LACROSSE SOLUTIONS

10 CFR 50.36(a)(2)

February 16, 2017 LC-2017-0016

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

La Crosse Boiling Water Reactor
Facility Operating License No. DPR-45
NRC Docket Nos. 50-409 and 72-046

Subject: La Crosse Boiling Water Reactor (LACBWR) Annual Radioactive Environmental Monitoring Report and Radioactive Effluent Release Report

In accordance with Facility Operation License No. DPR-45, Quality Assurance Program Description (QAPD) Appendix C, Section 2.5.1, "Annual Radiological Environmental Monitoring Report," and Section 2.5.2, "Annual Radioactive Effluent Release Report," this letter submits these reports for the year 2016. The reports are required to be submitted prior to March 1 per QAPD Appendix C, Section 2.5 "Reporting Requirements," and are provided as enclosures to this letter.

The Radiological Effluent Release Report also contains changes to the Process Control Program (PCP) and the Offsite Dose Calculation Manual (ODCM) per the requirements of QAPD Appendix C, Section 2.1, "Process Control Program," and Section 2.2, "Offsite Dose Calculation Manual," respectively. The current PCP and ODCM are provided as enclosures to this letter.

There are no new regulatory commitments in this submittal.

If you have any questions about this submittal please contact Mr. Joseph Jacobsen at (608) 689-4259.

Respectfully,

Gerard van Noordennen

Gerard van Noordennen
Vice President Regulatory Affairs

Attachments:

1. LACBWR Annual Radiological Environmental Operating Report
2. LACBWR Offsite Dose Calculation Manual
3. LACBWR Process Control Program

IE48
NMSS01
NMSS26
NMSS

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Attachment 1

LACBWR Annual Radiological Environmental Operating Report

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

FOR THE
LA CROSSE BOILING WATER REACTOR (LACBWR)

(January 1 to December 31, 2016)

LACROSSE*SOLUTIONS*
4601 STATE HIGHWAY 35
GENOA, WI 54632

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SECTION A

RADIOACTIVE EFFLUENT REPORT

INTRODUCTION

The La Crosse Boiling Water Reactor (LACBWR), also known as Genoa Station No. 2, is located on the east bank of the Mississippi River near Genoa, Vernon County, Wisconsin. The plant was designed and constructed by the Allis-Chalmers Manufacturing Company. It was completed in 1967 and had a generation capacity of 50 MW (165 $MW_{(th)}$). The reactor is owned by Dairyland Power Cooperative (DPC).

The reactor went critical in July 1967 and first contributed electricity to the DPC system in April 1968. After completing full power tests in August 1969, the plant operated between 60% and 100% full power, with the exception of plant shutdowns for maintenance and repair until 1987.

In April of 1987 plant operation was ceased. The reactor was defueled and placed in a SAFSTOR mode. In August of 1987 a possession-only license was received. In 2007 the reactor vessel was removed from the site and buried at the Barnwell waste repository. In 2012 all spent fuel was placed in dry storage and placed at the LACBWR Independent Spent Fuel Storage Installation (ISFSI).

In June of 2016 DPC, working with the selected decommissioning contractor LaCrosseSolutions LLC, transferred their NRC License to LaCrosseSolutions LLC for the purposes of decommissioning the site to unconditional release criteria, per license termination plan criteria.

In accordance with LC-RP-PG-004 "Radiological Environmental Monitoring Program and Preparation of the Annual Radiological Environmental Operating Report", this document is the Annual Radiological Environmental Operating Report (AREOR) for the Period January 1 through December 31, 2016.

EFFLUENT AND WASTE DISPOSAL REPORT

(Supplemental Information)

FACILITY: La Crosse Boiling Water Reactor LICENSEE: LaCrosse*Solutions*

LICENSE NO. DPR-45

DOCKET NO. 50-409

1.0 REGULATORY LIMITS

1.1 Airborne Effluent Release Limits:

LACBWR airborne particulates, with half-lives greater than 8 days, released to areas beyond the Effluent Release Boundary shall be limited to </= 7.5 mRem to any organ per calendar quarter and </= to 15 mRem to any organ per calendar year.

Also, in accordance with the provisions of 40 CFR 190, the restrictions for total dose to any member of the public from all LACBWR related sources and dose pathways are evaluated quarterly and on an annual basis.

1.2 Liquid Effluent Release Limits:

LACBWR's liquid effluent release limitations are those concentrations specified in 10 CFR 20 Appendix B, Table 2, Column 2. The values reported in Tables 2A and 2B, Liquid Effluents (this report), are based on dilution of the effluent with the Genoa Station No. 3 condenser cooling water flow prior to discharge to the Mississippi River. No credit is taken for further dilution in the mixing zone of the Mississippi River.

Also, in accordance with 10 CFR 50, Appendix I, the dose commitment to a member of the public from radioactive materials released in liquid effluents to

areas beyond the Effluent Release Boundary are limited to less than 1.5 mRem whole body and 5.0 mRem organ dose per calendar quarter, and less than 3.0 mRem whole body and 10 mRem organ dose per calendar year via the critical ingestion pathway.

In accordance with the provisions of 40 CFR 190, the restrictions for total dose to any member of the public from all LACBWR related sources and dose pathways are evaluated quarterly and on an annual basis.

1.3 Solid Radioactive Waste

All solid radioactive wastes are handled in accordance with a Process Control Program as defined by LaCrosseSolutions, LLC procedures, in order to assure that all applicable transportation and burial site disposal requirements are met.

2.0 EFFLUENT RELEASE CONCENTRATION LIMIT

The Effluent Release Concentration used to calculate permissible release rates are obtained from 10 CFR 20, Appendix B, Table 2, Column 2.

3.0 AVERAGE ENERGY

The release rate limits for LACBWR are not based on average energy.

4.0 ANALYTICAL METHODS

4.1 Liquid Effluents

Liquid effluent measurements for gross radioactivity are performed by HPGe gamma isotopic analysis of a representative sample from each tank prior to discharge. In addition, each batch discharge tank sample is analyzed for alpha and tritium activity concentrations using site approved bench top analysis equipment. A composite sample is created by collecting representative aliquots from each tank batch discharged during a calendar quarter. This composite is analyzed for Iron-55 and Strontium-90 by an off-site contractor on a quarterly basis.

4.2 Airborne Particulates

Airborne particulate releases are determined by HPGe gamma isotopic analysis and gross beta analyses of glass fiber filter paper taken from low volume air samplers. The air samplers either continuously monitor the air from areas outside of the RCA or low volume air monitors are specifically set up in predominant downwind pattern locations outside the RCA, for evaluation of outside work activities during decommissioning work. This filter is changed and analyzed on an approximate bi-

weekly basis and typically analyzed approximately 7 days after removal, to minimize interference from radon progeny. The glass fiber filters are also analyzed for alpha activity for outside work activities during decommissioning activities.

5.0 BATCH RELEASES

5.1 Airborne

The LACBWR stack was not operated during CY 2016 and therefore there were no stack airborne releases. In fact, during the start of decommissioning the stack dismantlement was initiated. Routine low volume air sampling was initiated in July of 2016 at four locations outside the RCA in the predominant typical downwind locations, to be used for environmental monitoring purposes. Two of the environmental air monitors are located on the DPC site and two monitors are located off site, collocated with State of Wisconsin environmental air samplers. The two air monitors located on the DPC site are also used for routine evaluation of potential ground level type releases due to site decommissioning work. There were no outside work activities during the calendar year such as significant facility demolition or operation of HEPA exhaust systems to outside areas that warranted the set-up of additional low volume air monitoring equipment to evaluate ground level type releases.

5.2 Liquid

All liquid effluent releases at LACBWR are batch releases as described in the ODCM. This is summarized as follows:

(1)	Number of Batch Releases:	30
(2)	Total Time Period for Batch Releases:	157.3 hours
(3)	Maximum Time Period for a Batch Release:	8.0 hours
(4)	Average Time Period for a Batch Release:	5.24 hours
(5)	Minimum Time Period for a Batch Release:	1.5 hours
(6)	Average Stream Flow Rate During Periods of Release of Effluent into a Flowing Stream:	90,000 ft^3/sec

6.0 ABNORMAL RELEASES

There were no abnormal releases of radioactivity in plant effluents.

7.0 ESTIMATED TOTAL ANALYTICAL ERROR

The reported analytical results contain the following estimated errors:

Counting Error 95% Confidence Level

Sampling Volume Error ± 5%.

EFFLUENT AND WASTE DISPOSAL REPORT

TABLE 1A

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT 2016

AIRBORNE PARTCULATE EFFLUENTS – SUMMATION OF ALL RELEASES

		UNIT	QTR 1	QTR 2	QTR 3	QTR 4	TOTAL
A.	**PARTICULATES**						
1.	BETA-GAMMA PARTICULATES WITH HALF-LIVES > 8 DAYS	Ci	0	0	0	0	0
2.	AVERAGE RELEASE RATE FOR PERIOD	µCi/ Sec	0	0	0	0	
3.	GROSS ALPHA RADIOACTIVITY	Ci	0	0	0	0	0
B.	**PERCENTAGE OF ODCM DOSE LIMITS FOR PARTICULATE EFFLUENT RELEASES**						
			QTR	QTR	QTR	QTR	YEARLY
1.	ALL RADIONUCLIDES IN PARTICULATE FORM WITH HALF-LIVES GREATER THAN 8 DAYS						
	Highest Organ % Limit	%	0	0	0	0	0

TABLE 1B

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT 2016

AIRBORNE PATICULATE EFFLUENTS –GROUND LEVEL RELEASE

			CONTINUOUS OR BATCH MODE				
		UNIT	QTR	QTR	QTR	QTR	TOTAL
NUCLIDES RELEASED							
1.	PARTICULATES						
	Gross Alpha	Ci	0	0	0	0	0
	CESIUM-134	Ci	0	0	0	0	0
	CESIUM-137	Ci	0	0	0	0	0
	COBALT-60	Ci	0	0	0	0	0
	MANGANESE-54	Ci	0	0	0	0	0
	ZINC-65	Ci	0	0	0	0	0
	TOTALS	Ci	0	0	0	0	0

EFFLUENT AND WASTE DISPOSAL REPORT

TABLE 2A

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT 2016

LIQUID EFFLUENTS – SUMMATION OF ALL RELEASES

		UNIT	QTR	QTR	QTR	QTR	TOTAL
A	**FISSION & ACTIVATION PRODUCTS**						
1.	TOTAL RELEASE (NOT INCL. TRITIUM, GASES, ALPHA)	Ci	1.50E-04	7.44 E-04	1.48E-03	8.11E-05	2.46E-03
2.	AVERAGE DILUTED CONCENTRATION DURING PERIOD	µCi/ ml	1.20E-10	5.68E-09	8.77E-10	2.92E-09	
B.	**TRITIUM**						
1.	TOTAL RELEASE	Ci	6.11E-06	5.04E-04	1.01E-04	1.63E-05	6.27E-04
	AVERAGE DILUTED CONCENTRATION DURING PERIOD	µCi/ ml	5.44E-11	2.49E-08	6.04E-10	4.34E-09	
C.	**DISSOLVED AND ENTRAINED GASES – no releases - no longer analyzed for.**						
D.	**GROSS ALPHA RADIOACTIVITY**						
1.	TOTAL RELEASE	Ci	1.33E-06	7.27E-07	4.07E-06	2.49E-06	8.61E-06
E.	**VOLUME OF WASTE RELEASED (PRIOR TO DILUTION)**	Liters	1.78E+04	4.85E+03	1.89E+05	9.93E+4	3.11E+05
F.	**VOLUME OF DILUTION WATER USED DURING PERIOD**	Liters	1.12E+08	2.02E+07	1.66E+08	3.65E+06	3.02E+08
G.	**PERCENTAGE OF ODCM LIMITS FOR LIQUID RELEASES**						
			QTR	QTR	QTR	QTR	YEARLY
	HIGHEST ORGAN	%	0.13%	0.78%	8.14%	14.64%	11.84%
	WHOLE BODY	%	0.24%	1.65%	17.46%	13.23%	16.29%

EFFLUENT AND WASTE DISPOSAL REPORT

TABLE 2B

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT 2016

LIQUID EFFLUENTS

NUCLIDES RELEASED	UNIT	QTR-1	QTR-2	QTR-3	QTR-4
MN-54	Ci	0.0	0.0	0.0	0.0
IRON -55	Ci	0.0	0.0	0.0	0.0
ZINC-65	Ci	0.0	0.0	0.0	0.0
COBALT-60	Ci	1.02E-05	1.58E-06	1.02E-05	1.58E-06
STRONTIUM-90	Ci	4.25E-05	1.90E-05	9.51E-05	6.65E-05
CESIUM-137	Ci	8.67E-05	7.23E-04	1.37E-03	1.30E-05
CESIUM-134	Ci	0.0	0.0	0.0	0.0
TOTAL FOR PERIOD (ABOVE)	Ci	1.50E-04	7.44E-04	1.48E-03	8.11E-05

TABLE 3

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT – 2016

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. SOLID WASTE SHIPPED OFFSITE FOR DISPOSAL (Not Irradiated Fuel)

1. TYPE OF WASTE	UNIT	1st 6-MONTH PERIOD	2nd 6-MONTH PERIOD	TOTAL
a. Spent resins, filter sludges, evaporator bottoms, etc.	m^3	0	0	0
	Ci	0	0	0
b. Dry compressible waste, contaminated equipment, etc.	m^3	0.00	508.4	508
	Ci	0.00	0.413	0.413
c. Irradiated components, control rods, etc.	m^3	0.00	0	0
	Ci	0.00	0	0
d. Other	m^3	0	0.00	0
	Ci	0	0.00	0

2. ESTIMATE OF MAJOR NUCLIDE COMPOSITION (BY TYPE OF WASTE)	PERCENT OF TOTAL	1st 6-MONTH PERIOD CURIES	2nd 6-MONTH PERIOD CURIES	Estimated Error Values %
Cs-137	50	0	0.206	+/- 10
Fe-55	22	0	0.090	+/- 10
Ni-63	13	0	0.053	+/- 10
Pu-241	8	0	0.034	+/- 10
Co-60	3	0	0.011	+/- 10

3. SOLID WASTE DISPOSITION

NO. OF SHIPMENTS	MODE OF TRANSPORTATION	DESTINATION
23	Rail	Clive, UT

B. IRRADIATED FUEL SHIPMENTS (DISPOSITION)

NO OF SHIPMENTS	MODE OF TRANSPORTATION	DESTINATION
NONE		

8.0 OFFSITE DOSE CALCULATIONS SUMMARY AND CONCLUSIONS:

Particulate Effluent Releases

The maximum quarterly offsite dose to any organ from the release of all radionuclides in particulate form with half-lives greater than 8 days was 0 mRem. The cumulative 2016 annual maximum organ dose from these radionuclides was also 0 mRem.

8.1 Liquid Effluent Releases

The maximum quarterly organ dose from liquid releases was approximately 7.32E-01mRem. The cumulative 2016 annual organ dose was approximately 1.18mRem. The maximum quarterly total body dose for liquid releases was approximately 2.62E-01mRem, and the cumulative 2016 annual total body dose was approximately 4.89E-01mRem.

8.2 Conclusion

All calculated offsite doses were below ODCM limits.

9.0 OFFSITE DOSE CALCULATION MANUAL (ODCM) REVIEW

LaCrosseSolutions issued Revision 0 and Revision1 to the ODCM with Revision 1 issued in August of 2016. The majority of the changes in Revision 1 were made to reflect the changes in the related environmental program and procedural documents which involved the addition of ambient direct radiation monitoring and environmental air sampling requirements.

10.0 PROCESS CONTROL PROGRAM (PCP) REVIEW

The LaCrosseSolutions PCP was issued as Revision 0 in November of 2016. The PCP addresses the waste management administrative and operational controls to be used by LaCrosseSolutions during the course of the decommissioning work to ensure the final waste product meets requirements of applicable federal, state, and disposal site waste requirements.

SECTION B

ANNUAL
RADIOLOGICAL
ENVIRONMENTAL MONITORING
REPORT

RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT

INTRODUCTION:

The Radiological Environmental Monitoring (REM) Program is conducted to comply with the requirements of the ODCM and in accordance with 10 CFR 50 Part 50.36a and 10 CFR 72.104. The REM Program provides measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides which could potentially lead to radiation doses to Members of the Public resulting from plant effluents. Environmental samples are taken within the surrounding areas of the plant and in selected control or background locations.

The monitoring program at the LACBWR facility includes monitoring of liquid and airborne particulate releases from the plant, as well as collecting environmental samples of surface air, river water, river sediment, and ambient radiation.

The REM program therefore supplements the Radioactive Effluent analyses 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 modeling of the environmental exposure pathways using the methodology of the Offsite Dose Calculation Manual (ODCM).

An Interlaboratory Comparison Program is provided to ensure that independent checks on the precision and accuracy of the measurements of radioactive material in environmental samples are performed.

1.0 SAMPLE COLLECTION

Environmental samples are collected from the area surrounding LACBWR at the frequencies outlined in the ODCM and the Environmental Monitoring Program. A series of figures and tables are included in this report to explain the LACBWR environmental program.

FIGURE 1	This map includes the plant exclusion boundary, roads, other generation plants, and the relationship of the plant to the nearest local community.
FIGURE 2	This map shows the location of the LACBWR RCA Fence Line Area Environmental TLD Locations.
FIGURE 3	These maps show the location of environmental low volume air sampler locations.
FIGURE 4	This map shows the location of ISFSI environmental TLDs.
TABLE 4	This table logs the environmental TLD locations at the ISFSI.
TABLE 5	This table shows the sampling frequency of the various environmental samples and the analyses performed on these samples
TABLE 6	This table shows the environmental air monitoring stations used in LACBWR's environmental program.
TABLE 7	This table logs the LACBWR environmental TLD locations.
TABLE 8	This table shows the number of various samples collected and analyzed during 2016.
TABLE 9	Quarterly Environmental TLD results for RCA Area around LACBWR
TABLE 10	Bi-Weekly Gross Beta Env. Air Sample Analysis Results

2.0 RESULTS OF THE 2016 RADIO-ENVIRONMENTAL MONITORING SURVEYS

During 2016, activity levels in the local environment were normal, indicating no significant plant attributed radioactivity.

2.1 PENETRATING RADIATION

The environmental penetrating radiation dose is measured by environmental TLDs.

2.1.1 LACBWR Plant - These environmental TLDs were changed on a quarterly basis starting in July 2016. The results for the LACBWR Plant from 2016 are shown on Table 9.

2.1.2 ISFSI – These environmental TLDs are changed on a quarterly basis. Table 14 results for 2016 are shown.

2.2 AIR PARTICULATE

Air samples were collected continuously from various sites (see Table 3) around LACBWR. Low volume particulate air samplers were used to collect air samples. The air filter consists of a glass fiber filter with an associated pore size of approximately 0.45 µm. The particulate filters were analyzed bi-weekly for gross beta activity with an internal proportional counter, as well as analyzed by gamma spectroscopy for individual isotopic concentration.

TABLE 10 This table shows the bi- weekly gross beta gamma activity concentration from the air particulate filters.

TABLE 11 This table shows the individual air sample particulate isotopic analysis results.

2.3 RIVER WATER

River water is collected semi-annually. River water samples before the intake structure, at plant outfall, and below the plant outfall

are collected and are gamma analyzed for isotopic concentration and tritium analysis. The river water gamma isotopic analysis results are shown in Table 12. The results indicate that there were no significant plant attributable radionuclides in the river water.

2.4 SEDIMENT SAMPLES

Sediment samples are collected semi-annually before the intake structure, at plant outfall, and below the plant outfall. These samples are gamma analyzed and these results appear on Table 13. They indicated that small amounts of plant-attributed radionuclides have accumulated in river sediments near the outfall. The amount of radionuclides in the sediment have declined significantly after plant shutdown. These amounts have remained relatively constant the last few years.

3.0 CONCLUSIONS

All environmental samples collected and analyzed during 2016 exhibited no significant contribution from LACBWR or ISFSI.

4.0 INTERLABORATORY COMPARISON PROGRAM RESULTS

During 2016, interlaboratory comparison samples were obtained from an outside contractor. The equipment used to analyze the environmental samples was tested against the contractors' results. The following are the results of these comparisons.

ANALYSIS	LACBWR RESULTS	CONTRACTOR RESULTS	RATIO
GROSS BETA	243 pCi	232 pCi	1.05
GROSS ALPHA	101 pCi	116 pCi	0.87
I-131	99 pCi/l	91.8 pCi/l	1.08
Cr-51	295 pCi/l	271 pCi/l	1.09
Cs-134	159 pCi/l	173 pCi/l	0.92
Cs-137	188 pCi/l	122 pCi/l	1.54
Co-58	153 pCi/l	142 pCi/l	1.08
Mn-54	142 pCi/l	125 pCi/l	1.13
Fe-59	139 pCi/l	121 pCi/l	1.15
Zn-65	281 pCi/l	236 pCi/l	1.19
Co-60	189 pCi/l	172 pCi/l	1.10
H-3	13000 pCi/l	11900 pCi/l	1.10

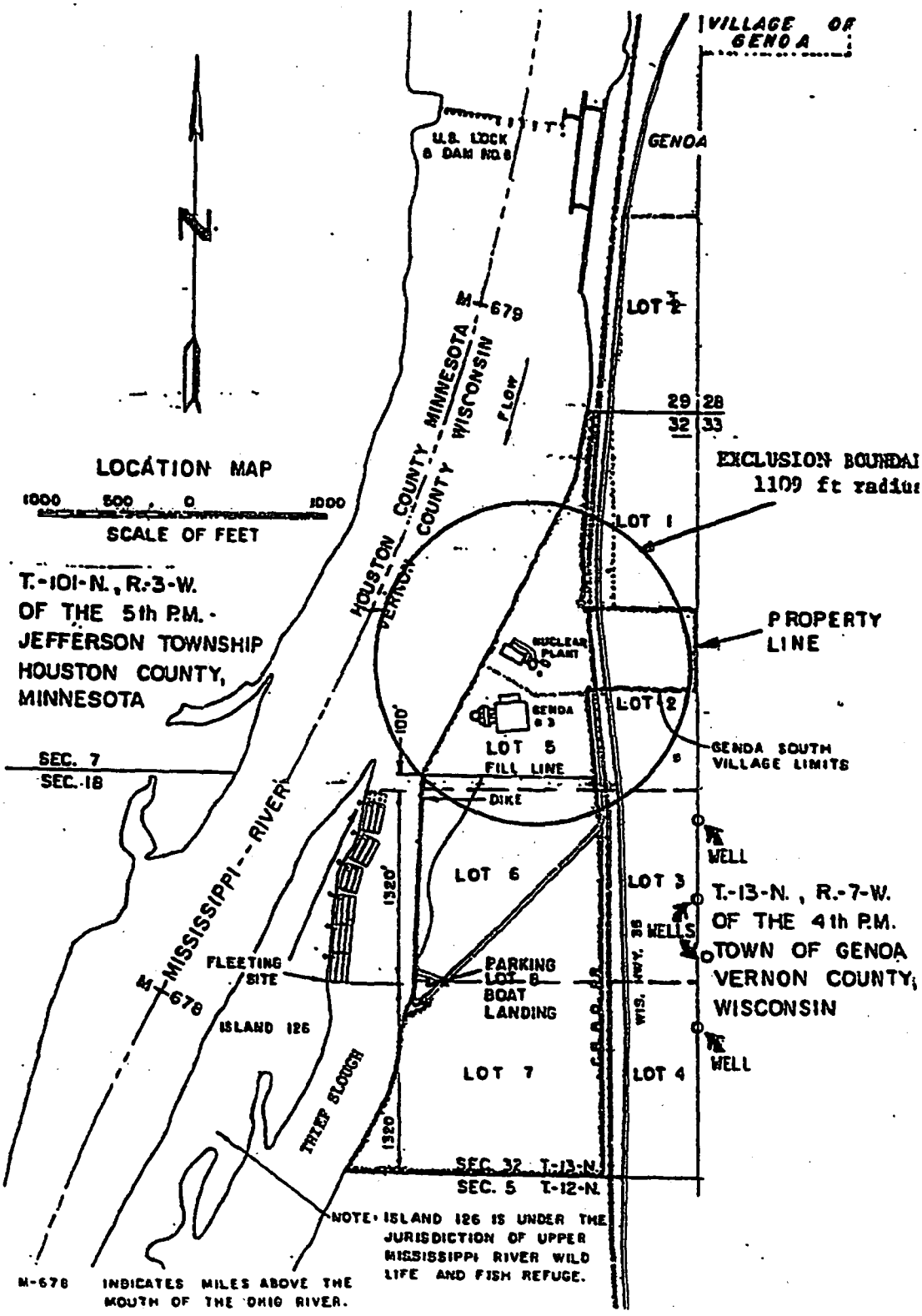

FIGURE 1 - LACBWR PROPERTY MAP

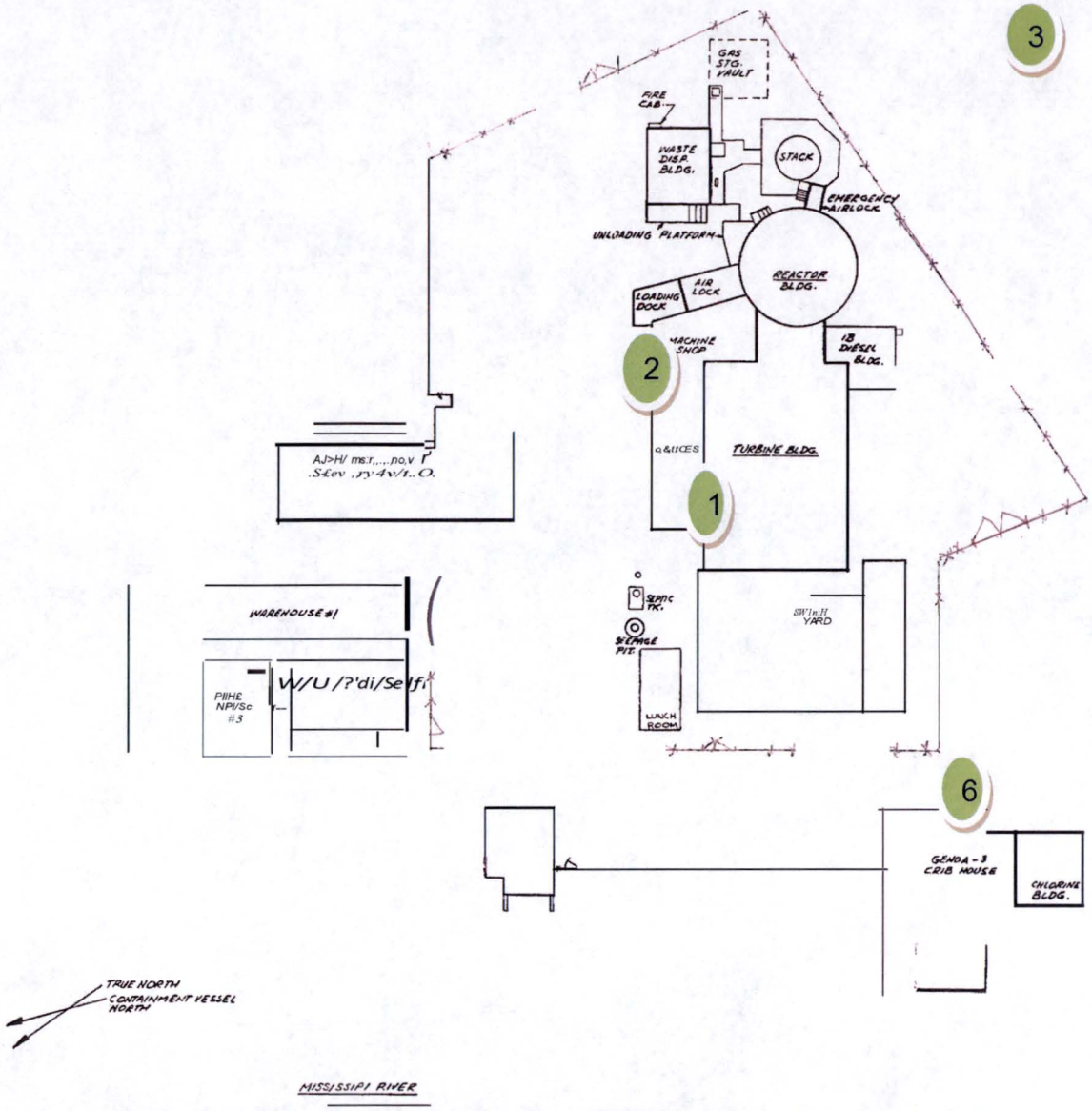

FIGURE 2 – LACBWR RCA FENCE LINE ENVIRONMENTAL TLD LOCATIONS

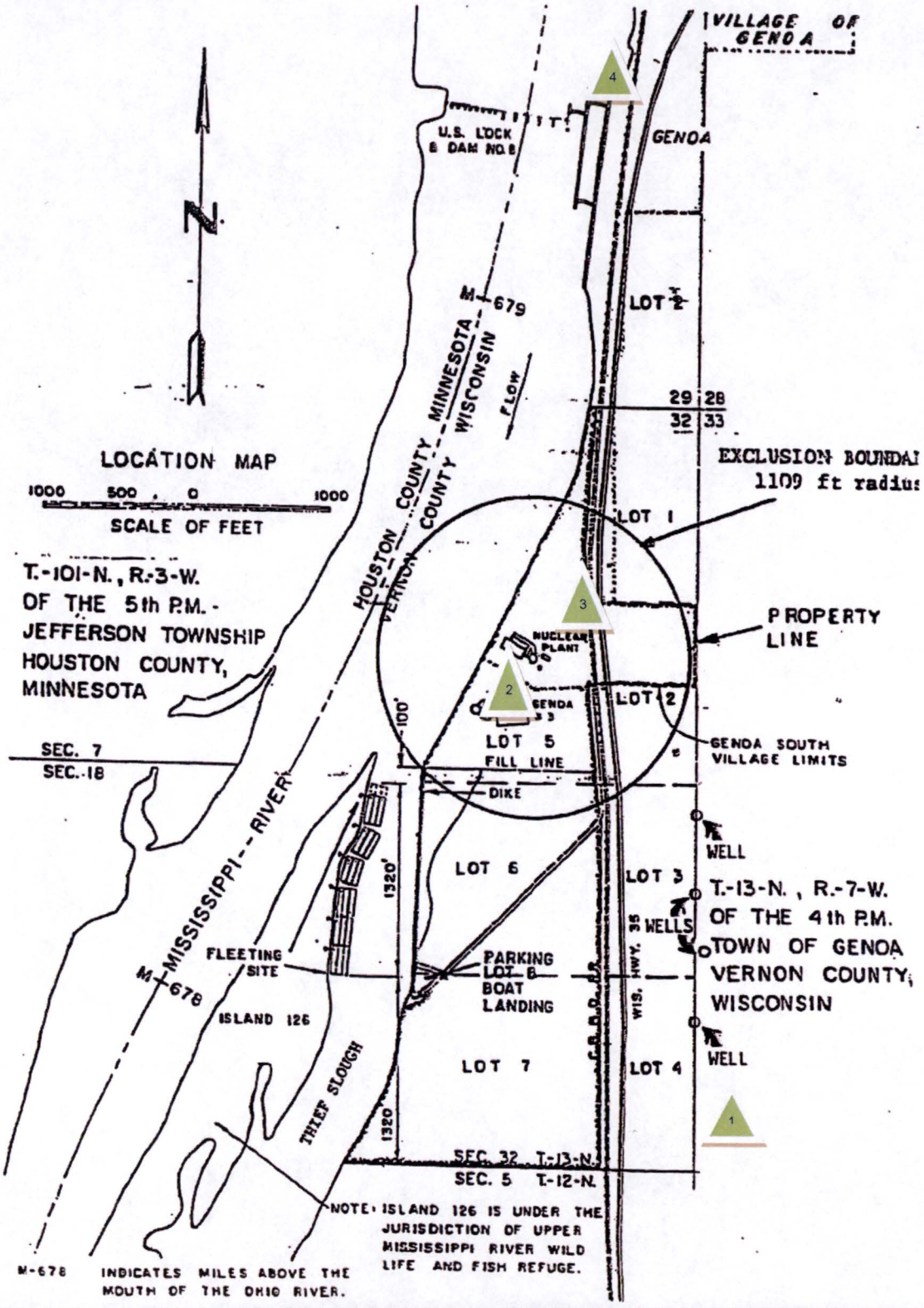

FIGURE 3 - LACBWR ENVIRONMENTAL LOW VOLUME AIR SAMPLER LOCATIONS

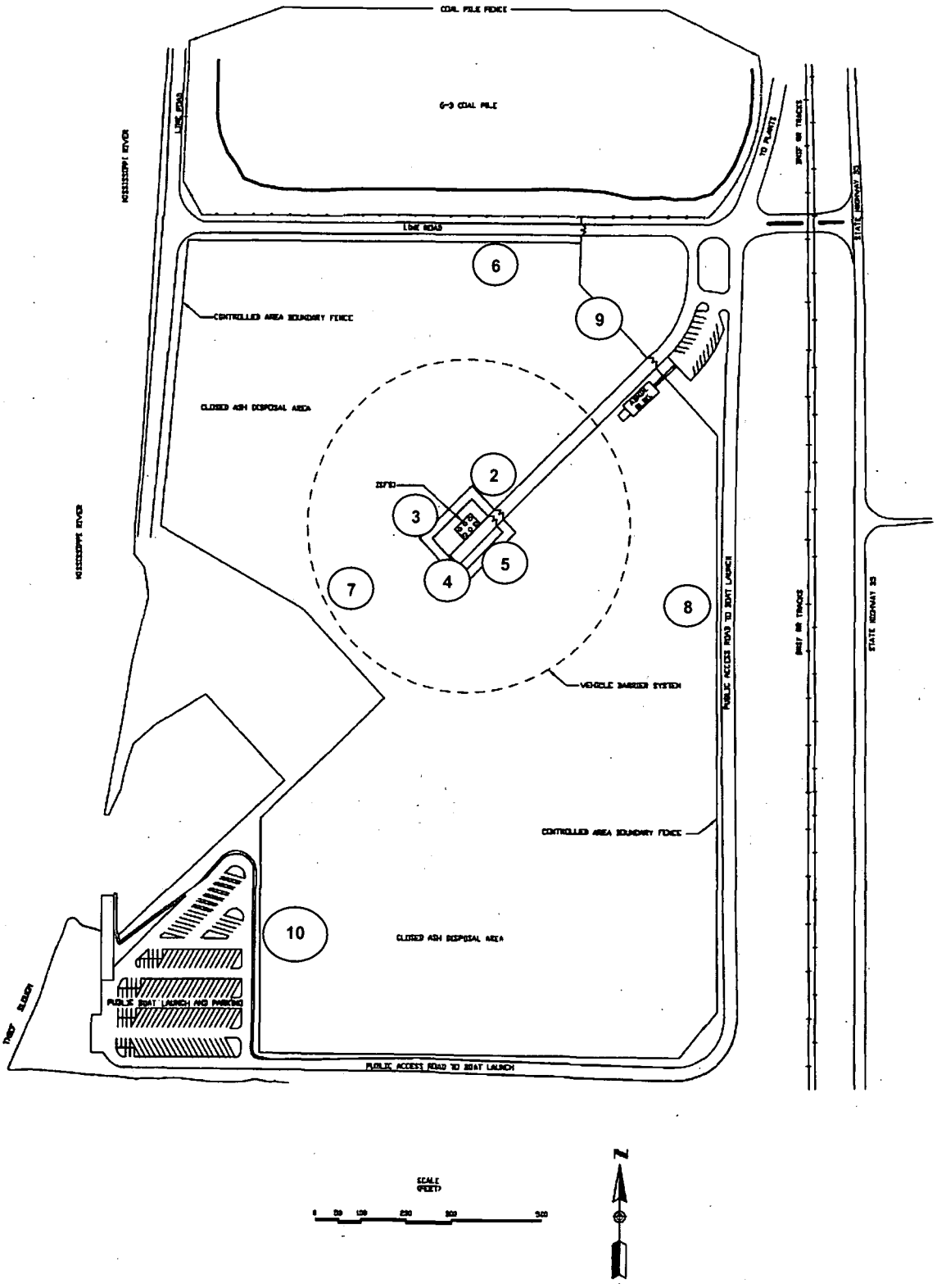

FIGURE 4 - ISFSI ENVIRONMENTAL TLD LOCATIONS

TABLE 4

ISFSI ENVIRONMENTAL DIRECT RADIATION BADGE LOCATIONS

LOCATION NO.	LOCATION
1	ISFSI ADMINISTRATIVE BUILDING WEST
2	ISFSI PROTECTED AREA NORTH EAST SIDE
3	ISFSI PROTECTED AREA NORTH WEST SIDE
4	ISFSI PROTECTED AREASOUTH WEST SIDE
5	ISFSI PROTECTED AREA SOUTH EAST SIDE
6	ISFSI OWNER Controlled FENCE NORTH
7	ISFSI OWNER CONTROLLED FENCE WEST
8	ISFSI OWNER CONTROLLED FENCE EAST
9	ISFSI OWNER CONTROLLED FENCE NORTH EAST BY HEAVY HALL PATH
10	ISFSI OWNER CONTROLLED FENCE WEST BY BOAT LANDING

TABLE 5

SAMPLE FREQUENCY AND ANALYSIS OF RADIOLOGICAL ENVIRONMENTAL SAMPLES

SAMPLE	FREQUENCY	ANALYSIS PERFORMED
Environmental TLDs	Quarterly	Dose in mRem
Particulate Air - Glass Fiber Filters	Bi-Weekly	Gross Beta and Gamma Spectroscopy
River Sediment	Semi-annually	Gamma Spectroscopy
River Water	Semi-annually	Gamma Spectroscopy and Tritium (Liquid Scintillation Analyzer)

TABLE 6

LOW VOLUME ENVIRONMENTAL AIR MONITORING STATION LOCATIONS

(Refer to Figure 3)

LOCATION NO.	LOCATION
1	Trailer Park
2	Coal Plant - North Side
3	SW of Main Switch Yard
4	Lock and Dam #8 - North Side

TABLE 7

LACBWR ENVIRONMENTAL TLD LOCATIONS

LOCATION NO.	LOCATION
1	ADMINISTRATION BUILDING VAULT WEST END
2	RCA FENCE LINE NORTH
3	RCA FENCELINE SOUTHEAST
4	RCA FENCELINE SOUTH
5	RCA FENCE LINE SOUTHWEST
6	RCA FENCE LINE WEST

TABLE 8

RADIOLOGICAL ENVIRONMENTAL SAMPLES COLLECTED

JANUARY-DECEMBER 2016

TYPE OF SAMPLE	NUMBER OF SAMPLES
Penetrating Radiation(Environmental TLDs)	52
Air Particulate	52
River Water	6
River Sediment	6

TABLE 9

QUARTERLY ENVIRONMENTAL TLD RESULTS IN THE LACBWR VICINITY

JULY- DECEMBER 2016

BACKGROUND AND OCCUPANCY FACTOR CORRECTED

STATION NO.	1st QUARTER mRem	2nd QUARTER mRem	3rd QUARTER mRem	4th QUARTER mRem
1	N/A	N/A	0.1	0.1
2	N/A	N/A	0.0	0.1
3	N/A	N/A	0.0	0.1
4	N/A	N/A	0.1	0.2
5	N/A	N/A	0.0	0.1
6	N/A	N/A	0.0	0.1

TABLE 10 BI-WEEKLY GROSS BETA AIR PARTICULATES IN THE LACBWR VICINITY

COLLECTION DATE	COAL PLANT pCi/m^3	TRAILER COURT pCi/m^3	LOCK AND DAM #8 pCi/m^3	SW MAIN SWITCHYARD pCi/m^3
7/21/2016	.019 ± .004	.016 ± .004	.019 ± .004	.017 ± .004
8/3/2106	.024 ± .003	.017 ± .003	.016 ± .003	.028 ± .003
8/17/2016	.022 ± .003	.019 ± .003	.023 ± .003	.026 ± .003
8/31/2016	.024 ± .002	.017 ± .002	.019 ± .002	.025 ± .002
9/14/2016	.018 ± .002	.015 ± .002	.020 ± .002	.022 ± .002
9/28/2016	.018 ± .002	.017 ± .002	.016 ± .002	.023 ± .002
10/12/2016	.021 ± .002	.018 ± .002	.019 ± .002	.020 ± .002
10/26/2016	.018 ± .002	.016 ± .002	.018 ± .002	.016 ± .002
11/9/2016	.026 ± .002	.024 ± .001	.025 ± .002	.021 ± .002
11/23/2016	.025 ± .001	.024 ± .001	NO DATA-POWER INTERRUPTION	.025 ± .001
12/7/2016	.027 ± .002	.020 ± .001	.024 ± .002	.024 ± .002
12/21/2016	.019 ± .002	.016 ± .001	.018 ± .003	.030 ± .002

TABLE 11

BI-WEEKLY AIR SAMPLE GAMMA SPECTROSCOPY RESULTS

(Concentrations in pCi/m^3)

LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM #8	SW MAIN SWITCHYARD
START DATE	7/7/16	7/7/16	7/7/16	7/7/16
END DATE	7/21/16	7/21/16	7/21/16	7/21/16
ISOTOPES				
Cs-134	< 6.50 E-03	< 4.03 E-03	< 8.04 E-03	< 2.92 E-03
Cs-137	< 7.15 E-03	< 1.75 E-03	< 5.85 E-03	< 3.13 E-03
Co-60	< 6.82 E-03	< 3.60 E-03	< 8.99 E-03	< 1.86 E-03

LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM #8	SW MAIN SWITCHYARD
START DATE	7/21/16	7/21/16	7/21/16	7/21/16
END DATE	8/3/16	8/3/16	8/3/16	8/3/16
ISOTOPES				
Cs-134	< 4.05 E-03	< 1.78 E-03	< 4.04 E-03	< 3.37 E-03
Cs-137	< 4.29 E-03	< 1.94 E-03	< 4.23 E-03	< 3.58 E-03
Co-60	< 4.25 E-03	< 1.87 E-03	< 4.17 E-03	< 2.25 E-03

TABLE 11

BI-WEEKLY AIR SAMPLE GAMMA SPECTROSCOPY RESULTS

(Concentrations in pCi/m^3)

LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM #8	SW MAIN SWITCHYARD
START DATE	8/3/16	8/3/17	8/3/16	8/3/16
END DATE	8/17/16	8/17/17	8/17/16	8/17/16
ISOTOPES				
Cs-134	< 6.65 E-03	< 1.67 E-03	< 3.71 E-03	< 2.32 E-03
Cs-137	< 6.92 E-03	< 1.68 E-03	< 3.94 E-03	< 2.54 E-03
Co-60	< 7.07 E-03	< 1.67 E-03	< 3.92 E-03	< 2.64 E-03

LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM#8	SW MAIN SWICHYARD
START DATE	8/17/16	8/17/164	8/17/16	8/17/16
END DATE	8/31/16	8/31/16	8/31/16	8/31/16
ISOTOPES				
Cs-134	< 3.70 E-03	< 1.62 E-03	< 3.63 E-03	< 3.21 E-03
Cs-137	< 3.86 E-03	< 1.79 E-03	< 3.95 E-03	< 3.39 E-03
Co-60	< 2.53 E-03	< 1.24 E-03	< 3.90 E-03	< 3.35 E-03

TABLE 11

BI-WEEKLY AIR SAMPLE GAMMA SPECTROSCOPY RESULTS

(Concentrations in pCi/m^3)

LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM #8	SW MAIN SWITCHYARD
START DATE	8/31/16	8/31/16	8/31/16	8/31/16
END DATE	9/14/16	9/14/16	9/14/16	9/14/16
ISOTOPES				
Cs-134	< 3.65 E-03	< 1.62 E-03	< 3.53 E-03	< 3.09E-03
Cs-137	< 3.84 E-03	< 1.77E-03	< 3.80 E-03	< 3.22 E-03
Co-60	< 3.93E-03	< 1.77E-03	< 3.81E-03	< 3.33E-03

LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM#8	SW MAIN SWITCHYARD
START DATE	9/14/16	9/14/16	9/14/16	9/14/16
END DATE	9/28/16	9/28/16	9/28/16	9/28/16
ISOTOPES/RL*				
Cs-134	< 3.69 E-03	< 1.65 E-03	< 3.77 E-03	< 3.08 E-03
Cs-137	< 3.86 E-03	< 1.77 E-03	< 3.94 E-03	< 3.34 E-03
Co-60	< 3.88 E-03	< 1.08 E-03	< 3.96 E-03	< 3.25 E-03

TABLE 11

BI-WEEKLY AIR SAMPLE GAMMA SPECTROSCOPY RESULTS

(Concentrations in pCi/m^3)

LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM #8	SW MAIN SWITCHYARD
START DATE	9/28/16	9/28/16	9/28/16	9/28/16
END DATE	10/12/16	10/12/16	10/12/16	10/12/16
ISOTOPES				
Cs-134	< 3.57 E-03	< 1.62 E-03	< 3.77 E-03	< 3.25 E-03
Cs-137	< 5.01E-03	< 1.53E-03	< 3.78 E-03	2.42 E-3 ± 3.94 E-4
Co-60	< 3.92E-03	< 1.11E-03	< 2.38 E-03	< 3.40 E-03
LOCATION	**COAL PLANT**	**TRAILER COURT**	**LOCK AND DAM #**	**SW MAIN SWITCHYARD**
START DATE	10/12/16	10/12/16	10/12/16	10/12/16
END DATE	10/26/16	10/26/16	10/26/16	10/26/16
ISOTOPES				
Cs-134	< 3.64 E-03	< 1.78 E-03	< 3.70 E-03	< 3.05 E-03
Cs-137	< 3.90 E-03	< 1.72E-03	< 3.75 E-03	< 3.17E-03
Co-60	< 3.89 E-03	< 1.87E-03	< 2.90E-03	< 3.33 E-03

TABLE 11

BI-WEEKLY AIR SAMPLE GAMMA SPECTROSCOPY RESULTS

(Concentrations in pCi/m^3)

LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM #	SW MAIN SWITCHYARD
START DATE	10/26/16	10/26/16	10/26/16	10/26/16
END DATE	11/9/16	11/9/16	11/9/16	11/9/16
ISOTOPES				
Cs-134	< 3.87 E-03	< 1.78 E-03	< 3.80 E-03	< 3.22 E-03
Cs-137	< 3.85 E-03	< 1.79 E-03	< 3.94 E-03	< 3.32 E-03
Co-60	< 3.90 E-03	< 1.73 E-03	< 4.00 E-03	< 3.39 E-03

LOCATION	COAL PLANT	TRAILER COURT	LOCK AND DAM#8	SW MAIN SWICHYARD
START DATE	11/9/16	11/9/16	11/9/16	11/9/16
END DATE	11/23/16	11/23/16	11/23/16	11/23/16
ISOTOPES				
Cs-134	< 3.89 E-03	< 1.76 E-03	NO DATA-POWER INTERRUPTION	< 3.17 E-3
Cs-137	< 3.99 E-03	< 1.84 E-03		< 3.55 E-03
Co-60	< 4.08 E-03	< 1.71 E-03		< 3.43 E-03

TABLE 11

BI-WEEKLY AIR SAMPLE GAMMA SPECTROSCOPY RESULTS

(Concentrations in pCi/m^3)

LOCATION	**COAL PLANT**	**TRAILER COURT**	**LOCK AND DAM#8**	**SW MAIN SWICHYARD**
START DATE	11/23/16	11/23/16	11/23/16	11/23/16
END DATE	12/7/16	12/7/16	12/7/16	12/7/16
ISOTOPES				
Cs-134	< 3.68 E-03	< 4.20 E-03	< 3.99 E-03	< 3.07 E-03
Cs-137	< 3.89 E-03	< 1.77 E-03	< 4.36 E-03	< 3.34 E-03
Co-60	< 2.57 E-03	< 1.74 E-03	< 4.46 E-03	< 2.14 E-03
LOCATION	**COAL PLANT**	**TRAILER COURT**	**LOCK AND DAM#8**	**SW MAIN SWICHYARD**
START DATE	12/7/16	12/7/16	12/7/16	12/7/16
END DATE	12/21/16	12/21/16	12/21/16	12/21/16
ISOTOPES				
Cs-134	< 3.67 E-03	< 1.77 E-03	< 4.19 E-03	< 3.15 E-03
Cs-137	< 3.96 E-03	< 1.78 E-03	< 4.12 E-03	< 3.40 E-03
Co-60	< 4.03 E-03	< 1.77 E-03	< 4.12 E-03	< 3.25 E-03

TABLE 12

RESULTS OF ANALYSIS OF MISSISSIPPI RIVER WATER IN THE VICINITY OF LACBWR

(Concentrations in pCi/Liter)

COLLECTION DATE: SAMPLE LOCATION:	SAMPLE #1 LOCK and DAM # 8 4/27/16	SAMPLE #2 LACBWR OUTFALL 4/27/16	SAMPLE #3 VICTORY, WI 4/27/16	SAMPLE #1 LOCK and DAM #8 10/17/16	SAMPLE #2 LACBWR OUTFALL 10/17/16	SAMPLE #3 VICTORY, WI 10/17/16
ISOTOPES/RL*						
H-3	671 ± 168	630 ± 164	844 ± 220	333 ± 95	309 ± 95	380 ± 96
Mn-54/1000	< 4.14	< 4.15	< 4.16	< 4.10	< 4.16	< 4.18
Co-60/300	< 4.45	< 4.32	< 4.31	< 4.34	< 4.46	< 4.39
Zn-65/300	< 8.51	< 8.90	< 9.20	< 9.12	< 9.13	< 9.10
Cs-134/30	< 4.68	< 4.46	< 4.67	< 4.64	< 4.77	< 4.60
Cs-137/50	< 4.60	< 2.67	< 2.94	< 3.24	< 4.51	< 2.91

RL = REPORTING LEVEL

TABLE 13

RESULTS OF ANALYSIS OF MISSISSIPPI RIVER SEDIMENT IN THE VICINITY OF LACBWR

(Concentration in pCi/Kg)

SAMPLE LOCATION COLLECTION DATE	UPSTREAM 04/27/16	OUTFALL 04/27/16	DOWNSTREAM 04/27/16	UPSTREAM 10/13/16	OUTFALL 10/13/16	DOWNSTREAM 10/13/16
ISOTOPES						
Cs-134	< 6.42	< 4.91	< 9.35	< 6.17	< 5.74	< 9.59
Cs-137	11.7 ± .98	191 ± 5.51	37.0 ± 1.74	5.91 ± 0.28	24.7 ± 1.02	64.5 ± 2.58
Co-60	< 6.06	4.49 ± 0.44	< 8.77	< 5.73	< 5.39	< 8.96

TABLE 14
QUARTERLY ENVIRONMENTAL DOSIMETER DOSE MEASUREMENTS IN THE ISFSI VICINITY
JANUARY-DECEMBER 2016
BACKGROUND AND OCCUPANCY FACTOR CORRECTED*

STATION NO.	1st QUARTER mRem	2nd QUARTER mRem	3rd QUARTER mRem	4th QUARTER mRem
1	0.0	0.0	0.0	0.0
2	37.5	43.2	36.2	41.7
3	108.5	119.7	122.2	112.2
4	19.4	26.8	24.5	24.2
5	33.6	46.4	44.0	41.5
6	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.1	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.1	0.0

*Occupancy Factor Applied to Owner Controlled Area Fence Line Only

Attachment 2

LACBWR Offsite Dose Calculation Manual

Attachment 3

LACBWR Process Control Program

LACROSSE SOLUTIONS

LACBWR Site Restoration Project

Process Control Program

Procedure No. LC-WM-PG-001

Revision No. 0

Preparer (Print name/Sign) D.C. Cummins DCC Date: 11/7/16

Secondary Reviewer (Print Name/Sign) Joe Wise Joe Wise Date: 11/7/16

Regulatory Required Reviews (attach completed LC-RA-PR-001 and QTR forms, as applicable)		
Part 50 License: 10 CFR 50.59 and 50.90	☒ YES	☐ NO
Fire Protection: 10 CFR 50.48(f)	☐ YES	☒ NO
Conditions of License: PSP: 10 CFR 50.54(p)	☐ YES	☒ NO
Conditions of License: E-Plan: 10 CFR 50.54(q)	☐ YES	☒ NO
Termination of License: 10 CFR 50.82(a)(6) and 50.82(a)(7)	☐ YES	☒ NO
Part 72 License: 10 CFR 72.48	☐ YES	☒ NO

Program Required Reviews

RP: ☒ YES ☐ NO SIGNATURE G. Peterschmidt DATE: 11/7/16

QA: ☐ YES ☒ NO SIGNATURE _____ DATE: _____

QTR: ☒ YES ☐ NO SIGNATURE AW Goodin DATE: 11/07/2016

Approval Section

PROJECT MANAGER: SIGNATURE Joseph a Mark DATE: 11/7/16

Effective Date: 11/8/16 (assigned by Document Control or Project Manager)

TABLE OF CONTENTS

1. PURPOSE AND SCOPE

1.1. Purpose

This Process Control Program (PCP) identifies the administrative and operation controls for waste processing, process parameters, and surveillance requirements, which assure that the final waste product meets the requirements of applicable Federal, State and Disposal Site Waste form requirements.

1.2. Scope

This Program is applicable to low level radioactive waste, which requires processing to meet Reference 2.1 stability and liquid content requirements.

2. REFERENCES

2.1. NRC, Title 10, Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste"

2.2. NRC, Title 10, Part 20, "Standards for Protection Against Radiation"

2.3. NRC, Title 10, Part 71, "Packaging and Transportation of Radioactive Material"

2.4. DOT, Title 49, "Transportation", Sub Chapter C – "Hazardous Materials Regulations", Part 173, "Shippers – General Requirements for Shipments."

2.5. NRC, Regulatory Guide 1.143, "Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants"

2.6. Amendment # 72 to License DPR-45, LaCrosse Permanently Defueled Technical Specifications (PDTS)

2.7. NRC, 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"

2.8. LaCrosse*Solutions*, procedure LC-RP-PR-025, "Generation of the Annual Radioactive Effluent Release Report (ARERR)"

2.9. NRC Branch Technical Position On "Concentration Averaging and Encapsulation", dated January 1995

2.10. NRC Branch Technical Position On "Waste Form", Revision 1, dated January 1991

2.11 NRC Low-Level Waste Licensing Branch Technical Position on Radioactive Waste Classification-1983

2.12 NEI 07-10A, Generic FSAR Template Guidance for Process Control Program (PCP) March 2009

3. GENERAL

3.1. Responsibilities

3.1.1 Waste Management is responsible for:

- Preparing and maintaining the Process Control Program and implementing procedures.
- Ensuring that waste is processed and packaged in accordance with the applicable procedures and the disposal facility waste acceptance criteria.

3.2. Definitions

3.2.1 Disposal Facility – A state or NRC licensed off-site facility used for the disposal of radioactive waste.

3.2.2 Dewatering – means the process, which removes the loosely bound liquid from a wet radioactive waste such that the accumulation of Free Standing Liquid in a disposal container is unlikely to approach the disposal limit threshold values of the disposal site.

3.2.3 Dry Active Waste (DAW) - Radioactive waste that is typically paper, wood, plastic, trash, air filters, metal, soil, concrete, asphalt, and used plant components, which without processing, contains essentially no free liquid.

3.2.4 Free Standing Liquid – means liquid that is in a disposal container but is not bound by the waste in the container.

3.2.5 Radioactive Waste Package - The packaging, together with its radioactive contents, as presented for transport.

3.2.6 Radioactive Waste Packaging - The assembly of components necessary to ensure compliance with the packaging requirements of 49 CFR and 10 CFR 71. It may consist of one or more containers, absorbent materials, spacing structures, thermal insulation, radiation shielding, and devices for cooling or absorbing mechanical shocks. The vehicle, the tie-down system, and auxiliary equipment may be designated as part of the packaging.

3.2.7 Radioactive Material - Byproduct material, source material, special nuclear material (SNM), and technologically enhanced naturally occurring radioactive material (TENORM).

3.2.8 Radioactive Material (for shipping purposes only) - Material having a specific and total activity as defined in 49 CFR 173.436. If the material is not radioactive for the purposes of hazardous material Class 7 transport, it is not subject to the requirements of 49 CFR 173. However, the material is not considered to be cleared or authorized for unrestricted (free) release, nor is it considered to be non-radioactive under the provisions of 10 CFR 20.

3.2.9 Stabilized - The use of an approved container or process to provide an acceptable, stable waste form. Some waste forms themselves are inherently stable.

3.2.10 Temporary System - Systems intended for short-term duration and subsequent removal once they have completed their specific task or tasks. This does not include permanent systems, consumables or vehicles and casks used for pick up or delivery service. Mobile radioactive waste processing systems used to support decommissioning activities are examples of temporary systems.

3.2.11 Waste Stream - An individual, specific type or source of radioactive waste and its associated process that exhibit similar radionuclide distributions and similar physical and chemical characteristics.

3.2.12 Wet Waste - Radioactive waste containing free standing liquids greater than the applicable waste acceptance criteria.

3.3. LACBWR Site Restoration Project Planned Activities

The LACBWR Site Restoration Project does not plan to ship Class B waste, Class C waste, wet waste or mixed waste directly to a disposal facility. These waste types will be shipped to processing facilities prior to disposal. Program elements identified are consistent with the planned activities.

3.4. Process Control Program Administration

Changes to the PCP or implementing procedures will be reviewed to assure that the requirements of applicable Federal, State and disposal site waste acceptance criteria and waste processing facility are met. PCP changes will be sent to the NRC with the Annual Radioactive Effluent Report.

Implementing procedures are developed, approved and maintained for performing activities in support of the PCP. Examples of functions that may be addressed in implementing procedures include:

- Sampling, analysis, scaling of hard to detect radionuclides and waste classification
- Control and acceptance of vendor waste processing equipment and processes for site and offsite processing of radioactive waste

- Verification of compliance with disposal and processor site acceptance criteria.

3.5 Approval Process For QA Approved Suppliers

Purchase orders for Suppliers for PCP related services will be reviewed and approved in accordance with EnergySolutions Purchasing procedures.

3.6 PCP Requirements for Vendor Processes and Services

Vendors providing PCP services offsite will meet the requirements of their PCP process and applicable quality assurance requirements.

3.7 Waste Types Expected

The waste types planned for disposal from the LACBWR site restoration project include Class A Waste, a limited amount of water processing media, oily waste and dry active waste. Waste will be evaluated for Class B and Class C wastes prior to packaging based on the dose rate to curie content classification methodology.

3.8 PCP Solidification Process Description

No solidification of waste is anticipated for the LACBWR site restoration project. If solidification is to be used to process waste to an acceptable form, then the PCP will be revised to reflect the change.

3.9 PCP Dewatering Process Description

No dewatering of water processing media for final disposal is anticipated for the LACBWR site restoration project.

Addition of absorbent to waste packages and containers to absorb incidental quantities of liquids and condensation is anticipated and is beyond the scope of this Program.

3.10 Annual Radioactive Effluent Release Report Input

Reference 2.8 provides direction for submission of the Annual Radioactive Effluent Release Report. Waste management will provide the following input.

Include the following information for each type of solid waste shipped offsite during the report period:

A. Dry compressible waste, contaminated equipment etc.

B. Irradiated components.

C. Other (furnish description).

i. Indicate the following information for each type of waste listed above (A – C):

ii. Total Volume in cubic meters.

- Total Radioactivity in Curies (specify whether determined by measurement or estimate)
- Principal radionuclides (specify whether determined by measurement or estimate).
- Type of container (e.g., LSA, Type A).
- Solidification Agent (e.g., cement, urea formaldehyde).
- Dates of shipment and disposition. Identify the number of shipments, the mode of transport, and the destination.
- The disposition of irradiated fuel shipments. Identify the number of shipments, the mode of transport, and the destination.
- Estimates of the total error associated with certain total values.