Summary of Health and Safety Plan Data Results for Process Area, Yerington Mine

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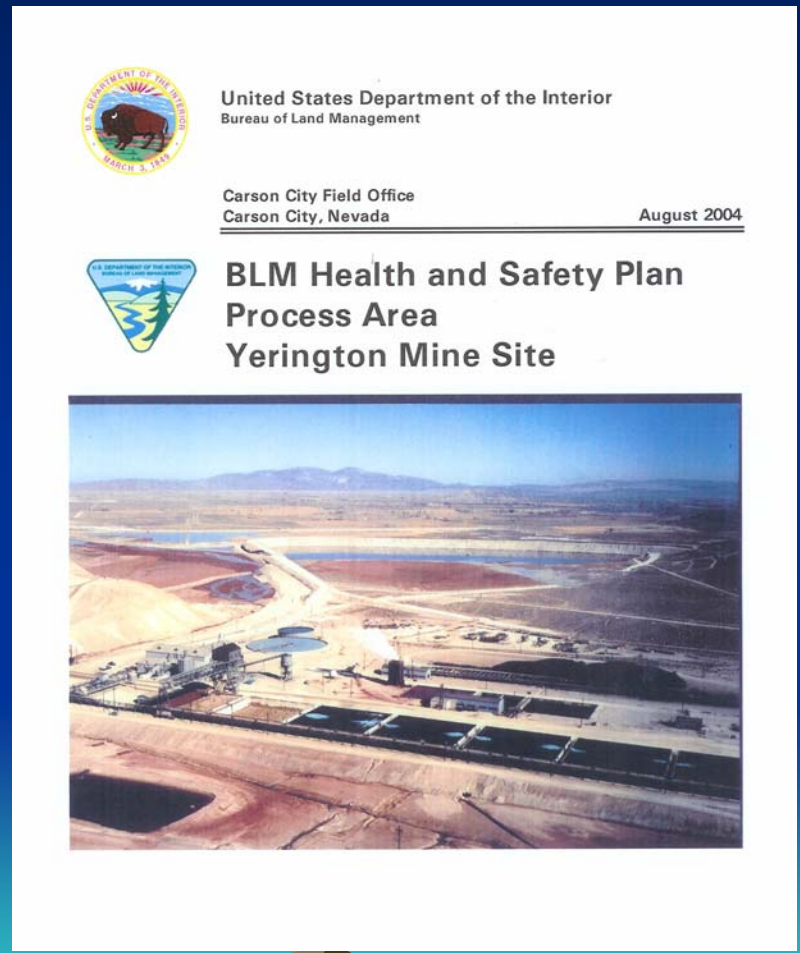
Bureau of Land Management - Carson City Field Office

August 2004

BLM Health & Safety Plan for the Process Area, Yerington Mine Site

- Updated, comprehensive HASP for BLM is required.
- For Process Area & other areas known to be hazardous.
- Not a risk assessment for offsite receptors.



United States Department of the Interior
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Carson City Field Office
Carson City, Nevada
August 2004

BLM Health and Safety Plan
Process Area
Yerington Mine Site

Executive Summary

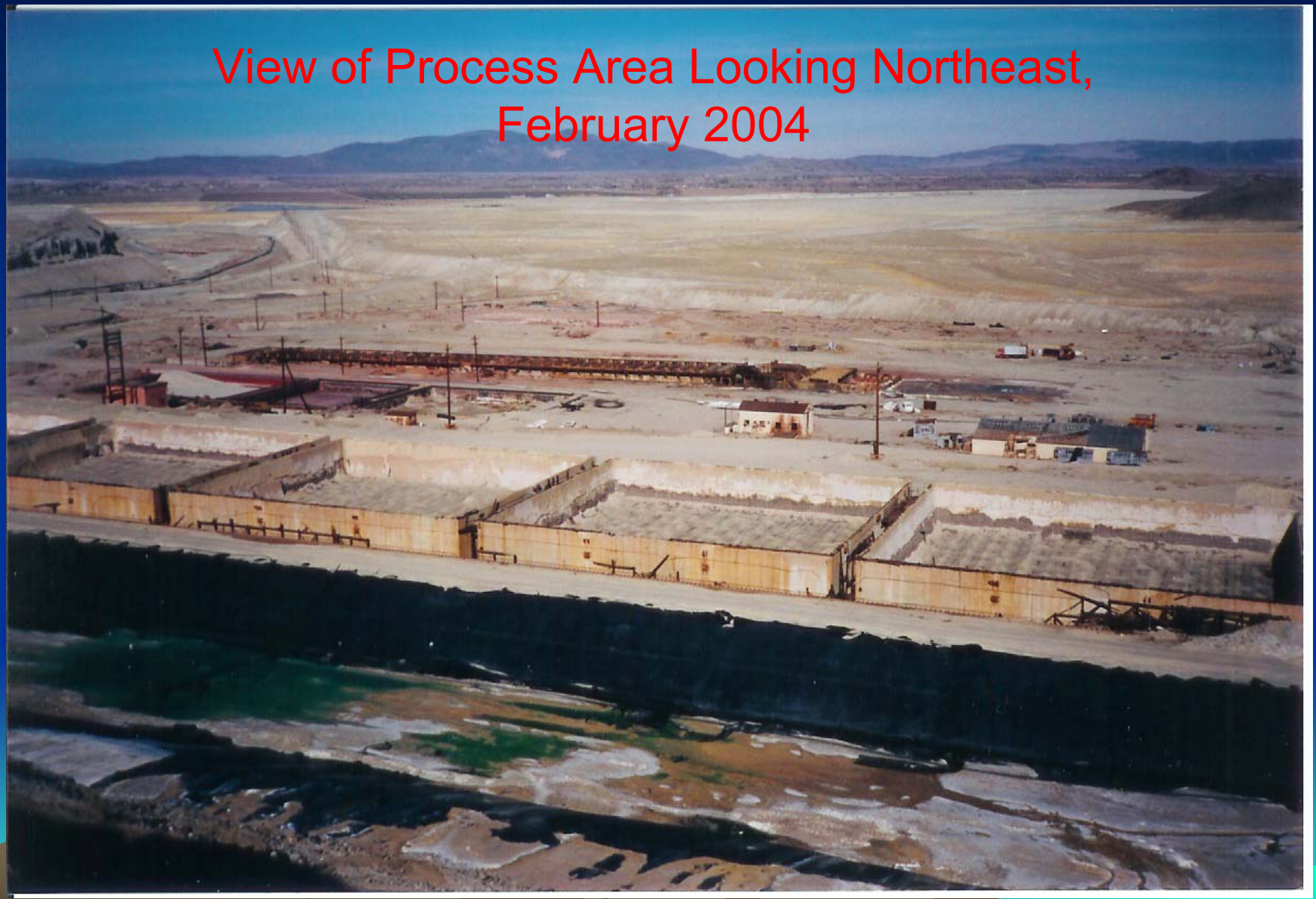
- Historical documents-photos, recent data & pre-HASP field work indicate Uranium-radioactivity in Cu ore, groundwater & waste rocks.
- BLM requires updated HASP for public land part of Process Area to support Work Plan under MOU.
- BLM conducted soil screening-sampling in June-July 2004 for radioactivity in Process Area & circuit to evap ponds at north end of Mine.

Executive Summary

- Results indicate elevated levels of radioactivity in Process Area – circuit such that workers must take formal precautions to protect themselves.
- More evaluation required to comprehensively assess worker hazard during future investigations on Site.
- Action Plan developed to secure site & evaluate radiological hazard further including offsite conditions.

Yerington Mine Site – 3600 Acres

View of Process Area Looking Northeast, February 2004



Historical Information on Radiological Materials at Yerington Mine

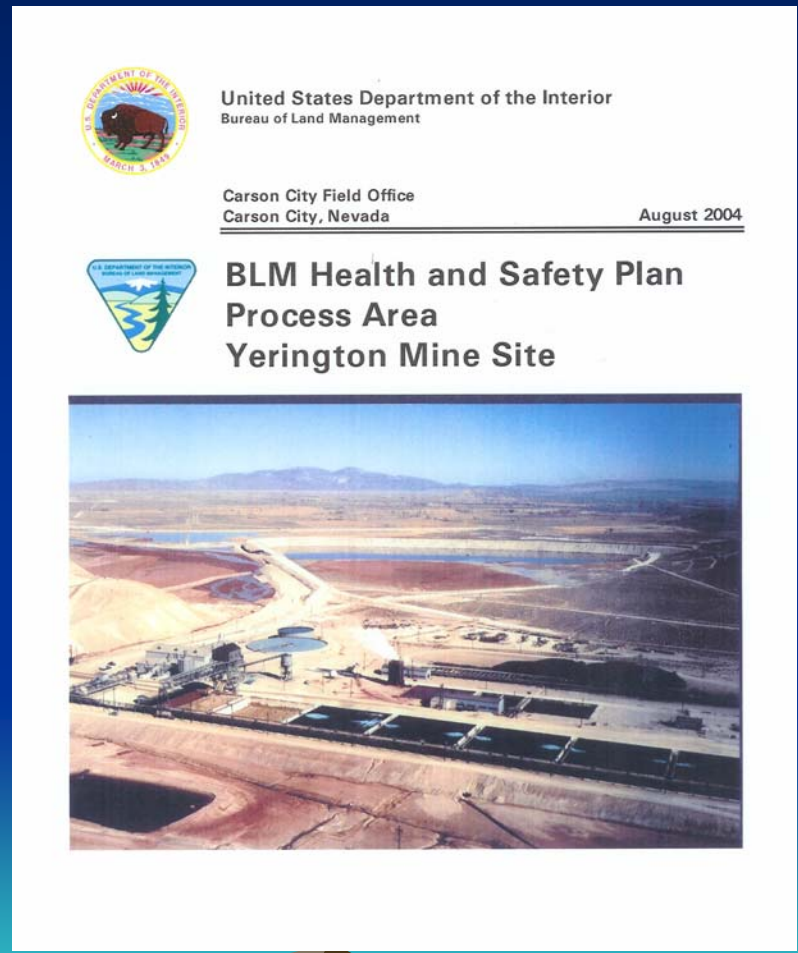
- BLM discovered Anaconda documents at University of Wyoming – Summer 2003
- 1973 NV Bureau of Mines – Bulletin 81
- 1976 MJ Bright Report on U in evap ponds
- 1979 Anaconda Internal Memo on ponds
- 1979 National Uranium Resource Evaluation Report describes U in Cu ore

Recent Information Also Indicates Uranium Is Onsite

- 1999 EPA TENORM report for AZ Cu mines describes conceptual model for Yerington
- December 2003 EPA radiological survey of evaporation ponds: 2x-3x background
- February 2004 BLM surveys Process Area for radiation
- March 2004 BLM reviews historical photos of mine for additional contamination
- March 2004 Quarterly groundwater monitoring data from December 2003 indicates Uranium in monitoring wells on site

BLM Health & Safety Plan: What Does the Data Say and Mean?

- Define radioactivity
- Types of radioactivity
- Units of radioactivity & dose
- Perspective about sources & annual dose in every day life



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BLM Health and Safety Plan
Process Area
Yerington Mine Site

UCRL-PRES-149818-REV-2

Understanding Radiation and Its Effects

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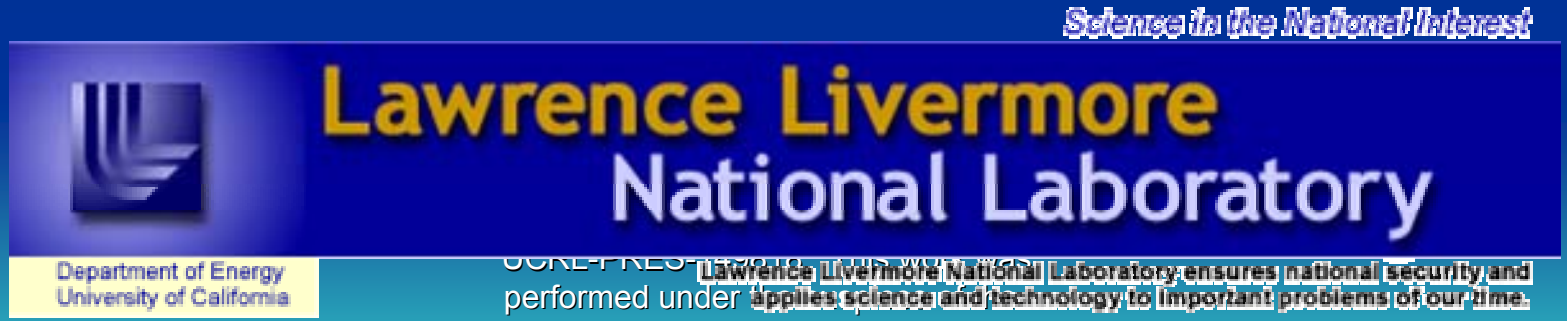
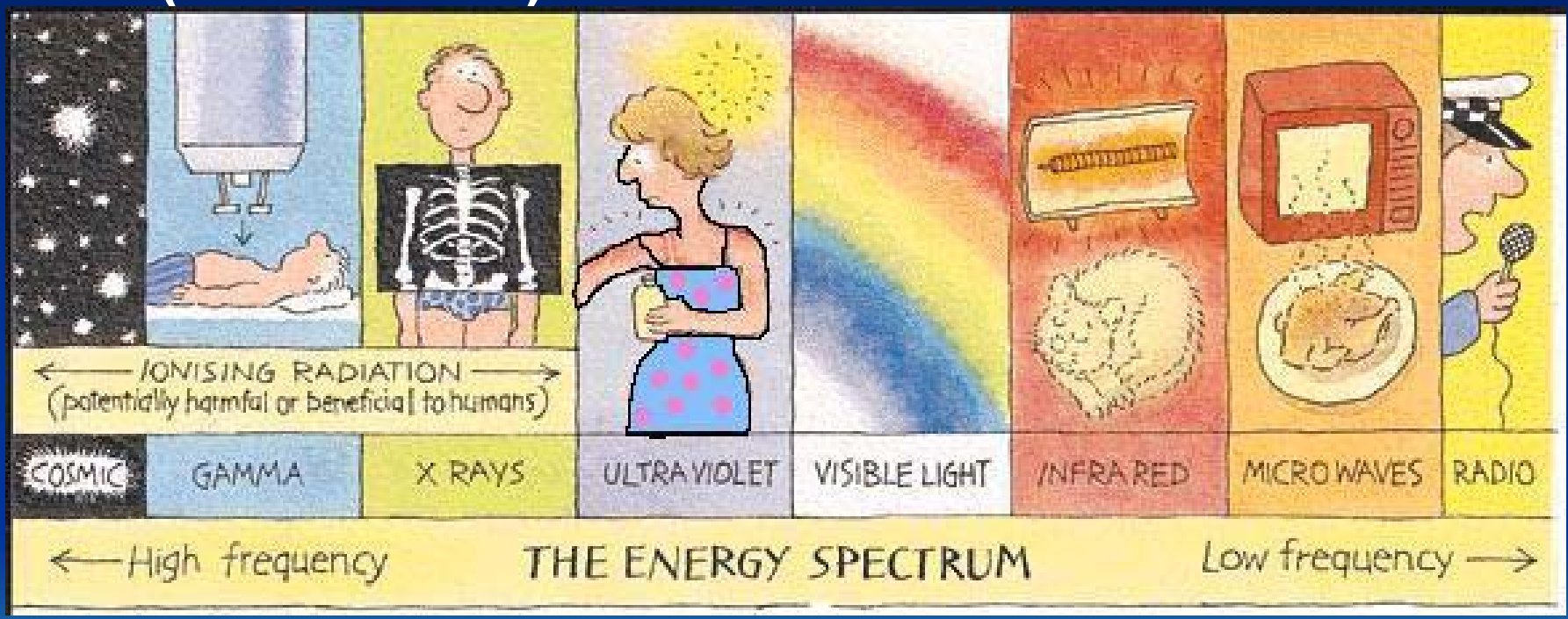


UCRL-PRES-149818-REV-2
performed under
U.S. Department of Energy by the University of California, Lawrence Livermore National Laboratory under Contract No. W-7405-Eng-48.

Radiation is Energy

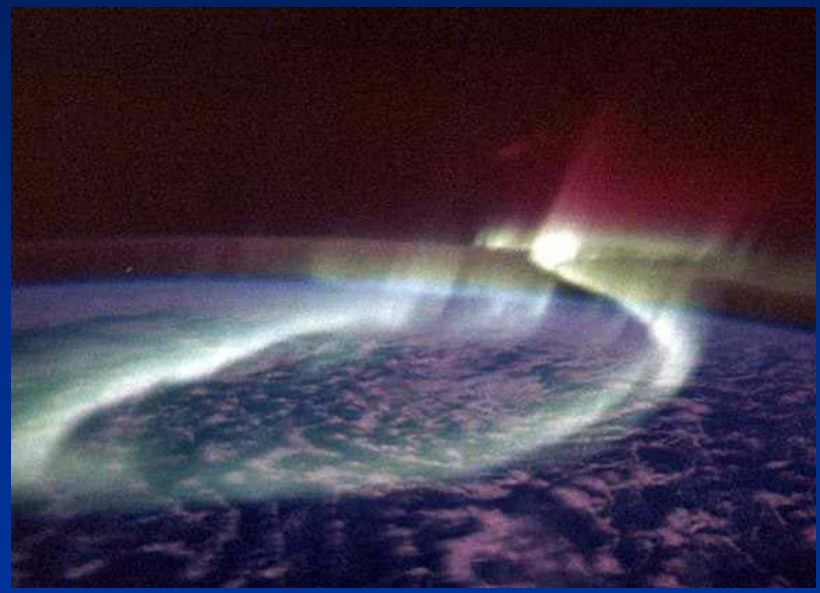
- The energy is given off by unstable (radioactive) atoms and some machines.



- For this talk, we will be focusing on ionizing radiation and its health effects.

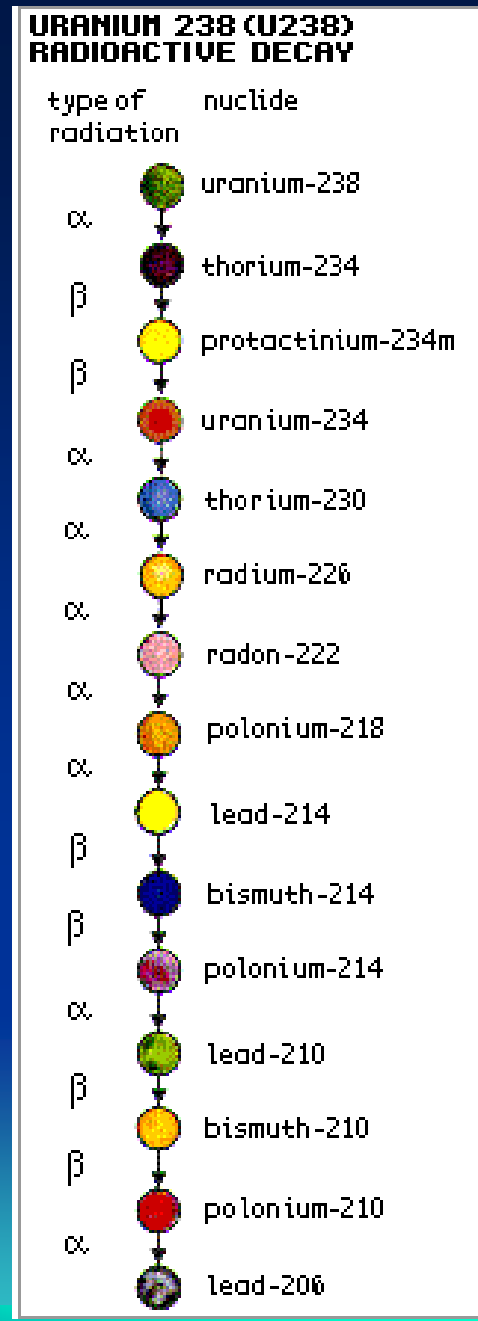
Radiation and Radioactive Material are a Natural Part of Our Lives

- We are constantly exposed to low levels of radiation from outer space, earth, and the healing arts.
- Low levels of naturally occurring radioactive material are in our environment, the food we eat, and in many consumer products.
- Some consumer products also contain small amounts of man-made radioactive material.



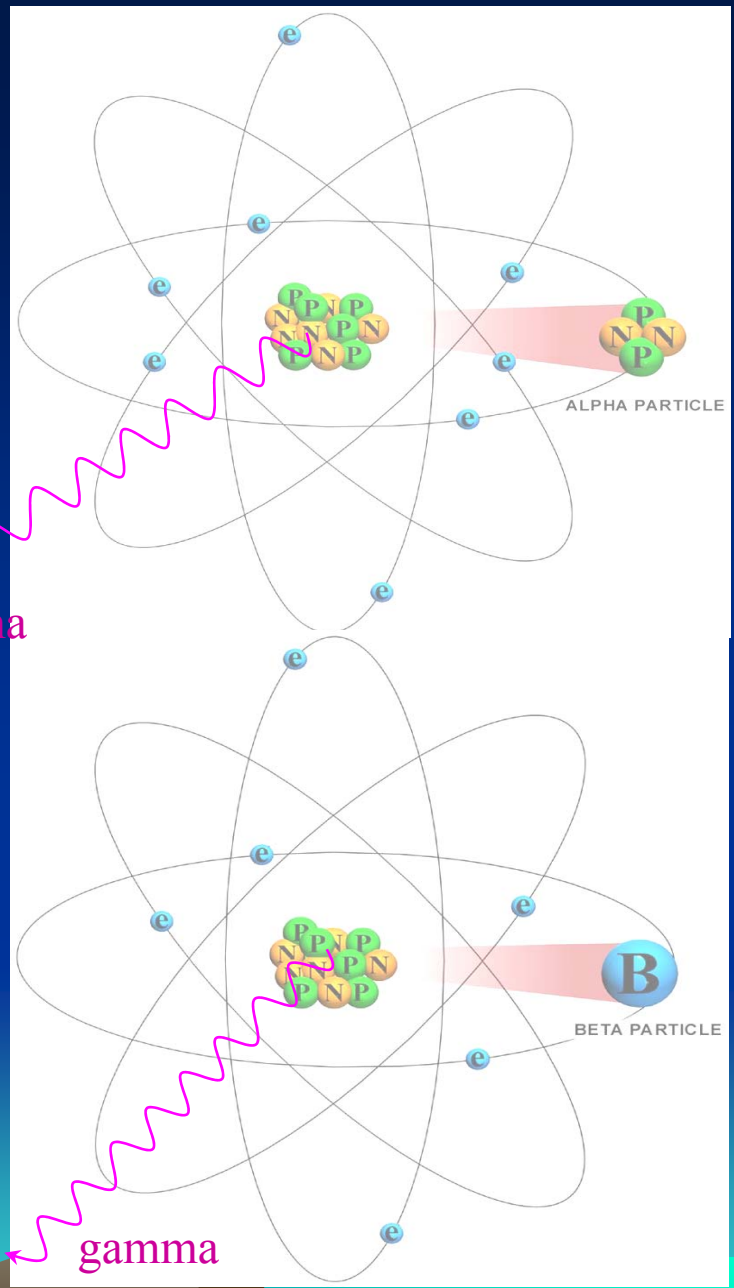
Unstable Atoms Decay

- The number of "decays" that occur per unit time in the radioactive material tell us how radioactive it is.
  - Units include Curies (Ci), decays per minute (dpm), and Becquerels (decays per second).
- When an unstable atom decays, it *transforms* into another atom and releases its excess energy in the form of radiation.
- Sometimes the new atom is also unstable, creating a "decay chain"



Forms of Radiation

- When unstable atoms transform, they often eject particles from their nucleus. The most common of these are:
  - **Alpha Radiation**
    High energy, but short range (travels an inch in air, not an external hazard)
  - **Beta Radiation**
    Longer range (10 – 20 feet in air) and can be a skin and eye hazard for high activity beta sources.
- **Gamma Rays**
  (electromagnetic radiation) often accompany particle radiation. This "penetrating" radiation is an external hazard and can travel 100s of feet in air.



What is a "Dose" of Radiation?

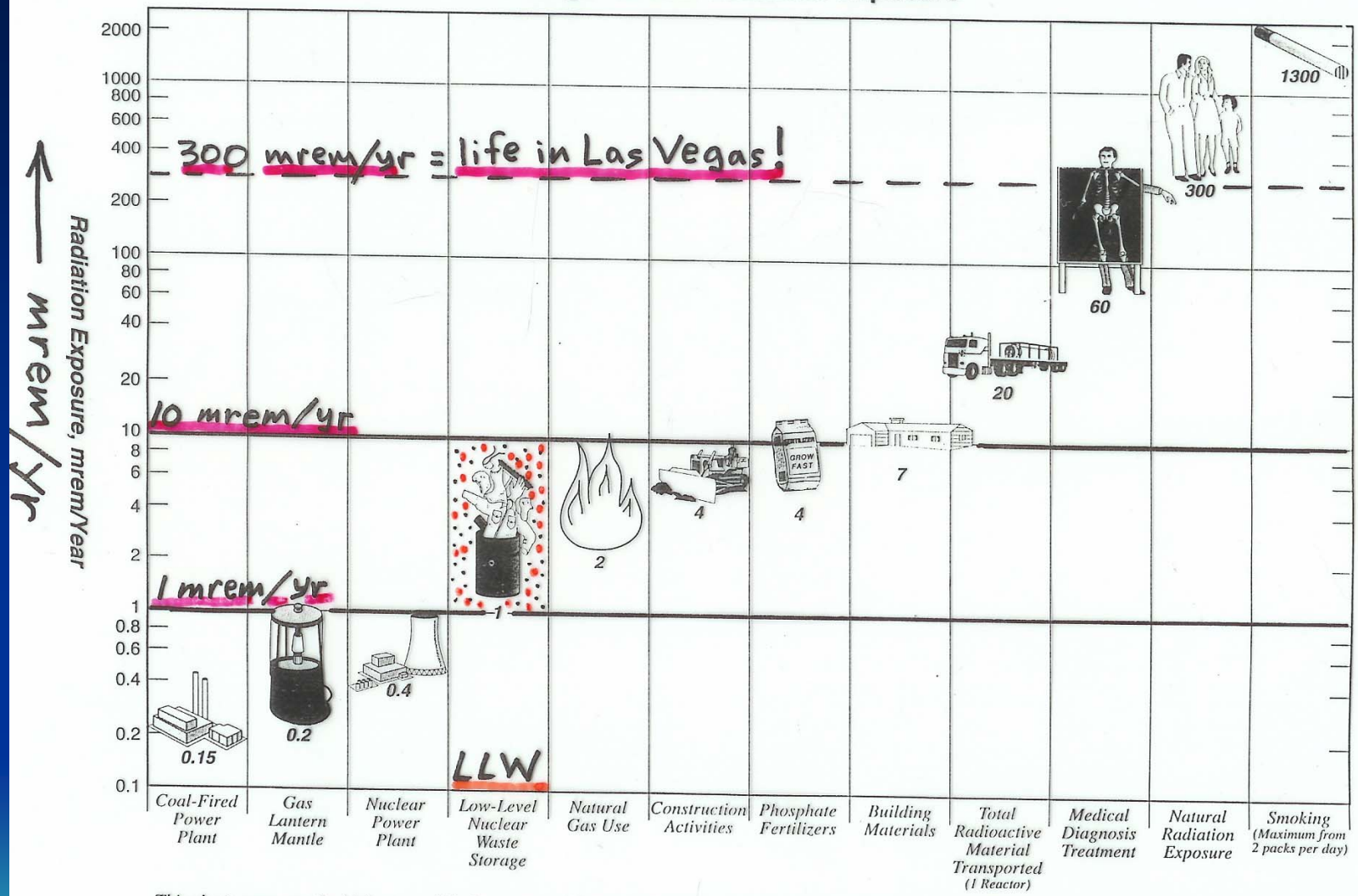
- When radiation's energy is deposited into our body's tissues, that is a dose of radiation.
- The more energy deposited into the body, the higher the dose.
- **Rem** is a unit of measure for radiation dose.
- Small doses expressed in **millirem = 1/1000 rem**.
- **Rad** & **R** (Roentgens) are similar units that are often equated to the Rem.

Typical Doses

Average Dose to US Public from All sources	360 mrem/year
Average Dose to US Public From Natural Sources	300 mrem/year
Average Dose to US Public From Medical Uses	53 mrem/year
Coal Burning Power Plant	0.2 mrem/year
Average dose to US Public from Weapons Fallout	< 1 mrem/year
Average Dose to US Public From Nuclear Power	< 0.1 mrem/year
Occupational Dose Limit for Radiation Workers	5,000 mrem/yr

Coast to coast Airplane roundtrip	5 mrem
Chest X ray	8 mrem
Dental X ray	10 mrem
Head/neck X ray	20 mrem
Shoe Fitting Fluoroscope (not in use now)	170 mrem
CT (head and body)	1,100 mrem

Some Exposures from Manmade Sources Compared to the Average Natural Radiation Exposure

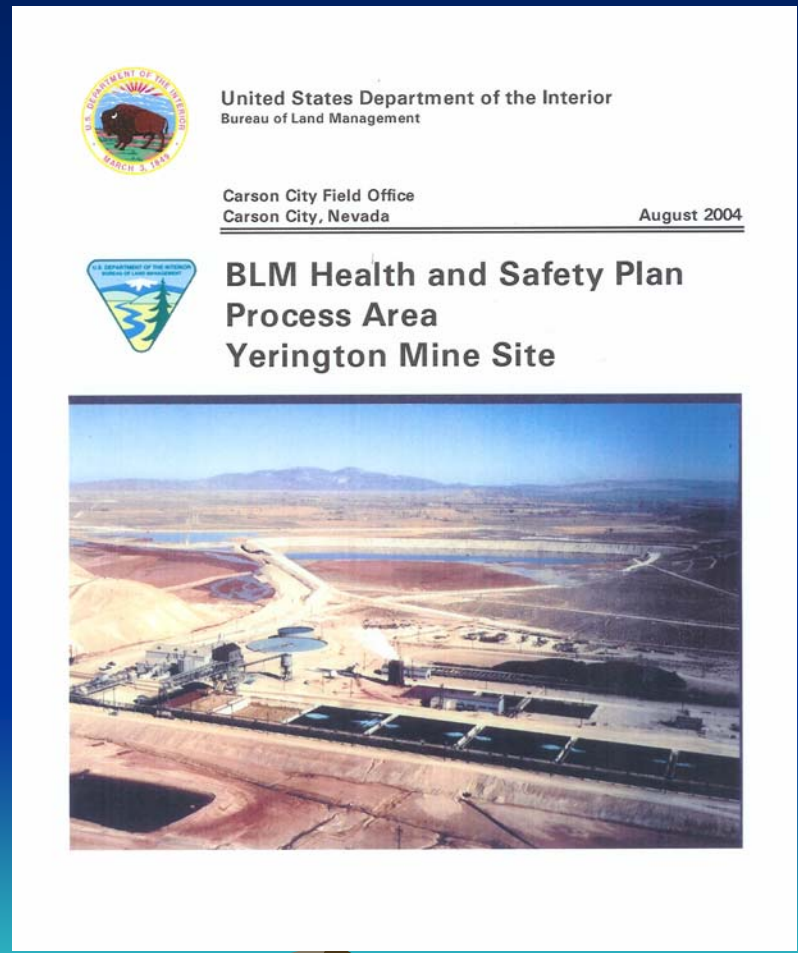


This chart compares the highest possible dose received from a number of activities to the average annual individual exposure to all sources of radiation. This chart was compiled in 1991 and reflects the most current numbers available at that time.

SOME SOURCES OF AVERAGE ANNUAL EXPOSURE →

BLM Health & Safety Plan: The Data & What Does It Mean?

- Some data is based on field measurements
- Some data is from lab analysis of soil (0 – 6”)
- 9 samples expedited for lab rad analysis
- 110 samples just lab gross alpha & beta
- Additional samples from area near evap ponds in northern part



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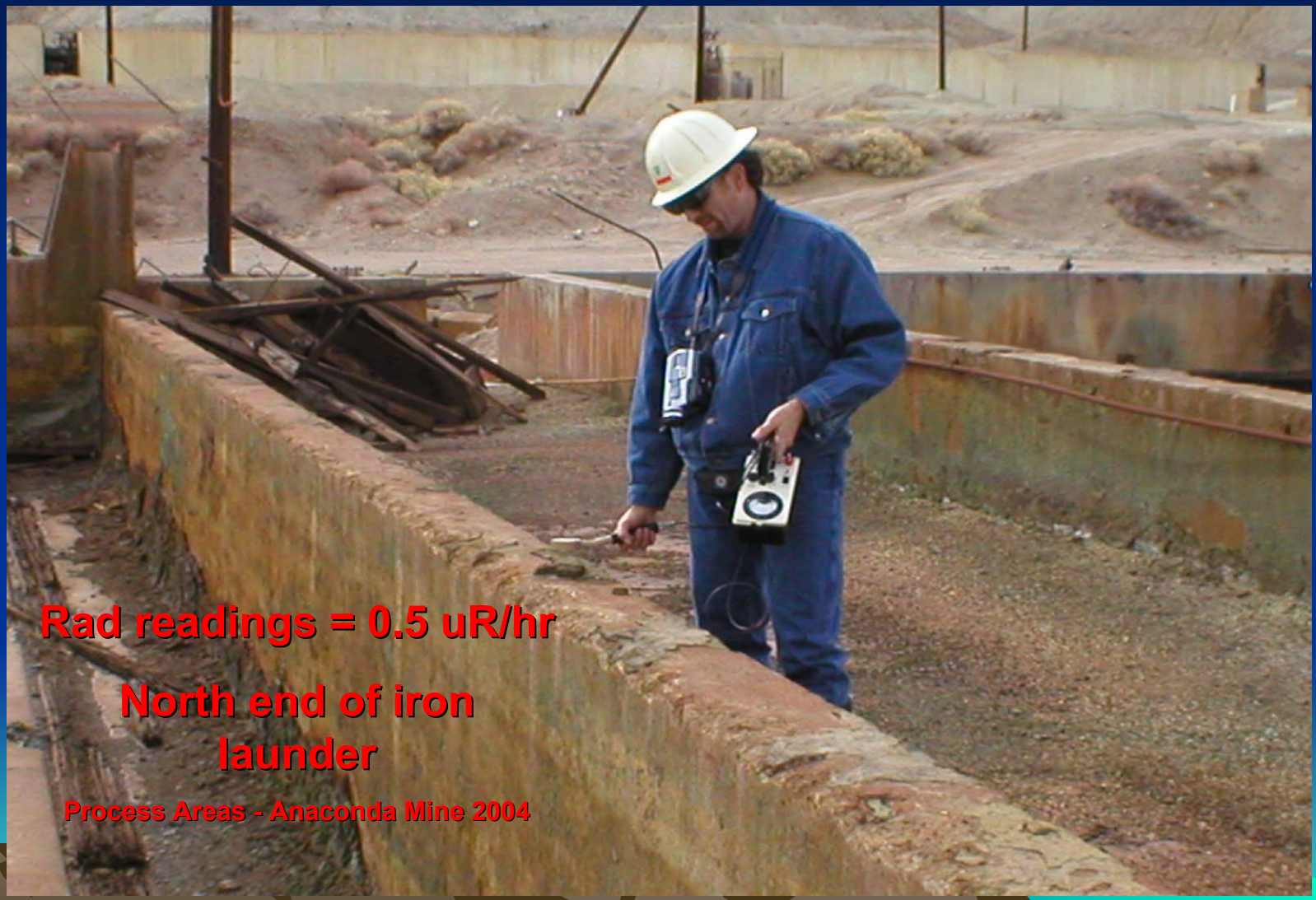
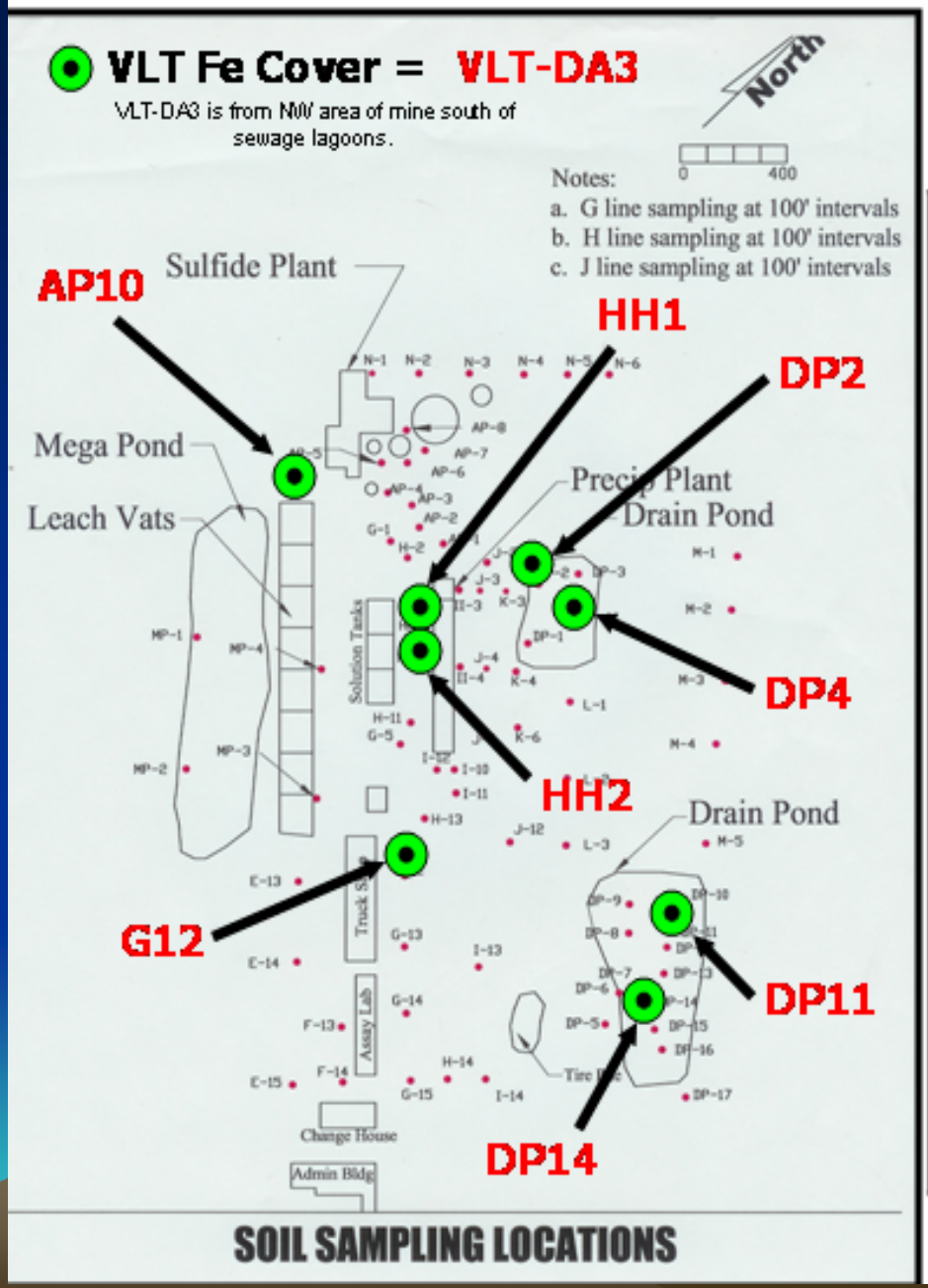
BLM Health and Safety Plan
Process Area
Yerington Mine Site

BLM Staff Conducted Field Reconnaissance of Process Area for Radioactivity & Other Evidence of Staining



Geiger-Muller Radiation Detector & Dosimeter Used at Yerington Mine, PAWP HASP 2004

Process Area EE marked w/ radioactivity hazard sign



Expedited Soil Sample Final Results from Process Area, Yerington Mine, July 2004

Sample No.	Gross Alpha pCi/g	Gross Beta pCi/g	Ra-226 pCi/g	Ra-228 pCi/g	U ppm	Th ppm
G12	7.9	8	3.3	1.8	2	10
AP10	242	152	17	9.3	177	80
HH1	325	262	13	3	4	20
HH2	55	35	38	5	6	50
DP2	194	85	25	16	14	170
DP4	1440	582	157	139	31	1350
DP11	736	391	76	4	430	410
DP14	199	107	26	7.5	100	120
VLT-DA3	15	12	4.2	5	2	20

Table E1 Page 1 of 6: Radiological Survey and Laboratory Data

Table E1 (page 1 of 6). *Yerington mine radiological survey data available as of 8/6/04.*

Sample ID	Easting m	Northing m	Date	ACZ rpt	Gross Alpha pCi/g	Gross Beta pCi/g	Solids %	Ra 226 pCi/g	Ra 228 pCi/g	Th mg/kg	U mg/kg	CPM	mR/hr
PAG-AP1	309110	4318904	6/23/2004	L46452	7.97	4.87	99.9					95	0.025
PAG-AP10	**309124**	**4318884**	**6/23/2004**	**L46419**	**242**	**152**	**98.2**	**16.7**	**9.25**	**80**	**177**	**192**	**0.059**
PAG-AP11	309133	4318874	6/23/2004	L46447	49.1	28.3	99.3	n/a	n/a	n/a	n/a	202	0.066
PAG-AP2	309097	4318897	6/23/2004	L46447	19.6	15	86.1	n/a	n/a	n/a	n/a	136	0.041
PAG-AP3	309045	4318872	6/23/2004	L46447	9.03	5.42	99.4	n/a	n/a	n/a	n/a	113	0.035
PAG-AP4	309022	4318885	6/23/2004	L46452	5.08	5.37	99.3	n/a	n/a	n/a	n/a	95	0.029
PAG-AP5	309039	4318905	6/23/2004	L46447	18.2	11.8	99.4	n/a	n/a	n/a	n/a	109	0.031
PAG-AP6	309030	4318912	6/23/2004	L46452	7.89	5.11	99.5	n/a	n/a	n/a	n/a	104	0.032
PAG-AP7	309046	4318945	6/23/2004	L46447	6.9	4.77	99.4	n/a	n/a	n/a	n/a	108	0.033
PAG-AP8	309018	4318957	6/23/2004	L46452	5.45	4.27	99.7	n/a	n/a	n/a	n/a	99	0.026
PAG-AP9	309117	4318893	6/23/2004	L46447	84	50.5	99	n/a	n/a	n/a	n/a	181	0.056
PAG-E13	309286	4318584	6/23/2004	L46449*	11.6	9.19	98.4	n/a	n/a	n/a	n/a	91	0.025
PAG-E14	309388	4318497	6/23/2004	L46449	12.4	6.42	99.4	n/a	n/a	n/a	n/a	81	0.033
PAG-E15	309478	4318412	6/23/2004	L46436	13.8	6.2	100	n/a	n/a	n/a	n/a	152	0.038
PAG-F13	309397	4318527	6/23/2004	L46449	12.1	4.93	99.5	n/a	n/a	n/a	n/a	83	0.027
PAG-F14	309503	4318441	6/23/2004	L46449	18.9	9.69	99.8	n/a	n/a	n/a	n/a	113	0.034
PAG-G03	309114	4318843	6/23/2004	L46436	19.1	9.17	99.6	n/a	n/a	n/a	n/a	105	0.032
PAG-G04	309136	4318823	6/23/2004	L46435	32.8	10.8	99.5	n/a	n/a	n/a	n/a	87	0.029
PAG-G05	309159	4318803	6/23/2004	L46448	15.8	10.5	99.2	n/a	n/a	n/a	n/a	130	0.040
PAG-G06	309182	4318782	6/23/2004	L46435	80.9	36.6	98.3	n/a	n/a	n/a	n/a	160	0.051
PAG-G07	309204	4318762	6/23/2004	L46435	14	6.98	99.4	n/a	n/a	n/a	n/a	75	0.027
PAG-G08	309227	4318742	6/23/2004	L46449*	18	6.8	99.7	n/a	n/a	n/a	n/a	118	0.036
PAG-G09	309249	4318721	6/23/2004	L46448	11.5	8.08	99.6	n/a	n/a	n/a	n/a	126	0.039
PAG-G10	309260	4318702	6/23/2004	L46449*	43.1	20.4	99	n/a	n/a	n/a	n/a	109	0.034
PAG-G11	309294	4318681	6/23/2004	L46449*	22.7	11.3	99.2	n/a	n/a	n/a	n/a	101	0.031
PAG-G12	**309322**	**4318657**	**6/23/2004**	**L46419**	**7.86**	**7.96**	**98.9**	**3.34**	**1.75**	**10**	**1.8**	**91**	**0.030**
PAG-G13	309394	4318592	6/23/2004	L46452	7.75	7.12	99.7	n/a	n/a	n/a	n/a	91	0.027
PAG-G14	309461	4318535	6/23/2004	L46449*	17.6	10.6	99.8	n/a	n/a	n/a	n/a	132	0.025
PAG-G15	309519	4318472	6/23/2004	L46447	8.01	4.55	100	n/a	n/a	n/a	n/a	101	0.031

Table E1 Page 5 of 6: Radiological Survey and Laboratory Data

Table E1 (page 5 of 6). *Yerington mine radiological survey data available as of 8/6/04.*

Sample ID	Easting m	Northing m	Date	ACZ rpt	Gross Alpha pCi/g	Gross Beta pCi/g	Solids %	Ra 226 pCi/g	Ra 228 pCi/g	Th mg/kg	U mg/kg	CPM	mR/hr
TP7-1	309653.9	4318817										848	0.270
TP8-1	309624.5	4318813										451	0.160
VLT-6	308626	4320705											
VLT-7	308613	4320734											
VLT-DA1	308784	4320792	6/24/2004	L46451	14.8	10.5	96.9	n/a	n/a	n/a	n/a	142	0.038
VLT-DA2	308766	4320876	6/24/2004	L46451	172	76.3	97.4	n/a	n/a	n/a	n/a	223	0.067
VLT-DA3	**308707**	**4320802**	**6/24/2004**	**L46419**	**15**	**11.8**	**98.7**	**4.21**	**4.55**	**20**	**2.2**	**162**	**0.047**
VLT-DA4	308638	4320691	6/24/2004	L46451	45.7	26.6	99.1	n/a	n/a	n/a	n/a	201	0.076
VLT-DA5	308626	4320705	6/24/2004	L46451	119	72.2	96.5	n/a	n/a	n/a	n/a	331	0.092
VLT-DA6	308613	4320734	6/24/2004	L46451	311	136	97	n/a	n/a	n/a	n/a	382	0.118
VLT-DA7	308608.7	4321102						n/a	n/a	n/a	n/a	146	0.045
VLT-DA8	308550.9	4321062						n/a	n/a	n/a	n/a	270	0.084
VLT-DA9	308512.1	4320930						n/a	n/a	n/a	n/a	429	0.129
VLT-E1	308760	4320180	6/24/2004	L46451	26.7	35.3	72.9	n/a	n/a	n/a	n/a	223	0.052
VLT-E2	308822	4320228	6/24/2004	L46451	23.3	24.9	92.1	n/a	n/a	n/a	n/a	91	0.034
VLT-E3	308864	4320248	6/24/2004	L46448	68.4	35	89	n/a	n/a	n/a	n/a	142	0.034
VLT-LP1	309121.6	4320362						n/a	n/a	n/a	n/a	101	0.022
VLT-ORE1	307600	4320700	6/24/2004	L46451	8.59	7.93	99.7	n/a	n/a	n/a	n/a	109	0.031
VLT-UP1	308655.8	4321146						n/a	n/a	n/a	n/a	492	0.153
VLT-UP2	308738.6	4321074						n/a	n/a	n/a	n/a	415	0.129
VLT-UP3	308858	4320962						n/a	n/a	n/a	n/a	189	0.059
Bldg Edge	309312	4318630						n/a	n/a	n/a	n/a	n/a	
FS-01	309084.7	4319057	7/20/2004					n/a	n/a	n/a	n/a	n/a	0.24
FS-02	309099.1	4319074	7/20/2004					n/a	n/a	n/a	n/a	n/a	0.25
FS-03	309125.1	4319068	7/20/2004					n/a	n/a	n/a	n/a	n/a	0.27
FS-04	309141.6	4319045	7/20/2004					n/a	n/a	n/a	n/a	n/a	0.20
FS-05	309113	4319051	7/20/2004					n/a	n/a	n/a	n/a	n/a	0.24
FS-06	309095.2	4318927	7/20/2004					n/a	n/a	n/a	n/a	n/a	0.17
FS-07	309119.9	4318920	7/20/2004					n/a	n/a	n/a	n/a	n/a	0.18
FS-08	309137.7	4318902	7/20/2004					n/a	n/a	n/a	n/a	n/a	0.12

Table E1 Page 6 of 6: Radiological Survey and Laboratory Data

Table E1 (page 6 of 6). *Yerington mine radiological survey data available as of 8/6/04.*

Sample ID	Easting m	Northing m	Date	ACZ rpt	Gross Alpha pCi/g	Gross Beta pCi/g	Solids %	Ra 226 pCi/g	Ra 228 pCi/g	Th mg/kg	U mg/kg	CPM	mR/hr
FS-09	309205.5	4318852	7/20/2004										0.13
FS-10	309237.2	4318823	7/20/2004										0.11
FS-11	309267.6	4318796	7/20/2004										0.10
FS-12	309100.8	4318791	7/20/2004										0.12
FS-13	309098.2	4318760	7/20/2004										0.11
FS-14	309126.9	4318770	7/20/2004										0.14
FS-15	309149.4	4318751	7/20/2004										0.12
FS-16	308799.7	4321094	7/20/2004										0.17
FS-17	308784.9	4321047	7/20/2004										0.29
FS-18	308817.1	4321017	7/20/2004										0.27
FS-19	308916.1	4321004	7/20/2004										0.20
FS-20	308990.8	4320985	7/20/2004										0.19
FS-21	309023.8	4320923	7/20/2004										0.21
FS-22	308991.6	4320833	7/20/2004										0.24
FS-23	308949.9	4320879	7/20/2004										0.30
FS-24	308902.2	4320920	7/20/2004										0.29
Slab	309297	4318736											
Slab	309317	4318760											
Count					119	119	119	9	9	9	9	134	158
Max					1440	592	100	157	139	1350	430	6200	1.92
Min					4.96	4.27	72.9	3.34	1.75	10	1.8	69	0.02
Average					69.2	33.4	97.8	39.9	21.1	247.8	85.0	228.5	0.1

Lab Results For 119 Soil Samples:

Average Gross Alpha: 69 pCi/g

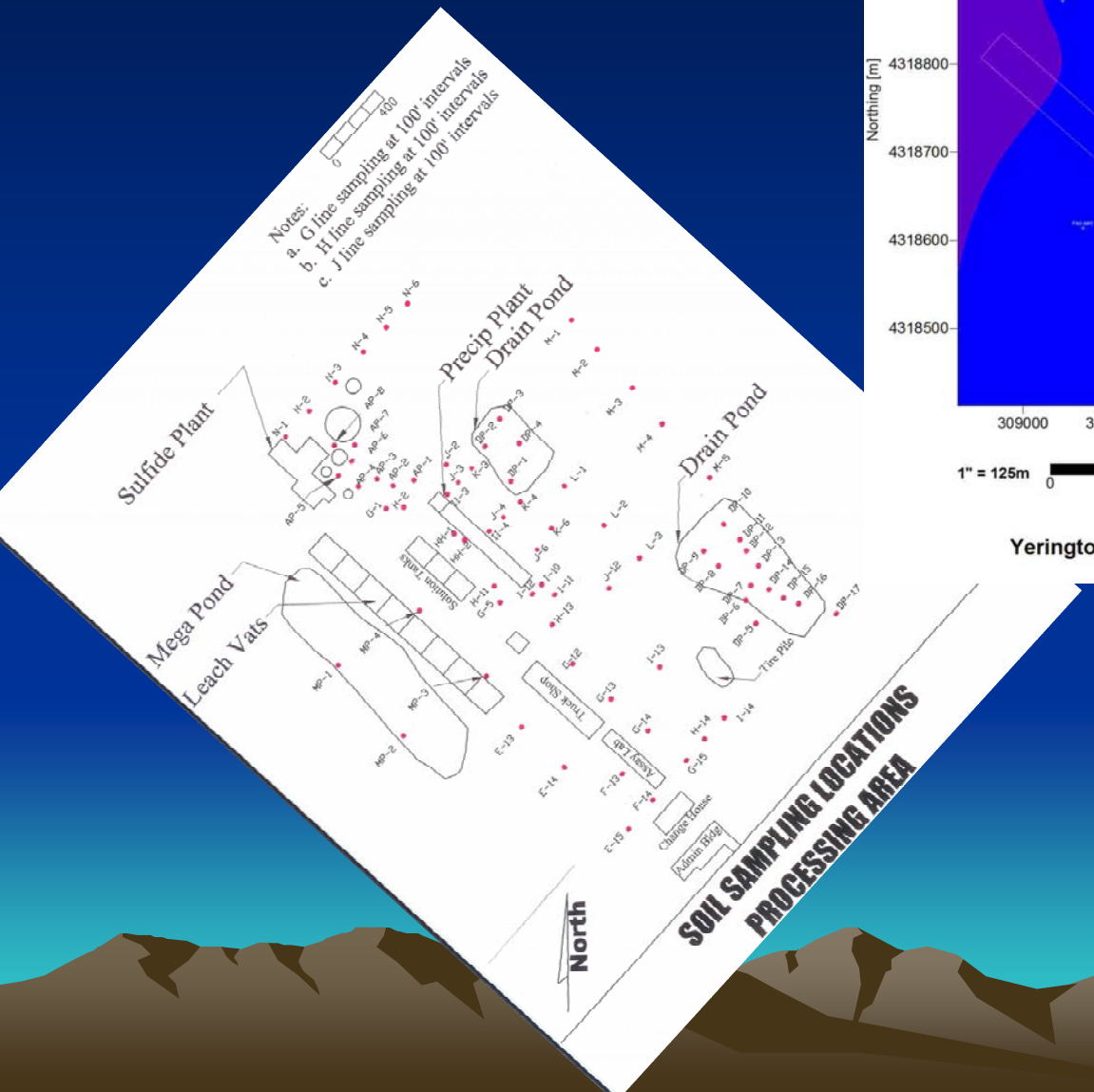
Average Gross Beta: 33 pCi/g

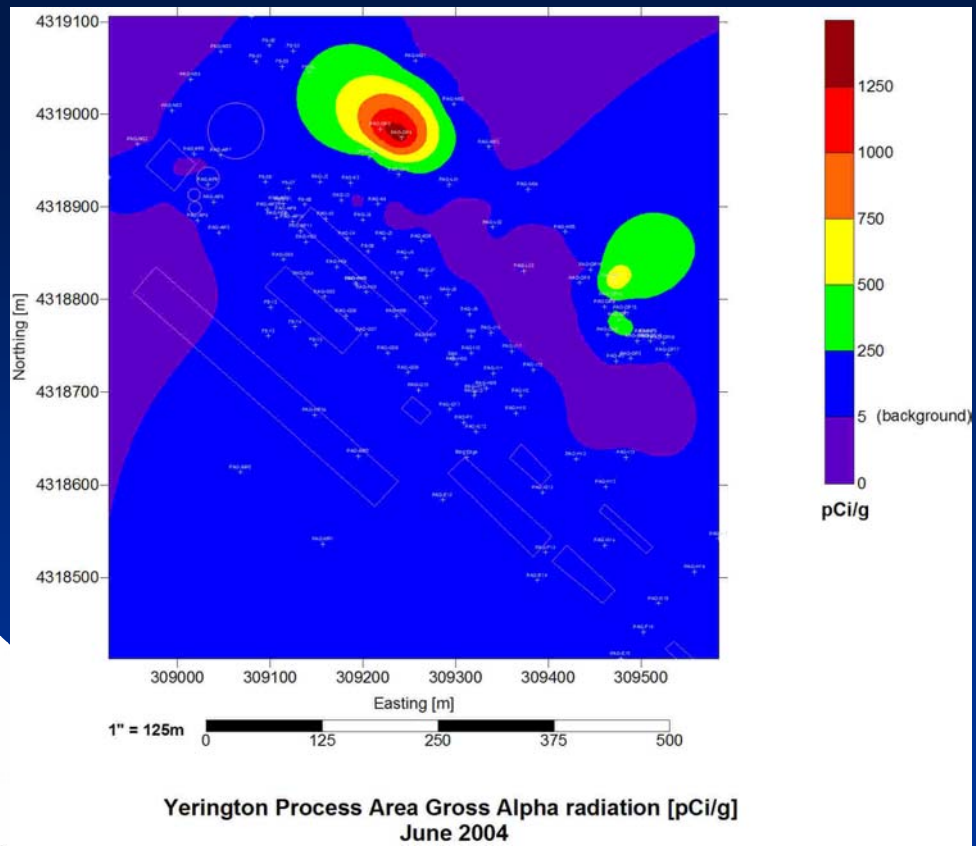
Note:
PAG = Process Area G gridline
PAO = Process Area Other
SP = Sewage Pond
TP = Tailings Pond
Bold = expedited samples.
n/a = not analyzed, and not applicable
n/r = not recorded

MP = Mega Pond
DP = Disposal Pond
VLT = Vat Leach Tailings
FS = ????

Arithmetic average results for all data values.

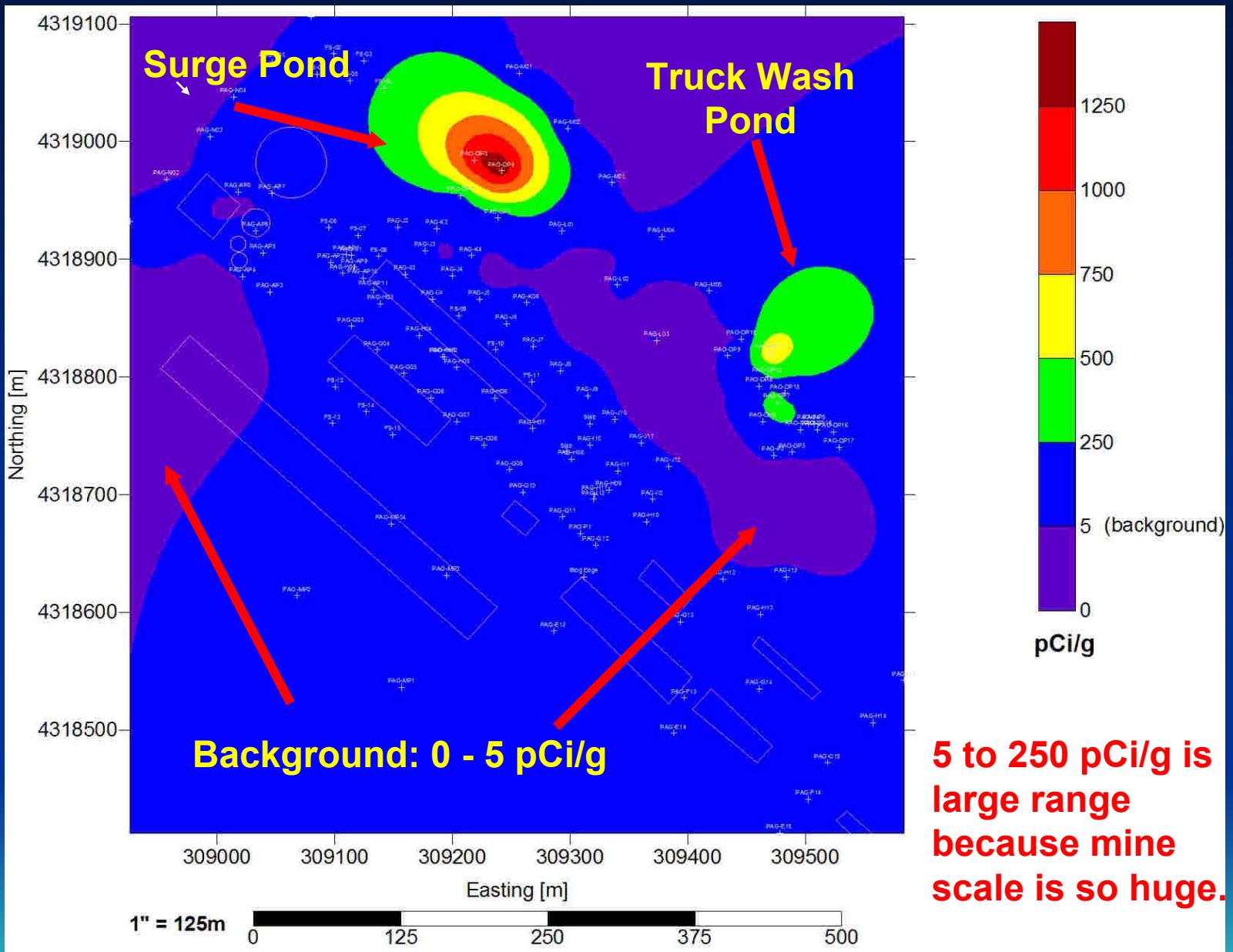
Orientate Maps With North Arrow





Yerington Process Area Gross Alpha radiation [pCi/g]
June 2004

NORTH



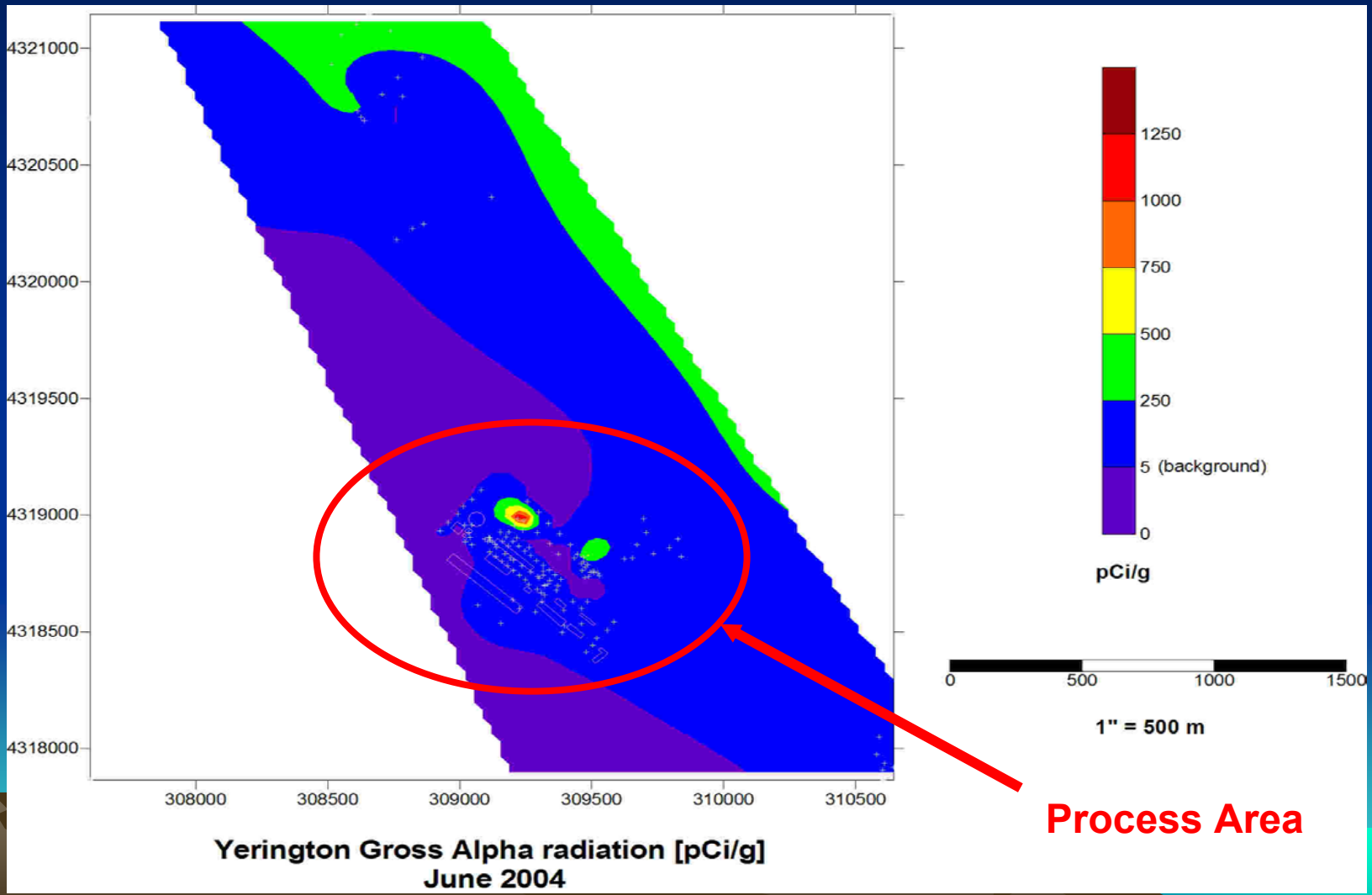
5 to 250 pCi/g is large range because mine scale is so huge.

Laboratory Analysis of Soil Samples

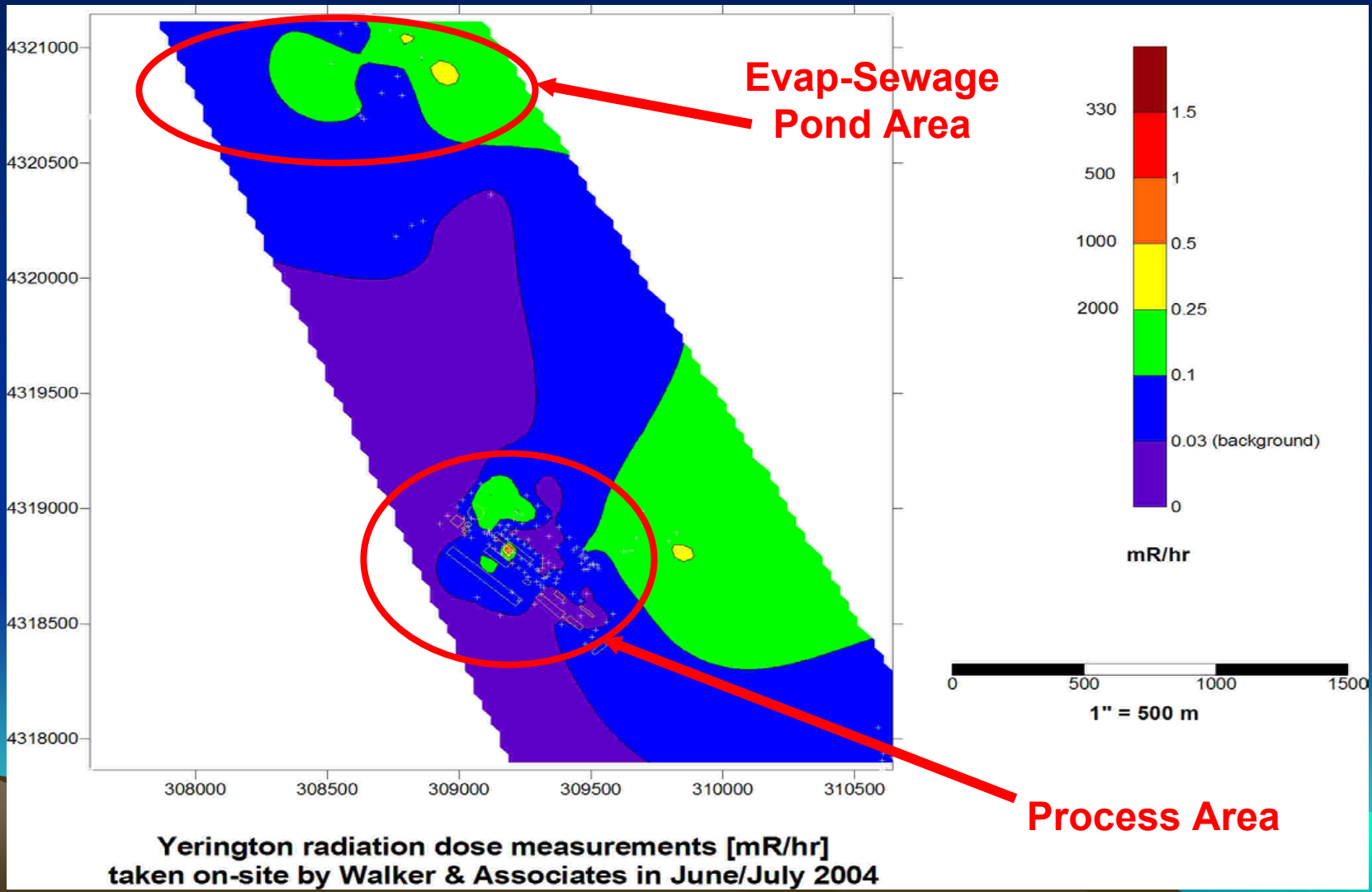
Yerington Process Area Gross Alpha radiation [pCi/g]

June 2004

Gross Alpha Radiation in pCi/g for Process Area & Northwest Mine Area Near Evaporation Ponds

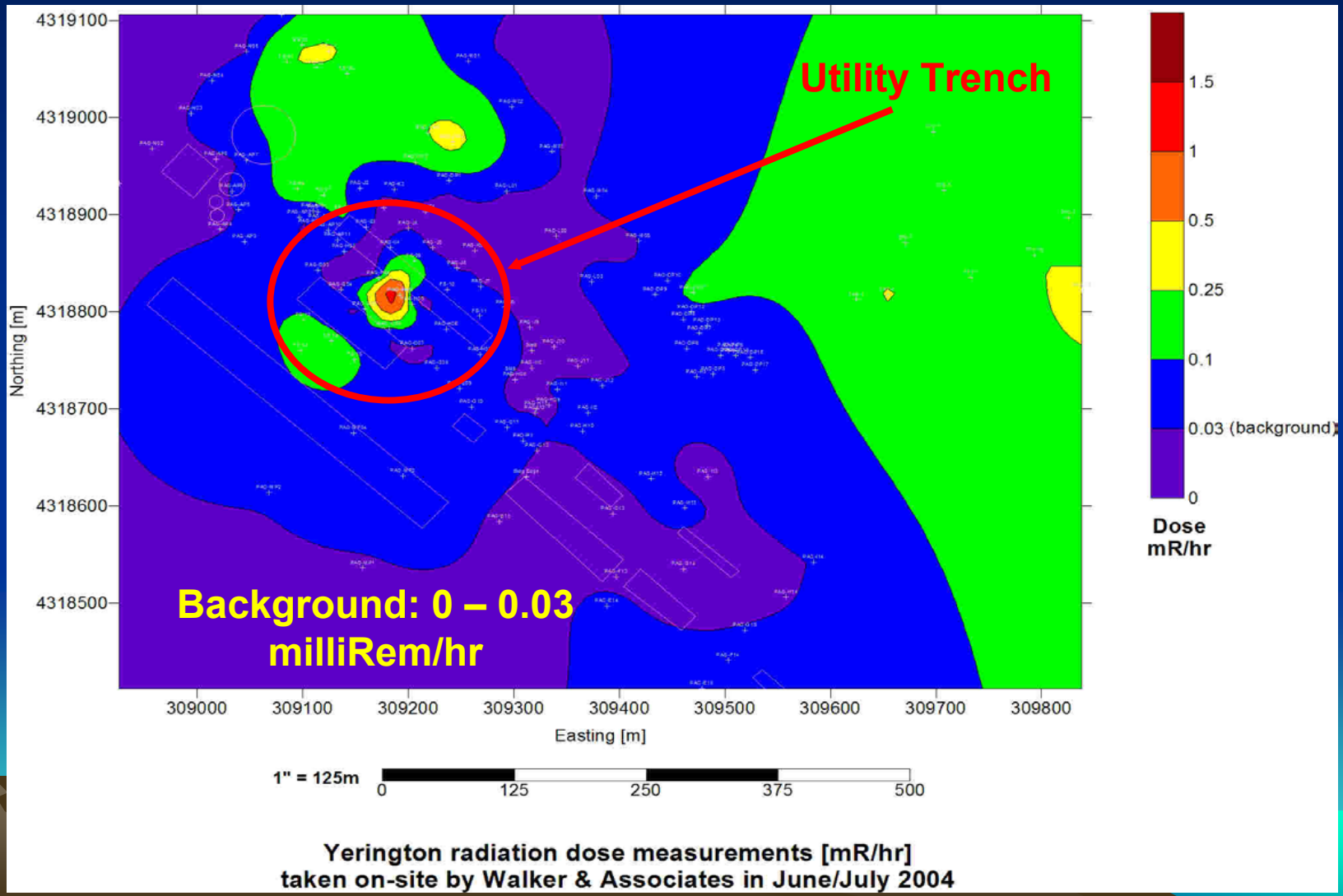


Radiation Dose Measurements in milliRem/hour (mR/hr) for Process Area & Northwest Part of Mine Near Evap Ponds



Yerington radiation dose measurements [mR/hr]
taken on-site by Walker & Associates in June/July 2004

Radiation Dose Measurements for Process Area and Southern Sulphide Pond Area



Yerington radiation dose measurements [mR/hr]
taken on-site by Walker & Associates in June/July 2004

Protocol for Sampling & Working in a Radiation Hazard Area

- Buddy system w/ one radiation detector/ 2 men both wearing dosimeters & carrying respirators
- SSO sets up work zone system to control contamination & provide clean areas
- CPM 300-500 then respirator & goggles
- CPM > 500 then Tyvec suite w/ tape, respirator & goggles under supervision of SSO
- Decontamination of tools, proper disposal of gloves, suits, and wash water

Summary of HASP Report

- Historical documents-photos, recent data & pre-HASP field work indicate Uranium-radioactivity in Cu ore, groundwater & waste rocks.
- BLM requires updated HASP for public land part of Process Area to support Work Plan under MOU.
- BLM conducted soil screening-sampling in June-July 2004 for radioactivity in Process Area & circuit to evap ponds at north end of Mine.

Summary of HASP Report

- Results indicate elevated levels of radioactivity in Process Area – circuit such that workers must take formal precautions to protect themselves.
- More evaluation required to comprehensively assess worker hazard during future investigations on Site.
- MOU agencies action plan developed to secure site & further evaluate radiological hazard including offsite conditions.