Nebraska Public Power District

Cooper Nuclear Station

Annual Environmental Operating Report
Volume II — Radiological

Environmental Radiation Monitoring Program

January 1, 1981 — December 31, 1981

USNRC Docket Number 50-298

Prepared by

TELEDYNE ISOTOPES

Nebraska Public Power District

GENERAL OFFICE
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TELEPHONE (402) 564-8561

LQA8200094

March 10, 1982

Mr. John T. Collins
Regional Administrator
U.S. Nuclear Regulatory Commission
Region IV
611 Ryan Plaza Drive
Suite 1000
Arlington, Texas 76011

Subject: Annual Environmental Operating Report
Volume II - Radiological
Cooper Nuclear Station
NRC Docket No. 50-298, DPR-46

Dear Mr. Collins:

In accordance with Paragraph 5.4.1.a(2) of the Cooper Nuclear Station Technical Specifications, the Nebraska Public Power District submits the Cooper Nuclear Station Annual Environmental Operating Report Volume II - Radiological for the period January 1, 1981 through December 31, 1981.

We are enclosing one signed original of the report for your use and are transmitting 18 copies to the Document Control Desk in accordance with Regulatory Guide 10.1, Revision 4.

Should you have any questions or comments regarding this report, please contact me.

Sincerely,

Jay M. Pilant
Division Manager of Licensing
and Quality Assurance

JMP:ACM:cmk
Enclosure

cc: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555

STATE OF NEBRASKA)
) ss
PLATTE COUNTY)

Jay M. Pilant, being first duly sworn, deposes and says that he is an authorized representative of the Nebraska Public Power District, a public corporation and political subdivision of the State of Nebraska; that he is duly authorized to submit this information on behalf of Nebraska Public Power District; and that the statements in said application are true to the best of his knowledge and belief.

Jay M. Pilant

Subscribed in my presence and sworn to before me this 10th day of March, 1982.

Colleen M. Kuta
NOTARY PUBLIC

COLLEEN M. KUTA
GENERAL
NOTARY
COMMISSION
EXPIRES
AUG. 4, 1985
STATE OF NEBRASKA

TELEDYNE
ISOTOPES

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

ANNUAL SUMMARY REPORT 1981

ENVIRONMENTAL RADIATION

MONITORING PROGRAM

PREPARED BY

TELEDYNE ISOTOPES
50 VAN BUREN AVENUE
WESTWOOD, NEW JERSEY 07675

REPORT APPROVED BY: J. David Martin

MANAGER
ENVIRONMENTAL ANALYSIS DEPARTMENT

TELEDYNE ISOTOPES

TABLE OF CONTENTS

TELEDYNE ISOTOPES

INTRODUCTION

This annual summary report of the radiological environmental monitoring program conducted in the environs of the Cooper Nuclear Station (CNS) for the Nebraska Public Power District (NPPD) contains summaries of the analysis of radionuclides monitored during 1981.

Samples were collected in the environs of CNS by NPPD and analyzed by Teledyne Isotopes in compliance with the Environmental Technical Specifications, Appendix B of the Cooper Nuclear Station Operating License.

The results of the analyses performed during 1981 were compared with previous studies conducted during 1973 through 1976 and in 1979 and 1980 by Teledyne Isotopes. In the years 1977 through 1978 the monitoring program was conducted by the Hazelton Environmental Science Company. From summaries of the 1981 results and comparisons with data generated previously assessments were made of the observed impact of the nuclear plant (CNS) operations on the environment.

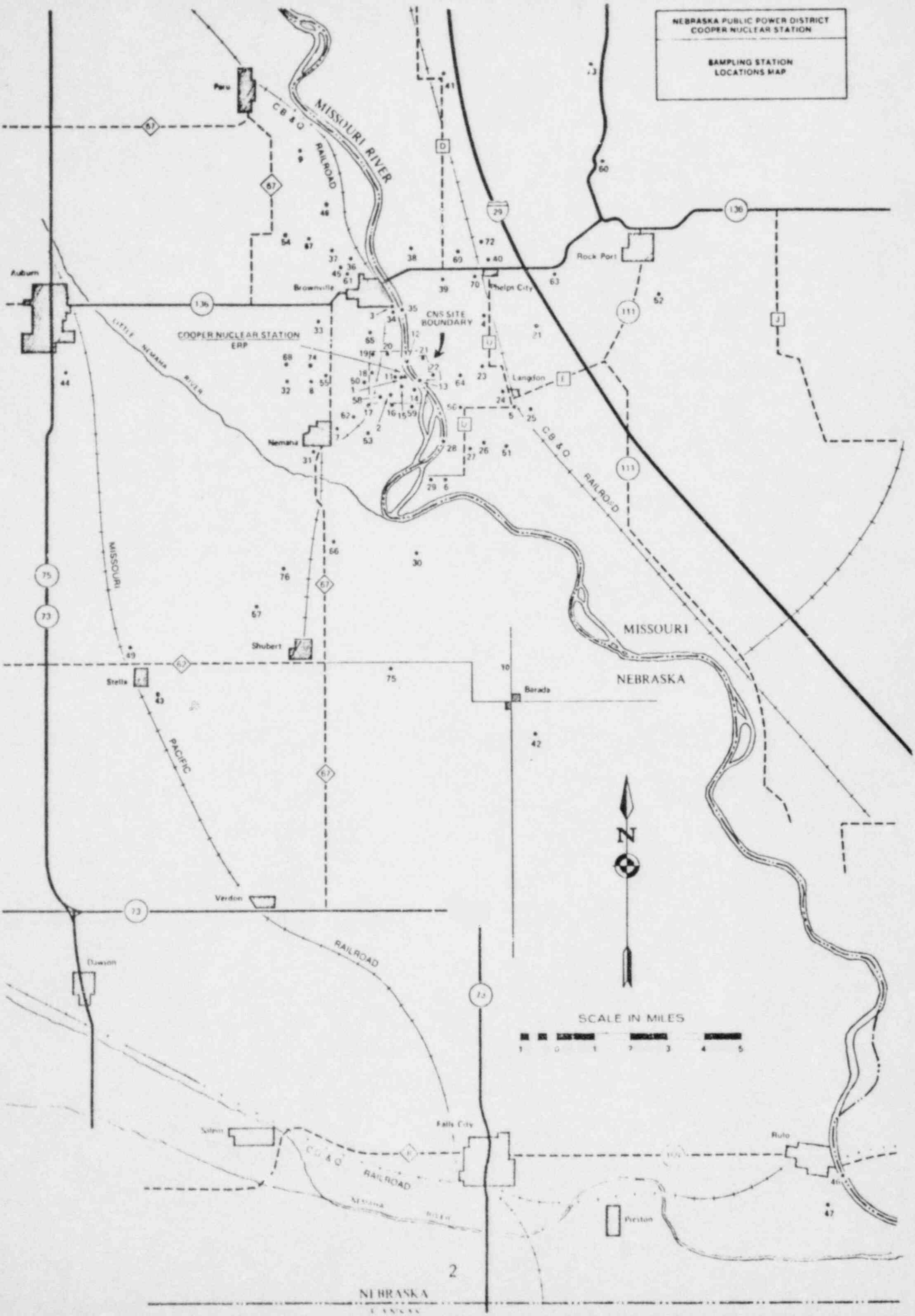
NEBRASKA PUBLIC POWER DISTRICT
COOPER NUCLEAR STATION
SAMPLING STATION
LOCATIONS MAP
MISSOURI RIVER
CB & Q
RAILROAD
Peru
Auburn
Brownville
COOPER NUCLEAR STATION
ERP
CNS SITE
BOUNDARY
Nemaha
LITTLE NEMAHA RIVER
Rock Port
Langdon
MISSOURI
PACIFIC
Shubert
Stella
Barada
MISSOURI
NEBRASKA
Verdon
Dawson
Falls City
Salem
Rulo
Preston
N
SCALE IN MILES
1 0 1 2 3 4 5
NEBRASKA

TABLE 1

Sampling schedule and analyses, 1981, 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 & Forage - Beef Producers (peak pasture only)	64, 65, 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 & Forage - Beef Producers (except peak pasture season)	64, 65, 67, 68, 71, 76	Gamma spec.
Feed & 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 & dis Gross β - sus & 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.

(Continued) TABLE 1

QUARTERLY

Sample Type	Station Nos.	Analyses
Background Radiation	1 - 10, 15, 18, 22, 44, 58, 59	TLD readout
Feed & Forage - Nearest Milk Producers (except peak pasture season)	61, 74	Sr-89, Sr-90 Elem. Ca Gamma spec.
Feed & 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 & 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 (cont'd.)

Sample Type	Station Nos.	Analyses
Garden Crops (at harvest)	34, 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.

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

TABLE 2

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	IND
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 1980-81 sampling program; NA = not active as of 1 January 1980.

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 STATION FRACTION	MEAN X E-00 RANGE STATION DESCRIPTION	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
GR-A	520	0.0020	0.0022 0.0019 - 0.0027 247/510	10 STATION 10 - 10.0 MI. 160 DEG. IND.	0.0027 032/051 0.0010 - 0.0064		0	12/29/80-12/28/81
GR-B	520	0.0030	0.11 0.083 - 0.15 507/510	02 STATION 02 - 0.75 MI. 225 DEG. IND.	0.15 050/051 0.019 - 0.44		0	12/29/80-12/28/81

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- AIRBORNE
SAMPLE - CHARCOAL 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
I-131	520	0.0300	LT 0.140 LT 0.0400 -LT 0.140 000/510			0	12/29/80-12/28/81

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-00 RANGE	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
BE-7	40	0.0500	0.103 0.0550 - 0.140 040/040	02 003/003 STATION 02 - 0.75 MI. 225 DEG. IND.	0.140 0.126 - 0.149		0	12/29/80-12/28/81
MN-54	40	0.00300	0.00168 0.00141- 0.00233 008/030	01 001/003 STATION 01 - 0.1 MI. 225 DEG. IND.	0.00233 0.00233- 0.00233		0	12/29/80-12/28/81
CO-60	40	0.00500	0.0176 0.00332- 0.0319 002/030	01 001/003 STATION 01 - 0.1 MI. 225 DEG. IND.	0.0319 0.0319 - 0.0319		0	12/29/80-12/28/81
ZR-95	40	0.00500	0.0433 0.0210 - 0.0697 024/030	01 002/003 STATION 01 - 0.1 MI. 225 DEG. IND.	0.0697 0.0595 - 0.0799		0	12/29/80-12/28/81
RU-103	40	0.00300	0.0176 0.0111 - 0.0214 021/030	04 002/003 STATION 04 - 3.0 MI. 43 DEG. IND.	0.0214 0.0155 - 0.0274		0	12/29/80-12/28/81
RU-106	40	0.0300	0.0181 0.0124 - 0.0221 009/030	08 001/003 STATION 08 - 2.5 MI. 260 DEG. IND.	0.0221 0.0221 - 0.0221		0	12/29/80-12/28/81
I-131	40	0.00300	LT 0.400 LT 0.200 - LT 0.400 000/030				0	12/29/80-12/28/81

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 MEAN X E-00 STATION FRACTION RANGE STATION DESCRIPTION	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
CS-137	40	0.00300	0.00238 0.00158- 0.00372 019/030	0.00372 10 001/003 0.00372- 0.00372 STATION 10 - 10.0 MI. 160 DEG. IND.		0	12/29/80- 12/28/81
CE-141	40	0.00300	0.0112 0.00681- 0.0174 020/030	0.0174 02 002/003 0.0113 - 0.0236 STATION 02 - 0.75 MI. 225 DEG. IND.		0	12/29/80- 12/28/81
CE-144	40	0.0100	0.0239 0.0203 - 0.0311 029/030	0.0311 02 003/003 0.0131 - 0.0570 STATION 02 - 0.75 MI. 225 DEG. IND.		0	12/29/80- 12/28/81

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	16		0.14 0.11 - 0.20 016/016	51 004/004 0.20 0.029 - 0.59 STATION 51 - 4.2 MI. 125 DEG. IND.		0	01/12/81-10/19/81
GR-B	16	0.060	1.5 1.3 - 2.0 016/016	67 004/004 2.0 0.75 - 2.9 STATION 67 - 4.75 MI. 325 DEG. IND.		C	01/12/81-10/19/81
SR-89	16	0.0060 LT	LT 0.0060 0.0060 -LT 0.0060 000/016			0	01/12/81-10/19/81
SR-90	16	0.0060	0.0017 0.0016 - 0.0018 003/016	67 002/004 0.0018 0.0018 - 0.0019 STATION 67 - 4.75 MI. 325 DEG. IND.		0	01/12/81-10/19/81
K-40	16	0.470	1.02 0.918 - 1.11 016/016	51 004/004 1.11 0.825 - 1.34 STATION 51 - 4.2 MI. 125 DEG. IND.		0	01/12/81-10/19/81
I-131	16	0.0310 LT	LT 0.0200 0.0100 -LT 0.0200 000/016			0	01/12/81-10/19/81
CS-137	16	0.0310 LT	LT 0.00900 0.00700-LT 0.00900 000/016			C	01/12/81-10/19/81

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- INGESTION
SAMPLE - FEED & 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
SAMPLE	4 (a)	LT	LT 0.00000 0.00000-LT 0.00000 000/004				0	05/04/81-07/27/81
BE-7	87	0.310	7.28 4.18 - 11.6 044/086	71 010/015 STATION 71 - 4.25 MI. 71 DEG. IND.	11.6 0.131 - 67.8		0	01/05/81-12/07/81
K-40	87	0.470	15.6 9.27 - 21.2 087/087	64 015/015 STATION 64 - 2.25 MI. 99 DEG. IND.	21.2 2.36 - 46.5		0	01/05/81-12/07/81
MN-54	87	0.0310	0.0816 0.0645 - 0.0987 002/087	64 001/015 STATION 64 - 2.25 MI. 99 DEG. IND.	0.0987 0.0987 - 0.0987		0	01/05/81-12/07/81
ZR-95	87	0.0470	0.839 0.643 - 0.972 021/086	67 003/014 STATION 67 - 4.75 MI. 325 DEG. IND.	0.972 0.566 - 1.20		0	01/05/81-12/07/81
RU-103	87	0.0310	0.138 0.114 - 0.172 009/087	64 002/015 STATION 64 - 2.25 MI. 99 DEG. IND.	0.172 0.131 - 0.214		0	01/05/81-12/07/81
RU-106	87	0.310	0.893 0.746 - 1.04 002/087	64 001/015 STATION 64 - 2.25 MI. 99 DEG. IND.	1.04 1.04 - 1.04		0	01/05/81-12/07/81

(a) There was no sample from Station 65 on 05/04, 06/08 and 07/27; no QA composite could be prepared for the second quarter; therefore there are four samples not collected from Station 65. The cattle were moved to a different location.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- INGESTION
SAMPLE - FEED & 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	MEAN X E-00 RANGE STATION DESCRIPTION	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERICD
I-131	87	0.0310	LT 2.00 LT 0.500 -LT 2.00 000/086				0	01/05/81-12/07/81
CS-137	87	0.0470	0.134 0.107 - 0.164 026/086	64	0.164 005/015 0.0669 - 0.295 STATION 64 - 2.25 MI. 99 DEG. IND.		0	01/05/81-12/07/81
CE-141	87	0.0470	0.134 0.0885 - 0.225 005/086	64	0.225 001/015 0.225 - 0.225 STATION 64 - 2.25 MI. 99 DEG. IND.		0	01/05/81-12/07/81
CE-144	87	0.160	1.06 0.552 - 1.55 027/085	64	1.55 005/015 0.552 - 2.70 STATION 64 - 2.25 MI. 99 DEG. IND.		0	01/05/81-12/07/81
TH-228	87	0.120	0.0209 0.0110 - 0.0309 002/086	76	0.0309 001/015 0.0309 - 0.0309 STATION 76 - 5.3 MI. 212 DEG. IND.		0	01/05/81-12/07/81

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	5		0.11 0.019 - 0.22 005/005	62 001/001 STATION 62 - 1.5 MI. 225 DEG. IND.	0.22 0.22 - 0.22		0	08/10/81-09/14/81
GR-E	5	0.030	3.9 2.9 - 5.2 005/005	62 001/001 STATION 62 - 1.5 MI. 225 DEG. IND.	5.2 5.2 - 5.2		0	08/10/81-09/14/81
SR-89	5	0.0030 LT	LT 0.0040 0.0020 -LT 0.0040 000/005				0	08/10/81-09/14/81
SR-90	5	0.0030	0.0016 0.0015 - 0.0017 002/005	34 001/001 STATION 34 - 2.5 MI. 333 DEG. IND.	0.0017 0.0017 - 0.0017		0	08/10/81-09/14/81
K-40	5	0.470	1.84 1.26 - 2.34 004/005	62 001/001 STATION 62 - 1.5 MI. 225 DEG. IND.	2.34 2.34 - 2.34		0	08/10/81-09/14/81
I-131	5	0.0310 LT	LT 0.0200 0.0100 -LT 0.0200 000/005				0	08/10/81-09/14/81
CS-137	5	0.0310 LT	LT 0.0200 0.00800-LT 0.0200 000/005				0	08/10/81-09/14/81

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- INGESTION
SAMPLE - FEED & 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	17		2.6 2.5 - 2.7 017/017	2.7 61 005/005 0.50 - 10.0 STATION 61 - 3.5 MI. 326 DEG. IND.		0	01/12/81-10/05/81
SR-89	17	0.60	0.047 0.033 - 0.060 003/017	0.060 74 002/008 0.037 - 0.082 STATION 74 - 2.4 MI 270 DEG. IND.		0	01/12/81-10/05/81
SR-90	17	0.60	0.079 0.055 - 0.102 009/017	0.10 74 005/008 0.014 - 0.59 STATION 74 - 2.4 MI. 270 DEG. IND.		0	01/12/81-10/05/81
BE-7	17	0.310	2.19 1.97 - 2.40 007/017	2.40 61 002/009 2.04 - 2.74 STATION 61 - 12.85 MI. 156 DEG. IND.		0	01/12/81-10/05 81
K-40	17	0.470	10.15 7.10 - 13.2 017/017	13.2 61 009/009 2.87 - 38.4 STATION 61 - 3.5 MI. 326 DEG. IND.		0	01/12/81-10/05/81
ZR-95	17	0.0470	0.418 0.332 - 0.503 005/017	0.503 74 001/005 0.503 0.503 STATION 74 - 2.4 MI. 270 DEG. IND.		0	01/12/81-10/05/81

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
RU-103	17	0.0310	0.115 0.0927 - 0.139 002/017	0.139 74 002/008 0.0360 - 0.242 STATION 74 - 2.4 MI. 270 DEG. IND.		0	01/12/81-10/05/81
I-131	17	0.0310	LT 0.200 LT 0.0500 -LT 0.200 000/030			0	01/12/81-10/05/81
CS-137	17	0.0470	0.062 0.062 - 0.062 001/017	0.062 74 001/008 0.062 0.062 STATION 74 2.4 MI. 270 DEG. IND.		0	01/12/81-10/05/81
CE-141	17	0.0470	0.137 0.0998 - 0.174 002/017	0.174 74 002/008 0.04 0.30 STATION 74 - 2.4 MI. 270 G. IND.		0	01/12/81-10/05/81
CE-144	17	0.160	0.517 0.409 - 0.624 003/017	0.624 61 001/009 0.624 0.624 STATION 61 - 3.5 MI. 326 DEG. IND.		0	01/12/81-10/05/81
RA-226	17	0.0930	0.264 0.207 - 0.321 003/017	0.321 61 002/009 0.316 - 0.327 STATION 61 - 3.5 MI. 326 DEG. IND.		0	01/12/81-10/05/81
TH-228	17	0.120	0.0241 0.0241 - 0.0241 001/017	0.0241 61 001/009 0.0241 - 0.0241 STATION 61 - 3.5 MI. 326 DEG. IND.		0	01/12/81-10/05/81

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- INGESTION
SAMPLE - FEED & FORAGE - MILK PRODUCERS (COMMERCIAL)
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
CA MG/GM	13		2.6 2.0 - 3.4 013/013	3.4 42 005/005 1.3 - 9.0 STATION 42 - 12.85 MI. 156 DEG. IND.		0	01/12/81-10/12/81
SR-89	13	0.60	0.20 0.06 - 0.35 002/013	0.35 42 001/005 0.35 - 0.35 STATION 42 - 12.85 MI. 156 DEG. IND.		0	01/12/81-10/12/81
SR-90	13	0.60	0.178 0.019 - 0.13 011/013	0.074 73 003/004 0.040 - 0.13 STATION 73 - 10.0 MI. 35 DEG. IND.		0	01/12/81-10/12/81
Be-7	13	0.310	1.15 0.564 - 3.94 005/013	3.94 42 001/005 3.94 - 3.94 STATION 42 - 12.85 MI. 145 DEG. IND.		0	01/12/81-10/12/81
K-40	13	0.470	9.65 4.75 - 11.6 013/013	11.6 42 005/005 5.84 - 28.1 STATION 42 - 12.85 MI. 156 DEG. IND.		0	01/12/81-10/12/81
MN-54	13	0.0310	0.0652 0.0652 - 0.0652 001/013	0.0652 73 001/004 0.0652 - 0.0652 STATION 73 - 10.0 MI. 35 DEG. IND.		0	01/12/81-10/12/81
ZR-95	13	0.0470	0.780 0.332 - 0.940 002/013	0.940 42 001/005 0.940 - 0.940 STATION 42 - 12.85 MI. 156 DEG. IND.		0	01/12/81-10/12/81

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- INGESTION
SAMPLE - FEED & FORAGE - MILK PRODUCERS (COMMERCIAL)
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
RU-103	13	0.0310	0.093 0.093 - 0.093 001/013	0.093 42 001/005 0.093 - 0.093 STATION 42 - 12.85 MI 156 DEG. IND.		0	01/12/81-10/12/81
I-131	13	0.0310 LT	LT 0.200 LT 0.0500 -LT 0.200 000/030			0	01/12/81-10/12/81
CS-137	13	0.0470	0.100 0.008 - 0.118 002/013	0.118 42 CC1/005 0.118 - 0.118 STATION 42 - 12.85 MI. 156 DEG. IND.		0	01/12/81-10/12/81
CE-141	13	0.0470	0.114 0.114 - 0.114 001/013	0.114 42 001/005 0.114 - 0.114 STATION 42 - 12.85 MI. 156 DEG. IND.		0	01/12/81-10/12/81
CE-144	13	0.160	1.000 0.900 - 1.14 002/013	1.14 42 001/005 1.14 - 1.14 STATION 42 - 12.85 MI. 156 DEG. IND.		0	01/12/81-10/12/81
RA-226	13	0.0930 LT	LT 1.00 1.00 - LT 1.00 000/013			0	01/12/81-10/12/81
TH-228	13	0.120 LT	LT 0.100 0.100 -LT 0.100 000/013			0	01/12/81-10/12/81

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- INGESTION
SAMPLE - FOOD AND FEED 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 MEAN X E-00 RANGE STATION FRACTION STATION DESCRIPTION	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
CA MG/GM	8		0.59 0.0080 - 2.2 008/008	2.2 15 001/001 2.2 - 2.2 STATION 15 - 0.51 MI. 180 DEG. IND.		0	09/21/81-09/21/81
GR-B	8	6.0	11. 4.0 - 31. 008/008	31. 15 001/001 31. - 31. STATION 15 - 0.51 MI. 180 DEG. IND.		1	09/21/81-09/21/81
SR-89	8	0.60	LT 0.030 LT 0.0060 -LT 0.030 000/008			0	09/21/81-09/21/81
SR-90	8	0.60	0.012 0.0071 - 0.021 003/008	0.021 38 001/001 0.021 - 0.021 STATION 38 - 4.0 MI. 360 DEG. IND.		0	09/21/81-09/21/81
BE-7	8	1.20	0.672 0.370 - 1.15 003/008	1.15 41 001/001 1.15 - 1.15 STATION 41 - 8.4 MI. 11 DEG. IND.		0	09/21/81-09/21/81
K-40	8	0.930	7.09 2.22 - 21.4 008/008	21.4 41 001/001 21.4 - 21.4 STATION 41 - 8.4 MI. 11 DEG. IND.		0	09/21/81-09/21/81
I-131	8	0.120	LT 0.0900 LT 0.0200 -LT 0.0900 000/008			0	09/21/81-09/21/81

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	MEAN X E-00 RANGE STATION DESCRIPTION	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
CS-137	8	0.160	LT 0.0300 LT 0.00900-LT 0.0300 000/008				0	09/21/81-09/21/81

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 MEAN X E-00 STATION FRACTION STATION DESCRIPTION RANGE	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
GR-B	10	0.25	3.7 3.5 - 3.9 010/010	3.9 28 005/005 2.9 - 5.6 STATION 28 - 1.8 MI. 150 DEG. IND.		0	04/20/81-10/17/81
SR-89	10	0.030	LT 0.030 LT 0.030 -LT 0.030 000/010			0	04/20/81-10/17/81
SR-90	10	0.030	0.10 0.019 - 0.20 008/010	0.20 35 004/005 0.0025 - 0.76 STATION 35 - 2.0 MI. 350 DEG. CON.		0	04/20/81-10/17/81
K-40	10	0.470	2.64 2.58 - 2.70 010/010	2.70 28 005/005 2.48 - 3.08 STATION 28 - 1.9 MI. 150 DEG. IND.		0	04/20/81-10/17/81
I-131	10	0.0310	LT 0.0300 LT 0.0200 -LT 0.0300 000/010			0	04/20/81-10/17/81
CS-137	10	0.0310	LT 0.0200 LT 0.00900-LT 0.0200 000/010			0	04/20/81-10/17/81

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- INGESTION
SAMPLE - MILK COMMERCIAL PRODUCER
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 STATION DESCRIPTION	MEAN X E-00 RANGE	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
CA MG/gm	12		1.89 1.78 - 2.10 012/012	73 STATION 73 - 10.0 MI. 35 DEG. IND.	004/004 1.4 - 2.8		0	01/19/81-12/15/81
I-131	12	0.78	LT 0.30 LT 0.20 -LT 0.30 000/012				0	01/19/81-12/15/81
LOST (a)	1		LT 0.00000 LT 0.00000-LT 0.00000 000/002				0	01/19/81-01/19/81
SR-89	12	2.0	LT 2.0 LT 2.0 -LT 2.0 000/012				0	01/19/81-12/15/81
SR-90	12	1.4	3.69 3.50 - 3.78 012/012	73 STATION 73 - 10.0 MI. 35 DEG IND.	004/004 2.6 - 5.4	3.78	0	01/19/81-12/15/81
K-40	12	140.	1200. 1110. - 1250. 012/012	75 STATION 75 - 9.0 MI. 180 DEG. IND.	004/004 1110. - 1250.	1250.	0	01/19/81-12/15/81
I-131	12	0.780	LT 60.0 LT 10.0 -LT 60.0 000/012				0	01/19/81-12/15/81

(a) January 19, Station 75 - Milk sample lost; discarded by air freight because it leaked; resampled 01/27.

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 RANGE STATION FRACTION STATION DESCRIPTION	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
CS-137	12	9.00	LT 9.00 LT 7.00 -LT 9.00 000/012			0	01/19/81-12/15/81
TH-228	12	31.0	LT 10.0 LT 10.0 -LT 10.0 000/012			0	01/19/81-12/15/81

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- INGESTION
SAMPLE - M I L K 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 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	27		1.90 1.75 - 2.05 034/034	74 STATION 74 - 2.4 MI. 270 DEG. IND.	014/014 0.98 - 2.80 2.05		0	01/19/81-12/15/81
I-131	62	0.78	LT 0.50 LT 0.20 -LT 0.50 000/062				0	01/19/81-12/15/81
LOST (a)	1		LT 0.00000 LT 0.00000 -LT 0.00000 000/001				0	01/19/81-01/19/81
SR-89	27	2.0	LT 2.0 LT 2.0 -LT 2.0 000/027				0	01/19/81-12/15/81
SR-90	27	1.4	2.03 1.93 - 2.13 024/027	61 STATION 61 - 3.5 MI. 326 DEG. IND.	012/013 0.79 - 3.9 2.13		0	01/19/81-12/15/81
K-40	27	140.	1145. 1110. - 1190. 027/027	74 STATION 74 2.4 MI. 270 DEG. IND.	014/014 1020. - 1420. 1190.		0	01/19/81-12/15/81
I-131	27	0.780	LT 60.0 LT 10.0 -LT 60.0 000/027				0	01/19/81-12/15/81

(a) January 19, Station 61 - Milk sample lost; discarded by air freight because it leaked; resampled 01/16.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- INGESTION
SAMPLE - M I L K 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 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	27	9.00	LT 9.00 LT 7.00 -LT 9.00 000/027			0	01/19/81-12/15/81
TH-228	27	31.0	5.58 5.58 - 5.58 001/027	5.58 61 001/012 5.58 - 5.58 STATION 61 - 3.5 MI. 326 DEG. IND.		0	01/19/81-12/15/81

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 MEAN X E-00 RANGE STATION FRACTION STATION DESCRIPTION	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
GR-A	8	0.80	LT 5.0 LT 4.0 -LT 5.0 000/008			C	01/26/81-10/26/81
GR-B	8	1.4	8.8 8.3 - 9.4 008/008	9.4 11 004/004 7.3 - 11. STATION 11 - 0.15 MI. 225 DEG. IND.		0	01/26/81-10/26/81
I-131	8	9.00	LT 30.0 LT 20.0 -LT 30.0 000/008			0	01/26/81-10/26/81
CS-137	8	9.00	LT 7.00 LT 6.00 -LT 7.00 000/008			0	01/26/81-10/26/81
H-3	8	140.	180. 110. - 250. 007/008	250. 47 004/004 180. - 330. STATION 47 - 25.75 MI. 154 DEG. IND.		0	01/26/81-10/26/81

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	0.80	2.9 2.9 - 2.9 002/036	2.9 13 002/012 1.0 - 4.9 STATION 13 - 0.25 MI. 120 DEG. IND.	LT 4.0 LT 0.70 -LT 4.0 000/012	0	01/06/81-12/08/81
GR-A SUS	36	0.80	2.7 1.5 - 4.5 007/036	4.5 28 001/012 4.5 - 4.5 STATION 28 - 1.8 MI. 150 DEG. IND.	2.2 1.6 - 2.8 002/012	0	01/06/81-12/08/81
GR-B DIS	36	1.4	9.5 9.0 - 10. 033/036	10. 13 011/012 5.8 - 18. STATION 13 - 0.25 MI. 120 DEG. IND.	9.0 3.6 - 12. 011/012	0	01/06/81-12/08/81
GR-B SUS	36	1.4	3.9 3.6 - 4.3 033/036	4.3 28 011/012 1.2 - 11. STATION 28 - 1.8 MI. 150 DEG. IND.	3.7 1.3 - 8.4 010/012	0	01/06/81-12/08/81
SR-89	36	1.1	LT 2.0 LT 1.0 -LT 2.0 000/036		LT 2.0 LT 1.0 -LT 2.0 000/012	0	01/06/81-12/08/81
SR-90	36	0.93	LT 1.0 LT 0.90 -LT 1.0 000/036		LT 0.90 LT 0.60 -LT 0.90 000/012	0	01/06/81-12/08/81
I-131	12	9.00	LT 600. LT 500. -LT 600. 000/012		LT 500. LT 90.0 -LT 500. 000/004	0	01/06/81-12/08/81

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
CS-137	12	9.00	LT 9.00 LT 6.00 -LT 9.00 000/012		LT 6.00 LT 5.00 -LT 6.00 000/004	0	01/06/81-12/08/81
H-3	12	140.	300. 270. - 320. 012/012	320. 13 004/004 210. - 530. STATION 13 - 0.25 MI. 120 DEG. IND.	270. 200. - 340. 004/004	0	01/06/81-12/08/81

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 MEAN X E-00 RANGE STATION FRACTION STATION DESCRIPTION	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
I-131	4		LT 0.70 LT 0.30 -LT 0.70 000/004	BY CHEMICAL SEPARATION		0	11/05/81-11/09/81
SR-89	4		LT 0.20 LT 0.10 -LT 0.20 000/004			0	11/05/81-11/09/81
SR-90	4		0.12 0.11 - 0.13 004/004	0.13 28 002/002 0.086 - 0.18 STATION 28 - 1.8 MI. 150 DEG. IND.		0	11/05/81-11/09/81
K-40	4		3.11 3.01 - 3.21 004/004	3.21 28 002/002 2.96 - 3.46 STATION 28 - 1.8 MI. 150 DEG. IND.		0	11/05/81-11/09/81
I-131	4		LT 0.100 LT 0.0900 -LT 0.100 000/004	BY Ge(Li) SPECTROMETER		0	11/05/81-11/09/81
CS-137	4		LT 0.0600 LT 0.0400 -LT 0.0600 000/004			0	11/05/81-11/09/81

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		3.8 3.6 - 4.0 002/002	4.0 28 001/001 4.0 - 4.0 STATION 28 - 1.8 MI. 150 DEG. IND.		3.6 3.6 - 3.6 001/001	0	10/17/81-10/17/81
SR-89	2	LT 0.020	LT 0.020 LT 0.020 -LT 0.020 000/002			LT 0.020 LT 0.020 -LT 0.020 000/001	0	10/17/81-10/17/81
SR-90	2	LT 0.010	LT 0.010 LT 0.0080 -LT 0.010 000/002			LT 0.0080 LT 0.0080 -LT 0.0080 000/001	0	10/17/81-10/17/81
K-40	2		3.87 3.87 - 3.87 001/002	3.87 28 001/001 3.87 - 3.87 STATION 28 - 1.8 MI. 150 DEG. IND.		LT 2.00 LT 2.00 -LT 2.00 000/001	0	10/17/81-10/17/81
MN-54	2		0.350 0.303 - 0.398 002/002	0.398 28 001/001 0.398 - 0.398 STATION 28 - 1.8 MI. 150 DEG. IND.		0.303 0.303 - 0.303 001/001	0	10/17/81-10/17/81
CO-58	2		0.517 0.466 - 0.568 002/002	0.568 12 001/001 0.568 - 0.568 STATION 12 - 0.1 MI. 360 DEG. CCN.		0.568 0.568 - 0.568 001/001	0	10/17/81-10/17/81
CO-60	2		0.767 0.660 - 0.875 002/002	0.875 12 001/001 0.875 - 0.875 STATION 12 - 0.1 MI. 360 DEG. CCN.		0.875 0.875 - 0.875 001/001	0	10/17/81-10/17/81

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
I-131	2		LT 0.200 LT 0.200 -LT 0.200 000/002			LT 0.200 LT 0.200 -LT 0.200 000/001	0	10/17/81-10/17/81
CS-137	2		LT 0.100 LT 0.0900 -LT 0.100 000/002			LT 0.100 LT 0.100 -LT 0.100 000/001	0	10/17/81-10/17/81

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- AIRBORNE
SAMPLE - S O I L
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	MEAN X E-00 RANGE STATION DESCRIPTION	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
SR-90	11	0.020	0.16 0.079 - 0.20 009/011	08 STATION 08 - 2.5 MI. 260 DEG. IND.	001/001	0.20 0.20 - 0.20		0	09/21/81-09/21/81
BE-7	11	0.230	0.720 0.720 - 0.720 001/011	07 STATION 07 - 2.5 MI. 230 DEG. IND.	001/001	0.720 0.720 - 0.720		0	09/21/81-09/21/81
K-40	11	0.470	17.1 15.2 - 19.6 010/011	04 STATION 04 - 3.0 MI. 43 DEG. IND.	002/002	19.6 19.2 - 20.1		0	09/21/81-09/21/81
ZR-95	11	0.0780	0.131 0.131 - 0.131 001/011	07 STATION 07 - 2.5 MI. 230 DEG. IND.	001/001	0.131 0.131 - 0.131		0	09/21/81-09/21/81
I-131	11	0.0310 LT	LT 0.300 0.200 -LT 0.300 000/011					0	09/21/81-09/21/81
CS-137	11	0.0310	0.397 0.0937 - 0.652 011/011	05 STATION 05 - 3.5 MI. 102 DEG. IND.	002/002	0.652 0.587 - 0.718		0	09/21/81-09/21/81
RA-226	11	0.110	1.89 1.34 - 2.78 011/011	08 STATION 08 - 2.5 MI. 260 DEG. IND.	001/001	2.78 2.78 - 2.78		0	09/21/81-09/21/81

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

PATHWAY- AIRBORNE
SAMPLE - S O I L
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
TH-228	11	0.110	1.13 0.825 - 1.64 011/011	1.64 08 CC1/001 1.64 - 1.64 STATION 08 - 2.5 MI. 260 DEG. IND.		0	09/21/81-09/21/81

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 STATION FRACTION	MEAN X E-00 RANGE STATION DESCRIPTION	CONTROL LOCATION MEAN X E-00 RANGE FRACTION	NON-ROUTINE	REPORTING PERIOD
TLD	64	2mR	81	148				01/02/81 - 01/04/82
Exposure/year			71 - 148 064/064	STATION 01 01 0.1 MI. 225 DEG. IND.				

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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. 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 since July 1980 is summarized below:

1980	Third Quarter	0.029 pCi/Cu. M.
	October 16 Chinese Atmospheric Nuclear Tests	
	Fourth Quarter	0.053 pCi/Cu. M.
1981	First Quarter	0.130 pCi/Cu. M.
	Second Quarter	0.260 pCi/Cu. M.
	Third Quarter	0.053 pCi/Cu. M.
	Fourth Quarter	0.033 pCi/Cu. M.

It is indicated by these averages that the level of gross beta activity rose sharply after the Chinese atmospheric nuclear tests of October 16, 1980. The activity reached a high in the second quarter of 1981 and is now tapering off to a level similar to that before the tests. This trend has been observed in may areas of the United States. It may be concluded that this increased activity was caused by fallout from the Chinese nuclear tests and not from the operations of CNS.

The gross alpha activity (Tables B-1 through B-4) continues low and close to the limits of detection. This low gross alpha activity is probably due to alpha emitters found in soil and cosmogenic radiation.

One air particulate filter for the second quarter was not included in the averages because the blue paper was not removed and no air was drawn through the filter.

STATION	FILTER	COLLECTION PERIOD	REASON
09	AP	04/20 - 04/27	No air drawn through

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 1981
(JANUARY-MARCH)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 12/29/80-02/03/81	MONTHLY SUMMARY 02/03/81-03/02/81	MONTHLY SUMMARY 03/02/81-03/30/81	QUARTERLY SUMMARY 12/29/80-03/30/81
A. P. FILTERS GROSS BETA	01	1.0 ± 0.8 E-01	9.5 ± 1.2 E-02	1.6 ± 0.5 E-01	1.2 ± 0.6 E-01
	02	1.6 ± 0.7 E-01	1.3 ± 0.9 E-01	3.1 ± 1.2 E-01	2.1 ± 1.0 E-01
	03	1.3 ± 0.6 E-01	1.1 ± 0.2 E-01	1.7 ± 0.6 E-01	1.3 ± 0.5 E-01
	04	1.2 ± 0.5 E-01	1.2 ± 0.3 E-01	2.1 ± 0.8 E-01	1.5 ± 0.7 E-01
	05	8.0 ± 3.0 E-02	5.1 ± 0.8 E-02	4.5 ± 3.3 E-02	6.1 ± 3.1 E-02
	06	1.2 ± 0.6 E-01	1.3 ± 0.6 E-01	1.7 ± 0.5 E-01	1.4 ± 0.6 E-01
	07	1.2 ± 0.5 E-01	8.2 ± 1.3 E-02	7.6 ± 2.0 E-02	9.5 ± 3.7 E-02
	08	1.2 ± 1.0 E-01	1.3 ± 0.5 E-01	2.6 ± 1.0 E-01	1.8 ± 0.9 E-01
	09	9.0 ± 4.0 E-02	7.3 ± 3.2 E-02	7.5 ± 2.0 E-02	7.8 ± 3.2 E-02
	10	1.6 ± 1.7 E-01	1.2 ± 0.3 E-01	2.1 ± 0.5 E-01	1.6 ± 1.1 E-01
GROSS BETA	01-10	1.2 ± 0.8 E-01	1.0 ± 0.4 E-01	1.7 ± 1.0 E-01	1.3 ± 0.8 E-01
		$\bar{x}$ and s			Grand $\bar{x}$ and s

TABLE A-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATH - AIRBORNE

AIR PARTICULATE FILTERS

pCi/Cu. M.

WEEKLY COLLECTIONS
SECOND QUARTER 1981
(APRIL-JUNE)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 03/30/81-04/27/81	MONTHLY SUMMARY 04/27/81-06/01/81	MONTHLY SUMMARY 06/01/81-06/29/81	QUARTERLY SUMMARY 03/30/81-06/29/81
A.P. FILTERS GROSS BETA	01	2.5 ± 0.8 E-01	3.5 ± 0.6 E-01	2.6 ± 1.1 E-01	2.9 ± 0.9 E-01
	02	3.7 ± 0.5 E-01	3.5 ± 0.6 E-01	2.0 ± 0.6 E-01	3.1 ± 1.0 E-01
	03	2.7 ± 0.7 E-01	2.6 ± 0.7 E-01	1.2 ± 0.3 E-01	2.2 ± 0.9 E-01
	04	3.2 ± 0.7 E-01	3.4 ± 0.6 E-01	1.9 ± 0.5 E-01	2.8 ± 0.9 E-01
	05	2.7 ± 1.6 E-01	3.5 ± 0.8 E-01	1.9 ± 0.6 E-01	2.8 ± 1.2 E-01
	06	2.9 ± 0.7 E-01	3.1 ± 0.6 E-01	1.8 ± 0.4 E-01	2.6 ± 0.8 E-01
	07	1.7 ± 1.1 E-01	2.7 ± 0.6 E-01	1.3 ± 0.4 E-01	1.9 ± 0.9 E-01
	08	3.2 ± 0.6 E-01	3.0 ± 0.5 E-01	1.7 ± 0.5 E-01	2.7 ± 0.8 E-01
	09	1.4 ± 1.1 E-01 (a)	3.1 ± 0.6 E-01	1.9 ± 0.5 E-01	2.2 ± 1.0 E-01
	10	3.5 ± 0.5 E-01	2.7 ± 0.6 E-01	1.4 ± 0.4 E-01	2.6 ± 0.9 E-01
GROSS BETA	01-10	2.8 ± 1.0 E-01	3.1 ± 0.7 E-01	1.7 ± 0.6 E-01	2.6 ± 1.0 E-01
		$\bar{x}$ and s			Grand $\bar{x}$ and s

(a) Week of 04/20-04/27 not included in averages; no flow of air, blocked by blue paper.

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 1981
(JULY-SEPTEMBER)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 06/29/81-08/03/81	MONTHLY SUMMARY 08/03/81-08/31/81	MONTHLY SUMMARY 08/31/81-09/28/81	QUARTERLY SUMMARY 06/29/81-09/28/81
A.P. FILTERS GROSS BETA	01	8.3 ± 4.8 E-02	6.4 ± 1.5 E-02	3.6 ± 0.5 E-02	6.3 ± 3.5 E-02
	02	7.9 ± 6.1 E-02	6.2 ± 1.6 E-02	4.6 ± 0.5 E-02	6.3 ± 3.9 E-02
	03	5.5 ± 2.1 E-02	5.5 ± 1.8 E-02	2.6 ± 0.3 E-02	4.6 ± 2.1 E-02
	04	7.3 ± 4.7 E-02	4.8 ± 1.2 E-02	4.3 ± 0.2 E-02	5.6 ± 0.3 E-02
	05	6.6 ± 3.9 E-02	4.1 ± 0.9 E-02	2.9 ± 0.2 E-02	4.7 ± 2.8 E-02
	06	7.3 ± 4.5 E-02	5.2 ± 1.3 E-02	3.3 ± 1.1 E-02	5.4 ± 3.2 E-02
	07	4.1 ± 3.0 E-02	1.9 ± 0.3 E-02	9.6 ± 2.9 E-03	2.4 ± 2.2 E-02
	08	7.7 ± 4.5 E-02	4.7 ± 1.0 E-02	3.0 ± 0.3 E-02	5.3 ± 3.3 E-02
	09	7.1 ± 4.1 E-02	5.7 ± 1.3 E-02	3.7 ± 0.1 E-02	5.6 ± 2.8 E-02
	10	5.6 ± 3.1 E-02	4.4 ± 0.9 E-02	2.8 ± 0.4 E-02	4.4 ± 2.2 E-02
GROSS BETA	01-10	7.3 ± 6.0 E-02	4.9 ± 1.7 E-02	3.1 ± 1.2 E-02	5.3 ± 3.8 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 1981
(OCTOBER-DECEMBER)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 09/28/81-11/02/81	MONTHLY SUMMARY 11/02/81-11/30/81	MONTHLY SUMMARY 11/30/81-12/28/81	QUARTERLY SUMMARY 09/28/81-12/28/81
A.P. FILTERS GROSS BETA	01	3.4 ± 0.5 E-02	3.2 ± 0.8 E-02	2.7 ± 0.9 E-02	3.1 ± 0.7 E-02
	02	3.2 ± 0.6 E-02	3.5 ± 0.6 E-02	3.9 ± 1.4 E-02	3.5 ± 0.9 E-02
	03	2.9 ± 0.7 E-02	2.9 ± 0.5 E-02	3.3 ± 1.0 E-02	3.1 ± 0.7 E-02
	04	3.5 ± 0.8 E-02	3.6 ± 0.8 E-02	4.1 ± 1.3 E-02	3.7 ± 0.9 E-02
	05	3.3 ± 0.4 E-02	3.1 ± 0.9 E-02	2.9 ± 1.0 E-02	3.1 ± 0.7 E-02
	06	3.0 ± 0.4 E-02	3.3 ± 0.8 E-02	3.5 ± 1.3 E-02	3.3 ± 0.8 E-02
	07	3.0 ± 0.4 E-02	3.2 ± 0.6 E-02	3.6 ± 1.4 E-02	3.2 ± 0.9 E-02
	08	2.8 ± 0.3 E-02	3.2 ± 0.7 E-02	3.5 ± 0.9 E-02	3.1 ± 0.7 E-02
	09	3.2 ± 0.5 E-02	3.1 ± 0.7 E-02	3.0 ± 0.8 E-02	3.1 ± 0.6 E-02
	10	3.3 ± 0.5 E-02	3.5 ± 0.7 E-02	3.3 ± 0.9 E-02	3.3 ± 0.6 E-02
GROSS BETA	01-10	3.2 ± 0.5 E-02	3.3 ± 0.6 E-02	3.4 ± 1.1 E-02	3.3 ± 0.8 E-02
		$\bar{x} \pm s$			Grand $\bar{x} \pm s$

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 1981
(JANUARY-MARCH)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 12/29/80-02/03/81	MONTHLY SUMMARY 02/03/81-03/02/81	MONTHLY SUMMARY 03/02/81-03/30/81	QUARTERLY SUMMARY 12/29/80-03/30/81
A.P. FILTERS GROSS ALPHA	01	1.9 ± 0.7 E-03	1.7 ± 0.5 E-03	2.3 ± 0.5 E-03	2.0 ± 0.6 E-03
	02	2.2 ± 0.9 E-03	2.7 ± 2.1 E-03	2.7 ± 1.2 E-03	2.5 ± 1.3 E-03
	03	2.2 ± 0.8 E-03	2.0 ± 0.7 E-03	2.1 ± 0.2 E-03	2.1 ± 0.6 E-03
	04	2.2 ± 0.8 E-03	2.2 ± 0.7 E-03	2.2 ± 0.4 E-03	2.2 ± 0.6 E-03
	05	1.9 ± 0.5 E-03	1.7 ± 0.5 E-03	2.0 ± 0.0 E-03	1.8 ± 0.4 E-03
	06	2.1 ± 1.0 E-03	2.5 ± 1.3 E-03	2.8 ± 1.3 E-03	2.4 ± 1.1 E-03
	07	2.0 ± 0.6 E-03	1.9 ± 0.3 E-03	2.3 ± 0.5 E-03	2.0 ± 0.5 E-03
	08	1.9 ± 0.5 E-03	2.3 ± 0.7 E-03	3.2 ± 2.4 E-03	2.4 ± 1.4 E-03
	09	2.2 ± 1.1 E-03	1.6 ± 0.6 E-03	2.2 ± 0.3 E-03	2.0 ± 0.8 E-03
	10	3.2 ± 2.0 E-03	2.7 ± 0.9 E-03	2.3 ± 0.7 E-03	2.8 ± 1.3 E-03
GROSS ALPHA	01-10	2.2 ± 1.0 E-03	2.1 ± 0.9 E-03	2.4 ± 0.9 E-03	2.2 ± 1.0 E-03
		$\bar{x}$ and s			Grand $\bar{x}$ and s

TABLE B-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

AIR PARTICULATE FILTERS

pCi/Cu. M.

WEEKLY COLLECTIONS
SECOND QUARTER 1981
(APRIL-JUNE)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 03/31/81-04/27/81	MONTHLY SUMMARY 04/27/81-06/01/81	MONTHLY SUMMARY 06/01/81-06/29/81	QUARTERLY SUMMARY 03/30/81-06/29-81
A.P. FILTERS GROSS ALPHA	01	2.2 ± 0.3 E-03	2.6 ± 0.7 E-03	1.7 ± 0.5 E-03	2.2 ± 0.6 E-03
	02	1.9 ± 0.6 E-03	1.5 ± 0.8 E-03	1.8 ± 0.8 E-03	1.8 ± 0.5 E-03
	03	2.7 ± 2.1 E-03	2.0 ± 0.5 E-03	1.2 ± 0.3 E-03	2.0 ± 1.2 E-03
	04	1.8 ± 0.4 E-03	1.8 ± 0.4 E-03	1.9 ± 0.2 E-03	1.8 ± 0.3 E-03
	05	2.2 ± 0.4 E-03	2.4 ± 0.4 E-03	1.3 ± 0.5 E-03	2.0 ± 0.6 E-03
	06	1.9 ± 0.6 E-03	1.6 ± 0.5 E-03	1.4 ± 0.5 E-03	1.6 ± 0.5 E-03
	07	1.7 ± 0.5 E-03	1.8 ± 0.4 E-03	1.8 ± 0.6 E-03	1.8 ± 0.5 E-03
	08	1.8 ± 0.6 E-03	1.9 ± 0.8 E-03	1.7 ± 0.5 E-03	1.8 ± 0.6 E-03
	09	1.5 ± 0.6 E-03 (a)	2.0 ± 0.1 E-03	1.6 ± 0.4 E-03	1.7 ± 0.4 E-03
	10	2.4 ± 0.4 E-03	2.9 ± 0.7 E-03	2.3 ± 1.1 E-03	2.5 ± 0.8 E-03
GROSS ALPHA	01-10	2.0 ± 0.8 E-03	2.1 ± 0.6 E-03	1.7 ± 0.6 E-03	1.9 ± 0.7 E-03
		$\bar{x}$ and s			Grand $\bar{x}$ and s

(a) Week of 04/20-04/27 not included in averages; no flow of air, blocked by blue paper.

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 1981
(JULY-SEPTEMBER)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 06/29/81-08/03/81	MONTHLY SUMMARY 08/03/81-08/31/81	MONTHLY SUMMARY 08/31/81-09/28/81	QUARTERLY SUMMARY 06/29/81-09/28/81
AP FILTERS GROSS ALPHA	01	1.5 ± 0.5 E-03	1.8 ± 0.5 E-03	2.1 ± 0.5 E-03	1.7 ± 0.5 E-03
	02	1.4 ± 0.5 E-03	2.1 ± 0.7 E-03	2.3 ± 0.9 E-03	1.9 ± 0.8 E-03
	03	1.1 ± 0.2 E-03	2.1 ± 0.6 E-03	1.9 ± 0.7 E-03	1.7 ± 0.7 E-03
	04	1.5 ± 0.6 E-03	1.6 ± 0.5 E-03	1.9 ± 0.2 E-03	1.6 ± 0.5 E-03
	05	1.2 ± 0.2 E-03	1.7 ± 0.5 E-03	2.2 ± 0.8 E-03	1.6 ± 0.7 E-03
	06	1.6 ± 0.5 E-03	1.7 ± 0.5 E-03	2.2 ± 0.9 E-03	1.8 ± 0.7 E-03
	07	1.2 ± 0.3 E-03	1.6 ± 0.5 E-03	1.6 ± 0.5 E-03	1.4 ± 0.5 E-03
	08	2.8 ± 2.2 E-03	2.0 ± 0.0 E-03	2.1 ± 0.8 E-03	2.3 ± 1.4 E-03
	09	1.2 ± 0.3 E-03	1.9 ± 0.2 E-03	1.9 ± 0.6 E-03	1.6 ± 0.5 E-03
	10	1.6 ± 0.7 E-03	1.8 ± 0.7 E-03	1.7 ± 0.3 E-03	1.7 ± 0.6 E-03
GROSS ALPHA	01-10	1.5 ± 0.9 E-03	1.8 ± 0.5 E-03	2.0 ± 0.6 E-03	1.8 ± 0.7 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 1981
(OCTOBER-DECEMBER)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 09/28/81-11/02/81	MONTHLY SUMMARY 11/02/81-11/30/81	MONTHLY SUMMARY 11/30/81-12/28/81	QUARTERLY SUMMARY 09/28/81-12/28/81
A.P. FILTERS GROSS ALPHA	01	2.0 ± 0.5 E-03	1.2 ± 0.7 E-03	2.0 ± 0.2 E-03	2.0 ± 0.5 E-03
	02	1.7 ± 0.6 E-03	1.7 ± 0.5 E-03	2.2 ± 0.5 E-03	1.8 ± 0.6 E-03
	03	1.9 ± 0.6 E-03	2.3 ± 0.4 E-03	1.6 ± 0.4 E-03	1.9 ± 0.5 E-03
	04	2.0 ± 0.3 E-03	2.0 ± 0.1 E-03	2.6 ± 0.4 E-03	2.2 ± 0.4 E-03
	05	1.4 ± 0.5 E-03	2.2 ± 0.7 E-03	1.8 ± 0.6 E-03	1.8 ± 0.6 E-03
	06	1.7 ± 0.7 E-03	1.7 ± 0.5 E-03	2.3 ± 0.7 E-03	1.9 ± 0.6 E-03
	07	1.9 ± 0.6 E-03	2.3 ± 0.4 E-03	2.0 ± 0.3 E-03	2.0 ± 0.5 E-03
	08	1.8 ± 0.5 E-03	2.1 ± 0.9 E-03	2.1 ± 0.2 E-03	2.0 ± 0.6 E-03
	09	1.6 ± 0.5 E-03	1.8 ± 0.6 E-03	2.0 ± 0.3 E-03	1.8 ± 0.5 E-03
	10	2.1 ± 0.8 E-03	1.9 ± 0.6 E-03	3.0 ± 0.8 E-03	2.3 ± 0.9 E-03
GROSS ALPHA	01-10	1.8 ± 0.6 E-03	2.0 ± 0.5 E-03	2.1 ± 0.6 E-03	2.0 ± 0.6 E-03
		$\bar{x}$ and s			Grand $\bar{x}$ 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 1981 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 for all 10 stations. No airborne I-131 was detected; all results were at or below the minimum level of detection.

The fact that no airborne I-131 was detected in charcoal filters during 1981 supports the fact that the increase in beta activity, summarized in Parts A and B was due to the Chinese atmospheric nuclear tests and not from any releases by 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 1981
(JANUARY-MARCH)

SAMPLE NUCLIDE	STATION NUMBER	MEAN AND STANDARD DEVIATION				
		MONTHLY SUMMARY 12/29/80-02/03/81	MONTHLY SUMMARY 02/03/81-03/02/81	MONTHLY SUMMARY 03/02/81-03/03/81	QUARTERLY SUMMARY 12/29/80-03/30/81	DET/ TOTAL / RANGE
Charcoal Filters I-131	01	L.T. 4. E-02	L.T. 7. E-02	L.T. 3. E-02	L.T. 6. E-02	0/13 (L.T.3.-L.T.6.)E-02
	02	L.T. 4. E-02	L.T. 6. E-02	L.T. 3. E-02	L.T. 6. E-02	0/13 (L.T.3.-L.T.6.)E-02
	03	L.T. 4. E-02	L.T. 6. E-02	L.T. 3. E-02	L.T. 6. E-02	0/13 (L.T.3.-L.T.6.)E-02
	04	L.T. 4. E-02	L.T. 6. E-02	L.T. 3. E-02	L.T. 6. E-02	0/13 (L.T.3.-L.T.6.)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.3.-L.T.5.)E-02
	06	L.T. 4. E-02	L.T. 6. E-02	L.T. 4. E-02	L.T. 6. E-02	0/13 (L.T.4.-L.T.6.)E-02
	07	L.T. 4. E-02	L.T. 6. E-02	L.T. 4. E-02	L.T. 6. E-02	0/13 (L.T.4.-L.T.6.)E-02
	08	L.T. 5. E-02	L.T. 6. E-02	L.T. 4. E-02	L.T. 6. E-02	0/13 (L.T.4.-L.T.6.)E-02
	09	L.T. 4. E-02	L.T. 6. E-02	L.T. 4. E-02	L.T. 6. E-02	0/13 (L.T.4.-L.T.6.)E-02
	10	L.T. 3. E-02	L.T. 4. E-02	L.T. 2. E-02	L.T. 4. E-02	0/13 (L.T.2.-L.T.4.)E-02
	01-10	L.T. 5. E-02	L.T. 6. E-02	L.T. 4. E-02	L.T. 6. 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.4.-L.T.6.)E-02	(L.T.2.-L.T.4.)E-02	(L.T.4.-L.T.6.)E-02	- -

TELEDYNE ISOTOPES

TABLE C-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

CHARCOAL FILTERS

pCi/Cu.M.

WEEKLY COLLECTIONS
SECOND QUARTER 1981
(APRIL-JUNE)

SAMPLE NUCLIDE	STATION NUMBER	MEAN AND STANDARD DEVIATION				
		MONTHLY SUMMARY 03/30/81-04/27/81	MONTHLY SUMMARY 04/27/81-06/01/81	MONTHLY SUMMARY 06/01/81-06/29/81	QUARTERLY SUMMARY 03/30/81-06/29/81	DET/ TOTAL	RANGE
Charcoal Filters I-131	01	L.T. 3. 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
	02	L.T. 3. 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
	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. 4. 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. 3. E-02	L.T. 3. E-02	L.T. 3. E-02	L.T. 3. E-02	0/13	-
	06	L.T. 4. E-02	L.T. 5. E-02	L.T. 4. E-02	L.T. 5. E-02	0/13	(L.T.4.-L.T.5.)E-02
	07	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	0/13	-
	08	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	0/13	-
	09	L.T. 4. E-02	L.T. 5. 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. 2. 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. 4. E-02	L.T. 5. E-02	L.T. 4. E-02	L.T. 5. E-02	-	-
	DET./TOTAL	0/40	0/50	0/40	0/130	0/130	-
	RANGE	(L.T.2.-L.T.4.)E-02	(L.T.3.-L.T.5.)E-02	(L.T.2.-L.T.4.)E-02	(L.T.3.-L.T.5.)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 1981
(JULY-SEPTEMBER)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 06/29/81-08/03/81	MONTHLY SUMMARY 08/03/81-08/31/81	MONTHLY SUMMARY 08/31/81-09/28/31	QUARTERLY SUMMARY 06/29/81-09/28/81	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. 3. 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. 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
	04	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
	05	L.T. 3. 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
	06	L.T. 4. E-02	L.T. 4. E-02	L.T. 1.4 E-01	L.T. 1.4 E-01	0/13	(L.T.0.4-L.T.1.4)E-01
	07	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	0/13	--
	08	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	0/13	(L.T.1.-L.T.4.)E-02
	09	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	0/13	--
	10	L.T. 2. E-02	L.T. 3. 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. 4. E-02	L.T. 4. E-02	L.T. 7. E-02	L.T. 7. E-02	--	--
	DET./TOTAL	0/50	0/40	0/40	0/130	0/130	--
	RANGE	(L.T2.-L.T.4.)E-02	(L.T.3.-L.T.4.)E-02	(L.T.3.-L.T.4.)E-02	(L.T.3.-L.T.7.)E-02	--	--

TELEDYNE ISOTOPES

TABLE C-4

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

CHARCOAL FILTERS

pCi/Cu. M.

WEEKLY COLLECTIONS
FOURTH QUARTER 1981
(OCTOBER-DECEMBER)

SAMPLE NUCLIDE	STATION NUMBER	MONTHLY SUMMARY 09/28/81-11/02/81	MONTHLY SUMMARY 11/02/81-11/30/81	MONTHLY SUMMARY 11/30/81-12/28/81	QUARTERLY SUMMARY 09/28/81-12/28/81	DET TOTAL	RANGE
Charcoal Filters I-131	01	L.T. 4. E-02	L.T. 5. E-02	L.T. 5. E-02	L.T. 5. E-02	0/13	(L.T.3.-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.3.-L.T.5.)E-02
	03	L.T. 4. E-02	L.T. 5. E-02	L.T. 5. E-02	L.T. 5. E-02	0/13	(L.T.3.-L.T.5.)E-02
	04	L.T. 4. E-02	L.T. 5. E-02	L.T. 5. 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. 4. E-02	L.T. 4. E-02	L.T. 4. E-02	0/13	(L.T.3.-L.T.4.)E-02
	06	L.T. 4. E-02	L.T. 6. E-02	L.T. 5. E-02	L.T. 6. E-02	0/13	(L.T.3.-L.T.6.)E-02
	07	L.T. 4. E-02	L.T. 7. E-02	L.T. 5. E-02	L.T. 7. E-02	0/13	(L.T.2.-L.T.7.)E-02
	08	L.T. 4. E-02	L.T. 6. E-02	L.T. 5. E-02	L.T. 6. E-02	0/13	(L.T.2.-L.T.6.)E-02
	09	L.T. 4. E-02	L.T. 6. E-02	L.T. 5. 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. 3. E-02	L.T. 3. E-02	L.T. 3. E-02	0/13	(L.T.1.-L.T.3.)E-02
	01-10	L.T. 4. 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					--	--

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 1981.

During the first two quarters there were detections of the fission product nuclides Zr-95, Ru-103, Ru-106, Cs-137, Ce-141 and Ce-144 at almost all 10 stations. These detections reached a peak in the second quarter of 1981 dropping off considerably in the third quarter and entirely in the fourth quarter. These nuclides are a continuing trend from the fourth quarter of 1980 and occurred after the Chinese atmospheric nuclear tests of October 16, 1980. This same trend was noted in other areas of the United States which lends support to the conclusion that they are due to the Chinese nuclear test.

There were two detections of Co-60 at station 01 and 02 during the second quarter and eight detections of Mn-54. Upon further testing of the composite of Station 01, it was found that the detection of Co-60 was for the period June 22 through June 29. This correlates with the period of maximum fallout from the Chinese nuclear tests. The detections of Mn-54 were low being slightly above detection level. Berillium-7, which is naturally occurring, was detected at all stations at about the same level as previously.

The average of gross beta measurements for all stations reached a maximum of 0.260 pCi/Cu.M. during the second quarter of 1981 and fell to a level of 0.033 pCi/Cu. M. by the end of 1981. The I-131 measured in charcoal filters in series with the air particulate filter remained below the limit of detection. There was no correlation between the level of activity and the stations close to the plant. This would tend to support the conclusion that the nuclides detected were from the Chinese test of October 16, 1980 and were not associated with 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 12/29/80-03/30/81	2nd Quarter 03/30/81-06/29/81	3rd Quarter 06/29/81-09/28/81	4th Quarter 09/28/81-12/28/81
Be-7	01-10	Mean±std.dev. det./total range	7.8 ±3.2 E-02 10/10 (2.7-12.6)E-02	1.3 ±0.2 E-01 10/10 (0.97-1.6)E-01	1.0 ±0.4 E-01 10/10 (0.32-1.0)E-01	1.1 ±0.1 E-01 10/10 (0.8-1.3)E-01
Mn-54	01-10	Mean±std.dev. det./total range	L.T. 9. E-04 0/10 --	1.7 ±0.3 E-03 8/10 (1.4-2.3)E-03	L.T. 8. E-04 0/10 --	L.T. 8. E-04 0/10 --
Co-60	01-10	Mean±std.dev. det./total range	L.T. 9. E-04 0/10 --	1.8 ±2.0 E-02 2/10 (0.3-3.2)E-02	L.T. 7. E-04 0/10 --	L.T. 8. E-04 0/10 --
Zr-95	01-10	Mean±std.dev. det./total range	5.0±2.4 E-02 10/10 (1.4-8.0)E-02	6.1 ±2.7 E-02 10/10 (2.5-10.1)E-02	L.T. 2. E-03 0/10 --	L.T. 2. E-03 0/10 --
Ru-103	01-10	Mean±std.dev. det./total range	2.0 ±1.0 E-02 10/10 (0.63-3.8)E-02	1.7 ±0.3 E-02 10/10 (1.2-2.3)E-02	2.2 ±1.3 E-02 1/10 --	L.T. 2. E-03 0/10 --
Ru-106	01-10	Mean±std.dev. det./total range	L.T. 1. E-02 0/10 --	1.8 ±0.3 E-02 9/10 (1.4-2.2)E-02	L.T. 7. E-03 0/10 --	L.T. 8. E-03 0/10 --
Cs-137	01-10	Mean±std.dev. det./total range	1.1 ±0.2 E-03 4/10 (0.8-1.3)E-03	3.0 ±0.6 E-03 10/10 (1.8-3.7)E-03	1.2 ±0.3 E-03 5/10 (0.86-1.6)E-03	L.T. 8. E-04 0/10 --
Cs-141	01-10	Mean±std.dev. det./total range	1.4 ±0.5 E-02 10/10 (0.63-2.4)E-02	8.8 ±1.8 E-03 10/10 (0.6-1.1)E-02	L.T. 4. E-03 0/10 --	L.T. 5. E-03 0/10 --
Ce-144	01-10	Mean±std.dev. det./total range	1.4 ±0.5 E-02 10/10 (0.7-2.3)E-02	4.8 ±0.9 E-02 10/10 (3.6-6.3)E-02	8.6 ±2.2 E-03 5/10 (6.0-11.0)E-03	L.T. 6. E-03 0/10 --

Note: Only nuclides with 2 or more detections during any of the four quarters are listed above.
See Table D-2 for gamma emitter nuclides below the limits of detection.

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	FIRST QUARTER 12/29/80-03/30/81	SECOND QUARTER 03/30/81-06/29/81	THIRD QUARTER 06/29/81-09/28/81	FOURTH QUARTER 09/28/81-12/28/81
Be-7	01-10	7.8 ± 3.2 E-02(10/10)	1.3 ±0.2 E-01(10/10)	1.0 ±0.4 E-01(10/10)	1.1 ±0.1 E-01(10/10)
K-40	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. 2. E-02(0/10)
Mn-54	01-10	L.T. 9. E-04(0/10)	1.7 ±0.3 E-03(8/10)	L.T. 8. E-04(0/10)	L.T. 8. E-04(0/10)
Co-58	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)
Fe-59	01-10	L.T. 3. E-03(0/10)	L.T. 5. E-03(0/10)	L.T. 4. E-03(0/10)	L.T. 4. E-03(0/10)
Co-60	01-10	L.T. 9. E-04(0/10)	1.8 ±2.0 E-02(2/10)	L.T. 4. E-03(0/10)	L.T. 8. E-04(0/10)
Zn-65	01-10	L.T. 2. 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)
Zr-95	01-10	5.0 ±2.4 E-02(10/10)	6.1 ±2.7 E-02(10/10)	L.T. 2. E-03(0/10)	L.T. 2. E-03(0/10)
Ru-103	01-10	2.0 ±1.0 E-02(10/10)	1.7 ± 0.3 E-02(10/10)	2.2 ± 1.3 E-02(1/10)	L.T. 2. E-03(0/10)
Ru-106	01-10	L.T. 1. E-02(0/10)	1.8 ±0.3 E-02(9/10)	L.T. 7. E-03(0/10)	L.T. 8. E-03(0/10)
I-131	01-10	L.T. 2. E-01(0/10)	L.T. 3. E-01(0/10)	L.T. 4. E-01(0/10)	L.T. 4. E-01(0/10)
Cs-134	01-10	L.T. 9. E-04(0/10)	L.T. 8. E-04(0/10)	L.T. 7. E-04(0/10)	L.T. 8. E-04(0/10)
Cs-137	01-10	1.1 ±0.2 E-03(4/10)	3.0 ±0.6 E-03(10/10)	1.2 ±0.3 E-03(5/10)	L.T. 8. E-04(0/10)
Ba-140	01-10	L.T. 2. E-02(0/10)	L.T. 4. E-02(0/10)	L.T. 3. E-02(0/10)	L.T. 4. E-02(0/10)
Cs-141	01-10	1.4 ±0.5 E-02(10/10)	8.8 ±1.8 E-03(10/10)	L.T. 4. E-03(0/10)	L.T. 5. E-03(0/10)
Ce-144	01-10	1.4 ±0.5 E-02(10/10)	4.8 ±0.9 E-02(10/10)	8.6 ±2.2 E-03(9/10)	L.T. 6. E-03(0/10)
Ra-226	01-10	L.T. 1. E-02(0/10)	L.T. 2. E-02(0/10)	L.T. 1. E-02(0/10)	L.T. 2. E-02(0/10)
Th-228	01-10	L.T. 2. E-03(0/10)	L.T. 2. E-03(0/10)	L.T. 1. E-03(0/10)	L.T. 2. E-03(0/10)

TELEDYNE ISOTOPES

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 1.5 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 minimum level of detection. There were no detections of Sr-89 and 3 detections of Sr-90 in 16 samples at a level of 0.0017 pCi per gram, wet, which is below the minimum level of detection. The level of elemental calcium in 16 samples was 0.14 mg per gram which is similar to the levels of previous years.

There is 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 01/12/81	2nd Quarter 04/13/81	3rd Quarter 07/20/81	4th Quarter 10/19/81
Gross Beta	42,51,67,76	Mean±std.dev. det./total range	1.1 ± 0.6 E 00 4/4 (0.7-2.0)E 00	2.1 ± 0.4 E 00 4/4 (1.6-2.5)E 00	1.1 ± 0.4 E 00 4/4 (0.8-1.6)E 00	2.0 ± 0.8 E 00 4/4 (1.0-2.9)E 00
Sr-89	42,51,67,76	Mean±std.dev. det./total range	L.T. 5. E-03 0/4 -	L.T. 6. E-03 0/4 -	L.T. 6. E-03 0/4 -	L.T. 6. E-03 0/4 -
Sr-90	42,51,67,76	Mean±std.dev. det./total range	1.7 ± 0.2 E-03 2/4 (1.6-1.8)E-03	1.9 ± 1.3 E-03 1/4 -	L.T. 4. E-03 0/4 -	L.T. 3. E-03 0/4 -
Ca (elem.) mg./gm.	42,51,67,76	Mean±std.dev. det./total range	4.1 ± 1.2 E-02 4/4 (2.9-5.5)E-02	6.3 ± 2.4 E-02 4/4 (3.9-9.3)E-02	1.2 ± 0.6 E-01 4/4 (0.6-1.7)E-01	3.8 ± 0.2 E-01 4/4 (1.4-5.9)E-01
K-40	42,51,67,76	Mean±std.dev. det./total range	1.0±0.1 E 00 4/4 (0.9-1.2)E 00	8.7 ± 0.7 E-01 4/4 (8.1-9.5)E-01	1.2 ± 0.1 E 00 4/4 (1.1-1.3)E 00	1.0 ± 0.1 E 00 4/4 (0.84-1.1)E 00

Note: No gamma activity above the limits of detection was monitored in eggs except for K-40. See Table E-2 for other gamma emitter nuclides monitored below the limits of detection.

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 01/12/81	2nd quarter 04/13/81	3rd quarter 07/20/81	4th quarter 10/19/81
Be-7	42,51,67,76	L.T. 8. E-02 (0/4)	L.T. 7. E-02 (0/4)	L.T. 6. E-02 (0/4)	L.T. 6. E-02 (0/4)
K-40	42,51,67,76	1.0 +-0.1 E 00 (4/4)	8.7 +- 0.7E-01 (4/4)	1.2 +-0.1 E 00 (4/4)	1.0 +-0.1 E 00 (4/4)
Mn-54	42,51,67,76	L.T. 8. E-03 (0/4)	L.T. 7. E-03 (0/4)	L.T. 6. 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. 7. E-03 (0/4)	L.T. 7. 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 (0/4)	L.T. 1. 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. 8. E-03 (0/4)	L.T. 7. E-03 (0/4)	L.T. 6. E-03 (0/4)
Zn-65	42,51,67,76	L.T. 2. E-02 (0/4)	L.T. 2. E-02 (0/4)	L.T. 1. E-02 (0/4)	L.T. 1. E-02 (0/4)
Zr-95	42,51,67,76	L.T. 8. E-03 (0/4)	L.T. 8. E-03 (0/4)	L.T. 7. E-03 (0/4)	L.T. 7. E-03 (0/4)
Ru-103	42,51,67,76	L.T. 1. E-02 (0/4)	L.T. 8. E-03 (0/4)	L.T. 7. 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. 7. E-02 (0/4)	L.T. 6. 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 (0/4)	L.T. 1. E-02 (0/4)	L.T. 2. E-02 (0/4)
Cs-134	42,51,67,76	L.T. 1. E-02 (0/4)	L.T. 8. E-03 (0/4)	L.T. 7. E-03 (0/4)	L.T. 7. E-03 (0/4)
Cs-137	42,51,67,76	L.T. 9. E-03 (0/4)	L.T. 8. E-03 (0/4)	L.T. 7. 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. 9. E-03 (0/4)	L.T. 1. E-02 (0/4)	L.T. 1. E-02 (0/4)
Ce-141	42,51,67,76	L.T. 2. E-02 (0/4)	L.T. 1. E-02 (0/4)	L.T. 1. E-02 (0/4)	L.T. 1. E-02 (0/4)
Ce-144	42,51,67,76	L.T. 8. E-02 (0/4)	L.T. 6. E-02 (0/4)	L.T. 6. E-02 (0/4)	L.T. 6. E-02 (0/4)
Ra-226	42,51,67,76	L.T. 2. E-01 (0/4)	L.T. 1. E-01 (0/4)	L.T. 2. E-01 (0/4)	L.T. 2. E-01 (0/4)
Th-228	42,51,67,76	L.T. 2. E-02 (0/4)	L.T. 1. E-02 (0/4)	L.T. 1. E-02 (0/4)	L.T. 1. E-02 (0/4)

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

STATIONS 64, 65, 67, 68, 71, 76

Feed and forage samples were collected monthly from beef producers at six 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. Beryllium-7, of cosmic origin, was detected in 44 of 79 samples and the terrestrial nuclide K-40 was detected in 87 of 87 samples at the levels encountered in the past.

There were 2 detections of the neutron activation product Mn-54; one at station 68, 3.4 miles from the plant in the June composite and one at station 64, 2.25 miles from the plant in the July composite. Both of these were slightly above the minimum detection level. Manganese-54 has been seen in air particulate filters and was probably due to the fallout or nuclear debris.

The fission product nuclides Zr-95, Ru-103, Ru-106, Cs-137, Ce-141 and Ce-144 were detected in several samples (See Table F-1). These reached a peak in the second and third quarters and tapered off to a lower level in the fourth quarter.

The incidence of these fission nuclides was not at any one particular station nor was it related to distance from the plant. These same nuclides and the same trend to peak in the second and third quarters was noted in the composite of air particulate filters (See Section D). This suggests that the probable source of these nuclides is atmospheric fallout from the Chinese nuclear tests and is not related to 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 01/05/81-03/02/81	2nd Quarter 04/06/81-06/01/81	3rd Quarter 07/06/81-09/28/81	4th Quarter 10/05/81-12/07/81
Be-7	64,65,67,68,71,76	Mean±std.dev. det./total range	1.0±1.0E 00 4/21 (0.1-2.6)E 00	2.3±1.1E 00 7/18 (a) (0.7-3.9)E 00	9.96±3.8E 00 20/27(b) (2.3-17.3)E 00	4.0±2.9E 00 13/21 (0.2-8.2)E 00
K-40	64,65,67,68,71,76	Mean±std.dev. det./total range	1.7±1.3E 01 21/21 (0.2-4.1)E 01	1.6±1.2E 01 18/18 (0.2-4.7)E 01	2.0±1.7E 01 27/27 (0.2-7.1)E 01	9.8±10.0E 00 21/21 (2.4-39.6)E 00
Mn-54	64,65,67,68,71,76	Mean±std.dev. det./total range	L.T. 9. E-02 0/21 --	6.5±3.4E-02 1/18 --	9.7±5.7E-02 1/27 --	L.T. 7. E-02 0/21 --
Zr-95	64,65,67,68,71,76	Mean±std.dev. det./total range	L.T. 1. E-01 0/21 --	9.8±0.4E-01 7/18 (0.4-1.4)E 00	8.6±4.4E-01 13/27 (0.24-1.8)E 00	2.2±0.2E-01 1/21 --
Ru-103	64,65,67,68,71,76	Mean±std.dev. det./total range	L.T. 1. E-01 0/21 --	1.2±0.5E-01 7/18 (0.6-2.1)E-01	2.0±0.2E-01 2/27 (1.9-2.1)E-01	L.T. 7. E-02 0/21 --
Ru-106	64,65,67,68,71,76	Mean±std.dev. det./total range	L.T. 9. E-01 0/21 --	7.5±3.7E-01 1/18 --	1.0±0.6E 00 1/27 --	L.T. 6. E-01 0/21 --

(a) No sample was available from station 65 on 05/04 or 06/08. No QA composite could be prepared; therefore there are three fewer samples in the second quarter.

(b) There was no sample available at station 65 for July (07/06-07/27); therefore there is one less sample for the third quarter (27 rather than 28 total).

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 01/05/81-03/02/81	2nd Quarter 04/06/81-06/01/81	3rd Quarter 07/06/81-09/28/81	4th Quarter 10/05/81-12/07/81
Cs-137	64,65,67,68,71,76	Mean±std.dev. det./total range	L.T. 1. E-01 0/21 --	8.0±4.0E-02 6/18 (0.2-1.3)E-01	1.7±0.7E-01 16/27 (0.9-3.0)E-01	7.0±1.4E-02 4/21 --
Ce-141	64,65,67,68,71,76	Mean±std.dev. det./total range	L.T. 2. E-01 0/21 --	1.3±0.7E-01 5/18 (0.5-2.3)E-01	L.T. 3. E-01 0/27 --	L.T. 1. E-01 0/21 --
Ce-144	64,65,67,68,71,76	Mean±std.dev. det./total range	L.T. 7. E-01 0/21 --	1.1±0.5E 00 7/18 (0.3-1.6)E 00	1.4±0.8E 00 17/27 (0.5-2.9)E 00	4.5±1.2E-01 4/21 (3.1-5.5)E-01
Th-228	64,65,67,68,71,76	Mean±std.dev. det./total range	2.1±1.4E-02 2/21 (1.1-3.1)E-02	L.T. 2. E-01 0/18 --	L.T. 2. E-01 0/27 --	L.T. 1. E-01 0/21 --

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 01/05/81-03/02/81	2nd Quarter 04/06/81-06/01/81	3rd Quarter 07/06/81-09/28/81	4th Quarter 10/05/81-12/07/81
Be-7	64,65,67,68,71,76	1.0 ±1.0 E 00 (4/21)	2.3 ±1.1 E 00 (7/18)	9.96±3.8 E 00 (20/27)	4.0 ±2.9 E 00 (13/21)
K-40	64,65,67,68,71,76	1.7 ±1.3 E 01(21/21)	1.6 ±1.2 E 01 (18/18)	2.0 ±1.7 E 01 (27/27)	9.8 ±10.0 E 00 (21/21)
Mn-54	64,65,67,68,71,76	L.T. 9. E-02 (0/21)	6.5 ±3.4 E-02 (1/18)	9.9 ±5.7 E-02 (1/27)	L.T. 7. E-02 (0/21)
Co-58	64,65,67,68,71,76	L.T. 1. E-01 (0/21)	L.T. 1. E-01 (0/18)	L.T. 1. E-01 (0/27)	L.T. 7. E-02 (0/21)
Fe-59	64,65,67,68,71,76	L.T. 2. E-01 (0/21)	L.T. 3. E-01 (0/18)	L.T. 3. E-01 (0/27)	L.T. 2. E-01 (0/21)
Co-60	64,65,67,68,71,76	L.T. 1. E-01 (0/21)	L.T. 1. E-01 (0/18)	L.T. 1. E-01 (0/27)	L.T. 8. E-02 (0/21)
Zn-65	64,65,67,68,71,76	L.T. 2. E-01 (0/21)	L.T. 3. E-01 (0/18)	L.T. 2. E-01 (0/27)	L.T. 2. E-01 (0/21)
Zr-95	64,65,67,68,71,76	L.T. 1. E-01 (0/21)	9.8 ±0.4 E-01 (7/18)	8.6 ±4.4 E-01 (13/27)	2.2 ±0.2 E-01 (1/21)
Ru-103	64,65,67,68,71,76	L.T. 1. E-01 (0/21)	1.2 ±0.5 E-01 (7/18)	2.0 ±0.2 E-01 (2/27)	L.T. 7. E-02 (0/21)
Ru-106	64,65,67,68,71,76	L.T. 9. E-01 (0/21)	7.5 ±3.7 E-01 (1/18)	1.0 ±0.6 E 00 (1/27)	L.T. 6. E-01 (0/21)
I-131	64,65,67,68,71,76	L.T. 2. E-01 (0/21)	L.T. 6. E-01 (0/18)	L.T. 2. E 00 (0/27)	L.T. 1. E-01 (0/21)
Cs-134	64,65,67,68,71,76	L.T. 1. E-01 (0/21)	L.T. 1. E-01 (0/18)	L.T. 1. E-01 (0/27)	L.T. 8. E-02 (0/21)
Cs-137	64,65,67,68,71,76	L.T. 1. E-01 (0/21)	8.0 ± 4.0 E-02 (6/18)	1.7 ± 0.7 E-01 (16/27)	7.0 ± 1.4 E-02 (4/21)
Ba-140	64,65,67,68,71,76	L.T. 1. E-01 (0/21)	L.T. 2. E-01 (0/18)	L.T. 5. E-01 (0/27)	L.T. 9. E-02 (0/21)
Ce-141	64,65,67,68,71,76	L.T. 2. E-01 (0/21)	1.3 ± 0.7 E-01 (5/18)	L.T. 3. E-01 (0/27)	L.T. 1. E-01 (0/21)
Ce-144	64,65,67,68,71,76	L.T. 7. E-01 (0/21)	1.1 ± 0.5 E 00 (7/18)	1.4 ± 0.8 E 00 (17/27)	4.5 ± 1.2 E-01 (4/21)
Ra-226	64,65,67,68,71,76	L.T. 2. E 00 (0/21)	L.T. 3. E 00 (0/18)	L.T. 2. E 00 (0/27)	L.T. 1. E 00 (0/21)
Th-228	64,65,67,68,71,76	2.1 ±1.4 E-02 (2/21)	L.T. 2. E-01 (0/18)	L.T. 2. E-01 (0/27)	L.T. 1. E-01 (0/21)

(19)

TELEDYNE ISOTOPES

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 - GARDEN VEGETABLES (TOMATOES AND CUCUMBERS)

Garden crops and apples were radioassayed once during the year at harvest for gross beta, Sr-89, Sr-90, elemental calcium and gamma emitters. Detectable concentrations of gross beta, elemental calcium and K-40 were monitored in each sample and are the usual elements measured in food and garden crops. The results monitored during 1981 duplicate measurements conducted during previous years.

No Sr-90 was detected in apples. Strontium-90 was detected in two of three garden vegetable samples at an average level of 0.0016 pCi/gm, wet, which is below the minimum level of detection. There were no gamma emitters above the minimum 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 09/14/81
Gross Beta	53, 54	Mean ± std. dev. det./total range	3.2 ± 0.4 E 00 2/2 (2.9-3.4) E 00
Sr-89	53, 54	Mean ± std. dev. det./total range	L.T. 4. E-03 0/2 --
Sr-90	53, 54	Mean ± std. dev. det./total range	L.T. 1. E-03 0/2 --
Ca(mg/gm wet)	53, 54	Mean ± std. dev. det./total range	3.7 ± 2.5 E-02 2/2 (1.9-5.4) E-02
K-40	53, 54	Mean ± std. dev. det./total range	1.4 ± 0.2 E 00 2/2 (1.3-1.6) 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

GAMMA SCAN

APPLES

SAMPLE NUMBER	STATION NUMBER	3rd quarter 09/14/81
Be-7	53, 54	L.T. 1. E-01 (0/2)
K-40	53, 54	1.4 +-0.2 E 00 (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. 3. E-02 (0/2)
Co-60	53, 54	L.T. 2. 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. 2. 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. 2. E-02 (0/2)
Cs-137	53, 54	L.T. 2. 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. 1. E-01 (0/2)
Ra-226	53, 54	L.T. 3. E-01 (0/2)
Th-228	53, 54	L.T. 3. 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

SAMPLE NUCLIDE	STATION NUMBER		3rd Quarter 08/10/81
Gross beta	34,56,62	Mean ± std. dev. det./total range	4.4 ± 0.7 E 00 3/3 (3.8-5.2) E 00
Sr-89	34,56,62	Mean ± std. dev. det./total range	L.T. 2. E-03 0/3 --
Sr-90	34,56,62	Mean ± std. dev. det./total range	1.6 ± 0.1 E-03 2/3 (1.5-1.7) E-03
Ca(mg/gm wet)	34,56,62	Mean ± std. dev. det./total range	1.6 ± 0.8 E-01 (0.8-2.2) E-01 3/3
K-40	34,56,62	Mean ± std. dev. det./total range	2.3 ± 0.1 E 00 2/3 (2.2-2.3) E 00

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

TELEDYNE ISOTOPES

TABLE H-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FOOD AND GARDEN CROPS - pCi/gm, wet

GARDEN VEGETABLES

SAMPLE NUCLIDE	STATION NUMBER	3rd Quarter 08/10/81
Be-7	34,56,62	L.T. 9.E-02 (0/3)
K-40	34,56,62	2.3± 0.1E00 (2/3)
Mn-54	34,56,62	L.T. 1.E-02 (0/3)
Co-58	34,56,62	L.T. 1.E-02 (0/3)
Fe-59	34,56,62	L.T. 2.E-02 (0/3)
Co-60	34,56,62	L.T. 1.E-02 (0/3)
Zn-65	34,56,62	L.T. 2.E-02 (0/3)
Zr-95	34,56,62	L.T. 1.E-02 (0/3)
Ru-103	34,56,62	L.T. 1.E-02 (0/3)
Ru-106	34,56,62	L.T. 9.E-02 (0/3)
I-131	34,56,62	L.T. 2.E-02 (0/3)
Cs-134	34,56,62	L.T. 1.E-02 (0/3)
Cs-137	34,56,62	L.T. 1.E-02 (0/3)
Ba-140	34,56,62	L.T. 1.E-02 (0/3)
Ce-141	34,56,62	L.T. 2.E-02 (0/3)
Ce-144	34,56,62	L.T. 8.E-02 (0/3)
Ra-226	34,56,62	L.T. 2.E-01 (0/3)
Th-228	34,56,62	L.T. 2.E-02 (0/3)

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. Sr-90 and elemental calcium were detected in these samples at levels similar to the levels monitored in 1973 through 1980. There were several detections of Sr-89 at both the nearest stations and at the commercial stations at approximately the same level. Sr-89 was detected in air particulate filters in some ares of the United States indicating that this was the result of fallout from previous nuclear tests especially those of October 16, 1980.

The naturally occurring nuclides Be-7, K-40, Ra-226 and Th-228 were detected at the levels seen in samples in previous years. There was one detection of the activation corrosion product Mn-54 at station 73 which is 10 miles from the plant. This was slightly above the detection level and has been seen in air particulate filters also, indicating that it was probably from fallout.

The fission related products Zr-95, Ru-103, Cs-137, Ce-141 and Ce-144 occurred in several samples reaching a peak in the third quarter and tapering off to zero in the fourth quarter. These nuclides were seen in samples equally at stations farthest from the plant as well as those nearest to it. This is the same trend seen in feed and forage from beef producers and in air particulate filters. This gives further support to the conclusion that these nuclides were due to fallout from the Chinese atmospheric nuclear tests on October 16, 1980. Thus it has been established that no nuclides which are related to CNS could be ingested by cows from feed and forage and there is 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 01/12/81	2nd Quarter 04/13/81-06/01/81	3rd Quarter 07/06/81-09/08/81	4th Quarter 10/05/81
Sr-89	61,74	Mean±std.dev.	L.T. 3. E-02	3.7 ± 1.6 E-02	5.8 ± 3.5 E-02	L.T. 3. E-02
		det./total	0/3	1/5	2/7	0/2
		range	--	--	(3.3-8.2) E-02	--
Sr-90	61,74	Mean±std.dev.	2.0 ± 2.0 E-01	1.9 ± 0.3 E-02	3.5 ± 1.7 E-02	L.T. 1. E-03
		det./total	3/3	1/5	5/7	0/2
		range	(0.8-3.9) E-01	--	(1.4-5.2) E-02	--
Ca (mg/gm)	61,74	Mean±std.dev.	6.7 ± 2.6 E 00	2.1 ± 1.4 E 00	1.6 ± 1.4 E 00	1.4 ± 0.8 E 00
		det./total	3/3	5/5	7/7	2/2
		range	(0.5-1.0) E 01	(0.6-4.3) E 00	(0.5-4.2) E 00	(0.8-1.9) E 00
Be-7	61,74	Mean±std.dev.	4.2 ± 0.7 E 00	3.8 ± 1.0 E-01	2.0 ± 0.9 E 00	L.T. 1. E-01
		det./total	1/3	1/5	5/7	0/2
		range	--	--	(0.6-2.8) E 00	--
K-40	61,74	Mean±std.dev.	2.7 ± 1.2 E 01	5.0 ± 1.3 E 00	8.3 ± 5.8 E 00	6.2 ± 0.5 E 00
		det./total	3/3	5/5	7/7	2/2
		range	(1.5-3.8) E 01	(2.9-6.2) E 00	(0.3-1.9) E 01	(5.8-6.5) E 00

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 01/12/81	2nd Quarter 04/13/81-06/01/81	3rd Quarter 07/06/81-09/08/81	4th Quarter 10/05/81
Zr-95	61,74	Mean±std.dev. det./total range	4.2 ± 0.8 E-01 1/3 --	2.3 ± 0.2 E-01 1/5 --	4.0 ± 1.8 E-01 3/7 (1.9-5.0) E-01	L.T. 1. E-02 0/2 --
Ru-103	61,74	Mean±std.dev. det./total range	2.4 ± 0.9 E-01 1/3 --	3.6 ± 1.1 E-02 1/5 --	L.T. 8. E-02 0/7 --	L.T. 1. E-02 0/2 --
Cs-137	61,74	Mean±std.dev. det./total range	L.T. 1. E-01 0/3 --	L.T. 2. E-02 0/5 --	6.2 ± 3.2 E-02 1/7 --	L.T. 1. E-02 0/2 --
Ce-141	61,74	Mean±std.dev. det./total range	3.1 ± 1.1 E-01 1/3 --	4.1 ± 1.4 E-02 1/5 --	L.T. 1. E-01 0/7 --	L.T. 2. E-02 0/2 --
Ce-144	61,74	Mean±std.dev.	L.T. 7. E-01 0/3 --	L.T. 7. E-02 0/5 --	4.8 ± 1.8 E-01 3/7 (2.7-6.2) E-01	L.T. 9. E-02 0/2 --

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 01/12/81	2nd Quarter 04/13/81-06/01/81	3rd Quarter 07/06/81-09/08/81	4th Quarter 10/05/81
Be-7	61,74	4.2 ± 0.7 E 00 (1/3)	3.8 ± 1.0 E-01 (1/5)	2.0 ± 0.9 E 00 (5/7)	L.T. 1. E-01 (0/2)
K-40	61,74	2.7 ± 1.2 E 01 (3/3)	5.0 ± 1.3 E 00 (5/5)	8.3 ± 5.8 E 00 (7/7)	6.2 ± 0.5 E 00 (2/2)
Mn-54	61,74	L.T. 9. E-02 (0/3)	L.T. 1. E-02 (0/5)	L.T. 6. E-02 (0/7)	L.T. 1. E-02 (0/2)
Co-58	61,74	L.T. 1. E-01 (0/3)	L.T. 1. E-02 (0/5)	L.T. 6. E-02 (0/7)	L.T. 1. E-02 (0/2)
Fe-59	61,74	L.T. 2. E-01 (0/3)	L.T. 2. E-02 (0/5)	L.T. 1. E-01 (0/7)	L.T. 2. E-02 (0/2)
Co-60	61,74	L.T. 1. E-01 (0/3)	L.T. 1. E-02 (0/5)	L.T. 6. E-02 (0/7)	L.T. 1. E-02 (0/2)
Zn-65	61,74	L.T. 2. E-02 (0/3)	L.T. 2. E-02 (0/5)	L.T. 1. E-01 (0/7)	L.T. 3. E-02 (0/2)
Zr-95	61,74	4.2 ± 0.8 E-01 (1/3)	2.3 ± 0.2 E-01 (1/5)	4.0 ± 1.8 E-01 (3/7)	L.T. 1. E-02 (0/2)
Ru-103	61,74	2.4 ± 0.9 E-01 (1/3)	3.6 ± 1.1 E-02 (1/5)	L.T. 8. E-02 (0/7)	L.T. 1. E-02 (0/2)
Ru-106	61,74	L.T. 9. E-01 (0/3)	L.T. 1. E-01 (0/5)	L.T. 5. E-01 (0/7)	L.T. 1. E-01 (0/2)
I-131	61,74	L.T. 2. E-01 (0/3)	L.T. 2. E-02 (0/5)	L.T. 2. E-01 (0/7)	L.T. 3. E-02 (0/2)
Cs-134	61,74	L.T. 1. E-01 (0/3)	L.T. 1. E-02 (0/5)	L.T. 6. E-02 (0/7)	L.T. 1. E-02 (0/2)
Cs-137	61,74	L.T. 1. E-01 (0/3)	L.T. 2. E-02 (0/5)	6.2 ± 3.2 E-02 (1/7)	L.T. 1. E-02 (0/2)
Ba-140	61,74	L.T. 1. E-01 (0/3)	L.T. 2. E-02 (0/5)	L.T. 1. E-01 (0/7)	L.T. 2. E-02 (0/2)
Ce-141	61,74	3.1 ± 1.1 E-01 (1/3)	4.1 ± 1.4 E-02 (1/5)	L.T. 1. E-01 (0/7)	L.T. 2. E-02 (0/2)
Ce-144	61,74	L.T. 7. E-01 (0/3)	L.T. 7. E-02 (0/5)	4.8 ± 1.8 E-01 (3/7)	L.T. 9. E-02 (0/2)
Ra-226	61,74	L.T. 2. E 00 (0/3)	2.7 ± 0.8 E-01 (2/5)	3.2 ± 1.3 E-01 (1/7)	L.T. 3. E-01 (0/2)
Th-228	61,74	L.T. 2. E-01 (0/3)	L.T. 2. E-02 (0/5)	2.4 ± 0.8 E-02 (1/7)	L.T. 2. E-02 (0/2)

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 01/12/81	2nd Quarter 04/13/81	3rd Quarter 07/13/81	4th Quarter 10/12/81
Sr-89	42,73,75	Mean±std.dev. det./total range	L.T. 3. E-02 0/3 --	L.T. 3. E-02 0/4 --	0 ± 1.9 E-01 2/3 (0.6-0.4) E-01	L.T. 3. E-02 0/3 --
Sr-90	42,73,75	Mean±std.dev. det./total range	6.0 ± 6.0 E-01 3/3 (0.1-1.3) E-01	4.8 ± 2.1 E-02 4/4 (2.9-7.7) E-02	5.7 ± 2.7 E-02 3/3 (3.2-8.6) E-02	6.3 ± 2.3 E-03 1/3 --
Ca(mg/gm)	42,73,75	Mean±std.dev. det./total range	4.1 ± 4.2 E 00 3/3 (1.6-9.0) E 00	3.1 ± 0.8 E 00 4/4 (2.3-4.2) E 00	2.7 1.5 E 00 3/3 (1.8-4.4) E 00	6.2 ± 6.1 E-01 3/3 (0.1-1.3) E 00
Be-7	42,73,75	Mean±std.dev. det./total range	1.2 ± 0.6 E-01 1/3 --	L.T. 2. E-01 0/4 --	2.5 ± 1.6 E 00 3/3 (0.8-3.9) E 00	8.2 ± 1.2 E-01 1/3 --
K-40	42,73,75	Mean±std.dev. det./total range	1.8 ± 1.3 E 01 3/3 (0.4-2.8) E 01	5.3 ± 1.2 E 00 4/4 (3.7-6.2) E 00	1.1 ± 0.4 E 01 3/3 (0.8-1.6) E 01	4.3 ± 1.5 E 00 3/3 (2.8-5.8) E 00
Mn-54	42,73,75	Mean±std.dev. det./total range	L.T. 7. E-02 0/3 --	L.T. 2. E-02 0/4 --	6.5 ± 2.7 E-02 1/3 --	L.T. 1. 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 01/12/81	2nd Quarter 04/13/81	3rd Quarter 07/13/81	4th Quarter 10/12/81
Zr-95	42,73,75	Mean±std.dev. det./total range	L.T. 8. E-02 0/3 --	L.T. 2. E-02 0/4 --	7.8 ± 2.2 E-01 2/3 (6.2-9.4) E-01	L.T. 2. E-02 0/3 --
Ru-103	42,73,75	Mean±std.dev. det./total range	L.T. 7. E-02 0/3 --	L.T. 2. E-02 0/4 --	9.3 ± 4.8 E-02 1/3 --	L.T. 2. E-02 0/3 --
Cs-137	42,73,75	Mean±std.dev. det./total range	L.T. 7. E-02 0/3 --	L.T. 2. E-02 0/4 --	1.0 ± 0.3 E-01 2/3 (0.8-1.2) E-01	L.T. 2. E-02 0/3 --
Ce-141	42,73,75	Mean±std.dev. det./total range	L.T. 1. E-01 0/3 --	L.T. 4. E-02 0/4 --	1.0 ± 0.4 E-01 1/3 --	L.T. 3. E-02 0/3 --
Ce-144	42,73,75	Mean±std.dev. det./total range	L.T. 5. E-01 0/3 --	L.T. 2. E-01 0/4 --	1.0 ± 0.1 E 00 2/3 (0.9-1.1) E 00	L.T. 1. E-01 0/3 --

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 01/12/81	2nd Quarter 04/13/81	3rd Quarter 07/13/81	4th Quarter 10/12/81
Be-7	42,73,75	1.2 ± 0.6 E-01 (1/3)	L.T. 2. E-01 (0/4)	2.5 ± 1.6 E 00 (3/3)	8.2 ± 1.2 E-01 (1/3)
K-40	42,73,75	1.8 ± 1.3 E 01 (3/3)	5.3 ± 1.2 E 00 (4/4)	1.1 ± 0.4 E 01 (3/3)	4.3 ± 1.5 E 00 (3/3)
Mn-54	42,73,75	L.T. 7. E-02 (0/3)	L.T. 2. E-02 (0/4)	6.5 ± 2.7 E-02 (1/3)	L.T. 1. E-02 (0/3)
Co-58	42,73,75	L.T. 7. E-02 (0/3)	L.T. 2. E-02 (0/4)	L.T. 5. E-02 (0/3)	L.T. 1. E-02 (0/3)
Fe-59	42,73,75	L.T. 2. E-01 (0/3)	L.T. 4. E-02 (0/4)	L.T. 1. E-01 (0/3)	L.T. 3. E-02 (0/3)
Co-60	42,73,75	L.T. 7. E-02 (0/3)	L.T. 2. E-02 (0/4)	L.T. 6. E-02 (0/3)	L.T. 1. E-02 (0/3)
Zn-65	42,73,75	L.T. 2. E-01 (0/3)	L.T. 4. E-02 (0/4)	L.T. 1. E-01 (0	L.T. 3. E-02 (0/3)
Zr-95	42,73,75	L.T. 8. E-02 (0/3)	L.T. 2. E-02 (0/4)	7.8 ± 2.2 E-01 3)	L.T. 2. E-02 (0/3)
Ru-103	42,73,75	L.T. 7. E-02 (0/3)	L.T. 2. E-02 (0/4)	9.3 ± 4.8 E-02 (1/3)	L.T. 2. E-02 (0/3)
Ru-106	42,73,75	L.T. 6. E-01 (0/3)	L.T. 2. E-01 (0/4)	L.T. 5. E-01 (0/3)	L.T. 1. E-01 (0/3)
I-131	42,73,75	L.T. 2. E-01 (0/3)	L.T. 3. E-02 (0/4)	L.T. 1. E-01 (0/3)	L.T. 4. E-02 (0/3)
Cs-134	42,73,75	L.T. 8. E-02 (0/3)	L.T. 2. E-02 (0/4)	L.T. 6. E-02 (0/3)	L.T. 1. E-02 (0/3)
Cs-137	42,73,75	L.T. 7. E-02 (0/3)	L.T. 2. E-02 (0/4)	1.0 ± 0.3 E-01 (2/3)	L.T. 2. E-02 (0/3)
Ba-140	42,73,75	L.T. 1. E-01 (0/3)	L.T. 2. E-02 (0/4)	L.T. 1. E-01 (0/3)	L.T. 3. E-02 (0/3)
Ce-141	42,73,75	L.T. 1. E-01 (0/3)	L.T. 4. E-02 (0/4)	1.0 ± 0.4 E-01 (1/3)	L.T. 3. E-02 (0/3)
Ce-144	42,73,75	L.T. 5. E-01 (0/3)	L.T. 2. E-01 (0/4)	1.0 ± 0.1 E 00 (2/3)	L.T. 1. E-01 (0/3)
Ra-226	42,73,75	L.T. 1. E 00 (0/3)	L.T. 4. E-01 (0/4)	L.T. 1. E 00 (0/3)	L.T. 3. E-01 (0/3)
Th-228	42,73,75	L.T. 1. E-01 (0/3)	L.T. 3. E-02 (0/4)	L.T. 1. E-01 (0/3)	L.T. 3. E-02 (0/3)

K. FOOD AND FEED CROPS - CORN AND SOY BEANS

(See Tables K-1 and K-2)

STATIONS 15, 18, 20, 27, 29, 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 - 1980.

Gross beta activity measured an average of 11.0+-0.9 pCi per gram, wet. This was largely due to K-40, the naturally occurring, terrestrial nuclide. Strontium-90 was detected in 3 of 8 samples at an average of 0.012 pCi/gm, wet, which is below the minimum level of detection. The elemental calcium level was similar to that of other years at 0.52 mg per gram.

From this monitoring data it may be concluded that there is 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 09/21/81
Gross Beta	15,18,20,27, 29,38,41	Mean±std.dev. det./total range	1.1 ± 0.9 E 01 8/8 (0.4-3.1) E 01
Sr-89	15,18,20,27, 29,38,41	Mean±std.dev. det./total range	L.T. 3. E-02 0/8 --
Sr-90	15,18,20,27, 29,38,41	Mean±std.dev. det./total range	1.2 ± 0.7 E-02 3/8 (0.7-2.1) E-02
Ca(mg/gm)	15,18,20,27, 29,38,41	Mean±std.dev. det./total range	5.2 ± 8.0 E-01 8/8 (0.007-2.2)E 00
K-40	15,18,20,27, 29,38,41,	Mean±std.dev. det./total range	6.5 ± 6.8 E 00 8/8 (2.1-21.4)E 00
Be-7	15,18,20,27, 29,38,41	Mean±std.dev. det./total range	6.7 ± 0.4 E-01 3/8 (0.4-1.2) E 00

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 09/21/81
Be-7	15,18,20,27,29,38,41	6.7 ± 0.4 E-01 (3/8)
K-40	15,18,20,27,29,38,41	6.5 ± 6.8 E 00 (8/8)
Mn-54	15,18,20,27,29,38,41	L.T. 3. E-02 (0/8)
Co-58	15,18,20,27,29,38,41	L.T. 3. E-02 (0/8)
Fe-59	15,18,20,27,29,38,41	L.T. 7. E-02 (0/8)
Co-60	15,18,20,27,29,38,41	L.T. 3. E-02 (0/8)
Zn-65	15,18,20,27,29,38,41	L.T. 7. E-02 (0/8)
Zr-95	15,18,20,27,29,38,41	L.T. 3. E-02 (0/8)
Ru-103	15,18,20,27,29,38,41	L.T. 3. E-02 (0/8)
Ru-106	15,18,20,27,29,38,41	L.T. 3. E-01 (0/8)
I-131	15,18,20,27,29,38,41	L.T. 9. E-02 (0/8)
Cs-134	15,18,20,27,29,38,41	L.T. 3. E-02 (0/8)
Cs-137	15,18,20,27,29,38,41	L.T. 3. E-02 (0/8)
Ba-140	15,18,20,27,29,38,41	L.T. 5. E-02 (0/8)
Ce-141	15,18,20,27,29,38,41	L.T. 5. E-02 (0/8)
Ce-144	15,18,20,27,29,38,41	L.T. 2. E-01 (0/8)
Ra-226	15,18,20,27,29,38,41	L.T. 5. E-01 (0/8)
Th-228	15,18,20,27,29,38,41	L.T. 5. E-02 (0/8)

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. There were no detections of Sr-89. All of the gamma emitters were at or below the minimum level of detection except K-40, a naturally occurring isotope, which was at the same level as 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 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.

TABLE L-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FISH - pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER		2nd Quarter 04/20,21/81	4th Quarter 10/17/81
Gross Beta	28,35	Mean±std.dev. det./total range	3.2 ± 0.4 E 00 5/5 (2.9-3.9) E 00	4.2 ± 0.9 E 00 5/5 (3.3-5.6) E 00
Sr-89	28,35	Mean±std.dev. det./total range	L.T. 3. E-02 0/5 --	L.T. 3. E-02 0/5 --
Sr-90	28,35	Mean±std.dev. det./total range	2.2 ± 0.6 E-02 3/5 (1.8-2.9) E-02	1.6 ± 1.3 E-02 5/5 (0.3-3.2) E-02
K-40 (a)	28,35	Mean±std.dev. det./total range	2.5 ± 0.3 E 00 5/5 (2.3-3.1) E 00	2.8 ± 0.4 E 00 5/5 (2.4-3.5) E 00

(a) K-40 is the only gamma emitter above the limits of detection on the Ge(Li) Spectrometer. The eighteen gamma emitters monitored are listed in Table L-2.

TELEDYNE ISOTOPES

TABLE L-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

FISH - pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER	2nd Quarter 04/20,21/81	4th Quarter 10/17/81
Be-7	28,35	L.T. 1. E-01 (0/5)	L.T. 8. E-02 (0/5)
K-40	28,35	2.5 ± 0.3 E 00 (5/5)	2.8 ± 0.4 E 00 (5/5)
Mn-54	28,35	L.T. 1. E-02 (0/5)	L.T. 8. E-03 (0/5)
Co-58	28,35	L.T. 1. E-02 (0/5)	L.T. 9. E-03 (0/5)
Fe-59	28,35	L.T. 3. 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. 3. E-02 (0/5)	L.T. 2. E-02 (0/5)
Zr-95	28,35	L.T. 2. E-02 (0/5)	L.T. 9. E-03 (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. 1. E-01 (0/5)	L.T. 8. E-02 (0/5)
I-131	28,35	L.T. 3. E-02 (0/5)	L.T. 3. E-02 (0/5)
Cs-134	28,35	L.T. 1. E-02 (0/5)	L.T. 9. E-03 (0/5)
Cs-137	28,35	L.T. 2. E-02 (0/5)	L.T. 9. E-03 (0/5)
Ba-140	28,35	L.T. 2. E-02 (0/5)	L.T. 2. E-02 (0/5)
Ce-141	28,35	L.T. 3. E-02 (0/5)	L.T. 2. E-02 (0/5)
Ce-144	28,35	L.T. 1. E-01 (0/5)	L.T. 7. E-02 (0/5)
Ra-226	28,35	L.T. 3. E-01 (0/5)	L.T. 2. E-01 (0/5)
Th-228	28,35	L.T. 3. E-02 (0/5)	L.T. 2. E-02 (0/5)

TELEDYNE ISOTOPES

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. A monthly sample was composited and monitored for the same analytes as the monthly sample.

There were no detections of I-131 or Sr-89 in milk from either the commercial producers or the nearest producers. Sr-90 was detected in 36 of 39 samples during the four quarters at levels slightly below those of 1980. Elemental calcium levels remained approximately the same. 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 naturally occurring Th-228 in the first quarter at a very low level.

Thus we conclude that the operations of CNS had no effect on the milk from commercial nor from nearest producers 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 01/19/81-01/27/81	2nd Quarter 04/20/81-04/21/81	3rd Quarter 07/18/81	4th Quarter 10/19/81
Sr-89	42, 73, 75 (a)	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	2.9 +-1.4 E 00 3/3 (2.1-4.5) E 00	1.9 +-0.8 E 00 3/3 (1.1-2.6) E 00	3.2 +-2.8 E 00 3/3 (0.71-6.3) E 00	4.0 +-1.2 E 00 3/3 (3.1-5.4) E 00
I-131	42, 73, 75	Mean±std.dev. det./total range	L.T. 3. 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 --
Ca (mg/liter)	42, 73, 75	Mean±std.dev. det./total range	1.7 +-0.2 E 00 3/3 (1.5-1.9) E 00	2.5 +-0.3 E 00 3/3 (2.3-2.8) E 00	1.4 +-0.3 E 00 3/3 (1.1-1.7) E 00	1.9 +-0.4 E 00 3/3 (1.6-2.3) E 00
K-40	42, 73, 75	Mean±std.dev. det./total range	1.2 +-0.1 E 03 3/3 (1.1-1.2) E 03	1.1 +-0.2 E 03 3/3 (1.0-1.3) E 03	1.3 +-0.3 E 03 3/3 (1.1-1.7) E 03	1.2 +-0.1 E 03 3/3 (1.1-1.3) E 03
Cs-137	42, 73, 75	Mean±std.dev. det./total range	L.T. 7. E 00 0/3 --	L.T. 7. E 00 0/3 --	L.T. 8. E 00 0/3	L.T. 9. E 00 0/3

(a) January 19, Station 75 -- Milk sample lost; discarded by air freight because it leaked; resampled 01/27.

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 01/19/81-01/27/81	2nd Quarter 4/20/81-4/21/81	3rd Quarter 07/13/81	4th Quarter 10/19/81
Be-7	42,73,75	L.T. 6. E 01 (0/3)	L.T. 5. E 01 (0/3)	L.T. 6. E 01 (0/3)	L.T. 8. E 01 (0/3)
K-40	42,73,75	1.2 +-0.1 E 03 (3/3)	1.1 +-0.2 E 03 (3/3)	1.3 +-0.3 E 03 (3/3)	1.2 +-0.1 E 03 (3/3)
Mn-54	42,73,75	L.T. 7. E 00 (0/3)	L.T. 6. E 00 (0/3)	L.T. 7. E 00 (0/3)	L.T. 8. E 00 (0/3)
Co-58	42,73,75	L.T. 7. E 00 (0/3)	L.T. 6. E 00 (0/3)	L.T. 7. E 00 (0/3)	L.T. 8. E 00 (0/3)
Fe-59	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. 2. E 01 (0/3)
Co-60	42,73,75	L.T. 7. E 00 (0/3)	L.T. 7. E 00 (0/3)	L.T. 7. E 00 (0/3)	L.T. 7. E 00 (0/3)
Zn-65	42,73,75	L.T. 2. E 01 (0/3)	L.T. 2. E 01 (0/3)	L.T. 1. E 01 (0/3)	L.T. 2. 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. 7. E 00 (0/3)	L.T. 7. E 00 (0/3)
Ru-103	42,73,75	L.T. 7. E 00 (0/3)	L.T. 6. E 00 (0/3)	L.T. 7. E 00 (0/3)	L.T. 9. E 00 (0/3)
Ru-106	42,73,75	L.T. 6. E 01 (0/3)	L.T. 6. E 01 (0/3)	L.T. 6. E 01 (0/3)	L.T. 6. E 01 (0/3)
I-131	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)
Cs-134	42,73,75	L.T. 8. E 00 (0/3)	L.T. 7. E 00 (0/3)	L.T. 8. E 00 (0/3)	L.T. 8. E 00 (0/3)
Cs-137	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. 9. E 00 (0/3)
Ba-140	42,73,75	L.T. 1. E 01 (0/3)	L.T. 7. E 00 (0/3)	L.T. 2. E 01 (0/3)	L.T. 1. E 01 (0/3)
Ce-141	42,73,75	L.T. 2. E 01 (0/3)	L.T. 1. E 01 (0/3)	L.T. 2. E 01 (0/3)	L.T. 2. E 01 (0/3)
Ce-144	42,73,75	L.T. 6. E 01 (0/3)	L.T. 6. E 01 (0/3)	L.T. 2. E 02 (0/3)	L.T. 7. 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. 2. 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 01/19/81-03/16/81	2nd Quarter 04/20/81-06/29/81	3rd Quarter 07/06/81-09/28/81	4th Quarter 10/12/81-12/14/81
Sr-89	61, 74 (a)	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	1.6 +-0.5 E 00 7/7 (0.8-2.2) E 00	2.3 +-1.2 E 00 4/7 (1.3-3.9) E 00	2.2 +-0.7 E 00 6/6 (1.3-3.3) E 00	1.8 +-0.9 E 00 7/7 (0.8-3.2) E 00
I-131	61, 74	Mean±std.dev. det./total range	L.T. 3. E-01 0/7 --	L.T. 3. E-01 0/17 --	L.T. 5. E-01 0/31 --	L.T. 2. E-01 0/7 --
Ca(mg/liter)	61, 74	Mean±std.dev. det./total range	1.2 +-0.4 E 00 7/7 (0.6-1.7) E 00	2.5 +-0.6 E 00 7/7 (1.6-3.1) E 00	2.0 +-0.3 E 00 6/6 (1.7-2.4) E 00	1.6 +-0.3 E 00 7/7 (1.3-2.1) E 00
K-40	61,74	Mean±std.dev. det./total range	1.2 +-0.1 E 03 7/7 (1.0-1.2) E 03	1.1 +-0.1 E 03 7/7 (1.0-1.2) E 03	1.2 +-0.1 E 03 6/6 (1.1-1.4) E 03	1.2 +-0.2 E 03 7/7 (1.0-1.4) E 03

(a) January 19, Station 61 -- Milk sample lost; discarded by air freight because it leaked; resampled 01/26.

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 Qiarter 01/19/81-03/16/81	2nd Quarter 04/20/81-06/29/81	3rd Quarter 07/06/81-09/28/81	4th Quarter 10/21/81-12/15/81
Be-7	61,74	L.T. 6. E 01 (6/7)	L.T. 7. E 01 (0/7)	L.T. 8. E 01 (0/6)	L.T. 6. E 01 (0/7)
K-40	61,74	1.2 +-0.1 E 03 (7/7)	1.1 +-0.1 E 03 (7/7)	1.2 +-0.1 E 03 (6/6)	1.2 +-0.2 E 03 (7/7)
Mn-54	61,74	L.T. 6. E 00 (0/7)	L.T. 7. E 00 (0/7)	L.T. 7. E 00 (0/6)	L.T. 7. E 00 (0/7)
Co-58	61,74	L.T. 7. E 00 (0/7)	L.T. 7. E 00 (0/7)	L.T. 8. E 00 (0/6)	L.T. 7. E 00 (0/7)
Fe-59	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. 1. E 01 (0/7)
Co-60	61,74	L.T. 6. E 00 (0/7)	L.T. 7. E 00 (0/7)	L.T. 7. E 00 (0/6)	L.T. 7. E 00 (0/7)
Zn-65	61,74	L.T. 2. E 01 (0/7)	L.T. 2. E 01 (0/7)	L.T. 2. E 01 (0/6)	L.T. 1. E 01 (0/7)
Zr-95	61,74	L.T. 7. E 00 (0/7)	L.T. 8. E 00 (0/7)	L.T. 9. E 00 (0/6)	L.T. 7. E 00 (0/7)
Ru-103	61,74	L.T. 7. E 00 (0/7)	L.T. 9. E 00 (0/7)	L.T. 1. E 01 (0/6)	L.T. 7. E 00 (0/7)
Ru-106	61,74	L.T. 6. E 01 (0/7)	L.T. 6. E 01 (0/7)	L.T. 7. E 01 (0.6)	L.T. 4. E 01 (0/7)
I-131	61,74	L.T. 1. E 01 (0/7)	L.T. 5. E 01 (0/7)	L.T. 6. E 01 (0/6)	L.T. 2. E 01 (0/7)
Cs-134	61,74	L.T. 7. E 00 (0/7)	L.T. 7. E 00 (0/7)	L.T. 8. E 00 (0/6)	L.T. 7. E 00 (0/7)
Cs-137	61,74	L.T. 7. E 00 (0/7)	L.T. 8. E 00 (0/7)	L.T. 8. E 00 (0/6)	L.T. 7. E 00 (0/7)
Ba-140	61,74	L.T. 9. E 00 (0/7)	L.T. 2. E 01 (0/7)	L.T. 3. E 01 (0/6)	L.T. 1. E 01 (0/7)
Ce-141	61,74	L.T. 2. E 01 (0/7)	L.T. 2. E 01 (0/7)	L.T. 2. E 01 (0/6)	L.T. 1. E 01 (0/7)
Ce-144	61,74	L.T. 6. E 01 (0/7)	L.T. 6. E 01 (0/7)	L.T. 6. E 01 (0/6)	L.T. 6. E 01 (0/7)
Ra-226	61,74	L.T. 2. E 02 (0/7)	L.T. 2. E 02 (0/7)	L.T. 2. E 02 (0/6)	L.T. 2. E 02 (0/7)
Th-228	61,74	5.6 +-3.0 E 00 (1/7)	L.T. 1. E 01 (0/7)	L.T. 1. E 01 (0/6)	L.T. 1. E 01 (0/7)

TELEDYNE ISOTOPES

O. 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. There was no gross alpha activity detected and no detections of gamma emitters above the minimum level of detection. The gross beta activity was statistically the same as in past years. The tritium level averaged 180 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/liter

SAMPLE NUCLIDE	STATION NUMBER		1st Quarter 01/26/81	2nd Quarter 04/27/81	3rd Quarter 07/26/81	4th Quarter 10/26/81
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. 4. E 00 0/2 --
Gross Beta	11,47	Mean±std.dev. det./total range	6.8 ± 0.7 E 00 2/2 (6.3-7.3) E 00	1.0 ± 0.1 E 01 2/2 (0.9-1.1) E 01	9.7 ± 1.8 E 00 2/2 (0.8-1.1) E 01	9.1 ± 0.9 E 00 2/2 (8.4-9.7) E 00
H-3	11,47	Mean±std.dev. det./total range	2.3 ± 1.5 E 02 2/2 (1.2-3.3) E 02	2.0 ± 0.9 E 02 2/2 (1.3-2.6) E 02	2.3 ± 0.8 E 02 1/2 --	1.4 ± 0.6 E 02 2/2 (0.9-1.8) E 02

Eighteen gamma emitters were monitored on a Ge(Li) spectrometer. All were below the limits of detection and are listed on Table 0-2.

TELEDYNE ISOTOPES

TABLE 0-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATH - WATERBORNE

GROUND WATER - pCi/liter

SAMPLE NUCLIDE	STATION NUMBER	1st Quarter 01/26/81	2nd Quarter 04/27/81	3rd Quarter 07/26/81	4th Quarter 10/26/81
Be-7	11,47	L.T. 6. E 01 (0/2)	L.T. 7. E 01 (0/2)	L.T. 5. E 01 (0/2)	L.T. 6. E 01 (0/2)
K-40	11,47	L.T. 2. 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. 5. E 00 (0/2)	L.T. 6. E 00 (0/2)
Co-58	11,47	L.T. 6. E 00 (0/2)	L.T. 7. E 00 (0/2)	L.T. 5. E 00 (0/2)	L.T. 6. E 00 (0/2)
Fe-59	11,47	L.T. 1. E 01 (0/2)	L.T. 2. E 01 (0/2)	L.T. 1. E 01 (0/2)	L.T. 1. E 01 (0/2)
Co-60	11,47	L.T. 7. E 00 (0/2)	L.T. 7. E 00 (0/2)	L.T. 5. E 00 (0/2)	L.T. 6. E 00 (0/2)
Zn-65	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. 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. 6. E 00 (0/2)	L.T. 7. E 00 (0/2)
Ru-103	11,47	L.T. 8. E 00 (0/2)	L.T. 9. E 00 (0/2)	L.T. 6. E 00 (0/2)	L.T. 7. E 00 (0/2)
Ru-106	11,47	L.T. 6. E 01 (0/2)	L.T. 6. E 01 (0/2)	L.T. 5. E 01 (0/2)	L.T. 5. E 01 (0/2)
I-131	11,47	L.T. 1. E 01 (0/2)	L.T. 3. E 01 (0/2)	L.T. 1. E 01 (0/2)	L.T. 2. E 01 (0/2)
Cs-134	11,47	L.T. 7. E 00 (0/2)	L.T. 8. E 00 (0/2)	L.T. 6. E 00 (0/2)	L.T. 7. E 00 (0/2)
Cs-137	11,47	L.T. 6. E 00 (0/2)	L.T. 7. E 00 (0/2)	L.T. 6. E 00 (0/2)	L.T. 6. E 00 (0/2)
Ba-140	11,47	L.T. 9. E 00 (0/2)	L.T. 1. E 01 (0/2)	L.T. 8. E 00 (0/2)	L.T. 1. E 01 (0/2)
Ce-141	11,47	L.T. 2. E 01 (0/2)	L.T. 2. E 01 (0/2)	L.T. 1. E 01 (0/2)	L.T. 1. E 01 (0/2)
Ce-144	11,47	L.T. 6. E 01 (0/2)	L.T. 6. E 01 (0/2)	L.T. 5. E 01 (0/2)	L.T. 5. E 01 (0/2)
Ra-226	11,47	L.T. 1. E 02 (0/2)	L.T. 2. E 02 (0/2)	L.T. 1. 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. 1. E 01 (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. All measurements during 1981 were in agreement with those of the period 1973 through 1980. There were no detections of Sr-89 or Sr-90 above the minimum level of detection. Gross beta and gross alpha readings, suspended and dissolved, were at normal environmental levels for river water. There were no detections of gamma emitters.

These measurements indicate that the river water samples monitored during 1981 contained no detectable CNS plant radionuclides. Additional verification of no detectable releases is the low range of H-3 activity which was from 200 to 520 pCi/liter.

TELEDYNE ISOTOPES

TABLE P-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - WATERBORNE

RIVER WATER - pCi/liter

SAMPLE NUCLIDE	STATION NUMBER		1st Quarter 01/06/81-03/10/81	2nd Quarter 04/13/81-06/15/81	3rd Quarter 07/20/81-09/15/81	4th Quarter 10/18/81-12/08/81
Gross alpha (dissolved)	12,13,28	Mean±std.dev. det./total range	L.T. 4. E 00 0/9 --	4.9 +-3.9 E 00 1/9 --	L.T. 4. E 00 0/9 --	L.T. 4. E 00 0/9 --
Gross alpha (suspended)	12,13,28	Mean±std.dev. det./total range	L.T. 1. E 00 0/9 --	2.4 +-1.5 E 00 6/9 (0.7-4.5) E 00	L.T. 2. E 00 0/9 --	7.2 +-4.5 E-01 1/9 --
Gross beta (dissolved)	12,13,28	Mean±std.dev. det./total range	7.1 +-2.6 E 00 9/9 (0.4-1.1) E 01	1.1 +-0.1 E 01 6/9 (0.9-1.3) E 01	1.1 +-0.3 E 01 9/9 (0.8-1.8) E 01	9.3 +-1.5 E 00 9/9 (8.0-12.0) E 00
Gross beta (suspended)	12,13,28	Mean±std.dev. det./total range	1.8 +-0.3 E 00 6/9 (1.6-2.3) E 00	5.6 +-2.8 E 00 9/9 (0.3-1.1) E 01	4.8 +-2.7 E 00 9/9 (1.2-7.3) E 00	2.9 +-0.6 E 00 9/9 (1.6-3.7) E 00
Sr-89	12,13,28	Mean±std.dev. det./total range	L.T. 1. 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	L.T. 8. E-01 0/9 --	L.T. 9. E-01 0/9 --	L.T. 1. E 00 0/9 --	L.T. 8. E-01 0/9 --
H-3 (a)	12,13,28	Mean±std.dev. det./total range	2.6 +-0.2 E 02 3/3 (2.5-2.8) E 02	3.1 +-0.3 E 02 3/3 (2.9-3.4) E 02	4.3 +-1.1 E 02 3/3 (3.0-5.2) E 02	2.1 +-0.2 E 02 3/3 (2.0-2.3) E 02

(a) Tritium analysis is performed on the quarterly composite of all stations only. See the accompanying Table P-2 for the eighteen gamma emitters monitored below the limits of detection on the quarterly composite.

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 01/06/81-03/10/81	2nd Quarter 04/13/81-06/15/81	3rd Quarter 07/20/81-09/15/81	4th Quarter 10/18/81-12/08/81
Be-7	12,13,38	L.T. 1. E 02 (0/3)	L.T. 1. E 02 (0/3)	L.T. 1. E 02 (0/3)	L.T. 8. 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. 2. E 02 (0/3)	L.T. 2. E 02 (0/3)
Mn-54	12,13,28	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)
Co-58	12,13,28	L.T. 1. E 01 (0/3)	L.T. 9. E 00 (0/3)	L.T. 1. E 01 (0/3)	L.T. 8. E 00 (0/3)
Fe-59	12,13,28	L.T. 3. 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. 7. E 00 (0/3)	L.T. 7. E 00 (0/3)	L.T. 5. E 00 (0/3)	L.T. 6. E 00 (0/3)
Zn-65	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. 1. E 01 (0/3)
Zr-95	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. 9. E 00 (0/3)
Ru-103	12,13,28	L.T. 2. 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)
Ru-106	12,13,28	L.T. 6. E 01 (0/3)	L.T. 6. E 01 (0/3)	L.T. 8. E 01 (0/3)	L.T. 6. E 01 (0/3)
I-131	12,13,28	L.T. 6. E 02 (0/3)	L.T. 4. E 02 (0/3)	L.T. 2. E 02 (0/3)	L.T. 2. E 02 (0/3)
Cs-134	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)
Cs-137	12,13,28	L.T. 7. E 00 (0/3)	L.T. 7. E 00 (0/3)	L.T. 9. E 00 (0/3)	L.T. 7. E 00 (0/3)
Ba-140	12,13,28	L.T. 1. E 02 (0/3)	L.T. 9. E 01 (0/3)	L.T. 6. E 01 (0/3)	L.T. 5. E 01 (0/3)
Ce-141	12,13,28	L.T. 4. E 01 (0/3)	L.T. 3. 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. 7. E 01 (0/3)	L.T. 7. E 01 (0/3)	L.T. 7. E 01 (0/3)	L.T. 6. E 01 (0/3)
Ra-226	12,13,28	L.T. 2. E 02 (0/3)	L.T. 2. E 02 (0/3)	L.T. 2. 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. 2. E 01 (0/3)	L.T. 1. E 01 (0/3)

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 1981. 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 slightly lower than previous years. Iodine-131 analyses were below the minimum 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 1980. Cesium -137 was at or below the lower limit 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

RABBITS pCi/Gm WET

SAMPLE NUCLIDE	STATION NUMBER		4th Quarter 11/05-11/09
Sr-89 (femur)	28,35	Mean ± std. dev. det./total range	L.T. 2. E-01 0/4 -
Sr-90 (femur)	28,35	Mean ± std. dev. det./total range	1.3 ± 0.6 E-01 4/4 (0.6-1.8) E-01
I-131 (thyroid)	28,35	Mean ± std. dev. det./total range	L.T. 7. E-01 0/4 -
K-40 (flesh)	28,35	Mean ± std. dev. det./total range	3.1 ± 0.5 E 00 4/4 (2.5-3.5) E 00
Cs-137	28,35	Mean ± std. dev. det./total range	L.T. 6. E-02 0/4 -

TELEDYNE ISOTOPES

TABLE Q-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

RABBITS pCi/gm WET

SAMPLE NUCLIDE	STATION NUMBER	4th Quarter 11/05-11/09
Be-7	28,35	L.T. 5. E-01 (0/4)
K-40	28,35	3.1 ± 0.5 E 00 (4/4)
Mn-54	28,35	L.T. 7. E-02 (0/4)
CO-58	28,35	L.T. 7. 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. 7. E-02 (0/4)
Ru-106	28,35	L.T. 5. E-01 (0/4)
I-131	28,35	L.T. 2. E-01 (0/4)
Cs-134	28,35	L.T. 7. E-02 (0/4)
Cs-137	28,35	L.T. 6. E-02 (0/4)
Ba-140	28,35	L.T. 1. E-01 (0/4)
Ce-141	28,35	L.T. 1. 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 (See Tables R1 and R2)

STATION 12, 13,28

Aquatic vegetation was scheduled to be collected semiannually and measured for gross beta, Sr-89, Sr-90 and gamma emitters. Samples were collected during the fall of 1981 at stations 12 and 28. No sample was available at station 13. No samples were collected during the summer of 1981 at any of the three stations because of dry conditions and lack of growth. No samples had been obtained in 1977 and 1979 for the same reasons.

The gross beta activity was slightly higher than in the past at 3.8 pCi/gm, wet. There were no detections of Sr-89 or Sr-90.

Potassium-40 was detected in one sample at the same level as in previous years. Manganese-54, Co-58 and Co-60, which are neutron activation products, were detected in both samples collected; Mn-54 at 0.35 pCi/gm, wet, Co-58 at 0.52 pCi/gm, wet, and Co-60 at 0.77 pCi/gm wet. This is slightly higher than the levels detected in 1980. Since the sampling locations are in close proximity (Station 12 is within the site boundaries and Station 28 is within three miles downstream of the discharge point), it is assumed that these nuclides originated from CNS. No other gamma emitters were detected above the minimum level of detection.

TELEDYNE ISOTOPES

TABLE R-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

VEGETATION/AQUATIC - pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER		4th Quarter 10/17/81
Gross Beta	12,13,28 (a)	Mean ± std. dev. det./total range	3.8 ± 0.3 E 00 2/2 (3.6-4.0) E 00
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	L.T. 1. E-02 0/2 --
K-40	12,28	Mean ± std. dev. det./total range	3.9 ± 0.7 E 00 1/2 --
Mn-54	12,28	Mean ± std. dev. det./total range	3.5 ± 0.7 E-01 2/2 (3.0-4.0) E-01

(a) Sample was not collected at Station 13; no sample available.

TELEDYNE ISOTOPES

TABLE R-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

VEGETATION/AQUATIC - pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER		4th Quarter 10/17/81
Co-58	12,28	Mean ± std. dev. det./total range	5.2 ± 0.7 E-01 2/2 (4.7-5.7) E-01
Co-60	12,28	Mean ± std. dev. det./total range	7.7 ± 1.5 E-01 2/2 (6.6-8.8) E-01
Cs-137	12,28	Mean ± std. dev. det./total range	L.T. 1. E-01 0/2 --

TELEDYNE ISOTOPES

TABLE R-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - INGESTION

VEGETATION/AQUATIC - pCi/gm, wet

SAMPLE NUCLIDE	STATION NUMBER	4th Quarter 10/17/81
Be-7	12,13,28	L.T. 8. E-01 (0/2)
K-40	12,13,28	3.9 ± 0.7 E 00 (1/2)
Mn-54	12,13,28	3.5 ± 0.7 E-01 (2/2)
Co-58	12,13,28	5.2 ± 0.7 E-01 (2/2)
Fe-59	12,13,28	L.T. 2. E-01 (0/2)
Co-60	12,13,28	7.7 ± 1.5 E-01 (2/2)
Zn-65	12,13,28	L.T. 2. E-01 (0/2)
Zr-95	12,13,28	L.T. 1. E-01 (0/2)
Ru-103	12,13,28	L.T. 1. E-01 (0/2)
Ru-106	12,13,28	L.T. 8. E-01 (0/2)
I-131	12,13,28	L.T. 2. E-01 (0/2)
Cs-134	12,13,28	L.T. 1. E-01 (0/2)
Cs-137	12,13,28	L.T. 1. E-01 (0/2)
Ba-140	12,13,28	L.T. 1. E-01 (0/2)
Ce-141	12,13,28	L.T. 2. E-01 (0/2)
Ce-144	12,13,28	L.T. 8. E-01 (0/2)
Ra-226	12,13,28	L.T. 2. E 00 (0/2)
Th-228	12,13,28	L.T. 2. E-01 (0/2)

TELEDYNE ISOTOPES

S. SOIL (See Tables S1 and S2)

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

Soil samples, which are collected every three years, were collected on September 10, 1981. Samples were analyzed for Sr-90 and gamma emitting isotopes. Strontium-90 was detected in 9 of 11 samples at a level of 0.16 pCi/gm, dry. This is very close to th levels detected in 1975 and 1978.

Among the gamma emitters K-40 remained at the previous level of 17.0 pCi/gm, dry. Radium-226 and Thorium-228 levels also remained constant. Trace levels of Cs-137 were detected in eleven of eleven samples and of Zr-95 in one of eleven samples. These nuclides were also detected in air particulate samples and are probably due to fallout from the Chinese nuclear atomspheric weapons tests of October 16, 1980. There is no indication of a plant effect.

TELEDYNE ISOTOPES

TABLE S-1

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

SOIL - pCi/gm, dry

SAMPLE NUCLIDE	STATION NUMBER		3rd Quarter 09/21/81
Sr-90	2,3,4,5,6,7, 8,9,10	Mean±std.dev. det./total range	1.6 ± 0.5 E-01 9/11 (0.8-2.1) E-01
K-40	2,3,4,5,6,7, 8,9,10	Mean±std.dev. det./total range	1.7 ± 0.2 E 01 10/11 (1.5-2.0) E 01
Zr-95	2,3,4,5,6,7, 8,9,10	Mean±std.dev. det./total range	1.3 ± 0.6 E-01 1/11 --
Cs-137	2,3,4,5,6,7, 8,9,10	Mean±std.dev. det./total range	4.4 ± 2.2 E-01 11/11 (0.9-7.2) E-01
Ra-226	2,3,4,5,6,7, 8,9,10	Mean±std.dev. det./total range	1.9 ± 0.5 E 00 11/11 (1.5-2.8) E 00
Th-228	2,3,4,5,6,7, 8,9,10	Mean±std.dev. det./total range	1.1 ± 0.2 E 00 11/11 (0.8-1.6) E 00

TELEDYNE ISOTOPES

TABLE S-2

NEBRASKA PUBLIC POWER DISTRICT

COOPER NUCLEAR STATION

EXPOSURE PATHWAY - AIRBORNE

SOIL - pCi/Gm, dry)

SAMPLE NUCLIDE	STATION NUMBER	3rd Quarter 09/21/81
Be-7	2,3,4,5,6,7,8,9,10	7.2 ± 3.4 E-01 (1/11)
K-40	2,3,4,5,6,7,8,9,10	1.7 ± 0.2 E 01 (10/11)
Mn-54	2,3,4,5,6,7,8,9,10	L.T. 4. E-02 (0/11)
Co-58	2,3,4,5,6,7,8,9,10	L.T. 4. E-02 (0/11)
Fe-59	2,3,4,5,6,7,8,9,10	L.T. 1. E-01 (0/11)
Co-60	2,3,4,5,6,7,8,9,10	L.T. 3. E-02 (0/11)
Zn-65	2,3,4,5,6,7,8,9,10	L.T. 1. E-01 (0/11)
Zr-95	2,3,4,5,6,7,8,9,10	1.3 ± 0.6 E-01 (1/11)
Ru-103	2,3,4,5,6,7,8,9,10	L.T. 6. E-02 (0/11)
Ru-106	2,3,4,5,6,7,8,9,10	L.T. 4. E-01 (0/11)
I-131	2,3,4,5,6,7,8,9,10	L.T. 2. E-01 (0/11)
Cs-134	2,3,4,5,6,7,8,9,10	L.T. 4. E-02 (0/11)
Cs-137	2,3,4,5,6,7,8,9,10	4.4 ± 2.2 E-01 (11/11)
Ba-140	2,3,4,5,6,7,8,9,10	L.T. 1. E-01 (0/11)
Ce-141	2,3,4,5,6,7,8,9,10	L.T. 7. E-02 (0/11)
Ce-144	2,3,4,5,6,7,8,9,10	L.T. 2. E-01 (0/11)
Ra-226	2,3,4,5,6,7,8,9,10	1.9 ± 0.5 E 00 (11/11)
Th-228	2,3,4,5,6,7,8,9,10	1.1 ± 0.2 E 00 (11/11)

TELEDYNE ISOTOPES

T. AMBIENT RADIATION - THERMOLUMINESCENT DOSIMETERS (TLDs - TABLE T-1)

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 19.4+-4.4 milliRoentgen/quarter to 21.2+-5.5 milli-Roentgen/quarter. The highest exposure during each of the four quarters at station 01 (0.1 mile, 225 degrees) and averaged 37.1+-5.6 mR/quarter. The lowest exposure was at station 03 (2.5 miles, 338 degrees) and averaged 17.1 mR/quarter.

These exposures were 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 01/02/81-04/01/81	2nd Quarter 04/01/81-07/01/81	3rd Quarter 07/01/81-10/01/81	4th Quarter 10/01/81-01/04/82
TLD Gamma	01	42.0 ± 0.8 (a)	30.4 ± 2.2	41.5 ± 0.8	34.6 ± 4.7
	02	18.8 ± 0.6	18.7 ± 0.3	19.5 ± 0.7	18.2 ± 0.6
	03	17.6 ± 0.5	16.9 ± 0.2	18.7 ± 1.3	15.3 ± 1.1
	04	18.2 ± 0.2	18.4 ± 0.5	18.3 ± 0.5	16.8 ± 0.2
	05	18.5 ± 0.2	19.1 ± 0.8	19.1 ± 0.5	17.6 ± 0.5
	06	18.9 ± 0.6	18.8 ± 0.4	19.2 ± 0.3	17.0 ± 0.6
	07	18.8 ± 0.2	18.8 ± 0.3	18.8 ± 0.4	17.8 ± 0.1
	08	19.6 ± 0.4	13.5 ± 0.7	19.9 ± 0.5	18.1 ± 0.3
	09	18.2 ± 0.3	18.3 ± 0.3 (a)	18.4 ± 0.4	17.7 ± 1.5
	10	18.9 ± 0.3	19.0 ± 0.6	18.8 ± 0.6	17.4 ± 0.8
	15	19.4 ± 0.4	19.5 ± 0.4	20.7 ± 1.3	16.7 ± 1.0
	18	19.8 ± 0.3	20.5 ± 0.3	20.3 ± 0.4	21.4 ± 1.8
	22	20.1 ± 0.7	21.1 ± 0.3	21.5 ± 0.8	18.4 ± 0.4
	44	21.2 ± 0.5	22.3 ± 1.0	22.3 ± 0.5	21.1 ± 0.4
	58	20.7 ± 0.3	21.0 ± 0.4	21.0 ± 0.6	19.5 ± 0.3
	59	19.8 ± 0.3	21.8 ± 0.3	21.0 ± 0.4	19.6 ± 0.2
Average/Quarter		20.7 ± 5.8 mR/89 days	19.9 ± 3.5 mR/91 days	21.1 ± 5.5 mR/92 days	19.2 ± 4.4 mR/95 days
Average/Day		0.23 ± 0.07 mR/day	0.22 ± 0.04 mR/day	0.23 ± 0.06 mR/day	0.20 ± 0.05 mR/day
Range		(17.6-42.0) mR/89 days	(13.5-30.4) mR/91 days	(18.3-41.5) mR/92 days	(15.3-34.6) mR/95 days
Det./Total		16/16	16/16	16/16	16/16

(a) Average of Areas 1, 2 and 3. Using the criterion that, if the value of one area is outside the range of 3 standard deviations from the average of the other 3 areas, then that area will be excluded from the final average determination.