Buckman Direct Diversion Project
Independent Peer Review

December 3rd, 2010

OVERALL CONCLUSIONS OF THE INDEPENDENT PEER REVIEW EVALUATION

The draft Independent Peer Review (IPR) conducted on the behalf of the Buckman Direct Diversion (BDD) Board has been finalized. The IPR team has concluded the following:

- There will be no health risk to people drinking BDD Project tap water.
- Chemical and radionuclide levels in the Rio Grande are below acceptable drinking water standards, and/or occur naturally in the environment.
- LANL contributes very little, if any, chemicals and radionuclides to the Rio Grande during normal river flow conditions.
- Pharmaceuticals and endocrine disrupting compounds are not present in the Rio Grande at levels that warrant a concern.
- Stormwater discharge from LANL does not pose a health risk.
- There are no contributions from LANL groundwater to the Buckman well field.

WHAT IS THE BUCKMAN DIRECT DIVERSION PROJECT?

The BDD Project is a water supply project that will divert water from the Rio Grande to a facility where it will be filtered and treated. The treated water will then be supplied as tap water to Santa Fe residents. Water for the BDD system will be taken from the Rio Grande at a point on the river's eastern descending bank at a location known as Buckman, about 11 miles northwest of the Santa Fe city limits, and about 3.5 miles downstream from where New Mexico Route 502 crosses the river at Otowi Bridge.

The BDD diversion intake structure is located about three miles east of Los Alamos National Laboratory (LANL), which occupies about 36 square miles of property on the Pajarito Plateau, on the western side of the river.

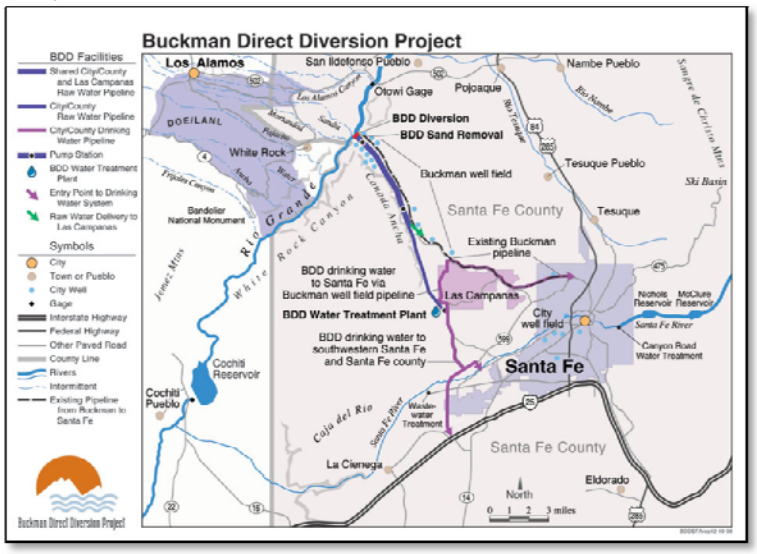

Figure 1. Map of the Buckman Direct Diversion project.

Through funding provided by the U.S. Department of Energy, the BDD board hired ChemRisk, a human health risk assessment consulting firm, to assemble an IPR team to determine whether LANL is contributing to the levels of chemicals and radionuclides in the Rio Grande, and to assess the possible health risks from using BDD project water as tap water. ChemRisk selected AMEC Earth and Environmental, a consulting firm specializing in New Mexico hydrology, hydrogeology, and geochemistry, to be part of the IPR team. This Community Summary presents the findings of the IPR team's evaluation.

Figure 2. Rio Grande near the Buckman Direct Diversion intake.

ChemRisk®

amec

Buckman Direct Diversion Project

LANL AS A POTENTIAL SOURCE OF CHEMICALS AND RADIONUCLIDES IN THE RIO GRANDE

Since 2000, there have been numerous untreated and unfiltered water samples collected at the Buckman diversion location, as well as at locations downstream and upstream of Buckman. Based on an evaluation of the results of these samples, the IPR team identified 35 chemicals and 15 radionuclides as "constituents of interest" (COIs). These samples were collected during normal river flow conditions, i.e., when storm events were not occurring.

The Otowi Bridge is located along the Rio Grande, upstream from LANL. The IPR team compared the average levels of COIs measured in the Rio Grande at Otowi Bridge to those downstream of LANL (at the Buckman diversion site).

For each COI, the concentrations downstream of LANL were *no greater* than those upstream of LANL. Some of the comparisons are shown in Figure 3. These results indicate that LANL contributes very little, if any, COIs to the Rio Grande during normal river flow conditions. The COIs found in the Rio Grande are present primarily because they come from naturally occurring sources.

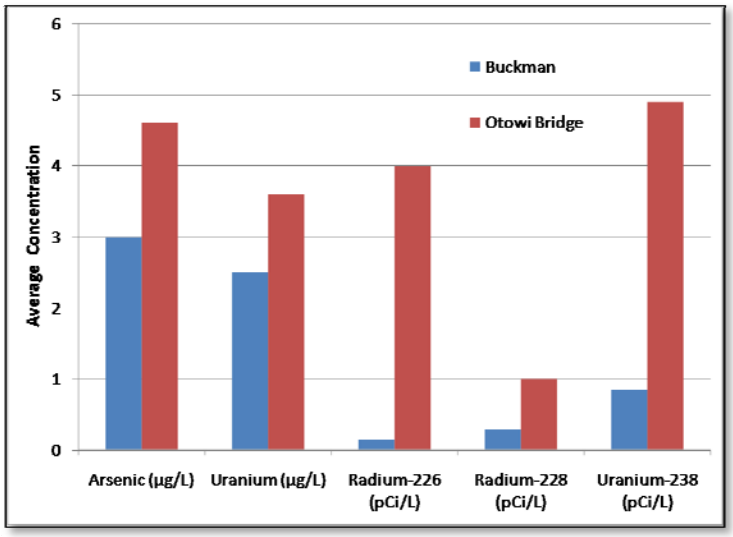

Figure 3. Comparison of average concentrations for select radionuclides at Buckman and Otowi Bridge.

COMPARISON OF CONSTITUENTS OF INTEREST LEVELS TO DRINKING WATER STANDARDS

Drinking water standards exist for many of the COIs. These standards are applicable to *finished, treated* water suitable for human consumption. The IPR team found that the COI levels in the *untreated* and *unfiltered* water samples taken from the Buckman diversion site were less than the drinking water standards for tap water; some of these comparisons are shown in Figures 4 and 5. In other words, the COI levels in the Rio Grande meet drinking water standards even before the water is treated. The only exception was uranium-234 (U-234), one of the radionuclide COIs. LANL's contribution of this radionuclide to the Rio Grande is negligible (based on the upstream vs. downstream comparison mentioned earlier), and in fact U-234 levels consistently exceed drinking water standards upstream of the BDD structure, as far upstream as Embudo. As described further below, the BDD water treatment system will remove U-234 from the untreated Rio Grande water so that U-234 levels in finished drinking water will be well below drinking water standards.

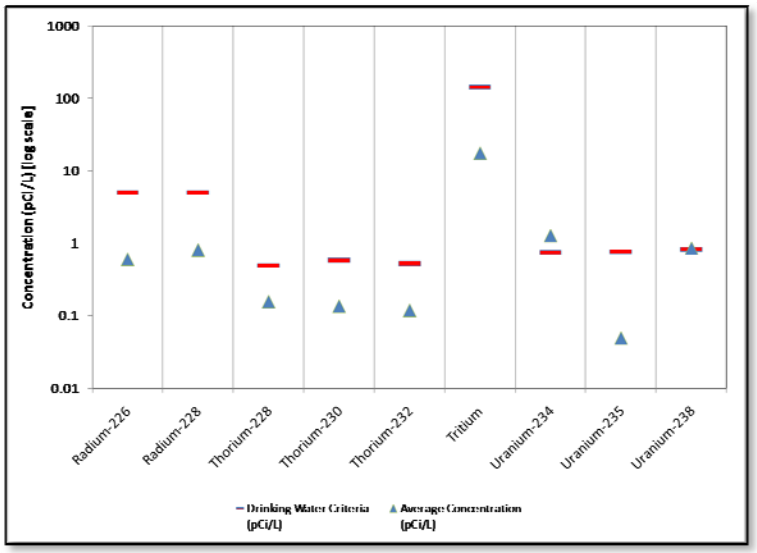

Figure 4. Comparison of average surface water concentrations for select radionuclide COIs to their associated drinking water standards.

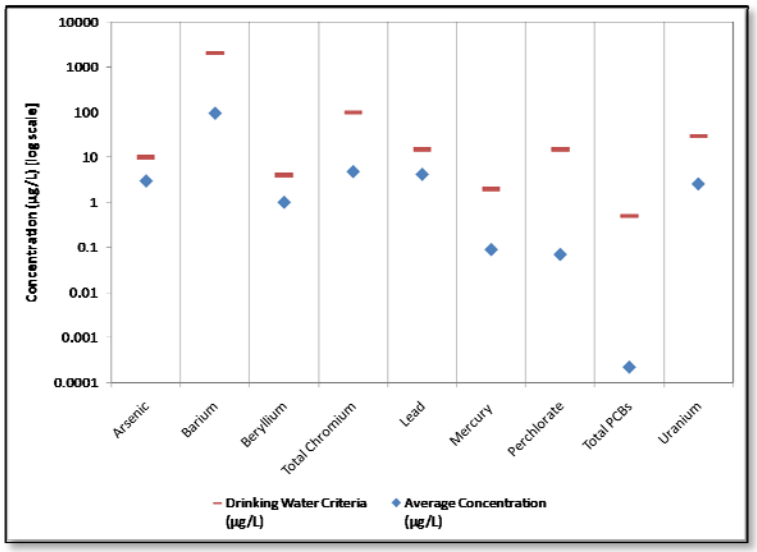

Figure 5. Comparison of average surface water concentrations for select chemical COIs to their associated drinking water standards.

RISKS FROM TAP WATER USE

The IPR team also evaluated the potential health risks associated with using *untreated and unfiltered* Rio Grande water for various tap water exposure routes (drinking, bathing, swimming, etc.). A lifetime of exposure to the water was

assumed, and different age groups (including infants) were evaluated. Figures 6 and 7 show the estimated increased cancer risk associated with exposure to various COIs. Six COIs had estimated risks in the range of 1 in 1,000,000 to 1 in 10,000; risks in this range and below are considered to be acceptable by the U.S. Environmental Protection Agency (USEPA) and other federal and state regulatory agencies. The total risk (all chemicals and radionuclides combined) was 1 in 10,000, which also falls within the acceptable risk range. The IPR team determined that ingestion of untreated and unfiltered water is the exposure pathway that contributes the most to the total theoretical risk. The other exposure pathways (bathing, etc.) do not contribute significantly to the theoretical risk.

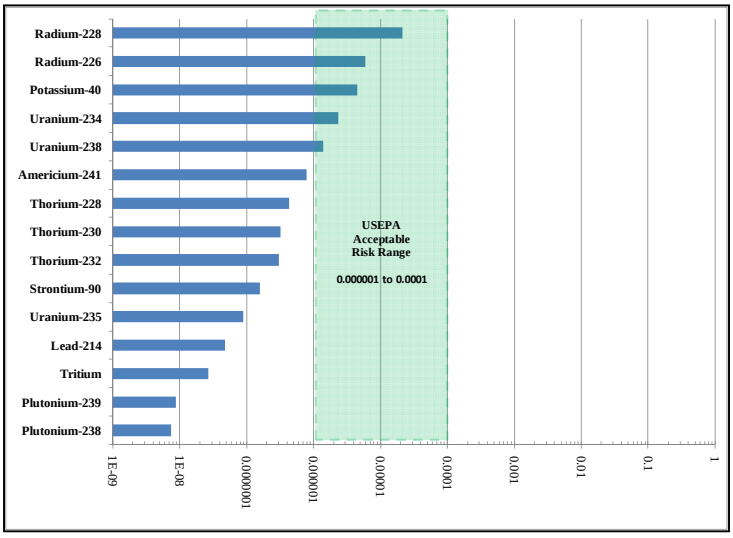

Figure 6. Estimated increased cancer risks associated with radionuclide COIs.

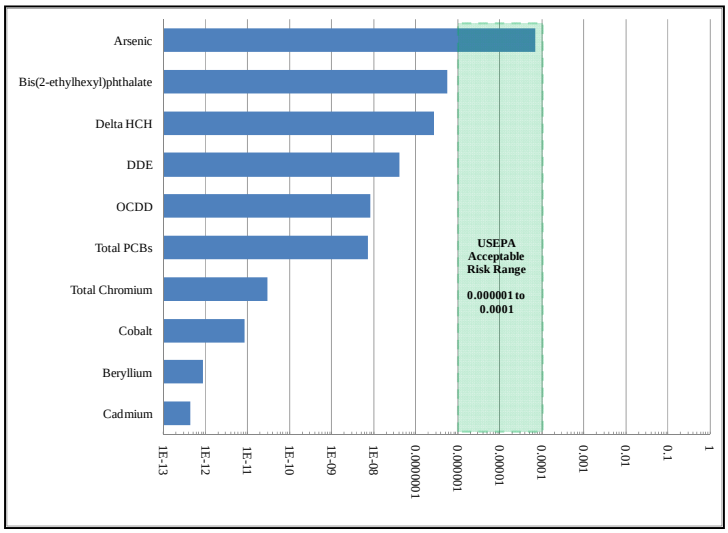

Figure 7. Estimated increased cancer risk associated with chemical COIs.

These estimates far over-state the theoretical risk because they assume that people are drinking *untreated and unfiltered* water from the Rio Grande.

Figure 8 shows the contribution of the different COIs to the total estimated cancer risk. Arsenic is the main contributor (65%); however, it is important to note that arsenic levels in the Rio Grande are naturally occurring, are below drinking water standards, and will be removed by the water treatment system. Radium-226, radium-228, and potassium-40 are also present in the water at levels that are naturally occurring, and below drinking water standards.

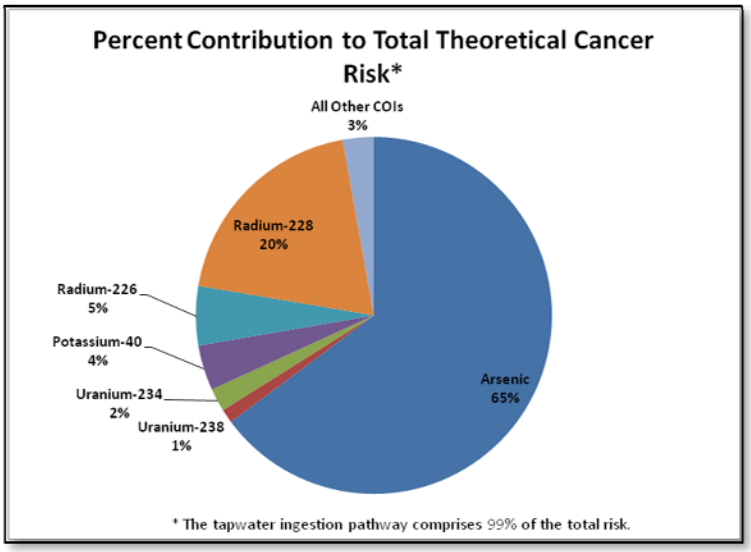

Figure 8. Percent contribution of the different COIs to the total estimated risk.

COMPARISON OF RADIONUCLIDE DOSE TO DOSE FROM EVERYDAY ACTIVITIES

There are numerous background sources of radiation to which people are exposed regularly, and these sources are well-characterized and understood. Figure 9 compares the radionuclide dose estimated for COIs found in the Rio Grande water to other, background doses of radiation. This figure illustrates that the estimated radionuclide dose from the Rio Grande COIs is very small when compared to other radiation doses we all experience.

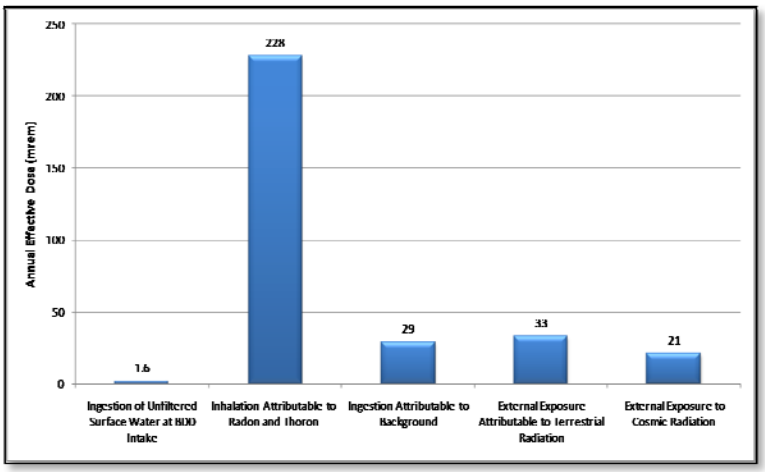

Figure 9. Comparison of the radionuclide dose estimated for COIs found in the Rio Grande water to other background doses of radiation.

IMPACTS OF LANL STORMWATER AND GROUNDWATER ON WATER QUALITY

Groundwater entering the Rio Grande from LANL will not impact the water quality at the BDD diversion intake because:

- Contaminant concentrations in the groundwater are low,
- There are long distances from the LANL contamination plumes to the Rio Grande, and
- The volume of contaminated groundwater discharged to the river is very small, as compared to Rio Grande flow.

The IPR team estimates that, during some storm events, contaminated sediments from LANL will enter the Rio Grande from the Los Alamos Canyon. An early notification system is being established that will allow BDD personnel to stop diverting Rio Grande water if it is anticipated to carry elevated levels of contaminants. If any such storm water contamination were to reach the BDD diversion intake, the treatment system (Figure 10) is designed to remove contaminants bound to suspended sediments and some dissolved contaminants, such as arsenic, uranium, and chromium. This system will also treat U-234 such that U-234 levels in finished drinking water will be well below drinking water standards.

HOW TO FIND MORE INFORMATION

For more information on the BDD project and IPR, please visit the BDD website at www.BDDproject.org.

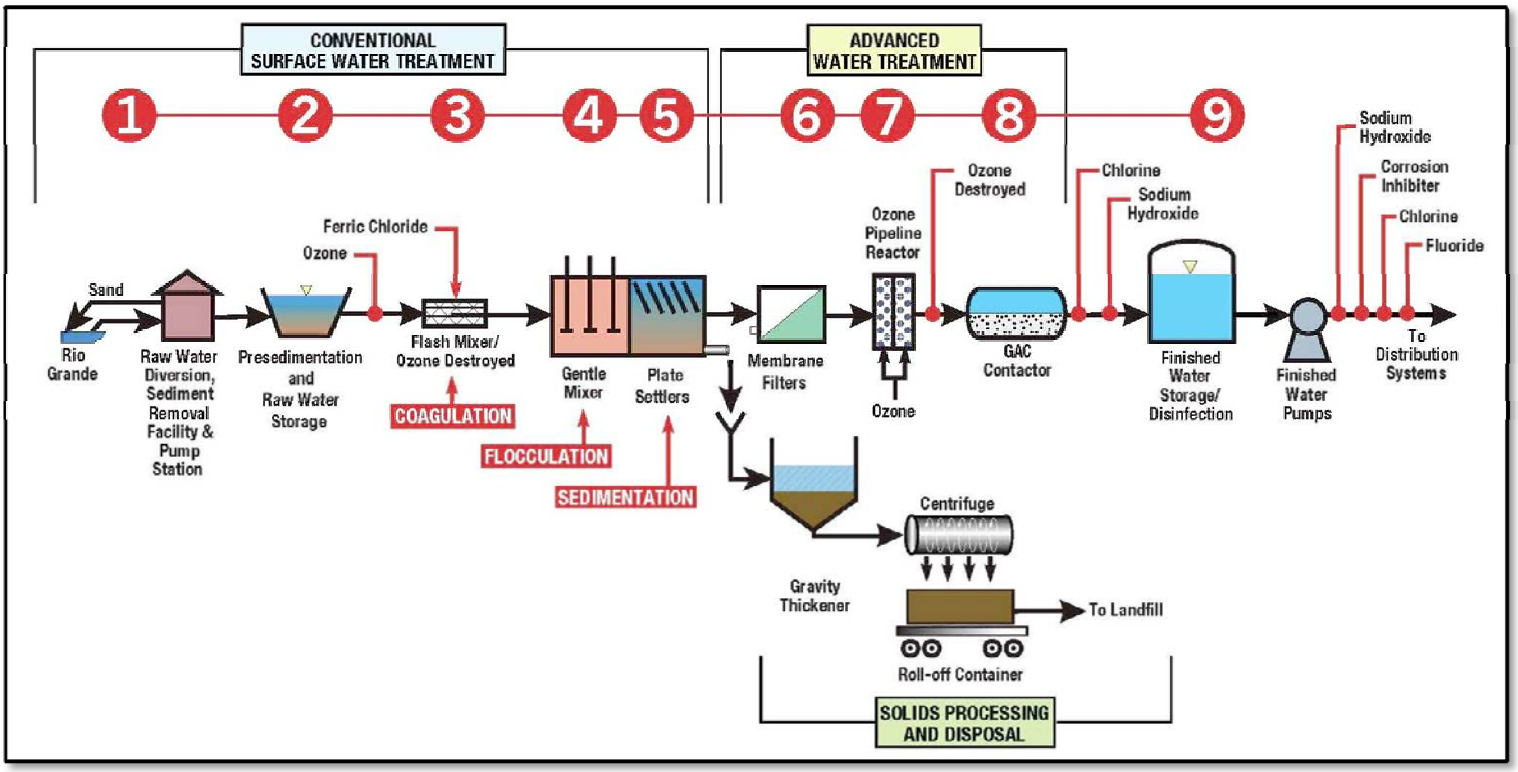

Figure 10. Diagram of the Buckman Direct Diversion water treatment system.