

**FINAL
CLOSURE REPORT**

**LOW-LEVEL RADIOACTIVE DISPOSAL CELL
EXHUMATION, TRANSPORTATION, AND DISPOSAL
FORMER RICHARDS-GEBAUR AIR FORCE BASE**

Prepared for:

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1.0 SUMMARY

Environmental Chemical Corporation was contracted to locate, exhume, package, and transport a low-level radioactive waste disposal storage cell (LLRDC) located on the former Richards - Gebaur Air Force Base, Belton, Missouri.

Prior to breaking ground the site was prepared and work zones demarcated in accordance with the USACE approved Work Plan. On September 15, 1997, the soil around the pipe was excavated to a depth of 18 feet. Soil on the east side of the pipe was then excavated to a depth of 24 feet. This completely exposed one side of the pipe and allowed it to be laid down. The pipe was successfully removed and remained intact throughout. The pipe was secondarily packaged into a 25 foot steel pipe. The void space was filled with sand to a minimum capacity of 85%.

The pipe waste package was loaded onto a transport vehicle on September 17, 1997. The package was transported to a R.M. Wester & Associates Facility in St. Peters, Missouri. R.M. Wester & Associates is licensed by the State of Missouri for the temporary storage of radium (See Appendix C). The waste package was held at this location pending the completion of the State of Washington Site Use Permit issued for the Richards-Gebaur Site. During this period the packaging integrity was reviewed and ensured by Wester and U.S Ecology personnel.

Radiologic surveying, monitoring, and characterization took place throughout the project activities. Field instrument monitoring did not indicate any incidence of personnel or equipment contamination. Soil monitoring with field survey instruments did not indicate that any contamination spread from LLRDC to the surrounding soil. Gamma Spectroscopy characterization was performed in the field and indicated the sole presence of Ra-226. Air monitoring results proved that the generation of dust contaminated with radioactive materials did not occur. Personnel exposure monitoring yielded non-detectable exposures for all individuals monitored.

Soil sampling proceeded during the excavation in accordance with the USACE approved Sampling and Analysis Plan. Preliminary laboratory results indicated elevated uranium levels in sample # RGS21-24 which are believed to be natural background concentrations. Further analysis performed on this sample confirmed the elevated uranium levels.

2.0 PROJECT BACKGROUND

2.1 Location

The project was located at Richard - Gebaur AFB, off of Highway 71 and Highway 150 south of Kansas City, Missouri, near the town of Belton. The LLRDC was located in an open field approximately 450 feet north of the base lake, 200 feet east of the Tactical Air Navigation System Building (Building 841) and about 300 feet west of Scope Creek. See Figure 4, Site Map.

2.2 History

The Base facility was originally leased by the Aerospace Defense Command in 1952 and transferred to the U.S. Government in 1953. The base was used by various branches of the U.S. Air Force. Beginning in 1979, control of many facility functions were gradually transferred to the City of Kansas City as part of an eventual closure of the base. The grounds and facilities are currently owned, leased, used, or being offered for future use by the City, various Federal and city government organizations, as well as civic and business organizations.

The LLRDC consisted of a ten to twelve inch diameter cast-iron pipe casing that stood approximately 5.5 feet above ground surface. The exact depth of the disposal cell was unknown, but an unverified United States Air Force-Air Logistics Command report indicated that the cell was 23 feet long and with concrete caps. The cell was believed to have been used intermittently from 1955 to 1970 for the disposal of dosimeter badges, and radium dials and gauges replaced during routine aircraft maintenance. The Air Force Bio-Engineering staff monitored disposal of these materials. Standard USAF operating procedures indicate that the contents of the pipe were slurried with concrete prior to capping and sealing of the pipe. The only permitted use of uranium on Richards-Gebaur, according to the U.S. Air Force Radioisotope Committee, was the storage of 25,000 depleted uranium rounds (30 mm). These rounds were intact and were not disposed in the LLRDC.

Previous monitoring for radioactivity at the site was completed externally at the well cap in 1983 and 1993. The activity counts were reported to be at, or near, background levels.

2.3 Purpose and Scope

The goal of this project was to remove, assay, package and dispose of a ten to twelve inch diameter cast- iron pipe that was reportedly twenty-three feet long. The LLR disposal cell (reported to contain radioactive aircraft components, i.e. electron tubes and luminescent dials, and dosimeter badges), any associated soils contaminated with radioactive isotopes, and any investigation derived waste contaminated with radioactive isotopes were to be properly disposed. It was anticipated that the site would be released for "unrestricted use following the removal action. The entire scope of activities proceeded in a manner that would prevent or minimize the spread of radioactive contamination (if encountered), and provide for the safety of the on-site personnel through

administrative controls and appropriate PPE. ECC provided the on-site services to complete the exhumation of the LLRDC, environmental sampling, waste profile characterization, and site reconditioning.

Site activities were coordinated through the USACE, Kansas City District, and Richards - Gebaur. Project documentation includes the Work Plan that incorporated the Site Safety and Health Plan (SSHP) and the Sampling and Analysis Plan (SAP), and this Closure Report.

During excavation activities removed soils were to be segregated and protected until the LLRDC cell was removed. All soils which passed the field screening measurements were returned to the excavation as backfill, compacted to 95% maximum density as determined by ASTM D 698.

Several assumptions were made in the preparation of the Work Plan. The more salient of these assumptions are described below:

- The radioactive materials would be naturally occurring radioactive material (NORM).
- Work would not commence until a NORM determination and Site Use Permit was issued by the State of Washington*.
- The LLRDC retained full integrity during excavation.
- Diffuse contamination was limited to an impact volume of ten (10) cubic yards of soil.
- Richards -Gebaur would provide a secured, safe storage location for the exhumed vault upon discovery of byproduct material or refusal for disposal by U.S. Ecology until arrangements for transfer to an active licensee, if necessary.
- Richards-Gebaur would provide solid waste disposal services for uncontaminated solid waste.

* Although the permit had yet to been issued, the application process was initiated; therefore, work commenced.

3.0 DAILY ACTIVITIES SUMMARIES

3.1 September 8, 1997

ECC employees met at the Whiteman Inn, Knob Noster, Missouri at 900. Dr. Clarence Styron of R.M. Wester and Associates also arrived at 900. Radioactive Materials training commenced in the conference room at 1000 and continued until 1500. At the end of this training session, a quiz was administered to the participants and was reviewed with Dr. Styron.

3.2 September 11, 1997

All ECC personnel and equipment mobilized to site.

3.3 September 12, 1997

All personnel arrived at site at 900. The work site was divided into 3 zones. An Exclusion Zone (EZ) was established to encompass the excavation. Orange snow fencing was utilized to mark the outer perimeter of the EZ. A designated Contamination Reduction Zone (CRZ) was provided for a frisking/decon station and a protective barrier to the Support Zone (SZ). The outer perimeter of the CRZ was marked with caution tape. "Caution Radioactive Materials" signs were posted at several locations around the CRZ. (See Figure 5, Site Diagram)

The Radiation Safety Officer (RSO) performed a background determination survey.

At 1200, Setup was completed and personnel departed the site.

3.4 September 15, 1997

All ECC personnel arrived at site at 530. A tailgate safety meeting was held to discuss the concerns of the day. Special attention was given to the hazards associated with the movement and operation of heavy equipment, working around an excavated area, and handling potentially radioactive materials and soils. Each individual was then issued a TLD (Thermo Luminescent Dosimeter). All equipment was thoroughly inspected by the operators. All Health and Safety documents are presented in Appendix A.

USACE and MDNR Personnel arrived to observe operations throughout the day. See Visitor Sign-in Sheet in Appendix A.

A high volume air sampler was set up at the northeast corner of the site, at the perimeter of the CRZ, to monitor for the release of airborne contaminants. The filter was scanned throughout the day using the alpha detection probe. The above ground portion of the LLRDC was anchored to the loader and bulldozer using heavy-duty straps. Excavation began on the eastern (down slope) side. Every third bucket of soil excavated was surveyed on contact with hand held instruments

by the RSO. The entire surface of the bucket of soil was surveyed for alpha and for beta/gamma activity using Ludlum Models 3/44-9 and 2350/44-10 respectively. Additionally, soil samples were collected with a hand trowel directly from the bucket. Six discrete samples were taken from each three-foot interval. Each soil sample was surveyed prior to being deposited into a labeled, plastic ziploc bag. The six samples were composited to produce a sample, which represented that three-foot section. Soil samples were collected by the QC Officer throughout the excavation activities.

The area around the LLRDC was excavated to a depth of 18 ft. This largely freed the pipe from its resting-place and allowed ECC to place the necessary supporting straps around the pipe. After the straps were in place, the soil on the east side of the pipe was excavated to 24 feet, completely exposing one side of the pipe. This procedure allowed the pipe to be laid down and facilitated its removal. To protect the integrity of the cell, the other sides of the excavation were not excavated to 24 feet until after the pipe was removed. At this point, the sampling at the 24 foot depth was completed. The area was then benched back to allow for partial descent and to provide an area to lay the cell horizontally. Visqueen sheeting was placed on the sloped portion. The LLRDC was then fitted with chains and straps and secured to the excavator. It was lifted from its vertical position and gently placed on the sloped area. The cell was then re-strapped and secured on both ends. It was determined to be completely intact. A staging area was prepared on the southern side of the EZ. At 1015, the LLRDC was removed from the excavation to the staging area and remained intact throughout the procedure.

During excavation activities the presence of small quantities of water was noted. No known water pipe sources were in the vicinity. The water was believed to have originated from pockets or perched water around the tree immediately west of the LLRDC.

Once dry, the pipe exterior was scanned for alpha contamination using the alpha scintillation detector. No surface contamination was detected on the pipe. The site RSO and USACE-HP began Gamma Spectroscopy Analysis operations. Radiological characterization was completed at 1430.

Prior to backfilling, two more soil samples were collected from the bottom of the excavation. No alpha or beta/gamma survey readings above background were detected from these samples or from any of the samples taken previously. These two samples were composited along with the four (4) other samples taken at a depth of 21-24 feet. An area to the southwest of the site was then chosen by USACE Geologist for collection of background samples. A 15-ft. hole was dug and samples were collected from the shovel of the excavator. Backfill commenced and was completed at 1500. (See Figure 5, Site Diagram)

A 25 ft. steel pipe was prepared for overpack of the LLRDC. Windows were cut into the pipe to aid with the filling of void spaces. One end of the LLRDC was propped up and the overpack pipe was slipped around it. The LLRDC remained intact throughout the overpack procedure. Small quantities of dirt/ rust were shaken off and re-surveyed. No contamination was detected.

Sand was then used to fill the void spaces to 85% capacity. At 1700, the windows and ends of the overpack pipe were welded shut. The RSO performed a swipe test on the waste package to determine if the removable alpha contamination was within NRC Guide 1.86 standards (<20 dpm / 100 cm^2). Removable alpha levels were determined to be below this level.

The site was compacted and leveled with bulldozer and excavator. The final survey of all materials and personnel was performed. No contamination was detected. All soil samples were composited correctly, site cleanup was completed, and the pipe waste package was labeled and staged for transport.

All personnel departed the site at 1800.

3.5 September 16, 1997

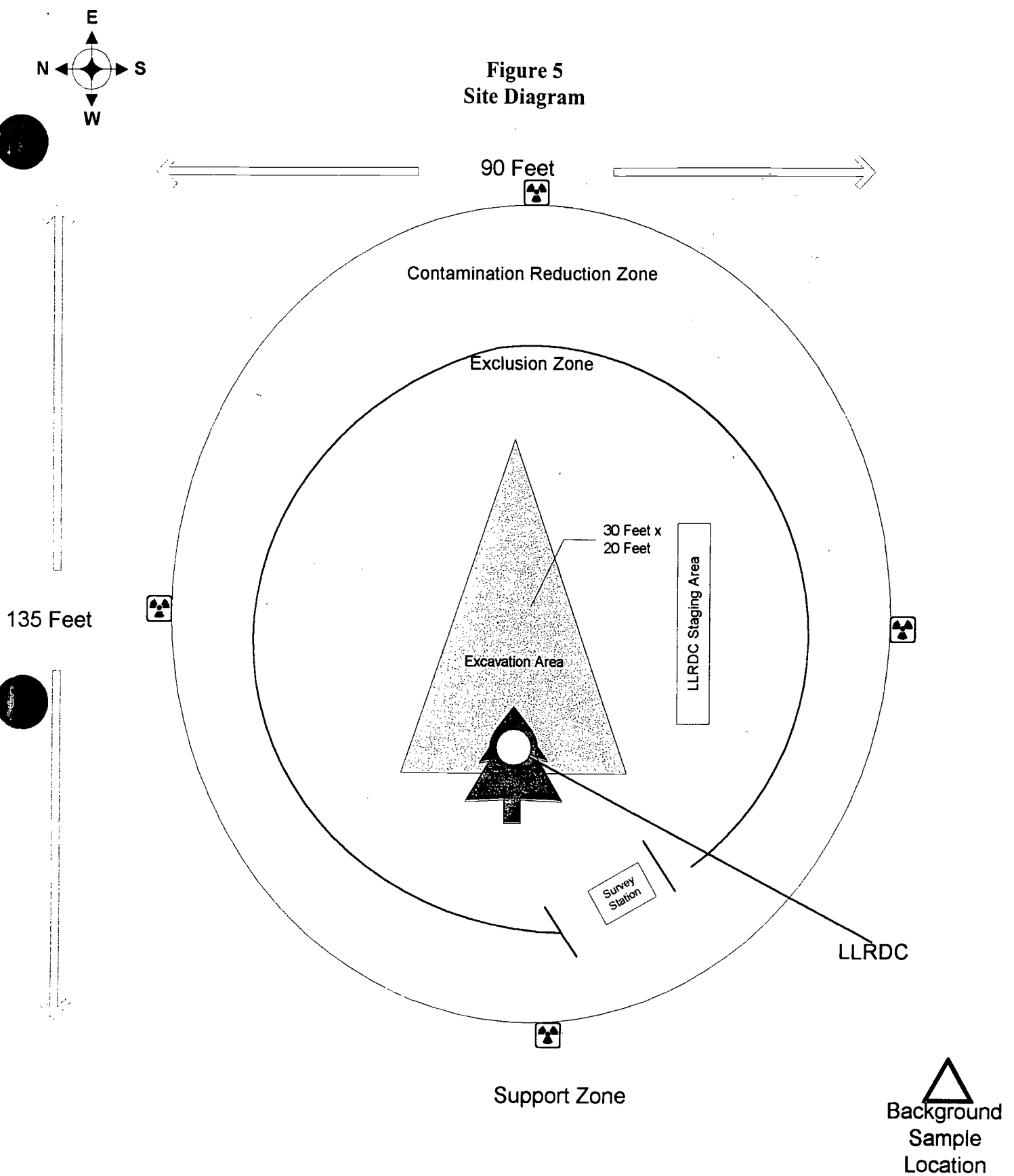
The RSO and QC Officer prepared the shipping documents. All samples were sent for analysis.

3.6 September 17, 1997

All personnel met at site at 1000. Following a safety meeting and equipment inspection, the waste package was moved to the parking lot north of the site. At 1200, the transport vehicle arrived. The package was loaded and well braced. The package and vehicle were surveyed by the RSO.

The QC Officer, USACE representative, and driver reviewed all shipping documentation. Following confirmation of the drivers' qualifications the shipping papers were signed and the vehicle left the site at 1330.

Figure 5
Site Diagram



6.0 CONCLUSIONS

Soil analytical results showed the concentration of ^{238}U fluctuated between 0.8 to 1.0 pCi/g between depths of 1 ft. to 20 ft. One sample collected below the bottom of the pipe from 21-24 ft. showed uranium concentrations of 56.2 pCi/g ^{238}U and 108 pCi/g $^{\text{total}}\text{U}$. According to the U.S. Air Force Radioisotope Committee, the only previously permitted use of radioactive materials at Richards-Gebaur Air Force Base involving uranium was a provision for the storage of 25,000 depleted uranium rounds (30 mm). These rounds were intact and, therefore, there could be no contamination in or around buildings/bunkers in which the rounds were stored. Further, the strict accountability system employed by the U.S. Air Force precluded any loss of material. These rounds were not disposed in the LLRDC. Thus, uranium is not a contaminant that should have been present in the pipe.

The pipe was surveyed visually and radiologically for evidence of a breach. No evidence was seen to indicate that there was a breach in the pipe. In the radiological survey, no fixed or removable alpha contamination (uranium is an alpha emitter) was detected anywhere on the exterior of the cell, indicating that the pipe did not leak. Since uranium was not disposed in the LLRDC and since the LLRDC apparently maintained its integrity, the most logical conclusion is that the elevated levels of uranium were due to natural geologic characteristics.

The concentrations of ^{226}Ra in each of the seven composite soil samples was less than, or equal to, the average ^{226}Ra concentration in the three background samples ($0 = 2.2$ pCi/g). ^{226}Ra analysis confirms that no breach in the LLRDC or incident of leaking material occurred into the surrounding soils.

North Transect

South Transect

Scope Creek

RADIOACTIVE
DISPOSAL WELL

320.86

317.31

317.33

LEGEND



TREE



MANHOLE



GUY WIRE



POLE



SPOT ELEVATIONS



SURFACE CONTOUR

10 0 10 20 30

SCALE IN METERS



US Army Corps
of Engineers

Former Richards-Gebaur
Air Force Base
Belton, Missouri

Figure 4: Radioactive
Waste Disposal Well Site Map

