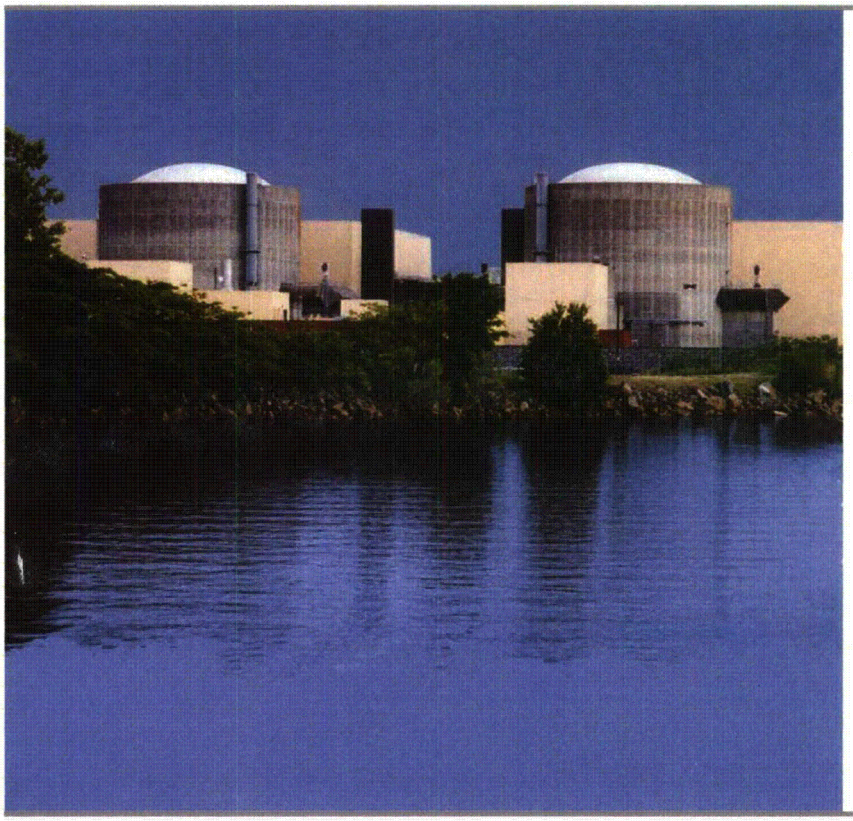
Duke Energy®

McGuire Nuclear Station
Units 1 and 2



AREOR

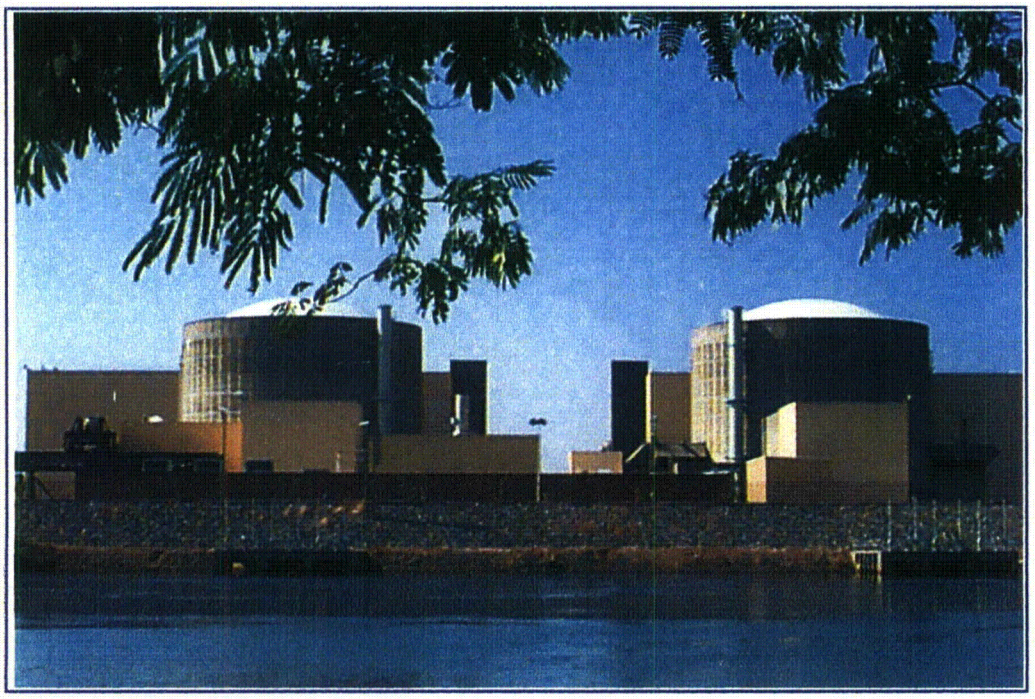
Annual
Radiological Environmental
Operating Report
2011

Duke Energy SM

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

DUKE ENERGY CORPORATION
MCGUIRE NUCLEAR STATION
Units 1 and 2

2011



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LIST OF ACRONYMS USED IN THIS TEXT *(in alphabetical order)*

BW	BiWeekly
C	Control
DEHNR	Department of Environmental Health and Natural Resources
DHEC	Department of Health and Environmental Control
EPA	Environmental Protection Agency
ERA	Environmental Resource Associates
GI-LLI	Gastrointestinal – Lower Large Intestine
GPS	Global Positioning System
ISFSI	Independent Spent Fuel Storage Installation
LLD	Lower Limit of Detection
M	Monthly
MDA	Minimum Detectable Activity
MNS	McGuire Nuclear Station
mrem	millirem
NIST	National Institute of Standards and Technology
NRC	Nuclear Regulatory Commission
ODCM	Offsite Dose Calculation Manual
pCi/kg	picocurie per kilogram
pCi/l	picocurie per liter
pCi/m3	picocurie per cubic meter
PIP	Problem Investigation Program
Q	Quarterly
REMP	Radiological Environmental Monitoring Program
SA	Semiannually
SLCs	Selected Licensee Commitments
SM	Semimonthly
TECH SPECs	Technical Specifications
TLD	Thermoluminescent Dosimeter
µCi/ml	microcurie per milliliter
UFSAR	Updated Final Safety Analysis Report
W	Weekly

1.0 EXECUTIVE SUMMARY

This Annual Radiological Environmental Operating Report describes the McGuire Nuclear Station Radiological Environmental Monitoring Program (REMP), and the program results for the calendar year 2011.

Included are the identification of sampling locations, descriptions of environmental sampling and analysis procedures, comparisons of present environmental radioactivity levels and pre-operational environmental data, comparisons of doses calculated from environmental measurements and effluent data, analysis of trends in environmental radiological data as potentially affected by station operations, and a summary of environmental radiological sampling results. Evaluation of the effect of trans-Pacific transport of airborne releases from Fukushima Daiichi following the March 11, 2011 Tohoku earthquake is included for affected sample media. Quality assurance practices, sampling deviations, unavailable samples, and program changes are also discussed.

Sampling activities were conducted as prescribed by Selected Licensee Commitments (SLC's). Required analyses were performed and detection capabilities were met for all collected samples as required by SLC's. Eleven-hundred thirty-one samples were analyzed comprising 1,586 test results in order to compile data for the 2011 report. Based on the annual land use census, the current number of sampling sites for McGuire Nuclear Station is sufficient.

Following the March 11, 2011 Tohoku earthquake in Japan, radioactive material migrated from the Fukushima Daiichi power plant to the United States. Radioactive material was detected at numerous U.S. nuclear plants (including all three Duke nuclear plants) and detected by state and federal monitoring agencies. Where applicable in this report, radioactive material determined to be from the Fukushima Daiichi power plant has been identified and distinguished from effluents from McGuire Nuclear Station.

Concentrations observed in the environment in 2011 for station related radionuclides were generally within the ranges of concentrations observed in the past. Inspection of data showed that radioactivity concentrations in surface water, drinking water, shoreline sediment and fish are higher than the activities reported for samples collected prior to the operation of the station. Measured concentrations were not higher than expected, and all positively identified measurements attributable to station operation were within limits as specified in SLC's.

Additionally, environmental radiological monitoring data is consistent with effluents introduced into the environment by plant operations. The total body dose estimated to the maximum exposed member of the public as calculated by environmental sampling data, excluding TLD results, was 1.12E-1 mrem for 2011. It is therefore concluded that station operations has had no significant radiological impact on the health and safety of the public or the environment.

2.0 INTRODUCTION

2.1 SITE DESCRIPTION AND SAMPLE LOCATIONS

McGuire Nuclear Station (MNS) is located geographically near the center of a highly industrialized region of the Carolinas. The land is predominantly rural non-farm with a small amount of land being used for farming. The McGuire site is in northwestern Mecklenburg County, North Carolina, 17 miles north-northwest of Charlotte, North Carolina. The site is bounded to the west by the Catawba River channel and to the north by 32,510 acre Lake Norman. Lake Norman is impounded by Duke Energy Corporation's Cowans Ford Dam Hydroelectric Station. The tailwater of Cowans Ford Dam is the upper limit of Mountain Island Reservoir. Mountain Island Dam is located 15 miles downstream from the site. Lookout Shoals Hydroelectric Station is at the upper reaches of Lake Norman. Marshall Steam Station is located on the western shore of Lake Norman, approximately 16 miles upstream from the site (reference 6.3).

MNS consists of two pressurized water reactors. Each reactor unit is essentially a mirror image of the other joined by an auxiliary building housing both separate and common equipment. Each unit was designed to produce approximately 1200 gross Megawatts of electricity. Unit 1 achieved criticality August 8, 1981 and Unit 2 on May 8, 1983.

Figures 2.1-1 and 2.1-2 are maps depicting the Thermoluminescent Dosimeter (TLD) monitoring locations and the sampling locations. The location numbers shown on these maps correspond to those listed in Tables 2.1-A and 2.1-B. Figure 2.1-1 comprises all sample locations within 0.5 mile radius of MNS. Figure 2.1-2 comprises all sample locations within a ten mile radius of MNS.

2.2 SCOPE AND REQUIREMENTS OF THE REMP

An environmental monitoring program has been in effect at McGuire Nuclear Station since 1977, four years prior to operation of Unit 1 in 1981. The preoperational program provides data on the existing environmental radioactivity levels for the site and vicinity which may be used to determine whether increases in environmental levels are attributable to the station. The operational program provides surveillance and backup support of detailed effluent monitoring which is necessary to evaluate the significance, if any, of the contributions to the existing environmental radioactivity levels that result from station operation.

This monitoring program is based on NRC guidance as reflected in the Selected Licensee Commitments Manual, with regard to sample media, sampling locations, sampling frequency, and analytical sensitivity requirements. Indicator and control locations were established for comparison purposes to distinguish radioactivity of station origin from natural or other "man-made" environmental radioactivity. The environmental monitoring program also verifies projected and anticipated radionuclide concentrations in the environment and related exposures from releases of radionuclides from McGuire Nuclear Station. This program satisfies the

requirements of Section IV.B.2 of Appendix I to 10CFR50 and provides surveillance of all appropriate critical exposure pathways to man and protects vital interests of the company, public, and state and federal agencies concerned with the environment. Reporting levels for radioactivity found in environmental samples are listed in Table 2.2-A. Table 2.2-B lists the REMP analysis and frequency schedule.

The Annual Land Use Census, required by Selected Licensee Commitments, is performed to ensure that changes in the use of areas at or beyond the site boundary are identified and that modifications to the Radiological Environmental Monitoring Program are made if required by changes in land use. This census satisfies the requirements of Section IV.B.3 of Appendix I to 10CFR50. Results are shown in Table 3.10.

Participation in an interlaboratory comparison program as required by Selected Licensee Commitments provides for independent checks on the precision and accuracy of measurements of radioactive material in REMP sample matrices. Such checks 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 10CFR50. A summary of the results obtained as part of this comparison program are in Section 5 of this annual report.

2.3 STATISTICAL AND CALCULATIONAL METHODOLOGY

2.3.1 ESTIMATION OF THE MEAN VALUE

There was one (1) basic statistical calculation performed on the raw data resulting from the environmental sample analysis program. The calculation involved the determination of the mean value for the indicator and the control samples for each sample medium. The mean is a widely used statistic. This value was used in the reduction of the data generated by the sampling and analysis of the various media in the Radiological Environmental Monitoring Program. "Net activity (or concentration)" is the activity (or concentration) determined to be present in the sample. No "Minimum Detectable Activity", "Lower Limit of Detection", "Less Than Level", or negative activities or concentrations are included in the calculation of the mean. The following equation was used to estimate the mean (reference 6.8):

$$\overline{x} = \frac{\sum_{i=1}^{N} x_i}{N}$$

Where:

$\overline{x}$ = estimate of the mean,
i = individual sample,
N = total number of samples with a net activity (or concentration),
χ_i = net activity (or concentration) for sample i.

2.3.2 LOWER LEVEL OF DETECTION AND MINIMUM DETECTABLE ACTIVITY

The Lower Level of Detection (LLD) and Minimum Detectable Activity (MDA) are used throughout the Environmental Monitoring Program.

LLD - The LLD, as defined in the Selected Licensee Commitments Manual is the smallest concentration of radioactive material in a sample that will yield a net count, above the system background, that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal. The LLD is an *a priori* lower limit of detection. The actual LLD is dependent upon the standard deviation of the background counting rate, the counting efficiency, the sample size (mass or volume), the radiochemical yield, and the radioactive decay of the sample between sample collection and counting. The "required" LLD's for each sample medium and selected radionuclides are given in the Selected Licensee Commitments and are listed in Table 2.2-C.

MDA - The MDA is the net counting rate (sample after subtraction of background) that must be surpassed before a sample is considered to contain a scientifically measurable amount of a radioactive material exceeding background amounts. The MDA is calculated using a sample background and may be thought of as an "actual" LLD for a particular sample measurement.

2.3.3 TREND IDENTIFICATION

One of the purposes of an environmental monitoring program is to determine if there is a buildup of radionuclides in the environment due to the operation of the nuclear station. Visual inspection of tabular or graphical presentations of data (including preoperational) is used to determine if a trend exists. A decrease in a particular radionuclide's concentration in an environmental medium does not indicate that reactor operations are removing radioactivity from the environment but that reactor operations are not adding that radionuclide to the environment in quantities exceeding the preoperational level and that the normal removal processes (radioactive decay, deposition, resuspension, etc.) are influencing the concentration.

Substantial increases or decreases in the amount of a particular radionuclide's release from the nuclear plant will greatly affect the resulting environmental levels; therefore, a knowledge of the release of a radionuclide from the nuclear plant is necessary to completely interpret the trends, or lack of trends, determined from the environmental data. Some factors that may affect environmental levels of radionuclides include prevailing weather conditions (periods of drought, solar cycles or heavier than normal precipitation), construction in or around either the nuclear plant or the sampling location, and addition or deletion of other sources of radioactive materials (such as the Chernobyl accident). Some of these factors may be obvious while others are sometimes unknown. Therefore, how trends are identified will include some judgment by plant personnel.

Figure 2.1-1

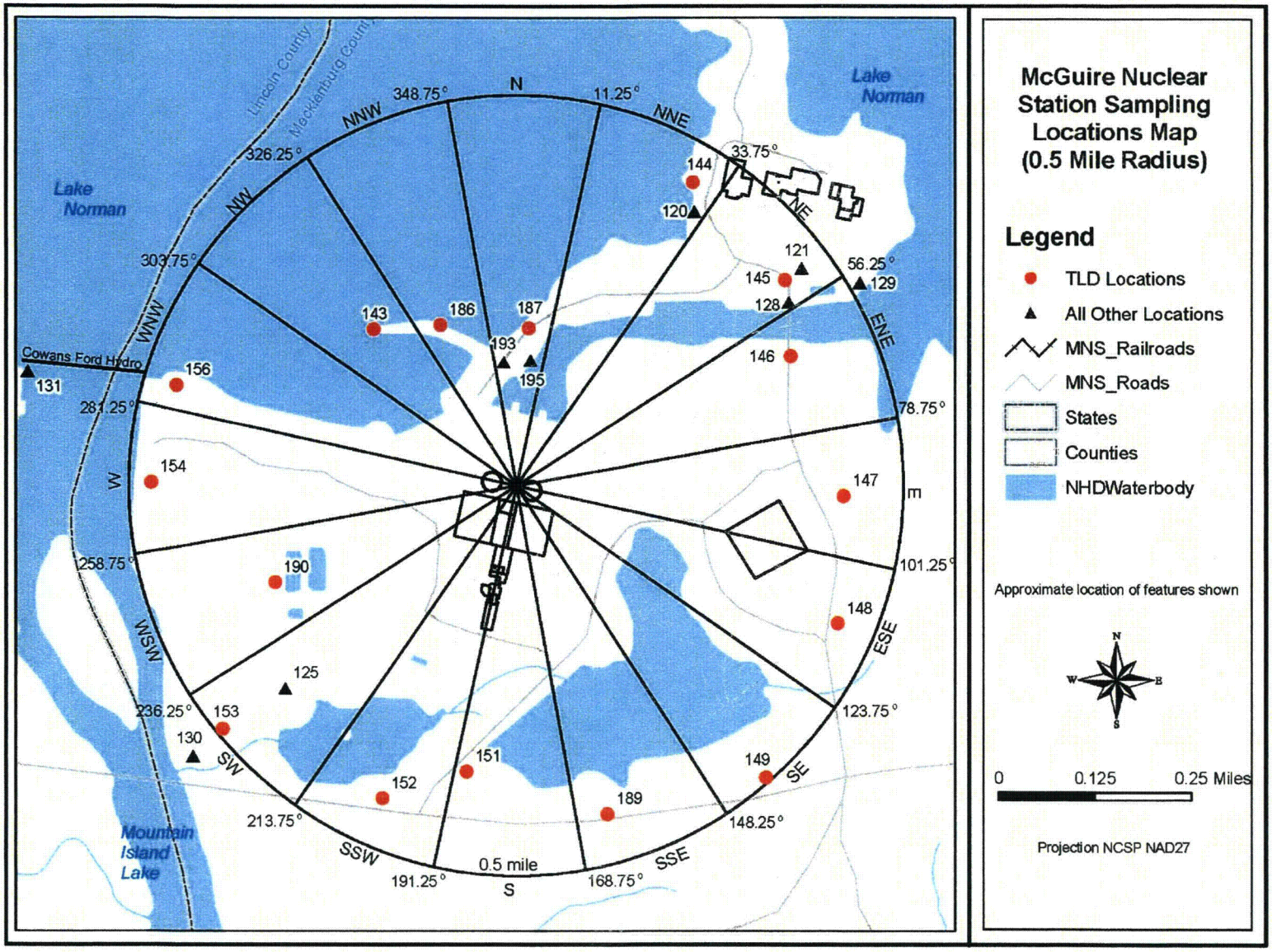
McGuire Nuclear Station Sampling Locations Map (0.5 Mile Radius)
Legend
TLD Locations
All Other Locations
MNS_Railroads
MNS_Roads
States
Counties
NHDWaterbody
Approximate location of features shown
0
0.125
0.25 Miles
Projection NCSP NAD27
Lake Norman
Lake Norman
Mountain Island Lake
Lincoln County
Mecklenburg County
Cowans Ford Hydro
0.5 mile
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
11.25°
33.75°
56.25°
78.75°
101.25°
123.75°
148.25°
168.75°
191.25°
213.75°
236.25°
258.75°
281.25°
303.75°
326.25°
348.75°
120
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Figure 2.1-2

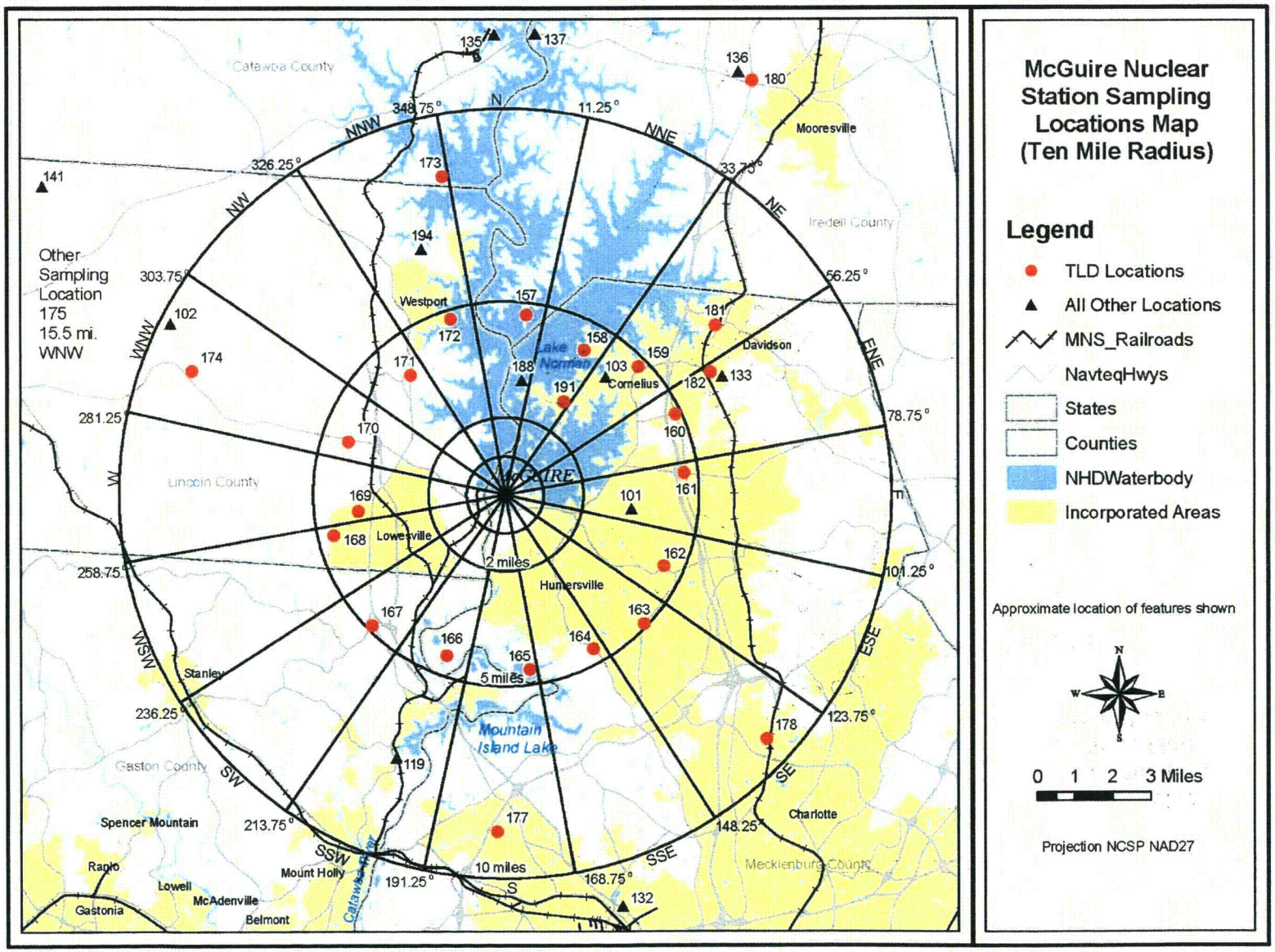

McGuire Nuclear Station Sampling Locations Map (Ten Mile Radius)
Legend
TLD Locations
All Other Locations
MNS_Railroads
NavteqHwys
States
Counties
NHDWaterbody
Incorporated Areas
Approximate location of features shown
0 1 2 3 Miles
Projection NCSP NAD27
Other Sampling Location 175 15.5 mi. WNW
Catawba County
Iredell County
Lincoln County
Gaston County
Mecklenburg County
Mooresville
Davidson
Cornelius
Westport
Lake Norman
Lowesville
Huntersville
Stanley
Mountain Island Lake
Spencer Mountain
Mount Holly
Lowell
McAdenville
Belmont
Gastonia
Rankin
Charlotte
McGUIRE
2 miles
5 miles
10 miles
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
11.25°
33.75°
56.25°
78.75°
101.25°
123.75°
148.25°
168.75°
191.25°
213.75°
236.25°
258.75°
281.25°
303.75°
326.25°
348.75°

TABLE 2.1-A

MCGUIRE RADIOLOGICAL MONITORING PROGRAM
SAMPLING LOCATIONS

Table 2.1-A Codes			
W	Weekly	SM	Semimonthly
BW	BiWeekly	Q	Quarterly
M	Monthly	SA	Semiannually
C	Control	I	Indicator

Site #	Measure Type	Location Description*	Air Rad. & Part.	Surface Water	Drinking Water	Shoreline Sediment	Food Products	Fish	Milk	Broad Leaf Veg.
101	I	North Mecklenburg Water Treatment Facility (3.31 mi E)			M					
102	C	Amity Church Road (9.89 mi WNW)	W							M (b)
103	I	Cottonwood Substation (4.20 mi NE)	W							
119	I	Mt. Holly Municipal Water Supply (7.40 mi SSW)			M					
120	I	Site Boundary (0.46 mi NNE)	W							M (b)
121	I	Site Boundary (0.47 mi NE)	W							
125	I	Site Boundary (0.38 mi SW)	W							M (b)
128	I	Discharge Canal Bridge (0.45 mi NE)		M						
129	I	Discharge Canal Entrance to Lake Norman (0.51 mi ENE)				SA		SA		
130	I	Hwy 73 Bridge Downstream (0.52 mi SW)				SA				
131	I	Cowans Ford Dam (0.64 mi WNW)		M						
132	I	Charlotte Municipal Water Supply (11.1 mi SSE)			M					
133	I	Cornelius (6.23 mi ENE)	W							
135	C	Plant Marshall Intake Canal (11.9 mi N)		M						
136	C	Mooresville Municipal Water Supply (12.7 mi NNE)			M					
137	C	Pinnacle Access Area (12.0 mi N)				SA		SA		
141	C	Lynch Dairy-Cows (14.8 mi WNW)							SM	
188	I	5 mile radius Gardens (2.79 mi NNE)					M (a)			
193	I	Site Boundary (0.19 mi N)								M (b)
194	I	East Lincoln County Water Supply (6.73 mi NNW)			M					
195	I	Fishing Access Road (0.19 mi N)	W							

(a) During Harvest Season
(b) When Available

* GPS data reflect approximate accuracy to within 2-5 meters. GPS field measurements were taken as close as possible to the item of interest.

TABLE 2.1-B

MCGUIRE RADIOLOGICAL MONITORING PROGRAM
SAMPLING LOCATIONS (TLD SITES)

Table 2.1-B Codes			
IR	Inner Ring	OR	Outer Ring
C	Control	SI	Special Interest

Site #	Measure Type	Location	Distance* (miles)	Sector	Site #	Measure Type	Location	Distance* (miles)	Sector
143	IR	SITE BOUNDARY	0.27	NW	164	OR	HAMBRIGHT & BEATTIES FORD ROAD	4.64	SSE
144	IR	SITE BOUNDARY	0.46	NNE	165	OR	ARTHER AUTEN ROAD	4.57	S
145	IR	SITE BOUNDARY	0.47	NE	166	OR	NECK ROAD REFUGE BOUNDARY	4.44	SSW
146	IR	SITE BOUNDARY	0.42	ENE	167	OR	LUCIA RIVERBEND HWY/OLD FIREHOUSE	4.87	SW
147	IR	SITE BOUNDARY	0.44	E	168	OR	OLD PLANK ROAD BRIDGE	4.60	WSW
148	IR	SITE BOUNDARY	0.46	ESE	169	OR	GLOVER LANE	4.03	W
149	IR	SITE BOUNDARY	0.50	SE	170	OR	LITTLE EGYPT ROAD	4.32	WNW
151	IR	SITE BOUNDARY	0.37	S	171	OR	TRIANGLE ACE HARDWARE	3.95	NW
152	IR	SITE BOUNDARY	0.44	SSW	172	OR	LAKESHORE S RD ISLAND VIEW COURT	4.69	NNW
153	IR	SITE BOUNDARY	0.47	SW	173	SI	KEISTLER STORE / GLENWOOD ROAD	8.39	NNW
154	IR	SITE BOUNDARY	0.45	W	174	SI	EAST LINCOLN JR. HIGH SCHOOL	8.77	WNW
156	IR	SITE BOUNDARY	0.44	WNW	175	C	BOGER CITY	15.5	WNW
189	IR	SITE BOUNDARY	0.43	SSE	177	SI	BELMARROW RD / COULWOOD	8.77	S
190	IR	SITE BOUNDARY	0.37	WSW	178	SI	FLORIDA STEEL CORPORATION	9.36	SE
157	IR	THE POINTE (MOORESVILLE)	4.69	N	180	SI	MOORESVILLE WATER TREATMENT FACILITY	12.7	NNE
158	OR	BETHEL CHURCH RD	4.33	NNE	181	SI	OLD DAVIDSON WATER FACILITY	7.02	NE
159	OR	HENDERSON ROAD & W CATAWBA AVENUE	4.73	NE	182	SI	CORNELIUS AIR SITE # 133	6.23	ENE
160	OR	ANCHORAGE MARINE SHOWROOM	4.89	ENE	186	SI	MCGUIRE FISHING ACCESS ROAD	0.24	NNW
161	OR	SAM FURR ROAD & HWY 21	4.70	E	187	SI	ENERGY EXPLORIUM / AIR SITE # 195	0.19	N
162	OR	RANSON ROAD	4.53	ESE	191	SI	PENINSULA DEV. / JOHN CONNOR ROAD	2.84	NNE
163	OR	MCCOY ROAD	4.94	SE					

* GPS data reflect approximate accuracy to within 2-5 meters. GPS field measurements were taken as close as possible to the item of interest.

TABLE 2.2-A

REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

Analysis	Water (pCi/liter)	Air Particulates or Gases (pCi/m^3)	Fish (pCi/kg-wet)	Milk (pCi/liter)	BroadLeaf Vegetation (pCi/kg-wet)
H-3	20,000[a],[b]				
Mn-54	1,000		30,000		
Fe-59	400		10,000		
Co-58	1,000		30,000		
Co-60	300		10,000		
Zn-65	300		20,000		
Zr-Nb-95	400				
I-131	2	0.9		3	100
Cs-134	30	10	1,000	60	1,000
Cs-137	50	20	2,000	70	2,000
Ba-La-140	200			300	

(a) If no drinking water pathway exists, a value of 30,000 pCi/liter may be used.
(b) H-3 Reporting level not applicable to surface water

TABLE 2.2-B

REMP ANALYSIS FREQUENCY

Sample Medium	Analysis Schedule	Gamma Isotopic	Tritium	Low Level I-131	Gross Beta	TLD
Air Radioiodine	Weekly	X				
Air	Weekly	X			X	
Direct Radiation	Quarterly					X
Surface Water	Monthly Composite	X				
	Quarterly Composite		X			
Drinking Water	Monthly Composite	X		(a)	X	
	Quarterly Composite		X			
Shoreline Sediment	Semiannually	X				
Milk	Semimonthly	X		X		
Fish	Semiannually	X				
Broadleaf Vegetation	Monthly[b]	X				
Food Products	Monthly[b]	X				

(a) Low-level I-131 analysis will be performed if the dose calculated for the consumption of drinking water is > 1 mrem per year. An LLD of 1 pCi/liter will be required for this analysis.
(b) When Available

TABLE 2.2-C

MAXIMUM VALUES FOR THE LOWER LIMITS OF DETECTION

Analysis	Water (pCi/liter)	Air Particulates or Gases (pCi/m^3)	Fish (pCi/kg-wet)	Milk (pCi/liter)	BroadLeaf Vegetation (pCi/kg-wet)	Sediment (pCi/kg-dry)
Gross Beta	4	0.01				
H-3	2000 [a]					
Mn-54	15		130			
Fe-59	30		260			
Co-58, 60	15		130			
Zn-65	30		260			
Zr-Nb-95	15					
I-131	1 [b]	0.07		1	60	
Cs-134	15	0.05	130	15	60	150
Cs-137	18	0.06	150	18	80	180
Ba-La-140	15			15		

(a) If no drinking water pathway exists, a value of 3000 pCi/liter may be used.
(b) If no drinking water pathway exists, the LLD of gamma isotopic analysis may be used.

3.0 INTERPRETATION OF RESULTS

Review of 2011 REMP analysis results was performed to detect and identify changes in environmental levels as a result of station operation. The radionuclides with Selected Licensee Commitments reporting levels that indicate consistent detectable activity have been historically trended from preoperation to present. Analyses from 1977 - 1978 have been excluded since these results were much higher than the other preoperational years due to outside influences such as weapons testing. The preoperational analyses from 1981 were combined with the operational analyses from the latter part of 1981 and averaged to give one concentration for each radionuclide for that year.

The highest annual mean concentration of applicable Selected Licensee Commitments radionuclides from the indicator locations for each media type was used for trending purposes. Trending was performed by comparing annual mean concentrations to historical results. Factors evaluated include the frequency of detection and the concentration in terms of the percent of the radionuclide's SLC reporting level (Table 2.2-A). All maximum percent of reporting level values attributable to MNS plant operation were well below the 100% action level. The highest value attributable to MNS plant operations during 2011 was 6.8% for drinking water tritium at the North Mecklenburg Water Treatment Facility (Location 101). Only Selected Licensee Commitments radionuclides were detected in 2011.

No Selected Licensee Commitments radionuclides reporting levels were exceeded in 2011 due to MNS station operations. However, during the Fukushima Daiichi fallout period several samples exceeded Selected Licensee Commitment reporting levels for I-131 and are indicated in the table below.

Sample Media	Date	Locations
Milk	3/28/2011	141
Milk	4/11/2011	141
Broadleaf Vegetation	4/4/2011	102, 120, 193
Crops	4/4/2011	188

Because the radioactivity exceeding reporting levels was attributed to Fukushima Daiichi no reports were made to the NRC.

Trending was performed by comparing annual mean concentrations of any effluent related detected radionuclide to historical results. Levels of I-131 and Cs-137 increased during the Fukushima Daiichi fallout period and comparisons were made to distinguish Fukushima Daiichi activity and normal activity. Samples taken during media-specific Fukushima Daiichi fallout periods (table below) were included in the trend evaluations for applicable sample media.

Sample Media	Fukushima Daiichi Period
Air Particulate/Radioiodine	3/14/2011 – 4/18/2011
Milk	4/4/2011
Broadleaf Vegetation	4/4/2011
Crops	4/4/2011

Changes in sample location, analytical technique, and presentation of results must be considered when reviewing for trends. Calculation of the annual mean concentrations has been performed differently over the history of the REMP. During 1979-1986, all net results (sample minus background) positive and negative, were included in the calculation of the mean. Only positive net activity results were used to calculate the mean for the other years. All negative values were replaced with a zero for calculational and graphical purposes to properly represent environmental conditions. A change in gamma spectroscopy analysis systems in 1987 ended a period when many measurements yielded detectable low-level activity for both indicator and control location samples. It is possible that the method the previous system used to estimate net activity may have been vulnerable to false-positive results.

This section includes tables and graphs containing the highest annual mean concentrations of any effluent related radionuclide detected since the change in analysis systems in 1987. Any zero concentrations used in tables or graphs represent activity measurements less than detectable levels. Only the specific radionuclides that represent the highest dose contributors or demonstrate consistent detectable activity are shown graphically.

Data presented in Sections 3.1 through 3.9 support the conclusion that there was no significant increase in radioactivity in the environment around McGuire Nuclear Station due to station operations in 2011. Similarly, there was no significant increase in ambient background radiation levels in the surrounding areas. The 2011 land use census data, shown in Section 3.10, indicates that no program changes are required as a result of the census.

3.1 AIRBORNE RADIOIODINE AND PARTICULATES

In 2011, 364 particulate and radioiodine samples were analyzed, 312 at six indicator locations and 52 at the control location. Particulate samples were analyzed weekly for gamma and gross beta. Radioiodine samples received a weekly gamma analysis. During 2011 there was an increase in I-131 and Cs-137 concentrations due to Fukushima Daiichi fallout activity as indicated in the tables below.

Air Particulate

Analysis	Annual Concentration with Fukushima Daiichi (pCi/m^3)				Annual Concentration without Fukushima Daiichi (pCi/m^3)			
	Indicator	FRL	Control	FRL	Indicator	FRL	Control	FRL
I-131	2.08E-2	2.31E-2	1.54E-2	1.71E-2	0.00	0	0.00	0
Cs-137	7.06E-3	3.53E-4	0.00	0	0.00	0	0.00	0

FRL = Fraction of Selected Licensee Commitment Reporting Level

Air Radioiodine

Analysis	Annual Concentration with Fukushima Daiichi (pCi/m^3)				Annual Concentration without Fukushima Daiichi (pCi/m^3)			
	Indicator	FRL	Control	FRL	Indicator	FRL	Control	FRL
I-131	6.00E-2	6.67E-2	5.46E-2	6.07E-2	0.00	0	0.00	0

FRL = Fraction of Selected Licensee Commitment Reporting Level

Gross beta analyses indicated 1.99E-2 pCi/m^3 at the location with the highest annual mean and 2.00E-2 pCi/m^3 at the control location. The control location was relocated during 2008. Detectable gamma emitting particulate activity (Co-58) was last observed in environmental air particulate samples in 2004 (reference 6.15).

No detectable I-131 activity in any environmental air radioiodine samples was found in 2011 due to MNS plant operations. K-40 and Be-7 that occur naturally were routinely detected in charcoal cartridges collected during the year. Cs-137 activity was not detected on any cartridges in 2011. Cs-137 detection on the charcoal cartridge was determined in 1990 to be an active constituent of the charcoal. A similar study was performed in 2001 again yielding this conclusion (reference 6.13). Therefore, any Cs-137 activities were not used in any dose calculations in Section 4.0 of this report.

Figure 3.1 shows gross beta highest annual mean indicator and control location concentrations since 1985. There is no reporting level for gross beta. Table 3.1-A shows indicator and control location highest annual means for Cs-137 (including Fukushima Daiichi) and gross beta.

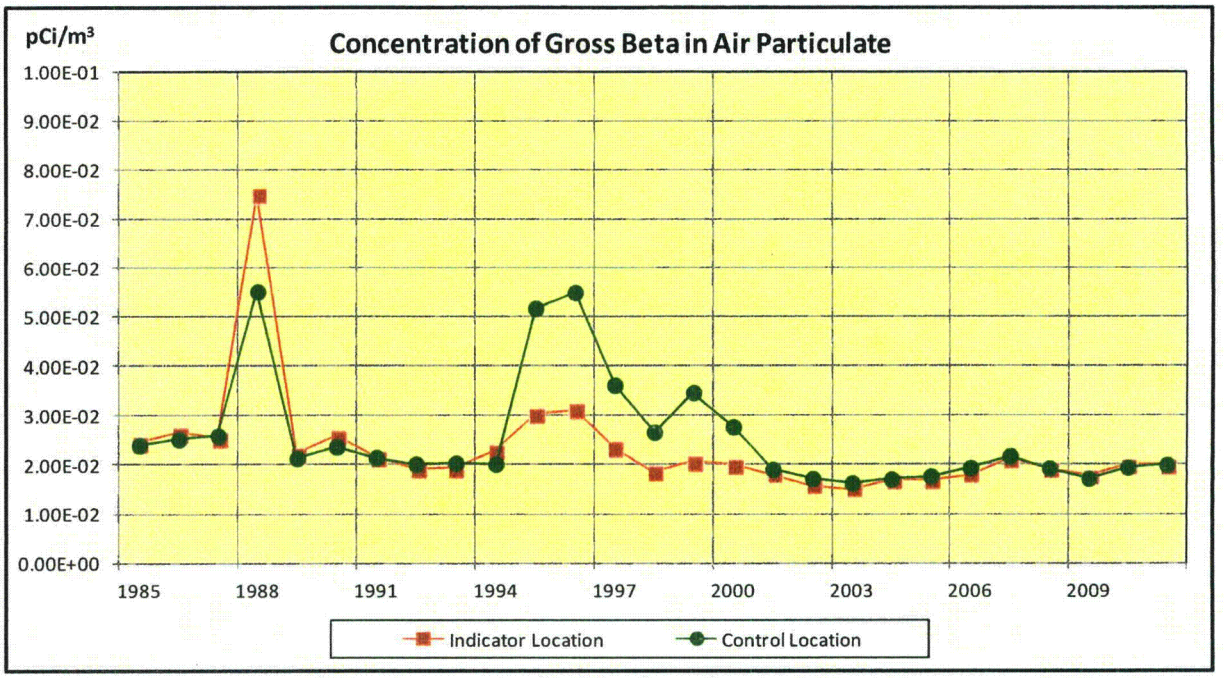
Table 3.1-B gives indicator location highest annual means and control means since 1979 for I-131 (including Fukushima Daiichi). Preoperational and ten year averages are also shown. No I-131 activity due to MNS plant operation has been detected since 1989.

Radioactivity identified in MNS airborne particulate and airborne radioiodine samples during the period of 3/14/2011 through 4/11/2011 was determined to be from the Fukushima Daiichi incident based on the following:

(1) The quantities of radioactive airborne effluents from McGuire Nuclear Station during 2011 did not increase significantly compared to year 2010.
(2) REMP sample results have not detected the presence of these isotopes in airborne particulate and airborne radioiodine samples since 1989.
(3) Concentrations detected in the indicator samples were also identified at similar levels in the control samples for McGuire Nuclear Station.
(4) Similar results were seen at other US nuclear plants and state and local government monitoring agencies.

As such, the atypical detection of these radionuclides in both indicator and control samples is credibly attributed to the trans-Pacific transport of airborne releases from Fukushima Daiichi following the March 11, 2011 Tohoku earthquake and is not related to the operations of McGuire Nuclear Station.

Figure 3.1



There is no reporting level for Gross Beta in air particulate

Table 3.1-A Mean Concentrations of Radionuclides in Air Particulate

YEAR	Cs-137 Indicator (pCi/m^3)	Cs-137 Control (pCi/m^3)	Beta Indicator (pCi/m^3)	Beta Control (pCi/m^3)
1979*	4.40E-3	1.47E-3	**	**
1980*	6.70E-3	4.53E-3	**	**
1981*	6.16E-3	5.32E-3	**	**
1982*	3.82E-3	2.29E-3	**	**
1983*	2.93E-3	3.21E-3	**	**
1984	1.74E-3	8.29E-4	**	**
1985	1.86E-3	1.32E-3	2.44E-2	2.40E-2
1986	4.98E-3	3.03E-3	2.64E-2	2.52E-2
1987	1.07E-2	7.91E-3	2.54E-2	2.59E-2
1988	0.00E0	0.00E0	7.49E-2	5.51E-2
1989	0.00E0	0.00E0	2.22E-2	2.14E-2
1990	0.00E0	0.00E0	2.58E-2	2.37E-2
1991	0.00E0	0.00E0	2.16E-2	2.15E-2
1992	0.00E0	0.00E0	1.92E-2	2.02E-2
1993	0.00E0	0.00E0	1.93E-2	2.04E-2
1994	0.00E0	0.00E0	2.28E-2	2.02E-2
1995	0.00E0	0.00E0	3.02E-2	5.17E-2
1996	0.00E0	0.00E0	3.11E-2	5.49E-2
1997	0.00E0	0.00E0	2.34E-2	3.62E-2
1998	0.00E0	0.00E0	1.86E-2	2.66E-2
1999	0.00E0	0.00E0	2.06E-2	3.47E-2
2000	0.00E0	0.00E0	2.00E-2	2.77E-2
2001	0.00E0	0.00E0	1.79E-2	1.91E-2

Table 3.1-A continued

YEAR	Cs-137 Indicator (pCi/m^3)	Cs-137 Control (pCi/m^3)	Beta Indicator (pCi/m^3)	Beta Control (pCi/m^3)
2002	0.00E0	0.00E0	1.57E-2	1.72E-2
2003	0.00E0	0.00E0	1.50E-2	1.63E-2
2004	0.00E0	0.00E0	1.67E-2	1.71E-2
2005	0.00E0	0.00E0	1.68E-2	1.77E-2
2006	0.00E0	0.00E0	1.79E-2	1.94E-2
2007	0.00E0	0.00E0	2.12E-2	2.18E-2
2008	0.00E0	0.00E0	1.92E-2	1.93E-2
2009	0.00E0	0.00E0	1.79E-2	1.76E-2
2010	0.00E0	0.00E0	2.01E-2	1.95E-2
Average (2001 – 2010)	NOT APPLICABLE	NOT APPLICABLE	1.78E-2	1.85E-2
2011	7.06E-3	0.00E0	1.99E-2	2.00E-2

0.00E0 = no detectable measurements * Radioiodine and Particulates analyzed together ** Gross Beta analysis not performed
2011 concentration affected by Fukushima Daiichi

Table 3.1-B Mean Concentrations of Air Radioiodine (I-131)

Year	Indicator Location (pCi/m^3)	Control Location (pCi/m^3)
1979*	3.28E-3	1.04E-3
1980*	2.01E-3	1.10E-3
1981*	4.17E-3	6.27E-4
1982*	1.42E-3	2.48E-3
1983*	1.99E-3	2.01E-4
1984	3.17E-3	0.00E0
1985	3.15E-3	1.04E-3
1986	1.27E-2	6.10E-3
1987	1.07E-2	6.60E-3
1988	0.00E0	0.00E0
1989	2.18E-2	0.00E0
1990	0.00E0	0.00E0
1991	0.00E0	0.00E0
1992	0.00E0	0.00E0
1993	0.00E0	0.00E0
1994	0.00E0	0.00E0
1995	0.00E0	0.00E0
1996	0.00E0	0.00E0
1997	0.00E0	0.00E0
1998	0.00E0	0.00E0
1999	0.00E0	0.00E0
2000	0.00E0	0.00E0
2001	0.00E0	0.00E0
2002	0.00E0	0.00E0
2003	0.00E0	0.00E0
2004	0.00E0	0.00E0
2005	0.00E0	0.00E0
2006	0.00E0	0.00E0
2007	0.00E0	0.00E0
2008	0.00E0	0.00E0
2009	0.00E0	0.00E0
2010	0.00E0	0.00E0
2011	6.00E-2	5.46E-2

0.00E0 = no detectable measurements * Radioiodine and Particulate analyzed together.
2011 concentration affected by Fukushima Daiichi

3.2 DRINKING WATER

In 2011, 65 drinking water samples were analyzed for gross beta and gamma emitting radionuclides. Fifty-two samples were from the four indicator locations and 13 from the control location. Tritium (H-3) analyses were performed on 20 composite samples, 16 at indicator locations and four at the control location.

No detectable gamma activity was found in drinking water samples in 2011 and has not been detected since 1987. Gross beta analyses indicated 1.77 pCi/l at the location with the highest annual mean and 1.75 pCi/l at the control location. Tritium was detected in thirteen of the 16 indicator composite samples taken in 2011 with the highest annual mean resulting in only 4.99% of the reporting level. Tritium was not detected in any of the four control location samples. The dose for consumption of water was less than one mrem per year, historically and for 2011; therefore low-level iodine analysis is not required.

Figure 3.2 shows tritium highest annual mean indicator and control location concentrations with comparisons to 20% of the reporting level. Table 3.2 gives indicator location highest annual means and control means since 1979 for tritium and gross beta. There is no reporting level for gross beta.

Drinking water Location 101 was added to the sampling program in 1999. Figure 3.2 shows an increase beginning in that year. There was an increase in tritium releases in 2006 due to silica removal from the spent fuel pools. This resulted in additional water volume being released from the plant. An extreme drought during the second half of 2007 and much of 2008 affecting the Catawba River Basin resulted in less dilution volume available in Lake Norman.

Figure 3.2

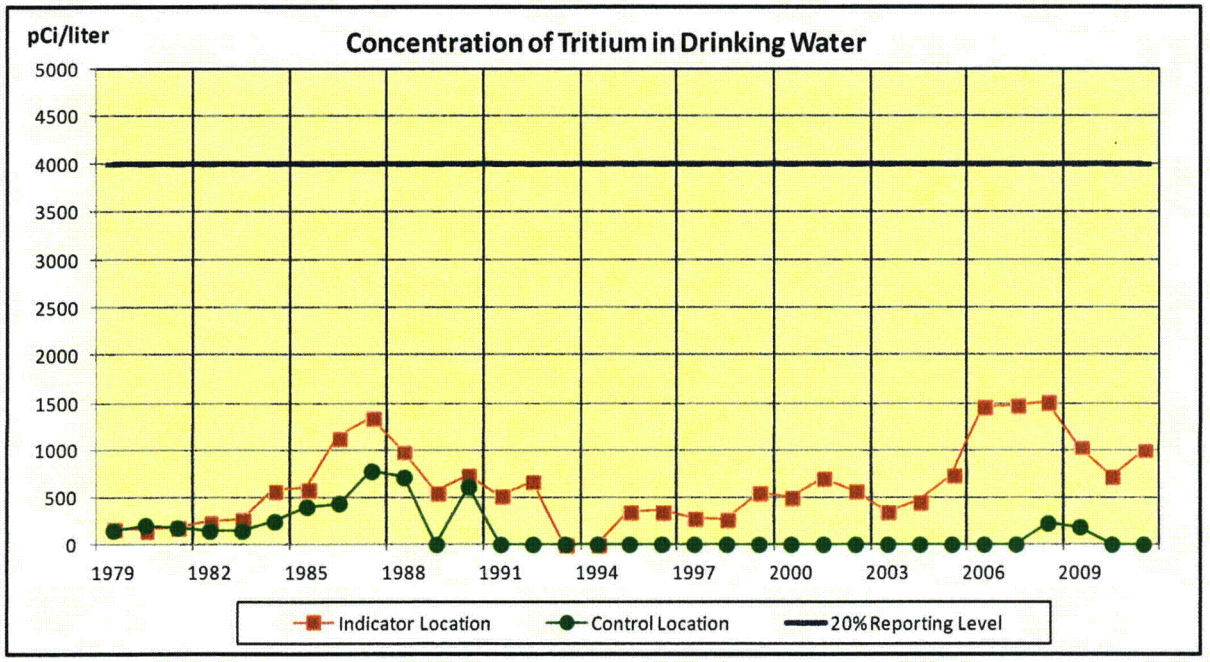


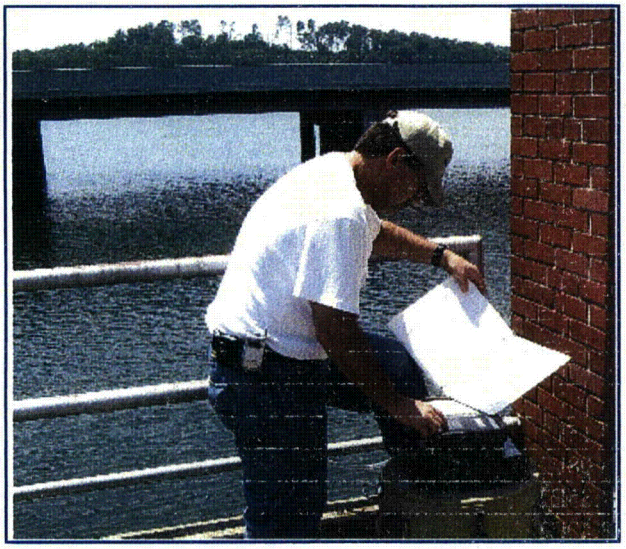
Table 3.2 Mean Concentrations of Radionuclides in Drinking Water

YEAR	Gross Beta (pCi/l)		Tritium (pCi/l)	
	Indicator Location	Control Location	Indicator Location	Control Location
1979	2.40E0	2.03E0	1.65E2	1.50E2
1980	2.34E0	1.87E0	1.63E2	2.05E2
1981	2.79E0	2.41E0	1.88E2	1.78E2
1982	2.62E0	2.43E0	2.43E2	1.45E2
1983	1.80E0	1.87E0	2.65E2	1.45E2
1984	2.78E0	1.81E0	5.77E2	2.45E2
1985	1.88E0	1.90E0	5.93E2	4.00E2
1986	2.13E0	2.15E0	1.14E3	4.37E2
1987	2.30E0	2.00E0	1.35E3	7.75E2
1988	2.00E0	2.00E0	9.92E2	7.11E2
1989	2.80E0	2.70E0	5.62E2	0.00E0
1990	3.70E0	4.30E0	7.32E2	6.11E2
1991	2.40E0	2.50E0	5.22E2	0.00E0
1992	2.00E0	1.70E0	6.73E2	0.00E0
1993	2.80E0	2.40E0	0.00E0	0.00E0
1994	2.47E0	2.90E0	0.00E0	0.00E0
1995	4.20E0	3.30E0	3.58E2	0.00E0
1996	2.75E0	2.11E0	3.60E2	0.00E0
1997	2.70E0	2.24E0	2.90E2	0.00E0
1998	2.75E0	2.33E0	2.68E2	0.00E0
1999	2.48E0	2.17E0	5.49E2	0.00E0
2000	2.66E0	1.99E0	5.04E2	0.00E0
2001	2.48E0	2.19E0	6.98E2	0.00E0
2002	2.47E0	2.08E0	5.64E2	0.00E0
2003	1.81E0	1.52E0	3.51E2	0.00E0
2004	1.68E0	1.29E0	4.61E2	0.00E0
2005	1.74E0	1.30E0	7.35E2	0.00E0
2006	1.75E0	1.80E0	1.46E3	0.00E0
2007	1.81E0	1.76E0	1.48E3	0.00E0
2008	2.40E0	1.87E0	1.52E3	2.26E2
2009	1.90E0	1.81E0	1.03E3	1.86E2
2010	1.85E0	1.74E0	7.20E2	0.00E0
2011	1.77E0	1.75E0	9.97E2	0.00E0

0.00E0 = no detectable measurements

3.3 SURFACE WATER

In 2011, 39 surface water samples were analyzed for gamma emitting radionuclides, 26 at the two indicator locations and 13 at the control location. Analyses for H-3 were performed on 12 samples, eight at indicator locations and four at the control location.



No detectable gamma activity was found in surface water samples in 2011 and has not been detected since 1988. Tritium was detected in all of the eight indicator composite samples taken in 2011. Tritium was detected in one of the four control location composite samples in 2011.

Figure 3.3 shows tritium highest annual mean indicator and control location concentrations. Table 3.3 gives indicator and control location highest annual means since 1979 for tritium.

There was an increase in surface water tritium in 2006 due to silica removal from the spent fuel pools. This resulted in additional water volume being released from the plant. An extreme drought during the second half of 2007 and much of 2008 affecting the Catawba River Basin resulted in less dilution volume available in Lake Norman.

Figure 3.3

There is no reporting level for tritium in surface water

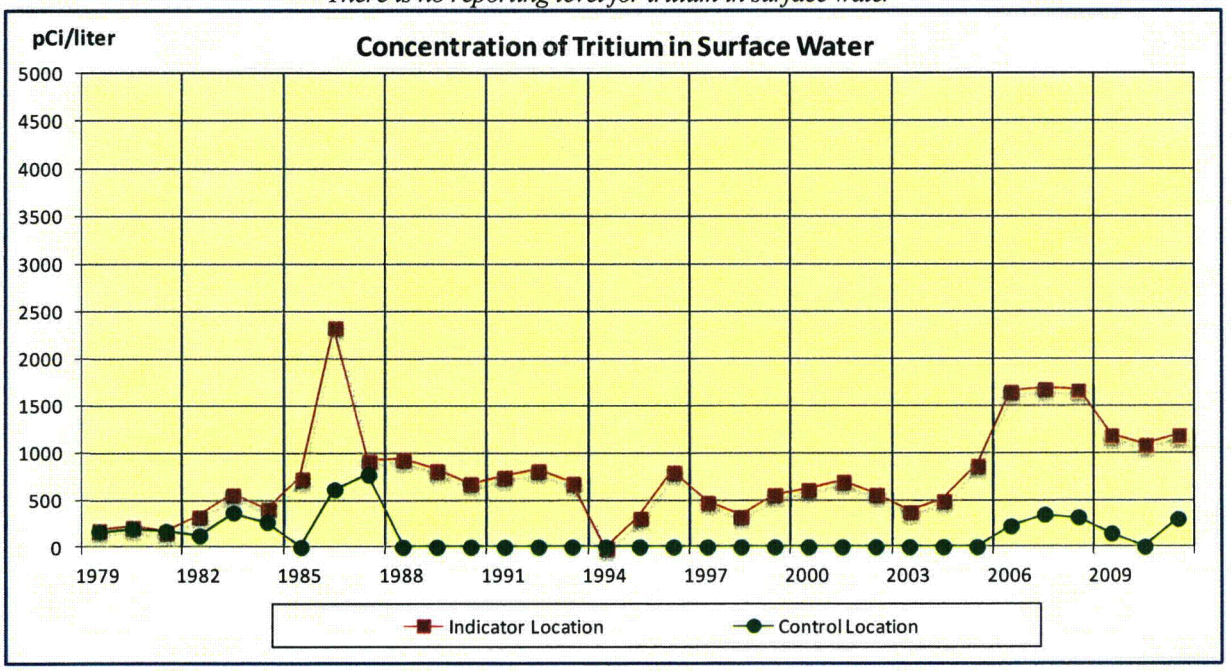


Table 3.3 Mean Concentrations of Tritium in Surface Water

YEAR	H-3 Indicator (pCi/l)	H-3 Control (pCi/l)
1979	1.85E2	1.66E2
1980	2.13E2	1.93E2
1981	1.75E2	1.70E2
1982	3.30E2	1.23E2
1983	5.75E2	3.67E2
1984	4.10E2	2.65E2
1985	7.33E2	0.00E0
1986	2.33E3	6.13E2
1987	9.20E2	7.70E2
1988	9.40E2	0.00E0
1989	8.22E2	0.00E0
1990	6.77E2	0.00E0
1991	7.53E2	0.00E0
1992	8.13E2	0.00E0
1993	6.85E2	0.00E0
1994	0.00E0	0.00E0
1995	3.15E2	0.00E0
1996	8.08E2	0.00E0
1997	4.85E2	0.00E0
1998	3.40E2	0.00E0
1999	5.60E2	0.00E0
2000	6.22E2	0.00E0
2001	6.98E2	0.00E0
2002	5.65E2	0.00E0
2003	3.91E2	0.00E0
2004	5.04E2	0.00E0
2005	8.74E2	0.00E0
2006	1.65E3	2.19E2
2007	1.68E3	3.42E2
2008	1.67E3	3.13E2
2009	1.18E3	1.41E2
2010	1.09E3	0.00E0
2011	1.19E3	2.94E2

0.00E0 = no detectable measurements

3.4 MILK

In 2011, 26 milk samples were analyzed for low level I-131 and other gamma emitting radionuclides. One control location was sampled. No indicator dairies were identified by the 2011 land use census. Iodine-131 was identified in three milk samples due to Fukushima Daiichi fallout activity as indicated in the table below.

Milk

Analysis	Annual Concentration with Fukushima Daiichi (pCi/l)				Annual Concentration without Fukushima Daiichi (pCi/l)			
	Indicator	FRL	Control	FRL	Indicator	FRL	Control	FRL
LLI-131	NA	NA	4.80	1.60	NA	NA	0.00	0

FRL = Fraction of Selected Licensee Commitment Reporting Level

No detectable activity due to MNS plant operations was found in milk samples in 2011. Cs-137 has not been detected in milk samples since 1990 and all other radionuclides have not been detected since 1987. K-40 is a naturally occurring radionuclide observed in milk samples in 2011.

Table 3.4 gives indicator location highest annual means and control means since 1979 for Cs-137. Since no Cs-137 was detected in 2011, no reporting levels were approached.

Radioactivity identified in the MNS milk samples collected during the period of 3/28/2011 through 4/25/2011 was determined to be from the Fukushima Daiichi incident based on the following:

(1) The quantities of radioactive airborne effluents from McGuire Nuclear Station during 2011 did not increase significantly compared to year 2010.
(2) REMP sample results have not detected the presence of radionuclides in milk samples since 1990.
(3) There are no indicator milk locations for McGuire Nuclear Station. Concentrations being detected were identified in the control samples only for McGuire Nuclear Station.
(4) Similar results were seen at other US nuclear plants and state and local government monitoring agencies.

As such, the atypical detection of these radionuclides in control samples is credibly attributed to the trans-Pacific transport of airborne releases from Fukushima Daiichi following the March 11, 2011 Tohoku earthquake and is not related to the operations of McGuire Nuclear Station.

Table 3.4 Mean Concentrations of Cs-137 in Milk

YEAR	Cs-137 Indicator (pCi/l)	Cs-137 Control (pCi/l)
1979	2.48E1	6.04E0
1980	1.72E1	4.13E0
1981	2.04E1	4.15E0
1982	1.21E1	5.20E0
1983	2.01E1	2.82E0
1984	1.48E1	2.56E0
1985	1.42E1	2.72E0
1986	3.74E0	3.45E0
1987	5.20E0	8.60E0
1988	3.40E0	2.90E0
1989	6.00E0	5.60E0
1990	5.30E0	2.60E0
1991	0.00E0	0.00E0
1992	0.00E0	0.00E0
1993	0.00E0	0.00E0
1994	0.00E0	0.00E0
1995	0.00E0	0.00E0
1996	0.00E0	0.00E0
1997	0.00E0	0.00E0
1998	0.00E0	0.00E0
1999	0.00E0	0.00E0
2000	0.00E0	0.00E0
2001	0.00E0	0.00E0
2002	0.00E0	0.00E0
2003	0.00E0	0.00E0
2004	0.00E0	0.00E0
2005	0.00E0	0.00E0
2006	0.00E0	0.00E0
2007	0.00E0	0.00E0
2008	0.00E0	0.00E0
2009	0.00E0	0.00E0
2010	0.00E0	0.00E0
2011	0.00E0	0.00E0

0.00E0 = no detectable measurements

3.5 BROADLEAF VEGETATION

In 2011, 48 broadleaf vegetation samples were analyzed, 36 at the three indicator locations and twelve at the control location. During 2011 there was an increase in I-131 and Cs-137 concentrations due to Fukushima Daiichi fallout activity as indicated in the table below.

Broadleaf Vegetation

Analysis	Annual Concentration with Fukushima Daiichi (pCi/kg)				Annual Concentration without Fukushima Daiichi (pCi/kg)			
	Indicator	FRL	Control	FRL	Indicator	FRL	Control	FRL
I-131	316	3.16	168	1.68	0.00	0	0.00	0
Cs-137	22.9	0.01	0.00	0.00	0.00	0	0.00	0

FRL = Fraction of Selected Licensee Commitment Reporting Level

The control location was relocated during 2008. There were no gamma emitting radionuclides attributable to MNS station operation identified in any indicator location or control location broadleaf vegetation samples during 2011.

No airborne Cs-137 has been released from the plant since 1998. Cs-137 attributable to past nuclear weapons testing is known to exist in many environmental media at low and highly variable levels.

Table 3.5 gives indicator and control location highest annual means since 1979 for Cs-137.

Radioactivity identified in the MNS broadleaf vegetation samples collected 4/4/2011 was determined to be from the Fukushima Daiichi incident based on the following:

(1) The quantities of radioactive airborne effluents from McGuire Nuclear Station during 2011 did not increase significantly compared to year 2010.
(2) REMP sample results do not typically detect the presence of these isotopes in broadleaf vegetation samples.
(3) Similar results were seen at other US nuclear plants and state and local government monitoring agencies.

As such, the atypical detection of these radionuclides in both indicator and control samples is credibly attributed to the trans-Pacific transport of airborne releases from Fukushima Daiichi following the March 11, 2011 Tohoku earthquake and is not related to the operations of McGuire Nuclear Station.

Table 3.5 Mean Concentrations of Cs-137 in Broadleaf Vegetation

YEAR	Cs-137 Indicator (pCi/kg)	Cs-137 Control (pCi/kg)
1979	2.19E1	1.93E1
1980	2.30E1	1.92E1
1981	3.04E1	2.02E1
1982	2.46E1	1.22E1
1983	9.07E0	7.85E0
1984	1.02E1	1.05E1
1985	8.05E0	2.37E-2
1986	4.03E1	1.27E1
1987	2.20E1	1.70E1
1988	3.90E1	3.40E1
1989	9.60E1	0.00E0
1990	4.00E1	0.00E0
1991	3.30E1	0.00E0
1992	4.90E1	0.00E0
1993	1.60E1	0.00E0
1994	0.00E0	0.00E0
1995	0.00E0	0.00E0
1996	0.00E0	0.00E0
1997	0.00E0	0.00E0
1998	0.00E0	2.69E1
1999	0.00E0	0.00E0
2000	0.00E0	0.00E0
2001	0.00E0	0.00E0
2002	0.00E0	0.00E0
2003	0.00E0	0.00E0
2004	0.00E0	0.00E0
2005	0.00E0	0.00E0
2006	2.98E1	0.00E0
2007	1.34E1	0.00E0
2008	0.00E0	0.00E0
2009	0.00E0	0.00E0
2010	0.00E0	0.00E0
2011	2.29E1	0.00E0

0.00E0 = no detectable measurements
2011 concentration affected by Fukushima Daiichi

3.6 FOOD PRODUCTS

In 2011, 12 food products (crops) samples were analyzed, all at one indicator location. There is no control location for this media. During 2011 there was an increase in I-131 and Cs-137 concentrations due to Fukushima Daiichi fallout activity as indicated in the table below.

Food Products (Crops)

Analysis	Annual Concentration with Fukushima Daiichi (pCi/kg)				Annual Concentration without Fukushima Daiichi (pCi/kg)			
	Indicator	FRL	Control	FRL	Indicator	FRL	Control	FRL
I-131	142	1.42	NA	NA	0.00	0	0.00	0
Cs-137	30.6	0.02	NA	NA	0.00	0	0.00	0

FRL = Fraction of Selected Licensee Commitment Reporting Level

No detectable activity attributable to MNS station operation has been detected in this media since 1987. Table 3.6 shows Cs-137 indicator highest annual means (including Fukushima Daiichi) with preoperational data.

Radioactivity identified in the MNS food products (crops) samples collected 4/4/2011 was determined to be from the Fukushima Daiichi incident based on the following:

(1) The quantities of radioactive airborne effluents from McGuire Nuclear Station during 2011 did not increase significantly compared to year 2010.
(2) REMP sample results have not detected the presence of radionuclides in food products (crops) samples since 1987.
(3) There is no control location sampled at McGuire Nuclear Station for this media.
(4) Similar results were seen at other US nuclear plants and state and local government monitoring agencies.

As such, the atypical detection of these radionuclides in both indicator and control samples is credibly attributed to the trans-Pacific transport of airborne releases from Fukushima Daiichi following the March 11, 2011 Tohoku earthquake and is not related to the operations of McGuire Nuclear Station.

Table 3.6 Mean Concentrations of Cs-137 in Food Products

YEAR	Cs-137 Indicator (pCi/kg)
1979	2.19E1
1980	2.30E1
1981	3.04E1
1982	2.46E1
1983	9.07E0
1984	8.45E0
1985	7.99E0
1986	2.15E1
1987	2.90E1
1988	0.00E0
1989	0.00E0
1990	0.00E0
1991	0.00E0
1992	0.00E0
1993	0.00E0
1994	0.00E0
1995	0.00E0
1996	0.00E0
1997	0.00E0
1998	0.00E0
1999	0.00E0
2000	0.00E0
2001	0.00E0
2002	0.00E0
2003	0.00E0
2004	0.00E0
2005	0.00E0
2006	0.00E0
2007	0.00E0
2008	0.00E0
2009	0.00E0
2010	0.00E0
2011	3.06E1

0.00E0 = no detectable measurements
2011 concentration affected by Fukushima Daiichi

3.7 FISH

In 2011, 12 fish samples were analyzed for gamma emitting radionuclides, six at the indicator location and six at the control location.

Figure 3.7-1 shows Cs-137 highest annual mean indicator and control location concentrations with comparisons to 5% of the reporting level. Figure 3.7-2 shows Co-60 highest annual mean indicator and control location concentrations also with comparisons to 5% of the reporting level. Table 3.7 gives indicator location highest annual means since 1980 for all radionuclides detected since the analysis change in 1988.

Co-58 activity was not detected in 2011 in any of the indicator or control samples. Cs-137 activity was detected in one of the six indicator samples taken at Location 129 with a mean concentration of 22.3 pCi/kg, which is 1.12% of the reporting level. Cs-137 was not detected in any of the six control samples.

All other radionuclides not shown in the table have demonstrated no detectable activity since 1986.

Figure 3.7-1

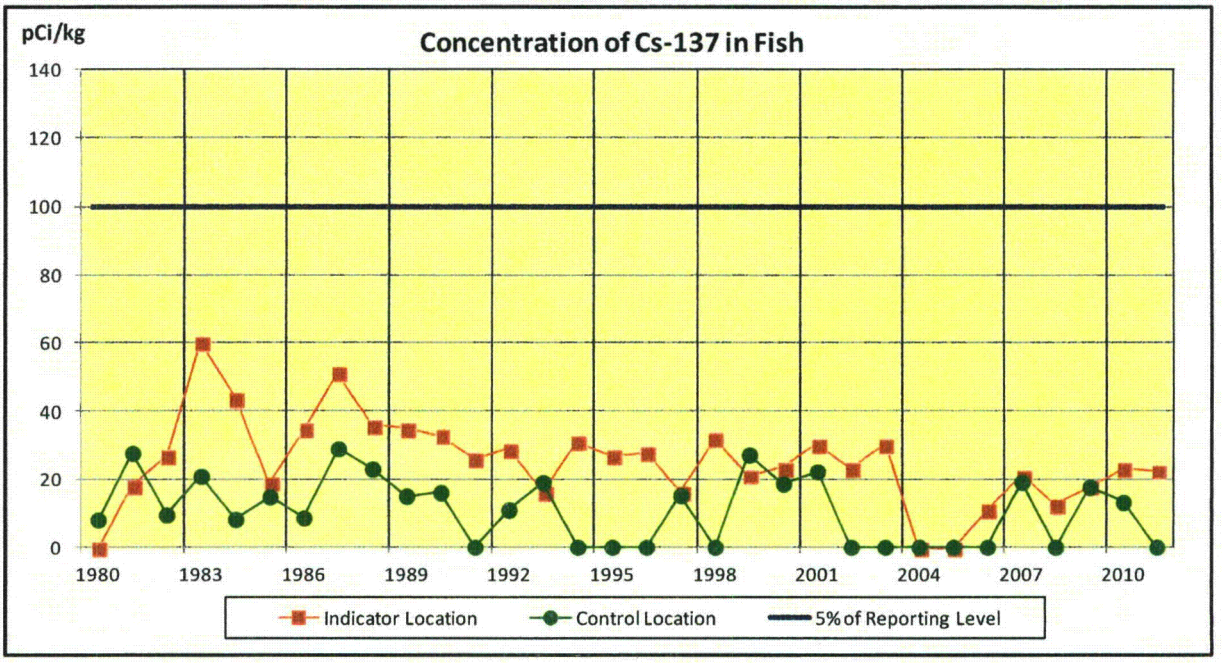


Figure 3.7-2

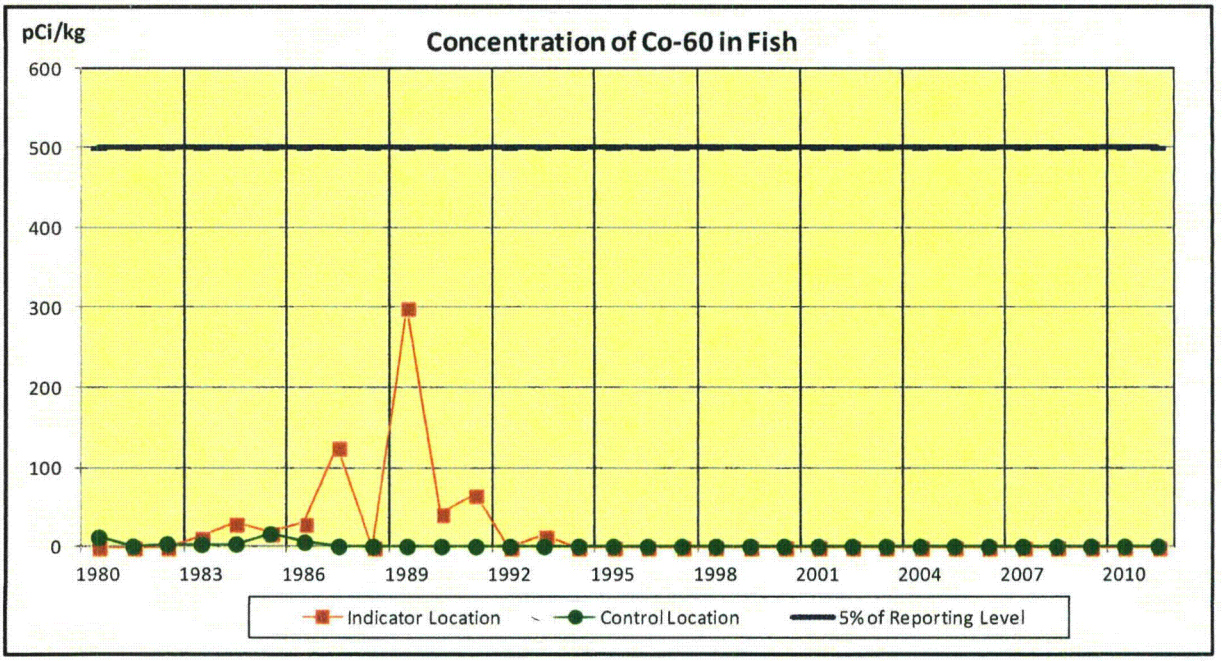


Table 3.7 Mean Concentrations of Radionuclides in Fish (pCi/kg)

YEAR	Mn-54 Indicator	Co-58 Indicator	Co-60 Indicator	Cs-134 Indicator	Cs-137 Indicator
1980	-1.97E1	8.36E0	-2.25E1	-2.70E1	-4.13E0
1981	-2.71E0	-2.98E0	-2.65E0	-1.99E0	1.80E1
1982	-3.83E0	8.16E0	-4.34E-1	-8.22E-1	2.69E1
1983	-2.60E0	2.60E1	1.11E1	-1.32E0	6.03E1
1984	3.61E0	1.45E2	2.82E1	3.11E1	4.38E1
1985	2.53E-1	7.19E0	1.72E1	-1.56E0	1.86E1
1986	1.03E0	3.17E1	2.96E1	1.67E1	3.49E1
1987	0.00E0	2.71E2	1.25E2	2.60E1	5.10E1
1988	1.20E1	7.70E1	0.00E0	2.70E1	3.60E1
1989	9.00E1	4.05E2	2.99E2	1.10E1	3.50E1
1990	0.00E0	5.60E1	4.10E1	0.00E0	3.30E1
1991	6.20E0	1.40E1	6.50E1	5.90E0	2.60E1
1992	0.00E0	0.00E0	0.00E0	0.00E0	2.90E1
1993	0.00E0	8.20E1	1.30E1	0.00E0	1.60E1
1994	0.00E0	0.00E0	0.00E0	0.00E0	3.10E1
1995	0.00E0	0.00E0	0.00E0	0.00E0	2.70E1
1996	0.00E0	0.00E0	0.00E0	0.00E0	2.78E1
1997	0.00E0	0.00E0	0.00E0	0.00E0	1.62E1
1998	0.00E0	0.00E0	0.00E0	0.00E0	3.21E1
1999	0.00E0	3.53E1	0.00E0	0.00E0	2.10E1
2000	0.00E0	4.28E1	0.00E0	0.00E0	2.34E1
2001	0.00E0	1.32E1	0.00E0	0.00E0	3.04E1
2002	0.00E0	0.00E0	0.00E0	0.00E0	2.33E1
2003	0.00E0	0.00E0	0.00E0	0.00E0	3.05E1
2004	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
2005	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0
2006	0.00E0	0.00E0	0.00E0	0.00E0	1.08E1
2007	0.00E0	0.00E0	0.00E0	0.00E0	2.11E1
2008	0.00E0	0.00E0	0.00E0	0.00E0	1.24E1
2009	0.00E0	0.00E0	0.00E0	0.00E0	1.76E1
2010	0.00E0	0.00E0	0.00E0	0.00E0	2.33E1
2011	0.00E0	0.00E0	0.00E0	0.00E0	2.23E1

0.00E0 = no detectable measurements

All negative values have been replaced with zeros for calculational purposes

3.8 SHORELINE SEDIMENT

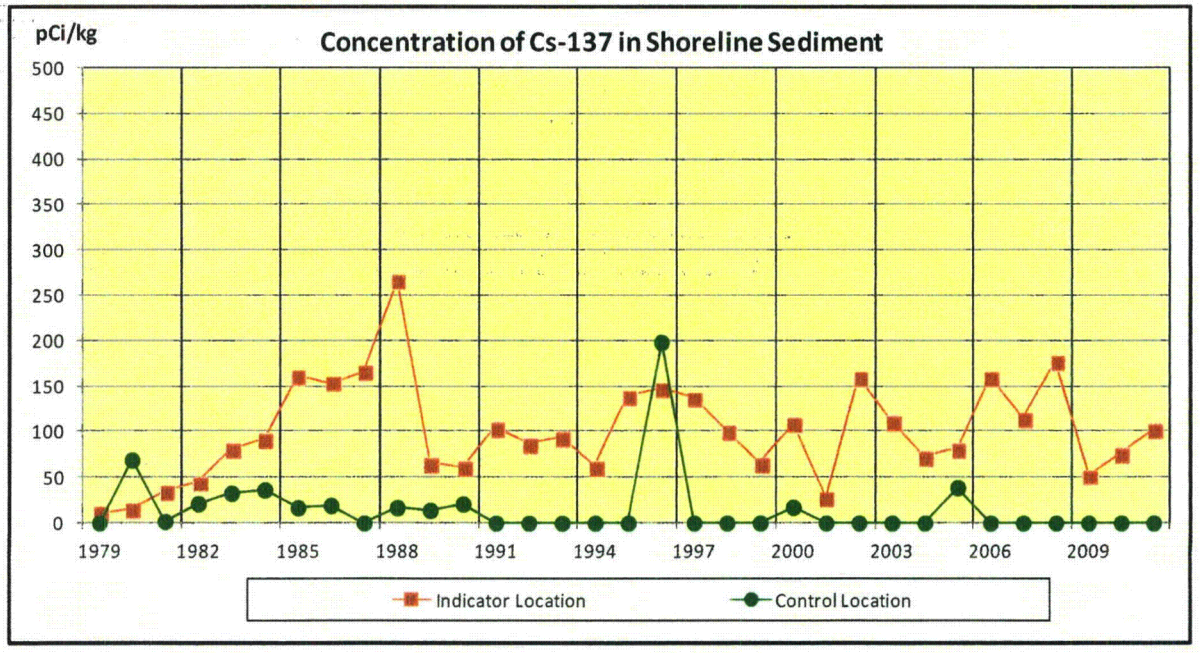
In 2011, six shoreline sediment samples were analyzed, four from two indicator locations and two at the control location.

Figure 3.8-1 shows Cs-137 highest annual mean indicator and control location concentrations since 1979. Figure 3.8-2 shows Co-60 highest annual mean indicator and control location concentrations since 1979.

Cs-137 activity was detected in two of the four indicator samples taken. The shoreline sediment location with the highest annual mean was Location 130 with a mean concentration of 102 pCi/kg. Cs-137 was not detected in any control location samples.

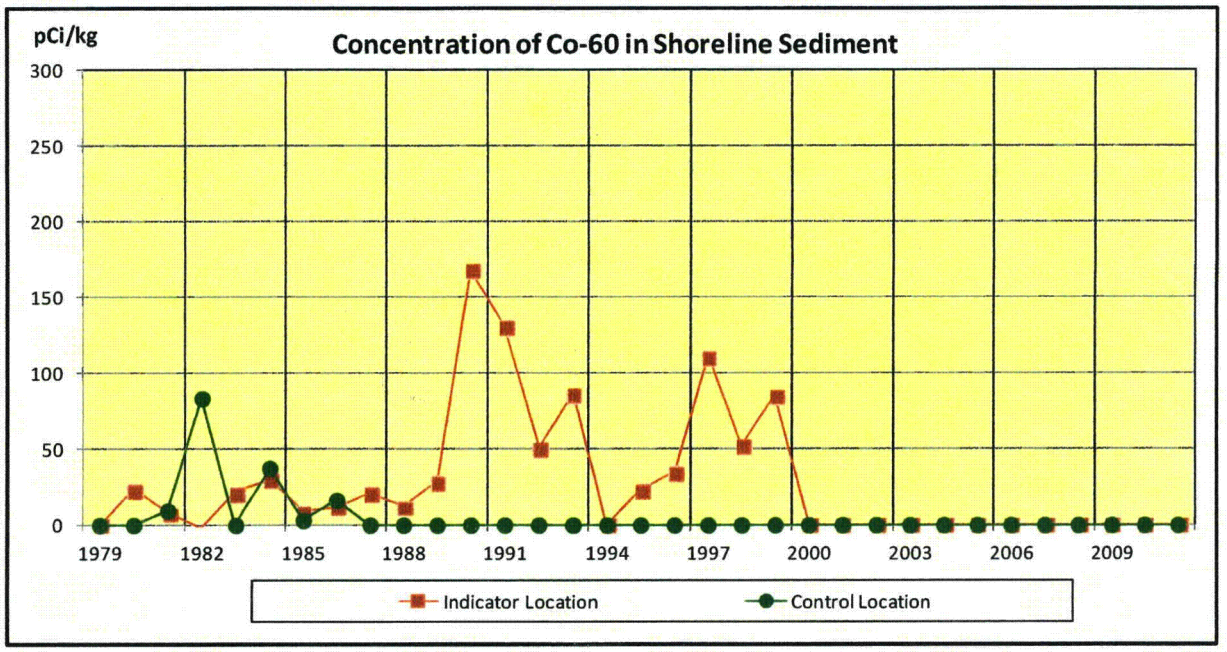
Table 3.8 gives indicator location highest annual means since 1979 for all radionuclides detected since the analysis change in 1988. There is no reporting level for shoreline sediment.

Figure 3.8-1



There is no reporting level for Cs-137 in shoreline sediment

Figure 3.8-2



There is no reporting level for Co-60 in shoreline sediment

Table 3.8 Mean Concentrations of Radionuclides in Shoreline Sediment (pCi/kg)

YEAR	Mn-54 Indicator	Co-58 Indicator	Co-60 Indicator	Cs-134 Indicator	Cs-137 Indicator
1979	-1.07E1	2.25E1	-6.50E0	0.00E0	1.20E1
1980	1.06E1	-8.74E0	2.36E1	-3.53E0	1.44E1
1981	2.13E1	1.20E1	8.21E0	3.97E1	3.36E1
1982	5.38E1	1.66E1	-1.69E0	7.67E1	4.40E1
1983	4.40E0	3.43E1	2.12E1	7.65E1	8.02E1
1984	1.19E1	7.11E1	3.04E1	3.34E1	9.13E1
1985	4.77E0	1.46E1	9.20E0	2.02E1	1.61E2
1986	1.37E1	1.02E1	1.16E1	6.35E1	1.53E2
1987	0.00E0	1.06E2	2.10E1	4.20E1	1.65E2
1988	6.50E0	9.20E1	1.20E1	9.10E0	2.66E2
1989	2.90E1	3.80E1	2.90E1	5.30E1	6.50E1
1990	3.80E1	2.70E1	1.68E2	0.00E0	6.10E1
1991	2.80E1	5.30E1	1.31E2	0.00E0	1.03E2
1992	9.40E0	0.00E0	5.10E1	9.20E0	8.60E1
1993	0.00E0	2.20E1	8.60E1	0.00E0	9.30E1
1994	4.10E1	0.00E0	0.00E0	0.00E0	8.00E1
1995	1.70E1	0.00E0	2.30E1	0.00E0	1.38E2
1996	2.90E1	1.78E1	3.50E1	0.00E0	1.47E2
1997	0.00E0	0.00E0	1.11E2	3.10E1	1.36E2
1998	0.00E0	0.00E0	5.21E1	0.00E0	9.97E1
1999	0.00E0	2.47E1	8.49E1	0.00E0	6.51E1
2000	0.00E0	3.04E1	0.00E0	0.00E0	1.08E2

Table 3.8 continued

YEAR	Mn-54 Indicator	Co-58 Indicator	Co-60 Indicator	Cs-134 Indicator	Cs-137 Indicator
2001	0.00E0	0.00E0	0.00E0	0.00E0	2.77E1
2002	2.24E1	0.00E0	0.00E0	0.00E0	1.59E2
2003	0.00E0	0.00E0	0.00E0	0.00E0	1.11E2
2004	0.00E0	0.00E0	0.00E0	0.00E0	7.17E1
2005	0.00E0	0.00E0	0.00E0	0.00E0	8.08E1
2006	0.00E0	0.00E0	0.00E0	0.00E0	1.59E2
2007	0.00E0	0.00E0	0.00E0	0.00E0	1.14E2
2008	0.00E0	0.00E0	0.00E0	0.00E0	1.77E2
2009	0.00E0	0.00E0	0.00E0	0.00E0	5.08E1
2010	0.00E0	0.00E0	0.00E0	0.00E0	7.58E1
2011	0.00E0	0.00E0	0.00E0	0.00E0	1.02E2

3.9 DIRECT GAMMA RADIATION

3.9.1 ENVIRONMENTAL TLD

In 2011, 163 TLDs were analyzed, 159 at indicator locations, four at the control location. TLDs are collected and analyzed quarterly. A transit background for environmental TLDs is determined based on ANSI N545. The highest annual mean exposure for an indicator location was 106 milliroentgen. The annual mean exposure for the control location was 94 milliroentgen.

Figure 3.9-1 and Table 3.9-A show TLD inner ring (site boundary), outer ring (4-5 miles), and control location annual averages in milliroentgen per year. Preoperational data and ten year rolling averages are also given. As shown in the graph, inner and outer ring averages historically compare closely, with control data somewhat higher. Inner and outer ring averages comprise a number of data points with the control average representing only one location.

The control location has historically been higher than indicator locations. This is most likely an artifact of the underlying geologic structures at the control location. TLDs located greater than 5 miles from the plant demonstrate a wide range of background radiation levels. The control location is 15.5 miles WNW, well beyond the influence of the plant.

The calculated total body dose from gaseous effluents for 2011 was 2.92E-1 millirem, which is 0.45% of the average inner ring TLD values. Therefore, it can be concluded that discharges from the plant had very little impact on the measured TLD values.

A TLD intercomparison program is conducted as part of the quality assurance program. Results of this program are included in section 5.10.

Figures 3.9-2 and 3.9-3 show the TLD mean for each inner and outer ring TLD location from 1987 through 2011.

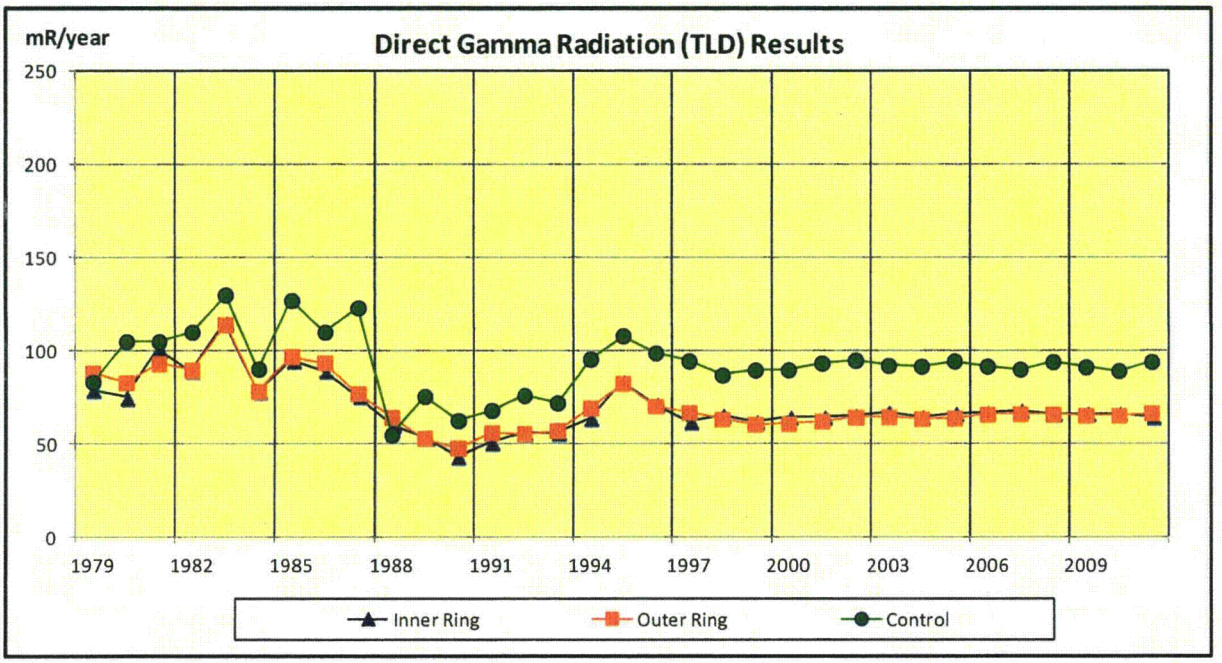
3.9.2 ISFSI

The McGuire ISFSI is located inside the protected area on the west side of the plant approximately 244 meters from plant centerline. The ISFSI protected area fence on the north side is approximately 60 meters from the owner control fence atop the berm adjacent to Lake Norman and just west of the intake structure. At a distance of 425 meters the ISFSI is closest to the Exclusion Area Boundary (EAB) on the west side along the Catawba River. The nearest resident to the ISFSI is just over a kilometer away in the east sector with the next closest resident at 1.1 kilometers in the WNW sector.

The ISFSI is situated in a slight depression in relationship to other structures inside the protected area. The ISFSI direct radiation to the north is shielded by the berm on the south boundary of Lake Norman. The EAB to the west of ISFSI is shielded from direct radiation by the drop in elevation from 754' at the ISFSI to the river bank below the Cowan's Ford Dam. These features lessen the dose impact to the public accessing the EAB west of ISFSI and the Lake Norman shoreline inside the EAB north of ISFSI.

There are 38 loaded casks currently in the ISFSI. There are no effluent releases from the fuel canisters stored inside the shielded casks to the environment. Doses measured by environmental TLDs show little or no change since the current TLD system was implemented.

Figure 3.9-1



There is no reporting level for Direct Radiation (TLD)

Table 3.9-A Direct Gamma Radiation (TLD) Results

YEAR	Inner Ring Average (mR/yr)	Outer Ring Average (mR/yr)	Control (mR/yr)
1979	7.91E1	8.82E1	8.32E1
1980	7.54E1*	8.29E1*	1.05E2
1981	1.01E2	9.31E1	1.05E2
1982	8.95E1	8.97E1	1.10E2
1983	1.16E2	1.14E2	1.30E2
1984	7.85E1	7.83E1	9.02E1
1985	9.54E1	9.69E1	1.27E2
1986	8.91E1	9.35E1	1.10E2
1987	7.58E1	7.71E1	1.23E2
1988	6.03E1	6.42E1	5.48E1
1989	5.37E1	5.30E1	7.55E1
1990	4.34E1	4.78E1	6.25E1
1991	5.14E1	5.59E1	6.80E1
1992	5.65E1	5.55E1	7.60E1
1993	5.61E1	5.71E1	7.20E1
1994	6.40E1	6.93E1	9.55E1
1995	8.36E1	8.25E1	1.08E2
1996	7.18E1	7.02E1	9.88E1
1997	6.22E1	6.68E1	9.45E1
1998	6.59E1	6.32E1	8.69E1
1999	6.23E1	6.05E1	8.96E1
2000	6.50E1	6.08E1	8.97E1
2001	6.51E1	6.22E1	9.33E1
2002	6.57E1	6.43E1	9.48E1
2003	6.74E1	6.45E1	9.20E1
2004	6.46E1	6.33E1	9.16E1
2005	6.62E1	6.34E1	9.44E1
2006	6.75E1	6.58E1	9.17E1
2007	6.84E1	6.60E1	9.00E1
2008	6.69E1	6.58E1	9.14E1
2009	6.67E1	6.53E1	9.12E1
2010	6.63E1	6.53E1	8.92E1
Average (2001 – 2010)	6.65E1	6.46E1	9.20E1
2011	6.51E1	6.64E1	9.40E1

* Values are based on two quarters due to change in TLD locations.

Figure 3.9-2

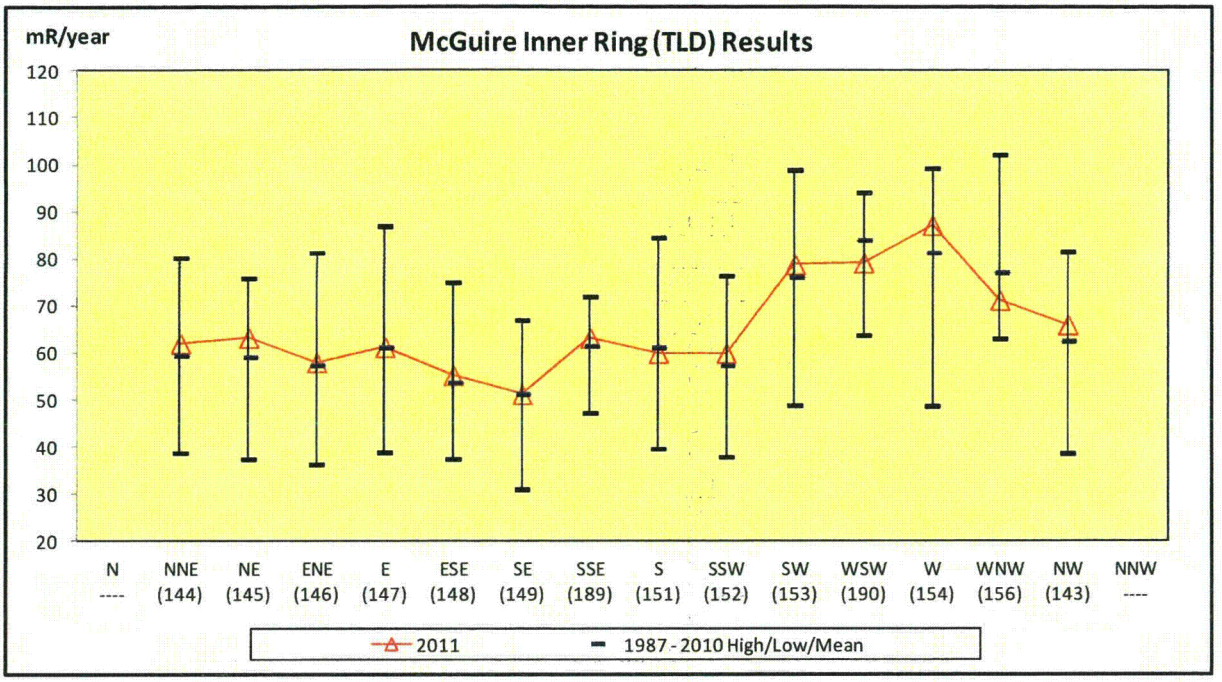


Table 3.9-B Direct Gamma Radiation (TLD) Results Inner Ring (mR/year)

Sector (Location)	1987 - 2010 Mean	1987 - 2010 Low	1987 - 2010 High	2011
NNE (144)	5.99E+01	3.88E+01	8.02E+01	6.20E+01
NE (145)	5.96E+01	3.75E+01	7.59E+01	6.32E+01
ENE (146)	5.79E+01	3.64E+01	8.13E+01	5.80E+01
E (147)	6.16E+01	3.89E+01	8.69E+01	6.12E+01
ESE (148)	5.43E+01	3.75E+01	7.50E+01	5.52E+01
SE (149)	5.14E+01	3.11E+01	6.70E+01	5.12E+01
SSE (189)	6.17E+01	4.73E+01	7.20E+01	6.32E+01
S (151)	6.16E+01	3.97E+01	8.45E+01	6.00E+01
SSW (152)	5.79E+01	3.80E+01	7.64E+01	6.00E+01
SW (153)	7.66E+01	4.89E+01	9.89E+01	7.88E+01
WSW (190)	8.45E+01	6.38E+01	9.41E+01	7.92E+01
W (154)	8.18E+01	4.88E+01	9.93E+01	8.72E+01
WNW (156)	7.74E+01	6.31E+01	1.02E+02	7.12E+01
NW (143)	6.28E+01	3.87E+01	8.15E+01	6.60E+01
NNE (144)	5.99E+01	3.88E+01	8.02E+01	6.20E+01
NE (145)	5.96E+01	3.75E+01	7.59E+01	6.32E+01

Figure 3.9-3

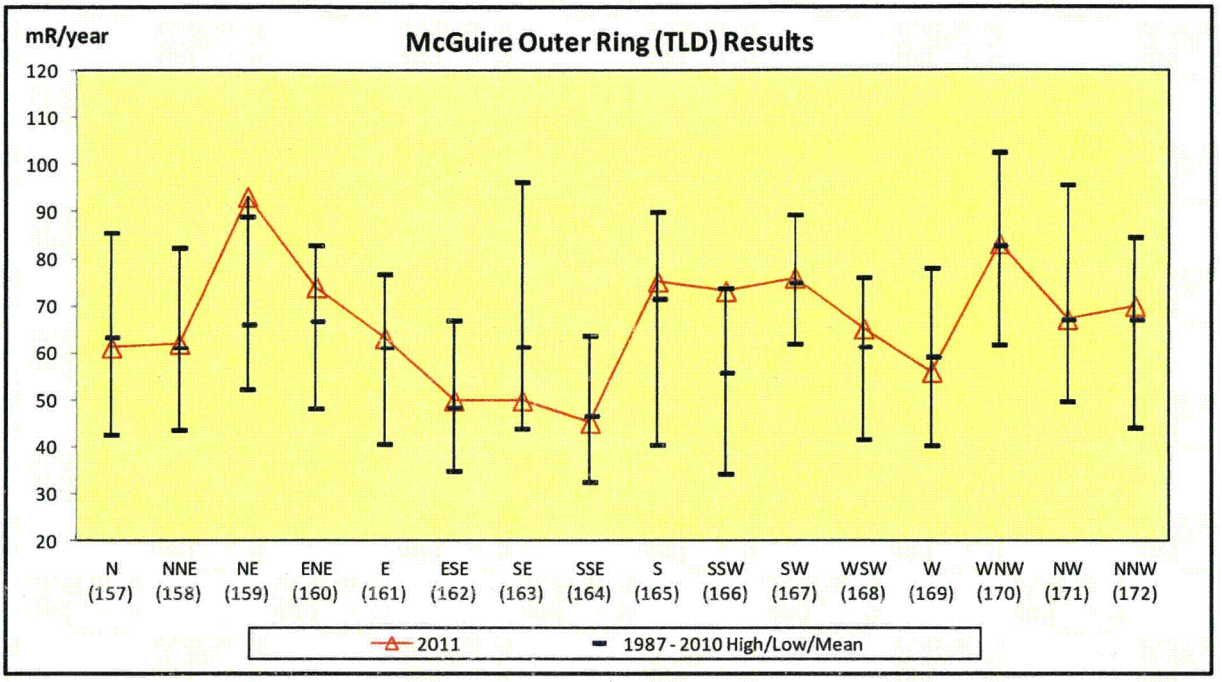


Table 3.9-C Direct Gamma Radiation (TLD) Results Outer Ring (mR/year)

Sector (Location)	1987 - 2010 Mean	1987 - 2010 Low	1987 - 2010 High	2011
N (157)	6.39E+01	4.27E+01	8.56E+01	6.12E+01
NNE (158)	6.14E+01	4.37E+01	8.24E+01	6.20E+01
NE (159)	6.64E+01	5.23E+01	8.90E+01	9.32E+01
ENE (160)	6.71E+01	4.82E+01	8.29E+01	7.40E+01
E (161)	6.16E+01	4.07E+01	7.68E+01	6.32E+01
ESE (162)	4.88E+01	3.50E+01	6.70E+01	5.00E+01
SE (163)	6.17E+01	4.40E+01	9.64E+01	5.00E+01
SSE (164)	4.68E+01	3.26E+01	6.37E+01	4.52E+01
S (165)	7.18E+01	4.05E+01	9.00E+01	7.52E+01
SSW (166)	5.62E+01	3.43E+01	7.38E+01	7.32E+01
SW (167)	7.56E+01	6.20E+01	8.94E+01	7.60E+01
WSW (168)	6.18E+01	4.17E+01	7.61E+01	6.52E+01
W (169)	5.96E+01	4.04E+01	7.81E+01	5.60E+01
WNW (170)	8.32E+01	6.18E+01	1.03E+02	8.32E+01
NW (171)	6.73E+01	4.98E+01	9.57E+01	6.72E+01
NNW (172)	6.76E+01	4.42E+01	8.46E+01	7.00E+01

3.10 LAND USE CENSUS

The land use census was conducted May 20, 2011 as required by SLC 16.11.14. Table 3.10 summarizes census results. A map indicating identified locations is shown in Figure 3.10.

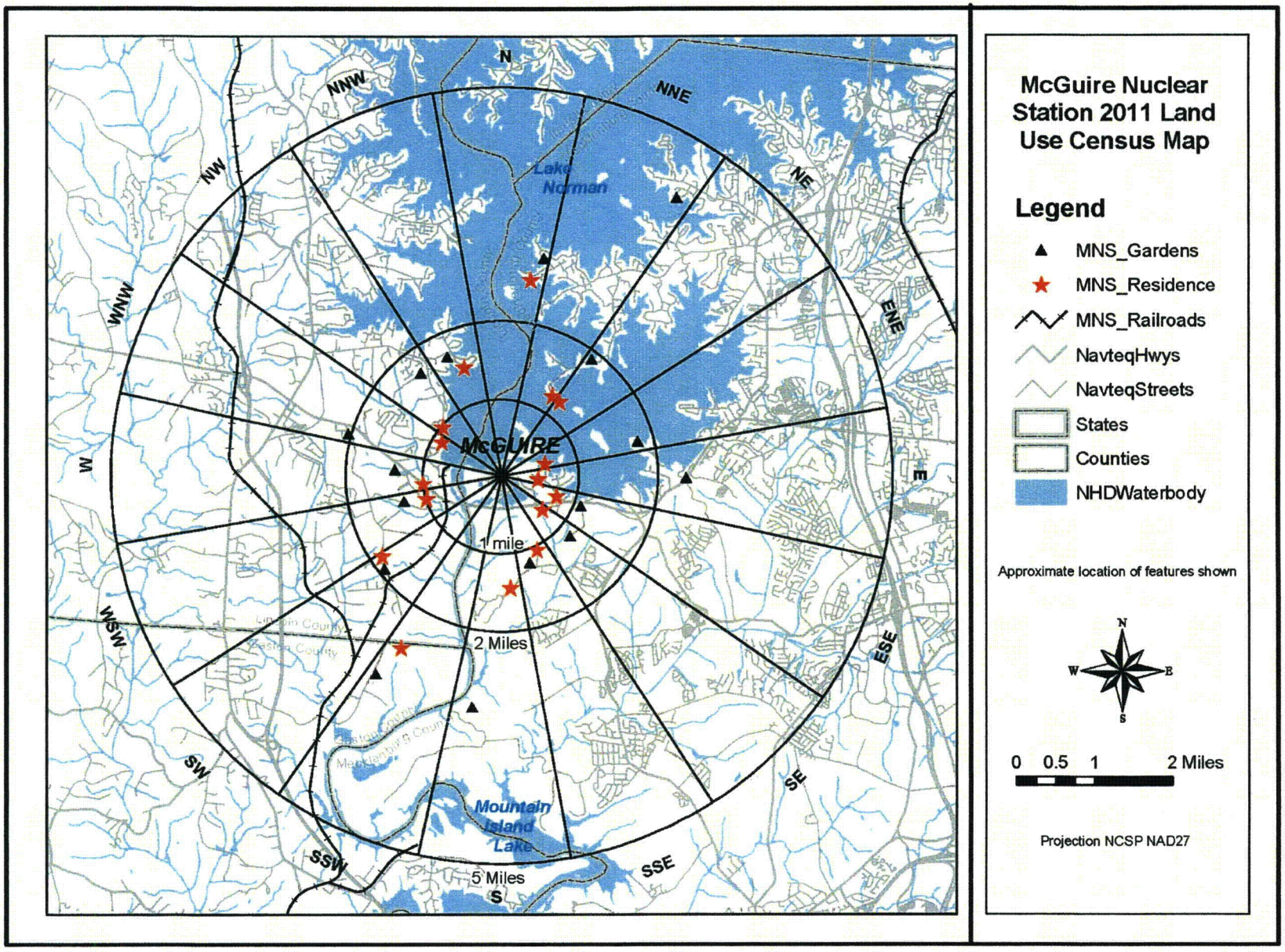
During the 2011 census, no new residences (nearer to the plant), irrigated gardens (superior to existing gardens) or milk locations were identified. The nearest residence is located in the East sector at 0.48 miles. No environmental program changes were required as a result of the 2011 land use census.

Table 3.10 McGuire 2011 Land Use Census Results

Sector		Distance (Miles)	Sector		Distance (Miles)
N	Nearest Residence	2.53	S	Nearest Residence	1.45
	Nearest Garden (irrigated)	2.79		Nearest Garden	3.14
	Nearest Milk Animal	-		Nearest Milk Animal	-
NNE	Nearest Residence	1.23	SSW	Nearest Residence	2.56
	Nearest Garden (irrigated)	4.27		Nearest Garden	2.94
	Nearest Milk Animal	-		Nearest Milk Animal	-
NE	Nearest Residence	1.21	SW	Nearest Residence	1.85
	Nearest Garden	1.80		Nearest Garden	1.98
	Nearest Milk Animal	-		Nearest Milk Animal	-
ENE	Nearest Residence	0.57	WSW	Nearest Residence	1.01
	Nearest Garden	1.98		Nearest Garden	1.33
	Nearest Milk Animal	-		Nearest Milk Animal	-
E	Nearest Residence	0.48	W	Nearest Residence	1.15
	Nearest Garden	2.07		Nearest Garden	1.23
	Nearest Milk Animal	-		Nearest Milk Animal	-
ESE	Nearest Residence	0.65	WNW	Nearest Residence	0.88
	Nearest Garden	1.20		Nearest Garden	2.06
	Nearest Milk Animal	-		Nearest Milk Animal	-
SE	Nearest Residence	0.67	NW	Nearest Residence	0.95
	Nearest Garden	1.18		Nearest Garden	1.68
	Nearest Milk Animal	-		Nearest Milk Animal	-
SSE	Nearest Residence	1.06	NNW	Nearest Residence	1.48
	Nearest Garden	1.26		Nearest Garden (irrigated)	1.69
	Nearest Milk Animal	-		Nearest Milk Animal	-

"-" indicates no occurrences within the 5 mile radius

Figure 3.10


McGuire Nuclear Station 2011 Land Use Census Map
Legend
MNS_Gardens
MNS_Residence
MNS_Railroads
NavteqHwys
NavteqStreets
States
Counties
NHDWaterbody
Approximate location of features shown
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
McGUIRE
1 mile
2 Miles
5 Miles
Lake Norman
Mountain Island Lake
0 0.5 1 2 Miles
Projection NCSP NAD27

4.0 EVALUATION OF DOSE

4.1 DOSE FROM ENVIRONMENTAL MEASUREMENTS

Annual doses to maximum exposed individuals were estimated based on measured concentrations of radionuclides in 2011 MNS REMP samples. Only those samples that were not affected by the Fukushima Daiichi fallout were used to calculate doses. The primary purpose of estimating doses based on sample results is to allow comparison to effluent program dose estimates.

Doses based on sample results were calculated using the methodology and data presented in NRC Regulatory Guide 1.109. Measured radionuclide concentrations, averaged over the entire year for a specific radionuclide, indicator location and sample type, were used to calculate REMP-based doses. Where applicable, average background concentration at the corresponding control location was subtracted. Regulatory Guide 1.109 consumption rates for the maximum exposed individual were used in the calculations. When the guide listed "NO DATA" as the dose factor for a given radionuclide and organ, a dose factor of zero was assumed.

Maximum dose estimates (Highest Annual Mean Concentration) based on drinking water, fish, and shoreline sediment sample results are reported in Table 4.1-A. The individual critical population and pathway dose calculations are reported in Table 4.1-B.

REMP-based dose estimates are not reported for airborne radioiodine, milk or vegetation sample types because no radionuclides attributable to MNS station operations were detected. Naturally occurring K-40 and Be-7 were detected in some samples but were not included in any REMP-based dose estimates. Dose estimates are not reported for surface water because sampled surface water is not considered to be a potable drinking water source although surface water tritium concentrations are used in calculating doses from fish. Exposure estimates based upon REMP TLD results are discussed in Section 3.9.

The maximum environmental organ dose estimate for any single sample type (excluding TLD results) collected during 2011 was 1.03E-1 mrem to the maximum exposed child liver, total body, thyroid, kidney, lung, and GI-LLI from the consumption of drinking water.

4.2 ESTIMATED DOSE FROM RELEASES

Throughout the year, dose estimates were calculated based on actual 2011 liquid and gaseous effluent release data. Effluent-based dose estimates were calculated using the RETDAS computer program which employs methodology and data presented in NRC Regulatory Guide 1.109. These doses are shown in Table 4.1-A along with the corresponding REMP-based dose estimates. Summaries of RETDAS dose calculations are reported in the Annual Radioactive Effluent Release Report (reference 6.6).

The effluent-based liquid release doses are summations of the dose contributions from the drinking water, fish, and shoreline pathways. For iodine, particulate, and tritium exposure the effluent-based gaseous release doses are summations of the dose contributors from ground/plane, inhalation, milk and vegetation pathways.

4.3 COMPARISON OF DOSES

The environmental and effluent dose estimates given in Table 4.1-A agree reasonably well. The similarity of the doses indicate that the radioactivity levels in the environment do not differ significantly from those expected based on effluent measurements and modeling of the environmental exposure pathways. This indicates that effluent program dose estimates are both valid and reasonably conservative.

There are some differences in how effluent and environmental doses are calculated that affect the comparison. Doses calculated from environmental data are conservative because they are based on a mean that includes only samples with a net positive activity versus a mean that includes all sample results (i.e. zero results are not included in the mean). Also, airborne tritium is not measured in environmental samples but is used to calculate effluent doses.

Additionally, in 2010 McGuire began reporting estimated dose from effluent Carbon 14 (C-14). This change came about with the issuing of Regulatory Guide 1.21, Revision 2, Measuring, Evaluating and Reporting Radioactive Material in Liquid and Gaseous Effluents and Solid Waste. A description of this change is found in the 2010 Annual Radiological Effluent Release Report. C-14 is not measured in the environment and therefore, environmental and effluent doses from C-14 cannot be compared directly.

In calculations based on liquid release pathways, drinking water and fish consumption were the predominant dose pathways based on environmental and effluent data. The maximum total organ dose based on 2011 environmental sample results was 1.52E-1 mrem to the child liver. The maximum total organ dose of 1.86E-1 mrem for liquid effluent-based estimates was to the child GI-LLI.

In calculations based on gaseous release pathways, vegetation was the predominant dose pathway for effluent samples. The maximum organ dose for gaseous effluent estimates was 8.70E-1 mrem to the child bone. No radioactivity was detected from gaseous pathways in environmental samples; therefore, there is no calculated dose.

The doses calculated do not exceed 40CFR190 or 10CFR50 dose commitment limits for members of the public. Doses to members of the public attributable to the operation of MNS are being maintained well within regulatory limits.

TABLE 4.1-A

MCGUIRE NUCLEAR STATION
2011 ENVIRONMENTAL AND EFFLUENT DOSE COMPARISON

LIQUID RELEASE PATHWAY

Organ	Environmental or Effluent Data	Critical Age [1]	Critical Pathway [2]	Location	Maximum Dose [3] (mrem)
Skin	Environmental	Teen	Shoreline Sediment	130 (0.52 mi SW)	2.68E-04
Skin	Effluent	Teen	Shoreline Sediment	Discharge Pt.	2.90E-03
Bone	Environmental	Child	Fish	129 (0.51 mi ENE)	5.03E-02
Bone	Effluent	Child	Fish	Discharge Pt.	1.01E-02
Liver	Environmental	Child	Drinking Water	101 (3.31 mi E)	1.52E-01
Liver	Effluent	Child	Drinking Water	3.31 mi E	1.85E-01
T. Body	Environmental	Adult	Drinking Water	101 (3.31 mi E)	1.12E-01
T. Body	Effluent	Child	Drinking Water	3.31 mi E	1.79E-01
Thyroid	Environmental	Child	Drinking Water	101 (3.31 mi E)	1.04E-01
Thyroid	Effluent	Child	Drinking Water	3.31 mi E	1.76E-01
Kidney	Environmental	Child	Drinking Water	101 (3.31 mi E)	1.20E-01
Kidney	Effluent	Child	Drinking Water	3.31 mi E	1.79E-01
Lung	Environmental	Child	Drinking Water	101 (3.31 mi E)	1.10E-01
Lung	Effluent	Child	Drinking Water	3.31 mi E	1.77E-01
GI-LLI	Environmental	Child	Drinking Water	101 (3.31 mi E)	1.04E-01
GI-LLI	Effluent	Child	Drinking Water	3.31 mi E	1.86E-01

(1) Critical Age is the highest total dose (all pathways) to an age group.

(2) Critial Pathway is the highest individual dose within the identified Critical Age group.

(3) Maximum dose is a summation of the fish, drinking water and shoreline sediment pathways.

GASEOUS RELEASE PATHWAY

IODINE, PARTICULATE, and TRITIUM

Organ	Environmental or Effluent Data	Critical Age [1]	Critical Pathway [2]	Location	Maximum Dose [3] (mrem)
Skin	Environmental	-	-	-	0.00E+00
Skin	Effluent	All	Ground Plane	1.5 mi. NE	4.20E-07
Bone	Environmental	-	-	-	0.00E+00
Bone	Effluent	Child	Vegetation	1.5 mi. NE	8.70E-01
Liver	Environmental	-	-	-	0.00E+00
Liver	Effluent	Child	Vegetation	1.5 mi. NE	2.92E-01
T. Body	Environmental	-	-	-	0.00E+00
T. Body	Effluent	Child	Vegetation	1.5 mi. NE	2.92E-01
Thyroid	Environmental	-	-	-	0.00E+00
Thyroid	Effluent	Child	Vegetation	1.5 mi. NE	2.92E-01
Kidney	Environmental	-	-	-	0.00E+00
Kidney	Effluent	Child	Vegetation	1.5 mi. NE	2.92E-01
Lung	Environmental	-	-	-	0.00E+00
Lung	Effluent	Child	Vegetation	1.5 mi. NE	2.92E-01
GI-LLI	Environmental	-	-	-	0.00E+00
GI-LLI	Effluent	Child	Vegetation	1.5 mi. NE	2.92E-01

(1) Critical Age is the highest total dose (all pathways) to an age group.

(2) Critial Pathway is the highest individual dose within the identified Critical Age group.

(3) Maximum dose is a summation of the ground/plane, inhalation, milk and vegetation pathways.

TABLE 4.1-B

Maximum Individual Dose for 2011 based on Environmental Measurements (mrem) for McGuire Nuclear Station

Age	Sample Medium	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI	Skin
Infant	Airborne	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Drinking Water	0.00E+00	1.01E-01	1.01E-01	1.01E-01	1.01E-01	1.01E-01	1.01E-01	0.00E+00
	Milk	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	TOTAL	0.00E+00	1.01E-01	1.01E-01	1.01E-01	1.01E-01	1.01E-01	1.01E-01	0.00E+00
Child	Airborne	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Drinking Water	0.00E+00	1.03E-01	1.03E-01	1.03E-01	1.03E-01	1.03E-01	1.03E-01	0.00E+00
	Milk	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Broadleaf Vegetation	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Fish	5.03E-02	4.93E-02	8.24E-03	1.13E-03	1.68E-02	6.78E-03	1.43E-03	0.00E+00
	Shoreline Sediment	0.00E+00	0.00E+00	4.80E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.60E-05
	TOTAL	5.03E-02	1.52E-01	1.11E-01	1.04E-01	1.20E-01	1.10E-01	1.04E-01	5.60E-05
Teen	Airborne	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Drinking Water	0.00E+00	5.39E-02	5.39E-02	5.39E-02	5.39E-02	5.39E-02	5.39E-02	0.00E+00
	Milk	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Broadleaf Vegetation	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Fish	4.00E-02	5.45E-02	1.99E-02	1.37E-03	1.95E-02	8.40E-03	2.13E-03	0.00E+00
	Shoreline Sediment	0.00E+00	0.00E+00	2.30E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.68E-04
	TOTAL	4.00E-02	1.08E-01	7.40E-02	5.53E-02	7.34E-02	6.23E-02	5.60E-02	2.68E-04
Adult	Airborne	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Drinking Water	0.00E+00	7.64E-02	7.64E-02	7.64E-02	7.64E-02	7.64E-02	7.64E-02	0.00E+00
	Milk	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Broadleaf Vegetation	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Fish	3.73E-02	5.28E-02	3.52E-02	1.78E-03	1.91E-02	7.54E-03	2.77E-03	0.00E+00
	Shoreline Sediment	0.00E+00	0.00E+00	4.11E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.80E-05
	TOTAL	3.73E-02	1.29E-01	1.12E-01	7.82E-02	9.55E-02	8.39E-02	7.92E-02	4.80E-05

Note: Dose tables are provided for sample media displaying positive nuclide occurrence.

McGuire Nuclear Station

Dose from Drinking Water Pathway for 2011 Data

Maximum Exposed Infant

Infant Dose from Drinking Water Pathway (mrem) = Usage (l) x Dose Factor (mrem/pCi ingested) x Concentration (pCi/l)

Usage (intake in one year) = 330 l

	Ingestion Dose Factor							Highest Annual Net Mean Concentration		Dose (mrem)						
Radionuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI	Indicator Location	Water (pCi/l)	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	1.99E-05	4.51E-06	NO DATA	4.41E-06	NO DATA	7.31E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	3.60E-06	8.98E-06	NO DATA	NO DATA	NO DATA	8.97E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-59	3.08E-05	5.38E-05	2.12E-05	NO DATA	NO DATA	1.59E-05	2.57E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	1.08E-05	2.55E-05	NO DATA	NO DATA	NO DATA	2.57E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	1.84E-05	6.31E-05	2.91E-05	NO DATA	3.06E-05	NO DATA	5.33E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-95	4.20E-08	1.73E-08	1.00E-08	NO DATA	1.24E-08	NO DATA	1.46E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zr-95	2.06E-07	5.02E-08	3.56E-08	NO DATA	5.41E-08	NO DATA	2.50E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	3.59E-05	4.23E-05	1.86E-05	1.39E-02	4.94E-05	NO DATA	1.51E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-134	3.77E-04	7.03E-04	7.10E-05	NO DATA	1.81E-04	7.42E-05	1.91E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	5.22E-04	6.11E-04	4.33E-05	NO DATA	1.64E-04	6.64E-05	1.91E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BaLa-140	1.71E-04	1.71E-07	8.81E-06	NO DATA	4.06E-08	1.05E-07	4.20E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
H-3	NO DATA	3.08E-07	3.08E-07	3.08E-07	3.08E-07	3.08E-07	3.08E-07	101	997	0.00E+00	1.01E-01	1.01E-01	1.01E-01	1.01E-01	1.01E-01	1.01E-01
						Dose Commitment (mrem) =				0.00E+00	1.01E-01	1.01E-01	1.01E-01	1.01E-01	1.01E-01	1.01E-01

McGuire Nuclear Station
Dose from Drinking Water Pathway for 2011 Data
Maximum Exposed Child

Child Dose from Drinking Water Pathway (mrem) = Usage (l) x Dose Factor (mrem/pCi ingested) x Concentration (pCi/l)

Usage (intake in one year) = **510 l**

	Ingestion Dose Factor							Highest Annual Net Mean Concentration		Dose (mrem)						
Radionuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI	Indicator Location	Water (pCi/l)	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	1.07E-05	2.85E-06	NO DATA	3.00E-06	NO DATA	8.98E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	1.80E-06	5.51E-06	NO DATA	NO DATA	NO DATA	1.05E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-59	1.65E-05	2.67E-05	1.33E-05	NO DATA	NO DATA	7.74E-06	2.78E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C0-60	NO DATA	5.29E-06	1.56E-05	NO DATA	NO DATA	NO DATA	2.93E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	1.37E-05	3.65E-05	2.27E-05	NO DATA	2.30E-05	NO DATA	6.41E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-95	2.25E-08	8.76E-09	6.26E-09	NO DATA	8.23E-09	NO DATA	1.62E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zr-95	1.16E-07	2.55E-08	2.27E-08	NO DATA	3.65E-08	NO DATA	2.66E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	1.72E-05	1.73E-05	9.83E-06	5.72E-03	2.84E-05	NO DATA	1.54E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-134	2.34E-04	3.84E-04	8.10E-05	NO DATA	1.19E-04	4.27E-05	2.07E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	3.27E-04	3.13E-04	4.62E-05	NO DATA	1.02E-04	3.67E-05	1.96E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BaLa-140	8.31E-05	7.28E-08	4.85E-06	NO DATA	2.37E-08	4.34E-08	4.21E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
H-3	NO DATA	2.03E-07	2.03E-07	2.03E-07	2.03E-07	2.03E-07	2.03E-07	101	997	0.00E+00	1.03E-01	1.03E-01	1.03E-01	1.03E-01	1.03E-01	1.03E-01
						Dose Commitment (mrem) =				0.00E+00	1.03E-01	1.03E-01	1.03E-01	1.03E-01	1.03E-01	1.03E-01

McGuire Nuclear Station
Dose from Fish Pathway for 2011 Data
Maximum Exposed Child

Child Dose from Fish Pathway (mrem) = Usage (kg) x Dose Factor (mrem/pCi ingested) x Concentration (pCi/kg)

H-3 Concentration in Fish = Surface Water pCi/l x Bioaccumulation Factor 0.9 pCi/kg per pCi/l = 897 pCi/l x 0.9 = 807 pCi/kg

Usage (intake in one year) = **6.9 kg**

	Ingestion Dose Factor							Highest Annual Net Mean Concentration		Dose (mrem)						
Radionuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI	Indicator Location	Fish (pCi/kg)	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	1.07E-05	2.85E-06	NO DATA	3.00E-06	NO DATA	8.98E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	1.80E-06	5.51E-06	NO DATA	NO DATA	NO DATA	1.05E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-59	1.65E-05	2.67E-05	1.33E-05	NO DATA	NO DATA	7.74E-06	2.78E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C0-60	NO DATA	5.29E-06	1.56E-05	NO DATA	NO DATA	NO DATA	2.93E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	1.37E-05	3.65E-05	2.27E-05	NO DATA	2.30E-05	NO DATA	6.41E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-134	2.34E-04	3.84E-04	8.10E-05	NO DATA	1.19E-04	4.27E-05	2.07E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	3.27E-04	3.13E-04	4.62E-05	NO DATA	1.02E-04	3.67E-05	1.96E-06	129	22.3	5.03E-02	4.82E-02	7.11E-03	0.00E+00	1.57E-02	5.65E-03	3.02E-04
H-3	NO DATA	2.03E-07	2.03E-07	2.03E-07	2.03E-07	2.03E-07	2.03E-07	128	807	0.00E+00	1.13E-03	1.13E-03	1.13E-03	1.13E-03	1.13E-03	1.13E-03
						Dose Commitment (mrem) =				5.03E-02	4.93E-02	8.24E-03	1.13E-03	1.68E-02	6.78E-03	1.43E-03

McGuire Nuclear Station
Dose from Shoreline Sediment Pathway for 2011 Data
Maximum Exposed Child

Shoreline Recreation =	**14**	**hr (in one year)**
Shore Width Factor =	**0.3**	**(lake shore - location 129)**
Shore Width Factor =	**0.2**	**(river shoreline - location 130)**
Sediment Surface Mass =	**40**	**kg/m^2**

Child Dose from Shoreline Sediment Pathway (mrem) = Shoreline Recreation (hr) x External Dose Factor (mrem/hr per pCi/m^2) x Shore Width Factor x Sediment Surface Mass (kg/m^2) x Sediment Concentration (pCi/kg)

	External Dose Factor Standing on Contaminated Ground		**Highest Annual Net Mean Concentration**		**Dose**	
	(mrem/hr per pCi/m^2)		**Indicator**	**Sediment**	**(mrem)**	
Radionuclide	**T. Body**	**Skin**	**Location**	**(pCi/kg)**	**T. Body**	**Skin**
Mn-54	**5.80E-09**	**6.80E-09**	**ALL**	**0.00**	**0.00E+00**	**0.00E+00**
Co-58	**7.00E-09**	**8.20E-09**	**ALL**	**0.00**	**0.00E+00**	**0.00E+00**
Co-60	**1.70E-08**	**2.00E-08**	**ALL**	**0.00**	**0.00E+00**	**0.00E+00**
Cs-134	**1.20E-08**	**1.40E-08**	**ALL**	**0.00**	**0.00E+00**	**0.00E+00**
Cs-137	**4.20E-09**	**4.90E-09**	**130**	**102**	**4.80E-05**	**5.60E-05**
		Dose Commitment (mrem) =			**4.80E-05**	**5.60E-05**

McGuire Nuclear Station

Dose from Drinking Water Pathway for 2011 Data

Maximum Exposed Teen

Teen Dose from Drinking Water Pathway (mrem) = Usage (l) x Dose Factor (mrem/pCi ingested) x Concentration (pCi/l)

Usage (intake in one year) = **510 l**

	Ingestion Dose Factor							Highest Annual Net Mean Concentration		Dose (mrem)						
Radionuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI	Indicator Location	Water (pCi/l)	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	5.90E-06	1.17E-06	NO DATA	1.76E-06	NO DATA	1.21E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	9.72E-07	2.24E-06	NO DATA	NO DATA	NO DATA	1.34E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-59	5.87E-06	1.37E-05	5.29E-06	NO DATA	NO DATA	4.32E-06	3.24E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	2.81E-06	6.33E-06	NO DATA	NO DATA	NO DATA	3.66E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	5.76E-06	2.00E-05	9.33E-06	NO DATA	1.28E-05	NO DATA	8.47E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-95	8.22E-09	4.56E-09	2.51E-09	NO DATA	4.42E-09	NO DATA	1.95E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zr-95	4.12E-08	1.30E-08	8.94E-09	NO DATA	1.91E-08	NO DATA	3.00E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	5.85E-06	8.19E-06	4.40E-06	2.39E-03	1.41E-05	NO DATA	1.62E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-134	8.37E-05	1.97E-04	9.14E-05	NO DATA	6.26E-05	2.39E-05	2.45E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	1.12E-04	1.49E-04	5.19E-05	NO DATA	5.07E-05	1.97E-05	2.12E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BaLa-140	2.84E-05	3.48E-08	1.83E-06	NO DATA	1.18E-08	2.34E-08	4.38E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
H-3	NO DATA	1.06E-07	1.06E-07	1.06E-07	1.06E-07	1.06E-07	1.06E-07	101	997	0.00E+00	5.39E-02	5.39E-02	5.39E-02	5.39E-02	5.39E-02	5.39E-02
						Dose Commitment (mrem)=				0.00E+00	5.39E-02	5.39E-02	5.39E-02	5.39E-02	5.39E-02	5.39E-02

McGuire Nuclear Station

Dose from Fish Pathway for 2011 Data

Maximum Exposed Teen

Teen Dose from Fish Pathway (mrem) = Usage (kg) x Dose Factor (mrem/pCi ingested) x Concentration (pCi/kg)

H-3 Concentration in Fish = Surface Water pCi/l x Bioaccumulation Factor 0.9 pCi/kg per pCi/l = 897 pCi/l x 0.9 = 807 pCi/kg

Usage (intake in one year) = **16 kg**

	Ingestion Dose Factor							Highest Annual Net Mean Concentration		Dose (mrem)						
Radionuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI	Location	(pCi/kg)	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	5.90E-06	1.17E-06	NO DATA	1.76E-06	NO DATA	1.21E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	9.72E-07	2.24E-06	NO DATA	NO DATA	NO DATA	1.34E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-59	5.87E-06	1.37E-05	5.29E-06	NO DATA	NO DATA	4.32E-06	3.24E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	2.81E-06	6.33E-06	NO DATA	NO DATA	NO DATA	3.66E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	5.76E-06	2.00E-05	9.33E-06	NO DATA	1.28E-05	NO DATA	8.47E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-134	8.37E-05	1.97E-04	9.14E-05	NO DATA	6.26E-05	2.39E-05	2.45E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	1.12E-04	1.49E-04	5.19E-05	NO DATA	5.07E-05	1.97E-05	2.12E-06	129	22.3	4.00E-02	5.32E-02	1.85E-02	0.00E+00	1.81E-02	7.03E-03	7.56E-04
H-3	NO DATA	1.06E-07	1.06E-07	1.06E-07	1.06E-07	1.06E-07	1.06E-07	128	807	0.00E+00	1.37E-03	1.37E-03	1.37E-03	1.37E-03	1.37E-03	1.37E-03
						Dose Commitment (mrem) =				4.00E-02	5.45E-02	1.99E-02	1.37E-03	1.95E-02	8.40E-03	2.13E-03

McGuire Nuclear Station
Dose from Shoreline Sediment Pathway for 2011 Data
Maximum Exposed Teen

Shoreline Recreation =	**67**	**hr (in one year)**
Shore Width Factor =	**0.3**	**(lake shore - location 129)**
Shore Width Factor =	**0.2**	**(river shoreline - location 130)**
Sediment Surface Mass =	**40**	**kg/m^2**

Teen Dose from Shoreline Sediment Pathway (mrem) = Shoreline Recreation (hr) x External Dose Factor (mrem/hr per pCi/m^2) x Shore Width Factor x Sediment Surface Mass (kg/m^2) x Sediment Concentration (pCi/kg)

	External Dose Factor Standing on Contaminated Ground ($mrem/hr$ per pCi/m^2)		Highest Annual Net Mean Concentration		Dose (mrem)	
Radionuclide	**T. Body**	**Skin**	**Indicator Location**	**Sediment (pCi/kg)**	**T. Body**	**Skin**
Mn-54	**5.80E-09**	**6.80E-09**	**ALL**	**0.00**	**0.00E+00**	**0.00E+00**
Co-58	**7.00E-09**	**8.20E-09**	**ALL**	**0.00**	**0.00E+00**	**0.00E+00**
Co-60	**1.70E-08**	**2.00E-08**	**ALL**	**0.00**	**0.00E+00**	**0.00E+00**
Cs-134	**1.20E-08**	**1.40E-08**	**ALL**	**0.00**	**0.00E+00**	**0.00E+00**
Cs-137	**4.20E-09**	**4.90E-09**	**130**	**102**	**2.30E-04**	**2.68E-04**
	Dose Commitment (mrem) =				**2.30E-04**	**2.68E-04**

McGuire Nuclear Station
Dose from Drinking Water Pathway for 2011 Data
Maximum Exposed Adult

Adult Dose from Drinking Water Pathway (mrem) = Usage (l) x Dose Factor (mrem/pCi ingested) x Concentration (pCi/l)

Usage (intake in one year) = 730 l

	Ingestion Dose Factor							Highest Annual Net Mean Concentration		Dose (mrem)						
Radionuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI	Indicator Location	Water (pCi/l)	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	4.57E-06	8.72E-07	NO DATA	1.36E-06	NO DATA	1.40E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	7.45E-07	1.67E-06	NO DATA	NO DATA	NO DATA	1.51E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-59	4.34E-06	1.02E-05	3.91E-06	NO DATA	NO DATA	2.85E-06	3.40E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	2.14E-06	4.72E-06	NO DATA	NO DATA	NO DATA	4.02E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	4.84E-06	1.54E-05	6.96E-06	NO DATA	1.03E-05	NO DATA	9.70E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-95	6.22E-09	3.46E-09	1.86E-09	NO DATA	3.42E-09	NO DATA	2.10E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zr-95	3.04E-08	9.75E-09	6.60E-09	NO DATA	1.53E-08	NO DATA	3.09E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	4.16E-06	5.95E-06	3.41E-06	1.95E-03	1.02E-05	NO DATA	1.57E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-134	6.22E-05	1.48E-04	1.21E-04	NO DATA	4.79E-05	1.59E-05	2.59E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	7.97E-05	1.09E-04	7.14E-05	NO DATA	3.70E-05	1.23E-05	2.11E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BaLa-140	2.03E-05	2.55E-08	1.33E-06	NO DATA	8.67E-09	1.46E-08	4.18E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
H-3	NO DATA	1.05E-07	1.05E-07	1.05E-07	1.05E-07	1.05E-07	1.05E-07	101	997	0.00E+00	7.64E-02	7.64E-02	7.64E-02	7.64E-02	7.64E-02	7.64E-02
						Dose Commitment (mrem) =				0.00E+00	7.64E-02	7.64E-02	7.64E-02	7.64E-02	7.64E-02	7.64E-02

McGuire Nuclear Station

Dose from Fish Pathway for 2011 Data

Maximum Exposed Adult

Adult Dose from Fish Pathway (mrem) = Usage (kg) x Dose Factor (mrem/pCi ingested) x Concentration (pCi/kg)

H-3 Concentration in Fish = Surface Water pCi/l x Bioaccumulation Factor 0.9 pCi/kg per pCi/l = 897 pCi/l x 0.9 = 807 pCi/kg

Usage (intake in one year) = 21 kg

	Ingestion Dose Factor							Highest Annual Net Mean Concentration		Dose (mrem)						
Radionuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI	Location	(pCi/kg)	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	4.57E-06	8.72E-07	NO DATA	1.36E-06	NO DATA	1.40E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	7.45E-07	1.67E-06	NO DATA	NO DATA	NO DATA	1.51E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-59	4.34E-06	1.02E-05	3.91E-06	NO DATA	NO DATA	2.85E-06	3.40E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	2.14E-06	4.72E-06	NO DATA	NO DATA	NO DATA	4.02E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	4.84E-06	1.54E-05	6.96E-06	NO DATA	1.03E-05	NO DATA	9.70E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-134	6.22E-05	1.48E-04	1.21E-04	NO DATA	4.79E-05	1.59E-05	2.59E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	7.97E-05	1.09E-04	7.14E-05	NO DATA	3.70E-05	1.23E-05	2.11E-06	129	22.3	3.73E-02	5.10E-02	3.34E-02	0.00E+00	1.73E-02	5.76E-03	9.88E-04
H-3	NO DATA	1.05E-07	1.05E-07	1.05E-07	1.05E-07	1.05E-07	1.05E-07	128	807	0.00E+00	1.78E-03	1.78E-03	1.78E-03	1.78E-03	1.78E-03	1.78E-03
						Dose Commitment (mrem) =				3.73E-02	5.28E-02	3.52E-02	1.78E-03	1.91E-02	7.54E-03	2.77E-03

McGuire Nuclear Station
Dose from Shoreline Sediment Pathway for 2011 Data
Maximum Exposed Adult

Shoreline Recreation =	**12**	**hr (in one year)**
Shore Width Factor =	**0.3**	**(lake shore - location 129)**
Shore Width Factor =	**0.2**	**(river shoreline - location 130)**
Sediment Surface Mass =	**40**	**kg/m^2**

Adult Dose from Shoreline Sediment Pathway (mrem) = Shoreline Recreation (hr) x External Dose Factor (mrem/hr per pCi/m^2) x Shore Width Factor x Sediment Surface Mass (kg/m^2) x Sediment Concentration (pCi/kg)

	External Dose Factor Standing on Contaminated Ground		**Highest Annual Net Mean Concentration**		**Dose**	
	(mrem/hr per pCi/m^2)				**(mrem)**	
Radionuclide	**T. Body**	**Skin**	**Indicator Location**	**Sediment (pCi/kg)**	**T. Body**	**Skin**
Mn-54	**5.80E-09**	**6.80E-09**	**ALL**	**0.00**	**0.00E+00**	**0.00E+00**
Co-58	**7.00E-09**	**8.20E-09**	**ALL**	**0.00**	**0.00E+00**	**0.00E+00**
Co-60	**1.70E-08**	**2.00E-08**	**ALL**	**0.00**	**0.00E+00**	**0.00E+00**
Cs-134	**1.20E-08**	**1.40E-08**	**ALL**	**0.00**	**0.00E+00**	**0.00E+00**
Cs-137	**4.20E-09**	**4.90E-09**	**130**	**102**	**4.11E-05**	**4.80E-05**
	Dose Commitment (mrem) =				**4.11E-05**	**4.80E-05**