Final Technical Report

The Carlsbad Environmental Monitoring Research Program

DE-FG29-91AL74167

04/24/1991 thru 09/30/2013

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The success of this research program and the results achieved are due primarily to the hard work and dedication of numerous individuals who worked tirelessly throughout the twenty-two (22) year period in which this grant was funded including previous CEMRC directors, current and previous staff members, and the administration of New Mexico State University and the NMSU College of Engineering. The CEMRC is especially grateful to several key individuals who contributed heavily in terms of developing and establishing the CEMRC program and for the guidance, leadership, and energy they contributed throughout the project. Those key individuals include:

- Former state representative Robert "Bob" Light and his late wife Joanna who donated the land to New Mexico State University for the construction of the CEMRC facility.
- Mr. Roger Nelson, DOE/CBFO Chief Scientist who has provided information, guidance, and feedback throughout much of the project period.
- Dr. Ron Bhada, former Dean of the College of Engineering at NMSU who authored the original grant proposal and implemented the CEMRC program.
- Dr. Punam Thakur, CEMRC Radiochemist, who provided leadership, oversight, and guidance in terms of the analysis of radiological samples obtained from within and in the vicinity of the WIPP site and who contributed heavily in the creation of the annual reports from 2008 through 2012.

Disclaimer

Executive Summary

Throughout the 22-year project period, samples were collected in and around the WIPP facility and were analyzed for both radiological as well as non-radiological impacts. Samples analyzed included air samples, water samples (including both drinking water and surface water samples), sediment samples, soil samples, and citizen volunteers living within a 100-mile radius of the WIPP facility.

Air samples consisted of two types, 1) those taken daily from the exhaust shaft of the WIPP repository (Station A) which provided a measure of the level of contamination flowing through the underground environment; and 2) ambient air samples taken at and near the WIPP repository (On-Site, Near-Field, and Cactus Flats) which provided a measure of the level of contamination present above ground.

Water samples consisted of two types as well, including 1) drinking water samples taken from the six municipal water systems in the vicinity of the WIPP repository (Carlsbad, Double Eagle, Hobbs, Loving, Malaga, and Otis), which provided a measure of the level of contamination present in community water supplies; and 2) surface water samples obtained from the three public reservoirs near the WIPP repository (Lake Brantley, Lake Carlsbad, and Red Bluff Reservoir), which provided a measure of the level of contamination present in area recreational bodies of water.

Sediment samples were collected in tandem with surface water samples from the three public reservoirs near the WIPP repository (Lake Brantley, Lake Carlsbad, and Red Bluff Reservoir), which provided a measure of the level of contamination present in the sediment of area recreational bodies of water.

Soil samples were taken from specific areas near the WIPP repository (Near Field and Cactus Flats) which provided a measure of the level of contamination present or being adsorbed into the soil.

Lastly, citizen volunteers from the area in the vicinity of the WIPP facility received lung and whole body counting services (*in-vivo internal dosimetry*) to determine if the waste being emplaced within the WIPP facility impacted local residents.

In all cases, samples were collected and analyzed prior to the acceptance of waste by the WIPP facility (March 1999) as well as during the 14-year-to-date WIPP operational period in which waste has been accepting and disposing of TRU and mixed waste. This was important as it allowed CEMRC scientist to develop a baseline of normal (pre-operational) activity from which to compare post-operational sampling results. Through this comparison, the results of the CEMRC independent environmental monitoring program conclude that:

1. Levels of the measured radiological and non-radiological constituents in the environment around WIPP throughout the life of the CEMRC environmental monitoring program are not different from the preoperational baseline levels.
2. The measured levels are similar to those measured by other organizations, to the extent that direct comparisons can be made.
3. Trace amounts of radionuclides (131I, 134Cs, and 137Cs) from the Fukushima nuclear power plant incident were detected in the station A and ambient air samples collected during March/April 2011. However, it is important to note that all of the radiation levels detected across the United States, including in Carlsbad, as the result of the Fukushima nuclear power plant accident, have been very low, well below any level of public or environmental concern.
4. No measureable radiation dose to the public resulted from WIPP-related operations throughout the CEMRC environmental monitoring program relative to the estimated baseline dose.

Summary of Project-Related Expenses and Budget Variance for Project Period 1991-2013.

	DOE Core	LBRE	Facility	Total	Budget	Variance	Variance %
Exempt Salary Pool	$ 10,992,973	$ 44,450	$ -	$ 11,037,424			
Faculty Salary Pool	$ 202,813	$ 91,622	$ -	$ 294,435			
Graduate	$ 2,067	$ -	$ -	$ 2,067			
Non-Exempt Pool	$ 731,354	$ -	$ -	$ 731,354			
Other Personnel Pool	$ 563,090	$ 10	$ -	$ 563,100			
Student	$ 68,555	$ 26,439	$ -	$ 94,994			
Technical Salary Pool	$ 1,293,143	$ 6,260	$ -	$ 1,299,403			
Fringe	$ 3,604,139	$ 31,579	$ -	$ 3,635,718			
Travel	$ 709,361	$ 33,363	$ -	$ 742,724			
Supplies	$ 2,175,424	$ 109,478	$ -	$ 2,284,902			
Cost Overrun	$ (5,282)	$ -	$ -	$ (5,282)			
Services	$ 5,772,415	$ 7,413	$ 286	$ 5,780,113			
Equipment	$ 6,481,570	$ 30,425	$ 5,809,657	$ 12,321,652			
Subcontracts	$ 1,457,217	$ -	$ -	$ 1,457,217			
Other	$ (25,926)	$ -	$ -	$ (25,926)			
Total Expenses	$ 34,022,911	$ 381,040	$ 5,809,942	$ 40,213,894			
F&A Recovery	$ 6,623,024	$ 88,816	$ -	$ 6,711,841			
F&A Cost Share	$ (11,760)	$ -	$ -	$ (11,760)			
Total F&A	$ 6,611,265	$ 88,816	$ -	$ 6,700,081			
Total	$ 40,634,176	$ 469,857	$ 5,809,942	$ 46,913,975	$ 47,415,831	$ 501,856	1.06%
Amounts reflected above are preliminary as of 12/20/2013 and are not final.							

Program Goals and Tasks

This final report summarizes the work done under the U.S. Department of Energy (DOE) financial assistance grant DE-FG29-91AL74167 for the period 04/24/1991 thru 09/30/2013. This work was conducted by the Carlsbad Environmental Monitoring and Research Center (CEMRC), an entity of New Mexico State University, on behalf of the citizens of Carlsbad and southeast New Mexico to measure the impact, if any, that the waste being emplaced in the DOE's Waste Isolation Pilot Plant (WIPP) could have on the local environment including air within the repository as well as air, soil, water, and people living near the WIPP repository.

The goals identified in the original statement of work (Amendment A000) centered around four themes and included the following language in support of each of those themes:

- Development of an independent environmental monitoring program.
    1. Initial services to be provided by the CEMRC will be an integral part of an independent assessment of the environment in the Carlsbad area in order to monitor the operation of the Waste Isolation Pilot Plant (WIPP) including the laboratory evaluation of air monitoring samples collected near WIPP, and the maintenance of an environmental database.
    2. The environmental monitoring facility will have sufficient instrumentation to provide laboratory analyses for hazardous and radioactive materials in environmental media, typical of potential contaminants and the environs of the WIPP site, and other locations in New Mexico.
    3. Laboratory capabilities shall be developed to the extent necessary to provide for laboratory comparisons, data validations and the establishment of monitoring standards.
- Development of a lung and whole body counting system.
    1. These services include the capability for the confirmation of bioassay results for a subset of WIPP employees and bioassay analysis for a representative sampling of Carlsbad residents. Contract services also will be provided to both public and private entities that have environmental monitoring requirements and a need for bioassay and laboratory analysis.
    2. The bioassay facilities at the CEMRC will constitute a whole body counter, and other radiation detection and sampling equipment. In particular, the actual exposure to radionuclides of WIPP employees and local Carlsbad residents will be established on a regular basis to corroborate that WIPP procedures have been effective. In the unlikely event of release of radioactive material to the environment, the intake and resulting doses to the community can be determined by the CEMRC once a baseline has been established.

- Development of a research and/or education-oriented focus to promote leadership in environmental monitoring concepts.
    1. The CEMRC has as its primary mission independent world leadership in the development of methods, procedures, and sensors for obtaining, processing, and disseminating bioassay data, and it will become a center providing education, consultation, and analytical services designed to improve the quality of environmental monitoring programs.
    2. Of special interest are improvements to current monitoring and sampling techniques.
- Development of a data center.
    1. The data center will have sufficient computer capacity to collect, organize and disseminate test information to the public and private sector upon request.
    2. There will be strict adherence to the Privacy Act, and confidential information on specific individuals will not be released. Access to national data centers also shall be provided.

Along with these broad goals, the following tasks were also listed in the original scope of work (Amendment A000):

1. Design permanent laboratory facilities through a subcontract with a qualified Architect-Engineering firm by March 31, 1992.
2. Develop a technical management plan for the CEMRC by September 30, 1992.
3. Procure, install and qualify a Whole Body Counter (WBC) system by September 30, 1992.
4. Procure, install and qualify a Lung Counting System (LCS) by January 31, 1994.
5. Establish a full-service environmental sample testing laboratory by July 8, 1998.
6. Establish a monitoring field service activity by July 8, 1998.
7. Develop an environmental database management and retrieval system by July 8, 1998.

The architectural firm Flatow Moore Shaffer McCabe (Albuquerque, NM) was selected in 1991 to design the current 26,000 ft^2 facility located at 1400 University Drive in Carlsbad, NM. Construction on the facility began in August 1995 and was completed in December 1996. The current CEMRC facility houses CEMRC scientific and administrative staff (19 FTE) as well as scientific staff from the Los Alamos National Laboratory – Actinide Chemistry Repository Science Program (LANL/ACRSP; approx. 7 FTE) and the scientific

staff from the Nuclear Waste Partnership, LLC (NWP) and URS Professional Solutions (URS-PS) radiochemistry group (approx. 9 FTE).

Results from the CEMRC independent environmental monitoring program were initially published in a 1996 annual report, which can be found on the CEMRC webpage (www.cemrc.org). In addition to this first report, annual reports have been published for the following periods: 1997, 1998, 1999, 2000, 2001, 2002, 2005/2006, 2007, 2008, 2009, 2010, 2011, and 2012 – all of which are also available on the CEMRC webpage. In addition to the published annual reports, additional information regarding the CEMRC environmental monitoring program, including the ability to see specific radiological and non-radiological data from various types of media (FAS and Non-FAS), are also available on the CEMRC webpage under "environmental data", "data reporting". Within the data reporting field, users can select the type of data they wish to review (FAS, Non-FAS Radiochemistry, Non-FAS Inorganic), the year, and the location or sample analyses dates within the particular year. Further, once displayed, this data then be printed for further review or for archival purposes.

The attached 2012 annual report provides additional information regarding these four themes and the progress made in terms of meeting the goals and accomplishing the tasks identified in the original scope of work as well as providing scientific and technical information regarding the preparation of samples, the analyses of samples, and the results obtained from these analyses.

For questions regarding this final scientific/technical report, the 2012 CEMRC annual report, or for more information regarding the U.S. Department of Energy (DOE) financial assistance grant DE-FG29-91AL74167, please contact Dr. Russell Hardy, Director of the Carlsbad Environmental Monitoring and Research Center at (575) 234-5555 or email him at rhardy@nmsu.edu.