History

Over ten years ago, the New Mexico Environment Department (NMED), Department of Energy (DOE) Oversight Bureau began identifying Los Alamos National Laboratory (LANL) legacy contaminants along the Rio Grande in northern New Mexico. A report released in April 2007[1] described the various levels of legacy contaminants along the Rio Grande including an area at Ancha Canyon – a location that also contains a historical area known as the Buckman Landing and the site for a water diversion (Buckman Direct Diversion, BDD) that will supply much of the drinking water to the city of Santa Fe and neighboring communities.

Once the observation was made that contaminants coming from the National Laboratory had the potential to impact the new water supply the Bureau began working closely with city, county, federal, other state agencies, and interested citizen groups to identify those potential impacts to this resource.

The Bureau completed a project delineating the area containing legacy contaminants at Ancha Canyon and shared that knowledge with the BDD Board, the National Forest Service, the NMED Hazardous Waste Bureau, LANL, and others. The report from this study[2], released in 2008, shows background or non-detectable levels of contaminants in sediment in the proposed construction area of Buckman Direct Diversion Project (BDD). The Bureau found the nearest contaminants are buried within an abandoned river channel 500 feet north of the BDD infrastructure and that construction activities and planned operations of the diversion would not disturb the contaminants.

The source of background contaminants at the diversion site originate from fallout related to atmospheric testing of nuclear weapons that occurred from 1945 into the 1980s.

Legacy contaminants originate from operations at the lab between the 1940s and 1960s when LANL discharged radioactive liquid wastes into watersheds that drained into the Rio Grande. Periodic floods during the 1950s and 1960s from the Los Alamos watershed transported some of those contaminants to the Rio Grande. Those contaminants were subsequently deposited within the abandoned river channel.

[1] "Distribution of Radionuclides in Northern Rio Grande Fluvial Deposits near LANL," Englert, D., Dale, M., Granzow, K., Mayer, R., 2007. http://www.nmenv.state.nm.us/doe_oversight/pubs.htm

[2] "Los Alamos National Laboratory Legacy Contaminant Study at the Buckman Direct Diversion," Englert, D., Dale, M., Ford-Schmid, R., Granzow, K., 2008. http://www.nmenv.state.nm.us/doe_oversight/pubs.htm

Since then and until the Cerro Grande Fire, the frequency of flooding from canyons at LANL diminished and clean sediments along the Rio Grande have covered the contaminants within the abandoned channel.

The most serious impacts that might affect the diversion come from occasional stormwater events flowing into the Rio Grande from Los Alamos Canyon three miles upstream. This watershed is also the source of the existing LANL derived contaminants in the Rio Grande. Treated and untreated wastewaters discharged into canyons at LANL until 1986 include radioactive materials, heavy metals, solvents, and other wastes associated with their research activities.

During the early years at the Laboratory these wastes were carried downstream into the Rio Grande by regular flooding in the canyons on the Pajarito Plateau. By the 1970's the flood frequencies and magnitudes diminished and the remaining contaminants were stored in sediments in and along the normally dry stream channels that run through the Laboratory.

Since the Cerro Grande fire in 2000, canyon floods have increased in intensity and frequency and are eroding the emplaced sediments, exposing and carrying legacy contaminants to the Rio Grande at rates not seen since the discharges of the wastes in the 1950's and 1960's. Although the state does not have authority to regulate special materials derived from nuclear research at the Laboratory, a number of other constituents like PCB's in stormwater leaving the Laboratory property can be regulated.

The Bureau has investigated (Cerro Grande) fire related impacts on the environment[3] around the Laboratory. The Bureau initiated investigations that include measurements of radionuclides and other contaminants in air, northern New Mexico farm soils and produce, forest floor ash, and ash-laden sediments in canyons within the Laboratory facility and in the Rio Grande valley from above LANL down to Albuquerque, and studied impacts to stream channels below burned watersheds. Most importantly, the Bureau also established a stormwater monitoring network within the Los Alamos watershed, and

[3] "Post Cerro Grande Fire Stormwater Transport of Plutonium$^{239/240}$ in Suspended Sediments from Pueblo Canyon, Los Alamos County, NM," Ford-Schmid, R., Englert, D. 2007.

"Post Cerro Grande Fire Channel Morphology in Lower Pueblo Canyon, Reach P-4 West and Storm Water Transport of Plutonium$^{239/240}$ in Suspended Sediments," Englert, D., Ford-Schmid, R., Bransford, K., 2004.

"Post Cerro Grande Fire Channel Morphology in Lower Pueblo Canyon, Reach P-4 East," Ford-Schmid, R., Englert, D. 2004. http://www.nmenv.state.nm.us/doe_oversight/pubs.htm

continues to observe re-mobilization of contaminants on and off Laboratory property, some of which ends up in the Rio Grande.

The department continues to work with LANL, the City of Santa Fe, Buckman Direct Diversion (BDD) Board and staff, and local communities to investigate and implement efforts to reduce the flow of contaminants transported with stormwater from the Lab. In addition, the department is working with those agencies to increase surface water monitoring efforts.

Several entities conduct sampling and analyses at various points along the river and in tributaries from the watershed. The environmental samples (water, sediments, ash, soil, and biota including fish tissue) are collected by staff from the New Mexico Environment Department (NMED), Los Alamos National Laboratory (LANL), contractors to the U.S. Army Corps of Engineers, U.S. Geological Survey, and other entities. The samples are analyzed by independent commercial analytical laboratories and the data appear in published studies and reports. Results are available to the public after they are reviewed and validated.

New data is continually added to the existing body of work and expands the understanding of river water quality and environmental response to various inputs. Please refer to the NMED websites including the DOE Oversight Bureau (www.nmenv.state.nm.us/doe_oversight/pubs.htm) and the Surface Water Quality Bureau (www.nmenv.state.nm.us/swqb/MAS/) to view technical reports, studies, water quality results, and fish consumption advisories.

A project administered by the New Mexico Community Foundation called RACER (www.racerdat.com) is a public access database containing results for nearly all environmental sampling that has been and continues to be conducted in the vicinity of LANL by both the National Laboratory and the NMED Oversight Bureau. This database is updated with new content weekly and will soon feature new tools to make it a more useful resource.

Water Quality

A sound-bite summary of Upper/Middle Rio Grande water quality under base flow ("normal" or ambient) conditions is that it is good overall, with few and occasional minor exceedances of individual water quality standards. Sediments carried in storm flow conditions generally exhibit concentrations that are elevated above ambient levels for

some of the constituents about which people are concerned. These storm flow events are short lived, transient, and their sediment loads fluctuate proportionately with changing flow. When the Buckman Direct Diversion or the Albuquerque Bernalillo County Water Utility Authority (ABCWUA) drinking water treatment plants close their intakes during storm flow events they do so to maintain the efficiency of the treatment process and avoid excess costs associated with removing heavy sediment loads.

Studies conducted by the Oversight Bureau (see "publications" on our website) show a strong correlation between certain contaminants (radionuclides, PCBs) and sediment concentrations[4]. That is, many of the contaminants of concern and other chemical compounds have a strong affinity for and are bound to the fine particles and organic matter in sediments.

As a matter of perspective, it should be noted that Los Alamos National Laboratory is not the only upstream contributor of contaminants found in river water. Metals, contaminants, and other compounds of modern industrial life are all found in surface waters.

Naturally occurring uranium is present in the sediments and is elevated under storm flow conditions. High pH caused by the ash of the recent Las Conchas fire will cause uranium concentrations to be elevated even more. Aluminum concentrations above water quality standards are also routinely observed in the Middle Rio Grande. Aluminum concentrations are known to be high in waters originating in the Jemez Mountains north of Albuquerque[5]. As such, the Jemez River and Rio Puerco, which drains this region, are two potential sources of elevated aluminum to the Rio Grande.

The Rio Grande from Cochiti to San Ildefonso is presently "listed" for turbidity and for PCB in fish tissue. Data collected in 2009 by SWQB exceed *E. coli* standards indicating that this impairment may be added in the 2012 (303d) list. Data collected from the Rio Grande do not indicate impairment for PCB in the water column at this time. The drainages out of the Laboratory property are all listed for PCB so the presence of a source make it possible that the main stem of the Rio Grande would show impairment when these canyons are running hard and the main bed load of sediment is suspended.

[4] "Los Alamos Canyon Watershed Stormwater Monitoring from 2003 through 2008: Contaminant Transport Assessment," Englert, D., Ford-Schmid, R., 2011. http://www.nmenv.state.nm.us/doe_oversight/pubs.htm

[5] "Middle Rio Grande Baseline Water Quality Survey – Final Report," Stringer, S., Davis, A., 2009. http://www.nmenv.state.nm.us/swqb/MAS/

The Rio Grande from Cochiti to Albuquerque is listed for PCB in fish tissue and *E. coli* in water south of the 550 bridge. The three top contributors of the *E. coli* in the middle Rio Grande are birds, dogs, and humans. Data collected by the DOE-OB from near the confluence of the north diversion channel and the Rio Grande in Albuquerque exceed standards for PCBs and indicating that this impairment may be added in the 2012 (303d) list. Low dissolved oxygen (DO) is measured in the river following storm events at this location when the north diversion channel is discharging. Storm flows here appear to push out a slug of water with no measurable dissolved oxygen. This condition is thought to develop in the "embayment" where the channel reaches the river. Efforts are being made to address the issue.

An extensive assessment of Middle Rio Grande water data last cycle (the 2010 list) by the Surface Water Quality Bureau (SWQB) indicates that PCB might be the only constituent added to the list in 2012. During this review cycle, the SWQB is taking a close look at the Upper Rio Grande, and preliminary assessments indicate that *E. coli* may be the only parameter to be added.

Overall water quality of the Rio Grande under normal flow conditions is good and the identified issues are largely related to *E. coli* and PCBs and these are generally wet weather (storm) water quality issues. They also are issues that are easily addressed in the processing of Rio Grande water for drinking water systems.

One study conducted in 2009[6] focused on collecting water samples from the Rio Grande at locations that would provide insight to water quality upstream from the BDD and the ABCWUA projects during wet weather events. Storm flows were expected to produce the highest levels of suspended sediment and subsequently the highest levels of contaminants for those constituents that are commonly bound to sediment particles (e.g., radionuclides, PCBs). Constituents typically found in storm water discharges from LANL were targeted to determine if past or current discharges from the Laboratory are detectible in the Rio Grande during storm flow events.

While the data evaluated does not indicate an influence from past LANL discharges on current water quality conditions in the Rio Grande near drinking water diversions the data were not sufficient to answer the same question when Los Alamos Canyon was discharging. Total PCB was below the human health and wildlife habitat water quality criteria at all four upstream locations but exceeded the criteria five times at Rio Grande above Alameda near Albuquerque.

[6] "Environment Department Finds Elevated Levels of PCBs in the Rio Grande near Albuquerque during Storm Flows," Ford-Schmid, R., Englert, D., 2010. http://www.nmenv.state.nm.us/doe_oversight/pubs.htm

Evaluations of the concentrations of total PCB and homologue[7] distributions of PCBs found in the Rio Grande above Alameda generated the following observations:

1. The PCBs measured in water collected from the Rio Grande during high flow storm water events were below the maximum contaminant level (MCL)[8] established in U.S. Environmental Protection Agency (USEPA) standards for drinking water. (Regular testing of Albuquerque's municipal water supply using USEPA authorized methods has not demonstrated the presence of PCBs.).
2. Total PCB exceeded the PCB human health and wildlife habitat water quality criteria[9] five times at Rio Grande above Alameda.
3. The median concentrations of PCB in suspended sediment from storm flow samples collected from the Rio Grande above Alameda are not representative of those found in the Rio Grande above Buckman Landing collected in this study and are two to three orders of magnitude greater.
4. The concentration of PCB in suspended sediment from storm flow samples collected from the Rio Grande above Alameda are not representative of upstream Rio Grande channel sediments sampled in previously studies (unpublished data);
5. The PCB homologue patterns found at Rio Grande above Alameda suggest that the PCBs found there are from a different source than those found upstream of Buckman Landing.
6. The PCB homologue patterns found at Rio Grande above Alameda are similar to those previously collected downstream of Albuquerque (unpublished data).
7. The PCB homologue patterns found at Rio Grande above Alameda are similar to those found in fish tissue samples[10] collected from the Rio Grande near Albuquerque.

[7] In chemistry, a homologue is a compound belonging to a series of compounds differing from each other by a repeating unit. Polychlorinated biphenyls (PCBs) are a class of organic compounds with 2 to 10 chlorine atoms attach to a biphenyl molecule. PCB homologues each have the same number of chlorine atoms.

[8] The MCL (maximum contaminant level) for PCBs in drinking water is derived from determinations of increased cancer risks per million people consuming a specified amount of water per day over a 70-year timeframe.

[9] The state human health criterion is based upon human consumption of fish and other aquatic life that bio-accumulate contaminants over time. The wildlife habitat criterion is determined based upon health risk to aquatic life living in the surface water.

[10] In conjunction with the New Mexico Department of Health and the Department of Game and Fish, NMED publishes fish consumption advisories for the stretch of the Rio Grande between I-25 to the south and US 550 to the north specifically because of PCB contamination. The advisories indicate that white bass from this area should not be consumed, and channel catfish between 14 and 18 inches should not be consumed more than three times per month. Fish advisories may be found on the NMED website at http://www.nmenv.state.nm.us/swqb/advisories/ and also in the New Mexico Department of Game and Fish fishing proclamation.

8. There is a positive correlation between total PCB and suspended sediment concentrations (SSC) at the Rio Grande above Alameda sampling location suggesting that the concentration of total PCBs may be predictable for this location if the SSC is known.
9. Additional PCB source investigations in the Albuquerque area may be needed.

Findings from this study also showed adjusted gross alpha (radiation) results exceeded the livestock watering criterion of 15 picocuries per Liter (pCi/L) once at each of the following locations: Rio Chama at Chamita (39 pCi/L), Rio Grande at Otowi (24 pCi/L), Rio Grande at Buckman (18 pCi/L), and three times at Rio Grande above Alameda (33 pCi/L, 32 pCi/L, and 21 pCi/L). There is a significant positive correlation of suspended sediment concentrations (SSC) to gross alpha measurements indicating that as SSC increases so will gross alpha proportionately.

Plutonium$^{239/240}$ was detected in seven water samples but the highest value found was 30 times less than the proposed water quality criteria. Evaluation of the plutonium$^{239/240}$ levels in the suspended sediments show they are indistinguishable from plutonium originating from integrated world-wide atmospheric fallout. There were no detections of cesium^{137} and strontium^{90}. In addition, concentrations of dissolved metals remained below their respective acute aquatic life criteria in all samples.

Stormwater Sampling

The DOE Oversight Bureau currently maintains or is trying to establish ten storm water monitoring stations within or below the Pajarito Plateau.

- Three stations are in the Los Alamos watershed (at or near LANL gage stations E050, E060, and E110);
- Four stations are on the Rio Grande above Cochiti Reservoir; and,
- Three stations are within the southern portion of the Pajarito Plateau.

E050 is located in the Los Alamos Canyon at the LANL eastern boundary just above the Los Alamos/Pueblo Canyon confluence. Upper Los Alamos Canyon is a source of legacy radioactive, PCB, and other contaminants, primarily from DP Canyon below Technical Area – 21 (TA-21), an old plutonium processing facility.

E060 is located in Pueblo Canyon at the LANL eastern boundary just above the Pueblo/Los Alamos confluence. Pueblo Canyon is a source of legacy radioactive

contaminants originating from Acid Canyon, sites for the original research and industrial discharge.

E110 is located downstream of LANL on San Ildefonso Pueblo property approximately ½ mile above the Rio Grande.

Stations on the Rio Grande include:

1. A station above the Otowi Bridge; just above the Los Alamos watershed/Rio Grande confluence. This device is programmed to collect regional storm events in the river.
2. Two stations are located at the Buckman Direct Diversion. One station is programmed to collect stormwater from regional storm events in the Rio Grande; the other is programmed to take timed samples when the Los Alamos watershed flows. A telemetric signal is received from E110 when Los Alamos flows. (In addition, the BDD maintains two automated samplers at this location; one is owned by BDD and the other is on loan from the Oversight Bureau.)
3. Another station is located on the Rio Grande in northern Albuquerque near the Alameda Bridge. It is a short distance above the ABCWUA drinking water diversion.
4. Stations within the southern Pajarito Plateau are being located in response to the recent Los Conchas fire.
5. A station is located in Peralta Canyon just above the Tent Rocks monument. Peralta Canyon goes into confluence with the Rio Grande below the Cochiti Reservoir. Stage and water quality will be monitored. A previous site had been located farther upstream but an extraordinary event washed away the Bureau's equipment.
6. A station is located in Bland Canyon on forest service land. Stage and water quality will be monitored. A previous site had been located farther upstream but has been abandoned. An unexpectedly large event destroyed access to the site. The Bureau monitoring equipment is also temporarily unavailable until access is reestablished.
7. A station had been located in Cochiti Canyon within the Dixon apple orchard. The station was demolished during large floods through the area. As of the middle of September the Bureau is still attempting to re-locate a new station.

Large stormwater flow event at Dixon Apple Orchard, August 22, 2012. Photograph by Kerry Jones.

Multiple large floods have occurred in canyons within the Pajarito Plateau. While the Bureau monitoring equipment has been largely unsuccessful in collecting samples or gaging flows during these events, staff is currently making indirect surveys to identify peak flows. The current stations have been replaced, fortified, and have been moderately successful in recording the less extreme flood events. Stormwater samples successfully collected, chemical analysis requested, and expected data delivery dates are shown in the table attached to this document.

Interagency Flood Risk Assessment Team

The New Mexico Environment Department's (NMED) Department of Energy Oversight Bureau is coordinating its stormwater sampling efforts with Los Alamos National Laboratory (LANL), the U.S. Army Corps of Engineers (USACOE), Cochiti Pueblo, Pueblo de San Ildefonso, Santa Clara Pueblo, and City/County of Santa Fe, and Buckman Direct Diversion staff. Other interested entities include the New Mexico Environment Department's Surface Water Quality Bureau, Sandia Pueblo, and the Albuquerque Bernalillo County Water Utility Authority (ABCWUA).

The Oversight Bureau and LANL have teamed with the New Mexico Department of Health to re-establish the Interagency Flood Risk Assessment Team (IFRAT) that was formed following the Cerro Grande Fire in 2000. The goal of the IFRAT is to collect and analyze data and distribute information to the public. This effort will help address some of the public's interest in risks associated with measured and potential contaminants in stormwater runoff and sediments and potential impact to drinking and irrigation water drawn from the Rio Grande.

The stormwater monitoring network at LANL consists of approximately 60 samplers at over 38 locations in the canyons and will collect runoff water from many of the burnout locations. In addition to LANLs network, four automated samplers are located at the Santa Fe/Buckman Direct Diversion (SF/BDD); one is owned by SF/BDD; one is loaned to the SF/BDD by the Oversight Bureau; and, the Bureau has two samplers deployed. All sampler programs are coordinated to gather samples at different times in response to different river flow inputs.

The coordinated effort between the Oversight Bureau, LANL, and others is to optimize sampling locations, maximize stormwater flow coverage, and minimize duplication of interagency effort. The interagency effort includes coordination of analyte lists (elements and substances to be sampled for) and coordinated laboratory analytical methods to ensure compatibility and comparability of data. Participating entities have also coordinated sampling regimes (at what point during the storm flow samples are collected) to enhance data comparability and help fill in data gaps. During the summer rainy season the primary focus is on stormwater and suspended sediment collection. In the autumn, when rains diminish, sample collection will transition to primary ash and soil sample collection. These data will allow comparison of constituents in ash, soil, suspended sediment, and stormwater.

Man-made radionuclides are part of the background due to global fallout from atmospheric weapons testing in the 1950s and 1960s and are measurable in sediments and soils. Some of these elements are the same as legacy contaminants from LANL which may be indistinguishable from what is present in the background. While measureable in the analytical laboratory, the levels are typically so low as to constitute no calculable risk.

Elements and isotopes that do not dissolve in water are not taken up by plants as nutrients but others that are soluble (various metals, strontium^{90}, and cesium^{137}) are present in vegetation, and consequently in ash when the plant material is burned. For example, polonium 210, a decay product of radon (itself in the uranium decay series), is commonly measured on the surface of vegetation (leaves, forest litter). Thus polonium is

measured at levels elevated above background when it is concentrated as the volume of vegetation is reduced to fire ash. This concentration of polonium is also demonstrated in tobacco ash.

Studies conducted in the aftermath of Cerro Grande showed that ingestion of plants grown directly in ash-containing flood deposits over a long period of time (30 years) may be associated with potential increases in chronic health problems, compared to plants grown in non-ash-containing sediment. This potential risk and the concern related to it can be reduced primarily by not using ash as a soil amendment in gardens in which food is grown. There was no marked difference in potential chronic health effects from swimming, fishing, or irrigation with ash-containing water versus water without ash.

Reports produced by the Oversight Bureau, Surface Water Quality Bureau and others are available on the Department's website (www.nmnev.state.nm.us) and the results from stormwater analysis is available on the RACER database (www.racerdat.com).

DOE OB Stormwater Samples Collected as of September 16, 2012

Water Samples taken to monitor Las Conchas flooding				Metals+B+U	SSC	CN	Gross Alpha	Gamma spec	Am-241	ISOPU	ISOU	Sr-90	Explosives	Dioxin/Furan	PCB Congeners
Sampling Station	**Collection Date**	**Retrieved Date**	**Submitted for Analysis**												
Analysis in sediments															
E050_9.16.11.01:48(W)	9/16/2011			x	x	x	x	x	x	x	x	x		x	x
E050_9.16.11.02:38(W)	9/16/2011			x	x	x	x	x	x	x	x	x			
E050_9.16.11.3:28(W)	9/16/2011			x	x	x	x	x	x	x	x	x			
E050_9.12.11.08:59(W)	9/12/2011			x	x	x	x	x	x	x	x	x		x	x
E050_9.12.11.09:49(W)	9/12/2011			x	x	x	x	x	x	x	x	x			
E050_9.12.11.10:39(W)	9/12/2011			x	x	x	x	x	x	x	x	x			
E050_9.10.11.02:10(W)	9/10/2011	9/12/2011		x	x	x	x	x	x	x	x	x		x	x
E050_9.10.11.03:00(W)	9/10/2011	9/12/2011		x	x	x	x	x	x	x	x	x		x	x
E050_9.10.11.03:50(W)	9/10/2011	9/12/2011		x	x	x	x	x	x	x	x	x			
Rio Grande @ BDD Regional-9.7.11.14:41	9/7/2011	9/12/2011		x	x	x	x	x	x	x	x	x			
Rio Grande @ BDD Regional-9.7.11.15:26	9/7/2011	9/12/2011		x	x	x	x	x	x	x	x	x		x	x
Rio Grande @ BDD Regional-9.7.11.16:11	9/7/2011	9/12/2011		x	x	x	x	x	x	x	x	x		x	x
Rio Grande @ BDD Regional-9.7.11.16:56	9/7/2011	9/12/2011		x	x	x	x	x	x	x	x	x			
E110-9.7.11.14:27	9/7/2011	9/7/2011		x	x	x	x	x	x	x	x	x			
E050-9.6.11.14:10	9/6/2011	9/8/2011		x	x	x	x	x	x	x	x	x		x	x
E050-9.6.11.15:00	9/6/2011	9/8/2011		x	x	x	x	x	x	x	x	x			
E050-9.6.11.15:50	9/6/2011	9/8/2011		x	x	x	x	x	x	x	x	x			
RG at Otowi-9.5.11.01:08(W)	9/5/11	9/6/2011	9/7/2011	x	x	x	x	x	x	x	x	x			
RG at Otowi-9.5.11.00:08(W)	9/5/11	9/6/2011	9/7/2011	x	x	x	x	x	x	x	x	x			
RG at Otowi-9.4.11.23:48(W)	9/4/11	9/6/2011	9/7/2011	x	x	x	x	x	x	x	x	x		x	x
E110.9.1.11.18:33(W)	9/1/11	9/6/2011	9/7/2011	x	x	x	x	x	x	x	x	x			
BDD.9.4.11.21:54(W)	9/4/11	9/6/2011	9/7/2011	x	x	x	x	x	x	x	x	x		x	x

DOE OB Stormwater Samples Collected as of September 16, 2012

Water Samples taken to monitor Las Conchas flooding				Metals+B+U	SSC	CN	Gross Alpha	Gamma spec	Am-241	ISOPU	ISOU	Sr-90	Explosives	Dioxin/Furan	PCB Congeners
Sampling Station	**Collection Date**	**Retrieved Date**	**Submitted for Analysis**												
BDD.9.4.11.21:55W)	9/4/11	9/6/2011	9/7/2011											x	x
BDD.9.4.11.22:44(W)	9/4/11	9/6/2011	9/7/2011	x	x	x	x	x	x	x	x	x		x	x
BDD.9.4.11.22:46(W)	9/4/11	9/6/2011	9/7/2011											x	x
E050.9.4.11.22:38(W)	9/4/11	9/6/2011	9/7/2011	x	x	x	x	x	x	x	x	x			
E050.9.4.11.21:48(W)	9/4/11	9/6/2011	9/7/2011	x	x	x	x	x	x	x	x	x			
E050.9.4.11.20:58(W)	9/4/11	9/6/2011	9/7/2011	x	x	x	x	x	x	x	x	x		x	x
E050.9.1.11.20:18(W)	9/1/11	9/2/2011	9/7/2011	x	x	x	x	x	x	x	x	x			
E050.9.1.11.19:28(W)	9/1/11	9/2/2011	9/7/2011	x	x	x	x	x	x	x	x	x			
E050.9.1.11.18:38(W)	9/1/11	9/2/2011	9/7/2011	x	x	x	x	x	x	x	x	x		x	x
Rio Grande above Alameda_8.17.11.21:47(W)	8/17/2011	8/18/2011	9/7/2011	x	x	x	x	x	x	x	x	x		x	x
Rio Grande at BDD_8.29.11.04:21(W)	8/29/11	8/30/2011	9/1/2011	x	x	x	x	x	x	x	x	x		x	x
Rio Grande at BDD_8.29.11.06:36(W)	8/29/11	8/30/2011	9/1/2011	x	x	x	x	x	x	x	x	x			
Rio Grande at BDD_8.29.11.05:06W)	8/29/11	8/30/2011	9/1/2011	x	x	x	x	x	x	x	x	x		x	x
Rio Grande at BDD_8.29.11.05:51W)	8/29/11	8/30/2011	9/1/2011	x	x	x	x	x	x	x	x	x			
Rio Grande at BDD_8.26.11.20:14W)	8/26/11	8/30/2011	9/1/2011	x	x	x	x	x	x	x	x	x		x	x
Rio Grande at BDD_8.26.11.21:04W)	8/26/11	8/30/2011	9/1/2011	x	x	x	x	x	x	x	x	x		x	x
E050_8.28.11.04:35(W)	8/28/11	8/29/2011	9/1/2011	x	x	x	x	x	x	x	x	x			
E050_8.28.11.03:45(W)	8/28/11	8/29/2011	9/1/2011	x	x	x	x	x	x	x	x	x			
E050_8.28.11.02:55(W)	8/28/11	8/29/2011	9/1/2011	x	x	x	x	x	x	x	x	x		x	x
Rio Grande at Otowi_8.26.11.21:00(W)	8/26/11	8/29/2011	9/1/2011	x	x	x	x	x	x	x	x	x			
Rio Grande at Otowi_8.26.11.19:40(W)	8/26/11	8/29/2011	9/1/2011	x	x	x	x	x	x	x	x	x		x	x
Rio Grande at Otowi_8.26.11.20:20(W)	8/26/11	8/29/2011	9/1/2011	x	x	x	x	x	x	x	x	x			
E110_8.28.11.20:41(W)	8/28/11	8/29/2011	9/1/2011	x	x	x	x	x	x	x	x	x			
Rio Grande @ Buckman_8.21.11.18:42(W)	8/21/11	8/22/2011	8/26/2011	x	x	x	x	x	x	x	x	x		x	x
Rio Grande @ Buckman_8.21.11.19:27(W)	8/21/11	8/22/2011	8/26/2011	x	x	x	x	x	x	x	x	x			
Rio Grande @ Buckman_8.21.11.19:29(W)	8/21/11	8/22/2011	8/26/2011	x	x	x	x	x	x	x	x	x		x	x
Rio Grande @ Buckman_8.21.11.20:19(W)	8/21/11	8/22/2011	8/26/2011	x	x	x	x	x	x	x	x	x		x	x

DOE OB Stormwater Samples Collected as of September 16, 2012

Water Samples taken to monitor Las Conchas flooding				Metals+B+U	SSC	CN	Gross Alpha	Gamma spec	Am-241	ISOPU	ISOU	Sr-90	Explosives	Dioxin/Furan	PCB Congeners
Sampling Station	**Collection Date**	**Retrieved Date**	**Submitted for Analysis**												
Rio Grande @ Otowi_8.21.11.18:11(W)	8/21/11	8/22/2011	8/26/2011	x	x	x	x	x	x	x	x	x		x	x
Rio Grande @ Otowi_8.21.11.18:51(W)	8/21/11	8/22/2011	8/26/2011	x	x	x	x	x	x	x	x	x			
Rio Grande @ Otowi_8.21.11.19:31(W)	8/21/11	8/22/2011	8/26/2011	x	x	x	x	x	x	x	x	x			
Rio Grande above Alameda_8.21.11.04:53(W)	8/21/11	8/22/2011	8/26/2011	x	x	x	x	x	x	x	x	x		x	x
Rio Grande above Alameda_8.13.11.04:53(W)	8/13/2011	8/16/2011	8/26/2011	x	x	x	x	x	x	x	x	x		x	x
E050_8.19.11.18:49(W)	8/19/11	8/20/2011	8/26/2011	x	x	x	x	x	x	x	x	x		x	x
E050_8.19.11.19:39(W)	8/19/11	8/20/2011	8/26/2011	x	x	x	x	x	x	x	x	x			
E050_8.19.11.20:29(W)	8/19/11	8/20/2011	8/26/2011	x	x	x	x	x	x	x	x	x			
E050_8.22.11.16:08(W)	8/22/11	8/24/2011	8/26/2011	x	x	x	x	x	x	x	x	x		x	x
E050_8.22.11.16:57(W)	8/22/11	8/24/2011	8/26/2011	x	x	x	x	x	x	x	x	x			
E050_8.22.11.17:47(W)	8/22/11	8/24/2011	8/26/2011	x	x	x	x	x	x	x	x	x			
E110_8.22.11.16:30(W)	8/22/11	8/24/2011	8/26/2011	x	x	x	x	x	x	x	x	x			
E110_8.22.11.17:20(W)	8/22/11	8/22/2011	8/26/2011	x	x	x	x	x	x	x	x	x			
Peralta.8.24.11.17:15(W)	8/24/2011	8/25/2011	8/26/2011	x	x	x	x	x	x	x	x	x			
E110 7-22-11	7/22/11	7/27/2011	7/28/2011	x	x	x	x	x	x	x	x	x			
Rio Grande @ Buckman-7-28-11 19:06	7/28/11	7/28/2011	8/2/2011	x	x	x	x	x	x	x	x	x		x	x
Rio Grande @ Buckman-7-28-11 19:56	7/28/11	7/28/2011	8/2/2011	x	x	x	x	x	x	x	x	x		x	x
BDD-8-3-11 18:09 (water)	8/3/11	8/4/2011	8/11/2011	x	x	x	x	x	x	x	x	x		x	x
BDD-8-3-11 18:59 (Water)	8/3/11	8/4/2011	8/14/2011	x	x	x	x	x	x	x	x	x		x	x
BDD-8-5-11 17:54 (Water)	8/5/11	8/4/2011	8/17/2011	x	x	x	x	x	x	x	x	x		x	x
BDD-8-5-11 18:44 (Water)	8/5/11	8/4/2011	8/20/2011	x	x	x	x	x	x	x	x	x		x	x
E110-8-5-11 14:47 (Water)	8/5/11	8/4/2011	8/23/2011	x	x	x	x	x	x	x	x	x			