KERR McGEE CHEMICAL L.L.C.
TECHNICAL CENTER
OKLAHOMA CITY, OK

APPLICATION DATED: JULY 11, 2000
REVISION DATED: APRIL 5, 2001

SAFETY EVALUATION REPORT

JUNE 5, 2003

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DOCKET: 040-08006
LICENSE: SUB-986

LICENSEE: Kerr McGee Corporation, Technical Center, Oklahoma City , OK

SUBJECT: SAFETY EVALUATION REPORT: APPLICATION DATED JULY 2000, AND REVISED MARCH 2001, TO APPROVE KERR McGEE CORPORATION'S TECHNICAL CENTER DECOMMISSIONING PLAN

1. BACKGROUND AND PROPOSED ACTION

1.1 Background

The Kerr-McGee Technical Center was established in 1963 to provide research and development for conducting chemical and radiochemical laboratory analysis. The primary use of the radioactive source material was for the development, testing and calibration of instruments used for the company's mineral prospecting business unit. At no time did the Technical Center engage in the degree of production activities associated with a fuel cycle facility.

The Kerr-McGee Corporation's NRC License No. SUB-986 is managed by Kerr-McGee Chemical, LLC, which operates the Technical Center to conduct research and development activities in support of its chemical facilities. In January 1999, the licensee determined it would no longer require source materials use authorizations, provided by NRC License No. SUB-986, to support any work. Additionally, the licensee had been notified by the Oklahoma Department of Transportation (ODOT) that the department would be expanding State Highway 74 and thus, would be expanding the existing right-of-way which may include the area where uranium calibration test pits, previously used under the license, were located.

The licensee has completed the remediation of the test pits with inspection oversight and confirmatory in-process surveys by the Region IV office of the NRC. The NRC staff conducted inspections and performed split sample analyses of the soils and surface water to assess the levels of contamination and subsequent remediation of the outdoor areas.

1.2 Purpose and Need for Proposed Action

The purpose of the proposed action is to reduce residual contamination at the Technical Center and release the site for unrestricted use. NRC is fulfilling its responsibilities under the Atomic Energy Act to make a decision on a proposed license amendment for decommissioning and subsequent termination of the NRC Byproduct Materials License, which ensures protection of the public health and safety and the environment.

1.3 Description of Proposed Action

The license termination will be based upon NRC staff's approval of the Licensee's Final Status Survey Report as required by the Decommissioning Plan (DP). The licensee remediated the facility in accordance with the licensee's radiation safety procedures as specified in their DP. Accordingly, the final status survey report documenting that the site meets the NRC's radiological criteria for

decommissioning will be submitted by the licensee for review and approval by the NRC upon its completion. The NRC staff has evaluated the DP and Derived Concentration Guideline Levels (DCGLs), and has developed an Environmental Assessment (EA) in accordance with the requirements of 10 CFR Part 51. Based on the staff evaluation, the conclusion of the EA is a Finding of No Significant Impact (FONSI) on human health and the environment for the proposed licensing action.

2. FACILITY OPERATING HISTORY

The Kerr-McGee Technical Center was established in 1963 to provide research and development for conducting chemical and radiochemical laboratory analysis. The Kerr-McGee Corporation's NRC License SUB-986 authorized use of natural uranium up to 250 kilo-grams (kg), natural thorium up to 150 kg and depleted uranium up to 35 kg. The source material could be in any chemical or physical form in accordance with the license. The primary use of the source material was the development, testing and calibration of instruments used for the company's mineral prospecting business unit. The company used the source material for batch type laboratory experiments to develop and prove new or proposed changes to processes for the extraction and purification of uranium and thorium. The laboratory testing conducted at Kerr-McGee Technical Center led to either process modifications or larger scale testing at other Kerr-McGee fuel cycle facilities. At no time did the Technical Center engage in the scale of production activities associated with a fuel cycle facility.

The source material was used in the facility's laboratories, sample preparation and sample storage shed and in five uranium calibration test pits. The uranium material in the form of U_3O_8 used in the calibration test pits had been blended with natural sands to produce a known, diluted-concentration of uranium and its daughter products. This material was used as calibration sources for instrument standardization and for instrument research and development. Most of the blended uranium was buried in the sealed uranium calibration test pits which were located out-of-doors on the 160-acre fenced site, approximately 250 yards from the building structure. The uranium calibration test pits or vaults, consisted of 1.8 m (6 ft) diameter corrugated steel pipe, 3.7 m (12 ft) long, placed vertically in the ground and sealed on the bottom by a steel plate. The top and bottom segments of the pipe contained clean sand. The middle 1.8 m (6 ft) section contained the source material. There was a 11.4 cm (4.5 inches) outer diameter (OD) fiberglass pipe installed in the centerline of the steel pipe. This provided the capability to lower monitoring instruments for calibration. A locked steel cover closed the tube when the test pits were not in use. Five of the eight test pits contained source material consisting of U_3O_8. There was a total of approximately 24 m^3 (32 cubic yards) of source material in the five pits with an average U_3O_8 concentration of approximately 0.25 weight percent. There was approximately 132 kg (290 lb) of U_3O_8, mostly in the form of crushed ore and sand with yellowcake. Three other test pits at the site never contained source material.

3. FACILITY DESCRIPTION

3.1 Site Location and Physical Description

The Kerr-McGee Technical Center (KMTC) is located in Oklahoma County approximately 15 miles northwest of downtown Oklahoma City and due west of Edmond at the intersection of NW 150th Street (City of Edmond 33rd Street) and State Highway 74 (Portland Avenue). The site consists of approximately 160 acres of land, in which the facility buildings are located on approximately 10

acres of land, with the rest of the land area consisting of grass fields or water, and not used for the facility's activities.

The area surrounding the facility is primarily rural; however, it is becoming more developed with suburban growth from Oklahoma City. A golf course is under construction approximately 0.5 miles north of the facility. There are subdivisions and churches which are under construction or have recently been built approximately 0.5 - 1.0 mile east of the facility. Angie Debo Elementary School is located 0.3 miles east of the facility and a Child Development Center (day care) is located diagonally across the street from the entrance to the 160-acre grounds, which surrounds the 10-acre facility.

3.2 Geology and Soils

The Kerr-McGee Technical Center is located in a shaly geologic area of Oklahoma known as the Shales of the Hennessey Group, which is characterized as red-brown to orange-brown that weather to soils characterized as a reddish-brown or dark brown, clay-loam which is 8 to 12 inches thick. This top layer is difficult to till and overlies a claypan subsoil. These upper soils, known as the Renfrow Series, are naturally well drained with low permeability. The soils are high in natural fertility but are susceptible to water erosion in sloping fields. These upper zone soils result in a water bearing zone that produces little water and movement making it unsuitable for resource development.

The Garber-Wellington aquifer is beneath the Hennessey Group shales. The uppermost unit is the Garber sandstone, characterized as primarily an orange-brown to red-brown, fine grained sandstone, irregularly bedded with red-brown shale and some chert and mudstone conglomerate. Its thickness varies from 150 to 400 feet or more.

The lowermost unit is the Wellington Formation. It is primarily a red-brown shale and orange-brown, fine grained sandstone, containing maroon mudstone conglomerate and chert conglomerate to the south. The thickness ranges from 150 to 500 feet. The base of the Garber-Wellington fresh water zone in the Kerr-McGee Technical Center vicinity is approximately 525 feet.

3.3 Water Resources

The shallow groundwater associated with Kerr-McGee Technical Center is located approximately 5 feet below the surface. This saturated zone produces little water, typically much less than 1 gallon per minute (gpm), as the ground consists of tight clays which have low permeability.

Deep groundwater is of good quality, suitable for drinking water, if desired. The licensee has documented that the shallow water table is hydraulically isolated from the productive water bearing horizon of the Garber-Wellington formation by over 200 feet of predominantly silts, clays and generally fine-grained material. Thus, the Garber-Wellington aquifer is unaffected by the surface activities. This aquifer is used in the regional area for drinking water purposes.

4. RADIOLOGICAL STATUS OF THE FACILITY

4.1 Summary of Radiological Conditions

The licensee has completed the remediation of the test pits with inspection oversight and confirmatory in-process surveys by the Region IV office of the NRC. The excavated soil was approximately 7-8000 cubic feet (ft^3), which was placed into 16 roll-off containers and shipped to Envirocare of Utah, Inc. The NRC staff conducted inspections and performed split sample analyses of the soils and surface water to assess the levels of contamination and subsequent remediation of the outdoor areas.

4.2 Radiological Status of Ground and Surface Water

The licensee has proposed a DCGL for the release criteria of 226 pCi/l for total uranium in groundwater in the submitted DP. The licensee's calculations estimate that over 80 percent of the potential dose to a resident farmer would come from direct ingestion of groundwater by human inhabitants. NRC staff concurs with these estimates, and expects that they are conservative for the purposes of determining groundwater release criteria.

4.3 Radiological Safety Program

A few of the areas which were remediated had small volumes of radioactive materials in concentrations which resulted in exposure rates of 180 micro-Roentgen per hour (µR/hr) on contact with the ground surface. The exposure rate was reduced significantly with distance from the ground surface. Workers did not receive any measurable exposure from licensed materials during the remediation activities. Based on the licensee's calculations, as documented in the submitted decommissioning plan, the highest expected dose to an onsite worker was approximately 100 mrem total effective dose equivalent (TEDE) from the decommissioning activities.

The licensee implemented a radiological safety program during decommissioning activities. The licensee excavated the soils from the test pits under their decommissioning procedures. Additionally, the licensee remediated other areas which had been identified during the MARSSIM Class 2 surveys conducted in areas surrounding the buildings and test pits. There was sufficient distance between the proposed remedial activities and public lands to ensure that any dose received would be insignificant. Airborne releases were not a pathway to the public. Consequently, there were no dose impacts, nor were they expected, to members of the public from remedial activities. There was no immediate threat to public health and safety from the remedial activities.

The Region IV office of the NRC conducted 3 inspections (ADAMS Accession Nos. ML011520269, ML023500440, ML030370529) to determine if procedures and activities were being conducted in accordance with the license, regulatory requirements, and the proposed DP. Confirmatory soil sample analysis results and exposure-rate measurements were below the proposed release criteria. The inspections were satisfactory and did not identify any violations.

4.4 Radiological Waste Management

The licensee's radioactive waste management program was reviewed under the NRC inspection program by the NRC Region IV office. The wastes generated during decommissioning activities were primarily soils containing uranium ore and/or yellowcake used to make up calibration standards. The source material wastes generated during decommissioning were transported Envirocare of Utah, Inc., a licensed low-level radioactive waste disposal facility.

5.0 ALARA ANAYSIS

The "Statements of Consideration" for 10 CFR Part 20, Subpart E (62 FR 39065, July 21, 1997), and the Final Generic Impact Statement (NUREG-1496), indicate that disposal of surface soil, at a licensed facility, for unrestricted release exposure scenarios meets the ALARA requirement and therefore, the licensee does not have to perform a cost justification as required by the Standard Review Plan. Kerr McGee Corporation will remove contaminated soil to achieve a calculated dose of less than 25 mrem/year; which is sufficient to comply with ALARA requirements.

The NRC staff has reviewed the information submitted by Kerr McGee Corporation to demonstrate that the preferred decommissioning option is ALARA as required in 10 CFR Part 20, Subpart E, in accordance with the criteria in the NMSS Decommissioning Standard Review Plan, Section 7.0 "ALARA Analysis." Based on this review, the NRC staff concludes that the preferred option provides reasonable assurance that the remediation will result in residual radioactivity levels which are ALARA.

6.0 DOSE MODELING EVALUATIONS

The licensee performed analysis of collected soil samples, scanning measurements and used historical information to classify soil survey units. The licensee calculated DCGLs for surface contamination of soils in the impacted areas of the facility using RESRAD code. The DCGLs define the maximum amount of residual contamination in soils and buildings, which satisfy U.S. NRC's regulations in 10 CFR Part 20, Subpart E, "Radiological Criteria for License Termination." The licensee used ICRP-72 dose factors in lieu of the default ICRP-30 dose factors, in which most decommissioning and other licensing actions are based. Although NRC regulations do not require the use of ICRP-30 dosimetry, ICRP-72 allows the determination of age-specific doses to critical groups. However, the licensee's calculations were restricted to adults only. The NRC staff supplemented the licensee's determination of DCGLs by calculating doses for children using ICRP-72. The NRC staff conducted a set of deterministic and probabilistic RESRAD runs comparing dose levels and soil cleanup levels for the three radionuclide series. These calculations differ from those of the licensee in three important respects:

1. Calculations were for all age categories greater than or equal to 1-year, using age-specific dose conversion factors from ICRP-72,

2. Calculations used age-specific usage factors, and

3. Calculations used worst-case inhalation absorption factors from ICRP-72.

There are several reasons which may be cited to support the use of the adult as the average member of the critical group.

1. The concept of an "average member of the critical group" recognizes that there will be a range of individuals in that group, some more affected by radiation and others less affected by radiation. If children are more affected by some of the radionuclides by factors of less than three, it could be argued that they are still members of the critical group, just not the average member.

2. The facility is being used as a laboratory by adults, and no children would be expected to stay in the building or grounds, other than for short visits.

3. Should the facility convert to some other use in the future that would allow significant use by children (e.g., a day care center), it would probably involve renovation, including replacement, painting, sealing or renewal of walls, ceilings, and floors.

4. The dose a person receives in a single year contributes to an overall risk over their lifetime. Risk to a person is proportional to the cumulative dose he or she has received since birth. In the Statement of Consideration for the License Termination Rule, risks were estimated assuming a 30-year lifetime exposure "...from contaminated sites based on the assumption that it is unlikely that an individual will continue to live or work in the same area for more than 30 years," (FR, 1997). Applying this same philosophy of a 30-year accumulation of risk, it is possible to demonstrate the difference in assuming that the exposed person is always an adult, versus assuming age-based doses in each category.

Following are the ratio for the age-based doses in each category as determined by the NRC staff calculations.

Table 1 - Age Related Doses for Soil

Age Category	U series and Progeny- mrem/pCi U	Ratio to Adult	Th-232, Th228 and Ra-228, mrem/pCi Th	Ratio to Adult	Th-230, and progeny mrem/pCi Th	Ratio to Adult
Adult	0.06262	1	3.097	1	4.518	1
15 yr old	0.0787	1.26	3.98	1.29	6.44	1.43
10 yr old	0.0958	1.53	4.02	1.3	6.52	1.44
5 yr old	0.101	1.61	4.02	1.3	6.7	1.43
1 yr old	0.111	1.77	4.02	1.3	6.7	1.48

Table 2 - Age Related Doses for Groundwater Contamination At Uranium Pit

Age Category	Dose mrem/pCi	Ratio to Adult Dose
Adult	0.1839	1
15 yr old	0.2791	1.52
10 yr old	0.219	1.19
5 yr old	0.1942	1.06
1 yr old	0.1258	0.684

Table 3 - Age Related Doses for Indoor Exposures from Contaminated Surfaces as Compared to Results from Standard Dosimetry of RESRAD-BUILD

Age Class	U Series - mrem/pCi U	Ratio to Adult	Th-232 mrem/pCi Th	Ratio to Adult	Th230 mrem/pCi Th	Ratio to Adult
Adult	1.71E-4	1	2.25E-3	1	1.55E-3	1
15 yr	2.17E-4	1.27	2.91E-3	1.29	1.86E-3	1.2
10 yr	3.5E-4	2.05	3.59E-3	1.6	3.6E-3	2.32
5 yr	3.92E-4	2.29	3.77E-3	1.68	3.85E-3	2.48
1 yr	4.15E-4	2.43	3.48E-3	1.55	3.67E-3	2.37

The RESRAD and RESRAD-BUILD results were compared for the adult age group only, using the ICRP-72 dosimetry and the default ICRP-30 dosimetry. Table 4 provides the comparisons between the two dose factors. All runs were deterministic, although probabilistic runs for RESRAD gave similar results. The higher allowed DCGLs calculated by the licensee reflect the lower dose factors of ICRP-72.

Table 4 - Comparison of Doses from ICRP-72 Dosimetry and ICRP-30 Dosimetry for Soils and Surfaces

Radionuclide Group	Ratio ICRP-30 results to ICRP-72 results RESRAD soil	Ratio ICRP-30 results to ICRP-72 results RESRAD-BUILD surfaces
Uranium Series	2.31	2.73
Th-232 Series	1.04	0.97
Th-230 Series	1.2	1.8

The staff agrees with the licensee that the adult is the average member of the critical group for this site, and is generally protective of all age groups likely to use the site. Furthermore, scenarios for which the site occupants would be different than the chosen scenario would be less likely, and therefore, could receive a lower weight than the main scenario when risk is considered.

The licensee proposes to assume that the contaminant is entirely the most restrictive one, Th-232, in their final status survey, unless they encounter values higher than the DCGL. In that circumstance, they will determine the relative contribution from the residual contamination of each radionuclide, combined into a single dose value with the unit rule. The staff considers this approach to be reasonable and concurs in its use. In consideration of all factors discussed above, the NRC staff recommends approval of the DCGLs for the licensee's Decommissioning Plan, as shown in Table 5.

Table 5 - Licensee's DCGLs for Soil and Surfaces

Radionuclide and Situation	DCGL Value
Uranium Series - Soil	228 pCi U/gram
Th-232 Series - Soil	5.3 pCi Th/gram
Th-230 Series - Soil	3.5 pCi Th/gram
Uranium Series - Indoor Surfaces	166,300 dpm/100 cm^2
Th-232 Series - Indoor Surfaces	12,500 dpm/100 cm^2
Th-230 Series - Indoor Surfaces	16,300 dpm/100 cm^2
Uranium Series - Soil in Test Pit	165 pCi U/gram

7. FINAL STATUS SURVEY DESIGN

Kerr McGee intends to follow MARSSIM for the survey design and sampling methodology to demonstrate that the Technical Center is suitable for unrestricted release for surface and soil contamination.

In accordance with 10 CFR 40.428(j)(2), Kerr McGee Corporation will submit a report of the FSS results. The NRC staff will review the adequacy of the FSS results and findings submitted, coupled with their inspection results. Based on the review, the NRC staff will determine if the report adequately demonstrates compliance with the radiological criteria for unrestricted release of the Kerr McGee Technical Center. The NRC staff expects in the FSSR, the radionuclides of concern, estimate of standard deviation, surrogate ratios (as applicable), corresponding DCGLs, data quality objectives (DQO), calculations of the number of samples and data quality assessment for each survey and sub-survey units will be clearly presented.

8. ENVIRONMENTAL REVIEW

The NRC staff evaluated the environmental impacts of approving the Decommissioning Plan for the Kerr McGee Technical Center in Oklahoma City, OK. The NRC staff prepared an EA with input from the State of Oklahoma Natural Heritage Inventory, by letter dated April 11, 2002, and the U.S. Fish and Wildlife Service, by letter dated May 9, 2002. By letter dated May 2, 2002, after considering the documentation submitted by the licensee concerning the location of the decommissioning project, the Oklahoma Historical Society determined that there were no hsitoric properties affected by the referenced project. In its letter dated April 11, 2002, the Oklahoma Archaeological Survey determined that no sites were listed as occurring in the decommissioning project area, and based on topographic and hydrologic settings, no archaeological materials were likely to be encountered. The NRC staff provided a draft of the EA to the State of Oklahoma for review. The state did not comment on the EA.

9.0 IMPACTS

The facility consists of approximately 160 acres of land in which the facility buildings are located on approximately 10 acres of land with the rest of the land area consisting of grass fields or water, and not used for the facility's activities. Short and long-term impacts to human health due to radiological exposure were not expected. These included the potential release to the environment of airborne effluents, which may contain low-levels of radioactive contamination during decommissioning activities such as excavation, packaging and waste transportation. NRC regulation 10 CFR Part 20 specifies the maximum amounts of radioactive materials that a licensee can release from a site in the form of either airborne or liquid effluents. The licensee described in the DP, the controls established for these activities. Occupational doses to decommissioning workers were expected to be low and well within the limits of 10 CFR Part 20. No radiation exposure to any member of the public was expected, and public exposure would, therefore, also be less than the applicable public exposure limits of 10 CFR Part 20. In addition, the licensee has a fence around their property which limited access to the facility. Therefore, the environmental impacts from the proposed action were expected to be small.

Since the site would be surveyed and meet the NRC criteria for unrestricted use in accordance with 10 CFR Part 20, the environmental impacts resulting from the release of this site for unrestricted use are expected to be insignificant. There are no additional activities which would result in cumulative impacts to the environment.

10. RECOMMENDATIONS

The NRC staff recommends approval of the DP with the DCGL values for each radionuclide as noted in this Safety Evaluation Report.

11. REFERENCES

NRC, "Radiological Criteria for License Termination," 10 CFR Part 20, Subpart E, 62 FR 39088, July 28, 1997.

NRC, "NMSS Decommissioning Standard Review Plan, " NUREG-1727, August 1991.

NRC, “Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM),” NUREG-1575, December 1997.

NRC, “Consolidated NMSS Decommissioning Guidance,” NUREG-1757, Volume 1, September 2002.

NRC, Draft, “Environmental Review Guidance for Licensing Actions Associated with NMSS Programs,” NUREG-1748, September 2001.

NRC, Draft, “Manual for Conducting Radiological Survey in Support of License Termination,” NUREG/CR-5849, June 1992.

NRC, NMSS Decommissioning Standard Review Plan,” NUREG-1727, September 2000.

FR 1997, Radiological Criteria for License Termination, IV. Summary of Public Comments, Responses to Comments, and Changes from Proposed Rule, A.2.2.1, page 39061, Federal Register, Vol 62, Rules and Regulations, July 21, 1997.

FR 2001, Rules and Regulations, pages 55752-55753, Federal Register, Vol 66, No. 213, November 2, 2001.

NRC Inspection Report 40-8006/01-01, June 1, 2001 (ADAMS Accession No. ML011520269)

NRC Inspection Report 40-8006/02-01, December 16, 2002 (ADAMS Accession No. ML023500440)

NRC Inspection Report 40-8006/02-02, February 5, 2003 (ADAMS Accession No. ML030370529)

Kerr-McGee Technical Center, “Revised Decommissioning Plan,” April 5, 2001.

Kerr-McGee Technical Center, “Responses to NRC Region IV Request for Information to Support the Environmental Assessment of Proposed Remediation Activities,” April 22, 2002.

Oklahoma Historical Society. Letter from Melvena Heisch to Russell Jones, KMTC, dated May 2, 2002.

U.S. Fish and Wildlife Service. Letter from Jerry Branrander to Russell Jones, KMTC, dated May 9, 2002.

Oklahoma Archeological Survey. Letter from Ryan A. Rowles and Robert L. Brooks to Russell Jones, KMTC, dated April 11, 2002.

Oklahoma Natural Heritage Inventory. Letter from Ian Butler to Russell Jones, KMTC, dated April 12, 2002.

12. REGIONAL COORDINATION

Rachel S. Browder, Health Physicist, Region IV

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