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March 6, 2002

D. Blair Spitzberg, Ph.D., Chief
Fuel Cycle Decommissioning Branch
United States Nuclear Regulatory Commission
Region IV
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011-8064

Re: Docket No. 040-08006; License No. SUB-986
Kerr-McGee Chemical LLC (KMCLLC) Technical Center
Responses to NRC Supplemental RAI with Regards to Derived Concentration Guideline Levels

Dear Dr. Spitzberg:

I am writing in response to your comments dated January 7, 2002 regarding the KMCLLC Technical Center Decommissioning Plan (D Plan). The attached responses to comments are provided for your consideration and application toward approval of the D Plan. We have not included change pages with this submittal, but will provide these pages once all agency comments are addressed.

Thank you for your assistance with these issues. Please feel free to contact me at (405) 270-2665 if you have any additional questions or concerns.

Sincerely yours,

Russell H. Jones
Project Manager

Kerr-McGee Corporation L.L.C. (KMCLLC) Technical Center
Responses to NRC Region IV Supplementary Request for Additional Information

NRC Comment #1:
Use of ICRP 72 dose factors for ingestion along with Federal Guidance Report 11/ICRP 30 dose factors for inhalation. The licensee should further justify the use of these factors, or accept the default values used in current versions of RESRAD and RESRAD-BUILD.

KMCLLC Response:
Kerr-McGee had initially modified only those dose conversion factors in the relevant pathways so that we would be changing as few default parameters as possible. To remedy the NRC's concern, we will use solely the dose conversion factors from ICRP 72. The ICRP 72 dose factors are scientifically recognized as incorporating more recent knowledge of physiology and transport of radionuclides throughout the body. Accordingly, we have attached new submittals of Appendices B, C, and D, incorporating ICPR 72 dose factor guidance. The revised DCGLs resulting from this change will be incorporated into the main text of the D Plan upon acceptance by the NRC.

NRC Comment #2:
Use of an air turnover rate of 10/hr for indoor DCGLs.

KMCLLC Response:
The air turnover rate of 10 per hour submitted in Appendix D of the D Plan is based upon the turnover rate for the building as currently used. The NRC questioned whether the building might be used at some future time in a manner that would employ a lower turnover rate. While it is possible that the building may be used in a different manner in the future, the current use as a laboratory/research facility will remain for the foreseeable future. It is unlikely that the air turnover rate would change unless substantial renovation work is performed to alter both the structure and the installed ventilation systems. In addition, the air exchange rate of 10 per hour is consistent with data presented in NUREG-6697 which shows that certain commercial buildings had measured air exchange rates exceeding 40 per hour (Pandian, et. al., 1993).

While Kerr-McGee believes that the exchange rate of 10 per hour is appropriate, guidance in Appendix C of NUREG-6697 suggests a rate of 1.52 per hour. This is the suggested mean for commercial buildings based upon data from a study by Turk et al., 1987. The data were gathered from 38 commercial buildings studied in the Pacific Northwest during all seasons of the year. The ranges reported are as follows:

Exchange rate (per hour)	# of bldgs
0-0.5	3
0.5-1	10
1-1.5	9
1.5-2	8
2-2.5	6
2.5-3	2
3-3.5	0
3.5-4	1
4-4.5	1

To further improve the RESRAD-BUILD model, a study was performed to determine a removal fraction that was representative of the Kerr-McGee Technical Center laboratories undergoing decommissioning. Characterization data were reviewed to determine where information existed regarding (fixed plus removable) beta measurements as well as beta smear measurements. The data were further reduced by selecting only those data sets that had a fixed plus removable beta reading of 500 dpm/100 cm^2 or higher. The 500 dpm/100 cm^2 threshold was selected to allow sufficient radioactivity so that changes would be reflective of the actual activity of the materials rather than changes due to background or other fluctuations. This data set was then used to calculate a removal fraction that would be representative. The data presented in the attached Table 1 show that the removal fraction calculated for the KMCLLC Technical Center is 0.007 or 0.7% as opposed to the default value of 0.1.

A revised Appendix D incorporating ICRP 72 dose factors (as described in the response to NRC Comment #1), an air exchange rate of 1.52 per hour, and a removal fraction of 0.7% is provided in Appendix D, and replaces the previous version submitted with the D Plan.

NRC Comment #3:
The licensee should include ALARA analysis for all pathways. An acceptable approach for conducting an ALARA analysis is provided in Appendix D of NUREG-1727, "NMSS Decommissioning Standard Review Plan." As noted in Appendix D, "Information submitted should include: (1) a cost-benefit analyses (or qualitative arguments) for the preferred option of removing residual radioactivity to a level that meets or exceeds the applicable limit, and (2) a description of the licensee's preferred method for showing compliance with the ALARA requirement at the time of decommissioning."

KMCLLC Response:
An evaluation was performed to determine the impact of performing additional remediation beyond that necessary to achieve compliance with the proposed DCGLs for soil and building surfaces. The evaluation for soils demonstrated that there are approximately 56,000 m^2 of affected soils survey units. In performing the ALARA evaluation, an assumption was made that any soil areas exceeding the DCGL have been

remediated to an average level of one Fractional Maximum Permissible Concentration (FMPC). The FMPC is calculated in accordance with the unity rule as follows:

$$FMPC = (activity_{U\text{-}total})/DCGL_{U\text{-}total} + (activity_{Ra\text{-}226})/DCGL_{Ra\text{-}226} + (activity_{Th\text{-}232+progeny})/DCGL_{Th\text{-}232+progeny}$$

The overall net fractional maximum permissible concentration (DCGL) for all affected soil survey units was calculated to be negative 0.03 (–0.03), indicating that the net average residual soil radioactivity is essentially equivalent to background. As shown in Table 2, the range of net residual soil radioactivity in terms of the FMPC did not exceed 0.09 over any of the survey units. This indicates that the proposed cleanup criteria are ALARA, since the site overall will be left with residual radioactivity concentrations that will be indistinguishable from background. The survey unit with the highest residual radioactivity will not exceed 10% of the 25 mrem per year regulatory criteria, and will also be essentially indistinguishable from the normal natural background radioactivity of approximately 300 mrem/y received by members of the public.

Table 3 presents a similar analysis performed for building characterization data. For building surfaces, net gross beta measurements (gross beta minus ambient beta background and net beta matrix background) were at levels characteristic of background (-83 dpm/100 cm^2). The highest net gross beta for any building survey unit averaged 206 dpm/100 cm^2. This low activity, assuming all residual activity is due to facility operations and is due to most restrictive radioisotope (Th-232 and progeny), represents less than 2 percent of the proposed DCGL (equivalent to less than 0.5 millirem per year). It would be unreasonable to reduce exposure to residual radioactivity below these levels, as these levels are ALARA.

Groundwater in the test pits was last measured below 80 pCi/L by two independent offsite laboratories, using two methods of analysis, prior to backfilling of the test pit area. This concentration is approximately 30 percent of the proposed DCGL for groundwater, and included the contribution from natural background. The groundwater that has been impacted is expected to attenuate naturally until such time as it is indistinguishable from natural background. Several factors point toward the preferred alternative of continuing the option of natural attenuation rather than any sort of active treatment. First, the shallow groundwater in the vicinity of the Technical Center is not currently used as a source of drinking water and low yields from the formation would most likely preclude its future use as a drinking water source. Second, the drinking water aquifer lies several hundred feet below the site. Third, public water supply systems are used in the area and finally, the proposed widening of Highway 74 will result in an easement that would not generally allow for the extraction of water in the area of the test pits. Therefore, the likelihood of a real dose from the small amounts of residual activity in groundwater is remote. Since the reasonableness test is met for the current conditions, it is ALARA and it would be unreasonable to expend funds for the purpose of removing any remaining residual radioactivity in groundwater at the site.

Table 1
Calculation of Removal Fraction

Room	Net Beta (dpm/100 cm^2)	Smear Results (dpm/100 cm^2)	Ratio (%)
C-1	784	3.02	0.385
C-1	686	8.87	1.293
C-1	504	2.83	0.562
C-1a	602	8.87	1.473
C-1a	714	9.07	1.270
C-1a	798	9.07	1.137
C-1a	994	5.85	0.589
C-1a	1176	5.85	0.497
C-1a	728	12.09	1.661
C-1a	784	9.07	1.157
C-13	1080	9.1	0.843
C-33	840	83.53	9.944
E-2	900	2.45	0.272
E-2	744	2.45	0.329
E-10	888	5.69	0.641
E-10	1464	0	0.000
E-10	1344	8.62	0.641
E-10	1440	2.76	0.192
E-14	1164	14.65	1.259
E-14	756	2.93	0.388
E-28	2544	8.82	0.347
E-28	1848	29.1	1.575
F-12	576	5.83	1.012
F-12	540	14.86	2.752
G-1	1386	0	0.000
G-1	1707	0	0.000
G-1	1229	0	0.000
G-1	1485	0	0.000
G-1	1779	0	0.000
G-1	1379	2.26	0.164
G-1	1379	0	0.000
G-1	1879	0	0.000
G-1	1757	0	0.000
G-1	1693	0	0.000
P-2L	1162	9.11	0.784
P-2L	1162	9.11	0.784
P-2L	1190	6.2	0.521
P-2L	1498	3.1	0.207
P-2L	728	2.91	0.400
P-2L	658	2.91	0.442
S-1	2198	6.04	0.275
S-1	1918	6.04	0.315
S-1	1736	0	0.000
S-1	1848	3.02	0.163
S-1	2268	2.83	0.125
S-1	2114	2.83	0.134
S-1	2016	3.02	0.150
S-1	2338	6.04	0.258
S-1	1316	6.04	0.459
S-1	1428	9.07	0.635
S-1	1274	0	0.000
S-1	532	3.02	0.568
MEAN	1288	6.71	0.70
MAX	2544	83.53	9.94
MIN	504	0.00	0.00

Table 2

KMTC Soil Results Report

3/2/02

Uses MEAN BK values as follows: U: 1.8; Th: 2.3; Ra:0.6 for calculation of Net Activities in pCi/g
Uses DCGLw Values as follows: U: 228; Th: 5.3; Ra: 3.5 for calculation of FMPC

	SampleID	*In (pCi/g):*	*Unet*	*Thnet*	*Ranet*	*FMPCnet*
SSU#:	*01*					
	Mean Values (pCi/g)		2.94	-0.37	0.03	-0.05
SSU#:	*02*					
	Mean Values (pCi/g)		0.68	-0.40	0.04	-0.06
SSU#:	*03*					
	Mean Values (pCi/g)		0.88	-0.18	0.15	0.01
SSU#:	*04*					
	Mean Values (pCi/g)		0.31	-0.49	0.04	-0.08
SSU#:	*05*					
	Mean Values (pCi/g)		0.91	-0.26	0.11	-0.01
SSU#:	*06*					
	Mean Values (pCi/g)		0.82	-0.38	0.14	-0.03
SSU#:	*07*					
	Mean Values (pCi/g)		0.66	-0.47	0.14	-0.04
SSU#:	*08*					
	Mean Values (pCi/g)		-0.64	-1.34	-0.19	-0.31
SSU#:	*09*					
	Mean Values (pCi/g)		-0.04	-1.09	-0.10	-0.23
SSU#:	*10*					
	Mean Values (pCi/g)		0.63	-0.42	0.11	-0.05
SSU#:	*11*					
	Mean Values (pCi/g)		0.76	-0.82	0.19	-0.10
SSU#:	*12*					
	Mean Values (pCi/g)		0.84	-0.80	0.10	-0.12

Table 2, page 2

	SampleID	In (pCi/g):	Unet	Thnet	Ranet	FMPCnet
SSU#:	*13*					
	Mean Values (pCi/g)		0.77	-0.34	0.09	-0.03
SSU#:	*14*					
	Mean Values (pCi/g)		0.70	-0.17	0.09	0.00
SSU#:	*15*					
	Mean Values (pCi/g)		0.77	-0.81	0.00	-0.15
SSU#:	*16*					
	Mean Values (pCi/g)		1.00	-0.34	0.27	0.02
SSU#:	*17*					
	Mean Values (pCi/g)		1.52	-0.28	0.35	0.05
SSU#:	*18*					
	Mean Values (pCi/g)		1.20	-0.30	0.28	0.03
SSU#:	*19*					
	Mean Values (pCi/g)		0.37	0.04	0.06	0.03
SSU#:	*20*					
	Mean Values (pCi/g)		1.09	-0.25	0.06	-0.03
SSU#:	*21*					
	Mean Values (pCi/g)		0.51	0.06	0.26	0.09
SSU#:	*22*					
	Mean Values (pCi/g)		0.58	0.06	0.26	0.09
SSU#:	*23*					
	Mean Values (pCi/g)		0.81	-0.09	0.23	0.05
SSU#:	*24*					
	Mean Values (pCi/g)		0.71	-0.30	0.11	-0.02
Site Wide Values:						
	Mean Values (pCi/g)		0.88	-0.36	0.11	-0.03
	Std Deviation (pCi/g)		2.37	0.53	0.30	0.15

Table 3

KMTC Surface Beta Report (units of dpm/100 cm^2) 3/2/02

		Gross Beta incl. bkg.	*Net Beta*
C-1			
	Room Average	241	3
C-13			
	Room Average	228	25
C-13c			
	Room Average	228	21
C-17			
	Room Average	9	-70
C-19			
	Room Average	238	145
C-1a			
	Room Average	417	206
C-21			
	Room Average	-50	-118
C-23			
	Room Average	-57	-200
C-25			
	Room Average	-64	-331
C-27			
	Room Average	89	-132
C-29a			
	Room Average	58	-152
C-29b			
	Room Average	54	-151

Table 3, page 2

C-33			
	Room Average	133	-80
C-39			
	Room Average	106	-110
E-10			
	Room Average	302	133
E-12			
	Room Average	65	-27
E-14			
	Room Average	-16	-132
E-2			
	Room Average	148	-72
E-22			
	Room Average	197	-25
E-28			
	Room Average	255	-9
E-30			
	Room Average	6	-169
E-8			
	Room Average	96	-119
F-12			
	Room Average	227	3
F-2&4			
	Room Average	168	-107

Table 3, page 3

F-4a			
	Room Average	188	-269
G-1			
	Room Average	1,003	196
P-1			
	Room Average	570	-176
P-2L			
	Room Average	542	-65
P-2U			
	Room Average	47	-259
S-1			
	Room Average	1,043	-53
T-1			
	Room Average	-46	-187
	Building Average:	186	-83
	Standard Deviation:	431	348