

157 B02

REVISION 4

MONTICELLO NUCLEAR GENERATING PLANT
OFFSITE DOSE CALCULATION MANUAL (ODCM)

TABLE 5.1-1 AND FIGURE 5.1-1 RADIATION ENVIRONMENTAL
MONITORING PROGRAM SAMPLING LOCATIONS

In accordance with the Monticello Technical Specifications, Section 6.5E, Offsite Dose Calculation Manual (ODCM) a change to Table 5.1-1 and Figure 5.1-1 Radiation Environmental Monitoring Program Sampling location is reported.

One of three dairy farms required by the sampling program is located 3.6 miles at 224°/SW from the facility. The dairy farm owner has decided to sell his animals and discontinue the dairy business. In replacing the farm, we used the Dispersion parameters (D/Q) in the ODCM, and the latest Land Use Census for the area to decide to sample milk from two highest D/Q farms. These farms are the Gary Hoglund Farm (3.8 miles @ 300°/WNW) and the Donald Anderson Farm (3.6 miles @ 308°/NW). A lower calculated dose farm deleted from the program is the Witschen Farm (3.2 miles and 260°/W) from the facility.

CHANGES TO SECTION 3.0 GASEOUS EFFLUENTS
(Monitor Alarm Setpoint Determinations)

This change removes the count rate calculation from the stack and vent isolation setpoint determination. The formulas are no longer required because of the upgraded monitoring systems.

INSTRUCTIONS FOR ENTERING REVISION 4 TO THE MONTICELLO
ODCM

1. Remove ODCM cover page and pages v, vi, 3-3 (3-4), 3-5 (3-6), 3-7 (3-8), 3-9, 5-2, 5-3, 5-4 and 5-5.
2. Replace new ODCM cover page and pages v, vi, 3-3 (3-4), 3-5 (3-6), 3-7 (3-8), 3-9, 5-2, 5-3, 5-4 and 5-5. (Pages 5-2 and 5-3, and 5-4 and 5-5 were originally printed back to back). Above replacement pages for Section 3 are printed back to back.
3. Use ODCM page vi to page check your manual if desired.

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**MONTICELLO NUCLEAR GENERATION PLANT
OFFSITE DOSE CALCULATION MANUAL
(ODCM)**

Rev 4

DOCKET NO. 50-263

**NORTHERN STATES POWER COMPANY
MINNEAPOLIS, MINNESOTA**

ALARA REVIEWED BY: GM Mathison DATE: 2/20/84
PREPARED BY: Charles A. K.
REVIEWED BY: BR Peterson
OPERATIONS COMMITTEE FINAL REVIEW: MEETING NO. 1251 DATE: 2/23/84
APPROVED BY: A. Waldinger DATE: 2/23/84

RECORD OF REVISIONS

<u>Revision No.</u>	<u>Date</u>	<u>Reason for Revision</u>
Original	May 2, 1979	-
1	Feb 29, 1980	Incorporation of NRC Staff comments and correction of miscellaneous errors
2	Jul 23, 1982	Incorporation of NRC Staff comments, addition of short term vent dispersion parameters, and addition of Appendices D and E
3	Mar 24, 1983	Change in milk sampling location
4	Dec 12, 1983	Change in milk sampling locations and remove formula for converting $\mu\text{Ci}/\text{sec}$ to mrad/hr for stack and vent wide range gas monitors

LIST OF EFFECTIVE PAGES

<u>Page No.</u>	<u>Revision</u>	<u>Page No.</u>	<u>Revision</u>	<u>Page No.</u>	<u>Revision</u>
1	2	3-18	2	A-5	2
11	1	3-19	2	A-6	1
111	2	3-20	2	A-7	0
iv	0	3-21	2	A-8 thru	0
v	4	3-22	0	A-57	0
vi	4	3-23	2	A-58 thru	0
1-1	2	3-24	1	A-74	2
2-1	1	3-25	1	B-1 thru	2
2-2	2	3-26	1	B-9	0
2-3	1	3-27	1	C-1 thru	0
2-4	1	3-28	1	C-9	0
2-4a	1	3-29	2	D-1 thru	0
2-4b	1	3-30	2	D-7	2
2-4c	1	3-31	2	E-1 thru	2
2-4d	2	3-32	2	E-14	2
2-5	0	3-33	2		
2-6	0	3-34	2		
2-7	2	3-35	2		
2-8	1	3-36	2		
2-9	1	3-37	2		
2-10	1	3-38	2		
2-11	2	3-39	2		
2-12	2	3-40	2		
2-13	0	3-41	2		
3-1	2	3-42	2		
3-2	2	3-43	1		
3-3	4	3-44	1		
3-4	4	3-45	1		
3-5	4	3-46	1		
3-6	4	4-1	0		
3-7	4	4-2	0		
3-8	4	4-3	0		
3-9	4	5-1	1		
3-9a	2	5-2	4		
3-10	1	5-3	2		
3-11	2	5-4	1		
3-12	2	5-5	4		
3-12a	2	5-6	1		
3-13	2	5-7	1		
3-14	2	A-1	2		
3-15	2	A-2	0		
3-16	2	A-3	0		
3-17	2	A-4	0		

(sec/m³) from Appendix A, Table A-3. For purge releases, substitute $(\chi/q)_v$, the highest short term dispersion factor from Table A-12.

K_i = The total whole body dose factor due to gamma emissions from noble gas radionuclide "i" (mrem/year/ $\mu\text{Ci}/\text{m}^3$) from Table 3.1-2

- c. Determine Q_t based upon the skin exposure limit (3000 mrem/yr).

$$Q_t = \frac{3000}{(\chi/Q)_v \sum_i (L_i + 1.1 M_i) S_i} \quad (3.1-3)$$

$L_i + 1.1 M_i$ = The total skin dose factor due to emissions from noble gas radionuclide "i" (mrem/year/ $\mu\text{Ci}/\text{m}^3$) from Table 3.1-2.

- d. Determine HHSP (the monitor high-high alarm setpoint above background (net $\mu\text{Ci}/\text{sec}$)).

NOTE: Use the lower of the Q_t values obtained in Sections 3.1.1.1b and 3.1.1.1c.

$$\text{HHSP} = 0.50 Q_t \quad (3.1-4)$$

0.50 = Fraction of the total radioactivity from the site via the monitored release point to ensure that the site boundary limit is not exceeded due to simultaneous releases from several release points.

- b. Determine Q_t (the maximum acceptable total release rate of all noble gas radionuclides in the gaseous effluent ($\mu\text{Ci}/\text{sec}$)) based upon the whole body exposure limit (500 mrem/yr).

$$Q_t = \frac{500}{\sum_i V_i S_i} \quad (3.1-6)$$

NOTE: For short-term batch releases (equal to or less than 500 hrs/year) via drywell purging, substitute v_i for V_i in Equation 3.1-6.

V_i = The constant for long-term releases (greater than 500 hrs/year) for noble gas radionuclide "i" accounting for the gamma radiation from the elevated finite plume (mrem/year/ $\mu\text{Ci}/\text{sec}$) from Table 3.1-2.

v_i = The constant for short-term releases (equal to or less than 500 hrs/year) for noble gas radionuclide "i" accounting for the gamma radiation from the elevated finite plume (mrem/ $\mu\text{Ci}/\text{sec}$) from Table 3.1-2.

- c. Determine Q_t based upon the skin exposure limit (3000 mrem/yr).

$$Q_t = \frac{3000}{\sum_i (L_i (\chi/Q)_s + 1.1 B_i) S_i} \quad (3.1-7)$$

NOTE: For short-term batch releases (equal to or less than 500 hrs/year) via drywell purging, use short-term $(\chi/q)_s$ value and substitute b_i for B_i in Equation 3.1-7.

the site boundary due to noble gas radionuclides in the gaseous effluent released from the site exceeds a small fraction of the limits specified in 10CFR100 in the event this effluent, including the radioactivity accumulated in the treatment system, is inadvertently discharged directly to the environment without treatment. Offgas flow is automatically terminated when this setpoint is reached.

3.1.2.1 Determine Q_t (the maximum acceptable total release rate in $\mu\text{Ci}/\text{sec}$ of all noble gas radionuclides in the gaseous effluent at the Off-Gas Monitor after a 5-minute decay based on the maximum acceptable total release rate of $2.60\text{E}5 \mu\text{Ci}/\text{sec}$ after a 30-minute decay).

- a. Determine the off-gas mixture of the gaseous effluent. The off-gas mixture is the fraction of the off-gas noble gas radioactivity caused by each recoil, diffusion, and equilibrium component. The off-gas mixture is determined, monthly, in conjunction with Monticello Technical Specification 4.8.B.5.c.
- b. Determine Q_t based on the off-gas mixture using Table 3.1-3. This table was prepared using a variation of the NSP EBARR computer code (Appendix D).

3.1.2.2 Determine C_t (the maximum acceptable total radioactivity concentration of all noble gas radionuclides in the gaseous effluent ($\mu\text{Ci}/\text{cc}$)).

$$C_t = \frac{(2.12 \text{ E-}3) Q_t}{f} \quad (3.1-9)$$

f = The maximum acceptable effluent flowrate at the point of release (cfm) = 85.5 cfm.

(in cfm determined from the last tank fill time). The resulting tank activity is multiplied by the air ejector monitor reading (converted to $\mu\text{Ci}/\text{sec}$) and divided by the maximum permitted air ejector release rate rate of 260,000 $\mu\text{Ci}/\text{sec}$. Linear interpolation of air inleakage is used.

As noted earlier, Table 3.1-3 is derived from the EBARR computer program described in Appendix D. It is extremely unlikely that the maximum tank activity limit will be exceeded.

TABLE 5.1-1

MONTICELLO NUCLEAR GENERATING PLANT
 RADIATION ENVIRONMENTAL MONITORING PROGRAM
 SAMPLING LOCATION

<u>Type of Sample</u>	<u>Code</u> *	<u>Collection Site</u>	<u>Location</u>
River Water	M-8 ^C	Upstream of Plant	0.19mi @ 235°/WNW
River Water	M-9	Downstream of Plant	0.19mi @ 62°/ENE
Drinking Water	M-14	City of Minneapolis	36 mi @ 128°/SE
Well Water	M-10 ^C	Kirchenbauer Farm	11.5 mi @ 323°/NW
Well Water	M-11	City of Monticello	3.2 mi @ 128°/SE
Well Water	M-12	Plant Well #1	0.2 mi @ 267°/W
Well Water	M-13	Hartung Residence	0.3 mi @ 214°/SW
Sediment-River	M-8 ^C	Upstream of Plant	0.19mi @ 285°/WNW
Sediment-River	M-9	Downstream of Plant	0.19mi @ 62°/ENE
Sediment-Shoreline	M-15	Montissippi Park	1.6 mi @ 117°/ESE
Periphyton or Macroinvertebrates	M-8 ^C	Upstream of Plant	0.19mi @ 285°/WNW
	M-9	Downstream of Plant	0.19mi @ 62°/ENE
Fish	M-8 ^C	Upstream of Plant	0.19mi @ 285°/WNW
Fish	M-9	Downstream of Plant	0.19mi @ 62°/ENE
Milk	M-10 ^C	Kirchenbauer Farm	11.5 mi @ 323°/NW
Milk	M-18	Olson Farm	2.5 mi @ 24°/NNE
Milk	M-24	Anderson Farm	3.6 mi @ 308°/NW
Milk	M-26	Peterson Farm	2.3 mi @ 111°/ESE
Milk	M-28	Hoglund Farm	3.8 mi @ 300°/WNW

TABLE 5.1-1 (continued)

MONTICELLO NUCLEAR GENERATING PLANT
RADIATION ENVIRONMENTAL MONITORING PROGRAM
SAMPLING LOCATIONS

<u>Type of Sample</u>	<u>Code</u>	<u>Collection Site</u>	<u>Location</u>
Cultivated Crops (Leafy Green Veg) (Corn) (Potatoes)	M-10 ^c	Kirchenbauer Farm	11.5 mi @ 323°/NW
	M-27	Hageman Residence	1.4 mi @ 131°/SE
	M-10 ^c	Kirchenbauer Farm	11.5 mi @ 323°/NW
	M-18	Olson Farm	2.5 mi @ 24°/NNE
	M-10 ^c	Kirchenbauer Farm	11.5 mi @ 323°/NW
	M-21	Ewing Farm	4.9 mi @ 115°/ESE
Particulates and Radioiodine (air)	M-1 ^c	Air Station M-1	11.1 mi @ 306°/NW
Particulates and Radioiodine (air)	M-2	Air Station M-2	0.8 mi @ 23°/NNE
Particulates and Radioiodine (air)	M-3	Air Station M-3	0.5 mi @ 181°/S
Particulates and Radioiodine (air)	M-4	Air Station M-4	0.9 mi @ 150°/SSE
Particulates and Radioiodines (air)	M-5	Air Station M-3	2.7 mi @ 136°/SE
Direct Radiation (TLD)	M01A	North Boundary Rd.	0.7 mi @ 353°/N
Direct Radiation (TLD)	M02A	North Boundary Rd.	0.8 mi @ 23°/NNE
Direct Radiation (TLD)	M03A	North Boundary Rd.	1.0 mi @ 43°/NE
Direct Radiation (TLD)	M04A	Biology Station Rd.	0.7 mi @ 92°/E
Direct Radiation (TLD)	M05A	Biology Station Rd.	0.6 mi @ 112°/ESE
Direct Radiation (TLD)	M06A	Biology Station Rd.	0.6 mi @ 133°/SE
Direct Radiation (TLD)	M07A	County Rd. 75	0.5 mi @ 158°/SSE
Direct Radiation (TLD)	M08A	County Rd. 75	0.5 mi @ 183°/S
Direct Radiation (TLD)	M09A	County Rd. 75	0.4 mi @ 203°/SSW
Direct Radiation (TLD)	M10A	County Rd. 75	0.3 mi @ 225°/SW
Direct Radiation (TLD)	M11A	County Rd. 75	0.4 mi @ 250°/WSW
Direct Radiation (TLD)	M12A	County Rd. 75	0.7 mi @ 273°/W
Direct Radiation (TLD)	M13A	North Boundary Rd.	1.1 mi @ 317°/NW
Direct Radiation (TLD)	M14A	North Boundary Rd.	0.8 mi @ 338°/NNW

TABLE 5.1-1 (continued)

MONTICELLO NUCLEAR GENERATING PLANT
RADIATION ENVIRONMENTAL MONITORING PROGRAM
SAMPLING LOCATIONS

<u>Type of Sample</u>	<u>Code</u>	<u>Collection Site</u>	<u>Location</u>
Direct Radiation(TLD)	M01B	Sherco #1 Air Sta.	4.6 mi @ 02°/N
Direct Radiation(TLD)	M02B	County Rd. 11	4.4 mi @ 17°/NNE
Direct Radiation(TLD)	M03B	County Rd. 73 & 81	4.5 mi @ 49°/NE
Direct Radiation(TLD)	M04B	Sherco #6 Air Sta.	4.2 mi @ 67°/ENE
Direct Radiation(TLD)	M05B	City of Big Lake	4.4 mi @ 87°/E
Direct Radiation(TLD)	M06B	County Rd 14 & 196 St.	4.3 mi @ 116°/ESE
Direct Radiation(TLD)	M07B	Monte Industrial Dr.	4.4 mi @ 135°/SE
Direct Radiation(TLD)	M08B	Dale Larson Res.	4.6 mi @ 162°/SSE
Direct Radiation(TLD)	M09B	Norbert Weinand Farm	4.7 mi @ 180°/S
Direct Radiation(TLD)	M10B	John Reisewitz Farm	4.4 mi @ 206°/SSW
Direct Radiation(TLD)	M11B	Clifford Vanlith Farm	4.2 mi @ 225°/SW
Direct Radiation(TLD)	M12B	Lake Maria St. Park	4.4 mi @ 253°/WSW
Direct Radiation(TLD)	M13B	Bridgewater Sta.	4.1 mi @ 271°/W
Direct Radiation(TLD)	M14B	Richard Anderson Res.	4.5 mi @ 288°/WNW
Direct Radiation(TLD)	M15B	Gary Williamson Res.	4.5 mi @ 308°/NW
Direct Radiation(TLD)	M16B	Sand Plain Research Farm	4.3 mi @ 338°/NNW
Direct Radiation(TLD)	M01S	Floyd Hartung Res.	0.5 mi @ 213°/SSW
Direct Radiation(TLD)	M02S	Edgar Klucas Res.	0.7 mi @ 142°/SE
Direct Radiation(TLD)	M03S	Big Oaks Park	1.3 mi @ 89°/E
Direct Radiation(TLD)	M04S	Pinewood School	2.3 mi @ 132°/SE
Direct Radiation(TLD)	M05S	Roman Greener Res.	2.5 mi @ 112°/ESE
Direct Radiation(TLD)	M06S	Monte Service Center	2.7 mi @ 136°/SE
Direct Radiation(TLD)	M01C	Kirchenbauer Farm	11.5 mi @ 323°/NW

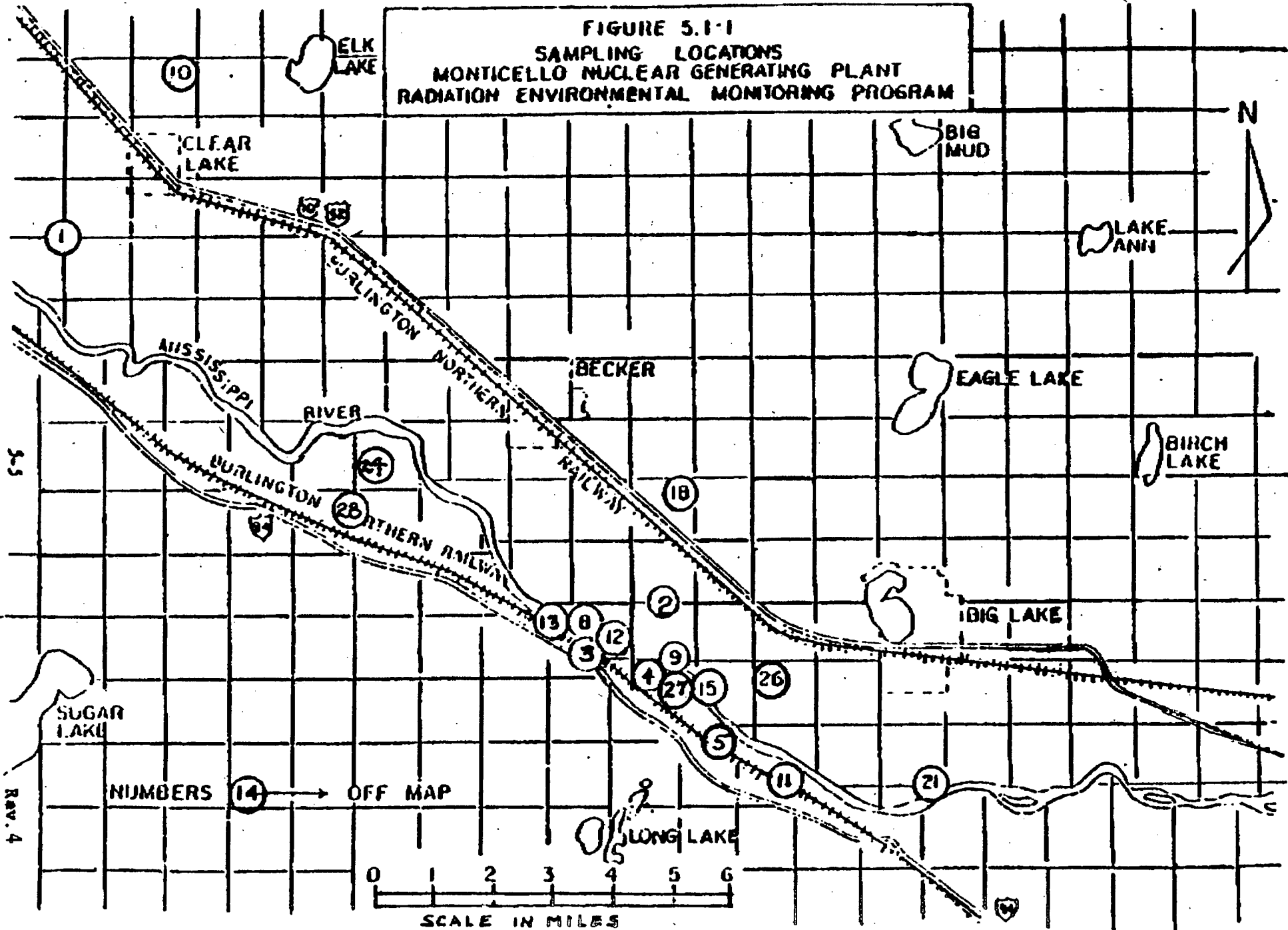
Notes:

- "c" denotes control location. All other locations are indicators.

The letters after numbered TLD's are as follows:

- "A" denotes locations in the general area of the site boundary
- "B" denotes locations about 4 to 5 miles distance from the plant.
- "S" denotes special interest locations.

FIGURE 5.1-1
 SAMPLING LOCATIONS
 MONTICELLO NUCLEAR GENERATING PLANT
 RADIATION ENVIRONMENTAL MONITORING PROGRAM



S-5

RAV. 4

NUMBERS 14 → OFF MAP

0 1 2 3 4 5 6
 SCALE IN MILES