KERR-McGEE CORPORATION

FINAL STATUS SURVEY REPORT FOR CONCRETE RUBBLE IN SUB-AREA 'F'

for
Cimarron Corporation's Former
Nuclear Fuel Fabrication Facility
Crescent, Oklahoma

March, 1998

License Number: SNM-928
Docket No. 70-0925

CIMARRON CORPORATION
CRESCENT, OKLAHOMA

CIMARRON CORPORATION

P.O. BOX 25861 • OKLAHOMA CITY, OKLAHOMA 73125

S. JESS LARSEN
VICE PRESIDENT

March 10, 1998

Mr. Kenneth L. Kalman, Project Manager
Facilities Decommissioning Section
Low Level Waste & Decommissioning Projects Branch
Division of Waste Management
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Ref: Docket No. 70-925; License No. SNM-928
Final Status Survey Report for Concrete Rubble in Sub-Area "F"

Dear Mr. Kalman:

Cimarron Corporation has recently completed Final Status Survey work on the Concrete Rubble located in Sub-Area "F". This Final Status Survey work was performed in order to demonstrate that the Concrete Rubble can be unconditionally released under the BTP Option #1 criteria (i.e., 30 pCi/g total uranium, excluding background) for soils and debris.

The purpose of this letter is to provide the above referenced report to the NRC staff for review and approval. Please find enclosed three (3) copies of this report for your review and approval. Two (2) copies of this report are for you and your staff and one (1) copy is for Mr. David Fauver. In addition, one (1) copy of this report has also been submitted to both the NRC Docket and to Mr. Louis Carson at NRC Region IV.

Please feel free to contact me if there are any questions or concerns.

Sincerely,

Jess Larsen

Jess Larsen
Vice-President

Enclosures

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for
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License Number: SNM-928
Docket No: 70-0925

Prepared for:

Cimarron Corporation
Oklahoma City, Oklahoma

March, 1998

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REFERENCES

1. Chase Environmental Group, Inc. "Radiological Characterization Report for Cimarron Corporation's Former Nuclear Fuel Fabrication Facility, Crescent, Oklahoma", October 1994.

2. USNRC, Comments dated July 11, 1996 on the Decommissioning Plan for Cimarron Corporation.

3. USNRC, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of License for By-Product, Source, or Special Nuclear Material", August 1987.

4. USNRC, "Branch Technical Position on Disposal or On-site Storage of Residual Thorium and Uranium from Past Operations", FR. Vol. 46, No. 205, Page 52061, October 23, 1981.

5. Cimarron Corporation Nuclear Materials License, SNM-928 Docket No. 070-00925, issued for possession only March 31, 1982; Amendment No. 10, issued November 4, 1994.

6. Cimarron Corporation Nuclear Materials License, SNM-1174, Docket No. 070-1193, terminated February 5, 1993.

7. Cimarron Corporation Letter to USNRC, August 20, 1990.

8. USNRC Letter from Mr. Richard E. Cunningham, Director , Division of Industrial and Medical Nuclear Safety to Dr. John Stauter, Director of Environmental Services, Cimarron Corporation, dated February 5, 1993.

9. Chase Environmental Group, Inc. "Decommissioning Plan for Cimarron Corporation's Former Nuclear Fuel Fabrication Facility, Crescent, Oklahoma", April 1995.

10. Chase Environmental Group, Inc. "Final Status Survey Plan for Unaffected Areas for Cimarron Corporation's Former Nuclear Fuel Fabrication Facility, Crescent, Oklahoma", October 1994.

11. USNRC Letter from Mr. Michael F. Weber, Chief Low-Level Waste and Decommissioning Project Branch, Division of Waste Management, to Mr. Jess Larsen, Vice President Kerr-McGee Corporation, dated May 1, 1995.

12. Cimarron Corporation, "Final Status Survey Report, Phase I Areas at the Cimarron Facility, License No. SNM-928", July 1995.

13. USNRC Letter from Mr. R. A. Nelson, Acting Chief Low-Level Waste and Decommissioning Project Branch, Division of Waste Management, to Mr. Jess Larsen, Vice President, Cimarron Corporation, dated April 23, 1996.

14. Chase Environmental Group, Inc., "Final Status Survey Plan for Phase II Areas for Cimarron Corporation's Former Nuclear Fuel Fabrication Facility", Crescent, Oklahoma, July 1995.

15. USNRC Letter from Mr. Kenneth L. Kalman, Project Manager, Low-Level Waste and Decommissioning Projects Branch, to Mr. Jess Larsen, Vice President, Cimarron Corporation, Dated March 14, 1997.

16. US NRC Letter from Mr. George M. McCann, Chief, Materials Licensing Section to Dr. John Stauter, Vice President, Kerr-McGee Corporation, dated December 30, 1992.

17. Chase Environmental Group, Inc. "Final Status Survey Plan for Phase III Area for Cimarron Corporation's Former Nuclear Fuel Fabrication Facility", Crescent, Oklahoma, June 1997.

18. USNRC, "Background as a Residual Radioactivity Criterion for Decommissioning", NUREG-1501, Draft Report, August, 1994.

19. Eichholz, G. G., et al., Radiation Exposure from Building Materials, in "Natural Radiation Environment III", US DOE CONF-780422, 1980.

20. Ingersoll, J. G., "A Survey of Radionuclide Contents and Radon Emanation Rates in Building Materials Used in the United States", University of California Lawrence Berkeley Laboratory Report LBL-11771, 1981.

21. E.W. Abelquist, "Confirmatory Survey for the South Uranium Yard Remediation, Kerr-McGee Corporation, Cimarron Facility, Crescent, Oklahoma,", Oak Ridge Institute for Science and Education, November 1995.

22. J.D. Berger, "Manual for Conducting Radiological Surveys in Support of License Termination"; Draft Report for Comment, Oak Ridge Associated Universities, NUREG/CR-5849, June 1992.

23. American National Standards Institute, "Radiation Protection Instrumentation Test and Calibration", ANSI N323-1978.

24. USNRC letter from Mr. Ross A. Scarano, Director Division of Nuclear Materials Safety to Mr. S. Jess Larsen, Vice President, Cimarron Corporation, dated July 31, 1997.

25. USNRC Letter from Mr. Michael F. Weber, Chief, Low-Level Waste and Decommissioning Project Branch, Division of Waste Management to Mr. Jess Larsen, Vice President, Kerr-McGee Corporation, dated May 31, 1995.

26. USNRC, "Scenarios for Assessing Potential; Doses Associated with Residual Activity", Policy Guidance PG 8-08.

27. USNRC, "Environmental Assessment Associated with the BTP Option #2 Onsite Disposal Cell at Cimarron", 1994.

FINAL STATUS SURVEY REPORT FOR DECOMMISSIONING CIMARRON FACILITY CONCRETE RUBBLE IN SUB-AREA "F"

1.0 Introduction

This Final Status Survey Report is submitted by Cimarron Corporation to the Nuclear Regulatory Commission (NRC) to release for unrestricted access concrete rubble located in and near the drainage areas and the discharge area of Reservoir #2, which is located in Sub-Area "F" of the Cimarron site. Sub-Area "F" is one of the five Sub-Areas within Phase II. Sub-Area "F" is shown on Drawing No. 95MOST-RF3 (Appendix I), and includes affected and unaffected areas that have been surveyed as part of the ongoing site decommissioning process. This report provides the information and justification for leaving the concrete located in Sub-Area "F" in-place. The concrete was placed as rip-rap to correct erosion problems associated with the Sub-Area "F" drainage ways. A drawing showing the surface topography for the site is provided in Appendix I (95SITE).

This report documents the survey and sampling data obtained for the concrete and establishes the basis for unconditional release of the concrete rubble. Section 2.3 of the Cimarron Decommissioning Plan[1] provides the proposed criteria for leaving the concrete in-place. In addition, there have been several NRC comments and Cimarron responses to comments regarding concrete in drainage areas. In this report, Cimarron has incorporated NRC recommendations (see NRC Comment #18 of the "NRC Comments dated July 11, 1996 on the Decommissioning Plan for Cimarron Corporation"[2]) to consider volumetric concentration averaging as a method for unconditional release of the concrete.

The concrete rubble met all of the applicable surface contamination criteria for unconditional release when it was relocated to Sub-Area "F" drainage ways for erosion control. The concrete rubble was placed into Sub-Area "F" since decommissioning activities commenced in 1976, and was subject to various release criteria in effect which depended on the time of release. The concrete rubble originated in on-site buildings and structures undergoing decommissioning and was surveyed for alpha contamination, and in some cases for beta-gamma contamination, before it was used for erosion control in drainage areas north of Reservoir #2 and northeast of Burial Ground #1 in Sub-Area "F". However, the surface contamination release criteria in effect during the early phases of facility decommissioning were not as restrictive as those currently in place and ranged as high as 25,000 (maximum) dpm/100 cm^2 gross alpha (per Annex A to License SNM-928, Section 3.4, Revision dated August 30, 1976). In addition, practices which were approved by the NRC and in effect during the early phase of facility decommissioning did not entail surveys for beta-gamma activity prior to release when the contaminant was known or believed to be pure enriched uranium. Consequently, surveys performed more recently have identified levels of gross beta-gamma activity and gross alpha activity which exceeds the 1987 NRC unconditional release criteria contained in "Guidelines of Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct,

Source, or Special Nuclear Materials"[3]. The concrete rubble in Sub-Area "F" is representative of concrete from all areas of the buildings and structures at the facility and also contains concrete from all facility areas.

The proposed release criteria for the concrete is equivalent to the 1981 BTP[4] Option #1 criteria for soils, which is 30 pCi/g for enriched uranium. This criteria is appropriate for concrete rubble and debris due to the similarities in dose pathways. Concrete rubble is, in many respects, less likely to contribute dose to members of the public due to limited accessibility and a decreased probability of mechanical or physical dispersion. This report also demonstrates that the estimated doses due to the pathways of concern for the concrete rubble are significantly less than the 1981 BTP Option #1 limit concentrations for enriched uranium, and are insignificant in comparison to exposures resulting from natural background.

Cimarron Corporation intends to leave the concrete in place by demonstrating that the risks from the concrete remaining in place are insignificant. In addition, the safety hazards and costs associated with removal of the concrete from the drainage areas are significant. This is due to the location of the concrete in drainage areas, the random manner in which it was placed into the drainage area, and the physical hazards from rebar protrusions and unstable, irregular surfaces which could result in falling or tripping. Finally, the concrete continues to serve the intended useful purpose of preventing unnecessary erosion in the drainage and spillway areas.

This report includes a discussion of the final status survey performed to more precisely define the extent and magnitude of residual contamination present in the concrete located within Sub-Area "F". The final status survey was conducted in order to demonstrate that the guideline values for the Cimarron site have been met. The results of the Sub-Area "F" concrete rubble Final Status Survey are presented in this Report, and indicate that the estimated activity of total uranium contained in the concrete rubble is 4.6 millicuries. The maximum projected dose rate to the hypothetical resident from residual activity contained in the concrete rubble was calculated to be approximately one millirem per year based upon the RESRAD computer code.

2.0 Background

Cimarron Corporation, a subsidiary of Kerr-McGee Corporation, operated two plants near Crescent, Oklahoma, for the manufacture of enriched uranium and mixed oxide reactor fuels. The 840-acre Cimarron site was originally licensed under two separate SNM Licenses. License SNM-928[5] was issued in 1965 for the Uranium Plant (U-Plant) and License SNM-1174[6] was issued in 1970 for the Mixed Oxide Fuel Fabrication (MOFF) Facility. Both facilities operated through 1975, at which time they were shut down and decommissioning work was initiated.

Decommissioning efforts at the MOFF Facility were completed in 1990 and Cimarron Corporation applied to the NRC on August 20, 1990[7], to terminate License SNM-1174. After confirmatory surveys, the NRC terminated the MOFF Facility License, SNM-1174, on February 5, 1993[8].

Decommissioning efforts involving characterization, decontamination and decommissioning for the 840-acres, licensed under SNM-928, were initiated in 1976 and are still ongoing. The final objective of the decommissioning effort is to release the entire 840-acre site for unrestricted use.

Based upon historic knowledge of site operations and the characterization work completed to date, Cimarron Corporation completed and submitted in October 1994 the Cimarron Radiological Characterization Report.[9] As discussed in this report, the site has been divided into affected and unaffected areas. The affected and unaffected areas are shown on Drawing No. 95MOST-RF3, included in Appendix I. For the Final Status Survey Plan, the entire 840-acre site has been divided into three major areas which contain both affected and unaffected areas. Each of these three major areas are also shown on Drawing No. 95MOST-RF3 and are designated by Roman Numerals I, II, and III (herein referenced as Phases I, II, and III). These three major areas are then further subdivided into smaller Sub-Areas (i.e. A, B, C, D, etc.).

2.1 Phase I Area

As presented in the Cimarron Decommissioning Plan,[1] the Final Status Survey Plan (Phases I, II and III) was discussed in general terms, with the understanding that each of the three phases would be submitted to the NRC under separate cover for approval. The Final Status Survey Plan for the first of these three phases (Phase I[10]) was approved by the NRC via letter dated May 1, 1995.[11] The Final Status Survey Report[12] for Phase I was submitted to the NRC and confirmatory sampling for the Phase I areas has been completed by the Oak Ridge Institute for Science and Education (ORISE). Cimarron Corporation received license Amendment #13 from the NRC to release this area from SNM-928; the amendment was forwarded by letter dated April 23, 1996[13]. This amendment reduced the licensed facility acreage from 840 to 152 acres.

2.2 Phase II Area

The area designated as Phase II on Drawing No. 95MOST-RF3 (Appendix I) contains both affected and some contiguous unaffected areas, and represents approximately 122 of the remaining licensed 152 acres. The Final Status Survey Plan for Phase II was submitted to the NRC in July 1995[14] and approved by the NRC on March 14, 1997[15]. Phase II includes Sub-Areas F, G, H, I and J. Included within Phase II are Burial Area #1 which was released in December 1992 by the NRC[16], backfilled with clean soil, and seeded. Also included in Phase II are the East and West Sanitary Lagoons, the MOFF Plant Building exterior and yard area, the Emergency Building, the Warehouse Building (Building #4) and surrounding yard, and numerous drainage areas. Cimarron has substantially completed the remediation of each Sub-Area and final status surveys are currently underway. In general, Sub-Area "F" is located north of Reservoir #2 and includes the roadway from the northern end of Reservoir #3 to the northern end of Reservoir #2. The concrete rubble within Sub-Area "F" is located on the berm area and in the drainage area to the north of Reservoir #2 and also alongside a drainage to the

northeast of Burial Area #1. The concrete rubble addressed in this report includes an area of approximately 0.3 acres of the entire 17 acre area within Sub-Area "F". The final status survey for the remaining acreage has been completed and is being assembled for submission under a separate report.

2.3 Phase III Area

The Phase III area survey is the last phase for completing the final status survey for the entire Cimarron site, and represents approximately 30 acres. This area is designated as Phase III on Drawing No. 95MOST-RF3. The Final Status Survey Plan for release of this area from the site license, has been submitted to the NRC[17] for approval. The Phase III area includes the Uranium Processing buildings and yard area, Burial Areas #2 and #3, the New Sanitary Lagoon, the New On-site Disposal Cell (Burial Area #4), and the Five Former Waste Water Ponds. These five former waste water ponds consist of Uranium Waste Ponds #1 and #2, the Plutonium Waste Pond, the Uranium Emergency Pond, and the Plutonium Emergency Pond.

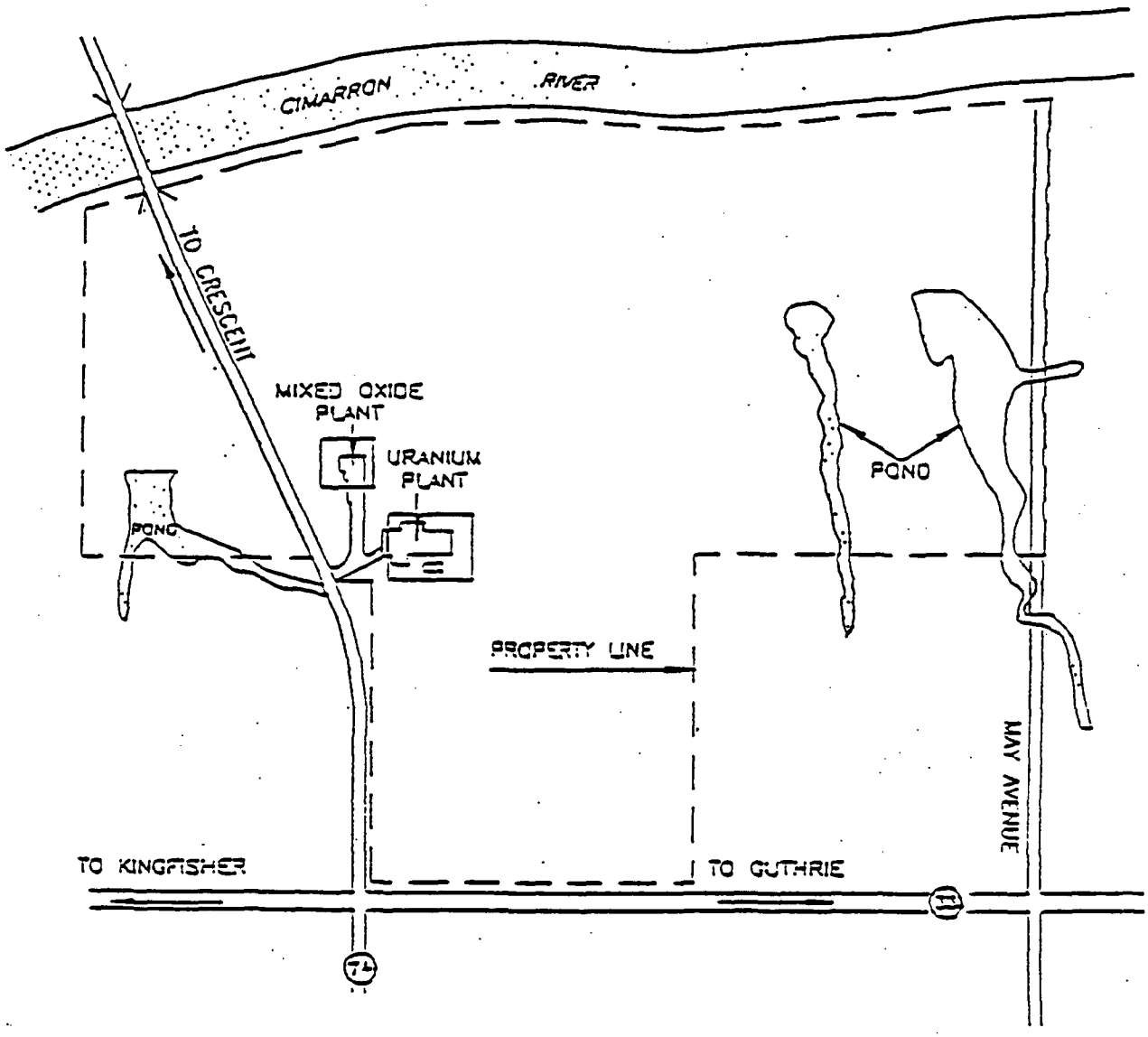
3.0 Site Description

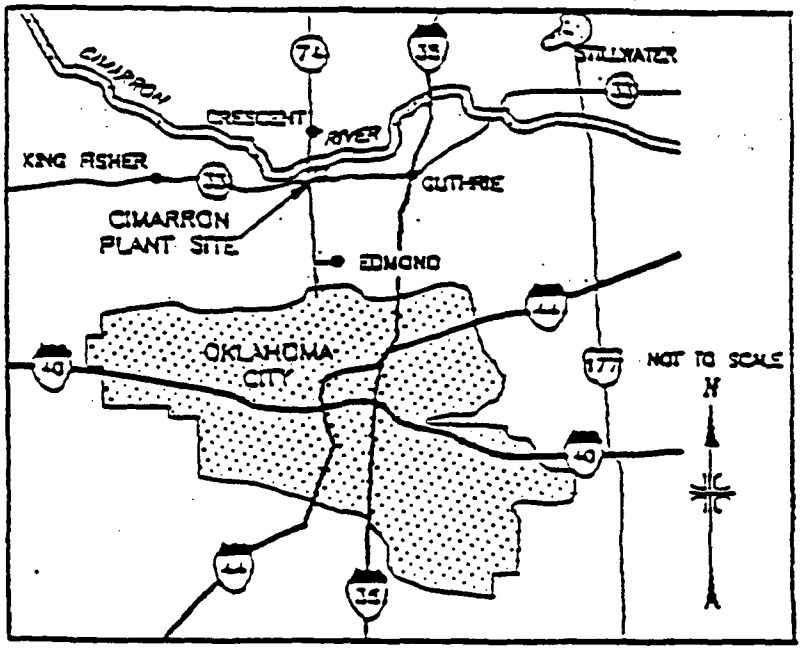
The Cimarron Facility is located in Logan County, State of Oklahoma, on the south side of the Cimarron River approximately 0.5 miles north of the intersection of Oklahoma State Highways #33 and #74. Figure 3.1 shows the site location. The 840-acre site (the licensed portion was recently reduced to 152 acres) is located in an area of low, rolling hills and incised drainages. Local elevations range from about 940 feet along the river to 1,010 feet Mean Sea Level at the plant. The county is primarily rural with an economy primarily based upon agriculture and ranching. The entire site is owned by Cimarron Corporation, a wholly owned subsidiary of Kerr-McGee Corporation.

In general, Sub-Area "F" is located north of Reservoir #2 and includes the roadway from the northern end of Reservoir #3 to the northern end of Reservoir #2. The concrete rubble within Sub-Area "F" is located on the berm area and in the drainage area to the north of Reservoir #2 and also alongside the drainage to the northeast of Burial Area #1.

4.0 Facility Description

License SNM-928 was originally issued in 1965 to Kerr-McGee Nuclear Corporation for the manufacture of enriched uranium reactor fuels. The Uranium Plant (U-Plant) was constructed to be a complete nuclear fuel service facility. Initial equipment provided for the production of UO_2, UF_4, uranium metal and the recovery of scrap materials from facility operations. In 1968 the plant was expanded by increasing the UO_2 and Pellet facilities through the installation of another complete production line for the fabrication of fuel pellets. In 1969 fabrication facilities were added for the production of fuel pins. In 1970 facilities were added for the production of the fuel





NOT TO SCALE

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Cimarron Corporation
Crescent Oklahoma Facility
Location Map

FIGURE 3.1

elements. Equipment initially installed for the recovery of enriched scrap material was not used after work performed under a scrap recovery contract was completed in 1970. All equipment utilized in fuel production activities has been either decontaminated and removed from the site for salvage or packaged and transported offsite for disposal at a commercial LLRW facility.

5.0 History of Site Operations

The Cimarron Facility was originally licensed under two separate licenses. License SNM-928 was issued for the U-Plant Facility and License SNM-1174 was issued for the MOFF Facility. Both facilities terminated production operations in 1975. Decontamination and decommissioning of the MOFF Facility was completed by 1990, and the license was terminated by the NRC in 1993. The U-Plant Facility decommissioning is in progress and nearing completion. A complete history of site operations can be found in both the Characterization Report[9] and the Decommissioning Plan[1].

6.0 Concrete Rubble Decommissioning Activities

The purpose of this section is to discuss the status of the on-going site decommissioning activities related to the concrete rubble located in Sub-Area "F" and to present the radiological criteria and guideline values utilized throughout the remediation and final status survey.

6.1 Identification of Contaminants

Based upon the knowledge of past site operations, the results of numerous characterization efforts to date, and other independent characterization efforts by regulatory agencies and their respective subcontractors, the possible radiological contaminants within this Sub-Area have been determined to consist of U-234, U-235 and U-238. The uranium is comprised of enriched forms, with an average enrichment above the naturally occurring level. The average U-235 enrichment at Cimarron has been previously established as approximately 2.7 weight percent.

Thorium, although not considered a contaminant of concern for the concrete rubble, has been included in the soil and sediment analysis for comparison with background levels found in other areas of the facility. Thorium was not used or processed at the facility.

6.2 Site Background Levels

6.2.1 Natural Background Radioactivity of Concrete

Concrete contains naturally occurring elements from the earth which emit radiation. NUREG-1501, "Background as a Residual Radioactivity Criterion for Decommissioning"[18], gives the typical radionuclide content for concrete used in the

United States. Table 2.3 of NUREG-1501 gives the range of U-238 as 19-89 Bq/kg (0.5-2.4 pCi/g), as reported by Eichholz[19]. Assuming radiological equilibrium between the Uranium-238 and it's radioactive daughter products through Ra-226, as suggested in NUREG-1501, the total uranium concentration (i.e., U-234 + U-235 + U-238) would range from 38-178 Bq/kg (1.0 to 4.8 pCi/g). In addition to uranium, Table 2.3 of NUREG-1501 states that concrete contains Th-232 (15 to 118 Bq/kg or 0.4 to 3.2 pCi/g) and K-40 (262 to 1147 Bq/kg or 7.1 to 31 pCi/g).

Ingersoll[20] collected ordinary concrete samples from around the country. These data are presented in Table 2.7 of NUREG-1501 and show a range for U-238 of 8 to 38 Bq/kg (0.2 to 1.0 pCi/g). Assuming radiological equilibrium between the U-238 and it's radioactive daughter products through Ra-226, the total uranium concentration (i.e., U-234 + U-235 + U-238) would range from 16-76 Bq/kg (0.4 to 2.1 pCi/g). Ingersoll also measured similar variations in concentrations of Th-232 and K-40.

A representative sample of "background" concrete was collected from the unaffected floor area under the former facility manager's office. This sample is representative of "background" concrete due to the fact that it: 1) Was poured at about the same time as the concrete rubble in Sub-Area "F"; 2) Was located in an office area of the facility that was never contaminated; and, 3) Had been covered with linoleum tile prior to use of the facility for uranium processing. This background sample was analyzed by an outside independent laboratory and was reported as containing 1.1 ± 0.4 pCi/g U-234, $<$0.2 pCi/g U-235, and 0.4 ± 0.2 pCi/g U-238. The sample was also analyzed using the on-site soil counter which produced a total uranium concentration of 5.7 ± 1.3 pCi/g. Conversion of the onsite counter results to natural uranium, using the conversion factor of 0.67/1.5 as described in Section 6.2.3, results in a total uranium concentration of 2.5 pCi/g. This confirms that this concrete sample is similar in concentration to background soils and is within the range of activities listed in NUREG-1501 (after consideration of measurement uncertainty).

Concrete, such as that in the Sub-Area "F" drainage areas, contains naturally occurring radioactivity such as Uranium, Thorium and Potassium-40 which affect instrument measurements and laboratory analysis. The natural background concentrations from activity due to total uranium in concrete are therefore subtracted from counting results to obtain the contribution of activity which resulted from facility operations. The total uranium background for concrete which will be used in this report is 1.5 pCi/g, based upon the sample collected at the facility and the literature which has been cited.

6.2.2 Establishment of a Background Value for Gross Alpha and Gross Beta-Gamma Surface Activity in Concrete

The average background for gross beta-gamma surface activity in concrete was determined using data gathered during the survey of the concrete rubble as well as data from the representative sample of "background" concrete as described in Section 6.2.1.

In order for data to qualify as representative of background, data from each selected 5m x 5m grid area had to have gross beta-gamma levels (average) of less than two times background (for concrete). Grid areas were initially selected by utilizing the data from areas with gross alpha survey results of less than 100 dpm/100cm^2 (maximum). In addition, the reported exposure rate at both the surface and at a distance of one meter for the grid area could not exceed 10 μR/h and could not be greater than 1 μR/h above the "one meter" measurement location at any point within the grid area. Data utilized in the determination of gross alpha and gross beta-gamma surface activity background are summarized in Table 6.1.

Table 6.1
Gross Alpha and Gross Beta Surface Activity Background Data

Location	Ave. Alpha Dpm/100cm^2	Max. Alpha dpm/100cm^2	Ave. Beta dpm/100cm^2	Max. Beta dpm/100cm^2	Surface μR/h**	1m μR/h**
Grid #6	10	40	1045	1650	7	8
Grid #7	10	40	278	1584	7	6
Grid #8	10	40	924	1397	7	7
Grid #9	10	80	557	935	6	6
Grid #21	50	80	1199	3212	6	6
Grid #33	5	20	889	1386	7	7
Grid #103	10	40	860	1353	7	7
Representative "background"	60*	60*	649*	649*	5*	5*
Average	**21**	**50**	**800**	**1520**	**6.5**	**6.5**

*Core sample-measurements taken at the surface of the area to be cored prior to sampling. As this area is within a building over a concrete slab, the ambient background exposure rate was lower.

**Exposure rate measurements include background contribution. All other measurements are net (instrument background subtracted).

Based upon Table 6.1, the average background for gross alpha surface activity was established as 21 dpm/100 cm^2. The gross alpha background activity is presented for reference purposes only. The data and evaluations presented in this report did not utilize the gross alpha background for subtraction as the value was insignificant to the overall conclusions made in the report. Thus, the data tables and drawings reflect the gross alpha activity, including background.

The average background for gross beta surface activity was established at 800 dpm/100 cm^2. The gross beta background was subtracted from the surface activity data prior to calculation of the volumetric activity concentration of total uranium.

6.2.3 Soils

Natural background levels for uranium in soil have been established through numerous measurements by Cimarron personnel utilizing the on-site soil counter and through

independent laboratory analysis. Analytical results from Cimarron Corporation's environmental sampling program are reported to the NRC annually in Environmental Reports. These reports provide sample analysis results for soil samples collected from numerous off-site locations which are representative of background in surrounding soils.

Cimarron personnel collected and analyzed 30 surface soil samples from the perimeter of the Cimarron site during the first quarter of 1995 to further validate background levels. Total uranium ranged from 2.3 pCi/g to 6.6 pCi/g, with the average being 4.0 ± 2.6 (2σ) pCi/g. These values were obtained as a result of using the Cimarron on-site soil counter. The on-site soil counter is calibrated to assume an enrichment of 2.7 weight percent as this is the average enrichment found throughout the site. When a correction factor (0.67/1.5) is applied to these results to convert the values from an assumed 2.7 weight percent enrichment to a natural enrichment, the converted results ranged from 1.0 pCi/g to 2.9 pCi/g with an average of 1.8 ± 1.0 (2σ) pCi/g total uranium. Based upon these results, the average value of 4 pCi/g total uranium for background was used when the soil sample analytical results were compared to guideline values.

6.2.4 Exposure Rates

Background exposure rates have been established at the Cimarron site by taking micro-R readings and pressurized ion chamber (PIC) readings at off-site sample locations in addition to Cimarron site areas which are unaffected by past operations. Site background exposure rates of approximately 7-10 μR/h have been observed in background areas by Cimarron personnel utilizing a Ludlum Micro-R survey meter, and have been used in past reports to the NRC. Site background exposure rates of approximately 7-10 μR/h have also been determined by ORISE personnel utilizing similar instrumentation. In addition, site background exposure rates were measured by ORAU (now ORISE) personnel utilizing a PIC[21], and were determined to be 9 to 10 μR/h. Thus, depending upon instrumentation utilized, the background exposure rate at the Cimarron site ranges from 7 to 10 μR/h.

Cimarron personnel performed exposure rates measurements at background locations in Sub-Area "F" in 1995 using a Micro-R meter. Confirmatory measurements were obtained at the same locations in 1997 using a Reuter-Stokes PIC. These data are tabulated below in Table 6.1. The average background as measured using the Micro-R meter was 7.6 ± 1.3 (2σ) μR/h, and is about 15 percent less than the average for the PIC measurements of 9.0 ± 1.1 (2σ) μR/h. These differences are not significant and indicate good agreement between the Micro-R measurements and the PIC measurements. Cimarron will continue the use of 7-10 μR/h as representative of background exposure rates for Micro-R measurements in accordance with past reports.

TABLE 6.2			
Sample ID No.	**Grid Location**	**Micro-R Reading (μR/h)**	**PIC Reading (μR/h)**
UAF-BKG-1	819W-81N	9	9.8
UAF-BKG-7	1600E-120N	7	7.6
UAF-BKG-11	840W-700S	8	9.5
UAF-BKG-13	840W-288S	9	9.8
UAF-BKG-16	808W-282S	8	9.7
UAF-BKG-19	640W-700S	9	10.5
UAF-BKG-23	1610E-300S	5	7.8
UAF-BKG-25	1610E-69N	6	7.6
UAF-BKG-27	1610E-469N	7	7.8
UAF-BKG-28	1610E-634N	8	9.6
	AVERAGE	**7.6 ± 2.7 (2σ)**	**9.0 ± 2.3 (2σ)**

6.3 Characterization Data

As noted earlier, the Cimarron site has been subdivided into survey units. These units are naturally distinguishable or have a common history of use, characterization and decommissioning activities. Throughout most of the decommissioning process at the Cimarron site, a unit was characterized, remediated (if required), and resurveyed. The description of the decommissioning activities and the final status survey data were then submitted to the NRC for review and approval. After review of the submittal, the NRC either released the unit and/or contracted with ORISE (previously ORAU) to perform a confirmatory survey. Based upon the ORISE confirmatory survey (if requested by the NRC), the NRC either would release the unit or require additional remediation. The concrete rubble within Sub-Area "F" is one such unit. Cimarron personnel have completed the characterization and final status survey of the concrete rubble.

6.4 Environmental Monitoring Data

The concrete rubble in Sub-Area "F" is near one location where environmental surface water monitoring has been performed in accordance with the Cimarron Environmental Sampling Program. All analyses for samples collected from this location are performed by an independent off-site laboratory.

The surface water monitoring at this location (location #1205) consists of an annual sample from Reservoir #2, which is upstream from the concrete rubble. The location of surface water sampling location #1205 is shown in Drawing No. 95MOST-RF1 (Appendix I). Since 1986, Gross α concentrations at this location have been reported as less than 10 pCi/l, and gross β concentrations have been less than 20 pCi/l. Total U has

been reported as less than 0.005 mg/l over the same period. The laboratory reported 0.5 pCi/l U-234, <0.1 pCi/l U-235, and 0.2 pCi/l U-238 for surface water location #1205 in 1997. Based upon the historical environmental data, Reservoir #2 has not been affected by facility operations or decommissioning activities.

The final status survey for the concrete rubble also included the collection and analysis of additional water samples from the stream originating from Reservoir #2. These results are discussed in Section 8.3 of this Report.

7.0 Final Status Survey Procedure

The purpose of this section is to describe the methodology utilized for the collection of the Final Status Survey data. The final status survey data will be used to demonstrate that the applicable radiological parameters (i.e., guideline values) have been met and that the concrete rubble in Sub-Area "F" can be released from License SNM-928. Due to the nature and location of the material and the physical limitations involved with the performance of surveys, Cimarron Corporation developed innovative calculational techniques to demonstrate compliance with the release criteria.

7.1 Survey Procedure

A 5m x 5m grid system was established for the concrete rubble. The grid system was established such that each grid area could be easily relocated in the future for additional survey work and/or confirmatory surveys. The concrete grid system can be described as consisting of three areas, consisting of: 1) the main body of concrete in the drainage area north of the reservoir (Grid #'s 20 through 122); 2) the concrete along the west bank of the spillway area (Grid #'s 1 through 19); and, 3) the concrete west of the main drainage area, northeast of Burial Ground #1 (Grid #'s 123 through 134). Grid locations are shown on Drawing No. 98FCONC-0.

The concrete was then further subdivided into those grids containing ≥85% concrete surface area and grid areas containing significantly less concrete. A computer generated random sampling plan representing 32 of the grids containing significant areas of concrete was developed. The random sample plan also contained those accessible areas known or suspected to have the highest gross beta-gamma surface contamination. The random sample plan thus should represent a worst case average for the concrete. The random sample represents 24% (32 of the 134) 5m x 5m grid areas containing concrete rubble. However, since the random sample was selected from grid areas containing >85% concrete, the random sample should generate data which represents even a higher percentage of the surface area for the concrete rubble as a whole. The grid areas representing the random sample are also shown in Drawing No. 98FCONC-0 (Appendix I).

Each randomly selected 5m x 5m grid area was then 100% scanned, to the extent practicable, for gross beta-gamma activity to identify any elevated areas of activity. Any location within each grid that exceeded 5,000 dpm/100cm^2 was documented on survey forms. The 5,000 dpm/100cm^2 cut-off value was chosen because it represents the unconditional release surface activity criteria (average) for uranium. Supplemental gross beta-gamma measurements were also collected for each of the 5m x 5m grid areas containing concrete along the west bank of the spillway, as well as at other locations, as shown in Drawing 98CONC-0 (Appendix I).

Gross alpha scans to identify elevated locations were not performed due to the fact that the concrete had been previously surveyed and released (all gross alpha was assumed to be due to uranium). Additionally, gross alpha scanning over rough surfaces has not proven to be an effective method due to the effects of geometry (source to detector distance) and attenuation (shields the alpha particles before they are able to reach the detector). The survey data for areas containing elevated measurements of gross beta-gamma activity versus the gross alpha measurement results provides evidence of this (See Tables 3 through 6 in Appendix II). It was therefore determined that the most effective method for locating the elevated areas was through the use of gross beta-gamma scans.

A 1m x 1m grid was established surrounding any location within a selected 5m x 5m grid area which exceeded 5,000 dpm/100cm^2 beta-gamma (i.e., hot-spot areas). Surveys or scans were then performed in each 1m x 1m grid area as described below.

- The average gross beta-gamma dpm/100cm^2 was measured.
- The maximum gross beta-gamma dpm/100cm^2 was measured.
- The average gross alpha dpm/100cm^2 was measured.
- The maximum gross alpha dpm/100cm^2 was measured.
- A μR/hour reading at the surface and at one meter above the surface directly above the location with the highest beta-gamma activity was measured.

In addition, a "representative" 1m x 1m survey area was selected from each of the selected 5m x 5m grid areas. The purpose for the representative area was to establish survey data that represented the surface areas within each 5m x 5m grid that did not contain any locations with elevated surface activity (i.e., above the 5,000 dpm/100cm^2 "hot-spot" criteria). The methodology utilized in locating these representative areas was to locate them in areas that were representative of the remainder of the concrete surfaces within the 5m x 5m grid area, preferably at the center of the grid area, but not in an area previously determined to have elevated readings above 5,000 dpm/100cm^2 beta-gamma. Measurements were performed in each of the representative grid areas as described above for the "hot-spot" areas exceeding 5,000 dpm/100 cm^2.

In addition to the 32 random survey measurements, Cimarron personnel performed final status surveys on 34 grid areas to supplement the random sample data and to provide assurance that the random sample survey data were representative. The

supplemental surveys were performed in exactly the same manner as the random sample surveys.

Surface activity measurements for gross beta-gamma were obtained using a Ludlum Model 2221 with a Model 43-68 gas proportional probe, or equivalent (e.g., Ludlum Model 43-89). Gross alpha surface scans were obtained using an Eberline Model PRM-6 with an Eberline Model AS-15 probe. Micro-R measurements were obtained utilizing a Ludlum Model 19. The top surface and any other accessible concrete surfaces were surveyed. This intent of the survey was to be as representative of the concrete rubble as a whole, through the use of statistically based sampling techniques and the application of reasonable calculational assumptions.

Removable contamination measurements were not obtained due to the fact that the concrete has been in the drainage area for over 10 years. It was determined that any potentially removable contamination remaining would have been removed by environmental interactions. Monitoring of soils and sediments downstream of the concrete provided confirmation that removable contamination has not contributed to natural concentrations of uranium in downstream soils and sediment.

7.2 Exposure Rate Measurements

Exposure rate measurements were obtained at the surface of the concrete and at one meter above the concrete surface utilizing a sodium iodide based micro-R meter, or equivalent. These measurements support the position that the concrete rubble does not pose any significant external dose hazard and that exposures are similar to background.

7.3 Environmental Exposure Rate Measurements

Three environmental thermoluminescent dosimeters (TLDs) were placed near and above the concrete rubble to support the results of previous exposure rate measurements and to demonstrate that there are not any seasonal or long-term upward trends in exposure rates. Data from these TLDs are compared to site background area TLD measurements.

7.4 Surface Water Sampling

Two surface water samples were collected from areas where surface water is normally available. These surface water samples were collected up-gradient and down-gradient from the concrete rubble area. The water samples were analyzed for isotopic uranium and thorium at an independent off-site analytical laboratory.

7.5 Soil/Sediment Sampling

Thirteen soil/sediment samples were collected from the concrete rubble area to demonstrate that the concrete is not contributing to levels of uranium and thorium

present in the sediment. One soil/sediment sample was collected up-gradient of the concrete, two samples immediately down-gradient in locations likely to collect sediments, and ten samples from soils and sediments beneath or within the concrete rubble. All samples were analyzed for total uranium and thorium activity utilizing the Cimarron soil counter. One sample collected down-gradient from the concrete rubble was also sent to an independent off-site laboratory for analysis.

7.6 Relationship Between Surface Activity and Concentration

A special study was conducted to determine the depth profile of the contamination in the concrete and for the purpose of establishing a relationship between gross beta-gamma surface activity (measured in dpm/100cm^2) and uranium concentrations (measured in pCi/g). A brief outline of this study is provided below:

1. Concrete rubble slabs with the following approximate gross beta-gamma surface activity were selected:

   - Background ($\leq$1,000 dpm/100cm^2 average beta-gamma)
   - $\approx$ 5,000 dpm/100cm^2 average beta-gamma
   - $\approx$ 20,000 dpm/100cm^2 average beta-gamma

2. The following measurements were then performed on each piece of concrete rubble selected for the study:

   - Exposure rates at the surface and at 1 meter above the surface utilizing micro-R meter;
   - Gross alpha dpm/100cm^2 - one measurement for each probe sized area located inside the area to be scabbled;
   - Gross beta-gamma dpm/100cm^2 - one measurement for each probe sized area located inside the area to be scabbled;
   - Hot-spot - all of the measurements described in #2 performed at the hot-spot.

3. The thickness of the concrete slab was measured.

4. The elevated area on the concrete rubble was scabbled to remove a layer of residual contamination.

5. Concrete scabble dust was collected and mixed thoroughly. A sample was obtained and analyzed using the on-site Soil Counter and/or an independent off-site laboratory.

6. All measurements were recorded, including the estimated thickness of the scabbled area.

7. Steps #2 through #6 were repeated until measurements of the scabbled area indicated that gross beta-gamma activity was reduced to less than twice background.

7.7 Guideline Values

The radiological guideline values discussed in this section are utilized for comparison to the final survey data to verify that the concrete rubble in Sub-Area "F" can be released from License SNM-928.

7.7.1 Concentration Guidelines for Concrete

Draft NUREG/CR-5849[22], Section 2.2, states that "Volume concentration guideline values, which apply to soil, induced activity, and debris, are expressed in terms of activity per unit mass [typically picocuries per gram (pCi/g).]". Cimarron Corporation has established the release guideline values for concrete in Sub-Area "F" in accordance with the Branch Technical Position[24] (BTP) Option #1. The BTP Option #1 criteria is 30 pCi/g total uranium (enriched), above background.

Due to the physical obstacles and potential safety hazards associated with monitoring the concrete rubble, it was necessary to develop new calculational methods for determining volumetric concentrations. The overall objective of the survey effort was to demonstrate that the release guideline values were complied with. Due to the nature of the random sampling performed, the methods of draft NUREG/CR-5849 for "hot-spot" averaging were not directly utilized. Rather, justification that the overall average concentration meets the release criteria (i.e., BTP Option #1 guideline value) is provided herein. This was determined to be appropriate based upon the characteristics of the concrete rubble and the low probability that a portion of the concrete rubble would be extracted and used in a manner that could contribute significantly to inadvertent exposure.

7.7.2 Exposure Rate Guidelines (External Dose)

The exposure rate (external dose) guideline value was established as 10 micro-Roentgens (μR) per hour (average) above background at one meter above the surface in accordance with the BTP[4] Option #1 criteria. As stated in the BTP, this is compatible with proposed EPA cleanup standards for inactive uranium processing sites.

Exposure rates may be averaged over a 100 m^2 grid area as described in draft NUREG/CR-5849[22]. Draft NUREG/CR-5849 also states that the maximum

exposure rate at any discrete location within a 100 square meter area cannot exceed 20 μR/h above background. Cimarron Corporation utilizes 7 to 10 μR/h as the average background exposure rate.

7.7.3 Volumetric Activity of Soils and Sediments

The guideline value for residual concentrations of total uranium which may remain in soils or sediments is specified as BTP Option #1 material for Sub-Area F. For enriched uranium, as specified in Table 2 of the BTP[16], the Option #1 limit is 30 pCi/g total uranium above background. The amount of soil and sediment sampling performed during this final status survey was confined to selected locations which were utilized to demonstrate that the concrete had not resulted in significant impact to site soils and/or sediments (i.e., the residual contamination is fixed).

7.8 Equipment Selection

Special Work Permits (SWPs) and Work Plans (WPs) were written and approved for the field work required during the conduct of this final status survey. The SWPs and/or WPs for this project specified the type of instrumentation to be utilized in performing the site surveys. The instrumentation utilized by site personnel is discussed below.

7.8.1 Equipment and Instrumentation

The instrumentation utilized to generate the characterization and final status survey data is calibrated and maintained in accordance with the Radiation Protection Program procedures. These procedures utilize the guidance contained in ANSI N323-1978, "Radiation Protection Instrumentation Test and Calibration"[23]. Specific requirements for instrumentation include traceability to NIST standards, field checks for operability, background radioactivity checks, operation of instruments within established environmental bounds (i.e. temperature and pressure), training of individuals, scheduled performance checks, calibration with isotopes with energies similar to those to be measured, quality assurance tests, data review, and recordkeeping.

Portable survey instruments utilized during the survey (micro-R survey meters, α/β survey meters, scalers/ratemeters, etc.), are calibrated on a quarterly basis. All instrumentation is calibrated with NIST traceable standards. Where applicable, activities of sources utilized for calibration are also corrected for decay. In addition to the quarterly calibration requirements, source checks are performed on a daily basis for all instruments being utilized for characterization and final status surveys. A calibrated electronic pulse generator is utilized for instrument scale linearity checks. All calibration and source check records are

completed, reviewed, signed off and retained in accordance with Cimarron Quality Assurance Program requirements.

An SWP was written and approved prior to commencement of field work covered under this Final Status Survey Plan. The SWP specified the type of instrumentation to be utilized in performing the site surveys. The instrumentation utilized by site personnel is discussed below.

7.8.1.1 Micro-R Survey Meter

The Micro-R meter utilizes a 1" x 1" NaI/Tl crystal gamma detector and measures exposure rates between 0 and 5,000 μR/h. Background readings are obtained daily at a defined location prior to placing each instrument into service. This instrument was utilized, in general, for determination of exposure rates at both systematic and random locations, and at locations of elevated radiation as identified by gross beta-gamma scans.

Quarterly comparisons and/or confirmatory measurements are obtained routinely to provide information concerning any measurement bias. These comparisons or confirmatory measurements are made using a pressurized ion chamber.

7.8.1.2 Soil Counter (Gamma Spectroscopy)

The Cimarron Soil Counter consists of a 4" x 4" x 16" sodium iodide crystal housed in a shielded chamber which is computer linked to a multi-channel analyzer (MCA). The soil counter is programmed to determine the total uranium concentration present in the soil sample by calculating the U-234 concentration present from the U-235 concentration which is measured in the soil. These two isotopic values are then summed with the measured U-238 value to determine the concentration of total U. Calibration of this counting system is performed annually and is traceable to NIST standards through contractor laboratory evaluations of the on-site standards.

ORISE has been used by the NRC for verification of a majority of the decommissioning work completed to date at the Cimarron site. ORISE has conducted an evaluation of the Cimarron Soil Counting system's ability to accurately measure total uranium concentrations in soil samples. This was done by comparing ORISE sample analysis results obtained by alpha pulse height analysis and gamma spectroscopy with the results obtained from the use of the Cimarron Soil Counter. ORISE and Cimarron analysis results compared favorably at levels above background as demonstrated by the most recent confirmatory analysis performed for the On-Site Disposal Cell, Pit #3 (NRC cover letter dated July 31, 1997)[24]. NRC inspection Report #70-925/97-02, which accompanied this letter, states that "no significant bias or statistical errors between

the license's soil results and the NRC's results were identified". Additionally, the confirmatory analysis performed on select soil samples collected during ORISE's site visit to investigate the South U-Yard[21], and DAP-3 stockpile[25] verified previously that Cimarron's on-site counter results are statistically identical to ORISE's results.

Established quality assurance measures for the soil counter include Cesium-137 centroid checks, Chi-square tests, background determinations, and the counting of soil standards. All of these quality assurance controls are recorded on control charts and are trended on a continuing basis.

Standards used for calibration and quality assurance checks for the soil counter have been analyzed by outside laboratories and are NIST traceable through these analyses. Comparisons have been made between the standards as counted using the soil counter and two off-site independent laboratories. The assigned values for the standards are the average of the results obtained from the off-site independent laboratories, when the standards were analyzed by more than one laboratory. The standards used at Cimarron range in concentration from 4.5 pCi/g total uranium to 292 pCi/g total uranium.

Cimarron personnel determine uranium and thorium activities based upon the evaluation of net counts from the soil counter. Activities are calculated through the use of efficiency and correction factors obtained using appropriate standards. Soil concentrations are calculated by dividing the net activity by the soil mass. Soil masses are determined on a laboratory scale which is checked on a daily basis (when in use) utilizing NIST traceable standards. Corrections for soil moisture content are also made as necessary.

7.9 Procedures/Plans

As discussed in Section 7.8, SWPs and WPs were written and approved for the field work required for this final status survey. These SWPs and WP's are an integral part of this site's radiation protection and quality assurance programs. Project organization and responsibilities, which are a part of the site's quality assurance program, are discussed in this section.

7.9.1 Organization

The final status survey of concrete rubble in Sub-Area "F" was performed by a survey team consisting of qualified personnel from the Cimarron site. The final status survey team operated under the general direction of a Decommissioning Supervisor who served as the Project manager and reported directly to the Site Manager of the Cimarron Facility.

The selection of field measurement equipment and sample collection techniques was performed under the direction of the RSO/Health Physics Supervisor who also reports to the Cimarron Site Manager. Actual field measurements and sample collection were performed under the direction of the Decommissioning Supervisor. The Decommissioning Supervisor was responsible for developing the SWP and WP for this sub-Area with input from the RSO/Health Physics Supervisor and the Cimarron Site Manager. The SWP and WP were reviewed and approved by the Cimarron Site Manager and the RSO/Health Physics Supervisor.

7.9.2 Training

Cimarron Corporation provides continuing training to Cimarron personnel and any other personnel (i.e., contractors, visitors, etc.) who are allowed access to the site. All members of the final status survey team attended an in-house training session on the SWP and WP for the work performed under the final status survey plan. All survey procedures and quality assurance requirements were reviewed during this training session.

7.9.3 Radiation Protection Program

Cimarron Corporation maintains a radiation protection program which meets and/or exceeds all of the applicable regulatory requirements associated with activities conducted under Special Nuclear Materials License SNM-928. The Cimarron Radiation Protection Program currently in place for all decommissioning activities is administered through the use of the following documents:

- Cimarron Quality Assurance Plan and Procedures
- Cimarron Radiation Protection Procedures
- Cimarron Site Health and Safety Plan
- Cimarron Emergency Plan

It is the policy of Cimarron Corporation to perform all work in strict compliance with applicable regulatory and internal requirements. The goal of the Cimarron decommissioning effort is to conduct all operations at a level of excellence which exceeds regulatory requirements. Cimarron staff will continue to exercise appropriate radiation protection precautions throughout the remaining decommissioning work and final survey process.

Independent Kerr-McGee Corporate audits for regulatory and internal requirements are conducted on a periodic basis and include the review of the Cimarron Radiation Protection Program and associated programs. Assessments of program effectiveness also are performed periodically by the Cimarron

RSO/Health Physics Supervisor. Additionally, the Cimarron Radiation Protection Program is inspected for compliance with applicable rules and regulations by NRC Region IV and NRC Headquarters staff.

7.9.4 Cimarron Quality Assurance Program (QAP)

The Cimarron Corporation QAP is an integral part of the Cimarron Radiation Protection Program. A principal component of the QAP is the confirmation of the quality of project work performed during decommissioning by assuring that all tasks are performed in a quality manner by qualified personnel. The Program ensures that samples are collected, controlled, and analyzed in accordance with applicable quality controls to provide adequate confidence that the resulting data accuracy and validity are verifiable. Such quality controls allow for the independent verification of analysis results by a third party review.

The Cimarron QAP is implemented and maintained in accordance with written policies, procedures, and instructions. This Program is administered under the direction of the Quality Assurance Manager. Periodic audits and reviews are conducted to ensure that all aspects of the Program are addressed.

Written procedures, designated as SWPs and WP's, are prepared, reviewed and approved for activities involved in carrying out the decommissioning process. The Sub-Area "F" concrete rubble survey SWP and WP were written in accordance with the Cimarron QAP. These documents designated the type of surveys to be performed, samples to be collected, frequency of sample collection, number of samples to be split with an off-site independent laboratory, and the type of field instrumentation required for the tasks required.

The facility performs its own radiological soil analysis in accordance with written procedures and QA/QC protocols. Field data are gathered and maintained in logs for all samples in accordance with the Cimarron QAP. Necessary data are transferred to the on-site laboratory sample log when the sample is brought to the on-site laboratory for analysis. The sample logs provide a record of sample collection and transport (chain of custody) and are incorporated into the facility quality assurance records.

In addition, off-site independent radiological analysis of split samples (samples are first counted on-site and then sent to an off-site independent laboratory) is an integral part of the Cimarron QAP. Samples sent to an off-site independent laboratory for analysis are accompanied by a chain of custody form in accordance with the Cimarron QAP. These forms provide documentation for all aspects of sample control and are maintained by the Quality Assurance Manager as permanent records.

Sample and survey data are reviewed by the Health Physics Department for accuracy and consistency and are compared to the guideline values. Reviews are performed on a regular basis. When identified, corrections to recognized deficiencies are performed.

Planned and periodic audits of Cimarron's Quality Assurance Program are performed by individuals who do not have direct responsibilities for the areas being audited. Audit results are documented for review by management.

8.0 Survey Findings

Final Status Survey data was generated for the concrete rubble located in Sub-Area "F" in order to demonstrate that this concrete rubble could be unconditionally released. The survey findings, including the methodology employed to evaluate the data, are described in this section.

8.1 Thermoluminescent Dosimeter (TLD) Exposure Rate Data

Thermoluminescent dosimeters were placed at three locations (#AM015, #AM016, and #AM017) near or above the concrete rubble. TLD data for 1996 and 1997 are provided in Tables 8.1 and 8.2, along with data for TLD location #AM014, which is located approximately one half mile south of the facility near the junction of Highways #33 and #74. Location #AM014 represents background. All TLDs were placed at a height of approximately one meter above the ground or concrete surface, and were oriented to face the area to be monitored. Drawing No. 98_TLD depicts these TLD locations.

Table 8.1
TLD Exposure Rate Measurements-1996

TLD#	Description	1Q96 µR/h	2Q96 µR/h	3Q96 µR/h	4Q96 µR/h	96 Ave. µR/h
AM014	Junction of Highways 33 & 74 (Background)	7.6	8.3	5.6	7.0	7.1
AM015	Res. #2, SE of Rubble	8.2	7.0	5.7	6.5	6.9
AM016	Res. #2, Middle of Rubble	9.3	10.2	5.3	6.7	7.9
AM017	Res. #2, Below Rubble	8.5	7.6	5.0	5.7	6.7

Table 8.2
TLD Exposure Rate Measurements-1997

TLD#	Description	1Q97 μR/h	2Q97 μR/h	3Q97 μR/h	97 Ave.* μR/h
AM014	Junction of Highways 33 & 74 (Background)	9.2	6.9	8.8	8.3
AM015	Res. #2, SE of Rubble	6.3	5.9	5.7	6.0
AM016	Res. #2, Middle of Rubble	6.7	6.0	6.4	6.4
AM017	Res. #2, Below Rubble	4.6	4.6	6.1	5.1

*Only the first three quarters of 1997 data were available at the time this report was published.

During 1996, the exposure rate near the concrete averaged 7.2 μR/h at the three indicator locations (#AM015, #AM016, and #AM017), and averaged 7.1 μR/h at the background location (#AM014). The exposure rates during the first three quarters of 1997 were similar, averaging 5.8 μR/h at the three indicator locations, and 8.3 μR/h at the background location. Data for the fourth quarter of 1997 have not yet been received from the contractor and are therefore not available.

The TLD exposure data does not indicate any elevated exposures occurring as a result of the elevated concrete surface contamination. This would be expected considering the low activity levels present in the concrete, and the attenuating characteristics of the concrete for any low energy gammas present due to the low residual uranium. In addition, the concrete provides shielding for naturally occurring gamma emitters within surface soils, and thus exposure rates are expected to be lower over concrete than in other locations. This observation is supported by the survey data presented in this report.

The TLD data also supports the measurements obtained with micro-R meters. The TLD data indicates that the guideline value of 10 micro-R above background is met at each TLD location during 1996 and 1997 to date.

8.2 Soil/Sediment Samples

In accordance with the Work Plan, one soil/sediment surface sample (6" depth) was collected from area upgradient of the main body of concrete rubble, ten surface samples from areas within and beneath the concrete, and two surface samples from areas downgradient of the concrete. The sampling locations and sample results are summarized in Table 8.3. The locations where each soil/sediment sample was collected are shown in Drawing No. 98FCRSS (Appendix I). Sample results do not indicate any samples above the BTP Option #1 guideline concentration of 30 pCi/g, above background. Concentrations of total uranium ranged from 2.9 to 8.6 pCi/g, while total thorium ranged from 0.2 to 1.0 pCi/g. The concentrations in these soil and sediment samples are similar to those found in unaffected areas, and do not indicate that there is any significant contribution occurring as a result of the concrete in the immediate vicinity.

Table 8.3
Soil/Sediment Samples Collected Around Concrete

Sample Number	Grid Location	Total U* (pCi/g)	Total Th* (pCi/g)
FA-535 (upgradient)	1451E-820N	4.2	1.2
FA-536	1419E-839N	2.9	0.9
FA-537	1419E-845N	5.9	0.8
FA-538	1420E-848N	8.6	0.2
FA-539	1412E-855N	7.0	0.8
FA-540	1404E-860N	4.2	0.7
FA-541	1341E-865N	4.6	0.7
FA-543 (downgradient)	1358E-870N	3.9	0.3
FA-544	1387E-870N	4.5	0.7
FA-545	1412E-870N	5.3	1.0
FA-546 (downgradient)	1365E-873N	4.3	0.7
FA-547	1378E-875N	4.4	0.6
FA-548	1370E-878N	3.6	0.6

*Reported measurements include the contribution from natural background.

8.3 Surface Water Samples

Surface water samples were collected upstream and downstream of the concrete on September 30, 1997. Sample results are summarized below in Table 8.4.

The upstream and downstream surface water samples show low levels of naturally occurring concentrations of uranium and thorium. There was no significant difference between the upstream and downstream sample. In addition, the sample data do not indicate any significant differences from the historical data reported for environmental

monitoring location #1205 (See Section 6.4). This indicates that the concrete is not contributing to the concentrations of these naturally occurring contaminants.

Table 8.4
Laboratory Data for Surface Water Samples
(Results in pCi/l)

Location	Th-228	Th-232	U-234	U-235	U-238
Upstream (FA-WAT-315)	0.4±0.3	<0.4	0.5±0.3	<0.1	<0.3
Downstream (FA-WAT-316)	0.4±0.4	<0.5	0.8±0.4	<0.2	0.3±0.2

8.4 Micro-R Measurements

A tabular summary of all micro-R meter surveys for the random grid samples and for the all sampled grids is provided in Tables 1 and 2 of Appendix II. Drawing No. 98FCRER (Appendix I) also presents the average exposure rate measurements for each 5m x 5m grid area for which measurements were collected. For the random sample, the average exposure rate over any 25 m^2 grid area ranged from 6 μR/h to 10 μR/h at one meter from the surface. The overall average exposure rate for the random sample was 7 μR/h at one meter from the surface. At one meter above the surface, the maximum exposure rate was 10 μR/h, including background. This maximum was measured at the location that had the highest exposure rate at the surface, which was 25 μR/h, including background (grid # 52). Assuming a background of 7 μR/h, the net annual exposure rate at this surface location would be 18 μR/h. This location was evaluated to determine any significance with respect to exposure of the general public. Under normal circumstances, it is unlikely that any additional exposure would occur to members of the public as this piece of concrete is within a drainage area, and is on land owned by Cimarron Corporation. The possible exposure scenarios evaluated included hunting the land or an intruder inadvertently remaining in the area for a period of time. Assuming ten hours per year exposure, the hypothetical individual could receive an annual dose of 180 μrem to the portion of the skin of the whole body or to any organs situated directly in contact with the concrete with high residual activity. A more likely scenario is from a person standing in the area for a period of several hours per year. The net annual dose rate above background from this hypothetical activity would be approximately 9 μrem/y to the whole body, based upon the net measured exposure rate at a height of one meter. Both of the above dose scenarios are unlikely, in that the concrete rubble is not in an area where it would be desirable to spend any amount of time. In comparison to the exposure that an individual receives from natural background radiation (≈300 millirem/y), the calculated hypothetical doses of 180 μrem/y and 9 μrem/y are insignificant.

The data summary for exposure rate measurements of all sample grids (i.e., random sample plus supplemental grid area data) is also included in Table 2 of Appendix II. This data is similar to the random grid sample data described above, and also indicates that there are no significant exposure risks from leaving the concrete in place.

The data summarized in Tables 1 and 2 of Appendix II, and presented in Drawing No. 98FCRER, include the exposure due to natural background radiation, which has been previously determined to range from 7-10 μR/h at the Cimarron site. Therefore, the estimated dose at one meter is essentially equal to that which would be received due to natural background.

8.5 Gross Alpha and Gross Beta-Gamma Surface Activity Data

Gross beta-gamma scans were performed over the entire surface of selected random grids containing concrete rubble to determine the nature and extent of the activity. In addition, the random sample data were supplemented with additional measurements to ensure that the random sample was representative. Gross alpha and gross beta-gamma surface activity data are summarized in Tables 3 through 6 in Appendix II. Drawings No. 98FCRA and 98FCRB (Appendix I) also present the average gross alpha and gross beta-gamma surface activity data for each 5m x 5m grid area. The data tables present the measured activity for each representative area and hot spots within the sampled 5m x 5m grids. Where applicable, background subtraction was performed on the gross beta-gamma hot spot data to obtain the expected increase that is due to residual activity. The average and maximum activity (dpm per 100 cm^2) is calculated for each of the 5m x 5m grids. The average volumetric concentration over the 5m x 5m grid area was then calculated using the relationship between gross beta-gamma surface activity and volumetric concentration that is presented in Section 8.6.2.

The volumetric concentration calculation assumes that the average gross beta-gamma surface activity is representative of the grid area as a whole, and that there is equal probability of measurement of the residual activity on the most elevated side of the concrete as there is for measurement on the least elevated side. This assumption is reasonable based upon the random manner in which the concrete was placed, and the random manner in which the sampling of the grid areas was performed. In order to account for the probability for residual activity to exist on both the top and bottom sides of each concrete slab, the average thickness for the concrete was divided by two. Therefore, since the average thickness of the concrete was found to be one foot, the volumetric concentration was calculated over a thickness of six inches.

8.5.1 Gross Beta-Gamma Data

Overall, the random grid sample data contained more elevated locations per grid and was found to be more limiting in that the data indicated higher overall concentrations than the data which included both the random sample and the

supplemental survey data. The maximum gross beta-gamma surface activity (concrete background subtracted, and averaged over $1m^2$) was found within grid #43 (hot spot #1). This hot spot location measured 26,075 dpm/100 cm^2. The highest average gross beta-gamma surface activity over any 5m x 5m grid was found in grid #51, which averaged 4,867 dpm/100 cm^2, with background subtracted. Using the conversion to volumetric concentration, this equates to 7.4 pCi/g average total uranium concentration over the $25m^2$ area. This concentration is well below the BTP Option #1 guideline value.

The overall average volumetric concentration calculated for the random sample was 2.9 pCi/g. For all sampled grids (i.e., random sample and supplemental samples), the average volumetric concentration was found to be 1.8 pCi/g. Although above typical background levels for concrete, these concentrations are similar to those found in nature and are well below the BTP Option #1 criteria. Therefore, the health and safety significance of leaving the concrete in place is similar to the health and safety considerations for natural soils. The potential uses of the concrete are limited by its portability and by the difficulty that would be experienced through attempts to remove it from the drainage areas. Therefore, it is anticipated that the any exposures to the concrete would be from casual contact or from its gradual disintegration over time due to environmental forces.

8.5.2 Gross Alpha Data

The gross alpha survey data are presented in Tables 5 and 6 in Appendix II and are also summarized in Drawing No. 98FCRA (Appendix I). Data are summarized for the random sample as well as for all sampled grids. Data generally indicate that the concrete rubble would meet the current gross alpha guideline criteria of 5,000 dpm/100 cm^2 (average) and 15,000 dpm/100 cm^2 (maximum) for unconditional release. As previously discussed in Section 1.0, the concrete was placed into Sub-Area "F" after gross alpha surveys were performed. The criteria in effect at the time the concrete was placed into Sub-Area "F" varied from the criteria currently in effect (as discussed above) up to 25,000 dpm/100 cm^2, which was allowable under the NRC criteria which was in effect at the time.

Review of the data indicate that two of the sampled grids contained hot spots exceeding 5,000 (average) or 15,000 (maximum) dpm/100 cm^2. Grid #52 contained a hot spot with 9,000 dpm/100 cm^2 (average) and 16,000 dpm/100 cm^2 (maximum). In addition, Grid #56 contained a hot spot with 15,600 dpm/100 cm^2 (maximum).

The criteria proposed for release of the concrete is based upon volumetric concentration. The concrete rubble does not have any smearable contamination and the activity would have to be removed through mechanical or physical forces. While it is probable that environmental forces will eventually act to remove the radioactivity,

normal environmental dispersion will result in insignificant quantities available for ingestion or inhalation.

8.6 Calculations

This section describes calculations and evaluations that were required in order to evaluate the concrete rubble and perform comparisons with the proposed release criteria. The calculations included determinations of the average thickness of the concrete, which was used to determine the appropriate volume of concrete for averaging the residual activity. The calculations performed to determine the relationship between gross beta-gamma surface activity and volumetric concentration of total uranium are also described in this section. Finally, source term was estimated based upon the random sample data. The source term allows for evaluation of the acceptability of the proposed action, which is to leave the concrete in place. The source term can be utilized for input into computer models or for use in comparing the residual activity with that present in the natural environment. A RESRAD computer model was run to calculate hypothetical dose to individuals over a period of 1000 years.

8.6.1 Calculation of Average Concrete Thickness

The volume estimate for the concrete was previously presented in the Decommissioning Plan. The data was evaluated and a weighted average thickness for the concrete was calculated. The weighted average thickness accounts for the presence of different volumes of concrete rubble that also have different thickness. The weighted average is calculated as follows:

$$\bar{t} = \text{Weighted Average} = \Sigma[(\text{thickness}) \times (\text{volume})]/\Sigma[\text{volume}];$$

The above formula can be explained as follows. For each area of the facility, the concrete thickness in the area is multiplied by the volume of the concrete that came from the area. These individual volume/thickness calculations are summed and divided by the overall volume of the concrete (i.e., all concrete that was placed into Sub-Area "F") to obtain the weighted average.

Using the above calculation, the weighted average thickness of the concrete in Sub-Area "F" was estimated to be 1 foot. The data tables showing the dimensions of the concrete present in Sub-Area "F" are presented in Appendix III.

8.6.2 Volumetric Concentration Conversion Factor

A special study was performed as described in Section 7.6 to determine a relationship between gross beta-gamma surface activity on the concrete (measured in dpm/100cm^2) and the volumetric concentration (measured in pCi/g) of total uranium. The solution to this problem is confounded due to the natural presence of beta and gamma emitters in concrete, including uranium. In addition, the low energy of the beta emitters

associated with enriched uranium and the variability in depth of the contaminated layer hinder the determination of a single conversion factor for this purpose. However, the data presented for the two slabs studied indicate a reasonable agreement between the data.

For this study, two slabs were selected. Slab #1 had an initial average gross beta-gamma surface activity of 4496 dpm/100cm^2 (concrete background subtracted), while slab #2 had an initial average gross beta-gamma surface activity of 17,697 dpm/100cm^2 (concrete background subtracted). Measurements were performed on each slab as described in Section 7.6, followed by scabbling of another layer (average depth approximately 1/8 inch), resurvey, and additional scabbling until the majority of the contamination was removed. The scabble dust and particles were collected and analyzed for total uranium content using either the onsite soil counter or using an off-site independent laboratory. Survey and laboratory data for the two slabs is presented in Table 8.5.

The special study data revealed that the maximum depth of the contamination was approximately 3/8 inch. The contamination was found to be highest, as expected, at the layer closest to the surface, and decreased substantially as additional layers of concrete were scabbled and removed.

The concentration of total uranium was assumed to be at background (i.e., 1.5 pCi/g) for all remaining concrete when the gross beta-gamma measurements indicated that the residual activity had been essentially removed. Complete removal of the residual activity was achieved after two scabbling operations on Slab #1, and after three scabbling operations on Slab #2. It was determined that each scabbling operation removed approximately 1/8 inch from the surface. The volumetric concentration conversion factor was determined using the average thickness of six inches as follows:

Slab #1

Volumetric average conversion factor (dpm/100 cm^2 gross beta-gamma per pCi/g total U) =

(17,697 dpm/100 cm^2) ÷ {[814.7 pCi/g + 102.7 pCi/g + (1.5 pCi/g x 46)] ÷ 48} =

861.2 dpm/100 cm^2 gross beta-gamma per pCi/g total U.

TABLE 8.5

Survey Data for Concrete Rubble Slabs Used to Determine the Volumetric Concentration Conversion Factor

	Gross Alpha dpm/100cm^2 (ave)	Gross Alpha dpm/100cm^2 (max)	Gross Beta dpm/100cm^2 (ave)	Gross Beta Dpm/100cm^2 (max)	Slab Surface µR/h	Slab 1m µR/h	Hot Surface µR/h	Spot 1m µR/h	Total U Conc. (pCi/g)
Slab #1									
Initial Measurement	1251	4800	17,697	44,540	9	7	11	7	814.7
After 1st Scabbling	157	480	2411	8330	6	6	6	6	102.7
After 2nd Scabbling	24	160	0	1310	6	6	6	6	
Slab #2									
Initial Measurement	329	1280	4496	24,390	6	6	9	8	313
After 1st Scabbling	115	480	935	13,370	5	6	8	6	74.9
After 2nd Scabbling	116	400	0	4,950	6	6	6	6	17.7
After 3rd Scabbling	<350	<350	0	230	9	9	9	9	

Notes:
1) Concrete gross beta-gamma background (800 dpm/100cm^2) subtracted from beta-gamma measurements.
2) No background subtraction performed for all other measurements.
3) Measurements less than 0 after background subtraction were recorded as 0.
4) Total U concentration assumed as 1.5 pCi/g when all residual gross beta-gamma activity was determined to be removed by scabbling.

Slab #2

Volumetric average conversion factor (dpm/100 cm^2 gross beta-gamma per pCi/g total U) =

(4496 dpm/100 cm^2) ÷ {[313 pCi/g + 74.9 pCi/g + 17.7 pCi/g + (1.5 pCi/g x 45)] ÷ 48} =

456.2 dpm/100 cm^2 gross beta-gamma per pCi/g total U.

In the above calculations, each scabbled layer is assigned a thickness of 1/8 inch, which corresponds to the measured concentration of the concrete. It follows that there are 48, 1/8 inch layers in a six inch slab of concrete. Each background layer is assumed to have a total uranium concentration of 1.5 pCi/g, as discussed in Section 6.2.1. The numerator in the above equations is the measured gross beta-gamma surface activity on the top layer. This data is readily available and was obtained during the surveys of the concrete rubble. The two slabs studied in this special project indicate that the conversion factor is in the range of 456 to 861 dpm/100 cm^2 gross beta-gamma per pCi/g total U. The two samples resulted in calculated conversion factors that were within a factor of two, which is good agreement considering the numerous areas of uncertainty.

The average of the two measurements, which is 661 dpm/100 cm^2 gross beta-gamma per pCi/g total U, was utilized to estimate the average volumetric concentration of residual activity present in the concrete. For comparison, the volumetric conversion factor was also calculated for an assumed concrete thickness of three inches. This conversion factor was also used to calculate average total uranium concentrations. The data tables for gross beta-gamma surface activity in Appendix II (Tables 3 and 4) also present the average volumetric concentrations for each 5m x 5m grid area.

8.6.3 Volumetric Concentration Calculations

Calculation of the estimated volumetric concentration (in pCi/g total U) was performed by multiplying the conversion factor described in Section 8.6.2 times the measured gross beta-gamma surface contamination measurement (with background subtracted). These calculations, which are summarized in Appendix II (Tables 3 and 4), resulted in average total uranium concentrations (after background subtraction) ranging from 0.8 pCi/g to 7.4 pCi/g. The negative results indicate that the 5m x 5m grid average was less than 1.5 pCi/g. Subtraction of the 800 dpm/100cm^2 concrete background thus resulted in a value that was less than average. Assuming a normal distribution of a background distribution, one half of the samples collected would be expected to be less than background.

The maximum 5m x 5m grid average total uranium concentration was 7.4 pCi/g (grid #51). This concentration is less than 25% of the guideline value of 30 pCi/g. The average total uranium concentration for the random sample was 2.9 pCi/g, which is less than 10% of the guideline value for enriched uranium (30 pCi/g). For the random

sample and the supplemental grid areas (66 grid areas), the total uranium average concentration was 1.8 pCi/g, which is equal to 6 percent of the guideline value.

8.6.4 Source Term Calculation

The average volumetric concentration for the random sample was calculated to be 2.9 pCi/g. Since the volume of concrete is known, an estimate of the total activity of uranium present in the concrete can be calculated as follows:

Total activity = (2.9 pCi/g-concrete) x (1.8 g-concrete/cc) x 31,985 ft^3 concrete x 28,320cc/ft^3

= 4.7 E+09 pCi = **4.7 E-03 Ci Total Uranium.**

8.6.5 Pathway Analysis

The RESRAD computer code was used to evaluate the potential dose due to leaving the concrete in place. The RESRAD code considers direct radiation, inhalation of resuspended radioactivity, ingestion of groundwater and foodstuffs grown in contaminated soils, or in soils irrigated with contaminated surface or ground water, and all other credible pathways. The RESRAD model generally will predict a more conservative dose (i.e., a higher dose) than that which could potentially be received, as it generally utilizes conservative assumptions and includes scenarios for use of the land area that are generally not consistent with the expected uses for concrete rubble.

The input parameters for RESRAD include those defined in NRC's Policy and Guidance Directive (PG) 8-08, "Scenarios for Assessing Potential Doses Associated with Residual Activity"[26]. The uranium isotopic ratios were chosen to be the same as those used by the NRC for the "Environmental Assessment Associated with the BTP Option #2 Onsite Disposal Cell at Cimarron"[27], which were U-234 (79%), U-235 (1.7%), and U-238 (20%). The selected density for the concrete was 1.8 g/cc. The calculated area of the contaminated zone is 2970 m^2 [31,985 ft^3 x (0.3048m/ft)^3 ÷ 0.3048m], while the calculated thickness is 0.3048m. (1 Foot)

The RESRAD calculated maximum dose rate will occur at 900 years and result in a maximum hypothetical annual dose to the resident of approximately 1 millirem per year. A printout of the parameters used and results of the RESRAD calculation are provided in Appendix IV.

9.0 Summary

A Final Status Survey was performed on the concrete in Sub-Area "F". The survey incorporated NRC guidance and suggestions for volumetric concentration averaging. This Report presents the results of the Final Status Survey. The survey data were evaluated and doses from leaving the concrete in place were calculated. The evaluations presented in this report indicate that the concrete should be left in place for the following reasons:

- **RESRAD dose evaluation indicates that the projected maximum dose would occur after 900 years, and that this dose would be approximately 1 millirem per year.**

- **Random sample data indicate that the average total uranium concentration for the concrete rubble is 2.9 pCi/g. The overall average total uranium concentration in the concrete is less than 10 percent of the BTP Option #1 guideline value (30 pCi/g). The average total uranium concentration, based upon all sample data, was calculated to be 1.8 pCi/g.**

- **The maximum concentration averaged over any 5m x 5m grid area was found to be 7.4 pCi/g., which is less than 25% of the BTP Option #1 guideline value.**

- **The overall average exposure rate at one meter from the surface was 7 μR/h, which is equivalent to natural background. The maximum exposure rate at one meter from the surface was 10 μR/h, which is within the range of natural background.**

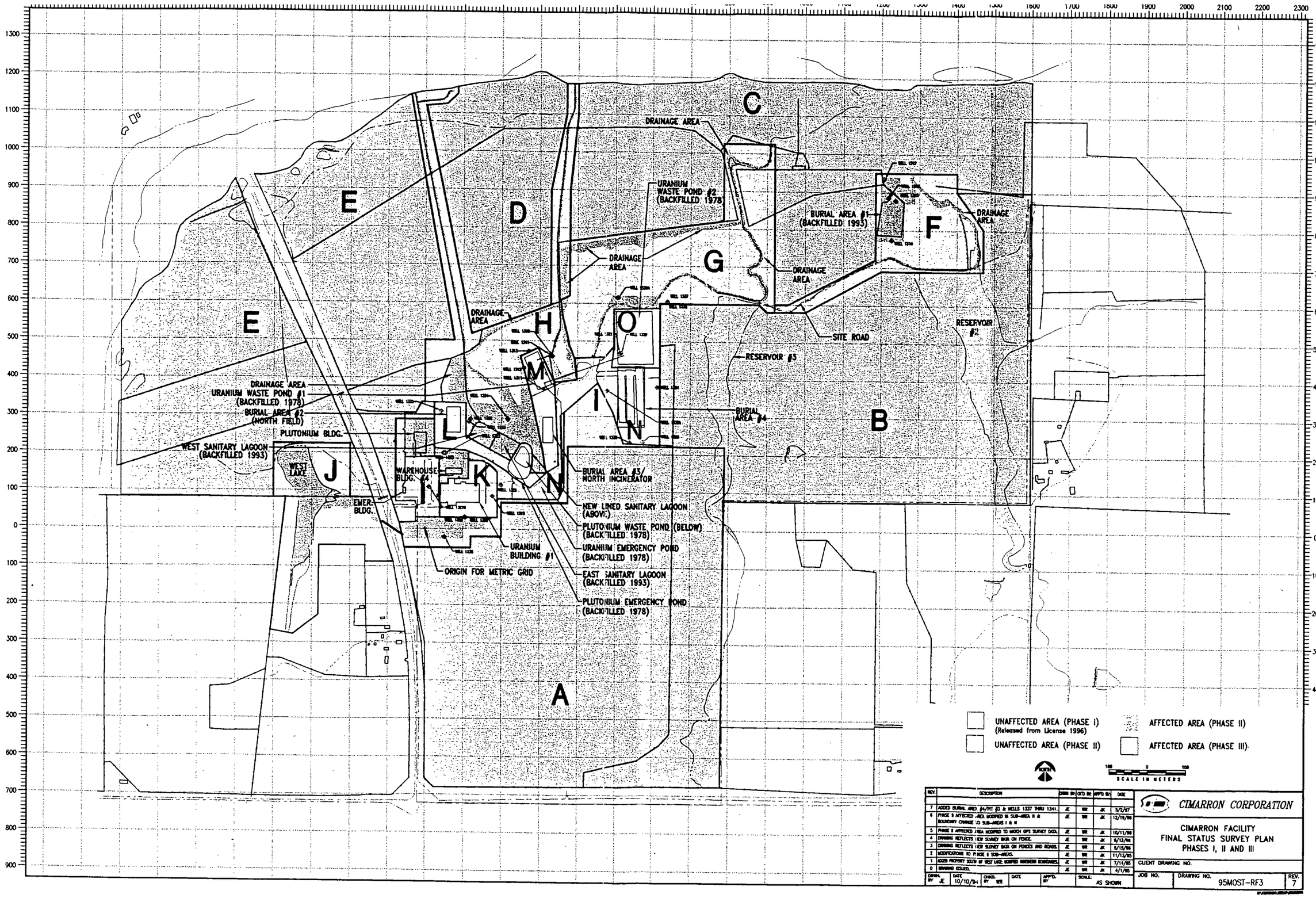
- **The calculated total uranium source term is 4.7 millicuries within the total volume of concrete rubble estimated at 31,985 ft^3.**

- **No elevated measurements observed for exposure rate as measured by thermoluminescent dosimeters placed in the field adjacent to the concrete rubble.**

- **Surface water samples collected upstream and downstream did not indicate any contribution of radioactivity from the concrete rubble. Soil/sediment samples collected upstream, within, and downstream of the concrete rubble reflect radioactivity levels which are characteristic of samples collected in unaffected areas of the facility.**

- **The concrete continues to serve the useful purpose of on-site erosion control.**

The calculations presented in this report utilized conservative assumptions. Therefore, it is unlikely that even the low dose which was calculated could be received by any member of the public. Based upon the evaluations in this report, Cimarron Corporation requests authorization from the NRC for unconditional release of the concrete.



REV.	DESCRIPTION	DRWN BY	CK'D BY	APP'D BY	DATE
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6	PHASE II AFFECTED AREA MODIFIED IN SUB-AREA N & BOUNDARY CHANGE TO SUB-AREAS I & N	JE	WR	JK	12/19/96
5	PHASE II AFFECTED AREA MODIFIED TO MATCH GPS SURVEY DATA.	JE	WR	JK	10/11/96
4	DRAWING REFLECTS NEW SURVEY DATA ON FENCE.	JE	WR	JK	6/13/96
3	DRAWING REFLECTS NEW SURVEY DATA ON FENCES AND ROADS.	JE	WR	JK	5/15/96
2	MODIFICATIONS TO PHASE II SUB-AREAS.	JE	WR	JK	11/13/95
1	ADDED PROPERTY SOUTH OF WEST LAKE, REMOVED UNKNOWN BOREHOLES.	JE	WR	JK	7/11/95
0	DRAWING ISSUED.	JE	WR	JK	4/1/95

DRWN BY JE | DATE 10/10/94 | CHKD. BY WR | DATE | APP'D. BY | SCALE: AS SHOWN

CIMARRON CORPORATION

CIMARRON FACILITY
FINAL STATUS SURVEY PLAN
PHASES I, II AND III

CLIENT DRAWING NO.

JOB NO. | DRAWING NO. 95MOST-RF3 | REV. 7

DRAINAGE AREA

URANIUM WASTE POND #2 (BACKFILLED 1978)

BURIAL AREA #1 (BACKFILLED 1993)

RESERVOIR #2

SITE ROAD

RESERVOIR #3

BURIAL AREA #4

URANIUM WASTE POND #1 (BACKFILLED 1978)

BURIAL AREA #2 (NORTH FIELD)

PLUTONIUM BLDG.

WEST SANITARY LAGOON (BACKFILLED 1993)

WEST LAKE

WAREHOUSE BLDG. #4

EMER. BLDG.

BURIAL AREA #3/ NORTH INCINERATOR

NEW LINED SANITARY LAGOON (ABOVE)

PLUTONIUM WASTE POND (BELOW) (BACKFILLED 1978)

URANIUM EMERGENCY POND (BACKFILLED 1978)

URANIUM BUILDING #1

EAST SANITARY LAGOON (BACKFILLED 1993)

ORIGIN FOR METRIC GRID

PLUTONIUM EMERGENCY POND (BACKFILLED 1978)

NORTH

100 0 100
SCALE IN METERS

REV.	DESCRIPTION	DRWN BY:	CK'D BY:	APP'D BY:	DATE
0	DRAWING ISSUED.	JE	WR	JL	2/17/95

DRWN. BY JE | DATE 10/10/94 | CHKD. BY WR | DATE | APP'D. BY | SCALE: AS SHOWN

CIMARRON CORPORATION

CIMARRON FACILITY
CIMARRON SITE PLAN

CLIENT DRAWING NO.

JOB NO. | DRAWING NO. 95SITE | REV. 0

CIMARRON RIVER

SURFACE 1201

SURFACE 1202

GW 1317

GW 1316

GW 1315

BURIAL AREA #1

GW 1314

AREA 1

SURFACE 1205

SURFACE 1208

GW 1336A

GW 1337

GW 1338

SURFACE 1209

RESERVOIR #2

BURIAL AREA #4 HOLDING POND

URANIUM WASTE POND #1

URANIUM WASTE POND #2

RESERVOIR #3

GW 1313

GW 1341

GW 1340

GW 1312

GW 1311

GW 1321

GW 1320

GW 1335

GW 1324

BURIAL AREA #4

AREA 4

AREA 3

AREA 2

BURIAL AREA #2 (NORTH FIELD)

GW 1331

GW 1332

GW 1333

GW 1334

SURFACE 1206

GW 1339

GW 1325

PLUTONIUM BUILDING

GW 1322

GW 1323

WAREHOUSE BLDG. #4

BURIAL AREA #3/ NORTH INCINERATOR

NEW LINED SANITARY LAGOON (ABOVE)

SURFACE 1204

EMERGENCY BUILDING

GW 1327B

URANIUM BLDG. #1

GW 1326

GW 1319

GW 1329

GW 1328

AREA 5

GW 1330

WEST LAKE

PLUTONIUM WASTE POND (BELOW)

URANIUM EMERGENCY POND

PLUTONIUM EMERGENCY POND

EAST SANITARY LAGOON

WEST SANITARY LAGOON

ORIGIN FOR METRIC GRID

SITE BOUNDARY

LEGEND

- GW XXXX — DEEP MONITORING WELL
- GW XXXX — SHALLOW MONITORING WELL
- SURFACE XXXX — SURFACE WATER SAMPLING LOCATION

SCALE IN METERS

NORTH

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0	DRAWING ISSUED.	JE	RS	JK	11/22/96

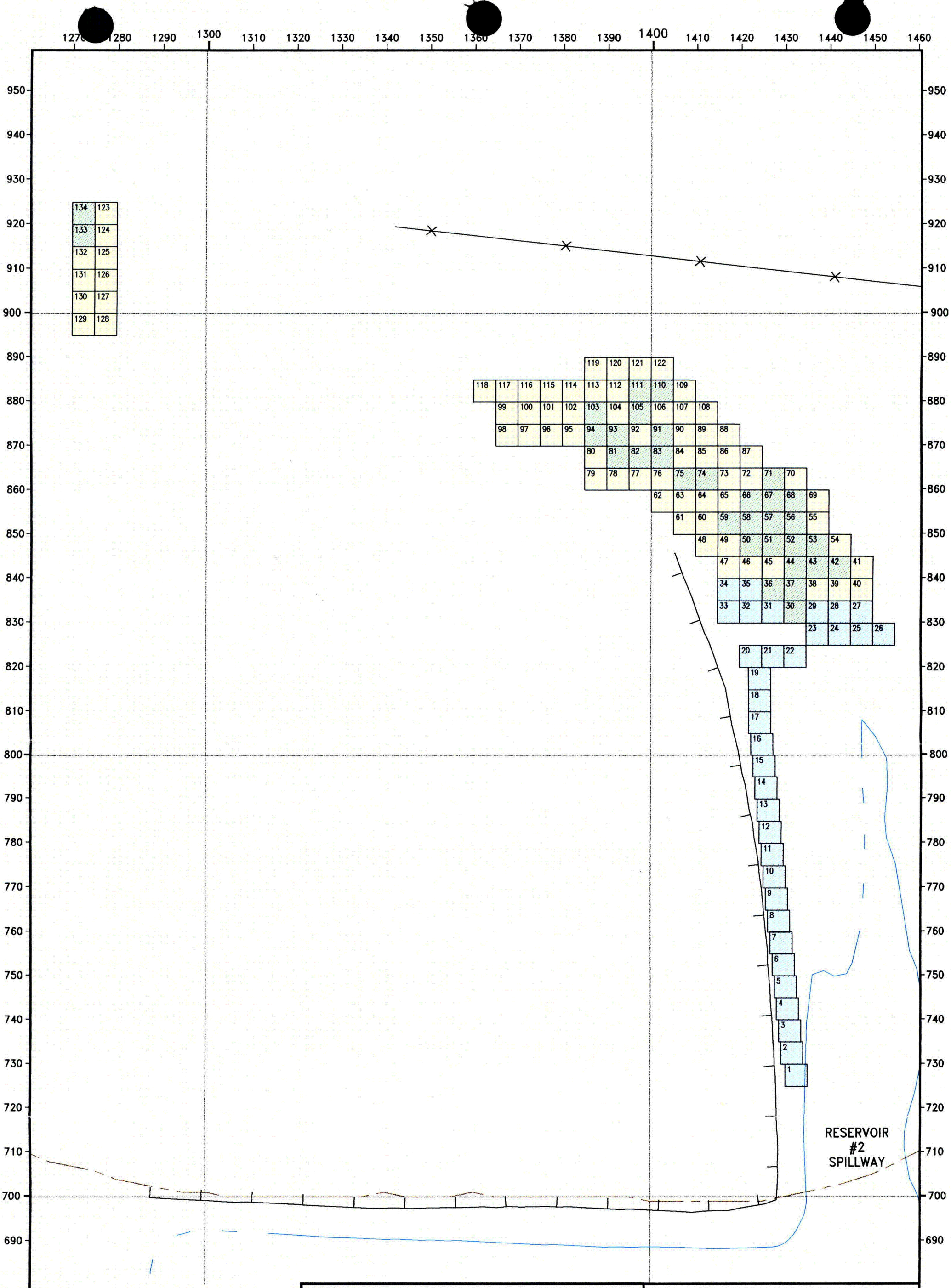
DRAWN BY: JE | DATE: 11/18/96 | CHK'D BY: RS | DATE: 11/22/96 | APP'D BY: JK | SCALE: AS SHOWN

CIMARRON CORPORATION

CIMARRON FACILITY
Ground Water and Surface Water Monitoring Locations

CLIENT DRAWING NO.

JOB NO. | DRAWING NO. 96MOST-RF1 | REV. 1



CIMARRON CORPORATION

CIMARRON FACILITY
Phase II – Sub-Area "F"
Concrete Rubble
5m x 5m Grid Areas

REV.	DESCRIPTION	DRWN BY:	CK'D BY:	APP'D BY:	DATE
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DRWN. BY	DATE	SCALE:
JE	3/10/98	AS SHOWN
JOB NO.	DRAWING NO.	REV.
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950 940 930 920 910 900 890 880 870 860 850 840 830 820 810 800 790 780 770 760 750 740 730 720 710 700 690

CONCRETE AREA

CONCRETE AREA

TLD17

TLD16

TLD15

TLD14 IS LOCATED AT THE NW CORNER OF 33/74 INTERSECTION

RESERVOIR #2 SPILLWAY

NORTH

20 0 20

SCALE IN METERS

REV.	DESCRIPTION	DRWN BY:	CK'D BY:	APP'D BY:	DATE
0	DRAWING ISSUED.	JE	HN	JL	3/13/98

CIMARRON CORPORATION

CIMARRON FACILITY
TLD MONITORING LOCATIONS

DRWN. BY	DATE	SCALE:
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JOB NO.	DRAWING NO.	REV.
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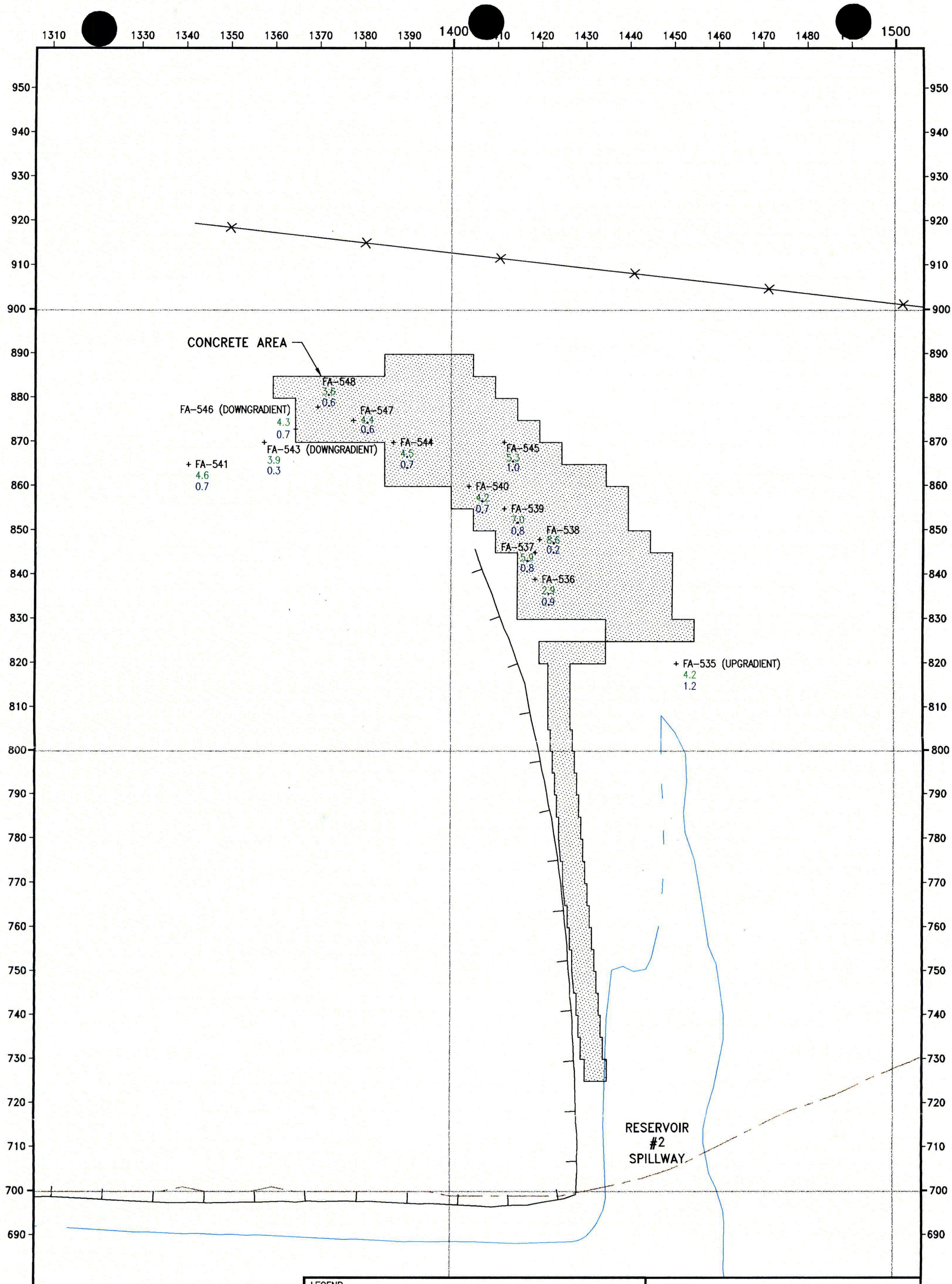

LEGEND

\+ FA-535 SAMPLE NUMBER
4.2 TOTAL U* (pCi/g)
1.2 TOTAL Th* (pCi/g)

* Reported measurements include the contribution from natural background.

Surface Samples 0 to 6" Depth

REV.	DESCRIPTION	DRWN BY:	CK'D BY:	APP'D BY:	DATE
0	DRAWING ISSUED.	JE	HN	JL	3/13/98

CIMARRON CORPORATION

CIMARRON FACILITY
Phase II – Sub-Area "F"
Concrete Rubble
Soil/Sediment Sampling Locations

DRWN. BY	DATE	SCALE:
JE	3/10/98	AS SHOWN

JOB NO.	DRAWING NO.	REV.
	98FCRSS	0

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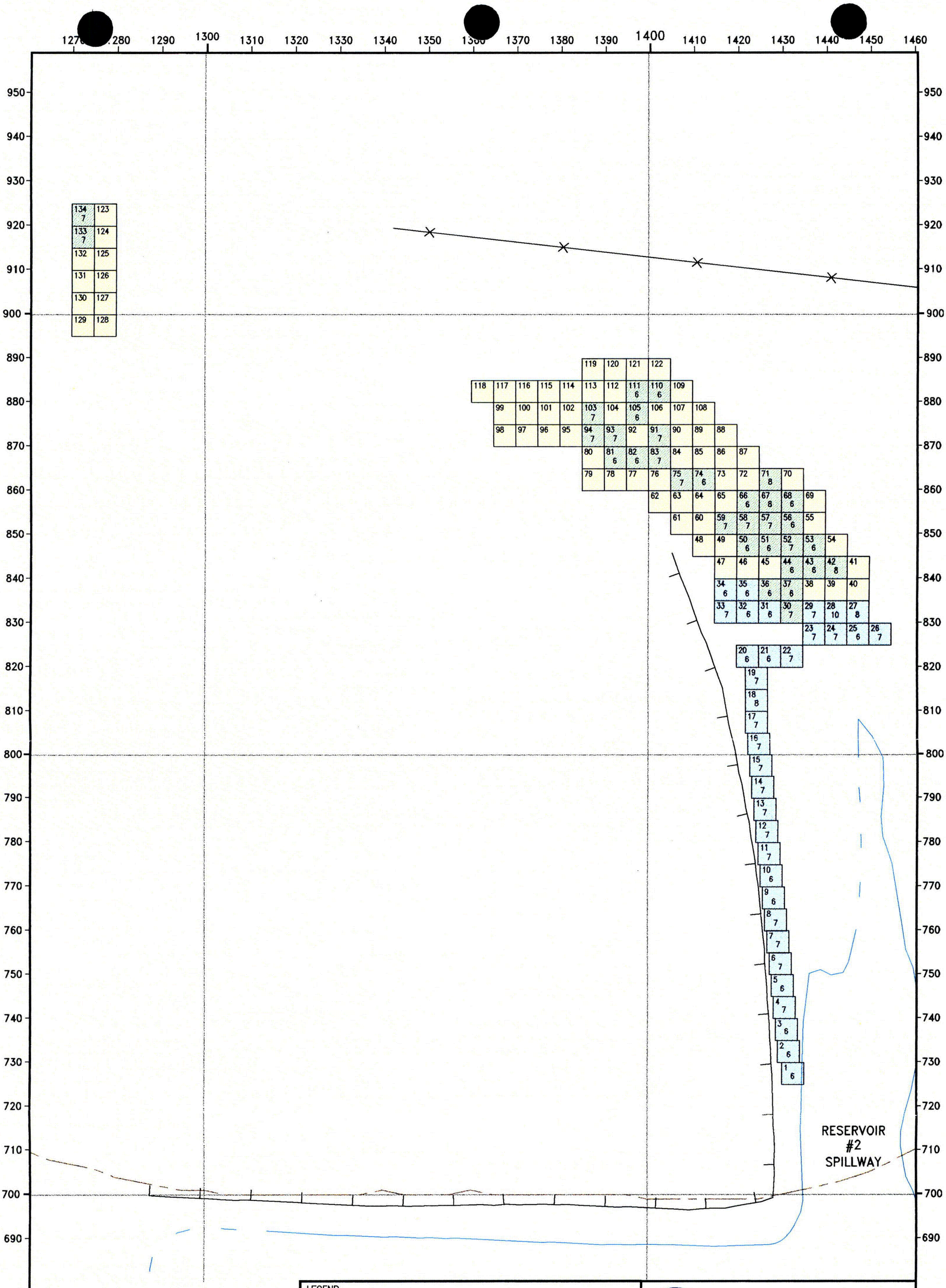

LEGEND

- 2 6 SUPPLEMENTAL SAMPLE GRIDS
- 37 6 RANDOM SAMPLE GRIDS
- 61 OTHER SAMPLE GRIDS

Measurements are in Micro-R at 1 Meter from Surface.

REV.	DESCRIPTION	DRWN BY:	CK'D BY:	APP'D BY:	DATE
0	DRAWING ISSUED.	JE	HN	JL	3/13/98

CIMARRON CORPORATION

CIMARRON FACILITY
Phase II - Sub-Area "F"
Concrete Rubble - Final Status Survey Results
Average Exposure Rate Measurements
at 1m for 5m x 5m Grid Areas

DRWN. BY	DATE	SCALE:	REV.
JE	3/10/98	AS SHOWN	0

JOB NO.

DRAWING NO. 98FCRER

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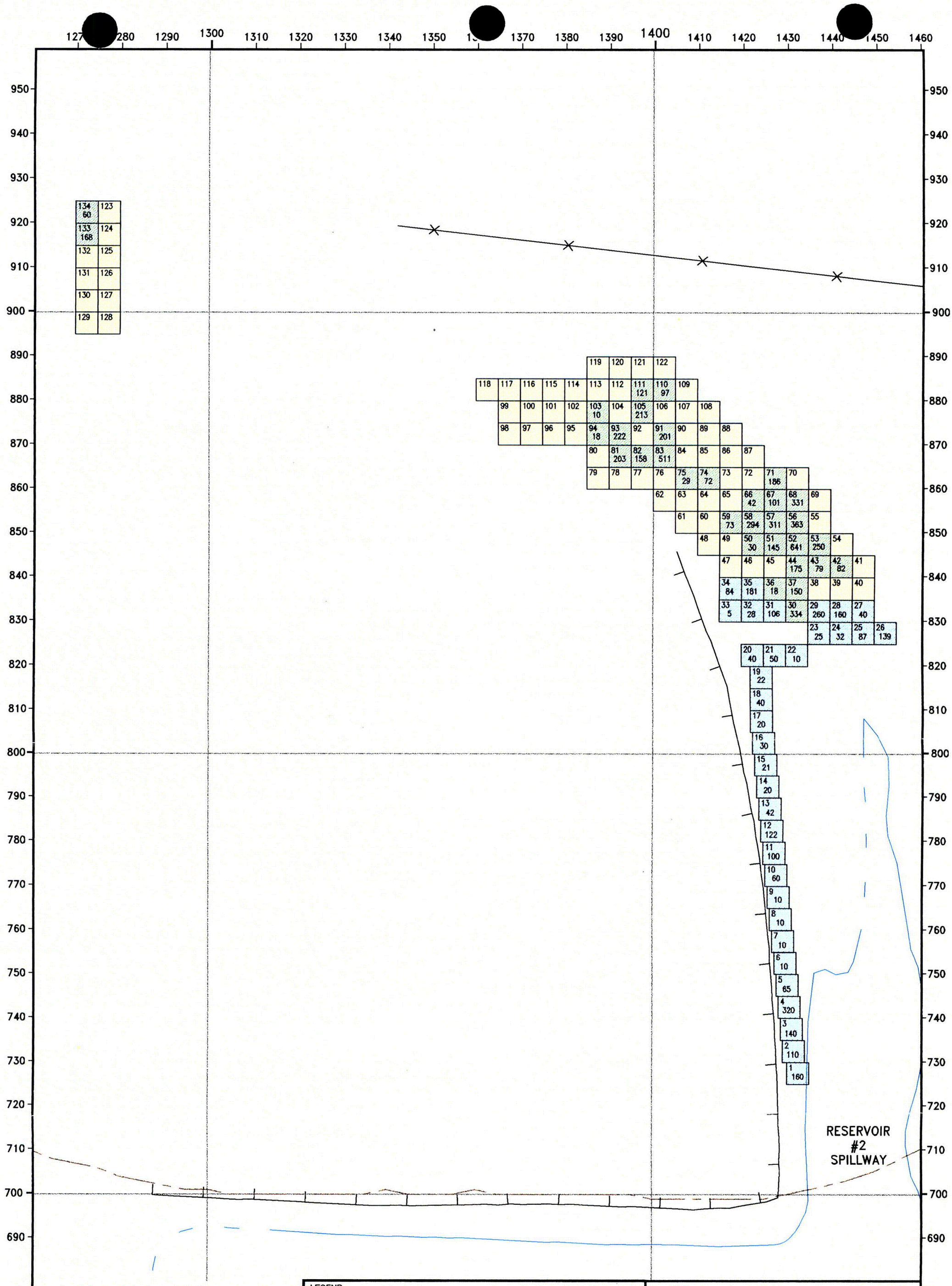

LEGEND

2 110 SUPPLEMENTAL SAMPLE GRIDS

37 150 RANDOM SAMPLE GRIDS

61 OTHER SAMPLE GRIDS

All Measurements Reported in DPM/100cm^2.
No background subtraction.

REV.	DESCRIPTION	DRWN BY:	CK'D BY:	APP'D BY:	DATE
0	DRAWING ISSUED.	JE	HN	JL	3/13/98

CIMARRON CORPORATION

CIMARRON FACILITY
Phase II – Sub-Area "F"
Concrete Rubble – Final Status Survey Results
Average Gross Alpha Surface Activity
for 5m x 5m Grid Areas

DRWN. BY	DATE	SCALE:
JE	3/10/98	AS SHOWN

JOB NO.	DRAWING NO.	REV.
	98FCRA	0

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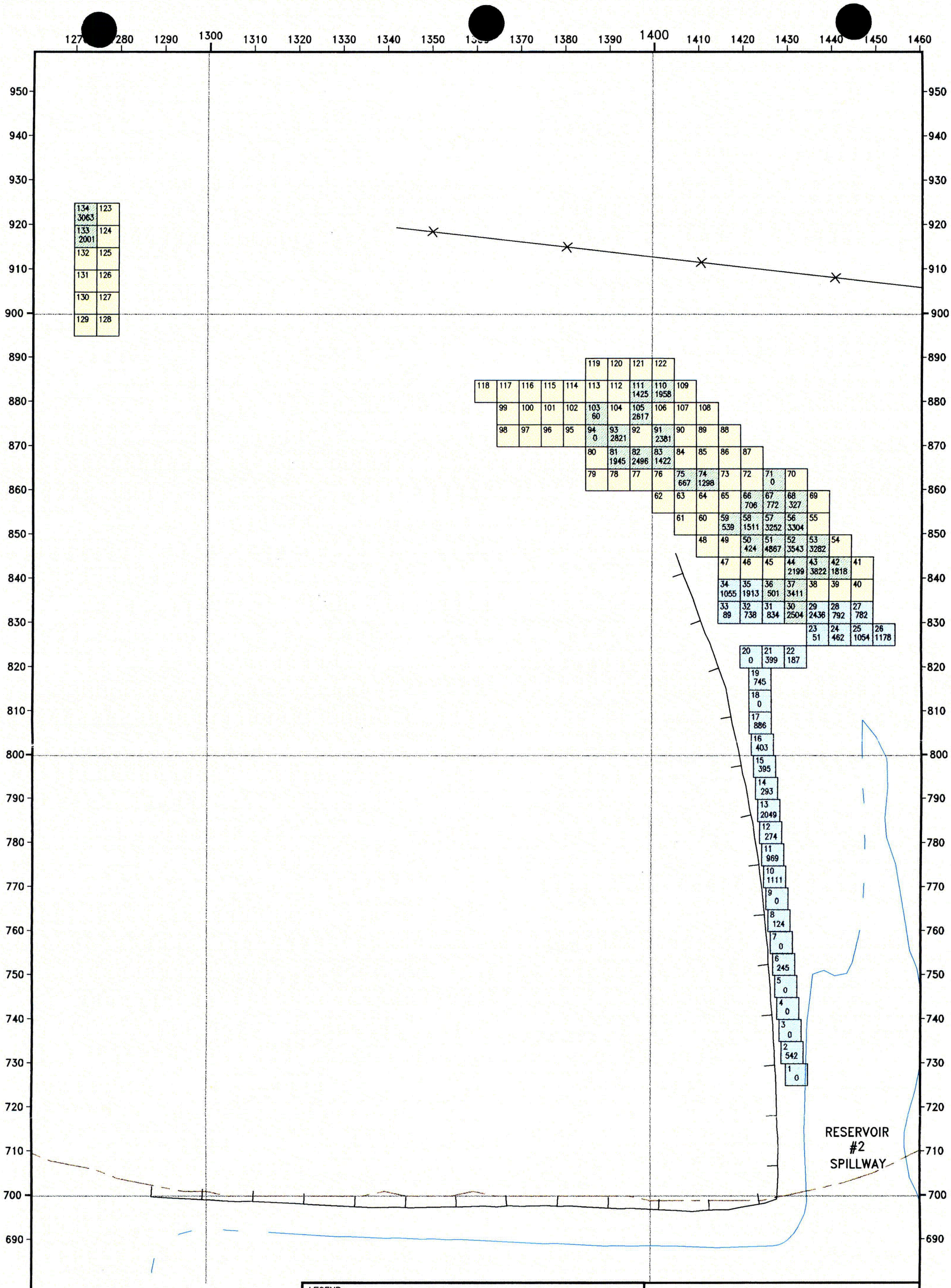


LEGEND

- 2 / 542 — SUPPLEMENTAL SAMPLE GRIDS
- 37 / 3411 — RANDOM SAMPLE GRIDS
- 61 — OTHER SAMPLE GRIDS

All Measurements Reported in DPM/100cm^2.
Background of 800 DPM/100cm^2 Subtracted.

REV.	DESCRIPTION	DRWN BY:	CK'D BY:	APP'D BY:	DATE
0	DRAWING ISSUED.	JE	HN	JL	3/13/98

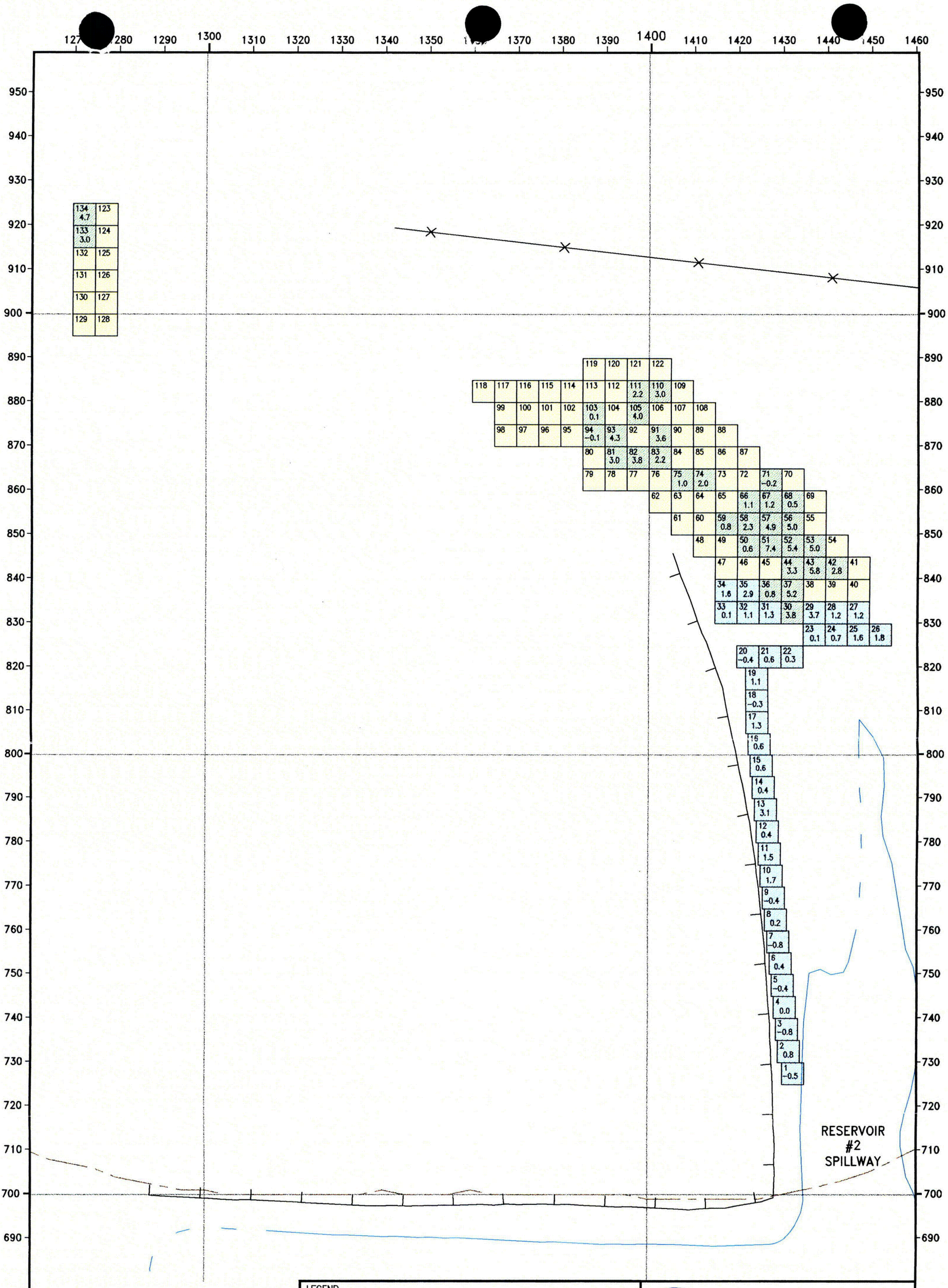
CIMARRON CORPORATION

CIMARRON FACILITY
Phase II – Sub-Area "F"
Concrete Rubble – Final Status Survey Results
Average Gross Beta-Gamma Surface Activity
for 5m x 5m Grid Areas

DRWN. BY	DATE	SCALE:
JE	3/10/98	AS SHOWN

JOB NO.	DRAWING NO.	REV.
	98FCRB	0

...\subareaf\concrete\98fcrb



LEGEND

- 2 0.8 SUPPLEMENTAL SAMPLE GRIDS
- 37 5.2 RANDOM SAMPLE GRIDS
- 61 OTHER SAMPLE GRIDS

All Measurements are in pCi/g.

REV.	DESCRIPTION	DRWN BY:	CK'D BY:	APP'D BY:	DATE
0	DRAWING ISSUED.	JE	HN	JL	3/13/98

CIMARRON CORPORATION

CIMARRON FACILITY
Phase II – Sub-Area "F"
Concrete Rubble – Final Status Survey Results
Average Concentration Measurements for 5m x 5m Grid Areas

DRWN. BY	DATE	SCALE:
JE	3/10/98	AS SHOWN

JOB NO.	DRAWING NO.	REV.
	98FCRC	0

...\subareaf\concrete\98fcrc

TABLE 1

OF

APPENDIX II

TABLE 1 - SUB-AREA "F" CONCRETE-ALL FINAL SURVEY DATA
Exposure Rate Summary (Random Sample)
PAGE 1

GRID #	REPRESENTATIVE AREA (Micro-R/Hr) SURFACE	1 METER	% CONCRETE	TOTAL # OF HOT SPOTS	#	HOT SPOT DATA SURFACE	1 METER	5m x 5m GRID AVE@1m	MAX@1m
30	7	6	100	7	1	10	7	7	7
					2	6	5		
					3	7	6		
					4	11	6		
					5	8	7		
					6	8	6		
					7	7	6		
36	6	6	100	2	1	6	5	6	6
					2	8	6		
37	5	6	100	11	1	6	6	6	7
					2	6	5		
					3	6	6		
					4	8	7		
					5	6	6		
					6	7	6		
					7	8	7		
					8	7	6		
					9	7	7		
					10	8	7		
					11	8	6		
42	8	7	100	7	1	8	7	8	7
					2	6	7		
					3	9	7		
					4	7	6		
					5	7	7		
					6	7	7		
					7	8	7		
43	6	6	100	6	1	8	7	6	7
					2	8	7		
					3	7	6		
					4	7	7		
					5	7	7		
					6	7	7		
44	6	6	100	7	1	6	6	6	7
					2	7	6		
					3	7	6		
					4	13	7		
					5	8	7		
					6	6	6		
					7	6	6		
50	6	6	100	2	1	7	6	6	7
					2	8	7		
51	6	6	100	11	1	7	6	6	7
					2	6	6		
					3	6	6		
					4	7	6		
					5	7	7		
					6	7	6		
					7	7	6		
					8	8	7		
					9	7	6		
					10	7	6		
					11	6	6		
52	7	6	100	10	1	9	8	7	10
					2	7	6		
					3	7	7		
					4	7	6		
					5	7	7		
					6	7	7		
					7	25	10		
					8	12	8		
					9	10	9		
					10	10	9		

TABLE 1 - SUB-AREA "F" CONCRETE-ALL FINAL SURVEY DATA
Exposure Rate Summary (Random Sample)
PAGE 2

	REPRESENTATIVE AREA (Micro-R/Hr)			TOTAL # OF		HOT SPOT DATA		5m x 5m GRID	
GRID #	SURFACE	1 METER	% CONCRETE	HOT SPOTS	#	SURFACE	1 METER	AVE@1m	MAX@1m
53	6	6	100	13	1	7	6	6	7
					2	9	7		
					3	7	6		
					4	7	7		
					5	6	7		
					6	7	7		
					7	6	6		
					8	8	7		
					9	7	6		
					10	8	7		
					11	8	6		
					12	6	6		
					13	7	7		
56	6	6	100	9	1	7	6	6	8
					2	9	7		
					3	10	8		
					4	9	7		
					5	8	7		
					6	7	6		
					7	8	7		
					8	6	6		
					9	7	7		
57	7	6	100	12	1	7	6	7	8
					2	7	6		
					3	8	7		
					4	9	6		
					5	7	7		
					6	9	8		
					7	8	7		
					8	9	8		
					9	11	8		
					10	11	8		
					11	8	7		
					12	8	7		
58	7	7	100	9	1	10	8	7	8
					2	7	7		
					3	8	7		
					4	7	6		
					5	7	6		
					6	7	7		
					7	8	7		
					8	7	6		
					9	7	6		
59	7	6	100	2	1	7	6	7	7
					2	8	7		
66	6	6	100	2	1	9	8	6	8
					2	7	7		
67	8	8	100	7	1	8	7	8	7
					2	6	7		
					3	9	7		
					4	7	6		
					5	7	6		
					6	9	7		
					7	8	7		
68	6	7	100	4	1	8	7	6	7
					2	6	6		
					3	7	6		
					4	6	6		
71	8	7	100	1	1	8	7	8	7
74	6	6	100	7	1	6	6	6	7
					2	6	5		
					3	7	6		
					4	7	6		
					5	7	7		
					6	8	7		
					7	7	6		

TABLE 1 - SUB-AREA "F" CONCRETE-ALL FINAL SURVEY DATA
Exposure Rate Summary (Random Sample)
PAGE 3

	REPRESENTATIVE AREA (Micro-R/Hr)			TOTAL # OF		HOT SPOT DATA		5m x 5m GRID	
GRID #	SURFACE	1 METER	% CONCRETE	HOT SPOTS	#	SURFACE	1 METER	AVE@1m	MAX@1m
75	7	6	100	5	1	6	5	7	7
					2	8	7		
					3	6	6		
					4	7	7		
					5	7	6		
81	5	6	85	9	1	6	6	6	7
					2	7	6		
					3	8	7		
					4	7	7		
					5	7	6		
					6	8	7		
					7	7	7		
					8	7	6		
					9	6	6		
82	6	6	100	12	1	7	7	6	7
					2	7	7		
					3	7	6		
					4	7	7		
					5	7	6		
					6	8	6		
					7	7	6		
					8	7	7		
					9	6	6		
					10	7	6		
					11	7	6		
					12	7	7		
83	7	6	100	11	1	8	6	7	8
					2	8	7		
					3	8	7		
					4	7	7		
					5	7	6		
					6	7	6		
					7	8	6		
					8	10	8		
					9	8	6		
					10	7	7		
					11	7	7		
91	7	6	100	12	1	8	6	7	7
					2	6	6		
					3	7	6		
					4	10	7		
					5	10	7		
					6	8	7		
					7	8	7		
					8	8	7		
					9	8	6		
					10	9	7		
					11	6	6		
					12	7	6		
93	7	6	100	9	1	7	6	7	7
					2	7	6		
					3	7	6		
					4	6	6		
					5	6	6		
					6	8	7		
					7	6	6		
					8	7	6		
					9	8	7		
94	7	6	100	1	1	8	6	7	6
103	7	7	100	0				7	7

TABLE 1 - SUB-AREA "F" CONCRETE-ALL FINAL SURVEY DATA
Exposure Rate Summary (Random Sample)
PAGE 4

GRID #	REPRESENTATIVE AREA (Micro-R/Hr) SURFACE	1 METER	% CONCRETE	TOTAL # OF HOT SPOTS	#	HOT SPOT DATA SURFACE	1 METER	5m x 5m GRID AVE@1m	MAX@1m
105	6	6	97	14	1	9	7	6	8
					2	7	7		
					3	7	6		
					4	7	6		
					5	11	7		
					5	7	6		
					7	10	7		
					8	8	7		
					9	9	8		
					10	7	6		
					11	8	7		
					12	10	8		
					13	7	6		
					14	9	8		
110	6	6	100	8	1	7	6	6	7
					2	7	6		
					3	8	7		
					4	7	6		
					5	7	7		
					6	7	6		
					7	6	6		
					8	8	7		
111	6	5	96	10	1	7	5	6	8
					2	6	5		
					3	9	8		
					4	8	6		
					5	7	7		
					6	7	6		
					7	10	7		
					8	7	6		
					9	8	7		
					10	7	7		
133	7	6	100	14	1	8	7	7	8
					2	9	7		
					3	6	6		
					4	7	6		
					5	8	7		
					6	8	6		
					7	8	8		
					8	7	6		
					9	7	6		
					10	8	7		
					11	8	7		
					12	8	7		
					13	8	7		
					14	8	7		
134	6	6	96	17	1	7	7	7	8
					2	7	6		
					3	6	6		
					4	9	8		
					5	9	7		
					6	8	6		
					7	10	8		
					8	8	7		
					9	9	8		
					10	8	7		
					11	6	6		
					12	9	6		
					13	9	8		
					14	7	6		
					15	7	6		
					16	12	8		
					17	7	6		

Representative Areas @ 1m

	1 m2 Minimum	Maximum	Overall Ave.
uR/h:	5	8	6

Hot Spots @ 1m

Total #	Ave. #/grid	1 m2 Minimum	1 m2 Maximum	1 m2 Ave.
251	8	5	10	7

5m x 5m Grids @ 1m

# of Grids	Area (m^2)	Ave. Minimum	Ave. Maximum	Overall Ave.	
32	794	6	8	7	uR/h

NOTES: 1. 5m x 5m grids.

TABLE 2

OF

APPENDIX II

TABLE 2 - SUB-AREA "F" CONCRETE-ALL FINAL SURVEY DATA
Exposure Rate Summary (All Sampled Grids)
PAGE 1

REPRESENTATIVE AREA (Micro-R/Hr)				TOTAL # OF	HOT SPOT DATA			5m x 5m GRID	
GRID #	SURFACE	1 METER	% CONCRETE	HOT SPOTS	#	SURFACE	1 METER	AVE@1m	MAX@1m
1	6	6	25	0				6	6
2	6	7	60	0				6	7
3	6	6	65	0				6	6
4	7	6	65	0				7	6
5	6	7	60	0				6	7
6	7	8	75	0				7	8
7	7	6	55	0				7	6
8	7	7	60	0				7	7
9	6	6	60	0				6	6
10	6	6	60	0				6	6
11	7	7	50	0				7	7
12	7	6	50	1	1	7	6	7	6
13	7	6	70	4	1 2 3 4	6 7 9 8	7 6 7 6	7	6
14	7	6	70	1	1	9	7	7	7
15	7	7	100	1	1	7	7	7	7
16	7	7	60	0				7	7
17	7	6	60	1	1	8	7	7	7
18	8	8	100	0				8	8
19	7	6	80	1	1	6	6	7	6
20	6	6	70	0				6	6
21	6	6	80	0				6	6
22	7	6	40	1	1	6	6	7	6
23	7	6	100	2	1 2	8 7	7 7	7	7
24	7	7	88	2	1 2	8 8	7 7	7	7
25	6	(5)	95	1	1	7	6	6	6
26	7	7	60	1	1	9	8	7	8
27	8	7	75	0				8	7
28	10	(8)	88	0				10	8
29	7	6	60	5	1 2 3 4 5	8 8 6 10 8	7 7 6 7 7	7	7
30	7	6	100	7	1 2 3 4 5 6 7	10 6 7 11 8 8 7	7 5 6 6 7 6 6	7	7

TABLE 2 - SUB-AREA "F" CONCRETE-ALL FINAL SURVEY DATA
Exposure Rate Summary (All Sampled Grids)
PAGE 2

REPRESENTATIVE AREA (Micro-R/Hr)				TOTAL # OF	HOT SPOT DATA			5m x 5m GRID	
GRID #	SURFACE	1 METER	% CONCRETE	HOT SPOTS	#	SURFACE	1 METER	AVE@1m	MAX@1m
31	6	5	85	1	1	6	6	6	6
32	6	7	40	2	1	7	7	6	7
					2	6	6		
33	7	7	25	0				7	7
34	6	6	20	2	1	7	6	6	7
					2	8	7		
35	6	6	93	3	1	8	6	6	6
					2	8	6		
					3	6	6		
36	6	6	100	2	1	6	5	6	6
					2	8	6		
37	5	6	100	11	1	6	6	6	7
					2	6	5		
					3	6	6		
					4	8	7		
					5	6	6		
					6	7	6		
					7	8	7		
					8	7	6		
					9	7	7		
					10	8	7		
					11	8	6		
42	8	7	100	7	1	8	7	8	7
					2	6	7		
					3	9	7		
					4	7	6		
					5	7	7		
					6	7	7		
					7	8	7		
43	6	6	100	6	1	8	7	6	7
					2	8	7		
					3	7	6		
					4	7	7		
					5	7	7		
					6	7	7		
44	6	6	100	7	1	6	6	6	7
					2	7	6		
					3	7	6		
					4	13	7		
					5	8	7		
					6	6	6		
					7	6	6		
50	6	6	100	2	1	7	6	6	7
					2	8	7		
51	6	6	100	11	1	7	6	6	7
					2	6	6		
					3	6	6		
					4	7	6		
					5	7	7		
					6	7	6		
					7	7	6		
					8	8	7		
					9	7	6		
					10	7	6		
					11	6	6		
52	7	6	100	10	1	9	8	7	10
					2	7	6		
					3	7	7		
					4	7	6		
					5	7	7		
					6	7	7		
					7	25	10		
					8	12	8		
					9	10	9		
					10	10	9		

TABLE 2 - SUB-AREA "F" CONCRETE-ALL FINAL SURVEY DATA
Exposure Rate Summary (All Sampled Grids)
PAGE 3

REPRESENTATIVE AREA (Micro-R/Hr)				TOTAL # OF	HOT SPOT DATA			5m x 5m GRID	
GRID #	SURFACE	1 METER	% CONCRETE	HOT SPOTS	#	SURFACE	1 METER	AVE@1m	MAX@1m
53	6	6	100	13	1	7	6	6	7
					2	9	7		
					3	7	6		
					4	7	7		
					5	6	7		
					6	7	7		
					7	6	6		
					8	8	7		
					9	7	6		
					10	8	7		
					11	8	6		
					12	6	6		
					13	7	7		
56	6	6	100	9	1	7	6	6	8
					2	9	7		
					3	10	8		
					4	9	7		
					5	8	7		
					6	7	6		
					7	8	7		
					8	6	6		
					9	7	7		
57	7	6	100	12	1	7	6	7	8
					2	7	6		
					3	8	7		
					4	9	6		
					5	7	7		
					6	9	8		
					7	8	7		
					8	9	8		
					9	11	8		
					10	11	8		
					11	8	7		
					12	8	7		
58	7	7	100	9	1	10	8	7	8
					2	7	7		
					3	8	7		
					4	7	6		
					5	7	6		
					6	7	7		
					7	8	7		
					8	7	6		
					9	7	6		
59	7	6	100	2	1	7	6	7	7
					2	8	7		
66	6	6	100	2	1	9	8	6	8
					2	7	7		
67	8	8	100	7	1	8	7	8	7
					2	6	7		
					3	9	7		
					4	7	6		
					5	7	6		
					6	9	7		
					7	8	7		
68	6	7	100	4	1	8	7	6	7
					2	6	6		
					3	7	6		
					4	6	6		
71	8	7	100	1	1	8	7	8	7

TABLE 2 - SUB-AREA "F" CONCRETE-ALL FINAL SURVEY DATA
Exposure Rate Summary (All Sampled Grids)
PAGE 4

REPRESENTATIVE AREA (Micro-R/Hr)				TOTAL # OF	HOT SPOT DATA			5m x 5m GRID	
GRID #	SURFACE	1 METER	% CONCRETE	HOT SPOTS	#	SURFACE	1 METER	AVE@1m	MAX@1m
74	6	6	100	7	1	6	6	6	7
					2	6	5		
					3	7	6		
					4	7	6		
					5	7	7		
					6	8	7		
					7	7	6		
75	7	6	100	5	1	6	5	7	7
					2	8	7		
					3	6	6		
					4	7	7		
					5	7	6		
81	5	6	85	9	1	6	6	6	7
					2	7	6		
					3	8	7		
					4	7	7		
					5	7	6		
					6	8	7		
					7	7	7		
					8	7	6		
					9	6	6		
82	6	6	100	12	1	7	7	6	7
					2	7	7		
					3	7	6		
					4	7	7		
					5	7	6		
					6	8	6		
					7	7	6		
					8	7	7		
					9	6	6		
					10	7	6		
					11	7	6		
					12	7	7		
83	7	6	100	11	1	8	6	7	8
					2	8	7		
					3	8	7		
					4	7	7		
					5	7	6		
					6	7	6		
					7	8	6		
					8	10	8		
					9	8	6		
					10	7	7		
					11	7	7		
91	7	6	100	12	1	8	6	7	7
					2	6	6		
					3	7	6		
					4	10	7		
					5	10	7		
					6	8	7		
					7	8	7		
					8	8	7		
					9	8	6		
					10	9	7		
					11	6	6		
					12	7	6		
93	7	6	100	9	1	7	6	7	7
					2	7	6		
					3	7	6		
					4	6	6		
					5	6	6		
					6	8	7		
					7	6	6		
					8	7	6		
					9	8	7		

TABLE 2 - SUB-AREA "F" CONCRETE-ALL FINAL SURVEY DATA
Exposure Rate Summary (All Sampled Grids)
PAGE 5

REPRESENTATIVE AREA (Micro-R/Hr)				TOTAL # OF	HOT SPOT DATA			5m x 5m GRID	
GRID #	SURFACE	1 METER	% CONCRETE	HOT SPOTS	#	SURFACE	1 METER	AVE@1m	MAX@1m
94	7	6	100	1	1	8	6	7	6
103	7	7	100	0				7	7
105	6	6	97	14	1	9	7	6	8
					2	7	7		
					3	7	6		
					4	7	6		
					5	11	7		
					5	7	6		
					7	10	7		
					8	8	7		
					9	9	8		
					10	7	6		
					11	8	7		
					12	10	8		
					13	7	6		
					14	9	8		
110	6	6	100	8	1	7	6	6	7
					2	7	6		
					3	8	7		
					4	7	6		
					5	7	7		
					6	7	6		
					7	6	6		
					8	8	7		
111	6	(5)	96	10	1	7	5	6	8
					2	6	5		
					3	9	8		
					4	8	6		
					5	7	7		
					6	7	6		
					7	10	7		
					8	7	6		
					9	8	7		
					10	7	7		
133	7	6	100	14	1	8	7	7	8
					2	9	7		
					3	6	6		
					4	7	6		
					5	8	7		
					6	8	6		
					7	8	8		
					8	7	6		
					9	7	6		
					10	8	7		
					11	8	7		
					12	8	7		
					13	8	7		
					14	8	7		

TABLE 2 - SUB-AREA "F" CONCRETE-ALL FINAL SURVEY DATA
Exposure Rate Summary (All Sampled Grids)
PAGE 6

REPRESENTATIVE AREA (Micro-R/Hr)				TOTAL # OF	HOT SPOT DATA			5m x 5m GRID	
GRID #	SURFACE	1 METER	% CONCRETE	HOT SPOTS	#	SURFACE	1 METER	AVE@1m	MAX@1m
134	6	6	96	17	1	7	7	7	8
					2	7	6		
					3	6	6		
					4	9	8		
					5	9	7		
					6	8	6		
					7	10	8		
					8	8	7		
					9	9	8		
					10	8	7		
					11	6	6		
					12	9	6		
					13	9	8		
					14	7	6		
					15	7	6		
					16	12	8		
					17	7	6		

	Representative Areas @ 1m			Hot Spots @ 1m				
	1 m2 Minimum	Maximum	Overall Ave.	Total #	Ave. #/grid	1 m2 Minimum	1 m2 Maximum	1 m2 Ave.
uR/h:	5	8	6	280	4	5	10	6

5m x 5m Grids @ 1m					
# of Grids	Area (m^2)	Ave. Minimum	Ave. Maximum	Overall Ave.	
66	1,355	6	10	6	uR/h

NOTES: 1. 5m x 5m grids.

TABLE 3

OF

APPENDIX II

TABLE 3 - SUB-AREA "F" CONCRETE RUBBLE
GROSS BETA-GAMMA RESULTS SUMMARY (Random Sample)
Page 1

REP. AREA NET READING (dpm/100cm2)				TOTAL # OF	HOT SPOT DATA (net reading)			HOT SPOT DATA (background subtracted)			5m x 5m GRID (dpm/100cm2)			AVE. CONC (pCi/g)	
GRID #	AVE	MAX	% CONCRETE	HOT SPOTS	#	AVE	MAX	#	AVE	MAX	AVE	MAX	WT. AVG.	3"	6"
30	954	979	100	7	1	23,757	57,002	1	22,957	56,202	2,504	56,202	2,504	7.2	3.8
					2	5,000	8,500	2	4,200	7,700					
					3	6,092	22,600	3	5,292	21,800					
					4	12,129	25,700	4	11,329	24,900					
					5	7,188	16,900	5	6,388	16,100					
					6	5,085	19,500	6	4,285	18,700					
					7	6,187	18,500	7	5,387	17,700					
36	636	1,243	100	2	1	4,677	5,599	1	3,877	4,799	501	29,010	501	1.4	0.8
					2	13,225	29,810	2	12,425	29,010					
37	535	979	100	11	1	9,573	35,783	1	8,773	34,983	3,411	34,983	3,411	9.8	5.2
					2	9,451	24,893	2	8,651	24,093					
					3	9,488	18,942	3	8,688	18,142					
					4	11,189	20,400	4	10,389	19,600					
					5	6,740	9,702	5	5,940	8,902					
					6	6,164	7,502	6	5,364	6,702					
					7	10,387	16,962	7	9,587	16,162					
					8	5,793	10,934	8	4,993	10,134					
					9	8,514	13,266	9	7,714	12,466					
					10	10,486	18,300	10	9,686	17,500					
					11	10,001	16,841	11	9,201	16,041					
42	1,261	1,837	100	7	1	4,940	12,200	1	4,140	11,400	1,818	22,700	1,818	5.2	2.8
					2	5,310	8,300	2	4,510	7,500					
					3	6,711	22,700	3	5,911	21,900					
					4	6,940	11,800	4	6,140	11,000					
					5	5,550	9,400	5	4,750	8,600					
					6	5,440	8,500	6	4,640	7,700					
					7	7,864	23,500	7	7,064	22,700					
43	1,810	4,796	100	6	1	26,875	46,000	1	26,075	45,200	3,822	45,200	3,822	10.9	5.8
					2	18,888	40,700	2	18,088	39,900					
					3	7,000	17,600	3	6,200	16,800					
					4	10,400	21,800	4	9,600	21,000					
					5	9,381	23,100	5	8,581	22,300					
					6	8,607	21,700	6	7,807	20,900					
44	929	1,616	100	7	1	8,288	15,000	1	7,488	14,200	2,199	33,100	2,199	6.3	3.3
					2	12,962	33,900	2	12,162	33,100					
					3	10,625	20,200	3	9,825	19,400					
					4	9,370	20,000	4	8,570	19,200					
					5	5,180	7,000	5	4,380	6,200					
					6	5,843	8,000	6	5,043	7,200					
					7	5,986	8,300	7	5,186	7,500					
50	788	891	100	2	1	6,022	13,800	1	5,222	13,000	424	17,200	424	1.2	0.6
					2	6,458	18,000	2	5,658	17,200					
51	1,646	1,991	100	11	1	22,000	54,100	1	21,200	53,300	4,867	53,300	4,867	13.9	7.4
					2	9,000	25,400	2	8,200	24,600					
					3	7,300	15,000	3	6,500	14,200					
					4	11,250	18,250	4	10,450	17,450					
					5	10,800	30,000	5	10,000	29,200					
					6	8,600	13,000	6	7,800	12,200					
					7	9,600	16,000	7	8,800	15,200					
					8	16,800	27,000	8	16,000	26,200					
					9	7,750	10,000	9	6,950	9,200					
					10	5,940	8,000	10	5,140	7,200					
					11	9,600	35,000	11	8,800	34,200					

SUB-AREA "F" CONCRETE RUBBLE
GROSS BETA-GAMMA RESULTS SUMMARY (Random Sample)
Page 2

REP. AREA NET READING (dpm/100cm2)				TOTAL # OF	HOT SPOT DATA (net reading)			HOT SPOT DATA (background subtracted)			5m x 5m GRID (dpm/100cm2)			AVE. CONC (pCi/g)	
GRID #	AVE	MAX	% CONCRETE	HOT SPOTS	#	AVE	MAX	#	AVE	MAX	AVE	MAX	WT. AVG.	3"	6"
52	755	847	100	10	1	5,883	12,600	1	5,083	11,800	3,543	85,200	3,543	10.1	5.4
					2	11,192	15,000	2	10,392	14,200					
					3	4,844	9,000	3	4,044	8,200					
					4	5,610	9,000	4	4,810	8,200					
					5	5,498	13,000	5	4,698	12,200					
					6	10,875	86,000	6	10,075	85,200					
					7	19,028	66,000	7	18,228	65,200					
					8	5,869	10,000	8	5,069	9,200					
					9	19,929	39,100	9	19,129	38,300					
					10	8,518	23,900	10	7,718	23,100					
53	1,256	1,496	100	13	1	5,391	15,000	1	4,591	14,200	3,282	29,200	3,282	9.4	5.0
					2	7,220	26,400	2	6,420	25,600					
					3	5,431	18,000	3	4,631	17,200					
					4	4,775	10,000	4	3,975	9,200					
					5	5,273	15,000	5	4,473	14,200					
					6	6,136	15,000	6	5,336	14,200					
					7	5,267	11,000	7	4,467	10,200					
					8	6,650	16,000	8	5,850	15,200					
					9	9,882	21,000	9	9,082	20,200					
					10	6,167	13,000	10	5,367	12,200					
					11	11,914	30,000	11	11,114	29,200					
					12	5,062	15,000	12	4,262	14,200					
					13	7,800	17,000	13	7,000	16,200					
56	1,201	1,947	100	9	1	4,314	12,400	1	3,514	11,600	3,304	63,800	3,304	9.4	5.0
					2	21,200	33,700	2	20,400	32,900					
					3	19,500	23,000	3	18,700	22,200					
					4	7,500	19,000	4	6,700	18,200					
					5	10,000	25,000	5	9,200	24,200					
					6	4,484	12,000	6	3,684	11,200					
					7	4,992	10,000	7	4,192	9,200					
					8	4,057	5,500	8	3,257	4,700					
					9	7,345	64,600	9	6,545	63,800					
57	1,047	2,332	100	12	1	4,882	23,000	1	4,082	22,200	3,252	50,200	3,252	9.3	4.9
					2	4,264	10,000	2	3,464	9,200					
					3	5,923	25,000	3	5,123	24,200					
					4	10,235	51,000	4	9,435	50,200					
					5	6,880	15,000	5	6,080	14,200					
					6	5,353	17,000	6	4,553	16,200					
					7	6,004	15,000	7	5,204	14,200					
					8	12,182	26,000	8	11,382	25,200					
					9	9,538	35,000	9	8,738	34,200					
					10	10,368	26,000	10	9,568	25,200					
					11	6,758	20,000	11	5,958	19,200					
					12	5,308	15,000	12	4,508	14,200					
58	999	1,353	100	9	1	5,783	22,000	1	4,983	21,200	1,511	24,200	1,511	4.3	2.3
					2	5,500	18,000	2	4,700	17,200					
					3	3,429	10,000	3	2,629	9,200					
					4	4,085	7,000	4	3,285	6,200					
					5	3,565	15,000	5	2,765	14,200					
					6	4,900	21,000	6	4,100	20,200					
					7	5,348	25,000	7	4,548	24,200					
					8	4,788	20,000	8	3,988	19,200					
					9	4,385	8,000	9	3,585	7,200					

SUB-AREA "F" CONCRETE RUBBLE
GROSS BETA-GAMMA RESULTS SUMMARY (Random Sample)

REP. AREA NET READING (dpm/100cm2)				TOTAL # OF	HOT SPOT DATA (net reading)			HOT SPOT DATA (background subtracted)			5m x 5m GRID (dpm/100cm2)			AVE. CONC (pCi/g)	
GRID #	AVE	MAX	% CONCRETE	HOT SPOTS	#	AVE	MAX	#	AVE	MAX	AVE	MAX	WT. AVG.	3"	6"
59	1,093	1,518	100	2	1	3,569	10,000	1	2,769	9,200	539	9,200	539	1.5	0.8
					2	4,760	10,000	2	3,960	9,200					
66	1,276	1,881	100	2	1	4,819	28,000	1	4,019	27,200	706	27,200	706	2.0	1.1
					2	3,472	10,000	2	2,672	9,200					
67	458	671	100	7	1	5,030	18,000	1	4,230	17,200	772	23,200	772	2.2	1.2
					2	3,267	7,000	2	2,467	6,200					
					3	7,500	24,000	3	6,700	23,200					
					4	2,889	10,000	4	2,089	9,200					
					5	4,455	8,000	5	3,655	7,200					
					6	4,913	16,000	6	4,113	15,200					
					7	3,000	10,000	7	2,200	9,200					
68	585	803	100	4	1	4,100	10,000	1	3,300	9,200	327	9,200	327	0.9	0.5
					2	3,933	10,000	2	3,133	9,200					
					3	4,848	9,000	3	4,048	8,200					
					4	3,000	7,000	4	2,200	6,200					
71	524	858	100	1	1	4,176	10,000	1	3,376	9,200	(130)	9,200	(130)	-0.4	-0.2
74	1,445	3,366	100	7	1	2,158	9,000	1	1,358	8,200	1,298	10,200	1,298	3.7	2.0
					2	3,900	10,000	2	3,100	9,200					
					3	3,750	8,000	3	2,950	7,200					
					4	4,333	10,000	4	3,533	9,200					
					5	3,666	5,000	5	2,866	4,200					
					6	4,700	11,000	6	3,900	10,200					
					7	3,923	10,000	7	3,123	9,200					
75	704	1,001	100	5	1	3,500	6,000	1	2,700	5,200	667	22,200	667	1.9	1.0
					2	4,710	23,000	2	3,910	22,200					
					3	4,437	10,000	3	3,637	9,200					
					4	4,765	10,000	4	3,965	9,200					
					5	5,174	22,000	5	4,374	21,200					
81	557	803	85	9	1	4,000	7,000	1	3,200	6,200	1,945	24,200	1,654	5.6	3.0
					2	10,074	19,000	2	9,274	18,200					
					3	5,864	25,000	3	5,064	24,200					
					4	5,067	15,000	4	4,267	14,200					
					5	4,063	12,000	5	3,263	11,200					
					6	6,925	22,000	6	6,125	21,200					
					7	6,467	16,000	7	5,667	15,200					
					8	5,056	18,000	8	4,256	17,200					
					9	4,000	15,000	9	3,200	14,200					
82	1,058	1,771	100	12	1	4,300	11,000	1	3,500	10,200	2,496	24,200	2,496	7.1	3.8
					2	4,636	17,000	2	3,836	16,200					
					3	8,370	25,000	3	7,570	24,200					
					4	11,000	20,000	4	10,200	19,200					
					5	3,900	11,000	5	3,100	10,200					
					6	4,782	15,000	6	3,982	14,200					
					7	5,640	17,000	7	4,840	16,200					
					8	4,951	15,000	8	4,151	14,200					
					9	4,888	10,000	9	4,088	9,200					
					10	5,608	22,000	10	4,808	21,200					
					11	5,000	10,000	11	4,200	9,200					
					12	5,575	20,000	12	4,775	19,200					

SUB-AREA "F" CONCRETE RUBBLE
GROSS BETA-GAMMA RESULTS SUMMARY (Random Sample)
Page 4

REP. AREA NET READING (dpm/100cm2)				TOTAL # OF	HOT SPOT DATA (net reading)			HOT SPOT DATA (background subtracted)			5m x 5m GRID (dpm/100cm2)			AVE. CONC (pCi/g)	
GRID #	AVE	MAX	% CONCRETE	HOT SPOTS	#	AVE	MAX	#	AVE	MAX	AVE	MAX	WT. AVG.	3"	6"
83	563	660	100	11	1	3,538	10,000	1	2,738	9,200	1,422	22,200	1,422	4.1	2.2
					2	4,000	15,000	2	3,200	14,200					
					3	4,806	23,000	3	4,006	22,200					
					4	4,600	12,000	4	3,800	11,200					
					5	3,222	6,000	5	2,422	5,200					
					6	4,667	15,000	6	3,867	14,200					
					7	4,500	17,000	7	3,700	16,200					
					8	4,813	15,000	8	4,013	14,200					
					9	4,842	15,000	9	4,042	14,200					
					10	4,273	7,000	10	3,473	6,200					
					11	4,400	10,000	11	3,600	9,200					
91	1,010	2,387	100	12	1	5,000	17,000	1	4,200	16,200	2,381	50,200	2,381	6.8	3.6
					2	3,769	19,000	2	2,969	18,200					
					3	4,800	15,000	3	4,000	14,200					
					4	4,809	26,000	4	4,009	25,200					
					5	7,868	51,000	5	7,068	50,200					
					6	4,955	12,000	6	4,155	11,200					
					7	8,326	26,000	7	7,526	25,200					
					8	6,786	27,000	8	5,986	26,200					
					9	4,583	11,000	9	3,783	10,200					
					10	5,258	16,000	10	4,458	15,200					
					11	4,333	13,000	11	3,533	12,200					
					12	5,900	25,000	12	5,100	24,200					
93	2,446	3,146	100	9	1	7,462	15,000	1	6,662	14,200	2,821	19,200	2,821	8.1	4.3
					2	6,682	17,000	2	5,882	16,200					
					3	7,240	18,000	3	6,440	17,200					
					4	4,793	10,000	4	3,993	9,200					
					5	3,500	8,000	5	2,700	7,200					
					6	8,333	20,000	6	7,533	19,200					
					7	3,636	13,000	7	2,836	12,200					
					8	5,550	20,000	8	4,750	19,200					
					9	4,182	8,000	9	3,382	7,200					
94	546	803	100	1	1	4,500	57,000	1	3,700	56,200	(96)	56,200	(96)	-0.3	-0.1
103	860	1,353	100	0							60	1,353	60	0.2	0.1
105	1,129	2,200	97	14	1	5,000	13,000	1	4,200	12,200	2,617	54,200	2,538	7.5	4.0
					2	3,077	10,000	2	2,277	9,200					
					3	4,182	7,000	3	3,382	6,200					
					4	4,250	8,000	4	3,450	7,200					
					5	5,000	15,000	5	4,200	14,200					
					5	3,143	6,000	5	2,343	5,200					
					7	8,921	55,000	7	8,121	54,200					
					8	7,929	25,000	8	7,129	24,200					
					9	5,815	25,000	9	5,015	24,200					
					10	3,917	7,000	10	3,117	6,200					
					11	4,361	15,000	11	3,561	14,200					
					12	5,083	13,000	12	4,283	12,200					
					13	5,000	17,000	13	4,200	16,200					
					14	5,600	15,000	14	4,800	14,200					
110	1,927	2,827	100	8	1	3,666	7,000	1	2,866	6,200	1,958	16,200	1,958	5.6	3.0
					2	4,600	17,000	2	3,800	16,200					
					3	5,032	12,000	3	4,232	11,200					
					4	4,000	7,000	4	3,200	6,200					
					5	4,875	13,000	5	4,075	12,200					
					6	4,200	6,000	6	3,400	5,200					
					7	5,077	11,000	7	4,277	10,200					
					8	4,750	17,000	8	3,950	16,200					

SUB-AREA "F" CONCRETE RUBBLE
GROSS BETA-GAMMA RESULTS SUMMARY (Random Sample)

REP. AREA NET READING (dpm/100cm2)				TOTAL # OF	HOT SPOT DATA (net reading)			HOT SPOT DATA (background subtracted)			5m x 5m GRID (dpm/100cm2)			AVE. CONC (pCi/g)	
GRID #	AVE	MAX	% CONCRETE	HOT SPOTS	#	AVE	MAX	#	AVE	MAX	AVE	MAX	WT. AVG.	3"	6"
111	708	968	96	10	1	4,700	10,000	1	3,900	9,200	1,425	16,200	1,368	4.1	2.2
					2	3,667	8,000	2	2,867	7,200					
					3	3,200	8,000	3	2,400	7,200					
					4	4,357	15,000	4	3,557	14,200					
					5	4,500	15,000	5	3,700	14,200					
					6	3,333	6,000	6	2,533	5,200					
					7	6,000	17,000	7	5,200	16,200					
					8	4,941	9,000	8	4,141	8,200					
					9	4,864	13,000	9	4,064	12,200					
					10	3,929	7,000	10	3,129	6,200					
133	867	1092	100	14	1	4,846	11,000	1	4,046	10,200	2,001	15,200		5.7	3.0
					2	4,333	6,000	2	3,533	5,200					
					3	3,214	5,000	3	2,414	4,200					
					4	4,125	8,000	4	3,325	7,200					
					5	4,125	8,000	5	3,325	7,200					
					6	5,750	12,000	6	4,950	11,200					
					7	4,429	8,000	7	3,629	7,200					
					8	4,875	11,000	8	4,075	10,200					
					9	3,333	6,000	9	2,533	5,200					
					10	2,625	15,000	10	1,825	14,200					
					11	4,000	7,000	11	3,200	6,200					
					12	5,350	10,000	12	4,550	9,200					
					13	5,080	10,000	13	4,280	9,200					
					14	4,400	16,000	14	3,600	15,200					
134	1056	1705	96	17	1	4,200	6,000	1	3,400	5,200	3,063	24,200		8.8	4.7
					2	4,190	11,000	2	3,390	10,200					
					3	6,217	25,000	3	5,417	24,200					
					4	5,852	11,000	4	5,052	10,200					
					5	5,889	15,000	5	5,089	14,200					
					6	5,167	14,000	6	4,367	13,200					
					7	5,409	24,000	7	4,609	23,200					
					8	5,296	12,000	8	4,496	11,200					
					9	3,600	5,000	9	2,800	4,200					
					10	4,300	10,000	10	3,500	9,200					
					11	4,565	11,000	11	3,765	10,200					
					12	7,138	23,000	12	6,338	22,200					
					13	5,409	13,000	13	4,609	12,200					
					14	4,857	11,000	14	4,057	10,200					
					15	4,437	6,000	15	3,637	5,200					
					16	4,300	6,000	16	3,500	5,200					
					17	4,500	8,000	17	3,700	7,200					

DATA SUMMARY

	Representative Areas (background subtracted)			Hot Spots (background subtracted)						Maximum pCi/g	
	1 m2 Minimum	Maximum	Overall Ave.	Total #	Ave. #/grid	1 m2 Ave. Min.	1 m2 Ave. Max.	1 m2 Ave.		3"	6"
dpm/100cm2:	(800)	1,646	270	251	8	0	26,075	5,555	dpm/100cm2	13.9	7.4
pCi/g U (6" ave.):	-1.2	2.5	0.4			0.0	39.6	8.4	pCi/g Total U (6" ave)		

5m x 5m Grids (background subtracted)					
# of Grids	Area (m^2)	Ave. Minimum	Ave. Maximum	Overall Ave.	
32	794	(130)	4,867	1,975	dpm/100cm2
		-0.2	7.4	2.9	pCi/g Total U (6" ave)

NOTES:
1. Random sample consisted of 30 5m x 5m grids.
2. Random sample taken from areas containing at least 85% concrete.
3. Gross beta background in concrete = 800 dpm/100cm2 (net).
4. Results reported in units of dpm/100cm2 unless otherwise indicated.

TABLE 4

OF

APPENDIX II

TABLE 4 - SUB-AREA "F" CONCRETE-ALL FINAL SURVEY DATA
GROSS BETA RESULTS SUMMARY (All Sampled Grids)
PAGE 1

REP. AREA NET READING (dpm/100cm2)				TOTAL # OF	HOT SPOT DATA (net reading)			HOT SPOT DATA (background subtracted)			5m x 5m GRID (dpm/100cm2)		AVE. CONC (pCi/g)	
GRID #	AVE	MAX	% CONCRETE	HOT SPOTS	#	AVE	MAX	#	AVE	MAX	AVE	MAX	3"	6"
1	440	473	25	0							(360)	(327)	-1.0	-0.5
2	1342	1661	60	0							542	861	1.5	0.8
3	270	440	65	0							(530)	(360)	-1.5	-0.8
4	792	3993	65	0							(8)	3,193	-0.0	-0.0
5	524	836	60	0							(276)	36	-0.8	-0.4
6	1045	1650	75	0							245	850	0.7	0.4
7	278	1584	55	0							(522)	784	-1.5	-0.8
8	924	1397	60	0							124	597	0.4	0.2
9	557	935	60	0							(243)	135	-0.7	-0.4
10	1911	4967	60	0							1,111	4,167	3.2	1.7
11	1769	2090	50	0							969	1,290	2.8	1.5
12	876	1793	50	1	1	3348	7425	1	2,548	6,625	274	6,625	0.8	0.4
13	2266	3454	70	4	1	4506	8833	1	3,706	8,033	2,049	11,366	5.9	3.1
					2	4829	7492	2	4,029	6,692				
					3	5016	12166	3	4,216	11,366				
					4	4917	6611	4	4,117	5,811				
14	1025	2332	70	1	1	2215	7117	1	1,415	6,317	293	6,317	0.8	0.4
15	1118	1760	100	1	1	3038	8635	1	2,238	7,835	395	7,835	1.1	0.6
16	1203	3190	60	0							403	2,390	1.2	0.6
17	1619	3069	60	1	1	2631	9625	1	1,831	8,825	886	8,825	2.5	1.3
18	570	715	100	0							(230)	(85)	-0.7	-0.3
19	1535	3454	80	1	1	1734	7230	1	934	6,430	745	6,430	2.1	1.1
20	508	726	70	0							(292)	(74)	-0.8	-0.4
21	1199	3212	80	0							399	2,412	1.1	0.6
22	694	1023	40	1	1	3625	5907	1	2,825	5,107	187	5,107	0.5	0.3
23	671	1001	100	2	1	1729	5126	1	929	4,326	51	15,744	0.1	0.1
					2	4123	16544	2	3,323	15,744				
24	959	1287	88	2	1	3863	12837	1	3,063	12,037	462	13,808	1.3	0.7
					2	4730	14608	2	3,930	13,808				
25	1786	2970	95	1	1	3412	7920	1	2,612	7,120	1,054	7,120	3.0	1.6
26	1892	3773	60	1	1	3188	6314	1	2,388	5,514	1,178	5,514	3.4	1.8
27	1582	1640	75	0							782	840	2.2	1.2
28	1592	1614	88	0							792	814	2.3	1.2

TABLE 4 - SUB-AREA "F" CONCRETE-ALL FINAL SURVEY DATA
GROSS BETA RESULTS SUMMARY (All Sampled Grids)
PAGE 2

REP. AREA NET READING (dpm/100cm2)				TOTAL # OF	HOT SPOT DATA (net reading)			HOT SPOT DATA (background subtracted)			5m x 5m GRID (dpm/100cm2)		AVE. CONC (pCi/g)	
GRID #	AVE	MAX	% CONCRETE	HOT SPOTS	#	AVE	MAX	#	AVE	MAX	AVE	MAX	3"	6"
29	1195	2156	60	5	1	9332	21703	1	8,532	20,903	2,436	26,100	7.0	3.7
					2	3863	13211	2	3,063	12,411				
					3	5666	15000	3	4,866	14,200				
					4	12909	26900	4	12,109	26,100				
					5	4815	8700	5	4,015	7,900				
30	954	979	100	7	1	23,757	57,002	1	22,957	56,202	2,504	56,202	7.2	3.8
					2	5,000	8,500	2	4,200	7,700				
					3	6,092	22,600	3	5,292	21,800				
					4	12,129	25,700	4	11,329	24,900				
					5	7,188	16,900	5	6,388	16,100				
					6	5,085	19,500	6	4,285	18,700				
					7	6,187	18,500	7	5,387	17,700				
31	1,230	1,452	85	1	1	9,820	21,100	1	9,020	20,300	834	20,300	2.4	1.3
32	609	1,012	40	2	1	5,903	10,582	1	5,103	9,782	738	9,782	2.1	1.1
					2	4,600	9,262	2	3,800	8,462				
33	889	1,386	25	0							89	586	0.3	0.1
34	766	979	20	2	1	1,200	5,700	1	400	4,900	1,055	9,881	3.0	1.6
					2	5,778	10,681	2	4,978	9,881				
35	711	2,079	93	3	1	15,128	34,200	1	14,328	33,400	1,913	62,659	5.5	2.9
					2	8,975	24,739	2	8,175	23,939				
					3	24,585	63,459	3	23,785	62,659				
36	636	1,243	100	2	1	4,677	5,599	1	3,877	4,799	501	29,010	1.4	0.8
					2	13,225	29,810	2	12,425	29,010				
37	535	979	100	11	1	9,573	35,783	1	8,773	34,983	3,411	34,983	9.8	5.2
					2	9,451	24,893	2	8,651	24,093				
					3	9,488	18,942	3	8,688	18,142				
					4	11,189	20,400	4	10,389	19,600				
					5	6,740	9,702	5	5,940	8,902				
					6	6,164	7,502	6	5,364	6,702				
					7	10,387	16,962	7	9,587	16,162				
					8	5,793	10,934	8	4,993	10,134				
					9	8,514	13,266	9	7,714	12,466				
					10	10,486	18,300	10	9,686	17,500				
					11	10,001	16,841	11	9,201	16,041				
42	1,261	1,837	100	7	1	4,940	12,200	1	4,140	11,400	1,818	22,700	5.2	2.8
					2	5,310	8,300	2	4,510	7,500				
					3	6,711	22,700	3	5,911	21,900				
					4	6,940	11,800	4	6,140	11,000				
					5	5,550	9,400	5	4,750	8,600				
					6	5,440	8,500	6	4,640	7,700				
					7	7,864	23,500	7	7,064	22,700				
43	1,810	4,796	100	6	1	26,875	46,000	1	26,075	45,200	3,822	45,200	10.9	5.8
					2	18,888	40,700	2	18,088	39,900				
					3	7,000	17,600	3	6,200	16,800				
					4	10,400	21,800	4	9,600	21,000				
					5	9,381	23,100	5	8,581	22,300				
					6	8,607	21,700	6	7,807	20,900				

TABLE 4 - SUB-AREA "F" CONCRETE-ALL FINAL SURVEY DATA
GROSS BETA RESULTS SUMMARY (All Sampled Grids)
PAGE 3

REP. AREA NET READING (dpm/100cm2)				TOTAL # OF	HOT SPOT DATA (net reading)			HOT SPOT DATA (background subtracted)			5m x 5m GRID (dpm/100cm2)		AVE. CONC (pCi/g)	
GRID #	AVE	MAX	% CONCRETE	HOT SPOTS	#	AVE	MAX	#	AVE	MAX	AVE	MAX	3"	6"
44	929	1,616	100	7	1	8,288	15,000	1	7,488	14,200	2,199	33,100	6.3	3.3
					2	12,962	33,900	2	12,162	33,100				
					3	10,625	20,200	3	9,825	19,400				
					4	9,370	20,000	4	8,570	19,200				
					5	5,180	7,000	5	4,380	6,200				
					6	5,843	8,000	6	5,043	7,200				
					7	5,986	8,300	7	5,186	7,500				
50	788	891	100	2	1	6,022	13,800	1	5,222	13,000	424	17,200	1.2	0.6
					2	6,458	18,000	2	5,658	17,200				
51	1,646	1,991	100	11	1	22,000	54,100	1	21,200	53,300	4,867	53,300	13.9	7.4
					2	9,000	25,400	2	8,200	24,600				
					3	7,300	15,000	3	6,500	14,200				
					4	11,250	18,250	4	10,450	17,450				
					5	10,800	30,000	5	10,000	29,200				
					6	8,600	13,000	6	7,800	12,200				
					7	9,600	16,000	7	8,800	15,200				
					8	16,800	27,000	8	16,000	26,200				
					9	7,750	10,000	9	6,950	9,200				
					10	5,940	8,000	10	5,140	7,200				
					11	9,600	35,000	11	8,800	34,200				
52	755	847	100	10	1	5,883	12,600	1	5,083	11,800	3,543	85,200	10.1	5.4
					2	11,192	15,000	2	10,392	14,200				
					3	4,844	9,000	3	4,044	8,200				
					4	5,610	9,000	4	4,810	8,200				
					5	5,498	13,000	5	4,698	12,200				
					6	10,875	86,000	6	10,075	85,200				
					7	19,028	66,000	7	18,228	65,200				
					8	5,869	10,000	8	5,069	9,200				
					9	19,929	39,100	9	19,129	38,300				
					10	8,518	23,900	10	7,718	23,100				
53	1,256	1,496	100	13	1	5,391	15,000	1	4,591	14,200	3,282	29,200	9.4	5.0
					2	7,220	26,400	2	6,420	25,600				
					3	5,431	18,000	3	4,631	17,200				
					4	4,775	10,000	4	3,975	9,200				
					5	5,273	15,000	5	4,473	14,200				
					6	6,136	15,000	6	5,336	14,200				
					7	5,267	11,000	7	4,467	10,200				
					8	6,650	16,000	8	5,850	15,200				
					9	9,882	21,000	9	9,082	20,200				
					10	6,167	13,000	10	5,367	12,200				
					11	11,914	30,000	11	11,114	29,200				
					12	5,062	15,000	12	4,262	14,200				
					13	7,800	17,000	13	7,000	16,200				
56	1,201	1,947	100	9	1	4,314	12,400	1	3,514	11,600	3,304	63,800	9.4	5.0
					2	21,200	33,700	2	20,400	32,900				
					3	19,500	23,000	3	18,700	22,200				
					4	7,500	19,000	4	6,700	18,200				
					5	10,000	25,000	5	9,200	24,200				
					6	4,484	12,000	6	3,684	11,200				
					7	4,992	10,000	7	4,192	9,200				
					8	4,057	5,500	8	3,257	4,700				
					9	7,345	64,600	9	6,545	63,800				

TABLE 4 - SUB-AREA "F" CONCRETE-ALL FINAL SURVEY DATA
GROSS BETA RESULTS SUMMARY (All Sampled Grids)
PAGE 4

REP. AREA NET READING (dpm/100cm2)				TOTAL # OF	HOT SPOT DATA (net reading)			HOT SPOT DATA (background subtracted)			5m x 5m GRID (dpm/100cm2)		AVE. CONC (pCi/g)	
GRID #	AVE	MAX	% CONCRETE	HOT SPOTS	#	AVE	MAX	#	AVE	MAX	AVE	MAX	3"	6"
57	1,047	2,332	100	12	1	4,882	23,000	1	4,082	22,200	3,252	50,200	9.3	4.9
					2	4,264	10,000	2	3,464	9,200				
					3	5,923	25,000	3	5,123	24,200				
					4	10,235	51,000	4	9,435	50,200				
					5	6,880	15,000	5	6,080	14,200				
					6	5,353	17,000	6	4,553	16,200				
					7	6,004	15,000	7	5,204	14,200				
					8	12,182	26,000	8	11,382	25,200				
					9	9,538	35,000	9	8,738	34,200				
					10	10,368	26,000	10	9,568	25,200				
					11	6,758	20,000	11	5,958	19,200				
					12	5,308	15,000	12	4,508	14,200				
58	999	1,353	100	9	1	5,783	22,000	1	4,983	21,200	1,511	24,200	4.3	2.3
					2	5,500	18,000	2	4,700	17,200				
					3	3,429	10,000	3	2,629	9,200				
					4	4,085	7,000	4	3,285	6,200				
					5	3,565	15,000	5	2,765	14,200				
					6	4,900	21,000	6	4,100	20,200				
					7	5,348	25,000	7	4,548	24,200				
					8	4,788	20,000	8	3,988	19,200				
					9	4,385	8,000	9	3,585	7,200				
59	1,093	1,518	100	2	1	3,569	10,000	1	2,769	9,200	539	9,200	1.5	0.8
					2	4,760	10,000	2	3,960	9,200				
66	1,276	1,881	100	2	1	4,819	28,000	1	4,019	27,200	706	27,200	2.0	1.1
					2	3,472	10,000	2	2,672	9,200				
67	458	671	100	7	1	5,030	18,000	1	4,230	17,200	772	23,200	2.2	1.2
					2	3,267	7,000	2	2,467	6,200				
					3	7,500	24,000	3	6,700	23,200				
					4	2,889	10,000	4	2,089	9,200				
					5	4,455	8,000	5	3,655	7,200				
					6	4,913	16,000	6	4,113	15,200				
					7	3,000	10,000	7	2,200	9,200				
68	585	803	100	4	1	4,100	10,000	1	3,300	9,200	327	9,200	0.9	0.5
					2	3,933	10,000	2	3,133	9,200				
					3	4,848	9,000	3	4,048	8,200				
					4	3,000	7,000	4	2,200	6,200				
71	524	858	100	1	1	4,176	10,000	1	3,376	9,200	(130)	9,200	-0.4	-0.2
74	1,445	3,366	100	7	1	2,158	9,000	1	1,358	8,200	1,298	10,200	3.7	2.0
					2	3,900	10,000	2	3,100	9,200				
					3	3,750	8,000	3	2,950	7,200				
					4	4,333	10,000	4	3,533	9,200				
					5	3,666	5,000	5	2,866	4,200				
					6	4,700	11,000	6	3,900	10,200				
					7	3,923	10,000	7	3,123	9,200				
75	704	1,001	100	5	1	3,500	6,000	1	2,700	5,200	667	22,200	1.9	1.0
					2	4,710	23,000	2	3,910	22,200				
					3	4,437	10,000	3	3,637	9,200				
					4	4,765	10,000	4	3,965	9,200				
					5	5,174	22,000	5	4,374	21,200				

TABLE 4 - SUB-AREA "F" CONCRETE-ALL FINAL SURVEY DATA
GROSS BETA RESULTS SUMMARY (All Sampled Grids)
PAGE 5

REP. AREA NET READING (dpm/100cm2)				TOTAL # OF	HOT SPOT DATA (net reading)			HOT SPOT DATA (background subtracted)			5m x 5m GRID (dpm/100cm2)		AVE. CONC (pCi/g)	
GRID #	AVE	MAX	% CONCRETE	HOT SPOTS	#	AVE	MAX	#	AVE	MAX	AVE	MAX	3"	6"
81	557	803	85	9	1	4,000	7,000	1	3,200	6,200	1,945	24,200	5.6	3.0
					2	10,074	19,000	2	9,274	18,200				
					3	5,864	25,000	3	5,064	24,200				
					4	5,067	15,000	4	4,267	14,200				
					5	4,063	12,000	5	3,263	11,200				
					6	6,925	22,000	6	6,125	21,200				
					7	6,467	16,000	7	5,667	15,200				
					8	5,056	18,000	8	4,256	17,200				
					9	4,000	15,000	9	3,200	14,200				
82	1,058	1,771	100	12	1	4,300	11,000	1	3,500	10,200	2,496	24,200	7.1	3.8
					2	4,636	17,000	2	3,836	16,200				
					3	8,370	25,000	3	7,570	24,200				
					4	11,000	20,000	4	10,200	19,200				
					5	3,900	11,000	5	3,100	10,200				
					6	4,782	15,000	6	3,982	14,200				
					7	5,640	17,000	7	4,840	16,200				
					8	4,951	15,000	8	4,151	14,200				
					9	4,888	10,000	9	4,088	9,200				
					10	5,608	22,000	10	4,808	21,200				
					11	5,000	10,000	11	4,200	9,200				
					12	5,575	20,000	12	4,775	19,200				
83	563	660	100	11	1	3,538	10,000	1	2,738	9,200	1,422	22,200	4.1	2.2
					2	4,000	15,000	2	3,200	14,200				
					3	4,806	23,000	3	4,006	22,200				
					4	4,600	12,000	4	3,800	11,200				
					5	3,222	6,000	5	2,422	5,200				
					6	4,667	15,000	6	3,867	14,200				
					7	4,500	17,000	7	3,700	16,200				
					8	4,813	15,000	8	4,013	14,200				
					9	4,842	15,000	9	4,042	14,200				
					10	4,273	7,000	10	3,473	6,200				
					11	4,400	10,000	11	3,600	9,200				
91	1,010	2,387	100	12	1	5,000	17,000	1	4,200	16,200	2,381	50,200	6.8	3.6
					2	3,769	19,000	2	2,969	18,200				
					3	4,800	15,000	3	4,000	14,200				
					4	4,809	26,000	4	4,009	25,200				
					5	7,868	51,000	5	7,068	50,200				
					6	4,955	12,000	6	4,155	11,200				
					7	8,326	26,000	7	7,526	25,200				
					8	6,786	27,000	8	5,986	26,200				
					9	4,583	11,000	9	3,783	10,200				
					10	5,258	16,000	10	4,458	15,200				
					11	4,333	13,000	11	3,533	12,200				
					12	5,900	25,000	12	5,100	24,200				
93	2,446	3,146	100	9	1	7,462	15,000	1	6,662	14,200	2,821	19,200	8.1	4.3
					2	6,682	17,000	2	5,882	16,200				
					3	7,240	18,000	3	6,440	17,200				
					4	4,793	10,000	4	3,993	9,200				
					5	3,500	8,000	5	2,700	7,200				
					6	8,333	20,000	6	7,533	19,200				
					7	3,636	13,000	7	2,836	12,200				
					8	5,550	20,000	8	4,750	19,200				
					9	4,182	8,000	9	3,382	7,200				

TABLE 4 - SUB-AREA "F" CONCRETE-ALL FINAL SURVEY DATA
GROSS BETA RESULTS SUMMARY (All Sampled Grids)
PAGE 6

REP. AREA NET READING (dpm/100cm2)				TOTAL # OF	HOT SPOT DATA (net reading)			HOT SPOT DATA (background subtracted)			5m x 5m GRID (dpm/100cm2)		AVE. CONC (pCi/g)	
GRID #	AVE	MAX	% CONCRETE	HOT SPOTS	#	AVE	MAX	#	AVE	MAX	AVE	MAX	3"	6"
94	546	803	100	1	1	4,500	57,000	1	3,700	56,200	(96)	56,200	-0.3	-0.1
103	860	1,353	100	0							60	1,353	0.2	0.1
105	1,129	2,200	97	14	1	5,000	13,000	1	4,200	12,200	2,617	54,200	7.5	4.0
					2	3,077	10,000	2	2,277	9,200				
					3	4,182	7,000	3	3,382	6,200				
					4	4,250	8,000	4	3,450	7,200				
					5	5,000	15,000	5	4,200	14,200				
					5	3,143	6,000	5	2,343	5,200				
					7	8,921	55,000	7	8,121	54,200				
					8	7,929	25,000	8	7,129	24,200				
					9	5,815	25,000	9	5,015	24,200				
					10	3,917	7,000	10	3,117	6,200				
					11	4,361	15,000	11	3,561	14,200				
					12	5,083	13,000	12	4,283	12,200				
					13	5,000	17,000	13	4,200	16,200				
					14	5,600	15,000	14	4,800	14,200				
110	1,927	2,827	100	8	1	3,666	7,000	1	2,866	6,200	1,958	16,200	5.6	3.0
					2	4,600	17,000	2	3,800	16,200				
					3	5,032	12,000	3	4,232	11,200				
					4	4,000	7,000	4	3,200	6,200				
					5	4,875	13,000	5	4,075	12,200				
					6	4,200	6,000	6	3,400	5,200				
					7	5,077	11,000	7	4,277	10,200				
					8	4,750	17,000	8	3,950	16,200				
111	708	968	96	10	1	4,700	10,000	1	3,900	9,200	1,425	16,200	4.1	2.2
					2	3,667	8,000	2	2,867	7,200				
					3	3,200	8,000	3	2,400	7,200				
					4	4,357	15,000	4	3,557	14,200				
					5	4,500	15,000	5	3,700	14,200				
					6	3,333	6,000	6	2,533	5,200				
					7	6,000	17,000	7	5,200	16,200				
					8	4,941	9,000	8	4,141	8,200				
					9	4,864	13,000	9	4,064	12,200				
					10	3,929	7,000	10	3,129	6,200				
133	867	1092	100	14	1	4,846	11,000	1	4,046	10,200	2,001	15,200	5.7	3.0
					2	4,333	6,000	2	3,533	5,200				
					3	3,214	5,000	3	2,414	4,200				
					4	4,125	8,000	4	3,325	7,200				
					5	4,125	8,000	5	3,325	7,200				
					6	5,750	12,000	6	4,950	11,200				
					7	4,429	8,000	7	3,629	7,200				
					8	4,875	11,000	8	4,075	10,200				
					9	3,333	6,000	9	2,533	5,200				
					10	2,625	15,000	10	1,825	14,200				
					11	4,000	7,000	11	3,200	6,200				
					12	5,350	10,000	12	4,550	9,200				
					13	5,080	10,000	13	4,280	9,200				
					14	4,400	16,000	14	3,600	15,200				

TABLE 4 - SUB-AREA "F" CONCRETE-ALL FINAL SURVEY DATA
GROSS BETA RESULTS SUMMARY (All Sampled Grids)
PAGE 7

REP. AREA NET READING (dpm/100cm2)				TOTAL # OF	HOT SPOT DATA (net reading)			HOT SPOT DATA (background subtracted)			5m x 5m GRID (dpm/100cm2)		AVE. CONC (pCi/g)	
GRID #	AVE	MAX	% CONCRETE	HOT SPOTS	#	AVE	MAX	#	AVE	MAX	AVE	MAX	3"	6"
134	1056	1705	96	17	1	4,200	6,000	1	3,400	5,200	3,063	24,200	8.8	4.7
					2	4,190	11,000	2	3,390	10,200				
					3	6,217	25,000	3	5,417	24,200				
					4	5,852	11,000	4	5,052	10,200				
					5	5,889	15,000	5	5,089	14,200				
					6	5,167	14,000	6	4,367	13,200				
					7	5,409	24,000	7	4,609	23,200				
					8	5,296	12,000	8	4,496	11,200				
					9	3,600	5,000	9	2,800	4,200				
					10	4,300	10,000	10	3,500	9,200				
					11	4,565	11,000	11	3,765	10,200				
					12	7,138	23,000	12	6,338	22,200				
					13	5,409	13,000	13	4,609	12,200				
					14	4,857	11,000	14	4,057	10,200				
					15	4,437	6,000	15	3,637	5,200				
					16	4,300	6,000	16	3,500	5,200				
					17	4,500	8,000	17	3,700	7,200				

	Representative Areas (background subtracted)			Hot Spots (background subtracted)						Maximum pCi/g	
	1 m2 Minimum	Maximum	Overall Ave.	Total #	Ave. #/grid	1 m2 Minimum	1 m2 Maximum	1 m2 Ave.		3" Ave.	6" Ave.
dpm/100cm2:	(800)	1,646	84	280	4	0	26,075	(5,276)	dpm/100cm2	13.9	7.4
pCi/g U (6" ave.):	-1.2	2.5	0.1			0.0	39.6	8.0	pCi/g Total U (6" ave)		

5m x 5m Grids (background subtracted)					
# of Grids	Area (m^2)	Ave. Minimum	Ave. Maximum	Overall Ave.	
66	1,355	(530)	4,867	1,186	dpm/100cm2
		-0.8	(7.4)	(1.8)	pCi/g Total U (6" ave)

NOTES:
1. 5m x 5m grids.
2. Gross beta background in concrete = 800 dpm/100cm2 (net).
3. Results reported in units of dpm/100cm2 unless otherwise indicated.

TABLE 5

OF

APPENDIX II

TABLE 5 - SUB-AREA "F" CONCRETE-ALL FINAL SURVEY DATA
GROSS ALPHA RESULTS SUMMARY (All Sampled Grids)
PAGE 1

REP. AREA NET READING (dpm/100cm2)				TOTAL # OF	HOT SPOT DATA (gross reading)			5m x 5m GRID (dpm/100cm2)		
GRID #	AVE	MAX	% CONCRETE	HOT SPOTS	#	AVE	MAX	AVE	MAX	WT. AVG.
30	200	320	100	7	1	160	320	334	6,400	334
					2	60	240			
					3	2,280	4,800			
					4	1,700	6,400			
					5	400	2,000			
					6	80	400			
					7	80	320			
36	15	60	100	2	1	0	0	18	800	18
					2	100	800			
37	80	160	100	11	1	420	800	150	1,600	150
					2	340	800			
					3	240	640			
					4	540	800			
					5	160	400			
					6	60	160			
					7	100	240			
					8	120	320			
					9	220	240			
					10	180	560			
					11	240	1,600			
42	60	160	100	7	1	140	400	82	640	82
					2	248	640			
					3	240	400			
					4	40	80			
					5	100	240			
					6	10	40			
					7	200	400			
43	10	40	100	6	1	500	800	79	960	79
					2	500	960			
					3	300	640			
					4	120	440			
					5	200	760			
					6	160	640			
44	10	40	100	7	1	415	640	175	4,000	175
					2	480	2,000			
					3	875	2,000			
					4	1,200	4,000			
					5	560	1,600			
					6	500	800			
					7	160	400			
50	5	40	100	2	1	260	600	30	1,360	30
					2	380	1,360			
51	10	60	100	11	1	480	1,600	145	2,100	145
					2	150	400			
					3	40	160			
					4	140	400			
					5	220	800			
					6	180	400			
					7	180	480			
					8	1,500	2,100			
					9	320	880			
					10	100	160			
					11	165	320			
52	160	320	100	10	1	540	1,600	641	16,000	641
					2	360	1,040			
					3	300	1,040			
					4	220	400			
					5	240	560			
					6	1,100	4,000			
					7	9,000	16,000			
					8	880	3,200			
					9	420	480			
					10	560	1,280			
53	10	60	100	13	1	400	800	250	4,000	250
					2	1,440	4,000			
					3	720	1,280			
					4	340	640			
					5	180	320			
					6	160	320			
					7	340	400			
					8	740	1,280			
					9	410	1,200			
					10	480	800			
					11	600	800			
					12	160	320			
					13	160	600			

TABLE 5 - SUB-AREA "F" CONCRETE-ALL FINAL SURVEY DATA
GROSS ALPHA RESULTS SUMMARY (All Sampled Grids)
PAGE 2

REP. AREA NET READING (dpm/100cm2)				TOTAL # OF	HOT SPOT DATA (gross reading)			5m x 5m GRID (dpm/100cm2)		
GRID #	AVE	MAX	% CONCRETE	HOT SPOTS	#	AVE	MAX	AVE	MAX	WT. AVG.
56	80	160	100	9	1	200	800	363	15,600	363
					2	630	1,040			
					3	840	1,760			
					4	380	640			
					5	800	1,120			
					6	4,000	15,600			
					7	220	320			
					8	100	160			
					9	620	1,280			
57	240	720	100	12	1	580	960	311	4,000	311
					2	220	480			
					3	180	480			
					4	160	240			
					5	340	800			
					6	120	320			
					7	180	320			
					8	480	880			
					9	160	240			
					10	540	800			
					11	220	400			
					12	1,470	4,000			
58	280	480	100	9	1	580	1,440	294	1,440	294
					2	180	240			
					3	380	640			
					4	100	240			
					5	500	720			
					6	140	240			
					7	100	160			
					8	700	880			
					9	180	480			
59	70	160	100	2	1	200	320	73	320	73
					2	10	40			
66	10	80	100	2	1	560	800	42	800	42
					2	270	640			
67	40	160	100	7	1	60	160	101	1,240	101
					2	520	1,040			
					3	170	320			
					4	120	240			
					5	380	400			
					6	530	1,240			
					7	20	80			
68	350	1,360	100	4	1	220	560	331	880	331
					2	140	240			
					3	240	400			
					4	320	880			
71	140	560	100	1	1	1,280	4,000	186	4,000	186
74	10	40	100	7	1	960	3,200	72	3,200	72
					2	60	240			
					3	280	640			
					4	240	640			
					5	10	40			
					6	60	240			
					7	20	80			
75	20	80	100	5	1	10	40	29	480	29
					2	80	160			
					3	60	180			
					4	10	40			
					5	160	480			
81	100	240	85	9	1	150	320	203	2,200	172
					2	680	1,600			
					3	640	1,040			
					4	220	480			
					5	100	240			
					6	20	80			
					7	322	640			
					8	220	320			
					9	730	2,200			

TABLE 5 - SUB-AREA "F" CONCRETE-ALL FINAL SURVEY DATA
GROSS ALPHA RESULTS SUMMARY (All Sampled Grids)
PAGE 3

REP. AREA NET READING (dpm/100cm2)				TOTAL # OF	HOT SPOT DATA (gross reading)			5m x 5m GRID (dpm/100cm2)		
GRID #	AVE	MAX	% CONCRETE	HOT SPOTS	#	AVE	MAX	AVE	MAX	WT. AVG.
82	20	80	100	12	1	300	1,320	158	4,320	158
					2	280	640			
					3	280	480			
					4	160	4,320			
					5	200	400			
					6	805	2,100			
					7	420	1,120			
					8	540	1,200			
					9	10	40			
					10	280	640			
					11	220	480			
					12	200	240			
83	500	1,360	100	11	1	1,120	3,600	511	4,800	511
					2	520	1,200			
					3	440	800			
					4	480	1,360			
					5	140	320			
					6	140	240			
					7	280	800			
					8	2,080	4,800			
					9	220	400			
					10	200	560			
					11	160	320			
91	80	160	100	12	1	260	720	201	1,760	201
					2	300	880			
					3	300	400			
					4	140	240			
					5	280	400			
					6	880	1,760			
					7	520	720			
					8	480	720			
					9	140	240			
					10	220	480			
					11	140	240			
					12	320	720			
93	80	160	100	9	1	1,000	1,440	222	1,680	222
					2	1,320	1,680			
					3	80	160			
					4	520	960			
					5	100	160			
					6	560	1,600			
					7	180	480			
					8	500	1,600			
					9	20	80			
94	10	40	100	1	1	220	800	18	800	18
103	10	40	100	0				10	40	10
105	40	80	97	14	1	260	400	213	3,200	207
					2	540	1,440			
					3	140	240			
					4	280	640			
					5	1,200	3,200			
					5	20	80			
					7	180	240			
					8	380	720			
					9	400	720			
					10	160	240			
					11	280	320			
					12	320	640			
					13	160	320			
					14	440	880			
110	20	80	100	8	1	20	80	97	1,520	97
					2	220	560			
					3	240	400			
					4	40	80			
					5	640	800			
					6	260	720			
					7	600	1,520			
					8	60	160			
111	10	40	96	10	1	260	480	121	1,600	116
					2	160	560			
					3	240	480			
					4	140	320			
					5	680	1,600			
					6	70	160			
					7	260	400			
					8	540	960			
					9	160	240			
					10	260	400			

TABLE 5 - SUB-AREA "F" CONCRETE-ALL FINAL SURVEY DATA
GROSS ALPHA RESULTS SUMMARY (All Sampled Grids)
PAGE 4

REP. AREA NET READING (dpm/100cm2)				TOTAL # OF	HOT SPOT DATA (gross reading)			5m x 5m GRID (dpm/100cm2)		
GRID #	AVE	MAX	% CONCRETE	HOT SPOTS	#	AVE	MAX	AVE	MAX	WT. AVG.
133	120	160	100	14	1	160	320	168	1,600	168
					2	220	720			
					3	40	160			
					4	320	560			
					5	200	320			
					6	260	480			
					7	50	160			
					8	140	240			
					9	140	320			
					10	400	1,600			
					11	10	40			
					12	455	1,200			
					13	220	400			
					14	260	560			
134	20	80	96	17	1	40	160	60	400	58
					2	80	160			
					3	80	160			
					4	10	40			
					5	220	400			
					6	100	240			
					7	180	400			
					8	60	160			
					9	40	160			
					10	20	80			
					11	40	160			
					12	40	160			
					13	20	80			
					14	60	240			
					15	120	240			
					16	140	320			
					17	60	160			

	Representative Areas (no background subtracted)			Hot Spots (no background subtracted)					
	1 m2 Minimum	Maximum	Overall Ave.	Total #	Ave. #/grid	1 m2 Minimum	1 m2 Maximum	1 m2 Ave.	
dpm/100cm2:	5	500	88	251	4	0	9,000	380	dpm/100cm2

5m x 5m Grids (no background subtracted)

# of Grids	Area (m^2)	Ave. Minimum	Ave. Maximum	Overall Ave.	
66	794	10	641	178	dpm/100cm2

NOTES:
1. 5m x 5m grids.
2. Results reported in units of dpm/100cm2 unless otherwise indicated.

TABLE 6

OF

APPENDIX II

TABLE 6 - SUB-AREA "F" CONCRETE-ALL FINAL SURVEY DATA
GROSS ALPHA RESULTS SUMMARY (All Sampled Grids)
PAGE 1

REP. AREA NET READING (dpm/100cm2)				TOTAL # OF	HOT SPOT DATA (net reading)			5m x 5m GRID (dpm/100cm2)		
GRID #	AVE	MAX	% CONCRETE	HOT SPOTS	#	AVE	MAX	AVE	MAX	WT. AVG.
1	160	240	25	0				160	240	40
2	110	320	60	0				110	320	66
3	140	240	65	0				140	240	91
4	320	480	65	0				320	480	208
5	65	240	60	0				65	240	39
6	10	40	75	0				10	40	8
7	10	40	55	0				10	40	6
8	10	40	60	0				10	40	6
9	10	80	60	0				10	80	6
10	60	200	60	0				60	200	36
11	100	600	50	0				100	600	50
12	100	160	50	1	1	380	1200	122	1,200	61
13	<350	<350	70	4	1	80	160	42	800	29
					2	210	320			
					3	200	800			
					4	240	800			
14	20	80	70	1	1	20	80	20	80	14
15	20	80	100	1	1	40	160	21	160	21
16	30	160	60	0				30	160	18
17	20	80	60	1	1	20	80	20	80	12
18	40	160	100	0				40	160	40
19	20	160	80	1	1	50	240	22	240	17
20	40	160	70	0				40	160	28
21	50	80	80	0				50	80	40
22	10	40	40	1	1	10	80	10	80	4
23	20	160	100	2	1	40	160	25	480	25
					2	120	480			
24	20	180	88	2	1	120	480	32	560	28
					2	180	560			
25	80	320	95	1	1	258	800	87	800	83
26	140	240	60	1	1	120	240	139	240	83
27	40	160	75	0				40	160	30
28	160	240	88	0				160	240	141
29	40	60	60	5	1	2100	6400	260	6,400	156
					2	200	800			
					3	760	2400			
					4	300	1400			
					5	140	320			
30	200	320	100	7	1	160	320	334	6,400	334
					2	60	240			
					3	2,280	4,800			
					4	1,700	6,400			
					5	400	2,000			
					6	80	400			
					7	80	320			
31	100	240	85	1	1	220	640	106	1,440	90
32	10	40	40	2	1	120	1,440	28	1,440	11
					2	80	1,200			
33	5	20	25	0				5	20	1
34	80	160	20	2	1	40	160	84	480	17
					2	140	480			

TABLE 6 - SUB-AREA "F" CONCRETE-ALL FINAL SURVEY DATA
GROSS ALPHA RESULTS SUMMARY (All Sampled Grids)
PAGE 2

REP. AREA NET READING (dpm/100cm2)				TOTAL # OF	HOT SPOT DATA (net reading)			5m x 5m GRID (dpm/100cm2)		
GRID #	AVE	MAX	% CONCRETE	HOT SPOTS	#	AVE	MAX	AVE	MAX	WT. AVG.
35	120	240	93	3	1	270	800	181	1,840	168
					2	280	1,040			
					3	1,220	1,840			
36	15	60	100	2	1	0	0	18	800	18
					2	100	800			
37	80	160	100	11	1	420	800	150	1,600	150
					2	340	800			
					3	240	640			
					4	540	800			
					5	160	400			
					6	60	160			
					7	100	240			
					8	120	320			
					9	220	240			
					10	180	560			
					11	240	1,600			
42	60	160	100	7	1	140	400	82	640	82
					2	248	640			
					3	240	400			
					4	40	80			
					5	100	240			
					6	10	40			
					7	200	400			
43	10	40	100	6	1	500	800	79	960	79
					2	500	960			
					3	300	640			
					4	120	440			
					5	200	760			
					6	160	640			
44	10	40	100	7	1	415	640	175	4,000	175
					2	480	2,000			
					3	875	2,000			
					4	1,200	4,000			
					5	560	1,600			
					6	500	800			
					7	160	400			
50	5	40	100	2	1	260	600	30	1,360	30
					2	380	1,360			
51	10	60	100	11	1	480	1,600	145	2,100	145
					2	150	400			
					3	40	160			
					4	140	400			
					5	220	800			
					6	180	400			
					7	180	480			
					8	1,500	2,100			
					9	320	880			
					10	100	160			
					11	165	320			
52	160	320	100	10	1	540	1,600	641	16,000	641
					2	360	1,040			
					3	300	1,040			
					4	220	400			
					5	240	560			
					6	1,100	4,000			
					7	9,000	16,000			
					8	880	3,200			
					9	420	480			
					10	560	1,280			
53	10	60	100	13	1	400	800	250	4,000	250
					2	1,440	4,000			
					3	720	1,280			
					4	340	640			
					5	180	320			
					6	160	320			
					7	340	400			
					8	740	1,280			
					9	410	1,200			
					10	480	800			
					11	600	800			
					12	160	320			
					13	160	600			

TABLE 6 - SUB-AREA "F" CONCRETE-ALL FINAL SURVEY DATA
GROSS ALPHA RESULTS SUMMARY (All Sampled Grids)
PAGE 3

REP. AREA NET READING (dpm/100cm2)				TOTAL # OF	HOT SPOT DATA (net reading)			5m x 5m GRID (dpm/100cm2)		
GRID #	AVE	MAX	% CONCRETE	HOT SPOTS	#	AVE	MAX	AVE	MAX	WT. AVG.
56	80	160	100	9	1	200	800	363	15,600	363
					2	630	1,040			
					3	840	1,760			
					4	380	640			
					5	800	1,120			
					6	4,000	15,600			
					7	220	320			
					8	100	160			
					9	620	1,280			
57	240	720	100	12	1	580	960	311	4,000	311
					2	220	480			
					3	180	480			
					4	160	240			
					5	340	800			
					6	120	320			
					7	180	320			
					8	480	880			
					9	160	240			
					10	540	800			
					11	220	400			
					12	1,470	4,000			
58	280	480	100	9	1	580	1,440	294	1,440	294
					2	180	240			
					3	380	640			
					4	100	240			
					5	500	720			
					6	140	240			
					7	100	160			
					8	700	880			
					9	180	480			
59	70	160	100	2	1	200	320	73	320	73
					2	10	40			
66	10	80	100	2	1	560	800	42	800	42
					2	270	640			
67	40	160	100	7	1	60	160	101	1,240	101
					2	520	1,040			
					3	170	320			
					4	120	240			
					5	380	400			
					6	530	1,240			
					7	20	80			
68	350	1,360	100	4	1	220	560	331	880	331
					2	140	240			
					3	240	400			
					4	320	880			
71	140	560	100	1	1	1,280	4,000	186	4,000	186
74	10	40	100	7	1	960	3,200	72	3,200	72
					2	60	240			
					3	280	640			
					4	240	640			
					5	10	40			
					6	60	240			
					7	20	80			
75	20	80	100	5	1	10	40	29	480	29
					2	80	160			
					3	60	180			
					4	10	40			
					5	160	480			
81	100	240	85	9	1	150	320	203	2,200	172
					2	680	1,600			
					3	640	1,040			
					4	220	480			
					5	100	240			
					6	20	80			
					7	322	640			
					8	220	320			
					9	730	2,200			
82	20	80	100	12	1	300	1,320	158	4,320	158
					2	280	640			
					3	280	480			
					4	160	4,320			
					5	200	400			
					6	805	2,100			
					7	420	1,120			
					8	540	1,200			
					9	10	40			
					10	280	640			
					11	220	480			
					12	200	240			

TABLE 6 - SUB-AREA "F" CONCRETE-ALL FINAL SURVEY DATA
GROSS ALPHA RESULTS SUMMARY (All Sampled Grids)
PAGE 4

REP. AREA NET READING (dpm/100cm2)				TOTAL # OF	HOT SPOT DATA (net reading)			5m x 5m GRID (dpm/100cm2)		
GRID #	AVE	MAX	% CONCRETE	HOT SPOTS	#	AVE	MAX	AVE	MAX	WT. AVG.
83	500	1,360	100	11	1	1,120	3,600	511	4,800	511
					2	520	1,200			
					3	440	800			
					4	480	1,360			
					5	140	320			
					6	140	240			
					7	280	800			
					8	2,080	4,800			
					9	220	400			
					10	200	560			
					11	160	320			
91	80	160	100	12	1	260	720	201	1,760	201
					2	300	880			
					3	300	400			
					4	140	240			
					5	280	400			
					6	880	1,760			
					7	520	720			
					8	480	720			
					9	140	240			
					10	220	480			
					11	140	240			
					12	320	720			
93	80	160	100	9	1	1,000	1,440	222	1,680	222
					2	1,320	1,680			
					3	80	160			
					4	520	960			
					5	100	160			
					6	560	1,600			
					7	180	480			
					8	500	1,600			
					9	20	80			
94	10	40	100	1	1	220	800	18	800	18
103	10	40	100	0				10	40	10
105	40	80	97	14	1	260	400	213	3,200	207
					2	540	1,440			
					3	140	240			
					4	280	640			
					5	1,200	3,200			
					5	20	80			
					7	180	240			
					8	380	720			
					9	400	720			
					10	160	240			
					11	280	320			
					12	320	640			
					13	160	320			
					14	440	880			
110	20	80	100	8	1	20	80	97	1,520	97
					2	220	560			
					3	240	400			
					4	40	80			
					5	640	800			
					6	260	720			
					7	600	1,520			
					8	60	160			
111	10	40	96	10	1	260	480	121	1,600	116
					2	160	560			
					3	240	480			
					4	140	320			
					5	680	1,600			
					6	70	160			
					7	260	400			
					8	540	960			
					9	160	240			
					10	260	400			
133	120	160	100	14	1	160	320	168	1,600	168
					2	220	720			
					3	40	160			
					4	320	560			
					5	200	320			
					6	260	480			
					7	50	160			
					8	140	240			
					9	140	320			
					10	400	1,600			
					11	10	40			
					12	455	1,200			
					13	220	400			
					14	260	560			

TABLE 6 - SUB-AREA "F" CONCRETE-ALL FINAL SURVEY DATA
GROSS ALPHA RESULTS SUMMARY (All Sampled Grids)
PAGE 5

REP. AREA NET READING (dpm/100cm2)				TOTAL # OF	HOT SPOT DATA (net reading)			5m x 5m GRID (dpm/100cm2)		
GRID #	AVE	MAX	% CONCRETE	HOT SPOTS	#	AVE	MAX	AVE	MAX	WT. AVG.
134	20	80	96	17	1	40	160	60	400	58
					2	80	160			
					3	80	160			
					4	10	40			
					5	220	400			
					6	100	240			
					7	180	400			
					8	60	160			
					9	40	160			
					10	20	80			
					11	40	160			
					12	40	160			
					13	20	80			
					14	60	240			
					15	120	240			
					16	140	320			
					17	60	160			

	Representative Areas (no background subtracted)			Hot Spots (no background subtracted)					
	1 m2 Minimum	Maximum	Overall Ave.	Total #	Ave. #/grid	1 m2 Minimum	1 m2 Maximum	1 m2 Ave.	
dpm/100cm2:	5	500	67	280	4	0	9,000	369	dpm/100cm2

5m x 5m Grids (background subtracted)					
# of Grids	Area (m^2)	Ave. Minimum	Ave. Maximum	Overall Ave.	
66	1,355	5	641	125	dpm/100cm2

NOTES:
1. 5m x 5m grids.
2. Results reported in units of dpm/100cm2 unless otherwise indicated.

Concrete Rubble from the Uranium Plant, U-Yard Area, Pu Plant

Slab #	Width (ft.)	Length (ft.)	Thickness (ft.)	Volume (ft^3)	Weighted Average Thickness (ft.)
1	8	5	0.66	26.4	5.447E-04
2	19	4	0.5	38.0	5.940E-04
3	32	5	1	160.0	5.002E-03
4	42	3	0.16	20.2	1.008E-04
5	76	4	0.16	48.6	2.433E-04
6	100	3	0.16	48.0	2.401E-04
7	40	60	0.83	1,992.0	5.169E-02
8	9	6	0.5	27.0	4.221E-04
9	16	4	0.83	53.1	1.378E-03
10	21	6.6	0.83	115.0	2.985E-03
11	5	5	0.83	20.8	5.384E-04
12	40	24	0.83	796.8	2.068E-02
13	12	30	0.5	180.0	2.814E-03
14	60	4.5	1.2	324.0	1.216E-02
15	132	12	0.66	1,045.4	2.157E-02
16	60	12	0.66	475.2	9.805E-03
17	15	15	2	450.0	2.814E-02
18	89	12	0.66	704.9	1.454E-02
19	156	12	0.66	1,235.5	2.549E-02
20	18	12	0.66	142.6	2.942E-03
21	40	6	1.25	300.0	1.172E-02
22	12	12	5	720.0	1.126E-01
23	14	14	3	588.0	5.515E-02
24	46	10	0.5	230.0	3.595E-03
25	67	15	2	2,010.0	1.257E-01
26	11	49.5	0.5	272.3	4.256E-03
27	45	10	0.5	225.0	3.517E-03
28	100	1.5	0.5	75.0	1.172E-03
29	20	20	0.33	132.0	1.362E-03
30	150	0.5	0.5	37.5	5.862E-04

Concrete Rubble from Pu Plant Floor and Yard

Slab #	Width (ft.)	Length (ft.)	Thickness (ft.)	Volume (ft^3)	Weighted Average Thickness (ft.)
31	30	0.5	0.5	7.5	1.172E-04
32	3	5	0.5	7.5	1.172E-04
33	5	6	0.33	9.9	1.021E-04
34	9	3	0.33	8.9	9.193E-05
35	54	0.66	0.66	23.5	4.854E-04
36	50	4	0.17	34.0	1.807E-04
37	24	18	0.66	285.1	5.883E-03
38	27	24	0.66	427.7	8.825E-03
39	23	13	0.66	197.3	4.072E-03
40	24	13	0.66	205.9	4.249E-03
41	10	10	0.66	66.0	1.362E-03
42	3	4	0.5	6.0	9.379E-05
43	3	4	0.5	6.0	9.379E-05
44	3	5	0.5	7.5	1.172E-04
45	2	5	0.5	5.0	7.816E-05
46	15	3	0.5	22.5	3.517E-04
47	3	4	0.5	6.0	9.379E-05
48	14	3	0.5	21.0	3.283E-04
49	3	3	0.5	4.5	7.034E-05
50	11	3	0.5	16.5	2.579E-04
51	12	3	0.5	18.0	2.814E-04
52	8	4	0.5	16.0	2.501E-04
53	Note 1	Note 1	0.5	2,908.0	4.546E-02

Concrete Rubble from U Plant and Vaporizer Room Floor

Slab #	Width (ft.)	Length (ft.)	Thickness (ft.)	Volume (ft^3)	Weighted Average Thickness (ft.)
54	180	3.3	0.5	297.0	4.643E-03
55	30	5	0.5	75.0	1.172E-03
56	76	11	0.5	418.0	6.534E-03
57	21	21	0.5	220.5	3.447E-03
58	26.6	3.3	0.5	43.9	6.861E-04
59	23.1	8	0.5	92.4	1.444E-03
60	6.6	6.6	0.5	21.8	3.405E-04
61	80	40	0.5	1,600.0	2.501E-02
62	40	20	0.5	400.0	6.253E-03
63	180	3.3	0.5	297.0	4.643E-03
64	40	3.3	0.5	66.0	1.032E-03
65	40	23.1	0.5	462.0	7.222E-03
66	36.5	20	0.5	365.0	5.706E-03
67	80	8	0.5	320.0	5.002E-03
68	66.6	3.3	0.5	109.9	1.718E-03
69	36.3	1.5	0.5	27.2	4.256E-04
70	8	9	0.5	36.0	5.628E-04
71	50	20	0.5	500.0	7.816E-03
72	40	3.3	0.5	66.0	1.032E-03
73	80	6.6	0.5	264.0	4.127E-03
74	26.6	20	0.5	266.0	4.158E-03
75	80	40	0.5	1,600.0	2.501E-02
76	20	13.2	0.5	132.0	2.063E-03
77	20	6	0.5	60.0	9.379E-04
78	74	33	0.5	1,221.0	1.909E-02

Concrete Rubble from U Yard and Buildings #2 and #3

Slab #	Width (ft.)	Length (ft.)	Thickness (ft.)	Volume (ft^3)	Weighted Average Thickness (ft.)
79	20	60	0.83	996.0	2.585E-02 *
80	55	21	2	2,310.0	1.444E-01
81	546	1.5	0.5	409.5	6.401E-03
82	72	3	2.5	540.0	4.221E-02
83	20	7	1	140.0	4.377E-03
84	40	24	1	960.0	3.001E-02
85	64	3	1	192.0	6.003E-03
86	24	5	0.33	39.6	4.086E-04
87	62	2.5	2	310.0	1.938E-02
88	30	2	1	60.0	1.876E-03
89	4	4	4	64.0	8.004E-03
90	10	4	0.5	20.0	3.126E-04
91	45	4	1	180.0	5.628E-03

	Average Thickness (ft)	**Total Volume (ft^3)**	**Weighted Ave. Thickness (ft)**
	0.75	**31,985**	**1.03** ← sum column above

Note 1: Miscellaneous Rubble (Estimate)

$w_{avg} = \frac{0.83 \times 996}{31,985} = 2.585\text{-}02$ *

Table of Contents

Part I: Mixture Sums and Single Radionuclide Guidelines

Dose Conversion Factor (and Related) Parameter Summary
File: DOSFAC30.BIN

Menu	Parameter	Current Value	Default	Parameter Name
B-1	Dose conversion factors for inhalation, mrem/pCi:			
B-1	Ac-227+D	6.720E+00	6.720E+00	DCF2(1)
B-1	Pa-231	1.280E+00	1.280E+00	DCF2(2)
B-1	Pb-210+D	1.380E-02	1.380E-02	DCF2(3)
B-1	Po-210	9.400E-03	9.400E-03	DCF2(4)
B-1	Ra-226+D	8.600E-03	8.600E-03	DCF2(5)
B-1	Th-230	3.260E-01	3.260E-01	DCF2(6)
B-1	U-234	1.320E-01	1.320E-01	DCF2(7)
B-1	U-235+D	1.230E-01	1.230E-01	DCF2(8)
B-1	U-238+D	1.180E-01	1.180E-01	DCF2(9)
D-1	Dose conversion factors for ingestion, mrem/pCi:			
D-1	Ac-227+D	1.480E-02	1.480E-02	DCF3(1)
D-1	Pa-231	1.060E-02	1.060E-02	DCF3(2)
D-1	Pb-210+D	5.370E-03	5.370E-03	DCF3(3)
D-1	Po-210	1.900E-03	1.900E-03	DCF3(4)
D-1	Ra-226+D	1.330E-03	1.330E-03	DCF3(5)
D-1	Th-230	5.480E-04	5.480E-04	DCF3(6)
D-1	U-234	2.830E-04	2.830E-04	DCF3(7)
D-1	U-235+D	2.670E-04	2.670E-04	DCF3(8)
D-1	U-238+D	2.690E-04	2.690E-04	DCF3(9)
D-34	Food transfer factors:			
D-34	Ac-227+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(1,1)
D-34	Ac-227+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,2)
D-34	Ac-227+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	2.000E-05	2.000E-05	RTF(1,3)
D-34				
D-34	Pa-231 , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(2,1)
D-34	Pa-231 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(2,2)
D-34	Pa-231 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(2,3)
D-34				
D-34	Pb-210+D , plant/soil concentration ratio, dimensionless	1.000E-02	1.000E-02	RTF(3,1)
D-34	Pb-210+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	8.000E-04	8.000E-04	RTF(3,2)
D-34	Pb-210+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.000E-04	3.000E-04	RTF(3,3)
D-34				
D-34	Po-210 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(4,1)
D-34	Po-210 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	5.000E-03	5.000E-03	RTF(4,2)
D-34	Po-210 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	3.400E-04	3.400E-04	RTF(4,3)
D-34				
D-34	Ra-226+D , plant/soil concentration ratio, dimensionless	4.000E-02	4.000E-02	RTF(5,1)
D-34	Ra-226+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,2)
D-34	Ra-226+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	1.000E-03	1.000E-03	RTF(5,3)
D-34				
D-34	Th-230 , plant/soil concentration ratio, dimensionless	1.000E-03	1.000E-03	RTF(6,1)
D-34	Th-230 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	1.000E-04	1.000E-04	RTF(6,2)
D-34	Th-230 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	5.000E-06	5.000E-06	RTF(6,3)
D-34				
D-34	U-234 , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(7,1)
D-34	U-234 , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(7,2)
D-34	U-234 , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(7,3)
D-34				

Dose Conversion Factor (and Related) Parameter Summary (continued)
File: DOSFAC30.BIN

Menu	Parameter	Current Value	Default	Parameter Name
D-34	U-235+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(8,1)
D-34	U-235+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(8,2)
D-34	U-235+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(8,3)
D-34				
D-34	U-238+D , plant/soil concentration ratio, dimensionless	2.500E-03	2.500E-03	RTF(9,1)
D-34	U-238+D , beef/livestock-intake ratio, (pCi/kg)/(pCi/d)	3.400E-04	3.400E-04	RTF(9,2)
D-34	U-238+D , milk/livestock-intake ratio, (pCi/L)/(pCi/d)	6.000E-04	6.000E-04	RTF(9,3)
D-5	Bioaccumulation factors, fresh water, L/kg:			
D-5	Ac-227+D , fish	1.500E+01	1.500E+01	BIOFAC(1,1)
D-5	Ac-227+D , crustacea and mollusks	1.000E+03	1.000E+03	BIOFAC(1,2)
D-5				
D-5	Pa-231 , fish	1.000E+01	1.000E+01	BIOFAC(2,1)
D-5	Pa-231 , crustacea and mollusks	1.100E+02	1.100E+02	BIOFAC(2,2)
D-5				
D-5	Pb-210+D , fish	3.000E+02	3.000E+02	BIOFAC(3,1)
D-5	Pb-210+D , crustacea and mollusks	1.000E+02	1.000E+02	BIOFAC(3,2)
D-5				
D-5	Po-210 , fish	1.000E+02	1.000E+02	BIOFAC(4,1)
D-5	Po-210 , crustacea and mollusks	2.000E+04	2.000E+04	BIOFAC(4,2)
D-5				
D-5	Ra-226+D , fish	5.000E+01	5.000E+01	BIOFAC(5,1)
D-5	Ra-226+D , crustacea and mollusks	2.500E+02	2.500E+02	BIOFAC(5,2)
D-5				
D-5	Th-230 , fish	1.000E+02	1.000E+02	BIOFAC(6,1)
D-5	Th-230 , crustacea and mollusks	5.000E+02	5.000E+02	BIOFAC(6,2)
D-5				
D-5	U-234 , fish	1.000E+01	1.000E+01	BIOFAC(7,1)
D-5	U-234 , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(7,2)
D-5				
D-5	U-235+D , fish	1.000E+01	1.000E+01	BIOFAC(8,1)
D-5	U-235+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(8,2)
D-5				
D-5	U-238+D , fish	1.000E+01	1.000E+01	BIOFAC(9,1)
D-5	U-238+D , crustacea and mollusks	6.000E+01	6.000E+01	BIOFAC(9,2)

Site-Specific Parameter Summary

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R011	Area of contaminated zone (m**2)	2.970E+03	1.000E+04	---	AREA
R011	Thickness of contaminated zone (m)	3.048E-01	2.000E+00	---	THICK0
R011	Length parallel to aquifer flow (m)	1.000E+02	1.000E+02	---	LCZPAQ
R011	Basic radiation dose limit (mrem/yr)	3.000E+01	3.000E+01	---	BRDL
R011	Time since placement of material (yr)	2.000E+01	0.000E+00	---	TI
R011	Times for calculations (yr)	1.000E+00	1.000E+00	---	T(2)
R011	Times for calculations (yr)	3.000E+00	3.000E+00	---	T(3)
R011	Times for calculations (yr)	1.000E+01	1.000E+01	---	T(4)
R011	Times for calculations (yr)	3.000E+01	3.000E+01	---	T(5)
R011	Times for calculations (yr)	1.000E+02	1.000E+02	---	T(6)
R011	Times for calculations (yr)	3.000E+02	3.000E+02	---	T(7)
R011	Times for calculations (yr)	5.000E+02	1.000E+03	---	T(8)
R011	Times for calculations (yr)	9.000E+02	0.000E+00	---	T(9)
R011	Times for calculations (yr)	1.000E+03	0.000E+00	---	T(10)
R012	Initial principal radionuclide (pCi/g): U-234	2.300E+00	0.000E+00	---	S1(7)
R012	Initial principal radionuclide (pCi/g): U-235	5.000E-02	0.000E+00	---	S1(8)
R012	Initial principal radionuclide (pCi/g): U-238	6.000E-01	0.000E+00	---	S1(9)
R012	Concentration in groundwater (pCi/L): U-234	not used	0.000E+00	---	W1(7)
R012	Concentration in groundwater (pCi/L): U-235	not used	0.000E+00	---	W1(8)
R012	Concentration in groundwater (pCi/L): U-238	not used	0.000E+00	---	W1(9)
R013	Cover depth (m)	0.000E+00	0.000E+00	---	COVER0
R013	Density of cover material (g/cm**3)	not used	1.500E+00	---	DENSCV
R013	Cover depth erosion rate (m/yr)	not used	1.000E-03	---	VCV
R013	Density of contaminated zone (g/cm**3)	1.800E+00	1.500E+00	---	DENSCZ
R013	Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	---	VCZ
R013	Contaminated zone total porosity	3.000E-01	4.000E-01	---	TPCZ
R013	Contaminated zone effective porosity	2.000E-01	2.000E-01	---	EPCZ
R013	Contaminated zone hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCCZ
R013	Contaminated zone b parameter	5.300E+00	5.300E+00	---	BCZ
R013	Humidity in air (g/cm**3)	not used	8.000E+00	---	HUMID
R013	Evapotranspiration coefficient	5.000E-01	5.000E-01	---	EVAPTR
R013	Precipitation (m/yr)	1.000E+00	1.000E+00	---	PRECIP
R013	Irrigation (m/yr)	7.600E-01	2.000E-01	---	RI
R013	Irrigation mode	overhead	overhead	---	IDITCH
R013	Runoff coefficient	2.000E-01	2.000E-01	---	RUNOFF
R013	Watershed area for nearby stream or pond (m**2)	1.000E+06	1.000E+06	---	WAREA
R013	Accuracy for water/soil computations	1.000E-03	1.000E-03	---	EPS
R014	Density of saturated zone (g/cm**3)	1.630E+00	1.500E+00	---	DENSAQ
R014	Saturated zone total porosity	3.000E-01	4.000E-01	---	TPSZ
R014	Saturated zone effective porosity	2.000E-01	2.000E-01	---	EPSZ
R014	Saturated zone hydraulic conductivity (m/yr)	1.000E+02	1.000E+02	---	HCSZ
R014	Saturated zone hydraulic gradient	2.000E-02	2.000E-02	---	HGWT
R014	Saturated zone b parameter	5.300E+00	5.300E+00	---	BSZ
R014	Water table drop rate (m/yr)	0.000E+00	1.000E-03	---	VWT
R014	Well pump intake depth (m below water table)	1.000E+01	1.000E+01	---	DWIBWT
R014	Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	---	MODEL
R014	Well pumping rate (m**3/yr)	2.500E+02	2.500E+02	---	UW

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R015	Number of unsaturated zone strata	1	1	---	NS
R015	Unsat. zone 1, thickness (m)	4.000E+00	4.000E+00	---	H(1)
R015	Unsat. zone 1, soil density (g/cm**3)	1.630E+00	1.500E+00	---	DENSUZ(1)
R015	Unsat. zone 1, total porosity	3.000E-01	4.000E-01	---	TPUZ(1)
R015	Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	---	EPUZ(1)
R015	Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	---	BUZ(1)
R015	Unsat. zone 1, hydraulic conductivity (m/yr)	1.000E+01	1.000E+01	---	HCUZ(1)
R016	Distribution coefficients for U-234				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(7)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(7,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(7)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.836E-02	ALEACH(7)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(7)
R016	Distribution coefficients for U-235				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(8)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(8,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(8)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.836E-02	ALEACH(8)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(8)
R016	Distribution coefficients for U-238				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(9)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(9,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(9)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.836E-02	ALEACH(9)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(9)
R016	Distribution coefficients for daughter Ac-227				
R016	Contaminated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCC(1)
R016	Unsaturated zone 1 (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCU(1,1)
R016	Saturated zone (cm**3/g)	2.000E+01	2.000E+01	---	DCNUCS(1)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	7.060E-02	ALEACH(1)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(1)
R016	Distribution coefficients for daughter Pa-231				
R016	Contaminated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCC(2)
R016	Unsaturated zone 1 (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCU(2,1)
R016	Saturated zone (cm**3/g)	5.000E+01	5.000E+01	---	DCNUCS(2)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.836E-02	ALEACH(2)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(2)
R016	Distribution coefficients for daughter Pb-210				
R016	Contaminated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCC(3)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCU(3,1)
R016	Saturated zone (cm**3/g)	1.000E+02	1.000E+02	---	DCNUCS(3)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.420E-02	ALEACH(3)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(3)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R016	Distribution coefficients for daughter Po-210				
R016	Contaminated zone (cm**3/g)	1.000E+01	1.000E+01	---	DCNUCC(4)
R016	Unsaturated zone 1 (cm**3/g)	1.000E+01	1.000E+01	---	DCNUCU(4,1)
R016	Saturated zone (cm**3/g)	1.000E+01	1.000E+01	---	DCNUCS(4)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	1.402E-01	ALEACH(4)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(4)
R016	Distribution coefficients for daughter Ra-226				
R016	Contaminated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCC(5)
R016	Unsaturated zone 1 (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCU(5,1)
R016	Saturated zone (cm**3/g)	7.000E+01	7.000E+01	---	DCNUCS(5)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.027E-02	ALEACH(5)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(5)
R016	Distribution coefficients for daughter Th-230				
R016	Contaminated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCC(6)
R016	Unsaturated zone 1 (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCU(6,1)
R016	Saturated zone (cm**3/g)	6.000E+04	6.000E+04	---	DCNUCS(6)
R016	Leach rate (/yr)	0.000E+00	0.000E+00	2.369E-05	ALEACH(6)
R016	Solubility constant	0.000E+00	0.000E+00	not used	SOLUBK(6)
R017	Inhalation rate (m**3/yr)	1.051E+04	8.400E+03	---	INHALR
R017	Mass loading for inhalation (g/m**3)	2.000E-04	2.000E-04	---	MLINH
R017	Dilution length for airborne dust, inhalation (m)	3.000E+00	3.000E+00	---	LM
R017	Exposure duration	5.000E+01	3.000E+01	---	ED
R017	Shielding factor, inhalation	5.000E-01	4.000E-01	---	SHF3
R017	Shielding factor, external gamma	3.300E-01	7.000E-01	---	SHF1
R017	Fraction of time spent indoors	5.500E-01	5.000E-01	---	FIND
R017	Fraction of time spent outdoors (on site)	2.100E-01	2.500E-01	---	FOTD
R017	Shape factor flag, external gamma	1.000E+00	1.000E+00	1 shows circular AREA.	FS
R017	Radii of shape factor array (used if FS = -1):				
R017	Outer annular radius (m), ring 1:	not used	5.000E+01	---	RAD SHAPE(1)
R017	Outer annular radius (m), ring 2:	not used	7.071E+01	---	RAD SHAPE(2)
R017	Outer annular radius (m), ring 3:	not used	0.000E+00	---	RAD SHAPE(3)
R017	Outer annular radius (m), ring 4:	not used	0.000E+00	---	RAD SHAPE(4)
R017	Outer annular radius (m), ring 5:	not used	0.000E+00	---	RAD SHAPE(5)
R017	Outer annular radius (m), ring 6:	not used	0.000E+00	---	RAD SHAPE(6)
R017	Outer annular radius (m), ring 7:	not used	0.000E+00	---	RAD SHAPE(7)
R017	Outer annular radius (m), ring 8:	not used	0.000E+00	---	RAD SHAPE(8)
R017	Outer annular radius (m), ring 9:	not used	0.000E+00	---	RAD SHAPE(9)
R017	Outer annular radius (m), ring 10:	not used	0.000E+00	---	RAD SHAPE(10)
R017	Outer annular radius (m), ring 11:	not used	0.000E+00	---	RAD SHAPE(11)
R017	Outer annular radius (m), ring 12:	not used	0.000E+00	---	RAD_SHAPE(12)

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
R017	Fractions of annular areas within AREA:				
R017	Ring 1	not used	1.000E+00	---	FRACA(1)
R017	Ring 2	not used	2.732E-01	---	FRACA(2)
R017	Ring 3	not used	0.000E+00	---	FRACA(3)
R017	Ring 4	not used	0.000E+00	---	FRACA(4)
R017	Ring 5	not used	0.000E+00	---	FRACA(5)
R017	Ring 6	not used	0.000E+00	---	FRACA(6)
R017	Ring 7	not used	0.000E+00	---	FRACA(7)
R017	Ring 8	not used	0.000E+00	---	FRACA(8)
R017	Ring 9	not used	0.000E+00	---	FRACA(9)
R017	Ring 10	not used	0.000E+00	---	FRACA(10)
R017	Ring 11	not used	0.000E+00	---	FRACA(11)
R017	Ring 12	not used	0.000E+00	---	FRACA(12)
R018	Fruits, vegetables and grain consumption (kg/yr)	1.660E+02	1.600E+02	---	DIET(1)
R018	Leafy vegetable consumption (kg/yr)	1.100E+01	1.400E+01	---	DIET(2)
R018	Milk consumption (L/yr)	1.000E+02	9.200E+01	---	DIET(3)
R018	Meat and poultry consumption (kg/yr)	6.300E+01	6.300E+01	---	DIET(4)
R018	Fish consumption (kg/yr)	5.400E+00	5.400E+00	---	DIET(5)
R018	Other seafood consumption (kg/yr)	9.000E-01	9.000E-01	---	DIET(6)
R018	Soil ingestion rate (g/yr)	1.825E+01	3.650E+01	---	SOIL
R018	Drinking water intake (L/yr)	7.300E+02	5.100E+02	---	DWI
R018	Contamination fraction of drinking water	1.000E+00	1.000E+00	---	FDW
R018	Contamination fraction of household water	not used	1.000E+00	---	FHHW
R018	Contamination fraction of livestock water	1.000E+00	1.000E+00	---	FLW
R018	Contamination fraction of irrigation water	1.000E+00	1.000E+00	---	FIRW
R018	Contamination fraction of aquatic food	5.000E-01	5.000E-01	---	FR9
R018	Contamination fraction of plant food	-1	-1	0.500E+00	FPLANT
R018	Contamination fraction of meat	-1	-1	0.148E+00	FMEAT
R018	Contamination fraction of milk	-1	-1	0.148E+00	FMILK
R019	Livestock fodder intake for meat (kg/day)	6.800E+01	6.800E+01	---	LFI5
R019	Livestock fodder intake for milk (kg/day)	5.500E+01	5.500E+01	---	LFI6
R019	Livestock water intake for meat (L/day)	5.000E+01	5.000E+01	---	LWI5
R019	Livestock water intake for milk (L/day)	1.600E+02	1.600E+02	---	LWI6
R019	Livestock soil intake (kg/day)	5.000E-01	5.000E-01	---	LSI
R019	Mass loading for foliar deposition (g/m**3)	1.000E-04	1.000E-04	---	MLFD
R019	Depth of soil mixing layer (m)	1.500E-01	1.500E-01	---	DM
R019	Depth of roots (m)	9.000E-01	9.000E-01	---	DROOT
R019	Drinking water fraction from ground water	1.000E+00	1.000E+00	---	FGWDW
R019	Household water fraction from ground water	1.000E+00	1.000E+00	---	FGWHH
R019	Livestock water fraction from ground water	not used	1.000E+00	---	FGWLW
R019	Irrigation fraction from ground water	1.000E+00	1.000E+00	---	FGWIR
C14	C-12 concentration in water (g/cm**3)	not used	2.000E-05	---	C12WTR
C14	C-12 concentration in contaminated soil (g/g)	not used	3.000E-02	---	C12CZ
C14	Fraction of vegetation carbon from soil	not used	2.000E-02	---	CSOIL
C14	Fraction of vegetation carbon from air	not used	9.800E-01	---	CAIR
C14	C-14 evasion layer thickness in soil (m)	not used	3.000E-01	---	DMC
C14	C-14 evasion flux rate from soil (1/sec)	not used	7.000E-07	---	EVSN
C14	C-12 evasion flux rate from soil (1/sec)	not used	1.000E-10	---	REVSN

Site-Specific Parameter Summary (continued)

Menu	Parameter	User Input	Default	Used by RESRAD (If different from user input)	Parameter Name
C14	Fraction of grain in beef cattle feed	not used	8.000E-01	---	AVFG4
C14	Fraction of grain in milk cow feed	not used	2.000E-01	---	AVFG5
STOR	Storage times of contaminated foodstuffs (days):				
STOR	Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	---	STOR T(1)
STOR	Leafy vegetables	1.000E+00	1.000E+00	---	STOR T(2)
STOR	Milk	1.000E+00	1.000E+00	---	STOR T(3)
STOR	Meat and poultry	2.000E+01	2.000E+01	---	STOR T(4)
STOR	Fish	7.000E+00	7.000E+00	---	STOR T(5)
STOR	Crustacea and mollusks	7.000E+00	7.000E+00	---	STOR T(6)
STOR	Well water	1.000E+00	1.000E+00	---	STOR T(7)
STOR	Surface water	1.000E+00	1.000E+00	---	STOR T(8)
STOR	Livestock fodder	4.500E+01	4.500E+01	---	STOR_T(9)
R021	Thickness of building foundation (m)	not used	1.500E-01	---	FLOOR
R021	Bulk density of building foundation (g/cm**3)	not used	2.400E+00	---	DENSFL
R021	Total porosity of the cover material	not used	4.000E-01	---	TPCV
R021	Total porosity of the building foundation	not used	1.000E-01	---	TPFL
R021	Volumetric water content of the cover material	not used	5.000E-02	---	PH2OCV
R021	Volumetric water content of the foundation	not used	3.000E-02	---	PH2OFL
R021	Diffusion coefficient for radon gas (m/sec):				
R021	in cover material	not used	2.000E-06	---	DIFCV
R021	in foundation material	not used	3.000E-07	---	DIFFL
R021	in contaminated zone soil	not used	2.000E-06	---	DIFCZ
R021	Radon vertical dimension of mixing (m)	not used	2.000E+00	---	HMIX
R021	Average annual wind speed (m/sec)	not used	2.000E+00	---	WIND
R021	Average building air exchange rate (1/hr)	not used	5.000E-01	---	REXG
R021	Height of the building (room) (m)	not used	2.500E+00	---	HRM
R021	Building interior area factor	not used	0.000E+00	---	FAI
R021	Building depth below ground surface (m)	not used	-1.000E+00	---	DMFL
R021	Emanating power of Rn-222 gas	not used	2.500E-01	---	EMANA(1)
R021	Emanating power of Rn-220 gas	not used	1.500E-01	---	EMANA(2)

Summary of Pathway Selections

Pathway	User Selection
1 -- external gamma	active
2 -- inhalation (w/o radon)	active
3 -- plant ingestion	active
4 -- meat ingestion	active
5 -- milk ingestion	active
6 -- aquatic foods	active
7 -- drinking water	active
8 -- soil ingestion	active
9 -- radon	suppressed

Contaminated Zone Dimensions		Initial Soil Concentrations, pCi/g	
Area:	2970.00 square meters	U-234	2.300E+00
Thickness:	0.30 meters	U-235	5.000E-02
Cover Depth:	0.00 meters	U-238	6.000E-01

Total Dose TDOSE(t), mrem/yr
Basic Radiation Dose Limit = 30 mrem/yr
Total Mixture Sum M(t) = Fraction of Basic Dose Limit Received at Time (t)

t (years):	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	5.000E+02	9.000E+02	1.000E+03
TDOSE(t):	4.914E-01	4.775E-01	4.508E-01	3.687E-01	2.075E-01	2.795E-02	8.502E-01	1.183E+00	1.240E+00	3.678E-01
M(t):	1.638E-02	1.592E-02	1.503E-02	1.229E-02	6.918E-03	9.317E-04	2.834E-02	3.943E-02	4.133E-02	1.226E-02

Maximum TDOSE(t): 1.240E+00 mrem/yr at t = 902.1 ± 0.9 years

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 902.1 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 902.1 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	7.822E-01	0.6309	1.209E-03	0.0010	0.000E+00	0.0000	1.536E-01	0.1239	2.442E-03	0.0020	5.041E-03	0.0041	9.445E-01	0.7618
U-235	5.952E-02	0.0480	7.185E-05	0.0001	0.000E+00	0.0000	1.171E-02	0.0094	4.297E-04	0.0003	1.084E-04	0.0001	7.184E-02	0.0579
U-238	1.853E-01	0.1495	4.109E-05	0.0000	0.000E+00	0.0000	3.645E-02	0.0294	4.192E-04	0.0003	1.220E-03	0.0010	2.235E-01	0.1802
Total	1.027E+00	0.8284	1.322E-03	0.0011	0.000E+00	0.0000	2.018E-01	0.1627	3.291E-03	0.0027	6.369E-03	0.0051	1.240E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	3.424E-04	0.0007	2.934E-01	0.5970	0.000E+00	0.0000	4.914E-02	0.1000	1.158E-03	0.0024	3.178E-03	0.0065	9.028E-03	0.0184
U-235	1.403E-02	0.0285	5.943E-03	0.0121	0.000E+00	0.0000	1.008E-03	0.0021	2.376E-05	0.0000	6.519E-05	0.0001	1.852E-04	0.0004
U-238	3.005E-02	0.0612	6.841E-02	0.1392	0.000E+00	0.0000	1.218E-02	0.0248	2.872E-04	0.0006	7.882E-04	0.0016	2.239E-03	0.0046
Total	4.442E-02	0.0904	3.677E-01	0.7483	0.000E+00	0.0000	6.233E-02	0.1268	1.469E-03	0.0030	4.032E-03	0.0082	1.145E-02	0.0233

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 0.000E+00 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.562E-01	0.7249
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.125E-02	0.0432
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.140E-01	0.2319
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.914E-01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	3.329E-04	0.0007	2.852E-01	0.5972	0.000E+00	0.0000	4.761E-02	0.0997	1.125E-03	0.0024	3.089E-03	0.0065	8.776E-03	0.0184
U-235	1.364E-02	0.0286	5.778E-03	0.0121	0.000E+00	0.0000	9.798E-04	0.0021	2.346E-05	0.0000	6.335E-05	0.0001	1.801E-04	0.0004
U-238	2.921E-02	0.0612	6.650E-02	0.1393	0.000E+00	0.0000	1.181E-02	0.0247	2.791E-04	0.0006	7.659E-04	0.0016	2.176E-03	0.0046
Total	4.318E-02	0.0904	3.574E-01	0.7486	0.000E+00	0.0000	6.040E-02	0.1265	1.428E-03	0.0030	3.918E-03	0.0082	1.113E-02	0.0233

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+00 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.461E-01	0.7248
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.066E-02	0.0433
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.107E-01	0.2319
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.775E-01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	3.147E-04	0.0007	2.695E-01	0.5977	0.000E+00	0.0000	4.469E-02	0.0991	1.063E-03	0.0024	2.917E-03	0.0065	8.292E-03	0.0184
U-235	1.289E-02	0.0286	5.462E-03	0.0121	0.000E+00	0.0000	9.260E-04	0.0021	2.286E-05	0.0001	5.983E-05	0.0001	1.705E-04	0.0004
U-238	2.760E-02	0.0612	6.283E-02	0.1394	0.000E+00	0.0000	1.108E-02	0.0246	2.635E-04	0.0006	7.233E-04	0.0016	2.056E-03	0.0046
Total	4.080E-02	0.0905	3.378E-01	0.7492	0.000E+00	0.0000	5.670E-02	0.1258	1.349E-03	0.0030	3.700E-03	0.0082	1.052E-02	0.0233

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+00 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.267E-01	0.7247
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.953E-02	0.0433
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.046E-01	0.2319
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.508E-01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	2.595E-04	0.0007	2.210E-01	0.5994	0.000E+00	0.0000	3.580E-02	0.0971	8.694E-04	0.0024	2.387E-03	0.0065	6.800E-03	0.0184
U-235	1.057E-02	0.0287	4.492E-03	0.0122	0.000E+00	0.0000	7.600E-04	0.0021	2.070E-05	0.0001	4.897E-05	0.0001	1.408E-04	0.0004
U-238	2.264E-02	0.0614	5.152E-02	0.1398	0.000E+00	0.0000	8.878E-03	0.0241	2.156E-04	0.0006	5.919E-04	0.0016	1.686E-03	0.0046
Total	3.347E-02	0.0908	2.770E-01	0.7513	0.000E+00	0.0000	4.544E-02	0.1233	1.106E-03	0.0030	3.028E-03	0.0082	8.627E-03	0.0234

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+01 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.671E-01	0.7245
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.604E-02	0.0435
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	8.553E-02	0.2320
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	3.687E-01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	1.567E-04	0.0008	1.254E-01	0.6044	0.000E+00	0.0000	1.895E-02	0.0913	4.899E-04	0.0024	1.346E-03	0.0065	3.859E-03	0.0186
U-235	6.008E-03	0.0290	2.578E-03	0.0124	0.000E+00	0.0000	4.309E-04	0.0021	1.483E-05	0.0001	2.763E-05	0.0001	8.180E-05	0.0004
U-238	1.284E-02	0.0619	2.922E-02	0.1408	0.000E+00	0.0000	4.697E-03	0.0226	1.214E-04	0.0006	3.339E-04	0.0016	9.563E-04	0.0046
Total	1.900E-02	0.0916	1.572E-01	0.7576	0.000E+00	0.0000	2.408E-02	0.1160	6.261E-04	0.0030	1.708E-03	0.0082	4.897E-03	0.0236

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+01 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	1.502E-01	0.7239
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	9.141E-03	0.0440
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	4.817E-02	0.2321
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.075E-01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	6.244E-05	0.0022	1.743E-02	0.6235	0.000E+00	0.0000	1.970E-03	0.0705	6.638E-05	0.0024	1.816E-04	0.0065	5.356E-04	0.0192
U-235	8.286E-04	0.0296	3.714E-04	0.0133	0.000E+00	0.0000	5.492E-05	0.0020	3.375E-06	0.0001	3.728E-06	0.0001	1.225E-05	0.0004
U-238	1.743E-03	0.0623	4.016E-03	0.1437	0.000E+00	0.0000	4.824E-04	0.0173	1.629E-05	0.0006	4.498E-05	0.0016	1.314E-04	0.0047
Total	2.634E-03	0.0942	2.181E-02	0.7804	0.000E+00	0.0000	2.507E-03	0.0897	8.604E-05	0.0031	2.303E-04	0.0082	6.793E-04	0.0243

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+02 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	2.024E-02	0.7242
U-235	5.659E-07	0.0000	1.129E-09	0.0000	0.000E+00	0.0000	1.123E-07	0.0000	1.842E-10	0.0000	1.266E-10	0.0000	1.275E-03	0.0456
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	6.434E-03	0.2302
Total	5.659E-07	0.0000	1.129E-09	0.0000	0.000E+00	0.0000	1.123E-07	0.0000	1.842E-10	0.0000	1.266E-10	0.0000	2.795E-02	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	5.938E-06	0.0000	9.202E-06	0.0000	0.000E+00	0.0000	1.048E-06	0.0000	4.114E-08	0.0000	3.475E-08	0.0000	2.758E-07	0.0000
U-235	3.829E-07	0.0000	4.642E-08	0.0000	0.000E+00	0.0000	6.910E-09	0.0000	7.712E-10	0.0000	4.063E-10	0.0000	1.671E-09	0.0000
U-238	7.937E-07	0.0000	4.431E-07	0.0000	0.000E+00	0.0000	3.915E-08	0.0000	1.763E-09	0.0000	4.882E-09	0.0000	1.450E-08	0.0000
Total	7.114E-06	0.0000	9.691E-06	0.0000	0.000E+00	0.0000	1.094E-06	0.0000	4.367E-08	0.0000	4.004E-08	0.0000	2.920E-07	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 3.000E+02 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	5.443E-01	0.6402	1.228E-04	0.0001	0.000E+00	0.0000	1.070E-01	0.1259	1.232E-03	0.0014	3.581E-03	0.0042	6.563E-01	0.7719
U-235	2.562E-02	0.0301	2.625E-05	0.0000	0.000E+00	0.0000	5.040E-03	0.0059	1.265E-04	0.0001	7.618E-05	0.0001	3.089E-02	0.0363
U-238	1.352E-01	0.1590	2.970E-05	0.0000	0.000E+00	0.0000	2.659E-02	0.0313	3.055E-04	0.0004	8.895E-04	0.0010	1.630E-01	0.1917
Total	7.051E-01	0.8293	1.787E-04	0.0002	0.000E+00	0.0000	1.387E-01	0.1631	1.664E-03	0.0020	4.547E-03	0.0053	8.502E-01	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 5.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 5.000E+02 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	7.521E-01	0.6358	3.750E-04	0.0003	0.000E+00	0.0000	1.479E-01	0.1250	1.836E-03	0.0016	4.927E-03	0.0042	9.071E-01	0.7669
U-235	4.360E-02	0.0369	4.865E-05	0.0000	0.000E+00	0.0000	8.575E-03	0.0072	2.588E-04	0.0002	1.057E-04	0.0001	5.258E-02	0.0445
U-238	1.851E-01	0.1565	4.074E-05	0.0000	0.000E+00	0.0000	3.640E-02	0.0308	4.184E-04	0.0004	1.218E-03	0.0010	2.232E-01	0.1887
Total	9.807E-01	0.8292	4.644E-04	0.0004	0.000E+00	0.0000	1.928E-01	0.1630	2.513E-03	0.0021	6.251E-03	0.0053	1.183E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 9.000E+02 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 9.000E+02 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	7.820E-01	0.6308	1.203E-03	0.0010	0.000E+00	0.0000	1.536E-01	0.1239	2.438E-03	0.0020	5.040E-03	0.0041	9.443E-01	0.7616
U-235	5.973E-02	0.0482	7.230E-05	0.0001	0.000E+00	0.0000	1.175E-02	0.0095	4.289E-04	0.0003	1.084E-04	0.0001	7.209E-02	0.0581
U-238	1.853E-01	0.1495	4.108E-05	0.0000	0.000E+00	0.0000	3.645E-02	0.0294	4.192E-04	0.0003	1.220E-03	0.0010	2.235E-01	0.1802
Total	1.027E+00	0.8284	1.317E-03	0.0011	0.000E+00	0.0000	2.018E-01	0.1627	3.286E-03	0.0027	6.368E-03	0.0051	1.240E+00	1.0000

*Sum of all water independent and dependent pathways.

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Independent Pathways (Inhalation excludes radon)

Radio-Nuclide	Ground		Inhalation		Radon		Plant		Meat		Milk		Soil	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-235	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
U-238	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000
Total	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000	0.000E+00	0.0000

Total Dose Contributions TDOSE(i,p,t) for Individual Radionuclides (i) and Pathways (p)
As mrem/yr and Fraction of Total Dose At t = 1.000E+03 years

Water Dependent Pathways

Radio-Nuclide	Water		Fish		Radon		Plant		Meat		Milk		All Pathways*	
	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.	mrem/yr	fract.
U-234	2.430E-01	0.6609	1.348E-03	0.0037	0.000E+00	0.0000	4.749E-02	0.1291	1.390E-03	0.0038	1.467E-03	0.0040	2.947E-01	0.8014
U-235	1.194E-02	0.0325	1.100E-05	0.0000	0.000E+00	0.0000	2.350E-03	0.0064	1.228E-04	0.0003	2.753E-05	0.0001	1.445E-02	0.0393
U-238	4.857E-02	0.1321	1.111E-05	0.0000	0.000E+00	0.0000	9.553E-03	0.0260	1.101E-04	0.0003	3.196E-04	0.0009	5.857E-02	0.1593
Total	3.036E-01	0.8254	1.370E-03	0.0037	0.000E+00	0.0000	5.939E-02	0.1615	1.623E-03	0.0044	1.814E-03	0.0049	3.678E-01	1.0000

*Sum of all water independent and dependent pathways.

Dose/Source Ratios Summed Over All Pathways
Parent and Progeny Principal Radionuclide Contributions Indicated

Parent (i)	Product (j)	Branch Fraction	t=	DSR(j,t) (mrem/yr)/(pCi/g) 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	5.000E+02	9.000E+02	1.000E+03
U-234	U-234	1.000E+00		1.549E-01	1.505E-01	1.420E-01	1.161E-01	6.525E-02	8.675E-03	2.853E-01	3.901E-01	3.898E-01	1.021E-01
U-234	Th-230	1.000E+00		0.000E+00	3.031E-06	8.812E-06	2.662E-05	6.152E-05	9.978E-05	3.508E-06	1.240E-06	3.496E-06	3.913E-06
U-234	Ra-226	1.000E+00		0.000E+00	1.101E-08	9.565E-08	9.429E-07	6.084E-06	2.347E-05	7.448E-06	3.186E-04	1.547E-03	1.938E-03
U-234	Pb-210	1.000E+00		0.000E+00	4.884E-11	1.005E-09	2.831E-08	4.443E-07	3.057E-06	1.310E-05	8.704E-04	4.235E-03	5.304E-03
U-234	Po-210	1.000E+00		0.000E+00	1.791E-12	6.407E-11	2.407E-09	4.267E-08	3.439E-07	4.629E-05	3.052E-03	1.501E-02	1.884E-02
U-234	∑DSR(j)			1.549E-01	1.505E-01	1.421E-01	1.161E-01	6.532E-02	8.802E-03	2.853E-01	3.944E-01	4.106E-01	1.281E-01
U-235	U-235	1.000E+00		4.250E-01	4.131E-01	3.902E-01	3.198E-01	1.810E-01	2.462E-02	2.694E-01	3.686E-01	3.687E-01	9.656E-02
U-235	Pa-231	1.000E+00		0.000E+00	1.033E-04	2.903E-04	7.801E-04	1.268E-03	4.864E-04	7.365E-02	1.634E-01	2.880E-01	8.354E-02
U-235	Ac-227	1.000E+00		0.000E+00	2.838E-06	2.242E-05	1.723E-04	5.910E-04	3.921E-04	2.748E-01	5.196E-01	7.851E-01	1.090E-01
U-235	∑DSR(j)			4.250E-01	4.132E-01	3.906E-01	3.207E-01	1.828E-01	2.550E-02	6.179E-01	1.052E+00	1.442E+00	2.891E-01
U-238	U-238	1.000E+00		1.899E-01	1.846E-01	1.743E-01	1.425E-01	8.027E-02	1.072E-02	2.714E-01	3.714E-01	3.714E-01	9.728E-02
U-238	U-234	1.000E+00		0.000E+00	4.289E-07	1.210E-06	3.293E-06	5.550E-06	2.460E-06	2.589E-04	5.755E-04	1.018E-03	2.955E-04
U-238	Th-230	1.000E+00		0.000E+00	4.297E-12	3.700E-11	3.597E-10	2.250E-09	8.218E-09	4.505E-10	1.451E-09	6.158E-09	7.274E-09
U-238	Ra-226	1.000E+00		0.000E+00	1.037E-14	2.688E-13	8.643E-12	1.570E-10	1.580E-09	2.693E-08	4.719E-07	2.134E-06	2.576E-06
U-238	Pb-210	1.000E+00		0.000E+00	3.766E-17	2.216E-15	2.012E-13	9.151E-12	1.820E-10	7.137E-08	1.264E-06	5.718E-06	6.905E-06
U-238	Po-210	1.000E+00		0.000E+00	5.547E-19	1.282E-16	1.640E-14	8.654E-13	2.039E-11	2.891E-07	4.567E-06	2.036E-05	2.458E-05
U-238	∑DSR(j)			1.899E-01	1.846E-01	1.743E-01	1.426E-01	8.028E-02	1.072E-02	2.716E-01	3.719E-01	3.725E-01	9.761E-02

Branch Fraction is the cumulative factor for the j'th principal radionuclide daughter: CUMBRF(j) = BRF(1)*BRF(2)* ... BRF(j).
The DSR includes contributions from associated (half-life ≤ 30 days) daughters.

Single Radionuclide Soil Guidelines G(i,t) in pCi/g
Basic Radiation Dose Limit = 30 mrem/yr

Nuclide (i)	t=	0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	5.000E+02	9.000E+02	1.000E+03
U-234		1.937E+02	1.994E+02	2.112E+02	2.583E+02	4.593E+02	3.409E+03	1.051E+02	7.607E+01	7.307E+01	2.341E+02
U-235		7.059E+01	7.260E+01	7.681E+01	9.354E+01	1.641E+02	1.176E+03	4.855E+01	2.853E+01	2.081E+01	1.038E+02
U-238		1.579E+02	1.625E+02	1.721E+02	2.104E+02	3.737E+02	2.798E+03	1.104E+02	8.066E+01	8.054E+01	3.073E+02

Summed Dose/Source Ratios DSR(i,t) in (mrem/yr)/(pCi/g)
and Single Radionuclide Soil Guidelines G(i,t) in pCi/g
at tmin = time of minimum single radionuclide soil guideline
and at tmax = time of maximum total dose = 902.1 ± 0.9 years

Nuclide (i)	Initial pCi/g	tmin (years)	DSR(i,tmin)	G(i,tmin) (pCi/g)	DSR(i,tmax)	G(i,tmax) (pCi/g)
U-234	2.300E+00	958.5 ± 1.0	4.136E-01	7.254E+01	4.107E-01	7.305E+01
U-235	5.000E-02	858.4 ± 0.9	1.480E+00	2.027E+01	1.437E+00	2.088E+01
U-238	6.000E-01	958.5 ± 1.0	3.725E-01	8.053E+01	3.725E-01	8.054E+01

Individual Nuclide Dose Summed Over All Pathways
Parent Nuclide and Branch Fraction Indicated

Nuclide (j)	Parent (i)	BRF(i)	DOSE(j,t), mrem/yr t= 0.000E+00	1.000E+00	3.000E+00	1.000E+01	3.000E+01	1.000E+02	3.000E+02	5.000E+02	9.000E+02	1.000E+03
U-234	U-234	1.000E+00	3.562E-01	3.461E-01	3.267E-01	2.670E-01	1.501E-01	1.995E-02	6.561E-01	8.973E-01	8.964E-01	2.347E-01
U-234	U-238	1.000E+00	0.000E+00	2.573E-07	7.261E-07	1.976E-06	3.330E-06	1.476E-06	1.553E-04	3.453E-04	6.107E-04	1.773E-04
U-234	∑DOSE(j):		3.562E-01	3.461E-01	3.267E-01	2.670E-01	1.501E-01	1.995E-02	6.563E-01	8.977E-01	8.970E-01	2.349E-01
Th-230	U-234	1.000E+00	0.000E+00	6.972E-06	2.027E-05	6.122E-05	1.415E-04	2.295E-04	8.070E-06	2.853E-06	8.041E-06	9.000E-06
Th-230	U-238	1.000E+00	0.000E+00	2.578E-12	2.220E-11	2.158E-10	1.350E-09	4.931E-09	2.703E-10	8.706E-10	3.695E-09	4.364E-09
Th-230	∑DOSE(j):		0.000E+00	6.972E-06	2.027E-05	6.122E-05	1.415E-04	2.295E-04	8.070E-06	2.854E-06	8.045E-06	9.005E-06
Ra-226	U-234	1.000E+00	0.000E+00	2.531E-08	2.200E-07	2.169E-06	1.399E-05	5.398E-05	1.713E-05	7.328E-04	3.558E-03	4.457E-03
Ra-226	U-238	1.000E+00	0.000E+00	6.223E-15	1.613E-13	5.186E-12	9.422E-11	9.478E-10	1.616E-08	2.832E-07	1.280E-06	1.546E-06
Ra-226	∑DOSE(j):		0.000E+00	2.531E-08	2.200E-07	2.169E-06	1.399E-05	5.398E-05	1.715E-05	7.331E-04	3.559E-03	4.459E-03
Pb-210	U-234	1.000E+00	0.000E+00	1.123E-10	2.311E-09	6.510E-08	1.022E-06	7.030E-06	3.013E-05	2.002E-03	9.740E-03	1.220E-02
Pb-210	U-238	1.000E+00	0.000E+00	2.260E-17	1.330E-15	1.207E-13	5.491E-12	1.092E-10	4.282E-08	7.585E-07	3.431E-06	4.143E-06
Pb-210	∑DOSE(j):		0.000E+00	1.123E-10	2.311E-09	6.510E-08	1.022E-06	7.030E-06	3.018E-05	2.003E-03	9.743E-03	1.220E-02
Po-210	U-234	1.000E+00	0.000E+00	4.119E-12	1.474E-10	5.536E-09	9.814E-08	7.909E-07	1.065E-04	7.020E-03	3.453E-02	4.334E-02
Po-210	U-238	1.000E+00	0.000E+00	3.328E-19	7.691E-17	9.837E-15	5.192E-13	1.223E-11	1.735E-07	2.740E-06	1.221E-05	1.475E-05
Po-210	∑DOSE(j):		0.000E+00	4.119E-12	1.474E-10	5.536E-09	9.814E-08	7.909E-07	1.066E-04	7.023E-03	3.454E-02	4.335E-02
U-235	U-235	1.000E+00	2.125E-02	2.065E-02	1.951E-02	1.599E-02	9.048E-03	1.231E-03	1.347E-02	1.843E-02	1.843E-02	4.828E-03
Pa-231	U-235	1.000E+00	0.000E+00	5.166E-06	1.452E-05	3.901E-05	6.340E-05	2.432E-05	3.683E-03	8.172E-03	1.440E-02	4.177E-03
Ac-227	U-235	1.000E+00	0.000E+00	1.419E-07	1.121E-06	8.615E-06	2.955E-05	1.961E-05	1.374E-02	2.598E-02	3.925E-02	5.448E-03
U-238	U-238	1.000E+00	1.140E-01	1.107E-01	1.046E-01	8.553E-02	4.816E-02	6.432E-03	1.628E-01	2.228E-01	2.229E-01	5.837E-02

BRF(i) is the branch fraction of the parent nuclide.