Indiana Michigan
Power Company
Cook Nuclear Plant
500 Circle Drive
Buchanan, MI 49107
616-465-5901

AEP
INDIANA MICHIGAN POWER

April 26, 2001

C0401-11
10 CFR 50, Appendix I

Docket Nos.: 50-315
50-316

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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Washington, D.C. 20555-0001

Donald C. Cook Nuclear Plant Units 1 and 2
ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

Enclosed is the Donald C. Cook Nuclear Plant Annual Radiological Environmental Operating Report. This report covers the period from January 1, 2000, through December 31, 2000, and it was prepared in accordance with the requirements of Technical Specification 6.9.1.6 and 10 CFR 50, Appendix I, Sections IV.B.2, IV.B.3 and IV.C.

Should you have any questions, please contact Mr. Ronald W. Gaston, Manager of Regulatory Affairs at (616) 697-5020.

Sincerely,

Scot A. Greenlee
Director of Design Engineering and Regulatory Affairs

/dmb

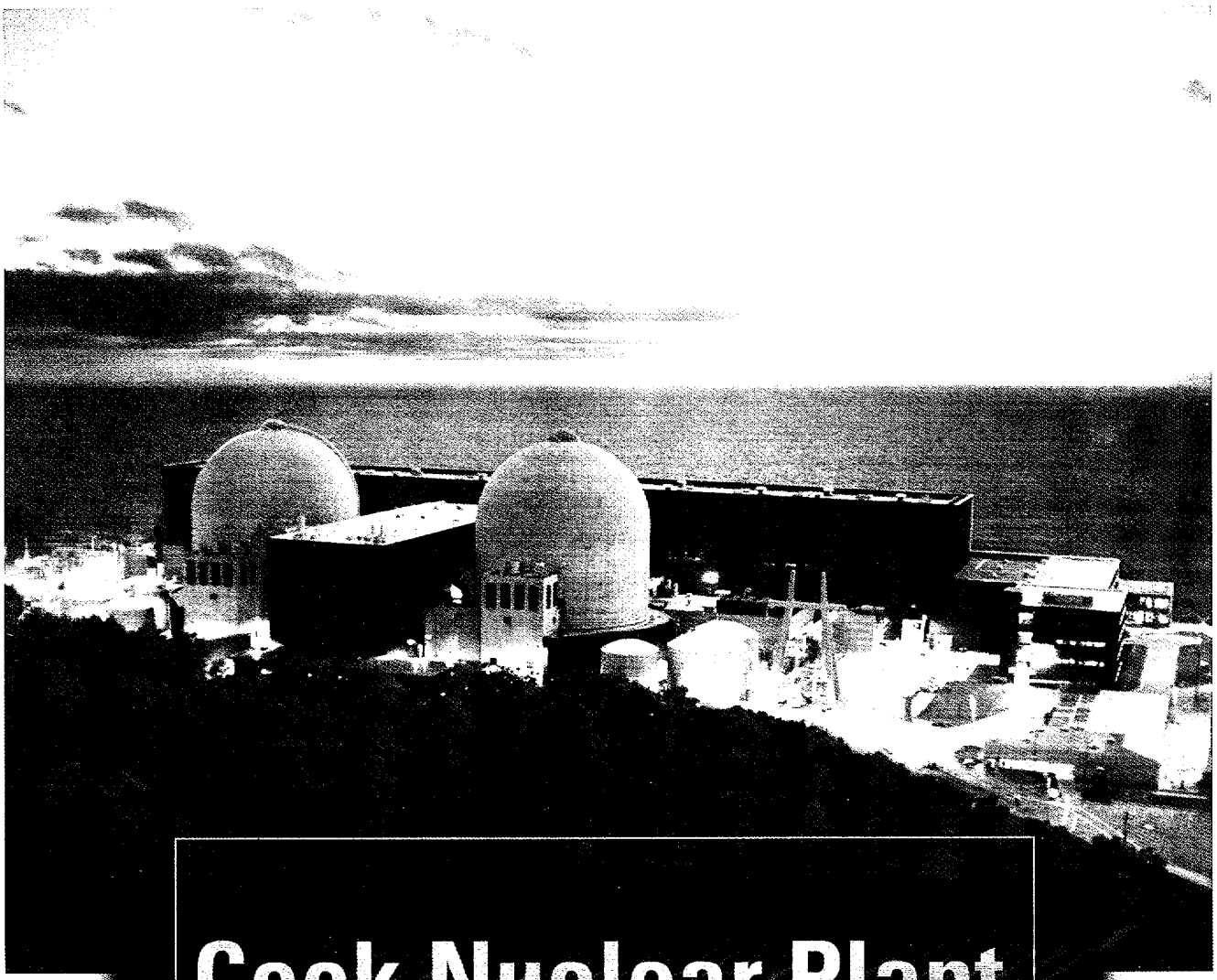
Enclosures

c: J. E. Dyer
MDEQ – DW & RPD, w/o attachment
NRC Resident Inspector
R. Whale, w/o attachment

C001

ATTACHMENT 1 TO C0401-11

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT



Cook Nuclear Plant
Nuclear Generation Group

Annual Radiological Environmental Operating Report

January 1, 2000 through December 31, 2000

AEP AMERICAN ELECTRIC POWER

AEP: America's Energy Partner™

DONALD C. COOK NUCLEAR PLANT

UNITS 1 & 2

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

JANUARY 1 to DECEMBER 31, 2000

Prepared by

Indiana Michigan Power Company
and
Teledyne Brown Engineering

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INDIANA MICHIGAN POWER COMPANY

DONALD C. COOK NUCLEAR PLANT

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

SUMMARY

This report summarizes the collection and analysis of various environmental sample media in 2000 for the Radiological Environmental Monitoring Program for the Donald C. Cook Nuclear Plant.

The various analyses of most sample media suggest that there was no discernible impact of the Donald C. Cook Nuclear Plant on the environment. The analysis of air particulate filters, charcoal cartridges, direct radiation by thermoluminescent dosimeters, fish, water, milk and sediments from Lake Michigan, drinking water, and food products, either did not detect any radioactivity or measured only naturally occurring radionuclides at normal background levels.

Tritium, measured at low levels in on-site wells, appears to be the only radionuclide attributable to the plant operations. However, the associated groundwater does not provide a direct dose pathway to humans.

I. INTRODUCTION

I. INTRODUCTION

The Donald C. Cook Nuclear Plant's Radiological Environmental Monitoring Program (REMP) is conducted in compliance with NRC Regulatory Guide 1.21 and 4.1, licensing commitments, and Technical Specifications. The REMP was developed in accordance with the NRC Radiological Assessment Branch Technical Position (BTP), Rev. 1, November 1979. A synopsis of the sampling program and maps can be found in Section III, Sampling and Analysis Program. This report represents the Annual Radiological Environmental Operating Report (AREOR) for Units 1 and 2 of the Donald C. Cook Nuclear Plant for the operating period from January 1, 2000 through December 31, 2000.

A. The Donald C. Cook Nuclear Plant of Indiana Michigan Power Company is located on the southeastern shore of Lake Michigan approximately one mile northwest of Bridgman, Michigan. The plant consists of two pressurized water reactors, Unit 1, 1030 MWE and Unit 2, 1100 MWE. Unit 1 achieved initial criticality on January 18, 1975 and Unit 2 achieved initial criticality on March 10, 1978.

B. Objectives

The objectives of the operational radiological environmental monitoring program are:

1. Identify and measure radiation and radioactivity in the plant environs for the calculation of potential dose to the population.

2. Verify the effectiveness of in-plant measures used for controlling the release of radioactive materials.

3. Provide reasonable assurance that the predicted doses, based on effluent data, have not been substantially underestimated and are consistent with applicable standards.

4. Comply with regulatory requirements and Station Technical Specifications and provide records to document compliance.

II. CHANGES

II. CHANGES

Move from Westwood, New Jersey to Knoxville, Tennessee

During the year 2000, Teledyne Brown Engineering relocated its laboratory facilities from Westwood, NJ to Knoxville, TN. During the transition period, arrangements were made with Midwest and Duke Engineering Laboratories, both NUPIC certified labs, to provide support services to our clients during this stage of the move. By the end of the year 2000, the move was completed and the analytical systems were brought on-line and operational in Knoxville.

REMP Procedure Changes for the AREOR

Most of the REMP procedures were revised during the year of 2000. This was due to a revision of PMP-2010.PRC.001, Procedure Writing procedure and PMP-2010.PRC.002, Procedure Correction, Change, and Review procedure. This was also the year in which the REMP procedures as well as the program were fully turned over to the Environmental section of the Cook Nuclear Plant. These two issues required many administrative changes to the REMP procedures.

12-THP-6010.RPP.630 Rev 2b, "Collection of REMP Surface Water Samples"
This revision improved the description of the locations at which the samples are to be taken. No changes to the procedure methods were performed.

12 THP-6010.RPP.630 Rev 2a, "Collection of REMP Surface Water Samples"
The majority of changes in this revision were administrative due to format, organizational changes, and the addition of increased detail. The requirement of a rope on a sample collection device was added due to foreign material exclusion precautions. The amount of acid added to the samples was changed from 5 ml to 2 ml. The characteristics of lake water allow less acid addition to achieve a solution with a pH of 2 or less. A procedure reference to sampling method EPA-600, Prescribed Procedures for Measurement of Radioactivity in Drinking Water was added.

12-THP-6010.RPP.632 Rev 4a, "Collection of Environmental Air Samples"
The only changes to this procedure other than administrative changes were the replacement of the sample location maps to match those in the ODCM. No changes to the procedure methods were performed.

12-THP-6010.RPP.633 Rev 4a, "Collection of Environmental Radiation Dosimeters"
All the changes performed under this revision were administrative in nature. No changes to the procedure methods were performed.

12-THP-6010.RPP.634 Rev 3, "Collection of Groundwater Samples"
Many changes were made to this procedure. The method for purging the well was changed to provide for the large swings in groundwater levels in recent years. The requirement to clean any equipment being inserted into the well was added to prevent contamination of the wells (especially non-radiological contaminants). A section was added to provide direction for the measurement the oil water interface of one of the wells. Direction was added for the acidification of samples, which are to be analyzed for gamma isotopes. Much more detail was added for the operation of the various types of sample pumps.

12-THP-6010.RPP.635 Rev 1, "Collection of Milk Samples"
All the changes performed under this revision were administrative in nature with the exception that a note was added to the label warning of the contents of sodium bisulfite. No changes to the procedure methods were performed.

12-THP-6010.RPP.636 Rev 2a, "Collection of Fish Samples"
All the changes performed under this revision were administrative in nature with the exception of the addition of safety equipment as per Coast Guard regulations. No changes to the procedure methods were performed.

12-THP-6010.RPP 637 Rev 1a, "Collection of Lake Sediment Samples"
All the changes performed under this revision were administrative in nature. No changes to the procedure methods were performed.

12-THP-6010-RPP.638 Rev 3, "Collection of Grape and Broadleaf Samples"
A step was added to the procedure for the REMP coordinator to receive landowner permission for the samples prior to the REMP technician going to the residence. This step was added to ensure the REMP technician safety. All other changes performed under this revision were administrative in nature.

12-THP-6010-RPP.639 Rev 2a, "Annual Radiological Environmental Operating Report (AREOR) Preparation and Submittal"
All the changes performed under this revision were administrative in nature. No changes to the procedure methods were performed.

2-THP-6010-RPP-640 Rev 1a, "Land Use Census"
All the changes performed under this revision were administrative in nature. No changes to the procedure methods were performed.

12-THP-6010-RPP.642 Rev 2, "Collection of REMP Drinking Water Samples"
Changed the volume of the sample to be collected from 500 ml to 1L due to the need to acidify a portion of the sample for preservation. Initiated the acidification of the sample designated for gross beta and gamma isotopic analysis to prevent the plating out of metals. Changed the frequency at which the collected samples are composited to once every seven days for proper acidification. The volumes of composited samples sent to the vendor laboratory were also increased due to the acidification changes. A reference to EPA-600 (4-80-032) method was added to the procedure. All other changes performed under this revision were administrative in nature.

12-THP-6010-RPP.642 Rev 1a, "Collection of REMP Drinking Water Samples"
All the changes performed under this revision were administrative in nature. No changes to the procedure methods were performed.

12-THP-6010-RPP.643 Rev 2, "Quarterly Review of REMP Data"
All the changes performed under this revision were administrative in nature. No changes to the procedure methods were performed.

Changes to OCDM

Several changes to the Off-Site Dose Calculation manual (ODCM) were made in 2000. These include corrections to the location of the sample stations, and changes to the sample types and frequency (ODCM, Attachment 3.19).

During 2000, the following changes were made to the ODCM procedure:

Rev 14, Administrative

"This procedure was reformatted in its entirety to comply with PMP-2010.PRC.001, Procedure Writing."

"Section 1 – Purpose and Scope, NOTE – Added NOTE, 'Only applicable Sections, Subsections, and Attachments within this procedure need to be performed'. Implements requirements of PMP-2010.PRC.003 while advising the user that individual Sections, Subsections, and Attachments can be performed without a requirement of the entire procedure being performed."

"Section 1 – Purpose and Scope – (Rev. 13, Objective, page 1) – Broke down paragraph into bulleted items. This is an editorial correction for ease of reading and interpretation."

"(Rev. 13, Section 2 – References, page 2) – Moved to Section 5 in new format per PRC.002."

"Section 2 – Definition and Abbreviations – This section has been added under the new format process. Abbreviations describe sampling frequency letters, (example: D, W, Q, S/A, etc). Clarification of abbreviations shown throughout attachments, in accordance with TS Table 1.2 (Definitions). This information was lost when the ODCM was originally moved out of the TS. Definition for sampling evolution has been added to define the actions associated with fulfilling a surveillance requirement."

"Throughout the entire procedure, added the title of each attachment after each reference to the attachment. This is to eliminate the possibility of human error."

"Subsection 3.2 – (Rev. 13, pages 8-11) – The following note and substeps within this Subsection all have been rewritten to reflect a correction from passive voice to active voice, which is a Microsoft Word grammatical correction and PRC.001 recommends writing in active voice. In most cases the passive voice sentences consist of 'shall be'. The NOTE preceding Subsection 3.2, steps 3.2.1a, 3.2.1e, 3.2.1f, 3.2.2a, 3.2.2e, 3.2.2f, 3.2.3a3, 3.2.3a4, 3.2.3b1, 3.2.3b3, 3.2.3b4, 3.2.3c1, 3.2.3c3, 3.2.3d1, 3.2.3d2, 3.2.4a1, 3.2.4a3, 3.2.4a4, 3.2.4b1, 3.2.4b3, 3.2.4c1, 3.2.4c3, 3.2.4d1, 3.2.4d2, 3.2.5c."

"Step 3.7.2 – (Rev. 13, page 20) – Changed 'the MIDAS' to 'a meteorological software' to be more generic in the event Cook Plant changes to another system."

"Attachment 3.20 – (Rev. 13, page 1) – Added 'REMP' to title of attachment, for clarification."

"Attachment 3.20 – (Rev. 13, page 1) – Added 'This Data is directly from out plant-specific Technical Specifications', for clarification of source documented."

"Attachment 3.20 – (Rev 13, page 1)_ - Notes, Item A, second paragraph and Item B, rewritten from passive voice to active voice, per PRC.002."

"Attachment 3.21 - (Rev. 13, page 1) – Added 'This Data is directly from out plant-specific Technical Specification.', for clarification of source document."

There were numerous other changes made to Rev 14 which do not impact the REMP.

Rev 14, Non Administrative

"Attachment 3.16 - (Rev. 13, pages 1-2) – All data within this attachment has been updated to reflect the latest 10 year averages."

"Attachment 3.16 - (Rev 13, page 1) – Changed Worst Case Chi/Q from '1.28E-5 sec/m3 in Sector A 1994' ti ' 1.54E-5 sec/m3 in Sector J 1998' as the analysis of 1998 meteorological data shows worst case has increased since the previous value."

"Attachment 3.19 – (Rev 13, page 2) – Changed Drinking Water LTW from '0.4 mi S.' To '0.6mi S', CR98-04943 provides new references to documents that provide the new measurement. Related plant documents will be updated concurrently."

"Attachment 3.19 –(Rev 13, page 3) – Added asterisk indicator after INGESTION – MILK Indicator Farms."

"Attachment 3.19 – (Rev 13, page 4) – Added asterisk footnote at end of attachment which states, 'The three milk indicator farms will be determined by the Annual Land Use Census and those that are willing to participate', This was added due to the farm turnover rate and 12-THP-6010.RPP.635, Collection of Milk Samples, controls which farm is sampled."

"Attachment 3.19 – (Rev 13, page 4) – Rewrote first paragraph on last page of attachment from passive voice to active voice, per PRC.002."

"Attachment 3.19 – (Rev 13, page 4) – Deleted definitions as end of attachment, as they have been incorporated into Section 2 of the procedure."

"Attachment 3.22 – (Rev 13, page 1) – Updated new map per land use census."

"Attachment 3.23 – (Rev 13, page 1) – Updated new map per land use census."

"Attachment 3.23 – (Rev 13, page 1) – Removed 'Sue Dorman.....Goat' from map as this goat is no longer part of the REMP program, as described in the 1998 Land Use Census. (12-THP-6103RPP.640, Attachment 1)."

"Attachment 3.23 – (Rev 13, page 1) – Added footnote, 'The current milk indicator farms are indicated here, but they will be determined and controlled.....' This was added due to the farm turnover rate and 12-THP-6010.RPP.635, Collection of Milk Samples, controls which farm is sampled."

REV. 15, OFF-SITE DOSE CALCULATION MANUAL

"Section 3.5.2a.4 – Conduct of the REMP – Changed wording to allow a special milk farm survey to include all sectors, not just the one the milk source had been in. This was done due to increase chances of determining that another milk source was available to continue the milk

sampling program as dairy farms are becoming less plentiful in the area. This is a correction based on Step 3.1.6a, item 18 of PMP 2010 PRC.002."

"Section 3.5.2a.4a – Changed wording to allow alternate sampling location in another sector to support the change made above for the same reasons. If a dairy source is found in another sector, this allows us to use it for sampling even though it is in another sector. This is a correction based on Step 3.1.6a, item 18 of PMP 2010 PRC.002."

"Attachment 3.6, – Radioactive Liquid Waste Sampling and Analysis Program. Deleted reference to UFSAR Appendix Q, Question 320.8 since this requirement was made moot with the implements of the Radiological Technical Specifications (RETS). There are several programs in place to implement the requirements of the RETS and ensure compliance of the Turbine Room Sump release point. This is a correction based on Step 3.1.6a, item 13 of PMP 2010 PRC.002."

"Attachment 3.16, – 10 Year Average of 1989-1998 Data. Corrected typographical error pertaining to the worst case χ/Q sector which is Sector A, not J. This is not a change as based on Step 3.1.6a, item 13 of PMP 2010 PRC.002."

"Attachment 3.19, – Radiological Environmental Monitoring Program Sample Stations, Sample Types, Sample Frequencies. Corrected typographical error form "mild" to "milk" in last footnote. This is not a change based on Step 3.1.6a, item 4 of PMP 2010 PRC.002."

There were various other administrative changes to Rev. 15 which do not impact the REMP.

III. SAMPLING AND ANALYSIS PROGRAM

III. SAMPLING AND ANALYSIS PROGRAM

Table 1 summarizes the sampling and analysis program for the Donald C. Cook Nuclear Plant for 2000. For each sample medium, the table lists the sample locations, including distance and direction from the center of the two units, and the station identification. The station identifications for the sampling locations are shown on Figures 1 and 2. Also for each sample medium the sample collection frequency, type of analysis, and frequency of analysis are listed.

TABLE 1

DONALD C. COOK NUCLEAR PLANT- 2000

RADIOLOGICAL SAMPLING STATIONS

DISTANCE AND DIRECTION FROM PLANT AXIS

Location	Station	Distance	Direction	Degrees	Collection Frequency	Analysis/Frequency
Environmental (TLDs)						
ONS-1	(T-01)	1945 ft.		18°	Quarterly	Direct Radiation/Quarterly
ONS-2	(T-02)	2338 ft.		48°		
ONS-3	(T-03)	2407 ft.		90°		
ONS-4	(T-04)	1852 ft.		118°		
ONS-5	(T-05)	1895 ft.		189°		
ONS-6	(T-06)	1917 ft.		210°		
Rosemary Beach	(T-07)	2103 ft.		36°		
Radioactive Material Bldg.	(T-08)	2208 ft.		82°		
Sewage Settling Pond	(T-09)	1368 ft.		149°		
2nd U/2 transmission tower to the 765 yard	(T-10)	1390 ft.		127°		
Well W-01	(T-11)	1969 ft.		11°		
Well W-02	(T-12)	2292 ft.		63°		
New Buffalo	(NBF)	15.6 mi	SSW			
South Bend	(SBN)	26.2 mi	SE			
Dowagiac	(DOW)	24.3 mi	ENE			
Coloma	(COL)	18.9 mi	NNE			
Intersection of Red Arrow Hwy. & Marquette Woods Rd., Pole #B294-44	(OFT-1)	4.5 mi	NNE			
Stevensville Substation	(OFT-2)	3.6 mi	NE			
Pole #B296-13	(OFT-3)	5.1 mi	NE			
Pole #B350-72	(OFT-4)	4.1 mi	ENE			
Intersection of Shawnee & Cleveland, Pole #B387-32	(OFT-5)	4.2 mi	SE			
Snow Rd., West of Landon Rd., #B426-1	(OFT-6)	4.9 mi	SSE			
Bridgman Substation	(OFT-7)	2.5 mi	S			
California Rd., Pole #B424-20	(OFT-8)	4.0 mi	S			

a) Broadleaf in lieu of milk was discontinued due to reimplementation of the milk program.

TABLE 1 (cont)

DONALD C. COOK NUCLEAR PLANT- 2000

RADIOLOGICAL SAMPLING STATIONS

DISTANCE AND DIRECTION FROM PLANT AXIS

Location	Station	Distance	Direction	Degrees	Collection Frequency	Analysis/Frequency
Ruggles Rd., Pole B369-214	(OFT-9)	4.4 mi	ESE			
Intersection of Red Arrow Hwy., & Floral Rd. West of Red Arrow Hwy	(OFT-10)	3.8 mi	SSW			
Intersection of Snow Rd. & Baldwin Rd., Pole #B423-12	(OFT-11)	3.8 mi	S			
Air Charcoal Particulates						
ONS-1	(ONS-1)	1945 ft.		18°	Weekly	Gross Beta/Weekly
ONS-2	(ONS-2)	2338 ft.		48°		I-131/Weekly
ONS-3	(ONS-3)	2407 ft.		90°		Gamma Isotopic/
ONS-4	(ONS-4)	1852 ft.		118°		Quarterly Composite
ONS-5	(ONS-5)	1895 ft.		189°		
ONS-6	(ONS-6)	1917 ft.		210°		
New Buffalo	(NBF)	15.6 mi	SSW			
South Bend	(SBN)	26.2 mi	SE			
Dowagiac	(DOW)	24.3 mi	ENE			
Coloma	(COL)	18.9 mi	NNE			

a) Broadleaf in lieu of milk was discontinued due to reimplementation of the milk program.

TABLE 1 (Cont.)

DONALD C. COOK NUCLEAR PLANT- 2000

RADIOLOGICAL SAMPLING STATIONS

DISTANCE AND DIRECTION FROM PLANT AXIS

Location	Station	Distance	Direction	Degrees	Collection Frequency	Analysis/Frequency
Groundwater						
Onsite	(W-1)	1969 ft.		11°	Quarterly	Gamma Isotopic/Quarterly
Onsite	(W-2)	2292 ft.		107°		Tritium/Quarterly
Onsite	(W-4)	418 ft.		301°		
Onsite	(W-5)	404 ft.		290°		
Onsite	(W-6)	424 ft.		273°		
Onsite	(W-7)	1895 ft.		189°		
Onsite	(W-8)	1279 ft.		53°		
Onsite	(W-9)	1447 ft.		22°		
Onsite	(W-10)	4216 ft.		129°		
Onsite	(W-11)	3206 ft.		153°		
Onsite	(W-12)	2631 ft.		162°		
Onsite	(W-13)	2152 ft.		182°		
Onsite	(W-14)	1780 ft.		164°		
Steam Generator Groundwater						
Steam Generator Storage Facility	(SG-1)	0.8 mi		95°	Quarterly	Gross Beta/Quarterly
Steam Generator Storage Facility	(SG-2)	0.7 mi		92°		Gross Alpha/Quarterly
Steam Generator Storage Facility	(SG-4)	0.7 mi		93°		Gamma Isotopic/Quarterly
Steam Generator Storage Facility	(SG-5)	0.7 mi		92°		

a) Broadleaf in lieu of milk was discontinued due to reimplementation of the milk program.

TABLE 1 (Cont.)

DONALD C. COOK NUCLEAR PLANT- 2000

RADIOLOGICAL SAMPLING STATIONS

DISTANCE AND DIRECTION FROM PLANT AXIS

Location	Station	Distance	Direction	Degrees	Collection Frequency	Analysis/Frequency
Drinking Water						
St. Joseph Public Intake	(STJ)	9.0 mi	NE		Daily	Gross Beta/14 Day Composite Gamma Isotopic/14 Day Composite I-131/14 Day Composite
Lake Township Public Intake Station	(LTW)	0.6 mi	S			Tritium/Quarterly Composite
Surface Water						
Condenser Circulating Water Intake Composite	SWL-1				Daily	Gamma Isotopic/Monthly
Lake Michigan Shoreline	SWL-2	500 ft.	S			
Lake Michigan Shoreline	SWL-3	500 ft.	N			Tritium/Quarterly Composite
Sediment						
Lake Michigan Shoreline	SL-2	500 ft	S			
Lake Michigan Shoreline	SL-3	500 ft	N		Semi-annually	Gamma Isotopic/Semi-annually

a) Broadleaf in lieu of milk was discontinued due to reimplementation of the milk program.

TABLE 1 (Cont.)

DONALD C. COOK NUCLEAR PLANT- 2000

RADIOLOGICAL SAMPLING STATIONS

DISTANCE AND DIRECTION FROM PLANT AXIS

Location	Station	Distance	Direction	Degrees	Collection Frequency	Analysis/Frequency
Milk-Indicator						
Baroda	Monroe Residence	5.0 mi	SE		Weekly	I-131/14 Day Gamma isotopic/14 Day
Baroda	Schuler Farm	4.1 mi	SSE			
Buchanan	Glen Troy Farm	7.0 mi	SSE			
Milk Background						
La Porte	Livinghouse Farm	20.0 mi	SSW		Weekly	I-131/14 days Gamma isotopic/14 days
Dowagiac	Wyant Farm	20.7 mi	ESE			
Broadleaf Vegetation						
(a)						
Fish						
Lake Michigan	ONS-N	0.3 mi	N		2/year	Gamma Isotopic/2/year
Lake Michigan	ONS-S	0.4 mi	S			
Lake Michigan	OFS-N	3.5 mi	N			
Lake Michigan	OFS-S	5.0 mi	S			

a) Broadleaf in lieu of milk was discontinued due to reimplementation of the milk program.

TABLE 1 (Cont.)

DONALD C. COOK NUCLEAR PLANT- 2000

RADIOLOGICAL SAMPLING STATIONS

DISTANCE AND DIRECTION FROM PLANT AXIS

Location	Station	Distance	Direction	Degrees	Collection Frequency	Analysis/Frequency
Grapes/Broadleaf						
Nearest sample to Plant in highest D/Q land sector containing media.	Sector D				At time of harvest	Gamma Isotopic at time of harvest
Grapes						
In a land sector containing grapes approximately 20 miles from the Plant in one of the less prevalent D/Q land sectors.	Sector J				At time of harvest	Gamma Isotopic at time of harvest.

* Composite samples of Drinking and Surface water shall be collected at least daily

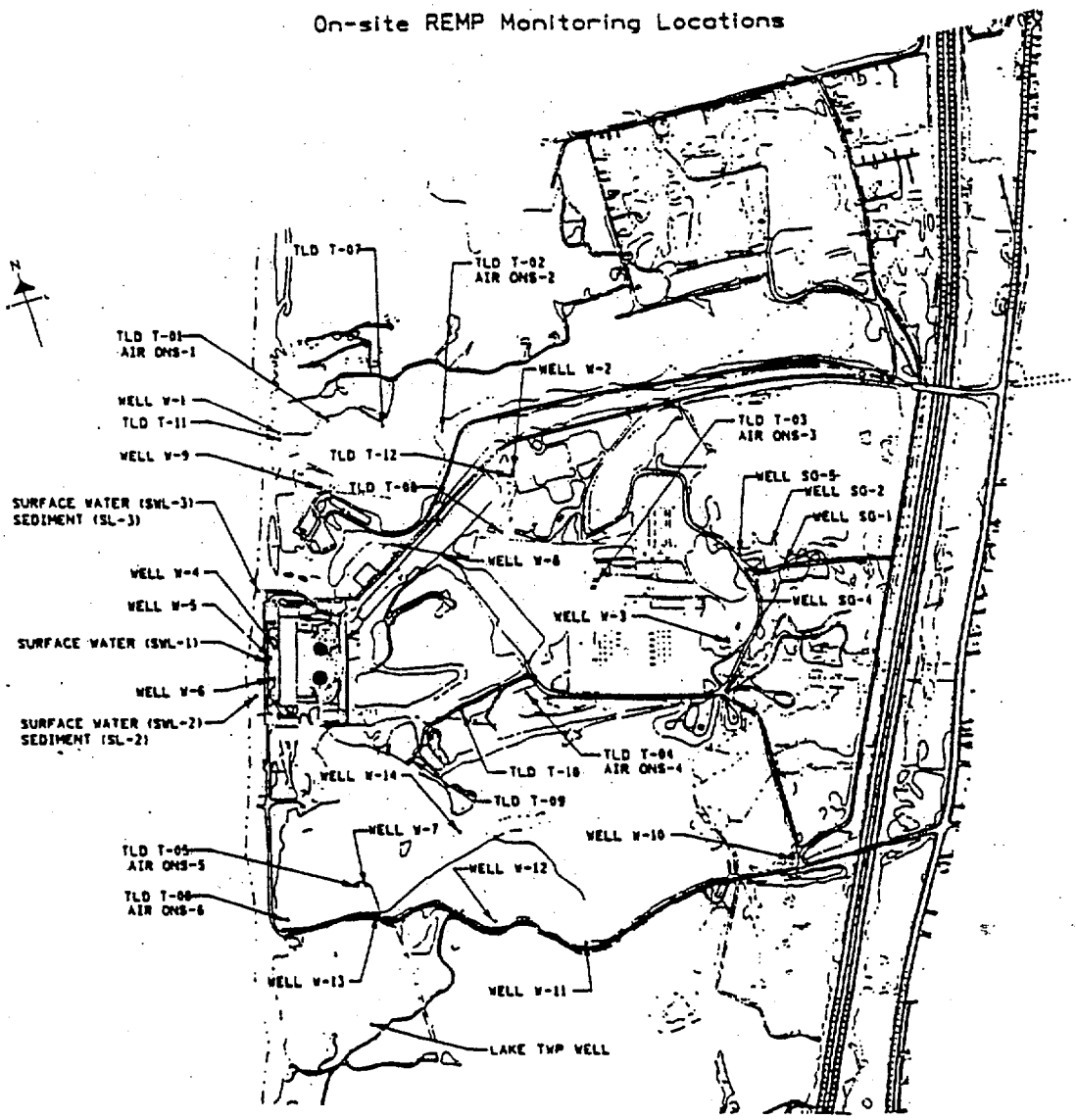
* Particulate sample filters should be analyzed for gross beta activity 24 or more hours following filter removal. This will allow for radon and thoron daughter decay. If gross beta activity in air or water is greater than 10 times the yearly mean of control samples for any medium, gamma isotopic analysis should be performed on the individual samples.

Please note the following definitions:

Weekly	-	at least once every seven (7) days
Monthly	-	at least once every (31) days
Quarterly	-	at least once every ninety-two (92) days
Semi-annually	-	at least once every one hundred eighty-four (184) days

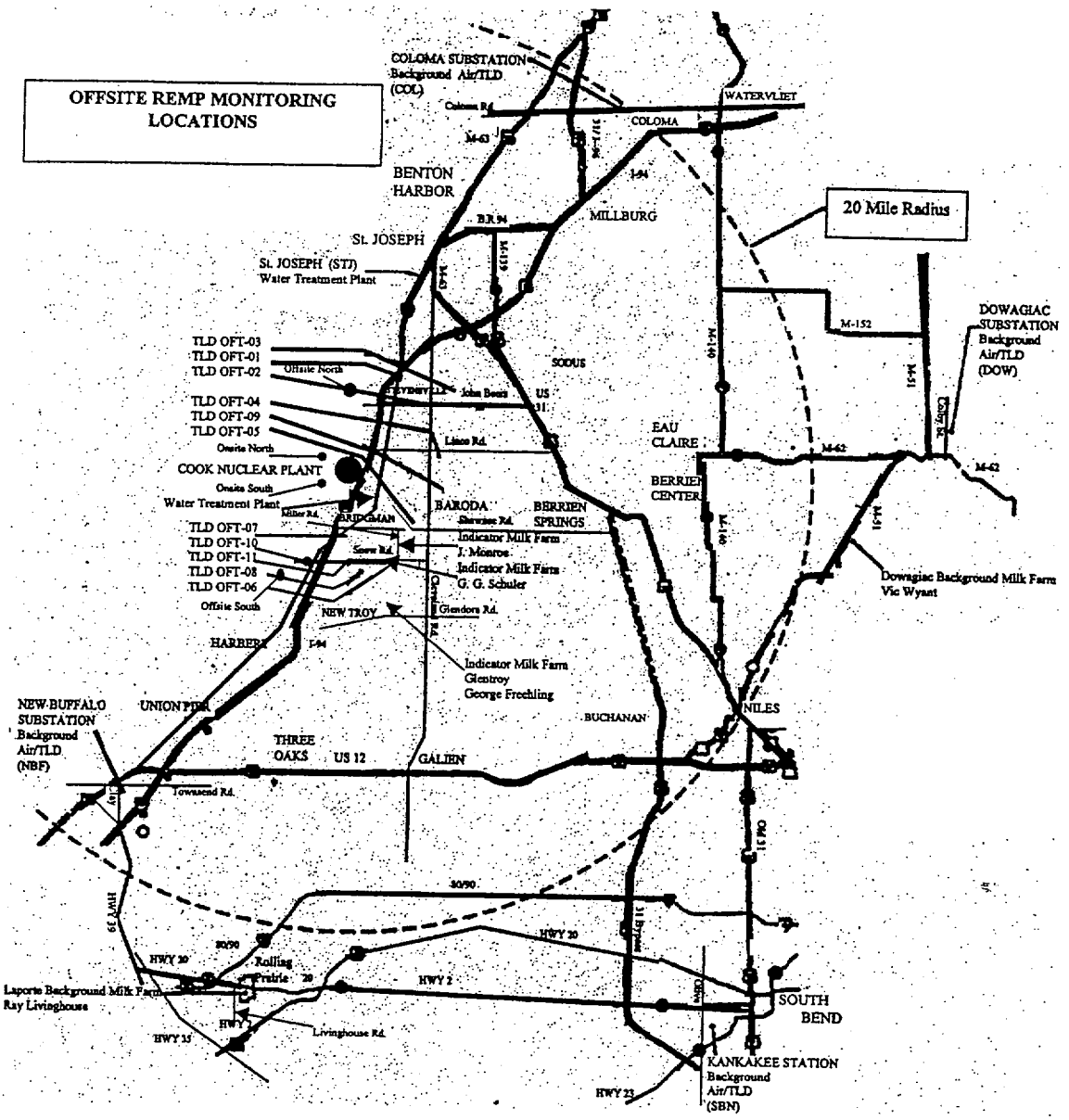
a) Broadleaf in lieu of milk was discontinued due to reimplementation of the milk program.

On-site REMP Monitoring Locations



LEGEND

ONS-1 – ONS-6: Air Sampling Stations
T-01 - T-12: TLD Sampling Stations
W-1 - W-14: REMP T/S Groundwater Wells
SG-1, SG-2, SG-4, SG-5: REMP Non T/S Groundwater Wells
SWL-1, 2, 3: Surface Water Sampling Stations
SL-2, SL-3: Sediment Sampling Stations


OFFSITE REMP MONITORING LOCATIONS
COLOMA SUBSTATION
Background Air/TLD
(COL)
WATERVLIET
COLOMA
BENTON HARBOR
MILLBURG
20 Mile Radius
St. JOSEPH
St. JOSEPH (STJ)
Water Treatment Plant
DOWAGIAC SUBSTATION
Background Air/TLD
(DOW)
TLD OFT-03
TLD OFT-01
TLD OFT-02
Offsite North
SODUS
TLD OFT-04
TLD OFT-09
TLD OFT-05
Onsite North
EAU CLAIRE
COOK NUCLEAR PLANT
Onsite South
Water Treatment Plant
BERRIEN CENTER
BARODA
BERRIEN SPRINGS
TLD OFT-07
TLD OFT-10
TLD OFT-11
TLD OFT-08
TLD OFT-06
Indicator Milk Farm
J. Monroe
Indicator Milk Farm
G. G. Schuler
Dowagiac Background Milk Farm
Vic Wyant
Offsite South
NEW TROY
Glendora Rd.
HARBERT
Indicator Milk Farm
Glentroy
George Frechling
NEW BUFFALO SUBSTATION
Background Air/TLD
(NBF)
UNION PIER
NILES
BUCHANAN
THREE OAKS
US 12
GALIEN
Townsend Rd.
30/90
HWY 39
HWY 20
Rolling Prairie
HWY 2
Laporte Background Milk Farm
Ray Livinghouse
HWY 35
Livinghouse Rd.
SOUTH BEND
KANKAKEE STATION
Background Air/TLD
(SBN)
HWY 23

IV. SUMMARY AND DISCUSSION OF 2000 ANALYTICAL RESULTS

IV. SUMMARY AND DISCUSSION OF 2000 ANALYTICAL RESULTS

The 2000 business year was a particularly auspicious and in many ways difficult year for the Teledyne Brown Engineering Environmental Service's radioanalytical laboratory and its customers. In late September of 1999, Teledyne Brown Engineering announced that the laboratory would move from its 35-year home in Westwood, NJ to co-locate with its sister laboratory in Knoxville, TN. Several reasons supported this decision: the Westwood, NJ lease was coming to a close, extensive remodeling of the Westwood facility was required for continued operations there, the employment pool for qualified radiological professionals in the Northeast had diminished over the years to nearly zero, the costs associated with relocating professional personnel to the Westwood area had become prohibitive, and the synergies resulting with co-location with the Air Force Technical Applications Center Reactor Products Program laboratory in Knoxville were cost compelling.

Build out of the new laboratory in Knoxville, began in January of 2000 with a two-phase move from Westwood to Knoxville scheduled for June and September. Unfortunately construction delays prevented the June phase one occupancy forcing the laboratory into a one-phase move, a significant delay in NUPIC approval of the Knoxville facility, and the use of NUPIC approved sub-contract laboratories to analyze REMP samples. This change resulted in significant delays in analytical turnaround times, in obtaining necessary regulatory compliance approvals, and caused extraordinary difficulties for the laboratory and all of its customers. The most important consequences of this delay was the need to utilize two-sub-contract laboratories: Allegheny Environmental Services in Northbrook, IL and the Duke Engineering Laboratory in Marlborough, MA to perform REMP analyses between October, 2000 and January, 2000. During this period many scheduling difficulties arose and were resolved, turnaround times were stretched, and tempers of all involved were tested; however, data quality remained high.

The Westwood laboratory ceased analytical operations in October and was closed on November 15; the Knoxville laboratory was ready to analyze samples by the middle of December, but was not scheduled for NUPIC audit until the end of January, 2001. During the period October 15 through December 15, 2000, the Knoxville laboratory under went several customer surveillances allowing it to perform some limited customer analyses. The Knoxville laboratory is now in full production, is NUPIC approved, and looks forward to another 35 years of partnership with our nuclear power colleagues.

A discussion of the data from the radiological analyses of environmental media collected during the report period is provided in this section. Analyses of samples for 2000 were analyzed by Teledyne Brown Engineering Environmental Services, Inc. in Westwood, NJ and Knoxville, TN. The procedures and specifications followed at Teledyne Brown Engineering are in accordance with the Teledyne Brown Engineering Quality Assurance Manual and are explained in the Teledyne Brown Engineering Analytical Procedures. A synopsis of analytical procedures used for the environmental samples is proved in Appendix C. In addition to internal quality control measures performed by Teledyne Brown Engineering, the laboratory also participates in Interlaboratory Comparison Programs. Participation in these programs ensures that independent checks on the precision and accuracy of the measurements of radioactive material in environmental samples are performed. The results of the Interlaboratory Comparison are provided in Appendix D.

a) Due to challenges, some LLDs were missed. See Appendix E.
b) Sample was lost. See Appendix E.

Radiological analyses of environmental media characteristically approach and frequently fall below the detection limits of state-of-the-art measurement methods. Teledyne Brown Engineering analytical methods meet or exceed the Lower Limit of Detection (LLD) requirements given in Table 2 of the USNRC Branch Technical Position of Radiological Monitoring, Revision 1, November 1979, and 12 PMP 6010 OSD.001, "Off-Site Dose Calculation Manual".(a)

The following is a discussion and summary of the results of the environmental measurements performed during the reporting period. Comparison is made where possible with radioactivity concentrations measured in the preoperational period of August 1971 to the initial criticality of Unit 1 on January 18, 1975. A brief summary of the preoperational program is found in Appendix G.

a) Due to challenges, some LLDs were missed. See Appendix E.
b) Sample was lost. See Appendix E.

A. Airborne Particulates

Airborne particulate samples are collected with an oil-less pump at approximately 56 LPM using a 47 mm particulate filter. Results of gross beta activities are presented in Table B-1. The measurement of the gross beta activity on the weekly air particulate filters is a good indication of the levels of natural and or manmade radioactivity in the environment. The average gross beta concentration of the six indicator locations was 0.020 pCi/m^3 with a range of individual values between 0.008 and 0.045 pCi/m^3. The average gross beta concentration of the four control locations was 0.019 pCi/m^3 with a range between 0.008 and 0.043 pCi/m^3. In Trending Graph 1 the monthly average gross beta concentrations for the indicator locations and for the control locations are plotted. The gross beta concentrations in air particulates filters in 2000 were lower than at the end of the preoperational period when the effects of recent atmospheric nuclear tests were being detected.

Air particulate filters were composited by location on a quarterly basis and were analyzed by gamma ray spectroscopy. Results are presented in Table B-2. Beryllium-7, which is produced continuously in the upper atmosphere by cosmic radiation, was measured in all forty samples. The average concentration for the control locations was 0.097 pCi/m^3 and the values ranged from 0.067 to 0.121 pCi/m^3. The average concentration for the indicator locations was 0.100 pCi/m^3 with a range of 0.073 to 0.132 pCi/m^3. These values are typical of beryllium-7 measured at various locations throughout the United States. Naturally occurring potassium-40 was measured in two of the twenty-four indicator quarterly composites with an average concentration of 0.003 pCi/m^3 and a range of 0.002 to 0.003 pCi/m^3. No potassium-40 was measured in the sixteen control quarterly composites. No other gamma emitting radioactivity was detected. (a)

B. Airborne Iodine

Airborne iodine samples are collected with an oil-less pump at approximately 56 LPM using a charcoal filter cartridge. Charcoal cartridges are installed downstream of the particulate filters and are used to collect airborne radioiodine. The results of the weekly analysis of the charcoal cartridges are presented in Table B-3. All results were below the lower level of detection of 0.30 pCi/m^3 with no positive activity detected.(a)

C. Direct Radiation - Thermoluminescent Dosimeters

Thermoluminescent dosimeters (TLDs) measure external radiation exposure from several sources including naturally occurring radionuclides in the air and soil, radiation from cosmic origin, fallout from atomic weapons testing, potential radioactive airborne releases from the power station and direct radiation from the power station. The TLDs record exposure from all of these potential sources. The TLDs are deployed quarterly at 27 locations in the environs surrounding the D. C. Cook Nuclear Plant. The average value of the four areas of each dosimeter (calibrated individually after each field exposure period for response to a known exposure and for transit exposure) are presented in Table B-4. Those exposure rates are quite typical of observed rates at many other locations in the country. The average annual measurement for the control samples was 5.2 mR/standard month with a range of 2.5 to 11.4 mR/standard month. The annual accumulation of indicator samples had a measurement of 4.91 mR/standard month with a range of 2.3 to 10.8

a) Due to challenges, some LLDs were missed. See Appendix E.
b) Sample was lost. See Appendix E.

mR/standard month. The fourth quarter results are 53% higher than the third quarter results, when Teledyne Brown Engineering stopped analyzing TLDs and Proxtronic started analyzing the TLDs. Nonconformance Report No. 01-23 has been issued to investigate why Proxtronic's TLD results are higher. Since the indicators as well as the controls are elevated, this is no indication of an environmental impact from the Donald C. Cook Nuclear Plant. The 2000 annual average in the environs of the Donald C. Cook Nuclear Plant is at the low range of the exposure rates (1.0 to 2.0 mR/week) measured during the preoperational period. The results of the indicator and control TLDs are in good agreement and are plotted in Trending Graph 2.

D. Surface Water

A 125 milliliter surface water sample is collected from the intake forebay and from two shoreline locations, all within 0.3 miles of the two reactors and were composited daily over a monthly period. The thirty-four samples were analyzed for iodine-131 by the radiochemical technique described on page 79. All results were less than or equal to the lower limit of detection of 1 pCi/liter. The quarterly composite was analyzed for tritium by liquid scintillation method described on page 78. Results are presented in Table B-5. Tritium was not detected in the 12 samples analyzed. During the preoperational period tritium was measured in surface water samples at concentrations of approximately 400 pCi/liter. Naturally occurring potassium-40 was measured in one of 12 samples with a concentration of 90 pCi/liter. Cesium-137 was not measured in any of the samples during 2000. Naturally occurring gamma emitting isotopes were detected using gamma ray spectroscopy.

E. Groundwater

Water samples are collected quarterly from fourteen wells, all within 4300 feet of the reactors. First, a static water elevation is determined and three well bore volumes are purged from the well using a groundwater pump, or equivalent. A four liter sample is then obtained and the gamma isotopic sample is preserved with nitric acid. The samples are analyzed for gamma emitters and tritium. The results are presented in Table B-6. Naturally occurring potassium-40 was measured in ten samples with an average concentration of 199 pCi/liter with a range of 74 to 310 pCi/liter. There were no other gamma emitting isotopes measured. The groundwater wells W-4, W-5, W-6, and W-14 had measurable tritium activity throughout 2000. Tritium was measured in 15 of the 56 samples at the locations with an average concentration of 969 pCi/liter and a range of 210 to 3000 pCi/liter. The annual concentrations of tritium in wells W-1 through W-7 are plotted in Trending Graph 3. Tritium concentration in groundwater wells during the preoperational period typically averaged 400 pCi/liter. Groundwater does not provide a dose pathway for the Cook plant environs.

F. Drinking Water

Daily samples are collected at the intake of the purification plants for St. Joseph and Lake Township. The 500 ml daily samples at each location are composited and analyzed for gross beta, iodine-131, and gamma emitters. However, starting on October 5, 2000 1000 mL of sample was collected daily at each location. These samples were composited, the gamma isotopic sample was preserved with nitric acid, then the samples were analyzed for gross beta, I-131, and gamma

a) Due to challenges, some LLDs were missed. See Appendix E.
b) Sample was lost. See Appendix E.

emmiters. On a quarterly basis the daily samples are composited and analyzed for tritium. The results of analyses of drinking water samples are shown in Table B-7.

Gross beta activity was measured in twenty-three of the twenty-six samples from the Lake Township intake with an average concentration of 2.77 pCi/liter and a range from 1.3 to 4.6 pCi/liter. Gross beta activity was measured in twenty-four of the twenty-six samples from the St. Joseph intake with an average concentration of 2.92 pCi/liter and a range from 1.7 to 7.5 pCi/liter. Naturally occurring radium-226 was measured in two of the twenty-six Lake Township intake with an average concentration of 215 pCi/liter and a range of 210 to 220 pCi/liter. Naturally occurring potassium-40 was measured in two of the twenty-six Lake Township intake with an average concentration of 170 pCi/liter and a range of 120 to 220 pCi/liter. Naturally occurring potassium-40 was measured in two of the twenty-six St. Joseph intake with an average concentration of 195 pCi/liter and a range of 150 to 240 pCi/liter. No other gamma emitting isotopes or iodine-131 were detected. Tritium was not measured at the Lake Township location or the St. Joseph intake location. Tritium (or LLD values) in drinking water are plotted in Trending Graph 4.

There were no drinking water analyses performed in the preoperational program.

G. Sediment

Sediment samples are collected semiannually along the shoreline of Lake Michigan at the same two locations as the surface water samples. Two liters of lake sediment are collected using a small dredge in an area covered part time by wave action. The sediment samples are analyzed by gamma ray spectroscopy, the results of which are shown in Table B-8. In March and October one sample was collected from location SL-2 and SL-3. Gamma ray spectroscopy detected naturally occurring potassium-40 in all four samples. The average potassium-40 concentration was 6385 pCi/kg (dry weight) with a range from 4090 to 7190 pCi/kg (dry weight). Thorium-228, also naturally occurring was measured in all four samples with an average concentration of 139 pCi/kg (dry weight) with a range from 72 to 253 pCi/kg (dry weight). Radium-226 and cesium-137 were measured in two of the four samples. The average radium-226 concentration was 99 pCi/kg (dry weight) with a range from 59 to 138 pCi/kg (dry weight). The average cesium-137 concentration was 5.9 pCi/kg (dry weight) with a range from 5.9 to 5.85 pCi/kg (dry weight). The level of cesium-137 found in these samples during 2000 are equivalent to the cesium-137 detected during the preoperational period. All other gamma emitters were below the lower limits of detection.

H. Milk

Milk samples of one gallon are collected from a 500 gallon bulk tank every fourteen days from four farms located between 4.1 miles and 20.7 miles from the site. The fifth farm is a goat farm located 5.0 miles from the site, where no bulk tank is used. Milk samples are preserved by adding 40 grams per gallon of sodium bisulfite when the samples are collected. The samples are analyzed for iodine-131 and other gamma emitters. The results are shown in Table B-9. Naturally occurring potassium-40 was measured in all of the thirty-six control samples with an average concentration of 1622 pCi/liter and a range of 1110 to 1600 pCi/liter. Potassium-40 was measured in fifty-three of the fifty-four indicator samples (b) with an average concentration of 1476 pCi/liter and a range of 1010 to 1820 pCi/liter. I-131 was not measured in any of the 90 samples analyzed.

a) Due to challenges, some LLDs were missed. See Appendix E.
b) Sample was lost. See Appendix E.

I. Broadleaf Vegetation

Broadleaf in lieu of milk collection was discontinued due to reimplementation of the milk sampling program in 2000.

J. Fish

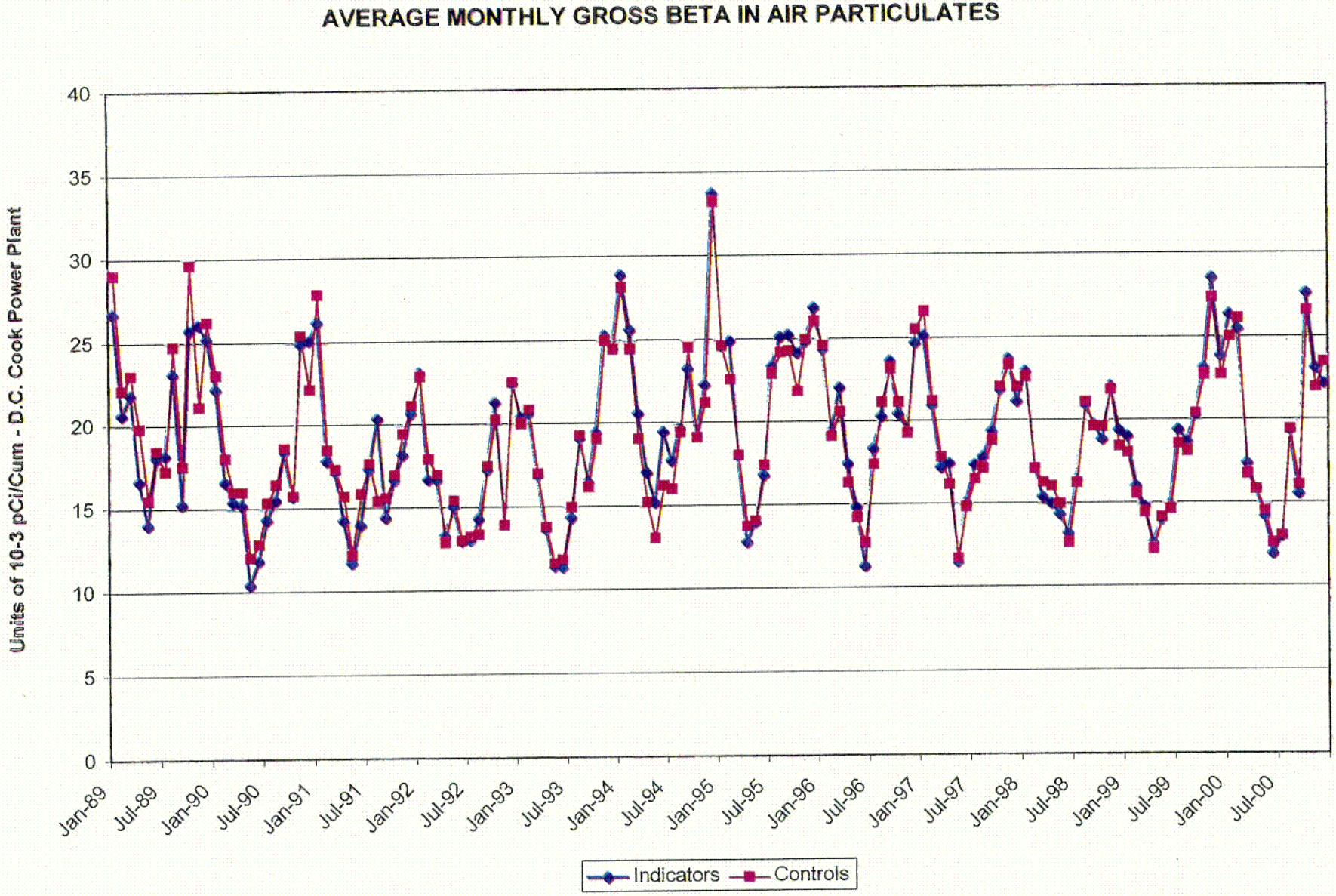
Using gill nets in approximately twenty feet of water in Lake Michigan, 4.5 pounds of fish are collected 2 times per year from each of four locations. The samples were then analyzed by gamma ray spectroscopy. Results are presented in Table B-10. Naturally occurring potassium-40 was measured in the two control samples with an average concentration of 3405 pCi/kg (wet weight) and a range of 2930 to 3880 pCi/kg (wet weight). Potassium-40 was measured in all four indicator samples with an average concentration of 2875 pCi/kg (wet weight) and a range of 2550 to 3300 pCi/kg (wet weight). Cesium-137 was measured in two control fish samples with a concentration of 22.5 pCi/kg (wet weight) and a range from 11.7 to 33.3 pCi/kg (wet weight). Cesium-137 was measured in the three indicator samples with an average concentration of 21.6 pCi/kg (wet weight) and a range of 9.5 to 29.2 pCi/kg (wet weight). The level of cesium-137 found in these samples during 2000 are equivalent to the cesium-137 detected during the preoperational period.

K. Food Products

Food samples are collected annually at harvest, at two locations, as near the site boundary as possible, and approximately twenty miles from the plant. Each sample consists of greater than 300 grams of grapes and and a large (12" x 15") zip lock bag moderately stuffed with broadleaves. There were four food samples collected during 2000 and results are presented in Table B-12. Naturally occurring potassium-40 was measured in both control samples with an average concentration of 3320 pCi/kg (wet weight) and a range of 2870 to 3770 pCi/kg (wet weight). Potassium-40 was measured in the two indicator food samples with an average concentration of 3290 pCi/kg (wet weight) and a range of 2490 to 4090 pCi/kg (wet weight). Cosmogenically produced beryllium-7 was measured in one of the two control samples with a concentration of 4120 pCi/kg (wet weight). Beryllium-7 was measured in one of the two indicator samples with a concentration of 2660 pCi/kg (wet weight). Cesium-137 was not detected in the two food samples for 2000. All other gamma emitters were below the lower limits of detection.

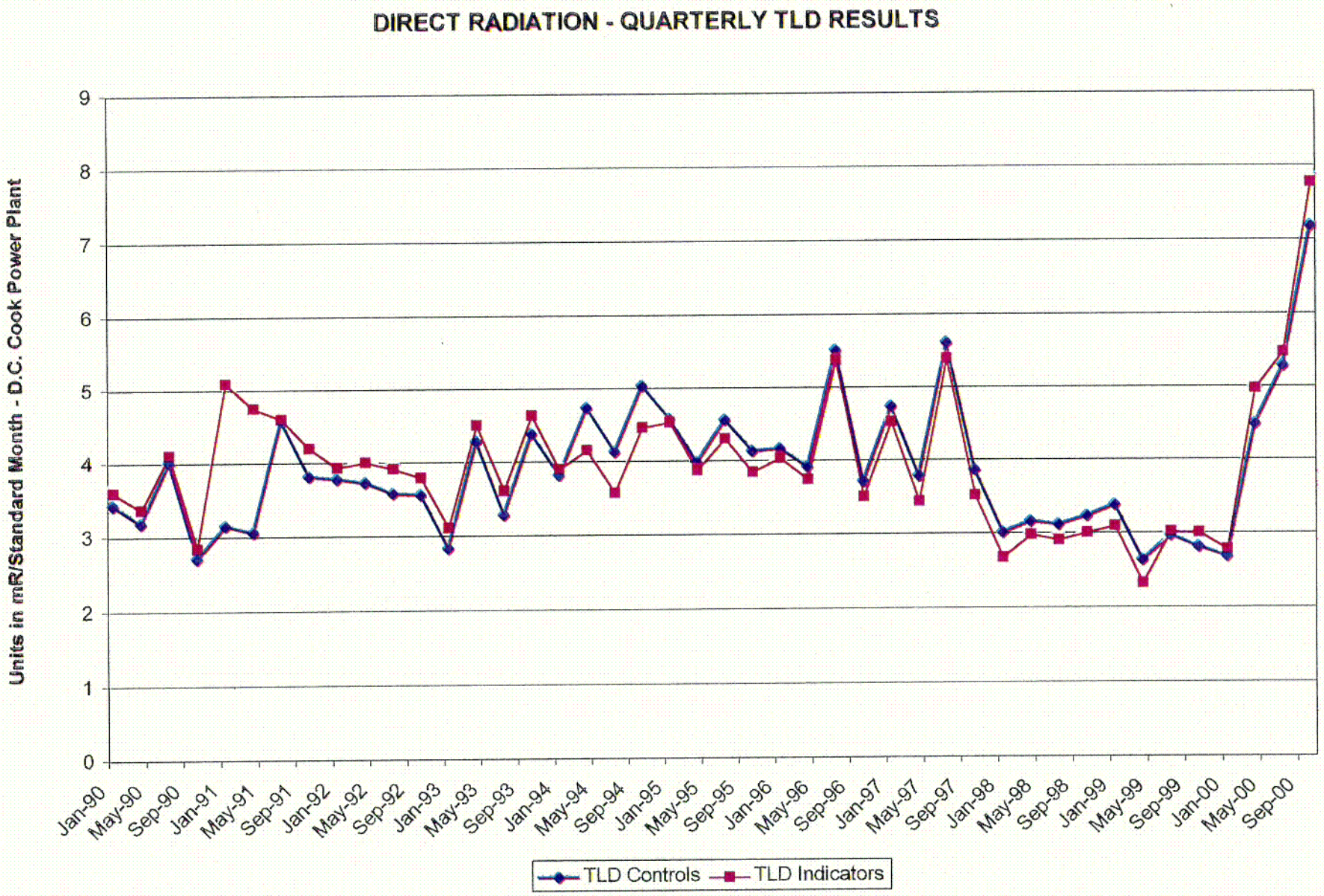
a) Due to challenges, some LLDs were missed. See Appendix E.
b) Sample was lost. See Appendix E.

Trending Graph - 1



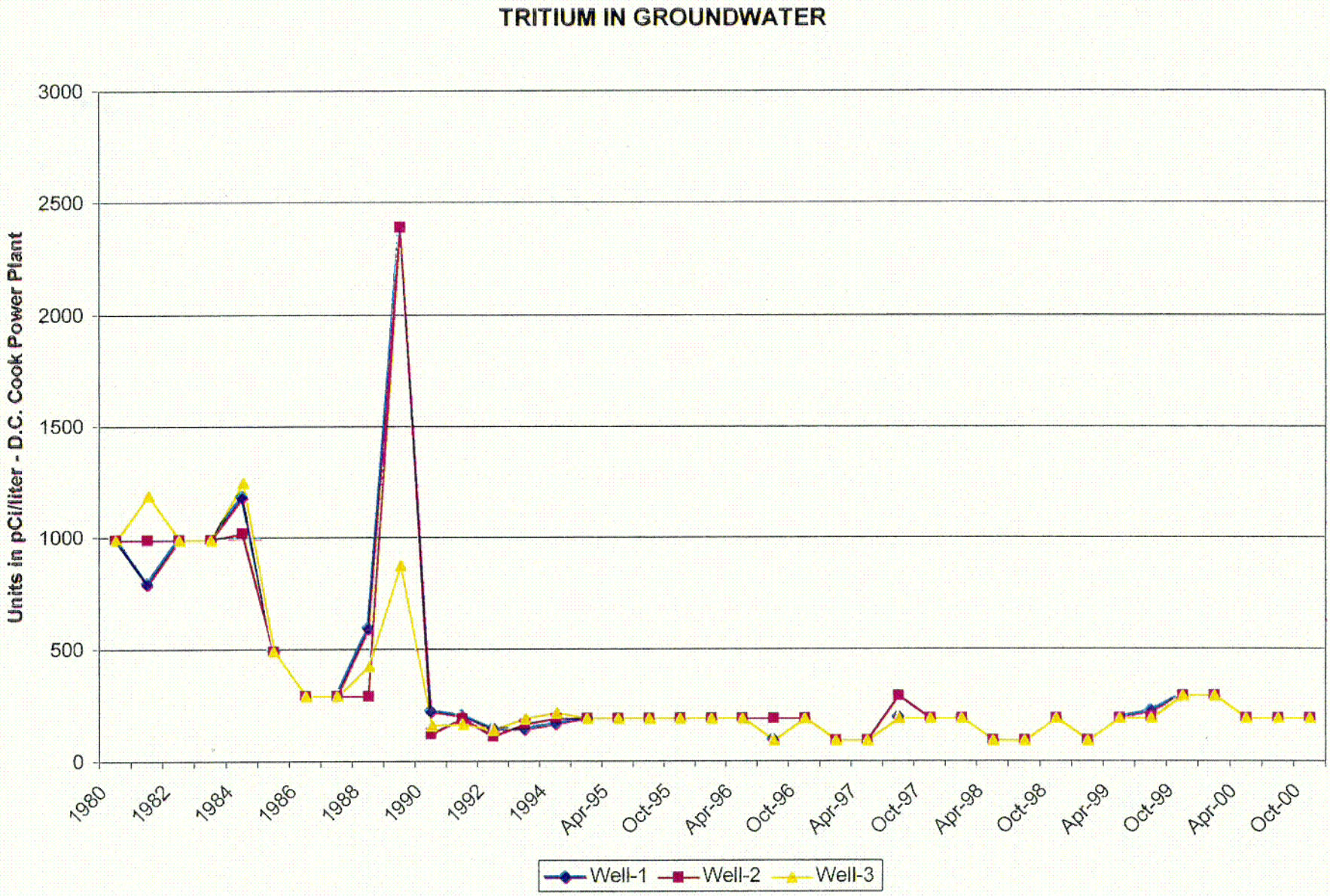
C01

Trending Graph - 2



C02

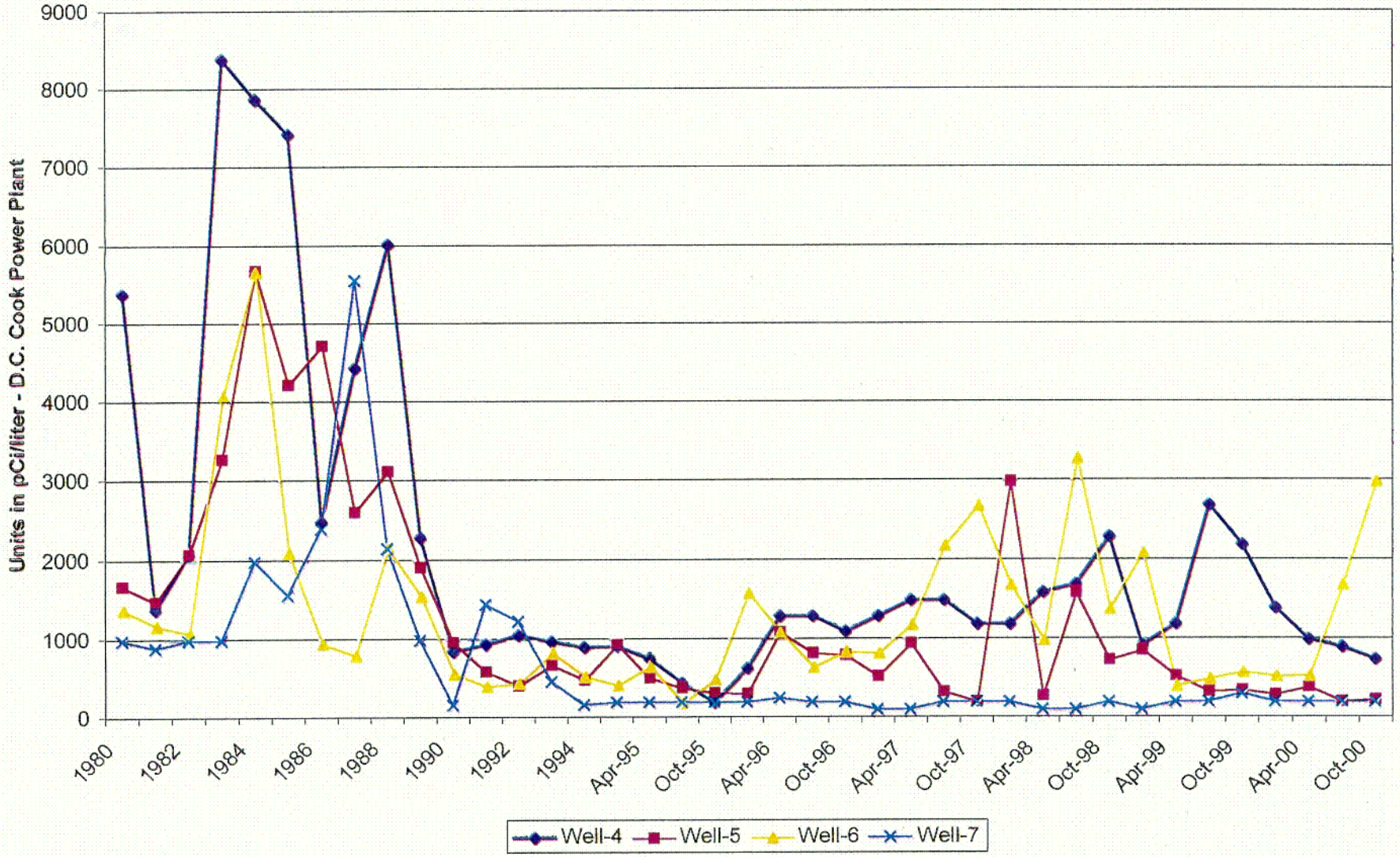
Trending Graph - 3



C03

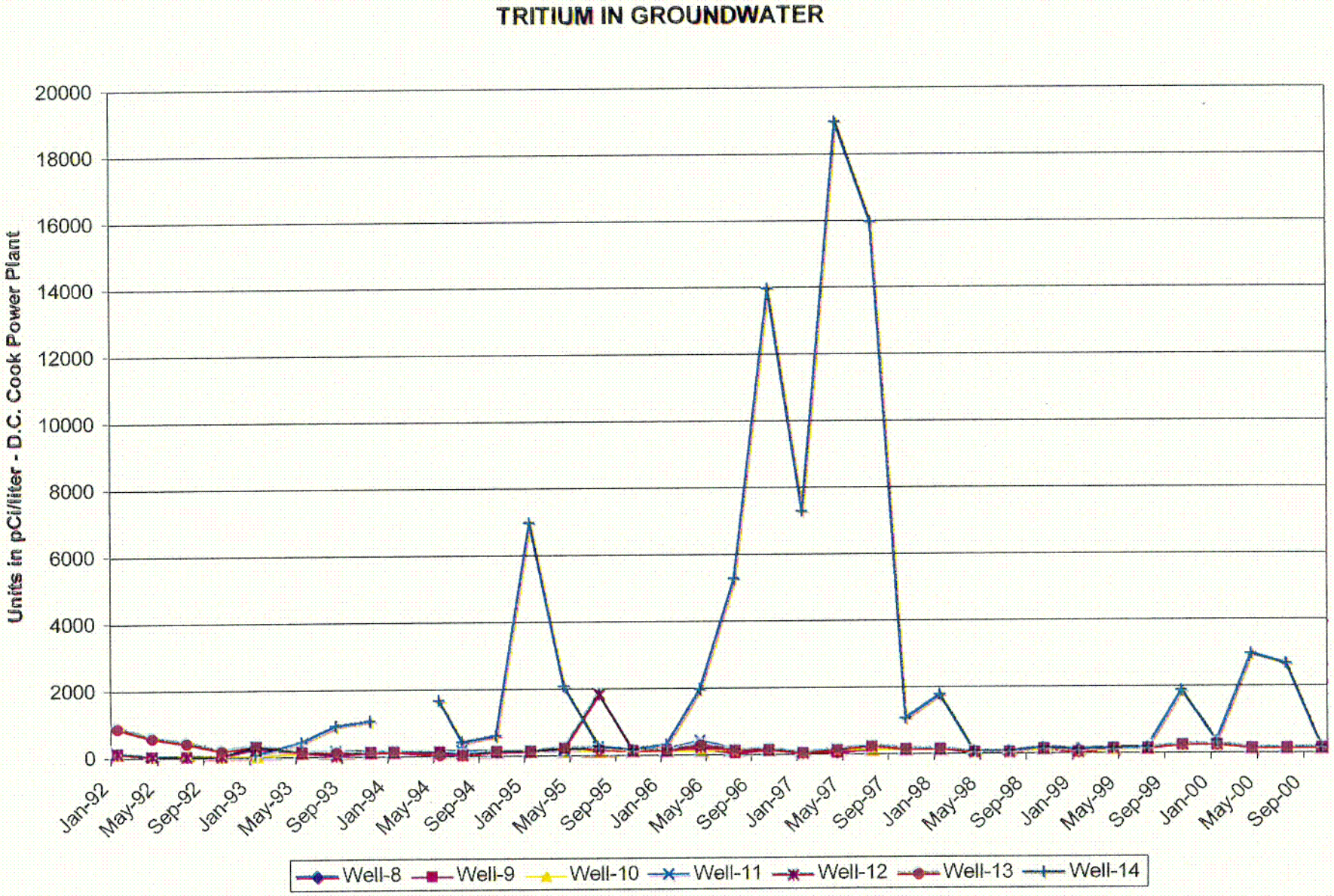
Trending Graph - 3 (cont.)

TRITIUM IN GROUNDWATER

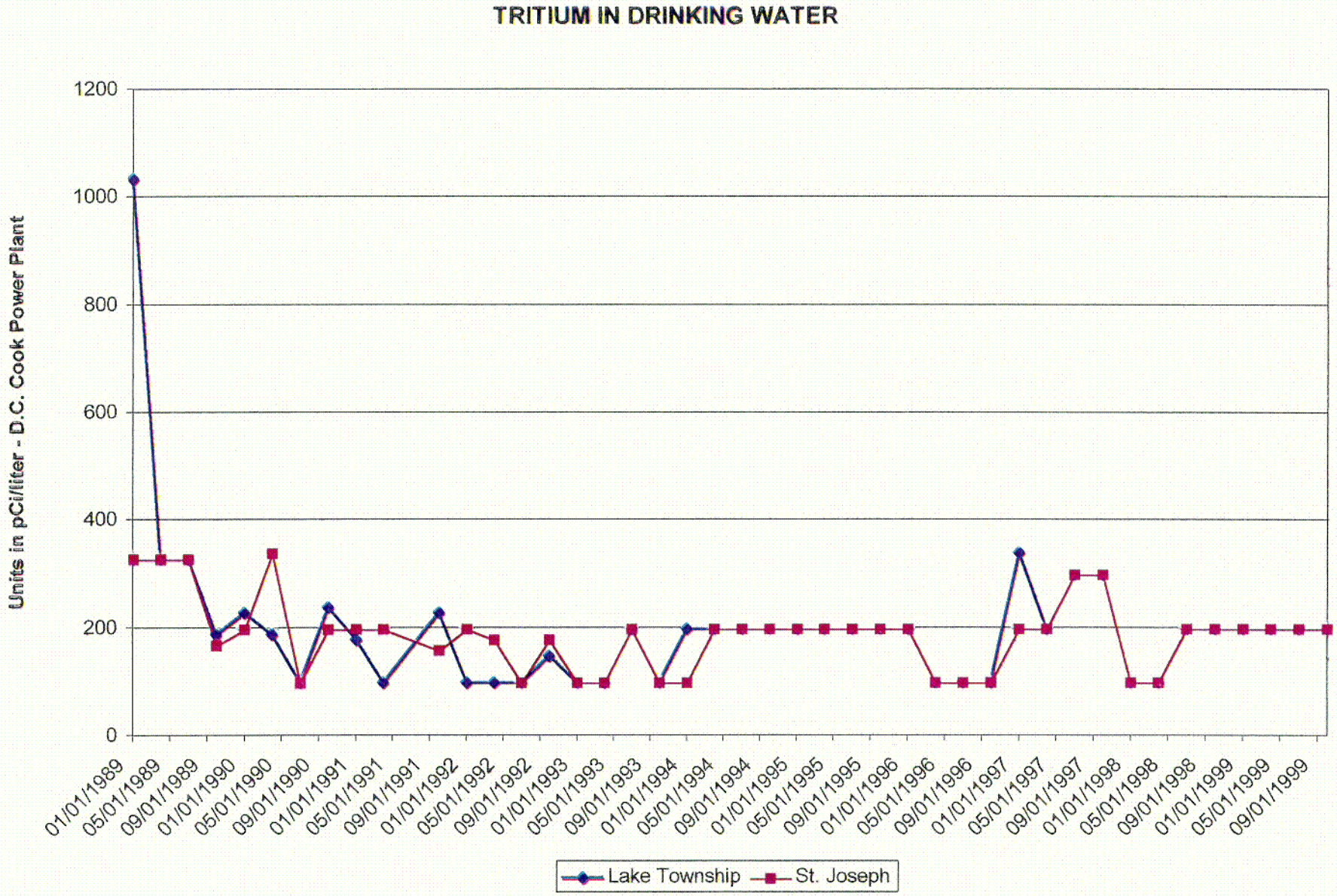


C04

Trending Graph - 3 (Cont.)



C05


TRITIUM IN DRINKING WATER
Units in pCi/liter - D.C. Cook Power Plant
1200
1000
800
600
400
200
0
01/01/1989
05/01/1989
09/01/1989
01/01/1990
05/01/1990
09/01/1990
01/01/1991
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09/01/1999
Lake Township
St. Joseph

C06

V. CONCLUSIONS

V. CONCLUSIONS

The results of the 2000 Radiological Environmental Monitoring Program for the Donald C. Cook Nuclear Plant have been presented. The results were as expected for normal environmental samples. Naturally occurring radioactivity was observed in sample media in the expected activity ranges.

Occasional samples of a few media showed the presence of man-made isotopes. These have been discussed individually in the text. Observed activities were at very low concentrations and had no significant dose consequence. Specific examples of sample media with positive analysis results are discussed below.

Air particulate gross beta concentrations of all the indicator locations for 2000 appear to follow the gross beta concentrations at the control locations. The concentration levels are actually lower than during the preoperational period. Gamma isotopic analysis of the particulate samples identified the gamma emitting isotopes as natural products (beryllium-7 and potassium-40). No man-made activity was found in the particulate media during 2000. No iodine-131 was detected in charcoal filters in 2000.

Thermoluminescent dosimeters (TLDs) measure external gamma radiation from naturally occurring radionuclides in the air and soil, radiation from cosmic origin and fallout from atmospheric nuclear weapons testing, and radioactive airborne releases and direct radiation from the power plant. The average annual TLD results were at normal background exposure levels.

Surface water samples are collected daily from the intake forebay and two locations in Lake Michigan. The samples are analyzed quarterly for tritium, and monthly for gamma emitting isotopes. Naturally occurring potassium-40 was the only gamma emitters detected during 2000. No tritium was measured in the twelve samples collected.

Groundwater samples were collected quarterly at fourteen wells, all within 4300 feet of the reactors. The three wells within 500 feet had measurable tritium, which is attributed to the operation of the plant. The highest concentration measured in 2000 was 3000 pCi/liter which compares closely with the highest concentration measured during 1999 of 2700 pCi/liter. Potassium-40, a naturally occurring nuclide was detected in eleven of the fifty-six samples with an average concentration of 199 pCi/liter. No other gamma emitting isotopes were detected.

Samples are collected daily at the intakes of the drinking purification plants for St. Joseph and Lake Township. Samples composited daily over a two week period are analyzed for iodine-131, gross beta, and measured for gamma emitting isotopes. Samples are also analyzed quarterly for tritium. Naturally occurring potassium-40 was detected in four of the fifty-two samples with an average concentration of 193 pCi/liter Naturally occurring radium-226 was detected in two of the fifty-two samples with an average concentration of 215 pCi/liter. No other gamma emitting isotopes or iodine-131 were detected. Gross beta was measured in all fifty-two samples at normal background concentrations. Tritium was not measured in the eight quarterly composite samples collected during 2000.

Sediment samples can be a sensitive indicator of discharges from nuclear power stations. Sediment samples are collected semiannually along the shoreline of Lake Michigan at two locations

in close proximity of the reactors. The samples were analyzed by gamma ray spectroscopy and only naturally occurring gamma emitters were detected. There is no evidence of station discharges affecting Lake Michigan, either in the sediments or in the water, as previously discussed.

The milk sampling program was reinstated in March of 2000. Milk samples are collected biweekly from five farms within the vicinity of the nuclear plant. Naturally occurring potassium-40 was detected in all of the ninety samples with an average concentration of 1429 pCi/liter. No other gamma emitters were detected.

Broadleaf sampling in lieu of milk was discontinued due to the reimplementation of the milk collection program in 2000.

Fish samples collected in Lake Michigan in the vicinity of the nuclear plant were analyzed by gamma ray spectroscopy. The only gamma emitting isotope measured was cesium-137 which was found in low concentrations in three samples. The level of cesium-137 found in these samples during 2000 are equivalent to the cesium-137 detected during the preoperational period.

Food products, consisting of grapes, and broadleaf vegetation were collected and analyzed by gamma ray spectroscopy. The only gamma emitting isotopes measured during 2000 were potassium-40 and cesium-137. The level of cesium-137 found in these samples during 2000 are equivalent to the cesium-137 detected during the preoperational period.

The results of the analyses have been presented. Based on the evidence of the Radiological Environmental Monitoring Program, the Donald C. Cook Nuclear Plant is operating within regulatory limits. Tritium in four on-site wells appears to be the only radionuclide which can be directly correlated with the plant. However the associated groundwater does not provide a direct dose pathway to humans because these wells do not supply water to the local population.

VI. REFERENCES

VI. REFERENCES

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4. United States Nuclear Regulatory Commission, Regulatory Guide 4.8, "Environmental Technical Specifications for Nuclear Power Plants", December 1975.

5. United States Nuclear Regulatory Commission, Regulatory Guide 1.21 "Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants," June 1974.

6. United States Nuclear Regulatory Commission, Regulatory Guide 4.1 "Programs for Monitoring Radioactivity in the Environs of Nuclear Power Plants", April 1975.

7. USNRC Branch Technical Position, "Acceptable Radiological Environmental Monitoring Program", Rev. 1, November 1979.

APPENDIX A

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT DOCKET NO. 50-315/50-316

BERRIEN COUNTY JANUARY 1 to DECEMBER 31, 2000

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED		ALL INDICATOR LOCATIONS MEAN (a/b) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN RANGE	CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
Air Iodine (pCi/m^3)	I-131	515	-(0/307) -	NA	NA	-(0/208) -	0
Airborne Particulates (pCi/m^3)	Gross Beta	515	19.5(307/307) (19.5)	ONS-2 2338 ft 48°	26.5(52/52) (9.4-45)	19.4(208/208) (8-43)	0
	Gamma	40					
	Be-7	40	99.6(23/24) (70.3-132)	ONS-1 1945 ft 18°	107(4/24) (81.7-132)	96.5(16/16) (66.8-121)	0
	K-40	40	2.9(2/24) (2.33-3.4)	ONS-3 2407 ft 90°	3.4(1/24) 3.4	-(0/16) -	0
Direct Radiation (mR/Standard Dose Month)	Gamma Quarterly	107	4.91(91/91) (4.91)	ONS-6 1917 ft 210°	4.9(4/4) (2.3-10.8)	5.2(16/16) (2.5-11.4)	0
Surface Water (pCi/liter)	Gamma	36	90(1/12) (90)	SWL-1 Condenser Circ	90(1/4) (90)	125(3/24) (94-150)	0
	H-3	12	-(0/4) -	NA	NA	-(0/24) -	0
Groundwater (pCi/liter)	Gamma	56					
	K-40	56	199(11/56) (74-310)	Well 6 424 ft 273°	310(1/56) 310	-(0/0) -	0
	Th-228	56	-(0/56) -	NA	NA	-(0/0) -	0
	H-3	56	969(15/56) (210-3000)	Well 6 424 ft 273°	930(4/4) (540-3000)	-(0/0) -	0

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT DOCKET NO. 50-315/50-316

BERRIEN COUNTY JANUARY 1 to DECEMBER 31, 2000

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED		ALL INDICATOR LOCATIONS MEAN (a/b) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN RANGE	CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
Drinking Water (pCi/liter)	Gross Beta	52	2.77(47/52) (1.3-7.5)	St. Joseph 9.0 mi NE	2.92(24/26) (1.7-7.5)	-(0/0) -	0
	I-131	52	-(0/52) -	NA	NA	-(0/0) -	0
	Gamma	52	193(6/52) (120-240)	LTW 0.6 mi S	215(2/26) (210-220)	-(0/0) -	0
	H-3	8	-(0/8) -	NA	NA	-(0/0) -	0
Fish (pCi/kg wet)	Gamma	8					
	K-40	8	2875(6/6) (2550-3300)	OFS-S South 5 mi S	3405(2/2) (2930-3880)	3405(2/2) (2930-3880)	0
	Cs-137	8	21.6(3/6) (9.5-29.2)	OFS-S South 5 mi S	22.5(2/2) (11.7-33.3)	22.5(2/2) (11.7-33.3)	0
Food/Vegetation (pCi/kg wet)	Gamma	4					
	Be-7	4	2660(1/2) (2660)	Sector J	4120(1/2) (4120)	4120(1/2) (4120)	0
	K-40	4	3290(2/2) (2490-4090)	Sector J	3320(2/2) (2870-3770)	3320(2/2) (2870-3770)	0
	Cs-137	4	-(0/2) -	NA	NA	-(0/0) -	0

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT DOCKET NO. 50-315/50-316

BERRIEN COUNTY JANUARY 1 to DECEMBER 31, 2000

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	ANALYSIS AND TOTAL NUMBER OF ANALYSES PERFORMED		ALL INDICATOR LOCATIONS MEAN (a/b) RANGE	LOCATION WITH HIGHEST MEAN NAME DISTANCE AND DIRECTION	MEAN RANGE	CONTROL LOCATION MEAN RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
Sediment (pCi/kg dry)	Gamma	4					
	K-40	4	6385(4/4) (4090-8190)	SL-3 500 ft North	6975(2/4) (5760-8190)	-(0/0) -	0
	Cs-137	4	5.9(2/4) (5.9)	SL-3 500 ft North	5.9(1/2) (5.9)	-(0/0) -	0
	Ra-226	4	138(2/4) (138)	SL-2 500 ft South	138(1/2) (138)	-(0/0) -	0
	Th-228	4	139(4/4) (72-253)	SL-2 500 ft South	193(2/4) (133-253)	-(0/0) -	0
Milk	Gamma	90					
(pCi/L)	Be-7	90	-(0/54) -	NA	-(0/90) -	-(0/0) -	0
	K-40	90	1476(53/54)(a) (1010-1820)	Monroe 5 mi SE	1622(18/54) (1240-1820)	1359(18/36) (110-1600)	0
	I-131	90	-(0/54) -	NA	-(0/90) -	-(0/36) -	0
	Cs-137	90	-(0/54) -	NA	-(0/90) -	-(0/36) -	0

APPENDIX B
DATA TABLES

TABLE B-1

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF GROSS BETA EMITTERS IN WEEKLY AIRBORNE PARTICULATES

Results in Units of 10^{-3} pCi/m^3 ± 2 sigma

COLLECTION DATES	STATION CODES ONS-1	ONS-2	ONS-3	ONS-4	ONS-5	ONS-6	NBF	SBN	DOW	COL	Average ± 2 s.d.
JANUARY 2000											
01/05/00	26 ± 2	30 ± 2	25 ± 2	22 ± 2	26 ± 2	27 ± 2	25 ± 2	27 ± 2	22 ± 2	22 ± 2	25 ± 5
01/12/00	28 ± 2	35 ± 3	29 ± 2	29 ± 2	30 ± 2	32 ± 2	26 ± 2	28 ± 2	28 ± 2	26 ± 2	29 ± 5
01/19/00	23 ± 2	24 ± 2	21 ± 2	21 ± 2	22 ± 2	24 ± 2	20 ± 2	21 ± 2	23 ± 2	20 ± 2	22 ± 3
01/26/00	36 ± 3	41 ± 3	34 ± 3	36 ± 2	32 ± 2	35 ± 3	33 ± 2	38 ± 3	38 ± 3	34 ± 3	36 ± 5
FEBRUARY											
02/02/00	20 ± 2	18 ± 2	18 ± 2	15 ± 2	16 ± 2	17 ± 2	19 ± 2	17 ± 2	18 ± 2	17 ± 2	18 ± 3
02/09/00	26 ± 2	27 ± 2	23 ± 2	24 ± 2	26 ± 2	26 ± 2	26 ± 2	27 ± 2	27 ± 2	27 ± 3	26 ± 3
02/16/00	29 ± 2	36 ± 3	27 ± 2	25 ±2	29 ± 2	31 ± 3	26 ± 2	30 ± 3	31 ± 2	32 ± 2	30 ± 6
02/23/00	28 ± 2	35 ± 3	30 ± 3	28 ± 2	28 ± 2	32 ± 3	31 ± 2	29 ± 2	30 ± 2	32 ± 3	30 ± 5
MARCH											
03/01/00	16 ± 2	18 ± 2	16 ± 2	16 ± 2	18 ± 2	19 ± 2	18 ± 2	19 ± 2	16 ± 2	18 ± 2	17 ± 3
03/08/00	21 ± 2	27 ± 2	23 ±2	23 ± 2	22 ± 2	27 ± 2	22 ± 2	24 ± 2	23 ± 2	24 ± 2	24 ± 4
03/15/00	13 ± 2	19 ± 2	17 ± 2	18 ± 2	16 ± 2	19 ± 2	17 ± 2	17 ± 2	16 ± 2	17 ± 2	17 ± 3
03/22/00	12 ± 2	18 ± 2	15 ± 2	12 ± 2	13 ± 2	17 ± 2	14 ± 2	15 ± 2	11 ± 1	14 ± 2	14 ± 4
03/29/00	14 ± 2	17 ± 2	14 ± 2	12 ± 2	13 ± 2	16 ± 2	13 ± 2	14 ± 2	13 ± 2	15 ± 2	14 ± 3
Quarter Avg.	**22 ± 15**	**27 ± 17**	**22 ± 13**	**22 ± 14**	**22 ± 13**	**25 ± 13**	**22 ± 12**	**24 ± 14**	**23 ± 16**	**23 ± 14**	**23 ± 14**

a) No volumes. The pump was off and the display was blank.

b) AVT-100 has erratic flow display. AVS28-5500 flow rate measured (using CRP-351 at 55 LPM total volume calculated at 556.55 m3).

TABLE B-1 (Cont.)

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF GROSS BETA EMITTERS IN WEEKLY AIRBORNE PARTICULATES

Results in Units of 10^{-3} pCi/m^3 ± 2 sigma

COLLECTION DATES	STATION CODES ONS-1	ONS-2	ONS-3	ONS-4	ONS-5	ONS-6	NBF	SBN	DOW	COL	Average ± 2 s.d.
APRIL											
04/05/00	17 ± 2	18 ± 2	15 ± 2	15 ± 2	17 ± 2	17 ± 2	14 ± 2	18 ± 2	15 ± 2	19 ± 2	17 ± 3
04/12/00	13 ± 2	14 ± 2	12 ± 2	11 ± 2	13 ± 2	15 ± 2	11 ± 2	15 ± 2	12 ± 2	14 ± 2	13 ± 3
04/19/00	15 ± 2	20 ± 2	14 ± 2	16 ± 2	16 ± 2	17 ± 2	14 ± 2	17 ± 2	16 ± 2	16 ± 2	16 ± 3
04/26/00	18 ± 2	18 ± 2	17 ± 2	17 ± 2	19 ± 2	18 ± 2	18 ± 2	17 ± 2	17 ± 2	21 ± 2	18 ± 2
MAY											
05/03/00	16 ± 2	14 ± 2	13 ± 2	14 ± 2	13 ± 2	17 ± 2	14 ± 2	15 ± 2	15 ± 2	15 ± 2	15 ± 3
05/10/00	15 ± 2	14 ± 2	11 ± 2	15 ± 2	15 ± 2	20 ± 2	16 ± 2	14 ± 2	16 ± 2	14 ± 2	15 ± 5
05/17/00	15 ± 2	14 ± 2	13 ± 2	15 ± 2	13 ± 2	13 ± 2	13 ± 2	14 ± 2	16 ± 2	16 ± 2	14 ± 2
05/24/00	17 ± 2	16 ± 2	16 ± 2	16 ± 2	15 ± 2	15 ± 2	15 ± 2	16 ± 2	15 ± 2	19 ± 2	16 ± 2
05/31/00	13 ± 2	11 ± 2	12 ± 2	13 ± 2	12 ± 2	11 ± 2	12 ± 2	12 ± 2	12 ± 2	12 ± 2	12 ± 1
JUNE											
06/07/00	11 ± 2	10 ± 2	10 ± 2	11 ± 2	10 ± 2	9.5 ± 1.7	9.7 ± 1.7	12 ± 2	11 ± 2	11 ± 2	11 ± 2
06/14/00	16 ± 2	16 ± 2	16 ± 2	16 ± 2	18 ± 2	13 ± 2	16 ± 2	18 ± 2	18 ± 2	18 ± 2	17 ± 3
06/21/00	8.1 ± 1.4	9.4 ± 1.5	9.4 ± 1.5	9.4 ± 1.5	< 8(a)	< 800(a)	9.3 ± 1.5	9.0 ± 1.6	8.5 ± 1.4	11 ± 2	9.0 ± 1.5
06/28/00	13 ± 2	12 ± 2	12 ± 2	12 ± 2	11 ± 2	10 ± 2	12 ± 2	11 ± 2	13 ± 2	15 ± 2	12 ± 3
Quarter Avg.	**14 ± 5**	**14 ± 6**	**13 ± 5**	**14 ± 5**	**14 ± 6**	**15 ± 7**	**13 ± 5**	**14 ± 6**	**14 ± 5**	**15 ± 6**	**14 ± 6**

a) No volumes. The pump was off and the display was blank.

b) AVT-100 has erratic flow display. AVS28-5500 flow rate measured (using CRP-351 at 55 LPM total volume calculated at 556.55 m3).

TABLE B-1 (Cont.)

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF GROSS BETA EMITTERS IN WEEKLY AIRBORNE PARTICULATES

Results in Units of 10^{-3} pCi/m^3 ± 2 sigma

COLLECTION DATES	STATION CODES ONS-1	ONS-2	ONS-3	ONS-4	ONS-5	ONS-6	NBF	SBN	DOW	COL	Average ± 2 s.d.
JULY											
07/05/00	14 ± 2	12 ± 2	14 ± 2	14 ± 2	14 ± 2	13 ± 2	12 ± 2	13 ± 2	13 ± 2	14 ± 2	13 ± 2
07/12/00	11 ± 2	11 ± 2	11 ± 2	12 ± 2	12 ± 2	13 ± 2	13 ± 2	10 ± 2	12 ± 2	12 ± 2	12 ± 2
07/19/00	12 ± 2	13 ± 2	12 ± 2	12 ± 2	12 ± 2	12 ± 2	14 ± 2	14 ± 2	12 ± 2	14 ± 2	13 ± 2
07/26/00	9.6 ± 1.7	9.8 ± 1.6	10 ± 2	8.7 ± 1.5	9.2 ± 1.6	9.7 ± 1.6	9.1 ± 1.6	10 ± 2	8.0 ± 1.5	8.7 ± 1.6	9 ± 1
AUGUST											
08/02/00	19 ± 2	20 ± 2	17 ± 2	18 ± 2	19 ± 2	19 ± 2	18 ± 2	17 ± 2	19 ± 2	18 ± 2	18 ± 2
08/09/00	15 ± 2	17 ± 2	15 ± 2	16 ± 2	15 ± 2	14 ± 2	15 ± 2	16 ± 2	16 ± 2	17 ± 2	16 ± 2
08/16/00	18 ± 2	19 ± 2	18 ± 2	18 ± 2	21 ± 2	17 ± 2	18 ± 2	19 ± 2	19 ± 2	20 ± 2	19 ± 2
08/23/00	13 ± 2	14 ± 2	13 ± 2	13 ± 2	15 ± 2	14 ± 2	14 ± 2	14 ± 2	14 ± 2	12 ± 2	14 ± 2
08/30/00	32 ± 3	27 ± 2	28 ± 2	31 ± 2	31 ± 3	32 ± 2	31 ± 2	29 ± 2	27 ± 2	31 ± 2	30 ± 4
SEPTEMBER											
09/06/00	19 ± 2	16 ± 2	16 ± 2	16 ± 2	19 ± 2	18 ± 2	18 ± 2	21 ± 2	17 ± 2	19 ± 2	18 ± 3
09/13/00	16 ± 2	12 ± 2	14 ± 2	13 ± 2	16 ± 2	13 ± 2	14 ± 2	12 ± 2	11 ± 2	21 ± 3	14 ± 6
09/20/00	23 ± 2	22 ± 2	22 ± 2	19 ± 2	14 ± 4	< 5	19 ± 2	22 ± 2	20 ± 2	20 ± 2	20 ± 5
09/27/00	9.9 ± 3.6	13 ± 2	12 ± 2	11 ± 2	14 ± 2	10 ± 2	10 ± 2	12 ± 2	11 ± 2	11 ± 2	11 ± 3
Quarter Avg.	**16 ± 12**	**16 ± 10**	**16 ± 10**	**16 ± 11**	**16 ± 11**	**15 ± 12**	**16 ± 11**	**16 ± 11**	**15 ± 10**	**17 ± 12**	**16 ± 11**

a) No volumes. The pump was off and the display was blank.

b) AVT-100 has erratic flow display. AVS28-5500 flow rate measured (using CRP-351 at 55 LPM total volume calculated at 556.55 m3).

TABLE B-1 (Cont.)

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF GROSS BETA EMITTERS IN WEEKLY AIRBORNE PARTICULATES

Results in Units of 10^{-3} pCi/m^3 ± 2 sigma

COLLECTION DATES	STATION CODES ONS-1	ONS-2	ONS-3	ONS-4	ONS-5	ONS-6	NBF	SBN	DOW	COL	Average ± 2 s.d.
OCTOBER											
10/04/00	22 ± 2	24 ± 2	21 ± 2	23 ± 2	22 ± 2	21 ± 2	24 ± 2	24 ± 2	24 ± 2	24 ± 2	23 ± 3
10/11/00	14 ± 2	17 ± 2	15 ± 2	16 ± 2	17 ± 2	16 ± 2	15 ± 2	16 ± 2	14 ± 2	15 ± 2	16 ± 2
10/18/00	30 ± 2	29 ± 2	31 ± 2	30 ± 2	27 ± 2	30 ± 2	26 ± 2	27 ± 2	30 ± 2	28 ± 2	29 ± 3
10/25/00	43 ± 3	45 ± 3	45 ± 3	42 ± 3	39 ± 3	45 ± 3	37 ± 3	39 ± 3	43 ± 3	42 ± 3	42 ± 6
NOVEMBER											
11/01/00	27 ± 2	32 ± 3	28 ± 2	25 ± 2	27 ± 2	27 ± 2	27 ± 2	25 ± 2	27 ± 2	26 ± 2	27 ± 4
11/08/00	26 ± 2	26 ± 2	25 ± 2	25 ± 2	25 ± 2	28 ± 2	20 ± 2	25 ± 2	25 ± 2	26 ± 2	25 ± 4
11/15/01	17 ± 2	17 ± 2	16 ± 2	16 ± 2	16 ± 2	18 ± 2	18 ± 2	12 ± 2	16 ± 2	14 ± 2	16 ± 4
11/22/01	26 ± 2	25 ± 2	25 ± 2	26 ± 2	23 ± 2	24 ± 2	27 ± 2	22 ± 2	25 ± 2	23 ± 2	25 ± 3
11/29/01	24 ± 2	25 ± 2	31 ± 3	26 ± 2	< 20	< 20	22 ± 2	23 ± 2	28 ± 2	27 ± 2	26 ± 6
DECEMBER											
12/06/01	15 ± 2	14 ± 2	15 ± 2	15 ± 2	13 ± 2	11 ± 2	13 ± 2	16 ± 2	15 ± 2	15 ± 2	14 ± 3
12/13/01	24 ± 2	23 ± 2	25 ± 2	23 ± 2	15 ± 10(b)	23 ± 2	21 ± 2	22 ± 2	26 ± 2	24 ± 2	23 ± 6
12/20/01	28 ± 2	30 ± 3	30 ± 3	35 ± 3	30 ± 2	29 ± 2	30 ± 3	33 ± 3	36 ± 3	31 ± 3	31 ± 5
12/27/01	23 ± 2	22 ± 2	23 ± 2	26 ± 2	21 ± 2	21 ± 2	21 ± 2	23 ± 2	25 ± 2	26 ± 2	23 ± 4
Quarter Avg.	**25 ± 15**	**25 ± 16**	**25 ± 16**	**25 ± 15**	**23 ± 15**	**24 ± 17**	**23 ± 13**	**24 ± 14**	**26 ± 16**	**25 ± 15**	**25 ± 15**
Annual Avg.	**19 ± 15**	**21 ± 17**	**19 ± 15**	**19 ± 15**	**19 ± 14**	**20 ± 16**	**19 ± 13**	**19 ± 14**	**19 ± 16**	**20 ± 14**	**19 ± 15**

a) No volumes. The pump was off and the display was blank.

b) AVT-100 has erratic flow display. AVS28-5500 flow rate measured (using CRP-351 at 55 LPM total volume calculated at 556.55 m3).

TABLE B-2

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF GAMMA EMITTERS* IN QUARTERLY COMPOSITES OF AIRBORNE PARTICULATES

Results in Units of 10^{-3} pCi/m^3 ± 2 sigma

Stations	Nuclides	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Average ± 2 s.d.
ONS-1	Be-7	107 ± 12	901 ± 72	119 ± 15	80.1 ± 5.7	99.1 ± 34.7
	K-40	< 0.1	< 10	< 4	< 3	-
	Cs-134	< 0.3	< 0.2	< 0.2	< 0.2	-
	Cs-137	< 0.3	< 0.3	< 0.2	< 0.1	-
ONS-2	Be-7	127 ± 13	a	93 ± 13	86.4 ± 6.7	102 ± 43.7
	K-40	< 05	2.33 ± 1.54	< 3.9	< 5	-
	Cs-134	< 0.3	< 0.1	< 0.2	< 0.2	-
	Cs-137	< 0.2	< 0.1	< 0.2	< 0.2	-
ONS-3	Be-7	104 ± 10	78.3 ± 6.57	95 ± 13	82.3 ± 7.3	90.0 ± 23.4
	K-40	< 5	3.17 ± 3.4	3.4 ± 3.0	< 3	-
	Cs-134	< 0.3	< 0.2	< 0.2	< 0.4	-
	Cs-137	< 0.3	< 0.2	< 0.2	< 0.4	-
ONS-4	Be-7	< 20	95.5 ± 7.3	98 ± 11	87.0 ± 7.9	98.9 ± 23.5
	K-40	< 0.4	< 10	< 3.4	< 3	-
	Cs-134	< 0.3	< 0.3	< 0.2	< 0.4	-
	Cs-137	< 0.2	< 0.3	< 0.2	< 0.4	-
ONS-5	Be-7	116 ± 12	109 ± 11	108 ± 15	70.3 ± 9.8	101 ± 41.3
	K-40	< 10	< 5	< 5	< 4	-
	Cs-134	< 0.4	< 0.3	< 0.2	< 0.3	-
	Cs-137	< 0.3	< 0.3	< 0.2	< 0.3	-

a) The nuclide library used for the gamma analyses did not include Be-7

TABLE B-2 (cont.)

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF GAMMA EMITTERS* IN QUARTERLY COMPOSITES OF AIRBORNE PARTICULATES

Results in Units of 10^{-3} pCi/m^3 ± 2 sigma

Stations	Nuclides	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Average ± 2 s.d.
ONS-6	Be-7	132 ± 13	118 ± 12	98 ± 15	81.7 ± 6.4	107 ± 44.3
	K-40	< 5	< 6	< 5	< 4	-
	Cs-134	< 0.3	< 0.3	< 0.2	< 0.3	-
	Cs-137	< 0.2	< 0.3	< 0.2	< 0.3	-
NBF	Be-7	121 ± 12	85.2 ± 8.5	92 ± 15	79.4 ± 6.2	94.4 ± 36.9
	K-40	2.61 ± 1.47	6.96 ± 1.98	< 3	< 0.6	-
	Cs-134	< 0.2	< 0.3	< 0.4	< 0.2	-
	Cs-137	< 0.2	< 0.3	< 0.4	< 0.2	-
SBN	Be-7	102 ± 10	66.8 ± 10.0	99 ± 71	76.8 ± 5.5	86.0 ± 34.0
	K-40	< 4	< 9	< 4	< 3	-
	Cs-134	< 0.3	< 0.4	< 0.5	< 0.1	-
	Cs-137	< 0.3	< 0.3	< 0.4	< 0.2	-
DOW	Be-7	101 ± 10	101 ± 74	110 ± 15	85.1 ± 6.2	99.3 ± 20.7
	K-40	< 5	< 3	< 4	< 4	-
	Cs-134	< 0.3	< 0.1	< 0.4	< 0.2	-
	Cs-137	< 0.2	< 0.2	< 0.3	< 0.2	-
COL	Be-7	121 ± 12	109 ± 85	105 ± 13	90.6 ± 7.0	107 ± 25.1
	K-40	< 10	< 10.5	< 3	< 5	-
	Cs-134	< 0.4	< 0.2	< 0.4	< 0.2	-
	Cs-137	< 0.4	< 0.2	< 0.3	< 0.2	-

a) The nuclide library used for the gamma analyses did not include Be-7

TABLE B-3

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF IODINE-131 IN WEEKLY AIR CARTRIDGE SAMPLES

Results in Units of 10^{-3} pCi/m^3 ± 2 sigma

COLLECTION DATES	STATION CODES ONS-1	ONS-2	ONS-3	ONS-4	ONS-5	ONS-6	NBF	SBN	DOW	COL
JANUARY 2000										
01/05/00	< 9	< 9	< 9	< 9	< 7	< 10	< 10	< 10	< 10	< 9
01/12/00	< 9	< 9	< 9	< 9	< 7	< 8	< 8	< 8	< 8	< 6
01/19/00	< 8	< 8	< 8	< 7	< 6	< 10	< 10	< 10	< 10	< 8
01/26/00	< 9	< 9	< 9	< 8	< 6	< 10	< 10	< 10	< 10	< 9
FEBRUARY										
02/02/00	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
02/09/00	< 9	< 20	< 20	< 10	< 20	< 10	< 10	< 10	< 10	< 20
02/16/00	< 8	< 8	< 8	< 7	< 6	< 10	< 10	< 10	< 10	< 8
02/23/00	< 9	< 10	< 9	< 8	< 6	< 10	< 10	< 10	< 10	< 9
MARCH										
03/01/00	< 9	< 10	< 9	< 9	< 7	< 10	< 8	< 10	< 9	< 6
03/08/00	< 9	< 9	< 9	< 9	< 6	< 10	< 10	< 20	< 10	< 9
03/15/00	< 9	< 9	< 9	< 9	< 7	< 8	< 8	< 8	< 8	< 8
03/22/00	< 8	< 8	< 8	< 8	< 6	< 9	< 7	< 10	< 7	< 5
03/29/00	< 8	< 9	< 9	< 8	< 6	< 10	< 10	< 10	< 10	< 9

TABLE B-3 (Cont.)

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF IODINE-131 IN WEEKLY AIR CARTRIDGE SAMPLES

Results in Units of 10^{-3} pCi/m^3 ± 2 sigma

COLLECTION DATES	STATION CODES ONS-1	ONS-2	ONS-3	ONS-4	ONS-5	ONS-6	NBF	SBN	DOW	COL
APRIL										
04/05/00	< 10	< 10	< 10	< 10	< 8	< 8	< 7	< 8	< 7	< 6
04/12/00	< 10	< 10	< 10	< 10	< 8	< 9	< 5	< 8	< 7	< 6
04/19/00	< 9	< 10	< 8	< 9	< 7	< 9	< 8	< 9	< 8	< 6
04/26/00	< 8	< 8	< 8	< 8	< 6	< 10	< 10	< 10	< 10	< 8
MAY										
05/03/00	< 10	< 10	< 10	< 10	< 7	< 20	< 10	< 20	< 20	< 10
05/10/00	< 10	< 10	< 10	< 10	< 9	< 10	< 10	< 10	< 10	< 9
05/17/00	< 10	< 10	< 10	< 10	< 8	< 20	< 20	< 20	< 20	< 10
05/24/00	< 9	< 9	< 8	< 8	< 7	< 9	< 9	< 10	< 9	< 6
05/31/00	< 10	< 10	< 10	< 10	< 8	< 10	< 10	< 20	< 10	< 10
JUNE										
06/07/00	< 10	< 10	< 10	< 10	< 8	< 20	< 20	< 20	< 20	< 10
06/14/00	< 20	< 20	< 20	< 20	< 10	< 7	< 8	< 9	< 8	< 6
06/21/00	< 7	< 7	< 7	< 7	< 0.003(a)	< 0.003(a)	< 7	< 8	< 7	< 5
06/28/00	< 20	< 20	< 20	< 10	< 10	< 20	< 20	< 20	<20	< 10

a) No volumes available. Found with pump off and display blank.

TABLE B-3 (Cont.)

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF IODINE-131 IN WEEKLY AIR CARTRIDGE SAMPLES

Results in Units of 10^{-3} pCi/m^3 ± 2 sigma

COLLECTION DATES	STATION CODES ONS-1	ONS-2	ONS-3	ONS-4	ONS-5	ONS-6	NBF	SBN	DOW	COL
JULY										
07/05/00	< 10	< 10	< 10	< 10	< 8	< 20	< 20	< 20	< 20	< 10
07/12/00	< 10	< 10	< 10	< 10	< 8	< 8	< 7	< 8	< 7	< 6
07/19/00	< 10	< 10	< 10	< 10	< 10	< 20	< 20	< 20	< 20	< 10
07/26/00	< 10	< 10	< 10	< 10	< 8	< 20	< 10	< 20	< 20	< 10
AUGUST										
08/02/00	< 10	< 10	< 10	< 10	< 10	< 20	< 20	< 20	< 20	< 10
08/09/00	< 10	< 10	< 10	< 10	< 10	< 20	< 20	< 20	< 20	< 10
08/16/00	< 20	< 10	< 10	< 10	< 10	< 20	< 20	< 20	< 20	< 10
08/23/00	< 10	< 20	< 20	< 20	< 20	< 10	< 10	< 10	< 10	< 10
08/30/00	< 20	< 30	< 30	< 30	< 30	< 20	< 20	< 20	< 20	< 20
SEPTEMBER										
09/06/00	< 10	< 10	< 10	< 10	< 10	< 20	< 20	< 20	< 20	< 10
09/13/00	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
09/20/00	< 20	< 20	< 20	< 20	< 40	< 70	< 30	< 30	< 30	< 20
09/27/00	< 60	< 20	< 20	< 20	< 20	< 30	< 30	< 30	< 30	< 20

TABLE B-4

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

DIRECT RADIATION MEASUREMENTS - QUARTERLY TLD RESULTS

Results in Units of mR/standard month

STATION CODES	FIRST QUARTER 12/29/99-03/29/00	SECOND QUARTER 03/29/00-06/28/00	THIRD QUARTER 06/28/00-09/27/00	FOURTH QUARTER 09/27/00-01/03/01	AVERAGE ± 2 s.d.
T-01	2.6 ± 0.6	4.1 ± 0.3	5.4 ± 0.2	8.1 ± 2.0	5.1 ± 4.7
T-02	2.7 ± 0.2	4.4 ± 0.2	5.2 ± 0.7	6.3 ± 1.1	4.7 ± 3.0
T-03	2.3 ± 0.5	3.9 ± 0.1	4.4 ± 0.3	5.8 ± 2.3	4.1 ± 2.9
T-04	2.7 ± 0.4	4.5 ± 0.2	5.0 ± 0.4	5.6 ± 0.5	4.5 ± 2.5
T-05	2.6 ± 0.5	4.5 ± 0.2	4.8 ± 0.6	7.1 ± 0.4	4.8 ± 3.7
T-06	2.5 ± 0.2	4.3 ± 0.3	5.0 ± 0.5	10.8 ± 0.6	5.7 ±7.2
T-07	2.5 ± 0.4	4.4 ± 0.3	5.1 ± 0.1	5.1 ± 0.8	4.3 ± 2.5
T-08	2.8 ± 0.3	4.5 ± 0.1	5.0 ± 0.3	8.2 ± 0.9	5.1 ± 4.5
T-09	2.5 ± 0.2	4.3 ± 0.2	5.1 ± 0.1	8.6 ± 2.0	5.1 ± 5.1
T-10	2.3 ± 0.4	4.2 ± 0.2	5.1 ± 0.5	5.4 ± 2.1	4.9 ± 4.8
T-11	2.7 ± 0.3	4.4 ± 0.4	5.0 ± 0.2	9.9 ± 1.6	5.5 ± 6.2
T-12	2.7 ± 0.2	4.4 ± 0.2	5.5 ± 0.7	6.7 ± 3.8	4.8 ± 3.4
OFT-1	2.3 ± 0.5	4.3 ± 0.1	5.3 ± 0.4	5.7 ± 1.0	4.4 ± 3.0
OFT-2	2.4 ± 0.2	4.0 ± 0.6	5.1 ± 0.2	5.4 ± 2.1	4.2 ± 2.7
OFT-3	2.7 ± 0.5	4.6 ± 0.7	5.4 ± 0.5	4.9 ± 1.0	4.4 ± 2.4
OFT-4	2.8 ± 0.1	4.4 ± 0.1	5.7 ± 0.3	7.2 ± 1.5	5.0 ± 3.7
OFT-5	3.0 ± 0.4	4.8 ± 0.4	5.6 ± 0.7	6.4 ± 0.03	5.0 ± 2.9
OFT-6	3.5 ± 0.3	5.3 ± 0.3	6.2 ± 1.2	7.8 ± 1.3	5.7 ± 3.6
OFT-7	2.6 ± 0.1	4.4 ± 0.1	5.5 ± 0.9	6.7 ± 2.6	4.8 ± 3.5
OFT-8	3.2 ± 0.6	5.0 ± 0.5	5.8 ± 0.5	6.8 ± 3.5	5.2 ± 3.0
OFT-9	3.1 ± 0.6	5.1 ± 0.3	5.7 ± 0.7	9.4 ± 5.0	5.8 ± 5.3
OFT-10	2.5 ± 0.4	4.6 ± 0.3	5.3 ± 0.4	8.1 ± 1.5	5.1 ± 4.6
OFT-11	3.3 ± 0.4	5.4 ± 0.7	6.1 ± 0.6	(a)	4.9 ± 2.9
NBF	2.8 ± 0.2	5.1 ± 0.7	5.9 ± 0.8	5.7 ± 0.6	4.9 ± 2.8
SBN	3.1 ± 0.2	5.4 ± 0.2	6.0 ± 0.3	7.9 ± 1.2	5.6 ± 4.0
DOW	2.6 ± 0.2	4.8 ± 0.6	4.7 ± 0.3	11.4 ± 2.0	5.9 ± 7.6
COL	2.5 ± 0.2	4.5 ± 0.3	5.2 ± 0.6	6.2 ± 4.4	4.6 ± 3.1
Average ± 2 s.d.	**2.7 ± 0.6**	**4.6 ± 0.8**	**5.3 ± 0.9**	**7.3 ± 3.4**	**5.0 ± 1.0**

a) TLD was missing during collection. See Appendix E.

TABLE B-5

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF IODINE, TRITIUM AND GAMMA EMITTERS* IN SURFACE WATER

Results in Units of pCi/liter ± 2 sigma

STATION	Collection Date	I-131	K-40	Tritium
SWL-1	01/31/00	< 0.6	< 50	< 200
(Condenser Circ.)	02/29/00	< 0.8	< 50	
	03/31/00	< 0.5	< 40	
	04/30/00	< 0.6	< 50	< 200
	05/31/00	< 0.7	< 40	
	06/30/00	< 1	< 50	
	07/31/00	< 1	< 40	< 100
	08/31/00	< 1	< 110	
	09/30/00	< 1	< 80	
	10/31/00	(a)	< 70	< 100
	11/30/00	(a)	< 90	
	12/31/00	(a)	90 ± 40	
SWL-2	01/18/00	< 1	< 50	< 200
(South Comp)	02/29/00	(b)	(b)	
	03/31/00	< 0.6	< 50	
	04/30/00	< 0.6	< 50	< 200
	05/31/00	< 0.7	< 50	
	06/30/00	< 1	< 40	
	07/31/00	< 1	< 60	< 100
	08/31/00	< 1	< 80	
	09/30/00	< 1	< 90	
	10/31/00	(a)	150 ± 50	< 100
	11/30/00	(a)	< 110	
	12/31/00	(a)	< 70	

a) Due to challenges, some LLDs were missed. See Appendix E.
b) No sample. See Appendix E.
* Typical LLDs are found in table B-12.

TABLE B-5 (Cont.)

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF IODINE, TRITIUM AND GAMMA EMITTERS* IN SURFACE WATER

Results in Units of pCi/liter ± 2 sigma

STATION	Collection Date	I-131	K-40	Tritium
SWL-3	01/18/00	< 1	< 70	< 200
(North Comp)	02/29/00	(b)	(b)	
	03/31/00	< 0.6	< 50	
	04/30/00	< 0.7	< 60	< 200
	05/31/00	< 0.8	< 60	
	06/30/00	< 1	< 80	
	07/31/00	< 1	< 80	
	08/31/00	< 1	< 100	
	09/30/00	<0 .9	94 ± 40	< 100
	10/31/00	(a)	130 ± 40	
	11/30/00	(a)	< 90	
	12/31/00	(a)	<150	< 100

a) Due to challenges, some LLDs were missed. See Appendix E.
b) No sample. See Appendix E.
* Typical LLDs are found in table B-12.

TABLE B-6

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF TRITIUM AND GAMMA EMITTERS* IN GROUNDWATER

Results in Units of pCi/liter ± 2 sigma

STATION	Collection Date	I-131	K-40	Tritium
Well W-1	01/27/00	< 0.2	< 70	< 300
	04/27/00	< 0.3	< 50	< 200
	07/27/00	< 0.3	< 100	< 200
	10/27/00	(a)	< 100	< 200
Well W-2	01/27/00	< 0.2	< 50	< 300
	04/27/00	< 0.3	< 90	< 200
	07/27/00	< 0.2	< 60	< 200
	10/26/00	(a)	230 ± 110	< 200
Well W-3	01/27/00	< 0.2	< 70	< 300
	04/27/00	< 0.3	74.0 ± 50.1	< 200
	07/27/00	< 0.3	< 70	< 200
	10/26/00	(a)	210 ± 90	< 200
Well W-4	01/28/00	< 0.2	< 50	1400 ± 200
	04/28/00	< 0.2	< 60	1000 ± 100
	07/28/00	< 0.2	< 100	900 ± 140
	10/26/00	(a)	< 80	750 ± 110
Well W-5	01/28/00	< 0.2	< 50	< 300
	04/28/00	< 0.2	< 50	400 ± 130
	07/28/00	< 0.3	< 100	210 ± 130
	10/26/00	(a)	270 ± 100	240 ± 90

a) Due to challenges, some LLDs were missed. See Appendix E.

* Typical LLDs are found in table B-12.

TABLE B-6 (Cont.)

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF TRITIUM AND GAMMA EMITTERS* IN GROUNDWATER

Results in Units of pCi/liter ± 2 sigma

STATION	Collection Date	I-131	K-40	Tritium
Well W-6	01/28/00	< 0.2	< 60	540 ±170
	04/28/00	< 0.2	< 80	550 ± 120
	07/28/00	< 0.2	< 100	1700 ± 200
	10/26/00	(a)	310 ± 80	3000 ± 200
Well W-7	02/09/00	< 0.2	< 100	< 200
	04/27/00	< 0.2	< 80	< 200
	07/27/00	< 0.3	< 100	< 200
	10/27/00	(a)	< 6	< 200
Well W-8	01/28/00	< 0.2	< 40	< 300
	05/02/00	< 0.2	< 60	< 200
	07/27/00	< 0.3	< 100	< 200
	10/26/00	(a)	290 ± 80	< 200
Well W-9	01/27/00	< 0.2	<80	< 300
	04/27/00	< 0.2	< 90	< 200
	07/27/00	< 0.2	< 100	< 200
	10/27/00	(a)	170 ± 70	< 200
Well W-10	01/27/00	< 0.4	<100	< 300
	04/27/00	< 0.3	< 40	< 200
	07/27/00	< 0.3	< 100	< 200
	10/26/00	(a)	150 ± 90	< 200

a) Due to challenges, some LLDs were missed. See Appendix E.

* Typical LLDs are found in table B-12

TABLE B-6 (Cont.)

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF TRITIUM AND GAMMA EMITTERS* IN GROUNDWATER

Results in Units of pCi/liter ± 2 sigma

STATION	Collection Date	I-131	K-40	Tritium
Well W-11	01/27/00	< 0.2	< 60	< 300
	04/27/00	< 0.5	< 90	< 200
	07/27/00	< 0.2	< 100	< 200
	10/27/00	(a)	160 ± 80	< 200
Well W-12	01/27/00	< 0.2	< 50	< 300
	04/27/00	< 0.2	< 90	< 200
	07/27/00	< 0.3	< 60	< 200
	10/27/00	(a)	< 100	< 200
Well W-13	01/27/00	< 0.2	< 40	< 300
	04/27/00	< 0.2	< 80	< 200
	07/27/00	< 0.3	< 60	< 200
	10/27/00	(a)	< 90	< 200
Well W-14	01/27/00	< 0.2	< 50	370 ± 170
	04/27/00	< 0.3	< 50	3000 ± 200
	07/27/00	< 0.3	< 30	2700 ± 120
	10/26/00	(a)	150 ± 70	210 ± 90
Average ± 2 s.d.			**199 ± 141**	**969 ± 1870**

a) Due to challenges, some LLDs were missed. See Appendix E.

* Typical LLDs are found in table B-12.

TABLE B-7

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF GROSS BETA, IODINE, TRITIUM AND GAMMA EMITTERS* IN DRINKING WATER

Results in Units of pCi/liter ± 2 sigma

COLLECTION DATE	Gross Beta	Gamma Spec	Iodine-131	Tritium
LTW				
01/12/00	2.9 ± 0.9	< LLD	< 0.4	< 200
01/26/00	2.4 ± 0.9	< LLD	< 0.4	< 200
02/09/00	2.7 ± 0.9	< LLD	< 0.3	< 200
02/13/00	2.9 ± 1.0	< LLD	< 0.2	< 200
03/08/00	2.7 ± 0.9	< LLD	< 0.2	< 200
03/22/00	1.6 ± 0.9	< LLD	< 0.3	< 200
04/05/00	2.9 ± 1.0	< LLD	< 0.4	< 200
04/19/00	3.9 ± 1.0	< LLD	< 0.2	< 200
05/03/00	4.4 ± 1.0	< LLD	< 0.3	< 200
05/17/00	2.9 ± 1.0	< LLD	< 0.4	< 200
05/31/00	2.3 ± 0.8	< LLD	< 0.4	< 200
06/14/00	2.6 ± 0.9	< LLD	< 0.3	< 200
06/28/00	1.3 ± 0.8	< LLD	< 0.6	< 200
07/12/00	2.6 ± 1.1	< LLD	< 0.6	< 200
07/26/00	2.8 ± 0.8	< LLD	< 0.3	< 200
08/09/00	2.2 ± 0.9	< LLD	< 0.4	< 200
08/23/00	2.8 ± 1.8	< LLD	< 0.6	< 200
09/06/00	< 2	< LLD	< 0.5	< 200
09/20/00	3.1 ± 0.9	< LLD	< 0.4	< 200
10/04/00	2.9 ± 2.0	< LLD	< 0.8	< 200
10/18/00	2.7 ± 1.0	< LLD	< 0.5	< 200
11/01/00	1.5 ± 0.9	220 ± 50 Ra-226	< 0.3	< 200
11/15/00	4.6 ± 0.9	< LLD	< 0.8	< 200
11/29/00	3.0 ± 1.2	120 ± 40 K-40	< 0.8	< 200
12/13/00	< 2	220 ± 80 K-40	< 2	< 200
12/27/00	< 3	4.0 ± 2.5 Th-228	< 20(a)	< 200
Average ± 2 s.d.	**2.8 ± 0.8**	**170 ± 70.7 K-40**		
		215 ± 7.1 Ra-226		

a) Due to challenges, some LLDs were missed. See Appendix E.

* Typical LLDs are found in table B-12.

TABLE B-7 (Cont.)

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF GROSS BETA, IODINE, TRITIUM AND GAMMA EMITTERS* IN DRINKING WATER

Results in Units of pCi/liter ± 2 sigma

COLLECTION DATE	Gross Beta	Gamma Spec	Iodine-131	Tritium
STJ				
01/12/00	2.6 ± 0.9	< LLD	< 0.4	< 200
01/26/00	2.3 ± 0.9	< LLD	< 0.4	< 200
02/09/00	3.0 ± 1.0	< LLD	< 0.3	< 200
02/23/00	2.9 ± 1.0	< LLD	< 0.3	< 200
03/08/00	3.1 ± 1.0	< LLD	< 0.3	< 200
03/22/00	7.5 ± 1.3	< LLD	< 0.4	< 200
04/05/00	2.0 ± 0.9	< LLD	< 0.4	< 200
04/19/00	3.3 ± 1.0	< LLD	< 0.2	< 200
05/03/00	1.9 ± 0.8	< LLD	< 0.3	< 200
05/17/00	2.1 ± 0.9	< LLD	< 0.3	< 200
05/31/00	3.1 ± 0.9	< LLD	< 0.4	< 200
06/14/00	2.9 ± 0.9	< LLD	< 0.4	< 200
06/28/00	1.7 ± 1.0	< LLD	< 0.5	< 200
07/12/00	2.4 ± 1.1	< LLD	< 0.7	< 200
07/26/00	3.3 ± 0.9	< LLD	< 0.5	< 200
08/09/00	2.1 ± 0.9	< LLD	< 0.4	< 200
08/23/00	2.9 ± 1.8	< LLD	< 0.1	< 200
09/06/00	1.9 ± 1.1	< LLD	< 0.4	< 200
09/20/00	5.5 ± 1.1	< LLD	< 0.5	< 200
10/04/00	< 3	< LLD	< 0.8	< 200
10/18/00	2.8 ± 0.9	< LLD	< 0.4	< 200
11/01/00	2.4 ± 0.9	150 ± 70 K-40	< 0.5	< 200
11/15/00	2.6 ± 1.0	< LLD	< 0.8	< 200
11/29/00	2.8 ± 1.1	< LLD	< 0.8	< 200
12/13/00	< 2	240 ± 70 K-40	< 2	< 200
12/27/00	2.9 ± 1.9	< LLD	< 10	< 200
Average ± 2 s.d.	**2.9 ± 1.2**			**195 ± 63.6**

a) Due to challenges, some LLDs were missed. See Appendix E.

* Typical LLDs are found in table B-12.

TABLE B-8

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF GAMMA EMITTERS* IN SEDIMENT

Results in Units of pCi/kg (dry) ± 2 sigma

Station	Collection Date	Be-7	K-40	Cs-137	Ra-226	Th-228
SL-2	03/31/00	< 100	7500 ± 750	< 20	< 300	253 ± 26
SL-3	03/31/00	< 200	8190 ±820	< 30	< 400	97.5 ± 21.8
SL-2	10/10/00	< 52	4090 ± 140	5.85 ± 1.28	138 ± 4	133 ± 4
SL-3	10/10/00	< 49	5760 ± 190	5.90 ± 1.52	59 ± 2.7	71.5 ± 3
Average ± 2 s.d.			**6385 ± 3680**	**5.88 ± 0.07**	**98.5 ± 112**	**139 ± 160**

* *Typical LLDs are found in table B-12.*

TABLE B-9
INDIANA MICHIGAN POWER COMPANY – DONALD C. COOK NUCLEAR PLANT
CONCENTRATIONS OF IODINE AND GAMMA EMITTERS IN MILK
Results in Units of pCi/liter±2 sigma

COLLECTION DATES	Station	Be-7	K-40	I-131	Cs-137
		STATION CODES			
03/29/00	Glen Troy Farm	< 30	1350 ± 140	< 0.2	< 4
	Monroe Residence	< 30	1670 ± 170	< 0.2	< 4
	Shuler Farm	< 30	1390 ± 140	< 0.2	< 4
	Living House Farm	< 40	1300 ± 130	< 0.2	< 5
	Wyant Farm	< 30	1110 ± 110	< 0.2	< 4
04/12/00	Glen Troy Farm	< 40	1340 ± 130	< 0.2	< 4
	Monroe Residence	< 30	1480 ± 150	< 0.2	< 4
	Shuler Farm	< 40	1520 ± 150	< 0.2	< 5
	Living House Farm	< 40	1370 ± 140	< 0.3	< 5
	Wyant Farm	< 30	1170 ± 120	< 0.3	< 4
04/26/00	Glen Troy Farm	< 30	1010 ± 100	< 0.2	< 4
	Monroe Residence	< 30	1450 ± 140	< 0.2	< 4
	Shuler Farm	< 30	1480 ± 150	< 0.2	< 3
	Living House Farm	< 30	1260 ± 130	< 0.2	< 4
	Wyant Farm	< 30	1150 ± 120	< 0.2	< 3
05/10/00	Glen Troy Farm	< 30	1180 ± 120	< 0.3	< 3
	Monroe Residence	< 30	1500 ± 150	< 0.2	< 3
	Shuler Farm	< 30	1370 ± 140	< 0.2	< 3
	Living House Farm	< 40	1310 ± 130	< 0.2	< 4
	Wyant Farm	< 30	1360 ± 140	< 0.2	< 3
05/24/00	Glen Troy Farm	< 40	1250 ± 120	< 0.4	< 4
	Monroe Residence	< 40	1800 ± 180	< 0.3	< 4
	Shuler Farm	< 50	1320 ± 130	< 0.3	< 5
	Living House Farm	< 30	1420 ± 140	< 0.3	< 3
	Wyant Farm	< 30	1360 ± 140	< 0.3	< 3
06/07/00	Glen Troy Farm	< 30	1360 ± 140	< 0.2	< 4
	Monroe Residence	< 40	1690 ± 170	< 0.2	< 4
	Shuler Farm	< 40	1490 ± 150	< 0.2	< 5
	Living House Farm	< 30	1270 ± 130	< 0.2	< 4
	Wyant Farm	< 40	1410 ± 140	< 0.2	< 4

a) One sample was lost. See Appendix E.

** Typical LLDs are found in table B-12. All other gamma emitters were <LLD.*

TABLE B-9 (CONT)
INDIANA MICHIGAN POWER COMPANY – DONALD C. COOK NUCLEAR PLANT
CONCENTRATIONS OF IODINE AND GAMMA EMITTERS IN MILK
Results in Units of pCi/liter±2 sigma

COLLECTION DATES	Station	Be-7	K-40	I-131	Cs-137
		STATION CODES			
06/21/00	Glen Troy Farm	< 30	1250 ± 120	< 0.2	< 4
	Monroe Residence	< 30	1820 ± 180	< 0.2	< 4
	Shuler Farm	< 30	1310 ± 130	< 0.2	< 4
	Living House Farm	< 30	1390 ± 140	< 0.2	< 4
	Wyant Farm	< 80	1420 ± 140	< 0.3	< 5
07/05/00	Monroe Residence	< 30	1800 ± 180	< 0.3	< 4
	Shuler Farm	< 39	1240 ± 88	< 0.2	< 4
	Glen Troy Farm	< 50	1480 ± 150	< 0.2	< 5
	Living House Farm	< 30	1260 ± 130	< 0.2	< 4
	Wyant Farm	< 40	1180 ± 120	< 0.2	< 4
07/19/00	Monroe Residence	< 30	1760 ± 85	< 0.2	< 4
	Shuler Farm	< 36	1410 ± 81	< 0.2	< 4
	Glen Troy Farm	< 52	1440 ± 92	< 0.2	< 5
	Living House Farm	< 53	1520 ± 95	< 0.2	< 5
	Wyant	< 40	1310 ± 130	< 0.2	< 4
08/02/00	Glen Troy	< 30	1330 ± 130	< 0.2	< 4
	Monroe Residence	< 40	1710 ± 170	< 0.2	< 4
	Shuler Farm	< 30	1360 ± 140	< 0.3	< 4
	Living House Farm	< 30	1260 ± 130	< 0.2	< 3
	Wyant	< 30	1390 ± 140	< 0.2	< 4
08/16/00	Glen Troy Farm	< 30	1370 ± 140	< 0.3	< 4
	Monroe Residence	< 30	1780 ± 180	< 0.2	< 4
	Shuler Farm	< 30	1280 ± 130	< 0.2	< 4
	Living House Farm	< 50	1210 ± 120	< 0.3	< 5
	Wyant Farm	< 40	1420 ± 140	< 0.3	< 4
08/30/00	Glen Troy Farm	(a)	(a)	< 0.2	(a)
	Monroe Residence	< 325	1560 ± 83	< 0.4	< 6
	Shuler Farm	< 339	1290 ± 83	< 0.2	< 6
	Living House Farm	< 261	1490 ± 89	< 0.2	< 5
	Wyant Farm	< 640	1200 ± 97	< 0.2	< 7

a) One sample was lost. See Appendix E.

** Typical LLDs are found in table B-12. All other gamma emitters were <LLD.*

TABLE B-9 (CONT)
INDIANA MICHIGAN POWER COMPANY – DONALD C. COOK NUCLEAR PLANT
CONCENTRATIONS OF IODINE AND GAMMA EMITTERS IN MILK
Results in Units of pCi/liter±2 sigma

COLLECTION DATES	Station	Be-7	K-40	I-131	Cs-137
		STATION CODES			
09/13/00	Glen Troy Farm	< 221	1420 ± 99	< 0.4	< 5
	Monroe Residence	< 2	1640 ± 77	< 0.5	< 3
	Shuler Farm	< 143	1570 ± 95	< 0.4	< 4
	Living House Farm	< 249	1370 ± 73	< 0.4	< 5
	Wyant Farm	< 317	1300 ± 8	< 0.3	< 6
09/27/00	Glen Troy Farm	< 184	1390 ± 85	< 0.4	< 4
	Monroe Residence	< 191	1730 ± 97	< 0.3	< 5
	Shuler Farm	< 249	1540 ± 123	< 0.4	< 6
	Livinghouse Farm	< 103	1470 ± 84	< 0.7	< 4
	Wyant Farm	< 114	1300 ± 84	< 0.3	< 5
10/11/00	Glen Troy Farm	< 59	1400 ± 78	< 0.2	< 4
	Monroe Residence	< 70	1620 ± 102	< 0.3	< 5
	Shuler Farm	< 57	1280 ± 74	< 0.3	< 4
	Livinghouse Farm	< 47	1470 ± 70	< 0.3	< 3
	Wyant Farm	< 54	1420 ± 78	< 0.3	< 4
10/25/00	Glen Troy Farm	< 20	1500 ± 100	< 0.4	< 3
	Monroe Residence	< 40	1800 ± 100	< 0.5	< 4
	Shuler Farm	< 30	1600 ± 100	< 0.5	< 5
	Livinghouse Farm	< 20	1600 ± 100	< 0.4	< 2
	Wyant Farm	< 20	1500 ± 0	< 0.4	< 2
11/08/00	Glen Troy Farm	< 60	1470 ± 170	< 0.4	< 6
	Monroe Residence	< 30	1700 ± 140	< 0.4	< 3
	Shuler Farm	< 30	1460 ± 110	< 0.4	< 3
	Livinghouse Farm	< 50	1600 ± 170	< 0.4	< 5
	Wyant Farm	< 40	1470 ± 160	< 0.4	< 4
12/06/00	Glen Troy Farm	< 40	1300 ± 100	< 0.3	< 4
	Monroe Residence	< 40	1600 ± 200	< 0.4	< 5
	Shuler Farm	< 30	1600 ± 100	< 0.3	< 3
	Livinghouse Farm	< 60	1600 ± 200	< 0.3	< 5
	Wyant Farm	< 40	1300 ± 200	< 0.3	< 6

a) One sample was lost. See Appendix E.

** Typical LLDs are found in table B-12. All other gamma emitters were <LLD.*

TABLE B-10

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF GAMMA EMITTERS* IN FISH

Results in Units of pCi/kg (wet) ± 2 sigma

Collection Date	Station	Description	Be-7	K-40	Cs-137	Ra-226	Th-228
06/07/00	OFS-N	Lake Michigan	< 200	2610 ± 340	< 30	< 400	< 40
06/07/00	ONS-N	Lake Michigan	< 300	3010 ± 390	< 30	< 500	< 50
06/07/00	ONS-S	Lake Michigan	< 200	3300 ± 420	< 30	< 400	< 40
06/07/00	OFS-S	Lake Michigan	< 200	2930 ± 290	33.3 ± 17.2	< 400	< 30
08/23/00	OFS-N	Lake Michigan	< 400	2580 ± 130	9.5 ± 2.1	< 100	< 100
08/23/00	ONS-N	Lake Michigan	< 600	3200 ± 170	26.1 ± 3.7	< 200	< 20
08/23/00	ONS-S	Lake Michigan	< 700	2550 ± 130	29.2 ± 3.3	< 10	< 10
08/23/00	OFS-S	Lake Michigan	< 800	3880 ± 220	11.7 ± 3.7	< 300	< 20
Average ± 2 s.d				**3104 ± 1029**	**22.0 ± 21.2**		

* *Typical LLDs are found in table B-12. All other gamma emitters were <LLD.*

TABLE B-11

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

CONCENTRATIONS OF GAMMA EMITTERS* IN FOOD/VEGETATION

Results in Units of pCi/kg (wet) ± 2 sigma

COLLECTION DATE	Station	Description	Be-7	K-40	I-131	Cs-137
09/20/00	Sector-J	Grapes	< 70	3770 ± 380	< 40	< 8
09/20/00	Sector-D	Grapes	< 50	2490 ± 250	< 30	< 5
09/20/00	Sector-J	Leaves	4120 ± 410	2870 ± 290	< 50	< 10
09/20/00	Sector-D	Leaves	2660 ± 270	4090 ± 410	< 60	< 10
Average ± 2 s.d.			**3390 ± 2065**	**3305 ± 1499**		

* *Typical LLDs are found in table B-12. All other gamma emitters were <LLD.*

TABLE B-12

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

GAMMA SPECTROMETRY LOWER LIMITS OF DETECTION AND REPORTING LEVELS

Isotope	TI LLD	ODCM LLD	Rept Level	TI LLD	ODCM LLD	Rept Level
	Vegetation - pCi/Kg-wet				Water - pCi/liter	
Cerium-144	60	N/A	N/A	30	N/A	N/A
Barium/La-140	10	N/A	N/A	50/10	60/15	200
Cesium-134	10	60	1000	7	15	30
Ru,Rh-106	80	N/A	N/A	50	N/A	N/A
Cesium-137	10	60	2000	6	18	50
Zr,Nb-95	10	N/A	N/A	10/15	30/15	400
Manganese-54	10	N/A	N/A	5	15	1000
Iron-59	15	N/A	N/A	15	30	400
Zinc-65	20	N/A	N/A	10	30	300
Cobalt-60	10	N/A	N/A	5	15	300
Cobalt-58	10	N/A	N/A	5	15	1000
Iodine-131	20	60	100	10	1	2
Iodine-131 (a)				1	1	
	Milk - pCi/liter				Air Filter - pCi/m3	
Cerium-144	30	N/A	N/A	0.007	N/A	N/A
Barium/La-140	50/10	60/15	300	0.005	N/A	N/A
Cesium-134	7	15	60	0.002	0.06	10
Ru,Rh-106	50	N/A	N/A	0.010	N/A	N/A
Cesium-137	6	18	70	0.002	0.06	20
Zr,Nb-95	20	N/A	N/A	0.002	N/A	N/A
Manganese-54	5	N/A	N/A	0.002	N/A	N/A
Iron-59	15	N/A	N/A	0.002	N/A	N/A
Zinc-65	10	N/A	N/A	0.002	N/A	N/A
Cobalt-60	5	N/A	N/A	0.002	N/A	N/A
Cobalt-58	5	N/A	N/A	0.002	N/A	N/A
Iodine-131	10	1	3	0.040	0.07	0.9
Iodine-131 (a)	1	1				

TABLE B-12 (Cont.)

INDIANA MICHIGAN POWER COMPANY - DONALD C. COOK NUCLEAR PLANT

GAMMA SPECTROMETRY LOWER LIMITS OF DETECTION AND REPORTING LEVELS

Isotope	TI LLD	ODCM LLD	Rept Level	TI LLD	ODCM LLD	Rept Level
	FISH - pCi/Kg-wet (b)			Sediment/Soil - pCi/Kg-dry		
Cerium-144	200	N/A	N/A	150	N/A	N/A
Barium/La-140	200	N/A	N/A	5	N/A	N/A
Cesium-134	20	130	1000	30	150	N/A
Ru,Rh-106	200	N/A	N/A	200	N/A	N/A
Cesium-137	20	150	2000	30	180	N/A
Zr,Nb-95	40	N/A	N/A	40	N/A	N/A
Manganese-54	20	130	30000	9	N/A	N/A
Iron-59	40	260	10000	50	N/A	N/A
Zinc-65	40	260	20000	60	N/A	N/A
Cobalt-60	20	130	10000	20	N/A	N/A
Cobalt-58	20	130	30000	20	N/A	N/A
Iodine-131	100	N/A	N/A	30	N/A	N/A

Gross Beta/Tritium LLDs and Reporting Levels

	Gross Beta		
Air Particulates	0.01 pCi/m^3	0.01 pCi/m^3	N/A
Drinking Water	2.0 pCi/l	4.0 pCi/l	N/A
	Tritium - pCi/l		
Surface Water	200	2000	20,000
Ground Water	200	2000	20,000
Drinking Water	200	2000	20,000

APPENDIX C
ANALYTICAL PROCEDURES SYNOPSIS

ANALYTICAL PROCEDURES SYNOPSIS

Appendix C is a synopsis of the analytical procedures performed during 2000 on samples collected for the Donald C. Cook Nuclear Plant's Radiological Environmental Monitoring Program. All analyses have been mutually agreed upon by American Electric Power and Teledyne Brown Engineering and include those recommended by the USNRC Branch Technical Position, Rev. 1, November 1979.

GROSS BETA ANALYSIS OF SAMPLES

Air Particulates

After a delay of five or more days, allowing for the radon-222 and radon-220 (thoron) daughter products to decay, the filters are counted in a gas-flow proportional counter. An unused air particulate filter, supplied by the customer, is counted as the blank.

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

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

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

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

where:

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

DETERMINATION OF GROSS BETA ACTIVITY IN WATER SAMPLES

Introduction

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

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

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

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

Detection Capability

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

The minimum detectable level (MDL) for water samples is nominally 1.6 picoCuries per liter for gross beta at the 4.66 sigma level (1.0 pCi/l at the 2.83 sigma level), assuming that 1 liter of sample is used and that ½ gram of sample residue is mounted on the planchette. These figures are based upon a counting time of 50 minutes and upon representative values of counting efficiency and background of 0.2 and 1.2 cpm, respectively.

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

ANALYSIS OF SAMPLES FOR TRITIUM

(Liquid Scintillation)

Water

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

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

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

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

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

where:

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

ANALYSIS OF SAMPLES FOR IODINE-131

Milk or Water

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

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

RESULT = $(N/\bullet t-B)/(2.22\ E\ V\ Y\ DF)$

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

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

where:

N	=	total counts from sample (counts)
$\bullet t$	=	counting time for sample (min)
B	=	background rate of counter (cpm)
2.22	=	dpm/pCi
V	=	volume or weight of sample analyzed
Y	=	chemical yield of the mount or sample counted
DF	=	decay factor from the collection to the counting date
E	=	efficiency of the counter for I-131, corrected for self absorption effects by the formula
E	=	$E_S(\exp-0.0061M)/(\exp-0.0061M_S)$
E_S	=	efficiency of the counter determined from an I-131 standard mount
Ms	=	mass of PdI_2 on the standard mount, mg
M	=	mass of PDI_2 on the sample mount, mg

GAMMA SPECTROMETRY OF SAMPLES

Milk and Water

A 1.0 liter Marinelli beaker is filled with a representative aliquot of the sample. The sample is then counted for approximately 1000 minutes with a shielded Ge(Li) detector coupled to a mini-computer-based data acquisition system which performs pulse height analysis.

Dried Solids Other Than Soils and Sediments

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

Fish

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

Soils and Sediments

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

Charcoal Cartridges (Air Iodine)

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

Air Particulate

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

A mini-computer software program defines peaks by certain changes in the slope of the spectrum. The program also compares the energy of each peak with a library of peaks for isotope identification and then performs the radioactivity calculation using the appropriate fractional gamma ray abundance, half life, detector efficiency, and net counts in the peak region. The calculation of results, two sigma error and the lower limit of detection (LLD) in pCi/volume of pCi/mass:

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

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

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

where:

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

ENVIRONMENTAL DOSIMETRY

Teledyne Brown Engineering uses a CaS04:Dy thermoluminescent dosimeter (TLD) which the company manufactures. This material has a high light output, negligible thermally induced signal loss (fading), and negligible self dosing. The energy response curve (as well as all other features) satisfies NRC Reg. Guide 4.13. Transit doses are accounted for by use of separate TLDs.

Following the field exposure period the TLDs are placed in a Teledyne Brown Engineering Model 8300. One fourth of the rectangular TLD is heated at a time and the measured light emission (luminescence) is recorded. The TLD is then annealed and exposed to a known Cs-137 dose; each area is then read again. This provides a calibration of each area of each TLD after every field use. The transit controls are read in the same manner.

In June of 2000, clients were notified that TBE would no longer be a provider of environmental TLD service. TBE made arrangements with a qualified vendor of this service to combine this monitoring for our clients. This vendor is Proxtronics, Inc. located in Burke, VA. This vendor was selected because 1) NU-AP accredited laboratory 2) They have been identified by the Nuclear Utility Procurement Issues committee (NUPIC) as an approved supplier and 3) They have had their Quality Assurance Program reviewed and approved by TBE. TBE uses Proxtronics for all its TLD monitoring needs.

The Proxtronics Environmental TLD Analytical Process

The purpose of this section is to provide a description of the procedures and steps taken to provide the client with an accurate evaluation of the exposure received by their environmental TLD's.

The following Standard Operating Procedures (SOPs) are used by Proxtronics:

- TLD-220, Operation of the Panasonic TLD Reader Model UD-710A
- TLD-240, Processing TLDs/Exposure Records Update
- TLD-250, Storage, Preparation and Assignment of TLD Badges
- OPS-170, Incoming Mail Processing/Contamination Checks.
- TLD-210, Cleaning the Panasonic TLD Reader UD-710A

The Proxtronics Technical Director is responsible for supervising the report generation steps and results.

Required information from the client includes their site zero control and the formatting requirements of their dose report.

For sample analysis, the Reader is set up in accordance with TLD-210 and TLD-240. The Panasonic TLD Reader, the Panasonic Udd-801 TLDs, the Williston-Elin Model WE-2001 TLD Irradiator, the Microdesigns TCA/1 Thermal Curve Adapter, and the Microdesigns GCI/1 Glow Curve interface are used in the analysis of environmental TLDs.

Acceptance criteria are evaluated during the analysis of environmental TLDs. The following criteria are evaluated, along with the acceptance limits:

- Thermal noise should be no greater than 5-10mR for LiBO and 2-5 mR for CaSO.

- Short-term fading should be no greater than 5% for LiBO and CaSO and shall be <10% for LiBO and CaSO.
- Long-term fading should be no greater than 10% fir LiBO and CaSO.

TLD receipt is required to ensure accurate identification and maintenance of chain-of-custody. Proxtronics procedure TLD-250 describes the TLD receipt process.

Proxtronics procedure TLD-220 identifies the steps which explain setting up a batch.

Proxtronics procedure TLD-240 provides the necessary guidance regarding the Reader computer set up and contains the detailed TLD calculation and reporting process.

Calculations of results and the two sigma error in net milliRoentgen (mR):

RESULT = $D = (D_1+D_2+D_3+D_4)/4$

TWO SIGMA ERROR = $2((D_1-D)^2+(D_2-D)^2+(D_3-D)^2+(D_4-D)^2)/3)^{1/2}$

WHERE:

D_1	=	the net mR of area 1 of the TLD, and similarly for D_2, D_3, and D_4
D1	=	I_1 K/R_1 - A
I_1	=	the instrument reading of the field dose in area 1
K	=	the known exposure by the Cs-137 source
R_1	=	the instrument reading due to the Cs-137 dose on area 1
A	=	average dose in mR, calculated in similar manner as above, of the transit control TLDs
D	=	the average net mR of all 4 areas of the TLD.

APPENDIX D
SUMMARY OF INTERLABORATORY COMPARISONS

Interlaboratory Comparison Program

The US Environmental Protection Agency (EPA) discontinued their Interlaboratory Comparison Program in December 1998.

Since the EPA is no longer in the program, there are no "approved" laboratories for Intercomparison Studies, however, Teledyne Brown Engineering participates in the Analytics, Inc. and Environmental Resource Associates (ERA) programs to the fullest extent possible. That is, we participate in the program for all radioactive isotopes prepared and at the maximum frequency of availability.

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

All the intercomparison data were not within acceptable limits. This was documented by Teledyne Brown Engineering under the Nonconformance Report (NCR) Number 00-02 which states the samples were analyzed at Teledyne Brown Engineering's Westwood, New Jersey location in the midst of the laboratory's relocation to Knoxville, Tennessee. It is likely the crosscheck samples did not receive adequate attention to review and analytical technique during this period. As analyses of these samples commenced in Knoxville, scrutiny in review and analytical technique was enhanced. Other factors that contributed to this issue included resources being focused on the laboratory relocation and less on data review and analysis. This is no longer the case. Also, new analytical equipment, which is more sophisticated was purchased and is being used in the new laboratory as well as a more technically capable work force available in the Oak Ridge/Knoxville Area.

See Appendix H for the Interlaboratory Comparison data for Analytics and Environmental Resource Associates (ERA).

APPENDIX E
REMP SAMPLING AND ANALYTICAL EXCEPTIONS

REMP SAMPLING AND ANALYTICAL EXCEPTIONS

1st and 2nd QTRS 2000

Air Particulates

Throughout the first half of the year the majority of air particulate gross beta results exceeded the ODCM LLD of 0.01 pCi/m3 (sample results which were at or below the LLD values include: NBF, ONS-2, ONS-3, ONS-5, and ONS-6 for 05/31/00 – 06/07/00 and ONS-6 for 06/21/00 – 06/28/00.

Due to an electrical power failure samples from air stations ONS-5 and ONS-6 collected on June 21, 2000 were not of sufficient volume to provide data points. This event was captured by the Cook Nuclear Plant corrective actions system under C/R # 00-265018.

Surface Water

Surface water samples were not obtained from beach locations SWL-2 and SWL-3 between 01/19/00 and 02/29/00 due to hazardous environmental conditions such as ice, wind, and high waves.

Due to challenges faced by Teledyne Brown Engineering, LLD's were not met for Ba-140 (60pCi/l) and La-140 (15pCi/l) for SWL-1, SWL-2, and SWL-3 for the April monthly composite samples. The LLDs, which were reported by Teledyne, were 400/100, 400/100, and 500/100 respectively. This event was captured by the Cook Nuclear Plant corrective actions system under C/R # 00-243086.

Groundwater

The 1st Quarter groundwater sample for location W-7 was delayed until 02/09/00 from 01/19/00 due to extremely low water tables. The collection of this sample was well within the 25% allowable extension time as per the ODCM.

The 2nd Quarter groundwater sample for location W-8 was delayed until 05/02/00 from 04/28/00 due to a groundwater pump failure. The collection of this sample was well within the 25% allowable extension time as per the ODCM.

The groundwater well sample from location W-14 for 04/27/00 had a tritium result of 3000 pCi/L, which exceeded the ODCM LLD level of 2000 pCi/l. This result is well below the reporting level of 20,000 pCi/l.

Due to challenges faced by Teledyne Brown Engineering, LLD's were not met for Ba-140 (60pCi/l), La-140 (15pCi/l), and/or Fe-59 (30 pCi/l) for W-2, W-4, W-5, W-8, and W-13 for the 2nd quarter well samples. The LLDs which were reported by Teledyne were W-2 La-140 20 pCi/l; W-4 Ba-140 3000 pCi/l, La-140 1000 pCi/l, and Fe-59 40 pCi/l; W-5 Ba-140 2000 pCi/l, La-140 1000 pCi/l; W-8 Ba-140 2000 pCi/l, La-140 900pCi/l, and Fe-59 40 pCi/l; W-13 La-140 20 pCi/l. In addition, well samples S/G-1, S/G-4, and S/G-5 did not meet LLDs for Ba-140 and/or La-140 for

the 2nd quarter well samples. The LLDs reported by Teledyne were S/G-1 La-140, 20 pCi/l; S/G-4 La-140, 20 pCi/l; and S/G-5 Ba-140 90 pCi/l, and La-140 30 pCi/l. These events were captured by the Cook Nuclear Plant corrective actions system under C/R # 00-243086.

There is no LLD's given by the ODCM for groundwater samples for Gross Alpha and Gross Beta. The LLD listed in the ODCM for Gross Beta (4 pCi/l) is only applicable to drinking water. Gross Beta and Gross Alpha results for 2000 were consistent with historical data.

Drinking Water

The St. Joseph water treatment facility gross beta composite result for dates 03/09/00 to 03/22/00, measured 7.5 pCi/l which is greater than the ODCM LLD level of 4.0 pCi/l.

Lake township water treatment facility gross beta composite result measured 4.4 pCi/l for the composite sample from 04/20/00 – 05/03/00. This composite result exceeded the ODCM LLD level of 4.0 pCi/L.

Broadleaf Samples in Lieu of Milk Samples

Broadleaf samples in lieu of milk samples were not obtained in 2000 due to the restart of our milk sample program in March of 2000.

Milk Sampling

Due to challenges faced by Teledyne Brown Engineering, LLD's were not met for Ba-140 (60pCi/l) and La-140 (15pCi/l) for the Wyant Farm for the 06-21-00 sample. The LLDs reported by Teledyne were 300/90 respectively. This event was captured by the Cook Nuclear Plant corrective actions system under C/R # 00-243086.

3rd and 4th QTRS 2000

Air Particulates

Throughout the second half of the year the majority of air particulate gross beta results exceeded the ODCM LLD of 0.01 pCi/m3 (sample results which were at or below the LLD values include: ONS-6 and DOW for 7/5/00 – 07/12/00, ONS-1, ONS-2, ONS-3, ONS-4, ONS-5, ONS-6, NBF, DOW, SBN and COL for 7/19/00 – 07/26/00, ONS-6 for 09/13/00 – 09/20/00, and ONS-1, ONS-6, NBF for 09/20/00 – 09/27/00. All of the results were less than 0.045 pCi/m3. The normal minor spike observed in the fall due to weather pattern changes was once again present in 2000.

Due to an electrical power interruption samples from air stations ONS-5 and ONS-6 were not of sufficient volume to provide data points for the dates of 09/13/00 – 09/20/00 and 11/22/00 – 11/29/00. The September event was caused by a damaged electrical line. These samples only ran for 74 hrs. The samples were collected and analyzed. The November event was caused by a blown line fuse on the utility pole. These samples only ran for 15 hours, therefore the volumes were too

low for adequate count data. The root cause of these events was captured by the Cook Nuclear Plant corrective actions system under C/R # 00-265018.

Due to the low volume of the sample for 11/22/00 to 11/29/00 for ONS-5 the LLD for I-131 (0.07 pCi/l) was missed. The reported LLD was 0.0708 pCi/l. Due to the low volume of the sample for ONS-6 the LLD for gross beta (0.01 pCi/l) was missed. The reported LLD was 0.012 pCi/l.

ONS-1 was found with its breaker tripped for 09/20/00 to 09/27/00. This station was unavailable for approximately 101 hours during this event. The sample was collected and analysis.

ONS-5 was found with its pump off and its totalizer display blank for the sample from 09/27/00 to 10/04/2000. The run time and volume was retrieved from the totalizer memory board. The sampler was off for approximately one hour. A sudden temporary power interruption is believed to be the cause of this condition.

Due to challenges faced by Teledyne Brown Engineering, LLD's were not met for the I-131 analysis for all the samples for the period of 12-13-00 to 12-20-00. The LLD for I-131 (0.07pCi/l) were reported as 0.103 to 0.177 pCi/l).

Surface Water

Due to challenges faced by Teledyne Brown Engineering, LLD's were not met for Fe-59 (30pCi/l), Nb-95 (15pCi/l), Ba-140 (60pCi/l) and La-140 (15pCi/l) for SWL-1, SWL-2, and SWL-3 for the September monthly composite samples. The LLDs, which were reported by Teledyne, were 57.7/24800/8070, 59.1/23700/7500, and 34.2/14300/4250 pCi/l respectively. In addition, the SWL-1 and SWL-2 samples did not meet the required LLD's for Nb-95 (15pCi/l). The reported LLDs were 15.9 and 15.3 pCi/l respectively. This event was captured by the Cook Nuclear Plant corrective actions system under C/R # 00-243086.

Due to challenges faced by Teledyne Brown Engineering, LLD's were not met for Fe-59 (30pCi/l), Ba-140 (60pCi/l) and La-140 (15pCi/l) for SWL-1, SWL-2, and SWL-3 for the November monthly composite samples. The LLDs, which were reported by Teledyne, were 35.5/1850/574, 47.3/2240/759, and 37.7/1770/581 pCi/l respectively. In addition, the SWL-2 sample did not meet the required LLD's for Co-58 (15pCi/l) or Nb-95 (15pCi/l). The reported LLDs were 15.7 and 16.3 pCi/l respectively. This event was captured by the Cook Nuclear Plant corrective actions system under C/R # 00-243086.

Surface water samples were not obtained from beach locations SWL-2 and SWL-3 between 12/13/00 and 12/31/00 due to hazardous environmental conditions at the sample locations (i.e. heavy ice build up).

Due to challenges faced by Teledyne Brown Engineering, LLD's were not met for Ba-140 (60pCi/l) and La-140 (15pCi/l) for SWL-1, SWL-2, and SWL-3 for the December monthly composite samples. The LLDs, which were reported by Teledyne were 126/37.3, 174/55.5, and 307/107 pCi/l respectively. This event was captured by the Cook Nuclear Plant corrective actions system under C/R # 00-243086. Also for the December surface water samples, hazardous (ice buildup) conditions caused the suspension of the collection of samples at SWL-2 and SWL-3 from 12-13-00 to the end of the year.

Thermoluminescent Dosimeters (TLDs)

On 12/28/00, while collecting the 4th quarter 2000 environmental dosimeters and distributing the 1st quarter 2001 environmental dosimeters, the TLD at OFT-11 was not located. The snow covered ground immediately surrounding the utility pole was searched; however the TLD was not located. This condition was documented on condition report number C/R # 00-364012. This TLD is located offsite. The suspected cause of the missing TLD is unusually high amounts of snow fall in December along with the TLD located on the side of the utility pole which is in the line of fire of the snow plows discharge.

Groundwater

Gross beta result for groundwater wells SG-1, SG-2, SG-4, and S/G-5 measured 7.2 pCi/l, 5.8 pCi/l, 8.2 pCi/l, and 5.4 pCi/l, respectively for samples drawn on 07/27/00. These results exceeded the ODCM LLD level of 4.0 pCi/L, however this maximum LLD level is applicable to drinking water only.

Due to challenges faced by Teledyne Brown Engineering, LLD's were not met for Ba-140 (60 pCi/l) for W-4 and W-9 for the 3rd quarter well samples. The LLDs, which were reported by Teledyne were 80 pCi/l and 70 pCi/l respectively. Teledyne documented this condition on NCR #01-21-01.

Ra-226 and Th-228 results were missing from the analysis report for the groundwater samples from W-9, W-10, W-11, W-12, W-13, and W-14 for the 3rd quarter groundwater samples. While these analyses are not required for groundwater samples, Teledyne documented this condition on NCR #01-21-01.

The groundwater well sample from location W-6 for 10/26/00 (4th quarter) had a tritium result of 3000 pCi/L, which exceeded the ODCM LLD level of 2000 pCi/l. This result is well below the reporting level of 20,000 pCi/l.

Nb-95 results were missing from the analysis report for the groundwater samples from W-1 through W-14 for the 4th quarter groundwater samples. While these analyses are not required for groundwater samples, Teledyne documented this condition on NCR #01-21-01.

Due to challenges faced by Teledyne Brown Engineering, LLD's were not met for Ba-140 (60pCi/l) for W-9 for the 4th quarter well samples. The LLD reported by Teledyne was 80 pCi/l. Teledyne documented this condition on NCR #01-21-01.

The failures to meet the needed LLDs were captured by the Cook Nuclear Plant corrective actions system under C/R # 00-243086.

Gross beta result for groundwater wells SG-1, SG-2, SG-4, and S/G-5 measured 4.8 pCi/l, 5.3 pCi/l, 5.1 pCi/l, and 6.1 pCi/l, respectively for samples drawn on 10/26/00. These results exceeded the ODCM LLD level of 4.0 pCi/L, however this maximum LLD level for gross beta is applicable to drinking water only.

Nb-95 results were missing from the analysis report for the groundwater samples from SG-1, SG-2, SG-4 and SG-5 for the 4th quarter groundwater samples. While these analyses are not required for groundwater samples, Teledyne documented this condition on NCR #01-21-01.

There is no LLD's given by the ODCM for groundwater samples for Gross Alpha and Gross Beta. The LLD listed in the ODCM for Gross Beta (4 pCi/l) is only applicable to drinking water. Gross Beta and Gross Alpha results for 2000 were consistent with historical data.

Drinking Water

Due to challenges faced by Teledyne Brown Engineering, LLD's were not met for Fe-59 (15pCi/l), Ba-140 (60pCi/l) and La-140 (15pCi/l) for the composite sample for the period of 07/27/00 to 08/09/00. The LLDs reported by Teledyne were, for STJ 33.1, 15300, 5390 pCi/l respectively.

Due to challenges faced by Teledyne Brown Engineering, LLD's were not met for Co-58 (15pCi/l), Fe-59 (15pCi/l), Nb-95 (15pCi/l), Zr-95 (30pCi/l), Ba-140 (60pCi/l) and La-140 (15pCi/l) for the composite sample for the period of 09/07/00 to 09/20/00. The LLDs reported by Teledyne were, for STJ 20.9, 116, 26.0, 48.3, 197000, and 54800 pCi/l respectively. The LLDs reported by Teledyne were, for LTW 22.4, 116, 25.6, 44.8, 194000, 666000 pCi/l respectively.

Due to challenges faced by Teledyne Brown Engineering, LLD's were not met for Co-58 (15pCi/l), Fe-59 (15pCi/l), Nb-95 (15pCi/l), Zr-95 (30pCi/l), Ba-140 (60pCi/l) and La-140 (15pCi/l) for the STJ composite sample for the period of 09/21/00 to 10/04/00. The LLDs reported by Teledyne were 17.5, 68.9, 21.1, 32.4, 16500, and 4900 pCi/l respectively. The LLDs for LTW were not met for Fe-59, Ba-140, and La-140. The LLDs reported by Teledyne were 46.6, 10900, and 3610 pCi/l respectively.

Nb-95 results were missing from the analysis report for the drinking water samples from STJ and LTW for 10/19/00 to 11/01/00, 11/02/00 to 11/15/00, 11/16/00 to 11/29/00 and 11/30/00 to 12/13/00. Teledyne documented this condition on NCR #01-21-01.

Lake Township water treatment facility gross beta composite result measured 4.6 pCi/l for the composite sample from 11/02/00 – 11/15/00. This composite result exceeded the ODCM LLD level of 4.0 pCi/L.

Due to challenges faced by Teledyne Brown Engineering, LLD was not met for Ba-140 (60pCi/l) for the STJ composite sample for the period of 11/16/00 to 11/29/00. The LLD reported by Teledyne was 90 pCi/l.

Due to challenges faced by Teledyne Brown Engineering, LLD was not met for I-131 (1 pCi/l) for the STJ and LTW composite samples for the period of 11/30/00 to 12/13/00. The LLD reported by Teledyne was 2 pCi/l for both samples.

Due to challenges faced by Teledyne Brown Engineering, LLD's were not met for I-131 (1 pCi/l), Ba-140 (60pCi/l) and La-140 (15pCi/l) for the STJ and LTW composite sample for the period of 12/14/00 to 12/27/00. The LLDs reported by Teledyne were 10, 103, 34.5 and 20, 87.4, 30.5 pCi/l respectively. Teledyne documented this condition on NCR #01-21-01.

The failures to meet the needed LLDs were captured by the Cook Nuclear Plant corrective actions system under C/R # 00-243086.

Milk Sampling

Due to challenges faced by Teledyne Brown Engineering, LLD's were not met for Ba-140 (60pCi/l) and/or La-140 (15pCi/l) for the 07/19/00 milk samples. The LLDs reported by Teledyne were: Monroe La-140 16.0 pCi/l; Shuler Ba-140 61.7 pCi/l, La-140 19.9 pCi/l; Glen Troy Ba-140 71.5 pCi/l, La-140 23.0 pCi/l; Livinghouse Ba-140 92.0 pCi/l, La-140 28.1 pCi/l; and Wyant La-140 20.0.

Due to challenges faced by Teledyne Brown Engineering, LLD's were not met for Ba-140 (60pCi/l) and/or La-140 (15pCi/l) for the 07/27/00 milk samples. The LLDs reported by Teledyne were: Monroe Ba-140 19700, La-140 5880 pCi/l; Shuler Ba-140 26100 pCi/l, La-140 8240 pCi/l; Glen Troy Ba-140 18900 pCi/l, La-140 6640 pCi/l; Livinghouse Ba-140 2020 pCi/l, La-140 664 pCi/l; and Wyant Ba-140 2210, La-140 655.

Due to challenges faced by Teledyne Brown Engineering, LLD's were not met for Ba-140 (60pCi/l) and/or La-140 (15pCi/l) for the 08/30/00 milk samples. The LLDs reported by Teledyne were: Monroe Ba-140 96600 pCi/l, La-140 28200 pCi/l; Shuler Ba-140 103000 pCi/l, La-140 32200 pCi/l; Wyant Ba-140 593000 pCi/l, La-140 192000 pCi/l; and Livinghouse Ba-140 78700 pCi/l, La-140 25200 pCi/l. The Glen Troy milk sample was lost after the I-131 analysis was performed. The lost sample was documented by Teledyne under UCR #01-06.

Due to challenges faced by Teledyne Brown Engineering, LLD's were not met for Ba-140 (60pCi/l) and La-140 (15pCi/l) for the 09/13/00 milk samples. The LLDs reported by Teledyne were: Glen Troy Ba-140 27700 pCi/l, La-140 8620 pCi/l; Monroe Ba-140 71400 pCi/l, La-140 22600 pCi/l; Shuler Ba-140 4990 pCi/l, La-140 1730 pCi/l; Wyant Ba-140 56700 pCi/l, La-140 18400 pCi/l; and Livinghouse Ba-140 44600 pCi/l, La-140 13500 pCi/l.

Due to challenges faced by Teledyne Brown Engineering, LLD's were not met for BA-140 (60pCi/l) and/or La-140 (15pCi/l) for the 10/11/00 milk samples. The LLDs reported by Teledyne were: Monroe Ba-140 225, La-140 66.1 pCi/l; Shuler Ba-140 171 pCi/l, La-140 51.1 pCi/l; Glen Troy Ba-140 171 pCi/l, La-140 55.5 pCi/l; Livinghouse Ba-140 128 pCi/l, La-140 40.9 pCi/l; and Wyant Ba-140 156, La-140 59.2.

Nb-95 results were missing from the analysis report for the milk samples from Glen Troy Farm, Monroe Residence, and Shuler Farm for 10/25/00. Ra-226 and Th-228 results were missing from the analysis report for the milk samples from Livinghouse Farm and Wyant Farm for 10/25/00. While these analyses are not required for milk samples, Teledyne documented this condition on NCR #01-21-01.

Nb-95 results were missing from the analysis report for the milk samples from Glen Troy Farm, Monroe Residence, Shuler Farm, Livinghouse Farm and Wyant Farm for 11/22/00, 12/06/00, and 12/20/00. While this analysis is not required for milk samples, Teledyne documented this condition on NCR #01-21-01.

The failures to meet the needed LLDs were captured by the Cook Nuclear Plant corrective actions system under C/R # 00-243086.

Fish Sampling

Due to challenges faced by Teledyne Brown Engineering, LLD's were not met for Fe-59 (260 pCi/l) for the 08/23/00 Fish samples at locations ONS-S and OFS-S. The LLDs reported by Teledyne were 322 pCi/l and 371 pCi/l respectively. The failures to meet the needed LLDs were captured by the Cook Nuclear Plant corrective actions system under C/R # 00-243086.

Lake Sediment

The lake sediment samples were collected on October 10. The previous lake sediment samples were collected on March 31. This frequency is 193 days which is greater than the 184 day routine frequency. However this is well within the 25 % allowable extension period as per the ODCM. This was done to re-establish the proper frequency period.

APPENDIX F
2000 LAND USE CENSUS

SUMMARY OF THE 2000 LAND USE CENSUS

The Land Use Census is performed to identify any significant changes in land usage in the area immediately surrounding the plant, which could affect exposure pathways. Any identified changes are evaluated to determine whether modifications should be made to the REMP or other related programs. See the attachments and the table that summarize the census results. The following is a narrative summary of the 2000 census.

Dairy Farm Survey

The dairy farm survey was performed to update the list of dairy farms located in the plant area (Berrien County), to identify the nearest animal whose milk is used for human consumption. The milk farm survey for the Cook Plant was conducted on September 26 and 27, 2000.

There were no changes in the dairy farm list from the Michigan Department of Agriculture between July 1, 1999 and July 1, 2000. Two new dairy farms were located in the County during this year's door-to-door survey.

At the present time, there are four farm/residence with dairy animals used for milk consumption within eight miles of the plant (Shuler, Monroe, Glen-Troy and Jerry Warmbein). After the land use census of 1999 when two farms agreed to participate, the Schuler farm was visited again to request their participation in the REMP milk sampling program. They agreed and the REMP milk-sampling program was restarted. The first set of samples was collected on March 29, 2000. Therefore, the collection of monthly broadleaf samples (in lieu of milk sample) was discontinued (as per 12 THP 6010 RPP.635).

The closest milk-producing animals (for human consumption) are milk cows at the Shuler & Son Farm located at 2791 Snow Road in Baroda.

Residential Survey

From June 1, 1999 through June 1, 2000, thirteen (13) residential building permits were issued for new construction in Lake Township for Sections 5, 6, 7 and 8. These sections border the Cook Plant property. None of the permits change which residence in each sector is closest to the Cook Plant. In addition, none of these permits were issued to the residences, which are the closest in each sector. Therefore, none of the construction permits will affect the Plant's radiological evaluation of residential households.

Grape and Broadleaf Survey

In accordance with the Offsite Dose Calculation Manual 12 PMP 6010 OSD.001 and the grape and broadleaf collection procedure 12 PMP 6010 RPP.638, broadleaf vegetation sampling is performed in lieu of a garden census. Broadleaf sampling is performed to monitor for plant impact on the environment. The samples were obtained as close to the site boundary as possible in a land sector, with sample media, with the highest average deposition factor (D/Q). Control samples were also obtained in a less prevalent sector approximately 20 miles from the site boundary. These locations were the B. Kunde vineyard at 3316 Linco Road in Stevensville and the Eldridge residence at 6156 Fail Road in LaPorte, Indiana, respectively. The analytical results for the grape and broadleaf samples obtained on September 20, 2000 were less than ODCM LLDs (60 Pico-curies/kg for Cs-134, Cs-137 and I-131).

2000 Land Use Census – Operating Dairy Farms in Berrien County

Name and Address	Township	Section	Sector/Distance
Andrews University Dairy Road Berrien Springs, 49103	Oronoko	12	E / 10.5 miles
Brohman Farm 1637 Mt Tabor Rd. Berrien Ssprings, 49103	Oronoko	29	F / 8.5 miles
Glen Troy Farm Mel Freehling 2221 Glendora Rd. Buchanan, 49107	Weesaw	10	H / 7.0 miles
Koebel Farm 16318 Avery Rd. Three Oaks, 49128	Three Oaks	36	J / 10.6 miles
Dean Lozmack 14843 Cleveland Rd. Galien, 49218	Weesaw	23	H / 9.2 miles
Paul Lozmack 4193 Elm Valley Three Oaks, 49128	Weesaw	30	J / 10.3 miles
William Nimtz 3445 Park Rd. Eau Claire, 49111	Pipestone	07	D / 13.5 miles
Howard Payne RFD 2 Box 148 Three Oaks, 49218	Weesaw	31	J / 10.9 miles
Powers Farm 16402 Wells Rd. Buchanan, 49107	Buchanan	31	H / 12.7 miles
Shuler Farm 2791 Snow Rd. Baroda, 49101	Lake	28	G & H / 4.1 miles
Wagner Farms Carl Wagner, Jr. 8523 Chapel Rd.	Berrien	35	F / 16.5 miles
Carl Wagner, Sr. 11215 Pucker St. Niles, 49120	Berrien	26	F / 17.0 miles
John Warmbein RFD 2 Box 180 (Old Mill Rd.) Three Oaks, 49128	Weesaw	19	J / 8.5 miles

The above farms are Michigan Department of Agriculture Grade A approved.

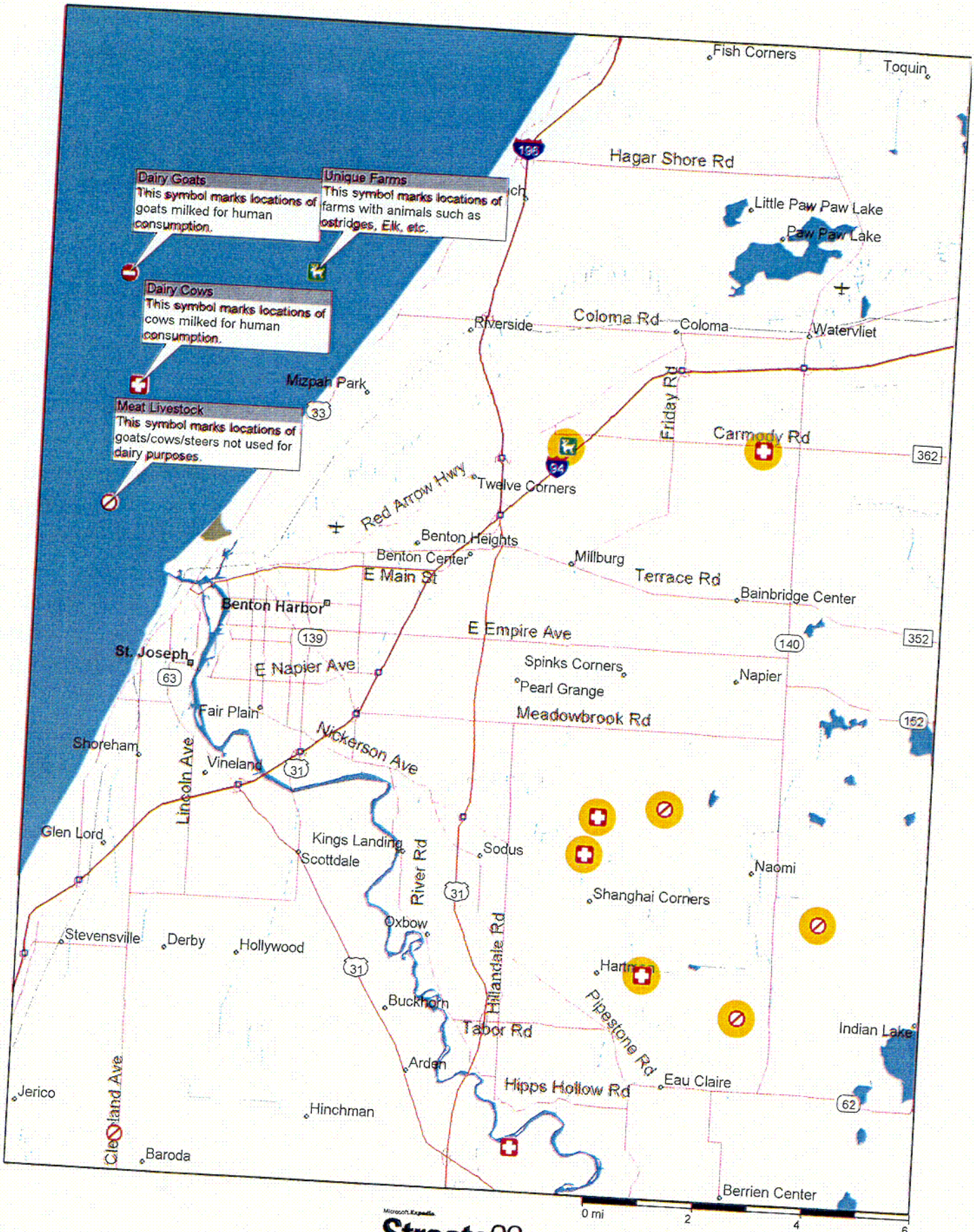
2000 Land Use Census – Operating Dairy Farms in Berrien County - Continued

The farms listed below are not MI Department of Agriculture approved Farms.

Name and Address	Township	Section	Sector/Distance
Arvon Arent 463-6546 2300 Angling Rd. Watervliet, MI 49098	Bainbridge	3	C / 19.2 miles
Jeff Monroe 10627 Miller Rd.. Baroda, 49101	Lake	27	G / 5.0 miles
Dr. Ken Siefert Town & Country (Vet Clinic) 3127 N, Fifth St. (M-51). Niles, 49120	Niles	12	F / 19.3 miles
Jerry Warmbein 14143 Mill Road. Three dOaks, 49128	Weesaw	18	J / 7.7 miles
Robert Zebell 7819 Kruger Road Three Oaks, 49128	Three Oaks	33 & 34	K / 12.0 miles
Zieger Farm 5692 Warren Woods Rd. Three Oaks, 49128	Three Oaks	25	J / 9.4 miles

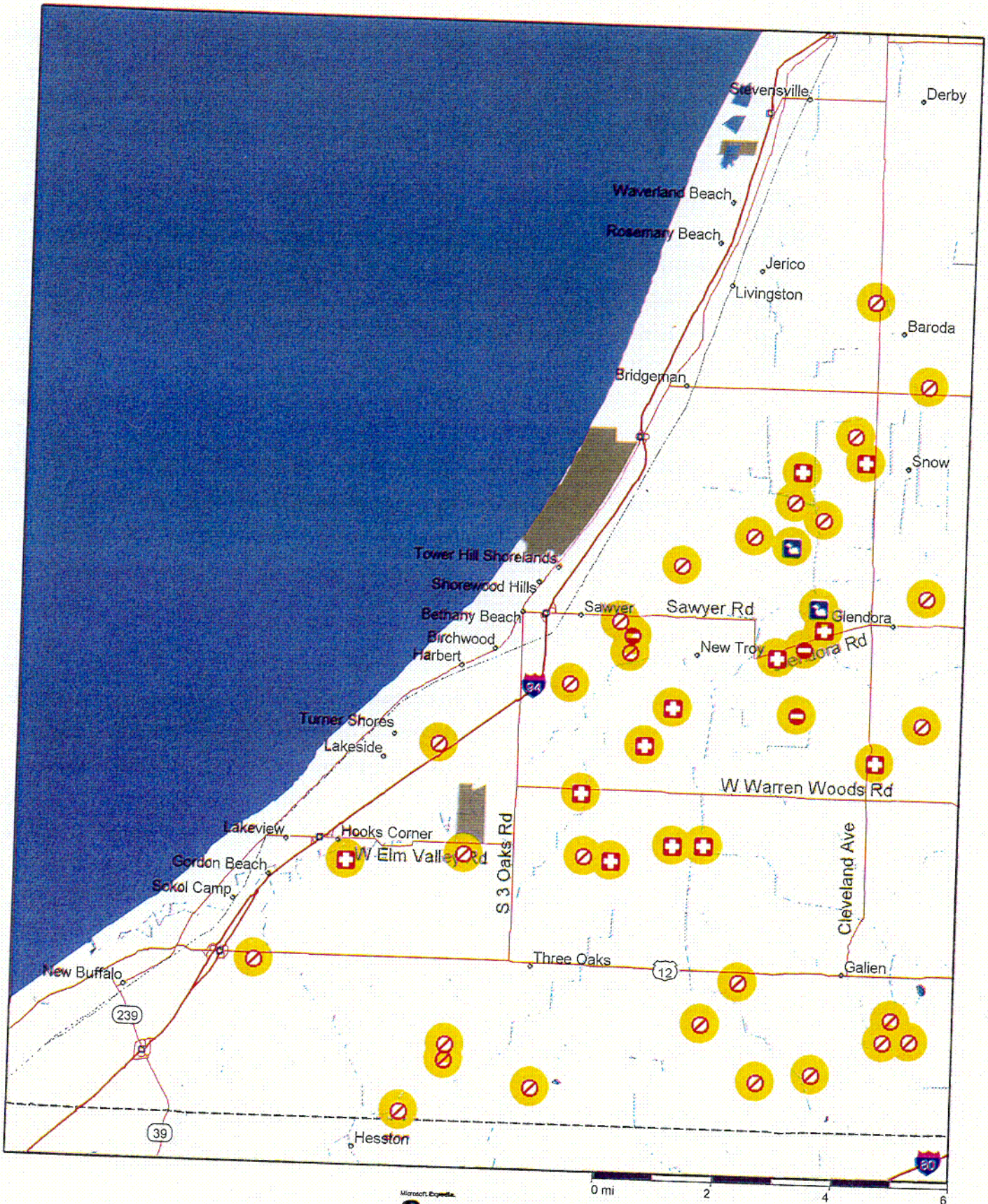
The following farms/residences have steer/cows (Holstein or Jersey)/goats which are not used for milking at this time but should be verified annually.

Devrie 1847 Gardner Rd.. Buchanan, 49107	Weesaw	10	G / 7.8 miles
William Haase 10276 Miller Rd Baroda, 49101	Lake	27	G / 4.5 miles
Patyno 2629 Glendora Rd. Buchanan, 49107	Weesaw	10	H / 7.2 miles
Arthur Phillips 2414 Park Rd. Eau Claire, 49111	Bainbridge	31	D / 14.0 miles
Nelson Farm Shawnee Rd. Berrien Springs, 49103	Oronoko	14	F / 10.5 miles
Roger Tumbleson 3120 Mayflower Rd. Niles, 49120	Bertrand	19	G / 19.0 miles
Chad While 1558 W. Shawnee Rd. Baroda, 49101	Lake	14	F / 4.5 miles



Microsoft Expedia Streets98

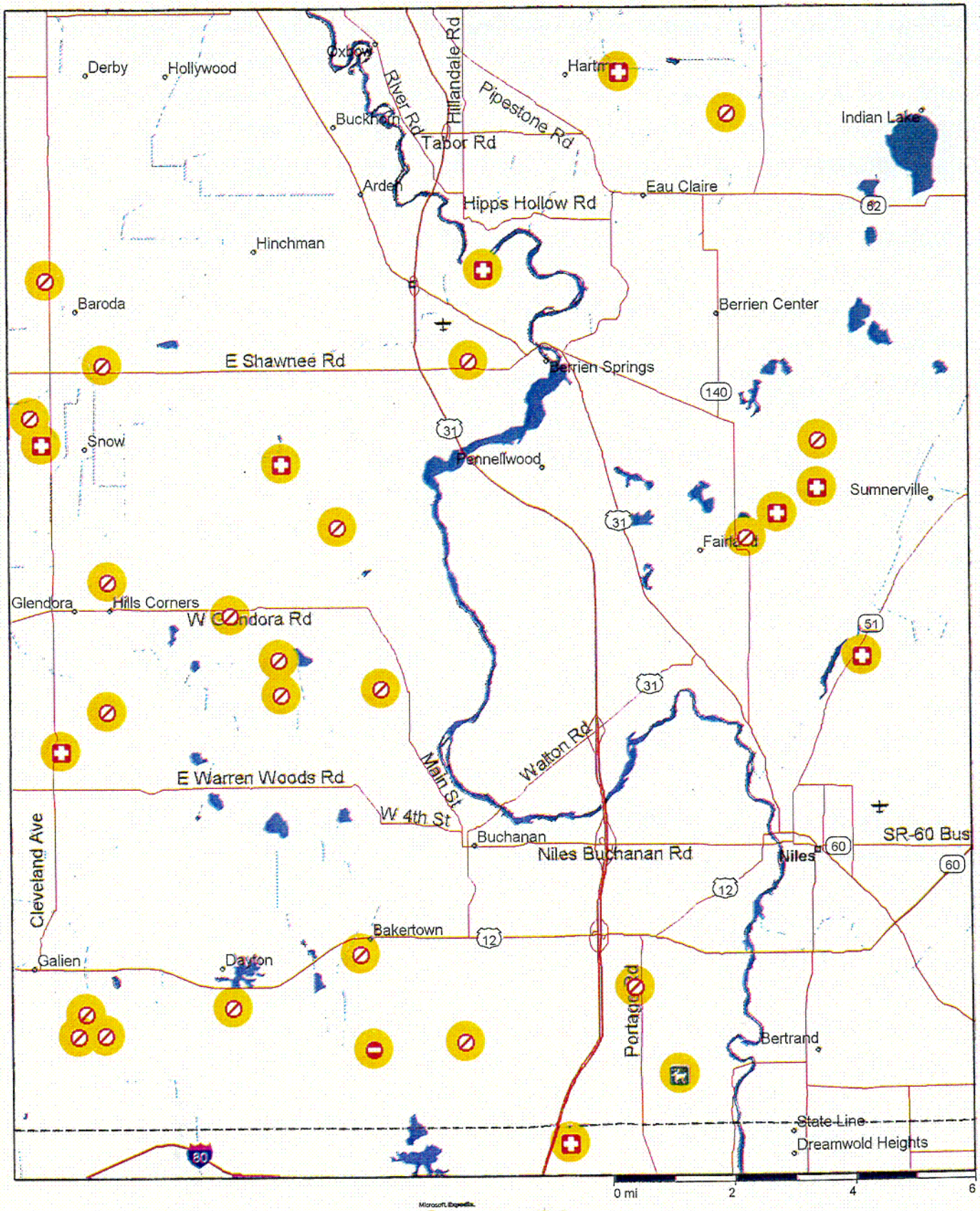
Landuse Marker



Microsoft Expedia
Streets98

C08

Landuse Marker



Microsoft Expedia
Streets98

I. Residential Land Use Data

Sector	House Number	Lot Number	Distance (ft)
A	1. Iler Rd. (Rosemary Beach)	11-11-0006-0004-01-7	2161
B	2. Iler Rd. (Rosemary Beach)	11-11-0006-0004-09-2	2165
C	3. Lake Rd. (Rosemary Beach)	11-11-6800-0028-00-0	3093
D	4. 7500 Thorton Rd.	11-11-0005-0036-01-8	5733
E	5. 7927 Red Arrow Highway	11-11-0008-0009-07-0	5631
F	6. 8197 Red Arrow Highway	11-11-0008-0015-03-1	5392
G	7. 8345 Red Arrow Highway	11-11-0008-0010-03-0	5382
H	8. Lot #6 Wildwood	11-11-8600-0006-00-4	4650
J	9. Livingston Hills	11-11-0007-0010-02-3	3366
K	10. Livingston Hills	11-11-0007-0010-03-1	3090

II Dairy Farm Survey

Additions

Sector	Name & Address	Distance (ft)
C	Dr. Ken Seifert Town and Country Vet Clinic 3127 N. Fifth Street Niles, 49120	101,900
F	Arvon Arent 2300 Angling Rd., Watervliet, 49098	101,400

Deletions

Sector	Name & Address	Distance (ft)
	None	

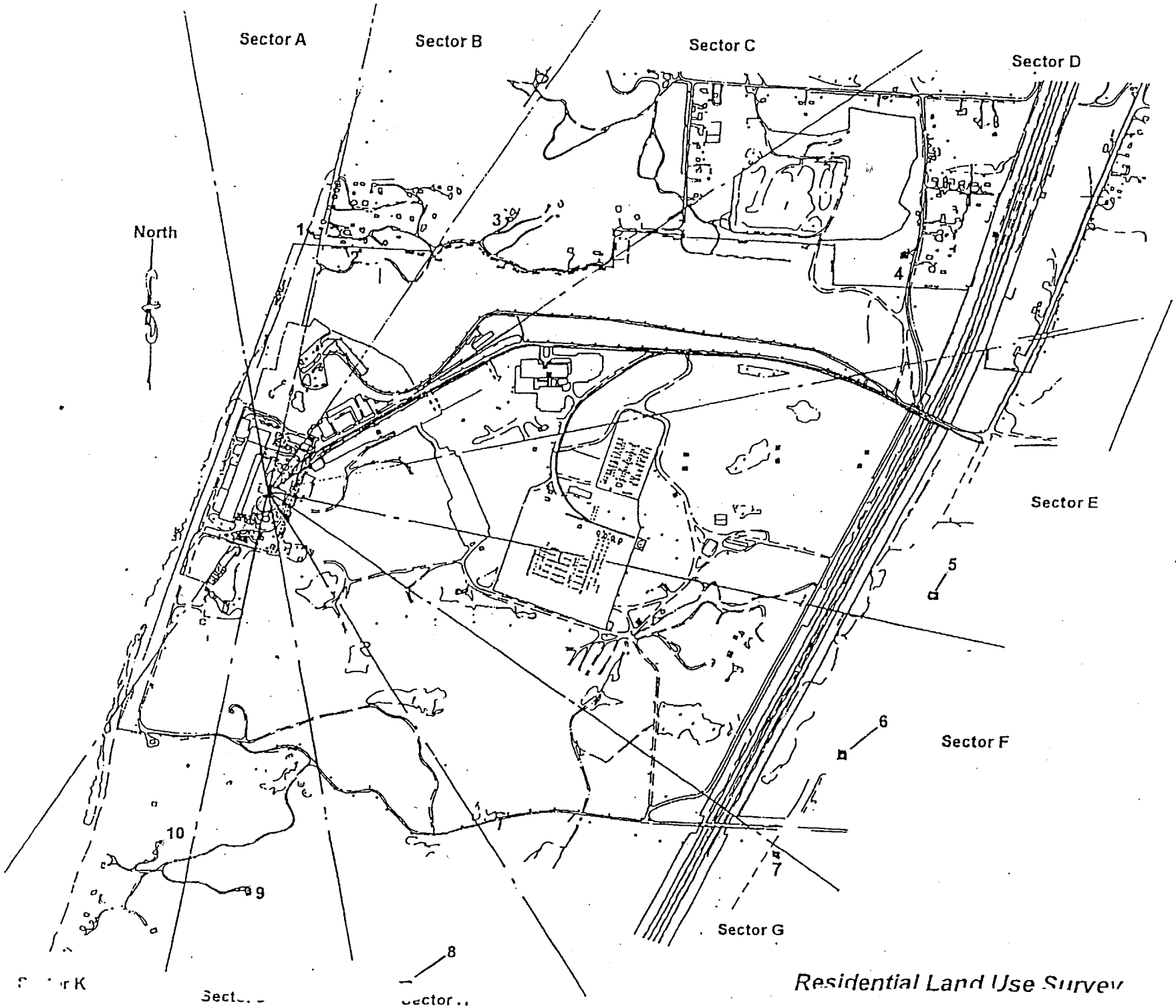
III Closest Milk Producing Animal [Ref.7.2.1b]

Sector	Name & Address	Distance (ft)
G & H	Shuler Farm, 2791 Snow Rd., Baroda 49101	21648

Performed By: Jon H. Hamm Date 09-29-00

Reviewed By: [signature] Date 10/11/00

Old Form RP-640-01



Residential Land Use Survey

APPENDIX G
SUMMARY OF THE PRE-OPERATIONAL RADIOLOGICAL MONITORING PROGRAM

SUMMARY OF THE PREOPERATIONAL RADIOLOGICAL MONITORING PROGRAM

A preoperational radiological environmental monitoring program was performed for the Donald C. Cook Nuclear Plant from August 1971 until the initial criticality of Unit 1 on January 18, 1975. The analyses of samples collected in the vicinity of the Donald C. Cook Nuclear Plant were performed by Eberline Instrument Corporation. The summary of the preoperational program presented in this appendix is based on the seven semi-annual reports covering the period. The purpose of this summary is to provide a comparison of the radioactivity measured in the environs of the Donald C. Cook Nuclear Plant during the pre-start up of Unit 1 and the radioactivity measured in 2000.

As stated in the report for the period of July 1 to December 31, 1971, the purposes of a preoperational radiological monitoring program include:

(a) "To yield average values of radiation levels and concentrations of radioactive material in various media of the environment.

(b) To identify sample locations and/or types of samples that deviate from the averages.

(c) To document seasonal variations that could be erroneously interpreted when the power station is operating.

(d) To indicate the range of values that should be considered "background" for various types of samples.

(e) To "proof test" the environmental monitoring equipment and procedures prior to operation of the nuclear power station.

(h) To provide baseline information that will yield estimates of the dose to man, if any, which will result from plant operation."

The discussion that follows is for the various sample media collected and analyzed in both the preoperational period and during 2000. Analyses performed during the preoperational but not required in 2000, are not discussed.

The gross beta activity in air particulate filters ranged from 0.01 to 0.17 pCi/m^3 from the middle of 1971 to the middle of 1973. In June of 1973 and in June of 1974 the People's Republic of China detonated atmospheric nuclear tests. As a result there were periods during which the gross beta results were elevated to as high as 0.45 pCi/m^3 with no statistically significant differences

between indicator and background stations. By the end of the preoperational period the values were approximately 0.06 pCi/m^3.

The gamma ray analyses of composited air particulate filters showed "trace amounts" of fission products, Ce-144, Ru-106, Ru-103, Zr-95, and Nb-95, the results of fallout from previous atmospheric nuclear tests. Cosmogenically produced beryllium-7 was also detected.

The direct radiation background as measured by thermoluminescent dosimeters (TLD) ranged between 1.0 and 2.0 mRem/week during the three and one-half years period.

Milk samples during the preoperational period were analyzed for iodine-131 and by gamma ray spectroscopy (and for strontium-89 and strontium-90). All samples had naturally occurring potassium-40 with values ranging between 520 and 2310 pCi/liter. Cesium-137 was measured in many samples after the two atmospheric nuclear tests mentioned above. The cesium-137 activity ranged from 8 to 33 pCi/liter. Iodine-131 was measured in four milk samples collected July 9, 1974. The values ranged between 0.2 and 0.9 pCi/liter.

Lake water samples were collected and analyzed for tritium and by gamma ray spectroscopy. Tritium activities were below 1000 pCi/liter and typically averaged about 400 pCi/liter. No radionuclides were detected by gamma ray spectroscopy.

Gamma ray spectroscopy analyses of lake sediment detected natural abundances of potassium-40, uranium and thorium daughters, and traces of cesium-137 below 0.1 pCi/g which is attributed to fallout.

Gamma spectroscopy analyses of fish detected natural abundances of potassium-40 and traces of cesium-137, the latter attributed to fallout.

Drinking water analysis was not part of the preoperational program.

APPENDIX H
SUMMARY OF THE REMP QUALITY CONTROL PROGRAM

Teledyne Brown Engineering
Quality Control Summary
2000

The quality assurance program at Teledyne Brown Engineering – Environmental Services (TBE-ES) is designed to serve two overall purposes: 1) Establish a measure of confidence in the measurement process to assure the licensee, regulatory agencies and the public that analytical results are accurate and precise; and 2) Identify deficiencies in the sampling and/or measurement process to those responsible for these operations so that corrective action can be taken. Quality assurance is applied to all steps of the measurement process, including the collection, measurement and reporting of data, as well as the record keeping of the final results. Quality control, as part of the quality assurance program, provides a means to control and measure the characteristics of the measurement equipment and processes, relative to established requirements.

TBE-ES laboratory employs a comprehensive quality assurance program designed to monitor the quality of analytical processing to ensure reliable environmental monitoring data. The program includes the use of controlled procedures for all work activities, a nonconformance and corrective action tracking system, systematic internal audits, audits by external groups, a laboratory quality control program which include regular Quality Control (QC) samples to include blanks, Laboratory Control Samples (LCS) and duplicates, and a staff training program. Monitoring programs also include the Interlaboratory Quality Control Program administered by the Laboratory Quality Assurance Manager (used in conjunction with the National Institute of Standards and Technology's Measurement Assurance Program, NIST MAP) and a third party interlaboratory program administered by Analytics, Inc. and Environmental Resource Associates. Together these programs are targeted to supply QA/QC sources at 5% of the client sample analysis load. In addition the Laboratory Quality Control Audit Committee administers a blind duplicate program conducted through client environmental monitoring programs. The Teledyne Brown Engineering (TBE) Quality Assurance Program meets or exceeds all requirements specified in Reg. Guide 18.1.5, Quality Assurance for Radiological Monitoring Programs.

This summary reports all available QC sample data ands interlaboratory known values or interlaboratory results analyzed or received by TBE-ES during the year 2000. Any problems that are identified during the course of these studies are investigated by means of the TBE Corrective Action Process.

Blanks

Laboratory blanks were analyzed on water.

These blanks were analyzed for gross beta and tritium. A total of 31 blanks were analyzed. The analytical results are presented in the attached table

Spikes

Laboratory spikes or laboratory control samples were analyzed for the following matrices: Water, Milk, Other Liquid, and Urine. These spikes were analyzed for americium-241, carbon-14, iron-55, gross alpha, gross beta, tritium, iodine-129, iodine-131, nickle-59, nickle-63, neptunium-237, lead-210, plutonium-238, 239, 240, and 241, radium-226 and 228, strontium-89 and 90, technicium-99, thorium-228, 230 and 232, and uranium-234, 235 and 238. A total of 693 spikes were analyzed. The analytical results are presented in the attached table.

Intercomparison Data

An update of the intercomparsion table was performed to include those sample results a obtained from Environmental Resource Associates Inc. Additional results for 2000 samples that were subcontracted to other laboratories for the Analytics samples will soon be available. The results for these data are presented in the attached table.

Sample #	QC Type	Sample Type	Nuclide	Result	Units	Analysis Date
L9548-1	BLANK	WO	GR-B	L.T. 7. E-01	pCi/l	02/03/2000
L9741-1	BLANK	WO	GR-B	L.T. 6. E-01	pCi/l	02/03/2000
L9977-1	BLANK	WO	GR-B	L.T. 7. E-01	pCi/l	03/24/2000
L10103-1	BLANK	WO	GR-B	L.T. 8. E-01	pCi/l	03/27/2000
L10187-1	BLANK	WO	GR-B	L.T. 7. E-01	pCi/l	03/24/2000
L10532-1	BLANK	WO	GR-B	L.T. 7. E-01	pCi/l	03/24/2000
L10939-1	BLANK	WO	GR-B	L.T. 7. E-01	pCi/l	05/19/2000
L11127-1	BLANK	WO	GR-B	L.T. 7. E-01	pCi/l	05/19/2000
L11305-1	BLANK	WO	GR-B	L.T. 7. E-01	pCi/l	05/19/2000
L9548-2	LCS	WO	GR-B	2.4 +-0.2 E 01	pCi/l	02/03/2000
L9741-2	LCS	WO	GR-B	1.9 +-0.1 E 01	pCi/l	02/03/2000
L9977-2	LCS	WO	GR-B	2.1 +-0.1 E 01	pCi/l	03/24/2000
L10103-2	LCS	WO	GR-B	1.9 +-0.1 E 01	pCi/l	03/17/2000
L10187-2	LCS	WO	GR-B	1.9 +-0.1 E 01	pCi/l	03/24/2000
L10532-2	LCS	WO	GR-B	1.7 +-0.1 E 01	pCi/l	03/24/2000
L10939-2	LCS	WO	GR-B	1.9 +-0.1 E 01	pCi/l	05/19/2000
L11127-2	LCS	WO	GR-B	1.9 +-0.1 E 01	pCi/l	05/19/2000
L11305-2	LCS	WO	GR-B	1.7 +-0.1 E 01	pCi/l	05/19/2000
L9549-1	BLANK	WO	H-3 (LS)	L.T. 2. E 03	pCi/l	01/18/2000
L9549-3	BLANK	WO	H-3 (LS)	L.T. 2. E 02	pCi/l	01/18/2000
L9742-1	BLANK	WO	H-3 (LS)	L.T. 2. E 03	pCi/l	02/03/2000
L9742-3	BLANK	WO	H-3 (LS)	L.T. 2. E 02	pCi/l	02/03/2000
L9979-1	BLANK	WO	H-3 (LS)	L.T. 2. E 03	pCi/l	02/09/2000
L9979-3	BLANK	WO	H-3 (LS)	L.T. 2. E 02	pCi/l	02/09/2000
L10104-1	BLANK	WO	H-3 (LS)	L.T. 1. E 03	pCi/l	02/22/2000
L10104-3	BLANK	WO	H-3 (LS)	L.T. 2. E 02	pCi/l	02/23/2000
L10188-1	BLANK	WO	H-3 (LS)	L.T. 2. E 03	pCi/l	03/09/2000
L10188-3	BLANK	WO	H-3 (LS)	L.T. 2. E 02	pCi/l	03/09/2000
L10533-1	BLANK	WO	H-3 (LS)	L.T. 1. E 03	pCi/l	03/25/2000
L10533-3	BLANK	WO	H-3 (LS)	L.T. 2. E 02	pCi/l	03/25/2000
L10940-1	BLANK	WO	H-3 (LS)	L.T. 1. E 03	pCi/l	04/13/2000
L10940-3	BLANK	WO	H-3 (LS)	L.T. 2. E 02	pCi/l	04/14/2000
L11128-1	BLANK	WO	H-3 (LS)	L.T. 1. E 03	pCi/l	04/26/2000
L11128-3	BLANK	WO	H-3 (LS)	L.T. 2. E 02	pCi/l	04/27/2000
L11306-1	BLANK	WO	H-3 (LS)	L.T. 1. E 03	pCi/l	05/14/2000
L11306-3	BLANK	WO	H-3 (LS)	L.T. 2. E 02	pCi/l	05/15/2000
L11508-1	BLANK	WO	H-3 (LS)	L.T. 1. E 03	pCi/l	06/27/2000
L11508-3	BLANK	WO	H-3 (LS)	L.T. 2. E 02	pCi/l	06/28/2000
L12584-1	BLANK	WO	H-3 (LS)	L.T. 2. E 03	pCi/l	08/15/2000
L12584-3	BLANK	WO	H-3 (LS)	L.T. 2. E 02	pCi/l	08/15/2000

Sample #	QC Type	Sample Type	Nuclide	Result	Units	Analysis Date
L9549-2	LCS	WO	H-3 (LS)	1.7 +-0.1 E 04	pCi/l	01/18/2000
L9549-4	LCS	WO	H-3 (LS)	1.5 +-0.2 E 03	pCi/l	01/18/2000
L9742-2	LCS	WO	H-3 (LS)	1.7 +-0.1 E 04	pCi/l	02/03/2000
L9742-4	LCS	WO	H-3 (LS)	1.5 +-0.2 E 03	pCi/l	02/03/2000
L9979-4	LCS	WO	H-3 (LS)	1.4 +-0.2 E 03	pCi/l	02/10/2000
L10104-2	LCS	WO	H-3 (LS)	1.7 +-0.1 E 04	pCi/l	02/22/2000
L10104-4	LCS	WO	H-3 (LS)	1.4 +-0.2 E 03	pCi/l	02/23/2000
L10188-2	LCS	WO	H-3 (LS)	1.7 +-0.1 E 04	pCi/l	03/09/2000
L10188-4	LCS	WO	H-3 (LS)	1.5 +-0.2 E 03	pCi/l	03/09/2000
L10533-2	LCS	WO	H-3 (LS)	1.5 +-0.1 E 04	pCi/l	03/25/2000
L10533-4	LCS	WO	H-3 (LS)	1.6 +-0.2 E 03	pCi/l	03/25/2000
L10940-2	LCS	WO	H-3 (LS)	1.6 +-0.1 E 04	pCi/l	04/13/2000
L10940-4	LCS	WO	H-3 (LS)	1.5 +-0.1 E 03	pCi/l	04/14/2000
L11128-2	LCS	WO	H-3 (LS)	1.6 +-0.1 E 04	pCi/l	04/27/2000
L11128-4	LCS	WO	H-3 (LS)	1.5 +-0.2 E 03	pCi/l	04/27/2000
L11306-2	LCS	WO	H-3 (LS)	1.6 +-0.1 E 04	pCi/l	05/15/2000
L11306-4	LCS	WO	H-3 (LS)	1.4 +-0.2 E 03	pCi/l	05/15/2000
L11508-2	LCS	WO	H-3 (LS)	1.6 +-0.1 E 04	pCi/l	06/28/2000
L11508-4	LCS	WO	H-3 (LS)	1.3 +-0.2 E 03	pCi/l	06/28/2000
L12584-2	LCS	WO	H-3 (LS)	1.5 +-0.1 E 04	pCi/l	08/15/2000
L12584-4	LCS	WO	H-3 (LS)	1.5 +-0.2 E 03	pCi/l	08/15/2000

Results of Duplicate Analyses for 2000

Sample Type	Analysis	First Analysis	Second Analysis
Air Particulates Results in Units of pCi/m^3	Gr-Beta	28 ± 2 E-03	28 ± 2 E-03
	"	35 ± 3 E-03	34 ± 3 E-03
	"	26 ± 2 E-03	26 ± 2 E-03
	"	29 ± 2 E-03	30 ± 3 E-03
	"	23 ± 2 E-03	24 ± 2 E-03
	"	14 ± 2 E-03	15 ± 2 E-03
	"	14 ± 2 E-03	14 ± 2 E-03
	"	24 ± 2 E-03	16 ± 2 E-03
	"	17 ± 2 E-03	15 ± 2 E-03
	"	15 ± 2 E-03	15 ± 2 E-03
	"	15 ± 2 E-03	16 ± 2 E-03
	"	9.5 ±1.7 E-03	10 ± 2 E-03
	"	9.3 ±1.5 E-03	9.0 ±1.5 E-03
	"	13 ± 2 E-03	13 ± 2 E-03
	"	12 ± 2 E-03	13 ± 2 E-03
	"	18 ± 2 E-03	20 ± 2 E-03
	"	18 ± 2 E-03	20 ± 2 E-03
	"	27 ± 2 E-03	29 ± 2 E-03
	"	14 ± 2 E-03	12 ± 2 E-03
	"	11 ± 2 E-03	11 ± 2 E-03
	"	17 ± 2 E-03	17 ± 2 E-03
	"	27 ± 2 E-03	28 ± 3 E-03
	"	20 ± 2 E-03	21 ± 2 E-03
	"	12 ± 2 E-03	15 ± 2 E-03
	"	25 ±2 E-03	26 ±2 E-03
	"	27 ± 2 E-03	26 ± 2 E-03
	"	24 ± 2 E-03	26 ± 2 E-03
	"	22 ± 2 E-03	24 ± 2 E-03
Air Particulates/ Charcoal Filters Results in Units of pCi/m^3	Iodine -131	L.T. 7 E-03	L.T. 2 E-02
	"	L.T. 1 E-02	L.T. 8 E -03
	"	L.T. 1 E-02	L.T. 1 E-02
	"	L.T. 1 E-02	L.T. 1 E-02
	"	L.T. 1 E-02	Not Analyzed
	"	L.T. 5 E-03	L.T. 2 E-02
	"	L.T. 8 E-03	L.T. 1 E-02
	"	L.T. 1 E-02	L.T. 8 E-03
	"	L.T. 8 E-03	L.T. 1 E-02
	"	L.T. 1 E-02	L.T. 8 E-03
	"	L.T. 7 E-03	L.T. 2 E-02
	"	L.T. 2 E-02	L.T. 1 E-02

Results of Duplicate Analyses for 2000 (cont)

Sample Type	Analysis	First Analysis	Second Analysis
Air Particulates/ Charcoal Filters Results in Units of pCi/m^3	Iodine-131	L.T. 7 E-03	L.T. 8 E-03
	"	L.T. 2 E-02	L.T. 2 E-02
	"	L.T. 2 E-02	L.T. 9 E-03
	"	L.T. 1 E-02	L.T. 1 E-02
	"	L.T. 2 E-02	L.T. 1 E-02
	"	L.T. 3 E-02	L.T. 1 E-01
	"	L.T. 1 E-02	L.T. 1 E-02
	"	L.T. 2 E-02	L.T. 2 E-02
	"	L.T. 6 E-03	L.T. 6 E-02
	"	L.T. 7 E-03	L.T. 2 E-02
	"	L.T. 7 E-03	L.T. 6 E-03
	"	L.T. 1 E-02	Not Analyzed
	"	L.T. 9 E-03	L.T. 1 E-02
	"	L.T. 9 E-03	L.T. 9 E-03
	"	L.T. 8 E-03	L.T. 8 E-03
	"	L.T. 1 E-02	L.T. 1 E-02
Surface Water 228 Results in Units of pCi/liter	Gamma	8.9 ± 4.2 E+01 K-40	6.9 ± 3.3 E+00 Th-
Ground Water Results in Units of pCi/liter	Gamma	(a)	(a)
	H-3	L.T. 3 E+02	L.T. 3E+02
	Gamma	(a)	7.9 ± 0.9 E+01 K-40
	H-3	L.T. 2 E+02	L.T. 2 E-02
Drinking Water Results in Units of pCi/liter	Gr-Beta	L.T. 2 E+00	2.3 ± 1.1 E 00
	I-131	L.T. 2 E+-00	L.T. 4. E-01
	Gamma	2.4 ± 0.7 E+02 K-40	1.1 ± 0.6 E+02 K-40
	Gr-Beta	L.T. 2 E+00	L.T. 2 E+00
	I-131	L.T. 2 E+00	L.T. 2 E+00
	Gamma	2.2 ± 0.8 E+02 K-40	(a)
Food Results in Units of pCi/kg (wet)	No duplicates analyzed.		

a) All gamma results were less than the detection limits (LLD).

ANALYTICS CROSS CHECK COMPARISON PROGRAM 2000

Sample Date	Media	Nuclide	Teledyne Brown Engineering Result (a)		Analytics Result		Ratio (b)
03/20/00	Milk	I-131	18 ±	1	20 ±	1	0.90
		Cr-51	381 ±	38	387 ±	19	0.98
		Cs-134	132 ±	13	143 ±	7	0.92
		Cs-137	128 ±	13	114 ±	6	1.12
		Co-58	89 ±	9	79 ±	4	1.13
		Mn-54	195 ±	20	176 ±	9	1.11
		Fe-59	161 ±	16	144 ±	7	1.12
		Zn-65	171 ±	17	165 ±	8	1.04
		CO-60	179 ±	18	176 ±	9	1.02
03/20/00	Milk	Sr-89	13 ±	3	25 ±	1	0.52(c)
		Sr-90	16 ±	1	19 ±	1	0.84
06/19/00	Air Filter	Ce-141	143 ±	8	132 ±	7	1.08
		Cr-51	229 ±	17	198 ±	10	1.16
		Cs-134	74 ±	4	81 ±	4	0.91
		Cs-137	143 ±	8	115 ±	6	1.24
		Co-58	89 ±	5	77 ±	4	1.16
		Mn-54	102 ±	6	84 ±	4	1.21
		Fe-59	98 ±	6	75 ±	4	1.31
		Zn-65	188 ±	11	139 ±	7	1.35
		Co-60	113 ±	7	104 ±	5	1.09
06/19/00	Cartridge	I-131	106 ±	6	88 ±	4	1.20
06/19/00	Air Filter	Sr-90	88 ±	5	96 ±	5	0.92
06/19/00	Air Filter	Gross Alpha	103 ±	6	93 ±	5	1.11
		Gross Beta	210 ±	6	193 ±	10	1.09
09/18/00	Milk	I-131	97 ±	10	87 ±	4	1.11
		Ce-141	83 ±	8	77 ±	4	1.08
		Cr-51	323 ±	40	304 ±	15	1.06
		Cs-134	98 ±	10	102 ±	5	0.96
		Cs-137	117 ±	12	107 ±	5	1.09
		Co-58	64 ±	6	60 ±	3	1.07
		Mn-54	99 ±	10	88 ±	4	1.13
		Fe-59	132 ±	13	119 ±	6	1.11
		Zn-65	218 ±	22	196 ±	10	1.11
		Co-60	209 ±	21	197 ±	10	1.06

ANALYTICS CROSS CHECK COMPARISON PROGRAM 2000 (cont.)

Sample Date	Media	Nuclide	Teledyne Brown Engineering Result (a)	Analytics Result	Ratio (b)
09/18/00	Milk	Sr-89	14 ± 1	15 ± 1	0.93
		Sr-90	18 ± 1	14 ± 1	1.29
09/18/00	Milk	Sr-89	77 ± 8	90 ± 5	0.86
		Sr-90	58 ± 1	59 ± 3	0.98
09/18/00	Milk	I-131	83 ± 8	84 ± 4	0.99
		Ce-141	470 ± 47	460 ± 23	1.02
		Cr-51	266 ± 35	256 ± 13	1.04
		Cs-134	150 ± 15	150 ± 8	1.00
		Cs-137	155 ± 15	138 ± 7	1.12
		Co-58	53 ± 5	47 ± 2	1.12
		Mn-54	191 ± 19	171 ± 9	1.12
		Fe-59	115 ± 12	99 ± 5	1.16
		Zn-65	237 ± 24	208 ± 10	1.14
		Co-60	133 ± 13	125 ± 6	1.06
09/18/00	Milk	Fe-55	140 ± 60	99 ± 5	1.41
		Sr-89	65 ± 7	74 ± 4	0.88
		Sr-90	35 ± 1	37 ± 2	0.90
09/18/00	Filter	Ce-141	90 ± 9	110 ± 6	0.82
		Cr-51	92 ± 25	133 ± 7	0.69
		Cs-134	48 ± 5	74 ± 4	0.64
		Cs-137	107 ± 11	126 ± 6	0.85
		Co58	27 ± 4	34 ± 2	0.80
		Mn-54	42 ± 4	52 ± 3	0.80
		Fe-59	24 ± 8	31 ± 2	0.77
		Zn-65	65 ± 9	77 ± 4	0.84
		Co-60	112 ± 11	142 ± 7	0.79

Footnotes:

(a) Teledyne Results - counting error is two standard deviations. Units are pCi/liter for water and milk. For gamma results, if two standard deviations are less than 10%, then a 10% error is reported. Units are total pCi for air particulate filters.

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

(c) Caused by incorrect rinsing of the strontium extraction column. Additional training was conducted and was documented in the analyst's training file. Subsequent tests on two milk samples spiked with Sr-89 produced correct results.

ERA STATISTICAL SUMMARY
PROFICIENCY TESTING (PT) PROGRAM - 2000

DATE	NUCLIDE	ERA Known Value (pCi/l)(a)	TBE Result (b) (pCi/l)	Expected Dev. Known (c) (pCi/l)	Control Limits (d) (pCi/l)	Warning Limits (e) (pCi/l)	Performance Evaluation (f)
2/10/00	Gr-A	58.4	83.6	14.6	33.3-83.5	41.5-75.3	NA
2/10/00	Gr-B	16.8	15.4	5.00	38.10-25.5	311.0-22.6	A
2/24/00	U(NAT)	6.07	5.77	3.00	.870-11.3	2.61 – 9.53	A
2/24/00	Ra-226	8.26	7.20	1.24	6.11 –10.4	6.83- 9.69	A
2/24/00	Ra-228	2.25	2.37	0.56	1.28-3.22	1.60- 2.90	A
2/24/00	Gr-A	25.4	14.0	6.35	14.5-36.3	18.132.7	NA
2/24/00	Gr-B	42.1	34.0	5.00	33.4-50.8	36.3-47.9	CE
2/25/00	Ba-133	98.2	91.7	9.82	81.5-115	86.9-110	A
2/25/00	Co-60	99.6	101	5.00	90.9-108	93.8-105	A
2/25/00	Cs-134	49.2	48.0	5.00	40.5-57.9	43.3-55.0	A
2/25/00	Cs-137	209	76.3	10.4	191-227	197-221	NA
2/26/00	Sr-89	16.4	15.7	5.00	7.70-25.1	10.6-22.2	A
2/26/00	Sr-90	28.9	29.0	5.00	20.2-37.6	23.1-34.7	A
2/26/00	Co-60	64.4	68.3	5.00	55.7-73.1	58.6-70.2	A
2/26/00	Cs-134	12.3	12.0	5.00	3.60-21.1	6.53-18.1	A
2/26/00	Cs-137	72.2	76.3	5.00	63.5-80.9	66.4-78.0	A
3/01/00	H-3	23800	22300	12380	21100-26500	21000-26500	A

ERA STATISTICAL SUMMARY
PROFICIENCY TESTING (PT) PROGRAM - 2000

DATE	NUCLIDE	ERA Known Value (pCi/l)(a)	TBE Result (b) (pCi/l)	Expected Dev. Known (c) (pCi/l)	Control Limits (d) (pCi/l)	Warning Limits (e) (pCi/l)	Performance Evaluation (f)
5/18/00	Sr-89	22.5	18.3	5.00	13.8-31.2	16.7-28.3	A
5/18/00	Sr-90	9.6	8.33	5.00	0.900-18.3	3.83-15.4	A
5/23/00	I-131	19.9	2.03	3.00	14.7-25.1	16.4-23.4	NA
9/1/00	Ra-226	13.0	9.70	1.15	7.41-18.6	9.25-16.8	A
9/1/00	U (NAT)	63.4	57.0	4.44	52.6-74.2	56.1-70.7	A
9/1/00	Ra-228	2.83	2.99	6.34	2.21-3.77	2.47-3.51	A
9/1/00	Ra-228	13.0	10.0	3.25	7.41-16.8	9.25-16.8	A
9/1/00	Sr-90	26.2	28.6	1.40	17.5-34.9	20.4-32.0	A
9/1/00	Gr-A	7.17	6.90	1.11	DL-15.9	1.40-12.9	A
9/1/00	Gr-B	87.5	88.8	9.76	70.2-105	76.0-99.0	A
9/1/00	H-3	8320	8740	174	6910-9730	7360-9280	A

Footnotes:

(a) The ERA Known Value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.
(b) Average ± 1 sigma.
(c) Established per the guidelines contained in the EPA's National Standards for Water Proficiency Testing Criteria Document, December 1998, as applicable.
(d) Established per the guidelines contained in the EPA's National Standards for Water Proficiency Testing Criteria Document, December 1998, as applicable.
(e) Established per the guidelines contained in the EPA's National Standards for Water Proficiency Testing Criteria Document, December 1998, as applicable.
(f) A= Acceptable. Reported Result falls within the Warning Limits.
NA = Not Acceptable. Reported Result falls outside of the Control Limits.
CE = Check for Error. Reported Result falls within the Control Limits and outside of the Warning Limits.

APPENDIX I
TLD QUALITY CONTROL PROGRAM

Thirty-three badges with no cases were prepared and color coded into 3 groups of eleven. Each group was assigned to a unique reader. Two dosimeters for each color group were used as exposed to three different rest levels: 33mR, 53.9 mR and 80.9 mR.

The results for the readers compare favorably with the requirements of regulatory Guide 4.13, Section C. The standard deviation of the three measurements is less than 7.5% and the variation from the known is less than 30%.

Attached are also graphs reflecting the normalized deviation from the known based on an expected laboratory precision for a single determination of 20% and for three determinations for all readers. All the TLD readers responded well within the acceptance limits at each dose level.

In June of 2000, clients were notified that Teledyne Brown Engineering (TBE) would no longer be a provider of environmental TLD service. TBE made arrangements with a qualified vendor of this service to combine this monitoring for our clients. This vendor is Proxtronics, Inc. located in Burke, VA. This vendor was selected because 1) NU-AP accredited laboratory 2) They have been identified by the Nuclear Utility Procurement Issues committee (NUPIC) as an approved supplier and 3) They have had their Quality Assurance Program reviewed and approved by TBE. TBE uses Proxtronics for all its TLD monitoring needs.