Final Status Survey Report for Building Foundations At the Molycorp Site

Washington, PA

MACTEC, Inc.

Revision - 0
Dated 8/30/02

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Reviews:

MACTEC Radiological Engineer — 8-30-02 Date

MACTEC Radiological Engineering/H&S Manager — 8/30/02 Date

MACTEC Project Manager — 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 Darrt 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, process equipment and supporting fixtures were removed, cleaned, and released or disposed of as low-level radioactive waste Contaminated structural surfaces identified during building surveys have been either decontaminated in-place by dry decontamination methods or have been marked as contaminated for later removal from buildings

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[1]	Building Number	Radiological Information
U	1	Concrete floor. Top surface of foundation not yet surveyed for final status. Building foundation is not located on contaminated fill
U	2	Concrete floor. Top surface of foundation final status surveyed Not yet released by NRC Building foundation is not located on contaminated fill
U	2W	Concrete floor. Top surface of foundation final status surveyed Not yet released by NRC. Building foundation is not located on contaminated fill
U	2 Train Bay	Concrete floor. Top surface of foundation final status surveyed Not yet released by NRC. Building foundation is not located on contaminated fill.
U	13	Concrete floor. Top surface of foundation final status surveyed and released by NRC Building foundation is not located on contaminated fill.
U	14	Concrete floor Top surface of foundation final status surveyed and released by NRC Building foundation is not located on contaminated fill
U	19	Concrete floor. Top surface of foundation final status surveyed. Not yet released by NRC Building foundation is not located on contaminated fill.
U	21	Concrete floor. Top surface of foundation final status surveyed Not yet released by NRC. Building foundation is not located on contaminated fill
U	22	Concrete floor. Top surface of foundation final status surveyed. Not yet released by NRC. Building foundation is not located on contaminated fill
U	23	Concrete floor Top surface of foundation final status surveyed. Not yet released by NRC. Building foundation is not located on contaminated fill.
U	25	Concrete floor. Top surface of foundation final status surveyed Not yet released by NRC. Building foundation is not located on contaminated fill
U	26	Building is currently being used as a rad storage/management area Concrete floor. Top surface of foundation not yet surveyed for final status Building foundation is not located on contaminated fill

A	28	Concrete floor. Top surface of foundation final status surveyed and released by NRC. Building foundation is located on contaminated fill.
U	29	Concrete floor. Top surface of foundation final status surveyed. Not yet released by NRC. Building foundation is not located on contaminated fill.
U	31	Concrete floor. Top surface of foundation final status surveyed. Not yet released by NRC Building foundation is not located on contaminated fill.
A	32	Concrete floor. Top surface of foundation final status surveyed Not yet released by NRC. Building foundation is located on contaminated fill
A	33	Concrete floor. Top surface of foundation final status surveyed. Not yet released by NRC Building foundation is located on contaminated fill.
A	34	Concrete floor. Top surface of foundation final status surveyed. Not yet released by NRC Building foundation is located on contaminated fill.
A	35	Concrete floor. Top surface of foundation final status surveyed and released by NRC Building foundation is located on contaminated fill.
A	36	Concrete floor. Top surface of foundation final status surveyed and released by NRC. Building foundation is located on contaminated fill
U	37	Concrete floor. Top surface of foundation final status surveyed Not yet released by NRC Building foundation is not located on contaminated fill
A	38	Concrete floor Top surface of foundation not yet surveyed for final status Building foundation is located on contaminated fill
A	39	Concrete floor. Top surface of foundation final status surveyed and released by NRC. Building foundation is located on contaminated fill.
A	42	Concrete floor. Top surface of foundation final status surveyed and released by NRC Building foundation is located on contaminated fill.

(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 l 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_2 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 reveled 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 titles "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 affects 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^2)

Radionuclide [1]	Average	Maximum	Removable
U-nat, U-235, U-238, and associated decay products	5,000 α	15,000α	1,000α
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^2 average, 3,000 dpm/100cm^2 maximum and 200 dpm/100cm^2 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

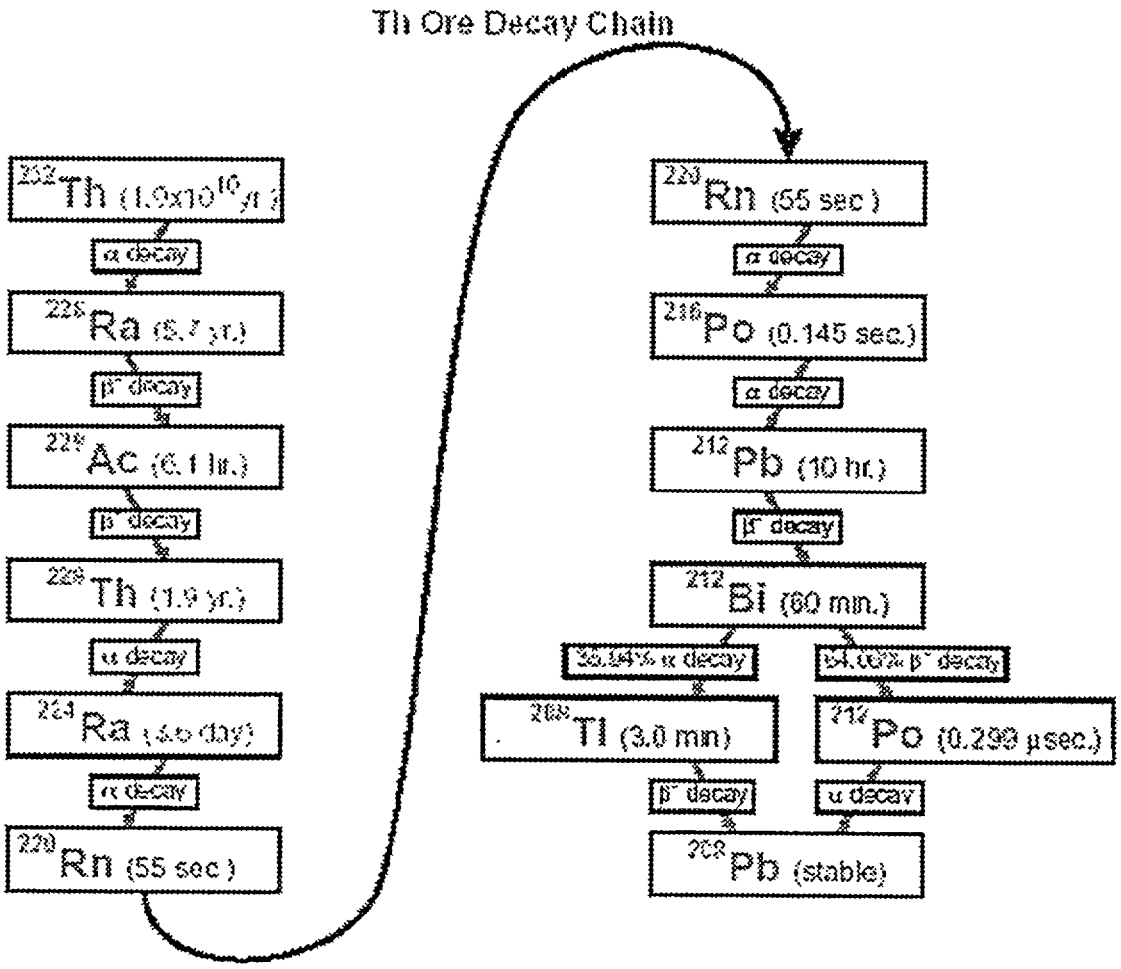
Due to the inherent difficulty of properly quantifying the alpha radiation component during the decay of natural thorium when using a hand-held instrument, a ratio of alpha decays to beta decays was identified and beta radiation was used as a surrogate to quantify the alpha activity This was not the 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

Foundation Classification	Survey Location	Surface Scan
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

Foundation Classification	Survey Location	Direct Measurement
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^2 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^2 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	Eternal surface of "clean" concrete waste pile.	Gamma exposure rates measured 1 meter perpendicular to the piled concrete surface at 1 measurement per 50 m^2 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^2)

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 personal. 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 cm²)	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^2) Dose rate measurements were recorded in units of micro-Roentgen per hour (uR/hr) and taken directly from the instruments 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 1 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 42 Foundation Data Package

Molycorp Washington, PA

August, 2002

Building 42 Foundation Data Package

This data package contains final status survey information for Building 42, Molycorp, Washington, PA site. The underside of the building's foundation/slab was surveyed as an affected foundation. The building's footer was not excavated as a part of the slab removal, and is not included in this report. The footer will be removed in the future and surveyed for final status at that time.

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 42 foundation provides evidence that all release criteria have been met, demonstrates that residual radioactivity is below the unrestricted use criteria, and confirms that the foundation (slab portion only) of Building 42 is 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
8-19-02	1108	Building #42	02-0787

RWP Number	Purpose of Survey FSS	Page
N/A	☐ RWP ☐ Routine Survey ☐ Unconditional Release ☒ Other	Page 1 of 4

Survey Title: FSS Foundation #42 underside

1 Minute Static's

		Concrete BKG	MDA
#1	B⁻	144	238
	α	8	78
#2	B⁻	144	243
	α	8	81

1 Minute Static

Metal		BKG	MDA
#1	α	2	46
	B⁻	27	109
#2	α	2	48
	B⁻	27	112

Bkgd Readings: 8-10 mr/hr

Smear Number	Beta dpm/100cm²	Alpha dpm/100cm²
1		
2		
3		
4		
5		
6		
7		
8		
9		
10	See	
11	Attached	
12	Sheets	
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		

Legend

00 = mRem/h gamma | 00 C = mRem/h gamma contact | ⊃ = Smear Location | 7 = 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 B⁻ (cpm/dpm)	Eff α	MDA B⁻ DPM	MDA α	Other B⁻ BKG	Other α
①	2350-1 / 95356	1-29-03	43-106 / 133866	1-29-03	.246	.204	643	62	280	1.8
②	2350-1 / 129414	8-2-03	43-106 / 128914	2-2-03	.240	.195	663	53	284	1.12
	2929 / 115563	6-14-03	43-10 / 127216	6-14-03	.231	.347	134	12	71	1.17
	19 / 22526	1-29-03	—	—	—		—		—	
	N/A	N/A	N/A	N/A	N/A		N/A		N/A	

Section 3: Review and Approval

Survey Performed By (Sign)	Area Posted and/or Barricaded	Date and Time
Joe Dubie / Mark Blancett	☐ Yes ☒ No ☐ Not Required	8-19-02 / 1500
Radiation Safety Officer (Print Name & Sign)		Date and Time
Steve Kowalski / Steve Kowalski		8-20-02 / 0900

Radiological Survey Results - Survey Location Indicator Survey # 02-0287

Survey Area Information FSS
Cursory on Foundation Bldg #42 (underside)

	Instrument Model/SN	Cal Due	Probe Model/SN	Cal Due	α Scan MDA	β Scan MDA	α Static MDA	β Static MDA
Instrument Data								

	Print Name	Signature	Date
Performed By			

Location	β Scan (cpm)	α Scan (cpm)	β Static (unsn) (cpm)	β Static (sn) (cpm)	α Static (cpm)	ER (μrem/hr)	Smears (dpm/100 cm²) α	Smears (dpm/100 cm²) β
1	400		386	321		10	-.5	0
2	420		395	318		10	2.4	-17
3	400		362	303		12	-.5	13
4	440		395	310		10	-.5	-30
5	430		396	299		11	-.5	0
6	390		381	334		10	5.3	-22
7	380		371	335		11	-.5	-48
8	390		378	298		12	-.5	4.3
9	380		367	335		11	-.5	39
10	410		373	313		10	-.5	30
11	420		376	290		10	2.4	43
12	450		410	318		12	-.5	8.7
13	460		420	302		11	-.5	-13
14	390		372	300		11	-.5	-4.3
15	400		369	291		10	-.5	8.7

Inst # 2

Radiological Survey Results - Survey Location Indicator Survey #02-0787

Survey Area Information FSS ~~Cursory~~ on Foundation Bldg #42 (underside)

Instrument Data	Instrument Model/SN	M.B. Cal Due	Probe Model/SN	Cal Due	α Scan MDA	β Scan MDA	α Static MDA	β Static MDA

Performed By	Print Name	Signature	Date

Location	β Scan (cpm)	α Scan (cpm)	β Static (unsh) (cpm)	β Static (sh) (cpm)	α Static (cpm)	ER (μrem/hr)	Smears (dpm/100 cm²) α	Smears (dpm/100 cm²) β
16	420		396	281		11	-.5	-26
17	400		392	301		10	-.5	-13
18	390		378	272		10	2.4	0
19	390		372	292		11	2.4	35
20	410		388	317		11	2.4	8.7
21	440		411	273		12	-.5	-35
22	340		315	292		10	-.5	-8.7
23	360		347	259		10	-.5	22
24	420		389	252		10	2.4	-26
25	460		422	281		11	-.5	-30
26	420		387	312		12	-.5	17
27	380		360	293		11	-.5	-17
28	410		381	285		11	2.4	-4.3
29	390		375	272		10	-.5	17
30	380		353	286		10	2.4	-4.3

INST # 1

Survey # 02-0787

Radiological Survey Results - Survey Location Indicator

Survey Area Information: 1 MINUTE STATIC'S TAKEN ON Misc. I-Beams/Metal Panels Bldg # 42

	Instrument Model/SN	Cal Due	Probe Model/SN	Cal Due	α Scan MDA	β Scan MDA	α Static MDA	β Static MDA
Instrument Data								

	Print Name	Signature	Date
Performed By			

Location	β Scan (cpm)	α Scan (cpm)	β Static (unsn) (cpm)	β Static (sn) (cpm)	α Static (cpm)	ER (μrem/hr)	Smears (dpm/100 cm²) α	β
1	340		317	273		10	2.4	-17
2	320		301	294		11	-.5	13
3	580		540	492		10	-.5	-26
4	480		447	441		10	-.5	30
5	520		486	423		10	-.5	22
6	340		330	251		9	-.5	-13
7	320		308	282		10	2.4	-8.7
8	300		259	247		11	-.5	-17
9	320		311	275		10	2.4	35
10	340		316	297		10	2.4	-8.7

1-5 → Metal Panels

6-10 → I-Beams

INSTRUMENT # 1

Results of Surface Scans
Molycorp - Building 42 Survey Unit

Underside of Foundation

Location	Beta Scan gross cpm	Beta Scan net cpm	Instrument Number
F1	400	116	2
F2	420	136	2
F3	400	116	2
F4	440	156	2
F5	430	146	2
F6	390	106	2
F7	380	96	2
F8	390	106	2
F9	380	96	2
F10	410	126	2
F11	420	136	2
F12	450	166	2
F13	460	176	2
F14	390	106	2
F15	400	116	2
F16	420	140	1
F17	400	120	1
F18	390	110	1
F19	390	110	1
F20	410	130	1
F21	440	160	1
F22	340	60	1
F23	360	80	1
F24	420	140	1
F25	460	180	1
F26	420	140	1
F27	380	100	1
F28	410	130	1
F29	390	110	1
F30	380	100	1

All foundation underside scans performed with either: #1 - Ludlum Model 2350-1 No 95356 with 43-106 No. 133866

Monitor Info:
Scan MDA Beta - 643 dpm/100cm^2
Scan background Beta - 280 cpm
Detector Eff. Beta - .246

or

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

Scan MDA Beta - 663 dpm/100cm^2
Scan background Beta - 284 cpm
Detector Eff. Beta - .240

Results of Surface Scans

Molycorp - Building 42 Survey Unit

Foundation Support I-Beams and Metal Panels

Location	Beta Scan gross cpm	Beta Scan net cpm
M1	340	60
M2	320	40
M3	580	300
M4	480	200
M5	520	240
M6	340	60
M7	320	40
M8	300	20
M9	320	40
M10	340	60

All foundation underside metal scans performed with Ludlum Model 2350-1 No. 95356 with 43-106 No. 133866

Monitor Info:
Scan MDA Beta - 643 dpm/100cm^2
Scan background Beta - 280 cpm
Detector Eff. Beta - .246

Elevated Results of Surface Scans

Molycorp - Building 42 Survey Unit

Underside of Foundation (including metal support r

No elevated scan results were reported

Direct Measurements (Total Activity)

Molycorp - Building 42 Survey Unit

Underside of Foundation

Location	Unshield Beta cpm	Shield Beta cpm	Gross Beta cpm	Bkgd cpm	Net cpm	Direct Beta ($dpm/100cm^2$)	Uncertainty 95% CL	MDA ($dpm/100cm^2$)	Direct Alpha [1] ($dpm/100cm^2$)	Instrument Number
F1	386	321	65	144	-79	-329	118	243	-658	2
F2	395	318	77	144	-67	-279	121	243	-558	2
F3	362	303	59	144	-85	-354	116	243	-708	2
F4	395	310	85	144	-59	-246	124	243	-492	2
F5	396	299	97	144	-47	-196	127	243	-392	2
F6	381	334	47	144	-97	-404	113	243	-808	2
F7	371	335	36	144	-108	-450	110	243	-900	2
F8	378	298	80	144	-64	-267	122	243	-533	2
F9	367	335	32	144	-112	-467	108	243	-933	2
F10	373	313	60	144	-84	-350	117	243	-700	2
F11	376	290	86	144	-58	-242	124	243	-483	2
F12	410	318	92	144	-52	-217	125	243	-433	2
F13	420	302	118	144	-26	-108	132	243	-217	2
F14	372	300	72	144	-72	-300	120	243	-600	2
F15	369	291	78	144	-66	-275	122	243	-550	2
F16	396	281	115	144	-29	-118	128	238	-236	1
F17	392	301	91	144	-53	-215	122	238	-431	1
F18	378	272	106	144	-38	-154	126	238	-309	1
F19	372	292	80	144	-64	-260	119	238	-520	1
F20	388	317	71	144	-73	-297	117	238	-593	1
F21	411	273	138	144	-6	-24	134	238	-49	1
F22	315	292	23	144	-121	-492	103	238	-984	1
F23	347	259	88	144	-56	-228	121	238	-455	1
F24	389	252	137	144	-7	-28	134	238	-57	1
F25	422	281	141	144	-3	-12	135	238	-24	1
F26	387	312	75	144	-69	-280	118	238	-561	1
F27	360	293	67	144	-77	-313	116	238	-626	1
F28	381	285	96	144	-48	-195	123	238	-390	1
F29	375	272	103	144	-41	-167	125	238	-333	1
F30	353	286	67	144	-77	-313	116	238	-626	1

All foundation underside direct measurements performed with either #1 -
Ludlum Model 2350-1 No. 95356 with 43-106 No 133866

Monitor Info:
Direct MDA Beta - 238 dpm/100cm^2
Direct background Beta - 144 cpm
Detector Eff Beta - .246

or

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

Direct MDA Beta - 243 dpm/100cm^2
Direct background Beta - 144 cpm
Detector Eff. Beta - .240

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

Direct Measurements (Total Activity)

Molycorp - Building 42 Survey Unit

Foundation Support I-Beams and Metal Panels

Location	Unshield Beta cpm	Shield Beta cpm	Gross Beta cpm	Bkgd cpm	Net cpm	Direct Beta (dpm/100cm^2)	Uncertainty 95% CL	MDA (dpm/100cm^2)	Direct Alpha [1] (dpm/100cm^2)
M1	317	273	44	27	17	69	67	109	138
M2	301	294	7	27	-20	-81	46	109	-163
M3	540	492	48	27	21	85	69	109	171
M4	447	441	6	27	-21	-85	46	109	-171
M5	486	423	63	27	36	146	76	109	293
M6	330	251	79	27	52	211	82	109	423
M7	308	282	26	27	-1	-4	58	109	-8
M8	259	247	12	27	-15	-61	50	109	-122
M9	311	275	36	27	9	37	63	109	73
M10	316	297	19	27	-8	-33	54	109	-65

All foundation underside metal direct measurements performed with Ludlum Model 2350-1 No. 95356 with 43-106 No. 133866

Monitor Info:
Direct MDA Beta - 109 dpm/100cm^2
Direct background Beta - 27 cpm
Detector Eff. Beta - 246

(1) - A beta to alpha ratio factoring (1.2, beta to alpha) was used to provide alpha activity.

Elevated Direct Measurements (Total Activity)

Molycorp - Building 42 Survey Unit

Underside of Foundation (including metal support materials)

No elevated direct measurements were reported.

Removable Surface Activity Measurements

Molycorp - Building 42 Survey Unit

Underside of Foundation

Location	Removable Beta (dpm/100cm^2)	Uncertainty 95% CL	MDA	Removable Alpha (dpm/100cm^2)	Uncertainty 95% CL	MDA
F1	0	9 2	134	-0 5	2.4	12
F2	-17	19.2	134	2 4	5.2	12
F3	13	17 4	134	-0.5	2 4	12
F4	-30	24 2	134	-0.5	2 4	12
F5	0	9.2	134	-0 5	2.4	12
F6	-22	21.2	134	5.3	7 7	12
F7	-48	29.7	134	-0.5	2.4	12
F8	4.3	12 5	134	-0.5	2 4	12
F9	39	27 1	134	-0 5	2.4	12
F10	30	24 2	134	-0.5	2.4	12
F11	43	28.3	134	2.4	5.2	12
F12	8.7	15 2	134	-0.5	2.4	12
F13	-13	17 4	134	-0.5	2.4	12
F14	-4.3	12.5	134	-0.5	2.4	12
F15	8.7	15 2	134	-0.5	2.4	12
F16	-26	22 8	134	-0.5	2 4	12
F17	-13	17.4	134	-0.5	2.4	12
F18	0	9.2	134	2 4	5 2	12
F19	35	25.8	134	2.4	5.2	12
F20	8 7	15.2	134	2 4	5 2	12
F21	-35	25.8	134	-0.5	2.4	12
F22	-8.7	15.2	134	-0.5	2.4	12
F23	22	21 2	134	-0 5	2 4	12
F24	-26	22.8	134	2.4	5.2	12
F25	-30	24.2	134	-0 5	2.4	12
F26	17	19.2	134	-0.5	2.4	12
F27	-17	19 2	134	-0.5	2 4	12
F28	-4.3	12 5	134	2.4	5 2	12
F29	17	19.2	134	-0 5	2.4	12
F30	-4.3	12 5	134	2.4	5.2	12

Smears counted with Ludlum 2929 No. 115563 with 43-10 No. 127216

	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

Removable Surface Activity Measurements

Molycorp - Building 42 Survey Unit

Underside of Foundation

Location	Removable Beta (dpm/100cm^2)	Uncertainty 95% CL	MDA	Removable Alpha (dpm/100cm^2)	Uncertainty 95% CL	MDA
F1	0	9 2	134	-0 5	2.4	12
F2	-17	19 2	134	2.4	5.2	12
F3	13	17.4	134	-0 5	2 4	12
F4	-30	24.2	134	-0.5	2.4	12
F5	0	9 2	134	-0.5	2.4	12
F6	-22	21.2	134	5 3	7.7	12
F7	-48	29.7	134	-0.5	2.4	12
F8	4.3	12.5	134	-0.5	2.4	12
F9	39	27.1	134	-0 5	2.4	12
F10	30	24.2	134	-0.5	2.4	12
F11	43	28.3	134	2.4	5 2	12
F12	8.7	15 2	134	-0 5	2.4	12
F13	-13	17.4	134	-0.5	2.4	12
F14	-4.3	12.5	134	-0.5	2.4	12
F15	8 7	15.2	134	-0.5	2.4	12
F16	-26	22.8	134	-0.5	2.4	12
F17	-13	17.4	134	-0.5	2.4	12
F18	0	9 2	134	2 4	5.2	12
F19	35	25.8	134	2.4	5 2	12
F20	8.7	15.2	134	2.4	5.2	12
F21	-35	25 8	134	-0.5	2.4	12
F22	-8.7	15 2	134	-0.5	2.4	12
F23	22	21.2	134	-0.5	2 4	12
F24	-26	22.8	134	2.4	5.2	12
F25	-30	24.2	134	-0.5	2 4	12
F26	17	19 2	134	-0.5	2 4	12
F27	-17	19.2	134	-0.5	2 4	12
F28	-4.3	12.5	134	2 4	5.2	12
F29	17	19.2	134	-0.5	2.4	12
F30	-4.3	12.5	134	2 4	5.2	12

Smears counted with Ludlum 2929 No. 115563 with 43-10 No 127216

	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 42 Survey Unit

Underside of Foundation (including metal support materials)

No elevated removable surface activity was reported above limits

Exposure Rate Measurements

Molycorp - Building 42 Survey Unit

Underside of Foundation

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

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

Exposure Rate Measurements

Molycorp - Building 42 Survey Unit

Foundation Support I-Beams and Metal Panels

Location	Exposure Rate (uR/hr)	Net Exp Rate (uR/hr)
M1	10	1
M2	11	2
M3	10	1
M4	10	1
M5	10	1
M6	9	0
M7	10	1
M8	11	2
M9	10	1
M10	10	1

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

Summary of Building Surface Direct Reading (Total Activity) Results

Molycorp - Building 42 Survey Unit

Underside of Foundation (including metal support materials)

	Beta				Alpha		
n	$\bar{x}$	s	μ_α	n	$\bar{x}$	s	μ_α
40	25	192 1	76.0	40	50	384.3	152.1

$t_{1-\alpha}$ 1.684

Guidelines/Conditions Satisfied?

Beta	Alpha
Yes	Yes

Summary of Exposure Rate Measurements

Molycorp - Building 42 Survey Unit

Underside of Foundation (including metal support materials)

n	$\bar{x}$	s	μ_α
40	1 6	0.7	1.7

$t_{1-\alpha}$ 1 684

Guidelines/Conditions Satisfied?

Yes

Appendix B

Building 21 Foundation Data Package

Molycorp Washington, PA

August, 2002

Building 21 Foundation Data Package

This data package contains final status survey information for Building 21, Molycorp, Washington, PA site. The underside of the building's foundation/slab was surveyed as an affected foundation. The building's footer was not excavated as a part of the slab removal, and is not included in this report. The footer will be removed in the future and surveyed for final status at that time

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

Several sections of concrete were identified with elevated levels of activity and were segregated from the pile. Clean concrete, surveyed and found to be below release limits, was moved to a clean area of the site and awaits verification surveys Concrete with elevated readings remain in the footprint of the building and will be treated and processed as rad waste

Summary

Results from the final status survey of Building 21 foundation provides evidence that all release criteria have been met, demonstrates that residual radioactivity is below the unrestricted use criteria, and confirms that the foundation (slab portion only) of Building 21 is 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
8-21-02	1145	Building #21 (Pad)	02-0817

RWP Number	Purpose of Survey	Page
N/A	FSS ☐ RWP ☐ Routine Survey ☐ Unconditional Release ☒ Other	1 of 3

Survey Title: FSS w Foundation Building #21 (Underside)

1 Minute Statics

		BKG	MDA
#1	B⁻	144 -	238
	α	8 -	78
#2	B⁻	144 -	243
	α	8 -	81

Bkgd Readings 10-12 Mr/hr

Smear Number	Beta dpm/100cm²	Alpha dpm/100cm²
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12	See	
13	Attached	
14	Sheets	
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		

Legend

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

Section 2: Instrument Used

	Instrument Model/SN	Cal Due Date	Probe Model/SN	Cal Due Date	Detector Eff β (cpm/dpm) α	MDA β⁻ DPM α	Other β BKG α
①	2350-1 / 95356	1-29-03	43-106 / 133866	1-29-03	.246 / .204	687 / 62	320 / 1.8
②	2350-1 / 129414	8-2-03	43-106 / 128914	2-2-03	.240 / .195	682 / 87	300 / 3.2
	2929 / 115563	6-14-03	43-10 / 127216	6-14-03	.231 / .347	134 / 12	69 / .1
	19 / 22526	1-29-03	—	—	—	—	—
	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Section 3: Review and Approval

Survey Performed By (Sign)	Area Posted and/or Barricaded	Date and Time
Joe Hulm / Mark Blanchil	☐ Yes ☒ No ☐ Not Required	8-21-02 / 1145

Radiation Safety Officer (Print Name & Sign)	Date and Time
Steve Kowalski / Steve Kowalski	8-24-02 / 1200

Radiological Survey Results - Survey Location Indicator Survey #02-0817

Survey Area Information: FSS ~~Survey~~ Bldg #31 Foundation (underside)

	Instrument Model/SN	J.H Cal Due	Probe Model/SN	Cal Due	α Scan MDA	β Scan MDA	α Static MDA	β Static MDA
Instrument Data								

	Print Name	Signature	Date
Performed By			

Location	β Scan (cpm)	α Scan (cpm)	β Static (unsh) (cpm)	β Static (sh) (cpm)	α Static (cpm)	ER (μrem/hr)	Smears (dpm/100 cm²) α	Smears (dpm/100 cm²) β
1	580		547	346		12	-.3	-22
2	900		852	300		11	2.6	39
3	910		875	346		11	-.3	-8.7
4	590		564	341		11	-.3	13
5	620		599	339		11	-.3	4.3
6	560		536	333		11	-.3	-30
7	590		562	323		11	-.3	4.3
8	520		490	362		12	-.3	-8.7
9	550		520	341		11	-.3	-6.9
10	540		501	313		10	2.6	22
11	520		517	330		10	2.6	13
12	640		609	349		10	-.3	74
13	750		705	335		10	-.3	65
14	630		590	360		11	-.3	-22
15	780		758	408		11	-.3	22
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								

INST #1

Radiological Survey Results - Survey Location Indicator Survey # 02-0817

Survey Area Information: FSS Cursory Bldg #21 Foundation (underside)

	Instrument Model/SN	Cal Due	Probe Model/SN	Cal Due	α Scan MDA	β Scan MDA	α Static MDA	β Static MDA
Instrument Data	JH							

	Print Name	Signature	Date
Performed By			

Location	β Scan (cpm)	α Scan (cpm)	β Static (unsh) (cpm)	β Static (sh) (cpm)	α Static (cpm)	ER (μrem/hr)	Smears (dpm/100 cm²) α	Smears (dpm/100 cm²) β
16	1200		1100	500		9	-.3	8.7
17	690		660	300		11	-.3	43
18	700		690	350		12	-.3	-22
19	660		650	411		12	-.3	-4.3
20	880		832	407		12	2.6	-35
21	563		542	318		12	-.3	13
22	605		580	326		11	2.6	8.7
23	735		690	400		10	-.3	-26
24	862		831	431		10	-.3	17
25	844		810	353		11	-.3	-13
26	980		917	647		12	-.3	13
27	1038		1027	444		14	2.6	17
28	683		658	396		14	-.3	22
29	576		526	330		15	-.3	61
30	437		419	312		13	-.3	17

Inst. #2

Results of Surface Scans
Molycorp - Building 21 Survey Unit

Underside of Foundation

Location	Beta Scan gross cpm	Beta Scan net cpm	Instrument Number
F1	580	260	1
F2	900	580	1
F3	910	590	1
F4	590	270	1
F5	620	300	1
F6	560	240	1
F7	590	270	1
F8	520	200	1
F9	550	230	1
F10	540	220	1
F11	520	200	1
F12	640	320	1
F13	750	430	1
F14	630	310	1
F15	780	460	1
F16	1200	900	2
F17	690	390	2
F18	700	400	2
F19	660	360	2
F20	880	580	2
F21	563	263	2
F22	605	305	2
F23	735	435	2
F24	862	562	2
F25	844	544	2
F26	980	680	2
F27	1038	738	2
F28	683	383	2
F29	576	276	2
F30	437	137	2

All foundation underside scans performed with either: #1 - Ludlum Model 2350-1 No 95356 with 43-106 No. 133866

Monitor Info.
Scan MDA Beta - 687 dpm/100cm^2
Scan background Beta - 320 cpm
Detector Eff Beta - 246

or

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

Scan MDA Beta - 682 dpm/100cm^2
Scan background Beta - 300 cpm
Detector Eff. Beta - 240

Elevated Results of Surface Scans

Molycorp - Building 21 Survey Unit

Underside of Foundation

Location	Beta Scan net cpm
F16	900
F26	680
F27	738

Direct Measurements (Total Activity)

Molycorp - Building 21 Survey Unit

Underside of Foundation

Location	Unshield Beta cpm	Shield Beta cpm	Gross Beta cpm	Bkgd cpm	Net cpm	Direct Beta (dpm/100cm^2)	Uncertainty 95% CL	MDA (dpm/100cm^2)	Direct Alpha [1] (dpm/100cm^2)	Instrument Number
F1	547	346	201	144	57	232	148	238	463	1
F2	852	300	552	144	408	1659	210	238	3317	1
F3	875	346	529	144	385	1565	207	238	3130	1
F4	564	341	223	144	79	321	153	238	642	1
F5	599	339	260	144	116	472	160	238	943	1
F6	536	333	203	144	59	240	148	238	480	1
F7	562	323	239	144	95	386	156	238	772	1
F8	490	362	128	144	-16	-65	131	238	-130	1
F9	520	341	179	144	35	142	143	238	285	1
F10	501	313	188	144	44	179	145	238	358	1
F11	517	330	187	144	43	175	145	238	350	1
F12	609	349	260	144	116	472	160	238	943	1
F13	705	335	370	144	226	919	181	238	1837	1
F14	590	360	230	144	86	350	154	238	699	1
F15	758	408	350	144	206	837	177	238	1675	1
F16	1100	500	600	144	456	1900	223	243	3800	2
F17	660	300	360	144	216	900	183	243	1800	2
F18	690	350	340	144	196	817	180	243	1633	2
F19	650	411	239	144	95	396	160	243	792	2
F20	832	407	425	144	281	1171	195	243	2342	2
F21	542	318	224	144	80	333	157	243	667	2
F22	580	326	254	144	110	458	163	243	917	2
F23	690	400	290	144	146	608	170	243	1217	2
F24	831	431	400	144	256	1067	190	243	2133	2
F25	810	353	457	144	313	1304	200	243	2608	2
F26	917	647	270	144	126	525	166	243	1050	2
F27	1027	444	583	144	439	1829	220	243	3658	2
F28	658	396	262	144	118	492	165	243	983	2
F29	526	330	196	144	52	217	151	243	433	2
F30	419	312	107	144	-37	-154	129	243	-308	2

All foundation underside direct measurements performed with either: #1 - Ludlum Model 2350-1 No. 95356 with 43-106 No. 133866

Monitor Info:
Direct MDA Beta - 238 dpm/100cm^2
Direct background Beta - 144 cpm
Detector Eff. Beta - .246

or

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

Direct MDA Beta - 243 dpm/100cm^2
Direct background Beta - 144 cpm
Detector Eff Beta - 240

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

Elevated Direct Measurements (Total Activity)

Molycorp - Building 21 Survey Unit

Underside of Foundation

Location	Direct Beta ($dpm/100cm^2$)	Direct Alpha ($dpm/100cm^2$)
F2	1659	3317
F3	1565	3130
F13		1873
F15		1675
F16	1900	3800
F17		1800
F18		1633
F20	1171	2342
F23		1217
F24	1067	2133
F25	1304	2608
F26		1050
F27	1829	3658

Concrete pieces with elevated readings and those pieces that are surveyed radiologically clean have been segregated. Radiologically clean concrete has been removed from the footprint of the building and placed in a designated storage location in the north-east portion of the site, awaiting release authorization. Contaminated concrete will remain within the footprint of the building's foundation until it is removed as radiological waste.

Removable Surface Activity Measurements

Molycorp - Building 21 Survey Unit

Underside of Foundation

Location	Removable Beta (dpm/100cm^2)	Uncertainty 95% CL	MDA	Removable Alpha (dpm/100cm^2)	Uncertainty 95% CL	MDA
F1	-22	21.2	134	-0 3	1 8	12
F2	39	27.0	134	2 6	5 4	12
F3	-8.7	15.1	134	-0 3	1 8	12
F4	13	17.3	134	-0.3	1 8	12
F5	4.3	12 4	134	-0.3	1.8	12
F6	-30	24 1	134	-0 3	1.8	12
F7	4 3	12.4	134	-0 3	1 8	12
F8	-8.7	15.1	134	-0.3	1 8	12
F9	-69	35.1	134	-0.3	1.8	12
F10	22	21.2	134	2.6	5.4	12
F11	13	17.3	134	2.6	5.4	12
F12	74	36 2	134	-0.3	1.8	12
F13	65	34.1	134	-0.3	1.8	12
F14	-22	21.2	134	-0 3	1.8	12
F15	22	21.2	134	-0.3	1.8	12
F16	8.7	15.1	134	-0.3	1 8	12
F17	43	28 2	134	-0.3	1.8	12
F18	-22	21.2	134	-0.3	1 8	12
F19	-4.3	12.4	134	-0 3	1.8	12
F20	-35	25.8	134	2.6	5 4	12
F21	13	17.3	134	-0.3	1.8	12
F22	8 7	15.1	134	-0.3	1.8	12
F23	-26	22.7	134	-0 3	1 8	12
F24	17	19.1	134	-0.3	1 8	12
F25	-13	17.3	134	-0.3	1.8	12
F26	13	17.3	134	-0.3	1.8	12
F27	17	19.1	134	2 6	5 4	12
F28	22	21 2	134	-0.3	1.8	12
F29	61	33.1	134	-0.3	1 8	12
F30	17	19 1	134	-0.3	1.8	12

Smears counted with Ludlum 2929 No. 115563 with 43-10 No 127216

	Beta	Alpha
Background (cpm)	69	0.1
Bkgd ct. time	60	60
Sample ct. time	1	1
Efficiency	0.231	0.347
MDA	134	12

Elevated Removable Surface Activity Measurements

Molycorp - Building 21 Survey Unit

Underside of Foundation

No elevated removable surface activity was reported above limits.

Exposure Rate Measurements

Molycorp - Building 21 Survey Unit

Underside of Foundation

Location	Exposure Rate (uR/hr)	Net Exp Rate (uR/hr)
F1	12	1
F2	11	0
F3	11	0
F4	11	0
F5	11	0
F6	11	0
F7	11	0
F8	12	1
F9	11	0
F10	10	-1
F11	10	-1
F12	10	-1
F13	10	-1
F14	11	0
F15	11	0
F16	9	-2
F17	11	0
F18	12	1
F19	12	1
F20	12	1
F21	12	1
F22	11	0
F23	10	-1
F24	10	-1
F25	11	0
F26	12	1
F27	14	3
F28	14	3
F29	15	4
F30	13	2

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

Summary of Building Surface Direct Reading (Total Activity) Results

Molycorp - Building 21 Survey Unit

Underside of Foundation

Beta				Alpha			
n	$\bar{x}$	s	μ_α	n	$\bar{x}$	s	μ_α
17	273	183.5	350 6	17	546	367.1	701 3

$t_{1-\alpha}$ 1.74

Guidelines/Conditions Satisfied?

Beta	Alpha
Yes	Yes

Summary of Exposure Rate Measurements

Molycorp - Building 21 Survey Unit

Underside of Foundation

n	$\bar{x}$	s	μ_α
30	0.4	1.3	0.8

$t_{1-\alpha}$	1.697

Guidelines/Conditions Satisfied?

Yes

Appendix C

Building 19 Foundation Data Package

Molycorp Washington, PA

August, 2002

Building 19 Foundation Data Package

This data package contains final status survey information for Building 19, Molycorp, Washington, PA site The underside of the building's foundation/slab was surveyed as an affected foundation. The building's footer was not excavated as a part of the slab removal, and is not included in this report. The footer will be removed in the future and surveyed for final status at that time.

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

All the concrete within the footprint of Building 19 was surveyed and found to be below release limits.

Summary

Results from the final status survey of Building 19 foundation provides evidence that all release criteria have been met, demonstrates that residual radioactivity is below the unrestricted use criteria, and confirms that the foundation (slab portion only) of Building 19 is 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
8-19-02	1500	Building #19	02-0789

RWP Number	Purpose of Survey FSS	Page
N/A	☐ RWP ☐ Routine Survey ☐ Unconditional Release ☒ Other	1 of 3

Survey Title: FSS on Foundation (Underside) #19

1 Minute STATIC's

Concrete BKG MDA

#1 B- 144 - 238

α 8 - 78

#2 B- 144 - 243

α 8 - 81

Bkgd Readings 8-10 Mr/hr

Smear Number	Beta dpm/100cm²	Alpha dpm/100cm²
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11	See	
12	Attached	
13	Sheets	
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		

Legend

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

Section 2: Instrument Used

	Instrument Model/SN	Cal Due Date	Probe Model/SN	Cal Due Date	Detector Eff β cpm/dpm α	MDA β- DPM α	Other β- BKG α
①	2350-1 / 95356	1-29-03	43-106 / 133866	1-29-03	.246 / .204	622 / 41	262 / .8
②	2350-1 / 129414	8-2-03	43-106 / 128914	2-2-03	.240 / 195	669 / 84	289 / 3
	2929 / 115563	6-14-03	43-10 / 127216	6-14-03	.231 / .347	134 / 13	71 / .17
	19 / 22526	1-29-03	—	—	—	—	—
	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Section 3 Review and Approval

Survey Performed By (Sign)	Area Posted and/or Barricaded	Date and Time
Joe Mulvey / Mark Blancaid	☐ Yes ☒ No ☐ Not Required	8-19-02 / 1500

Radiation Safety Officer (Print Name & Sign)	Date and Time
Steve Kowalski / Steve Kowalski	8-20-02 / 0900

Radiological Survey Results - Survey Location Indicator Survey # 02-0789

Survey Area Information: FSS ~~Survey~~ on FOUNDATION Bldg #19 (underside)

Instrument Data	M.D. Instrument Model/SN	Cal Due	Probe Model/SN	Cal Due	α Scan MDA	β Scan MDA	α Static MDA	β Static MDA

Performed By	Print Name	Signature	Date

Location	β Scan (cpm)	α Scan (cpm)	β Static (unsh) (cpm)	β Static (sh) (cpm)	α Static (cpm)	ER (μrem/hr)	Smears (dpm/100 cm²) α	Smears (dpm/100 cm²) β
16	490		476	370		8	-.5	8.7
17	390		370	321		9	-.5	0
18	440		409	347		9	2.4	-48
19	400		380	370		9	2.4	48
20	420		407	375		9	-.5	13
21	440		419	309		9	2.4	0
22	420		393	327		9	-.5	39
23	430		406	374		8	-.5	-30
24	480		447	368		9	-.5	61
25	500		474	370		8	-.5	4.3
26	460		433	349		9	2.4	-48
27	420		390	314		8	-.5	-26
28	430		412	342		9	-.5	4.3
29	420		407	363		8	2.4	8.7
30	480		440	362		9	-.5	22

Inst #1

Radiological Survey Results - Survey Location Indicator Survey #02.0789

Survey Area Information: FSS ~~Excavation~~ of Foundation #19 Cuddenside

	Instrument Model/SN (M.B)	Cal Due	Probe Model/SN	Cal Due	α Scan MDA	β Scan MDA	α Static MDA	β Static MDA
Instrument Data								

	Print Name	Signature	Date
Performed By			

Location	β Scan (cpm)	α Scan (cpm)	β Static (unsh) (cpm)	β Static (sh) (cpm)	α Static (cpm)	ER (μrem/hr)	Smears (dpm/100 cm²) α	Smears (dpm/100 cm²) β
1	455		435	353		9	2.4	65
2	465		419	333		9	-.5	-61
3	419		405	348		8	-.5	0
4	422		401	333		8	-.5	-48
5	454		435	335.		9	-.5	-43
6	406		379	319		8	-.5	-26
7	413		395	367		8	-.5	-48
8	414		379	333		9	-.5	4.3
9	431		394	367		9	2.4	-48
10	474		419	365		10	-.5	8.7
11	482		423	334		10	-.5	26
12	495		462	331		9	-.5	4.3
13	425		396	361		9	-.5	-30
14	426		414	343		10	2.4	30
15	421		400	358		10	-.5	4.3

Inst #2

Results of Surface Scans

Molycorp - Building 19 Survey Unit

Underside of Foundation

Location	Beta Scan gross cpm	Beta Scan net cpm	Instrument Number
F1	455	166	2
F2	465	176	2
F3	419	130	2
F4	422	133	2
F5	454	165	2
F6	406	117	2
F7	413	124	2
F8	414	125	2
F9	431	142	2
F10	474	185	2
F11	482	193	2
F12	495	206	2
F13	425	136	2
F14	426	137	2
F15	421	132	2
F16	490	228	1
F17	390	128	1
F18	440	178	1
F19	400	138	1
F20	420	158	1
F21	440	178	1
F22	420	158	1
F23	430	168	1
F24	480	218	1
F25	500	238	1
F26	460	198	1
F27	420	158	1
F28	430	168	1
F29	420	158	1
F30	480	218	1

All foundation underside scans performed with either: #1 - Ludlum Model 2350-1 No 95356 with 43-106 No 133866

Monitor Info.
Scan MDA Beta - 622 dpm/100cm^2
Scan background Beta - 262 cpm
Detector Eff Beta - .246

or

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

Scan MDA Beta - 669 dpm/100cm^2
Scan background Beta - 289 cpm
Detector Eff. Beta - .240

Elevated Results of Surface Scans

Molycorp - Building 19 Survey Unit

Underside of Foundation

No elevated scan results were reported

Direct Measurements (Total Activity)

Molycorp - Building 19 Survey Unit

Underside of Foundation

Location	Unshield Beta cpm	Shield Beta cpm	Gross Beta cpm	Bkgd cpm	Net cpm	Direct Beta (dpm/100cm^2)	Uncertainty 95% CL	MDA (dpm/100cm^2)	Direct Alpha [1] (dpm/100cm^2)	Instrument Number
F1	435	353	82	144	-62	-258	123	243	-517	2
F2	419	333	86	144	-58	-242	124	243	-483	2
F3	405	348	57	144	-87	-363	116	243	-725	2
F4	401	333	68	144	-76	-317	119	243	-633	2
F5	435	335	100	144	-44	-183	128	243	-367	2
F6	379	319	60	144	-84	-350	117	243	-700	2
F7	395	367	28	144	-116	-483	107	243	-967	2
F8	379	333	46	144	-98	-408	113	243	-817	2
F9	394	367	27	144	-117	-488	107	243	-975	2
F10	419	365	54	144	-90	-375	115	243	-750	2
F11	423	334	89	144	-55	-229	125	243	-458	2
F12	462	331	131	144	-13	-54	135	243	-108	2
F13	396	361	35	144	-109	-454	109	243	-908	2
F14	414	343	71	144	-73	-304	120	243	-608	2
F15	400	358	42	144	-102	-425	111	243	-850	2
F16	476	370	106	144	-38	-154	126	238	-309	1
F17	370	321	49	144	-95	-386	111	238	-772	1
F18	409	347	62	144	-82	-333	114	238	-667	1
F19	380	370	10	144	-134	-545	99	238	-1089	1
F20	407	375	32	144	-112	-455	106	238	-911	1
F21	419	309	110	144	-34	-138	127	238	-276	1
F22	393	327	66	144	-78	-317	115	238	-634	1
F23	406	374	32	144	-112	-455	106	238	-911	1
F24	447	368	79	144	-65	-264	119	238	-528	1
F25	474	370	104	144	-40	-163	125	238	-325	1
F26	433	349	84	144	-60	-244	120	238	-488	1
F27	390	314	76	144	-68	-276	118	238	-553	1
F28	412	342	70	144	-74	-301	117	238	-602	1
F29	407	363	44	144	-100	-407	109	238	-813	1
F30	440	362	78	144	-66	-268	119	238	-537	1

All foundation underside direct measurements performed with either #1 - Ludlum Model 2350-1 No. 95356 with 43-106 No 133866

Monitor Info:
Direct MDA Beta - 238 dpm/100cm^2
Direct background Beta - 144 cpm
Detector Eff. Beta - 246

or

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

Direct MDA Beta - 243 dpm/100cm^2
Direct background Beta - 144 cpm
Detector Eff Beta - .240

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

Elevated Direct Measurements (Total Activity)

Molycorp - Building 19 Survey Unit

Underside of Foundation

No elevated direct measurements were reported

Removable Surface Activity Measurements

Molycorp - Building 19 Survey Unit

Underside of Foundation

Location	Removable Beta (dpm/100cm^2)	Uncertainty 95% CL	MDA	Removable Alpha (dpm/100cm^2)	Uncertainty 95% CL	MDA
F1	65	34 1	134	2 4	5.2	13
F2	-61	33 2	134	-0.5	2.4	13
F3	0	9 2	134	-0.5	2.4	13
F4	-48	29.7	134	-0 5	2.4	13
F5	-43	28 3	134	-0.5	2.4	13
F6	-26	22.8	134	-0 5	2 4	13
F7	-48	29 7	134	-0.5	2.4	13
F8	4.3	12.5	134	-0 5	2.4	13
F9	-48	29 7	134	2.4	5.2	13
F10	8.7	15.2	134	-0.5	2.4	13
F11	26	22 8	134	-0.5	2.4	13
F12	4.3	12 5	134	-0.5	2.4	13
F13	-30	24.2	134	-0.5	2 4	13
F14	30	24.2	134	2.4	5 2	13
F15	4.3	12.5	134	-0.5	2 4	13
F16	8.7	15.2	134	-0 5	2.4	13
F17	0	9 2	134	-0.5	2.4	13
F18	-48	29.7	134	2.4	5 2	13
F19	48	29 7	134	2.4	5.2	13
F20	13	17.4	134	-0 5	2 4	13
F21	0	9.2	134	2.4	5.2	13
F22	39	27.1	134	-0.5	2.4	13
F23	-30	24 2	134	-0.5	2.4	13
F24	61	33 2	134	-0 5	2.4	13
F25	4.3	12.5	134	-0.5	2 4	13
F26	-48	29.7	134	2.4	5.2	13
F27	-26	22.8	134	-0.5	2.4	13
F28	4 3	12.5	134	-0.5	2.4	13
F29	8.7	15.2	134	2 4	5 2	13
F30	22	21 2	134	-0.5	2.4	13

Smears counted with Ludlum 2929 No 115563 with 43-10 No. 127216

	Beta	Alpha
Background (cpm)	71	0.17
Bkgd ct. time	60	60
Sample ct time	1	1
Efficiency	0 231	0.347
MDA	134	13

Elevated Removable Surface Activity Measurements

Molycorp - Building 19 Survey Unit

Underside of Foundation

No elevated removable surface activity was reported above limits.

Exposure Rate Measurements

Molycorp - Building 19 Survey Unit

Underside of Foundation

Location	Exposure Rate (uR/hr)	Net Exp Rate (uR/hr)
F1	9	0
F2	9	0
F3	8	-1
F4	8	-1
F5	9	0
F6	8	-1
F7	8	-1
F8	9	0
F9	9	0
F10	10	1
F11	10	1
F12	9	0
F13	9	0
F14	10	1
F15	10	1
F16	8	-1
F17	9	0
F18	9	0
F19	9	0
F20	9	0
F21	9	0
F22	9	0
F23	8	-1
F24	9	0
F25	8	-1
F26	9	0
F27	8	-1
F28	9	0
F29	8	-1
F30	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 19 Survey Unit

Underside of Foundation

Beta				Alpha			
n	$\bar{x}$	s	μ_α	n	$\bar{x}$	s	μ_α
30	-321	117 9	-284.8	30	-643	235 8	-569.6

$t_{1-\alpha}$ 1.697

Guidelines/Conditions Satisfied?

Beta	Alpha
Yes	Yes

Summary of Exposure Rate Measurements

Molycorp - Building 19 Survey Unit

Underside of Foundation

n	$\bar{x}$	s	μ_α
30	-0.2	0.6	0 0

$t_{1-\alpha}$ 1.697

Guidelines/Conditions Satisfied?

Yes

Appendix D

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=.251

Daily Instrumentation Operational Check Sheet

Instrument 2350-1 #117563 Probe: 43-106 #138912

Cal Due 8-6-02 Cal Due: 8-6-02

Source ID.	Mean Source Count Rate:	Mean +2 σ Value:	Mean -2 σ Value:
Tc 99 #3935	4851	4974	4730

Radiation Type.	Sigma Value.	Mean +3 σ Value.	Mean -3 σ Value:
B⁻	61	5035	4669

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/I 2 σ Value	W/I 3 σ Value	LLD	SAT/ UNSAT
7-29-02	0619	5	1587	317	1	4968	✓	✓	67	Sat
7-27-02	1700	—	—	—	1	4942	—	✓	—	Sat
7-30-02	0626	5	1726	345	1	4954	✓	✓	70	Sat
7-30-02	1640	—	—	—	1	4872	✓	✓	—	Sat
7-31-02	0613	5	1656	331	1	4933	✓	✓	69	Sat
7-31-02	1610	—	—	—	1	4971	—	—	—	Sat

Daily Instrumentation Operational Check Sheet

EFF = .212

Instrument 2350 / # 117563 Probe 43-106 # 128912

Cal Due 8-6-02 Cal Due: 8-6-02

Source ID.	Th 230 #3931	Mean Source Count Rate	735	Mean +2 σ Value	785	Mean -2 σ Value:	685
Radiation Type.	α	Sigma Value	25	Mean +3 σ Value.	810	Mean -3 σ Value:	660

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/I 2 σ Value	W/I 3 σ Value	LLD	SAT/ UNSAT
7-29-02	0619	5	7	1.4	1	698	✓	✓	7	~~SAT~~
7-29-02	1600	—	—	—	1	759	✓	✓	—	Sat
7-30-02	0620	5	12	2.4	1	726	✓	✓	9	~~SAT~~
7-30-02	1642	—	—	—	1	687	✓	✓	—	Sat
7-31-02	0613	5	8	1.6	1	736	✓	✓	8	~~SAT~~
7-31-02	1610	—	—	—	1	727	✓	✓	—	Sat

EFF .240 B⁻

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.	Mean Source Count Rate:	Mean +2 σ Value:	Mean -2 σ Value:
Tc 99 3935	4643	4791	4495

Radiation Type:	Sigma Value:	Mean +3 σ Value:	Mean -3 σ Value
β-	74	4864	4421

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/I 2 σ Value	W/I 3 σ Value	LLD	SAT/ UNSAT
8-7-02	0605	5	1552	310	1	4704	—	—	66	Sat
8-7-02	1720	—	—	—	1	4687	✓	✓	—	Sat
8-8-02	0615	5	1559	312	1	4727	✓	—	67	Sat
8-8-02	1600	—	—	—	1	4687	—	—	—	Sat
8-12-02	0610	5	1625	325	1	4599	—	—	68	Sat
8-12-02	1635	—	—	—	1	4709	✓	✓	—	Sat
8-13-02	0650	5	1568	314	1	4687	✓	✓	67	Sat
8-13-02	1650	—	—	—	1	4729	—	—	—	Sat
8-14-02	0610	5	1565	313	1	4614	—	—	67	Sat
8-14-02	1658 ~~1645~~	~~M 5~~	~~M 1454~~	—	1	4710	—	—	—	Sat
8-15-02	0615	5	1454	291	1	4663	—	—	64	Sat
8-15-02	1645	—	—	—	1	4724	✓	✓	—	Sat
8-19-02	0610	5	1468	294	1	4710	—	—	65	Sat
8-19-02	1635	—	—	—	1	4624	✓	✓	—	Sat
8-20-02	0625	5	1534	307	1	4668	—	—	66	Sat
8-20-02	1635	N/A	—	—	1	4686	—	—	—	Sat

EFF. 195 α

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:	Mean Source Count Rate.	Mean +2 σ Value:	Mean -2 σ Value:
Th 230 3937	739	799	679

Radiation Type:	Sigma Value.	Mean +3 σ Value.	Mean -3 σ Value.
α	30	829	649

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/I 2 σ Value	W/I 3 σ Value	LLD	SAT/ UNSAT
8 7-02	0615	5	8	1.6	1	736	—	—	8	Sat
8-7-02	1721	—	—	—	1	720	✓	✓	—	Sat
8-8-02	0615	5	5	1	1	765	—	—	7	Sat
8 8-02	1605	—	—	—	1	737	—	—	—	Sat
8-12-02	0615	5	10	2.0	1	736	—	—	8	Sat
8-12-02	1620	—	—	—	1	731	✓	✓	—	Sat
8-13-02	0705	5	18	3.6	1	709	—	—	10	Sat
8 13-02	1645	"	"	—	1	731	"	—	—	Sat
8-14-02	0615	5	10	2	1	712	—	—	8	Sat
8-14-02	1630	—	—	—	1	721	—	—	—	Sat
8-15-02	0625	5	7	1.4	1	751	—	—	7	Sat
8-15-02	1645	—	—	—	1	707	✓	✓	—	Sat
8-19-02	0635	5	5	1	1	753	—	—	7	Sat
8-19-02	1635	—	—	—	1	702	—	—	—	Sat
8-20-02	0625	5	4	.8	1	711	—	—	7	Sat
8 20-02	1640	—	—	—	1	746	—	—	—	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:	Mean Source Count Rate:	Mean +2 σ Value:	Mean -2 σ Value:
Te 99 #3935	4643	4791	4495

Radiation Type:	Sigma Value:	Mean +3 σ Value:	Mean -3 σ Value:
B-	74	4864	4421

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/I 2 σ Value	W/I 3 σ Value	LLD	SAT/ UNSAT
8-21-02	0610	5	1625	325	1	4612	✓	✓	68	Sat
8-21-02	1700	—	—	—	1	4518	✓	✓	—	Sat
8-22-02	0620	5	1464	293	1	4672	✓	✓	65	Sat
8-22-02	1610	—	—	—	1	4637	✓	✓	—	Sat
8-26-02	0615	5	1508	302	1	4501	✓	✓	66	Sat
8-27-02	0610	5	1422	286	1	4423	✓	✓	61	Sat
8-27-02	1620	—	—	—	1	4528	✓	✓	—	Sat
8-28-02	0730	~~0605~~	1409	282	1	4501	✓	✓	64	Sat
8-28-02	1700	—	—	—	1	4478	✓	✓	—	Sat
8-29-02	0610	5	1287	257	1	4506	✓	✓	61	Sat
8-29-02	1600	—	—	—	1	4511	✓	✓	—	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	Mean Source Count Rate:	Mean +2 σ Value:	Mean -2 σ Value:
Th 230 C 3937	739	799	679

Radiation Type:	Sigma Value:	Mean +3 σ Value:	Mean -3 σ Value:
α	30	829	649

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/I 2 σ Value	W/I 3 σ Value	LLD	SAT/ UNSAT
8-21-02	0620	5	7	1.4	1	701	⌐	⌐	7	Sat
8-21-02	1700	—	—	—	1	671	⌐	⌐	—	Sat
8-22-02	0630	5	6	1.2	1	742	⌐	⌐	7	Sat
8-22-02	1605	—	—	—	1	713	⌐	⌐	—	Sat
8-26-02	0615	5	7	1.4	1	725	⌐	⌐	7	Sat
8-27-02	0615	5	7	1.4	1	725	⌐	⌐	7	Sat
8-27-02	1630	—	—	—	1	654	⌐	⌐	—	Sat
8-28-02	0715	5	4	0.8	1	685	⌐	⌐	6	Sat
8-28-02	1700	—	—	—	1	721	⌐	⌐	—	Sat
8-29-02	0615	5	7	1.4	1	731809 ND	⌐	⌐	7	Sat
8-29-02	1600	—	—	—	1	716				

EFF .246 B⁻

Daily Instrumentation Operational Check Sheet

Instrument 2350 95356 Probe: 43-106 133866

Cal Due 1-24-03 Cal Due: 1-29-03

Source ID	Mean Source Count Rate.	Mean +2 σ Value:	Mean -2 σ Value:
Tc 99 3135	7741	4873	4609

Radiation Type:	Sigma Value:	Mean +3 σ Value:	Mean -3 σ Value:
β⁻	66	4939	4543

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/I 2 σ Value	W/I 3 σ Value	LLD	SAT/ UNSAT
8-1-02	0135	.5	1427	285	1	4566	✓	✓	64	Sat
8-1-02	1555	"	—	—	1	4711	✓	—	—	Sat
8-2-02	0710		1415	283	1	4623	✓	✓	64	Sat
8-5-02	0610		1620	324	1	4650	—	✓	69	Sat
8 5-02	1630		—	—	1	4913	✓	✓	—	Sat
8-6-02	0630		1564	312	1	4662	✓	✓	66	Sat
8-6-02	1600		—	—	1	4849	—	—	—	Sat
8-7-02	0610		1536	307	1	4682	✓	—	66	Sat
8-7-02	1310		—	—	1	4616	✓	✓	—	Sat
8-8-02	0610		1582	316	1	4673	✓	✓	67	Sat
8-8-02	1600		—	—	1	4760	✓	✓	—	Sat
8-12-02	0700		1373	275	1	4800	✓	✓	63	Sat
8-12-02	1640		—	—	1	4692	✓	✓	—	Sat
8-13-02	0655		1516	303	1	4593	✓	✓	65	Sat
8 13-02	1640		—	—	1	4651	—	—	—	Sat
8-13-02	1655	✓	—	—	1	46	—	—	—	~~Sat~~

VOID mb 8-13-02

Daily Instrumentation Operational Check Sheet

EFF .204 ✓

Instrument: 2350 95356 Probe: 43-106 133866

Cal Due 1-29-03 Cal Due: 1-29-03

Source ID:	Mean Source Count Rate:	Mean +2 σ Value:	Mean -2 σ Value:
Th 230 3931	718	776	660

Radiation Type.	Sigma Value:	Mean +3 σ Value.	Mean -3 σ Value:
α	29	805	631

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/I 2 σ Value	W/I 3 σ Value	LLD	SAT/ UNSAT
8-1-02	0745	5	11	2.2	1	696	✓	✓	8	Sat
8-1-02	1600	"	—	—	"	702	—	—	—	Sat
8-2-02	0710		12	2.4		753	✓	✓	9	~~Sat~~
8-5-02	0620		12	2.4		709	—	—	9	Sat
8-5-02	1630		—	—		721	✓	✓	—	Sat
8-6-02	0635		12	2.4		706	✓	✓	9	Sat
8-6-02	1600		—	—		688	—	—	—	Sat
8-7-02	0615		9	1.8		697	—	—	8	Sat
8-7-02	1705		—	—		651	✓	✓	—	Sat
8-8-02	0615		7	1.4		701	—	—	7	Sat
8-8-02	1555		—	—		661	—	—	—	Sat
8-12-02	0710		8	1.6		699	—	—	8	Sat
8-12-02	1640		—	—		685	✓	✓	—	Sat
8-13-02	0725		7	1.4		719	✓	✓	7	Sat
8-13-02	1635		—	—		717	—	—	—	Sat
~~8-13-02~~	1700	✓	—	—	✓	VOID	—	—	—	~~Sat~~

WS 8-13-02

EFF = .246

Daily Instrumentation Operational Check Sheet

Instrument 2350 #95356 Probe: 43-106 # 133866

Cal Due 1-29-03 Cal Due: 1-29-03

Source ID:	Tc 99 #3935	Mean Source Count Rate:	4741	Mean +2 σ Value:	4873	Mean -2 σ Value:	4609
Radiation Type.	B⁻	Sigma Value.	66	Mean +3 σ Value:	4939	Mean -3 σ Value:	4543

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/I 2 σ Value	W/I 3 σ Value	LLD	SAT/ UNSAT
8-14-02	0605	5	1570	304	1	4720	—	—	66	Sat
8-14-02	1605	—	—	—	1	4810	—	—	—	Sat
8-15-02	0610	5	1543	309	1	4776	✓	✓	66	Sat
8-15-02	1630	—	—	—	1	4854	✓	✓	—	Sat
8-19-02	0615	5	1367	273	1	4612	—	—	63	Sat
8-19-02	1630	—	—	—	1	4648	✓	✓	—	Sat
8-20-02	0650	5	1725	345	1	4891	—	—	70	Sat
8-20-02	1615	—	—	—	1	4665	—	—	—	Sat
8-21-02	0610	5	1628	327	1	4554	✓	✓	68	Sat
8-21-02	1610	—	—	—	1	4825	—	—	—	Sat
8-22-02	0615	5	1529	306	1	4640	—	—	66	Sat
8-22-02	1600	—	—	—	1	4895	✓	✓	—	Sat
8-26-02	0615	5	1530	306	1	4625	—	—	66	Sat
8-26-02	1650	—	—	—	1	4779	✓	✓	—	Sat
8-27-02	0610	5	1526	305	1	4547	✓	✓	66	Sat
8-27-02	1655	—	—	—	1	4579	—	—	—	Sat

EFF = .204

Daily Instrumentation Operational Check Sheet

Instrument: 2350-1 # 95356 Probe. 43-106 # 133866

Cal Due 1-29-03 Cal Due: 1-29-03

Source ID.	Mean Source Count Rate:	Mean +2 σ Value:	Mean -2 σ Value:
Th 230 3937	718	776	660

Radiation Type:	Sigma Value.	Mean +3 σ Value.	Mean -3 σ Value:
α	29	805	631

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/I 2 σ Value	W/I 3 σ Value	LLD	SAT/ UNSAT
8-14-02	0615	5	11	2.2	1	662	⌐	⌐	8	Sat
8-14-02	1630	—	—	—	1	701	⌐	⌐	—	Sat
8-15-02	0630	5	11	2.2	1	712	⌐	⌐	8	Sat
8-15-02	1620	—	—	—	1	703	⌐	⌐	—	Sat
8-19-02	0640	5	7	1.4	1	723	⌐	⌐	7	Sat
8-19-02	1630	—	—	—	1	707	⌐	⌐	—	Sat
8-20-02	0650	5	14	2.8	1	717	⌐	⌐	9	Sat
8-20-02	1620	—	—	—	1	666	⌐	⌐	—	Sat
8-21-02	0630	5	11	2.2	1	672	⌐	⌐	8	Sat
8-21-02	1615	—	—	—	1	747	⌐	⌐	—	Sat
8-22-02	0625	5	10	2	1	690	⌐	⌐	8	Sat
8-22-02	1600	—	—	—	1	668	⌐	⌐	—	Sat
8-26-02	0625	5	12	2.4	1	693	⌐	⌐	9	Sat
8-26-02	1655	—	—	—	1	710	⌐	⌐	—	Sat
8-27-02	0615	5	14	2.8	1	723	⌐	⌐	9	Sat
8-27-02	1650	—	—	—	1	688	—	—	—	Sat

Daily Instrumentation Operational Check Sheet

EFF = .246

Instrument: 2350 #95356 Probe: 43-106 # 133366

Cal Due: 1-29-03 Cal Due: 1-29-03

Source ID: Tc99 #3935 Mean Source Count Rate: 4741 Mean +2 σ Value: 4873 Mean -2 σ Value: 4609

Radiation Type: B- Sigma Value: 66 Mean +3 σ Value: 4939 Mean -3 σ Value: 4543

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/I 2 σ Value	W/I 3 σ Value	LLD	SAT/ UNSAT
5-28-02	0720	5	1505	301	1	4671	—	—	66	Sat
5-28-02	1630	—	—	—	1	4697	—	—	—	Sat
5-29-02	0615	5	1454	291	1	4624	—	—	64	Sat
5-29-02	1600	—	—	—	1	4631	—	—	—	SAT

EFF = .204

Daily Instrumentation Operational Check Sheet

Instrument: 2350-1 #95356 Probe: 43-106 # 133866

Cal Due: 1-29-03 Cal Due: 1-29-03

Source ID: Th230 # 3937 Mean Source Count Rate: 718 Mean +2 σ Value: 776 Mean -2 σ Value: 660

Radiation Type: α Sigma Value: 29 Mean +3 σ Value: 805 Mean -3 σ Value: 631

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/I 2 σ Value	W/I 3 σ Value	LLD	SAT/ UNSAT
8-28-02	0730	5	7	1.4	1	664	—	—	7	Sat
8-28-02	1625	—	—	—	1	672	—	—	—	Sat
8-29-02	0620	5	6	1.2	1	707	—	—	7	Sat
8-29-02	1600	—	—	—	1	689	—	—	—	SAT

EFF=.231

Daily Instrumentation Operational Check Sheet

Instrument 2929 # 115563 Probe: 43-10 # 127216

Cal Due 6-14-03 Cal Due: 6-14-03

Source ID:	Mean Source Count Rate:	Mean +2 σ Value:	Mean -2 σ Value:
Te 99 # 3935	3722	3824	3620

Radiation Type:	Sigma Value:	Mean +3 σ Value:	Mean -3 σ Value:
B-	51	3875	3569

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/I 2 σ Value	W/I 3 σ Value	LLD	SAT/ UNSAT
8-13-02	0600	60	4340	72	1	3727	—	✓	.31	Sat
8-14-02	0600		4220	70	1	3719	—	—	31	Sat
8-15-02	0605		4256	71	1	3736	—	—	31	Sat
8-19-02	0605		4243	71	1	3782	—	—	31	Sat
8-20-02	0625		4317	73	1	3810	✓	—	31	Sat
8-21-02	0600		4114	69	1	3727	—	—	31	Sat
8-22-02	0605		4161	69	1	3793	—	—	31	Sat
8-26-02	0605		4199	70	1	3723	—	—	31	Sat
8-27-02	0700		4355	73	1	3825	✓	✓	31	Sat
8-28-02	0700		4160	69	1	3820	—	—	31	Sat
8-29-02	0605		4031	67	1	3784	—	—	30	Sat
		60								

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: Th 230 #3937 Mean Source Count Rate: 1376 Mean +2 σ Value: 1448 Mean -2 σ Value: 1304

Radiation Type: α Sigma Value. 36 Mean +3 σ Value: 1484 Mean -3 σ Value: 1268

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/I 2 σ Value	W/I 3 σ Value	LLD	SAT/ UNSAT
8-13-02	0630	60	10	.17	1	1357	✓	✓	4	Sat
8-14-02	0600		9	.15	1	1425	—	—	4	Sat
8-15-02	0605		15	.25	1	1365	—	—	5	Sat
8-19-02	0605		10	.17	1	1409	—	—	4	Sat
8-20-02	0625		17	.28	1	1340	✓	✓	5	Sat
8-21-02	0600		6	.1	1	1371	—	✓	4	Sat
8-22-02	0600		14	.23	1	1410	—	—	5	Sat
8-26-02	0600		10	.17	1	1438	—	—	4	Sat
8-27-02	0710		5	.08	1	1386	✓	✓	4	Sat
8-28-02	0710		7	.12	1	1365	—	—	4	Sat
8-29-02	0605		10	a.17	1	1389	—	—	4	sat
		↓								

Eff .347

Daily Instrumentation Operational Check Sheet

Instrument 2929 115563 Probe. 43-10 177216

Cal Due 6-14-03 Cal Due 6-14-03

Source ID: 76230 3937 Mean Source Count Rate: 1376 Mean +2 σ Value: 1448 Mean -2 σ Value: 1304

Radiation Type: α Sigma Value: 36 Mean +3 σ Value: 1484 Mean -3 σ Value. 1268

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/I 2 σ Value	W/I 3 σ Value	LLD	SAT/ UNSAT
7-17-02	0615	60	12	.2	1	1347	✓	✓	4	Sat
7-19-02	0610		14	.2		1362	✓	✓	4	Sat
7-22-02	0600		5	.05		1440	✓	✓	4	Sat
7-23-02	0605		5	.08		1383	✓	✓	4	Sat
7-24-02	0800		8	.13		1392	✓	✓	4	SAT
7-25-02	0715		5	.08		1417	✓	✓	4	Sat
7-29-02	0600		12	.2		1360	✓	✓	4	Sat
7-30-02	0610		10	.16		1389	✓	✓	4	Sat
7-31-02	0605		13	.2		1446	✓	✓	4	Sat
8-1-02	0715		16	.3		1326	✓	✓	5	Sat
8-2-02	0700		11	.18		1377	✓	✓	4	Sat
8-5-02	0720		11	.18		1390	✓	✓	4	Sat
8-6 02	0620		11	.18		1320	✓	✓	4	Sat
8-7-02	0600		6	.1 HIGHS		1399	-	-	4	Sat
8-7-02	0600		9	.15		1330	-	-	4	Sat
8-17-02	0600	60	11	.18	1	1402	-	-	4	Sat

Daily Instrumentation Operational Check Sheet

231

Instrument 2929 115563 Probe. 43-10 127216

Cal Due 6-14-03 Cal Due 6-14-03

Source ID:	Mean Source Count Rate:	Mean +2 σ Value.	Mean -2 σ Value:
Tc 99 3435	3727	3824	3620

Radiation Type.	Sigma Value.	Mean +3 σ Value	Mean -3 σ Value:
β⁻	51	3875	3569

Background					Source Check				Results	
Date	Time	Count Time (min)	Gross Counts	BKGD CPM	Count Time (min)	Gross Counts	W/I 2 σ Value	W/I 3 σ Value	LLD	SAT/ UNSAT
7-17-02	0615	60	4234	71	1	3820	✓	✓	31	~~sat~~
7-18-02	0610	↑	4172	69	↑	3815	✓	✓	31	~~sat~~
7-22-02	0600		4265	71		3820	✓	✓	31	~~sat~~
7-23-02	0605		4257	71		3812	✓	✓	31	~~sat~~
7-24-02	0800		4135	69		3817	✓	✓	31	SAT
7-25-02	0715		4251	71		3793	✓	✓	31	Sat
7-29-02	0600		4161	69		3739	✓	✓	31	~~sat~~
7-30-02	0610		4154	69		3777	✓	✓	31	~~sat~~
7-31-02	0605		4201	70		3819	✓	✓	31	~~sat~~
8-1-02	0715		4347	74		3817	✓	✓	31	Sat
8-2-02	0700		4090	68		3751	✓	✓	30	~~sat~~
8-5-02	0720		4352	73		3752	✓	✓	34	Sat
8-6-02	0615		4349	72		3797	✓	✓	31	Sat
8-7-02	0600		4123	69		3776	✓	✓	31	Sat
8-8-02	0600	↓	4261	71	↓	3773	✓	✓	31	Sat
8-12-02	0600	60	4219	70	1	3732	✓	✓	31	Sat

Appendix E

Background Assessment Data

Molycorp Washington, PA

Ludlum Model 19 Micro-Rem

Routine Performance and Background Data Form

Instrument ID #: 22526	Cal. Due. 1-29-03	Source ID #: Cs-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 µrem (sat/unsat)	50 µrem (sat/unsat)	250 µrem +/-20% value	500 µrem +/-20% value		
7-30-02	1045			160		10	Sat
7-31-02	0630			160		11	Sat
8-2-02	0805			160		10	Sat
8-5-02	0605			150		11	Sat
8-6-02	0630			160		12	Sat
8-7-02	0615			170		11	Sat
8-8-02	0620			170		11	Sat
8-12-02	0630			170		11	Sat
8-13-02	0655	N		165	N	10	Sat
8-14-02	0630		A	170	A	12	Sat
8-15-02	0625			170		12	Sat
8-19-02	0620			170		11	Sat
8-20-02	0625			170		10	Sat
8-21-02	0635			160		10	Sat
8-22-02	0615			160		11	Sat
8-26-02	0610			160		10	Sat
8-27-02	0635			160		10	Sat
8-28-02	0715			160		10	Sat
8-29-02	0630			150		10	Sat

Ludlum Model 19 Micro-Rem

Routine Performance and Background Data Form

Instrument ID #: 22526	Cal. Due: 1-29-03	Source ID #: Cs-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 µrem (sat/unsat)	50 µrem (sat/unsat)	250 µrem +/-20% value	500 µrem +/-20% value		
8-30-02	0700			160		11	SAT
9-3-02	0630			150		10	Sat
		N			N		
			A				

Background Assessment

MACTEC performed material-specific backgrounds for poured concrete with its three large-area gas flow instruments. The most conservative backgrounds 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 (117563) with 43-106 (128912)

	Beta - Direct Measurements (cpm)			Alpha - Direct Measurements (cpm)
	Unshield	Shield	Net	Net
	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_b	6			7

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)
	Unshield	Shield	Net	Net
	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_b	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 (126190) with 43-106 (133871)

	Beta - Direct Measurements (cpm)			Alpha - Direct Measurements (cpm)
	Unshield	Shield	Net	Net
	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_b	4			8

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

Metal/Drywall Background Assessment
Molycorp Washington, PA

Metal/Drywall Surfaces

Ludlum Model 2350-1 (117566) with 43-68 (19046)

	Beta - Direct Measurements (cpm)			Alpha - Direct Measurements (cpm)
	Unshield	Shield	Net	Net
	268	246	22	3
	268	238	30	2
	291	275	16	1
	286	245	41	2
	290	274	16	1
	312	283	29	3
	333	312	21	2
	325	275	50	1
	274	251	23	1
	266	237	29	4
Mean (cpm)	28			2
Stand Deviation	10.8			1.1
n_b	11			21

Readings taken at the Canton Volunteer Fire Department Station 52-1, Canton Township, PA on their metal/drywall surfaces.

Metal/Drywall Background Assessment

Molycorp Washington, PA

Metal/Drywall Surfaces

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

	Beta - Direct Measurements (cpm)			Alpha - Direct Measurements (cpm)
	Unshield	Shield	Net	Net
	288	266	22	3
	305	224	81	4
	277	252	25	5
	331	291	40	2
	294	290	4	3
	312	301	11	1
	311	302	9	1
	315	300	15	1
	320	285	35	3
	313	286	27	1
Mean (cpm)	27			2
Stand Deviation	22.2			1.4
n_b	56			26

Readings taken at the Canton Volunteer Fire Department Station 52-1, Canton Township, PA on their metal/drywall surfaces

Amendment to Appendix C

Building 19 Foundation Data Package

Molycorp Washington, PA

October, 2002

Building 19 Foundation Data Package

This data package contains final status survey information for Building 19 located at the Molycorp, Washington, PA site. The underside of the building's foundation/slab was surveyed for final status in August, 2002 as an affected foundation. During the IV survey performed by the NRC, several localized areas were identified with elevated levels, above the release limits.

Additional radiological surveys were conducted by MACTEC and an averaging calculation was performed on those survey results. Of the five elevated areas identified, four areas averaged less than release limits when averaged over one square meter. One area was identified as having contamination greater than 3000 dpm/100 cm^2, and was removed from the footprint of building 19 and taken to a designated RMA for proper handing and control.

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

Summary

Results from the final status survey of Building 19 foundation, after averaging four identified areas, provides evidence that all release criteria have been met, demonstrates that residual radioactivity is below the unrestricted use criteria, and confirms that the foundation (slab portion only) of Building 19 is suitable for unrestricted use and release.

Amendment to Appendix C - October 2002

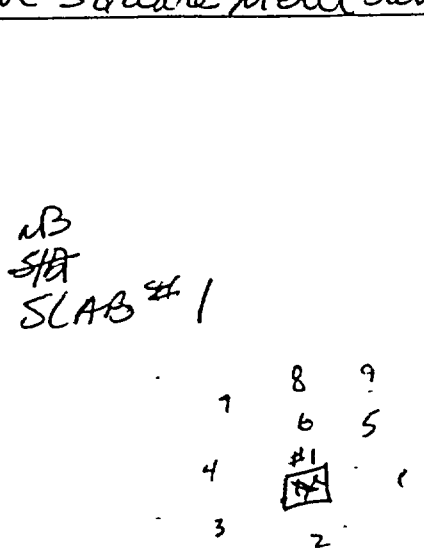
	DDO-138 Radiation Protection Survey Report	Site Molycorp / Washington PA

Section 1: Survey Information

Date	Time	Location	Survey Issue Log Number
9-30-02	1600	Bldg 19	02-1181

RWP Number	Purpose of Survey	Page
N/A	☐ RWP ☐ Routine Survey ☐ Unconditional Release ☐ Other	1 of 2

Survey Title: One Square Meter Survey (Average)



$1493.5\left(\frac{100}{10,000}\right) + 248\left(1 - \frac{100}{10,000}\right)$

$14.93 + 245.5 = 260.4$

Smear Number	Beta dpm/100cm²	Alpha dpm/100cm²
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18	N/A	
19		
20		
21		
22		
23		
24		
25		
26		

Bkgd Readings N/A

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 | –○– = 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)	MDA β⁻	Other β⁻ BKG
2350-1/126190	1-16-03	43-106/133871	12-14-02	.231/.177	253	144

Section 3. Review and Approval

Survey Performed By (Sign)	Area Posted and/or Barricaded	Date and Time
Mark Blaurock	☐ Yes ☐ No ☐ Not Required	9/30/02 / 1600
Radiation Safety Officer (Print Name & Sign)		Date and Time
Steve Kowalski / Steve Kowalski		10/2/02 / 0830

Radiological Survey Results - Calculational Sheet

survey # 02-1181

Location	β Static (unsh) (cpm)	β Static (sh) (cpm)	Gross β	Minus Bkgd = (Net β)	Net β dpm/100 cm²
1	617	443	174	30	129.8
2	643	416	227	83	359.3
3	756	486	270	126	545.4
4	459	406	53	-91	-394
5	760	511	249	105	454.5
6	674	487	187	43	186.1
7	818	429	389	245	1060.6
8	655	428	227	83	359.3
9	504	468	36	-108	-467.5
					+3995 / -461 / 9 | 2234 / 248.2
#1	974	485	489	345	1493.5

Instrument Model/SN:	Probe Model/SN:	Detector Eff.: (cpm/dpm)

Material	Bkgd

BKG - 144 (Concrete)

	DDO-138 Radiation Protection Survey Report	Site Molycorp / Washington PA

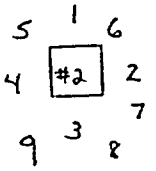
Section 1: Survey Information

Date	Time	Location	Survey Issue Log Number
10-1-02	0900	Bldg #19	02-1183

RWP Number	Purpose of Survey	Page
N/A	☐ RWP ☐ Routine Survey ☐ Unconditional Release ☒ Other Average Survey	1 of 2

Survey Title: One Square Meter Average Survey

Slab #2



$1026\left(\frac{100}{10000}\right) + 218\left(1-\frac{100}{10000}\right)$

$10.26 + 215.82$

226 Average

Smear Number	Beta dpm/100cm²	Alpha dpm/100cm²
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13	N	
14		A
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		

Bkgd Readings N/A

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 (cpm/dpm)	MDA DPM	Other BKG
2350/126190	1-16-03	43-106/133871	2-14-02	.231/.172	253 B⁻	144 B⁻

Section 3: Review and Approval

Survey Performed By (Sign)	Area Posted and/or Barricaded	Date and Time
Mark Blancuk	☐ Yes ☒ No ☐ Not Required	10-1-02 / 0900
Radiation Safety Officer (Print Name & Sign)		Date and Time
Steve Kowalski / Steve Kowalski		10-2-02 / 0900

Survey # 02-1183

Radiological Survey Results - Calculational Sheet

Bldg # 19

Location	β Static (unsh) (cpm)	β Static (sh) (cpm)	Gross β	Minus Bkgd = (Net β)	Net β dpm/100 cm²
1	744	460	284	140	606
2	545	408	137	-7	-30
3	753	438	315	171	740
4	776	535	241	97	420
5	555	519	36	-108	-468
6	779	528	251	107	463
7	784	605	179	35	152
8	605	543	62	-82	-355
9	803	558	245	101	437
				9	1929 (1965)
					214 (218)
#2	796	415	381	237	1026

Instrument Model/SN:	Probe Model/SN:	Detector Eff.: (cpm/dpm)

Material	Bkgd

BKG = 144 (corrected)

	DDO-138 Radiation Protection Survey Report	Site Molycorp / Washington PA

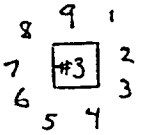
Section 1: Survey Information

Date	Time	Location	Survey Issue Log Number
10-1-02	1000	Bldg #19	02-1198

RWP Number	Purpose of Survey	Page
N/A	AVERAGE Survey ☐ RWP ☐ Routine Survey ☐ Unconditional Release ☒ Other	1 of 2

Survey Title: One Square Meter Average Survey

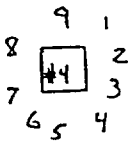
Slab #3



$1058\left(\frac{100}{10000}\right) + 184.9\left(1-\frac{100}{10000}\right)$

$10.58 + 183.1 = (194)$ Average

Slab #4



$900\left(\frac{100}{10000}\right) + 323\left(1-\frac{100}{10000}\right)$

$9 + 319.77 = (329)$ Average

Smear Number	Beta dpm/100cm²	Alpha dpm/100cm²
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13	N	
14		A
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		

Bkgd Readings N/A

Legend

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

Section 2: Instrument Used

Instrument Model/SN	Cal Due Date	Probe Model/SN	Cal Due Date	Detector Eff (cpm/dpm)	MDA DPM	Other BKG
2350/129414	8-2-03	43-106/128914	2-2-03	.240 B^-	244 B^-	144 B^-
	N				N	
		A			A	

Section 3. Review and Approval

Survey Performed By (Sign)	Area Posted and/or Barricaded	Date and Time
Joe Fuller	☐ Yes ☐ No ☒ Not Required	10-1-02 / 1000
Radiation Safety Officer (Print Name & Sign)		Date and Time
Steve Kowalski / Steve Kowalski		10-2-02 / 1030

Survey # 1198

Radiological Survey Results - Calculational Sheet

B26 # 19

Location	β Static (unsh) (cpm)	β Static (sh) (cpm)	Gross β	Minus Bkgd = (Net β)	Net β dpm/100 cm²
1	354	209	145	1	~~0.24~~ 4.2
2	367	213	154	10	41.6
3	431	213	218	74	308
4	461	211	250	106	442
5	377	188	189	45	187.5
6	405	204	201	57	238
7	370	186	184	40	167
8	386	223	153	9	38
9	422	221	201	57	238
				9	~~1660.78~~ 1664.3
					J.H.
					(184.5) 189.9
					J.H.
Slab # 3	800	402	398	254	1058
1	450	197	253	109	454
2	400	200	200	56	233
3	456	205	251	107	446
4	483	213	270	126	525
5	428	220	208	64	267
6	434	220	214	70	292
7	421	269	152	8	33
8	416	210	206	62	258
9	467	227	240	96	400
				9	~~2908~~
					(323)
Slab #4	820	460	360	216	900

Instrument Model/SN:	Probe Model/SN:	Detector Eff.: (cpm/dpm)

Material	Bkgd

Bkg = 144 (concrete)