TELEDYNE
ISOTOPES

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

ANNUAL SUMMARY REPORT 1983

ENVIRONMENTAL RADIATION

MONITORING PROGRAM

PREPARED BY

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TELEDYNE ISOTOPES

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TELEDYNE ISOTOPES

I. INTRODUCTION

This report contains a complete tabulation of data collected during the period January to December 1983, for the operational Radiological Environmental Monitoring Program performed for the Cooper Nuclear Station (CNS) of the Nebraska Public Power District (NPPD) by Teledyne Isotopes. Samples were collected in the environs of CNS by NPPD and analyzed by the Teledyne Isotopes Laboratories in compliance with the Environmental Technical Specifications, Appendix B of the Cooper Nuclear Station Operating License.

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 a 778 megawatt boiling water reactor. Initial criticality was attained on February 21, 1974. The reactor reached 50% power on June 25, 1974 and 100% power on November 20, 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. Samples are collected by NPPD personnel. All are shipped for analysis to the contractor's laboratory where there exists special facilities required for measurements of extremely low levels of radioactivity. From 1971 through 1976 the contractor was Teledyne Isotopes, Westwood, New Jersey. NALCO Environmental Sciences assumed responsibility for the analyses January 1, 1977. On November 1, 1978 Hazelton Environmental Sciences Corporation assumed responsibility for the program. Prior to November 1, 1978 Hazelton Environmental Sciences operated as NALCO Environmental Sciences. Teledyne Isotopes again assumed responsibility for the analyses effective January 1, 1979 through the present period, December 31, 1983.

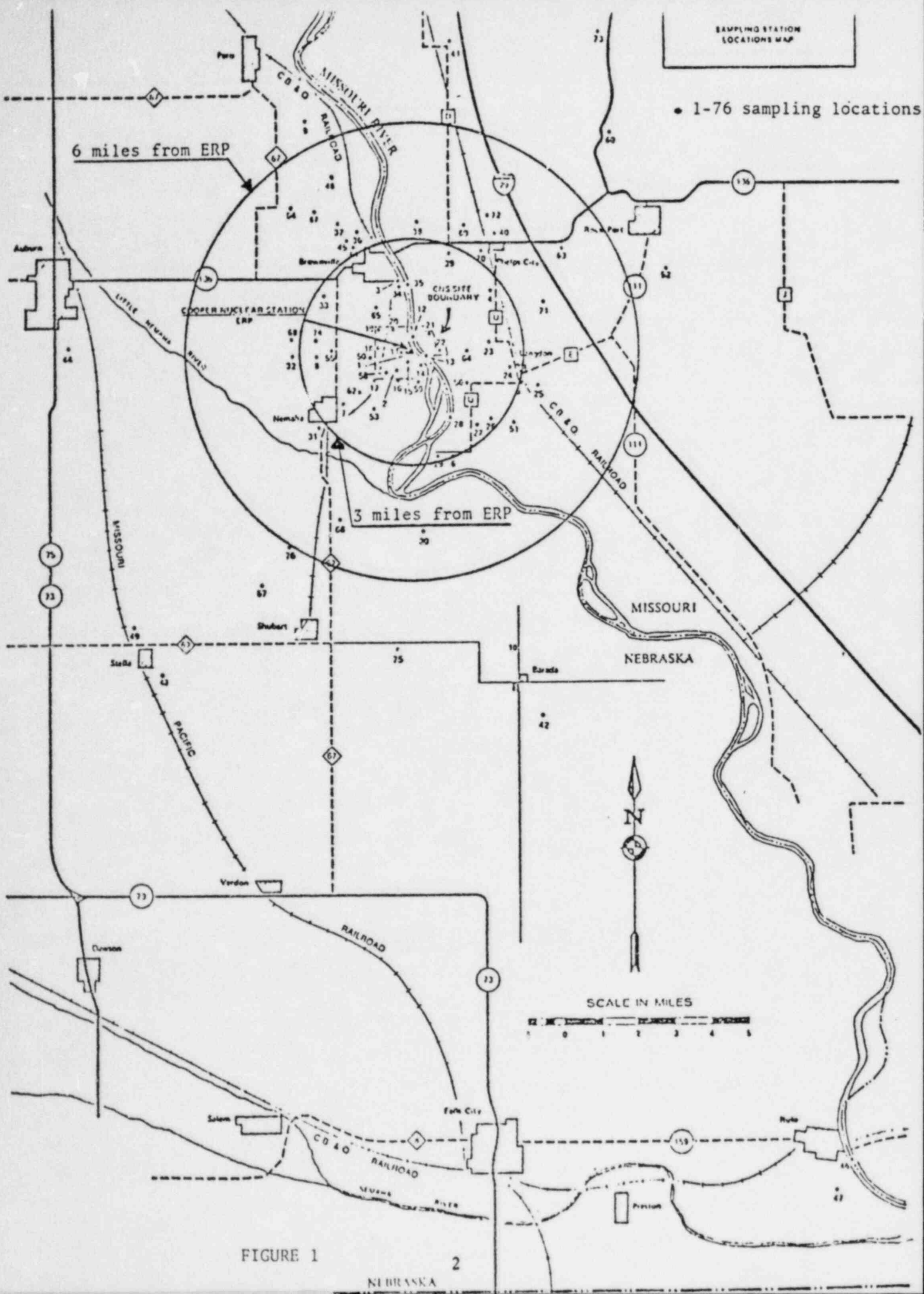

FIGURE 1

NEBRASKA

TELEDYNE ISOTOPES

TABLE 1

Sampling schedule and analyses, 1983, Cooper Nuclear Station

WEEKLY

Sample Type	Station Nos.	Analyses
Airborne - Particulates	1 - 10	Gross α, β Gamma spec. on quarterly composite of each station and on samples with β levels > 300 dpm
Airborne - Iodine	1 - 10	I-131
Feed and Forage - Beef Producers (peak pasture only)	64,65(a),67,68,71,76	Gamma spec. on monthly composite
Milk - Nearest Producers (peak pasture only)	61, 74	I-131 (low level) Sr-89, Sr-90 Elem. Ca Gamma spec. on monthly composite

MONTHLY

Sample Type	Station Nos.	Analyses
Feed and Forage - Beef Producers (except peak pasture season)	64,65(a),67,68,71,76	Gamma spec.
Feed and Forage - Nearest Milk Producers (peak pasture only)	61, 74	Sr-89, Sr-90 Elem. Ca Gamma spec.
River Water	12, 13, 28	Gross α - sus and dis Gross β - sus and dis Sr-89, Sr-90 Gamma spec. and tritium on quarterly composite
Milk - Nearest Producers	61, 74	I-131 (low level) Sr-89, Sr-90 Elem Ca Gamma spec.

(a) Cattle sold; station discontinued after 05/03/82.

TELEDYNE ISOTOPES

(continued)

TABLE 1

QUARTERLY

Sample Type	Station Nos.	Analyses
Background Radiation	1 - 10, 15,18,22, 44,58,59	TLD readout
Feed and Forage - Nearest Milk Producers (except peak pasture season)	61, 74	Sr-89, Sr-90 Elem. Ca Gamma spec.
Feed and Forage Commercial Milk Producers	42, 73, 75	Sr-89, Sr-90 Elem. Ca Gamma spec.
Ground Water	11, 47	Gross α, β Gamma spec. Tritium
Milk - Commercial Producers	42, 73, 75	I-131 (low level) Sr-89, Sr-90 Elem. Ca Gamma spec.
Eggs	42, 51, 67, 76	Gross β Sr-89, Sr-90 Elem. Ca Gamma spec.

2 TIMES/YEAR

Sample Type	Station Nos.	Analyses
Fish (Summer and Fall)	28, 35	Gross β Sr-89, Sr-90 Gamma spec.
Aquatic Vegetation	12, 13, 28	Gross β Sr-89, Sr-90 Gamma spec.

ANNUALLY

Sample Type	Station Nos.	Analyses
Food and Feed Crops (at harvest)	15,18,20,27,29 38, 41	Gross β Sr-89, Sr-90 Elem. Ca Gamma spec.

(continued)

TABLE 1

ANNUALLY

Sample Type	Station Nos.	Analyses
Garden Crops (at harvest)	34(b), 56, 62	Gross β Sr-89, Sr-90 Elem, Ca Gamma spec.
Apples (at harvest)	53, 54	Gross β Sr-89, Sr-90 Elem, Ca Gamma spec.
Rabbits (fall or early winter)	28, 35	Thyroid - I-131 Femur - Sr-89, Sr-90 Muscle - Gamma spec.

ONCE EVERY THREE YEARS

Sample Type	Station Nos.	Analyses
Soil (Sampled in 1981)	2 - 10	Sr-90 Gamma spec.

(b) No crop at station 34 for 1982 or 1983.

TELEDYNE ISOTOPES

TABLE 2

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION
BROWNVILLE, NEBRASKA

DISTANCE AND DIRECTION FROM THE ELEVATED RELEASE POINT (ERP) TO THE SAMPLE STATION LOCATIONS

STATION NUMBER	DISTANCE (MILES)	DIRECTION (DEGREES)	CLASSIFICATION (a)
1	.1	225	IND
2	.75	225	IND
3	2.5	338	IND
4	3.0	43	IND
5	3.5	102	IND
6	3.0	165	IND
7	2.5	230	IND
8	2.5	260	IND
9	7.25	335	IND
10	10.0	160	IND
11	.15	225	IND
12	.1	360	CON
13	.25	120	IND
14	.5	140	PO
15	.51	180	IND
16	.75	202	NA
17	1.5	235	PO
18	.8	270	IND
19	1.0	300	PO
20	.96	315	IND
21	.6	46	PO
22	.7	95	IND
23	1.9	80	PO
24	3.0	97	PO
25	3.75	105	PO
26	3.0	130	PO
27	3.0	143	IND
28	1.8	150	IND
29	3.0	170	IND
30	5.0	178	PO
31	2.75	222	NA
32	3.4	268	PO
33	2.8	302	PO
34	2.5	333	IND
35	2.0	350	CON
36	3.6	335	PO
37	3.9	330	NA
38	4.0	360	IND
39	2.75	25	PO

TELEDYNE ISOTOPES

TABLE 2

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION
BROWNVILLE, NEBRASKA

DISTANCE AND DIRECTION FROM THE ELEVATED RELEASE POINT (ERP) TO THE SAMPLE STATION LOCATIONS

STATION NUMBER	DISTANCE (MILES)	DIRECTION (DEGREES)	CLASSIFICATION (a)
40	3.9	37	PO
41	8.4	11	IND
42	12.85	156	IND
43	11.75	217	NA
44	10.25	270	CON
45	4.0	325	NA
46	24.75	153	NA
47	25.75	154	IND
48	5.6	332	NA
49	11.4	222	NA
50	1.1	270	NA
51	4.2	125	IND
52	7.4	79	NA
53	2.0	216	IND
54	5.2	320	IND
55	1.75	270	NA
56	1.9	118	IND
57	6.6	208	NA
58	1.25	219	IND
59	1.0	189	IND
60	8.4	42	NA
61	3.5	326	IND
62	1.5	225	IND
63	5.0	56	NA
64	2.25	99	IND
65	1.1	305	NA
66	4.5	200	NA
67	4.75	325	IND
68	3.4	270	IND
69	3.5	3	NA
70	3.5	3	NA
71	4.25	71	IND
72	3.75	39	NA
73	10.0	35	IND
74	2.4	270	IND
75	9.0	180	IND
76	5.3	212	IND

(a) Classification codes: IND = indicator; CON = control; PO = pre-operational sampling site not used in 1980-1981 sampling program; NA = not active as of 1 January 1983.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- AIRBORNE
SAMPLE - AIR PARTICULATE FILTERS
UNITS - PCI/CU. M

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN MEAN X E-00 RANGE STATION FRACTION STATION DESCRIPTION	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
GR-A	520	0.00200	0.00266 0.00220- 0.00337 315/520	0.00337 01 029/052 0.00140- 0.0053 STATION 01 - 0.1 MI. 225 DEG. INC.			12/28/82-12/27/83
GR-B	520	0.00300	0.0267 0.0236 - 0.0291 518/520	0.0291 10 052/052 0.0130 0.0900 STATION 10 - 10.0 MI. 160 DEG. IND.			12/28/82-12/27/83

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- AIRBORNE
SAMPLE - CHARCOAL FILTERS
UNITS - PCI/GM WET

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN MEAN X E-00 RANGE STATION FRACTION STATION DESCRIPTION	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
LOST IN	2 (a)		LT 0.CC000 LT 0.00000-LT 0.000C0. 000/002			0	03/22/83-03/29/83
I-131	518	0.03000	LT 0.0800 LT 0.0200 -LT 0.0800 000/518			0	12/28/82-12/27/83

(a) The charcoal filters from Stations 01 and 02 for 03/22-03/29 were lost in transit. The package was damaged.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- AIRBORNE
SAMPLE - COMPOSITE AIR PARTICULATE FILTERS
UNITS - PCI/CU. M

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN STATION FRACTION STATION DESCRIPTION	MEAN X E-CC RANGE	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
BE-7	40	0.05000	0.1135 0.09030- 040/040	06 STATION 06 - 3.0 MI. 165 DEG. IND.	0.1328 004/004 0.06930- 0.1820		0	12/28/82-12/27/83
K-40	40	0.06000	0.02188 0.00831- 004/040	04 STATION 04 - 3.0 MI. 43 DEG. IND.	0.02940 001/004 0.02940- 0.02940		0	12/28/82-12/27/83
I-131	40	0.00300 LT	LT 4.00 2.00 -LT 4.00 000/040				0	12/28/82-12/27/83
CS-137	40	0.00300	0.00176 0.00176- 001/040	05 STATION 05 - 3.5 MI. 102 DEG. IND.	0.00176 001/004 0.00176- 0.00176		0	12/28/82-12/27/83
TH-228	40	0.01000	0.00273 0.00035- 002/040	04 STATION 04 - 3.0 MI. 43 DEG. IND.	0.00510 001/004 0.00510- 0.00510		0	12/28/82-12/27/83

01

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- INGESTION
SAMPLE - E G G S
UNITS - PCI/GM WET

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN STATION FRACTION STATION DESCRIPTION	MEAN X E-00 RANGE	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
CA MG/GM	15		0.200 0.165 - 0.260 015/015	76 STATION 76 - 5.3 MI. 212 DEG. IND.	0.260 004/004 0.170 - 0.360		0	01/17/83-10/18/83
GR-B	15	0.0600	1.8 1.8 - 1.9 015/015	42 STATION 42 - 12.85 MI. 156 DEG. IND.	1.9 004/004 1.4 - 2.4		0	01/17/83-10/18/83
SAMPLE	1 (a)	LT	LT 0.CC000 0.00000-LT 0.00000 000/001				0	04/26/83-04/26/83
SR-89	15	0.00600	LT 0.00600 0.00200-LT 0.00600 000/015				0	01/17/83-10/18/83
SR-90	15	0.00600	0.00185 0.00130- 0.00240 003/015	67 STATION 67 - 4.75 MI. 325 DEG. IND.	0.00240 002/003 0.00150- 0.00330		0	01/17/83-10/18/83
K-40	15	0.4700	1.08 1.05 - 1.13 015/015	51 STATION 51 - 4.2 MI. 125 DEG. IND.	1.13 004/004 1.03 - 1.26		0	01/17/83-10/18/83
I-131	15	0.03100	LT 0.02000 0.02000-LT 0.02000 000/015				0	01/17/83-10/18/83

(a) No sample collected at Station 67 on April 26; no sample available.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- INGESTION
SAMPLE - E G G S
UNITS - PCI/GM WET

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN MEAN X E-00 RANGE STATION FRACTION STATION DESCRIPTION	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
CS-137	15	0.03100	LT 0.01000 LT 0.00700-LT 0.01000 000/015			0	01/17/83-10/18/83

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY - INGESTION
SAMPLE - FEED AND FORAGE - BEEF PRODUCERS
UNITS - PCI/GM WET

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN STATION FRACTION STATION DESCRIPTION	MEAN X E-00 RANGE	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
BE-7	73	0.3100	3.83 2.94 - 5.33 032/073	76 004/014 STATION 76 - 5.3 MI. 212 DEG. IND.	5.33 3.67 8.04		0	01/04/83-12/06/83
K-40	73	0.4700	11.38 9.10 - 15.25 073/073	67 015/015 STATION 67 - 4.75 MI. 325 DEG. IND.	15.25 2.21 28.9		0	01/04/83-12/06/83
I-131	73	0.03100	LT 10.00 LT 0.2000 -LT 10.00 000/073				0	01/04/83-12/06/83
CS-137	73	0.04700	0.03813 0.01650 - 0.06790 005/073	71 002/015 STATION 71 - 4.25 MI. 145 DEG. IND.	0.06790 0.06510 0.07070		0	01/04/83-12/06/83
RA-226	73	0.09300	0.1780 0.1780 - 0.1780 001/073	64 001/014 STATION 64 - 2.25 MI. 99 DEG IND 0.2000	0.1780 0 1780- 0.1780		0	01/04/83-12/06/83
TH-228	73	0.1200	0.1426 0.07640 - 0.2000 009/073	76 005/014 STATION 76 - 5.3 MI. 212 DEG IND	0.2000 0.03810- 0.4310		0	01/04/83-12/06/83

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- INGESTION
SAMPLE - FOOD/GARDEN CROPS
UNITS - PCI/GM

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN STATION FRACTION STATION DESCRIPTION	MEAN X E-00 RANGE	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
CA MG/GM	4		1.2 0.280 - 3.8 004/004	56 STATION 56 - 1.9 MI. 118 DEG. IND.	001/001 3.8 - 3.8		0	08/09/83-09/13/83
GR-B	4	0.0300	3.2 1.3 - 5.4 004/004	56 STATION 56 - 1.9 MI. 118 DEG. IND.	C01/001 5.4 - 5.4		0	08/09/83-09/13/83
SAMPLE	1	LT 0.00000 LT 0.00000	LT 0.00000 -LT 0.00000 000/001	(a)			0	08/09/83-08/09/83
SR-89	4	0.00300 LT 0.00300	LT 0.00800 -LT 0.00800 000/004				0	08/09/83-09/13/83
SR-90	4	0.00300	0.00560 0.00490- 0.00630 002/004	62 STATION 62 - 1.5 MI. 225 DEG. IND.	001/001 0.00630 - 0.00630		0	08/09/83-09/13/83
K-40	4	0.4700	2.35 0.3880 - 5.01 004/004	56 STATION 56 - 1.9 MI. 118 DEG. IND.	001/001 5.01 - 5.01		0	08/09/83-09/13/83
I-131	4	0.03100 LT 0.02000	LT 0.07000 -LT 0.07000 000/004				0	08/09/83-09/13/83

(a) There were no samples from Station 34 in 1983; there was no crop.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- INGESTION
SAMPLE - FOOD/GARDEN CROPS
UNITS - PCI/GM WET

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN MEAN X E-00 RANGE STATION FRACTION STATION DESCRIPTION	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
CS-137	4	0.03100	LT 0.02000 LT 0.00900-LT 0.02000 000/004			0	08/09/83-09/13/83

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY - INGESTION
SAMPLE - FEED AND FORAGE - MILK PRODUCERS
UNITS - PCI/GM WET (NEAREST)

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN MEAN X E-00 RANGE STATION FRACTION STATION DESCRIPTION	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
CA MG/GM	14 (a)		3.6 0.200 - 7.2 014/014	7.2 61 009/009 0.200 - 16.0 STATION 61 - 3.5 MI. 326 DEG. IND.		0	01/04/83-10/04/83
SR-89 (a)	14	0.600	LT 0.0400 LT 0.0100 -LT 0.0400 000/014			0	01/04/83-10/04/83
SR-90 (a)	14	0.600	0.0173 0.0039 - 0.116 010/014	0.116 61 005/009 0.00390- 0.510 STATION 61 - 3.5 MI. 326 DEG. IND.		0	01/04/83-10/04/83
BE-7	17	0.3100	1.31 1.07 - 2.66 011/017	2.66 74 005/008 1.65 - 4.30 STATION 74 - 2.4 MI. 270 DEG. IND.		0	01/04/83-10/04/83
K-40	17	0.4700	10.39 9.85 - 10.94 017/017	10.94 74 007/008 1.2 - 23.5 STATION 74 - 2.4 MI. 270 DEG. IND.		0	01/04/83-10/04/83
I-131	17	0.03100	LT 0.2000 LT 0.0300 -LT 0.2000 000/017			0	01/04/83-10/04/83
CS-137	17	0.04700	0.03570 0.03570 - 0.03570 001/017	0.03570 74 001/008 0.03570- 0.03570 STATION 74 - 2.4 MI. 270 DEG. IND.		0	01/04/83-10/04/83
TH-228	17	0.1200	0.09780 0.09780- 0.09780 001/017	0.09780 74 001/008 0.09780 - 0.09780 STATION 74 - 2.4 MI. 270 DEG. IND.		0	01/04/83-10/04/83

(a) Three samples from 61 and 74, collected on 04/04, were incorrectly marked as Feed and Forage -- Beef Producers (FB) and were not analyzed for Sr-89, Sr-90 nor elemental calcium.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY - INGESTION
SAMPLE - FEED AND FORAGE - MILK PRODUCERS
UNITS - PCI/GM WET (COMMERCIAL)

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN STATION FRACTION STATION DESCRIPTION MEAN X E-00 RANGE FRACTION	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
CA MG/GM	14		2.28 1.20 - 3.39 014/014	42 005/005 3.39 0.950 - 7.30 STATION 42 - 12.85 MI. 35 DEG. IND.		0	01/11/83-10/11/83
SR-89	14	0.600	LT 0.05 LT 0.00500 -LT 0.05 000/014			0	01/11/83-10/11/83
SR-90	14	0.600	0.0270 0.00670 - 0.060 009/014	73 003/005 0.060 0.048 - 0.67 STATION 73 - 10.0 MI. 35 DEG. IND.		0	01/11/83-10/11/83
BE-7	14	1.20	1.357 1.230 - 1.550 003/014	42 001/005 1.550 1.550 - 1.550 STATION 42 - 12.85 MI. 145 DEG. IND.		0	01/11/83-10/11/83
K-40	14	0.9300	5.43 2.86 - 8.44 014/014	73 005/005 8.44 2.81. - 20.7 STATION 73 - 10.0 MI. 35 DEG. IND..		0	01/11/83-10/11/83
I-131	14	0.1200	LT 0.1000 LT 0.00700 -LT 0.1000 000/014			0	01/11/83-10/11/83
CS-137	14	0.0470	0.1220 0.01220 - 0.01220 001/014	42 001/005 0.01220 0.01220 - 0.01220 STATION 42 - 12.85 MI. 145 DEG. IND.		0	01/11/83-10/11/83
RA-226	14	0.0930	LT 1.00 LT 1.00 -LT 1.00 000/014			0	01/11/83-10/11/83
TH-228	14	0.120	LT 0.200 LT 0.200 -LT 0.200 000/014			0	01/11/83-10/11/83

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- INGESTION
SAMPLE - FOOD AND FEED CROPS
UNITS - PCI/GM WET

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN STATION FRACTION STATION DESCRIPTION	MEAN X E-00 RANGE	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
CA MG/GM	8		3.3 0.0760 - 12.0 008/008	27 STATION 27 - 3.0 MI. 143 DEG. IND.	12.0 001/001 12.0 - 12.0		0	09/20/83-09/20/83
GR-B	8	6.0	4.7 3.6 - 7.4 008/008	27 STATION 27 - 3.0 MI. 143 DEG. IND.	7.4 001/001 7.4 - 7.4		0	09/20/83-09/20/83
SR-89	8	0.600 LT	LT 0.0200 0.00600-LT 0.0200 000/008				0	09/20/83-09/20/83
SR-90	8	0.600	0.0182 0.00690- 0.0240 004/008	27 STATION 27 - 3.0 MI. 143 DEG. IND.	0.0240 001/001 0.0240 - 0.0240		0	09/20/83-09/20/83
BE-7	8	1.20	0.4477 0.2840 - 0.5900 004/008	27 STATION 27 - 3.0 MI. 143 DEG. IND.	0.5900 001/001 0.5900 - 0.5900		0	09/20/83-09/20/83
K-40	8	0.9300	5.50 2.65 - 11.70 008/008	27 STATION 27 - 3.0 MI. 143 DEG. IND.	11.70 001/001 11.70 - 11.70		0	09/20/83-09/20/83
I-131	8	0.1200 LT	LT 0.02000 0.00500-LT 0.02000 000/008				0	09/20/83-09/20/83

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- INGESTION
SAMPLE - FOOD AND FEED CROPS
UNITS - PCI/GM WET

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN STATION FRACTION STATION DESCRIPTION	MEAN X E-00 RANGE	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
CS-137	6	0.1600	LT 0.02000 LT 0.00500-LT 0.02000 000/008				0	09/20/83-09/20/83.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- INGESTION
SAMPLE - F I S H
UNITS - PCI/GM WET

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN STATION FRACTION STATION DESCRIPTION	MEAN X E-00 RANGE	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
GR-B	10	0.250	4.7 4.3 - 5.1 010/010	35 005/005 STATION 35 - 2.0 MI. 350 DEG. CON.	5.1 3.9 - 6.8		0	06/06/83-10/11/83
SR-89	10	0.0300	LT 0.0300 LT 0.0200 -LT 0.0300 000/010				0	06/06/83-10/11/83
SR-90	10	0.0300	0.0180 0.0166 - 0.0193 009/010	35 004/005 STATION 35 - 2.0 MI. 350 DEG. CON.	0.0193 0.00750- 0.0270		0	06/06/83-10/11/83
K-40	10	0.4700	2.83 2.67 - 2.99 010/010	28 005/005 STATION 28 - 1.8 MI. 150 DEG. IND.	2.99 2.34 - 3.86		0	06/06/83-10/11/83
I-131	10	0.03100	LT 0.04000 LT 0.03000-LT 0.04000 000/010				0	06/06/83-10/11/83
CS-137	10	0.03100	LT 0.01000 LT 0.01000-LT 0.01000 000/010				0	06/06/83-10/11/83

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY - INGESTION
SAMPLE - MILK COMMERCIAL PRODUCERS
UNITS - PCI/LITER

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN MEAN X E-00 STATION FRACTION RANGE STATION DESCRIPTION	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
CA MG/GM	12		1.2 1.0 - 1.3 012/012	1.3 75 004/004 0.780 1.8 STATION 75 - 9.0 MI. 180 DEG. IND		0	01/18/83-10/18/83
I-131	12	0.780	LT 0.400 LT 0.200 -LT 0.400 000/012	BY CHEMICAL SEPARATION		0	01/18/83-10/18/83
SR-89	12	2.0	LT 2.0 LT 2.0 -LT 2.0 000/012			0	01/18/83-10/18/83
SR-90	12	1.4	2.5 2.4 - 2.6 012/012	2.6 75 004/004 1.9 3.9 STATION 75 - 9.0 MI. 32 DEG. IND		0	01/18/83-10/18/83
K-40	12	140.0	1189. 1095. - 1272. 012/012	1272 75 004/004 1140. -1420. STATION 75 - 9.0 MI. 180 DEG. IND		0	01/18/83-10/18/83
I-131	12	0.7800	LT 20.0 LT 8.00 -LT 20.0 000/012	BY GAMMA SCAN		0	01/18/83-10/18/83
Cs-137	12	9.00	13.50 13.50 - 13.50 001/012	13.50 42 001/004 13.50 13.50 STATION 42 - 12.85 MI. 156 DEG IND		0	01/18/83-10/18/83

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY - INGESTION
SAMPLE - MILK NEAREST PRODUCERS
UNITS - PCI/LITER

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICAT.. SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN STATION FRACTION STATION DESCRIPTION MEAN X E-00 RANGE	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
CA MG/GM	26 (a)		1.4 1.4 - 1.4 026/026	1.4 74 012/012 1.1 - 1.9 STATION 74 - 2.4 MI. 270 DEG. IND. 1.4 61 014/014 1.1 - 1.6 STATION 61 - 3.5 MI. 326 DEG IND		0	01/11/83-12/20/83
I-131	60	0.780	LT 0.500 LT 0.100 -LT 0.500 000/060	BY CHEMICAL SEPARATION		0	01/11/83-12/20/83
SR-89	27	2.0	LT 2.0 LT 2.0 -LT 2.0 000/027			0	01/11/83-12/20/83
SR-90	27	1.4	1.6 1.3 - 1.8 027/027	1.8 74 013/013 0.530 5.9 STATION 74 - 2.4 MI. 270 DEG. IND.		0	01/11/83-12/20/83
K-40	(b) 28	140.0	1243. 1242. - 1244. 028/028	1244. 74 014/014 759. 1670. STATION 74 - 2.4 MI. 270 DEG. IND		0	01/11/83-12/20/83
I-131	28	0.7800	LT 200.0 LT 6.00 -LT 200.0 000/028	BY GAMMA SCAN		0	01/11/83-12/20/83
CS-137	28	9.00	LT 20.0 LT 4.00 -LT 20.0 000/028			0	01/11/83-12/20/83

(a) For the sample from Station 74 for 04/09 the calcium was lost in analysis; there was not enough sample to repeat the analysis.

(b) Sample collected on 12/13 from Station 74 was lost in analysis for I-131. There was not enough sample to do Sr-89, Sr-90 or calcium. It was replaced with a sample on 12/20 which was analyzed. The gamma scan was done on both samples making a total of 28 for the year.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- WATERBORNE
SAMPLE - WATER - GROUND
UNITS - PCI/LITER

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN STATION FRACTION	MEAN X E-00 RANGE STATION DESCRIPTION	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
GR-A	8	0.800	LT 4.0 LT 4.0 -LT 4.0 000/008				0	01/23/83-10/25/83
GR-B	8	1.4	7.9 7.2 - 8.7 008/008	11 004/004 STATION 11 - 0.15 MI. 225 DEG. IND.	8.7 8.0 - 9.4		0	01/23/83-10/25/83
I-131	8	9.00	LT 20.00 LT 20.00 -LT 20.00 000/008				0	01/23/83-10/25/83
CS-137	8	9.00	LT 9.00 LT 8.00 -LT 9.00 000/008				0	01/23/83-10/25/83
H-3	8	140.	257. 210. - 305. 006/008	47 004/004 STATION 47 - 25.75 MI. 154 DEG. IND.	305. 110. - 490.		0	01/23/83-10/25/83

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- WATERBORNE
SAMPLE - WATER - RIVER
UNITS - PCI/LITER

COMPILATION - ANNUAL SUMMARY
CONTROL - STATION 12 - 0.1 MI. 360 DEG. CO

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN MEAN X E-00 RANGE STATION FRACTION STATION DESCRIPTION	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
GR-A DIS	36	0.800	14.2 11.0 - 17.7 006/036	17.7 12 002/012 3.4 - 32.0 STATION 12 - 0.1 MI. 360 DEG. CON.	17.7 3.4 - 32.0 002/012	1	01/17/83-12/13/83
GR-A SUS	36	0.800	3.5 3.2 - 3.9 016/036	3.9 28 003/012 0.910 - 8.3 STATION 28 - 1.8 MI. 150 DEG. IND.	3.4 1.3 - 5.1 006/012	0	01/17/83-12/13/83
GR-B DIS	36	1.4	10.7 9.7 - 12.9 033/036	12.9 28 011/012 2.1 - 58.0 STATION 28 - 1.8 MI. 150 DEG. IND.	9.7 5.3 - 13.0 011/012	0	01/17/83-12/13/83
GR-B SUS	36	1.4	7.8 7.0 - 8.5 036/036	8.5 12 012/012 2.1 - 21.0 STATION 12 - 0.1 MI. 360 DEG. CON.	8.5 2.1 - 21.0 012/012	0	01/17/83-12/13/83
SR-89	36	1.1	LT 2.0 LT 1.0 -LT 2.0 000/036		LT 1.0 LT 1. -LT 1.0 000/012	0	01/17/83-12/13/83
SR-90	36	0.930	1.2 1.2 - 1.2 001/036	1.2 13 001/012 1.2 - 1.2 STATION 13 - 0.25 MI. 120 DEG. IND.	LT 1.0 LT 0.600 -LT 1.0 000/012	0	01/17/83-12/13/83
I-131(a)	12	9.00	LT 800.0 LT 500.0 -LT 800.0 000/012		LT 700.0 LT 60.00 -LT 700.0 000/004	0	01/17/83-12/13/83

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- WATERBORNE
SAMPLE - WATER - RIVER
UNITS - PCI/LITER

COMPILATION - ANNUAL SUMMARY
CONTROL - STATION 12 - 0.1 MI. 360 DEG. CO

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN MEAN X E-00 STATION FRACTION RANGE STATION DESCRIPTION	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
CS-137	12	9.00	LT 50.00 LT 5.00 -LT 50.00 000/012		LT 7.00 LT 4.00 -LT 7.CC 000/004	0	01/17/83-12/13/83
H-3	12	140.	235. 185. - 280. 010/012	280. 12 004/004 160. - 430. STATION 12 - 0.1 MI. 360 DEG. CON.	280. 160. - 430. 004/004	0	01/17/83-12/13/83

(a) A tritium analysis and gamma scan is performed only on the quarterly composite of each station.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- INGESTION
SAMPLE - RABBITS ANIMALS
UNITS - PCI/GM WET

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN STATION FRACTION STATION DESCRIPTION MEAN X E-00 RANGE	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
I-131 THYROID	3 (a)		LT 10.0 LT 10.0 -LT 10.0 000/003	BY CHEMICAL SEPARATION		0	11/18/83-12/09/83
SR-89 FEMUR	4		LT 0.100 LT 0.0800 -LT 0.100 000/004			0	11/07/83-11/18/83
SR-90 FEMUR	4		0.227 0.205 - 0.250 004/004	28 002/002 0.250 - 0.250 STATION 28 - 1.8 MI. 150 DEG. INC.	0.250	0	11/07/83-11/18/83
K-40 FLESH	4		2.76 2.52 - 3.00 004/004	28 002/002 2.89 - 3.12 STATION 28 - 1.8 MI. 150 DEG. INC.	3.00	0	11/07/83-11/18/83
I-131 FLESH	4		LT 0.5000 LT 0.1000 -LT 0.5000 000/004	BY GAMMA SCAN		0	11/07/83-11/18/83
CS-137 FLESH	4		LT 0.09000 LT 0.02000-LT 0.09000 000/004			0	11/07/83-11/18/83

(a) The samples of the thyroid glands of the rabbits from Stations 28 and 35, collected 11/07, were lost in analysis; one replacement sample was received 12/09 from Station 35.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- AQUATIC
SAMPLE - VEGETATION - AQUATIC
UNITS - PCI/GM WET

COMPILATION - ANNUAL SUMMARY
CONTROL - STATION 12 - 0.1 MI. 360 DEG. CO

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN STATION FRACTION STATION DESCRIPTION	MEAN X E-00 RANGE	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
GR-B	2		1.2 1.1 - 1.4 002/002	12 001/001 STATION 12 - 0.1 MI. 360 DEG. CCN.	1.4 1.4 - 1.4	1.4 1.4 - 1.4 001/001	0	08/09/83-08/09/83
SAMPLE	4	LT 0.CC000	LT 0.00000-LT 0.00000 000/004	(a)			0	08/09/83-08/09/83
SR-89	2	LT 0.0200	LT 0.00600-LT 0.0200 000/002			LT 0.00600 LT 0.00600-LT 0.00600 000/001	0	08/09/83-08/09/83
SR-90	2		0.0160 0.0140 - 0.0180 002/002	28 001/001 STATION 28 - 1.8 MI. 150 DEG. IND.	0.0180 0.0180 - 0.0180	0.0140 0.0140 - 0.0140 001/001	0	08/09/83-08/09/83
BE-7	2		1.35 1.08 - 1.63 002/002	28 001/001 STATION 28 - 1.8 MI. 150 DEG. IND.	1.63 1.63 - 1.63	1.08 1.08 - 1.08 001/001	0	08/09/83-08/09/83
K-40	2		0.5645 0.2000 - 0.9290 002/002	28 001/001 STATION 28 - 1.8 MI. 150 DEG. IND.	0.9290 0.9290 - 0.9290	0.2000 0.2000 - 0.2000 001/001	0	08/09/83-08/09/83
I-131	2	LT 0.07000	LT 0.04000-LT 0.07000 000/002			LT 0.04000 LT 0.04000-LT 0.04000 000/001	0	08/09/83-08/09/83

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- AQUATIC
SAMPLE - VEGETATION - AQUATIC
UNITS - PCI/GM WET

COMPILATION - ANNUAL SUMMARY
CONTROL - STATION 12 - 0.1 MI. 360 DEG. SO

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN STATION FRACTION STATION DESCRIPTION	MEAN X E-00 RANGE	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
CS-137	2		LT 0.01000 LT 0.00700-LT 0.01000 000/002			LT 0.00700 LT 0.00700-LT 0.00700 000/001	0	08/09/83-08/09/83
TH-228	2		0.02070 0.02070- 0.02070 001/002	12 001/001 STATION 12 - 0.1 MI. 360 DEG. CON.	0.02070 0.02070- 0.02070	0.02070 0.02070- 0.02070 001/001	0	08/09/83-08/09/83

(a) There was no sample collected from Station 13 on 08/09; there was no vegetation available.

There were no samples collected in the fourth quarter from station 12, 13, or 28. The fluctuating level of the Missouri River prevented the accumulations of aquatic vegetation. (Total 2 samples collected.)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY - GAMMA EXPOSURE
SAMPLE - ENVIRONMENTAL TLD
UNITS - mR/YEAR

COMPILATION - ANNUAL SUMMARY
CONTROL -

NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION

ANALYSIS	NO	LIMIT OF DETECTION MEAN X E-00	ALL INDICATOR SAMPLES MEAN X E-00 RANGE FRACTION	LOCATION WITH HIGHEST MEAN MEAN X E-00 RANGE STATION FRACTION STATION DESCRIPTION	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
TLD	64	2mR				0	01/04/83-01/04/84
Total Exposure/year			76.9 mR 68.7- 119.5 064/064	119.5 mR 01 004/004 STATION 01 - 0.1 MI 225 DEG. IND.			

TELEDYNE ISOTOPES

DISCUSSION, IMPACT ON THE ENVIRONMENT

AND

STATISTICAL TABLES

TELEDYNE ISOTOPES

A and B. AIR PARTICULATE SAMPLES - GROSS BETA AND GROSS ALPHA

(See Tables A-1 - A-4, B-1 - B-4

STATIONS 01 to 10

Air particulates were collected continuously on membrane filters which were changed weekly at Stations 01 through 10. The filters were shipped to Teledyne Isotopes and analyzed for gross beta and gross alpha activity. They were composited for each station quarterly and monitored for gamma activity (See Tables D-1 and D-2).

The gross beta activity for each quarter of 1982 and 1983 is summarized below:

1982	First Quarter	0.035 pCi/Cu. M.
	Second Quarter	0.021 pCi/Cu. M.
	Third Quarter	0.023 pCi/Cu. M.
	Fourth Quarter	0.031 pCi/Cu. M.
1983	First Quarter	0.024 pCi/Cu. M.
	Second Quarter	0.019 pCi/Cu. M.
	Third Quarter	0.025 pCi/Cu. M.
	Fourth Quarter	0.039 pCi/Cu. M.

The level of gross beta activity has returned to normal environmental levels since the Chinese atmospheric nuclear weapons testing in 1980 increased levels worldwide. There was an increase in gross beta levels in the fourth quarter of 1983 because of the increased activity monitored in the month of December. This increase in both gross beta and gross alpha activity in this month could be related to weather conditions or to an increase in particulate matter on the filters. A trend of the same magnitude was found at other midwestern sites.

The gross alpha activity (Tables B-1 through B-4) continues low and close to the limits of detection with a slight increase in December as noted above. This low gross alpha activity is probably due to alpha emitters found in soil and to cosmogenic radiation. The gross beta particulate levels in all of the stations are similar to other areas of the United States and indicate no influence from the operations of the Cooper Nuclear Station (CNS) of the Nebraska Public Power District.

TELEDYNE ISOTOPES

TABLE A-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE FILTERS

pCi/Cu. M.

WEEKLY COLLECTIONS
FIRST QUARTER 1983
(JANUARY-MARCH)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 12/28/82-02/03/83	MONTHLY SUMMARY 02/03/83-03/01/83	MONTHLY SUMMARY 03/01/83-03/29/83	QUARTERLY SUMMARY 12/28/82-03/29/83
AIR PARTICULATE FILTERS GROSS BETA	01	2.6 ± 0.8 E-02	2.7 ± 1.5 E-02	1.8 ± 0.3 E-02	2.4 ± 1.0 E-02
	02	2.5 ± 0.7 E-02	2.7 ± 1.5 E-02	2.2 ± 0.4 E-02	2.5 ± 0.9 E-02
	03	2.9 ± 0.7 E-02	3.0 ± 1.5 E-02	2.1 ± 0.6 E-02	2.7 ± 1.0 E-02
	04	2.5 ± 0.9 E-02	2.7 ± 1.5 E-02	1.9 ± 0.4 E-02	2.4 ± 1.0 E-02
	05	2.8 ± 1.0 E-02	2.8 ± 1.4 E-02	2.3 ± 0.3 E-02	2.6 ± 0.9 E-02
	06	3.2 ± 1.0 E-02	3.4 ± 1.8 E-02	2.4 ± 0.6 E-02	3.0 ± 1.2 E-02
	07	1.3 ± 0.6 E-02	1.5 ± 0.6 E-02	8.0 ± 1.7 E-03	1.2 ± 0.5 E-02
	08	3.0 ± 1.0 E-02	3.0 ± 1.5 E-02	2.1 ± 0.6 E-02	2.7 ± 1.1 E-02
	09	2.0 ± 1.5 E-02	2.7 ± 1.3 E-02	2.0 ± 0.4 E-02	2.2 ± 1.1 E-02
	10	2.7 ± 0.9 E-02	2.8 ± 1.3 E-02	2.2 ± 0.4 E-02	2.6 ± 0.9 E-02
AVERAGE ALL STATIONS	01-10	2.5 ± 1.0 E-02	2.7 ± 1.3 E-02	2.0 ± 0.6 E-02	2.4 ± 1.1 E-02
		$\bar{x}$ and s			Grand $\bar{x}$ and s

TELEDYNE ISOTOPES

TABLE A-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE FILTERS

pCi/Cu. M.

WEEKLY COLLECTIONS
SECOND QUARTER 1983
(APRIL -JUNE)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 03/29/83-05/02/83	MONTHLY SUMMARY 05/02/83-05/31/83	MONTHLY SUMMARY 05/31/83-06/27/83	QUARTERLY SUMMARY 03/29/83-06/27/83
AIR PARTICULATE FILTERS GROSS BETA	01	1.6 ± 0.8 E-02	1.7 ± 0.4 E-02	2.3 ± 0.6 E-02	1.8 ± 0.7 E-02
	02	1.8 ± 0.5 E-02	1.8 ± 0.2 E-02	2.0 ± 0.4 E-02	1.8 ± 0.4 E-02
	03	1.6 ± 0.5 E-02	1.9 ± 0.3 E-02	2.0 ± 0.5 E-02	1.8 ± 0.4 E-02
	04	1.5 ± 0.7 E-02	1.6 ± 0.5 E-02	2.0 ± 0.5 E-02	1.7 ± 0.6 E-02
	05	1.8 ± 0.6 E-02	2.1 ± 1.1 E-02	2.2 ± 0.4 E-02	2.0 ± 0.7 E-02
	06	1.8 ± 0.6 E-02	1.7 ± 0.5 E-02	2.0 ± 0.5 E-02	1.9 ± 0.5 E-02
	07	1.2 ± 1.0 E-02	1.9 ± 0.2 E-02	2.2 ± 0.6 E-02	1.7 ± 0.8 E-02
	08	1.8 ± 0.5 E-02	1.6 ± 0.2 E-02	1.9 ± 0.5 E-02	1.8 ± 0.4 E-02
	09	1.5 ± 0.6 E-02	2.0 ± 0.4 E-02	1.9 ± 0.6 E-02	1.8 ± 0.5 E-02
	10	1.5 ± 0.5 E-02	1.8 ± 0.5 E-02	1.9 ± 0.5 E-02	1.7 ± 0.5 E-02
AVERAGE ALL STATIONS	01-10	1.7 ± 0.7 E-02	1.8 ± 0.5 E-02	2.0 ± 0.5 E-02	1.9 ± 0.8 E-02
		$\bar{x}$ and s			Grand $\bar{x}$ and s

TELEDYNE ISOTOPES

TABLE A-3

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE FILTERS

pCi/Cu. M.

WEEKLY COLLECTIONS
THIRD QUARTER 1983
(JULY -- SEPTEMBER)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 06/27/83-08/01/83	MONTHLY SUMMARY 08/01/83-08/30/83	MONTHLY SUMMARY 08/30/83-09/27/83	QUARTERLY SUMMARY 06/27/83-09/27/83
AIR PARTICULATE FILTERS GROSS BETA	01	2.4 ± 0.4 E-02	2.9 ± 0.4 E-02	2.5 ± 0.9 E-02	2.6 ± 0.6 E-02
	02	2.4 ± 0.4 E-02	3.1 ± 0.3 E-02	2.6 ± 0.7 E-02	2.6 ± 0.6 E-02
	03	2.1 ± 0.3 E-02	2.7 ± 0.1 E-02	2.5 ± 0.5 E-02	2.4 ± 0.4 E-02
	04	2.3 ± 0.6 E-02	3.1 ± 0.3 E-02	2.4 ± 0.7 E-02	2.6 ± 0.6 E-02
	05	2.3 ± 0.3 E-02	3.0 ± 0.5 E-02	2.5 ± 0.8 E-02	2.6 ± 0.6 E-02
	06	2.3 ± 0.3 E-02	2.8 ± 0.4 E-02	2.2 ± 0.5 E-02	2.4 ± 0.4 E-02
	07	2.4 ± 0.3 E-02	2.8 ± 0.4 E-02	2.3 ± 0.9 E-02	2.5 ± 0.6 E-02
	08	1.9 ± 0.3 E-02	2.6 ± 0.2 E-02	2.3 ± 0.9 E-02	2.2 ± 0.6 E-02
	09	2.5 ± 0.5 E-02	3.1 ± 0.4 E-02	2.8 ± 1.1 E-02	2.8 ± 0.7 E-02
	10	2.5 ± 0.5 E-02	3.1 ± 0.3 E-02	2.4 ± 0.8 E-02	2.6 ± 0.6 E-02
AVERAGE ALL STATIONS	01-10	2.3 ± 0.4 E-02	2.9 ± 0.4 E-02	2.4 ± 0.7 E-02	2.5 ± 0.6 E-02
	$\bar{x}$ and s				Grand $\bar{x}$ and s

TELEDYNE ISOTOPES

TABLE A-4

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE FILTERS

pCi/Cu. M.

WEEKLY COLLECTIONS
FOURTH QUARTER 1983
(OCTOBER -- DECEMBER)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 09/27/83-11/01/83	MONTHLY SUMMARY 11/01/83-11/29/83	MONTHLY SUMMARY 11/29/83-12/27/83	QUARTERLY SUMMARY 09/27/83-12/27/83
AIR PARTICULATE FILTERS GROSS BETA	01	2.8 ± 0.9 E-02	2.9 ± 0.6 E-02	7.4 ± 1.4 E-02	4.3 ± 2.4 E-02
	02	2.7 ± 0.7 E-02	2.3 ± 0.5 E-02	6.2 ± 1.2 E-02	3.7 ± 1.9 E-02
	03	2.4 ± 0.7 E-02	2.5 ± 0.7 E-02	6.1 ± 0.9 E-02	3.6 ± 1.9 E-02
	04	3.0 ± 0.8 E-02	2.5 ± 0.4 E-02	6.1 ± 1.7 E-02	3.8 ± 1.9 E-02
	05	2.8 ± 1.3 E-02	3.0 ± 0.7 E-02	6.5 ± 1.2 E-02	4.0 ± 2.0 E-02
	06	2.8 ± 0.9 E-02	2.6 ± 0.6 E-02	6.8 ± 1.0 E-02	3.9 ± 2.1 E-02
	07	2.7 ± 0.7 E-02	2.4 ± 0.6 E-02	6.2 ± 1.2 E-02	3.7 ± 1.9 E-02
	08	2.5 ± 0.5 E-02	2.5 ± 0.5 E-02	6.1 ± 1.4 E-02	3.6 ± 1.9 E-02
	09	2.7 ± 0.9 E-02	2.6 ± 0.6 E-02	6.5 ± 0.7 E-02	3.8 ± 1.9 E-02
	10	2.8 ± 0.7 E-02	3.1 ± 1.0 E-02	7.4 ± 1.5 E-02	4.3 ± 2.4 E-02
AVERAGE ALL STATIONS	01-10	2.7 ± 0.8 E-02	2.6 ± 0.6 E-02	6.5 ± 1.2 E-02	3.9 ± 2.0 E-02
	$\bar{x}$ and s				Grand $\bar{x}$ and s

TELEDYNE ISOTOPES

TABLE B-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE FILTERS

pCi/Cu. M.

WEEKLY COLLECTIONS
FIRST QUARTER 1983
(JANUARY-MARCH)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 12/28/82-02/03/83	MONTHLY SUMMARY 02/03/83-03/01/83	MONTHLY SUMMARY 03/01/83-03/29/83	QUARTERLY SUMMARY 12/28/82-03/29/83
AIR PARTICULATE FILTERS GROSS ALPHA	01	1.5 ± 0.5 E-03	1.8 ± 0.5 E-03	1.5 ± 0.6 E-03	1.6 ± 0.5 E-03
	02	1.6 ± 0.5 E-03	1.9 ± 0.3 E-03	2.0 ± 0.1 E-03	1.8 ± 0.4 E-03
	03	1.5 ± 0.5 E-03	1.5 ± 0.6 E-03	1.7 ± 0.5 E-03	1.6 ± 0.5 E-03
	04	1.9 ± 0.2 E-03	1.9 ± 0.6 E-03	1.9 ± 0.5 E-03	1.8 ± 0.7 E-03
	05	1.5 ± 0.5 E-03	1.5 ± 0.6 E-03	2.0 ± 0.6 E-03	1.7 ± 0.5 E-03
	06	1.9 ± 0.6 E-03	1.9 ± 0.7 E-03	2.0 ± 0.2 E-03	1.9 ± 0.5 E-03
	07	1.2 ± 0.4 E-03	1.8 ± 0.5 E-03	1.5 ± 0.6 E-03	1.5 ± 0.5 E-03
	08	2.0 ± 0.8 E-03	1.5 ± 0.6 E-03	1.7 ± 0.5 E-03	1.7 ± 0.6 E-03
	09	1.3 ± 0.5 E-03	1.5 ± 0.6 E-03	1.7 ± 0.5 E-03	1.5 ± 0.5 E-03
	10	1.9 ± 0.8 E-03	1.8 ± 0.5 E-03	1.6 ± 0.8 E-03	1.8 ± 0.7 E-03
AVERAGE ALL STATIONS	01-10	1.6 ± 0.6 E-03	1.7 ± 0.5 E-03	1.7 ± 0.5 E-03	1.7 ± 0.5 E-03
		$\bar{x}$ and s			Grand $\bar{x}$ and s

TELEDYNE ISOTOPES

TABLE B-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE FILTERS

pCi/Cu. M.

WEEKLY COLLECTIONS
SECOND QUARTER 1983
(APRIL - JUNE)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 03/29/83-05/02/83	MONTHLY SUMMARY 05/02/83-05/31/83	MONTHLY SUMMARY 05/31/83-06/27/83	QUARTERLY SUMMARY 03/29/83-06/27/83
AIR PARTICULATE FILTERS GROSS ALPHA	01	2.0 ± 0.7 E-03	1.7 ± 0.5 E-03	2.4 ± 0.8 E-03	2.0 ± 0.7 E-03
	02	1.7 ± 0.6 E-03	1.4 ± 0.7 E-03	2.0 ± 0.1 E-03	1.7 ± 0.6 E-03
	03	1.9 ± 0.3 E-03	1.4 ± 0.5 E-03	2.1 ± 0.3 E-03	1.8 ± 0.4 E-03
	04	1.7 ± 0.9 E-03	1.4 ± 0.6 E-03	2.2 ± 0.2 E-03	1.8 ± 0.7 E-03
	05	2.1 ± 0.7 E-03	1.5 ± 0.6 E-03	1.8 ± 0.5 E-03	1.8 ± 0.6 E-03
	06	1.5 ± 0.5 E-03	1.6 ± 0.7 E-03	1.8 ± 0.5 E-03	1.6 ± 0.5 E-03
	07	1.2 ± 0.4 E-03	1.9 ± 0.4 E-03	2.0 ± 0.4 E-03	1.7 ± 0.5 E-03
	08	1.6 ± 0.6 E-03	1.5 ± 0.6 E-03	2.0 ± 0.1 E-03	1.7 ± 0.5 E-03
	09	1.8 ± 0.6 E-03	1.5 ± 0.6 E-03	2.2 ± 0.7 E-03	1.8 ± 0.7 E-03
	10	1.9 ± 1.0 E-03	1.4 ± 0.5 E-03	1.8 ± 0.5 E-03	1.7 ± 0.7 E-03
AVERAGE ALL STATIONS	01-10	1.7 ± 0.6 E-03	1.5 ± 0.6 E-03	2.0 ± 0.6 E-03	1.7 ± 0.6 E-03
		$\bar{x}$ and s			Grand $\bar{x}$ and s

TELEDYNE ISOTOPES

TABLE B-3

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE FILTERS

pCi/Cu. M.

WEEKLY COLLECTIONS
THIRD QUARTER 1983
(JULY - SEPTEMBER)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 06/27/83-08/01/83	MONTHLY SUMMARY 08/01/83-08/30/83	MONTHLY SUMMARY 08/30/83-09/27/83	QUARTERLY SUMMARY 06/27/83-09/27/83
AIR PARTICULATE FILTERS GROSS ALPHA	01	2.0 ± 0.8 E-03	3.3 ± 1.1 E-03	2.1 ± 0.6 E-03	2.4 ± 1.0 E-03
	02	1.7 ± 0.6 E-03	2.5 ± 1.1 E-03	1.4 ± 0.2 E-03	1.9 ± 0.8 E-03
	03	2.1 ± 0.8 E-03	3.0 ± 1.1 E-03	2.2 ± 1.4 E-03	2.4 ± 1.1 E-03
	04	1.7 ± 0.5 E-03	2.7 ± 0.6 E-03	2.3 ± 1.4 E-03	2.2 ± 0.9 E-03
	05	2.0 ± 0.9 E-03	2.7 ± 0.4 E-03	2.8 ± 2.4 E-03	2.4 ± 1.4 E-03
	06	2.1 ± 1.3 E-03	2.9 ± 1.8 E-03	3.2 ± 1.8 E-03	2.7 ± 1.6 E-03
	07	2.1 ± 1.0 E-03	3.2 ± 0.5 E-03	2.9 ± 1.6 E-03	2.7 ± 1.1 E-03
	08	1.5 ± 0.6 E-03	3.4 ± 1.6 E-03	1.9 ± 1.3 E-03	2.3 ± 1.4 E-03
	09	2.4 ± 1.2 E-03	2.7 ± 0.8 E-03	1.5 ± 0.6 E-03	2.2 ± 1.0 E-03
	10	2.4 ± 0.9 E-03	3.6 ± 0.8 E-03	1.8 ± 0.9 E-03	2.6 ± 1.1 E-03
AVERAGE ALL STATIONS	01-10	2.0 ± 0.9 E-03	3.0 ± 1.0 E-03	2.2 ± 1.3 E-03	2.4 ± 1.1 E-03
		$\bar{x}$ and s			Grand $\bar{x}$ and s

TELEDYNE ISOTOPES

TABLE B-4

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE FILTERS

pCi/Cu. M.

WEEKLY COLLECTIONS
FOURTH QUARTER 1983
(OCTOBER-DECEMBER)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 09/27/83-11/01/83	MONTHLY SUMMARY 11/01/83-11/29/83	MONTHLY SUMMARY 11/29/83-12/27/83	QUARTERLY SUMMARY 09/27/83-12/27/83
AIR PARTICULATE FILTERS GROSS ALPHA	01	2.6 ± 1.8 E-03	2.5 ± 0.8 E-03	5.0 ± 0.3 E-03	3.3 ± 1.6 E-03
	02	1.8 ± 0.5 E-03	1.9 ± 0.7 E-03	4.0 ± 1.2 E-03	2.5 ± 1.3 E-03
	03	2.1 ± 0.9 E-03	1.5 ± 0.4 E-03	4.5 ± 1.3 E-03	2.7 ± 1.5 E-03
	04	1.8 ± 1.1 E-03	1.8 ± 1.0 E-03	4.6 ± 2.6 E-03	2.6 ± 2.0 E-03
	05	2.7 ± 2.1 E-03	1.8 ± 0.4 E-03	4.5 ± 1.0 E-03	2.9 ± 1.8 E-03
	06	2.2 ± 1.2 E-03	1.7 ± 0.7 E-03	5.2 ± 0.3 E-03	3.0 ± 1.8 E-03
	07	2.2 ± 0.4 E-03	2.2 ± 2.1 E-03	3.9 ± 1.4 E-03	2.7 ± 1.5 E-03
	08	2.7 ± 2.0 E-03	1.8 ± 0.7 E-03	5.2 ± 1.6 E-03	3.2 ± 2.0 E-03
	09	2.3 ± 1.6 E-03	2.6 ± 0.5 E-03	3.9 ± 0.7 E-03	2.9 ± 1.2 E-03
	10	2.2 ± 1.2 E-03	2.8 ± 1.8 E-03	4.0 ± 2.2 E-03	2.9 ± 1.7 E-03
AVERAGE ALL STATIONS	01-10	2.3 ± 1.3 E-03	2.1 ± 1.0 E-03	4.5 ± 1.4 E-03	2.9 ± 1.6 E-03
	x and s				Grand x and s

C. AIR RADIOIODINE - CHARCOAL FILTERS (See Tables C-1 through C-4)

STATIONS 01 to 10

Charcoal filters used in series with air particulate filters were collected weekly during 1983 at station 01 through 10 and monitored for radioiodine.

Tables C-1 through C-4 show the average monthly and quarterly results for each station and the average for all 10 stations. No airborne I-131 was detected; all results were at or below the normal level of detection.

Lack of any detections of I-131 supports the conclusion that no detectable radionuclides were emitted in air releases from CNS.

TELEDYNE ISOTOPES

TABLE C-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

CHARCOAL FILTERS

pCi/Cu. M.

WEEKLY COLLECTIONS
FIRST QUARTER 1983
(JANUARY-MARCH)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 12/28/82-02/03/83	MONTHLY SUMMARY 02/03/83-03/01/83	MONTHLY SUMMARY 03/01/83-03/29/83	QUARTERLY SUMMARY 12/28/83-03/29/83	DET./ TOTAL	RANGE
CHARCOAL FILTERS I-131	01	L.T. 4. E-02	L.T. 4. E-02	L.T. 3. E-02 (a)	L.T. 4. E-02	0/13	(L.T.3.-L.T.4.)E-02
	02	L.T. 4. E-02	L.T. 4. E-02	L.T. 3. E-02 (a)	L.T. 4. E-02	0/13	(L.T.3.-L.T.4.)E-02
	03	L.T. 4. E-02	L.T. 4. E-02	L.T. 3. E-02	L.T. 4. E-02	0/13	(L.T.3.-L.T.4.)E-02
	04	L.T. 4. E-02	L.T. 3. E-02	L.T. 3. E-02	L.T. 4. E-02	0/13	(L.T.3.-L.T.4.)E-02
	05	L.T. 4. E-02	L.T. 3. E-02	L.T. 3. E-02	L.T. 4. E-02	0/13	(L.T.3.-L.T.4.)E-02
	06	L.T. 5. E-02	L.T. 4. E-02	L.T. 4. E-02	L.T. 5. E-02	0/13	(L.T.3.-L.T.5.)E-02
	07	L.T. 4. E-02	L.T. 5. E-02	L.T. 4. E-02	L.T. 5. E-02	0/13	(L.T.3.-L.T.5.)E-02
	08	L.T. 5. E-02	L.T. 4. E-02	L.T. 4. E-02	L.T. 5. E-02	0/13	(L.T.3.-L.T.5.)E-02
	09	L.T. 5. E-02	L.T. 4. E-02	L.T. 4. E-02	L.T. 5. E-02	0/13	(L.T.4.-L.T.5.)E-02
	10	L.T. 3. E-02	L.T. 2. E-02	L.T. 3. E-02	L.T. 3. E-02	0/13	(L.T.2.-L.T.3.)E-02
	01-10	L.T. 5. E-02	L.T. 5. E-02	L.T. 4. E-02	L.T. 5. E-02		--
	DET./TOTAL	0/50	0/40	0/40	0/130	0/130	--
	RANGE	(L.T.3.-L.T.5.)E-02	(L.T.2.-L.T.5.)E-02	(L.T.3.-L.T.4.)E-02	(L.T.3.-L.T.5.)E-02	--	--

(a) The charcoal filters for Stations 01 and 02 for 03/22-03/29 were lost in transit. The package arrived damaged.

TELEDYNE ISOTOPES

TABLE C-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

CHARCOAL FILTERS

pCi/Cu. M.

WEEKLY COLLECTIONS
SECOND QUARTER 1983
(APRIL-JUNE)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 03/29/83-05/03/83	MONTHLY SUMMARY 05/02/83-05/31/83	MONTHLY SUMMARY 05/31/83-06/27/83	QUARTERLY SUMMARY 03/29/83-06/27/83	DET./ TOTAL	RANGE
CHARCOAL FILTERS I-131	01	L.T. 5. E-02	L.T. 5. E-02	L.T. 4. E-02	L.T. 5. E-02	0/13	(L.T.3.-L.T.5.)E-02
	02	L.T. 5. E-02	L.T., 5. E-02	L.T. 4. E-02	L.T. 5. E-02	0/13	(L.T.3.-L.T.5.)E-02
	03	L.T. 5. E-02	L.T. 5. E-02	L.T. 4. E-02	L.T. 5. E-02	0/13	(L.T.3.-L.T.5.)E-02
	04	L.T. 5. E-02	L.T. 5. E-02	L.T. 4. E-02	L.T. 5. E-02	0/13	(L.T.3.-L.T.5.)E-02
	05	L.T. 4. E-02	L.T. 7. E-02	L.T. 3. E-02	L.T. 7. E-02	0/13	(L.T.2.-L.T.7.)E-02
	06	L.T. 5. E-02	L.T. 4. E-02	L.T. 5. E-02	L.T. 5. E-02	0/13	(L.T.3.-L.T.5.)E-02
	07	L.T. 5. E-02	L.T. 4. E-02	L.T. 5. E-02	L.T. 5. E-02	0/13	(L.T.3.-L.T.5.)E-02
	08	L.T. 5. E-02	L.T. 4. E-02	L.T. 5. E-02	L.T. 5. E-02	0/13	(L.T.3.-L.T.5.)E-02
	09	L.T. 5. E-02	L.T. 4. E-02	L.T. 5. E-02	L.T. 5. E-02	0/13	(L.T.3.-L.T.5.)E-02
	10	L.T. 3. E-02	L.T. 2. E-02	L.T. 3. E-02	L.T. 3. E-02	0/13	(L.T.2.-L.T.3.)E-02
	01-10	L.T. 5. E-02	L.T. 7. E-02	L.T. 5. E-02	L.T. 7. E-02	--	--
	DET./TOTAL	0/50	0/40	0/40	0/130	0/130	--
	RANGE	(L.T.3.-L.T.5.)E-02	(L.T.2.-L.T.7.)E-02	(L.T.3.-L.T.5.)E-02	(L.T.3.-L.T.7.)E-02	--	--

TELEDYNE ISOTOPES

TABLE C-3

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

CHARCOAL FILTERS

pCi/Cu. M.

WEEKLY COLLECTIONS
THIRD QUARTER 1983
(JULY-SEPTEMBER)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 06/27/83-08/01/83	MONTHLY SUMMARY 08/01/83-08/30/83	MONTHLY SUMMARY 08/30/83-09/27/83	QUARTERLY SUMMARY 06/27/83-09/27/83	DET./ TOTAL	RANGE
CHARCOAL FILTERS I-131	01	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	0/13	(L.T.3.-L.T.4.)E-02
	02	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	0/13	(L.T.3.-L.T.4.)E-02
	03	L.T. 5. E-02	L.T. 5. E-02	L.T. 4. E-02	L.T. 5. E-02	0/13	(L.T.3.-L.T.5.)E-02
	04	L.T. 5. E-02	L.T. 5. E-02	L.T. 4. E-02	L.T. 5. E-02	0/13	(L.T.3.-L.T.5.)E-02
	05	L.T. 3. E-02	L.T. 3. E-02	L.T. 2. E-02	L.T. 3. E-02	0/13	(L.T.2.-L.T.3.)E-02
	06	L.T. 4. E-02	L.T. 3. E-02	L.T. 8. E-02 (a)	L.T. 8. E-02 (a)	0/13	(L.T.2.-L.T.8.)E-02
	07	L.T. 4. E-02	L.T. 3. E-02	L.T. 4. E-02	L.T. 4. E-02	0/13	(L.T.2.-L.T.4.)E-02
	08	L.T. 4. E-02	L.T. 3. E-02	L.T. 4. E-02	L.T. 4. E-02	0/13	(L.T.2.-L.T.4.)E-02
	09	L.T. 4. E-02	L.T. 3. E-02	L.T. 4. E-02	L.T. 4. E-02	0/13	(L.T.2.-L.T.4.)E-02
	10	L.T. 3. E-02	L.T. 3. E-02	L.T. 2. E-02	L.T. 3. E-02	0/13	(L.T.2.-L.T.3.)E-02
	01-10	L.T. 5. E-02	L.T. 5. E-02	L.T. 8. E-02	L.T. 8. E-02	--	--
	DET./TOTAL	0/50	0/40	0/40	0/130	0/130	--
	RANGE	(L.T.3.-L.T.5.)E-02	(L.T.3.-L.T.5.)E-02	(L.T.2.-L.T.8.)E-02	(L.T.3.-L.T.8.)E-02	--	--

(a) High MDL is because of low volume; pump at station 06 off 112 hours week of 09/13-09/20.

TELEDYNE ISOTOPES

TABLE C-4

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

CHARCOAL FILTERS

pCi/Cu. M.

WEEKLY COLLECTIONS
FOURTH QUARTER 1983
(OCTOBER-DECEMBER)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 09/27/83-11/01/83	MONTHLY SUMMARY 11/01/83-11/29/83	MONTHLY SUMMARY 11/29/83-12/27/83	QUARTERLY SUMMARY 09/27/83-12/27/83	DET./ TOTAL	RANGE
CHARCOAL FILTERS I-131	01	L.T. 4. E-02	L.T. 5. E-02	L.T. 4. E-02	L.T. 5. E-02	0/13	(L.T.2.-L.T.5.)E-02
	02	L.T. 4. E-02	L.T. 5. E-02	L.T. 4. E-02	L.T. 5. E-02	0/13	(L.T.2.-L.T.5.)E-02
	03	L.T. 4. E-02	L.T. 5. E-02	L.T. 4. E-02	L.T. 5. E-02	0/13	(L.T.2.-L.T.5.)E-02
	04	L.T. 4. E-02	L.T. 5. E-02	L.T. 4. E-02	L.T. 5. E-02	0/13	(L.T.2.-L.T.5.)E-02
	05	L.T. 3. E-02	L.T. 5. E-02	L.T. 3. E-02	L.T. 5. E-02	0/13	(L.T.1.-L.T.5.)E-02
	06	L.T. 3. E-02	L.T. 6. E-02	L.T. 4. E-02	L.T. 6. E-02	0/13	(L.T.1.-L.T.6.)E-02
	07	L.T. 3. E-02	L.T. 6. E-02	L.T. 4. E-02	L.T. 6. E-02	0/13	(L.T.1.-L.T.6.)E-02
	08	L.T. 3. E-02	L.T. 6. E-02	L.T. 4. E-02	L.T. 6. E-02	0/13	(L.T.2.-L.T.6.)E-02
	09	L.T. 3. E-02	L.T. 6. E-02	L.T. 4. E-02	L.T. 6. E-02	0/13	(L.T.3.-L.T.6.)E-02
	10	L.T. 3. E-02	L.T. 5. E-02	L.T. 8. E-02	L.T. 8. E-02	0/13	(L.T.2.-L.T.8.)E-02
	01-10	L.T. 4. E-02	L.T. 6. E-02	L.T. 8. E-02	L.T. 8. E-02	0/130	--
	DET./TOTAL	0/50	0/40	0/40	0/130	--	--
	RANGE	(L.T.2.-L.T.4.)E-02	(L.T.2.-L.T.6.)E-02	(L.T.1.-L.T.8.)E-02	(L.T.5.-L.T.8.)E-02	--	--

D. COMPOSITE OF AIR PARTICULATE FILTERS - GAMMA

(See Tables D-1 and D-2)

STATIONS 01 to 10

Weekly Air Particulate filters were composited for each station for a quarterly gamma spectral analysis during the four quarters of 1983.

Beryllium-7, a naturally occurring cosmogenic nuclide, was detected in 40 of 40 samples at a level of 0.117 pCi per cubic meter which is the same level as in past years. There were two detections of Thorium-228 at station 07 in the first quarter of 1983. This is a natural terrestrial nuclide and the activity was below the normal limit of detection. Potassium-40, also a natural nuclide, was detected in 4 of 40 samples also below the normal limit of detection.

There was one detection of Cs-137, which is a fission product, in the first quarter of 1983 at slightly below the normal limit of detection. This is probably due to fallout from past nuclear weapons testing and occurred in other areas of the United States.

There were no detections of I-131 in the charcoal filters in series with the air particulate filters. There was no correlation between the level of activity and the stations close to the plant. There was no indication of an effect from the operations of CNS.

TELEDYNE ISOTOPES

TABLE D-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

COMPOSITE OF WEEKLY AIR PARTICULATE FILTERS

pCi/Cu. M.

SAMPLE NUCLIDE	STATION NUMBER		1st QUARTER 12/28/82-03/29/83	2nd QUARTER 03/29/83-06/27/83	3rd QUARTER 06/27/83-09/27/83	4th QUARTER 09/27/83-12/27/83
Be-7	01-10	Mean±std.dev.	5.6 ± 1.5 E-02	1.5 ± 0.2 E-01	1.6 ± 0.3 E-01	9.7 ± 0.1 E-02
		det./total	10/10	10/10	10/10	10/10
		range	(2.9-7.9)E-02	(0.96-1.8)E-01	(1.0-1.9)E-01	(0.81-1.1)E-02
K-40	01-10	Mean±std.dev.	2.9 ± 0.8 E-02	L.T. 3. E-02	2.5 ± 0.6 E-02	8.3 ± 4.4 E-03
		det./total	1/10	0/10	2/10	1/10
		range	--	--	(2.1-2.9)E-02	--
I-131	01-10	Mean±std.dev.	L.T. 1. E-02	L.T. 1. E 00	L.T. 4. E 00	L.T. 8. E-01
		det./total	0/10	0/10	0/10	0/10
		range	--	--	--	--
Cs-137	01-10	Mean±std.dev.	1.8 +-0.5 E-03	L.T. 1. E-03	L.T. 9. E-04	L.T. 1. E-03
		det./total	1/10	0/10	0/10	0/10
		range	--	--	--	--
Th-228	01-10	Mean±std.dev.	2.7 +-3.4 E-03	L.T. 3. E-03	L.T. 2. E-03	L.T. 1. E-03
		det./total	2/10	0/10	0/10	0/10
		range	(0.03-5.1)E-03	--	--	--

TELEDYNE ISOTOPES

TABLE D-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

COMPOSITE OF WEEKLY AIR PARTICULATE FILTERS

pCi/Cu.M.

SAMPLE NUCLIDE	STATION NUMBER	1st QUARTER 12/28/82-03/29/83	2nd QUARTER 03/29/83-06/27/83	3rd QUARTER 06/27/83-09/27/83	4th QUARTER 09/27/83-12/27/83
Be-7	01-10	5.6 ± 1.5 E-02 (10/10)	1.5 ± 0.2 E-01 (10/10)	1.6 ± 0.3 E-01 (10/10)	9.7 ± 0.1 E-02 (10/10)
K-40	01-10	2.9 ± 0.8 E-02 (1/10)	L.T. 3. E-02 (0/10)	2.5 ± 0.6 E-02 (2/10)	8.3 ± 4.4 E-03 (1/10)
Mn-54	01-10	L.T. 1. E-03 (0/10)	L.T. 1. E-03 (0/10)	L.T. 1. E-03 (0/10)	L.T. 1. E-03 (0/10)
Co-58	01-10	L.T. 1. E-03 (0/10)	L.T. 2. E-03 (0/10)	L.T. 2. E-03 (0/10)	L.T. 2. E-03 (0/10)
Fe-59	01-10	L.T. 3. E-02 (0/10)	L.T. 7. E-03 (0/10)	L.T. 8. E-03 (0/10)	L.T. 7. E-03 (0/10)
Co-60	01-10	L.T. 1. E-03 (0/10)	L.T. 2. E-03 (0/10)	L.T. 1. E-03 (0/10)	L.T. 1. E-03 (0/10)
Zn-65	01-10	L.T. 3. E-03 (0/10)	L.T. 3. E-03 (0/10)	L.T. 3. E-03 (0/10)	L.T. 3. E-03 (0/10)
Zr-95	01-10	L.T. 1. E-03 (0/10)	L.T. 2. E-03 (0/10)	L.T. 2. E-03 (0/10)	L.T. 2. E-03 (0/10)
Ru-103	01-10	L.T. 2. E-03 (0/10)	L.T. 4. E-03 (0/10)	L.T. 4. E-03 (0/10)	L.T. 3. E-03 (0/10)
Ru-106	01-10	L.T. 1. E-02 (0/10	L.T. 1. E-02 (0/10)	L.T. 9. E-03 (0/10)	L.T. 9. E-03 (0/10)
I-131	01-10	L.T. 1. E-02 (0/10)	L.T. 1. E 00 (0/10)	L.T. 4. E 00 (0/10)	L.T. 8. E-01 (0/10)
Cs-134	01-10	L.T. 1. E-03 (0/10)	L.T. 1. E-03 (0/10)	L.T. 1. E-03 (0/10)	L.T. 1. E-03 (0/10)
Cs-137	01-10	1.8 +-0.5 E-03 (1/10)	L.T. 1. E-03 (0/10)	L.T. 9. E-04 (0/10)	L.T. 1. E-03 (0/10)
Ba-140	01-10	L.T. 4. E-03 (0/10)	L.T. 8. E-02 (0/10)	L.T. 2. E-01 (0/10)	L.T. 8. E-02 (0/10)
Ce-141	01-10	L.T. 2. E-03 (0/10)	L.T. 9. E-03 (0/10)	L.T. 8. E-03 (0/10)	L.T. 5. E-03 (0/10)
Ce-144	01-10	L.T. 6. E-03 (0/10)	L.T. 9. E-03 (0/10)	L.T. 7. E-03 (0/10)	L.T. 5. E-03 (0/10)
RA-226	01-10	L.T. 2. E-02 (0/10)	L.T. 2. E-02 (0/10)	L.T. 2. E-02 (0/10)	L.T. 1. E-02 (0/10)
Th-228	01-10	2.7 ± 3.4 E-03 (2/10)	L.T. 3. E-03 (0/10)	L.T. 2. E-03 (0/10)	L.T. 1. E-03 (0/10)

E. EGGS (See Tables E1, E2)

STATIONS 42, 51, 67, 76

Egg samples were collected quarterly from four locations and analyzed for elemental calcium, gross beta, Sr-89, Sr-90 and gamma emitters. The gross beta measured 1.8 pCi per gram, wet, which was accounted for largely by the naturally occurring, terrestrial isotope K-40. No other gamma emitters were measured above the normal level of detection. There were no detections of Sr-89. The level of elemental calcium in 16 samples was 0.12 mg per gram which is similar to the levels of previous years.

There were three detections of Sr-90 in 15 samples at a level of 0.0019 pCi per gram, wet, which is below the normal level of detection and is a residue from past nuclear explosions.

There was no evidence of an effect from the operation of CNS on egg samples.

TELEDYNE ISOTOPES

TABLE E-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

EGGS - pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER		1st QUARTER 01/18/83	2nd QUARTER 04/26/83	3rd QUARTER 07/19/83	4th QUARTER 10/18/83
Gross Beta	42,51,67,76	Mean±std.dev.	1.7 ± 0.6 E 00	1.6 ± 0.2 E 00	1.8 ± 0.5 E 00	2.5 ± 0.2 E 00
		det./total	4/4	3/3(a)	4/4	4/4
		range	(1.0-2.4)E 00	(1.4-1.7)E 00	(1.2-2.4)E 00	(2.3-2.7)E 00
Sr-89	42,51,67,76	Mean±std.dev.	L.T. 6. E-03	L.T. 4. E-03	L.T. 5. E-03	L.T. 6. E-03
		det./total	0/4	0/3	0/4	0/4
		range	--	--	--	--
Sr-90	42,51,67,76	Mean±std.dev.	L.T. 4. E-03	L.T. 2. E-03	3.3 ± 1.5 E-03	1.4 ± 0.2 E-03
		det./total	0/4	0/3	1/4	2/4
		range	--	--	--	(1.3-1.5)E-03
Ca (elem.) mg/gm	42,51,67,76	Mean±std.dev.	2.0 ± 0.6 E-01	2.8 ± 0.9 E-01	2.0 ± 0.4 E-01	1.6 ± 0.3 E-01
		det./total	4/4	3/3	4/4	4/4
		range	(1.4-2.6)E-01	(1.9-3.6)E-01	(1.6-2.5)E-01	(1.1-1.7)E-01
K-40	42,51,67,76	Mean±std.dev.	1.0 ± 0.2 E 00	1.1 ± 0.1 E 00	1.1 ± 0.1 E 00	1.2 ± 0.1 E 00
		det./total	4/4	3/3	4/4	4/4
		range	(0.7-1.2)E 00	(1.0-1.2)E 00	(1.0-1.2)E 00	(1.0-1.3)E 00
I-131	42,51,67,76	Mean±std.dev.	L.T. 2. E-02	L.T. 1. E-02	L.T. 2. E-02	L.T. 1. E-02
		det./total	0/4	0/3	0/4	0/4
		range	--	--	--	--
Cs-137	42,51,67,76	Mean±std.dev.	L.T. 1. E-02	L.T. 7. E-03	L.T. 9. E-03	L.T. 7. E-03
		det./total	0/4	0/3	0/4	0/4
		range	--	--	--	--

(a) No sample collected at Station 67 on April 26; no sample available.

TELEDYNE ISOTOPES

TABLE E-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

EGGS - pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER	1st QUARTER 01/18/83	2nd QUARTER 04/26/83	3rd QUARTER 07/19/83	4th QUARTER 10/18/83
Be-7	42,51,67,76	L.T. 8. E-02 (0/4)	L.T. 6. E-02 (0/3)(a)	L.T. 7. E-02 (0/4)	L.T. 6. E-02 (0/4)
K-40	42,51,67,76	1.0 ± 0.2 E 00 (4/4)	1.1 ± 0.1 E 00 (3/3)	1.1 ± 0.1 E 00 (4/4)	1.2 ± 0.1 E 00 (4/4)
Mn-54	42,51,67,76	L.T. 8. E-03 (0/4)	L.T. 6. E-03 (0/3)	L.T. 8. E-03 (0/4)	L.T. 6. E-03 (0/4)
Co-58	42,51,67,76	L.T. 8. E-03 (0/4)	L.T. 6. E-03 (0/3)	L.T. 8. E-03 (0/4)	L.T. 6. E-03 (0/4)
Fe-59	42,51,67,76	L.T. 2. E-02 (0/4)	L.T. 1. E-02 (0/3)	L.T. 2. E-02 (0/4)	L.T. 1. E-02 (0/4)
Co-60	42,51,67,76	L.T. 9. E-03 (0/4)	L.T. 6. E-03 (0/3)	L.T. 7. E-03 (0/4)	L.T. 7. E-03 (0/4)
Zn-65	42,51,67,76	L.T. 2. E-02 (0/4)	L.T. 1. E-02 (0/3)	L.T. 2. E-02 (0/4)	L.T. 1. E-02 (0/4)
Zr-95	42,51,67,76	L.T. 9. E-03 (0/4)	L.T. 7. E-03 (0/3)	L.T. 8. E-03 (0/4)	L.T. 6. E-03 (0/4)
Ru-103	42,51,67,76	L.T. 1. E-02 (0/4)	L.T. 7. E-03 (0/3)	L.T. 9. E-03 (0/4)	L.T. 7. E-03 (0/4)
Ru-106	42,51,67,76	L.T. 8. E-02 (0/4)	L.T. 6. E-02 (0/3)	L.T. 7. E-02 (0/4)	L.T. 6. E-02 (0/4)
I-131	42,51,67,76	L.T. 2. E-02 (0/4)	L.T. 1. E-02 (0/3)	L.T. 2. E-02 (0/4)	L.T. 1. E-02 (0/4)
Cs-134	42,51,67,76	L.T. 1. E-02 (0/4)	L.T. 7. E-03 (0/3)	L.T. 9. E-03 (0/4)	L.T. 7. E-03 (0/4)
Cs-137	42,51,67,76	L.T. 1. E-02 (0/4)	L.T. 7. E-03 (0/3)	L.T. 9. E-03 (0/4)	L.T. 7. E-03 (0/4)
Ba-140	42,51,67,76	L.T. 1. E-02 (0/4)	L.T. 1. E-02 (0/3)	L.T. 1. E-02 (0/4)	L.T. 8. E-03 (0/4)
Ce-141	42,51,67,76	L.T. 2. E-02 (0/4)	L.T. 1. E-02 (0/3)	L.T. 2. E-02 (0/4)	L.T. 1. E-02 (0/4)
Ce-144	42,51,67,76	L.T. 7. E-02 (0/4)	L.T. 6. E-02 (0/3)	L.T. 6. E-02 (0/4)	L.T. 5. E-02 (0/4)
RA-226	42,51,67,76	L.T. 2. E-01 (0/4)	L.T. 2. E-01 (0/3)	L.T. 2. E-01 (0/4)	L.T. 1. E-01 (0/4)
Th-228	42,51,67,76	L.T. 2. E-02 (0/4)	L.T. 1. E-02 (0/3)	L.T. 1. E-02 (0/4)	L.T. 1. E-02 (0/4)

(a) No sample collected at Station 67 on April 26; no sample available.

F. FEED AND FORAGE - BEEF PRODUCERS (See Tables F-1 and F-2)

STATIONS 64, 67, 68, 71, 76

Feed and forage samples were collected monthly from beef producers at five stations and radioassayed for gamma emitters . During peak pasture season (June through September) a monthly composite was made of the weekly samples received and also measured for gamma activity. The cattle at station 65 were sold and the station discontinued. No sample was collected after May 1982. Beryllium-7, of cosmic origin, was detected in 32 of 73 samples and the terrestrial nuclide K-40 was detected in 76 of 76 samples at the levels encountered in the past.

There was one detection of Ra-226 and nine detections of Th-228 in the 76 samples analyzed. These are naturally occurring terrestrial nuclides.

Five detections of Cs-137 occurred at an average activity level of 0.0381 pCi/gm, wet which is below the normal level of detection. There were no detections of Ce-144. These are fission products which occurred in other areas of the United States and are probably residual fallout from previous nuclear weapons testing. There was no indication of a plant effect on feed and forage from the operations of CNS.

TELEDYNE ISOTOPES

TABLE F-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FEED AND FORAGE - BEEF PRODUCERS - pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER		1st QUARTER 01/04/83-03/01/83	2nd QUARTER 04/04/83-06/27/83	3rd QUARTER 07/05/83-09/27/83	4th QUARTER 10/04/83-12/05/83
Be-7	64,,67,68, 71,76	Mean±std.dev.	7.4 ± 5.2 E-01	4.0 ± 2.1 E 00	4.6 ± 2.0 E 00	4.5 ± 2.3 E-01
		det./total	2/18	7/18	19/19	4/18
		range	(0.37-1.1)E 00	(1.3-6.7)E 00	(1.1-8.0)E 00	(2.1-7.6)E-01
K-40	64,67,68, 71,76	Mean±std.dev.	10.2 ± 7.1 E 00	12.9 ± 9.2E 00	15.5 ±10.7 E 00	6.5 ± 4.3 E 00
		det./total	18/18	18/18	19/19	18/18
		range	(2.4-21.7)E 00	(3.1-31.1)E 00	(5.4-54.3)E 00	(2.2-18.4)E 00
I-131	64,67,68, 71,76	Mean±std.dev.	L.T. 3. E-01	L.T. 1. E 00	L.T. 1. E 01	L.T. 1. E-01
		det./total	0/18	0/18	0/19	0/18
		range	--	--	--	--
Cs-137	64,67,68, 71,76	Mean±std.dev.	4.2 ± 3.0 E-02	L.T. 1. E-01	L.T. 5. E-01	3.0 ± 1.2 E-02
		det./total	4/18	0/18	0/19	1/18
		range	(1.4-7.1)E-02	--	--	--
Ce-144	64,67,68, 71,76	Mean±std.dev.	L.T. 8. E-01	L.T. 8. E-01	L.T. 1. E 00	L.T. 3. E-01
		det./total	0/18	0/18	0/19	0/18
		range	--	--	--	--
Ra-226	64,67,68, 71,76	Mean±std.dev.	L.T. 2. E 00	L.T. 2. E 00	L.T. 4. E 00	1.8 ± 1.0 E-01
		det./total	0/18	0/18	0/19	1/18
		range	--	--	--	--
Th-228	64,67,68, 71,76	Mean±std.dev.	1.4 ± 1.2 E-01	L.T. 2. E-01	2.5 ± 1.0 E-01	3.8 +-3.4 E-02
		det./total	3/18	0/18	2/19	4/18
		range	(0.38-2.9)	--	(1.8-3.2)E-01	(1.1-8.6)E-02

TELEDYNE ISOTOPES

TABLE F-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FEED AND FORAGE - BEEF PRODUCERS - pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER	1st QUARTER 01/04/83-03/01/83	2nd QUARTER 04/04/83-06/27/83	3rd QUARTER 07/05/83-09/27/83	4th QUARTER 10/04/83-12/06/83
Be-7	64,67,68,71,76	7.4 ± 5.2 E-01 (2/18)	4.0 ± 2.1 E 00 (7/18)	4.6 ± 2.0 E 00 (19/19)	4.5 ± 2.3 E-01 (4/18)
K-40	64,67,68,71,76	10.2± 7.1 E 00 (18/18)	12.9± 9.2 E 00 (18/18)	15.5±10.7E 00 (19/19)	6.5 ± 4.3 E 00 (18/18)
Mn-54	64,67,68,71,76	L.T. 9. E-02 (0/18)	L.T. 9. E-02 (0/18)	L.T. 2. E-01 (0/19)	L.T. 4. E-02 (0/18)
Co-58	64,67,68,71,76	L.T. 1. E-01 (0/18)	L.T. 1. E-01 (0/18)	L.T. 2. E-01 (0/19)	L.T. 4. E-02 (0/18)
Fe-59	64,67,68,71,76	L.T. 2. E-01 (0/18)	L.T. [illegible] E-01 (0/18)	L.T. 5. E-01 (0/19)	L.T. 1. E-01 (0/18)
Co-60	64,67,68,71,76	L.T. 1. E-01 (0/18)	L.T. 9. E-02 (0/18)	L.T. 2. E-01 (0/19)	L.T. 4. E-02 (0/18)
Zn-65	64,67,68,71,76	L.T. 2. E-01 (0/18)	L.T. 2. E-01 (0/18)	L.T. 4. E-01 (0/19)	L.T. 1. E-01 (0/18)
Zr-95	64,67,68,71,76	L.T. 1. E-01 (0/18)	L.T. 1. E-01 (0/18)	L.T. 2. E-01 (0/19)	L.T. 5. E-02 (0/18)
Ru-103	64,67,68,71,76	L.T. 1. E-01 (0/18)	L.T. 1. E-01 (0/18)	L.T. 3. E-01 (0/19)	L.T. 5. E-02 (0/18)
Ru-106	64,67,68,71,76	L.T. 9. E-01 (0/18)	L.T. 8. E-01 (0/18)	L.T. 2. E 00 (0/19)	L.T. 4. E-01 (0/18)
I-131	64,67,68,71,76	L.T. 3. E-01 (0/18)	L.T. 1. E 00 (0/18)	L.T. 1. E 01 (0/19)	L.T. 1. E-01 (0/18)
Cs-134	64,67,68,71,76	L.T. 1. E-01 (0/18)	L.T. 1. E-01 (0/18)	L.T. 2. E-01 (0/19)	L.T. 5. E-02 (0/18)
Cs-137	64,67,68,71,76	4.2 ± 3.0 E-02 (4/18)	L.T. 1. E-01 (0/18)	L.T. 5. E-01 (0/19)	3.0 ± 1.2 E-02 (1/18)
Ba-140	64,67,68,71,76	L.T. 2. E-01 (0/18)	L.T. 4. E-01 (0/18)	L.T. 2. E 00 (0/19)	L.T. 7. E-02 (0/18)
Ce-141	64,67,68,71,76	L.T. 2. E-01 (0/18)	L.T. 3. E-01 (0/18)	L.T. 6. E-01 (0/19)	L.T. 1. E-01 (0/18)
Ce-144	64,67,68,71,76	L.T. 8. E-01 (0/18)	L.T. 8. E-01 (0/18)	L.T. 1. E 00 (0/19)	L.T. 3. E-01 (0/18)
RA-226	64,67,68,71,76	L.T. 2. E 00 (0/18)	L.T. 2. E 00 (0/18)	L.T. 4. E 00 (0/19)	1.8 ± 1.0 E-01 (1/18)
Th-228	64,67,68,71,76	1.4 +-1.2 E-01 (3/18)	L.T. 2. E-01 (0/18)	2.5 ± 1.0 E-01 (2/19)	3.8 ± 3.4 E-02 (4/18)

FOOD AND GARDEN CROPS (SEE TABLES G-1, G-2 and H-1, H-2)

G. STATIONS 53, 54 - APPLES

H. STATIONS 34, 56, 62 - TOMATOES AND GARDEN VEGETABLES

Garden crops and apples were radioassayed once during the year at harvest time for gross beta, Sr-89, Sr-90, elemental calcium and gamma emitters. There was no sample available from station 34; no crop was planted in 1983. Detectable concentrations of gross beta, elemental calcium and K-40 were monitored in each sample and are the naturally occurring terrestrial nuclides found in food and garden crops. The results monitored during 1983 duplicate measurements conducted during previous years.

No Sr-90 was detected in apples; however a small amount of Sr-90 was detected in garden vegetables at slightly above the normal level of detection. This is probably due to residual fallout from past atmospheric nuclear weapons testing.

There were no gamma emitters above the normal levels of detection except K-40 as cited above. It may be concluded that there was no detectable effect on food and garden crops from the operations of CNS.

TELEDYNE ISOTOPES

TABLE G-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FOOD AND GARDEN CROPS - pCi/gm, wet

APPLES

SAMPLE NUCLIDE	STATION NUMBER		3rd QUARTER 09/13/83
Gross Beta	53, 54	Mean±std.dev.	1.9 ± 1.4 E 00
		det./total	2/2
		range	(1.3-2.1) E 00
Sr-89	53, 54	Mean±std.dev.	L.T. 3. E-03
		det./total	0/2
		range	--
Sr-90	53, 54	Mean±std.dev.	L.T. 2. E-03
		det./total	0/2
		range	--
Ca (mg/gm,wet)	53, 54	Mean±std.dev.	3.0 ± 0.2 E-01
		det./total	2/2
		range	(2.8-3.1) E-01
K-40	53, 54	Mean±std.dev.	9.1 ± 7.4 E-01
		det./total	2/2
		range	(0.39-1.4)E 00

K-40 is the only gamma emitter above the limits of detection. See Table G-2 for the list of gamma emitters monitored.

TELEDYNE ISOTOPES

TABLE G-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FOOD AND GARDEN CROPS - pCi/gm, wet

APPLES

SAMPLE NUCLIDE	STATION NUMBER	3rd QUARTER 09/13/83
Be-7	53, 54	L.T. 1. E-01 (0/2)
K-40	53, 54	9.1 ± 7.4 E-01 (2/2)
Mn-54	53, 54	L.T. 1. E-02 (0/2)
Co-58	53, 54	L.T. 1. E-02 (0/2)
Fe-59	53, 54	L.T. 2. E-02 (0/2)
Co-60	53, 54	L.T. 1. E-02 (0/2)
Zn-65	53, 54	L.T. 3. E-02 (0/2)
Zr-95	53, 54	L.T. 1. E-02 (0/2)
Ru-103	53, 54	L.T. 1. E-02 (0/2)
Ru-106	53, 54	L.T. 1. E-01 (0/2)
I-131	53, 54	L.T. 2. E-02 (0/2)
Cs-134	53, 54	L.T. 1. E-02 (0/2)
Cs-137	53, 54	L.T. 1. E-02 (0/2)
Ba-140	53, 54	L.T. 2. E-02 (0/2)
Ce-141	53, 54	L.T. 2. E-02 (0/2)
Ce-144	53, 54	L.T. 9. E-02 (0/2)
RA-226	53, 54	L.T. 2. E-01 (0/2)
Th-228	53, 54	L.T. 2. E-02 (0/2)

TELEDYNE ISOTOPES

TABLE H-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FOOD AND GARDEN CROPS - pCi/gm, wet

GARDEN VEGETABLES - TOMATOES, STRING BEANS, BEETS, CABBAGE, CUCUMBER

SAMPLE NUCLIDE	STATION NUMBER		3rd QUARTER 08/09/83
Gross Beta	56, 62 (a)	Mean±std.dev. det./total range	4.7 ± 1.0 E 00 2/2 (4.0-5.4) E 00
Sr-89	56, 62	Mean±std.dev. det./total range	L.T. 8. E-03 0/2 --
Sr-90	56, 62	Mean±std.dev. det./total range	5.6 ± 1.0 E-03 2/2 (4.9-6.3) E-03
Ca (mg/gm,wet)	56, 62	Mean±std.dev. det./total range	2.1 ± 2.3 E 00 2/2 (.48-3.8) E 00
K-40	56, 62	Mean±std.dev. det./total range	3.8 ± 1.7 E 00 2/2 (2.6-5.0) E 00

(a) There was no sample from station 34; there was no crop in 1983.

TELEDYNE ISOTOPES

TABLE H-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FOOD AND GARDEN CROPS - pCi/gm, wet

GARDEN VEGETABLES - TOMATOES, STRING BEANS, BEETS, CABBAGE, CUCUMBER

SAMPLE NUCLIDE	STATION NUMBER	3rd QUARTER 08/09/83
Be-7	56, 62(a)	L.T. 2. E-01 (0/2)
K-40	56, 62	3.8 ± 1.7 E 00 (2/2)
Mn-54	56, 62	L.T. 2. E-02 (0/2)
Co-58	56, 62	L.T. 2. E-02 (0/2)
Fe-59	56, 62	L.T. 4. E-02 (0/2)
Co-60	56, 62	L.T. 2. E-02 (0/2)
Zn-65	56 , 62	L.T. 3. E-02 (0/2)
Zr-95	56, 62	L.T. 2. E-02 (0/2)
Ru-103	56, 62	L.T. 2. E-02 (0/2)
Ru-106	56, 62	L.T. 1. E-01 (0/2)
I-131	56, 62	L.T. 7. E-02 (0/2)
Cs-134	56, 62	L.T. 2. E-02 (0/2)
Cs-137	56, 62	L.T. 2. E-02 (0/2)
Ba-140	56, 62	L.T. 3. E-02 (0/2)
Ce-141	56, 62	L.T. 3. E-02 (0/2)
Ce-144	56, 62	L.T. 1. E-01 (0/2)
RA-226	56, 62	L.T. 3. E-01 (0/2)
Th-228	56, 62	L.T. 3. E-02 (0/2)

(a) There was no sample from station 34; there was no crop in 1983.

FEED AND FORAGE (See Tables I-1, I-2 and J-1, J-2)

I. STATIONS 61, 74 (Nearest Milk Producers)

J. STATIONS 42, 73, 75 (Commercial Milk Producers)

Feed and forage was collected from milk producers, nearest the plant, quarterly from two stations and monthly during peak pasture season. Feed and forage from commercial milk producers was collected quarterly from three stations. These samples were monitored for Sr-89, Sr-90, elemental calcium and gamma emitting nuclides.

There were no detections of Sr-89 and elemental calcium remained at levels seen in previous years. There were 10 detections of Sr-90 in 14 samples collected from the nearest producers at a level of 0.0173 pCi/gm, wet. There were nine detections of Sr-90 in samples collected from commercial producers at a level of 0.0270 pCi/gm, wet. Cs-137 was detected in one sample collected from the nearest producers and one from the commercial producers both slightly below the normal level of detection. Both of these nuclides are fission products and are probably the result of fallout from previous nuclear atmospheric testing. Both nuclides are at a lower level than that of the year 1982.

The naturally occurring nuclide Be-7 was seen in 18 of 31 samples at a level of 1.34 pCi/gm, wet. Potassium-40 was detected in 31 of 31 samples at a level of 7.91 pCi/gm wet, the same as in previous years. There was one detection of thorium-228 which is a terrestrial nuclide.

There was no essential difference in the number or level of detection of the naturally occurring nuclides or of the fission fallout products between the feed and forage from the nearest producers or from the commercial producers. Thus it has been established that no nuclides which were related to CNS could be ingested by cows from feed and forage and there was no dose impact to the population.

TELEDYNE ISOTOPES

TABLE I-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FEED AND FORAGE - NEAREST MILK PRODUCERS

pCi/gm wet

SAMPLE NUCLIDE	STATION NUMBER		1st QUARTER 01/04/83	2nd QUARTER 04/04/83-06/06/83	3rd QUARTER 07/05/83-09/20/83	4th QUARTER 10/04/83
Sr-89	61, 74	Mean±std.dev. det./total range	L.T. 1. E-02 0/2 --	L.T. 1. E-02 0/2(a) --	L.T. 4. E-02 0/7 --	L.T. 2. E-02 0/3 --
Sr-90	61, 74	Mean±std.dev. det./total range	2.5 ± 1.1 E-02 1/2 --	3.9 ± 2.2 E-03 1/2 --	3.4 ± 2.4 E-02 7/7 (1.2-7.6)E-02	6.2 ± 3.4 E-03 1/3 --
Ca (elem.) mg/gm	61, 74	Mean±std.dev. det./total range	4.3 ± 4.4 E 00 2/2 (1.2-7.4)E 00	1.2 ± 0.4 E 00 2/2 (0.87-1.5)E 00	4.7 ± 5.6 E 00 7/7 (0.2-16.0)E 00	1.8 ± 0.8 E 00 3/3 (0.9-2.3)E 00
Be-7	61, 74	Mean±std.dev. det./total range	L.T. 1. E-01 0/2 --	1.4 +-0.3 E 00 2/5 (1.2-1.7) E 00	2.7 ± 1.0 E 00 7/7 (1.1-4.3)E 00	5.3.± 0.7 E-01 2/3 (4.8-5.8) E-01
K-40	61, 74	Mean±std.dev. det./total range	5.7 ± 2.8 E 00 2/2 (3.7-7.7)E 00	8.0 ± 4.6 E 00 5/5 (1.2-12.2)E 00	1.6 ± 0.6 E 01 7/7 (6.43-21.6) E 00	5.4 ± 0.6 E 00 3/3 (5.1-6.1)E 00
Cs-137	61, 74	Mean±std.dev. det./total range	L.T. 1. E-02 0/2 --	L.T. 8. E-02 0/5 --	3.6 ± 2.1 E-02 1/7 --	L.T. 2. E-02 0/3 --
TH-228	61, 74	Mean±std.dev. det./total range	9.8 ± 1.1 E-02 1/2 --	L.T. 1. E-01 0/5 --	L.T. 1. E-01 0/7 --	L.T. 3. E-02 0/3 --

(a) Three samples from stations 61 and 74, collected on 04/04, were incorrectly marked as Feed and Forage -- Beef Producers (FB) and were not analyzed for Sr-89, Sr-90 nor elemental calcium.

TELEDYNE ISOTOPES

TABLE I-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FEED AND FORAGE - NEAREST MILK PRODUCERS

pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER	1st QUARTER 01/04/83	2nd QUARTER 04/04/83-06/06/83	3rd QUARTER 07/05/83-09/20/83	4th QUARTER 10/04/83
Be-7	61, 74	L.T. 1. E-01 (0/2)	1.4 ± 0.3 E 00 (2/5)	2.7 ± 1.0 E 00 (7/7)	5.3 +-0.7 E-01 (2/3)
K-40	71, 74	5.7 ± 2.8 E 00 (2/2)	8.0 ± 4.6 E 00 (5/5)	1.6 ± 0.6 E 01 (7/7)	5.4 ± 0.6 E 00 (3/3)
Mn-54	61, 74	L.T. 1. E-02 (0/2)	L.T. 7. E-02 (0/5)	L.T. 6. E-02 (0/7)	L.T. 2. E-02 (0/3)
Co-58	61, 74	L.T. 1. E-02 (0/2)	L.T. 7. E-02 (0/5)	L.T. 6. E-02 (0/7)	L.T. 2. E-02 (0/3)
Fe-59	61, 74	L.T. 3. E-02 (0/2)	L.T. 2. E-01 (0/5)	L.T. 2. E-01 (0/7)	L.T. 3. E-02 (0/3)
Co-60	61, 74	L.T. 1. E-02 (0/2)	L.T. 7. E-02 (0/5)	L.T. 6. E-02 (0/7)	L.T. 2. E-02 (0/3)
Zn-65	61, 74	L.T. 3. E-02 (0/2)	L.T. 2. E-01 (0/5)	L.T. 1. E-01 (0/7)	L.T. 3. E-02 (0/3)
Zr-95	61, 74	L.T. 1. E-02 (0/2)	L.T. 8. E-02 (0/5)	L.T. 7. E-02 (0/7)	L.T. 2. E-02 (0/3)
Ru-103	61, 74	L.T. 1. E-02 (0/2)	L.T. 8. E-02 (0/5)	L.T. 7. E-02 (0/7)	L.T. 2. E-02 (0/3)
Ru-106	61, 74	L.T. 9. E-02 (0/2)	L.T. 6. E-01 (0/5)	L.T. 6. E-01 (0/7)	L.T. 1. E-01 (0/3)
I-131	61, 74	L.T. 3. E-02 (0/2)	L.T. 2. E-01 (0/5)	L.T. 2. E-01 (0/7)	L.T. 4. E-02 (0/3)
Cs-134	61, 74	L.T. 1. E-02 (0/2)	L.T. 8. E-02 (0/5)	L.T. 7. E-02 (0/7)	L.T. 2. E-02 (0/3)
Cs-137	61, 74	L.T. 1. E-02 (0/2)	L.T. 8. E-02 (0/5)	3.6 ± 2.1 E-02 (1/7)	L.T. 2. E-02 (0/3)
Ba-140	61, 74	L.T. 2. E-02 (0/2)	L.T. 1. E-01 (0/5)	L.T. 1. E-01 (0/7)	L.T. 2. E-02 (0/3)
Ce-141	61, 74	L.T. 2. E-02 (0/2)	L.T. 2. E-01 (0/5)	L.T. 1. E-01 (0/7)	L.T. 3. E-02 (0/3)
Ce-144	61, 74	L.T. 8. E-02 (0/2)	L.T. 6. E-01 (0/5)	L.T. 5. E-01 (0/7)	L.T. 1. E-01 (0/3)
RA-226	61, 74	L.T. 2. E-01 (0/2)	L.T. 2. E 00 (0/5)	L.T. 1. E 00 (0/7)	L.T. 3. E-01 (0/3)
Th-228	61, 74	9.8 ± 1.1 E-02 (1/2)	L.T. 1. E-01 (0/5)	L.T. 1. E-01 (0/7)	L.T. 3. E-02 (0/3)

TELEDYNE ISOTOPES

TABLE J-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FEED AND FORAGE - COMMERCIAL MILK PRODUCERS

pCi/gm wet

SAMPLE NUCLIDE	STATION NUMBER		1st QUARTER 01/11, 12/83	2nd QUARTER 04/12/83	3rd QUARTER 07/11/83	4th QUARTER 10/11/83
Sr-89	42, 73, 75	Mean±std.dev.	L.T. 9. E-03	L.T. 7. E-02	L.T. 3. E-02	L.T. 2. E-02
		det./total	0/3	0/4	0/3	0/4
		range	--	--	--	--
Sr-90	42, 73, 75	Mean±std.dev.	7.1 ± 3.5 E-03	3.4 ± 2.7 E-02	4.2 ± 3.5 E-02	2.5 ± 0.5 E-02
		det./total	2/3	4/4	2/3	1/4
		range	(4.6-9.5)E-03	(0.38-6.4) E-02	(1.7-6.7)E-02	--
Ca (elem.) mg/gm	42, 73, 75	Mean±std.dev.	6.0 ± 5.1 E-01	2.9 ± 2.3 E 00	2.1 ± 1.6 E 00	3.2 ± 3.1 E 00
		det./total	3/3	4/4	3/3	4/4
		range	(0.2-9.5)E-01	(0.51-4.6) E 00	(0.26-3.3)E 00	(0.74-7.3)E 00
Be-7	42, 73, 75	Mean±std.dev.	L.T. 1. E-01	L.T. 9. E-01	4.5 ± 3.9 E 00	L.T. 8. E-02
		det./total	0/3	0/4	3/3	0/4
		range	--	--	(0.12-7.4)E 00	--
K-40	42, 73, 75	Mean±std.dev.	3.0 ± 0.8 E 00	9.7 ± 7.9 E 00	4.5 ± 3.9 E 00	4.4 ± 1.2 E 00
		det./total	3/3	4/4	3/3	4/4
		range	(2.5-3.8)E 00	(2.1-20.7)E 00	(0.1-7.4)E 00	(2.8-5.4)E 00
Cs-137	42, 73, 75	Mean±std.dev.	L.T. 1. E-02	L.T. 9. E-02	L.T. 6. E-02	1.2 ± 0.5 E-02
		det./total	0/3	0/4	0/3	1/4
		range	--	--	--	--

TELEDYNE ISOTOPES

TABLE J-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FEED AND FORAGE - COMMERCIAL MILK PRODUCERS

pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER	1st QUARTER 01/11, 12/83	2nd QUARTER 04/12/83	3rd QUARTER 07/11/83	4th QUARTER 10/11/83
Be-7	42, 73, 75	L.T. 1. E-01 (0/3)	L.T. 9. E-01 (0/4)	1.4 ± 0.2 E 00 (3/3)	L.T. 8. E-02 (0/4)
K-40	42, 73, 75	3.0 ± 0.8 E 00 (3/3)	9.7 ± 7.9 E 00 (4/4)	4.5 ± 3.9 E 00 (3/3)	4.4 ± 1.2 E 00 (4/4)
Mn-54	42, 73, 75	L.T. 1. E-02 (0/3)	L.T. 8. E-02 (0/4)	L.T. 6. E-02 (0/3)	L.T. 9. E-03 (0/4)
Co-58	42, 73, 75	L.T. 1. E-02 (0/3)	L.T. 9. E-02 (0/4)	L.T. 6. E-02 (0/3)	L.T. 8. E-03 (0/4)
Fe-59	42, 73, 75	L.T. 3. E-02 (0/3)	L.T. 2. E-01 (0/4)	L.T. 1. E-01 (0/3)	L.T. 2. E-02 (0/4)
Co-60	42, 73, 75	L.T. 1. E-02 (0/3)	L.T. 7. E-02 (0/4)	L.T. 6. E-02 (0/3)	L.T. 9. E-03 (0/4)
Zn-65	42, 73, 75	L.T. 3. E-02 (0/3)	L.T. 2. E-01 (0/4)	L.T. 1. E-01 (0/3)	L.T. 2. E-02 (0/4)
Zr-95	42, 73, 75	L.T. 1. E-02 (0/3)	L.T. 1. E-01 (0/4)	L.T. 6. E-02 (0/3)	L.T. 9. E-03 (0/4)
Ru-103	42, 73, 75	L.T. 1. E-02 (0/3)	L.T. 1. E-01 (0/4)	L.T. 6. E-02 (0/3)	L.T. 9. E-03 (0/4)
Ru-106	42, 73, 75	L.T. 1. E-01 (0/3)	L.T. 7. E-01 (0/4)	L.T. 5. E-01 (0/3)	L.T. 8. E-02 (0/4)
I-131	42, 73, 75	L.T. 7. E-02 (0/3)	L.T. 8. E-01 (0/4)	L.T. 1. E-01 (0/3)	L.T. 1. E-02 (0/4)
Cs-134	42, 73, 75	L.T. 1. E-02 (0/3)	L.T. 8. E-02 (0/4)	L.T. 6. E-02 (0/3)	L.T. 9. E-03 (0/4)
Cs-137	42, 73, 75	L.T. 1. E-02 (0/3)	L.T. 9. E-02 (0/4)	L.T. 6. E-02 (0/3)	1.2 ± 0.5 E-02 (1/4)
Ba-140	42, 73, 75	L.T. 3. E-02 (0/3)	L.T. 3. E-01 (0/4)	L.T. 1. E-01 (0/3)	L.T. 1. E-02 (0/4)
Ce-141	42, 73, 75	L.T. 3. E-02 (0/3)	L.T. 2. E-01 (0/4)	L.T. 1. E-01 (0/3)	L.T. 2. E-02 (0/4)
Ce-144	42, 73, 75	L.T. 1. E-01 (0/3)	L.T. 6. E-01 (0/4)	L.T. 5. E-01 (0/3)	L.T. 7. E-02 (0/4)
RA-226	42, 73, 75	L.T. 2. E-01 (0/3)	L.T. 1. E 00 (0/4)	L.T. 1. E 00 (0/3)	L.T. 2. E-01 (0/4)
Th-228	42, 73, 75	L.T. 2. E-02 (0/3)	L.T. 2. E-91 (0/4)	L.T. 1. E-01 (0/3)	L.T. 1. E-02 (0/4)

TELEDYNE ISOTOPES

K. FOOD AND FEED CROPS - CORN AND SOY BEANS

(See Tables K-1 and K-2)

STATIONS 15, 18, 20, 27, 28, 38, and 41

Food and feed crops were collected once during the year at harvest time and monitored for gross beta, Sr-89, Sr-90, elemental calcium and gamma emitters. Measurements on all of these analyses were similar in activity level and range to those measured in the previous years of 1973 - 1982.

Gross beta activity measured an average of 4.7 ± 1.2 pCi per gram, wet. This was largely due to K-40, the naturally occurring, terrestrial nuclide. Strontium-90 was detected in 4 of 8 samples at an average of 0.0182 pCi/gm, wet, which is below the normal level of detection. The elemental calcium level was somewhat higher than that of other years at 3.4 mg per gram.

From this monitoring data it may be concluded that there was no effect on food and feed crops from the operations of CNS.

TELEDYNE ISOTOPES

TABLE K-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FOOD AND FEED CROPS - pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER		3rd QUARTER 09/20/83
Gross Beta	15,18,20,27, 29,38,41	Mean±std.dev. det./total range	4.7 ± 1.2 E 00 8/8 (3.6-7.4)E 00
Sr-89	15,18,20,27, 29,38,41	Mean±std.dev. det./total range	L.T. 2. E-02 0/8 --
Sr-90	15,18,20,27, 29,38,41	Mean±std.dev. det./total range	1.8 ± 0.8 E-02 4/8 (0.69-2.4)E-02
Ca (mg/gm,wet)	15,18,20,27, 29,38,41	Mean±std.dev. det./total range	3.4 ± 3.8 E 00 8/8 (.076-12.0)E 00
K-40	15,18,20,27, 29,38,41	Mean±std.dev. det./total range	5.5 ± 3.4 E 00 8/8 (2.7-11.7)E 00
Be-7	15,18,20,27, 29,38,41	Mean±std.dev. det./total range	4.5 ± 1.4 E-01 4/8 (2.8-5.9)E-01
I-131	15,18,20,27, 29,38,41	Mean±std.dev. det./total range	L.T. 2. E-02 0/8 --
Cs-137	15,18,20,27, 29,38,41	Mean±std.dev. det./total range	L.T. 2. E-02 0/8 --

TELEDYNE ISOTOPES

TABLE K-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FOOD AND FEED CROPS - pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER	3rd QUARTER 09/20/83
Be-7	15,18,20,27,29,38,41	4.5 ± 1.4 E-01 (4/8)
K-40	15,18,20,27,29,38,41	5.5 ± 3.4 E 00 (8/8)
Mn-54	15,18,20,27,29,38,41	L.T. 2. E-02 (0/8)
Co-58	15,18,20,27,29,38,41	L.T. 2. E-02 (0/8)
Fe-59	15,18,20,27,29,38,41	L.T. 3. E-02 (0/8)
Co-60	15,18,20,27,29,38,41	L.T. 2. E-02 (0/8)
Zn-65	15,18,20,27,29,38,41	L.T. 4. E-02 (0/8)
Zr-95	15,18,20,27,29,38,41	L.T. 2. E-02 (0/8)
Ru-103	15,18,20,27,29,38,41	L.T. 2. E-02 (0/8)
Ru-106	15,18,20,27,29,38,41	L.T. 1. E-01 (0/8)
I-131	15,18,20,27,29,38,41	L.T. 2. E-02 (0/8)
Cs-134	15,18,20,27,29,38,41	L.T. 2. E-02 (0/8)
Cs-137	15,18,20,27,29,38,41	L.T. 2. E-02 (0/8)
Ba-140	15,18,20,27,29,38,41	L.T. 2. E-02 (0/8)
Ce-141	15,18,20,27,29,38,41	L.T. 3. E-02 (0/8)
Ce-144	15,18,20,27,29,38,41	L.T. 1. E-01 (0/8)
RA-226	15,18,20,27,29,38,41	L.T. 3. E-01 (0/8)
Th-228	15,18,20,27,29,38,41	L.T. 3. E-02 (0/8)

TELEDYNE ISOTOPES

L. FISH (See Tables L-1, L-2)

STATIONS 28, 35

Fish samples were collected during the spring and fall and analyzed for gross beta, Sr-89, Sr-90 and gamma emitting isotopes. The gross beta and Sr-90 activities were similar to the levels of previous years. Strontium-90 was detected in nine of ten samples at a level of 0.018 pCi per gram wet, which is below the normal level of detection. There were no detections of Sr-89. All of the gamma emitters were at or below the normal level of detection except K-40, a naturally occurring isotope, which was at a level of 2.83 pCi per gram, wet, approximately the same level as in previous years.

There was no significant difference between the fish caught at station 28 downstream from the discharge point and that caught at station 35 upstream from the discharge point. Since no change has occurred in levels of activity in the isotopes monitored since 1975 it can be concluded that the operations of CNS have had no effect on fish samples.

TELEDYNE ISOTOPES

TABLE L-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FISH - pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER		1st QUARTER	2nd QUARTER 06/06/83	3rd QUARTER	4th QUARTER 10/11/83
Gross beta	28, 35	Mean±std.dev. det./total range		5.3 ± 1.0 E 00 5/5 (4.5-6.8)E 00		4.2.± 0.9 E 00 5/5 (3.4-5.5)E 00
Sr-89	28, 35	Mean±std.dev. det./total range		L.T. 3. E-02 0/5 --		L.T. 2. E-02 0/5 --
Sr-90	28, 35	Mean±std.dev. det./total range		1.9 ± 1.0 E-02 5/5 (0.75-2.8)E-03		1.6.± 0.7 E-02 4/5 (0.61-2.0)E-02
K-40	28, 35	Mean±std.dev. det./total range		2.7 ± 0.2 E 00 5/5 (2.4-3.0)E 00		2.9 ± 0.6 E 00 5/5 (2.3-3.9)E 00
I-131	28, 35	Mean±std.dev. det./total range		L.T. 4. E-02 0/5 --		L.T. 2. E-02 0/5 --
Cs-137	28, 35	Mean±std.dev. det./total range		L.T. 1. E-02 0/5 --		L.T. 1. E-02 0/5 --

TELEDYNE ISOTOPES

TABLE L-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FISH - pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER	1st QUARTER	2nd QUARTER 06/06/83	3rd QUARTER	4th QUARTER 10/11/83
Be-7	28, 35		L.T. 1. E-01 (0/5)		L.T. 9. E-02 (0/5)
K-40	28, 35		2.7 ± 0.2 E 00 (5/5)		2.9 ± 0.6 E 00 (5/5)
Mn-54	28, 35		L.T. 1. E-02 (0/5)		L.T. 9. E-03 (0/5)
Co-58	28, 35		L.T. 1. E-02 (0/5)		L.T. 1. E-02 (0/5)
Fe-59	28, 35		L.T. 2. E-02 (0/5)		L.T. 2. E-02 (0/5)
Co-60	28, 35		L.T. 1. E-02 (0/5)		L.T. 1. E-02 (0/5)
Zn-65	28, 35		L.T. 2. E-02 (0/5)		L.T. 2. E-02 (0/5)
Zr-95	28, 35		L.T. 1. E-02 (0/5)		L.T. 1. E-02 (0/5)
Ru-103	28, 35		L.T. 1. E-02 (0/5)		L.T. 1. E-02 (0/5)
Ru-106	28, 35		L.T. 9. E-02 (0/5)		L.T. 8. E-02 (0/5)
I-131	28, 35		L.T. 4. E-02 (0/5)		L.T. 2. E-02 (0/5)
Cs-134	28, 35		L.T. 1. E-02 (0/5)		L.T. 1. E-02 (0/5)
Cs-137	28, 35		L.T. 1. E-02 (0/5)		L.T. 1. E-02 (0/5)
Ba-140	28, 35		L.T. 2. E-02 (0/5)		L.T. 1. E-02 (0/5)
Ce-141	28, 35		L.T. 2. E-02 (0/5)		L.T. 2. E-02 (0/5)
Ce-144	28, 35		L.T. 8. E-02 (0/5)		L.T. 7. E-02 (0/5)
RA-226	28, 35		L.T. 2. E-01 (0/5)		L.T. 2. E-01 (0/5)
Th-228	28, 35		L.T. 2. E-02 (0/5)		L.T. 2. E-02 (0/5)

MILK (See Tables M-1, M-2 and N-1, N-2)

M. STATIONS 42, 73, 75 (COMMERCIAL PRODUCERS)

N. STATIONS 61, 74 (NEAREST PRODUCERS)

Milk samples from commercial producers were collected quarterly from 3 stations and monitored for I-131, Sr-89, Sr-90, elemental calcium and gamma emitters. Milk samples from nearest producers were collected from two stations monthly and monitored for I-131, Sr-89, Sr-90, elemental calcium and gamma emitters. During peak pasture season weekly samples were collected and monitored for I-131 for the nearest producers. The weekly samples were composited monthly and monitored for Sr-89, Sr-90 elemental calcium and gamma emitters.

There were no detections of I-131 in milk from either the twelve samples from the commercial producers or the 60 samples from the nearest producers. No Sr-89 was detected in any of the milk samples. Strontium-90 was detected in the 12 samples of commercial producers at an average level of 2.5 pCi/liter. There were detections of Sr-90 in 27 of the 27 samples collected from the nearest producers at an average level of 1.6 pCi/liter. The elemental calcium levels remained stable as compared with other years. Naturally occurring K-40 remained at the same levels as previous years. There were no other detections of gamma emitting nuclides except for one detection of Cs-137 during the second quarter at station 42, a commercial producer. This was at a level of 13.5 pCi per liter, which is above the normal level of detection. This was probably the result of fallout from previous atmospheric nuclear tests and was observed in other areas of the United States.

There is no statistical difference between the samples collected from nearest producers as compared with commercial producers' samples. Thus we conclude that the operations of CNS had no effect on milk from commercial and thus no dose impact on the population.

TELEDYNE ISOTOPES

TABLE M-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

MILK - pCi/liter

COMMERCIAL PRODUCERS

SAMPLE NUCLIDE	STATION NUMBER		1st QUARTER 01/18/83	2nd QUARTER 04/19/83	3rd QUARTER 07/18/83	4th QUARTER 10/18/83
Sr-89	42,73,75	Mean±std.dev. det./total range	L.T. 2. E 00 0/3 --	L.T. 2. E 00 0/3 --	L.T. 2. E 00 0/3 --	L.T. 2. E 00 0/3 --
Sr-90	42,73,75	Mean±std.dev. det./total range	3.1 ± 0.5 E 00 3/3 (2.7-3.6)E 00	2.8 ± 0.9 E 00 3/3 (2.1-3.8)E 00	2.0 ± 0.4 E 00 3/3 (1.6-2.4)E 00	2.3.± 1.6 E 00 3/3 (0.68-3.9)E 00
I-131 (by chemical separation)	42,73,75	Mean±std.dev. det./total range	L.T. 3. E-01 0/3 --	L.T. 3. E-01 0/3 --	L.T. 4. E-01 0/3 --	L.T. 4. E-01 0/3 --
Ca(mg/liter)	42,73,75	Mean±std.dev. det./total range	1.7 ± 0.1 E 00 3/3 (1.6-1.8))E 00	1.1 ± 0.0 E 00 3/3 (1.1-1.1)E 00	7.1 ± 1.1 E-01 3/3 (5.9-7.8)E-01	1.2 ± 0.1 E 00 3/3 (1.1-1.3)E 00
K-40	42,73,75	Mean±std.dev. det./total range	1.1 ± 0.1 E 03 3/3 (1.0-1.3)E 03	1.1 ± 0.4 E 03 3/3 (0.69-1.4)E 03	1.2 ± 0.1 E 03 3/3 (1.1-1.3)E 03	1.3 ± 0.1 E 03 3/3 (1.2-1.3)E 03
Cs-137	42,73,75	Mean±std.dev. det./total range	L.T. 7. E 00 0/3 --	1.4 ± 0.3 E 01 1/3 --	L.T. 8. E 00 0/3 --	L.T. 7. E 00 0/3 --

TELEDYNE ISOTOPES

TABLE M-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

MILK - pCi/liter

COMMERCIAL PRODUCERS

SAMPLE NUCLIDE	STATION NUMBER	1st QUARTER 01/18/83	2nd QUARTER 04/19/83	3rd QUARTER 07/18/83	4th QUARTER 10/18/83
Be-7	42,73,75	L.T. 5. E 01 (0/3)	L.T. 6. E 01 (0/3)	L.T. 7. E 01 (0/3)	L.T. 6. E 01 (0/3)
K-40	42,73,75	1.1 ± 0.1 E 03 (3/3)	1.1 ± 0.4 E 03 (3/3)	1.2 ± 0.1 E 03 (3/3)	1.3 ± 0.1 E 03 (3/3)
Mn-54	42,73,75	L.T. 6. E 00 (0/3)	L.T. 6. E 00 (0/3)	L.T. 7. E 00 (0/3)	L.T. 6. E 00 (0/3)
Co-58	42,73,75	L.T. 6. E 00 (0/3)	L.T. 6. E 00 (0/3)	L.T. 7. E 00 (0/3)	L.T. 6. E 00 (0/3)
Fe-59	42,73,75	L.T. 2. E 01 (0/3)	L.T. 2. E 01 (0/3)	L.T. 2. E 01 (0/3)	L.T. 1. E 01 (0/3)
Co-60	42,73,75	L.T. 7. E 00 (0/3)	L.T. 6. E 00 (0/3)	L.T. 8. E 00 (0/3)	L.T. 6. E 00 (0/3)
Zn-65	42,73,75	L.T. 1. E 01 (0/3)	L.T. 1. E 01 (0/3)	L.T. 2. E 01 (0/3)	L.T. 1. E 01 (0/3)
Zr-95	42,73,75	L.T. 7. E 00 (0/3)	L.T. 7. E 00 (0/3)	L.T. 8. E 00 (0/3)	L.T. 6. E 00 (0/3)
Ru-103	42,73,75	L.T. 7. E 00 (0/3)	L.T. 7. E 00 (0/3)	L.T. 8. E 00 (0/3)	L.T. 7. E 00 (0/3)
Ru-106	42,73,75	L.T. 6. E 01 (0/3)	L.T. 5. E 01 (0/3)	L.T. 7. E 01 (0/3)	L.T. 5. E 01 (0/3)
I-131	42,73,75	L.T. 1. E 01 (0/3)	L.T. 2. E 01 (0/3)	L.T. 2. E 01 (0/3)	L.T. 2. E 01 (0/3)
Cs-134	42,73,75	L.T. 7. E 00 (0/3)	L.T. 7. E 00 (0/3)	L.T. 8. E 00 (0/3)	L.T. 6. E 00 (0/3)
Cs-137	42,73,75	L.T. 7. E 00 (0/3)	1.4 ± 0.3 E 01 (1/3)	L.T. 8. E 00 (0/3)	L.T. 7. E 00 (0/3)
Ba-140	42,73,75	L.T. 2. E 01 (0/3)	L.T. 1. E 01 (0/3)	L.T. 1. E 01 (0/3)	L.T. 7. E 00 (0/3)
Ce-141	42,73 75	L.T. 1. E 01 (0/3)	L.T. 1. E 01 (0/3)	L.T. 1. E 01 (0/3)	L.T. 1. E 01 (0/3)
Ce-144	42,73,75	L.T. 6. E 01 (0/3)	L.T. 5. E 01 (0/3)	L.T. 5. E 01 (0/3)	L.T. 4. E 01 (0/3)
RA-226	42,73,75	L.T. 2. E 02 (0/3)	L.T. 1. E 02 (0/3)	L.T. 2. E 02 (0/3)	L.T. 1. E 02 (0/3)
Th-228	42,73,75	L.T. 1. E 01 (0/3)	L.T. 1. E 01 (0/3)	L.T. 1. E 01 (0/3)	L.T. 1. E 01 (0/3)

TELEDYNE ISOTOPES

TABLE N-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

MILK - pCi/liter

NEAREST PRODUCERS

SAMPLE NUCLIDE	STATION NUMBER		1st QUARTER 01/11/83-03/15/83	2nd QUARTER 04/09/83-06/28/83	3rd QUARTER 07/05/83-09/27/83	4th QUARTER 10/11/83-12/20/83
Sr-89	61, 74	Mean±std.dev. det./total range	L.T. 2. E 00 0/7 --	L.T. 2. E 00 0/7 --	L.T. 2. E 00 0/6 --	L.T. 2. E 00 0/7 --
Sr-90	61, 74	Mean±std.dev. det./total range	1.3 ± 0.3 E 00 7/7 (0.95-1.7)E 00	1.5 ± 0.9 E 00 7/7 (1.0-3.6)E 00	1.4 ± 0.8 E 00 6/6 (0.53-2.4)E 00	2.0 ± 1.8 E 00 7/7 (0.56-5.9) E 00
I-131 by chemical separation	61, 74	Mean±std.dev. det./total range	L.T. 3. E-01 0/7 --	L.T. 4. E-01 0/25 --	L.T. 5. E-01 0/31 --	L.T. 3. E-01 0/7 --
Ca(mg/liter)	61, 74	Mean±std.dev. det./total range	1.6 ± 0.2 E 00 7/7 (1.4-1.9)E 00	1.3 ± 0.2 E 00 6/6 (a) (1.1-1.6)E 00	1.3 ± 0.2 E 00 6/6 (1.1-1.5)E 00	1.2 ± 0.1 E 00 7/7 (1.1-1.4)E 00
K-40	61, 74	Mean±std.dev. det./total range	1.2 ± 0.1 E 03 7/7 (1.1-1.4)E 03	1.2 ± 0.2 E 03 7/7 (0.76-1.4)E 03	1.3 ± 0.1 E 03 6/6 (1.2-1.4)E 03	1.3 ± 0.2 E 03 8/8 (b) (1.1-1.7)E 03
Cs-137	61, 74	Mean±std.dev. det./total range	L.T. 7. E 00 0/7 --	L.T. 9. E 00 0/7 --	L.T. 7. E 00 0/6 --	L.T. 2. E 01 0/8 (b) --

(a) Sample for Station 74 for 04/09; Ca lost in analysis. Not enough sample to repeat analysis.

(b) Sample collected 12/13 from Station 74 was lost in the analysis for I-131 and the Sr-89, 90 and Ca could not be done. It was replaced with a sample collected 12/20. The gamma scan was completed on both samples giving a total of 8 samples for the fourth quarter.

TELEDYNE ISOTOPES

TABLE N-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

MILK - pCi/liter

NEAREST PRODUCERS

SAMPLE NUCLIDE	STATION NUMBER	1st QUARTER 01/11/83-03/15/83	2nd QUARTER 04/09/83-06/28/83	3rd QUARTER 07/05/83-09/27/83	4th QUARTER 10/11/83-12/20/83
Be-7	61, 74	L.T. 5. E 01 (0/7)	L.T. 1. E 02 (0/7)	L.T. 1. E 02 (0/6)	L.T. 7. E 01 (0/8)
K-40	61, 74	1.2 ± 0.1 E 03 (7/7)	1.2 ± 0.2 E 03 (7/7)	1.3 ± 0.1 E 03 (6/6)	1.3.± 0.2 E 03 (8/8)
Mn-54	61, 74	L.T. 6. E 00 (0/7)	L.T. 9. E 00 (0/7)	L.T. 6. E 00 (0/6)	L.T. 7. E 00 (0/8)
Co-58	61, 74	L.T. 6. E 00 (0/7)	L.T. 1. E 01 (0/7)	L.T. 1. E 01 (0/6)	L.T. 8. E 00 (0/8)
Fe-59	61, 74	L.T. 1. E 01 (0/7)	L.T. 3. E 01 (0/7)	L.T. 4. E 01 (0/6)	L.T. 2. E 01 (0/8)
Co-60	61, 74	L.T. 7. E 00 (0/7)	L.T. 9. E 00 (0/7)	L.T. 6. E 00 (0/6)	L.T. 9. E 00 (0/8)
Zn-65	61, 74	L.T. 1. E 01 (0/7)	L.T. 2. E 01 (0/7)	L.T. 2. E 01 (0/6)	L.T. 2. E 01 (0/8)
Zr-95	61, 74	L.T. 6. E 00 (0/7)	L.T. 1. E 01 (0/7)	L.T. 1. E 01 (0/6)	L.T. 9. E 00 (0/8)
Ru-103	61, 74	L.T. 6. E 00 (0/7)	L.T. 2. E 01 (0/7)	L.T. 2. E 01 (0/6)	L.T. 9. E 00 (0/8)
Ru-106	61, 74	L.T. 6. E 01 (0/7)	L.T. 8 E 01 (0/7)	L.T. 5. E 01 (0/6)	L.T. 7. E 01 (0/8)
I-131	61, 74	L.T. 1. E 01 (0/7)	L.T. 2. E 02 (0/7)	L.T. 5. E 04 (0/6)(C)	L.T. 3. E 01 (0/8)
Cs-134	61, 74	L.T. 7. E 00 (0/7)	L.T. 9. E 00 (0/7)	L.T. 7. E 00 (0/6)	L.T. 8. E 00 (0/8)
Cs-137	61, 74	L.T. 7. E 00 (0/7)	L.T. 9. E 00 (0/7)	L.T. 7. E 00 (0/6)	L.T. 8. E 00 (0/8)
Ba-140	61, 74	L.T. 8. E 00 (0/7)	L.T. 5. E 01 (0/7)	L.T. 1. E 03 (0/6)(C)	L.T. 2. E 01 (0/8)
Ce-141	61, 74	L.T. 1. E 01 (0/7)	L.T. 3. E 01 (0/7)	L.T. 6. E 01 (0/6)	L.T. 2. E 01 (0/8)
Ce-144	61, 74	L.T. 5. E 01 (0/7)	L.T. 7. E 01 (0/7)	L.T. 5. E 01 (0/6)	L.T. 6. E 01 (0/8)
RA-226	61, 74	L.T. 1. E 02 (0/7)	L.T. 2. E 02 (0/7)	L.T. 1. E 02 (0/6)	L.T. 2. E 02 (0/8)
Th-228	61, 74	L.T. 1. E 01 (0/7)	L.T. 2. E 01 (0/7)	L.T. 1. E 01 (0/6)	L.T. 2. E 01 (0/8)

(c) It was not possible to obtain a low LLD on the samples collected 09/06-09/27 from Stations 61 and 74 because of the long decay period.

TELEDYNE ISOTOPES

C. GROUNDWATER (See Tables O-1 and O-2)

STATIONS 11, 47

Groundwater was collected from two stations quarterly and analyzed for gross beta and gross alpha activity, for tritium and for gamma emitting radionuclides. Station 11 is 0.15 miles from the plant and station 47 is 25.75 miles from, the plant.

The gross beta activity averaged 7.9 pCi/liter which is statistically the same as in past years. There were no detections of gamma emitters above the minimum level of detection. The tritium level averaged 257 pCi/liter for the year which is the normal environmental level.

There was no difference in levels of beta activity or tritium for the station close to the plant as compared with the more distant station. It may be concluded that there is no impact from the operations of CNS on the environment as shown by measurements of radionuclides in groundwater.

TELEDYNE ISOTOPES

TABLE 0-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - WATERBORNE

GROUND WATER - pCi/ℓ

SAMPLE NUCLIDE	STATION NUMBER		1st QUARTER 01/23,24/83	2nd QUARTER 04/26/83	3rd QUARTER 07/26/83	4th QUARTER 10/25/83
Gross Alpha	11, 47	Mean±std.dev. det./total range	L.T. 4. E 00 0/2 --	L.T. 3. E 00 0/2 --	L.T. 4. E 00 0/2 --	L.T. 3. E 00 0/2 --
Gross Beta	11, 47	Mean±std.dev. det./total range	7.3 ± 3.0 E 00 2/2 (5.1-9.4)E 00	8.2 ± 0.4 E 00 2/2 (7.9-8.4)E 00	7.3 ± 1.1 E 00 2/2 (6.5-8.0)E 00	9.3 ± 0.1 E 00 2/2 (9.2-9.3)E 00
I-131	11, 47	Mean±std.dev. det./total range	L.T. 2. E-01 0/2 --	L.T. 2. E 01 0/2 --	L.T. 2. E 01 0/2 --	L.T. 7. E 00 0/2 --
Cs-137	11, 47	Mean±std.dev. det./total range	L.T. 6. E 00 0/2 --	L.T. 7. E 00 0/2 --	L.T. 9. E 00 0/2 --	L.T. 5. E 00 0/2 --
H-3	11, 47	Mean±std.dev. det./total range	3.2 ± 0.7 E 02 1/2 --	1.1 ± 0.7 E 02 1/2 --	3.2 ± 0.2 E 02 2/2 (3.0-3.3)E 02	2.9 ± 2.8 E 02 2/2 (0.90-4.9)E 02

TELEDYNE ISOTOPES

TABLE O-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - WATERBORNE

GROUNDWATER - pCi/ℓ

SAMPLE NUCLIDE	STATION NUMBER	1st QUARTER 01/23,24/83	2nd QUARTER 04/26/83	3rd QUARTER 07/26/83	4th QUARTER 10/25/83
Be-7	11, 47	L.T. 6. E 01 (0/2)	L.T. 6. E 01 (0/2)	L.T. 8. E 01 (0/2)	L.T. 4. E 01 (0/2)
K-40	11, 47	L.T. 1. E 02 (0/2)	L.T. 2. E 02 (0/2)	L.T. 2. E 02 (0/2)	L.T. 1. E 02 (0/2)
Mn-54	11, 47	L.T. 6. E 00 (0/2)	L.T. 6. E 00 (0/2)	L.T. 7. E 00 (0/2)	L.T. 5. E 00 (0/2)
Co-58	11, 47	L.T. 6. E 00 (0/2)	L.T. 6. E 00 (0/2)	L.T. 9. E 00 (0/2)	L.T. 5. E 00 (0/2)
Fe-59	11, 47	L.T. 1. E 01 (0/2)	L.T. 1. E 01 (0/2)	L.T. 1. E 01 (0/2)	L.T. 9. E 00 (0/2)
Co-60	11, 47	L.T. 6. E 00 (0/2)	L.T. 7. E 00 (0/2)	L.T. 9. E 00 (0/2)	L.T. 5. E 00 (0/2)
Zn-65	11, 47	L.T. 1. E 01 (0/2)	L.T. 2. E 01 (0/2)	L.T. 2. E 01 (0/2)	L.T. 1. E 01 (0/2)
Zr-95	11, 47	L.T. 7. E 00 (0/2)	L.T. 7. E 00 (0/2)	L.T. 8. E 00 (0/2)	L.T. 5. E 00 (0/2)
Ru-103	11, 47	L.T. 8. E 00 (0/2)	L.T. 8. E 00 (0/2)	L.T. 9. E 00 (0/2)	L.T. 5. E 00 (0/2)
Ru-106	11, 47	L.T. 5. E 01 (0/2)	L.T. 6. E 01 (0/2)	L.T. 8. E 01 (0/2)	L.T. 4. E 01 (0/2)
I-131	11, 47	L.T. 2. E 01 (0/2)	L.T. 2 E 01 (0/2)	L.T. 2. E 01 (0/2)	L.T. 7. E 00 (0/2)
Cs-134	11, 47	L.T. 7. E 00 (0/2)	L.T. 7. E 00 (0/2)	L.T. 9. E 00 (0/2)	L.T. 5. E 00 (0/2)
Cs-137	11, 47	L.T. 6. E 00 (0/2)	L.T. 7. E 00 (0/2)	L.T. 9. E 00 (0/2)	L.T. 5 E 00 (0/2)
Ba-140	11, 47	L.T. 1. E 01 (0/2)	L.T. 1. E 01 (0/2)	L.T. 1. E 01 (0/2)	L.T. 6. E 00 (0/2)
Ce-141	11, 47	L.T. 1. E 01 (0/2)	L.T. 1. E 01 (0/2)	L.T. 2. E 01 (0/2)	L.T. 9. E 00 (0/2)
Ce-144	11, 47	L.T. 5. E 01 (0/2)	L.T. 4. E 01 (0/2)	L.T. 6. E 01 (0/2)	L.T. 4. E 01 (0/2)
RA-226	11, 47	L.T. 1. E 02 (0/2)	L.T. 1. E 02 (0/2)	L.T. 2. E 02 (0/2)	L.T. 1. E 02 (0/2)
Th-228	11, 47	L.T. 1. E 01 (0/2)	L.T. 1. E 01 (0/2)	L.T. 1. E 01 (0/2)	L.T. 9. E 00 (0/2)

TELEDYNE ISOTOPES

P. RIVER WATER (See Table P-1 and P-2)

STATIONS 12,13,28

River water was collected monthly and monitored for gross beta and gross alpha, suspended and dissolved, Sr-89 and Sr-90. A quarterly composite was measured for gamma emitters and tritium.

There were no detections of gamma emitters above the minimum level of detection. No Sr-89 was detected.

There was one detection of Sr-90 at station 13 (0.25 miles, 120 degrees) in the first quarter at 1.2 pCi/liter which is slightly above the minimum level of detection. This may have been caused by the flood conditions in the spring. No further detections occurred. The gross alpha and gross beta suspended and dissolved were high as in 1982. The yearly average was increased by the high readings in the fourth quarter due to flooding conditions. This is further supported by the increase in gross alpha and gross beta, suspended particules, due to the turbulence.

The yearly averages are as follows:

	1983 Average pCi/liter	1982 Average per/liter
Gross Alpha (dissolved)	14.2	4.5
Gross Alpha (suspended)	3.5	7.2
Gross Beta (dissolved)	10.7	10.0
Gross Beta (suspended)	7.8	16.0

This increase in gross beta and gross alpha activity was probably due to naturally occurring nuclides and was not associated with the operations of CNS.

These measurements indicate that the river water samples monitored during 1983 contained no detectable CNS plant radionuclides. Additional verification of no detectable releases is the low range of H-3 activity which was from 100 to 430 pCi/liter.

TELEDYNE ISOTOPES

TABLE P-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - Waterborne

River Water - pCi/ℓ

SAMPLE NUCLIDE	STATION NUMBER		1st QUARTER 01/17/83-03/14/83	2nd QUARTER 04/13/83-06/07/83	3rd QUARTER 07/18/83-09/13/83	4th QUARTER 10/12/83-12/13/83
Gross Alpha (dissolved)	12, 13, 28	Mean±std.dev. det./total range	L.T. 4. E 00 0/9 --	3.4 ± 2.3 E 00 1/9 --	7.0.± 4.4 E 00 1/9 --	19.5 ± 14.1 E 00 4/9 (4.1-32.0)E 00
Gross Alpha (suspended)	12, 13, 28	Mean±std.dev. det./total range	6.4 ± 1.8 E 00 4/9 (4.6-8.3)E 00	5.3 ± 0.3 E 00 2/9 (5.1-5.5)E 00	1.0 ± 0.3 E 00 4/9 (0.68-1.3)E 00	2.4 ± 1.4 E 00 6/9 (0.98-4.8)E 00
Gross Beta (dissolved)	12, 13, 28	Mean±std.dev. det./total range	9.1 ± 3.5 E 00 9/9 (2.1-13.0)E 00	7.7 ± 4.3 E 00 9/9 (2.0-15.0)E 00	11.2 ± 1.6 E 00 6/9 (9.4-14.0)E 00	15.2 ± 16.1 E 00 9/9 (6.8-58.0)E 00
Gross Beta (suspended)	12, 13, 28	Mean±std.dev. det./total range	13.9 ± 8.6 E 00 9/9 (1.9-24.0) E 00	8.5 ± 6.8 E 00 9/9 (3.0-16.0)E 00	5.2 ± 2.1 E 00 9/9 (2.5 ± 10.0)E 00	3.8 1.4 E 00 9/9 (1.8-5.6)E 00
Sr-89	12, 13, 28	Mean±std.dev. det./total range	L.T. 2. E 00 0/9 --	L.T. 1. E 00 0/9 --	L.T. 1. E 00 0/9 --	L.T. 1. E 00 0/9 --
Sr-90	12, 13, 28	Mean±std.dev. det./total range	1.2 ± 0.4 E 00 1/9 --	L.T. 9. E-01 0/9 --	L.T. 9. E-01 0/9 --	L.T. 1. E 00 0/9 --
H-3	12, 13, 28 (a)	Mean±std.dev. det./total range	1.5 ± 0.2 E 02 2/3 (1.3-1.6)E 02	2.2.± 0.7 E 02 3/3 (1.8-3.0)E 02	2.7 ± 1.4 E 02 3/3 (1.8-4.3)E 02	1.7 ± 0.9 E 02 2/3 (1.0-2.3)E 02
I-131	12, 13, 28 (a)	Mean±std.dev. det./total range	L.T. 3. E 02 0/3 --	L.T. 6. E 01 0/3 --	L.T. 8. E 02 0/3 --	L.T. 4. E 02 0/3 --
Cs-137	12, 13, 28 (a)	Mean±std.dev. det./total range	L.T. 6. E 00 0/3 --	L.T. 7. E 00 0/3 --	L.T. 5. E 00 0/3 --	L.T. 5. E 00 0/3 --

(a) Tritium analysis and gamma scan is performed only on the quarterly composite of each station.

TELEDYNE ISOTOPES

TABLE P-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - WATERBORNE

RIVER WATER - pCi/liter

SAMPLE NUCLIDE	STATION NUMBER	1st QUARTER 01/17/83-03/14/83	2nd QUARTER 04/13/83-06/07/83	3rd QUARTER 07/18/83-09/13/83	4th QUARTER 10/12/83-12/13/83
Be-7	12, 13, 28(a)	L.T. 8. E 01 (0/3)	L.T. 7. E 01 (0/3)	L.T. 9. E 01 (0/3)	L.T. 7. E 01 (0/3)
K-40	12, 13, 28	L.T. 2. E 02 (0/3)	L.T. 2. E 02 (0/3)	L.T. 1. E 02 (0/3)	L.T. 6. E 01 (0/3)
Mn-54	12, 13, 28	L.T. 6. E 00 (0/3)	L.T. 7. E 00 (0/3)	L.T. 6. E 00 (0/3)	L.T. 4. E 00 (0/3)
Co-58	12, 13, 28	L.T. 8. E 00 (0/3)	L.T. 7. E 00 (0/3)	L.T. 8. E 00 (0/3)	L.T. 6. E 00 (0/3)
Fe-59	12, 13, 28	L.T. 2. E 01 (0/3)	L.T. 2. E 01 (0/3)	L.T. 2. E 01 (0/3)	L.T. 2. E 01 (0/3)
Co-60	12, 13, 28	L.T. 6. E 00 (0/3)	L.T. 6. E 00 (0/3)	L.T. 5. E 00 (0/3)	L.T. 5. E 00 (0/3)
Zn-65	12, 13, 28	L.T. 1. E 01 (0/3)	L.T. 2. E 01 (0/3)	L.T. 1. E 01 (0/3)	L.T. 1. E 01 (0/3)
Zr-95	12, 13, 28	L.T. 9. E 00 (0/3)	L.T. 8. E 00 (0/3)	L.T. 9. E 00 (0/3)	L.T. 7. E 00 (0/3)
Ru-103	12, 13, 28	L.T. 1. E 01 (0/3)	L.T. 8. E 00 (0/3)	L.T. 1. E 01 (0/3)	L.T. 1. E 01 (0/3)
Ru-106	12, 13, 28	L.T. 5. E 01 (0/3)	L.T. 6. E 01 (0/3)	L.T. 5. E 01 (0/3)	L.T. 4. E 01 (0/3)
I-131	12, 13, 28	L.T. 3. E 02 (0/3)	L.T. 6. E 01 (0/3)	L.T. 8. E 02 (0/3)	L.T. 4. E 02 (0/3)
Cs-134	12, 13, 28	L.T. 6. E 00 (0/3)	L.T. 7. E 00 (0/3)	L.T. 6. E 00 (0/3)	L.T. 5. E 00 (0/3)
Cs-137	12, 13, 28	L.T. 6. E 00 (0/3)	L.T. 7. E 00 (0/3)	L.T. 5. E 00 (0/3)	L.T. 5. E 00 (0/3)
Ba-140	12, 13, 28	L.T. 7. E 01 (0/3)	L.T. 2. E 01 (0/3)	L.T. 1. E 02 (0/3)	L.T. 8. E 01 (0/3)
Ce-141	12, 13, 28	L.T. 3. E 01 (0/3)	L.T. 2. E 01 (0/3)	L.T. 3. E 01 (0/3)	L.T. 3. E 01 (0/3)
Ce-144	12, 13, 28	L.T. 5. E 01 (0/3)	L.T. 6. E 01 (0/3)	L.T. 4. E 01 (0/3)	L.T. 4. E 01 (0/3)
RA-226	12, 13, 28	L.T. 1. E 02 (0/3)	L.T. 1. E 02 (0/3)	L.T. 1. E 02 (0/3)	L.T. 1. E 02 (0/3)
Th-228	12, 13, 28	L.T. 1. E 01 (0/3)	L.T. 1. E 01 (0/3)	L.T. 1. E 01 (0/3)	L.T. 1. E 01 (0/3)

(a) A gamma scan is performed only on the quarterly composite of each station.

TELEDYNE ISOTOPES

Q. ANIMALS - RABBITS (See Tables Q-1 and Q-2)

STATION 28 and 35

Rabbit samples were collected from stations 28 and 35 in the fall of 1983. The femur was analyzed for Sr-89 and Sr-90, the thyroid gland for I-131 and the muscle for gamma emitters. Strontium 90 was detected in four of four samples analyzed at a level of 0.227 pCi/gm, wet, which is similar to the levels of previous years. Iodine-131 analyses of the thyroid gland conducted by the chemical separation method were below the normal level of detection. There were no gamma emitters detected except for naturally occurring K-40 which was at the same level as in the previous years from 1977 through 1982. The were no detections of Cesium-137 above the normal level of detection.

The results of the monitoring of rabbit samples indicate that no nuclear plant effects resulting from the operations of CNS were detectable in animal life.

TELEDYNE ISOTOPES

TABLE Q-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

RABBIT - pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER		4th QUARTER 11/07/83-11/21/83
Sr-89 (femur)	28, 35	Mean±std.dev. det./total range	L.T. 1. E-01 0/4 --
Sr-90 (femur)	28, 35	Mean±std.dev. det./total range	2.3 ± 0.5 E-01 4/4 (1.5-2.6) E-01
I-131 (throid by chemical separation)	28, 35	Mean±std.dev. det./total range	L.T. 1. E 01 0/3 (a) --
K-40 (flesh)	28, 35	Mean±std.dev. det./total range	2.8 ± 0.7 E 00 4/4 (1.8-3.3) E 00
Cs-137 (flesh)	28, 35	Mean±std.dev. det./total range	L.T. 9. E-02 0/4 --

(a) The sample of the thyroid gland of the rabbit from Stations 28 and 35, collected 11/07, was lost in analysis; one replacement sample was received 12/09 from Station 35.

TELEDYNE ISOTOPES

TABLE Q-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

RABBIT - pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER	4th QUARTER 11/07/83-11/21/83
Be-7	28, 35	L.T. 6. E-01 (0/4)
K-40	28, 35	2.8 ± 0.7 E 00 (4/4)
Mn-54	28, 35	L.T. 6. E-02 (0/4)
Co-58	28, 35	L.T. 6. E-02 (0/4)
Fe-59	28, 35	L.T. 1. E-01 (0/4)
Co-60	28, 35	L.T. 6. E-02 (0/4)
Zn-65	28, 35	L.T. 1. E-01 (0/4)
Zr-95	28, 35	L.T. 7. E-02 (0/4)
Ru-103	28, 35	L.T. 8. E-02 (0/4)
Ru-106	28, 35	L.T. 5. E-01 (0/4)
I-131	28, 35	L.T. 5. E-01 (0/4)
Cs-134	23, 35	L.T. 6. E-02 (0/4)
Cs-137	28, 35	L.T. 9. E-02 (0/4)
Ba-140	28, 35	L.T. 2. E-01 (0/4)
Ce-141	28, 35	L.T. 2. E-01 (0/4)
Ce-144	28, 35	L.T. 5. E-01 (0/4)
RA-226	28, 35	L.T. 1. E 00 (0/4)
Th-228	28, 35	L.T. 1. E-01 (0/4)

TELEDYNE ISOTOPES

R. AQUATIC VEGETATION

STATION 12, 13, 28

Samples of acquatic vegetation were to be collected twice during the year at Stations 12, 13 and 38. In the third quarter two samples were collected from Stations 12 and 28. There was no growth at Station 13. This aquatic vegetation was analyzed for gross beta activity, for Strontium 89 and 90 and for gamma emitting nuclides. The gross beta activity was at a nominal level. There was a small amount of Sr-90, near the minimum level of detection, probably due to fallout from previous nuclear testing.

Beryllium-7, a cosmogenic nuclide, was detected in the samples collected. Potassium-40 and thorium-228, terrestrial nuclides, were detected at normal environmental levels.

There is no evidence of an effect from the nuclear plant operations on the samples of aquatic vegetation collected.

TELEDYNE ISOTOPES

TABLE R-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

VEGETATION/AQUATIC pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER		3rd QUARTER 08/09/83	4th QUARTER 10/83
Gross Beta	12, 13(a), 28	Mean±std.dev. det./total range	1.3 ± 0.2 E 00 2/2 (1.1 ± 1.4)E 00	(b)
Sr-89	12, 28	Mean±std.dev. det./total range	L.T. 2. E-02 0/2 --	
Sr-90	12, 28	Mean±std.dev. det./total range	1.6 ± 0.3 E-02 2/2 (1.4-1.8)E-02	
Be-7	12, 28	Mean±std.dev. det./total range	1.4 ± 0.4 E 00 2/2 (1.1-1.6)E 00	
K-40	12, 28	Mean±std.dev. det./total range	5.6 ± 5.1 E-01 2/2 (2.0-9.3)E-01	
I-131	12, 28	Mean±std.dev. det./total range	L.T. 7. E-02 0/2 --	
Cs-137	12, 28	Mean±std.dev. det./total range	L.T. 1. E-02 0/2 --	
Th-228	12, 28	Mean±std.dev. det./total range	2.1 ± 0.5 E-02 1/2 --	

(a) No sample was collected from Station 13 on 08/09; no vegetation was available.
(b) No samples were collected in 10/83 from Stations 12, 13 or 28; the fluctuating level of the Missouri River prevented the accumulation of aquatic vegetation.

TELEDYNE ISOTOPES

TABLE R-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

VEGETATION/AQUATIC pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER	3rd QUARTER 08/09/83	4th QUARTER 10/83
Be-7	12, 13(a), 28	1.4 ± 0.4 E 00 (2/2)	(b)
K-40	12, 13 28	5.6 ± 5.1 E-01 (2/2)	
Mn-54	12, 13 28	L.T. 1. E-02 (0/2)	
Co-58	12, 13 28	L.T. 1. E-02 (0/2)	
Fe-59	12, 13 28	L.T. 2. E-02 (0/2)	
Co-60	12, 13 28	L.T. 1. E-02 (0/2)	
Zn-65	12, 13 28	L.T. 2. E-02 (0/2)	
Zr-95	12, 13 28	L.T. 1. E-02 (0/2)	
Ru-103	12, 13 28	L.T. 1. E-02 (0/2)	
Ru-106	12, 13 28	L.T. 9. E-02 (0/2)	
I-131	12, 13 28	L.T. 7. E-02 (0/2)	
Cs-134	12, 13 28	L.T. 1. E-02 (0/2)	
Cs-137	12, 13 28	L.T. 1. E-02 (0/2)	
Ba-140	12, 13 28	L.T. 3. E-02 (0/2)	
Ce-141	12, 13 28	L.T. 2. E-02 (0/2)	
Ce-144	12, 13 28	L.T. 7. E-02 (0/2)	
Ra-226	12, 13 28	L.T. 2. E-01 (0/2)	
Th-228	12, 13 28	2.1 ± 0.5 E-02 (1/2)	

(a) No sample was collected from Station 13 on 08/09; no vegetation was available.

(b) No samples were collected in 10/83 from stations 12, 13 nor 28; the fluctuating level of the Missouri River prevented the accumulation of acquatic vegetation.

TELEDYNE ISOTOPES

S. SOIL

STATIONS 2,3,4,5,6,7,8,9,10

Soil samples, which must be analyzed every three years for Strontium-90 and gamma emitters, were collected and analyzed in 1981.

Soil samples will be collected and analyzed in 1984.

TELEDYNE ISOTOPES

T. AMBIENT RADIATION - THERMOLUMINESCENT DOSIMETERS (TLDs - SEE TABLES T-1 AND T-2)

STATIONS 01-10,15,18,22,44,58,59

Ambient radiation was monitored at 16 locations within a 10 mile radius of CNS and collected quarterly. The quarterly averages of ambient net gamma radiation ranged from 17.2 milliRoentgen/quarter (91 days) to 29.9 milli-Roentgen/quarter. The highest exposure during each of the four quarters was at Station 01 (0.1 mile, 225 degrees) and averaged 29.9 mR/quarter. The lowest exposure was at Station 03 (2.5 miles, 338 degrees) and Station 05 (3.5 miles, 102 degrees) and averaged 17.2 mR/quarter.

The radiation at station 44, which is the control station, was similar to that at the other stations.

The average total exposure for the year was 76.9 mR which is considerably below the 125 millirems per quarter specified in 10 CFR 20.105 for an unrestricted area. The relationship between milliRoentgen (mR) and millirems (mr) is approximately one for the exposure conditions encountered. No plant effect from CNS was indicated.

TELEDYNE ISOTOPES

TABLE T-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AMBIENT GAMMA RADIATION: TLD

milliRoentgen/Quarter

SAMPLE NUCLIDE	STATION NUMBER	1st QUARTER 01/04/83-04/04/83	2nd QUARTER 04/04/83-07/06/83	3rd QUARTER 07/06/83-10/04/83	4th QUARTER 10/04/83-01/04/84
TLD Gamma	01	41.3 ± 0.9	24.3 ± 0.7	24.5 ± 1.0	29.4 ± 0.4
	02	17.4 ± 0.2	17.6 ± 0.4	18.7 ± 0.6	18.9 ± 0.4
	03	16.5 ± 0.2	17.2 ± 0.7	17.4 ± 0.6	17.6 ± 0.3
	04	17.0 ± 0.5	16.5 ± 1.0	18.9 ± 0.3	17.8 ± 0.4
	05	17.6 ± 0.6	15.9 ± 1.1	18.8 ± 1.1	19.1 ± 0.3
	06	17.4 ± 0.4	16.8 ± 0.5	18.7 ± 0.5	18.8 ± 0.6
	07	17.5 ± 0.3	17.3 ± 0.3	18.8 ± 0.4	18.9 ± 0.2
	08	17.6 ± 0.3	17.6 ± 0.1	19.4 ± 0.5	19.1 ± 0.6
	09	16.0 ± 0.4	16.6 ± 0.7	17.8 ± 0.6	18.3 ± 0.1
	10	16.9 ± 0.2	17.2 ± 1.1	18.4 ± 0.4	18.8 ± 0.4
	15	18.1 ± 0.4	18.3 ± 0.8	19.2 ± 0.6	21.0 ± 1.2
	18	18.1 ± 0.3	18.5 ± 0.4	19.5 ± 0.6	20.6 ± 0.6
	22	19.0 ± 0.4	16.4 ± 0.5	19.9 ± 1.0	20.0 ± 0.1
	44	18.7 ± 0.3	20.6 ± 0.2	21.4 ± 0.7	21.3 ± 0.3
	58	19.5 ± 0.1	18.7 ± 0.4	20.6 ± 0.5	21.6 ± 0.5
	59	18.9 ± 0.3	18.9 ± 0.2	20.4 ± 0.5	20.7 ± 0.4
Average/Quarter		19.2 ± 6.0 mR/90 Days	18.0 ± 2.1 mR/93 days	19.5 ± 1.7 mR/90 days	20.1 ± 2.8 mR/92 days
Average/Day		0.21 ± 0.07 mR/day	0.19 ± 0.02 mR/day	0.22 ± 0.02 mR/day	0.22 ± 0.03 mR/day
Range		(16.0-41.3) mR/90 days	(16.4-24.3) mR/93 days	(17.4-24.5) mR/90 days	(17.6-29.4) mR/92 days
Det./Total		16/16	16/16	16/16	16/16

TELEDYNE ISOTOPES

TABLE T-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AMBIENT GAMMA RADIATION: TLD

milliRoentgen

SAMPLE NUCLIDE	STATION NUMBER	AVER/QUARTER 01/04/83-01/04/84	TOTAL mR/year 01/04/83-01/04/84
TLD Gamma	01	29.9	119.5
	02	18.2	72.6
	03	17.2	68.7
	04	17.6	70.2
	05	17.7	71.4
	06	17.9	71.7
	07	18.1	72.5
	08	18.4	73.7
	09	17.2	68.7
	10	17.8	71.3
	15	19.2	76.6
	18	19.2	76.7
	22	18.8	75.3
	44	20.5	82.0
	58	20.3	80.4
	59	19.7	78.9
	Average of four quarters	19.2 ± 3.0	76.9 ± 12.5 Average Total mR/year
	Range	(17.2-29.9)	(68.7-119.5)