

***NEBRASKA PUBLIC POWER DISTRICT  
COOPER NUCLEAR STATION  
Radiological Environmental Monitoring Program  
2012 Annual Report  
January 1, 2012 to December 31, 2012***

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## **Preface**

This report covers the period of January 1 through December 31, 2012. Personnel of the Nebraska Public Power District made all sample collections. Analyses were performed and reports of analyses were prepared by Teledyne Brown Engineering – Environmental Services and forwarded to Nebraska Public Power District. Environmental Thermoluminescent Dosimeter (TLD) analyses were performed and reports of analyses were prepared by Mirion Technologies.

**SECTION I. INTRODUCTION**

## **I. INTRODUCTION**

This report contains a complete tabulation of data collected during the period January through December 2012, for the operational Radiological Environmental Monitoring Program performed for the Cooper Nuclear Station (CNS) of the Nebraska Public Power District (NPPD) by Teledyne Brown Engineering - Environmental Services.

Cooper Nuclear Station is located in Nemaha County in the southeast corner of Nebraska on the Missouri River. A portion of the site extends into Missouri. The reactor is an 830-megawatt (net electrical) boiling water reactor. Initial criticality was attained on February 21, 1974.

Radiological environmental monitoring began in 1971 before the plant became operational and has continued to the present. The program monitors radiation levels in air, terrestrial and aquatic environments. All samples are collected by NPPD personnel. All samples are shipped for analysis to a contractor's laboratory where there exists special facilities required for measurements of extremely low levels of radioactivity. Teledyne Brown Engineering - Environmental Services has the responsibility for the analyses for Cooper Nuclear Station.

The United States Nuclear Regulatory Commission (USNRC) regulations (10CFR50.34a) require that nuclear power plants be designed, constructed, and operated to keep levels of radioactive material in effluents to unrestricted areas as low as is reasonably achievable (ALARA). Inplant monitoring is used to ensure that release limits are not exceeded. As a precaution against unexpected or undefined environmental processes, which might allow undue accumulation of radioactivity in the environment, a program for monitoring the plant environs is included in NPPD's CNS Offsite Dose Assessment Manual (ODAM).



## **A. Atmospheric Nuclear Tests and Nuclear Incidents**

Three atmospheric nuclear detonations in the People's Republic of China influenced program results significantly in late 1976 and in 1977. Two of these detonations occurred in late 1976 (September 26 and November 17) and one in late 1977 (September 17). As a consequence of these tests elevated activities of gross beta in air particulate filters and I-131 in milk were observed throughout most of the United States. No atmospheric nuclear tests have been conducted since 1980, thus no short-lived fission products were detected in air particulate samples.

On April 26, 1986 the fire and explosion of Chernobyl Reactor No. 4 in the Soviet Union resulted in the release of fission products to the atmosphere and worldwide fallout. Following the explosion, elevated levels of gross beta activities in air particulates and Iodine-131 in charcoal filters and milk samples were measured. Additionally, in 1986, Cesium-137 and the short-lived radionuclides Iodine-131, Ruthenium-106, and Cesium-134 were detected in broadleaf vegetation. Similar results occurred in other areas of the United States and the entire Northern Hemisphere.

## **B. Monitoring Program Objectives and Data Interpretation**

The objective of the monitoring program is to detect and assess the impact of possible releases to the environs of radionuclides from the operations of the Cooper Nuclear Station. This objective requires measurements of low levels of radioactivity equal to or lower than pre-determined limits of detection. In addition the source of the environmental radiation must be established. Sources of environmental radiation include:

- (1) Natural background radiation from cosmic rays (Beryllium-7).
- (2) Terrestrial, primordial radionuclides from the environment (potassium-40, radium-226, thorium-228).
- (3) Fallout from atmospheric nuclear tests such as the September 1977 detonation by the Peoples' Republic of China and the atmospheric weapons test of October 16, 1980 (fission products and fusion products).
- (4) Releases from nuclear power plants such as CNS (fission products and neutron activation products).
- (5) Fallout from the Chernobyl nuclear reactor accident.

Radiation levels measured in the vicinity of an operating power station are compared with preoperational measurements at the same locations to distinguish power plant effects from other sources. Also, results of the monitoring program are related to events known to cause elevated levels of radiation in the environment, e.g., atmospheric nuclear detonations or abnormal plant releases.

**SECTION II. SUMMARY**

## II. SUMMARY

Presented in this report are summaries and discussions of the data generated for the Radiological Environmental Monitoring Program (REMP) for the Cooper Nuclear Station (CNS) of the Nebraska Public Power District (NPPD) for 2012.

The sampling and analyses program is described in Section III. It contains the sampling schedule and required analyses in Table 1 and the site map.

A discussion of each type of sample analyzed and its impact, if any, on the environment is presented in Section IV. Included are graphs of the radionuclides of interest for the past several years and the statistical results for each quarter of the year.

Section V presents the yearly conclusions of the program.

Section VI is the Radiological Environmental Monitoring Program Summary. It contains the yearly summary of the program with the total number of samples of each type analyzed. It lists the yearly average and range for the control locations versus the indicator locations and the number of detections per total number of samples. It identifies the station with the highest yearly average, the distance and location of that station and provides the range of detection.

Section VII contains the complete data tables for the period.

References are presented in Section VIII.

**SECTION III. SAMPLING AND ANALYSES PROGRAM**

### **III. SAMPLING AND ANALYSES PROGRAM**

The 2012 sampling and analyses program is described in Table 1. Teledyne Brown Engineering - Environmental Services has a comprehensive quality assurance/quality control program designed to assure the reliability of data obtained. The results for the 2012 Interlaboratory Comparison Program conducted by Analytics, Inc., the Department of Energy's (DOE) Mixed Analyte Performance Evaluation Program (MAPEP) and Environmental Resource Associates (ERA) are contained in Appendix B.

Sampling locations are indicated in the map labeled Figure 1. The sample types collected at each location and the approximate distance and direction from the reactor elevated release point are specified.

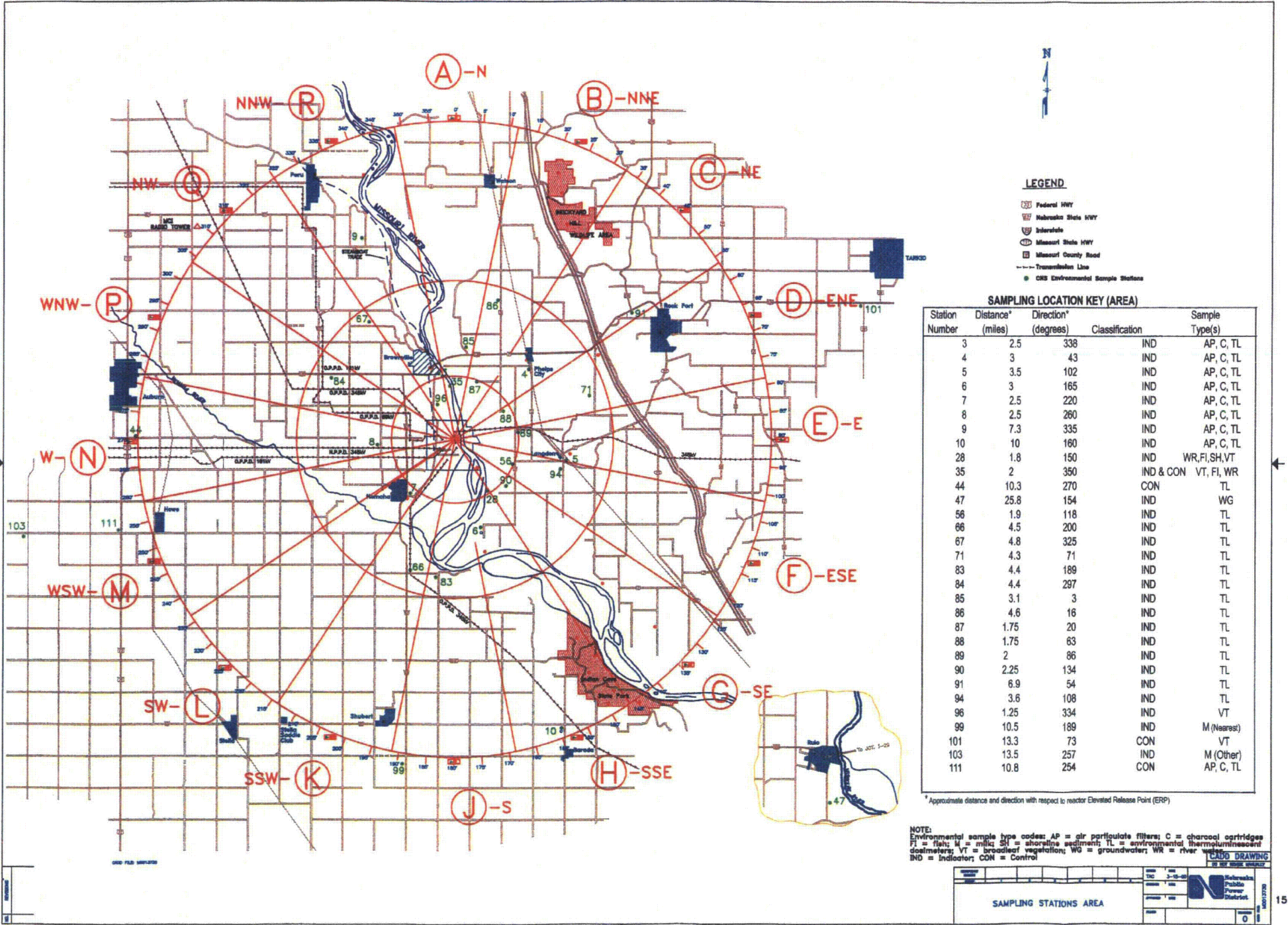
The annual land use census for 2012 is described in Appendix A. There were no milk animals found within three miles of CNS in 2012 and no evidence of potable water use from the river. The nearest garden to CNS is in sector L, 1.3 miles from CNS. From year to year there is a slight variation in the number of gardens tended. The nearest resident to CNS is in sector Q, 0.9 miles from CNS.

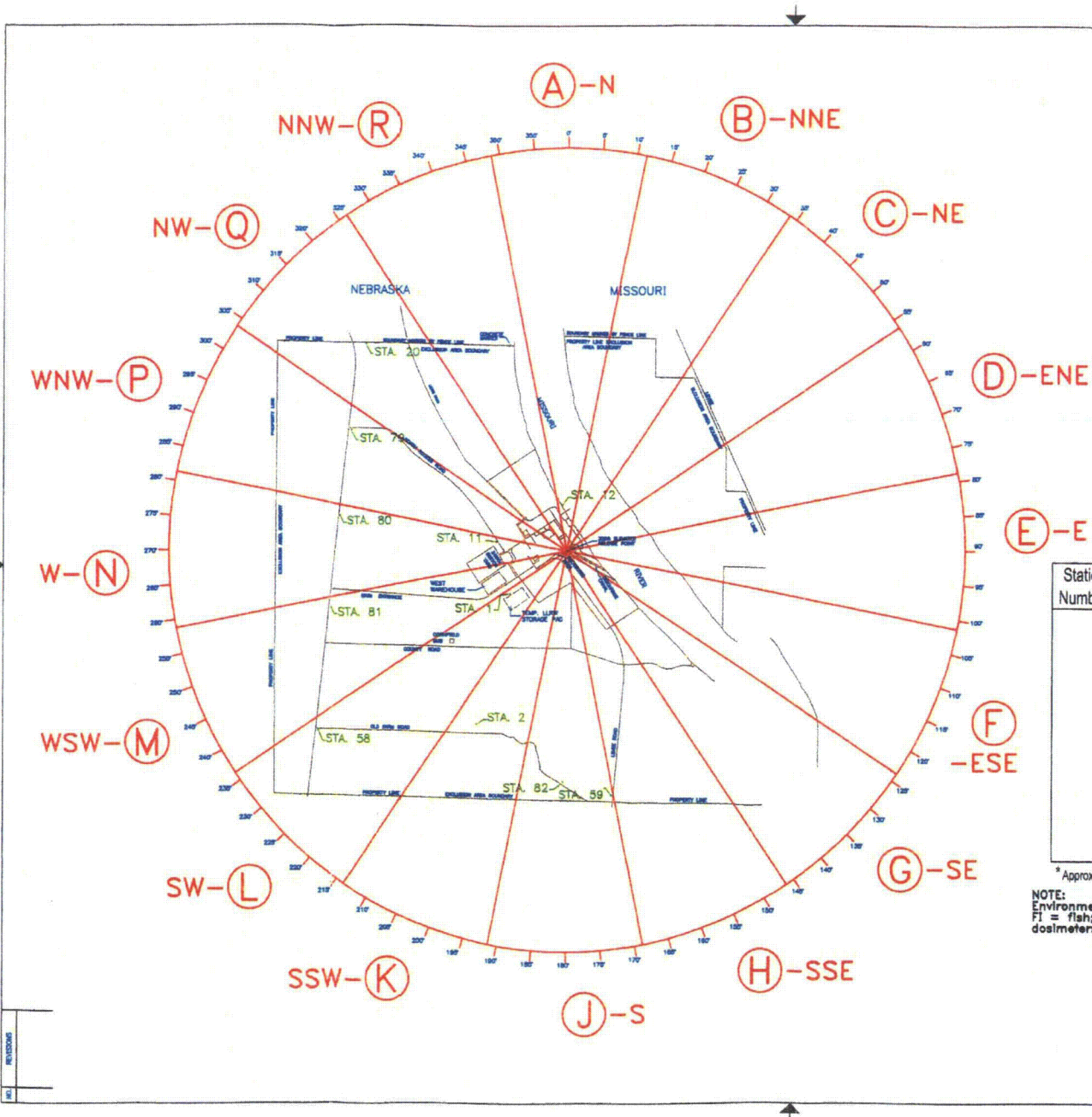
All of the required 2012 environmental monitoring, including sampling and analyses, were conducted as specified in Table D4.1-1 of the CNS Offsite Dose Assessment Manual (ODAM), except as noted in Appendix E, REMP Sampling and Analytical Exceptions table.

**TABLE 1**

**NEBRASKA PUBLIC POWER DISTRICT**  
**COOPER NUCLEAR STATION**  
*Environmental Radiation Surveillance Program*  
*Sampling Schedule and Analyses*

<b><i>Sample Type</i></b>	<b><i>Station</i></b>	<b><i>Frequency</i></b>	<b><i>Analyses</i></b>
Airborne/ Particulate	1-10	Once per 7 days	Gross beta. Gamma Isotopic on quarterly composite of each station, and on each sample in which gross beta activity is >10 times the yearly mean of control samples
Airborne/Iodine	1-10	Once per 7 days	I-131
Milk / Nearest Producer peak pasture only	99	Once per 15 days	I-131 (low level), Gamma Isotopic analysis of each sample
River Water	28, 35	Once per 31 days	Gamma Isotopic, each sample Tritium on quarterly composite
Milk/ Nearest Producer Non-peak pasture	99	Once per 31 days	I-131 (low level), Gamma Isotopic analysis of each sample
Food Products / Broadleaf Vegetation	28, 35, 96, 101	Monthly when required	I-131 (low level), Gamma Isotopic analysis of each sample
Background Radiation Thermoluminescent Dosimeters	1-10, 20, 44, 56, 58, 59, 66, 67, 71, 79-91, 94,	Once per 92 days	TLD Readout (gamma dose)
Groundwater	11, 47	Once per 92 days	I-131 (low level), Gamma Isotopic, Tritium
Fish (Summer and Fall)	28, 35	Two times per year	Gamma Isotopic on edible portions
Shoreline Sediment	28, 35	Two times per year	Gamma Isotopic





**LEGEND**

- Federal HWY
- Nebraska State HWY
- Interstate
- Missouri State HWY
- Missouri County Road
- Transmission Line
- CNS Environmental Sample Stations

**SAMPLING LOCATION KEY (SITE)**

Station Number	Distance* (miles)	Direction* (degrees)	Classification	Sample Type(s)
1	0.1	230	IND	AP, C, TL
2	0.75	210	IND	AP, C, TL
11	0.15	275	IND	WG
12	0.1	355	CON	WR
20	0.96	315	IND	TL
58	1.1	234	IND	TL
59	1	170	IND	TL
79	0.85	299	IND	TL
80	0.75	280	IND	TL
81	0.8	255	IND	TL
82	0.8	185	IND	TL

\* Approximate distance and direction with respect to reactor Elevated Release Point (ERP)

NOTE:  
 Environmental sample type codes: AP = air particulate filters; C = charcoal cartridges  
 FI = fish; M = milk; SH = shoreline sediment; TL = environmental thermoluminescent dosimeters; VT = broadleaf vegetation; WG = groundwater; WR = river water.

CADD DRAWING  
 DO NOT REUSE UNLESS

DATE	3-15-00	
TAC	3-15-00	
MAP OF SAMPLING STATIONS SITE		160013729 0



**SECTION IV. SUMMARY AND DISCUSSION OF 2012 ANALYTICAL RESULTS**

#### **IV. SUMMARY AND DISCUSSION OF 2012 ANALYTICAL RESULTS**

Data from the radiological analyses of environmental media collected during 2012 are tabulated and discussed below. The procedures and specifications followed in the laboratory for these analyses are as required in the Teledyne Brown Engineering Quality Assurance manual and are explained in the Teledyne Brown Engineering Analytical Procedures. A synopsis of analytical procedures used for the environmental samples is provided in Appendix C. In addition to internal quality control measures performed by Teledyne Brown Engineering, the laboratory also participates in an Interlaboratory Comparison Program. Participation in this program ensures that independent checks on the precision and accuracy of the measurements of radioactive material in environmental samples are performed. The results of the Interlaboratory Comparison are provided in Appendix B.

Radiological analyses of environmental media characteristically approach and frequently fall below the detection limits of state-of-the-art measurement methods. The "less than" values in the data tables were calculated from each specific analysis and are dependent on sample size, detector efficiency, length of counting time, chemical yield (when appropriate) and the radioactive decay factor from time of counting to time of collection. Teledyne Brown Engineering's analytical methods meet or are below the Lower Limit of Detection (LLD) requirements given in Table 2 of the USNRC Branch Technical Position, Radiological Monitoring Acceptable Program (November 1979, Revision 1). Appendix C contains a discussion of the LLD formulas.

The following is a discussion and summary of the results of the environmental measurements taken during the 2012 reporting period:

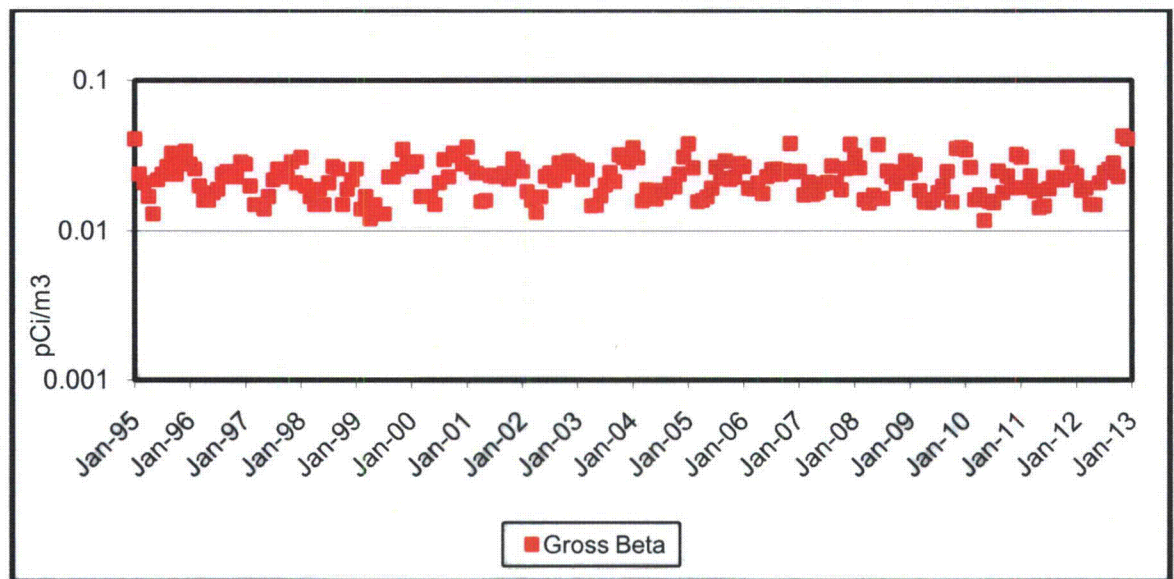
**A. Airborne Particulates**

Gross beta activity was observed in 367 of the 367 indicator samples collected during 2012. The average concentration was 0.027 pCi/m<sup>3</sup> with a range of 0.007 to 0.089 pCi/m<sup>3</sup>. The results of the gross beta activities are presented in Section VII-1 and Trending Graph 1. The gross beta activities for 2012 were comparable to levels measured in the previous several years. Prior to that period the gross beta activities were higher due to atmospheric nuclear weapons testing performed in other countries. The preoperational period of 1971 through 1974 averaged 0.098 pCi/m<sup>3</sup> gross beta.

Air particulate filters were collected weekly and composited by locations on a quarterly basis. They were analyzed by gamma ray spectroscopy. The results are presented in Section VII-2. Beryllium-7, which is produced continuously in the upper atmosphere by cosmic radiation, was measured in 32 of 32 composite samples. The indicator locations had an average concentration of 0.136 pCi/m<sup>3</sup> with a range of 0.069 to 0.258 pCi/m<sup>3</sup>. Naturally occurring potassium-40 was detected in one of 32 composite samples. The indicator location had a concentration of 0.047 pCi/m<sup>3</sup>. During the preoperational period, beryllium-7 was measured at comparable levels. All other gamma emitters were below the detection limits.

TRENDING GRAPH 1

**GROSS BETA IN AIR PARTICULATES**  
MONTHLY AVERAGE – ALL LOCATIONS



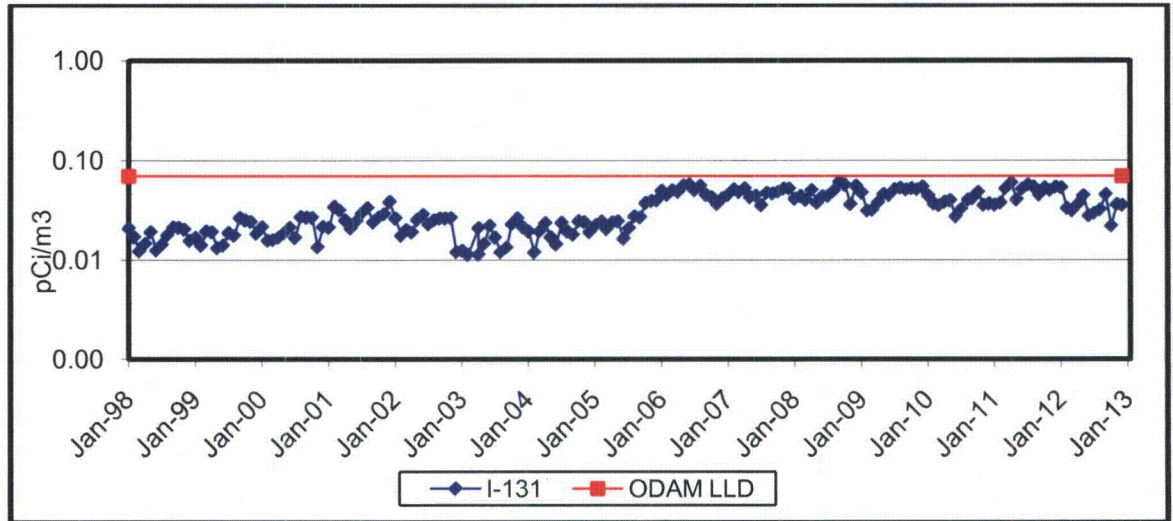
**B. Airborne Iodine**

Charcoal cartridges used to collect airborne iodine were collected weekly and analyzed by gamma spectrometry for iodine-131. Stations 01 through 10 were monitored. The results are presented in Section VII-1 and Trending Graph 2. All results were below the required lower limit of detection.

TRENDING GRAPH 2

**IODINE-131 IN CHARCOAL FILTERS**

MONTHLY AVERAGE – ALL LOCATIONS



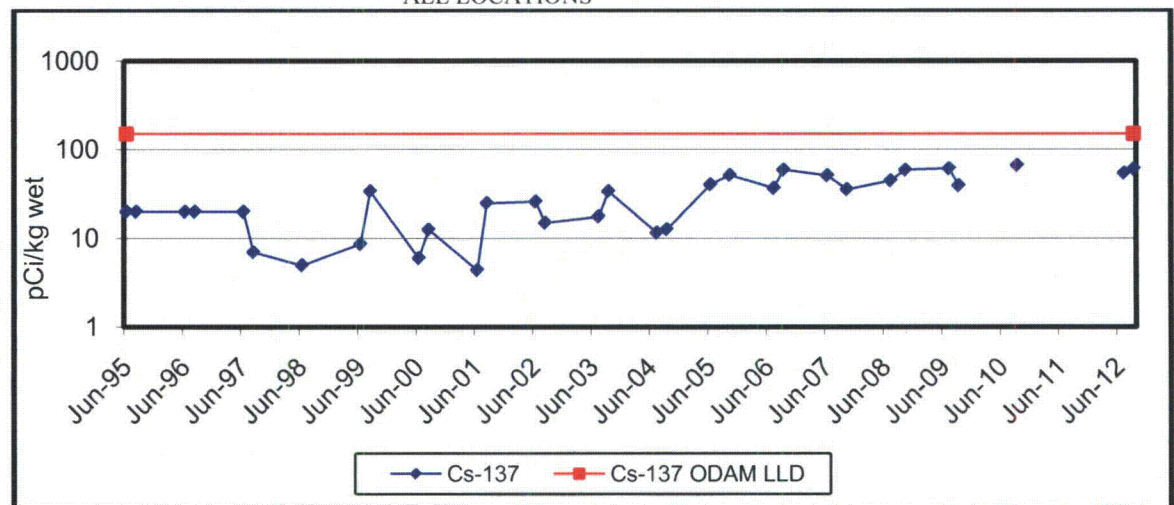
Trending Graph 2 represents minimum detectable concentration (MDC) results. This graph has the ODAM LLD trend line, showing the MDC results as below the ODAM required LLDs. The upward trend indicates shortened detector count time in order to maximize the number of samples counted each day, and is not an indication that the trend will continue to increase above the LLD limit.

### C. Fish

Aquatic biota can be sensitive indicators of radionuclide accumulation in the environment because of their ability to concentrate certain chemical elements, which have radioisotopes. The results are presented in Table VII-3 and Trending Graph 3. Four samples of fish were collected during the fall of 2012. A middle-top feeding fish (carp) and a bottom feeding fish (catfish) were collected in July and September. These samples were analyzed by gamma ray spectroscopy. Naturally occurring potassium-40 was detected in all samples. The average concentration at the upstream control location was 3597 pCi/kg (wet weight) with a range of 3169 to 3890 pCi/kg (wet weight). The average concentration for the two indicator samples was 3340 pCi/kg (wet weight) with a range of 2590 to 3925 pCi/kg (wet weight). The preoperational period of 1971 through 1974 averaged 2400 pCi/kg potassium-40. All other gamma emitters were below their detection levels.

TRENDING GRAPH 3

#### CESIUM-137 IN FISH ALL LOCATIONS



Trending Graph 3 represents minimum detectable concentration (MDC) results. This graph has the ODAM LLD trend line, showing the MDC results as below the ODAM required LLDs. The upward trend indicates shortened detector count time in order to maximize the number of samples counted each day, and is not an indication that the trend will continue to increase above the LLD limit.

July samples were not collected in July 2010.

Flooding of the Missouri River prevented collection of fish in 2011.

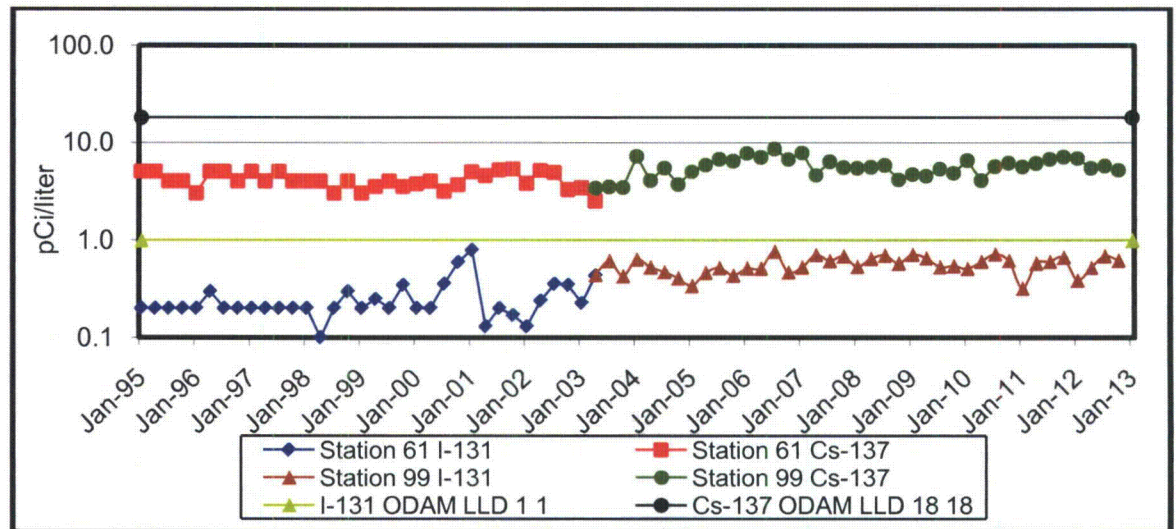
**D. Milk – Nearest Producer**

Milk samples are collected once every 15 days in peak pasture season and once every 31 days the rest of the year from Station 99. The results are presented in Table VII-4 and Trending Graph 4. Sixteen samples were analyzed by gamma ray spectroscopy and for low-level iodine-131 by radiochemical separation. All iodine-131 results were below the required lower limit of detection. Naturally occurring potassium-40 was measured in all samples with an average concentration of 1268 pCi/liter and a range of 1117 to 1514 pCi/liter. All other gamma emitters were below their detection levels. The operation of the Cooper Nuclear Station has no discernable impact on milk samples.

TRENDING GRAPH 4

**IODINE-131 AND CESIUM-137 IN MILK – NEAREST PRODUCER**

STATIONS 61 & 99



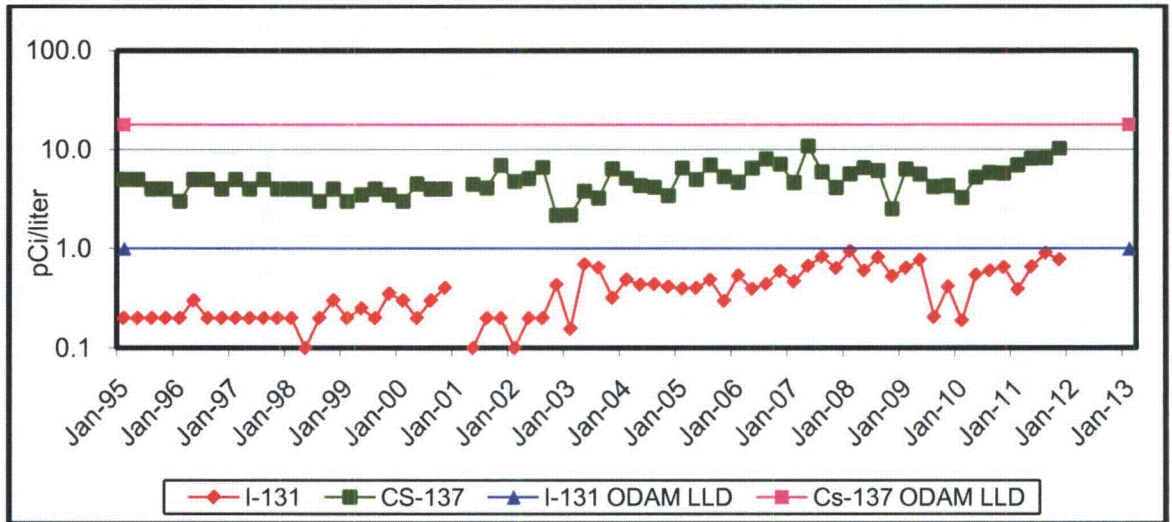
Station 61 went out of business in May of 2003. Station 99 replaced station 61 in May of 2003. Trending Graph 4 represents minimum detectable concentration (MDC) results. This graph has the ODAM LLD trend line, showing the MDC results as below the ODAM required LLDs. The upward trend indicates shortened detector count time in order to maximize the number of samples counted each day, and is not an indication that the trend will continue to increase above the LLD limit.

**E. Milk – Other Producers**

Milk – Other Producer location 103 is no longer available but will remain as an option for sample collection if conditions change.

TRENDING GRAPH 5

**IODINE-131 AND CESIUM-137 IN MILK – OTHER PRODUCERS**  
QUARTERLY AVERAGE – ALL LOCATIONS



Due to delay in analysis, sample results for I-131 for the first quarter of 2001 were excluded and are not plotted.

Milk station 102 went out of business April 2006. Vegetation samples are taken in lieu of milk.

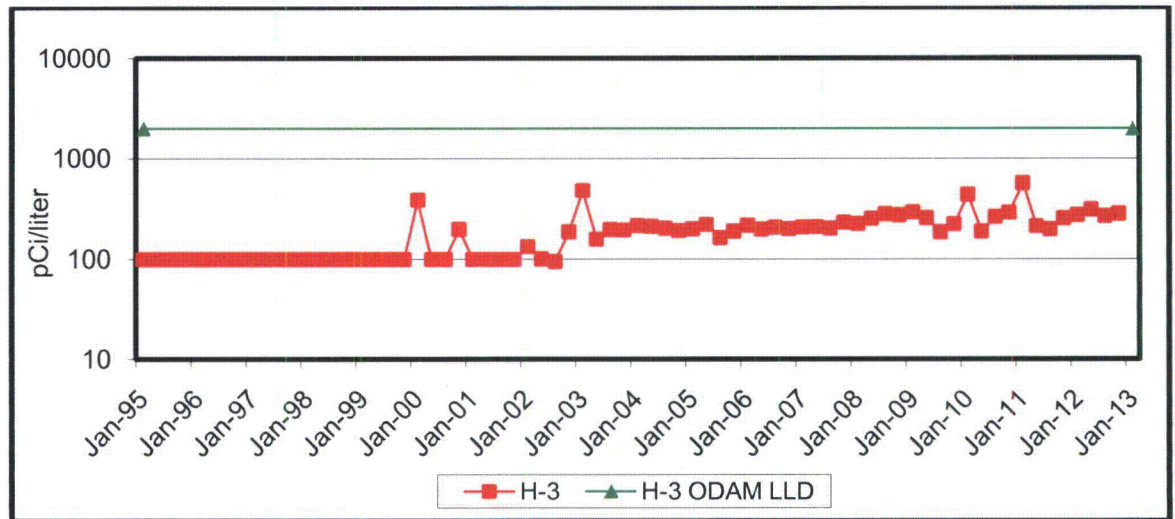
Trending Graph 5 represents minimum detectable concentration (MDC) results. This graph has the ODAM LLD trend line, showing the MDC results as below the ODAM required LLDs. The upward trend indicates shortened detector count time in order to maximize the number of samples counted each day, and is not an indication that the trend will continue to increase above the LLD limit.

**F. Ground Water**

Groundwater was collected from two stations quarterly and analyzed for tritium and for gamma emitting radionuclides. Station 11 is located 0.15 miles from the plant and station 47 is 25.8 miles from the plant. The results are presented in Table VII-6 and Trending Graph 6. All tritium results were below the required lower limit of detection. All gamma emitters were below their detection levels.

TRENDING GRAPH 6

**TRITIUM IN GROUND WATER**  
QUARTERLY AVERAGE – ALL LOCATIONS



Trending Graph 6 represents minimum detectable concentration (MDC) results. This graph has the ODAM LLD trend line, showing the MDC results as below the ODAM required LLDs. The upward trend indicates shortened detector count time in order to maximize the number of samples counted each day, and is not an indication that the trend will continue to increase above the LLD limit.

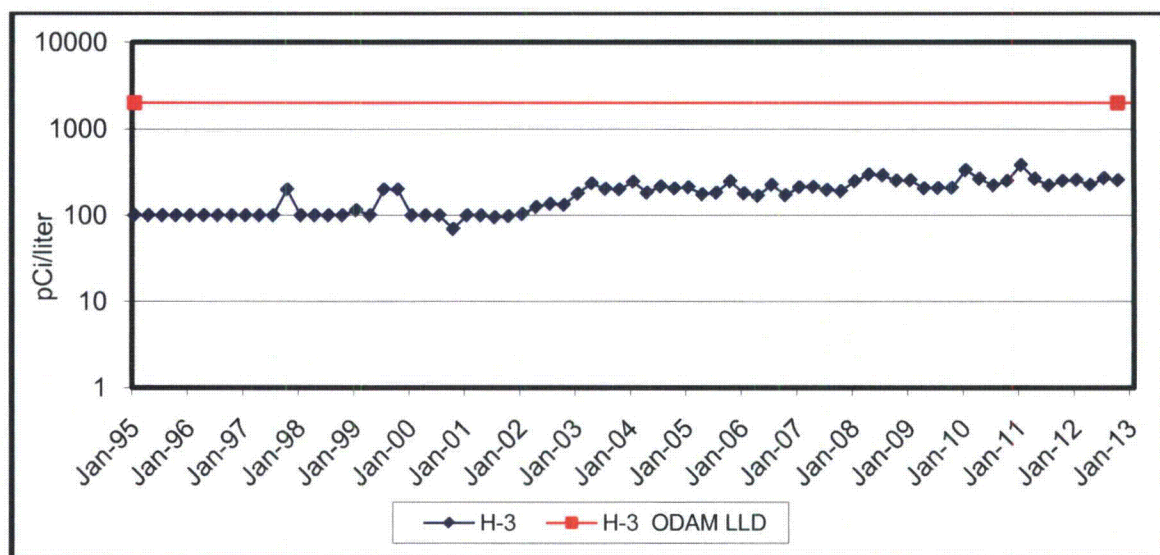


**G. River Water**

River water was collected monthly and monitored for gamma emitting radionuclides and tritium. The results are presented in Table VII-7 and Trending Graph 7. All tritium results were below the required lower limit of detection. Naturally occurring potassium-40 was detected in one sample at location 35 with a concentration of 114 pCi/liter. Naturally occurring thorium-228 was detected in one sample at location 28 with a concentration of 12.2 pCi/liter. All other gamma emitters were below their detection levels.

TRENDING GRAPH 7

**TRITIUM IN RIVER WATER**  
QUARTERLY AVERAGE – ALL LOCATIONS



Trending Graph 7 represents minimum detectable concentration (MDC) results. This graph has the ODAM LLD trend line, showing the MDC results as below the ODAM required LLDs. The upward trend indicates shortened detector count time in order to maximize the number of samples counted each day, and is not an indication that the trend will continue to increase above the LLD limit.

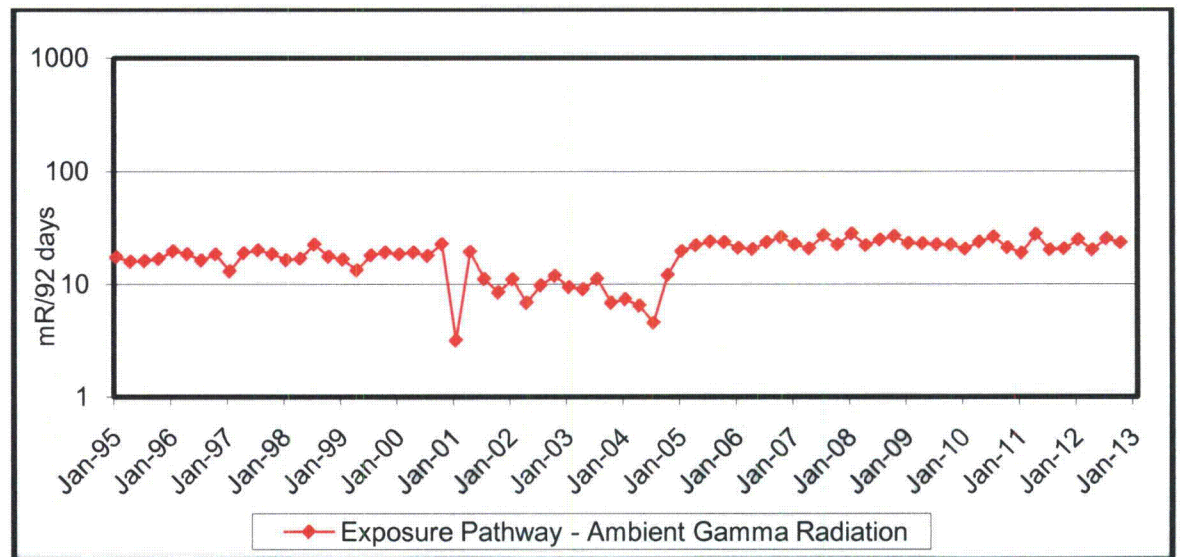
## H. Thermoluminescent Dosimeters

Thermoluminescent dosimeters (TLDs) determine environmental radiation doses and the results are presented in Table VII-8 and Trending Graph 8. Ambient radiation was monitored at 32 locations within an 11 mile radius of the Cooper Nuclear Station and collected quarterly. The quarterly average for the indicator locations was 23.4 millirem/quarter and a range from 14.7 to 62.4 millirem/quarter. The control station 44, which is located 10.3 miles, 270 degrees, had an average of 22.8 millirem/quarter and a range from 19.2 to 25.6 millirem/quarter. The highest station was Station 44 with an average of 25.1 millirem/quarter and a range from 21.3 to 27.0 millirem/quarter. The preoperational period of 1971 through 1974 averaged 37.0 millirem/quarter; which is the preoperational four year average. Current year TLD averages deviate from the preoperational averages due to instrument variations from previous vendors.

The data from year to year is in good agreement and indicates no adverse changes in radiation exposure to the population near the Cooper Nuclear Station.

TRENDING GRAPH 8

### THERMOLUMINESCENT DOSIMETRY QUARTERLY AVERAGE - ALL LOCATIONS



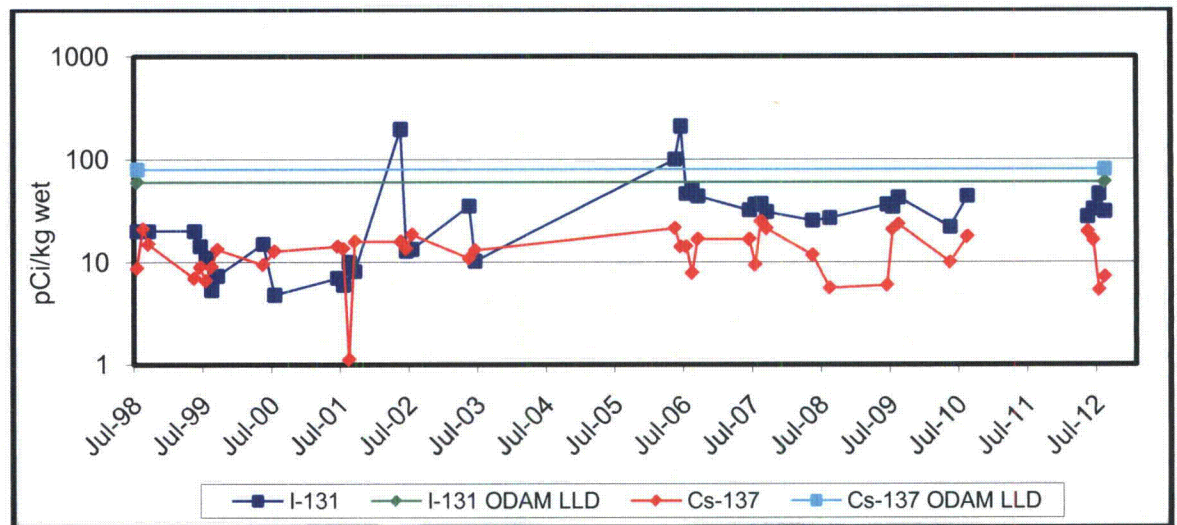
First quarter 2001 TLD data low but still within acceptable limits due to possible dry conditions.

## I. Food – Broadleaf Vegetation

Eight broadleaf vegetation samples were collected from two locations in May, June, July and August during 2012. The samples were analyzed by gamma ray spectroscopy and for low-level iodine-131 by radiochemical separation. The results are presented in Table VII-9 and Trending Graph 9. Beryllium-7, which is produced continuously in the upper atmosphere by cosmic radiation was measured in all eight samples analyzed. The average concentration for the indicator location was 541 pCi/kg wet with a range of 376 to 785 pCi/kg wet. The average concentration for the control location was 655 pCi/kg wet with a range of 392 to 1003 pCi/kg wet. Naturally occurring potassium-40 was measured in all eight samples analyzed. The concentration for the indicator location was 5508 pCi/kg wet with a range of 4345 to 6335 pCi/kg wet. The average concentration for the control location was 6349 pCi/kg wet with a range of 5519 to 7157 pCi/kg wet. All other gamma emitters were below their detection levels. The operation of the Cooper Nuclear Station has no discernable impact on broadleaf vegetation samples.

TRENDING GRAPH 9

### IODINE-131 AND CESIUM-137 IN FOOD – BROADLEAF VEGETATION ALL LOCATIONS



The low Cs-137 value reported in July 2001 was due to the wrong aliquot being entered for the gamma analysis resulted in an invalid analysis and is not reported

Due to delay in sample receipt, the I-131 had decayed away, resulting in an invalid analysis for May 2002 and is not reported.

Milk samples were collected in lieu of broadleaf vegetation samples in 2004 and 2005.

Due to delay in counting sample, the I-131 had decayed away, resulting in an invalid analysis for June 2006 and is not reported. The I-131 by chemical separation met required I-131 LLD.

Trending Graph 9 represents minimum detectable concentration (MDC) results. This graph has the ODAM LLD trend line, showing the MDC results as below the ODAM required LLDs. The upward trend indicates shortened detector count time in order to maximize the number of samples counted each day, and is not an indication that the trend will continue to increase above the LLD limit.

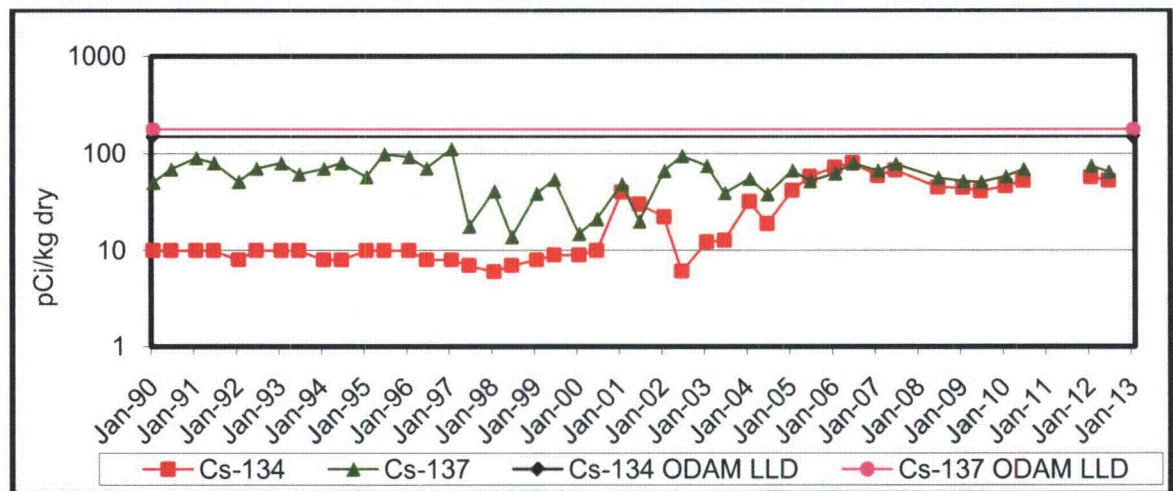
Broadleaf vegetation samples were not available for collection in 2011 due to Missouri River flooding.

**J. Shoreline Sediment**

Sediment samples were collected during May and October from Stations 28 and 35 and were analyzed by gamma spectrometry. The results are presented in Table VII-10 and Trending Graph 10. A number of naturally occurring radionuclides were detected in these samples. Naturally occurring potassium-40 was observed in all four samples. The average concentration for the one supplemental station was 13705 pCi/kg (dry weight) and a range of 13560 to 13850 pCi/kg (dry weight). The average concentration for the one indicator station was 16370 pCi/kg (dry weight) and a range of 15790 to 16950 pCi/kg (dry weight). Radium-226 was observed in three of four samples. The concentration for the supplemental station was 1913 pCi/kg (dry weight). The average concentration for the indicator station was 2577 pCi/kg (dry weight) with a range of 2258 to 2895 pCi/kg (dry weight). Thorium-228 was observed in all samples. The average concentration for the supplemental station was 921 pCi/kg (dry weight) with a range of 816 to 1027 pCi/kg (dry weight). The average concentration for the indicator station was 1007 pCi/kg (dry weight) with a range of 845 to 1169 pCi/kg (dry weight). All other gamma emitters were below their detection limits.

TRENDING GRAPH 10

**CESIUM-134 AND CESIUM-137 IN SHORELINE SEDIMENT**  
STATIONS 28 AND 35



Trending Graph 10 represents minimum detectable concentration (MDC) results. Only one sample was collected in 2008. This graph has the ODAM LLD trend line, showing the MDC results as below the ODAM required LLDs. The upward trend indicates shortened detector count time in order to maximize the number of samples counted each day, and is not an indication that the trend will continue to increase above the LLD limit.

Shoreline sediment samples were not available for collection due to flooding of the Missouri River in 2011.

## **K. Errata Data**

Due to an incorrect setting on one of twelve gamma detectors, there was an incorrect MDC reported for samples analyzed on this detector. Teledyne Brown Engineering initiated Nonconformance 13-07 to investigate the issue and corrective actions have been implemented. As a result, all MDCs for these samples have increased by 41.6%. The previously reported activities and uncertainties were not affected. One air particulate 4<sup>th</sup> quarter 2012 composite sample at Location 07 was reprocessed using the correct calculation. All required LLDs were met.

Nuclide	MDC, original result	MDC, reprocessed result
K-40	<3.01E-02	<4.27E-02
Mn-54	<1.93E-03	<2.73E-03
Co-58	<3.30E-03	<4.67E-03
Fe-59	<1.14E-02	<1.61E-02
Co-60	<1.67E-03	<2.37E-03
Zn-65	<5.99E-03	<8.49E-03
Zr-95	<6.69E-03	<9.48E-03
Ru-103	<5.31E-03	<7.52E-03
Ru-106	<1.99E-02	<2.82E-02
I-131	<7.92E-01	<1.12E+00
Cs-134	<2.57E-03	<3.64E-03
Cs-137	<2.03E-03	<2.87E-03
Ba-140	<2.78E-01	<3.94E-01
La-140	<1.21E-01	<1.72E-01
Ce-141	<7.04E-03	<9.97E-03
Ce-144	<7.36E-03	<1.04E-03
Ra-226	<2.91E-02	<4.13E-02
Th-228	<3.02E-03	<4.28E-03

**SECTION V. CONCLUSIONS**

## V. CONCLUSIONS

The results of the 2012 Radiological Environmental Monitoring Program (REMP) for the Cooper Nuclear Station (CNS) of the Nebraska Public Power District (NPPD) have been presented. The report contains data tables, summaries, and discussions of the data and trending graphs.

Naturally occurring radioactivity and residual traces of fallout were observed in sample media in the expected ranges. They have been discussed individually in the text. Observed radioactivity was at very low concentrations.

The results of the analyses have been presented. Based on the evidence of the Radiological Environmental Monitoring Program, the Nebraska Public Power District, Cooper Nuclear Station has had no discernable radiological impact on the environment and is operating within regulatory limits.

**SECTION VI. RADIOLOGICAL ENVIRONMENTAL MONITORING**  
**PROGRAM SUMMARY TABLE - 2012**



**ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY**

Name of Facility Cooper Nuclear Station  
 Location of Facility Nemaha Nebraska  
 (County/State)

Docket No. 50-298  
 Reporting Period January 1 2012 to December 31 2012

Medium of Pathway Sampled (Unit of Measurement)	Type & Total No. of Analysis Performed	Lower Limit of Detection(1) (LLD)	All Indicator Locations Mean(2) Range(2)	<u>Location with Highest Annual Mean</u> Name		Mean(2) Range(2)	Control Location Mean(2) Range(2)	No. of Reportable Occurrences
<b>Air Iodine</b> (pCi/m <sup>3</sup> )	I-131	367	0.07 ND(0/367) (ND-ND)	NA		NA(0/0) (NA-NA)	NA(0/0) (NA-NA)	0
<b>Air Particulate</b> (pCi/m <sup>3</sup> )	GR-B	367	0.01 0.027(367/367) (0.007/0.089)	Sta. 4	3.0 mi.	0.041(13/13) (0.017/0.089)	NA(0/0) (NA-NA)	0
	BE-7	32	NA 0.136(28/32) (0.069/0.258)	Sta. 10	10.0 mi.	0.199(4/4) (0.127/0.258)	NA(0/0) (NA-NA)	0
	K-40	32	NA 0.047(1/32) NA-NA	Sta. 1	0.10 mi.	0.047(1/4) NA-NA	NA(0/0) (NA-NA)	0
	CO-60	32	NA ND(0/32) (ND-ND)	NA		NA(0/0) (NA-NA)	NA(0/0) (NA-NA)	0
	TH-228	32	NA ND(0/32) (ND-ND)	NA		NA(0/0) (NA-NA)	NA(0/0) (NA-NA)	0
<b>Fish</b> (pCi/kg wet)	K-40	8	NA 3340(4/4) (2590/3925)	Sta. 35	2.0 mi.	3597(4/4) (3169/3890)	3597(4/4) (3169/3890)	0
	CO-60	8	130 ND(0/4) (ND-ND)	NA		NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0

(1) Nominal Lower Limit of Detection (LLD), as stated in ODAM.

(2) Mean and Range based upon detectable measurements only. Fraction of detectable measurements at specified location indicated in brackets(.

(3) ND = Non Detectable.

(4) NA = Not Applicable.

**ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY**

Name of Facility Cooper Nuclear Station  
 Location of Facility Nemaha Nebraska  
 (County/State)

Docket No. 50-298  
 Reporting Period January 1 2012 to December 31 2012

Medium of Pathway Sampled (Unit of Measurement)	Type & Total No. of Analysis Performed		Lower Limit of Detection(1) (LLD)	All Indicator Locations Mean(2) Range(2)	<u>Location with Highest Annual Mean</u>		Control Location Mean(j)(2) Range(2)	No. of Reportable Occurrences
					Name	Mean(j)(2) Range(2)		
<b>Fish (cont'd)</b> (pCi/kg wet)	CS-137	8	150	ND(0/4) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
	TH-228	8	NA	ND(0/4) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
<b>Milk Nearest</b> (pCi/L)	I-131	16	NA	ND(0/16) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/0) (NA-NA)	0
	K-40	16	NA	1268(16/16) (1117/1514)	Sta. 99 10.5 mi.	1268(16/16) (1117/1514)	NA(0/0) (NA-NA)	0
	RA-226	16	NA	ND(0/16) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/0) (NA-NA)	0
	TH-228	16	NA	ND(0/16) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/0) (NA-NA)	0
<b>Water - Ground</b> (pCi/L)	I-131	8	1	ND(0/8) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/0) (NA-NA)	0
	H-3	8	2000	ND(0/8) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/0) (NA-NA)	0

(1) Nominal Lower Limit of Detection (LLD), as stated in ODAM.

(2) Mean and Range based upon detectable measurements only. Fraction of detectable measurements at specified location indicated in brackets().

(3) ND = Non Detectable.

(4) NA = Not Applicable.

## ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY

Name of Facility <u>Cooper Nuclear Station</u> Location of Facility <u>Nemaha Nebraska</u> (County/State)	Docket No. <u>50-298</u> Reporting Period <u>January 1 2012 to December 31 2012</u>
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Medium of Pathway Sampled (Unit of Measurement)	Type & Total No. of Analysis Performed	Lower Limit of Detection(1) (LLD)	All Indicator Locations Mean(2) Range(2)	<u>Location with Highest Annual Mean</u>		Control Location Mean(1)(2) Range(2)	No. of Reportable Occurrences	
				Name		Mean(1)(2) Range(2)		
<b>Water - Ground (cont'd)</b> (pCi/L)	K-40	8	NA	ND(0/8) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/0) (NA-NA)	0
	TH-228	8	NA	ND(0/8) (ND-ND)	NA	NA(0/0) (NA-NA)	NA(0/0) (NA-NA)	0
<b>River Water</b> (pCi/L)	H-3	32	2000	ND(0/16) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/16) (ND-ND)	0
	K-40	24	NA	114(1/12) NA-NA	Sta. 35 2.0 mi.	117(1/12) NA-NA	117(1/12) NA-NA	0
<b>River Water (cont'd)</b> (pCi/L)	TH-228	24	NA	12.2(1/12) NA-NA	Sta. 28 1.8 mi.	12.2(1/12) NA-NA	ND(0/12) (ND-ND)	0
<b>Thermoluminescence Dosimeter</b> (mR/Quarter)	Gamma Dose Quarterly	128	NA	23.4(124/124) (14.2/27.3)	Sta. 44 10.3 mi.	25.1(4/4) (21.3/27.0)	25.1(4/4) (21.3/27.0)	0
<b>Broadleaf Vegetation</b> (pCi/kg wet)	I-131	8	60	ND(0/4) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
	BE-7	8	NA	541(4/4) (376/785)	Sta. 35 2.0 mi.	655(4/4) (392/1003)	655(4/4) (392/1003)	0

(1) Nominal Lower Limit of Detection (LLD), as stated in ODAM.

(2) Mean and Range based upon detectable measurements only. Fraction of detectable measurements at specified location indicated in brackets().

(3) ND = Non Detectable.

(4) NA = Not Applicable.

**ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM SUMMARY**

Name of Facility Cooper Nuclear Station  
 Location of Facility Nemaha Nebraska  
 (County/State)

Docket No. 50-298  
 Reporting Period January 1 2012 to December 31 2012

Medium of Pathway Sampled (Unit of Measurement)	Type & Total No. of Analysis Performed	Lower Limit of Detection(1) (LLD)	All Indicator Locations Mean(2) Range(2)	Location with Highest Annual Mean		Control Location Mean()(2) Range(2)	No. of Reportable Occurrences
				Name	Mean()(2) Range(2)		
<b>Broadleaf Vegetation (cont'd)</b> (pCi/kg wet)	K-40	8	NA 5508(4/4) (4345/6335)	Sta. 35 2.0 mi.	6349(4/4) (5519/7157)	6349(4/4) (5519/7157)	0
	RA-226	8	NA ND(0/4) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
	TH-228	8	NA ND(0/4) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/4) (ND-ND)	0
<b>Shoreline Sediment</b> (pCi/kg dry)	BE-7	4	NA ND(0/2) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/2) (ND-ND)	0
	K-40	4	NA 16370(2/2) (15790/16950)	Sta. 28 1.8 mi.	16370(2/2) (15790/16950)	13705(2/2) (13560/13850)	0
<b>Shoreline Sediment (cont'd)</b> (pCi/kg dry)	CS-137	4	NA ND(0/2) (ND-ND)	NA	NA(0/0) (NA-NA)	ND(0/2) (ND-ND)	0
	RA-226	4	NA 2577(2/2) (2258/2895)	Sta. 28 1.8 mi.	2577(2/2) (2258/2895)	1913(1/2) NA-NA	0
	TH-228	4	NA 1007(2/2) (845/1169)	Sta. 28 1.8 mi.	1007(2/2) (845/1169)	921(2/2) (816/1027)	0

(1) Nominal Lower Limit of Detection (LLD), as stated in ODAM.

(2) Mean and Range based upon detectable measurements only. Fraction of detectable measurements at specified location indicated in brackets().

(3) ND = Non Detectable.

(4) NA = Not Applicable.

**SECTION VII. COMPLETE DATA TABLES**

VII-1  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - AIRBORNE**  
**AIR PARTICULATE AND CHARCOAL FILTERS**

STATION NUMBER 1

COLL START DATE	TIME STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
01/03/12	01/10/12	1.00E+04	CU.FT.	2.06E-02 ± 4.91E-03	L.T. 5.E-02
01/10/12	01/17/12	1.00E+04	CU.FT.	2.52E-02 ± 5.29E-03	L.T. 6.E-02
01/17/12	01/24/12	1.01E+04	CU.FT.	3.50E-02 ± 5.06E-03	L.T. 5.E-02
01/24/12	01/30/12	8.66E+03	CU.FT.	2.47E-02 ± 4.98E-03	L.T. 6.E-02
01/30/12	02/07/12	1.15E+04	CU.FT.	2.46E-02 ± 4.18E-03	L.T. 2.E-02
02/07/12	02/14/12	1.00E+04	CU.FT.	1.89E-02 ± 4.13E-03	L.T. 2.E-02
02/14/12	02/20/12	8.59E+03	CU.FT.	2.60E-02 ± 4.99E-03	L.T. 5.E-02
02/20/12	02/28/12	1.15E+04	CU.FT.	1.19E-02 ± 3.33E-03	L.T. 4.E-02
02/28/12	03/06/12	1.02E+04	CU.FT.	2.20E-02 ± 4.78E-03	L.T. 2.E-02
03/06/12	03/13/12	9.85E+03	CU.FT.	1.95E-02 ± 4.15E-03	L.T. 2.E-02
03/13/12	03/20/12	1.02E+04	CU.FT.	2.08E-02 ± 4.61E-03	L.T. 3.E-02
03/20/12	03/27/12	9.98E+03	CU.FT.	2.02E-02 ± 4.55E-03	L.T. 5.E-02
03/27/12	04/03/12	1.01E+04	CU.FT.	2.80E-02 ± 5.10E-03	L.T. 3.E-02
04/03/12	04/10/12	9.98E+03	CU.FT.	1.68E-02 ± 3.99E-03	L.T. 4.E-02
04/10/12	04/17/12	1.02E+04	CU.FT.	1.21E-02 ± 3.55E-03	L.T. 3.E-02
04/17/12	04/24/12	9.92E+03	CU.FT.	1.07E-02 ± 4.00E-03	L.T. 6.E-02
04/24/12	05/02/12	1.15E+04	CU.FT.	2.43E-02 ± 4.06E-03	L.T. 2.E-02
05/02/12	05/08/12	8.73E+03	CU.FT.	9.32E-03 ± 4.33E-03	L.T. 2.E-02
05/08/12	05/15/12	1.01E+04	CU.FT.	1.36E-02 ± 4.15E-03	L.T. 6.E-02
05/15/12	05/22/12	1.00E+04	CU.FT.	1.59E-02 ± 4.24E-03	L.T. 6.E-02
05/22/12	05/29/12	1.00E+04	CU.FT.	1.81E-02 ± 4.33E-03	L.T. 4.E-02
05/29/12	06/05/12	1.00E+04	CU.FT.	1.47E-02 ± 3.72E-03	L.T. 6.E-02
06/05/12	06/12/12	1.00E+04	CU.FT.	1.78E-02 ± 4.10E-03	L.T. 2.E-02
06/12/12	06/20/12	1.15E+04	CU.FT.	2.08E-02 ± 4.41E-03	L.T. 1.E-02
06/20/12	06/27/12	1.00E+04	CU.FT.	2.21E-02 ± 4.24E-03	L.T. 3.E-02
06/27/12	07/03/12	8.62E+03	CU.FT.	2.83E-02 ± 5.10E-03	L.T. 2.E-02

VII-1  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - AIRBORNE**  
**AIR PARTICULATE AND CHARCOAL FILTERS**

STATION NUMBER 1

COLL START DATE	TIME STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
07/03/12	07/10/12	1.01E+04	CU.FT.	1.85E-02 ± 3.97E-03	L.T. 3.E-02
07/10/12	07/16/12	8.60E+03	CU.FT.	2.58E-02 ± 5.13E-03	L.T. 2.E-02
07/16/12	07/24/12	1.15E+04	CU.FT.	2.59E-02 ± 4.17E-03	L.T. 4.E-02
07/24/12	08/01/12	1.15E+04	CU.FT.	2.56E-02 ± 4.29E-03	L.T. 3.E-02
08/01/12	08/08/12	1.00E+04	CU.FT.	2.71E-02 ± 4.78E-03	L.T. 3.E-02
08/08/12	08/14/12	8.65E+03	CU.FT.	2.00E-02 ± 5.08E-03	L.T. 3.E-02
08/14/12	08/21/12	1.00E+04	CU.FT.	2.07E-02 ± 4.33E-03	L.T. 4.E-02
08/21/12	08/29/12	1.15E+04	CU.FT.	2.91E-02 ± 4.25E-03	L.T. 2.E-02
08/29/12	09/04/12	8.61E+03	CU.FT.	2.60E-02 ± 4.90E-03	L.T. 2.E-02
09/04/12	09/11/12	1.00E+04	CU.FT.	2.43E-02 ± 4.41E-03	L.T. 4.E-02
09/11/12	09/17/12	8.73E+03	CU.FT.	2.36E-02 ± 5.41E-03	L.T. 7.E-02
09/17/12	09/25/12	1.15E+04	CU.FT.	2.32E-02 ± 4.40E-03	L.T. 5.E-02
09/25/12	10/02/12	1.01E+04	CU.FT.	4.37E-02 ± 5.68E-03	L.T. 5.E-02
10/02/12	10/09/12	9.98E+03	CU.FT.	1.38E-02 ± 4.60E-03	L.T. 2.E-02
10/09/12	10/16/12	1.02E+04	CU.FT.	2.36E-02 ± 4.98E-03	L.T. 2.E-02
10/16/12	10/23/12	1.00E+04	CU.FT.	2.32E-02 ± 4.34E-03	L.T. 2.E-02
10/23/12	10/31/12	1.15E+04	CU.FT.	2.62E-02 ± 4.33E-03	L.T. 3.E-02
10/31/12	11/07/12	1.00E+04	CU.FT.	3.40E-02 ± 5.15E-03	L.T. 4.E-02
11/07/12	11/13/12	8.65E+03	CU.FT.	3.09E-02 ± 5.73E-03	L.T. 5.E-02
11/13/12	11/20/12	1.00E+04	CU.FT.	6.51E-02 ± 6.80E-03	L.T. 2.E-02
11/20/12	11/27/12	1.01E+04	CU.FT.	4.41E-02 ± 5.75E-03	L.T. 3.E-02
11/27/12	12/04/12	1.01E+04	CU.FT.	5.40E-02 ± 6.31E-03	L.T. 4.E-02
12/04/12	12/11/12	1.01E+04	CU.FT.	2.36E-02 ± 4.47E-03	L.T. 2.E-02
12/11/12	12/19/12	1.15E+04	CU.FT.	5.08E-02 ± 5.72E-03	L.T. 3.E-02
12/19/12	12/26/12	1.02E+04	CU.FT.	5.21E-02 ± 5.94E-03	L.T. 1.E-02
12/26/12	01/02/13	1.02E+04	CU.FT.	4.65E-02 ± 5.69E-03	L.T. 2.E-02

VII-1  
**NEBRASKA PUBLIC POWER DISTRICT**  
**COOPER NUCLEAR STATION**  
**EXPOSURE PATHWAY - AIRBORNE**  
**AIR PARTICULATE AND CHARCOAL FILTERS**

STATION NUMBER 2

COLL START DATE	TIME STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
01/03/12	01/10/12	1.03E+04	CU.FT.	2.02E-02 ± 4.77E-03	L.T. 4.E-02
01/10/12	01/17/12	9.79E+03	CU.FT.	2.96E-02 ± 5.61E-03	L.T. 7.E-02
01/17/12	01/24/12	1.01E+04	CU.FT.	3.50E-02 ± 5.06E-03	L.T. 5.E-02
01/24/12	01/30/12	8.66E+03	CU.FT.	2.39E-02 ± 4.92E-03	L.T. 6.E-02
01/30/12	02/07/12	1.15E+04	CU.FT.	1.60E-02 ± 3.60E-03	L.T. 2.E-02
02/07/12	02/14/12	1.01E+04	CU.FT.	1.97E-02 ± 4.16E-03	L.T. 2.E-02
02/14/12	02/20/12	8.52E+03	CU.FT.	1.86E-02 ± 4.48E-03	L.T. 6.E-02
02/20/12	02/28/12	1.01E+04	CU.FT.	9.35E-03 ± 3.45E-03	L.T. 5.E-02
02/28/12	03/06/12	1.02E+04	CU.FT.	1.86E-02 ± 4.57E-03	L.T. 2.E-02
03/06/12	03/13/12	9.88E+03	CU.FT.	2.29E-02 ± 4.38E-03	L.T. 2.E-02
03/13/12	03/20/12	1.02E+04	CU.FT.	1.90E-02 ± 4.50E-03	L.T. 3.E-02
03/20/12	03/27/12	1.00E+04	CU.FT.	1.75E-02 ± 4.36E-03	L.T. 5.E-02
03/27/12	04/03/12	1.02E+04	CU.FT.	2.31E-02 ± 4.78E-03	L.T. 3.E-02
04/03/12	04/10/12	9.94E+03	CU.FT.	1.18E-02 ± 3.60E-03	L.T. 4.E-02
04/10/12	04/17/12	1.02E+04	CU.FT.	1.37E-02 ± 3.69E-03	L.T. 3.E-02
04/17/12	04/24/12	9.92E+03	CU.FT.	1.48E-02 ± 4.29E-03	L.T. 6.E-02
04/24/12	05/02/12	1.16E+04	CU.FT.	2.04E-02 ± 3.78E-03	L.T. 2.E-02
05/02/12	05/08/12	8.58E+03	CU.FT.	1.03E-02 ± 4.47E-03	L.T. 2.E-02
05/08/12	05/15/12	1.01E+04	CU.FT.	1.48E-02 ± 4.23E-03	L.T. 6.E-02
05/15/12	05/22/12	1.01E+04	CU.FT.	1.89E-02 ± 4.42E-03	L.T. 6.E-02
05/22/12	05/29/12	1.00E+04	CU.FT.	1.51E-02 ± 4.12E-03	L.T. 4.E-02
05/29/12	06/05/12	1.00E+04	CU.FT.	1.53E-02 ± 3.77E-03	L.T. 6.E-02
06/05/12	06/12/12	1.01E+04	CU.FT.	1.58E-02 ± 3.93E-03	L.T. 2.E-02
06/12/12	06/20/12	1.16E+04	CU.FT.	1.88E-02 ± 4.26E-03	L.T. 1.E-02
06/20/12	06/27/12	1.01E+04	CU.FT.	2.32E-02 ± 4.29E-03	L.T. 3.E-02
06/27/12	07/03/12	8.63E+03	CU.FT.	3.58E-02 ± 5.58E-03	L.T. 2.E-02



VII-1  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - AIRBORNE**  
**AIR PARTICULATE AND CHARCOAL FILTERS**

STATION NUMBER 2

COLL START DATE	TIME STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
07/03/12	07/10/12	1.01E+04	CU.FT.	1.94E-02 ± 4.04E-03	L.T. 3.E-02
07/10/12	07/16/12	8.67E+03	CU.FT.	3.25E-02 ± 5.54E-03	L.T. 2.E-02
07/16/12	07/24/12	1.15E+04	CU.FT.	2.63E-02 ± 4.19E-03	L.T. 4.E-02
07/24/12	08/01/12	1.15E+04	CU.FT.	2.14E-02 ± 4.03E-03	L.T. 3.E-02
08/01/12	08/08/12	1.01E+04	CU.FT.	2.66E-02 ± 4.72E-03	L.T. 3.E-02
08/08/12	08/14/12	8.69E+03	CU.FT.	2.06E-02 ± 5.10E-03	L.T. 3.E-02
08/14/12	08/21/12	1.01E+04	CU.FT.	1.93E-02 ± 4.20E-03	L.T. 4.E-02
08/21/12	08/29/12	1.16E+04	CU.FT.	3.23E-02 ± 4.42E-03	L.T. 2.E-02
08/29/12	09/04/12	8.51E+03	CU.FT.	2.35E-02 ± 4.76E-03	L.T. 2.E-02
09/04/12	09/11/12	1.02E+04	CU.FT.	2.18E-02 ± 4.18E-03	L.T. 4.E-02
09/11/12	09/17/12	8.56E+03	CU.FT.	2.50E-02 ± 5.57E-03	L.T. 7.E-02
09/17/12	09/25/12	1.15E+04	CU.FT.	2.36E-02 ± 4.42E-03	L.T. 5.E-02
09/25/12	10/02/12	1.00E+04	CU.FT.	4.26E-02 ± 5.66E-03	L.T. 5.E-02
10/02/12	10/09/12	1.01E+04	CU.FT.	1.51E-02 ± 4.64E-03	L.T. 2.E-02
10/09/12	10/16/12	1.01E+04	CU.FT.	2.22E-02 ± 4.93E-03	L.T. 2.E-02
10/16/12	10/23/12	1.01E+04	CU.FT.	2.25E-02 ± 4.26E-03	L.T. 2.E-02
10/23/12	10/31/12	1.16E+04	CU.FT.	2.55E-02 ± 4.26E-03	L.T. 3.E-02
10/31/12	11/07/12	1.00E+04	CU.FT.	3.49E-02 ± 5.20E-03	L.T. 4.E-02
11/07/12	11/13/12	8.68E+03	CU.FT.	3.06E-02 ± 5.70E-03	L.T. 5.E-02
11/13/12	11/20/12	1.01E+04	CU.FT.	6.45E-02 ± 6.73E-03	L.T. 2.E-02
11/20/12	11/27/12	1.02E+04	CU.FT.	4.06E-02 ± 5.53E-03	L.T. 3.E-02
11/27/12	12/04/12	9.97E+03	CU.FT.	5.55E-02 ± 6.42E-03	L.T. 4.E-02
12/04/12	12/11/12	1.01E+04	CU.FT.	2.12E-02 ± 4.31E-03	L.T. 2.E-02
12/11/12	12/19/12	1.16E+04	CU.FT.	5.29E-02 ± 5.79E-03	L.T. 3.E-02
12/19/12	12/26/12	1.02E+04	CU.FT.	5.14E-02 ± 5.90E-03	L.T. 2.E-02
12/26/12	01/02/13	9.96E+03	CU.FT.	4.50E-02 ± 5.69E-03	L.T. 2.E-02

VII-1  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - AIRBORNE**  
**AIR PARTICULATE AND CHARCOAL FILTERS**

STATION NUMBER 3

COLL START DATE	TIME STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
01/03/12	01/10/12	0.00E+00	CU.FT. (a)		
01/10/12	01/17/12	0.00E+00	CU.FT. (a)		
01/17/12	01/24/12	0.00E+00	CU.FT. (a)		
01/24/12	01/30/12	0.00E+00	CU.FT. (a)		
01/30/12	02/07/12	0.00E+00	CU.FT. (a)		
02/07/12	02/14/12	0.00E+00	CU.FT. (a)		
02/14/12	02/20/12	0.00E+00	CU.FT. (a)		
02/20/12	02/28/12	0.00E+00	CU.FT. (a)		
02/28/12	03/06/12	0.00E+00	CU.FT. (a)		
03/06/12	03/13/12	0.00E+00	CU.FT. (a)		
03/13/12	03/20/12	0.00E+00	CU.FT. (a)		
03/20/12	03/27/12	0.00E+00	CU.FT. (a)		
03/27/12	04/03/12	0.00E+00	CU.FT. (a)		
04/03/12	04/10/12	0.00E+00	CU.FT. (a)		
04/10/12	04/17/12	0.00E+00	CU.FT. (a)		
04/17/12	04/24/12	0.00E+00	CU.FT. (a)		
04/24/12	05/02/12	0.00E+00	CU.FT. (a)		
05/02/12	05/08/12	0.00E+00	CU.FT. (a)		
05/08/12	05/15/12	0.00E+00	CU.FT. (a)		
05/15/12	05/22/12	0.00E+00	CU.FT. (a)		
05/22/12	05/29/12	0.00E+00	CU.FT. (a)		
05/29/12	06/05/12	0.00E+00	CU.FT. (a)		
06/05/12	06/12/12	0.00E+00	CU.FT. (a)		
06/12/12	06/20/12	0.00E+00	CU.FT. (a)		
06/20/12	06/27/12	0.00E+00	CU.FT. (a)		
06/27/12	07/03/12	0.00E+00	CU.FT. (a)		

(a) Sample unavailable due to flooding of the Missouri River

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**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - AIRBORNE**  
**AIR PARTICULATE AND CHARCOAL FILTERS**

STATION NUMBER 3

COLL START DATE	TIME STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
07/03/12	07/10/12	0.00E+00	CU.FT. (a)		
07/10/12	07/16/12	0.00E+00	CU.FT. (a)		
07/16/12	07/24/12	0.00E+00	CU.FT. (a)		
07/24/12	08/01/12	0.00E+00	CU.FT. (a)		
08/01/12	08/08/12	0.00E+00	CU.FT. (a)		
08/08/12	08/14/12	0.00E+00	CU.FT. (a)		
08/14/12	08/21/12	0.00E+00	CU.FT. (a)		
08/21/12	08/29/12	0.00E+00	CU.FT. (a)		
08/29/12	09/04/12	0.00E+00	CU.FT. (a)		
09/04/12	09/11/12	0.00E+00	CU.FT. (a)		
09/11/12	09/17/12	0.00E+00	CU.FT. (a)		
09/17/12	09/25/12	0.00E+00	CU.FT. (a)		
09/25/12	10/02/12	8.78E+03	CU.FT.	3.35E-02 ± 5.59E-03	L.T. 6.E-02
10/02/12	10/09/12	9.82E+03	CU.FT.	1.73E-02 ± 4.89E-03	L.T. 2.E-02
10/09/12	10/16/12	1.04E+04	CU.FT.	2.21E-02 ± 4.82E-03	L.T. 2.E-02
10/16/12	10/23/12	1.00E+04	CU.FT.	2.04E-02 ± 4.14E-03	L.T. 2.E-02
10/23/12	10/31/12	1.15E+04	CU.FT.	2.79E-02 ± 4.43E-03	L.T. 3.E-02
10/31/12	11/07/12	1.00E+04	CU.FT.	2.86E-02 ± 4.83E-03	L.T. 4.E-02
11/07/12	11/13/12	8.63E+03	CU.FT.	2.96E-02 ± 5.66E-03	L.T. 5.E-02
11/13/12	11/20/12	1.00E+04	CU.FT.	5.69E-02 ± 6.43E-03	L.T. 2.E-02
11/20/12	11/27/12	1.03E+04	CU.FT.	3.90E-02 ± 5.42E-03	L.T. 3.E-02
11/27/12	12/04/12	1.00E+04	CU.FT.	5.39E-02 ± 6.34E-03	L.T. 4.E-02
12/04/12	12/11/12	1.01E+04	CU.FT.	2.23E-02 ± 4.38E-03	L.T. 2.E-02
12/11/12	12/19/12	1.15E+04	CU.FT.	4.91E-02 ± 5.64E-03	L.T. 3.E-02
12/19/12	12/26/12	1.02E+04	CU.FT.	4.24E-02 ± 5.44E-03	L.T. 2.E-02
12/26/12	01/02/13	9.93E+03	CU.FT.	4.14E-02 ± 5.51E-03	L.T. 2.E-02

(a) Sample unavailable due to flooding of the Missouri River

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**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - AIRBORNE**  
**AIR PARTICULATE AND CHARCOAL FILTERS**

STATION NUMBER 4

COLL START DATE	TIME STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
01/03/12	01/10/12	0.00E+00	CU.FT. (a)		
01/10/12	01/17/12	0.00E+00	CU.FT. (a)		
01/17/12	01/24/12	0.00E+00	CU.FT. (a)		
01/24/12	01/30/12	0.00E+00	CU.FT. (a)		
01/30/12	02/07/12	0.00E+00	CU.FT. (a)		
02/07/12	02/14/12	0.00E+00	CU.FT. (a)		
02/14/12	02/20/12	0.00E+00	CU.FT. (a)		
02/20/12	02/28/12	0.00E+00	CU.FT. (a)		
02/28/12	03/06/12	0.00E+00	CU.FT. (a)		
03/06/12	03/13/12	0.00E+00	CU.FT. (a)		
03/13/12	03/20/12	0.00E+00	CU.FT. (a)		
03/20/12	03/27/12	0.00E+00	CU.FT. (a)		
03/27/12	04/03/12	0.00E+00	CU.FT. (a)		
04/03/12	04/10/12	0.00E+00	CU.FT. (a)		
04/10/12	04/17/12	0.00E+00	CU.FT. (a)		
04/17/12	04/24/12	0.00E+00	CU.FT. (a)		
04/24/12	05/02/12	0.00E+00	CU.FT. (a)		
05/02/12	05/08/12	0.00E+00	CU.FT. (a)		
05/08/12	05/15/12	0.00E+00	CU.FT. (a)		
05/15/12	05/22/12	0.00E+00	CU.FT. (a)		
05/22/12	05/29/12	0.00E+00	CU.FT. (a)		
05/29/12	06/05/12	0.00E+00	CU.FT. (a)		
06/05/12	06/12/12	0.00E+00	CU.FT. (a)		
06/12/12	06/20/12	0.00E+00	CU.FT. (a)		
06/20/12	06/27/12	0.00E+00	CU.FT. (a)		
06/27/12	07/03/12	0.00E+00	CU.FT. (a)		

(a) Sample unavailable due to flooding of the Missouri River

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**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - AIRBORNE**  
**AIR PARTICULATE AND CHARCOAL FILTERS**

STATION NUMBER 4

COLL START DATE	TIME STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
07/03/12	07/10/12	0.00E+00	CU.FT. (a)		
07/10/12	07/16/12	0.00E+00	CU.FT. (a)		
07/16/12	07/24/12	0.00E+00	CU.FT. (a)		
07/24/12	08/01/12	0.00E+00	CU.FT. (a)		
08/01/12	08/08/12	0.00E+00	CU.FT. (a)		
08/08/12	08/14/12	0.00E+00	CU.FT. (a)		
08/14/12	08/21/12	0.00E+00	CU.FT. (a)		
08/21/12	08/29/12	0.00E+00	CU.FT. (a)		
08/29/12	09/04/12	0.00E+00	CU.FT. (a)		
09/04/12	09/11/12	0.00E+00	CU.FT. (a)		
09/11/12	09/17/12	0.00E+00	CU.FT. (a)		
09/17/12	09/25/12	0.00E+00	CU.FT. (a)		
09/25/12	10/02/12	9.98E+03	CU.FT.	4.51E-02 ± 5.80E-03	L.T. 5.E-02
10/02/12	10/09/12	1.01E+04	CU.FT.	1.67E-02 ± 4.74E-03	L.T. 2.E-02
10/09/12	10/16/12	1.01E+04	CU.FT.	2.51E-02 ± 5.11E-03	L.T. 2.E-02
10/16/12	10/23/12	1.01E+04	CU.FT.	2.21E-02 ± 4.23E-03	L.T. 2.E-02
10/23/12	10/31/12	1.15E+04	CU.FT.	2.78E-02 ± 4.42E-03	L.T. 3.E-02
10/31/12	11/07/12	9.98E+03	CU.FT.	3.56E-02 ± 5.25E-03	L.T. 4.E-02
11/07/12	11/13/12	8.69E+03	CU.FT.	3.51E-02 ± 5.95E-03	L.T. 5.E-02
11/13/12	11/20/12	1.01E+04	CU.FT.	6.64E-02 ± 6.82E-03	L.T. 2.E-02
11/20/12	11/27/12	1.02E+04	CU.FT.	4.72E-02 ± 5.87E-03	L.T. 3.E-02
11/27/12	12/04/12	1.00E+04	CU.FT.	5.89E-02 ± 6.57E-03	L.T. 4.E-02
12/04/12	12/11/12	1.01E+04	CU.FT.	2.58E-02 ± 4.61E-03	L.T. 2.E-02
12/11/12	12/19/12	1.15E+04	CU.FT.	5.58E-02 ± 5.95E-03	L.T. 3.E-02
12/19/12	12/26/12	6.72E+02	CU.FT.	8.92E-02 ± 4.32E-02	L.T. 4.E-01
12/26/12	01/02/13	0.00E+00	CU.FT. (b)		

(a) Sample unavailable due to flooding of the Missouri River

(b) Sample unavailable due to power failure

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**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - AIRBORNE**  
**AIR PARTICULATE AND CHARCOAL FILTERS**

STATION NUMBER 5

COLL START DATE	TIME STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
01/03/12	01/10/12	0.00E+00	CU.FT. (a)		
01/10/12	01/17/12	0.00E+00	CU.FT. (a)		
01/17/12	01/24/12	0.00E+00	CU.FT. (a)		
01/24/12	01/30/12	0.00E+00	CU.FT. (a)		
01/30/12	02/07/12	0.00E+00	CU.FT. (a)		
02/07/12	02/14/12	0.00E+00	CU.FT. (a)		
02/14/12	02/20/12	0.00E+00	CU.FT. (a)		
02/20/12	02/28/12	0.00E+00	CU.FT. (a)		
02/28/12	03/06/12	0.00E+00	CU.FT. (a)		
03/06/12	03/13/12	0.00E+00	CU.FT. (a)		
03/13/12	03/20/12	0.00E+00	CU.FT. (a)		
03/20/12	03/27/12	0.00E+00	CU.FT. (a)		
03/27/12	04/03/12	0.00E+00	CU.FT. (a)		
04/03/12	04/10/12	0.00E+00	CU.FT. (a)		
04/10/12	04/17/12	0.00E+00	CU.FT. (a)		
04/17/12	04/24/12	0.00E+00	CU.FT. (a)		
04/24/12	05/02/12	0.00E+00	CU.FT. (a)		
05/02/12	05/08/12	0.00E+00	CU.FT. (a)		
05/08/12	05/15/12	0.00E+00	CU.FT. (a)		
05/15/12	05/22/12	0.00E+00	CU.FT. (a)		
05/22/12	05/29/12	0.00E+00	CU.FT. (a)		
05/29/12	06/05/12	0.00E+00	CU.FT. (a)		
06/05/12	06/12/12	0.00E+00	CU.FT. (a)		
06/12/12	06/20/12	0.00E+00	CU.FT. (a)		
06/20/12	06/27/12	0.00E+00	CU.FT. (a)		
06/27/12	07/03/12	0.00E+00	CU.FT. (a)		

(a) Sample unavailable due to flooding of the Missouri River

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**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - AIRBORNE**  
**AIR PARTICULATE AND CHARCOAL FILTERS**

STATION NUMBER 5

COLL START DATE	TIME STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
07/03/12	07/10/12	0.00E+00	CU.FT. (a)		
07/10/12	07/16/12	0.00E+00	CU.FT. (a)		
07/16/12	07/24/12	0.00E+00	CU.FT. (a)		
07/24/12	08/01/12	0.00E+00	CU.FT. (a)		
08/01/12	08/08/12	0.00E+00	CU.FT. (a)		
08/08/12	08/14/12	0.00E+00	CU.FT. (a)		
08/14/12	08/21/12	0.00E+00	CU.FT. (a)		
08/21/12	08/29/12	0.00E+00	CU.FT. (a)		
08/29/12	09/04/12	0.00E+00	CU.FT. (a)		
09/04/12	09/11/12	0.00E+00	CU.FT. (a)		
09/11/12	09/17/12	0.00E+00	CU.FT. (a)		
09/17/12	09/25/12	0.00E+00	CU.FT. (a)		
09/25/12	10/02/12	9.97E+03	CU.FT.	4.03E-02 ± 5.55E-03	L.T. 5.E-02
10/02/12	10/09/12	1.01E+04	CU.FT.	2.01E-02 ± 4.95E-03	L.T. 2.E-02
10/09/12	10/16/12	1.01E+04	CU.FT.	2.53E-02 ± 5.11E-03	L.T. 2.E-02
10/16/12	10/23/12	1.01E+04	CU.FT.	2.33E-02 ± 4.31E-03	L.T. 2.E-02
10/23/12	10/31/12	1.15E+04	CU.FT.	2.76E-02 ± 4.41E-03	L.T. 3.E-02
10/31/12	11/07/12	9.98E+03	CU.FT.	3.33E-02 ± 5.12E-03	L.T. 4.E-02
11/07/12	11/13/12	8.64E+03	CU.FT.	2.61E-02 ± 5.43E-03	L.T. 5.E-02
11/13/12	11/20/12	1.00E+04	CU.FT.	7.04E-02 ± 7.02E-03	L.T. 2.E-02
11/20/12	11/27/12	1.01E+04	CU.FT.	4.92E-02 ± 6.01E-03	L.T. 3.E-02
11/27/12	12/04/12	1.00E+04	CU.FT.	6.16E-02 ± 6.69E-03	L.T. 4.E-02
12/04/12	12/11/12	1.01E+04	CU.FT.	2.74E-02 ± 4.71E-03	L.T. 2.E-02
12/11/12	12/19/12	1.15E+04	CU.FT.	5.62E-02 ± 5.96E-03	L.T. 4.E-02
12/19/12	12/26/12	1.02E+04	CU.FT.	4.33E-02 ± 5.49E-03	L.T. 2.E-02
12/26/12	01/02/13	9.91E+03	CU.FT.	6.04E-02 ± 6.46E-03	L.T. 2.E-02

(a) Sample unavailable due to flooding of the Missouri River

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**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - AIRBORNE**  
**AIR PARTICULATE AND CHARCOAL FILTERS**

STATION NUMBER 6

COLL START DATE	TIME STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
01/03/12	01/10/12	0.00E+00	CU.FT. (a)		
01/10/12	01/17/12	0.00E+00	CU.FT. (a)		
01/17/12	01/24/12	0.00E+00	CU.FT. (a)		
01/24/12	01/30/12	0.00E+00	CU.FT. (a)		
01/30/12	02/07/12	0.00E+00	CU.FT. (a)		
02/07/12	02/14/12	0.00E+00	CU.FT. (a)		
02/14/12	02/20/12	0.00E+00	CU.FT. (a)		
02/20/12	02/28/12	0.00E+00	CU.FT. (a)		
02/28/12	03/06/12	0.00E+00	CU.FT. (a)		
03/06/12	03/13/12	0.00E+00	CU.FT. (a)		
03/13/12	03/20/12	0.00E+00	CU.FT. (a)		
03/20/12	03/27/12	0.00E+00	CU.FT. (a)		
03/27/12	04/03/12	0.00E+00	CU.FT. (a)		
04/03/12	04/10/12	0.00E+00	CU.FT. (a)		
04/10/12	04/17/12	0.00E+00	CU.FT. (a)		
04/17/12	04/24/12	0.00E+00	CU.FT. (a)		
04/24/12	05/02/12	0.00E+00	CU.FT. (a)		
05/02/12	05/08/12	0.00E+00	CU.FT. (a)		
05/08/12	05/15/12	0.00E+00	CU.FT. (a)		
05/15/12	05/22/12	0.00E+00	CU.FT. (a)		
05/22/12	05/29/12	0.00E+00	CU.FT. (a)		
05/29/12	06/05/12	0.00E+00	CU.FT. (a)		
06/05/12	06/12/12	0.00E+00	CU.FT. (a)		
06/12/12	06/20/12	0.00E+00	CU.FT. (a)		
06/20/12	06/27/12	0.00E+00	CU.FT. (a)		
06/27/12	07/03/12	0.00E+00	CU.FT. (a)		

(a) Sample unavailable due to flooding of the Missouri River



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**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - AIRBORNE**  
**AIR PARTICULATE AND CHARCOAL FILTERS**

STATION NUMBER 6

COLL START DATE	TIME STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
07/03/12	07/10/12	0.00E+00	CU.FT. (a)		
07/10/12	07/16/12	0.00E+00	CU.FT. (a)		
07/16/12	07/24/12	0.00E+00	CU.FT. (a)		
07/24/12	08/01/12	0.00E+00	CU.FT. (a)		
08/01/12	08/08/12	0.00E+00	CU.FT. (a)		
08/08/12	08/14/12	0.00E+00	CU.FT. (a)		
08/14/12	08/21/12	0.00E+00	CU.FT. (a)		
08/21/12	08/29/12	0.00E+00	CU.FT. (a)		
08/29/12	09/04/12	0.00E+00	CU.FT. (a)		
09/04/12	09/11/12	0.00E+00	CU.FT. (a)		
09/11/12	09/17/12	0.00E+00	CU.FT. (a)		
09/17/12	09/25/12	0.00E+00	CU.FT. (a)		
09/25/12	10/02/12	9.98E+03	CU.FT.	4.34E-02 ± 5.71E-03	L.T. 5.E-02
10/02/12	10/09/12	1.01E+04	CU.FT.	2.31E-02 ± 5.12E-03	L.T. 2.E-02
10/09/12	10/16/12	1.01E+04	CU.FT.	2.59E-02 ± 5.15E-03	L.T. 2.E-02
10/16/12	10/23/12	9.97E+03	CU.FT.	2.02E-02 ± 4.13E-03	L.T. 2.E-02
10/23/12	10/31/12	1.15E+04	CU.FT.	2.34E-02 ± 4.15E-03	L.T. 3.E-02
10/31/12	11/07/12	1.00E+04	CU.FT.	3.46E-02 ± 5.19E-03	L.T. 4.E-02
11/07/12	11/13/12	8.65E+03	CU.FT.	2.61E-02 ± 5.43E-03	L.T. 5.E-02
11/13/12	11/20/12	1.00E+04	CU.FT.	7.36E-02 ± 7.16E-03	L.T. 2.E-02
11/20/12	11/27/12	1.03E+04	CU.FT.	4.68E-02 ± 5.82E-03	L.T. 3.E-02
11/27/12	12/04/12	1.00E+04	CU.FT.	5.14E-02 ± 6.22E-03	L.T. 4.E-02
12/04/12	12/11/12	1.01E+04	CU.FT.	2.15E-02 ± 4.33E-03	L.T. 2.E-02
12/11/12	12/19/12	1.15E+04	CU.FT.	4.75E-02 ± 5.57E-03	L.T. 4.E-02
12/19/12	12/26/12	1.02E+04	CU.FT.	3.89E-02 ± 5.25E-03	L.T. 2.E-02
12/26/12	01/02/13	9.92E+03	CU.FT.	5.40E-02 ± 6.15E-03	L.T. 2.E-02

(a) Sample unavailable due to flooding of the Missouri River

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**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - AIRBORNE**  
**AIR PARTICULATE AND CHARCOAL FILTERS**

STATION NUMBER 7

COLL START DATE	TIME STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
01/03/12	01/10/12	1.03E+04	CU.FT.	7.11E-03 ± 3.90E-03	L.T. 4.E-02
01/10/12	01/17/12	9.79E+03	CU.FT.	1.94E-02 ± 5.02E-03	L.T. 7.E-02
01/17/12	01/24/12	1.01E+04	CU.FT.	2.87E-02 ± 4.69E-03	L.T. 5.E-02
01/24/12	01/30/12	8.65E+03	CU.FT.	1.73E-02 ± 4.44E-03	L.T. 6.E-02
01/30/12	02/07/12	1.15E+04	CU.FT.	1.95E-02 ± 3.85E-03	L.T. 2.E-02
02/07/12	02/14/12	1.01E+04	CU.FT.	1.91E-02 ± 4.12E-03	L.T. 2.E-02
02/14/12	02/20/12	8.52E+03	CU.FT.	2.53E-02 ± 4.97E-03	L.T. 5.E-02
02/20/12	02/28/12	1.17E+04	CU.FT.	1.37E-02 ± 3.43E-03	L.T. 4.E-02
02/28/12	03/06/12	1.00E+04	CU.FT.	1.58E-02 ± 4.45E-03	L.T. 2.E-02
03/06/12	03/13/12	9.86E+03	CU.FT.	1.06E-02 ± 3.44E-03	L.T. 2.E-02
03/13/12	03/20/12	1.01E+04	CU.FT.	1.77E-02 ± 4.45E-03	L.T. 3.E-02
03/20/12	03/27/12	9.99E+03	CU.FT.	1.79E-02 ± 4.39E-03	L.T. 5.E-02
03/27/12	04/03/12	1.02E+04	CU.FT.	2.72E-02 ± 5.02E-03	L.T. 3.E-02
04/03/12	04/10/12	9.94E+03	CU.FT.	1.43E-02 ± 3.81E-03	L.T. 4.E-02
04/10/12	04/17/12	1.02E+04	CU.FT.	1.32E-02 ± 3.65E-03	L.T. 3.E-02
04/17/12	04/24/12	9.92E+03	CU.FT.	1.43E-02 ± 4.26E-03	L.T. 6.E-02
04/24/12	05/02/12	1.16E+04	CU.FT.	2.15E-02 ± 3.85E-03	L.T. 2.E-02
05/02/12	05/08/12	8.62E+03	CU.FT.	6.69E-03 ± 4.16E-03	L.T. 2.E-02
05/08/12	05/15/12	1.01E+04	CU.FT.	6.59E-03 ± 3.62E-03	L.T. 6.E-02
05/15/12	05/22/12	1.01E+04	CU.FT.	1.26E-02 ± 3.97E-03	L.T. 6.E-02
05/22/12	05/29/12	1.00E+04	CU.FT.	2.10E-02 ± 4.52E-03	L.T. 4.E-02
05/29/12	06/05/12	1.00E+04	CU.FT.	1.85E-02 ± 4.01E-03	L.T. 7.E-02
06/05/12	06/12/12	1.00E+04	CU.FT.	1.31E-02 ± 3.75E-03	L.T. 2.E-02
06/12/12	06/20/12	1.16E+04	CU.FT.	1.51E-02 ± 4.03E-03	L.T. 1.E-02
06/20/12	06/27/12	1.00E+04	CU.FT.	1.86E-02 ± 3.99E-03	L.T. 3.E-02
06/27/12	07/03/12	8.65E+03	CU.FT.	2.44E-02 ± 4.82E-03	L.T. 2.E-02

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**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - AIRBORNE**  
**AIR PARTICULATE AND CHARCOAL FILTERS**

STATION NUMBER 7

COLL START DATE	TIME STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
07/03/12	07/10/12	1.01E+04	CU.FT.	1.25E-02 ± 3.49E-03	L.T. 3.E-02
07/10/12	07/16/12	8.65E+03	CU.FT.	2.19E-02 ± 4.83E-03	L.T. 2.E-02
07/16/12	07/24/12	1.15E+04	CU.FT.	1.89E-02 ± 3.71E-03	L.T. 4.E-02
07/24/12	08/01/12	1.15E+04	CU.FT.	1.84E-02 ± 3.83E-03	L.T. 3.E-02
08/01/12	08/08/12	1.01E+04	CU.FT.	2.24E-02 ± 4.45E-03	L.T. 3.E-02
08/08/12	08/14/12	8.69E+03	CU.FT.	2.01E-02 ± 5.06E-03	L.T. 3.E-02
08/14/12	08/21/12	1.02E+04	CU.FT.	1.78E-02 ± 4.07E-03	L.T. 4.E-02
08/21/12	08/29/12	1.14E+04	CU.FT.	3.08E-02 ± 4.37E-03	L.T. 2.E-02
08/29/12	09/04/12	8.48E+03	CU.FT.	2.41E-02 ± 4.81E-03	L.T. 2.E-02
09/04/12	09/11/12	1.03E+04	CU.FT.	1.25E-02 ± 3.45E-03	L.T. 4.E-02
09/11/12	09/17/12	8.57E+03	CU.FT.	2.20E-02 ± 5.38E-03	L.T. 7.E-02
09/17/12	09/25/12	1.15E+04	CU.FT.	1.44E-02 ± 3.84E-03	L.T. 5.E-02
09/25/12	10/02/12	1.00E+04	CU.FT.	2.51E-02 ± 4.64E-03	L.T. 5.E-02
10/02/12	10/09/12	1.01E+04	CU.FT.	1.83E-02 ± 4.84E-03	L.T. 2.E-02
10/09/12	10/16/12	1.01E+04	CU.FT.	2.85E-02 ± 5.30E-03	L.T. 2.E-02
10/16/12	10/23/12	1.01E+04	CU.FT.	1.87E-02 ± 3.99E-03	L.T. 2.E-02
10/23/12	10/31/12	1.16E+04	CU.FT.	2.16E-02 ± 4.02E-03	L.T. 3.E-02
10/31/12	11/07/12	1.00E+04	CU.FT.	9.55E-03 ± 3.45E-03	L.T. 4.E-02
11/07/12	11/13/12	8.68E+03	CU.FT.	2.91E-02 ± 5.60E-03	L.T. 5.E-02
11/13/12	11/20/12	1.01E+04	CU.FT.	3.53E-02 ± 5.30E-03	L.T. 2.E-02
11/20/12	11/27/12	1.02E+04	CU.FT.	2.24E-02 ± 4.47E-03	L.T. 3.E-02
11/27/12	12/04/12	9.99E+03	CU.FT.	2.17E-02 ± 4.58E-03	L.T. 4.E-02
12/04/12	12/11/12	1.01E+04	CU.FT.	1.60E-02 ± 3.94E-03	L.T. 2.E-02
12/11/12	12/19/12	1.16E+04	CU.FT.	3.75E-02 ± 5.05E-03	L.T. 4.E-02
12/19/12	12/26/12	1.02E+04	CU.FT.	3.66E-02 ± 5.11E-03	L.T. 3.E-02
12/26/12	01/02/13	9.97E+03	CU.FT.	4.32E-02 ± 5.59E-03	L.T. 3.E-02

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**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - AIRBORNE**  
**AIR PARTICULATE AND CHARCOAL FILTERS**

STATION NUMBER 8

COLL START DATE	TIME STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
01/03/12	01/10/12	1.01E+04	CU.FT.	1.75E-02 ± 4.68E-03	L.T. 5.E-02
01/10/12	01/17/12	9.92E+03	CU.FT.	2.03E-02 ± 5.03E-03	L.T. 6.E-02
01/17/12	01/24/12	1.01E+04	CU.FT.	3.24E-02 ± 4.91E-03	L.T. 5.E-02
01/24/12	01/30/12	8.66E+03	CU.FT.	2.46E-02 ± 4.97E-03	L.T. 5.E-02
01/30/12	02/07/12	1.15E+04	CU.FT.	1.99E-02 ± 3.99E-03	L.T. 2.E-02
02/07/12	02/14/12	1.02E+04	CU.FT.	1.63E-02 ± 3.89E-03	L.T. 2.E-02
02/14/12	02/20/12	8.36E+03	CU.FT.	2.28E-02 ± 4.85E-03	L.T. 6.E-02
02/20/12	02/28/12	1.18E+04	CU.FT.	1.19E-02 ± 3.27E-03	L.T. 4.E-02
02/28/12	03/06/12	1.00E+04	CU.FT.	1.60E-02 ± 4.46E-03	L.T. 2.E-02
03/06/12	03/13/12	1.00E+04	CU.FT.	2.27E-02 ± 4.34E-03	L.T. 2.E-02
03/13/12	03/20/12	1.00E+04	CU.FT.	1.33E-02 ± 4.17E-03	L.T. 3.E-02
03/20/12	03/27/12	9.98E+03	CU.FT.	1.36E-02 ± 4.09E-03	L.T. 5.E-02
03/27/12	04/03/12	1.02E+04	CU.FT.	2.05E-02 ± 4.61E-03	L.T. 3.E-02
04/03/12	04/10/12	9.85E+03	CU.FT.	1.26E-02 ± 3.69E-03	L.T. 4.E-02
04/10/12	04/17/12	1.03E+04	CU.FT.	9.91E-03 ± 3.35E-03	L.T. 3.E-02
04/17/12	04/24/12	9.81E+03	CU.FT.	1.04E-02 ± 4.01E-03	L.T. 6.E-02
04/24/12	05/02/12	1.15E+04	CU.FT.	1.94E-02 ± 3.74E-03	L.T. 2.E-02
05/02/12	05/08/12	8.65E+03	CU.FT.	1.11E-02 ± 4.50E-03	L.T. 2.E-02
05/08/12	05/15/12	1.01E+04	CU.FT.	1.63E-02 ± 4.33E-03	L.T. 6.E-02
05/15/12	05/22/12	1.00E+04	CU.FT.	1.82E-02 ± 4.40E-03	L.T. 6.E-02
05/22/12	05/29/12	1.00E+04	CU.FT.	1.60E-02 ± 4.18E-03	L.T. 4.E-02
05/29/12	06/05/12	1.00E+04	CU.FT.	1.88E-02 ± 4.04E-03	L.T. 7.E-02
06/05/12	06/12/12	9.97E+03	CU.FT.	1.93E-02 ± 4.22E-03	L.T. 2.E-02
06/12/12	06/20/12	1.14E+04	CU.FT.	2.11E-02 ± 4.45E-03	L.T. 1.E-02
06/20/12	06/27/12	1.03E+04	CU.FT.	2.68E-02 ± 4.53E-03	L.T. 3.E-02
06/27/12	07/03/12	8.47E+03	CU.FT.	3.16E-02 ± 5.38E-03	L.T. 2.E-02

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**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - AIRBORNE**  
**AIR PARTICULATE AND CHARCOAL FILTERS**

STATION NUMBER 8

COLL START DATE	TIME STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
07/03/12	07/10/12	1.02E+04	CU.FT.	2.16E-02 ± 4.16E-03	L.T. 3.E-02
07/10/12	07/16/12	8.79E+03	CU.FT.	3.28E-02 ± 5.50E-03	L.T. 2.E-02
07/16/12	07/24/12	1.13E+04	CU.FT.	2.38E-02 ± 4.07E-03	L.T. 4.E-02
07/24/12	08/01/12	1.15E+04	CU.FT.	2.24E-02 ± 4.09E-03	L.T. 3.E-02
08/01/12	08/08/12	1.01E+04	CU.FT.	2.98E-02 ± 4.92E-03	L.T. 3.E-02
08/08/12	08/14/12	8.59E+03	CU.FT.	1.81E-02 ± 4.97E-03	L.T. 3.E-02
08/14/12	08/21/12	1.01E+04	CU.FT.	2.08E-02 ± 4.30E-03	L.T. 4.E-02
08/21/12	08/29/12	1.15E+04	CU.FT.	3.44E-02 ± 4.56E-03	L.T. 2.E-02
08/29/12	09/04/12	8.53E+03	CU.FT.	2.90E-02 ± 5.14E-03	L.T. 2.E-02
09/04/12	09/11/12	9.98E+03	CU.FT.	2.33E-02 ± 4.35E-03	L.T. 4.E-02
09/11/12	09/17/12	8.71E+03	CU.FT.	2.35E-02 ± 5.41E-03	L.T. 7.E-02
09/17/12	09/25/12	1.15E+04	CU.FT.	1.83E-02 ± 4.10E-03	L.T. 5.E-02
09/25/12	10/02/12	9.98E+03	CU.FT.	3.83E-02 ± 5.44E-03	L.T. 5.E-02
10/02/12	10/09/12	1.01E+04	CU.FT.	1.58E-02 ± 4.69E-03	L.T. 2.E-02
10/09/12	10/16/12	9.92E+03	CU.FT.	2.57E-02 ± 5.21E-03	L.T. 2.E-02
10/16/12	10/23/12	1.02E+04	CU.FT.	2.04E-02 ± 4.09E-03	L.T. 2.E-02
10/23/12	10/31/12	1.15E+04	CU.FT.	2.32E-02 ± 4.14E-03	L.T. 3.E-02
10/31/12	11/07/12	1.01E+04	CU.FT.	3.77E-02 ± 5.33E-03	L.T. 4.E-02
11/07/12	11/13/12	8.54E+03	CU.FT.	2.82E-02 ± 5.61E-03	L.T. 5.E-02
11/13/12	11/20/12	1.00E+04	CU.FT.	7.32E-02 ± 7.14E-03	L.T. 2.E-02
11/20/12	11/27/12	1.02E+04	CU.FT.	4.33E-02 ± 5.68E-03	L.T. 3.E-02
11/27/12	12/04/12	1.01E+04	CU.FT.	5.55E-02 ± 6.38E-03	L.T. 4.E-02
12/04/12	12/11/12	1.01E+04	CU.FT.	2.39E-02 ± 4.49E-03	L.T. 2.E-02
12/11/12	12/19/12	1.15E+04	CU.FT.	4.90E-02 ± 5.64E-03	L.T. 4.E-02
12/19/12	12/26/12	1.01E+04	CU.FT.	4.23E-02 ± 5.46E-03	L.T. 3.E-02
12/26/12	01/02/13	1.00E+04	CU.FT.	4.21E-02 ± 5.52E-03	L.T. 3.E-02

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**NEBRASKA PUBLIC POWER DISTRICT**  
**COOPER NUCLEAR STATION**  
**EXPOSURE PATHWAY - AIRBORNE**  
**AIR PARTICULATE AND CHARCOAL FILTERS**

STATION NUMBER 9

COLL START DATE	TIME STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
01/03/12	01/10/12	1.01E+04	CU.FT.	1.98E-02 ± 4.82E-03	L.T. 6.E-02
01/10/12	01/17/12	9.96E+03	CU.FT.	2.01E-02 ± 5.00E-03	L.T. 6.E-02
01/17/12	01/24/12	1.01E+04	CU.FT.	2.97E-02 ± 4.75E-03	L.T. 5.E-02
01/24/12	01/30/12	8.66E+03	CU.FT.	2.21E-02 ± 4.79E-03	L.T. 6.E-02
01/30/12	02/07/12	1.15E+04	CU.FT.	1.98E-02 ± 3.98E-03	L.T. 1.E-02
02/07/12	02/14/12	1.01E+04	CU.FT.	1.96E-02 ± 4.15E-03	L.T. 2.E-02
02/14/12	02/20/12	8.72E+03	CU.FT.	2.63E-02 ± 4.97E-03	L.T. 6.E-02
02/20/12	02/28/12	1.14E+04	CU.FT.	1.21E-02 ± 3.37E-03	L.T. 3.E-02
02/28/12	03/06/12	1.00E+04	CU.FT.	1.90E-02 ± 4.66E-03	L.T. 2.E-02
03/06/12	03/13/12	9.98E+03	CU.FT.	1.76E-02 ± 3.99E-03	L.T. 2.E-02
03/13/12	03/20/12	1.01E+04	CU.FT.	1.88E-02 ± 4.51E-03	L.T. 4.E-02
03/20/12	03/27/12	9.97E+03	CU.FT.	1.99E-02 ± 4.53E-03	L.T. 7.E-02
03/27/12	04/03/12	1.02E+04	CU.FT.	1.96E-02 ± 4.56E-03	L.T. 4.E-02
04/03/12	04/10/12	9.87E+03	CU.FT.	1.41E-02 ± 3.81E-03	L.T. 3.E-02
04/10/12	04/17/12	1.03E+04	CU.FT.	1.21E-02 ± 3.53E-03	L.T. 3.E-02
04/17/12	04/24/12	9.81E+03	CU.FT.	1.02E-02 ± 3.99E-03	L.T. 6.E-02
04/24/12	05/02/12	1.15E+04	CU.FT.	1.98E-02 ± 3.76E-03	L.T. 2.E-02
05/02/12	05/08/12	8.64E+03	CU.FT.	1.78E-02 ± 4.98E-03	L.T. 2.E-02
05/08/12	05/15/12	1.01E+04	CU.FT.	1.67E-02 ± 4.36E-03	L.T. 6.E-02
05/15/12	05/22/12	1.01E+04	CU.FT.	1.68E-02 ± 4.27E-03	L.T. 5.E-02
05/22/12	05/29/12	1.00E+04	CU.FT.	1.83E-02 ± 4.34E-03	L.T. 3.E-02
05/29/12	06/05/12	9.85E+03	CU.FT.	1.20E-02 ± 3.69E-03	L.T. 3.E-02
06/05/12	06/12/12	1.01E+04	CU.FT.	1.71E-02 ± 4.03E-03	L.T. 2.E-02
06/12/12	06/20/12	1.14E+04	CU.FT.	2.04E-02 ± 4.42E-03	L.T. 2.E-02
06/20/12	06/27/12	1.03E+04	CU.FT.	2.41E-02 ± 4.35E-03	L.T. 3.E-02
06/27/12	07/03/12	8.48E+03	CU.FT.	3.19E-02 ± 5.39E-03	L.T. 3.E-02

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**NEBRASKA PUBLIC POWER DISTRICT**  
**COOPER NUCLEAR STATION**  
**EXPOSURE PATHWAY - AIRBORNE**  
**AIR PARTICULATE AND CHARCOAL FILTERS**

STATION NUMBER 9

COLL START DATE	TIME STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
07/03/12	07/10/12	1.01E+04	CU.FT.	1.79E-02 ± 3.92E-03	L.T. 4.E-02
07/10/12	07/16/12	8.82E+03	CU.FT.	3.08E-02 ± 5.37E-03	L.T. 2.E-02
07/16/12	07/24/12	1.12E+04	CU.FT.	3.16E-02 ± 4.58E-03	L.T. 4.E-02
07/24/12	08/01/12	1.16E+04	CU.FT.	2.01E-02 ± 3.92E-03	L.T. 4.E-02
08/01/12	08/08/12	1.01E+04	CU.FT.	2.52E-02 ± 4.63E-03	L.T. 3.E-02
08/08/12	08/14/12	8.59E+03	CU.FT.	2.00E-02 ± 5.10E-03	L.T. 4.E-02
08/14/12	08/21/12	1.01E+04	CU.FT.	1.71E-02 ± 4.05E-03	L.T. 4.E-02
08/21/12	08/29/12	1.16E+04	CU.FT.	3.56E-02 ± 4.61E-03	L.T. 2.E-02
08/29/12	09/04/12	8.54E+03	CU.FT.	2.76E-02 ± 5.04E-03	L.T. 2.E-02
09/04/12	09/11/12	9.97E+03	CU.FT.	2.42E-02 ± 4.41E-03	L.T. 3.E-02
09/11/12	09/17/12	8.73E+03	CU.FT.	2.22E-02 ± 5.32E-03	L.T. 7.E-02
09/17/12	09/25/12	1.16E+04	CU.FT.	2.19E-02 ± 4.29E-03	L.T. 6.E-02
09/25/12	10/02/12	1.00E+04	CU.FT.	4.10E-02 ± 5.57E-03	L.T. 4.E-02
10/02/12	10/09/12	1.01E+04	CU.FT.	1.76E-02 ± 4.80E-03	L.T. 2.E-02
10/09/12	10/16/12	1.00E+04	CU.FT.	3.23E-02 ± 5.54E-03	L.T. 2.E-02
10/16/12	10/23/12	1.02E+04	CU.FT.	2.88E-02 ± 4.65E-03	L.T. 2.E-02
10/23/12	10/31/12	1.15E+04	CU.FT.	2.22E-02 ± 4.08E-03	L.T. 3.E-02
10/31/12	11/07/12	1.01E+04	CU.FT.	3.26E-02 ± 5.04E-03	L.T. 4.E-02
11/07/12	11/13/12	8.65E+03	CU.FT.	2.94E-02 ± 5.63E-03	L.T. 4.E-02
11/13/12	11/20/12	1.01E+04	CU.FT.	5.75E-02 ± 6.42E-03	L.T. 2.E-02
11/20/12	11/27/12	1.01E+04	CU.FT.	4.10E-02 ± 5.59E-03	L.T. 4.E-02
11/27/12	12/04/12	1.01E+04	CU.FT.	5.18E-02 ± 6.20E-03	L.T. 4.E-02
12/04/12	12/11/12	1.01E+04	CU.FT.	2.46E-02 ± 4.54E-03	L.T. 2.E-02
12/11/12	12/19/12	1.16E+04	CU.FT.	4.80E-02 ± 5.57E-03	L.T. 3.E-02
12/19/12	12/26/12	1.02E+04	CU.FT.	3.17E-02 ± 4.83E-03	L.T. 3.E-02
12/26/12	01/02/13	9.92E+03	CU.FT.	3.99E-02 ± 5.43E-03	L.T. 3.E-02

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VII-1  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - AIRBORNE**  
**AIR PARTICULATE AND CHARCOAL FILTERS**

STATION NUMBER 10

COLL START DATE	TIME STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
01/03/12	01/10/12	1.02E+04	CU.FT.	2.02E-02 ± 4.81E-03	L.T. 6.E-02
01/10/12	01/17/12	9.93E+03	CU.FT.	1.65E-02 ± 4.79E-03	L.T. 6.E-02
01/17/12	01/24/12	1.01E+04	CU.FT.	3.37E-02 ± 4.99E-03	L.T. 5.E-02
01/24/12	01/30/12	8.67E+03	CU.FT.	1.97E-02 ± 4.61E-03	L.T. 6.E-02
01/30/12	02/07/12	1.15E+04	CU.FT.	1.94E-02 ± 3.96E-03	L.T. 1.E-02
02/07/12	02/14/12	1.01E+04	CU.FT.	2.02E-02 ± 4.20E-03	L.T. 2.E-02
02/14/12	02/20/12	8.78E+03	CU.FT.	2.55E-02 ± 4.97E-03	L.T. 6.E-02
02/20/12	02/28/12	1.14E+04	CU.FT.	1.16E-02 ± 3.32E-03	L.T. 3.E-02
02/28/12	03/06/12	1.00E+04	CU.FT.	1.96E-02 ± 4.69E-03	L.T. 2.E-02
03/06/12	03/13/12	9.88E+03	CU.FT.	1.56E-02 ± 3.86E-03	L.T. 2.E-02
03/13/12	03/20/12	1.01E+04	CU.FT.	2.00E-02 ± 4.59E-03	L.T. 4.E-02
03/20/12	03/27/12	9.98E+03	CU.FT.	1.78E-02 ± 4.39E-03	L.T. 7.E-02
03/27/12	04/03/12	1.02E+04	CU.FT.	2.53E-02 ± 4.91E-03	L.T. 4.E-02
04/03/12	04/10/12	9.94E+03	CU.FT.	1.31E-02 ± 3.71E-03	L.T. 3.E-02
04/10/12	04/17/12	1.02E+04	CU.FT.	1.68E-02 ± 3.92E-03	L.T. 3.E-02
04/17/12	04/24/12	9.94E+03	CU.FT.	1.45E-02 ± 4.26E-03	L.T. 6.E-02
04/24/12	05/02/12	1.15E+04	CU.FT.	1.92E-02 ± 3.72E-03	L.T. 2.E-02
05/02/12	05/08/12	8.66E+03	CU.FT.	1.26E-02 ± 4.61E-03	L.T. 2.E-02
05/08/12	05/15/12	1.01E+04	CU.FT.	1.39E-02 ± 4.17E-03	L.T. 6.E-02
05/15/12	05/22/12	1.01E+04	CU.FT.	1.75E-02 ± 4.33E-03	L.T. 5.E-02
05/22/12	05/29/12	1.00E+04	CU.FT.	2.01E-02 ± 4.46E-03	L.T. 3.E-02
05/29/12	06/05/12	1.00E+04	CU.FT.	1.47E-02 ± 3.86E-03	L.T. 3.E-02
06/05/12	06/12/12	1.01E+04	CU.FT.	2.02E-02 ± 4.25E-03	L.T. 2.E-02
06/12/12	06/20/12	1.16E+04	CU.FT.	1.67E-02 ± 4.14E-03	L.T. 2.E-02
06/20/12	06/27/12	1.01E+04	CU.FT.	1.80E-02 ± 3.98E-03	L.T. 3.E-02
06/27/12	07/03/12	8.78E+03	CU.FT.	3.37E-02 ± 5.39E-03	L.T. 3.E-02



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**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - AIRBORNE**  
**AIR PARTICULATE AND CHARCOAL FILTERS**

STATION NUMBER 10

COLL START DATE	TIME STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
07/03/12	07/10/12	9.95E+03	CU.FT.	2.09E-02 ± 4.18E-03	L.T. 4.E-02
07/10/12	07/16/12	8.65E+03	CU.FT.	3.64E-02 ± 5.78E-03	L.T. 2.E-02
07/16/12	07/24/12	1.16E+04	CU.FT.	3.50E-02 ± 4.67E-03	L.T. 4.E-02
07/24/12	08/01/12	1.15E+04	CU.FT.	2.78E-02 ± 4.42E-03	L.T. 4.E-02
08/01/12	08/08/12	1.00E+04	CU.FT.	3.33E-02 ± 5.16E-03	L.T. 3.E-02
08/08/12	08/14/12	8.68E+03	CU.FT.	2.91E-02 ± 5.64E-03	L.T. 4.E-02
08/14/12	08/21/12	1.02E+04	CU.FT.	2.51E-02 ± 4.56E-03	L.T. 4.E-02
08/21/12	08/29/12	1.14E+04	CU.FT.	4.63E-02 ± 5.22E-03	L.T. 2.E-02
08/29/12	09/04/12	8.50E+03	CU.FT.	3.30E-02 ± 5.42E-03	L.T. 2.E-02
09/04/12	09/11/12	1.01E+04	CU.FT.	2.67E-02 ± 4.54E-03	L.T. 3.E-02
09/11/12	09/17/12	8.61E+03	CU.FT.	2.76E-02 ± 5.71E-03	L.T. 7.E-02
09/17/12	09/25/12	1.15E+04	CU.FT.	2.31E-02 ± 4.39E-03	L.T. 6.E-02
09/25/12	10/02/12	1.00E+04	CU.FT.	4.85E-02 ± 5.96E-03	L.T. 4.E-02
10/02/12	10/09/12	1.01E+04	CU.FT.	2.19E-02 ± 5.05E-03	L.T. 2.E-02
10/09/12	10/16/12	1.01E+04	CU.FT.	2.85E-02 ± 5.30E-03	L.T. 2.E-02
10/16/12	10/23/12	1.00E+04	CU.FT.	2.44E-02 ± 4.42E-03	L.T. 2.E-02
10/23/12	10/31/12	1.15E+04	CU.FT.	3.32E-02 ± 4.73E-03	L.T. 3.E-02
10/31/12	11/07/12	1.00E+04	CU.FT.	4.31E-02 ± 5.65E-03	L.T. 4.E-02
11/07/12	11/13/12	8.54E+03	CU.FT.	3.66E-02 ± 6.11E-03	L.T. 4.E-02
11/13/12	11/20/12	1.00E+04	CU.FT.	8.60E-02 ± 7.66E-03	L.T. 2.E-02
11/20/12	11/27/12	1.01E+04	CU.FT.	5.90E-02 ± 6.47E-03	L.T. 4.E-02
11/27/12	12/04/12	1.01E+04	CU.FT.	6.82E-02 ± 6.95E-03	L.T. 4.E-02
12/04/12	12/11/12	1.01E+04	CU.FT.	2.08E-02 ± 4.28E-03	L.T. 2.E-02
12/11/12	12/19/12	1.16E+04	CU.FT.	4.06E-02 ± 5.21E-03	L.T. 3.E-02
12/19/12	12/26/12	1.02E+04	CU.FT.	4.04E-02 ± 5.33E-03	L.T. 3.E-02
12/26/12	01/02/13	9.95E+03	CU.FT.	3.95E-02 ± 5.40E-03	L.T. 3.E-02

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**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - AIRBORNE**  
**COMPOSITE AIR PARTICULATE FILTERS**  
 (PCI/CU.M.)

STATION NUMBER 1

DATE COLLECTED                      01/03 - 04/03/12                      04/03 - 07/03/12                      07/03 - 10/02/12                      10/02 - 01/02/13

GAMMA SPECTRUM ANALYSIS:

BE-7	9.61E-02 ± 4.23E-02	2.43E-01 ± 6.30E-02	1.36E-01 ± 5.29E-02	1.08E-01 ± 3.10E-02
K-40	L.T. 2.E-02	L.T. 6.E-02	4.68E-02 ± 2.92E-02	L.T. 2.E-02
MN-54	L.T. 3.E-03	L.T. 4.E-03	L.T. 3.E-03	L.T. 2.E-03
CO-58	L.T. 5.E-03	L.T. 7.E-03	L.T. 6.E-03	L.T. 4.E-03
FE-59	L.T. 2.E-02	L.T. 3.E-02	L.T. 2.E-02	L.T. 1.E-02
CO-60	L.T. 2.E-03	L.T. 4.E-03	L.T. 3.E-03	L.T. 2.E-03
ZN-65	L.T. 6.E-03	L.T. 1.E-02	L.T. 8.E-03	L.T. 6.E-03
ZR-95	L.T. 9.E-03	L.T. 1.E-02	L.T. 8.E-03	L.T. 7.E-03
RU-103	L.T. 8.E-03	L.T. 1.E-02	L.T. 1.E-02	L.T. 6.E-03
RU-106	L.T. 2.E-02	L.T. 4.E-02	L.T. 2.E-02	L.T. 2.E-02
I-131	L.T. 1.E+00	L.T. 2.E+00	L.T. 5.E+00	L.T. 8.E-01
CS-134	L.T. 2.E-03	L.T. 4.E-03	L.T. 3.E-03	L.T. 2.E-03
CS-137	L.T. 3.E-03	L.T. 3.E-03	L.T. 3.E-03	L.T. 2.E-03
BA-140	L.T. 4.E-01	L.T. 7.E-01	L.T. 1.E+00	L.T. 3.E-01
LA-140	L.T. 2.E-01	L.T. 3.E-01	L.T. 3.E-01	L.T. 6.E-02
CE-141	L.T. 9.E-03	L.T. 1.E-02	L.T. 2.E-02	L.T. 8.E-03
CE-144	L.T. 1.E-02	L.T. 1.E-02	L.T. 1.E-02	L.T. 1.E-02
RA-226	L.T. 3.E-02	L.T. 5.E-02	L.T. 4.E-02	L.T. 3.E-02
TH-228	L.T. 3.E-03	L.T. 6.E-03	L.T. 4.E-03	L.T. 3.E-03

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**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - AIRBORNE**  
**COMPOSITE AIR PARTICULATE FILTERS**  
 (PCI/CU.M.)

STATION NUMBER 2

DATE COLLECTED                      01/03 - 04/03/12                      04/03 - 07/03/12                      07/03 - 10/02/12                      10/02 - 01/02/13

GAMMA SPECTRUM ANALYSIS:

BE-7	1.27E-01 ± 4.69E-02	1.77E-01 ± 5.87E-02	1.07E-01 ± 4.80E-02	1.09E-01 ± 4.68E-02
K-40	L.T. 5.E-02	L.T. 2.E-02	L.T. 3.E-02	L.T. 3.E-02
MN-54	L.T. 3.E-03	L.T. 3.E-03	L.T. 3.E-03	L.T. 3.E-03
CO-58	L.T. 5.E-03	L.T. 5.E-03	L.T. 5.E-03	L.T. 6.E-03
FE-59	L.T. 2.E-02	L.T. 1.E-02	L.T. 2.E-02	L.T. 2.E-02
CO-60	L.T. 3.E-03	L.T. 3.E-03	L.T. 3.E-03	L.T. 3.E-03
ZN-65	L.T. 7.E-03	L.T. 5.E-03	L.T. 9.E-03	L.T. 8.E-03
ZR-95	L.T. 1.E-02	L.T. 6.E-03	L.T. 9.E-03	L.T. 1.E-02
RU-103	L.T. 1.E-02	L.T. 8.E-03	L.T. 1.E-02	L.T. 9.E-03
RU-106	L.T. 3.E-02	L.T. 2.E-02	L.T. 2.E-02	L.T. 3.E-02
I-131	L.T. 2.E+00	L.T. 1.E+00	L.T. 5.E+00	L.T. 1.E+00
CS-134	L.T. 3.E-03	L.T. 3.E-03	L.T. 3.E-03	L.T. 3.E-03
CS-137	L.T. 3.E-03	L.T. 2.E-03	L.T. 2.E-03	L.T. 3.E-03
BA-140	L.T. 6.E-01	L.T. 6.E-01	L.T. 8.E-01	L.T. 5.E-01
LA-140	L.T. 2.E-01	L.T. 2.E-01	L.T. 3.E-01	L.T. 2.E-01
CE-141	L.T. 1.E-02	L.T. 9.E-03	L.T. 2.E-02	L.T. 1.E-02
CE-144	L.T. 1.E-02	L.T. 9.E-03	L.T. 1.E-02	L.T. 1.E-02
RA-226	L.T. 5.E-02	L.T. 4.E-02	L.T. 4.E-02	L.T. 4.E-02
TH-228	L.T. 4.E-03	L.T. 3.E-03	L.T. 4.E-03	L.T. 4.E-03

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**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - AIRBORNE**  
**COMPOSITE AIR PARTICULATE FILTERS**  
 (PCI/CU.M.)

STATION NUMBER 3

DATE COLLECTED                      01/03 - 04/03/12                      04/03 - 07/03/12                      07/03 - 10/02/12                      10/02 - 01/02/13

GAMMA SPECTRUM ANALYSIS:

BE-7	(a)	(a)	L.T. 9.E-01	1.19E-01 ± 3.15E-02
K-40	(a)	(a)	L.T. 7.E-01	L.T. 3.E-02
MN-54	(a)	(a)	L.T. 5.E-02	L.T. 2.E-03
CO-58	(a)	(a)	L.T. 8.E-02	L.T. 5.E-03
FE-59	(a)	(a)	L.T. 3.E-01	L.T. 9.E-03
CO-60	(a)	(a)	L.T. 4.E-02	L.T. 2.E-03
ZN-65	(a)	(a)	L.T. 1.E-01	L.T. 7.E-03
ZR-95	(a)	(a)	L.T. 2.E-01	L.T. 6.E-03
RU-103	(a)	(a)	L.T. 2.E-01	L.T. 6.E-03
RU-106	(a)	(a)	L.T. 5.E-01	L.T. 2.E-02
I-131	(a)	(a)	L.T. 7.E+01	L.T. 1.E+00
CS-134	(a)	(a)	L.T. 5.E-02	L.T. 2.E-03
CS-137	(a)	(a)	L.T. 4.E-02	L.T. 2.E-03
BA-140	(a)	(a)	L.T. 2.E+01	L.T. 3.E-01
LA-140	(a)	(a)	L.T. 6.E+00	L.T. 1.E-01
CE-141	(a)	(a)	L.T. 3.E-01	L.T. 8.E-03
CE-144	(a)	(a)	L.T. 2.E-01	L.T. 9.E-03
RA-226	(a)	(a)	L.T. 6.E-01	L.T. 3.E-02
TH-228	(a)	(a)	L.T. 6.E-02	L.T. 3.E-03

(a) Sample unavailable due to flooding of the Missouri River

VII-2  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - AIRBORNE**  
**COMPOSITE AIR PARTICULATE FILTERS**  
 (PCI/CU.M.)

STATION NUMBER 4

DATE COLLECTED                      01/03 - 04/03/12                      04/03 - 07/03/12                      07/03 - 10/02/12                      10/02 - 01/02/13

GAMMA SPECTRUM ANALYSIS:

BE-7	(a)	(a)	L.T. 9.E-01	1.18E-01 ± 3.13E-02
K-40	(a)	(a)	L.T. 4.E-01	L.T. 2.E-02
MN-54	(a)	(a)	L.T. 5.E-02	L.T. 3.E-03
CO-58	(a)	(a)	L.T. 8.E-02	L.T. 5.E-03
FE-59	(a)	(a)	L.T. 3.E-01	L.T. 1.E-02
CO-60	(a)	(a)	L.T. 4.E-02	L.T. 2.E-03
ZN-65	(a)	(a)	L.T. 1.E-01	L.T. 8.E-03
ZR-95	(a)	(a)	L.T. 1.E-01	L.T. 1.E-02
RU-103	(a)	(a)	L.T. 2.E-01	L.T. 7.E-03
RU-106	(a)	(a)	L.T. 4.E-01	L.T. 2.E-02
I-131	(a)	(a)	L.T. 9.E+01	L.T. 1.E+00
CS-134	(a)	(a)	L.T. 4.E-02	L.T. 3.E-03
CS-137	(a)	(a)	L.T. 5.E-02	L.T. 3.E-03
BA-140	(a)	(a)	L.T. 1.E+01	L.T. 3.E-01
LA-140	(a)	(a)	L.T. 4.E+00	L.T. 2.E-01
CE-141	(a)	(a)	L.T. 3.E-01	L.T. 1.E-02
CE-144	(a)	(a)	L.T. 2.E-01	L.T. 1.E-02
RA-226	(a)	(a)	L.T. 6.E-01	L.T. 4.E-02
TH-228	(a)	(a)	L.T. 6.E-02	L.T. 4.E-03

(a) Sample unavailable due to flooding of the Missouri River

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**NEBRASKA PUBLIC POWER DISTRICT**  
**COOPER NUCLEAR STATION**  
**EXPOSURE PATHWAY - AIRBORNE**  
**COMPOSITE AIR PARTICULATE FILTERS**  
 (PCI/CU.M.)

STATION NUMBER 5

DATE COLLECTED                      01/03 - 04/03/12                      04/03 - 07/03/12                      07/03 - 10/02/12                      10/02 - 01/02/13

GAMMA SPECTRUM ANALYSIS:

BE-7	(a)	(a)	L.T. 8.E-01	7.40E-02 ± 2.88E-02
K-40	(a)	(a)	L.T. 5.E-01	L.T. 3.E-02
MN-54	(a)	(a)	L.T. 3.E-02	L.T. 1.E-03
CO-58	(a)	(a)	L.T. 8.E-02	L.T. 2.E-03
FE-59	(a)	(a)	L.T. 2.E-01	L.T. 1.E-02
CO-60	(a)	(a)	L.T. 3.E-02	L.T. 2.E-03
ZN-65	(a)	(a)	L.T. 1.E-01	L.T. 5.E-03
ZR-95	(a)	(a)	L.T. 1.E-01	L.T. 7.E-03
RU-103	(a)	(a)	L.T. 1.E-01	L.T. 5.E-03
RU-106	(a)	(a)	L.T. 3.E-01	L.T. 1.E-02
I-131	(a)	(a)	L.T. 7.E+01	L.T. 7.E-01
CS-134	(a)	(a)	L.T. 4.E-02	L.T. 2.E-03
CS-137	(a)	(a)	L.T. 4.E-02	L.T. 2.E-03
BA-140	(a)	(a)	L.T. 2.E+01	L.T. 2.E-01
LA-140	(a)	(a)	L.T. 2.E+00	L.T. 8.E-02
CE-141	(a)	(a)	L.T. 2.E-01	L.T. 7.E-03
CE-144	(a)	(a)	L.T. 2.E-01	L.T. 7.E-03
RA-226	(a)	(a)	L.T. 6.E-01	L.T. 3.E-02
TH-228	(a)	(a)	L.T. 6.E-02	L.T. 2.E-03

(a) Sample unavailable due to flooding of the Missouri River

VII-2  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - AIRBORNE**  
**COMPOSITE AIR PARTICULATE FILTERS**  
 (PCI/CU.M.)

STATION NUMBER 6

DATE COLLECTED                      01/03 - 04/03/12                      04/03 - 07/03/12                      07/03 - 10/02/12                      10/02 - 01/02/13

GAMMA SPECTRUM ANALYSIS:

BE-7	(a)	(a)	L.T. 7.E-01	1.07E-01 ± 3.02E-02
K-40	(a)	(a)	L.T. 5.E-01	L.T. 3.E-02
MN-54	(a)	(a)	L.T. 3.E-02	L.T. 2.E-03
CO-58	(a)	(a)	L.T. 6.E-02	L.T. 4.E-03
FE-59	(a)	(a)	L.T. 2.E-01	L.T. 7.E-03
CO-60	(a)	(a)	L.T. 4.E-02	L.T. 1.E-03
ZN-65	(a)	(a)	L.T. 7.E-02	L.T. 5.E-03
ZR-95	(a)	(a)	L.T. 1.E-01	L.T. 7.E-03
RU-103	(a)	(a)	L.T. 9.E-02	L.T. 6.E-03
RU-106	(a)	(a)	L.T. 2.E-01	L.T. 2.E-02
I-131	(a)	(a)	L.T. 6.E+01	L.T. 9.E-01
CS-134	(a)	(a)	L.T. 3.E-02	L.T. 3.E-03
CS-137	(a)	(a)	L.T. 3.E-02	L.T. 1.E-03
BA-140	(a)	(a)	L.T. 1.E+01	L.T. 3.E-01
LA-140	(a)	(a)	L.T. 4.E+00	L.T. 1.E-01
CE-141	(a)	(a)	L.T. 2.E-01	L.T. 1.E-02
CE-144	(a)	(a)	L.T. 1.E-01	L.T. 1.E-02
RA-226	(a)	(a)	L.T. 4.E-01	L.T. 4.E-02
TH-228	(a)	(a)	L.T. 4.E-02	L.T. 3.E-03

(a) Sample unavailable due to flooding of the Missouri River

VII-2  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - AIRBORNE**  
**COMPOSITE AIR PARTICULATE FILTERS**  
 (PCI/CU.M.)

STATION NUMBER 7

DATE COLLECTED                      01/03 - 04/03/12                      04/03 - 07/03/12                      07/03 - 10/02/12                      10/02 - 01/02/13

GAMMA SPECTRUM ANALYSIS:

BE-7	8.48E-02 ± 3.92E-02	1.44E-01 ± 6.56E-02	1.28E-01 ± 4.70E-02	6.91E-02 ± 2.94E-02
K-40	L.T. 2.E-02	L.T. 3.E-02	L.T. 4.E-02	L.T. 5.E-02
MN-54	L.T. 2.E-03	L.T. 4.E-03	L.T. 3.E-03	L.T. 3.E-03
CO-58	L.T. 3.E-03	L.T. 7.E-03	L.T. 6.E-03	L.T. 4.E-03
FE-59	L.T. 1.E-02	L.T. 2.E-02	L.T. 2.E-02	L.T. 1.E-02
CO-60	L.T. 2.E-03	L.T. 5.E-03	L.T. 3.E-03	L.T. 3.E-03
ZN-65	L.T. 5.E-03	L.T. 9.E-03	L.T. 9.E-03	L.T. 8.E-03
ZR-95	L.T. 7.E-03	L.T. 1.E-02	L.T. 1.E-02	L.T. 7.E-03
RU-103	L.T. 7.E-03	L.T. 9.E-03	L.T. 1.E-02	L.T. 6.E-03
RU-106	L.T. 2.E-02	L.T. 3.E-02	L.T. 3.E-02	L.T. 2.E-02
I-131	L.T. 1.E+00	L.T. 2.E+00	L.T. 5.E+00	L.T. 1.E+00
CS-134	L.T. 2.E-03	L.T. 4.E-03	L.T. 3.E-03	L.T. 2.E-03
CS-137	L.T. 2.E-03	L.T. 4.E-03	L.T. 3.E-03	L.T. 2.E-03
BA-140	L.T. 5.E-01	L.T. 6.E-01	L.T. 9.E-01	L.T. 3.E-01
LA-140	L.T. 1.E-01	L.T. 2.E-01	L.T. 6.E-01	L.T. 1.E-01
CE-141	L.T. 1.E-02	L.T. 1.E-02	L.T. 2.E-02	L.T. 9.E-03
CE-144	L.T. 1.E-02	L.T. 1.E-02	L.T. 1.E-02	L.T. 1.E-02
RA-226	L.T. 4.E-02	L.T. 5.E-02	L.T. 4.E-02	L.T. 4.E-02
TH-228	L.T. 3.E-03	L.T. 4.E-03	L.T. 4.E-03	L.T. 3.E-03



VII-2  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - AIRBORNE**  
**COMPOSITE AIR PARTICULATE FILTERS**  
 (PCI/CU.M.)

STATION NUMBER 8

DATE COLLECTED                      01/03 - 04/03/12                      04/03 - 07/03/12                      07/03 - 10/02/12                      10/02 - 01/02/13

GAMMA SPECTRUM ANALYSIS:

BE-7	1.35E-01 ± 3.73E-02	1.92E-01 ± 6.52E-02	1.84E-01 ± 5.93E-02	8.35E-02 ± 3.14E-02
K-40	L.T. 2.E-02	L.T. 7.E-02	L.T. 4.E-02	L.T. 5.E-02
MN-54	L.T. 3.E-03	L.T. 4.E-03	L.T. 3.E-03	L.T. 2.E-03
CO-58	L.T. 4.E-03	L.T. 8.E-03	L.T. 6.E-03	L.T. 5.E-03
FE-59	L.T. 1.E-02	L.T. 3.E-02	L.T. 3.E-02	L.T. 1.E-02
CO-60	L.T. 2.E-03	L.T. 4.E-03	L.T. 3.E-03	L.T. 3.E-03
ZN-65	L.T. 5.E-03	L.T. 1.E-02	L.T. 7.E-03	L.T. 7.E-03
ZR-95	L.T. 8.E-03	L.T. 2.E-02	L.T. 1.E-02	L.T. 8.E-03
RU-103	L.T. 8.E-03	L.T. 1.E-02	L.T. 1.E-02	L.T. 6.E-03
RU-106	L.T. 2.E-02	L.T. 3.E-02	L.T. 3.E-02	L.T. 2.E-02
I-131	L.T. 1.E+00	L.T. 2.E+00	L.T. 6.E+00	L.T. 1.E+00
CS-134	L.T. 2.E-03	L.T. 5.E-03	L.T. 3.E-03	L.T. 3.E-03
CS-137	L.T. 2.E-03	L.T. 3.E-03	L.T. 3.E-03	L.T. 2.E-03
BA-140	L.T. 4.E-01	L.T. 8.E-01	L.T. 1.E+00	L.T. 3.E-01
LA-140	L.T. 9.E-02	L.T. 2.E-01	L.T. 4.E-01	L.T. 1.E-01
CE-141	L.T. 1.E-02	L.T. 1.E-02	L.T. 2.E-02	L.T. 1.E-02
CE-144	L.T. 1.E-02	L.T. 1.E-02	L.T. 1.E-02	L.T. 1.E-02
RA-226	L.T. 4.E-02	L.T. 5.E-02	L.T. 5.E-02	L.T. 4.E-02
TH-228	L.T. 3.E-03	L.T. 5.E-03	L.T. 5.E-03	L.T. 4.E-03

VII-2  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - AIRBORNE**  
**COMPOSITE AIR PARTICULATE FILTERS**  
 (PCI/CU.M.)

STATION NUMBER 9

DATE COLLECTED                      01/03 - 04/03/12                      04/03 - 07/03/12                      07/03 - 10/02/12                      10/02 - 01/02/13

GAMMA SPECTRUM ANALYSIS:

BE-7	9.58E-02 ± 5.61E-02	1.83E-01 ± 4.88E-02	1.11E-01 ± 6.52E-02	9.55E-02 ± 2.79E-02
K-40	L.T. 2.E-02	L.T. 4.E-02	L.T. 6.E-02	L.T. 2.E-02
MN-54	L.T. 3.E-03	L.T. 3.E-03	L.T. 4.E-03	L.T. 2.E-03
CO-58	L.T. 5.E-03	L.T. 5.E-03	L.T. 8.E-03	L.T. 4.E-03
FE-59	L.T. 2.E-02	L.T. 2.E-02	L.T. 3.E-02	L.T. 1.E-02
CO-60	L.T. 3.E-03	L.T. 3.E-03	L.T. 4.E-03	L.T. 1.E-03
ZN-65	L.T. 7.E-03	L.T. 6.E-03	L.T. 1.E-02	L.T. 5.E-03
ZR-95	L.T. 1.E-02	L.T. 9.E-03	L.T. 1.E-02	L.T. 8.E-03
RU-103	L.T. 9.E-03	L.T. 9.E-03	L.T. 1.E-02	L.T. 7.E-03
RU-106	L.T. 3.E-02	L.T. 2.E-02	L.T. 4.E-02	L.T. 2.E-02
I-131	L.T. 2.E+00	L.T. 1.E+00	L.T. 6.E+00	L.T. 1.E+00
CS-134	L.T. 3.E-03	L.T. 3.E-03	L.T. 4.E-03	L.T. 3.E-03
CS-137	L.T. 2.E-03	L.T. 3.E-03	L.T. 4.E-03	L.T. 1.E-03
BA-140	L.T. 5.E-01	L.T. 4.E-01	L.T. 2.E+00	L.T. 4.E-01
LA-140	L.T. 1.E-01	L.T. 2.E-01	L.T. 6.E-01	L.T. 1.E-01
CE-141	L.T. 2.E-02	L.T. 1.E-02	L.T. 2.E-02	L.T. 1.E-02
CE-144	L.T. 2.E-02	L.T. 1.E-02	L.T. 1.E-02	L.T. 1.E-02
RA-226	L.T. 6.E-02	L.T. 5.E-02	L.T. 5.E-02	L.T. 4.E-02
TH-228	L.T. 5.E-03	L.T. 4.E-03	L.T. 4.E-03	L.T. 3.E-03

VII-2  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - AIRBORNE**  
**COMPOSITE AIR PARTICULATE FILTERS**  
 (PCI/CU.M.)

STATION NUMBER 10

DATE COLLECTED                      01/03 - 04/03/12                      04/03 - 07/03/12                      07/03 - 10/02/12                      10/02 - 01/02/13

GAMMA SPECTRUM ANALYSIS:

BE-7	1.91E-01 ± 3.95E-02	2.58E-01 ± 6.49E-02	2.18E-01 ± 5.98E-02	1.27E-01 ± 4.02E-02
K-40	L.T. 5.E-02	L.T. 7.E-02	L.T. 6.E-02	L.T. 2.E-02
MN-54	L.T. 3.E-03	L.T. 4.E-03	L.T. 4.E-03	L.T. 3.E-03
CO-58	L.T. 5.E-03	L.T. 7.E-03	L.T. 9.E-03	L.T. 5.E-03
FE-59	L.T. 2.E-02	L.T. 3.E-02	L.T. 3.E-02	L.T. 1.E-02
CO-60	L.T. 2.E-03	L.T. 5.E-03	L.T. 4.E-03	L.T. 3.E-03
ZN-65	L.T. 7.E-03	L.T. 1.E-02	L.T. 9.E-03	L.T. 7.E-03
ZR-95	L.T. 9.E-03	L.T. 1.E-02	L.T. 1.E-02	L.T. 9.E-03
RU-103	L.T. 8.E-03	L.T. 1.E-02	L.T. 1.E-02	L.T. 7.E-03
RU-106	L.T. 3.E-02	L.T. 4.E-02	L.T. 3.E-02	L.T. 2.E-02
I-131	L.T. 1.E+00	L.T. 2.E+00	L.T. 6.E+00	L.T. 1.E+00
CS-134	L.T. 3.E-03	L.T. 5.E-03	L.T. 4.E-03	L.T. 3.E-03
CS-137	L.T. 3.E-03	L.T. 3.E-03	L.T. 3.E-03	L.T. 2.E-03
BA-140	L.T. 5.E-01	L.T. 7.E-01	L.T. 2.E+00	L.T. 4.E-01
LA-140	L.T. 2.E-01	L.T. 2.E-01	L.T. 7.E-01	L.T. 1.E-01
CE-141	L.T. 1.E-02	L.T. 1.E-02	L.T. 2.E-02	L.T. 1.E-02
CE-144	L.T. 1.E-02	L.T. 1.E-02	L.T. 2.E-02	L.T. 1.E-02
RA-226	L.T. 5.E-02	L.T. 5.E-02	L.T. 6.E-02	L.T. 4.E-02
TH-228	L.T. 4.E-03	L.T. 6.E-03	L.T. 5.E-03	L.T. 4.E-03

VII-3  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - INGESTION**  
**FISH**  
 (PCI/KG WET)

STATION NUMBER 28

DATE COLLECTED	07/17/12	07/17/12	09/18/12	09/18/12
	CATFISH	CARP	CATFISH	CARP

GAMMA SPECTRUM ANALYSIS:

BE-7	L.T. 5.E+02	L.T. 5.E+02	L.T. 6.E+02	L.T. 7.E+02
K-40	3.47E+03 ± 8.70E+02	2.59E+03 ± 8.07E+02	3.93E+03 ± 1.10E+03	3.38E+03 ± 9.92E+02
MN-54	L.T. 5.E+01	L.T. 5.E+01	L.T. 7.E+01	L.T. 6.E+01
CO-58	L.T. 6.E+01	L.T. 6.E+01	L.T. 8.E+01	L.T. 7.E+01
FE-59	L.T. 1.E+02	L.T. 1.E+02	L.T. 2.E+02	L.T. 2.E+02
CO-60	L.T. 6.E+01	L.T. 6.E+01	L.T. 7.E+01	L.T. 6.E+01
ZN-65	L.T. 1.E+02	L.T. 1.E+02	L.T. 1.E+02	L.T. 1.E+02
ZR-95	L.T. 1.E+02	L.T. 1.E+02	L.T. 1.E+02	L.T. 1.E+02
RU-103	L.T. 7.E+01	L.T. 7.E+01	L.T. 8.E+01	L.T. 1.E+02
RU-106	L.T. 4.E+02	L.T. 5.E+02	L.T. 5.E+02	L.T. 7.E+02
I-131	L.T. 3.E+02	L.T. 3.E+02	L.T. 6.E+02	L.T. 6.E+02
CS-134	L.T. 5.E+01	L.T. 5.E+01	L.T. 5.E+01	L.T. 6.E+01
CS-137	L.T. 5.E+01	L.T. 5.E+01	L.T. 6.E+01	L.T. 6.E+01
BA-140	L.T. 6.E+02	L.T. 5.E+02	L.T. 7.E+02	L.T. 7.E+02
CE-141	L.T. 1.E+02	L.T. 9.E+01	L.T. 1.E+02	L.T. 1.E+02
CE-144	L.T. 3.E+02	L.T. 3.E+02	L.T. 3.E+02	L.T. 4.E+02
RA-226	L.T. 1.E+03	L.T. 1.E+03	L.T. 1.E+03	L.T. 1.E+03
TH-228	L.T. 8.E+01	L.T. 8.E+01	L.T. 1.E+02	L.T. 1.E+02

VII-3  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - INGESTION**  
**FISH**  
 (PCI/KG WET)

STATION NUMBER 35

DATE COLLECTED	07/17/12	07/17/12	09/18/12	09/18/12
	CATFISH	CARP	CATFISH	CARP

GAMMA SPECTRUM ANALYSIS:

BE-7	L.T. 9.E+02	L.T. 5.E+02	L.T. 5E+02	L.T. 7E+02
K-40	3.74E+03 ± 1.15E+03	3.17E+03 ± 9.17E+02	3.59E+03 ± 7.34E+02	3.89E+03 ± 1.03E+03
MN-54	L.T. 8.E+01	L.T. 4.E+01	L.T. 4E+01	L.T. 6E+01
CO-58	L.T. 1.E+02	L.T. 5.E+01	L.T. 5.E+01	L.T. 8.E+01
FE-59	L.T. 2.E+02	L.T. 1.E+02	L.T. 1.E+02	L.T. 2.E+02
CO-60	L.T. 9.E+01	L.T. 4.E+01	L.T. 6.E+01	L.T. 7.E+01
ZN-65	L.T. 2.E+02	L.T. 1.E+02	L.T. 1.E+02	L.T. 1.E+02
ZR-95	L.T. 1.E+02	L.T. 9.E+01	L.T. 1.E+02	L.T. 1.E+02
RU-103	L.T. 1.E+02	L.T. 7.E+01	L.T. 7.E+01	L.T. 1.E+02
RU-106	L.T. 7.E+02	L.T. 5.E+02	L.T. 5.E+02	L.T. 5.E+02
I-131	L.T. 5.E+02	L.T. 3.E+02	L.T. 5.E+02	L.T. 7.E+02
CS-134	L.T. 8.E+01	L.T. 5.E+01	L.T. 5.E+01	L.T. 7.E+01
CS-137	L.T. 7.E+01	L.T. 5.E+01	L.T. 5.E+01	L.T. 7.E+01
BA-140	L.T. 1.E+03	L.T. 5.E+02	L.T. 6.E+02	L.T. 9.E+02
CE-141	L.T. 2.E+02	L.T. 9.E+01	L.T. 1.E+02	L.T. 1.E+02
CE-144	L.T. 5.E+02	L.T. 2.E+02	L.T. 3.E+02	L.T. 4.E+02
RA-226	L.T. 2.E+03	L.T. 1.E+03	L.T. 1.E+03	L.T. 1.E+03
TH-228	L.T. 2.E+02	L.T. 9.E+01	L.T. 1.E+02	L.T. 1.E+02

VII-4  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - INGESTION**  
**MILK NEAREST PRODUCER**  
 (PCI/LITER)

STATION NUMBER 99

DATE COLLECTED	01/03/12	02/07/12	03/06/12	04/03/12
RADIOCHEMICAL ANALYSIS:				
I-131	L.T. 4.E-01	L.T. 4.E-01	L.T. 4.E-01	L.T. 3.E-01
GAMMA SPECTRUM ANALYSIS:				
BE-7	L.T. 7.E+01	L.T. 5.E+01	L.T. 4.E+01	L.T. 3.E+01
K-40	1.12E+03 ± 1.91E+02	1.21E+03 ± 1.98E+02	1.15E+03 ± 1.04E+02	1.22E+03 ± 9.21E+01
MN-54	L.T. 7.E+00	L.T. 5.E+00	L.T. 4.E+00	L.T. 4.E+00
CO-58	L.T. 7.E+00	L.T. 9.E+00	L.T. 5.E+00	L.T. 4.E+00
FE-59	L.T. 2.E+01	L.T. 2.E+01	L.T. 1.E+01	L.T. 1.E+01
CO-60	L.T. 1.E+01	L.T. 6.E+00	L.T. 6.E+00	L.T. 5.E+00
ZN-65	L.T. 2.E+01	L.T. 2.E+01	L.T. 1.E+01	L.T. 1.E+01
ZR-95	L.T. 2.E+01	L.T. 1.E+01	L.T. 7.E+00	L.T. 8.E+00
RU-103	L.T. 8.E+00	L.T. 8.E+00	L.T. 5.E+00	L.T. 4.E+00
RU-106	L.T. 8.E+01	L.T. 7.E+01	L.T. 4.E+01	L.T. 3.E+01
I-131	L.T. 2.E+01	L.T. 1.E+01	L.T. 9.E+00	L.T. 7.E+00
CS-134	L.T. 8.E+00	L.T. 7.E+00	L.T. 4.E+00	L.T. 4.E+00
CS-137	L.T. 8.E+00	L.T. 1.E+01	L.T. 5.E+00	L.T. 4.E+00
BA-140	L.T. 4.E+01	L.T. 3.E+01	L.T. 2.E+01	L.T. 2.E+01
LA-140	L.T. 1.E+01	L.T. 5.E+00	L.T. 6.E+00	L.T. 7.E+00
CE-141	L.T. 2.E+01	L.T. 1.E+01	L.T. 9.E+00	L.T. 7.E+00
CE-144	L.T. 6.E+01	L.T. 5.E+01	L.T. 4.E+01	L.T. 3.E+01
RA-226	L.T. 2.E+02	L.T. 2.E+02	L.T. 1.E+02	L.T. 9.E+01
TH-228	L.T. 2.E+01	L.T. 1.E+01	L.T. 8.E+00	L.T. 7.E+00

VII-4  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - INGESTION**  
**MILK NEAREST PRODUCER**  
 (PCI/LITER)

STATION NUMBER 99

DATE COLLECTED	05/01/12	06/05/12	06/26/12	07/03/12
RADIOCHEMICAL ANALYSIS:				
I-131	L.T. 4.E-01	L.T. 6.E-01	L.T. 5.E-01	L.T. 8.E-01
GAMMA SPECTRUM ANALYSIS:				
BE-7	L.T. 4.E+01	L.T. 5.E+01	L.T. 4.E+01	L.T. 6.E+01
K-40	1.16E+03 ± 1.41E+02	1.43E+03 ± 1.48E+02	1.24E+03 ± 1.03E+02	1.43E+03 ± 1.49E+02
MN-54	L.T. 6.E+00	L.T. 6.E+00	L.T. 4.E+00	L.T. 7.E+00
CO-58	L.T. 7.E+00	L.T. 4.E+00	L.T. 5.E+00	L.T. 6.E+00
FE-59	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01
CO-60	L.T. 8.E+00	L.T. 7.E+00	L.T. 6.E+00	L.T. 8.E+00
ZN-65	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01
ZR-95	L.T. 1.E+01	L.T. 9.E+00	L.T. 8.E+00	L.T. 1.E+01
RU-103	L.T. 5.E+00	L.T. 6.E+00	L.T. 5.E+00	L.T. 7.E+00
RU-106	L.T. 5.E+01	L.T. 5.E+01	L.T. 4.E+01	L.T. 5.E+01
I-131	L.T. 9.E+00	L.T. 1.E+01	L.T. 2.E+01	L.T. 1.E+01
CS-134	L.T. 5.E+00	L.T. 5.E+00	L.T. 4.E+00	L.T. 6.E+00
CS-137	L.T. 7.E+00	L.T. 5.E+00	L.T. 4.E+00	L.T. 7.E+00
BA-140	L.T. 3.E+01	L.T. 3.E+01	L.T. 4.E+01	L.T. 4.E+01
LA-140	L.T. 1.E+01	L.T. 8.E+00	L.T. 6.E+00	L.T. 1.E+01
CE-141	L.T. 1.E+01	L.T. 9.E+00	L.T. 1.E+01	L.T. 1.E+01
CE-144	L.T. 4.E+01	L.T. 4.E+01	L.T. 3.E+01	L.T. 5.E+01
RA-226	L.T. 1.E+02	L.T. 1.E+02	L.T. 9.E+01	L.T. 2.E+02
TH-228	L.T. 1.E+01	L.T. 1.E+01	L.T. 7.E+00	L.T. 1.E+01

VII-4  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - INGESTION**  
**MILK NEAREST PRODUCER**  
 (PCI/LITER)

STATION NUMBER 99

DATE COLLECTED	07/24/12	08/08/12	08/29/12	09/04/12
RADIOCHEMICAL ANALYSIS:				
I-131	L.T. 5.E-01	L.T. 6.E-01	L.T. 7.E-01	L.T. 7.E-01
GAMMA SPECTRUM ANALYSIS:				
BE-7	L.T. 5.E+01	L.T. 4.E+01	L.T. 4.E+01	L.T. 5.E+01
K-40	1.51E+03 ± 1.31E+02	1.14E+03 ± 1.06E+02	1.34E+03 ± 1.15E+02	1.35E+03 ± 1.55E+02
MN-54	L.T. 5.E+00	L.T. 5.E+00	L.T. 4.E+00	L.T. 6.E+00
CO-58	L.T. 5.E+00	L.T. 5.E+00	L.T. 5.E+00	L.T. 5.E+00
FE-59	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 2.E+01
CO-60	L.T. 5.E+00	L.T. 6.E+00	L.T. 6.E+00	L.T. 6.E+00
ZN-65	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01
ZR-95	L.T. 8.E+00	L.T. 1.E+01	L.T. 8.E+00	L.T. 1.E+01
RU-103	L.T. 5.E+00	L.T. 5.E+00	L.T. 5.E+00	L.T. 6.E+00
RU-106	L.T. 4.E+01	L.T. 5.E+01	L.T. 4.E+01	L.T. 6.E+01
I-131	L.T. 9.E+00	L.T. 8.E+00	L.T. 8.E+00	L.T. 1.E+01
CS-134	L.T. 4.E+00	L.T. 5.E+00	L.T. 4.E+00	L.T. 5.E+00
CS-137	L.T. 5.E+00	L.T. 5.E+00	L.T. 5.E+00	L.T. 5.E+00
BA-140	L.T. 3.E+01	L.T. 2.E+01	L.T. 2.E+01	L.T. 3.E+01
LA-140	L.T. 8.E+00	L.T. 7.E+00	L.T. 5.E+00	L.T. 1.E+01
CE-141	L.T. 9.E+00	L.T. 9.E+00	L.T. 8.E+00	L.T. 1.E+01
CE-144	L.T. 4.E+01	L.T. 4.E+01	L.T. 3.E+01	L.T. 5.E+01
RA-226	L.T. 1.E+02	L.T. 1.E+02	L.T. 1.E+02	L.T. 1.E+02
TH-228	L.T. 1.E+01	L.T. 8.E+00	L.T. 9.E+00	L.T. 6.E+00



VII-4  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - INGESTION**  
**MILK NEAREST PRODUCER**  
 (PCI/LITER)

STATION NUMBER 99

DATE COLLECTED	09/25/12	10/02/12	11/06/12	12/04/12
RADIOCHEMICAL ANALYSIS:				
I-131	L.T. 1.E+00	L.T. 6.E-01	L.T. 6.E-01	L.T. 6.E-01

GAMMA SPECTRUM ANALYSIS:

BE-7	L.T. 7.E+01	L.T. 6.E+01	L.T. 5.E+01	L.T. 3.E+01
K-40	1.37E+03 ± 2.19E+02	1.13E+03 ± 1.40E+02	1.22E+03 ± 1.45E+02	1.27E+03 ± 9.64E+01
MN-54	L.T. 8.E+00	L.T. 5.E+00	L.T. 6.E+00	L.T. 4.E+00
CO-58	L.T. 7.E+00	L.T. 6.E+00	L.T. 6.E+00	L.T. 4.E+00
FE-59	L.T. 2.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 8.E+00
CO-60	L.T. 1.E+01	L.T. 7.E+00	L.T. 8.E+00	L.T. 4.E+00
ZN-65	L.T. 2.E+01	L.T. 1.E+01	L.T. 2.E+01	L.T. 9.E+00
ZR-95	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 7.E+00
RU-103	L.T. 8.E+00	L.T. 6.E+00	L.T. 7.E+00	L.T. 4.E+00
RU-106	L.T. 7.E+01	L.T. 5.E+01	L.T. 6.E+01	L.T. 3.E+01
I-131	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 7.E+00
CS-134	L.T. 9.E+00	L.T. 5.E+00	L.T. 6.E+00	L.T. 3.E+00
CS-137	L.T. 9.E+00	L.T. 6.E+00	L.T. 6.E+00	L.T. 4.E+00
BA-140	L.T. 4.E+01	L.T. 3.E+01	L.T. 3.E+01	L.T. 2.E+01
LA-140	L.T. 1.E+01	L.T. 9.E+00	L.T. 7.E+00	L.T. 5.E+00
CE-141	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 8.E+00
CE-144	L.T. 7.E+01	L.T. 4.E+01	L.T. 4.E+01	L.T. 3.E+01
RA-226	L.T. 2.E+02	L.T. 1.E+02	L.T. 1.E+02	L.T. 9.E+01
TH-228	L.T. 2.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 8.E+00

VII-5  
**NEBRASKA PUBLIC POWER DISTRICT**  
COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - INGESTION**  
**MILK OTHER PRODUCERS**  
(PCI/LITER)

STATION NUMBER 103

DATE COLLECTED

MILK - OTHER PRODUCER LOCATON 103 IS NO LONGER AVAILABLE BUT WILL REMAIN AS AN  
COLLECTION IF CONDITIONS CHANGE.

RADIOCHEMICAL ANALYSIS:

I-131

GAMMA SPECTRUM ANALYSIS:

BE-7

K-40

MN-54

CO-58

FE-59

CO-60

ZN-65

ZR-95

RU-103

RU-106

I-131

CS-134

CS-137

BA-140

LA-140

CE-141

CE-144

RA-226

TH-228

VII-6  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - INGESTION**  
**WATER - GROUND**  
 (PCI/LITER)

STATION NUMBER 11

DATE COLLECTED	01/10/12	04/17/12	07/16/12	10/16/12
RADIOCHEMICAL ANALYSIS:				
I-131	L.T. 5.E-01	L.T. 5.E-01	L.T. 4.E-01	L.T. 8.E-01
GAMMA SPECTRUM ANALYSIS:				
BE-7	L.T. 8.E+01	L.T. 5.E+01	L.T. 5.E+01	L.T. 5.E+01
K-40	L.T. 9.E+01	L.T. 7.E+01	L.T. 5.E+01	L.T. 5.E+01
MN-54	L.T. 7.E+00	L.T. 7.E+00	L.T. 5.E+00	L.T. 6.E+00
CO-58	L.T. 9.E+00	L.T. 8.E+00	L.T. 6.E+00	L.T. 6.E+00
FE-59	L.T. 2.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01
CO-60	L.T. 8.E+00	L.T. 8.E+00	L.T. 6.E+00	L.T. 6.E+00
ZN-65	L.T. 2.E+01	L.T. 1.E+01	L.T. 9.E+00	L.T. 1.E+01
ZR-95	L.T. 1.E+01	L.T. 1.E+01	L.T. 9.E+00	L.T. 9.E+00
RU-103	L.T. 9.E+00	L.T. 8.E+00	L.T. 6.E+00	L.T. 6.E+00
RU-106	L.T. 8.E+01	L.T. 6.E+01	L.T. 5.E+01	L.T. 5.E+01
I-131	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01
CS-134	L.T. 8.E+00	L.T. 6.E+00	L.T. 5.E+00	L.T. 5.E+00
CS-137	L.T. 8.E+00	L.T. 7.E+00	L.T. 6.E+00	L.T. 6.E+00
BA-140	L.T. 4.E+01	L.T. 3.E+01	L.T. 3.E+01	L.T. 3.E+01
LA-140	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01
CE-141	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01
CE-144	L.T. 5.E+01	L.T. 4.E+01	L.T. 4.E+01	L.T. 4.E+01
RA-226	L.T. 2.E+02	L.T. 1.E+02	L.T. 2.E+02	L.T. 2.E+02
TH-228	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01
H-3	L.T. 3.E+02	L.T. 3.E+02	L.T. 3.E+02	L.T. 3.E+02

VII-6  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - INGESTION**  
**WATER - GROUND**  
 (PCI/LITER)

STATION NUMBER 47

DATE COLLECTED	01/10/12	04/17/12	07/16/12	10/16/12
<b>RADIOCHEMICAL ANALYSIS:</b>				
I-131	L.T. 5.E-01	L.T. 5.E-01	L.T. 4.E-01	L.T. 7.E-01
<b>GAMMA SPECTRUM ANALYSIS:</b>				
BE-7	L.T. 7.E+01	L.T. 5.E+01	L.T. 4.E+01	L.T. 5.E+01
K-40	L.T. 8.E+01	L.T. 9.E+01	L.T. 8.E+01	L.T. 9.E+01
MN-54	L.T. 8.E+00	L.T. 6.E+00	L.T. 4.E+00	L.T. 4.E+00
CO-58	L.T. 7.E+00	L.T. 5.E+00	L.T. 5.E+00	L.T. 6.E+00
FE-59	L.T. 2.E+01	L.T. 1.E+01	L.T. 8.E+00	L.T. 1.E+01
CO-60	L.T. 7.E+00	L.T. 6.E+00	L.T. 4.E+00	L.T. 6.E+00
ZN-65	L.T. 1.E+01	L.T. 1.E+01	L.T. 9.E+00	L.T. 1.E+01
ZR-95	L.T. 1.E+01	L.T. 7.E+00	L.T. 8.E+00	L.T. 1.E+01
RU-103	L.T. 8.E+00	L.T. 6.E+00	L.T. 5.E+00	L.T. 7.E+00
RU-106	L.T. 7.E+01	L.T. 4.E+01	L.T. 4.E+01	L.T. 5.E+01
I-131	L.T. 1.E+01	L.T. 9.E+00	L.T. 8.E+00	L.T. 9.E+00
CS-134	L.T. 5.E+00	L.T. 4.E+00	L.T. 4.E+00	L.T. 5.E+00
CS-137	L.T. 8.E+00	L.T. 5.E+00	L.T. 4.E+00	L.T. 6.E+00
BA-140	L.T. 3.E+01	L.T. 2.E+01	L.T. 2.E+01	L.T. 2.E+01
LA-140	L.T. 1.E+01	L.T. 8.E+00	L.T. 8.E+00	L.T. 1.E+01
CE-141	L.T. 1.E+01	L.T. 8.E+00	L.T. 9.E+00	L.T. 1.E+01
CE-144	L.T. 4.E+01	L.T. 3.E+01	L.T. 3.E+01	L.T. 4.E+01
RA-226	L.T. 2.E+02	L.T. 1.E+02	L.T. 1.E+02	L.T. 1.E+02
TH-228	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01
H-3	L.T. 3.E+02	L.T. 3.E+02	L.T. 2.E+02	L.T. 3.E+02

VII-7  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - INGESTION**  
**WATER - RIVER**  
 (PCI/LITER)

STATION NUMBER 28

DATE COLLECTED	01/24/12	02/07/12	03/12/12	04/03/12
<b>RADIOCHEMICAL ANALYSIS:</b>				
H-3	L.T. 2.E+02	L.T. 3.E+02	L.T. 2.E+02	L.T. 3.E+02
H-3 Qtrly			L.T. 3.E+02	
<b>GAMMA SPECTRUM ANALYSIS:</b>				
BE-7	L.T. 4.E+01	L.T. 5.E+01	L.T. 5.E+01	L.T. 5.E+01
K-40	L.T. 6.E+01	L.T. 1.E+02	L.T. 9.E+01	L.T. 9.E+01
MN-54	L.T. 3.E+00	L.T. 5.E+00	L.T. 5.E+00	L.T. 6.E+00
CO-58	L.T. 4.E+00	L.T. 6.E+00	L.T. 4.E+00	L.T. 5.E+00
FE-59	L.T. 7.E+00	L.T. 1.E+01	L.T. 9.E+00	L.T. 1.E+01
CO-60	L.T. 4.E+00	L.T. 5.E+00	L.T. 4.E+00	L.T. 6.E+00
ZN-65	L.T. 7.E+00	L.T. 9.E+00	L.T. 1.E+01	L.T. 1.E+01
ZR-95	L.T. 6.E+00	L.T. 1.E+01	L.T. 6.E+00	L.T. 9.E+00
RU-103	L.T. 5.E+00	L.T. 6.E+00	L.T. 5.E+00	L.T. 6.E+00
RU-106	L.T. 3.E+01	L.T. 6.E+01	L.T. 4.E+01	L.T. 4.E+01
I-131	L.T. 7.E+00	L.T. 1.E+01	L.T. 9.E+00	L.T. 9.E+00
CS-134	L.T. 4.E+00	L.T. 6.E+00	L.T. 4.E+00	L.T. 5.E+00
CS-137	L.T. 5.E+00	L.T. 7.E+00	L.T. 5.E+00	L.T. 5.E+00
BA-140	L.T. 2.E+01	L.T. 3.E+01	L.T. 2.E+01	L.T. 3.E+01
LA-140	L.T. 5.E+00	L.T. 1.E+01	L.T. 7.E+00	L.T. 8.E+00
CE-141	L.T. 9.E+00	L.T. 1.E+01	L.T. 9.E+00	L.T. 8.E+00
CE-144	L.T. 3.E+01	L.T. 5.E+01	L.T. 3.E+01	L.T. 3.E+01
RA-226	L.T. 1.E+02	L.T. 2.E+02	L.T. 1.E+02	L.T. 1.E+02
TH-228	L.T. 8.E+00	L.T. 1.E+01	L.T. 7.E+00	L.T. 1.E+01

VII-7  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - INGESTION**  
**WATER - RIVER**  
 (PCI/LITER)

STATION NUMBER 28

DATE COLLECTED	05/02/12	06/05/12	07/10/12	08/08/12
<b>RADIOCHEMICAL ANALYSIS:</b>				
H-3	L.T. 1.E+02	L.T. 3.E+02	L.T. 2.E+02	L.T. 3.E+02
H-3 Qtrly		L.T. 2.E+02		
<b>GAMMA SPECTRUM ANALYSIS:</b>				
BE-7	L.T. 5.E+01	L.T. 5.E+01	L.T. 5.E+01	L.T. 4.E+01
K-40	L.T. 4.E+01	L.T. 6.E+01	L.T. 9.E+01	L.T. 6.E+01
MN-54	L.T. 5.E+00	L.T. 7.E+00	L.T. 6.E+00	L.T. 3.E+00
CO-58	L.T. 5.E+00	L.T. 6.E+00	L.T. 7.E+00	L.T. 4.E+00
FE-59	L.T. 9.E+00	L.T. 1.E+01	L.T. 1.E+01	L.T. 7.E+00
CO-60	L.T. 4.E+00	L.T. 7.E+00	L.T. 5.E+00	L.T. 3.E+00
ZN-65	L.T. 8.E+00	L.T. 1.E+01	L.T. 1.E+01	L.T. 7.E+00
ZR-95	L.T. 9.E+00	L.T. 9.E+00	L.T. 8.E+00	L.T. 6.E+00
RU-103	L.T. 6.E+00	L.T. 6.E+00	L.T. 6.E+00	L.T. 5.E+00
RU-106	L.T. 4.E+01	L.T. 5.E+01	L.T. 5.E+01	L.T. 3.E+01
I-131	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 7.E+00
CS-134	L.T. 5.E+00	L.T. 6.E+00	L.T. 5.E+00	L.T. 4.E+00
CS-137	L.T. 5.E+00	L.T. 6.E+00	L.T. 5.E+00	L.T. 4.E+00
BA-140	L.T. 3.E+01	L.T. 3.E+01	L.T. 3.E+01	L.T. 2.E+01
LA-140	L.T. 9.E+00	L.T. 7.E+00	L.T. 1.E+01	L.T. 6.E+00
CE-141	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 8.E+00
CE-144	L.T. 4.E+01	L.T. 5.E+01	L.T. 4.E+01	L.T. 3.E+01
RA-226	L.T. 1.E+02	L.T. 2.E+02	L.T. 1.E+02	L.T. 9.E+01
TH-228	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 7.E+00

VII-7  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - INGESTION**  
**WATER - RIVER**  
 (PCI/LITER)

STATION NUMBER 28

DATE COLLECTED	09/04/12	10/02/12	11/07/12	12/04/12
<b>RADIOCHEMICAL ANALYSIS:</b>				
H-3	L.T. 3.E+02	L.T. 3.E+02	L.T. 3.E+02	L.T. 2.E+02
H-3 Qtrly	L.T. 3.E+02			L.T. 3.E+02
<b>GAMMA SPECTRUM ANALYSIS:</b>				
BE-7	L.T. 4.E+01	L.T. 6.E+01	L.T. 4.E+01	L.T. 4.E+01
K-40	L.T. 8.E+01	L.T. 1.E+02	L.T. 6.E+01	1.14E+02 ± 5.16E+01
MN-54	L.T. 5.E+00	L.T. 7.E+00	L.T. 5.E+00	L.T. 4.E+00
CO-58	L.T. 5.E+00	L.T. 7.E+00	L.T. 5.E+00	L.T. 4.E+00
FE-59	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 8.E+00
CO-60	L.T. 5.E+00	L.T. 7.E+00	L.T. 5.E+00	L.T. 4.E+00
ZN-65	L.T. 8.E+00	L.T. 1.E+01	L.T. 1.E+01	L.T. 8.E+00
ZR-95	L.T. 8.E+00	L.T. 1.E+01	L.T. 9.E+00	L.T. 7.E+00
RU-103	L.T. 4.E+00	L.T. 9.E+00	L.T. 5.E+00	L.T. 4.E+00
RU-106	L.T. 4.E+01	L.T. 6.E+01	L.T. 4.E+01	L.T. 3.E+01
I-131	L.T. 8.E+00	L.T. 2.E+01	L.T. 7.E+00	L.T. 8.E+00
CS-134	L.T. 4.E+00	L.T. 7.E+00	L.T. 5.E+00	L.T. 4.E+00
CS-137	L.T. 5.E+00	L.T. 8.E+00	L.T. 5.E+00	L.T. 4.E+00
BA-140	L.T. 2.E+01	L.T. 5.E+01	L.T. 2.E+01	L.T. 2.E+01
LA-140	L.T. 9.E+00	L.T. 2.E+01	L.T. 8.E+00	L.T. 5.E+00
CE-141	L.T. 9.E+00	L.T. 1.E+01	L.T. 9.E+00	L.T. 1.E+01
CE-144	L.T. 3.E+01	L.T. 4.E+01	L.T. 4.E+01	L.T. 5.E+01
RA-226	L.T. 1.E+02	L.T. 1.E+02	L.T. 1.E+02	L.T. 2.E+02
TH-228	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	1.22E+01 ± 6.03E+00

VII-7  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - INGESTION**  
**WATER - RIVER**  
 (PCI/LITER)

STATION NUMBER 35

DATE COLLECTED	01/24/12	02/07/12	03/12/12	04/03/12
<b>RADIOCHEMICAL ANALYSIS:</b>				
H-3	L.T. 2.E+02	L.T. 3.E+02	L.T. 2.E+02	L.T. 3.E+02
H-3 Qtrly			L.T. 3.E+02	
<b>GAMMA SPECTRUM ANALYSIS:</b>				
BE-7	L.T. 5.E+01	L.T. 5.E+01	L.T. 5.E+01	L.T. 4.E+01
K-40	L.T. 1.E+02	L.T. 6.E+01	L.T. 1.E+02	L.T. 9.E+01
MN-54	L.T. 5.E+00	L.T. 6.E+00	L.T. 5.E+00	L.T. 4.E+00
CO-58	L.T. 5.E+00	L.T. 7.E+00	L.T. 5.E+00	L.T. 5.E+00
FE-59	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01
CO-60	L.T. 6.E+00	L.T. 6.E+00	L.T. 7.E+00	L.T. 5.E+00
ZN-65	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 9.E+00
ZR-95	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 9.E+00
RU-103	L.T. 6.E+00	L.T. 7.E+00	L.T. 6.E+00	L.T. 5.E+00
RU-106	L.T. 4.E+01	L.T. 5.E+01	L.T. 5.E+01	L.T. 5.E+01
I-131	L.T. 1.E+01	L.T. 1.E+01	L.T. 9.E+00	L.T. 8.E+00
CS-134	L.T. 6.E+00	L.T. 7.E+00	L.T. 6.E+00	L.T. 4.E+00
CS-137	L.T. 4.E+00	L.T. 7.E+00	L.T. 6.E+00	L.T. 5.E+00
BA-140	L.T. 2.E+01	L.T. 3.E+01	L.T. 3.E+01	L.T. 2.E+01
LA-140	L.T. 9.E+00	L.T. 1.E+01	L.T. 1.E+01	L.T. 7.E+00
CE-141	L.T. 1.E+01	L.T. 1.E+01	L.T. 9.E+00	L.T. 8.E+00
CE-144	L.T. 4.E+01	L.T. 5.E+01	L.T. 4.E+01	L.T. 4.E+01
RA-226	L.T. 2.E+02	L.T. 2.E+02	L.T. 1.E+02	L.T. 1.E+02
TH-228	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 8.E+00



VII-7  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - INGESTION**  
**WATER - RIVER**  
 (PCI/LITER)

STATION NUMBER 35

DATE COLLECTED	05/02/12	06/05/12	07/10/12	08/08/12
<b>RADIOCHEMICAL ANALYSIS:</b>				
H-3	L.T. 1.E+02	L.T. 3.E+02	L.T. 2.E+02	L.T. 3.E+02
H-3 Qtrly		L.T. 2.E+02		
<b>GAMMA SPECTRUM ANALYSIS:</b>				
BE-7	L.T. 6.E+01	L.T. 4.E+01	L.T. 5.E+01	L.T. 3.E+01
K-40	L.T. 7.E+01	L.T. 5.E+01	L.T. 4.E+01	L.T. 5.E+01
MN-54	L.T. 7.E+00	L.T. 5.E+00	L.T. 3.E+00	L.T. 4.E+00
CO-58	L.T. 7.E+00	L.T. 5.E+00	L.T. 6.E+00	L.T. 4.E+00
FE-59	L.T. 1.E+01	L.T. 1.E+01	L.T. 9.E+00	L.T. 9.E+00
CO-60	L.T. 6.E+00	L.T. 5.E+00	L.T. 5.E+00	L.T. 4.E+00
ZN-65	L.T. 2.E+01	L.T. 9.E+00	L.T. 8.E+00	L.T. 9.E+00
ZR-95	L.T. 2.E+01	L.T. 9.E+00	L.T. 8.E+00	L.T. 7.E+00
RU-103	L.T. 7.E+00	L.T. 5.E+00	L.T. 5.E+00	L.T. 4.E+00
RU-106	L.T. 6.E+01	L.T. 4.E+01	L.T. 3.E+01	L.T. 4.E+01
I-131	L.T. 2.E+01	L.T. 9.E+00	L.T. 8.E+00	L.T. 7.E+00
CS-134	L.T. 6.E+00	L.T. 5.E+00	L.T. 5.E+00	L.T. 4.E+00
CS-137	L.T. 7.E+00	L.T. 5.E+00	L.T. 5.E+00	L.T. 3.E+00
BA-140	L.T. 4.E+01	L.T. 2.E+01	L.T. 2.E+01	L.T. 2.E+01
LA-140	L.T. 2.E+01	L.T. 1.E+01	L.T. 7.E+00	L.T. 6.E+00
CE-141	L.T. 1.E+01	L.T. 8.E+00	L.T. 9.E+00	L.T. 8.E+00
CE-144	L.T. 4.E+01	L.T. 4.E+01	L.T. 3.E+01	L.T. 3.E+01
RA-226	L.T. 1.E+02	L.T. 1.E+02	L.T. 1.E+02	L.T. 9.E+01
TH-228	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 8.E+00

VII-7  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - INGESTION**  
**WATER - RIVER**  
 (PCI/LITER)

STATION NUMBER 35

DATE COLLECTED	09/04/12	10/02/12	11/07/12	12/04/12
<b>RADIOCHEMICAL ANALYSIS:</b>				
H-3	L.T. 3.E+02	L.T. 3.E+02	L.T. 3.E+02	L.T. 2.E+02
H-3 Qrtly	L.T. 3.E+02			L.T. 3.E+02
<b>GAMMA SPECTRUM ANALYSIS:</b>				
BE-7	L.T. 4.E+01	L.T. 5.E+01	L.T. 5.E+01	L.T. 4.E+01
K-40	L.T. 5.E+01	L.T. 3.E+01	1.17E+02 ± 6.81E+01	L.T. 4.E+01
MN-54	L.T. 5.E+00	L.T. 4.E+00	L.T. 4.E+00	L.T. 4.E+00
CO-58	L.T. 5.E+00	L.T. 5.E+00	L.T. 4.E+00	L.T. 4.E+00
FE-59	L.T. 1.E+01	L.T. 1.E+01	L.T. 8.E+00	L.T. 7.E+00
CO-60	L.T. 6.E+00	L.T. 4.E+00	L.T. 4.E+00	L.T. 5.E+00
ZN-65	L.T. 1.E+01	L.T. 1.E+01	L.T. 9.E+00	L.T. 7.E+00
ZR-95	L.T. 8.E+00	L.T. 8.E+00	L.T. 8.E+00	L.T. 8.E+00
RU-103	L.T. 5.E+00	L.T. 6.E+00	L.T. 5.E+00	L.T. 4.E+00
RU-106	L.T. 5.E+01	L.T. 4.E+01	L.T. 4.E+01	L.T. 4.E+01
I-131	L.T. 9.E+00	L.T. 2.E+01	L.T. 9.E+00	L.T. 6.E+00
CS-134	L.T. 4.E+00	L.T. 5.E+00	L.T. 5.E+00	L.T. 4.E+00
CS-137	L.T. 5.E+00	L.T. 6.E+00	L.T. 5.E+00	L.T. 5.E+00
BA-140	L.T. 2.E+01	L.T. 3.E+01	L.T. 2.E+01	L.T. 2.E+01
LA-140	L.T. 7.E+00	L.T. 1.E+01	L.T. 5.E+00	L.T. 7.E+00
CE-141	L.T. 1.E+01	L.T. 1.E+01	L.T. 2.E+01	L.T. 7.E+00
CE-144	L.T. 4.E+01	L.T. 4.E+01	L.T. 7.E+01	L.T. 3.E+01
RA-226	L.T. 1.E+02	L.T. 1.E+02	L.T. 2.E+02	L.T. 9.E+01
TH-228	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 8.E+00

VII-8  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - THERMOLUMINESCENT DOSIMETRY - TLD**  
 MILLIREM/QUARTER

Sample Nuclide	Station Number	First Quarter 01/01-03/31	Second Quarter 04/01-06/30	Third Quarter 07/01-09/30	Fourth Quarter 10/01-01/01	Quarter Average - 1 S.D.
TLD	01	25.6 ± 0.9	19.7 ± 0.6	24.6 ± 0.2	23.3 ± 0.7	23.3 ± 2.6
	02	24.3 ± 0.6	19.7 ± 0.1	24.9 ± 0.2	23.4 ± 1.5	23.1 ± 2.3
	03	20.9 ± 1.2	20.1 ± 0.2	22.5 ± 0.8	21.0 ± 0.0	21.1 ± 1.0
	04	25.0 ± 0.9	20.2 ± 0.4	25.2 ± 0.5	22.3 ± 0.3	23.2 ± 2.4
	05	23.9 ± 1.2	18.4 ± 0.3	24.5 ± 0.4	21.9 ± 0.5	22.2 ± 2.8
	06	24.4 ± 1.1	19.4 ± 0.8	25.1 ± 0.5	21.2 ± 0.5	22.5 ± 2.7
	07	24.0 ± 0.6	20.0 ± 0.6	24.6 ± 0.9	22.8 ± 0.4	22.8 ± 2.0
	08	24.1 ± 1.2	14.2 ± 0.1	26.0 ± 0.9	23.5 ± 0.2	22.0 ± 5.2
	09	24.4 ± 1.0	19.5 ± 0.1	24.4 ± 0.3	22.7 ± 0.9	22.8 ± 2.3
	10	24.3 ± 1.0	19.6 ± 0.4	24.8 ± 1.2	23.1 ± 0.3	22.9 ± 2.3
	20	25.8 ± 1.9	21.5 ± 0.6	26.9 ± 1.3	24.1 ± 0.4	24.6 ± 2.3
	44	26.4 ± 0.6	21.3 ± 0.6	27.0 ± 0.7	25.5 ± 0.4	25.1 ± 2.6
	56	23.9 ± 0.6	20.1 ± 0.5	25.5 ± 1.7	21.1 ± 0.4	22.7 ± 2.5
	58	24.6 ± 0.8	20.4 ± 0.7	25.5 ± 0.6	23.2 ± 0.2	23.4 ± 2.2
	59	25.2 ± 0.7	20.6 ± 0.5	25.7 ± 0.3	24.5 ± 0.4	24.0 ± 2.3
	66	26.5 ± 0.6	21.2 ± 1.0	27.3 ± 0.9	25.0 ± 0.3	25.0 ± 2.7
	67	25.4 ± 1.3	20.2 ± 0.5	26.3 ± 0.7	24.6 ± 0.5	24.1 ± 2.7
	71	26.0 ± 0.1	21.1 ± 0.1	26.7 ± 1.3	24.9 ± 0.6	24.7 ± 2.5
	79	25.1 ± 0.1	20.1 ± 0.8	24.4 ± 0.9	24.5 ± 0.5	23.6 ± 2.3
	80	24.7 ± 0.6	21.3 ± 0.4	25.4 ± 0.7	24.8 ± 0.7	24.0 ± 1.8
	81	25.7 ± 0.8	20.6 ± 0.1	26.0 ± 0.9	23.2 ± 0.4	23.9 ± 2.5
	82	27.1 ± 1.0	20.3 ± 0.5	27.0 ± 0.7	24.1 ± 0.4	24.6 ± 3.2
	83	26.0 ± 0.4	22.2 ± 0.5	27.1 ± 0.9	24.7 ± 0.6	25.0 ± 2.1
	84	25.8 ± 0.4	21.2 ± 0.4	26.6 ± 1.3	25.3 ± 0.2	24.7 ± 2.4
	85	23.7 ± 0.3	19.6 ± 0.8	24.5 ± 0.4	22.2 ± 0.2	22.5 ± 2.1

VII-8  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - THERMOLUMINESCENT DOSIMETRY - TLD**  
 MILLIREM/QUARTER

Sample Nuclide	Station Number	First Quarter 01/01-03/31	Second Quarter 04/01-06/30	Third Quarter 07/01-09/30	Fourth Quarter 10/01-01/01	Quarter Average - 1 S.D.
	86	27.2 ± 1.1	21.0 ± 0.4	25.3 ± 0.5	24.3 ± 0.2	24.4 ± 2.6
	87	25.5 ± 0.8	21.1 ± 0.2	25.9 ± 0.4	24.0 ± 0.6	24.1 ± 2.1
	88	24.2 ± 0.5	20.2 ± 0.7	24.9 ± 0.9	23.2 ± 0.9	23.1 ± 2.1
	89	25.7 ± 1.0	20.6 ± 0.9	25.0 ± 0.5	23.5 ± 0.1	23.7 ± 2.2
	90	23.7 ± 0.5	20.5 ± 0.4	24.9 ± 0.2	21.9 ± 0.4	22.7 ± 1.9
	91	23.1 ± 0.7	20.1 ± 0.7	24.1 ± 0.3	21.2 ± 0.8	22.1 ± 1.8
	94	26.2 ± 0.9	20.6 ± 0.6	25.0 ± 0.4	23.5 ± 0.2	23.8 ± 2.4
	Average/Quarter	24.9 ± 2.5	20.2 ± 2.6	25.4 ± 2.1	23.3 ± 2.6	
	Range Detection/Total	(20.9-27.2) 33/33	(14.2-22.2) 33/33	(22.5-27.3) 33/33	(21-25.5) 33/33	

VII-9  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - INGESTION**  
**VEGETATION - TERRESTRIAL, BROADLEAF**  
 (PCI/KG WET)

STATION NUMBER 35

DATE COLLECTED	05/22/12	06/12/12	07/10/12	08/15/12
RADIOCHEMICAL ANALYSIS:				
I-131	L.T. 2.E+01	L.T. 3.E+01	L.T. 5.E+01	L.T. 3.E+01
GAMMA SPECTRUM ANALYSIS:				
BE-7	3.92E+02 ± 1.71E+02	3.94E+02 ± 1.04E+02	8.32E+02 ± 6.70E+01	1.00E+03 ± 8.69E+01
K-40	6.45E+03 ± 6.64E+02	6.27E+03 ± 3.32E+02	7.16E+03 ± 1.84E+02	5.52E+03 ± 2.09E+02
MN-54	L.T. 3.E+01	L.T. 1.E+01	L.T. 6.E+00	L.T. 8.E+00
CO-58	L.T. 2.E+01	L.T. 1.E+01	L.T. 6.E+00	L.T. 9.E+00
FE-59	L.T. 6.E+01	L.T. 3.E+01	L.T. 2.E+01	L.T. 2.E+01
CO-60	L.T. 3.E+01	L.T. 1.E+01	L.T. 8.E+00	L.T. 1.E+01
ZN-65	L.T. 6.E+01	L.T. 3.E+01	L.T. 2.E+01	L.T. 2.E+01
ZR-95	L.T. 4.E+01	L.T. 2.E+01	L.T. 1.E+01	L.T. 2.E+01
RU-103	L.T. 3.E+01	L.T. 1.E+01	L.T. 6.E+00	L.T. 1.E+01
RU-106	L.T. 2.E+02	L.T. 9.E+01	L.T. 5.E+01	L.T. 8.E+01
I-131	L.T. 7.E+01	L.T. 2.E+01	L.T. 2.E+01	L.T. 3.E+01
CS-134	L.T. 2.E+01	L.T. 1.E+01	L.T. 5.E+00	L.T. 7.E+00
CS-137	L.T. 3.E+01	L.T. 1.E+01	L.T. 6.E+00	L.T. 8.E+00
BA-140	L.T. 2.E+02	L.T. 6.E+01	L.T. 4.E+01	L.T. 6.E+01
CE-141	L.T. 3.E+01	L.T. 2.E+01	L.T. 1.E+01	L.T. 1.E+01
CE-144	L.T. 1.E+02	L.T. 7.E+01	L.T. 3.E+01	L.T. 5.E+01
RA-226	L.T. 5.E+02	L.T. 2.E+02	L.T. 1.E+02	L.T. 2.E+02
TH-228	L.T. 4.E+01	L.T. 2.E+01	L.T. 1.E+01	L.T. 1.E+01

VII-9  
**NEBRASKA PUBLIC POWER DISTRICT**  
**COOPER NUCLEAR STATION**  
**EXPOSURE PATHWAY - INGESTION**  
**VEGETATION - TERRESTRIAL, BROADLEAF**  
**(PCI/KG WET)**

STATION NUMBER 96

DATE COLLECTED 2012

RADIOCHEMICAL ANALYSIS:

I-131 (a)

GAMMA SPECTRUM ANALYSIS:

BE-7 (a)  
K-40 (a)  
MN-54 (a)  
CO-58 (a)  
FE-59 (a)  
CO-60 (a)  
ZN-65 (a)  
ZR-95 (a)  
RU-103 (a)  
RU-106 (a)  
I-131 (a)  
CS-134 (a)  
CS-137 (a)  
BA-140 (a)  
CE-141 (a)  
CE-144 (a)  
RA-226 (a)  
TH-228 (a)

(a) Broadleaf vegetation was not available due to Missouri River flooding

VII-9  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - INGESTION**  
**VEGETATION - TERRESTRIAL, BROADLEAF**  
 (PCI/KG WET)

STATION NUMBER 101

DATE COLLECTED	05/22/12	06/12/12	07/10/12	08/15/12
RADIOCHEMICAL ANALYSIS:				
I-131	L.T. 3.E+01	L.T. 3.E+01	L.T. 4.E+01	L.T. 4.E+01
GAMMA SPECTRUM ANALYSIS:				
BE-7	3.76E+02 ± 1.85E+02	4.72E+02 ± 1.94E+02	5.30E+02 ± 5.23E+01	7.85E+02 ± 6.79E+01
K-40	5.40E+03 ± 4.85E+02	5.96E+03 ± 5.20E+02	6.34E+03 ± 1.50E+02	4.35E+03 ± 1.54E+02
MN-54	L.T. 2.E+01	L.T. 2.E+01	L.T. 5.E+00	L.T. 6.E+00
CO-58	L.T. 2.E+01	L.T. 2.E+01	L.T. 5.E+00	L.T. 6.E+00
FE-59	L.T. 4.E+01	L.T. 5.E+01	L.T. 1.E+01	L.T. 1.E+01
CO-60	L.T. 2.E+01	L.T. 2.E+01	L.T. 6.E+00	L.T. 7.E+00
ZN-65	L.T. 4.E+01	L.T. 5.E+01	L.T. 1.E+01	L.T. 1.E+01
ZR-95	L.T. 3.E+01	L.T. 3.E+01	L.T. 9.E+00	L.T. 1.E+01
RU-103	L.T. 2.E+01	L.T. 2.E+01	L.T. 6.E+00	L.T. 7.E+00
RU-106	L.T. 1.E+02	L.T. 2.E+02	L.T. 5.E+01	L.T. 5.E+01
I-131	L.T. 5.E+01	L.T. 4.E+01	L.T. 2.E+01	L.T. 2.E+01
CS-134	L.T. 1.E+01	L.T. 2.E+01	L.T. 5.E+00	L.T. 6.E+00
CS-137	L.T. 1.E+01	L.T. 2.E+01	L.T. 5.E+00	L.T. 6.E+00
BA-140	L.T. 1.E+02	L.T. 1.E+02	L.T. 4.E+01	L.T. 4.E+01
CE-141	L.T. 3.E+01	L.T. 4.E+01	L.T. 1.E+01	L.T. 1.E+01
CE-144	L.T. 1.E+02	L.T. 1.E+02	L.T. 3.E+01	L.T. 4.E+01
RA-226	L.T. 4.E+02	L.T. 6.E+02	L.T. 1.E+02	L.T. 1.E+02
TH-228	L.T. 3.E+01	L.T. 4.E+01	L.T. 9.E+00	L.T. 1.E+01

VII-10  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - AIRBORNE**  
**SHORELINE SEDIMENT**  
 (PCI/KG DRY)

STATION NUMBER 28

DATE COLLECTED                      05/08/12                      10/16/12

GAMMA SPECTRUM ANALYSIS:

BE-7	L.T. 6.E+02	L.T. 5.E+02
K-40	1.58E+04 ± 1.56E+03	1.70E+04 ± 1.37E+03
MN-54	L.T. 6.E+01	L.T. 7.E+01
CO-58	L.T. 7.E+01	L.T. 5.E+01
FE-59	L.T. 1.E+02	L.T. 1.E+02
CO-60	L.T. 7.E+01	L.T. 7.E+01
ZN-65	L.T. 1.E+02	L.T. 1.E+02
ZR-95	L.T. 1.E+02	L.T. 1.E+02
RU-103	L.T. 6.E+01	L.T. 7.E+01
RU-106	L.T. 6.E+02	L.T. 5.E+02
I-131	L.T. 1.E+02	L.T. 1.E+02
CS-134	L.T. 6.E+01	L.T. 5.E+01
CS-137	L.T. 8.E+01	L.T. 7.E+01
BA-140	L.T. 3.E+02	L.T. 3.E+02
CE-141	L.T. 7.E+01	L.T. 1.E+02
CE-144	L.T. 3.E+02	L.T. 4.E+02
RA-226	2.90E+03 ± 1.48E+03	2.26E+03 ± 1.12E+03
TH-228	8.45E+02 ± 1.36E+02	1.17E+03 ± 1.48E+02



VII-10  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - AIRBORNE**  
**SHORELINE SEDIMENT**  
 (PCI/KG DRY)

STATION NUMBER 35

DATE COLLECTED                      05/08/12                      10/17/12

GAMMA SPECTRUM ANALYSIS:

BE-7	L.T. 5.E+02	L.T. 6.E+02
K-40	1.39E+04 ± 1.60E+03	1.36E+04 ± 1.30E+03
MN-54	L.T. 6.E+01	L.T. 6.E+01
CO-58	L.T. 5.E+01	L.T. 6.E+01
FE-59	L.T. 1.E+02	L.T. 1.E+02
CO-60	L.T. 7.E+01	L.T. 7.E+01
ZN-65	L.T. 1.E+02	L.T. 1.E+02
ZR-95	L.T. 1.E+02	L.T. 1.E+02
RU-103	L.T. 6.E+01	L.T. 6.E+01
RU-106	L.T. 5.E+02	L.T. 5.E+02
I-131	L.T. 1.E+02	L.T. 1.E+02
CS-134	L.T. 6.E+01	L.T. 6.E+01
CS-137	L.T. 7.E+01	L.T. 6.E+01
BA-140	L.T. 3.E+02	L.T. 3.E+02
CE-141	L.T. 1.E+02	L.T. 1.E+02
CE-144	L.T. 4.E+02	L.T. 4.E+02
RA-226	L.T. 1.E+03	1.91E+03 ± 1.12E+03
TH-228	8.16E+02 ± 1.20E+02	1.03E+03 ± 1.06E+02

**SECTION VIII. REFERENCES**

## VIII. REFERENCES

1. Nebraska Public Power District, Cooper Nuclear Station Environmental Radiation Monitoring Program, Annual Report, January 1, 1982-December 31, 1982 (prepared by Teledyne Isotopes).
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8. U.S. Regulatory Commission, Branch Technical Position, Radiological Monitoring Acceptable Program (November, 1979, Revision 1).

**APPENDIX A**  
**2012 LAND USE CENSUS**

## **2012 LAND USE CENSUS**

Conducted July 18-19, 2012  
0-3 miles

Cooper Nuclear Station (CNS) Offsite Dose Assessment Manual (ODAM) requires an annual land use census. This census identifies the location of the nearest garden that is greater than 500 square feet in area and yields leafy green vegetables, the nearest milk animal, and the location of the nearest resident in each of the 16 meteorological sectors within 3 miles of CNS.

A land use census was performed on July 18-19, 2012, in accordance with the CNS ODAM. The nearest residence was found in sector Q, 0.9 miles from CNS, and the nearest garden was found in sector L, 1.3 miles from CNS.

No milk animals were found within 3 miles of CNS and there was no evidence of potable water use from the Missouri River within three miles of CNS.

## 2012 LAND USE CENSUS

July 18-19, 2012

0-3 Miles

SECTOR	NEAREST RESIDENT	Direction in Degrees	NEAREST GARDEN	Direction in Degrees	NEAREST MILK ANIMAL
	Distance		Distance		
A/N	3.0 Miles	1.0°	NONE	NA	NONE
B/NNE	1.9 Miles	15.0°	NONE	NA	NONE
C/NE	3.0 Miles	40.0°	NONE	NA	NONE
D/ENE	1.7 Miles	61.0°	1.7 Miles	61.0°	NONE
E/E	2.2 Miles	90.0°	2.2 Miles	90.0°	NONE
F/ESE	2.3 Miles	112.0°	2.3 Miles	112.0°	NONE
G/SE	3.0 Miles	135.0°	NONE	NA	NONE
H/SSE	NONE	NA	NONE	NA	NONE
J/S	NONE	NA	NONE	NA	NONE
K/SSW	3.0 Miles	205.0°	3.0 Miles	205.0°	NONE
L/SW	1.3 Miles	232.0°	1.3 Miles	232.0°	NONE
M/WSW	1.9 Miles	241.0°	1.9 Miles	241.0°	NONE
N/W	2.9 Miles	268.0°	2.9 Miles	268.0°	NONE
P/WNW	1.7 Miles	299.0°	2.4 Miles	298.0°	NONE
Q/NW	0.9 Miles	307.0°	2.9 Miles	310.0°	NONE
R/NNW	1.9 Miles	339.0°	2.8 Miles	335.0°	NONE

**APPENDIX B**  
**SUMMARY OF INTERLABORATORY COMPARISONS**

**The Teledyne Brown Engineering ICP report is presented in this section**

## **INTERLABORATORY COMPARISON PROGRAM**

The purpose of the Interlaboratory Comparison Program (ICP) is to confirm the accuracy of results produced by Teledyne Brown Engineering. Samples of various matrices (i.e. soil, water, vegetation, air filters, and milk) are spiked with known amounts of radioactivity by commercial vendors of this service and by departments within the government. TBE participates in three programs. Two are commercial, Analytics Inc. and Environmental Resource Associates (ERA) and one is a government sponsored program, the Department of Energy's (DOE) Mixed Analyte Performance Evaluation Program (MAPEP). The DOE's Idaho National Engineering Laboratory administers the MAPEP. All three programs are blind performance evaluation studies in which samples with known activities are sent to TBE for analysis. Once analyzed, TBE submits the results to the respective agency for evaluation. The results of these evaluations are published in TBE's quarterly and annual QA reports.

The 2012 Interlaboratory Comparison Program includes all contractually required matrices and analyses we supply to customers.

The National Institute of Standards and Technology (NIST) is the approval authority for laboratory providers participating in Intercomparison Study Programs; however, at this time, there are no approved laboratories for environmental and/or radiochemical isotope analyses.

Trending graphs are provided in this section for the Analytics and ERA Programs.



**ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM  
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES**

(PAGE 1 OF 2)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)				
March 2012	E10066	Milk	Sr-89	pCi/L	101	94.8	1.07	A				
			Sr-90	pCi/L	11.7	13.5	0.87	A				
March 2012	E10067	Milk	I-131	pCi/L	87.5	92.5	0.95	A				
			Ce-141	pCi/L	247	260	0.95	A				
			Cr-51	pCi/L	435	436	1.00	A				
			Cs-134	pCi/L	133	149	0.89	A				
			Cs-137	pCi/L	156	159	0.98	A				
			Co-58	pCi/L	127	132	0.96	A				
			Mn-54	pCi/L	190	195	0.97	A				
			Fe-59	pCi/L	179	168	1.07	A				
			Zn-65	pCi/L	327	333	0.98	A				
			Co-60	pCi/L	274	279	0.98	A				
			March 2012	E10069	AP	Ce-141	pCi	167	164	1.02	A	
						Cr-51	pCi	310	276	1.12	A	
						Cs-134	pCi	107	94.5	1.13	A	
						Cs-137	pCi	109	101	1.08	A	
Co-58	pCi	87.6				83.5	1.05	A				
Mn-54	pCi	133				123	1.08	A				
Fe-59	pCi	113				106	1.07	A				
Zn-65	pCi	226				210	1.08	A				
March 2012	E10068	Charcoal	I-131	pCi	92.8	94.2	0.99	A				
			Fe-55	pCi/L	1800	1570	1.15	A				
June 2012	E10198	Milk	Sr-89	pCi/L	86.1	99.8	0.86	A				
			Sr-90	pCi/L	9.2	12.7	0.72	W				
	June 2012	E10199	Milk	I-131	pCi/L	88.9	99.7	0.89	A			
				Ce-141	pCi/L	72.8	82.2	0.89	A			
				Cr-51	pCi/L	394	402	0.98	A			
				Cs-134	pCi/L	159	174	0.91	A			
				Cs-137	pCi/L	206	212	0.97	A			
				Co-58	pCi/L	89.5	92.3	0.97	A			
				Mn-54	pCi/L	129	132	0.98	A			
				Fe-59	pCi/L	129	128	1.01	A			
				Zn-65	pCi/L	193	199	0.97	A			
				Co-60	pCi/L	342	355	0.96	A			
				June 2012	E10201	AP	Ce-141	pCi	73.2	75.1	0.97	A
							Cr-51	pCi	367	366	1.00	A
Cs-134	pCi	165	159				1.04	A				
Cs-137	pCi	205	193				1.06	A				
Co-58	pCi	84.7	84.2				1.01	A				
Mn-54	pCi	118	121				0.98	A				
Fe-59	pCi	125	117				1.07	A				
Zn-65	pCi	181	182				0.99	A				
June 2012	E10200	Charcoal	I-131	pCi	101	96.6	1.05	A				

**ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM  
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES**

(PAGE 2 OF 2)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)		
June 2012	E10202	Water	Fe-55	pCi/L	1890	1580	1.20	A		
September 2012	E10296	Milk	Sr-89	pCi/L	106	99.6	1.06	A		
			Sr-90	pCi/L	13.6	16.0	0.85	A		
	E10297	Milk	I-131	pCi/L	89.8	99.6	0.90	A		
			Ce-141	pCi/L	160	164	0.98	A		
			Cr-51	pCi/L	230	248	0.93	A		
			Cs-134	pCi/L	101	108	0.94	A		
			Cs-137	pCi/L	174	174	1.00	A		
			Co-58	pCi/L	97.2	100	0.97	A		
			Mn-54	pCi/L	188	196	0.96	A		
			Fe-59	pCi/L	159	152	1.05	A		
			Zn-65	pCi/L	195	192	1.02	A		
			Co-60	pCi/L	155	152	1.02	A		
			E10299	AP	Ce-141	pCi	145	135	1.07	A
					Cr-51	pCi	219	205	1.07	A
					Cs-134	pCi	94.1	89.4	1.05	A
					Cs-137	pCi	140	144	0.97	A
Co-58	pCi	88.3			83.0	1.06	A			
Mn-54	pCi	173			162	1.07	A			
Fe-59	pCi	136			125	1.09	A			
Zn-65	pCi	165			159	1.04	A			
E10298	Charcoal	I-131	pCi	95.5	97.2	0.98	A			
								E10300	Water	Fe-55
December 2012	E10334	Milk	Sr-89	pCi/L	101	96.6	1.05	A		
			Sr-90	pCi/L	11.3	13.8	0.82	A		
	E10335	Milk	I-131	pCi/L	93.1	90.0	1.03	A		
			Ce-141	pCi/L	52.5	51.0	1.03	A		
			Cr-51	pCi/L	373	348	1.07	A		
			Cs-134	pCi/L	157	165	0.95	A		
			Cs-137	pCi/L	113	117	0.97	A		
			Co-58	pCi/L	94.1	98.5	0.96	A		
			Mn-54	pCi/L	116	116	1.00	A		
			Fe-59	pCi/L	124	116	1.07	A		
			Zn-65	pCi/L	190	186	1.02	A		
			Co-60	pCi/L	172	170	1.01	A		
			E10337A	AP	Ce-141	pCi	51.8	49.6	1.04	A
					Cr-51	pCi	372	338	1.10	A
Cs-134	pCi	165			161	1.02	A			
Cs-137	pCi	113			114	0.99	A			
Co-58	pCi	96.5			95.8	1.01	A			
Mn-54	pCi	118			112	1.05	A			
Fe-59	pCi	105			112	0.94	A			
Zn-65	pCi	166			181	0.92	A			
Co-60	pCi	179	165	1.08	A					

**ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM**  
**TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES**  
(PAGE 3 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
December 2012	E10336	Charcoal	I-131	pCi	73.1	72.7	1.01	A
	E10333	Water	Fe-55	pCi/L	1550	1750	0.89	A

(a) Teledyne Brown Engineering reported result.

(b) The Analytics known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(c) Ratio of Teledyne Brown Engineering to Analytics results.

(d) Analytics evaluation based on TBE internal QC limits: A= Acceptable. Reported result falls within ratio limits of 0.80-1.20. W-Acceptable with warning. Reported result falls within 0.70-0.80 or 1.20-1.30. N = Not Acceptable. Reported result falls outside the ratio limits of < 0.70 and > 1.30.

**DOE's MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)**  
**TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES**  
(PAGE 1 OF 3)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
March 2012	12-MaW26	Water	Am-241	Bq/L	1.41	1.63	1.14 - 2.12	A
			Cs-134	Bq/L	-0.0045		(1)	A
			Cs-137	Bq/L	37.5	39.9	27.9 - 51.9	A
			Co-57	Bq/L	30.8	32.9	23.0 - 42.8	A
			Co-60	Bq/L	22.4	23.72	16.60 - 30.84	A
			H-3	Bq/L	456	437	306 - 568	A
			Mn-54	Bq/L	31.0	31.8	22.3 - 41.3	A
			Ni-63	Bq/L	60.0	60.0	42.0 - 78.0	A
			Pu-238	Bq/L	0.510	0.629	0.440 - 0.818	A
			Pu-239/240	Bq/L	0.956	1.34	0.94 - 1.74	W
			K-40	Bq/L	144	142	99 - 185	A
			Sr-90	Bq/L	-0.0084		(1)	A
			Tc-99	Bq/L	28.2	27.9	19.5 - 36.3	A
			U-234/233	Bq/L	0.332	0.392	0.274 - 0.510	A
			U-238	Bq/L	2.41	2.76	1.93 - 3.59	A
			Zn-65	Bq/L	-0.369		(1)	A
				12-GrW26	Water	Gr-A	Bq/L	2.06
Gr-B	Bq/L	7.48				6.36	3.18 - 9.54	A
	12-MaS26	Soil	Am-241	Bq/kg	177	159	111 - 207	A
			Cs-134	Bq/kg	831	828	580 - 1076	A
			Cs-137	Bq/kg	0.145		(1)	A
			Co-57	Bq/kg	1270	1179	825 - 1533	A
			Co-60	Bq/kg	7.61	1.56	(2)	N (3)
			Mn-54	Bq/kg	634	558	391 - 725	A
			Ni-63	Bq/kg	739	862	603 - 1121	A
			Pu-238	Bq/kg	144	136	95 - 177	A
			Pu-239/240	Bq/kg	67.9	65.8	46.1 - 85.5	A
			K-40	Bq/kg	1690	1491	1044 - 1938	A
			Sr-90	Bq/kg	328	392	274 - 540	A
			Tc-99	Bq/kg	370	374	362 - 486	A
			U-234/233	Bq/kg	56.3	68.1	47.7 - 88.5	A
			U-238	Bq/kg	286	329	230 - 428	A
			Zn-65	Bq/kg	753	642	449 - 835	A
	12-RdF26	AP	Am-241	Bq/sample	0.0651	0.073	0.051 - 0.095	A
			Cs-134	Bq/sample	2.31	2.38	1.67 - 3.09	A
			Cs-137	Bq/sample	2.15	1.79	1.25 - 2.33	W
			Co-57	Bq/sample	-0.0701		(1)	A
			Co-60	Bq/sample	2.62	2.182	1.527 - 2.837	W
			Mn-54	Bq/sample	4.13	3.24	2.27 - 4.21	W
			Pu-238	Bq/sample	0.0385	0.0015	(2)	A
			Pu-239/240	Bq/sample	0.0878	0.097	0.068 - 0.126	A
			Sr-90	Bq/sample	0.0185		(1)	A
			U-234/233	Bq/sample	0.0164	0.188	0.0132 - 0.0244	A
			U-238	Bq/sample	0.1082	0.124	0.087 - 0.161	A
			Zn-65	Bq/sample	4.19	2.99	2.09 - 3.89	N (3)
				12-GrF26	AP	Gr-A	Bq/sample	0.365
Gr-B	Bq/sample	2.31				2.4	1.2 - 3.6	A

**DOE's MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)**  
**TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES**  
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Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)			
March 2012	12-RdV26	Vegetation	Cs-134	Bq/sample	8.72	8.43	5.90 - 10.96	A			
			Cs-137	Bq/sample	0.0424		(1)	A			
			Co-57	Bq/sample	15.5	12.0	8.4 - 15.6	W			
			Co-60	Bq/sample	6.80	6.05	4.24 - 7.87	A			
			Mn-54	Bq/sample	0.0057		(1)	A			
			Sr-90	Bq/sample	2.24	2.11	1.48 - 2.74	A			
			Zn-65	Bq/sample	10.5	8.90	6.23 - 11.57	A			
September 2011	12-MaW27	Water	Am-241	Bq/L	0.953	1.06	0.074 - 1.38	A			
			Cs-134	Bq/L	21.4	23.2	16.2 - 30.2	A			
			Cs-137	Bq/L	17.0	16.7	11.7 - 21.7	A			
			Co-57	Bq/L	28.7	29.3	20.5 - 38.1	A			
			Co-60	Bq/L	0.179		(1)	A			
			H-3	Bq/L	387	334	234 - 434	A			
			Mn-54	Bq/L	18.1	17.8	12.5 - 23.1	A			
			Ni-63	Bq/L	61.5	66.3	42.0 - 78.0	A			
			Pu-238	Bq/L	0.0095	0.013	(2)	A			
			Pu-239/240	Bq/L	1.317	1.61	1.13 - 2.09	A			
			K-40	Bq/L	139	134	94 - 174	A			
			Sr-90	Bq/L	19.6	12.2	8.5 - 15.9	N (4)			
			Tc-99	Bq/L	4.14	4.58	3.21 - 5.95	A			
			U-234/233	Bq/L	0.4477	0.451	0.316 - 0.586	A			
			U-238	Bq/L	3.10	3.33	2.33 - 4.33	A			
			Zn-65	Bq/L	27.2	25.9	18.1 - 33.7	A			
				12-GrW27	Water	Gr-A	Bq/L	0.966	1.79	0.54 - 3.04	A
						Gr-B	Bq/L	10.0	9.1	4.6 - 13.7	A
				12-MaS27	Soil	Am-241	Bq/kg	102	111	78 - 144	A
						Cs-134	Bq/kg	880	939	657 - 1221	A
Cs-137	Bq/kg	1220				1150	805 - 1495	A			
Co-57	Bq/kg	1330				1316	921 - 1711	A			
Co-60	Bq/kg	552				531	372 - 690	A			
Mn-54	Bq/kg	1000				920	644 - 1196	A			
Ni-63	Bq/kg	360				406	284 - 528	A			
Pu-238	Bq/kg	101				105.8	74.1 - 137.5	A			
Pu-239/240	Bq/kg	124				134	94 - 174	A			
K-40	Bq/kg	674				632	442 - 822	A			
Sr-90	Bq/kg	528				508	356 - 660	A			
Tc-99	Bq/kg	431				469	328 - 610	A			
U-234/233	Bq/kg	50.7				60.3	42.2 - 78.4	A			
U-238	Bq/kg	238				263	184 - 342	A			
Zn-65	Bq/kg	665				606	424 - 788	A			

**DOE's MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)**  
**TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES**  
(PAGE 3 OF 3)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
September 2012	12-RdF27	AP	Am-241	Bq/sample	0.104	0.0780	0.0546 - 0.1014	N (4)
			Cs-134	Bq/sample	2.760	2.74	1.92 - 3.56	A
			Cs-137	Bq/sample	0.0415		(1)	A
			Co-57	Bq/sample	2.00	191.00	1.34 - 2.48	A
			Co-60	Bq/sample	1.78	1.728	1.210 - 2.246	A
			Mn-54	Bq/sample	2.40	2.36	1.65 - 3.07	A
			Pu-238	Bq/sample	0.0881	0.6250	0.0438 - 0.0813	N (4)
			Pu-239/240	Bq/sample	0.001	0.00081	(2)	A
			Sr-90	Bq/sample	0.931	1.03	0.72 - 1.34	A
			U-234/233	Bq/sample	0.0207	0.0141	0.0099 - 0.0183	N (4)
			U-238	Bq/sample	0.077	0.100	0.070 - 0.130	W
			Zn-65	Bq/sample	-0.688		(1)	A
	12-GrF27	AP	Gr-A	Bq/sample	0.434	0.97	0.29 - 1.65	A
			Gr-B	Bq/sample	1.927	1.92	0.96 - 2.88	A
	12-RdV27	Vegetation	Cs-134	Bq/sample	6.28	6.51	4.56 - 8.46	A
Cs-137			Bq/sample	4.62	4.38	3.07 - 5.69	A	
Co-57			Bq/sample	6.51	5.66	3.96 - 7.36	A	
Co-60			Bq/sample	5.32	5.12	3.58 - 6.66	A	
Mn-54			Bq/sample	3.59	3.27	2.29 - 4.25	A	
Sr-90			Bq/sample	0.0012		(1)	A	
Zn-65			Bq/sample	-0.046		(1)	A	

(1) False positive test.

(2) Sensitivity evaluation

(3) No cause was found for the failed high soil CO-60 sensitivity test or the high Zn-65 in AP. The high Zn-65 in AP TBE considers an anomaly. The two warning high Plutonium results were due to the breakdown of the ammonium iodide reagent. NCR 12-08.

(4) Sr-90 in water high due to incorrect aliquot entered in LIMS. Am-241, Pu-238 & U-234/233 in AP were very low activity. TBE value with its given uncertainty overlaps MAPEP's reference value, which indicates a statistically correct value. NCR 12-11

(a) Teledyne Brown Engineering reported result.

(b) The MAPEP known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(c) DOE/MAPEP evaluation: A=acceptable, W=acceptable with warning, N=not acceptable.

**ERA ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM  
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES**

(PAGE 1 OF 1)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Limits	Evaluation (c)
May 2012	RAD-89	Water	Sr-89	pCi/L	63.4	58.5	46.9 - 66.3	A
			Sr-90	pCi/L	33.5	37.4	27.4 - 43.1	A
			Ba-133	pCi/L	89.2	82.3	69.1 - 90.5	A
			Cs-134	pCi/L	66.5	74.2	60.6 - 81.6	A
			Cs-137	pCi/L	152	155	140 - 172	A
			Co-60	pCi/L	73.3	72.9	65.6 - 82.6	A
			Zn-65	pCi/L	109	105	94.5 - 125	A
			Gr-A	pCi/L	82.4	62.9	33.0 - 78.0	N (1)
			Gr-B	pCi/L	43.6	44.2	29.6 - 51.5	A
			I-131	pCi/L	25.9	27.1	22.5 - 31.9	A
			U-Nat	pCi/L	56.4	61.5	50.0 - 68.2	A
			H-3	pCi/L	15433	15800	13800 - 17400	A
				MRAD-16	Filter	Gr-A	pCi/filter	39.5
November, 2012	RAD-91	Water	Sr-89	pCi/L	46.5	39.1	29.7 - 46.1	N (2)
			Sr-90	pCi/L	16.6	20.1	14.4 - 23.8	A
			Ba-133	pCi/L	85.2	84.8	71.3 - 93.3	A
			Cs-134	pCi/L	76.9	76.6	62.6 - 84.3	A
			Cs-137	pCi/L	177	183	165 - 203	A
			Co-60	pCi/L	77.4	78.3	70.5 - 88.5	A
			Zn-65	pCi/L	209	204	184 - 240	A
			Gr-A	pCi/L	50.6	58.6	30.6 - 72.9	A
			Gr-B	pCi/L	59.3	39.2	26.0 - 46.7	A
			I-131	pCi/L	22.9	24.8	20.6 - 29.4	A
			U-Nat	pCi/L	59.8	62.5	50.8 - 69.3	A
			H-3	pCi/L	5020	4890	4190 - 5380	A
				MRAD-17	Filter	Gr-A	pCi/filter	59.6

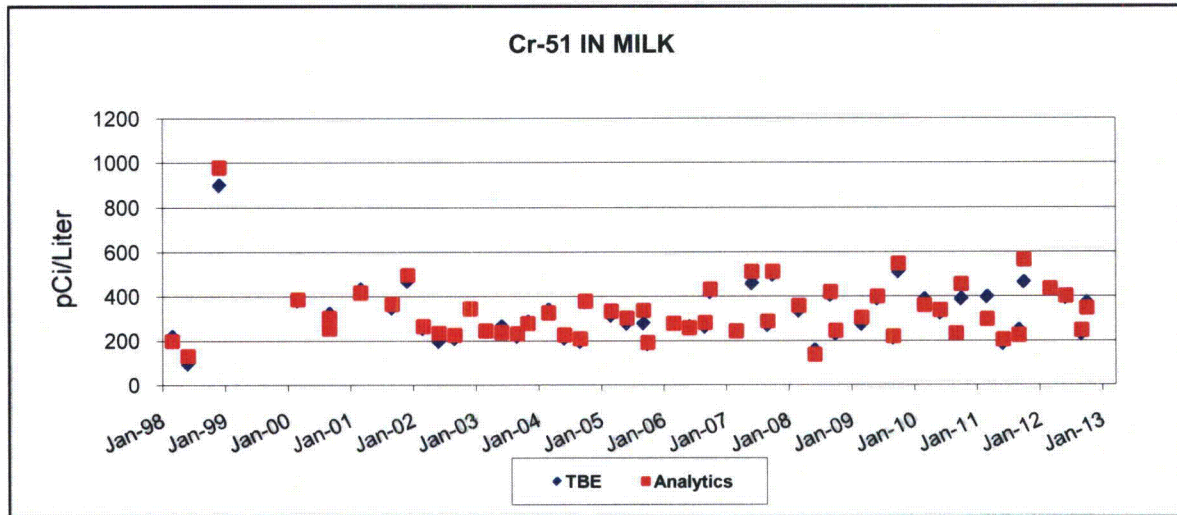
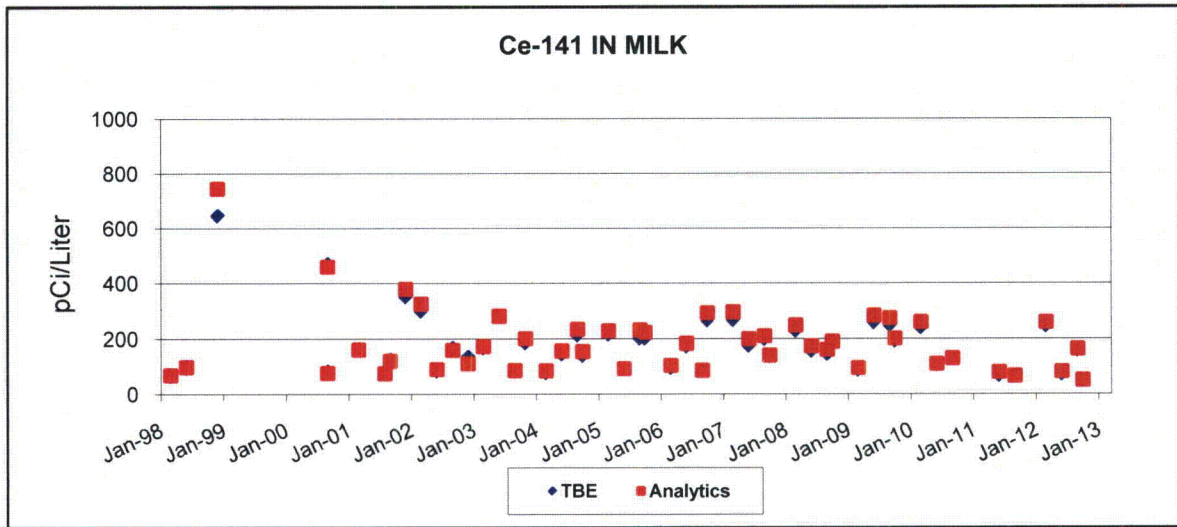
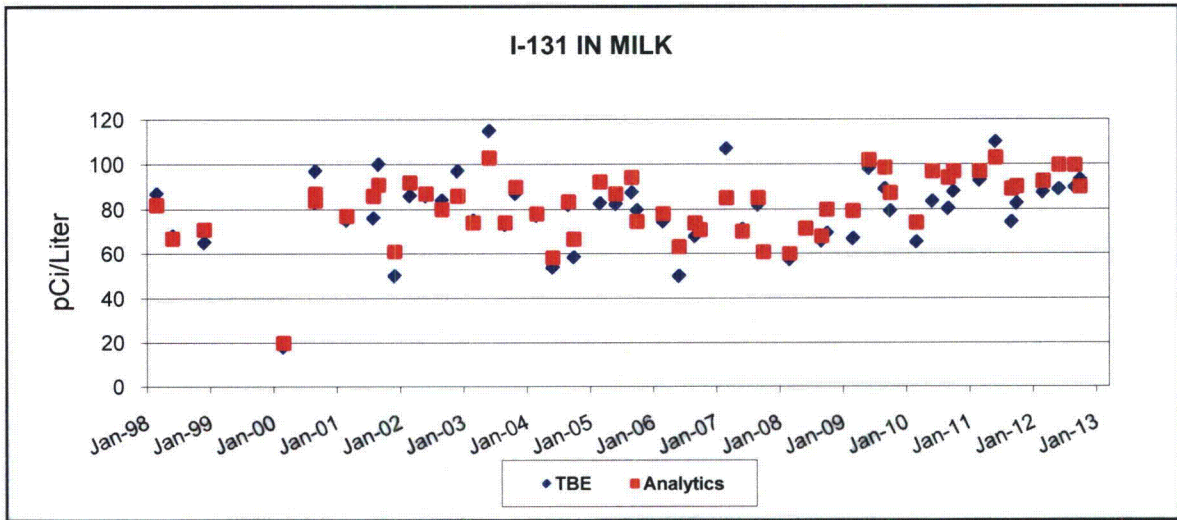
(1) Detector G1 is slightly biased high for Th-230 based measurements used only for ERA Gross Alpha samples. NCR 12-05

(a) Teledyne Brown Engineering reported result.

(b) The ERA known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

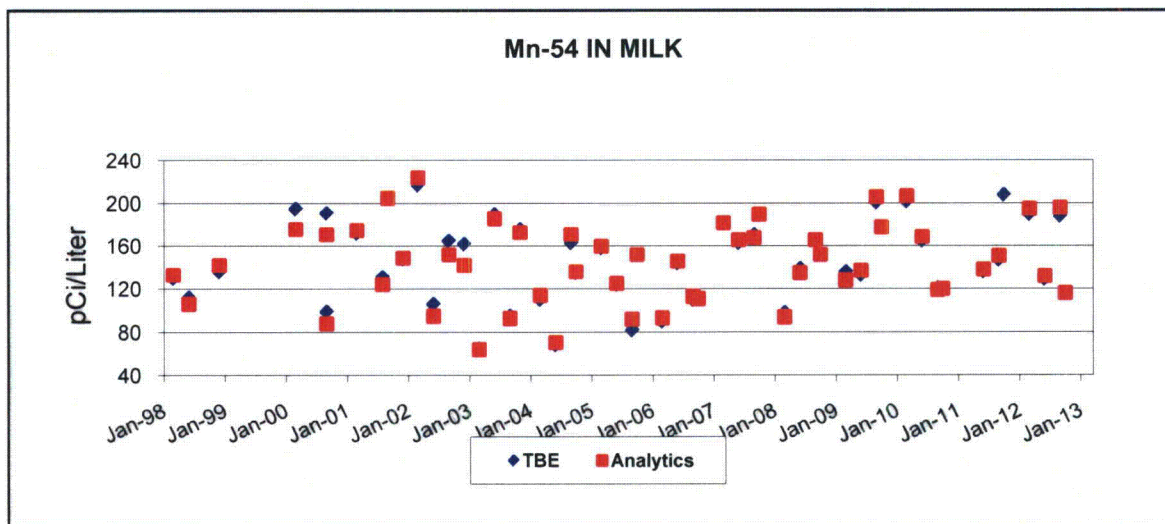
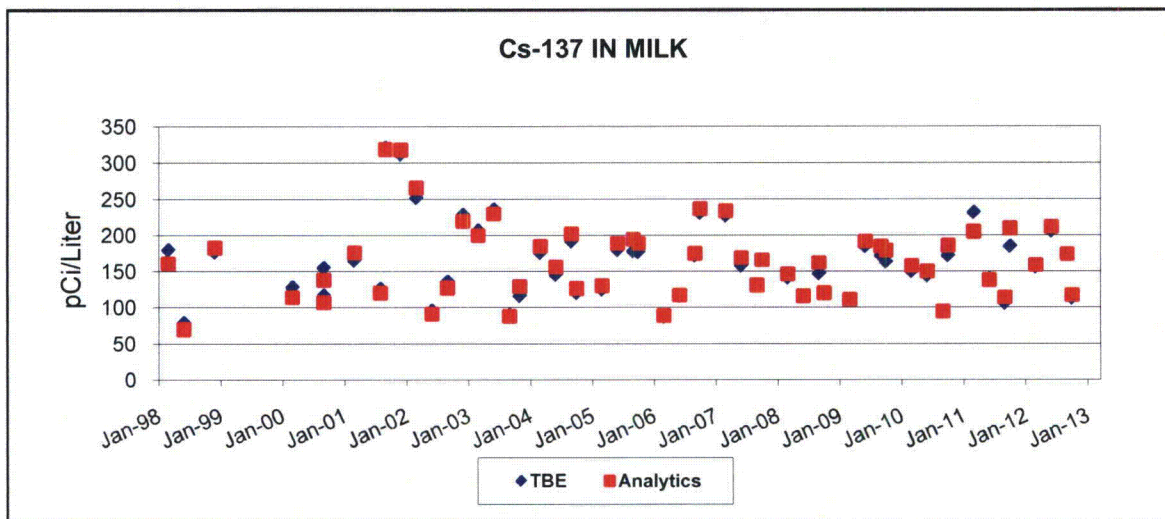
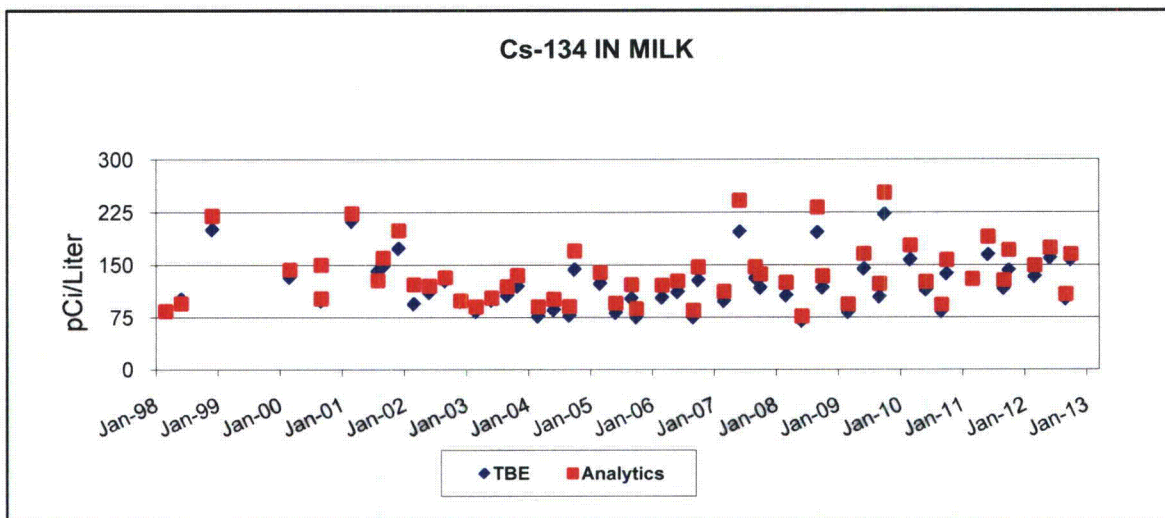
(c) ERA evaluation: A=acceptable. Reported result falls within the Warning Limits. NA=not acceptable. Reported result falls outside of the Control Limits. CE=check for Error. Reported result falls within the Control Limits and outside of the Warning Limit.

INTERLABORATORY COMPARISON PROGRAM GRAPHS

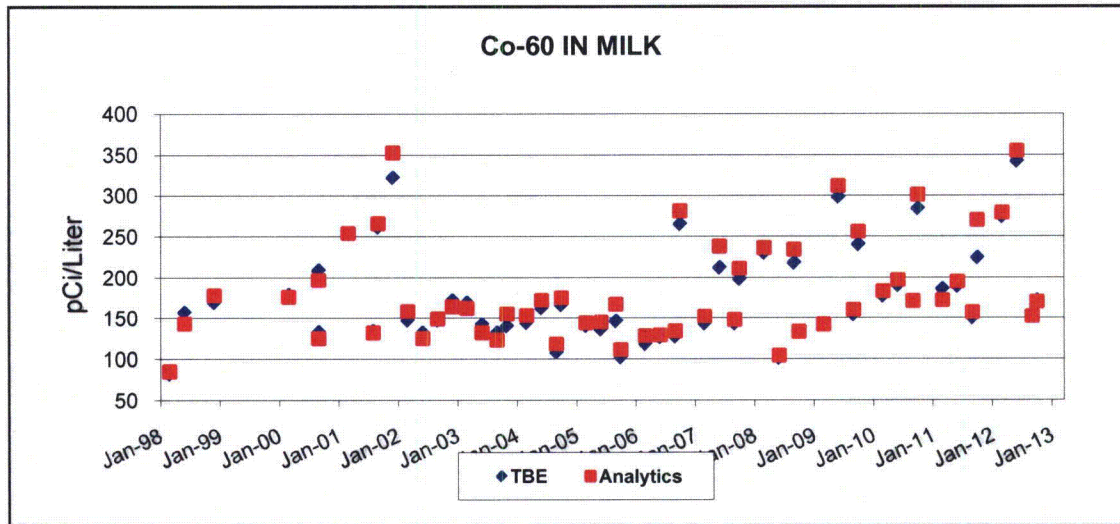
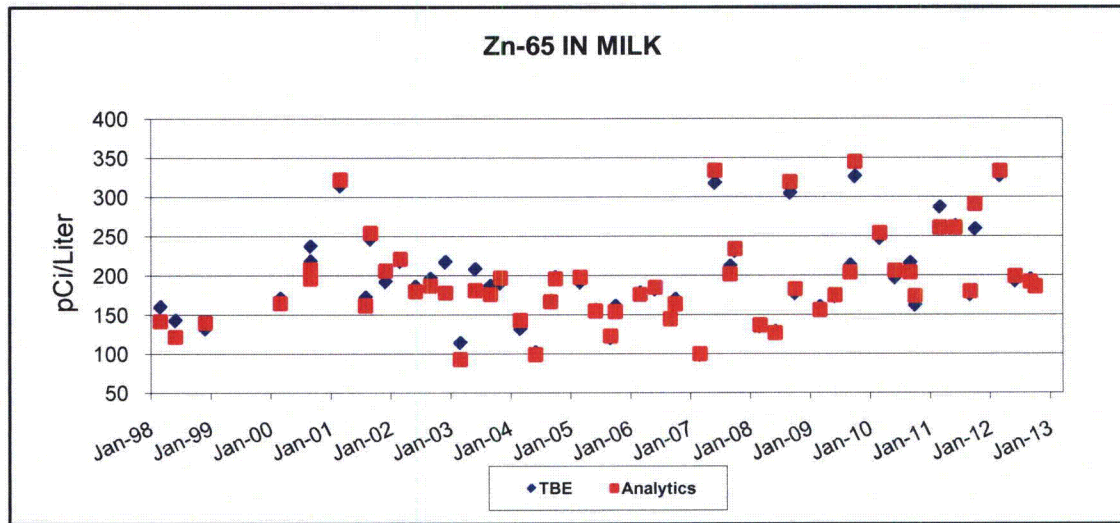
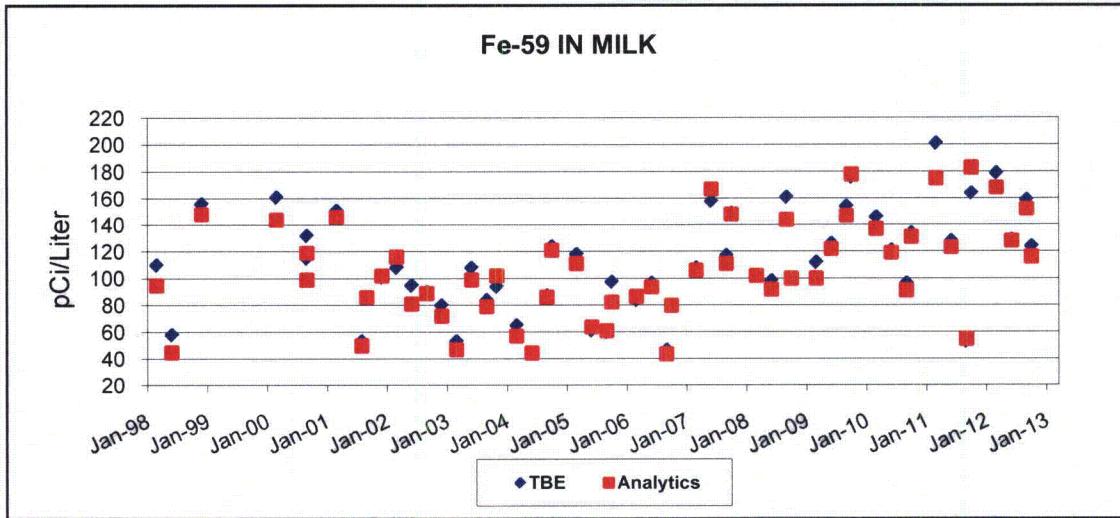




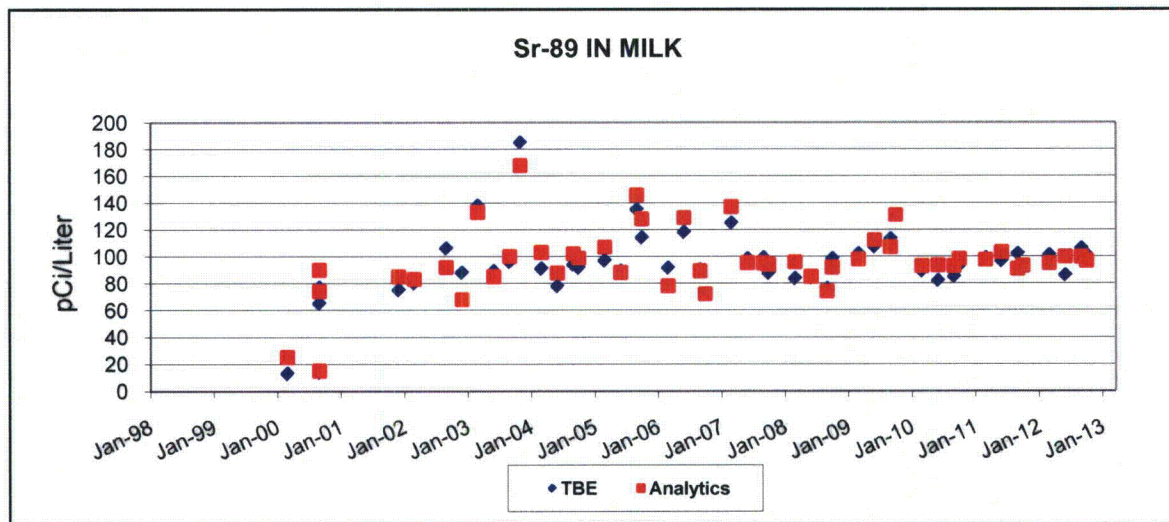
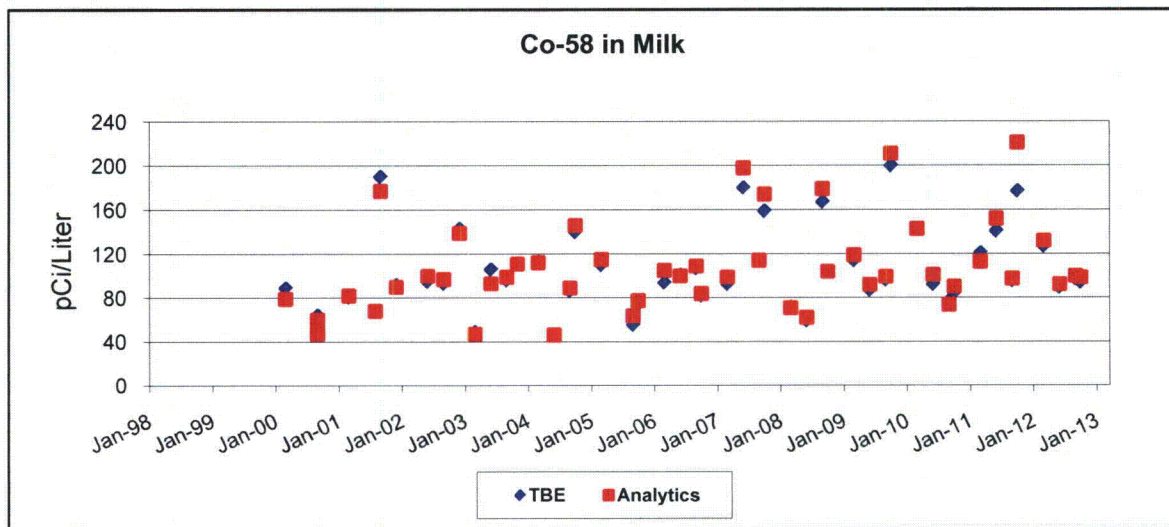
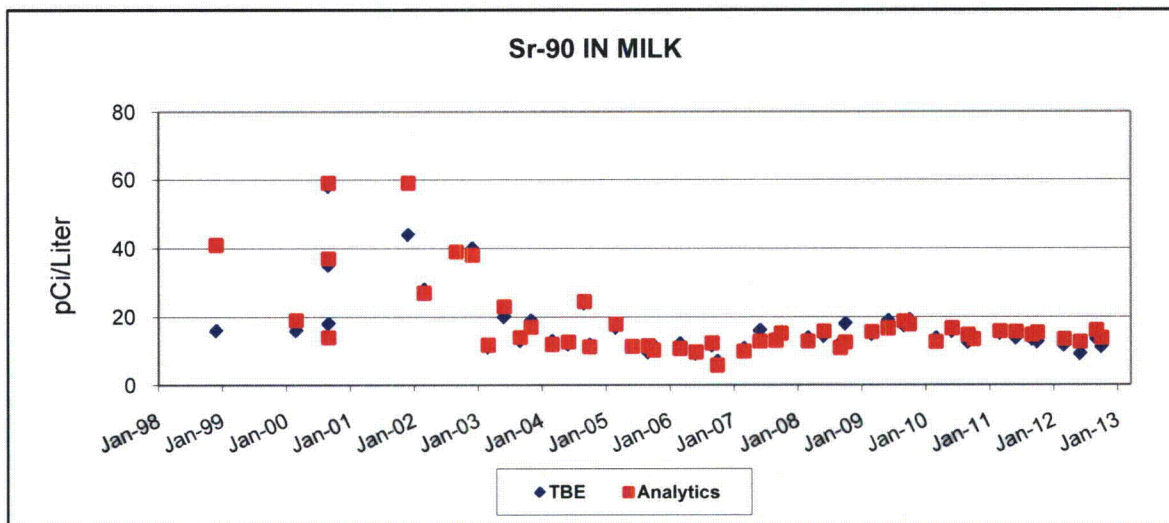
INTERLABORATORY COMPARISON PROGRAM GRAPHS



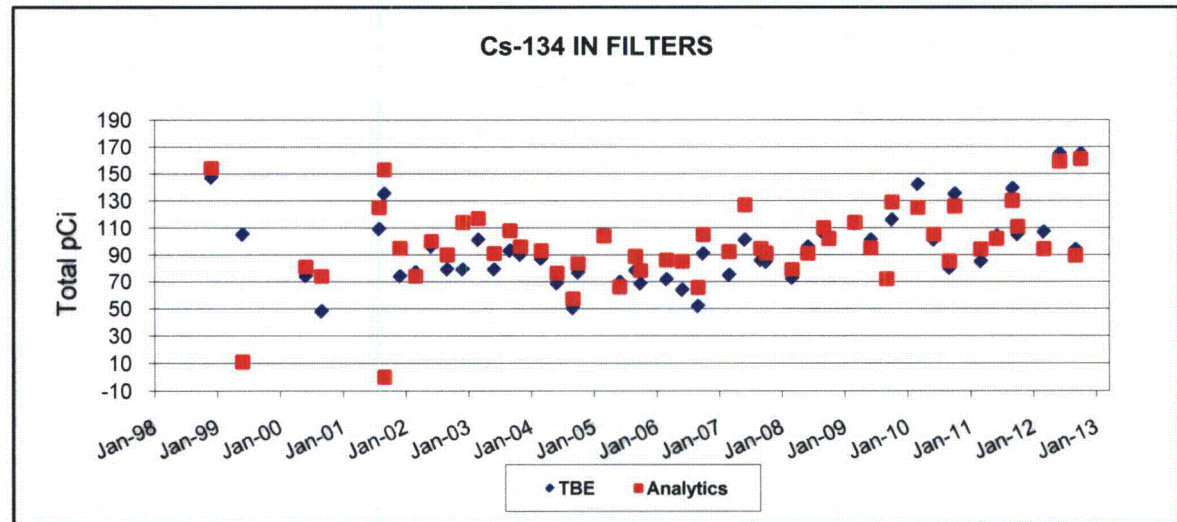
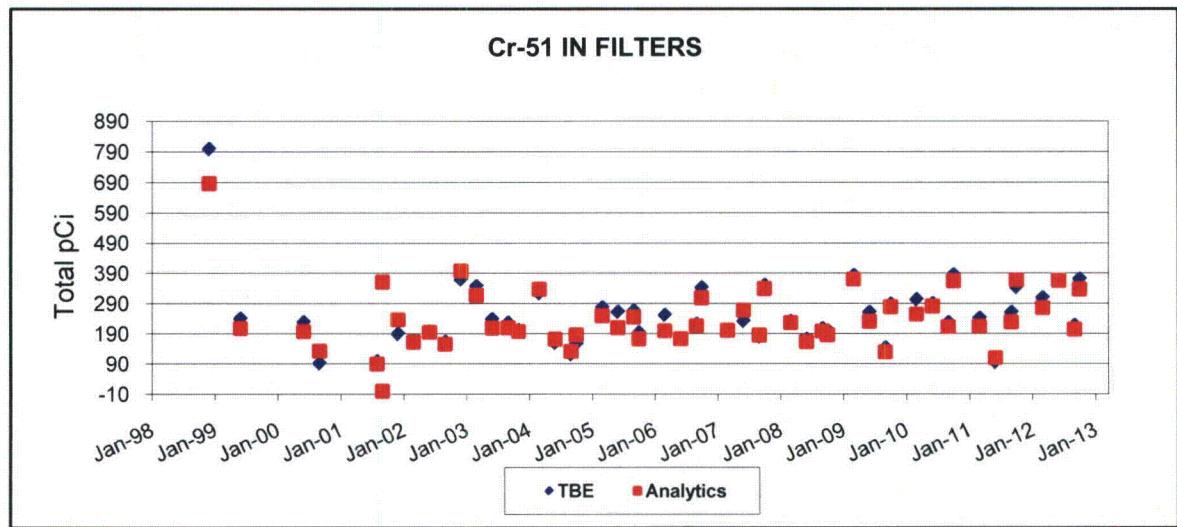
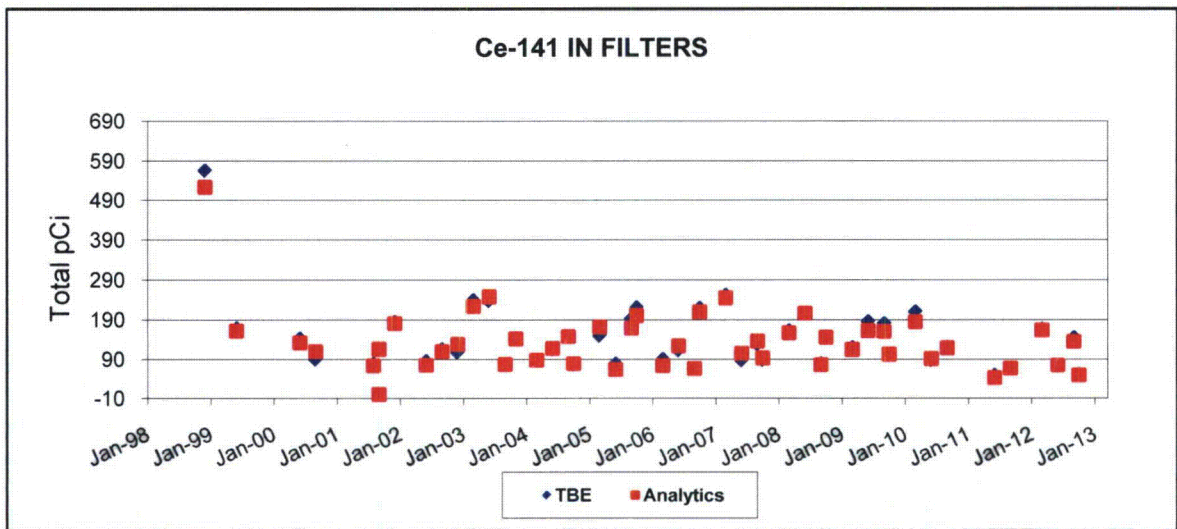
INTERLABORATORY COMPARISON PROGRAM GRAPHS



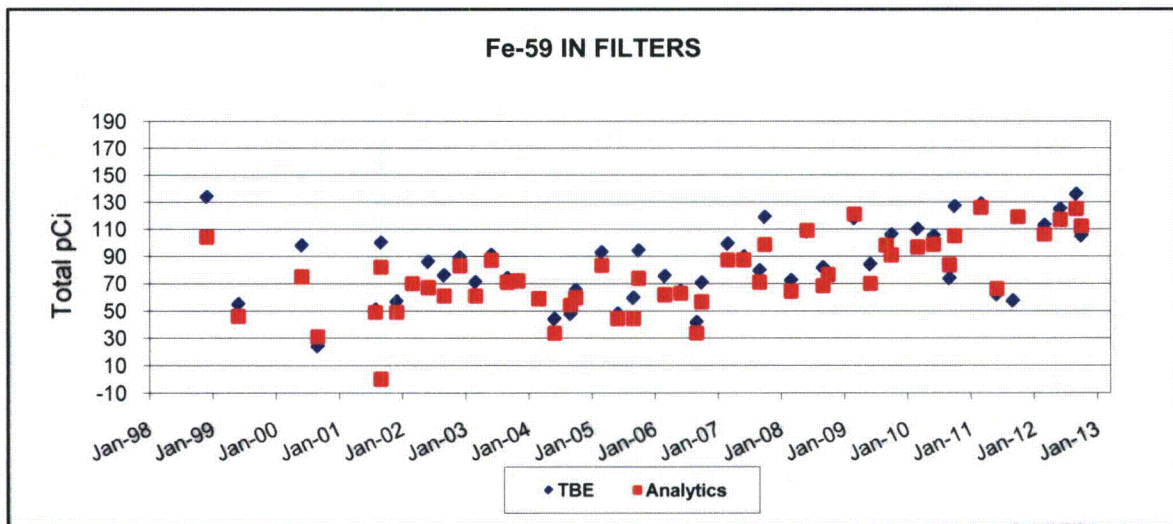
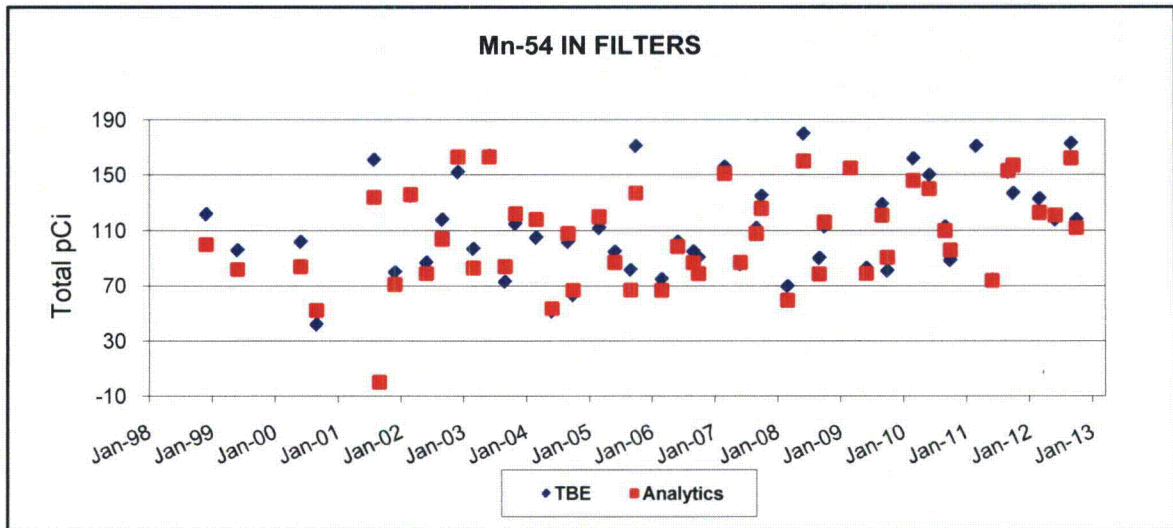
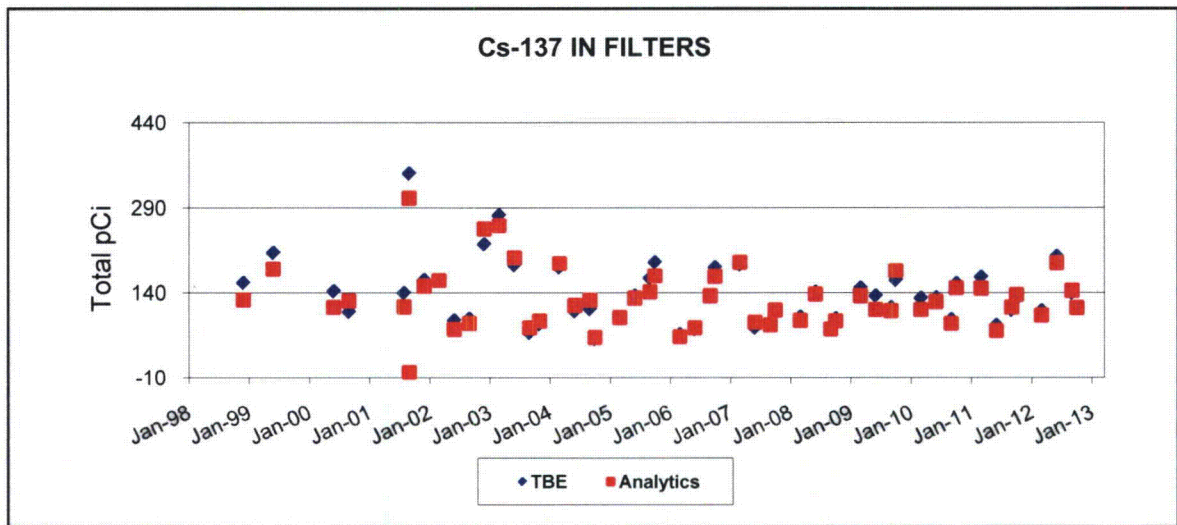
INTERLABORATORY COMPARISON PROGRAM GRAPHS



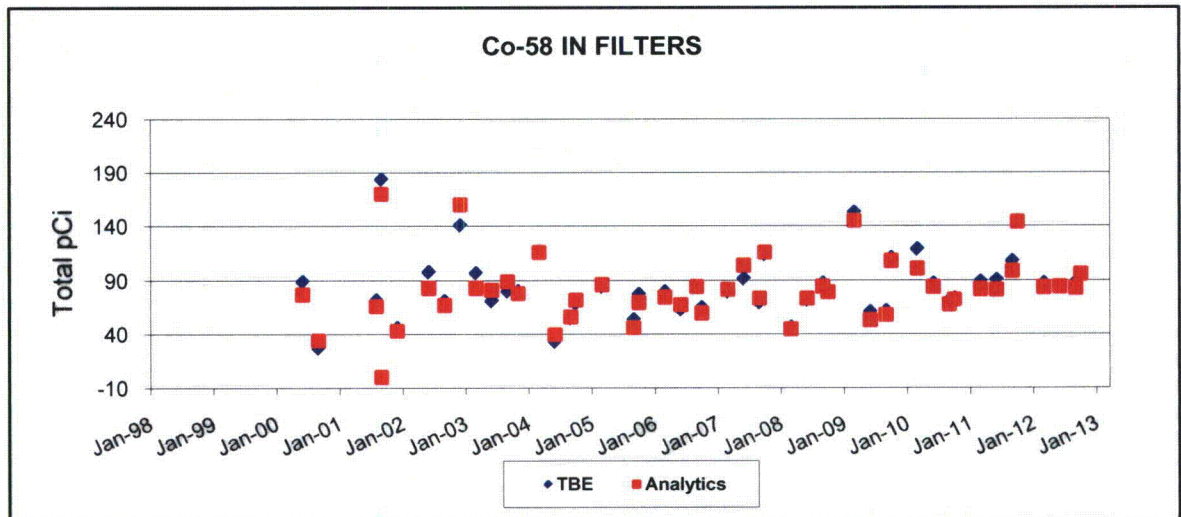
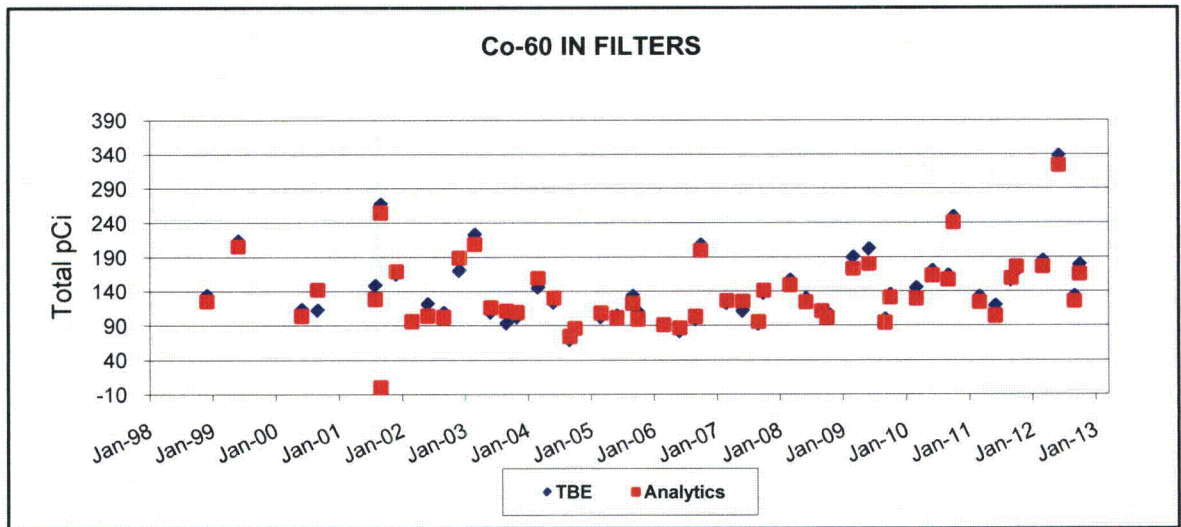
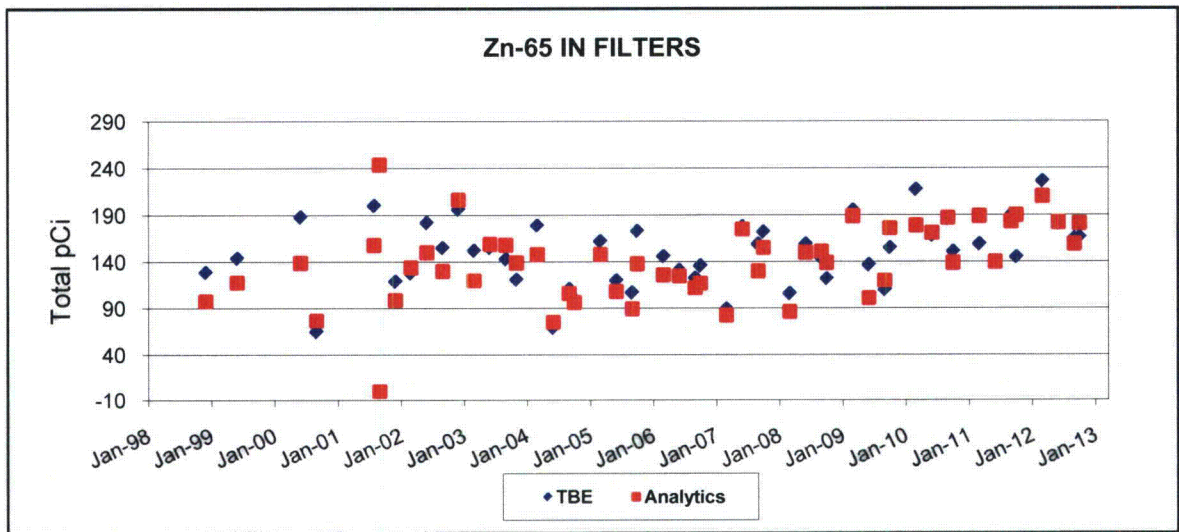
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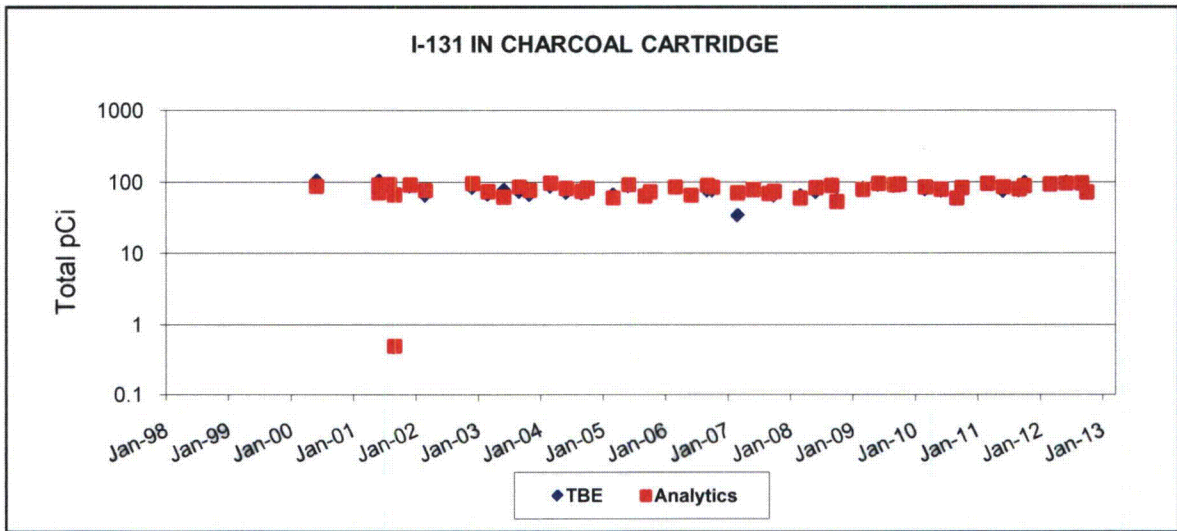
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INTERLABORATORY COMPARISON PROGRAM GRAPHS

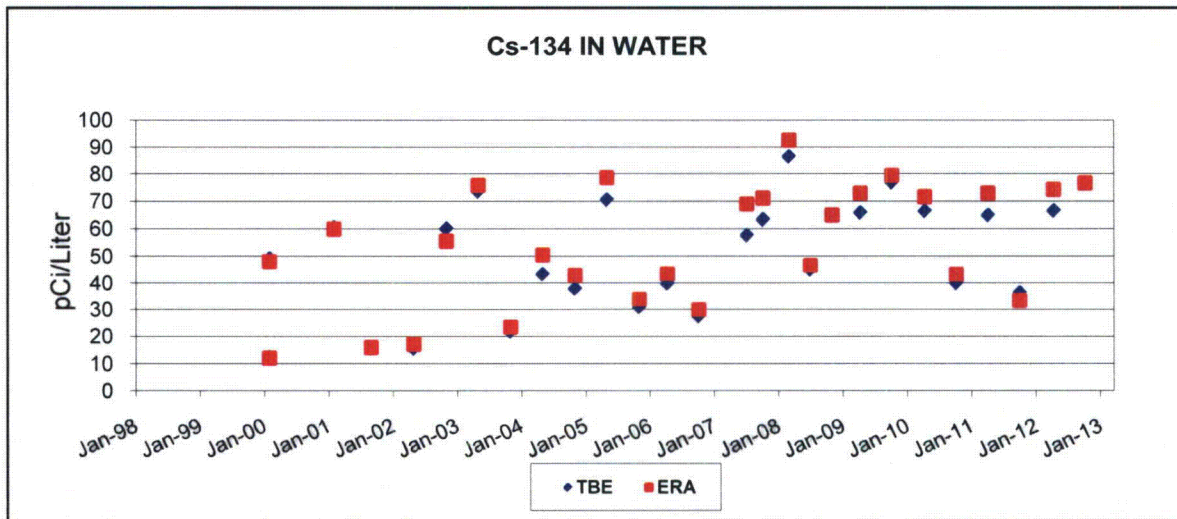
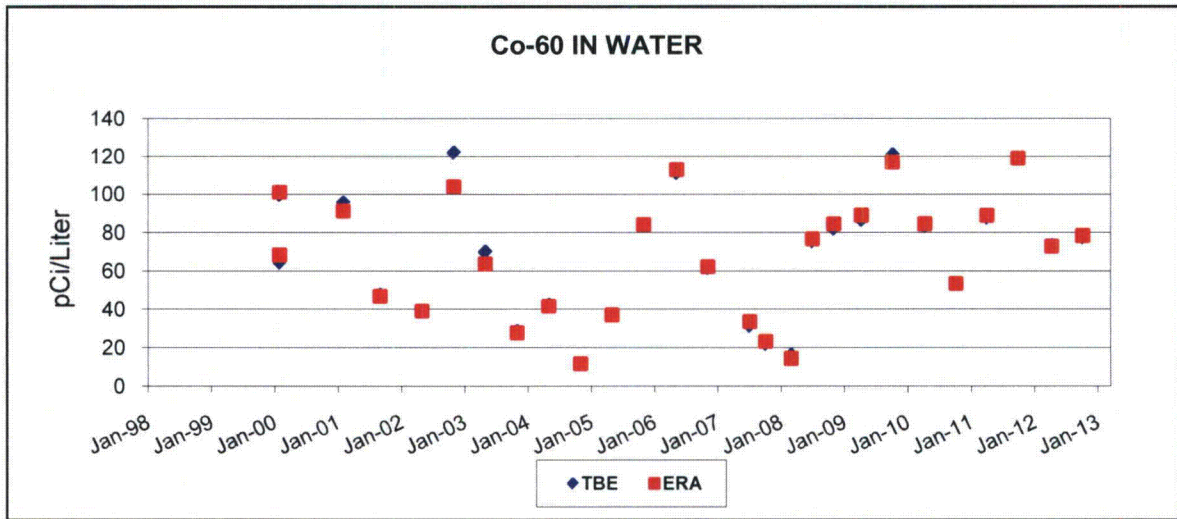
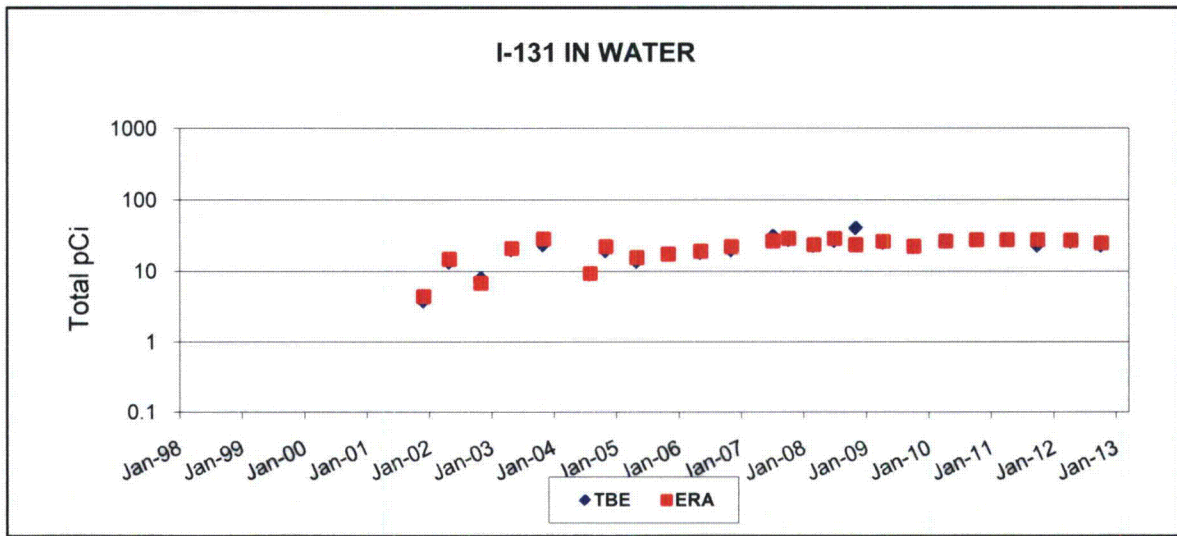


INTERLABORATORY COMPARISON PROGRAM GRAPHS



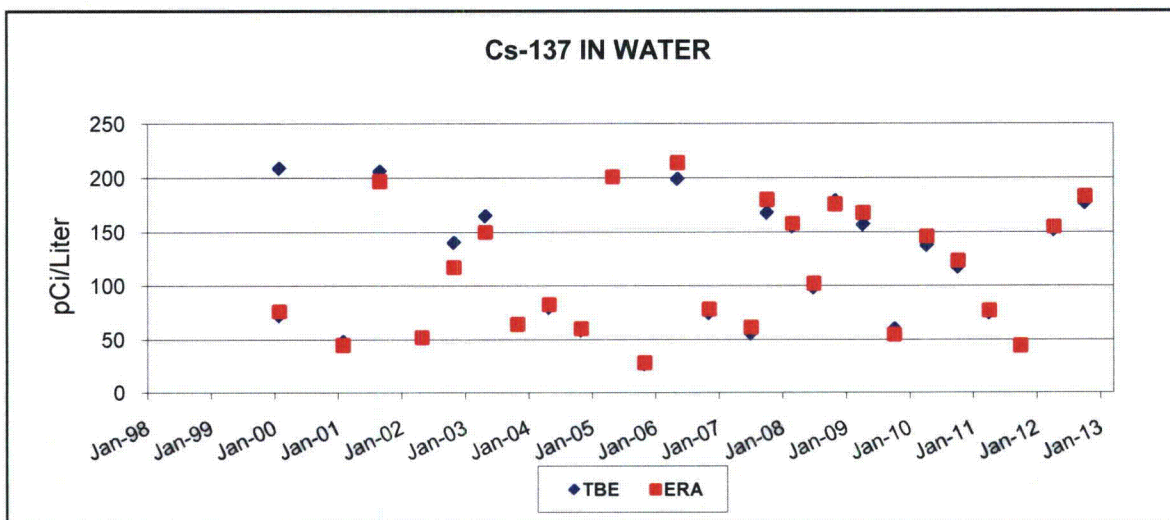
March 2007 - Incorrect side of the cartridge was counted

INTERLABORATORY COMPARISON PROGRAM GRAPHS

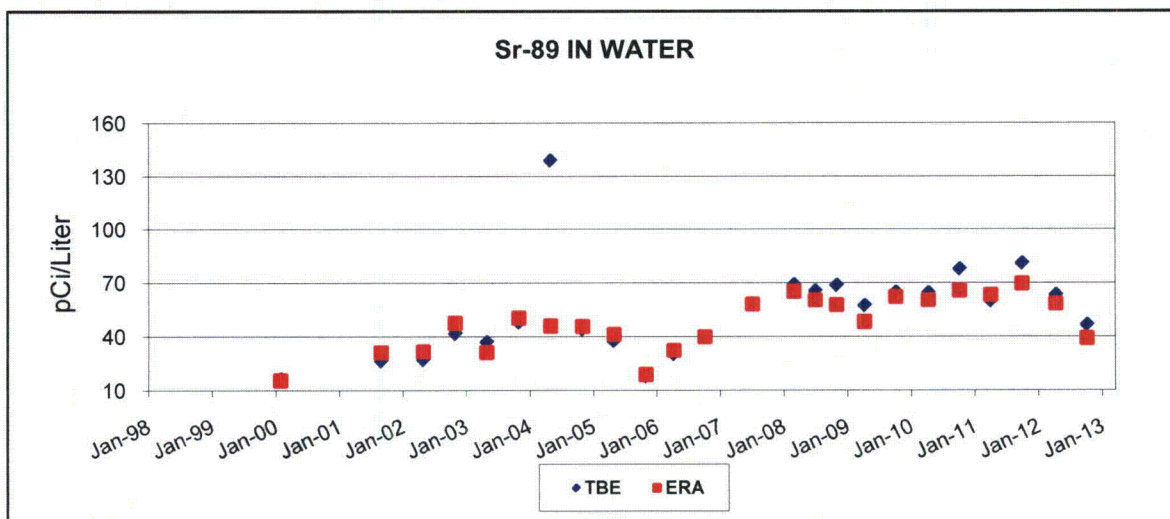




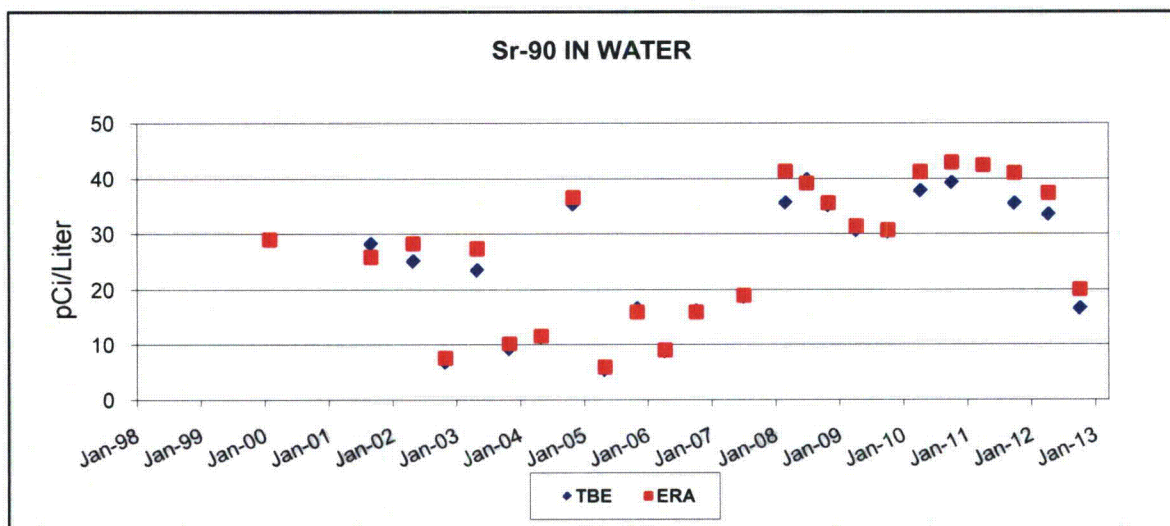
INTERLABORATORY COMPARISON PROGRAM GRAPHS



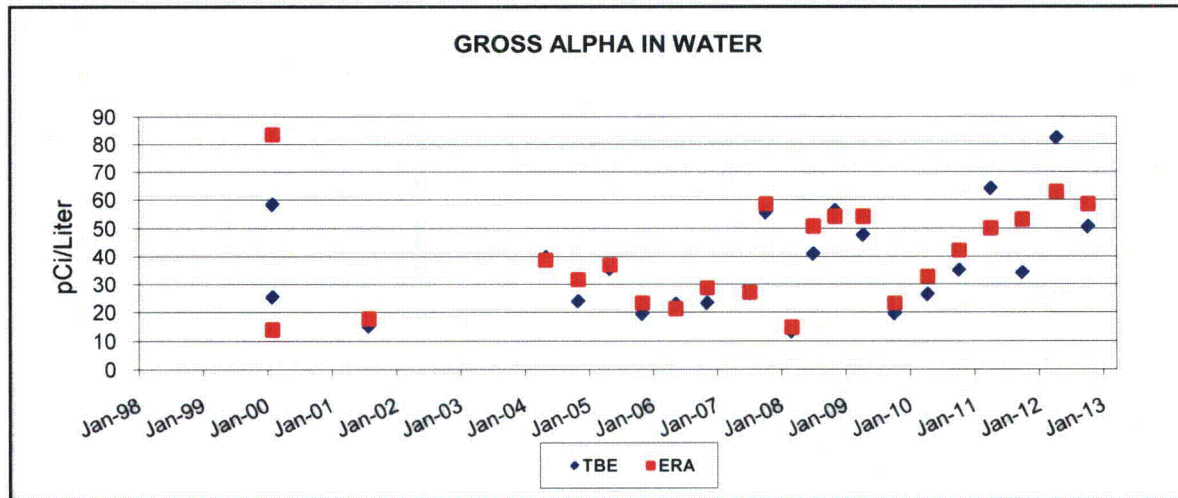
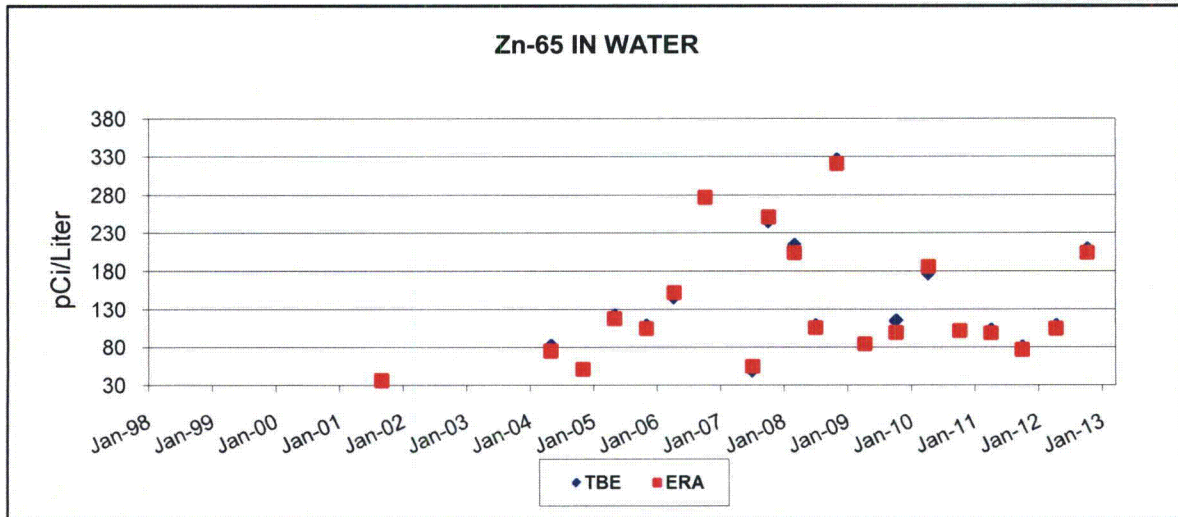
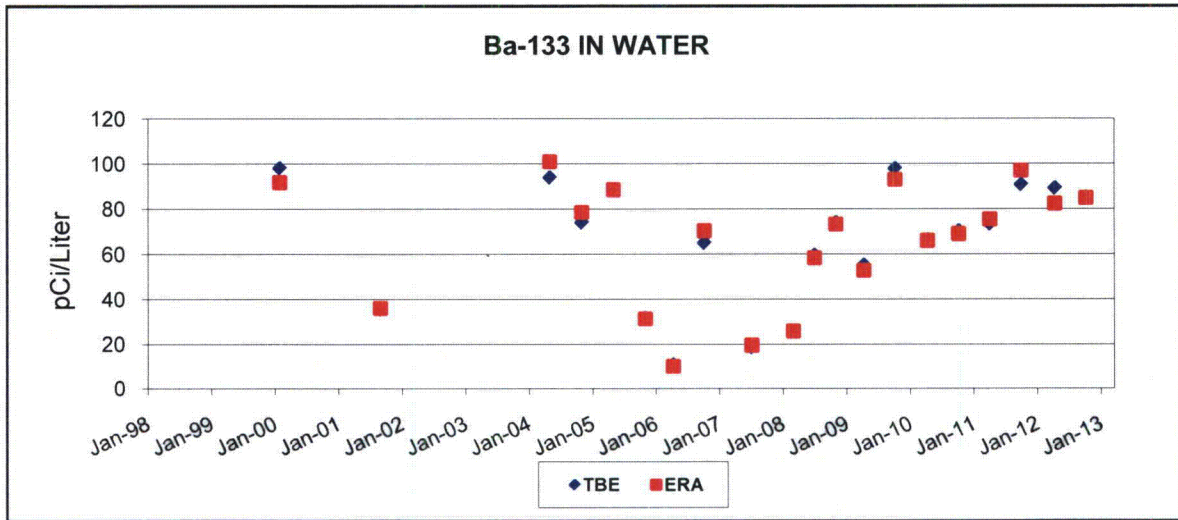
February 2001 - Analyst error or equipment failure.



May 2004 - Counted without absorber.

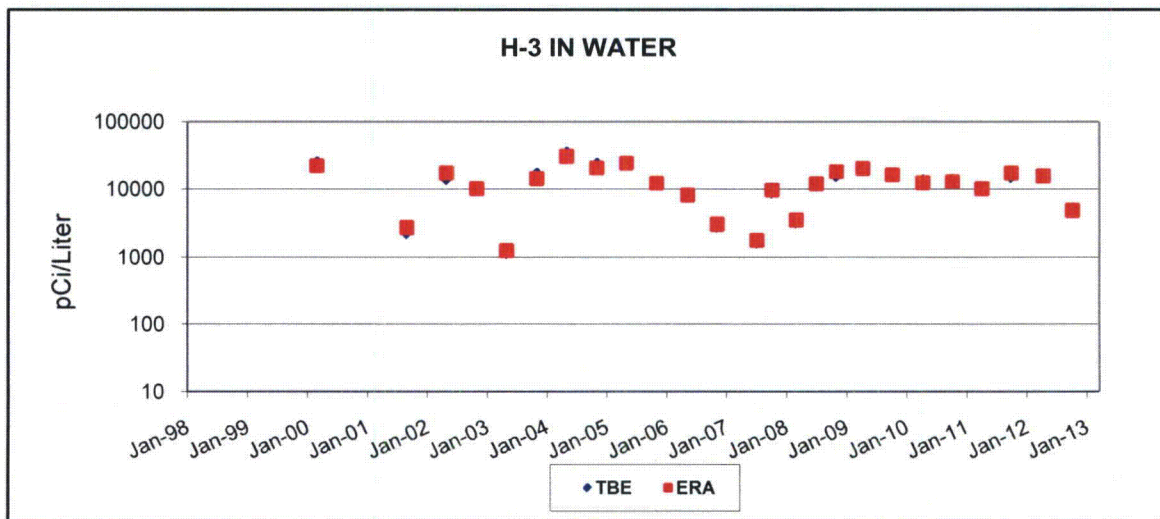
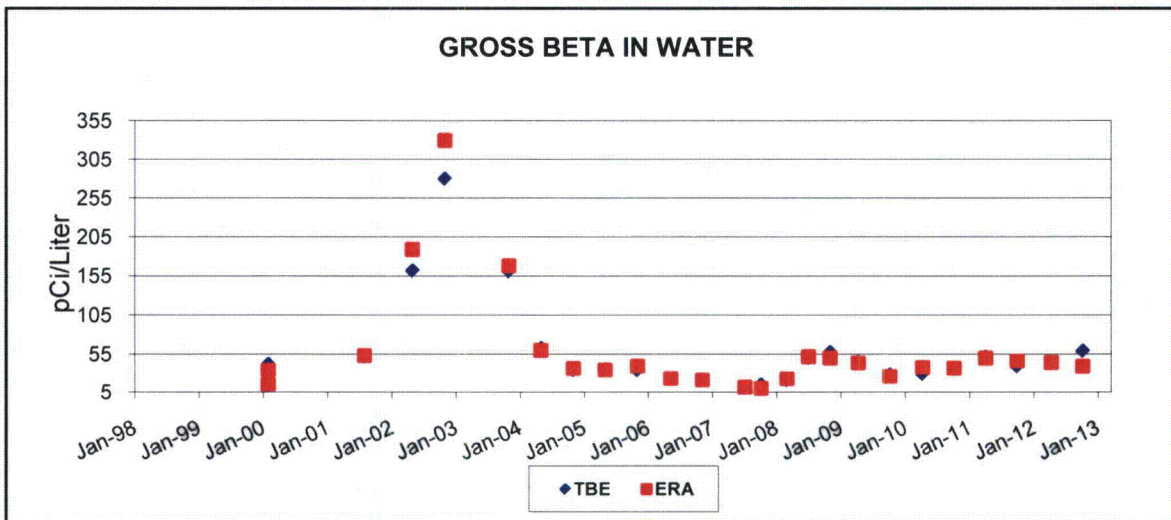


INTERLABORATORY COMPARISON PROGRAM GRAPHS



February 2000 - Analyst error or equipment failure.  
 April 2011 - Solids exceeded 100 mg limit.

INTERLABORATORY COMPARISON PROGRAM GRAPHS



**APPENDIX C**  
**SYNOPSIS OF ANALYTICAL PROCEDURES**

## SYNOPSIS OF ANALYTICAL PROCEDURES

Appendix C is a synopsis of the analytical procedures performed during 2010 on samples collected for the Nebraska Public Power Nuclear Plant's Radiological Environmental Monitoring Program. All analyses have been mutually agreed upon by Nebraska Public Power District and Teledyne Brown Engineering and include those recommended by the USNRC Branch Technical Position, Rev. 1, November 1979.

<u>ANALYSIS TITLE</u>	<u>PAGE</u>
Gross Beta Analysis of Air Particulate Samples.....	C-3
Air Particulates.....	C-3
Determination of Gross Beta Activity in Water Samples.....	C-4
Introduction.....	C-4
Detection Capability .....	C-4
Analysis of Samples for Tritium (Liquid Scintillation).....	C-5
Water.....	C-5
Analysis of Samples for Iodine-131 .....	C-6
Milk or Water.....	C-6
Gamma Spectrometry of Samples .....	C-7
Milk or Water.....	C-7
Dried Solids other than Soils and Sediments.....	C-7
Fish .....	C-7
Soils and Sediments .....	C-7
Charcoal Cartridges (Air Iodine) .....	C-7
Airborne Particulates .....	C-8
Addendum to Gamma Spectrometry Procedure .....	C-9
Environmental Dosimetry.....	C-10
Lower Limit of Detection Formulas .....	C-11

## GROSS BETA ANALYSIS OF AIR PARTICULATE SAMPLES

### **Air Particulates**

After a delay of five or more days, allowing for the radon-222 and radon-220 (thoron) daughter products to decay, the filters are counted in a gas-flow proportional counter.

Calculations of the results, the two sigma error and the lower limit of detection (LLD):

$$\text{RESULT (pCi/m}^3\text{)} = ((S/T) - (B/t))/(2.22 V E)$$

$$\text{TWO SIGMA ERROR (pCi/m}^3\text{)} = 2((S/T)^2 + (B/t^2))^{1/2}/(2.22 V E)$$

$$\text{LLD (pCi/m}^3\text{)} = 4.66(B^{1/2})/(2.22 V E t)$$

where:

- S = Gross counts of sample including blank
- B = Counts of blank
- E = Counting efficiency
- T = Number of minutes sample was counted
- t = Number of minutes blank was counted
- V = Sample aliquot size (cubic meters)

## **DETERMINATION OF GROSS BETA ACTIVITY IN WATER SAMPLES**

### **Introduction**

The procedures described in this section are used to measure the overall radioactivity of water samples without identifying the radioactive species present. No chemical separation techniques are involved.

One liter of the sample is evaporated on a hot plate. A smaller volume may be used if the sample has a significant salt content as measured gravimetrically. If requested by the customer, the sample is filtered through No. 54 filter paper before evaporation, removing particles greater than 30 microns in size.

After evaporating to a small volume in a beaker, the sample is rinsed into a 2-inch diameter stainless steel planchette, which is stamped with a concentric ring pattern to distribute residue evenly. Final evaporation to dryness takes place under heat lamps.

Residue mass is determined by weighing the planchette before and after mounting the sample. The planchette is counted for beta activity on an automatic proportional counter. Results are calculated using empirical self-absorption curves which allow for the change in effective counting efficiency caused by the residue mass.

### **Detection Capability**

Detection capability depends upon the sample volume actually represented on the planchette, the background and the efficiency of the counting instrument, and upon self-absorption of beta particles by the mounted sample. Because the radioactive species are not identified, no decay corrections are made and the reported activity refers to the counting time.

The minimum detectable level (MDL) for water samples is nominally 1.6 picoCuries per liter for gross beta at the 4.66 sigma level (1.0 pCi/L at the 2.83 sigma level), assuming that 1 liter of sample is used and that 0.5 gram of sample residue is mounted on the planchette. These figures are based upon a counting time of 50 minutes and upon representative values of counting efficiency and background of 0.2 and 1.2 cpm, respectively

The MDL becomes significantly lower as the mount weight decreases because of reduced self-absorption. At a zero mount weight, the 4.66 sigma MDL for gross beta is 0.9 picoCuries per liter. These values reflect a beta counting efficiency of 0.38.

**ANALYSIS OF SAMPLES FOR TRITIUM**  
(Liquid Scintillation)

**Water**

Ten milliliters of water are mixed with 10 ml of a liquid scintillation "cocktail" and then the mixture is counted in an automatic liquid scintillator.

Calculation of the results, the two sigma error and the lower limit detection (LLD) in pCi/L:

$$\text{RESULT} = (N-B)/(2.22 V E)$$

$$\text{TWO SIGMA ERROR} = 2((N + B)/\Delta t)^{1/2} / (2.22 V E)$$

$$\text{LLD} = 4.66(B/\Delta t)^{1/2} / (2.22 V E)$$

where:

N	=	the gross cpm of the sample
B	=	the background of the detector in cpm
2.22	=	conversion factor changing dpm to pCi
V	=	volume of the sample in ml
E	=	efficiency of the detector
$\Delta t$	=	counting time for the sample



## ANALYSIS OF SAMPLES FOR IODINE-131

### **Milk or Water**

Two or more liters of sample are first equilibrated with stable iodide carrier. A batch treatment with anion exchange resin is used to remove iodine from the sample. The iodine is then stripped from the resin with sodium hypochlorite solution, is reduced with hydroxylamine hydrochloride and is extracted into carbon tetrachloride as free iodine. It is then back-extracted as iodide into sodium bisulfite solution and is precipitated as palladium iodide. The precipitate is weighed for chemical yield and is mounted on a nylon planchette for low-level beta counting.

Calculations of results, two sigma error and the lower limit of detection (LLD) in pCi/L:

$$\begin{aligned} \text{RESULT} &= (N/\Delta t - B)/(2.22 E V Y DF) \\ \text{TWO SIGMA ERROR} &= 2((N/\Delta t + B)/\Delta t)^{1/2}/(2.22 E V Y DF) \\ \text{LLD} &= 4.66(B/\Delta t)^{1/2}/(2.22 E V Y DF) \end{aligned}$$

where:	N	=	total counts from sample (counts)
	$\Delta t$	=	counting time for sample (min)
	B	=	background rate of counter (cpm)
	2.22	=	dpm/pCi
	V	=	volume or weight of sample analyzed
	Y	=	chemical yield of the mount or sample counted
	DF	=	decay factor from the collection to the counting date
	E	=	efficiency of the counter for I-131, corrected for self absorption effects by the formula
	E	=	$E_s(\exp(-0.0061M))/(\exp(-0.0061M_s))$
	$E_s$	=	efficiency of the counter determined from an I-131 standard mount
	$M_s$	=	mass of PdI <sub>2</sub> on the standard mount, mg
	M	=	mass of PdI <sub>2</sub> on the sample mount, mg

## **GAMMA SPECTROMETRY OF SAMPLES**

### **Milk or Water**

A 1.0 liter Marinelli beaker is filled with a representative aliquot of the sample. The sample is then counted for approximately 1000 minutes with a shielded high purity germanium (HPGe) detector coupled to a VAX-based data acquisition system, which performs pulse height analysis.

### **Dried Solids other than Soils and Sediments**

A large quantity of the sample is dried at a low temperature, less than 100°C. As much as possible (up to the total sample) is loaded into a tared 1-liter Marinelli and weighed. The sample is then counted for approximately 1000 minutes with a shielded HPGe detector coupled to a VAX-based data acquisition system, which performs pulse height analysis.

### **Fish**

As much as possible (up to the total sample) of the edible portion of the sample is loaded into a tared Marinelli and weighed. The sample is then counted for approximately 1000 minutes with a shielded HPGe detector coupled to a VAX-based data acquisition system, which performs pulse height analysis.

### **Soils and Sediments**

Soils and sediments are dried at a low temperature, less than 100°C. The soil or sediment is loaded fully into a tared, standard 300 cc container and weighed. The sample is then counted for approximately six hours with a shielded HPGe detector coupled to a VAX-based data acquisition system, which performs pulse height and analysis.

### **Charcoal Cartridges (Air Iodine)**

Charcoal cartridges are counted up to five at a time, with one positioned on the face of an HPGe detector and up to four on the side of the HPGe detector. Each HPGe detector is calibrated for both positions. The detection limit for I-131 of each charcoal cartridge can be determined (assuming no positive I-131) uniquely from the volume of air, which passed through it. In the event I-131 is observed in the initial counting of a set, each charcoal cartridge is then counted separately, positioned on the face of the detector.

## Air Particulates

The thirteen airborne particulate filters for a quarterly composite for each field station are aligned one in front of another and then counted for at least six hours with a shielded HPGe detector coupled to a VAX-based data acquisition system which performs pulse height analysis.

A VAX software program defines peaks by certain changes in the slope of the spectrum. The program also compares the energy of each peak with a library of peaks for isotope identification and then performs the radioactivity calculation using the appropriate fractional gamma ray abundance, half-life, detector efficiency, and net counts in the peak region.

The calculation of results, two sigma error and the lower limit of detection (LLD) in pCi/volume or pCi/mass:

$$\text{RESULT} = (S-B)/(2.22 t E V F DF)$$

$$\text{TWO SIGMA ERROR} = 2(S+B)^{1/2}/(2.22 t E V F DF)$$

$$\text{LLD} = 4.66(B)^{1/2}/(2.22 t E V F DF)$$

where:	S	=	Area, in counts, of sample peak and background (region of spectrum of interest)
	B	=	Background area, in counts, under sample peak, determined by a linear interpolation of the representative backgrounds on either side of the peak
	t	=	length of time in minutes the sample was counted
	2.22	=	dpm/pCi
	E	=	detector efficiency for energy of interest and geometry of sample
	V	=	sample aliquot size (liters, cubic meters, kilograms, or grams)
	F	=	fractional gamma abundance (specific for each emitted gamma)
	DF	=	decay factor from the mid-collection date to the counting date

## **ADDENDUM TO GAMMA SPECTROMETRY PROCEDURE**

Ba-140 (half-life = ~12.8d) decays to La-140 (half-life ~40 hrs) and the daughter radionuclide, La-140 approaches ~ 90 % of the Ba-140 activity within ~ 6 days. The La-140 photon energy at 1596 keV is used to quantify the Ba-140 activity due to its high photon emission probability yield (96%) producing a higher count rate when present and therefore, a smaller associated counting error.

Zr-95 (half-life = ~65d) decays to Nb-95 (half-life = ~35d). The photon energy of Nb-95 (~765 keV) is used to quantify Zr-95 because of the high photon emission probability yield (~100%) yielding a higher count rate and an associated lower counting error. The daughter radionuclide, Nb-95 approaches the Zr-95 activity after a time period of ~65 days, an estimated time interval occurring between sample exposure, collection and shipping, and analysis.

## ENVIRONMENTAL DOSIMETRY

Environmental Dosimetry services are provided by Mirion Technologies. Mirion Technologies uses a thermoluminescent dosimeter (TLD) manufactured by Panasonic, Inc. Panasonic identifies it as an UD-814A1 TLD. The TLD has four elements, numbered 1-4. Elements and their filtration are composed of:

ELEMENT	MATERIAL	FILTRATION
1	${}^6\text{Li}_2\text{{}^{10}\text{B}_4\text{O}_7\text{-Cu}}$	Thin plastic
2	$\text{CaSO}_4\text{-Tm}$	Lead
3	$\text{CaSO}_4\text{-Tm}$	Lead
4	$\text{CaSO}_4\text{-Tm}$	Lead

This material has a high light output, negligible thermally induced signal loss (fading) and negligible self-dosing. The energy response curve (as well as other features) satisfies NRC Regulatory Guide 4.13. Transit doses are accounted for by use of separate TLDs.

Prior to being sent to Cooper Nuclear Station, the Mirion badges are exposed to Cs-137, to know a dose and read in the Panasonic UD-710 reader, with reference badges to establish an element response level for each badge. Badges are then re-annealed for assignment and distribution to Cooper Nuclear Station.

Following the field exposure the badges are returned to Mirion Technologies for processing in a Panasonic UD-710 reader. Each element is heated and the measured light emission is recorded. The transit controls are read in the same manner. Total exposure for each badge is the average of Elements 2, 3, and 4.

Transit Controls are calculated using the following equation:

$$\text{TRANSDOSE} = \frac{(E_{3_1} + E_{4_1} + E_{3_2} + E_{4_2})}{4} - \frac{(E_{3_{\text{trans}}} + E_{4_{\text{trans}}})}{2}$$

## **LOWER LIMIT of DETECTION FORMULAS**

The LLD formulas in Appendix C are consistent with the LLD discussion in the ODAM. The term  $s_b$  in the ODAM equals  $\sqrt{B/t}$  by Poisson statistics, where  $B$  = blank counts and  $t$  = blank counting intervals. The decay factor term  $e^{-\lambda\Delta t}$  in the ODAM is the same as the DF terms in Appendix C, but does not appear in certain analyses such as gross beta because decay does not apply. In the tritium analysis, decay is not considered because of the relatively long half-life.

Efficiencies and volumes are consistent between the two documents. Chemical yields appear in Appendix C where applicable but do not apply to other analyses such as tritium and gross beta.

**APPENDIX D**  
**DETECTION LIMITS AND REPORTING LEVELS**

NEBRASKA PUBLIC POWER - COOPER NUCLEAR STATION  
DETECTION LIMITS AND REPORTING LEVELS

Isotope	ODAM LLD	NRC Rept. Level
<b><u>Water - pCi/liter</u></b>		
Gross beta	4	N/A
H-3	2000	20000 <sup>(a)</sup> /30000 <sup>(b)</sup>
Mn-54	15	1000
Fe-59	30	400
Co-58	15	1000
Co-60	15	300
Zn-65	30	300
Zr-95	30	400
Nb-95	15	400
I-131	1 <sup>(c)</sup>	2
Cs-134	15	30
Cs-137	18	50
Ba-140	60	200
La-140	15	200
<b><u>Air Filter - pCi/m<sup>3</sup></u></b>		
Gross Beta	0.01	N/A
I-131	0.07	0.9
Cs-134	0.05	10
Cs-137	0.06	20
<b><u>Fish - pCi/kg-wet</u></b>		
Mn-54	130	30000
Fe-59	260	10000
Co-58	130	30000
Co-60	130	10000
Zn-65	260	20000
Cs-134	130	1000
Cs-137	150	2000
<b><u>Milk - pCi/liter</u></b>		
I-131	1	3
Cs-134	15	60
Cs-137	18	70
Ba-140	60	300
La-140	15	300

(a) For drinking water samples

(b) For samples of water not used as a source of drinking water

(c) LLD for drinking water



NEBRASKA PUBLIC POWER - COOPER NUCLEAR STATION  
DETECTION LIMITS AND REPORTING LEVELS

<u>Isotope</u>	<u>ODAM LLD</u>	<u>NRC Rept. Level</u>
<b><u>Vegetation - pCi/kg-wet</u></b>		
I-131	60	100
Cs-134	60	1000
Cs-137	80	2000
<b><u>Sediment - pCi/kg-dry</u></b>		
Cs-134	150	N/A
Cs-137	180	N/A

**APPENDIX E**  
**REMP SAMPLING AND ANALYTICAL EXCEPTIONS**

## **EXCEPTIONS**

Appendix E contains the exceptions to the 2012 REMP Program. Where possible, causes of the deviation have been corrected to prevent recurrence.

Any deviations from the sampling schedule are documented on the data tables. Data Tables are in Section VII.

## **REMP SAMPLING AND ANALYTICAL EXCEPTIONS, 2012**

Air Station 3 sample was unavailable due to complications from the flooding of the Missouri River. Week end 01/03/12 through 09/25/12

Air Station 4 sample was unavailable due to complications from the flooding of the Missouri River. Week end 01/03/12 through 09/25/12

Air Station 4 sample was unavailable due to a power failure. Week end 01/02/13

Air Station 5 sample was unavailable due to complications from the flooding of the Missouri River. Week end 01/03/12 through 09/25/12

Air Station 6 sample was unavailable due to complications from the flooding of the Missouri River. Week end 01/03/12 through 09/25/12

Broadleaf vegetation Station 96 was not available

**APPENDIX F**

**SUMMARY OF DOSES TO A MEMBER OF THE PUBLIC OFFSITE**

## **LIQUID EFFLUENT DOSE CALCULATIONS**

Doses to the maximum individual and 0 to 50 - mile population resulting from the release of radioactive material in liquid effluents from Cooper Nuclear Station were calculated using the LADTAP II computer program. The LADTAP II program implements the radiological dose models of Regulatory Guide 1.109 for determining the radiation exposure to man from three principal exposure pathways in the aquatic environment -- potable water, aquatic foods, and recreational water use. Doses to both the maximum individual and 0 to 50 mile population are calculated as a function of age group and pathway for significant body organs, and are presented in Tables 1 - 6.

Assumptions and data sources used for input to the LADTAP II code are described in a separate section of this appendix (see page F-67).

**\*No Liquid Releases 2012**

**TABLE 1. Doses to Maximum Individual at the Site Boundary, Resulting From Exposure to Radioactivity Discharged in Liquid Effluents, January-June 2012 Cooper Nuclear Station**

Period and Pathway	Dose to Individual, mrem							
	Skin	Bone	Liver	Total Body	Thyroid	Kidney	Lung	GI-LLI
<u>1st Quarter</u>								
Drinking Water		0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Shoreline	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
<b>Totals</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>
<u>2nd Quarter</u>								
Eating Fish		0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Drinking Water		0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Shoreline	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
<b>Totals</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>
<b>Totals for 1st &amp; 2nd Quarters</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>

Calculated doses are based on the following periods of exposures: Fishing: April - November;  
 Drinking water and shoreline: January - December

**TABLE 2. Doses to Maximum Individual at the Site Boundary, Resulting From Exposure to Radioactivity Discharged in Liquid Effluents, July-December 2012, Cooper Nuclear Station**

Period and Pathway	Dose to Individual, mrem							
	Skin	Bone	Liver	Total Body	Thyroid	Kidney	Lung	GI-LLI
<u>3rd Quarter</u>								
Eating Fish		0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Drinking Water		0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Shoreline	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
<b>Totals</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>
<u>4th Quarter</u>								
Eating Fish		0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Drinking Water		0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Shoreline	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
<b>Totals</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>
<b>Totals for 3rd &amp; 4th Quarters</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>

Calculated doses are based on the following periods of exposures: Fishing: April - November; Drinking water and shoreline: January - December



**TABLE 3. Summary of Doses to Maximum Individual at the Site Boundary, Resulting from Exposure to Radioactivity Discharged in Liquid Effluents, January-December 2012, Cooper Nuclear Station**

Period and Pathway	Dose to Individual, mrem							
	Skin	Bone	Liver	Total Body	Thyroid	Kidney	Lung	GI-LLI
<u>1st Quarter</u>	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
<u>2nd Quarter</u>	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
<u>3rd Quarter</u>	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
<u>4th Quarter</u>	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
<b>Totals for 2012</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>

**TABLE 4. Doses to Population Within a 50-Mile Radius, Resulting From Exposure to Radioactivity Discharged in Liquid Effluents, January-June 2012, Cooper Nuclear Station**

Period and Pathway	Dose to Population, manrem							
	Skin	Bone	Liver	Total Body	Thyroid	Kidney	Lung	GI-LLI
<u>1st Quarter</u>								
Drinking Water		0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Shoreline	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
<b>Totals</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>
<u>2nd Quarter</u>								
Eating Fish		0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Drinking Water		0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Shoreline	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Swimming	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Boating	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
<b>Totals</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>
<b>Totals for 1st &amp; 2nd Quarters</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>

Calculated doses are based on the following periods of exposures: Fishing and Boating: April - November; Drinking water and shoreline: January - December; Swimming: June - September. Exposure from drinking water is calculated for the city of St. Joseph, Missouri, nearest public water intake from the Missouri River, 84 miles downstream.

**TABLE 5. Doses to Population Within a 50-Mile Radius, Resulting From Exposure to Radioactivity Discharged in Liquid Effluents, July-December 2012, Cooper Nuclear Station**

Period and Pathway	Dose to Population, manrem							
	Skin	Bone	Liver	Total Body	Thyroid	Kidney	Lung	GI-LLI
<u>3rd Quarter</u>								
Eating Fish		0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Drinking Water		0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Shoreline	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Swimming	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Boating	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
<b>Totals</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>
<u>4<sup>th</sup> Quarter</u>								
Eating Fish		0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Drinking Water		0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Shoreline	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
Boating	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
<b>Totals</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>
<b>Totals for 3rd &amp; 4th Quarters</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>

Calculated doses are based on the following periods of exposures: Fishing and Boating: April - November; Drinking water and shoreline: January - December; Swimming: June - September. Exposure from drinking water is calculated for the city of St. Joseph, Missouri, nearest public water intake from the Missouri River, 84 miles downstream.

**TABLE 6. Summary of Doses to Population Within a 50-Mile Radius, Resulting from Exposure to Radioactivity Discharged in Liquid Effluents, January-December 2012 Cooper Nuclear Station**

Period and Pathway	Dose to Population, manrem							
	Skin	Bone	Liver	Total Body	Thyroid	Kidney	Lung	GI-LLI
<u>1st Quarter</u>	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
<u>2nd Quarter</u>	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
<u>3rd Quarter</u>	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
<u>4th Quarter</u>	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00
<b>Totals for 2012</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>	<b>0.00 E+00</b>

## **GASEOUS EFFLUENT DOSE CALCULATIONS (EXCEPT CARBON-14)**

Doses to the maximum individual and 0 to 50 mile population resulting from the release of radioactive material in gaseous effluents from the Cooper Nuclear Station were calculated using the GASPARG computer code. Four sites were selected for individual dose calculations: the site boundary, the nearest residence, the nearest garden and the nearest cow. GASPARG implements the radiological dose models of Regulatory Guide 1.109 for determining the radiation exposure to man from four principal atmospheric exposure pathways: plume, ground, inhalation, and ingestion. Doses to the maximum individual and the population are calculated as a function of age group and pathway for significant body organs.

Tables 1 through 7 present maximum individual doses. Population doses are given in Tables 8 through 14.

Assumptions and data used for input to the GASPARG code are described in a separate section of this appendix (see page F-67).

TABLE 1. DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-MARCH 2012

SPECIAL LOCATION NO. 1 A Site Boundary  
 AT .69 MILES NNW

ANNUAL BETA AIR DOSE = 1.84E-06 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 3.40E-06 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	2.27E-06	2.27E-06	2.27E-06	2.27E-06	2.27E-06	2.27E-06	2.29E-06	4.26E-06
GROUND	2.09E-03	2.09E-03	2.09E-03	2.09E-03	2.09E-03	2.09E-03	2.09E-03	2.46E-03
VEGET								
ADULT	4.49E-05	2.70E-04	1.55E-05	3.71E-05	1.10E-05	7.63E-04	2.12E-06	0.00E+00
TEEN	6.14E-05	2.88E-04	2.53E-05	5.81E-05	1.72E-05	1.03E-03	3.97E-06	0.00E+00
CHILD	1.10E-04	1.88E-04	6.03E-05	9.50E-05	2.78E-05	1.97E-03	6.04E-06	0.00E+00
MEAT								
ADULT	9.39E-06	7.12E-05	1.17E-06	5.41E-06	6.37E-07	2.05E-05	1.73E-07	0.00E+00
TEEN	7.07E-06	3.83E-05	9.69E-07	4.25E-06	5.16E-07	1.49E-05	1.64E-07	0.00E+00
CHILD	1.06E-05	1.93E-05	1.78E-06	5.22E-06	6.54E-07	2.24E-05	1.92E-07	0.00E+00
COW MILK								
ADULT	1.13E-05	1.63E-05	1.07E-05	1.56E-05	7.45E-06	5.73E-04	1.46E-06	0.00E+00
TEEN	1.28E-05	1.93E-05	1.95E-05	2.75E-05	1.32E-05	9.06E-04	3.03E-06	0.00E+00
CHILD	1.54E-05	1.29E-05	4.69E-05	4.74E-05	2.20E-05	1.79E-03	4.65E-06	0.00E+00
INFANT	2.18E-05	1.14E-05	7.76E-05	9.54E-05	3.65E-05	4.36E-03	8.42E-06	0.00E+00
GOATMILK								
ADULT	2.69E-05	3.22E-06	3.00E-05	4.12E-05	1.69E-05	6.87E-04	4.39E-06	0.00E+00
TEEN	2.63E-05	3.98E-06	5.43E-05	7.26E-05	2.99E-05	1.09E-03	9.08E-06	0.00E+00
CHILD	2.21E-05	2.84E-06	1.31E-04	1.26E-04	4.96E-05	2.15E-03	1.40E-05	0.00E+00
INFANT	2.48E-05	2.63E-06	2.12E-04	2.49E-04	8.12E-05	5.23E-03	2.53E-05	0.00E+00
INHAL								
ADULT	7.50E-07	7.14E-06	4.62E-07	9.88E-07	6.22E-07	7.09E-05	1.47E-04	0.00E+00
TEEN	8.47E-07	6.51E-06	6.49E-07	1.33E-06	8.55E-07	8.91E-05	2.15E-04	0.00E+00
CHILD	8.24E-07	2.45E-06	8.79E-07	1.25E-06	7.98E-07	1.03E-04	1.74E-04	0.00E+00
INFANT	4.53E-07	8.28E-07	5.97E-07	9.46E-07	5.15E-07	9.47E-05	1.11E-04	0.00E+00

TABLE 1. DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-MARCH 2012 (Continued)

SPECIAL LOCATION NO. 2 A Site Boundary  
 AT .67 MILES N

ANNUAL BETA AIR DOSE = 3.31E-06 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 6.11E-06 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	4.09E-06	4.09E-06	4.09E-06	4.09E-06	4.09E-06	4.09E-06	4.12E-06	7.66E-06
GROUND	3.48E-03	3.48E-03	3.48E-03	3.48E-03	3.48E-03	3.48E-03	3.48E-03	4.09E-03
VEGET								
ADULT	7.46E-05	4.48E-04	2.59E-05	6.16E-05	1.83E-05	1.28E-03	3.52E-06	0.00E+00
TEEN	1.02E-04	4.77E-04	4.23E-05	9.64E-05	2.86E-05	1.73E-03	6.59E-06	0.00E+00
CHILD	1.82E-04	3.12E-04	1.01E-04	1.58E-04	4.64E-05	3.31E-03	1.00E-05	0.00E+00
MEAT								
ADULT	1.56E-05	1.18E-04	1.94E-06	8.98E-06	1.06E-06	3.45E-05	2.87E-07	0.00E+00
TEEN	1.17E-05	6.36E-05	1.61E-06	7.05E-06	8.59E-07	2.50E-05	2.72E-07	0.00E+00
CHILD	1.75E-05	3.21E-05	2.96E-06	8.67E-06	1.09E-06	3.77E-05	3.19E-07	0.00E+00
COW MILK								
ADULT	1.88E-05	2.71E-05	1.78E-05	2.59E-05	1.24E-05	9.62E-04	2.43E-06	0.00E+00
TEEN	2.13E-05	3.21E-05	3.24E-05	4.57E-05	2.21E-05	1.52E-03	5.02E-06	0.00E+00
CHILD	2.56E-05	2.14E-05	7.80E-05	7.88E-05	3.66E-05	3.01E-03	7.72E-06	0.00E+00
INFANT	3.64E-05	1.89E-05	1.29E-04	1.59E-04	6.09E-05	7.32E-03	1.40E-05	0.00E+00
GOATMILK								
ADULT	4.47E-05	5.36E-06	4.98E-05	6.84E-05	2.81E-05	1.15E-03	7.29E-06	0.00E+00
TEEN	4.37E-05	6.62E-06	9.03E-05	1.21E-04	4.97E-05	1.83E-03	1.51E-05	0.00E+00
CHILD	3.67E-05	4.73E-06	2.18E-04	2.09E-04	8.26E-05	3.62E-03	2.32E-05	0.00E+00
INFANT	4.12E-05	4.39E-06	3.53E-04	4.14E-04	1.35E-04	8.79E-03	4.19E-05	0.00E+00
INHAL								
ADULT	1.06E-06	1.01E-05	6.52E-07	1.40E-06	8.74E-07	9.93E-05	2.08E-04	0.00E+00
TEEN	1.20E-06	9.22E-06	9.15E-07	1.88E-06	1.20E-06	1.25E-04	3.04E-04	0.00E+00
CHILD	1.16E-06	3.48E-06	1.24E-06	1.77E-06	1.12E-06	1.45E-04	2.47E-04	0.00E+00
INFANT	6.39E-07	1.18E-06	8.41E-07	1.33E-06	7.23E-07	1.33E-04	1.57E-04	0.00E+00

TABLE 1. DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-MARCH 2012 (Continued)

SPECIAL LOCATION NO. 3 A Nearest Resident  
 AT .90 MILES NW

ANNUAL BETA AIR DOSE = 6.44E-06 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 1.19E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	7.95E-06	7.95E-06	7.95E-06	7.95E-06	7.95E-06	7.95E-06	8.01E-06	1.49E-05
GROUND	8.57E-04	8.57E-04	8.57E-04	8.57E-04	8.57E-04	8.57E-04	8.57E-04	1.01E-03
VEGET								
ADULT	1.84E-05	1.11E-04	6.58E-06	1.53E-05	4.62E-06	3.35E-04	8.69E-07	0.00E+00
TEEN	2.52E-05	1.18E-04	1.08E-05	2.39E-05	7.22E-06	4.51E-04	1.63E-06	0.00E+00
CHILD	4.50E-05	7.69E-05	2.56E-05	3.91E-05	1.17E-05	8.65E-04	2.48E-06	0.00E+00
MEAT								
ADULT	3.84E-06	2.91E-05	4.81E-07	2.22E-06	2.64E-07	9.00E-06	7.10E-08	0.00E+00
TEEN	2.90E-06	1.57E-05	4.00E-07	1.74E-06	2.14E-07	6.52E-06	6.72E-08	0.00E+00
CHILD	4.33E-06	7.92E-06	7.36E-07	2.14E-06	2.71E-07	9.85E-06	7.89E-08	0.00E+00
COW MILK								
ADULT	4.68E-06	6.71E-06	4.45E-06	6.45E-06	3.15E-06	2.51E-04	6.01E-07	0.00E+00
TEEN	5.30E-06	7.93E-06	8.06E-06	1.14E-05	5.58E-06	3.98E-04	1.24E-06	0.00E+00
CHILD	6.39E-06	5.29E-06	1.94E-05	1.96E-05	9.27E-06	7.88E-04	1.91E-06	0.00E+00
INFANT	9.12E-06	4.67E-06	3.22E-05	3.95E-05	1.54E-05	1.91E-03	3.45E-06	0.00E+00
GOATMILK								
ADULT	1.11E-05	1.34E-06	1.24E-05	1.69E-05	7.02E-06	3.02E-04	1.80E-06	0.00E+00
TEEN	1.08E-05	1.66E-06	2.24E-05	2.99E-05	1.24E-05	4.78E-04	3.72E-06	0.00E+00
CHILD	9.15E-06	1.19E-06	5.40E-05	5.18E-05	2.07E-05	9.45E-04	5.72E-06	0.00E+00
INFANT	1.04E-05	1.10E-06	8.76E-05	1.03E-04	3.38E-05	2.30E-03	1.04E-05	0.00E+00
INHAL								
ADULT	1.95E-07	1.85E-06	1.22E-07	2.59E-07	1.67E-07	1.91E-05	3.80E-05	0.00E+00
TEEN	2.21E-07	1.69E-06	1.71E-07	3.49E-07	2.29E-07	2.40E-05	5.55E-05	0.00E+00
CHILD	2.15E-07	7.10E-07	2.32E-07	3.28E-07	2.14E-07	2.79E-05	4.50E-05	0.00E+00
INFANT	1.19E-07	2.82E-07	1.58E-07	2.49E-07	1.38E-07	2.56E-05	2.87E-05	0.00E+00



TABLE 1. DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-MARCH 2012 (Continued)

SPECIAL LOCATION NO. 4 A Nearest Cow  
AT 3.50 MILES NNW

ANNUAL BETA AIR DOSE = 1.02E-06 MILLRADS  
ANNUAL GAMMA AIR DOSE = 1.52E-06 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.02E-06	1.02E-06	1.02E-06	1.02E-06	1.02E-06	1.02E-06	1.02E-06	2.08E-06
GROUND	4.19E-05	4.19E-05	4.19E-05	4.19E-05	4.19E-05	4.19E-05	4.19E-05	4.93E-05
VEGET								
ADULT	9.06E-07	5.42E-06	3.38E-07	7.52E-07	2.34E-07	1.78E-05	4.26E-08	0.00E+00
TEEN	1.24E-06	5.76E-06	5.52E-07	1.18E-06	3.66E-07	2.40E-05	7.99E-08	0.00E+00
CHILD	2.21E-06	3.77E-06	1.32E-06	1.93E-06	5.92E-07	4.60E-05	1.22E-07	0.00E+00
MEAT								
ADULT	1.88E-07	1.43E-06	2.38E-08	1.09E-07	1.32E-08	4.79E-07	3.48E-09	0.00E+00
TEEN	1.42E-07	7.67E-07	1.98E-08	8.54E-08	1.07E-08	3.47E-07	3.30E-09	0.00E+00
CHILD	2.12E-07	3.87E-07	3.64E-08	1.05E-07	1.35E-08	5.24E-07	3.87E-09	0.00E+00
COW MILK								
ADULT	2.31E-07	3.29E-07	2.21E-07	3.20E-07	1.60E-07	1.34E-05	2.95E-08	0.00E+00
TEEN	2.63E-07	3.89E-07	4.01E-07	5.63E-07	2.84E-07	2.12E-05	6.09E-08	0.00E+00
CHILD	3.19E-07	2.60E-07	9.66E-07	9.72E-07	4.71E-07	4.19E-05	9.36E-08	0.00E+00
INFANT	4.58E-07	2.30E-07	1.61E-06	1.96E-06	7.86E-07	1.02E-04	1.69E-07	0.00E+00
GOATMILK								
ADULT	5.46E-07	6.70E-08	6.10E-07	8.35E-07	3.51E-07	1.61E-05	8.84E-08	0.00E+00
TEEN	5.36E-07	8.30E-08	1.11E-06	1.47E-06	6.22E-07	2.54E-05	1.83E-07	0.00E+00
CHILD	4.56E-07	5.95E-08	2.67E-06	2.55E-06	1.03E-06	5.03E-05	2.81E-07	0.00E+00
INFANT	5.21E-07	5.53E-08	4.33E-06	5.06E-06	1.70E-06	1.22E-04	5.08E-07	0.00E+00
INHAL								
ADULT	2.35E-08	2.17E-07	1.52E-08	3.16E-08	2.18E-08	2.57E-06	4.45E-06	0.00E+00
TEEN	2.67E-08	2.01E-07	2.14E-08	4.27E-08	2.99E-08	3.23E-06	6.49E-06	0.00E+00
CHILD	2.61E-08	1.08E-07	2.90E-08	4.02E-08	2.79E-08	3.75E-06	5.26E-06	0.00E+00
INFANT	1.45E-08	5.51E-08	1.99E-08	3.08E-08	1.81E-08	3.44E-06	3.36E-06	0.00E+00

TABLE 1. DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-MARCH 2012 (Continued)

SPECIAL LOCATION NO. 5 A Nearest Garden  
 AT 2.80 MILES NNW

ANNUAL BETA AIR DOSE = 1.15E-06 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 1.74E-06 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.16E-06	1.16E-06	1.16E-06	1.16E-06	1.16E-06	1.16E-06	1.17E-06	2.36E-06
GROUND	7.15E-05	7.15E-05	7.15E-05	7.15E-05	7.15E-05	7.15E-05	7.15E-05	8.41E-05
VEGET								
ADULT	1.54E-06	9.23E-06	5.72E-07	1.28E-06	3.97E-07	3.00E-05	7.26E-08	0.00E+00
TEEN	2.11E-06	9.82E-06	9.34E-07	2.00E-06	6.20E-07	4.05E-05	1.36E-07	0.00E+00
CHILD	3.77E-06	6.42E-06	2.23E-06	3.28E-06	1.00E-06	7.75E-05	2.07E-07	0.00E+00
MEAT								
ADULT	3.21E-07	2.43E-06	4.05E-08	1.85E-07	2.24E-08	8.07E-07	5.93E-09	0.00E+00
TEEN	2.42E-07	1.31E-06	3.37E-08	1.45E-07	1.81E-08	5.85E-07	5.61E-09	0.00E+00
CHILD	3.61E-07	6.60E-07	6.20E-08	1.79E-07	2.30E-08	8.83E-07	6.60E-09	0.00E+00
COW MILK								
ADULT	3.93E-07	5.61E-07	3.76E-07	5.44E-07	2.71E-07	2.25E-05	5.02E-08	0.00E+00
TEEN	4.47E-07	6.63E-07	6.81E-07	9.58E-07	4.81E-07	3.57E-05	1.04E-07	0.00E+00
CHILD	5.42E-07	4.42E-07	1.64E-06	1.65E-06	7.99E-07	7.06E-05	1.59E-07	0.00E+00
INFANT	7.77E-07	3.91E-07	2.73E-06	3.34E-06	1.33E-06	1.72E-04	2.89E-07	0.00E+00
GOATMILK								
ADULT	9.29E-07	1.14E-07	1.04E-06	1.42E-06	5.97E-07	2.71E-05	1.51E-07	0.00E+00
TEEN	9.12E-07	1.41E-07	1.88E-06	2.51E-06	1.06E-06	4.28E-05	3.11E-07	0.00E+00
CHILD	7.75E-07	1.01E-07	4.54E-06	4.35E-06	1.76E-06	8.48E-05	4.78E-07	0.00E+00
INFANT	8.85E-07	9.40E-08	7.37E-06	8.62E-06	2.88E-06	2.06E-04	8.66E-07	0.00E+00
INHAL								
ADULT	3.55E-08	3.30E-07	2.28E-08	4.76E-08	3.22E-08	3.78E-06	6.78E-06	0.00E+00
TEEN	4.03E-08	3.05E-07	3.20E-08	6.43E-08	4.42E-08	4.75E-06	9.90E-06	0.00E+00
CHILD	3.93E-08	1.50E-07	4.34E-08	6.05E-08	4.13E-08	5.51E-06	8.02E-06	0.00E+00
INFANT	2.19E-08	7.08E-08	2.97E-08	4.62E-08	2.67E-08	5.05E-06	5.12E-06	0.00E+00

TABLE 2. DOSES TO MAXIMUM INDIVIDUAL (MREM), APRIL-JUNE 2012

SPECIAL LOCATION NO. 1 A Site Boundary  
 AT .67 MILES N

ANNUAL BETA AIR DOSE = 5.47E-06 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 1.12E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	7.49E-06	7.49E-06	7.49E-06	7.49E-06	7.49E-06	7.49E-06	7.55E-06	1.34E-05
GROUND	4.64E-03	4.64E-03	4.64E-03	4.64E-03	4.64E-03	4.64E-03	4.64E-03	5.46E-03
VEGET								
ADULT	1.16E-04	5.89E-04	5.51E-05	1.06E-04	3.42E-05	2.05E-03	7.59E-06	0.00E+00
TEEN	1.50E-04	6.27E-04	9.02E-05	1.67E-04	5.37E-05	2.76E-03	1.42E-05	0.00E+00
CHILD	2.53E-04	4.10E-04	2.15E-04	2.77E-04	8.76E-05	5.29E-03	2.16E-05	0.00E+00
MEAT								
ADULT	2.21E-05	1.57E-04	4.15E-06	1.40E-05	2.16E-06	5.51E-05	6.20E-07	0.00E+00
TEEN	1.62E-05	8.44E-05	3.45E-06	1.11E-05	1.75E-06	3.99E-05	5.87E-07	0.00E+00
CHILD	2.36E-05	4.26E-05	6.35E-06	1.38E-05	2.22E-06	6.02E-05	6.90E-07	0.00E+00
COW MILK								
ADULT	3.72E-05	3.65E-05	3.74E-05	5.31E-05	2.40E-05	1.54E-03	5.25E-06	0.00E+00
TEEN	4.00E-05	4.32E-05	6.78E-05	9.36E-05	4.25E-05	2.44E-03	1.08E-05	0.00E+00
CHILD	4.34E-05	2.89E-05	1.63E-04	1.62E-04	7.06E-05	4.82E-03	1.67E-05	0.00E+00
INFANT	5.85E-05	2.56E-05	2.68E-04	3.24E-04	1.17E-04	1.17E-02	3.02E-05	0.00E+00
GOATMILK								
ADULT	9.51E-05	8.46E-06	1.06E-04	1.45E-04	5.72E-05	1.85E-03	1.57E-05	0.00E+00
TEEN	9.20E-05	1.05E-05	1.92E-04	2.57E-04	1.01E-04	2.92E-03	3.25E-05	0.00E+00
CHILD	7.46E-05	7.63E-06	4.64E-04	4.45E-04	1.68E-04	5.79E-03	5.00E-05	0.00E+00
INFANT	8.07E-05	7.15E-06	7.49E-04	8.77E-04	2.74E-04	1.41E-02	9.05E-05	0.00E+00
INHAL								
ADULT	1.00E-06	7.64E-06	7.34E-07	1.34E-06	8.78E-07	9.34E-05	1.57E-04	0.00E+00
TEEN	1.07E-06	6.99E-06	1.03E-06	1.82E-06	1.21E-06	1.18E-04	2.29E-04	0.00E+00
CHILD	9.74E-07	2.72E-06	1.40E-06	1.73E-06	1.13E-06	1.37E-04	1.86E-04	0.00E+00
INFANT	5.34E-07	9.65E-07	9.32E-07	1.33E-06	7.30E-07	1.26E-04	1.18E-04	0.00E+00

TABLE 2. DOSES TO MAXIMUM INDIVIDUAL (MREM), APRIL-JUNE 2012 (Continued)

SPECIAL LOCATION NO. 2 A Site Boundary  
 AT .60 MILES NNE

ANNUAL BETA AIR DOSE = 1.46E-06 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 2.99E-06 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 2.00E-06	: 2.00E-06	: 2.00E-06	: 2.00E-06	: 2.00E-06	: 2.00E-06	: 2.01E-06	: 3.59E-06
GROUND	: 2.01E-03	: 2.01E-03	: 2.01E-03	: 2.01E-03	: 2.01E-03	: 2.01E-03	: 2.01E-03	: 2.37E-03
VEGET								
ADULT	: 5.02E-05	: 2.55E-04	: 2.34E-05	: 4.58E-05	: 1.46E-05	: 8.59E-04	: 3.28E-06	: 0.00E+00
TEEN	: 6.48E-05	: 2.71E-04	: 3.82E-05	: 7.21E-05	: 2.30E-05	: 1.16E-03	: 6.14E-06	: 0.00E+00
CHILD	: 1.09E-04	: 1.78E-04	: 9.11E-05	: 1.20E-04	: 3.75E-05	: 2.22E-03	: 9.34E-06	: 0.00E+00
MEAT								
ADULT	: 9.56E-06	: 6.79E-05	: 1.79E-06	: 6.07E-06	: 9.30E-07	: 2.31E-05	: 2.68E-07	: 0.00E+00
TEEN	: 7.01E-06	: 3.66E-05	: 1.48E-06	: 4.78E-06	: 7.53E-07	: 1.67E-05	: 2.53E-07	: 0.00E+00
CHILD	: 1.02E-05	: 1.85E-05	: 2.73E-06	: 5.95E-06	: 9.56E-07	: 2.52E-05	: 2.98E-07	: 0.00E+00
COW MILK								
ADULT	: 1.60E-05	: 1.58E-05	: 1.61E-05	: 2.29E-05	: 1.03E-05	: 6.45E-04	: 2.27E-06	: 0.00E+00
TEEN	: 1.72E-05	: 1.87E-05	: 2.92E-05	: 4.03E-05	: 1.82E-05	: 1.02E-03	: 4.68E-06	: 0.00E+00
CHILD	: 1.87E-05	: 1.25E-05	: 7.03E-05	: 6.97E-05	: 3.02E-05	: 2.02E-03	: 7.20E-06	: 0.00E+00
INFANT	: 2.51E-05	: 1.11E-05	: 1.15E-04	: 1.39E-04	: 4.99E-05	: 4.91E-03	: 1.30E-05	: 0.00E+00
GOATMILK								
ADULT	: 4.10E-05	: 3.63E-06	: 4.57E-05	: 6.27E-05	: 2.46E-05	: 7.74E-04	: 6.80E-06	: 0.00E+00
TEEN	: 3.96E-05	: 4.52E-06	: 8.29E-05	: 1.11E-04	: 4.35E-05	: 1.23E-03	: 1.40E-05	: 0.00E+00
CHILD	: 3.21E-05	: 3.27E-06	: 2.00E-04	: 1.92E-04	: 7.22E-05	: 2.43E-03	: 2.16E-05	: 0.00E+00
INFANT	: 3.46E-05	: 3.06E-06	: 3.23E-04	: 3.78E-04	: 1.18E-04	: 5.90E-03	: 3.91E-05	: 0.00E+00
INHAL								
ADULT	: 6.85E-07	: 5.22E-06	: 5.03E-07	: 9.18E-07	: 6.04E-07	: 6.44E-05	: 1.07E-04	: 0.00E+00
TEEN	: 7.30E-07	: 4.77E-06	: 7.06E-07	: 1.24E-06	: 8.31E-07	: 8.12E-05	: 1.57E-04	: 0.00E+00
CHILD	: 6.67E-07	: 1.81E-06	: 9.56E-07	: 1.18E-06	: 7.77E-07	: 9.47E-05	: 1.27E-04	: 0.00E+00
INFANT	: 3.66E-07	: 6.21E-07	: 6.39E-07	: 9.10E-07	: 5.02E-07	: 8.68E-05	: 8.10E-05	: 0.00E+00

TABLE 2. DOSES TO MAXIMUM INDIVIDUAL (MREM), APRIL-JUNE 2012 (Continued)

SPECIAL LOCATION NO. 3 A Nearest Resident  
 AT .90 MILES NW

ANNUAL BETA AIR DOSE = 6.25E-06 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 1.28E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	8.57E-06	8.57E-06	8.57E-06	8.57E-06	8.57E-06	8.57E-06	8.63E-06	1.54E-05
GROUND	1.29E-03	1.29E-03	1.29E-03	1.29E-03	1.29E-03	1.29E-03	1.29E-03	1.52E-03
VEGET ADULT	3.23E-05	1.64E-04	1.56E-05	2.96E-05	9.58E-06	5.83E-04	2.11E-06	0.00E+00
TEEN	4.17E-05	1.74E-04	2.55E-05	4.66E-05	1.51E-05	7.85E-04	3.96E-06	0.00E+00
CHILD	7.03E-05	1.14E-04	6.07E-05	7.73E-05	2.46E-05	1.50E-03	6.03E-06	0.00E+00
MEAT ADULT	6.14E-06	4.36E-05	1.16E-06	3.90E-06	6.04E-07	1.57E-05	1.73E-07	0.00E+00
TEEN	4.50E-06	2.34E-05	9.62E-07	3.08E-06	4.89E-07	1.13E-05	1.63E-07	0.00E+00
CHILD	6.57E-06	1.18E-05	1.77E-06	3.83E-06	6.21E-07	1.71E-05	1.92E-07	0.00E+00
COW MILK ADULT	1.04E-05	1.02E-05	1.04E-05	1.48E-05	6.73E-06	4.38E-04	1.46E-06	0.00E+00
TEEN	1.12E-05	1.20E-05	1.89E-05	2.61E-05	1.19E-05	6.93E-04	3.02E-06	0.00E+00
CHILD	1.21E-05	8.05E-06	4.57E-05	4.52E-05	1.98E-05	1.37E-03	4.64E-06	0.00E+00
INFANT	1.64E-05	7.13E-06	7.50E-05	9.03E-05	3.28E-05	3.34E-03	8.40E-06	0.00E+00
GOATMILK ADULT	2.65E-05	2.37E-06	2.96E-05	4.06E-05	1.60E-05	5.26E-04	4.39E-06	0.00E+00
TEEN	2.56E-05	2.95E-06	5.37E-05	7.15E-05	2.83E-05	8.32E-04	9.06E-06	0.00E+00
CHILD	2.09E-05	2.14E-06	1.29E-04	1.24E-04	4.70E-05	1.65E-03	1.39E-05	0.00E+00
INFANT	2.26E-05	2.00E-06	2.09E-04	2.45E-04	7.67E-05	4.00E-03	2.52E-05	0.00E+00
INHAL ADULT	2.10E-07	1.59E-06	1.56E-07	2.83E-07	1.89E-07	2.03E-05	3.27E-05	0.00E+00
TEEN	2.24E-07	1.47E-06	2.18E-07	3.84E-07	2.60E-07	2.55E-05	4.78E-05	0.00E+00
CHILD	2.05E-07	6.74E-07	2.96E-07	3.65E-07	2.43E-07	2.98E-05	3.87E-05	0.00E+00
INFANT	1.13E-07	2.96E-07	1.98E-07	2.81E-07	1.57E-07	2.73E-05	2.47E-05	0.00E+00

TABLE 2. DOSES TO MAXIMUM INDIVIDUAL (MREM), APRIL-JUNE 2012 (Continued)

SPECIAL LOCATION NO. 4 A Nearest Cow  
 AT 3.50 MILES NNW

ANNUAL BETA AIR DOSE = 2.87E-06 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 5.87E-06 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	3.93E-06	3.93E-06	3.93E-06	3.93E-06	3.93E-06	3.93E-06	3.95E-06	7.04E-06
GROUND	5.68E-05	5.68E-05	5.68E-05	5.68E-05	5.68E-05	5.68E-05	5.68E-05	6.68E-05
VEGET								
ADULT	1.43E-06	7.21E-06	7.17E-07	1.31E-06	4.32E-07	2.73E-05	9.38E-08	0.00E+00
TEEN	1.85E-06	7.68E-06	1.17E-06	2.07E-06	6.80E-07	3.67E-05	1.76E-07	0.00E+00
CHILD	3.11E-06	5.02E-06	2.80E-06	3.43E-06	1.11E-06	7.04E-05	2.67E-07	0.00E+00
MEAT								
ADULT	2.71E-07	1.92E-06	5.17E-08	1.72E-07	2.70E-08	7.33E-07	7.66E-09	0.00E+00
TEEN	1.98E-07	1.03E-06	4.29E-08	1.36E-07	2.19E-08	5.31E-07	7.25E-09	0.00E+00
CHILD	2.89E-07	5.21E-07	7.91E-08	1.69E-07	2.77E-08	8.01E-07	8.52E-09	0.00E+00
COW MILK								
ADULT	4.62E-07	4.48E-07	4.67E-07	6.61E-07	3.04E-07	2.05E-05	6.49E-08	0.00E+00
TEEN	4.98E-07	5.31E-07	8.46E-07	1.16E-06	5.39E-07	3.24E-05	1.34E-07	0.00E+00
CHILD	5.43E-07	3.56E-07	2.04E-06	2.01E-06	8.96E-07	6.42E-05	2.06E-07	0.00E+00
INFANT	7.36E-07	3.15E-07	3.36E-06	4.03E-06	1.48E-06	1.56E-04	3.73E-07	0.00E+00
GOATMILK								
ADULT	1.18E-06	1.06E-07	1.32E-06	1.80E-06	7.16E-07	2.46E-05	1.95E-07	0.00E+00
TEEN	1.14E-06	1.32E-07	2.39E-06	3.18E-06	1.27E-06	3.89E-05	4.02E-07	0.00E+00
CHILD	9.32E-07	9.60E-08	5.76E-06	5.51E-06	2.10E-06	7.70E-05	6.18E-07	0.00E+00
INFANT	1.02E-06	9.01E-08	9.32E-06	1.09E-05	3.44E-06	1.87E-04	1.12E-06	0.00E+00
INHAL								
ADULT	1.76E-08	1.30E-07	1.36E-08	2.41E-08	1.71E-08	1.92E-06	2.65E-06	0.00E+00
TEEN	1.89E-08	1.25E-07	1.90E-08	3.27E-08	2.36E-08	2.42E-06	3.88E-06	0.00E+00
CHILD	1.74E-08	1.04E-07	2.58E-08	3.11E-08	2.21E-08	2.81E-06	3.14E-06	0.00E+00
INFANT	9.66E-09	6.72E-08	1.74E-08	2.42E-08	1.43E-08	2.58E-06	2.01E-06	0.00E+00

TABLE 2. DOSES TO MAXIMUM INDIVIDUAL (MREM), APRIL-JUNE 2012 (Continued)

SPECIAL LOCATION NO. 5 A Nearest Garden  
 AT 1.30 MILES SW

ANNUAL BETA AIR DOSE = 2.87E-06 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 5.87E-06 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	3.93E-06	3.93E-06	3.93E-06	3.93E-06	3.93E-06	3.93E-06	3.95E-06	7.04E-06
GROUND	1.70E-04	1.70E-04	1.70E-04	1.70E-04	1.70E-04	1.70E-04	1.70E-04	2.00E-04
VEGET								
ADULT	4.28E-06	2.16E-05	2.10E-06	3.92E-06	1.28E-06	7.95E-05	2.80E-07	0.00E+00
TEEN	5.52E-06	2.30E-05	3.43E-06	6.18E-06	2.01E-06	1.07E-04	5.25E-07	0.00E+00
CHILD	9.30E-06	1.51E-05	8.19E-06	1.03E-05	3.28E-06	2.05E-04	7.99E-07	0.00E+00
MEAT								
ADULT	8.11E-07	5.75E-06	1.54E-07	5.16E-07	8.03E-08	2.14E-06	2.29E-08	0.00E+00
TEEN	5.95E-07	3.10E-06	1.28E-07	4.07E-07	6.51E-08	1.55E-06	2.17E-08	0.00E+00
CHILD	8.67E-07	1.56E-06	2.36E-07	5.07E-07	8.26E-08	2.34E-06	2.54E-08	0.00E+00
COW MILK								
ADULT	1.38E-06	1.34E-06	1.39E-06	1.97E-06	9.01E-07	5.98E-05	1.94E-07	0.00E+00
TEEN	1.48E-06	1.59E-06	2.52E-06	3.47E-06	1.60E-06	9.46E-05	4.00E-07	0.00E+00
CHILD	1.62E-06	1.07E-06	6.07E-06	6.00E-06	2.65E-06	1.87E-04	6.15E-07	0.00E+00
INFANT	2.19E-06	9.44E-07	9.98E-06	1.20E-05	4.39E-06	4.55E-04	1.11E-06	0.00E+00
GOATMILK								
ADULT	3.52E-06	3.15E-07	3.93E-06	5.38E-06	2.13E-06	7.17E-05	5.81E-07	0.00E+00
TEEN	3.40E-06	3.94E-07	7.13E-06	9.49E-06	3.77E-06	1.14E-04	1.20E-06	0.00E+00
CHILD	2.77E-06	2.86E-07	1.72E-05	1.65E-05	6.26E-06	2.25E-04	1.85E-06	0.00E+00
INFANT	3.02E-06	2.68E-07	2.78E-05	3.25E-05	1.02E-05	5.46E-04	3.34E-06	0.00E+00
INHAL								
ADULT	3.75E-08	2.82E-07	2.82E-08	5.08E-08	3.48E-08	3.79E-06	5.76E-06	0.00E+00
TEEN	4.01E-08	2.63E-07	3.96E-08	6.89E-08	4.79E-08	4.78E-06	8.42E-06	0.00E+00
CHILD	3.67E-08	1.56E-07	5.36E-08	6.56E-08	4.49E-08	5.57E-06	6.82E-06	0.00E+00
INFANT	2.03E-08	8.45E-08	3.60E-08	5.07E-08	2.90E-08	5.11E-06	4.35E-06	0.00E+00

TABLE 3. DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-JUNE 2012

SPECIAL LOCATION NO. 1 A Site Boundary  
 AT .69 MILES NNW

ANNUAL BETA AIR DOSE = 6.98E-06 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 1.34E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	8.97E-06	8.97E-06	8.97E-06	8.97E-06	8.97E-06	8.97E-06	9.03E-06	1.65E-05
GROUND	4.85E-03	4.85E-03	4.85E-03	4.85E-03	4.85E-03	4.85E-03	4.85E-03	5.70E-03
VEGET								
ADULT	1.13E-04	6.20E-04	4.70E-05	9.89E-05	3.07E-05	1.96E-03	6.48E-06	0.00E+00
TEEN	1.50E-04	6.60E-04	7.68E-05	1.55E-04	4.83E-05	2.64E-03	1.21E-05	0.00E+00
CHILD	2.59E-04	4.31E-04	1.83E-04	2.56E-04	7.85E-05	5.05E-03	1.85E-05	0.00E+00
MEAT								
ADULT	2.24E-05	1.64E-04	3.55E-06	1.36E-05	1.88E-06	5.26E-05	5.29E-07	0.00E+00
TEEN	1.67E-05	8.84E-05	2.95E-06	1.07E-05	1.53E-06	3.81E-05	5.01E-07	0.00E+00
CHILD	2.46E-05	4.46E-05	5.43E-06	1.33E-05	1.93E-06	5.75E-05	5.89E-07	0.00E+00
COW MILK								
ADULT	3.28E-05	3.80E-05	3.22E-05	4.62E-05	2.13E-05	1.47E-03	4.48E-06	0.00E+00
TEEN	3.60E-05	4.49E-05	5.85E-05	8.14E-05	3.78E-05	2.33E-03	9.26E-06	0.00E+00
CHILD	4.07E-05	3.00E-05	1.41E-04	1.41E-04	6.28E-05	4.61E-03	1.42E-05	0.00E+00
INFANT	5.60E-05	2.65E-05	2.32E-04	2.82E-04	1.04E-04	1.12E-02	2.58E-05	0.00E+00
GOATMILK								
ADULT	8.16E-05	8.17E-06	9.10E-05	1.25E-04	4.98E-05	1.76E-03	1.34E-05	0.00E+00
TEEN	7.92E-05	1.01E-05	1.65E-04	2.20E-04	8.82E-05	2.79E-03	2.78E-05	0.00E+00
CHILD	6.51E-05	7.30E-06	3.98E-04	3.82E-04	1.46E-04	5.53E-03	4.27E-05	0.00E+00
INFANT	7.13E-05	6.81E-06	6.43E-04	7.54E-04	2.39E-04	1.34E-02	7.73E-05	0.00E+00
INHAL								
ADULT	1.35E-06	1.14E-05	9.26E-07	1.80E-06	1.16E-06	1.27E-04	2.35E-04	0.00E+00
TEEN	1.48E-06	1.04E-05	1.30E-06	2.44E-06	1.59E-06	1.60E-04	3.43E-04	0.00E+00
CHILD	1.39E-06	4.00E-06	1.76E-06	2.31E-06	1.49E-06	1.86E-04	2.78E-04	0.00E+00
INFANT	7.63E-07	1.39E-06	1.18E-06	1.76E-06	9.62E-07	1.70E-04	1.77E-04	0.00E+00



TABLE 3. DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-JUNE 2012 (Continued)

SPECIAL LOCATION NO. 2 A Site Boundary  
 AT .67 MILES N

ANNUAL BETA AIR DOSE = 1.01E-05 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 1.94E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.29E-05	1.29E-05	1.29E-05	1.29E-05	1.29E-05	1.29E-05	1.30E-05	2.39E-05
GROUND	8.02E-03	8.02E-03	8.02E-03	8.02E-03	8.02E-03	8.02E-03	8.02E-03	9.43E-03
VEGET								
ADULT	1.87E-04	1.03E-03	7.82E-05	1.64E-04	5.11E-05	3.28E-03	1.07E-05	0.00E+00
TEEN	2.48E-04	1.09E-03	1.28E-04	2.57E-04	8.02E-05	4.42E-03	2.01E-05	0.00E+00
CHILD	4.29E-04	7.13E-04	3.05E-04	4.24E-04	1.30E-04	8.47E-03	3.06E-05	0.00E+00
MEAT								
ADULT	3.71E-05	2.72E-04	5.88E-06	2.25E-05	3.12E-06	8.82E-05	8.76E-07	0.00E+00
TEEN	2.75E-05	1.46E-04	4.88E-06	1.78E-05	2.53E-06	6.39E-05	8.29E-07	0.00E+00
CHILD	4.06E-05	7.38E-05	9.00E-06	2.20E-05	3.21E-06	9.64E-05	9.74E-07	0.00E+00
COW MILK								
ADULT	5.43E-05	6.28E-05	5.34E-05	7.66E-05	3.54E-05	2.46E-03	7.41E-06	0.00E+00
TEEN	5.96E-05	7.43E-05	9.69E-05	1.35E-04	6.28E-05	3.90E-03	1.53E-05	0.00E+00
CHILD	6.75E-05	4.97E-05	2.34E-04	2.33E-04	1.04E-04	7.72E-03	2.36E-05	0.00E+00
INFANT	9.30E-05	4.39E-05	3.84E-04	4.67E-04	1.73E-04	1.88E-02	4.26E-05	0.00E+00
GOATMILK								
ADULT	1.35E-04	1.36E-05	1.51E-04	2.07E-04	8.26E-05	2.96E-03	2.22E-05	0.00E+00
TEEN	1.31E-04	1.68E-05	2.73E-04	3.65E-04	1.46E-04	4.68E-03	4.60E-05	0.00E+00
CHILD	1.08E-04	1.21E-05	6.58E-04	6.32E-04	2.43E-04	9.26E-03	7.07E-05	0.00E+00
INFANT	1.18E-04	1.13E-05	1.06E-03	1.25E-03	3.97E-04	2.25E-02	1.28E-04	0.00E+00
INHAL								
ADULT	2.05E-06	1.72E-05	1.41E-06	2.74E-06	1.79E-06	1.97E-04	3.54E-04	0.00E+00
TEEN	2.24E-06	1.57E-05	1.98E-06	3.70E-06	2.46E-06	2.48E-04	5.17E-04	0.00E+00
CHILD	2.11E-06	6.02E-06	2.68E-06	3.50E-06	2.30E-06	2.89E-04	4.19E-04	0.00E+00
INFANT	1.16E-06	2.09E-06	1.80E-06	2.68E-06	1.48E-06	2.65E-04	2.67E-04	0.00E+00

TABLE 3. DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-JUNE 2012 (Continued)

SPECIAL LOCATION NO. 3 A Nearest Resident  
 AT .90 MILES NW

ANNUAL BETA AIR DOSE = 1.37E-05 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 2.63E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.76E-05	1.76E-05	1.76E-05	1.76E-05	1.76E-05	1.76E-05	1.77E-05	3.24E-05
GROUND	2.08E-03	2.08E-03	2.08E-03	2.08E-03	2.08E-03	2.08E-03	2.08E-03	2.45E-03
VEGET								
ADULT	4.86E-05	2.66E-04	2.08E-05	4.27E-05	1.35E-05	8.87E-04	2.79E-06	0.00E+00
TEEN	6.44E-05	2.83E-04	3.40E-05	6.70E-05	2.11E-05	1.19E-03	5.23E-06	0.00E+00
CHILD	1.11E-04	1.85E-04	8.10E-05	1.11E-04	3.43E-05	2.29E-03	7.95E-06	0.00E+00
MEAT								
ADULT	9.62E-06	7.04E-05	1.53E-06	5.86E-06	8.16E-07	2.38E-05	2.28E-07	0.00E+00
TEEN	7.15E-06	3.79E-05	1.27E-06	4.61E-06	6.62E-07	1.73E-05	2.16E-07	0.00E+00
CHILD	1.05E-05	1.91E-05	2.35E-06	5.71E-06	8.39E-07	2.61E-05	2.53E-07	0.00E+00
COW MILK								
ADULT	1.42E-05	1.63E-05	1.40E-05	2.00E-05	9.35E-06	6.66E-04	1.93E-06	0.00E+00
TEEN	1.56E-05	1.93E-05	2.53E-05	3.52E-05	1.66E-05	1.05E-03	3.98E-06	0.00E+00
CHILD	1.77E-05	1.29E-05	6.11E-05	6.08E-05	2.75E-05	2.09E-03	6.12E-06	0.00E+00
INFANT	2.44E-05	1.14E-05	1.01E-04	1.22E-04	4.57E-05	5.07E-03	1.11E-05	0.00E+00
GOATMILK								
ADULT	3.52E-05	3.55E-06	3.93E-05	5.38E-05	2.17E-05	7.99E-04	5.78E-06	0.00E+00
TEEN	3.42E-05	4.42E-06	7.12E-05	9.50E-05	3.83E-05	1.26E-03	1.20E-05	0.00E+00
CHILD	2.82E-05	3.18E-06	1.72E-04	1.65E-04	6.37E-05	2.50E-03	1.84E-05	0.00E+00
INFANT	3.11E-05	2.97E-06	2.78E-04	3.25E-04	1.04E-04	6.09E-03	3.32E-05	0.00E+00
INHAL								
ADULT	4.11E-07	3.45E-06	2.84E-07	5.49E-07	3.60E-07	3.97E-05	7.08E-05	0.00E+00
TEEN	4.50E-07	3.17E-06	3.98E-07	7.43E-07	4.95E-07	4.99E-05	1.03E-04	0.00E+00
CHILD	4.23E-07	1.39E-06	5.39E-07	7.03E-07	4.63E-07	5.81E-05	8.38E-05	0.00E+00
INFANT	2.33E-07	5.81E-07	3.63E-07	5.38E-07	2.99E-07	5.33E-05	5.35E-05	0.00E+00

TABLE 3. DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-JUNE 2012 (Continued)

SPECIAL LOCATION NO. 4 A Nearest Cow  
AT 3.50 MILES NNW

ANNUAL BETA AIR DOSE = 7.20E-06 MILLRADS  
ANNUAL GAMMA AIR DOSE = 1.38E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	9.24E-06	9.24E-06	9.24E-06	9.24E-06	9.24E-06	9.24E-06	9.31E-06	1.70E-05
GROUND	9.71E-05	9.71E-05	9.71E-05	9.71E-05	9.71E-05	9.71E-05	9.71E-05	1.14E-04
VEGET								
ADULT	2.28E-06	1.24E-05	1.02E-06	2.01E-06	6.47E-07	4.45E-05	1.31E-07	0.00E+00
TEEN	3.02E-06	1.32E-05	1.66E-06	3.15E-06	1.02E-06	6.00E-05	2.45E-07	0.00E+00
CHILD	5.22E-06	8.65E-06	3.97E-06	5.20E-06	1.65E-06	1.15E-04	3.73E-07	0.00E+00
MEAT								
ADULT	4.50E-07	3.29E-06	7.26E-08	2.74E-07	3.87E-08	1.20E-06	1.07E-08	0.00E+00
TEEN	3.34E-07	1.77E-06	6.03E-08	2.16E-07	3.14E-08	8.67E-07	1.01E-08	0.00E+00
CHILD	4.92E-07	8.94E-07	1.11E-07	2.67E-07	3.98E-08	1.31E-06	1.19E-08	0.00E+00
COW MILK								
ADULT	6.69E-07	7.65E-07	6.62E-07	9.45E-07	4.50E-07	3.34E-05	9.05E-08	0.00E+00
TEEN	7.37E-07	9.05E-07	1.20E-06	1.67E-06	7.99E-07	5.29E-05	1.87E-07	0.00E+00
CHILD	8.40E-07	6.05E-07	2.90E-06	2.88E-06	1.33E-06	1.05E-04	2.88E-07	0.00E+00
INFANT	1.17E-06	5.36E-07	4.78E-06	5.78E-06	2.20E-06	2.55E-04	5.20E-07	0.00E+00
GOATMILK								
ADULT	1.66E-06	1.69E-07	1.85E-06	2.54E-06	1.03E-06	4.01E-05	2.72E-07	0.00E+00
TEEN	1.61E-06	2.11E-07	3.36E-06	4.47E-06	1.83E-06	6.35E-05	5.61E-07	0.00E+00
CHILD	1.34E-06	1.52E-07	8.10E-06	7.76E-06	3.03E-06	1.26E-04	8.63E-07	0.00E+00
INFANT	1.49E-06	1.42E-07	1.31E-05	1.53E-05	4.96E-06	3.06E-04	1.56E-06	0.00E+00
INHAL								
ADULT	4.28E-08	3.50E-07	3.07E-08	5.82E-08	4.08E-08	4.65E-06	7.15E-06	0.00E+00
TEEN	4.71E-08	3.31E-07	4.31E-08	7.88E-08	5.61E-08	5.86E-06	1.04E-05	0.00E+00
CHILD	4.45E-08	2.31E-07	5.84E-08	7.47E-08	5.25E-08	6.81E-06	8.46E-06	0.00E+00
INFANT	2.48E-08	1.38E-07	3.97E-08	5.78E-08	3.40E-08	6.24E-06	5.40E-06	0.00E+00

TABLE 3. DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-JUNE 2012 (Continued)

SPECIAL LOCATION NO. 5 A Nearest Garden  
 AT 2.80 MILES NNW

ANNUAL BETA AIR DOSE = 8.64E-06 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 1.66E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.11E-05	1.11E-05	1.11E-05	1.11E-05	1.11E-05	1.11E-05	1.12E-05	2.04E-05
GROUND	1.59E-04	1.59E-04	1.59E-04	1.59E-04	1.59E-04	1.59E-04	1.59E-04	1.87E-04
VEGET								
ADULT	3.72E-06	2.03E-05	1.65E-06	3.28E-06	1.06E-06	7.25E-05	2.14E-07	0.00E+00
TEEN	4.93E-06	2.16E-05	2.71E-06	5.14E-06	1.66E-06	9.76E-05	4.00E-07	0.00E+00
CHILD	8.52E-06	1.41E-05	6.45E-06	8.49E-06	2.69E-06	1.87E-04	6.09E-07	0.00E+00
MEAT								
ADULT	7.35E-07	5.37E-06	1.18E-07	4.48E-07	6.32E-08	1.95E-06	1.75E-08	0.00E+00
TEEN	5.45E-07	2.89E-06	9.83E-08	3.52E-07	5.12E-08	1.41E-06	1.65E-08	0.00E+00
CHILD	8.04E-07	1.46E-06	1.81E-07	4.36E-07	6.49E-08	2.13E-06	1.94E-08	0.00E+00
COW MILK								
ADULT	1.09E-06	1.25E-06	1.08E-06	1.54E-06	7.34E-07	5.44E-05	1.48E-07	0.00E+00
TEEN	1.20E-06	1.48E-06	1.96E-06	2.72E-06	1.30E-06	8.62E-05	3.05E-07	0.00E+00
CHILD	1.37E-06	9.88E-07	4.72E-06	4.69E-06	2.16E-06	1.71E-04	4.69E-07	0.00E+00
INFANT	1.90E-06	8.75E-07	7.80E-06	9.43E-06	3.59E-06	4.15E-04	8.49E-07	0.00E+00
GOATMILK								
ADULT	2.70E-06	2.76E-07	3.02E-06	4.14E-06	1.68E-06	6.53E-05	4.43E-07	0.00E+00
TEEN	2.63E-06	3.43E-07	5.48E-06	7.30E-06	2.98E-06	1.03E-04	9.16E-07	0.00E+00
CHILD	2.18E-06	2.48E-07	1.32E-05	1.27E-05	4.94E-06	2.05E-04	1.41E-06	0.00E+00
INFANT	2.43E-06	2.32E-07	2.14E-05	2.50E-05	8.08E-06	4.98E-04	2.55E-06	0.00E+00
INHAL								
ADULT	6.51E-08	5.35E-07	4.62E-08	8.81E-08	6.09E-08	6.90E-06	1.09E-05	0.00E+00
TEEN	7.15E-08	5.01E-07	6.49E-08	1.19E-07	8.38E-08	8.68E-06	1.60E-05	0.00E+00
CHILD	6.75E-08	3.06E-07	8.79E-08	1.13E-07	7.83E-08	1.01E-05	1.30E-05	0.00E+00
INFANT	3.75E-08	1.70E-07	5.97E-08	8.72E-08	5.07E-08	9.26E-06	8.27E-06	0.00E+00

TABLE 4. DOSES TO MAXIMUM INDIVIDUAL (MREM), JULY-SEPTEMBER 2012

SPECIAL LOCATION NO. 1 A Site Boundary  
 AT .69 MILES NNW

ANNUAL BETA AIR DOSE = 6.12E-06 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 1.25E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 8.36E-06	: 8.36E-06	: 8.36E-06	: 8.36E-06	: 8.36E-06	: 8.36E-06	: 8.42E-06	: 1.50E-05
GROUND	: 6.78E-03	: 6.78E-03	: 6.78E-03	: 6.78E-03	: 6.78E-03	: 6.78E-03	: 6.78E-03	: 7.97E-03
VEGET	:	:	:	:	:	:	:	:
ADULT	: 1.24E-04	: 8.99E-04	: 4.31E-04	: 7.41E-05	: 3.87E-05	: 6.51E-03	: 2.11E-08	: 0.00E+00
TEEN	: 1.92E-04	: 9.59E-04	: 5.98E-04	: 1.13E-04	: 5.82E-05	: 8.75E-03	: 2.83E-08	: 0.00E+00
CHILD	: 3.83E-04	: 6.30E-04	: 1.24E-03	: 1.78E-04	: 9.26E-05	: 1.68E-02	: 4.35E-08	: 0.00E+00
MEAT	:	:	:	:	:	:	:	:
ADULT	: 2.90E-05	: 2.36E-04	: 6.13E-06	: 1.56E-05	: 2.66E-06	: 1.74E-04	: 7.54E-10	: 0.00E+00
TEEN	: 2.30E-05	: 1.27E-04	: 4.34E-06	: 1.21E-05	: 2.03E-06	: 1.26E-04	: 7.13E-10	: 0.00E+00
CHILD	: 3.56E-05	: 6.40E-05	: 6.97E-06	: 1.44E-05	: 2.40E-06	: 1.90E-04	: 8.38E-10	: 0.00E+00
COW MILK	:	:	:	:	:	:	:	:
ADULT	: 1.97E-05	: 6.29E-05	: 3.27E-05	: 2.85E-05	: 3.35E-05	: 4.93E-03	: 1.10E-07	: 0.00E+00
TEEN	: 3.35E-05	: 7.47E-05	: 5.31E-05	: 4.94E-05	: 5.86E-05	: 7.82E-03	: 1.94E-07	: 0.00E+00
CHILD	: 6.53E-05	: 5.05E-05	: 1.17E-04	: 8.13E-05	: 9.56E-05	: 1.55E-02	: 3.96E-07	: 0.00E+00
INFANT	: 1.08E-04	: 7.83E-05	: 1.82E-04	: 1.77E-04	: 1.60E-04	: 3.77E-02	: 6.91E-07	: 0.00E+00
GOATMILK	:	:	:	:	:	:	:	:
ADULT	: 1.26E-05	: 1.39E-05	: 5.25E-05	: 2.04E-05	: 3.29E-05	: 5.92E-03	: 3.06E-08	: 0.00E+00
TEEN	: 2.09E-05	: 1.76E-05	: 8.39E-05	: 3.61E-05	: 5.86E-05	: 9.38E-03	: 5.93E-08	: 0.00E+00
CHILD	: 3.93E-05	: 1.32E-05	: 1.83E-04	: 6.23E-05	: 9.72E-05	: 1.86E-02	: 1.03E-07	: 0.00E+00
INFANT	: 7.08E-05	: 1.65E-05	: 2.66E-04	: 1.50E-04	: 1.68E-04	: 4.53E-02	: 1.83E-07	: 0.00E+00
INHAL	:	:	:	:	:	:	:	:
ADULT	: 3.54E-06	: 8.26E-05	: 7.88E-06	: 5.90E-06	: 7.93E-06	: 9.32E-04	: 5.65E-04	: 0.00E+00
TEEN	: 4.71E-06	: 1.20E-04	: 9.88E-06	: 8.04E-06	: 1.09E-05	: 1.19E-03	: 8.30E-04	: 0.00E+00
CHILD	: 5.37E-06	: 2.21E-04	: 1.23E-05	: 7.79E-06	: 1.03E-05	: 1.43E-03	: 6.76E-04	: 0.00E+00
INFANT	: 3.37E-06	: 1.61E-04	: 7.21E-06	: 6.69E-06	: 6.80E-06	: 1.32E-03	: 4.43E-04	: 0.00E+00

TABLE 4. DOSES TO MAXIMUM INDIVIDUAL (MREM), JULY-SEPTEMBER 2012 (Continued)

SPECIAL LOCATION NO. 2 A Site Boundary  
 AT .67 MILES N

ANNUAL BETA AIR DOSE = 1.17E-05 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 2.40E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.60E-05	1.60E-05	1.60E-05	1.60E-05	1.60E-05	1.60E-05	1.61E-05	2.88E-05
GROUND	1.24E-02	1.24E-02	1.24E-02	1.24E-02	1.24E-02	1.24E-02	1.24E-02	1.46E-02
VEGET ADULT	2.27E-04	1.64E-03	7.87E-04	1.36E-04	7.10E-05	1.19E-02	4.59E-08	0.00E+00
TEEN	3.50E-04	1.75E-03	1.09E-03	2.07E-04	1.07E-04	1.60E-02	6.53E-08	0.00E+00
CHILD	6.99E-04	1.15E-03	2.28E-03	3.25E-04	1.70E-04	3.07E-02	1.00E-07	0.00E+00
MEAT ADULT	5.30E-05	4.30E-04	1.12E-05	2.85E-05	4.87E-06	3.19E-04	1.97E-09	0.00E+00
TEEN	4.19E-05	2.31E-04	7.94E-06	2.21E-05	3.72E-06	2.31E-04	1.86E-09	0.00E+00
CHILD	6.51E-05	1.17E-04	1.27E-05	2.62E-05	4.40E-06	3.49E-04	2.19E-09	0.00E+00
COW MILK ADULT	3.61E-05	1.15E-04	5.99E-05	5.22E-05	6.14E-05	9.04E-03	2.06E-07	0.00E+00
TEEN	6.12E-05	1.36E-04	9.72E-05	9.04E-05	1.07E-04	1.43E-02	3.64E-07	0.00E+00
CHILD	1.19E-04	9.23E-05	2.14E-04	1.49E-04	1.75E-04	2.85E-02	7.39E-07	0.00E+00
INFANT	1.97E-04	1.43E-04	3.34E-04	3.25E-04	2.93E-04	6.92E-02	1.29E-06	0.00E+00
GOATMILK ADULT	2.31E-05	2.54E-05	9.61E-05	3.75E-05	6.04E-05	1.09E-02	7.09E-08	0.00E+00
TEEN	3.84E-05	3.23E-05	1.54E-04	6.63E-05	1.07E-04	1.72E-02	1.39E-07	0.00E+00
CHILD	7.21E-05	2.41E-05	3.36E-04	1.15E-04	1.78E-04	3.41E-02	2.36E-07	0.00E+00
INFANT	1.30E-04	3.03E-05	4.88E-04	2.75E-04	3.09E-04	8.30E-02	4.21E-07	0.00E+00
INHAL ADULT	5.96E-06	1.39E-04	1.33E-05	9.91E-06	1.33E-05	1.56E-03	9.53E-04	0.00E+00
TEEN	7.93E-06	2.03E-04	1.66E-05	1.35E-05	1.83E-05	2.00E-03	1.40E-03	0.00E+00
CHILD	9.03E-06	3.74E-04	2.07E-05	1.31E-05	1.73E-05	2.40E-03	1.14E-03	0.00E+00
INFANT	5.67E-06	2.71E-04	1.21E-05	1.12E-05	1.14E-05	2.21E-03	7.48E-04	0.00E+00

TABLE 4. DOSES TO MAXIMUM INDIVIDUAL (MREM), JULY-SEPTEMBER 2012 (Continued)

SPECIAL LOCATION NO. 3 A Nearest Resident  
 AT .90 MILES NW

ANNUAL BETA AIR DOSE = 1.22E-05 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 2.50E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.67E-05	1.67E-05	1.67E-05	1.67E-05	1.67E-05	1.67E-05	1.68E-05	3.01E-05
GROUND	2.48E-03	2.48E-03	2.48E-03	2.48E-03	2.48E-03	2.48E-03	2.48E-03	2.91E-03
VEGET								
ADULT	4.55E-05	3.29E-04	1.58E-04	2.73E-05	1.44E-05	2.41E-03	1.42E-08	0.00E+00
TEEN	7.02E-05	3.51E-04	2.20E-04	4.16E-05	2.16E-05	3.25E-03	2.24E-08	0.00E+00
CHILD	1.40E-04	2.30E-04	4.57E-04	6.54E-05	3.44E-05	6.22E-03	3.43E-08	0.00E+00
MEAT								
ADULT	1.06E-05	8.61E-05	2.25E-06	5.71E-06	9.79E-07	6.45E-05	8.03E-10	0.00E+00
TEEN	8.39E-06	4.63E-05	1.60E-06	4.43E-06	7.47E-07	4.67E-05	7.60E-10	0.00E+00
CHILD	1.30E-05	2.34E-05	2.56E-06	5.26E-06	8.85E-07	7.05E-05	8.92E-10	0.00E+00
COW MILK								
ADULT	7.27E-06	2.30E-05	1.21E-05	1.05E-05	1.24E-05	1.83E-03	4.46E-08	0.00E+00
TEEN	1.23E-05	2.73E-05	1.96E-05	1.83E-05	2.17E-05	2.90E-03	7.99E-08	0.00E+00
CHILD	2.40E-05	1.85E-05	4.33E-05	3.01E-05	3.54E-05	5.76E-03	1.59E-07	0.00E+00
INFANT	3.96E-05	2.86E-05	6.75E-05	6.57E-05	5.92E-05	1.40E-02	2.78E-07	0.00E+00
GOATMILK								
ADULT	4.73E-06	5.11E-06	1.94E-05	7.67E-06	1.22E-05	2.20E-03	2.46E-08	0.00E+00
TEEN	7.80E-06	6.50E-06	3.10E-05	1.36E-05	2.18E-05	3.48E-03	4.93E-08	0.00E+00
CHILD	1.46E-05	4.86E-06	6.79E-05	2.34E-05	3.62E-05	6.91E-03	8.01E-08	0.00E+00
INFANT	2.63E-05	6.09E-06	9.89E-05	5.62E-05	6.26E-05	1.68E-02	1.44E-07	0.00E+00
INHAL								
ADULT	6.68E-07	1.55E-05	1.48E-06	1.12E-06	1.50E-06	1.76E-04	1.06E-04	0.00E+00
TEEN	8.89E-07	2.26E-05	1.86E-06	1.52E-06	2.07E-06	2.26E-04	1.56E-04	0.00E+00
CHILD	1.01E-06	4.19E-05	2.32E-06	1.47E-06	1.95E-06	2.71E-04	1.27E-04	0.00E+00
INFANT	6.36E-07	3.05E-05	1.36E-06	1.27E-06	1.29E-06	2.49E-04	8.32E-05	0.00E+00

TABLE 4. DOSES TO MAXIMUM INDIVIDUAL (MREM), JULY-SEPTEMBER 2012 (Continued)

SPECIAL LOCATION NO. 4 A Nearest Cow  
 AT 3.50 MILES NNW

ANNUAL BETA AIR DOSE = 9.18E-06 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 1.87E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.25E-05	1.25E-05	1.25E-05	1.25E-05	1.25E-05	1.25E-05	1.26E-05	2.25E-05
GROUND	1.30E-04	1.30E-04	1.30E-04	1.30E-04	1.30E-04	1.30E-04	1.30E-04	1.53E-04
VEGET								
ADULT	2.40E-06	1.73E-05	8.34E-06	1.44E-06	7.57E-07	1.27E-04	9.83E-10	0.00E+00
TEEN	3.70E-06	1.85E-05	1.16E-05	2.19E-06	1.14E-06	1.71E-04	1.65E-09	0.00E+00
CHILD	7.38E-06	1.21E-05	2.42E-05	3.45E-06	1.81E-06	3.28E-04	2.51E-09	0.00E+00
MEAT								
ADULT	5.58E-07	4.53E-06	1.19E-07	3.01E-07	5.16E-08	3.40E-06	6.35E-11	0.00E+00
TEEN	4.42E-07	2.44E-06	8.42E-08	2.33E-07	3.94E-08	2.47E-06	6.01E-11	0.00E+00
CHILD	6.86E-07	1.23E-06	1.35E-07	2.77E-07	4.67E-08	3.72E-06	7.06E-11	0.00E+00
COW MILK								
ADULT	3.84E-07	1.21E-06	6.36E-07	5.55E-07	6.53E-07	9.64E-05	2.31E-09	0.00E+00
TEEN	6.50E-07	1.44E-06	1.04E-06	9.62E-07	1.14E-06	1.53E-04	4.20E-09	0.00E+00
CHILD	1.26E-06	9.70E-07	2.29E-06	1.58E-06	1.86E-06	3.03E-04	8.14E-09	0.00E+00
INFANT	2.08E-06	1.50E-06	3.56E-06	3.46E-06	3.11E-06	7.36E-04	1.43E-08	0.00E+00
GOATMILK								
ADULT	2.52E-07	2.68E-07	1.03E-06	4.08E-07	6.45E-07	1.16E-04	1.81E-09	0.00E+00
TEEN	4.14E-07	3.40E-07	1.64E-06	7.21E-07	1.15E-06	1.83E-04	3.67E-09	0.00E+00
CHILD	7.71E-07	2.54E-07	3.60E-06	1.25E-06	1.90E-06	3.64E-04	5.84E-09	0.00E+00
INFANT	1.38E-06	3.18E-07	5.24E-06	2.98E-06	3.30E-06	8.84E-04	1.05E-08	0.00E+00
INHAL								
ADULT	1.11E-07	2.19E-06	2.47E-07	1.86E-07	2.51E-07	3.02E-05	1.72E-05	0.00E+00
TEEN	1.48E-07	2.86E-06	3.10E-07	2.53E-07	3.46E-07	3.87E-05	2.52E-05	0.00E+00
CHILD	1.68E-07	3.45E-06	3.86E-07	2.46E-07	3.26E-07	4.63E-05	2.05E-05	0.00E+00
INFANT	1.06E-07	2.22E-06	2.28E-07	2.12E-07	2.15E-07	4.25E-05	1.33E-05	0.00E+00



TABLE 4. DOSES TO MAXIMUM INDIVIDUAL (MREM), JULY-SEPTEMBER 2012 (Continued)

SPECIAL LOCATION NO. 5 A Nearest Garden  
 AT 1.30 MILES SW

ANNUAL BETA AIR DOSE = 6.63E-06 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 1.35E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	9.06E-06	9.06E-06	9.06E-06	9.06E-06	9.06E-06	9.06E-06	9.12E-06	1.63E-05
GROUND	4.96E-04	4.96E-04	4.96E-04	4.96E-04	4.96E-04	4.96E-04	4.96E-04	5.83E-04
VEGET								
ADULT	9.11E-06	6.57E-05	3.16E-05	5.45E-06	2.87E-06	4.83E-04	2.87E-09	0.00E+00
TEEN	1.40E-05	7.01E-05	4.39E-05	8.31E-06	4.32E-06	6.49E-04	4.56E-09	0.00E+00
CHILD	2.80E-05	4.61E-05	9.15E-05	1.31E-05	6.87E-06	1.24E-03	6.96E-09	0.00E+00
MEAT								
ADULT	2.12E-06	1.72E-05	4.50E-07	1.14E-06	1.96E-07	1.29E-05	1.63E-10	0.00E+00
TEEN	1.68E-06	9.26E-06	3.19E-07	8.86E-07	1.49E-07	9.35E-06	1.55E-10	0.00E+00
CHILD	2.60E-06	4.68E-06	5.13E-07	1.05E-06	1.77E-07	1.41E-05	1.82E-10	0.00E+00
COW MILK								
ADULT	1.46E-06	4.60E-06	2.41E-06	2.11E-06	2.48E-06	3.66E-04	8.94E-09	0.00E+00
TEEN	2.47E-06	5.47E-06	3.92E-06	3.65E-06	4.34E-06	5.80E-04	1.60E-08	0.00E+00
CHILD	4.80E-06	3.70E-06	8.66E-06	6.02E-06	7.08E-06	1.15E-03	3.18E-08	0.00E+00
INFANT	7.92E-06	5.73E-06	1.35E-05	1.31E-05	1.18E-05	2.80E-03	5.57E-08	0.00E+00
GOATMILK								
ADULT	9.48E-07	1.02E-06	3.88E-06	1.53E-06	2.45E-06	4.39E-04	4.99E-09	0.00E+00
TEEN	1.56E-06	1.30E-06	6.21E-06	2.71E-06	4.36E-06	6.96E-04	1.00E-08	0.00E+00
CHILD	2.92E-06	9.73E-07	1.36E-05	4.69E-06	7.23E-06	1.38E-03	1.63E-08	0.00E+00
INFANT	5.25E-06	1.22E-06	1.98E-05	1.12E-05	1.25E-05	3.36E-03	2.92E-08	0.00E+00
INHAL								
ADULT	1.91E-07	4.39E-06	4.24E-07	3.21E-07	4.33E-07	5.09E-05	3.00E-05	0.00E+00
TEEN	2.55E-07	6.41E-06	5.32E-07	4.37E-07	5.97E-07	6.52E-05	4.41E-05	0.00E+00
CHILD	2.90E-07	1.20E-05	6.62E-07	4.24E-07	5.64E-07	7.83E-05	3.59E-05	0.00E+00
INFANT	1.82E-07	8.75E-06	3.90E-07	3.65E-07	3.71E-07	7.19E-05	2.36E-05	0.00E+00

TABLE 5. DOSES TO MAXIMUM INDIVIDUAL (MREM), OCTOBER-DECEMBER 2012

SPECIAL LOCATION NO. 1 A Site Boundary  
 AT .69 MILES NNW

ANNUAL BETA AIR DOSE = 3.97E-04 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 5.03E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	3.37E-04	3.37E-04	3.37E-04	3.37E-04	3.37E-04	3.37E-04	3.40E-04	7.23E-04
GROUND	1.55E-02	1.55E-02	1.55E-02	1.55E-02	1.55E-02	1.55E-02	1.55E-02	1.82E-02
VEGET								
ADULT	2.65E-04	2.18E-03	5.65E-05	1.86E-04	4.35E-05	2.20E-03	4.22E-06	0.00E+00
TEEN	4.15E-04	2.32E-03	8.85E-05	2.84E-04	6.43E-05	2.96E-03	7.45E-06	0.00E+00
CHILD	8.34E-04	1.52E-03	2.04E-04	4.35E-04	9.61E-05	5.68E-03	1.09E-05	0.00E+00
MEAT								
ADULT	7.51E-05	6.05E-04	1.01E-05	5.66E-05	1.37E-05	5.93E-05	2.22E-06	0.00E+00
TEEN	5.95E-05	3.26E-04	7.46E-06	4.39E-05	1.01E-05	4.29E-05	1.99E-06	0.00E+00
CHILD	9.24E-05	1.65E-04	1.21E-05	5.19E-05	1.14E-05	6.48E-05	2.25E-06	0.00E+00
COW MILK								
ADULT	5.17E-05	1.76E-04	2.96E-05	8.89E-05	5.98E-05	1.64E-03	3.48E-07	0.00E+00
TEEN	8.92E-05	2.05E-04	4.70E-05	1.50E-04	9.75E-05	2.60E-03	6.78E-07	0.00E+00
CHILD	1.79E-04	1.34E-04	9.69E-05	2.28E-04	1.47E-04	5.13E-03	1.03E-06	0.00E+00
INFANT	2.52E-04	3.70E-04	1.46E-04	4.12E-04	2.07E-04	1.25E-02	2.10E-06	0.00E+00
GOATMILK								
ADULT	9.54E-06	2.31E-05	1.06E-05	1.63E-05	1.66E-05	1.97E-03	7.00E-08	0.00E+00
TEEN	1.62E-05	2.73E-05	1.85E-05	2.80E-05	2.85E-05	3.12E-03	1.40E-07	0.00E+00
CHILD	3.15E-05	1.82E-05	4.28E-05	4.49E-05	4.55E-05	6.16E-03	2.13E-07	0.00E+00
INFANT	4.92E-05	4.65E-05	7.90E-05	9.20E-05	7.32E-05	1.50E-02	4.15E-07	0.00E+00
INHAL								
ADULT	4.20E-06	7.84E-05	1.23E-06	5.32E-06	2.32E-06	2.05E-04	1.28E-03	0.00E+00
TEEN	5.61E-06	8.34E-05	1.66E-06	7.01E-06	3.08E-06	2.55E-04	1.87E-03	0.00E+00
CHILD	6.38E-06	6.78E-05	2.15E-06	6.18E-06	2.77E-06	2.90E-04	1.52E-03	0.00E+00
INFANT	3.41E-06	3.88E-05	1.47E-06	4.08E-06	1.65E-06	2.64E-04	9.75E-04	0.00E+00

TABLE 5. DOSES TO MAXIMUM INDIVIDUAL (MREM), OCTOBER-DECEMBER 2012(Continued)

SPECIAL LOCATION NO. 2 A Site Boundary  
 AT .67 MILES N

ANNUAL BETA AIR DOSE = 5.03E-04 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 5.86E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	3.91E-04	3.91E-04	3.91E-04	3.91E-04	3.91E-04	3.91E-04	3.96E-04	8.68E-04
GROUND	2.53E-02	2.53E-02	2.53E-02	2.53E-02	2.53E-02	2.53E-02	2.53E-02	2.98E-02
VEGET ADULT	4.32E-04	3.56E-03	9.09E-05	3.03E-04	7.09E-05	3.57E-03	6.88E-06	0.00E+00
TEEN	6.77E-04	3.79E-03	1.43E-04	4.64E-04	1.05E-04	4.82E-03	1.22E-05	0.00E+00
CHILD	1.36E-03	2.48E-03	3.29E-04	7.09E-04	1.57E-04	9.23E-03	1.78E-05	0.00E+00
MEAT ADULT	1.23E-04	9.87E-04	1.64E-05	9.25E-05	2.23E-05	9.64E-05	3.62E-06	0.00E+00
TEEN	9.71E-05	5.32E-04	1.22E-05	7.17E-05	1.64E-05	6.98E-05	3.25E-06	0.00E+00
CHILD	1.51E-04	2.70E-04	1.97E-05	8.47E-05	1.87E-05	1.05E-04	3.67E-06	0.00E+00
COW MILK ADULT	8.43E-05	2.87E-04	4.82E-05	1.45E-04	9.76E-05	2.67E-03	5.66E-07	0.00E+00
TEEN	1.46E-04	3.35E-04	7.66E-05	2.44E-04	1.59E-04	4.22E-03	1.10E-06	0.00E+00
CHILD	2.92E-04	2.19E-04	1.58E-04	3.72E-04	2.40E-04	8.34E-03	1.68E-06	0.00E+00
INFANT	4.12E-04	6.03E-04	2.38E-04	6.72E-04	3.37E-04	2.03E-02	3.43E-06	0.00E+00
GOATMILK ADULT	1.55E-05	3.77E-05	1.72E-05	2.66E-05	2.70E-05	3.20E-03	1.10E-07	0.00E+00
TEEN	2.63E-05	4.45E-05	2.99E-05	4.56E-05	4.63E-05	5.06E-03	2.19E-07	0.00E+00
CHILD	5.13E-05	2.97E-05	6.92E-05	7.31E-05	7.41E-05	1.00E-02	3.34E-07	0.00E+00
INFANT	8.01E-05	7.58E-05	1.28E-04	1.50E-04	1.19E-04	2.43E-02	6.54E-07	0.00E+00
INHAL ADULT	7.25E-06	1.36E-04	2.11E-06	9.18E-06	3.97E-06	3.51E-04	2.22E-03	0.00E+00
TEEN	9.70E-06	1.45E-04	2.84E-06	1.21E-05	5.27E-06	4.38E-04	3.24E-03	0.00E+00
CHILD	1.10E-05	1.17E-04	3.67E-06	1.07E-05	4.73E-06	4.97E-04	2.63E-03	0.00E+00
INFANT	5.89E-06	6.71E-05	2.51E-06	7.02E-06	2.81E-06	4.53E-04	1.69E-03	0.00E+00

TABLE 5. DOSES TO MAXIMUM INDIVIDUAL (MREM), OCTOBER-DECEMBER 2012(Continued)

SPECIAL LOCATION NO. 3 A Nearest Resident  
 AT .90 MILES NW

ANNUAL BETA AIR DOSE = 7.61E-04 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 1.16E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 7.79E-04	: 7.79E-04	: 7.79E-04	: 7.79E-04	: 7.79E-04	: 7.79E-04	: 7.86E-04	: 1.57E-03
GROUND	: 5.40E-03	: 5.40E-03	: 5.40E-03	: 5.40E-03	: 5.40E-03	: 5.40E-03	: 5.40E-03	: 6.35E-03
VEGET	:	:	:	:	:	:	:	:
ADULT	: 9.25E-05	: 7.60E-04	: 2.55E-05	: 6.49E-05	: 1.55E-05	: 8.30E-04	: 1.47E-06	: 0.00E+00
TEEN	: 1.45E-04	: 8.09E-04	: 3.98E-05	: 9.93E-05	: 2.30E-05	: 1.12E-03	: 2.60E-06	: 0.00E+00
CHILD	: 2.91E-04	: 5.30E-04	: 9.18E-05	: 1.52E-04	: 3.44E-05	: 2.14E-03	: 3.81E-06	: 0.00E+00
MEAT	:	:	:	:	:	:	:	:
ADULT	: 2.61E-05	: 2.10E-04	: 3.57E-06	: 1.97E-05	: 4.77E-06	: 2.24E-05	: 7.71E-07	: 0.00E+00
TEEN	: 2.07E-05	: 1.13E-04	: 2.65E-06	: 1.53E-05	: 3.51E-06	: 1.62E-05	: 6.91E-07	: 0.00E+00
CHILD	: 3.22E-05	: 5.75E-05	: 4.29E-06	: 1.81E-05	: 3.99E-06	: 2.45E-05	: 7.81E-07	: 0.00E+00
COW MILK	:	:	:	:	:	:	:	:
ADULT	: 1.81E-05	: 6.14E-05	: 1.07E-05	: 3.12E-05	: 2.11E-05	: 6.21E-04	: 1.27E-07	: 0.00E+00
TEEN	: 3.12E-05	: 7.15E-05	: 1.71E-05	: 5.25E-05	: 3.45E-05	: 9.82E-04	: 2.48E-07	: 0.00E+00
CHILD	: 6.26E-05	: 4.68E-05	: 3.54E-05	: 8.01E-05	: 5.21E-05	: 1.94E-03	: 3.78E-07	: 0.00E+00
INFANT	: 8.85E-05	: 1.29E-04	: 5.39E-05	: 1.45E-04	: 7.34E-05	: 4.72E-03	: 7.66E-07	: 0.00E+00
GOATMILK	:	:	:	:	:	:	:	:
ADULT	: 3.55E-06	: 8.16E-06	: 4.49E-06	: 6.04E-06	: 6.15E-06	: 7.45E-04	: 4.31E-08	: 0.00E+00
TEEN	: 5.93E-06	: 9.65E-06	: 7.80E-06	: 1.04E-05	: 1.06E-05	: 1.18E-03	: 8.72E-08	: 0.00E+00
CHILD	: 1.14E-05	: 6.47E-06	: 1.81E-05	: 1.67E-05	: 1.70E-05	: 2.33E-03	: 1.33E-07	: 0.00E+00
INFANT	: 1.79E-05	: 1.63E-05	: 3.30E-05	: 3.44E-05	: 2.74E-05	: 5.66E-03	: 2.52E-07	: 0.00E+00
INHAL	:	:	:	:	:	:	:	:
ADULT	: 1.21E-06	: 2.15E-05	: 4.15E-07	: 1.58E-06	: 7.40E-07	: 5.83E-05	: 3.51E-04	: 0.00E+00
TEEN	: 1.62E-06	: 2.29E-05	: 5.63E-07	: 2.09E-06	: 9.89E-07	: 7.28E-05	: 5.12E-04	: 0.00E+00
CHILD	: 1.85E-06	: 1.92E-05	: 7.33E-07	: 1.86E-06	: 8.93E-07	: 8.28E-05	: 4.15E-04	: 0.00E+00
INFANT	: 1.01E-06	: 1.13E-05	: 5.14E-07	: 1.27E-06	: 5.40E-07	: 7.55E-05	: 2.67E-04	: 0.00E+00

TABLE 5. DOSES TO MAXIMUM INDIVIDUAL (MREM), OCTOBER-DECEMBER 2012(Continued)

SPECIAL LOCATION NO. 4 A Nearest Cow  
 AT 3.50 MILES NNW

ANNUAL BETA AIR DOSE = 7.84E-04 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 1.23E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	8.23E-04	8.23E-04	8.23E-04	8.23E-04	8.23E-04	8.23E-04	8.31E-04	1.64E-03
GROUND	3.15E-04	3.15E-04	3.15E-04	3.15E-04	3.15E-04	3.15E-04	3.15E-04	3.71E-04
VEGET								
ADULT	5.46E-06	4.45E-05	2.62E-06	3.84E-06	9.75E-07	6.08E-05	8.68E-08	0.00E+00
TEEN	8.53E-06	4.74E-05	4.06E-06	5.87E-06	1.45E-06	8.19E-05	1.54E-07	0.00E+00
CHILD	1.71E-05	3.10E-05	9.35E-06	9.00E-06	2.18E-06	1.57E-04	2.25E-07	0.00E+00
MEAT								
ADULT	1.53E-06	1.23E-05	2.21E-07	1.15E-06	2.80E-07	1.64E-06	4.45E-08	0.00E+00
TEEN	1.21E-06	6.61E-06	1.64E-07	8.93E-07	2.07E-07	1.18E-06	3.99E-08	0.00E+00
CHILD	1.88E-06	3.35E-06	2.68E-07	1.05E-06	2.35E-07	1.79E-06	4.51E-08	0.00E+00
COW MILK								
ADULT	1.08E-06	3.59E-06	7.03E-07	1.86E-06	1.29E-06	4.56E-05	8.51E-09	0.00E+00
TEEN	1.86E-06	4.19E-06	1.13E-06	3.13E-06	2.11E-06	7.21E-05	1.68E-08	0.00E+00
CHILD	3.71E-06	2.74E-06	2.39E-06	4.80E-06	3.20E-06	1.43E-04	2.56E-08	0.00E+00
INFANT	5.27E-06	7.53E-06	3.71E-06	8.73E-06	4.56E-06	3.47E-04	5.10E-08	0.00E+00
GOATMILK								
ADULT	2.50E-07	4.98E-07	4.14E-07	4.20E-07	4.30E-07	5.47E-05	6.13E-09	0.00E+00
TEEN	4.03E-07	5.93E-07	7.20E-07	7.25E-07	7.45E-07	8.66E-05	1.26E-08	0.00E+00
CHILD	7.52E-07	4.02E-07	1.68E-06	1.18E-06	1.20E-06	1.71E-04	1.93E-08	0.00E+00
INFANT	1.19E-06	9.76E-07	2.99E-06	2.47E-06	1.96E-06	4.16E-04	3.55E-08	0.00E+00
INHAL								
ADULT	2.08E-07	2.48E-06	1.31E-07	3.13E-07	1.97E-07	9.15E-06	4.08E-05	0.00E+00
TEEN	2.81E-07	2.63E-06	1.79E-07	4.22E-07	2.68E-07	1.15E-05	5.96E-05	0.00E+00
CHILD	3.29E-07	2.42E-06	2.39E-07	3.92E-07	2.47E-07	1.32E-05	4.84E-05	0.00E+00
INFANT	1.99E-07	1.65E-06	1.77E-07	3.11E-07	1.57E-07	1.21E-05	3.11E-05	0.00E+00

TABLE 5. DOSES TO MAXIMUM INDIVIDUAL (MREM), OCTOBER-DECEMBER 2012(Continued)

SPECIAL LOCATION NO. 5 A Nearest Garden  
 AT 2.80 MILES NNW

ANNUAL BETA AIR DOSE = 8.46E-04 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 1.32E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	8.87E-04	8.87E-04	8.87E-04	8.87E-04	8.87E-04	8.87E-04	8.95E-04	1.77E-03
GROUND	5.14E-04	5.14E-04	5.14E-04	5.14E-04	5.14E-04	5.14E-04	5.14E-04	6.04E-04
VEGET								
ADULT	8.88E-06	7.25E-05	4.04E-06	6.24E-06	1.57E-06	9.64E-05	1.41E-07	0.00E+00
TEEN	1.39E-05	7.72E-05	6.26E-06	9.55E-06	2.33E-06	1.30E-04	2.50E-07	0.00E+00
CHILD	2.79E-05	5.05E-05	1.44E-05	1.46E-05	3.51E-06	2.49E-04	3.66E-07	0.00E+00
MEAT								
ADULT	2.49E-06	2.00E-05	3.58E-07	1.88E-06	4.57E-07	2.60E-06	7.27E-08	0.00E+00
TEEN	1.97E-06	1.08E-05	2.66E-07	1.45E-06	3.37E-07	1.88E-06	6.51E-08	0.00E+00
CHILD	3.06E-06	5.46E-06	4.33E-07	1.72E-06	3.83E-07	2.84E-06	7.36E-08	0.00E+00
COW MILK								
ADULT	1.76E-06	5.86E-06	1.13E-06	3.02E-06	2.08E-06	7.23E-05	1.36E-08	0.00E+00
TEEN	3.02E-06	6.83E-06	1.82E-06	5.09E-06	3.41E-06	1.14E-04	2.68E-08	0.00E+00
CHILD	6.04E-06	4.47E-06	3.82E-06	7.79E-06	5.19E-06	2.26E-04	4.09E-08	0.00E+00
INFANT	8.57E-06	1.23E-05	5.93E-06	1.42E-05	7.37E-06	5.50E-04	8.17E-08	0.00E+00
GOATMILK								
ADULT	3.99E-07	8.07E-07	6.44E-07	6.70E-07	6.86E-07	8.67E-05	9.25E-09	0.00E+00
TEEN	6.45E-07	9.60E-07	1.12E-06	1.16E-06	1.19E-06	1.37E-04	1.89E-08	0.00E+00
CHILD	1.21E-06	6.50E-07	2.61E-06	1.89E-06	1.91E-06	2.71E-04	2.91E-08	0.00E+00
INFANT	1.91E-06	1.59E-06	4.66E-06	3.93E-06	3.12E-06	6.60E-04	5.36E-08	0.00E+00
INHAL								
ADULT	2.84E-07	3.75E-06	1.58E-07	4.13E-07	2.44E-07	1.28E-05	6.23E-05	0.00E+00
TEEN	3.82E-07	3.90E-06	2.16E-07	5.53E-07	3.31E-07	1.61E-05	9.11E-05	0.00E+00
CHILD	4.45E-07	3.19E-06	2.87E-07	5.09E-07	3.04E-07	1.84E-05	7.39E-05	0.00E+00
INFANT	2.62E-07	2.04E-06	2.11E-07	3.92E-07	1.92E-07	1.68E-05	4.75E-05	0.00E+00

TABLE 6. DOSES TO MAXIMUM INDIVIDUAL (MREM), JULY-DECEMBER 2012

SPECIAL LOCATION NO. 1 A Site Boundary  
 AT .69 MILES NNW

ANNUAL BETA AIR DOSE = 6.03E-04 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 8.58E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	5.75E-04	5.75E-04	5.75E-04	5.75E-04	5.75E-04	5.75E-04	5.81E-04	1.19E-03
GROUND	2.28E-02	2.28E-02	2.28E-02	2.28E-02	2.28E-02	2.28E-02	2.28E-02	2.68E-02
VEGET								
ADULT	3.98E-04	3.15E-03	4.85E-04	2.66E-04	8.25E-05	8.55E-03	4.40E-06	0.00E+00
TEEN	6.20E-04	3.36E-03	6.84E-04	4.06E-04	1.23E-04	1.15E-02	7.77E-06	0.00E+00
CHILD	1.24E-03	2.20E-03	1.45E-03	6.26E-04	1.89E-04	2.21E-02	1.14E-05	0.00E+00
MEAT								
ADULT	1.07E-04	8.61E-04	1.65E-05	7.42E-05	1.68E-05	2.29E-04	2.30E-06	0.00E+00
TEEN	8.45E-05	4.64E-04	1.20E-05	5.76E-05	1.24E-05	1.66E-04	2.06E-06	0.00E+00
CHILD	1.31E-04	2.35E-04	1.94E-05	6.80E-05	1.42E-05	2.51E-04	2.33E-06	0.00E+00
COW MILK								
ADULT	7.29E-05	2.45E-04	6.28E-05	1.20E-04	9.44E-05	6.45E-03	4.48E-07	0.00E+00
TEEN	1.25E-04	2.86E-04	1.01E-04	2.03E-04	1.58E-04	1.02E-02	8.59E-07	0.00E+00
CHILD	2.49E-04	1.89E-04	2.15E-04	3.16E-04	2.45E-04	2.02E-02	1.38E-06	0.00E+00
INFANT	3.67E-04	4.61E-04	3.29E-04	5.99E-04	3.68E-04	4.92E-02	2.73E-06	0.00E+00
GOATMILK								
ADULT	2.21E-05	3.74E-05	6.27E-05	3.66E-05	4.88E-05	7.74E-03	1.10E-07	0.00E+00
TEEN	3.70E-05	4.54E-05	1.02E-04	6.39E-05	8.57E-05	1.22E-02	2.18E-07	0.00E+00
CHILD	7.07E-05	3.16E-05	2.25E-04	1.07E-04	1.40E-04	2.43E-02	3.43E-07	0.00E+00
INFANT	1.19E-04	6.42E-05	3.43E-04	2.40E-04	2.37E-04	5.90E-02	6.49E-07	0.00E+00
INHAL								
ADULT	7.89E-06	1.44E-04	8.97E-06	1.11E-05	9.50E-06	1.08E-03	1.95E-03	0.00E+00
TEEN	1.05E-05	1.57E-04	1.13E-05	1.49E-05	1.30E-05	1.38E-03	2.85E-03	0.00E+00
CHILD	1.20E-05	1.06E-04	1.41E-05	1.38E-05	1.21E-05	1.63E-03	2.31E-03	0.00E+00
INFANT	6.84E-06	5.29E-05	8.38E-06	1.04E-05	7.78E-06	1.49E-03	1.48E-03	0.00E+00

TABLE 6. DOSES TO MAXIMUM INDIVIDUAL (MREM), JULY-DECEMBER 2012 (Continued)

SPECIAL LOCATION NO. 2 A Site Boundary  
 AT .67 MILES N

ANNUAL BETA AIR DOSE = 1.10E-03 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 1.53E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.03E-03	1.03E-03	1.03E-03	1.03E-03	1.03E-03	1.03E-03	1.04E-03	2.13E-03
GROUND	3.89E-02	3.89E-02	3.89E-02	3.89E-02	3.89E-02	3.89E-02	3.89E-02	4.58E-02
VEGET								
ADULT	6.80E-04	5.39E-03	8.35E-04	4.55E-04	1.43E-04	1.49E-02	7.55E-06	0.00E+00
TEEN	1.06E-03	5.74E-03	1.18E-03	6.95E-04	2.13E-04	2.01E-02	1.33E-05	0.00E+00
CHILD	2.13E-03	3.76E-03	2.50E-03	1.07E-03	3.28E-04	3.85E-02	1.95E-05	0.00E+00
MEAT								
ADULT	1.82E-04	1.47E-03	2.83E-05	1.27E-04	2.87E-05	4.00E-04	3.94E-06	0.00E+00
TEEN	1.44E-04	7.92E-04	2.06E-05	9.83E-05	2.13E-05	2.90E-04	3.53E-06	0.00E+00
CHILD	2.24E-04	4.01E-04	3.33E-05	1.16E-04	2.43E-05	4.37E-04	3.99E-06	0.00E+00
COW MILK								
ADULT	1.25E-04	4.18E-04	1.08E-04	2.06E-04	1.63E-04	1.13E-02	8.17E-07	0.00E+00
TEEN	2.15E-04	4.90E-04	1.74E-04	3.49E-04	2.72E-04	1.79E-02	1.56E-06	0.00E+00
CHILD	4.28E-04	3.23E-04	3.72E-04	5.42E-04	4.23E-04	3.54E-02	2.54E-06	0.00E+00
INFANT	6.30E-04	7.88E-04	5.71E-04	1.03E-03	6.37E-04	8.61E-02	4.98E-06	0.00E+00
GOATMILK								
ADULT	3.85E-05	6.46E-05	1.09E-04	6.39E-05	8.54E-05	1.35E-02	2.22E-07	0.00E+00
TEEN	6.44E-05	7.84E-05	1.77E-04	1.12E-04	1.50E-04	2.14E-02	4.44E-07	0.00E+00
CHILD	1.23E-04	5.48E-05	3.91E-04	1.87E-04	2.46E-04	4.25E-02	6.99E-07	0.00E+00
INFANT	2.07E-04	1.10E-04	5.99E-04	4.19E-04	4.16E-04	1.03E-01	1.31E-06	0.00E+00
INHAL								
ADULT	1.30E-05	2.70E-04	1.50E-05	1.88E-05	1.69E-05	1.86E-03	3.14E-03	0.00E+00
TEEN	1.74E-05	3.40E-04	1.90E-05	2.52E-05	2.31E-05	2.37E-03	4.59E-03	0.00E+00
CHILD	1.98E-05	4.77E-04	2.37E-05	2.34E-05	2.16E-05	2.82E-03	3.73E-03	0.00E+00
INFANT	1.14E-05	3.29E-04	1.43E-05	1.80E-05	1.39E-05	2.58E-03	2.41E-03	0.00E+00



TABLE 6. DOSES TO MAXIMUM INDIVIDUAL (MREM), JULY-DECEMBER 2012 (Continued)

SPECIAL LOCATION NO. 3 A Nearest Resident  
 AT .90 MILES NW

ANNUAL BETA AIR DOSE = 1.12E-03 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 1.74E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.17E-03	1.17E-03	1.17E-03	1.17E-03	1.17E-03	1.17E-03	1.18E-03	2.34E-03
GROUND	8.08E-03	8.08E-03	8.08E-03	8.08E-03	8.08E-03	8.08E-03	8.08E-03	9.51E-03
VEGET								
ADULT	1.42E-04	1.12E-03	1.81E-04	9.49E-05	3.03E-05	3.21E-03	1.58E-06	0.00E+00
TEEN	2.21E-04	1.19E-03	2.57E-04	1.45E-04	4.51E-05	4.31E-03	2.79E-06	0.00E+00
CHILD	4.42E-04	7.81E-04	5.47E-04	2.24E-04	6.95E-05	8.26E-03	4.09E-06	0.00E+00
MEAT								
ADULT	3.78E-05	3.05E-04	5.97E-06	2.63E-05	5.99E-06	8.59E-05	8.17E-07	0.00E+00
TEEN	2.99E-05	1.64E-04	4.36E-06	2.04E-05	4.44E-06	6.22E-05	7.32E-07	0.00E+00
CHILD	4.65E-05	8.32E-05	7.05E-06	2.41E-05	5.08E-06	9.39E-05	8.28E-07	0.00E+00
COW MILK								
ADULT	2.62E-05	8.70E-05	2.31E-05	4.31E-05	3.43E-05	2.42E-03	1.80E-07	0.00E+00
TEEN	4.49E-05	1.02E-04	3.72E-05	7.31E-05	5.74E-05	3.83E-03	3.47E-07	0.00E+00
CHILD	8.93E-05	6.72E-05	7.97E-05	1.14E-04	8.93E-05	7.60E-03	5.63E-07	0.00E+00
INFANT	1.32E-04	1.64E-04	1.23E-04	2.17E-04	1.35E-04	1.85E-02	1.10E-06	0.00E+00
GOATMILK								
ADULT	8.39E-06	1.36E-05	2.37E-05	1.39E-05	1.83E-05	2.91E-03	8.04E-08	0.00E+00
TEEN	1.39E-05	1.65E-05	3.87E-05	2.42E-05	3.23E-05	4.60E-03	1.63E-07	0.00E+00
CHILD	2.62E-05	1.16E-05	8.60E-05	4.06E-05	5.29E-05	9.13E-03	2.54E-07	0.00E+00
INFANT	4.43E-05	2.31E-05	1.33E-04	9.12E-05	8.95E-05	2.22E-02	4.69E-07	0.00E+00
INHAL								
ADULT	1.86E-06	3.65E-05	2.14E-06	2.74E-06	2.46E-06	2.57E-04	4.23E-04	0.00E+00
TEEN	2.48E-06	4.60E-05	2.73E-06	3.68E-06	3.36E-06	3.28E-04	6.19E-04	0.00E+00
CHILD	2.84E-06	6.55E-05	3.43E-06	3.42E-06	3.14E-06	3.90E-04	5.03E-04	0.00E+00
INFANT	1.66E-06	4.55E-05	2.11E-06	2.67E-06	2.03E-06	3.58E-04	3.25E-04	0.00E+00

TABLE 6. DOSES TO MAXIMUM INDIVIDUAL (MREM), JULY-DECEMBER 2012 (Continued)

SPECIAL LOCATION NO. 4 A Nearest Cow  
 AT 3.50 MILES NNW

ANNUAL BETA AIR DOSE = 9.11E-04 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 1.43E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	9.59E-04	9.59E-04	9.59E-04	9.59E-04	9.59E-04	9.59E-04	9.69E-04	1.92E-03
GROUND	4.52E-04	4.52E-04	4.52E-04	4.52E-04	4.52E-04	4.52E-04	4.52E-04	5.32E-04
VEGET								
ADULT	7.96E-06	6.27E-05	1.09E-05	5.35E-06	1.75E-06	1.89E-04	8.94E-08	0.00E+00
TEEN	1.24E-05	6.68E-05	1.56E-05	8.17E-06	2.61E-06	2.54E-04	1.58E-07	0.00E+00
CHILD	2.49E-05	4.38E-05	3.35E-05	1.26E-05	4.03E-06	4.87E-04	2.32E-07	0.00E+00
MEAT								
ADULT	2.11E-06	1.70E-05	3.43E-07	1.47E-06	3.37E-07	5.06E-06	4.55E-08	0.00E+00
TEEN	1.67E-06	9.18E-06	2.51E-07	1.14E-06	2.50E-07	3.67E-06	4.08E-08	0.00E+00
CHILD	2.60E-06	4.65E-06	4.08E-07	1.35E-06	2.86E-07	5.54E-06	4.61E-08	0.00E+00
COW MILK								
ADULT	1.48E-06	4.87E-06	1.35E-06	2.45E-06	1.96E-06	1.43E-04	1.10E-08	0.00E+00
TEEN	2.54E-06	5.71E-06	2.18E-06	4.15E-06	3.28E-06	2.26E-04	2.14E-08	0.00E+00
CHILD	5.04E-06	3.77E-06	4.70E-06	6.46E-06	5.12E-06	4.48E-04	3.44E-08	0.00E+00
INFANT	7.45E-06	9.17E-06	7.32E-06	1.23E-05	7.75E-06	1.09E-03	6.67E-08	0.00E+00
GOATMILK								
ADULT	5.06E-07	7.75E-07	1.44E-06	8.34E-07	1.08E-06	1.71E-04	7.90E-09	0.00E+00
TEEN	8.23E-07	9.45E-07	2.36E-06	1.46E-06	1.90E-06	2.71E-04	1.61E-08	0.00E+00
CHILD	1.54E-06	6.64E-07	5.28E-06	2.45E-06	3.13E-06	5.38E-04	2.50E-08	0.00E+00
INFANT	2.59E-06	1.31E-06	8.25E-06	5.48E-06	5.29E-06	1.31E-03	4.58E-08	0.00E+00
INHAL								
ADULT	3.33E-07	4.84E-06	3.89E-07	5.26E-07	4.70E-07	3.98E-05	5.86E-05	0.00E+00
TEEN	4.47E-07	5.84E-06	5.06E-07	7.11E-07	6.44E-07	5.07E-05	8.58E-05	0.00E+00
CHILD	5.20E-07	7.20E-06	6.48E-07	6.72E-07	6.03E-07	6.03E-05	6.96E-05	0.00E+00
INFANT	3.20E-07	4.96E-06	4.25E-07	5.54E-07	3.91E-07	5.53E-05	4.49E-05	0.00E+00

TABLE 6. DOSES TO MAXIMUM INDIVIDUAL (MREM), JULY-DECEMBER 2012 (Continued)

SPECIAL LOCATION NO. 5 A Nearest Garden  
 AT 2.80 MILES NNW

ANNUAL BETA AIR DOSE = 9.74E-04 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 1.53E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.02E-03	1.02E-03	1.02E-03	1.02E-03	1.02E-03	1.02E-03	1.03E-03	2.05E-03
GROUND	7.67E-04	7.67E-04	7.67E-04	7.67E-04	7.67E-04	7.67E-04	7.67E-04	9.02E-04
VEGET								
ADULT	1.35E-05	1.06E-04	1.82E-05	9.05E-06	2.94E-06	3.15E-04	1.51E-07	0.00E+00
TEEN	2.10E-05	1.13E-04	2.59E-05	1.38E-05	4.38E-06	4.24E-04	2.67E-07	0.00E+00
CHILD	4.21E-05	7.42E-05	5.54E-05	2.13E-05	6.75E-06	8.12E-04	3.92E-07	0.00E+00
MEAT								
ADULT	3.59E-06	2.89E-05	5.78E-07	2.50E-06	5.71E-07	8.44E-06	7.73E-08	0.00E+00
TEEN	2.84E-06	1.56E-05	4.23E-07	1.94E-06	4.23E-07	6.12E-06	6.93E-08	0.00E+00
CHILD	4.41E-06	7.89E-06	6.85E-07	2.29E-06	4.84E-07	9.23E-06	7.83E-08	0.00E+00
COW MILK								
ADULT	2.51E-06	8.26E-06	2.26E-06	4.13E-06	3.30E-06	2.38E-04	1.81E-08	0.00E+00
TEEN	4.30E-06	9.68E-06	3.65E-06	7.01E-06	5.53E-06	3.77E-04	3.51E-08	0.00E+00
CHILD	8.53E-06	6.39E-06	7.85E-06	1.09E-05	8.61E-06	7.47E-04	5.64E-08	0.00E+00
INFANT	1.26E-05	1.56E-05	1.22E-05	2.08E-05	1.30E-05	1.82E-03	1.10E-07	0.00E+00
GOATMILK								
ADULT	8.39E-07	1.31E-06	2.39E-06	1.38E-06	1.80E-06	2.85E-04	1.18E-08	0.00E+00
TEEN	1.37E-06	1.59E-06	3.91E-06	2.42E-06	3.17E-06	4.52E-04	2.40E-08	0.00E+00
CHILD	2.57E-06	1.12E-06	8.73E-06	4.06E-06	5.21E-06	8.96E-04	3.72E-08	0.00E+00
INFANT	4.34E-06	2.21E-06	1.36E-05	9.10E-06	8.82E-06	2.18E-03	6.82E-08	0.00E+00
INHAL								
ADULT	4.69E-07	7.32E-06	5.45E-07	7.24E-07	6.46E-07	5.90E-05	9.01E-05	0.00E+00
TEEN	6.29E-07	8.66E-06	7.05E-07	9.77E-07	8.85E-07	7.51E-05	1.32E-04	0.00E+00
CHILD	7.27E-07	9.61E-06	8.97E-07	9.19E-07	8.27E-07	8.91E-05	1.07E-04	0.00E+00
INFANT	4.41E-07	6.34E-06	5.77E-07	7.46E-07	5.36E-07	8.18E-05	6.90E-05	0.00E+00

TABLE 7. DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-DECEMBER 2012

SPECIAL LOCATION NO. 1 A Site Boundary  
 AT .69 MILES NNW

ANNUAL BETA AIR DOSE = 6.69E-04 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 9.56E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	6.41E-04	6.41E-04	6.41E-04	6.41E-04	6.41E-04	6.41E-04	6.47E-04	1.32E-03
GROUND	2.73E-02	2.73E-02	2.73E-02	2.73E-02	2.73E-02	2.73E-02	2.73E-02	3.21E-02
VEGET								
ADULT	5.06E-04	3.73E-03	5.27E-04	3.62E-04	1.14E-04	1.06E-02	1.09E-05	0.00E+00
TEEN	7.62E-04	3.97E-03	7.56E-04	5.58E-04	1.72E-04	1.43E-02	2.00E-05	0.00E+00
CHILD	1.49E-03	2.60E-03	1.62E-03	8.77E-04	2.69E-04	2.74E-02	3.01E-05	0.00E+00
MEAT								
ADULT	1.27E-04	1.01E-03	1.99E-05	8.68E-05	1.84E-05	2.84E-04	2.81E-06	0.00E+00
TEEN	9.99E-05	5.45E-04	1.49E-05	6.74E-05	1.38E-05	2.06E-04	2.54E-06	0.00E+00
CHILD	1.54E-04	2.76E-04	2.47E-05	8.03E-05	1.60E-05	3.11E-04	2.90E-06	0.00E+00
COW MILK								
ADULT	1.05E-04	2.79E-04	9.51E-05	1.66E-04	1.15E-04	8.00E-03	5.04E-06	0.00E+00
TEEN	1.60E-04	3.27E-04	1.60E-04	2.84E-04	1.95E-04	1.27E-02	1.03E-05	0.00E+00
CHILD	2.87E-04	2.16E-04	3.58E-04	4.55E-04	3.08E-04	2.51E-02	1.60E-05	0.00E+00
INFANT	4.19E-04	4.80E-04	5.65E-04	8.80E-04	4.73E-04	6.11E-02	2.91E-05	0.00E+00
GOATMILK								
ADULT	1.05E-04	4.55E-05	1.55E-04	1.64E-04	1.00E-04	9.60E-03	1.38E-05	0.00E+00
TEEN	1.18E-04	5.54E-05	2.70E-04	2.89E-04	1.76E-04	1.52E-02	2.86E-05	0.00E+00
CHILD	1.37E-04	3.89E-05	6.30E-04	4.97E-04	2.91E-04	3.01E-02	4.39E-05	0.00E+00
INFANT	1.92E-04	7.04E-05	1.00E-03	1.01E-03	4.84E-04	7.33E-02	7.95E-05	0.00E+00
INHAL								
ADULT	8.40E-06	1.51E-04	8.75E-06	1.19E-05	9.97E-06	1.09E-03	1.90E-03	0.00E+00
TEEN	1.08E-05	1.85E-04	1.13E-05	1.60E-05	1.36E-05	1.39E-03	2.78E-03	0.00E+00
CHILD	1.18E-05	2.44E-04	1.43E-05	1.49E-05	1.27E-05	1.65E-03	2.25E-03	0.00E+00
INFANT	6.76E-06	1.66E-04	8.76E-06	1.14E-05	8.21E-06	1.51E-03	1.45E-03	0.00E+00

TABLE 7. DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-DECEMBER 2012 (Continued)

SPECIAL LOCATION NO. 2 A Site Boundary  
 AT .67 MILES N

ANNUAL BETA AIR DOSE = 1.06E-03 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 1.51E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.01E-03	1.01E-03	1.01E-03	1.01E-03	1.01E-03	1.01E-03	1.02E-03	2.09E-03
GROUND	4.59E-02	4.59E-02	4.59E-02	4.59E-02	4.59E-02	4.59E-02	4.59E-02	5.40E-02
VEGET								
ADULT	8.51E-04	6.27E-03	8.96E-04	6.10E-04	1.92E-04	1.80E-02	1.84E-05	0.00E+00
TEEN	1.28E-03	6.68E-03	1.28E-03	9.39E-04	2.90E-04	2.42E-02	3.37E-05	0.00E+00
CHILD	2.50E-03	4.37E-03	2.76E-03	1.48E-03	4.54E-04	4.64E-02	5.06E-05	0.00E+00
MEAT								
ADULT	2.14E-04	1.70E-03	3.35E-05	1.46E-04	3.10E-05	4.82E-04	4.72E-06	0.00E+00
TEEN	1.68E-04	9.16E-04	2.51E-05	1.13E-04	2.32E-05	3.49E-04	4.27E-06	0.00E+00
CHILD	2.59E-04	4.64E-04	4.17E-05	1.35E-04	2.69E-05	5.27E-04	4.87E-06	0.00E+00
COW MILK								
ADULT	1.77E-04	4.70E-04	1.61E-04	2.79E-04	1.95E-04	1.36E-02	8.48E-06	0.00E+00
TEEN	2.70E-04	5.50E-04	2.70E-04	4.78E-04	3.29E-04	2.15E-02	1.74E-05	0.00E+00
CHILD	4.84E-04	3.64E-04	6.04E-04	7.67E-04	5.19E-04	4.26E-02	2.69E-05	0.00E+00
INFANT	7.06E-04	8.07E-04	9.55E-04	1.48E-03	7.98E-04	1.04E-01	4.90E-05	0.00E+00
GOATMILK								
ADULT	1.78E-04	7.66E-05	2.62E-04	2.77E-04	1.69E-04	1.63E-02	2.33E-05	0.00E+00
TEEN	1.99E-04	9.34E-05	4.56E-04	4.87E-04	2.98E-04	2.58E-02	4.81E-05	0.00E+00
CHILD	2.31E-04	6.57E-05	1.06E-03	8.37E-04	4.92E-04	5.11E-02	7.40E-05	0.00E+00
INFANT	3.25E-04	1.19E-04	1.69E-03	1.70E-03	8.17E-04	1.24E-01	1.34E-04	0.00E+00
INHAL								
ADULT	1.30E-05	2.32E-04	1.36E-05	1.86E-05	1.58E-05	1.74E-03	2.92E-03	0.00E+00
TEEN	1.67E-05	2.84E-04	1.76E-05	2.49E-05	2.16E-05	2.22E-03	4.27E-03	0.00E+00
CHILD	1.84E-05	3.76E-04	2.23E-05	2.32E-05	2.02E-05	2.63E-03	3.47E-03	0.00E+00
INFANT	1.05E-05	2.56E-04	1.37E-05	1.79E-05	1.30E-05	2.41E-03	2.24E-03	0.00E+00

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TABLE 7. DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-DECEMBER 2012 (Continued)

SPECIAL LOCATION NO. 3 A Nearest Resident  
 AT .90 MILES NW

ANNUAL BETA AIR DOSE = 1.19E-03 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 1.86E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.25E-03	1.25E-03	1.25E-03	1.25E-03	1.25E-03	1.25E-03	1.26E-03	2.50E-03
GROUND	1.10E-02	1.10E-02	1.10E-02	1.10E-02	1.10E-02	1.10E-02	1.10E-02	1.29E-02
VEGET								
ADULT	2.04E-04	1.50E-03	2.23E-04	1.46E-04	4.67E-05	4.44E-03	4.41E-06	0.00E+00
TEEN	3.07E-04	1.60E-03	3.21E-04	2.25E-04	7.06E-05	5.98E-03	8.08E-06	0.00E+00
CHILD	5.98E-04	1.04E-03	6.91E-04	3.54E-04	1.10E-04	1.15E-02	1.21E-05	0.00E+00
MEAT								
ADULT	5.12E-05	4.06E-04	8.12E-06	3.49E-05	7.44E-06	1.19E-04	1.13E-06	0.00E+00
TEEN	4.01E-05	2.19E-04	6.08E-06	2.71E-05	5.57E-06	8.63E-05	1.02E-06	0.00E+00
CHILD	6.17E-05	1.11E-04	1.01E-05	3.23E-05	6.45E-06	1.30E-04	1.16E-06	0.00E+00
COW MILK								
ADULT	4.27E-05	1.12E-04	3.91E-05	6.71E-05	4.72E-05	3.35E-03	2.04E-06	0.00E+00
TEEN	6.49E-05	1.32E-04	6.57E-05	1.15E-04	7.98E-05	5.31E-03	4.18E-06	0.00E+00
CHILD	1.16E-04	8.71E-05	1.47E-04	1.85E-04	1.26E-04	1.05E-02	6.46E-06	0.00E+00
INFANT	1.70E-04	1.93E-04	2.34E-04	3.58E-04	1.94E-04	2.56E-02	1.18E-05	0.00E+00
GOATMILK								
ADULT	4.29E-05	1.85E-05	6.40E-05	6.68E-05	4.12E-05	4.02E-03	5.60E-06	0.00E+00
TEEN	4.81E-05	2.26E-05	1.11E-04	1.18E-04	7.27E-05	6.37E-03	1.16E-05	0.00E+00
CHILD	5.62E-05	1.59E-05	2.60E-04	2.02E-04	1.20E-04	1.26E-02	1.78E-05	0.00E+00
INFANT	7.93E-05	2.86E-05	4.14E-04	4.12E-04	2.00E-04	3.07E-02	3.22E-05	0.00E+00
INHAL								
ADULT	2.18E-06	3.73E-05	2.29E-06	3.14E-06	2.66E-06	2.80E-04	4.68E-04	0.00E+00
TEEN	2.80E-06	4.57E-05	2.96E-06	4.23E-06	3.65E-06	3.56E-04	6.85E-04	0.00E+00
CHILD	3.09E-06	6.16E-05	3.77E-06	3.95E-06	3.41E-06	4.22E-04	5.56E-04	0.00E+00
INFANT	1.79E-06	4.24E-05	2.35E-06	3.07E-06	2.20E-06	3.87E-04	3.58E-04	0.00E+00

TABLE 7. DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-DECEMBER 2012 (Continued)

SPECIAL LOCATION NO. 4 A Nearest Cow  
AT 3.50 MILES NNW

ANNUAL BETA AIR DOSE = 7.99E-04 MILLRADS  
ANNUAL GAMMA AIR DOSE = 1.26E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	8.44E-04	8.44E-04	8.44E-04	8.44E-04	8.44E-04	8.44E-04	8.52E-04	1.68E-03
GROUND	5.46E-04	5.46E-04	5.46E-04	5.46E-04	5.46E-04	5.46E-04	5.46E-04	6.42E-04
VEGET								
ADULT	1.02E-05	7.47E-05	1.20E-05	7.33E-06	2.40E-06	2.34E-04	2.21E-07	0.00E+00
TEEN	1.53E-05	7.95E-05	1.74E-05	1.13E-05	3.63E-06	3.15E-04	4.05E-07	0.00E+00
CHILD	2.99E-05	5.21E-05	3.76E-05	1.78E-05	5.68E-06	6.04E-04	6.07E-07	0.00E+00
MEAT								
ADULT	2.55E-06	2.02E-05	4.15E-07	1.74E-06	3.73E-07	6.28E-06	5.59E-08	0.00E+00
TEEN	2.00E-06	1.09E-05	3.11E-07	1.35E-06	2.79E-07	4.55E-06	5.06E-08	0.00E+00
CHILD	3.07E-06	5.51E-06	5.18E-07	1.61E-06	3.24E-07	6.87E-06	5.77E-08	0.00E+00
COW MILK								
ADULT	2.15E-06	5.60E-06	2.01E-06	3.38E-06	2.41E-06	1.77E-04	1.02E-07	0.00E+00
TEEN	3.27E-06	6.57E-06	3.39E-06	5.80E-06	4.08E-06	2.80E-04	2.10E-07	0.00E+00
CHILD	5.85E-06	4.35E-06	7.62E-06	9.33E-06	6.44E-06	5.54E-04	3.25E-07	0.00E+00
INFANT	8.58E-06	9.63E-06	1.21E-05	1.81E-05	9.95E-06	1.35E-03	5.92E-07	0.00E+00
GOATMILK								
ADULT	2.18E-06	9.42E-07	3.32E-06	3.40E-06	2.12E-06	2.12E-04	2.82E-07	0.00E+00
TEEN	2.45E-06	1.15E-06	5.77E-06	5.98E-06	3.75E-06	3.36E-04	5.84E-07	0.00E+00
CHILD	2.89E-06	8.14E-07	1.35E-05	1.03E-05	6.19E-06	6.65E-04	8.97E-07	0.00E+00
INFANT	4.09E-06	1.45E-06	2.16E-05	2.10E-05	1.03E-05	1.62E-03	1.62E-06	0.00E+00
INHAL								
ADULT	3.28E-07	4.27E-06	3.57E-07	5.07E-07	4.37E-07	3.80E-05	5.62E-05	0.00E+00
TEEN	4.27E-07	4.98E-06	4.70E-07	6.87E-07	6.00E-07	4.84E-05	8.22E-05	0.00E+00
CHILD	4.83E-07	5.69E-06	6.07E-07	6.50E-07	5.61E-07	5.72E-05	6.67E-05	0.00E+00
INFANT	2.95E-07	3.88E-06	4.01E-07	5.32E-07	3.64E-07	5.25E-05	4.29E-05	0.00E+00

TABLE 7. DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-DECEMBER 2012 (Continued)

SPECIAL LOCATION NO. 5 A Nearest Garden  
 AT 2.80 MILES NNW

ANNUAL BETA AIR DOSE = 8.63E-04 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 1.36E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	9.10E-04	9.10E-04	9.10E-04	9.10E-04	9.10E-04	9.10E-04	9.19E-04	1.82E-03
GROUND	9.36E-04	9.36E-04	9.36E-04	9.36E-04	9.36E-04	9.36E-04	9.36E-04	1.10E-03
VEGET								
ADULT	1.75E-05	1.28E-04	2.02E-05	1.26E-05	4.09E-06	3.97E-04	3.78E-07	0.00E+00
TEEN	2.63E-05	1.36E-04	2.93E-05	1.93E-05	6.18E-06	5.34E-04	6.93E-07	0.00E+00
CHILD	5.13E-05	8.93E-05	6.33E-05	3.04E-05	9.68E-06	1.02E-03	1.04E-06	0.00E+00
MEAT								
ADULT	4.37E-06	3.47E-05	7.08E-07	2.98E-06	6.39E-07	1.06E-05	9.59E-08	0.00E+00
TEEN	3.42E-06	1.87E-05	5.30E-07	2.32E-06	4.79E-07	7.71E-06	8.69E-08	0.00E+00
CHILD	5.27E-06	9.45E-06	8.83E-07	2.76E-06	5.55E-07	1.16E-05	9.90E-08	0.00E+00
COW MILK								
ADULT	3.68E-06	9.61E-06	3.43E-06	5.79E-06	4.11E-06	2.99E-04	1.75E-07	0.00E+00
TEEN	5.59E-06	1.13E-05	5.77E-06	9.93E-06	6.96E-06	4.74E-04	3.60E-07	0.00E+00
CHILD	1.00E-05	7.45E-06	1.30E-05	1.60E-05	1.10E-05	9.40E-04	5.56E-07	0.00E+00
INFANT	1.47E-05	1.65E-05	2.07E-05	3.10E-05	1.70E-05	2.28E-03	1.01E-06	0.00E+00
GOATMILK								
ADULT	3.72E-06	1.61E-06	5.64E-06	5.80E-06	3.62E-06	3.59E-04	4.83E-07	0.00E+00
TEEN	4.19E-06	1.97E-06	9.81E-06	1.02E-05	6.38E-06	5.69E-04	9.98E-07	0.00E+00
CHILD	4.92E-06	1.39E-06	2.29E-05	1.76E-05	1.05E-05	1.13E-03	1.53E-06	0.00E+00
INFANT	6.97E-06	2.47E-06	3.66E-05	3.58E-05	1.75E-05	2.74E-03	2.78E-06	0.00E+00
INHAL								
ADULT	4.71E-07	6.70E-06	5.08E-07	7.14E-07	6.14E-07	5.69E-05	8.68E-05	0.00E+00
TEEN	6.10E-07	7.92E-06	6.64E-07	9.64E-07	8.42E-07	7.24E-05	1.27E-04	0.00E+00
CHILD	6.85E-07	9.35E-06	8.54E-07	9.09E-07	7.87E-07	8.56E-05	1.03E-04	0.00E+00
INFANT	4.12E-07	6.33E-06	5.56E-07	7.34E-07	5.10E-07	7.86E-05	6.64E-05	0.00E+00



TABLE 8. DOSES TO POPULATION WITHIN 50 MILES, JANUARY-MARCH 2012

ALARA ANNUAL INTEGRATED POPULATION DOSE SUMMARY (PERSON-REM)

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 2.65E-06 : : 1.83% :	: 2.65E-06 : : 1.58% :	: 2.65E-06 : : 1.86% :	: 2.65E-06 : : 1.82% :	: 2.65E-06 : : 1.90% :	: 2.65E-06 : : .87% :	: 2.68E-06 : : 1.68% :	: 6.36E-06 : : 3.87% :
GROUND	: 1.34E-04 : : 92.65% :	: 1.34E-04 : : 79.78% :	: 1.34E-04 : : 94.23% :	: 1.34E-04 : : 92.18% :	: 1.34E-04 : : 96.04% :	: 1.34E-04 : : 44.22% :	: 1.34E-04 : : 84.01% :	: 1.58E-04 : : 96.13% :
INHAL	: 1.17E-07 : : .08% :	: 8.91E-07 : : .53% :	: 9.20E-08 : : .06% :	: 1.67E-07 : : .11% :	: 1.25E-07 : : .09% :	: 1.58E-05 : : 5.21% :	: 2.22E-05 : : 13.89% :	: 0.00E+00 : : .00% :
VEGET	: 4.68E-06 : : 3.24% :	: 2.07E-05 : : 12.31% :	: 1.98E-06 : : 1.39% :	: 3.88E-06 : : 2.67% :	: 7.95E-07 : : .57% :	: 1.77E-06 : : .58% :	: 2.56E-07 : : .16% :	: 0.00E+00 : : .00% :
COW MILK	: 2.03E-06 : : 1.41% :	: 2.59E-06 : : 1.54% :	: 3.34E-06 : : 2.34% :	: 4.02E-06 : : 2.76% :	: 1.88E-06 : : 1.35% :	: 1.46E-04 : : 48.12% :	: 3.96E-07 : : .25% :	: 0.00E+00 : : .00% :
MEAT	: 1.16E-06 : : .80% :	: 7.18E-06 : : 4.27% :	: 1.60E-07 : : .11% :	: 6.54E-07 : : .45% :	: 8.09E-08 : : .06% :	: 3.03E-06 : : 1.00% :	: 2.19E-08 : : .01% :	: 0.00E+00 : : .00% :
*TOTAL*	: 1.45E-04 :	: 1.68E-04 :	: 1.42E-04 :	: 1.45E-04 :	: 1.40E-04 :	: 3.03E-04 :	: 1.60E-04 :	: 1.64E-04 :

TABLE 9. DOSES TO POPULATION WITHIN 50 MILES, APRIL-JUNE 2012

ALARA ANNUAL INTEGRATED POPULATION DOSE SUMMARY (PERSON-REM)

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 1.62E-06 : : .99%	: 1.62E-06 : : .87%	: 1.62E-06 : : 1.00%	: 1.62E-06 : : .97%	: 1.62E-06 : : 1.03%	: 1.62E-06 : : .47%	: 1.64E-06 : : .96%	: 3.50E-06 : : 1.92%
GROUND	: 1.52E-04 : : 92.80%	: 1.52E-04 : : 81.32%	: 1.52E-04 : : 93.21%	: 1.52E-04 : : 91.11%	: 1.52E-04 : : 96.16%	: 1.52E-04 : : 43.88%	: 1.52E-04 : : 88.70%	: 1.79E-04 : : 98.08%
INHAL	: 1.04E-07 : : .06%	: 6.72E-07 : : .36%	: 9.75E-08 : : .06%	: 1.56E-07 : : .09%	: 1.15E-07 : : .07%	: 1.37E-05 : : 3.96%	: 1.65E-05 : : 9.66%	: 0.00E+00 : : .00%
VEGET	: 5.65E-06 : : 3.45%	: 2.20E-05 : : 11.80%	: 3.43E-06 : : 2.11%	: 5.55E-06 : : 3.33%	: 1.32E-06 : : .84%	: 2.08E-06 : : .60%	: 4.49E-07 : : .26%	: 0.00E+00 : : .00%
COW MILK	: 3.09E-06 : : 1.89%	: 2.82E-06 : : 1.51%	: 5.64E-06 : : 3.46%	: 6.66E-06 : : 3.99%	: 2.87E-06 : : 1.82%	: 1.73E-04 : : 50.06%	: 6.95E-07 : : .41%	: 0.00E+00 : : .00%
MEAT	: 1.32E-06 : : .81%	: 7.73E-06 : : 4.14%	: 2.77E-07 : : .17%	: 8.32E-07 : : .50%	: 1.32E-07 : : .08%	: 3.57E-06 : : 1.03%	: 3.85E-08 : : .02%	: 0.00E+00 : : .00%
*TOTAL*	: 1.64E-04	: 1.87E-04	: 1.63E-04	: 1.67E-04	: 1.58E-04	: 3.46E-04	: 1.71E-04	: 1.82E-04

TABLE 10. DOSES TO POPULATION WITHIN 50 MILES, JANUARY-JUNE 2012

ALARA ANNUAL INTEGRATED POPULATION DOSE SUMMARY (PERSON-REM)

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 4.35E-06 : : 1.41% :	: 4.35E-06 : : 1.23% :	: 4.35E-06 : : 1.43% :	: 4.35E-06 : : 1.40% :	: 4.35E-06 : : 1.47% :	: 4.35E-06 : : .67% :	: 4.40E-06 : : 1.33% :	: 1.01E-05 : : 2.91% :
GROUND	: 2.85E-04 : : 92.69% :	: 2.85E-04 : : 80.56% :	: 2.85E-04 : : 93.64% :	: 2.85E-04 : : 91.57% :	: 2.85E-04 : : 96.06% :	: 2.85E-04 : : 43.90% :	: 2.85E-04 : : 86.34% :	: 3.35E-04 : : 97.09% :
INHAL	: 2.25E-07 : : .07% :	: 1.57E-06 : : .44% :	: 1.96E-07 : : .06% :	: 3.31E-07 : : .11% :	: 2.46E-07 : : .08% :	: 3.00E-05 : : 4.62% :	: 3.88E-05 : : 11.76% :	: 0.00E+00 : : .00% :
VEGET	: 1.03E-05 : : 3.35% :	: 4.26E-05 : : 12.05% :	: 5.41E-06 : : 1.78% :	: 9.42E-06 : : 3.03% :	: 2.11E-06 : : .71% :	: 3.85E-06 : : .59% :	: 7.05E-07 : : .21% :	: 0.00E+00 : : .00% :
COW MILK	: 5.12E-06 : : 1.66% :	: 5.40E-06 : : 1.52% :	: 8.97E-06 : : 2.95% :	: 1.07E-05 : : 3.43% :	: 4.76E-06 : : 1.60% :	: 3.20E-04 : : 49.20% :	: 1.09E-06 : : .33% :	: 0.00E+00 : : .00% :
MEAT	: 2.47E-06 : : .80% :	: 1.49E-05 : : 4.20% :	: 4.37E-07 : : .14% :	: 1.48E-06 : : .48% :	: 2.12E-07 : : .07% :	: 6.60E-06 : : 1.02% :	: 6.05E-08 : : .02% :	: 0.00E+00 : : .00% :
*TOTAL*	: 3.08E-04 :	: 3.54E-04 :	: 3.04E-04 :	: 3.11E-04 :	: 2.97E-04 :	: 6.50E-04 :	: 3.30E-04 :	: 3.45E-04 :

TABLE 11. DOSES TO POPULATION WITHIN 50 MILES, JULY-SEPTEMBER 2012

ALARA ANNUAL INTEGRATED POPULATION DOSE SUMMARY (PERSON-REM)

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 3.26E-06 : : .80% :	: 3.26E-06 : : .67% :	: 3.26E-06 : : .74% :	: 3.26E-06 : : .81% :	: 3.26E-06 : : .82% :	: 3.26E-06 : : .22% :	: 3.29E-06 : : .68% :	: 7.11E-06 : : 1.54% :
GROUND	: 3.86E-04 : : 94.49% :	: 3.86E-04 : : 79.68% :	: 3.86E-04 : : 88.09% :	: 3.86E-04 : : 95.98% :	: 3.86E-04 : : 97.14% :	: 3.86E-04 : : 25.62% :	: 3.86E-04 : : 79.41% :	: 4.54E-04 : : 98.46% :
INHAL	: 6.61E-07 : : .16% :	: 9.19E-06 : : 1.90% :	: 1.46E-06 : : .33% :	: 1.07E-06 : : .27% :	: 1.45E-06 : : .36% :	: 1.90E-04 : : 12.63% :	: 9.68E-05 : : 19.91% :	: 0.00E+00 : : .00% :
VEGET	: 1.14E-05 : : 2.79% :	: 5.77E-05 : : 11.91% :	: 3.97E-05 : : 9.06% :	: 4.89E-06 : : 1.21% :	: 3.96E-07 : : .10% :	: 1.06E-05 : : .70% :	: 5.56E-09 : : .00% :	: 0.00E+00 : : .00% :
COW MILK	: 4.10E-06 : : 1.00% :	: 8.25E-06 : : 1.70% :	: 7.13E-06 : : 1.63% :	: 5.40E-06 : : 1.34% :	: 6.02E-06 : : 1.51% :	: 8.99E-04 : : 59.62% :	: 9.75E-09 : : .00% :	: 0.00E+00 : : .00% :
MEAT	: 3.10E-06 : : .76% :	: 2.01E-05 : : 4.14% :	: 6.45E-07 : : .15% :	: 1.58E-06 : : .39% :	: 2.69E-07 : : .07% :	: 1.83E-05 : : 1.22% :	: 4.47E-10 : : .00% :	: 0.00E+00 : : .00% :
*TOTAL*	: 4.09E-04 : : .80% :	: 4.85E-04 : : 1.14% :	: 4.38E-04 : : 1.04% :	: 4.02E-04 : : 1.00% :	: 3.98E-04 : : 1.00% :	: 1.51E-03 : : 3.70% :	: 4.86E-04 : : 1.14% :	: 4.62E-04 : : 1.14% :

TABLE 12. DOSES TO POPULATION WITHIN 50 MILES, OCTOBER-DECEMBER 2012

ALARA ANNUAL INTEGRATED POPULATION DOSE SUMMARY (PERSON-REM)

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 1.19E-03 : : 54.82% :	: 1.19E-03 : : 50.39% :	: 1.19E-03 : : 55.58% :	: 1.19E-03 : : 55.01% :	: 1.19E-03 : : 55.66% :	: 1.19E-03 : : 45.19% :	: 1.20E-03 : : 50.77% :	: 2.68E-03 : : 71.06% :
GROUND	: 9.27E-04 : : 42.84% :	: 9.27E-04 : : 39.38% :	: 9.27E-04 : : 43.44% :	: 9.27E-04 : : 42.99% :	: 9.27E-04 : : 43.50% :	: 9.27E-04 : : 35.32% :	: 9.27E-04 : : 39.18% :	: 1.09E-03 : : 28.94% :
INHAL	: 8.96E-07 : : .04% :	: 1.11E-05 : : .47% :	: 4.47E-07 : : .02% :	: 1.13E-06 : : .05% :	: 6.20E-07 : : .03% :	: 6.03E-05 : : 2.30% :	: 2.37E-04 : : 10.03% :	: 0.00E+00 : : .00% :
VEGET	: 2.82E-05 : : 1.30% :	: 1.49E-04 : : 6.32% :	: 1.10E-05 : : .52% :	: 1.63E-05 : : .76% :	: 2.76E-06 : : .13% :	: 5.42E-06 : : .21% :	: 2.32E-07 : : .01% :	: 0.00E+00 : : .00% :
COW MILK	: 1.29E-05 : : .60% :	: 2.52E-05 : : 1.07% :	: 8.15E-06 : : .38% :	: 1.94E-05 : : .90% :	: 1.29E-05 : : .61% :	: 4.37E-04 : : 16.64% :	: 9.25E-08 : : .00% :	: 0.00E+00 : : .00% :
MEAT	: 8.67E-06 : : .40% :	: 5.56E-05 : : 2.36% :	: 1.25E-06 : : .06% :	: 6.15E-06 : : .29% :	: 1.47E-06 : : .07% :	: 9.13E-06 : : .35% :	: 2.45E-07 : : .01% :	: 0.00E+00 : : .00% :
*TOTAL*	: 2.16E-03	: 2.35E-03	: 2.13E-03	: 2.16E-03	: 2.13E-03	: 2.62E-03	: 2.37E-03	: 3.77E-03

TABLE 13. DOSES TO POPULATION WITHIN 50 MILES, JULY-DECEMBER 2012

ALARA ANNUAL INTEGRATED POPULATION DOSE SUMMARY (PERSON-REM)

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 1.27E-03 : 47.61%	: 1.27E-03 : 43.30%	: 1.27E-03 : 47.61%	: 1.27E-03 : 47.87%	: 1.27E-03 : 48.42%	: 1.27E-03 : 30.06%	: 1.29E-03 : 43.59%	: 2.86E-03 : 64.68%
GROUND	: 1.33E-03 : 49.76%	: 1.33E-03 : 45.25%	: 1.33E-03 : 49.76%	: 1.33E-03 : 50.02%	: 1.33E-03 : 50.60%	: 1.33E-03 : 31.42%	: 1.33E-03 : 44.98%	: 1.56E-03 : 35.32%
INHAL	: 1.55E-06 : .06%	: 1.98E-05 : .68%	: 1.90E-06 : .07%	: 2.18E-06 : .08%	: 2.02E-06 : .08%	: 2.46E-04 : 5.84%	: 3.36E-04 : 11.41%	: 0.00E+00 : .00%
VEGET	: 3.96E-05 : 1.49%	: 2.07E-04 : 7.05%	: 5.10E-05 : 1.91%	: 2.12E-05 : .80%	: 3.16E-06 : .12%	: 1.60E-05 : .38%	: 2.38E-07 : .01%	: 0.00E+00 : .00%
COW MILK	: 1.70E-05 : .64%	: 3.35E-05 : 1.14%	: 1.53E-05 : .57%	: 2.48E-05 : .94%	: 1.89E-05 : .72%	: 1.34E-03 : 31.65%	: 1.03E-07 : .00%	: 0.00E+00 : .00%
MEAT	: 1.18E-05 : .44%	: 7.57E-05 : 2.58%	: 1.90E-06 : .07%	: 7.72E-06 : .29%	: 1.74E-06 : .07%	: 2.75E-05 : .65%	: 2.46E-07 : .01%	: 0.00E+00 : .00%
*TOTAL*	: 2.66E-03	: 2.93E-03	: 2.66E-03	: 2.65E-03	: 2.62E-03	: 4.22E-03	: 2.95E-03	: 4.42E-03

TABLE 14. DOSES TO POPULATION WITHIN 50 MILES, JANUARY-DECEMBER 2012

ALARA ANNUAL INTEGRATED POPULATION DOSE SUMMARY (PERSON-REM)

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 1.12E-03 : : 39.75% :	: 1.12E-03 : : 35.82% :	: 1.12E-03 : : 39.79% :	: 1.12E-03 : : 39.90% :	: 1.12E-03 : : 40.54% :	: 1.12E-03 : : 23.88% :	: 1.13E-03 : : 37.03% :	: 2.52E-03 : : 57.10% :
GROUND	: 1.61E-03 : : 57.13% :	: 1.61E-03 : : 51.47% :	: 1.61E-03 : : 57.18% :	: 1.61E-03 : : 57.33% :	: 1.61E-03 : : 58.26% :	: 1.61E-03 : : 34.31% :	: 1.61E-03 : : 52.54% :	: 1.89E-03 : : 42.90% :
INHAL	: 1.54E-06 : : .05% :	: 1.81E-05 : : .58% :	: 1.78E-06 : : .06% :	: 2.20E-06 : : .08% :	: 1.97E-06 : : .07% :	: 2.38E-04 : : 5.08% :	: 3.17E-04 : : 10.36% :	: 0.00E+00 : : .00% :
VEGET	: 4.99E-05 : : 1.77% :	: 2.49E-04 : : 7.98% :	: 5.65E-05 : : 2.01% :	: 3.07E-05 : : 1.09% :	: 5.27E-06 : : .19% :	: 2.00E-05 : : .43% :	: 9.43E-07 : : .03% :	: 0.00E+00 : : .00% :
COW MILK	: 2.22E-05 : : .79% :	: 3.89E-05 : : 1.25% :	: 2.43E-05 : : .87% :	: 3.55E-05 : : 1.27% :	: 2.37E-05 : : .86% :	: 1.67E-03 : : 35.57% :	: 1.19E-06 : : .04% :	: 0.00E+00 : : .00% :
MEAT	: 1.43E-05 : : .51% :	: 9.06E-05 : : 2.90% :	: 2.34E-06 : : .08% :	: 9.21E-06 : : .33% :	: 1.95E-06 : : .07% :	: 3.43E-05 : : .73% :	: 3.06E-07 : : .01% :	: 0.00E+00 : : .00% :
*TOTAL*	: 2.81E-03	: 3.12E-03	: 2.81E-03	: 2.80E-03	: 2.76E-03	: 4.68E-03	: 3.06E-03	: 4.41E-03

## CARBON-14 GASEOUS EFFLUENT DOSE CALCULATIONS

Doses to the maximum individual resulting from the release of Carbon-14 in gaseous effluents from the Cooper Nuclear Station (CNS) were calculated using the GASPAR computer code. Four pathways were selected for individual dose calculations: the nearest site boundary for inhalation, nearest garden for vegetation ingestion, nearest animal for meat ingestion, and the nearest milk animal (cow). Based on the 2012 Land Use Census, there are no meat or milk animals identified within 5 miles of CNS. However, CNS maintains a virtual cow receptor at 3.5 miles north-northwest of the plant and conservatively includes this receptor in dose calculations.

Use of a normalized Carbon-14 source term and scaling factors based on the annual thermal gigawatts ( $GW_T$ ) power generation were utilized to determine the quantity of Carbon-14 in the CNS gaseous effluent discharge for 2012. Specifically, the Boiling Water Reactor proxy production rate of 5.1 curies Carbon-14 per  $GW_T$  generation using the methodology described in EPRI, 2010 was the basis for the CNS total calculated emissions of 10.7 curies of Carbon-14 in 2012.

GASPAR implements the radiological dose models of Regulatory Guide 1.109 for determining the radiation exposure to man from four principal atmospheric exposure pathways: plume, ground, inhalation, and ingestion. Doses to the maximum individual are calculated as a function of age group and pathway for significant body organs.

Tables 15 through 21 present maximum individual doses. Note that the inhalation pathway was calculated at the closest site boundary receptor and was negligible for Carbon-14 and is not included in the tables. In addition, the doses presented were conservatively calculated based on the annual site X/Qs. These X/Qs result in doses approximately 20% higher than those calculated with the X/Qs based on growing season meteorology.

Additional assumptions and data used for input to the GASPAR code are described in a separate section of this appendix (see page F-67).



TABLE 15. CARBON-14 DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-MARCH 2012

SPECIAL LOCATION NO. 4 A Nearest Cow  
 AT 3.50 MILES NNW

ANNUAL BETA AIR DOSE = 0.00E+00 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 0.00E+00 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GROUND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VEGET								
ADULT	6.56E-03	6.56E-03	3.28E-02	6.56E-03	6.56E-03	6.56E-03	6.56E-03	6.56E-03
TEEN	1.10E-02	1.10E-02	5.48E-02	1.10E-02	1.10E-02	1.10E-02	1.10E-02	1.10E-02
CHILD	2.67E-02	2.67E-02	1.33E-01	2.67E-02	2.67E-02	2.67E-02	2.67E-02	2.67E-02
MEAT								
ADULT	2.62E-03	2.62E-03	1.31E-02	2.62E-03	2.62E-03	2.62E-03	2.62E-03	2.62E-03
TEEN	2.21E-03	2.21E-03	1.11E-02	2.21E-03	2.21E-03	2.21E-03	2.21E-03	2.21E-03
CHILD	4.16E-03	4.16E-03	2.08E-02	4.16E-03	4.16E-03	4.16E-03	4.16E-03	4.16E-03
COW MILK								
ADULT	2.85E-03	2.85E-03	1.43E-02	2.85E-03	2.85E-03	2.85E-03	2.85E-03	2.85E-03
TEEN	5.27E-03	5.27E-03	2.63E-02	5.27E-03	5.27E-03	5.27E-03	5.27E-03	5.27E-03
CHILD	1.29E-02	1.29E-02	6.47E-02	1.29E-02	1.29E-02	1.29E-02	1.29E-02	1.29E-02
INFANT	2.71E-02	2.71E-02	1.27E-01	2.71E-02	2.71E-02	2.71E-02	2.71E-02	2.71E-02
GOATMILK								
ADULT	2.85E-03	2.85E-03	1.43E-02	2.85E-03	2.85E-03	2.85E-03	2.85E-03	2.85E-03
TEEN	5.27E-03	5.27E-03	2.63E-02	5.27E-03	5.27E-03	5.27E-03	5.27E-03	5.27E-03
CHILD	1.29E-02	1.29E-02	6.47E-02	1.29E-02	1.29E-02	1.29E-02	1.29E-02	1.29E-02
INFANT	2.71E-02	2.71E-02	1.27E-01	2.71E-02	2.71E-02	2.71E-02	2.71E-02	2.71E-02

TABLE 15. CARBON-14 DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-MARCH 2012 (Continued)

SPECIAL LOCATION NO. 5 A Nearest Garden  
 AT 2.80 MILES NNW

ANNUAL BETA AIR DOSE = 0.00E+00 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 0.00E+00 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 0.00E+00	: 0.00E+00	: 0.00E+00	: 0.00E+00	: 0.00E+00	: 0.00E+00	: 0.00E+00	: 0.00E+00
GROUND	: 0.00E+00	: 0.00E+00	: 0.00E+00	: 0.00E+00	: 0.00E+00	: 0.00E+00	: 0.00E+00	: 0.00E+00
VEGET	:	:	:	:	:	:	:	:
ADULT	: 9.83E-03	: 9.83E-03	: 4.92E-02	: 9.83E-03	: 9.83E-03	: 9.83E-03	: 9.83E-03	: 9.83E-03
TEEN	: 1.64E-02	: 1.64E-02	: 8.22E-02	: 1.64E-02	: 1.64E-02	: 1.64E-02	: 1.64E-02	: 1.64E-02
CHILD	: 4.00E-02	: 4.00E-02	: 2.00E-01	: 4.00E-02	: 4.00E-02	: 4.00E-02	: 4.00E-02	: 4.00E-02
MEAT	:	:	:	:	:	:	:	:
ADULT	: 3.93E-03	: 3.93E-03	: 1.96E-02	: 3.93E-03	: 3.93E-03	: 3.93E-03	: 3.93E-03	: 3.93E-03
TEEN	: 3.32E-03	: 3.32E-03	: 1.66E-02	: 3.32E-03	: 3.32E-03	: 3.32E-03	: 3.32E-03	: 3.32E-03
CHILD	: 6.23E-03	: 6.23E-03	: 3.12E-02	: 6.23E-03	: 6.23E-03	: 6.23E-03	: 6.23E-03	: 6.23E-03
COW MILK	:	:	:	:	:	:	:	:
ADULT	: 4.28E-03	: 4.28E-03	: 2.14E-02	: 4.28E-03	: 4.28E-03	: 4.28E-03	: 4.28E-03	: 4.28E-03
TEEN	: 7.90E-03	: 7.90E-03	: 3.95E-02	: 7.90E-03	: 7.90E-03	: 7.90E-03	: 7.90E-03	: 7.90E-03
CHILD	: 1.94E-02	: 1.94E-02	: 9.71E-02	: 1.94E-02	: 1.94E-02	: 1.94E-02	: 1.94E-02	: 1.94E-02
INFANT	: 4.06E-02	: 4.06E-02	: 1.90E-01	: 4.06E-02	: 4.06E-02	: 4.06E-02	: 4.06E-02	: 4.06E-02
GOATMILK	:	:	:	:	:	:	:	:
ADULT	: 4.28E-03	: 4.28E-03	: 2.14E-02	: 4.28E-03	: 4.28E-03	: 4.28E-03	: 4.28E-03	: 4.28E-03
TEEN	: 7.90E-03	: 7.90E-03	: 3.95E-02	: 7.90E-03	: 7.90E-03	: 7.90E-03	: 7.90E-03	: 7.90E-03
CHILD	: 1.94E-02	: 1.94E-02	: 9.71E-02	: 1.94E-02	: 1.94E-02	: 1.94E-02	: 1.94E-02	: 1.94E-02
INFANT	: 4.06E-02	: 4.06E-02	: 1.90E-01	: 4.06E-02	: 4.06E-02	: 4.06E-02	: 4.06E-02	: 4.06E-02

TABLE 16. CARBON-14 DOSES TO MAXIMUM INDIVIDUAL (MREM), APRIL-JUNE 2012

SPECIAL LOCATION NO. 4 A Nearest Cow  
AT 3.50 MILES NNW

ANNUAL BETA AIR DOSE = 0.00E+00 MILLRADS  
ANNUAL GAMMA AIR DOSE = 0.00E+00 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GROUND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VEGET								
ADULT	3.71E-03	3.71E-03	1.85E-02	3.71E-03	3.71E-03	3.71E-03	3.71E-03	3.71E-03
TEEN	6.20E-03	6.20E-03	3.10E-02	6.20E-03	6.20E-03	6.20E-03	6.20E-03	6.20E-03
CHILD	1.51E-02	1.51E-02	7.54E-02	1.51E-02	1.51E-02	1.51E-02	1.51E-02	1.51E-02
MEAT								
ADULT	1.48E-03	1.48E-03	7.40E-03	1.48E-03	1.48E-03	1.48E-03	1.48E-03	1.48E-03
TEEN	1.25E-03	1.25E-03	6.25E-03	1.25E-03	1.25E-03	1.25E-03	1.25E-03	1.25E-03
CHILD	2.35E-03	2.35E-03	1.17E-02	2.35E-03	2.35E-03	2.35E-03	2.35E-03	2.35E-03
COW MILK								
ADULT	1.61E-03	1.61E-03	8.07E-03	1.61E-03	1.61E-03	1.61E-03	1.61E-03	1.61E-03
TEEN	2.98E-03	2.98E-03	1.49E-02	2.98E-03	2.98E-03	2.98E-03	2.98E-03	2.98E-03
CHILD	7.32E-03	7.32E-03	3.66E-02	7.32E-03	7.32E-03	7.32E-03	7.32E-03	7.32E-03
INFANT	1.53E-02	1.53E-02	7.17E-02	1.53E-02	1.53E-02	1.53E-02	1.53E-02	1.53E-02
GOATMILK								
ADULT	1.61E-03	1.61E-03	8.07E-03	1.61E-03	1.61E-03	1.61E-03	1.61E-03	1.61E-03
TEEN	2.98E-03	2.98E-03	1.49E-02	2.98E-03	2.98E-03	2.98E-03	2.98E-03	2.98E-03
CHILD	7.32E-03	7.32E-03	3.66E-02	7.32E-03	7.32E-03	7.32E-03	7.32E-03	7.32E-03
INFANT	1.53E-02	1.53E-02	7.17E-02	1.53E-02	1.53E-02	1.53E-02	1.53E-02	1.53E-02

TABLE 16. CARBON-14 DOSES TO MAXIMUM INDIVIDUAL (MREM), APRIL-JUNE 2012 (Continued)

SPECIAL LOCATION NO. 5 A Nearest Garden  
 AT 1.30 MILES SW

ANNUAL BETA AIR DOSE = 0.00E+00 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 0.00E+00 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GROUND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VEGET								
ADULT	7.27E-03	7.27E-03	3.63E-02	7.27E-03	7.27E-03	7.27E-03	7.27E-03	7.27E-03
TEEN	1.22E-02	1.22E-02	6.08E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02
CHILD	2.96E-02	2.96E-02	1.48E-01	2.96E-02	2.96E-02	2.96E-02	2.96E-02	2.96E-02
MEAT								
ADULT	2.90E-03	2.90E-03	1.45E-02	2.90E-03	2.90E-03	2.90E-03	2.90E-03	2.90E-03
TEEN	2.45E-03	2.45E-03	1.23E-02	2.45E-03	2.45E-03	2.45E-03	2.45E-03	2.45E-03
CHILD	4.61E-03	4.61E-03	2.30E-02	4.61E-03	4.61E-03	4.61E-03	4.61E-03	4.61E-03
COW MILK								
ADULT	3.16E-03	3.16E-03	1.58E-02	3.16E-03	3.16E-03	3.16E-03	3.16E-03	3.16E-03
TEEN	5.84E-03	5.84E-03	2.92E-02	5.84E-03	5.84E-03	5.84E-03	5.84E-03	5.84E-03
CHILD	1.44E-02	1.44E-02	7.18E-02	1.44E-02	1.44E-02	1.44E-02	1.44E-02	1.44E-02
INFANT	3.00E-02	3.00E-02	1.41E-01	3.00E-02	3.00E-02	3.00E-02	3.00E-02	3.00E-02
GOATMILK								
ADULT	3.16E-03	3.16E-03	1.58E-02	3.16E-03	3.16E-03	3.16E-03	3.16E-03	3.16E-03
TEEN	5.84E-03	5.84E-03	2.92E-02	5.84E-03	5.84E-03	5.84E-03	5.84E-03	5.84E-03
CHILD	1.44E-02	1.44E-02	7.18E-02	1.44E-02	1.44E-02	1.44E-02	1.44E-02	1.44E-02
INFANT	3.00E-02	3.00E-02	1.41E-01	3.00E-02	3.00E-02	3.00E-02	3.00E-02	3.00E-02

TABLE 17. CARBON-14 DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-JUNE 2012

SPECIAL LOCATION NO. 4 A Nearest Cow  
AT 3.50 MILES NNW

ANNUAL BETA AIR DOSE = 0.00E+00 MILLRADS  
ANNUAL GAMMA AIR DOSE = 0.00E+00 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GROUND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VEGET								
ADULT	1.03E-02	1.03E-02	5.13E-02	1.03E-02	1.03E-02	1.03E-02	1.03E-02	1.03E-02
TEEN	1.72E-02	1.72E-02	8.58E-02	1.72E-02	1.72E-02	1.72E-02	1.72E-02	1.72E-02
CHILD	4.18E-02	4.18E-02	2.09E-01	4.18E-02	4.18E-02	4.18E-02	4.18E-02	4.18E-02
MEAT								
ADULT	4.10E-03	4.10E-03	2.05E-02	4.10E-03	4.10E-03	4.10E-03	4.10E-03	4.10E-03
TEEN	3.46E-03	3.46E-03	1.73E-02	3.46E-03	3.46E-03	3.46E-03	3.46E-03	3.46E-03
CHILD	6.50E-03	6.50E-03	3.25E-02	6.50E-03	6.50E-03	6.50E-03	6.50E-03	6.50E-03
COW MILK								
ADULT	4.47E-03	4.47E-03	2.23E-02	4.47E-03	4.47E-03	4.47E-03	4.47E-03	4.47E-03
TEEN	8.24E-03	8.24E-03	4.12E-02	8.24E-03	8.24E-03	8.24E-03	8.24E-03	8.24E-03
CHILD	2.03E-02	2.03E-02	1.01E-01	2.03E-02	2.03E-02	2.03E-02	2.03E-02	2.03E-02
INFANT	4.24E-02	4.24E-02	1.98E-01	4.24E-02	4.24E-02	4.24E-02	4.24E-02	4.24E-02
GOATMILK								
ADULT	4.47E-03	4.47E-03	2.23E-02	4.47E-03	4.47E-03	4.47E-03	4.47E-03	4.47E-03
TEEN	8.24E-03	8.24E-03	4.12E-02	8.24E-03	8.24E-03	8.24E-03	8.24E-03	8.24E-03
CHILD	2.03E-02	2.03E-02	1.01E-01	2.03E-02	2.03E-02	2.03E-02	2.03E-02	2.03E-02
INFANT	4.24E-02	4.24E-02	1.98E-01	4.24E-02	4.24E-02	4.24E-02	4.24E-02	4.24E-02

TABLE 17. CARBON-14 DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-JUNE 2012 (Continued)

SPECIAL LOCATION NO. 5 A Nearest Garden  
 AT 2.80 MILES NNW

ANNUAL BETA AIR DOSE = 0.00E+00 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 0.00E+00 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GROUND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VEGET								
ADULT	1.54E-02	1.54E-02	7.70E-02	1.54E-02	1.54E-02	1.54E-02	1.54E-02	1.54E-02
TEEN	2.57E-02	2.57E-02	1.29E-01	2.57E-02	2.57E-02	2.57E-02	2.57E-02	2.57E-02
CHILD	6.27E-02	6.27E-02	3.13E-01	6.27E-02	6.27E-02	6.27E-02	6.27E-02	6.27E-02
MEAT								
ADULT	6.14E-03	6.14E-03	3.07E-02	6.14E-03	6.14E-03	6.14E-03	6.14E-03	6.14E-03
TEEN	5.19E-03	5.19E-03	2.59E-02	5.19E-03	5.19E-03	5.19E-03	5.19E-03	5.19E-03
CHILD	9.76E-03	9.76E-03	4.88E-02	9.76E-03	9.76E-03	9.76E-03	9.76E-03	9.76E-03
COW MILK								
ADULT	6.70E-03	6.70E-03	3.35E-02	6.70E-03	6.70E-03	6.70E-03	6.70E-03	6.70E-03
TEEN	1.24E-02	1.24E-02	6.18E-02	1.24E-02	1.24E-02	1.24E-02	1.24E-02	1.24E-02
CHILD	3.04E-02	3.04E-02	1.52E-01	3.04E-02	3.04E-02	3.04E-02	3.04E-02	3.04E-02
INFANT	6.36E-02	6.36E-02	2.98E-01	6.36E-02	6.36E-02	6.36E-02	6.36E-02	6.36E-02
GOATMILK								
ADULT	6.70E-03	6.70E-03	3.35E-02	6.70E-03	6.70E-03	6.70E-03	6.70E-03	6.70E-03
TEEN	1.24E-02	1.24E-02	6.18E-02	1.24E-02	1.24E-02	1.24E-02	1.24E-02	1.24E-02
CHILD	3.04E-02	3.04E-02	1.52E-01	3.04E-02	3.04E-02	3.04E-02	3.04E-02	3.04E-02
INFANT	6.36E-02	6.36E-02	2.98E-01	6.36E-02	6.36E-02	6.36E-02	6.36E-02	6.36E-02

TABLE 18. CARBON-14 DOSES TO MAXIMUM INDIVIDUAL (MREM), JULY-SEPTEMBER 2012

SPECIAL LOCATION NO. 4 A Nearest Cow  
AT 3.50 MILES NNW

ANNUAL BETA AIR DOSE = 0.00E+00 MILLRADS  
ANNUAL GAMMA AIR DOSE = 0.00E+00 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 0.00E+00	: 0.00E+00	: 0.00E+00	: 0.00E+00	: 0.00E+00	: 0.00E+00	: 0.00E+00	: 0.00E+00
GROUND	: 0.00E+00	: 0.00E+00	: 0.00E+00	: 0.00E+00	: 0.00E+00	: 0.00E+00	: 0.00E+00	: 0.00E+00
VEGET								
ADULT	: 9.08E-03	: 9.08E-03	: 4.54E-02	: 9.08E-03	: 9.08E-03	: 9.08E-03	: 9.08E-03	: 9.08E-03
TEEN	: 1.52E-02	: 1.52E-02	: 7.59E-02	: 1.52E-02	: 1.52E-02	: 1.52E-02	: 1.52E-02	: 1.52E-02
CHILD	: 3.70E-02	: 3.70E-02	: 1.85E-01	: 3.70E-02	: 3.70E-02	: 3.70E-02	: 3.70E-02	: 3.70E-02
MEAT								
ADULT	: 3.62E-03	: 3.62E-03	: 1.81E-02	: 3.62E-03	: 3.62E-03	: 3.62E-03	: 3.62E-03	: 3.62E-03
TEEN	: 3.06E-03	: 3.06E-03	: 1.53E-02	: 3.06E-03	: 3.06E-03	: 3.06E-03	: 3.06E-03	: 3.06E-03
CHILD	: 5.76E-03	: 5.76E-03	: 2.88E-02	: 5.76E-03	: 5.76E-03	: 5.76E-03	: 5.76E-03	: 5.76E-03
COW MILK								
ADULT	: 3.95E-03	: 3.95E-03	: 1.98E-02	: 3.95E-03	: 3.95E-03	: 3.95E-03	: 3.95E-03	: 3.95E-03
TEEN	: 7.29E-03	: 7.29E-03	: 3.65E-02	: 7.29E-03	: 7.29E-03	: 7.29E-03	: 7.29E-03	: 7.29E-03
CHILD	: 1.79E-02	: 1.79E-02	: 8.97E-02	: 1.79E-02	: 1.79E-02	: 1.79E-02	: 1.79E-02	: 1.79E-02
INFANT	: 3.75E-02	: 3.75E-02	: 1.76E-01	: 3.75E-02	: 3.75E-02	: 3.75E-02	: 3.75E-02	: 3.75E-02
GOATMILK								
ADULT	: 3.95E-03	: 3.95E-03	: 1.98E-02	: 3.95E-03	: 3.95E-03	: 3.95E-03	: 3.95E-03	: 3.95E-03
TEEN	: 7.29E-03	: 7.29E-03	: 3.65E-02	: 7.29E-03	: 7.29E-03	: 7.29E-03	: 7.29E-03	: 7.29E-03
CHILD	: 1.79E-02	: 1.79E-02	: 8.97E-02	: 1.79E-02	: 1.79E-02	: 1.79E-02	: 1.79E-02	: 1.79E-02
INFANT	: 3.75E-02	: 3.75E-02	: 1.76E-01	: 3.75E-02	: 3.75E-02	: 3.75E-02	: 3.75E-02	: 3.75E-02

TABLE 18. CARBON-14 DOSES TO MAXIMUM INDIVIDUAL (MREM), JULY-SEPTEMBER 2012 (Continued)

SPECIAL LOCATION NO. 5 A Nearest Garden  
 AT 1.30 MILES SW

ANNUAL BETA AIR DOSE = 0.00E+00 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 0.00E+00 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GROUND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VEGET								
ADULT	1.43E-02	1.43E-02	7.13E-02	1.43E-02	1.43E-02	1.43E-02	1.43E-02	1.43E-02
TEEN	2.39E-02	2.39E-02	1.19E-01	2.39E-02	2.39E-02	2.39E-02	2.39E-02	2.39E-02
CHILD	5.81E-02	5.81E-02	2.90E-01	5.81E-02	5.81E-02	5.81E-02	5.81E-02	5.81E-02
MEAT								
ADULT	5.70E-03	5.70E-03	2.85E-02	5.70E-03	5.70E-03	5.70E-03	5.70E-03	5.70E-03
TEEN	4.81E-03	4.81E-03	2.41E-02	4.81E-03	4.81E-03	4.81E-03	4.81E-03	4.81E-03
CHILD	9.04E-03	9.04E-03	4.52E-02	9.04E-03	9.04E-03	9.04E-03	9.04E-03	9.04E-03
COW MILK								
ADULT	6.21E-03	6.21E-03	3.11E-02	6.21E-03	6.21E-03	6.21E-03	6.21E-03	6.21E-03
TEEN	1.15E-02	1.15E-02	5.73E-02	1.15E-02	1.15E-02	1.15E-02	1.15E-02	1.15E-02
CHILD	2.82E-02	2.82E-02	1.41E-01	2.82E-02	2.82E-02	2.82E-02	2.82E-02	2.82E-02
INFANT	5.89E-02	5.89E-02	2.76E-01	5.89E-02	5.89E-02	5.89E-02	5.89E-02	5.89E-02
GOATMILK								
ADULT	6.21E-03	6.21E-03	3.11E-02	6.21E-03	6.21E-03	6.21E-03	6.21E-03	6.21E-03
TEEN	1.15E-02	1.15E-02	5.73E-02	1.15E-02	1.15E-02	1.15E-02	1.15E-02	1.15E-02
CHILD	2.82E-02	2.82E-02	1.41E-01	2.82E-02	2.82E-02	2.82E-02	2.82E-02	2.82E-02
INFANT	5.89E-02	5.89E-02	2.76E-01	5.89E-02	5.89E-02	5.89E-02	5.89E-02	5.89E-02



TABLE 19. CARBON-14 DOSES TO MAXIMUM INDIVIDUAL (MREM), OCTOBER-DECEMBER 2012

SPECIAL LOCATION NO. 4 A Nearest Cow  
 AT 3.50 MILES NNW

ANNUAL BETA AIR DOSE = 0.00E+00 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 0.00E+00 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GROUND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VEGET								
ADULT	8.65E-03	8.65E-03	4.32E-02	8.65E-03	8.65E-03	8.65E-03	8.65E-03	8.65E-03
TEEN	1.45E-02	1.45E-02	7.23E-02	1.45E-02	1.45E-02	1.45E-02	1.45E-02	1.45E-02
CHILD	3.52E-02	3.52E-02	1.76E-01	3.52E-02	3.52E-02	3.52E-02	3.52E-02	3.52E-02
MEAT								
ADULT	3.45E-03	3.45E-03	1.73E-02	3.45E-03	3.45E-03	3.45E-03	3.45E-03	3.45E-03
TEEN	2.92E-03	2.92E-03	1.46E-02	2.92E-03	2.92E-03	2.92E-03	2.92E-03	2.92E-03
CHILD	5.48E-03	5.48E-03	2.74E-02	5.48E-03	5.48E-03	5.48E-03	5.48E-03	5.48E-03
COW MILK								
ADULT	3.77E-03	3.77E-03	1.88E-02	3.77E-03	3.77E-03	3.77E-03	3.77E-03	3.77E-03
TEEN	6.95E-03	6.95E-03	3.47E-02	6.95E-03	6.95E-03	6.95E-03	6.95E-03	6.95E-03
CHILD	1.71E-02	1.71E-02	8.54E-02	1.71E-02	1.71E-02	1.71E-02	1.71E-02	1.71E-02
INFANT	3.57E-02	3.57E-02	1.67E-01	3.57E-02	3.57E-02	3.57E-02	3.57E-02	3.57E-02
GOATMILK								
ADULT	3.77E-03	3.77E-03	1.88E-02	3.77E-03	3.77E-03	3.77E-03	3.77E-03	3.77E-03
TEEN	6.95E-03	6.95E-03	3.47E-02	6.95E-03	6.95E-03	6.95E-03	6.95E-03	6.95E-03
CHILD	1.71E-02	1.71E-02	8.54E-02	1.71E-02	1.71E-02	1.71E-02	1.71E-02	1.71E-02
INFANT	3.57E-02	3.57E-02	1.67E-01	3.57E-02	3.57E-02	3.57E-02	3.57E-02	3.57E-02

TABLE 19. CARBON-14 DOSES TO MAXIMUM INDIVIDUAL (MREM), OCTOBER-DECEMBER 2012 (Continued)

SPECIAL LOCATION NO. 5 A Nearest Garden  
 AT 2.80 MILES NNW

ANNUAL BETA AIR DOSE = 0.00E+00 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 0.00E+00 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GROUND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VEGET								
ADULT	1.31E-02	1.31E-02	6.56E-02	1.31E-02	1.31E-02	1.31E-02	1.31E-02	1.31E-02
TEEN	2.19E-02	2.19E-02	1.10E-01	2.19E-02	2.19E-02	2.19E-02	2.19E-02	2.19E-02
CHILD	5.34E-02	5.34E-02	2.67E-01	5.34E-02	5.34E-02	5.34E-02	5.34E-02	5.34E-02
MEAT								
ADULT	5.23E-03	5.23E-03	2.62E-02	5.23E-03	5.23E-03	5.23E-03	5.23E-03	5.23E-03
TEEN	4.42E-03	4.42E-03	2.21E-02	4.42E-03	4.42E-03	4.42E-03	4.42E-03	4.42E-03
CHILD	8.31E-03	8.31E-03	4.16E-02	8.31E-03	8.31E-03	8.31E-03	8.31E-03	8.31E-03
COW MILK								
ADULT	5.71E-03	5.71E-03	2.86E-02	5.71E-03	5.71E-03	5.71E-03	5.71E-03	5.71E-03
TEEN	1.05E-02	1.05E-02	5.27E-02	1.05E-02	1.05E-02	1.05E-02	1.05E-02	1.05E-02
CHILD	2.59E-02	2.59E-02	1.30E-01	2.59E-02	2.59E-02	2.59E-02	2.59E-02	2.59E-02
INFANT	5.42E-02	5.42E-02	2.54E-01	5.42E-02	5.42E-02	5.42E-02	5.42E-02	5.42E-02
GOATMILK								
ADULT	5.71E-03	5.71E-03	2.86E-02	5.71E-03	5.71E-03	5.71E-03	5.71E-03	5.71E-03
TEEN	1.05E-02	1.05E-02	5.27E-02	1.05E-02	1.05E-02	1.05E-02	1.05E-02	1.05E-02
CHILD	2.59E-02	2.59E-02	1.30E-01	2.59E-02	2.59E-02	2.59E-02	2.59E-02	2.59E-02
INFANT	5.42E-02	5.42E-02	2.54E-01	5.42E-02	5.42E-02	5.42E-02	5.42E-02	5.42E-02

TABLE 20. CARBON-14 DOSES TO MAXIMUM INDIVIDUAL (MREM), JULY-DECEMBER 2012

SPECIAL LOCATION NO. 4 A Nearest Cow  
AT 3.50 MILES NNW

ANNUAL BETA AIR DOSE = 0.00E+00 MILLRADS  
ANNUAL GAMMA AIR DOSE = 0.00E+00 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GROUND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VEGET								
ADULT	1.79E-02	1.79E-02	8.94E-02	1.79E-02	1.79E-02	1.79E-02	1.79E-02	1.79E-02
TEEN	2.99E-02	2.99E-02	1.49E-01	2.99E-02	2.99E-02	2.99E-02	2.99E-02	2.99E-02
CHILD	7.28E-02	7.28E-02	3.64E-01	7.28E-02	7.28E-02	7.28E-02	7.28E-02	7.28E-02
MEAT								
ADULT	7.13E-03	7.13E-03	3.57E-02	7.13E-03	7.13E-03	7.13E-03	7.13E-03	7.13E-03
TEEN	6.03E-03	6.03E-03	3.01E-02	6.03E-03	6.03E-03	6.03E-03	6.03E-03	6.03E-03
CHILD	1.13E-02	1.13E-02	5.66E-02	1.13E-02	1.13E-02	1.13E-02	1.13E-02	1.13E-02
COW MILK								
ADULT	7.78E-03	7.78E-03	3.89E-02	7.78E-03	7.78E-03	7.78E-03	7.78E-03	7.78E-03
TEEN	1.44E-02	1.44E-02	7.18E-02	1.44E-02	1.44E-02	1.44E-02	1.44E-02	1.44E-02
CHILD	3.53E-02	3.53E-02	1.76E-01	3.53E-02	3.53E-02	3.53E-02	3.53E-02	3.53E-02
INFANT	7.38E-02	7.38E-02	3.46E-01	7.38E-02	7.38E-02	7.38E-02	7.38E-02	7.38E-02
GOATMILK								
ADULT	7.78E-03	7.78E-03	3.89E-02	7.78E-03	7.78E-03	7.78E-03	7.78E-03	7.78E-03
TEEN	1.44E-02	1.44E-02	7.18E-02	1.44E-02	1.44E-02	1.44E-02	1.44E-02	1.44E-02
CHILD	3.53E-02	3.53E-02	1.76E-01	3.53E-02	3.53E-02	3.53E-02	3.53E-02	3.53E-02
INFANT	7.38E-02	7.38E-02	3.46E-01	7.38E-02	7.38E-02	7.38E-02	7.38E-02	7.38E-02

TABLE 20. CARBON-14 DOSES TO MAXIMUM INDIVIDUAL (MREM), JULY-DECEMBER 2012(Continued)

SPECIAL LOCATION NO. 5 A Nearest Garden  
 AT 2.80 MILES NNW

ANNUAL BETA AIR DOSE = 0.00E+00 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 0.00E+00 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GROUND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VEGET								
ADULT	2.71E-02	2.71E-02	1.35E-01	2.71E-02	2.71E-02	2.71E-02	2.71E-02	2.71E-02
TEEN	4.53E-02	4.53E-02	2.27E-01	4.53E-02	4.53E-02	4.53E-02	4.53E-02	4.53E-02
CHILD	1.10E-01	1.10E-01	5.52E-01	1.10E-01	1.10E-01	1.10E-01	1.10E-01	1.10E-01
MEAT								
ADULT	1.08E-02	1.08E-02	5.41E-02	1.08E-02	1.08E-02	1.08E-02	1.08E-02	1.08E-02
TEEN	9.14E-03	9.14E-03	4.57E-02	9.14E-03	9.14E-03	9.14E-03	9.14E-03	9.14E-03
CHILD	1.72E-02	1.72E-02	8.59E-02	1.72E-02	1.72E-02	1.72E-02	1.72E-02	1.72E-02
COW MILK								
ADULT	1.18E-02	1.18E-02	5.90E-02	1.18E-02	1.18E-02	1.18E-02	1.18E-02	1.18E-02
TEEN	2.18E-02	2.18E-02	1.09E-01	2.18E-02	2.18E-02	2.18E-02	2.18E-02	2.18E-02
CHILD	5.35E-02	5.35E-02	2.68E-01	5.35E-02	5.35E-02	5.35E-02	5.35E-02	5.35E-02
INFANT	1.12E-01	1.12E-01	5.24E-01	1.12E-01	1.12E-01	1.12E-01	1.12E-01	1.12E-01
GOATMILK								
ADULT	1.18E-02	1.18E-02	5.90E-02	1.18E-02	1.18E-02	1.18E-02	1.18E-02	1.18E-02
TEEN	2.18E-02	2.18E-02	1.09E-01	2.18E-02	2.18E-02	2.18E-02	2.18E-02	2.18E-02
CHILD	5.35E-02	5.35E-02	2.68E-01	5.35E-02	5.35E-02	5.35E-02	5.35E-02	5.35E-02
INFANT	1.12E-01	1.12E-01	5.24E-01	1.12E-01	1.12E-01	1.12E-01	1.12E-01	1.12E-01

TABLE 21. CARBON-14 DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-DECEMBER 2012

SPECIAL LOCATION NO. 4 A Nearest Cow  
 AT 3.50 MILES NNW

ANNUAL BETA AIR DOSE = 0.00E+00 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 0.00E+00 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GROUND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VEGET								
ADULT	2.80E-02	2.80E-02	1.40E-01	2.80E-02	2.80E-02	2.80E-02	2.80E-02	2.80E-02
TEEN	4.68E-02	4.68E-02	2.34E-01	4.68E-02	4.68E-02	4.68E-02	4.68E-02	4.68E-02
CHILD	1.14E-01	1.14E-01	5.70E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01	1.14E-01
MEAT								
ADULT	1.12E-02	1.12E-02	5.59E-02	1.12E-02	1.12E-02	1.12E-02	1.12E-02	1.12E-02
TEEN	9.44E-03	9.44E-03	4.72E-02	9.44E-03	9.44E-03	9.44E-03	9.44E-03	9.44E-03
CHILD	1.77E-02	1.77E-02	8.87E-02	1.77E-02	1.77E-02	1.77E-02	1.77E-02	1.77E-02
COW MILK								
ADULT	1.22E-02	1.22E-02	6.09E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02
TEEN	2.25E-02	2.25E-02	1.12E-01	2.25E-02	2.25E-02	2.25E-02	2.25E-02	2.25E-02
CHILD	5.53E-02	5.53E-02	2.76E-01	5.53E-02	5.53E-02	5.53E-02	5.53E-02	5.53E-02
INFANT	1.16E-01	1.16E-01	5.41E-01	1.16E-01	1.16E-01	1.16E-01	1.16E-01	1.16E-01
GOATMILK								
ADULT	1.22E-02	1.22E-02	6.09E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02	1.22E-02
TEEN	2.25E-02	2.25E-02	1.12E-01	2.25E-02	2.25E-02	2.25E-02	2.25E-02	2.25E-02
CHILD	5.53E-02	5.53E-02	2.76E-01	5.53E-02	5.53E-02	5.53E-02	5.53E-02	5.53E-02
INFANT	1.16E-01	1.16E-01	5.41E-01	1.16E-01	1.16E-01	1.16E-01	1.16E-01	1.16E-01

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TABLE 21. CARBON-14 DOSES TO MAXIMUM INDIVIDUAL (MREM), JANUARY-DECEMBER 2012(Continued)

SPECIAL LOCATION NO. 5 A Nearest Garden  
 AT 2.80 MILES NNW

ANNUAL BETA AIR DOSE = 0.00E+00 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 0.00E+00 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
GROUND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
VEGET								
ADULT	4.23E-02	4.23E-02	2.11E-01	4.23E-02	4.23E-02	4.23E-02	4.23E-02	4.23E-02
TEEN	7.07E-02	7.07E-02	3.53E-01	7.07E-02	7.07E-02	7.07E-02	7.07E-02	7.07E-02
CHILD	1.72E-01	1.72E-01	8.60E-01	1.72E-01	1.72E-01	1.72E-01	1.72E-01	1.72E-01
MEAT								
ADULT	1.69E-02	1.69E-02	8.43E-02	1.69E-02	1.69E-02	1.69E-02	1.69E-02	1.69E-02
TEEN	1.43E-02	1.43E-02	7.13E-02	1.43E-02	1.43E-02	1.43E-02	1.43E-02	1.43E-02
CHILD	2.68E-02	2.68E-02	1.34E-01	2.68E-02	2.68E-02	2.68E-02	2.68E-02	2.68E-02
COW MILK								
ADULT	1.84E-02	1.84E-02	9.20E-02	1.84E-02	1.84E-02	1.84E-02	1.84E-02	1.84E-02
TEEN	3.39E-02	3.39E-02	1.70E-01	3.39E-02	3.39E-02	3.39E-02	3.39E-02	3.39E-02
CHILD	8.35E-02	8.35E-02	4.17E-01	8.35E-02	8.35E-02	8.35E-02	8.35E-02	8.35E-02
INFANT	1.75E-01	1.75E-01	8.17E-01	1.75E-01	1.75E-01	1.75E-01	1.75E-01	1.75E-01
GOATMILK								
ADULT	1.84E-02	1.84E-02	9.20E-02	1.84E-02	1.84E-02	1.84E-02	1.84E-02	1.84E-02
TEEN	3.39E-02	3.39E-02	1.70E-01	3.39E-02	3.39E-02	3.39E-02	3.39E-02	3.39E-02
CHILD	8.35E-02	8.35E-02	4.17E-01	8.35E-02	8.35E-02	8.35E-02	8.35E-02	8.35E-02
INFANT	1.75E-01	1.75E-01	8.17E-01	1.75E-01	1.75E-01	1.75E-01	1.75E-01	1.75E-01

## DOSE CALCULATION MODELS

To evaluate the radiological consequences of the routine release of liquid and gaseous effluents from the Cooper Nuclear Station, two computer codes were used: LADTAP II for liquid doses and GASPAR for gaseous doses. Both of these computer codes implement the dose calculational methodologies of U.S. NRC Regulatory Guide 1.109, Revision 1.

Source terms for each quarter are combined with station-specific demographic data and either hydrological dilution factors, for liquid dose calculations, or atmospheric diffusion estimates, for gaseous dose calculations.

For liquid dose calculations, the hydrological dilution factors used for input to LADTAP II, as well as other input parameters, are listed in Table 22. Other inputs not specifically listed in this table are taken from Regulatory Guide 1.109, Revision 1. Semiannual doses are obtained by summing the contributions from the appropriate quarters.

For gaseous dose calculations, atmospheric diffusion estimates are obtained from the reduction and processing of onsite meteorological data, as described in Appendix B. Source terms for the semiannual period are obtained by summing source terms for the appropriate quarters. Additional input to GASPAR includes the following station-supplied data:

- 0 to 50 mile population distribution
- 0 to 50 mile meat, milk, and vegetable distributions
- Absolute humidity at Cooper Nuclear Station (14.61 g/m<sup>3</sup>)
- The fraction of the year that the vegetables are grown (0.5)
- The fraction of the daily feed intake derived from pasture for milk and meat animals (0.5)

Other values used for input to GASPAR are default values from Regulatory Guide 1.109, Rev. 1.

TABLE 22. Values of Parameters Used to Make Dose Estimates Resulting From Liquid Discharges at Cooper Nuclear Station January-December 2012

Parameter	Values Assigned	
	Individual	Population
Cooling flow rate (cfs) * (Average daily value)	Q1 NR	NR
	Q2 NR	NR
	Q3 NR	NR
	Q4 NR	NR
Dilution factor*	Q1 NR	NR
	Q2 NR	NR
	Q3 NR	NR
	Q4 NR	NR
Holding time:		
Fish	24 hr ***	168 hr ***
Drinking water	12 hr ***	22.4 hr **
Shoreline exposure	0 hr ***	22.4 hr **
Swimming	0 hr ***	22.4 hr **
Boating	0 hr ***	22.4 hr **

\* Q1, Q2, Q3, and Q4 represent first, second, third and fourth quarter station data for 2012, respectively.

\*\* Based on an average Missouri River water flow of 5.5 ft/sec, 84 miles down the river.

\*\*\* Values from Regulatory Guide 1.109, Revision 1.

NR- No release



## REFERENCES

Electric Power Research Institute, Technical Report 1021106, "Estimation of Carbon-14 in Nuclear Power Plant Gaseous Effluents", December 2010.

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U.S. Nuclear Regulatory Commission, Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors", Revision 1, 1977.

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U.S. Nuclear Regulatory Commission, NUREG/CR-1276, "User's Manual for LADTAP II: A Computer Code for Calculating Radiation Exposure to Man From Routine Release of Nuclear Reactor Liquid Effluents", 1980.

U.S. Nuclear Regulatory Commission, Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR 50, Appendix I", Revision 1, 1977.

**APPENDIX G**  
**REMP SAMPLE STATION DESCRIPTIONS**

## **REMP SAMPLE STATION DESCRIPTIONS**

The following pages contain descriptions of the CNS REMP Sample Stations that were active or were used for part or all of 2012.

**REMP SAMPLE STATION DESCRIPTIONS**  
**SAMPLE TYPES AND SAMPLE LOCATIONS**

<u>Sample Station (a)</u>	<u>Sample Description – Type and Location</u>
No. 1	Type: (1) Air Particulate and Charcoal Filters (2) Environmental Thermoluminescent Dosimetry  Location: Outside the northwest edge of fence, east of the gate to the LLRW storage pad on the CNS site, NW ¼, S32, T5N, R16E, Nemaha County, Nebraska. Lon. 095.38.634 W – Lat. 40.21.523 N
No. 2	Type: (1) Air Particulate and Charcoal Filters (2) Environmental Thermoluminescent Dosimetry  Location: North side of county road to the south portion of CNS site, SW ¼, S32, T5N, R16E, Nemaha County, Nebraska. Lon. 095.38.954 W – Lat. 40.21.126 N
No. 3	Type: (1) Air Particulate and Charcoal Filters (2) Environmental Thermoluminescent Dosimetry  Location: Located on the north side of the Brownville State Recreation Park access road near water gauging station, SE ¼, S18, T5N, R16E, Nemaha County, Nebraska. Lon. 095.39.108 W – Lat. 40.23.777 N
No. 4	Type: (1) Air Particulate and Charcoal Filters (2) Environmental Thermoluminescent Dosimetry  Location: Located ½ mile south of Phelps City, Missouri, on west side of highway “U”, NE ¼, S2, T64N, R42W, Atchison County, Missouri. Lon. 095.35.792 W – Lat. 40.23.797 N
No. 5	Type: (1) Air Particulate and Charcoal Filters (2) Environmental Thermoluminescent Dosimetry  Location: Located ¼ mile south and ¼ mile east of Langdon, Missouri, on north side of road, west of railroad tracks, SW ¼, T64N, R41W, Atchison County, Missouri. Lon. 095.34.434 W – Lat. 40.21.151 N

NOTES:

(a) Sample station numbers missing from the sequence are for inactive or discontinued sampling locations.

<u>Sample Station (a)</u>	<u>Sample Description – Type and Location</u>
No. 6	<p>Type: (1) Air Particulate and Charcoal Filters (2) Environmental Thermoluminescent Dosimetry</p> <p>Location: One mile west of the end of Missouri State Highway “U”, SW corner of the intersection, NW ¼, S34, T64N, R42W, Atchison County, Missouri. Lon. 095.37.620 W – Lat. 40.19.459 N</p>
No 7	<p>Type: (1) Air Particulate and Charcoal Filters (2) Environmental Thermoluminescent Dosimetry</p> <p>Location: 300 yards east of Highway 67 on north side of road, SW ¼, S6, T4N, R16E, Nemaha, Nebraska. Lon. 095.40.207 W – Lat. 40.20.287 N</p>
No. 8	<p>Type: (1) Air Particulate and Charcoal Filters (2) Environmental Thermoluminescent Dosimetry</p> <p>Location: ½ mile north, ¾ mile west and ¾ mile north of Nemaha, on west side of road adjacent to transmission line, NE ¼, S35, T5N, R15E, Nemaha County, Nebraska. Lon. 095.41.220 W – Lat. 40.21.570 N</p>
No. 9	<p>Type: (1) Air Particulate and Charcoal Filters (2) Environmental Thermoluminescent Dosimetry</p> <p>Location: Four miles north of Highway 136, on Highway 67. Then 1 mile east of Highway 67 and ½ mile north on west side of road, SW ¼, S26, T6N, R15E, Nemaha County, Nebraska. Lon. 095.41.810 W – Lat. 40.27.259 N</p>
No. 10	<p>Type: (1) Air Particulate and Charcoal Filters (2) Environmental Thermoluminescent Dosimetry</p> <p>Location: One mile north of Barada, Nebraska, in SW corner of intersection, NE ¼, S14, T3N, R16E, Richardson County, Nebraska. Lon. 095.34.723 W – Lat. 40.13.970 N</p>

NOTES:

(a) Sample station numbers missing from the sequence are for inactive or discontinued sampling locations.

<u>Sample Station (a)</u>	<u>Sample Description – Type and Location</u>
No. 11	<p>Type: (1) Water – Ground</p> <p>Location: Plant well water supply header at well pits, NW ¼, S32, T5N, R16E, Nemaha County, Nebraska. Lon. 095.53.866 W – Lat. 40.18.970 N</p>
No. 12	<p>Type: (1) Water – River</p> <p>Location: Sample (1) taken from the Missouri River immediately upstream from the Plant Intake Structure (River Mile 532.5). During periods when unsafe conditions warrant, Station 35 may be used as an alternate upstream collection site. Lon. 095.53.866 W – Lat. 40.18.970 N</p>
No.20	<p>Type: (1) Environmental Thermoluminescent Dosimetry</p> <p>Location: On NNW boundary of NPPD property, east side of county road, SE, S30, T5N, R16E, Nemaha County, Nebraska. Lon. 095.39.226 W – Lat. 40.22.260 N</p>
No.28	<p>Type: (1) Water – River, (2) Fish (3) Sediment from Shoreline (4) Food Products – Broadleaf Vegetation</p> <p>Location: Samples (1), (3), and (4) are taken from the Missouri River or its shore downstream near River Mile 530, Sample (2) is taken from the Missouri River ½ to 3 miles downstream of the plant site. Lon. 095.37.301 W – Lat. 40.20.336 N</p>

NOTES:

(a) Sample station numbers missing from the sequence are for inactive or discontinued sampling locations.

<u>Sample Station (a)</u>	<u>Sample Description – Type and Location</u>
No. 35	<p>Type: (1) Fish  (2) Water – River (Alternate Site)  (3) Food Products – Broadleaf Vegetation</p> <p>Location: Sample (1) will be taken from the Missouri River about 1 to 3 miles above the CNS intake structure. During periods when unsafe conditions warrant, Station 35 may be used as an alternate to Station 12 (upstream collection site) for sample type (2). Sample (3) is taken about ¼ mile south of the Brownville State Recreation Area in Sector A.  Lon. 095.39.046 W – Lat. 40.23.737 N</p>
No. 44	<p>Type: (1) Environmental Thermoluminescent Dosimetry</p> <p>Location: ¼ mile south of Auburn Country Club on Highway 75, then ½ mile east of Highway 75 at fence line north of county road, SE1/4, S27, T5N, R14E, Nemaha County, Nebraska.  Lon. 095.49.759 W – Lat. 40.21.840 N</p>
No. 47	<p>Type: (1) Water – Ground</p> <p>Location: At Falls City Municipal water supply well.  Lon. 095.25.537 W – Lat. 40.01.939 N</p>
No. 56	<p>Type: (1) Environmental Thermoluminescent Dosimetry</p> <p>Location: 1 ¼ miles SW of Langdon, Missouri, on Highway “U”, on the right side of the highway, NW ¼, S23, T64N, R42W, Atchison County, Missouri.  Lon. 095.36.383 W – Lat. 40.21.157 N</p>
No. 58	<p>Type: (1) Environmental Thermoluminescent Dosimetry</p> <p>Location: Three miles south of Brownville, Nebraska, on county road, at the SE corner of the intersection with the farm road leading to Sample Station No. 2, SE1/4, S31, T5N, R16E, Nemaha County, Nebraska.  Lon. 095.39.338 W – Lat. 40.21.126 N</p>

NOTES:

(a) Sample station numbers missing from the sequence are for inactive or discontinued sampling locations.

<u>Sample Station (a)</u>	<u>Sample Description – Type and Location</u>
No. 59	<p>Type: (1) Environmental Thermoluminescent Dosimetry</p> <p>Location: One mile SSE of the CNS Elevated Release Point, in the vicinity of the levee at the south boundary of NPPD property, SE ¼, S32, T5N, R16E, Nemaha County, Nebraska. Lon. 095.38.223 W – Lat. 40.20.986 N</p>
No. 66	<p>Type: (1) Environmental Thermoluminescent Dosimetry</p> <p>Location: Two miles south of Nemaha, Nebraska, on Highway 67 east side of road, NW1/4, S19, T4N, R16E, Nemaha County, Nebraska. Lon. 095.40.307 W – Lat. 40.18.277 N</p>
No. 67	<p>Type: (1) Environmental Thermoluminescent Dosimetry</p> <p>Location: 2 miles west of Brownville, Nebraska, on Highway 136, then north 1 ½ miles on county road and east ½ mile, on north side of road, NE1/4, S11, T5N, R15E, Nemaha County, Nebraska. Lon. 095.41.520 W – Lat. 40.24.898 N</p>
No. 71	<p>Type: (1) Environmental Thermoluminescent Dosimetry</p> <p>Location: Two miles east of Phelps City, Missouri, on Highway 36, then south 1 ½ miles on county road and west ¼ mile, SE1/4, S6, T64N, R41W, Atchison County, Missouri. Lon. 095.34.727 W – Lat. 40.21.664 N</p>
No. 79	<p>Type: (1) Environmental Thermoluminescent Dosimetry</p> <p>Location: 1 7/8 miles south of Brownville, NE, on east side of paved road, NPPD property, SE1/4, S30, T5N, R16E, Nemaha County, Nebraska. Lon. 095.39.238 W – Lat. 40.22.006 N</p>

NOTES:

(a) Sample station numbers missing from the sequence are for inactive or discontinued sampling locations.



<u>Sample Station (a)</u>	<u>Sample Description – Type and Location</u>
No. 80	Type: (1) Environmental Thermoluminescent Dosimetry  Location: 2 1/8 miles south of Brownville, on east side of paved road, NPPD property, NE1/4, S31, T5N, R16E, Nemaha County, Nebraska. Lon. 095.39.259 W – Lat. 40.21.834 N
No. 81	Type: (1) Environmental Thermoluminescent Dosimetry  Location: 2 3/8 miles south of Brownville, Nebraska, in the NE corner of the intersection of the paved county road and CNS access road, NPPD property, NE1/4, S31, T5N, R16E, Nemaha County, Nebraska. Lon. 095.39.291 W – Lat. 40.21.582 N
No. 82	Type: (1) Environmental Thermoluminescent Dosimetry  Location: 7/8 mile south of CNS in a field, on NPPD property, SW1/4, S32, T5N, R16E, Nemaha County, Nebraska. Lon. 095.38.395 W – Lat. 40.20.961 N
No. 83	Type: (1) Environmental Thermoluminescent Dosimetry  Location: 2 ¼ miles south of Nemaha, Nebraska, on Highway 67, then east 1 mile to the junction of the driveway and county road (east side of drive), NE1/4, S19, T4N, R16E, Nemaha County, Nebraska. Lon. 095.39.411 W – Lat. 40.18.119 N
No. 84	Type: (1) Environmental Thermoluminescent Dosimetry  Location: 2 ½ miles west of Brownville, NE, south side of Highway 136 west of Locust Grove School, NW1/4, S22, T5N, R15E, Nemaha County, Nebraska. Lon. 095.42.993 W – Lat. 40.23.564 N

NOTES:

(a) Sample station numbers missing from the sequence are for inactive or discontinued sampling locations.

<u>Sample Station (a)</u>	<u>Sample Description – Type and Location</u>
No. 85	<p>Type: (1) Environmental Thermoluminescent Dosimetry</p> <p>Location: One mile east of Brownville, Nebraska, on Highway 136, then north ¼ mile on the east side of the county road, NE1/4, S33, T65N, R42W, Atchison County, Missouri. Lon. 095.38.309 W – Lat. 40.24.508 N</p>
No. 86	<p>Type: (1) Environmental Thermoluminescent Dosimetry</p> <p>Location: One mile west of Phelps City, Missouri, on Highway 136, then north 1 ½ miles on Highway “D” on west side, SE1/4, S22, T65N, R42W, Atchison County, Missouri. Lon. 095.36.938 W – Lat. 40.25.563 N</p>
No. 87	<p>Type: (1) Environmental Thermoluminescent Dosimetry</p> <p>Location: One mile west of Phelps City, Missouri, on Highway 136, then south ½ mile on county road and ¾ mile west on county road to the end of the road, NW1/4, S3, T64N, R42W, Atchison County, Missouri. Lon. 095.37.806 W – Lat. 40.23.818 N</p>
No. 88	<p>Type: (1) Environmental Thermoluminescent Dosimetry</p> <p>Location: One mile west of Phelps City, Missouri, on Highway 136, then south 2 miles at the end of the county road, NW1/4, S11, T64N, R42W, Atchison County, Missouri. Lon. 095.37.771 W – Lat. 40.24.762 N</p>
No. 89	<p>Type: (1) Environmental Thermoluminescent Dosimetry</p> <p>Location: 2 ½ miles south of Phelps City, Missouri, on Highway “U”, then ½ mile west in the SE corner of the county road intersection, NE1/4, S14, T64N, R42W, Atchison County, Missouri. Lon. 095.36.361 W – Lat. 40.21.962 N</p>

NOTES:

(a) Sample station numbers missing from the sequence are for inactive or discontinued sampling locations.

Sample Station (a)	Sample Description – Type and Location
No. 90	<p>Type: (1) Environmental Thermoluminescent Dosimetry</p> <p>Location: 1 ½ miles west and ¾ mile south of Langdon, Missouri, on Highway “U”, then ¼ mile west, SW1/4, S23, T64N, R42W, Atchison County, Missouri. Lon. 095.35.808 W – Lat. 40.19.472 N</p>
No. 91	<p>Type: (1) Environmental Thermoluminescent Dosimetry</p> <p>Location: ½ mile west of Rockport, Missouri, on the south side of the intersection of U.S. Highway 136 and U.S. Highway 275, at the south side of the water tower, NW1/4, S28, T65N, R41W, Atchison County, Missouri. Lon. 095.32.217 W – Lat. 40.25.181 N</p>
No. 94	<p>Type: (1) Environmental Thermoluminescent Dosimetry</p> <p>Location: ¼ mile of Langdon, Missouri, on the west side of the road, NE1/4, S24, T64N, R42W, Atchison County, Missouri. Lon. 095.34.673 W – Lat. 40.20.931 N</p>
No. 96	<p>Type: (1) Food products – Broadleaf Vegetation</p> <p>Location: Approximately 1 mile south of Brownville, Nebraska, along the paved road, in the road ditch in Sector R, SW1/4, S19, T5N, R16E, Nemaha County, Nebraska. Lon. 095.39.318 W – Lat. 40.23.144 N</p>
No. 99	<p>Type: (1) Milk (Nearest and Other Producer)</p> <p>Location: 1 ¼ mile south of Shubert, Nebraska, on the west side of Highway 67, NE1/4, S24, T3N, R15E, Richardson County, Nebraska. Lon. 095.40.368 W – Lat. 40.12.850 N</p>

NOTES:

(a) Sample station numbers missing from the sequence are for inactive or discontinued sampling locations.

Sample  
Station (a)

Sample Description – Type and Location

No. 101

Type: (1) Food Products – Broadleaf Vegetation

Location: 5 ½ miles east and ½ mile north of Rock Port, Missouri,  
near the junction of Highway 136 and Highway 59, in  
Sector D, encompasses portions of several sections,  
Athison County, Missouri.

Lon. 095.23.822 W – Lat. 40.25.222 N

**APPENDIX H**  
**ANNUAL RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM**  
**(ARGPP) REPORT**

***NEBRASKA PUBLIC POWER DISTRICT  
COOPER NUCLEAR STATION  
Radiological Groundwater Protection Program  
2012 Annual Report  
January 1, 2012 to December 31, 2012***

Prepared by  
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Table A-1: Radiological Groundwater Protection Program - Sampling Locations, Nebraska Public Power District, Cooper Nuclear Station, 2012

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Appendix B: Data Tables of the Annual Radiological Groundwater Protection Program Report (ARGPPR)

Table B-1: Exposure Pathway – Water - Ground, 2012



**SECTION I. SUMMARY**

## I. SUMMARY

In 2008, the Cooper Nuclear Station (CNS) of the Nebraska Public Power District (NPPD) Nebraska Public Power District instituted a comprehensive program to evaluate the impact of station operations on groundwater in the vicinity of CNS. This report covers groundwater samples, collected outside of the Licensee required Off-Site Dose Assessment Manual (ODAM) requirements, both on and off station property in 2012. During that time period, 746 analyses were performed on 155 samples from 15 locations.

In assessing all the data gathered for this report, it was concluded that the operation of CNS had no adverse radiological impact on the environment, and there are no known active releases into the groundwater or surface water at Nebraska Public Power District.

Gross alpha was not detected in any of the groundwater samples.

Tritium was not detected in any of the groundwater samples at concentrations greater than the United States Environmental Protection Agency (USEPA) drinking water standard (and the Nuclear Regulatory Commission [NRC] reporting limit) of 20,000 pCi/L. The tritium concentrations ranged from  $288 \pm 166$  pCi/L to  $4,730 \pm 514$  pCi/L.

Strontium-89 and strontium-90 were not detected at concentrations greater than the Lower Limit of Detection (LLD) as specified in NUREG-1302 in any of the groundwater samples.

Iron-55 was not detected in any of the groundwater samples.

Nickel-63 was not detected in any of the groundwater samples.

Gamma-emitting radionuclides associated with licensed plant operations were not detected at concentrations greater than their respective Lower Limits of Detection (LLDs) as specified in NUREG-1302 in any of the groundwater samples. In the case of tritium, CNS specified that the independent laboratory achieve a lower limit of detection 10 times lower than that required by the United States Environmental Protection Agency (USEPA) regulation.

**SECTION II. CHARACTERISTICS OF TRITIUM (H-3)**

## II. CHARACTERISTICS OF TRITIUM (H-3)

Tritium (chemical symbol H-3) is a radioactive isotope of hydrogen. The most common form of tritium is tritium oxide, which is also called "tritiated water." The chemical properties of tritium are essentially those of ordinary hydrogen.

Tritiated water functions the same as ordinary water in both the environment and the body. Tritium can be taken into the body by drinking water, breathing air, eating food, or absorption through skin. Once tritium enters the body, it disperses quickly and is uniformly distributed throughout the body. Tritium is excreted primarily through urine with a clearance rate characterized by an effective biological half-life of about 14 days. Within one month or so after ingestion, essentially all tritium is cleared. Organically bound tritium (tritium that is incorporated in organic compounds) can remain in the body for a longer period.

Tritium is produced naturally in the upper atmosphere when cosmic rays strike air molecules. Tritium is also produced during nuclear weapons explosions, as a by-product in reactors producing electricity, and in special production reactors, where the isotopes lithium-7 and/or boron-10 are activated to produce tritium. Like normal water, tritiated water is colorless and odorless. Tritiated water behaves chemically and physically like non-tritiated water in the subsurface, and therefore tritiated water will travel at the same velocity as the average groundwater velocity.

Tritium has a half-life of approximately 12.3 years. It decays spontaneously to helium-3 ( $^3\text{He}$ ). This radioactive decay releases a beta particle (low-energy electron). The radioactive decay of tritium is the source of the health risk from exposure to tritium. Tritium is one of the least dangerous radionuclides because it emits very weak beta radiation and leaves the body relatively quickly. Since tritium is almost always found as water, it goes directly into soft tissues and organs. The associated dose to these tissues is generally uniform and is dependent on the water content of the specific tissue.

**SECTION III. INTRODUCTION**

### **III. INTRODUCTION**

Cooper Nuclear Station is located in Nemaha County in the southeast corner of Nebraska on the Missouri River. A portion of the site extends into Missouri. The reactor is an 830-megawatt (net electrical) boiling water reactor. Initial criticality was attained on February 21, 1974.

This report covers those analyses performed by Teledyne Brown Engineering (TBE) on samples collected in 2012.

### **III. INTRODUCTION (cont)**

#### **A. Objectives of the Radiological Groundwater Protection Program (RGPP)**

The long-term objectives of the RGPP are as follows:

1. Identify suitable locations to monitor and evaluate potential impacts from station operations before significant radiological impact to the environment and potential drinking water sources.
2. Understand the local hydrogeologic regime in the vicinity of the station and maintain up-to-date knowledge of flow patterns on the surface and shallow subsurface.
3. Perform routine water sampling and radiological analysis of water from selected locations.
4. Report new leaks, spills, or other detections with potential radiological significance to stakeholders in a timely manner.
5. Regularly assess analytical results to identify adverse trends.
6. Take necessary corrective actions to protect groundwater resources.

#### **B. Implementation of the Objectives**

The objectives identified have been implemented at CNS as discussed below:

1. Cooper Nuclear Station will continue to perform routine sampling and radiological analysis of water from selected locations.
2. Cooper Nuclear Station has implemented new procedures to identify and report new leaks, spills, or other detections with potential radiological significance in a timely manner.
3. Cooper Nuclear Station staff assesses analytical results on an ongoing basis to identify adverse trends.

#### **C. Program Description**

##### **1. Sample Collection**

Sample locations can be found in Appendix A, Table A-1 and Map A-1.

##### **Groundwater**

Samples of water are collected, managed, transported and analyzed in

accordance with approved procedures following regulatory methods. Sample locations, sample collection frequencies and analytical frequencies are controlled in accordance with approved station procedures. Contractor and/or station personnel are trained in the collection, preservation management, and shipment of samples, as well as in documentation of sampling events. Analytical laboratories are subject to internal quality assurance programs, inter-laboratory cross-check programs, as well as nuclear industry audits. Station personnel review and evaluate all analytical data deliverables after initial review by the contractor.

Analytical data results are reviewed by station personnel for adverse trends or changes to hydrogeologic conditions.



**SECTION IV. PROGRAM DESCRIPTION**

#### IV. Program Description

##### A. Sample Analysis

This section describes the general analytical methodologies used by TBE to analyze the environmental samples for radioactivity for the CNS RGPP in 2012.

In order to achieve the stated objectives, the current program includes the following analyses:

1. Concentrations of gross alpha in groundwater.
2. Concentrations of tritium in groundwater.
3. Concentrations of strontium-89 and strontium-90 in groundwater.
4. Concentrations of iron-55 in groundwater.
5. Concentration of nickel-63 in groundwater.
6. Concentrations of gamma emitters in groundwater.

##### B. Data Interpretation

The radiological data collected prior to CNS becoming operational were used as a baseline with which these operational data were compared. For the purpose of this report, CNS was considered operational at initial criticality. Several factors were important in the interpretation of the data:

###### 1. Lower Limit of Detection and Minimum Detectable Concentration

The lower limit of detection (LLD) is specified by federal regulation as a minimum sensitivity value that must be achieved routinely by the analytical parameter.

###### 2. Laboratory Measurements Uncertainty

The estimated uncertainty in measurement of tritium in environmental samples is frequently on the order of 50% of the measurement value.

Statistically, the exact value of a measurement is expressed as a range with a stated level of confidence. The convention is to report results with a 95% level of confidence. The uncertainty comes from calibration standards, sample volume or weight measurements, sampling uncertainty and other factors. CNS reports the uncertainty of a measurement created by statistical process (counting error). Each result has two values calculated. CNS reports the result with plus or minus ( $\pm$ ) the estimated

sample standard deviation.

Analytical uncertainties are reported at the 95% confidence level in this report for reporting consistency with the REMP.

Gamma spectroscopy results for each type of sample were grouped as follows:

For groundwater 18 nuclides, Be-7, K-40, Mn-54, Co-58, Fe-59, Co-60, Zn-65, Zr-95, Ru-103, Ru-106, I-131, Cs-134, Cs-137, Ba-140, Ce-141, Ce-144, Ra-226 and Th-228 were reported.

**SECTION V. RESULTS AND DISCUSSION**

## V. Results and Discussion

### A. *Groundwater Results*

#### Gross Alpha

Samples from 15 locations were analyzed for gross alpha (Table B-1, Appendix B). Gross alpha was not detected at any location in 2012.

#### Tritium

Samples from 15 locations were analyzed for tritium activity (Table B-1, Appendix B). Tritium was detected at four locations. Tritium values ranged from 288 to 4,730 pCi/L. All values were below the United States Environmental Protection Agency (USEPA) drinking water standard (and the Nuclear Regulatory Commission [NRC] reporting limit) of 20,000 pCi/L.

#### Strontium

Samples from 15 locations were analyzed for strontium-89 and strontium-90 (Table B-1, Appendix B). Strontium-89 and strontium-90 were not detected at concentrations greater than the LLD.

#### Iron-55

Samples from 15 locations were analyzed for iron-55 (Table B-1, Appendix B). Iron-55 was not detected at concentrations greater than the LLD.

#### Nickel-63

Samples from 15 locations were analyzed for nickel-63 (Table B-1, Appendix B). Nickel-63 was not detected at concentrations greater than the LLD.

#### Gamma Emitters

Naturally occurring potassium-40 was detected in four of 131 samples. The concentrations ranged from 42.3 to 72.8 pCi/liter. Naturally occurring Thorium-228 was detected in seven of 131 samples. The concentrations ranged from 5.1 to 8.7 pCi/liter. No other gamma emitting nuclides were detected (Table B-1, Appendix B).

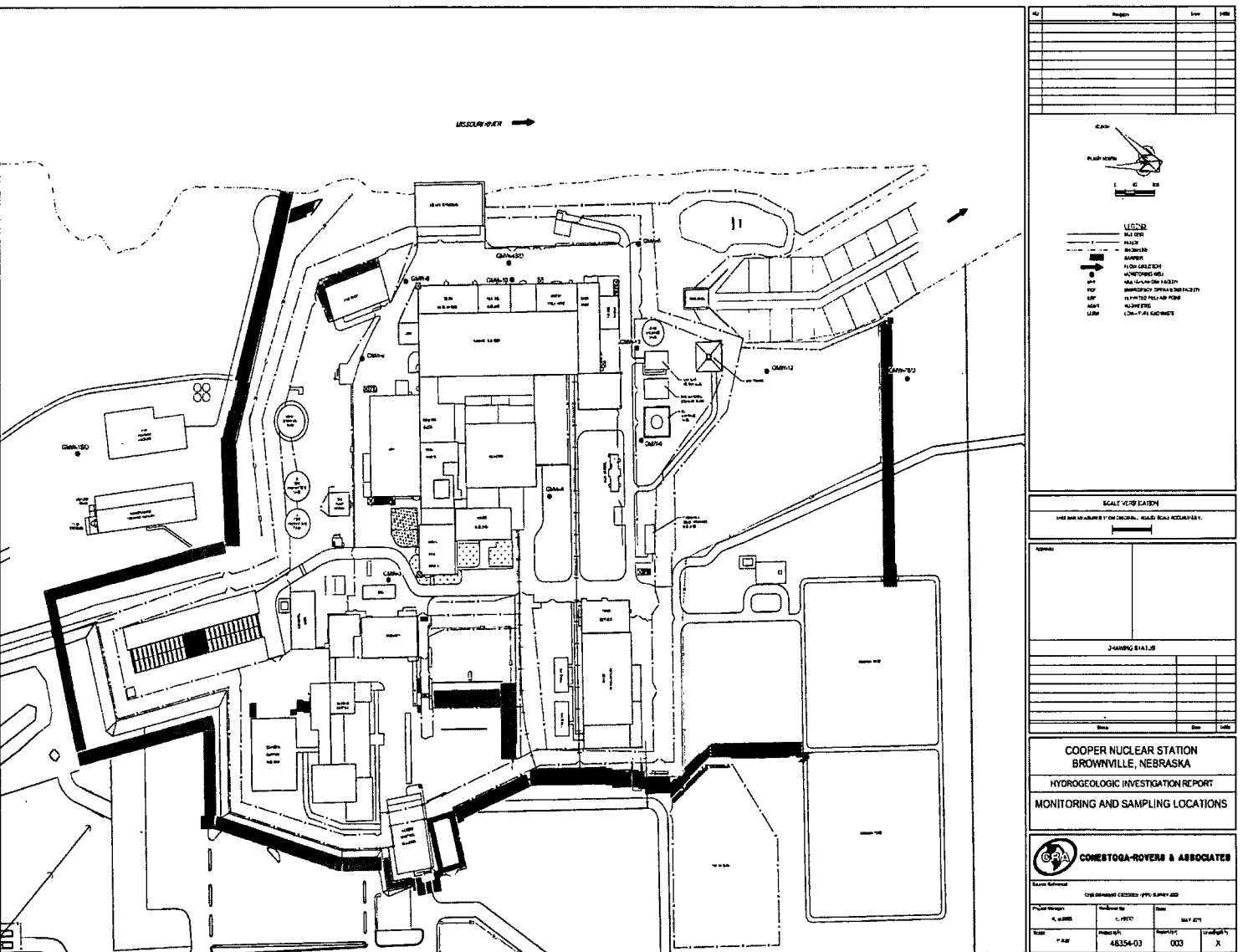
**APPENDIX A**

**LOCATION DESIGNATION OF THE ANNUAL  
RADIOLOGICAL GROUNDWATER PROTECTION  
PROGRAM REPORT (ARGPPR)**

TABLE A-1: Radiological Groundwater Protection Program - Sampling Locations,  
NEBRASKA PUBLIC POWER DISTRICT, Cooper Nuclear Station,  
2012

Site	Type
Ground Monitoring Well-1D	Ground Water
Ground Monitoring Well-1S	Ground Water
Ground Monitoring Well-2	Ground Water
Ground Monitoring Well-3	Ground Water
Ground Monitoring Well-4D	Ground Water
Ground Monitoring Well-4S	Ground Water
Ground Monitoring Well-5	Ground Water
Ground Monitoring Well-6	Ground Water
Ground Monitoring Well-7D	Ground Water
Ground Monitoring Well-7S	Ground Water
Ground Monitoring Well-8	Ground Water
Ground Monitoring Well-9	Ground Water
Ground Monitoring Well-10	Ground Water
Ground Monitoring Well-12	Ground Water
Ground Monitoring Well-13	Ground Water

MAP A-1



Routine Well Water Sample Locations for the Radiological Groundwater Protection Program, Nebraska Public Power District, Cooper Nuclear Station, 2012



## **APPENDIX B**

### **DATA TABLES**

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 1D

DATE COLLECTED	01/11/12	05/15/12	09/20/12	10/26/12
<b>RADIOCHEMICAL ANALYSIS:</b>				
GROSS ALPHA	L.T. 2.E+01	L.T. 6.E+01	NA	NA
SR-89	L.T. 4.E+00	L.T. 3.E+00	NA	NA
SR-90	L.T. 6.E-01	L.T. 5.E-01	NA	NA
FE-55	L.T. 2.E+02	L.T. 1.E+02	NA	NA
NI-63	L.T. 3.E+00	L.T. 3.E+00	NA	NA
<b>GAMMA SPECTRUM ANALYSIS:</b>				
BE-7	L.T. 3.E+01	L.T. 1.E+01	NA	NA
K-40	L.T. 2.E+01	L.T. 9.E+00	NA	NA
MN-54	L.T. 3.E+00	L.T. 1.E+00	NA	NA
CO-58	L.T. 3.E+00	L.T. 1.E+00	NA	NA
FE-59	L.T. 7.E+00	L.T. 3.E+00	NA	NA
CO-60	L.T. 3.E+00	L.T. 1.E+00	NA	NA
ZN-65	L.T. 5.E+00	L.T. 2.E+00	NA	NA
ZR-95	L.T. 6.E+00	L.T. 2.E+00	NA	NA
RU-103	L.T. 4.E+00	L.T. 2.E+00	NA	NA
RU-106	L.T. 2.E+01	L.T. 1.E+01	NA	NA
I-131	L.T. 3.E+01	L.T. 1.E+01	NA	NA
CS-134	L.T. 3.E+00	L.T. 1.E+00	NA	NA
CS-137	L.T. 3.E+00	L.T. 1.E+00	NA	NA
BA-140	L.T. 4.E+01	L.T. 2.E+01	NA	NA
LA-140	L.T. 1.E+01	L.T. 5.E+00	NA	NA
CE-141	L.T. 8.E+00	L.T. 3.E+00	NA	NA
CE-144	L.T. 2.E+01	L.T. 9.E+00	NA	NA
RA-226	L.T. 8.E+01	L.T. 3.E+01	NA	NA
TH-228	L.T. 5.E+00	L.T. 2.E+00	NA	NA
H-3	L.T. 2.E+02	L.T. 5.E+02	L.T. 2.E+02	L.T. 4.E+02

B-2

H-22

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 1D

DATE COLLECTED	10/26/12	11/20/12
----------------	----------	----------

RADIOCHEMICAL ANALYSIS:

GROSS ALPHA	NA	NA
SR-89	NA	NA
SR-90	NA	NA
FE-55	NA	NA
NI-63	NA	NA

GAMMA SPECTRUM ANALYSIS:

BE-7	NA	NA
K-40	NA	NA
MN-54	NA	NA
CO-58	NA	NA
FE-59	NA	NA
CO-60	NA	NA
ZN-65	NA	NA
ZR-95	NA	NA
RU-103	NA	NA
RU-106	NA	NA
I-131	NA	NA
CS-134	NA	NA
CS-137	NA	NA
BA-140	NA	NA
LA-140	NA	NA
CE-141	NA	NA
CE-144	NA	NA
RA-226	NA	NA
TH-228	NA	NA

H-3	L.T. 4.E+02	L.T. 2.E+02
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B-3

H-23

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 1S

DATE COLLECTED	01/11/12	05/15/12	09/20/12	10/26/12
RADIOCHEMICAL ANALYSIS:				
GROSS ALPHA	L.T. 2.E+00	L.T. 6.E+00	NA	NA
SR-89	L.T. 3.E+00	L.T. 3.E+00	NA	NA
SR-90	L.T. 6.E-01	L.T. 5.E-01	NA	NA
FE-55	L.T. 2.E+02	L.T. 2.E+02	NA	NA
NI-63	L.T. 4.E+00	L.T. 3.E+00	NA	NA
GAMMA SPECTRUM ANALYSIS:				
BE-7	L.T. 2.E+01	L.T. 2.E+01	NA	NA
K-40	L.T. 5.E+01	L.T. 3.E+01	NA	NA
MN-54	L.T. 1.E+00	L.T. 2.E+00	NA	NA
CO-58	L.T. 2.E+00	L.T. 2.E+00	NA	NA
FE-59	L.T. 5.E+00	L.T. 6.E+00	NA	NA
CO-60	L.T. 2.E+00	L.T. 2.E+00	NA	NA
ZN-65	L.T. 4.E+00	L.T. 4.E+00	NA	NA
ZR-95	L.T. 5.E+00	L.T. 4.E+00	NA	NA
RU-103	L.T. 3.E+00	L.T. 3.E+00	NA	NA
RU-106	L.T. 2.E+01	L.T. 2.E+01	NA	NA
I-131	L.T. 2.E+01	L.T. 2.E+01	NA	NA
CS-134	L.T. 2.E+00	L.T. 2.E+00	NA	NA
CS-137	L.T. 2.E+00	L.T. 2.E+00	NA	NA
BA-140	L.T. 3.E+01	L.T. 3.E+01	NA	NA
LA-140	L.T. 1.E+01	L.T. 1.E+01	NA	NA
CE-141	L.T. 6.E+00	L.T. 5.E+00	NA	NA
CE-144	L.T. 2.E+01	L.T. 1.E+01	NA	NA
RA-226	L.T. 6.E+01	L.T. 5.E+01	NA	NA
TH-228	L.T. 6.E+00	L.T. 4.E+00	NA	NA
H-3	L.T. 2.E+02	L.T. 5.E+02	L.T. 2.E+02	L.T. 4.E+02

B-4

H-24

B-1  
**COOPER NUCLEAR STATION**  
EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 1S

DATE COLLECTED 11/20/12

RADIOCHEMICAL ANALYSIS:

GROSS ALPHA	NA
SR-89	NA
SR-90	NA
FE-55	NA
NI-63	NA

GAMMA SPECTRUM ANALYSIS:

BE-7	NA
K-40	NA
MN-54	NA
CO-58	NA
FE-59	NA
CO-60	NA
ZN-65	NA
ZR-95	NA
RU-103	NA
RU-106	NA
I-131	NA
CS-134	NA
CS-137	NA
BA-140	NA
LA-140	NA
CE-141	NA
CE-144	NA
RA-226	NA
TH-228	NA

H-3 L.T. 3.E+02

B-5

H-25

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 2

DATE COLLECTED	01/10/12	05/14/12	09/20/12	11/20/12
RADIOCHEMICAL ANALYSIS:				
GROSS ALPHA	L.T. 7.E+00	L.T. 7.E+00	L.T. 4.E+00	NA
SR-89	L.T. 4.E+00	L.T. 3.E+00	L.T. 3.E+00	NA
SR-90	L.T. 5.E-01	L.T. 8.E-01	L.T. 7.E-01	NA
FE-55	L.T. 2.E+02	L.T. 1.E+02	L.T. 1.E+02	NA
NI-63	L.T. 3.E+00	L.T. 3.E+00	L.T. 4.E+00	NA
GAMMA SPECTRUM ANALYSIS:				
BE-7	L.T. 3.E+01	L.T. 2.E+01	L.T. 6.E+01	NA
K-40	L.T. 6.E+01	L.T. 4.E+01	L.T. 3.E+01	NA
MN-54	L.T. 2.E+00	L.T. 2.E+00	L.T. 5.E+00	NA
CO-58	L.T. 3.E+00	L.T. 2.E+00	L.T. 5.E+00	NA
FE-59	L.T. 4.E+00	L.T. 5.E+00	L.T. 9.E+00	NA
CO-60	L.T. 2.E+00	L.T. 2.E+00	L.T. 4.E+00	NA
ZN-65	L.T. 5.E+00	L.T. 4.E+00	L.T. 7.E+00	NA
ZR-95	L.T. 5.E+00	L.T. 4.E+00	L.T. 9.E+00	NA
RU-103	L.T. 4.E+00	L.T. 3.E+00	L.T. 7.E+00	NA
RU-106	L.T. 2.E+01	L.T. 2.E+01	L.T. 5.E+01	NA
I-131	L.T. 3.E+01	L.T. 2.E+01	L.T. 3.E+01	NA
CS-134	L.T. 2.E+00	L.T. 2.E+00	L.T. 5.E+00	NA
CS-137	L.T. 2.E+00	L.T. 2.E+00	L.T. 5.E+00	NA
BA-140	L.T. 4.E+01	L.T. 3.E+01	L.T. 5.E+01	NA
LA-140	L.T. 1.E+01	L.T. 8.E+00	L.T. 6.E+00	NA
CE-141	L.T. 7.E+00	L.T. 7.E+00	L.T. 2.E+01	NA
CE-144	L.T. 2.E+01	L.T. 2.E+01	L.T. 6.E+01	NA
RA-226	L.T. 7.E+01	L.T. 5.E+01	L.T. 2.E+02	NA
TH-228	L.T. 4.E+00	L.T. 4.E+00	L.T. 1.E+01	NA
H-3	L.T. 2.E+02	L.T. 5.E+02	L.T. 3.E+02	L.T. 3.E+02

B-6

H-26

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 3

DATE COLLECTED	01/10/12	05/14/12	09/20/12	11/20/12
RADIOCHEMICAL ANALYSIS:				
GROSS ALPHA	L.T. 7.E+00	L.T. 7.E+00	L.T. 5.E+00	NA
SR-89	L.T. 4.E+00	L.T. 2.E+00	L.T. 3.E+00	NA
SR-90	L.T. 5.E-01	L.T. 8.E-01	L.T. 6.E-01	NA
FE-55	L.T. 1.E+02	L.T. 5.E+01	L.T. 7.E+01	NA
NI-63	L.T. 4.E+00	L.T. 3.E+00	L.T. 4.E+00	NA
GAMMA SPECTRUM ANALYSIS:				
BE-7	L.T. 2.E+01	L.T. 2.E+01	L.T. 3.E+01	NA
K-40	L.T. 2.E+01	L.T. 1.E+01	L.T. 3.E+01	NA
MN-54	L.T. 2.E+00	L.T. 1.E+00	L.T. 3.E+00	NA
CO-58	L.T. 2.E+00	L.T. 2.E+00	L.T. 3.E+00	NA
FE-59	L.T. 5.E+00	L.T. 4.E+00	L.T. 8.E+00	NA
CO-60	L.T. 3.E+00	L.T. 2.E+00	L.T. 3.E+00	NA
ZN-65	L.T. 3.E+00	L.T. 3.E+00	L.T. 8.E+00	NA
ZR-95	L.T. 4.E+00	L.T. 3.E+00	L.T. 6.E+00	NA
RU-103	L.T. 3.E+00	L.T. 2.E+00	L.T. 4.E+00	NA
RU-106	L.T. 2.E+01	L.T. 1.E+01	L.T. 3.E+01	NA
I-131	L.T. 2.E+01	L.T. 1.E+01	L.T. 1.E+01	NA
CS-134	L.T. 2.E+00	L.T. 1.E+00	L.T. 3.E+00	NA
CS-137	L.T. 2.E+00	L.T. 1.E+00	L.T. 3.E+00	NA
BA-140	L.T. 3.E+01	L.T. 2.E+01	L.T. 3.E+01	NA
LA-140	L.T. 1.E+01	L.T. 7.E+00	L.T. 1.E+01	NA
CE-141	L.T. 6.E+00	L.T. 4.E+00	L.T. 8.E+00	NA
CE-144	L.T. 1.E+01	L.T. 1.E+01	L.T. 2.E+01	NA
RA-226	L.T. 5.E+01	L.T. 3.E+01	L.T. 9.E+01	NA
TH-228	L.T. 5.E+00	L.T. 3.E+00	L.T. 8.E+00	NA
H-3	L.T. 2.E+02	L.T. 5.E+02	L.T. 3.E+02	L.T. 3.E+02

B-7

H-27

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 4D

DATE COLLECTED	01/10/12	05/14/12	09/20/12	11/20/12
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RADIOCHEMICAL ANALYSIS:

GROSS ALPHA	L.T. 9.E-01	L.T. 7.E+00	L.T. 2.E+00	NA
SR-89	L.T. 4.E+00	L.T. 3.E+00	L.T. 3.E+00	NA
SR-90	L.T. 5.E-01	L.T. 6.E-01	L.T. 6.E-01	NA
FE-55	L.T. 2.E+02	L.T. 2.E+02	L.T. 1.E+02	NA
NI-63	L.T. 3.E+00	L.T. 3.E+00	L.T. 4.E+00	NA

GAMMA SPECTRUM ANALYSIS:

BE-7	L.T. 2.E+01	L.T. 1.E+01	L.T. 5.E+01	NA
K-40	L.T. 8.E+01	L.T. 3.E+01	L.T. 8.E+01	NA
MN-54	L.T. 3.E+00	L.T. 1.E+00	L.T. 5.E+00	NA
CO-58	L.T. 3.E+00	L.T. 1.E+00	L.T. 5.E+00	NA
FE-59	L.T. 7.E+00	L.T. 3.E+00	L.T. 1.E+01	NA
CO-60	L.T. 2.E+00	L.T. 1.E+00	L.T. 4.E+00	NA
ZN-65	L.T. 5.E+00	L.T. 3.E+00	L.T. 1.E+01	NA
ZR-95	L.T. 5.E+00	L.T. 3.E+00	L.T. 1.E+01	NA
RU-103	L.T. 4.E+00	L.T. 2.E+00	L.T. 6.E+00	NA
RU-106	L.T. 2.E+01	L.T. 1.E+01	L.T. 4.E+01	NA
I-131	L.T. 3.E+01	L.T. 1.E+01	L.T. 2.E+01	NA
CS-134	L.T. 2.E+00	L.T. 1.E+00	L.T. 4.E+00	NA
CS-137	L.T. 2.E+00	L.T. 1.E+00	L.T. 4.E+00	NA
BA-140	L.T. 4.E+01	L.T. 2.E+01	L.T. 4.E+01	NA
LA-140	L.T. 1.E+01	L.T. 6.E+00	L.T. 1.E+01	NA
CE-141	L.T. 6.E+00	L.T. 4.E+00	L.T. 1.E+01	NA
CE-144	L.T. 2.E+01	L.T. 1.E+01	L.T. 3.E+01	NA
RA-226	L.T. 7.E+01	L.T. 4.E+01	L.T. 1.E+02	NA
TH-228	L.T. 6.E+00	L.T. 3.E+00	L.T. 1.E+01	NA

H-3	L.T. 2.E+02	L.T. 5.E+02	L.T. 3.E+02	L.T. 3.E+02
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B-8

H-28



B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 4S

DATE COLLECTED	01/10/12	02/24/12	03/22/12	04/26/12
<b>RADIOCHEMICAL ANALYSIS:</b>				
GROSS ALPHA	L.T. 1.E+00	L.T. 3.E+00	L.T. 1.E+00	L.T. 6.E+00
SR-89	L.T. 4.E+00	L.T. 3.E+00	L.T. 3.E+00	L.T. 3.E+00
SR-90	L.T. 5.E-01	L.T. 6.E-01	L.T. 6.E-01	L.T. 5.E-01
FE-55	L.T. 1.E+02	L.T. 2.E+02	L.T. 1.E+02	L.T. 1.E+02
NI-63	L.T. 3.E+00	L.T. 4.E+00	L.T. 4.E+00	L.T. 4.E+00
<b>GAMMA SPECTRUM ANALYSIS:</b>				
BE-7	L.T. 3.E+01	L.T. 5.E+01	L.T. 4.E+01	L.T. 2.E+01
K-40	L.T. 6.E+01	L.T. 5.E+01	7.28E+01 ± 3.70E+01	L.T. 4.E+01
MN-54	L.T. 3.E+00	L.T. 5.E+00	L.T. 3.E+00	L.T. 2.E+00
CO-58	L.T. 3.E+00	L.T. 5.E+00	L.T. 4.E+00	L.T. 3.E+00
FE-59	L.T. 6.E+00	L.T. 1.E+01	L.T. 7.E+00	L.T. 6.E+00
CO-60	L.T. 3.E+00	L.T. 4.E+00	L.T. 3.E+00	L.T. 2.E+00
ZN-65	L.T. 5.E+00	L.T. 1.E+01	L.T. 5.E+00	L.T. 4.E+00
ZR-95	L.T. 5.E+00	L.T. 9.E+00	L.T. 7.E+00	L.T. 5.E+00
RU-103	L.T. 3.E+00	L.T. 7.E+00	L.T. 4.E+00	L.T. 3.E+00
RU-106	L.T. 2.E+01	L.T. 4.E+01	L.T. 3.E+01	L.T. 2.E+01
I-131	L.T. 3.E+01	L.T. 3.E+01	L.T. 2.E+01	L.T. 2.E+01
CS-134	L.T. 2.E+00	L.T. 5.E+00	L.T. 3.E+00	L.T. 2.E+00
CS-137	L.T. 3.E+00	L.T. 5.E+00	L.T. 3.E+00	L.T. 2.E+00
BA-140	L.T. 4.E+01	L.T. 4.E+01	L.T. 3.E+01	L.T. 3.E+01
LA-140	L.T. 1.E+01	L.T. 1.E+01	L.T. 8.E+00	L.T. 1.E+01
CE-141	L.T. 7.E+00	L.T. 1.E+01	L.T. 9.E+00	L.T. 5.E+00
CE-144	L.T. 2.E+01	L.T. 4.E+01	L.T. 3.E+01	L.T. 1.E+01
RA-226	L.T. 7.E+01	L.T. 1.E+02	L.T. 8.E+01	L.T. 5.E+01
TH-228	L.T. 6.E+00	L.T. 1.E+01	L.T. 8.E+00	L.T. 4.E+00
H-3	5.48E+02 ± 1.75E+02	1.29E+03 ± 2.36E+02	1.59E+03 ± 2.49E+02	1.98E+03 ± 2.82E+02

B-9

H-29

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 4S

DATE COLLECTED	05/14/12	06/13/12	06/20/12	06/25/12
RADIOCHEMICAL ANALYSIS:				
GROSS ALPHA	L.T. 4.E+00	L.T. 3.E+00	L.T. 3.E+00	L.T. 3.E+00
SR-89	L.T. 3.E+00	L.T. 3.E+00	L.T. 3.E+00	L.T. 2.E+00
SR-90	L.T. 5.E-01	L.T. 8.E-01	L.T. 7.E-01	L.T. 7.E-01
FE-55	L.T. 5.E+01	L.T. 8.E+01	L.T. 1.E+02	L.T. 9.E+01
NI-63	L.T. 3.E+00	L.T. 4.E+00	L.T. 3.E+00	L.T. 3.E+00
GAMMA SPECTRUM ANALYSIS:				
BE-7	L.T. 2.E+01	L.T. 7.E+01	L.T. 6.E+01	L.T. 6.E+01
K-40	L.T. 2.E+01	L.T. 7.E+01	L.T. 7.E+01	L.T. 1.E+02
MN-54	L.T. 2.E+00	L.T. 1.E+01	L.T. 6.E+00	L.T. 6.E+00
CO-58	L.T. 3.E+00	L.T. 8.E+00	L.T. 6.E+00	L.T. 6.E+00
FE-59	L.T. 7.E+00	L.T. 2.E+01	L.T. 2.E+01	L.T. 1.E+01
CO-60	L.T. 2.E+00	L.T. 8.E+00	L.T. 7.E+00	L.T. 6.E+00
ZN-65	L.T. 5.E+00	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01
ZR-95	L.T. 5.E+00	L.T. 2.E+01	L.T. 1.E+01	L.T. 7.E+00
RU-103	L.T. 3.E+00	L.T. 8.E+00	L.T. 8.E+00	L.T. 6.E+00
RU-106	L.T. 2.E+01	L.T. 6.E+01	L.T. 6.E+01	L.T. 5.E+01
I-131	L.T. 2.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01
CS-134	L.T. 2.E+00	L.T. 7.E+00	L.T. 6.E+00	L.T. 5.E+00
CS-137	L.T. 2.E+00	L.T. 7.E+00	L.T. 7.E+00	L.T. 5.E+00
BA-140	L.T. 3.E+01	L.T. 3.E+01	L.T. 3.E+01	L.T. 3.E+01
LA-140	L.T. 1.E+01	L.T. 1.E+01	L.T. 9.E+00	L.T. 1.E+01
CE-141	L.T. 5.E+00	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01
CE-144	L.T. 1.E+01	L.T. 6.E+01	L.T. 6.E+01	L.T. 5.E+01
RA-226	L.T. 5.E+01	L.T. 2.E+02	L.T. 2.E+02	L.T. 2.E+02
TH-228	L.T. 3.E+00	L.T. 2.E+01	L.T. 1.E+01	L.T. 1.E+01
H-3	2.39E+03 ± 3.10E+02	2.52E+03 ± 4.91E+02	3.07E+03 ± 5.81E+02	3.01E+03 ± 6.03E+02

B-10

H-30

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 4S

DATE COLLECTED	07/02/12	07/11/12	07/18/12	07/26/12
<b>RADIOCHEMICAL ANALYSIS:</b>				
GROSS ALPHA	L.T. 5.E+00	L.T. 4.E+00	L.T. 6.E+00	L.T. 4.E+00
SR-89	L.T. 2.E+00	L.T. 3.E+00	L.T. 2.E+00	L.T. 3.E+00
SR-90	L.T. 8.E-01	L.T. 6.E-01	L.T. 6.E-01	L.T. 7.E-01
FE-55	L.T. 2.E+02	L.T. 1.E+02	L.T. 9.E+01	L.T. 9.E+01
NI-63	L.T. 4.E+00	L.T. 3.E+00	L.T. 3.E+00	L.T. 4.E+00
<b>GAMMA SPECTRUM ANALYSIS:</b>				
BE-7	L.T. 4.E+01	L.T. 3.E+01	L.T. 5.E+01	L.T. 5.E+01
K-40	L.T. 6.E+01	L.T. 2.E+01	L.T. 1.E+02	L.T. 9.E+01
MN-54	L.T. 4.E+00	L.T. 3.E+00	L.T. 6.E+00	L.T. 5.E+00
CO-58	L.T. 4.E+00	L.T. 3.E+00	L.T. 5.E+00	L.T. 4.E+00
FE-59	L.T. 9.E+00	L.T. 7.E+00	L.T. 1.E+01	L.T. 1.E+01
CO-60	L.T. 4.E+00	L.T. 3.E+00	L.T. 5.E+00	L.T. 5.E+00
ZN-65	L.T. 9.E+00	L.T. 6.E+00	L.T. 1.E+01	L.T. 1.E+01
ZR-95	L.T. 8.E+00	L.T. 6.E+00	L.T. 1.E+01	L.T. 9.E+00
RU-103	L.T. 5.E+00	L.T. 4.E+00	L.T. 7.E+00	L.T. 6.E+00
RU-106	L.T. 4.E+01	L.T. 3.E+01	L.T. 5.E+01	L.T. 4.E+01
I-131	L.T. 1.E+01	L.T. 9.E+00	L.T. 2.E+01	L.T. 2.E+01
CS-134	L.T. 4.E+00	L.T. 3.E+00	L.T. 6.E+00	L.T. 4.E+00
CS-137	L.T. 4.E+00	L.T. 3.E+00	L.T. 5.E+00	L.T. 5.E+00
BA-140	L.T. 2.E+01	L.T. 2.E+01	L.T. 3.E+01	L.T. 3.E+01
LA-140	L.T. 6.E+00	L.T. 7.E+00	L.T. 1.E+01	L.T. 1.E+01
CE-141	L.T. 1.E+01	L.T. 8.E+00	L.T. 1.E+01	L.T. 8.E+00
CE-144	L.T. 4.E+01	L.T. 3.E+01	L.T. 5.E+01	L.T. 3.E+01
RA-226	L.T. 1.E+02	L.T. 7.E+01	L.T. 2.E+02	L.T. 9.E+01
TH-228	8.66E+00 ± 5.48E+00	L.T. 6.E+00	L.T. 1.E+01	L.T. 7.E+00
H-3	2.87E+03 ± 5.38E+02	2.99E+03 ± 5.48E+02	3.89E+03 ± 4.32E+02	4.33E+03 ± 4.82E+02

B-11

H-31

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 4S

DATE COLLECTED	08/01/12	08/09/12	08/16/12	08/23/12
<b>RADIOCHEMICAL ANALYSIS:</b>				
GROSS ALPHA	L.T. 4.E+00	L.T. 3.E+00	L.T. 3.E+00	L.T. 5.E-01
SR-89	L.T. 2.E+00	L.T. 3.E+00	L.T. 2.E+00	L.T. 2.E+00
SR-90	L.T. 7.E-01	L.T. 8.E-01	L.T. 7.E-01	L.T. 5.E-01
FE-55	L.T. 1.E+02	L.T. 1.E+02	L.T. 1.E+02	L.T. 1.E+02
NI-63	L.T. 4.E+00	L.T. 4.E+00	L.T. 4.E+00	L.T. 3.E+00
<b>GAMMA SPECTRUM ANALYSIS:</b>				
BE-7	L.T. 4.E+01	L.T. 3.E+01	L.T. 4.E+01	L.T. 5.E+01
K-40	L.T. 9.E+01	L.T. 4.E+01	L.T. 5.E+01	L.T. 1.E+02
MN-54	L.T. 5.E+00	L.T. 3.E+00	L.T. 5.E+00	L.T. 5.E+00
CO-58	L.T. 5.E+00	L.T. 3.E+00	L.T. 5.E+00	L.T. 5.E+00
FE-59	L.T. 1.E+01	L.T. 6.E+00	L.T. 1.E+01	L.T. 1.E+01
CO-60	L.T. 5.E+00	L.T. 3.E+00	L.T. 4.E+00	L.T. 5.E+00
ZN-65	L.T. 9.E+00	L.T. 6.E+00	L.T. 9.E+00	L.T. 1.E+01
ZR-95	L.T. 1.E+01	L.T. 5.E+00	L.T. 1.E+01	L.T. 9.E+00
RU-103	L.T. 6.E+00	L.T. 3.E+00	L.T. 6.E+00	L.T. 6.E+00
RU-106	L.T. 5.E+01	L.T. 2.E+01	L.T. 5.E+01	L.T. 5.E+01
I-131	L.T. 1.E+01	L.T. 6.E+00	L.T. 2.E+01	L.T. 1.E+01
CS-134	L.T. 5.E+00	L.T. 3.E+00	L.T. 5.E+00	L.T. 5.E+00
CS-137	L.T. 5.E+00	L.T. 3.E+00	L.T. 5.E+00	L.T. 5.E+00
BA-140	L.T. 2.E+01	L.T. 1.E+01	L.T. 3.E+01	L.T. 4.E+01
LA-140	L.T. 9.E+00	L.T. 5.E+00	L.T. 9.E+00	L.T. 1.E+01
CE-141	L.T. 1.E+01	L.T. 6.E+00	L.T. 1.E+01	L.T. 1.E+01
CE-144	L.T. 4.E+01	L.T. 2.E+01	L.T. 4.E+01	L.T. 5.E+01
RA-226	L.T. 1.E+02	L.T. 8.E+01	L.T. 1.E+02	L.T. 2.E+02
TH-228	L.T. 1.E+01	L.T. 6.E+00	L.T. 1.E+01	L.T. 1.E+01
H-3	3.97E+03 ± 4.47E+02	4.36E+03 ± 4.77E+02	4.58E+03 ± 4.95E+02	4.03E+03 ± 4.79E+02

B-12

H-32

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 4S

DATE COLLECTED	08/28/12	09/06/12	09/13/12	09/20/12
<b>RADIOCHEMICAL ANALYSIS:</b>				
GROSS ALPHA	L.T. 9.E-01	L.T. 5.E+00	L.T. 7.E+00	L.T. 9.E+00
SR-89	L.T. 2.E+00	L.T. 4.E+00	L.T. 3.E+00	L.T. 3.E+00
SR-90	L.T. 5.E-01	L.T. 8.E-01	L.T. 8.E-01	L.T. 6.E-01
FE-55	L.T. 3.E+01	L.T. 9.E+01	L.T. 5.E+01	L.T. 1.E+02
NI-63	L.T. 4.E+00	L.T. 4.E+00	L.T. 4.E+00	L.T. 4.E+00
<b>GAMMA SPECTRUM ANALYSIS:</b>				
BE-7	L.T. 4.E+01	L.T. 4.E+01	L.T. 6.E+01	L.T. 5.E+01
K-40	L.T. 1.E+02	L.T. 4.E+01	L.T. 1.E+02	L.T. 8.E+01
MN-54	L.T. 5.E+00	L.T. 4.E+00	L.T. 5.E+00	L.T. 4.E+00
CO-58	L.T. 5.E+00	L.T. 4.E+00	L.T. 5.E+00	L.T. 5.E+00
FE-59	L.T. 9.E+00	L.T. 8.E+00	L.T. 1.E+01	L.T. 1.E+01
CO-60	L.T. 4.E+00	L.T. 4.E+00	L.T. 7.E+00	L.T. 5.E+00
ZN-65	L.T. 1.E+01	L.T. 9.E+00	L.T. 1.E+01	L.T. 9.E+00
ZR-95	L.T. 8.E+00	L.T. 8.E+00	L.T. 1.E+01	L.T. 9.E+00
RU-103	L.T. 6.E+00	L.T. 5.E+00	L.T. 7.E+00	L.T. 6.E+00
RU-106	L.T. 5.E+01	L.T. 3.E+01	L.T. 5.E+01	L.T. 4.E+01
I-131	L.T. 9.E+00	L.T. 1.E+01	L.T. 2.E+01	L.T. 2.E+01
CS-134	L.T. 5.E+00	L.T. 4.E+00	L.T. 5.E+00	L.T. 4.E+00
CS-137	L.T. 6.E+00	L.T. 4.E+00	L.T. 6.E+00	L.T. 4.E+00
BA-140	L.T. 2.E+01	L.T. 2.E+01	L.T. 3.E+01	L.T. 4.E+01
LA-140	L.T. 8.E+00	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01
CE-141	L.T. 1.E+01	L.T. 8.E+00	L.T. 1.E+01	L.T. 1.E+01
CE-144	L.T. 4.E+01	L.T. 3.E+01	L.T. 5.E+01	L.T. 4.E+01
RA-226	L.T. 2.E+02	L.T. 1.E+02	L.T. 2.E+02	L.T. 1.E+02
TH-228	L.T. 1.E+01	L.T. 8.E+00	L.T. 1.E+01	L.T. 9.E+00
H-3	4.31E+03 ± 5.10E+02	3.35E+03 ± 3.90E+02	3.99E+03 ± 4.44E+02	3.58E+03 ± 4.19E+02

B-13

H-33

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 4S

DATE COLLECTED	09/27/12	10/03/12	10/11/12	10/18/12
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RADIOCHEMICAL ANALYSIS:

GROSS ALPHA	NA	NA	NA	NA
SR-89	NA	NA	NA	NA
SR-90	NA	NA	NA	NA
FE-55	NA	NA	NA	NA
NI-63	NA	NA	NA	NA

GAMMA SPECTRUM ANALYSIS:

BE-7	L.T. 6.E+01	L.T. 8.E+01	L.T. 2.E+01	L.T. 7.E+01
K-40	L.T. 1.E+02	L.T. 1.E+02	L.T. 2.E+01	L.T. 2.E+02
MN-54	L.T. 5.E+00	L.T. 8.E+00	L.T. 2.E+00	L.T. 9.E+00
CO-58	L.T. 6.E+00	L.T. 8.E+00	L.T. 2.E+00	L.T. 8.E+00
FE-59	L.T. 1.E+01	L.T. 2.E+01	L.T. 4.E+00	L.T. 2.E+01
CO-60	L.T. 7.E+00	L.T. 8.E+00	L.T. 2.E+00	L.T. 8.E+00
ZN-65	L.T. 1.E+01	L.T. 1.E+01	L.T. 4.E+00	L.T. 2.E+01
ZR-95	L.T. 1.E+01	L.T. 1.E+01	L.T. 4.E+00	L.T. 2.E+01
RU-103	L.T. 8.E+00	L.T. 1.E+01	L.T. 2.E+00	L.T. 9.E+00
RU-106	L.T. 6.E+01	L.T. 7.E+01	L.T. 2.E+01	L.T. 6.E+01
I-131	L.T. 2.E+01	L.T. 2.E+01	L.T. 6.E+00	L.T. 2.E+01
CS-134	L.T. 5.E+00	L.T. 9.E+00	L.T. 2.E+00	L.T. 1.E+01
CS-137	L.T. 5.E+00	L.T. 7.E+00	L.T. 2.E+00	L.T. 9.E+00
BA-140	L.T. 5.E+01	L.T. 5.E+01	L.T. 1.E+01	L.T. 4.E+01
LA-140	L.T. 1.E+01	L.T. 1.E+01	L.T. 4.E+00	L.T. 1.E+01
CE-141	L.T. 2.E+01	L.T. 2.E+01	L.T. 5.E+00	L.T. 2.E+01
CE-144	L.T. 5.E+01	L.T. 5.E+01	L.T. 2.E+01	L.T. 8.E+01
RA-226	L.T. 2.E+02	L.T. 2.E+02	L.T. 5.E+01	L.T. 2.E+02
TH-228	L.T. 1.E+01	L.T. 2.E+01	L.T. 4.E+00	L.T. 2.E+01

H-3	3.52E+03 ± 4.02E+02	3.15E+03 ± 3.78E+02	2.79E+03 ± 3.47E+02	3.31E+03 ± 3.84E+02
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B-14

H-34

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 4S

DATE COLLECTED	10/24/12	10/31/12	11/07/12	11/14/12
RADIOCHEMICAL ANALYSIS:				
GROSS ALPHA	NA	NA	NA	NA
SR-89	NA	NA	NA	NA
SR-90	NA	NA	NA	NA
FE-55	NA	NA	NA	NA
NI-63	NA	NA	NA	NA
GAMMA SPECTRUM ANALYSIS:				
BE-7	L.T. 4.E+01	L.T. 2.E+01	L.T. 2.E+01	L.T. 2.E+01
K-40	L.T. 4.E+01	L.T. 3.E+01	5.72E+01 ± 3.19E+01	L.T. 3.E+01
MN-54	L.T. 5.E+00	L.T. 2.E+00	L.T. 2.E+00	L.T. 2.E+00
CO-58	L.T. 6.E+00	L.T. 2.E+00	L.T. 2.E+00	L.T. 2.E+00
FE-59	L.T. 1.E+01	L.T. 5.E+00	L.T. 5.E+00	L.T. 5.E+00
CO-60	L.T. 4.E+00	L.T. 2.E+00	L.T. 2.E+00	L.T. 2.E+00
ZN-65	L.T. 7.E+00	L.T. 4.E+00	L.T. 4.E+00	L.T. 4.E+00
ZR-95	L.T. 1.E+01	L.T. 4.E+00	L.T. 4.E+00	L.T. 4.E+00
RU-103	L.T. 8.E+00	L.T. 2.E+00	L.T. 3.E+00	L.T. 3.E+00
RU-106	L.T. 4.E+01	L.T. 2.E+01	L.T. 2.E+01	L.T. 2.E+01
I-131	L.T. 2.E+01	L.T. 7.E+00	L.T. 1.E+01	L.T. 1.E+01
CS-134	L.T. 5.E+00	L.T. 2.E+00	L.T. 2.E+00	L.T. 2.E+00
CS-137	L.T. 5.E+00	L.T. 2.E+00	L.T. 2.E+00	L.T. 2.E+00
BA-140	L.T. 4.E+01	L.T. 1.E+01	L.T. 2.E+01	L.T. 2.E+01
LA-140	L.T. 1.E+01	L.T. 4.E+00	L.T. 7.E+00	L.T. 6.E+00
CE-141	L.T. 1.E+01	L.T. 4.E+00	L.T. 5.E+00	L.T. 5.E+00
CE-144	L.T. 4.E+01	L.T. 1.E+01	L.T. 2.E+01	L.T. 2.E+01
RA-226	L.T. 1.E+02	L.T. 5.E+01	L.T. 5.E+01	L.T. 5.E+01
TH-228	L.T. 1.E+01	L.T. 4.E+00	L.T. 4.E+00	6.30E+00 ± 3.22E+00
H-3	3.39E+03 ± 3.84E+02	3.07E+03 ± 3.78E+02	3.23E+03 ± 4.23E+02	3.29E+03 ± 3.79E+02

B-15

H-35

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 4S

DATE COLLECTED	11/20/12	11/27/12	12/06/12	12/12/12
<b>RADIOCHEMICAL ANALYSIS:</b>				
GROSS ALPHA	NA	NA	NA	NA
SR-89	NA	NA	NA	NA
SR-90	NA	NA	NA	NA
FE-55	NA	NA	NA	NA
NI-63	NA	NA	NA	NA
<b>GAMMA SPECTRUM ANALYSIS:</b>				
BE-7	L.T. 2.E+01	L.T. 3.E+01	L.T. 2.E+01	L.T. 2.E+01
K-40	L.T. 2.E+01	L.T. 3.E+01	L.T. 3.E+01	L.T. 2.E+01
MN-54	L.T. 2.E+00	L.T. 3.E+00	L.T. 2.E+00	L.T. 2.E+00
CO-58	L.T. 2.E+00	L.T. 3.E+00	L.T. 2.E+00	L.T. 2.E+00
FE-59	L.T. 4.E+00	L.T. 7.E+00	L.T. 6.E+00	L.T. 5.E+00
CO-60	L.T. 2.E+00	L.T. 3.E+00	L.T. 2.E+00	L.T. 2.E+00
ZN-65	L.T. 3.E+00	L.T. 7.E+00	L.T. 4.E+00	L.T. 4.E+00
ZR-95	L.T. 3.E+00	L.T. 6.E+00	L.T. 4.E+00	L.T. 4.E+00
RU-103	L.T. 2.E+00	L.T. 4.E+00	L.T. 3.E+00	L.T. 3.E+00
RU-106	L.T. 2.E+01	L.T. 3.E+01	L.T. 2.E+01	L.T. 2.E+01
I-131	L.T. 1.E+01	L.T. 1.E+01	L.T. 2.E+01	L.T. 1.E+01
CS-134	L.T. 2.E+00	L.T. 3.E+00	L.T. 2.E+00	L.T. 2.E+00
CS-137	L.T. 2.E+00	L.T. 3.E+00	L.T. 2.E+00	L.T. 2.E+00
BA-140	L.T. 2.E+01	L.T. 2.E+01	L.T. 3.E+01	L.T. 2.E+01
LA-140	L.T. 6.E+00	L.T. 7.E+00	L.T. 1.E+01	L.T. 6.E+00
CE-141	L.T. 4.E+00	L.T. 8.E+00	L.T. 5.E+00	L.T. 5.E+00
CE-144	L.T. 1.E+01	L.T. 2.E+01	L.T. 1.E+01	L.T. 2.E+01
RA-226	L.T. 4.E+01	L.T. 8.E+01	L.T. 5.E+01	L.T. 5.E+01
TH-228	L.T. 3.E+00	L.T. 5.E+00	L.T. 4.E+00	L.T. 4.E+00
H-3	3.12E+03 ± 3.61E+02	2.83E+03 ± 3.36E+02	3.25E+03 ± 3.82E+02	3.25E+03 ± 3.82E+02

B-16

H-36



B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 4S

DATE COLLECTED	12/18/12	12/28/12
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RADIOCHEMICAL ANALYSIS:

GROSS ALPHA	NA	NA
SR-89	NA	NA
SR-90	NA	NA
FE-55	NA	NA
NI-63	NA	NA

GAMMA SPECTRUM ANALYSIS:

BE-7	L.T. 5.E+01	L.T. 3.E+01
K-40	L.T. 5.E+01	L.T. 3.E+01
MN-54	L.T. 6.E+00	L.T. 3.E+00
CO-58	L.T. 6.E+00	L.T. 4.E+00
FE-59	L.T. 1.E+01	L.T. 8.E+00
CO-60	L.T. 6.E+00	L.T. 3.E+00
ZN-65	L.T. 1.E+01	L.T. 7.E+00
ZR-95	L.T. 1.E+01	L.T. 7.E+00
RU-103	L.T. 8.E+00	L.T. 5.E+00
RU-106	L.T. 6.E+01	L.T. 3.E+01
I-131	L.T. 2.E+01	L.T. 1.E+01
CS-134	L.T. 5.E+00	L.T. 3.E+00
CS-137	L.T. 6.E+00	L.T. 3.E+00
BA-140	L.T. 4.E+01	L.T. 3.E+01
LA-140	L.T. 1.E+01	L.T. 7.E+00
CE-141	L.T. 2.E+01	L.T. 8.E+00
CE-144	L.T. 5.E+01	L.T. 3.E+01
RA-226	L.T. 2.E+02	L.T. 9.E+01
TH-228	L.T. 1.E+01	L.T. 8.E+00

H-3	2.63E+03 ± 3.24E+02	3.20E+03 ± 3.63E+02
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B-17

H-37

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 5

DATE COLLECTED	01/10/12	05/15/12	09/20/12	11/21/12
<b>RADIOCHEMICAL ANALYSIS:</b>				
GROSS ALPHA	L.T. 1.E+00	L.T. 7.E+00	L.T. 4.E+00	NA
SR-89	L.T. 4.E+00	L.T. 4.E+00	L.T. 3.E+00	NA
SR-90	L.T. 6.E-01	L.T. 7.E-01	L.T. 7.E-01	NA
FE-55	L.T. 1.E+02	L.T. 1.E+02	L.T. 1.E+02	NA
NI-63	L.T. 4.E+00	L.T. 4.E+00	L.T. 4.E+00	NA
<b>GAMMA SPECTRUM ANALYSIS:</b>				
BE-7	L.T. 2.E+01	L.T. 2.E+01	L.T. 6.E+01	NA
K-40	L.T. 2.E+01	L.T. 3.E+01	L.T. 1.E+02	NA
MN-54	L.T. 3.E+00	L.T. 2.E+00	L.T. 5.E+00	NA
CO-58	L.T. 3.E+00	L.T. 2.E+00	L.T. 7.E+00	NA
FE-59	L.T. 7.E+00	L.T. 5.E+00	L.T. 1.E+01	NA
CO-60	L.T. 2.E+00	L.T. 2.E+00	L.T. 7.E+00	NA
ZN-65	L.T. 5.E+00	L.T. 3.E+00	L.T. 1.E+01	NA
ZR-95	L.T. 5.E+00	L.T. 4.E+00	L.T. 1.E+01	NA
RU-103	L.T. 3.E+00	L.T. 3.E+00	L.T. 9.E+00	NA
RU-106	L.T. 2.E+01	L.T. 2.E+01	L.T. 5.E+01	NA
I-131	L.T. 3.E+01	L.T. 2.E+01	L.T. 3.E+01	NA
CS-134	L.T. 2.E+00	L.T. 2.E+00	L.T. 6.E+00	NA
CS-137	L.T. 2.E+00	L.T. 2.E+00	L.T. 6.E+00	NA
BA-140	L.T. 4.E+01	L.T. 2.E+01	L.T. 5.E+01	NA
LA-140	L.T. 1.E+01	L.T. 9.E+00	L.T. 2.E+01	NA
CE-141	L.T. 7.E+00	L.T. 4.E+00	L.T. 1.E+01	NA
CE-144	L.T. 2.E+01	L.T. 1.E+01	L.T. 3.E+01	NA
RA-226	L.T. 6.E+01	L.T. 4.E+01	L.T. 1.E+02	NA
TH-228	L.T. 4.E+00	L.T. 3.E+00	L.T. 9.E+00	NA
H-3	L.T. 2.E+02	L.T. 5.E+02	L.T. 3.E+02	L.T. 3.E+02

B-18

H-38

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 6

DATE COLLECTED	01/10/12	05/15/12	09/20/12	11/21/12
RADIOCHEMICAL ANALYSIS:				
GROSS ALPHA	L.T. 7.E+00	L.T. 7.E+00	L.T. 4.E+00	NA
SR-89	L.T. 3.E+00	L.T. 3.E+00	L.T. 3.E+00	NA
SR-90	L.T. 7.E-01	L.T. 7.E-01	L.T. 6.E-01	NA
FE-55	L.T. 2.E+02	L.T. 1.E+02	L.T. 1.E+02	NA
NI-63	L.T. 4.E+00	L.T. 3.E+00	L.T. 4.E+00	NA
GAMMA SPECTRUM ANALYSIS:				
BE-7	L.T. 3.E+01	L.T. 2.E+01	L.T. 4.E+01	NA
K-40	L.T. 2.E+01	L.T. 5.E+01	L.T. 3.E+01	NA
MN-54	L.T. 2.E+00	L.T. 2.E+00	L.T. 4.E+00	NA
CO-58	L.T. 3.E+00	L.T. 2.E+00	L.T. 5.E+00	NA
FE-59	L.T. 4.E+00	L.T. 6.E+00	L.T. 1.E+01	NA
CO-60	L.T. 2.E+00	L.T. 2.E+00	L.T. 5.E+00	NA
ZN-65	L.T. 5.E+00	L.T. 4.E+00	L.T. 8.E+00	NA
ZR-95	L.T. 5.E+00	L.T. 4.E+00	L.T. 8.E+00	NA
RU-103	L.T. 3.E+00	L.T. 3.E+00	L.T. 6.E+00	NA
RU-106	L.T. 2.E+01	L.T. 2.E+01	L.T. 4.E+01	NA
I-131	L.T. 3.E+01	L.T. 2.E+01	L.T. 2.E+01	NA
CS-134	L.T. 2.E+00	L.T. 2.E+00	L.T. 4.E+00	NA
CS-137	L.T. 2.E+00	L.T. 2.E+00	L.T. 5.E+00	NA
BA-140	L.T. 3.E+01	L.T. 3.E+01	L.T. 4.E+01	NA
LA-140	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	NA
CE-141	L.T. 6.E+00	L.T. 5.E+00	L.T. 1.E+01	NA
CE-144	L.T. 2.E+01	L.T. 1.E+01	L.T. 3.E+01	NA
RA-226	L.T. 6.E+01	L.T. 5.E+01	L.T. 1.E+02	NA
TH-228	L.T. 4.E+00	L.T. 4.E+00	L.T. 9.E+00	NA
H-3	L.T. 2.E+02	L.T. 5.E+02	L.T. 2.E+02	L.T. 3.E+02

B-19

H-39

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 7D

DATE COLLECTED	01/10/12	05/15/12	09/20/12	11/20/12
RADIOCHEMICAL ANALYSIS:				
GROSS ALPHA	L.T. 1.E+01	L.T. 6.E+01	NA	NA
SR-89	L.T. 3.E+00	L.T. 3.E+00	NA	NA
SR-90	L.T. 5.E-01	L.T. 6.E-01	NA	NA
FE-55	L.T. 2.E+02	L.T. 1.E+02	NA	NA
NI-63	L.T. 3.E+00	L.T. 5.E+00	NA	NA
GAMMA SPECTRUM ANALYSIS:				
BE-7	L.T. 3.E+01	L.T. 2.E+01	NA	NA
K-40	L.T. 2.E+01	L.T. 1.E+01	NA	NA
MN-54	L.T. 3.E+00	L.T. 1.E+00	NA	NA
CO-58	L.T. 3.E+00	L.T. 2.E+00	NA	NA
FE-59	L.T. 8.E+00	L.T. 4.E+00	NA	NA
CO-60	L.T. 3.E+00	L.T. 1.E+00	NA	NA
ZN-65	L.T. 6.E+00	L.T. 3.E+00	NA	NA
ZR-95	L.T. 6.E+00	L.T. 3.E+00	NA	NA
RU-103	L.T. 5.E+00	L.T. 2.E+00	NA	NA
RU-106	L.T. 3.E+01	L.T. 1.E+01	NA	NA
I-131	L.T. 4.E+01	L.T. 2.E+01	NA	NA
CS-134	L.T. 3.E+00	L.T. 1.E+00	NA	NA
CS-137	L.T. 3.E+00	L.T. 2.E+00	NA	NA
BA-140	L.T. 5.E+01	L.T. 2.E+01	NA	NA
LA-140	L.T. 1.E+01	L.T. 6.E+00	NA	NA
CE-141	L.T. 9.E+00	L.T. 5.E+00	NA	NA
CE-144	L.T. 2.E+01	L.T. 1.E+01	NA	NA
RA-226	L.T. 8.E+01	L.T. 4.E+01	NA	NA
TH-228	L.T. 6.E+00	L.T. 3.E+00	NA	NA
H-3	L.T. 2.E+02	L.T. 5.E+02	L.T. 2.E+02	L.T. 2.E+02

B-20

H-40

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 7S

DATE COLLECTED	01/10/12	05/15/12	09/20/12	11/20/12
RADIOCHEMICAL ANALYSIS:				
GROSS ALPHA	L.T. 2.E+00	L.T. 7.E+00	NA	NA
SR-89	L.T. 4.E+00	L.T. 3.E+00	NA	NA
SR-90	L.T. 6.E-01	L.T. 5.E-01	NA	NA
FE-55	L.T. 7.E+01	L.T. 2.E+02	NA	NA
NI-63	L.T. 4.E+00	L.T. 4.E+00	NA	NA
GAMMA SPECTRUM ANALYSIS:				
BE-7	L.T. 3.E+01	L.T. 2.E+01	NA	NA
K-40	L.T. 2.E+01	4.50E+01 ± 2.38E+01	NA	NA
MN-54	L.T. 3.E+00	L.T. 1.E+00	NA	NA
CO-58	L.T. 3.E+00	L.T. 2.E+00	NA	NA
FE-59	L.T. 7.E+00	L.T. 4.E+00	NA	NA
CO-60	L.T. 2.E+00	L.T. 1.E+00	NA	NA
ZN-65	L.T. 5.E+00	L.T. 3.E+00	NA	NA
ZR-95	L.T. 5.E+00	L.T. 3.E+00	NA	NA
RU-103	L.T. 3.E+00	L.T. 2.E+00	NA	NA
RU-106	L.T. 2.E+01	L.T. 1.E+01	NA	NA
I-131	L.T. 3.E+01	L.T. 1.E+01	NA	NA
CS-134	L.T. 2.E+00	L.T. 1.E+00	NA	NA
CS-137	L.T. 3.E+00	L.T. 2.E+00	NA	NA
BA-140	L.T. 4.E+01	L.T. 2.E+01	NA	NA
LA-140	L.T. 1.E+01	L.T. 6.E+00	NA	NA
CE-141	L.T. 7.E+00	L.T. 4.E+00	NA	NA
CE-144	L.T. 2.E+01	L.T. 1.E+01	NA	NA
RA-226	L.T. 6.E+01	L.T. 4.E+01	NA	NA
TH-228	L.T. 6.E+00	L.T. 2.E+00	NA	NA
H-3	L.T. 2.E+02	L.T. 5.E+02	L.T. 2.E+02	L.T. 2.E+02

B-21

H-41

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 8

DATE COLLECTED	01/10/12	05/15/12	09/20/12	11/21/12
RADIOCHEMICAL ANALYSIS:				
GROSS ALPHA	L.T. 1.E+00	L.T. 7.E+00	L.T. 1.E+01	NA
SR-89	L.T. 4.E+00	L.T. 4.E+00	L.T. 3.E+00	NA
SR-90	L.T. 6.E-01	L.T. 5.E-01	L.T. 6.E-01	NA
FE-55	L.T. 2.E+02	L.T. 1.E+02	L.T. 1.E+02	NA
NI-63	L.T. 3.E+00	L.T. 4.E+00	L.T. 4.E+00	NA
GAMMA SPECTRUM ANALYSIS:				
BE-7	L.T. 4.E+01	L.T. 2.E+01	L.T. 4.E+01	NA
K-40	L.T. 3.E+01	L.T. 2.E+01	L.T. 5.E+01	NA
MN-54	L.T. 3.E+00	L.T. 2.E+00	L.T. 4.E+00	NA
CO-58	L.T. 4.E+00	L.T. 2.E+00	L.T. 4.E+00	NA
FE-59	L.T. 9.E+00	L.T. 5.E+00	L.T. 1.E+01	NA
CO-60	L.T. 3.E+00	L.T. 2.E+00	L.T. 5.E+00	NA
ZN-65	L.T. 8.E+00	L.T. 4.E+00	L.T. 7.E+00	NA
ZR-95	L.T. 7.E+00	L.T. 4.E+00	L.T. 9.E+00	NA
RU-103	L.T. 6.E+00	L.T. 3.E+00	L.T. 5.E+00	NA
RU-106	L.T. 3.E+01	L.T. 2.E+01	L.T. 4.E+01	NA
I-131	L.T. 4.E+01	L.T. 2.E+01	L.T. 2.E+01	NA
CS-134	L.T. 3.E+00	L.T. 2.E+00	L.T. 5.E+00	NA
CS-137	L.T. 3.E+00	L.T. 2.E+00	L.T. 6.E+00	NA
BA-140	L.T. 5.E+01	L.T. 3.E+01	L.T. 3.E+01	NA
LA-140	L.T. 1.E+01	L.T. 7.E+00	L.T. 1.E+01	NA
CE-141	L.T. 9.E+00	L.T. 5.E+00	L.T. 9.E+00	NA
CE-144	L.T. 2.E+01	L.T. 1.E+01	L.T. 3.E+01	NA
RA-226	L.T. 7.E+01	L.T. 4.E+01	L.T. 1.E+02	NA
TH-228	L.T. 6.E+00	L.T. 4.E+00	L.T. 9.E+00	NA
H-3	L.T. 2.E+02	L.T. 5.E+02	L.T. 2.E+02	L.T. 3.E+02

B-22

H-42

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 9

DATE COLLECTED	01/10/12	05/14/12	09/20/12	11/20/12
<b>RADIOCHEMICAL ANALYSIS:</b>				
GROSS ALPHA	L.T. 2.E+00	L.T. 7.E+00	L.T. 4.E+00	NA
SR-89	L.T. 3.E+00	L.T. 2.E+00	L.T. 3.E+00	NA
SR-90	L.T. 6.E-01	L.T. 6.E-01	L.T. 7.E-01	NA
FE-55	L.T. 2.E+02	L.T. 1.E+02	L.T. 8.E+01	NA
NI-63	L.T. 3.E+00	L.T. 3.E+00	L.T. 4.E+00	NA
<b>GAMMA SPECTRUM ANALYSIS:</b>				
BE-7	L.T. 2.E+01	L.T. 2.E+01	L.T. 5.E+01	NA
K-40	L.T. 5.E+01	L.T. 3.E+01	L.T. 1.E+02	NA
MN-54	L.T. 2.E+00	L.T. 2.E+00	L.T. 5.E+00	NA
CO-58	L.T. 2.E+00	L.T. 2.E+00	L.T. 6.E+00	NA
FE-59	L.T. 4.E+00	L.T. 6.E+00	L.T. 1.E+01	NA
CO-60	L.T. 2.E+00	L.T. 2.E+00	L.T. 4.E+00	NA
ZN-65	L.T. 3.E+00	L.T. 4.E+00	L.T. 1.E+01	NA
ZR-95	L.T. 4.E+00	L.T. 4.E+00	L.T. 1.E+01	NA
RU-103	L.T. 3.E+00	L.T. 3.E+00	L.T. 8.E+00	NA
RU-106	L.T. 2.E+01	L.T. 2.E+01	L.T. 5.E+01	NA
I-131	L.T. 2.E+01	L.T. 2.E+01	L.T. 3.E+01	NA
CS-134	L.T. 1.E+00	L.T. 2.E+00	L.T. 5.E+00	NA
CS-137	L.T. 2.E+00	L.T. 2.E+00	L.T. 6.E+00	NA
BA-140	L.T. 2.E+01	L.T. 3.E+01	L.T. 5.E+01	NA
LA-140	L.T. 9.E+00	L.T. 1.E+01	L.T. 1.E+01	NA
CE-141	L.T. 5.E+00	L.T. 5.E+00	L.T. 2.E+01	NA
CE-144	L.T. 1.E+01	L.T. 1.E+01	L.T. 5.E+01	NA
RA-226	L.T. 5.E+01	L.T. 5.E+01	L.T. 2.E+02	NA
TH-228	L.T. 3.E+00	L.T. 4.E+00	L.T. 1.E+01	NA
H-3	L.T. 2.E+02	L.T. 5.E+02	L.T. 2.E+02	L.T. 3.E+02

B-23

H-43

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 10

DATE COLLECTED	01/10/12	02/24/12	03/22/12	04/26/12
<b>RADIOCHEMICAL ANALYSIS:</b>				
GROSS ALPHA	L.T. 2.E+00	L.T. 4.E+00	L.T. 2.E+00	L.T. 8.E+00
SR-89	L.T. 3.E+00	L.T. 4.E+00	L.T. 3.E+00	L.T. 3.E+00
SR-90	L.T. 6.E-01	L.T. 7.E-01	L.T. 5.E-01	L.T. 4.E-01
FE-55	L.T. 2.E+02	L.T. 2.E+02	L.T. 9.E+01	L.T. 9.E+01
NI-63	L.T. 3.E+00	L.T. 4.E+00	L.T. 3.E+00	L.T. 4.E+00
<b>GAMMA SPECTRUM ANALYSIS:</b>				
BE-7	L.T. 3.E+01	L.T. 5.E+01	L.T. 4.E+01	L.T. 2.E+01
K-40	L.T. 2.E+01	L.T. 5.E+01	L.T. 7.E+01	L.T. 3.E+01
MN-54	L.T. 2.E+00	L.T. 5.E+00	L.T. 4.E+00	L.T. 2.E+00
CO-58	L.T. 3.E+00	L.T. 5.E+00	L.T. 4.E+00	L.T. 2.E+00
FE-59	L.T. 8.E+00	L.T. 1.E+01	L.T. 9.E+00	L.T. 5.E+00
CO-60	L.T. 3.E+00	L.T. 7.E+00	L.T. 4.E+00	L.T. 2.E+00
ZN-65	L.T. 6.E+00	L.T. 1.E+01	L.T. 7.E+00	L.T. 4.E+00
ZR-95	L.T. 6.E+00	L.T. 1.E+01	L.T. 7.E+00	L.T. 3.E+00
RU-103	L.T. 4.E+00	L.T. 6.E+00	L.T. 5.E+00	L.T. 3.E+00
RU-106	L.T. 2.E+01	L.T. 5.E+01	L.T. 4.E+01	L.T. 2.E+01
I-131	L.T. 3.E+01	L.T. 3.E+01	L.T. 2.E+01	L.T. 2.E+01
CS-134	L.T. 2.E+00	L.T. 5.E+00	L.T. 4.E+00	L.T. 2.E+00
CS-137	L.T. 2.E+00	L.T. 6.E+00	L.T. 3.E+00	L.T. 2.E+00
BA-140	L.T. 5.E+01	L.T. 5.E+01	L.T. 4.E+01	L.T. 2.E+01
LA-140	L.T. 1.E+01	L.T. 2.E+01	L.T. 9.E+00	L.T. 8.E+00
CE-141	L.T. 8.E+00	L.T. 1.E+01	L.T. 9.E+00	L.T. 5.E+00
CE-144	L.T. 2.E+01	L.T. 3.E+01	L.T. 3.E+01	L.T. 1.E+01
RA-226	L.T. 7.E+01	L.T. 1.E+02	L.T. 1.E+02	L.T. 5.E+01
TH-228	L.T. 6.E+00	L.T. 9.E+00	L.T. 8.E+00	L.T. 4.E+00
H-3	1.37E+03 ± 2.26E+02	9.94E+02 ± 2.20E+02	1.28E+03 ± 2.33E+02	1.42E+03 ± 2.51E+02

B-24

H-44



B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 10

DATE COLLECTED	05/14/12	06/13/12	06/20/12	06/25/12
RADIOCHEMICAL ANALYSIS:				
GROSS ALPHA	L.T. 7.E+00	L.T. 5.E+00	L.T. 4.E+00	L.T. 4.E+00
SR-89	L.T. 3.E+00	L.T. 3.E+00	L.T. 3.E+00	L.T. 3.E+00
SR-90	L.T. 6.E-01	L.T. 8.E-01	L.T. 8.E-01	L.T. 8.E-01
FE-55	L.T. 2.E+02	L.T. 1.E+02	L.T. 9.E+01	L.T. 2.E+02
NI-63	L.T. 3.E+00	L.T. 4.E+00	L.T. 3.E+00	L.T. 3.E+00
GAMMA SPECTRUM ANALYSIS:				
BE-7	L.T. 2.E+01	L.T. 6.E+01	L.T. 6.E+01	L.T. 5.E+01
K-40	L.T. 2.E+01	L.T. 6.E+01	L.T. 6.E+01	L.T. 4.E+01
MN-54	L.T. 2.E+00	L.T. 5.E+00	L.T. 6.E+00	L.T. 5.E+00
CO-58	L.T. 2.E+00	L.T. 7.E+00	L.T. 7.E+00	L.T. 8.E+00
FE-59	L.T. 5.E+00	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01
CO-60	L.T. 2.E+00	L.T. 7.E+00	L.T. 8.E+00	L.T. 7.E+00
ZN-65	L.T. 3.E+00	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01
ZR-95	L.T. 4.E+00	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01
RU-103	L.T. 3.E+00	L.T. 7.E+00	L.T. 7.E+00	L.T. 6.E+00
RU-106	L.T. 2.E+01	L.T. 6.E+01	L.T. 6.E+01	L.T. 6.E+01
I-131	L.T. 2.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01
CS-134	L.T. 2.E+00	L.T. 6.E+00	L.T. 5.E+00	L.T. 6.E+00
CS-137	L.T. 2.E+00	L.T. 8.E+00	L.T. 7.E+00	L.T. 7.E+00
BA-140	L.T. 3.E+01	L.T. 3.E+01	L.T. 3.E+01	L.T. 3.E+01
LA-140	L.T. 9.E+00	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01
CE-141	L.T. 6.E+00	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01
CE-144	L.T. 2.E+01	L.T. 5.E+01	L.T. 5.E+01	L.T. 5.E+01
RA-226	L.T. 5.E+01	L.T. 2.E+02	L.T. 2.E+02	L.T. 2.E+02
TH-228	L.T. 4.E+00	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01
H-3	1.98E+03 ± 2.86E+02	3.20E+03 ± 5.42E+02	3.51E+03 ± 6.07E+02	3.69E+03 ± 6.52E+02

B-25

H-45

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 10

DATE COLLECTED	07/02/12	07/11/12	07/18/12	07/26/12
RADIOCHEMICAL ANALYSIS:				
GROSS ALPHA	L.T. 7.E+00	L.T. 4.E+00	L.T. 8.E+00	L.T. 6.E+00
SR-89	L.T. 2.E+00	L.T. 3.E+00	L.T. 2.E+00	L.T. 3.E+00
SR-90	L.T. 7.E-01	L.T. 5.E-01	L.T. 7.E-01	L.T. 7.E-01
FE-55	L.T. 1.E+02	L.T. 9.E+01	L.T. 1.E+02	L.T. 2.E+02
NI-63	L.T. 4.E+00	L.T. 3.E+00	L.T. 3.E+00	L.T. 4.E+00
GAMMA SPECTRUM ANALYSIS:				
BE-7	L.T. 5.E+01	L.T. 3.E+01	L.T. 8.E+01	L.T. 3.E+01
K-40	L.T. 1.E+02	L.T. 6.E+01	L.T. 1.E+02	L.T. 6.E+01
MN-54	L.T. 6.E+00	L.T. 3.E+00	L.T. 8.E+00	L.T. 3.E+00
CO-58	L.T. 5.E+00	L.T. 4.E+00	L.T. 8.E+00	L.T. 3.E+00
FE-59	L.T. 1.E+01	L.T. 8.E+00	L.T. 2.E+01	L.T. 6.E+00
CO-60	L.T. 6.E+00	L.T. 4.E+00	L.T. 1.E+01	L.T. 3.E+00
ZN-65	L.T. 1.E+01	L.T. 7.E+00	L.T. 2.E+01	L.T. 6.E+00
ZR-95	L.T. 1.E+01	L.T. 6.E+00	L.T. 1.E+01	L.T. 6.E+00
RU-103	L.T. 7.E+00	L.T. 4.E+00	L.T. 1.E+01	L.T. 4.E+00
RU-106	L.T. 5.E+01	L.T. 3.E+01	L.T. 7.E+01	L.T. 3.E+01
I-131	L.T. 1.E+01	L.T. 1.E+01	L.T. 2.E+01	L.T. 1.E+01
CS-134	L.T. 6.E+00	L.T. 3.E+00	L.T. 8.E+00	L.T. 3.E+00
CS-137	L.T. 6.E+00	L.T. 3.E+00	L.T. 8.E+00	L.T. 3.E+00
BA-140	L.T. 3.E+01	L.T. 2.E+01	L.T. 6.E+01	L.T. 2.E+01
LA-140	L.T. 1.E+01	L.T. 8.E+00	L.T. 2.E+01	L.T. 7.E+00
CE-141	L.T. 1.E+01	L.T. 8.E+00	L.T. 1.E+01	L.T. 8.E+00
CE-144	L.T. 5.E+01	L.T. 3.E+01	L.T. 4.E+01	L.T. 3.E+01
RA-226	L.T. 2.E+02	L.T. 9.E+01	L.T. 2.E+02	L.T. 9.E+01
TH-228	L.T. 1.E+01	L.T. 6.E+00	L.T. 1.E+01	L.T. 7.E+00
H-3	2.96E+03 ± 5.45E+02	3.27E+03 ± 5.66E+02	3.31E+03 ± 3.78E+02	4.42E+03 ± 4.91E+02

B-26

H-46

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 10

DATE COLLECTED	08/01/12	08/09/12	08/16/12	08/23/12
RADIOCHEMICAL ANALYSIS:				
GROSS ALPHA	L.T. 7.E+00	L.T. 5.E+00	L.T. 5.E+00	L.T. 4.E+00
SR-89	L.T. 3.E+00	L.T. 3.E+00	L.T. 2.E+00	L.T. 2.E+00
SR-90	L.T. 7.E-01	L.T. 8.E-01	L.T. 7.E-01	L.T. 5.E-01
FE-55	L.T. 1.E+02	L.T. 1.E+02	L.T. 2.E+02	L.T. 1.E+02
NI-63	L.T. 4.E+00	L.T. 4.E+00	L.T. 4.E+00	L.T. 3.E+00
GAMMA SPECTRUM ANALYSIS:				
BE-7	L.T. 5.E+01	L.T. 3.E+01	L.T. 5.E+01	L.T. 5.E+01
K-40	L.T. 9.E+01	L.T. 6.E+01	L.T. 1.E+02	L.T. 1.E+02
MN-54	L.T. 5.E+00	L.T. 3.E+00	L.T. 5.E+00	L.T. 7.E+00
CO-58	L.T. 5.E+00	L.T. 3.E+00	L.T. 5.E+00	L.T. 8.E+00
FE-59	L.T. 1.E+01	L.T. 6.E+00	L.T. 1.E+01	L.T. 1.E+01
CO-60	L.T. 3.E+00	L.T. 3.E+00	L.T. 4.E+00	L.T. 6.E+00
ZN-65	L.T. 1.E+01	L.T. 7.E+00	L.T. 1.E+01	L.T. 1.E+01
ZR-95	L.T. 1.E+01	L.T. 6.E+00	L.T. 1.E+01	L.T. 1.E+01
RU-103	L.T. 6.E+00	L.T. 3.E+00	L.T. 6.E+00	L.T. 7.E+00
RU-106	L.T. 5.E+01	L.T. 3.E+01	L.T. 5.E+01	L.T. 5.E+01
I-131	L.T. 1.E+01	L.T. 6.E+00	L.T. 1.E+01	L.T. 2.E+01
CS-134	L.T. 4.E+00	L.T. 3.E+00	L.T. 5.E+00	L.T. 5.E+00
CS-137	L.T. 5.E+00	L.T. 3.E+00	L.T. 5.E+00	L.T. 6.E+00
BA-140	L.T. 3.E+01	L.T. 1.E+01	L.T. 4.E+01	L.T. 4.E+01
LA-140	L.T. 8.E+00	L.T. 5.E+00	L.T. 1.E+01	L.T. 1.E+01
CE-141	L.T. 1.E+01	L.T. 6.E+00	L.T. 1.E+01	L.T. 1.E+01
CE-144	L.T. 4.E+01	L.T. 2.E+01	L.T. 4.E+01	L.T. 5.E+01
RA-226	L.T. 1.E+02	L.T. 8.E+01	L.T. 1.E+02	L.T. 2.E+02
TH-228	L.T. 1.E+01	L.T. 5.E+00	L.T. 1.E+01	L.T. 1.E+01
H-3	4.52E+03 ± 5.00E+02	4.73E+03 ± 5.14E+02	4.68E+03 ± 5.06E+02	3.82E+03 ± 4.57E+02

B-27

H-47

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 10

DATE COLLECTED	08/28/12	09/16/12	09/13/12	09/20/12
RADIOCHEMICAL ANALYSIS:				
GROSS ALPHA	L.T. 1.E+00	L.T. 5.E+00	L.T. 7.E+00	L.T. 4.E+00
SR-89	L.T. 2.E+00	L.T. 3.E+00	L.T. 4.E+00	L.T. 3.E+00
SR-90	L.T. 6.E-01	L.T. 6.E-01	L.T. 7.E-01	L.T. 7.E-01
FE-55	L.T. 2.E+02	L.T. 1.E+02	L.T. 1.E+02	L.T. 1.E+02
NI-63	L.T. 4.E+00	L.T. 3.E+00	L.T. 3.E+00	L.T. 4.E+00
GAMMA SPECTRUM ANALYSIS:				
BE-7	L.T. 5.E+01	L.T. 6.E+01	L.T. 5.E+01	L.T. 5.E+01
K-40	L.T. 5.E+01	L.T. 8.E+01	L.T. 5.E+01	L.T. 4.E+01
MN-54	L.T. 6.E+00	L.T. 5.E+00	L.T. 5.E+00	L.T. 4.E+00
CO-58	L.T. 5.E+00	L.T. 6.E+00	L.T. 4.E+00	L.T. 5.E+00
FE-59	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 8.E+00
CO-60	L.T. 6.E+00	L.T. 5.E+00	L.T. 6.E+00	L.T. 4.E+00
ZN-65	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 9.E+00
ZR-95	L.T. 1.E+01	L.T. 1.E+01	L.T. 8.E+00	L.T. 1.E+01
RU-103	L.T. 6.E+00	L.T. 7.E+00	L.T. 6.E+00	L.T. 6.E+00
RU-106	L.T. 5.E+01	L.T. 5.E+01	L.T. 4.E+01	L.T. 4.E+01
I-131	L.T. 9.E+00	L.T. 1.E+01	L.T. 2.E+01	L.T. 2.E+01
CS-134	L.T. 5.E+00	L.T. 6.E+00	L.T. 4.E+00	L.T. 4.E+00
CS-137	L.T. 6.E+00	L.T. 6.E+00	L.T. 5.E+00	L.T. 4.E+00
BA-140	L.T. 3.E+01	L.T. 4.E+01	L.T. 3.E+01	L.T. 4.E+01
LA-140	L.T. 1.E+01	L.T. 1.E+01	L.T. 8.E+00	L.T. 1.E+01
CE-141	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01
CE-144	L.T. 4.E+01	L.T. 4.E+01	L.T. 3.E+01	L.T. 4.E+01
RA-226	L.T. 1.E+02	L.T. 2.E+02	L.T. 1.E+02	L.T. 1.E+02
TH-228	L.T. 1.E+01	L.T. 1.E+01	L.T. 9.E+00	L.T. 1.E+01
H-3	3.75E+03 ± 4.56E+02	4.11E+03 ± 4.67E+02	4.11E+03 ± 4.56E+02	3.83E+03 ± 4.44E+02

B-28

H-48

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 10

DATE COLLECTED	09/27/12	10/03/12	10/11/12	10/18/12
<b>RADIOCHEMICAL ANALYSIS:</b>				
GROSS ALPHA	NA	NA	NA	NA
SR-89	NA	NA	NA	NA
SR-90	NA	NA	NA	NA
FE-55	NA	NA	NA	NA
NI-63	NA	NA	NA	NA
<b>GAMMA SPECTRUM ANALYSIS:</b>				
BE-7	L.T. 5.E+01	L.T. 6.E+01	L.T. 2.E+01	L.T. 5.E+01
K-40	L.T. 5.E+01	L.T. 1.E+02	L.T. 2.E+01	L.T. 9.E+01
MN-54	L.T. 5.E+00	L.T. 5.E+00	L.T. 2.E+00	L.T. 5.E+00
CO-58	L.T. 5.E+00	L.T. 6.E+00	L.T. 2.E+00	L.T. 5.E+00
FE-59	L.T. 1.E+01	L.T. 1.E+01	L.T. 4.E+00	L.T. 1.E+01
CO-60	L.T. 5.E+00	L.T. 7.E+00	L.T. 2.E+00	L.T. 5.E+00
ZN-65	L.T. 1.E+01	L.T. 1.E+01	L.T. 4.E+00	L.T. 9.E+00
ZR-95	L.T. 9.E+00	L.T. 1.E+01	L.T. 3.E+00	L.T. 9.E+00
RU-103	L.T. 6.E+00	L.T. 7.E+00	L.T. 2.E+00	L.T. 6.E+00
RU-106	L.T. 4.E+01	L.T. 5.E+01	L.T. 2.E+01	L.T. 5.E+01
I-131	L.T. 1.E+01	L.T. 2.E+01	L.T. 5.E+00	L.T. 1.E+01
CS-134	L.T. 5.E+00	L.T. 6.E+00	L.T. 2.E+00	L.T. 5.E+00
CS-137	L.T. 5.E+00	L.T. 7.E+00	L.T. 2.E+00	L.T. 5.E+00
BA-140	L.T. 3.E+01	L.T. 4.E+01	L.T. 1.E+01	L.T. 3.E+01
LA-140	L.T. 1.E+01	L.T. 1.E+01	L.T. 4.E+00	L.T. 9.E+00
CE-141	L.T. 9.E+00	L.T. 1.E+01	L.T. 3.E+00	L.T. 1.E+01
CE-144	L.T. 3.E+01	L.T. 4.E+01	L.T. 1.E+01	L.T. 4.E+01
RA-226	L.T. 1.E+02	L.T. 1.E+02	6.45E+01 ± 4.03E+01	L.T. 1.E+02
TH-228	L.T. 9.E+00	L.T. 1.E+01	L.T. 3.E+00	L.T. 1.E+01
H-3	3.45E+03 ± 3.95E+02	3.57E+03 ± 4.22E+02	3.23E+03 ± 3.91E+02	2.42E+03 ± 3.00E+02

B-29

H-49

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 10

DATE COLLECTED	10/24/12	10/31/12	11/07/12	11/14/12
<b>RADIOCHEMICAL ANALYSIS:</b>				
GROSS ALPHA	NA	NA	NA	NA
SR-89	NA	NA	NA	NA
SR-90	NA	NA	NA	NA
FE-55	NA	NA	NA	NA
NI-63	NA	NA	NA	NA
<b>GAMMA SPECTRUM ANALYSIS:</b>				
BE-7	L.T. 4.E+01	L.T. 2.E+01	L.T. 2.E+01	L.T. 2.E+01
K-40	L.T. 3.E+01	L.T. 4.E+01	L.T. 2.E+01	L.T. 1.E+01
MN-54	L.T. 4.E+00	L.T. 2.E+00	L.T. 2.E+00	L.T. 1.E+00
CO-58	L.T. 5.E+00	L.T. 2.E+00	L.T. 2.E+00	L.T. 2.E+00
FE-59	L.T. 1.E+01	L.T. 4.E+00	L.T. 5.E+00	L.T. 4.E+00
CO-60	L.T. 5.E+00	L.T. 2.E+00	L.T. 2.E+00	L.T. 2.E+00
ZN-65	L.T. 8.E+00	L.T. 4.E+00	L.T. 4.E+00	L.T. 3.E+00
ZR-95	L.T. 9.E+00	L.T. 4.E+00	L.T. 4.E+00	L.T. 3.E+00
RU-103	L.T. 5.E+00	L.T. 2.E+00	L.T. 3.E+00	L.T. 2.E+00
RU-106	L.T. 4.E+01	L.T. 2.E+01	L.T. 2.E+01	L.T. 1.E+01
I-131	L.T. 2.E+01	L.T. 7.E+00	L.T. 1.E+01	L.T. 9.E+00
CS-134	L.T. 3.E+00	L.T. 2.E+00	L.T. 2.E+00	L.T. 1.E+00
CS-137	L.T. 4.E+00	L.T. 2.E+00	L.T. 2.E+00	L.T. 2.E+00
BA-140	L.T. 4.E+01	L.T. 1.E+01	L.T. 2.E+01	L.T. 2.E+01
LA-140	L.T. 1.E+01	L.T. 4.E+00	L.T. 6.E+00	L.T. 5.E+00
CE-141	L.T. 9.E+00	L.T. 5.E+00	L.T. 5.E+00	L.T. 4.E+00
CE-144	L.T. 3.E+01	L.T. 2.E+01	L.T. 2.E+01	L.T. 1.E+01
RA-226	L.T. 1.E+02	L.T. 5.E+01	L.T. 5.E+01	L.T. 3.E+01
TH-228	L.T. 7.E+00	6.07E+00 ± 3.25E+00	8.12E+00 ± 2.93E+00	L.T. 3.E+00
H-3	2.78E+03 ± 3.24E+02	2.13E+03 ± 2.94E+02	2.08E+03 ± 3.40E+02	1.81E+03 ± 2.57E+02

B-30

H-50

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 10

DATE COLLECTED	11/20/12	11/27/12	12/06/12	12/12/12
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RADIOCHEMICAL ANALYSIS:

GROSS ALPHA	NA	NA	NA	NA
SR-89	NA	NA	NA	NA
SR-90	NA	NA	NA	NA
FE-55	NA	NA	NA	NA
NI-63	NA	NA	NA	NA

GAMMA SPECTRUM ANALYSIS:

BE-7	L.T. 2.E+01	L.T. 4.E+01	L.T. 2.E+01	L.T. 2.E+01
K-40	L.T. 3.E+01	L.T. 7.E+01	4.23E+01 ± 2.46E+01	L.T. 2.E+01
MN-54	L.T. 2.E+00	L.T. 3.E+00	L.T. 2.E+00	L.T. 2.E+00
CO-58	L.T. 2.E+00	L.T. 4.E+00	L.T. 2.E+00	L.T. 2.E+00
FE-59	L.T. 4.E+00	L.T. 9.E+00	L.T. 4.E+00	L.T. 5.E+00
CO-60	L.T. 2.E+00	L.T. 3.E+00	L.T. 2.E+00	L.T. 2.E+00
ZN-65	L.T. 3.E+00	L.T. 7.E+00	L.T. 3.E+00	L.T. 4.E+00
ZR-95	L.T. 3.E+00	L.T. 7.E+00	L.T. 4.E+00	L.T. 4.E+00
RU-103	L.T. 2.E+00	L.T. 5.E+00	L.T. 2.E+00	L.T. 3.E+00
RU-106	L.T. 2.E+01	L.T. 3.E+01	L.T. 1.E+01	L.T. 2.E+01
I-131	L.T. 1.E+01	L.T. 1.E+01	L.T. 2.E+01	L.T. 1.E+01
CS-134	L.T. 2.E+00	L.T. 4.E+00	L.T. 2.E+00	L.T. 2.E+00
CS-137	L.T. 2.E+00	L.T. 4.E+00	L.T. 2.E+00	L.T. 2.E+00
BA-140	L.T. 2.E+01	L.T. 3.E+01	L.T. 3.E+01	L.T. 2.E+01
LA-140	L.T. 6.E+00	L.T. 9.E+00	L.T. 8.E+00	L.T. 7.E+00
CE-141	L.T. 4.E+00	L.T. 1.E+01	L.T. 5.E+00	L.T. 5.E+00
CE-144	L.T. 1.E+01	L.T. 3.E+01	L.T. 1.E+01	L.T. 2.E+01
RA-226	L.T. 4.E+01	L.T. 1.E+02	L.T. 4.E+01	L.T. 5.E+01
TH-228	L.T. 3.E+00	L.T. 8.E+00	L.T. 3.E+00	6.10E+00 ± 3.23E+00
H-3	1.82E+03 ± 2.59E+02	2.15E+03 ± 2.79E+02	1.59E+03 ± 2.56E+02	2.37E+03 ± 3.00E+02

B-31

H-51

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 10

DATE COLLECTED	12/18/12	12/28/12
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RADIOCHEMICAL ANALYSIS:

GROSS ALPHA	NA	NA
SR-89	NA	NA
SR-90	NA	NA
FE-55	NA	NA
NI-63	NA	NA

GAMMA SPECTRUM ANALYSIS:

BE-7	L.T. 5.E+01	NA
K-40	L.T. 1.E+02	NA
MN-54	L.T. 5.E+00	NA
CO-58	L.T. 6.E+00	NA
FE-59	L.T. 1.E+01	NA
CO-60	L.T. 6.E+00	NA
ZN-65	L.T. 1.E+01	NA
ZR-95	L.T. 1.E+01	NA
RU-103	L.T. 6.E+00	NA
RU-106	L.T. 5.E+01	NA
I-131	L.T. 2.E+01	NA
CS-134	L.T. 5.E+00	NA
CS-137	L.T. 6.E+00	NA
BA-140	L.T. 4.E+01	NA
LA-140	L.T. 1.E+01	NA
CE-141	L.T. 1.E+01	NA
CE-144	L.T. 5.E+01	NA
RA-226	L.T. 2.E+02	NA
TH-228	L.T. 1.E+01	NA
H-3	1.62E+03 ± 2.61E+02	NA

B-32

H-52



B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 12

DATE COLLECTED	01/10/12	05/15/12	09/20/12	11/07/12
RADIOCHEMICAL ANALYSIS:				
GROSS ALPHA	L.T. 7.E+00	L.T. 7.E+00	L.T. 9.E+00	NA
SR-89	L.T. 3.E+00	L.T. 3.E+00	L.T. 3.E+00	NA
SR-90	L.T. 5.E-01	L.T. 6.E-01	L.T. 1.E+00	NA
FE-55	L.T. 1.E+02	L.T. 1.E+02	L.T. 1.E+02	NA
NI-63	L.T. 4.E+00	L.T. 3.E+00	L.T. 4.E+00	NA
GAMMA SPECTRUM ANALYSIS:				
BE-7	L.T. 3.E+01	L.T. 2.E+01	L.T. 4.E+01	NA
K-40	L.T. 6.E+01	L.T. 1.E+01	L.T. 7.E+01	NA
MN-54	L.T. 3.E+00	L.T. 1.E+00	L.T. 4.E+00	NA
CO-58	L.T. 3.E+00	L.T. 2.E+00	L.T. 5.E+00	NA
FE-59	L.T. 7.E+00	L.T. 4.E+00	L.T. 1.E+01	NA
CO-60	L.T. 2.E+00	L.T. 2.E+00	L.T. 4.E+00	NA
ZN-65	L.T. 5.E+00	L.T. 3.E+00	L.T. 8.E+00	NA
ZR-95	L.T. 5.E+00	L.T. 3.E+00	L.T. 8.E+00	NA
RU-103	L.T. 4.E+00	L.T. 2.E+00	L.T. 6.E+00	NA
RU-106	L.T. 2.E+01	L.T. 1.E+01	L.T. 4.E+01	NA
I-131	L.T. 3.E+01	L.T. 2.E+01	L.T. 2.E+01	NA
CS-134	L.T. 2.E+00	L.T. 1.E+00	L.T. 4.E+00	NA
CS-137	L.T. 3.E+00	L.T. 2.E+00	L.T. 5.E+00	NA
BA-140	L.T. 4.E+01	L.T. 2.E+01	L.T. 4.E+01	NA
LA-140	L.T. 1.E+01	L.T. 7.E+00	L.T. 1.E+01	NA
CE-141	L.T. 8.E+00	L.T. 4.E+00	L.T. 1.E+01	NA
CE-144	L.T. 2.E+01	L.T. 1.E+01	L.T. 3.E+01	NA
RA-226	L.T. 6.E+01	L.T. 3.E+01	L.T. 1.E+02	NA
TH-228	L.T. 5.E+00	L.T. 3.E+00	L.T. 7.E+00	NA
H-3	L.T. 2.E+02	L.T. 5.E+02	L.T. 2.E+02	L.T. 3.E+02

B-33

H-53

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 13

DATE COLLECTED	01/10/12	02/24/12	03/22/12	04/26/12
<b>RADIOCHEMICAL ANALYSIS:</b>				
GROSS ALPHA	L.T. 1.E+00	L.T. 4.E+00	L.T. 8.E-01	L.T. 4.E+00
SR-89	L.T. 3.E+00	L.T. 3.E+00	L.T. 2.E+00	L.T. 3.E+00
SR-90	L.T. 5.E-01	L.T. 5.E-01	L.T. 6.E-01	L.T. 6.E-01
FE-55	L.T. 2.E+02	L.T. 2.E+02	L.T. 1.E+02	L.T. 8.E+01
NI-63	L.T. 3.E+00	L.T. 4.E+00	L.T. 4.E+00	L.T. 4.E+00
<b>GAMMA SPECTRUM ANALYSIS:</b>				
BE-7	L.T. 3.E+01	L.T. 6.E+01	L.T. 5.E+01	L.T. 3.E+01
K-40	L.T. 3.E+01	L.T. 5.E+01	L.T. 1.E+02	L.T. 3.E+01
MN-54	L.T. 3.E+00	L.T. 5.E+00	L.T. 6.E+00	L.T. 3.E+00
CO-58	L.T. 4.E+00	L.T. 6.E+00	L.T. 8.E+00	L.T. 3.E+00
FE-59	L.T. 9.E+00	L.T. 1.E+01	L.T. 1.E+01	L.T. 7.E+00
CO-60	L.T. 3.E+00	L.T. 6.E+00	L.T. 6.E+00	L.T. 3.E+00
ZN-65	L.T. 6.E+00	L.T. 1.E+01	L.T. 1.E+01	L.T. 6.E+00
ZR-95	L.T. 6.E+00	L.T. 1.E+01	L.T. 1.E+01	L.T. 6.E+00
RU-103	L.T. 5.E+00	L.T. 7.E+00	L.T. 7.E+00	L.T. 5.E+00
RU-106	L.T. 3.E+01	L.T. 5.E+01	L.T. 5.E+01	L.T. 2.E+01
I-131	L.T. 4.E+01	L.T. 2.E+01	L.T. 2.E+01	L.T. 3.E+01
CS-134	L.T. 3.E+00	L.T. 6.E+00	L.T. 6.E+00	L.T. 3.E+00
CS-137	L.T. 3.E+00	L.T. 6.E+00	L.T. 7.E+00	L.T. 3.E+00
BA-140	L.T. 5.E+01	L.T. 4.E+01	L.T. 5.E+01	L.T. 4.E+01
LA-140	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01
CE-141	L.T. 9.E+00	L.T. 1.E+01	L.T. 1.E+01	L.T. 8.E+00
CE-144	L.T. 2.E+01	L.T. 4.E+01	L.T. 3.E+01	L.T. 2.E+01
RA-226	L.T. 8.E+01	L.T. 2.E+02	L.T. 1.E+02	L.T. 6.E+01
TH-228	L.T. 6.E+00	L.T. 1.E+01	L.T. 9.E+00	L.T. 5.E+00
H-3	1.06E+03 ± 2.10E+02	1.31E+03 ± 2.37E+02	8.70E+02 ± 1.59E+02	9.52E+02 ± 2.33E+02

B-34

H-54

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 13

DATE COLLECTED	05/15/12	06/13/12	06/20/12	06/25/12
<b>RADIOCHEMICAL ANALYSIS:</b>				
GROSS ALPHA	L.T. 7.E+00	L.T. 5.E+00	L.T. 5.E+00	L.T. 5.E+00
SR-89	L.T. 3.E+00	L.T. 3.E+00	L.T. 4.E+00	L.T. 3.E+00
SR-90	L.T. 6.E-01	L.T. 8.E-01	L.T. 9.E-01	L.T. 8.E-01
FE-55	L.T. 2.E+02	L.T. 1.E+02	L.T. 1.E+02	L.T. 1.E+02
NI-63	L.T. 4.E+00	L.T. 4.E+00	L.T. 3.E+00	L.T. 3.E+00
<b>GAMMA SPECTRUM ANALYSIS:</b>				
BE-7	L.T. 2.E+01	L.T. 7.E+01	L.T. 4.E+01	L.T. 5.E+01
K-40	L.T. 5.E+01	L.T. 6.E+01	L.T. 4.E+01	L.T. 6.E+01
MN-54	L.T. 2.E+00	L.T. 7.E+00	L.T. 4.E+00	L.T. 5.E+00
CO-58	L.T. 3.E+00	L.T. 6.E+00	L.T. 4.E+00	L.T. 6.E+00
FE-59	L.T. 6.E+00	L.T. 2.E+01	L.T. 1.E+01	L.T. 1.E+01
CO-60	L.T. 2.E+00	L.T. 7.E+00	L.T. 5.E+00	L.T. 8.E+00
ZN-65	L.T. 4.E+00	L.T. 1.E+01	L.T. 7.E+00	L.T. 1.E+01
ZR-95	L.T. 5.E+00	L.T. 1.E+01	L.T. 7.E+00	L.T. 1.E+01
RU-103	L.T. 3.E+00	L.T. 9.E+00	L.T. 5.E+00	L.T. 7.E+00
RU-106	L.T. 2.E+01	L.T. 7.E+01	L.T. 4.E+01	L.T. 5.E+01
I-131	L.T. 2.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01
CS-134	L.T. 2.E+00	L.T. 8.E+00	L.T. 4.E+00	L.T. 5.E+00
CS-137	L.T. 2.E+00	L.T. 9.E+00	L.T. 4.E+00	L.T. 6.E+00
BA-140	L.T. 3.E+01	L.T. 3.E+01	L.T. 3.E+01	L.T. 3.E+01
LA-140	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 9.E+00
CE-141	L.T. 6.E+00	L.T. 2.E+01	L.T. 9.E+00	L.T. 1.E+01
CE-144	L.T. 2.E+01	L.T. 6.E+01	L.T. 3.E+01	L.T. 4.E+01
RA-226	L.T. 5.E+01	L.T. 2.E+02	L.T. 1.E+02	L.T. 1.E+02
TH-228	L.T. 4.E+00	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01
H-3	7.79E+02 ± 2.15E+02	1.03E+03 ± 3.40E+02	8.18E+02 ± 4.00E+02	9.52E+02 ± 4.07E+02

B-35

H-55

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 13

DATE COLLECTED	07/02/12	07/11/12	07/18/12	07/26/12
<b>RADIOCHEMICAL ANALYSIS:</b>				
GROSS ALPHA	L.T. 7.E+00	L.T. 5.E+00	L.T. 8.E+00	L.T. 6.E+00
SR-89	L.T. 2.E+00	L.T. 3.E+00	L.T. 2.E+00	L.T. 3.E+00
SR-90	L.T. 8.E-01	L.T. 6.E-01	L.T. 8.E-01	L.T. 6.E-01
FE-55	L.T. 2.E+02	L.T. 7.E+01	L.T. 7.E+01	L.T. 1.E+02
NI-63	L.T. 4.E+00	L.T. 4.E+00	L.T. 3.E+00	L.T. 4.E+00
<b>GAMMA SPECTRUM ANALYSIS:</b>				
BE-7	L.T. 5.E+01	L.T. 5.E+01	L.T. 6.E+01	L.T. 3.E+01
K-40	L.T. 5.E+01	L.T. 5.E+01	L.T. 7.E+01	L.T. 4.E+01
MN-54	L.T. 7.E+00	L.T. 5.E+00	L.T. 6.E+00	L.T. 3.E+00
CO-58	L.T. 6.E+00	L.T. 6.E+00	L.T. 5.E+00	L.T. 3.E+00
FE-59	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 6.E+00
CO-60	L.T. 6.E+00	L.T. 5.E+00	L.T. 6.E+00	L.T. 2.E+00
ZN-65	L.T. 9.E+00	L.T. 1.E+01	L.T. 1.E+01	L.T. 5.E+00
ZR-95	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 5.E+00
RU-103	L.T. 7.E+00	L.T. 6.E+00	L.T. 7.E+00	L.T. 3.E+00
RU-106	L.T. 6.E+01	L.T. 5.E+01	L.T. 5.E+01	L.T. 3.E+01
I-131	L.T. 1.E+01	L.T. 1.E+01	L.T. 2.E+01	L.T. 1.E+01
CS-134	L.T. 5.E+00	L.T. 4.E+00	L.T. 5.E+00	L.T. 2.E+00
CS-137	L.T. 6.E+00	L.T. 5.E+00	L.T. 7.E+00	L.T. 3.E+00
BA-140	L.T. 3.E+01	L.T. 3.E+01	L.T. 4.E+01	L.T. 2.E+01
LA-140	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 6.E+00
CE-141	L.T. 1.E+01	L.T. 8.E+00	L.T. 1.E+01	L.T. 6.E+00
CE-144	L.T. 5.E+01	L.T. 3.E+01	L.T. 4.E+01	L.T. 2.E+01
RA-226	L.T. 2.E+02	L.T. 1.E+02	L.T. 2.E+02	L.T. 6.E+01
TH-228	L.T. 1.E+01	L.T. 8.E+00	L.T. 1.E+01	L.T. 5.E+00
H-3	5.13E+02 ± 3.26E+02	6.95E+02 ± 3.58E+02	9.50E+02 ± 2.20E+02	8.62E+02 ± 2.05E+02

B-36

H-56

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 13

DATE COLLECTED	08/01/12	08/09/12	08/16/12	08/23/12
<b>RADIOCHEMICAL ANALYSIS:</b>				
GROSS ALPHA	L.T. 7.E+00	L.T. 5.E+00	L.T. 5.E+00	L.T. 5.E+00
SR-89	L.T. 3.E+00	L.T. 3.E+00	L.T. 2.E+00	L.T. 2.E+00
SR-90	L.T. 7.E-01	L.T. 8.E-01	L.T. 6.E-01	L.T. 7.E-01
FE-55	L.T. 1.E+02	L.T. 8.E+01	L.T. 1.E+02	L.T. 1.E+02
NI-63	L.T. 4.E+00	L.T. 4.E+00	L.T. 4.E+00	L.T. 3.E+00
<b>GAMMA SPECTRUM ANALYSIS:</b>				
BE-7	L.T. 5.E+01	L.T. 4.E+01	L.T. 5.E+01	L.T. 5.E+01
K-40	L.T. 1.E+02	L.T. 9.E+01	L.T. 1.E+02	L.T. 6.E+01
MN-54	L.T. 5.E+00	L.T. 5.E+00	L.T. 5.E+00	L.T. 5.E+00
CO-58	L.T. 4.E+00	L.T. 5.E+00	L.T. 5.E+00	L.T. 5.E+00
FE-59	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01
CO-60	L.T. 5.E+00	L.T. 5.E+00	L.T. 4.E+00	L.T. 6.E+00
ZN-65	L.T. 9.E+00	L.T. 9.E+00	L.T. 1.E+01	L.T. 1.E+01
ZR-95	L.T. 9.E+00	L.T. 9.E+00	L.T. 1.E+01	L.T. 9.E+00
RU-103	L.T. 6.E+00	L.T. 5.E+00	L.T. 6.E+00	L.T. 6.E+00
RU-106	L.T. 4.E+01	L.T. 4.E+01	L.T. 5.E+01	L.T. 5.E+01
I-131	L.T. 1.E+01	L.T. 9.E+00	L.T. 1.E+01	L.T. 1.E+01
CS-134	L.T. 4.E+00	L.T. 4.E+00	L.T. 6.E+00	L.T. 4.E+00
CS-137	L.T. 5.E+00	L.T. 5.E+00	L.T. 6.E+00	L.T. 5.E+00
BA-140	L.T. 2.E+01	L.T. 2.E+01	L.T. 4.E+01	L.T. 3.E+01
LA-140	L.T. 9.E+00	L.T. 9.E+00	L.T. 1.E+01	L.T. 1.E+01
CE-141	L.T. 1.E+01	L.T. 7.E+00	L.T. 1.E+01	L.T. 1.E+01
CE-144	L.T. 4.E+01	L.T. 3.E+01	L.T. 4.E+01	L.T. 4.E+01
RA-226	L.T. 1.E+02	L.T. 9.E+01	L.T. 2.E+02	L.T. 1.E+02
TH-228	L.T. 9.E+00	L.T. 7.E+00	L.T. 1.E+01	L.T. 1.E+01
H-3	8.02E+02 ± 2.01E+02	8.93E+02 ± 2.00E+02	1.22E+03 ± 1.69E+02	8.37E+02 ± 2.39E+02

B-37

H-57

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 13

DATE COLLECTED	08/28/12	09/06/12	09/13/12	09/20/12
RADIOCHEMICAL ANALYSIS:				
GROSS ALPHA	L.T. 1.E+00	L.T. 5.E+00	L.T. 1.E+00	L.T. 1.E+01
SR-89	L.T. 2.E+00	L.T. 3.E+00	L.T. 3.E+00	L.T. 3.E+00
SR-90	L.T. 7.E-01	L.T. 8.E-01	L.T. 8.E-01	L.T. 7.E-01
FE-55	L.T. 9.E+01	L.T. 1.E+02	L.T. 8.E+01	L.T. 1.E+02
NI-63	L.T. 4.E+00	L.T. 3.E+00	L.T. 3.E+00	L.T. 4.E+00
GAMMA SPECTRUM ANALYSIS:				
BE-7	L.T. 4.E+01	L.T. 5.E+01	L.T. 5.E+01	L.T. 4.E+01
K-40	L.T. 8.E+01	L.T. 7.E+01	L.T. 5.E+01	L.T. 4.E+01
MN-54	L.T. 4.E+00	L.T. 6.E+00	L.T. 6.E+00	L.T. 4.E+00
CO-58	L.T. 4.E+00	L.T. 6.E+00	L.T. 5.E+00	L.T. 4.E+00
FE-59	L.T. 9.E+00	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01
CO-60	L.T. 6.E+00	L.T. 6.E+00	L.T. 5.E+00	L.T. 4.E+00
ZN-65	L.T. 9.E+00	L.T. 1.E+01	L.T. 1.E+01	L.T. 8.E+00
ZR-95	L.T. 8.E+00	L.T. 1.E+01	L.T. 9.E+00	L.T. 8.E+00
RU-103	L.T. 5.E+00	L.T. 7.E+00	L.T. 5.E+00	L.T. 5.E+00
RU-106	L.T. 4.E+01	L.T. 5.E+01	L.T. 5.E+01	L.T. 4.E+01
I-131	L.T. 7.E+00	L.T. 1.E+01	L.T. 2.E+01	L.T. 2.E+01
CS-134	L.T. 4.E+00	L.T. 5.E+00	L.T. 5.E+00	L.T. 4.E+00
CS-137	L.T. 5.E+00	L.T. 5.E+00	L.T. 5.E+00	L.T. 4.E+00
BA-140	L.T. 2.E+01	L.T. 4.E+01	L.T. 4.E+01	L.T. 4.E+01
LA-140	L.T. 9.E+00	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01
CE-141	L.T. 8.E+00	L.T. 1.E+01	L.T. 1.E+01	L.T. 1.E+01
CE-144	L.T. 3.E+01	L.T. 4.E+01	L.T. 4.E+01	L.T. 3.E+01
RA-226	L.T. 1.E+02	L.T. 1.E+02	L.T. 1.E+02	L.T. 1.E+02
TH-228	L.T. 9.E+00	L.T. 1.E+01	L.T. 1.E+01	L.T. 8.E+00
H-3	5.73E+02 ± 2.36E+02	5.01E+02 ± 1.88E+02	5.98E+02 ± 1.46E+02	4.54E+02 ± 2.08E+02

B-38

H-58

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 13

DATE COLLECTED	09/27/12	10/03/12	10/11/12	10/18/12
RADIOCHEMICAL ANALYSIS:				
GROSS ALPHA	NA	NA	NA	NA
SR-89	NA	NA	NA	NA
SR-90	NA	NA	NA	NA
FE-55	NA	NA	NA	NA
NI-63	NA	NA	NA	NA
GAMMA SPECTRUM ANALYSIS:				
BE-7	L.T. 7.E+01	NA	L.T. 2.E+01	L.T. 6.E+01
K-40	L.T. 1.E+02	NA	L.T. 2.E+01	L.T. 7.E+01
MN-54	L.T. 7.E+00	NA	L.T. 2.E+00	L.T. 6.E+00
CO-58	L.T. 8.E+00	NA	L.T. 2.E+00	L.T. 7.E+00
FE-59	L.T. 2.E+01	NA	L.T. 6.E+00	L.T. 2.E+01
CO-60	L.T. 8.E+00	NA	L.T. 2.E+00	L.T. 6.E+00
ZN-65	L.T. 2.E+01	NA	L.T. 4.E+00	L.T. 1.E+01
ZR-95	L.T. 1.E+01	NA	L.T. 4.E+00	L.T. 1.E+01
RU-103	L.T. 8.E+00	NA	L.T. 3.E+00	L.T. 8.E+00
RU-106	L.T. 7.E+01	NA	L.T. 2.E+01	L.T. 6.E+01
I-131	L.T. 2.E+01	NA	L.T. 7.E+00	L.T. 2.E+01
CS-134	L.T. 7.E+00	NA	L.T. 2.E+00	L.T. 6.E+00
CS-137	L.T. 8.E+00	NA	L.T. 2.E+00	L.T. 8.E+00
BA-140	L.T. 5.E+01	NA	L.T. 2.E+01	L.T. 4.E+01
LA-140	L.T. 2.E+01	NA	L.T. 5.E+00	L.T. 1.E+01
CE-141	L.T. 1.E+01	NA	L.T. 4.E+00	L.T. 1.E+01
CE-144	L.T. 4.E+01	NA	L.T. 1.E+01	L.T. 4.E+01
RA-226	L.T. 2.E+02	NA	L.T. 5.E+01	L.T. 2.E+02
TH-228	L.T. 1.E+01	NA	5.41E+00 ± 3.20E+00	L.T. 1.E+01
H-3	5.12E+02 ± 1.82E+02	L.T. 3.E+02	3.27E+02 ± 1.89E+02	3.05E+02 ± 1.73E+02

B-39

H-59

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 13

DATE COLLECTED	10/24/12	10/31/12	11/07/12	11/14/12
<b>RADIOCHEMICAL ANALYSIS:</b>				
GROSS ALPHA	NA	NA	NA	NA
SR-89	NA	NA	NA	NA
SR-90	NA	NA	NA	NA
FE-55	NA	NA	NA	NA
NI-63	NA	NA	NA	NA
<b>GAMMA SPECTRUM ANALYSIS:</b>				
BE-7	L.T. 5.E+01	L.T. 2.E+01	NA	L.T. 2.E+01
K-40	L.T. 5.E+01	L.T. 2.E+01	NA	L.T. 1.E+01
MN-54	L.T. 4.E+00	L.T. 2.E+00	NA	L.T. 2.E+00
CO-58	L.T. 5.E+00	L.T. 2.E+00	NA	L.T. 2.E+00
FE-59	L.T. 1.E+01	L.T. 4.E+00	NA	L.T. 4.E+00
CO-60	L.T. 4.E+00	L.T. 2.E+00	NA	L.T. 2.E+00
ZN-65	L.T. 1.E+01	L.T. 4.E+00	NA	L.T. 4.E+00
ZR-95	L.T. 1.E+01	L.T. 3.E+00	NA	L.T. 3.E+00
RU-103	L.T. 6.E+00	L.T. 2.E+00	NA	L.T. 2.E+00
RU-106	L.T. 4.E+01	L.T. 2.E+01	NA	L.T. 1.E+01
I-131	L.T. 2.E+01	L.T. 7.E+00	NA	L.T. 9.E+00
CS-134	L.T. 4.E+00	L.T. 2.E+00	NA	L.T. 2.E+00
CS-137	L.T. 4.E+00	L.T. 2.E+00	NA	L.T. 2.E+00
BA-140	L.T. 5.E+01	L.T. 1.E+01	NA	L.T. 2.E+01
LA-140	L.T. 1.E+01	L.T. 4.E+00	NA	L.T. 5.E+00
CE-141	L.T. 1.E+01	L.T. 4.E+00	NA	L.T. 4.E+00
CE-144	L.T. 3.E+01	L.T. 2.E+01	NA	L.T. 1.E+01
RA-226	L.T. 1.E+02	L.T. 5.E+01	NA	L.T. 4.E+01
TH-228	L.T. 8.E+00	5.09E+00 ± 2.69E+00	NA	L.T. 3.E+00
H-3	6.39E+02 ± 1.89E+02	3.12E+02 ± 1.95E+02	L.T. 4.E+02	5.01E+02 ± 1.81E+02

B-40

H-60



B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 13

DATE COLLECTED	11/21/12	11/27/12	12/06/12	12/12/12
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RADIOCHEMICAL ANALYSIS:

GROSS ALPHA	NA	NA	NA	NA
SR-89	NA	NA	NA	NA
SR-90	NA	NA	NA	NA
FE-55	NA	NA	NA	NA
NI-63	NA	NA	NA	NA

GAMMA SPECTRUM ANALYSIS:

BE-7	L.T. 2.E+01	L.T. 5.E+01	L.T. 2.E+01	L.T. 1.E+01
K-40	L.T. 2.E+01	L.T. 5.E+01	L.T. 1.E+01	L.T. 2.E+01
MN-54	L.T. 2.E+00	L.T. 5.E+00	L.T. 2.E+00	L.T. 8.E-01
CO-58	L.T. 3.E+00	L.T. 6.E+00	L.T. 2.E+00	L.T. 1.E+00
FE-59	L.T. 6.E+00	L.T. 1.E+01	L.T. 5.E+00	L.T. 2.E+00
CO-60	L.T. 2.E+00	L.T. 5.E+00	L.T. 2.E+00	L.T. 9.E-01
ZN-65	L.T. 5.E+00	L.T. 1.E+01	L.T. 3.E+00	L.T. 2.E+00
ZR-95	L.T. 5.E+00	L.T. 1.E+01	L.T. 4.E+00	L.T. 2.E+00
RU-103	L.T. 3.E+00	L.T. 7.E+00	L.T. 3.E+00	L.T. 1.E+00
RU-106	L.T. 2.E+01	L.T. 5.E+01	L.T. 1.E+01	L.T. 8.E+00
I-131	L.T. 1.E+01	L.T. 2.E+01	L.T. 2.E+01	L.T. 6.E+00
CS-134	L.T. 2.E+00	L.T. 5.E+00	L.T. 2.E+00	L.T. 9.E-01
CS-137	L.T. 2.E+00	L.T. 5.E+00	L.T. 2.E+00	L.T. 1.E+00
BA-140	L.T. 2.E+01	L.T. 4.E+01	L.T. 2.E+01	L.T. 1.E+01
LA-140	L.T. 8.E+00	L.T. 1.E+01	L.T. 8.E+00	L.T. 3.E+00
CE-141	L.T. 5.E+00	L.T. 1.E+01	L.T. 5.E+00	L.T. 3.E+00
CE-144	L.T. 1.E+01	L.T. 3.E+01	L.T. 1.E+01	L.T. 7.E+00
RA-226	L.T. 4.E+01	L.T. 1.E+02	L.T. 3.E+01	L.T. 3.E+01
TH-228	L.T. 4.E+00	L.T. 9.E+00	L.T. 3.E+00	L.T. 2.E+00

H-3	2.88E+02 ± 1.66E+02	4.11E+02 ± 1.76E+02	4.98E+02 ± 1.93E+02	3.99E+02 ± 1.84E+02
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B-41

H-61

B-1  
**COOPER NUCLEAR STATION**  
 EXPOSURE PATHWAY - INGESTION  
**WATER - GROUND (PCI/LITER)**

STATION NUMBER 13

DATE COLLECTED                      12/18/13                      12/28/12

RADIOCHEMICAL ANALYSIS:

GROSS ALPHA	NA	NA
SR-89	NA	NA
SR-90	NA	NA
FE-55	NA	NA
NI-63	NA	NA

GAMMA SPECTRUM ANALYSIS:

BE-7	L.T. 4.E+01	L.T. 5.E+01
K-40	L.T. 4.E+01	L.T. 4.E+01
MN-54	L.T. 5.E+00	L.T. 4.E+00
CO-58	L.T. 5.E+00	L.T. 5.E+00
FE-59	L.T. 1.E+01	L.T. 1.E+01
CO-60	L.T. 5.E+00	L.T. 5.E+00
ZN-65	L.T. 1.E+01	L.T. 1.E+01
ZR-95	L.T. 9.E+00	L.T. 1.E+01
RU-103	L.T. 6.E+00	L.T. 5.E+00
RU-106	L.T. 4.E+01	L.T. 4.E+01
I-131	L.T. 2.E+01	L.T. 2.E+01
CS-134	L.T. 4.E+00	L.T. 5.E+00
CS-137	L.T. 5.E+00	L.T. 5.E+00
BA-140	L.T. 3.E+01	L.T. 4.E+01
LA-140	L.T. 1.E+01	L.T. 1.E+01
CE-141	L.T. 1.E+01	L.T. 9.E+00
CE-144	L.T. 4.E+01	L.T. 3.E+01
RA-226	L.T. 1.E+02	L.T. 1.E+02
TH-228	L.T. 9.E+00	L.T. 8.E+00
H-3	4.55E+02 ± 1.89E+02	5.19E+02 ± 1.75E+02

B-42

H-62

**APPENDIX I**  
**NON-ODAM REQUIRED SAMPLING, SUPPLEMENTARY STATIONS**

***NEBRASKA PUBLIC POWER DISTRICT  
COOPER NUCLEAR STATION  
Non-ODAM Required Sampling, Supplementary Stations  
2012 Annual Report  
January 1, 2012 to December 31, 2012***

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APPENDICES

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**SECTION I. INTRODUCTION**

## **I. INTRODUCTION**

This report contains a complete tabulation of data for non-ODAM required Sampling Stations collected during the period January through December 2012 for the Cooper Nuclear Station (CNS) of the Nebraska Public Power District (NPPD) by Teledyne Brown Engineering - Environmental Services.

In assessing all the data gathered for this report, it was concluded that the operation of CNS had no adverse radiological impact on the environment, and there are no known active releases into the groundwater or surface water at Nebraska Public Power District.



**SECTION II. SUMMARY**

## **II. Summary**

Data from the radiological analyses of environmental media collected during 2012 for non-ODAM required stations are tabulated and discussed below.

Radiological analyses of environmental media characteristically approach and frequently fall below the detection limits of state-of-the-art measurement methods. The “less than” values in the data tables were calculated from each specific analysis and are dependent on sample size, detector efficiency, length of counting time, chemical yield (when appropriate) and the radioactive decay factor from time of counting to time of collection. Teledyne Brown Engineering meets the Lower Limit of Detection (LLD) requirements given in Table 2 of the USNRC Branch Technical Position, Radiological Monitoring Acceptable Program (November 1979, Revision 1).

The following is a discussion and summary of the results of the environmental measurements taken during the 2012 reporting period:

**SECTION III. RESULTS and Discussion of 2012 Analytical Results**

### **III. Results and Discussion of 2012 Analytical Results**

#### **A. *Airborne Particulates***

Gross beta activity was observed in 50 of the 50 samples collected during 2012. The average concentration was 0.024 pCi/m<sup>3</sup> with a range of 0.007 to 0.66 pCi/m<sup>3</sup>. The results of the gross beta activities are presented in Table B-1. The gross beta activities for 2012 were comparable to levels measured in the previous several years. Prior to that period the gross beta activities were higher due to atmospheric nuclear weapons testing performed in other countries. The preoperational period of 1971 through 1974 averaged 0.098 pCi/m<sup>3</sup> gross beta.

Air particulate filters were collected weekly and composited by locations on a quarterly basis. They were analyzed by gamma ray spectroscopy. Beryllium-7 was observed in four of the four composites. The average concentration was 0.0131 pCi/m<sup>3</sup> with a range of 0.094 to 0.222 pCi/m<sup>3</sup>. The results are presented in Table B-2. All other gamma emitters were below the detection limits.

#### **B. *Airborne Iodine***

Charcoal cartridges used to collect airborne iodine were collected weekly and analyzed by gamma spectrometry for iodine-131. The results are presented in Table B-1. All results were below the required lower limit of detection.

#### **C. *Thermoluminescent Dosimeters***

Thermoluminescent dosimeters (TLDs) determine environmental radiation doses and the results are presented in Table B-3. Ambient radiation was monitored at 26 non-ODAM required locations and collected quarterly. The quarterly average for the locations was 22.9 millirem/quarter and a range from 19.0 to 27.5 millirem/quarter. The preoperational period of 1971 through 1974 averaged 37.0 millirem/quarter. Current year TLD averages deviate from the preoperational averages due to instrument variations from previous vendors.

The data from year to year is in good agreement and indicates no adverse changes in radiation exposure to the population near the Cooper Nuclear Station.

#### **D. *Errata Data***

There was no errata data for 2012.

**APPENDIX A**  
**NON-ODAM REQUIRED SAMPLING STATIONS**

**NON-ODAM SAMPLE STATION DESCRIPTION,**  
**SAMPLE TYPE AND SAMPLE LOCATION**

<u>Sample Station (a)</u>	<u>Sample Description – Type and Location</u>
No. 111	Type: (1) Air Particulate and Charcoal Filters (2) Environmental Thermoluminescent Dosimetry  Location: 10.8 miles west southwest and 1.3 miles west of Howe, Nebraska, NE ¼, S13, T4N, R13E, Nemaha County, Nebraska. Lon. 095.84.165 W – Lat. 40.31.955 N
N01	Type: (1) Environmental Thermoluminescent Dosimetry
N02	Type: (1) Environmental Thermoluminescent Dosimetry
N03	Type: (1) Environmental Thermoluminescent Dosimetry
N04	Type: (1) Environmental Thermoluminescent Dosimetry
N05	Type: (1) Environmental Thermoluminescent Dosimetry
N06	Type: (1) Environmental Thermoluminescent Dosimetry
N07	Type: (1) Environmental Thermoluminescent Dosimetry
N08	Type: (1) Environmental Thermoluminescent Dosimetry
N09	Type: (1) Environmental Thermoluminescent Dosimetry
N10	Type: (1) Environmental Thermoluminescent Dosimetry
N11	Type: (1) Environmental Thermoluminescent Dosimetry
N12	Type: (1) Environmental Thermoluminescent Dosimetry
N13	Type: (1) Environmental Thermoluminescent Dosimetry
N14	Type: (1) Environmental Thermoluminescent Dosimetry
N15	Type: (1) Environmental Thermoluminescent Dosimetry

**NON-ODAM SAMPLE STATION DESCRIPTION,  
SAMPLE TYPE AND SAMPLE LOCATION**

<u>Sample Station (a)</u>	<u>Sample Description – Type and Location</u>
N16	Type: (1) Environmental Thermoluminescent Dosimetry
N17	Type: (1) Environmental Thermoluminescent Dosimetry
N18	Type: (1) Environmental Thermoluminescent Dosimetry
N19	Type: (1) Environmental Thermoluminescent Dosimetry
N20	Type: (1) Environmental Thermoluminescent Dosimetry
N21	Type: (1) Environmental Thermoluminescent Dosimetry
N22	Type: (1) Environmental Thermoluminescent Dosimetry
N23	Type: (1) Environmental Thermoluminescent Dosimetry
N24	Type: (1) Environmental Thermoluminescent Dosimetry
N25	Type: (1) Environmental Thermoluminescent Dosimetry

**APPENDIX B**  
**DATA TABLES OF NON-ODAM REQUIRED SAMPLING LOCATIONS**



B-1  
**NEBRASKA PUBLIC POWER DISTRICT**  
**COOPER NUCLEAR STATION**  
**EXPOSURE PATHWAY - AIRBORNE**  
**AIR PARTICULATE & CHARCOAL FILTERS**

STATION NUMBER 111

COLL START DATE	TIME STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
01/03/12	01/10/12	1.01E+04	CU.FT.	1.91E-02 ± 4.78E-03	L.T. 6.E-02
01/10/12	01/17/12	9.92E+03	CU.FT.	2.32E-02 ± 5.20E-03	L.T. 6.E-02
01/17/12	01/24/12	1.01E+04	CU.FT.	3.54E-02 ± 5.09E-03	L.T. 5.E-02
01/24/12	01/30/12	8.68E+03	CU.FT.	2.36E-02 ± 4.89E-03	L.T. 6.E-02
01/30/12	02/07/12	1.15E+04	CU.FT.	2.13E-02 ± 4.08E-03	L.T. 1.E-02
02/07/12	02/14/12	1.01E+04	CU.FT.	2.09E-02 ± 4.25E-03	L.T. 2.E-02
02/14/12	02/20/12	8.77E+03	CU.FT.	2.69E-02 ± 5.07E-03	L.T. 6.E-02
02/20/12	02/28/12	1.14E+04	CU.FT.	9.86E-03 ± 3.19E-03	L.T. 3.E-02
02/28/12	03/06/12	1.00E+04	CU.FT.	2.15E-02 ± 4.82E-03	L.T. 2.E-02
03/06/12	03/13/12	9.98E+03	CU.FT.	1.66E-02 ± 3.91E-03	L.T. 2.E-02
03/13/12	03/20/12	1.01E+04	CU.FT.	2.04E-02 ± 4.62E-03	L.T. 4.E-02
03/20/12	03/27/12	1.01E+04	CU.FT.	1.58E-02 ± 4.21E-03	L.T. 7.E-02
03/27/12	04/03/12	1.01E+04	CU.FT.	1.64E-02 ± 4.38E-03	L.T. 4.E-02
04/03/12	04/10/12	9.96E+03	CU.FT.	1.31E-02 ± 3.70E-03	L.T. 3.E-02
04/10/12	04/17/12	1.03E+04	CU.FT.	1.48E-02 ± 3.68E-03	L.T. 3.E-02
04/17/12	04/24/12	9.85E+03	CU.FT.	1.19E-02 ± 4.17E-03	L.T. 6.E-02
04/24/12	05/02/12	1.15E+04	CU.FT.	2.26E-02 ± 3.95E-03	L.T. 2.E-02
05/02/12	05/08/12	8.72E+03	CU.FT.	1.17E-02 ± 4.51E-03	L.T. 2.E-02
05/08/12	05/15/12	1.01E+04	CU.FT.	1.70E-02 ± 4.38E-03	L.T. 6.E-02
05/15/12	05/22/12	1.01E+04	CU.FT.	1.62E-02 ± 4.23E-03	L.T. 5.E-02
05/22/12	05/29/12	1.00E+04	CU.FT.	1.51E-02 ± 4.12E-03	L.T. 3.E-02
05/29/12	06/05/12	1.00E+04	CU.FT.	1.69E-02 ± 4.03E-03	L.T. 3.E-02
06/05/12	06/12/12	1.01E+04	CU.FT.	1.82E-02 ± 4.10E-03	L.T. 2.E-02
06/12/12	06/20/12	1.16E+04	CU.FT.	1.79E-02 ± 4.21E-03	L.T. 2.E-02
06/20/12	06/27/12	1.02E+04	CU.FT.	2.44E-02 ± 4.40E-03	L.T. 3.E-02
06/27/12	07/03/12	8.48E+03	CU.FT.	3.05E-02 ± 5.30E-03	L.T. 3.E-02

B-2

L-15

B-1  
**NEBRASKA PUBLIC POWER DISTRICT**  
**COOPER NUCLEAR STATION**  
**EXPOSURE PATHWAY - AIRBORNE**  
**AIR PARTICULATE & CHARCOAL FILTERS**

STATION NUMBER 111

COLL START DATE	TIME STOP DATE	SAMPLE VOLUME	UNITS	AP FILTER GROSS BETA (PCI/CU.M.)	CHARCOAL FILTER I-131 (PCI/CU.M.)
07/03/12	07/10/12	1.00E+04	CU.FT.	1.98E-02 ± 4.09E-03	L.T. 4.E-02
07/10/12	07/16/12	8.79E+03	CU.FT.	2.42E-02 ± 4.95E-03	L.T. 2.E-02
07/16/12	07/24/12	1.16E+04	CU.FT.	2.52E-02 ± 4.10E-03	L.T. 4.E-02
07/24/12	08/01/12	1.13E+04	CU.FT.	2.17E-02 ± 4.09E-03	L.T. 4.E-02
08/01/12	08/08/12	1.01E+04	CU.FT.	2.17E-02 ± 4.40E-03	L.T. 3.E-02
08/08/12	08/14/12	8.59E+03	CU.FT.	2.30E-02 ± 5.30E-03	L.T. 4.E-02
08/14/12	08/21/12	1.02E+04	CU.FT.	1.68E-02 ± 4.00E-03	L.T. 4.E-02
08/21/12	08/29/12	1.14E+04	CU.FT.	3.41E-02 ± 4.57E-03	L.T. 2.E-02
08/29/12	09/04/12	8.54E+03	CU.FT.	2.76E-02 ± 5.04E-03	L.T. 2.E-02
09/04/12	09/11/12	9.97E+03	CU.FT.	2.06E-02 ± 4.16E-03	L.T. 3.E-02
09/11/12	09/17/12	8.72E+03	CU.FT.	2.59E-02 ± 5.56E-03	L.T. 7.E-02
09/17/12	09/25/12	1.15E+04	CU.FT.	1.96E-02 ± 4.18E-03	L.T. 6.E-02
09/25/12	10/02/12	1.00E+04	CU.FT.	2.87E-02 ± 4.87E-03	L.T. 4.E-02
10/02/12	10/09/12	1.01E+04	CU.FT.	1.49E-02 ± 4.63E-03	L.T. 2.E-02
10/09/12	10/16/12	1.01E+04	CU.FT.	2.50E-02 ± 5.10E-03	L.T. 2.E-02
10/16/12	10/23/12	1.01E+04	CU.FT.	2.46E-02 ± 4.40E-03	L.T. 2.E-02
10/23/12	10/31/12	1.15E+04	CU.FT.	2.39E-02 ± 4.18E-03	L.T. 3.E-02
10/31/12	11/07/12	1.00E+04	CU.FT.	4.00E-02 ± 5.49E-03	L.T. 4.E-02
11/07/12	11/13/12	8.66E+03	CU.FT.	3.50E-02 ± 5.96E-03	L.T. 4.E-02
11/13/12	11/20/12	1.00E+04	CU.FT.	6.57E-02 ± 6.83E-03	L.T. 2.E-02
11/20/12	11/27/12	1.00E+04	CU.FT.	4.09E-02 ± 5.62E-03	L.T. 4.E-02
11/27/12	12/04/12	1.01E+04	CU.FT.	6.22E-02 ± 6.68E-03	L.T. 4.E-02
12/04/12	12/11/12	1.01E+04	CU.FT.	2.52E-02 ± 4.57E-03	L.T. 2.E-02
12/11/12	12/19/12	1.16E+04	CU.FT.	7.21E-03 ± 3.15E-03	L.T. 3.E-02
12/19/12	12/26/12		(1)		
12/26/12	01/02/13		(2)		

(1) Sample not taken. Pump was operating but there was no flow through the filter.

(2) Sample was not taken. The pump was not operating.

B-3

I-16

B-2  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - AIRBORNE**  
**COMPOSITE AIR PARTICULATE FILTERS**  
 (PCI/CU.M.)

STATION NUMBER 111

DATE COLLECTED	01/03 - 04/03/12	04/03 - 07/03/12	07/03 - 10/02/12	10/02 - 01/02/13
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GAMMA SPECTRUM ANALYSIS:

BE-7	1.18E-01 ± 3.26E-02	2.19E-01 ± 5.07E-02	2.22E-01 ± 5.40E-02	9.40E-02 ± 4.27E-02
K-40	L.T. 3.E-02	L.T. 4.E-02	L.T. 4.E-02	L.T. 6.E-02
MN-54	L.T. 2.E-03	L.T. 4.E-03	L.T. 3.E-03	L.T. 4.E-03
CO-58	L.T. 3.E-03	L.T. 6.E-03	L.T. 5.E-03	L.T. 7.E-03
FE-59	L.T. 1.E-02	L.T. 1.E-02	L.T. 2.E-02	L.T. 2.E-02
CO-60	L.T. 2.E-03	L.T. 3.E-03	L.T. 2.E-03	L.T. 3.E-03
ZN-65	L.T. 5.E-03	L.T. 8.E-03	L.T. 7.E-03	L.T. 9.E-03
ZR-95	L.T. 6.E-03	L.T. 9.E-03	L.T. 7.E-03	L.T. 1.E-02
RU-103	L.T. 5.E-03	L.T. 1.E-02	L.T. 1.E-02	L.T. 8.E-03
RU-106	L.T. 2.E-02	L.T. 4.E-02	L.T. 2.E-02	L.T. 3.E-02
I-131	L.T. 1.E+00	L.T. 2.E+00	L.T. 5.E+00	L.T. 1.E+00
CS-134	L.T. 2.E-03	L.T. 3.E-03	L.T. 3.E-03	L.T. 4.E-03
CS-137	L.T. 1.E-03	L.T. 3.E-03	L.T. 2.E-03	L.T. 3.E-03
BA-140	L.T. 3.E-01	L.T. 6.E-01	L.T. 1.E+00	L.T. 5.E-01
LA-140	L.T. 1.E-01	L.T. 2.E-01	L.T. 4.E-01	L.T. 3.E-01
CE-141	L.T. 8.E-03	L.T. 2.E-02	L.T. 2.E-02	L.T. 1.E-02
CE-144	L.T. 8.E-03	L.T. 2.E-02	L.T. 1.E-02	L.T. 1.E-02
RA-226	L.T. 3.E-02	L.T. 5.E-02	L.T. 4.E-02	L.T. 5.E-02
TH-228	L.T. 2.E-03	L.T. 5.E-03	L.T. 5.E-03	L.T. 4.E-03

B-4

I-17

B-3  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - THERMOLUMINESCENT DOSIMETRY - TLD**  
 COOPER NUCLEAR STATION 2012

Sample Nuclide	Station Number	First Quarter 01/01-03/31	Second Quarter 04/01-06/30	Third Quarter 07/01-09/30	Fourth Quarter 10/01-01/01	Quarter Average - 1 S.D.
TLD	111	24.3 ± 0.7	20.4 ± 0.1	25.9 ± 1.1	21.7 ± 0.2	23.1 ± 2.5
	N01	23.5 ± 0.4	19.7 ± 0.3	25.7 ± 0.3	25.1 ± 5.7	23.5 ± 1.7
	N02	23.8 ± 0.3	19.8 ± 0.2	25.1 ± 0.9	21.5 ± 0.6	22.5 ± 0.5
	N03	25.0 ± 1.0	20.3 ± 0.6	25.1 ± 0.7	21.7 ± 0.8	23.0 ± 0.8
	N04	22.6 ± 1.3	19.0 ± 0.8	22.7 ± 0.3	21.3 ± 0.5	21.4 ± 0.7
	N05	24.2 ± 1.5	20.2 ± 0.5	24.7 ± 1.0	22.5 ± 1.5	22.9 ± 1.1
	N06	23.8 ± 1.0	19.7 ± 1.2	24.7 ± 0.7	22.0 ± 0.5	22.6 ± 0.8
	N07	24.4 ± 1.2	21.8 ± 1.8	25.9 ± 0.8	23.1 ± 0.9	23.8 ± 1.2
	N08	21.7 ± 0.3	19.2 ± 0.5	22.6 ± 0.3	20.0 ± 0.7	20.9 ± 0.4
	N09	23.6 ± 0.4	19.1 ± 0.4	25.0 ± 0.4	22.4 ± 0.7	22.5 ± 0.5
	N10	23.6 ± 1.0	20.4 ± 0.6	23.8 ± 0.2	22.0 ± 0.6	22.5 ± 0.6
	N11	24.9 ± 1.7	20.2 ± 0.3	23.5 ± 0.5	21.6 ± 0.3	22.5 ± 0.7
	N12	25.0 ± 1.1	20.8 ± 0.2	24.8 ± 0.6	22.3 ± 0.3	23.2 ± 0.5
	N13	24.8 ± 0.9	20.8 ± 0.3	26.6 ± 1.1	23.7 ± 0.5	24.0 ± 0.7
	N14	23.3 ± 1.0	20.5 ± 0.2	24.7 ± 0.7	21.8 ± 1.2	22.6 ± 0.8
	N15	25.0 ± 0.6	21.2 ± 0.0	25.7 ± 0.9	23.4 ± 1.5	23.8 ± 0.7
	N16	25.4 ± 0.7	20.8 ± 0.1	25.3 ± 0.5	22.2 ± 0.5	23.4 ± 0.4
	N17	24.9 ± 0.6	20.5 ± 0.4	24.8 ± 0.7	21.9 ± 0.8	23.0 ± 0.6
	N18	23.2 ± 0.5	19.7 ± 0.5	24.5 ± 0.4	20.6 ± 0.8	22.0 ± 0.6
	N19	24.6 ± 0.6	20.2 ± 0.5	26.2 ± 0.7	23.7 ± 0.2	23.7 ± 0.5
	N20	24.8 ± 0.6	21.7 ± 0.5	27.5 ± 0.2	24.4 ± 2.3	24.6 ± 0.9
	N21	23.9 ± 1.1	19.7 ± 0.6	25.1 ± 0.3	21.0 ± 0.4	22.4 ± 0.6

B-5

I-18

B-3  
**NEBRASKA PUBLIC POWER DISTRICT**  
 COOPER NUCLEAR STATION  
**EXPOSURE PATHWAY - THERMOLUMINESCENT DOSIMETRY - TLD**  
 COOPER NUCLEAR STATION 2012

Sample Nuclide	Station Number	First Quarter 01/01-03/31	Second Quarter 04/01-06/30	Third Quarter 07/01-09/30	Fourth Quarter 10/01-01/01	Quarter Average - 1 S.D.
	N22	24.3 ± 0.9	20.5 ± 0.6	26.7 ± 0.6	21.9 ± 0.6	23.4 ± 0.7
	N23	22.8 ± 0.1	19.2 ± 0.9	24.2 ± 0.2	19.7 ± 0.4	21.5 ± 0.4
	N24	24.3 ± 0.9	20.4 ± 0.4	26.5 ± 0.7	21.8 ± 1.3 <sup>(1)</sup>	23.7 ± 0.7
	N25	23.8 ± 1.1	20.2 ± 0.1	25.5 ± 0.9		22.8 ± 0.8
	Average/Quarter	24.1 ± 0.9	20.2 ± 0.7	25.1 ± 1.2	22.1 ± 1.3	
	Range	(21.7-25.4)	(19.0-21.8)	(22.6-27.5)	(19.7-25.1)	
	Detection/Total	26/26	26/26	26/26	25/26	

B-6

(1) TLD missing

I-19

**END OF DOCUMENT**