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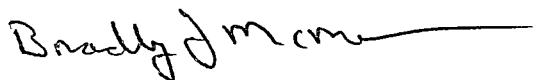
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DOMINION ENERGY KEWAUNEE, INC.
KEWAUNEE POWER STATION
2021 ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

Enclosed is the Kewaunee Power Station (KPS) 2021 Annual Radioactive Effluent Release Report for January through December 2021. This report is submitted to meet the requirements of KPS Technical Requirements Manual (TRM) Section 10.3. Also included is Revision 23 of the Radiological Environmental Monitoring Manual and Revision 0 of the Solid Radioactive Waste Process Control Program, submitted to meet the requirements of KPS TRM Section 10.1.1.

If you have questions or require additional information, please feel free to contact Mr. William Zipp at 920-304-9729.

Sincerely,



Bradly J. McMahon
Director Kewaunee Site

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NR R

Commitments made by this letter: NONE



**Dominion
Energy®**

**2021
Annual
Radioactive
Effluent
Release
Report**
Kewaunee Power Station

Dominion Energy Kewaunee, Inc.

DOCKET 50-305

KEWAUNEE POWER STATION

**ANNUAL RADIOACTIVE
EFFLUENT RELEASE REPORT**

January 1 - December 31, 2021

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Appendix A Solid Radioactive Waste Process Control Program (PCP) Revision 0

Appendix B Radiological Environmental Monitoring Manual (REMM) Revision 23

0.0 SUMMARY

On October 22, 2012, Dominion made known the decision to permanently shut down the Kewaunee Power Station (KPS). On February 25, 2013, Dominion Energy Kewaunee (DEK) submitted a certification of permanent cessation of power operations pursuant to 10 CFR 50.82(a)(1)(i), stating that DEK has decided to permanently cease power operation of KPS on May 7, 2013. On May 15, 2013 the NRC docketed the certification for permanent removal of fuel from the reactor vessel pursuant to 10 CFR 50.82(a)(1)(ii). Therefore the 10 CFR Part 50 license no longer authorizes KPS to operate the reactor or emplace or retain fuel in the reactor vessel, as specified in 10 CFR 50.82(a)(2).

On June 15, 2017, the transfer of all spent fuel from the KPS Spent Fuel Pool (SFP) to the Independent Spent Fuel Storage Installation (ISFSI) was completed. All remaining irradiated materials were removed from the SFP in October 2017.

All radioactive liquid was drained from systems in the Auxiliary Building by the end of the first week of August 2018.

The remaining effluent release paths are continuous gaseous radioactive releases from the Auxiliary Building Vent and batch liquid radioactive waste releases to Lake Michigan. Batch gaseous radioactive releases and continuous liquid radioactive releases are no longer performed.

In 2021 there were no identified gaseous radionuclides released from the Auxiliary Building Vent, and no batch liquid radioactive waste releases to Lake Michigan.

In 2021 there were no solid and /or oil waste shipments off site.

1.0 INTRODUCTION

This report is being submitted in accordance with the requirements of Kewaunee Technical Requirements Manual, Section 10.3.2 and the Offsite Dose Calculation Manual, Section 15.2. It includes data from all effluent releases made from January 1 - December 31, 2021. The report contains summaries of the gaseous and liquid releases made to the environment including the quantity, characterization, time duration and calculated radiation dose at the site boundary resulting from these releases. The report also includes a summation of solid radioactive waste disposal and the revisions to the Solid Radioactive Waste Process Control Program (PCP) and Radiological Environmental Monitoring Manual (REMM). Values indicated as 0 (zero) in this report refer to actual values less than the detection limits. A table of these less than detectable (LLD) values is identified in sections 2.1 and 3.1.

1.1 Effluent Dose Limits

Specifications are set to ensure that offsite doses are maintained as low as reasonably achievable while still allowing for practical and dependable evolutions at the Kewaunee Power Station.

The Kewaunee Offsite Dose Calculation Manual (ODCM) describes the methodology and parameters used in:

1. The calculation of radioactive liquid effluent monitoring instrumentation alarm/trip set points.
2. The calculation of radioactive liquid and gaseous concentrations, dose rates and cumulative quarterly and annual doses. The ODCM methodology is acceptable for use in demonstrating compliance with 10 CFR 20.1301/1302; 10 CFR 50, Appendix I; and 40 CFR 190.

2.0 GASEOUS EFFLUENTS

2.1 Lower Limits of Detection (LLD) for Gaseous Effluents

Gaseous radioactive effluents are released in the continuous mode. Batch gaseous radioactive releases are no longer performed. The Auxiliary Building ventilation stack was sampled continuously for Particulates, Gross Alpha, and Strontium 90, by an "off-line" sample train. This stack was also grab-sampled monthly for Tritium.

The LLD's for gaseous radio-analyses, as listed in Table 13.2.1-1 of the Kewaunee ODCM are:

Analysis	LLD ($\mu\text{Ci/ml}$)
Particulate Gamma Emitters	1.00E-11
Particulate Gross Alpha	1.00E-11
Strontium 90	1.00E-11
Tritium (H-3)	1.00E-06

The nominal "a priori" LLD values are shown below.

Isotope	a priori LLD ($\mu\text{Ci/ml}$)
---------	------------------------------------

a. Particulate emissions:

Mn-54	1.11E-13
Co-60	3.57E-13
Cs-134	4.69E-13
Cs-137	1.68E-13
Ce-144	1.24E-12

b. Composite particulate samples:

Sr-90	1.00E-14
Gross Alpha	1.00E-14

These "a priori" LLDs represent the capabilities of the counting systems in use, not an after the fact "a posteriori" limit for a particular measurement.

2.2 Gaseous Effluent Data

Table 2.1 presents a quarterly summation of the total activity released and average release rates of gaseous effluents (continuous mode). Table 2.2 presents the dose limits for gaseous effluents, and the calculated doses this year from gaseous effluents.

Table 2.1
Gaseous Effluents - Summation of all Releases (Continuous Mode)

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Total
<u>Particulates</u>					
Total Activity Released (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Average Release Rate (μ Ci/sec)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<u>Tritium</u>					
Total Activity Released (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Average Release Rate (μ Ci/sec)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<u>Gross Alpha Released</u> (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 2.2
Dose from Gaseous Effluents

The offsite dose limits from radioactive materials in gaseous effluents are specified in Section 13.2.3 of the Kewaunee ODCM and can be summarized as follows:

	<u>Organ</u>
Quarterly Limit	7.5 mrem
Annual Limit	15.0 mrem

The following offsite doses were calculated using equation 2.2 from the Kewaunee ODCM. Calculated offsite doses versus quarterly and annual limits are shown below.

In 2021 there were no identified gaseous radionuclides released from the Auxiliary Building Vent.

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Annual
1. <u>Organ Dose</u>					
Specification (mrem)	7.50E+00	7.50E+00	7.50E+00	7.50E+00	1.50E+01
<u>Total Body</u>					
Actual Dose (mrem)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
% of Specification	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<u>Bone</u>					
Actual Dose (mrem)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
% of Specification	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<u>Liver</u>					
Actual Dose (mrem)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
% of Specification	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 2.2 (continued)
Dose from Gaseous Effluents

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Annual
<u>Thyroid</u>					
Actual Dose (mrem)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
% of Specification	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<u>Kidney</u>					
Actual Dose (mrem)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
% of Specification	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<u>Lung</u>					
Actual Dose (mrem)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
% of Specification	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<u>GI-LLI</u>					
Actual Dose (mrem)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
% of Specification	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

3.0 LIQUID EFFLUENTS

3.1 Lower Limits of Detection (LLD) for Liquid Effluents

Liquid radioactive effluents are released as batch releases. Continuous liquid radioactive releases are no longer performed. Each batch is sampled prior to release and analyzed for gamma emitters and tritium. A fraction of each sample is retained for a proportional composite which is then analyzed for Gross Alpha, Strontium 90, Iron 55 and Nickel 63.

The LLD's for liquid batch release radio-analyses, as listed in Table 13.1.1-1 of the Kewaunee ODCM are:

<u>Analysis</u>	<u>LLD (μCi/ml)</u>
Principal Gamma Emitters	1.00 E-06
Tritium (H-3)	1.00 E-05
Gross Alpha	5.00 E-07
Strontium 90	5.00 E-08
Iron 55	1.00 E-06
Nickel 63	1.00 E-04

There were no batch liquid radioactive waste releases to Lake Michigan in 2021, therefore there are no "a priori" LLD values shown below.

3.2 Liquid Batch Release Statistics

The following is a summation of all liquid batch releases during 2021.

Number of batch releases.....0

Total time for all batch releases (min).....0

Maximum time for a batch release (min).....0

Minimum time for a batch release (min).....0

Average time for a batch release (min).....0

3.3 Liquid Effluent Data

The following Table 3.1 presents a quarterly summation of the total activity released (batch mode) and average concentration for all liquid effluents. It also presents the gross alpha activity released, volume of waste released, and volume of dilution water used. Table 3.2 presents the doses from liquid effluents for each quarter and the calculated doses this year from liquid effluents.

Table 3.1
Liquid Effluents - Summation of all Releases (Batch Mode)

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Total
<u>Fission and Activation Products</u>					
Total Release (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Average Concentration (μ Ci/ml)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<u>Tritium</u>					
Total Release (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Average Concentration (μ Ci/ml)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
% of Specification Limit(3.0E-3 μ Ci/ml)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<u>Gross Alpha Activity</u>					
Total Release (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<u>Volume of Waste Released</u>					
Total (liters)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<u>Volume of Dilution Water</u>					
Total (liters)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

There were no batch liquid radioactive waste releases to Lake Michigan in 2021.

Table 3.2
Dose from Liquid Effluents

There were no batch liquid radioactive releases to Lake Michigan in 2021.

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Annual
<u>Total Body</u>					
Specification (mrem)	1.50E+00	1.50E+00	1.50E+00	1.50E+00	3.00E+00
Actual Dose (mrem)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
% of Specification	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<u>Organs</u>					
Specification (mrem)	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
<u>Bone</u>					
Actual Dose (mrem)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
% of Specification	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<u>Liver</u>					
Actual Dose (mrem)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
% of Specification	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<u>Thyroid</u>					
Actual Dose (mrem)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
% of Specification	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<u>Kidney</u>					
Actual Dose (mrem)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
% of Specification	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<u>Lung</u>					
Actual Dose (mrem)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
% of Specification	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<u>GI-LLI</u>					
Actual Dose (mrem)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
% of Specification	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

3.4 Ground Water Monitoring

The Kewaunee Power Station has 14 wells used to sample for groundwater contamination. Eight of the wells are located to monitor for leakage from the Auxiliary Building (AB). The other six wells are designated as Monitoring Wells (MW) and sample areas outside the industrial security area to identify any spread of contamination. As the data below indicates there was no gamma activity identified and the tritium in all the AB and MW wells was below Minimum Detectable Concentrations (MDC). The tritium levels have decreased to below MDC in the AB and MW wells since the plant was permanently shut down in 2013. There were no voluntary ground water communications, no spills, and no leaks in 2021.

Sample Point Sample Date	Tritium pCi/L	Total Gamma Activity μCi/ml
AB-707		
4/29/2021	<278	None Detected
AB-708		
4/29/2021	<278	None Detected
AB-709		
5/18/2021	<295	None Detected
AB-710		
5/17/2021	<295	None Detected
AB-711		
6/2/2021	<302	None Detected
AB-712		
6/3/2021	<302	None Detected

Sample Point Sample Date	Tritium pCi/L	Total Gamma Activity μCi/ml
AB-715		
7/15/2021	<317	None Detected
AB-717		
7/15/2021	<317	None Detected
MW-701		
8/19/2021	<384	None Detected
MW-702		
8/19/2021	<384	None Detected
MW-703		
9/9/2021	<273	None Detected
MW-704		
9/9/2021	<273	None Detected
MW-705		
10/6/2021	<339	None Detected
MW-706		
10/6/2021	<339	None Detected

4.0 METEOROLOGICAL DATA

Meteorological data is no longer required to be reported in accordance with the Kewaunee ODCM Rev. 19, Section 15.2.

5.0 SOLID WASTE DISPOSAL

Table 5.1 is a summation of solid and oil radioactive waste shipped during 2021. Presented are the types of waste streams, waste classification, and major nuclides.

In 2021 there were no solid and /or oil waste shipments off site.

Table 5.1
Solid Waste and Irradiated Fuel Shipments

A. Solid Radioactive Waste Shipped Off-Site for Burial or Disposal

1. Type of Waste with Estimate of Major Nuclide Composition

Resins, Filters, and Evaporator Bottoms	Volume		Curies Shipped
Waste Class	ft ³	m ³	Curies
A	0.00E+00	0.00E+00	0.00E+00
B	0.00E+00	0.00E+00	0.00E+00
C	0.00E+00	0.00E+00	0.00E+00
Unclassified	0.00E+00	0.00E+00	0.00E+00
All	0.00E+00	0.00E+00	0.00E+00

Major nuclides for the above table: NA

Dry Active Waste	Volume		Curies Shipped
Waste Class	ft ³	m ³	Curies
A	0.00E+00	0.00E+00	0.00E+00
B	0.00E+00	0.00E+00	0.00E+00
C	0.00E+00	0.00E+00	0.00E+00
Unclassified	0.00E+00	0.00E+00	0.00E+00
All	0.00E+00	0.00E+00	0.00E+00

Major nuclides for the above table: NA

Table 5.1 (continued)
Solid Waste and Irradiated Fuel Shipments

Irradiated Components	Volume		Curies Shipped
Waste Class	ft ³	m ³	Curies
A	0.00E+00	0.00E+00	0.00E+00
B	0.00E+00	0.00E+00	0.00E+00
C	0.00E+00	0.00E+00	0.00E+00
Unclassified	0.00E+00	0.00E+00	0.00E+00
All	0.00E+00	0.00E+00	0.00E+00

Major nuclides for the above table: NA

Other Waste –Oil	Volume		Curies Shipped
Waste Class	ft ³	m ³	Curies
A	0.00E+00	0.00E+00	0.00E+00
B	0.00E+00	0.00E+00	0.00E+00
C	0.00E+00	0.00E+00	0.00E+00
Unclassified	0.00E+00	0.00E+00	0.00E+00
All	0.00E+00	0.00E+00	0.00E+00

Major nuclides for the above table: NA

Sum of All Low-Level Waste	Volume		Curies Shipped
Waste Class	ft ³	m ³	Curies
A	0.00E+00	0.00E+00	0.00E+00
B	0.00E+00	0.00E+00	0.00E+00
C	0.00E+00	0.00E+00	0.00E+00
Unclassified	0.00E+00	0.00E+00	0.00E+00
All	0.00E+00	0.00E+00	0.00E+00

Major nuclides for the above table: NA

Table 5.1 (continued)
Solid Waste and Irradiated Fuel Shipments

B. Irradiated Fuel Shipments

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
None	NA	NA

No irradiated fuel shipments were made from the Kewaunee Power Station during 2021.

6.0 SUPPLEMENTAL INFORMATION

6.1 Abnormal Releases or Abnormal Discharges

No abnormal releases or abnormal discharges were made from the Kewaunee Power Station during the report period.

6.2 Non-routine Planned Discharges

No non-routine planned discharges were made from the Kewaunee Power Station during the reporting period.

6.3 Program Revisions

In accordance with Technical Requirements Manual Section 10.1.1.c.3 and the Offsite Dose Calculation Manual Section 15.2.f, revisions to the Process Control Program, Offsite Dose Calculation Manual, or the Radiological Environmental Monitoring Program for the report period are listed below.

6.3.1 Process Control Program

Revision 0 of the Process Control Program was issued February 25, 2021. See Appendix A.

6.3.2 Offsite Dose Calculation Manual

There were no revisions to the Offsite Dose Calculation Manual during the report period.

6.3.3 Radiological Environmental Monitoring Manual

Revision 23 of the Kewaunee Power Station Radiological Environmental Monitoring Manual (REMM) was issued October 20, 2021. See Appendix B.

6.4 Major Changes to the Radioactive Liquid, Gaseous and Solid Waste Systems

There were no changes to the radioactive liquid, gaseous, or solid waste systems during the reporting period.

6.5 Effluent Monitoring System Inoperability

There were no effluent radiation monitors inoperable for the consecutive time period listed in the ODCM for this report period.

6.6 Corrections to Previous Reports

None.

6.7 Other

None.

Appendix A

Kewaunee Power Station

Solid Radioactive Waste Process Control Program (PCP)

Revision 0
February 25, 2021

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**Dominion
Energy®**

Kewaunee Power Station

Administrative Procedure

Title: Solid Radioactive Waste Process Control Program (PCP)

Procedure Number RP-KW-114	Revision Number 0	Effective Date and Approvals On File
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Revision Summary

This revision 0 procedure replaces the Word formatted procedure NAD-01.16 with this FrameMaker formatted procedure.

- The content of the procedure was updated to reflect the current plant decommissioning SAFSTOR configuration.

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1.0 PURPOSE

- 1.1 This procedure provides instruction for describing the requirements and responsibilities for the Solid Radioactive Waste Process Control Program (PCP).

2.0 SCOPE

- 2.1 This procedure implements the requirements of 10CFR50.36(a), July 1967 Atomic Energy Commission (AEC) General Design Criteria 70, 10CFR61.56, and the Off-Site Dose Calculation Manual (ODCM).
- 2.2 This program applies to each radioactive waste stream employed on site which routinely requires preparation and packaging for off-site processing or disposal as solid radioactive waste including the following:
- Spent resin media from the Liquid Radioactive Waste Processing System.
 - Filter media from the Liquid Radioactive Waste Processing System. This waste stream includes cotton mop heads used for plant area decontamination activities.
 - Dry Active Waste (DAW) consisting of plastic bags and sheeting, rags, wood, paper, scrap metal, and large components (e.g., steam generators), from activities conducted in the radiologically controlled areas of the plant.

3.0 INSTRUCTIONS

3.1 The Solid Radioactive Waste Process Control Program is implemented using the following procedures:

- HP-09.015, High Integrity Containers Operating Guidelines
- HP-09.017, 14-190H, 14-210H, and 14-215H Cask Shipping Procedure
- HP-09.025, 8-120B Cask Shipping Procedure for Shipping a Liner
- HP-09.026, RAMSHP Operating Procedure
- HP-09.027, FILTRK Operating Procedure
- HP-09.028, OSM Operating Procedure
- HP-09.029, RADMAN Operating Procedure
- HP-09.030, 8-120A Cask Shipping Procedure
- RP-KW-009-003, Hydraulic Compactor Operation
- RP-KW-009-005, Radioactive Waste Storage and Inventory
- RP-KW-009-011, Waste Stream Analysis
- RP-KW-009-014, Shipping Casks - Certificates/Procedures
- RP-KW-009-024, Inspection of Low Level Radioactive Waste Packages in Storage
- RP-KW-009-031, Radioactive Material Shipping
- RP-KW-009-032, HIC/Liner Shipment Preparation
- RP-KW-009-037, Energy Solutions Containerized Waste Facility Shipments

3.2 Radioactive waste shipments **SHALL** be sent in accordance with applicable NRC, DOT, State, Burial Site, and Processing Facilities regulations and requirements.

3.3 Radioactive waste **SHALL** be shipped **ONLY** to licensed burial sites or processing facilities in accordance with applicable NRC, DOT, and State regulations.

- 3.4 A Radwaste Sampling and Analysis Program **SHALL** be implemented to ensure compliance with 10CFR61. Scaling factors will be developed to calculate concentrations of hard to measure isotopes from more easily determined isotopes. The scaling factors will enable concentrations of all 10CFR61 required isotopes to be determined for each radioactive waste shipment.
- 3.5 **IF** shipping for disposal, radioactive material content and waste class **SHALL** be determined based on a pre-established radionuclide distribution **AND** dose rate to curie content conversion in accordance with approved procedures.
- 3.6 Packaging of radioactive waste **SHALL** be in containers meeting NRC, DOT, Burial Site, and Processing Facilities requirements and regulations, **EXCEPT** under special exemption request approvals.
- 3.7 Each radioactive waste package **SHALL** be assigned a unique identification number for traceability of records.
- 3.8 Container integrity **SHALL** be verified by visual or physical examination to assure an acceptable waste package for transportation and an acceptable waste form for disposal.
- 3.9 Wet radioactive wastes are processed through the use of High Integrity Containers (HIC) which meet the stability requirements of 10CFR61.56(b) for disposal.
- 3.10 Wet radioactive waste processing **SHALL** be in accordance with the PCP to meet shipping, and processing and burial site requirements. Shipments **NOT** meeting the provisions of the PCP **SHALL** be suspended.
- 3.11 The dewatering process **SHALL** be conducted to provide a waste product with as little free standing water as possible, but in no case in excess of 1 percent by package volume.
- 3.12 **WHEN** shipping DAW:
- During preparation and packaging, wastes **SHALL** be examined to ensure exclusion of unacceptable waste products such as water and oil
 - Absorbent materials may be utilized to absorb incidental liquids to ensure no free standing liquids are contained in the package.

3.13 Quality Assurance

3.13.1 Radioactive waste procedures **SHALL** contain Quality Control Inspection Hold Points where applicable.

3.13.2 The appropriate QA controls required by 10CFR20, Appendix G, Section III.3 are encompassed by the following:

- DOM-QA-1, Nuclear Facility Quality Assurance Program Description
- Routine documented QA audits of radioactive waste processing, packaging, and shipping activities
- Management evaluations of QA audits
- Management review and approval of procedures for waste classification and waste characteristics
- Management review and approval of procedures for all other radioactive waste related activities

3.13.3 QA requirements of 10CFR71, Subpart H, apply only to a package containing a Type B quantity of radioactive material. These requirements are satisfied by maintaining documents appropriate to each package used to ship a Type B quantity:

- Certificate of Compliance (NRC Form 618)
- Controlled copy of the owner's handling procedure
- NRC user registration
- Package safety analysis report
- Package design analysis
- Package design drawings
- Package acceptance test results
- Package maintenance program

3.14 Use of Contractor for Waste Processing

- 3.14.1 Contractor supplied process or service may be used for the processing of radioactive waste for off-site disposal. For the operation of such a process, it may be desirable to use process control measures and procedures developed by the contractor specifically for the system or process. Therefore, previously addressed process control measures for a particular type waste may be superseded by contractor supplied measures as appropriate.
- 3.14.2 Prior to use of a contractor supplied process or service for waste processing, a management review of the contractor's process control and procedures shall be performed to assure an operation compatible with plant operation and in accordance with regulatory requirements.
- 3.14.3 For contractor processing of waste that is intended to be shipped for disposal at a licensed radioactive waste burial site, additional precautions are to be taken to assure a final waste product that meets the appropriate waste stability requirements of 10CFR61.56. In particular, the following items, as applicable, are to be documented prior to utilization for waste processing:
 - a. A general description of the solidification or dewatering process, including type solidification agent (if applicable), major process equipment and interface with plant equipment, types of waste that can be processed, and operating parameters.
 - b. Process control measures that provide for the verification of the generation of a suitable waste product, including items (as may be appropriate for the process method) such as representative sampling, laboratory tests, and acceptance criteria, etc.
 - c. Specifically approved procedures for the operation of the process equipment that will assure operation within the bounds as delineated by the process control measures.
 - d. Appropriate acceptance criteria for evaluating the acceptability of the final waste product.

4.0 RECORDS

The following QA records and non-QA records are generated by or created according to this document and are listed on the KPS Records Retention Schedule. These records shall be maintained according to the KPS Records Management Program.

4.1 QA Records

- None

4.2 Non-QA Records

- None

5.0 ADMINISTRATIVE INFORMATION

5.1 Commitments

- None

5.2 Responsibilities

5.2.1 Radiological Protection and Chemistry Manager (RPCM)

The RPCM is responsible for:

- Administration of the Solid Radioactive Waste Process Control Program
- Assigning trained and qualified personnel to implement the program
- Ensuring any revisions to the program receive the appropriate reviews and approvals including the Facility Safety Review Group (FSRG) [DSAR 4.1.2.1.2]
- Ensuring all shipments and changes to the PCP are included in the Annual Radioactive Effluent Release Report (ARERR) [TRM 10.3]

5.2.2 Nuclear Oversight

Nuclear Oversight is responsible for:

- Periodic inspection and review of all types of radioactive waste shipments to ensure procedural compliance

5.3 Definitions

5.3.1 Free Standing Liquid

Drainable liquid or free liquid able to be removed from a waste package through a solidification, absorption, or dewatering process. It includes liquid which is still visible after solidification or dewatering is complete or is drainable from the low point of a punctured container.

5.3.2 High Integrity Container (HIC)

A waste container used as an alternative to solidifying some waste streams, especially ion exchange resins and filter media/sludges. Provides the long term stability required to meet the structural stability requirements of 10CFR61. Is designed to maintain its structural integrity for 300 years while being subjected to corrosive chemicals, thermal cycling, radiation dose, ultra-violet radiation, transportation, handling, and disposal site trench compaction.

5.3.3 Off-Site Disposal

Off-Site Disposal includes licensed burial or processing facilities. The processing activities are designed to minimize the volume of radwaste ultimately sent to the burial facility.

5.3.4 Radioactive Waste

Any material designated as waste which also contains detectable radioactive material resulting from the operation of the plant.

5.4 Reference

5.4.1 Other

- a. KPS Defueled Safety Analysis Report (DSAR)
- b. Technical Requirements Manual (TRM)
- c. Off-site Dose Calculation Manual (ODCM)
- d. July 1967 Atomic Energy Commission (AEC) General Design Criteria 70
- e. DOM-QA-1, Nuclear Facility Quality Assurance Program Description
- f. USNRC Waste Form Technical Position, Revision 1, (Letter K-91-011), dated 1/24/91

- g. NUREG-0800, Rev. 2, July 1981, USNRC Standard Review Plan, Section 11.4, Solid Waste Management Systems
- h. USNRC Branch Technical Position - ETSB 11-3, Design Guidance for Solid Radioactive Waste Management Systems Installed in Light-Water-Cooled Nuclear Power Reactor Plants, Rev. 2, July 1981
- i. USNRC Generic Letter 84-12 (K-84-95), Compliance with 10CFR Part 61 and Implementation of the Radiological Effluent Technical Specifications (RETS) and Attendant Process Control Program (PCP), dated 4/30/84
- j. 10CFR20.2006, Transfer for Disposal and Manifests and 10CFR20, Appendix G, Requirements for Transfers of Low-Level Radioactive Waste Intended for Disposal at Licensed Land Disposal Facilities and Manifests
- k. 10CFR50.36(a), Technical specifications on effluents from nuclear power reactors
- l. 10CFR61, Licensing Requirements for Land Disposal of Radioactive Waste
- m. NUREG-0133, October 1978, Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants
- n. NUREG-0472, Revision 3, 9/3/82, Standard Radiological Effluent Technical Specifications for Pressurized Water Reactors
- o. 10CFR71, Packaging and Transportation of Radioactive Material
- p. Letter NRC-84-178, Hintz to Varga, Radiological Effluent Technical Specifications - TAC #08145
- q. 49CFR173, Shippers General Requirements for Shipments and Packagings; Subpart I, Radioactive Materials
- r. Barnwell Waste Management Facility Site Disposal Criteria, Chem-Nuclear Systems, Inc., Document S20-AD-010
- s. USNRC License No. 12-13536-01, Barnwell Facility Special Nuclear Material License
- t. South Carolina Department of Health and Environmental Control License No. 097, Barnwell Facility Operating License
- u. NRC Generic Letter 96-07, Interim Guidance on Transportation of Steam Generator, USNRC, December 5, 1996

Appendix B

Kewaunee Power Station

Radiological Environmental Monitoring Manual (REMM)

Revision 23
October 20, 2021

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Dominion Energy Kewaunee, Inc.

Kewaunee Power Station


RADIOLOGICAL ENVIRONMENTAL MONITORING MANUAL (REMM)

Revision 23

DATE: October 20, 2021

Approved By: DJ Shannon / 
Manager – Radiological Protection and Chemistry

Date: 10/20/21

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Date: 10/20/21

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Facility Safety Review Group

Date: 10/20/2021

Reviewed By: BJ McMahon / 
Director – Kewaunee Site

Date: 10/20/2021

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1.0 Introduction

1.1 Purpose

The purpose of this document is to define the Radiological Environmental Monitoring Program (REMP) for the Kewaunee Power Station (KPS). The REMP is required by the Offsite Dose Calculation Manual (ODCM) 13.5.

This document is known as the Radiological Environmental Monitoring Manual (REMM) and is intended to serve as a tool for program administration and as a guidance document for contractors which implement the monitoring program.

1.2 Scope

This program defines the sampling and analysis schedule which was developed to provide representative measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides that lead to the highest potential radiation exposures of MEMBERS OF THE PUBLIC resulting from plant decommissioning activities. This monitoring program implements Section IV.B.2 of Appendix I to 10CFR Part 50 and thereby verifies that the measurable concentrations of radioactivity and levels of radiation are not higher than expected on the basis of the effluent measurements and the modeling of the environmental exposure pathways. Guidance for the development of this monitoring program is provided by the Radiological Assessment Branch Technical Position on Environmental Monitoring. This program has been developed in accordance with NUREG 0472.

On October 22, 2012, Dominion made known the decision to permanently shut down the Kewaunee Power Station (KPS). On February 25, 2013, Dominion Energy Kewaunee (DEK) submitted a certification of permanent cessation of power operations pursuant to 10 CFR 50.82(a)(1)(i), stating that DEK has decided to permanently cease power operation of KPS on May 7, 2013. On May 15, 2013 the NRC docketed the certification for permanent removal of fuel from the reactor vessel pursuant to 10 CFR 50.82(a)(1)(ii). Therefore, the 10 CFR Part 50 license no longer authorizes KPS to operate the reactor or emplace or retain fuel in the reactor vessel, as specified in 10 CFR 50.82(a)(2). On June 15th, 2017 transfer of all spent nuclear fuel into dry cask storage was completed.

On April 24, 2017 Radiation Safety and Control Services, Inc. (RSCS) submitted Technical Support Document No. 16-086 Rev. 2, Kewaunee Shut-Down Environmental Radionuclides of Concern and Radiological Environmental Monitoring Manual Changes, to KPS. This document evaluated the radionuclides of concern for environmental releases after permanent shutdown of KPS. The result of the evaluation was the optimization of the environmental program due to radioactive decay and reduced source terms during the decommissioning phase of the plant.

The program will provide field and analytical data on the air, aquatic, and terrestrial radioecology of the area near the Kewaunee Power Station so as to:

1. Determine the effects of the decommissioning activities on the environment.
2. Serve as a gauge of the operating effectiveness of in-plant control of waste discharges; and
3. Provide data on the radiation dose to the public by direct or indirect pathways of exposure.

1.3 Implementation

This document is considered, by reference, to be part of the Offsite Dose Calculation Manual. This is as required by KPS Technical Requirements Manual (TRM) 10.1.1. The REMM is controlled as a separate document for ease of revision, use in the field and use by contractors. This format was approved by the NRC as part of TS Amendment No. 64, which provided Radiological Effluent Technical Specifications (RETS) for KPS.

The REMP is set up to be implemented by a vendor and controlled by KPS in accordance with procedure RP-KW-113, "Radiological Effluent and Environmental Monitoring Programs". Monthly reviews of the vendor's progress report are performed by KPS in accordance with this manual in section 3.4. Annual reviews and submittals of the vendor's report and monitoring data are checked and approved by KPS in accordance with procedure RP-KW-HSP-HPE-280, "Annual Effluent and Environmental Report Review and Submittal." All sample collection, preparation, and analysis are performed by the vendor except where noted. Procedure RP-KW-HSP-HPE-164, "Environmental Sample Collection," outlines the environmental sample collection performed by KPS.

Periodic reviews of monitoring data and an annual land use census will be used to develop modifications to the existing monitoring program. Upon approval, these modifications will be incorporated into this document per RP-KW-280, "Revision and Control of ODCM and REMM," so that it will accurately reflect the current radiological environmental monitoring program in effect for KPS.

The remainder of this document is divided into two sections. The first section, 2.0 REMP Requirements, describes the different TRM and REMM requirements associated with the REMP. The second section, 3.0 REMP Implementation, describes the specific requirements used to implement the REMP.

2.0 REMP Requirements

KPS TS Amendment No. 104 implemented the guidance provided in Generic Letter 89-01, "Implementation of Programmatic Controls for Radiological Effluent Technical Specifications (RETS)." These changes included:

1. Incorporation of *programmatic controls* in the Administrative Controls section of the TS to satisfy existing regulatory requirements for RETS, and
2. Relocation of the *procedural details* on radioactive effluents monitoring, radiological environmental monitoring, reporting details, and other related specifications from the TS to the ODCM.

Relocating the procedural details to the ODCM allows for revising these requirements using the 10CFR50.59 process instead of requiring prior NRC approval using the TS Amendment process.

The RETS requirements were incorporated verbatim into the ODCM, Revision 6. Several of these requirements pertain only to the environmental monitoring program and therefore have been relocated into this document (REMM, Revision 3 and 4) and are identified as REMM requirements.

All KPS TS related REMM requirements were removed from KPS TS and placed in the Technical Requirements Manual as part of TRM Revision 0 on 4/26/2016.

2.1 ODCM 13.5 Requirements

ODCM 13.5 provides the programmatic control, which requires a program to monitor for radiation and radionuclides in the environs of the plant. This is the reason for the existence of the REMP. ODCM 13.5 also provides the programmatic control which requires:

- a. The program to perform the monitoring, sampling, analysis, and reporting in accordance with the methodology and parameters in the ODCM,
- b. A land use census to be performed, and
- c. Participation in an Interlaboratory Comparison Program.

The details of each requirement are described in the REMM requirements stated below.

TRM 10.3.1 requires an "Annual Radiological Environmental Operating Report," be submitted to the NRC each year. The specific contents of this report are detailed in REMM 2.4.1. Additional specific reporting requirements are listed in the other REMM requirements.

2.2 REMM Requirements

The following REMM requirements include the procedural details that were originally located in the KPS RETS section and then relocated into Revision 6 of the ODCM, as discussed above. These requirements are specific to the radiological environmental monitoring program and have been relocated into this document for ease of use and completeness.

The REMM requirements for the Monitoring Program, Land Use Census, and the Interlaboratory Comparison Program include a detailed operating requirement (numbered 2.2.1, 2.2.2, and 2.2.3 respectively) and an associated verification requirement (numbered 2.3.1, 2.3.2, and 2.3.3 respectively), along with the basis for the requirement. Reporting requirements are listed in requirement REMM 2.4.1.

ODCM 13.0, USE AND APPLICATION, apply to both the ODCM and REMM.

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

REMM 2.2.1 The radiological environmental monitoring program shall be conducted as specified in Table 2.2.1-A.

APPLICABILITY: At all times.

ACTIONS

NON-CONFORMANCE	CONTINGENCY MEASURES	RESTORATION TIME
A. Radiological Environmental Monitoring Program not conducted as specified in REMM Table 2.2.1-A.	A.1 Prepare and submit to the NRC in the Annual Radiological Environmental Operating Report, a description of the reasons for not conducting the program as required and the plans for preventing a recurrence.	In accordance with the Annual Radiological Environmental Operating Report frequency.
B. Level of radioactivity in an environmental sampling medium at a specified location exceeds the reporting levels of REMM Table 2.2.1-D when averaged over any calendar quarter. <u>OR</u>	B.1 -----NOTES----- 1. Only applicable if the radioactivity/radionuclides are the result of plant effluents. 2. For radionuclides other than those in REMM Table 2.2.1-D, this report shall indicate the methodology and parameters used to estimate the potential annual dose to a MEMBER OF THE PUBLIC. -----	

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ACTIONS (continued)

NON-CONFORMANCE	CONTINGENCY MEASURES	RESTORATION TIME
<p>More than one of the radionuclides in REMM Table 2.2.1-D are detected in the environmental sampling medium and</p> <p><u>Concentration 1</u> + Reporting level 1</p> <p><u>Concentration 2</u> + ... \geq 1.0. Reporting level 2</p> <p><u>OR</u></p> <p>Radionuclides other than those in REMM Table 2.2.1-D are detected in an environmental sampling medium at a specified location which are the result of plant effluents and the potential annual dose to a MEMBER OF THE PUBLIC from all radionuclides is \geq the calendar year limits of DNC 13.1.2, DNC 13.2.2, DNC 13.2.3</p>	<p>Prepare and submit to the NRC, a Special Report, pursuant to DNC 15.3, that</p> <ol style="list-style-type: none"> (1) Identifies the cause(s) for exceeding the limit(s) and (2) Defines the corrective actions to be taken to reduce radioactive effluents so that the potential annual dose to a MEMBER OF THE PUBLIC is less than the calendar year limits of DNC 13.1.2, DNC 13.2.2, DNC 13.2.3 <p><u>OR</u></p> <p>B.2 -----NOTES-----</p> <ol style="list-style-type: none"> 1. Only applicable if the radioactivity/radionuclides are not the result of plant effluents. 2. For radionuclides other than those in REMM Table 2.2.1-D, this report shall indicate the methodology and parameters used to estimate the potential annual dose to a MEMBER OF THE PUBLIC. <p>-----</p> <p>Report and describe the condition in the Annual Radiological Environmental Operating Report.</p>	<p>30 days</p> <p>In accordance with the Annual Radiological Environmental Operating Report frequency.</p>

ACTIONS (continued)

NON-CONFORMANCE	CONTINGENCY MEASURES	RESTORATION TIME
C. Broad leaf vegetation samples unavailable from one or more of the sample locations required by REMM Table 2.2.1-A.	<p>C.1 Identify specific alternative locations for obtaining replacement samples and add them to the Radiological Environmental Operating Program.</p> <p><u>AND</u></p> <p>C.2 When changes in sampling locations are permanent, then the sampling schedule in the REMM will be updated to reflect the new routine and alternative sampling locations. This revision will be submitted in the next Annual Radiological Environmental Operating Report.</p>	30 days

VERIFICATION REQUIREMENTS

VERIFICATION	FREQUENCY
REMM 2.3.1 Collect and analyze radiological environmental monitoring samples pursuant to the requirements of REMM Table 2.2.1-A and the detection capabilities required by Table 2.2.1-A.	In accordance with REMM Table 2.2.1-A

BASES

The radiological environmental monitoring program provides representative measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides that lead to the highest potential radiation exposures of MEMBERS OF THE PUBLIC resulting from the station decommissioning activities. This monitoring program implements Section IV.B.2 of Appendix I to 10CFR Part 50 and thereby supplements the radiological effluent monitoring program by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and the modeling of the environmental exposure pathways. Guidance for this monitoring program is provided by the Radiological Assessment Branch Technical Position on Environmental Monitoring. Program changes may be initiated based on operational experience.

The required detection capabilities for environmental sample analyses are tabulated in terms of the lower limits of detection (LLDs). The LLDs required by Table 2.3.1-A are considered optimum for routine environmental measurements in industrial laboratories. It should be recognized that the LLD is defined as a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement.

Detailed discussion of the LLD, and other detection limits, can be found in HASL Procedures Manual, HASL-300 (revised annually), Currie, L.A., "Limits for Qualitative Detection and Quantitative Determination - Application to Radiochemistry," Anal. Chem. 40, 586-93 (1968), and Hartwell, J.K., "Detection Limits for Radioanalytical Counting Techniques," Atlantic Richfield Hanford Company Report ARH-SA-215 (June 1975).

RADIOLOGICAL ENVIRONMENTAL MONITORING LAND USE CENSUS

REMM 2.2.2

A land use census shall:

- a. Be conducted,
- b. Identify within a distance of 8 km (5 miles) the location, in each of the 10 meteorological sectors, of the nearest residence, and the nearest garden > 50 m² (500 ft²) producing broad leaf vegetation. Sampling of broad leaf vegetation may be performed at the site boundary in each of two different direction sectors with the highest predicted D/Qs in lieu of the garden census. Requirements for broad leaf vegetation sampling in REMM Table 2.2.1-A item 4b shall be followed, including analysis of control samples.

APPLICABILITY: At all times.

ACTIONS

NON-CONFORMANCE	CONTINGENCY MEASURES	RESTORATION TIME
A. Land use census identifies location(s) that yields a calculated dose, dose commitment greater than the values currently being calculated in ODCM 13.2.3.1.	A.1 Identify the new location(s) in the next Radiological Environmental Operating Program.	In accordance with the Radiological Environmental Operating Report.

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NON-CONFORMANCE	CONTINGENCY MEASURES	RESTORATION TIME
B. Land use census identifies location(s) that yields a calculated dose, or dose commitment (via the same exposure pathway) greater than 20% at a location from which samples are currently being obtained in accordance with REMM 2.2.1.	<p>B.1 Add the new location(s) to the Radiological Environmental Operating Program.</p> <p><u>AND</u></p> <p>B.2 Delete the sampling locations(s), excluding the control station location, having the lowest calculated dose, dose commitment(s) or D/Q value, via the same exposure pathway, from the Radiological Environmental Operating Program.</p> <p><u>AND</u></p> <p>B.3 Submit in the next Radiological Environmental Operating Report documentation for a change which includes revised figures(s) and table(s) reflecting the new location(s) with information supporting the change in sampling locations.</p>	<p>30 days</p> <p>In accordance with Radiological Environmental Operating Report.</p>

VERIFICATION REQUIREMENTS

VERIFICATION	FREQUENCY
<p>REMM 2.3.2 Conduct the land use census during the growing season using that information that will provide the best results, such as by a door-to-door survey, aerial survey, or by consulting local agricultural authorities. Report the results of the land use census in the Annual Radiological Environmental Operating.</p>	12 months

BASES

This requirement is provided to ensure that changes in the use of areas at and beyond the SITE BOUNDARY are identified and that modifications to the radiological environmental monitoring program are made if required by the door-to-door survey, from aerial survey or from consulting with local agricultural authorities. This census satisfies the requirements of Section IV.B.3 of Appendix I to 10CFR Part 50. Restricting the census to gardens of greater than 50 m² provides assurance that significant exposure pathways via broad leaf vegetation will be identified and monitored since a garden of this size is the minimum required to produce the quantity (26 kg/yr) of broad leaf vegetation assumed in Regulatory Guide 1.109 for consumption by a child. To determine this minimum garden size, the following assumptions were made:

1. 20% of the garden was used for growing broad leaf vegetation (e.g., similar to lettuce and cabbage), and
 2. A broad leaf vegetation yield of 2 kg/m².
-

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RADIOLOGICAL ENVIRONMENTAL MONITORING INTERLABORATORY COMPARISON
PROGRAM

REMM 2.2.3 Analyses shall be performed on all radioactive materials, supplied as part of an Interlaboratory Comparison Program that has been approved by the Commission.

APPLICABILITY: At all times.

ACTIONS

NON-CONFORMANCE	CONTINGENCY MEASURES	RESTORATION TIME
A. Analyses not performed as required.	A.1 Report the corrective actions taken to prevent a recurrence to the NRC in the Annual Radiological Environmental Operating Report.	In accordance with the Annual Radiological Environmental Operating Report.

VERIFICATION REQUIREMENTS

VERIFICATION	FREQUENCY
REMM 2.3.3 Report a summary of the results obtained as part of the Interlaboratory Comparison Program in the Annual Radiological Environmental Operating Report.	In accordance with the Annual Radiological Environmental Operating Report.

BASES

The requirement for participation in an approved Interlaboratory Comparison Program is provided to ensure that independent checks on the precision and accuracy of measurements of radioactive material in environmental sample matrices are performed as part of the quality assurance program for environmental monitoring in order to demonstrate that the results are valid for the purposes of Section IV.B.2 of Appendix I to 10CFR Part 50.

REMM 2.4.1 Reporting Requirements

2.4.1 The Annual Radiological Environmental Operating Report shall include:

- a. Summaries, interpretations, and an analysis of trends of the results of the radiological environmental surveillance activities for the report period, including a comparison with pre-operational studies, with operational controls as appropriate, and with previous environmental surveillance reports, and an assessment of the observed impacts of the plant decommissioning activities on the environment. The reports shall also include the results of land use censuses required by REMM 2.2.2.
- b. The results of analyses of radiological environmental samples and of environmental radiation measurements taken during the period pursuant to the locations specified in the table and figures in the Radiological Environmental Monitoring Manual (REMM), as well as summarized and tabulated results of these analyses and measurements in the format of the table in the Radiological Assessment Branch Technical Position, Revision 1, November 1979. In the event that some individual results are not available for inclusion with the report, the report shall be submitted noting and explaining the reasons for the missing results. The missing data shall be submitted as soon as possible in a supplementary report when applicable.
- c. A summary description of the radiological environmental monitoring program; legible maps covering all sampling locations keyed to a table giving distances and directions from the centerline of one reactor; the results of licensee participation in the Interlaboratory Comparison Program, required by REMM 2.2.3; discussion of all deviations from the sampling schedule of Table 2.2.1-A; and discussion of all analyses in which the LLD required by Table 2.3.1-A was not achievable.

Discussion

KPS TRM 10.3.1 provides the programmatic control, which requires that an Annual Radiological Environmental Operating Report be submitted to the NRC. It also states that this report shall include summaries, interpretations, and analysis of trends of the results of the REMP for the reporting period.

The procedural details of this report are included in this requirement. REMM 2.2.1/2.3.1, 2.2.2/2.3.2, and 2.2.3/2.3.3 also include specific reporting requirements. These requirements reference this REMM, along with TRM 10.3.1, as the method for reporting deviations from the current program during the reporting period, and require that this information be included in the Annual Radiological Environmental Operating Report.

3.0 REMM Implementation

The Radiological Environmental Monitoring Program for KPS is under the direction of a Contracted Vendor (CV). This section describes this program, as required by REMM 2.2.1 and the process the CV uses to perform it.

3.1 Sampling Requirements

Table 2.2.1-A identifies the various samples required by the REMM. Identified in the "available sample locations" column in Table 2.2.1-A are the sample locations selected, in conjunction with the vendor, to meet or exceed the REMM requirements. Table 2.2.1-B includes the same requirements as in Table 2.2.1-A, but presents the information in a different format by identifying the type of samples required at each location and the collection frequency. Table 2.2.1-C identifies the location and description of each sample location. Figure 1 shows the physical location of each sample point on an area map.

3.2 Analysis Methodology

Analytical procedures and counting methods employed by the CV will follow those recommended by the U.S. Public Health Service publication, Radioassay Procedures for Environmental Samples, January 1967; and the U.S. Atomic Energy Commission Health and Safety Laboratory, HASL Procedures Manual (HASL-300), 1972. The manual is also available on-line at www.eml.st.dhs.gov/publications/procman.

Updated copies shall be kept on file at KPS or can be obtained from the CV with sufficient notification.

3.3 Detection Capability (LLD) Requirements

The required detection capabilities for environmental sample and analysis are tabulated in terms of lower limits of detection (LLDs) in Table 2.3.1-A. The LLDs required by Table 2.3.1-A are considered optimum for routine environmental measurements in industrial laboratories. It should be recognized that the LLD is defined as a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement.

Detailed discussion of the LLD, and other detection limits, can be found in HASL Procedures Manual, HASL-300 (revised annually), Currie, L.A., "Limits for Qualitative Detection and Quantitative Determination - Application to Radiochemistry," *Anal. Chem.* 40, 586-93 (1968), and Hartwell, J.K., "Detection Limits for Radioanalytical Counting Techniques," Atlantic Richfield Hanford Company Report ARH-SA-215 (June 1975).

3.4 Contracted Vendor Reporting Requirements

Monthly Progress Reports

Monthly progress reports will include a tabulation of completed analytical data on samples obtained during the previous 30 day period. Included in the report are the status of field collections and graphic representations indicating possible trends. One copy of the reports will be submitted within 30 to 60 days of the reporting month. Monthly progress reports are reviewed for:

- ☐ Reasonableness
- ☐ Consistency
- ☐ Accuracy
- ☐ Completeness
- ☐ Recognition of deficiencies
- ☐ Examination of any past deficiencies and corrective actions taken
- ☐ Recommendations for any modifications or improvements to the REMM

Notify the vendor of any unusual or abnormal data noted during the review, including an evaluation of the applicability of REMM Specification 2.2.1.b.

The review shall include determination of the need to make notifications to State and Local Agencies due to levels of radioactive materials in water samples.

Annual Reports

Annual reports will be submitted in two parts. Part I, to be submitted to the NRC, will be prepared in accordance with NRC Regulatory Guide 4.8. It will contain an introductory statement, a summary of results, description of the program, discussion of the results, and summary table. Part II of the annual report will include tables of analytical data for all samples collected during the reporting period, together with graphic presentation where trends are evident and statistical evaluation of the results. Gamma scan data will be complemented by figures of representative spectra if requested by KPS.

Non-Routine Reports

If analyses of any samples collected show abnormally high levels of radioactivity, KPS will be notified by telephone immediately after data becomes available.

Action Limits

The CV will report any radioactive concentrations found in the environmental samples which exceed the reporting levels shown in Table 2.2.1-D, CV to KPS column. These levels are set below the NRC required reporting levels (KPS to NRC column) so actions can be initiated to prevent exceeding the NRC concentration limits.

3.5 *Quality Assurance Program*

To ensure the validity of the data, the CV maintains a Quality Assurance (QA) Program, which employs quality control checks, with documentation of the analytical phase of its environmental monitoring studies. The program and procedures are defined in the CV's Quality Manual. The program shall be reviewed and meet the requirements of Regulatory Guide 4.15 and 10CFR21. All data related to quality control will be available for review by Dominion Energy Kewaunee upon reasonable prior notification. Proprietary information will be identified so that it may be treated accordingly.

Updated copies of the Quality Manual shall be kept on file at KPS or can be obtained from the CV with sufficient notification.

3.6 *Sample Descriptions*

A description of each of the samples required by this program follows:

Ambient Radiation

Two packets of thermo-luminescent dosimeters (CaSO_4 : Dy cards) are placed at fifteen locations as follows:

- ☐ Four at the ISFSI fence as part of inner ring locations (K-1m, K-1o, K-1q, K-1r)
- ☐ Four inner ring locations (K-1f, K-25, K-27, K-30)
- ☐ Six outer ring locations (K-3, K-5, K-8, K-17, K-39, K-43)
- ☐ One control location (K-2)

One packet is changed quarterly and one annually. Annual TLDs will serve as an emergency set to be read when needed. They will be exchanged annually (without reading) if not read during the year. To insure the precision of the measurement, each packet will contain two cards with four dosimeters each (four sensitive areas each for a total of eight). For protection against moisture each set of cards is sealed in a plastic bag and placed in a plastic container.

Each card is individually calibrated for self-irradiation and light response. Fading is guaranteed by the TLD vendor not to exceed 20% in one year. Minimum sensitivity for the multi-area dosimeter is 0.5 mR defined as 3 times the standard deviation of the background. Maximum Error (1 standard deviation) - ^{60}Co Gamma ± 0.2 mR or $\pm 3\%$, whichever is greater. The maximum spread between areas on the same dosimeter is 3.5% at 1 standard deviation.

Reporting units for TLDs are mR/91 days for quarterly TLDs and mR/exposure period for annual TLDs.

Tests for uniformity and reproducibility of TLDs as specified in NRC Regulatory Guide 4.13 are performed annually.

Airborne Particulates

Airborne particulates are collected at four locations (K-1f, K-2(control), K-8, and K-43) on a continuous basis on a 47 mm diameter filter at a volumetric rate of approximately one cubic foot per minute (CFM). The filters are changed weekly, placed in protective envelopes, and delivered to the CV for Gamma Isotopic Analysis. Filter samples are analyzed weekly for gross beta activity after sufficient time (usually 3 to 5 days) has elapsed to allow decay of Radon and Thoron daughters. If gross beta concentrations in air particulate samples are greater than ten (10) times the yearly mean of the control samples, gamma isotopic analysis shall be performed on the individual samples. Quarterly composites from each location receive Gamma Isotopic Analysis using a Germanium detector. All identifiable gamma-emitters are quantified. Reporting units are pCi/m^3 .

Surface Water

Surface water is sampled quarterly from Lake Michigan at the KPS discharge (K-1d).

Samples are collected quarterly at the Green Bay Municipal Pumping station between Kewaunee and Green Bay (K-9) – both raw and treated water is collected.

Quarterly samples are also taken, when available, from creek locations (K-1b, K-1e) that pass through the reactor site. The samples are taken at a point near the mouth of each creek and at the shore of the drainage pond. The water is analyzed for gross beta activity in:

- a. The total residue,
- b. The dissolved solids, and
- c. The suspended solids.

The samples are also analyzed for K-40, Gamma Isotopic Analysis, tritium, and Sr-90. Reporting units are pCi/l.

Well Water

One gallon of drinking water samples are taken once every three months from one off-site well, (K-13) and three on-site wells (K-1h, K-1t, and K-1u). All samples are analyzed for gross beta in the total residue, K-40, tritium, and by Gamma Isotopic Analysis. Samples from one on-site well are analyzed for Sr-90. Samples from K-1h, K-1t, and K-1u are also analyzed for gross alpha. Reporting units are pCi/l.

Shoreline Sediment

Shoreline sediment samples are taken semi-annually from three locations (K-1c, K-1j, K-9) in areas with potential for recreational value. Samples are analyzed for gross beta, Sr-90 and Gamma Isotopic Analysis. Reporting units are pCi/g dry weight.

Fish

Fish are collected once per year (third quarter) near the discharge area (K-1d). An alternate source for fish is a local fish market (e.g., LaFond's in Kewaunee). Flesh is separated from the bones and analyzed for gross beta activity and by Gamma Isotopic Analysis. The bones are analyzed for gross beta activity and Sr-90. Reporting units are pCi/g wet weight.

Vegetation

Annually, during the 3rd quarter, samples of broad leaf vegetation grown and marketed for human consumption are collected from K-26 (control), depending upon the availability of samples. If samples are not available from this location, samples may be obtained from any local source so there is some sample of record. The location will be documented. In addition, two samples of broad leaf vegetation from the highest predicted X/Q and D/Q, if available, are collected annually from the farmland owned by Dominion Energy Kewaunee (K-23 a and b) and rented to a private individual for growing crops. Reporting units are pCi/g wet weight.

Soil

Twice during the growing season samples of the top two inches of soil are collected from five locations (K-1f, K-3(control), K-34, K-35 (control), K-38). The soil is analyzed for gross alpha and gross beta activities, for Sr-90, and Gamma Isotopic Analysis to identify and quantify gamma-emitting manmade radionuclides. Reporting units are pCi/g dry weight.

Cattle feed

Once per year, during the first quarter when grass is not available, cattle feed (such as hay or silage) is collected from the five dairy farms (K-3 (control), K-34, K-35 (control), K-38, K-45). The analyses performed are the same as for grass. Reporting units are pCi/g wet weight.

Grass

Grass is collected three times per year (2nd, 3rd, and 4th quarters) from the six dairy farms (K-3(control), K-5, K-35 (control), K-34, K-38, and K-39) and from two on-site locations (K-1b and K-1f). The samples are analyzed for gross beta activity, for Sr-90, and Gamma Isotopic Analysis to identify and quantify gamma-emitting radionuclides. Reporting units are pCi/g wet weight.

Groundwater Monitoring Wells

The Groundwater Protection Program (RP-KW-502, Groundwater Protection Program) consists of 14 wells. Figure 2 shows the locations of the 14 installed groundwater monitoring wells. The wells and locations are identified with a diamond shape in Figure 2. The wells are labeled MW (Monitoring Well) and AB (Auxiliary Building).

Results of analyses and a description of any event above Reporting Levels will be included in the Annual Radioactive Effluent Release Report for the 14 wells.

Any results exceeding the limits of Table 2.2.1-D shall be reported in accordance with section 2.2.1-B of the REMM, as well as:

- ☐ Informal notification to the State and Local Agencies before the end of the next business day.
- ☐ Providing a copy of the written 30 day NRC report to State and Local Agencies.

Table 2.2.1-A Radiological Environmental Monitoring Program				
Exposure Pathway And/Or Sample	Minimum Required Samples ^a	Available Sample Locations ^b	Sampling, Collection and Analysis Frequency	Type of Analysis
1. Ambient Radiation ^c	8 Inner Ring locations	K-1f, K-1m, K-1o, K-1q, K-1r, K-25, K-27, K-30,	See Table 2.2.1-B	Gamma dose
	6 Outer Ring locations	K-3, K-5, K-8, K-17, K-39, K-43		
	1 Control location	K-2		
	1 Population center	K-43		
	1 Special interest location	K-8		
	1 Nearby resident	K-27		
2. Airborne Particulates	3 samples close to the site boundary in highest average X/Q	K-1f, K-8, K-43	See Table 2.2.1.B Continuous sampler operation	Particulates; gross beta analysis ^e Gamma isotopic ^f of composite (by location)
	1 sample from the closest community having the highest X/Q	K-43	Particulates See Table 2.2.1-B	
	1 sample from a control location	K-2 ^d	See Table 2.2.1-B	
3. Waterborne				
a. Surface ^g	1 Upstream sample 1 Downstream sample	K-1b, K-1d K-1e, K-9 ^j	Grab sample See Table 2.2.1-B	Gross Beta, Gamma isotopic ^f K-40 tritium, and Sr-90 ⁱ
b. Well	1-2 locations likely to be affected ^d 1 off-site location	K-1h, K-1t ^h , K-1u ^h K-13	Grab sample See Table 2.2.1-B	Gamma isotopic ^f , tritium and K-40 analysis Gross Beta, One onsite well for Sr-90 3 onsite wells for gross alpha
c. Shoreline Sediment	1 sample from downstream area with potential for recreational value	K-1c, K-1j, K-9	Grab sample See Table 2.2.1-B	Gamma isotopic ^f analysis Gross Beta, Sr-90

Table 2.2.1-A Radiological Environmental Monitoring Program				
Exposure Pathway And/Or Sample	Minimum Required Samples ^a	Available Sample Locations ^b	Sampling, Collection and Analysis Frequency	Type of Analysis
4. Ingestion				
a. Fish	1 random sample of commercially and recreationally important species in the vicinity of the plant.	K-1d	See Table 2.2.1-B	Gamma Isotopic ^f and Gross Beta on edible portions, Gross Beta and Sr-90 on bones
b. Food Products	Two samples of broad leaf vegetation grown nearest each of two different offsite locations within 5 miles of the plant since milk sampling is no longer performed. ^k 1 sample 15-30 km distant since milk sampling is no longer performed.	K-23a, K-23b K-26 (control)	See Table 2.2.1-B	Gamma Isotopic ^f Analysis.
5. Miscellaneous samples not identified in NUREG-0472 ^k				
a. Soil	None required	K-1f, K-34, K-35 (control) K-38 K-3 (control)	See Table 2.2.1-B	Gross Alpha/Beta Sr-90 Gamma Isotopic ^f
b. Cattle feed	None required	K-35 (control) K-34, K-38, K-45 K-3 (control)	See Table 2.2.1-B	Gross Beta Sr-90 Gamma Isotopic ^f
c. Grass	None required	K-1b, K-1f, K-35 (control), K-39 K-5, K-34, K-38 K-3 (control)	See Table 2.2.1-B	Gross Beta Sr-90 Gamma Isotopic ^f

Table Notations for Table 2.2.1-A

a.	The samples listed in this column describe the minimum sampling required to meet REMP requirements.
b.	Additional details of sample locations are provided in Table 2.2.1-C and Figure 1. The REMP requires that samples be taken from each of the "available sample locations" listed (see section 3.1). Deviations from the required sampling schedule will occur if specimens are unobtainable due to hazardous conditions, seasonal unavailability, malfunction of automatic sampling equipment and other legitimate reasons. If specimens are unobtainable due to sampling equipment malfunction, reasonable efforts shall be made to complete corrective actions prior to the end of the next sampling period. All deviations from the sampling schedule shall be documented, as required by REMM 2.4.1.c, in the Annual Radiological Environmental Operating Report. It is recognized that, at times, it may not be possible or practicable to continue to obtain samples of the media of choice at the most desired location or time. In these instances suitable alternative media and locations may be chosen for the particular pathway in question and appropriate substitutions made within 30 days in the REMM. The cause of the unavailability of samples for that pathway and the new location(s) for obtaining replacement samples will be identified in the Annual Radiological Environmental Operating Report.
c.	For the purposes of this table, each location will have 2 packets of thermoluminescent dosimeters (TLDs). The TLDs are CaSO ₄ : Dy cards with 2 cards/packet and 4 dosimeters/card (four sensitive areas each for a total of eight dosimeters/packet). The NRC guidance of 40 stations is not an absolute number. The number of direct radiation monitoring stations has been reduced according to geographical limitations; e.g., Lake Michigan. The frequency of analysis or readout for TLD systems depends upon the characteristics of the specific system used and selection is made to obtain optimum dose information with minimal fading.
d.	The purpose of this sample is to obtain background information. If it is not practical to establish control locations in accordance with the distance and wind direction criteria, other sites that provide valid background data may be substituted.
e.	Airborne particulate sample filters shall be analyzed for gross beta radioactivity 24 hours or more after sampling to allow for radon and thoron daughter decay. If gross beta activity in air particulate samples is greater than ten times the yearly mean of control samples, gamma isotopic analysis shall be performed on the individual samples.
f.	Gamma isotopic analysis means the identification and quantification of gamma-emitting radionuclides that may be attributable to the effluents from the facility.
g.	The "upstream sample" shall be taken at a distance beyond significant influence of the discharge. The "downstream" sample shall be taken in an area near the mixing zone.
h.	Well water samples shall be taken when this source is tapped for drinking or irrigation purposes in areas where the hydraulic gradient or recharge properties are suitable for contamination.
i.	In the event elevated analyses are reported by CV for gamma isotopic or tritium, a review will be conducted with the option to retest additional analysis for hard to detect isotopes or alpha emitters. The additional test may include Fe-55, Ni-63, or alpha emitters anticipated on current plant conditions.
j.	Two samples to be collected, Raw and Treated
k.	See Regulatory Guide 4.1, Revision 2. Broad leaf vegetation, as well as grass, soil, and cattle feed, are a sufficient substitute if milk samples are not performed.

Table 2.2.1-B							
Type and Frequency of Collection							
Location	Weekly	Monthly	Quarterly		Semi-Annually		Annually
K-1b			SW	GR ^a			
K-1c					SS ^b		
K-1d			SW				FI ^c
K-1e			SW				
K-1f	AP ^g		GR ^a	TLD	SO		
K-1h			WW				
K-1j					SS ^b		
K-1m			TLD				
K-1o			TLD				
K-1q			TLD				
K-1r			TLD				
K-1t			WW				
K-1u			WW				
K-2	AP ^g		TLD				
K-3			GR ^a	TLD	SO		CF ^d
K-5			GR ^a	TLD			
K-8	AP ^g		TLD				
K-9			SW ^f		SS ^b		
K-13			WW				
K-17			TLD				
K-23a							BLV ^e
K-23b							BLV ^e
K-25			TLD				
K-26							BLV ^e
K-27			TLD				
K-30			TLD				
K-34			GR ^a		SO		CF ^d
K-35			GR ^a		SO		CF ^d
K-38			GR ^a		SO		CF ^d
K-39			GR ^a	TLD			
K-43	AP ^g		TLD				
K-45							CF ^d

Table Notations for Table 2.2.1-B

- a. Three times a year, second (April, May, June), third (July, August, September), and fourth (October, November, December) quarters
- b. To be collected in May and November
- c. Annually in third quarter (July, August, or September)
- d. First (January, February, March) quarter only
- e. Alternate since milk sampling is no longer performed
- f. Two samples, raw and treated
- g. The frequency may be increased dependent on the dust loading.

<u>Code</u>	<u>Description</u>	<u>Code</u>	<u>Description</u>	<u>Code</u>	<u>Description</u>
AP	Airborne Particulate	GR	Grass	SW	Surface Water
CF	Cattle feed	SO	Soil	WW	Well Water
FI	Fish	SS	Shoreline Sediment		
BLV	Broad Leaf Vegetation	TLD	Thermo-luminescent Dosimeter		

Table 2.2.1-C Sampling Locations, Kewaunee Power Station			
Code	Type^a	Distance (Miles)^b and Sector	Location
K-1			Onsite – generic code
K-1b	I	0.12 N	Middle Creek 87°32'8.62"W 44°20'44.80"N
K-1c	I	0.10 N	500' North of Condenser Discharge 87°32'4.21"W 44°20'39.76"N
K-1d	I	0.10 E	Condenser Discharge 87°32'1.87"W 44°20'32.71"N
K-1e	I	0.12 S	South Creek 87°32'5.03"W 44°20'25.04"N
K-1f	I	0.12 S	Maintenance Waste Oil and Material Storage Building 87°32'14"W 44°21'26"N
K-1h	I	0.12 NW	North Well 87°32'18.05"W 44°20'39.15"N
K-1j	I	0.10 S	500' south of Condenser Discharge 87°31'58.75"W 44°20'29.33"N
K-1m	I	0.15 N	ISFSI East 87°32'8.78"W 44°20'37.13"N
K-1o	I	0.16 N	ISFSI North 87°32'9.19"W 44°20'40.11"N
K-1q	I	0.16 N	ISFSI West 87°32'13.41"W 44°20'39.86"N
K-1r	I	0.13 N	ISFSI West 87°32'14.25"W 44°20'39.09"N
K-1t	I	0.10 ESE	Gatehouse 87°32'4.47"W 44°20'30.79"N
K-1u	I	0.05 SSW	Maintenance Building 87°33'21"W 44°21'19"N
K-2	C	8.91 NNE	WPS Operations Building in Kewaunee 87°29'59.62"W 44°28'25.49"N
K-3 ^f	I/C	5.9 N	Lyle and John Siegmund Farm, N2815 Hwy 42, Kewaunee 87°32'35.98"W 44°25'39.21"N
K-5	I	3.2 NNW	Ed Paplham Farm, E4160 Old Settlers Rd, Kewaunee 87°33'47.10"W 44°23'2.83"N

Table 2.2.1-C Sampling Locations, Kewaunee Power Station			
Code	Type^a	Distance (Miles)^b and Sector	Location
K-8	I	4.85 WSW	Saint Isadore the Farmer Church, 18424 Tisch Mills Rd, Tisch Mills 87°37'50.85"W 44°19'18.48"N
K-9	C	11.5 NNE	Green Bay Municipal Pumping Station, six miles east of Green Bay (sample source is Lake Michigan from Rostok Intake 2 miles north of Kewaunee) 87°46'16.94"W 44°29'16.55"
K-13	C	3.0 SSW	Rand's General Store, Two Creeks 87°33'48.23"W 44°18'8.69"N
K-17	I	4.0 W	Klimesh's Farm, N885 Cty Tk B, Kewaunee 87°36'47.52"W 44°21'21.62"N
K-23a	I	0.5 W	0.5 miles west of plant, Kewaunee site 87°32'3.38"W 44°21'12.12"N
K-23b	I	0.6N	0.6 miles north of plant, Kewaunee site 87°32'43.93"W 44°20'32.36"N
K-25	I	1.9 SW	Wotachek Farm, E3968 Cty Tk BB, Two Rivers 87°34'10.67"W 44°19'38.81"N
K-26 ^c	C	9.1 SSW	Wilfert's Vegetable Stand 7528 Manitou Dr., Two Rivers 87°39'3.75"W 44°11'21.60"N
K-27	I	1.53 NW	Schleis Farm, E4298 Sandy Bay Rd 87°33'6.93"W 44°21'22.96"N
K-30	I	0.8 N	End of site boundary 87°32'2.61"W 44°21'12.86"N
K-34	I	2.7 N	Leon & Vicky Struck Farm, N1549 Lakeshore Dr, Kewaunee 87°31'14.33"W 44°22'48.13"N
K-35 ^d	C	6.71 WNW	Duane Ducat Farm, N1215 Sleepy Hollow, Kewaunee 87°40'1.53"W 44°22'10.90"N
K-38	I	2.45 WNW	Dave Sinkula Farm, N890 Town Hall Road, Kewaunee 87°34'56.92"W 44°21'22.64"N
K-39	I	3.46 N	Francis Wotja Farm, N1859 Lakeshore Road, Kewaunee 87°31'14.28"W 44°23'28.25"N
K-43 ^e	I	2.71 SSW	Gary Maigatter Property, 17333 Highway 42, Two Rivers 87°33'42.99"W 44°18'26.63"N

Table 2.2.1-C Sampling Locations, Kewaunee Power Station			
Code	Type^a	Distance (Miles)^b and Sector	Location
K-45	I	5.1 N	Wakker's Dairy, N2348 Highway 42, Kewaunee 87°32'29.76"W 44°24'32.5"N

Table Notations for Table 2.2.1-C

- a. I = indicator; C = control.
- b. Distances are measured from reactor stack.
- c. Location K-18 was changed because Schmidt's Food Stand went out of business. It was replaced by Bertler's Fruit Stand (K-26). It was replaced with Sandy's Vegetable in 2007. The location as of 2009 is Wilfert's Vegetable Stand.
- d. Removed from the program in fall of 2001, back to program in August 2008.
- e. K-7 moved to a nearby location and relabeled K-43, within 0.2 miles of original, August/September 2010.
- f. Location K-3 is an indicator for ambient radiation and a control for soil, cattle feed, and grass.

Table 2.2.1-D Reporting Levels for Radioactivity Concentrations in Environmental Samples			
Medium	Radionuclide	Reporting Levels	
		CV to KPS ^a	KPS to NRC ^b
Airborne Particulate (pCi/m ³)	Gross Beta	1	--
	Cs-134	1	10
	Cs-137	1	20
Water (pCi/l)	Gross Alpha	10	--
	Gross Beta	30	--
	H-3	10,000	20,000 ^c
	Mn-54	100	1,000
	Co-60	30	300
	Cs-134	10	30
	Cs-137	20	50
	Sr-90	8 ^d	--
Grass, Cattle Feed, and Broad Leaf Vegetation (pCi/g wet)	Gross Beta	30	--
	Cs-134	0.2	1
	Cs-137	0.2	2
	Sr-90	1	--
Soil, Shoreline Sediments (pCi/g)	Gross Beta	50	--
	Cs-134	5	--
	Cs-137	5	--
	Sr-90	5	--
Fish (pCi/g wet)	Gross Beta (Flesh, Bones)	10	--
	Mn-54	--	30.0
	Co-60	--	10.0
	Cs-134 (Flesh)	1	1.0
	Cs-137 (Flesh)	2	2.0
	Sr-90 (Bones)	2	--

- Radionuclides will be monitored by the CV and concentrations above the listed limits will be reported to KPS.
- Concentrations above the listed limits will be reported to NRC as required by REMM 2.2.1.b.
- For drinking water samples, this is 40CFR Part 141 value. If no drinking water pathway exists, then a value of 30,000 pCi/l may be used.
- The Sr-90 values are based on the EPA drinking water standards. See note "e" of Table 2.3.1-A for further information

Table 2.3.1-A
Detection Capabilities for Environmental Sample Analysis^a
Lower Limit of Detection (LLD) ^{b,c}

Analysis	Water (pCi/l)	Airborne Particulate (pCi/m ³)	Fish (pCi/kg, wet)	Food Products (pCi/kg, wet)	Sediment (pCi/kg, dry)
Gross Beta	4	0.01			
H-3	2000 ^d				
Mn-54	15		130		
Co-60	15		130		
Cs-134	15	0.05	130	60	150
Cs-137	18	0.06	150	80	180
Sr-90 ^e	5				

Table Notations for Table 2.3.1-A

- a. This list does not mean that only these nuclides are to be considered. Other peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Annual Radiological Environment Operating Report.
- b. Required detection capabilities for thermoluminescent dosimeters used for environmental measurements are given in Regulatory Guide 4.13.
- c. The LLD is defined, for purposes of these requirements, as the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation:

$$LLD = \frac{4.66s_b}{E \times V \times 2.22 \times Y \times e^{-\lambda \Delta t}}$$

Where:

LLD is the a priori lower limit of detection as defined above, as picocuries per unit mass or volume,

s_b is the standard deviation of the background counting rate or of the counting rate of blank sample as appropriate, as counts per minute,

E is the counting efficiency, as counts per disintegration,

V is the sample size in units of mass or volume,

2.22 is the number of disintegrations per minute per picocurie,

Y is the fractional radiochemical yield, when applicable,

λ is the radioactive decay constant for the particular radionuclide, and

Δt for environmental samples is the elapsed time between sample collection, or end of the sample collection period, and time of counting,

Typical values of E, V, Y, and Δt should be used in calculation.

Table Notations for Table 2.3.1-A (con't)

It should be recognized that the LLD is defined as a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement. Analyses shall be performed in such a manner that the stated LLDs will be achieved under routine conditions. Occasionally background fluctuations, unavoidable small sample sizes, the presence of interfering nuclides, or other uncontrollable circumstances may render these LLDs unachievable. In such cases, the contributing factors shall be identified and described in the Annual Radiological Environmental Operating Report.

- d. If no drinking water pathway exists, a value of 3,000 pCi/l may be used.
- e. This is NOT a NUREG-0472 required value. It is based on EPA drinking water standards, which tie into the NEI Groundwater Protection Initiative that was implemented at KPS on August 4, 2006.

FIGURE 1

FIGURE 1
ENVIRONMENTAL SAMPLING LOCATION

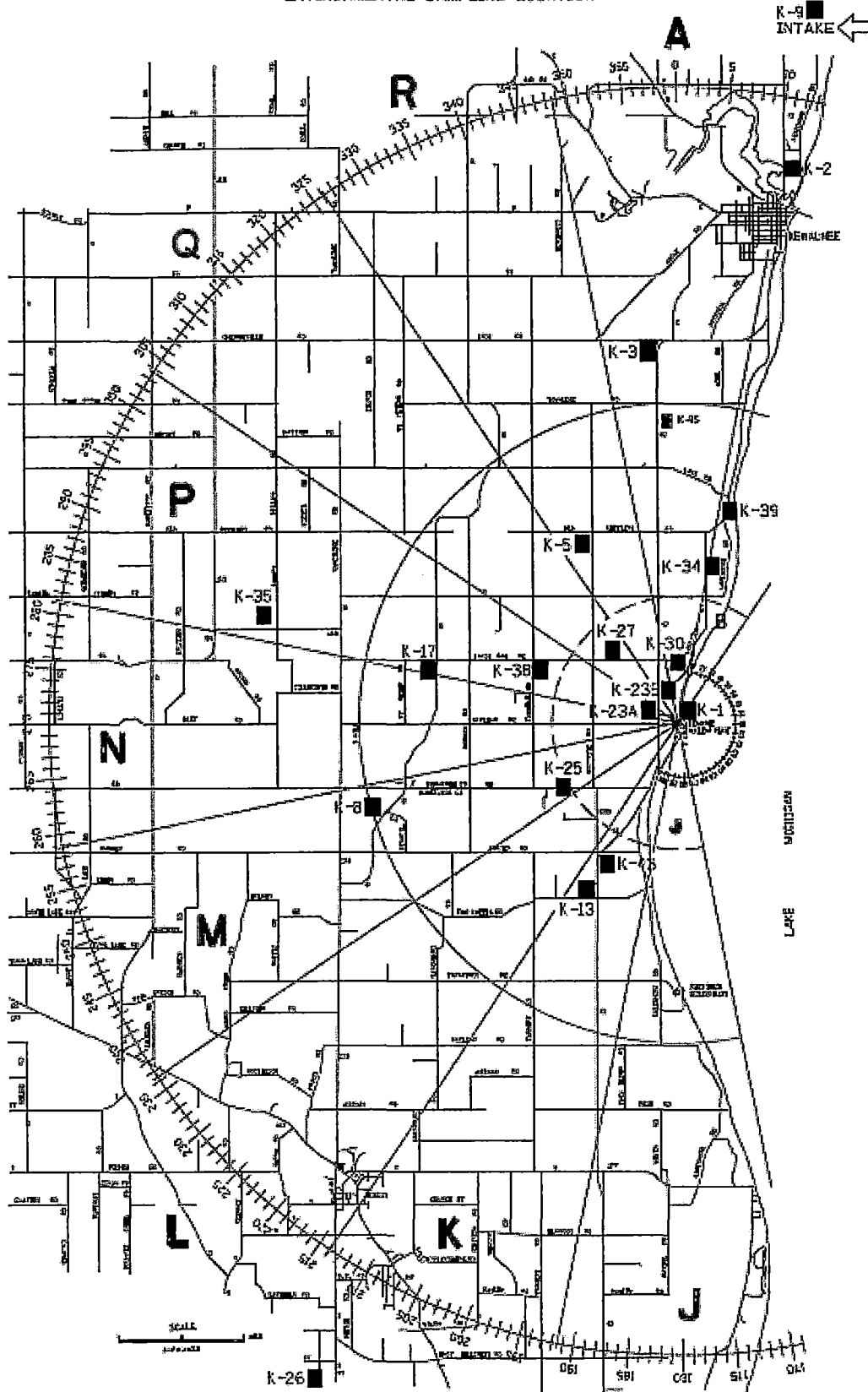


FIGURE 2

NOTES:

1. LOCATIONS OF MONITORING WELLS SURVEYED BY STS ON JUNE 21, 2007.
2. LOCATIONS OF WATER SUPPLY WELLS ARE ESTIMATED.
3. COORDINATES ARE IN NAD 1983 WISCONSIN STATE PLANE CENTRAL.

LEGEND:

- 6" HIGH FENCE
- ⊙ SUPPLY WELL
- ⊕ MONITORING WELL

FIGURE 2
WELL LOCATIONS

LOCATION	NORTHING	EASTING	ELEVATION
MW-0701 GROUND	195,059.5	2,644,681	605.528
MW-0701 TPVC	195,059	2,644,681	605.677
MW-0702 GROUND	195,372.1	2,644,036	607.597
MW-0702 TPVC	195,372.6	2,644,097	607.305
MW-0703 GROUND	194,761.4	2,644,855	603.112
MW-0703 TPVC	194,762.3	2,644,855	602.685
MW-0704 GROUND	194,956.2	2,644,265	608.915
MW-0704 TPVC	194,958.7	2,644,265	608.502
MW-0705 GROUND	195,264.4	2,644,927	603.339
MW-0705 TPVC	195,264.4	2,644,927	604.912
MW-0706 GROUND	195,481.2	2,644,555	605.407
MW-0706 TPVC	195,481.2	2,644,555	605.597
AB 0707 GROUND	195,481	2,644,563	605.052
AB 0707 TPVC	195,460.4	2,644,563	605.673
AB 0708 GROUND	195,451.3	2,644,550	605.035
AB 0708 TPVC	195,451	2,644,525	605.5165
AB 0709 GROUND	195,448.3	2,644,493	605.1195
AB 0709 TPVC	195,448	2,644,493	605.2533
AB 0710 GROUND	195,429.7	2,644,450	606.1493
AB 0710 TPVC	195,429.2	2,644,450	605.5572
AB 0711 GROUND	195,421.1	2,644,417	605.5548
AB 0711 TPVC	195,420.9	2,644,417	605.4393
AB 0712 GROUND	195,412.4	2,644,367	605.5062
AB 0712 TPVC	195,412	2,644,356	605.1851
AB 0713 GROUND	195,156.2	2,644,512	605.1333
AB 0713 TPVC	195,155.4	2,644,512	605.4239
AB 0717 GROUND	195,503.1	2,644,690	605.4198
AB 0717 TPVC	195,503.7	2,644,690	605.2917

