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April 27, 2004

U. S. Nuclear Regulatory Commission
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Ladies and Gentlemen: ULNRC-04990

DOCKET NUMBER 50-483
CALLAWAY PLANT UNIT 1
UNION ELECTRIC CO.
FACILITY OPERATING LICENSE NPF-30
2003 ANNUAL ENVIRONMENTAL OPERATING REPORT

Please find enclosed the 2003 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,

Keith D. Young

Keith D. Young
Manager, Regulatory Affairs

DJW/jdg

Enclosure

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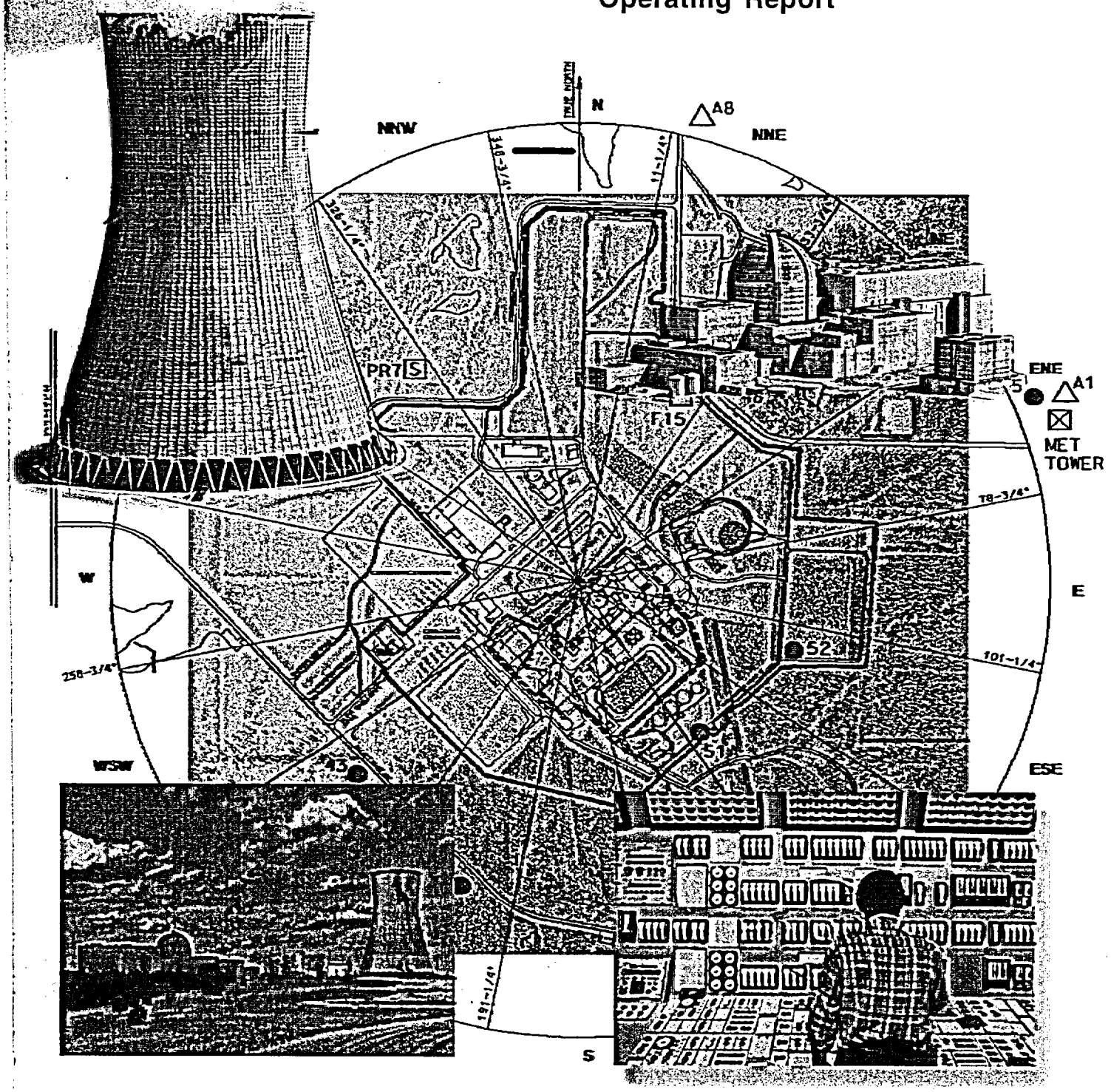
2003 Callaway Plant

Annual Radiological Environmental Operating Report



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Docket no. 50-483

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1.0 Executive Summary

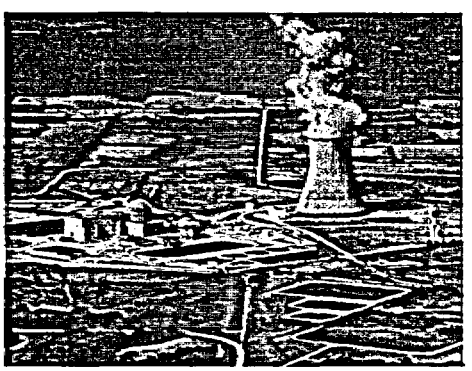
This Annual Radiological Environmental Operating Report describes the Union Electric Company, Callaway Plant Radiological Environmental Monitoring Program (REMP), and the program results for the calendar year 2003. It is submitted in accordance with section 5.6.2 of the Callaway Plant Technical Specifications.

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 2003 the Callaway Plant operated in compliance with the OffSite Dose Calculation Manual (ODCM) requirements. Comparison of results for 2003 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 2003 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 radioactive effluent 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 OffSite Dose Calculation Manual, NPDES Permit, and continuation of the Callaway Plant Pre-Operational Environmental Monitoring Program.

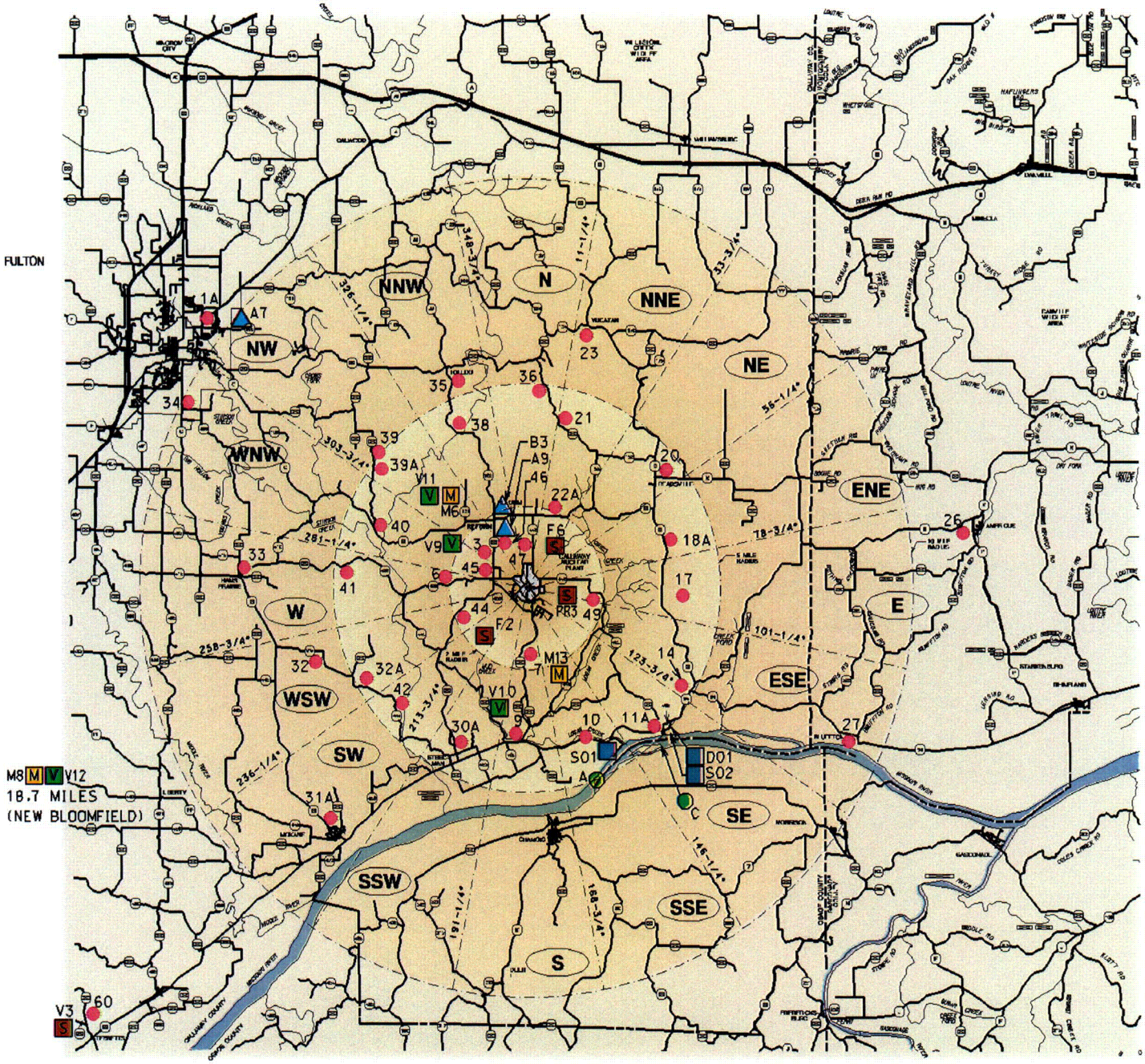
Samples are collected from waterborne, airborne, ingestion, and direct radiation pathways. The types of sample media collected are: milk, surface water, ground water, shoreline sediment, bottom sediment, soil, wetlands, fish, vegetation, airborne particulate, airborne radioiodine, and direct radiation (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. - MidWest 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



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LEGEND:

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

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Figure II Near Site Collection Locations

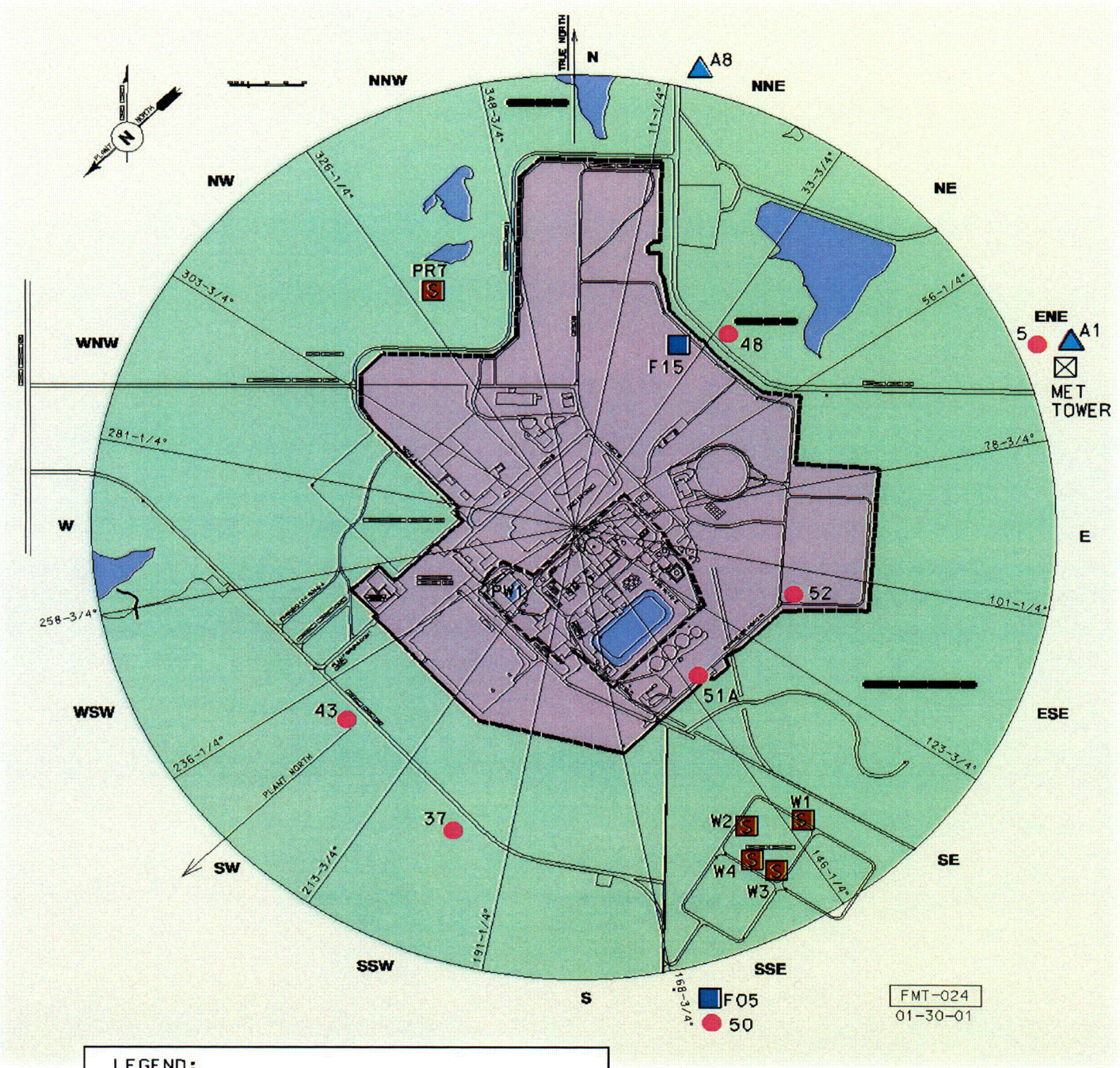

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Table I REMP Sample Locations

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 O, 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 O, 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 O, 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

Table I REMP Sample Locations Continued

Location Code	Description[1]	Sample Types[2]
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
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 O, 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 Utiility Pole No. 18580.	IDM

Table I REMP Sample Locations Continued

Location Code	Description[1]	Sample Types[2]
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 O, Callaway Electric Cooperative Utility Pole No. 28151.	IDM
48	0.4 mi. NE; County Road 448, 1.5 mi. South of Hwy O, 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
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. 50422.	APT, AIO
D01	5.0 mi. SE; Holzhouser Grocery Store/Tavern (Portland, MO).	WWA
F05	0.9 mi. SSE; Offsite Groundwater Monitoring Well.	WWA
F15	0.4 mi. NNE; Onsite Groundwater Monitoring Well.	WWA
PW1	Callaway Cafeteria.	WWA
M6	2.6 mi. NW; Pierce's Farm (Cow's Milk).	MLK
M8[3]	18.7 mi. WSW, Kissock's Farm, South of New Bloomfield, MO (Cow's Milk).	MLK
M13	2.53 mi. SSE; Miller's Farm, located on Highway 448.	MLK
V3[3]	15.0 mi. SW; Beazley Farm, West of Tebbetts, MO.	SOL
V9	2.0 mi. WNW; Meehan Farm.	FPL

Table I REMP Sample Locations Continued

Location Code	Description[1]	Sample Types[2]
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.	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
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] All distances are measured from the midpoint of the two reactors as described in Final Safety Analysis Report (FSAR) Section 2.1.1.1. Differs from FSAR 16.11.5.1 - see section 2.5 for explanation.

[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 Location.

[4] The fish collection area for location "A" is between 0.6 and 3.0 river miles upstream of the plant discharge on the north bank and for location "C" is between discharge area and 1.5 miles downstream of the discharge on the north bank. The expanded collection areas are needed to guarantee there is sufficient habitat for sampling to insure the ability to collect the required number of fish species.

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

Sample Type	Sample Code	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
Fish	AQF	Semiannually (April 1st and Oct 1st)	Gamma Isotopic
Sediment (Shoreline and Bottom)	AQS	Semiannually (April 1st and Oct 1st)	Gamma Isotopic (Bottom sample NPDES requirement)
Leafy Green Vegetables	FPL	Monthly during the growing season (2nd Tues. of month)	Gross Alpha, Gross Beta, I-131, and Gamma Isotopic
TLD	IDM	Quarterly (1st day of each quarter)	Gamma Dose
Milk	MLK	Semimonthly when animals are on pasture; monthly otherwise	I-131 and Gamma Isotopic
Soil	SOL	Annually (November 1st)	Gross Alpha, Gross Beta Gamma Isotopic (Continuation of preoperational program)
Surface Water	SWA	Monthly composite (2nd Tues. of month)	H-3 and Gamma Isotopic
Ground Water	WWA	Quarterly Grab (1st day of each quarter)	H-3 and Gamma Isotopic

[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 2003, no significant changes were made to the Radiological Environmental Monitoring Program.

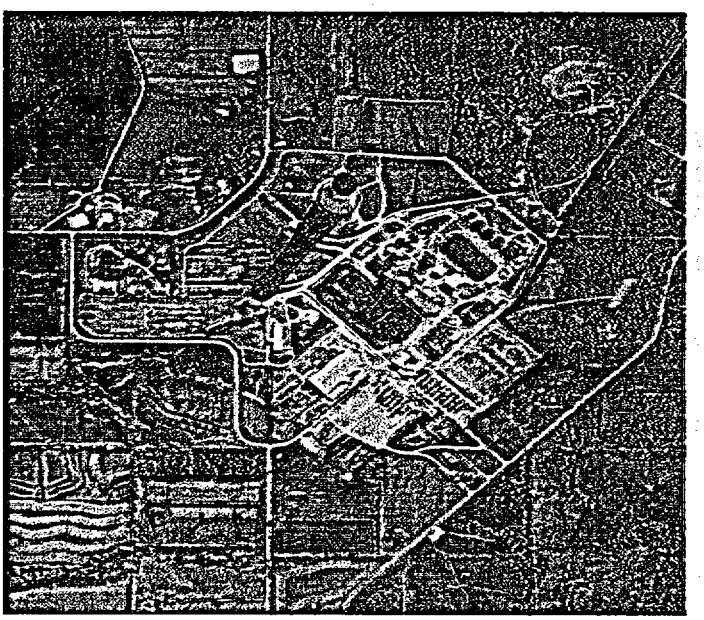
The Radiological Environmental Monitoring Program was executed as described in the ODCM with any exceptions listed in this report.

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 Radiological Assessment Branch Technical Position, Rev. 1, 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). Cases where the activity is found to be below the sample analysis minimum detection level are reported as Not Detected (ND).

Note: In 2003, Callaway began adding depleted Zinc to the reactor coolant system to reduce radiation exposure. As a result, FSAR Tables 16.11-8/9 were revised to add detection and reporting levels for Zinc-65 as per the NRC Branch Technical Position, Rev. 1, November 1979.



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 Environmental Sample Analysis[1]

Analysis	Water (pCi/l)	Airborne (pCi/m³)	Fish (pCi/kg wet)	Milk (pCi/l)	Food Products (pCi/kg wet)	Soil and Sediment (pCi/kg dry)
Gross beta	4	0.01				
H-3	3000/2000[3]					
Mn-54	15		130			
Fe-59	30		260			
Co-58/60	15		130			
Zn-65	30		260			
Zr-Nb-95[2]	15					
I-131	1000/1[3]	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. Zn-65 was added to FSAR 16.11-9 in 2003, due to Zinc addition to the reactor coolant system.

[2] Total activity, parent plus daughter activity.

[3] LLDs for Surface and Drinking water are the same, with the exception of H-3 and I-131. The Drinking water LLDs for H-3 and I-131 are 2000 and 1 pCi/liter respectively.

2.4.3 Quality Control Program

The vendor 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 to ensure accuracy and precision of analyses. QC checks include blind, duplicate, 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 Measurements Laboratory Quality Assessment Program (EML), Mixed Analyte Performance Evaluation Program (MAPEP), and Environmental Resource Associates (ERA). The results of these cross check programs are presented in Section 2.6.

The Callaway Plant Personnel Dosimetry program is accredited 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 greater 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

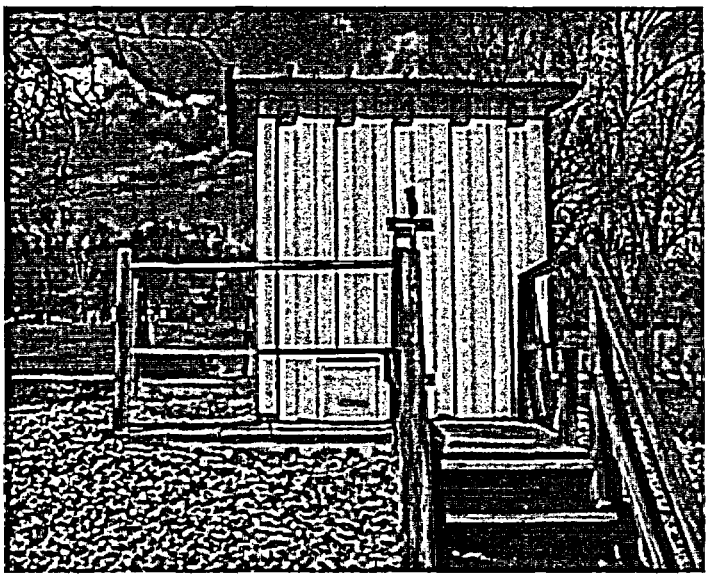
Tritium: A 60-70 ml aliquot of water is purified by distillation. A portion of the distillate is transferred to a counting vial and scintillation fluid added. The contents of the vial are thoroughly mixed and counted in a liquid scintillation counter.

Gamma Spectrometry: A suitable aliquot of 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 analysis.

Radiological Monitoring Program



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.

Results

The indicator water sampler (S02) was operational 92% of the time during 2003. Sampler operability is verified shiftly (every 8 hours) by use of a dial up modem. Immediate actions are taken to return the sampler to service when a problem is identified. If the sampler does not collect >250 mls per day, daily grab samples are collected and composited.

Sixteen of the thirty days of indicator water sampler inoperability (S02) were due to pump controller failure in January and February. Obsolete pump controller parts contributed to and/or extended the out of service time as described in CAR 200300874. Additional operational problems with the indicator water sampler (S02) included issues encountered during scheduled maintenance, inadequate pump rebuild instructions (CAR 200305727), inadequate drawings (CAR 200308728), sample proportioning (D-Y) valve leakage/oscillations (CARs 200305922/200308246), and pump failures (CAR 200304608/200308728). These conditions were repaired and/or corrected and the sampler was returned to service. Other conditions such as frozen sample lines, electric power outages, and low river water levels also contributed to sampler inoperability. Operability concerns with indicator water sampler S02 were also tracked in CARs 200303422/200300874/200302227.

Deviations during 2003 included missed grab samples on 1/23 and 1/24. These samples were not taken due to snow and ice on the shoreline of the Missouri River (CAR 200300871). The indicator water sampler S02 was also inadvertantly secured on 3/11 and 3/12 during maintenance activities (CAR 200302227). Grab samples were collected from the Missouri River on both days. On 11/14/03, a indicator water station grab sample was miscomposited as per HTP-ZZ-07001 (CAR 200308265). This combined with excessive sampling during the week from faulty sample proportioning valve operation (CAR 200308246) caused the indicator water sample for the period to become disproportionate. As a compensatory measure, the composite sample collected from 11/10 - 11/19 was sent to Environmental Inc. - Midwest Laboratory for analysis. The remaining portion of the monthly sample (11/19 - 12/9) was collected and shipped as normal. The contract lab analyzed each sample and then composited the two samples and reanalyzed. The reported value for S02 in Table XI is the combination of the two samples.

The control water sampler (S01) was operational 98% of the time during 2003. This sampler is checked weekly. Immediate action is taken to return the sampler back to service when a problem is identified. If the sampler cannot be returned to service within 24 hours, daily grab

samples are collected. Exceptions during 2003 included 5 days of inoperability in November, due to timer failure. As a result of timer failure, grab samples were missed on 11/24 and 11/25. The missed grab samples were due to miscommuncation between Operations and Health Physics (CAR 200308622). To help eliminate this problem a scale similar to the one at indicator sampler S02 was placed under the sample bottle. Operations procedure OOA-RM-0002 was also revised and the groups were coached and trained on the new requirements. The control sampler was also inoperable for 1 day in October due to a scheduled power outage.

Tritium was the only radionuclide detected in surface water samples collected during 2003. Five of twelve samples collected at indicator location S02 contained measurable levels of tritium with a mean concentration of 404.2 pCi/L. The Tritium results at S02 are less than 1.5% of the reporting limit in surface water and well within regulatory requirements. Tritium results at S02 are being trended along with monthly liquid H-3 releases and Missouri river flow. The 2003 results are consistent with previous operational levels and 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. Analysis for I-131 is accomplished using chemical separation followed by gas flow proportional counting techniques.

Sampling and Frequency

Ground water samples are collected quarterly from two sampling wells (F05 and F15) and two drinking water wells (D01 and PW1).

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 analysis.

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 analysis.

Radiological Monitoring Program

Results

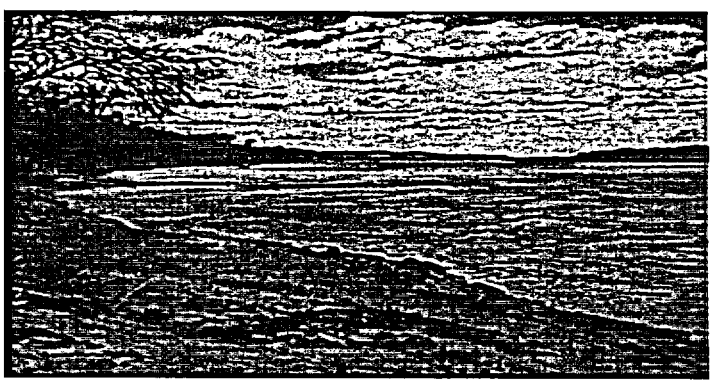
Cesium-137 (Cs-137) was detected in both the indicator (C) and control (A) bottom sediment sample locations taken in May and October (CAR 200304877). Control station (A) indicated 49 pCi/kg dry in May and 52 pCi/kg dry in October. Indicator station (C) Cs-137 results were 59 pCi/kg dry in May and no detectable activity in October.

The analysis results for bottom sediment samples in 2003 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 (CAR 200304877).

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 Callaway Plant liquid discharges/effluents.

Sampling and Frequency

Shoreline sediment samples are collected semiannually in the same area as bottom sediment. These 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 analysis.

Results

Cesium-137 (Cs-137) was detected in both the indicator (C) and control (A) shoreline sediment sample locations taken in May and October (CAR 200304877). Control station (A) indicated 45 pCi/kg dry in May and 90.3 pCi/kg dry in October. Indicator station (C) results were 62 pCi/kg dry in May and no detectable activity in October.

The analysis results for shoreline sediment samples in 2003 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 (CAR 200304877).

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 analysis.

Results

Cesium 137 (Cs-137) was detected in the Wetlands soil samples. Station (W1) indicated 147 pCi/Kg dry and Station (W2) indicated 161 pCi/Kg dry.

The analysis results for Wetlands soil samples in 2003 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. A 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 calculated the concentration at counting time. The equilibrium concentration at the end of the 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.

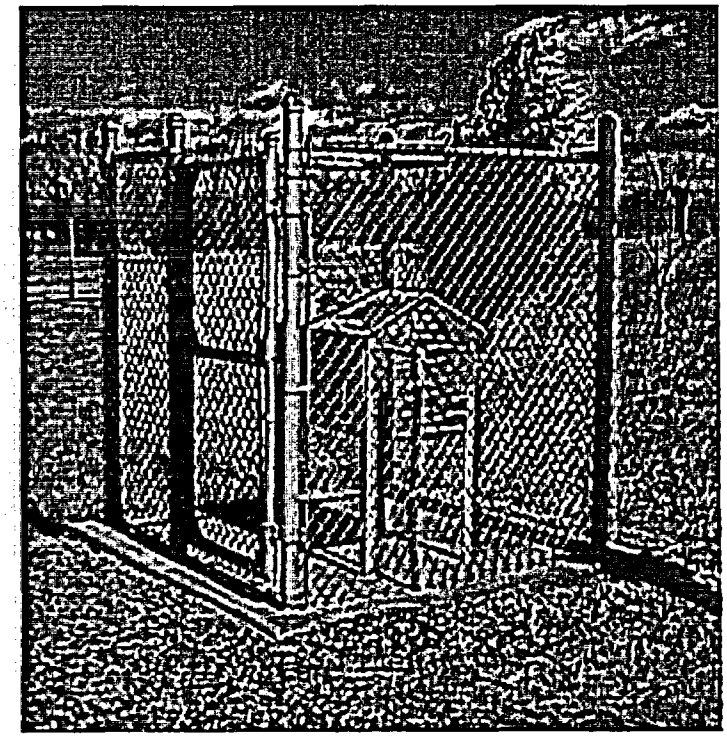
Sampling and Frequency

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.

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 analysis.

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.



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.

Results

Air station A-1 was operational 99.7% of the time in 2003. Problems with the flow meter on the air sample skids in Jan and Dec was the cause(CAR 200400018). To correct this problem, Callaway is in the process of systematically replacing these flowmeters.

Air station A-7 was operational for 99.9% of the time in 2003. Timer failure in May caused the air sampler to be out of service 30 minutes for sampler replacement after it was determined the air sampler was operable by electric meter reading. Also, during the first weekly filter changeout in April, the flowmeter was reading high as per Health Physics procedure. The air sample skid was replaced and 6.5 hours of inoperability assigned to air station A-7 for the changeout. However, since the air flow was higher than normal, the air sampler essentially collected a higher sample volume and therefore operability was not affected. The filters were sent to Environmental Inc. - Midwest labs for analysis and assigned a conservative flow rate.

Air station A-8, was operational 98% of the time during 2003. During the week of 6/12/03, the timer on the pump skid was reading approximately 17 hours low for the week (CAR 200304875). Thunderstoms during the week caused the air station to become teporarily inoperable. As a result, 168.3 hours of inoperability was conservatively assigned to air station A-8. The air samples were sent to Environmental Inc. - Midwest labs for analysis.

On 9/12/03, the air sampler on/off switch failed during sample changeout. The air sampler was replaced and 2.2 hrs of inoperability were assigned (CAR 20036756).

Air station A-9 was operational 98% of the time during 2003. During the week of 8/7/03, electrical problems caused the sampler to shutdown (CAR 200305713). As a result, 168.4 hours of inoperability were conservatively assigned to air station A-9. The pump skid was replaced and the filters were sent to Environmental Inc. - Midwest Laboratory for analysis.

Air station B-3 was operational 98% of the time in 2003. On 3/27/03, air sample line integrity was found to be unsatisfactory. The pump skid was replaced and the filter was sent to the vendor lab for analysis and operation of air station was resumed. As a result, 168 hours of inoperability was assigned to air station B-3.

Gross beta activity ranged from 0.009 to 0.041 pCi/m^3 in all samples. The average gross beta activity at all locations was 0.023 pCi/m^3. In 2003, there were 13 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 were 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. Analysis for I-131 is accomplished using chemical separation followed by gas proportional counting techniques.

Radiological Monitoring Program

Sampling and Frequency

When available, one-gallon milk samples are collected semimonthly during the grazing season (typically April through September) and monthly during the winter from two indicator stations near the Plant (M6 and M13) and one control location away from the Plant (M8). Milk samples are shipped on ice to Environmental Inc. - Midwest Laboratory for analysis within eight days after collection.

Results

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

Location M13:

Samples were unavailable on 1/14, 2/11, 3/11, and 4/8 due to inadequate milk production (CAR 200304219). No sample was collected on 5/27 due to miscommunication with the resident (CAR 200304219).

Samples were unavailable on 11/10, 11/24, 12/9, and 12/22 due to gestation (CAR 20040978).

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.

Location M8:

Samples were unavailable due to problems encountered during the gestation period for the milking animal. Samples were not collected on 8/12, 8/26, 9/9, 9/23, 10/13, 10/28, and 11/10.

The residents of sample location M8 replaced the milking animal and samples resumed 11/24 (CAR 200307567).

Location M6:

Samples were collected as scheduled. Samples were collected semimonthly in December, since the milking animal was spending a portion of it's time at pasture.

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

Fish

Analysis

Gamma Spectrometry: A 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). On 1/22/03, the Missouri Dept. of Conservation issued a revised permit that allowed Union Electric to resume collecting channel catfish samples for 2003. After collection, Fish samples are shipped on ice to Environmental Inc. - Midwest Laboratory for analysis.

Results

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

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 broad leaf vegetation is requested and/or collected if primary varieties are not available. Samples are shipped to Environmental Inc. - Midwest Laboratory for analysis.

Results

Vegetation samples were collected as available from May through December due to unseasonably milder temperatures in November and December. Green leafy vegetation was unavailable due to lack of plant growth, drought conditions, and consumption by deer in 2003. The following indicates the months where no vegetation samples were collected:

Location V9:
January through April, August and September.

Location V10:
January through April, and September.

Location V11:
January through May, and December

Location V12:
January through April, 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 water proof 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.

Sampling and Frequency

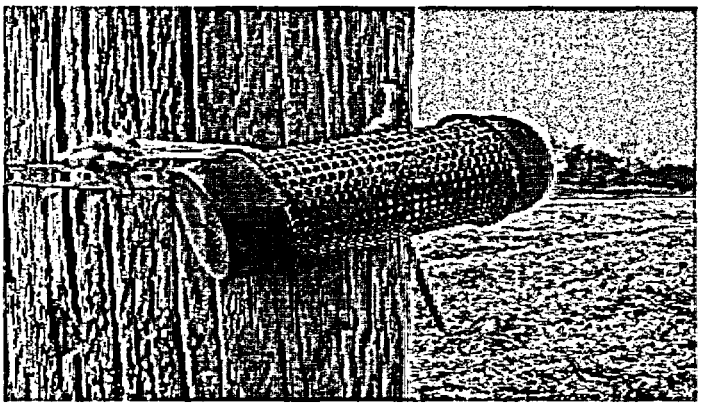
Thermoluminescent Dosimetry (TLD) is used to determine direct radiation levels in and around the Callaway site. Forty-three dosimeters are placed in 16 sectors around the plant as specified in the ODCM. The dosimeters are read once per quarter. Three locations are designated as controls (IDM-26, IDM-27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

Radiological Monitoring Program

Results

Direct radiation data for IDM-34 and IDM-39 was unavailable in the second and fourth quarter respectively. The apparent cause was due to the replacement of power poles (CAR 200305046). The TLDs at sample stations 34 and 39 were promptly replaced.

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



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.

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

Cesium 137 (Cs-137) was detected in the soil samples. Control station V3 indicated 277 pCi/Kg dry while the highest indicator station indicated 755 pCi/L dry.

The analysis results for soil samples in 2003 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.

REMP Supplemental Samples

Several samples were taken during 2003 which were not required by FSAR Table 16.11-7. On 5/27/03, a local landowner requested that samples from their vegetable garden be analyzed (CAR 200304121).

In addition, samples of venison, beef, and corn leaves were also taken to further assess the impact of plant operation on the environment. The beef and corn samples were taken from an animal that grazes in and feeds on corn grown within the site boundary.

The samples were sent to Environmental Inc. - Midwest Laboratory for analysis. The results are listed in Table XVI and are consistent with previously accumulated data and no plant operational effects were identified.

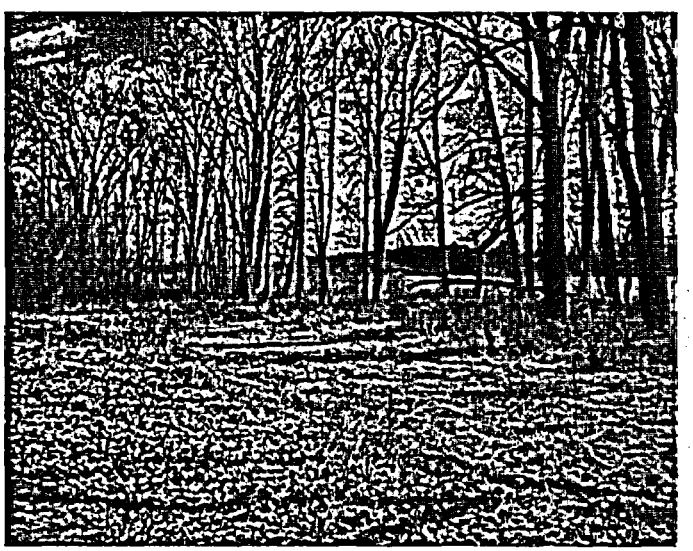
2.5 Land Use Census

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 than 50 square meters is identified by contacting residents by phone and/or in field surveys for each of the sixteen meteorological sectors using the midpoint of the two units. This is contrary to FSAR 16.11.5.1 which requires using the centerline of one reactor. However, HTP-ZZ-07101 notes that the midpoint of the two units will be used as per FSAR 2.1.1.1. CAR 200402426 was generated to address the issue.

The AmerenUE Real Estate Department conducted the 2003 Land Use Census in September, a month earlier than in 2002, for improved garden indentification.

Results

The results of the 2003 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.



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

Nearest Resident

The distance of the nearest resident with the highest D/Q was unchanged for 2003. This resident lives 1.82 miles from the plant in the NNW sector.

Milking Animals

Milking animals identified in sector L (SW) and M (WSW) during the 2002 Land Use Census are no longer present. A resident in sector N (W) was identified as having milking animals. However, the resident is outside of 3 miles from the plant and does not meet the requirements of FSAR Table 16.11-7 (Sheet 3) for sample collection.

In sector A (N), a resident indicated that he temporarily had milking goats in 2003. The goats were removed due to sewage contamination on his property. The resident indicates that he may have goats in the future if he is able to find available space to relocate them.

Comparison of the current REMP milk sample participants with residents identified as having milking animals in the 2003 Land Use Census indicates that no changes are necessary.

Vegetable Gardens

As was the case in 2002, a residence in sector R (NNW) with a vegetable garden was determined to have a 20% higher average ground level D/Q than current REMP sample participants. The Union Electric Real Estate Dept. made several attempts to request their participation in the Callaway REMP. However, after several calls and letters, it was determined that the resident was not interested (CAR 200308034).

Changes were identified for the nearest garden in the following sectors: NE, ENE, ESE, SW, and WSW.

Table IV 2003 Land Use Census Results

Closest Receptor in Miles[1]

Sector	Residence	Garden	Milk
N(A)	2.2	NI	NI
NNE(B)	2.2	2.4	NI
NE(C)	2.3	4.0	NI
ENE(D)	1.7	2.9	NI
E(E)	3.5	NI	NI
ESE(F)	2.1	4.4	NI
SE(G)	2.2	4.8	NI
SSE(H)	2.5	2.5	2.5
S(J)	2.7	2.9	NI
SSW(K)	2.4	2.8	NI
SW(L)	2.6	3.1	NI
WSW(M)	1.2	2.5	NI
W(N)	1.6	2.3	4.0
WNW(P)	1.9	1.9	NI
NW(Q)	2.1	3.2	2.6
NNW(R)	1.8	3.2	NI

[1] NI=None Identified

2.6 Cross-Check Results

The crosscheck results performed by the vendor laboratory during 2003 are presented in Table V. The results indicate satisfactory laboratory performance.

2003 Environmental Measurement Laboratory

Table V Quality Assessment Program Results

Date	Type	Nuclide	Reported Value[1]	Reference Value	Control Limits[2]	Result
Mar-03	Water	Gr. Alpha	304.30 ± 53.10	377.50	0.58 - 1.29	**PASS**
Mar-03	Water	Gr. Beta	615.80 ± 14.70	627.50	0.61 - 1.43	**PASS**
Mar-03	Water	Am-241	2.00± 0.10	2.13	0.79 - 1.41	**PASS**
Mar-03	Water	Co-60	221.30 ± 1.20	234.00	0.80 - 1.20	**PASS**
Mar-03(3)	Water	Cs-134	23.30 ± 1.10	30.50	0.80 - 1.30	**PASS**
Mar-03	Water	Cs-137	61.40 ± 0.60	63.80	0.80 - 1.22	**PASS**
Mar-03(4)	Water	H-3	341.90 ± 22.70	390.00	0.78 - 2.45	**PASS**
Mar-03	Water	Pu-238	3.70 ± 0.20	3.33	0.74 - 1.20	**PASS**
Mar-03	Water	Pu-239/40	4.40 ± 0.10	3.92	0.79 - 1.20	**PASS**
Mar-03	Water	Sr-90	4.60 ± 0.30	4.34	0.69 - 1.34	**PASS**
Mar-03	Water	Uranium	5.10 ± 0.60	4.29	0.75 - 1.33	**PASS**
Mar-03	Soil	Ac-228	55.60 ± 2.50	57.6	0.80 - 1.38	**PASS**
Mar-03	Soil	Am-241	12.42 ± 0.90	15.6	0.65 - 2.28	**PASS**
Mar-03	Soil	Bi-212	57.70 ± 3.20	60.6	0.50 - 1.34	**PASS**
Mar-03	Soil	Bi-214	60.40 ± 3.20	67.0	0.78 - 1.42	**PASS**
Mar-03	Soil	Cs-137	1416.80 ± 70.00	1450.00	0.80 - 1.25	**PASS**
Mar-03	Soil	K-40	653.80 ± 11.90	636.00	0.80 - 1.32	**PASS**
Mar-03	Soil	Pb-212	51.10 ± 5.20	57.90	0.78 - 1.32	**PASS**
Mar-03	Soil	Pb-214	64.70 ± 5.10	71.10	0.76 - 1.46	**PASS**
Mar-03	Soil	Pu-239/40	24.40 ± 0.30	23.40	0.71 - 1.30	**PASS**
Mar-03	Soil	Sr-90	54.50 ± 2.60	64.40	0.67 - 2.90	**PASS**
Mar-03	Soil	Uranium	245.00 ± 1.50	249.00	0.71 - 1.32	**PASS**
Mar-03	Vegetation	Am-241	3.10 ± 0.20	3.51	0.73 - 2.02	**PASS**
Mar-03	Vegetation	Cm-244	1.40 ± 0.50	2.01	0.61 - 1.59	**PASS**
Mar-03	Vegetation	Co-60	12.60 ± 0.40	12.10	0.80 - 1.44	**PASS**
Mar-03	Vegetation	Cs-137	449.70 ± 6.20	444.00	0.80 - 1.31	**PASS**
Mar-03	Vegetation	K-40	1159.00 ± 38.60	1120.00	0.79 - 1.39	**PASS**
Mar-03	Vegetation	Pu-239/40	4.80 ± 0.40	5.17	0.69 - 1.31	**PASS**
Mar-03	Vegetation	Sr-90	659.70 ± 50.40	650.00	0.55 - 1.21	**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.

[3] A low bias for Cs-134 activity has been observed in the past. No errors have been found in the library or efficiency. Additional spike analysis will be performed and a correction factored into the calculation.

[4] Reporting error.

2003 Environmental Measurement Laboratory

Table V Quality Assessment Program Results (continued)

Date	Type	Nuclide	Reported Value[1]	Reference Value	Control Limits[2]	Result
Mar-03	Air Filter	Am-241	0.27 ± 0.10	0.34	0.70 - 2.34	**PASS**
Mar-03	Air Filter	Co-60	30.20 ± 0.30	33.50	0.80 - 1.26	**PASS**
Mar-03	Air Filter	Cs-137	90.30 ± 1.30	99.70	0.80 - 1.32	**PASS**
Mar-03	Air Filter	Mn-54	41.80 ± .60	43.80	0.80 - 1.35	**PASS**
Mar-03	Air Filter	Pu-238	0.52 ± 0.10	0.52	0.67 - 1.33	**PASS**
Mar-03	Air Filter	Pu-239/40	0.35 ± 0.10	0.33	0.73 - 1.26	**PASS**
Mar-03	Air Filter	Sr-90	2.50 ± 0.10	2.80	0.53 - 1.84	**PASS**
Mar-03	Air Filter	Uranium	0.51 ± 0.10	0.50	0.79 - 2.10	**PASS**
Mar-03	Air Filter	Gr. Alpha	0.90 ± 0.10	1.17	0.73 - 1.43	**PASS**
Mar-03	Air Filter	Gr. Beta	1.50 ± 0.10	1.50	0.76 - 1.36	**PASS**
Sep-03	Water	Am-241	9.78 ± 0.32	8.76	0.79 - 1.41	**PASS**
Sep-03	Water	Co-60	468.30 ± 4.10	513.00	0.80 - 1.20	**PASS**
Sep-03	Water	Cs-134	53.90 ± 0.80	63.00	0.80 - 1.30	**PASS**
Sep-03	Water	Cs-137	76.10 ± 1.40	80.30	0.80 - 1.22	**PASS**
Sep-03	Water	H-3	355.20 ± 12.80	446.30	0.78 - 2.45	**PASS**
Sep-03	Water	Pu-238	1.71 ± 0.07	2.07	0.74 - 1.20	**PASS**
Sep-03	Water	Pu-239/40	4.24 ± 0.01	4.99	0.79 - 1.20	**PASS**
Sep-03	Water	Sr-90	6.70 ± 0.50	7.04	0.69 - 1.34	**PASS**
Sep-03	Water	Uranium	5.10 ± 0.60	5.69	0.75 - 1.33	**PASS**
Sep-03	Water	Gr. Alpha	688.00 ± 7.60	622.00	0.58 - 1.29	**PASS**
Sep-03	Water	Gr. Beta	1985.00 ± 111.00	1948.00	0.61 - 1.43	**PASS**
Sep-03	Soil	Am-241	19.70 ± 1.50	18.40	0.65 - 2.28	**PASS**
Sep-03	Soil	Cs-137	1928.00 ± 19.00	1973.00	0.80 - 1.25	**PASS**
Sep-03	Soil	K-40	533.00 ± 79.00	488.00	0.80 - 1.32	**PASS**
Sep-03	Soil	Pu-238	15.30 ± 0.80	14.60	0.59 - 2.88	**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.

[3]Naturally-occurring radium daughters are present in the shielded background, and a probable cause of the higher bias seen for isotopes of lead and bismuth.

[4]Reporting error. The average result of the triplicate analyses was 14.1 +/- 5.7 Bq/Kg.

[5]STAP-963, Calculations for the tranuranics analyses(Am-241, Uranium, Pu-238, -239/40) were not converted to Bq/total filter. The data listed is the result of the recalculation.

[6]The analysis was repeated in duplicate; result of reanalysis, 87.05 +/- 7.64 Bq/kg.

2003 Environmental Measurement Laboratory

Table V Quality Assessment Program Results (continued)

Date	Type	Nuclide	Reported Value[1]	Reference Value	Control Limits[2]	Result
Sep-03	Soil	Pu-239/40	32.50 ± 2.30	30.40	0.71 - 1.30	**PASS**
Sep-03	Soil	Sr-90	69.80 ± 2.30	80.30	0.67 - 2.90	**PASS**
Sep-03	Soil	Uranium	228.30 ± 17.10	259.30	0.71 - 1.32	**PASS**
Sep-03	Air Filter	Am-241	0.64 ± 0.05	0.44	0.70 - 2.34	**PASS**
Sep-03	Air Filter	Co-60	48.50 ± 0.40	55.10	0.80 - 1.26	**PASS**
Sep-03	Air Filter	Cs-137	51.20 ± 1.10	54.80	0.80 - 1.32	**PASS**
Sep-03	Air Filter	Mn-54	53.70 ± 1.10	58.00	0.80 - 1.35	**PASS**
Sep-03	Air Filter	Pu-238	0.24 ± 0.05	0.23	0.67 - 1.33	**PASS**
Sep-03	Air Filter	Pu-239/40	0.41 ± 0.10	0.40	0.73 - 1.26	**PASS**
Sep-03	Air Filter	Sr-90	1.90 ± 0.10	2.06	0.53 - 1.84	**PASS**
Sep-03	Air Filter	Uranium	0.80 ± 0.06	0.82	0.79 - 2.10	**PASS**
Sep-03	Air Filter	Gr. Alpha	3.23 ± 0.07	3.11	0.73 - 1.43	**PASS**
Sep-03	Air Filter	Gr. Beta	4.18 ± 0.03	3.89	0.76 - 1.36	**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 2003 MAPEP Results

MAPEP

Date	Type	Nuclide	Reported Value[1]	Reference Value	Control Limits[2]	Result
Dec-02	Water	Am-241	0.56 ± 0.06	0.58	0.40 - 0.75	**PASS**
Dec-02	Water	Co-57	57.1 ± 1.90	57.00	39.90 - 74.10	**PASS**
Dec-02	Water	Co-60	38.30 ± 0.60	38.20	26.74 - 49.66	**PASS**
Dec-02	Water	Cs-134	395.30 ± 10.10	421.00	294.70 - 547.30	**PASS**
Dec-02	Water	Cs-137	316.40 ± 5.30	329.00	230.30 - 427.30	**PASS**
Dec-02	Water	Fe-55	94.90 ± 24.50	96.00	67.20 - 124.80	**PASS**
Dec-02	Water	Mn-54	33.40 ± 0.10	32.90	23.03 - 42.77	**PASS**
Dec-02	Water	Ni-63	123.80 ± 5.50	136.50	95.55 - 177.45	**PASS**
Dec-02	Water	Pu-238	0.66 ± 0.06	0.83	0.58 - 1.08	**PASS**
Dec-02	Water	Pu-239/40	0.001 ± 0.001	0.000	0.000 - 0.005	**PASS**
Dec-02	Water	Sr-90	13.80 ± 1.0	12.31	8.62 - 16.0	**PASS**
Dec-02	Water	Tc-99	128.10 ± 3.80	132.00	92.40 - 171.60	**PASS**
Dec-02	Water	U-233/4	1.60 ± 0.09	1.54	1.08 - 2.00	**PASS**
Dec-02	Water	U-238	1.64 ± 0.09	1.60	1.12 - 2.08	**PASS**
Dec-02	Water	Zn-65	540.40 ± 9.9	516.0	361.20 - 670.80	**PASS**
Jan-03	Soil	Co-57	534.36 ± 2.61	530.0	371.0 - 689.0	**PASS**
Jan-03	Soil	Co-60	442.16 ± 2.31	420.0	294.0 - 546.0	**PASS**
Jan-03	Soil	Cs-134	211.00 ± 2.30	238.0	166.6 - 309.4	**PASS**
Jan-03	Soil	Cs-137	849.50 ± 3.30	832.0	582.4 - 1081.6	**PASS**
Jan-03	Soil	K-40	716.50 ± 12.80	652.0	456.4 - 847.6	**PASS**
Jan-03	Soil	Mn-54	148.76 ± 2.84	137.0	95.9 - 178.1	**PASS**
Jan-03	Soil	Ni-63	597.10 ± 23.50	770.0	539.0 - 1001.0	**PASS**
Jan-03	Soil	Pu-238	67.05 ± 3.10	66.9	46.83 - 86.97	**PASS**
Jan-03	Soil	Pu-239/40	52.80 ± 3.60	52.7	36.9 - 68.5	**PASS**
Jan-03	Soil	Sr-90	609.50 ± 9.80	714.0	499.8 - 928.2	**PASS**
Jan-03	Soil	U-233/4	99.50 ± 7.60	89.0	62.3 - 115.7	**PASS**
Jan-03	Soil	U-238	508.60 ± 42.20	421.0	294.7 - 547.3	**PASS**
Jan-03	Soil	Zn-65	492.70 ± 28.10	490.0	343.0 - 637.0	**PASS**

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

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

Table V 2003 ERA Results

ERA

Date	Type	Nuclide	Reported Value[1]	Reference Value	Control Limits[2]	Result
Feb-03	Water	Sr-89	17.0 ± 0.5	15.9	7.2 - 24.6	**PASS**
Feb-03	Water	Sr-90	8.9 ± 0.3	9.0	0.4 - 17.7	**PASS**
Feb-03	Water	Ba-133	14.5 ± 0.9	19.5	10.8 - 28.2	**PASS**
Feb-03	Water	Co-60	37.5 ± 0.9	37.4	28.7 - 46.1	**PASS**
Feb-03	Water	Cs-134	18.2 ± 0.6	17.8	9.1 - 26.5	**PASS**
Feb-03	Water	Cs-137	42.7 ± 1.0	44.2	35.5 - 52.9	**PASS**
Feb-03	Water	Zn-65	56.8 ± 2.2	60.3	49.9 - 70.7	**PASS**
Feb-03	Water	Gr. Alpha[3]	18.4 ± 0.3	37.6	21.3 - 53.9	**FAILED**
Feb-03	Water	Gr. Beta	11.7 ± 0.5	8.6	0.0 - 17.2	**PASS**
Feb-03	Water	Ra-226	4.1 ± 0.1	4.7	3.5 - 6.0	**PASS**
Feb-03	Water	Ra-228	7.6 ± 0.5	6.5	3.7 - 9.3	**PASS**
Feb-03	Water	Uranium	52.9 ± 1.9	53.7	44.4 - 63.0	**PASS**
May-03	Water	H-3	1290.0 ± 25.0	1250.0	678.0 - 1820.0	**PASS**
May-03	Water	I-131	19.7 ± 1.3	20.8	15.6 - 26.0	**PASS**
May-03	Water	Gr. Alpha	54.4 ± 3.0	70.3	39.9 - 101.0	**PASS**
May-03	Water	Ra-226	14.9 ± 0.2	16.5	12.2 - 20.8	**PASS**
May-03	Water	Ra-228	13.1 ± 0.6	10.3	5.8 - 14.8	**PASS**
May-03	Water	Uranium	14.5 ± 0.4	15.1	9.9 - 20.3	**PASS**
May-03	Water	Co-60	56.9 ± 8.6	63.8	55.1 - 72.5	**PASS**
May-03	Water	Cs-134[4]	61.6 ± 6.6	75.7	67.0 - 84.4	**FAILED**
May-03	Water	Cs-137	143.0 ± 1.2	150.0	137.0 - 163.3	**PASS**
May-03	Water	Gr. Beta	309.0 ± 2.7	363.0	269.0 - 457.0	**PASS**
May-03	Water	Sr-89	33.1 ± 0.2	31.3	22.6 - 40.0	**PASS**
May-03	Water	Sr-90	28.8 ± 1.3	27.4	18.7 - 36.1	**PASS**
Aug-03	Water	Ra-226	13.3 ± 1.1	13.4	9.9 - 16.9	**PASS**
Aug-03	Water	Ra-228	11.5 ± 1.0	12.5	7.1 - 17.9	**PASS**

[1]Results are reported as: pCi/l for ERA.

[2]Control Limits are defined by ERA.

[3]Recount of the original sample still low. The ERA blank was spiked in the lab; known value of 20.1 pCi/L, measured 21.5 +/- 1.1 pCi/L. Result of reanalysis; 29.3 pCi/L.

[4]Lower bias observed for gamma spectroscopic analysis. The undiluted sample was reanalyzed; Results of reanalysis, Co-60: 62.3 pCi/L., Cs-134: 69.2 pCi/L., Cs-137: 152.3 pCi/L.

Table V 2003 ERA Results (cont.)

Date	Type	Nuclide	Reported Value[1]	Reference Value	Control Limits[2]	Result
Aug-03	Water	Uranium	12.3 ± 0.4	11.4	6.2 - 16.6	**PASS**
Aug-03	Water	Ba-133	18.1 ± 1.9	20.7	12.0 - 29.4	**PASS**
Aug-03	Water	Co-60	35.9 ± 1.3	37.4	28.7 - 46.1	**PASS**
Aug-03	Water	Cs-134	32.6 ± 1.8	32.6	23.9 - 41.3	**PASS**
Aug-03	Water	Cs-137	48.3 ± 0.6	44.3	35.6 - 53.0	**PASS**
Aug-03	Water	Zn-65	58.9 ± 2.1	60.2	49.8 - 70.6	**PASS**
Aug-03	Water	Gr. Alpha	41.8 ± 3.4	56.2	36.9 - 93.3	**PASS**
Aug-03	Water	Gr. Beta[5]	51.3 ± 3.0	31.6	22.9 - 40.3	**FAILED**
Aug-03	Water	Sr-89	57.2 ± 4.3	58.8	50.1 - 67.5	**PASS**
Aug-03	Water	Sr-90	21.2 ± 0.9	20.6	11.9 - 29.3	**PASS**
Nov-03	Water	Gr. Alpha	37.0 ± 2.0	29.5	16.7 - 42.3	**PASS**
Nov-03	Water	Gr. Beta	26.5 ± 0.8	26.3	17.6 - 35.0	**PASS**
Nov-03	Water	I-131	14.8 ± 0.3	16.5	11.3 - 21.7	**PASS**
Nov-03	Water	Ra-226	17.2 ± 1.1	17.8	13.2 - 22.4	**PASS**
Nov-03	Water	Ra-228	6.6 ± 0.3	6.8	3.8 - 9.7	**PASS**
Nov-03	Water	Uranium	11.7 +- 0.3	11.7	6.5 - 16.9	**PASS**
Nov-03	Water	H-3	15,900 ± 174.0	14,300	11,800 - 16,800	**PASS**
Nov-03	Water	Gr. Alpha	32.9 ± 0.3	54.2	30.7 - 77.7	**PASS**
Nov-03	Water	Ra-226	16.5 ± 0.9	16.1	11.9 - 20.3	**PASS**
Nov-03	Water	Ra-228	6.2 ± 0.5	5.5	3.1 - 7.9	**PASS**
Nov-03	Water	Uranium	9.7 ± 1.5	9.3	4.1 - 14.5	**PASS**
Nov-03	Water	Co-60	27.7 ± 1.9	27.7	19.0 - 36.4	**PASS**
Nov-03	Water	Cs-134	21.5 ± 1.1	23.4	17.6 - 29.2	**PASS**
Nov-03	Water	Cs-137	66.3 ± 2.8	64.2	55.5 - 72.9	**PASS**
Nov-03	Water	Gr. Beta	159.0 ± 2.5	168.0	124.0 - 212.0	**PASS**
Nov-03	Water	Sr-89	48.5 ± 0.4	50.4	41.7 - 59.1	**PASS**
Nov-03	Water	Sr-90	10.1 ± 3.0	10.2	1.5 - 18.9	**PASS**

[1]Results are reported as: pCi/l for ERA.

[2]Control Limits are defined by ERA.

[5]Reason for deviation unknown. A recount of the original planchets averaged 43.4 pCi/L. Cs-137 activity by gamma spectroscopy; 28.3 pCi/L. Result of the reanalysis; 29.3 pCi/L.

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, the activity is reported as Not Detected (ND).

2.8 Radiological Environmental Monitoring Program Annual Summary

The REMP Summary is presented in Table VI in accordance with 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". In cases where the activity is found to be below the sample analysis minimum, the activity is reported as < LLD.

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	H-3	(24)	3000	404 (5/12)	S02	404 (5/12)	< LLD	0
(pCi/l)				(160 - 642)	4.9 mi SE	(160 - 642)		
	Gamma	(24)	--	< LLD	--	< LLD	< LLD	0
Shoreline Sediment	G-spec.	(4)						
(pCi/kg)	Cs-137		180	62(1/2) (62)	S02 4.9 mi SE	62(1/2)	68(2/2) (45-90.3)	0
Airborne Pathway								
Airborne Particulate	Gross							
(pCi/m^3)	Beta	(260)	0.010	(0.009 – 0.041)	A-1	0.025 (52/52)	--	0
					1.3 mi. ENE	(0.013 - 0.040)		
	Gamma	(13)	—	< LLD	--	< LLD	--	0
	I-131	(260)	0.070	< LLD	--	< LLD	--	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 (45)	—	< LLD	--	< LLD	< LLD	0
	I-131 (45)	1.0	< LLD	--	< LLD	< LLD	0
Fish (pCi/kg - wet)	Gamma (10)	—	< LLD	--	< LLD	< LLD	0
Vegetation (pCi/kg - wet)	Gamma (47)	—	< LLD	--	< LLD	< LLD	0
	I-131 (47)	60	< LLD	--	< LLD	< LLD	0
Direct Radiation							
Quarterly TLDs (mRem/Standard Quarter)	Gamma (170) Dose	—	15.8 (158/158) (11-18)	39a 5.0 mi. NW	17.5 (4/4) (17 - 18)	14.9 (12/12) (11 - 18)	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 .

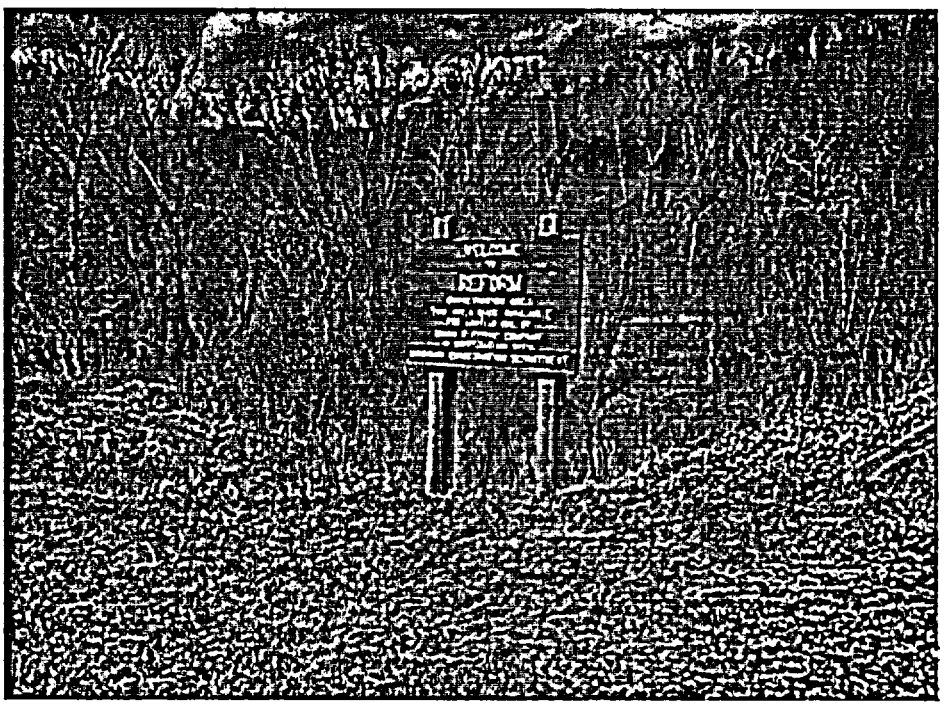
2.9 Individual Sampling Results

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.

(2003)	A-1	B-3	A-7	A-8	A-9
1-3	0.032	0.032	0.033	0.035	0.035
1-9	0.026	0.026	0.030	0.028	0.027
1-17	0.023	0.019	0.022	0.023	0.022
1-22	0.034	0.033	0.032	0.030	0.032
1-31	0.037	0.036	0.035	0.035	0.040
2-6	0.029	0.027	0.029	0.031	0.027
2-14	0.025	0.022	0.024	0.023	0.024
2-21	0.016	0.017	0.018	0.015	0.017
2-27	0.033	0.026	0.027	0.024	0.030
3-6	0.040	0.032	0.040	0.037	0.040
3-13	0.036	0.031	0.036	0.029	0.041
3-20	0.028	0.023	0.024	0.026	0.023
3-27	0.022	0.016[3]	0.019	0.018	0.021
4-3	0.020	0.020	0.019[4]	0.016	0.019
4-10	0.013	0.013	0.009	0.012	0.014
4-17	0.026	0.026	0.019	0.021	0.022
4-25	0.015	0.012	0.016	0.016	0.016
5-1	0.023	0.020	0.018	0.021	0.023
5-8	0.014	0.014	0.015	0.014	0.014
5-16	0.015	0.017	0.013	0.016	0.016
5-22	0.016	0.016	0.016	0.016	0.015
5-29	0.020	0.022	0.017	0.020	0.021
6-5	0.016	0.017	0.013	0.013	0.014
6-12	0.017	0.017	0.016	0.015[1]	0.016
6-19	0.019	0.019	0.020	0.020	0.023
6-26	0.019	0.015	0.018	0.017	0.019

	A-1	B-3	A-7	A-8	A-9
7-3	0.021	0.024	0.021	0.021	0.023
7-10	0.024	0.023	0.023	0.023	0.022
7-17	0.019	0.020	0.017	0.016	0.019
7-24	0.020	0.018	0.015	0.017	0.016
7-31	0.028	0.026	0.024	0.024	0.026
8-7	0.025	0.023	0.020	0.023	0.010[2]
8-14	0.023	0.021	0.021	0.021	0.024
8-21	0.039	0.041	0.032	0.033	0.035
8-28	0.037	0.039	0.034	0.029	0.033
9-4	0.016	0.015	0.015	0.013	0.013
9-12	0.032	0.029	0.024	0.022[6]	0.025
9-18	0.021	0.026	0.019	0.018	0.020
9-25	0.026	0.028	0.024	0.024	0.023
10-2	0.021	0.020	0.017	0.019	0.021
10-9	0.031	0.031	0.028	0.024	0.032
10-16	0.024	0.024	0.019	0.023	0.025
10-23	0.032	0.034	0.028	0.030	0.032
10-30	0.024	0.027	0.021	0.021	0.023
11-6	0.029	0.029	0.023	0.024	0.027
11-14	0.038	0.039	0.032	0.034	0.035
11-20	0.022	0.025	0.019	0.020	0.023
11-28	0.025	0.026	0.020	0.020	0.024
12-4	0.022	0.023	0.019	0.022	0.022
12-12	0.030	0.030	0.027	0.026	0.032
12-19	0.028	0.025	0.026	0.026	0.028
12-26	0.027	0.020	0.015	0.020	0.019[5]
1-2-04	0.019	0.020	0.021	0.020	0.021

1Thunderstorms in area => Loss of power. inoperable for the week.

2Electrical failure ==> Inoperable for the week.

3Sample line integrity failure ==> Inoperable for the week.

4Sample volume high => Assigned 6.5 hrs inoperability for changeout.

5Sample flow high => Assigned 2.2 hrs inoperability for changeout.

6Sampler switch failure during weekly changeout => 2.2 hours of inoperability assigned for changeout.

Airborne Gamma Composites

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

Gamma Isotopic[1] (pCi/m³)

A-1

	QTR 1	QTR 2	QTR 3	QTR 4
Be-7	0.061	0.078	0.068	0.057

A-7

	QTR 1	QTR 2	QTR 3	QTR 4
Be-7	0.063	0.062	0.049	0.049

A-8

	QTR 1	QTR 2	QTR 3	QTR 4
Be-7	0.063	0.070	0.052	0.053

A-9

	QTR 1	QTR 2	QTR 3	QTR 4
Be-7	0.077	0.072	0.053	0.055

B-3

	QTR 1	QTR 2	QTR 3	QTR 4
Be-7	0.061	0.080	0.074	0.054

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

Soil

Table IX

(All results are the effect of natural background)

Gamma Isotopic[1] (pCi/kg)

	F2	F6	PR3	PR7	V3
	11/21/03	11/21/03	11/21/03	11/21/03	11/21/03
Gross Alpha	17,072	14,075	14,779	14,990	10,553
Gross Beta	24,240	25,905	21,341	23,009	27,663
K-40	12,726	11,368	10,146	10,468	14,802
Cs-137	755	712	476	353	277

	W1	W2	W3	W4
	11/21/03	11/21/03	11/21/03	11/21/03
Gross Alpha	10,364	11,846	13,570	7,275
Gross Beta	24,466	24,505	18,994	14,770
K-40	13,552	14,939	9,047	5,325
Cs-137	147	161	ND	ND

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

Vegetation

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

Gamma Isotopic[1] (pCi/kg wet)

	V9				
	5/12/03 Lettuce	6/9/03 Cabbage	6/9/03 Lettuce	7/7/03 Lettuce	10/15/03 Lettuce
Gross Alpha	177	108	284	ND	228
Gross Beta	4,007	3,490	4,727	9,298	4,715
K-40	4,431	3,580	4,580	7,525	4,696

	10/15/03 Turnips	10/15/03 Mustard	10/15/03 Cabbage	11/6/03 Mustard	11/6/03 Cabbage
Gross Alpha	99	238	ND	111	ND
Gross Beta	5,015	5,281	5,253	4,950	4,918
K-40	4,900	4,424	4,918	4,567	4,352

	11/6/03 Turnips	11/6/03 Lettuce	12/8/03 Lettuce	12/8/03 Cabbage	12/8/03 Turnips
Gross Alpha	ND	ND	ND	43	ND
Gross Beta	4,326	3,655	5,489	3,265	5,511
K-40	4,685	3,851	5,833	3,547	5,893

	12/8/03 Mustard
Gross Alpha	ND
Gross Beta	4,472
K-40	4,891

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

Vegetation

Table X

(All results are the effect of natural background)

Gamma Isotopic[1] (pCi/kg wet)

	V10				
	5/27/03 Lettuce	5/27/03 Turnips	6/10/03 Lettuce	7/8/03 Lettuce	7/8/03 Cabbage
Gross Alpha	ND	106	166	ND	ND
Gross Beta	3,662	3,198	3,823	5,489	3,634
K-40	3,494	3,632	3,429	4,590	3,344
	8/12/03 Cabbage	8/12/03 Lettuce	10/16/03 Mustard	10/16/03 Turnips	11/25/03 Lettuce
Gross Alpha	ND	ND	142	69	61
Gross Beta	4,481	9,505	3,559	4,949	4,002
K-40	3,884	7,740	3,943	3,582	3,594
	11/25/03 Mustard	11/25/03 Turnips	12/9/03 Lettuce	12/9/03 Cabbage	12/9/03 Mustard
Gross Alpha	97	145	ND	66	89
Gross Beta	4,493	5,190	5,112	3,789	4,759
K-40	5,383	4,971	5,190	3,893	5,939

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

Vegetation

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

Gamma Isotopic[1] (pCi/kg wet)

	V11				
	6/23/03 Swiss Chard	7/7/03 Collards	8/11/03 Collards	9/8/03 Cabbage	10/13/03 Cabbage
Gross Alpha	183	ND	ND	75	176
Gross Beta	6,639	8,566	8,549	3,525	3,963
K-40	6,461	3,974	5,080	3,725	9,993

	10/13/03 Choklar	11/9/03 Broccoli	11/9/03 Chard	11/9/03 Broccoli
Gross Alpha	157	ND	ND	200
Gross Beta	2,632	5,694	2,601	4,712
K-40	3,480	5,081	3,406	5,625

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

Vegetation

Table X

(All results are the effect of natural background)

Gamma Isotopic[1] (pCi/kg wet)

	V12				
	5/27/03 Lettuce	6/10/03 Lettuce	7/8/03 Swiss Chard	8/12/03 Cabbage	10/13/03 Cabbage
Gross Alpha	65	129	ND	ND	ND
Gross Beta	3,634	3,593	12,111	5,312	4,592
K-40	3,401	3,039	10,004	4,772	4,031

	10/13/03 Swiss Chard	11/9/03 Cabbage
Gross Alpha	ND	134
Gross Beta	4,883	4,472
K-40	4,752	4,436

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

Surface Water

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

Gamma Isotopic[1] (pCi/L)

S01

	1/4/03	2/11/03	3/11/03	4/8/03	5/13/03	6/10/03
Gross Alpha	2.2	4.8	3.1	ND	3.9	4.8
Gross Beta	6.7	10.6	7.7	8.6	7.5	9.3
H-3	ND	ND	ND	ND	ND	ND

	7/8/03	8/12/03	9/9/03	10/14/03	11/10/03	12/9/03
Gross Alpha	3.6	3.7	2.3	3.0	2.8	2.4
Gross Beta	7.2	7.0	5.9	6.1	6.8	6.3
H-3	ND	ND	ND	ND	ND	ND

S02

	1/4/03	2/11/03	3/11/03	4/8/03	5/13/03	6/10/03
Gross Alpha	4.4	2.2	2.4	2.4	4.7	4.5
Gross Beta	6.3	8.3	7.2	6.5	7.7	9.0
H-3	ND	ND	ND	642	160	ND

	7/8/03	8/12/03	9/9/03	10/14/03	11/10/03	12/9/03
Gross Alpha	3.9	2.7	1.8	3.4	2.6	2.6
Gross Beta	8.3	8.6	7.3	6.5	5.6	5.9
H-3	ND	ND	ND	233	415	571[2]

	11/19/03[3]	12/9/03[4]
Gross Alpha	2.2	2.1
Gross Beta	6.4	6.9
H-3	671	431

[1]Mn-54, Fe-59, Co-58, Co-60, Zn-65, Zr-95, Nb-95, I-131, Cs-134, Cs-137, Ba-140, La-140, and ND = Not Detectable.

[2]Composite of 9-day and 3 week sample.

[3]9 day sample. 11/10 - 11/19

[4]3 week sample. 11/19 - 12/9

Table XII Ground Water

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

PW001

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

[1]H-3, I-131, Mn-54, Fe-59, Co-58, Co-60, Zn-65, Zr-95, Nb-95, Cs-134, Cs-137, Ba-140, La-140, and ND = Not Detectable.

Sediments

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

Gamma Isotopic[1] (pCi/kg dry)

Bottom Sediments

	A			C	
	5/6/03	10/21/03		5/6/03	10/21/03
K-40	12,680	14,178	**K-40**	13,918	12,596
Cs-137	49	52	**Cs-137**	59	ND

Shoreline Sediments

	A			C	
	5/6/03	10/21/03		5/6/03	10/21/03
K-40	13,785	16,723	**K-40**	15,188	13,383
Cs-137	45	90.3	**Cs-137**	62	ND

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

Fish

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

Gamma Isotopic[1] (pCi/kg wet)

	A				
	5/6/03	5/6/03	5/6/03	5/6/03	5/6/03
	Carp	River Carpsucker	Freshwater Drum	Smallmouth Buffalo	Bigmouth Buffalo
K-40	2,702	2,909	2,714	2,357	3,068
	10/21/03	10/21/03	10/21/03	10/21/03	10/21/03
	Channel Catfish	Carp	River Carpsucker	Bigmouth Buffalo	Smallmouth Buffalo
K-40	2,660	2,782	2,653	2,971	3,197

	C				
	5/6/03	5/6/03	5/6/03	5/6/03	5/6/03
	Carp	River Carpsucker	Bigmouth Buffalo	Freshwater Drum	Smallmouth Buffalo
K-40	2,583	2,630	2,750	4,178	2,757
	10/21/03	10/21/03	10/21/03	10/21/03	10/21/03
	Channel Catfish	Carp	River Carpsucker	Bigmouth Buffalo	Smallmouth Buffalo
K-40	3,709	3,746	3,214	3,712	3,388

[1]Mn-54, Fe-59, Co-58, Co-60, Zn-65, Cs-134, Cs-137, and
ND = Not Detectable.

Milk

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

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

M6

	1/14/03	2/11/03	3/11/03	4/8/03	4/22/03	5/13/03
K-40	1,418	1,375	1,199	1,273	1,444	1,104
	5/27/03	6/10/03	6/24/03	7/8/03	7/22/03	8/12/03
K-40	1,050	1,429	1,329	1,476	1,336	1,425
	8/26/03	9/9/03	9/23/03	10/14/03	10/28/03	11/10/03
K-40	1,310	1,441	1,456	1,186	1,085	1,294
	12/8/03					
K-40	971					

M8

	1/14/03	2/11/03	3/11/03	4/8/03	4/22/03	5/13/03
K-40	1,176	1,264	937	1,129	947	1,186
	5/26/03	6/9/03	6/23/03	7/8/03	7/21/03	11/24/03
K-40	1,007	1,210	1,171	940	968	1,281
	12/8/03	12/22/03				
K-40	1,244	1,362				

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

Milk

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

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

	M13					
	4/22/03	5/13/03	6/9/03	6/23/03	7/7/03	7/21/03
K-40	1,443	1,501	1,613	1,491	1,616	1,423
	8/11/03	8/25/03	9/8/03	9/22/03	10/13/03	10/28/03
K-40	1,676	1,500	1,600	1,464	1,178	1,071

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

Supplemental REMP Samples

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

Gamma Isotopic[1] (pCi/kg)wet

	Beef	Venison
	10/20/03	12/29/03
Gamma Isotopic	ND	ND

	Corn Feed Leaves
	10/16/03
Gamma Isotopic	ND
Gross Alpha	ND
Gross Beta	3913
K-40	5128

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

[2]Mn-54, Co-58, Co-60, I-131, Cs-134, Cs-137, and ND = Not Detectable.

Supplemental REMP samples (continued)

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

Gamma Isotopic[1] (pCi/kg wet)

	Plants		
	5/27/03 Spinach	5/27/03 Radishes	5/27/03 Sweet Potatoes
Gross Alpha	107	179	162
Gross Beta	8,313	6,429	3,798
K-40	7,290	6,459	3,825

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

[2]These samples were taken at the request of local landowners (CAR 200304121).

Direct Radiation

Table XVII (All results are the effect of natural background)

Gamma Dose (mrem)

	QTR 1	QTR 2	QTR 3	QTR 4		QTR 1	QTR 2	QTR 3	QTR 4
1a	15.7	17.3	16.5	15.0	**34**	15.6	NA	15.4	15.2
3	17.9	17.0	18.0	15.3	**35**	14.6	15.6	14.3	14.7
5	14.0	15.3	13.4	14.1	**36**	15.1	17.5	15.1	16.4
6	17.8	17.3	17.4	16.3	**37**	15.9	16.2	16.9	14.5
7	15.2	17.3	15.8	15.2	**38**	11.4	12.4	11.3	11.6
9	15.1	16.6	15.3	15.1	**39**	15.4	16.1	16.5	NA
10	17.0	18.1	17.4	16.9	**39a**	17.3	17.0	18.0	17.6
11a	17.7	17.8	17.4	15.5	**40**	16.5	17.9	16.7	16.5
14	16.0	15.7	15.3	14.7	**41**	16.3	14.9	16.9	14.7
17	15.3	16.9	15.6	15.6	**42**	12.6	15.2	13.5	13.4
18a	16.4	17.0	16.2	16.3	**43**	15.9	16.7	16.0	15.9
20	16.8	16.2	16.7	15.6	**44**	17.3	16.4	18.2	15.4
21	17.8	17.5	18.1	15.5	**45**	15.1	15.6	14.7	15.0
22a	15.5	16.0	15.6	14.1	**46**	16.4	16.8	16.1	15.9
23	16.4	16.4	16.5	14.7	**47**	16.1	15.4	16.5	14.4
26	11.2	12.5	10.6	11.3	**48**	16.3	17.2	17.1	17.1
27	17.4	16.6	17.5	15.4	**49**	15.2	15.9	15.7	15.0
30a	16.2	14.5	15.8	14.0	**50**	16.2	16.4	16.7	15.1
31a	17.3	16.8	18.1	15.1	**51a**	16.5	18.3	17.4	17.2
32	17.0	16.8	17.9	15.3	**52**	15.6	17.4	16.4	16.2
32a	17.0	16.9	16.4	15.6	**60**	16.7	16.5	16.2	16.8
33	16.5	15.4	16.5	14.2					

3.0 Non-Radiological Monitoring Program

3.1 Introduction

Union Electric Company 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 2003.

3.2 Unusual or Important Events

No unusual or important events reportable under the EPP Section 4.1 were identified during 2003.

3.3 EPP Noncompliances

During 2003 there were no noncompliances with the EPP.

3.4 Nonroutine Reports

There were no nonroutine reports submitted in accordance with the EPP.

3.5 Plant Design and Operation Environmental Evaluations.

This section lists all changes in the plant design, operation, tests or experiments completed during 2003, which could have involved a potentially significant unreviewed environmental question in accordance with section 3.1 of Appendix B.

During 2003, there were five plant design and operation changes that could have involved a potentially significant unreviewed environmental question. The interpretations and conclusions regarding these plant changes along with a description of the change are presented below.

Callaway Request for Resolution 22046 Revision A

Description of Change:

This change is to allow the addition of depleted or natural soluble zinc to the Callaway primary system to reduce radiation fields in out-of-core piping and components. Industry experience has shown that even low concentrations of zinc (5ppb) have reduced reactor coolant system (RCS) dose rates by 10-25% per cycle for the cycle zinc is added. The maximum average RCS zinc concentration allowed by this evaluation is 40 ppb.

Evaluation of Change:

During this first cycle of injection much of the zinc will be incorporated into the system oxide films. Some of the zinc added will also be removed by the CVCS mixed bed deminerlizers. Some metals such as cobalt and nickel in the oxide films that are displaced by the zinc may increase slightly in the RCS. The expected chemical concentration change of the displaced metals is expected to be insignificant. Small amounts of the zinc and displaced metals will also be present in primary system waste streams and will be treated by the liquid radwaste system prior to discharge to the Missouri River via Outfall 001, Radwaste system discharge.

It is expected that the treatment systems will remove the majority of the zinc. Industry experience has also shown that the total liquid release of radioactive material for several plants

has not increased above their normal liquid effluent releases prior to the addition of zinc. This provides an indication that the chemical concentration of these metals in any wastewater will also be similar to levels present before zinc addition.

The most recent Callaway Plant NPDES Permit Renewal Application dated October 26, 2000, indicated a total maximum daily zinc concentration in Outfall 001 of 22.1 ppb. Up to five times this reported concentration is allowed without notification to the Missouri Department of Natural Resources (MDNR). Water Quality Standard 10 CSR 20-7 limits zinc in drinking water to 5000 ppb and limits zinc to 103 ppb (worse case - lakes, with a higher limit for the Missouri River) for protection of aquatic life. Assuming an average RCS concentration of 40 ppb zinc, the concentration of zinc expected in Outfall 001 even assuming no treatment of primary liquid waste, should not increase significantly from the levels previously reported prior to zinc addition.

The modificaiton 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.

Callaway Modification MP 03-2003

Description of Change:

This modification constructs a permanent Replacement Steam Generator (RSG) Storage Facility to both store the RSGs and permit onsite preparations of the RSG components to be performed in a facility protected from adverse environmental conditions. To achieve these objectives, the facility itself will have the character of a permanent warehouse erected over a concrete slab.

The RSG Storage Facility has technical requirements to ensure it's present and future uses will be appropriately designed for, including factors suchas building size, capabilities for off/on loading the RSGs and performing RSG component preparations, and functionality for materials handling and storage. The RSG Storage FAcility as constructed under this modificaion does not include tie-ins from potable water or sewage treatment, but rather has rough-in connection points embedded within the facility concrete slab for these two services for potential future use. Such future use would involve routing servicing lines to the facility, connecting them to their associated exterior rough-in penetrations to the facility, and installing servicing equipment within the facility itself.

Evaluation of Change:

Construction of the RSG Storage Facility will require excavation of the structure's foundation, and these activities will be controlled by means appropriate to limit any potential soil erosion. The areas surrounding the facility will be surface stabilized as part of this modification. Grading of the area of the RSG Storage Facility construction will route rainfall to an acceptable water runoff pattern to account for the effects of local intense precipitation described in Section 2.4.2.3 of Site FSAR Addendum. Stormwater discharge from the area where RSG Storage facility is being built ultimately discharges through a permitted outfall in Callaway Plant's NPDES permit. As such, no stormwater permit is necessary for this activity.

Evaluation of Change - Callaway Modification 03-2003 (continued):

The RSG storage facility construction area is on a location that has been previously disturbed during construction and as such will not affect any cultural resources at the site. Since the building will not initially be connected to the sewage treatment system, it will not add any additional load to the sewage treatment system. If it is connected in the future, the increased load should be minor as it will be balanced out from decreased load from other buildings.

This modification will not significantly affect the concentrations, frequencies or types of efluent 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.

Callaway Modification MP 01-1001

Description of Change:

This modification allows the installation and use of Duratek - Advanced Liquid Processing System, (ALPS), equipment for the processing of liquid radioactive waste. Equipment will be installed to allow treatement options of ion exchange and/or filtration with the intent to maximize the activity removal from liquid while minimizing the generation of solid waste.

This modification will also change the vents on the Secondary Liquid Waste (SLW) Monitor Tanks. The vents will be changed so that the vapors from the tanks will be directed to the Radwaste Building Exhaust ductwork instead of the Radwaste Building.

Evaluation of Change:

The vent path for the SLW Monitor tanks is being changed. They currently discharge to the Radwast e Building. After the modification, they will discharge to the Radwaste Building Exhaust ductwork. This modification means that the gaseous vent from the tank will no longer mix with Radwaste Building air prior to the release. This modification means that the gaseous vent from the tank will no longer mix with Radwaste Building air prior to release. The change in the vent path will not result in any net change in gaseous releases or gaseous release points.

The new treatment system will not have any significant environmental impact that hasnot been previously evaluated. Releases of liquid effluents were evaluated in the Final Environmental Statement - Operating License (FES-OL) and the Environmental Report (ER) assuming evaporation, demineralization or filtration treatment prior to discharge. The results from the use of a similar treatment system supplied by a different vendor has shown that deminerlization and filtration can provide adequate treatment to remove pollutants and radioactive isotopes prior to discharge and still meet all limitations on those discharges. Using demineralization and filtration to treat liquid radwaste as per this modification will not create any new or different environmental impact that would be significantly different from those already evaluated in the FES-OL or ER.

An additional treatment chemical, a polyamine coagulent as a filter aid may be used. Some of this chemical will attach to particles and be removed, but some may be discharged from outfall 001. This use of this type of chemical was already described in our last permit reapplication that was submitted to the Missouri Department of Natural Resources in October, 2000. Additionally, the boron concentration may increase some with deminerlization and filtration when compared to treatment with evaporators. The Missouri Department of Natural Resources has already been informed of this change in the

boron concentration.

This modification will not significantly affect the concentrations, frequencies or types of effluents 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.

Callaway Modification MP 02-1017

Description of Change:

This modification installs two sirens on site. One siren will be installed at stores 2 (construction warehouse) and the second siren will be installed at the water treatment plant building. Each siren is an array of speakers capable of 4800 watts. The use is to add coverage to the public address system. The siren/speaker array will announce storm warnings and plant emergency conditions as well as the three plant siren sounds, (wail, yelp, and pulse). Each voice message will be less than thirty seconds. Each siren usage should be thirty seconds up to 3 minutes long. Operations will be sounding the siren from the control room along with/followed by Gaitronics announcements.

Evaluation of Change:

This modificaiton involves an increase in noise from the plant but it is very intermittent and limited in duration. Thus it will not have significant increase in the plant's operational noise.

The installation of the loudspeakers will result in minor land disturbance in an area that has already been disturbed from previous construction. No environmental concerns result from this minor amount of land disturbance.

This 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 envrionmental question per Section 3.1 of Appendix B to the Callaway Plant Operating License.

Callaway Modification RFR 22952

Description of Change:

This request for resolution allows for the use of an alternative design for replacement drift eliminators in the cooling tower. The new design is made from PVC and will replace the asbestos cement board drift eliminators that are currently in use. This review applies to a partial or full replacement of the drift eliminators in the cooling tower. The new design has a lower drift rate when compared to the drift eliminators currently in use.

Evaluation of Change:

The current drift eliminators have a drift rate of 0.02% or 113.6 gpm at design cooling water flow of 586,000 gpm. The new design has a lower drift rate range of 0.003% to 0.0005% which will significantly reduce drift where the new drift eliminators are installed. This will result in less drift and lower the total amount of solids that will be deposited in the area surrounding the Cooling Tower. The result will be less stress on vegetation around the cooling tower from deposited solids.

The lower drift will also result in slightly more solids being retained in the cooling tower basin. To maintain total dissolved solids in the cooling tower water, it may be necessary to slightly increase discharge from cooling tower blowdown, outfall 002. This change is expected to be less than 1% even if all drift eliminators are replaced.

Evaluation of Change - Callaway Modification RFR 22952 (continued):

This is expected to be insignificant with regards to normal colling tower blowdown and all parameters on the outall are expected to remain essentially the same.

This modification will not significantly affect the concentrations, frequencies or types of efluent 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.