used</b>														
Instrument Model/SN	Cal Due Date	Probe Model/SN	Cal Due Date	Detector Eff. <b>B-</b> (cpm/dpm) <input checked="" type="checkbox"/>	MDA <b>2</b> Other <b>Bkg</b> <b>2</b>									
2929/115563	6-14-03	43-10/127216	6-14-03	231/347	134 / 12    73 / .18									
2750/129414	2-02-03	43-106/128914	2-02-03	240/195	595 / 68    229 / 2									
	N				N									
		A			A									
<b>Section 3: Review and Approval</b>														
Survey Performed By (Sign) <b>Joe Auler</b>			Area Posted and/or Barricaded <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Not Required		Date and Time <b>9-11-02 1130</b>									
Radiation Safety Officer (Print Name & Sign) <b>Steve Kowalski / Steve Kowalski</b>					Date and Time <b>9-16-02 / 1230</b>									

# Radiological Survey Results - Survey Location Indicator

Survey Area Information:								
Instrument Data	Instrument Model/SN	Cal Due	Probe Model/SN	Cal Due	$\alpha$ Scan MDA	$\beta$ Scan MDA	$\alpha$ Static MDA	$\beta$ Static MDA
Performed By:	Print Name		Signature			Date		
Location Ramp	$\beta$ Scan (cpm)	$\alpha$ Scan (cpm)	$\beta$ Static (unsh) (cpm)	$\beta$ Static (sh) (cpm)	$\alpha$ Static (cpm)	ER ( $\mu$ rem/hr)	Smears (dpm/100 cm <sup>2</sup> )	
							$\alpha$	$\beta$
1	312	7	298	268	5	7	-1.5	-4.3
2	383	10	362	317	7	8	-1.5	-2.2
3	425	9	409	327	7	8	-1.5	-6.5
4	392	8	257	273	6	8	-1.5	-3.0
5	382	5	361	279	2	7	-1.5	-1.3
6	370	6	346	254	3	8	-1.5	4.3
7	385	10	358	282	7	8	-1.5	8.7
8	352	6	316	238	4	9	2.4	1.7
9	360	7	318	255	5	8	-1.5	-8.7
10	370	8	259	292	5	8	2.4	-4.3
11	410	11	393	296	8	8	-1.5	1.3
12	360	10	347	279	7	8	-1.5	4.3
TANK	400							
1	400	3	388	299	1	5	-1.5	1.3
2	390	2	370	273	1	6	-1.5	4.3
3	410	3	379	310	2	6	2.4	-2.2
4	390	7	376	282	5	5	-1.5	-1.7
5	385	6	372	252	4	5	-1.5	3.5
6	370	5	346	305	3	5	-1.5	-8.7

**Results of Surface Scans**  
**Molycorp - Building 2W Ramp Survey Unit**

**Concrete Material**

Location	Beta Scan gross cpm	Beta Scan net cpm
F1	312	83
F2	383	154
F3	425	196
F4	392	163
F5	382	153
F6	370	141
F7	385	156
F8	352	123
F9	360	131
F10	370	141
F11	410	181
F12	360	131

All concrete scans performed with Ludlum Model 2350-1 No. 129414 with  
43-106 No. 128914

Scan MDA Beta - 595 dpm/100cm<sup>2</sup>  
Scan background Beta - 229 cpm  
Detector Eff. Beta - .240

**Elevated Results of Surface Scans**  
**Molycorp - Building 2W Ramp Survey Unit**

**Concrete Material**

No elevated scan results were reported.

## Direct Measurements (Total Activity)

Molycorp - Building 2W Ramp Survey Unit

### Concrete Material

Location	Unshield Beta cpm	Shield Beta cpm	Gross Beta cpm	Bkgd cpm	Net cpm	Direct Beta (dpm/100cm <sup>2</sup> )	Uncertainty 95% CL	MDA (dpm/100cm <sup>2</sup> )	Direct Alpha <sup>(1)</sup> (dpm/100cm <sup>2</sup> )
F1	298	268	30	144	-114	-475	108	244	-950
F2	362	317	45	144	-99	-413	112	244	-825
F3	409	327	82	144	-62	-258	123	244	-517
F4	357	273	84	144	-60	-250	123	244	-500
F5	361	279	82	144	-62	-258	123	244	-517
F6	346	254	92	144	-52	-217	125	244	-433
F7	358	282	76	144	-68	-283	121	244	-567
F8	316	238	78	144	-66	-275	122	244	-550
F9	318	255	63	144	-81	-338	117	244	-675
F10	359	292	67	144	-77	-321	119	244	-642
F11	393	296	97	144	-47	-196	127	244	-392
F12	347	279	68	144	-76	-317	119	244	-633

All concrete direct measurements performed with Ludlum Model 2350-1 No. 129414 with 43-106 No. 128914

Direct MDA Beta - 244 dpm/100cm<sup>2</sup>

Concrete background Beta - 144 cpm

Detector Eff. Beta - .240

(1) - A beta to alpha ratio factoring (1:2, beta to alpha) was used to provide a more accurate alpha activity determination.

**Elevated Direct Measurements (Total Activity)**  
**Molycorp - Building 2W Ramp Survey Unit**

**Concrete Material**

No elevated direct measurements were reported.

## Removable Surface Activity Measurements

Molycorp - Building 2W Ramp Survey Unit

### Concrete Material

Location	Removable Beta (dpm/100cm <sup>2</sup> )	Uncertainty 95% CL	MDA	Removable Alpha (dpm/100cm <sup>2</sup> )	Uncertainty 95% CL	MDA
F1	-4.3	12.6	134	-0.5	2.4	12
F2	-22	21.3	134	-0.5	2.4	12
F3	-65	34.2	134	-0.5	2.4	12
F4	-30	24.2	134	-0.5	2.4	12
F5	-13	17.4	134	-0.5	2.4	12
F6	4.3	12.6	134	-0.5	2.4	12
F7	8.7	15.2	134	-0.5	2.4	12
F8	17	19.2	134	2.4	5.2	12
F9	-8.7	15.2	134	-0.5	2.4	12
F10	-4.3	12.6	134	2.4	5.2	12
F11	13	17.4	134	-0.5	2.4	12
F12	4.3	12.6	134	-0.5	2.4	12

Ludlum 2929 No. 115563 with 43-10 No.  
127216 Info:

	Beta	Alpha
Background (cpm)	73	0.18
Bkgd ct. time	60	60
Sample ct. time	1	1
Efficiency	0.231	0.347
MDA	134	12.0

**Elevated Removable Surface Activity Measurements**  
**Molycorp - Building 2W Ramp Survey Unit**

**Concrete Material**

No elevated removable surface activity was reported above limits.



**Exposure Rate Measurements**  
**Molycorp - Building 2W Ramp Survey Unit**

**Concrete Material**

Location	Exposure Rate (uR/hr)	Net Exp Rate (uR/hr)
F1	7	-2
F2	8	-1
F3	8	-1
F4	8	-1
F5	7	-2
F6	8	-1
F7	8	-1
F8	9	0
F9	8	-1
F10	8	-1
F11	8	-1
F12	8	-1

Background dose rate: 8-10 uR/hr with Model 19, No. 22526

# Summary of Building Surface Direct Reading (Total Activity) Results Molycorp - Building 2W Ramp Survey Unit

## Concrete Material

Beta				Alpha			
n	$\bar{x}$	s	$\mu_\alpha$	n	$\bar{x}$	s	$\mu_\alpha$
12	-300	79.8	-258.9	12	-600	159.6	-517.9
	$t_{1-\alpha}$	1.782					

## Guidelines/Conditions Satisfied?

Beta	Alpha
Yes	Yes

**Summary of Exposure Rate Measurements**  
**Molycorp - Building 2W Ramp Survey Unit**

**Concrete Material**

$n$	$\bar{x}$	$s$	$\mu_{\alpha}$
12	-1.1	0.5	-0.8
$t_{1-\alpha}$	1.782		

**Guidelines/Conditions  
Satisfied?**

Yes

---

## Appendix F

# **Instrumentation Data**

**Molycorp Washington, PA**

## **Instrumentation Data**

This data package contains instrumentation information (background, QC, and source response data forms) for the instruments used during the final status survey of building foundations.

# EFF = .23<sup>1</sup> Daily Instrumentation Operational Check Sheet

Instrument: 2350-1 #126190 Probe: 43-106 #133871

Cal Due: 1-16-03 Cal Due: 12-14-02

Source ID: Te 99 #3935 Mean Source Count Rate: 4638 Mean +2  $\sigma$  Value: 4780 Mean -2  $\sigma$  Value: 4496

Radiation Type: B<sup>-</sup> Sigma Value: 71 Mean +3  $\sigma$  Value: 4851 Mean -3  $\sigma$  Value: 4425

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/ 2 $\sigma$ Value	W/ 3 $\sigma$ Value	LLD	SAT/ UNSAT
9-17-02	0615	5	1653	331	1	4490	✓	✓	69	Sat
9-17-02	1650	—	—	—	1	4773	✓	—	—	Sat
9-18-02	0710	5	1647	329	1	4748	✓	✓	69	Sat
9-18-02	1705	—	—	—	1	4612	✓	—	—	Sat
9-19-02	0635	5	1677	335	1	4501	—	—	69	Sat
9-19-02	1620	—	—	—	1	4621	✓	✓	—	Sat
9-23-02	0800	5	1588	318	1	4427	✓	✓	67	Sat
9-23-02	1650	—	—	—	1	4571	✓	✓	—	Sat
9-24-02	0640	5	1713	343	1	4498	—	—	69.7	Sat
9-24-02	1645	—	—	—	1	4622	✓	✓	—	Sat
9-25-02	0655	5	1591	318	1	4498	✓	✓	67.2	Sat
9-25-02	1705	—	—	—	1	4676	✓	✓	—	Sat
9-26-02	0620	5	1406	281	1	4520	—	—	63	Sat
9-30-02	0645	5	1520	304	1	4544	—	—	65.8	Sat
9-30-02	1710	—	—	—	1	4651	✓	—	—	Sat
10-1-02	0640	5	1604	321	1	4556	—	—	67.5	Sat

EFF = 1.72

## Daily Instrumentation Operational Check Sheet

Instrument: 2350-1 #126190 Probe: 43-106 #133871Cal Due: 1-16-03 Cal Due: 12-14-02Source ID: th230 #3937Mean Source  
Count Rate: 660Mean +2  $\sigma$   
Value: 718Mean -2  $\sigma$   
Value: 602Radiation  
Type:  $\alpha$ Sigma Value: 29Mean +3  $\sigma$   
Value: 747Mean -3  $\sigma$   
Value: 573

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/ 2 $\sigma$ Value	W/ 3 $\sigma$ Value	LLD	SAT/ UNSAT
9-17-02	0620	5	27	5	1	695	✓	✓	11	Sat
9-17-02	1655	—	—	—	1	672	✓	✓	—	Sat
9-18-02	0645	5	16	3.2	1	645	✓	✓	9	Sat
9-18-02	1705	—	—	—	1	691	✓	✓	—	Sat
9-19-02	0625	.5	12	2.4	1	686	✓	✓	9	Sat
9-19-02	1830	—	—	—	1	682	✓	✓	—	Sat
9-23-02	0810	5	14	2.8	1	671	✓	✓	9	Sat
9-23-02	1650	—	—	—	1	664	✓	✓	—	Sat
9-24-02	0640	5	17	3.4	1	665	✓	✓	9.6	Sat
9-24-02	1645	—	—	—	1	704	✓	✓	—	Sat
9-25-02	0655	5	25	5	1	644	✓	✓	11	Sat
9-25-02	1705	—	—	—	1	647	✓	✓	—	Sat
9-26-02	0640	5	9	1.8	1	671	✓	✓	7.8	Sat
9-30-02	0645	5	14	2.8	1	697	✓	✓	9	Sat
9-30-02	1710	—	—	—	1	673	✓	✓	—	Sat
10-1-02	0640	5	21	4.2	1	665	✓	✓	—	Sat

EFF: .231

## Daily Instrumentation Operational Check Sheet

Instrument: 2350-1 #126190Probe: 43-106 #133871Cal Due: 1-16-03Cal Due: 12-14-02

Source ID:

Te 99 3935

Mean Source

Count Rate:

4638

Mean +2  $\sigma$ 

Value:

4780

Mean -2  $\sigma$ 

Value:

4496

Radiation

Type:

B-

Sigma Value:

71

Mean +3  $\sigma$ 

Value:

4851

Mean -3  $\sigma$ 

Value:

4425

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/ 2 $\sigma$ Value	W/ 3 $\sigma$ Value	LLD	SAT/ UNSAT
8-14-02	1640	—	—	—	1	4731	✓	✓	—	SAT
8-15-02	0630	5	1562	312	1	4544	—	—	67	Sat
8-15-02	1640	—	—	—	1	4620	✓	✓	—	Sat
8-19-02	0615	5	1526	305	1	4588	—	—	66	Sat
8-19-02	1640	—	—	—	1	4467	✓	✓	—	Sat
8-20-02	0645	5	1507	301	1	4520	—	—	65	Sat
8-20-02	1640	—	—	—	1	4629	—	—	—	Sat
8-21-02	0605	5	1556	311	1	4507	—	—	68	Sat
9-9-02	0705	5	1528	306	1	4557	—	—	66	Sat
9-9-02	1630	—	—	—	1	4662	—	—	—	Sat
9-10-02	0710	5	2090	418	1	4534	✓	✓	77	Sat
9-11-02	0650	5	1934	387	1	4654	—	—	74	Sat
9-12-02	0640	5	1689	338	1	4627	—	—	69	Sat
9-12-02	1625	—	—	—	1	4786	✓	✓	—	Sat
9-16-02	0620	5	1645	329	1	4761	—	—	69	Sat
4-16-02	1530	—	—	—	1	4776	—	—	—	Sat



# Daily Instrumentation Operational Check Sheet

EFF = .172

Instrument: 2350-1 #126190 Probe: 43-106 #133871

Cal Due: 1-16-02 Cal Due: 12-14-02

Source ID: Th 230 3937 Mean Source Count Rate: 660 Mean +2  $\sigma$  Value: 718 Mean -2  $\sigma$  Value: 602

Radiation Type: L Sigma Value: 29 Mean +3  $\sigma$  Value: 747 Mean -3  $\sigma$  Value: 573

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/ 2 $\sigma$ Value	W/ 3 $\sigma$ Value	LLD	SAT/ UNSAT
8-14-02	1650	—	—	—	1	681	—	—	—	Sat
8-15-02	0635	5	12	2.4	1	703	—	—	9	Sat
8-15-02	1640	—	—	—	1	620	✓	✓	—	Sat
8-19-02	0630	5	13	2.6	1	679	—	—	9	Sat
8-19-02	1640	—	—	—	1	678	✓	✓	—	Sat
8-20-02	0630	5	7	1.4	1	642	—	—	7.8 MB	Sat
8-20-02	1645	—	—	—	1	655	—	—	—	Sat
8-21-02	0620	5	8	1.6	1	617	—	—	8	Sat
9-9-02	0705	5	8	1.6	1	658	—	—	8	Sat
9-9-02	1630	—	—	—	1	697	—	—	—	Sat
9-10-02	0715	5	22	4.4	1	682	✓	✓	11	Sat
9-11-02	0655	5	20	4	1	690	—	—	10	Sat
9-12-02	0645	5	18	3.6	1	680	—	—	10	Sat
9-12-02	1625	—	—	—	1	677	✓	✓	—	Sat
9-16-02	0625	5	9	1.8	1	655	—	—	8	Sat
9-16-02	1535	—	—	—	1	669	—	—	—	Sat

EFF = .240

## Daily Instrumentation Operational Check Sheet

Instrument: 2350-1 # 129414 Probe: 43-106 # 128914Cal Due: 8-2-03 Cal Due: 2-2-03Source ID: Te 99 # 3935Mean Source  
Count Rate: 4643Mean +2  $\sigma$   
Value: 4791Mean -2  $\sigma$   
Value: 4495Radiation  
Type: B<sup>-</sup>Sigma Value: 74Mean +3  $\sigma$   
Value: 4864Mean -3  $\sigma$   
Value: 4421

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/ 2 $\sigma$ Value	W/ 3 $\sigma$ Value	LLD	SAT/ UNSAT
9-18-02	0705/1711	5	—	—	1	4732	✓	✓	—	Sat
9-19-02	0655	5	1625	325	1	4513	—	—	68	Sat
9-19-02	1635	—	—	—	1	4574	✓	✓	—	Sat
9-23-02	0645	5	1332	266	1	4422	—	—	62	Sat
9-23-02	1655	—	—	—	1	4552	✓	✓	—	Sat
9-24-02	0640	5	1487	297	1	4496	—	—	65	Sat
9-24-02	1650	—	—	—	1	4569	✓	✓	—	Sat
9-25-02	0655	5	1512	302	1	4502	—	—	65.6	Sat
9-25-02	1700	—	—	—	1	4530	✓	✓	—	Sat
9-26-02	0635	5	1441	288	1	4502	—	—	64	Sat
9-30-02	0655	5	1205	241	1	4524	✓	—	58.9	Sat
9-30-02	1700	—	—	—	1	4435	✓	✓	—	Sat
10-1-02	0640	5	1362	272	1	4510	✓	—	62.4	Sat
10-1-02	1645	—	—	—	1	4552	✓	✓	—	Sat
10-2-02	0625	5	1251	250	1	4498	—	—	60	Sat
10-2-02	1630	—	—	—	1	4490	✓	✓	—	Sat

EFF = .195

# Daily Instrumentation Operational Check Sheet

Instrument: 2350-1 #129414 Probe: 43-106 #128914

Cal Due: 8-2-03 Cal Due: 2-2-03

Source ID: 4h230 #3937 Mean Source Count Rate: 739 Mean +2  $\sigma$  Value: 799 Mean -2  $\sigma$  Value: 679

Radiation Type:  $\alpha$  Sigma Value: 30 Mean +3  $\sigma$  Value: 829 Mean -3  $\sigma$  Value: 649

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/ 2 $\sigma$ Value	W/ 3 $\sigma$ Value	LLD	SAT/ UNSAT
9-18-02	1700	—	—	—	1	717	✓	✓	—	Sat
9-19-02	0645	5	14	2.8	1	729	—	—	9	Sat
9-19-02	1635	—	—	—	1	735	✓	—	—	Sat
9-23-02	0650	5	10	2	1	684	✓	✓	8	Sat
9-23-02	1655	—	—	—	1	705	✓	✓	—	Sat
9-24-02	0640	5	11	2.2	1	728	—	—	8.3	Sat
9-24-02	1650	—	—	—	1	709	✓	✓	—	Sat
9-25-02	0700	5	17	3.4	1	681	—	—	9.6	Sat
9-25-02	1700	—	—	—	1	695	✓	✓	—	Sat
9-26-02	0655	5	11	2.2	1	764	—	—	8.3	Sat
9-30-02	0650	5	12	2.4	1	755	—	—	8.6	Sat
9-30-02	1700	—	—	—	1	732	✓	✓	—	Sat
10-1-02	0640	5	10	2	1	721	—	—	8.0	Sat
10-1-02	1650	—	—	—	1	706	✓	✓	—	Sat
10-2-02	0645	5	10	2	1	684	—	—	8.0	Sat
10-2-02	1630	—	—	—	1	704	✓	✓	—	Sat

# Daily Instrumentation Operational Check Sheet

EFF = .240

Instrument: 2350-1 # 129414 Probe: 43-106 # 128914

Cal Due: 8-2-03 Cal Due: 2-2-03

Source ID: Te 99 # 3935 Mean Source Count Rate: 4643 Mean +2  $\sigma$  Value: 4791 Mean -2  $\sigma$  Value: 4495

Radiation Type: B<sup>-</sup> Sigma Value: 74 Mean +3  $\sigma$  Value: 4864 Mean -3  $\sigma$  Value: 4421

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/ 2 $\sigma$ Value	W/ 3 $\sigma$ Value	LLD	SAT/ UNSAT
9-5-02	1705	—	—	—	1	4650	✓	✓	—	Sat
9-6-02	0700	5	1698	340	1	4544	—	—	69	Sat
9-6-02	1300	—	—	—	1	4635	—	—	—	Sat
9-9-02	0615	5	1747	349	1	4605	—	—	70	Sat
9-9-02	1640	—	—	—	1	4778	✓	✓	—	Sat
9-10-02	0715	5	1695	339	1	4557	✓	✓	69	Sat
9-10-02	1650	—	—	—	1	4781	—	—	—	Sat
9-11-02	0650	5	1509	302	1	4530	—	—	66	Sat
9-11-02	1615	4:40	—	—	1	4631	✓	✓	—	Sat
9-12-02	0630	5	1576	315	1	4510	—	—	67	Sat
9-12-02	1600	—	—	—	1	4568	—	—	—	Sat
9-16-02	0610	5	1503	301	1	4501	—	—	66	Sat
9-16-02	1600	—	—	—	1	4650	—	—	—	Sat
9-17-02	0615	5	1605	321	1	4548	✓	✓	68	Sat
9-17-02	1640	—	—	—	1	4589	—	—	—	Sat
9-18-02	0705	5	1541	308	1	4466	—	—	66	Sat

EFF = .195

## Daily Instrumentation Operational Check Sheet

Instrument: 2350-1 #129414 Probe: 43-106 #128914Cal Due: 8-2-03 Cal Due: 2-2-03

Source ID: Th 230 #3937 Mean Source Count Rate: 739 Mean +2  $\sigma$  Value: 799 Mean -2  $\sigma$  Value: 679

Radiation Type:  $\alpha$  Sigma Value: 30 Mean +3  $\sigma$  Value: 829 Mean -3  $\sigma$  Value: 649

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/ 2 $\sigma$ Value	W/ 3 $\sigma$ Value	LLD	SAT/ UNSAT
9-5-02	1705	—	—	—	1	725	✓	✓	—	Sat
9-6-02	0700	5	9	1.8	1	735	—	—	8	Sat
9-6-02	1300	—	—	—	1	741	—	—	—	Sat
9-9-02	0615	5	11	2.2	1	744	✓	✓	8	Sat
9-9-02	1640	—	—	—	1	743	✓	✓	—	Sat
9-10-02	0720	5	12	2.4	1	745	✓	✓	9	Sat
9-10-02	1650	—	—	—	1	698	—	—	—	Sat
9-11-02	0650	5	14	2.8	1	687	—	—	9	Sat
9-11-02	1615	—	—	—	1	729	✓	✓	—	Sat
9-12-02	0635	5	11	2.2	1	739	—	✓	8	Sat
9-12-02	1620	—	—	—	1	695	✓	✓	—	Sat
9-16-02	0635	5	7	1.4	1	738	—	—	7	Sat
9-16-02	1630	—	—	—	1	704	—	—	—	Sat
9-17-02	0620	5	8	1.6	1	739	✓	✓	8	Sat
9-17-02	1645	—	—	—	1	712	—	—	—	Sat
9-18-02	0705	5	15	3	1	708	✓	✓	9	Sat

# Ludlum Model 19 Micro-Rem

## Routine Performance and Background Data Form

Instrument ID #: 22526	Cal. Due: 1-29-03	Source ID #: C5-137 A6143
Mean Source Value: 160	Mean plus + 20% Value: 192	Mean plus - 20% Value: 128

Date	Time	Meter Scale				Background Reading	Sat/Unsat
		25 $\mu$ rem (sat/unsat)	50 $\mu$ rem (sat/unsat)	250 $\mu$ rem +/-20% value	500 $\mu$ rem +/-20% value		
8-30-02	0700			160		11	SAT
9-3-02	0630			150		10	Sat
9-4-02	0610			160		11	Sat
9-5-02	0600			160		10	Sat
9-6-02	0635			160		10	Sat
9-9-02	0610			160		10	Sat
9-10-02	0605			160		15	Sat
9-11-02	0625			160		11	Sat
9-12-02	0610	N		160	N	11	Sat
9-16-02	0600		A	150	A	11	Sat
9-17-02	0610			140		12	Sat
9-18-02	0640			160		12	Sat
9-19-02	0615			150		10	Sat
9-23-02	0635			160		9	Sat
9-24-02	0635			160		10	Sat
9-25-02	0650			140		10	Sat
9-26-02	0640			140		8	Sat
9-30-02	0640			140		8	Sat
10-1-02	0630			140		9	Sat

# Daily Instrumentation Operational Check Sheet

EFF-1231

Instrument: 2929 - 115563

Probe: 43-10 #127216

Cal Due: 6-14-03

Cal Due: 6-14-03

Source ID:

TC99 #3935

Mean Source

Count Rate:

3722

Mean +2  $\sigma$

Value:

3824

Mean -2  $\sigma$

Value:

3620

Radiation

Type:

B<sup>-</sup>

Sigma Value:

51

Mean +3  $\sigma$

Value:

3875

Mean -3  $\sigma$

Value:

3569

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/ 2 $\sigma$ Value	W/ 3 $\sigma$ Value	LLD	SAT/ UNSAT
9-6-02	0630	60	4169	69	1	3815	—	—	31	Sat
9-9-02	0600	60	4333	72	1	3757	—	—	31	Sat
9-10-02	0600	60	4425	74	1	3624	✓	✓	32	Sat
9-11-02	0615	60	4358	73	1	3661	—	—	31	Sat
9-12-02	0610	60	4351	73	1	3757	—	—	31	Sat
9-16-02	0610	60	4245	71	1	3775	—	—	31	Sat
9-17-02	0605	60	4404	73	1	3732	✓	✓	31	Sat
9-18-02	0630	60	4388	73	1	3785	—	—	31	Sat
9-19-02	0600	60	4503	75	1	3802	—	—	32	Sat
9-23-02	0630	60	4339	72	1	3767	—	—	31	Sat
9-24-02	0615	60	4332	72	1	3776	—	—	31	Sat
9-25-02	0630	60	4425	74	1	3641	—	—	31	Sat
9-26-02	0720	60	4229	70	1	3759	—	—	30.7	Sat
9-30-02	0620	60	4278	71	1	3687	—	—	30.9	Sat
10-1-02	0620	60	4312	72	1	3651	—	—	31	Sat
10-2-02	0620	60	4196	70	1	3784	—	—	30.7	Sat

# Daily Instrumentation Operational Check Sheet

EFF: .347

Instrument: 2929 # 115563

Probe: 43-10 # 127216

Cal Due: 6-14-03

Cal Due: 6-14-03

Source ID:

Th230 #3937

Mean Source

Count Rate:

1376

Mean +2  $\sigma$

Value:

1448

Mean -2  $\sigma$

Value:

1304

Radiation

Type:

2

Sigma Value:

.36

Mean +3  $\sigma$

Value:

1484

Mean -3  $\sigma$

Value:

1268

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/ 2 $\sigma$ Value	W/ 3 $\sigma$ Value	LLD	SAT/ UNSAT
9-6-02	0635	60	12	.2	1	1371	—	—	4	Sat
9-9-02	0600	60	10	.17	1	1431	—	—	4	Sat
9-10-02	0600	60	8	.13	1	1368	✓	✓	4	Sat
9-11-02	0615	60	11	.18	1	1329	—	—	4	Sat
9-12-02	0610	60	11.45 MB	.18.27 MB	1	1408	—	—	4.5 MB	Sat
9-16-02	0615	60	10	.17	1	1350	—	—	4	Sat
9-17-02	0605	60	7	.1	1	1427	✓	✓	4	Sat
9-18-02	0630	60	13	.22	1	1369	—	—	4.5	Sat
9-19-02	0600	60	8	.13	1	1353	—	—	4	Sat
9-23-02	0630	60	20	.33	1	1402	—	—	5	Sat
9-24-02	0620	60	11	.18	1	1388	—	—	4	Sat
9-25-02	0620	60	13	.22	1	1357	—	—	5	Sat
9-26-02	0720	60	12	.2	1	1436	✓	✓	4.5	Sat
9-30-02	0620	60	10	.17	1	1443	✓	—	4.4	Sat
10-1-02	0620	60	9	.15	1	1374	—	—	4.3	Sat
10-2-02	0620	60	10	.17	1	1357	—	—	4.4	Sat



## Appendix G

# **Background Assessment Data**

Molycorp Washington, PA

## **Background Assessment**

MACTEC performed material-specific backgrounds for poured concrete with its three large-area gas flow instruments. The most conservative background values were selected and used for all background subtracts for direct (static) type surveys performed.

Background measurements for poured concrete and metal/drywall were calculated from surveys obtained at the Canton Volunteer Fire Department Station 52-1, Canton Township, PA on their poured concrete surfaces and their building structure. A mean value for each instrument was calculated. The most conservative background value was selected and used by the Health Physics technicians for all instrument background subtractions.

Included in this appendix are the results of MACTEC's background assessment data

**Concrete Background Assessment**  
**Molycorp Washington, PA**

Poured Concrete Surfaces

Ludlum Model 2350-1 (126190) with 43-106 (133871)

Beta - Direct Measurements (cpm)			Alpha - Direct Measurements (cpm)
<u>Unshield</u>	<u>Shield</u>	<u>Net</u>	<u>Net</u>
500	350	150	9
418	314	104	6
447	326	121	8
494	312	182	5
483	351	132	3
466	306	160	6
478	347	131	9
469	327	142	8
426	353	73	12
429	343	86	7
499	349	150	10
462	330	132	9
496	372	124	8
491	336	155	9
458	295	163	12
527	337	190	11
464	327	137	13
521	302	219	12
492	323	169	4
484	319	165	8
Mean (cpm)	144		8
Stand Deviation	34.4		2.8
n <sub>b</sub>	4		8

Readings taken at the Canton Volunteer Fire Department Station 52-1, Canton Township, PA on their poured concrete surfaces.

**Concrete Background Assessment**  
**Molycorp Washington, PA**

Poured Concrete Surfaces

Ludlum Model 2350-1 (129414) with 43-106 (128914)

**Beta - Direct Measurements (cpm)**

	<u>Unshield</u>	<u>Shield</u>	<u>Net</u>
	492	301	191
	479	348	131
	496	306	190
	537	340	197
	610	316	294
	465	302	163
	547	331	216
	509	335	174
	510	355	155
	541	346	195
	563	320	243
	517	341	176
	505	375	130
	530	352	178
	520	370	150
	518	332	186
	519	411	108
	506	365	141
	570	360	210
	534	343	191
Mean (cpm)	181		
Stand Deviation	42.0		
n <sub>b</sub>	4		

Readings taken at the Canton Volunteer Fire Department Station 52-1, Canton Township, PA on their poured concrete surfaces.

**Concrete Background Assessment**  
**Molycorp Washington, PA**

Poured Concrete Surfaces

Ludlum Model 2350-1 (95359) with 43-106 (133866)

Beta - Direct Measurements (cpm)

	<u>Unshield</u>	<u>Shield</u>	<u>Net</u>
	460	330	130
	482	397	85
	592	381	211
	589	381	208
	561	344	217
	555	408	147
	491	388	103
	511	392	119
	643	409	234
	606	375	231
	563	429	134
	590	386	204
	703	407	296
	682	389	293
	551	370	181
	518	332	186
	601	411	190
	599	365	234
	520	403	117
	522	407	115
Mean (cpm)	182		
Stand Deviation	61.1		
$n_b$	8		

Readings taken at the Canton Volunteer Fire Department Station 52-1, Canton Township, PA on their poured concrete surfaces.

**Concrete Background Assessment**  
**Molycorp Washington, PA**

Poured Concrete Surfaces

Ludlum Model 2350-1 (95356) with 43-68 (91046)

Beta - Direct Measurements (cpm)			Alpha - Direct Measurements (cpm)
<u>Unshield</u>	<u>Shield</u>	<u>Net</u>	<u>Net</u>
460	330	130	10
482	397	85	14
592	381	211	15
589	381	208	12
561	348	213	23
555	408	147	11
491	388	103	13
511	392	119	6
1014	409	605	18
606	375	231	17
523	429	94	12
590	386	204	14
703	407	296	17
662	389	273	13
551	408	143	10
518	346	172	7
478	349	129	12
465	345	120	5
520	403	117	14
522	407	115	13
Mean (cpm)	186		13
Stand Deviation	115.5		4.2
n <sub>b</sub>	29		8

Readings taken at the Canton Volunteer Fire Department Station 52-1, Canton Township, PA on their poured concrete surfaces.

**Concrete Background Assessment**  
**Molycorp Washington, PA**

Poured Concrete Surfaces

Ludlum Model 2350-1 (117563) with 43-106 (128912)

Beta - Direct Measurements (cpm)			Alpha - Direct Measurements (cpm)
<u>Unshield</u>	<u>Shield</u>	<u>Net</u>	<u>Net</u>
549	429	120	14
641	449	192	13
629	487	142	9
630	501	129	16
651	498	153	14
629	480	149	10
634	494	140	8
684	467	217	5
728	458	270	11
741	576	165	10
Mean (cpm)	168		11
Stand Deviation	46.3		3.3
n <sub>b</sub>	6		7

Readings taken at the Canton Volunteer Fire Department Station 52-1, Canton Township, PA on their poured concrete surfaces.