Nevada Site Specific Advisory Board

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Full Board Meeting Handouts for
Wednesday, November 28, 2012

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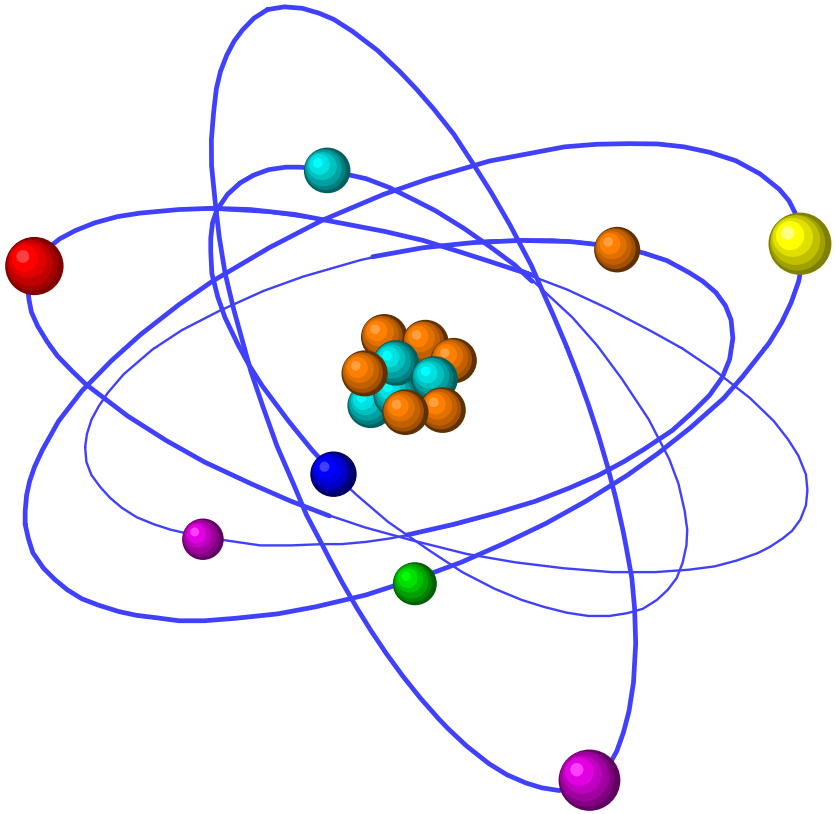
Fundamental Principles of Radiation

Kathryn Knapp
Environmental Monitoring Programs
Nevada Site Specific Advisory Board
November 28, 2012

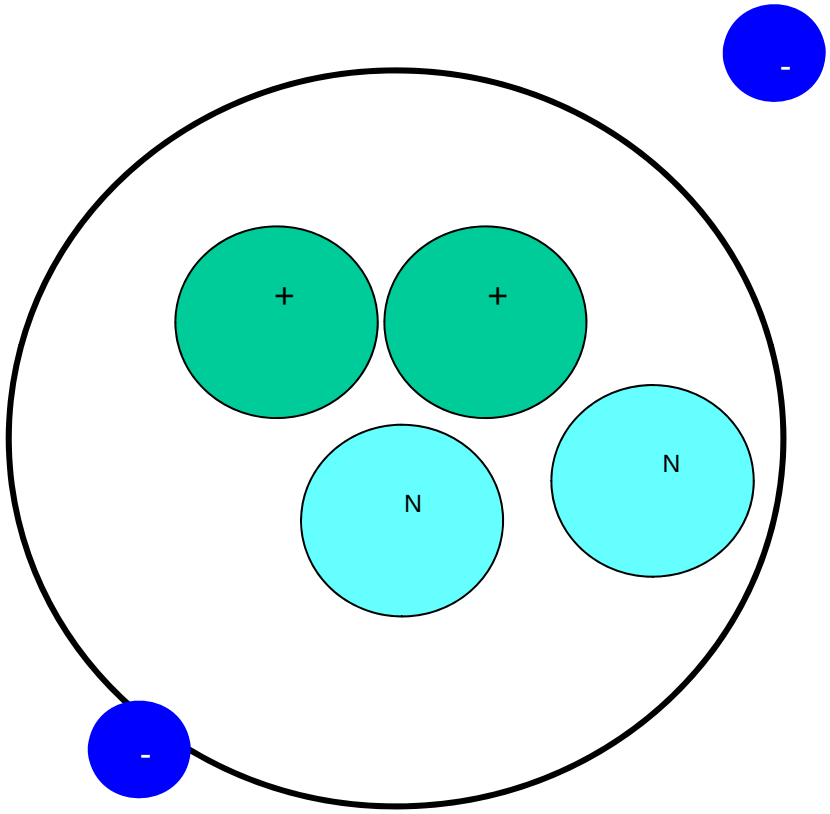
Fundamentals of Ionizing Radiation

What is an Atom?



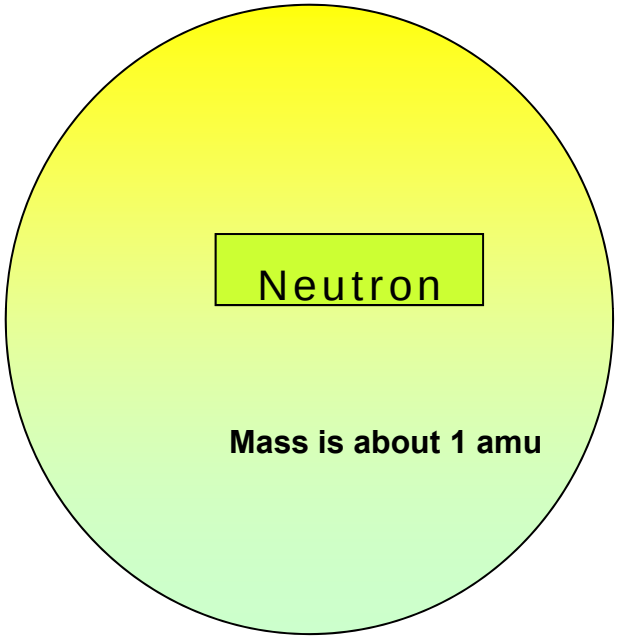
Atoms

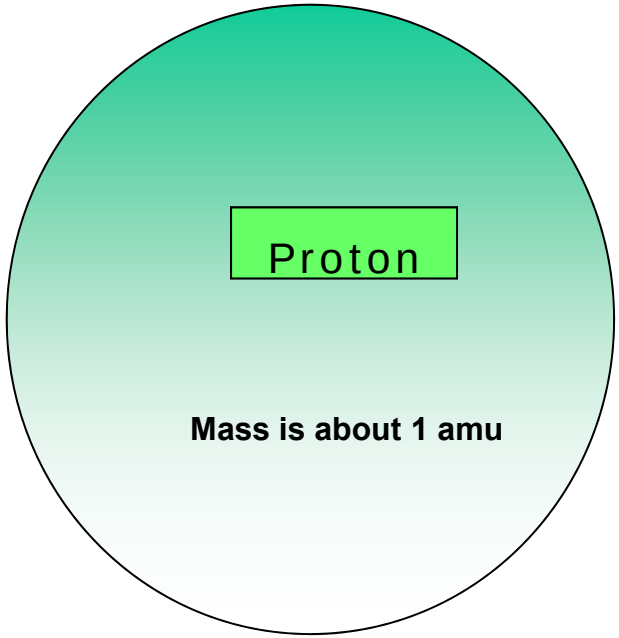
Atoms are the building blocks of ALL matter



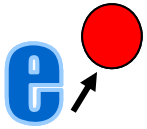
A Helium atom is used in this example

Nucleons





1 Atomic Mass Unit (amu) =
1.66×10^{-24} gram



Mass is about 0.0005 amu

Atoms

- Nuclear particles form atoms
- Similar atoms combine to form elements
- Elements combine to form molecules
- Molecules combine to form compounds

Isotopes

- The number of **PROTONS** defines the **ELEMENT**
- The number of **NEUTRONS** defines the **ISOTOPE**
- The isotopes of an element have similar chemical properties but different nuclear properties
  - Some isotopes are stable
  - Some isotopes are radioactive

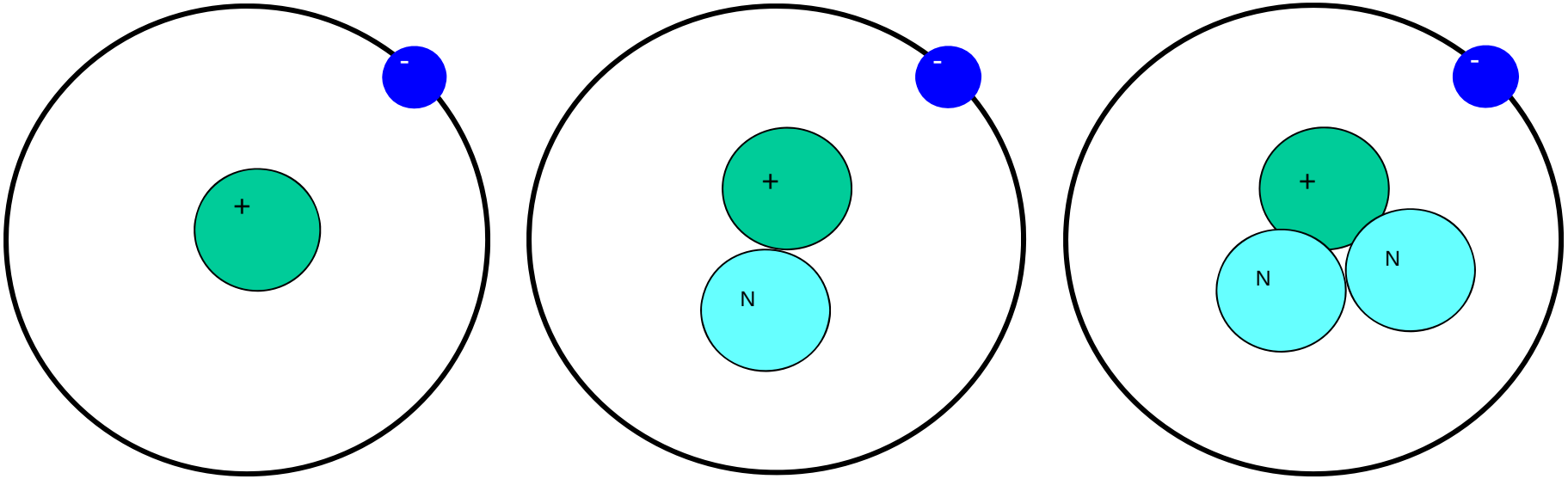
Isotopes

Different Isotopes of Hydrogen

"Normal" Hydrogen
or Protium
1 proton
0 neutron
1 electron
$_1H^1$

Deuterium
1 proton
1 neutron
1 electron
$_1H^2$

Tritium
1 proton
2 neutrons
1 electron
$_1H^3$



Isotopes and Atomic Notation

X = The symbol of the element

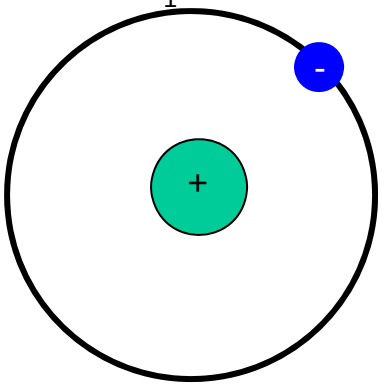
Z = The atomic number (# of protons)

$_{Z}X^{A}$

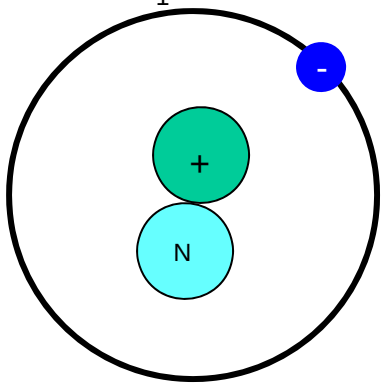
A = The atomic mass number (# of protons + neutrons)

Different Isotopes of Hydrogen

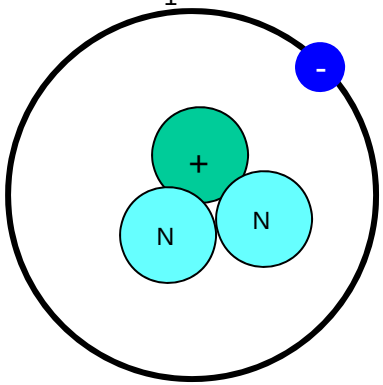
"Normal" Hydrogen or Protium
1 proton
0 neutrons
1 electron
$_{1}H^{1}$



Deuterium
1 proton
1 neutron
1 electron
$_{1}H^{2}$



Tritium
1 proton
2 neutrons
1 electron
$_{1}H^{3}$



Ionizing Radiation

Two Types of Radiation

- Non-Ionizing
- Ionizing

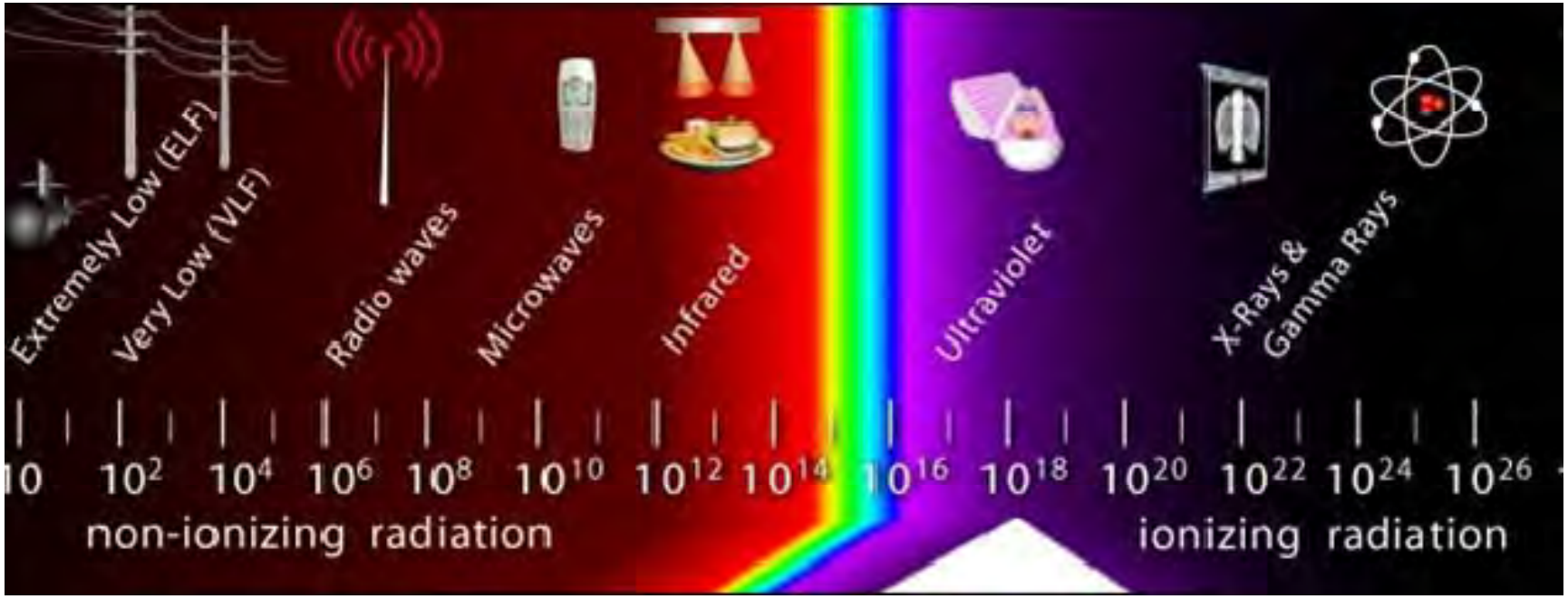
Non-Ionizing

Radiation that doesn't have enough energy to form ions:

- Radar Waves
- Microwaves
- Laser
- Visible Light

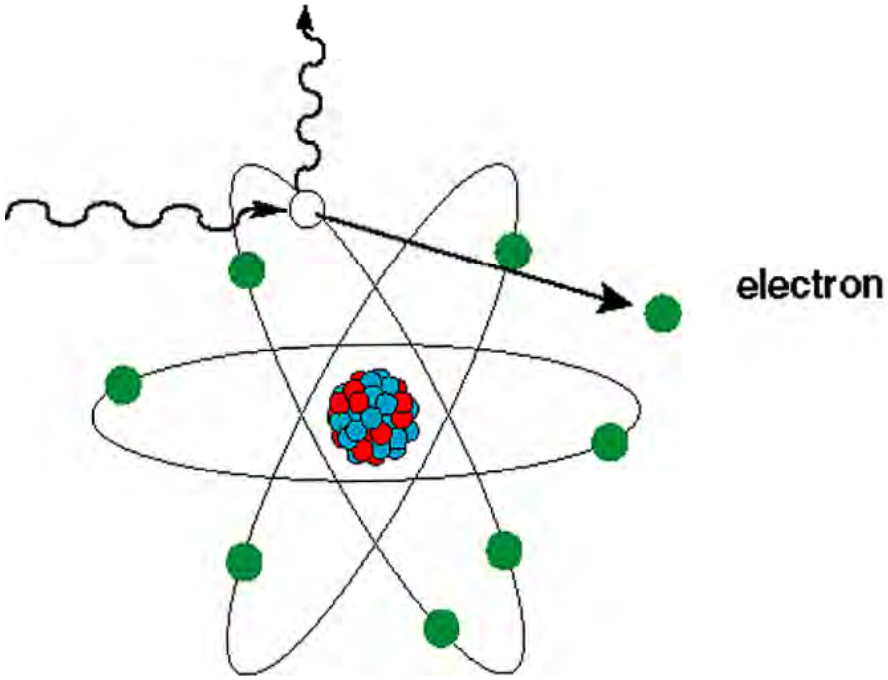
Electromagnetic Spectrum

The Electromagnetic Spectrum is a large family of radiation that includes light, infrared, ultraviolet, X-rays, radio waves, and gamma rays



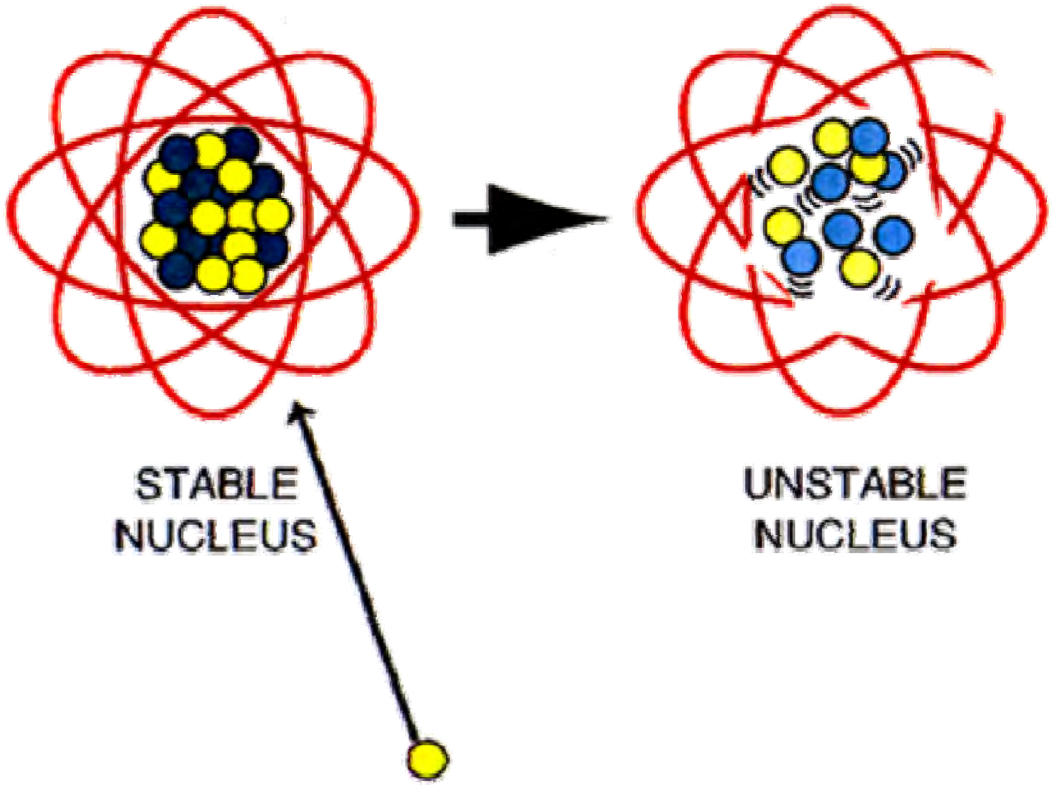
Ionizing Radiation

Excess energy (from unstable atoms) capable of removing orbiting electrons from an atom, producing electrically-charged particles called **ions**. The “free” electron (- charge) and the remaining atom (+ charge) are the ions.



Stability of Nucleus

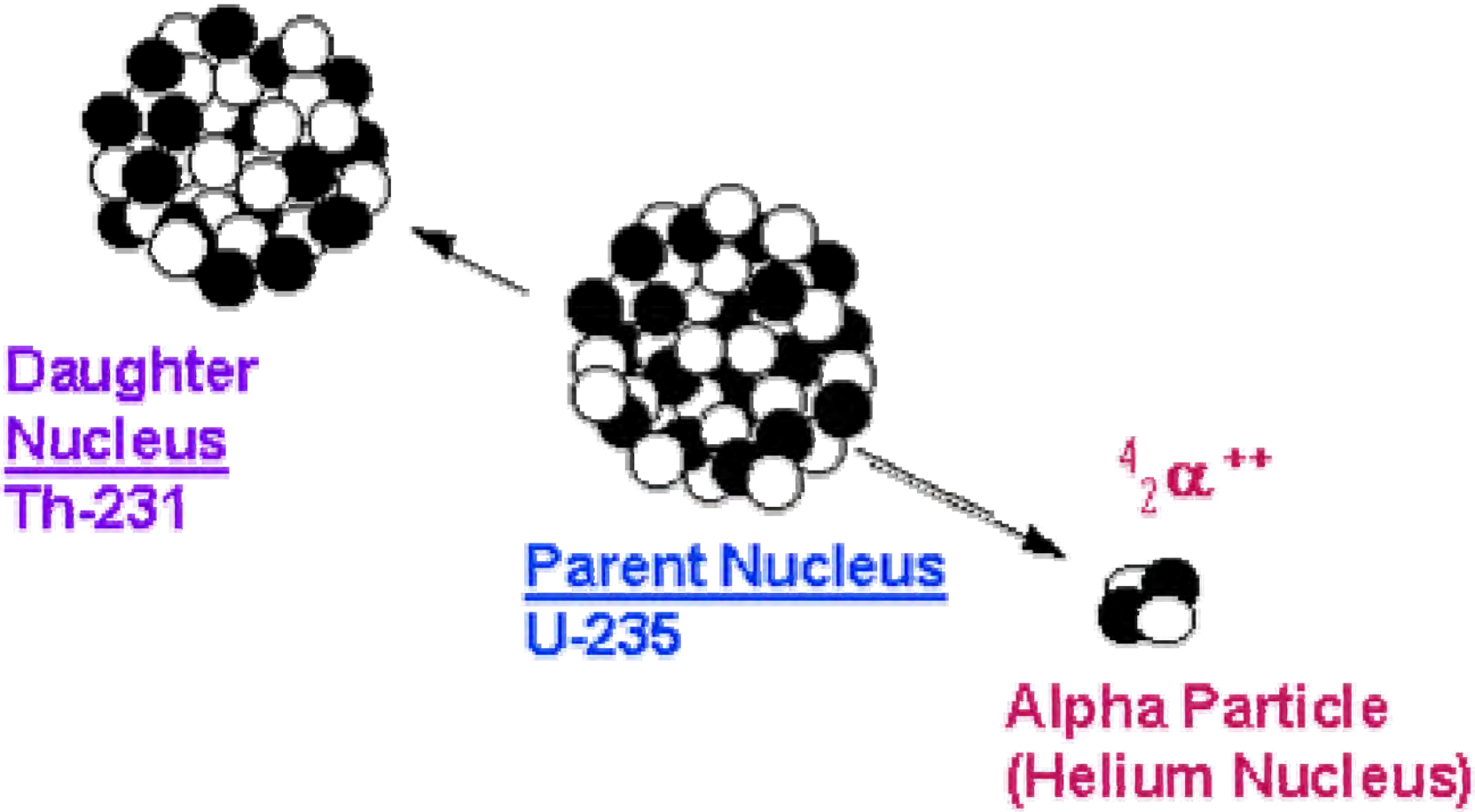
NUCLEI MAY BE STABLE OR UNSTABLE



Do any or all of the following:

- **Emit particle**
  - Alpha (α)
  - Beta (β)
  - **Positron**
  - **Neutron**
- **Emit EM radiation**
  - Gamma (γ)
- **Grab electron**
- **Split (fission)**

Alpha Particle Radiation

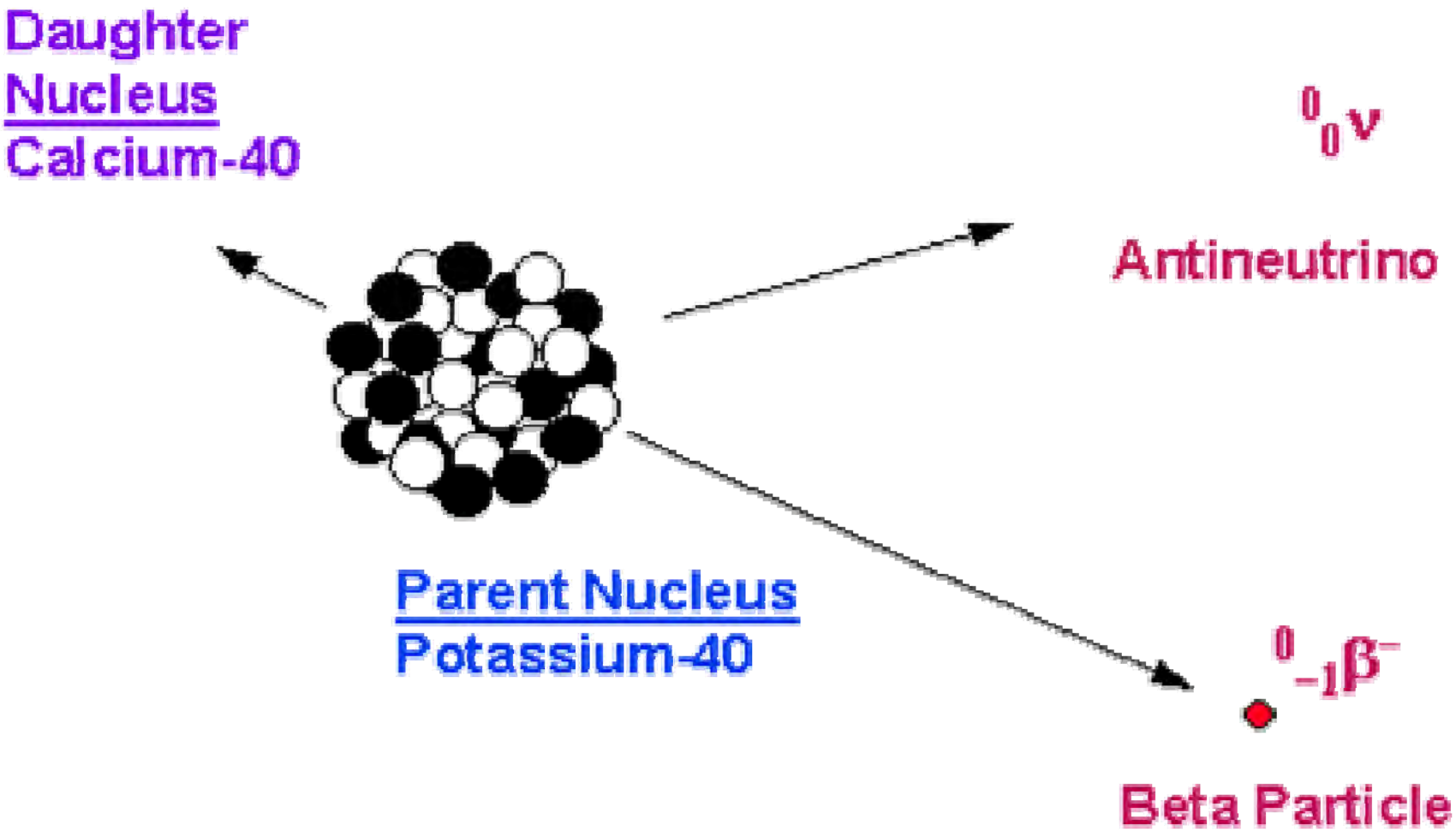


Alpha Particle Radiation
(continued)

Alpha

- Large, highly positive charged **particle**
- Range in air about 1 - 2 inches
- Shielding can be a piece of paper, clothing or even the dead outer layer of skin
- Biological hazard is inhalation or ingestion

Beta Particle Radiation

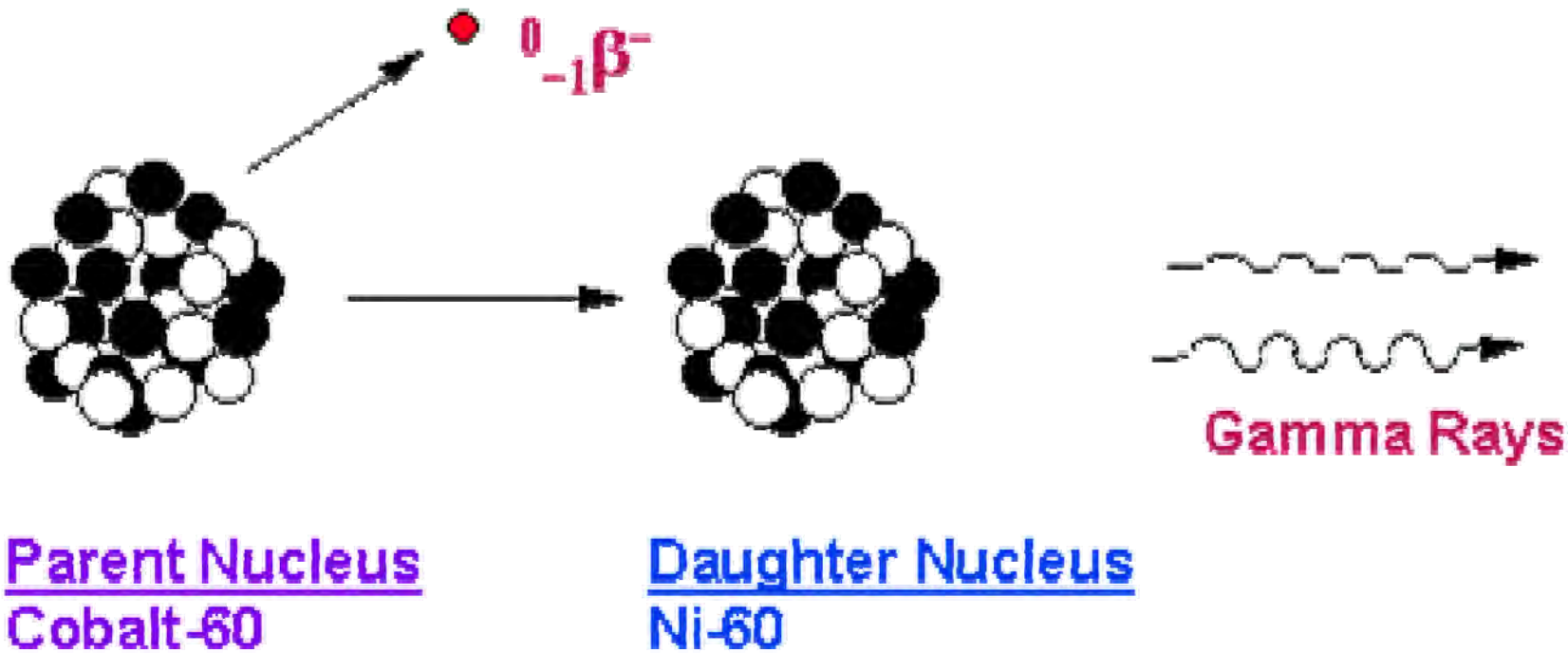


Beta Particle Radiation
(continued)

Beta

- Small, negative charged **particle**
- Range in air is about 10 feet
- Shielding can be plastic, glass, metal foil, or safety glasses
- Biological hazard is inhalation or ingestion
- Externally, the eyes and skin are at risk

Gamma-Ray Radiation



Gamma-Ray Radiation
(continued)

Gamma

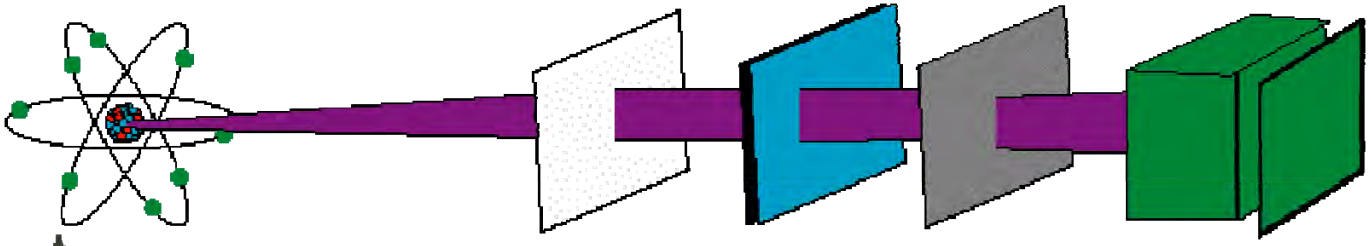
- Electromagnetic **waves** or photons that have no charge, similar to X-rays
- Range in air is several hundred feet
- Shielding is more difficult due to high penetrating power - dense materials (high Z number) such as concrete, lead, steel
- Biological hazard is whole body

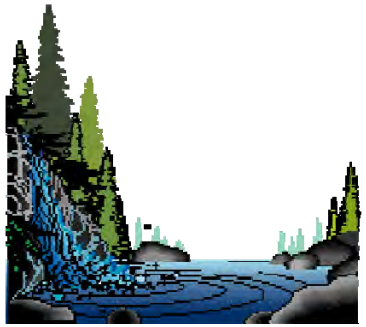
Neutron Radiation

are very penetrating;
therefore, they can affect all organs.

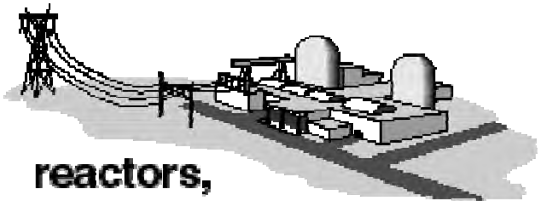
eyes are the
most susceptible

slowed by hydrogenous
materials and then absorbed
by cadmium or boron





few natural
emitters



reactors,
research accelerators

Neutron Radiation
(continued)

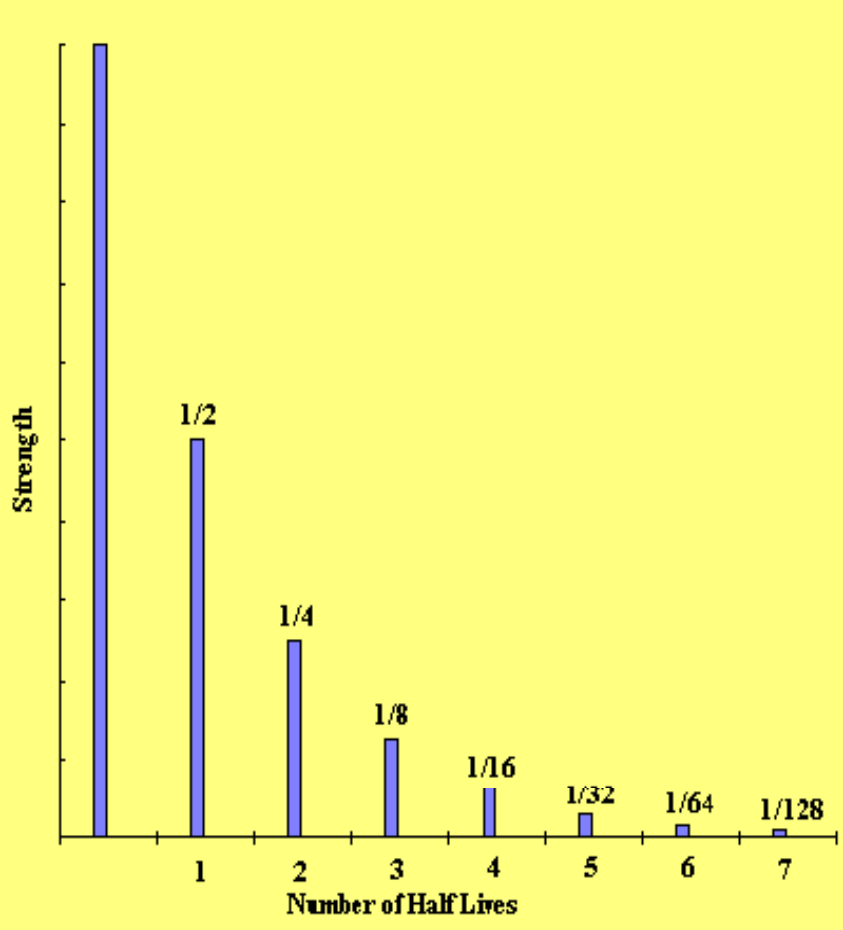
Neutron

- Neutral **particle** ejected from nucleus
- Range in air is several hundred feet
- Shielding is better with materials that have high hydrogen content - water, plastic, boron, and even paraffin (low Z number)
- Biological hazard is whole body due to high penetrating power

Radioactivity

Radioactivity is a natural and spontaneous process by which unstable radioactive atoms decay to a different state and emit excess energy in the form of radiation

Half-life (T½) is the amount of time required for radioactive material to decrease by one half; each radioisotope has a unique Half-life time period



Units of Measure

Units for Radiation Dose and Exposure

Roentgen (R)
Unit for measuring exposure
Defined only for effect on air
Applies only to gamma and X-ray radiation
Does not relate biological effects of radiation to the human body

Units for Radiation Dose and Exposure
(continued)

Rad (Radiation Absorbed Dose)
Unit for measuring absorbed dose in any material
Defined for any material
Applies to all types of radiation
Does not take into account the potential effect that different types of radiation have on the body

Units for Radiation Dose and Exposure
(continued)

Rem (Roentgen Equivalent Man)
Unit for measuring effective dose (most commonly used unit)
Pertains to human body
Applies to all types of radiation
Takes into account the energy absorbed (dose) and the biological effect on the body due to the different types of radiation

Units for Radiation Dose and Exposure
(continued)

Roentgen (R)	Rad (Radiation Absorbed Dose)	Rem (Roentgen Equivalent Man)
Unit for measuring exposure	Unit for measuring absorbed dose in any material	Unit for measuring dose equivalence (most commonly used unit)
Defined only for effect on air	Defined for any material	Pertains to human body
Applies only to gamma and X-ray radiation	Applies to all types of radiation	Applies to all types of radiation
Does not relate biological effects of radiation to the human body	Does not take into account the potential effect that different types of radiation have on the body	Takes into account the energy absorbed (dose) and the biological effect on the body due to the different types of radiation

Rem = Rad x WF

Not All Radiation is the Same

- Different radiation has different biological effects
- Radiation **WEIGHTING FACTORS**

Alpha = 20	α
Neutron = 5 - 20	η
Beta = 1	β
Gamma = 1	γ

Prefixes for Units

1 rem = 1,000 **m**rem (millirem)

1 mrem = 1,000 **µ**rem (microrem)

The same holds true for the new SI units, i.e.,

1 Sievert (Sv) = 1,000 **m**Sv (millisieverts)

1 mSv = 1,000 **µ**Sv (microsieverts)

Unit Conversions

	Source Activity (disintegrations per unit time)	**Exposure**	**Dose**
Old Units	Curie (Ci) = 37×10^9 dps dps = disintegrations per second	Roentgen (R) RAD or rad: radiation absorbed dose	Rem-roentgen equivalent man
New SI Units	Becquerel (Bq) 1 Bq – 1 dps 1 Ci – 37 GBq	Gray (Gy) 1 Gy – 100 rad 1 rad – 1 cGy	Sievert (Sv) 1 Sv – 100 rem 1 rem – 10 mSv

For gamma and x-ray radiation, a common "conversion factor" between exposure, absorbed dose, and dose equivalent is:

1 R = 1 rad = 1 rem

Sources of Radiation

Natural Sources of Radiation

- Cosmic radiation
- Terrestrial radiation
- Radon
- Human body

Man-made Sources of Radiation

- Medical radiation
- Nuclear Power
- Consumer products
- Industry and Research
- Other minor sources

Average Annual Dose

Cosmic radiation – 30 mrem/yr @ sea level

Terrestrial radiation – 19 mrem/yr

Radon – 230 mrem/yr

Human body – 31 mrem/yr

Consumer products – 12 mrem/yr

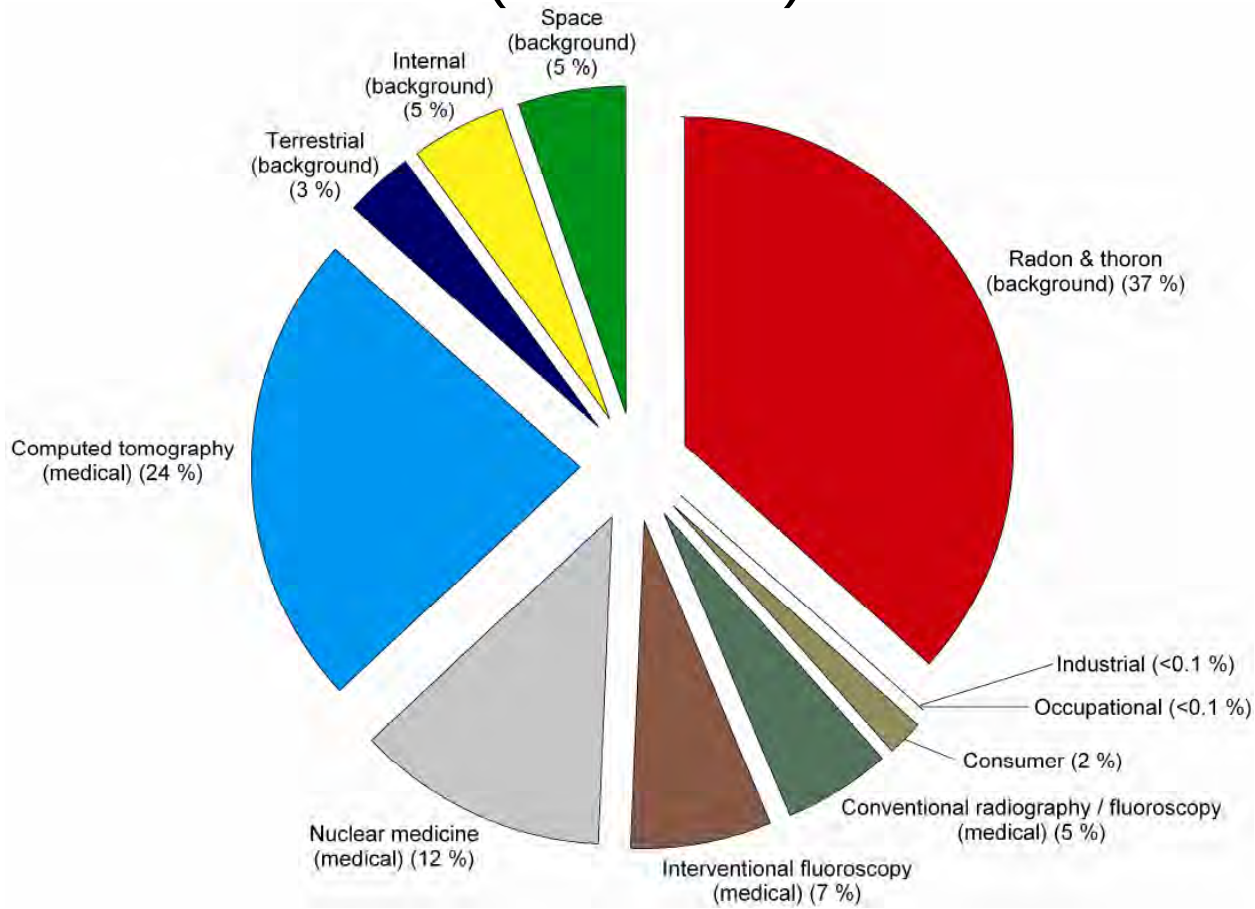
Nuclear power, industry, research – <1 mrem/yr

Average Annual Total – 322 mrem/yr

Medical radiation – 298 mrem/yr

Average Annual Total including medical radiation – 620 mrem/yr

Average Annual Dose
(continued)

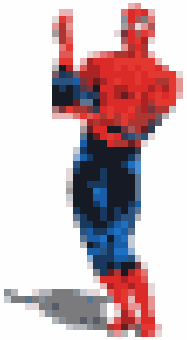


From NCRP Report No. 160, “Ionizing Radiation Exposure of the Population of the United States” (2009)

Biological Effects of Radiation Exposure

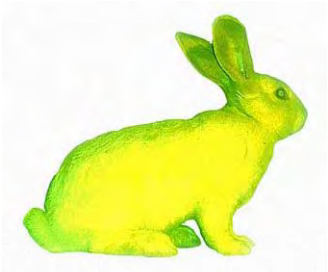
Exposure to radiation will cause none of these things to happen

You will not get super powers



Radiation does not cause things to grow larger

You will not turn green



You will not glow in the dark

Two Categories of Radiation Dose

- Acute
- Chronic

Acute Radiation Doses

- An acute effect is a physical reaction due to massive cell damage
- Damage caused by a large amount of radiation in a short period of time

Acute Radiation Dose Effects

Blood changes	25 – 100 Rad
Anorexia (loss of appetite)	150 Rad
Nausea	200 Rad
Fatigue	220 Rad
Vomiting	280 Rad
Epilation	300 Rad
Diarrhea	350 Rad
Mortality (w/o supportive care)	350 Rad
Mortality (with supportive care)	500 Rad

Chronic Radiation Doses

- Chronic radiation dose is typically a small amount of radiation received over a long period of time
- Example: the dose we receive from natural background radiation every day of our lives

Chronic Radiation Dose Effects

- The principal effect of chronic radiation dose is increased risk of contracting cancer
- No increased risk of cancer has been observed in individuals who receive radiation dose at occupational levels (500 – 5,000 mrem/yr)
- No observable radiation effects in humans below a one-time dose of about 10,000 mrem

Possible Effects of Radiation on Cells

When a cell is exposed to ionizing radiation, several things can happen:

- No damage
- Cells repair the damage and operate normally
- Cells are damaged and operate abnormally
- Cells die as a result of the damage

Factors Affecting Biological Damage from Radiation

- Total dose
- Dose rate
- Type of radiation
- Area of the body receiving the dose
- Cell sensitivity
- Individual sensitivity

Genetic Effects

There is no direct evidence of radiation-induced genetic effects in humans, even at high doses. Various analyses indicate that the rate of genetic disorders produced in humans is expected to be extremely low, on the order of a few disorders per million live born per rem of parental exposure.

Comparison of Risks

Health Risk	***Estimate of Life Expectancy Lost***
Smoking 20 cigarettes a day	6 years
Overweight (by 15%)	2 years
Alcohol consumption (U.S. average)	1 year
Agricultural accidents	320 days
Construction accidents	227 days
Automobile accidents	207 days
Home accidents	74 days
1 rem/yr from age 18 to 65	**51 days**
All natural hazards (earthquake, etc.)	7 days
Medical radiation	6 days

Radiation Protection

ALARA

As

Low

As

Reasonably

Achievable

ALARA Exposure Practices

There are three basic practices used to maintain exposures to ALARA:

TIME	Reduce Exposure Time
DISTANCE	Increase Distance
SHIELDING	Use Shielding

Time

DOSE RATE: Energy per unit time

DOSE: Total energy absorbed

Dose = (Dose rate) x Time

Example of dose rate: 100 mrem/hr

Time
(continued)

DOSE RATE: Energy per unit time

DOSE: Total energy absorbed

Dose = (Dose rate) x Time

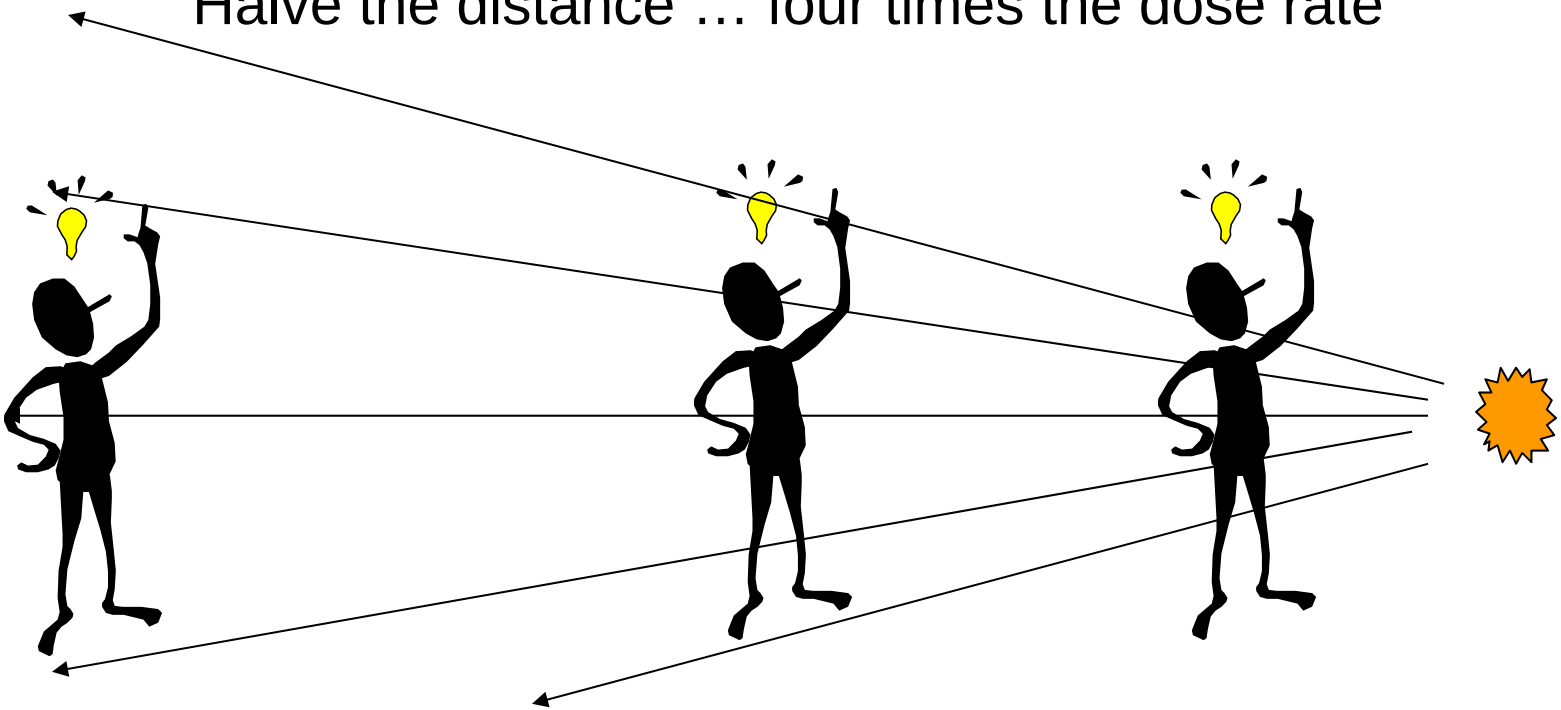
Example of dose rate: 100 mrem/hr

- If you stayed in this *dose rate* for an hour, what would your *total dose* be?
- What would your *dose* be after 15 minutes?
- If your allowed total dose is 75 mrem, what is your stay time?

Distance

Inverse Square Law

Double the distance … ¼ the dose rate
Halve the distance … four times the dose rate



Distance
(continued)

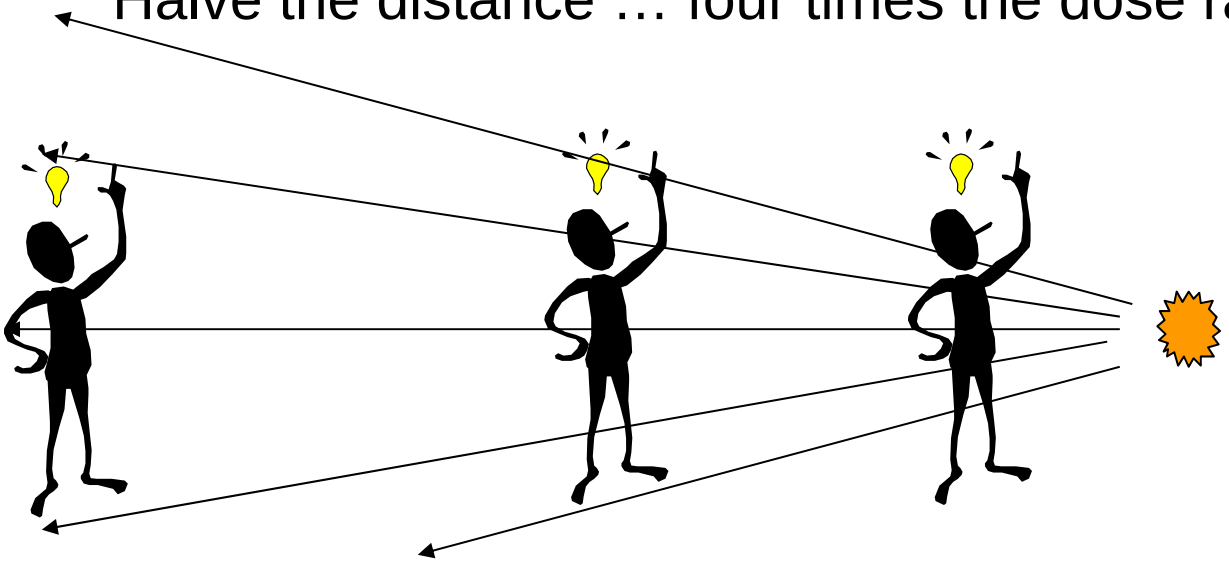
Inverse Square Law

$R1\ D1^2 = R2\ D2^2$

R = Radius, D = Dose Rate

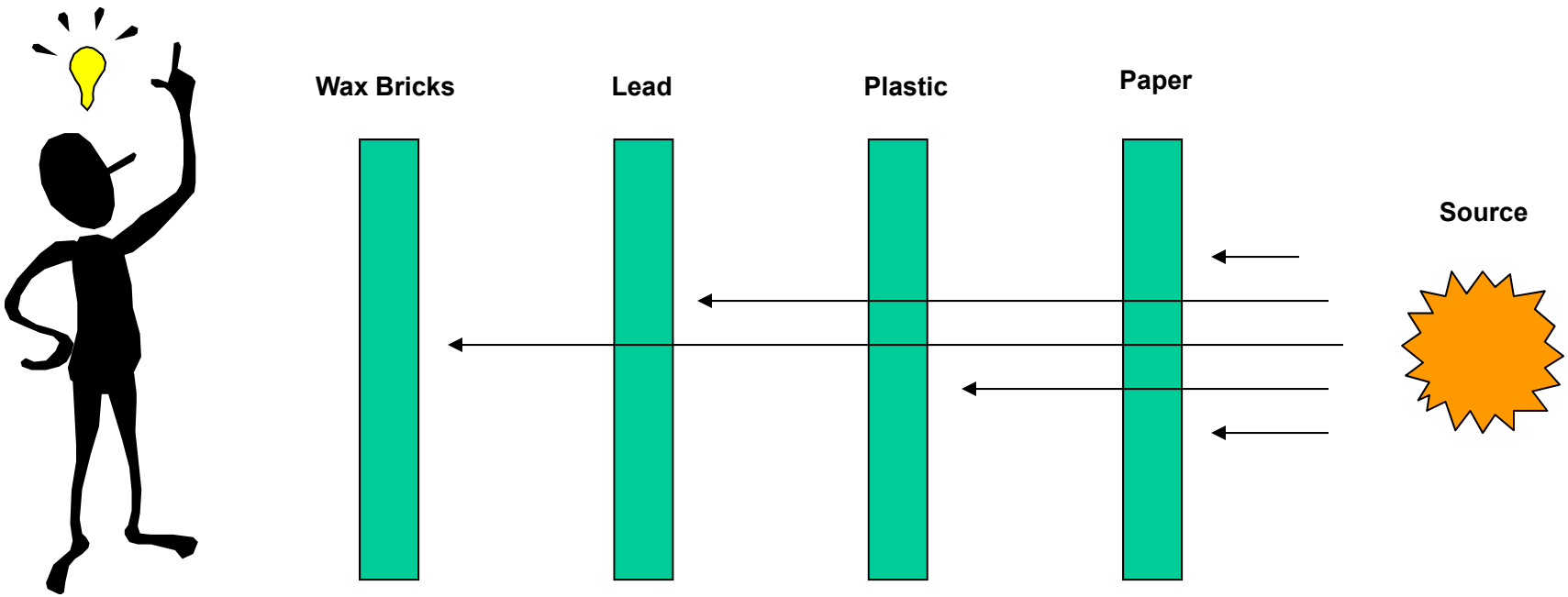
Double the distance … ¼ the dose rate

Halve the distance … four times the dose rate

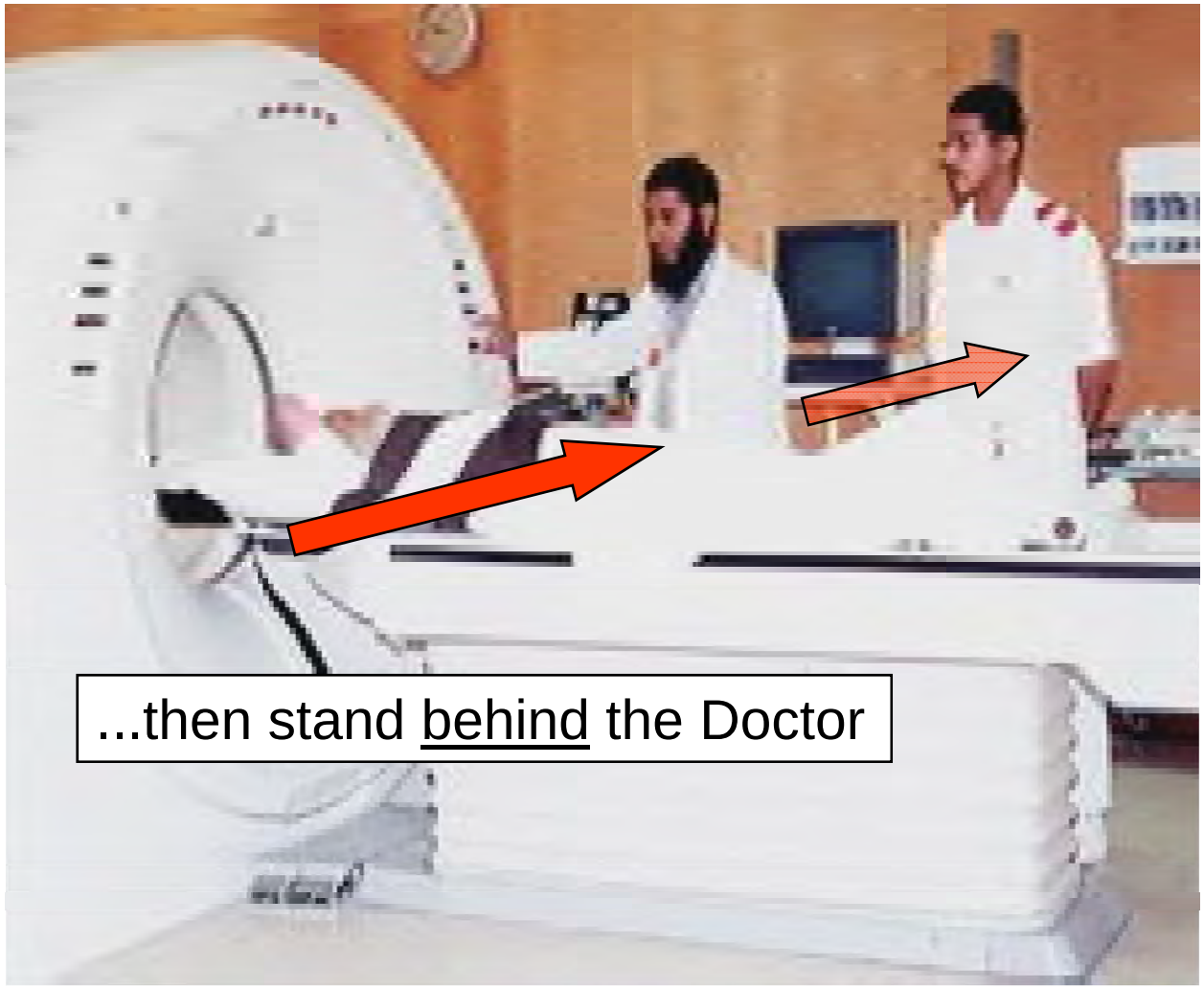


Shielding

Shielding: Material between you and the source



Shielding:
If you can't be in the shielded booth...


...then stand behind the Doctor

Radiation Dose Limits*

	Mrem
Annual limit for occupational workers	5,000
Annual limit for member of public	100

* Limits for radiation exposure above background radiation (620 mrem/yr U.S. average from all sources)

ALARA

Radiation exposure to the work force and general public shall be controlled such that exposures are well below regulatory limits and that there is:

no radiation exposure without an equal benefit

AGENDA

NSSAB FULL BOARD MEETING

Atomic Testing Museum (Frank Roberts Auditorium)
755 East Flamingo Road, Las Vegas, NV

November 28, 2012

5:00 PM - 5:05 PM	**Open Meeting / Introductions**	**Barb Ulmer**, Facilitator
5:05 PM - 5:10 PM	**Chair's Opening Remarks** ▪ Agenda approval	**Kathleen Bienenstein,** Chair
5:10 PM - 5:40 PM	**Liaison Updates**	
	▪ Clark County	Phil Klevorick
	▪ Elko County Commission	Demar Dahl
	▪ Nye County Nuclear Waste Repository Project Office	John Klenke
	▪ Nye County Commission	Joni Eastley
	▪ West Career and Technical Academy	Marcy Brown/Donna Hruska
	▪ Update on Student Project	
	▪ State of Nevada Division of Environmental Protection	Tim Murphy
	▪ U.S. National Park Service	Genne Nelson
	▪ U.S. Department of Energy	Scott Wade
5:40 PM - 5:45 PM	**Public Comment**	**Barb Ulmer**, Facilitator
5:45 PM 5:55 PM	**U-233 Waste Update**	**Scott Wade,** DOE
5:55 PM - 6:05 PM	**Break**	**Barb Ulmer**, Facilitator
6:05 PM - 7:15 PM	**Nye County Drilling Proposal (Work Plan Item #4)**	**Barb Ulmer**, Facilitator
6:05 PM - 6:35 PM	▪ Nye County Presentation	**Levi Kryder,** NWRPO
6:35 PM - 6:55 PM	▪ DOE Presentation	**Bill Wilborn,** DOE
6:55 PM - 7:15 PM	▪ NSSAB Discussion and Determine Path Forward	**Kathleen Bienenstein,** Chair
7:15 PM - 8:00 PM	**Industrial Sites - Closing Use Restriction Sites (Work Plan Item #2)**	**Barb Ulmer**, Facilitator
7:15 PM - 7:45 PM	▪ DOE Presentation	**Tiffany Lantow,** DOE

7:45 PM -	8:00 PM	▪ NSSAB Discussion and Determine Path Forward	**Kathleen Bienenstein,** Chair

8:00 PM -	**8:30 PM**	**Other NSSAB Business:**
		▪ EM SSAB Chairs Meeting Synposis (October 2012)
		  ▪ Discuss and vote on four draft recommendations
		  ▪ Status of NSSAB Sponsored Recommendation Letter
		▪ Transportation Working Group Update
		▪ NNSS Tour Update (November 14)
			Kathleen Bienenstein, Chair

8:30 PM	**8:35 PM**	**Meeting Wrap-up/Adjournment**	**Barb Ulmer**, Facilitator

NSSAB MEETING ATTENDANCE

Full Board Meetings

October 2012 through September 2013 (FY 2013)

Name	11/28/12	1/16/13	4/17/13	5/15/13	8/21/13	9/18/13	Maximum Terms Limit
MEMBERS							
Jason Abel	√						2018
Kathleen Bienenstein	√						2014
Ed Brown	E						2018
Matthew Clapp	√						2017
Thomas Fisher	√						2017
Arthur Goldsmith	√						2017
Donna Hruska	√						2016
Cheryl Kastelic	√						2018
Janice Keiserman	√						2018
Barry LiMarzi	√						2017
Michael Moore	√						2016
Edward Rosemark	√						2018
William Sears	√						2018
Jack Sypolt	√						2017
James Weeks	√						2013
LIAISONS							
Marcy Brown	E						2013
Demar Dahl	√						
Joni Eastley	√						
John Klenke	√						
Phil Klevorick	√						
Tim Murphy	√						
Genne Nelson	E						
Scott Wade	√						

Key:

√ = Present

E = Excused U = Unexcused

RM = Removed RS = Resigned

Term Limit

Nevada Site Specific Advisory Board

Members
Jason Abel
Kathleen Bienenstein, *Chair*
Edward Brown
Matthew Clapp
Thomas Fisher, PhD
Arthur Goldsmith
Donna Hruska, *Vice Chair*
Cheryl Kastelic
Janice Keiserman
Barry LiMarzi
Michael Moore
Edward Rosemark
Williams Sears
Jack Sypolt
James Weeks

Liaisons
Clark County
Elko County Commission
Nye County Commission
Nye County Nuclear Waste Repository Project Office
State of Nevada Division of Environmental Protection
U.S. Department of Energy, Nevada Site Office
U.S. National Park Service
West Career and Technical Academy (Clark County School District)

Administration
Barbara Ulmer, Administrator
Navarro-Intera
Kelly Snyder, DDFO
U.S. Department of Energy, Nevada Site Office

November 29, 2012

West Career and Technical Academy
11945 West Charleston Blvd.
Las Vegas, NV 89135

Dear WCTA Teachers,

The Nevada Site Specific Advisory Board (NSSAB) is a federally appointed group of southern Nevada citizens who provide informed recommendations to the U.S. Department of Energy (DOE), Nevada Site Office Environmental Management program at the Nevada National Security Site (NNSS) [formerly known as the Nevada Test Site].

Ms. Marcy Brown, a WCTA senior, has been appointed as the student liaison on the NSSAB. As part of her liaison responsibilities, Ms. Brown is developing a briefing that she would like to present to your students during the school day, and we are asking for your support in this effort. Ms. Brown's briefing will touch on the history and current activities at the NNSS, and the responsibilities of the NSSAB.

Please find enclosed a WCTA Student Liaison Project handout that provides the goals and timelines for this project.

The NSSAB appreciates Ms. Brown's youth perspective on environmental management concerns and hope her student project will provide a unique learning opportunity for all the WCTA students.

If you have any questions, please feel free to contact the NSSAB Office at (702) 630-0522 or visit the NSSAB website at www.nv.energy.gov/NSSAB. Thank you for your consideration in support of this student activity. NSSAB appreciates all the efforts of the teachers and staff at WCTA.

Sincerely,

Kathleen Bienenstein, Chair Kelly Snyder, Department of Energy

Enclosure: WCTA Student Liaison Project

cc: D. Leberger, WCTA, Las Vegas, NV
K. Semmler, WCTA, Las Vegas, NV
B. Ulmer, N-I, Las Vegas, NV
NSSAB Membership Committee

DRAFT

West Career and Technical Academy (WCTA) Student Liaison Project

Primary Goal: Develop a project (e.g., brochure, app, video, paper, etc) which could be shared with high school students to increase their knowledge of an aspect of the Environmental Management Program (groundwater, radioactive waste disposal, monitoring, geology, etc) at the Nevada National Security Site.

Secondary Goal: Allow Ms. Brown to enhance her portfolio, increase her community service participation, and establish relationships with professionals in her planned career path.

Fall 2012

Tasks:

- After orientation, Ms. Brown will develop 2-3 proposals for a project she will complete during the 2012-2013 school year that relates to the U.S. Department of Energy Environmental Management Program at the Nevada National Security Site (October - November) COMPLETED
- Ms. Brown will present the 2-3 proposals to the NSSAB Membership Committee and the Committee will select which project Ms. Brown will complete (November 26, 2012) COMPLETED
- Ms. Brown begins developing a presentation that will be presented to WCTA students (December)

Spring 2013

Tasks:

- Ms. Brown continues to develop the presentation (December - January)
- Ms. Brown will present the draft presentation to the NSSAB Membership Committee (January, date TBD)
- Ms. Brown will attend NSSAB Full Board meeting and provide the status of the project during liaison updates (January 16 at 5 pm)
- Ms. Brown will present project to WCTA Engineering and Environmental Science students and measure results through a questionnaire (February – April)
- Ms. Brown will attend NSSAB Full Board meeting and provide the status of the project during liaison updates (April 17 at 5 pm)
- Ms. Brown will attend NSSAB Full Board meeting and provide a formal presentation of the final project (May 15 at 5 pm)

Support:

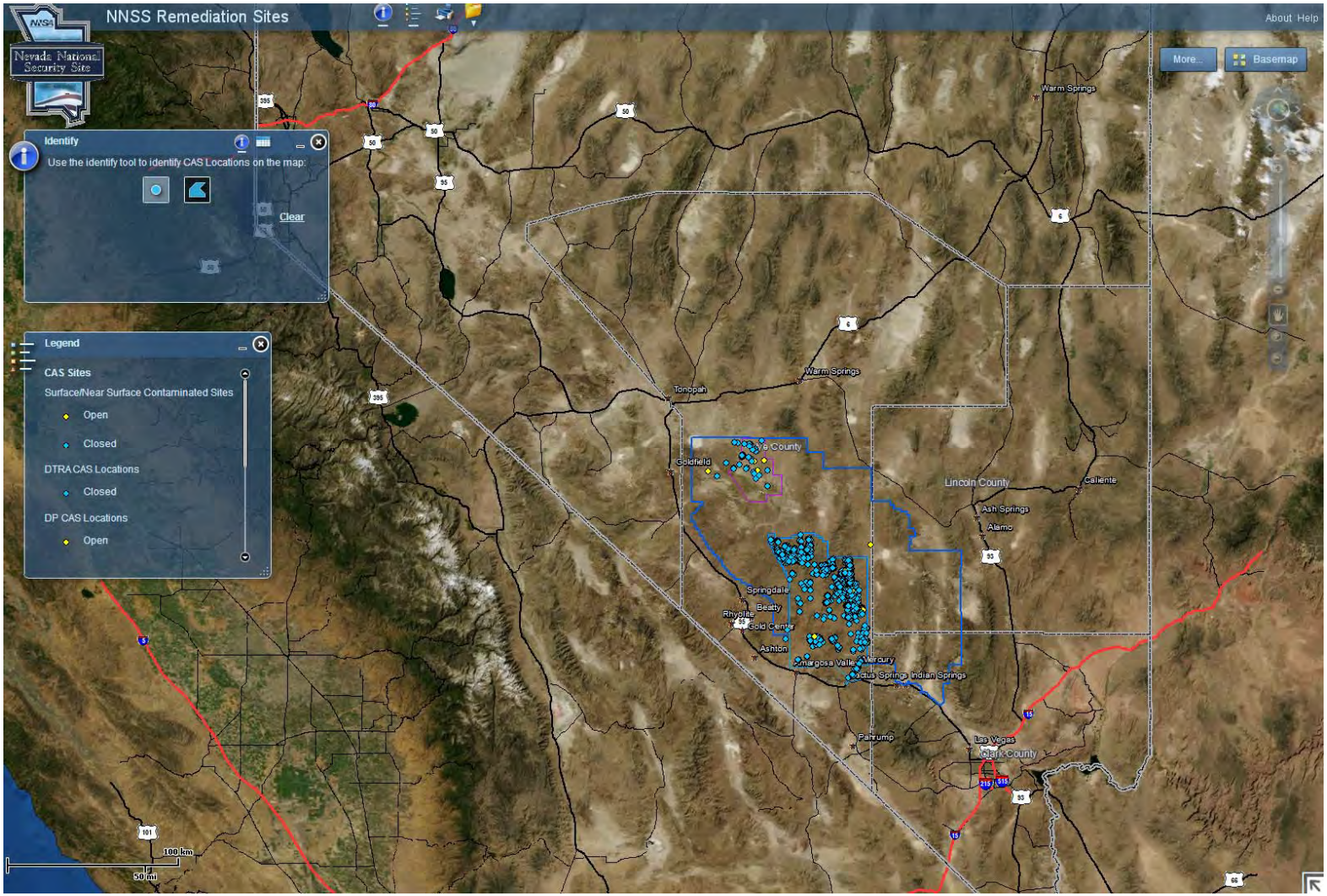
NSSAB Mentor - Michael Moore, NSSAB member, has volunteered to act as a mentor regarding NSSAB activities. Mr. Moore can be reached at 702-434-9765 or mooremj@digimechs.com

Department of Energy- there are a variety of professional (scientists, engineers, geologists, communications, hydrologists, etc) that are available to assist in the development of the educational tool. Contact Kelly Snyder at 702-295-2836 or snyderk@nnsa.doe.gov for assistance.

NSSAB Office – Barb Ulmer, NSSAB administrator, can assist in all items related to NSSAB meetings and communication. Ms. Ulmer can be reached at 702-630-0522 or nssab@nnsa.doe.gov

http://nnssremediation.dri.edu

Historic nuclear research and testing in Nevada resulted in some environmental contamination. The locations of this contamination are identified and categorized in a legal agreement between the U.S. Department of Energy (DOE), Department of Defense, and the State of Nevada. This map depicts these sites on the Nevada National Security Site and the surrounding Nevada Test and Training Range, and provides information on environmental restoration activities that have or will be conducted.



Far-Field Hydrogeologic Characterization Relevant to Underground Nuclear Test Areas -- Nye County Proposal --

Levi Kryder

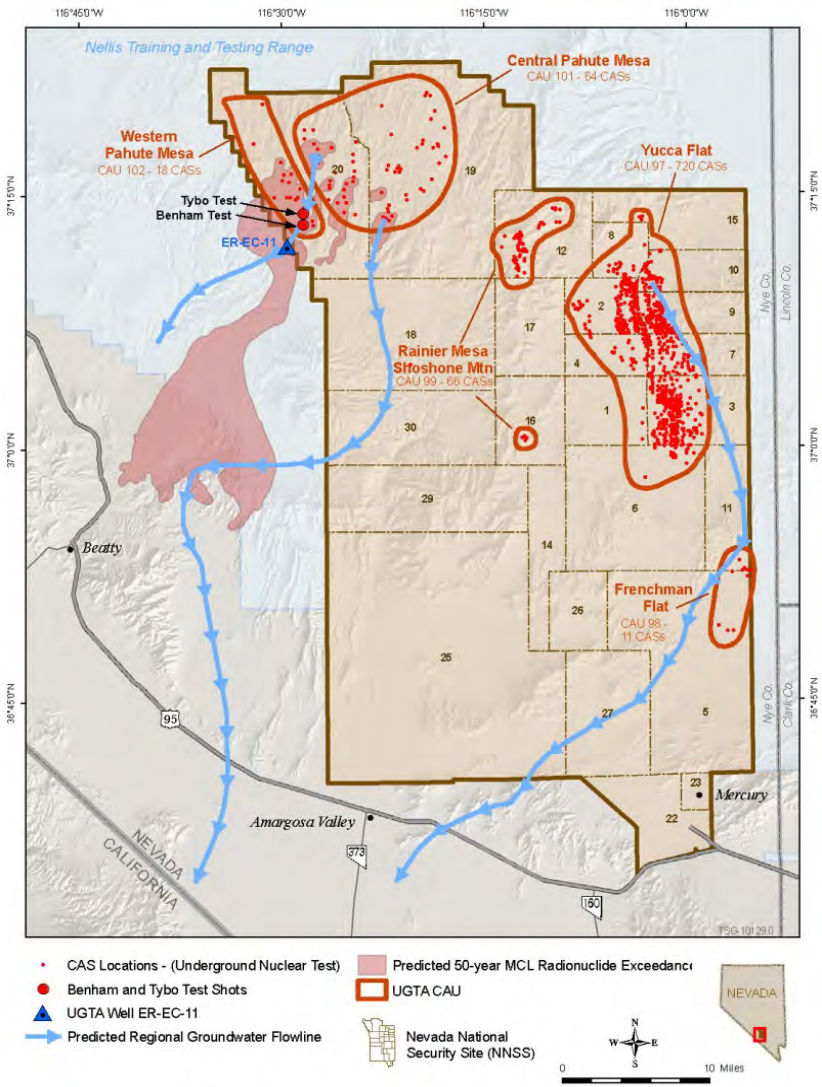
Nye County Nuclear Waste Repository Project Office

Outline

- Introduction
  - Purpose
  - Qualifications
- Proposed Activities
  - Shallow Piezometer Drilling Program
  - Hydrogeologic Characterization Wells
  - Water Chemistry Monitoring
  - Water Level Monitoring
  - Data Management, Analysis, and Reporting
- Budget
- Conclusions
- Contact Information

Introduction

- Radionuclides from legacy underground nuclear tests on Pahute Mesa are being transported southwest through Oasis Valley toward the residents of Beatty; these contaminants are predicted by UGTA's groundwater model to reach populated area in as little as 50 years.
- Radionuclides are moving – DOE has documented tritium detection at wells ER-EC-11 (12,500 pCi/L) and PM-3 (<64 pCi/L) off the NNSS.

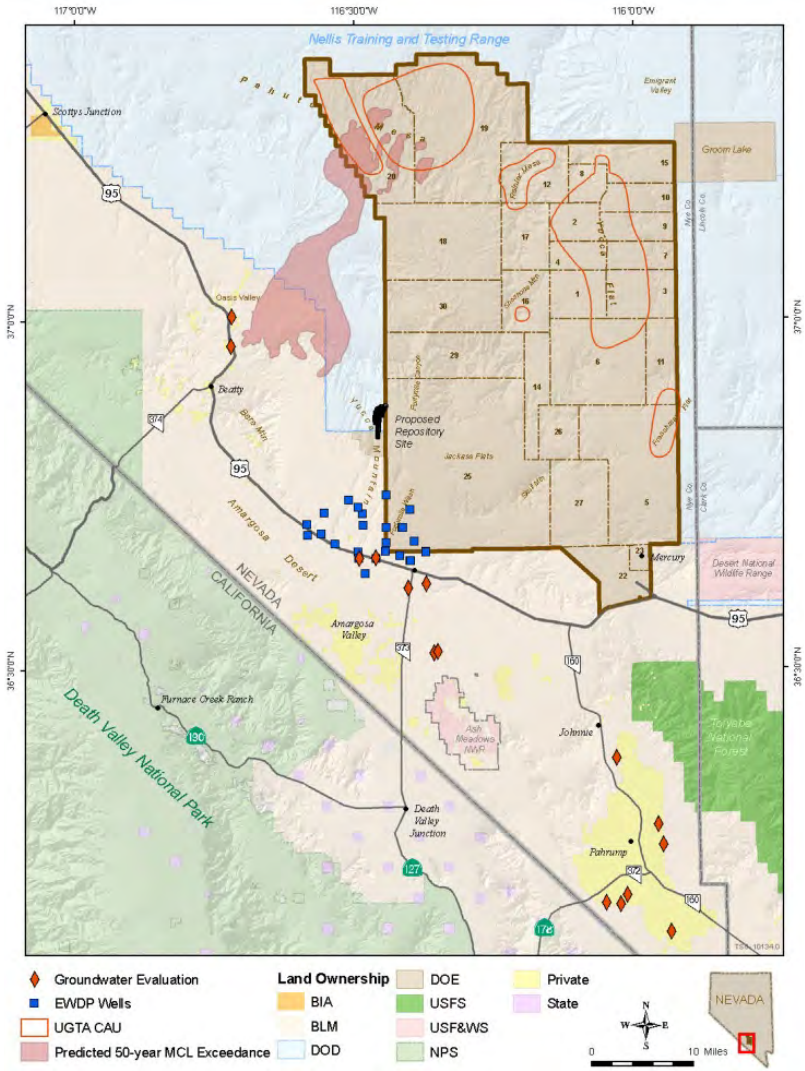


Introduction

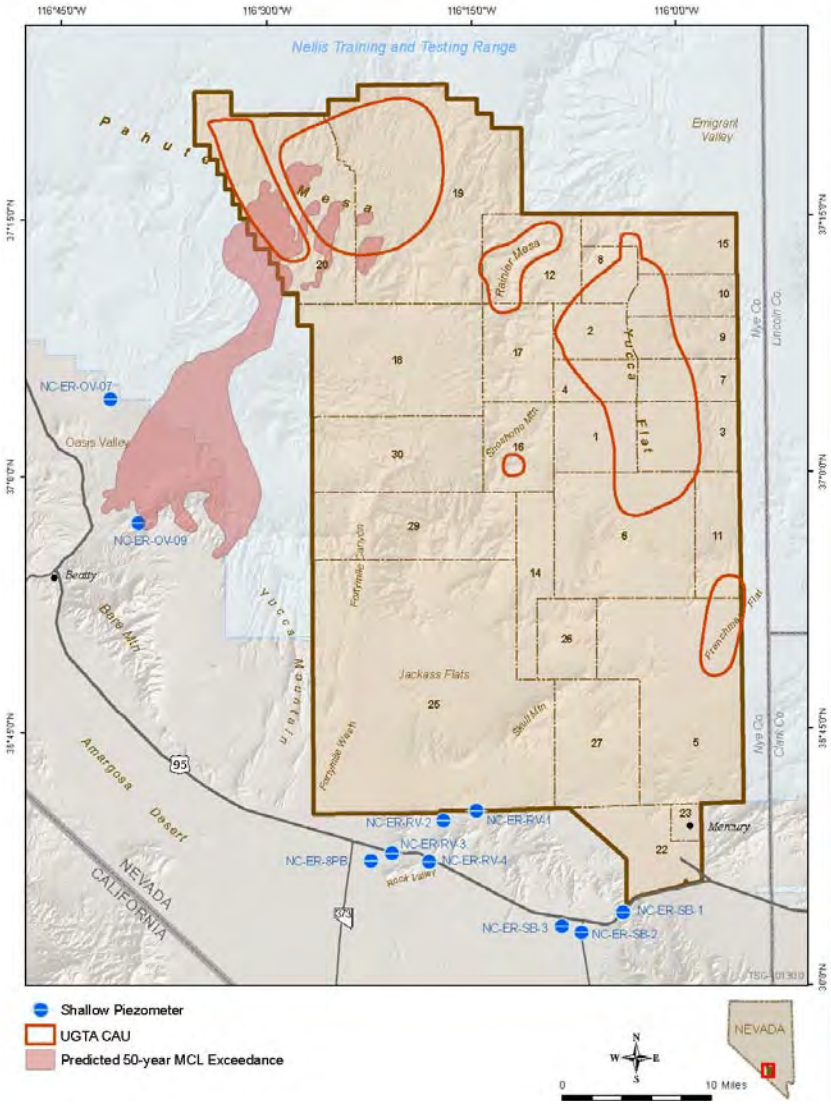
- The Nye County NWRPO is committed to protecting the health, safety, and interests of Nye County citizens with respect to activities conducted by DOE regarding radioactive waste or other materials.
- Purpose – the work discussed in this proposal is intended to compliment UGTA's legacy nuclear characterization work and to address data gaps in areas Nye County feels are critical to understanding the hydrogeologic flow system down gradient from Pahute Mesa and around the NNSS in general.
- NOTE: These efforts are intended to be cooperative with and further the data collected under the UGTA program.

Introduction

- Qualifications – NWRPO staff and contractors have worked to characterize the hydrogeologic flow system down gradient from Yucca Mountain since the mid-1990's under DOE Cooperative Agreements:
  - Over 50 wells drilled
  - Multiple tracer tests (single-well and cross-hole)
  - Water sampling and chemistry
  - Water level monitoring
  - Geophysical logging
  - Surface geophysics
  - Other cutting-edge data collection efforts (DTPS, etc.)
  - Data were collected to NQA-1 standards and are publically available at www.nyecounty.com.

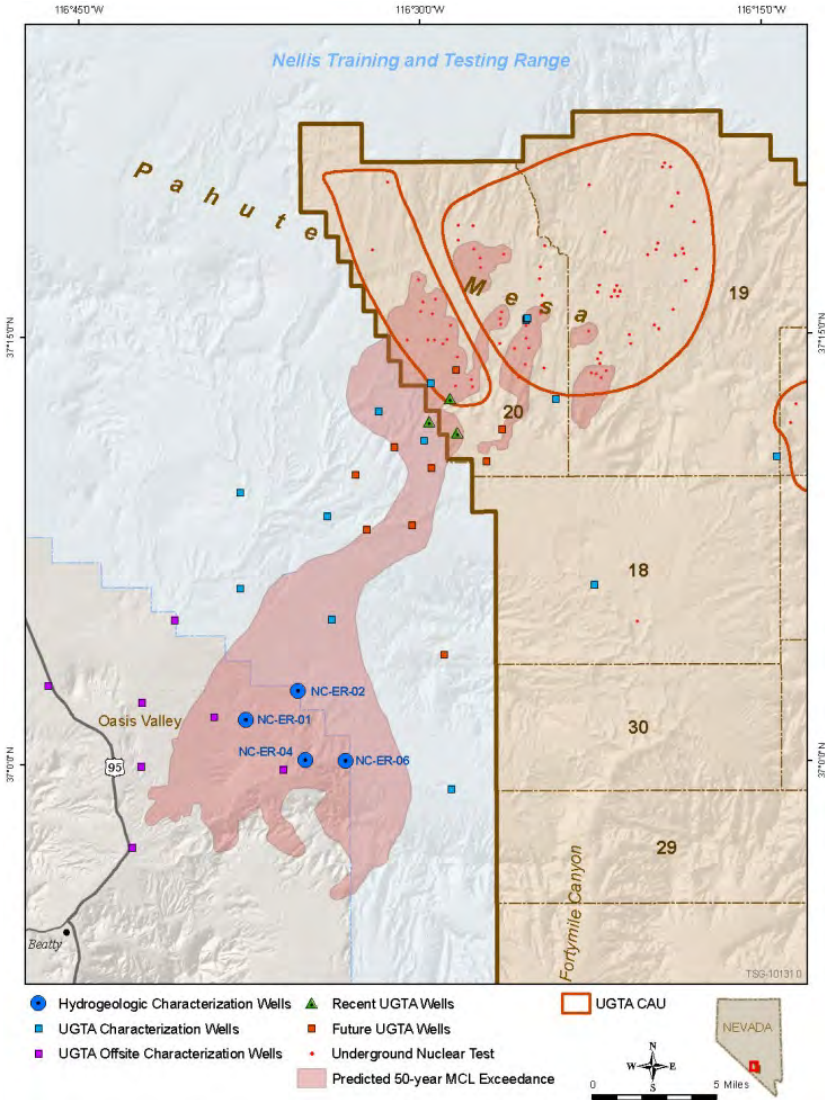


Proposed Activities
Shallow Piezometer Drilling Program



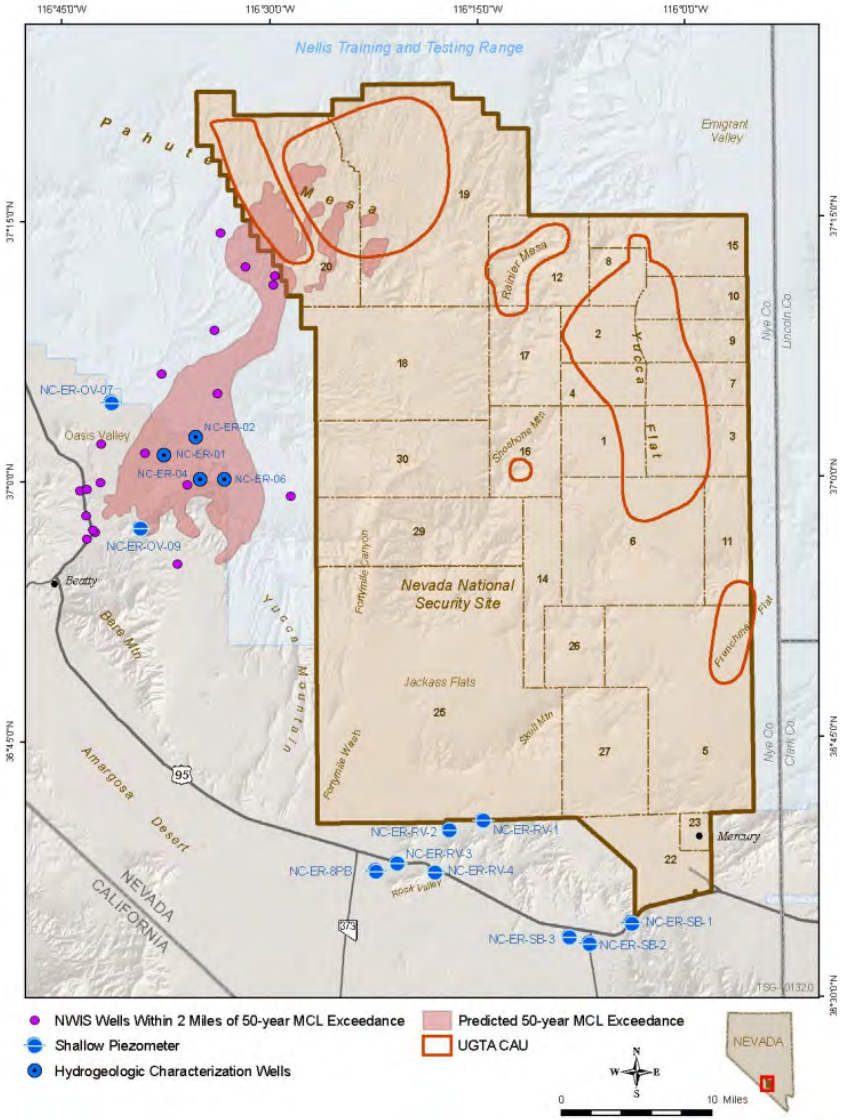
- Series of 10 relatively shallow piezometer wells to characterize the subsurface; focus is on:
  - Rock Valley
  - Mercury Gap
  - Area down gradient from Pahute Mesa
- Most wells (with the exception of the OV wells) are sited to target the carbonate aquifer, allowing us to obtain head relationships between this unit and the shallower alluvial and volcanic aquifers.
- These wells will infill data gaps and provide opportunities for cutting sample collection, geophysical logging, water chemistry, and water level monitoring.
- Wells expected to be drilled using conventional or reverse-circulation methods; maximum depth is 1,000 feet.

Proposed Activities
Hydrogeologic Characterization Wells



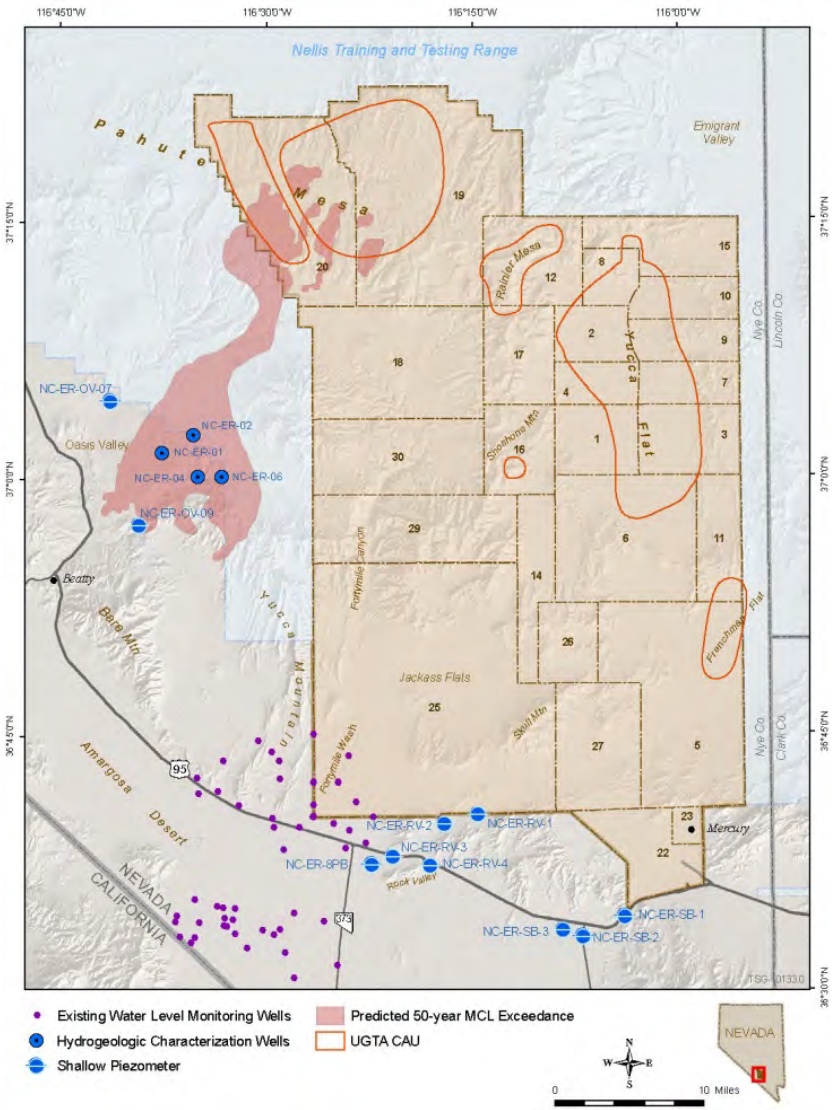
- Four deeper wells located in the 50-year MCL exceedance zone.
- Objectives for these wells:
  - Obtain geologic and geophysical information within the projected radionuclide flow path
  - Allow collection of water samples and water level data
  - Determine aquifer characteristics through test pumping
- Boreholes will be drilled to a maximum of 1,500 feet and completed with 8-inch diameter stainless steel as single- or multiple-screen wells (depending on the geologic units encountered).
- All boreholes are expected to penetrate either the Ammonia Tanks or Rainier Mesa volcanic formations.

Proposed Activities
Water Chemistry Monitoring



- Expand the regional baseline water chemistry dataset through sampling of all new wells.
- In addition, sample selected wells within the 50-year MCL exceedance zone, Yucca and Frenchman Flats.
- This work builds on recent work by Nye County and others to better understand the regional groundwater flow system, including the carbonate aquifer. This will also help delineate potential groundwater flow paths
- Standard geochemical suites (anions, cations, metals, nutrients, isotopes, tritium, C-14, etc.) will be run, in addition to cutting-edge DNA sampling and analysis techniques (this effort is cooperative with Desert Research Institute).
- Sampling events will be coordinated with other interested agencies (DOE, USGS, DRI, etc.)

Proposed Activities
Water Level Monitoring



- Main objective is to expand Nye County's Water Level Measurement Program to include all newly drilled wells, in addition to selected wells in the predicted 50-year MCL exceedance area.
- These additional data provide the baseline necessary for determining groundwater flow directions, flow rates, and rates of recharge, and temporal groundwater level changes.
- New data will build on Nye County's efforts to analyze temporal water level changes throughout the Pahrump and Amargosa Valleys, and expand to include the areas around the NNSS and Oasis Valley.

Proposed Activities
Data Management, Analysis, and Reporting

- All data will be collected in accordance with existing Nye County Quality Assurance procedures; new procedures will be developed and implemented as necessary. This task specifically includes:
  - Development and maintenance of databases that contain borehole data, water level and chemistry data, and geophysical logging data.
  - Entry of new data into the above databases
  - Use of above databases to help screen and qualify data and ensure their accuracy and reliability
  - Analysis of data to determine their quality and usability in numerical models
- All data will be interpreted, summarized, and presented through a series of annual and summary reports by Nye County staff and contractors.
- Qualified data will be shared publically on the NWRPO website (www.nyecounty.com).

Budget

- Work element budgets include staff, contractor, environmental support, laboratory analysis, and other related costs.
- As currently proposed, total cost of the work is $4.55 million, spread over 3 to 4 years.
- Costs could be spread out further if required.
- Process for obtaining rights-of-way from Bureau of Land Management could cause additional delays in startup of drilling programs.

Work Element	Estimated Cost ($)
1. Shallow Piezometer Drilling Program	1,000,000
2. Hydrogeologic Characterization Wells	2,000,000
3. Water Chemistry Monitoring	350,000
4. Water Level Monitoring	700,000
5. Data Management, Analysis, and Reporting	500,000
TOTAL	4,550,000

Conclusions

- Independent data collection and dissemination efforts can lend credibility to past and ongoing Federal efforts.
- Collection of additional data in the area surrounding the NNSS and in Oasis Valley will expand the regional data set, benefiting all interested organizations and ultimately the public.
- Analysis and incorporation of data into the UGTA groundwater flow model will lead to a better understanding of potential contaminant travel times, and better analysis of safety for down gradient water users.

Contact Information

Nye County Board of Commissioners	**Nye County Administration**	**Nye County Nuclear Waste Repository Project Office**	
Lorinda Wichman, Chairman	Pam Webster, County Manager	Darrell Lacy, Director	Levi Kryder, Geoscience Manager
101 Radar Road, PO Box 153	2100 Walt Williams Drive, Suite 100	2101 E. Calvada Blvd, Suite 100	
Tonopah, NV 89049	Pahrump, NV 89048	Pahrump, NV 89048	
775-482-8191	775-751-7073	775-727-3490	775-727-3484

References

- Low Levels of Tritium Detected in Groundwater on Federal Land Near the Nevada Test Site. DOE/NNSA News Release NSO-09-10. October 20, 2009
- Moser, D.P., 2010. Characterization of Ingenenous Microorganisms from Nye County Wells and Assessment of their Utility as Hydrologic Tracers – A proposal to the Nye County Nuclear Waste Repository Project Office. Desert Research Institute: Las Vegas, Nevada.
- Nevada National Security Site Environmental Report Summary 2011. DOE/NV/25946—1604-SUM. September 2012.
- Nevada Test Site Environmental Report 2007. DOE/NV/25946-543. September 2009, Figure 4-1.
- Phase I Transport Model of Corrective Action Units 101 and 102: Central and Western Pahute Mesa, Nevada Test Site, Nye County, Nevada. S-N/99205—111, Revision No. 1. February 2009.
- Regional Groundwater Flow and Tritium Transport Modeling and Risk Assessment of the Underground Test Area, Nevada Test Site, Nevada. DOE/NV—477 UC-700. October 1997

Department of Energy, Nevada Site Office's Technical Needs Analysis of the Nye County Proposal

Bill Wilborn
Underground Test Area Activity Lead
Nevada Site Specific Advisory Board
November 28, 2012

Background

- Unsolicited proposal submitted by the Nye County Nuclear Waste Repository Project Office on October 12, 2011 to the U.S. Department of Energy's (DOE) Assistant Secretary for the Office of Environmental Management
- DOE Nevada Site Office technical review completed August 2012
- Proposal includes five work elements related to Underground Test Areas Far-Field Hydrogeologic Characterization

Considerations

- Review has been based on details provided in October 12, 2011 proposal
- Funding for work under this proposal would be derived from existing or future Environmental Management budget
  - If derived from existing funds, current approved contractor scope and personnel would be impacted and schedules delayed
  - If included in future budgets, the next request cycle is for the FY 2015 budget

Considerations
(continued)

- All existing contract commitments remain in place
- Data generated would be available to DOE and collected consistent with Federal Facility Agreement and Consent Order requirements (i.e. Quality Assurance Program)

Some Key Technical Questions

1. Are the locations identified and data collected appropriate for current flow and transport model needs?
2. Is the data of immediate value? Should a Value of Information Analysis be applied prior to identifying collection sites?
3. What are the costs and benefits associated with these work elements?
4. Is the effort duplicative of work already being conducted?

Some Key Technical Questions
(continued)

5. Is the effort duplicative of already existing well assets?
6. Will this effort support the Federal Facility Agreement and Consent Order regulatory objectives?
7. Would the data be available for DOE analysis, interpretation, and reference?
8. Will data collection and analysis meet current model development schedules?

DOE Technical Needs Analysis
Work Element 1

Work Element 1 - Drilling, logging, and completion of ten shallow piezometer wells around the south and west boundaries of the Nevada National Security Site (NNSS) and Nevada Test and Training Range

- *Benefits*
  - Any data collected is usable data
  - Data may be less expensive to collect
  - Increased Nye County technical interaction
- *Risks*
  - Locations identified for data collection not driven by model data needs
  - Yucca and Frenchman Flat models and monitoring data show limited transport; contamination is unlikely to migrate off the NNSS
  - Required groundwater monitoring locations not identified but expected to be inside the NNSS boundaries

DOE Technical Needs Analysis
Work Element 2

Work Element 2 -Drilling, logging, and completion of four deeper hydrogeologic characterization wells in Oasis Valley, near the Nevada Test and Training Range boundary

- *Benefits*
  - Any data collected is usable data
  - Data may be less expensive to collect
  - Increased Nye County technical interaction
- *Risks*
  - Locations for data collection not driven by model data needs
  - Pahute Mesa transport limited to northwest border (i.e. ER-EC-11)
  - DOE currently has 10+ wells drilled and being sampled down gradient from ER-EC-11 and throughout Oasis Valley

DOE Technical Needs Analysis
Work Element 3 and 4

Work Element 3 - Water chemistry monitoring in newly drilled wells and existing wells near the predicted 50-year Maximum Contamination Level exceedance boundary

Work Element 4 - Expansion of existing Nye County water level monitoring program to include all newly drilled wells

- *Benefits*
  - All water chemistry data collected is usable data
  - Water chemistry data plays an important role in building model confidence
  - Data may be less expensive to collect
  - Increased Nye County technical interaction
- *Risks*
  - Locations for data collection not driven by model data needs
  - Pahute Mesa transport limited to northwest border (i.e. ER-EC-11)
  - DOE currently has 10+ wells drilled and being sampled down gradient from ER-EC-11 and throughout Oasis Valley

DOE Technical Needs Analysis
Work Element 5

Work Element 5 - Management, analysis, and reporting of data collected under this program

- *Benefits*
  - Reporting of data can be referenced in modeling documentation
- *Risks*
  - Characterization data needs to be applied to models during their development
  - This work would be duplicative of current contracts
  - Who would be the "owner" of the data and database

Path Forward

- DOE Headquarters is responsible for the process of determining if/how the proposal is implemented
- Nevada Site Office will provide technical input
- The NSSAB's recommendation will be transmitted to DOE Headquarters for their consideration when determining the path forward of the proposal

Use Restrictions and Long-Term Monitoring

Tiffany Lantow
Nevada Site Specific Advisory Board (NSSAB)
November 28, 2012

Objective

- Provide the NSSAB with information on cost/benefit analysis regarding the potential removal of Use Restrictions (UR) at seven Industrial Sites Corrective Action Sites (CASs). Information will include:
  - Current site conditions
  - Contaminants of Concern (COCs)
  - Proposed activities
- Solicit recommendation from NSSAB on conclusions of the cost/benefit analysis

Background

- At March 2012 briefing, NSSAB's input was solicited on removal of URs at 37 sites. NNSAB concluded:
  - Removal required only paperwork review
  - Benefits were clearly shown to outweigh costs
- Nevada Site Office (NSO) is proceeding with this effort
- Seven additional sites were identified where the removal decision appeared to be less clear cut
  - Cost/benefit was not as obvious
  - Field work might be required and may involve hazards

Background
(continued)

- At the time of investigation, some sites, such as bunkers, were not entered because of safety or other concerns
- As program continued, more information was obtained about typical hazards at such sites
- May make sense to lift some URs based on what has been learned

Assumptions

- Estimated costs are accurate
- Hazards at each site are not greater than currently understood
- Any removal of URs will require Nevada Division of Environmental Protection (NDEP) approval

Seven CASs

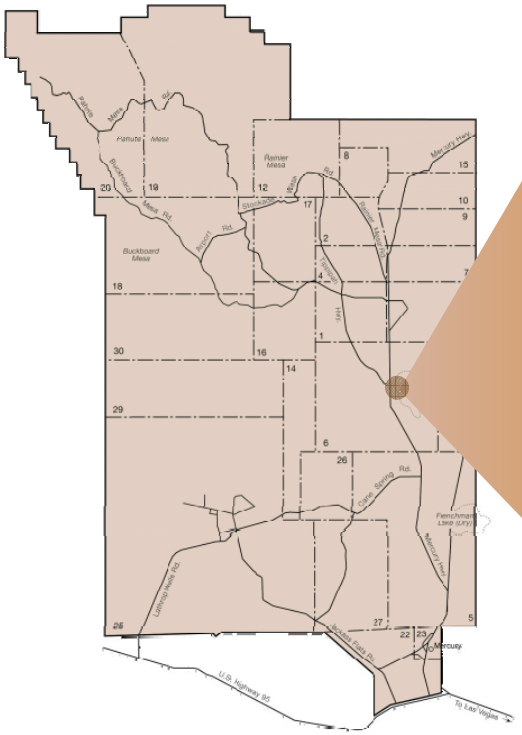
- CAS 06-04-01, Decon Pad Oil/Water Separator
- CAS 01-34-01, Underground Instrument House Bunker
- CAS 02-34-01, Instrument Bunker
- CAS 03-34-01, Underground Bunker
- CAS 25-25-07, Hydraulic Oil Spill(s)
- CAS 25-25-08, Hydraulic Oil Spill(s)
- CAS 02-02-03, Underground Storage Tank (UST) 2-300-1

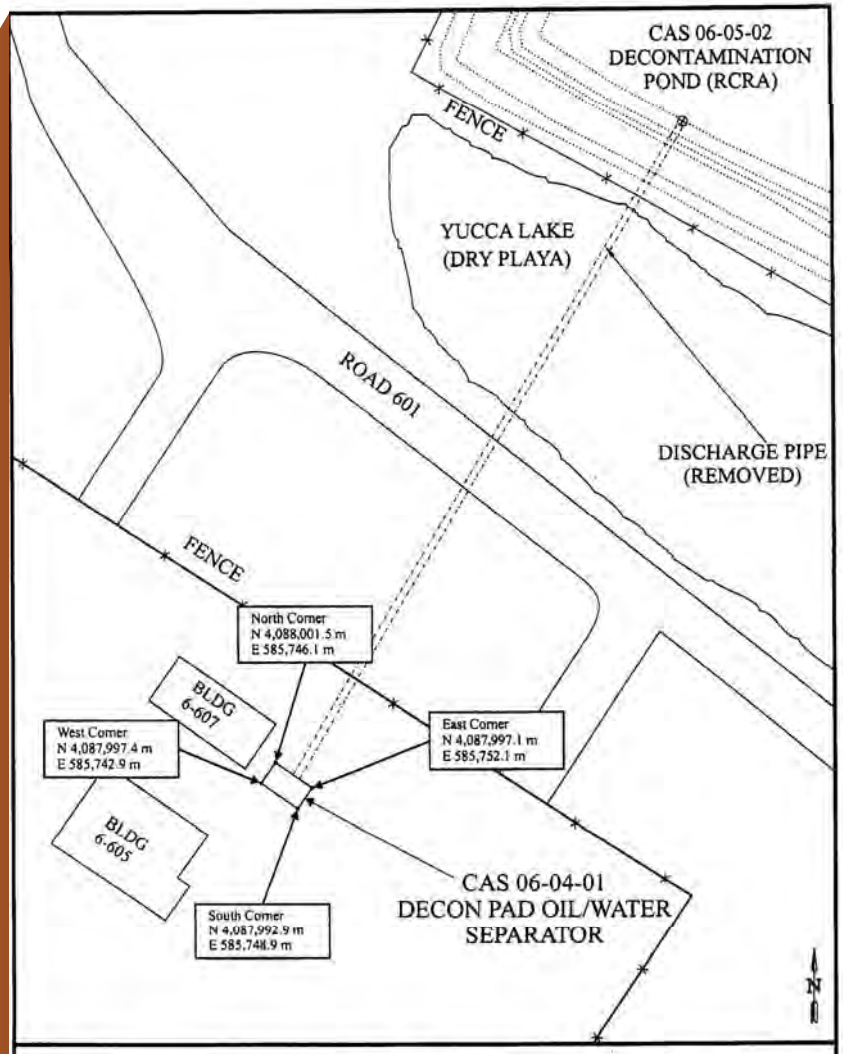
CAS 06-04-01, Decon Pad Oil/Water Separator (OWS)

- OWS and 20 feet of attached pipe (both filled with grout)
- Proposed activities for UR removal:
  - Attempt to remove UR based on paperwork review/documentation and NDEP concurrence
    - No COCs
    - Conceptual cost: $5,000

  OR
  - Excavate separator and pipe/dispose of waste
  - Collect verification soil samples below excavation
  - Conceptual Cost: $192,000

Current UR at OWS (CAS 06-04-01)





CORRECTIVE ACTION SITE 06-04-01, DECON PAD OIL/WATER SEPARATOR
USE RESTRICTION BOUNDARY

Considerations

- Waste volume and disposal costs
- No current monitoring requirements
- Annual visual inspections are performed as a best management practice to ensure postings are in good condition (cost: ~$3,000/year, indefinitely)

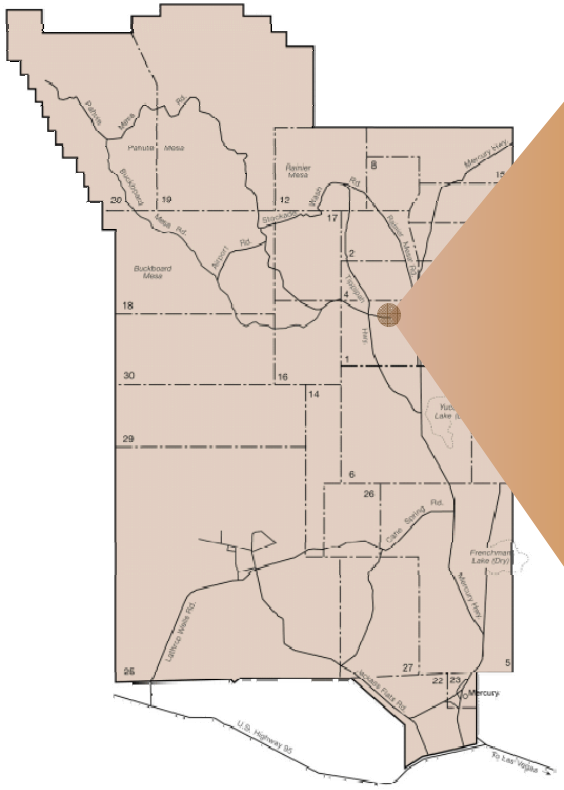
Recommendation

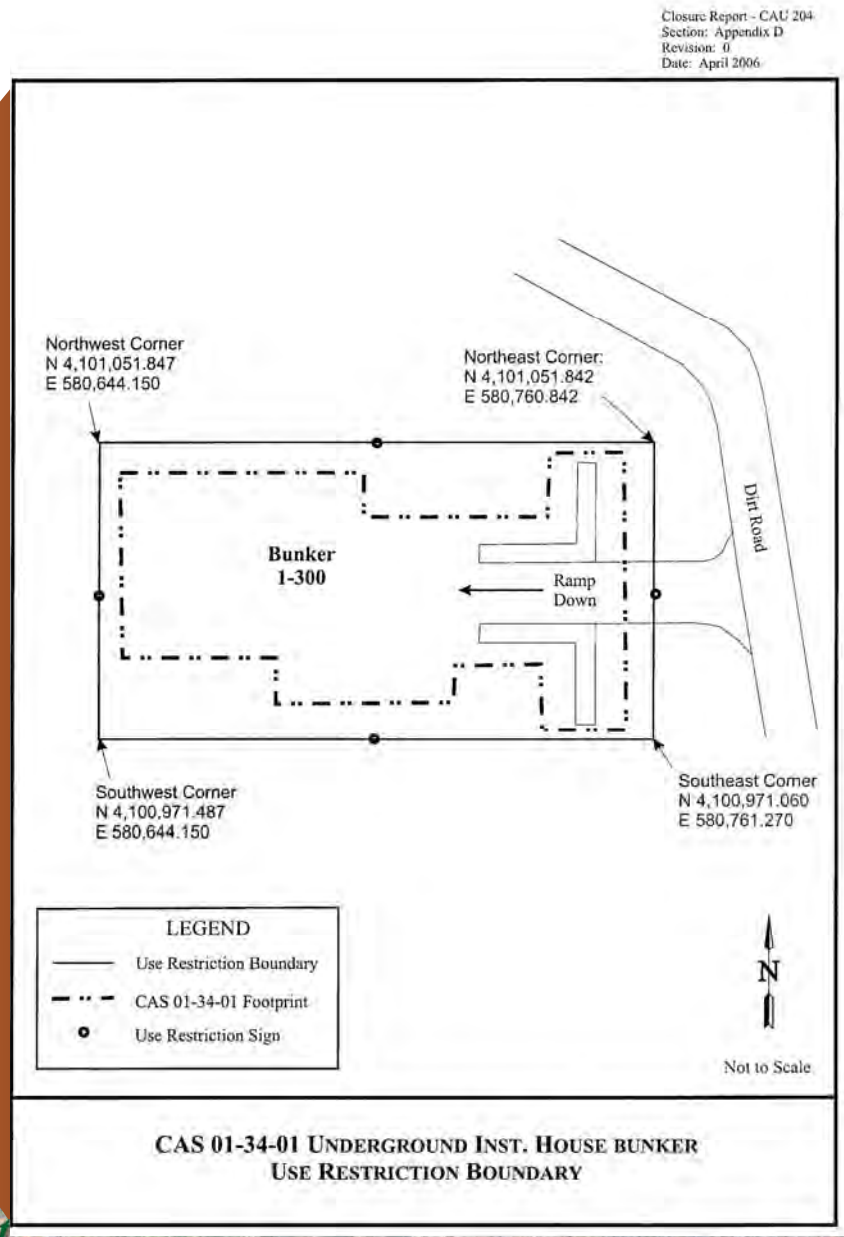
- Because there are no COCs and the OWS is grouted and does not present a safety hazard, recommend pursuing UR removal using paperwork option; If that isn't possible, retain the UR

Bunkers (CASs 01-34-01, 02-34-01, 03-34-01)

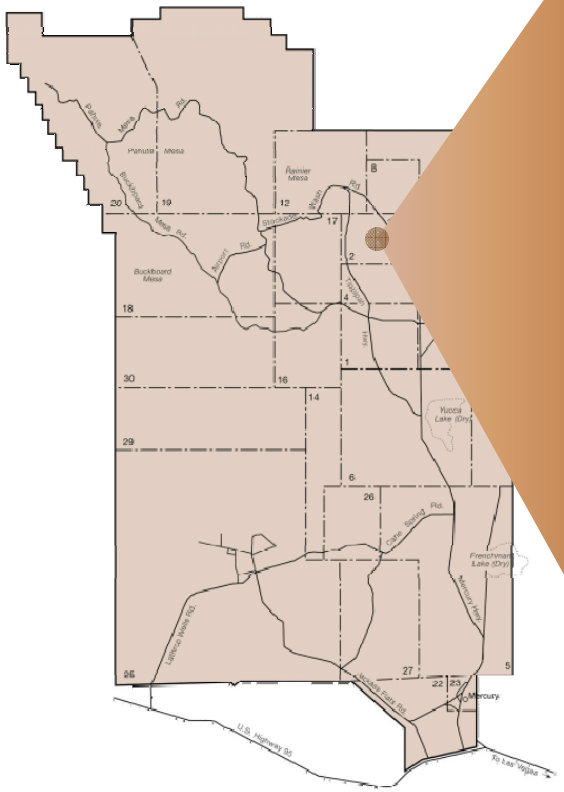
- Subsurface concrete structures used to house instrumentation during testing activities
- Potential COCs: Radionuclides, metals, organics
- Proposed Activities for UR removal:
  - Open/enter bunkers, complete visual survey, and obtain samples as necessary
  - Remove any waste and obtain verification samples
- Conceptual cost: $180,000 ($60,000 each)

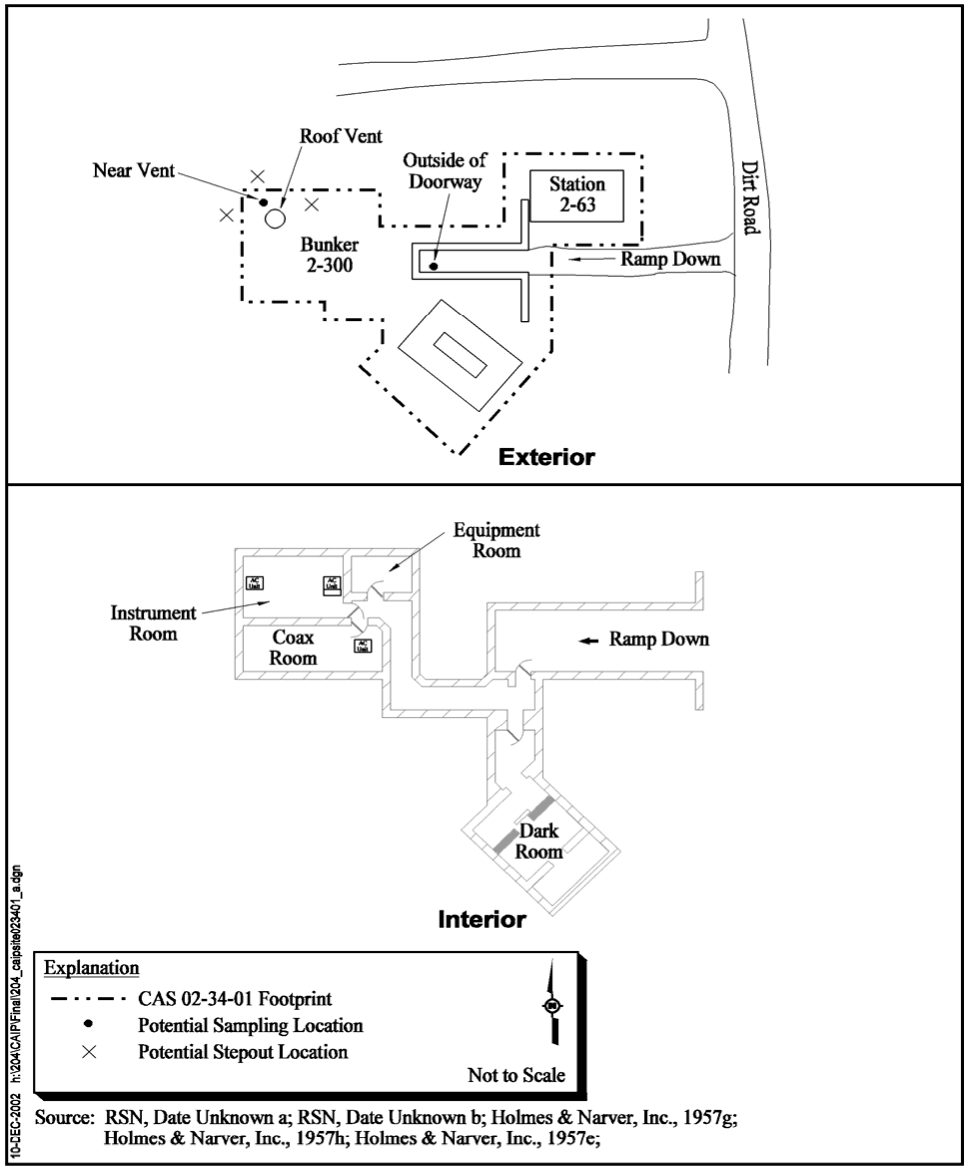
Current UR at CAS 01-34-01





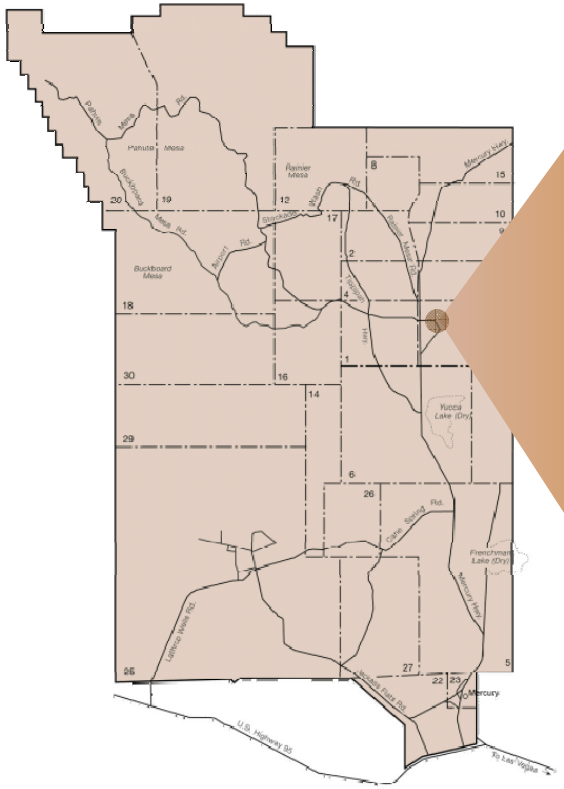
Current UR at CAS 02-34-01



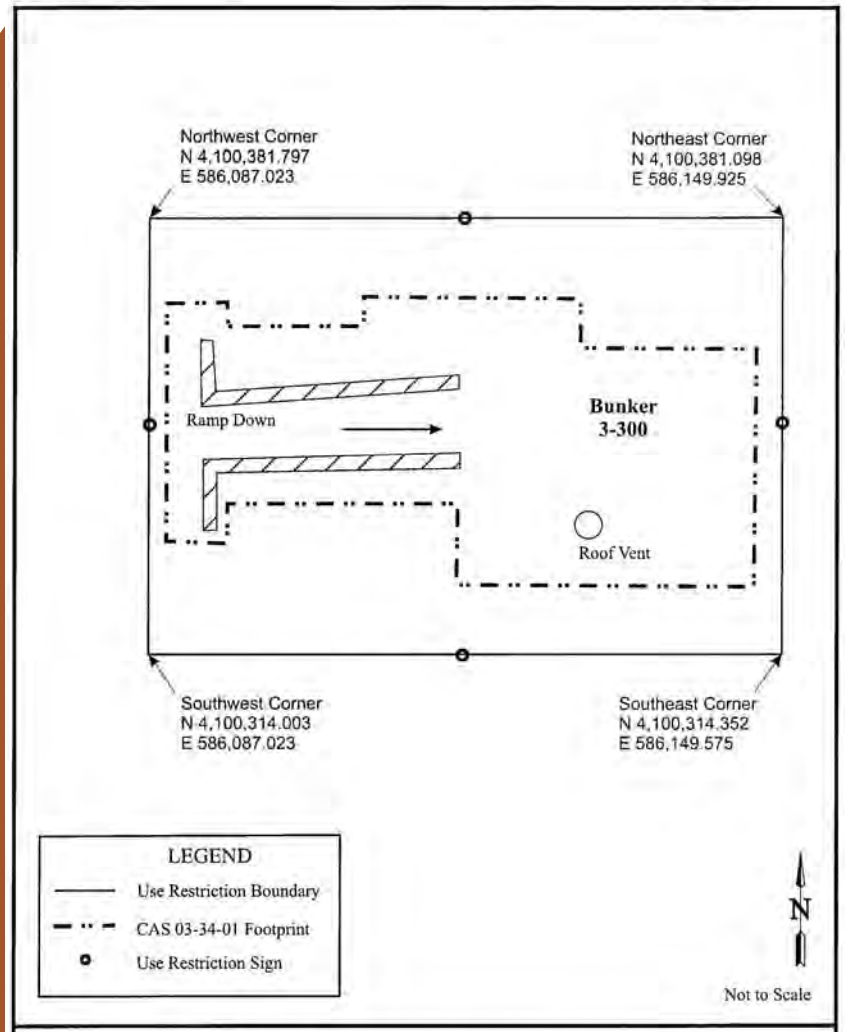


Source: RSN, Date Unknown a; RSN, Date Unknown b; Holmes & Narver, Inc., 1957g; Holmes & Narver, Inc., 1957h; Holmes & Narver, Inc., 1957e;

Current UR at CAS 03-34-01



Closure Report - CAU 204
Section: Appendix D
Revision: 0
Date: April 2006



CAS 03-34-01 UNDERGROUND BUNKER
USE RESTRICTION BOUNDARY

Considerations

- Current Monitoring: Annual visual inspections
  - Cost: ~$3,000/year, indefinitely
- Worker safety: Potential hazards of bunker entry
  - What is inside the bunkers is unknown (and the reason for the original UR); however, they are not expected to contain contamination
- Remote sampling is being considered
  - Open bunkers, but not enter; take swipe samples with a long pole

Recommendation

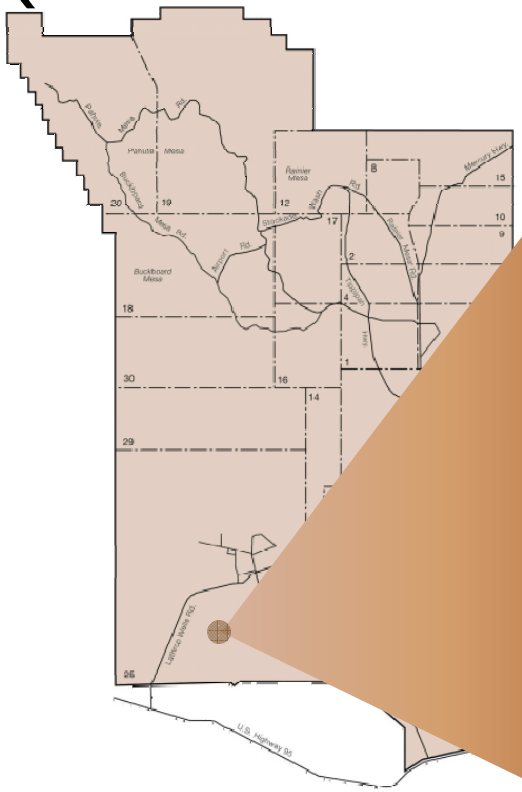
- Based on knowledge gained over the course of the Industrial Sites activity, bunkers are no longer assumed to be contaminated

- Recommend opening bunkers and attempt to remove URs

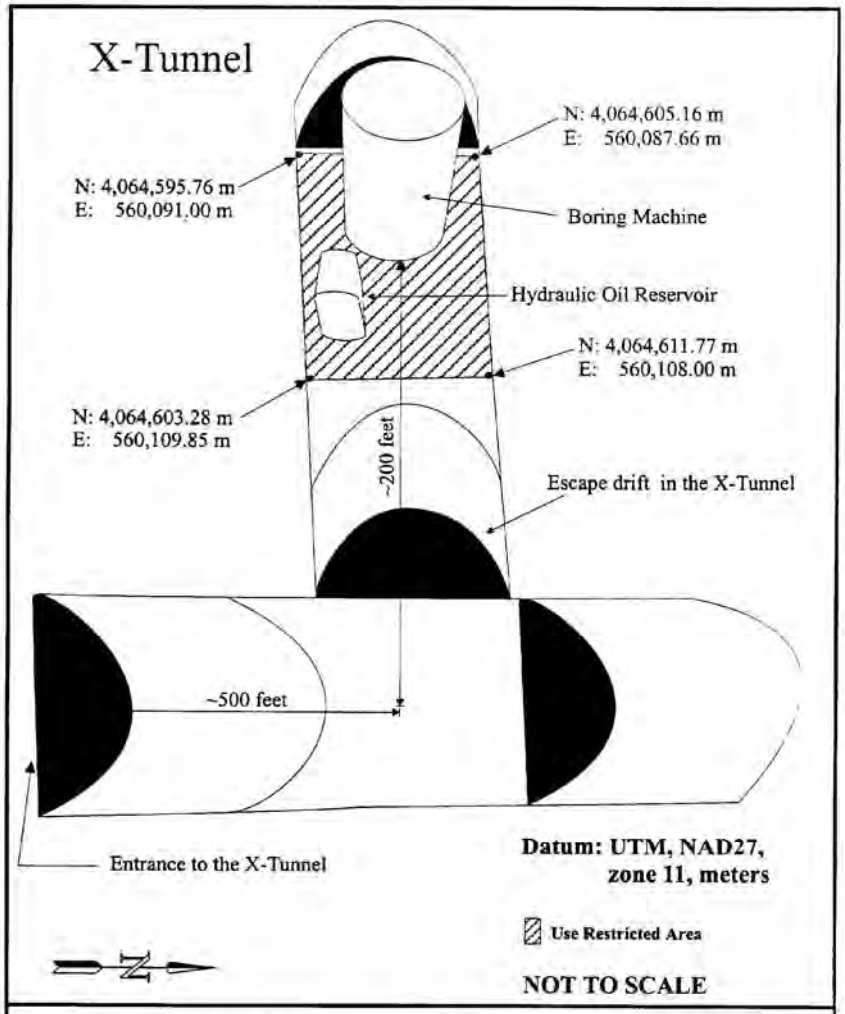
Hydraulic Oil Spills (CASs 25-25-07, 25-25-08)

- Located inside X- and Y- Tunnels
  - Tunnels used for ballistics research and tunnel boring machine tests
- COC: Total Petroleum Hydrocarbons (TPH) diesel/oil in soil
- Proposed activities for UR removal:
  - Lift UR by showing no hazardous impact to environment
    - Hydraulic doesn't contain Polychlorinated Biphenyls (PCBs)
    - No pathway to exposure for TPH (contained in tunnels)
    - Conceptual cost: $5,000

Current UR at X-Tunnel (CAS 25-25-07)

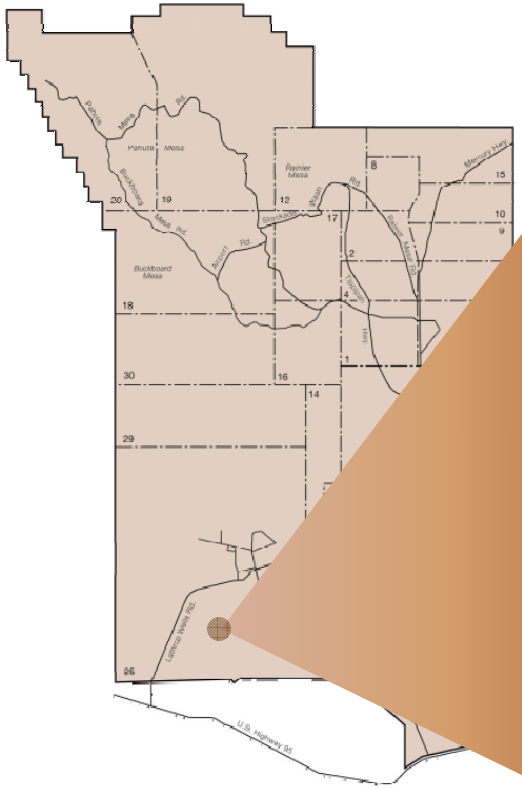


CLOSURE REPORT – CAU 398
Section: Appendix C
Revision: 1
Date: April 2003

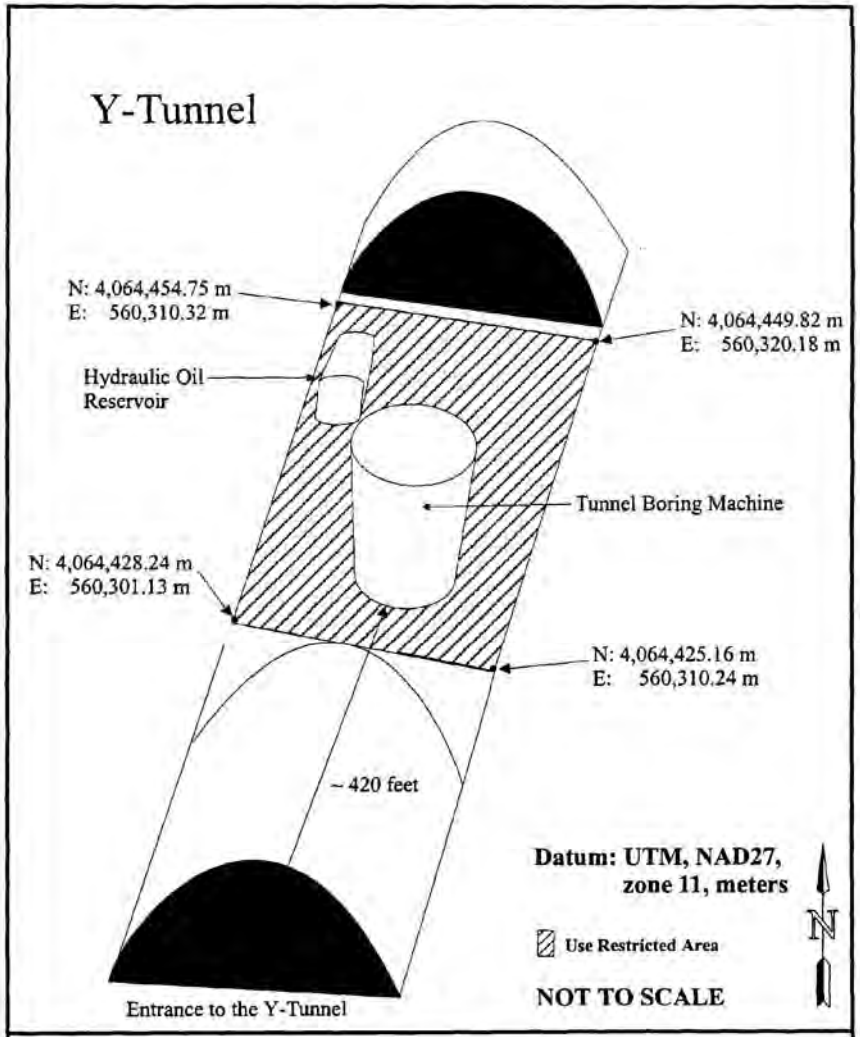


USE RESTRICTION INFORMATION
CAU 398: Area 25 Spill Site, Nevada National Security Site
CAS 25-25-07: Hydraulic Oil Spill(s)

Current UR at Y-Tunnel (CAS 25-25-08)



CLOSURE REPORT – CAU 398
Section: Appendix C
Revision: 1
Date: April 2003



USE RESTRICTION INFORMATION
CAU 398: Area 25 Spill Sites, Nevada Test Site
CAS 25-25-08: Hydraulic Oil Spill(s)

Considerations

- No current monitoring requirements
  - Annual visual inspections NOT performed (not accessible), so no cost
- Tunnels could potentially be used in the future

Recommendation

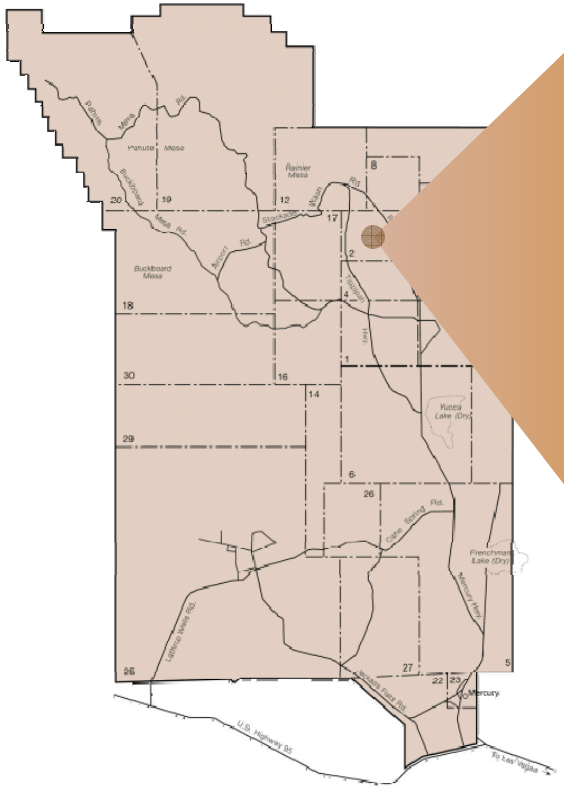
- Recommend pursuing UR removal using paperwork option; if that isn't possible, retain the UR

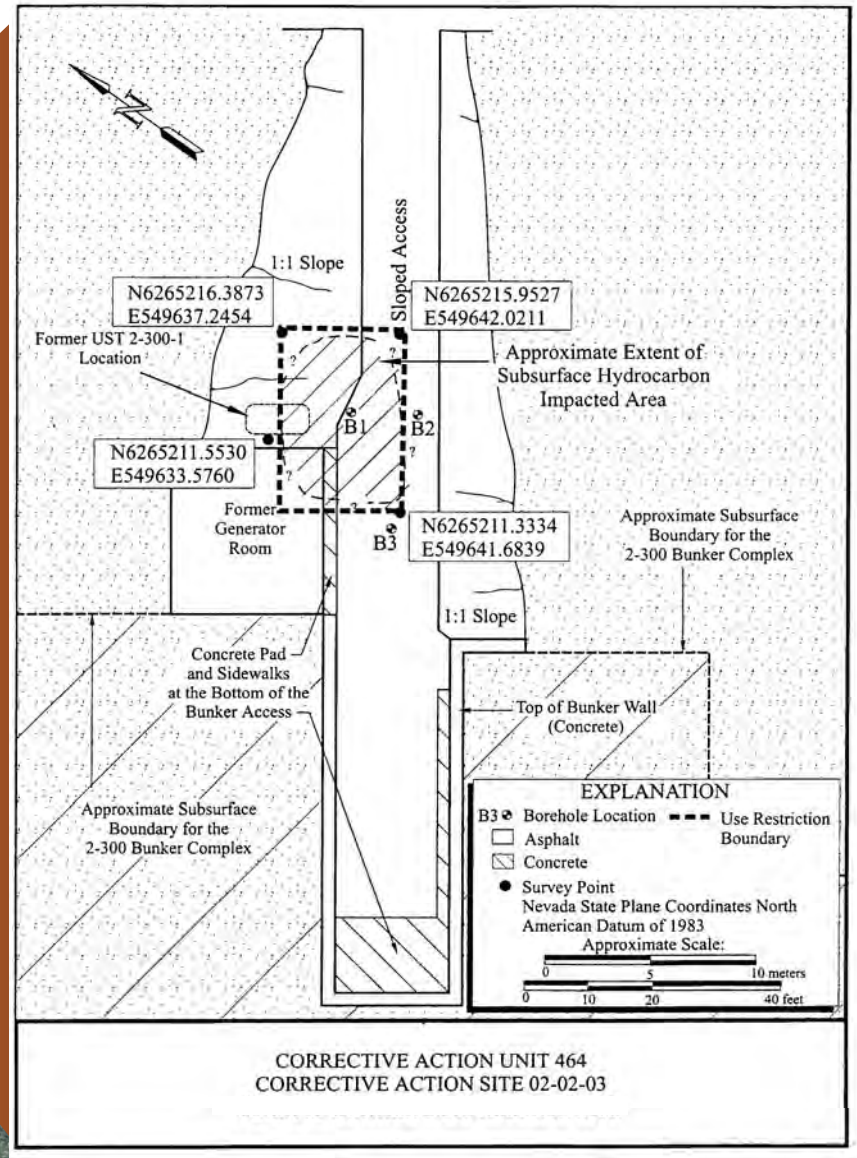
CAS 02-02-03, UST 2-300-1

- Diesel contamination from former Underground Storage Tank (UST)
- COCs: TPH in soil
- Proposed activities for UR removal:
  - Attempt to remove UR based on paperwork review/documentation and NDEP concurrence
    - Conceptual cost: $5,000

    OR
  - Conduct additional sampling
  - Potentially excavate soil/dispose of waste
  - Collect verification soil samples
    - Conceptual cost: $50,000
      - Includes sampling, not excavation/disposal

Current UR at UST 2-300-1 (CAS 02-02-03)





Considerations

- Limited access
  - Slope of surrounding area
  - Adjacent bunker room
- Depth of contamination (20 ft)
- No current monitoring requirements
  - Annual visual inspections NOT performed, so no cost

Recommendation

- Recommend pursuing UR removal using paperwork option; if that isn't possible, retain the UR

Summary

UR Site	DOE Recommendation
CAS 06-04-01, Decon Pad Oil/Water Separator	Remove UR using paperwork option; if that is not possible, retain UR
CAS 01-34-01, Underground Instrument House Bunker	Open bunker and attempt to remove UR
CAS 02-34-01, Instrument Bunker	Open bunker and attempt to remove UR
CAS 03-34-01, Underground Bunker	Open bunker and attempt to remove UR
CAS 25-25-07, Hydraulic Oil Spill(s)	Remove UR using paperwork option; if that is not possible, retain UR
CAS 25-25-08, Hydraulic Oil Spill(s)	Remove UR using paperwork option; if that is not possible, retain UR
CAS 02-02-03, Underground Storage Tank 2-300-1	Remove UR using paperwork option; if that is not possible, retain UR

NSSAB Recommendation

- NSO will provide a cost/benefit analysis with recommendations

- DOE solicits a recommendation from the NSSAB on:
  - Does NSSAB concur with DOE's conclusions for each site?
  - Does NSSAB identify any opportunities for enhancement?

Use Restriction Removal – 7 Sites

Cost/Benefit Analysis

1. *Introduction*

There are currently 125 Industrial Sites (IS) locations where a use restriction (UR) has been implemented as a result of a corrective action site (CAS) investigation under the *Federal Facility Agreement and Consent Order* (FFACO). Each UR was implemented to protect human health, safety, and the environment.

These URs were implemented at sites where (1) contamination was found above regulatory limits; (2) remediation of the contamination was not cost effective or feasible; or (3) contamination was below regulatory limits but other safety concerns (such as underground physical hazards) existed.

As the process for establishing final action levels (FALs) changed during the life of the IS Project, there often was no time to review existing sites where a UR had been implemented to determine whether the UR was still warranted. Now that nearly every IS location has been investigated and closed (only two IS CAUs remain to be closed), it was decided to reevaluate the potential for conducting additional work to demonstrate that a specific UR could be removed.

One hundred twenty-five (125) sites were evaluated in early 2012 to determine whether the total number of URs could be reduced through additional work. Thirty-seven sites were selected for UR removal. This is being conducted through a reevaluation of the analytical results obtained during the original characterization and closure effort (i.e., no additional fieldwork is planned). The effort to reevaluate and remove these URs is under way. *Note:* This activity was briefed to the NSSAB in February 2012, and the board recommended that the work proceed.

An additional seven sites were identified where UR removal could be conducted but where additional fieldwork such as sampling, excavation, or removal of waste might be required. This analysis will present the potential for UR removal at these seven sites. The potential need for fieldwork at these sites requires an investment of additional time and resources (i.e., funding). To determine whether this is a good investment (e.g., will not cost significantly more than it saves), an analysis was developed of the

likely costs required in performing the work to remove a specific UR and the benefits (e.g., reduced long-term costs and/or future use of the land). These costs and benefits were then compared to the cost of maintaining the UR (e.g., cost of monitoring and maintaining the UR) as well as the restrictions on the land use imposed by the UR. This report documents this analysis.

The Nevada Division of Environmental Protection (NDEP) must approve proposed changes to URs at these sites before any changes are implemented.

2. *Purpose*

Implementing inspections at UR sites and completing repairs required at sites where damage to engineered barriers or warning signs is discovered results in costs to the Environmental Management program. These costs can be reduced if the number of sites that require inspection (and potentially repair) can be reduced. This is possible if the UR implemented at the site can be removed. The purpose of this review is to provide information on which to base a decision to pursue UR removal at seven IS locations at the Nevada National Security Site (NNSS). Additionally, removal of the UR may allow for future unrestricted use of the land area currently under the UR.

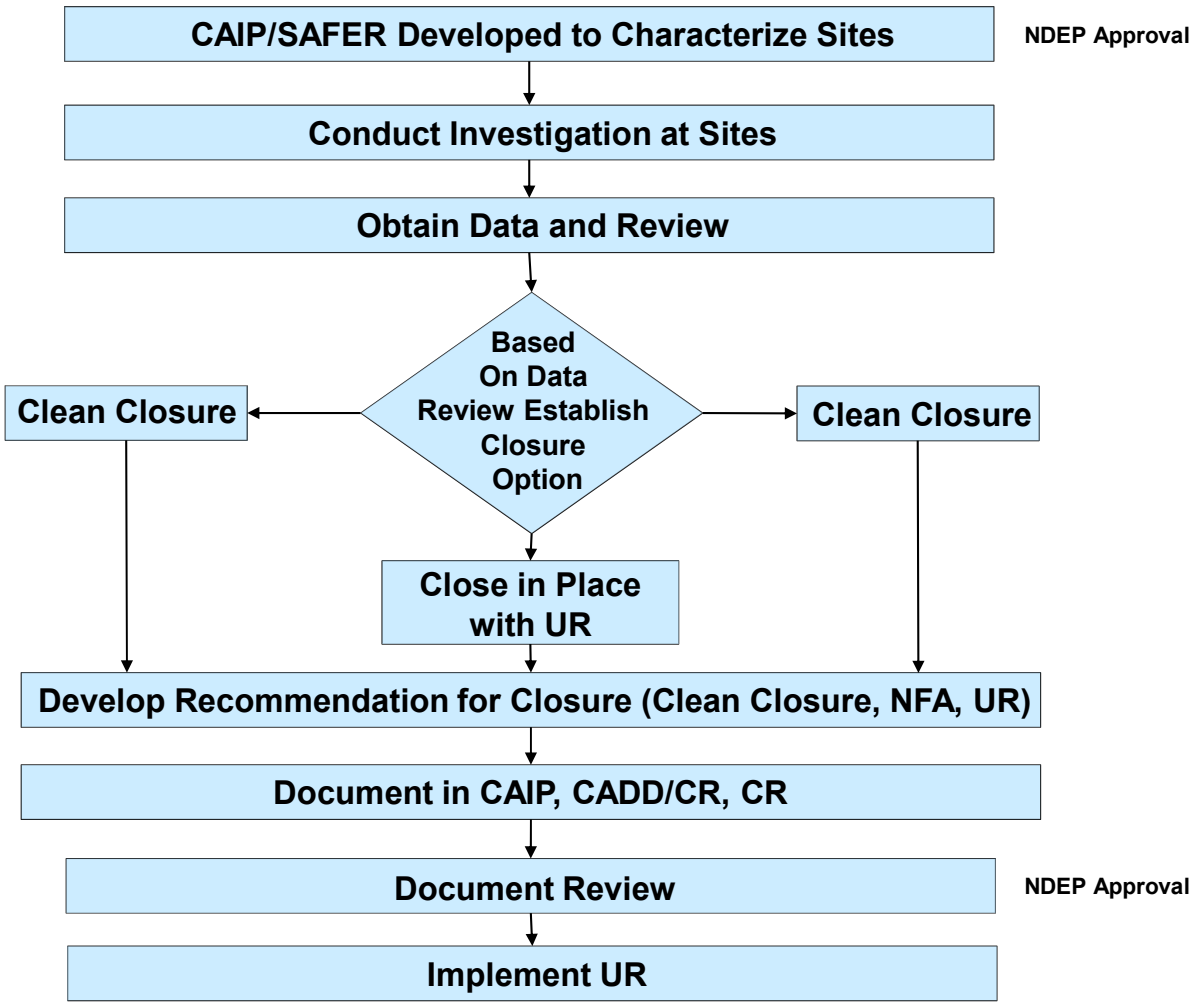
3. *Designating URs*

During the process of conducting CAU investigations, it sometimes became apparent that a UR must be imposed. There are various reasons for deciding to implement a UR. For the seven sites being discussed in this cost/benefit analysis, the following reasons were included:

a. Short-term risk of cleanup vs. long-term risk of UR
    a. Short-term risk results from potential harm to workers who must perform cleanup activities.
    b. Long-term risk results from potential exposure to future workers, the environment, and potentially members of the public as a result of leaving the contamination in place.
b. Cost of cleanup vs. benefit of working at other sites where hazard was higher
    a. Cost of cleanup (or full investigation) was seen as limiting at the time of the original CAU investigation based on several factors.
    b. It was beneficial for site workers to finalize characterization and implement a UR at a site so work could begin at other sites where a more immediate (closer proximity to personnel) or higher hazard (higher level of contamination) existed.

c. Technical difficulty (e.g., depth of contamination)
    a. A UR was implemented due to the depth of contamination. In these cases, at the time of the initial decision to proceed with the UR, the cost of additional investigation was determined to outweigh the benefit of obtaining additional information from deep sampling, even if this information allowed for the closure of the site without a UR.

Ultimately, if a UR is agreed upon, the intent is to protect personnel from the hazard associated with the contamination. The process for implementing a UR is depicted in the following flow chart.



4. UR Descriptions

As described in the introduction, an additional seven sites were identified where potential UR removal might involve work such as sampling or excavation. A cost estimate was developed for these seven sites based on the work that is projected to remove the UR. The following table provides a summary of the estimated costs for each of the seven sites and estimated benefit of not having to perform the annual inspection.

CAS	Description	Conceptual Estimate	Annual Inspection Cost	Considerations
06-04-01	Decon Pad Oil/Water Separator	$5,000 paperwork or $192,000 fieldwork	$3,000	No known contamination
01-34-01	Underground Inst. House Bunker	$60,000	$3,000	No known contamination
02-34-01	Instrument Bunker	$60,000	$3,000	No known contamination
03-34-01	Underground Bunker	$60,000	$3,000	No known contamination
25-25-07	Hydraulic Oil Spill(s)	$5,000 paperwork or $35,000 fieldwork	$0	This is inside X-Tunnel, no inspection, restricted access, possible future use
25-25-08	Hydraulic Oil Spill(s)	$5,000 paperwork or $35,000 fieldwork	$0	This is inside Y-Tunnel, no inspection, restricted access, possible future use
02-02-03	UST 2-300-1	$5,000 paperwork or $50,000 fieldwork	$0	No inspection, difficult area for fieldwork, paperwork option possible

The UR removal costs (Conceptual Estimate column) are estimates based on the potential contaminants present at the sites, the fieldwork required to verify the contaminant presence, and the follow-on changes to documents required to record the removal of the specific UR. The annual inspection costs are estimated based on the annual cost of the entire UR inspection program spread across each of the 125 IS locations that require inspection.

These costs are preliminary and are based on data developed during the IS Closeout process conducted in early 2012. Further refinement of the costs will be conducted if the decision is made to proceed with the UR removal.

The work proposed for UR removal at each of the seven sites is defined in the following table.

CAS	Proposal for UR Removal
06-04-01 Decon Pad Oil/Water Separator	*Site description:* This site consists of a grouted underground storage tank (UST) and approximately 20 feet of piping that formerly served the Area 6 Decontamination Pad. *Current UR requirements:* The current requirement for this site consists of an annual inspection and maintenance of the UR to include replacement of signs and fencing when needed. The inspection is documented along with any required repairs and reported to NDEP annually. *Costs to maintain this UR:* Approximately $3,000 annually. *Option 1 for UR removal:* Attempt to remove the UR based on existing closure documentation, which indicates no contaminants around the grouted UST at this site. DOE will document existing conditions and provide supporting information as to why the site does not present a risk to future workers. Documentation will be sent to NDEP for approval. If approved, the UR will be removed. The estimated cost for this option is $5,000. *Option 2 for UR removal:* Perform excavation and disposal of the UST and approximately 20 feet of pipe. Perform verification sampling and backfill. The estimated cost for this option is $192,000. *Conclusion:* Option 1 should be pursued. If Option 1 is not successful, Option 2 should not be pursued. UR removal under Option 1 provides for ongoing cost avoidance for approximately the cost of the two years of UR maintenance, and thus will pay for itself in this time frame. Option 2 takes many years to return the cost of investment. Additionally, removal of this UR and freeing up access to this land area is not currently important to ongoing or future site missions.

CAS	Proposal for UR Removal
01-34-01 Underground Inst. House Bunker 02-34-01 Instrument Bunker 03-34-01 Underground Bunker	*Site description:* These underground bunkers were used during atmospheric testing to house equipment and instruments. The closed bunkers were not entered during the closure process, so information regarding interior contamination is unknown and would be assessed as part of the effort to lift the URs. *Current UR requirements:* The current requirements for these sites consist of an annual inspection and maintenance of URs to include replacement of signs when needed. The inspections are documented along with any required repairs and reported to NDEP annually. *Costs to maintain these three URs:* Approximately $9,000 annually. *Option 1 for UR removal:* Perform inspection of the bunkers by opening the entrance doors and entering the bunkers either directly or remotely (remote camera or sampling remotely from the doorway). Any contaminants discovered within the bunkers will require remediation to remove the URs. Should the bunkers prove to be free of contamination, the URs can be lifted without remediation. The estimated costs for this effort are $60,000 per site, for a total of $180,000. *Conclusion:* Pursue Option 1 to open bunkers and attempt to remove URs, with the understanding that once the bunkers are opened, conditions may not make it feasible to remove the URs; in that case, the URs will be maintained.

CAS	Proposal for UR Removal
25-25-07 Hydraulic Oil Spill(s) 25-25-08 Hydraulic Oil Spill(s)	*Site description:* There are two tunnels in Area 25 of the NNSS, X-Tunnel and Y-Tunnel, where past operations resulted in hydraulic fluid spills on the floor of each tunnel. *Current UR requirements:* Though listed as URs in the FFACO, there are no requirements to inspect these areas because they are underground in a closed tunnel complex and the hazard to personnel is minimal. *Costs to maintain this UR:* No annual costs. *Option 1 for UR removal:* Paperwork option where an attempt to remove the UR will be made based on the remote location within the tunnel, and demonstration that migration and eventual release do not pose a risk. This risk-based approach was not available at the time of the original closure, but it is likely that using this approach will support removal of the UR. The estimated costs for this option are $5,000 per site, for a total of $10,000. *Option 2 for UR removal:* Remove the UR by entering the tunnel and remediating the sites by removing the contaminated soil. The estimated cost for this option is $35,000 per site, for a total of $70,000. *Conclusion:* Option 1 should be pursued. If Option 1 is not successful, Option 2 should not be pursued. Removal of the UR at CASs 25-25-07 (X-Tunnel) and 25-25-08 (Y-Tunnel) will be pursued only if Option 1 can be accomplished. The pursuit of Option 2 does not provide enough benefit in relation to the cost and hazards associated with remediation of the site. Additionally, removing this UR and freeing up access to this land area is not currently important to ongoing or future site missions.

CAS	Proposal for UR Removal
02-02-03 UST 2-300-1	*Site description:* This site consists of an area of subsurface hydrocarbon contamination adjacent to the 2-300 bunker (CAS 02-34-01) in Area 2. *Current UR requirements:* There are no current inspection requirements for this UR. *Costs to maintain this UR:* No annual costs. *Option 1 for UR removal:* A paperwork option is proposed where justification is provided, based on depth of contamination and amount of contamination, that the UR can be removed through risk-based analysis. When originally closed, the sites were use restricted based on exceeding compliance levels for contaminants of concern. It is now likely possible to demonstrate through risk-based analysis that a UR is no longer required. The estimated cost for this option is $5,000. *Option 2 for UR removal:* The fieldwork option involves obtaining additional samples to strengthen the position that through risk-based analysis the UR can be removed. The estimated cost for this option is $50,000. *Conclusion:* Option 1 should be pursued. If Option 1 is not successful, Option 2 should not be pursued. Removal of the UR at CAS 02-02-03 should be pursued if Option 1 is viable. The cost of additional sampling and the hazards presented in accessing the location to perform sampling do not outweigh the benefits of removing the UR. Removing this UR and freeing up access to this land area is not currently important to ongoing or future site missions.

5. *Path Forward*

The NSSAB toured two of the sites in mid-November. The NSSAB will receive a briefing on all seven sites and the analysis conducted, and then will be asked to provide a recommendation whether the board concurs or not with DOE's conclusions regarding UR removal. This recommendation should be site specific and is anticipated by the end of January 2013.

November 14, 2012	Tour to two of the seven sites, CAS 02-34-01 and 03-34-01
November 28, 2012	Provide NSSAB with briefing on seven sites, cost/benefit analysis, and DOE recommendations for each site
January 31, 2013	NSSAB to provide recommendation of whether it supports DOE conclusions at the seven sites, or provide opportunities for enhancement

LETTER #1

EM SSAB Chairs Meeting
Washington, D.C.
Draft Chairs' Recommendation
October 3, 2012

The EM SSAB has noted with considerable interest and support that the Waste Isolation Pilot Plant (WIPP) has been remarkably successful in disposing of transuranic waste (TRU) throughout the DOE complex for approximately ten years. The success of the TRU waste program is among DOE's most notable achievements during this time frame.

The EM SSAB is also aware that the mission of the WIPP is being assessed for possible expansion to include disposal of some surplus plutonium from defense programs weapons production activities and certain other nuclear waste such as Greater-Than-Class-C Waste from NRC-related programs.

The success and activity of the WIPP program represents an opportunity for the DOE to make still further progress in addressing some of DOE's legacy waste streams.

The EM SSAB encourages the DOE to evaluate additional storage and disposal options for DOE legacy waste that could result from an expansion of the WIPP disposal mission.

For example, one specific test program that would support this concept involves shipment of a small number of SRS Defense Waste Processing Facility Canisters from SRS to WIPP for storage and evaluation for disposal. Such a test program would permit DOE to evaluate significant issues in DOE's complex-wide high-level waste disposition program such as:

- Shipment container development issues
- Packaging and shipment/receipt issues for both the shipper and the receiver
- Other transportation issues
- Dealing with consent-based approvals

It is the intent of this test program to provide valuable input and to serve as a precursor for the DOE program for the disposal of DOE's high-level waste.

PRE-DECISIONAL DRAFT

LETTER #2

EM SSAB Chairs Meeting
Washington, D.C.
Draft Chairs' Recommendation
October 3, 2012

The EM SSAB would like to offer one recommendation that should increase the effectiveness and timeliness of addressing the disposal of DOE high-level waste.

It is recommended that DOE work with other national leaders to separate the disposition programs for the Defense Program high-level waste and the commercial nuclear industry high-level waste.

The DOE high-level waste program is at a more advanced stage relative to disposition than the commercial nuclear power industry waste-disposal program. For example, DOE presently has over 3,000 canisters at SRS awaiting the next step in the disposition process. Further, the waste form characterization and content is well known and understood. The same will be true for the waste forms in canisters that will be produced at Hanford and Idaho.

Also, the amount of DOE high-level waste is only 10% of the commercial nuclear volume. It is the intent of this recommendation to afford DOE an opportunity to address a much reduced quantity of high-level waste with well known forms. Disposition of the smaller volume in this manner could serve as an excellent learning tool for addressing the commercial high-level waste-disposition program.

PRE-DECISIONAL DRAFT

LETTER #3

EM SSAB Chairs Meeting
Washington, D.C.
Draft Chairs' Recommendation
October 3, 2012

The EM budget is composed of several components, including costs to maintain the EM complex in a safe 'operations ready' state, out-year compliance costs to meet future regulatory milestones, current-year compliance costs to meet regulatory milestones in the current fiscal year and other costs not directly tied to regulatory milestones.

Included in these costs is funding for the development of new technology that will improve the productivity of cleanup projects across the complex. The enhanced solvent for the Salt Waste Processing Facility at SRS is an example of a successful R&D project.

As the current federal budgeting activities continue to constrain EM cleanup activities, the EM SSAB recommends that DOE not constrain funding in areas of technology research and development. The EM SSAB recognizes that without innovative solutions for the future, the cost and timing of cleanup projects could jeopardize compliance with regulatory milestones and extend cleanup costs beyond reasonable expectations.

PRE-DECISIONAL DRAFT

LETTER #4

EM SSAB Chairs Meeting
Washington, D.C.
Draft Chairs' Recommendation
October 3, 2012

The EM SSAB recommends that DOE place more emphasis and priority on evaluating technologies that could make recycling excess materials cost effective. Decontaminating these materials for resale can have many positive benefits:

- Saving space in onsite CERCLA disposal cells
- Adding more dollars for cleanup from the sale of excess
- Reducing cumulative environmental insult
- Reducing long-term monitoring and stewardship costs

To facilitate continuous cost-effective recycling, the EM SSAB recommends that DOE identify and establish a national recycling center of excellence, incentivize contractors to recycle and repurpose items, and add a recycling and repurposing element to future Requests for Proposals.

PRE-DECISIONAL DRAFT

NSSAB Sponsored Recommendation Letter

David Huizenga
Senior Advisor for Environmental Management
U.S. Department of Energy, EM-1
1000 Independence Ave., SW
Washington, DC 20585

Dear Senior Advisor Huizenga:

The Environmental Management Site Specific Advisory Board (EM SSAB) appreciates the opportunity to fulfill its charter by making recommendations to the U.S. Department of Energy (DOE) Environmental Management Program. In support of this initiative, representatives from each of the eight boards convene biannually to receive timely updates from DOE Headquarters (HQ) and to provide recommendations to DOE HQ regarding complex-wide issues.

During previous EM SSAB Chairs meetings, HQ personnel have provided broad topic areas (i.e., communication, technology development, etc) for the EM SSAB to consider when creating recommendations. With this approach, the Chairs struggle on occasion to determine where their efforts can be best utilized or what opportunities are available to enhance EM operations on a complex-wide level. As a way to increase efficiency and ensure recommendations are valuable and warranted, the EM SSAB recommends DOE HQ work with the EM SSAB to develop specific focus areas for the EM SSAB Chairs. This would help the time spent meeting in person to be focused on developing recommendations that meet the needs of HQ and the individual site boards.

The concept of focus areas is already in place and working extremely well at many sites. Members know at the beginning of the fiscal year what specific EM items are identified for consideration and potential recommendations. This allows members to come prepared to meetings, having already discussed items and developed their board's viewpoints.

We look forward to continuing to provide input and hope this recommendation is an enhancement for all involved. DOE should fully support this approach to the work of the EM SSAB by any means necessary to ensure the success of the EM SSAB mission.

DRAFT

Nevada Site Specific Advisory Board FY 2013 Work Plan

Item 1	**Description of Work Plan Item:**	*Corrective Action Unit (CAU) 105 - Area 2 Yucca Flat Atmospheric Test Sites Evaluation of Corrective Action Alternatives* - Provide DOE a recommendation on which corrective action alternative (closure in place or clean closure) should be selected by DOE for CAU 105 (Soils Activity)
	Deadline for Submittal to DOE:	May 2013
	Supporting Activities:	Field investigations at CAU 105 begin in October of 2012 and will continue through January of 2013. The NSO will provide a briefing to the NSSAB in April 2013 that outlines the nature and extent of contamination, the potential risk to human health and the environment, and an overview of the *Evaluation of Corrective Action Alternatives* document (a copy of the draft document will also be made available). This evaluation utilizes EPA's screening criteria for ranking corrective actions (i.e. no further action, clean closure, and closure in place) and will provide the basis for NSO's recommended preferred corrective action option.

Picture at left: Mounds of scraped up surface soil containing Trinity glass (fused soil) at the T-2B Diablo site. Location of the Diablo atmospheric nuclear test conducted on July 15, 1957, with a yield of 17 kilotons. Soil was mounded in 1989 in preparation for removal to and disposal at the Area 3 Radioactive Waste Management Site. The pre-Environmental Management restoration experiment was cancelled prior to removal of all the soil mounds.

Item 2	**Description of Work Plan Item:**	*Closing Use Restriction (UR) Sites* - Provide Recommendation for Removal or Retention of Use Restrictions at seven specific Industrial Sites
	Deadline for Submittal to DOE:	January 2013
	Supporting Activities:	During development of the Industrial Sites closeout document, it was determined that the potential exists for the removal of use restrictions at certain Industrial Sites. A total of 48 sites were identified as candidates and work is underway to remove the URs at 37 of these sites. An additional four sites were determined to be too expensive to pursue. The remaining seven sites are still potential candidates and a decision is needed on whether to pursue removal of the UR. At each of the seven sites, additional field investigation would be required. The key factors in whether the UR can be removed are the risks to workers in conducting field work and the cost/benefit of investigation required to conduct UR removal. A briefing/document describing each of the seven sites along with a proposed plan for additional investigation and UR removal and a cost/benefit analysis will be provided to the NSSAB in November 2012 to allow for a recommendation by January 2013 as to which of the seven sites should be pursued for UR removal.

Bunker 2-300, Corrective Action Site 02-34-01

Bunker 3-300, Corrective Action Site 03-34-01

Item 3	**Description of Work Plan Item:**	*Review Questions for Rainier Mesa Peer Review Panel* - Review the draft questions developed for the Rainier Mesa Peer Review panel and provide recommendations on how they could be enhanced (UGTA Activity)
	Deadline for Submittal to DOE:	September 2013
	Supporting Activities:	Upon completion of the Rainier Mesa flow and transport model document, a peer review panel will be assembled to provide an independent review of the modeling, similar to the Frenchman Flat Peer Review conducted in 2010. A set of questions will be prepared for the panel to answer during the review. DOE will provide a briefing on this process and provide the NSSAB with a list of draft questions in August 2013.

Item 4	**Description of Work Plan Item:**	*Nye County Drilling Proposal* - Review the Nye County Drilling Proposal and determine from a community perspective if this is something the Board recommends the DOE support (UGTA Activity)
	Deadline for Submittal to DOE:	January 2013
	Supporting Activities:	DOE will invite the Nye County Nuclear Waste Repository Project Office liaison to share the county's groundwater well proposal with the NSSAB in November 2012. DOE will discuss the potential impacts and benefits of the proposal.

Item 5	**Description of Work Plan Item:**	*FY 2015 Baseline Prioritization* - Review FY 2015 baseline funding needs and provide a recommendation to DOE prioritizing the work by activity
	Deadline for Submittal to DOE:	January 2013
	Supporting Activities:	DOE will provide briefings on planned FY 2015 activities in January 2013. The NSSAB will provide a recommendation ranking the activities.

Item 6	**Description of Work Plan Item:**	*Community Environmental Monitoring Program* – Provide a recommendation to DOE regarding potential ways the CEMP could be enhanced to ensure it reflects current missions
	Deadline for Submittal to DOE:	August 2013
	Supporting Activities:	DOE will provide an overview briefing on the current program and path forward options in May 2013. One-two NSSAB members will have the opportunity to attend the CEMP workshop in July 2013.

Item 7	**Description of Work Plan Item:**	*Waste Acceptance Review Panel* – Review the existing Waste Acceptance Review Panel process and provide a recommendation for ways the process could be enhanced
	Deadline for Submittal to DOE:	August 2013
	Supporting Activities:	DOE will provide an overview briefing on the WARP process in April 2013. Two NSSAB member representatives will be invited to observe WARP meetings between May-August 2013.

Item 8	**Description of Work Plan Item:**	*Groundwater Sampling Plan* – Review the sampling plan and provide the DOE with a recommendation for ways the plan could be enhanced from a community perspective
	Deadline for Submittal to DOE:	September 2013
	Supporting Activities:	The UGTA Activity is developing a comprehensive groundwater sampling plan to guide the collection of analytical and physical data for determining source term characteristics, plume migration, and baseline water quality. In May, DOE will brief the Board on the plan. DOE will provide the NSSAB a copy of the plan in early August after a public release review. In August, DOE will answer questions during the Full Board meeting.