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10 CFR 50, Appendix I

U. S. Nuclear Regulatory Commission
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Palisades Nuclear Plant
Docket 50-255
License No. DPR-20

2004 Radiological Environmental Operating Report

Nuclear Management Company, LLC, is submitting the attached Radiological Environmental Operating Report for the Palisades Nuclear Plant. This report was prepared in accordance with the requirements of 10 CFR 50, Appendix I, Sections IV.B.2, IV.B.3, IV.C, and Technical Specification 5.6.2. The period covered by the enclosed report is January 1, 2004, through December 31, 2004.

Summary of Commitments

This letter contains no new commitments and no revisions to existing commitments.

for
Daniel J. Malone
Site Vice President, Palisades Nuclear Plant
Nuclear Management Company, LLC

Enclosure (1)
Attachments (6)

CC Administrator, Region III, USNRC
Project Manager, Palisades Nuclear Plant, USNRC
Resident Inspector, Palisades Nuclear Plant, USNRC

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ENCLOSURE 1

2004 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT JANUARY 1, 2004 THROUGH DECEMBER 31, 2004

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I. INTRODUCTION

The Nuclear Management Company, LLC (NMC) Radiological Environmental Operating Report provides a summary and data interpretation of the Palisades Nuclear Plant (PNP) Radiological Environmental Monitoring Program as conducted during the 2004 reporting period. This report was prepared in accordance with the requirements of 10 CFR 50, Appendix I, Sections IV.B.2, IV.B.3, IV.C, and Technical Specification 5.6.2.

Detailed sample station identification and location information can be found in Attachment 2 of Health Physics Procedure HP 10.10, "Palisades Radiological Environmental Program Sample Collection and Shipment." HP 10.10 is included as Attachment C. The results of all environmental samples collected are evaluated as follows:

- A. Air iodine and particulate and thermoluminescent dosimetry (TLD) (monthly and quarterly) data were statistically evaluated at the 95% confidence level. The data were compared against two criteria. The first criterion is the statistical difference, which indicates whether the sample results from near sites are greater than those from control sites, and whether or not the difference is significant. The second criterion is the evaluation level (twice the statistical difference), which is the minimum difference in the population means for which a corresponding difference in sample means will exceed the statistical difference with 95% confidence. If the evaluation level is exceeded, then correlation of the results with effluent releases is performed.
- B. Well water, lake water, sediment, fish, and other aquatic biota samples were evaluated using data mean comparisons against an appropriate control location (if available) and the PNP Offsite Dose Calculation Manual (ODCM), Appendix A, limits.

II. NON-ROUTINE REPORTS

Non-routine reportable events did not occur during this reporting period.

III. DISCUSSION AND INTERPRETATION OF RESULTS

A. Air Samples

There were 633 air samples collected and analyzed for gross beta and I-131. Two samples were not included in the data comparisons because samples were "light," indicating that the filters were installed off center in the sample head. Refer to Attachment A for sample collection anomaly evaluations.

Air iodine/particulate samples are collected weekly from 12 air-sampling locations. Air is metered into the sampling unit at a continuous one cubic foot per minute flow rate (approximately) through a Radeco 47 mm air filter (air particulate) and a HI-Q air iodine cartridge. Both filters are in-line with each other and housed within the same filter holder. Weekly samples were sent to Environmental, Inc., Midwest Laboratory for analysis.

Statistical analysis of the airborne particulate sample data, between the nine near-site indicator locations and the three control locations, demonstrated that they were statistically different. However, the control mean was greater than the site mean. The mean values of gross beta results for indicator and control locations were 0.0261 pCi/m³, and 0.0271 pCi/m³, respectively. In 2004, control station 10-GR had the highest annual mean for gross beta results at 0.0272 pCi/m³. No trends in gross beta results are discernable when compared to previous years' sample results.

No sample analyses identified I-131 activity above minimum detectable levels.

B. Lake Water

Palisades Lake-in, South Haven Municipal, and Ludington Lake-in water samples are collected daily for composite into a monthly sample. One gallon of Palisades Lake-in water and Ludington Lake-in water, and two gallons of South Haven Municipal raw water are sent to Environmental, Inc., Midwest Laboratory for analysis. No treatment of the water samples with preservative is required.

There were thirty-six monthly lake water composite samples collected from three locations during 2004. Lake water samples from the indicator locations, Palisades Lake-in (1-ST Intake), South Haven Municipal water system intake (25-SH Raw water), and the control location Ludington Lake-in (32-LP Intake), were collected daily.

Gross beta analyses were completed for all lake water samples. Statistical analysis of the sample data, between the two site indicator locations and the control location, demonstrated that they were statistically different. However, the control mean was greater than the site mean, 2.3 pCi/L and 2.0 pCi/L, respectively. The results were also evaluated against the PNP ODCM, Appendix A, reporting limits. No limits were exceeded. No trends in gross beta results are discernable when compared to previous years' sample results.

C. Drinking Water

Water samples from South Haven Municipal Water System (25-SH Raw Water, 25-SH Treated), and Ludington Lake-in (32-LP Intake), are collected daily for composite into a monthly sample. One gallon of Ludington Lake-in water, and two gallons each of South Haven Municipal treated and raw water are sent to Environmental, Inc., Midwest Laboratory for analysis. No treatment of water samples with preservative is required.

Thirty-six monthly drinking water samples were collected from the three locations in 2004.

Statistical analysis of the drinking water sample data, between the two indicator locations and the control location, demonstrated that they were statistically different. However, the control mean was greater than the indicator mean. The results were also evaluated against the PNP ODCM, Appendix A, reporting limits. Both of the South Haven Municipal lake water intake and treated drinking water samples require gross beta analyses. A tritium analysis is required for the treated water only. The gross beta mean values for the indicator and control locations were 1.9 pCi/L and 2.3 pCi/L, respectively. Tritium was detected in South Haven treated water on six samples during the months of March – August, with an average mean value of 528 pCi/L.

D. Milk

Milk samples are required monthly from each designated location. Two one-gallon quantities of raw milk (grab sample) are obtained per sample location from dairy milk holding tanks. Each sample quantity is treated with a sodium bisulfate (40 grams per gallon) preservative prior to being sent to Environmental, Inc., Midwest Laboratory.

Forty-eight monthly milk samples were collected from four different dairy farms (stations 26-JH, 27-DH, 28-DC and 29-WS) during 2004.

No milk analysis identified activity above the minimum detectable level, with the exception of naturally occurring potassium-40.

E. TLDs - Gamma Dose

Environmental gamma doses are measured monthly, quarterly, and annually, by placement of three TLD badges per designated location. Each TLD badge contains a 4-zone Calcium Sulfate (CaSO₄) wafer (the wafer includes an additional backup/reserve readout zone). Sensitivity for the multi-zone TLDs is 1.0 millirem, with a linear response of 0.1 millirem to 1000 rem.

The PNP gamma assessment program consists of 29 locations. There is a total of 16 inner ring TLDs, including one on-site, nine near-site and six steam generator storage facility locations. There are ten outer ring TLD locations (1.0 to 5.5 miles out) and three control TLDs (30 to 55 miles out). A 30th TLD is placed in a lead storage cave (location number 22), and is used as a control for in-transit dose monitoring and subtraction.

There were 347 monthly, 116 quarterly and 29 annual TLDs collected and analyzed during 2004. During July 2004, the three TLDs (annual, quarterly, and monthly) at inner ring station number 20 were found missing during a monthly collection on July 30, 2004. This resulted in no data for the July monthly reading. New TLDs taken from the spares were installed to replace the missing quarterly and annual TLDs. However, these two TLDs (when collected and read) were not included when calculating the quarterly and annual means. Refer to Attachment A for sample collection anomaly evaluations.

The TLD data evaluations were performed by comparing the inner ring TLDs (site boundary locations 1, 13-21 and 33-38), and the outer ring TLDs (locations 2-9, 23 and 24), against the control TLD locations (10, 11, 12).

For 2004, the average gamma readings (mR) were:

| Location | Monthly | Quarterly | Annual |
|------------|---------|-----------|--------|
| Inner Ring | 3.79 | 11.90 | 42.62 |
| Outer Ring | 4.48 | 13.52 | 48.94 |
| Control | 4.84 | 13.84 | 50.07 |

The one on-site TLD location (1-ST) serves as an individual reference TLD; however, it was evaluated along with the inner ring (site boundary) TLDs in the statistical evaluation.

The highest site monthly, quarterly and annual doses were observed at outer ring station number 2 (5.6 miles south) at 5.9, 16.3 and 58.8 mrem, respectively.

Statistical analysis demonstrated that inner ring vs control TLDs were two different populations. However, the control mean was greater than the inner ring mean. There was no statistical difference between the outer ring and control means. No trends are discernable when comparing inner ring with outer ring and control TLD results in monthly, quarterly or annual sample results. Overall, outer ring TLD mean results are consistently higher than inner ring TLD mean results, and control station TLD mean results are slightly higher than outer ring mean results.

F. Crops

Food crop samples are collected when available, and in season. Two principal area crops, apples and blueberries, are regularly collected. While there are no designated locations where food crops are collected, samples are generally obtained from the same areas where the air monitoring stations are located within the ESE, SE or SSE sectors. The collection of food crops assists in verifying stack effluent deposition patterns. When collected, approximately 1 Kg of sample is placed in a sealable plastic bag for shipment to Environmental, Inc., Midwest Laboratory. No special treatment of the samples with a preservative is necessary.

Four crop samples were collected. Blueberries and apples were collected at indicator station 4-JS (3.5 miles SE), and at a control station located in the least prevalent wind direction, approximately 11 miles NNE.

Evaluation of the crop sample analytical results was based on a data means comparison between the indicator location and the control location, as well as a comparison to the PNP ODCM, Appendix A, reporting limits. Of the radionuclide analyses listed in Table HP 10.4-2, only gross beta analysis resulted in any detectable activity. The gross beta mean values for the indicator and control locations were 0.71 pCi/L and 0.81 pCi/L, respectively. Based on the number of samples collected, and the minimal difference in activity between the controls and indicator locations, no statistical difference can be discerned.

G. Sediment

Sediment samples are collected semi-annually from each designated location. No treatment of the samples with a preservative is necessary prior to shipment to Environmental, Inc., Midwest Laboratory.

Ten sediment samples were collected from three locations during 2004. Eight sediment samples were obtained from Palisades [1-ST discharge, 31-STs (0.5 miles south of discharge), 30-STN (0.5 miles north of

discharge), and 25-SH (South Haven beach)] locations and two samples from the Ludington Control Station (32-LP).

The evaluation of the sediment analytical results was based on a data means comparison between Palisades and Ludington control samples, as well as the PNP ODCM, Appendix A, reporting limits. Of the radionuclide analyses listed in Table HP 10.4-2, only gross beta was detectable. The gross beta mean values for indicator and control locations were 7.79 pCi/g and 9.23 pCi/g, respectively. No trends for gross beta results are discernable when compared to previous years' sample results.

H. Fish

Fish samples are collected semi-annually. Samples consist of two species of commercially and/or recreational important species near the plant discharge area. One sample of the same species in an area not influenced by plant discharge is collected. Each one-liter quantity of fish sample is prepared for shipment to Environmental, Inc., Midwest Laboratory. Each sample is either frozen, or treated with a ten percent formaldehyde solution for preservation.

Six individual fish samples were collected from three locations. Three indicator samples were obtained from Palisades (1-ST discharge) and three control samples obtained, two from the Ludington Station (32-LP), and one from the St Joseph vicinity. The same species were collected at both indicator and control locations during each of the two collection periods.

Evaluation of the fish analytical results was based on a data means comparison between the Palisades and Ludington control samples, as well as with the PNP ODCM reporting limits. The gross beta mean values for indicator and control locations were 2.25 pCi/g and 3.04 pCi/g, respectively. Cs-137 was the only gamma emitter detected and only at the Ludington Station. The mean was 0.039 pCi/g. No trends in Cs-137 are discernable when compared to previous years' sample results. No trends for gross beta results are discernable when compared to previous years' sample results.

I. Broad Leaf Vegetation

No broad leaf vegetation samples were collected from the surrounding PNP environs during 2004. The collection of broad leaf vegetation samples serves as a backup and/or alternative sampling media in case any milk sampling location(s) become(s) unavailable.

J. Non-Routine Samples

There were no non-routine samples collected during this reporting period.

K. Gaseous and Liquid Radwaste Effluent Composite Samples

Both the gaseous and liquid radwaste effluent composite samples are collected monthly and sent to Environmental, Inc., Midwest Laboratory for analysis. No special sample treatment with a preservative is required prior to laboratory analysis. The liquid effluent composite sample is based on a specific amount of sample collected, per total batch volume release. For those months in which there were no liquid batch effluent releases, no sample is sent to Environmental, Inc., Midwest Laboratory. The gaseous radwaste effluent weekly composite sample results are based on analyzing weekly stack gas filters.

Although not a direct reporting component in the PNP Annual Radiological Environmental Operating Report, results of the gaseous and liquid monthly radwaste effluent composite samples are evaluated against overall environmental trending data. This evaluation is the basis for determining isotopic dispersion and deposition patterns within the surrounding environs of PNP. All gaseous and liquid effluent results are compared to the PNP ODCM, Appendix A, reporting levels. All isotopic lower limits of detection (LLDs) were met.

IV. ASSESSMENT OF PALISADES OPERATION ENVIRONMENTAL IMPACT

In reviewing the 2004 PNP radiological environmental monitoring data, and comparing it to previous operational and pre-operational data, all trending parameters continue to indicate that the operation of PNP has minimal environmental impact. Most isotopic activity is at environmental background levels. Evidence of an overall environmental isotopic buildup (attributable to plant effluents) remains negligible as well. In most instances, sample analytical results were below previously established environmental background levels.

**Table HP 10.4-1
Sampling and Analysis Summary**

| Medium | Description | Location | Number of Samples Collected | Type of Analysis | Frequency of Analysis |
|----------------|---|---|-----------------------------|--|--------------------------------|
| Air | Continuous at appx 1CFM, collected weekly | 1-ST through 12-ST | 633 | Gross Beta, I-131 | Weekly |
| Lake Water | 1 gallon composite | 1-ST, 25-SH Raw, 32-LP Intake | 36 | Gross Beta, Gross Alpha (1), Tritium (1) | Monthly |
| Drinking Water | 1 gallon composite/grab | 25-SH Raw, 25-SH Treated, 32-LP Intake | 36, (2, 3) | Gross Beta, Tritium (1) | Monthly |
| Milk | 2 gallon grab | 26-JH, 27-DH, 28-DC, 29-WS | 48 | I-131, Cs-137, Cs-134, Ba-La-140 | Monthly |
| TLD | Continuous | 1-ST through 24-ST, 33-ST through 38-ST | 347 116 29 | Gamma | Monthly Quarterly Annual |
| Crops | Grab | 4-JS, 44-Con | 4 | Gross Beta, Cs-137, Other gamma | In Season |
| Sediment | Grab | 1-ST, 25-SH, 30-STN, 31-STS, 32-LP | 10 | Gross Beta, Cs-137, Other gamma | Semi-annual |
| Fish | Grab | 1-ST, 32-LP, St. Josephs | 6 | Gross Beta, Cs-137, Other gamma | Seasonally |

(1) Not required for 25-SH raw

(2) Same 25-SH raw water samples as lake water

(3) Same 32-LP intake water samples as lake water

Table HP 10.4-2
Sample Data Summary

| Medium or Pathway Sampled & Unit of Measurement | Analysis Evaluated/ Analysis Performed | | All Indicator Locations | | Locations with Greatest Annual Mean | | | All Control Locations | | Nonroutine Reports (c) |
|---|--|-------------------------|-------------------------|------------------------------------|--|---------------|------------------------------------|-----------------------|-------------------------------|------------------------|
| | | | | Mean (b) Range (b) | Name | | Mean (b) Range (b) | | Mean (b) Range (b) | |
| Air (pCi/m ³) | I-131 Gross Beta | 633/633 631/633 | 0/477 475/477 | LLD 0.026 (0.013-0.047) | N/A 10-GR 55 mi NNE | 52/52 | LLD 0.027 (0.016-0.040) | 0/156 156/156 | LLD 0.027 (0.011-0.043) | None None |
| Lake Water (pCi/L) | Gross Alpha (f) | 12/12 | 2/12 | 0.45 (0.4 - 0.5) | PAL Lake In | 2/12 | 0.45 (0.4 - 0.5) | LLD | N/A | None |
| | Gross Beta | 36/36 | 24/24 | 2.0 (1.2-2.7) | 32-LP 125 mi N | 12/12 | 2.3 (1.7-3.7) | 12/12 | 2.3 (1.7-2.7) | None |
| | Tritium (f) | 24/24 | 2/12 | 177 - 220 | PAL Lake-in | 2/12 | 198.5 (177-220) | 0/12 | LLD | None |
| Drinking Water (pCi/L) | Gross Beta Tritium | 36/36 24/24 | 24/24 6/12 | 1.9 (1.2-2.5) 527.8 (413 - 668) | 32-LP 125 mi N SH Treated 5 ½ mi NNE | 12/12 1/12 | 2.3 (1.7-3.7) 527.8 (413 - 668) | 12/12 0/12 | 2.3 (1.7-3.7) LLD | None None |
| Milk (pCi/L) | I-131 Cs-137 Other Gamma | 48/48 48/48 48/48 | 0/36 0/36 0/36 | LLD LLD LLD | N/A N/A N/A | | LLD LLD LLD | 0/12 0/12 0/12 | LLD LLD LLD | None None None |
| TLD (gamma mR) Inner Ring (Site Boundary) | TLD Monthly (e) | 227/227 | 191/191 | 3.8 (2.9-5.2) | 11-KZ 35 mi E | 12/12 | 5.4 (4.8 - 6.3) | 36/36 | 4.8 (3.8-6.6) | None |
| | TLD Quarterly (e) | 75/76 | 63/64 | 11.9 (10.3 -15.2) | 11-KZ 35 mi E | 4/4 | 15.9 (13.9 - 16.1) | 12/12 | 13.8 (11.9-16.1) | None |
| | TLD Annual (e) | 18/19 | 15/16 | 42.6 (37.8-49.2) | 11-KZ 35 mi E | 1/1 | 54.5 | 3/3 | 50.1 (45.3 - 54.5) | None |
| TLD (gamma mR) | TLD Monthly (e) | 156/156 | 120/120 | 4.5 (1.6 - 5.9) | 11-KZ 35 mi E | 12/12 | 5.4 (4.8-6.3) | 36/36 | 4.8 (3.8-6.6) | None |
| | TLD Quarterly (e) | 52/52 | 40/40 | 13.5 (11.3-16.3) | 2-TH 5.6 mi S | 4/4 | 15.8 (14.7-16.3) | 12/12 | 13.8 (11.9-16.1) | None |
| | TLD Annual (e) | 13/13 | 10/10 | 48.9 (41.3-58.8) | 2-TH 5.6 mi S | 1/1 | 58.8 | 3/3 | 50.1 (45.3 - 54.5) | None |
| Crops | Gross Beta | 4/4 | 2/2 | 0.71 (0.69 - 0.72) | 44-C 11.0 mi NNE | 2/2 | 0.81 (0.74 - 0.87) | 2/2 | 0.81 (0.74 - 0.87) | None |
| | Other Gamma | 4/4 | 0/2 | LLD | N/A | | LLD | 0/2 | LLD | None |

Table HP 10.4-2
Sample Data Summary

| Medium or Pathway Sampled & Unit of Measurement | Analysis Evaluated/ Analysis Performed | | All Indicator Locations | | Locations with Greatest Annual Mean | | | All Control Locations | | Nonroutine Reports (c) |
|---|--|-------|-------------------------|-----------------------|-------------------------------------|-----|------------------------|-----------------------|------------------------|------------------------|
| | | | | Mean (b) Range (b) | Name | | Mean (b) Range (b) | | Mean (b) Range (b) | |
| Sediment | Gross Beta | 10/10 | 8/8 | 7.79 (6.14-10.32) | 32-LP Ludington 125 mi N | 2/2 | 9.23 (9.06 - 9.39) | 2/2 | 9.23 (9.06 - 9.39) | None |
| | Cs-137 | 10/10 | 0/8 | LLD | N/A | 1/2 | LLD | 0/2 | LLD | None |
| | Other Gamma | 10/10 | 0/8 | LLD | N/A | | LLD | 0/2 | LLD | None |
| Fish (pCi/g wet) | Gross Beta | 6/6 | 3/3 | 2.25 (2.09 – 2.34) | 32-LP Ludington125 mi N | 2/2 | 3.3 (2.3 - 4.3) | 3/3 | 3.04 (2.3 – 4.3) | None |
| | Cs-137 | 6/6 | 3/3 | LLD | 32-LP Ludington 5 mi N | 2/2 | 0.039 (0.032-0.046) | 2/3 | 0.039 (0.032-0.046) | None |
| | Other Gamma | 6/6 | 3/3 | LLD | N/A | 0/2 | LLD | 0/3 | LLD | None |
| Broadleaf Vegetation (d) (pCi/g wet) | Gross Beta Cs-137 Other Gamma | | No samples collected | | | | | | | |

- (a) Nominal Lower Limit of Detection (LLD) as defined in MASL-300, Rev 0/73, pages D-06-01, 02 and 03; PNP ODCM, Appendix A, Table E-3, and vendor analytical capabilities.
- (b) Mean and range based upon detectable measurements only. Fraction of detectable measurements at specific locations is indicated next to the mean.
- (c) Nonroutine reported measurements are defined in the PNP ODCM, Appendix A, Section IV.C.
- (d) Supplemental sample when milk is unavailable.
- (e) Monthly TLD results are normalized for 30 days net; Quarterly TLD results are normalized for 91 days net.
- (f) Analysis not required for 25-SH, South Haven Municipal raw water.

Table HP 10.4-3
Greatest Mean Sampling Location

| Medium | Type of Analysis | Location | High | Low | Mean |
|--------------------------------------|----------------------|--------------------------|------|------|-------|
| Air (pCi/m ³) | I-131 | N/A – LLD | --- | --- | --- |
| | Gross Beta | 10-GR 55 mi NNE | .040 | .016 | .0272 |
| Lake Water pCi/l | Gross Alpha | PAL Lake in | 0.5 | 0.4 | 0.45 |
| | Gross Beta | 32-LP Ludington 125 mi N | 3.7 | 1.7 | 2.3 |
| | Tritium | PAL Lake In | 220 | 177 | 198.5 |
| Drinking Water pCi/l | Gross Beta | 32-LP Ludington 125 mi N | 3.7 | 1.7 | 2.3 |
| | Tritium | South Haven Treated | 668 | 413 | 527.8 |
| Milk (pCi/L) | I-131 | N/A – LLD | --- | --- | <1.0 |
| | Cs-137 | N/A – LLD | --- | --- | <18.0 |
| | Other Gamma | N/A – LLD | --- | --- | <15.0 |
| TLD (gamma mR) Inner ring | TLD – Monthly | 11-KZ 35 mi E | 6.3 | 4.8 | 5.4 |
| | TLD – Quarterly | 11-KZ 35 mi E | 16.1 | 13.9 | 15.2 |
| | TLD – Annual | 11-KZ 35 mi E | N/A | N/A | 54.5 |
| TLD (gamma mR) Outer Ring | TLD – Monthly | 11-KZ 35 mi E | 6.3 | 4.8 | 5.4 |
| | TLD – Quarterly | 2-TH 5.6 mi S | 16.3 | 14.7 | 15.8 |
| | TLD – Annual | 2-TH 5.6 mi S | N/A | N/A | 58.8 |
| Crops (pCi/g wet) | Gross Beta | 44-Control 11.0 mi NNE | 0.87 | 0.74 | 0.81 |
| | Other Gamma | LLD | --- | --- | --- |
| Sediment (pCi/g dry) | Gross Beta | 32-LP Ludington 125 mi N | 9.39 | 9.06 | 9.23 |
| | Cs-137 | LLD | --- | --- | --- |
| | Other Gamma | LLD | --- | --- | --- |
| Fish (pCi/g wet) | Gross Beta | 32-LP Ludington 125 mi N | 4.3 | 2.3 | 3.3 |
| | Cs-137 | 32-LP Ludington 125 mi N | .046 | .032 | .039 |
| | Other Gamma | N/A | --- | --- | --- |
| Broad Leaf Vegetation (pCi/g wet) | Gross Beta | No samples collected | | | |
| | I-131 Other Gamma | | | | |

ATTACHMENT A

SAMPLE COLLECTION ANOMALIES

| Sample Affected | Location | Date | Problem | Evaluation |
|---------------------------------|----------|---|---|--|
| Air particulate: I-131, Beta | 4JS | 3/22/04 | Sample filter "light." Results not included in statistical analysis | Filter installed off-center in sample head. (1) |
| Air Particulate: I-131, Beta | 5PR | 5/3/04 | Sample filter "light." Results not included in statistical analysis | Filter installed off-center in sample head. (1) |
| TLD | ST-20 | July Monthly | TLD was missing from holder | Unable to obtain results. (2) |
| TLD | ST-20 | 3 rd Quarter and Annual | TLDs were missing from holder. | Spares were used for replacements but results were not included in statistical analyses. (2) |

- (1) During 2004, two of the 633 particulate filters collected were light, and the results were not included in statistical analysis. These filters were likely installed off-center in the sample head. This occurred twice in 2004 (failure rate of 0.316%). A human performance reminder was put in place to prevent recurrence.
- (2) One time occurrence. Station is located in remote wooded area not subject to foot traffic. No additional actions are necessary.

ATTACHMENT B

PALISADES 2004 LAND USE CENSUS

6 Pages Follow

To JL Beer, Palisades

From MLGrogan, Palisades

Date October 22, 2004

Subject PALISADES PLANT -
2004 LAND USE CENSUS

CC JLFontaine, Palisades,
REMP/RETS File, ERC: LANUSECEN

The attached tables are the results of the Palisades Land Use Census conducted by MLGrogan and GL Stama on September 9, 2004, and by ML Grogan and ML Sweet on October 7, 2004. Table 10.11-1 references the distance from Palisades to the nearest residence, garden (greater than 500 square feet), beef/dairy cattle, and goat per meteorological sector. Table 10.11-2 identifies the locations of the nearest residence and garden; and of all beef/dairy cattle and goats within a five (5) mile radius of Palisades per meteorological sector. Table 10.11-3 lists the critical receptor locations used in calculation of the offsite doses by the GASPARG computer program.

There are two changes to critical receptor locations from the 2003 Land Use Survey. Goats and beef cattle were found in a new location, at the SE sector at 1.9 miles. This will change the X/Q value for goats from 2.14E-07 to 2.32E-07. This will change the X/Q value for beef cattle from 1.86E-07 to 2.32 E-07. As a result of these two critical receptor changes, Design Basis Quantities (DBQ) for I-131, Cs-136, Nb-95 and Ru103 will decrease. DBQ changes will be documented in a subsequent memo.

Tables 10.11-1 and 10.11-3 will be updated in the ODCM as Tables 1.4 and 1.4a respectively. Attached to this report are the new revisions of Tables 1.4 and 1.4a. The ODCM revision is in progress.

In addition, I requested Air Improvement Resource, Inc. (Dennis Kahlbaum) to run computer code XOQDOQ82, using the 1999 - 2003 met data, in conjunction with the critical receptor, to determine if X/Q values had significantly changed. The following table compares existing data with the results of this run, with the most conservative value listed in bold.

| Location | Current X/Q (met data 1/92 - 12/96) | Calculated X/Q (met data 1/99 - 12/03) |
|----------------------------|--|---|
| *Site boundary SSE 0.48 mi | 2.13E-06 | 2.23E-06 |
| Residence S 0.50 mi | 1.38E-06 | 1.59E-06 |
| Garden SE 1.0 mi | 5.87E-07 | 5.95E-07 |
| Beef Cattle SE 1.9 mi | 2.32E-07 | 2.30E-07 |
| Dairy Cow SE 4.3 mi | 6.83E-08 | 6.97E-08 |
| Goat SE 1.9 mi | 2.32E-07 | 2.30E-07 |

*site boundary data used in all effluent calculations

Currently Palisades uses the 1992-1996 met data due to it being conservative when compared to more current met data. In a comparison of the 1992-1996 met data, with the most current met data, the results show that the site boundary X/Q currently used is within 4.5% of the most current met data. The other critical receptors comparisons are nearly identical. Based on this comparison, I recommend continued use of the 1992-1996 met data.

2004 PALISADES LAND USE CENSUS

TABLE 10.11-1

Distance to the nearest residence, garden, dairy/beef cattle and goat in each sector.

| <u>SECTOR</u> | <u>RESIDENCE</u> | <u>GARDEN</u> | <u>BEEF CATTLE</u> | <u>DAIRY COW</u> | <u>GOAT</u> |
|---------------|------------------|---------------|--------------------|------------------|-------------|
| NNE | 1.1 mi | 1.7 mi | >5 mi | >5 mi | >5mi |
| NE | 1.2 mi | 1.2 mi | >5 mi | >5 mi | >5 mi |
| ENE | 1.3 mi | 1.6 mi | 4.0 mi | >5 mi | 1.8 mi |
| E | 1.0 mi | 2.1 mi | >5 mi | >5 mi | 3.5 mi |
| ESE | 1.0 mi | *1.0 mi | >5 mi | >5 mi | >5 mi |
| SE | 1.0 mi | *1.0 mi | 1.9 mi | 4.3 mi | 1.9 mi |
| SSE | 0.7 mi | 1.6 mi | >5 mi | >5 mi | 4.8 mi |
| S | 0.5 mi | 4.0 mi | >5 mi | >5 mi | 4.7 mi |
| SSW | 0.7 mi | >5.0mi | >5 mi | >5 mi | >5 mi |

* Note: Garden and Farm bisected by ESE/SE boundary line.

2004 PALISADES LAND USE CENSUS

TABLE 10.11-3

Critical Receptor Items

| <u>Sector</u> | <u>Distance Miles</u> | <u>Location/Description</u> | <u>Item</u> | <u>*X/Q (sec/m³).</u> |
|---------------|---------------------------|--|----------------|----------------------------------|
| SSE | 0.48 | Site Boundary | N/A | 2.13E-06 |
| S | 0.50 | Residence, Palisades Park; ½ mile West of 29th Avenue and Blue Star intersection. | Residence | 1.38E-06 |
| SE | 1.0 | 77550 28th Avenue | Garden | 5.87E-07 |
| SE | 1.9 | SE corner of 76 th Street and 30 th | Beef Cattle | 2.32E-07 |
| SE | 4.3 | 72401 36th Ave. | Dairy Cow | 6.83E-08 |
| SE | 1.9 | SE corner of 76 th Street and 30 th | Goat | 2.32E-07 |

*Based on Palisades 5 year composite meteorological data, 1992 -1996.

TABLE 1.4a

2004 PALISADES LAND USE CENSUS

Critical Receptor Items

| <u>Sector</u> | <u>Distance Miles</u> | <u>Location/Description</u> | <u>Item</u> | <u>*X/Q (sec/m³).</u> |
|---------------|---------------------------|--|----------------|----------------------------------|
| SSE | 0.48 | Site Boundary | N/A | 2.13E-06 |
| S | 0.50 | Residence, Palisades Park; ½ mile West of 29th Avenue and Blue Star intersection. | Residence | 1.38E-06 |
| SE | 1.0 | 77550 28th Avenue | Garden | 5.87E-07 |
| SE | 1.9 | SE corner of 76 th Street and 30 th | Beef Cattle | 2.32E-07 |
| SE | 4.3 | 72401 36th Ave. | Dairy Cow | 6.83E-08 |
| SE | 1.9 | SE corner of 76 th Street and 30 th | Goat | 2.32E-07 |

*Based on Palisades 5 year composite meteorological data, 1992 -1996.

TABLE 1.4

2004 PALISADES LAND USE CENSUS

Distance to the nearest residence, garden, dairy/beef cattle and goat in each sector.

| <u>SECTOR</u> | <u>RESIDENCE</u> | <u>GARDEN</u> | <u>BEEF CATTLE</u> | <u>DAIRY COW</u> | <u>GOAT</u> |
|---------------|------------------|---------------|--------------------|------------------|-------------|
| NNE | 1.1 mi | 1.7 mi | >5 mi | >5 mi | >5 mi |
| NE | 1.2 mi | 1.2 mi | >5 mi | >5 mi | >5 mi |
| ENE | 1.3 mi | 1.6 mi | 4.0 mi | >5 mi | 1.8 mi |
| E | 1.0 mi | 2.1 mi | >5 mi | >5 mi | 3.5 mi |
| ESE | 1.0 mi | *1.0 mi | >5 mi | >5 mi | >5 mi |
| SE | 1.0 mi | *1.0 mi | 1.9 mi | 4.3 mi | 1.9 mi |
| SSE | 0.7 mi | 1.6 mi | >5 mi | >5 mi | 4.8 mi |
| S | 0.5 mi | 4.0 mi | >5 mi | >5 mi | 4.7 mi |
| SSW | 0.7 mi | >5.0 mi | >5 mi | >5 mi | >5 mi |

* Note: Garden and Farm bisected by ESE/SE boundary line.

ATTACHMENT C

**HEALTH PHYSICS PROCEDURE HP 10.10
"PALISADES RADIOLOGICAL ENVIRONMENTAL PROGRAM
SAMPLE COLLECTION AND SHIPMENT"**

34 Pages Follow

Procedure No HP 10.10
Revision 8
Effective Date 7/14/04

PALISADES NUCLEAR PLANT
HEALTH PHYSICS PROCEDURE

**TITLE: PALISADES RADIOLOGICAL ENVIRONMENTAL PROGRAM
SAMPLE COLLECTION AND SHIPMENT**

Approved: MLGrogan
Procedure Sponsor

/

7/12/04
Date

New Procedure/Revision Summary:

Editorial

Specific Changes

Added non-Palisades personnel to Step 5.1.3, for clarification.

Added more information on control station locations in Attachment 2.

**TITLE: PALISADES RADIOLOGICAL ENVIRONMENTAL PROGRAM
SAMPLE COLLECTION AND SHIPMENT**

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ATTACHMENTS

- Attachment 1, "Environmental Sample Collection Schedule"
- Attachment 2, "Sample Locations"
- Attachment 3, "Sample Identification"
- Attachment 4, "Sample Packaging and Shipment"
- Attachment 5, "Palisades Sample Collection Forms and Records"

**TITLE: PALISADES RADIOLOGICAL ENVIRONMENTAL PROGRAM
SAMPLE COLLECTION AND SHIPMENT**

USER ALERT
INFORMATION USE PROCEDURE

The activities covered by this procedure may be performed from memory.

1.0 PURPOSE

To provide methodology for collection of environmental samples in support of the Radiological Environmental Monitoring Program (REMP).

2.0 REFERENCES

2.1 SOURCE DOCUMENTS

2.1.1 Reg Guide 4.15(7)

2.1.2 10CFR50, Appendix I

2.1.3 Palisades Administrative Procedure 7.08, "Nuclear Plants Radiological Environmental Monitoring Program"

2.1.4 REMP Sample Shipping Manual, Environmental Inc

2.1.5 Health Physics Procedure HP 10.1, "Radiological Environmental Monitoring Program Surveillance"

2.1.6 Technical Specifications ADMIN 5.5.1, "Offsite Dose Calculation Manual (ODCM)"

2.1.7 Branch Technical Position (Revision 1, 1979), "Radiological Portion of the Environmental Monitoring Program"

2.2 REFERENCE DOCUMENTS

2.2.1 Palisades ODCM, Appendix A, Sections III.J, IV.C, and Tables E-1 and E-2

2.2.2 Palisades Administrative Procedure 10.46, "Plant Records"

2.2.3 Palisades Administrative Procedure 10.41, "Procedure and Policy Processes"

**TITLE: PALISADES RADIOLOGICAL ENVIRONMENTAL PROGRAM
SAMPLE COLLECTION AND SHIPMENT**

3.0 PREREQUISITES

As indicated in procedure.

4.0 PRECAUTIONS AND LIMITATIONS

- 4.1 This procedure shall be applicable to Palisades/C&RP, Environmental Department, and any contractual personnel assigned to collect or evaluate REMP samples.
- 4.2 Any revisions to this procedure shall be reviewed against Palisades ODCM Specifications to verify compliance to all requirements.
- 4.3 Deviations from the required sampling schedule shall be documented in the Annual Radiological Environmental Operating Report.
- 4.4 Every effort shall be made to complete corrective action on malfunctioning sampling equipment prior to the end of the next sampling period.
- 4.5 If it is not possible to obtain the required samples, suitable alternative media and locations shall be substituted within 30 days.
- 4.6 Samples shall be collected, prepared, and shipped for analysis in a timely manner to preserve integrity. Other specific handling precautions for sample media are indicated in Section 5.0 as required.
- 4.7 Obtain best available replacement sample for any missing sample. Some samples are not replaceable (TLDs, air samples, etc), however, water, milk, crop samples, etc, should be.
- 4.8 Document any missing samples or malfunctioning equipment on sample data collection sheets.

**TITLE: PALISADES RADIOLOGICAL ENVIRONMENTAL PROGRAM
SAMPLE COLLECTION AND SHIPMENT**

5.0 PROCEDURE

USER ALERT
INFORMATION USE PROCEDURE

The activities covered by this procedure may be performed from memory.

5.1 CONTROL AND OVERSIGHT OF SAMPLING FOR THE RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

5.1.1 Sampling techniques described by this procedure must be strictly adhered with.

- a. This includes use of tweezers for air sample media change out to ensure the collected media is not disturbed.
- b. Recorded data should be verified including verification of transcribed data to avoid errors.
- c. All deviations from performance requirements, unavailable samples, or other sampling anomalies must be reported to the C&RP Radiological Environmental Contact.

5.1.2 Failure of sample collectors to comply with sampling and reporting requirements may result in remedial training, or reassignment of sampling duties.

5.1.3 The C&RP radiological environmental contact shall conduct periodic (annual) audits of air sampling activities performed by non-Palisades C&RP personnel.

- a. These audits shall include observation of collection techniques, verification of procedural compliance, and review of equipment condition.

Included in the review of equipment condition, is to ensure that any fast growing trees and bushes in the vicinity of the station are removed, along with any branches extending over the top of the sampler. The goal is to keep every station away from the drip line (with the exception of station 9, which has an existing canopy 50 feet above the station).

- b. Audits should specifically address air sample collection and should include observation of all individuals involved in sample changeout.

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- c. Results of the audits and any follow up action should be documented in the REMP file.

Collect samples using the following methodology in accordance with schedule and location data described in Attachments 1 and 2.

5.2 REMP AIR SAMPLE COLLECTION

5.2.1 Precautions

- a. New filters and cartridges should be transported and handled such that potential contamination of them is minimized (ie, placed in clean plastic bags, etc).
- b. If an air sampling unit is discovered not operating, attempt to find the cause and repair. If this cannot be done, replace applicable component and document on air sample collection data sheet.
- c. Airflow meters shall be calibrated annually by General Meter. All in service calibrated meters will have affixed a valid calibration sticker/card stating date of calibration and calibration due date.
- d. Airflow meters shall be changed out prior to the expiration of calibration dates.
- e. Air station leakage shall be none detectable. If the replacement of air station components is required due to air leakage, document on air sample collection data sheet.

5.2.2 Prerequisites

- a. Glass fiber (particulate) air filters
- b. Charcoal cartridges for iodine sampling (prelabeled for each air sampler)
- c. Glassine or plastic envelopes (prelabeled for each air sampler)
- d. REMP Air Sample Data Sheet (containing installation data)
- e. Replacement air sample meters (as required)

**TITLE: PALISADES RADIOLOGICAL ENVIRONMENTAL PROGRAM
SAMPLE COLLECTION AND SHIPMENT**

- f. Tweezers
- g. Stop Watch
- h. Step Ladder

NOTE: The Control Stations 10-GR, 11-KZ, are changed out weekly by independent collectors, and mailed in separately. The prelabeling of cartridges and envelopes, detailed below, is not required for these stations as sample mix-up is not possible. In addition, for these control stations, the Palisades Sample Collection Form and Records (Page 1 of Attachment 5) is completed by the Technician changing out the ten local stations by transferring the recorded data provided by the independent collectors.

5.2.3 Perform the following weekly at each sample location:

- a. Open the protective cover on the air sample station and verify the sampling location number written on the inside of the door is the same as the prelabeled sample change-out package.
- b. Verify that the meter serial number and calibration due date are correctly documented on Palisades Plant Environmental Monitor Operability Check and Sample Collection data form (Page 1 of Attachment 5).
- c. Determine and record the "As Found Flow" rate (seconds for one cubic foot of volume).
- d. Determine and record the "As Found Leak" rate by placing hand over filter housing inlet to form a seal. While holding hand over the inlet, determine if air leakage is evident by checking the air flow meter needle for movement (leakage). If no air leakage, record (N) in the "As Found Leak" column. If air leakage is indicated, determine the cause and repair as soon as possible.
- e. Unplug or turn off the air pump and record the "REMOVED MONTH/DAY/YEAR," "REMOVED TIME," and "GAS METER READING REMOVED."
- f. Remove the prelabeled charcoal cartridge and place in zip lock bag.
- g. Using tweezers, carefully remove particulate filter from the sampler head and place in the prelabeled glassine envelope or plastic envelope.

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- h. Clean out any residue or moisture buildup in sampler head before replacement filter is installed. Check the condition of the sampler head o-rings. Replace cracked o-rings as necessary to prevent air leakage.
- i. Install new particulate filter and charcoal cartridge and ensure that both are properly centered in sampler head to prevent air leakage. Ensure the fiber side of the particulate filter is facing out (smooth side facing inward).
- j. Restart air pump. Place hand over the filter housing inlet to form a seal, determine if air leakage is evident by checking air flow meter needle movement. If no air leakage, record (N) in the "As Left Leak" column. If air leakage indicated, determine the cause of the leakage (filter not centered in holder properly or cracked o-ring) and correct problem as soon as possible, restoring system to no air leakage.
- k. Determine and record "As Left" flow rate. If greater than 90 seconds are required for one cubic foot of volume, the sample pump is degrading. Replace pump as soon as possible to avoid failure to reach minimum sample volume. (5000 ft³).
- l. If an airflow meter must be replaced, record this in the "Comments" column. Record replacement meter data in the reading on the upcoming week's sample collection data sheet.
- m. Close the protective cover on the air sample station.
- n. Proceed to the next station. Date and sign the current week's data sheet upon completion of the entry of all current data.
- o. Calculate and record "SAMPLE VOL (FT3)," ALSO ensure all pertinent data is recorded.
- p. Transcribe the "REMOVED MONTH/DAY/YR" and "GAS METER READING REMOVED" taken in Step 5.2.3e to the "INSTALLED" reading columns on the sample collection sheet to be used for the upcoming week's air sample collection. Also transcribe the meter serial number and calibration due date to the upcoming week's sample collection sheet.

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**5.3 REMP LAKE (DRINKING) WATER SAMPLE COLLECTION -
SOUTH HAVEN, MICHIGAN**

5.3.1 Prerequisites

- a. Two clean, one-gallon plastic containers labeled with sample type, location, amount, and date (or collection period)
- b. Data Sheet (Attachment 3)

5.3.2 Perform the following sample collection monthly:

- a. Leave two containers with the plant personnel at the South Haven Municipal Water Treatment Plant. New water sample containers should be left at the South Haven Water Treatment Plant upon pickup of end-of-month composite samples.
- b. Instruct the plant personnel to add approximately 300 ml per day of raw water to containers labeled "RAW."
- c. Return at end of month to collect containers. Obtain verbal verification that Step 5.3.2b was carried out. Note any deviations in "Remarks" column of data sheet.
- d. Label containers with sample type, location, and collection period.
- e. Package and ship samples per Attachment 4.
- f. Record location, sample types, and amount on sample identification data sheet (Attachment 3).

**5.4 STEAM GENERATOR STORAGE FACILITY MONITORING WELL WATER
SAMPLE COLLECTION**

5.4.1 Prerequisites

- a. Clean, one-gallon plastic containers
- b. Data Sheet (Attachment 3)

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5.4.2 Perform the following sample collection monthly:

- a. Begin pumping water, and allow water to run for approximately one minute to purge the lines.
- b. Fill two clean, one-gallon plastic containers with well water from each sample location.
- c. Label containers with sample type, location, and collection date.
- d. Package and ship samples per Attachment 4.
- e. Record on data sheet location, type, date, amount, and under "Remarks" any pertinent information.

5.5 REMP MILK SAMPLE COLLECTION

5.5.1 Precautions

- a. Milk samples shall be sent to the laboratory as soon as possible because of the short half-life of I-131. Any undue delay may cause ODCM, Appendix A, Table E-3 analytical LLD requirements to be violated.
- b. Obtain best available replacement sample for any missing milk sample(s). Identify new sample location(s) and update location in Attachment 2.
- c. If milk samples are unavailable, then samples of three different kinds of broad leaf vegetation grown nearest to Palisades in each of two different offsite locations of the highest predicted average ground level D/Q (SE or SSE sectors near site), and one sample of each kind of similar broad leaf vegetation grown 15-30 km distant from Palisades in the least prevalent wind direction (NNE, NE or ENE sectors) may be used as replacement samples. The new sample locations shall be identified and the REMP procedures revised within 30 days to reflect sampling changes. Collect approximately one kilogram (2.2 lb) of each sample type.

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5.5.2 Prerequisites

- a. Two clean, plastic one-gallon containers for each sample location
- b. Sodium bisulfite preservative (approximately 40 gm per gallon of milk required)
- c. Data Sheet (Attachment 3)

5.5.3 Perform the following monthly at each specified sample collection location:

- a. Obtain two one-gallon grab samples of raw milk as specified in Attachments 1 and 2.
- b. Add approximately 40 gm of sodium bisulfite to each one-gallon container of milk and thoroughly mix. The sodium bisulfite can either be in prepared packets or "scooped" with a volumetric measure from its container.
- c. Label containers with sample type, location, and date.
- d. Package and ship samples as per Attachment 4.
- e. Record on Sample Data Sheet, the location, type, date, and amount of samples. Under "Remarks," note any other pertinent information.

5.6 REMP AQUATIC BIOTA COLLECTION

5.6.1 Precautions

- a. Collection to be coordinated between Radiological Services Department RMC Section and the Environmental Department. At least one individual in the collection party is required to have MDEQ Cultural and Scientific Fish Collectors Permit if gill net is used.
- b. If logistical problems prevent use of a boat to set gill nets from the lake side of Palisades, then the nets can be set offshore from the site boundary (by wading). Notify Security prior to using offshore wading method for beach access.

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5.6.2 Prerequisites

- a. Boat with required safety equipment, or waders
- b. Gill nets with weights and floats
- c. Plastic one-liter wide-mouth bottles
- d. Data Sheet (Attachment 3)
- e. Fillet knives
- f. Black permanent felt markers for sample identification on containers
- g. Notify district MDEQ Fisheries biologist prior to sample collection

5.6.3 Collect samples twice during the season of greatest abundance (typically May through October) as follows:

- a. Gill nets are placed at the locations specified in Attachment 1 to collect at least two species of commercially and/or recreationally important fish in the vicinity of the Plant discharge area and the same species in an area not influenced by the Plant discharge (Ludington Pump Storage Plant or other CMS Energy facility). One liter of flesh should be collected for each species caught for analysis accuracy.
- b. Normally fish will be collected first from the vicinity of the discharge. REMP coordinator will then collect at least two of the same species at Ludington (control station). Or REMP coordinator will provide the Ludington collector with a list of the species collected in the vicinity of the discharge, with instructions to collect at least two of the same species.
- c. Label all containers with sample type, location, and date.
- d. Package and ship samples per Attachment 4.
- e. Record on data sheet location, type, date, amount, and under "Remarks" indicate any pertinent information.

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5.7 REMP SEDIMENT SAMPLE COLLECTION

5.7.1 Prerequisites

- a. One-liter, wide-mouth plastic sample bottles
- b. Data Sheet (Attachment 3)

5.7.2 Collect sediment samples semiannually at collection locations specified in Attachment 1 (includes control sample at the Ludington Pump Storage Plant).

- a. Label containers with sample type, location, and date.
- b. Package and ship samples per Attachment 4.
- c. Record on Sample Data Sheet location, type, date, and amount of sample. Note any other pertinent information in the "Remarks" section.

5.8 REMP FOOD PRODUCT SAMPLE COLLECTION

- a. Sample containers
- b. Data Sheet (Attachment 3)

5.8.1 Collect food samples monthly during the harvest season, as per ODCM, Appendix A, Table E-1. One sample each of the two principal fruit crops blueberries and apples must be collected.

- a. Collect approximately one kilogram (2.2 lb) of each sample type. Samples are not to be washed, shaken, or cleaned. Samples should not be collected from a single source, but at random from the entire orchard or field.
- b. Label all containers with sample type, location, and date.
- c. Package and ship samples per Attachment 4.
- d. Record on data sheet location, type, date, amount, and under "Remarks" note any unusual conditions.

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5.9 REMP TLD SAMPLE COLLECTION

5.9.1 Prerequisites

- a. TLDs
- b. TLD Data Sheet (Attachment 5)

5.9.2 Monthly, quarterly, and annually at each sample location perform the following:

- a. Upon receipt of TLDs from the laboratory contractor, all TLDs shall be inventoried and immediately placed in the lead cave. Note date of receipt and inventory on TLD data sheet.
- b. Field TLDs shall only be removed from the lead cave for delivery to their proper locations. All control TLDs remain in the lead cave throughout the entire exposure period.
- c. Remove and replace TLDs at each sample location.
- d. For any missing TLDs, perform the following:
 - 1. Search immediate area.
 - 2. If lost TLD is found, collect it and perform standard change out procedure.
 - 3. If lost TLD is not found, post the new TLD in proper location.
 - 4. Record in "Remarks" column of data sheet any of the above circumstances.
- e. Store collected field TLDs in lead cave along with control TLDs until ready for mailing to laboratory contractor. Mark "Do not x-ray" on TLD package.
- f. Transportation control TLDs (Shield TLDs) are to be stored in a special lead shield provided by laboratory contractor after the field TLDs are posted.

Ensure that designated transportation control TLDs are included with the correct TLD package being mailed to laboratory contractor. Also ensure that laboratory contractor's TLD data sheet is completed and enclosed with shipment.

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- g. Record TLD collection date and the date that the TLDs are returned to the vendor. Initial/sign the data sheet (Attachment 5). Record the installation date for the new TLDs on the appropriate data sheet.
- h. Package and ship samples per Attachment 4.

5.10 MISCELLANEOUS SAMPLES

5.10.1 Ludington - Control Station

NOTE: Sediment samples are also collected at Ludington Pump Storage Plant per Section 5.7 of this procedure.

- a. Ludington Lake In composites are collected daily and shipped to Palisades on a monthly basis.
- b. Palisades RETS/REMP personnel record appropriate data on the Sample Data Sheet for shipment to Environmental Inc.

5.10.2 Palisades Daily Samples

- a. Palisades Lake In, Lake Out, Site Water, Service Water, and Turbine Sump effluent samples are collected on a daily basis per Palisades per Health Physics Procedure HP 6.52, "Palisades (Onsite) Radiological Environmental Program Sample Collection."
- b. Palisades RETS/REMP personnel record appropriate data on the Sample Data Sheet and label all samples.

6.0 ACCEPTANCE CRITERIA

Proper completion of procedure.

**TITLE: PALISADES RADIOLOGICAL ENVIRONMENTAL PROGRAM
SAMPLE COLLECTION AND SHIPMENT**

7.0 ATTACHMENTS AND RECORDS

7.1 ATTACHMENTS

7.1.1 Attachment 1, "Environmental Sample Collection Schedule"

7.1.2 Attachment 2, "Sample Locations"

7.1.3 Attachment 3, "Sample Identification"

7.1.4 Attachment 4, "Sample Packaging and Shipment"

7.1.5 Attachment 5, "Palisades Sample Collection Forms and Records"

7.2 RECORDS

7.2.1 Distribution of Sample Collection Data Sheet as per Attachment 4.

7.2.2 All Radiological Environmental Monitoring Program Records shall be considered complete when the Annual Radiological Environmental Operating Report is submitted to the NRC. Records shall be retained in accordance with Palisades Administrative Procedure 10.46, "Plant Records."

8.0 SPECIAL REVIEWS

8.1 The scope of this procedure does not include activities that require a 50.59 review per Palisades Administrative Procedure 10.41, "Procedure and Policy Processes." Therefore, changes to this procedure do not require a 50.59 review.

ENVIRONMENTAL SAMPLE COLLECTION SCHEDULE

Palisades Nuclear Plant

| <u>Exposure Pathway and/or Sample</u> | <u>Number of Samples and Locations*</u> | <u>Sample Type</u> | <u>Collection Frequency</u> |
|---------------------------------------|---|---|-----------------------------|
| Airborne: Particulates | 1 - Onsite 8 - Within a 10 km Radius 3 - 25 to 89 km Distant | Continuous at approximately 1 cfm (may be less due to dust loading) | Weekly |
| Iodines | Same as Particulates | Same as particulates | Weekly |
| Waterborne: Lake Water | 1 - Intake 1 - Discharge 1 - Intake (Ludington Control) | Daily composite to obtain a one-gallon sample | Monthly |
| Drinking Water | 1 - S Haven Municipal System - Raw | | |
| Well Water | **3 - Plant Site Locations | Two-gallon grab sample | Monthly |
| Sediment | 1 - Within 152.4 m of discharge (500 ft) 1 - 0.8 km North of discharge 1 - 0.8 km South of discharge 1 - 8.9 km North 1 - Ludington control | One-liter grab sample | Semiannually |

**These are monitoring wells of the groundwater for the Steam Generator Storage Facility, this is not part of the environmental sampling program.

*If samples are unavailable at the specified location, an attempt should be made to sample at an alternate location (refer to Step 4.5).

ENVIRONMENTAL SAMPLE COLLECTION SCHEDULE

Palisades Nuclear Plant

| <u>Exposure Pathway and/or Sample</u> | <u>Number of Samples and Locations*</u> | <u>Sample Type</u> | <u>Collection Frequency</u> |
|---------------------------------------|---|--------------------|-----------------------------|
|---------------------------------------|---|--------------------|-----------------------------|

NOTE: Currently there are no dairy farms within a distance of 5 to 8 km from the Plant. However, milk samples will be obtained at 3 locations within a distance of 15 km when available. When milk samples are collected, broad leaf vegetation sampling is not required.

| | | | |
|--------------------|--|---|--------------------------------------|
| Ingestion: Milk | 3 - From 5 to 8 km 1 - Control from 15 to 30 km | Two-gallon grab sample | Monthly |
| Food Products | 1 - Each of two principal fruit crops (blueberries and apples). | Two-pound grab sample | At time of harvest |
| Fish | 2 - Location in vicinity of Plant discharge 2 - Ludington control or other CMS Energy facility | One-liter fish flesh from each available species, two species required. Obtain the same species from the control location. | Twice in season |
| Direct: TLD | 1 -Onsite 16 - 9 -Within 12 km radius 3 -Control stations 1 -Control in lead cave | Continuous | Monthly Quarterly and Annually |

*If samples are unavailable at the specified location, an attempt should be made to sample at an alternate location (refer to Step 4.5).

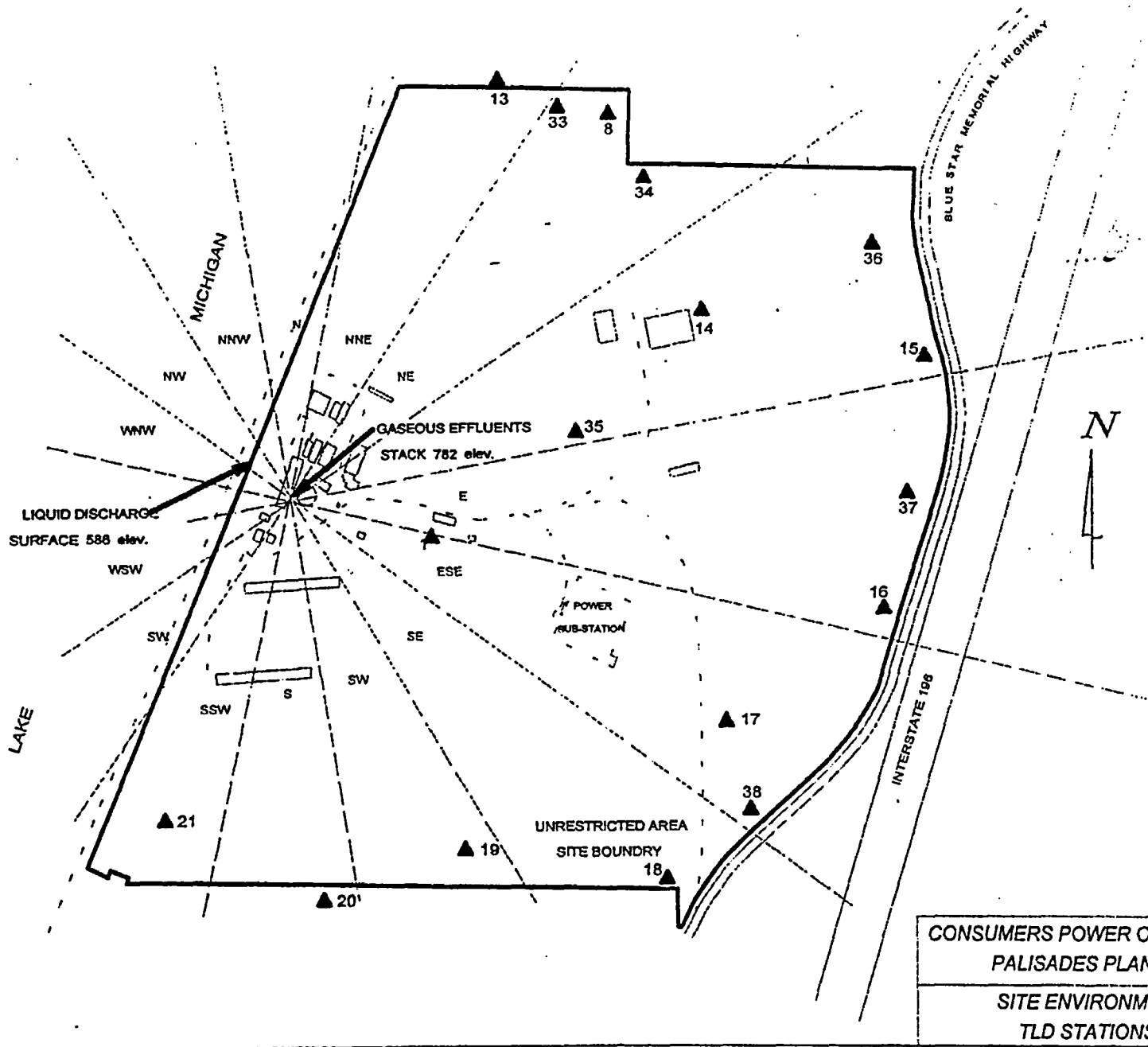
SAMPLE LOCATIONS
 Palisades Nuclear Plant

| Station | Code | Location | Air Particulates | Air Iodine | Lake Water | Well Water | Milk | Food Products | Sediment | TLD | Fish |
|---------|------|---|---|------------|------------|------------|------|---------------|----------|-----|------|
| *1 | ST | Palisades Nuclear Plant | Mounted onsite, 500 ft east of main gate. 25 ft south of access road next to well. | X | X | X | | | X | X | X |
| 2 | TH | RR 3 Coloma, MI 5.6 miles S | Along 48th Ave, 50 ft east of 80th St, 25 ft off north side of road. TLD located on 80th Street, west side on post, 200 feet south of the air sample station. | X | X | | | | | X | |
| 3 | HS | 76182 48th Ave Covert, MI 5.8 miles SSE | Along 48th Ave, 1/4 mile west of 76th St. In barnyard 50 yds off north side of road. | X | X | | | | | X | |
| 4 | JS | 36197 M-140 Hwy Covert, MI 3-1/2 miles SE | Along 36th Ave, 1/2 mile east of M-140 15 ft off south side of road. TLD located in front yard of residence. | X | X | | | X | | X | |
| 5 | PR | 72723 CR 378 Covert, MI 3-1/2 miles ESE | Along CR 378, 3/4 mile east of M-140, 30 ft off north side of road. TLD located at Paul Rood residence, on tree in back yard just past driveway. | X | X | | | X | | X | |
| 6 | RB | RR 3 South Haven, MI 4-1/2 miles NE | Along 12th Ave, 1/4 mile west of M-43, 30 ft off south side of road. | X | X | | | | | X | |
| 7 | SD | Sherman Dairy South Haven, MI 6.5 miles NNE | Along Phoenix Rd, directly behind Sherman Dairy. 1/4 mile east of I-196 and Phoenix Rd on north side. | X | X | | | | | | |
| 7a | SN21 | Emergency Siren 21 4.1 miles NNE | On Monroe Blvd, at corner of 11th Street. | | | | | | | X | |
| 8 | SP | State Park 1 mile N | Onsite along the dump road, north of Plant. One mile from main gate. Near State Park boundary, on side of road as road turns west. | X | X | | | | | X | |

*Plant Site Well #2 or #3

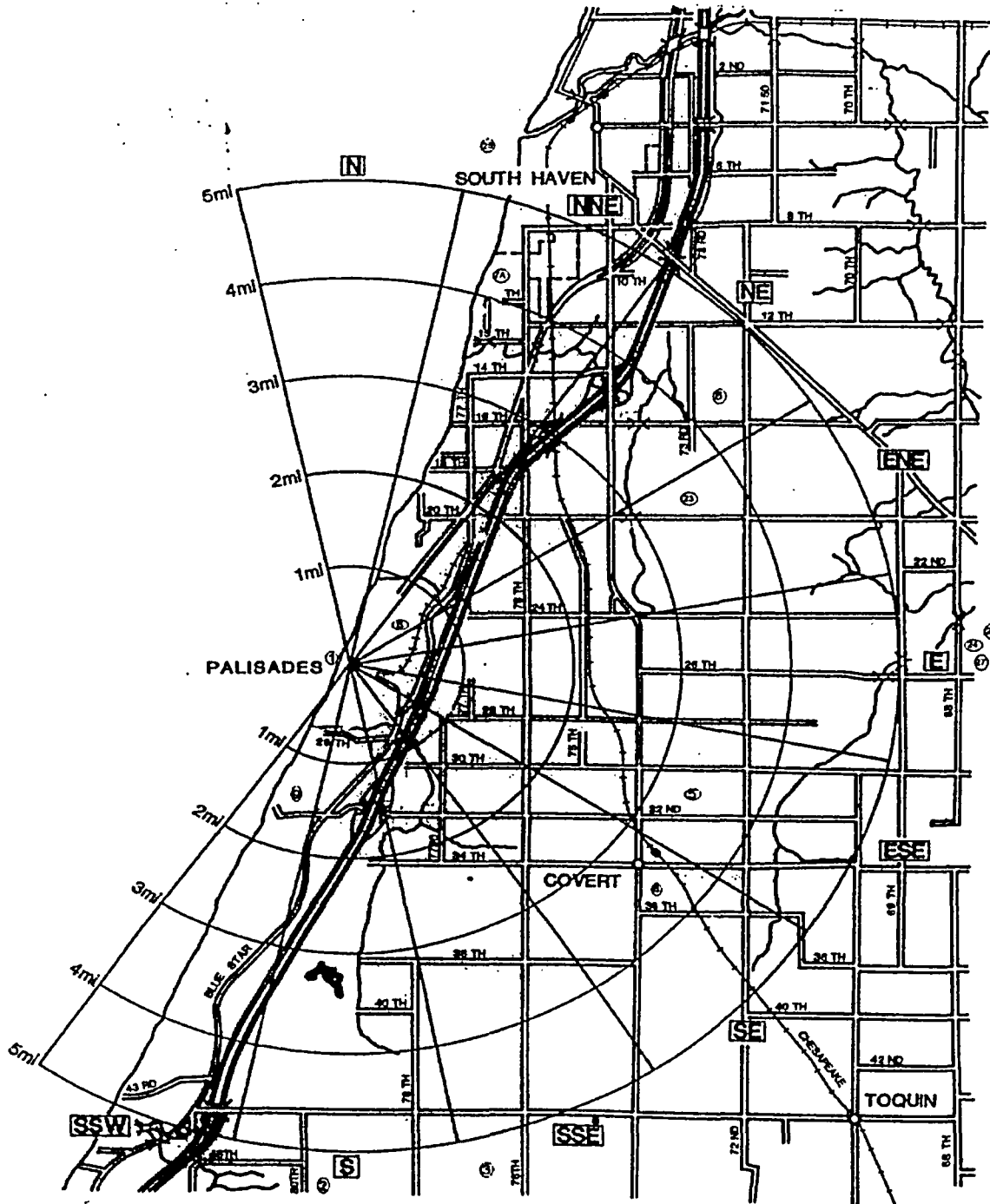
SAMPLE LOCATIONS
Palisades Nuclear Plant

| Station | Code | Location | Air Particulates | Air Iodine | Lake Water | Well Water | Milk | Food Products | Sediment | TLD | Fish |
|---------|------|--------------------------------|---------------------|---------------|---------------|---------------|------|------------------|----------|-----|------|
| 34 | ST | Perimeter of Palisades NE | | | | | | | | X | |
| 35 | ST | Perimeter of Palisades ENE | | | | | | | | X | |
| 36 | ST | Perimeter of Palisades ENE | | | | | | | | X | |
| 37 | ST | Perimeter of Palisades E | | | | | | | | X | |
| 38 | ST | Perimeter of Palisades SE | | | | | | | | X | |
| 41 | ST | Plant Site Monitoring Well #14 | | | | X | | | | | |
| 42 | ST | Plant Site Monitoring Well #15 | | | | X | | | | | |
| 43 | ST | Plant Site Monitoring Well #16 | | | | X | | | | | |
| 44 | ST | Control Station NNE | | | | | | | X | | |



SAMPLE LOCATIONS
Palisades Nuclear Plant

SAMPLE LOCATIONS
Palisades Nuclear Plant

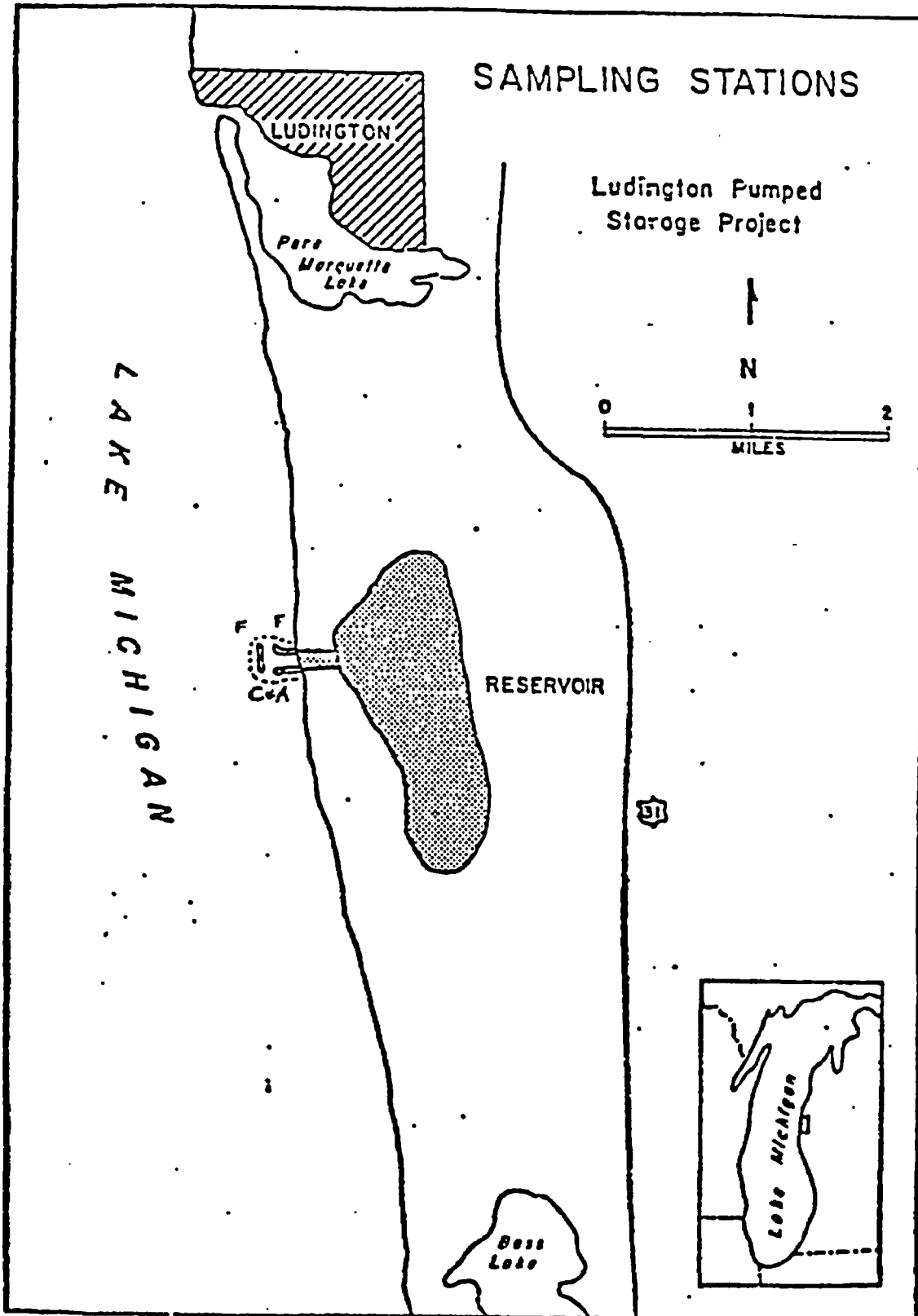


NOT SHOWN (Control Locations)

- 10 Grand Rapids (55 mi NNE)
- 11 Kalamazoo (35 mi E)
- 12 Dowagiac (30 mi SSE)
- 22 Control TLD placed in lead cave off site
- 26 Joe Hay (JH - 11.4 mi ESE)

SAMPLE LOCATIONS
Palisades Nuclear Plant

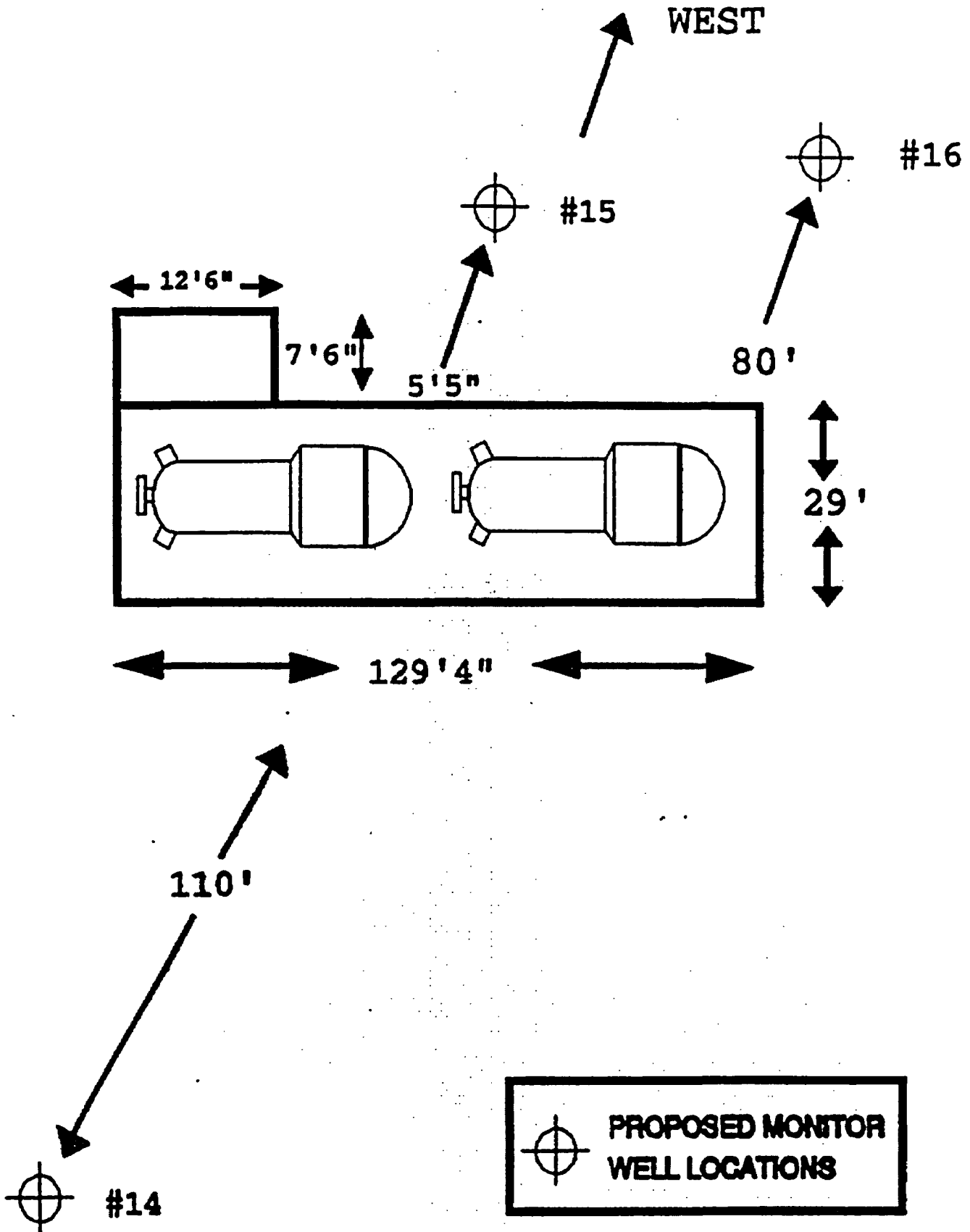
Proc No HP 10.10
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SAMPLE LOCATIONS
Palisades Nuclear Plant

| <u>REMP SAMPLING</u> | <u>NUMBER</u> | <u>WELL STATUS</u> | <u>LOCATION</u> |
|----------------------|---------------|--------------------|---|
| NO | #1 | Abandon | NA |
| NO | #2 | Abandon | North side of Support Building. Supports Plant site. |
| NO | #3 | Abandon | Across from East-Radwaste (South Side) backup for well #2. |
| NO | #4 | Abandon | NA |
| NO | #5 | Abandon | NA |
| NO | #6 | Active | Located ~ 145 ft west of Blue Star Hwy. Used for training trailers, well capped when not in service and well is outside of Westerly Groundwater Flow to Plant and interim storage facility. |
| NO | #7 | Abandon | Just to the west & between outage building and interim storage facility: Water is nonpotable and used in warehouse restrooms (later to be used for fire system only). |
| NO | #8 | Abandon | NA |
| NO | #9 | Abandon | Located at junction of access and warehouse road, domestic water supply for warehouse when it is put in service. |
| NO | #10 | Abandon | NA |
| NO | #11 | Abandon | North of access road and east of construction road, supplies domestic water for outage building, all in one tie-in. |
| | #12 | Abandon | |
| | #13 | Abandon | |
| YES | #14 | Active | East of Interim Storage Facility, used for REMP monitoring well. |
| YES | #15 | Active | Southwest of Interim Storage Facility, used for REMP monitoring well. |
| YES | #16 | Active | Northwest of Interim Storage Facility, used for REMP monitoring well. |

SAMPLE LOCATIONS
Palisades Nuclear Plant



SAMPLE IDENTIFICATION

PALISADES PLANT

Miscellaneous Radiological Environmental Samples

Date Shipped: _____

| Location | Type | Date | Time | Amount | Remarks |
|----------------------|----------------|---------------------|------|-----------|---------|
| Allen Karr | Milk | | | 2 Gallons | |
| Danny Carpenter | Milk | | | 2 Gallons | |
| Dennis Hessey | Milk | | | 2 Gallons | |
| William Shine | Milk | | | 2 Gallons | |
| South Haven | Raw Water | Monthly Composite - | NA | 2 Gallons | |
| Site #14 | Well Water | | | 2 Gallons | |
| Site #15 | Well Water | | | 2 Gallons | |
| Site #16 | Well Water | | | 2 Gallons | |
| Lake In | Plant Water | Monthly Composite - | NA | 1 Gallon | |
| Lake Out | Plant Water | Monthly Composite - | NA | 1 Gallon | |
| Service Water | Plant Water | Monthly Composite - | NA | 1 Gallon | |
| Plant Drinking Water | Plant Water | Monthly Composite - | NA | 1 Gallon | |
| Ludington Lake | Control Sample | Monthly Composite - | NA | 1 Gallon | |
| Ludington Well | Control Sample | Monthly Composite - | NA | 1 Gallon | |

SAMPLE PACKAGING AND SHIPMENT

1. Label samples clearly per Attachment 3.
2. Seal all liquid, biota, fish, and sediment sample containers with tape to prevent leakage.
3. Ship liquid samples separately from air particulate and air iodine samples and TLDs.
4. Use sufficient packing material (ie, crumpled newspaper) to avoid possible sample container damage during shipment.
5. Package air filters in glassine or plastic envelopes.
6. For TLD shipments, make sure that laboratory contractor's own TLD data sheet is enclosed with package.
7. Ship milk samples as soon as possible. Be sure to add a sufficient amount of sodium bisulfite (40 grams) as preservative to each sample.
8. Ship food products as soon as possible after collection.
9. Ship fish frozen or packed in ice, or with a 10% formaldehyde solution added (preservative). Only 10 milliliters is required per sample. Samples should be shipped as soon as possible after processing.
10. Distribute copies of the Sample Collection Data Sheet(s) to the:

Analytical Laboratory
Radiological Services Department Environmental Contact (Palisades)
11. Send samples to the following address:

Environmental Inc.
Att: Laboratory Manager
700 Landwehr Road
Northbrook, IL 60062
12. Ship all samples to the laboratory contractor with minimal delay after collection so as to avoid elevated analytical levels of detection.

PALISADES SAMPLE COLLECTION FORMS AND RECORDS

**PALISADES PLANT
 ENVIRONMENTAL MONITOR OPERABILITY CHECK
 AND SAMPLE COLLECTION**

| | | | REMOVED TIME | GAS METER READING | | METER SERIAL NO | FLOW TEST | | | | REPLACEMENT METER | | SAMPLE VOL (F13) | COMMENTS |
|------|----------------------|--------------------|--------------|-------------------|---------------|-----------------|----------------|------------|----------------|------------|-------------------|---------------------------|------------------|----------|
| | INSTALLED (MO/DA/YR) | REMOVED (MO/DA/YR) | | INSTALLED (F13) | REMOVED (F13) | | AS FOUND | | AS LEFT | | SERIAL NUMBER | CALIB ACCURACY ACCEPTABLE | | |
| | | | | | | | FLOW (SEC/F13) | LEAK (Y/N) | FLOW (SEC/F13) | LEAK (Y/N) | CAL DUE DATE | | | |
| 1ST | | | | | | | | | | | | | | |
| 2TH | | | | | | | | | | | | | | |
| 3HS | | | | | | | | | | | | | | |
| 4JS | | | | | | | | | | | | | | |
| 5PR | | | | | | | | | | | | | | |
| 6RB | | | | | | | | | | | | | | |
| 7SD | | | | | | | | | | | | | | |
| 8SP | | | | | | | | | | | | | | |
| 9TP | | | | | | | | | | | | | | |
| 10GR | | | | | | | | | | | | | | |
| 11KZ | | | | | | | | | | | | | | |
| 12DG | | | | | | | | | | | | | | |

TEST PERFORMED BY: _____ DATE: _____

REVIEWED BY: _____ DATE: _____

**PALISADES SAMPLE COLLECTION FORMS
AND RECORDS**

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Page 2 of 2

CONSUMERS ENERGY
PALISADES ENVIRONMENTAL TLD REPORT

- MONTHLY
 QUARTERLY
 ANNUAL

Collector _____

| STATION - LOCATION | INSTALLED | | COLLECTED | | REMARKS |
|--|--|------|--|------|---------|
| | DATE | TIME | DATE | TIME | |
| C-1 | | | | | |
| C-2 | | | | | |
| ST22 ST | | | | | |
| ST5 PR | | | | | |
| ST6 RB | | | | | |
| ST24 SN6 | | | | | |
| ST23 SN19 | | | | | |
| ST7a SN21 | | | | | |
| ST16 ST | | | | | |
| ST15 ST | | | | | |
| ST1 ST | | | | | |
| ST14 ST | | | | | |
| ST8 SP | | | | | |
| ST13 ST | | | | | |
| ST17 ST | | | | | |
| ST18 ST | | | | | |
| ST19 ST | | | | | |
| ST20 ST | | | | | |
| ST21 ST | | | | | |
| ST9 TP | | | | | |
| ST12 DG | | | | | |
| ST3 HS | | | | | |
| ST2 TH | | | | | |
| ST4 JS | | | | | |
| ST10 GR | | | | | |
| ST11 KZ | | | | | |
| ST-33 ST | | | | | |
| ST-34 ST | | | | | |
| ST-35 ST | | | | | |
| ST-36 ST | | | | | |
| ST-37 ST | | | | | |
| ST-38 ST | | | | | |
| | | | | | |
| | | | | | |
| Date Received From Vendor (With Intransit TLDs) and Initials | Date TLDs Inventoried and Placed in Lead Cave (With Intransit TLDs) and Initials | | Date TLDs Returned to Vendor For Analysis (With Intransit TLDs) and Initials | | |

ATTACHMENT D

**PALISADES 2004 FINAL REPORT
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)
AS PROVIDED BY ENVIRONMENTAL, INC, MIDWEST LABORATORY**

48 Pages Follow



Environmental, Inc.
Midwest Laboratory
an Allegheny Technologies Co.

700 Landwehr Road • Northbrook, IL 60062-2310
ph. (847) 564-0700 • fax (847) 564-4517

MONTHLY PROGRESS REPORT
TO
CONSUMER'S ENERGY COMPANY
JACKSON, MICHIGAN

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)
FOR
PALISADES NUCLEAR GENERATING PLANT

PREPARED AND SUBMITTED
BY
ENVIRONMENTAL, INC., MIDWEST LABORATORY

Project Number: 8022

Reporting Period: January-May, 2000

Reviewed and
Approved by _____
B. Grob, M.S.
Technical Lead

Date _____

Distribution: M. Grogan (1 copy)

1.0 INTRODUCTION

The following constitutes the current 2004 Monthly Progress Report for the Radiological Environmental Monitoring Program conducted at the Consumers Energy Company, Palisades Nuclear Generating Plant. Results of completed analyses are presented in the attached tables. Missing entries indicate analyses that are not yet completed.

Missing tables indicate that those tables are not yet used in the monthly report.

For all gamma isotopic analyses, spectrum is computer scanned from 80 to 2048 KeV. Specifically included are Mn-54, Fe-59, Co-58, Co-60, Zn-65, Zr-95, Nb-95, I-131, Ba-La-140, Cs-134 and Cs-137. Naturally-occurring gamma-emitters, such as K-40 and Ra daughters, are frequently detected but not listed here. Data listed as "<" are at the 4.66 sigma level, others are 2 sigma.

All concentrations, except gross alpha and gross beta, are decay corrected to the time of collection.

All samples were collected within the scheduled period unless noted otherwise in the Listing of Missed Samples.

1.0 INTRODUCTION

The following constitutes the final 2004 Monthly Progress Report for the Radiological Environmental Monitoring Program conducted at the Consumers Energy Company, Palisades Nuclear Generating Plant. Results of completed analyses are presented in the attached tables.

For all gamma isotopic analyses, spectrum is computer scanned from 80 to 2048 KeV. Specifically included are Mn-54, Fe-59, Co-58, Co-60, Zn-65, Zr-95, Nb-95, I-131, Ba-La-140, Cs-134 and Cs-137. Naturally-occurring gamma-emitters, such as K-40 and Ra daughters, are frequently detected but not listed here. Data listed as "<" are at the 4.66 sigma level, others are 2 sigma.

All concentrations, except gross alpha and gross beta, are decay corrected to the time of collection.

All samples were collected within the scheduled period unless noted otherwise in the Listing of Missed Samples.

PALISADES

2.0 LISTING OF MISSED SAMPLES

| Sample Type | Location | Expected Collection Date | Reason |
|-------------|----------|--------------------------|---------------------------|
| AP | PA-4 | 03-22-04 | Low result; filter light. |
| AP | PA-5 | 05-03-04 | Low result; filter light. |
| TLD | ST-20 | 07-30-04 | TLD missing in field. |

PALISADES

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.

Location: 1ST - Palisades

Units: pCi/m³

Collection: Continuous, weekly exchange.

| Date Collected | Volume (m ³) | Gross Beta | I-131 | Date Collected | Volume (m ³) | Gross Beta | I-131 |
|-------------------------|--------------------------|---------------|--------------|----------------------|--------------------------|---------------|--------------|
| <u>Required LLD</u> | | <u>0.010</u> | <u>0.070</u> | | | <u>0.010</u> | <u>0.070</u> |
| 01-05-04 | 394 | 0.030 ± 0.003 | < 0.010 | 07-06-04 | 371 | 0.025 ± 0.003 | < 0.012 |
| 01-11-04 | 297 | 0.039 ± 0.004 | < 0.010 | 07-12-04 | 278 | 0.019 ± 0.003 | < 0.010 |
| 01-19-04 | 402 | 0.031 ± 0.003 | < 0.010 | 07-18-04 | 283 | 0.024 ± 0.003 | < 0.017 |
| 01-26-04 | 348 | 0.033 ± 0.004 | < 0.015 | 07-26-04 | 354 | 0.025 ± 0.003 | < 0.010 |
| 02-01-04 | 300 | 0.037 ± 0.004 | < 0.015 | 08-02-04 | 317 | 0.028 ± 0.004 | < 0.011 |
| 02-09-04 | 402 | 0.035 ± 0.003 | < 0.009 | 08-09-04 | 323 | 0.026 ± 0.003 | < 0.009 |
| 02-16-04 | 348 | 0.033 ± 0.004 | < 0.018 | 08-16-04 | 326 | 0.018 ± 0.003 | < 0.012 |
| 02-23-04 | 343 | 0.036 ± 0.003 | < 0.013 | 08-23-04 | 314 | 0.028 ± 0.003 | < 0.025 |
| 03-01-04 | 340 | 0.028 ± 0.003 | < 0.010 | 08-30-04 | 309 | 0.022 ± 0.004 | < 0.006 |
| 03-08-04 | 346 | 0.026 ± 0.003 | < 0.012 | 09-07-04 | 371 | 0.032 ± 0.003 | < 0.017 |
| 03-15-04 | 337 | 0.033 ± 0.003 | < 0.009 | 09-13-04 | 272 | 0.024 ± 0.003 | < 0.017 |
| 03-22-04 | 343 | 0.023 ± 0.003 | < 0.014 | 09-20-04 | 329 | 0.028 ± 0.004 | < 0.014 |
| 03-29-04 | 334 | 0.023 ± 0.003 | < 0.014 | 09-26-04 | 266 | 0.034 ± 0.004 | < 0.020 |
| | | | | 10-03-04 | 340 | 0.020 ± 0.003 | < 0.014 |
| 1st Qtr. Mean ± s.d. | | 0.031 ± 0.005 | < 0.018 | 3rd Qtr. Mean ± s.d. | | 0.025 ± 0.005 | < 0.025 |
| 04-05-04 | 331 | 0.022 ± 0.003 | < 0.011 | 10-10-04 | 329 | 0.026 ± 0.003 | < 0.016 |
| 04-12-04 | 295 | 0.023 ± 0.004 | < 0.011 | 10-17-04 | 331 | 0.024 ± 0.004 | < 0.008 |
| 04-20-04 | 391 | 0.024 ± 0.003 | < 0.010 | 10-25-04 | 382 | 0.020 ± 0.003 | < 0.010 |
| 04-26-04 | 283 | 0.022 ± 0.004 | < 0.013 | 11-01-04 | 326 | 0.032 ± 0.004 | < 0.013 |
| 05-03-04 | 334 | 0.022 ± 0.003 | < 0.009 | 11-08-04 | 331 | 0.021 ± 0.003 | < 0.012 |
| 05-10-04 | 331 | 0.026 ± 0.003 | < 0.011 | 11-15-04 | 346 | 0.025 ± 0.003 | < 0.015 |
| 05-17-04 | 323 | 0.023 ± 0.003 | < 0.019 | 11-22-04 | 323 | 0.033 ± 0.002 | < 0.014 |
| 05-24-04 | 289 | 0.022 ± 0.003 | < 0.029 | 11-29-04 | 317 | 0.027 ± 0.004 | < 0.010 |
| 06-01-04 | 377 | 0.013 ± 0.002 | < 0.021 | 12-06-04 | 340 | 0.029 ± 0.003 | < 0.013 |
| 06-07-04 | 275 | 0.022 ± 0.004 | < 0.019 | 12-14-04 | 394 | 0.029 ± 0.003 | < 0.012 |
| 06-14-04 | 323 | 0.020 ± 0.003 | < 0.015 | 12-20-04 | 289 | 0.028 ± 0.004 | < 0.013 |
| 06-21-04 | 320 | 0.020 ± 0.003 | < 0.008 | 12-27-04 | 351 | 0.031 ± 0.003 | < 0.016 |
| 06-28-04 | 323 | 0.016 ± 0.003 | < 0.021 | 01-03-05 | 340 | 0.040 ± 0.004 | < 0.010 |
| 2nd Qtr. Mean ± s.d. | | 0.021 ± 0.003 | < 0.029 | 4th Qtr. Mean ± s.d. | | 0.028 ± 0.005 | < 0.016 |
| Cumulative Average | | | | | | 0.026 | |
| Previous Annual Average | | | | | | 0.027 | |

PALISADES

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.

Location: 2TH - Coloma (5.6 mi. S)

Units: pCi/m³

Collection: Continuous, weekly exchange.

| Date Collected | Volume (m ³) | Gross Beta | I-131 | Date Collected | Volume (m ³) | Gross Beta | I-131 |
|----------------------|--------------------------|---------------|--------------|-------------------------|--------------------------|--------------------------|--------------|
| <u>Required LLD</u> | | <u>0.010</u> | <u>0.070</u> | | | <u>0.010</u> | <u>0.070</u> |
| 01-05-04 | 394 | 0.036 ± 0.004 | < 0.010 | 07-06-04 | 374 | 0.023 ± 0.003 | < 0.012 |
| 01-11-04 | 309 | 0.028 ± 0.003 | < 0.010 | 07-12-04 | 275 | 0.015 ± 0.003 | < 0.010 |
| 01-19-04 | 405 | 0.034 ± 0.003 | < 0.010 | 07-19-04 | 326 | 0.022 ± 0.003 | < 0.014 |
| 01-26-04 | 351 | 0.024 ± 0.003 | < 0.015 | 07-26-04 | 326 | 0.028 ± 0.003 | < 0.011 |
| 02-01-04 | 317 | 0.033 ± 0.004 | < 0.014 | 08-02-04 | 323 | 0.031 ± 0.004 | < 0.011 |
| 02-09-04 | 399 | 0.035 ± 0.003 | < 0.009 | 08-09-04 | 326 | 0.028 ± 0.003 | < 0.009 |
| 02-16-04 | 363 | 0.032 ± 0.004 | < 0.017 | 08-15-04 | 280 | 0.015 ± 0.004 | < 0.015 |
| 02-23-04 | 348 | 0.030 ± 0.003 | < 0.013 | 08-23-04 | 374 | 0.028 ± 0.003 | < 0.022 |
| 03-01-04 | 340 | 0.028 ± 0.003 | < 0.010 | 08-30-04 | 323 | 0.022 ± 0.003 | < 0.006 |
| 03-08-04 | 351 | 0.026 ± 0.003 | < 0.011 | 09-07-04 | 368 | 0.031 ± 0.003 | < 0.017 |
| 03-15-04 | 346 | 0.035 ± 0.003 | < 0.008 | 09-13-04 | 283 | 0.022 ± 0.003 | < 0.016 |
| 03-22-04 | 348 | 0.021 ± 0.003 | < 0.014 | 09-20-04 | 331 | 0.025 ± 0.003 | < 0.014 |
| 03-29-04 | 340 | 0.026 ± 0.003 | < 0.013 | 09-26-04 | 269 | 0.036 ± 0.004 | < 0.020 |
| | | | | 10-03-04 | 337 | 0.023 ± 0.003 | < 0.014 |
| 1st Qtr. Mean ± s.d. | | 0.030 ± 0.005 | < 0.017 | 3rd Qtr. Mean ± s.d. | | 0.025 ± 0.006 | < 0.022 |
| 04-05-04 | 346 | 0.017 ± 0.003 | < 0.011 | 10-10-04 | 331 | 0.027 ± 0.003 | < 0.016 |
| 04-12-04 | 340 | 0.023 ± 0.003 | < 0.010 | 10-17-04 | 329 | 0.022 ± 0.003 | < 0.008 |
| 04-20-04 | 391 | 0.024 ± 0.003 | < 0.010 | 10-25-04 | 388 | 0.019 ± 0.003 | < 0.010 |
| 04-26-04 | 280 | 0.025 ± 0.004 | < 0.013 | 11-01-04 | 329 | 0.035 ± 0.004 | < 0.013 |
| 05-03-04 | 343 | 0.022 ± 0.003 | < 0.009 | 11-08-04 | 343 | 0.020 ± 0.003 | < 0.011 |
| 05-10-04 | 331 | 0.026 ± 0.003 | < 0.011 | 11-15-04 | 337 | 0.028 ± 0.004 | < 0.015 |
| 05-17-04 | 329 | 0.019 ± 0.003 | < 0.018 | 11-22-04 | 334 | 0.034 ± 0.002 | < 0.013 |
| 05-24-04 | 331 | 0.018 ± 0.003 | < 0.025 | 11-29-04 | 346 | 0.028 ± 0.003 | < 0.009 |
| 06-01-04 | 382 | 0.015 ± 0.002 | < 0.021 | 12-06-04 | 343 | 0.031 ± 0.003 | < 0.013 |
| 06-07-04 | 278 | 0.027 ± 0.004 | < 0.019 | 12-14-04 | 391 | 0.027 ± 0.003 | < 0.012 |
| 06-14-04 | 323 | 0.021 ± 0.003 | < 0.015 | 12-20-04 | 303 | 0.027 ± 0.004 | < 0.012 |
| 06-21-04 | 326 | 0.020 ± 0.003 | < 0.008 | 12-27-04 | 357 | 0.029 ± 0.003 | < 0.016 |
| 06-28-04 | 329 | 0.015 ± 0.003 | < 0.020 | 01-03-05 | 343 | 0.041 ± 0.004 | < 0.010 |
| 2nd Qtr. Mean ± s.d. | | 0.021 ± 0.004 | < 0.025 | 4th Qtr. Mean ± s.d. | | 0.028 ± 0.006 ± 0.006 | < 0.016 |
| | | | | Cumulative Average | | 0.026 | |
| | | | | Previous Annual Average | | 0.027 | |

PALISADES

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.

Location: 3HS - Covert (5.8 mi. SE)

Units: pCi/m³

Collection: Continuous, weekly exchange.

| Date Collected | Volume (m ³) | Gross Beta | I-131 | Date Collected | Volume (m ³) | Gross Beta | I-131 |
|-------------------------|--------------------------|---------------|--------------|----------------------|--------------------------|---------------|--------------|
| <u>Required LLD</u> | | <u>0.010</u> | <u>0.070</u> | | | <u>0.010</u> | <u>0.070</u> |
| 01-05-04 | 391 | 0.028 ± 0.003 | < 0.010 | 07-06-04 | 379 | 0.024 ± 0.003 | < 0.012 |
| 01-11-04 | 297 | 0.032 ± 0.004 | < 0.010 | 07-12-04 | 278 | 0.016 ± 0.003 | < 0.010 |
| 01-19-04 | 399 | 0.032 ± 0.003 | < 0.010 | 07-19-04 | 326 | 0.021 ± 0.003 | < 0.014 |
| 01-26-04 | 306 | 0.026 ± 0.004 | < 0.018 | 07-26-04 | 329 | 0.024 ± 0.003 | < 0.011 |
| 02-01-04 | 261 | 0.037 ± 0.005 | < 0.017 | 08-02-04 | 326 | 0.027 ± 0.004 | < 0.011 |
| 02-09-04 | 399 | 0.031 ± 0.003 | < 0.009 | 08-09-04 | 329 | 0.027 ± 0.003 | < 0.009 |
| 02-16-04 | 357 | 0.035 ± 0.004 | < 0.017 | 08-15-04 | 280 | 0.015 ± 0.004 | < 0.015 |
| 02-23-04 | 348 | 0.030 ± 0.003 | < 0.013 | 08-23-04 | 374 | 0.025 ± 0.003 | < 0.022 |
| 03-01-04 | 343 | 0.029 ± 0.003 | < 0.010 | 08-30-04 | 329 | 0.018 ± 0.003 | < 0.006 |
| 03-08-04 | 351 | 0.024 ± 0.003 | < 0.011 | 09-07-04 | 371 | 0.032 ± 0.003 | < 0.017 |
| 03-15-04 | 346 | 0.035 ± 0.003 | < 0.008 | 09-13-04 | 283 | 0.023 ± 0.003 | < 0.016 |
| 03-22-04 | 351 | 0.023 ± 0.003 | < 0.014 | 09-20-04 | 337 | 0.028 ± 0.004 | < 0.014 |
| 03-29-04 | 334 | 0.026 ± 0.004 | < 0.014 | 09-26-04 | 275 | 0.032 ± 0.004 | < 0.019 |
| | | | | 10-03-04 | 343 | 0.021 ± 0.003 | < 0.013 |
| 1st Qtr. Mean ± s.d. | | 0.030 ± 0.004 | < 0.018 | 3rd Qtr. Mean ± s.d. | | 0.024 ± 0.005 | < 0.022 |
| 04-05-04 | 346 | 0.019 ± 0.003 | < 0.011 | 10-10-04 | 331 | 0.024 ± 0.003 | < 0.016 |
| 04-12-04 | 343 | 0.021 ± 0.003 | < 0.010 | 10-17-04 | 331 | 0.023 ± 0.003 | < 0.008 |
| 04-20-04 | 388 | 0.026 ± 0.003 | < 0.010 | 10-25-04 | 396 | 0.019 ± 0.002 | < 0.010 |
| 04-26-04 | 280 | 0.022 ± 0.004 | < 0.013 | 11-01-04 | 334 | 0.034 ± 0.004 | < 0.013 |
| 05-03-04 | 343 | 0.021 ± 0.003 | < 0.009 | 11-08-04 | 343 | 0.022 ± 0.003 | < 0.011 |
| 05-10-04 | 331 | 0.026 ± 0.003 | < 0.011 | 11-15-04 | 340 | 0.027 ± 0.003 | < 0.015 |
| 05-17-04 | 329 | 0.022 ± 0.003 | < 0.018 | 11-22-04 | 365 | 0.035 ± 0.002 | < 0.012 |
| 05-24-04 | 331 | 0.021 ± 0.003 | < 0.025 | 11-29-04 | 379 | 0.028 ± 0.003 | < 0.008 |
| 06-01-04 | 382 | 0.015 ± 0.002 | < 0.021 | 12-06-04 | 374 | 0.030 ± 0.003 | < 0.012 |
| 06-07-04 | 280 | 0.023 ± 0.004 | < 0.019 | 12-14-04 | 428 | 0.025 ± 0.003 | < 0.011 |
| 06-14-04 | 326 | 0.019 ± 0.003 | < 0.015 | 12-20-04 | 329 | 0.025 ± 0.004 | < 0.011 |
| 06-21-04 | 329 | 0.020 ± 0.003 | < 0.008 | 12-27-04 | 385 | 0.030 ± 0.003 | < 0.015 |
| 06-28-04 | 329 | 0.017 ± 0.003 | < 0.020 | 01-03-05 | 365 | 0.044 ± 0.004 | < 0.010 |
| 2nd Qtr. Mean ± s.d. | | 0.021 ± 0.003 | < 0.025 | 4th Qtr. Mean ± s.d. | | 0.028 ± 0.007 | < 0.016 |
| Cumulative Average | | | | | | 0.026 | |
| Previous Annual Average | | | | | | 0.027 | |

PALISADES

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.

Location: 4JS - Covert (3.5 mi. SE)

Units: pCi/m³

Collection: Continuous, weekly exchange.

| Date Collected | Volume (m ³) | Gross Beta | I-131 | Date Collected | Volume (m ³) | Gross Beta | I-131 |
|----------------------|--------------------------|----------------------------|--------------|-------------------------|--------------------------|----------------------------|--------------|
| <u>Required LLD</u> | | <u>0.010</u> | <u>0.070</u> | | | <u>0.010</u> | <u>0.070</u> |
| 01-05-04 | 371 | 0.031 ± 0.004 | < 0.010 | 07-06-04 | 348 | 0.026 ± 0.003 | < 0.013 |
| 01-11-04 | 286 | 0.029 ± 0.004 | < 0.010 | 07-12-04 | 278 | 0.015 ± 0.003 | < 0.010 |
| 01-19-04 | 379 | 0.032 ± 0.003 | < 0.011 | 07-19-04 | 300 | 0.022 ± 0.003 | < 0.015 |
| 01-26-04 | 334 | 0.022 ± 0.003 | < 0.016 | 07-26-04 | 297 | 0.029 ± 0.003 | < 0.012 |
| 02-01-04 | 295 | 0.034 ± 0.004 | < 0.015 | 08-02-04 | 292 | 0.036 ± 0.004 | < 0.012 |
| 02-09-04 | 377 | 0.032 ± 0.003 | < 0.009 | 08-09-04 | 300 | 0.032 ± 0.003 | < 0.009 |
| 02-16-04 | 331 | 0.035 ± 0.004 | < 0.018 | 08-15-04 | 261 | 0.016 ± 0.004 | < 0.016 |
| 02-23-04 | 320 | 0.034 ± 0.003 | < 0.014 | 08-23-04 | 346 | 0.025 ± 0.003 | < 0.024 |
| 03-01-04 | 317 | 0.031 ± 0.003 | < 0.011 | 08-30-04 | 286 | 0.018 ± 0.004 | < 0.006 |
| 03-08-04 | 323 | 0.026 ± 0.003 | < 0.012 | 09-07-04 | 340 | 0.035 ± 0.003 | < 0.019 |
| 03-15-04 | 323 | 0.033 ± 0.004 | < 0.009 | 09-13-04 | 261 | 0.025 ± 0.003 | < 0.017 |
| 03-22-04 | 329 | 0.008 ± 0.002 ^a | < 0.015 | 09-20-04 | 306 | 0.029 ± 0.004 | < 0.015 |
| 03-29-04 | 317 | 0.027 ± 0.004 | < 0.014 | 09-26-04 | 252 | 0.032 ± 0.004 | < 0.021 |
| | | | | 10-03-04 | 314 | 0.019 ± 0.003 | < 0.015 |
| 1st Qtr. Mean ± s.d. | | 0.029 ± 0.007 | < 0.018 | 3rd Qtr. Mean ± s.d. | | 0.026 ± 0.007 | < 0.024 |
| 04-05-04 | 317 | 0.022 ± 0.003 | < 0.011 | 10-10-04 | 309 | 0.029 ± 0.003 | < 0.017 |
| 04-12-04 | 314 | 0.027 ± 0.004 | < 0.011 | 10-17-04 | 303 | 0.024 ± 0.004 | < 0.009 |
| 04-20-04 | 360 | 0.025 ± 0.003 | < 0.010 | 10-25-04 | 365 | 0.020 ± 0.003 | < 0.010 |
| 04-26-04 | 263 | 0.023 ± 0.004 | < 0.014 | 11-01-04 | 309 | 0.032 ± 0.004 | < 0.014 |
| 05-03-04 | 317 | 0.025 ± 0.003 | < 0.010 | 11-08-04 | 320 | 0.023 ± 0.003 | < 0.012 |
| 05-10-04 | 303 | 0.028 ± 0.003 | < 0.012 | 11-15-04 | 150 | 0.041 ± 0.007 ^b | < 0.034 |
| 05-17-04 | 306 | 0.024 ± 0.003 | < 0.020 | 11-22-04 | 309 | 0.034 ± 0.003 | < 0.014 |
| 05-24-04 | 306 | 0.023 ± 0.003 | < 0.028 | 11-29-04 | 320 | 0.032 ± 0.004 | < 0.010 |
| 06-01-04 | 354 | 0.015 ± 0.003 | < 0.022 | 12-06-04 | 326 | 0.028 ± 0.003 | < 0.014 |
| 06-07-04 | 258 | 0.023 ± 0.004 | < 0.021 | 12-14-04 | 368 | 0.026 ± 0.003 | < 0.013 |
| 06-14-04 | 303 | 0.023 ± 0.004 | < 0.016 | 12-20-04 | 286 | 0.029 ± 0.004 | < 0.013 |
| 06-21-04 | 300 | 0.019 ± 0.003 | < 0.008 | 12-27-04 | 337 | 0.030 ± 0.003 | < 0.017 |
| 06-28-04 | 303 | 0.017 ± 0.003 | < 0.022 | 01-03-05 | 326 | 0.047 ± 0.004 | < 0.011 |
| 2nd Qtr. Mean ± s.d. | | 0.023 ± 0.004 | < 0.028 | 4th Qtr. Mean ± s.d. | | 0.030 ± 0.007 | < 0.034 |
| | | | | Cumulative Average | | 0.027 | |
| | | | | Previous Annual Average | | 0.027 | |

^a Filter light.

^b New pump installed.

PALISADES

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.

Location: 5PR - Covert (3.5 mi. ESE)

Units: pCi/m³

Collection: Continuous, weekly exchange.

| Date Collected | Volume (m ³) | Gross Beta | I-131 | Date Collected | Volume (m ³) | Gross Beta | I-131 |
|----------------------|--------------------------|----------------------------|--------------|-------------------------|--------------------------|---------------|--------------|
| <u>Required LLD</u> | | <u>0.010</u> | <u>0.070</u> | | | <u>0.010</u> | <u>0.070</u> |
| 01-05-04 | 396 | 0.030 ± 0.003 | < 0.010 | 07-06-04 | 382 | 0.024 ± 0.003 | < 0.012 |
| 01-11-04 | 306 | 0.030 ± 0.003 | < 0.010 | 07-12-04 | 266 | 0.019 ± 0.003 | < 0.010 |
| 01-19-04 | 411 | 0.033 ± 0.003 | < 0.010 | 07-19-04 | 326 | 0.021 ± 0.003 | < 0.014 |
| 01-26-04 | 357 | 0.025 ± 0.003 | < 0.015 | 07-26-04 | 323 | 0.028 ± 0.003 | < 0.011 |
| 02-01-04 | 312 | 0.034 ± 0.004 | < 0.014 | 08-02-04 | 323 | 0.029 ± 0.004 | < 0.011 |
| 02-09-04 | 405 | 0.035 ± 0.003 | < 0.009 | 08-09-04 | 329 | 0.027 ± 0.003 | < 0.009 |
| 02-16-04 | 354 | 0.034 ± 0.004 | < 0.017 | 08-15-04 | 280 | 0.014 ± 0.004 | < 0.015 |
| 02-23-04 | 348 | 0.032 ± 0.003 | < 0.013 | 08-23-04 | 371 | 0.026 ± 0.003 | < 0.022 |
| 03-01-04 | 346 | 0.028 ± 0.003 | < 0.010 | 08-30-04 | 309 | 0.024 ± 0.004 | < 0.006 |
| 03-08-04 | 346 | 0.024 ± 0.003 | < 0.012 | 09-07-04 | 368 | 0.033 ± 0.003 | < 0.017 |
| 03-15-04 | 348 | 0.036 ± 0.003 | < 0.008 | 09-13-04 | 283 | 0.020 ± 0.003 | < 0.016 |
| 03-22-04 | 348 | 0.023 ± 0.003 | < 0.014 | 09-20-04 | 334 | 0.023 ± 0.003 | < 0.014 |
| 03-29-04 | 337 | 0.024 ± 0.003 | < 0.014 | 09-26-04 | 272 | 0.032 ± 0.004 | < 0.019 |
| | | | | 10-03-04 | 343 | 0.021 ± 0.003 | < 0.013 |
| 1st Qtr. Mean ± s.d. | | 0.030 ± 0.005 | < 0.017 | 3rd Qtr. Mean ± s.d. | | 0.024 ± 0.005 | < 0.022 |
| 04-05-04 | 346 | 0.020 ± 0.003 | < 0.011 | 10-10-04 | 331 | 0.024 ± 0.003 | < 0.016 |
| 04-12-04 | 343 | 0.021 ± 0.003 | < 0.010 | 10-17-04 | 331 | 0.023 ± 0.003 | < 0.008 |
| 04-20-04 | 385 | 0.025 ± 0.003 | < 0.010 | 10-25-04 | 394 | 0.017 ± 0.002 | < 0.010 |
| 04-26-04 | 283 | 0.020 ± 0.004 | < 0.013 | 11-01-04 | 331 | 0.029 ± 0.004 | < 0.013 |
| 05-03-04 | 346 | 0.006 ± 0.002 ^a | < 0.009 | 11-08-04 | 343 | 0.023 ± 0.003 | < 0.011 |
| 05-10-04 | 331 | 0.025 ± 0.003 | < 0.011 | 11-15-04 | 340 | 0.029 ± 0.004 | < 0.015 |
| 05-17-04 | 326 | 0.021 ± 0.003 | < 0.018 | 11-22-04 | 331 | 0.034 ± 0.002 | < 0.013 |
| 05-24-04 | 329 | 0.020 ± 0.003 | < 0.026 | 11-29-04 | 346 | 0.024 ± 0.003 | < 0.009 |
| 06-01-04 | 379 | 0.015 ± 0.002 | < 0.021 | 12-06-04 | 346 | 0.031 ± 0.003 | < 0.013 |
| 06-07-04 | 278 | 0.020 ± 0.004 | < 0.019 | 12-14-04 | 391 | 0.029 ± 0.003 | < 0.012 |
| 06-14-04 | 320 | 0.021 ± 0.003 | < 0.015 | 12-20-04 | 303 | 0.026 ± 0.004 | < 0.012 |
| 06-21-04 | 323 | 0.020 ± 0.003 | < 0.008 | 12-27-04 | 360 | 0.030 ± 0.003 | < 0.016 |
| 06-28-04 | 329 | 0.017 ± 0.003 | < 0.020 | 01-03-05 | 343 | 0.042 ± 0.004 | < 0.010 |
| 2nd Qtr. Mean ± s.d. | | 0.019 ± 0.005 | < 0.026 | 4th Qtr. Mean ± s.d. | | 0.028 ± 0.006 | < 0.016 |
| | | | | Cumulative Average | | 0.025 | |
| | | | | Previous Annual Average | | 0.027 | |

^a Filter light.

PALISADES

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.

Location: 6RB - South Haven (4.75 mi. NE)

Units: pCi/m³

Collection: Continuous, weekly exchange.

| Date Collected | Volume (m ³) | Gross Beta | I-131 | Date Collected | Volume (m ³) | Gross Beta | I-131 |
|----------------------|--------------------------|---------------|--------------|-------------------------|--------------------------|---------------|--------------|
| <u>Required LLD</u> | | <u>0.010</u> | <u>0.070</u> | | | <u>0.010</u> | <u>0.070</u> |
| 01-05-04 | 379 | 0.029 ± 0.003 | < 0.010 | 07-06-04 | 354 | 0.023 ± 0.003 | < 0.012 |
| 01-11-04 | 292 | 0.030 ± 0.004 | < 0.010 | 07-12-04 | 261 | 0.018 ± 0.003 | < 0.011 |
| 01-19-04 | 391 | 0.033 ± 0.003 | < 0.010 | 07-19-04 | 306 | 0.025 ± 0.003 | < 0.015 |
| 01-26-04 | 337 | 0.023 ± 0.003 | < 0.016 | 07-26-04 | 306 | 0.025 ± 0.003 | < 0.012 |
| 02-01-04 | 292 | 0.034 ± 0.004 | < 0.015 | 08-02-04 | 309 | 0.029 ± 0.004 | < 0.012 |
| 02-09-04 | 382 | 0.035 ± 0.004 | < 0.009 | 08-09-04 | 309 | 0.027 ± 0.003 | < 0.009 |
| 02-16-04 | 337 | 0.033 ± 0.004 | < 0.018 | 08-15-04 | 266 | 0.015 ± 0.004 | < 0.015 |
| 02-23-04 | 331 | 0.033 ± 0.003 | < 0.014 | 08-23-04 | 354 | 0.025 ± 0.003 | < 0.023 |
| 03-01-04 | 326 | 0.029 ± 0.003 | < 0.011 | 08-30-04 | 306 | 0.019 ± 0.003 | < 0.006 |
| 03-08-04 | 329 | 0.026 ± 0.003 | < 0.012 | 09-07-04 | 348 | 0.034 ± 0.003 | < 0.018 |
| 03-15-04 | 329 | 0.037 ± 0.004 | < 0.009 | 09-13-04 | 272 | 0.025 ± 0.003 | < 0.017 |
| 03-22-04 | 331 | 0.022 ± 0.003 | < 0.015 | 09-20-04 | 314 | 0.026 ± 0.004 | < 0.015 |
| 03-29-04 | 323 | 0.027 ± 0.004 | < 0.014 | 09-26-04 | 255 | 0.032 ± 0.004 | < 0.021 |
| | | | | 10-03-04 | 329 | 0.020 ± 0.003 | < 0.014 |
| 1st Qtr. Mean ± s.d. | | 0.030 ± 0.005 | < 0.018 | 3rd Qtr. Mean ± s.d. | | 0.025 ± 0.005 | < 0.023 |
| 04-05-04 | 323 | 0.021 ± 0.003 | < 0.011 | 10-10-04 | 314 | 0.025 ± 0.003 | < 0.016 |
| 04-12-04 | 326 | 0.022 ± 0.003 | < 0.010 | 10-17-04 | 309 | 0.022 ± 0.004 | < 0.009 |
| 04-20-04 | 363 | 0.022 ± 0.003 | < 0.010 | 10-25-04 | 374 | 0.020 ± 0.003 | < 0.010 |
| 04-26-04 | 269 | 0.020 ± 0.004 | < 0.014 | 11-01-04 | 312 | 0.030 ± 0.004 | < 0.014 |
| 05-03-04 | 320 | 0.023 ± 0.003 | < 0.010 | | | | |
| | | | | 11-08-04 | 329 | 0.021 ± 0.003 | < 0.012 |
| 05-10-04 | 314 | 0.025 ± 0.003 | < 0.011 | 11-15-04 | 326 | 0.029 ± 0.004 | < 0.016 |
| 05-17-04 | 312 | 0.021 ± 0.003 | < 0.019 | 11-22-04 | 320 | 0.031 ± 0.002 | < 0.014 |
| 05-24-04 | 306 | 0.021 ± 0.003 | < 0.028 | 11-29-04 | 329 | 0.028 ± 0.004 | < 0.009 |
| 06-01-04 | 360 | 0.015 ± 0.002 | < 0.022 | | | | |
| | | | | 12-06-04 | 331 | 0.031 ± 0.003 | < 0.013 |
| 06-07-04 | 263 | 0.023 ± 0.004 | < 0.020 | 12-14-04 | 374 | 0.026 ± 0.003 | < 0.013 |
| 06-14-04 | 303 | 0.023 ± 0.004 | < 0.016 | 12-20-04 | 295 | 0.030 ± 0.004 | < 0.013 |
| 06-21-04 | 306 | 0.018 ± 0.003 | < 0.008 | 12-27-04 | 343 | 0.030 ± 0.003 | < 0.017 |
| 06-28-04 | 312 | 0.018 ± 0.003 | < 0.022 | 01-03-05 | 334 | 0.042 ± 0.004 | < 0.011 |
| | | | | | | | |
| 2nd Qtr. Mean ± s.d. | | 0.021 ± 0.003 | < 0.028 | 4th Qtr. Mean ± s.d. | | 0.028 ± 0.006 | < 0.017 |
| | | | | Cumulative Average | | 0.026 | |
| | | | | Previous Annual Average | | 0.027 | |

PALISADES

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.

Location: 7SD - South Haven (6.5 mi. NNE)

Units: pCi/m³

Collection: Continuous, weekly exchange.

| Date Collected | Volume (m ³) | Gross Beta | I-131 | Date Collected | Volume (m ³) | Gross Beta | I-131 |
|-------------------------|--------------------------|---------------|--------------|----------------------|--------------------------|---------------|--------------|
| <u>Required LLD</u> | | <u>0.010</u> | <u>0.070</u> | | | <u>0.010</u> | <u>0.070</u> |
| 01-05-04 | 351 | 0.031 ± 0.004 | < 0.009 | 07-06-04 | 246 | 0.029 ± 0.004 | < 0.017 |
| 01-11-04 | 266 | 0.030 ± 0.004 | < 0.014 | 07-12-04 | 286 | 0.017 ± 0.003 | < 0.008 |
| 01-19-04 | 363 | 0.031 ± 0.003 | < 0.012 | 07-19-04 | 340 | 0.021 ± 0.003 | < 0.014 |
| 01-26-04 | 312 | 0.026 ± 0.004 | < 0.011 | 07-26-04 | 337 | 0.027 ± 0.003 | < 0.011 |
| 02-01-04 | 272 | 0.033 ± 0.004 | < 0.020 | 08-02-04 | 340 | 0.032 ± 0.004 | < 0.013 |
| 02-09-04 | 357 | 0.034 ± 0.004 | < 0.012 | 08-09-04 | 340 | 0.029 ± 0.003 | < 0.016 |
| 02-16-04 | 312 | 0.034 ± 0.004 | < 0.011 | 08-15-04 | 292 | 0.017 ± 0.004 | < 0.011 |
| 02-23-04 | 309 | 0.034 ± 0.004 | < 0.012 | 08-23-04 | 391 | 0.025 ± 0.003 | < 0.020 |
| 03-01-04 | 303 | 0.031 ± 0.004 | < 0.015 | 08-30-04 | 337 | 0.019 ± 0.003 | < 0.010 |
| 03-08-04 | 303 | 0.026 ± 0.003 | < 0.014 | 09-07-04 | 382 | 0.032 ± 0.003 | < 0.021 |
| 03-15-04 | 309 | 0.036 ± 0.004 | < 0.012 | 09-13-04 | 297 | 0.026 ± 0.003 | < 0.012 |
| 03-22-04 | 300 | 0.025 ± 0.003 | < 0.008 | 09-20-04 | 351 | 0.029 ± 0.003 | < 0.015 |
| 03-29-04 | 295 | 0.026 ± 0.004 | < 0.013 | 09-26-04 | 286 | 0.036 ± 0.004 | < 0.012 |
| | | | | 10-03-04 | 363 | 0.024 ± 0.003 | < 0.010 |
| 1st Qtr. Mean ± s.d. | | 0.031 ± 0.004 | < 0.020 | 3rd Qtr. Mean ± s.d. | | 0.026 ± 0.006 | < 0.021 |
| 04-05-04 | 283 | 0.019 ± 0.003 | < 0.008 | 10-10-04 | 351 | 0.026 ± 0.003 | < 0.009 |
| 04-12-04 | 286 | 0.021 ± 0.004 | < 0.015 | 10-17-04 | 348 | 0.022 ± 0.003 | < 0.009 |
| 04-20-04 | 320 | 0.026 ± 0.003 | < 0.008 | 10-25-04 | 419 | 0.017 ± 0.002 | < 0.007 |
| 04-26-04 | 235 | 0.026 ± 0.005 | < 0.017 | 11-01-04 | 348 | 0.028 ± 0.003 | < 0.010 |
| 05-03-04 | 266 | 0.023 ± 0.004 | < 0.013 | 11-08-04 | 365 | 0.021 ± 0.003 | < 0.014 |
| 05-10-04 | 283 | 0.028 ± 0.004 | < 0.011 | 11-15-04 | 360 | 0.025 ± 0.003 | < 0.014 |
| 05-17-04 | 272 | 0.021 ± 0.004 | < 0.011 | 11-22-04 | 357 | 0.031 ± 0.002 | < 0.008 |
| 05-24-04 | 275 | 0.023 ± 0.003 | < 0.018 | 11-29-04 | 363 | 0.027 ± 0.003 | < 0.007 |
| 06-01-04 | 320 | 0.016 ± 0.003 | < 0.019 | 12-06-04 | 365 | 0.028 ± 0.003 | < 0.013 |
| 06-07-04 | 221 | 0.025 ± 0.004 | < 0.013 | 12-14-04 | 413 | 0.026 ± 0.003 | < 0.006 |
| 06-14-04 | 329 | 0.023 ± 0.003 | < 0.018 | 12-20-04 | 323 | 0.026 ± 0.004 | < 0.017 |
| 06-21-04 | 334 | 0.019 ± 0.003 | < 0.013 | 12-27-04 | 379 | 0.028 ± 0.003 | < 0.010 |
| 06-28-04 | 348 | 0.017 ± 0.003 | < 0.019 | 01-03-05 | 365 | 0.043 ± 0.004 | < 0.016 |
| 2nd Qtr. Mean ± s.d. | | 0.022 ± 0.004 | < 0.019 | 4th Qtr. Mean ± s.d. | | 0.027 ± 0.006 | < 0.017 |
| Cumulative Average | | | | | | 0.026 | |
| Previous Annual Average | | | | | | 0.028 | |

PALISADES

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.

Location: 8SP - State Park (1.0 mi. N)

Units: pCi/m³

Collection: Continuous, weekly exchange.

| Date Collected | Volume (m ³) | Gross Beta | I-131 | Date Collected | Volume (m ³) | Gross Beta | I-131 |
|----------------------|--------------------------|---------------|--------------|-------------------------|--------------------------|---------------|--------------|
| <u>Required LLD</u> | | <u>0.010</u> | <u>0.070</u> | | | <u>0.010</u> | <u>0.070</u> |
| 01-05-04 | 357 | 0.030 ± 0.004 | < 0.009 | 07-06-04 | 379 | 0.023 ± 0.003 | < 0.011 |
| 01-11-04 | 269 | 0.030 ± 0.004 | < 0.013 | 07-12-04 | 278 | 0.017 ± 0.003 | < 0.008 |
| 01-19-04 | 357 | 0.036 ± 0.003 | < 0.012 | 07-18-04 | 295 | 0.024 ± 0.003 | < 0.018 |
| 01-26-04 | 306 | 0.026 ± 0.004 | < 0.011 | 07-26-04 | 363 | 0.025 ± 0.003 | < 0.010 |
| 02-01-04 | 266 | 0.035 ± 0.004 | < 0.021 | 08-02-04 | 326 | 0.031 ± 0.004 | < 0.014 |
| 02-09-04 | 354 | 0.035 ± 0.004 | < 0.012 | 08-09-04 | 331 | 0.028 ± 0.003 | < 0.016 |
| 02-16-04 | 246 | 0.042 ± 0.005 | < 0.015 | 08-15-04 | 286 | 0.015 ± 0.004 | < 0.012 |
| 02-23-04 | 354 | 0.029 ± 0.003 | < 0.010 | 08-23-04 | 377 | 0.027 ± 0.003 | < 0.021 |
| 03-01-04 | 354 | 0.029 ± 0.003 | < 0.013 | 08-30-04 | 317 | 0.023 ± 0.003 | < 0.010 |
| 03-08-04 | 360 | 0.027 ± 0.003 | < 0.012 | 09-07-04 | 382 | 0.033 ± 0.003 | < 0.021 |
| 03-15-04 | 351 | 0.034 ± 0.003 | < 0.011 | 09-13-04 | 280 | 0.022 ± 0.003 | < 0.012 |
| 03-22-04 | 360 | 0.025 ± 0.003 | < 0.006 | 09-20-04 | 340 | 0.026 ± 0.003 | < 0.015 |
| 03-29-04 | 343 | 0.025 ± 0.003 | < 0.011 | 09-26-04 | 280 | 0.033 ± 0.004 | < 0.012 |
| | | | | 10-03-04 | 351 | 0.021 ± 0.003 | < 0.011 |
| 1st Qtr. Mean ± s.d. | | 0.031 ± 0.005 | < 0.021 | 3rd Qtr. Mean ± s.d. | | 0.025 ± 0.005 | < 0.021 |
| 04-05-04 | 348 | 0.019 ± 0.003 | < 0.007 | 10-10-04 | 343 | 0.024 ± 0.003 | < 0.009 |
| 04-12-04 | 346 | 0.022 ± 0.003 | < 0.012 | 10-17-04 | 348 | 0.023 ± 0.003 | < 0.009 |
| 04-20-04 | 391 | 0.023 ± 0.003 | < 0.007 | 10-25-04 | 396 | 0.019 ± 0.003 | < 0.008 |
| 04-26-04 | 289 | 0.024 ± 0.004 | < 0.014 | 11-01-04 | 343 | 0.034 ± 0.004 | < 0.010 |
| 05-03-04 | 343 | 0.022 ± 0.003 | < 0.010 | | | | |
| | | | | 11-08-04 | 351 | 0.023 ± 0.003 | < 0.015 |
| 05-10-04 | 334 | 0.025 ± 0.003 | < 0.009 | 11-15-04 | 354 | 0.029 ± 0.003 | < 0.014 |
| 05-17-04 | 334 | 0.023 ± 0.003 | < 0.009 | 11-22-04 | 348 | 0.032 ± 0.002 | < 0.008 |
| 05-24-04 | 334 | 0.020 ± 0.003 | < 0.015 | 11-29-04 | 357 | 0.028 ± 0.003 | < 0.007 |
| 06-01-04 | 385 | 0.017 ± 0.002 | < 0.016 | | | | |
| | | | | 12-06-04 | 360 | 0.030 ± 0.003 | < 0.013 |
| 06-07-04 | 283 | 0.022 ± 0.004 | < 0.010 | 12-14-04 | 413 | 0.027 ± 0.003 | < 0.006 |
| 06-14-04 | 326 | 0.022 ± 0.003 | < 0.018 | 12-20-04 | 306 | 0.030 ± 0.004 | < 0.018 |
| 06-21-04 | 329 | 0.022 ± 0.003 | < 0.013 | 12-27-04 | 371 | 0.028 ± 0.003 | < 0.010 |
| 06-28-04 | 334 | 0.019 ± 0.003 | < 0.020 | 01-03-05 | 360 | 0.040 ± 0.003 | < 0.017 |
| | | | | | | | |
| 2nd Qtr. Mean ± s.d. | | 0.022 ± 0.002 | < 0.020 | 4th Qtr. Mean ± s.d. | | 0.028 ± 0.005 | < 0.018 |
| | | | | Cumulative Average | | 0.026 | |
| | | | | Previous Annual Average | | 0.028 | |

PALISADES

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.

Location: 9TP - Covert Township Park (1.5 mi. SSW)

Units: pCi/m³

Collection: Continuous, weekly exchange.

| Date Collected | Volume (m ³) | Gross Beta | I-131 | Date Collected | Volume (m ³) | Gross Beta | I-131 |
|----------------------|--------------------------|----------------------------|--------------|-------------------------|--------------------------|---------------|--------------|
| <u>Required LLD</u> | | <u>0.010</u> | <u>0.070</u> | | | <u>0.010</u> | <u>0.070</u> |
| 01-05-04 | 388 | 0.028 ± 0.003 | < 0.008 | 07-06-04 | 382 | 0.024 ± 0.003 | < 0.011 |
| 01-11-04 | 297 | 0.026 ± 0.003 | < 0.012 | 07-12-04 | 272 | 0.017 ± 0.003 | < 0.008 |
| 01-19-04 | 396 | 0.032 ± 0.003 | < 0.011 | 07-19-04 | 320 | 0.022 ± 0.003 | < 0.015 |
| 01-26-04 | 348 | 0.025 ± 0.003 | < 0.010 | 07-26-04 | 329 | 0.023 ± 0.003 | < 0.011 |
| 02-01-04 | 303 | 0.036 ± 0.004 | < 0.018 | 08-02-04 | 329 | 0.031 ± 0.004 | < 0.014 |
| 02-09-04 | 399 | 0.034 ± 0.003 | < 0.011 | 08-09-04 | 331 | 0.027 ± 0.003 | < 0.016 |
| 02-16-04 | 351 | 0.032 ± 0.004 | < 0.010 | 08-15-04 | 286 | 0.016 ± 0.004 | < 0.012 |
| 02-23-04 | 343 | 0.035 ± 0.003 | < 0.011 | 08-23-04 | 382 | 0.021 ± 0.003 | < 0.021 |
| 03-01-04 | 331 | 0.031 ± 0.003 | < 0.014 | 08-30-04 | 317 | 0.021 ± 0.003 | < 0.010 |
| 03-08-04 | 173 | 0.031 ± 0.005 ^a | < 0.024 | 09-07-04 | 374 | 0.031 ± 0.003 | < 0.021 |
| 03-15-04 | 351 | 0.037 ± 0.003 | < 0.011 | 09-13-04 | 292 | 0.025 ± 0.003 | < 0.012 |
| 03-22-04 | 357 | 0.019 ± 0.003 | < 0.006 | 09-20-04 | 343 | 0.029 ± 0.004 | < 0.015 |
| 03-29-04 | 348 | 0.026 ± 0.003 | < 0.011 | 09-26-04 | 278 | 0.027 ± 0.004 | < 0.012 |
| | | | | 10-03-04 | 351 | 0.022 ± 0.003 | < 0.011 |
| 1st Qtr. Mean ± s.d. | | 0.030 ± 0.005 | < 0.024 | 3rd Qtr. Mean ± s.d. | | 0.024 ± 0.005 | < 0.021 |
| 04-05-04 | 351 | 0.019 ± 0.003 | < 0.007 | 10-10-04 | 340 | 0.027 ± 0.003 | < 0.009 |
| 04-12-04 | 351 | 0.022 ± 0.003 | < 0.012 | 10-17-04 | 343 | 0.023 ± 0.003 | < 0.009 |
| 04-20-04 | 394 | 0.022 ± 0.003 | < 0.007 | 10-25-04 | 396 | 0.017 ± 0.002 | < 0.008 |
| 04-26-04 | 292 | 0.022 ± 0.004 | < 0.014 | 11-01-04 | 340 | 0.032 ± 0.004 | < 0.010 |
| 05-03-04 | 346 | 0.020 ± 0.003 | < 0.010 | | | | |
| | | | | 11-08-04 | 357 | 0.021 ± 0.003 | < 0.014 |
| 05-10-04 | 340 | 0.027 ± 0.003 | < 0.009 | 11-15-04 | 346 | 0.026 ± 0.003 | < 0.015 |
| 05-17-04 | 334 | 0.023 ± 0.003 | < 0.009 | 11-22-04 | 348 | 0.033 ± 0.002 | < 0.008 |
| 05-24-04 | 292 | 0.020 ± 0.003 | < 0.017 | 11-29-04 | 354 | 0.025 ± 0.003 | < 0.007 |
| 06-01-04 | 388 | 0.015 ± 0.002 | < 0.016 | | | | |
| | | | | 12-06-04 | 357 | 0.033 ± 0.003 | < 0.013 |
| 06-07-04 | 283 | 0.021 ± 0.004 | < 0.010 | 12-14-04 | 411 | 0.026 ± 0.003 | < 0.006 |
| 06-14-04 | 329 | 0.022 ± 0.003 | < 0.018 | 12-20-04 | 306 | 0.032 ± 0.004 | < 0.018 |
| 06-21-04 | 326 | 0.020 ± 0.003 | < 0.013 | 12-27-04 | 368 | 0.031 ± 0.003 | < 0.010 |
| 06-28-04 | 337 | 0.016 ± 0.003 | < 0.020 | 01-03-05 | 357 | 0.042 ± 0.004 | < 0.017 |
| | | | | | | | |
| 2nd Qtr. Mean ± s.d. | | 0.021 ± 0.003 | < 0.020 | 4th Qtr. Mean ± s.d. | | 0.028 ± 0.006 | < 0.018 |
| | | | | Cumulative Average | | 0.026 | |
| | | | | Previous Annual Average | | 0.027 | |

^a Low volume; pump head replaced.

PALISADES

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.

Location: 10GR - Grand Rapids (55 mi. NNE)

Units: pCi/m³

Collection: Continuous, weekly exchange.

| Date Collected | Volume (m ³) | Gross Beta | I-131 | Date Collected | Volume (m ³) | Gross Beta | I-131 |
|-------------------------|--------------------------|---------------|----------------------|----------------------|--------------------------|---------------|--------------|
| <u>Required LLD</u> | | <u>0.010</u> | <u>0.070</u> | | | <u>0.010</u> | <u>0.070</u> |
| 01-07-04 | 391 | 0.034 ± 0.003 | < 0.016 | 07-07-04 | 306 | 0.023 ± 0.003 | < 0.012 |
| 01-14-04 | 346 | 0.036 ± 0.003 | < 0.018 | 07-14-04 | 317 | 0.017 ± 0.003 | < 0.023 |
| 01-22-04 | 139 | 0.030 ± 0.007 | ^a < 0.028 | 07-21-04 | 331 | 0.028 ± 0.003 | < 0.017 |
| 01-28-04 | 297 | 0.022 ± 0.004 | < 0.026 | 07-28-04 | 317 | 0.023 ± 0.004 | < 0.022 |
| 02-04-04 | 357 | 0.039 ± 0.004 | < 0.018 | 08-04-04 | 314 | 0.039 ± 0.004 | < 0.026 |
| 02-11-04 | 357 | 0.034 ± 0.004 | < 0.015 | 08-11-04 | 323 | 0.025 ± 0.004 | < 0.015 |
| 02-18-04 | 346 | 0.032 ± 0.003 | < 0.017 | 08-18-04 | 323 | 0.019 ± 0.003 | < 0.036 |
| 02-25-04 | 348 | 0.040 ± 0.004 | < 0.020 | 08-25-04 | 323 | 0.030 ± 0.004 | < 0.016 |
| 03-03-04 | 340 | 0.027 ± 0.003 | < 0.019 | 09-01-04 | 329 | 0.019 ± 0.003 | < 0.038 |
| 03-10-04 | 337 | 0.037 ± 0.004 | < 0.018 | 09-09-04 | 368 | 0.033 ± 0.003 | < 0.014 |
| 03-17-04 | 348 | 0.024 ± 0.003 | < 0.010 | 09-15-04 | 261 | 0.040 ± 0.005 | < 0.030 |
| 03-24-04 | 354 | 0.021 ± 0.003 | < 0.016 | 09-22-04 | 320 | 0.028 ± 0.003 | < 0.015 |
| 03-31-04 | 334 | 0.020 ± 0.003 | < 0.011 | 09-28-04 | 280 | 0.034 ± 0.004 | < 0.020 |
| 1st Qtr. Mean ± s.d. | | 0.030 ± 0.007 | < 0.028 | 3rd Qtr. Mean ± s.d. | | 0.028 ± 0.007 | < 0.038 |
| 04-07-04 | 337 | 0.023 ± 0.003 | < 0.019 | 10-06-04 | 377 | 0.022 ± 0.003 | < 0.011 |
| 04-14-04 | 337 | 0.018 ± 0.003 | < 0.013 | 10-13-04 | 320 | 0.028 ± 0.004 | < 0.014 |
| 04-21-04 | 329 | 0.028 ± 0.004 | < 0.019 | 10-20-04 | 343 | 0.022 ± 0.003 | < 0.013 |
| 04-28-04 | 329 | 0.021 ± 0.003 | < 0.016 | 10-27-04 | 329 | 0.025 ± 0.003 | < 0.016 |
| 05-05-04 | 337 | 0.023 ± 0.003 | < 0.014 | 11-04-04 | 368 | 0.024 ± 0.003 | < 0.021 |
| 05-12-04 | 323 | 0.027 ± 0.004 | < 0.014 | 11-10-04 | 289 | 0.038 ± 0.004 | < 0.025 |
| 05-19-04 | 326 | 0.021 ± 0.003 | < 0.023 | 11-17-04 | 337 | 0.031 ± 0.002 | < 0.012 |
| 05-26-04 | 334 | 0.016 ± 0.003 | < 0.029 | 11-24-04 | 331 | 0.032 ± 0.004 | < 0.009 |
| 06-02-04 | 323 | 0.020 ± 0.003 | < 0.014 | 12-01-04 | 354 | 0.022 ± 0.003 | < 0.020 |
| 06-09-04 | 312 | 0.033 ± 0.004 | < 0.029 | 12-08-04 | 340 | 0.032 ± 0.003 | < 0.011 |
| 06-16-04 | 334 | 0.024 ± 0.003 | < 0.020 | 12-15-04 | 343 | 0.033 ± 0.004 | < 0.025 |
| 06-23-04 | 323 | 0.022 ± 0.003 | < 0.025 | 12-22-04 | 354 | 0.031 ± 0.003 | < 0.016 |
| 06-30-04 | 326 | 0.019 ± 0.003 | < 0.020 | 12-29-04 | 357 | 0.034 ± 0.003 | < 0.026 |
| 2nd Qtr. Mean ± s.d. | | 0.023 ± 0.005 | < 0.029 | 4th Qtr. Mean ± s.d. | | 0.029 ± 0.005 | < 0.026 |
| Cumulative Average | | | | | | 0.028 | |
| Previous Annual Average | | | | | | 0.028 | |

^a New pump installed.

PALISADES

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.

Location: 11KZ - Kalamazoo (35 mi. E)

Units: pCi/m³

Collection: Continuous, weekly exchange.

| Date Collected | Volume (m ³) | Gross Beta | I-131 | Date Collected | Volume (m ³) | Gross Beta | I-131 |
|----------------------|--------------------------|---------------|--------------|-------------------------|--------------------------|---------------|--------------|
| <u>Required LLD</u> | | <u>0.010</u> | <u>0.070</u> | | | <u>0.010</u> | <u>0.070</u> |
| 01-08-04 | 419 | 0.035 ± 0.003 | < 0.013 | 07-08-04 | 343 | 0.023 ± 0.003 | < 0.010 |
| 01-15-04 | 320 | 0.038 ± 0.004 | < 0.018 | 07-15-04 | 297 | 0.019 ± 0.003 | < 0.023 |
| 01-23-04 | 365 | 0.021 ± 0.003 | < 0.012 | 07-21-04 | 246 | 0.029 ± 0.004 | < 0.022 |
| 01-28-04 | 221 | 0.026 ± 0.005 | < 0.034 | 07-29-04 | 348 | 0.025 ± 0.003 | < 0.019 |
| 02-06-04 | 399 | 0.040 ± 0.004 | < 0.015 | 08-05-04 | 295 | 0.037 ± 0.004 | < 0.026 |
| 02-13-04 | 326 | 0.033 ± 0.004 | < 0.014 | 08-12-04 | 300 | 0.020 ± 0.004 | < 0.015 |
| 02-19-04 | 269 | 0.030 ± 0.004 | < 0.019 | 08-20-04 | 337 | 0.020 ± 0.003 | < 0.030 |
| 02-26-04 | 309 | 0.034 ± 0.004 | < 0.022 | 08-26-04 | 255 | 0.032 ± 0.004 | < 0.018 |
| | | | | 09-01-04 | 266 | 0.011 ± 0.003 | < 0.045 |
| 03-04-04 | 292 | 0.028 ± 0.003 | < 0.020 | | | | |
| 03-11-04 | 320 | 0.032 ± 0.003 | < 0.017 | 09-09-04 | 326 | 0.031 ± 0.003 | < 0.016 |
| 03-17-04 | 269 | 0.027 ± 0.004 | < 0.012 | 09-15-04 | 263 | 0.033 ± 0.005 | < 0.030 |
| 03-24-04 | 317 | 0.023 ± 0.004 | < 0.018 | 09-23-04 | 343 | 0.032 ± 0.003 | < 0.014 |
| 03-31-04 | 295 | 0.024 ± 0.003 | < 0.012 | 09-30-04 | 297 | 0.024 ± 0.003 | < 0.016 |
| 1st Qtr. Mean ± s.d. | | 0.030 ± 0.006 | < 0.034 | 3rd Qtr. Mean ± s.d. | | 0.026 ± 0.007 | < 0.045 |
| 04-07-04 | 303 | 0.022 ± 0.004 | < 0.021 | 10-06-04 | 275 | 0.022 ± 0.003 | < 0.015 |
| 04-15-04 | 312 | 0.024 ± 0.003 | < 0.013 | 10-14-04 | 340 | 0.030 ± 0.004 | < 0.013 |
| 04-21-04 | 224 | 0.037 ± 0.005 | < 0.028 | 10-20-04 | 280 | 0.020 ± 0.003 | < 0.016 |
| 04-28-04 | 306 | 0.021 ± 0.003 | < 0.018 | 10-28-04 | 340 | 0.029 ± 0.004 | < 0.015 |
| 05-06-04 | 360 | 0.024 ± 0.003 | < 0.013 | 11-04-04 | 309 | 0.022 ± 0.004 | < 0.024 |
| 05-13-04 | 297 | 0.030 ± 0.004 | < 0.014 | 11-10-04 | 218 | 0.036 ± 0.005 | < 0.034 |
| 05-19-04 | 261 | 0.018 ± 0.003 | < 0.027 | 11-17-04 | 312 | 0.032 ± 0.003 | < 0.013 |
| 05-26-04 | 295 | 0.017 ± 0.003 | < 0.033 | 11-24-04 | 300 | 0.032 ± 0.004 | < 0.010 |
| 06-02-04 | 312 | 0.019 ± 0.003 | < 0.014 | 12-02-04 | 360 | 0.025 ± 0.003 | < 0.019 |
| 06-10-04 | 340 | 0.024 ± 0.003 | < 0.025 | 12-08-04 | 263 | 0.032 ± 0.004 | < 0.014 |
| 06-16-04 | 232 | 0.019 ± 0.004 | < 0.029 | 12-16-04 | 354 | 0.029 ± 0.004 | < 0.023 |
| 06-23-04 | 303 | 0.020 ± 0.003 | < 0.027 | 12-23-04 | 215 ^a | 0.034 ± 0.004 | < 0.024 |
| 06-30-04 | 300 | 0.025 ± 0.003 | < 0.022 | 01-03-05 | 368 | 0.039 ± 0.003 | < 0.019 |
| 2nd Qtr. Mean ± s.d. | | 0.023 ± 0.005 | < 0.033 | 4th Qtr. Mean ± s.d. | | 0.029 ± 0.006 | < 0.034 |
| | | | | Cumulative Average | | 0.027 | |
| | | | | Previous Annual Average | | 0.028 | |

^a Pump found off; volume low.

PALISADES

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131.

Location: 12DG - Dowagiac (30 mi. SSE)

Units: pCi/m³

Collection: Continuous, weekly exchange.

| Date Collected | Volume (m ³) | Gross Beta | I-131 | Date Collected | Volume (m ³) | Gross Beta | I-131 |
|----------------------|--------------------------|---------------|--------------|-------------------------|--------------------------|---------------|--------------|
| <u>Required LLD</u> | | <u>0.010</u> | <u>0.070</u> | | | <u>0.010</u> | <u>0.070</u> |
| 01-11-04 | 405 | 0.034 ± 0.003 | < 0.010 | 07-06-04 | 382 | 0.025 ± 0.003 | < 0.011 |
| 01-19-04 | 371 | 0.034 ± 0.003 | < 0.011 | 07-12-04 | 258 | 0.019 ± 0.003 | < 0.009 |
| 01-25-04 | 261 | 0.029 ± 0.004 | < 0.013 | 07-18-04 | 258 | 0.028 ± 0.004 | < 0.021 |
| 02-01-04 | 326 | 0.036 ± 0.004 | < 0.018 | 07-25-04 | 280 | 0.029 ± 0.004 | < 0.014 |
| | | | | 08-01-04 | 297 | 0.029 ± 0.004 | < 0.017 |
| 02-08-04 | 317 | 0.033 ± 0.004 | < 0.014 | | | | |
| 02-16-04 | 374 | 0.034 ± 0.004 | < 0.010 | 08-08-04 | 295 | 0.030 ± 0.003 | < 0.020 |
| 02-23-04 | 317 | 0.032 ± 0.004 | < 0.012 | 08-15-04 | 303 | 0.014 ± 0.003 | < 0.011 |
| 02-29-04 | 261 | 0.031 ± 0.004 | < 0.019 | 08-23-04 | 334 | 0.025 ± 0.003 | < 0.024 |
| | | | | 08-29-04 | 252 | 0.024 ± 0.004 | < 0.014 |
| 03-07-04 | 320 | 0.024 ± 0.003 | < 0.015 | | | | |
| 03-14-04 | 312 | 0.035 ± 0.004 | < 0.014 | 09-05-04 | 292 | 0.025 ± 0.003 | < 0.031 |
| 03-21-04 | 320 | 0.019 ± 0.003 | < 0.008 | 09-13-04 | 348 | 0.028 ± 0.003 | < 0.011 |
| 03-28-04 | 317 | 0.027 ± 0.004 | < 0.013 | 09-19-04 | 255 | 0.023 ± 0.004 | < 0.021 |
| | | | | 09-26-04 | 289 | 0.034 ± 0.004 | < 0.012 |
| | | | | 10-03-04 | 317 | 0.024 ± 0.003 | < 0.012 |
| 1st Qtr. Mean ± s.d. | | 0.031 ± 0.005 | < 0.019 | 3rd Qtr. Mean ± s.d. | | 0.026 ± 0.005 | < 0.031 |
| 04-05-04 | 351 | 0.017 ± 0.003 | < 0.007 | 10-10-04 | 303 | 0.028 ± 0.003 | < 0.010 |
| 04-11-04 | 269 | 0.030 ± 0.004 | < 0.016 | 10-17-04 | 289 | 0.024 ± 0.004 | < 0.011 |
| 04-18-04 | 306 | 0.027 ± 0.003 | < 0.010 | 10-25-04 | 360 | 0.022 ± 0.003 | < 0.009 |
| 04-25-04 | 295 | 0.020 ± 0.004 | < 0.016 | 11-01-04 | 303 | 0.034 ± 0.004 | < 0.012 |
| 05-03-04 | 357 | 0.024 ± 0.003 | < 0.010 | | | | |
| | | | | 11-08-04 | 300 | 0.021 ± 0.004 | < 0.017 |
| 05-09-04 | 263 | 0.029 ± 0.004 | < 0.012 | 11-15-04 | 306 | 0.029 ± 0.004 | < 0.016 |
| 05-16-04 | 295 | 0.024 ± 0.004 | < 0.011 | 11-22-04 | 303 | 0.033 ± 0.003 | < 0.009 |
| 05-23-04 | 246 | 0.020 ± 0.003 | < 0.022 | 11-29-04 | 320 | 0.024 ± 0.003 | < 0.007 |
| 05-31-04 | 303 | 0.017 ± 0.003 | < 0.022 | | | | |
| | | | | 12-06-04 | 303 | 0.035 ± 0.004 | < 0.015 |
| 06-06-04 | 288 | 0.022 ± 0.004 | < 0.013 | 12-14-04 | 388 | 0.028 ± 0.003 | < 0.006 |
| 06-13-04 | 295 | 0.022 ± 0.004 | < 0.022 | 12-20-04 | 249 ^a | 0.035 ± 0.005 | < 0.022 |
| 06-21-04 | 334 | 0.020 ± 0.003 | < 0.014 | 12-27-04 | 323 | 0.033 ± 0.003 | < 0.011 |
| 06-27-04 | 258 | 0.019 ± 0.004 | < 0.027 | 01-03-05 | 314 | 0.043 ± 0.004 | < 0.019 |
| | | | | | | | |
| 2nd Qtr. Mean ± s.d. | | 0.022 ± 0.004 | < 0.027 | 4th Qtr. Mean ± s.d. | | 0.030 ± 0.006 | < 0.022 |
| | | | | Cumulative Average | | 0.027 | |
| | | | | Previous Annual Average | | 0.029 | |

^a Volume low due to pump malfunction; pump replaced.

PALISADES

Table 2. Gamma radiation, as measured by TLDs, monthly exposure.

Units: mR/31 days^a

| | <u>January</u> | <u>February</u> | <u>March</u> |
|----------------|------------------|------------------|------------------|
| Date Placed | 12-31-03 | 01-30-04 | 03-01-04 |
| Date Removed | 01-30-04 | 03-01-04 | 03-31-04 |
| Intransit (mR) | 4.3 ± 0.5 | 1.6 ± 0.3 | 2.6 ± 0.3 |
| ST-01 | 3.4 ± 0.6 | 3.5 ± 0.5 | 3.2 ± 0.4 |
| ST-02 | 5.2 ± 0.6 | 3.9 ± 0.5 | 5.2 ± 0.4 |
| ST-03 | 4.8 ± 0.6 | 4.2 ± 0.4 | 4.7 ± 0.5 |
| ST-04 | 5.2 ± 0.9 | 4.6 ± 0.4 | 4.9 ± 0.6 |
| ST-05 | 4.7 ± 0.7 | 3.8 ± 0.4 | 4.6 ± 0.4 |
| ST-06 | 4.9 ± 0.8 | 3.6 ± 0.4 | 4.4 ± 0.5 |
| ST-07A | 4.5 ± 0.7 | 3.4 ± 0.3 | 4.2 ± 0.5 |
| ST-08 | 4.3 ± 0.7 | 3.6 ± 0.3 | 4.1 ± 0.4 |
| ST-09 | 4.2 ± 0.6 | 3.7 ± 0.6 | 3.8 ± 0.4 |
| ST-10 | 5.3 ± 0.6 | 3.8 ± 0.3 | 4.2 ± 0.5 |
| ST-11 | 5.2 ± 0.7 | 4.8 ± 0.4 | 5.3 ± 0.5 |
| ST-12 | 4.1 ± 0.6 | 4.5 ± 0.4 | 4.0 ± 0.4 |
| ST-13 | 3.9 ± 0.6 | 3.6 ± 0.5 | 3.7 ± 0.4 |
| ST-14 | 3.7 ± 0.7 | 3.3 ± 0.4 | 3.3 ± 0.5 |
| ST-15 | 3.9 ± 0.6 | 3.5 ± 0.3 | 3.7 ± 0.4 |
| ST-16 | 3.8 ± 0.7 | 3.1 ± 0.3 | 3.6 ± 0.5 |
| ST-17 | 3.8 ± 0.6 | 3.1 ± 0.3 | 3.5 ± 0.4 |
| ST-18 | 4.3 ± 0.6 | 3.8 ± 0.4 | 3.9 ± 0.5 |
| ST-19 | 3.5 ± 0.6 | 3.4 ± 0.5 | 3.7 ± 0.4 |
| ST-20 | 4.1 ± 0.6 | 3.2 ± 0.4 | 4.0 ± 0.4 |
| ST-21 | 3.9 ± 0.6 | 3.2 ± 0.3 | 3.7 ± 0.4 |
| ST-22 | 2.7 ± 0.6 | 2.2 ± 0.4 | 2.3 ± 0.4 |
| ST-23 | 4.4 ± 0.8 | 4.2 ± 0.6 | 4.4 ± 0.5 |
| ST-24 | 4.3 ± 0.7 | 3.8 ± 0.4 | 4.3 ± 0.4 |
| ST-33 | 4.2 ± 0.8 | 3.1 ± 0.3 | 3.6 ± 0.4 |
| ST-34 | 3.6 ± 0.6 | 3.4 ± 0.3 | 3.5 ± 0.4 |
| ST-35 | 4.5 ± 0.6 | 4.1 ± 0.3 | 4.4 ± 0.4 |
| ST-36 | 3.6 ± 0.7 | 3.5 ± 0.4 | 3.5 ± 0.4 |
| ST-37 | 3.6 ± 0.7 | 3.4 ± 0.4 | 3.5 ± 0.4 |
| ST-38 | <u>3.3 ± 0.6</u> | <u>3.6 ± 0.4</u> | <u>3.5 ± 0.5</u> |
| Mean ± s.d. | 4.2 ± 0.6 | 3.6 ± 0.5 | 4.0 ± 0.6 |
| Control 1 | 2.6 ± 0.6 | 2.0 ± 0.3 | 2.0 ± 0.4 |
| Control 2 | 2.6 ± 0.6 | 2.0 ± 0.3 | 2.0 ± 0.4 |

^a Intransit exposure has been subtracted.

PALISADES

Table 2. Gamma radiation, as measured by TLDs, monthly exposure.

Units: mR/31 days^a

| | <u>April</u> | <u>May</u> | <u>June</u> |
|----------------|--------------|------------|-------------|
| Date Placed | 03-31-04 | 04-29-04 | 06-01-04 |
| Date Removed | 04-29-04 | 06-01-04 | 07-01-04 |
| Intransit (mR) | 2.7 ± 0.2 | 1.6 ± 0.3 | 2.1 ± 0.2 |
| ST-01 | 3.1 ± 0.3 | 3.9 ± 0.5 | 3.1 ± 0.2 |
| ST-02 | 4.4 ± 0.3 | 5.9 ± 0.4 | 4.5 ± 0.2 |
| ST-03 | 4.6 ± 0.4 | 5.0 ± 0.5 | 4.5 ± 0.3 |
| ST-04 | 5.1 ± 0.6 | 5.1 ± 0.4 | 4.9 ± 0.3 |
| ST-05 | 4.2 ± 0.3 | 4.8 ± 0.4 | 4.6 ± 0.5 |
| ST-06 | 4.3 ± 0.6 | 4.6 ± 0.4 | 3.9 ± 0.3 |
| ST-07A | 3.6 ± 0.3 | 4.4 ± 0.4 | 3.5 ± 0.3 |
| ST-08 | 3.9 ± 0.3 | 4.6 ± 0.3 | 4.0 ± 0.2 |
| ST-09 | 3.7 ± 0.4 | 4.3 ± 0.3 | 3.9 ± 0.3 |
| ST-10 | 3.8 ± 0.3 | 4.9 ± 0.4 | 4.4 ± 0.3 |
| ST-11 | 4.9 ± 0.3 | 5.9 ± 0.4 | 6.2 ± 0.6 |
| ST-12 | 4.7 ± 0.4 | 4.5 ± 0.3 | 4.7 ± 0.4 |
| ST-13 | 3.8 ± 0.4 | 4.0 ± 0.3 | 3.8 ± 0.3 |
| ST-14 | 3.5 ± 0.4 | 3.5 ± 0.4 | 3.4 ± 0.3 |
| ST-15 | 3.8 ± 0.3 | 4.3 ± 0.4 | 3.7 ± 0.4 |
| ST-16 | 3.3 ± 0.3 | 3.8 ± 0.3 | 3.3 ± 0.3 |
| ST-17 | 3.4 ± 0.3 | 3.9 ± 0.3 | 3.6 ± 0.3 |
| ST-18 | 4.0 ± 0.3 | 4.3 ± 0.4 | 4.2 ± 0.4 |
| ST-19 | 3.9 ± 0.3 | 4.3 ± 0.3 | 4.0 ± 0.3 |
| ST-20 | 3.8 ± 0.3 | 4.6 ± 0.4 | 3.7 ± 0.3 |
| ST-21 | 3.6 ± 0.4 | 4.4 ± 0.4 | 3.7 ± 0.4 |
| ST-22 | 2.3 ± 0.3 | 2.7 ± 0.3 | 2.1 ± 0.3 |
| ST-23 | 4.5 ± 0.4 | 4.8 ± 0.4 | 4.3 ± 0.3 |
| ST-24 | 4.4 ± 0.4 | 5.2 ± 0.4 | 4.4 ± 0.3 |
| ST-33 | 3.6 ± 0.4 | 3.9 ± 0.3 | 3.4 ± 0.3 |
| ST-34 | 3.7 ± 0.3 | 3.8 ± 0.3 | 3.7 ± 0.2 |
| ST-35 | 4.3 ± 0.4 | 4.7 ± 0.3 | 4.3 ± 0.3 |
| ST-36 | 3.6 ± 0.3 | 3.8 ± 0.5 | 3.5 ± 0.4 |
| ST-37 | 3.7 ± 0.3 | 3.9 ± 0.4 | 3.7 ± 0.3 |
| ST-38 | 3.7 ± 0.3 | 3.7 ± 0.3 | 4.0 ± 0.5 |
| Mean ± s.d. | 3.9 ± 0.6 | 4.4 ± 0.7 | 4.0 ± 0.7 |
| Control 1 | 2.1 ± 0.3 | 2.4 ± 0.3 | 2.2 ± 0.4 |
| Control 2 | 2.2 ± 0.3 | 2.5 ± 0.3 | 2.2 ± 0.3 |

^a Intransit exposure has been subtracted.

PALISADES

Table 2. Gamma radiation, as measured by TLDs, monthly exposure.

Units: mR/31 days^a

| | <u>July</u> | <u>August</u> | <u>September</u> |
|----------------|-----------------|---------------|------------------|
| Date Placed | 07-01-04 | 07-30-04 | 08-31-04 |
| Date Removed | 07-30-04 | 08-31-04 | 09-30-04 |
| Intransit (mR) | 2.0 ± 0.3 | 2.1 ± 0.2 | 2.2 ± 0.4 |
| ST-01 | 3.6 ± 0.4 | 3.8 ± 0.4 | 3.7 ± 0.7 |
| ST-02 | 5.5 ± 0.4 | 5.5 ± 0.3 | 5.5 ± 0.4 |
| ST-03 | 4.8 ± 0.5 | 5.2 ± 0.4 | 4.5 ± 0.6 |
| ST-04 | 5.1 ± 0.6 | 5.8 ± 0.6 | 4.9 ± 0.6 |
| ST-05 | 4.9 ± 0.4 | 5.1 ± 0.3 | 4.7 ± 0.4 |
| ST-06 | 4.6 ± 0.5 | 4.7 ± 0.3 | 4.6 ± 0.6 |
| ST-07A | 4.5 ± 0.6 | 4.2 ± 0.3 | 4.3 ± 0.5 |
| ST-08 | 4.3 ± 0.4 | 4.6 ± 0.3 | 4.3 ± 0.5 |
| ST-09 | 4.2 ± 0.5 | 4.3 ± 0.3 | 4.1 ± 0.5 |
| ST-10 | 4.7 ± 0.4 | 4.5 ± 0.2 | 4.6 ± 0.5 |
| ST-11 | 5.5 ± 0.5 | 6.3 ± 0.3 | 5.1 ± 0.4 |
| ST-12 | 4.6 ± 0.5 | 5.2 ± 0.3 | 4.2 ± 0.5 |
| ST-13 | 3.8 ± 0.4 | 4.2 ± 0.3 | 4.0 ± 0.6 |
| ST-14 | 3.7 ± 0.4 | 3.9 ± 0.3 | 3.6 ± 0.5 |
| ST-15 | 4.1 ± 0.4 | 4.2 ± 0.3 | 3.9 ± 0.5 |
| ST-16 | 3.9 ± 0.4 | 3.7 ± 0.3 | 3.7 ± 0.5 |
| ST-17 | 3.8 ± 0.4 | 4.0 ± 0.3 | 3.7 ± 0.4 |
| ST-18 | 4.1 ± 0.5 | 4.7 ± 0.2 | 4.1 ± 0.6 |
| ST-19 | 4.1 ± 0.4 | 4.4 ± 0.3 | 4.1 ± 0.4 |
| ST-20 | ND ^b | 4.3 ± 0.3 | 4.5 ± 0.4 |
| ST-21 | 4.2 ± 0.4 | 4.1 ± 0.3 | 4.2 ± 0.5 |
| ST-22 | 3.0 ± 0.4 | 2.6 ± 0.4 | 2.8 ± 0.4 |
| ST-23 | 4.6 ± 0.5 | 5.0 ± 0.3 | 4.6 ± 0.5 |
| ST-24 | 4.8 ± 0.6 | 5.2 ± 0.4 | 4.7 ± 0.5 |
| ST-33 | 3.8 ± 0.4 | 3.9 ± 0.3 | 3.9 ± 0.5 |
| ST-34 | 3.7 ± 0.4 | 4.1 ± 0.2 | 3.8 ± 0.4 |
| ST-35 | 4.5 ± 0.4 | 4.7 ± 0.3 | 4.5 ± 0.5 |
| ST-36 | 3.7 ± 0.4 | 3.9 ± 0.3 | 3.5 ± 0.5 |
| ST-37 | 3.8 ± 0.4 | 4.1 ± 0.3 | 3.7 ± 0.5 |
| ST-38 | 3.7 ± 0.4 | 4.0 ± 0.3 | 3.8 ± 0.6 |
| Mean ± s.d. | 4.3 ± 0.6 | 4.5 ± 0.7 | 4.2 ± 0.5 |
| Control 1 | 2.6 ± 0.4 | 2.5 ± 0.4 | 2.6 ± 0.4 |
| Control 2 | 2.6 ± 0.5 | 2.5 ± 0.3 | 2.6 ± 0.4 |

^a Intransit exposure has been subtracted.

^b "ND" = No data; see Table 2.0, Listing of Missed Samples.

PALISADES

Table 2. Gamma radiation, as measured by TLDs, monthly exposure.

Units: mR/31 days^a

| | <u>October</u> | <u>November</u> | <u>December</u> |
|----------------|----------------|-----------------|-----------------|
| Date Placed | 09-30-04 | 11-01-04 | 11-30-04 |
| Date Removed | 11-01-04 | 11-30-04 | 12-30-04 |
| Intransit (mR) | 1.4 ± 0.3 | 2.2 ± 0.9 | 3.9 ± 0.3 |
| ST-01 | 3.5 ± 0.4 | 3.3 ± 0.9 | 2.9 ± 0.3 |
| ST-02 | 5.1 ± 0.4 | 5.4 ± 0.9 | 4.1 ± 0.3 |
| ST-03 | 4.7 ± 0.4 | 1.6 ± 1.0 | 4.1 ± 0.4 |
| ST-04 | 5.0 ± 0.4 | 5.3 ± 1.1 | 4.4 ± 0.4 |
| ST-05 | 5.0 ± 0.4 | 4.8 ± 0.9 | 4.6 ± 0.5 |
| ST-06 | 4.3 ± 0.4 | 4.5 ± 1.0 | 4.0 ± 0.4 |
| ST-07A | 3.9 ± 0.4 | 4.2 ± 1.0 | 3.7 ± 0.4 |
| ST-08 | 4.2 ± 0.4 | 4.4 ± 1.0 | 4.0 ± 0.3 |
| ST-09 | 3.9 ± 0.4 | 4.1 ± 0.9 | 3.6 ± 0.4 |
| ST-10 | 6.6 ± 0.6 | 4.5 ± 1.0 | 4.3 ± 0.3 |
| ST-11 | 5.6 ± 0.5 | 5.4 ± 1.0 | 4.8 ± 0.4 |
| ST-12 | 4.8 ± 0.5 | 4.2 ± 1.0 | 4.2 ± 0.3 |
| ST-13 | 3.7 ± 0.4 | 3.7 ± 0.9 | 3.6 ± 0.3 |
| ST-14 | 3.4 ± 0.4 | 3.5 ± 0.9 | 3.4 ± 0.4 |
| ST-15 | 3.8 ± 0.4 | 3.9 ± 0.9 | 3.7 ± 0.4 |
| ST-16 | 3.4 ± 0.5 | 3.7 ± 1.0 | 3.1 ± 0.4 |
| ST-17 | 3.5 ± 0.4 | 3.7 ± 1.0 | 3.3 ± 0.4 |
| ST-18 | 4.1 ± 0.3 | 4.1 ± 1.0 | 4.2 ± 0.6 |
| ST-19 | 4.0 ± 0.4 | 4.0 ± 0.9 | 3.9 ± 0.4 |
| ST-20 | 3.9 ± 0.4 | 4.1 ± 0.9 | 3.9 ± 0.3 |
| ST-21 | 3.7 ± 0.4 | 4.0 ± 0.9 | 3.7 ± 0.5 |
| ST-22 | 2.1 ± 0.4 | 2.5 ± 0.9 | 2.3 ± 0.4 |
| ST-23 | 4.8 ± 0.5 | 4.8 ± 1.1 | 4.7 ± 0.5 |
| ST-24 | 4.7 ± 0.4 | 4.4 ± 0.9 | 4.0 ± 0.4 |
| ST-33 | 3.7 ± 0.4 | 3.7 ± 0.9 | 3.7 ± 0.4 |
| ST-34 | 3.9 ± 0.4 | 3.6 ± 0.9 | 3.8 ± 0.3 |
| ST-35 | 5.2 ± 0.5 | 4.5 ± 0.9 | 4.2 ± 0.4 |
| ST-36 | 3.6 ± 0.5 | 3.4 ± 1.0 | 3.4 ± 0.4 |
| ST-37 | 4.0 ± 0.4 | 3.6 ± 1.0 | 3.8 ± 0.4 |
| ST-38 | 3.7 ± 0.4 | 3.4 ± 0.9 | 3.4 ± 0.3 |
| Mean ± s.d. | 4.2 ± 0.8 | 4.0 ± 0.8 | 3.8 ± 0.5 |
| Control 1 | 2.0 ± 0.4 | 2.2 ± 0.9 | 2.1 ± 0.3 |
| Control 2 | 2.0 ± 0.4 | 2.1 ± 0.9 | 2.1 ± 0.3 |

^a Intransit exposure has been subtracted.

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Table 3. Gamma radiation, as measured by TLDs, quarterly exposure.
Units: mR/91 days^a

| | <u>1st Qtr.</u> | <u>2nd Qtr.</u> | <u>3rd Qtr.</u> | <u>4th Qtr.</u> |
|----------------|-----------------|-----------------|-----------------|-----------------|
| Date Placed | 12-31-03 | 03-31-04 | 07-01-04 | 09-30-04 |
| Date Removed | 03-31-04 | 07-01-04 | 09-30-04 | 12-30-04 |
| Intransit (mR) | 2.2 ± 0.2 | 1.2 ± 0.6 | 1.1 ± 0.4 | 0.7 ± 0.5 |
| ST-01 | 11.5 ± 0.5 | 12.7 ± 0.6 | 11.7 ± 0.6 | 12.7 ± 0.6 |
| ST-02 | 14.7 ± 0.6 | 16.3 ± 0.8 | 16.1 ± 0.7 | 16.1 ± 0.7 |
| ST-03 | 13.1 ± 0.4 | 14.2 ± 0.6 | 13.9 ± 0.6 | 14.0 ± 0.5 |
| ST-04 | 13.8 ± 0.6 | 15.3 ± 0.7 | 14.5 ± 0.7 | 15.2 ± 0.5 |
| ST-05 | 13.5 ± 0.3 | 14.4 ± 0.6 | 14.2 ± 0.5 | 14.9 ± 0.8 |
| ST-06 | 12.8 ± 0.3 | 13.1 ± 0.6 | 13.7 ± 0.7 | 13.5 ± 0.7 |
| ST-07A | 11.7 ± 0.4 | 12.0 ± 0.8 | 11.9 ± 0.5 | 12.4 ± 0.7 |
| ST-08 | 11.8 ± 0.5 | 13.1 ± 0.7 | 12.5 ± 0.6 | 13.2 ± 0.6 |
| ST-09 | 11.3 ± 0.5 | 12.6 ± 0.6 | 11.8 ± 0.8 | 12.5 ± 0.5 |
| ST-10 | 12.9 ± 0.4 | 13.8 ± 1.3 | 11.9 ± 0.6 | 13.2 ± 0.6 |
| ST-11 | 13.9 ± 0.5 | 16.1 ± 0.6 | 15.1 ± 1.2 | 15.6 ± 0.7 |
| ST-12 | 12.2 ± 0.5 | 14.5 ± 0.7 | 12.9 ± 0.7 | 14.0 ± 0.6 |
| ST-13 | 11.7 ± 0.9 | 12.8 ± 0.6 | 11.8 ± 0.8 | 12.5 ± 0.6 |
| ST-14 | 10.3 ± 0.4 | 11.3 ± 0.6 | 10.6 ± 0.7 | 11.3 ± 0.6 |
| ST-15 | 10.6 ± 0.5 | 15.2 ± 0.6 | 11.5 ± 1.1 | 12.0 ± 0.6 |
| ST-16 | 10.7 ± 1.0 | 12.7 ± 1.0 | 10.6 ± 0.9 | 12.1 ± 0.7 |
| ST-17 | 10.4 ± 0.2 | 11.8 ± 0.8 | 11.0 ± 0.4 | 11.9 ± 0.6 |
| ST-18 | 11.4 ± 0.4 | 12.8 ± 0.6 | 12.1 ± 0.4 | 12.6 ± 0.6 |
| ST-19 | 11.4 ± 0.3 | 12.6 ± 0.6 | 12.7 ± 0.5 | 12.6 ± 0.5 |
| ST-20 | 11.1 ± 0.4 | 12.4 ± 0.6 | 9.9 ± 0.9 | 12.2 ± 0.6 |
| ST-21 | 11.2 ± 0.3 | 11.4 ± 0.7 | 12.0 ± 0.5 | 11.4 ± 0.8 |
| ST-22 | 7.1 ± 0.3 | 7.5 ± 0.6 | 7.3 ± 0.5 | 7.3 ± 0.6 |
| ST-23 | 11.8 ± 0.5 | 13.3 ± 0.6 | 12.9 ± 0.9 | 12.9 ± 0.6 |
| ST-24 | 12.1 ± 0.5 | 15.2 ± 0.6 | 13.9 ± 1.1 | 14.5 ± 0.5 |
| ST-33 | 10.3 ± 0.4 | 11.8 ± 0.8 | 11.0 ± 0.6 | 11.6 ± 0.7 |
| ST-34 | 10.9 ± 0.4 | 12.3 ± 0.6 | 11.3 ± 0.6 | 11.8 ± 0.6 |
| ST-35 | 13.1 ± 0.6 | 13.6 ± 0.6 | 13.8 ± 0.6 | 14.4 ± 0.7 |
| ST-36 | 10.9 ± 0.4 | 12.7 ± 1.0 | 11.6 ± 0.4 | 11.9 ± 0.7 |
| ST-37 | 11.6 ± 0.5 | 12.6 ± 0.7 | 12.4 ± 0.6 | 12.3 ± 0.7 |
| ST-38 | 10.7 ± 0.3 | 12.3 ± 0.8 | 11.3 ± 0.4 | 12.1 ± 0.9 |
| Mean ± s.d. | 11.7 ± 1.4 | 13.1 ± 1.7 | 12.3 ± 1.7 | 12.8 ± 1.7 |
| Control 1 | 6.8 ± 0.4 | 7.6 ± 0.6 | 6.8 ± 0.5 | 7.5 ± 0.6 |
| Control 2 | 6.9 ± 0.3 | 7.8 ± 0.7 | 6.8 ± 0.4 | 7.5 ± 0.6 |

^a Intransit exposure has been subtracted.

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Table 4. Gamma radiation, as measured by TLDs, annual exposure.
Units: mR/365 days^a

| | <u>2004</u> |
|----------------|-------------------|
| Date Placed | 12-31-03 |
| Date Removed | 12-30-04 |
| Intransit (mR) | 2.1 ± 1.0 |
| ST-01 | 43.4 ± 2.2 |
| ST-02 | 58.8 ± 2.0 |
| ST-03 | 48.8 ± 1.8 |
| ST-04 | 52.3 ± 1.3 |
| ST-05 | 50.1 ± 1.7 |
| ST-06 | 45.4 ± 1.0 |
| ST-07A | 41.3 ± 1.4 |
| ST-08 | 46.7 ± 1.2 |
| ST-09 | 45.0 ± 1.5 |
| ST-10 | 45.3 ± 1.0 |
| ST-11 | 54.5 ± 1.1 |
| ST-12 | 50.4 ± 1.3 |
| ST-13 | 43.5 ± 1.7 |
| ST-14 | 37.8 ± 1.5 |
| ST-15 | 41.5 ± 1.9 |
| ST-16 | 39.7 ± 2.1 |
| ST-17 | 40.7 ± 1.3 |
| ST-18 | 44.8 ± 1.0 |
| ST-19 | 46.1 ± 1.1 |
| ST-20 | 33.0 ± 1.4 |
| ST-21 | 43.7 ± 1.1 |
| ST-22 | 24.3 ± 1.2 |
| ST-23 | 48.1 ± 1.3 |
| ST-24 | 52.9 ± 1.7 |
| ST-33 | 40.0 ± 1.0 |
| ST-34 | 41.4 ± 1.1 |
| ST-35 | 49.2 ± 1.2 |
| ST-36 | 42.7 ± 1.5 |
| ST-37 | 42.4 ± 1.5 |
| ST-38 | <u>42.4 ± 1.5</u> |
| Mean ± s.d. | 44.5 ± 6.6 |
| Control 1 | 24.0 ± 1.1 |
| Control 2 | 23.9 ± 1.3 |

^a Intransit exposure has been subtracted.

PALISADES

Table 5. Lake Water, analyses for gross alpha, gross beta and tritium.

Collection: Monthly composites of daily collections.

Units: pCi/L

| Location Date Collected | Lab Code | Discharge | | |
|----------------------------|--------------|-------------|------------|------------|
| | | Gross Alpha | Gross Beta | H-3 |
| <u>Required LLD</u> | | <u>1.0</u> | <u>4.0</u> | <u>500</u> |
| 01-31-04 | PALW -616 | < 0.9 | 2.0 ± 0.6 | < 161 |
| 02-29-04 | PALW -1011 | < 0.5 | 2.2 ± 0.6 | 4863 ± 206 |
| 03-31-04 | PALW -1530 | < 0.9 | 1.9 ± 0.6 | < 160 |
| 04-30-04 | PALW -2244 | < 0.5 | 2.5 ± 0.4 | < 159 |
| 05-31-04 | PALW -2904 | < 1.0 | 2.3 ± 0.7 | < 154 |
| 06-30-04 | PALW 3589,90 | < 1.0 | 2.4 ± 0.5 | 8298 ± 185 |
| 07-31-04 | PALW -4382 | < 0.7 | 1.9 ± 0.6 | < 163 |
| 08-31-04 | PALW -5065 | < 1.0 | 2.1 ± 0.7 | 206 ± 87 |
| 09-30-04 | PALW -6009 | < 0.4 | 1.3 ± 0.4 | 8083 ± 265 |
| 10-31-04 | PALW 6762,3 | < 0.9 | 1.8 ± 0.5 | < 167 |
| 11-30-04 | PALW -7350 | < 0.5 | 1.8 ± 0.4 | 6754 ± 229 |
| 12-31-04 | PALW 7719,20 | < 0.4 | 2.1 ± 0.3 | < 161 |

| Location Date Collected | Lab Code | Intake | | |
|----------------------------|------------|-------------|------------|------------|
| | | Gross Alpha | Gross Beta | H-3 |
| <u>Required LLD</u> | | <u>1.0</u> | <u>4.0</u> | <u>500</u> |
| 01-31-04 | PALW -617 | < 1.0 | 2.5 ± 0.6 | < 161 |
| 02-29-04 | PALW -1012 | < 0.4 | 1.5 ± 0.6 | < 157 |
| 03-31-04 | PALW -1531 | 0.5 ± 0.3 | 2.1 ± 0.5 | < 160 |
| 04-30-04 | PALW -2245 | < 0.7 | 2.3 ± 0.4 | < 159 |
| 05-31-04 | PALW -2905 | < 0.9 | 1.9 ± 0.7 | < 154 |
| 06-30-04 | PALW -3591 | < 0.9 | 2.7 ± 0.7 | < 155 |
| 07-31-04 | PALW -4383 | < 0.9 | 2.3 ± 0.7 | < 163 |
| 08-31-04 | PALW -5066 | < 0.8 | 1.9 ± 0.7 | 177 ± 86 |
| 09-30-04 | PALW -6010 | < 0.4 | 1.7 ± 0.4 | < 164 |
| 10-31-04 | PALW -6764 | < 1.0 | 2.2 ± 0.7 | < 167 |
| 11-30-04 | PALW -7351 | < 1.0 | 1.8 ± 0.7 | 220 ± 83 |
| 12-31-04 | PALW -7718 | 0.4 ± 0.3 | 1.8 ± 0.4 | < 161 |

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Table 6. Lake Water, drinking, analysis for gross beta.
Collection: Monthly composites of daily collections.
Units: pCi/L

| Location | South Haven Municipal System (Raw) | |
|---------------------|------------------------------------|------------|
| Date Collected | Lab Code | Gross Beta |
| <u>Required LLD</u> | | <u>4.0</u> |
| 01-31-04 | PALW -618 | 1.8 ± 0.5 |
| 03-01-04 | PALW 1014,5 | 1.9 ± 0.4 |
| 03-31-04 | PALW 1464,5 | 2.3 ± 0.4 |
| 04-30-04 | PALW -2248 | 2.3 ± 0.5 |
| 05-31-04 | PALW -2907 | 1.6 ± 0.5 |
| 06-30-04 | PALW -3592 | 1.2 ± 0.5 |
| 07-31-04 | PALW -4384 | 2.5 ± 0.5 |
| 08-31-04 | PALW -5068 | 1.6 ± 0.5 |
| 09-30-04 | PALW -6003 | 2.3 ± 0.5 |
| 10-31-04 | PALW -6766 | 1.6 ± 0.5 |
| 11-30-04 | PALW -7303 | 1.6 ± 0.6 |
| 12-31-04 | PALW -7722 | 1.9 ± 0.6 |

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Table 7. Well water, analyses for gross beta and tritium.
 Collection: Monthly composites of daily collections.
 Units: pCi/L

| Location | Palisades Drinking Water (South Haven Municipal System (Treated)) | | |
|---------------------|---|------------|-----------------------|
| Date Collected | Lab Code | Gross Beta | H-3 |
| <u>Required LLD</u> | | <u>4.0</u> | <u>500</u> |
| 01-31-04 | PAWW -619 | 1.8 ± 0.5 | < 330 |
| 02-29-04 | PAWW -1016 | 1.8 ± 0.5 | < 330 |
| 03-31-04 | PAWW -1532 | 2.0 ± 0.5 | 413 ± 97 ^a |
| 04-30-04 | PAWW -2249 | 2.0 ± 0.5 | 668 ± 106 |
| 05-31-04 | PAWW -2908 | 1.9 ± 0.5 | 645 ± 103 |
| 06-30-04 | PAWW -3597 | 2.2 ± 0.5 | 520 ± 99 |
| 07-31-04 | PAWW -4385 | 1.9 ± 0.5 | 467 ± 100 |
| 08-31-04 | PAWW -5069 | 1.9 ± 0.5 | 454 ± 97 |
| 09-30-04 | PAWW -6011 | 2.0 ± 0.5 | < 164 |
| 10-31-04 | PAWW -6768 | 1.7 ± 0.5 | < 167 |
| 11-30-04 | PAWW -7352 | 1.9 ± 0.6 | < 138 |
| 12-31-04 | PAWW -7723 | 1.9 ± 0.5 | < 161 |

| Location | Site Well #14 | | |
|---------------------|---------------|------------|------------|
| Date Collected | Lab Code | Gross Beta | H-3 |
| <u>Required LLD</u> | | <u>4.0</u> | <u>500</u> |
| 01-12-04 | PAWW -209 | 3.0 ± 0.7 | < 161 |
| 02-09-04 | PAWW -576 | 2.9 ± 0.6 | < 161 |
| 03-10-04 | PAWW -1018 | 2.8 ± 0.6 | < 157 |
| 04-07-04 | PAWW -1533 | 2.2 ± 0.5 | < 160 |
| 05-11-04 | PAWW -2251 | 2.5 ± 0.6 | < 159 |
| 06-08-04 | PAWW -2909 | 2.5 ± 0.6 | < 154 |
| 07-06-04 | PAWW -3598 | 2.7 ± 0.6 | < 159 |
| 08-03-04 | PAWW -4386 | 2.6 ± 0.7 | < 163 |
| 09-07-04 | PAWW -5070 | 3.8 ± 0.7 | < 156 |
| 10-13-04 | PAWW -6012 | 2.9 ± 0.5 | < 164 |
| 11-10-04 | PAWW -6769 | 3.0 ± 0.6 | < 167 |
| 12-15-04 | PAWW -7353 | 2.7 ± 0.6 | < 138 |

NOTE: Gamma isotopic analysis required if gross beta exceeds 10 pCi/L. Results listed in Appendix C.
^a Tritium repeated with a result of 382±115 pCi/L.

PALISADES

Table 7. Well water, analyses for gross beta and tritium.
 Collection: Monthly composites of daily collections.
 Units: pCi/L

| Location Date Collected | Lab Code | Site Well #15 | |
|----------------------------|-------------|---------------|------------|
| | | Gross Beta | H-3 |
| <u>Required LLD</u> | | <u>4.0</u> | <u>500</u> |
| 01-12-04 | PAWW -210 | 7.9 ± 0.8 | < 161 |
| 02-09-04 | PAWW -577 | 7.4 ± 0.7 | < 161 |
| 03-10-04 | PAWW -1019 | 6.0 ± 0.7 | < 157 |
| 04-07-04 | PAWW -1534 | 6.5 ± 0.7 | < 160 |
| 05-11-04 | PAWW -2252 | 5.1 ± 0.8 | < 159 |
| 06-08-04 | PAWW -2910 | 4.4 ± 0.6 | < 154 |
| 07-06-04 | PAWW -3599 | 4.6 ± 0.6 | 196 ± 88 |
| 08-03-04 | PAWW 4387,8 | 6.1 ± 0.5 | < 163 |
| 09-07-04 | PAWW -5071 | 6.6 ± 0.8 | < 156 |
| 10-13-04 | PAWW -6013 | 6.1 ± 0.7 | < 164 |
| 11-10-04 | PAWW -6770 | 6.8 ± 0.7 | < 167 |
| 12-15-04 | PAWW -7354 | 5.3 ± 0.8 | < 138 |

| Location Date Collected | Lab Code | Site Well #16 | |
|----------------------------|-------------|-------------------------|------------|
| | | Gross Beta | H-3 |
| <u>Required LLD</u> | | <u>4.0</u> | <u>500</u> |
| 01-12-04 | PAWW -211 | 9.0 ± 0.9 | < 149 |
| 02-09-04 | PAWW -578 | 14.4 ± 1.0 ^a | < 161 |
| 03-10-04 | PAWW -1020 | 15.2 ± 1.0 ^b | < 157 |
| 04-07-04 | PAWW -1535 | 14.0 ± 1.0 ^c | < 160 |
| 05-11-04 | PAWW -2253 | 13.6 ± 1.0 ^d | < 159 |
| 06-08-04 | PAWW -2911 | 9.9 ± 0.8 | < 154 |
| 07-06-04 | PAWW -3600 | 8.7 ± 0.8 | < 160 |
| 08-03-04 | PAWW -4389 | 6.0 ± 0.7 | < 163 |
| 09-07-04 | PAWW 5072,3 | 4.2 ± 0.5 | < 156 |
| 10-13-04 | PAWW -6014 | 4.5 ± 0.7 | < 164 |
| 11-10-04 | PAWW -6771 | 4.1 ± 0.6 | < 167 |
| 12-15-04 | PAWW -7355 | 4.6 ± 0.7 | < 138 |

NOTE: Gamma isotopic analysis required if gross beta exceeds 10 pCi/L. Results listed in Appendix C.

^a Gross beta repeated with a result of 12.6±0.9 pCi/L. Gamma isotopic results in Appendix C.

^b Gross beta repeated with a result of 13.1±1.1 pCi/L. Gamma isotopic results in Appendix C.

^c Gross beta repeated with a result of 12.5±0.9 pCi/L. Gamma isotopic results in Appendix C.

^d Gross beta repeated with a result of 16.5±1.0 pCi/L. Gamma isotopic results in Appendix C.

PALISADES

Table 8. Water, Ludington controls, analyses for gross beta and tritium.

Collection: Monthly composites of daily collections.

Units: pCi/L

| Location | Ludington (Lake In) | | | | |
|---------------------|---------------------|------------|------------|------------|------------|
| Date Collected | Lab Code | Gross Beta | H-3 | Sr-89 | Sr-90 |
| <u>Required LLD</u> | | <u>4.0</u> | <u>500</u> | <u>5.0</u> | <u>1.0</u> |
| 02-02-04 | PALW -574 | 2.1 ± 0.5 | < 161 | < 0.6 | < 0.7 |
| 03-01-04 | PALW -1013 | 1.8 ± 0.6 | < 157 | < 0.5 | 0.6 ± 0.3 |
| 04-01-04 | PALW -1463 | 2.2 ± 0.5 | < 159 | < 0.5 | 1.3 ± 0.4 |
| 05-03-04 | PALW 2246,7 | 3.7 ± 1.8 | < 159 | < 0.5 | 1.1 ± 0.4 |
| 06-01-04 | PALW -2906 | 2.1 ± 0.5 | < 154 | < 0.9 | < 0.6 |
| 06-30-04 | PALW -3726 | 2.1 ± 0.5 | < 155 | < 1.0 | < 0.9 |
| 08-09-04 | PALW -4626 | 3.0 ± 0.6 | < 163 | < 0.6 | < 0.5 |
| 09-01-04 | PALW -5067 | 2.1 ± 0.5 | < 156 | < 0.6 | < 0.5 |
| 10-06-04 | PALW -6002 | 1.7 ± 0.5 | < 164 | < 0.6 | < 0.6 |
| 11-01-04 | PALW -6765 | 2.2 ± 0.5 | < 167 | < 0.7 | < 0.6 |
| 12-01-04 | PALW -7302 | 2.0 ± 0.5 | < 138 | < 0.5 | < 0.5 |
| 01-03-05 | PALW -7721 | 2.3 ± 0.6 | < 161 | < 1.1 | < 1.0 |

| Location | Ludington (Well water) | | |
|---------------------|------------------------|------------|------------|
| Date Collected | Lab Code | Gross Beta | H-3 |
| <u>Required LLD</u> | | <u>4.0</u> | <u>500</u> |
| 02-02-04 | PAWW -575 | < 0.8 | < 161 |
| 03-01-04 | PAWW -1017 | 0.9 ± 0.4 | < 157 |
| 04-01-04 | PAWW -1466 | 1.6 ± 0.5 | < 159 |
| 05-03-04 | PAWW -2250 | < 0.8 | < 159 |
| 06-01-04 | NS ^a | - | - |

^a " NS" = No sample; location discontinued.

PALISADES

Table 9. In-Plant water, analyses for gross alpha, gross beta, strontium-89, strontium-90, tritium and gamma emitting isotopes.

Collection: Monthly composites

Units: uCi/mL

| Location | | Service Water | | | |
|---------------------|----------|----------------|----------------|----------------|--|
| Date Collected | Required | 01-31-04 | 02-29-04 | 03-31-04 | |
| Lab Code | LLD | PACW-615 | PACW-1010 | PACW-1529 | |
| Gross Alpha | 1.0 E-07 | < 9.2 E-10 | < 4.5 E-10 | < 9.4 E-10 | |
| Gross Beta | 1.0 E-09 | 2.3 ± 0.7 E-09 | 2.6 ± 0.7 E-09 | 2.2 ± 0.7 E-09 | |
| H-3 | 5.0 E-07 | < 1.6 E-07 | < 1.5 E-07 | < 1.6 E-07 | |
| Sr-89 | 5.0 E-08 | < 6.3 E-10 | < 5.3 E-10 | < 4.9 E-10 | |
| Sr-90 | 5.0 E-08 | < 6.5 E-10 | < 5.6 E-10 | 1.0 ± 0.3 E-9 | |
| Cs-137 | 1.0 E-08 | < 2.4 E-09 | < 1.9 E-09 | < 3.7 E-09 | |
| Others ^a | 1.0 E-08 | < 2.1 E-09 | < 3.0 E-09 | < 2.7 E-09 | |
| Date Collected | Required | 04-30-04 | 05-31-04 | 06-30-04 | |
| Lab Code | LLD | PACW-2241 | PACW-2903 | PACW-3588 | |
| Gross Alpha | 1.0 E-07 | 2.7 ± 0.7 E-09 | < 9.2 E-10 | < 9.3 E-10 | |
| Gross Beta | 1.0 E-09 | 2.7 ± 0.7 E-09 | 1.6 ± 0.6 E-09 | 1.7 ± 0.6 E-09 | |
| H-3 | 5.0 E-07 | < 1.6 E-07 | < 1.5 E-07 | < 1.5 E-07 | |
| Sr-89 | 5.0 E-08 | < 4.8 E-10 | < 7.7 E-10 | < 6.7 E-10 | |
| Sr-90 | 5.0 E-08 | < 5.8 E-10 | < 6.1 E-10 | 8.6 ± 4.0 E-10 | |
| Cs-137 | 1.0 E-08 | < 3.4 E-09 | < 1.6 E-09 | < 3.3 E-09 | |
| Others ^a | 1.0 E-08 | < 3.1 E-09 | < 1.5 E-09 | < 2.7 E-09 | |
| Date Collected | Required | 07-31-04 | 08-31-04 | 09-30-04 | |
| Lab Code | LLD | PACW-4325 | PACW-5064 | PACW-6008 | |
| Gross Alpha | 1.0 E-07 | < 9.0 E-10 | < 1.1 E-09 | < 8.4 E-10 | |
| Gross Beta | 1.0 E-09 | 2.7 ± 0.7 E-09 | 1.7 ± 0.6 E-09 | 2.3 ± 0.5 E-09 | |
| H-3 | 5.0 E-07 | < 1.6 E-07 | < 1.6 E-07 | < 1.6 E-07 | |
| Sr-89 | 5.0 E-08 | < 5.5 E-10 | < 6.2 E-10 | < 6.8 E-10 | |
| Sr-90 | 5.0 E-08 | < 5.8 E-10 | 5.8 ± 3.2 E-10 | < 6.0 E-10 | |
| Cs-137 | 1.0 E-08 | < 3.2 E-09 | < 2.5 E-09 | < 2.7 E-09 | |
| Others ^a | 1.0 E-08 | < 5.6 E-09 | < 1.7 E-09 | < 2.2 E-09 | |

^a Co-60

PALISADES

Table 9. In-Plant water, analyses for gross alpha, gross beta, strontium-89, strontium-90, tritium and gamma emitting isotopes.

Collection: Monthly composites

Units: uCi/mL

| Location | Service Water | | | |
|---------------------|---------------|----------------|----------------|----------------|
| Date Collected | Required | 10-31-04 | 11-30-04 | 12-31-04 |
| Lab Code | LLD | PACW-6767 | PACW-7349 | PACW-7717 |
| Gross Alpha | 1.0 E-07 | < 9.2 E-10 | < 9.3 E-10 | < 4.2 E-10 |
| Gross Beta | 1.0 E-09 | 2.7 ± 0.7 E-09 | 1.5 ± 0.7 E-09 | 1.9 ± 0.4 E-09 |
| H-3 | 5.0 E-07 | < 1.67 E-07 | < 1.38 E-07 | < 1.61 E-07 |
| Sr-89 | 5.0 E-08 | < 7.5 E-10 | < 1.3 E-09 | < 6.9 E-10 |
| Sr-90 | 5.0 E-08 | < 5.9 E-10 | < 5.8 E-10 | 8.0 ± 4.0 E-10 |
| Cs-137 | 1.0 E-08 | < 3.0 E-09 | < 2.1 E-09 | < 4.4 E-09 |
| Others ^a | 1.0 E-08 | < 3.5 E-09 | < 1.8 E-09 | < 4.1 E-09 |

^a Co-60

PALISADES

Table 9. In-Plant water, analyses for gross alpha, gross beta, strontium-89, strontium-90, tritium and gamma emitting isotopes.

Collection: Monthly composites

Units: uCi/mL

| Location | | Turbine Sump | | | |
|---------------------|----------|----------------|----------------|----------------|--|
| Date Collected | Required | 01-31-04 | 02-29-04 | 03-31-04 | |
| Lab Code | LLD | PACW-631 | PACW-982 | PACW-1770 | |
| Gross Alpha | 1.0 E-07 | < 7.3 E-10 | < 8.6 E-10 | < 5.4 E-10 | |
| Gross Beta | 1.0 E-09 | 1.4 ± 0.6 E-09 | 1.4 ± 0.6 E-09 | 1.5 ± 0.4 E-09 | |
| H-3 | 5.0 E-07 | 1.9 ± 0.1 E-05 | 1.6 ± 0.1 E-05 | 1.3 ± 0.1 E-05 | |
| Sr-89 | 5.0 E-08 | < 6.6 E-10 | < 5.7 E-10 | < 6.5 E-10 | |
| Sr-90 | 5.0 E-08 | < 6.2 E-10 | < 5.3 E-10 | < 5.3 E-10 | |
| Cs-137 | 1.0 E-08 | < 2.5 E-09 | < 4.4 E-09 | < 2.3 E-09 | |
| Others ^a | 1.0 E-08 | < 2.9 E-09 | < 4.4 E-09 | < 2.5 E-09 | |
| Date Collected | Required | 04-30-04 | 05-31-04 | 06-30-04 | |
| Lab Code | LLD | PACW-2243 | PACW-3153 | PACW-3736 | |
| Gross Alpha | 1.0 E-07 | < 9.6 E-10 | < 6.8 E-10 | < 9.6 E-10 | |
| Gross Beta | 1.0 E-09 | 1.3 ± 0.6 E-09 | < 1.2 E-09 | 1.1 ± 0.6 E-09 | |
| H-3 | 5.0 E-07 | 1.3 ± 0.1 E-05 | 1.5 ± 0.1 E-05 | 1.5 ± 0.1 E-05 | |
| Sr-89 | 5.0 E-08 | < 4.7 E-10 | < 9.8 E-10 | < 8.9 E-10 | |
| Sr-90 | 5.0 E-8 | < 5.2 E-10 | < 6.2 E-10 | < 6.4 E-10 | |
| Cs-137 | 1.0 E-08 | < 2.8 E-09 | < 3.4 E-09 | < 3.0 E-09 | |
| Others ^a | 1.0 E-08 | < 3.2 E-09 | < 4.2 E-09 | < 2.7 E-09 | |
| Date Collected | Required | 07-31-04 | 08-31-04 | 09-30-04 | |
| Lab Code | LLD | PACW-4209 | PACW-5180 | PACW-5846 | |
| Gross Alpha | 1.0 E-07 | 4.9 ± 1.0 E-09 | < 1.0 E-09 | < 4.0 E-10 | |
| Gross Beta | 1.0 E-09 | 1.8 ± 0.6 E-09 | 1.4 ± 0.6 E-09 | 1.9 ± 0.4 E-09 | |
| H-3 | 5.0 E-07 | 1.1 ± 0.1 E-05 | 6.1 ± 0.2 E-06 | 4.3 ± 0.2 E-06 | |
| Sr-89 | 5.0 E-08 | < 6.0 E-10 | < 5.3 E-10 | < 8.4 E-10 | |
| Sr-90 | 5.0 E-08 | < 6.1 E-10 | < 4.9 E-10 | < 6.4 E-10 | |
| Cs-137 | 1.0 E-08 | < 2.9 E-09 | < 3.5 E-09 | < 4.9 E-09 | |
| Others ^a | 1.0 E-08 | < 5.5 E-09 | < 5.3 E-09 | < 2.2 E-09 | |

^a Co-60

PALISADES

Table 9. In-Plant water, analyses for gross alpha, gross beta, strontium-89, strontium-90, tritium and gamma emitting isotopes.

Collection: Monthly composites

Units: uCi/mL

| Location | Turbine Sump | | | |
|---------------------|----------------------------|-----------------|-----------------------|------------------------------------|
| | Date Collected Lab Code | Required LLD | 10-31-04 PACW-6854 | 11-30-04 PACW-7326 ^b |
| Gross Alpha | 1.0 E-07 | < 1.1 E-09 | < 8.8 E-10 | < 4.5 E-10 |
| Gross Beta | 1.0 E-09 | 3.9 ± 0.7 E-09 | 1.2 ± 0.7 E-09 | 1.3 ± 0.3 E-09 |
| H-3 | 5.0 E-07 | 1.2 ± 0.1 E-05 | 7.7 ± 1.1 E-06 | 8.2 ± 0.3 E-06 |
| Sr-89 | 5.0 E-08 | < 8.9 E-10 | < 7.0 E-10 | < 7.1 E-10 |
| Sr-90 | 5.0 E-08 | < 6.6 E-10 | 8.9 ± 3.2 E-10 | < 6.0 E-10 |
| Cs-137 | 1.0 E-08 | < 2.5 E-09 | < 3.5 E-09 | < 2.7 E-09 |
| Others ^a | 1.0 E-08 | < 2.6 E-09 | < 2.2 E-09 | < 2.1 E-09 |

^a Co-60

PALISADES

Table 10. Milk, analyses for iodine-131 and gamma emitting isotopes,
Collection: Monthly

| Location | | JH - Joseph Hay Farm | | | | |
|---------------------|------------|-----------------------|------------|-------------|-------------|-------------|
| Date | Lab | Concentration (pCi/L) | | | | |
| Collected | Code | I-131 | K-40 | Cs-134 | Cs-137 | Ba-La-140 |
| <u>Required LLD</u> | | <u>1.0</u> | - | <u>15.0</u> | <u>18.0</u> | <u>15.0</u> |
| 01-30-04 | PAMI -379 | < 0.3 | 1313 ± 172 | < 10.0 | < 5.4 | < 6.2 |
| 02-11-04 | PAMI -590 | < 0.3 | 1235 ± 172 | < 5.3 | < 6.7 | < 4.8 |
| 03-10-04 | PAMI -998 | < 0.3 | 1476 ± 129 | < 4.1 | < 4.6 | < 3.6 |
| 04-06-04 | PAMI -1452 | < 0.2 | 1401 ± 170 | < 5.0 | < 4.4 | < 4.1 |
| 05-11-04 | PAMI -2224 | < 0.3 | 1311 ± 173 | < 6.1 | < 4.9 | < 10.0 |
| 06-08-04 | PAMI -2865 | < 0.4 | 1324 ± 124 | < 4.3 | < 4.2 | < 3.8 |
| 07-06-04 | PAMI -3427 | < 0.4 | 1257 ± 164 | < 7.1 | < 5.3 | < 6.2 |
| 08-03-04 | PAMI -4202 | < 0.2 | 1307 ± 198 | < 5.1 | < 6.3 | < 8.7 |
| 09-07-04 | PAMI -4996 | < 0.5 | 1336 ± 125 | < 3.5 | < 4.7 | < 4.6 |
| 10-12-04 | PAMI -5925 | < 0.2 | 1338 ± 196 | < 8.7 | < 7.1 | < 11.3 |
| 11-09-04 | PAMI -6735 | < 0.4 | 1287 ± 169 | < 4.2 | < 5.3 | < 5.5 |
| 12-14-04 | PAMI -7300 | < 0.2 | 1233 ± 160 | < 5.0 | < 5.0 | < 7.0 |

| Location | | DC - Danny Carpenter Farm | | | | |
|---------------------|------------|---------------------------|------------|-------------|-------------|-------------|
| Date | Lab | Concentration (pCi/L) | | | | |
| Collected | Code | I-131 | K-40 | Cs-134 | Cs-137 | Ba-La-140 |
| <u>Required LLD</u> | | <u>1.0</u> | - | <u>15.0</u> | <u>18.0</u> | <u>15.0</u> |
| 01-07-04 | PAMI -143 | < 0.3 | 1465 ± 167 | < 4.8 | < 7.3 | < 8.5 |
| 02-11-04 | PAMI -587 | < 0.5 | 1364 ± 126 | < 4.9 | < 5.4 | < 3.5 |
| 03-10-04 | PAMI -999 | < 0.3 | 1178 ± 108 | < 4.6 | < 3.0 | < 1.6 |
| 04-06-04 | PAMI -1453 | < 0.2 | 1344 ± 129 | < 4.8 | < 2.7 | < 3.4 |
| 05-11-04 | PAMI -2222 | < 0.2 | 1318 ± 183 | < 4.5 | < 8.8 | < 3.7 |
| 06-08-04 | PAMI -2863 | < 0.2 | 1419 ± 184 | < 5.0 | < 5.3 | < 6.1 |
| 07-06-04 | PAMI -3425 | < 0.3 | 1340 ± 122 | < 4.2 | < 2.6 | < 12.5 |
| 08-03-04 | PAMI -4200 | < 0.3 | 1424 ± 232 | < 9.1 | < 8.5 | < 10.5 |
| 09-07-04 | PAMI -4994 | < 0.2 | 1417 ± 123 | < 5.0 | < 3.1 | < 6.1 |
| 10-12-04 | PAMI -5922 | < 0.2 | 1237 ± 130 | < 4.3 | < 4.0 | < 3.5 |
| 11-09-04 | PAMI -6733 | < 0.4 | 1179 ± 120 | < 3.8 | < 3.1 | < 2.6 |
| 12-14-04 | PAMI -7298 | < 0.2 | 1418 ± 126 | < 4.8 | < 4.4 | < 1.5 |

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Table 10. Milk, analyses for iodine-131 and gamma emitting isotopes,
Collection: Monthly

| Location | | DH - Dennis Hessey Farm | | | | |
|---------------------|-------------|-------------------------|------------|-------------|-------------|-------------|
| Date | Lab | Concentration (pCi/L) | | | | |
| Collected | Code | I-131 | K-40 | Cs-134 | Cs-137 | Ba-La-140 |
| <u>Required LLD</u> | | <u>1.0</u> | - | <u>15.0</u> | <u>18.0</u> | <u>15.0</u> |
| 01-07-04 | PAMI -144 | < 0.3 | 1218 ± 125 | < 4.4 | < 4.4 | < 6.7 |
| 02-11-04 | PAMI 588,9 | < 0.4 | 1262 ± 112 | < 5.9 | < 5.8 | < 2.9 |
| 03-10-04 | PAMI -1000 | < 0.3 | 1151 ± 168 | < 7.2 | < 7.3 | < 7.7 |
| 04-06-04 | PAMI -1454 | < 0.3 | 1258 ± 172 | < 5.1 | < 6.0 | < 9.5 |
| 05-11-04 | PAMI -2223 | < 0.2 | 1310 ± 118 | < 4.4 | < 3.5 | < 3.5 |
| 06-08-04 | PAMI -2864 | < 0.2 | 1140 ± 176 | < 6.6 | < 5.4 | < 5.1 |
| 07-06-04 | PAMI -3426 | < 0.4 | 1358 ± 118 | < 4.0 | < 3.3 | < 8.7 |
| 08-03-04 | PAMI -4201 | < 0.3 | 1332 ± 179 | < 6.3 | < 5.7 | < 6.7 |
| 09-07-04 | PAMI -4995 | < 0.4 | 1349 ± 220 | < 9.0 | < 4.9 | < 13.7 |
| 10-12-04 | PAMI 5923,4 | < 0.3 | 1443 ± 128 | < 5.8 | < 6.2 | < 10.1 |
| 11-09-04 | PAMI -6734 | < 0.4 | 1385 ± 119 | < 2.5 | < 2.6 | < 6.3 |
| 12-14-04 | PAMI -7299 | < 0.2 | 1344 ± 202 | < 4.6 | < 7.8 | < 6.9 |

| Location | | WS - William Shine Farm | | | | |
|---------------------|-------------|-------------------------|------------|-------------|-------------|-------------|
| Date | Lab | Concentration (pCi/L) | | | | |
| Collected | Code | I-131 | K-40 | Cs-134 | Cs-137 | Ba-La-140 |
| <u>Required LLD</u> | | <u>1.0</u> | - | <u>15.0</u> | <u>18.0</u> | <u>15.0</u> |
| 01-07-04 | PAMI -145 | < 0.3 | 1380 ± 165 | < 4.9 | < 6.0 | < 8.5 |
| 02-11-04 | PAMI -591 | < 0.4 | 1458 ± 182 | < 6.4 | < 7.2 | < 5.0 |
| 03-10-04 | PAMI -1001 | < 0.3 | 1444 ± 177 | < 7.3 | < 6.1 | < 3.3 |
| 04-06-04 | PAMI -1455 | < 0.2 | 1391 ± 177 | < 6.7 | < 5.8 | < 3.6 |
| 05-11-04 | PAMI 2225,6 | < 0.2 | 1312 ± 88 | < 3.1 | < 3.8 | < 3.5 |
| 06-08-04 | PAMI -2866 | < 0.2 | 1217 ± 167 | < 9.5 | < 6.7 | < 11.1 |
| 07-06-04 | PAMI -3428 | < 0.3 | 1284 ± 173 | < 7.9 | < 5.8 | < 8.2 |
| 08-03-04 | PAMI -4203 | < 0.2 | 1287 ± 170 | < 6.0 | < 4.3 | < 10.1 |
| 09-07-04 | PAMI -4997 | < 0.3 | 1386 ± 114 | < 4.1 | < 3.3 | < 8.8 |
| 10-12-04 | PAMI -5926 | < 0.3 | 1568 ± 133 | < 5.1 | < 2.3 | < 4.5 |
| 11-09-04 | PAMI -6736 | < 0.4 | 1543 ± 126 | < 5.1 | < 4.3 | < 3.8 |
| 12-14-04 | PAMI -7301 | < 0.2 | 1394 ± 175 | < 3.6 | < 4.9 | < 4.1 |

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Table 11. Food Crops, analyses for gross beta and gamma-emitting isotopes.
Collection: Semiannually, at the time of harvest.
Units: pCi/g wet

| Location | Paul Rood | | | |
|----------------|-------------|-------------|-------------|-------------------|
| Lab Code | PAVE-5225 | PAVE-6349 | PAVE-6350 | |
| Date Collected | 8/5/2002 | 9/28/2002 | 9/28/2002 | Req. LLD |
| Sample Type | Blueberries | Pears | Apples | |
| Gross Beta | 0.63 ± 0.02 | 1.19 ± 0.02 | 1.67 ± 0.03 | 1.00 |
| Mn-54 | < 0.008 | < 0.007 | < 0.012 | 0.08 |
| Fe-59 | < 0.020 | < 0.008 | < 0.026 | 0.10 |
| Co-58 | < 0.010 | < 0.004 | < 0.009 | 0.08 |
| Co-60 | < 0.008 | < 0.007 | < 0.014 | 0.05 |
| Zn-65 | < 0.014 | < 0.010 | < 0.018 | 0.10 |
| Zr-Nb-95 | < 0.011 | < 0.010 | < 0.014 | 0.10 |
| I-131 | < 0.023 | < 0.022 | < 0.032 | 0.06 ^a |
| Cs-134 | < 0.008 | < 0.005 | < 0.010 | 0.08 |
| Cs-137 | < 0.012 | < 0.007 | < 0.019 | 0.08 |

^a Required for broadleaf vegetation only.

PALISADES

Table 11. Food Crops, analyses for gross beta and gamma-emitting isotopes.
Collection: Semiannually, at the time of harvest.
Units: pCi/g wet

| Location | J. Sarno Farm | | |
|----------------|---------------|-------------|-------------------|
| Lab Code | PAVE-4198 | PAVE-5788 | |
| Date Collected | 8/3/2004 | 10/6/2004 | Req. LLD |
| Sample Type | Blueberries | Apples | |
| Gross Beta | 0.69 ± 0.01 | 0.72 ± 0.02 | 1.00 |
| Mn-54 | < 0.007 | < 0.017 | 0.08 |
| Fe-59 | < 0.043 | < 0.033 | 0.10 |
| Co-58 | < 0.014 | < 0.016 | 0.08 |
| Co-60 | < 0.013 | < 0.018 | 0.05 |
| Zn-65 | < 0.049 | < 0.045 | 0.10 |
| Zr-Nb-95 | < 0.011 | < 0.012 | 0.10 |
| I-131 | < 0.023 | < 0.020 | 0.06 ^a |
| Cs-134 | < 0.014 | < 0.023 | 0.08 |
| Cs-137 | < 0.021 | < 0.015 | 0.08 |

^a Required for broadleaf vegetation only.

PALISADES

Table 11. Food Crops, analyses for gross beta and gamma-emitting isotopes.
Collection: Semiannually, at the time of harvest.
Units: pCi/g wet

| Location | | Control Station | |
|----------------|-------------|-----------------|-------------------|
| Lab Code | PAVE-4199 | PAVE-5789 | |
| Date Collected | 8/3/2004 | 10/6/2004 | Req. LLD |
| Sample Type | Blueberries | Apples | |
| Gross Beta | 0.74 ± 0.01 | 0.87 ± 0.02 | 1.00 |
| Mn-54 | < 0.008 | < 0.016 | 0.08 |
| Fe-59 | < 0.028 | < 0.014 | 0.10 |
| Co-58 | < 0.015 | < 0.011 | 0.08 |
| Co-60 | < 0.013 | < 0.013 | 0.05 |
| Zn-65 | < 0.026 | < 0.023 | 0.10 |
| Zr-Nb-95 | < 0.013 | < 0.018 | 0.10 |
| I-131 | < 0.020 | < 0.032 | 0.06 ^a |
| Cs-134 | < 0.014 | < 0.028 | 0.08 |
| Cs-137 | < 0.017 | < 0.011 | 0.08 |

^a Required for broadleaf vegetation only.

PALISADES

Table 11. Food Crops, analyses for gross beta and gamma-emitting isotopes.
Collection: Semiannually, at the time of harvest.
Units: pCi/g wet

| Location | | Dutch Farm |
|----------------|-------------|-------------------|
| Lab Code | PAVE-5872 | |
| Date Collected | 10/8/2003 | Req. LLD |
| Sample Type | Apples | |
| Gross Beta | 1.10 ± 0.03 | 1.00 |
| Mn-54 | < 0.021 | 0.08 |
| Fe-59 | < 0.041 | 0.10 |
| Co-58 | < 0.017 | 0.08 |
| Co-60 | < 0.014 | 0.05 |
| Zn-65 | < 0.048 | 0.10 |
| Zr-Nb-95 | < 0.014 | 0.10 |
| I-131 | < 0.041 | 0.06 ^a |
| Cs-134 | < 0.026 | 0.08 |
| Cs-137 | < 0.018 | 0.08 |

^a Required for broadleaf vegetation only.

PALISADES

Table 12. Fish, analyses for gross beta and gamma-emitting isotopes.
 Collection: Semiannually
 Units: pCi/g wet

| Location | Discharge | | | | |
|----------------|-----------------|--------------|-------------|-----------------|----------|
| Lab Code | PAF-2894 | PAF-5016 | PAF-5467 | PAF-5468 | |
| Date Collected | 6/4/2004 | 9/2/2004 | 9/23/2004 | 9/25/2004 | Req. LLD |
| Sample Type | Freshwater Drum | Yellow Perch | Suckers | Freshwater Drum | |
| Gross Beta | 2.33 ± 0.07 | 2.34 ± 0.08 | 2.52 ± 0.14 | 2.09 ± 0.08 | 1.00 |
| Mn-54 | < 0.019 | < 0.011 | < 0.013 | < 0.010 | 0.13 |
| Fe-59 | < 0.047 | < 0.055 | < 0.049 | < 0.043 | 0.26 |
| Co-58 | < 0.027 | < 0.023 | < 0.012 | < 0.009 | 0.13 |
| Co-60 | < 0.018 | < 0.014 | < 0.019 | < 0.007 | 0.13 |
| Zn-65 | < 0.044 | < 0.016 | < 0.032 | < 0.011 | 0.26 |
| Zr-Nb-95 | < 0.027 | < 0.026 | < 0.021 | < 0.020 | 0.10 |
| Cs-134 | < 0.017 | < 0.010 | < 0.018 | < 0.019 | 0.13 |
| Cs-137 | < 0.028 | < 0.023 | < 0.019 | < 0.021 | 0.15 |

| Location | Ludington Pumped Storage Plant (Control) | | | | |
|----------------|--|-------------|-----------------|-------------|----------|
| Lab Code | PAF-2895 | PAF-2896 | PAF-5465 | PAF-5466 | |
| Date Collected | 6/3/2004 | 6/3/2004 | 9/22/2004 | 9/22/2004 | Req. LLD |
| Sample Type | Freshwater Drum | Alewife | Freshwater Drum | Suckers | |
| Gross Beta | 2.30 ± 0.07 | 2.01 ± 0.07 | 4.30 ± 0.23 | 2.98 ± 0.09 | 1.00 |
| Mn-54 | < 0.021 | < 0.017 | < 0.009 | < 0.010 | 0.13 |
| Fe-59 | < 0.048 | < 0.026 | < 0.026 | < 0.052 | 0.26 |
| Co-58 | < 0.025 | < 0.017 | < 0.014 | < 0.011 | 0.13 |
| Co-60 | < 0.012 | < 0.010 | < 0.009 | < 0.013 | 0.13 |
| Zn-65 | < 0.029 | < 0.016 | < 0.026 | < 0.022 | 0.26 |
| Zr-Nb-95 | < 0.015 | < 0.027 | < 0.013 | < 0.017 | 0.10 |
| Cs-134 | < 0.025 | < 0.019 | < 0.013 | < 0.018 | 0.13 |
| Cs-137 | 0.046 ± 0.025 | < 0.017 | 0.032 ± 0.014 | < 0.021 | 0.15 |

PALISADES

Table 12. Fish, analyses for gross beta and gamma-emitting isotopes.
Collection: Semiannually
Units: pCi/g wet

| | | |
|----------------|------------------|----------|
| Location | St. Joseph's, MI | |
| Lab Code | PAF-5017 | |
| Date Collected | 8/25/2004 | Req. LLD |
| Sample Type | Yellow Perch | |
| Gross Beta | 2.53 ± 0.09 | 1.00 |
| Mn-54 | < 0.031 | 0.13 |
| Fe-59 | < 0.089 | 0.26 |
| Co-58 | < 0.025 | 0.13 |
| Co-60 | < 0.016 | 0.13 |
| Zn-65 | < 0.043 | 0.26 |
| Zr-Nb-95 | < 0.029 | 0.10 |
| Cs-134 | < 0.031 | 0.13 |
| Cs-137 | < 0.027 | 0.15 |

PALISADES

Table 13. Bottom sediment, analyses for gross beta and gamma-emitting isotopes.
 Collection: Semiannually
 Units: pCi/g dry

| Location | | Palisades Discharge | | | |
|----------------|--|---------------------|--|-------------|----------|
| Lab Code | | PABS-1540 | | PABS-5847 | |
| Date Collected | | 4/6/2004 | | 10/7/2004 | Req. LLD |
| Gross Beta | | 6.14 ± 1.16 | | 7.20 ± 1.72 | 1.00 |
| Mn-54 | | < 0.011 | | < 0.012 | 0.08 |
| Fe-59 | | < 0.021 | | < 0.019 | 0.10 |
| Co-58 | | < 0.015 | | < 0.011 | 0.08 |
| Co-60 | | < 0.007 | | < 0.012 | 0.05 |
| Zn-65 | | < 0.044 | | < 0.022 | 0.10 |
| Zr-Nb-95 | | < 0.016 | | < 0.010 | 0.10 |
| Cs-134 | | < 0.019 | | < 0.012 | 0.15 |
| Cs-137 | | < 0.020 | | < 0.012 | 0.18 |

| Location | | North Property (0.8 mi.) | | South Property (0.8 mi.) | |
|----------------|--|--------------------------|--------------|--------------------------|-------------|
| Lab Code | | PABS-1537,8 | PABS-5848 | PABS-1539 | PABS-5849 |
| Date Collected | | 4/6/2004 | 10/7/2004 | 4/6/2004 | 10/7/2004 |
| Gross Beta | | 6.79 ± 0.86 | 10.32 ± 1.95 | 6.73 ± 1.21 | 7.35 ± 1.72 |
| Mn-54 | | < 0.006 | < 0.011 | < 0.010 | < 0.005 |
| Fe-59 | | < 0.023 | < 0.018 | < 0.017 | < 0.022 |
| Co-58 | | < 0.012 | < 0.013 | < 0.009 | < 0.010 |
| Co-60 | | < 0.012 | < 0.008 | < 0.011 | < 0.008 |
| Zn-65 | | < 0.032 | < 0.020 | < 0.030 | < 0.016 |
| Zr-Nb-95 | | < 0.010 | < 0.009 | < 0.014 | < 0.011 |
| Cs-134 | | < 0.013 | < 0.012 | < 0.015 | < 0.007 |
| Cs-137 | | < 0.012 | < 0.006 | < 0.012 | < 0.009 |

PALISADES

Table 13. Bottom sediment, analyses for gross beta and gamma-emitting isotopes.
Collection: Semiannually
Units: pCi/g dry

| Location | South Haven (8.9 km North) | | Ludington (Control) | | |
|----------------|----------------------------|-------------|---------------------|-------------|----------|
| Lab Code | PABS-1536 | PABS-5850 | PABS-2897,8 | PABS-5464 | |
| Date Collected | 4/6/2004 | 10/7/2004 | 6/4/2004 | 9/28/2004 | Req. LLD |
| Gross Beta | 8.58 ± 1.32 | 9.22 ± 1.87 | 9.06 ± 1.00 | 9.39 ± 1.47 | 1.00 |
| Mn-54 | < 0.014 | < 0.010 | < 0.012 | < 0.016 | 0.08 |
| Fe-59 | < 0.043 | < 0.029 | < 0.044 | < 0.043 | 0.10 |
| Co-58 | < 0.017 | < 0.011 | < 0.022 | < 0.017 | 0.08 |
| Co-60 | < 0.017 | < 0.009 | < 0.012 | < 0.011 | 0.05 |
| Zn-65 | < 0.040 | < 0.026 | < 0.050 | < 0.057 | 0.10 |
| Zr-Nb-95 | < 0.009 | < 0.016 | < 0.014 | < 0.027 | 0.10 |
| Cs-134 | < 0.025 | < 0.012 | < 0.025 | < 0.022 | 0.15 |
| Cs-137 | < 0.018 | < 0.011 | < 0.021 | < 0.020 | 0.18 |

PALISADES

Table 14.1. Liquid Radwaste, analyses for gross alpha, tritium, strontium-89, strontium-90, plutonium-239 and gamma emitting isotopes.

Collection: Monthly

Units: uCi/ml

| Lab Code | Required LLD | NS ^a | PARW-983 | NS ^a |
|----------------|--------------|-----------------|------------------|-----------------|
| Date Collected | - | 01-31-04 | 02-10-04 | 03-31-04 |
| Gross Alpha | 1.0 E-07 | - | < 9.0 E-10 | - |
| H-3 | 1.0 E-05 | - | 4.51 ± 0.01 E-01 | - |
| Sr-89 | 5.0 E-08 | - | < 1.6 E-10 | - |
| Sr-90 | 5.0 E-08 | - | 1.2 ± 0.2 E-08 | - |
| Pu-239 | 5.0 E-08 | - | < 2.4 E-09 | - |
| Cr-51 | 5.0 E-07 | - | < 7.57 E-08 | - |
| Mn-54 | 5.0 E-07 | - | < 5.08 E-09 | - |
| Fe-59 | 5.0 E-07 | - | < 1.89 E-08 | - |
| Co-58 | 5.0 E-07 | - | 1.68 ± 0.52 E-08 | - |
| Co-60 | 5.0 E-07 | - | 9.28 ± 0.92 E-08 | - |
| Zn-65 | 5.0 E-07 | - | < 1.49 E-08 | - |
| Zr-95 | 5.0 E-07 | - | < 6.91 E-09 | - |
| Nb-95 | 5.0 E-07 | - | < 7.41 E-08 | - |
| Ag-110m | 5.0 E-07 | - | < 5.60 E-09 | - |
| Sb-124 | 5.0 E-07 | - | < 7.43 E-09 | - |
| Cs-134 | 5.0 E-07 | - | < 6.60 E-09 | - |
| Cs-137 | 5.0 E-07 | - | 4.77 ± 0.51 E-08 | - |
| Ba-140 | 5.0 E-07 | - | < 1.11 E-07 | - |
| La-140 | 5.0 E-07 | - | < 2.68 E-08 | - |
| Ce-141 | 5.0 E-07 | - | < 1.25 E-08 | - |
| Ce-144 | 5.0 E-07 | - | < 2.20 E-08 | - |

^a No sample received.

PALISADES

Table 14.1. Liquid Radwaste, analyses for gross alpha, tritium, strontium-89, strontium-90, plutonium-239 and gamma emitting isotopes.

Collection: Monthly

Units: uCi/ml

| Lab Code | Required LLD | NS ^a 04-30-04 | NS ^a 05-31-04 | PARW-3735 06-30-04 |
|----------------|--------------|-----------------------------|-----------------------------|-----------------------|
| Date Collected | - | 04-30-04 | 05-31-04 | 06-30-04 |
| Gross Alpha | 1.0 E-07 | - | - | 1.1 ± 0.9 E-09 |
| H-3 | 1.0 E-05 | - | - | 4.85 ± 0.01 E-01 |
| Sr-89 | 5.0 E-08 | - | - | < 3.2 E-09 |
| Sr-90 | 5.0 E-08 | - | - | 2.8 ± 1.4 E-09 |
| Pu-239 | 5.0 E-08 | - | - | < 5.8 E-11 |
| Cr-51 | 5.0 E-07 | - | - | < 5.35 E-08 |
| Mn-54 | 5.0 E-07 | - | - | < 4.04 E-09 |
| Fe-59 | 5.0 E-07 | - | - | < 8.86 E-09 |
| Co-58 | 5.0 E-07 | - | - | < 5.55 E-09 |
| Co-60 | 5.0 E-07 | - | - | 2.30 ± 0.40 E-08 |
| Zn-65 | 5.0 E-07 | - | - | < 1.31 E-08 |
| Zr-95 | 5.0 E-07 | - | - | < 8.40 E-09 |
| Nb-95 | 5.0 E-07 | - | - | < 5.63 E-09 |
| Ag-110m | 5.0 E-07 | - | - | < 4.82 E-09 |
| Sb-124 | 5.0 E-07 | - | - | < 5.52 E-09 |
| Cs-134 | 5.0 E-07 | - | - | < 4.62 E-09 |
| Cs-137 | 5.0 E-07 | - | - | 9.11 ± 3.40 E-09 |
| Ba-140 | 5.0 E-07 | - | - | < 4.52 E-08 |
| La-140 | 5.0 E-07 | - | - | < 1.55 E-08 |
| Ce-141 | 5.0 E-07 | - | - | < 7.54 E-09 |
| Ce-144 | 5.0 E-07 | - | - | < 2.49 E-08 |

^a No sample received.

PALISADES

Table 14.1. Liquid Radwaste, analyses for gross alpha, tritium, strontium-89, strontium-90, plutonium-239 and gamma emitting isotopes.

Collection: Monthly
Units: uCi/ml

| Lab Code | Required LLD | NS ^a | NS ^a | PARW-5179 |
|----------------|--------------|-----------------|-----------------|------------------|
| Date Collected | - | 07-31-04 | 08-31-04 | 09-06-04 |
| Gross Alpha | 1.0 E-07 | - | - | 2.3 ± 1.0 E-09 |
| H-3 | 1.0 E-05 | - | - | 8.56 ± 0.01 E-01 |
| Sr-89 | 5.0 E-08 | - | - | < 3.0 E-10 |
| Sr-90 | 5.0 E-08 | - | - | 1.8 ± 1.0 E-09 |
| Pu-239 | 5.0 E-08 | - | - | 1.75 ± 1.61 E-10 |
| Cr-51 | 5.0 E-07 | - | - | < 6.15 E-08 |
| Mn-54 | 5.0 E-07 | - | - | < 1.92 E-08 |
| Fe-59 | 5.0 E-07 | - | - | < 2.10 E-08 |
| Co-58 | 5.0 E-07 | - | - | 1.46 ± 0.10 E-07 |
| Co-60 | 5.0 E-07 | - | - | 4.58 ± 0.11 E-07 |
| Zn-65 | 5.0 E-07 | - | - | < 1.92 E-08 |
| Zr-95 | 5.0 E-07 | - | - | < 1.51 E-08 |
| Nb-95 | 5.0 E-07 | - | - | < 1.21 E-08 |
| Ag-110m | 5.0 E-07 | - | - | < 1.56 E-08 |
| Sb-124 | 5.0 E-07 | - | - | < 9.34 E-09 |
| Cs-134 | 5.0 E-07 | - | - | < 8.42 E-09 |
| Cs-137 | 5.0 E-07 | - | - | 2.13 ± 0.52 E-08 |
| Ba-140 | 5.0 E-07 | - | - | < 6.00 E-08 |
| La-140 | 5.0 E-07 | - | - | < 1.73 E-08 |
| Ce-141 | 5.0 E-07 | - | - | < 1.11 E-08 |
| Ce-144 | 5.0 E-07 | - | - | < 2.38 E-08 |

^a No sample received.

PALISADES

Table 14.1. Liquid Radwaste, analyses for gross alpha, tritium, strontium-89, strontium-90, plutonium-239 and gamma emitting isotopes.

Collection: Monthly

Units: uCi/ml

| Lab Code | Required LLD | NS ^a | PARW-6853 | NS ^a |
|----------------|--------------|-----------------|------------------|-----------------|
| Date Collected | - | 10-31-04 | 11-11-04 | 12-31-04 |
| Gross Alpha | 1.0 E-07 | - | 4.48 ± 1.19 E-09 | - |
| H-3 | 1.0 E-05 | - | 3.96 ± 0.01 E-01 | - |
| Sr-89 | 5.0 E-08 | - | < 3.4 E-09 | - |
| Sr-90 | 5.0 E-08 | - | 5.7 ± 1.3 E-09 | - |
| Pu-239 | 5.0 E-08 | - | 1.48 ± 1.06 E-10 | - |
| Cr-51 | 5.0 E-07 | - | < 2.34 E-07 | - |
| Mn-54 | 5.0 E-07 | - | < 8.41 E-08 | - |
| Fe-59 | 5.0 E-07 | - | < 6.70 E-08 | - |
| Co-58 | 5.0 E-07 | - | 5.58 ± 0.10 E-06 | - |
| Co-60 | 5.0 E-07 | - | 2.22 ± 0.10 E-07 | - |
| Zn-65 | 5.0 E-07 | - | < 4.04 E-08 | - |
| Zr-95 | 5.0 E-07 | - | < 4.23 E-08 | - |
| Nb-95 | 5.0 E-07 | - | < 3.56 E-08 | - |
| Ag-110m | 5.0 E-07 | - | 8.10 ± 1.23 E-08 | - |
| Sb-124 | 5.0 E-07 | - | < 2.94 E-08 | - |
| Cs-134 | 5.0 E-07 | - | < 1.86 E-08 | - |
| Cs-137 | 5.0 E-07 | - | 1.73 ± 1.01 E-08 | - |
| Ba-140 | 5.0 E-07 | - | < 5.33 E-07 | - |
| La-140 | 5.0 E-07 | - | < 5.37 E-08 | - |
| Ce-141 | 5.0 E-07 | - | < 3.70 E-08 | - |
| Ce-144 | 5.0 E-07 | - | < 6.67 E-08 | - |

^a No sample received.

PALISADES

Table 14.2. Stack Filters, analyses for gross alpha, plutonium-239, strontium-89 and strontium-90.

Collection: Continuous, monthly exchange.

Units: pCi/filter

| Location | | Palisades | | | |
|---------------------|------------|-------------|-----------|------------|-----------|
| Date Collected | Lab Code | Gross Alpha | Sr-89 | Sr-90 | Pu-239 |
| <u>Required LLD</u> | | <u>10</u> | <u>10</u> | <u>10</u> | <u>10</u> |
| 01-31-04 | PASP -632 | < 0.4 | < 4.7 | < 2.7 | < 0.4 |
| 02-29-04 | PASP -984 | < 0.5 | < 3.9 | < 2.9 | < 0.1 |
| 03-31-04 | PASP -1771 | 0.6 ± 0.5 | < 3.9 | < 3.5 | < 0.2 |
| 04-30-04 | PASP -2242 | < 0.6 | < 6.5 | 11.4 ± 2.2 | < 0.5 |
| 05-31-04 | PASP -3150 | < 0.5 | < 5.8 | < 3.0 | < 0.3 |
| 06-30-04 | PASP -3734 | < 0.6 | < 3.7 | 3.7 ± 1.8 | < 0.3 |
| 07-31-04 | PASP -4208 | < 0.5 | < 4.0 | < 3.2 | < 0.4 |
| 08-31-04 | PASP -5178 | 1.0 ± 0.5 | < 5.4 | 4.0 ± 1.8 | < 0.4 |
| 09-30-04 | PASP -5845 | < 0.5 | < 5.8 | 4.8 ± 1.9 | < 0.8 |
| 10-31-04 | PASP -6852 | 1.2 ± 0.6 | < 7.2 | 8.3 ± 2.4 | < 0.2 |
| 11-30-04 | PASP -7325 | 0.8 ± 0.5 | < 9.1 | < 3.5 | < 0.4 |
| 12-31-04 | PASP -7725 | < 0.7 | < 3.5 | < 2.2 | < 0.3 |

PALISADES

APPENDIX C

SPECIAL ANALYSES

PALISADES

Appendix C: Gamma isotopic
 Units: pCi/L

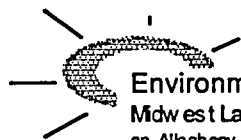
| Lab Code | PAWW-578 | PAWW-1020 | PAWW-1535 |
|----------------|----------|-----------|-----------|
| Date Collected | 02-09-04 | 03-10-04 | 04-07-04 |
| K-40 | < 18.8 | < 45.6 | < 28.6 |
| Mn-54 | < 1.5 | < 2.7 | < 1.5 |
| Fe-59 | < 3.3 | < 11.9 | < 5.4 |
| Co-58 | < 2.0 | < 4.1 | < 1.0 |
| Co-60 | < 1.4 | < 3.2 | < 1.3 |
| Zn-65 | < 2.7 | < 3.9 | < 2.4 |
| Zr-Nb-95 | < 4.2 | < 5.7 | < 4.6 |
| Cs-134 | < 1.5 | < 2.8 | < 1.6 |
| Cs-137 | < 1.3 | < 2.2 | < 1.3 |
| Ce-141 | < 8.7 | < 18.3 | < 8.0 |
| Ce-144 | < 13.2 | < 28.5 | < 36.6 |

| Lab Code | PAWW-2253 | PAWW-2911 |
|----------------|-----------|-----------|
| Date Collected | 05-11-04 | 06-08-04 |
| K-40 | < 28.6 | < 117.3 |
| Mn-54 | < 1.2 | < 4.3 |
| Fe-59 | < 7.9 | < 17.6 |
| Co-58 | < 2.1 | < 5.7 |
| Co-60 | < 0.9 | < 4.3 |
| Zn-65 | < 2.9 | < 8.5 |
| Zr-Nb-95 | < 4.1 | < 4.7 |
| Cs-134 | < 1.5 | < 3.5 |
| Cs-137 | < 1.2 | < 4.6 |
| Ce-141 | < 9.6 | < 9.7 |
| Ce-144 | < 15.0 | < 17.6 |

ATTACHMENT E

**ENVIRONMENTAL, INC, MIDWEST LABORATORY,
INTERLABORATORY COMPARISON PROGRAM RESULTS**

18 Pages Follow



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APPENDIX A

INTERLABORATORY COMPARISON PROGRAM RESULTS

NOTE: Environmental Inc., Midwest Laboratory participates in intercomparison studies administered by Environmental Resources Associates, and serves as a replacement for studies conducted previously by the U.S. EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada. Results are reported in Appendix A. TLD Intercomparison results, in-house spikes, blanks, duplicates and mixed analyte performance evaluation program results are also reported. Appendix A is updated four times a year; the complete Appendix is included in March, June, September and December monthly progress reports only.

January through December, 2004

Appendix A

Interlaboratory Comparison Program Results

Environmental, Inc., Midwest Laboratory, formerly Teledyne Brown Engineering Environmental Services Midwest Laboratory has participated in interlaboratory comparison (crosscheck) programs since the formulation of its quality control program in December 1971. These programs are operated by agencies which supply environmental type samples containing concentrations of radionuclides known to the issuing agency but not to participant laboratories. The purpose of such a program is to provide an independent check on a laboratory's analytical procedures and to alert it of any possible problems.

Participant laboratories measure the concentration of specified radionuclides and report them to the issuing agency. Several months later, the agency reports the known values to the participant laboratories and specifies control limits. Results consistently higher or lower than the known values or outside the control limits indicate a need to check the instruments or procedures used.

Results in Table A-1 were obtained through participation in the environmental sample crosscheck program administered by Environmental Resources Associates, serving as a replacement for studies conducted previously by the U.S. EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada.

The results in Table A-2 list results for thermoluminescent dosimeters (TLDs), via International Intercomparison of Environmental Dosimeters, when available, and internal laboratory testing.

Table A-3 lists results of the analyses on in-house "spiked" samples for the past twelve months. All samples are prepared using NIST traceable sources. Data for previous years available upon request.

Table A-4 lists results of the analyses on in-house "blank" samples for the past twelve months. Data for previous years available upon request.

Table A-5 list results of the in-house "duplicate" program for the past twelve months. Acceptance is based on the difference of the results being less than the sum of the errors. Data for previous years available upon request.

The results in Table A-6 were obtained through participation in the Mixed Analyte Performance Evaluation Program.

The results in Table A-7 were obtained through participation in the Environmental Measurement Laboratory Quality Assessment Program.

Attachment A lists acceptance criteria for "spiked" samples.

Out-of-limit results are explained directly below the result.

Attachment A

ACCEPTANCE CRITERIA FOR "SPIKED" SAMPLES

LABORATORY PRECISION: ONE STANDARD DEVIATION VALUES FOR VARIOUS ANALYSES^a

| Analysis | Level | One standard deviation for single determination |
|--|---|--|
| Gamma Emitters | 5 to 100 pCi/liter or kg > 100 pCi/liter or kg | 5.0 pCi/liter 5% of known value |
| Strontium-89 ^b | 5 to 50 pCi/liter or kg > 50 pCi/liter or kg | 5.0 pCi/liter 10% of known value |
| Strontium-90 ^b | 2 to 30 pCi/liter or kg > 30 pCi/liter or kg | 5.0 pCi/liter 10% of known value |
| Potassium-40 | ≥ 0.1 g/liter or kg | 5% of known value |
| Gross alpha | ≤ 20 pCi/liter > 20 pCi/liter | 5.0 pCi/liter 25% of known value |
| Gross beta | ≤ 100 pCi/liter > 100 pCi/liter | 5.0 pCi/liter 5% of known value |
| Tritium | ≤ 4,000 pCi/liter > 4,000 pCi/liter | ± 1σ = (pCi/liter) = 169.85 x (known) ^{0.0933} 10% of known value |
| Radium-226,-228 | ≥ 0.1 pCi/liter | 15% of known value |
| Plutonium | ≥ 0.1 pCi/liter, gram, or sample | 10% of known value |
| Iodine-131, Iodine-129 ^b | ≤ 55 pCi/liter > 55 pCi/liter | 6.0 pCi/liter 10% of known value |
| Uranium-238, Nickel-63 ^b Technetium-99 ^b | ≤ 35 pCi/liter > 35 pCi/liter | 6.0 pCi/liter 15% of known value |
| Iron-55 ^b | 50 to 100 pCi/liter > 100 pCi/liter | 10 pCi/liter 10% of known value |
| Others ^b | --- | 20% of known value |

^a From EPA publication, "Environmental Radioactivity Laboratory Intercomparison Studies Program, Fiscal Year, 1981-1982, EPA-600/4-81-004.

^b Laboratory limit.

TABLE A-1. Interlaboratory Comparison Crosscheck program, Environmental Resource Associates (ERA)^a.

| Lab Code | Date | Analysis | Concentration (pCi/L) | | |
|----------|----------|-----------|--------------------------------|-------------------------|----------------|
| | | | Laboratory Result ^b | ERA Result ^c | Control Limits |
| STW-1005 | 02/17/04 | Sr-89 | 36.5 ± 6.5 | 44.9 ± 4.5 | 36.2 - 53.6 |
| STW-1005 | 02/17/04 | Sr-90 | 13.4 ± 0.8 | 11.6 ± 1.2 | 2.9 - 20.3 |
| STW-1006 | 02/17/04 | Ba-133 | 60.9 ± 2.8 | 63.2 ± 6.3 | 52.3 - 74.1 |
| STW-1006 | 02/17/04 | Co-60 | 95.2 ± 1.5 | 96.4 ± 9.6 | 87.7 - 105.0 |
| STW-1006 | 02/17/04 | Cs-134 | 71.2 ± 5.4 | 75.8 ± 7.6 | 67.1 - 84.5 |
| STW-1006 | 02/17/04 | Cs-137 | 157.0 ± 6.5 | 155.0 ± 15.5 | 142.0 - 168.0 |
| STW-1006 | 02/17/04 | Zn-65 | 103.0 ± 1.1 | 102.0 ± 10.2 | 84.4 - 120.0 |
| STW-1007 | 02/17/04 | Gr. Alpha | 15.6 ± 1.2 | 16.6 ± 1.7 | 7.9 - 25.3 |
| STW-1007 | 02/17/04 | Gr. Beta | 46.3 ± 4.4 | 41.5 ± 4.2 | 32.8 - 50.2 |
| STW-1008 | 02/17/04 | Ra-226 | 8.7 ± 0.2 | 9.3 ± 0.0 | 6.9 - 11.7 |
| STW-1008 | 02/17/04 | Ra-228 | 16.6 ± 0.4 | 18.2 ± 1.8 | 10.3 - 26.1 |
| STW-1008 | 02/17/04 | Uranium | 34.2 ± 0.8 | 33.0 ± 3.3 | 27.8 - 38.2 |
| STW-1015 | 05/18/04 | Sr-89 | 39.7 ± 3.3 | 45.9 ± 5.0 | 37.2 - 54.6 |
| STW-1015 | 05/18/04 | Sr-90 | 12.4 ± 0.9 | 11.6 ± 5.0 | 2.9 - 20.3 |
| STW-1016 | 05/18/04 | Ba-133 | 96.9 ± 2.4 | 101.0 ± 10.1 | 83.5 - 118.0 |
| STW-1016 | 05/18/04 | Co-60 | 39.9 ± 0.5 | 41.6 ± 5.0 | 32.9 - 50.3 |
| STW-1016 | 05/18/04 | Cs-134 | 48.8 ± 0.8 | 50.5 ± 5.0 | 41.8 - 59.2 |
| STW-1016 | 05/18/04 | Cs-137 | 82.6 ± 2.3 | 82.5 ± 5.0 | 73.8 - 91.2 |
| STW-1016 | 05/18/04 | Zn-65 | 77.5 ± 1.5 | 75.2 ± 7.5 | 62.2 - 88.2 |
| STW-1017 | 05/18/04 | Gr. Alpha | 32.4 ± 2.1 | 38.8 ± 9.7 | 22.0 - 55.6 |
| STW-1017 | 05/18/04 | Gr. Beta | 63.4 ± 3.5 | 59.6 ± 10.0 | 42.3 - 76.9 |
| STW-1018 | 05/18/04 | I-131 | 25.2 ± 0.4 | 25.1 ± 3.0 | 19.9 - 30.3 |
| STW-1019 | 05/18/04 | Ra-226 | 16.0 ± 1.1 | 17.3 ± 2.6 | 12.8 - 21.8 |
| STW-1019 | 05/18/04 | Ra-228 | 12.6 ± 0.9 | 10.3 ± 2.6 | 5.8 - 14.8 |
| STW-1019 | 05/18/04 | Uranium | 13.0 ± 0.0 | 12.7 ± 3.0 | 7.5 - 17.9 |
| STW-1020 | 05/18/04 | H-3 | 32043 ± 166 | 30900 ± 3090 | 25600 - 36200 |
| STW-1028 | 08/17/04 | Sr-89 | 16.1 ± 1.9 | 20.0 ± 2.0 | 11.3 - 28.7 |
| STW-1028 | 08/17/04 | Sr-90 | 13.4 ± 0.1 | 13.6 ± 1.4 | 4.9 - 22.3 |
| STW-1029 | 08/17/04 | Ba-133 | 30.2 ± 3.9 | 32.1 ± 3.2 | 23.4 - 40.8 |
| STW-1029 | 08/17/04 | Co-60 | 24.9 ± 1.9 | 24.0 ± 2.4 | 15.3 - 32.7 |
| STW-1029 | 08/17/04 | Cs-134 | 21.4 ± 3.4 | 21.6 ± 2.2 | 12.9 - 30.3 |
| STW-1029 | 08/17/04 | Cs-137 | 205.6 ± 4.3 | 193.0 ± 19.3 | 176.0 - 210.0 |
| STW-1029 | 08/17/04 | Zn-65 | 145.5 ± 3.0 | 143.0 ± 14.3 | 118.0 - 168.0 |
| STW-1030 | 08/17/04 | Gr. Alpha | 47.7 ± 9.1 | 57.0 ± 5.7 | 32.3 - 81.7 |
| STW-1030 | 08/17/04 | Gr. Beta | 28.1 ± 2.5 | 20.0 ± 2.0 | 11.3 - 28.7 |
| STW-1030 | 08/17/04 | Gr. Beta | 28.1 ± 2.5 | 20.0 ± 2.0 | 11.3 - 28.7 |
| STW-1031 | 08/17/04 | Ra-226 | 6.9 ± 0.5 | 6.3 ± 0.6 | 4.6 - 7.9 |
| STW-1031 | 08/17/04 | Ra-228 | 13.1 ± 1.4 | 14.7 ± 1.5 | 8.3 - 21.1 |
| STW-1031 | 08/17/04 | Uranium | 6.0 ± 0.1 | 6.2 ± 0.6 | 1.0 - 11.4 |

TABLE A-1. Interlaboratory Comparison Crosscheck program, Environmental Resource Associates (ERA)^a.

| Lab Code | Date | Analysis | Concentration (pCi/L) | | |
|----------|----------|-----------|--------------------------------|-------------------------|-------------------|
| | | | Laboratory Result ^b | ERA Result ^c | Control Limits |
| STW-1037 | 11/15/04 | Sr-89 | 42.2 ± 3.5 | 45.7 ± 5.0 | 37.0 - 51.5 |
| STW-1037 | 11/15/04 | Sr-90 | 37.3 ± 1.3 | 36.6 ± 5.0 | 27.9 - 45.3 |
| STW-1038 | 11/15/04 | Ba-133 | 75.5 ± 0.8 | 78.4 ± 7.8 | 64.8 - 92.0 |
| STW-1038 | 11/15/04 | Co-60 | 12.2 ± 0.7 | 11.7 ± 5.0 | 3.0 - 20.4 |
| STW-1038 | 11/15/04 | Cs-134 | 43.6 ± 0.5 | 42.9 ± 5.0 | 34.2 - 51.6 |
| STW-1038 | 11/15/04 | Cs-137 | 59.5 ± 2.9 | 60.1 ± 5.0 | 51.4 - 68.8 |
| STW-1038 | 11/15/04 | Zn-65 | 50.7 ± 3.2 | 50.9 ± 5.1 | 42.1 - 59.7 |
| STW-1039 | 11/15/04 | Gr. Alpha | 23.9 ± 2.2 | 31.7 ± 7.9 | 18.0 - 45.4 |
| STW-1039 | 11/15/04 | Gr. Beta | 35.8 ± 1.3 | 36.3 ± 5.0 | 27.6 - 45.0 |
| STW-1040 | 11/15/04 | I-131 | 22.4 ± 1.9 | 22.0 ± 5.0 | 16.9 - 27.3 |
| STW-1041 | 11/15/04 | Ra-226 | 9.8 ± 0.4 | 9.2 ± 1.4 | 6.8 - 11.6 |
| STW-1041 | 11/15/04 | Ra-228 | 8.6 ± 0.3 | 7.1 ± 1.8 | 7.0 - 10.2 |
| STW-1041 | 11/15/04 | Uranium | 11.1 ± 0.3 | 11.4 ± 3.0 | 6.2 - 16.6 |
| STW-1042 | 11/15/04 | H-3 | 21218.0 ± 285.0 | 20700.0 ± 2070.0 | 17100.0 - 24300.0 |

^a Results obtained by Environmental, Inc., Midwest Laboratory as a participant in the crosscheck program for proficiency testing in drinking water conducted by Environmental Resources Associates (ERA).

^b Unless otherwise indicated, the laboratory result is given as the mean ± standard deviation for three determinations.

^c Results are presented as the known values, expected laboratory precision (1 sigma, 1 determination) and control limits as provided by ERA.

TABLE A-2. Crosscheck program results; Thermoluminescent Dosimetry, (TLDs).

| Lab Code | TLD Type | Date | Description | Known Value | mR | |
|----------------------------|-----------------|-----------|------------------|-------------|-------------------------|----------------|
| | | | | | Lab Result ± 2 sigma | Control Limits |
| <u>Environmental, Inc.</u> | | | | | | |
| 2003-1 | CaSO4: Dy Cards | 8/8/2003 | Reader 1, 120 | 4.69 | 4.74 ± 0.54 | 3.28 - 6.10 |
| 2003-1 | CaSO4: Dy Cards | 8/8/2003 | Reader 1, 150 | 3.00 | 3.02 ± 0.20 | 2.10 - 3.90 |
| 2003-1 | CaSO4: Dy Cards | 8/8/2003 | Reader 1, 180 | 2.08 | 1.89 ± 0.45 | 1.46 - 2.70 |
| 2003-1 | CaSO4: Dy Cards | 8/8/2003 | Reader 1, 180 | 2.08 | 2.11 ± 0.22 | 1.46 - 2.70 |
| 2003-1 | CaSO4: Dy Cards | 8/8/2003 | Reader 1, 30 | 75.00 | 84.40 ± 4.87 | 52.50 - 97.50 |
| 2003-1 | CaSO4: Dy Cards | 8/8/2003 | Reader 1, 60 | 18.75 | 19.11 ± 1.86 | 13.13 - 24.38 |
| 2003-1 | CaSO4: Dy Cards | 8/8/2003 | Reader 1, 60 | 18.75 | 22.82 ± 5.41 | 13.13 - 24.38 |
| 2003-1 | CaSO4: Dy Cards | 8/8/2003 | Reader 1, 90 | 8.33 | 9.05 ± 1.17 | 5.83 - 10.83 |
| 2003-1 | CaSO4: Dy Cards | 8/8/2003 | Reader 1, 90 | 8.33 | 7.60 ± 1.08 | 5.83 - 10.83 |
| <u>Environmental, Inc.</u> | | | | | | |
| 2003-2 | CaSO4: Dy Cards | 1/12/2004 | Reader 1, 30 | 61.96 | 73.50 ± 2.58 | 43.37 - 80.55 |
| 2003-2 | CaSO4: Dy Cards | 1/12/2004 | Reader 1, 60 | 15.49 | 19.70 ± 0.51 | 10.84 - 20.14 |
| 2003-2 | CaSO4: Dy Cards | 1/12/2004 | Reader 1, 60 | 15.49 | 16.93 ± 1.37 | 10.84 - 20.14 |
| 2003-2 | CaSO4: Dy Cards | 1/12/2004 | Reader 1, 90 | 6.88 | 8.06 ± 0.60 | 4.82 - 8.94 |
| 2003-2 | CaSO4: Dy Cards | 1/12/2004 | Reader 1, 90 | 6.88 | 6.64 ± 0.58 | 4.82 - 8.94 |
| 2003-2 | CaSO4: Dy Cards | 1/12/2004 | Reader 1, 120 | 3.87 | 4.39 ± 0.17 | 2.71 - 5.03 |
| 2003-2 | CaSO4: Dy Cards | 1/12/2004 | Reader 1, 150 | 2.48 | 2.34 ± 0.18 | 1.74 - 3.22 |
| 2003-2 | CaSO4: Dy Cards | 1/12/2004 | Reader 1, 150 | 2.48 | 2.51 ± 0.16 | 1.74 - 3.22 |
| 2003-2 | CaSO4: Dy Cards | 1/12/2004 | Reader 1, 180 | 1.72 | 2.01 ± 0.13 | 1.20 - 2.24 |
| <u>Environmental, Inc.</u> | | | | | | |
| 2004-1 | CaSO4: Dy Cards | 7/12/2004 | Reader 1, 30 cm | 55.23 | 61.07 ± 4.38 | 38.66 - 71.80 |
| 2004-1 | CaSO4: Dy Cards | 7/12/2004 | Reader 1, 30 cm | 55.23 | 62.82 ± 1.75 | 38.66 - 71.80 |
| 2004-1 | CaSO4: Dy Cards | 7/12/2004 | Reader 1, 60 cm | 13.81 | 14.10 ± 0.56 | 9.67 - 17.95 |
| 2004-1 | CaSO4: Dy Cards | 7/12/2004 | Reader 1, 60 cm | 13.81 | 14.03 ± 0.48 | 9.67 - 17.95 |
| 2004-1 | CaSO4: Dy Cards | 7/12/2004 | Reader 1, 90 cm | 6.14 | 5.97 ± 0.21 | 4.30 - 7.98 |
| 2004-1 | CaSO4: Dy Cards | 7/12/2004 | Reader 1, 90 cm | 6.14 | 6.26 ± 0.14 | 4.30 - 7.98 |
| 2004-1 | CaSO4: Dy Cards | 7/12/2004 | Reader 1, 120 cm | 3.45 | 4.40 ± 0.63 | 2.42 - 4.49 |
| 2004-1 | CaSO4: Dy Cards | 7/12/2004 | Reader 1, 150 cm | 2.21 | 2.34 ± 0.12 | 1.55 - 2.87 |
| 2004-1 | CaSO4: Dy Cards | 7/12/2004 | Reader 1, 180 cm | 1.53 | 1.65 ± 0.02 | 1.07 - 1.99 |

TABLE A-3. In-House "Spike" Samples

| Lab Code | Sample Type | Date | Analysis | Concentration (pCi/L) ^a | | |
|-----------|-------------|-----------|----------|--|----------------|-----------------------------|
| | | | | Laboratory results 2s, n=1 ^b | Known Activity | Control Limits ^c |
| SPVE-707 | Vegetation | 2/20/2004 | I-131(G) | 5.68 ± 0.15 | 4.93 | 2.96 - 6.90 |
| SPCH-711 | Charcoal | 2/20/2004 | I-131(G) | 6.35 ± 0.11 | 6.94 | 0.00 - 16.94 |
| SPW-721 | water | 2/20/2004 | Ni-63 | 161.00 ± 13.20 | 169.00 | 101.40 - 236.60 |
| SPAP-733 | Air Filter | 2/25/2004 | Gr. Beta | 1.39 ± 0.02 | 1.48 | 0.00 - 11.48 |
| SPW-735 | water | 2/25/2004 | Cs-134 | 41.59 ± 7.02 | 39.10 | 29.10 - 49.10 |
| SPW-735 | water | 2/25/2004 | Cs-137 | 64.11 ± 7.39 | 64.56 | 54.56 - 74.56 |
| SPW-735 | water | 2/25/2004 | I-131 | 36.55 ± 0.48 | 40.08 | 28.08 - 52.08 |
| SPW-735 | water | 2/25/2004 | I-131 | 41.97 ± 8.93 | 40.08 | 28.08 - 52.08 |
| SPMI-737 | Milk | 2/25/2004 | Cs-134 | 37.40 ± 5.40 | 39.10 | 29.10 - 49.10 |
| SPMI-737 | Milk | 2/25/2004 | Cs-137 | 69.13 ± 9.58 | 64.56 | 54.56 - 74.56 |
| SPMI-737 | Milk | 2/25/2004 | I-131 | 45.03 ± 0.53 | 40.08 | 28.08 - 52.08 |
| SPMI-737 | Milk | 2/25/2004 | I-131 | 44.43 ± 9.22 | 40.08 | 28.08 - 52.08 |
| SPW-1109 | water | 3/18/2004 | Fe-55 | 39.98 ± 1.72 | 39.98 | 23.99 - 55.97 |
| SPW-1496 | water | 4/7/2004 | H-3 | 80006.60 ± 776.00 | 83896.00 | 67116.80 - 100675.20 |
| SPMI-1683 | Milk | 4/16/2004 | Sr-90 | 42.80 ± 1.81 | 43.43 | 34.74 - 52.12 |
| SPW-1683 | water | 4/16/2004 | I-131 | 54.47 ± 0.73 | 66.60 | 53.28 - 79.92 |
| SPW-1683 | water | 4/16/2004 | I-131(G) | 65.82 ± 8.86 | 66.60 | 56.60 - 76.60 |
| SPMI-1685 | Milk | 4/16/2004 | Cs-134 | 33.60 ± 4.24 | 37.29 | 27.29 - 47.29 |
| SPMI-1685 | Milk | 4/16/2004 | Cs-137 | 61.77 ± 7.59 | 64.36 | 54.36 - 74.36 |
| SPMI-1685 | Milk | 4/16/2004 | I-131 | 65.85 ± 0.79 | 66.60 | 53.28 - 79.92 |
| SPMI-1685 | Milk | 4/16/2004 | I-131(G) | 75.56 ± 11.86 | 66.60 | 56.60 - 76.60 |
| SPMI-1685 | Milk | 4/16/2004 | Sr-90 | 42.56 ± 1.66 | 43.43 | 34.74 - 52.12 |
| SPW-1686 | water | 4/16/2004 | Cs-134 | 39.31 ± 4.35 | 37.29 | 27.29 - 47.29 |
| SPW-1686 | water | 4/16/2004 | Cs-137 | 67.73 ± 7.92 | 64.36 | 54.36 - 74.36 |
| SPVE-1862 | Vegetation | 4/26/2004 | I-131(G) | 1.32 ± 0.03 | 1.12 | 0.67 - 1.57 |
| SPCH-1886 | Charcoal | 4/26/2004 | I-131(G) | 2.90 ± 0.07 | 2.80 | 1.68 - 3.92 |
| SPAP-1888 | Air Filter | 4/27/2004 | Gr. Beta | 1.35 ± 0.02 | 1.48 | 0.00 - 11.48 |
| SPF-1917 | Fish | 4/29/2004 | Cs-134 | 1.44 ± 0.04 | 1.47 | 0.88 - 2.06 |
| SPF-1917 | Fish | 4/29/2004 | Cs-137 | 1.33 ± 0.06 | 1.29 | 0.77 - 1.81 |
| SPW-3151 | water | 6/24/2004 | Fe-55 | 33.85 ± 1.61 | 37.32 | 22.39 - 52.25 |
| SPW-4232 | water | 8/4/2004 | H-3 | 80225.00 ± 785.00 | 82380.00 | 65904.00 - 98856.00 |
| SPAP-4234 | Air Filter | 8/4/2004 | Gr. Beta | 1.63 ± 0.02 | 1.46 | 0.00 - 11.46 |
| SPW-5712 | water | 10/6/2004 | Cs-134 | 61.04 ± 2.51 | 63.61 | 53.61 - 73.61 |
| SPW-5712 | water | 10/6/2004 | Cs-137 | 62.01 ± 2.76 | 63.66 | 53.66 - 73.66 |
| SPW-5712 | water | 10/6/2004 | Sr-90 | 48.40 ± 2.00 | 42.94 | 34.35 - 51.53 |
| SPMI-5714 | Milk | 10/6/2004 | Sr-90 | 41.61 ± 1.57 | 42.94 | 34.35 - 51.53 |

TABLE A-3. In-House "Spike" Samples

| Lab Code | Sample Type | Date | Analysis | Concentration (pCi/L) | | |
|-----------|-------------|------------|----------|--|----------------|-----------------------------|
| | | | | Laboratory results 2s, n=1 ^b | Known Activity | Control Limits ^c |
| SPMI-7418 | Milk | 12/22/2004 | Cs-134 | 59.09 ± 2.59 | 59.25 | 49.25 - 69.25 |
| SPMI-7418 | Milk | 12/22/2004 | Cs-137 | 65.45 ± 5.61 | 63.35 | 53.35 - 73.35 |
| SPW-7420 | water | 12/22/2004 | Cs-134 | 58.42 ± 1.99 | 59.25 | 49.25 - 69.25 |
| SPW-7420 | water | 12/22/2004 | Cs-137 | 64.26 ± 4.18 | 63.35 | 53.35 - 73.35 |
| SPW-7420 | water | 12/22/2004 | Sr-89 | 105.26 ± 4.21 | 103.47 | 82.78 - 124.16 |
| SPW-7420 | water | 12/22/2004 | Sr-90 | 48.24 ± 1.70 | 42.72 | 34.18 - 51.26 |
| SPAP-7437 | Air Filter | 12/22/2004 | Gr. Beta | 1.65 ± 0.02 | 1.45 | 0.00 - 11.45 |
| SPF-7524 | Fish | 12/29/2004 | Cs-134 | 1.11 ± 0.03 | 1.27 | 0.76 - 1.78 |
| SPF-7524 | Fish | 12/29/2004 | Cs-137 | 1.21 ± 0.05 | 1.19 | 0.71 - 1.67 |
| SPW-7526 | water | 12/29/2004 | H-3 | 78615.70 ± 773.70 | 80543.00 | 64434.40 - 96651.60 |
| SPW-7532 | water | 12/29/2004 | Fe-55 | 30894.00 ± 1484.00 | 32752.00 | 26201.60 - 39302.40 |
| SPW-7540 | water | 12/29/2004 | Tc-99 | 30.28 ± 1.11 | 32.98 | 20.98 - 44.98 |

^a Liquid sample results are reported in pCi/Liter, air filters (pCi/m³), charcoal (pCi/m³), and solid samples (pCi/g).

^b Results are based on single determinations.

^c Control limits are based on Attachment A, Page A2 of this report.

NOTE: For fish, Jello is used for the Spike matrix. For Vegetation, cabbage is used for the Spike matrix.

TABLE A-4. In-House "Blank" Samples

| Lab Code | Sample Type | Date | Analysis | Concentration (pCi/L) ^a | | |
|-----------|-------------|-----------|----------|------------------------------------|-----------------------|------------------------------|
| | | | | Laboratory results (4.66σ) | | Acceptance Criteria (4.66 σ) |
| | | | | LLD | Activity ^b | |
| SPCH-712 | Charcoal | 2/20/2004 | I-131(G) | 2.24 | | 9.6 |
| SPW-722 | Water | 2/20/2004 | Ni-63 | 2.64 | -0.78 ± 1.58 | 20 |
| SPAP-734 | Air Filter | 2/25/2004 | Gr. Beta | 0.96 | -1.02 ± 0.42 | 3.2 |
| SPW-736 | Water | 2/25/2004 | Cs-134 | 2.47 | | 10 |
| SPW-736 | Water | 2/25/2004 | Cs-137 | 1.91 | | 10 |
| SPW-736 | Water | 2/25/2004 | I-131 | 0.15 | -0.031 ± 0.10 | 0.5 |
| SPW-736 | Water | 2/25/2004 | I-131(G) | 3.24 | | 20 |
| SPMI-738 | Milk | 2/25/2004 | Cs-134 | 2.54 | | 10 |
| SPMI-738 | Milk | 2/25/2004 | Cs-137 | 5.34 | | 10 |
| SPMI-738 | Milk | 2/25/2004 | I-131 | 0.16 | -0.071 ± 0.10 | 0.5 |
| SPMI-738 | Milk | 2/25/2004 | I-131(G) | 5.36 | | 20 |
| SPW-1110 | Water | 3/18/2004 | Fe-55 | 772.70 | 168.4 ± 480.90 | 1000 |
| SPW-1497 | Water | 4/7/2004 | H-3 | 152.30 | 81.4 ± 79.40 | 200 |
| SPW-1684 | Water | 4/16/2004 | Cs-134 | 2.43 | | 10 |
| SPW-1684 | Water | 4/16/2004 | Cs-137 | 2.53 | | 10 |
| SPW-1684 | Water | 4/16/2004 | I-131 | 0.50 | 0.21 ± 0.26 | 0.5 |
| SPW-1684 | Water | 4/16/2004 | I-131(G) | 4.49 | | 20 |
| SPW-1684 | Water | 4/16/2004 | Sr-89 | 0.64 | 0.19 ± 0.52 | 5 |
| SPW-1684 | Water | 4/16/2004 | Sr-90 | 0.64 | 0.13 ± 0.31 | 1 |
| SPMI-1686 | Milk | 4/16/2004 | Cs-134 | 5.00 | | 10 |
| SPMI-1686 | Milk | 4/16/2004 | Cs-137 | 4.16 | | 10 |
| SPMI-1686 | Milk | 4/16/2004 | I-131 | 0.45 | 0.13 ± 0.24 | 0.5 |
| SPMI-1686 | Milk | 4/16/2004 | I-131(G) | 6.53 | | 20 |
| SPMI-1686 | Milk | 4/16/2004 | Sr-89 | 0.71 | 0.11 ± 0.70 | 5 |
| SPMI-1686 | Milk | 4/16/2004 | Sr-90 | 0.71 | 0.66 ± 0.40 | 1 |
| SPVE-1863 | Vegetation | 4/26/2004 | I-131(G) | 3.55 | | 20 |
| SPCH-1887 | Charcoal | 4/26/2004 | I-131(G) | 7.04 | | 9.6 |
| SPAP-1889 | Air Filter | 4/27/2004 | Gr. Beta | 0.74 | -0.96 ± 0.35 | 3.2 |
| SPF-1918 | Fish | 4/29/2004 | Cs-134 | 7.13 | | 100 |
| SPF-1918 | Fish | 4/29/2004 | Cs-137 | 6.59 | | 100 |
| SPW-3152 | Water | 6/24/2004 | Fe-55 | 790.30 | -70.0 ± 474.50 | 1000 |
| SPW-4233 | Water | 8/4/2004 | H-3 | 154.23 | 102.67 ± 81.38 | 200 |
| SPAP-4235 | Air Filter | 8/4/2004 | Gr. Beta | 0.96 | -0.99 ± 0.38 | 3.2 |
| SPW-5711 | Water | 10/6/2004 | Co-60 | 4.26 | | 10 |
| SPW-5711 | Water | 10/6/2004 | Cs-134 | 6.02 | | 10 |
| SPW-5711 | Water | 10/6/2004 | Cs-137 | 5.28 | | 10 |
| SPW-5711 | Water | 10/6/2004 | Sr-90 | 0.61 | -0.13 ± 0.27 | 1 |

TABLE A-4. In-House "Blank" Samples

| Lab Code | Sample Type | Date | Analysis | Concentration (pCi/L) ^a | | Acceptance Criteria (4.66 σ) |
|-----------|-------------|------------|----------|-------------------------------------|-----------------------|--------------------------------------|
| | | | | Laboratory results (4.66 σ) | | |
| | | | | LLD | Activity ^b | |
| SPMI-5713 | Milk | 10/6/2004 | Cs-134 | 4.60 | | 10 |
| SPMI-5713 | Milk | 10/6/2004 | Cs-137 | 5.81 | | 10 |
| SPMI-5713 | Milk | 10/6/2004 | I-131(G) | 6.07 | | 20 |
| SPMI-5713 | Milk | 10/6/2004 | Sr-90 | 0.68 | 1.4 \pm 0.45 | 1 |
| SPMI-7419 | Milk | 12/22/2004 | Cs-134 | 8.66 | | 10 |
| SPMI-7419 | Milk | 12/22/2004 | Cs-137 | 5.61 | | 10 |
| SPMI-7419 | Milk | 12/22/2004 | Sr-90 | 0.82 | 1.67 \pm 0.48 | 1 |
| SPW-7421 | Water | 12/22/2004 | Sr-89 | 1.21 | 0.58 \pm 0.94 | 5 |
| SPW-7421 | Water | 12/22/2004 | Sr-90 | 0.82 | 0.26 \pm 0.41 | 1 |
| SPAP-7438 | Air Filter | 12/22/2004 | Gr. Beta | 0.93 | -0.78 \pm 0.40 | 3.2 |
| SPF-7525 | Fish | 12/29/2004 | Cs-134 | 8.27 | | 100 |
| SPF-7525 | Fish | 12/29/2004 | Cs-137 | 10.60 | | 100 |
| SPW-7526 | Water | 12/29/2004 | H-3 | 164.80 | -47.0 \pm 84.60 | 200 |
| SPW-7533 | Water | 12/29/2004 | Fe-55 | 753.00 | 118.6 \pm 465.80 | 1000 |
| SPW-7535 | Water | 12/29/2004 | Ni-63 | 13.10 | 4.3 \pm 8.10 | 20 |
| SPW-7540 | Water | 12/29/2004 | Tc-99 | 1.19 | -0.036 \pm 0.72 | 10 |

^a Liquid sample results are reported in pCi/Liter, air filters(pCi/filter), charcoal (pCi/charcoal canister), and solid samples (pCi/kg).

^b Activity reported is a net activity result. For gamma spectroscopic analysis, activity detected below the LLD value is not reported.

^c I-131(G); Iodine-131 as analyzed by gamma spectroscopy.

^d Low levels of Sr-90 are still detected in the environment. A concentration of (1-5 pCi/L) in milk is not unusual.

TABLE A-5. In-House "Duplicate" Samples

| Lab Code | Date | Analysis | Concentration (pCi/L) ^a | | |
|----------------|-----------|-----------|------------------------------------|-------------------|-------------------|
| | | | First Result | Second Result | Averaged Result |
| E-30, 31 | 1/5/2004 | Gr. Beta | 1.27 ± 0.06 | 1.26 ± 0.05 | 1.27 ± 0.04 |
| E-30, 31 | 1/5/2004 | K-40 | 1.33 ± 0.21 | 1.11 ± 0.20 | 1.22 ± 0.15 |
| WW-58, 59 | 1/5/2004 | Gr. Beta | 4.20 ± 1.33 | 4.46 ± 1.34 | 4.33 ± 0.94 |
| WW-58, 59 | 1/5/2004 | K-40 | 2.30 ± 0.23 | 2.70 ± 0.27 | 2.50 ± 0.18 |
| TD-7889, 7890 | 1/5/2004 | H-3 | 16582.00 ± 366.00 | 16060.00 ± 360.00 | 16321.00 ± 256.69 |
| MI-79, 80 | 1/7/2004 | K-40 | 1451.50 ± 125.90 | 1383.60 ± 115.50 | 1417.55 ± 85.43 |
| MI-79, 80 | 1/7/2004 | Sr-90 | 0.90 ± 0.31 | 1.05 ± 0.34 | 0.97 ± 0.23 |
| S-100, 101 | 1/13/2004 | Cs-137 | 8.50 ± 0.23 | 8.52 ± 0.21 | 8.51 ± 0.16 |
| SW-225, 226 | 1/13/2004 | Gr. Alpha | 2.62 ± 1.26 | 2.05 ± 1.16 | 2.34 ± 0.86 |
| SW-225, 226 | 1/13/2004 | Gr. Beta | 6.37 ± 1.15 | 4.92 ± 1.06 | 5.65 ± 0.78 |
| U-304, 305 | 1/16/2004 | Gr. Beta | 5.18 ± 1.38 | 7.04 ± 1.53 | 6.11 ± 1.03 |
| SW-345, 346 | 1/27/2004 | I-131 | 1.32 ± 0.24 | 1.56 ± 0.21 | 1.44 ± 0.16 |
| SWT-423, 424 | 1/27/2004 | Gr. Beta | 2.34 ± 0.54 | 2.38 ± 0.52 | 2.36 ± 0.38 |
| SWU-469, 470 | 1/27/2004 | Gr. Beta | 2.99 ± 0.57 | 3.09 ± 0.67 | 3.04 ± 0.44 |
| TD-545, 546 | 2/2/2004 | H-3 | 658.40 ± 104.60 | 712.30 ± 106.60 | 685.35 ± 74.67 |
| MI-524, 525 | 2/4/2004 | K-40 | 1240.00 ± 147.90 | 1265.60 ± 166.30 | 1252.80 ± 111.28 |
| MI-567, 568 | 2/9/2004 | K-40 | 1322.90 ± 105.50 | 1340.80 ± 112.80 | 1331.85 ± 77.22 |
| MI-567, 568 | 2/9/2004 | Sr-90 | 0.98 ± 0.48 | 0.79 ± 0.42 | 0.89 ± 0.32 |
| MI-588, 589 | 2/11/2004 | K-40 | 1185.70 ± 157.80 | 1337.70 ± 160.00 | 1261.70 ± 112.36 |
| SWU-778, 779 | 2/24/2004 | Gr. Beta | 2.55 ± 0.54 | 2.53 ± 0.56 | 2.54 ± 0.39 |
| LW-1014, 1015 | 3/1/2004 | Gr. Beta | 1.78 ± 0.56 | 2.06 ± 0.57 | 1.92 ± 0.40 |
| SW-966, 967 | 3/9/2004 | Gr. Alpha | 2.70 ± 1.43 | 2.96 ± 1.63 | 2.83 ± 1.08 |
| SW-966, 967 | 3/9/2004 | Gr. Beta | 8.06 ± 1.20 | 7.33 ± 1.21 | 7.69 ± 0.85 |
| SW-966, 967 | 3/9/2004 | H-3 | 182.04 ± 86.24 | 198.87 ± 86.97 | 190.45 ± 61.24 |
| SW-1249, 1250 | 3/31/2004 | Gr. Beta | 4.71 ± 1.11 | 5.25 ± 1.10 | 4.98 ± 0.78 |
| LW-1464, 1465 | 3/31/2004 | Gr. Beta | 2.13 ± 0.52 | 2.39 ± 0.53 | 2.26 ± 0.37 |
| AP-1633, 1634 | 3/31/2004 | Be-7 | 0.05 ± 0.02 | 0.05 ± 0.02 | 0.05 ± 0.01 |
| AP-1714, 1715 | 3/31/2004 | Be-7 | 0.04 ± 0.01 | 0.05 ± 0.01 | 0.05 ± 0.01 |
| TD-1489, 1490 | 4/1/2004 | H-3 | 681.00 ± 110.00 | 709.00 ± 111.00 | 695.00 ± 78.14 |
| SWT-1299, 1300 | 4/2/2004 | Gr. Beta | 3.13 ± 0.57 | 3.64 ± 0.60 | 3.39 ± 0.41 |
| DW-1420, 1421 | 4/2/2004 | Gr. Beta | 1.29 ± 0.83 | 1.62 ± 0.87 | 1.46 ± 0.60 |
| DW-1510, 1511 | 4/2/2004 | I-131 | 0.68 ± 0.27 | 0.62 ± 0.36 | 0.65 ± 0.23 |
| BS-1537, 1538 | 4/6/2004 | Gr. Beta | 6.81 ± 1.20 | 6.76 ± 1.23 | 6.78 ± 0.86 |
| WW-1654, 1655 | 4/13/2004 | Gr. Beta | 6.83 ± 1.17 | 5.60 ± 1.12 | 6.21 ± 0.81 |
| LW-1680, 1681 | 4/13/2004 | Gr. Beta | 2.45 ± 0.64 | 2.93 ± 0.62 | 2.69 ± 0.45 |
| MI-1735, 1736 | 4/14/2004 | K-40 | 1384.90 ± 182.00 | 1408.20 ± 187.90 | 1396.55 ± 130.80 |
| MI-1802, 1803 | 4/19/2004 | K-40 | 1327.50 ± 109.10 | 1206.30 ± 113.30 | 1266.90 ± 78.64 |
| MI-1802, 1803 | 4/19/2004 | Sr-90 | 0.72 ± 0.40 | 0.77 ± 0.41 | 0.74 ± 0.28 |
| U-1781, 1782 | 4/21/2004 | Gr. Alpha | 0.20 ± 1.90 | -0.30 ± 2.40 | -0.05 ± 1.53 |
| SWT-1933, 1934 | 4/27/2004 | Gr. Beta | 2.60 ± 0.55 | 2.33 ± 0.52 | 2.46 ± 0.38 |
| F-1912, 1913 | 4/29/2004 | H-3 | 8875.00 ± 250.00 | 9119.00 ± 253.00 | 8997.00 ± 177.84 |
| F-1912, 1913 | 4/29/2004 | K-40 | 3406.90 ± 533.30 | 3550.60 ± 581.40 | 3478.75 ± 394.47 |
| LW-1960, 1961 | 4/29/2004 | Gr. Beta | 2.23 ± 0.55 | 2.38 ± 0.57 | 2.31 ± 0.40 |

TABLE A-5. In-House "Duplicate" Samples

| Lab Code | Date | Analysis | Concentration (pCi/L) ^a | | |
|----------------------------|-----------|-----------|------------------------------------|-------------------|-------------------|
| | | | First Result | Second Result | Averaged Result |
| BS-2083, 2084 | 5/3/2004 | Be-7 | 1.10 ± 0.44 | 1.17 ± 0.20 | 1.14 ± 0.24 |
| BS-2083, 2084 | 5/3/2004 | Gr. Beta | 28.44 ± 2.27 | 25.56 ± 2.04 | 27.00 ± 1.53 |
| BS-2083, 2084 | 5/3/2004 | K-40 | 6.75 ± 0.89 | 6.35 ± 0.53 | 6.55 ± 0.52 |
| BS-2083, 2084 | 5/3/2004 | Sr-90 | 0.12 ± 0.04 | 0.17 ± 0.05 | 0.15 ± 0.03 |
| MI-2225, 2226 | 5/11/2004 | K-40 | 1396.30 ± 124.20 | 1227.60 ± 125.40 | 1311.95 ± 88.25 |
| SW-2267, 2268 | 5/11/2004 | Gr. Alpha | 2.95 ± 1.44 | 2.41 ± 1.37 | 2.68 ± 0.99 |
| SW-2267, 2268 | 5/11/2004 | Gr. Beta | 6.80 ± 1.18 | 7.25 ± 1.21 | 7.03 ± 0.84 |
| MI-2437, 2438 | 5/17/2004 | K-40 | 1549.00 ± 123.40 | 1566.20 ± 118.60 | 1557.60 ± 85.58 |
| MI-2437, 2438 | 5/17/2004 | Sr-90 | 1.83 ± 0.44 | 1.99 ± 0.42 | 1.91 ± 0.30 |
| F-2413, 2414 | 5/20/2004 | K-40 | 2844.60 ± 550.40 | 2963.00 ± 532.30 | 2903.80 ± 382.85 |
| SO-2578, 2579 | 5/26/2004 | Cs-137 | 0.16 ± 0.02 | 0.21 ± 0.05 | 0.18 ± 0.03 |
| SO-2578, 2579 | 5/26/2004 | Gr. Beta | 28.07 ± 3.24 | 28.73 ± 3.00 | 28.40 ± 2.21 |
| SO-2578, 2579 | 5/26/2004 | K-40 | 19.41 ± 0.78 | 18.93 ± 1.04 | 19.17 ± 0.65 |
| SS-2603, 2604 | 5/26/2004 | Cs-137 | 0.06 ± 0.02 | 0.06 ± 0.02 | 0.06 ± 0.02 |
| SS-2603, 2604 | 5/26/2004 | K-40 | 10.18 ± 0.63 | 10.43 ± 0.56 | 10.30 ± 0.42 |
| G-2677, 2678 | 6/1/2004 | Be-7 | 1.31 ± 0.25 | 1.25 ± 0.23 | 1.28 ± 0.17 |
| G-2677, 2678 | 6/1/2004 | Gr. Beta | 5.73 ± 0.12 | 5.86 ± 0.12 | 5.79 ± 0.09 |
| G-2677, 2678 | 6/1/2004 | K-40 | 5.56 ± 0.49 | 5.78 ± 0.50 | 5.67 ± 0.35 |
| G-2677, 2678 | 6/1/2004 | Sr-90 | 0.01 ± 0.00 | 0.01 ± 0.01 | 0.01 ± 0.00 |
| DW-2700, 2701 | 6/1/2004 | Gr. Beta | 1.82 ± 1.01 | 2.66 ± 0.94 | 2.24 ± 0.69 |
| TD-2876, 2877 | 6/1/2004 | H-3 | 13116.00 ± 324.00 | 12746.00 ± 320.00 | 12931.00 ± 227.69 |
| MI-2724, 2725 | 6/3/2004 | K-40 | 1509.00 ± 116.10 | 1489.20 ± 126.10 | 1499.10 ± 85.70 |
| MI-2724, 2725 | 6/3/2004 | Sr-90 | 1.64 ± 0.46 | 1.81 ± 0.44 | 1.73 ± 0.32 |
| BS-2921, 2922 | 6/3/2004 | K-40 | 8.32 ± 0.63 | 8.55 ± 0.62 | 8.44 ± 0.44 |
| TD-2876, 2877 | 6/4/2004 | H-3 | 13116.00 ± 324.00 | 12746.00 ± 320.00 | 12931.00 ± 227.69 |
| BS-2897, 2898 | 6/4/2004 | Gr. Beta | 9.31 ± 1.43 | 8.82 ± 1.39 | 9.06 ± 1.00 |
| SWU-3092, 3093 | 6/9/2004 | Gr. Beta | 1.95 ± 0.71 | 2.55 ± 0.76 | 2.25 ± 0.52 |
| CF-2986, 2987 | 6/14/2004 | Be-7 | 0.69 ± 0.12 | 0.84 ± 0.19 | 0.76 ± 0.11 |
| CF-2986, 2987 | 6/14/2004 | K-40 | 4.50 ± 0.32 | 3.82 ± 0.48 | 4.16 ± 0.29 |
| MI-2977, 2978 | 6/15/2004 | K-40 | 1486.70 ± 120.10 | 1291.60 ± 167.40 | 1389.15 ± 103.01 |
| MI-3007, 3008 | 6/15/2004 | K-40 | 1333.90 ± 121.30 | 1355.80 ± 176.50 | 1344.85 ± 107.08 |
| W-3031, 3032 | 6/18/2004 | H-3 | 642.00 ± 108.00 | 562.00 ± 105.00 | 602.00 ± 75.31 |
| W-3071, 3072 | 6/21/2004 | H-3 | 273.00 ± 94.00 | 203.00 ± 92.00 | 238.00 ± 65.76 |
| SW-3145, 3146 ^b | 6/22/2004 | I-131 | 0.97 ± 0.20 | 1.43 ± 0.20 | 1.20 ± 0.14 |
| DW-3278, 3279 | 6/25/2004 | I-131 | 0.67 ± 0.26 | 0.48 ± 0.25 | 0.57 ± 0.18 |
| AP-3922, 3923 | 6/28/2004 | Be-7 | 0.08 ± 0.01 | 0.07 ± 0.01 | 0.07 ± 0.01 |
| AP-3637, 3638 | 6/29/2004 | Be-7 | 0.08 ± 0.01 | 0.07 ± 0.01 | 0.07 ± 0.01 |
| LW-3589, 3590 | 6/30/2004 | Gr. Alpha | 0.28 ± 0.55 | 1.29 ± 0.89 | 0.79 ± 0.53 |
| LW-3589, 3590 | 6/30/2004 | Gr. Beta | 1.91 ± 0.64 | 2.86 ± 0.70 | 2.39 ± 0.48 |
| LW-3589, 3590 | 6/30/2004 | H-3 | 8369.20 ± 262.57 | 8226.01 ± 260.51 | 8297.61 ± 184.94 |
| AP-3943, 3944 | 6/30/2004 | Be-7 | 0.08 ± 0.02 | 0.09 ± 0.02 | 0.08 ± 0.01 |

TABLE A-5. In-House "Duplicate" Samples

| Lab Code | Date | Analysis | Concentration (pCi/L) ^a | | Averaged Result |
|----------------|-----------|-----------|------------------------------------|-------------------|--------------------|
| | | | First Result | Second Result | |
| E-3327, 3328 | 7/1/2004 | Gr. Beta | 1.21 ± 0.06 | 1.35 ± 0.07 | 1.28 ± 0.05 |
| E-3327, 3328 | 7/1/2004 | K-40 | 1.08 ± 0.20 | 1.30 ± 0.22 | 1.19 ± 0.15 |
| G-3377, 3378 | 7/1/2004 | Be-7 | 1.10 ± 0.13 | 1.16 ± 0.16 | 1.13 ± 0.10 |
| G-3377, 3378 | 7/1/2004 | Gr. Beta | 6.42 ± 0.19 | 6.28 ± 0.19 | 6.35 ± 0.13 |
| G-3377, 3378 | 7/1/2004 | K-40 | 5.26 ± 0.31 | 5.36 ± 0.28 | 5.31 ± 0.21 |
| VE-3681, 3682 | 7/13/2004 | K-40 | 2.65 ± 0.45 | 2.90 ± 0.61 | 2.77 ± 0.38 |
| CF-3707, 3708 | 7/13/2004 | Be-7 | 1.97 ± 0.44 | 2.11 ± 0.25 | 2.04 ± 0.25 |
| CF-3707, 3708 | 7/13/2004 | K-40 | 5.39 ± 0.44 | 4.98 ± 0.42 | 5.19 ± 0.30 |
| SW-3773, 3774 | 7/14/2004 | H-3 | 10697.20 ± 295.70 | 10689.60 ± 295.70 | 10693.40 ± 209.09 |
| LW-3849, 3850 | 7/14/2004 | Gr. Beta | 2.21 ± 0.54 | 2.32 ± 0.65 | 2.27 ± 0.42 |
| SWU-4307, 4308 | 7/14/2004 | Gr. Beta | 3.49 ± 0.57 | 3.68 ± 0.61 | 3.59 ± 0.42 |
| MI-4051, 4052 | 7/28/2004 | K-40 | 1190.70 ± 204.60 | 1357.00 ± 145.90 | 1273.85 ± 125.65 |
| VE-4079, 4080 | 7/28/2004 | K-40 | 4.90 ± 0.51 | 4.62 ± 0.61 | 4.76 ± 0.40 |
| MI-4163, 4164 | 7/28/2004 | K-40 | 1422.40 ± 186.50 | 1330.80 ± 181.00 | 1376.60 ± 129.95 |
| MI-4163, 4164 | 7/28/2004 | Sr-90 | 0.87 ± 0.32 | 1.00 ± 0.35 | 0.93 ± 0.24 |
| WW-4387, 4388 | 8/3/2004 | Gr. Beta | 5.94 ± 0.76 | 6.28 ± 0.76 | 6.11 ± 0.54 |
| MI-4286, 4287 | 8/4/2004 | K-40 | 1435.20 ± 76.90 | 1404.70 ± 80.54 | 1419.95 ± 55.68 |
| MI-4286, 4287 | 8/4/2004 | Sr-90 | 1.88 ± 0.40 | 1.31 ± 0.35 | 1.59 ± 0.26 |
| VE-4370, 4371 | 8/4/2004 | H-3 | 0.54 ± 0.08 | 0.62 ± 0.08 | 0.58 ± 0.06 |
| VE-4408, 4409 | 8/5/2004 | K-40 | 2.03 ± 0.39 | 2.12 ± 0.32 | 2.08 ± 0.25 |
| VE-4467, 4468 | 8/9/2004 | K-40 | 6.28 ± 0.76 | 6.11 ± 0.75 | 6.20 ± 0.53 |
| MI-4492, 4493 | 8/10/2004 | K-40 | 1478.70 ± 116.70 | 1472.50 ± 105.10 | 1475.60 ± 78.53 |
| MI-4492, 4493 | 8/10/2004 | Sr-90 | 1.35 ± 0.40 | 1.08 ± 0.42 | 1.22 ± 0.29 |
| MI-4518, 4519 | 8/11/2004 | K-40 | 1197.30 ± 158.50 | 1350.20 ± 202.30 | 1273.75 ± 128.50 |
| VE-4748, 4749 | 8/25/2004 | Gr. Beta | 2.31 ± 0.05 | 2.32 ± 0.05 | 2.31 ± 0.04 |
| VE-4748, 4749 | 8/25/2004 | K-40 | 1.70 ± 0.25 | 1.94 ± 0.31 | 1.82 ± 0.20 |
| LW-4769, 4770 | 8/26/2004 | Gr. Beta | 2.00 ± 0.58 | 2.07 ± 0.58 | 2.04 ± 0.41 |
| ME-4905, 4906 | 9/1/2004 | Gr. Beta | 3.06 ± 0.10 | 2.93 ± 0.10 | 3.00 ± 0.07 |
| ME-4905, 4906 | 9/1/2004 | K-40 | 2.33 ± 0.67 | 3.26 ± 0.58 | 2.80 ± 0.44 |
| MI-4926, 4927 | 9/1/2004 | K-40 | 1316.20 ± 115.40 | 1285.80 ± 117.30 | 1301.00 ± 82.27 |
| MI-4926, 4927 | 9/1/2004 | Sr-90 | 3.62 ± 0.52 | 2.07 ± 0.43 | 2.84 ± 0.34 |
| VE-5027, 5028 | 9/2/2004 | Gr. Beta | 2.43 ± 0.07 | 2.39 ± 0.06 | 2.41 ± 0.05 |
| VE-5027, 5028 | 9/2/2004 | K-40 | 1.77 ± 0.20 | 1.94 ± 0.31 | 1.86 ± 0.18 |
| SW-5003, 5004 | 9/7/2004 | I-131 | 1.69 ± 0.23 | 1.50 ± 0.25 | 1.59 ± 0.17 |
| MI-5050, 5051 | 9/7/2004 | K-40 | 1559.40 ± 131.80 | 1560.70 ± 121.20 | 1560.05 ± 89.53 |
| MI-5050, 5051 | 9/7/2004 | Sr-90 | 2.26 ± 0.52 | 1.61 ± 0.47 | 1.94 ± 0.35 |
| WW-5072, 5073 | 9/7/2004 | Gr. Beta | 4.31 ± 0.70 | 4.11 ± 0.69 | 4.21 ± 0.49 |
| SW-5216, 5217 | 9/14/2004 | Gr. Alpha | 4.34 ± 1.71 | 4.30 ± 1.77 | 4.32 ± 1.23 |
| SW-5216, 5217 | 9/14/2004 | Gr. Beta | 7.97 ± 1.24 | 8.58 ± 1.29 | 8.27 ± 0.89 |

TABLE A-5. In-House "Duplicate" Samples

| Lab Code | Date | Analysis | Concentration (pCi/L) ^a | | Averaged Result |
|----------------|------------|-----------|------------------------------------|------------------|------------------|
| | | | First Result | Second Result | |
| G-5237, 5238 | 9/15/2004 | Be-7 | 1.18 ± 0.23 | 1.28 ± 0.24 | 1.23 ± 0.17 |
| G-5237, 5238 | 9/15/2004 | K-40 | 7.16 ± 0.58 | 7.56 ± 0.55 | 7.36 ± 0.40 |
| LW-5316, 5317 | 9/16/2004 | Gr. Beta | 2.76 ± 0.58 | 2.64 ± 0.54 | 2.70 ± 0.40 |
| SS-5450, 5451 | 9/24/2004 | K-40 | 10.33 ± 0.66 | 10.10 ± 0.74 | 10.22 ± 0.50 |
| AP-6308, 6309 | 9/27/2004 | Be-7 | 0.08 ± 0.01 | 0.08 ± 0.01 | 0.08 ± 0.01 |
| SWU-5495, 5496 | 9/28/2004 | Gr. Beta | 3.38 ± 1.78 | 4.41 ± 1.94 | 3.90 ± 1.32 |
| AP-6070, 6071 | 9/28/2004 | Be-7 | 0.08 ± 0.01 | 0.08 ± 0.01 | 0.08 ± 0.01 |
| G-5516, 5517 | 9/29/2004 | Be-7 | 1.81 ± 0.29 | 1.74 ± 0.30 | 1.77 ± 0.21 |
| G-5516, 5517 | 9/29/2004 | K-40 | 7.35 ± 0.70 | 7.43 ± 0.62 | 7.39 ± 0.47 |
| AP-6258, 6259 | 9/29/2004 | Be-7 | 0.07 ± 0.01 | 0.07 ± 0.01 | 0.07 ± 0.01 |
| F-7211, 7212 | 9/29/2004 | Cs-137 | 0.04 ± 0.01 | 0.05 ± 0.02 | 0.05 ± 0.01 |
| F-7211, 7212 | 9/29/2004 | K-40 | 2.76 ± 0.27 | 3.07 ± 0.26 | 2.92 ± 0.19 |
| BS-5902, 5903 | 10/1/2004 | Co-60 | 0.25 ± 0.05 | 0.26 ± 0.03 | 0.25 ± 0.03 |
| BS-5902, 5903 | 10/1/2004 | Co-60 | 2.53 ± 0.11 | 2.52 ± 0.06 | 2.52 ± 0.06 |
| E-5654, 5655 | 10/4/2004 | Gr. Beta | 1.40 ± 0.06 | 1.32 ± 0.06 | 1.36 ± 0.04 |
| E-5654, 5655 | 10/4/2004 | K-40 | 1.32 ± 0.26 | 1.22 ± 0.24 | 1.27 ± 0.18 |
| MI-5676, 5677 | 10/4/2004 | K-40 | 1311.00 ± 122.00 | 1398.00 ± 125.00 | 1354.50 ± 87.33 |
| SO-5756, 5757 | 10/4/2004 | Gr. Alpha | 7.12 ± 3.09 | 6.69 ± 2.92 | 6.91 ± 2.13 |
| SO-5756, 5757 | 10/4/2004 | Gr. Beta | 19.66 ± 2.63 | 22.32 ± 2.65 | 20.99 ± 1.87 |
| SO-5756, 5757 | 10/4/2004 | K-40 | 16.45 ± 0.86 | 17.52 ± 0.78 | 16.99 ± 0.58 |
| VE-6483, 6484 | 10/6/2004 | K-40 | 9.35 ± 0.55 | 9.88 ± 0.23 | 9.61 ± 0.30 |
| MI-5923, 5924 | 10/12/2004 | K-40 | 1333.60 ± 183.50 | 1552.40 ± 179.20 | 1443.00 ± 128.24 |
| SS-6046, 6047 | 10/13/2004 | Cs-137 | 0.02 ± 0.01 | 0.02 ± 0.01 | 0.02 ± 0.01 |
| SS-6046, 6047 | 10/13/2004 | Gr. Beta | 7.93 ± 1.72 | 9.57 ± 1.88 | 8.75 ± 1.27 |
| SS-6046, 6047 | 10/13/2004 | K-40 | 5.77 ± 0.42 | 5.77 ± 0.40 | 5.77 ± 0.29 |
| DW-6208, 6209 | 10/15/2004 | I-131 | 0.89 ± 0.26 | 0.65 ± 0.27 | 0.77 ± 0.19 |
| BS-6694, 6695 | 10/19/2004 | K-40 | 11.84 ± 0.67 | 12.75 ± 0.79 | 12.29 ± 0.52 |
| VE-6354, 6355 | 10/25/2004 | Gr. Beta | 4.82 ± 0.14 | 4.76 ± 0.14 | 4.79 ± 0.10 |
| VE-6354, 6355 | 10/25/2004 | K-40 | 4.71 ± 0.54 | 4.82 ± 0.61 | 4.77 ± 0.41 |
| DW-6462, 6463 | 10/27/2004 | Gr. Beta | 8.46 ± 1.27 | 8.22 ± 1.24 | 8.34 ± 0.89 |
| LW-6377, 6378 | 10/28/2004 | Gr. Beta | 2.18 ± 0.54 | 2.33 ± 0.53 | 2.25 ± 0.38 |
| SS-6504, 6505 | 10/29/2004 | K-40 | 9.28 ± 0.61 | 8.51 ± 0.78 | 8.89 ± 0.50 |
| LW-6762, 6763 | 10/31/2004 | Gr. Beta | 1.85 ± 0.66 | 1.69 ± 0.64 | 1.77 ± 0.46 |
| BS-6576, 6577 | 11/1/2004 | Gr. Beta | 11.02 ± 1.54 | 13.77 ± 1.77 | 12.40 ± 1.17 |
| BS-6576, 6577 | 11/1/2004 | K-40 | 9.43 ± 0.71 | 8.84 ± 0.68 | 9.14 ± 0.49 |
| SO-6715, 6716 | 11/2/2004 | Cs-137 | 0.29 ± 0.04 | 0.33 ± 0.06 | 0.31 ± 0.04 |
| SO-6715, 6716 | 11/2/2004 | Gr. Alpha | 10.94 ± 3.95 | 14.72 ± 4.16 | 12.83 ± 2.87 |
| SO-6715, 6716 | 11/2/2004 | Gr. Beta | 21.33 ± 3.10 | 24.82 ± 3.10 | 23.07 ± 2.19 |
| SO-6715, 6716 | 11/2/2004 | K-40 | 10.42 ± 0.71 | 12.16 ± 1.06 | 11.29 ± 0.64 |
| VE-6673, 6674 | 11/8/2004 | Gr. Alpha | 0.07 ± 0.04 | 0.14 ± 0.05 | 0.11 ± 0.03 |
| VE-6673, 6674 | 11/8/2004 | Gr. Beta | 4.50 ± 0.12 | 4.48 ± 0.12 | 4.49 ± 0.09 |
| VE-6673, 6674 | 11/8/2004 | K-40 | 4.05 ± 0.49 | 4.65 ± 0.55 | 4.35 ± 0.37 |

TABLE A-5. In-House "Duplicate" Samples

| Lab Code | Date | Analysis | Concentration (pCi/L) ^a | | Averaged Result |
|----------------|------------|----------|------------------------------------|------------------|-----------------|
| | | | First Result | Second Result | |
| SO-6820, 6821 | 11/10/2004 | K-40 | 14.41 ± 1.03 | 15.01 ± 1.09 | 14.71 ± 0.75 |
| SO-6820, 6821 | 11/10/2004 | Sr-90 | 0.04 ± 0.02 | 0.07 ± 0.02 | 0.06 ± 0.02 |
| SWU-7160, 7161 | 11/30/2004 | Gr. Beta | 4.39 ± 1.98 | 3.09 ± 1.77 | 3.74 ± 1.33 |
| MI-7062, 7063 | 12/1/2004 | K-40 | 1456.00 ± 124.80 | 1640.50 ± 131.40 | 1548.25 ± 90.61 |
| MI-7062, 7063 | 12/1/2004 | Sr-90 | 1.13 ± 0.41 | 0.98 ± 0.43 | 1.06 ± 0.30 |
| S-7281, 7282 | 12/5/2004 | Cs-137 | 0.82 ± 0.15 | 1.16 ± 0.20 | 0.99 ± 0.12 |
| VE-7343, 7344 | 12/13/2004 | Gr. Beta | 5.25 ± 0.14 | 5.08 ± 0.14 | 5.16 ± 0.10 |
| VE-7343, 7344 | 12/13/2004 | K-40 | 4.23 ± 0.71 | 4.33 ± 0.69 | 4.28 ± 0.49 |
| MI-7317, 7318 | 12/14/2004 | K-40 | 1702.80 ± 129.70 | 1536.80 ± 115.10 | 1619.80 ± 86.70 |
| WW-7375, 7376 | 12/14/2004 | Gr. Beta | 14.13 ± 1.03 | 15.22 ± 1.06 | 14.68 ± 0.74 |
| SWU-7507, 7508 | 12/14/2004 | Gr. Beta | 4.48 ± 0.66 | 5.31 ± 0.69 | 4.89 ± 0.48 |
| DW-7563, 7564 | 12/27/2004 | Gr. Beta | 1.88 ± 0.51 | 2.34 ± 0.52 | 2.11 ± 0.37 |
| P-7698, 7699 | 12/27/2004 | H-3 | 246.01 ± 95.00 | 259.06 ± 95.51 | 252.53 ± 67.35 |
| AP-7741, 7742 | 12/28/2004 | Be-7 | 0.06 ± 0.02 | 0.05 ± 0.02 | 0.05 ± 0.01 |

Note: Duplicate analyses are performed on every twentieth sample received in-house. Results are not listed for those analyses with activities that measure below the LLD.

^a Results are reported in units of pCi/L, except for air filters (pCi/Filter), food products, vegetation, soil, sediment (pCi/g).

^b 600 minute count time or longer, resulting in lower error.

TABLE A-6. Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP)^a.

| Lab Code | Type | Date | Analysis | Concentration ^b | | |
|--------------------------|------------|----------|-----------|----------------------------|----------------|-----------------------------|
| | | | | Laboratory result | Known Activity | Control Limits ^c |
| STSO-1022 | soil | 05/01/04 | Am-241 | 65.90 ± 4.50 | 66.97 ± 6.70 | 46.88 - 87.06 |
| STSO-1022 | soil | 05/01/04 | Co-57 | 388.90 ± 4.00 | 399.60 ± 40.00 | 279.72 - 519.48 |
| STSO-1022 | soil | 05/01/04 | Co-60 | 524.80 ± 7.10 | 518.00 ± 51.80 | 362.60 - 673.40 |
| STSO-1022 | soil | 05/01/04 | Cs-134 | 403.40 ± 4.60 | 414.40 ± 41.40 | 290.08 - 538.72 |
| STSO-1022 | soil | 05/01/04 | Cs-137 | 829.10 ± 7.60 | 836.20 ± 83.62 | 585.34 - 1088.00 |
| STSO-1022 | soil | 05/01/04 | K-40 | 620.60 ± 29.50 | 604.00 ± 60.40 | 422.80 - 785.20 |
| STSO-1022 | soil | 05/01/04 | Ni-63 | 254.80 ± 8.40 | 357.05 ± 35.70 | 249.94 - 464.17 |
| STSO-1022 ^{d,1} | soil | 05/01/04 | Tc-99 | 59.00 ± 6.00 | 117.66 ± 11.78 | 82.36 - 152.96 |
| STSO-1022 ^{d,1} | soil | 05/01/04 | U-233/4 | 24.70 ± 3.60 | 37.00 ± 3.70 | 25.90 - 48.40 |
| STSO-1022 ^{d,1} | soil | 05/01/04 | U-238 | 24.20 ± 3.50 | 38.85 ± 3.90 | 27.20 - 50.51 |
| STSO-1022 | soil | 05/01/04 | Zn-65 | 743.00 ± 13.10 | 699.30 ± 69.90 | 489.51 - 909.09 |
| STAP-1023 | Air Filter | 05/01/04 | Gr. Alpha | 0.06 ± 0.02 | 0.40 ± 0.04 | 0.00 - 0.80 |
| STAP-1023 | Air Filter | 05/01/04 | Gr. Beta | 1.37 ± 0.08 | 1.20 ± 0.12 | 0.60 - 1.80 |
| STAP-1024 | Air Filter | 05/01/04 | Am-241 | 0.08 ± 0.03 | 0.10 ± 0.01 | 0.07 - 0.13 |
| STAP-1024 | Air Filter | 05/01/04 | Co-57 | 2.07 ± 0.06 | 2.40 ± 0.24 | 1.68 - 3.12 |
| STAP-1024 | Air Filter | 05/01/04 | Co-60 | 2.11 ± 0.08 | 2.30 ± 0.23 | 1.61 - 2.99 |
| STAP-1024 ^g | Air Filter | 05/01/04 | Cs-134 | 1.78 ± 0.08 | 2.90 ± 0.29 | 2.03 - 3.77 |
| STAP-1024 | Air Filter | 05/01/04 | Cs-137 | 1.76 ± 0.08 | 2.00 ± 0.20 | 1.40 - 2.60 |
| STAP-1024 | Air Filter | 05/01/04 | Mn-54 | 2.84 ± 0.11 | 3.00 ± 0.30 | 2.10 - 3.90 |
| STAP-1024 | Air Filter | 05/01/04 | Pu-238 | 0.12 ± 0.01 | 0.13 ± 0.01 | 0.09 - 0.17 |
| STAP-1024 | Air Filter | 05/01/04 | Pu-239/40 | 0.08 ± 0.01 | 0.09 ± 0.01 | 0.06 - 0.12 |
| STAP-1024 | Air Filter | 05/01/04 | Sr-90 | 0.66 ± 0.19 | 0.80 ± 0.08 | 0.56 - 1.04 |
| STAP-1024 | Air Filter | 05/01/04 | U-233/4 | 0.23 ± 0.03 | 0.21 ± 0.02 | 0.15 - 0.27 |
| STAP-1024 | Air Filter | 05/01/04 | U-238 | 0.23 ± 0.03 | 0.22 ± 0.02 | 0.15 - 0.29 |
| STAP-1024 | Air Filter | 05/01/04 | Zn-65 | 3.90 ± 0.22 | 4.00 ± 0.40 | 2.80 - 5.20 |
| STW-1026 | water | 05/01/04 | Am-241 | 0.56 ± 0.07 | 0.60 ± 0.06 | 0.42 - 0.78 |
| STW-1026 | water | 05/01/04 | Co-57 | 184.10 ± 13.50 | 185.00 ± 18.50 | 129.50 - 240.50 |
| STW-1026 | water | 05/01/04 | Co-60 | 164.40 ± 11.70 | 163.00 ± 16.30 | 114.10 - 211.90 |
| STW-1026 | water | 05/01/04 | Cs-134 | 201.10 ± 14.00 | 208.00 ± 20.80 | 145.60 - 270.40 |
| STW-1026 | water | 05/01/04 | Cs-137 | 245.50 ± 15.80 | 250.00 ± 25.00 | 175.00 - 325.00 |
| STW-1026 | water | 05/01/04 | Fe-55 | 37.60 ± 25.30 | 33.00 ± 3.30 | 23.10 - 42.90 |
| STW-1026 | water | 05/01/04 | H-3 | 76.50 ± 5.40 | 83.00 ± 8.30 | 58.10 - 107.90 |
| STW-1026 | water | 05/01/04 | Mn-54 | 272.10 ± 17.50 | 267.00 ± 26.70 | 186.90 - 347.10 |
| STW-1026 | water | 05/01/04 | Ni-63 | 94.40 ± 3.20 | 100.00 ± 10.00 | 70.00 - 130.00 |
| STW-1026 | water | 05/01/04 | Pu-238 | 1.11 ± 0.09 | 1.20 ± 0.12 | 0.84 - 1.56 |
| STW-1026 | water | 05/01/04 | Pu-239/40 | 0.01 ± 0.01 | 0.00 ± 0.00 | 0.00 - 0.10 |
| STW-1026 | water | 05/01/04 | Sr-90 | 6.20 ± 1.10 | 7.00 ± 0.70 | 4.90 - 9.10 |
| STW-1026 | water | 05/01/04 | Tc-99 | 10.70 ± 1.00 | 10.00 ± 1.00 | 7.00 - 13.00 |

TABLE A-6. Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP)^a.

| Lab Code | Type | Date | Analysis | Laboratory result | Concentration ^b | |
|----------|-------|----------|-----------|-------------------|----------------------------|-----------------------------|
| | | | | | Known Activity | Control Limits ^c |
| STW-1026 | water | 05/01/04 | U-233/4 | 0.14 ± 0.02 | 0.12 ± 0.01 | 0.08 - 0.16 |
| STW-1026 | water | 05/01/04 | U-238 | 0.94 ± 0.05 | 0.90 ± 0.09 | 0.63 - 1.17 |
| STW-1026 | water | 05/01/04 | Zn-65 | 219.60 ± 27.90 | 208.00 ± 20.80 | 145.60 - 270.40 |
| STW-1027 | water | 05/01/04 | Gr. Alpha | 1.20 ± 0.10 | 1.20 ± 0.12 | 0.00 - 2.40 |
| STW-1027 | water | 05/01/04 | Gr. Beta | 4.30 ± 0.10 | 4.10 ± 0.41 | 2.05 - 6.15 |

^a Results obtained by Environmental, Inc., Midwest Laboratory as a participant in the Department of Energy's Mixed Analyte Performance Evaluation Program, Idaho Operations office, Idaho Falls, Idaho

^b Results are reported in units of Bq/kg (soil), Bq/L (water) or Bq/total sample (filters, vegetation) as requested by the Department of Energy.

^c MAPEP results are presented as the known values and expected laboratory precision (1 sigma, 1 determination) and control limits as defined by the MAPEP.

^d The cause of the deviation seems to be incomplete dissolution of the sample.

^e A spiked soil sample was prepared. Known activity; 32.98 pCi/g; laboratory result 33.47 pCi/g.

^f The sample was reanalyzed with the same results. Investigation is in progress.

^g Based on the results of gamma emitting isotopes (Cs-137 and Co-60), the filter geometry appears to be biased by -10%. Addition of the summation peak at 1400 KeV results in a recalculation of 2.12 ± 0.15 Bq/sample.

TABLE A-7. Environmental Measurements Laboratory Quality Assessment Program (EML)

| Lab Code | Type | Date | Analysis | Concentration ^a | | |
|------------------------|------------|----------|-----------|----------------------------|-------------------------|-----------------------------|
| | | | | Laboratory results | EML Result ^b | Control Limits ^c |
| STW-1009 | water | 03/01/04 | Am-241 | 1.21 ± 0.02 | 1.31 | 0.66 - 1.56 |
| STW-1009 | water | 03/01/04 | Co-60 | 152.30 ± 0.30 | 163.20 | 0.87 - 1.17 |
| STW-1009 | water | 03/01/04 | Cs-137 | 50.40 ± 0.90 | 51.95 | 0.90 - 1.25 |
| STW-1009 | water | 03/01/04 | H-3 | 263.50 ± 10.00 | 186.60 | 0.69 - 1.91 |
| STW-1009 | water | 03/01/04 | Pu-238 | 1.03 ± 0.04 | 1.10 | 0.68 - 1.33 |
| STW-1009 | water | 03/01/04 | Pu-239/40 | 2.90 ± 0.10 | 3.08 | 0.62 - 1.38 |
| STW-1009 | water | 03/01/04 | Sr-90 | 5.20 ± 0.30 | 4.76 | 0.73 - 1.65 |
| STW-1009 | water | 03/01/04 | Uranium | 4.35 ± 0.21 | 4.62 | 0.40 - 1.45 |
| STW-1010 | water | 03/01/04 | Gr. Alpha | 208.00 ± 20.70 | 326.00 | 0.55 - 1.31 |
| STW-1010 | water | 03/01/04 | Gr. Beta | 1063.00 ± 27.00 | 1170.00 | 0.75 - 1.65 |
| STSO-1011 | Soil | 03/01/04 | Am-241 | 14.10 ± 4.30 | 13.00 | 0.52 - 2.41 |
| STSO-1011 | Soil | 03/01/04 | Cs-137 | 1292.00 ± 13.00 | 1323.00 | 0.74 - 1.40 |
| STSO-1011 | Soil | 03/01/04 | K-40 | 563.00 ± 83.00 | 539.00 | 0.70 - 1.59 |
| STSO-1011 | Soil | 03/01/04 | Pu-239/40 | 20.70 ± 1.10 | 22.82 | 0.62 - 1.99 |
| STSO-1011 | Soil | 03/01/04 | Sr-90 | 72.10 ± 5.80 | 51.00 | 0.58 - 2.96 |
| STSO-1011 | Soil | 03/01/04 | Uranium | 139.10 ± 10.20 | 180.22 | 0.27 - 1.48 |
| STVE-1012 | Vegetation | 03/01/04 | Am-241 | 4.50 ± 0.20 | 4.93 | 0.58 - 2.86 |
| STVE-1012 | Vegetation | 03/01/04 | Co-60 | 14.10 ± 0.40 | 14.47 | 0.64 - 1.49 |
| STVE-1012 | Vegetation | 03/01/04 | Cs-137 | 573.90 ± 6.00 | 584.67 | 0.75 - 1.48 |
| STVE-1012 | Vegetation | 03/01/04 | K-40 | 709.00 ± 19.30 | 720.00 | 0.45 - 1.51 |
| STVE-1012 | Vegetation | 03/01/04 | Pu-239/40 | 6.60 ± 0.50 | 6.81 | 0.60 - 1.98 |
| STVE-1012 | Vegetation | 03/01/04 | Sr-90 | 766.50 ± 51.30 | 734.00 | 0.50 - 1.37 |
| STAP-1013 | Air Filter | 03/01/04 | Am-241 | 0.11 ± 0.01 | 0.10 | 0.62 - 1.93 |
| STAP-1013 | Air Filter | 03/01/04 | Co-60 | 30.90 ± 1.08 | 35.40 | 0.74 - 1.25 |
| STAP-1013 ^d | Air Filter | 03/01/04 | Cs-134 | 12.30 ± 1.30 | 18.20 | 0.70 - 1.21 |
| STAP-1013 | Air Filter | 03/01/04 | Cs-137 | 24.90 ± 0.60 | 26.40 | 0.72 - 1.32 |
| STAP-1013 | Air Filter | 03/01/04 | Pu-238 | 0.04 ± 0.01 | 0.04 | 0.61 - 1.55 |
| STAP-1013 | Air Filter | 03/01/04 | Pu-239/40 | 0.17 ± 0.02 | 0.16 | 0.67 - 1.58 |
| STAP-1013 | Air Filter | 03/01/04 | Sr-90 | 1.80 ± 0.20 | 1.76 | 0.62 - 2.26 |
| STAP-1013 | Air Filter | 03/01/04 | Uranium | 0.17 ± 0.01 | 0.17 | 0.79 - 2.88 |
| STAP-1014 | Air Filter | 03/01/04 | Gr. Alpha | 1.09 ± 0.06 | 1.20 | 0.82 - 1.58 |
| STAP-1014 | Air Filter | 03/01/04 | Gr. Beta | 2.68 ± 0.05 | 2.85 | 0.75 - 1.94 |

^a Results are reported in Bq/L with the following exceptions: Air Filters (Bq/Filter), Soil and Vegetation (Bq/kg).

^b The EML result listed is the mean of replicate determinations for each nuclide ± the standard error of the mean.

^c Control limits are reported by EML as the ratio of Reported Value / EML value.

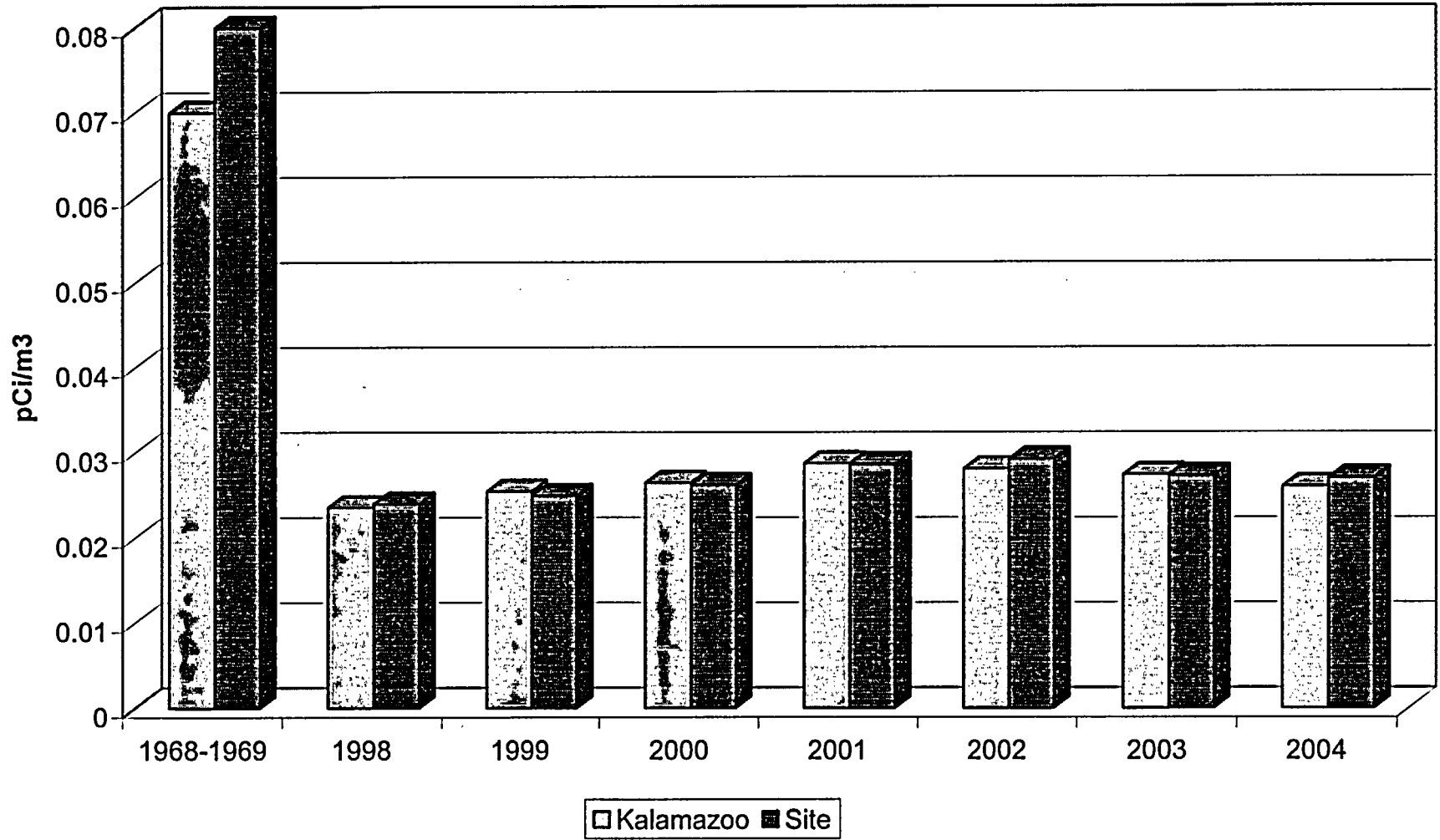
^d Probable effect of summation peaks and slight difference in filter geometry.

ATTACHMENT F

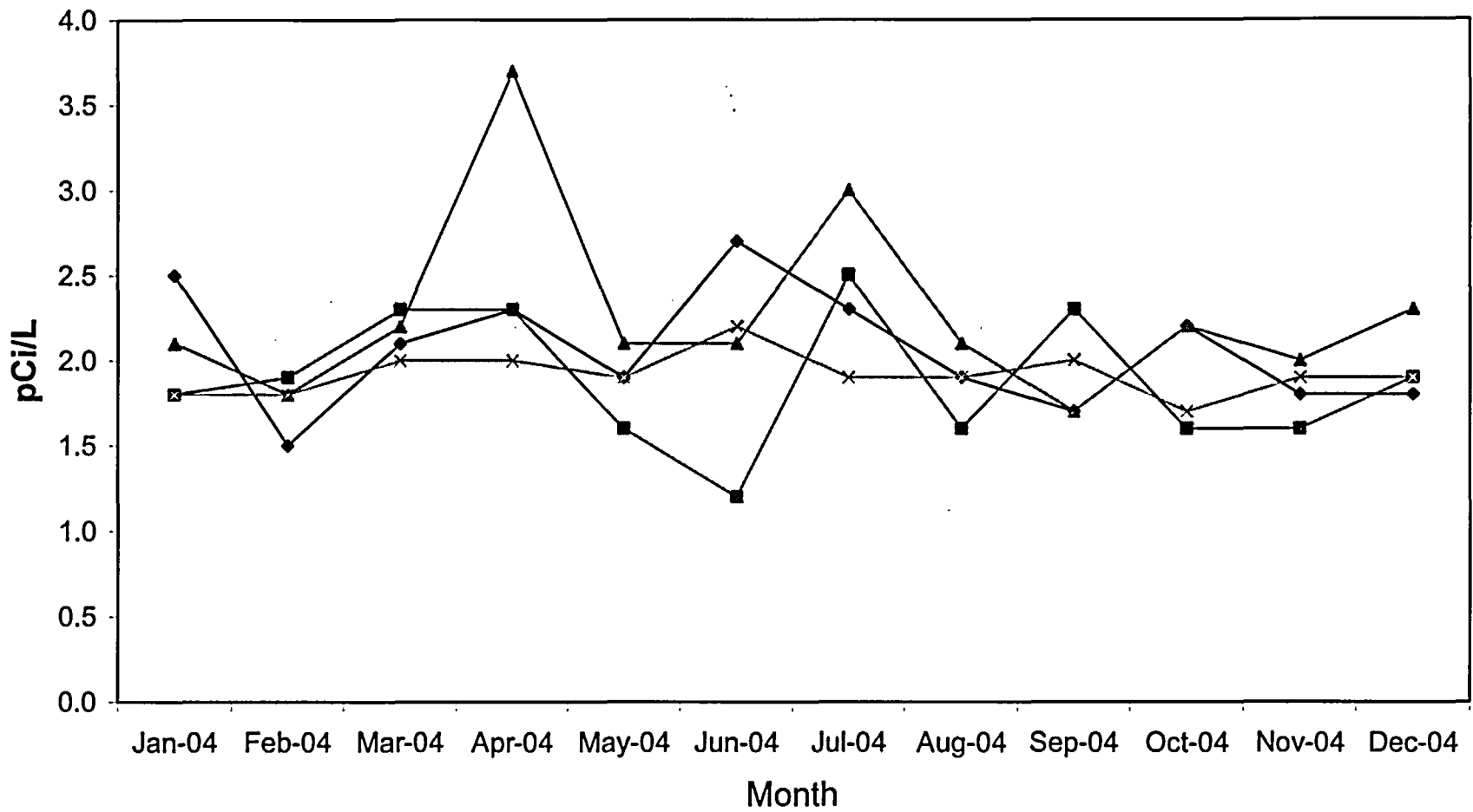
DATA GRAPHS

9 Pages Follow

Palisades Air Particulate
Gross Beta
Pre-Operational vs. Operational

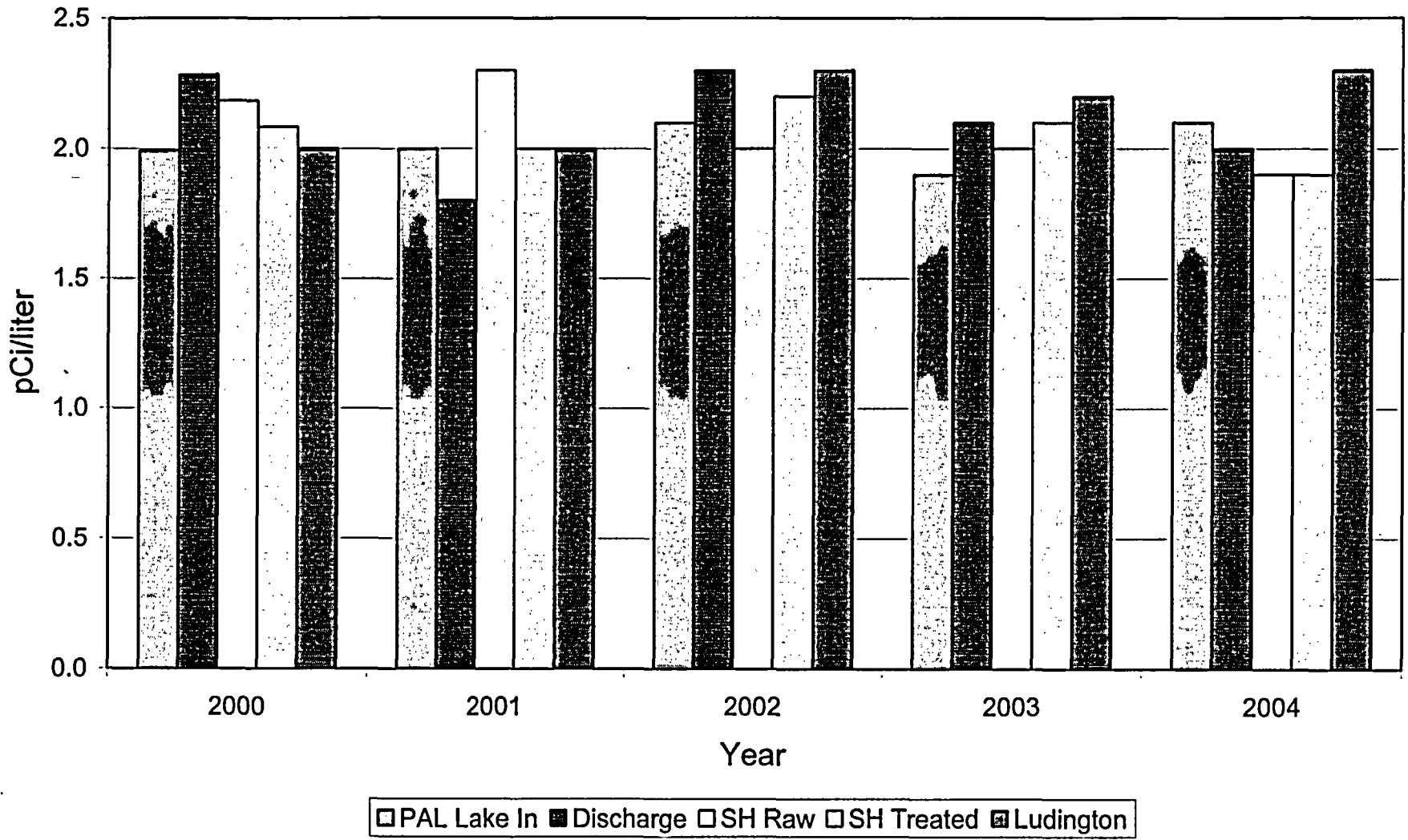


2004 Palisades Lake Water Samples
Gross Beta pCi/L
Ludington Control vs. Intake, SH Treated and Raw

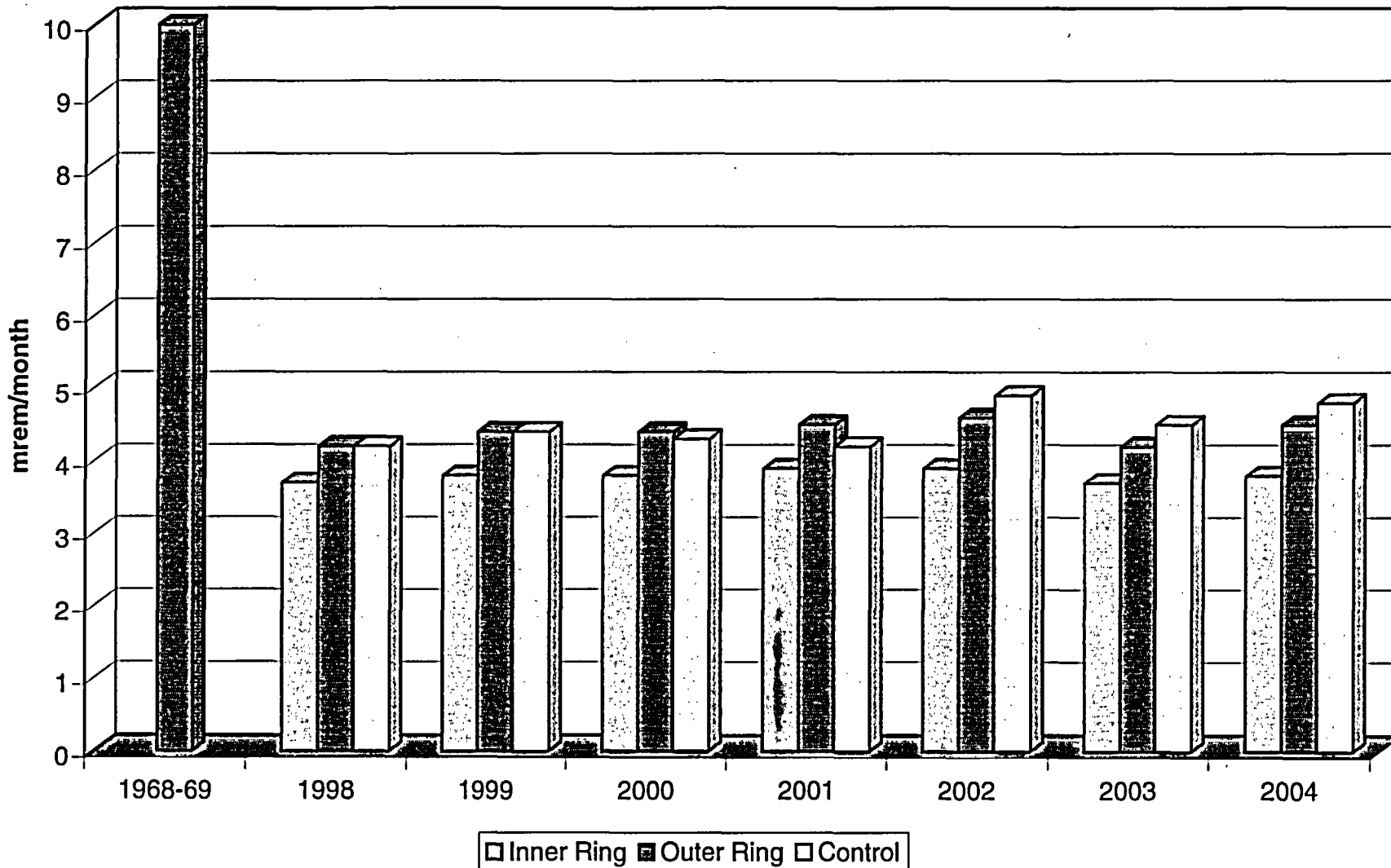


◆ Palisades Lake In ■ South Haven Raw ▲ Ludington ✕ South Haven Treated

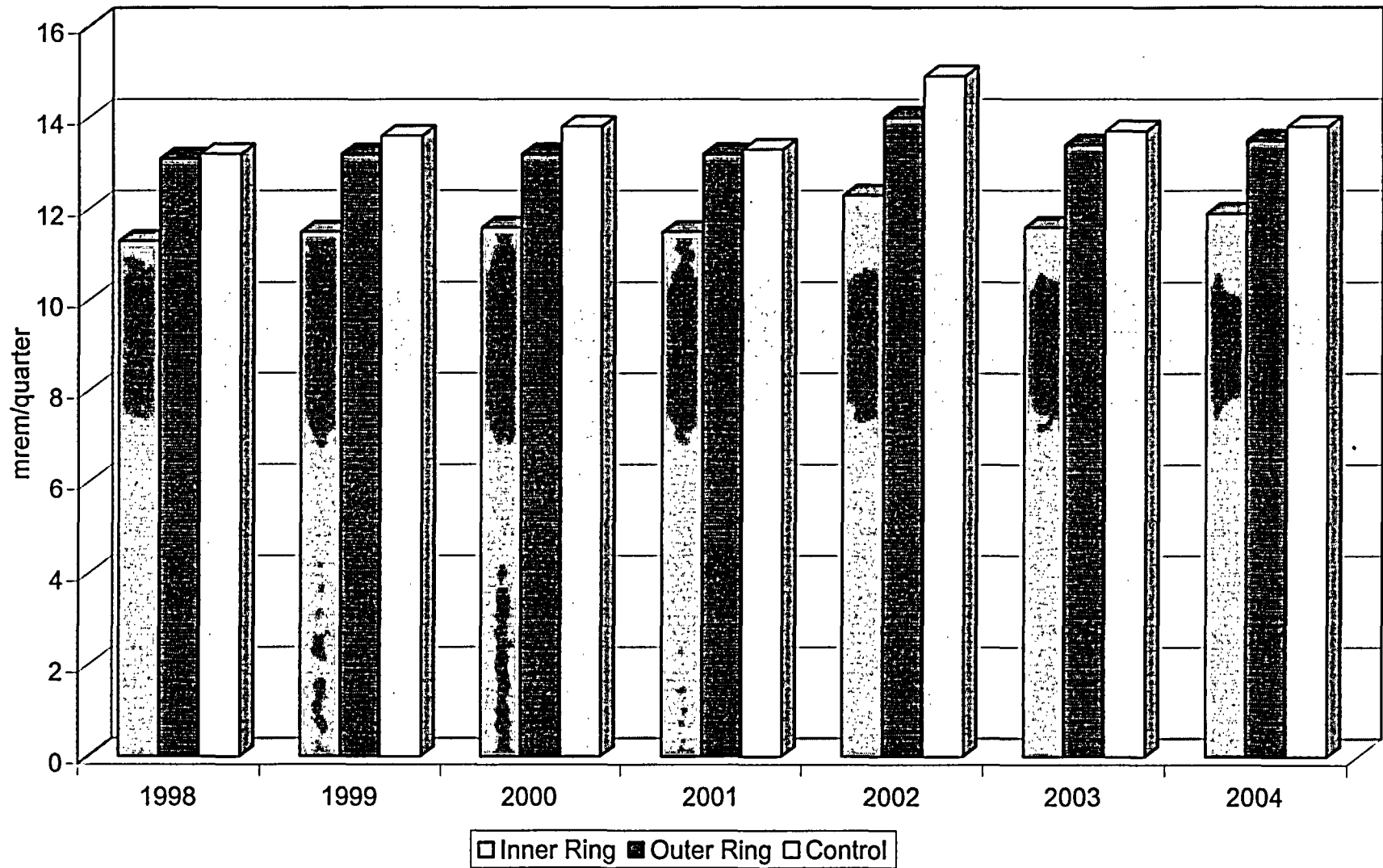
Lake Water Gross Beta 2000 to 2004



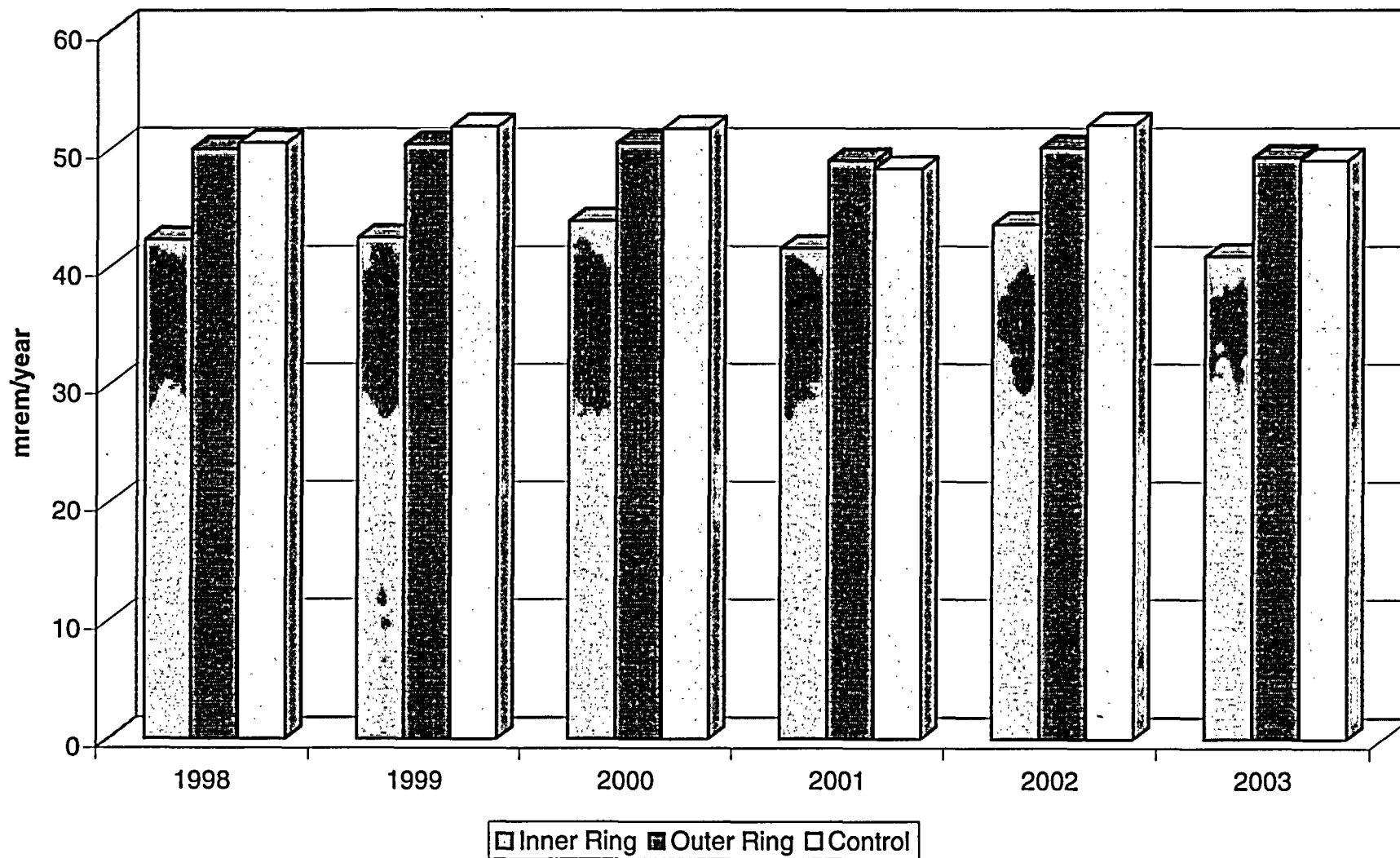
Palisades Monthly Thermoluminescent Dosimeters
Pre-Operational vs. Operational



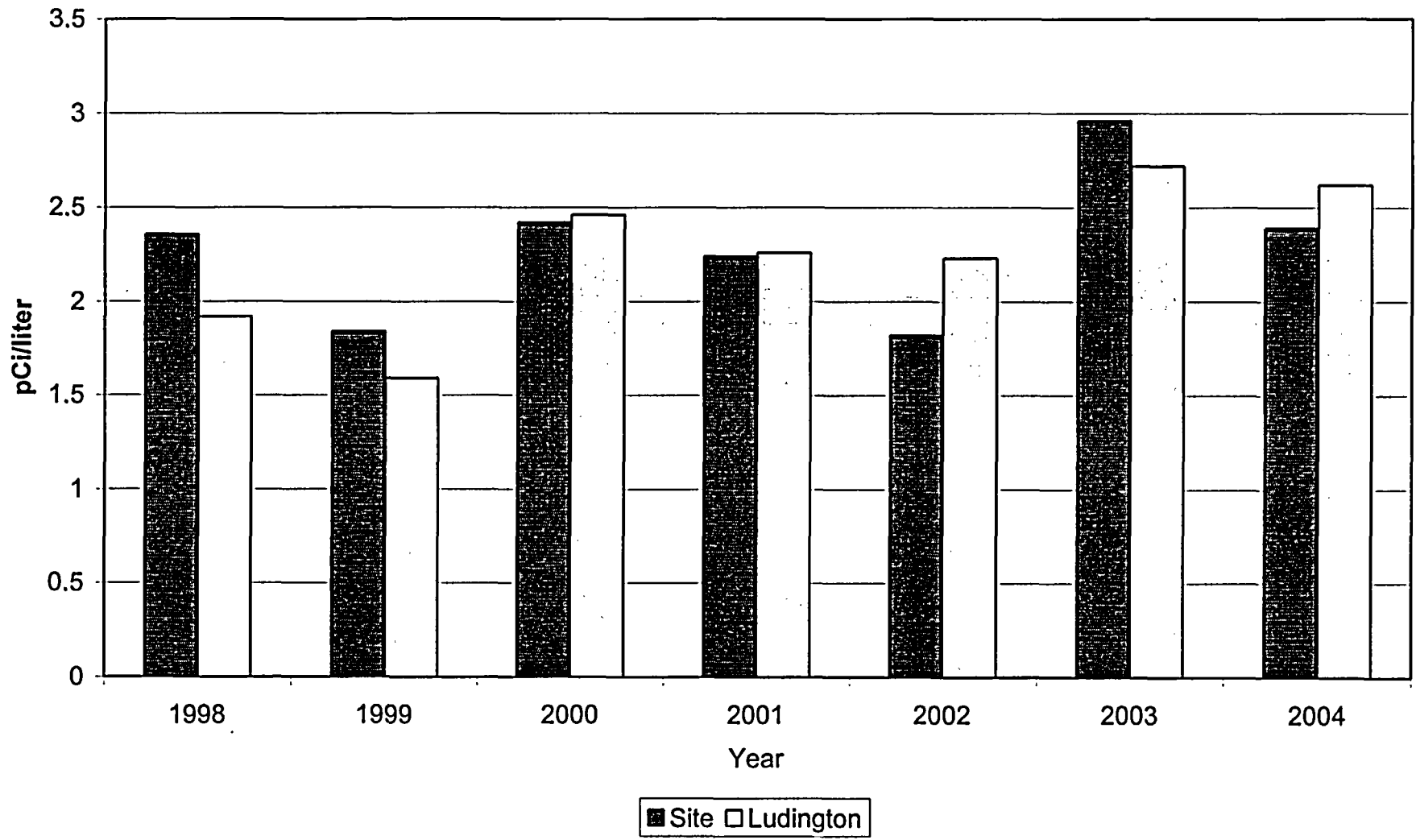
Palisades Quarterly Thermoluminescent Dosimeters 1998-2004



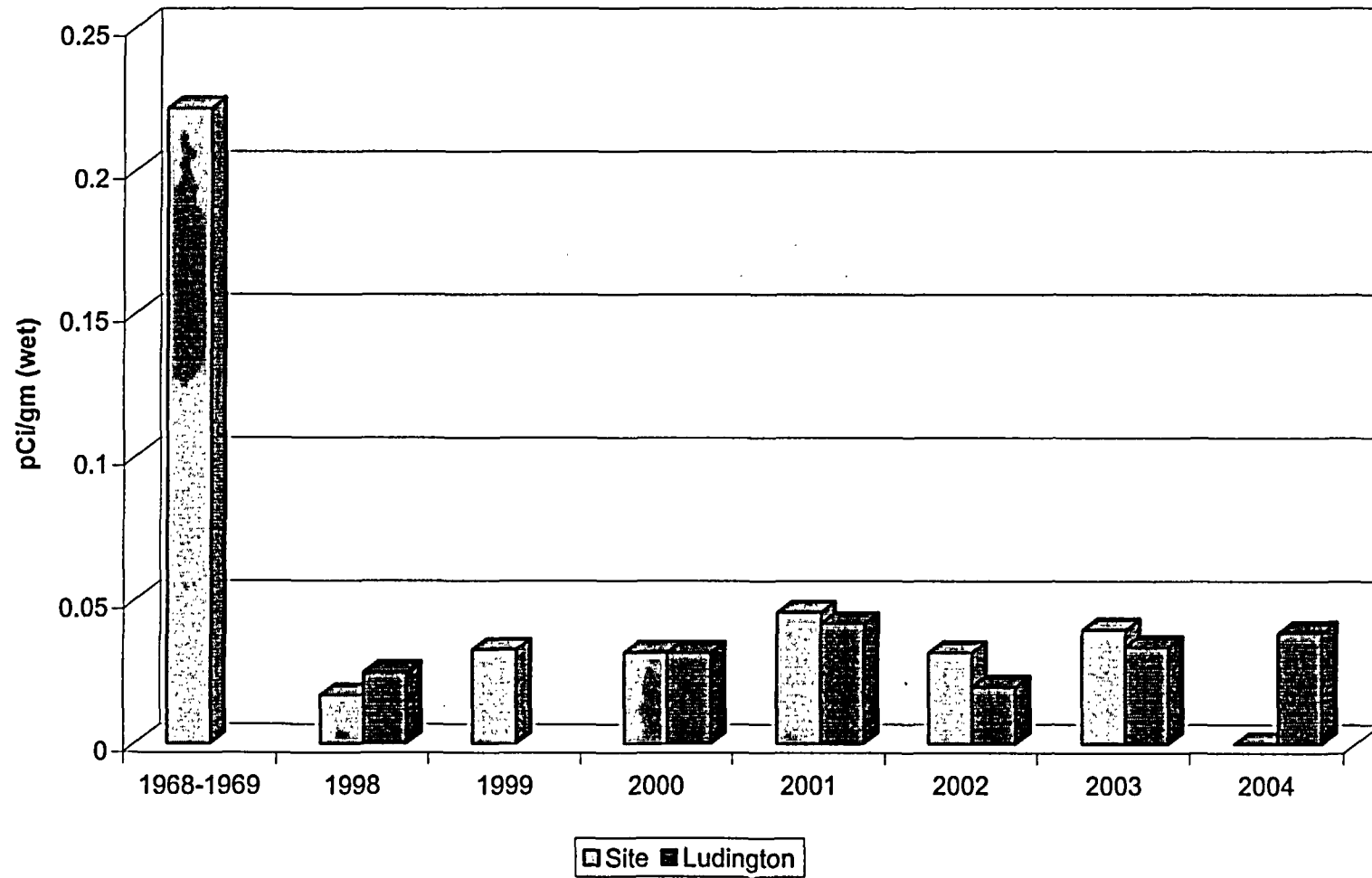
Palisades Annual Thermoluminescent Dosimeters 1998-2003



Palisades Fish Gross Beta
1998-2004



Palisades Fish Cs-137 Pre-Operational vs. Operational



Palisades Sediment Gross Beta
1998-2004

