Union Electric

One Ameren Plaza
1901 Chouteau Avenue
PO Box 66149
St. Louis, MO 63166-6149
314.621.3222

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U. S. Nuclear Regulatory Commission
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Gentlemen: ULNRC-4646

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UNION ELECTRIC COMPANY
CALLAWAY PLANT
FACILITY OPERATING LICENSE NPF-30
2001 ANNUAL ENVIRONMENTAL OPERATING REPORT

Please find enclosed the 2001 Annual Environmental Operating Report for the Callaway Plant. This report is submitted in accordance with section 5.6.2 of the Technical Specification and Appendix B to the Callaway Plant Operating License.

Very truly yours,

David Shafer
for John D. Blosser
Manager - Regulatory Affairs

BFH/jdg

Enclosure

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cc: M. H. Fletcher
Professional Nuclear Consulting, Inc.
19041 Raines Drive
Derwood, MD 20855-2432

Regional Administrator
U.S. Nuclear Regulatory Commission
Region IV
611 Ryan Plaza Drive
Suite 400
Arlington, TX 76011-8064

Senior Resident Inspector
Callaway Resident Office
U.S. Nuclear Regulatory Commission
8201 NRC Road
Steedman, MO 65077

Mr. Jack Donohew (2)- **OPEN BY ADDRESSEE ONLY**
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
1 White Flint, North, Mail Stop OWFN 7E1
11555 Rockville Pike
Rockville, MD 20852-2738

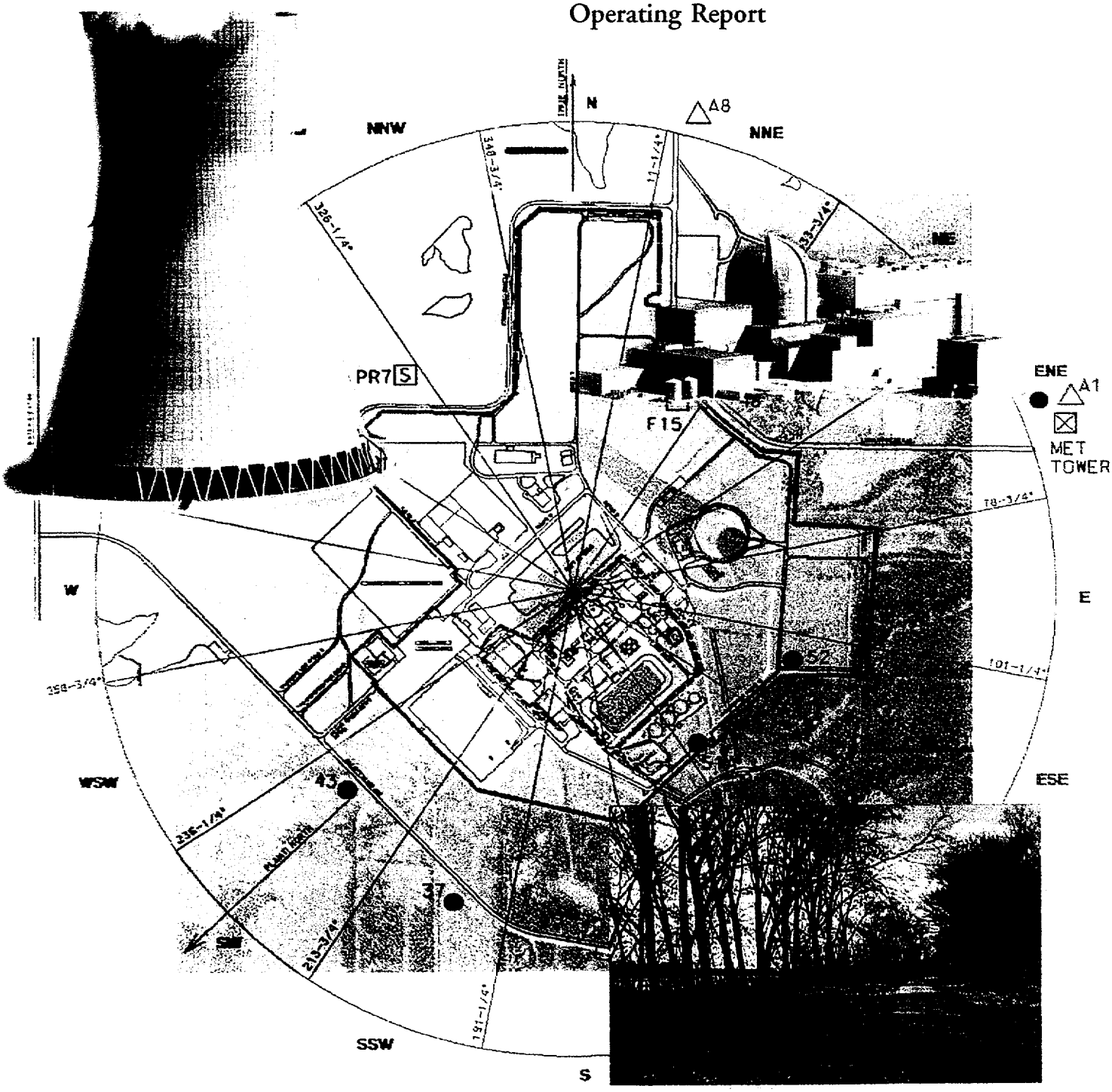
Manager, Electric Department
Missouri Public Service Commission
P.O. Box 360
Jefferson City, MO 65102

Regional Administrator
Department of Natural Resources
Central Regional Office
P. O. Box 176
Jefferson City, MO 65102-0176

Mr. Gerhard K. Samide
ANI Account Engineer
Town Center, Suite 3005
29 S. Main St.
West Hartford, CT 06107-2445

2001 Callaway Plant

Annual Radiological Environmental Operating Report



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1.0 Executive Summary

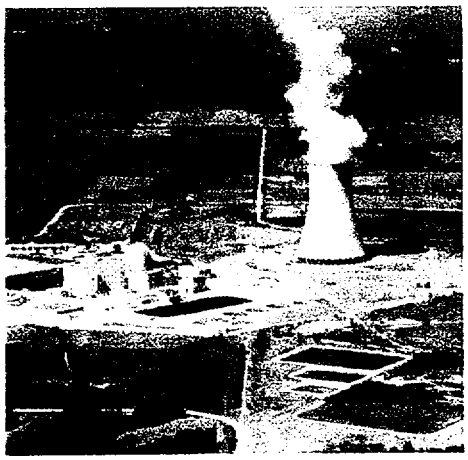
This Annual Radiological Environmental Operating Report describes the Union Electric Company, Callaway Plant Radiological Environmental Monitoring Program (REMP), and the program results for the calendar year 2001. It is submitted in accordance with section 5.6.2 of the Callaway Plant Technical Specifications.

Section 2.0 describes the Radiological Monitoring Program. Included is the identification of sampling locations, descriptions of sampling and analysis procedures, analysis results, data interpretations and program modifications. Quality assurance results, sampling deviations, unavailable samples and program changes are also discussed.

Section 3.0 describes the Non-Radiological Monitoring Program. Included are any unusual or important events, Environmental Protection Plan non-compliance, non-routine reports and plant design and operation environmental evaluations.

During 2001 the Callaway Plant operated in compliance with the Off Site Dose Calculation Manual requirements. Comparison of results for 2001 to pre-operational data and data from previous years show no significant differences.

Results from the REMP indicate the Callaway Plant has had no significant radiological impact on the health and safety of the public or on the environment.



2.0 *Radiological Monitoring Program*

2.1 Introduction

This report presents an analysis of the results of the REMP conducted during 2001 for Union Electric Company, Callaway Plant.

The radiological environmental monitoring program began in April 1982.

The objectives of the REMP are to monitor potential critical pathways of radioeffluent to man and determine the radiological impact on the environment caused by operation of Callaway Plant.

Callaway Plant consists of one 1239 MWe pressurized water reactor, which achieved initial criticality on October 2, 1984. The plant is located on a plateau approximately ten miles southeast of the City of Fulton in Callaway County, Missouri and approximately eighty miles west of the St. Louis metropolitan area. The Missouri River flows by the site in an easterly direction approximately five miles south of the site at its closest point.

2.2 Program Design

The sample locations, frequency of sampling and sample analysis requirements originate from the Callaway Plant Off-Site Dose Calculation Manual, DNR Missouri State Operating Permit and continuation of the Callaway Plant Pre-Operational Environmental Monitoring Program.

Samples are collected from waterborne, airborne, ingestion and direct radiation pathways. The types of sample media collected are: milk, surface water, groundwater, shoreline sediment, bottom sediment, soil, wetlands, fish, vegetation, airborne particulate, airborne radioiodine and direct radiation (TLD). Indicator samples are collected from locations, which could be influenced by plant effluents. Control samples are collected at locations that are not significantly affected by plant operation.

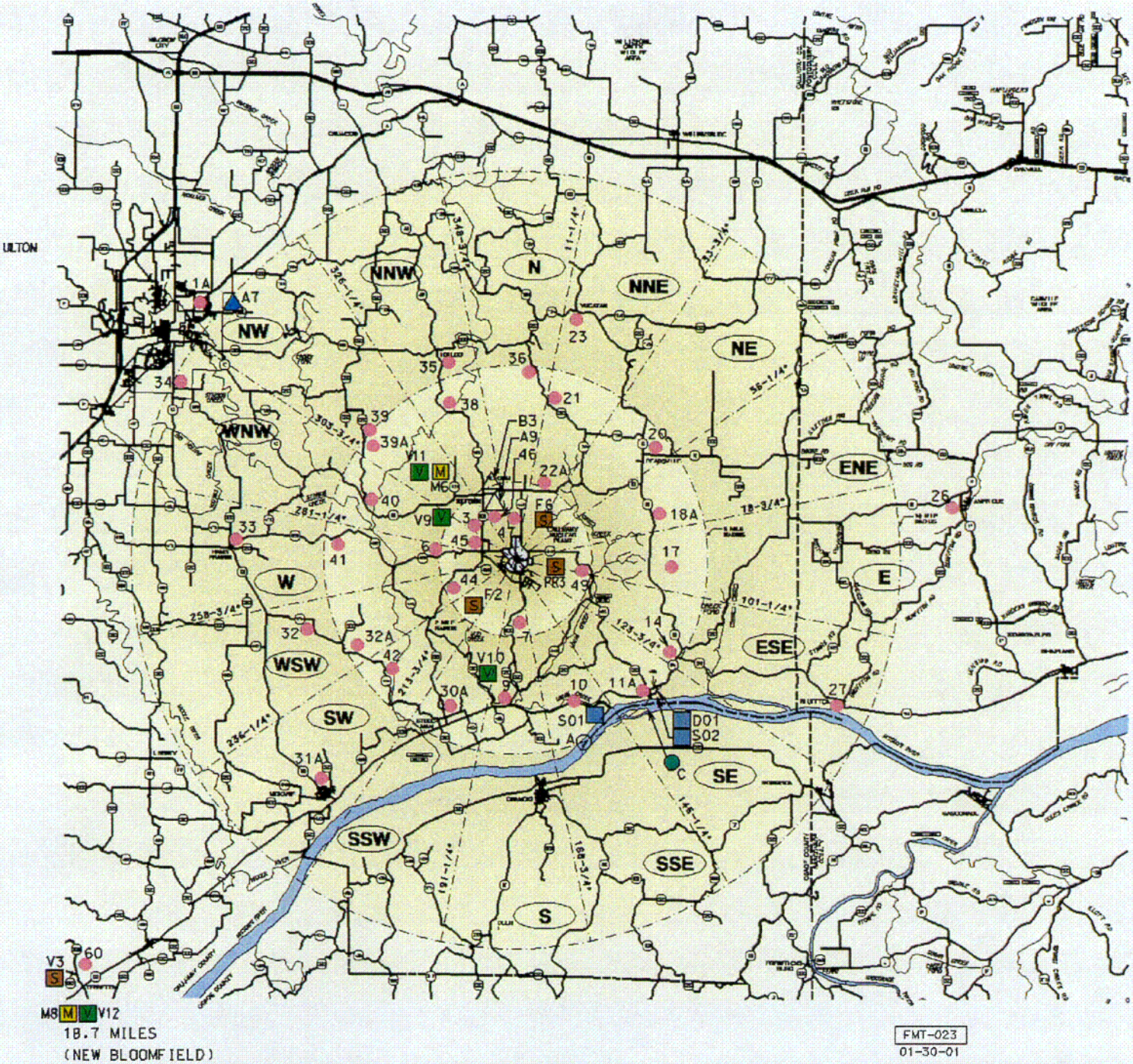
Samples are collected by Union Electric personnel or contractors to Union Electric and shipped to Environmental, Inc. Mid West Laboratory for analysis. The data is reported monthly and summarized in the annual report. TLD's are analyzed by Union Electric personnel.

2.3 Program Description

Sample locations for the REMP are shown in Figures I, and II. Table I identifies the location code, description and sample type. Table II specifies the collection frequency and required analysis.

Figure I

Distant Collection Locations



LEGEND:

- = TLD
- = AIR
- = WATER
- = VEGETATION
- = MILK
- = SOIL
- = FISH, SEDIMENT

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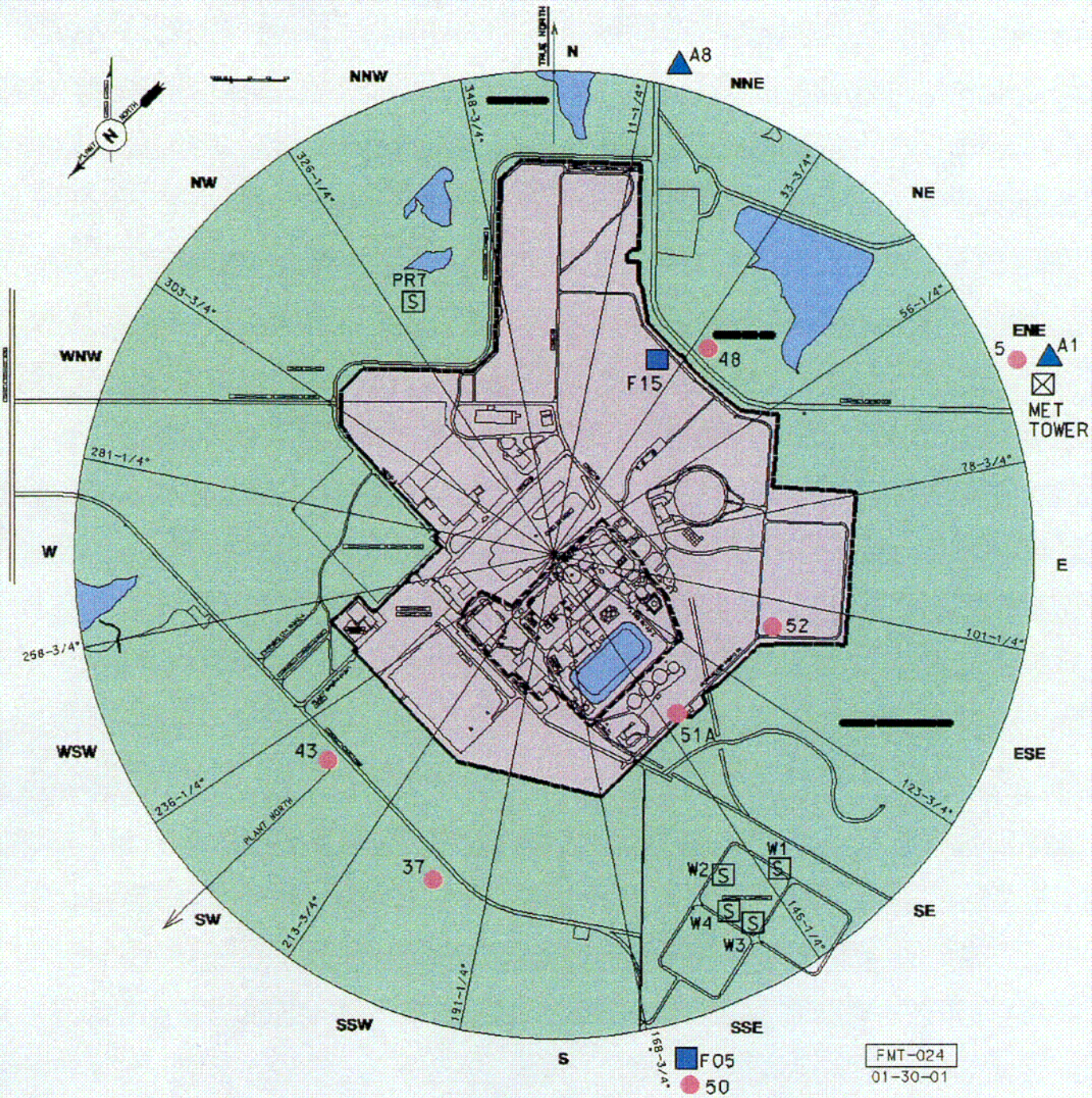
Figure II

Near Site Collection Locations



LEGEND:

- = TLD
- = AIR
- = WATER
- V = VEGETATION
- M = MILK
- S = SOIL
- = FISH, SEDIMENT

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Table I

Sampling Locations

Location Code	Description[1]	Sample Types[2]
1a	10.8 mi. NW, City of Fulton on Hwy Z, 0.65 mi. East of Business 54, West of Campus Apartments	IDM
3	1.2 mi. NW; 0.1 mi. West of Hwy CC on Gravel Road, 0.8 mi. South Hwy 0, Callaway Electric Cooperative Utility Pole No. 18559.	IDM
5	1.3 mi. ENE; Primary Meteorological Tower.	IDM
6	2.0 mi. W; County Road 428, 1.2 mi. West of Hwy CC, Callaway Electric Cooperative Utility Pole No. 18609.	IDM
7	1.4 mi. S; County Road 459, 2.6 mi. North of Hwy 94, Callaway Electric Cooperative Utility Pole No. 35097	IDM
9	3.8 mi. S; NW Side of the County Road 459 and Hwy 94 Junction, Callaway Electric Cooperative Utility Pole No. 06754.	IDM
10	3.9 mi. SSE; Hwy 94, 1.8 mi. East of County Road 459, Callaway Electric Cooperative Utility Pole No. 12182.	IDM
11a	4.7 mi. SE; City of Portland, Callaway Electric Cooperative Utility Pole No. 12110.	IDM
14	4.9 mi. ESE; SE Side of Intersection D and 94, Callaway Electric Cooperative Utility Pole No. 11940.	IDM
17	3.8 mi. E; County Road 4053, 0.3 mi. East of Hwy 94, Kingdom Telephone Company Pole No. 3X12.	IDM
18a	3.7 mi. ENE; East side of Hwy D, 0.5 mi. South of 0, Callaway Electric Cooperative Utility Pole No. 38579.	IDM
20	4.7 mi. NE; City of Readsville, Callaway Electric Cooperative Utility Pole No. 12830.	IDM
21	3.8 mi. NNE; County Road 155, 1.9 mi. North of Hwy 0, Callaway Electric Cooperative Utility Pole No. 19100	IDM
22a	1.9 mi. NNE; North side of Hwy O, 100 feet East of County Road 150, Callaway Electric Cooperative Utility Pole No. 31094.	IDM
23	6.6 mi. NNE; City of Yucatan, Callaway Electric Cooperative Utility Pole No. 12670	IDM
26[3]	11.7 mi. E; Town of Americus, Callaway Cooperative Utility Pole No. 11159.	IDM
27[3]	9.3 mi. ESE; Town of Bluffton, Callaway Electric Cooperative Utility Pole No. 11496.	IDM
30a	4.4 mi. SSW; City of Steedman, N side of Belgian Dr., 150 feet East of Hwy CC, Callaway Electric Cooperative Utility Pole No. 06557.	IDM
31a	7.8 mi. SW; City of Mokane, Junction Hwy C and County Road 400, 0.9 mi. North of Hwy 94, Callaway Electric Cooperative Utility Pole.	IDM
32	5.4 mi. WSW; Hwy VV, 0.6 mi. West of County Road 447, Callaway Electric Cooperative Utility Pole No. 27031.	IDM

Location Code	Description[1]	Sample Types[2]
32a	5.0 mi. WSW; County Road 447, Callaway Electric Cooperative Utility Pole No. 06354.	IDM
33	7.4 mi. W; City of Hams Prairie, SE of Hwy C and AD Junction	IDM
34	9.5 mi. WNW; NE Side of Hwy C and County Road 408 Junction.	IDM
35	5.8 mi. NNW; City of Toledo, Callaway Electric Cooperative Utility Pole No. 17684.	IDM
36	4.9 mi. N; County Road 155, 0.8 mi. South of County Road 132, Callaway Electric Cooperative Utility Pole No. 19137.	IDM
37	0.5 mi. SSW; County Road 459, 0.9 mi. South of Hwy CC, Callaway Electric Cooperative Utility Pole No. 35077.	IDM
38	4.6 mi. NNW; County Road 133, 1.5 mi. South of Hwy UU, Callaway Electric Cooperative Utility Pole No. 34708.	IDM
39	5.4 mi. NW; County Road 111, Callaway Electric Cooperative Utility Pole No. 17516.	IDM
39a	5.0 mi. NW County Road 111, Callaway Electric Cooperative Utility Pole No. 17526	IDM
40	4.2 mi. WNW; NE Side of County Road 112 and Hwy 0, Callaway Electric Cooperative Utility Pole No. 06326.	IDM
41	4.9 mi. W; Hwy AD, 2.8 mi. East of Hwy C, Callaway Electric Cooperative Utility Pole No. 18239.	IDM
42	4.4 mi. SW; County Road 447, 2.6 mi. North of County Road 463, Callaway Electric Cooperative Utility Pole No. 06326.	IDM
43	0.5 mi. SW; County Road 459, 0.7 mi. South of Hwy CC, Callaway Electric Cooperative Utility Pole No. 35073.	IDM
44	1.6 mi. WSW; Hwy CC, 1.0 mi. South of County Road 459, Callaway Electric Cooperative Utility Pole No. 18769.	IDM
45	1.0 mi. WNW; County Road 428, 0.1 mi. West of Hwy CC, Callaway Electric Cooperative Utility Pole No. 18580.	IDM
46	1.5 mi. NNW; NE Side of Hwy CC and County Road 466 Intersection, Callaway Electric Cooperative Utility Pole No. 28242.	IDM
47	1.0 mi. N; County Road 448, 0.9 mi. South of Hwy 0, Callaway Electric Cooperative Utility Pole No. 28151. IDM	IDM
48	0.4 mi. NE; County Road 448, 1.5 mi. South of Hwy 0, Plant Security Sign Post.	IDM
49	1.6 mi. E; County Road 448, Callaway Electric Cooperative Utility Pole No. 06959, Reform Wildlife Management Parking Area.	IDM

Location Code	Description[1]	Sample Types[2]
50	0.9 mi. SSE; County Road 459, 3.3 mi. North of Hwy 94, Callaway Electric Cooperative Utility Pole No. 35086.	IDM
51a	0.3 mi. SE; Owner Control Fence, SE of the Water Treatment Plant.	IDM
52	0.4 mi. ESE; Light Pole Near the East Plant Security Fence	IDM
60[3]	13.5 mi. SW; Callaway Electric Cooperative Utility Pole No. 43744 just past Tebbetts City sign.	IDM
A1	1.3 mi. ENE; Primary Meteorological Tower.	APT, AIO
A7	9.5 mi. NW; C. Bartley Farm.	APT, AIO
A8	0.9 mi. NNE; County Road 448, 0.9 miles South of Hwy 0.	APT, AIO
A9	1.9 mi. NNW; Community of Reform.	APT, AIO
B3	1.8 mi. NNW; 0.3 mi. East of the O and CC Junction, Callaway Electric Cooperative Utility Pole No. 18892.	APT, AIO
D01	5.0 mi. SE; Holzhouser Grocery Store/ Tavern (Portland, MO).	WWA
F05	0.9 mi. SSE; Onsite Groundwater Monitoring Well.	WWA
F15[3]	0.4 mi. NNE; Onsite Groundwater Monitoring Well.	WWA
M6	2.6 mi. NW, Pierce's Farm (Cow's Milk) MLK	MLK
M8[3]	18.7 mi. WSW, Kissock's Farm, South of New Bloomfield, MO (Cow's Milk).	MLK
V3[3]	15.0 mi. SW; Beazley Farm, West of Tebbetts, MO.	SOL
V9	2.0 mi. WNW; Meehan Farm	FPL
V10	3.4 mi. SSW; Brandt Farm	FPL
V11	3.2 mi. NW; Hickman Farm	FPL
V12[3]	18.7 mi. WSW, Kissock's Farm, South of New Bloomfield, MO (Cow's Milk).	FPL
A[3,4]	4.9 mi. SSE; 0.6 River Miles Upstream of Discharge North Bank.	AQS, AQF
C[4]	4.9 mi. SE; 1.0 River Miles Downstream of Discharge North Bank.	AQS, AQF
S01[3]	4.7 mi. SSE; 105 feet Upstream of Discharge North Bank.	SWA
S02	4.9 mi. SE; 1.1 River Miles Downstream of Discharge North Bank.	SWA
F2	1.64 mi. SW; Callaway Plant Forest Ecology Plot F2.	SOL
F6	1.72 mi. NE; Callaway Plant Forest Ecology Plot F6.	SOL
PR3	1.02 mi. ESE; Callaway Plant Prairie Ecology Plot PR3.	SOL

Location Code	Description[1]	Sample Types[2]
PR7	0.45 mi. NNW; Callaway Plant Prairie Ecology Plant PR7.	SOL
W4	0.68 mi. SSE; Callaway Plant Wetlands, SW Bank	SOL
W2	0.60 mi. SSE; Callaway Plant Wetlands, Inlet Area	SOL
W1[3]	0.61 mi. SE; Callaway Plant Wetlands, High Ground	SOL
W3	0.72 mi. SSE; Callaway Plant Wetlands, Discharge Area	SOL

[1] Distance is measured from the centerline of the reactor.

[2] AIO = Air Iodine, APT = Air Particulate, AQF = Fish, AQS = Sediment, FPL = Leafy Green Vegetables, IDM = TLD, MLK = Milk, SOL = Soil, SWA = Surface Water, WWA = Ground Water.

[3] Control Locations.

[4] The fish collection area for location "A" is between 0.6 river miles and 3.0 river miles upstream of the plant discharge. Location "C" is between the plant discharge and 1.5 miles downstream.

Table II *REMP Sample Collection Frequencies and Required Analysis*[1]

Sample	Sample Type	Collection Frequency	Required Analysis
Airborne Iodine	AIO	Weekly	I-131 weekly
Air Particulate	APT	Weekly	Gross Beta weekly[2] and Gamma Isotopic of quarterly filter composite
Soil	SOL	Annually	Gamma Isotopic (Continuation of pre-operational program)
Fish	AQF	Semiannually	Gamma Isotopic
Sediment (Shoreline and Bottom)	AQS	Semiannually	Gamma Isotopic (Bottom sample NPDES requirement)
Leafy Green Vegetables	FPL	Monthly during the growing season	I-131, and Gamma Isotopic
TLD	IDM	Quarterly	Gamma Dose
Milk	MLK	Semimonthly when animals are on Pasture; monthly otherwise	I-131, and Gamma Isotopic
Surface Water	SWA	Monthly composite	H-3 and Gamma Isotopic
Ground Water	WWA	Quarterly Grab	H-3 and Gamma Isotopic (NPDES Requirement)

[1] Samples required by ODCM and NPDES permit. Additional sampling is performed as a continuation of the pre-operational monitoring program.

[2] If gross beta activity is greater than the established baseline activity level gamma isotopic analysis is performed on the individual sample.

2.4 Sampling Program Execution and Results

2.4.1 Program Modifications and Exceptions

During 2001 no significant changes were made to the Radiological Environmental Monitoring Program.

The Radiological Environmental Monitoring Program was executed as described in the ODCM with any exceptions listed in this report.

2.4.2 Detection and Reporting Limits

Table III gives the required detection limits for radiological environmental sample analysis. For each sample type, the table lists the detection level for each isotope.

The lower limit of detection (LLD) used in this report is described in NRC Regulatory Guide 4.1 Rev. 1, "Program for Monitoring Radioactivity in the Environs of Nuclear Power Plants" and the NRC Branch Technical Position, November 1979, "An Acceptable Radiological Environmental Monitoring Program".

Positive sample results are reported with a 2 sigma counting uncertainty (corresponding to the 95% confidence level). In cases where the activity is found to be below the sample analysis minimum detection level it is reported as Not Detected.

Aerial view of the Callaway Plant site. Included is some of the land worked by local farmers to produce feed for cattle.

Table III Detection Capabilities for Radiological Environmental Sample Analysis[1]

Analysis	Water (pCi/l)	Airborne (pCi/m^3)	Fish (pCi/kg wet)	Milk (pCi/I)	Food Products (pCi/kg wet)	Soil and Sediment (pCi/kg dry)
Gross beta	4	0.01				
H-3	3000					
Mn-54	15		130			
Fe-59	30		260			
Co-58, -60	15		130			
Zr-Nb-95[4]	15					
I-131	1000	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[2]	15			15		

[1] This list does not mean only these nuclides will be detected and reported. Other peaks which are measurable and identifiable will be reported.

[2] Total activity, parent plus daughter activity.

2.4.3 Quality Control Program

The contractor laboratory (Environmental, Inc. Midwest Laboratory) maintains a quality control (QC) program in accordance with Regulatory Guide 4.15. The Program includes laboratory procedures designed to prevent cross-contamination and ensure accuracy and precision of analyses. QC checks include blind samples, duplicate samples, and spiked samples as necessary to verify laboratory analysis activities are being maintained at a high level of accuracy.

The contractor laboratory participates in the Department of Energy's Environmental Laboratory Quality Assessment Program (EML), Mixed Analyte Performance Evaluation Program (MAPEP) and Environmental Resource Associates (ERA). The results of these crosscheck programs are presented in Section 2.6.

The Callaway Plant Personnel Dosimetry program is certified by the National Voluntary Laboratory Accreditation Program (NVLAP) of the National Institute of Standards and Technology (NIST). The Environmental TLD Program has demonstrated compliance with the recommendations of Regulatory Guide 4.13. Quality control checks are performed including blanks, blind samples, daily performance checks and quarterly crosschecks.

2.4.4 Data Interpretations

Sample analysis results are evaluated to determine if the result was due to the operation of the Callaway Plant or other sources.

One evaluation method used is the indicator-control concept. Most sample types are collected at both indicator (areas potentially affected by plant operations) and control locations (areas not significantly affected by plant discharge). A possible plant effect would be indicated if the detected level at an indicator location was statistically larger than at the control location.

Another method involves determining if the result originated from weapons testing. The indicator or control sample result can be compared to established environmental levels produced from weapons testing.

Sample results can also be compared with preoperational levels or samples collected in other parts of the country. Results can also be related to events known to have caused elevated levels of radiation in the environment.

2.4.5 Waterborne Pathway

Surface Water

Analysis

Tritium: A 60-70 ml aliquot of water is purified by distillation. A portion of the distillate is transferred to a counting vial and scintillation fluid added. The contents of the vial are thoroughly mixed and counted in a liquid scintillation counter.

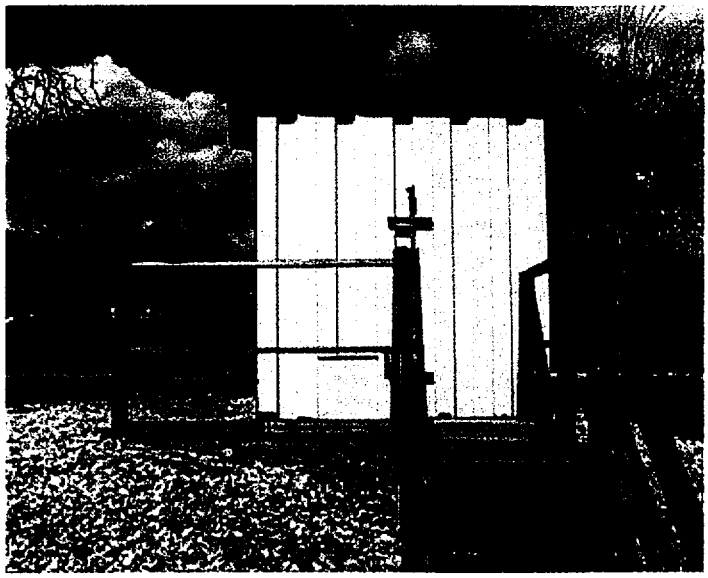
Gamma Spectrometry: A suitable aliquot of prepared sample is placed in a standard calibrated container and specific nuclides are identified and quantified using a germanium detector coupled to a computer based, multichannel analyzer.

Sampling and Frequency

Monthly composite samples of surface water from the Missouri River are collected from one indicator location (SO2) and from one control location (SO1) and shipped to Environmental, Inc., Midwest Laboratory for analyses..

Results

The indicator water sampler (S02) was operational 60% of the time during 2001. This sampler is checked daily. Immediate action is taken to place the sampler back in service when a problem is identified. If the sampler cannot be returned to service, daily grab



Sampling of the Missouri River is accomplished using an automated compositor. Samples are collected on an hourly basis and mixed to make the monthly composite sample. River sampling verifies that Callaway Plant discharges meet stringent regulatory requirements.

samples are obtained.

CAR 200102965 documents the details of the operational problems and corrective actions taken. Operational problems included timer and pump failure, clogged suction pipe, electric power outages and low river water levels. Corrective actions taken were 1) installation of remote indication equipment which allows for closer monitoring of compositor operation 2) the pump used to transport water from the river to the compositor was upgraded 3) a review was conducted on sample pump preventative maintenance and modifications made to improve performance 4) an additional extension was added to the suction piping to prevent failure due to low river water 5) the priority to perform work on the sampler was increased.

The control water sampler (S01) was operational 93% of the time during 2001. This sampler is checked weekly. Immediate action is taken to place the sampler back in service when a problem is identified. If the sampler cannot be returned to service, daily grab samples are obtained. Operational problems included a breaker trip, repairs at the Intake Structure that down powered the sampler and a burnt out pump. The sampler was out of service for one day on 3/10/01 before the failure was identified. The sampler was returned to service on 3/11/01. This event is documented on CAR 200101012.

Tritium was the only radionuclide detected in surface water samples collected during 2001. Four of twelve samples collected at indicator location S02 contained measurable levels of tritium with a mean concentration of 317 pCi/l. This is < 1% of the reporting limit for tritium in surface water. CARS 200100164, 200101268, 200102968 and 200103898 were initiated to trend the positive results.

The quantity of tritium measured at the indicator station is well within regulatory requirements. These results are inside the range of previous operational levels. There was no significant radiological impact on the health and safety of the public or the environment.

The gamma analysis results for surface water samples were consistent with previously accumulated data and no plant operational effects were identified.

Ground Water

Analysis

Tritium: A 60-70 ml aliquot of water is purified by distillation. A portion of the distillate is transferred to a counting vial and scintillation fluid added. The contents of the vial are thoroughly mixed and counted in a liquid scintillation counter.

Gamma Spectrometry: A suitable aliquot of prepared sample is placed in a standard calibrated container and specific nuclides are identified and quantified using a germanium detector coupled to a computer based, multichannel analyzer.

Sampling and Frequency

Ground water samples are collected quarterly from two sampling wells (F05 and F15) and one drinking water well (D01). The well samples are collected using an

electric pump that is located in the well. The drinking water sample is collected from a faucet after allowing the line to flush for two minutes. Samples are shipped to Environmental, Inc., Midwest Laboratory for analyses.

Results

The analysis results for all ground water samples were consistent with previously accumulated data and no plant operational effects were identified.

Bottom Sediment

Analysis

Gamma Spectrometry: A suitable aliquot of prepared sample is placed in a standard calibrated container and specific nuclides are identified and quantified using a germanium detector coupled to a computer based, multichannel analyzer.

Sampling and Frequency

Bottom sediment samples are collected semiannually from one indicator location (C) and one control location (A). The samples are taken from water at least 2 meters deep to prevent influence of bank erosion. A Ponar dredge is used to obtain the samples, consisting of the uppermost layer of sediment. Each sample is placed, without preservative, in a plastic bag, sealed and shipped to Environmental, Inc., Midwest Laboratory for analyses.

Results

The analysis results for bottom sediment samples were consistent with previously accumulated data including pre-operation and no plant operational effects were identified.

Shoreline Sediment

Analysis

Gamma Spectrometry: A suitable aliquot of prepared sample is placed in a standard calibrated container and specific nuclides are identified and quantified using a germanium detector coupled to a computer based, multichannel analyzer.

Shoreline sediment samples are collected two feet from the edge of the water in the same location as the bottom sediment samples. Sediment samples indicate there has been no impact on the environment from the Callaway Plant liquid discharge.

Sampling and Frequency

Shoreline sediment samples are collected semiannually in the same area as bottom sediment. The samples are collected within two feet of the edge of the water and consist of 2 six-inch diameter by two-inch deep sediment plugs. Each sample is placed in a plastic bag, sealed and shipped to Environmental, Inc., Midwest Laboratory for analyses.

Results

The analysis results for shoreline sediment samples

were consistent with previously accumulated data including pre-operation and no plant operational effects were identified.

Wetlands Soil

Analysis

Gamma Spectrometry: A suitable aliquot of prepared sample is placed in a standard calibrated container and specific nuclides are identified and quantified using a germanium detector coupled to a computer based, multichannel analyzer.

Sampling and Frequency

Wetlands soil samples are collected annually from 3 indicator locations (W2, W3, and W4) and one control location (W1). Two 6-inch square soil plugs consisting of the uppermost two-inch layer of soil are taken at each location. The samples are placed in plastic bags, sealed and shipped to Environmental, Inc., Midwest Laboratory for analyses.

Results

Cs-137 was detected in the Wetlands soil samples. Station W2 indicated 165 pCi/kg dry, Station W3 indicated 101 pCi/kg dry and Station W4 indicated 91 pCi/kg dry.

The analysis results for Wetlands soil samples were consistent with previously accumulated data and no plant operational effects were identified. The Cs-137 activity is due to worldwide fallout from atmospheric nuclear testing.

2.4.6 Airborne Pathway

Airborne

Analysis

Gross Beta: The filters are analyzed approximately five days after collection to allow for decay of natural short-lived radionuclides. The glass fiber type filter is placed into a stainless steel planchet and counted for gross beta radioactivity using a proportional counter.

Iodine: Each Charcoal cartridge is placed on the germanium detector and counted. A peak of 0.36 MeV is used to calculate the concentration at counting time. The equilibrium concentration at the end of collection is then calculated. Decay correction for the time interval between sample collection and counting is then made.

Gamma Spectrometry: Filters are composited according to location and counted using a germanium detector coupled to a computer based multichannel analyzer. The resulting spectrum is analyzed by computer and specific nuclides, if present, identified and quantified.

Sampling and Frequency

Airborne particulate samples are collected on a 47mm diameter glass fiber filter type A/E (99 percent removal efficiency at 1 micron particulate) at a volumetric rate of one and one-half cubic feet per minute at five locations.

Each airborne particulate air sampler is equipped with a charcoal cartridge filter in-line after the particulate filter holder.

The filters are collected weekly and shipped to Environmental, Inc., Midwest Laboratory for analyses.

All five sample locations are considered indicator locations (A1, A7, A8, A9, and B3). One indicator station (A9) is located at the community with the highest D/Q.

Results

Air stations A-8, B-3 and A-7 were operational 100% of the time during 2001.

Station A-1 was operational 98.6% of the year. The sampler had a timer failure during the week of 9-12 (CAR 200105776). The timer was replaced. A high flowrate was discovered for the sample collected during

Airborne samples are continuously collected. Particulates are gathered on a glass fiber filter. A charcoal filter is in line after the particulate filter to collect iodines. Air samples indicate the Callaway Plant has had no impact on the surrounding environment.

the week of 9/6. This caused additional sample to be collected for the time period, which made the analysis conservative (CAR 200105612).

Station A-9 was operational 98% of the year. The particulate filter for Station A-9 collected during the week of 9-20 was lost in transit to the vendor laboratory. The cause for the lost sample could not be identified. Plant and vendor laboratory personnel were coached to increase attention to detail when handling samples (CAR 200105974). This Air Station lost four hours of operational time during the week of 8/23 when the power pole was replaced.

Air Station A-7 had a clogged flow meter which caused a low flow reading for the week of 9-20 The clog was caused by dirt that entered through a loose fitting. The fitting was replaced (CAR 200107910).

Gross beta activity ranged from 0.006 to 0.054 pCi/m^3 in all samples. The average gross beta activity at all locations was 0.023 pCi/m^3. During 2001 there were 15 weekly samples with gross beta activities greater then the baseline action level of 0.037 pCi/m^3. Gamma spectral analysis was performed on these filters and no gamma emitting isotopes of plant origin was detected.

The analysis results for airborne samples are consistent with previously accumulated data and no plant operational effects were identified.

2.4.7 Ingestion Pathway

Milk

Analysis

Iodine-131: Two liters of milk containing standardized Iodine carrier is stirred with anion exchange resin for one hour. The resin is washed with NaCl and the iodine is eluted with sodium hypochlorite. Iodine in the iodate form is reduced to I_2 and the elemental iodine extracted into CCl_4, back-extracted into water, then precipitated as palladium iodide. The precipitate is counted for I-131 using a proportional counter.

Gamma Spectrometry: An aliquot of milk is placed in a standard counting container and specific nuclides are identified and quantified using a germanium detector coupled to a computer based, multichannel analyzer.

Sampling and Frequency

When available, two-gallon milk samples are collected semimonthly during the pasture season (April through September) and monthly during the winter from one cow milk location near the Plant M6 and one cow milk location away from the Plant M8. Milk samples are shipped in ice to Environmental, Inc., Midwest Laboratory for analyses within eight days after collection.

Results

Milk samples were unavailable due to animals not producing milk during the following periods:

Location M8:
Samples were unavailable in August, September and October due to the cow in calf.

The analysis results for milk samples were consistent with previously accumulated data and no plant operational effects were identified.

Fish

Analysis

Gamma Spectrometry: A suitable aliquot of prepared sample is placed in a standard calibrated container and specific nuclides are identified and quantified using a germanium detector coupled to a computer based, multichannel analyzer.

Sampling and Frequency

The five most abundant recreational or commercial fish species are collected semiannually from one indicator location (C) and one control location (A). Fish samples are shipped to Environmental, Inc., Midwest Laboratory for analyses.

Results

The analysis results for fish samples were consistent with previously accumulated data and no plant operational effects were identified.

Fish are collected by Ameren UE biologists. Fish samples indicate there has been no impact on the environment due to operation of the Callaway Plant.

Vegetation

Analysis

Iodine-131: A suitable aliquot of wet (as received) sample is placed into a standard calibrated container and counted using a germanium detector coupled to a computer based, multichannel analyzer. A peak of 0.36 MeV is used to calculate the concentration at counting time. The equilibrium concentration at the end of collection is calculated by decay correcting for the time interval between sample collection and counting.

Gamma Spectrometry: A suitable aliquot of wet (as received) sample is placed into a standard calibrated container and specific nuclides are identified and quantified using a germanium detector coupled to a computer based, multichannel analyzer.

Sampling and Frequency

Monthly, during the growing season, green leafy vegetation is collected from three indicator locations V9, V10, and V11 and from one control location V12. Vegetation samples consist of mustard greens, turnip greens, cabbage, lettuce, and spinach. Other vegetation is collected if primary varieties are not available. Samples are shipped to Environmental, Inc., Midwest Laboratory for analyses.

Results

Green leafy vegetation was unavailable due to lack of plant growth during the

following periods:

Location V9:
January through May, and August

Location V10:
No samples were collected during the year due to weather and flooding

Location V11:
January through May, and December

Location V12:
January through April, August, November and December

The analysis results for vegetation samples were consistent with previously accumulated data and no plant operational effects were identified.

Direct Radiation

Analysis

The Union Electric program uses the Panasonic Model UD-814 TLD and Model UD-710A automatic dosimeter reader. Each dosimeter consists of three elements of $CaSO_4$:Tm. The dosimeters are sealed in a moisture resistant plastic bag and placed inside a polypropylene mesh cylindrical holder in the environment. After exposure in the environment the dosimeters are read and the result is adjusted to a standard quarter of 90 days.

Pictured is one of the forty three dosimeter locations used to measure direct radiation. Direct radiation data indicates there has been no impact from the operation of the Callaway Plant.

Sampling and Frequency

Thermoluminescent Dosimetry (TLD) is used to determine direct radiation levels in and around the Callaway site. Forty-three dosimeters are placed in 16 sectors around the plant as specified in the ODCM. The dosimeters are read once per quarter. Three locations are designated as controls (IDM-26, IDM-27 and IDM-60).

Results

Direct Radiation data was unavailable due to vandalism at location IDM-6 and IDM-21 during the first quarter and IDM-14 and 31a during the second quarter. IDM-5 had to be replaced after the first 13 days of the second quarter due to vandalism.

The analysis results for TLD samples were consistent with previously accumulated data and no plant operational effects were identified.

Soil

Analysis

Gamma Spectrometry: A suitable aliquot of prepared sample is placed in a standard calibrated container and specific nuclides are identified and quantified using a germanium detector coupled to a computer based, multichannel analyzer.

Sampling and Frequency

Soil samples are collected annually from four indicator locations (F2, PR3, F6, and PR7) and one control location (V3). To ensure only the most recent deposition is sampled, the uppermost two-inch layer of soil is taken at each location. Samples consist of 2 six-inch square soil plugs. The litter at the surface and the root mat is considered part of the sample. The samples are placed in plastic bags, sealed and shipped to Environmental, Inc., Midwest Laboratory for analyses.

Results

Cs-137 was detected in the soil samples. Control station V3 indicated 220 pCi/kg dry while the highest indicator station indicated 913 pCi/l dry.

The analysis results for soil samples were consistent with previously accumulated data including pre-operation and no plant operational effects were identified. The Cs-137 activity is due to worldwide fallout from atmospheric nuclear testing.

2.5 Land Use Census

The Land Use Census is performed annually during the growing season within a five-mile radius of the Callaway Plant. The location of the nearest resident, milking animal and garden greater then 50 square meters is identified in each of the sixteen meteorological sectors.

The AmerenUE Real Estate Department conducted the 2001 Land Use Census during November. Information was collected by contacting residents by phone and conducting field surveys.

Results

The results of the 2001 Land Use Census are presented in Table IV. The table includes radial direction and distance from the Callaway Plant for each location. These parameters were determined using a combination of map position, aerial photography and Global Positioning System (GPS) receiver.

Nearest Resident

The distance of the nearest resident with the highest D/Q was unchanged for 2001. This resident lives 1.8 miles from the plant in the NNW sector.

Milking Animals

Milking animals were identified in the SW sector. Milk is not collected for human consumption at this location. The owners did not want to participate in a sampling program. The owners of milking animals in the SSE sector indicated they would participate in the sampling program. This location will be pursued for the 2002 sample program.

Vegetable Gardens

A volunteer in the SE sector had a higher average ground level D/Q then the current participants. This location will be pursued for the 2002 sample program.

Changes were identified for the nearest garden in the following sectors: E, ESE, SE, S, SSW, SW, WSW, NE, and W.

View of land near the Callaway Plant during late Winter. In the background is the Missouri River.

Table IV **2001 Land Use Census Results**

Closest Receptor in Miles[1]

Sector	Residence	Garden	Milk
N	2.2	NI	NI
NNE	2.2	2.4	NI
NE	2.3	2.3	NI
ENE	1.7	2.9	NI
E	3.5	3.5	NI
ESE	2.1	4.7	NI
SE	2.2	2.3	NI
SSE	2.5	2.5	2.5
S	2.7	2.9	NI
SSW	2.4	2.8	NI
SW	2.6	2.7	2.7
WSW	1.2	3.2	NI
W	1.6	2.3	4.0
WNW	1.9	1.9	NI
NW	2.1	3.2	2.6
NNW	1.8	3.2	NI

[1] NI=None Identified

2.6 Cross-Check Results

The crosscheck results performed by the vendor laboratory during 2001 are presented in Table V. The results indicate satisfactory laboratory performance.

2001 Environmental Measurement Labratory

Table V Quality Assessment Program Results

Date	Type	Nuclide	Reported Value[1]	Reference Value	Control Limits[2]	Result
Mar-01	Air Filter	Beta	2.30 ± 0.02	2.58	0.76 - 1.52	PASS
Mar-01	Air Filter	Cs-134	2.71 ± 0.15	2.83	0.74 - 1.21	PASS
Mar-01	Air Filter	Co-60	20.11 ± 0.16	19.44	0.79 - 1.30	PASS
Mar-01	Air Filter	Cs-137	9.86 ± 0.23	8.76	0.78 - 1.35	PASS
Mar-01	Air Filter	Mn-54	7.25 ± 0.22	6.52	0.80 - 1.36	PASS
Mar-01	Water	Cs-137	70.10 ± 4.00	73.00	0.80 - 1.20	PASS
Mar-01	Water	Alpha	1724.60 ± 141.70	1900.00	0.58 - 1.26	PASS
Mar-01	Water	Beta	1246.40 ± 31.10	1297.00	0.56 - 1.50	PASS
Mar-01	Water	H-3	76.50 ± 5.50	79.3	0.74 - 2.29	PASS
Mar-01	Water	Co-60	97.00 ± 0.80	98.20	0.80 - 1.20	PASS
Mar-01	Soil	K-40	583.80 ± 52.60	468.00	0.80 - 1.37	PASS
Mar-01	Soil	Cs-137	1772.60 ± 79.8	1740.00	0.80 - 1.29	PASS
Mar-01	Vegetation	Cs-137	795.50 ± 76.40	842.00	0.80 - 1.37	PASS
Mar-01	Vegetation	K-40	592.60 ± 42.50	603.00	0.78 - 1.43	PASS
Mar-01	Vegetation	C0-60	28.50 ± 2.10	30.40	0.75 - 1.51	PASS
Sep-01	Air Filter	Co-60	16.90 ± 0.30	17.50	0.79 - 1.30	PASS
Sep-01	Air Filter	Cs-137	18.30 ± 0.30	17.10	0.78- 1.35	PASS
Sep-01	Air Filter	Mn-54	85.40 ± 1.30	81.15	0.80 - 1.36	PASS
Sep-01	Air Filter	Beta	13.80 ± 0.10	12.77	0.76- 1.52	PASS
Sep-01	Air Filter	Cs-134	11.80 ± 0.20	12.95	0.74- 1.21	PASS
Sep-01	Water	Co-60	206.70 ± 4.70	209.00	0.80 - 1.20	PASS
Sep-01	Water	Cs-137	46.60 ± 0.80	45.133	0.80 - 1.24	PASS
Sep-01	Water	Alpha	1220.00 ± 32.00	1150.00	0.58 - 1.26	PASS
Sep-01	Water	Beta	8461.00 ± 206.00	7970.00	0.56 - 1.50	PASS
Sep-01	Water	H-3	254.10 ± 3.60	207.00	0.74 - 2.29	PASS
Sep-01	Soil	Cs-137	659.20 ± 10.80	612.33	0.80 - 1.29	PASS
Sep-01	Soil	K-40	737.70 ± 16.60	623.33	0.80 - 1.37	PASS
Sep-01	Vegetation	Co-60	40.20 ± 0.90	35.30	0.75 - 1.51	PASS
Sep-01	Vegetation	Cs-137	1184.00 ± 2.80	1030.00	0.80 - 1.37	PASS
Sep-01	Vegetation	K-40	1023.00 ± 44.10	898.67	0.78 - 1.43	PASS

[1] Results are reported as follows: Water Bq/L, Air Filters Bq/Filter, Soil and Vegetation Bq/Kg.

[2] Control Limits are the ratio of Reported Value / Reference Value established using historic data.

Table V

2001 MAPEP and ERA Results

MAPEP

Date	Type	Nuclide	Reported Value[1]	Reference Value	Control Limits[2]	Result
Jan-01	Soil	Co-57	100.20 ± 3.50	103.00	72.10 - 133.90	PASS
Jan-01	Soil	Co-60	1285.10 ± 5.30	1270.00	889.00 - 1651.00	PASS
Jan-01	Soil	Cs-134	81.10 ± 1.80	91.10	63.77 - 118.43	PASS
Jan-01	Soil	K-40	732.60 ± 21.20	652.00	456.40 - 847.60	PASS
Jan-01	Soil	Cs-137	1210.60 ± 6.60	1240.00	868.00 - 1612.00	PASS
Jan-01	Soil	Mn-54	212.60 ± 6.70	203.00	142.10 - 263.90	PASS
Jan-01	Soil	Zn-65	428.50 ± 10.90	382.00	267.40 - 496.60	PASS

ERA

Date	Type	Nuclide	Reported Value[1]	Reference Value	Control Limits[2]	Result
Oct-01	Water	Co-60	82.4 ± 0.9	78.40	69.7 - 87.1	PASS
Oct-01	Water	Cs-134	52.2 ± 1.3	54.1	45.4 - 62.8	PASS
Oct-01	Water	Cs-137	39.4 ± 0.6	37.9	26.3 - 43.7	PASS
Oct-01	Water	Gr. Beta	166.0 ± 7.1	192.0	142.0 - 242.0	PASS
Oct-01	Water	Gr. Alpha	63.5 ± 2.5	64.0	36.5 - 91.5	PASS
Oct-01	Water	Gr. Beta	26.0 ± 1.2	21.5	12.8 - 30.2	PASS
Nov-01	Water	Ba-133	66.7 ± 1.2	69.3	57.5 - 81.1	PASS
Nov-01	Water	Co-60	59.3 ± 0.6	59.7	51.0 - 68.4	PASS
Nov-01	Water	Cs-134	86.7 ± 1.5	93.9	85.2 - 103.0	PASS
Nov-01	Water	Cs-137	45.0 ± 1.0	42.0	33.3 - 50.7	PASS
Nov-01	Water	Zn-65	80.7 ± 0.6	77.3	63.9 - 90.7	PASS

[1] Results are reported as: Bq/Kg for MAPEP and pCi/l for ERA.

[2]Control Limits are defined by MAPEP and ERA.

2.7 Data Reporting Conventions

Lower Limit of Detection

The lower limit of detection (LLD) used in this report is per NRC Regulatory Guide 4.1, Rev. 1, "Program for Monitoring Radioactivity in the Environs of Nuclear Power Plants", and the NRC Branch Technical Position, November 1979, "An Acceptable Radiological Environmental Monitoring Program". The LLD is defined as the smallest concentration of radioactivity material in a sample that will yield a net count (above system background) that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

The maximum LLDs for radiological environmental sample analysis is presented in Table III.

Data Reporting

Positive sample results are reported with a 2 sigma counting uncertainty (corresponding to the 95% confidence level). In cases where the activity is found to be below the sample analysis minimum detection activity it is reported as Not Detected (ND).

2.8 Radiological Environmental Monitoring Program Annual Summary

The REMP Summary is presented in Table VI With the exception of a small indication of tritium in river water, there was no measurable impact on the environment due to plant operation.

Table VI

REMP Summary

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analysis Performed		Lower Limit of Detection (LLD)	All Indicator Locations Mean (f)[2] Range	Location With Highest Annual Mean		Control Location Mean (f)[2] Range	Number of Non-routine Reported Measurements
					Name Distance and Direction	Mean (f)[2] Range		
Waterborne Pathway								
Surface Water (pCi/l)	H-3	(24)	105	317 (4/12) (199 - 548)	S02 4.9 mi SE	317 (4/12) (199 - 548)	— (0/12)	0
	Gamma	(24)	—	— (0/12)	NA	NA	— (0/12)	0
Shoreline Sediment (pCi/kg)	Gamma	(4)	—	— (0/2)	NA	NA	— (0/2)	0
Airborne Pathway								
Airborne Particulate (pCi/m^3)	Gross Beta	(258)	—	0.023 (258/258) (0.006 – 0.054)	B-3 1.8 mi NNW	0.024 (52/52) (.008 - 0.050)	NA —	0
	Gamma	(20)	—	— (0/20)	NA	NA	NA	0
	I-131	(259)	0.070	— (0/259)	NA	NA	NA	0

Table VI

REMP Summary

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analysis Performed	Lower Limit of Detection (LLD)	All Indicator Locations Mean (f)[2] Range	Location With Highest Annual Mean		Control Location Mean (f)[2] Range	Number of Non-routine Reported Measurements
				Name Distance and Direction	Mean (f)[2] Range		
Ingestion Pathway							
Milk	Gamma (32)	—	(0/18)	NA	NA	— (0/14)	0
	I-131 (32)	0.2	— (0/18)	NA	NA	— (0/14)	0
Fish (pCi/kg - wet)	Gamma (20)	—	— (0/10)	NA	NA	— (0/10)	0
Vegetation (pCi/kg - wet)	Gamma (30)	—	— (0/30)	NA	NA	— (0/8)	0
	I-131 (30)	7.2	— (0/30)	NA	NA	— (0/8)	0
Direct Radiation							
Quarterly TLDs (mRem/Standard Quarter)	Gamma (168) Dose	10	16.6 (156/156) (10/20)	31a 7.8 mi SW	18.7 (3/3) (18 - 19)	15.3 (12/12) (10 - 19)	0

[1] The LLDs quoted is the lowest actual detection limit obtained in the various media during the reporting period. The required LLDs for radiological environmental sample analysis is found in Table III. Where all nuclides were LLD for specific media, no LLD was listed.

[2] Mean and range are based upon detectable measurements only. Fraction of detectable measurements is indicated in parentheses.

2.9 Individual Sampling Results

The REMP Individual sample results are presented in Tables VII through XVI.

The following acronyms are used in these tables:

ND = Not Detected (Result below analysis detection limit)

NA = Not Available (Circumstances discussed in body of report)

The area surrounding the Callaway Plant includes the Reform Conservation Area. The 7,044 acres that comprise this area is owned by Ameren UE and managed by the Missouri Department of Conservation.

Airborne Beta & Iodine

Table VII *(All results are the effect of natural background)*

Gross Beta data is listed. All Iodine-131 results are <0.07. All results are in pCi/m³.

	A-1	B-3	A-7	A-8	A-9
01/04/01	0.047	0.050	0.045	0.054	0.044
01/11/01	0.023	0.024	0.022	0.026	0.021
01/18/01	0.028	0.032	0.028	0.037	0.025
01/25/01	0.038	0.042	0.036	0.049	0.037
02/01/01	0.025	0.028	0.025	0.032	0.024
02/08/01	0.023	0.025	0.023	0.027	0.023
02/15/01	0.019	0.021	0.018	0.023	0.019
02/22/01	0.031	0.036	0.034	0.039	0.032
03/01/01	0.022	0.027	0.026	0.033	0.022
03/08/01	0.028	0.027	0.027	0.032	0.024
03/15/01	0.020	0.019	0.020	0.017	0.018
03/22/01	0.014	0.018	0.014	0.014	0.013
03/29/01	0.018	0.018	0.017	0.016	0.020
04/05/01	0.018	0.019	0.015	0.017	0.018
04/12/01	0.019	0.020	0.019	0.018	0.018
04/19/01	0.016	0.016	0.013	0.015	0.014
04/26/01	0.021	0.020	0.014	0.017	0.020
05/03/01	0.024	0.025	0.022	0.022	0.022
05/10/01	0.019	0.022	0.014	0.018	0.020
05/17/01	0.022	0.018	0.017	0.020	0.020
05/24/01	0.014	0.011	0.010	0.009	0.012
05/31/01	0.013	0.013	0.012	0.011	0.013
06/07/01	0.007	0.008	0.006	0.006	0.006
06/14/01	0.023	0.024	0.018	0.018	0.022
06/21/01	0.023	0.021	0.015	0.018	0.023
06/28/01	0.023	0.019	0.019	0.018	0.021
07/05/01	0.022	0.020	0.018	0.020	0.022
07/12/01	0.025	0.026	0.021	0.018	0.024
07/19/01	0.024	0.022	0.018	0.019	0.020
07/26/01	0.027	0.027	0.022	0.025	0.025
08/02/01	0.025	0.024	0.015	0.020	0.023
08/09/01	0.030	0.029	0.024	0.024	0.025
08/16/01	0.025	0.023	0.022	0.023	0.023
08/23/01	0.021	0.017	0.012	0.016	0.020
08/30/01	0.030	0.025	0.022	0.026	0.030
09/06/01	0.028	0.024	0.021	0.023	0.026
09/12/01	NA	0.018	0.015	0.013	0.018
09/20/01	0.026	0.011	0.022	0.023	NA
09/27/01	0.019	0.022	0.020	0.018	0.021
10/04/01	0.020	0.021	0.022	0.022	0.025
10/11/01	0.022	0.022	0.020	0.024	0.026
10/18/01	0.014	0.014	0.014	0.016	0.016
10/25/01	0.025	0.025	0.025	0.023	0.025
11/01/01	0.024	0.025	0.020	0.021	0.026
11/08/00	0.020	0.022	0.021	0.021	0.022
11/15/01	0.036	0.040	0.031	0.032	0.037
11/21/01	0.033	0.041	0.030	0.034	0.038
11/29/01	0.018	0.024	0.020	0.022	0.023
12/06/01	0.029	0.032	0.028	0.026	0.027
12/13/01	0.030	0.034	0.026	0.026	0.029
12/20/01	0.025	0.031	0.012	0.023	0.023
12/27/01	0.023	0.033	0.029	0.026	0.026

Airborne Gamma Composites

Table VIII *(All results are the effect of natural background)*

Gamma Isotopic[1] (pCi/m^3)

	A-1			
	QTR 1	QTR 2	QTR 3	QTR 4
Be-7	0.065	0.081	0.078	0.053

	A-7			
	QTR 1	QTR 2	QTR 3	QTR 4
Be-7	0.067	0.067	0.052	0.062

	A-8			
	QTR 1	QTR 2	QTR 3	QTR 4
Be-7	0.064	0.081	0.065	0.065

	A-9			
	QTR 1	QTR 2	QTR 3	QTR 4
Be-7	0.062	0.084	0.071	0.066

	B-3			
	QTR 1	QTR 2	QTR 3	QTR 4
Be-7	0.083	0.085	0.066	0.061

[1] Co-58, Co-60, Zr-95, Nb-95, Cs-134, Cs-137, Ba-140, La-140, Ce-144 Not Detectable

Soil

Table IX *(All results are the effect of natural background)*

Gamma Isotopic[1] (pCi/kg)

	F2	F6	PR3	PR7	V3
	12/19/01	12/19/01	12/19/01	12/19/01	12/19/01
Gross Alpha	12,382	13,921	14,982	14,558	14,471
Gross Beta	25,638	31,144	27,388	21,223	29,782
K-40	12,452	10,919	11,057	11,318	18,210
Cs-137	632	913	527	354	220

	W1	W2	W3	W4
	12/19/01	12/19/01	12/19/01	12/19/01
Gross Alpha	8,978	16,376	13,048	11,248
Gross Beta	19,164	28,443	24,565	21,617
K-40	12,880	15,886	13,032	13,215
Cs-137	ND	165	101	91

[1] Mn-54, Fe-59, Co-58, Co-60, Zr-95, Nb-95, Cs-134, Ba-140, La-140, Not Detectable

Vegetation

Table X ***(All results are the effect of natural background)***

Gamma Isotopic[1] (pCi/kg wet)

	V9					
	6/11/01 Lettuce	**6/11/01** Mustard Greens	**6/11/01** Cabbage	**7/23/01** Lettuce	**9/26/01** Mustard Greens	**10/8/01** Mustard Greens
Gross Alpha	ND	ND	77	ND	60	66
Gross Beta	4,702	ND	4,920	10,661	2,754	4,100
K-40	3,003	4,904	4,987	7,536	3,209	4,477

	11/12/01 Turnip Greens	**11/12/01** Mustard Greens	**12/10/01** Cabbage	**12/10/01** Mustard Greens
Gross Alpha	124	ND	ND	68
Gross Beta	5,675	4,252	4,405	4,496
K-40	5,360	4,720	4,124	4,661

[1] Mn-54, Co-58, Co-60, I-131, Cs-134, Cs-137, Not Detectable

Vegetation

Table X *(All results are the effect of natural background)*

Gamma Isotopic[1] (pCi/kg wet)

V11

	6/11/01 Chard	6/11/01 Cabbage	6/26/01 Broccoli	6/26/01 Turnip Greens	7/11/01 Broccoli	7/11/01 Turnip Greens
Gross Alpha	ND	ND	63	ND	ND	329
Gross Beta	6,502	ND	4,297	5,222	5,261	5,728
K-40	7,085	3,073	3,691	4,097	4,597	4,986

	8/14/01 Cauliflower	8/14/01 Cabbage	9/10/01 Broccoli	9/25/01 Greens	10/8/01 Kale	11/13/01 Cabbage
Gross Alpha	68	38	ND	ND	54	74
Gross Beta	4,186	2,652	5,730	3,844	4,104	3,930
K-40	4,274	2,962	5,038	4,102	3,596	2,786

V12

	5/7/01 Lettuce	5/22/01 Mustard Greens	6/11/01 Cabbage	6/26/01 Lettuce	7/10/01 Mustard Greens	7/23/01 Mustard Greens
Gross Alpha	129	ND	ND	ND	ND	ND
Gross Beta	4,403	ND	ND	5,163	6,886	3,074
K-40	5,417	3,853	3,665	5,305	6,783	3,052

	9/25/01 Turnip Greens	10/9/01 Mustard Greens
Gross Alpha	85	90
Gross Beta	3,765	4,438
K-40	4,304	4,583

[1] Mn-54, Co-58, Co-60, I-131, Cs-134, Cs-137, Not Detectable

Surface Water

Table XI *(All results except tritium are the effect of natural background)*

Gamma Isotopic[1] (pCi/L)

S01

	1/10/01	2/13/01	3/13/01	4/10/01	5/8/01	6/12/01
Gross Alpha	1.8	2.3	2.2	3.9	3.2	3.7
Gross Beta	6.8	7.3	6.4	8.6	9.8	10.9
H-3	ND	ND	ND	ND	ND	ND

	7/10/01	8/14/01	9/11/01	10/12/01	11/15/01	12/11/01
Gross Alpha	2.9	3.2	3.4	3.0	3.1	3.8
Gross Beta	8.5	8.7	8.3	9.4	8.2	7.5
H-3	ND	ND	ND	ND	ND	ND

S02

	1/10/01	2/13/01	3/13/01	4/10/01	5/8/01	6/12/01
Gross Alpha	2.4	4.4	2.4	2.4	3.9	4.2
Gross Beta	7.5	6.5	5.7	8.1	7.9	10.6
H-3	548	281	240	199	ND	ND

	7/10/01	8/14/01	9/11/01	10/12/01	11/15/01	12/11/01
Gross Alpha	1.7	3.5	3.4	3.4	4.3	2.8
Gross Beta	7.7	8.1	8.4	8.6	9.6	7.2
H-3	ND	ND	ND	ND	ND	ND

[1] Mn-54, Fe-59, Co-58, Co-60, Zr-95, Nb-95, Cs-134, Cs-137, Ba-140, La-140,Not Detectable

Gamma Isotopic[1] (pCi/L)

D01

	QTR 1	QTR 2	QTR 3	QTR 4
All	ND	ND	ND	ND

F05

	QTR 1	QTR 2	QTR 3	QTR 4
All	ND	ND	ND	ND

F015

	QTR 1	QTR 2	QTR 3	QTR 4
All	ND	ND	ND	ND

[1] H-3, Mn-54, Fe-59, Co-58, Co-60, Zr-95, Nb-95, Cs-134, Cs-137, Ba-140, La-140, Not Detectable

Sediments

Table XIII *(All results are the effect of natural background)*

Gamma Isotopic[1] (pCi/kg dry)

Bottom Sediments

	A		C	
	4/25/01	10/23/01	4/25/01	10/23/01
K-40	11,712	12,176	13,156	13,278
Cs-137	ND	ND	ND	ND

Shoreline Sediments

	A		C	
	4/25/01	10/23/01	4/25/01	10/23/01
K-40	13,362	13,376	15,794	13,388
Cs-137	ND	ND	ND	ND

[1] Mn-54, Fe-59, Co-58, Co-60, Zr-95, Nb-95, Cs-134, Ba-140, La-140, Not Detectable

Fish

Table XIV *(All results are the effect of natural background)*

Gamma Isotopic[1] (pCi/kg wet)

	A				
	4/25/01	4/25/01	4/25/01	4/25/01	4/25/01
	Bigmouth Buffalo	Carp	River Carpsucker	Freshwater Drum	Grass Carp
K-40	3,745	2,878	2,662	3,115	2,833
	10/23/01	**10/23/01**	**10/23/01**	**10/23/01**	**10/23/01**
	Carp	Channel Catfish	Freshwater Drum	Bigmouth Buffalo	River Carpsucker
K-40	3,323	3,061	2,696	2,513	3,271

	C				
	4/25/01	4/25/01	4/25/01	4/25/01	4/25/01
	Bigmouth Buffalo	Freshwater Drum	Carp	River Carpsucker	Grass Carp
K-40	2,553	2,673	2,799	2,706	3,365
	10/23/01	**10/23/01**	**10/23/01**	**10/23/01**	**10/23/01**
	Freshwater Drum	Carp	Smallmouth Buffalo	Channel Catfish	River Carpsucker
K-40	2,767	2,732	2,729	3,180	2,642

[1] Mn-54, Fe-59, Co-58, Co-60, Cs-134, Cs-137, Not Detectable

Milk

Table XV *(All results are the effect of natural background)*

Gamma Isotopic and Iodine[1] (pCi/L)

M6

	1/8/01	2/12/01	3/13/01	4/10/01	4/24/01	5/8/01
K-40	1,335	1,318	1,250	1,196	1,138	1,275
	5/22/01	**6/12/01**	**6/26/01**	**7/10/01**	**7/24/01**	**8/14/01**
K-40	1,353	1,292	1,196	1,292	1,309	1,218
	8/28/01	**9/11/01**	**9/25/01**	**10/9/01**	**11/13/01**	**12/11/01**
K-40	1,228	1,214	1,204	1,257	1,246	1,168

M8

	1/8/01	2/12/01	3/13/01	4/9/01	4/24/01	5/8/01
K-40	1,364	1,239	1,369	1,033	1,391	1,045
	5/21/01	**6/12/01**	**6/25/01**	**7/09/01**	**7/24/01**	**8/13/01**
K-40	1,164	912	1,157	877	976	810
	8/28/01	**9/11/01**	**9/25/01**	**10/9/01**	**11/12/01**	**12/10/01**
K-40	NA	NA	NA	NA	1,216	1,398

[1] I-131, Zn-65, Cs-134, Cs-137, Ba-140, La-140,Not Detectable

Direct Radiation

Table XVI *(All results are the effect of natural background)*

Gamma Dose (mrem)

	QTR 1	QTR 2	QTR 3	QTR 4
1a	15	15	18	18
3	18	16	20	18
5	14	15	16	16
6	NA	14	19	16
7	18	15	19	17
9	14	13	16	15
10	18	16	19	19
11a	17	16	19	19
14	16	NA	18	17
17	16	15	18	17
18a	16	15	17	17
20	17	15	19	17
21	NA	16	19	18
22a	16	15	18	16
23	16	15	19	17
26	11	10	13	13
27	17	15	19	17
30a	17	13	18	16
31a	19	NA	19	18
32	18	16	19	17
32a	17	16	20	17
33	18	15	18	17

	QTR 1	QTR 2	QTR 3	QTR 4
34	15	16	17	18
35	13	15	16	17
36	15	12	16	16
37	17	15	18	17
38	12	10	13	12
39	15	15	17	17
39a	17	17	19	19
40	17	17	19	19
41	17	15	19	16
42	12	12	14	15
43	16	16	18	18
44	17	15	19	18
45	15	15	16	16
46	16	15	18	17
47	17	15	18	16
48	16	17	19	19
49	17	15	18	17
50	17	15	18	20
51a	17	18	18	19
52	16	17	18	19
60	17	16	18	18

3.0 *Non-Radiological Monitoring Program*

3.1 Introduction

Union Electric Company, d.b.a. AmerenUE, in accordance with federal regulations and a desire to maintain the quality of the local environment around Callaway Plant has implemented an Environmental Protection Plan, (EPP) contained in Appendix B of the Callaway Plant Operating License.

The objective of the EPP is to provide for protection of non-radiological environmental values during operation of the Callaway Plant.

This report describes the conduct of the EPP for the Callaway Plant during 2001.

3.2 Unusual or Important Events

No unusual or important events reportable under the EPP Section 4.1 were identified during 2001.

3.3 EPP Noncompliances

During 2001 there were no noncompliances with the EPP.

3.4 Nonroutine Reports

There were no nonroutine reports submitted in accordance with the EPP, Section 5.4.2 in 2001.

3.5 Plant Design and Operation Environmental Evaluations.

This section lists all changes in the plant design, operation, tests or experiments completed during 2000, which could have involved a potentially significant unreviewed environmental question in accordance with section 3.1 of Appendix B.

During 2001, there was one plant design and operation change that could have involved a potentially significant unreviewed environmental question. The interpretations and conclusions regarding this plant change along with a description of the change are presented below.

Callaway Temporary Modification TM 01-0009 Revision 0

Description of Change:

Temporary modification TM 01-0009 installed a NUKEM Ultra-Filtration Demin Skid in the liquid radwaste system. This filtration and demineralization treatment system is used to treat liquid radwaste. This system is being evaluated and it may replace the secondary liquid waste evaporator.

Evaluation of Change:

The decontamination factors for processing liquid radwaste with the temporary NUKEM equipment are not currently known. However, all effluents from this treatment system will be routed to the discharge monitor tanks where each tank will be sampled and analyzed to ensure all limits are met prior to discharge. This includes NPDES limits as well as radiological limits including 10 CFR 50 requirements. During the trial period, the NUKEM equipment will be evaluated to determine decontamination factors for radionuclides as well as for conventional pollutants. Should additional treatment be necessary, the waste stream can be routed to current processing equipment or back to the NUKEM equipment for further treatment. This temporary modification will not significantly affect the concentrations, frequencies or types of effluent being discharged from the plant, and does not affect the current plant power level. Therefore, this change does not constitute an unreviewed environmental question per Section 3.1 of appendix B to the Callaway Plant Operating License.