Buckman Direct Diversion Project

Independent Peer Review (IPR)

Presentation of Draft Findings

September 30, 2010

ChemRisk®

amec

Buckman Direct Diversion Project

Objectives of Today's Meeting

1. Provide summary of the independent peer review and preliminary results
2. Describe how the public can review and comment on the draft IPR reports
3. Discuss the schedule going forward
4. Answer questions

Tom Widner (1958-2010)

- Tom Widner, principal investigator, passed away suddenly during the IPR process.
- Over his career, he wrote more than 10,000 pages of scientific text describing his analyses of the Rocky Flats, Oak Ridge, and Los Alamos sites.

ChemRisk®

Pioneering innovative human health and ecological risk assessment methods

Home | Company Profile | Practice Areas | ChemRisk Publications | Contacts | Search

Home > Home

Quick Search [ ] Go

Project of the Month

July 2010
June 2010

Reach Project Highlights

- Develop REACH Training Module for a Global chemical and plastics manufacturing company

- Pre-Registration assistance to U.S.-based adhesives manufacturer

- Article determination and pre-registration determination for U.S – based polymer manufacturer

- Only Representative services to U.S.- based optical products manufacturer through our partnership with REACH Law

- Developed generic exposure scenarios (GES) for 200 chemicals used rubber product manufacturing, as well as article service life and end of life.

- Emission factor evaluation for chemicals used in rubber product manufacturing including antioxidants, accelerators, vulcanizing agents, plasticizers, solvents and fillers.

For Further Information, Contact-
Julie Panko at
jpanko@chemrisk.com.

Home Office:

Welcome to ChemRisk®

ChemRisk® is a scientific consulting firm that specializes in using risk assessment methods to characterize and provide improved understanding of complex exposures involving chemicals, pharmaceuticals, or radionuclides in a variety of potentially contaminated media. We have more than 60 scientists experienced in addressing health and safety concerns, with backgrounds including toxicology, industrial hygiene, epidemiology, ecotoxicology, environmental sciences, medicine, statistical analysis, and risk assessment.

Professionals on our team have a longstanding reputation for thorough scientific analysis and for sharing their results both at major scientific meetings and in the peer-reviewed scientific literature.

Many of the more than 1,000 papers presented at scientific conferences and 400 papers published by **ChemRisk®** scientists are frequently referenced in regulatory decision-making and relied upon in litigation proceedings. Sharing our work in the peer-reviewed literature is a priority that we have found to be unique in the consulting field.

Memoriam

In Memoriam of Thomas E. Widner

Breaking News

ChemRisk Recognized by American Industrial Hygiene Community

ChemRisk Upcoming and Recent Events

- ChemRisk presenting at 30th International Symposium on Halogenated Persistent Organic Pollutants (POPs)
  September 12-17, 2010, San Antonio, Texas

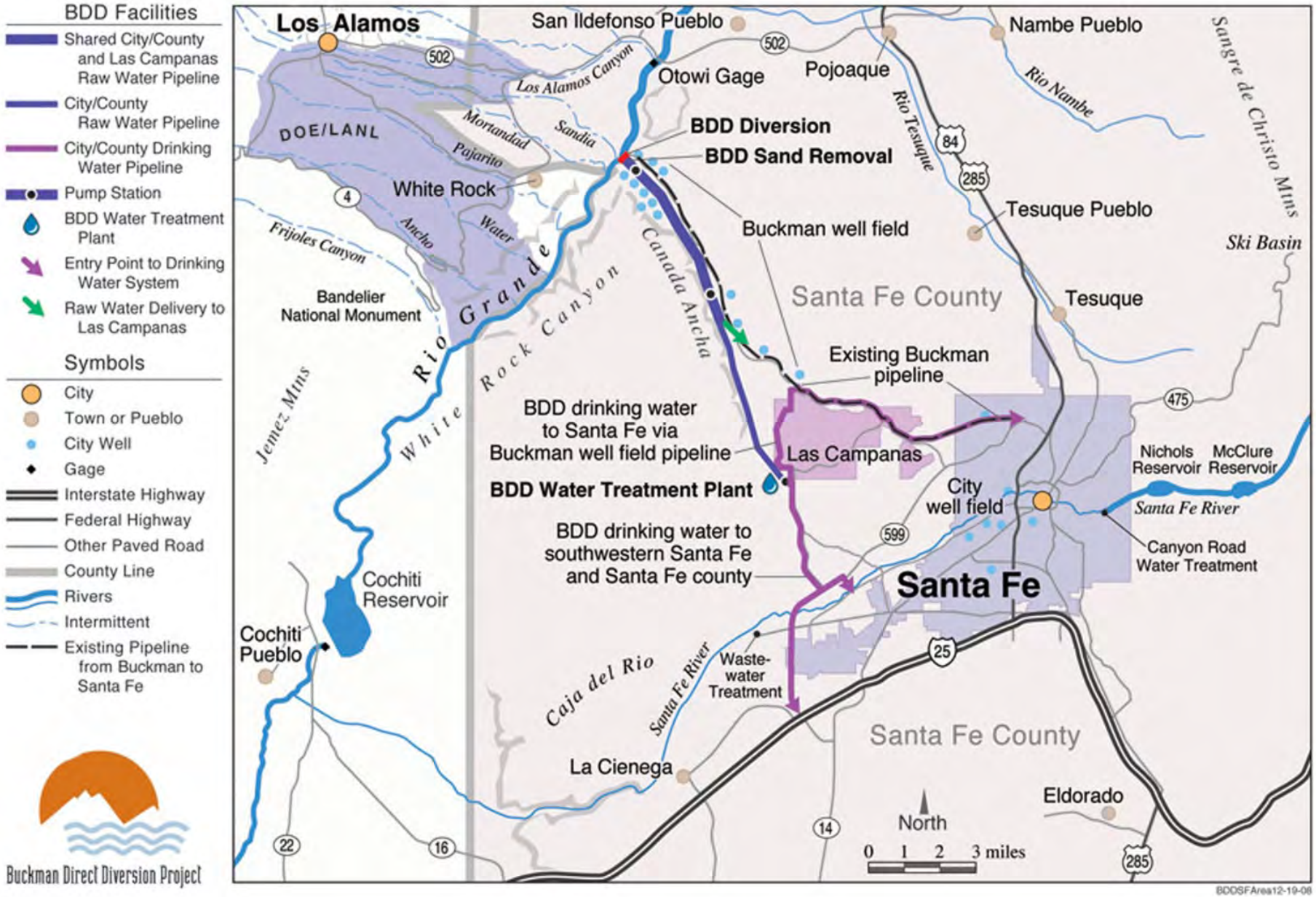
- ChemRisk presenting at upcoming 2010 Society of Environmental Toxicology and Chemistry (SETAC) Conference
  November 7-11, 2010, Portland, Oregon

- ChemRisk presenting at upcoming 2010 Society for Risk Analysis Conference
  December 5 - December 8, 2010, Salt Lake City, Utah

Internet 120%

The Buckman Direct Diversion (BDD) Project

- Co-owned by City of Santa Fe and Santa Fe County
- Diversion of water from the Rio Grande
- Tapwater source for residents of Santa Fe
- Renewable resource intended to replace unsustainable groundwater pumping
- Approximately 3 miles downstream of Los Alamos Canyon (LANL)


BDD Facilities
Shared City/County and Las Campanas Raw Water Pipeline
City/County Raw Water Pipeline
City/County Drinking Water Pipeline
Pump Station
BDD Water Treatment Plant
Entry Point to Drinking Water System
Raw Water Delivery to Las Campanas
Symbols
City
Town or Pueblo
City Well
Gage
Interstate Highway
Federal Highway
Other Paved Road
County Line
Rivers
Intermittent
Existing Pipeline from Buckman to Santa Fe
Buckman Direct Diversion Project
Los Alamos
San Ildefonso Pueblo
Nambe Pueblo
Pojoaque
Otowi Gage
Los Alamos Canyon
Mortandad
Sandia
Pajarito
DOE/LANL
White Rock
Ancho
Water
Frijoles Canyon
Bandelier National Monument
Rio Grande
Rock Canyon
Canada Ancha
Jemez Mts
White
BDD Diversion
BDD Sand Removal
Buckman well field
Rio Tesuque
Rio Nambe
Sangre de Christo Mtns
Tesuque Pueblo
Ski Basin
Santa Fe County
Tesuque
Existing Buckman pipeline
BDD drinking water to Santa Fe via Buckman well field pipeline
Las Campanas
BDD Water Treatment Plant
City well field
Nichols Reservoir
McClure Reservoir
Santa Fe River
Canyon Road Water Treatment
BDD drinking water to southwestern Santa Fe and Santa Fe county
Santa Fe
Cochiti Reservoir
Cochiti Pueblo
Caja del Rio
Santa Fe River
Waste-water Treatment
La Cienega
Santa Fe County
Eldorado
North
0 1 2 3 miles
502
4
84
285
475
599
25
22
16
14
BDDSFArea12-19-08

What is "Peer Review"?

- Objective…no bias
- Transparent…all facts and estimates explained and cited
- Reproducible…can be checked for accuracy
- Comprehensive…historical and current information
- Critique…of previous analyses

Goals of the Independent Peer Review (IPR)

- Independent 3rd party analysis of potential health risk
- Consider outside review and comments (Public, BDD Board, LANL)
- Address public concerns
- Transparent process
- High quality technical work

- Use of best methodology (Federal Guidance, USEPA)
- Use of recent data and information
- Public communication

Summary of Draft IPR Findings

- Chemical and radionuclide levels in the Rio Grande are within acceptable standards and/or are primarily naturally occurring
- Very little contribution from LANL during baseflow conditions
- Stormwater discharge from LANL is not expected to be a health risk
- No LANL contributions to Buckman well field
- No significant health risk to people drinking BDD Project tapwater

Initial Steps of the IPR Process

- Conducted first public meeting to introduce IPR process and peer review team (1/14/2010)
- Review selected BDD public and technical communication materials
- Identified and assessed relevant information
  - Data selection
  - Human health risk assessment

Public Questions and Concerns Expressed at the First Public Meeting

1. **BDD Water Treatment Plant**: – what will it remove and will it be efficient?
2. **IPR**: Potential sources and chemicals of concern – what are they?
3. **IPR**: Potential exposures and health risk – what will be considered and how will they be evaluated?
4. **IPR**: Transparency – how will it be ensured?

Review of Selected BDD Communications

- Review of public communications
- Review of technical communications
- Presented findings to the BDD Board (06/08/2010)
  - BDD communications were timely, accurate, complete, and supported specific references that were available

Information Resources in the IPR

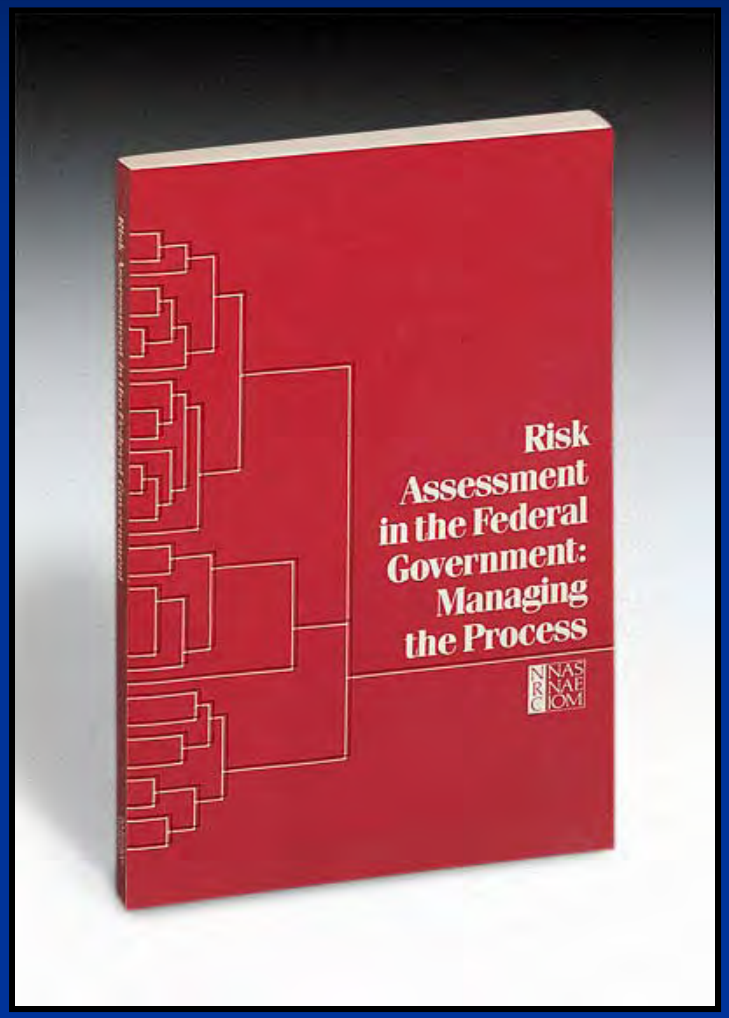
- Reports by NMED and LANL
- Rio Grande water quality databases
  - RACER
  - LANL
  - USGS
- LANL ground- and surface water databases (storm water impacts)

The RACER Database

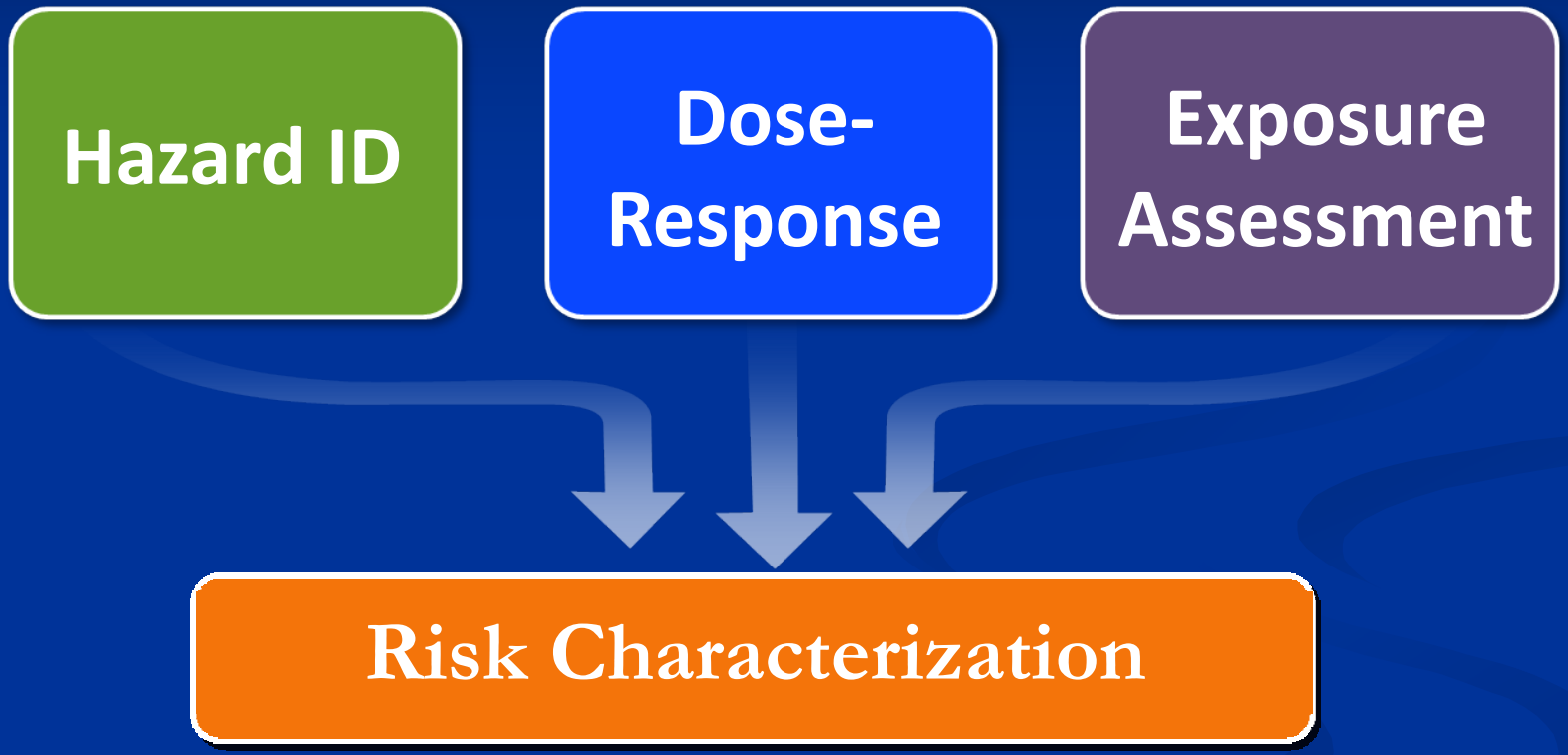
- Managed by the NM Community Foundation
- 7 million results, primarily from LANL and NMED
- Publically accessible
- Searchable by location and date
- Largest Rio Grande surface water database
- Primary database used in this analysis

Human Health Risk Assessment

National Research Council Standards for Risk Assessment



Health Risk Assessment

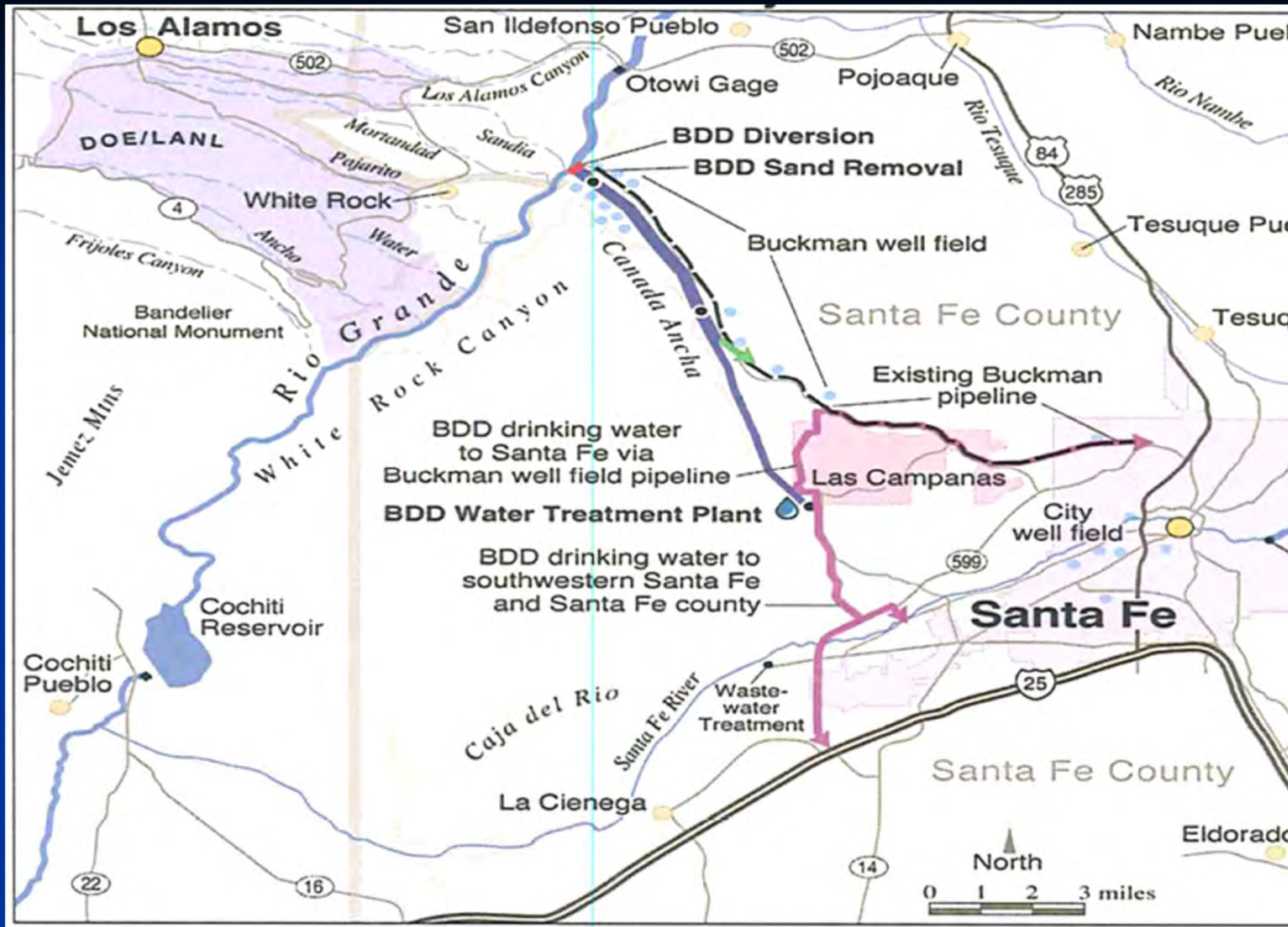


Key IPR Risk Assessment Questions

- What are the *contaminant concentrations* in the Rio Grande?
- *How much* contaminant *exposure* could occur via *tapwater* use from the BDD structure?
- Is that exposure a *health risk*?
- *How much* of that exposure is coming from *LANL vs. other sources*?

Surface Water Data Used to Assess Tapwater Risks

- Rio Grande samples since 2000
  - 11 events at 2 Buckman locations
  - 22 events at 5 upstream Otowi locations
- 287 chemical analytes/77 radionuclide analytes
- Unfiltered samples collected during baseflow conditions


Los Alamos
San Ildefonso Pueblo
Nambe Pueblo
502
Otowi Gage
Pojoaque
Los Alamos Canyon
Rio Nambe
DOE/LANL
Mortandad
Pajarito
Sandia
BDD Diversion
BDD Sand Removal
Rio Tesuque
84
285
White Rock
4
Tesuque Pueblo
Frijoles Canyon
Ancho
Water
Canada Ancha
Buckman well field
Bandelier
National Monument
Rio Grande
White Rock Canyon
Santa Fe County
Existing Buckman
pipeline
Jemez Mtns
BDD drinking water
to Santa Fe via
Buckman well field pipeline
Las Campanas
BDD Water Treatment Plant
City
well field
599
BDD drinking water to
southwestern Santa Fe
and Santa Fe county
Santa Fe
Cochiti
Reservoir
Cochiti
Pueblo
Caja del Rio
Santa Fe River
Waste-
water
Treatment
25
Santa Fe County
La Cienega
Eldorado
14
North
22
16
0 1 2 3 miles

Identifying the "Constituents of Interest" (COIs)

- All chemicals and radionuclides measured in surface water at Otowi and Buckman since 2000 were evaluated
- Those capable of causing health effects were considered to be COIs
  - to be conservative, we included compounds that were detected at Otowi but not Buckman
- Exposure and risk was estimated for all COIs

Chemical COIs

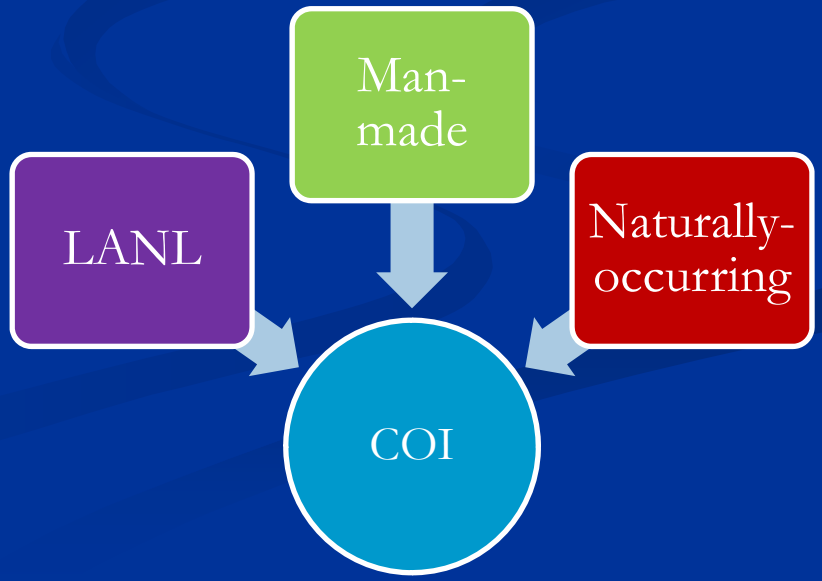
1. Acetone
2. Aluminum
3. Ammonia
4. Antimony
5. Arsenic
6. Barium
7. Beryllium
8. Bis(2-ethylhexyl)phthalate
9. Boron
10. Cadmium
11. Chloromethane
12. Total Chromium
13. Cobalt
14. Copper
15. Cyanide
16. DDE
17. Fluoride
18. Delta HCH
19. Iron
20. Lead
21. Manganese
22. Mercury
23. Molybdenum
24. Nickel
25. Nitrite
26. OCDD
27. Perchlorate
28. Total PCBs
29. Selenium
30. Silver
31. Strontium
32. Thallium
33. Uranium
34. Vanadium
35. Zinc

Radionuclide COIs

1. Americium-241
2. Lead-214
3. Plutonium-238
4. Plutonium-239
5. Potassium-40
6. Radium-226
7. Radium-228
8. Strontium-90
9. Thorium-228
10. Thorium-230
11. Thorium-232
12. Tritium (H-3)
13. Uranium-234
14. Uranium-235
15. Uranium-238

Characterization of COI levels in the Rio Grande

- Comparison to drinking water standards and guidelines
- Comparison of upstream (Otowi and other locations) to downstream (Buckman)
- Evaluation of sources
  - LANL
  - man-made
  - naturally occurring



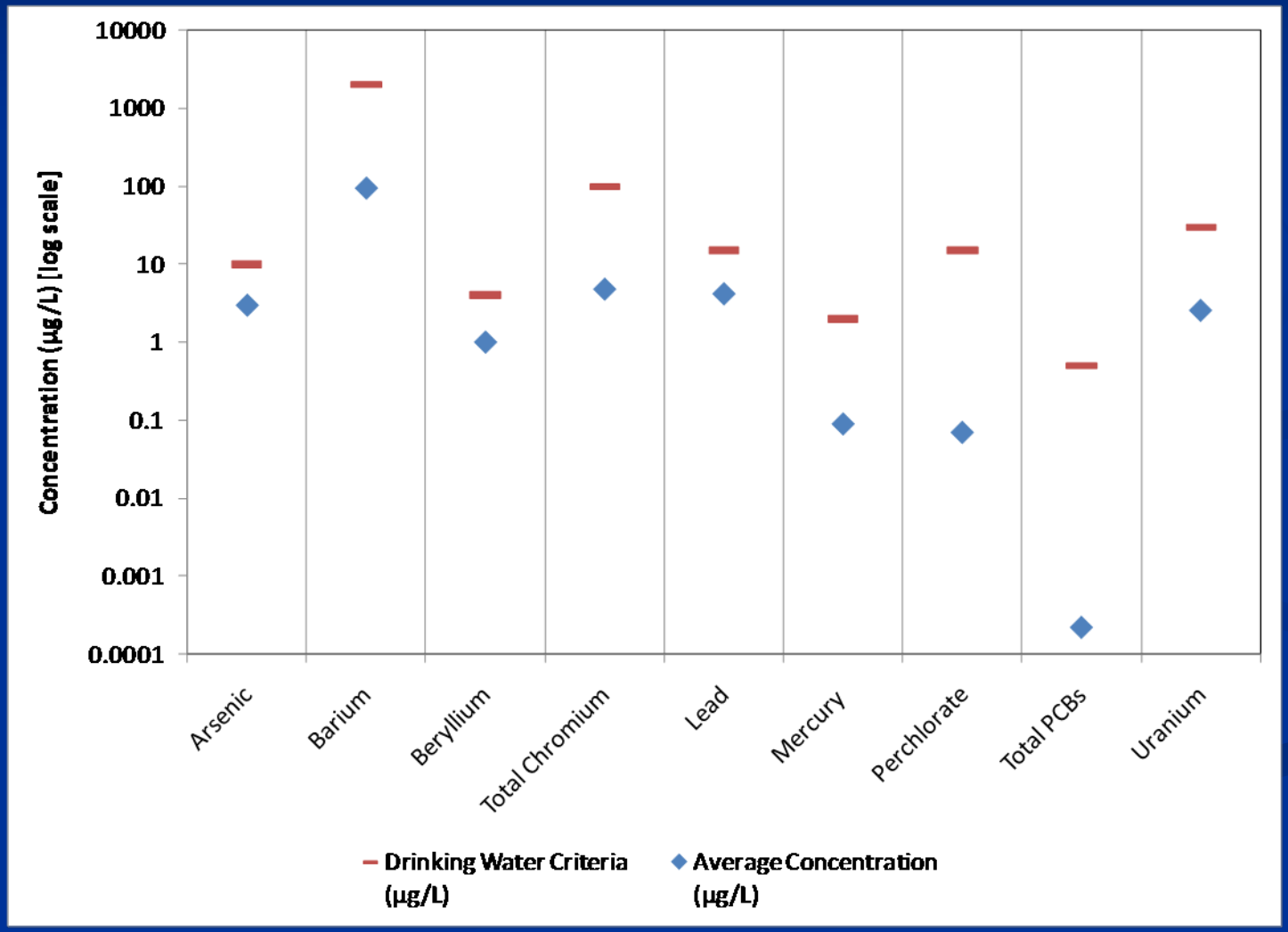
Drinking Water Standards and Criteria

- USEPA Maximum Contaminant Levels (MCLs) when available
- MCLs are
  - Standards set by USEPA for drinking water quality
  - Enforceable limits on chemical levels allowed in public water systems under the Safe Drinking Water Act
  - Apply to treated tap water

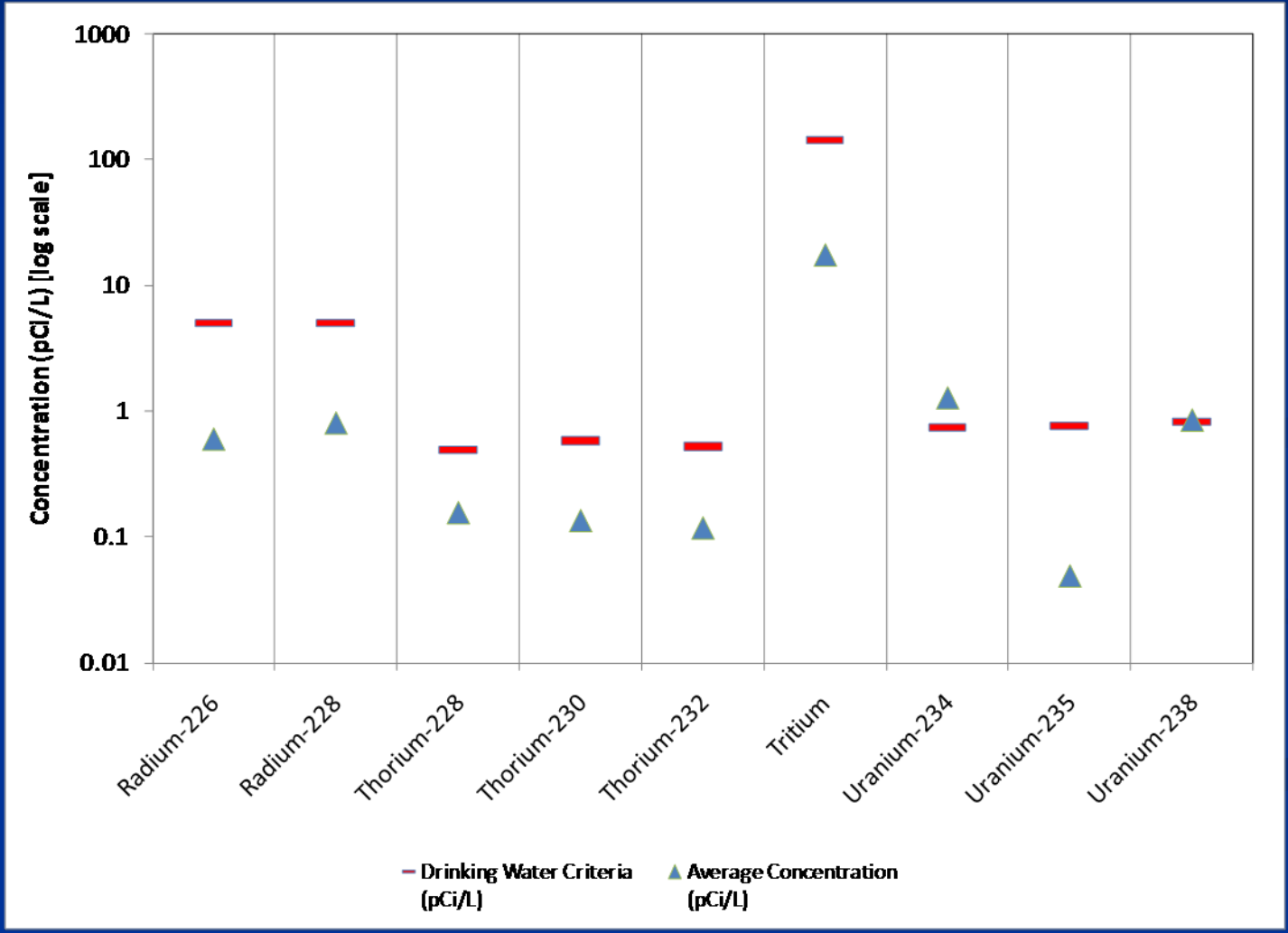
Other Drinking Water Criteria Used

- When MCLs were not available, the following risk-based guidelines were used:
  - NMED Tap Water Screening Levels
  - USEPA Regional Tap Water Screening Levels
  - USEPA Preliminary Remediation Goals for Radionuclides
  - USEPA Drinking Water Equivalent Levels
  - Lifetime Health Advisories
  - USEPA Secondary Drinking Water Regulations

Comparison of Chemical COIs at Buckman with DWS

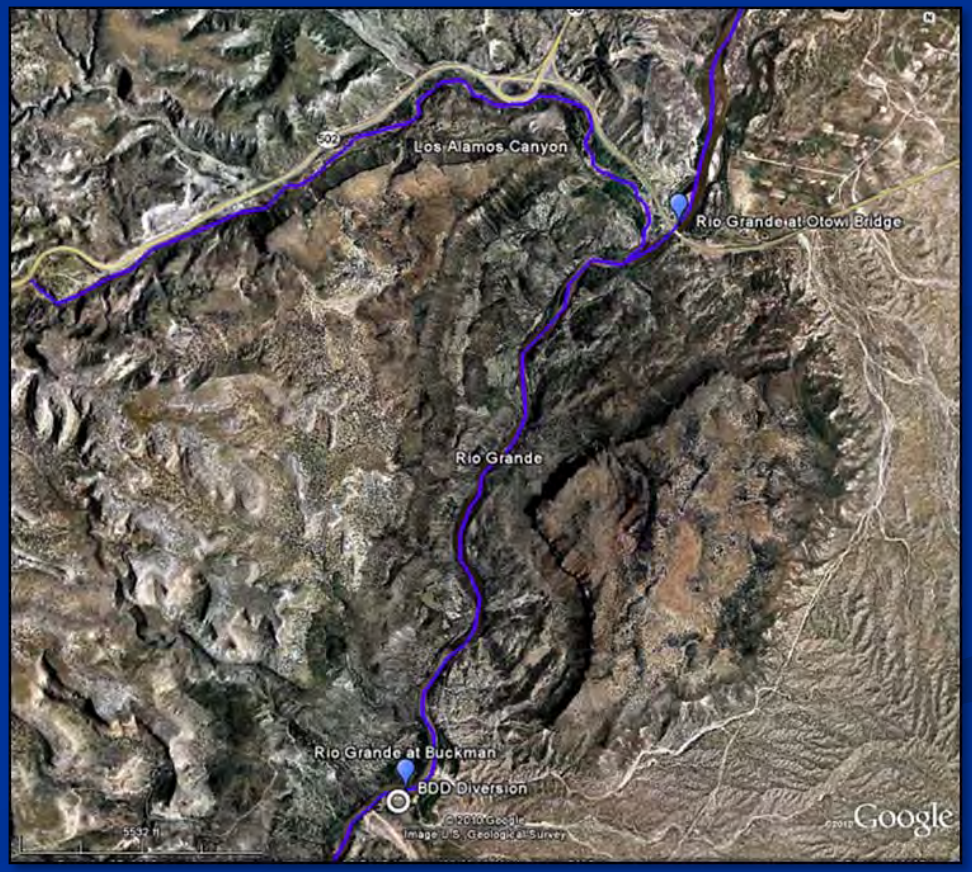


Comparison of Radionuclide COIs at Buckman with DWS



Comparison of Buckman to Regional Background

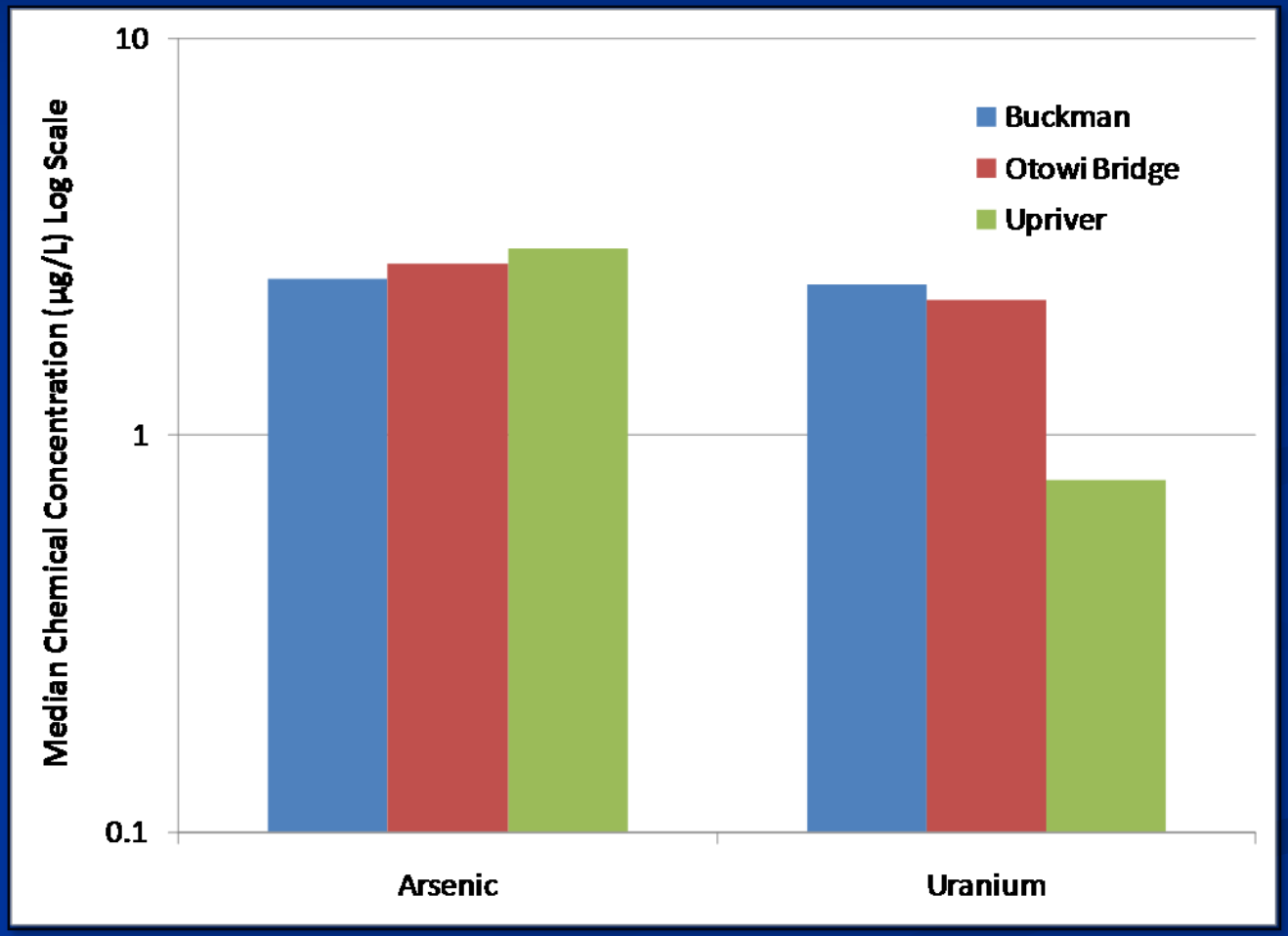
- Otowi is approximately ¼ mile upstream of the Los Alamos canyon watershed (LACW) = "regional background"
- Buckman is three miles downstream of LACW = "regional background + LANL"



Regional Background: Sources

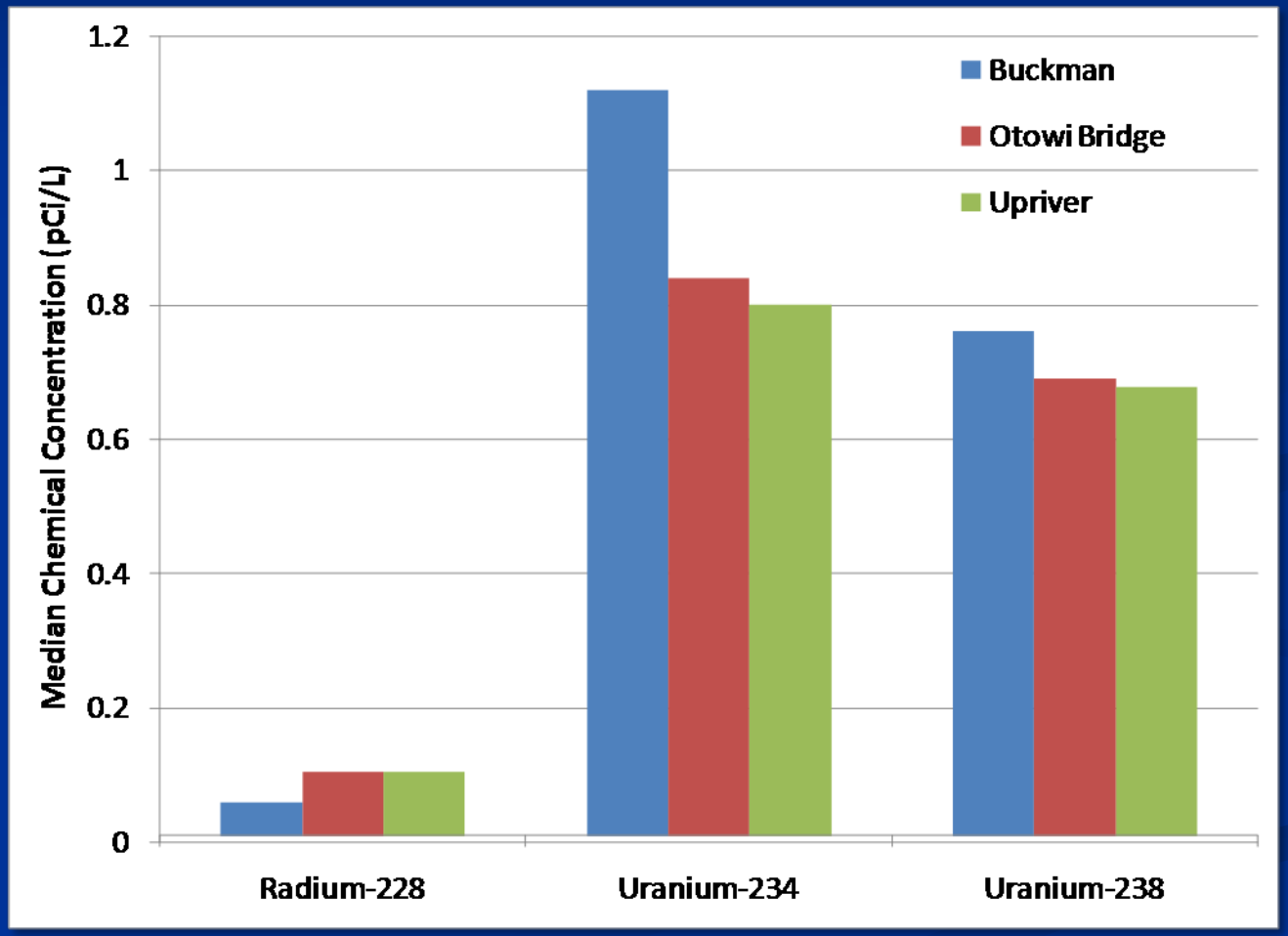
- Naturally occurring
- Sewage outfalls
- Surface run-off
- Fall-out from nuclear testing

Comparison of Arsenic and Uranium Concentrations At Buckman vs. Upstream Locations



Upriver locations include Rio Grande at Espanola; Rio Grande at Embudo; and Rio Chama at Chamita

Comparison of Select Radionuclide Concentrations At Buckman with Upstream Locations



Upriver locations include Rio Grande at Espanola; Rio Grande at Embudo; and Rio Chama at Chamita

Summary of Buckman vs. Otowi Comparisons

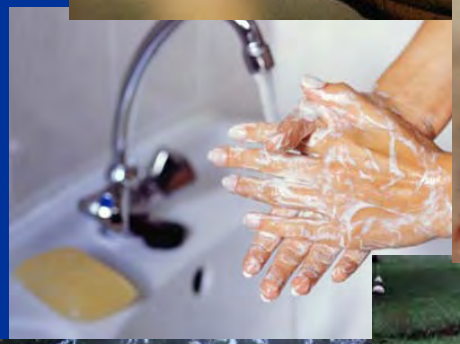
- None of the COIs were present at Buckman at statistically significantly higher concentrations than Otowi
- Some radionuclide COIs were present at Otowi but not at Buckman:
  - Lead
  - Plutonium
  - Potassium
  - Strontium

Summary Observations Regarding COI Levels in the Rio Grande

- Most COI levels at Buckman below drinking water standards or guidelines
  - those that exceeded are present due mainly to naturally occurring sources
- No difference between COI levels at Otowi vs. Buckman
  - several COIs present at Otowi but not Buckman
- Contributions from LANL are minor

Tapwater Exposure Pathways

- Drinking tap water
- Showering /bathing
  - inhalation
  - dermal contact
- Washing hands
- Swimming/hot tub
  - inhalation
  - dermal contact
- Eating home-grown vegetables
- External exposure (radiation)



Primary Risk Assessment Guidance

- USEPA Exposure Factors Handbook (2009)
- USEPA Risk Assessment Guidance for Superfund
- USEPA Guidelines for Susceptible Populations
  - Selecting age groups for children's exposures (2005)
  - Evaluating cancer susceptibility for early-life exposures (2005)
  - Assessing children's health risks (2006)
- USEPA Federal Guidance Reports 12 and 13: internal and external radionuclide exposures

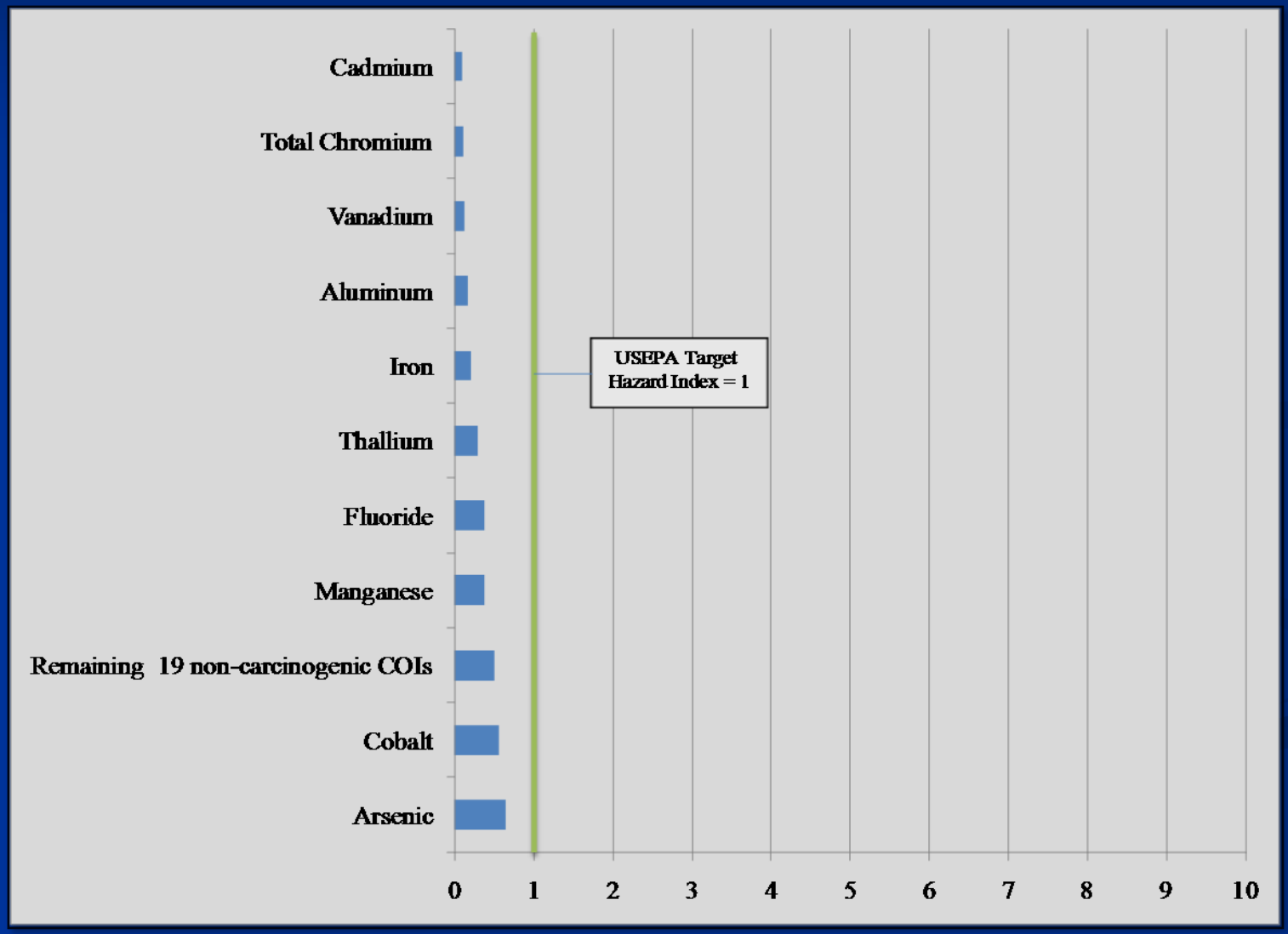
Residential Age Groups Evaluated

General Age Group Classification	Chemical Risk Evaluation (years of age)	Radionuclide Risk Evaluation (years of age)
Infant	<1	0 to 4
Toddler	1 to 2	
Child	3 to 5	
	6 to 10	5 to 14
	11 to 15	
Teen/young adult	16 to 20	15 to 24
Adult	21 to 70	25 to70
Lifetime	0 to 70	0 to 70

How are "Risks" Calculated?

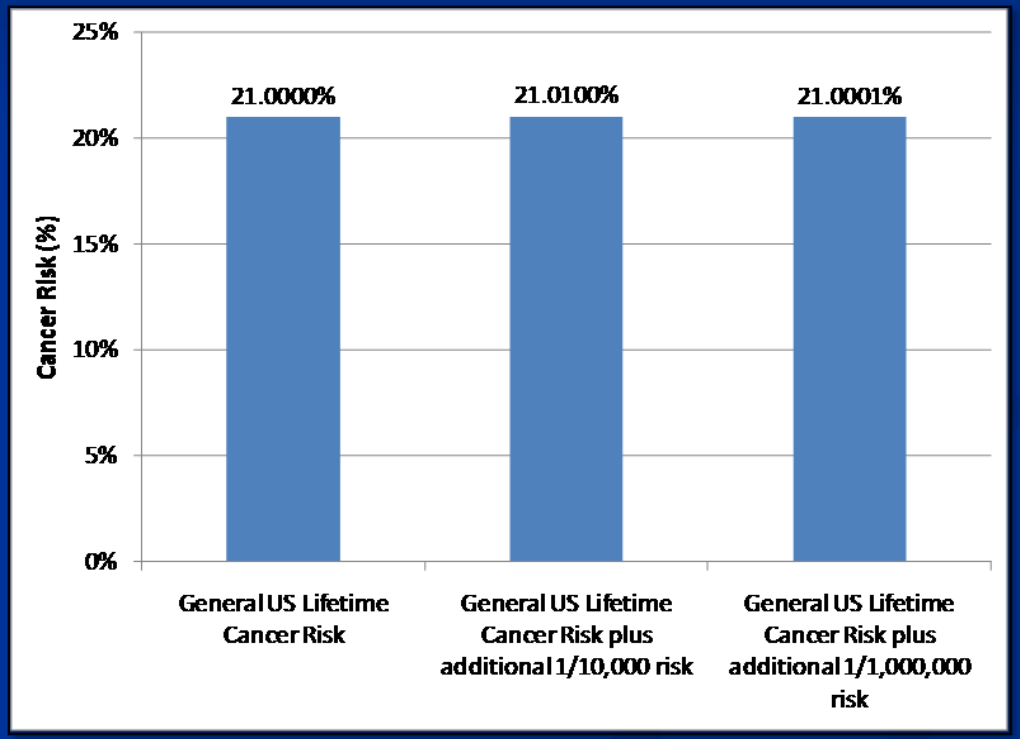
- Dose and USEPA toxicity criteria are combined
- Two endpoints are evaluated separately
  - non-cancer
  - cancer
- Chemicals and radionuclides are evaluated separately

Noncancer Hazards for Untreated Water

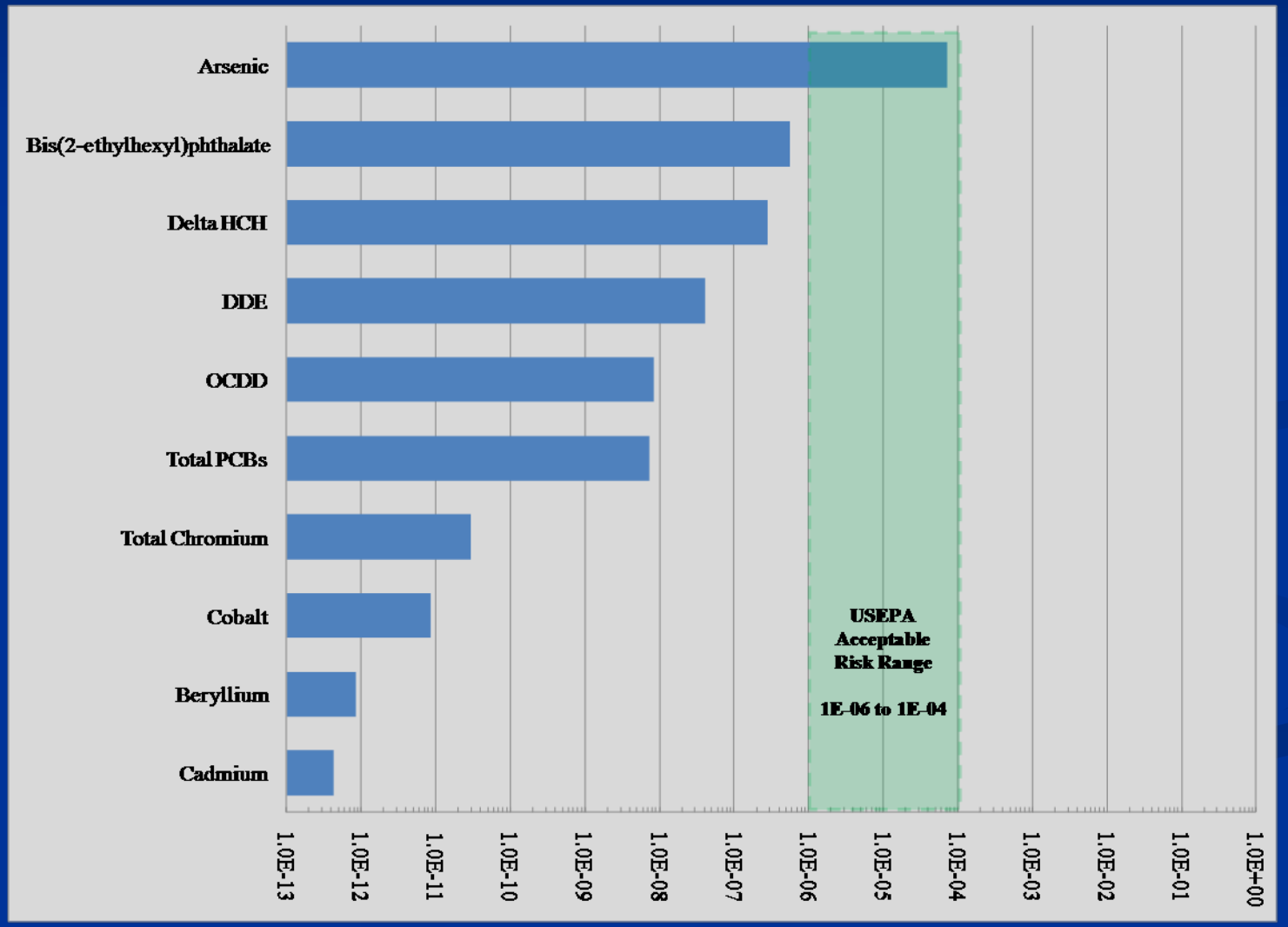


What is an "Increased Cancer Risk"?

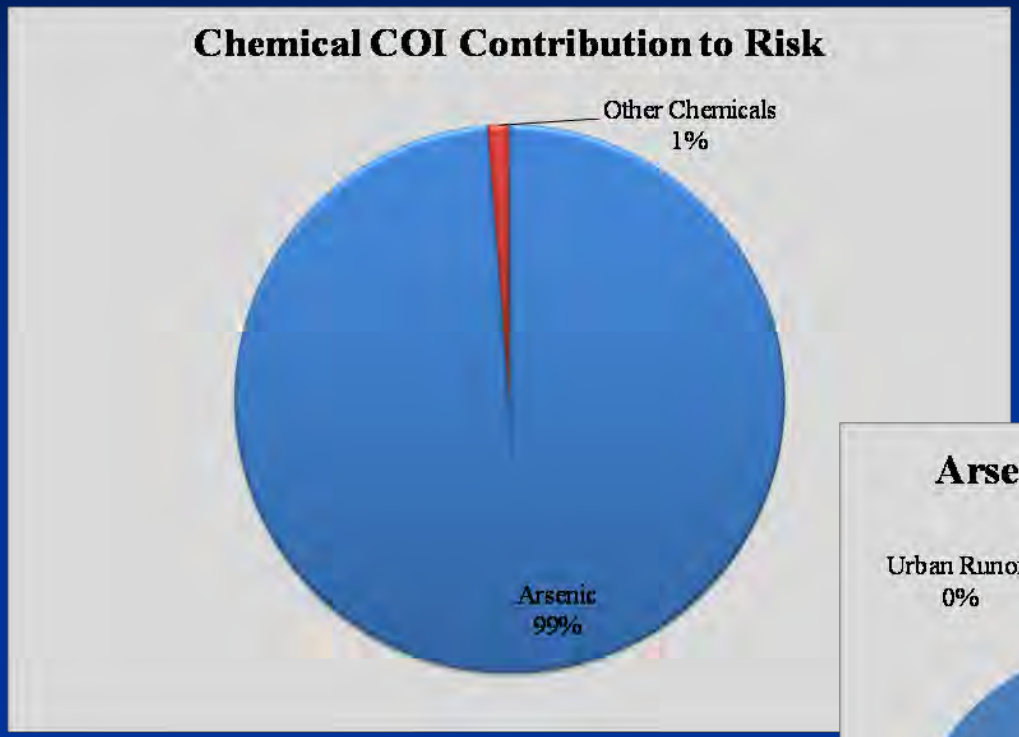
- An increase over "background" risk of cancer
- Lifetime cancer risk in the U.S. is about 21%
- By convention, increased risks less than 1/10,000
  - 1/1,000,000 are considered to be negligible

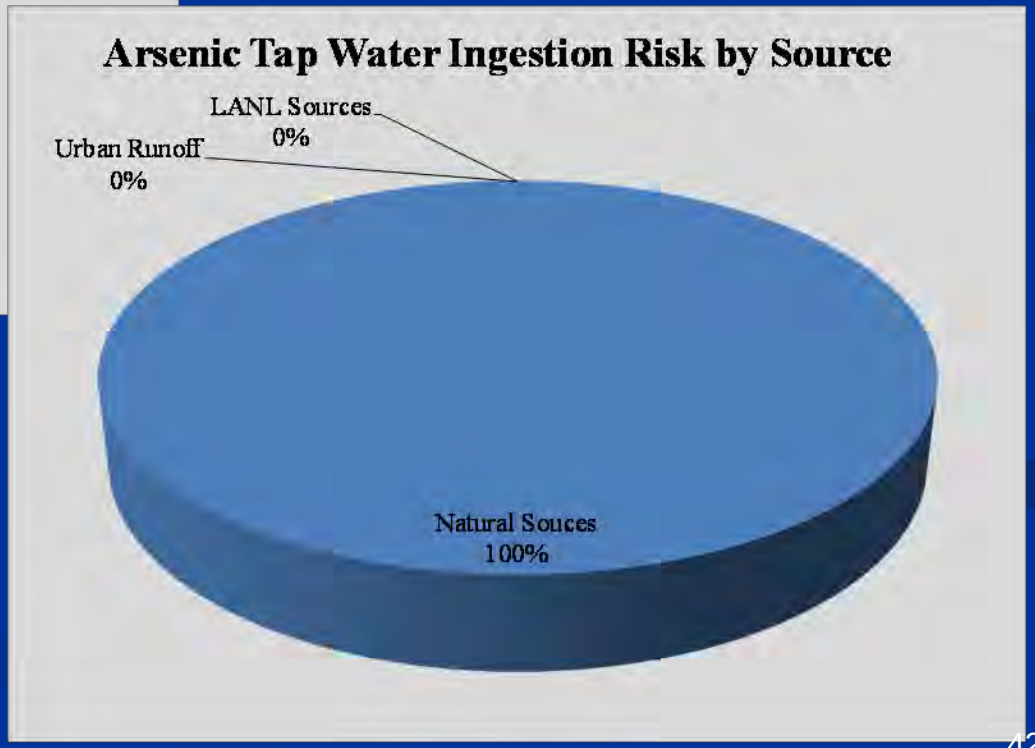


Theoretical Cancer Risks for Chemical COIs in Untreated Water



Arsenic Risk Summary





Arsenic Risk

- Ingestion of arsenic in untreated tap water is the only chemical exposure pathway that exceeds a theoretical 1 x 10^{-6} increased cancer risk
- Arsenic levels at Buckman:
  1. are lower than the drinking water standard (10 ppb)
  2. are no different from levels upstream
  3. are the same as those measured in treated tap water in the Santa Fe region and elsewhere the United States (1-5 ppb)

Arsenic in NM Drinking Water

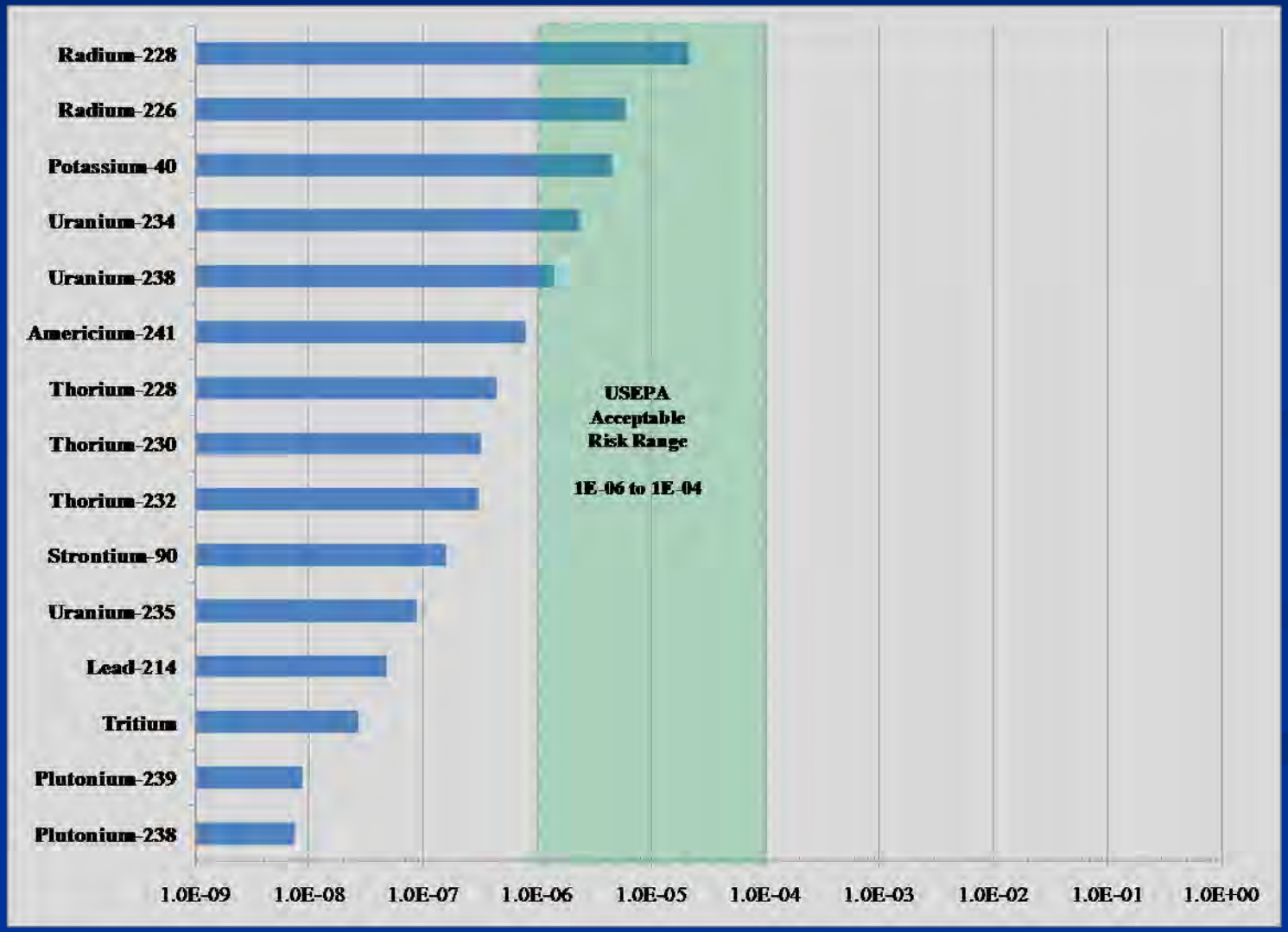
- It is naturally-occurring in soil and rocks, and is released to groundwater and surface water through erosion, dissolution, and weathering

- NMED has identified arsenic as a problematic, naturally-occurring chemical contaminant for drinking water in New Mexico

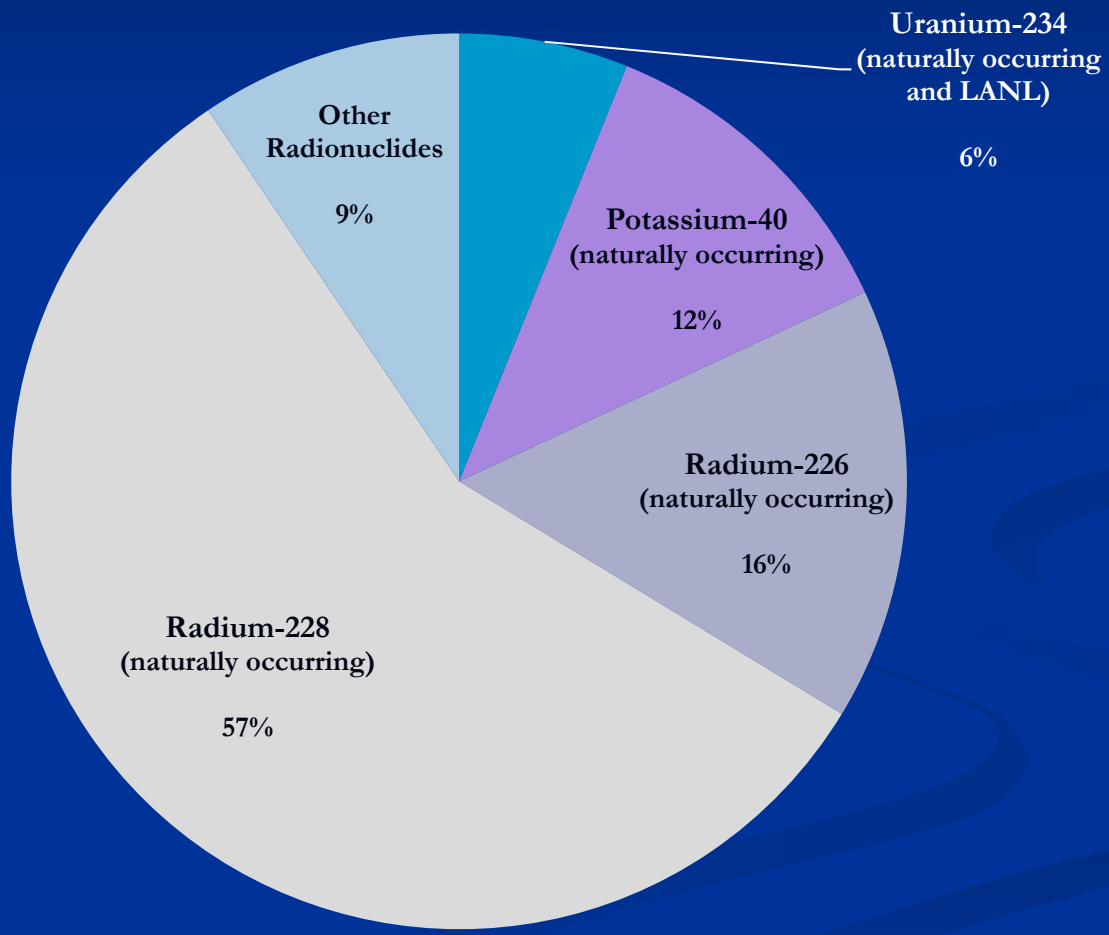
In Summary:

- Almost all of the theoretical cancer risk estimated for the *chemical* COIs in *untreated* Rio Grande surface water is associated with *consumption* of *arsenic* at *naturally-occurring levels*
- The BDD plant is expected to *remove* a substantial portion of the arsenic present in the water it receives
- The IPR team believes that public exposures to arsenic in *treated* tap water are *not* a health concern

Theoretical Radionuclide Cancer Risks for Untreated Water



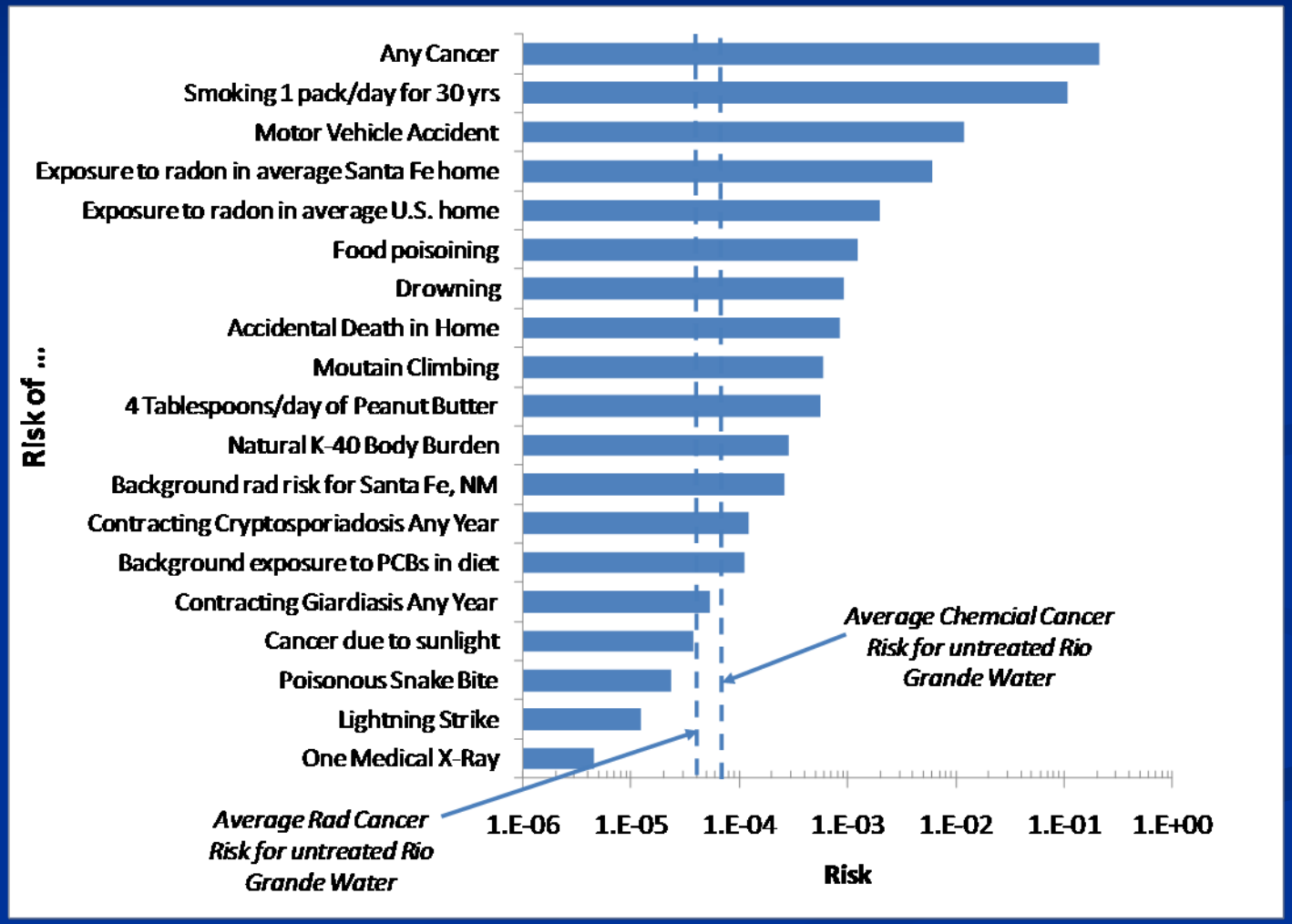
Contribution to Theoretical Radionuclide Risk - Untreated Water



Summary of Radionuclide Theoretical Cancer Risks

- Almost all of the theoretical cancer risk estimated for the *radionuclide* COIs in *untreated* Rio Grande surface water is associated with *consumption* of *naturally-occurring levels*
- Some of these radionuclides were *rarely or never* detected at Buckman
- The BDD plant is expected to *remove* a substantial portion of the radionuclides present in the water it receives
- The IPR team believes that public exposures to radionuclides in *treated* tap water are *not* a health concern

How do the risks associated with untreated Rio Grande water compare to risks associated with everyday activities?



Other Tapwater Exposure Scenarios Evaluated by IPR

- Risk from untreated tapwater that contains *maximum acceptable levels* of all COIs
  - theoretical risks are higher but implausible
- Risk assuming *95% removal* of plutonium and uranium at BDD
  - total radionuclide risk decreases by 12%
- Risk using radium and uranium levels measured in Buckman well tank
  - risks are higher, but over-estimated

Pharmaceuticals and Personal Care Products

- Medicinals
  - rarely detected in the Rio Grande
  - very low levels, consistent with background in U.S.
- Perfumes, detergents, soaps
  - have not been analyzed in the Rio Grande
- There are no major metropolitan areas in the upper Rio Grande
- The IPR team believes that public exposures to these compounds in treated tap water are not a health concern

Endocrine Disrupting Compounds (EDCs)

- Compounds that can cause immune, developmental, and other effects:

  -DDE -PCBs

  -lead -cadmium

  -mercury -perchlorate

- None of these COIs exceeded their MCLs
- Estimated noncancer hazards for these COIs were very low
- The IPR team believes that public exposures to these compounds in *treated* tap water are *not* a health concern

What About Storm Runoff from the LACW?

- There are few measurements in the Rio Grande downstream of the LACW during storms
- Storm events will discharge contaminated sediments into the Rio Grande at the LACW – a short-term release
- Some of that sediment would be expected to reach the BDD intake point

What About Storm Runoff from the LACW?

- However:
  - the BDD intake will shut down during storms
  - suspended sediments that reach the intake would be removed by the filtration system
- The IPR team believes that storm-related discharge from LANL is not a health concern

What About Contaminated Groundwater at LANL?

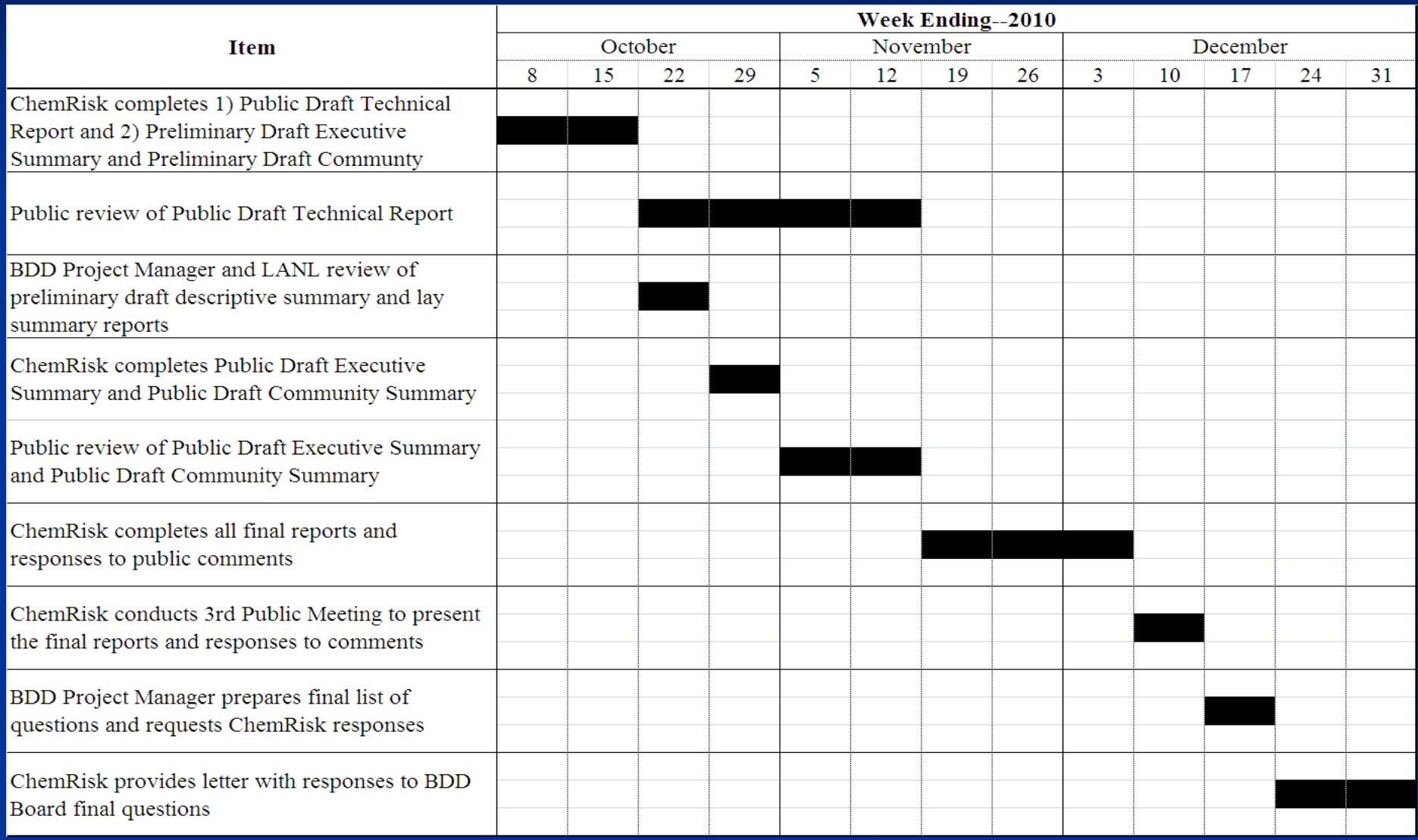
- Contaminated groundwater does exist at LANL
- Contaminated groundwater can flow from LANL to the west bank of the Rio Grande
- However, even under very conservative assumptions, if the COIs reach the Rio Grande, they would be diluted to negligible amounts
- A hydraulic connection between the LANL groundwater contamination and the Buckman Well Field is negligible and too small to be hydrologically measured

Summary of Draft IPR Findings

- Chemical and radionuclide levels in the Rio Grande are within acceptable standards and/or are primarily naturally occurring
- Very little contribution from LANL during baselflow conditions
- Stormwater discharge from LANL is not expected to be a health risk
- No LANL contributions to Buckman well field
- No significant health risk to people drinking BDD Project tapwater

IPR Project Timeline

December 2009 through December 2010



This Meeting is Important

- After this meeting, we will not meet in public until our work products are complete
- Tonight, we want to answer questions you have about:
  - Aspects of the IPR that are unclear
  - Your questions about the contaminants of interest, results of the risk assessment, etc.

For the Next Twenty Minutes

- We will have members of the IPR project team positioned with you at your tables.
- They will facilitate the discussion and take note of key topics that are raised.
- We may not be able to answer all questions tonight, but we will capture your question and get back with you as soon as possible.
- After the discussion period, each team member will summarize for all of us the key points that were raised at his or her table.

For Information After This Meeting

- Please check these Web sites:
  - www.bddproject.org
  - www.chemrisk.com
- You can contact Matthew Le at:
  - (415) 618-3206 - Office
  - 888-ChemRisk, ext. 3206 - toll free, office (888-243-6747)

Additional Information

- BDD Project
  - BDD Website: http://www.bddproject.org
- Exposure and Risk Assessment Guidance:
  - Exposure Factors Handbook (2009): http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=209866
  - Radionuclide risk assessment
    - Federal Guidance Reports- various guidelines: http://www.epa.gov/radiation/federal/techdocs.html
  - Chemical risk assessment
    - IRIS- chemical toxicity factors: http://www.epa.gov/IRIS/
    - EPA- various guidelines: http://www.epa.gov/risk/guidance.htm
- IPR Team
  - www.ChemRisk.com
  - www.AMEC.com

Thanks for coming!

ChemRisk®

amec

Buckman Direct Diversion Project