

# Rogers & Associates Engineering Corporation

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December 9, 1996

Ms. Pat Scofield  
Oak Ridge National Laboratory  
Building 4500 South, Mail Stop 6102  
P.O. Box 2008  
Knoxville, TN 37831-6102

C9143/4  
Airborne

Dear Ms. Scofield:

I am writing in response to your requests for radiation dosimetry information pertinent to exposures from materials with concentrations of uranium and thorium similar to the source material value of 0.05 percent. The attached information is provided on behalf of Molycorp Inc. (Bill Almas) related to its operations at the Mountain Pass Plant (Molycorp) which mines and processes ore containing the mineral bastnasite for recovery of rare earths. Bastnasite contains about 50 percent cerium, 34 percent lanthanum, 11 percent neodymium, 2 percent other rare earths, and about 0.02 percent thorium and 0.002 percent uranium. The concentrations of thorium and uranium in bastnasite are about one-hundredth of those in monazite.

Although Molycorp has a radioactive materials license for sealed sources used for "process control," the rare earth recovery operations have not been performed under license. However, Molycorp did perform recent operations related to management of lead/iron filter cake under a radioactive materials license from the State of California. The lead/iron filter cake contained uranium concentrations greater than 0.05 percent uranium and lead that was above the TCLP criterion for hazardous waste. The stabilization of this material and subsequent processing of the material were performed under a radioactive materials license. Molycorp has decontaminated the facilities used to stabilize the lead/iron filter cake, is in the process of decontaminating about one-half of the facilities used to store the stabilized lead/iron filter cake, and expects to receive approval for unrestricted use of these facilities in about six months. It is worth noting that these facilities required minimal decontamination to meet the criteria for unrestricted use.

The attachments to this letter provide radiation dosimetry data collected by Rogers and Associates Engineering (RAE) during facility characterization work in 1992 (also includes results from prior studies) and the lead/iron filter cake project. Attachment A provides a summary of information from the 1992 facility characterization work. Information is provided on extensive gamma surveys, TLDs placed in selected areas of the facility, TLDs worn by plant workers for three months, and radiation surveys for surface contamination in selected areas of the facility. The various segments of this attachment are identified as A-1, A-2, etc.

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Attachment B provides the radiation dosimetry, air sampling, and bio-assay results from the lead/iron filter cake project.

I hope this information is of help to you in your work. Both sets of results illustrate that the gamma dose to workers is well below regulatory criteria. The air sampling and bioassay results for the lead/iron filter project indicate that the potential inhalation and any intake are also well below the regulatory criteria.

If you have any questions please contact Bill Almas, of Molycorp, or me and we will be glad to assist you.

Sincerely,



David E. Bernhardt, CHP  
Vice President

DEB:csd  
enc

cc: Bill Almas, Molycorp Inc.

## ATTACHMENT A

### **Molycorp, Mountain Pass, Facility Characterization Information (1992 Facility Studies)**

The following information was obtained during studies during 1992 at the Molycorp Mountain Pass Facility. In addition to the field work in 1992, information from prior studies, including a study by Dr. Ed Wrenn of the University of Utah, is given.

Figure A-1 shows the general layout of the plant. The basic operations are:

- Mining and crushing ore.
- Grinding and enriching ore in the mill. The primary operation is flotation. Bastnasite concentrate is both sold as product and delivered by truck to the Chemical Plant.
- Roasting the ore and processing it for recovery of rare earth concentrates in the Chemical Plant
- Production of high purity cerium in the Ce-96 Plant

Table A-1 provides the results for 3 months of personnel TLD results obtained in 1992. The personnel expected to receive the highest exposures were selected for monitoring. Essentially all of the results were below the reporting level of 10 mrem per month. The reported results are based on using the detailed reporting data to determine the best estimates of the exposures.

Urine bioassay samples were collected and analyzed by Eberline Laboratory in 1981. The results for uranium and radium-226 were all below the limits of detection (uranium 5  $\mu\text{g/l}$  and radium-226 1 pCi/l).

Table A-2 provides results for TLDs that were located for periods of one to two months in various areas of the plant. The exposure rates for the various periods of time are derived from the basic reading and the period of exposure. The reported exposures are for full-time occupancy of the areas, based on the exposure periods indicated. As is indicated by results in Table A-1, the actual exposures of personnel is much less than the values indicated in Table A-2, because of low occupancy times.

Table A-3 provides survey results for smearable and total activity in the non-production areas of the plant.

43-4tldp.s  
11/23/96

Table A-1. Molycorp Personnel TLD Results, 1992

<u>PERIOD</u>	<u>LOCATION</u>	<u>DAYS</u>	<u>EXP</u> <u>(mrem)</u>	<u>EXPOSURE</u> <u>(mrem/168-hr)</u>
FEBRUARY 92 (2/01 to 2/29)		20		
	Pb/Fe Carbonate Operation	20	4	4.2
	Roaster Operator	20	2	2.1
	Bastnasite Packaging	20	3	3.2
	Crusher Operator	20	1	1.1
	Driller in Mine	20	0	0.0
	Ce Dryer Operator	20	4	4.2
	Cerium Packaging	20	--	--
	Chem & Ion Exch Plant Superint.	20	2	2.1
	Ce-96 Operator	20	4	4.2
	Ce-96 Plant Helper	20	2	2.1
MARCH 92 (3/01 to 3/31)		22		
	Pb/Fe Carbonate Operation	22	5	4.8
	Roaster Operator	22	1	1.0
	Bastnasite Packaging	22	0	0.0
	Crusher Operator	22	0	0.0
	Driller in Mine	22	1	1.0
	Ce Dryer Operator	22	4	3.8
	Cerium Packaging	22	3	2.9
	Chem & Ion Exch Plant Superint.	22	1	1.0
	Ce-96 Operator	22	0	0.0
	Ce-96 Plant Helper	22	6	5.7
APRIL 92 (4/01 to 4/30)		22		
	Pb/Fe Carbonate Operation	22	10	9.5
	Roaster Operator	22	8	7.6
	Bastnasite Packaging	22	6	5.7
	Crusher Operator	22	10	9.5
	Driller in Mine	22	7	6.7
	Ce Dryer Operator	22	8	7.6
	Cerium Packaging	22	11	10.5
	Chem & Ion Exch Plant Superint.	22	11	10.5
	Ce-96 Operator	22	8	7.6
	Ce-96 Plant Helper	22	10	9.5
			<b>AVERAGE</b>	<b>4.4</b>

Table A-2. Molycorp Area TLD Results.  
(Based on Full-time Occupancy of Area)

<u>Location</u>	<u>Gamma Exposure (mRad)</u>	<u>Exposure Rate (uRad/hr)</u>	<u>40-Hr Exp. (mrad)</u>	<u>Jan/Feb Month 168-Hr (mRad/mo)</u>	<u>Feb/Apr Month 168-Hr (mRad/mo)</u>
<u>Jan. 9 to Feb. 12, 1992. Exposure in Facility</u>					
Control					
Ce Bagging	32	40	2	7	6
Ce Bagging	26	33	1	5	
Pb Sand Filter Area					
Sand Filter	28	34	1	6	8
Sand Filter	29	36	1	6	
SX Plant Area					
SX-1 Raff Cell	433	546	22	92	95
Sx-1 Sump Pump	80	101	4	17	25
Sx-1 Feed Tanks	341	420	17	71	86
Ce-96 Plant					
Platform, Sample Area	0	0	0	0	0
Residue Filter	20	25	1	4	3
Mill Drum Filter					1
Bast. Bag/Ware H					10
<u>Feb. 11 to Apr. 15, 1992. Exposure in Facility</u>					
Ce Bagging	55	38	2		6
Sand Filter	69	48	2		8
SX Plant Area					
SX-1 Raff Cell	816	567	23		95
Sx-1 Sump Pump	211	147	6		25
Sx-1 Feed Tanks	739	513	21		86
Ce-96 Plant					
Platform, Sample Area	2	1	0		0
Residue Filter	25	17	1		3
Mill Drum Filter	6	4	0		1
Bast. Bag/Ware H	87	60	2		10

Notes:

TLDs located at Crusher disappeared; may have been dislodged by vibration.  
Exposures from February and April moved to top of table for comparison.

Table A-3. Residual surface activity in non-production areas.

<u>Major Systems</u>	<u>Ave Exp. (uR/HR)</u>	<u>Survey Date</u>	<u>Total Activity DPM/100 cm<sup>2</sup></u>	<u>Smearable Activity DPM/100 cm<sup>2</sup></u>
<u>Mill</u>				
Ball Mill Area	20			
Ball Mill Control Rm		2\13	211	
Desk		2\13		8
		2\13		0
Instruments		2\13		2
Wall		2\13		0
Floor		2\13		3
Top of Air Cond		2\13		0
<u>Mill Control Rm and Lunch Rm</u>				
Lunch Room (up stairs)	40			
General Area		2\13	278	
		2\13	347	
Sink Counter		2\13		0
Table		2\13		0
		2\13	347	0
Trash Can		2\13		0
Top of Refrigerator		2\13		0
Inside Refrigerator		2\13		0
Handle of Refrigerator		2\13		3
Food prep area		2\13	167	
Floor		2\13		0
Control Room	30	2\13	31	
Desk		2\13		0
		2\13		0
Floor		2\13		3
Computer Desk		2\13		0
Top of Computer CRT		2\13		2
Sample Prep Rm	30	2\13	180	
By coffee pot		2\13		5
Center Table		2\13		0
		2\13		0
Bench		2\13		15
Bastnasite Warehouse	70			
Floor		1\9		48
<u>Chemical Plant (Feed from Mill)</u>				
Operator Control Rm				
Dryer/Switch/Control Rm	37	2\12	0	
	38	2\13		

Table A-3 Continued.

<u>Major Systems</u>	<u>Ave Exp. (uR/HR)</u>	<u>Survey Date</u>	<u>Total Activity DPM/100 cm<sup>2</sup></u>	<u>Smearable Activity DPM/100 cm<sup>2</sup></u>
<u>Chemical Plant (Feed from Mill) (cont.)</u>				
Maintenance Lunch Rm				
Top of Refrigerator		2\13		0
Top of Microwave		2\13		0
		1\10		15
		1\10		4
Table		2\13		0
		2\13		0
		1\10	556	17
		1\10		0
		1\10		0
Silverware Tray		2\13		15
Trash Can		2\13		0
Bulletin Board		1\10		20
Floor		1\10	444	0
		2\13		
<u>SX Process Building</u> <i>(count taken on 2nd scale)</i>				
Operators Lunch Rm	16	2\13	153	
Trash Can		2\13		0
		1\10		0
Sink Counter		2\13		2
		1\10		2
Top of Microwave		2\13		0
Candy Machine		2\13		
Front		1\10		7
Top		2\13		0
Table		1\10	333	2
Floor		1\10	411	8
		1\10		2
SX Control Rm	21	2\13	267	
Desk		2\13		3
Top of Computer		2\13		5
Counter with Computer		2\13		0
Locker Rm	19	2\13		
Door Handle (dirty)		2\13		0
Urinal		2\13		0
Locker		2\13		0

Table A-3 Continued (Page 3 of 3).

<u>Major Systems</u>	<u>Ave Exp. (uR/HR)</u>	<u>Survey Date</u>	<u>Total Activity DPM/100 cm<sup>2</sup></u>	<u>Smearable Activity DPM/100 cm<sup>2</sup></u>
<u>SX Process Bldg (cont.)</u>				
Operators Rm				
Top of Metal Cabinet		2\13		10
Desk		2\13		0
Top of Cabinet		2\13		13
Supervisors Office				
Desk		2\13		0
Bookshelf		2\13		22
Top of Computer		2\13		0
Purification Area	13			
Lunch Room	13	2\13	78	
<u>Process Chem Trailer, N of SX</u>				
Lunch Room	28	2\13	13	
Big Coffee Pot		2\13		5
Top of Certrifuge		2\13		8
Top of Microwave		2\13		0
Stove		2\13		0
Table		2\13		0
Max in area		2\13	222	5
Gloves, sample prep.		2\13	222	
<u>96 Cerium Plant (Cerium 5300) [Feed Chem Plant]</u>				
Ce 96 Operators Room	25	2\12	511	
		2\12	511	
		2\12	622	
Desk		1\10		21
Floor		1\10		18
Coffee Pot Counter		2\12		0
Top of First Aid Kit		2\12		0
Top of Refrigerator		2\12		0
Microwave		2\12		0
Bench for Food Prep		2\12	250	
Desk		2\12		0
Floor		2\12	250	3
Floor		2\12	361	0

## **ATTACHMENT B**

### **Molycorp, Mountain Pass, Lead/Iron Filter Cake Project**

This attachment provides personnel dosimetry, area air sampling, and environmental dosimetry results from the lead/iron filter cake project.

The attached results are provided for the total sequence of the project. The dates related to the measurements are given, and when possible the operational phases for the measurements are given. As a general guide the following items briefly describe the sequence of activities and where the activities were performed:

- Stabilization of filter cake to reduce leachability of the lead--April to June 1995 (air samples were collected, results were below the DAC, but this data is not given in the attached data sets).
- Decontamination of the pad and equipment where the stabilization was performed--June to August 1995.
- Storage of the stabilized filter cake in warehouses:
  - Warehouse B: April 1995 to date.
  - Warehouse A: June 1995 till August 1996.
- Reintroduction of stabilized material for processing; August 1995 to date. A brief effort was made to initially reintroduce the material in the Ce-96 plant in August 1995, but the primary introduction has been at the Chemical Plant (pertinent to the air sample and environmental TLD results).

Table B-1 provides a summary of the personnel TLD results. Several averages are shown at the bottom of the table. Most of the TLD values are below the reporting limit of 10 mrem/month.

Table B-2 provides a compilation of the air sample results for two months. Averages for the locations and the overall average for all stations are given. The administrative control value for air samples and the parameters used to derive the DAC are given at the bottom of Table B-2. The bioassay results for uranium in urine are also given at the bottom of Table B-2. All results were below the detection limit. The data for air sampling for other months is attached at the end of this enclosure as Table B-4.

Table B-3 provides results from environmental TLDs used in work areas and several non-work areas. The environmental TLDs include 5 TLD chips and the results represent the average of the results for the five chips.

Table B-1. Personnel TLD Results For Lead/Iron Filter Cake Project.

Person	Type Work	Whole-body Dose (1-cm depth). mrem Per Period				
		7/95-8/95	8/95-10/95	10/95-1/96	1/96-4/96	4/96-10/96
1		0				
2		0	0			
4		0				
5		0				
10		0				
11		0				
14		0				
15		0				
16		0				
17		0				
18		0				
19	Assist. RSO	0	0	0	0	0
25		0				
27		0				
34		0				
39		0				
40		0				
43						
44		0				
63		0	0	0	0	0
64						
65		0	0	0	0	
71		0				
80		0				
82		0				
85		0				
91		0	0			
96		0	0	0	16	0
97		0	0	0	0	
100		0	0	0	0	0
107		0	0	0	0	0
108						
121		0	0			
129		0				
148		0				
172		0	0	0	21	0
173		0	0	0	0	
174		0	0	0	19	0
175		0	0	0	13	181
176		0	0	0	0	
177		0	0	0	27	
178		0	0	0	12	
179		0	0	0	0	
180		0	0	0	0	
181		0	0	0	10	0
182		0	0	0	0	
183		0	0	0	0	
184	Truck Driver	0	0	0	0	0
185	Truck Driver	0	0	0	0	0
186	Truck Driver	0	0	0	0	0
187	Truck Driver	0	0	0	0	0
188	Truck Driver	0	0	0	0	0
189	Truck Driver	0	0	0	0	0
190	Truck Driver	0	0	0	11	0
191	Truck Driver	0	0			
192		0	0			
193		0	0			
194		0	0	0	0	0
195		0	0	0	19	12
196		0	0	0	0	0
197		0	0	0		
198		0	0	0	0	0
199		0	0	0	0	0
200				0	0	
201				0	0	
203				0	16	

Monthly Ave TLD      0.0      0.0      0.0      4.8      9.2      Tot Average 1.0  
 [Blanks indicate person not present or TLD not worn].  
 Bioassay; U mg/l      <5 ug/l      <5 ug/l      <5 ug/l      <5 ug/l      <5 ug/l

Phase of Operations      Stabilize Material      Reintroduce Filter Cake into Normal Plant Process  
Decon Equip      Decon Work Areas

43-4nrc2						
11/23/96		Table B-2. Concentrations of Airborne Long Half-Life Activity . Lead/Iron Filter Cake Operations				
Concentrations Based on Gross Alpha Activity						
Reintroduction						
		Area	Warehouse A	Warehouse B	Guarde Gt	
Date		HV-1	HV-2	HV-3	HV-4	
Year	Month	Day	(uCi/cc)	(uCi/cc)	(uCi/cc)	(uCi/cc)
1995	August	4	4.43E-14	3.73E-14	3.77E-14	1.76E-13
		8	4.73E-14	3.81E-14	3.55E-14	8.55E-14
		10	3.03E-14	1.41E-14	5.65E-14	7.28E-14
		13	2.00E-14	3.32E-14	1.96E-14	4.19E-14
		16	3.74E-14	7.17E-14	6.22E-14	7.36E-14
		18	1.98E-13	5.54E-14	9.80E-15	4.38E-14
		21	4.96E-13	2.01E-14	1.65E-14	1.74E-14
		22	5.02E-13	4.57E-14	2.43E-14	2.76E-14
		23	4.69E-13	2.50E-14	5.75E-15	3.00E-14
		24	4.24E-13	5.70E-15	3.53E-14	4.07E-14
		25	8.44E-13	3.49E-14	3.45E-14	4.50E-14
		28	4.15E-13	2.39E-14	6.26E-14	8.75E-15
		29	2.62E-13	3.74E-14	2.02E-14	2.02E-14
		30	2.32E-13	3.76E-14	1.59E-14	1.44E-14
		31	3.57E-13	2.72E-14	9.51E-15	1.44E-14
	Averages		2.92E-13	3.38E-14	2.97E-14	3.83E-14
	Overall Average					9.94E-14
	November	1	1.27E-13	2.42E-14	2.18E-14	2.94E-14
		2	6.40E-14	4.19E-14	4.19E-14	4.19E-14
		3	1.55E-13	2.44E-14	3.99E-14	9.56E-14
		6	1.51E-13	5.38E-14	3.65E-15	2.29E-14
		7	1.03E-13	3.97E-14	3.22E-14	6.09E-14
		8	1.32E-13	4.64E-14	1.92E-14	3.26E-14
		9	2.17E-13	3.37E-14	1.51E-14	1.37E-14
		13	1.49E-13	4.59E-14	5.10E-15	3.97E-14
		14	2.45E-13	4.35E-14	3.73E-14	5.20E-14
		15	2.77E-13	2.99E-14	9.55E-16	2.99E-14
		16	1.15E-13	2.91E-14	9.35E-15	3.02E-14
		17	1.58E-13	1.93E-13	3.50E-14	9.35E-14
		20	1.27E-13	5.15E-14	8.20E-15	2.53E-14
		21	8.25E-14	4.33E-14	1.69E-13	1.69E-13
		22	3.94E-14	7.75E-15	4.50E-15	3.97E-14
		27	1.73E-13	3.11E-14	3.11E-14	3.11E-14
		28	3.66E-13	3.11E-14	3.11E-14	3.11E-14
		29	7.48E-13	3.73E-14	3.15E-15	3.73E-14
		30	1.80E-13	3.00E-14	9.45E-15	3.10E-14
	Monthly Average		1.90E-13	4.41E-14	2.73E-14	4.77E-14
	Overall Average					7.73E-14
DAC for U-238:					2.00E-11	uCi/cc
DAC for U-238, based on sum of ratios for radionuclides present:					5.00E-12	uCi/cc
Gross alpha or beta DAC, based on sum of ratios for radionuclides present:					1.50E-11	uCi/cc
Administrative limit for gross alpha or beta:					1.50E-12	uCi/cc
Based on sum of ratios and 3 alphas and 3 betas from radionuclides that are present.						

11/22/96

**Table B-3. Environmental TLD Measurements.  
(Based on Full-time Occupancy)**

<b>Date</b>	<b>Control Adm Office (mrem/mo)</b>	<b>Backgd Guard H (mrem/mo)</b>	<b>Fence Ln Near School (mrem/mo)</b>	<b>WareH-A (mrem/mo)</b>	<b>WareH-B (mrem/mo)</b>	<b>Chemical Plant Reintroduction (mrem/mo)</b>
10/95-1/96	7.2	8.3	8.1	9.3	19.2	13.1
1/96-4/96	19.4	24.4	lost	30.4	lost	25.6
7/96-10/96	17.4	19.0	17.3	17.4	lost	21.3
<b>Averages</b>	<b>14.7</b>	<b>17.2</b>	<b>12.7</b>	<b>19.0</b>	<b>19.2</b>	<b>20.0</b>
<b>Location Use</b>	<b>Admin Office</b>	<b>Background</b>	<b>Property Line</b>	<b>Store Filter Ck 6/95-8/96</b>	<b>Store Filte Ck 4/95-to date</b>	<b>Reintroduce 8/95-to date</b>

Table 4-4. Additional Air Sample Results, Filter Cake Project.

**LEAD IRON RE-INTRODUCTION PROCESSING  
AIR MONITORING RESULTS  
(RADIATION)**

**LEGEND:**

- 1) HV-1: High Volume Pump Located @ Chemical Plant Re-Introduction Area.
- 2) HV-2: High Volume Pump Located @ inside Warehouse "A".
- 3) HV-3: High Volume Pump Located @ inside Warehouse "B".
- 4) HV-4: High Volume Pump For Background Located @ Guard Gate.
- 5) HV-5: High Volume Pump Located @ inside Ce-96 Plant.

**LOCATIONS**  
**ACTION LEVEL = 1.50E-12**  
(Action Level is One-Tenth Allowable Exposure)

*✓ 500 m*

DATE	HV-1	HV-2	HV-3	HV-4	HV-5
8/4/95	4.43E-14	3.73E-14	3.77E-14	1.76E-13	
8/8/95	4.73E-14	3.81E-14	3.55E-14	8.55E-14	
8/10/95	3.03E-14	1.41E-14	5.64E-14	7.28E-14	
8/13/95	2.00E-14	3.32E-14	1.96E-14	4.19E-14	
8/16/95	3.74E-14	7.17E-14	6.22E-14	7.36E-14	
8/18/95	1.98E-13	5.64E-14	9.80E-15	4.38E-14	
8/21/95	4.96E-13	2.01E-14	1.65E-14	1.74E-14	
8/22/95	5.02E-13	4.57E-14	2.43E-14	2.76E-14	
8/23/95	4.69E-13	2.50E-14	5.75E-15	3.00E-14	
8/24/95	4.24E-13	5.70E-15	3.53E-14	4.07E-14	
8/25/95	8.44E-13	3.49E-14	3.45E-14	4.50E-14	
8/28/95	4.15E-13	2.39E-14	6.26E-15	8.76E-15	
8/29/95	2.62E-13	3.74E-14	2.02E-14	2.02E-14	
8/30/95	2.32E-13	3.76E-14	1.59E-14	1.44E-14	
8/31/95	3.57E-13	2.72E-14	9.51E-15	1.44E-14	9.46E-15

# LEAD IRON RE-INTRODUCTION PROCESSING AIR MONITORING RESULTS

October 1995  
(RADIATION)

**LEGEND:**

- 1) HV-1: High Volume Pump Located @ Chemical Plant Re-Introduction Area.
- 2) HV-2: High Volume Pump Located @ inside Warehouse "A".
- 3) HV-3: High Volume Pump Located @ inside Warehouse "B".
- 4) HV-4: High Volume Pump For Background Located @ Guard Gate

**LOCATIONS**

ACTION LEVEL = 1.50E-12 (uCi/cc)

(Action Level is One-Tenth Allowable Exposure)

DATE	HV-1	HV-2	HV-3	HV-4	HV-5
10/2/95	8.72E-14	4.75E-14	9.10E-15	3.53E-14	
10/3/95	<1.20E-13	1.15E-13	<1.20E-13	1.20E-13	
10/4/95	2.41E-13	8.64E-14	2.05E-14	3.56E-14	
10/5/95	2.92E-13	2.44E-14	<4.38E-14	4.38E-14	
10/6/95	1.60E-13	<4.10E-14	<4.10E-14	4.10E-14	
10/9/95	2.00E-13	5.09E-14	2.10E-14	2.99E-14	
10/10/95	1.50E-13	1.34E-13	1.41E-14	7.09E-14	
10/11/95	3.41E-13	8.38E-14	1.49E-14	2.82E-14	
10/12/95	<2.12E-13	<2.12E-13	<2.12E-13	2.12E-13	
10/13/95	<8.16E-14	<8.16E-14	2.85E-13	8.16E-14	
10/16/95	8.27E-14	3.05E-14	6.60E-15	2.53E-14	
10/17/95	1.12E-13	2.89E-14	6.48E-14	5.52E-14	
10/19/95	1.51E-13	<2.15E-14	1.62E-14	2.15E-14	
10/20/95	2.30E-13	<4.97E-14	3.83E-14	4.97E-14	
10/23/95	2.03E-13	3.79E-14	1.73E-14	5.52E-15	
10/24/95	5.05E-14	1.73E-13	4.80E-14	1.24E-13	
10/25/95	1.81E-13	1.73E-14	<1.71E-14	1.71E-14	
10/26/95	1.53E-13	2.48E-14	2.21E-15	2.85E-14	
10/27/95	1.37E-13	7.64E-14	1.40E-14	2.51E-14	
10/30/95	1.31E-13	1.46E-14	<1.93E-14	1.93E-14	
10/31/95	1.49E-13	4.48E-14	8.95E-15	4.63E-14	

# LEAD / IRON RE-INTRODUCTION PROCESSING AIR MONITORING RESULTS

November 1995  
(RADIATION)

**LEGEND:**

- 1) HV-1: High Volume Pump Located @ Chemical Plant Re-Introduction Area.
- 2) HV-2: High Volume Pump Located @ inside Warehouse "A".
- 3) HV-3: High Volume Pump Located @ inside Warehouse "B".
- 4) HV-4: High Volume Pump For Background Located @ Guard Gate.

**LOCATIONS**

ACTION LEVEL = 1.50E-12 (uCi/cc)  
(Action Level is One-Tenth Allowable Exposure)

DATE	HV-1	HV-2	HV-3	HV-4	HV-5
11/1/95	1.27E-13	2.42E-14	2.18E-14	2.94E-14	
11/2/95	6.40E-14	<4.19E-14	<4.19E-14	4.19E-14	
11/3/95	1.55E-13	2.44E-14	3.99E-14	9.56E-14	
11/6/95	1.51E-13	5.38E-14	3.65E-15	2.29E-14	
11/7/95	1.03E-13	3.97E-14	3.22E-14	6.09E-14	
11/8/95	1.32E-13	4.64E-14	1.92E-14	3.26E-14	
11/9/95	2.17E-13	3.37E-14	1.51E-14	1.37E-14	
11/13/95	1.49E-13	4.59E-14	5.10E-15	3.97E-14	
11/14/95	2.45E-13	4.35E-14	3.73E-14	5.21E-14	
11/15/95	2.77E-13	<2.99E-14	9.55E-16	2.99E-14	
11/16/95	1.15E-13	2.91E-14	9.35E-15	3.02E-14	
11/17/95	1.58E-13	1.93E-13	3.50E-14	9.35E-14	
11/20/95	1.27E-13	5.15E-14	8.20E-15	2.53E-14	
11/21/95	8.25E-14	4.33E-13	<1.69E-13	1.69E-13	
11/22/95	3.94E-14	7.75E-15	4.50E-15	3.97E-14	
11/27/95	1.73E-13	<3.11E-14	<3.11E-14	3.11E-14	
11/28/95	3.66E-13	<3.11E-14	<3.11E-14	3.11E-14	
11/29/95	7.48E-13	<3.73E-14	3.15E-15	3.73E-14	
11/30/95	1.80E-13	<3.10E-14	9.45E-15	3.10E-14	

# LEAD / IRON RE-INTRODUCTION PROCESSING AIR MONITORING RESULTS

December 1995  
(RADIATION)

## LEGEND:

- 1) HV-1: High Volume Pump Located @ Chemical Plant Re-Introduction Area.
- 2) HV-2: High Volume Pump Located @ inside Warehouse "A".
- 3) HV-3: High Volume Pump Located @ inside Warehouse "B".
- 4) HV-4: High Volume Pump For Background Located @ Guard Gate.

## LOCATIONS

ACTION LEVEL =  $1.50E-12$  (uCi/cc)  
(Action Level is One-Tenth Allowable Exposure)

DATE	HV-1	HV-2	HV-3	HV-4	HV-5
12/4/95	1.34E-13	1.43E-14	<2.10E-14	2.10E-14	
12/6/95	1.75E-13	3.23E-14	<2.91E-14	2.91E-14	
12/8/95	1.61E-13	5.03E-14	1.88E-14	5.55E-14	
12/11/95	1.77E-13	3.14E-14	<2.07E-14	2.07E-14	
12/18/95	1.29E-13	2.00E-14	<1.36E-14	1.36E-14	
12/19/95	4.59E-13	2.55E-13	4.59E-13	1.44E-13	
12/20/95	1.58E-13	3.19E-14	<6.37E-14	<.37E-14	
12/21/95	2.59E-13	1.39E-13	1.45E-14	1.34E-14	
12/27/95	1.64E-13	3.78E-14	4.70E-15	3.64E-14	
12/28/95	2.28E-13	1.04E-14	<3.22E-14	3.22E-14	

# LEAD / IRON RE-INTRODUCTION PROCESSING AIR MONITORING RESULTS

January 1996  
(RADIATION)

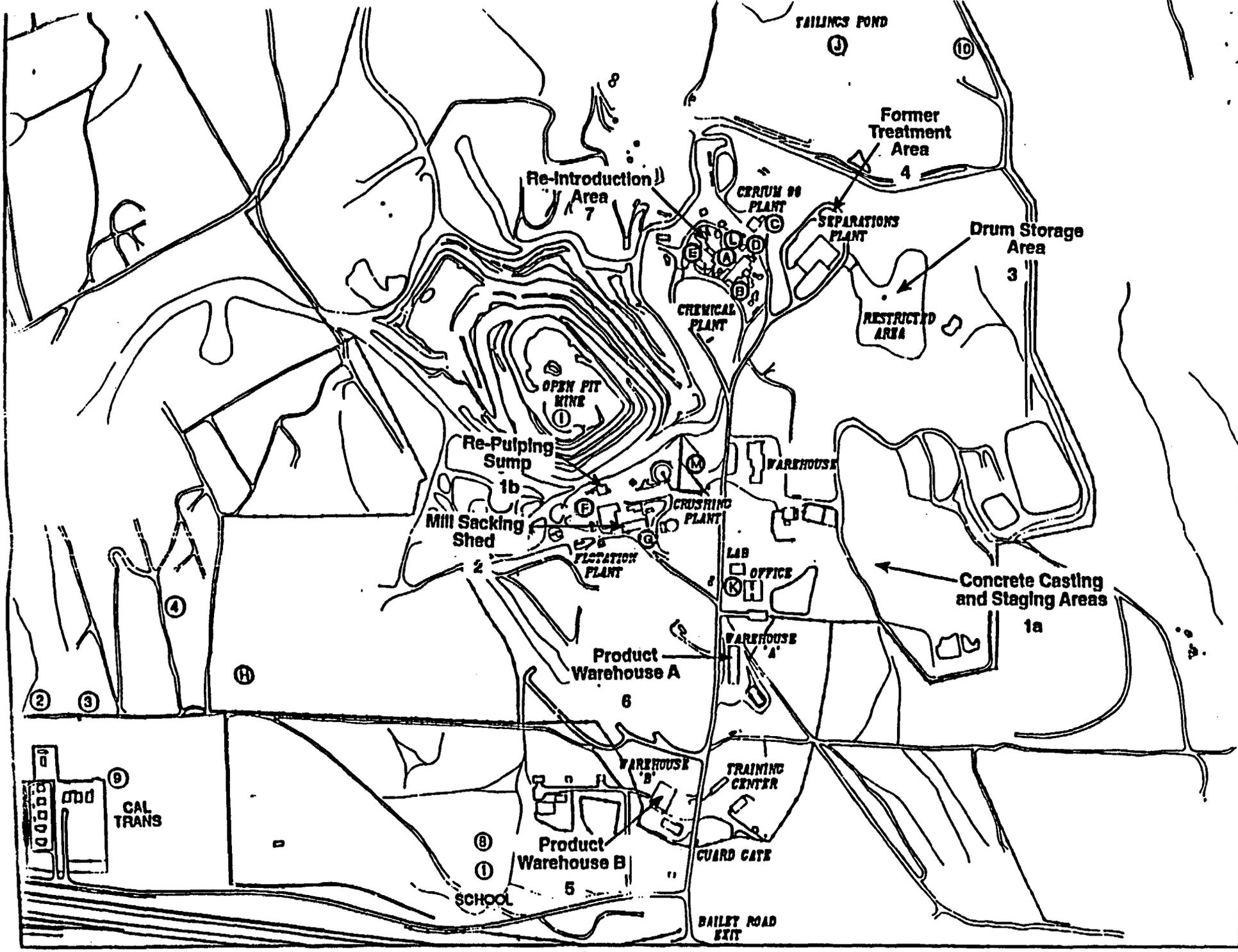
**LEGEND:**

- 1) HV-1: High Volume Pump Located @ Chemical Plant Re-Introduction Area.
- 2) HV-2: High Volume Pump Located @ inside Warehouse "A".
- 3) HV-3: High Volume Pump Located @ inside Warehouse "B".
- 4) HV-4: High Volume Pump For Background Located @ Guard Gate.

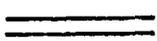
**LOCATIONS**

ACTION LEVEL = 1.50E-12 (uCi/cc)  
(Action Level is One-Tenth Allowable Exposure)

DATE	HV-1	HV-2	HV-3	HV-4	HV-5
1/2/96	4.47E-14	2.73E-14	1.05E-12	1.13E-14	
1/3/96	<2.40E-13	<2.40E-13	<2.40E-13	2.40E-13	
1/5/96	1.05E-13	<1.34E-14	1.05E-14	1.34E-14	
1/8/96	2.98E-13	3.10E-14	2.20E-15	1.33E-14	
1/9/96	2.59E-13	6.28E-14	2.65E-14	2.65E-14	
1/10/96	<5.83E-14	1.79E-13	<5.83E-14	5.83E-14	
1/11/96	1.80E-13	<3.72E-14	<3.72E-14	3.72E-14	
1/15/96	1.18E-13	1.59E-14	<1.15E-14	1.15E-14	
1/16/96	1.51E-13	1.31E-14	7.43E-15	3.73E-14	
1/18/96	8.16E-14	6.20E-14	<2.61E-14	2.61E-14	
1/22/96	3.06E-15	6.04E-15	1.55E-15	8.91E-15	
1/26/96					
1/29/96					
1/30/96					



**LEGEND**



**PAVED ROAD**



**CHEMICAL PLANT**



**OPEN PIT MINE**

0

0.5 MILES

1 MILE