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THREE MILE ISLAND NUCLEAR STATION
UNITS 1 and 2

Annual Radiological
Environmental Operating Report

1 January Through 31 December 2012

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Appendices

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I. Summary and Conclusions

This report on the Radiological Environmental Monitoring Program conducted for the Three Mile Island Nuclear Station (TMINS) by Exelon covers the period 1 January 2012 through 31 December 2012. During that time period, 1,734 analyses were performed on 1,320 samples. In assessing all the data gathered for this report and comparing these results with preoperational data and operational REMP data, it was concluded that the operation of TMINS had no adverse radiological impact on the environment.

Surface, drinking and effluent water samples were analyzed for concentrations of tritium and gamma emitting nuclides. Surface, drinking and effluent water samples were also analyzed for concentrations of I-131. Drinking and effluent water samples were also analyzed for concentrations of gross beta. Effluent water samples were also analyzed for concentrations of Sr-89 and Sr-90. All groundwater, precipitation water and storm water results are now being reported in the ARGPPR, Appendix F. No Sr-89 and Sr-90 activities were detected. Iodine-131 and gross beta concentrations detected were consistent with those detected in previous years. Tritium activity in twelve surface water samples and monthly effluent water samples was due to TMINS activities or releases. No other fission or activation products potentially attributed to TMI liquid releases were detected.

Fish (predator and bottom feeder) and sediment samples were analyzed for concentrations of gamma emitting nuclides. Fish samples were also analyzed for concentrations of Sr-90. No Sr-90 activity was detected. No fission or activation products were detected in fish samples. Cesium-137 was detected in six sediment samples. Occasionally Cs-137 is detected at very low levels (just above LLD) and is not distinguishable from background levels.

Air particulate samples were analyzed for concentrations of gross beta and gamma emitting nuclides. Gross beta activity is consistent with data from previous years. Cosmogenic Be-7 was detected at levels consistent with those detected in previous years. No other activation products were detected.

High sensitivity I-131 analyses were performed on weekly air samples. All results were less than the minimum detectable activity for I-131.

Cow milk samples were analyzed for concentrations of I-131, gamma emitting nuclides, Sr-89 and Sr-90. No I-131 or Sr-89 activities were detected. Concentrations of naturally occurring K-40 were consistent with those detected in previous years. Strontium-90 activities detected were consistent with those detected in previous years and were attributed to fallout from nuclear weapons testing. No other fission or activation products were found.

Food Product samples were analyzed for concentrations of gamma emitting nuclides (including I-131) and Sr-90. Strontium-90 activity was detected in both the indicator and control samples. This was a result of plant uptake of Sr-90 in soil as a result of past nuclear weapons testing. Concentrations of naturally

occurring Be-7 and K-40 were consistent with those detected in previous years. No other fission or activation products were detected.

Beginning in 2012, Exelon changed the type of dosimetry used for the Radiological Environmental Monitoring Program (REMP). Optically Stimulated Luminescent Dosimetry (OSLD) were deployed and Thermo-luminescent Dosimetry (TLD) were discontinued. This change may result in a step change in readings, up or down, depending on site characteristics. The relative comparison to control locations remains valid. OSLD technology is different than that used in a TLD but has the same purpose (to measure direct radiation).

In conclusion, radioactive materials related to TMINS operations were detected in environmental samples, but the measured concentrations were low and consistent with measured effluents. The environmental sample results verified that the doses received by the public from TMINS effluents in 2012 were well below applicable dose limits and only a small fraction of the doses received from natural background radiation. Additionally, the results indicated that there was no permanent buildup of radioactive materials in the environment and no increase in background radiation levels.

Therefore, based on the results of the radiological environmental monitoring program (REMP) and the doses calculated from measured effluents, TMINS operations in 2012 did not have any adverse effects on the health of the public or on the environment.

II. Introduction

The Three Mile Island Nuclear Station (TMINS), consisting of two pressurized water reactors (PWR), is located on the northern end of Three Mile Island in the Susquehanna River approximately 2.5 miles south of Middletown in Londonderry Township, Dauphin County, Pennsylvania. TMI-1 is owned and operated by Exelon and became operational in 1974. TMI-2 is operated by GPU Nuclear, Inc. and owned by Metropolitan Edison (50%), Pennsylvania Electric (25%) and Jersey Central Power & Light (25%). TMI-2 became operational in 1978 and was shut down following the 1979 accident. At the end of 1993 TMI-2 was placed in a condition called Post-Defueling Monitored Storage. TMI-2 is maintained by Exelon under contract with GPU Nuclear.

A Radiological Environmental Monitoring Program (REMP) for TMINS was initiated in 1974. This report covers those analyses performed by Teledyne Brown Engineering (TBE), Landauer and Environmental Inc. (Midwest Labs) on samples collected during the period 1 January 2012 through 31 December 2012.

A. Objective of the REMP

The objectives of the REMP are to:

1. Evaluate the relationship between quantities of radioactive material released from the plant and resultant radiation doses to individuals from principal pathways of exposure.

2. Provide data on measurable levels of radiation and radioactive materials in the site environs.

3. To verify inplant controls for the containment of radioactive materials.

4. To determine buildup of long-lived radionuclides in the environment and changes in background radiation levels.

5. To provide reassurance to the public that the program is capable of adequately assessing impacts and identifying noteworthy changes in the radiological status of the environment.

6. To fulfill the requirements of the TMI-1 and TMI-2 Technical Specifications.

B. Implementation of the Objectives

The implementation of the objectives is accomplished by:

1. Identifying significant exposure pathways.

2. Establishing baseline radiological data of media within those pathways.

3. Continuously monitoring those media before and during Station operation to assess Station radiological effects (if any) on man and the environment.

III. Program Description

A. Sample Collection

Samples for the TMINS REMP were collected for Exelon by Normandeau Associates, RMC Environmental Services Division (RMC). This section describes the general collection methods used by RMC to obtain environmental samples for the TMINS REMP in 2012. Sample locations and descriptions can be found in Tables B-1 and B-2, and Figures B-1 through B-3, Appendix B. The collection procedures used by RMC are listed in Table B-3.

Aquatic Environment

The aquatic environment was evaluated by performing radiological analyses on samples of surface water, drinking water, effluent water, fish and sediment. Two gallon water samples were collected monthly from continuous samplers located at three surface water locations (A3-2, J1-2 and Q9-1), three drinking water locations (G15-2, G15-3 and Q9-1), and one effluent water location (K1-1). Control locations were A3-2 and Q9-1. All groundwater and storm water results are now being reported in the ARGPPR, Appendix F. All water samples were collected in unused plastic bottles, which were rinsed at least twice with source water prior to collection. Fish samples comprising the flesh of two groups, bottom feeders and predators, were collected semiannually at an upstream control (BKG) and a downstream Indicator (IND) location. Location IND could be affected by TMINS' effluent releases. Sediment samples composed of recently deposited substrate were collected semiannually at three locations (A1-3, J2-1 and K1-3). In addition, one sediment sample was collected annually at the EDCB. Location A1-3 was the control.

Atmospheric Environment

The atmospheric environment was evaluated by performing radiological analyses on samples of air particulates, airborne iodine, milk and food product. Airborne iodine and particulate samples were collected and analyzed weekly at seven locations (A3-1, E1-2, F1-3, G2-1, H3-1, M2-1 and Q15-1). The control location was Q15-1. Airborne iodine and particulate samples were obtained at each location, using a vacuum pump with charcoal and glass fiber filters attached. The pumps were run continuously and sampled air at the rate of approximately one cubic foot per minute. The filters were replaced weekly and sent to the laboratory for analysis.

Terrestrial Environment

The terrestrial environment was evaluated by performing radiological analyses on samples of milk and food product. Milk samples were collected biweekly at five locations (E2-2, F4-1, G2-1, K15-3 and P4-1) from March through November, and monthly from December through February. The control location was K15-3. All samples were collected in new unused two gallon plastic bottles from the bulk tank at each location, preserved with sodium bisulfite and shipped promptly to the laboratory.

Food products were collected monthly at three locations (B10-2, E1-2 and H1-2), in lieu of milk sampling and annually from the four food product groups at two locations (B10-2 and H1-2). B10-2 was the control location for both annual and monthly sampling. Six different kinds of vegetation samples and eight different kinds of vegetation leaves were collected and placed in new unused plastic bags, and sent to the laboratory for analysis.

Ambient Gamma Radiation

Beginning in 2012, Exelon changed the type of dosimetry used for the Radiological Environmental Monitoring Program (REMP). Optically Stimulated Luminescent Dosimetry (OSLD) were deployed and Thermo-luminescent Dosimetry (TLD) were discontinued. This change may result in a step change in readings, up or down, depending on site characteristics. The relative comparison to control locations remains valid. OSLD technology is different than that used in a TLD but has the same purpose (to measure direct radiation). The OSLDs were placed at locations on and around the TMINS site as follows:

A site boundary ring consisting of 19 locations (A1-4, B1-2, C1-2, D1-1, E1-4, F1-2, F1-4, G1-3, G1-5, G1-6, H1-1, J1-3, K1-4, L1-1, M1-1, N1-3, P1-2, Q1-2 and R1-1) near and within the site perimeter representing

fence post doses (i.e., at locations where the doses will be potentially greater than maximum annual off–site doses) from TMINS release.

An indicator ring consisting of 60 locations (A3-1, A5-1, A9-3, B1-1, B2-1, B5-1, B10-1, C1-1, C2-1, C5-1, C8-1, D1-2, D2-2, D6-1, E1-2, E2-3, E5-1, E7-1, F1-1, F2-1, F5-1, F10-1, G1-2, G2-4, G5-1, H3-1, H5-1, H8-1, J1-1, J3-1, J5-1, J7-1 K2-1, K3-1, K5-1, K8-1, L1-2, L2-1, L5-1, L8-1, M1-2, M2-1, M5-1, M9-1, N1-1, N2-1, N5-1, N8-1, P1-1, P2-1, P5-1, P8-1, Q1-1, Q2-1, Q5-1, Q9-1, R1-2, R3-1, R5-1 and R9-1) extending to approximately 10 miles from the site designed to measure possible exposures to close-in population.

The balance of 11 locations (D15-1, F25-1, G10-1, G15-1, H15-1, J15-1, K15-1, L15-1, N15-2, Q15-1 and R15-1) represent control areas.

The specific dosimeter locations were determined by the following criteria:

1. The presence of relatively dense population;

2. Site meteorological data taking into account distance and elevation for each of the sixteen–22 1/2 degree sectors around the site, where estimated annual dose from TMINS, if any, would be most significant;

3. On hills free from local obstructions and within sight of the vents (where practical);

4. And near the closest dwelling to the vents in the prevailing downwind direction.

Each station has two Al_2O_3:C Optically Stimulated Luminescence Dosimeters enclosed in plastic placed at each location in a frame located approximately three to six feet above ground level. Since each OSLD responds to radiation independently, this provides two independent detectors at each station.

B. Sample Analysis

This section describes the general analytical methods used by TBE and Midwest Labs to analyze the environmental samples for radioactivity for the TMINS REMP in 2012. The analytical procedures used by the laboratories are listed in Table B-3.

In order to achieve the stated objectives the current program includes the following analyses:

1. Concentrations of beta emitters in drinking and effluent water and air particulates.

2. Concentrations of gamma emitters in surface, drinking, and effluent water, air particulates, milk, fish, sediment and food products.

3. Concentrations of tritium in surface, drinking and effluent water.

4. Concentrations of I-131 in surface, drinking and effluent water, air, milk and food products.

5. Concentrations of strontium in effluent water, fish, milk and food products.

6. Ambient gamma radiation levels at various site environs.

C. Data Interpretation

Data were compared to previous years' operational data for consistency and trending. In addition, comparison to pre-operational data is sometimes made. For the purpose of this report, TMINS was considered operational at initial criticality. Several factors were important in the interpretation of the data:

1. Lower Limit of Detection and Minimum Detectable Concentration

The lower limit of detection (LLD) was defined as the smallest concentration of radioactive material in a sample that would yield a net count (above background) that would be detected with only a 5% probability of falsely concluding that a blank observation represents a "real" signal. The LLD was intended as a before the fact estimate of a system (including instrumentation, procedure and sample type) and not as an after the fact criteria for the presence of activity. All analyses were designed to achieve the required TMINS detection capabilities for environmental sample analysis.

The minimum detectable concentration (MDC) is defined above with the exception that the measurement is an after the fact estimate of the presence of activity.

2. Net Activity Calculation and Reporting of Results

Net activity for a sample was calculated by subtracting background activity from the sample activity. Since the REMP measures extremely small changes in radioactivity in the environment,

background variations may result in sample activity being lower than the background activity affecting a negative number. An MDC was reported in all cases where positive activity was not detected. Gamma spectroscopy results for each type of sample were grouped as follows:

For surface, drinking, and effluent water 11 nuclides, Mn-54, Co-58, Fe-59, Co-60, Zn-65, Nb-95, Zr-95, Cs-134, Cs-137, Ba-140 and La-140 were reported.

For fish eight nuclides, K-40, Mn-54, Co-58, Fe-59, Co-60, Zn-65, Cs-134 and Cs-137 were reported.

For sediment six nuclides, K-40, Mn-54, Co-58, Co-60, Cs-134 and Cs-137 were reported.

For air particulate eight nuclides, Be-7, Mn-54, Co-58, Co-60, Nb-95, Zn-95, Cs-134 and Cs-137 were reported.

For milk five nuclides, K-40, Cs-134, Cs-137, Ba-140 and La-140 were reported.

For food products five nuclides, Be-7, K-40, I-131, Cs-134 and Cs-137 were reported.

Means and standard deviations of the results were calculated. The standard deviations represent the variability of measured results for different samples rather than single analysis uncertainty.

D. Program Exceptions

For 2012 the TMINS REMP had a sample recovery rate in excess of 99%. Issue Reports (IR) were initiated to document significant exceptions and missing samples. All exceptions are listed below:

AIR

E1-2, E1-2Q

1. For the sampling period 02/15/12 – 02/22/12, samplers were temporarily turned off due to problems at the visitor's center. The power supply was repaired and the air samplers were returned to service. The samples were valid and sent to the lab for analysis. (IR 1327164 and IR 1327256)

F1-3

2. For the sampling period 06/13/12 – 06/20/12, the pump was not operating at the time of sampling. The timer was still operating making the sample invalid per procedure, therefore the sample was not sent to the lab. The pump was replaced on 06/22/12 returning the sampling station to service. (IR 1384487)

G2-1, E1-2, E1-2Q, M2-1

3. For the sampling period 07/25/12 – 08/18/12, power outages due to severe storms caused lower than expected volumes. All samples were valid and sent to the lab for analysis (IR 488572).

M2-1

4. For the sampling period 08/01/12 – 08/08/12, lower than expected run times and sample volumes were noted, probably due to substation maintenance power interruption. All samples were valid and sent to the lab for analysis (IR 488572).

A3-1

5. For the sampling period 09/19/12 – 09/26/12, lower than expected run times and sample volumes were noted, probably due to substation maintenance power interruption. All samples were valid and sent to the lab for analysis (IR 488572).

<u>WATER</u>

J1-2

1. Hourly composite samples were missed when the sample line into the Susquehanna became submerged/lifted or disconnected from its anchoring cinderblocks due to river conditions. Heat trace and insulation were also knocked off. In all cases the line was either repositioned/reconnected and/or the heat trace/insulation was reattached. The sampler was verified operating during sample collection. At all times enough sample was collected for the weekly composite sample so grab sampling was not required. The impacted sampling periods were (IR 1376592):

   01/03/12 – 01/10/12 – sufficient volume, no grab sample required
   01/17/12 – 01/24/12 – sufficient volume, no grab sample required
   02/28/12 – 03/06/12 – sufficient volume, no grab sample required

Q9-1

2. Surface water – source water to ISCO sampler was unavailable due to plant upgrades. Grab sampling was performed for the following sampling periods (IR 1326498):

   01/31/12 – 02/07/12
   02/07/12 – 02/14/12
   02/14/12 – 02/21/12
   02/21/12 – 02/28/12

   J1-2

3. For the sampling period 05/15/12 – 05/22/12, sixty-three hourly samples were missed. The intake tubing was out of the water lying on the shoreline. The intake line was repositioned into the water and the line was reattached to the anchor and buoy. Sufficient sample for the week was collected and a grab samples was not required (IR 488572).

   J1-2

4. For the following sampling periods, hourly samples were missed due to partially submerged line:

   08/28/12 – 09/04/12 – thirty-five samples were missed. Sufficient sample for the week was collected and a grab sample was not required.

   09/04/12 – 09/11/12- 43 samples were missed. Sufficient volume for the week was collected and a grab sample was not required. (IR 1446309)

   The line was repositioned on 09/07/12.

   J1-2

5. For the sampling period 09/18/12 – 09/25/12, the composite sample was not available due to the sample line being detached from the sampler. A grab sample was taken for the week. The sample line was reattached to the sampler. (IR 1446309)

   J1-2

6. For the sampling period 10/02/12 – 10/09/12, fifty-three samples were missed due to a no liquid detected error. Sufficient sample volume was collected and a grab sample was not required. During sampler troubleshooting and return to service, the controller continued to receive a no sample detected error even though full volume was delivered. On 10/10/12 the sampler was replaced with a new sampler. (IR 1446309)

TLD

K15-1

1. During the first quarter collection, station K15-1 was found missing/stolen. New mounting hardware and second quarter dosimeters were installed. (IR 1353661)

Each program exception was reviewed to understand the causes of the program exception. Sampling and maintenance errors were reviewed with the personnel involved to prevent recurrence. Occasional equipment breakdowns and power outages were unavoidable.

The overall sample recovery rate indicates that the appropriate procedures and equipment are in place to assure reliable program implementation.

E. Program Changes

No program changes for 2012.

IV. Results and Discussion

A. Aquatic Environment

1. Surface Water

Samples were taken weekly from a continuous sampler at three locations (A3-2, J1-2 and Q9-1) and composited on a monthly schedule. Of these locations only J1-2 located downstream could be affected by TMINS' effluent releases. The following analyses were performed:

Tritium

Monthly samples from J1-2 and Q9-1 were analyzed for tritium activity (Table C–I.1, Appendix C). Positive tritium activity was detected in five of 12 samples at location J1-2 which is located immediately downstream of the TMINS effluent outfall. The concentrations ranged from 278 to 10,000 pCi/l. The increased tritium concentrations detected were a result of TMINS releasing radwaste treatment system effluent water under permitted discharges in accordance with NRC regulations. The indicator surface water sample is taken just downstream of the liquid discharge outfall where mixing of liquid effluents with the river water

is incomplete. More complete mixing is not achieved until liquid effluents pass over the York Haven Dam. This water is normally not consumed by humans. The concentrations detected were well below any regulatory limits (Figures C–1 and C–2, Appendix C).

Iodine

Monthly samples from location A3-2 were analyzed for I-131 activity (Table C–I.2, Appendix C). This is a control or background station sampled because known medical discharges of radiopharmaceuticals occur into the surface water upstream of TMI from a nearby hospital. Iodine-131 from medical discharges was detected in one sample, at a concentration of 1.5 pCi/l.

Gamma Spectrometry

Locations J1-2 and Q9-1 were analyzed for gamma emitting nuclides (Table C–I.3, Appendix C). All nuclides were less than the MDC.

2. Drinking Water

Monthly samples were collected from continuous water samplers at three locations (G15-2, G15-3 and Q9-1). Two locations (G15-2 and G15-3) could be affected by TMINS' effluent releases. The following analyses were performed:

Gross Beta

Monthly samples from all locations were analyzed for concentrations of gross beta (Tables C–II.1, Appendix C). Gross beta activity was detected in 24 of 36 samples. The concentrations ranged from 1.7 to 4.2 pCi/l. Concentrations detected were consistent with those detected in previous years (Figure C–3, Appendix C).

Iodine

Monthly samples from all locations were analyzed for concentrations of I-131 (Table C–II.2, Appendix C). Iodine-131 activity was not detected in any samples.

Tritium

Monthly samples from all locations were analyzed for tritium activity

(Table C–II.3, Appendix C). Tritium was detected in one of 36 samples at concentrations just above the LLD. The concentration was 254 pCi/L (Figures C–4, Appendix C). The hypothetical dose to the maximum exposed individual from consuming this water from two locations was calculated as <0.004 mrem. (IR 1459647)

Gamma Spectrometry

Samples from all locations were analyzed for gamma emitting nuclides (Table C–II.4, Appendix C). All nuclides were less than the MDC.

3. Effluent Water

Monthly samples were collected from a continuous water sampler at one location (K1-1). The following analyses were performed:

Gross Beta

Monthly samples from location K1-1 were analyzed for concentrations of gross beta (Tables C–III.1, Appendix C). Gross beta was detected in all 12 samples. The concentrations ranged from 2.7 to 6.9 pCi/l. Concentrations detected were consistent with those detected in previous years.

Iodine-131

Monthly samples from location K1-1 were analyzed for concentrations of I-131 (Tables C–III.1, Appendix C). Iodine-131 was not detected in any of the samples.

Tritium

Monthly samples from location K1-1 were analyzed for tritium activity (Table C–III.1, Appendix C). Tritium activity was detected in seven of 12 samples. The concentrations ranged from 475 to 63,300 pCi/l. The elevated results were a result of TMI releasing radwaste treatment system effluent water under permitted discharges in accordance with NRC regulations. These results were from the liquid discharge mixing basin. The concentrations detected agree with those obtained from the TMINS Effluent Monitoring Program. The concentrations were well below any regulatory limits.

Strontium

Semiannual composite samples from location K1-1 were analyzed for Sr-89 and Sr-90 (Table C–III.1, Appendix C). No strontium activity was detected. The highest MDC was calculated at <3.4 pCi/l for Sr-89 and at <1.0 pCi/l for Sr-90.

Gamma Spectrometry

Samples from location K1-1 were analyzed for gamma emitting nuclides (Table C–III.2, Appendix C). All nuclides were less than the MDC.

4. Storm Water

Storm water results are now included in the Annual Radiological Groundwater Protection Program (ARGPPR), Appendix F.

5. Ground Water

Groundwater results are now included in the Annual Radiological Groundwater Protection Program (ARGPPR), Appendix F.

6. Fish

Fish samples comprised of bottom feeders and predators were collected at two locations (IND and BKG) semiannually. Location IND could be affected by TMINS' effluent releases. The following analyses were performed:

Strontium

The edible portions of fish samples from both locations were analyzed for Sr-90 (Table C–IV.1, Appendix C). No strontium activity was detected. The highest MDC was calculated at <4.1 pCi/kg wet for Sr-90.

Gamma Spectrometry

The edible portions of fish samples from both locations were analyzed for gamma emitting nuclides (Table C–IV.2, Appendix C). Naturally occurring K-40 was found in all fish samples and ranged from 2,756 to 4,637 pCi/kg wet and was consistent with levels detected in previous years. No fission or activation products were detected.

7. Sediment

Aquatic sediment samples were collected at three locations (A1-3, J2-1 and K1-3) semiannually. Of these locations two (J2-1 and K1-3) could be affected by TMINS' effluent releases. The following analysis was performed:

Gamma Spectrometry

Sediment samples from all locations were analyzed for gamma emitting nuclides (Table C–V.1, Appendix C). Potassium-40 was found in all sediment samples and ranged from 8,405 to 19,760 pCi/kg dry. Cesium-137 was detected in six sediment samples. The concentrations ranged from 74 to 248 pCi/L. Cesium-137 is occasionally found in sediment at very low levels (just above LLD) and is not distinguishable from background levels. No other fission or activation products were detected (Figure C–5, Appendix C).

B. Atmospheric Environment

1. Airborne Particulates

a. Air Particulates

Continuous air particulate samples were collected from seven locations on a weekly basis. Six locations (A3-1, E1-2, F1-3, G2-1, H3-1 and M2-1) were indicator stations located in the highest D/Q sectors and the nearest communities to TMI. One sample (Q15-1) represents the control location at a remote distance from TMINS. The following analyses were performed:

Gross Beta

Weekly samples were analyzed for concentrations of beta emitters (Table C–VI.1 and C–VI.2, Appendix C).

Detectable gross beta activity was observed at all locations. Comparison of results aid in determining the effects, if any, resulting from the operation of TMINS. The results from the closest to the site boundary locations (Group I) ranged from 6 to 33 E–3 pCi/m^3 with a mean of 18 E–3 pCi/m^3. The results from the intermediate offsite locations (Group II) ranged from 7 to 32 E–3 pCi/m^3 with a mean of 18 E–3 pCi/m^3. The results from the Control location (Group III)

ranged from 9 to 31 E–3 pCi/m^3 with a mean of 19 E–3 pCi/m^3. Comparison of the 2012 air particulate data with previous years' data indicate no effects from the operation of TMINS (Figure C–6, Appendix C). In addition a comparison of the weekly mean values for 2012 indicate no notable differences between indicator and control stations (Figure C-7, Appendix C).

Gamma Spectrometry

Weekly samples were composited quarterly and analyzed for gamma emitting nuclides (Table C–VI.3, Appendix C). Naturally occurring Be-7 due to cosmic ray activity was detected in 25 samples. These concentrations ranged from 52 to 134 E–3 pCi/m3. All other nuclides were less than the MDC.

Airborne Iodine

Continuous air samples were collected from seven (A3-1, E1-2, F1-3, G2-1, H3-1, M2-1 and Q15-1) locations and analyzed weekly for I-131 (Table C–VII.1, Appendix C). All results were less than the MDC for I-131.

2. Terrestrial

a. Milk

Samples were collected from five locations (K15-3, E2-2, F4-1 G2-1 and P4-1) biweekly March through November and monthly December through February. The following analyses were performed:

Iodine–131

Milk samples from all locations were analyzed for concentrations of I-131 (Table C-VIII.1, Appendix C). All results were less than the MDC.

Strontium

Milk samples from all locations were composited quarterly and analyzed for Sr-89 and Sr-90 (Table C–VIII.2, Appendix C). No Sr-89 activity was detected. Strontium-90 activity was detected in two of 20 samples. The concentrations

were 0.7 and 1.1 pCi/l. The activity detected was consistent with those detected in the pre–operational years (Figure C-8, Appendix C).

Gamma Spectrometry

Milk samples from all locations were analyzed for concentrations of gamma emitting nuclides (Table C-VIII.3, Appendix C).

Naturally occurring K-40 activity was found in all samples. The concentrations ranged from 623 to 1,659 pCi/l. All other nuclides were less than the MDC.

b. Food Products

Samples were collected from two locations (B10-2 and H1-2) on a monthly basis in lieu of milk sampling. Samples from the four food product groups were collected annually from three locations (B10-2, E1-2 and H1-2) this year due to unavailability of sweet corn and a root vegetable at E1-2. The following analyses were performed:

Strontium

Twenty-six of 32 food product samples were analyzed for concentrations of Sr-90 (Table C-IX.1, Appendix C). Strontium-90 activity was detected in 10 of 26 samples. The concentrations ranged from 4 to 7 pCi/kg wet.

Gamma Spectrometry

Each food product sample was analyzed for concentrations of gamma emitting nuclides (Table C–IX.1, Appendix C). Naturally occurring Be-7 due to cosmic ray activity was detected in 23 of 32 samples. These concentrations ranged from 179 to 5,459 pCi/l. Naturally occurring K-40 activity was found in all samples. The concentrations ranged from 1,894 to 8,952 pCi/l. All other nuclides were less than the MDC.

C. Ambient Gamma Radiation

Ambient gamma radiation levels were measured utilizing Optically

Stimulated Luminescence Dosimeter (OSLD). Ninety OSLD locations were established around the site. Results of OSLD measurements are listed in Tables C–X.1 to C–X.3, Appendix C

All of the OSLD measurements were below 40 mR/quarter, with a range of 12.1 to 35.0 mR/standard month. A comparison of the Site Boundary and Indicator data to the Control Location data, indicate that the ambient gamma radiation levels from the Control Locations D15-1, F25-1, G10-1, G15-1, H15-1, J15-1, K15-1, L15-1, N15-2, Q15-1 and R15-1 averaged higher than indicator stations. Locations D15-1, F25-1, G10-1, G15-1, H15-1, J15-1, K15-1, L15-1, N15-2, Q15-1 and R15-1 have a historical high bias, but tracked with the data from all three groups this bias is most likely due to radon and other naturally occurring nuclides, e.g. K-40, emanating from the ground.

D. Land Use Survey

A Land Use Survey conducted in the July, August, September, and October 2012 growing season around the Three Mile Island Nuclear Station (TMINS) was performed by Normandeau Associates, RMC Environmental Services Division for Exelon to comply with Sections 8.2 of the Plant's Offsite Dose Calculation Manual (ODCM). The purpose of the survey was to document the nearest resident, milk-producing animal and garden of greater than 500 ft^2 in each of the sixteen 22 ½ degree sectors around the site. The results of this survey are summarized below.

Distance in Miles from the TMINS Reactor Buildings					
Sector		Residence Miles	Garden Miles	Milk Farm Miles	Meat Animal Miles
1	N	1.1	1.6	2.1	2.1
2	NNE	0.7	0.9	-	2.4
3	NE	0.5	1.5	4.2	2.4
4	ENE	0.5	0.5	4.5	1.1
5	E	0.4	0.5	1.1	1.1
6	ESE	1.1	1.2	3.2	1.1
7	SE	0.7	1.9	1.4	1.4
8	SSE	0.7	0.8	-	-
9	S	2.3	2.7	-	3.3
10	SSW	0.6	2.5	4.9, 14.4	-
11	SW	0.5	1.0		-
12	WSW	0.5	1.3	-	-
13	W	0.7	1.3	-	-
14	WNW	0.4	2.2	3.7	2.4
15	NW	0.4	1.2	-	-
16	NNW	0.7	2.4	-	-

E. Radiological Impact of TMINS Operations

An assessment of potential radiological impact indicated that radiation doses to the public from 2012 operations at TMINS were well below all applicable regulatory limits and were significantly less than doses received from natural sources of radiation. The 2012 whole body dose potentially received by an assumed maximum exposed individual from TMI-1 and TMI-2 liquid and airborne effluents was conservatively calculated to be 0.16 mrem. This dose is equivalent to 0.05% of the dose that an individual living in the TMI area receives each year from natural background radiation.

1. Determination of Radiation Doses to the Public

Dose assessments can be performed by using either effluent data and an environmental transport model or environmental sample data. To the extent possible, doses to the public are based on the direct measurement of dose rates from external sources and the measurement of radionuclide concentrations in environmental media which may contribute to an internal dose of radiation. Optically Stimulated Luminescent Dosimetry (OSLDs) positioned in the environment around TMINS provide measurements to determine external radiation doses to humans. Samples of air, water and food products are used to determine internal doses.

The quantity of radioactive materials released during normal operations are typically too small to be measured once distributed in the offsite environment. Therefore, the potential offsite doses are more effectively calculated for TMINS operations using a computerized model that predicts concentrations of radioactive materials in the environment and subsequent radiation doses based on measured effluents.

Doses are calculated using an advanced "class A" dispersion model. This model incorporates the guidelines and methodology set forth by the USNRC in Regulatory Guide 1.109. Due to the conservative assumptions that are used in the model, the calculated doses are generally higher than the doses based on actual environmental sample concentrations.

Therefore, the model predicts doses that are higher than actual doses received by people. The type and amount of radioactivity released from TMINS is calculated using measurements from effluent sample analyses. Once released, the dispersion of

radionuclides in the environment is readily determined by computer modeling.

Airborne releases are diluted and carried away from the site by atmospheric diffusion, which continuously acts to disperse radioactivity. Variables that affect atmospheric dispersion include wind speed, temperature at different elevations, terrain, and shift in wind direction. A weather station on the north end of TMI is linked to a data logger that records the meteorological data.

Computer models also are used to predict the downstream dilution and travel times for liquid releases into the Susquehanna River. Actual monthly Susquehanna River flows are obtained from the USGS Stream gauging station 01570500 located at Harrisburg, PA.

The human exposure pathways also are included in the model and are depicted in Figure 1. The exposure pathways that are considered for the discharge of TMINS liquid effluents are consumption of drinking water and fish and shoreline exposure. The exposure pathways considered for the discharge of TMINS airborne effluents are plume exposure, inhalation, cow milk consumption, fruit and vegetable consumption, meat consumption and land deposition.

Numerous data files are used in the calculations that describe the area around TMI in terms of receptors. Data files include such information as the distance from the plant stack to the site boundary in each sector, the population groupings, milk cows, milk goats, gardens of more than 500 square feet, meat animals, downstream drinking water users and crop yields.

When determining the dose to humans, it is necessary to consider all applicable pathways and all exposed tissues, summing the dose from each to provide the total dose for each organ as well as the whole body from a given radionuclide. Dose calculations involve determining the energy absorbed per unit mass in the various tissues. Thus, for radionuclides taken into the body, the metabolism of the radionuclide in the body must be known along with the physical characteristics of the nuclide such as energies, types of radiations emitted and half-life. The dose assessment model also contains dose conversion factors for the radionuclides for each of four age groups (adults, teenagers, children and infants) and eight organs (total body, thyroid, liver, skin, kidney, lung, bone and GI tract).

Doses are calculated for what is termed the "maximum hypothetical

individual". This individual is assumed to be affected by the combined maximum environmental concentrations wherever they occur.

For liquid releases, the maximum hypothetical individual would consume 193 gallons of Susquehanna River water per year from the first downstream drinking water supplier, eat 46 pounds of fish each year that reside in the plant discharge area and stand 67 hours per year on the shoreline influenced by the plant discharge.

For airborne releases, the maximum hypothetical individual would live at the location of highest radionuclide concentration for inhalation and direct plume exposure. Additionally, each year the hypothetical individual would consume 106 gallons of cow milk, 141 pounds of leafy vegetables, 1389 pounds of non-leafy vegetables and fruits and 243 pounds of meat produced at the locations with the highest predicted radionuclide concentrations. The exposure pathway through goat milk does not currently exist. Therefore, goat milk is not included.

2. Result of Dose Calculations

The maximum hypothetical doses due to 2012 TMI-1 and TMI-2 liquid and airborne effluents are summarized in Tables 1 and 2. Table 1 compares the calculated maximum hypothetical individual doses to the USNRC 10 CFR 50 App. I guidelines. This table also compares the calculated doses (to an individual of the public) from effluents and direct radiation to USEPA 40 CFR 190 dose limits. Table 2 presents the maximum hypothetical whole body doses to an individual. As shown in Table 1, the doses calculated for 2012 operations at TMINS were well below the Federal dose limits (USEPA 40 CFR 190) and the guidelines of USNRC 10 CFR 50 App. I. This conclusion was supported by radionuclide concentrations detected in actual environmental samples.

Doses from natural background radiation provide a baseline for assessing the potential public health significance of radioactive effluents. Natural background radiation from cosmic, terrestrial and natural radionuclides in the human body (not including radon), averages about 81 mrem/yr (Ref. 5). Additionally, the average individual living in the United States receives an annual dose of about 2,760 mrem to the lung from natural radon gas. This lung dose is considered to be equivalent to a whole (or total) body dose of 230 mrem (Ref. 5). Therefore, the average person in the United

States receives a whole body dose of about 311 mrem/yr from natural background radiation sources.

As shown on Table 2, the maximum hypothetical whole body dose received by an individual from 2012 TMI-1 and TMI-2 liquid and airborne effluents combined was conservatively calculated to be 0.16 mrem. This dose is equivalent to 0.05% percent of the dose that an individual living in the TMI area receives each year from natural background radiation (311 mrem).

The low doses calculated for 2012 TMINS operations were the result of efforts to maintain releases "as low as reasonably achievable" (ALARA).

In conclusion, radioactive materials related to 2012 TMINS operations were detected in environmental samples, but the measured concentrations were low and consistent with measured effluents. The environmental sample results verified that the doses received by the public from TMINS effluents in 2012 were well below applicable dose limits and only a small fraction of the doses received from natural background radiation. Additionally, the results indicated that there was no permanent buildup of radioactive materials in the environment and no increase in background radiation levels.

Therefore, based on the results of the radiological environmental monitoring program (REMP) and the doses calculated from measured effluents, TMINS operations in 2012 did not have any adverse effects on the health of the public or on the environment.

TABLE 1

Calculated Maximum Hypothetical Doses to an Individual from 2012 TMI-1 and TMI-2 Liquid and Airborne Effluents

	Maximum Hypothetical Doses To An Individual		
	USNRC 10 CFR 50 APP. I Guidelines (mrem/yr)	**Calculated Dose (mrem/yr)**	
		TMI-1	**TMI-2**
From Radionuclides In Liquid Releases	3 total body, or	1.77E-2	2.02E-4
	10 any organ	1.85E-2	3.22 E-4
From Radionuclides In Airborne Releases (Noble Gases)	5 total body, or	8.93E-5	0*
	15 skin	1.54E-4	0*
From Radionuclides In Airborne Releases (Iodines, Tritium and Particulates)	15 any organ	1.36E-1	1.46E-5

*No noble gases were released from TMI-2.

	USEPA 40 CFR 190 Limits (mrem/yr)	**Calculated Dose (mrem/yr) TMI-1 and TMI-2 Combined****
Total from Site	75 thyroid	0.74
	25 total body or other organs	0.84

* *This sums together TMI-1 and TMI-2 maximum doses regardless of age group for different pathways. The combined doses include those due to radioactive effluents and direct radiation from TMINS. The direct radiation dose is calculated from environmental dosimeter data. For this calculation, exposure is assumed to be equal to dose.

The direct radiation dose from 2012 TMINS operations was 0.60 mrem. This dose was based on a maximum net fence-line exposure rate of 8.7 mR/std month and a shoreline/fence-line occupancy factor of 67 hours (Regulatory Guide 1.109). The combination of the maximum organ dose from TMI-1 and TMI-2 effluents (0.16 mrem) and the dose from direct radiation (0.60 mrem) yielded a maximum hypothetical dose of 0.76 mrem.

TABLE 2

Calculated Whole Body Doses to the Maximum Individual From 2012 TMI-1 and TMI-2 Liquid and Airborne Effluents

	Calculated Maximum Individual Whole Body Dose (mrem/yr)	
	TMI-1	TMI-2
From Radionuclides In Liquid Releases	1.77E-2	2.02E-4
From Radionuclides in Airborne Releases (Noble Gases)	8.93E-5	0*
From Radionuclides In Airborne Releases (Iodines, Tritium and Particulates)	1.36E-1	1.46E-5

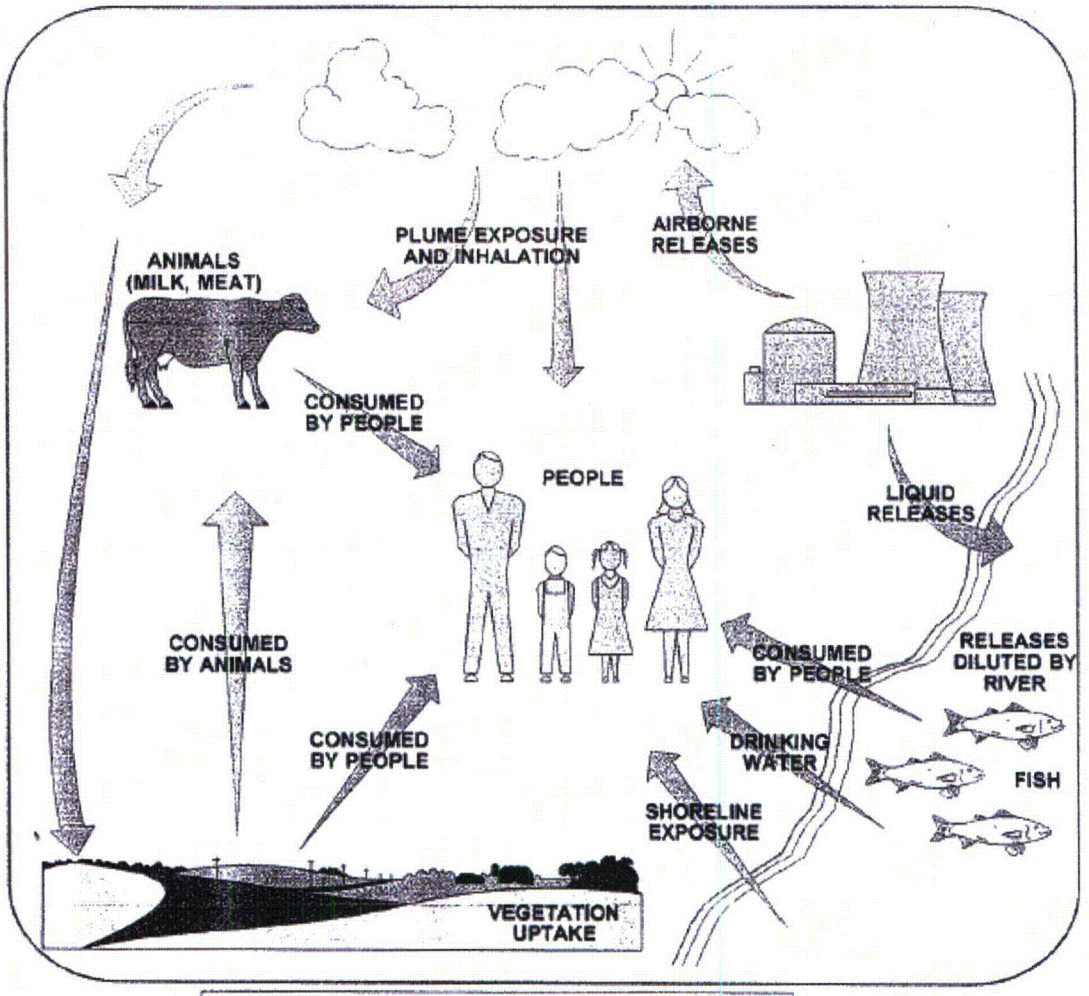
*No noble gases were released from TMI-2.

Individual Whole Body Dose Due to TMI-1 and TMI-2 Operations:	0.16 mrem/yr
Individual Whole Body Dose Due to Natural Background Radiation (1)	311 mrem/yr

(1) NCRP 160 – (2009)

Figure 1

Exposure Pathways For Radionuclides Routinely Released From TMINS



PREDOMINANT RADIONUCLIDES

NOBLE GASES (Xe,Kr)
Plume exposure

RADIOIODINES (I-131, I-133)
Inhalation and consumption of milk, water, fruits, and vegetables

RADIOSTRONTIUMS (Sr-89, Sr-90)
Consumption of milk, meat, fruits, and vegetables

ACTIVATION PRODUCTS (Co-60, Mn-54)
Shoreline exposure

RADIOCESIUMS (Cs-134, Cs-137)
Shoreline exposure and consumption of milk, meat, fish, water, fruits, and vegetables

TRITIUM (H-3)
Inhalation and consumption of water, milk, fruits, and vegetables

F. Summary of Results – Inter-Laboratory Comparison Program

The primary and secondary laboratories analyzed Performance Evaluation (PE) samples of air particulate, air iodine, milk, soil, vegetation and water matrices (Appendix E). The PE samples, supplied by Analytics Inc., Environmental Resource Associates (ERA) and DOE's MAPEP, were evaluated against the following pre-set acceptance criteria:

1. Analytics Evaluation Criteria

   Analytics' evaluation report provides a ratio of TBE's result and Analytics' known value. Since flag values are not assigned by Analytics, TBE-ES evaluates the reported ratios based on internal QC requirements, which are based on the DOE MAPEP criteria.

2. ERA Evaluation Criteria

   ERA's evaluation report provides an acceptance range for control and warning limits with associated flag values. ERA's acceptance limits are established per the USEPA, NELAC, state specific PT program requirements or ERA's SOP for the Generation of Performance Acceptance Limits, as applicable. The acceptance limits are either determined by a regression equation specific to each analyte or a fixed percentage limit promulgated under the appropriate regulatory document.

3. DOE Evaluation Criteria

   MAPEP's evaluation report provides an acceptance range with associated flag values.

   The MAPEP defines three levels of performance: Acceptable (flag = "A"), Acceptable with Warning (flag = "W"), and Not Acceptable (flag = "N"). Performance is considered acceptable when a mean result for the specified analyte is ± 20% of the reference value. Performance is acceptable with warning when a mean result falls in the range from ±20% to ±30% of the reference value (i.e., 20% < bias < 30%). If the bias is greater than 30%, the results are deemed not acceptable.

For the TBE laboratory, 12 out of 18 analytes met the specified acceptance criteria. Six analytes (Co-60, Gross Alpha, Gross Beta, Sr-89, Sr-90 and Zn-65) did not meet the specified acceptance criteria for the following reason:

1. Teledyne Brown Engineering's MAPEP March 2012 Co-60 in soil result of 7.61 Bq/kg was higher than the known value of 1.56 Bq/kg, resulting in a found to known ratio of 4.88 on a sensitivity evaluation. NCR 12-08 was initiated to investigate this failure. No cause could be found for the failure. TBE is monitoring the Co-60 in soil analyses on a case-to-case basis.

2. Teledyne Brown Engineering's MAPEP March 2012 Zn-65 in AP result of 4.19 Bq/sample was higher than the known value of 2.99 Bq/sample, exceeding the upper control limit of 3.89 Bq/sample. NCR 12-08 was initiated to investigate this failure. No cause could be found for the failure and is considered an anomaly specific to the MAPEP sample. The first and second quarter 2012 Analytics AP Zn-65 analyses were acceptable.

3. Teledyne Brown Engineering's MAPEP September 2012 Sr-90 in water result of 19.6 pCi/L was higher than the known value of 12.2 pCi/L, exceeding the upper control limit of 15.9 pCi/L. NCR 12-11 was initiated to investigate this failure. An incorrect aliquot was entered into LIMS. Using the correct aliquot, the result would have fallen within the acceptance range.

4. Teledyne Brown Engineering's ERA May 2012 Gross Alpha in water result of 82.4 pCi/L was higher than the known value of 62.9 pCi/L, which exceeded the upper control limit of 78.0 pCi/L. NCR 12-05 was initiated to investigate this failure. The G-1 detector is slightly biased high for Th-230 based measurements. The G-1 detector is used only for ERA samples. The detector was recalibrated.

5. Teledyne Brown Engineering's ERA November 2012 Gross Beta in water result of 59.3 pCi/L was higher than the known value of 39.2 pCi/L, which exceeded the upper control limit of 46.7 pCi/L. NCR 12-13 was initiated to investigate this failure. The rerun result of 44.8 fell within the control limits. It appears an incorrect aliquot was entered into LIMS.

6. Teledyne Brown Engineering's ERA November 2012 Sr-89 in water result of 46.5 pCi/L was higher than the known value of 39.1 pCi/L, which exceeded the upper control limit of 46.1 pCi/L. NCR 12-13 was initiated to investigate this failure. The found to known ratio was 1.19, which TBE considers acceptable with warning.

For the EIML laboratory, 12 out of 14 analytes met the specified acceptance criteria. Two analytes (Gross Beta and Co-57) did not meet the specified acceptance criteria for the following reason:

1. Environmental Inc., Midwest Laboratory's ERA April 2012 Gross Beta in water result of 76.2 pCi/L was higher than the known value of 44.2 pCi/L, exceeding the upper control limit of 51.5 pCi/L. The rerun result of 38.3 fell within the control limits. A sample dilution problem is suspected.

2. Environmental Inc., Midwest Laboratory's MAPEP August 2012 Co-57 in vegetation result of 7.44 pCi/L was higher than the known value of 5.66 pCi/L, exceeding the upper control limit of 7.36 pCi/L. The recount result of 6.74 fell within the control limits. The sample was recounted using a geometry more closely matched to the MAPEP sample size.

The Inter-Laboratory Comparison Program provides evidence of "in control" counting systems and methods, and that the laboratories are producing accurate and reliable data.

V. References

1. Three Mile Island Nuclear Station, Unit 1, Technical Specifications, DPR 50.
2. Three Mile Island Nuclear Station, Unit 2, PDMS Technical Specifications, DPR 73.
3. Radiation Management Corporation. "Three Mile Island Nuclear Station, Preoperational Radiological Environmental Monitoring Program, January 1, 1974 – June 5, 1974." RMC-TR-75-17, January 1975.
4. Exelon. "Three Mile Island Nuclear Station Offsite Dose Calculation Manual (ODCM)."
5. National Council of Radiation Protection and Measurements Report No. 160. "Ionizing Radiation Exposure of the Population of the United States." 2009.

APPENDIX A

RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT SUMMARY

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE THREE MILE ISLAND NUCLEAR STATION, 2012

Name of Facility: THREE MILE ISLAND NUCLEAR STATION **DOCKET NUMBER:** 50-289 & 50-320 2012
Location of Facility: MIDDLETOWN, PA **REPORTING PERIOD:** 2012

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (M) (F) RANGE	CONTROL LOCATION MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
SURFACE WATER (PCI/LITER)	H-3	24	2000	3046 (5/12) (278/10000)	<LLD	3046 (5/12) (278/10000)	J1-2 INDICATOR WEST SHORE; TMI 0.5 MILES S OF SITE	0
	I-131	12	1	NA	1.5 (1/12)	1.5 (1/12)	A3-2 CONTROL SWATARA CREEK 2.5 MILES N OF SITE	0
	GAMMA	24						
	MN-54		15	<LLD	<LLD	-		0
	CO-58		15	<LLD	<LLD	-		0
	FE-59		30	<LLD	<LLD	-		0
	CO-60		15	<LLD	<LLD	-		0
	ZN-65		30	<LLD	<LLD	-		0
	NB-95		15	<LLD	<LLD	-		0

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SURFACE WATER (PCI/LITER)	ZR-95		30	<LLD	<LLD	-		0
	CS-134		15	<LLD	<LLD	-		0
	CS-137		18	<LLD	<LLD	-		0
	BA-140		60	<LLD	<LLD	-		0
	LA-140		15	<LLD	<LLD	-		0
DRINKING WATER (PCI/LITER)	GR-B	36	4	2.8 (18/24) (1.9/4.2)	2.1 (6/12) (1.7/3.0)	2.9 (12/12) (1.9/4.2)	G15-2 INDICATOR WRIGHTS WATER SUPPLY 13.3 MILES SE OF SITE	0
	I-131	36	1	<LLD	<LLD	-		0
	H-3	36	2000	254 (1/24)	<LLD	254 (1/12)	TM-DW-G15-3 INDICATOR LANCASTER WATER AUTHORITY 14.8 MILES SE OF SITE	0

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DRINKING WATER (PCI/LITER)	GAMMA	36						
	MN-54		15	<LLD	<LLD	-		0
	CO-58		15	<LLD	<LLD	-		0
	FE-59		30	<LLD	<LLD	-		0
	CO-60		15	<LLD	<LLD	-		0
	ZN-65		30	<LLD	<LLD	-		0
	NB-95		15	<LLD	<LLD	-		0
	ZR-95		30	<LLD	<LLD	-		0
	CS-134		15	<LLD	<LLD	-		0

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DRINKING WATER (PCI/LITER)	CS-137		18	<LLD	<LLD	-		0
	BA-140		60	<LLD	<LLD	-		0
	LA-140		15	<LLD	<LLD	-		0
EFFLUENT WATER (PCI/LITER)	GR-B	12	4	4.7 (12/12) (2.7/6.9)	NA	4.7 (12/12) (2.7/6.9)	K1-1 INDICATOR MAIN STATION LIQ. DISCHARGE ONSITE	0
	I-131	12	1	<LLD	NA	-		0
	H-3	12	2000	15589 (7/12) (475/63300)	NA	15589 (7/12) (475/63300)	K1-1 INDICATOR MAIN STATION LIQ. DISCHARGE ONSITE	0
	SR-89	2	5	<LLD	NA	-		0
	SR-90	2	2	<LLD	NA	-		0

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EFFLUENT WATER (PCI/LITER)	GAMMA	12						
	MN-54		15	<LLD	NA	-		0
	CO-58		15	<LLD	NA	-		0
	FE-59		30	<LLD	NA	-		0
	CO-60		15	<LLD	NA	-		0
	ZN-65		30	<LLD	NA	-		0
	NB-95		15	<LLD	NA	-		0
	ZR-95		30	<LLD	NA	-		0
	CS-134		15	<LLD	NA	-		0

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EFFLUENT WATER (PCI/LITER)	CS-137		18	<LLD	NA	-		0
	BA-140		60	<LLD	NA	-		0
	LA-140		15	<LLD	NA	-		0
BOTTOM FEEDER (PCI/KG WET)	SR-90	4	10	<LLD	<LLD	-		0
	GAMMA	4						
	K-40		NA	2974 (2/2) (2756/3192)	4138 (2/2) (3964/4311)	4138 (2/2) (3964/4311)	BKGB CONTROL CITY ISLAND UPSTREAM OF DISCHARGE	0
	MN-54		130	<LLD	<LLD	-		0
	CO-58		130	<LLD	<LLD	-		0
	FE-59		260	<LLD	<LLD	-		0

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BOTTOM FEEDER (PCI/KG WET)	CO-60		130	<LLD	<LLD	-		0
	ZN-65		260	<LLD	<LLD	-		0
	CS-134		130	<LLD	<LLD	-		0
	CS-137		150	<LLD	<LLD	-		0
PREDATOR (PCI/KG WET)	SR-90	4	10	<LLD	<LLD	-		0
	GAMMA	4						
	K-40		NA	4110 (2/2) (3739/4480)	4048 (2/2) (3459/4637)	4110 (2/2) (3739/4480)	INDP INDICATOR YORK HAVEN DAM DOWNSTREAM OF DISCHARGE	0
	MN-54		130	<LLD	<LLD	-		0
	CO-58		130	<LLD	<LLD	-		0

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE THREE MILE ISLAND NUCLEAR STATION, 2012

Name of Facility: THREE MILE ISLAND NUCLEAR STATION **DOCKET NUMBER:** 50-289 & 50-320 2012
Location of Facility: MIDDLETOWN, PA **REPORTING PERIOD:** 2012

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (M) (F) RANGE	CONTROL LOCATION MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) MEAN (M) (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
PREDATOR (PCI/KG WET)	FE-59		260	<LLD	<LLD	-		0
	CO-60		130	<LLD	<LLD	-		0
	ZN-65		260	<LLD	<LLD	-		0
	CS-134		130	<LLD	<LLD	-		0
	CS-137		150	<LLD	<LLD	-		0
SEDIMENT (PCI/KG DRY)	GAMMA	7						
	K-40		NA	14195 (5/5) (8405/19760)	13545 (2/2) (11090/16000)	17110 (1/1)	EDCB INDICATOR STORM WATER BASIN 0.2 MILES SE OF SITE	0
	MN-54		NA	<LLD	<LLD	-		0
	CO-58		NA	<LLD	<LLD	-		0

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE THREE MILE ISLAND NUCLEAR STATION, 2012

Name of Facility: THREE MILE ISLAND NUCLEAR STATION **DOCKET NUMBER:** 50-289 & 50-320 2012
Location of Facility: MIDDLETOWN, PA **REPORTING PERIOD:** 2012

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (M) (F) RANGE	CONTROL LOCATION MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
SEDIMENT (PCI/KG DRY)	CO-60		NA	<LLD	<LLD	-		0
	CS-134		150	<LLD	<LLD	-		0
	CS-137		180	169 (4/5) (74/248)	<LLD	248 (1/1)	EDCB INDICATOR STORM WATER BASIN 0.2 MILES SE OF SITE	0
AIR PARTICULATE (E-3 PCI/CU.METER)	GR-B	370	10	18 (312/317) (6/33)	19 (52/53) (9/31)	19 (52/53) (9/31)	Q15-1 CONTROL WEST FAIRVIEW 13.5 MILES NW OF SITE	0
	GAMMA BE-7	28	NA	71.7 (21/24) (51.8/134)	73.7 (4/4) (54.1/96.7)	79.5 (3/4) (57.7/93.3)	A3-1 INDICATOR MIDDLETOWN 2.6 MILES N OF SITE	0
	MN-54		NA	<LLD	<LLD	-		0
	CO-58		NA	<LLD	<LLD	-		0
	CO-60		NA	<LLD	<LLD	-		0

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE THREE MILE ISLAND NUCLEAR STATION, 2012

Name of Facility: THREE MILE ISLAND NUCLEAR STATION **DOCKET NUMBER:** 50-289 & 50-320 2012
Location of Facility: MIDDLETOWN, PA **REPORTING PERIOD:** 2012

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (M) (F) RANGE	CONTROL LOCATION MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) MEAN (M) (F) RANGE	STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
AIR PARTICULATE (E-3 PCI/CU.METER)	NB-95		NA	<LLD	<LLD	-		0
	ZR-95		NA	<LLD	<LLD	-		0
	CS-134		50	<LLD	<LLD	-		0
	CS-137		60	<LLD	<LLD	-		0
AIR IODINE - (E-3 PCI/CU.METER)	GAMMA I-131	370	70	<LLD	<LLD	-		0
MILK (PCI/LITER)	I-131	115	1	<LLD	<LLD	-		0
	SR-89	20	5	<LLD	<LLD	-		0
	SR-90	20	2	0.7 (1/16)	1.1 (1/4)	1.1 (1/4)	K15-3 CONTROL MEYER'S FARM 14.5 MILES SSW OF SITE	0

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE THREE MILE ISLAND NUCLEAR STATION, 2012

Name of Facility: THREE MILE ISLAND NUCLEAR STATION **DOCKET NUMBER:** 50-289 & 50-320 2012
Location of Facility: MIDDLETOWN, PA **REPORTING PERIOD:** 2012

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (M) (F) RANGE	CONTROL LOCATION MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
MILK (PCI/LITER)	GAMMA	115						
	K-40		NA	1274 (92/92) (623/1659)	1299 (23/23) (1021/1597)	1415 (23/23) (1119/1659)	P4-1 INDICATOR	0
	CS-134		15	<LLD	<LLD	-		0
	CS-137		18	<LLD	<LLD	-		0
	BA-140		60	<LLD	<LLD	-		0
	LA-140		15	<LLD	<LLD	-		0
VEGETATION (PCI/KG WET)	SR-90	26	10	5.8 (5/13) (4.5/7.1)	5.5 (4/13) (3.9/7.2)	5.8 (5/12) (4.5/7.1)	H1-2 INDICATOR RED HILL MARKET 1.0 MILES SSE OF SITE	0 ALONG ROUTE 441
	GAMMA	32						
	BE-7		NA	920 (12/16) (208/2644)	1748 (11/16) (179/5459)	1748 (11/16) (179/5459)	B10-2 CONTROL MILTON HERSHEY SCHOOL 10.1 MILES NNE OF SITE	0

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE THREE MILE ISLAND NUCLEAR STATION, 2012

Name of Facility: THREE MILE ISLAND NUCLEAR STATION **DOCKET NUMBER:** 50-289 & 50-320 2012
Location of Facility: MIDDLETOWN, PA **REPORTING PERIOD:** 2012

MEDIUM OR PATHWAY SAMPLED (UNIT OF MEASUREMENT)	TYPES OF ANALYSIS PERFORMED	NUMBER OF ANALYSIS PERFORMED	REQUIRED LOWER LIMIT OF DETECTION (LLD)	INDICATOR LOCATIONS MEAN (M) (F) RANGE	CONTROL LOCATION MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) MEAN (M) (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN (M) STATION # NAME DISTANCE AND DIRECTION	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
VEGETATION (PCI/KG WET)	K-40		NA	4549 (16/16) (2590/7721)	5280 (16/16) (1894/8952)	5280 (16/16) (1894/8952)	B10-2 CONTROL MILTON HERSHEY SCHOOL 10.1 MILES NNE OF SITE	0
	I-131		60	<LLD	<LLD	-		0
	CS-134		60	<LLD	<LLD	-		0
	CS-137		80	<LLD	<LLD	-		0
DIRECT RADIATION (MILLI-ROENTGEN/QUARTER)	OSLD-QUARTER	356	NA	19.7 (316/316) (12.1/35.0)	21.7 (40/40) (17.0/33.4)	29.8 (4/4) (27.7/35.0)	H8-1 INDICATOR SAGINAW ROAD 7.4 MILES SSE OF SITE	0 STARVIEW

APPENDIX B

LOCATION DESIGNATION, DISTANCE & DIRECTION, AND SAMPLE COLLECTION & ANALYTICAL METHODS

TABLE B-1: Location Designation and Identification System for the Three Mile Island Nuclear Station

XYY-Z- General code for identification of locations, where:

X - Angular Sector of Sampling Location. The compass is divided into 16 sectors of 22 1/2 degrees each with center at Three Mile Island's Units 1 and 2 off-gas vents. Sector A is centered due North, and others are alphabetical in a clockwise direction.

YY - Radial Zone of Sampling Location in miles.

Z - Station's Numerical Designation within sector and zone, using 1, 2, 3... in each sector and zone.

TABLE B-2: Radiological Environmental Monitoring Program - Sampling Locations, Distance and Direction, Three Mile Island Nuclear Station, 2012

Sample Medium	Station Code	Map Number	Distance (miles)	Azimuth	Description
AQS	A1-3	1	0.5	359°	N of site off north tip of TMI in Susquehanna River
ID	A1-4	1	0.3	6°	N of Reactor Building on W fence adjacent to North Weather Station, TMI
AP,AI,ID	A3-1	2	2.7	357°	N of site at Mill Street Substation
SW	A3-2	2	2.7	356°	N of site at Swatara Creek, Middletown
ID	A5-1	2	4.4	3°	N of site on Vine Street Exit off Route 283
ID	A9-3	3	8.0	2°	N of site at Duke Street Pumping Station, Hummelstown
ID	B1-1	1	0.6	25°	NNE of site on light pole in middle of North Bridge, TMI
ID	B1-2	1	0.4	23°	NNE of Reactor Building on top of dike, TMI
ID	B2-1	2	1.9	17°	NNE of site on Sunset Dr. (off Hillsdale Rd.)
ID	B5-1	2	4.9	19°	NNE of site at intersection of School House and Miller Roads
ID	B10-1	3	9.2	21°	NNE of site at intersection of West Areba Avenue and Mill Street, Hershey
FP	B10-2	3	10	31°	NNE of site at Milton Hershey School, Hershey
ID	C1-1	1	0.7	37°	NE of site along Route 441 N
ID	C1-2	1	0.3	50°	NE of Reactor Building on top of dike, TMI
ID	C2-1	2	1.5	44°	NE of site at Middletown Junction
ID	C5-1	2	4.7	43°	NE of site on Kennedy Lane
ID	C8-1	3	7.1	48°	NE of site at Schenk's Church on School House Road
AQF	Control	-	-	-	All locations where finfish are collected above Dock St. Dam, Harrisburg
ID	D1-1	1	0.2	76°	ENE of Reactor Building on top of dike, TMI
ID	D1-2	1	0.5	67°	ENE of site off Route 441 along lane between garden center and residence
ID	D2-2	2	1.6	74°	ENE of site along Hillsdale Rd. (S of Zion Rd.)
ID	D6-1	3	5.2	66°	ENE of site off Beagle Road
ID	D15-1	3	10.8	64°	ENE of site along Route 241, Lawn
AP, AI, ID, FP	E1-2	1	0.4	97°	E of site at TMI Visitor's Center
ID	E1-4	1	0.2	97°	E of Reactor Building on top of dike, TMI
M	E2-2	2	1.1	96°	E of site at farm on Pecks Road
ID	E2-3	2	2.0	97°	E of site along Hillsdale Rd. (N of Creek Rd.)
ID	E5-1	2	4.7	82°	E of site at intersection of North Market Street (Route 230) and Zeager Road
ID	E7-1	3	6.7	88°	E of site along Hummelstown Street, Elizabethtown
ID	F1-1	1	0.5	117°	ESE of site near entrance to 500 kV Substation
ID	F1-2	1	0.2	112°	ESE of Reactor Building on top of dike midway within ISWSF, TMI
AP, AI	F1-3	1	0.6	112°	ESE of site in 500 kV Substation
ID	F1-4	1	0.2	122°	ESE of Reactor Building on top of dike, TMI
ID	F2-1	2	1.3	119°	ESE of site along Engle Road
M	F4-1	2	3.2	104°	ESE of site at farm on Turnpike Road
ID	F5-1	2	4.7	109°	ESE of site along Amosite Road
ID	F10-1	3	9.4	112°	ESE of site along Donegal Springs Road, Donegal Springs
ID	F25-1	3	22	106°	ESE of site at intersection of Steel Way and Loop Roads, Lancaster
ID	G1-2	1	0.7	145°	SE of site along Route 441 S
ID	G1-3	1	0.2	130°	SE of Reactor Building on top of dike, TMI
ID	G1-5	1	0.3	143°	SE of Reactor Building on top of dike, TMI
ID	G1-6	1	0.3	139°	SE of Reactor Building on top of dike, TMI
AI, AP, M	G2-1	2	1.4	126°	SE of site at farm on Becker Road
ID	G2-4	2	1.7	138°	SE of site on Becker Road
ID	G5-1	2	4.8	131°	SE of site at intersection of Bainbridge and Risser Roads
ID	G10-1	3	9.7	128°	SE of site at farm along Engles Tollgate Road, Marietta
ID	G15-1	3	14.4	126°	SE of site at Columbia Water Treatment Plant
DW	G15-2	3	13.3	129°	SE of site at Wrightsville Water Treatment Plant
DW	G15-3	3	15.7	124°	SE of site at Lancaster Water Treatment Plant

TABLE B-2: Radiological Environmental Monitoring Program - Sampling Locations, Distance and Direction, Three Mile Island Nuclear Station, 2012

Sample Medium	Station Code	Map Number	Distance (miles)	Azimuth	Description
ID	H1-1	1	0.5	167°	SSE of site, TMI
FP	H1-2	1	1.0	151°	SSE of site along Route 441, Red Hill Market
AP, AI, ID	H3-1	2	2.2	160°	SSE of site in Falmouth-Collins Substation
ID	H5-1	2	4.1	158°	SSE of site by Guard Shack at Brunner Island Steam Electric Station
ID	H8-1	3	7.4	163°	SSE of site along Saginaw Road, Starview
ID	H15-1	3	13.2	157°	SSE of site at intersection of Orchard and Stonewood Roads, Wilshire Hills
AQF	Indicator	-	-	-	All locations where finfish are collected downstream of the TMINS liquid discharge outfall
ID	J1-1	1	0.8	176°	S of site, TMI
SW	J1-2	1	0.5	188°	S of site downstream of the TMINS liquid discharge outfall in Susquehanna River
ID	J1-3	1	0.3	189°	S of Reactor Building just S of SOB, TMI
AQS	J2-1	2	1.4	179°	S of site in Susquehanna River just upstream of the York Haven Dam
ID	J3-1	2	2.7	179°	S of site at York Haven/Cly
ID	J5-1	2	4.9	181°	S of site along Canal Road, Conewago Heights
ID	J7-1	3	6.5	176°	S of site off of Maple Street, Manchester
ID	J15-1	3	12.6	183°	S of site in Met-Ed York Load Dispatch Station
EW	K1-1	1	0.2	210°	On site at RML-7 Main Station Discharge Building
AQS	K1-3	1	0.2	212°	SSW of site downstream of the TMINS liquid discharge outfall in the Susquehanna River
ID	K1-4	1	0.2	209°	SSW of Reactor Building on top of dike behind Warehouse 2, TMI
ID	K2-1	2	1.2	200°	SSW of site on S Shelley Island
ID	K3-1	2	2.0	206°	SSW of site along Rt. 262, N of Cly
ID	K5-1	2	4.9	202°	SSW of site along Conewago Creek Road, Strinestown
ID	K8-1	3	7.5	196°	SSW of site at intersection of Coppenhaffer Road and Route 295, Zions View
ID	K15-1	3	12.8	203°	SSW of site behind McDonald's and next to child care center, Weiglestown
M	K15-3	3	14.4	205°	SSW of site at farm along S Salem Church Rd, Dover
ID	L1-1	1	0.1	236°	SW of site on top of dike W of Mech. Draft Cooling Tower, TMI
ID	L1-2	1	0.5	221°	SW of site on Beech Island
ID	L2-1	2	1.8	224°	SW of site along Route 262
ID	L5-1	2	4.1	228°	SW of site at intersection of Stevens and Wilson Roads
ID	L8-1	3	8.0	225°	SW of site along Rohlers Church Rd., Andersontown
ID	L15-1	3	11.8	226°	SW of site on W side of Route 74, rear of church, Mt. Royal
ID	M1-1	1	0.1	250°	WSW of Reactor Building on SE corner of U-2 Screenhouse fence, TMI
ID	M1-2	1	0.4	252°	WSW of site on E side of Shelley Island, Lot #157
AP, AI, ID	M2-1	2	1.3	256°	WSW of site along Route 262 and adjacent to Fishing Creek, Goldsboro
ID	M5-1	2	4.3	249°	WSW of site at intersection of Lewisberry and Roxberry Roads, Newberrytown
ID	M9-1	3	8.7	243°	WSW of site along Alpine Road, Maytown
ID	N1-1	1	0.7	274°	W of site on W side of Shelley Island, between lots #13 and #14
ID	N1-3	1	0.1	274°	W of Reactor Building on fence adjacent to Screenhouse entrance gate, TMI
ID	N2-1	2	1.2	261°	W of site at Goldsboro Marina
ID	N5-1	2	5.0	268°	W of site off of Old York Road along Robin Hood Drive
ID	N8-1	3	7.7	262°	W of site along Route 382, 1/2 mile north of Lewisberry
ID	N15-2	3	10.4	275°	W of site at intersection of Lisburn Road and Main Street, Lisburn
ID	P1-1	1	0.4	303°	WNW of site on Shelley Island

TABLE B-2: Radiological Environmental Monitoring Program - Sampling Locations, Distance and Direction, Three Mile Island Nuclear Station, 2012

Sample Medium	Station Code	Map Number	Distance (miles)	Azimuth	Description
ID	P1-2	1	0.1	292°	WNW of Reactor Building on fence N of Unit 1 Screenhouse, TMI
ID	P2-1	2	2.0	283°	WNW of site along Route 262
M	P4-1	2	3.7	295°	WNW of site at farm on Valley Road
ID	P5-1	2	5.0	284°	WNW of site at intersection of Valley Road (Route 262) and Beinhower Road
ID	P8-1	3	8.0	292°	WNW of site along Evergreen Road, Reesers Summit
ID	Q1-1	1	0.5	317°	NW of site on E side of Shelley Island
ID	Q1-2	1	0.2	321°	NW of Reactor Building on fence W of Warehouse 1, TMI
ID	Q2-1	2	1.9	310°	NW of site along access road along river
ID	Q5-1	2	5.0	317°	NW of site along Lumber Street, Highspire
SW, DW, ID	Q9-1	3	8.5	310°	NW of site at the Steelton Water Company
AP, AI, ID	Q15-1	3	13.4	309°	NW of site behind West Fairview Fire Dept. Social Hall (abandoned)
ID	R1-1	3	0.2	335°	NNW of Reactor Building along W fence, TMI
ID	R1-2	1	0.7	334°	NNW of site on central Henry Island
ID	R3-1	2	2.6	341°	NNW of site at Crawford Station, Middletown
ID	R5-1	2	4.9	339°	NNW of site at intersection of Spring Garden Drive and Route 441
ID	R9-1	3	8.0	341°	NNW of site at intersection of Derry and 66th Streets, Rutherford Heights
ID	R15-1	3	11.2	332°	NNW of site at intersection of Route 22 and Colonial Road, Colonial Park

IDENTIFICATION KEY

ID = Immersion Dose (OSLD)
SW = Surface Water
AI = Air Iodine
AP = Air Particulate
FP = Food Products (Green Leafy Vegetation, Fruits, Vegetables)
EW = Effluent Water
DW = Drinking Water
M = Milk (Cow)
AQF = Finfish
AQS = Aquatic Sediment

TABLE B-3: Radiological Environmental Monitoring Program – Summary of Sample Collection and Analytical Methods, Three Mile Island Nuclear Station, 2012

Sample Medium	Analysis	Sampling Method	Collection Procedure Number	Sample Size	Analytical Procedure Number
Surface Water	Gamma Spectroscopy	Monthly composite from a continuous water compositor.	ER-TMI-06 Collection of water samples for radiological analysis (Three Mile Island Nuclear Station)	2 gallon	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., GS-01 Determination of gamma emitters by gamma spectroscopy
Surface Water	Tritium	Monthly composite from a continuous water compositor.	ER-TMI-06 Collection of water samples for radiological analysis (Three Mile Island Nuclear Station)	2 gallon	TBE, TBE-2010 Tritium and carbon-14 analysis by liquid scintillation Env. Inc., T-02 Determination of tritium in water (direct method)
Surface Water	Iodine-131	Monthly composite from a continuous water compositor.	ER-TMI-06 Collection of water samples for radiological analysis (Three Mile Island Nuclear Station)	2 gallon	TBE, TBE-2012 Radioiodine in various matrices Env. Inc., I-131-01 Determination of I-131 in milk by anion exchange
Drinking Water	Gross Beta	Monthly composite from a continuous water compositor.	ER-TMI-06 Collection of water samples for radiological analysis (Three Mile Island Nuclear Station)	2 gallon	TBE, TBE-2008 Gross alpha and/or gross beta activity in various matrices Env. Inc., W(DS)-01 Determination of gross alpha and/or gross beta in water (dissolved solids or total residue)
Drinking Water	Gamma Spectroscopy	Monthly composite from a continuous water compositor.	ER-TMI-06 Collection of water samples for radiological analysis (Three Mile Island Nuclear Station)	2 gallon	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., GS-01 Determination of gamma emitters by gamma spectroscopy
Drinking Water	Tritium	Monthly composite from a continuous water compositor.	ER-TMI-06 Collection of water samples for radiological analysis (Three Mile Island Nuclear Station)	2 gallon	TBE, TBE-2010 Tritium and carbon-14 analysis by liquid scintillation Env. Inc., T-02 Determination of tritium in water (direct method)
Drinking Water	Iodine-131	Monthly composite from a continuous water compositor.	ER-TMI-06 Collection of water samples for radiological analysis (Three Mile Island Nuclear Station)	2 gallon	TBE, TBE-2012 Radioiodine in various matrices Env. Inc., I-131-01 Determination of I-131 in milk by an ion exchange
Effluent Water	Iodine-131	Monthly composite from a continuous water compositor.	ER-TMI-06 Collection of water samples for radiological analysis (Three Mile Island Nuclear Station)	2 gallon	TBE, TBE-2012 Radioiodine in various matrices Env. Inc., I-131-01 Determination of I-131 in milk by an ion exchange
Effluent Water	Gross Beta	Monthly composite from a continuous water compositor.	ER-TMI-06 Collection of water samples for radiological analysis (Three Mile Island Nuclear Station)	2 gallon	TBE, TBE-2008 Gross alpha and/or gross beta activity in various matrices Env. Inc., W(DS)-01 Determination of gross alpha and/or gross beta in water (dissolved solids or total residue)

TABLE B-3: Radiological Environmental Monitoring Program – Summary of Sample Collection and Analytical Methods, Three Mile Island Nuclear Station, 2012

Sample Medium	Analysis	Sampling Method	Collection Procedure Number	Sample Size	Analytical Procedure Number
Effluent Water	Gamma Spectroscopy	Monthly composite from a continuous water compositor.	ER-TMI-06 Collection of water samples for radiological analysis (Three Mile Island Nuclear Station)	2 gallon	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., GS-01 Determination of gamma emitters by gamma spectroscopy
Effluent Water	Tritium	Monthly composite from a continuous water compositor.	ER-TMI-06 Collection of water samples for radiological analysis (Three Mile Island Nuclear Station)	2 gallon	TBE, TBE-2010 Tritium and carbon-14 analysis by liquid scintillation Env. Inc., T-02 Determination of tritium in water (direct method)
Effluent Water	Strontium-89/90	Semi-annual composite from monthly samples.	TBE, TBE-2023 Compositing of samples	2 gallon	TBE, TBE-2019 Radiostrontium analysis by ion exchange
Storm Water	Gamma Spectroscopy	Quarterly composite of monthly grab samples	ER-TMI-06 Collection of water samples for radiological analysis (Three Mile Island Nuclear Station)	1 gallon	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., GS-01 Determination of gamma emitters by gamma spectroscopy
Storm Water	Tritium	Quarterly composite of monthly grab samples	ER-TMI-06 Collection of water samples for radiological analysis (Three Mile Island Nuclear Station)	1 gallon	TBE, TBE-2010 Tritium and carbon-14 analysis by liquid scintillation Env. Inc., T-02 Determination of tritium in water (direct method)
Fish	Gamma Spectroscopy	Semi-annual samples collected via electroshocking or other techniques	ER-TMI-13 Collection of fish samples for radiological analysis (Three Mile Island Nuclear Station)	1000 grams (wet)	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., GS-01 Determination of gamma emitters by gamma spectroscopy
Fish	Strontium-90	Semi-annual samples collected via electroshocking or other techniques	ER-TMI-13 Collection of fish samples for radiological analysis (Three Mile Island Nuclear Station)	1000 grams (wet)	TBE, TBE-2019 Radiostrontium analysis by ion exchange Env. Inc., SR-05, Determination of Sr-89 and Sr-90 in Ashed Samples

TABLE B-3: Radiological Environmental Monitoring Program – Summary of Sample Collection and Analytical Methods, Three Mile Island Nuclear Station, 2012

Sample Medium	Analysis	Sampling Method	Collection Procedure Number	Sample Size	Analytical Procedure Number
Sediment	Gamma Spectroscopy	Semi-annual grab samples	ER-TMI-03 Collection of sediment samples for radiological analysis (Three Mile Island Nuclear Station)	500 grams (dry)	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., GS-01 Determination of gamma emitters by gamma spectroscopy
Air Particulates	Gross Beta	One-week composite of continuous air sampling through glass fiber filter paper	ER-TMI-14 Collection of air particulate and air iodine samples for radiological analysis (Three Mile Island Nuclear Station)	1 filter (approximately 280 cubic meters weekly)	TBE, TBE-2008 Gross alpha and/or gross beta activity in various matrices Env. Inc., AP-02 Determination of gross alpha and/or gross beta in air particulate filters
Air Particulates	Gamma Spectroscopy	Quarterly composite of each station	TBE, TBE-2023 Compositing of samples Env. Inc., AP-03 Procedure for compositing air particulate filters for gamma spectroscopic analysis	13 filters (approximately 3600 cubic meters)	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., GS-01 Determination of gamma emitters by gamma spectroscopy
Air Iodine	Gamma Spectroscopy	One-week composite of continuous air sampling through charcoal filter	ER-TMI-14 Collection of air particulate and air iodine samples for radiological analysis (Three Mile Island Nuclear Station)	1 filter (approximately 280 cubic meters weekly)	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., I-131-02 Determination of I-131 in charcoal canisters by gamma spectroscopy (batch method)
Milk	I-131	Bi-weekly grab sample when cows are on pasture. Monthly all other times	ER-TMI-01 Collection of milk samples for radiological analysis (Three Mile Island Nuclear Station)	2 gallon	TBE, TBE-2012 Radioiodine in various matrices Env. Inc., I-131-01 Determination of I-131 in milk by anion exchange
Milk	Strontium-89/90	Quarterly composite of Bi-weekly and monthly grab samples	ER-TMI-01 Collection of milk samples for radiological analysis (Three Mile Island Nuclear Station) TBE, TBE-2023 Compositing of samples	2 gallon	TBE, TBE-2019 Radiostrontium analysis by ion exchange Enc. Inc., SR-07, Determination of Sr-89 and Sr-90 in Milk (Ion Exchange Batch Method)
Milk	Gamma Spectroscopy	Bi-weekly grab sample when cows are on pasture. Monthly all other times	ER-TMI-01 Collection of milk samples for radiological analysis (Three Mile Island Nuclear Station)	2 gallon	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., GS-01 Determination of gamma emitters by gamma spectroscopy
Vegetation	Gamma Spectroscopy	Monthly and annual grab sample	ER-TMI-04 Collection of vegetation samples for radiological analysis (Three Mile Island Nuclear Station)	1000 grams	TBE, TBE-2007 Gamma emitting radioisotope analysis Env. Inc., GS-01 Determination of gamma emitters by gamma spectroscopy

TABLE B-3: Radiological Environmental Monitoring Program – Summary of Sample Collection and Analytical Methods, Three Mile Island Nuclear Station, 2012

Sample Medium	Analysis	Sampling Method	Collection Procedure Number	Sample Size	Analytical Procedure Number
Vegetation	Strontium-89/90	Monthly and annual grab sample	ER-TMI-04 Collection of vegetation samples for radiological analysis (Three Mile Island Nuclear Station)	1000 grams	TBE, TBE-2019 Radiostrontium analysis by ion exchange Env. Inc., SR-05, Determination of Sr-89 and Sr-90 in Ashed Samples
OSLD	Optically Stimulated Luminescence Dosimetry	Quarterly OSLDs comprised of two Al_2O_3:C Landauer Incorporated elements.	ER-TMI-02 Collection of OSLD samples for radiological analysis (Three Mile Island Nuclear Station)	2 badges with 3 dosimeters	Landauer Incorporated

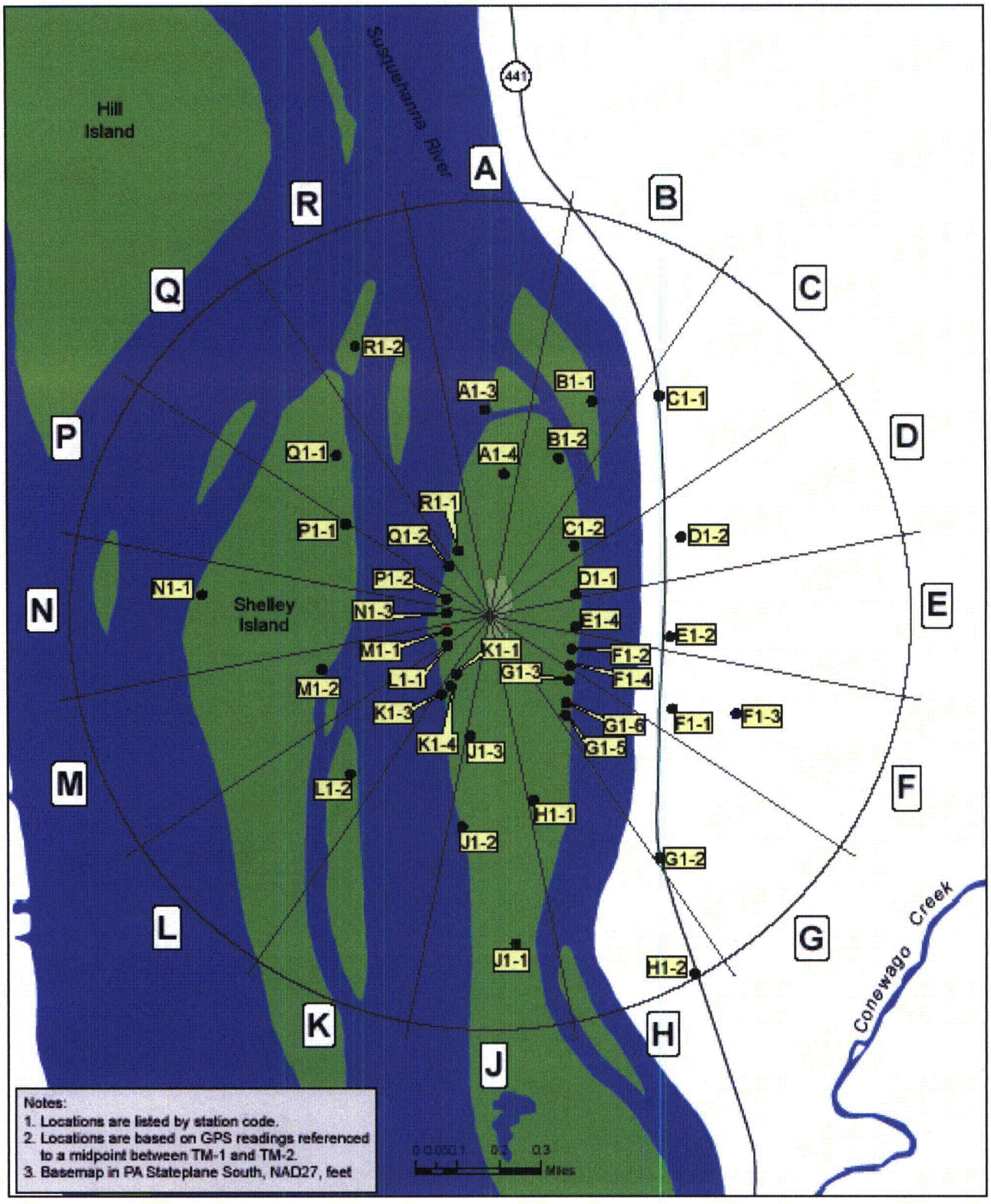

Figure B-1
Environmental Sampling Locations Within One Mile of the Three Mile Island Nuclear Station, 2012

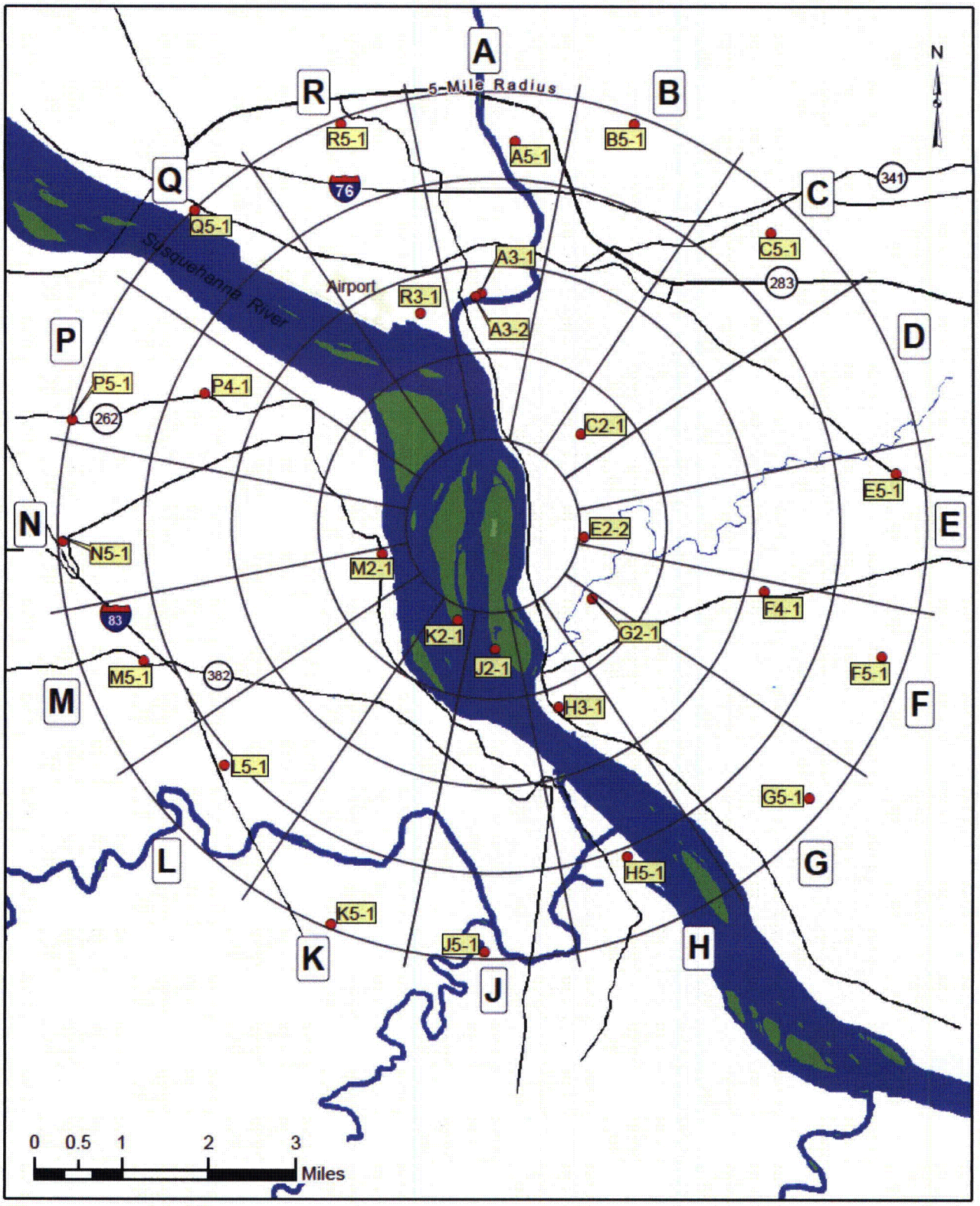

Figure B-2
Environmental Sampling Locations Between One and Five Miles of the Three Mile Island Nuclear Station, 2012

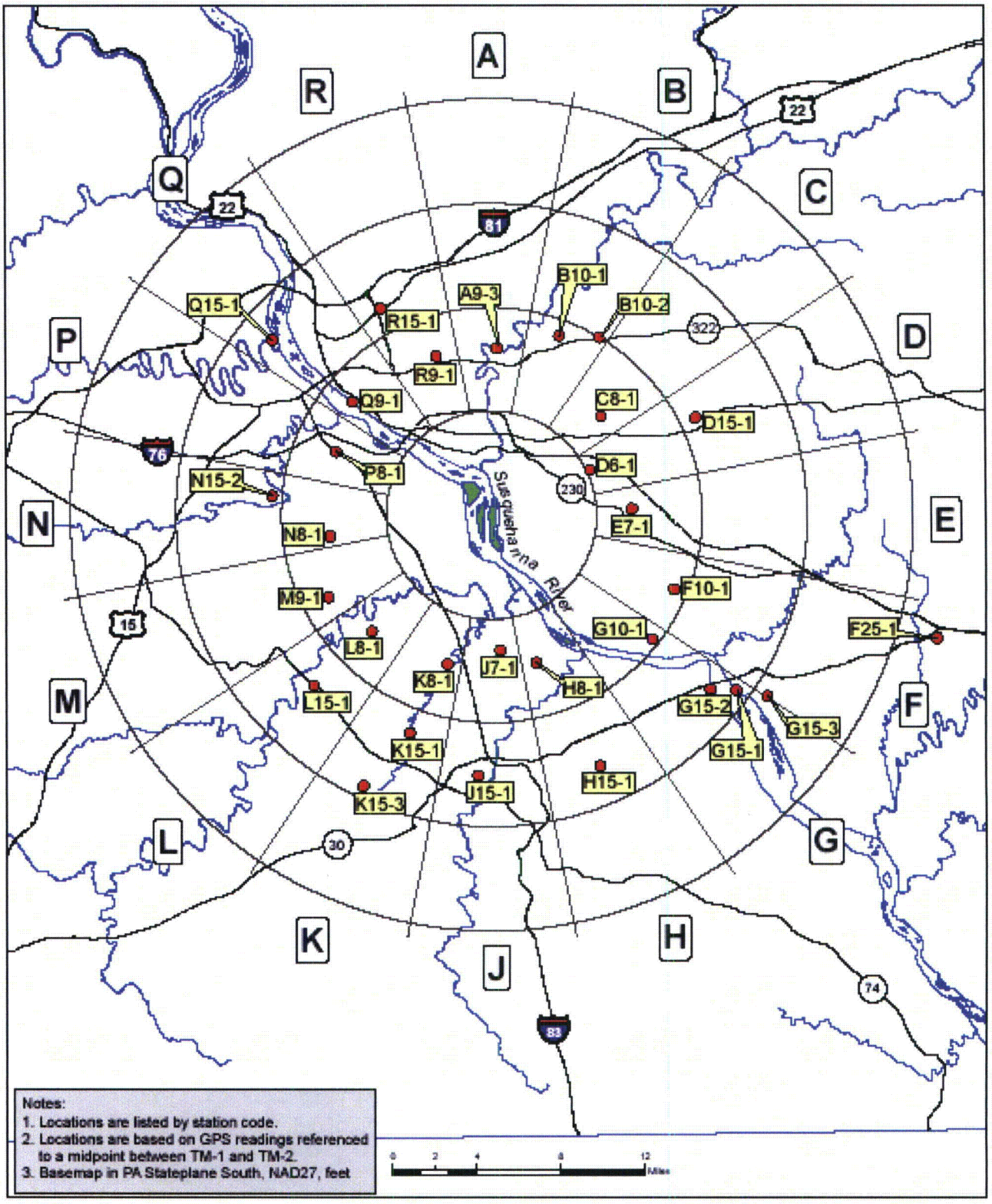

Figure B-3
Environmental Sampling Locations Greater than Five Miles of the Three Mile Island Nuclear Station, 2012

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APPENDIX C

DATA TABLES AND FIGURES - PRIMARY LABORATORY

TABLE C-I.1 **CONCENTRATIONS OF TRITIUM IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD		J1-2	Q9-1
01/03/12 - 01/31/12	(1)	278 ± 118	< 167
01/31/12 - 02/28/12	(1)	< 174	< 174
02/28/12 - 04/03/12	(1)	< 184	< 181
04/03/12 - 05/01/12		< 183	< 184
05/01/12 - 05/29/12	(1)	< 186	< 182
05/29/12 - 07/03/12		354 ± 129	< 184
07/03/12 - 07/31/12		< 169	< 168
07/31/12 - 08/28/12		< 161	< 160
08/28/12 - 10/02/12	(1)	446 ± 139	< 195
10/02/12 - 10/30/12	(1)	4150 ± 463	< 183
10/30/12 - 11/27/12		10000 ± 1040	< 167
11/27/12 - 12/31/12		< 184	< 183
MEAN*		3046 ± 8441	-

TABLE C-I.2 **CONCENTRATIONS OF I-131 IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	A3-2
01/10/12 - 01/31/12	< 0.6
02/07/12 - 02/28/12	< 0.6
03/06/12 - 04/03/12	< 0.4
04/10/12 - 05/01/12	< 0.5
05/08/12 - 05/29/12	< 0.6
06/05/12 - 07/03/12	< 0.8
07/10/12 - 07/31/12	1.5 ± 0.5
08/07/12 - 08/28/12	< 0.7
09/04/12 - 10/02/12	< 0.6
10/09/12 - 10/30/12	< 0.6
11/06/12 - 11/27/12	< 0.7
12/05/12 - 12/31/12	< 0.7
MEAN	-

* THE MEAN AND TWO STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

TABLE C-I.3 **CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD		Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
J1-2	01/03/12 - 01/31/12	(1)	< 5	< 5	< 10	< 6	< 12	< 5	< 9	< 5	< 5	< 26	< 9
	01/31/12 - 02/28/12		< 6	< 8	< 16	< 8	< 14	< 7	< 16	< 6	< 10	< 35	< 10
	02/28/12 - 04/03/12	(1)	< 4	< 4	< 9	< 4	< 9	< 5	< 8	< 4	< 5	< 20	< 6
	04/03/12 - 05/01/12		< 6	< 7	< 13	< 7	< 12	< 6	< 11	< 6	< 7	< 30	< 10
	05/01/12 - 05/29/12	(1)	< 5	< 5	< 13	< 7	< 10	< 6	< 9	< 5	< 6	< 20	< 7
	05/29/12 - 07/03/12		< 4	< 4	< 8	< 4	< 7	< 4	< 6	< 4	< 4	< 19	< 6
	07/03/12 - 07/31/12		< 6	< 5	< 9	< 6	< 12	< 6	< 9	< 5	< 6	< 28	< 6
	07/31/12 - 08/28/12		< 5	< 6	< 14	< 6	< 14	< 6	< 11	< 4	< 6	< 31	< 11
	08/28/12 - 10/02/12	(1)	< 4	< 3	< 9	< 3	< 7	< 4	< 8	< 4	< 4	< 28	< 8
	10/02/12 - 10/30/12		< 5	< 5	< 12	< 7	< 11	< 6	< 9	< 5	< 6	< 28	< 7
	10/30/12 - 11/27/12		< 6	< 6	< 13	< 5	< 10	< 6	< 12	< 6	< 7	< 36	< 4
	11/27/12 - 12/31/12		< 5	< 6	< 11	< 5	< 11	< 6	< 10	< 5	< 5	< 29	< 7
	MEAN		-	-	-	-	-	-	-	-	-	-	-
Q9-1	01/03/12 - 01/31/12		< 4	< 4	< 8	< 3	< 8	< 4	< 6	< 3	< 4	< 16	< 5
	01/31/12 - 02/28/12	(1)	< 6	< 6	< 13	< 7	< 14	< 6	< 11	< 6	< 7	< 31	< 11
	02/28/12 - 04/03/12		< 4	< 4	< 12	< 4	< 9	< 5	< 8	< 4	< 6	< 23	< 5
	04/03/12 - 05/01/12		< 9	< 9	< 19	< 9	< 19	< 10	< 16	< 9	< 9	< 45	< 14
	05/01/12 - 05/29/12		< 4	< 5	< 8	< 4	< 10	< 5	< 10	< 4	< 6	< 25	< 6
	05/29/12 - 07/03/12		< 4	< 4	< 9	< 4	< 8	< 4	< 8	< 4	< 4	< 17	< 7
	07/03/12 - 07/31/12		< 5	< 6	< 10	< 6	< 12	< 6	< 9	< 5	< 6	< 25	< 11
	07/31/12 - 08/28/12		< 6	< 6	< 11	< 6	< 10	< 7	< 9	< 6	< 6	< 30	< 13
	08/28/12 - 10/02/12		< 4	< 4	< 9	< 3	< 7	< 4	< 7	< 3	< 4	< 29	< 9
	10/02/12 - 10/30/12		< 5	< 5	< 12	< 4	< 11	< 4	< 9	< 4	< 5	< 21	< 9
	10/30/12 - 11/27/12		< 6	< 6	< 13	< 5	< 12	< 6	< 11	< 6	< 6	< 30	< 11
	11/27/12 - 12/31/12		< 5	< 6	< 15	< 5	< 12	< 6	< 9	< 5	< 6	< 29	< 13
	MEAN		-	-	-	-	-	-	-	-	-	-	-

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

TABLE C-II.1 **CONCENTRATIONS OF GROSS BETA IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	G15-2	G15-3	Q9-1
01/03/12 - 01/31/12	2.7 ± 1.0	< 1.4	< 1.4
01/31/12 - 02/28/12	3.0 ± 1.4	3.0 ± 1.3	< 1.9
02/28/12 - 04/03/12	3.3 ± 2.0	< 2.8	< 2.6
04/03/12 - 05/01/12	1.9 ± 1.2	< 1.8	< 1.7
05/01/12 - 05/29/12	2.9 ± 1.9	< 2.7	< 2.6
05/29/12 - 07/03/12	2.3 ± 1.0	< 1.5	2.0 ± 1.0
07/03/12 - 07/31/12	2.2 ± 1.0	2.5 ± 1.1	1.7 ± 1.0
07/31/12 - 08/28/12	2.8 ± 1.2	2.4 ± 1.2	1.8 ± 1.1
08/28/12 - 10/02/12	3.4 ± 1.1	3.1 ± 1.2	3.0 ± 1.1
10/02/12 - 10/30/12	3.2 ± 1.1	2.5 ± 1.1	1.8 ± 1.0
10/30/12 - 11/27/12	4.2 ± 1.2	2.5 ± 1.1	2.5 ± 1.0
11/27/12 - 12/31/12	3.1 ± 1.4	< 2.0	< 2.0
MEAN*	2.9 ± 1.2	2.6 ± 0.6	2.1 ± 1.0

TABLE C-II.2 **CONCENTRATIONS OF I-131 IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	G15-2	G15-3	Q9-1
01/03/12 - 01/31/12	< 1.0	< 0.5	< 0.6
01/31/12 - 02/28/12	< 0.3	< 0.3	< 0.3
02/28/12 - 04/03/12	< 0.5	< 0.4	< 0.4
04/03/12 - 05/01/12	< 0.4	< 0.3	< 0.3
05/01/12 - 05/29/12	< 0.4	< 0.3	< 0.4
05/29/12 - 07/03/12	< 0.8	< 0.9	< 0.9
07/03/12 - 07/31/12	< 0.6	< 0.5	< 0.6
07/31/12 - 08/28/12	< 0.6	< 0.7	< 0.6
08/28/12 - 10/02/12	< 0.6	< 0.5	< 0.6
10/02/12 - 10/30/12	< 0.7	< 0.7	< 0.7
10/30/12 - 11/27/12	< 0.6	< 0.6	< 0.6
11/27/12 - 12/31/12	< 0.6	< 0.7	< 0.7
MEAN	-	-	-

TABLE C-II.3 **CONCENTRATIONS OF TRITIUM IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	G15-2	G15-3	Q9-1
01/03/12 - 01/31/12	< 166	< 166	< 167
01/31/12 - 02/28/12	< 174	< 175	< 173
02/28/12 - 04/03/12	< 189	< 184	< 182
04/03/12 - 05/01/12	< 179	< 164	< 166
05/01/12 - 05/29/12	< 169	< 157	< 199
05/29/12 - 07/03/12	< 186	< 181	< 182
07/03/12 - 07/31/12	< 167	< 165	< 172
07/31/12 - 08/28/12	< 162	< 163	< 163
08/28/12 - 10/02/12	< 192	< 194	< 193
10/02/12 - 10/30/12	< 184	< 173	< 182
10/30/12 - 11/27/12	< 164	254 ± 139	< 165
11/27/12 - 12/31/12	< 186	< 176	< 187
MEAN*	-	-	

* THE MEAN AND TWO STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES

TABLE C-II.4 **CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES COLLECTED COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
G15-2	01/03/12 - 01/31/12	< 4	< 3	< 5	< 2	< 6	< 4	< 5	< 3	< 3	< 14	< 5
	01/31/12 - 02/28/12	< 8	< 8	< 17	< 7	< 16	< 7	< 15	< 8	< 8	< 31	< 11
	02/28/12 - 04/03/12	< 4	< 4	< 9	< 5	< 9	< 5	< 8	< 4	< 5	< 21	< 7
	04/03/12 - 05/01/12	< 6	< 6	< 11	< 6	< 11	< 6	< 9	< 6	< 5	< 27	< 8
	05/01/12 - 05/29/12	< 4	< 5	< 8	< 4	< 10	< 5	< 7	< 4	< 4	< 19	< 7
	05/29/12 - 07/03/12	< 3	< 3	< 6	< 3	< 6	< 3	< 5	< 3	< 3	< 14	< 4
	07/03/12 - 07/31/12	< 6	< 5	< 9	< 6	< 9	< 6	< 9	< 6	< 5	< 24	< 11
	07/31/12 - 08/28/12	< 5	< 4	< 7	< 5	< 7	< 5	< 8	< 4	< 5	< 24	< 9
	08/28/12 - 10/02/12	< 4	< 3	< 9	< 3	< 7	< 5	< 7	< 4	< 4	< 26	< 9
	10/02/12 - 10/30/12	< 5	< 5	< 10	< 5	< 9	< 5	< 10	< 5	< 5	< 25	< 6
	10/30/12 - 11/27/12	< 8	< 6	< 12	< 6	< 16	< 8	< 14	< 8	< 7	< 37	< 13
	11/27/12 - 12/31/12	< 5	< 5	< 13	< 6	< 11	< 6	< 11	< 4	< 5	< 34	< 13
	MEAN	-	-	-	-	-	-	-	-	-	-	-
G15-3	01/03/12 - 01/31/12	< 6	< 4	< 9	< 5	< 9	< 5	< 8	< 4	< 5	< 21	< 8
	01/31/12 - 02/28/12	< 6	< 6	< 14	< 7	< 10	< 6	< 11	< 6	< 7	< 23	< 8
	02/28/12 - 04/03/12	< 5	< 6	< 13	< 5	< 11	< 5	< 10	< 5	< 6	< 27	< 8
	04/03/12 - 05/01/12	< 7	< 7	< 14	< 7	< 15	< 8	< 12	< 8	< 8	< 37	< 13
	05/01/12 - 05/29/12	< 5	< 6	< 16	< 7	< 14	< 6	< 11	< 6	< 8	< 35	< 9
	05/29/12 - 07/03/12	< 4	< 5	< 10	< 5	< 9	< 5	< 8	< 4	< 5	< 22	< 6
	07/03/12 - 07/31/12	< 5	< 5	< 11	< 6	< 13	< 8	< 10	< 5	< 7	< 33	< 11
	07/31/12 - 08/28/12	< 6	< 5	< 12	< 8	< 10	< 8	< 10	< 6	< 7	< 32	< 9
	08/28/12 - 10/02/12	< 4	< 4	< 9	< 3	< 7	< 4	< 7	< 3	< 4	< 26	< 8
	10/02/12 - 10/30/12	< 4	< 4	< 9	< 4	< 10	< 5	< 7	< 4	< 5	< 22	< 7
	10/30/12 - 11/27/12	< 6	< 6	< 14	< 7	< 14	< 7	< 13	< 5	< 7	< 26	< 11
	11/27/12 - 12/31/12	< 6	< 6	< 13	< 5	< 9	< 7	< 12	< 5	< 7	< 28	< 9
	MEAN	-	-	-	-	-	-	-	-	-	-	-

TABLE C-II.4 **CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES COLLECTED COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
Q9-1	01/03/12 - 01/31/12	< 4	< 4	< 8	< 4	< 8	< 4	< 8	< 3	< 4	< 18	< 6
	01/31/12 - 02/28/12	< 5	< 6	< 11	< 6	< 12	< 6	< 13	< 7	< 6	< 31	< 9
	02/28/12 - 04/03/12	< 4	< 4	< 7	< 4	< 8	< 4	< 7	< 4	< 5	< 21	< 7
	04/03/12 - 05/01/12	< 7	< 9	< 16	< 8	< 19	< 9	< 15	< 9	< 8	< 43	< 14
	05/01/12 - 05/29/12	< 8	< 8	< 14	< 10	< 14	< 8	< 14	< 8	< 8	< 39	< 11
	05/29/12 - 07/03/12	< 5	< 4	< 8	< 4	< 9	< 4	< 7	< 4	< 4	< 20	< 7
	07/03/12 - 07/31/12	< 5	< 5	< 9	< 5	< 9	< 4	< 8	< 4	< 4	< 19	< 6
	07/31/12 - 08/28/12	< 5	< 4	< 11	< 4	< 10	< 6	< 8	< 4	< 5	< 25	< 9
	08/28/12 - 10/02/12	< 4	< 5	< 11	< 5	< 11	< 5	< 8	< 4	< 4	< 27	< 9
	10/02/12 - 10/30/12	< 4	< 5	< 10	< 4	< 10	< 4	< 7	< 4	< 4	< 20	< 7
	10/30/12 - 11/27/12	< 6	< 6	< 11	< 6	< 15	< 6	< 13	< 7	< 6	< 29	< 11
	11/27/12 - 12/31/12	< 5	< 5	< 11	< 6	< 9	< 5	< 12	< 4	< 5	< 30	< 10
	MEAN	-	-	-	-	-	-	-	-	-	-	-

TABLE C-III.1 **CONCENTRATIONS OF GROSS BETA, IODINE-131, TRITIUM, AND STRONTIUM IN EFFLUENT WATER SAMPLES FOR STATION K1-1 COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	GR-B	I-131	H-3	SR-89	SR-90
K1-1	01/03/12 - 01/31/12	2.8 ± 1.1	< 0.6	475 ± 127		
	01/03/12 - 07/03/12				< 1.9	< 1.0
	01/31/12 - 02/28/12	3.8 ± 1.4	< 0.3	< 172		
	02/28/12 - 04/03/12	4.2 ± 2.1	< 0.4	< 182		
	04/03/12 - 05/01/12	4.0 ± 1.5	< 0.3	< 182		
	05/01/12 - 05/29/12	4.3 ± 2.0	< 0.5	< 178		
	05/29/12 - 07/03/12	2.7 ± 1.2	< 0.8	5530 ± 605		
	07/03/12 - 07/31/12	6.9 ± 1.5	< 0.6	1820 ± 234		
	07/03/12 - 12/31/12				< 3.4	< 0.7
	07/31/12 - 08/28/12	4.5 ± 1.4	< 0.8	2110 ± 253		
	08/28/12 - 10/02/12	5.4 ± 1.4	< 0.6	4690 ± 526		
	10/02/12 - 10/30/12	6.9 ± 1.4	< 0.6	31200 ± 3150		
	10/30/12 - 11/27/12	5.0 ± 1.3	< 0.8	63300 ± 6340		
	11/27/12 - 12/31/12	6.4 ± 1.7	< 0.6	< 184		
	MEAN*	4.7 ± 2.9	-	15589 ± 47186	-	-

* THE MEAN AND TWO STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES

TABLE C-III.2 **CONCENTRATIONS OF GAMMA EMITTERS IN EFFLUENT WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
K1-1	01/03/12 - 01/31/12	< 4	< 4	< 6	< 4	< 8	< 4	< 7	< 3	< 4	< 16	< 6
	01/31/12 - 02/28/12	< 6	< 4	< 13	< 5	< 11	< 5	< 10	< 4	< 7	< 30	< 7
	02/28/12 - 04/03/12	< 3	< 2	< 7	< 3	< 7	< 3	< 4	< 2	< 3	< 16	< 5
	04/03/12 - 05/01/12	< 7	< 7	< 12	< 6	< 18	< 7	< 12	< 9	< 7	< 30	< 10
	05/01/12 - 05/29/12	< 4	< 4	< 15	< 4	< 11	< 6	< 10	< 5	< 5	< 22	< 9
	05/29/12 - 07/03/12	< 4	< 4	< 8	< 4	< 7	< 4	< 7	< 4	< 5	< 20	< 6
	07/03/12 - 07/31/12	< 5	< 4	< 9	< 4	< 8	< 6	< 8	< 5	< 6	< 26	< 9
	07/31/12 - 08/28/12	< 6	< 6	< 14	< 7	< 11	< 6	< 12	< 6	< 6	< 33	< 12
	08/28/12 - 10/02/12	< 3	< 4	< 7	< 3	< 7	< 3	< 6	< 3	< 3	< 24	< 7
	10/02/12 - 10/30/12	< 5	< 5	< 11	< 6	< 9	< 5	< 9	< 5	< 6	< 23	< 9
	10/30/12 - 11/27/12	< 8	< 8	< 13	< 7	< 13	< 6	< 11	< 6	< 7	< 35	< 11
	11/27/12 - 12/31/12	< 5	< 6	< 10	< 5	< 13	< 7	< 13	< 5	< 6	< 26	< 8
	MEAN	-	-	-	-	-	-	-	-	-	-	-

TABLE C-IV.1 CONCENTRATIONS OF STRONTIUM IN PREDATOR AND BOTTOM FEEDER (FISH) SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD	Sr-90
INDP	PREDATOR	
	06/04/12	< 4.1
	09/25/12	< 3.9
	MEAN	-
INDB	BOTTOM FEEDER	
	06/04/12	< 3.5
	10/04/12	< 3.3
	MEAN	-
BKGP	PREDATOR	
	06/14/12	< 3.1
	10/11/12	< 2.5
	MEAN	-
BKGB	BOTTOM FEEDER	
	06/14/12	< 3.5
	10/11/12	< 3.0
	MEAN	-

TABLE C-IV.2 **CONCENTRATIONS OF GAMMA EMITTERS IN PREDATOR AND BOTTOM FEEDER (FISH) SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012**

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137
BKGB	BOTTOM FEEDER								
	06/14/12	4311 ± 1166	< 72	< 84	< 156	< 81	< 122	< 62	< 75
	10/11/12	3964 ± 773	< 59	< 58	< 103	< 57	< 119	< 55	< 61
	MEAN	4138 ± 491	-	-	-	-	-	-	-
BKGP	PREDATOR								
	06/14/12	3459 ± 863	< 46	< 58	< 155	< 58	< 110	< 43	< 57
	10/11/12	4637 ± 920	< 41	< 44	< 109	< 47	< 87	< 47	< 44
	MEAN	4048 ± 1666	-	-	-	-	-	-	-
INDB	BOTTOM FEEDER								
	06/04/12	3192 ± 847	< 50	< 59	< 121	< 73	< 105	< 57	< 47
	10/04/12	2756 ± 854	< 43	< 53	< 122	< 45	< 116	< 48	< 50
	MEAN	2974 ± 617	-	-	-	-	-	-	-
INDP	PREDATOR								
	06/04/12	4480 ± 897	< 51	< 70	< 128	< 66	< 133	< 53	< 55
	09/25/12	3739 ± 821	< 44	< 48	< 92	< 57	< 81	< 47	< 53
	MEAN	4110 ± 1048	-	-	-	-	-	-	-

TABLE C-V.1 CONCENTRATIONS OF GAMMA EMITTERS IN SEDIMENT SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012

RESULTS IN UNITS OF PCI/KG DRY ± 2 SIGMA

SITE	COLLECTION PERIOD	K-40	Mn-54	Co-58	Co-60	Cs-134	Cs-137
A1-3	06/18/12	16000 ± 1275	< 59	< 54	< 58	< 48	< 66
	10/24/12	11090 ± 1396	< 74	< 56	< 85	< 57	< 81
	MEAN	13545 ± 6944	-	-	-	-	-
EDCB	10/24/12	17110 ± 1896	< 83	< 80	< 90	< 69	248 ± 117
	MEAN*	-	-	-	-	-	-
J2-1	06/18/12	19760 ± 1892	< 85	< 89	< 90	< 72	124 ± 71
	10/24/12	10700 ± 1393	< 69	< 57	< 68	< 54	< 70
	MEAN*	15230 ± 12813	-	-	-	-	-
K1-3	06/18/12	15000 ± 1502	< 79	< 86	< 83	< 70	229 ± 83
	10/24/12	8405 ± 1090	< 57	< 49	< 68	< 46	74 ± 38
	MEAN	11703 ± 9327	-	-	-	-	152 ± 220

* THE MEAN AND TWO STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES

TABLE C-VI.1 CONCENTRATIONS OF GROSS BETA IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION. 2012

RESULTS IN UNITS OF E-3 PCI/CU METER ± 2 SIGMA

COLLECTION PERIOD	GROUP I		GROUP II				GROUP III
	E1-2	F1-3	A3-1	G2-1	H3-1	M2-1	Q15-1
12/28/11 - 01/04/12	10 ± 5	17 ± 5	13 ± 5	14 ± 5	11 ± 5	20 ± 5	18 ± 5
01/04/12 - 01/11/12	16 ± 6	18 ± 6	23 ± 6	16 ± 6	17 ± 6	18 ± 6	18 ± 6
01/11/12 - 01/18/12	16 ± 5	14 ± 5	16 ± 5	16 ± 5	13 ± 5	15 ± 5	16 ± 5
01/18/12 - 01/25/12	22 ± 6	20 ± 6	15 ± 5	17 ± 5	19 ± 6	24 ± 6	19 ± 6
01/25/12 - 02/01/12	18 ± 5	18 ± 5	15 ± 5	17 ± 5	19 ± 5	16 ± 5	16 ± 5
02/01/12 - 02/08/12	15 ± 5	16 ± 5	18 ± 5	15 ± 5	17 ± 5	19 ± 5	15 ± 5
02/08/12 - 02/15/12	18 ± 5	22 ± 5	16 ± 5	17 ± 5	25 ± 5	22 ± 5	27 ± 6
02/15/12 - 02/22/12 (1)	15 ± 6	16 ± 5	15 ± 5	15 ± 5	21 ± 5	20 ± 5	22 ± 5
02/22/12 - 02/29/12	13 ± 5	17 ± 6	21 ± 6	14 ± 5	25 ± 6	18 ± 6	19 ± 6
02/29/12 - 03/07/12	10 ± 5	11 ± 5	13 ± 5	10 ± 5	14 ± 5	13 ± 5	12 ± 5
03/07/12 - 03/14/12	15 ± 5	19 ± 5	15 ± 5	19 ± 5	18 ± 5	15 ± 5	17 ± 5
03/14/12 - 03/21/12	21 ± 5	13 ± 5	20 ± 5	21 ± 5	17 ± 5	20 ± 5	21 ± 5
03/21/12 - 03/28/12	16 ± 5	15 ± 5	16 ± 5	13 ± 5	12 ± 5	16 ± 5	19 ± 5
03/28/12 - 04/04/12	< 7	9 ± 5	12 ± 5	< 7	12 ± 5	10 ± 5	9 ± 5
04/04/12 - 04/11/12	15 ± 5	18 ± 5	17 ± 5	10 ± 4	14 ± 5	15 ± 5	14 ± 5
04/11/12 - 04/18/12	15 ± 5	19 ± 5	17 ± 5	16 ± 5	16 ± 5	19 ± 5	19 ± 5
04/18/12 - 04/25/12	9 ± 5	16 ± 5	15 ± 5	12 ± 5	14 ± 5	17 ± 5	19 ± 5
04/25/12 - 05/02/12	18 ± 5	24 ± 6	25 ± 6	22 ± 5	24 ± 6	22 ± 6	25 ± 6
05/02/12 - 05/09/12	11 ± 5	11 ± 5	9 ± 5	< 6	10 ± 5	8 ± 4	< 6
05/09/12 - 05/16/12	< 7	10 ± 5	12 ± 5	9 ± 5	14 ± 5	12 ± 5	12 ± 5
05/16/12 - 05/22/12	17 ± 6	11 ± 5	10 ± 5	10 ± 5	11 ± 5	14 ± 5	15 ± 6
05/22/12 - 05/30/12	< 6	15 ± 5	17 ± 5	13 ± 4	15 ± 5	10 ± 4	15 ± 5
05/30/12 - 06/06/12	6 ± 4	12 ± 5	10 ± 5	13 ± 5	15 ± 5	13 ± 5	12 ± 5
06/06/12 - 06/13/12	13 ± 5	16 ± 5	19 ± 5	19 ± 5	14 ± 5	17 ± 5	17 ± 5
06/13/12 - 06/20/12	9 ± 4	(1)	10 ± 5	14 ± 5	12 ± 5	10 ± 4	15 ± 5
06/20/12 - 06/27/12	13 ± 5	19 ± 7	22 ± 5	19 ± 5	24 ± 6	15 ± 5	25 ± 5
06/27/12 - 07/04/12	19 ± 6	23 ± 6	25 ± 6	23 ± 6	23 ± 6	27 ± 6	28 ± 6
07/04/12 - 07/11/12	18 ± 5	16 ± 5	17 ± 5	22 ± 6	17 ± 5	13 ± 5	17 ± 5
07/11/12 - 07/18/12	11 ± 5	18 ± 5	14 ± 5	19 ± 5	19 ± 6	20 ± 5	21 ± 5
07/18/12 - 07/25/12 (1)	13 ± 5	12 ± 5	14 ± 5	14 ± 5	15 ± 5	16 ± 5	13 ± 5
07/25/12 - 08/01/12	9 ± 5	13 ± 5	11 ± 5	13 ± 6	14 ± 6	17 ± 6	15 ± 6
08/01/12 - 08/08/12 (1)	28 ± 6	26 ± 6	23 ± 6	23 ± 6	29 ± 6	24 ± 6	24 ± 6
08/08/12 - 08/15/12	20 ± 6	15 ± 5	14 ± 5	18 ± 5	19 ± 6	20 ± 6	16 ± 5
08/15/12 - 08/22/12	20 ± 6	26 ± 6	26 ± 6	29 ± 6	23 ± 6	21 ± 6	24 ± 6
08/22/12 - 08/29/12	26 ± 6	27 ± 6	25 ± 6	24 ± 6	21 ± 6	24 ± 6	19 ± 5
08/29/12 - 09/05/12	28 ± 6	33 ± 6	29 ± 6	32 ± 6	26 ± 6	30 ± 6	31 ± 6
09/05/12 - 09/12/12	19 ± 5	12 ± 5	13 ± 5	16 ± 5	14 ± 5	14 ± 5	17 ± 5
09/12/12 - 09/19/12	23 ± 5	20 ± 5	18 ± 5	16 ± 5	20 ± 5	19 ± 5	17 ± 5
09/19/12 - 09/26/12 (1)	18 ± 6	12 ± 5	14 ± 6	17 ± 6	18 ± 6	18 ± 6	16 ± 5
09/26/12 - 10/03/12	17 ± 6	21 ± 6	18 ± 6	18 ± 6	23 ± 6	23 ± 6	26 ± 6
10/03/12 - 10/10/12	24 ± 6	23 ± 6	23 ± 6	20 ± 6	21 ± 6	22 ± 6	20 ± 6
10/10/12 - 10/17/12	12 ± 5	11 ± 5	9 ± 5	13 ± 5	15 ± 5	14 ± 5	16 ± 5
10/17/12 - 10/24/12	21 ± 5	28 ± 5	24 ± 5	28 ± 5	26 ± 5	23 ± 5	28 ± 5
10/24/12 - 10/31/12	20 ± 5	23 ± 5	20 ± 5	20 ± 5	18 ± 5	21 ± 5	20 ± 5
10/31/12 - 11/07/12	6 ± 3	7 ± 2	8 ± 3	7 ± 2	8 ± 3	9 ± 3	9 ± 3
11/07/12 - 11/14/12	22 ± 5	29 ± 6	24 ± 5	26 ± 5	22 ± 5	25 ± 5	29 ± 6
11/14/12 - 11/20/12	27 ± 7	23 ± 6	26 ± 6	28 ± 6	23 ± 6	26 ± 6	28 ± 6
11/20/12 - 11/28/12	21 ± 5	21 ± 5	27 ± 6	20 ± 6	26 ± 6	26 ± 6	24 ± 5
11/28/12 - 12/06/12	23 ± 5	25 ± 5	25 ± 5	27 ± 5	30 ± 6	26 ± 5	31 ± 6
12/06/12 - 12/12/12	18 ± 6	17 ± 6	18 ± 6	14 ± 5	15 ± 6	16 ± 6	17 ± 6
12/12/12 - 12/19/12	27 ± 6	27 ± 6	22 ± 6	17 ± 5	29 ± 6	27 ± 6	23 ± 6
12/19/12 - 12/27/12	14 ± 5	19 ± 5	17 ± 5	17 ± 5	15 ± 5	13 ± 4	16 ± 5
12/27/12 - 01/02/13	17 ± 6	16 ± 6	16 ± 6	19 ± 6	18 ± 6	32 ± 7	19 ± 6
MEAN*	17 ± 11	18 ± 12	18 ± 11	18 ± 11	18 ± 11	18 ± 11	19 ± 11

* THE MEAN AND TWO STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES
(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

TABLE C-VI.2 **MONTHLY AND YEARLY MEAN VALUES OF GROSS BETA CONCENTRATIONS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012**

RESULTS IN UNITS OF E-3 PCI/CU METER ± 2 SIGMA

GROUP I - CLOSEST TO THE SITE BOUNDARY				GROUP II - INTERMEDIATE OFFSITE				GROUP III - CONTROL LOCATIONS			
COLLECTION PERIOD	MIN	MAX	MEAN ± 2SD	COLLECTION PERIOD	MIN	MAX	MEAN ± 2SD	COLLECTION PERIOD	MIN	MAX	MEAN ± 2SD
12/28/11 - 02/01/12	10	22	17 ± 7	12/28/11 - 02/01/12	11	24	17 ± 6	12/28/11 - 02/01/12	16	19	18 ± 3
02/01/12 - 02/29/12	13	22	16 ± 5	02/01/12 - 02/29/12	14	25	19 ± 7	02/01/12 - 02/29/12	15	27	21 ± 10
02/29/12 - 03/28/12	10	21	15 ± 7	02/29/12 - 03/28/12	10	21	16 ± 6	02/29/12 - 03/28/12	12	21	17 ± 8
03/28/12 - 05/02/12	9	24	16 ± 10	03/28/12 - 05/02/12	10	25	16 ± 9	03/28/12 - 05/02/12	9	25	17 ± 12
05/02/12 - 05/30/12	10	17	13 ± 6	05/02/12 - 05/30/12	8	17	12 ± 5	05/09/12 - 05/30/12	12	15	14 ± 3
05/30/12 - 06/27/12	6	19	13 ± 8	05/30/12 - 06/27/12	10	24	15 ± 9	05/30/12 - 06/27/12	12	25	17 ± 11
06/27/12 - 08/01/12	9	23	15 ± 8	06/27/12 - 08/01/12	11	27	18 ± 9	06/27/12 - 08/01/12	13	28	19 ± 12
08/01/12 - 08/29/12	15	28	24 ± 9	08/01/12 - 08/29/12	14	29	22 ± 8	08/01/12 - 08/29/12	16	24	21 ± 8
08/29/12 - 10/03/12	12	33	20 ± 13	08/29/12 - 10/03/12	13	32	20 ± 11	08/29/12 - 10/03/12	16	31	21 ± 14
10/03/12 - 10/31/12	11	28	20 ± 12	10/03/12 - 10/31/12	9	28	20 ± 10	10/03/12 - 10/31/12	16	28	21 ± 10
10/31/12 - 11/20/12	6	29	19 ± 20	10/31/12 - 11/20/12	7	28	20 ± 17	10/31/12 - 11/20/12	9	29	22 ± 23
11/20/12 - 01/02/13	14	27	20 ± 9	11/20/12 - 01/02/13	13	32	21 ± 12	11/20/12 - 01/02/13	16	31	22 ± 11
12/28/11 - 01/02/13	6	33	18 ± 11	12/28/11 - 01/02/13	7	32	18 ± 11	12/28/11 - 01/02/13	9	31	19 ± 11

* THE MEAN AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES

TABLE C-VI.3 **CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012**

RESULTS IN UNITS OF E-3 PCI/CU METER ± 2 SIGMA

SITE	COLLECTION PERIOD	Be-7	Mn-54	Co-58	Co-60	Nb-95	Zr-95	Cs-134	Cs-137
A3-1	12/28/11 - 03/28/12	93 ± 28	< 3	< 3	< 3	< 3	< 6	< 3	< 2
	03/28/12 - 06/27/12	88 ± 25	< 2	< 3	< 2	< 3	< 5	< 3	< 2
	10/03/12 - 01/02/13	58 ± 21	< 3	< 2	< 2	< 3	< 5	< 2	< 3
	06/27/12 - 10/03/12	< 91	< 4	< 8	< 3	< 9	< 12	< 4	< 4
	MEAN*	80 ± 38	-	-	-	-	-	-	-
E1-2	12/28/11 - 03/28/12	70 ± 31	< 3	< 3	< 3	< 3	< 7	< 2	< 3
	03/28/12 - 06/27/12	63 ± 37	< 3	< 4	< 4	< 5	< 7	< 3	< 3
	10/03/12 - 01/02/13	52 ± 20	< 3	< 3	< 3	< 5	< 7	< 3	< 3
	06/27/12 - 10/03/12	81 ± 39	< 3	< 6	< 3	< 9	< 15	< 4	< 3
	MEAN	67 ± 24	-	-	-	-	-	-	-
F1-3	12/28/11 - 03/28/12	58 ± 28	< 3	< 3	< 3	< 3	< 4	< 3	< 2
	03/28/12 - 06/27/12	78 ± 24	< 3	< 4	< 3	< 4	< 7	< 3	< 3
	10/03/12 - 01/02/13	53 ± 21	< 2	< 3	< 3	< 3	< 6	< 3	< 2
	06/27/12 - 10/03/12	78 ± 57	< 2	< 5	< 4	< 6	< 12	< 3	< 3
	MEAN	67 ± 27	-	-	-	-	-	-	-
G2-1	12/28/11 - 03/28/12	52 ± 17	< 2	< 3	< 3	< 3	< 6	< 2	< 2
	03/28/12 - 06/27/12	63 ± 39	< 4	< 4	< 4	< 4	< 9	< 4	< 3
	10/03/12 - 01/02/13	52 ± 27	< 4	< 4	< 4	< 5	< 8	< 4	< 4
	06/27/12 - 10/03/12	134 ± 92	< 3	< 7	< 3	< 9	< 14	< 3	< 2
	MEAN	75 ± 79	-	-	-	-	-	-	-
H3-1	12/28/11 - 03/28/12	54 ± 26	< 4	< 3	< 2	< 4	< 7	< 3	< 2
	03/28/12 - 06/27/12	96 ± 35	< 3	< 5	< 4	< 5	< 8	< 3	< 3
	10/03/12 - 01/02/13	71 ± 35	< 3	< 3	< 2	< 2	< 3	< 2	< 2
	06/27/12 - 10/03/12	< 77	< 3	< 6	< 4	< 7	< 14	< 3	< 2
	MEAN*	74 ± 42	-	-	-	-	-	-	-
M2-1	12/28/11 - 03/28/12	69 ± 36	< 4	< 4	< 3	< 4	< 9	< 4	< 4
	03/28/12 - 06/27/12	81 ± 32	< 3	< 5	< 3	< 4	< 6	< 3	< 3
	10/03/12 - 01/02/13	63 ± 26	< 3	< 3	< 3	< 4	< 7	< 3	< 3
	06/27/12 - 10/03/12	< 93	< 4	< 9	< 4	< 10	< 16	< 5	< 4
	MEAN*	71 ± 18	-	-	-	-	-	-	-
Q15-1	12/28/11 - 03/28/12	97 ± 35	< 3	< 4	< 4	< 4	< 8	< 3	< 3
	03/28/12 - 06/27/12	72 ± 28	< 4	< 4	< 5	< 5	< 10	< 4	< 4
	10/03/12 - 01/02/13	54 ± 27	< 3	< 4	< 3	< 4	< 6	< 3	< 3
	06/27/12 - 10/03/12	72 ± 33	< 3	< 6	< 3	< 7	< 9	< 3	< 2
	MEAN	74 ± 35	-	-	-	-	-	-	-

* THE MEAN AND TWO STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES

TABLE C-VII.1 CONCENTRATIONS OF I-131 IN AIR IODINE SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012

RESULTS IN UNITS OF E-3 PCI/CU METER ± 2 SIGMA

COLLECTION PERIOD		GROUP I		GROUP II				GROUP III
		E1-2	F1-3	A3-1	G2-1	H3-1	M2-1	Q15-1
12/28/11 - 01/04/12		< 56	< 57	< 60	< 55	< 57	< 58	< 61
01/04/12 - 01/11/12		< 29	< 30	< 31	< 18	< 30	< 30	< 31
01/11/12 - 01/18/12		< 31	< 31	< 41	< 30	< 31	< 40	< 42
01/18/12 - 01/25/12		< 46	< 47	< 62	< 45	< 26	< 60	< 62
01/25/12 - 02/01/12		< 35	< 36	< 26	< 35	< 36	< 25	< 26
02/01/12 - 02/08/12		< 39	< 40	< 25	< 38	< 25	< 15	< 25
02/08/12 - 02/15/12		< 55	< 56	< 52	< 53	< 56	< 49	< 52
02/15/12 - 02/22/12	(1)	< 48	< 35	< 49	< 34	< 49	< 47	< 19
02/22/12 - 02/29/12		< 37	< 38	< 35	< 37	< 38	< 33	< 35
02/29/12 - 03/07/12		< 48	< 49	< 24	< 47	< 62	< 60	< 63
03/07/12 - 03/14/12		< 38	< 38	< 34	< 36	< 38	< 33	< 34
03/14/12 - 03/21/12		< 32	< 32	< 41	< 31	< 32	< 40	< 42
03/21/12 - 03/28/12		< 49	< 50	< 46	< 48	< 49	< 44	< 46
03/28/12 - 04/04/12		< 12	< 32	< 45	< 31	< 32	< 43	< 45
04/04/12 - 04/11/12		< 29	< 30	< 21	< 28	< 30	< 20	< 21
04/11/12 - 04/18/12		< 56	< 57	< 40	< 21	< 57	< 38	< 40
04/18/12 - 04/25/12		< 54	< 56	< 47	< 53	< 55	< 45	< 47
04/25/12 - 05/02/12		< 43	< 44	< 38	< 42	< 17	< 37	< 39
05/02/12 - 05/09/12		< 47	< 48	< 43	< 46	< 47	< 41	< 42
05/09/12 - 05/16/12		< 60	< 61	< 43	< 58	< 41	< 22	< 42
05/16/12 - 05/22/12		< 61	< 62	< 52	< 59	< 62	< 49	< 51
05/22/12 - 05/30/12		< 61	< 62	< 64	< 60	< 66	< 61	< 27
05/30/12 - 06/06/12		< 53	< 55	< 54	< 52	< 54	< 52	< 54
06/06/12 - 06/13/12		< 37	< 37	< 20	< 36	< 51	< 48	< 51
06/13/12 - 06/20/12		< 57	(1)	< 49	< 56	< 58	< 47	< 49
06/20/12 - 06/27/12		< 31	< 60	< 66	< 59	< 61	< 66	< 65
06/27/12 - 07/04/12		< 38	< 37	< 43	< 38	< 39	< 44	< 43
07/04/12 - 07/11/12		< 67	< 65	< 68	< 29	< 68	< 68	< 67
07/11/12 - 07/18/12		< 40	< 39	< 33	< 39	< 40	< 34	< 33
07/18/12 - 07/25/12	(1)	< 48	< 47	< 47	< 48	< 20	< 47	< 45
07/25/12 - 08/01/12		< 51	< 49	< 55	< 54	< 51	< 58	< 55
08/01/12 - 08/08/12	(1)	< 36	< 35	< 38	< 37	< 40	< 40	< 16
08/08/12 - 08/15/12		< 47	< 45	< 29	< 46	< 47	< 29	< 29
08/15/12 - 08/22/12		< 34	< 33	< 21	< 33	< 56	< 54	< 53
08/22/12 - 08/29/12		< 39	< 38	< 24	< 38	< 39	< 25	< 24
08/29/12 - 09/05/12		< 44	< 17	< 30	< 43	< 45	< 30	< 30
09/05/12 - 09/12/12		< 29	< 28	< 24	< 28	< 29	< 23	< 23
09/12/12 - 09/19/12		< 22	< 37	< 58	< 37	< 38	< 58	< 57
09/19/12 - 09/26/12	(1)	< 57	< 56	< 45	< 56	< 58	< 44	< 42
09/26/12 - 10/03/12		< 35	< 34	< 30	< 18	< 35	< 30	< 30
10/03/12 - 10/10/12		< 60	< 59	< 64	< 59	< 61	< 65	< 63
10/10/12 - 10/17/12		< 37	< 36	< 27	< 37	< 16	< 26	< 26
10/17/12 - 10/24/12		< 11	< 10	< 15	< 10	< 11	< 15	< 15
10/24/12 - 10/31/12		< 38	< 37	< 36	< 38	< 37	< 13	< 36
10/31/12 - 11/07/12		< 29	< 28	< 25	< 29	< 29	< 25	< 25
11/07/12 - 11/14/12		< 29	< 28	< 34	< 28	< 35	< 34	< 14
11/14/12 - 11/20/12		< 65	< 64	< 69	< 64	< 65	< 66	< 68
11/20/12 - 11/28/12		< 46	< 45	< 8	< 50	< 46	< 22	< 21
11/28/12 - 12/06/12		< 33	< 32	< 36	< 32	< 33	< 36	< 36
12/06/12 - 12/12/12		< 61	< 23	< 65	< 60	< 62	< 65	< 64
12/12/12 - 12/19/12		< 13	< 37	< 27	< 37	< 38	< 27	< 27
12/19/12 - 12/27/12		< 47	< 44	< 53	< 45	< 46	< 53	< 52
12/27/12 - 01/02/13		< 66	< 65	< 60	< 65	< 66	< 60	< 59
MEAN		-	-	-	-	-	-	-

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

TABLE C-VIII.1 **CONCENTRATIONS OF I-131 IN MILK SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

	CONTROL FARM	INDICATOR FARM			
COLLECTION PERIOD	K15-3	E2-2	F4-1	G2-1	P4-1
01/04/12	< 0.6	< 0.6	< 0.5	< 0.6	< 0.7
02/01/12	< 0.6	< 0.5	< 0.5	< 0.5	< 0.5
03/07/12	< 0.4	< 0.5	< 0.3	< 0.4	< 0.3
03/21/12	< 0.4	< 0.5	< 0.3	< 0.5	< 0.5
04/04/12	< 0.4	< 0.3	< 0.4	< 0.3	< 0.4
04/18/12	< 0.4	< 0.3	< 0.3	< 0.4	< 0.4
05/02/12	< 0.5	< 0.5	< 0.3	< 0.5	< 0.5
05/16/12	< 0.5	< 0.5	< 0.4	< 0.5	< 0.4
05/30/12	< 0.5	< 0.6	< 0.5	< 0.6	< 0.6
06/13/12	< 0.6	< 0.7	< 0.6	< 0.7	< 0.6
06/27/12	< 0.7	< 0.8	< 0.7	< 0.7	< 0.7
07/11/12	< 0.6	< 0.5	< 0.5	< 0.5	< 0.5
07/25/12	< 0.7	< 0.6	< 0.6	< 0.7	< 0.7
08/08/12	< 0.5	< 0.6	< 0.5	< 0.6	< 0.5
08/22/12	< 0.7	< 0.7	< 0.6	< 0.7	< 0.7
09/05/12	< 0.6	< 0.5	< 0.6	< 0.6	< 0.6
09/19/12	< 0.6	< 0.6	< 0.6	< 0.6	< 0.7
10/03/12	< 0.8	< 0.7	< 0.8	< 0.7	< 0.7
10/17/12	< 0.7	< 0.8	< 0.7	< 0.8	< 0.7
10/31/12	< 0.9	< 0.8	< 0.8	< 0.9	< 0.7
11/14/12	< 0.7	< 0.9	< 0.7	< 0.8	< 0.8
11/28/12	< 0.7	< 0.7	< 0.8	< 0.8	< 0.8
12/12/12	< 0.7	< 0.8	< 0.7	< 0.7	< 0.6
MEAN	-	-	-	-	-

TABLE C-VIII.2 **CONCENTRATIONS OF STRONTIUM IN MILK SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION	CONTROL FARM		INDICATOR FARMS							
	K15-3		P4-1		E2-2		F4-1		G2-1	
PERIOD	SR-89	SR-90	SR-89	SR-90	SR-89	SR-90	SR-89	SR-90	SR-89	SR-90
01/04/12 - 03/21/12	< 3.1	< 0.6	< 2.6	< 0.6	< 3.1	< 0.6	< 3.0	< 1.0	< 2.6	< 0.6
04/04/12 - 06/27/12	< 1.7	< 0.7	< 1.8	< 0.6	< 1.8	< 0.6	< 1.4	< 0.4	< 1.7	< 0.4
07/11/12 - 09/19/12	< 1.6	1.1 ± 0.2	< 1.5	< 0.9	< 1.7	< 0.9	< 1.6	0.7 ± 0.2	< 1.3	< 0.8
10/03/12 - 12/12/12	< 2.6	< 0.8	< 3.9	< 0.8	< 2.5	< 0.8	< 2.3	< 0.8	< 2.4	< 0.7
MEAN	-	-	-	-	-	-	-	-	-	-

TABLE C-VIII.3 CONCENTRATIONS OF GAMMA EMITTERS IN MILK SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	K-40	Cs-134	Cs-137	Ba-140	La-140
E2-2	01/04/12	1376 ± 117	< 4	< 5	< 25	< 8
	02/01/12	1287 ± 121	< 5	< 5	< 20	< 7
	03/07/12	1353 ± 114	< 4	< 5	< 21	< 7
	03/21/12	1210 ± 123	< 5	< 6	< 25	< 7
	04/04/12	1329 ± 157	< 6	< 6	< 32	< 9
	04/18/12	1186 ± 152	< 6	< 7	< 38	< 10
	05/02/12	1354 ± 160	< 7	< 6	< 29	< 9
	05/16/12	1230 ± 151	< 6	< 7	< 30	< 8
	05/30/12	1218 ± 168	< 5	< 7	< 25	< 8
	06/13/12	1449 ± 146	< 5	< 6	< 27	< 7
	06/27/12	1206 ± 132	< 4	< 5	< 41	< 14
	07/11/12	1319 ± 199	< 6	< 6	< 32	< 13
	07/25/12	1353 ± 158	< 5	< 8	< 30	< 11
	08/08/12	1263 ± 142	< 5	< 6	< 29	< 8
	08/22/12	1332 ± 180	< 6	< 9	< 44	< 8
	09/05/12	1237 ± 111	< 4	< 5	< 20	< 5
	09/19/12	1218 ± 133	< 5	< 5	< 27	< 9
	10/03/12	1444 ± 183	< 6	< 6	< 33	< 14
	10/17/12	1356 ± 153	< 4	< 5	< 21	< 7
	10/31/12	1287 ± 171	< 7	< 7	< 39	< 8
	11/14/12	1369 ± 140	< 5	< 5	< 22	< 8
	11/28/12	1150 ± 184	< 6	< 7	< 40	< 8
	12/12/12	1212 ± 125	< 3	< 4	< 16	< 3
	MEAN	1293 ± 165	-	-	-	-
F4-1	01/04/12	1333 ± 130	< 6	< 6	< 29	< 7
	02/01/12	1302 ± 144	< 6	< 6	< 26	< 6
	03/07/12	1457 ± 136	< 5	< 6	< 28	< 7
	03/21/12	1375 ± 125	< 3	< 4	< 16	< 5
	04/04/12	1347 ± 154	< 4	< 5	< 20	< 7
	04/18/12	1498 ± 161	< 6	< 7	< 46	< 13
	05/02/12	1349 ± 134	< 5	< 6	< 28	< 7
	05/16/12	1401 ± 161	< 7	< 9	< 36	< 10
	05/30/12	1547 ± 218	< 6	< 7	< 40	< 9
	06/13/12	1389 ± 151	< 6	< 6	< 28	< 10
	06/27/12	1357 ± 130	< 5	< 6	< 56	< 12
	07/11/12	1451 ± 166	< 5	< 6	< 28	< 8
	07/25/12	1364 ± 192	< 5	< 5	< 23	< 9
	08/08/12	1379 ± 129	< 5	< 6	< 26	< 6
	08/22/12	1299 ± 164	< 8	< 10	< 40	< 8
	09/05/12	1345 ± 89	< 4	< 4	< 20	< 6
	09/19/12	1439 ± 146	< 4	< 5	< 21	< 8
	10/03/12	1450 ± 199	< 6	< 8	< 38	< 12
	10/17/12	1464 ± 127	< 4	< 5	< 22	< 7
	10/31/12	1435 ± 165	< 5	< 6	< 29	< 8
	11/14/12	1453 ± 174	< 6	< 7	< 28	< 6
	11/28/12	1403 ± 159	< 6	< 6	< 33	< 9
	12/12/12	1413 ± 159	< 6	< 6	< 28	< 8
	MEAN	1402 ± 125	-	-	-	-

TABLE C-VIII.3 CONCENTRATIONS OF GAMMA EMITTERS IN MILK SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	K-40	Cs-134	Cs-137	Ba-140	La-140
G2-1	01/04/12	1187 ± 152	< 6	< 6	< 33	< 8
	02/01/12	1193 ± 104	< 5	< 5	< 22	< 7
	03/07/12	983 ± 154	< 4	< 5	< 23	< 9
	03/21/12	1165 ± 124	< 5	< 6	< 25	< 7
	04/04/12	855 ± 144	< 7	< 8	< 38	< 13
	04/18/12	863 ± 101	< 3	< 3	< 21	< 6
	05/02/12	841 ± 116	< 6	< 6	< 28	< 9
	05/16/12	1318 ± 168	< 8	< 6	< 32	< 9
	05/30/12	1259 ± 144	< 7	< 6	< 27	< 8
	06/13/12	1342 ± 128	< 5	< 6	< 24	< 7
	06/27/12	841 ± 111	< 5	< 5	< 47	< 14
	07/11/12	699 ± 107	< 4	< 5	< 24	< 7
	07/25/12	1058 ± 127	< 5	< 7	< 27	< 9
	08/08/12	1267 ± 155	< 5	< 7	< 33	< 10
	08/22/12	623 ± 141	< 6	< 8	< 32	< 10
	09/05/12	986 ± 89	< 4	< 4	< 23	< 7
	09/19/12	841 ± 94	< 4	< 5	< 21	< 8
	10/03/12	967 ± 150	< 8	< 9	< 41	< 13
	10/17/12	1261 ± 127	< 5	< 6	< 25	< 7
	10/31/12	631 ± 144	< 7	< 7	< 32	< 11
	11/14/12	890 ± 136	< 5	< 6	< 28	< 11
	11/28/12	868 ± 113	< 7	< 6	< 39	< 11
	12/12/12	752 ± 141	< 6	< 6	< 30	< 9
	MEAN	987 ± 447	-	-	-	-
K15-3	01/04/12	1308 ± 134	< 5	< 7	< 31	< 10
	02/01/12	1296 ± 145	< 5	< 6	< 25	< 8
	03/07/12	1385 ± 143	< 5	< 6	< 26	< 8
	03/21/12	1324 ± 104	< 4	< 4	< 21	< 7
	04/04/12	1316 ± 140	< 6	< 6	< 31	< 9
	04/18/12	1438 ± 170	< 6	< 6	< 39	< 10
	05/02/12	1330 ± 131	< 10	< 9	< 33	< 8
	05/16/12	1597 ± 183	< 8	< 10	< 40	< 14
	05/30/12	1377 ± 159	< 6	< 6	< 27	< 6
	06/13/12	1355 ± 141	< 5	< 6	< 29	< 7
	06/27/12	1269 ± 153	< 3	< 4	< 38	< 14
	07/11/12	1447 ± 132	< 5	< 5	< 25	< 7
	07/25/12	1259 ± 138	< 5	< 5	< 28	< 5
	08/08/12	1241 ± 148	< 4	< 5	< 26	< 7
	08/22/12	1021 ± 173	< 6	< 7	< 30	< 6
	09/05/12	1239 ± 118	< 5	< 6	< 22	< 8
	09/19/12	1263 ± 105	< 4	< 5	< 24	< 6
	10/03/12	1186 ± 163	< 8	< 8	< 39	< 13
	10/17/12	1254 ± 138	< 7	< 8	< 38	< 12
	10/31/12	1255 ± 158	< 8	< 8	< 35	< 7
	11/14/12	1148 ± 118	< 4	< 5	< 23	< 6
	11/28/12	1304 ± 172	< 9	< 10	< 50	< 9
	12/12/12	1268 ± 125	< 5	< 6	< 26	< 8
	MEAN	1299 ± 224	-	-	-	-

TABLE C-VIII.3 CONCENTRATIONS OF GAMMA EMITTERS IN MILK SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	K-40	Cs-134	Cs-137	Ba-140	La-140
P4-1	01/04/12	1482 ± 150	< 5	< 6	< 26	< 8
	02/01/12	1443 ± 125	< 4	< 5	< 20	< 5
	03/07/12	1549 ± 155	< 5	< 6	< 34	< 11
	03/21/12	1654 ± 130	< 5	< 5	< 22	< 6
	04/04/12	1426 ± 152	< 5.5	< 7	< 28	< 6.7
	04/18/12	1414 ± 171	< 4.8	< 6	< 30	< 9.3
	05/02/12	1550 ± 165	< 8.9	< 9	< 41	< 13
	05/16/12	1516 ± 150	< 6	< 7	< 30	< 9
	05/30/12	1328 ± 144	< 5	< 6	< 24	< 3
	06/13/12	1298 ± 156	< 4	< 5	< 24	< 5
	06/27/12	1575 ± 119	< 4.6	< 5	< 35	< 14
	07/11/12	1379 ± 137	< 5	< 5	< 29	< 6
	07/25/12	1231 ± 162	< 8	< 8	< 34	< 11
	08/08/12	1574 ± 143	< 5	< 6	< 25	< 7
	08/22/12	1659 ± 205	< 7	< 9	< 31	< 10
	09/05/12	1567 ± 122	< 4	< 4	< 19	< 8
	09/19/12	1216 ± 149	< 6	< 6	< 31	< 10
	10/03/12	1254 ± 207	< 5	< 9	< 42	< 11
	10/17/12	1438 ± 115	< 5	< 5	< 24	< 6
	10/31/12	1119 ± 218	< 6	< 6	< 31	< 11
	11/14/12	1255 ± 102	< 4	< 4	< 19	< 4
	11/28/12	1313 ± 149	< 6	< 8	< 40	< 8
	12/12/12	1296 ± 148	< 5	< 7	< 28	< 8
	MEAN	1415 ± 302	-	-	-	-.

TABLE C-IX.1 CONCENTRATIONS OF STRONTIUM AND GAMMA EMITTERS IN FOOD PRODUCT SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

	COLLECTION PERIOD	TYPE	Sr-90	Be-7	K-40	I-131	Cs-134	Cs-137
B10-2	06/26/12	Broccoli Leaves	< 4	179 ± 63	5380 ± 169	< 31	< 7	< 7
	06/26/12	Green Cabbage	< 3	< 75	3273 ± 172	< 32	< 7	< 7
	06/26/12	Sunflower Leaves	< 2	598 ± 95	8952 ± 276	< 27	< 6	< 7
	07/17/12	Cabbage	< 2	< 48	2616 ± 132	< 12	< 5	< 5
	07/17/12	Red Beets		< 33	3215 ± 142	< 7	< 4	< 4
	07/31/12	Green Cabbage	< 4	284 ± 150	2966 ± 443	< 25	< 18	< 21
	07/31/12	Red Beet Leaves	7 ± 4	907 ± 253	7013 ± 683	< 46	< 28	< 32
	07/31/12	Sunflower Leaves	5 ± 4	874 ± 209	5534 ± 596	< 33	< 20	< 20
	07/31/12	Sweet Corn		< 181	1894 ± 378	< 32	< 25	< 22
	07/31/12	Tomatoes		< 145	2101 ± 341	< 23	< 16	< 19
	08/28/12	Pumpkin Leaves	4 ± 2	3729 ± 282	7248 ± 420	< 31	< 14	< 15
	08/28/12	Red Beet Leaves	5 ± 2	1148 ± 189	8333 ± 496	< 39	< 19	< 20
	08/28/12	Sunflower Leaves	< 2	1016 ± 115	6833 ± 320	< 24	< 11	< 13
	09/26/12	Pumpkin Leaves	< 3	2657 ± 331	4867 ± 551	< 56	< 15	< 18
	09/26/12	Squash Leaves	< 3	5459 ± 184	6750 ± 254	< 42	< 12	< 12
	09/26/12	Sunflower Leaves	< 3	2380 ± 262	7510 ± 522	< 60	< 17	< 18
	MEAN*		5 ± 3	1748 ± 3300	5280 ± 4670	-	-	-
E1-2	07/17/12	Cabbage	< 3	< 75	2903 ± 179	< 18	< 8	< 9
	07/17/12	Red Beets		< 89	4823 ± 257	< 18	< 9	< 10
	07/31/12	Sweet Corn		< 151	2628 ± 350	< 27	< 16	< 17
	07/31/12	Tomatoes		< 137	2590 ± 434	< 31	< 17	< 24
	MEAN		-	-	3236 ± 2134	-	-	-
H1-2	06/26/12	Eggplant Leaves	< 2	528 ± 73	7721 ± 207	< 32	< 6	< 7
	06/26/12	Yellow Squash Leaves	6 ± 2	495 ± 76	5103 ± 170	< 27	< 5	< 6
	06/26/12	Zucchini Leaves	< 3	427 ± 62	5403 ± 155	< 26	< 6	< 6
	07/31/12	Eggplant Leaves	4 ± 2	1595 ± 296	5901 ± 626	< 35	< 22	< 27
	07/31/12	Squash Leaves	5 ± 3	848 ± 283	5185 ± 573	< 39	< 22	< 27
	07/31/12	Zucchini Leaves	6 ± 4	587 ± 258	3975 ± 541	< 37	< 26	< 28
	08/28/12	Eggplant Leaves	< 3	2644 ± 336	3353 ± 481	< 48	< 20	< 21
	08/28/12	Pumpkin Leaves	7 ± 2	1620 ± 158	5152 ± 319	< 27	< 12	< 14
	08/28/12	Squash Leaves	< 3	867 ± 123	4784 ± 340	< 28	< 14	< 15
	09/26/12	Squash Leaves	< 3	813 ± 227	4422 ± 481	< 55	< 17	< 18
	09/26/12	Turnip Greens	< 3	208 ± 117	4822 ± 401	< 44	< 13	< 13
	09/26/12	Zucchini Leaves	< 3	402 ± 147	4011 ± 380	< 56	< 16	< 21
	MEAN*		6 ± 2	920 ± 1401	4986 ± 2224	-	-	-

* THE MEAN AND TWO STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES

TABLE C-X.1 QUARTERLY OSLD RESULTS FOR THREE MILE ISLAND NUCLEAR STATION, 2012

RESULTS IN UNITS OF MILLI-ROENTGEN/QUARTER

STATION CODE	MEAN ± 2 S.D.	JAN - MAR	APR - JUN	JUL - SEP	OCT - DEC
A1-4	17.3 ± 4.0	16.2 ± 0.0	20.2 ± 0.3	17.0 ± 0.8	15.7 ± 0.3
A3-1	17.2 ± 4.4	15.0 ± 0.0	20.1 ± 1.9	17.5 ± 1.0	16.1 ± 1.5
A5-1	20.6 ± 4.0	19.3 ± 0.0	23.4 ± 1.1	20.6 ± 2.8	19.1 ± 0.3
A9-3	17.7 ± 5.2	15.0 ± 0.0	21.0 ± 0.1	18.5 ± 0.2	16.4 ± 0.0
B1-1	17.4 ± 4.9	15.6 ± 0.0	20.8 ± 0.4	17.6 ± 0.7	15.6 ± 1.3
B1-2	18.6 ± 4.6	16.3 ± 0.0	21.1 ± 2.1	20.0 ± 0.7	17.1 ± 0.1
B2-1	17.7 ± 3.9	16.5 ± 0.0	20.3 ± 1.3	18.0 ± 1.1	16.0 ± 0.4
B5-1	19.6 ± 5.2	18.7 ± 1.4	22.7 ± 1.2	20.3 ± 1.5	16.6 ± 2.1
C1-1	19.8 ± 4.1	18.9 ± 1.4	22.7 ± 1.1	19.7 ± 0.1	17.9 ± 1.4
C1-2	17.2 ± 5.1	16.2 ± 0.0	20.8 ± 0.9	17.0 ± 0.5	14.9 ± 0.2
C2-1	19.0 ± 3.4	18.4 ± 0.0	21.4 ± 1.5	18.9 ± 0.2	17.4 ± 0.3
C5-1	19.6 ± 5.6	16.8 ± 7.1	23.0 ± 7.2	20.6 ± 2.1	17.8 ± 3.8
C8-1	21.1 ± 6.1	18.7 ± 1.4	25.5 ± 1.9	20.4 ± 0.7	19.6 ± 0.7
D1-1	18.8 ± 5.0	17.0 ± 7.1	22.4 ± 2.2	18.7 ± 1.4	17.2 ± 0.3
D1-2	18.5 ± 5.0	17.6 ± 7.1	21.8 ± 1.7	18.8 ± 1.8	15.8 ± 3.0
D2-2	22.9 ± 6.7	20.4 ± 1.4	27.7 ± 2.1	22.7 ± 2.4	20.8 ± 1.3
D6-1	22.6 ± 5.3	20.7 ± 0.0	26.3 ± 0.3	22.6 ± 2.3	20.6 ± 1.3
E1-2	18.3 ± 4.9	17.0 ± 0.0	21.9 ± 0.8	17.9 ± 0.4	16.5 ± 0.6
E1-4	23.2 ± 7.5	24.3 ± 0.0	27.7 ± 0.1	21.6 ± 0.5	19.0 ± 3.7
E2-3	20.7 ± 8.2	17.9 ± 0.0	26.3 ± 1.8	21.1 ± 0.3	17.3 ± 1.5
E5-1	20.4 ± 4.3	18.8 ± 1.4	23.3 ± 0.1	20.6 ± 1.2	18.7 ± 0.6
E7-1	20.7 ± 6.0	18.7 ± 9.9	25.0 ± 0.4	20.4 ± 0.5	18.6 ± 0.6
F1-1	22.6 ± 7.1	17.7 ± 0.0	23.7 ± 1.4	26.1 ± 2.9	22.9 ± 4.5
F1-2	27.0 ± 11	28.2 ± 2.8	34.5 ± 0.5	23.5 ± 0.1	21.8 ± 3.5
F1-4	25.7 ± 9.6	25.0 ± 8.5	32.6 ± 3.2	22.9 ± 1.4	22.1 ± 0.5
F2-1	22.0 ± 6.3	19.4 ± 1.4	26.6 ± 0.2	21.5 ± 2.7	20.6 ± 1.3
F5-1	23.0 ± 6.0	20.7 ± 1.4	27.3 ± 0.4	22.6 ± 1.7	21.3 ± 0.0
G1-2	20.7 ± 4.6	18.3 ± 0.0	23.4 ± 2.9	21.6 ± 0.2	19.4 ± 5.1
G1-3	21.6 ± 11	24.3 ± 1.4	28.3 ± 2.3	18.2 ± 0.4	15.7 ± 0.5
G1-5	19.2 ± 3.9	17.0 ± 0.0	21.4 ± 2.4	20.1 ± 1.3	18.2 ± 0.0
G1-6	23.0 ± 3.9	20.2 ± 4.2	23.4 ± 0.0	24.2 ± 1.4	24.3 ± 2.1
G2-4	24.1 ± 8.0	21.6 ± 1.4	29.9 ± 5.6	23.7 ± 0.5	21.2 ± 1.4
G5-1	20.2 ± 6.9	18.2 ± 0.0	25.3 ± 0.8	19.5 ± 0.4	17.9 ± 1.2
H1-1	20.1 ± 7.7	17.8 ± 7.1	25.7 ± 0.1	19.5 ± 1.8	17.4 ± 0.3
H3-1	16.5 ± 4.7	14.9 ± 0.0	19.7 ± 0.8	16.6 ± 0.3	14.6 ± 0.6
H5-1	15.4 ± 3.0	14.7 ± 0.0	17.2 ± 0.2	15.9 ± 0.3	13.7 ± 0.3
H8-1	29.8 ± 7.0	27.7 ± 1.4	35.0 ± 3.3	28.5 ± 1.9	28.0 ± 0.7
J1-1	17.7 ± 4.6	16.4 ± 0.0	20.8 ± 1.9	17.9 ± 0.6	15.5 ± 1.2
J1-3	15.2 ± 5.1	14.4 ± 0.0	18.0 ± 2.7	16.3 ± 1.0	12.1 ± 0.8
J3-1	19.4 ± 5.1	17.6 ± 7.1	22.7 ± 1.3	19.9 ± 0.4	17.2 ± 0.8
J5-1	21.5 ± 6.3	19.6 ± 1.4	25.5 ± 1.8	22.3 ± 0.4	18.4 ± 3.0
J7-1	21.4 ± 6.2	18.9 ± 2.8	25.9 ± 2.2	20.1 ± 3.1	20.6 ± 0.3
K1-4	18.1 ± 4.2	17.1 ± 7.1	20.9 ± 0.2	18.4 ± 0.7	16.1 ± 1.0
K2-1	21.9 ± 6.0	19.5 ± 1.4	26.2 ± 1.3	21.6 ± 1.1	20.3 ± 0.8
K3-1	17.9 ± 6.1	15.9 ± 0.0	22.3 ± 2.5	17.8 ± 1.4	15.7 ± 0.0
K5-1	21.6 ± 6.5	19.4 ± 0.0	26.3 ± 3.6	21.2 ± 1.9	19.4 ± 0.0
K8-1	20.1 ± 3.6	19.2 ± 1.4	22.5 ± 4.5	20.3 ± 1.7	18.4 ± 0.5

TABLE C-X.1 QUARTERLY OSLD RESULTS FOR THREE MILE ISLAND NUCLEAR STATION, 2012

RESULTS IN UNITS OF MILLI-ROENTGEN/QUARTER

STATION CODE	MEAN ± 2 S.D.	JAN - MAR	APR - JUN	JUL - SEP	OCT - DEC
L1-1	18.8 ± 5.1	17.1 ± 0.0	22.3 ± 3.5	18.9 ± 0.3	16.7 ± 0.6
L1-2	18.4 ± 4.8	17.1 ± 0.0	21.9 ± 0.2	18.2 ± 1.9	16.5 ± 1.0
L2-1	19.6 ± 4.3	18.1 ± 0.0	22.5 ± 0.2	20.0 ± 1.9	17.8 ± 1.0
L5-1	18.4 ± 4.7	17.4 ± 0.0	21.7 ± 3.1	18.4 ± 0.6	16.2 ± 0.3
L8-1	19.4 ± 7.2	17.1 ± 7.1	24.4 ± 2.7	19.6 ± 1.8	16.5 ± 3.3
M1-1	16.1 ± 3.5	14.9 ± 0.0	18.4 ± 2.1	16.4 ± 0.1	14.6 ± 0.5
M1-2	19.1 ± 4.4	17.3 ± 7.1	21.7 ± 3.5	20.1 ± 1.8	17.3 ± 1.7
M2-1	17.3 ± 4.7	16.3 ± 0.0	20.5 ± 1.4	17.2 ± 2.0	15.0 ± 1.0
M5-1	19.2 ± 4.4	18.4 ± 0.0	22.4 ± 0.7	18.8 ± 0.3	17.3 ± 1.8
M9-1	24.1 ± 6.9	22.1 ± 0.0	29.1 ± 1.6	23.5 ± 1.4	21.5 ± 1.4
N1-1	18.8 ± 5.3	17.0 ± 7.1	22.5 ± 2.3	19.0 ± 0.7	16.7 ± 0.4
N1-3	17.5 ± 2.6	15.9 ± 0.0	19.0 ± 4.4	17.2 ± 0.4	17.9 ± 0.1
N2-1	20.1 ± 4.8	19.5 ± 1.4	23.3 ± 0.8	19.9 ± 1.2	17.5 ± 0.7
N5-1	16.5 ± 5.0	15.1 ± 0.0	19.9 ± 1.1	16.9 ± 1.4	14.2 ± 2.7
N8-1	20.5 ± 5.3	18.6 ± 1.4	24.3 ± 1.9	20.4 ± 0.1	18.7 ± 1.2
P1-1	18.7 ± 5.2	16.8 ± 0.0	22.4 ± 2.1	18.5 ± 0.4	17.0 ± 0.1
P1-2	18.7 ± 4.6	16.2 ± 0.0	21.2 ± 3.7	17.4 ± 1.2	20.0 ± 0.2
P2-1	22.2 ± 5.5	20.8 ± 2.8	25.9 ± 2.1	22.6 ± 0.9	19.5 ± 4.1
P5-1	19.9 ± 5.0	18.7 ± 1.4	23.4 ± 1.7	19.8 ± 1.9	17.7 ± 0.2
P8-1	16.6 ± 4.6	15.2 ± 0.0	19.6 ± 2.9	17.1 ± 1.5	14.5 ± 2.8
Q1-1	18.7 ± 5.6	16.4 ± 0.0	22.3 ± 0.2	19.6 ± 0.9	16.6 ± 0.7
Q1-2	15.6 ± 4.5	14.1 ± 0.0	18.8 ± 0.8	15.7 ± 0.3	13.9 ± 3.0
Q2-1	16.8 ± 3.0	15.8 ± 0.0	17.8 ± 3.4	18.3 ± 1.8	15.2 ± 0.5
Q5-1	18.2 ± 4.6	16.8 ± 0.0	21.2 ± 1.5	18.7 ± 0.0	16.0 ± 0.3
Q9-1	18.8 ± 4.9	17.4 ± 7.1	22.3 ± 0.2	18.3 ± 0.1	17.0 ± 0.3
R1-1	16.3 ± 5.0	15.4 ± 0.0	19.3 ± 0.1	16.9 ± 0.7	13.4 ± 0.5
R1-2	17.6 ± 4.7	16.6 ± 7.1	20.8 ± 0.7	17.6 ± 1.0	15.3 ± 0.2
R3-1	22.4 ± 6.4	20.1 ± 0.0	27.0 ± 2.7	21.9 ± 1.4	20.4 ± 0.6
R5-1	21.4 ± 6.2	19.1 ± 0.0	25.9 ± 2.8	20.8 ± 0.8	19.8 ± 0.6
R9-1	20.7 ± 6.5	18.5 ± 1.4	25.2 ± 0.8	20.8 ± 0.5	18.2 ± 3.3
B10-1	18.5 ± 6.8	17.5 ± 8.5	23.4 ± 0.2	17.7 ± 0.3	15.5 ± 0.5
D15-1	20.1 ± 4.7	18.5 ± 1.4	23.5 ± 0.0	19.7 ± 1.0	18.7 ± 0.5
F10-1	21.5 ± 9.8	20.2 ± 2.8	28.6 ± 0.7	19.4 ± 1.0	17.6 ± 1.4
F25-1	21.3 ± 5.7	18.7 ± 1.4	25.2 ± 3.1	21.5 ± 1.3	19.8 ± 0.7
G10-1	24.2 ± 13	24.2 ± 2.8	33.4 ± 0.7	21.0 ± 0.6	18.2 ± 1.5
G15-1	26.5 ± 5.9	22.6 ± 1.4	29.8 ± 0.9	26.9 ± 0.1	26.5 ± 0.7
H15-1	21.0 ± 5.8	19.2 ± 0.0	25.3 ± 1.4	20.3 ± 0.2	19.2 ± 0.0
J15-1	22.7 ± 5.7	21.1 ± 0.0	26.9 ± 0.4	21.8 ± 0.3	20.8 ± 1.0
L15-1	19.5 ± 6.2	17.0 ± 7.1	23.9 ± 0.8	19.1 ± 0.7	17.8 ± 0.4
N15-2	21.5 ± 5.2	19.7 ± 1.4	25.2 ± 1.0	21.2 ± 0.2	19.8 ± 0.8
Q15-1	21.2 ± 4.6	19.8 ± 2.8	24.5 ± 1.6	20.8 ± 2.1	19.6 ± 1.2
R15-1	19.2 ± 4.7	18.2 ± 1.4	22.6 ± 0.3	18.5 ± 0.9	17.4 ± 0.2

TABLE C-X.2 MEAN QUARTERLY TLD RESULTS FOR THE SITE BOUNDARY, INDICATOR AND CONTROL LOCATIONS FOR THREE MILE ISLAND NUCLEAR STATION, 2012

RESULTS IN UNITS OF MILLI-ROENTGEN/QUARTER

COLLECTION PERIOD	SITE BOUNDARY ± 2 S.D.	INDICATOR	CONTROL
JAN-MAR	18.3 ± 8.2	18.1 ± 4.3	19.9 ± 4.3
APR-JUN	22.9 ± 9.5	23.6 ± 6.2	26.0 ± 6.5
JUL-SEP	18.9 ± 5.1	19.9 ± 4.5	21.1 ± 4.6
OCT-DEC	17.3 ± 6.3	17.9 ± 4.9	19.8 ± 5.2

TABLE C-X.3 SUMMARY OF THE AMBIENT DOSIMETRY PROGRAM FOR THREE MILE ISLAND NUCLEAR STATION, 2012

RESULTS IN UNITS OF MILLI-ROENTGEN/QUARTER

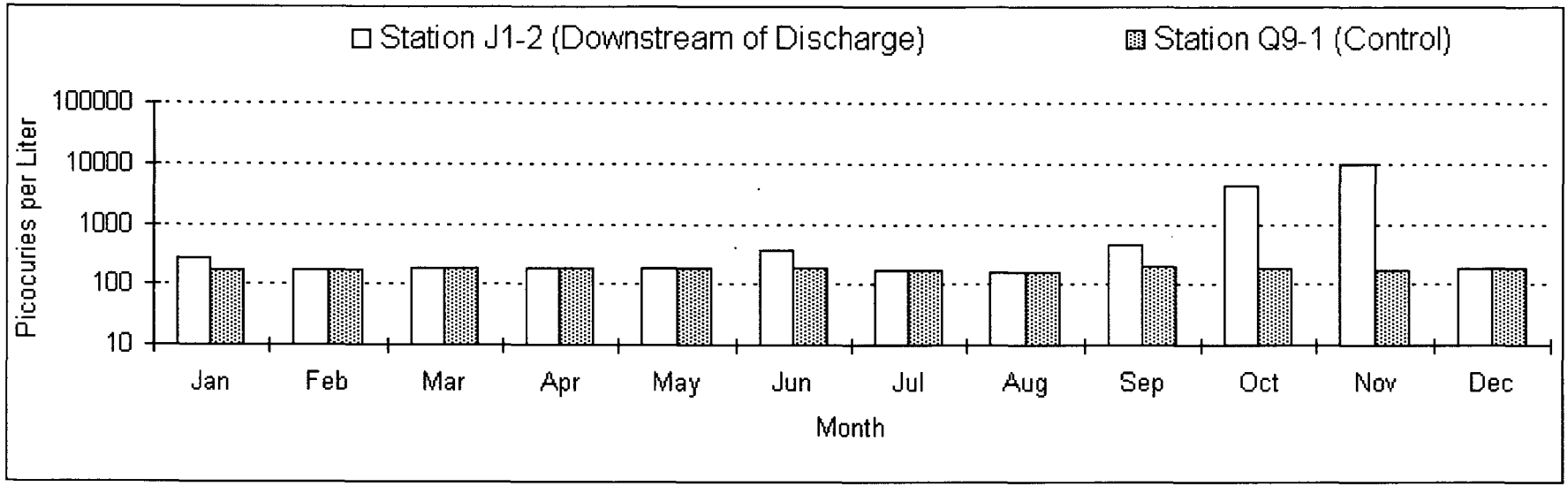
LOCATION	SAMPLES ANALYZED	PERIOD MINIMUM	PERIOD MAXIMUM	PERIOD MEAN ± 2 S.D.
SITE BOUNDARY	76	12.1	34.5	19.4 ± 8.5
INDICATOR	240	13.7	35.0	19.9 ± 6.8
CONTROL	40	17.0	33.4	21.7 ± 7.2

SITE BOUNDARY STATIONS - A1-4, B1-2, C1-2, D1-1, E1-4, F1-2, F1-4, G1-3, G1-5, G1-6, H1-1, J1-3, K1-4, L1-1, M1-1, N1-3, P1-2, Q1-2, R1-1

INDICATOR STATIONS - A3-1, A5-1, A9-3, B1-1, B10-1, B2-1, B5-1, C1-1, C2-1, C5-1, C8-1, D1-2, D2-2, D6-1, E1-2, E2-3, E5-1, E7-1, F1-1, F10-1, F2-1, F5-1, G1-2, G2-4, G5-1, H3-1, H5-1, H8-1, J1-1, J3-1, J5-1, J7-1, K2-1, K3-1, K5-1, K8-1, L1-2, L2-1, L5-1, L8-1, M1-2, M2-1, M5-1, M9-1, N1-1, N2-1, N5-1, N8-1, P1-1, P2-1, P5-1, P8-1, Q1-1, Q2-1, Q5-1, Q9-1, R1-2, R3-1, R5-1, R9-1

CONTROL STATIONS - D15-1, F25-1, G10-1, G15-1, H15-1, J15-1, L15-1, N15-2, Q15-1, R15-1

FIGURE C-1
Monthly Tritium Concentrations in Surface Water and Effluent Water
Three Mile Island Nuclear Station, 2012



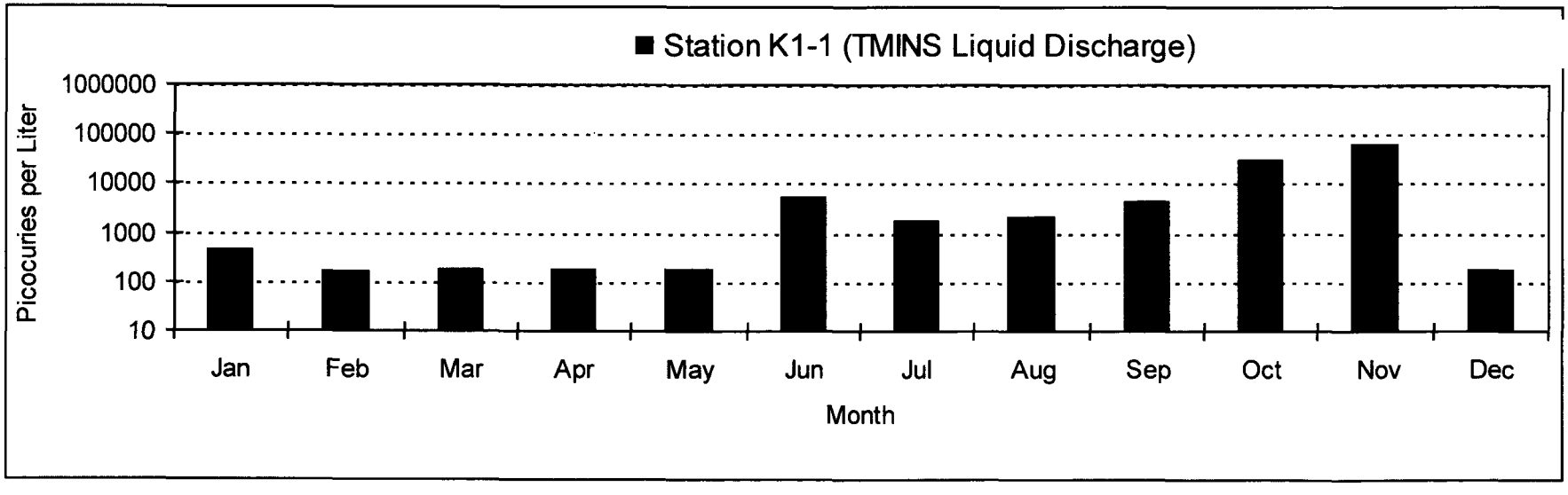


FIGURE C-2
Mean Quarterly Tritium Concentrations in Surface Water
Three Mile Island Nuclear Station, 1974 - 2012

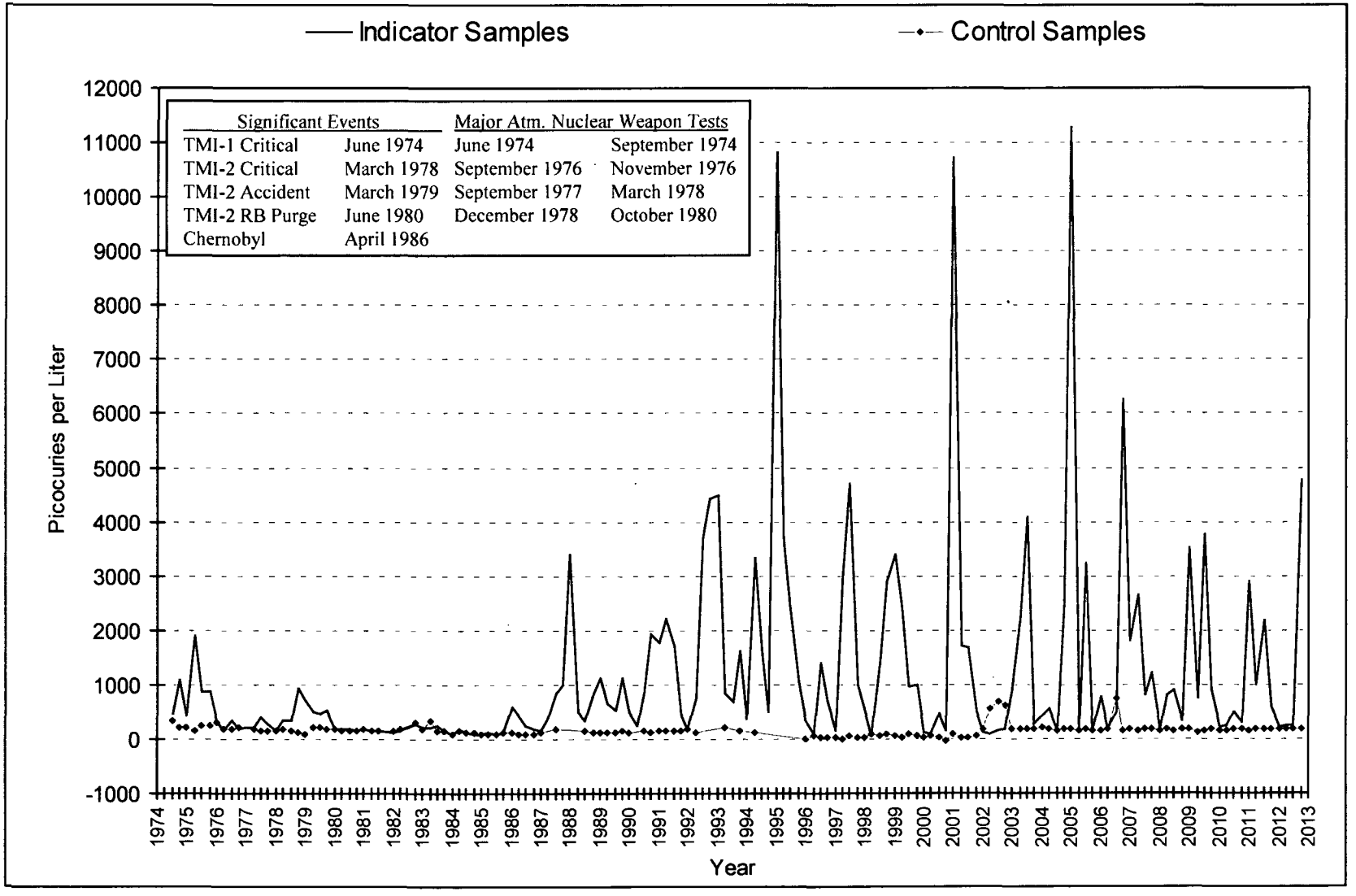


FIGURE C-3
Mean Monthly Gross Beta Concentrations in Drinking Water
Three Mile Island Nuclear Station, 2012

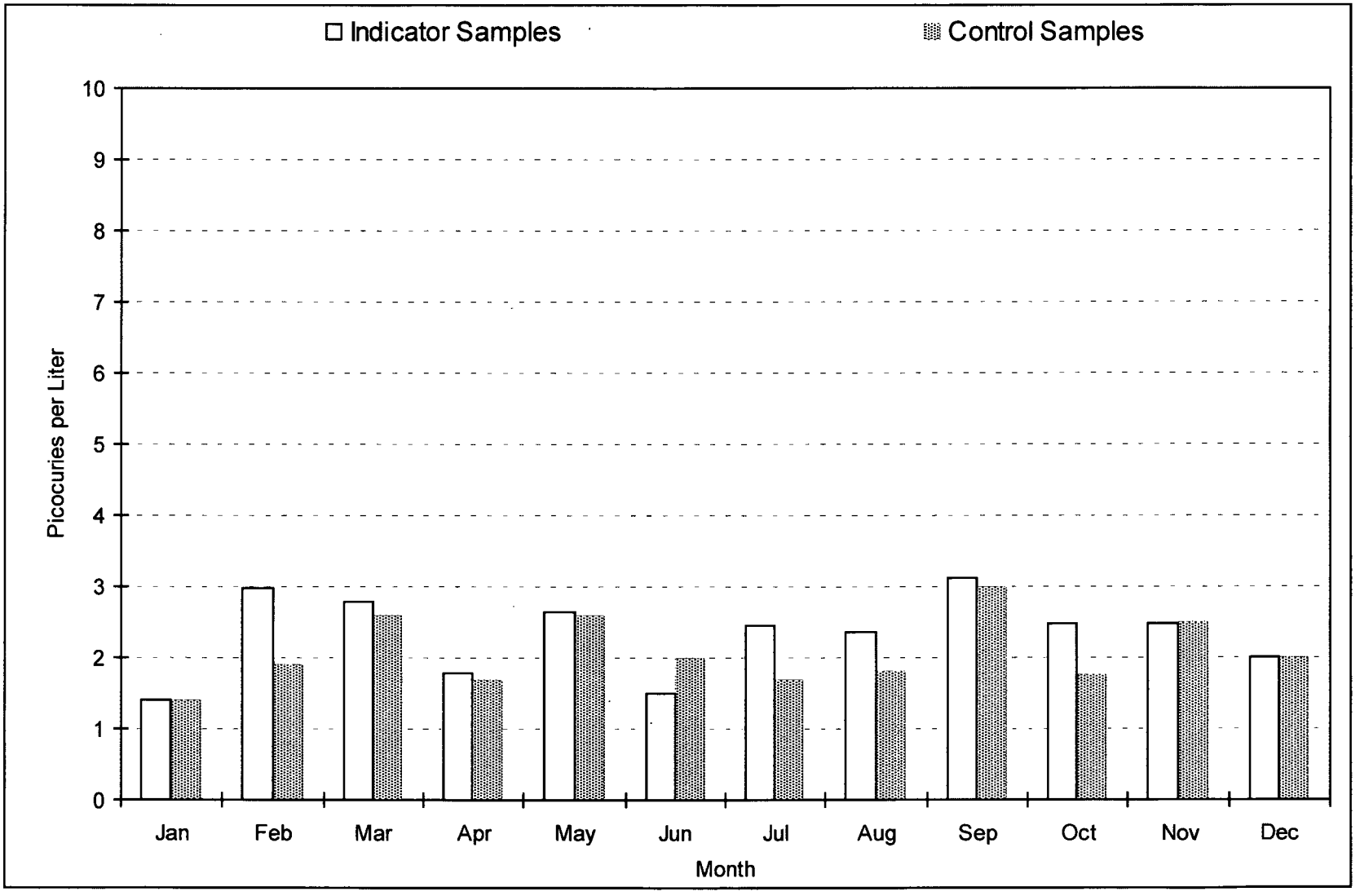
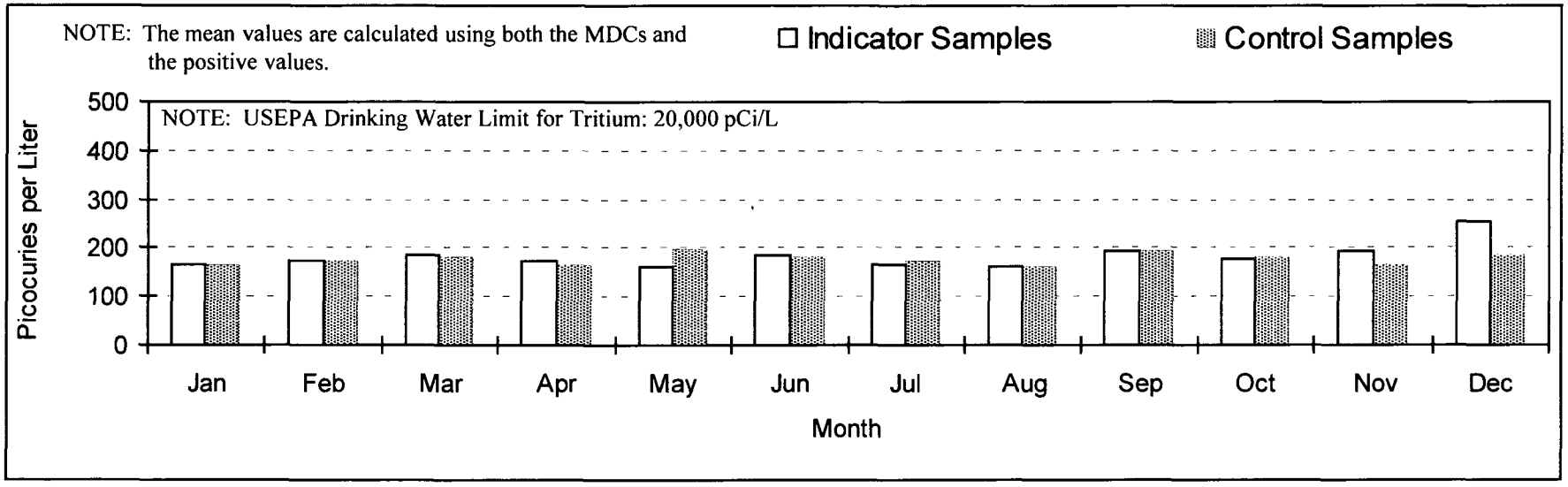


FIGURE C-4

Mean Monthly Tritium Concentrations in Drinking Water and Effluent Water

Three Mile Island Nuclear Station, 2012



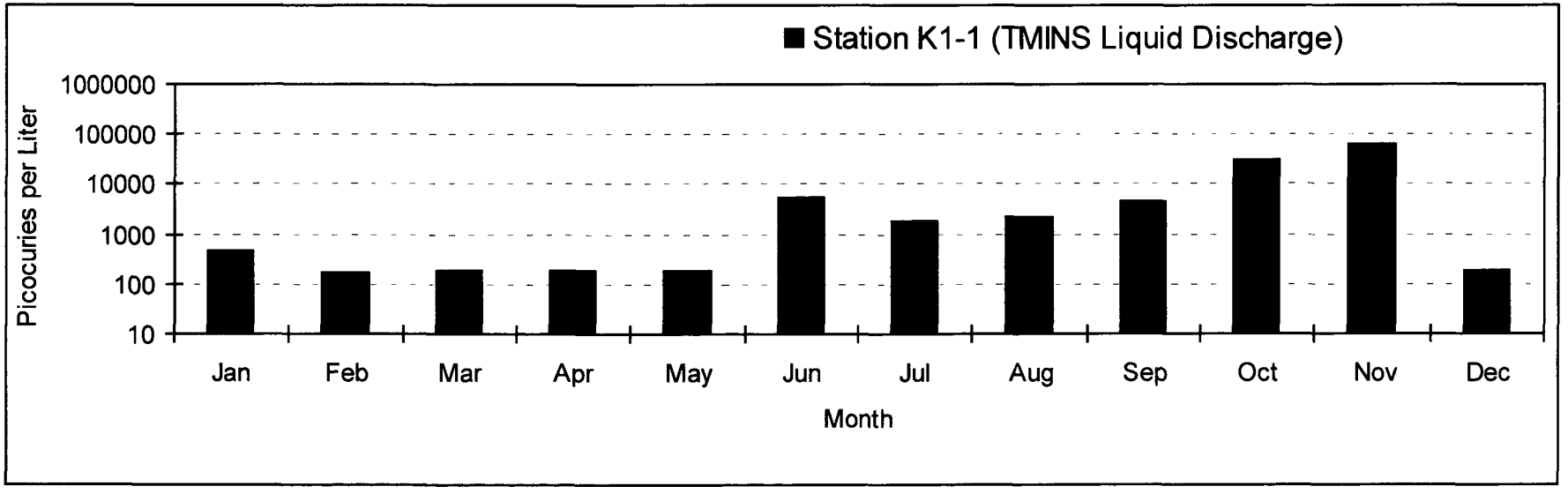


FIGURE C-5
Mean Cesium-137 Concentrations in Aquatic Sediments
Three Mile Island Nuclear Station, 1984 – 2012

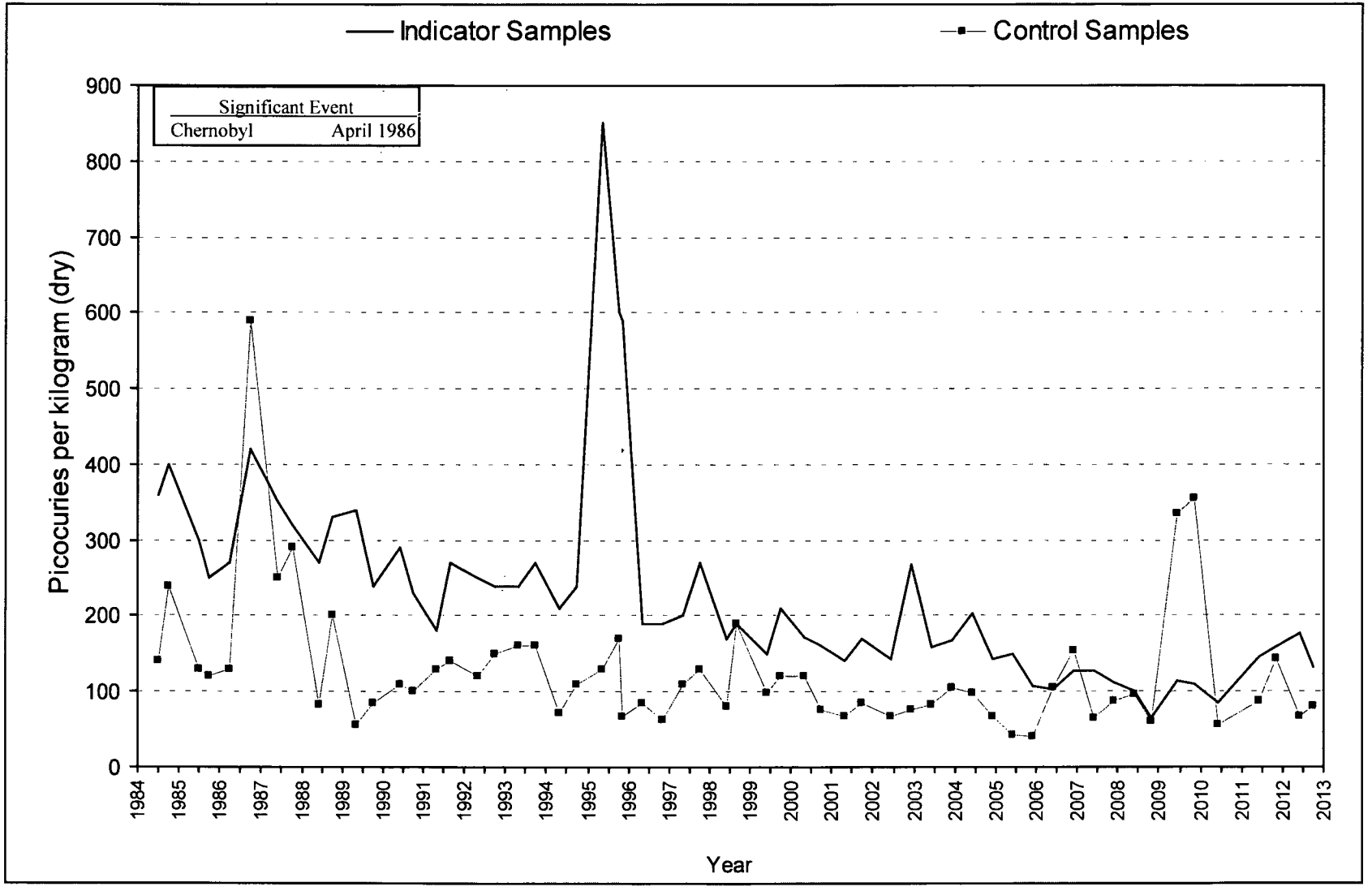


FIGURE C-6

Mean Quarterly Gross Beta Concentrations in Air Particulates

Three Mile Island Nuclear Station, 1972 - 2012

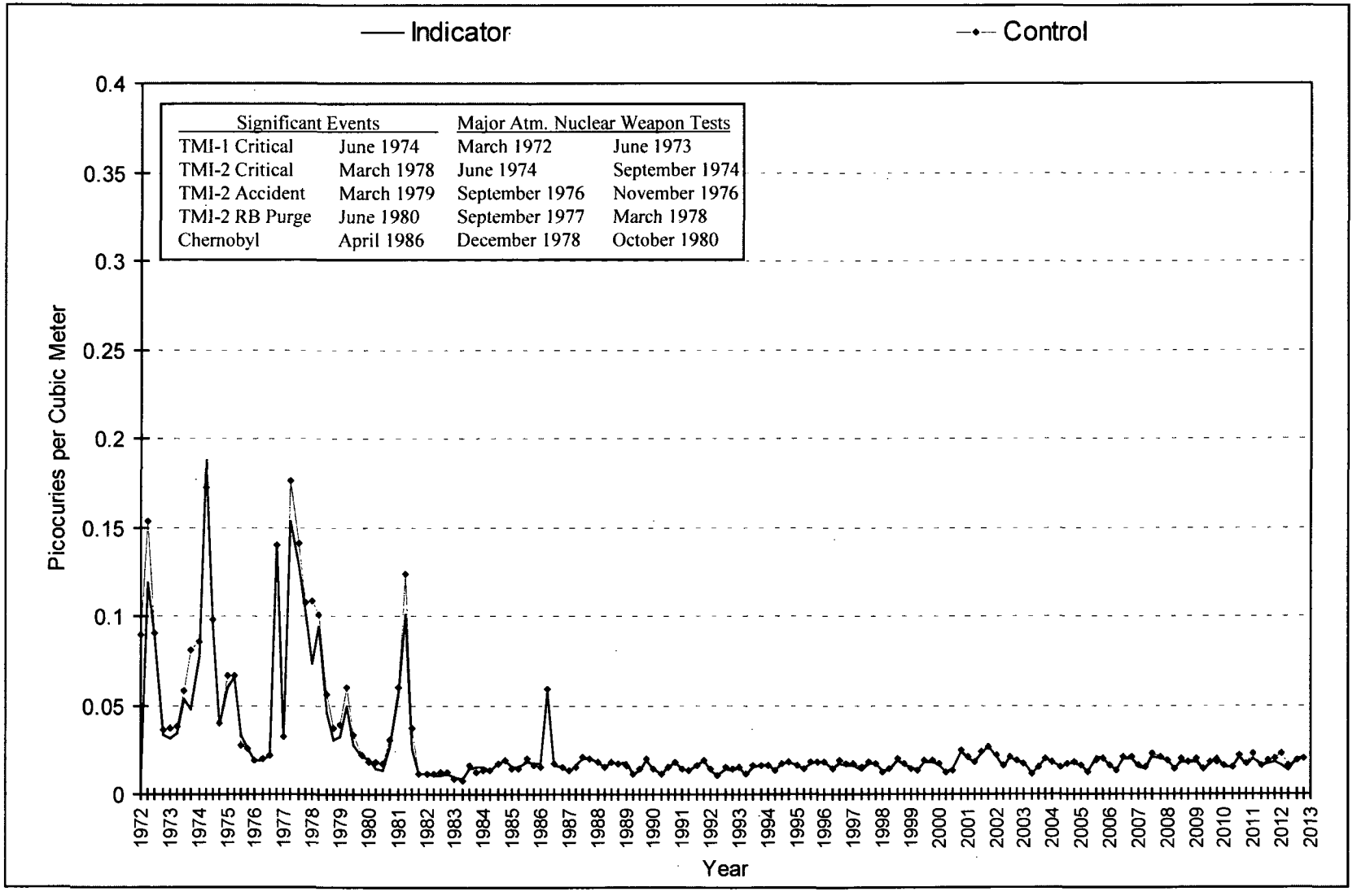
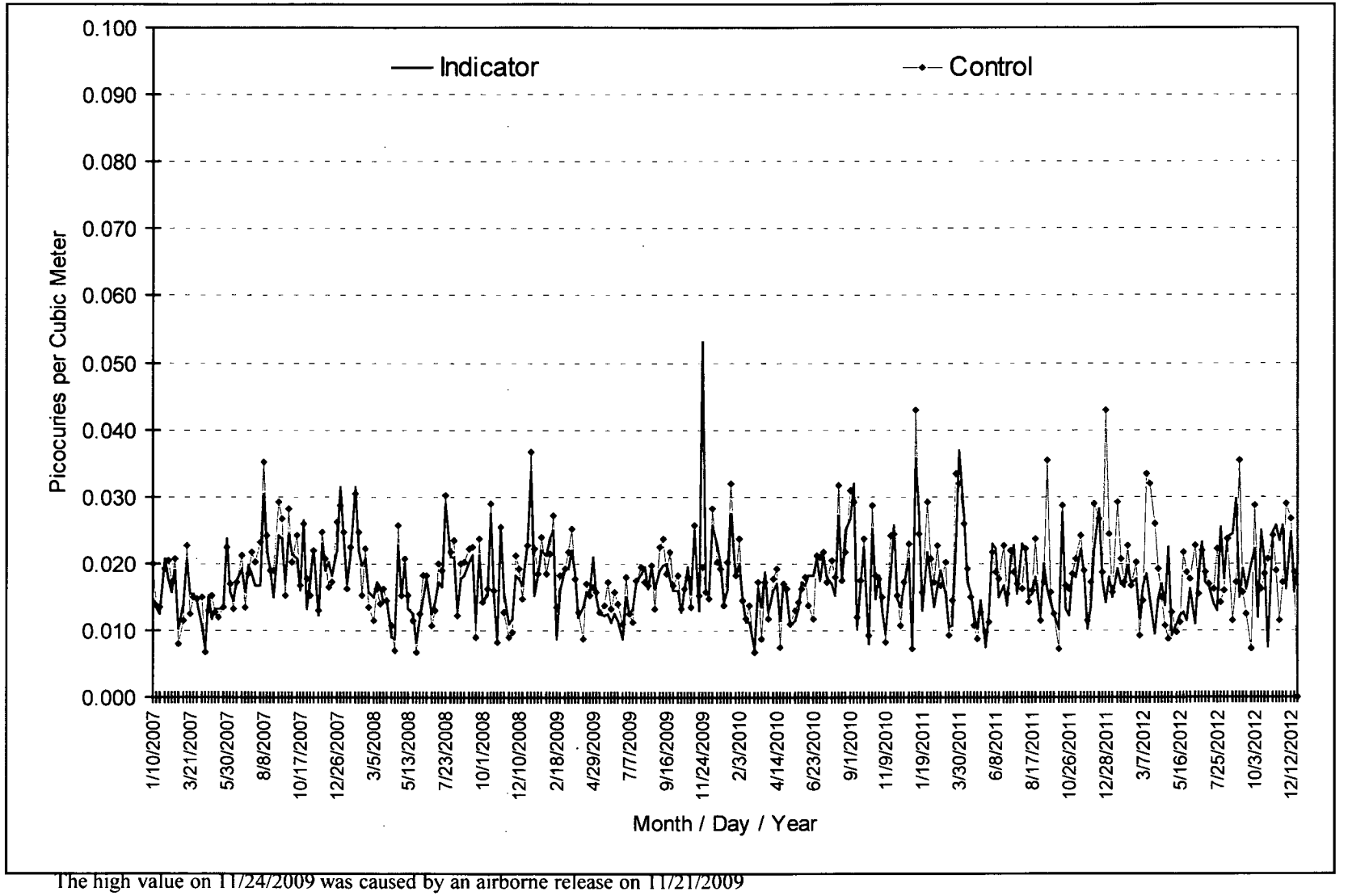
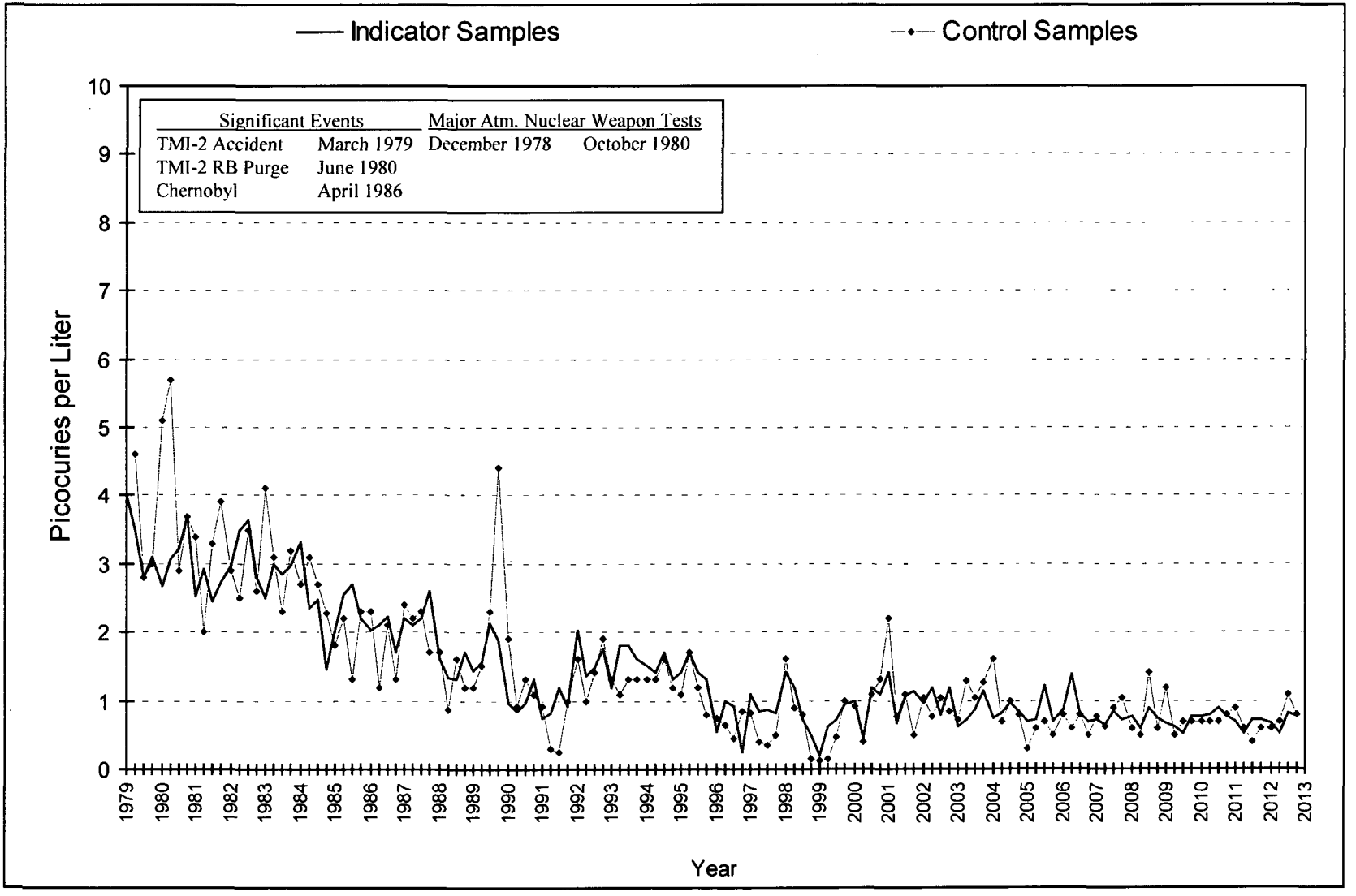


FIGURE C-7
Mean Weekly Gross Beta Concentrations in Air Particulates
Three Mile Island Nuclear Station, 2007 - 2012



The high value on 11/24/2009 was caused by an airborne release on 11/21/2009

FIGURE C-8
Mean Quarterly Strontium-90 Concentrations in Cow Milk
Three Mile Island Nuclear Station, 1979 - 2012



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APPENDIX D

DATA TABLES AND FIGURES
COMPARISON LABORATORY

The following section presents the results of data analysis performed by the QC laboratory, Environmental Inc. Duplicate samples were obtained from several locations and media and split between the primary laboratory, Teledyne Brown Engineering (TBE) and the QC laboratory. Comparison of the results for most media were within expected ranges.

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TABLE D-I.1 **CONCENTRATIONS OF GROSS BETA IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	Q9-1Q
01/03/12 - 01/31/12	< 0.6
01/31/12 - 02/28/12	< 1.3
02/28/12 - 04/03/12	< 0.8
04/03/12 - 05/01/02	< 0.9
05/01/12 - 05/29/12	< 0.8
05/29/12 - 07/03/12	1.5 ± 0.7
07/03/12 - 07/31/12	1.6 ± 0.9
07/31/12 - 08/28/12	2.1 ± 1.0
08/12/12 - 10/02/12	2.0 ± 0.9
10/02/12 - 10/30/12	1.0 ± 0.3
10/30/12 - 11/27/12	2.4 ± 1.0
11/27/12 - 12/31/12	< 1.7
MEAN*	1.8 ± 1.0

TABLE D-I.2 **CONCENTRATIONS OF TRITIUM IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	Q9-1Q
01/03/12 - 01/31/12	< 146
01/31/12 - 02/28/12	< 141
02/28/12 - 04/03/12	< 152
04/03/12 - 05/01/12	< 157
05/01/12 - 05/29/12	< 152
05/29/12 - 07/03/12	< 141
07/03/12 - 07/31/12	< 151
07/31/12 - 08/28/12	< 150
08/28/12 - 10/02/12	< 151
10/02/12 - 10/30/12	< 152
10/30/12 - 11/27/12	< 144
11/27/12 - 12/31/12	< 144
MEAN	-

TABLE D-I.3 **CONCENTRATIONS OF IODINE-131 IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	Q9-1Q
01/03/12 - 01/31/12	< 0.5
01/31/12 - 02/28/12	< 0.2
02/28/12 - 04/03/12	< 0.5
04/03/12 - 05/01/12	< 0.4
05/01/12 - 05/29/12	< 0.3
05/29/12 - 07/03/12	< 0.2
07/03/12 - 07/31/12	< 0.3
07/31/12 - 08/28/12	< 0.3
08/12/12 - 10/02/12	< 0.3
10/02/12 - 10/30/12	< 0.4
10/30/12 - 11/27/12	< 0.2
11/27/12 - 12/31/12	< 0.4
MEAN	-

* THE MEAN AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES

TABLE D-I.4 CONCENTRATIONS OF GAMMA EMITTERS IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	Mn-54	Fe-59	Co-58	Co-60	Zn-65	Zr-95	Nb-95	Cs-134	Cs-137	Ba-140	La-140
Q9-1Q	01/03/12 - 01/31/12	< 3	< 5	< 2	< 2	< 4	< 3	< 2	< 1	< 2	< 15	< 2
	01/31/12 - 02/28/12	< 2	< 4	< 2	< 2	< 4	< 3	< 3	< 3	< 3	< 13	< 3
	02/28/12 - 04/03/12	< 2	< 7	< 2	< 1	< 4	< 3	< 3	< 5	< 3	< 16	< 3
	04/03/12 - 05/01/12	< 2	< 4	< 2	< 2	< 5	< 6	< 3	< 3	< 2	< 22	< 5
	05/01/12 - 05/29/12	< 3	< 6	< 2	< 2	< 3	< 4	< 2	< 3	< 3	< 11	< 2
	05/29/12 - 07/03/12	< 2	< 5	< 3	< 4	< 5	< 5	< 4	< 3	< 2	< 16	< 2
	07/03/12 - 07/31/12	< 1	< 8	< 2	< 2	< 2	< 4	< 2	< 2	< 2	< 19	< 6
	07/31/12 - 08/28/12	< 2	< 7	< 3	< 2	< 4	< 3	< 3	< 2	< 3	< 13	< 4
	08/28/12 - 10/02/12	< 3	< 6	< 1	< 2	< 2	< 5	< 3	< 1	< 2	< 22	< 4
	10/02/12 - 10/30/12	< 2	< 8	< 3	< 2	< 3	< 5	< 2	< 1	< 2	< 19	< 2
	10/30/12 - 11/27/12	< 2	< 6	< 2	< 2	< 5	< 5	< 3	< 3	< 3	< 12	< 4
	11/27/12 - 12/31/12	< 2	< 5	< 3	< 2	< 4	< 3	< 3	< 3	< 2	< 20	< 3
	MEAN	-	-	-	-	-	-	-	-	-	-	-

TABLE D-II.1 **CONCENTRATIONS OF STRONTIUM AND GAMMA EMITTERS IN FISH SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012**

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD	Sr-89	Sr-90	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137
INDP	10/04/12	< 18	< 7	3330 ± 400	< 8	< 10	< 17	< 18	< 17	< 12	< 14

TABLE D-III.1 CONCENTRATIONS OF GAMMA EMITTERS IN SEDIMENT SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD	K-40	Cs-134	Cs-137
J2-1	10/24/12	7510 ± 540	< 26	< 21

TABLE D-IV.1 CONCENTRATIONS OF GAMMA EMITTERS AND STRONTIUM IN FOOD PRODUCT SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD	K-40	I-131	Cs-134	Cs-137	Sr-89	Sr-90
H1-2Q	08/28/12	5050 ± 370	< 16	< 10	< 13	< 13	9 ± 4
B10-2Q	07/17/12	2630 ± 240	< 13	< 10	< 7	< 3	2 ± 1
	MEAN	3840 ± 3422	-	-	-	-	6 ± 10

TABLE D-V.1 CONCENTRATIONS OF GROSS BETA IN AIR PARTICULATE AND I-131 IN AIR IODINE SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012

RESULTS IN UNITS OF E-3 PCI/CU METER ± 2 SIGMA

COLLECTION PERIOD	E1-2Q GROSS BETA	E1-2Q I-131
12/28/11 - 01/04/12	15 ± 4	< 15
01/04/12 - 01/11/12	26 ± 4	< 18
01/11/12 - 01/18/12	22 ± 4	< 18
01/18/12 - 01/25/12	26 ± 4	< 19
01/25/12 - 02/01/12	26 ± 4	< 9
02/01/12 - 02/08/12	24 ± 4	< 25
02/08/12 - 02/15/12	16 ± 5	< 27
02/16/12 - 02/22/12	30 ± 5	< 10
02/22/12 - 02/29/12	41 ± 5	< 13
02/29/12 - 03/07/12	20 ± 4	< 12
03/07/12 - 03/14/12	28 ± 4	< 12
03/14/12 - 03/21/12	24 ± 4	< 22
03/21/12 - 03/28/12	17 ± 4	< 23
03/28/12 - 04/04/12	16 ± 4	< 10
04/04/12 - 04/11/12	18 ± 4	< 17
04/11/12 - 04/18/12	20 ± 4	< 21
04/18/12 - 04/25/12	20 ± 4	< 11
04/25/12 - 05/02/12	23 ± 4	< 15
05/02/12 - 05/09/12	15 ± 4	< 14
05/09/12 - 05/16/12	20 ± 4	< 16
05/16/12 - 05/22/12	16 ± 5	< 20
05/22/12 - 05/30/12	19 ± 4	< 13
05/30/12 - 06/06/12	20 ± 4	< 10
06/06/12 - 06/13/12	23 ± 5	< 24
06/13/12 - 06/20/12	14 ± 4	< 17
06/20/12 - 06/27/12	28 ± 5	< 14
06/27/12 - 07/04/12	26 ± 5	< 11
07/04/12 - 07/11/12	36 ± 5	< 20
07/11/12 - 07/18/12	32 ± 5	< 16
07/18/12 - 07/25/12	26 ± 5	< 10
07/25/12 - 08/01/12	20 ± 4	< 14
08/01/12 - 08/08/12	34 ± 5	< 14
08/08/12 - 08/15/12	31 ± 5	< 13
08/15/12 - 08/22/12	24 ± 5	< 21
08/22/12 - 08/29/12	51 ± 5	< 24
08/29/12 - 09/05/12	38 ± 5	< 12
09/05/12 - 09/12/12	24 ± 4	< 28
09/12/12 - 09/19/12	25 ± 5	< 22
09/19/12 - 09/26/12	20 ± 4	< 16
09/26/12 - 10/03/12	25 ± 4	< 21
10/03/12 - 10/10/12	40 ± 5	< 21
10/10/12 - 10/17/12	29 ± 5	< 21
10/17/12 - 10/24/12	31 ± 5	< 17
10/24/12 - 10/31/12	32 ± 5	< 19
10/31/12 - 11/07/12	9 ± 4	< 25
11/07/12 - 11/14/12	44 ± 5	< 19
11/14/12 - 11/20/12	45 ± 6	< 26
11/20/12 - 11/28/12	41 ± 5	< 12
11/28/12 - 12/06/12	35 ± 5	< 13
12/06/12 - 12/12/12	24 ± 5	< 17
12/12/12 - 12/19/12	35 ± 5	< 9
12/19/12 - 12/27/12	27 ± 4	< 18
12/27/12 - 01/02/13	26 ± 5	< 17
MEAN	26 ± 18	-

* THE MEAN AND 2 STANDARD DEVIATION ARE CALCULATED USING THE POSITIVE VALUES

(1) SEE PROGRAM EXCEPTIONS SECTION FOR EXPLANATION

TABLE D-V.2 CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012

RESULTS IN UNITS OF E-3 PCI/CU METER ± 2 SIGMA

SITE	COLLECTION PERIOD	Be-7	Cs-134	Cs-137
E1-2Q	12/28/11 - 03/28/12	73 ± 14	< 0.8	< 0.5
	03/28/12 - 06/27/12	113 ± 22	< 1.0	< 1.0
	06/27/12 - 10/03/12	97 ± 18	< 0.5	< 0.1
	10/03/12 - 01/02/13	59 ± 16	< 0.7	< 0.4
	MEAN	86 ± 48	-	-

TABLE D-VI.1 CONCENTRATIONS OF I-131 BY CHEMICAL SEPARATION, GAMMA EMITTERS, AND STRONTIUM IN MILK SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2012

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE	I-131	K-40	Cs-134	Cs-137	Ba-140	La-140	Sr-89	Sr-90
G2-1Q	01/04/12	< 0.3	1255 ± 101	< 5	< 4	< 14	< 3		
	02/01/12	< 0.3	1529 ± 95	< 2	< 3	< 16	< 4		
	03/07/12	< 0.3	1034 ± 103	< 4	< 3	< 17	< 7		
	03/21/12	< 0.4	1011 ± 88	< 4	< 4	< 16	< 3		
	03/23/12	-	-	-	-	-	-	< 0.8	< 0.6
	04/04/12	< 0.5	1153 ± 105	< 3	< 4	< 17	< 6		
	04/18/12	< 0.2	1038 ± 101	< 4	< 4	< 26	< 2		
	05/02/12	< 0.3	877 ± 94	< 4	< 4	< 19	< 4		
	05/16/12	< 0.4	1288 ± 115	< 3	< 4	< 29	< 4		
	05/30/12	< 0.2	1255 ± 109	< 3	< 2	< 20	< 3		
	06/13/12	< 0.3	914 ± 94	< 5	< 4	< 19	< 3		
	06/27/12	< 0.2	740 ± 74	< 4	< 2	< 19	< 5	< 1.0	< 0.5
	07/11/12	< 0.4	686 ± 74	< 3	< 3	< 35	< 6		
	07/25/12	< 0.2	1385 ± 106	< 4	< 4	< 28	< 4		
	08/08/12	< 0.3	1269 ± 85	< 3	< 3	< 31	< 4		
	08/22/12	< 0.2	882 ± 85	< 4	< 3	< 18	< 4		
	09/05/12	< 0.4	952 ± 90	< 4	< 3	< 18	< 3		
	09/19/12	< 0.3	946 ± 83	< 3	< 2	< 27	< 6	< 0.7	0.6 ± 0.3
	10/03/12	< 0.3	970 ± 59	< 2	< 2	< 25	< 4		
	10/17/12	< 0.4	1336 ± 101	< 2	< 4	< 40	< 7		
	10/31/12	< 0.5	836 ± 75	< 3	< 3	< 19	< 7		
	11/14/12	< 0.3	1070 ± 114	< 4	< 6	< 40	< 9		
	11/28/12	< 0.1	989 ± 159	< 7	< 9	< 32	< 10		
	12/12/12	< 0.3	887 ± 183	< 8	< 7	< 34	< 6	< 0.5	0.5 ± 0.3
	MEAN*		1057 ± 433	-	-	-	-	-	0.5 ± 0.2

* THE MEAN AND 2 STANDARD DEVIATION VALUES ARE CALCULATED USING THE POSITIVE VALUES

FIGURE D-1
MONTHLY GROSS BETA CONCENTRATIONS IN DRINKING WATER SAMPLES COLLECTED FROM TMINS LOCATION Q9-1Q, 2012

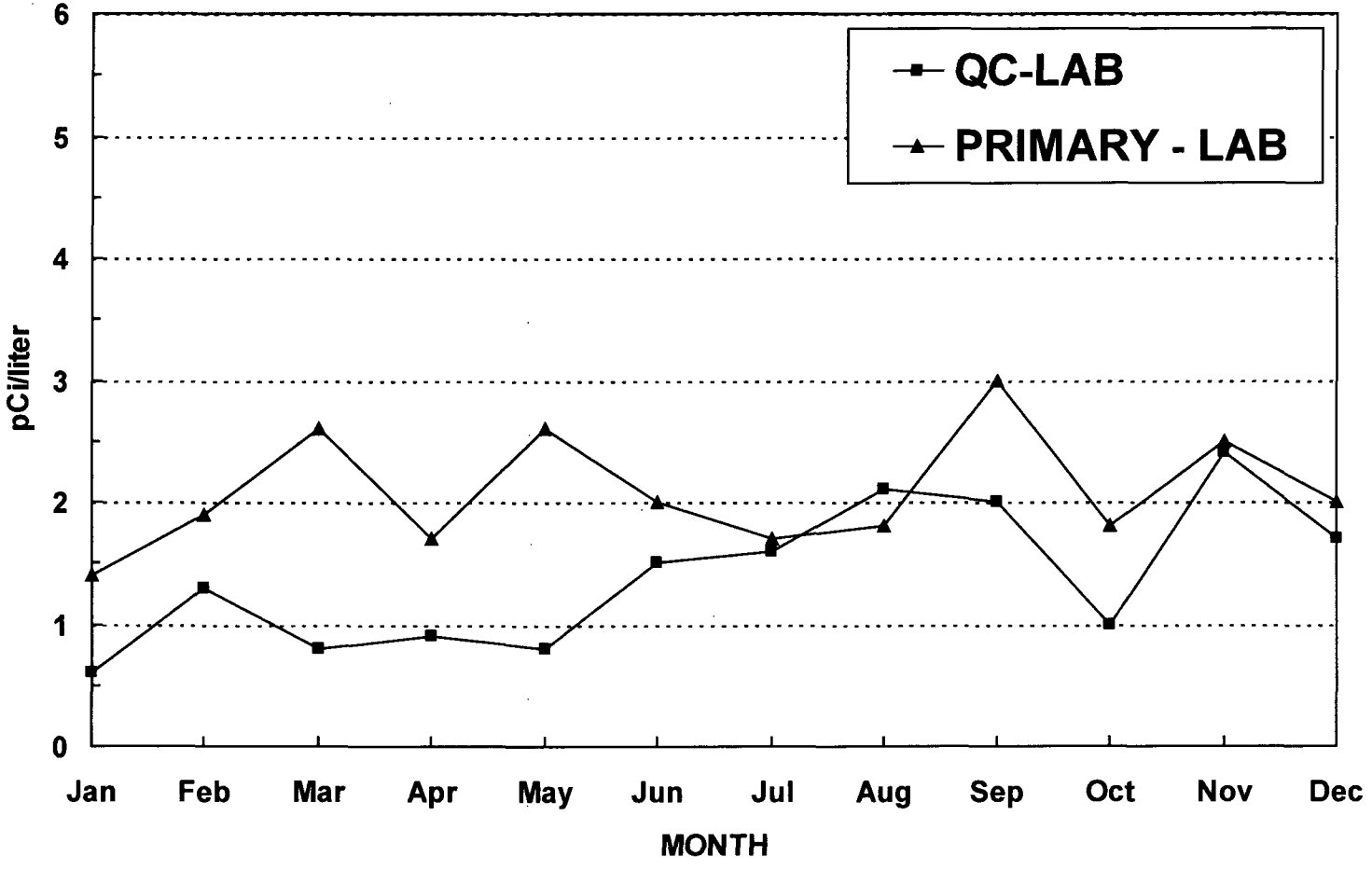
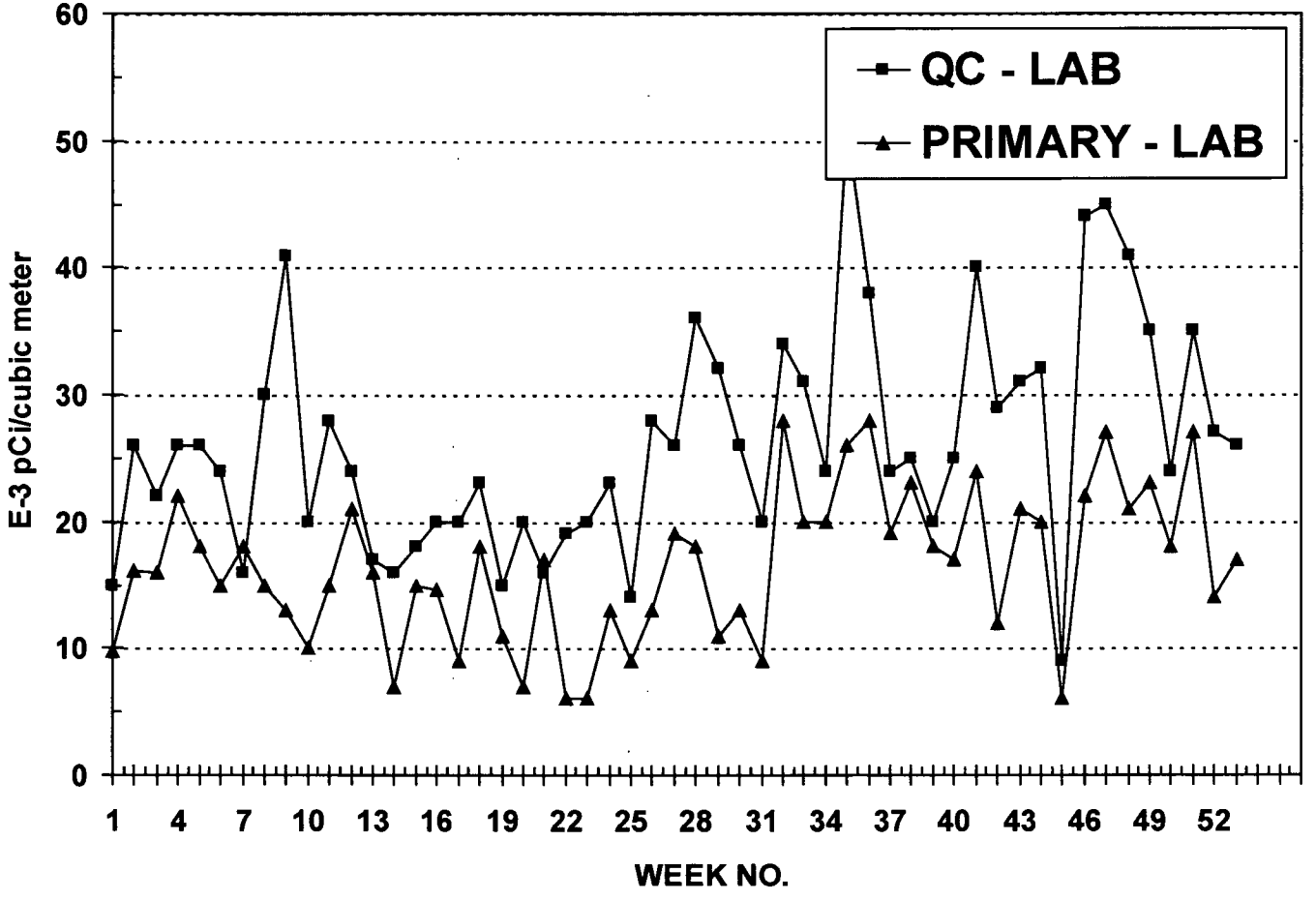


FIGURE D-2
WEEKLY GROSS BETA CONCENTRATIONS IN AIR PARTICULATE SAMPLES COLLECTED FROM TMINS LOCATION E1-2Q, 2012



APPENDIX E

INTER-LABORATORY COMPARISON PROGRAM

TABLE E-1 ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING, 2012
(PAGE 1 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
March 2012	E10066	Milk	Sr-89	pCi/L	101	94.8	1.07	A
			Sr-90	pCi/L	11.7	13.5	0.87	A
	E10067	Milk	I-131	pCi/L	87.5	92.5	0.95	A
			Ce-141	pCi/L	247	260	0.95	A
			Cr-51	pCi/L	435	436	1.00	A
			Cs-134	pCi/L	133	149	0.89	A
			Cs-137	pCi/L	156	159	0.98	A
			Co-58	pCi/L	127	132	0.96	A
			Mn-54	pCi/L	190	195	0.97	A
			Fe-59	pCi/L	179	168	1.07	A
			Zn-65	pCi/L	327	333	0.98	A
			Co-60	pCi/L	274	279	0.98	A
	E10069	AP	Ce-141	pCi	167	164	1.02	A
			Cr-51	pCi	310	276	1.12	A
			Cs-134	pCi	107	94.5	1.13	A
			Cs-137	pCi	109	101	1.08	A
			Co-58	pCi	87.6	83.5	1.05	A
			Mn-54	pCi	133	123	1.08	A
			Fe-59	pCi	113	106	1.07	A
			Zn-65	pCi	226	210	1.08	A
			Co-60	pCi	185	176	1.05	A
	E10068	Charcoal	I-131	pCi	92.8	94.2	0.99	A
	E10070	Water	Fe-55	pCi/L	1800	1570	1.15	A
June 2012	E10198	Milk	Sr-89	pCi/L	86.1	99.8	0.86	A
			Sr-90	pCi/L	9.2	12.7	0.72	W
	E10199	Milk	I-131	pCi/L	88.9	99.7	0.89	A
			Ce-141	pCi/L	72.8	82.2	0.89	A
			Cr-51	pCi/L	394	402	0.98	A
			Cs-134	pCi/L	159	174	0.91	A
			Cs-137	pCi/L	206	212	0.97	A
			Co-58	pCi/L	89.5	92.3	0.97	A
			Mn-54	pCi/L	129	132	0.98	A
			Fe-59	pCi/L	129	128	1.01	A
			Zn-65	pCi/L	193	199	0.97	A
			Co-60	pCi/L	342	355	0.96	A
	E10201	AP	Ce-141	pCi	73.2	75.1	0.97	A
			Cr-51	pCi	367	366	1.00	A
			Cs-134	pCi	165	159	1.04	A
			Cs-137	pCi	205	193	1.06	A
			Co-58	pCi	84.7	84.2	1.01	A
			Mn-54	pCi	118	121	0.98	A
			Fe-59	pCi	125	117	1.07	A
			Zn-65	pCi	181	182	0.99	A
			Co-60	pCi	338	324	1.04	A
	E10200	Charcoal	I-131	pCi	101	96.6	1.05	A

TABLE E-1 ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING, 2012
(PAGE 2 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
June 2012	E10202	Water	Fe-55	pCi/L	1890	1580	1.20	A
September 2012	E10296	Milk	Sr-89	pCi/L	106	99.6	1.06	A
			Sr-90	pCi/L	13.6	16.0	0.85	A
	E10297	Milk	I-131	pCi/L	89.8	99.6	0.90	A
			Ce-141	pCi/L	160	164	0.98	A
			Cr-51	pCi/L	230	248	0.93	A
			Cs-134	pCi/L	101	108	0.94	A
			Cs-137	pCi/L	174	174	1.00	A
			Co-58	pCi/L	97.2	100	0.97	A
			Mn-54	pCi/L	188	196	0.96	A
			Fe-59	pCi/L	159	152	1.05	A
			Zn-65	pCi/L	195	192	1.02	A
			Co-60	pCi/L	155	152	1.02	A
	E10299	AP	Ce-141	pCi	145	135	1.07	A
			Cr-51	pCi	219	205	1.07	A
			Cs-134	pCi	94.1	89.4	1.05	A
			Cs-137	pCi	140	144	0.97	A
			Co-58	pCi	88.3	83.0	1.06	A
			Mn-54	pCi	173	162	1.07	A
			Fe-59	pCi	136	125	1.09	A
			Zn-65	pCi	165	159	1.04	A
			Co-60	pCi	133	125	1.06	A
	E10298	Charcoal	I-131	pCi	95.5	97.2	0.98	A
	E10300	Water	Fe-55	pCi/L	1630	1900	0.86	A
December 2012	E10334	Milk	Sr-89	pCi/L	101	96.6	1.05	A
			Sr-90	pCi/L	11.3	13.8	0.82	A
	E10335	Milk	I-131	pCi/L	93.1	90.0	1.03	A
			Ce-141	pCi/L	52.5	51.0	1.03	A
			Cr-51	pCi/L	373	348	1.07	A
			Cs-134	pCi/L	157	165	0.95	A
			Cs-137	pCi/L	113	117	0.97	A
			Co-58	pCi/L	94.1	98.5	0.96	A
			Mn-54	pCi/L	116	116	1.00	A
			Fe-59	pCi/L	124	116	1.07	A
			Zn-65	pCi/L	190	186	1.02	A
			Co-60	pCi/L	172	170	1.01	A
	E10337A	AP	Ce-141	pCi	51.8	49.6	1.04	A
			Cr-51	pCi	372	338	1.10	A
			Cs-134	pCi	165	161	1.02	A
			Cs-137	pCi	113	114	0.99	A
			Co-58	pCi	96.5	95.8	1.01	A
			Mn-54	pCi	118	112	1.05	A
			Fe-59	pCi	105	112	0.94	A
			Zn-65	pCi	166	181	0.92	A
			Co-60	pCi	179	165	1.08	A

TABLE E-1 ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING, 2012
(PAGE 3 OF 3)

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
December 2012	E10336	Charcoal	I-131	pCi	73.1	72.7	1.01	A
	E10333	Water	Fe-55	pCi/L	1550	1750	0.89	A

(a) Teledyne Brown Engineering reported result.

(b) The Analytics known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(c) Ratio of Teledyne Brown Engineering to Analytics results.

(d) Analytics evaluation based on TBE internal QC limits: A= Acceptable. Reported result falls within ratio limits of 0.80-1.20. W-Acceptable with warning. Reported result falls within 0.70-0.80 or 1.20-1.30. N = Not Acceptable. Reported result falls outside the ratio limits of < 0.70 and > 1.30.

TABLE E-2 **ERA ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM**
TELEDYNE BROWN ENGINEERING, 2012
(PAGE 1 OF 1)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Limits	Evaluation (c)
May 2012	RAD-89	Water	Sr-89	pCi/L	63.4	58.5	46.9 - 66.3	A
			Sr-90	pCi/L	33.5	37.4	27.4 - 43.1	A
			Ba-133	pCi/L	89.2	82.3	69.1 - 90.5	A
			Cs-134	pCi/L	66.5	74.2	60.6 - 81.6	A
			Cs-137	pCi/L	152	155	140 - 172	A
			Co-60	pCi/L	73.3	72.9	65.6 - 82.6	A
			Zn-65	pCi/L	109	105	94.5 - 125	A
			Gr-A	pCi/L	82.4	62.9	33.0 - 78.0	N (1)
			Gr-B	pCi/L	43.6	44.2	29.6 - 51.5	A
			I-131	pCi/L	25.9	27.1	22.5 - 31.9	A
			H-3	pCi/L	15433	15800	13800 - 17400	A
	MRAD-16	Filter	Gr-A	pCi/filter	39.5	77.8	26.1 - 121	A
November, 2012	RAD-91	Water	Sr-89	pCi/L	46.5	39.1	29.7 - 46.1	N (2)
			Sr-90	pCi/L	16.6	20.1	14.4 - 23.8	A
			Ba-133	pCi/L	85.2	84.8	71.3 - 93.3	A
			Cs-134	pCi/L	76.9	76.6	62.6 - 84.3	A
			Cs-137	pCi/L	177	183	165 - 203	A
			Co-60	pCi/L	77.4	78.3	70.5 - 88.5	A
			Zn-65	pCi/L	209	204	184 - 240	A
			Gr-A	pCi/L	50.6	58.6	30.6 - 72.9	A
			Gr-B	pCi/L	59.3	39.2	26.0 - 46.7	N (2)
			I-131	pCi/L	22.9	24.8	20.6 - 29.4	A
			H-3	pCi/L	5020	4890	4190 - 5380	A
	MRAD-17	Filter	Gr-A	pCi/filter	59.6	87.5	29.3 - 136	A

(1) Detector G1 is slightly biased high for Th-230 based measurements used only for ERA Gross Alpha samples. NCR 12-05

(2) The Sr-89 found to known ratio was 1.19, which TBE considers acceptable. It appears the aliquot was entered incorrectly for the Gross Beta NCR 12-13

(a) Teledyne Brown Engineering reported result.

(b) The ERA known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(c) ERA evaluation: A=acceptable. Reported result falls within the Warning Limits. NA=not acceptable. Reported result falls outside of the Control Limits. CE=check for Error. Reported result falls within the Control Limits and outside of the Warning Limit.

TABLE E-3 DOE'S MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)
TELEDYNE BROWN ENGINEERING, 2012
(PAGE 1 OF 2)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
March 2012	12-MaW26	Water	Cs-134	Bq/L	-0.0045		(1)	A
			Cs-137	Bq/L	37.5	39.9	27.9 - 51.9	A
			Co-57	Bq/L	30.8	32.9	23.0 - 42.8	A
			Co-60	Bq/L	22.4	23.72	16.60 - 30.84	A
			H-3	Bq/L	456	437	306 - 568	A
			Mn-54	Bq/L	31.0	31.8	22.3 - 41.3	A
			K-40	Bq/L	144	142	99 - 185	A
			Sr-90	Bq/L	-0.0084		(1)	A
			Zn-65	Bq/L	-0.369		(1)	A
	12-GrW26	Water	Gr-A	Bq/L	2.06	2.14	0.64 - 3.64	A
			Gr-B	Bq/L	7.48	6.36	3.18 - 9.54	A
	12-MaS26	Soil	Cs-134	Bq/kg	831	828	580 - 1076	A
			Cs-137	Bq/kg	0.145		(1)	A
			Co-57	Bq/kg	1270	1179	825 - 1533	A
			Co-60	Bq/kg	7.61	1.56	(2)	N (3)
			Mn-54	Bq/kg	634	558	391 - 725	A
			K-40	Bq/kg	1690	1491	1044 - 1938	A
			Sr-90	Bq/kg	328	392	274 - 540	A
			Zn-65	Bq/kg	753	642	449 - 835	A
	12-RdF26	AP	Cs-134	Bq/sample	2.31	2.38	1.67 - 3.09	A
			Cs-137	Bq/sample	2.15	1.79	1.25 - 2.33	W
			Co-57	Bq/sample	-0.0701		(1)	A
			Co-60	Bq/sample	2.62	2.182	1.527 - 2.837	W
			Mn-54	Bq/sample	4.13	3.24	2.27 - 4.21	W
			Sr-90	Bq/sample	0.0185		(1)	A
			Zn-65	Bq/sample	4.19	2.99	2.09 - 3.89	N (3)
	12-GrF26	AP	Gr-A	Bq/sample	0.365	1.2	0.4 - 2.0	A
			Gr-B	Bq/sample	2.31	2.4	1.2 - 3.6	A
	12-RdV26	Vegetation	Cs-134	Bq/sample	8.72	8.43	5.90 - 10.96	A
			Cs-137	Bq/sample	0.0424		(1)	A
			Co-57	Bq/sample	15.5	12.0	8.4 - 15.6	W
			Co-60	Bq/sample	6.80	6.05	4.24 - 7.87	A
			Mn-54	Bq/sample	0.0057		(1)	A
			Sr-90	Bq/sample	2.24	2.11	1.48 - 2.74	A
			Zn-65	Bq/sample	10.5	8.90	6.23 - 11.57	A
September 2012	12-MaW27	Water	Cs-134	Bq/L	21.4	23.2	16.2 - 30.2	A
			Cs-137	Bq/L	17.0	16.7	11.7 - 21.7	A
			Co-57	Bq/L	28.7	29.3	20.5 - 38.1	A
			Co-60	Bq/L	0.179		(1)	A
			H-3	Bq/L	387	334	234 - 434	A
			Mn-54	Bq/L	18.1	17.8	12.5 - 23.1	A
			K-40	Bq/L	139	134	94 - 174	A
			Sr-90	Bq/L	19.6	12.2	8.5 - 15.9	N (4)
			Zn-65	Bq/L	27.2	25.9	18.1 - 33.7	A
	12-GrW27	Water	Gr-A	Bq/L	0.966	1.79	0.54 - 3.04	A
			Gr-B	Bq/L	10.0	9.1	4.6 - 13.7	A

TABLE E-3 DOE'S MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP)
TELEDYNE BROWN ENGINEERING, 2012
(PAGE 2 OF 2)

Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
September 2012	12-MaS27	Soil	Cs-134	Bq/kg	880	939	657 - 1221	A
			Cs-137	Bq/kg	1220	1150	805 - 1495	A
			Co-57	Bq/kg	1330	1316	921 - 1711	A
			Co-60	Bq/kg	552	531	372 - 690	A
			Mn-54	Bq/kg	1000	920	644 - 1196	A
			K-40	Bq/kg	674	632	442 - 822	A
			Sr-90	Bq/kg	528	508	356 - 660	A
			Zn-65	Bq/kg	665	606	424 - 788	A
	12-RdF27	AP	Cs-134	Bq/sample	2.760	2.74	1.92 - 3.56	A
			Cs-137	Bq/sample	0.0415		(1)	A
			Co-57	Bq/sample	2.00	191.00	1.34 - 2.48	A
			Co-60	Bq/sample	1.78	1.728	1.210 - 2.246	A
			Mn-54	Bq/sample	2.40	2.36	1.65 - 3.07	A
			Sr-90	Bq/sample	0.931	1.03	0.72 - 1.34	A
			Zn-65	Bq/sample	-0.688		(1)	A
	12-GrF27	AP	Gr-A	Bq/sample	0.434	0.97	0.29 - 1.65	A
			Gr-B	Bq/sample	1.927	1.92	0.96 - 2.88	A
	12-RdV27	Vegetation	Cs-134	Bq/sample	6.28	6.51	4.56 - 8.46	A
			Cs-137	Bq/sample	4.62	4.38	3.07 - 5.69	A
			Co-57	Bq/sample	6.51	5.66	3.96 - 7.36	A
			Co-60	Bq/sample	5.32	5.12	3.58 - 6.66	A
			Mn-54	Bq/sample	3.59	3.27	2.29 - 4.25	A
			Sr-90	Bq/sample	0.0012		(1)	A
			Zn-65	Bq/sample	-0.046		(1)	A

(1) False positive test.

(2) Sensitivity evaluation

(3) No cause was found for the failed high soil Co-60 sensitivity test or the high Zn-65 in AP, which TBE considers an anomaly. NCR 12-08

(4) Sr-90 in water high due to incorrect aliquot entered in LIMS. 12-11

(a) Teledyne Brown Engineering reported result.

(b) The MAPEP known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(c) DOE/MAPEP evaluation: A=acceptable, W=acceptable with warning, N=not acceptable.

TABLE E-4 **ERA (a) STATISTICAL SUMMARY PROFICIENCY TESTING PROGRAM[a]**
ENVIRONMENTAL, INC., 2012

Lab Code	Date	Concentration (pCi/L)				
		Analysis	Laboratory Result [b]	ERA Result [c]	Control Limits	Acceptance
ERW-1783	04/09/12	Sr-89	62.2 ± 6.0	58.5	46.9 - 66.3	Pass
ERW-1783	04/09/12	Sr-90	33.7 ± 2.1	37.4	27.4 - 43.1	Pass
ERW-1786	04/09/12	Ba-133	75.7 ± 4.1	82.3	69.1 - 90.5	Pass
ERW-1786	04/09/12	Co-60	71.9 ± 4.0	72.9	65.6 - 82.6	Pass
ERW-1786	04/09/12	Cs-134	70.0 ± 4.3	74.2	60.6 - 81.6	Pass
ERW-1786	04/09/12	Cs-137	151.5 ± 6.1	155.0	140.0 - 172.0	Pass
ERW-1786	04/09/12	Zn-65	108.3 ± 89.0	105.0	94.5 - 125.0	Pass
ERW-1789	04/09/12	Gr. Alpha	55.0 ± 2.4	62.9	33.0 - 78.0	Pass
ERW-1789 [d]	04/09/12	Gr. Beta	76.2 ± 1.8	44.2	29.6 - 51.5	Fail
ERW-1798	04/09/12	H-3	16023 ± 355	15800	13800 - 17400	Pass
ERW-6283	10/05/12	Sr-89	41.5 ± 4.1	39.1	29.7 - 46.1	Pass
ERW-6283	10/05/12	Sr-90	19.7 ± 1.6	20.1	14.4 - 23.8	Pass
ERW-6286	10/05/12	Ba-133	82.7 ± 4.4	84.8	71.3 - 93.3	Pass
ERW-6286	10/05/12	Co-60	77.2 ± 3.7	78.3	70.5 - 88.5	Pass
ERW-6286	10/05/12	Cs-134	74.4 ± 1.5	76.6	62.6 - 84.3	Pass
ERW-6286	10/05/12	Cs-137	183.0 ± 6.2	183.0	165.0 - 203.0	Pass
ERW-6286	10/05/12	Zn-65	211.0 ± 9.9	204.0	184.0 - 240.0	Pass
ERW-6288	10/05/12	Gr. Alpha	47.0 ± 2.3	58.6	30.6 - 72.9	Pass
ERW-6288	10/05/12	Gr. Beta	33.4 ± 1.2	39.2	26.0 - 46.7	Pass
ERW-6290	10/05/12	I-131	23.3 ± 1.0	24.8	20.6 - 29.4	Pass

[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.

[d] Result of reanalysis: 38.3 ± 1.3 pCi/L. Sample dilution problem suspected. A new dilution was prepared.

TABLE E-5 DOE'S MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP) ENVIRONMENTAL, INC., 2012

			Concentration [a]			
Lab Code [b]	Date	Analysis	oratory result	Known Activity	Control Limits [c]	Acceptance
STSO-1766	02/01/12	Co-57	1352.10 ± 4.00	1179.00	825.00 - 1533.00	Pass
STSO-1766	02/01/12	Co-60	1.70 ± 0.70	1.56	1.00 - 2.00	Pass
STSO-1766	02/01/12	Cs-134	842.20 ± 4.30	828.00	580.00 - 1076.00	Pass
STSO-1766	02/01/12	Cs-137	0.40 ± 0.90	0.00	0.00 - 1.00	Pass
STSO-1766	02/01/12	K-40	1729.60 ± 22.20	1491.00	1044.00 - 1938.00	Pass
STSO-1766	02/01/12	Mn-54	647.60 ± 4.20	558.00	391.00 - 725.00	Pass
STSO-1766	02/01/12	Sr-90	383.20 ± 15.30	392.00	274.00 - 510.00	Pass
STSO-1766	02/01/12	Zn-65	766.70 ± 6.70	642.00	449.00 - 835.00	Pass
STAP-1772	02/01/12	Co-57	0.010 ± 0.01	0.00	0.000 - 1.00	Pass
STAP-1772	02/01/12	Co-60	2.40 ± 0.08	2.18	1.53 - 2.84	Pass
STAP-1772	02/01/12	Cs-134	2.33 ± 0.13	2.38	1.67 - 3.09	Pass
STAP-1772	02/01/12	Cs-137	2.07 ± 0.10	1.79	1.25 - 2.33	Pass
STAP-1772	02/01/12	Mn-54	3.77 ± 0.14	3.24	2.27 - 4.21	Pass
STAP-1772	02/01/12	Sr-90	-0.010 ± 0.060	0.000	-0.10 - 0.13	Pass
STAP-1772	02/01/12	Zn-65	3.67 ± 0.20	2.99	2.09 - 3.89	Pass
STAP-1773	02/01/12	Gr. Alpha	0.51 ± 0.05	1.20	0.40 - 2.00	Pass
STAP-1773	02/01/12	Gr. Beta	2.75 ± 0.10	2.40	1.20 - 3.60	Pass
STVE-1776	02/01/12	Co-57	14.57 ± 0.28	12.00	8.40 - 15.60	Pass
STVE-1776	02/01/12	Co-60	6.45 ± 0.23	6.05	4.24 - 7.87	Pass
STVE-1776	02/01/12	Cs-134	8.39 ± 0.29	8.43	5.90 - 10.96	Pass
STVE-1776	02/01/12	Cs-137	0.01 ± 0.09	0.00	0.00 - 0.10	Pass
STVE-1776	02/01/12	Mn-54	0.03 ± 0.08	0.00	0.00 - 0.10	Pass
STVE-1776	02/01/12	Zn-65	10.31 ± 0.67	8.90	6.23 - 11.57	Pass
STW-1960	02/01/12	Gr. Alpha	1.68 ± 0.09	2.14	0.64 - 3.64	Pass
STW-1960	02/01/12	Gr. Beta	6.33 ± 0.10	6.36	3.18 - 9.54	Pass
STW-1964	02/01/12	Co-57	33.30 ± 0.40	32.90	23.00 - 42.80	Pass
STW-1964	02/01/12	Co-60	23.20 ± 0.40	23.72	16.60 - 30.84	Pass
STW-1964	02/01/12	Cs-134	0.30 ± 3.00	0.00	0.00 - 1.00	Pass
STW-1964	02/01/12	Cs-137	40.10 ± 0.60	39.90	27.90 - 51.90	Pass
STW-1964	02/01/12	H-3	460.00 ± 12.10	437.00	306.00 - 568.00	Pass
STW-1964	02/01/12	K-40	153.00 ± 4.20	142.00	99.00 - 185.00	Pass
STW-1964	02/01/12	Mn-54	32.70 ± 0.60	31.80	22.30 - 41.30	Pass
STW-1964	02/01/12	Sr-90	0.10 ± 0.20	0.00	0.00 - 1.00	Pass
STW-1964	02/01/12	Zn-65	0.01 ± 0.20	0.00	0.00 - 1.00	Pass

TABLE E-5 DOE'S MIXED ANALYTE PERFORMANCE EVALUATION PROGRAM (MAPEP) ENVIRONMENTAL, INC., 2012

			Concentration [a]			
Lab Code [b]	Date	Analysis	oratory result	Known Activity	Control Limits [c]	Acceptance
STSO-5392	08/01/12	Sr-90	483.52 ± 16.47	508.00	356.00 - 660.00	Pass
STSO-5394	08/01/12	Co-57	1528.00 ± 4.10	1316.00	921.00 - 1711.00	Pass
STSO-5394	08/01/12	Co-60	592.00 ± 3.20	531.00	372.00 - 690.00	Pass
STSO-5394	08/01/12	Cs-134	933.60 ± 5.82	939.00	657.00 - 1221.00	Pass
STSO-5394	08/01/12	Cs-137	1319.80 ± 5.50	1150.00	805.00 - 1495.00	Pass
STSO-5394	08/01/12	K-40	737.30 ± 17.70	632.00	442.00 - 822.00	Pass
STSO-5394	08/01/12	Mn-54	1083.20 ± 5.20	920.00	644.00 - 1196.00	Pass
STSO-5394	08/01/12	Zn-65	696.10 ± 7.00	606.00	424.00 - 788.00	Pass
STVE-5395 [d]	08/01/12	Co-57	7.44 ± 0.17	5.66	3.96 - 7.36	Fail
STVE-5395	08/01/12	Co-60	5.90 ± 0.15	5.12	3.58 - 6.66	Pass
STVE-5395	08/01/12	Cs-134	7.40 ± 0.31	6.51	4.56 - 8.46	Pass
STVE-5395	08/01/12	Cs-137	5.45 ± 0.18	4.38	3.07 - 5.69	Pass
STVE-5395	08/01/12	Mn-54	4.06 ± 0.21	3.27	2.29 - 4.25	Pass
STAP-5398	08/01/12	Gr. Alpha	0.41 ± 0.05	0.97	0.29 - 1.65	Pass
STAP-5398	08/01/12	Gr. Beta	2.11 ± 0.09	1.92	0.96 - 2.88	Pass
STAP-5403	08/01/12	Co-57	1.96 ± 0.05	1.91	1.34 - 2.48	Pass
STAP-5403	08/01/12	Co-60	1.76 ± 0.07	1.73	1.21 - 2.25	Pass
STAP-5403	08/01/12	Cs-134	2.74 ± 0.18	2.74	1.92 - 3.56	Pass
STAP-5403	08/01/12	Cs-137	0.00 ± 0.03	0.00	-0.01 - 0.01	Pass
STAP-5403	08/01/12	Mn-54	2.52 ± 0.10	2.36	1.65 - 3.07	Pass
STAP-5403	08/01/12	Zn-65	0.01 ± 0.06	0.00	-0.010 - 0.010	Pass

[a] Results are reported in units of Bq/kg (soil), Bq/L (water) or Bq/total sample (filters, vegetation).

[b] Laboratory codes as follows: STW (water), STAP (air filter), STSO (soil), STVE (vegetation).

[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. A known value of "zero" indicates an analysis was included in the testing series as a "false positive". MAPEP does not provide control limits.

[d] Result of reanalysis; 6.74 ± 0.15 Bq/sample. Gamma emitters for the vegetation matrix exhibited a high bias, only Co-57 exceeded acceptance limits. Recounted using a geometry more closely matched to the MAPEP sample size.

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APPENDIX F

ANNUAL RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM REPORT (ARGPPR)