Exelon Generation®

Three Mile Island Nuclear Station, Unit 1
441 S. P.O. Box 480
Middletown, PA 17057

TMI-21-019

April 27, 2021

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Three Mile Island Nuclear Station, Unit 1
Renewed Facility License No. DPR-50
NRC Docket Nos. 50-289

Three Mile Island Nuclear Station, Unit 2
Possession Only License No. DPR-73
NRC Docket No. 50-320

Subject: 2020 Annual Radiological Environmental Operating Report

In accordance with TMI-1 Technical Specification 6.9.2.1 and TMI-2 Technical Specification 6.8.1.1, enclosed is the Annual Radiological Environmental Operating Report covering the time period for January 1 through December 31, 2019, for the Three Mile Island Nuclear Station.

There are no commitments in this letter.

Should you have any questions concerning this letter, please contact Mr. Daniel Jordan, Chemistry/Environmental Specialist, at (717) 948-8470.

Respectfully,

Trevor L. Orth
Site Decommissioning Director
Three Mile Island Nuclear Station, Unit 1

Attachment: Three Mile Island 2020 Annual Radiological Environmental Operating Report

cc: w/ Attachment

Regional Administrator – NRC Region I
NRC Project Manager, NMSS – Three Mile Island, Unit 1 and Unit 2
W. DeHaas – Commonwealth of Pennsylvania - Bureau of Radiation Protection
G. Van Noordennen – TMI-2 Solutions, LLC

Docket No: 50-289
50-320

THREE MILE ISLAND NUCLEAR STATION
UNITS 1 AND 2

Annual Radiological
Environmental Operating Report

1 January through 31 December 2020

Prepared By
Teledyne Brown Engineering
Environmental Services

Three Mile Island Nuclear Station
Middletown, PA 17057

April 2021

Intentionally left blank

Table Of Contents

Appendices

Intentionally Left Blank

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 2020 through 31 December 2020. During that time period, 1,650 analyses were performed on 1,304 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 iodine-131 (I-131). Drinking and effluent water samples were also analyzed for concentrations of gross beta. Effluent water samples were analyzed for concentrations of strontium-89 (Sr-89) and strontium-90 (Sr-90). All groundwater, precipitation water, and stormwater results are reported in the ARGPPR, Appendix F. No I-131, Sr-89 or Sr-90 activities were detected. Gross beta concentrations detected were consistent with those detected in previous years. Tritium activity in 5 surface water samples and 8 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 or in sediment samples.

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 beryllium-7 (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. Concentrations of naturally-occurring potassium-40 (K-40) were consistent with those detected in previous years. No I-131, Sr-89 or Sr-90 activities were detected. Occasionally Sr-90 activity may be detected. These results have been is consistent with results 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. 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 resulted in a slight change in process and reporting of quarterly results. 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 2020 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 2020 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 Exelon Industrial Services (EIS)/GEL Laboratories on samples collected during the period 1 January 2020 through 31 December 2020.

A. Objectives 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 in-plant 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.

Intentionally left blank

III. Program Description

A. Sample Collection

Samples for the TMINS REMP were collected for Exelon by Exelon Industrial Services, LLC (EIS) and Normandeau Associates, Inc. (NAI). This section describes the general collection methods used by EIS & NAI to obtain environmental samples for the TMINS REMP in 2020. 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 EIS & NAI 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 two surface water locations (J1-2 and Q9-1), three drinking water locations (G15-2, G15-3 and Q9-1), and one effluent water location (K1-1). A composite of weekly grab samples at one surface water location (A3-2) were collected. The control locations were A3-2 and Q9-1. All groundwater and storm water results are 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). Location A1-3 was the control.

Atmospheric Environment

The atmospheric environment was evaluated by performing radiological analyses on samples of air particulates and airborne iodine. 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 four locations (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 from June through September 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. Three different kinds of vegetation samples and twelve different kinds of vegetation leaves were collected, 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 22½ 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 3-6 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 EIS to analyze the environmental samples for radioactivity for the TMINS REMP in 2020. 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. <u>Lower Limit of Detection and Minimum Detectable Concentration</u>

   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 MDC's were reported.

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

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

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

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

For food products five nuclides, Be-7, K-40, I-131, Cs-134 and Cs-137 MDC's 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 2020, the TMINS REMP had a sample recovery rate of 100%. Issue Reports (IR) were initiated to document significant exceptions and missing samples. All exceptions are listed below:

Water

1. G15-2 (Drinking Water)

   For the sampling period 3/21/20 - 3/28/20, no water sample was collected. For the sampling period 03/28/20 - 04/04/20, a grab sample was collected due to no access to set up sampler the prior week. (IR 04347697)

2. Q9-1 (Surface Water and Drinking Water)

   For the sampling period 3/28/20 - 4/4/20, samplers were not set back up for collection due to no access to plant for visitors. No sample obtained. (IR 04347697)

3. Q9-1 (Surface Water and Drinking Water)

   For the sampling periods 4/4/20 - 7/4/20, 7/4/20 - 10/3/20 and 10/3/20 - 1/2/21, composite samplers were not set back up for collection due to no access to plant for visitors. Weekly grab samples were collected by a plant worker at both locations and used to make a monthly composite. (IR's 04370872, 04390216 and 04405601)

Dosimetry

1. E1-2

   For the sampling period 9/15/20 - 1/5/21, the field tech upon arrival found that the 3rd dosimeter was missing. The two main dosimeters of legal record were still inside the bracket, but the 3rd (QA) dosimeter (#EX00041993L) was missing. The field tech did a complete sweep of the area, but nothing was found. Reference IR 04394059. (IR 04405601)

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

There were no changes to the program in 2020.

Intentionally left blank

IV. Results and Discussion

A. Aquatic Environment

1. Surface Water

Samples were taken weekly from a continuous sampler at two locations (J1-2 and Q9-1) and weekly grab samples from one location (A3-2). Weekly samples were 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 10 of 12 samples at location J1-2, which is located immediately downstream of the TMINS effluent outfall. The concentrations ranged from 426 to 2,910 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 were taken from location A3-2. 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. Monthly samples were taken from A3-2 and analyzed for I-131. (Table C–I.2, Appendix C). I-131 activity was not detected in any samples.

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 18 of 36 samples. The concentrations ranged from 1.9 to 5.3 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. I-131 activity was not detected in any sample.
(Table C–II.2, Appendix C)

Tritium

Monthly samples from all locations were analyzed for tritium activity (Table C–II.3, Appendix C). Tritium was not detected in any sample.
(Figures C–4, Appendix C)

Gamma Spectrometry

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

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. Gross beta was detected in 7 of 12 samples. The concentrations ranged from 2.5 to 3.6 pCi/L. Concentrations detected were consistent with those detected in previous years.
(Tables C–III.1, Appendix C)

Iodine-131

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

Tritium

Monthly samples from location K1-1 were analyzed for tritium activity. Tritium activity was detected in 10 of 12 samples. The concentrations ranged from 4,030 to 20,000 pCi/L. (Table C–III.1, Appendix C)
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. (Figure C-4, Appendix C)

Strontium

Semiannual composite samples from location K1-1 were analyzed for Sr-89 and Sr-90. No strontium activity was detected. The highest MDC was calculated at <4.7 pCi/L for Sr-89 and at <0.9 pCi/L for Sr-90. (Table C–III.1, Appendix C)

Gamma Spectrometry

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

4. Storm Water

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

5. Ground Water

   Groundwater results are 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. No strontium activity was detected. The highest MDC was calculated at <4.7 pCi/kg wet for Sr-90. (Table C–IV.1, Appendix C)

   Gamma Spectrometry

   The edible portions of fish samples from both locations were analyzed for gamma-emitting nuclides. Naturally-occurring K-40 was found in all fish samples. Concentrations ranged from 2,538 to 4,277 pCi/kg wet and was consistent with levels detected in previous years. No fission or activation products were detected. (Table C–IV.2, Appendix C)

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. Potassium-40 was found in all sediment samples and ranged from 6,795 to 12,280 pCi/kg dry. Cs-137 is occasionally found in sediment at very low levels (just above LLD) and is not distinguishable from background levels. (Figure C–5, Appendix C) No other fission or activation products were detected.
(Table C–V.1, 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. Detectable gross beta activity was observed at all locations. (Table C–VI.1 and C–VI.2, Appendix C)

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 28E–3 pCi/m^3 with a mean of 13E–3 pCi/m^3. The results from the intermediate offsite locations (Group II) ranged from 5 to 29E–3 pCi/m^3 with a mean of 13E–3 pCi/m^3. The results from the Control location (Group III) ranged from 6 to 28E–3 pCi/m^3 with a mean of 15E–3 pCi/m^3. Comparison of the 2020 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 2020 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. Naturally-occurring Be-7 due to cosmic ray activity was detected in all 28 samples. These concentrations ranged from 39 to 88E–3 pCi/m3. All other nuclides were less than MDC. (Table C–VI.3, Appendix C)

b. 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. All results were less than the MDC for I-131. (Table C–VII.1, Appendix C)

2. Terrestrial

a. Milk

Samples were collected from four locations (K15-3, 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. All results were less than the MDC. (Table C-VIII.1, Appendix C)

Strontium

Milk samples from all locations were composited quarterly and analyzed for Sr-89 and Sr-90. No Sr-89 or Sr-90 activity was detected. (Table C–VIII.2, Appendix C) The results are 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. Naturally-occurring K-40 activity was found in all samples. The concentrations ranged from 777 to 1,625 pCi/L. All other nuclides were less than the MDC. (Table C-VIII.3, Appendix C).

b. Food Products

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 E1-2). B10-2

was the control location for both annual and monthly sampling. The following analyses were performed:

Strontium

Six food product samples were analyzed for concentrations of Sr-90. No Sr-90 activity was detected in any sample. (Table C-IX.1, Appendix C)

Gamma Spectrometry

Each food product sample was analyzed for concentrations of gamma-emitting nuclides. Naturally-occurring Be-7 due to cosmic ray activity was detected in 15 of 42 samples with concentrations ranging from 444 to 1,5197pCi/kg. Naturally-occurring K-40 activity was found in all samples. The concentrations ranged from 1,310 to 8,717 pCi/kg. All other nuclides were less than the MDC. (Table C–IX.1, Appendix C)

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 32 mR/quarter, with a range of 11.1 to 31.1 mR/standard quarter. 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, and 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 2020 fall growing season around the Three Mile Island Nuclear Station (TMINS) was performed by Exelon Industrial Services (EIS) for Exelon to comply with TMI-2 Tech Spec 6.7.2.b and Section 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 22½ degree sectors around the site. The results of these surveys are summarized below:

Distance in Miles from the TMINS Reactor Buildings				
Sector		Residence Miles	Garden Miles	Milk Farm Miles
A	N	1.0	1.9	2.1
B	NNE	0.8	1.2	-
C	NE	0.5	1.1	4.2
D	ENE	0.5	0.5	4.5
E	E	0.4	0.5	1.1
F	ESE	1.1	0.5	3.2
G	SE	0.7	0.6	1.4
H	SSE	0.7	0.8	-
J	S	2.2	2.5	-
K	SSW	0.6	1.6	4.9, 14.4
L	SW	0.5	1.7	-
M	WSW	1.2	1.3	-
N	W	1.2	1.3	-
P	WNW	1.1	1.7	3.7
Q	NW	1.1	1.2	-
R	NNW	1.1	2.4	-

E. Radiological Impact of TMINS Operations

An assessment of potential radiological impact indicated that radiation doses to the public from 2020 operations at TMINS were well below all applicable regulatory limits and were significantly less than doses received from natural sources of radiation. The 2020 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 0.05 mrem. This dose is equivalent to 0.02% 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 a model that incorporates the guidelines and methodology set forth by the USNRC in Regulatory Guide 1.109 and NUREG 0133. 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.

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. The exposure pathways considered for the discharge of TMINS airborne effluents are plume exposure, inhalation, cow milk consumption, fruit and vegetable consumption, and meat consumption.

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).

2. Result of Dose Calculations

The maximum hypothetical doses due to 2020 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 2020 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 2020 TMI-1 and TMI-2 liquid and airborne effluents combined was conservatively calculated to be 0.05 mrem. This dose is equivalent to 0.02% 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 2020 TMINS operations were the result of efforts to maintain releases "as low as reasonably achievable" (ALARA).

In conclusion, radioactive materials related to 2020 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 2020 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 2020 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 2020 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	2.10E-02	4.74E-04
	10 any organ	2.69E-02	7.54E-04
From Radionuclides In Airborne Releases (Noble Gases)	5 total body, or	0*	0*
	15 skin	0*	0*
From Radionuclides In Airborne Releases (Iodines, Tritium and Particulates)	15 any organ	2.39E-02	4.62E-05

*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	0.034
	25 total body or other organs	0.052

* *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 2020 TMINS operations was 0.00 mrem/yr based on calculations from ANSI/HI Standard N13.37.

TABLE 2

Calculated Whole Body Doses to the Maximum Individual from 2020 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	2.10E-02	4.74E-04
From Radionuclides in Airborne Releases (Noble Gases)	0*	0*
From Radionuclides In Airborne Releases (Iodines, Tritium and Particulates)	2.39E-02	4.62E-05

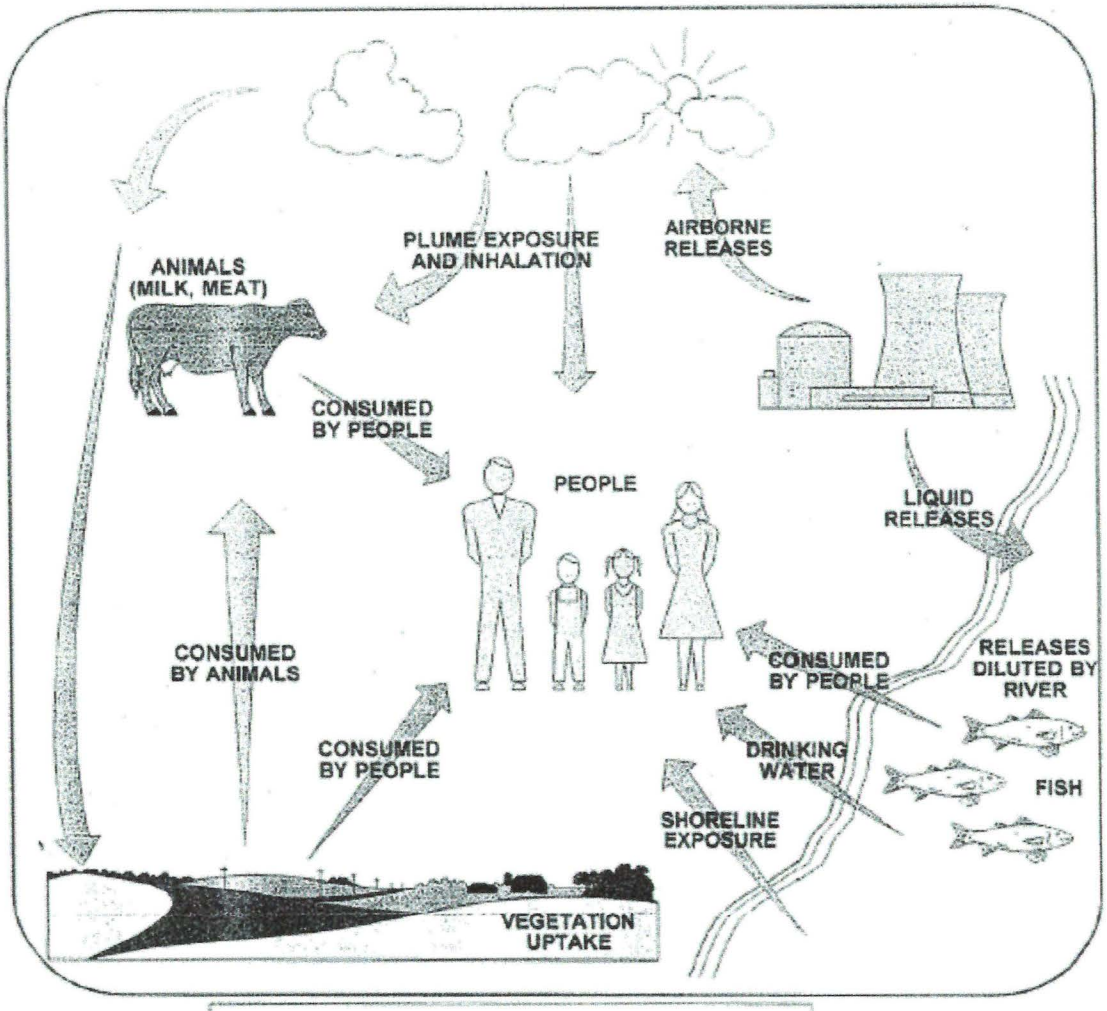
*No noble gases were released from TMI-2.

Individual Whole Body Dose Due to TMI-1 and TMI-2 Operations:	0.05 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. Errata Data

In the 2019 AEROR, an incorrect Issue Report number (IR 4240350) was referenced for a missed surface water sample at Station J1-2 due to the sample line being pulled into the river and disconnected. The correct IR number should have been IR 4240530.

G. Summary of Results – Inter-Laboratory Comparison Program

The primary and other 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.

   Note: The Department of Energy (DOE) Mixed Analyte Performance Evaluation Program (MAPEP) samples are created to mimic conditions found at DOE sites which do not resemble typical environmental samples obtained at commercial nuclear power facilities.

For the TBE laboratory, 126 out of 133 analyses performed met the specified acceptance criteria. Seven analyses did not meet the specified acceptance criteria for the following reasons and were addressed through the TBE Corrective Action Program:

1. The MAPEP February 2020 AP U-233/234 and U-238 results were evaluated as *Not Acceptable*. The reported value for U-233/234 was 0.0416 ± 0.0102 Bq/sample and the known result was 0.075 Bq/sample (acceptance range 0.053 - 0.098). The reported value for U-238 was 0.0388 ± 0.00991 Bq/sample and the known result was 0.078 Bq/sample (acceptance range 0.055 - 0.101). This sample was run as the workgroup duplicate and had RPD's of 10.4% (U-234) and 11.7% (U-238). After the known results were obtained, the sample was relogged. The filter was completely digested with tracer added originally; the R1 results were almost identical. It was concluded that the recorded tracer amount was actually double, causing the results to be skewed. Lab worksheets have been modified to verify actual tracer amount vs. LIMS data. TBE changed vendors for this cross-check to ERA MRAD during the 2nd half of 2020. Results were acceptable at 97.8% for U-234 and 106% for U-238. (NCR 20-13)

2. The Analytics September 2020 milk Sr-89 result was evaluated as *Not Acceptable*. The reported value was 62.8 pCi/L and the known result was 95.4 (66%). All QC data was reviewed and there were no anomalies. This was the first failure for milk Sr-89 since 2013 and there have only been 3 upper/lower boundary warnings since that time. It is believed that there may have been some Sr-89 loss during sample prep. The December 2020 result was at 92% of the known. (NCR 20-19)

3. The ERA October 2020 water I-131 result was evaluated as *Not Acceptable*. The reported value was 22.9 pCi/L and the known result was 28.2 (acceptance range 23.5 - 33.1). The reported result was 81% of the known, which passes TBE QC criteria. This was the first failure for water I-131. (NCR 20-17)

4. The ERA October 2020 water Gross Alpha and Gross Beta results were evaluated as *Not Acceptable*. The reported/acceptable values and ranges are as follows:

	Reported	Known	Range
Gross Alpha	40.0	26.2	13.3 - 34.7
Gross Beta	47.5	69.1	48.0 - 76.0

   All QC data was reviewed with no anomalies and a cause for failure could not be determined. This was the first failure for water Gross Beta. A Quick Response follow-up cross-check was analyzed as soon as possible with acceptable results at 96.8% for Gross Alpha and

102% for Gross Beta. (NCR 20-18)

5. The MAPEP August 2020 soil Ni-63 result was evaluated as *Not Acceptable*. The reported value was 438 ± 21.1 Bq/kg and the known result was 980 Bq/kg (acceptance range 686 - 1274). It is believed that some Ni-63 loss occurred during the sample prep step. (NCR 20-20)

For the secondary QC samples, EIS laboratory, analyzed gross beta, gramma, and I-131 for TMINS. For the EIS Laboratory, 158 out of 162 analyses performed met the specified NRC Resolution Test Criteria (NRC Inspection Manual, Inspection Procedure 84750, March 15, 1994). The EIS Laboratory's results are reported with 2-sigma uncertainty. When evaluating with the NRC Resolution Test, a 1-sigma uncertainty is used to determine Pass or Fail. Failures have been entered into the Corrective Action Program for tracking and to prevent future occurrence. Failures are summarized below:

1. The ERA April 2020 reported Gross Beta result was 43.3 pCi/L and the known was 60.5 pCi/L (acceptance range was 41.7 - 67.2 pCi/L). Although the reported result passed the low end of the vendor acceptance criteria, but failed NRC Resolution Test Criteria. It was determined that glassware used in preparation is cleaned with nitric acid except for the volumetric pipets, which are rinsed with DI water only. The glass is potentially not as clean and could retain microdroplets of activity on the glass. Going forward, volumetric pipets are rinsed with nitric acid to remove mineral deposit and activity that might be retained on the glass during use and preventing a clean delivery of the sample.
2. The Analytics (EZA) December 2020 result for AP filter and milk Zn-65 were evaluated as failing. The reported result and known are :

	Reported	Known
AP (Detector 2)	105 pCi	149 pCi
AP (Detector 5)	111 pCi	149 pCi
Milk	135 pCi/L	190 pCi/L

The failure was due to an error in mapping the raw data cell to the calculated data cell in the evaluation spreadsheet. The spreadsheet was peer-reviewed and verified. The cell was mapped to the Co-60 raw data instead of the Zn-65 raw data. Had the cell been mapped correctly, the result and uncertainty would have passed NRC acceptance criteria with less than 10% difference from the True value.

For the secondary QC samples, GEL laboratory analyzed only H-3 and (water matrix) for TMINS REMP & RGPP. GEL also analyzed Sr-89/90, gross alpha and gamma nuclides for the RGPP. For these analyses, 94 of

101 cross-check samples met the specified acceptance criteria. Failures were addressed through GEL's Corrective Action Program and the pertinent failures are described below:

1. CARR 190225-1192 - ERA 1st quarter 2020 (RAD-120) water:

   a. The H-3 reported value of 15,200 pCi/L were evaluated as *Not Acceptable*. The known result was 17,800 pCi/L with an acceptance range of 15,600 - 19,600 pCi/L. All data and lab processes were evaluated and no errors were found. It was concluded that the low bias was an isolated occurrence and that the overall process is within control.

   b. Two Sr-89 results were evaluated as *Not Acceptable*. The reported values were 73.3 pCi/L and 70.8 pCi/L. The known result was 59.3 pCi/L, with an acceptance range of 47.6 - 67.1 pCi/L. A review of the data as well as of the preparation processes did not reveal any errors or possible contributors to the high bias. In addition, the reported values are 117% and 114% of the reference value, which is within the lab's standard acceptance criteria of +/- 25% for Laboratory Control Samples.

   c. The I-131 reported value of 23.7 pCi/L was evaluated as *Not Acceptable*. The known result was 29.9 pCi/L with an acceptance range of 24.9 - 34.9 pCi/L. The laboratory reviewed the data and found no errors. All batch QA samples including a duplicate, met acceptability criteria. The lab will continue to investigate all steps of the analytical process.

      No permanent corrective actions/preventative actions or improvements were needed at this time. The lab must assume unidentified random errors caused the biases because all quality control criteria were met in the batch. Subsequent analyses of these isotopes for drinking water were acceptable in other PT samples during the year.

2. Two ERA 2nd quarter 2020 water Sr-89 results were evaluated as *Not Acceptable*. The reported values were 68.8 and 71.6 pCi/L and the known result was 60.1 pCi/L (acceptance range of 48.3 - 67.9 pCi/L). No Corrective Action information was included in the 2020 QA Report.

3. CARR 200902-1287 - The ERA 3rd quarter 2020 water Co-60 result was evaluated as *Not Acceptable*. The reported value was 97.9 pCi/L and the known result was 86.1 pCi/L (acceptance range of 77.5 - 97.0 pCi/L). The data was reviewed and no anomalies were noted. The batch duplicate result from the original analysis met the

acceptance criteria of the study and replication criteria of the lab with RPDs of <10%. Laboratory processes were evaluated and no gross errors were found. The other reported analytes for this method were within the limits of the study (except for Ba-133). A definitive contributor to the slightly high bias could not be identified, concluding that this was an isolated occurrence

No permanent corrective actions/preventative actions or improvements were needed at this time. The lab will continue to monitor the recoveries to ensure that there are no continued process issues.

The Inter-Laboratory Comparison Program provides evidence of "in control" counting systems and methods, and that the laboratories are producing accurate and reliable data. Interlaboratory Comparison results may be found in Appendix E.

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

Intentionally left blank

Intentionally left blank

Intentionally left blank

APPENDIX A

RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT SUMMARY

Intentionally left blank

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE THREE MILE ISLAND NUCLEAR STATION, 2020

NAME OF FACILITY: THREE MILE ISLAND NUCLEAR STATION **DOCKET NUMBER: 50-289 & 50-320**

LOCATION OF FACILITY: MIDDLETOWN COUNTY, PA **REPORTING PERIOD: 2020**

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
SURFACE WATER *(PCI/LITER)*	**H-3**	24	**2000**	1082 (10/12) *426 - 2910*	<LLD	1082 (10/12) *426 - 2910*	J1-2 INDICATOR DOWNSTREAM OF TMINS LIQUID DISCHARGE OUTFALL 0.5 MILES S OF SITE	0
	I-131	12	**1**	NA	<LLD	-		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
	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**	3.1 (15/24) *2.0 - 5.3*	3.3 (5/12) *1.9 - 4.1*	3.8 (5/12) *1.9 - 4.1*	Q9-1 CONTROL STEELTON WATER COMPANY 8.5 MILES NW OF SITE	0
	I-131	36	**1**	<LLD	<LLD	-		0
	H-3	36	**2000**	<LLD	<LLD	-		0
	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
	CS-137		**18**	<LLD	<LLD	-		0
	BA-140		**60**	<LLD	<LLD	-		0
	LA-140		**15**	<LLD	<LLD	-		0

(M) *The Mean Values are calculated using the positive values.* ***(F)*** *Fraction of detectable measurement are indicated in parentheses.*

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE THREE MILE ISLAND NUCLEAR STATION, 2020

NAME OF FACILITY: THREE MILE ISLAND NUCLEAR STATION **DOCKET NUMBER: 50-289 & 50-320**

LOCATION OF FACILITY: MIDDLETOWN COUNTY, PA **REPORTING PERIOD: 2020**

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
EFFLUENT WATER *(PCI/LITER)*	**GR-B**	12	**4**	2.9 (7/12) *2.5 - 3.6*	NA	2.9 (7/12) *2.5 - 3.6*	K1-1 INDICATOR RML-7 MAIN STATION DISCHARGE BLDG 0.2 MILES ONSITE	0
	I-131 (LOW LVL)	12	**1**	<LLD	NA	-		0
	H-3	12	**2000**	11454 (10/12) *4030 - 20000*	NA	11454 (10/12) *4030 - 20000*	K1-1 INDICATOR RML-7 MAIN STATION DISCHARGE BLDG 0.2 MILES ONSITE	0
	SR-89	2	**5**	<LLD	NA	-		0
	SR-90	2	**2**	<LLD	NA	-		0
	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
	CS-137		**18**	<LLD	NA	-		0
	BA-140		**60**	<LLD	NA	-		0
	LA-140		**15**	<LLD	NA	-		0
BOTTOM FEEDER *(PCI/KGWET)*	**SR-90**	4	**10**	<LLD	<LLD	-		0
	GAMMA	4						
	K-40		*NA*	2736 (2/2) *2538 - 2933*	2773 (2/2) *2671 - 2874*	2773 (2/2) *2671 - 2874*	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
	CO-60		**130**	<LLD	<LLD	-		0
	ZN-65		**260**	<LLD	<LLD	-		0
	CS-134		**130**	<LLD	<LLD	-		0
	CS-137		**150**	<LLD	<LLD	-		0

(M) *The Mean Values are calculated using the positive values.* ***(F)*** *Fraction of detectable measurement are indicated in parentheses.*

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE THREE MILE ISLAND NUCLEAR STATION, 2020

NAME OF FACILITY: THREE MILE ISLAND NUCLEAR STATION **DOCKET NUMBER: 50-289 & 50-320**

LOCATION OF FACILITY: MIDDLETOWN COUNTY, PA **REPORTING PERIOD: 2020**

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/KGWET)*	**SR-90**		4	**10**	<LLD	<LLD	-		0
	GAMMA		4						
		K-40		*NA*	3613 (2/2) *2948 - 4277*	3557 (2/2) *3456 - 3657*	3613 (2/2) *2948 - 4277*	INDP INDICATOR YORK HAVEN DAM DOWNSTREAM OF DISCHARGE	0
		MN-54		**130**	<LLD	<LLD	-		0
		CO-58		**130**	<LLD	<LLD	-		0
		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**		6						
		K-40		*NA*	9968 (4/4) *7858 - 12280*	7432 (2/2) *6795 - 8069*	11640 (2/2) *1100 - 12280*	J2-1 INDICATOR YORK HAVEN DAM 1.5 MILES S OF SITE	0
		MN-54		*NA*	<LLD	<LLD	-		0
		CO-58		*NA*	<LLD	<LLD	-		0
		CO-60		*NA*	<LLD	<LLD	-		0
		CS-134		**150**	<LLD	<LLD	-		0
		CS-137		**180**	<LLD	<LLD	-		0
AIR PARTICULATE *(E-3 PCI/CU.METER)*	**GR-B**		364	**10**	13 (311/313) *5 - 29*	15 (52/52) *6 - 28*	15 (52/52) *6 - 28*	Q15-1 CONTROL WEST FAIRVIEW FIRE DEPT SOCIAL HALL 13.4 MILES NW OF SITE	0
	GAMMA		28						
		BE-7		*NA*	67 (24/24) *38 - 94*	68 (4/4) *56 - 80*	70 (4/4) *59 - 81*	M2-1 INDICATOR FISHING CREEK; GOLDSBORO 1.3 MILES WSW OF SITE	0
		MN-54		*NA*	<LLD	<LLD	-		0
		CO-58		*NA*	<LLD	<LLD	-		0
		CO-60		*NA*	<LLD	<LLD	-		0
		NB-95		*NA*	<LLD	<LLD	-		0
		ZR-95		*NA*	<LLD	<LLD	-		0
		CS-134		**50**	<LLD	<LLD	-		0
		CS-137		**60**	<LLD	<LLD	-		0

(M) *The Mean Values are calculated using the positive values.* ***(F)*** *Fraction of detectable measurement are indicated in parentheses.*

TABLE A-1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY FOR THE THREE MILE ISLAND NUCLEAR STATION, 2020

NAME OF FACILITY: THREE MILE ISLAND NUCLEAR STATION **DOCKET NUMBER: 50-289 & 50-320**

LOCATION OF FACILITY: MIDDLETOWN COUNTY, PA **REPORTING PERIOD: 2020**

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 IODINE	**GAMMA**		364						
(E-3 PCI/CU.METER)		*I-131*		**70**	<LLD	<LLD	-		0
MILK	**I-131**		88	**1**	<LLD	<LLD	-		0
(PCI/LITER)									
	SR-89		16	**5**	<LLD	<LLD	-		0
	SR-90		16	**2**	<LLD	<LLD	-		0
	GAMMA		88						
		K-40		*NA*	1285	1068	1366	P4-1 INDICATOR	0
					(66/66)	(22/22)	(22/22)	FARM ON VALLEY ROAD	
					777 - 1625	*852 - 1220*	*1141 - 1582*	3.6 MILES WNW OF SITE	
		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	**SR-90**		6	**10**	<LLD	<LLD	-		0
(PCI/KG WET)									
	GAMMA		42						
		BE-7		*NA*	825.7	876.5	947.9	H1-2 INDICATOR	0
					(12/27)	(3/15)	(7/12)	RED HILL MARKET	
					444 - 1527	*820 - 930*	*444 - 1257*	1.0 MILES SSE OF SITE	
		K-40		*NA*	3960.9	4042.9	4328.9	E1-2 INDICATOR	0
					(27/27)	(15/15)	(15/15)	TMI VISITOR'S CENTER	
					1310 - 8717	*1577 - 7134*	*1310 - 8717*	0.4 MILES E OF SITE	
		I-131		**60**	<LLD	<LLD	-		0
		CS-134		**60**	<LLD	<LLD	-		0
		CS-137		**80**	<LLD	<LLD	-		0
DIRECT RADIATION	**OSLD - QUARTERLY**		360	*NA*	17.1	19.1	28.3	H8-1 INDICATOR	0
(MILLIREM/STD.MO.)					(316/316)	(44/44)	(4/4)	SAGINAW ROAD, STARVIEW	
					11.1 - 13.1	*14.2 - 27.9*	*24.7 - 31.1*	7.4 MILES SSE OF SITE	

(M) *The Mean Values are calculated using the positive values.* ***(F)*** *Fraction of detectable measurement are indicated in parentheses.*

APPENDIX B

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

Intentionally left blank

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

XYYZ - 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, 2020

Sample Medium	Station Code	Map Number	Distance (miles)	Azimuth	Description
AQS	A1-3	1	0.6	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	24°	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, 2020

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	211°	On site at RML-7 Main Station Discharge Building
AQS	K1-3	1	0.2	213°	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	249°	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	4.9	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, 2020

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	1.9	283°	WNW of site along Route 262
M	P4-1	2	3.6	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	7.9	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	1	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, 2020

Sample Medium	Analysis	Sampling Method	Collection Procedure Number	Sample Size	Analytical Procedure Number
Surface Water	Gamma Spectroscopy	Monthly composite from a continuous water compositor	CY-ES-240 EIS Collection of Surface-Drinking-Effluent Water Samples for Radiological Analysis (TMI)	2 gallon	TBE, TBE-2007 Gamma-Emitting Radioisotope Analysis EIS, CY-ES-205 Gamma Counting Using the HPGe Detector with the Genie PC Counting System
Surface Water	Gross Beta	Monthly composite from a continuous water compositor	CY-ES-240 EIS Collection of Surface-Drinking-Effluent Water Samples for Radiological Analysis (TMI)	2 gallon	TBE, TBE-2008 Gross Alpha and/or Gross Beta Activity in Various Matrices EIS, CY-ES-206 Operation of the Tennelec S5E Proportional Counter
Surface Water	Tritium	Monthly composite from a continuous water compositor	CY-ES-240 EIS Collection of Surface-Drinking-Effluent Water Samples for Radiological Analysis (TMI)	2 gallon	TBE, TBE-2011 Tritium Analysis in Drinking Water by Liquid Scintillation GEL, EPA 906.0 Mod, for Tritium analysis by Liquid scintillation
Surface Water	Iodine-131	Monthly composite from a continuous water compositor	CY-ES-240 EIS Collection of Surface-Drinking-Effluent Water Samples for Radiological Analysis (TMI)	2 gallon	TBE, TBE-2012 Radioiodine in Various Matrices EIS, CY-ES-205 Gamma Counting Using the HPGe Detector with the Genie PC Counting System
Drinking Water	Gross Beta	Monthly composite from a continuous water compositor	CY-ES-240 EIS Collection of Surface-Drinking-Effluent Water Samples for Radiological Analysis (TMI)	2 gallon	TBE, TBE-2008 Gross Alpha and/or Gross Beta Activity in Various Matrices
Drinking Water	Gamma Spectroscopy	Monthly composite from a continuous water compositor	CY-ES-240 EIS Collection of Surface-Drinking-Effluent Water Samples for Radiological Analysis (TMI)	2 gallon	TBE, TBE-2007 Gamma-Emitting Radioisotope Analysis
Drinking Water	Iodine-131	Monthly composite from a continuous water compositor	CY-ES-240 EIS Collection of Surface-Drinking-Effluent Water Samples for Radiological Analysis (TMI)	2 gallon	TBE, TBE-2012 Radioiodine in Various Matrices
Drinking Water	Tritium	Monthly composite from a continuous water compositor	CY-ES-240 EIS Collection of Surface-Drinking-Effluent Water Samples for Radiological Analysis (TMI)	2 gallon	TBE, TBE-2011 Tritium Analysis in Drinking Water by Liquid Scintillation
Effluent Water	Iodine-131	Monthly composite from a continuous water compositor	CY-ES-240 EIS Collection of Surface-Drinking-Effluent Water Samples for Radiological Analysis (TMI)	2 gallon	TBE, TBE-2012 Radioiodine in Various Matrices
Effluent Water	Gamma Spectroscopy	Monthly composite from a continuous water compositor	CY-ES-240 EIS Collection of Surface-Drinking-Effluent Water Samples for Radiological Analysis (TMI)	2 gallon	TBE, TBE-2007 Gamma-Emitting Radioisotope Analysis

TABLE B-3: Radiological Environmental Monitoring Program – Summary of Sample Collection and Analytical Methods, Three Mile Island Nuclear Station, 2020

Sample Medium	Analysis	Sampling Method	Collection Procedure Number	Sample Size	Analytical Procedure Number
Effluent Water	Tritium	Monthly composite from a continuous water compositor	CY-ES-240 EIS Collection of Surface-Drinking-Effluent Water Samples for Radiological Analysis (TMI)	2 gallon	TBE, TBE-2011 Tritium Analysis in Drinking Water by Liquid Scintillation
Effluent Water	Strontium-89/90	Semi-annual composite from monthly samples	TBE, TBE-2023 Compositing of Samples	2 gallon	TBE, TBE-2018 Radiostrontium Analysis by Chemical Separation
Storm Water	Gamma Spectroscopy	Quarterly composite of monthly grab samples	CY-ES-240 EIS Collection of Surface-Drinking-Effluent Water Samples for Radiological Analysis (TMI)	1 gallon	TBE, TBE-2007 Gamma-Emitting Radioisotope Analysis
Storm Water	Tritium	Quarterly composite of monthly grab samples	CY-ES-240 EIS Collection of Surface-Drinking-Effluent Water Samples for Radiological Analysis (TMI)	1 gallon	TBE, TBE-2011 Tritium Analysis in Drinking Water by Liquid Scintillation
Fish	Gamma Spectroscopy	Semi-annual samples collected via electroshocking or other techniques	ER-TMI-13 Collection of fish samples for radiological analysis (TMINS)	1000 grams (wet)	TBE, TBE-2007 Gamma-Emitting Radioisotope Analysis EIS, CY-ES-205 Gamma Counting Using the HPGe Detector with the Genie PC Counting System
Fish	Strontium-90	Semi-annual samples collected via electroshocking or other techniques	ER-TMI-13 Collection of fish samples for radiological analysis (TMINS)	1000 grams (wet)	TBE, TBE-2018 Radiostrontium Analysis by Chemical Separation GEL, EPA 905.0 Mod/DOE RP501 Rev. 1 Mod
Sediment	Gamma Spectroscopy	Semi-annual grab samples	ER-TMI-03 Collection of sediment samples for radiological analysis (TMINS)	500 grams (dry)	TBE, TBE-2007 Gamma-Emitting Radioisotope Analysis EIS, CY-ES-205 Gamma Counting Using the HPGe Detector with the Genie PC Counting System
Air Particulates	Gamma Spectroscopy	Quarterly composite of each station	TBE, TBE-2023 Compositing of Samples CY-ES-204 Sample Preparation for Gamma and Beta Counting	13 filters (approx.. 3600 cubic meters)	TBE, TBE-2007 Gamma-Emitting Radioisotope Analysis EIS, CY-ES-205 Gamma Counting Using the HPGe Detector with the Genie PC Counting System
Air Particulates	Gross Beta	One-week composite of continuous air sampling through glass fiber filter paper	CY-ES-237 Collection of Air Iodine & Air Particulate for Radiological Analysis (TMI)	1 filter (approx.. 280 cubic meters weekly)	TBE, TBE-2008 Gross Alpha and/or Gross Beta Activity in Various Matrices CY-ES-206 Operation of the Tennelec S5E Proportional Counter

TABLE B-3: Radiological Environmental Monitoring Program – Summary of Sample Collection and Analytical Methods, Three Mile Island Nuclear Station, 2020

Sample Medium	Analysis	Sampling Method	Collection Procedure Number	Sample Size	Analytical Procedure Number
Air Iodine	Gamma Spectroscopy	One-week composite of continuous air sampling through charcoal filter	CY-ES-237 Collection of Air Iodine & Air Particulate for Radiological Analysis (TMI)	1 filter (approx. 280 cubic meters weekly)	TBE, TBE-2007 Gamma-Emitting Radioisotope Analysis EIS, CY-ES-205 Gamma Counting Using the HPGe Detector with the Genie PC Counting System
Milk	I-131	Bi-weekly grab sample when cows are on pasture. Monthly all other times	CY-ES-238 Sample Collection for Radiological Analysis - Milk (TMI)	2 gallon	TBE, TBE-2012 Radioiodine in Various Matrices EIS, CY-ES-205 Gamma Counting Using the HPGe Detector with the Genie PC Counting System
Milk	Sr-89/90	Quarterly composite of bi-weekly and monthly grab samples	TBE, TBE-2023 Compositing of Samples CY-ES-238 Sample Collection for Radiological Analysis - Milk (TMI)	2 gallon	TBE, TBE-2019 Radiostrontium Analysis by Ion Exchange GEL, EPA 905.0 Mod/DOE RP501 Rev. 1 Mod
Milk	Gamma Spectroscopy	Bi-weekly grab sample when cows are on pasture. Monthly all other times	CY-ES-238 Sample Collection for Radiological Analysis - Milk (TMI)	2 gallon	TBE, TBE-2007 Gamma-Emitting Radioisotope Analysis EIS, CY-ES-205 Gamma Counting Using the HPGe Detector with the Genie PC Counting System
Vegetation	Gamma Spectroscopy	Monthly and annual grab sample	CY-ES-241 Sample Collection for Gamma Counting - Vegetation (TMI)	1000 grams	TBE, TBE-2007 Gamma-Emitting Radioisotope Analysis EIS, CY-ES-205 Gamma Counting Using the HPGe Detector with the Genie PC Counting System
Vegetation	Strontium-89/90	Monthly and annual grab sample	CY-ES-241 Sample Collection for Gamma Counting - Vegetation (TMI)	1000 grams	TBE, TBE-2018 Radiostrontium Analysis by Chemical Separation GEL, EPA 905.0 Mod/DOE RP501 Rev. 1 Mod
OSLD	Optically Stimulated Luminescence Dosimetry	Quarterly OSLDs comprised of two Al_2O_3:C Landauer Incorporated elements.	CY-ES-239 Collection of OSLD samples for radiological analysis (TMINS)	2 badges with 3 dosimeters	Landauer Incorporated

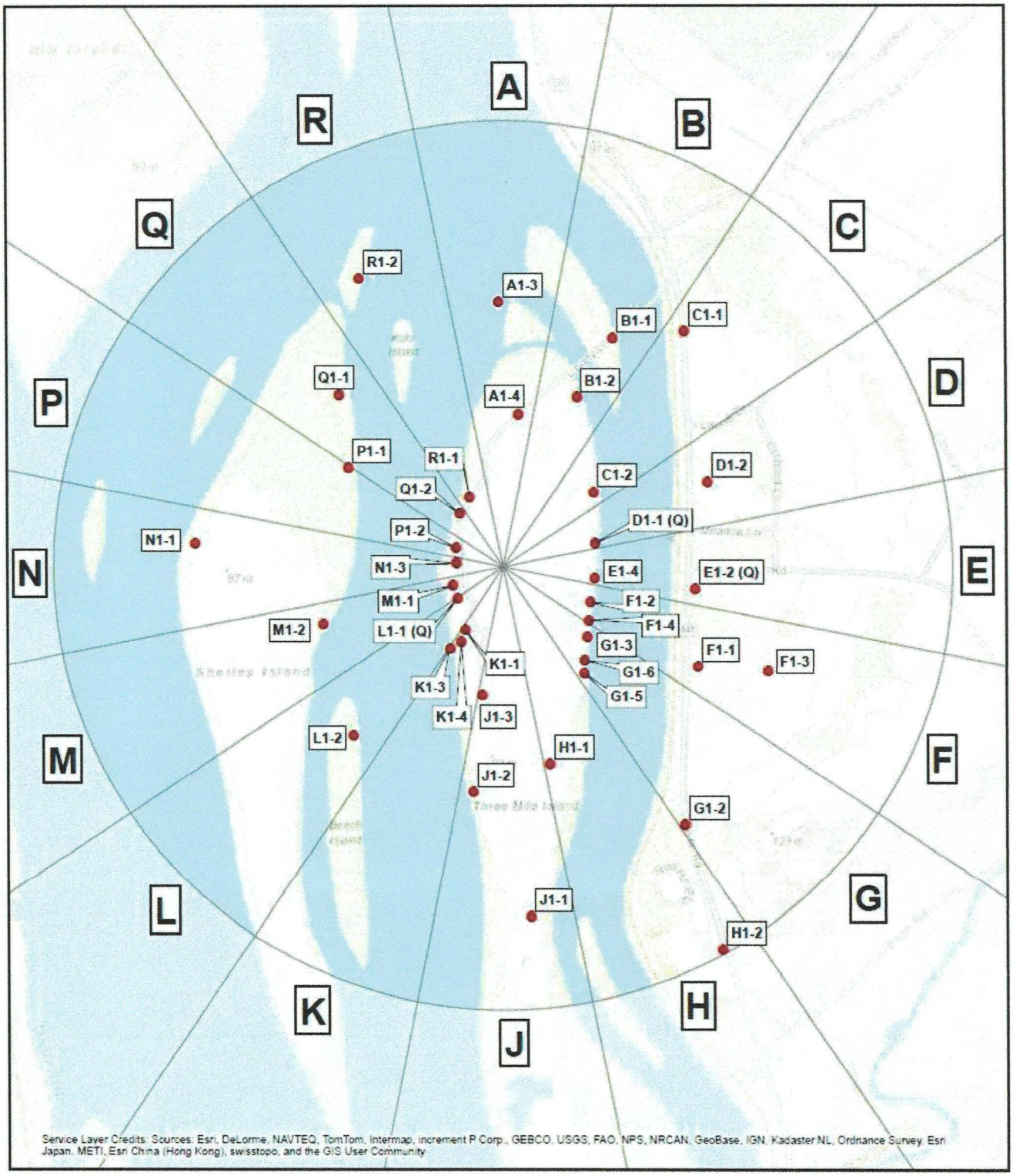


Figure B-1
Environmental Sampling Locations Within One Mile of the Three Mile Island Nuclear Station, 2020

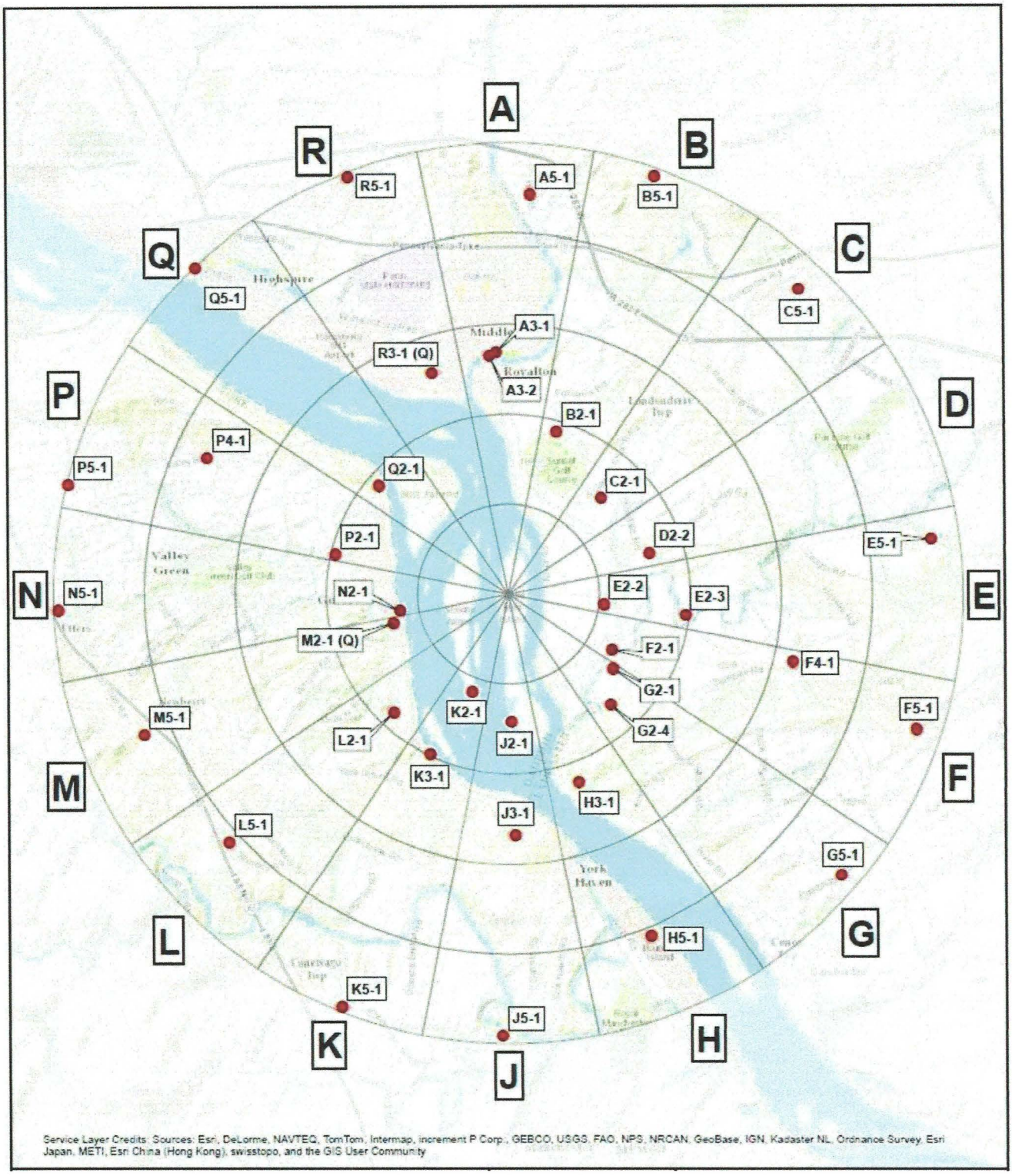


Figure B-2
Environmental Sampling Locations Between One and Five Miles of the Three Mile Island Nuclear Station, 2020

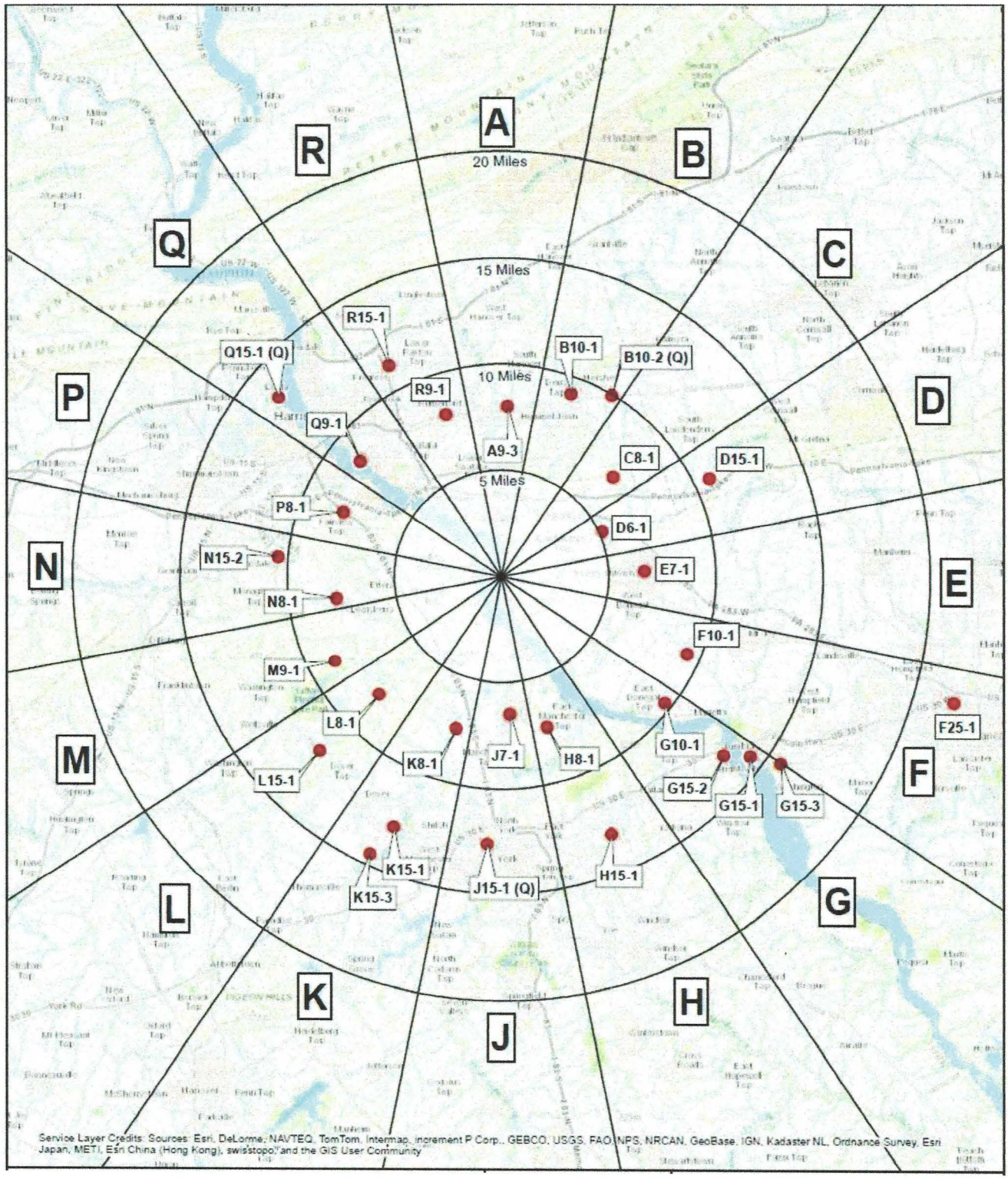


Figure B-3
Environmental Sampling Locations Greater than Five Miles of the Three Mile Island Nuclear Station, 2020

APPENDIX C

DATA TABLES AND FIGURES
PRIMARY LABORATORY

Intentionally left blank

Table C-I.1 CONCENTRATIONS OF TRITIUM IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2020

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	J1-2	Q9-1
01/02/20 - 01/30/20	< 170	< 175
01/30/20 - 02/27/20	< 181	< 185
02/27/20 - 04/01/20	426 ± 135	< 193
04/01/20 - 04/29/20	673 ± 134	< 165
04/29/20 - 05/28/20	788 ± 150	< 178
05/28/20 - 06/30/20	2910 ± 350	< 177
06/30/20 - 07/30/20	1220 ± 192	< 182
07/30/20 - 09/02/20	1150 ± 183	< 173
09/02/20 - 10/01/20	949 ± 162	< 175
10/01/20 - 10/29/20	1240 ± 200	< 187
10/29/20 - 12/03/20	747 ± 149	< 179
12/03/20 - 12/29/20	712 ± 148	< 183
MEAN ± 2 STD DEV	1082 ± 1389	-

Table C-I.2 CONCENTRATIONS OF I-131 IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2020

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	A3-2
01/02/20 - 01/30/20	< 0.9
01/30/20 - 02/27/20	< 0.8
02/27/20 - 04/01/20	< 0.7
04/01/20 - 04/29/20	< 0.7
04/29/20 - 05/28/20	< 0.7
05/28/20 - 06/30/20	< 0.6
06/30/20 - 07/30/20	< 0.7
07/30/20 - 09/02/20	< 0.8
09/02/20 - 10/01/20	< 0.9
10/01/20 - 10/29/20	< 0.9
10/29/20 - 12/03/20	< 0.9
12/03/20 - 12/29/20	< 0.9
MEAN	-

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

Table C-I.3 **CONCENTRATIONS OF GAMMA EMITTERS IN SURFACE WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2020**

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	01/02/20 - 01/30/20	< 7	< 8	< 14	< 5	< 15	< 7	< 12	< 7	< 7	< 29	< 11
	01/30/20 - 02/27/20	< 6	< 6	< 12	< 6	< 10	< 6	< 12	< 8	< 7	< 30	< 10
	02/27/20 - 04/01/20	< 6	< 5	< 12	< 7	< 13	< 5	< 11	< 5	< 6	< 27	< 13
	04/01/20 - 04/29/20	< 6	< 8	< 12	< 8	< 13	< 6	< 13	< 10	< 7	< 34	< 11
	04/29/20 - 05/28/20	< 8	< 6	< 14	< 6	< 14	< 9	< 15	< 8	< 8	< 38	< 11
	05/28/20 - 06/30/20	< 5	< 5	< 10	< 5	< 12	< 6	< 8	< 5	< 6	< 25	< 7
	06/30/20 - 07/30/20	< 6	< 6	< 15	< 7	< 15	< 8	< 11	< 7	< 7	< 29	< 7
	07/30/20 - 09/02/20	< 8	< 9	< 15	< 8	< 16	< 8	< 10	< 8	< 8	< 32	< 10
	09/02/20 - 10/01/20	< 8	< 8	< 13	< 7	< 16	< 7	< 13	< 7	< 7	< 30	< 13
	10/01/20 - 10/29/20	< 6	< 7	< 13	< 6	< 10	< 6	< 9	< 7	< 6	< 26	< 7
	10/29/20 - 12/03/20	< 6	< 7	< 9	< 10	< 14	< 5	< 9	< 8	< 5	< 30	< 11
	12/03/20 - 12/29/20	< 7	< 7	< 7	< 10	< 9	< 8	< 13	< 9	< 7	< 30	< 12
	MEAN	-	-	-	-	-	-	-	-	-	-	-
Q9-1	01/02/20 - 01/30/20	< 9	< 9	< 17	< 5	< 10	< 6	< 16	< 9	< 8	< 35	< 12
	01/30/20 - 02/27/20	< 7	< 6	< 13	< 6	< 13	< 6	< 13	< 8	< 7	< 34	< 9
	02/27/20 - 04/01/20	< 6	< 5	< 12	< 8	< 12	< 7	< 10	< 6	< 7	< 22	< 11
	04/01/20 - 04/29/20	< 6	< 8	< 13	< 8	< 15	< 7	< 11	< 7	< 7	< 29	< 10
	04/29/20 - 05/28/20	< 4	< 7	< 17	< 8	< 12	< 8	< 14	< 6	< 6	< 34	< 12
	05/28/20 - 06/30/20	< 6	< 5	< 11	< 5	< 11	< 5	< 8	< 7	< 6	< 27	< 10
	06/30/20 - 07/30/20	< 6	< 4	< 13	< 7	< 10	< 7	< 9	< 6	< 7	< 24	< 7
	07/30/20 - 09/02/20	< 7	< 8	< 19	< 8	< 19	< 9	< 14	< 8	< 7	< 37	< 14
	09/02/20 - 10/01/20	< 8	< 3	< 10	< 6	< 16	< 8	< 10	< 5	< 6	< 29	< 9
	10/01/20 - 10/29/20	< 7	< 7	< 12	< 4	< 10	< 7	< 8	< 7	< 7	< 27	< 10
	10/29/20 - 12/03/20	< 7	< 8	< 13	< 7	< 12	< 9	< 11	< 8	< 7	< 32	< 11
	12/03/20 - 12/29/20	< 5	< 7	< 12	< 6	< 11	< 5	< 11	< 6	< 5	< 25	< 5
	MEAN	-	-	-	-	-	-	-	-	-	-	-

Table C-II.1 **CONCENTRATIONS OF GROSS BETA IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2020**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	G15-2	G15-3	Q9-1
01/02/20 - 01/30/20	2.0 ± 1.3	< 1.7	3.7 ± 1.4
01/30/20 - 02/27/20	< 1.8	< 1.7	1.9 ± 1.2
02/27/20 - 04/01/20	3.5 ± 1.6	2.7 ± 1.5	< 2.0
04/01/20 - 04/29/20	< 2.0	< 2.0	< 1.9
04/29/20 - 05/28/20	2.4 ± 1.5	< 2.0	< 2.0
05/28/20 - 06/30/20	2.9 ± 1.5	3.1 ± 1.5	< 2.0
06/30/20 - 07/30/20	3.3 ± 1.4	3.4 ± 1.5	3.4 ± 1.5
07/30/20 - 09/02/20	2.8 ± 1.5	3.0 ± 1.5	3.5 ± 1.6
09/02/20 - 10/01/20	5.3 ± 1.7	3.7 ± 1.6	4.1 ± 1.7
10/01/20 - 10/29/20	2.4 ± 1.4	< 2.0	< 2.0
10/29/20 - 12/03/20	2.8 ± 1.6	< 2.1	< 2.1
12/03/20 - 12/29/20	3.1 ± 1.7	< 2.2	< 2.2
MEAN ± 2 STD DEV	3.0 ± 1.8	3.2 ± 0.7	3.3 ± 1.7

Table C-II.2 **CONCENTRATIONS OF I-131 IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2020**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	G15-2	G15-3	Q9-1
01/02/20 - 01/30/20	< 0.8	< 0.7	< 0.8
01/30/20 - 02/27/20	< 0.5	< 0.8	< 0.6
02/27/20 - 04/01/20	< 0.7	< 0.6	< 0.6
04/01/20 - 04/29/20	< 0.8	< 0.7	< 0.8
04/29/20 - 05/28/20	< 0.7	< 0.7	< 0.7
05/28/20 - 06/30/20	< 0.7	< 0.8	< 0.7
06/30/20 - 07/30/20	< 0.9	< 0.6	< 0.8
07/30/20 - 09/02/20	< 0.7	< 0.8	< 0.8
09/02/20 - 10/01/20	< 0.8	< 0.8	< 0.9
10/01/20 - 10/29/20	< 0.9	< 0.9	< 0.8
10/29/20 - 12/03/20	< 0.9	< 0.9	< 0.9
12/03/20 - 12/29/20	< 0.8	< 0.8	< 0.8
MEAN	-	-	-

Table C-II.3 **CONCENTRATIONS OF TRITIUM IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2020**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION PERIOD	G15-2	G15-3	Q9-1
01/02/20 - 01/30/20	< 174	< 170	< 172
01/30/20 - 02/27/20	< 190	< 184	< 181
02/27/20 - 04/01/20	< 191	< 189	< 192
04/01/20 - 04/29/20	< 165	< 165	< 162
04/29/20 - 05/28/20	< 182	< 181	< 179
05/28/20 - 06/30/20	< 178	< 181	< 178
06/30/20 - 07/30/20	< 181	< 185	< 183
07/30/20 - 09/02/20	< 169	< 179	< 175
09/02/20 - 10/01/20	< 170	< 175	< 179
10/01/20 - 10/29/20	< 184	< 187	< 191
10/29/20 - 12/03/20	< 182	< 181	< 175
12/03/20 - 12/29/20	< 187	< 188	< 180
MEAN ± 2 STD DEV	-	-	-

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, 2020**

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	01/02/20 - 01/30/20	< 5	< 6	< 15	< 8	< 10	< 7	< 11	< 6	< 7	< 25	< 9
	01/30/20 - 02/27/20	< 5	< 5	< 11	< 6	< 10	< 6	< 8	< 6	< 5	< 24	< 6
	02/27/20 - 04/01/20	< 6	< 5	< 11	< 5	< 10	< 6	< 10	< 7	< 5	< 27	< 9
	04/01/20 - 04/29/20	< 9	< 6	< 13	< 8	< 13	< 7	< 11	< 9	< 8	< 33	< 8
	04/29/20 - 05/28/20	< 7	< 7	< 13	< 10	< 16	< 7	< 13	< 8	< 7	< 37	< 9
	05/28/20 - 06/30/20	< 6	< 6	< 9	< 6	< 12	< 7	< 11	< 7	< 6	< 26	< 7
	06/30/20 - 07/30/20	< 7	< 7	< 15	< 8	< 15	< 7	< 11	< 10	< 8	< 26	< 11
	07/30/20 - 09/02/20	< 4	< 5	< 13	< 6	< 11	< 6	< 10	< 8	< 5	< 22	< 5
	09/02/20 - 10/01/20	< 8	< 7	< 15	< 6	< 10	< 6	< 14	< 7	< 8	< 33	< 10
	10/01/20 - 10/29/20	< 6	< 6	< 16	< 7	< 13	< 6	< 11	< 8	< 7	< 28	< 10
	10/29/20 - 12/03/20	< 6	< 7	< 13	< 9	< 9	< 4	< 14	< 7	< 7	< 31	< 5
	12/03/20 - 12/29/20	< 6	< 6	< 14	< 7	< 14	< 7	< 13	< 5	< 7	< 30	< 13
	MEAN	-	-	-	-	-	-	-	-	-	-	-
G15-3	01/02/20 - 01/30/20	< 8	< 8	< 17	< 6	< 15	< 9	< 13	< 9	< 7	< 34	< 12
	01/30/20 - 02/27/20	< 6	< 5	< 12	< 6	< 12	< 8	< 10	< 4	< 6	< 21	< 9
	02/27/20 - 04/01/20	< 6	< 6	< 15	< 6	< 11	< 6	< 9	< 5	< 7	< 29	< 9
	04/01/20 - 04/29/20	< 6	< 7	< 14	< 8	< 17	< 7	< 15	< 6	< 8	< 34	< 12
	04/29/20 - 05/28/20	< 7	< 7	< 13	< 7	< 13	< 7	< 9	< 7	< 7	< 34	< 12
	05/28/20 - 06/30/20	< 4	< 4	< 10	< 4	< 7	< 5	< 7	< 5	< 5	< 18	< 9
	06/30/20 - 07/30/20	< 6	< 7	< 16	< 9	< 15	< 7	< 12	< 6	< 7	< 32	< 9
	07/30/20 - 09/02/20	< 6	< 7	< 12	< 6	< 14	< 7	< 12	< 8	< 6	< 30	< 6
	09/02/20 - 10/01/20	< 6	< 8	< 15	< 7	< 15	< 8	< 12	< 7	< 7	< 30	< 10
	10/01/20 - 10/29/20	< 4	< 4	< 13	< 6	< 11	< 7	< 6	< 8	< 8	< 24	< 9
	10/29/20 - 12/03/20	< 7	< 7	< 13	< 6	< 10	< 9	< 10	< 7	< 7	< 30	< 11
	12/03/20 - 12/29/20	< 6	< 8	< 14	< 5	< 13	< 8	< 14	< 9	< 7	< 27	< 13
	MEAN	-	-	-	-	-	-	-	-	-	-	-
Q9-1	01/02/20 - 01/30/20	< 5	< 6	< 14	< 7	< 12	< 6	< 12	< 8	< 7	< 31	< 9
	01/30/20 - 02/27/20	< 5	< 4	< 12	< 5	< 11	< 5	< 9	< 6	< 6	< 28	< 7
	02/27/20 - 04/01/20	< 6	< 7	< 12	< 6	< 12	< 6	< 13	< 7	< 6	< 32	< 10
	04/01/20 - 04/29/20	< 7	< 7	< 10	< 5	< 12	< 5	< 8	< 8	< 5	< 28	< 8
	04/29/20 - 05/28/20	< 7	< 7	< 14	< 7	< 12	< 8	< 12	< 8	< 7	< 32	< 8
	05/28/20 - 06/30/20	< 4	< 5	< 10	< 6	< 10	< 5	< 8	< 6	< 6	< 24	< 8
	06/30/20 - 07/30/20	< 7	< 8	< 11	< 7	< 13	< 6	< 8	< 8	< 7	< 27	< 9
	07/30/20 - 09/02/20	< 6	< 7	< 13	< 7	< 9	< 5	< 10	< 7	< 6	< 28	< 11
	09/02/20 - 10/01/20	< 7	< 6	< 14	< 8	< 11	< 8	< 12	< 7	< 6	< 27	< 12
	10/01/20 - 10/29/20	< 5	< 5	< 9	< 5	< 9	< 5	< 10	< 7	< 6	< 28	< 5
	10/29/20 - 12/03/20	< 5	< 5	< 11	< 4	< 13	< 6	< 8	< 6	< 5	< 24	< 5
	12/03/20 - 12/29/20	< 6	< 7	< 16	< 6	< 11	< 7	< 11	< 9	< 8	< 30	< 12
	MEAN	-	-	-	-	-	-	-	-	-	-	-

Table C-III.1 **CONCENTRATIONS OF GROSS BETA, IODINE-131, TRITIUM, AND STRONTIUM IN EFFLUENT WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2020**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	GR-B	I-131	H-3	SR-89	SR-90
K1-1	01/02/20 - 01/30/20	< 1.8	< 0.9	< 172		
	01/30/20 - 02/27/20	< 1.7	< 0.7	< 185		
	02/27/20 - 04/01/20	< 2.0	< 0.7	15200 ± 1580		
	04/01/20 - 04/29/20	< 1.8	< 0.9	20000 ± 2040		
	04/29/20 - 05/28/20	2.5 ± 1.3	< 0.7	20000 ± 2050		
	05/28/20 - 06/30/20	2.6 ± 1.4	< 0.8	19300 ± 1980		
	01/02/20 - 06/30/20				< 3.4	< 0.9
	06/30/20 - 07/30/20	3.2 ± 1.5	< 0.8	9070 ± 964		
	07/30/20 - 09/02/20	2.7 ± 1.5	< 0.7	7760 ± 828		
	09/02/20 - 10/01/20	3.6 ± 1.6	< 0.8	5480 ± 600		
	10/01/20 - 10/29/20	2.5 ± 1.5	< 0.8	9330 ± 994		
	10/29/20 - 12/03/20	3.5 ± 1.5	< 0.9	4030 ± 462		
	12/03/20 - 12/29/20	< 2.3	< 0.9	4370 ± 495		
	06/30/20 - 12/29/20				< 4.7	< 0.9
	MEAN ± 2 STD DEV	2.9 ± 1.0	-	11454 ± 13106	-	-

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, 2020**

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	01/02/20 - 01/30/20	< 8	< 8	< 14	< 9	< 14	< 8	< 13	< 8	< 8	< 38	< 10
	01/30/20 - 02/27/20	< 6	< 7	< 15	< 7	< 11	< 7	< 14	< 7	< 7	< 31	< 10
	02/27/20 - 04/01/20	< 7	< 7	< 12	< 7	< 16	< 7	< 12	< 7	< 8	< 33	< 13
	04/01/20 - 04/29/20	< 7	< 7	< 16	< 7	< 11	< 6	< 13	< 6	< 6	< 38	< 7
	04/29/20 - 05/28/20	< 7	< 7	< 16	< 6	< 15	< 9	< 13	< 7	< 7	< 38	< 9
	05/28/20 - 06/30/20	< 5	< 5	< 11	< 5	< 11	< 6	< 7	< 5	< 6	< 23	< 9
	06/30/20 - 07/30/20	< 6	< 6	< 11	< 8	< 13	< 5	< 14	< 7	< 6	< 32	< 11
	07/30/20 - 09/02/20	< 7	< 8	< 12	< 10	< 13	< 8	< 12	< 7	< 8	< 29	< 8
	09/02/20 - 10/01/20	< 7	< 7	< 14	< 6	< 14	< 8	< 10	< 7	< 7	< 30	< 12
	10/01/20 - 10/29/20	< 7	< 7	< 14	< 6	< 10	< 6	< 12	< 8	< 7	< 31	< 10
	10/29/20 - 12/03/20	< 5	< 5	< 12	< 7	< 10	< 6	< 9	< 6	< 6	< 23	< 7
	12/03/20 - 12/29/20	< 6	< 7	< 13	< 7	< 10	< 7	< 11	< 8	< 7	< 35	< 10
	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, 2020

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD	Sr-90
BKGB		
BOTTOM FEEDER	06/11/20	< 4.5
	11/05/20	< 4.5
	MEAN	-
BKGP		
PREDATOR	06/11/20	< 4.4
	11/05/20	< 4.5
	MEAN	-
INDB		
BOTTOM FEEDER	05/20/20	< 4.6
	11/04/20	< 4.7
	MEAN	-
INDP		
PREDATOR	06/05/20	< 4.2
	10/15/20	< 3.9
	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, 2020**

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	06/11/20	2874 ± 897	< 52	< 54	< 102	< 51	< 101	< 61	< 58
	11/05/20	2671 ± 999	< 62	< 58	< 123	< 58	< 149	< 70	< 73
	MEAN ± 2 STD DEV	2773 + 287	-	-	-	-	-	-	-
BKGP									
PREDATOR	06/11/20	3456 ± 784	< 41	< 40	< 78	< 43	< 70	< 50	< 39
	11/05/20	3657 ± 1079	< 65	< 70	< 142	< 57	< 138	< 61	< 69
	MEAN ± 2 STD DEV	3557 + 284	-	-	-	-	-	-	-
INDB									
BOTTOM FEEDER	05/20/20	2538 ± 913	< 69	< 71	< 135	< 64	< 162	< 73	< 58
	11/04/20	2933 ± 1023	< 56	< 61	< 108	< 80	< 111	< 57	< 67
	MEAN ± 2 STD DEV	2736 + 559	-	-	-	-	-	-	-
INDP									
PREDATOR	06/05/20	4277 ± 1097	< 58	< 48	< 132	< 48	< 105	< 62	< 61
	10/15/20	2948 ± 939	< 60	< 57	< 115	< 68	< 116	< 51	< 55
	MEAN ± 2 STD DEV	3613 ± 1879	-	-	-	-	-	-	-

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

Table C-V.1 CONCENTRATIONS OF GAMMA EMITTERS IN SEDIMENT SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2020

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	06/05/20	8069 ± 1482	< 72	< 65	< 87	< 97	< 85
	12/01/20	6795 ± 1208	< 56	< 47	< 63	< 75	< 75
	MEAN ± 2 STD DEV	7432 ± 1802	-	-	-	-	-
J2-1	06/05/20	12280 ± 1754	< 79	< 71	< 70	< 106	< 89
	12/01/20	11000 ± 1412	< 78	< 60	< 71	< 90	< 87
	MEAN ± 2 STD DEV	11640 + 1810	-	-	-	-	-
K1-3	06/05/20	8732 ± 1565	< 91	< 93	< 117	< 117	< 107
	12/01/20	7858 ± 1342	< 65	< 69	< 85	< 81	< 81
	MEAN ± 2 STD DEV	8295 ± 1236	-	-	-	-	-

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, 2020**

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

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

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

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, 2020**

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
01/02/20 - 01/30/20	9	18	12 ± 7	01/02/20 - 01/30/20	7	22	12 ± 9	01/02/20 - 01/30/20	8	19	14 ± 9
01/30/20 - 02/27/20	7	16	12 ± 7	01/30/20 - 02/27/20	7	20	13 ± 6	01/30/20 - 02/27/20	9	17	13 ± 7
02/27/20 - 04/01/20	6	12	10 ± 4	02/27/20 - 04/01/20	5	14	10 ± 5	02/27/20 - 04/01/20	6	13	10 ± 5
04/01/20 - 04/29/20	10	14	12 ± 3	04/01/20 - 04/29/20	6	15	11 ± 5	04/01/20 - 04/29/20	10	16	14 ± 5
04/29/20 - 06/04/20	7	16	11 ± 6	04/29/20 - 06/04/20	7	16	11 ± 6	04/29/20 - 06/04/20	10	17	13 ± 6
06/04/20 - 06/30/20	7	20	13 ± 8	06/04/20 - 06/30/20	7	18	12 ± 7	06/04/20 - 06/30/20	9	13	11 ± 4
06/30/20 - 07/30/20	9	19	15 ± 7	06/30/20 - 07/30/20	10	21	16 ± 7	06/30/20 - 07/30/20	12	23	18 ± 9
07/30/20 - 09/02/20	9	22	17 ± 8	07/30/20 - 09/02/20	5	21	16 ± 9	07/30/20 - 09/02/20	12	21	18 ± 8
09/02/20 - 10/01/20	10	24	17 ± 10	09/02/20 - 10/01/20	7	24	16 ± 11	09/02/20 - 10/01/20	13	23	18 ± 11
10/01/20 - 10/29/20	7	17	12 ± 7	10/01/20 - 10/29/20	6	19	13 ± 8	10/01/20 - 10/29/20	12	22	18 ± 8
10/29/20 - 12/03/20	9	28	16 ± 12	10/29/20 - 12/03/20	9	29	16 ± 13	10/29/20 - 12/03/20	12	28	19 ± 13
12/03/20 - 12/29/20	8	23	14 ± 10	12/03/20 - 12/29/20	6	23	14 ± 10	12/03/20 - 12/29/20	9	23	15 ± 12
01/02/20 - 12/29/20	6	28	13 ± 9	01/02/20 - 12/29/20	5	29	13 ± 9	01/02/20 - 12/29/20	6	28	15 ± 10

Table C-VI.3 CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2020

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	01/02/20 - 04/01/20	68 ± 17	< 2	< 2	< 1	< 2	< 4	< 2	< 2
	04/01/20 - 06/30/20	72 ± 17	< 2	< 2	< 2	< 1	< 3	< 2	< 2
	06/30/20 - 10/01/20	72 ± 18	< 2	< 2	< 2	< 2	< 4	< 2	< 2
	10/01/20 - 12/29/20	66 ± 20	< 3	< 3	< 4	< 4	< 6	< 5	< 4
	MEAN ± 2 STD DEV	69 ± 6	-	-	-	-	-	-	-
E1-2	01/02/20 - 04/01/20	77 ± 17	< 2	< 2	< 2	< 2	< 3	< 2	< 2
	04/01/20 - 06/30/20	62 ± 19	< 2	< 3	< 3	< 2	< 3	< 2	< 2
	06/30/20 - 10/01/20	68 ± 21	< 2	< 2	< 2	< 2	< 4	< 2	< 2
	10/01/20 - 12/29/20	67 ± 18	< 2	< 2	< 2	< 2	< 3	< 3	< 2
	MEAN ± 2 STD DEV	68 ± 12	-	-	-	-	-	-	-
F1-3	01/02/20 - 04/01/20	54 ± 13	< 2	< 2	< 2	< 2	< 3	< 2	< 2
	04/01/20 - 06/30/20	83 ± 20	< 3	< 2	< 4	< 2	< 4	< 3	< 2
	06/30/20 - 10/01/20	83 ± 26	< 4	< 3	< 5	< 5	< 7	< 4	< 3
	10/01/20 - 12/29/20	52 ± 14	< 2	< 2	< 2	< 2	< 3	< 2	< 2
	MEAN ± 2 STD DEV	68 ± 35	-	-	-	-	-	-	-
G2-1	01/02/20 - 04/01/20	50 ± 20	< 2	< 3	< 3	< 3	< 4	< 2	< 2
	04/01/20 - 06/30/20	76 ± 19	< 2	< 2	< 2	< 2	< 3	< 2	< 2
	06/30/20 - 10/01/20	69 ± 19	< 2	< 2	< 2	< 3	< 4	< 2	< 2
	10/01/20 - 12/29/20	38 ± 23	< 3	< 3	< 2	< 3	< 5	< 3	< 3
	MEAN ± 2 STD DEV	59 ± 34	-	-	-	-	-	-	-
H3-1	01/02/20 - 04/01/20	55 ± 16	< 2	< 2	< 2	< 2	< 4	< 2	< 2
	04/01/20 - 06/30/20	72 ± 18	< 3	< 2	< 2	< 3	< 5	< 3	< 3
	06/30/20 - 10/01/20	94 ± 28	< 3	< 4	< 3	< 4	< 7	< 4	< 3
	10/01/20 - 12/29/20	57 ± 22	< 2	< 2	< 3	< 2	< 4	< 3	< 2
	MEAN ± 2 STD DEV	69 ± 35	-	-	-	-	-	-	-
M2-1	01/02/20 - 04/01/20	59 ± 17	< 2	< 2	< 3	< 2	< 2	< 2	< 2
	04/01/20 - 06/30/20	81 ± 24	< 2	< 2	< 1	< 2	< 4	< 2	< 2
	06/30/20 - 10/01/20	75 ± 20	< 2	< 2	< 3	< 2	< 4	< 2	< 2
	10/01/20 - 12/29/20	67 ± 18	< 2	< 1	< 4	< 1	< 3	< 2	< 2
	MEAN ± 2 STD DEV	70 ± 19	-	-	-	-	-	-	-
Q15-1	01/02/20 - 04/01/20	58 ± 21	< 4	< 4	< 4	< 4	< 7	< 4	< 4
	04/01/20 - 06/30/20	77 ± 19	< 2	< 2	< 3	< 2	< 3	< 2	< 2
	06/30/20 - 10/01/20	80 ± 18	< 2	< 2	< 2	< 2	< 4	< 2	< 2
	10/01/20 - 12/29/20	56 ± 18	< 3	< 3	< 4	< 3	< 4	< 3	< 2
	MEAN ± 2 STD DEV	68 ± 25	-	-	-	-	-	-	-

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, 2020**

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
01/02/20 - 01/09/20	< 22	< 22	< 11	< 27	< 26	< 27	< 28
01/09/20 - 01/16/20	< 23	< 24	< 17	< 42	< 42	< 42	< 43
01/16/20 - 01/23/20	< 30	< 31	< 19	< 20	< 20	< 20	< 10
01/23/20 - 01/30/20	< 25	< 36	< 21	< 54	< 54	< 51	< 53
01/30/20 - 02/06/20	< 22	< 23	< 32	< 21	< 22	< 23	< 36
02/06/20 - 02/13/20	< 43	< 45	< 13	< 28	< 27	< 27	< 28
02/13/20 - 02/20/20	< 23	< 18	< 14	< 33	< 32	< 32	< 33
02/20/20 - 02/27/20	< 52	< 54	< 29	< 27	< 32	< 30	< 31
02/27/20 - 03/05/20	< 19	< 17	< 26	< 35	< 33	< 34	< 35
03/05/20 - 03/11/20	< 45	< 19	< 26	< 31	< 29	< 29	< 30
03/11/20 - 03/19/20	< 30	< 31	< 16	< 41	< 41	< 41	< 42
03/19/20 - 03/26/20	< 32	< 33	< 17	< 37	< 37	< 37	< 38
03/26/20 - 04/01/20	< 19	< 24	< 11	< 24	< 23	< 23	< 12
04/01/20 - 04/09/20	< 30	< 26	< 20	< 31	< 31	< 31	< 24
04/09/20 - 04/16/20	< 25	< 26	< 17	< 42	< 42	< 42	< 44
04/16/20 - 04/23/20	< 32	< 28	< 34	< 33	< 33	< 33	< 31
04/23/20 - 04/29/20	< 35	< 36	< 56	< 60	< 59	< 59	< 26
04/29/20 - 05/07/20	< 29	< 17	< 32	< 29	< 29	< 29	< 35
05/07/20 - 05/14/20	< 18	< 31	< 48	< 31	< 30	< 31	< 22
05/14/20 - 05/21/20	< 16	< 33	< 21	< 33	< 33	< 34	< 23
05/21/20 - 05/28/20	< 23	< 22	< 15	< 28	< 28	< 28	< 29
05/28/20 - 06/04/20	< 19	< 15	< 17	< 45	< 45	< 45	< 46
06/04/20 - 06/11/20	< 17	< 40	< 28	< 40	< 40	< 40	< 30
06/11/20 - 06/18/20	< 23	< 18	< 36	< 39	< 38	< 39	< 33
06/18/20 - 06/24/20	< 21	< 47	< 42	< 48	< 48	< 49	< 20
06/24/20 - 06/30/20	< 16	< 28	< 40	< 28	< 27	< 28	< 44
06/30/20 - 07/08/20	< 14	< 24	< 40	< 24	< 23	< 24	< 44
07/08/20 - 07/16/20	< 17	< 41	< 24	< 41	< 41	< 41	< 27
07/16/20 - 07/23/20	< 27	< 27	< 16	< 33	< 33	< 34	< 34
07/23/20 - 07/30/20	< 31	< 30	< 35	< 16	< 38	< 38	< 38
07/30/20 - 08/05/20	< 18	< 37	< 38	< 37	< 37	< 35	< 41
08/05/20 - 08/13/20	< 37	< 36	< 30	< 32	< 31	< 32	< 15
08/13/20 - 08/20/20	< 17	< 39	< 29	< 39	< 38	< 39	< 32
08/20/20 - 08/27/20	< 20	< 46	< 21	< 47	< 46	< 43	< 22
08/27/20 - 09/02/20	< 49	< 49	< 37	< 40	< 39	< 42	< 18
09/02/20 - 09/10/20	< 16	< 37	< 16	< 37	< 37	< 37	< 16
09/10/20 - 09/17/20	< 51	< 50	< 19	< 20	< 20	< 21	< 21
09/17/20 - 09/24/20	< 19	< 23	< 23	< 59	< 59	< 59	< 60
09/24/20 - 10/01/20	< 13	< 30	< 26	< 30	< 30	< 30	< 29
10/01/20 - 10/08/20	< 45	< 44	< 26	< 33	< 33	< 33	< 34
10/08/20 - 10/15/20	< 11	< 24	< 54	< 24	< 24	< 24	< 25
10/15/20 - 10/22/20	< 41	< 40	< 22	< 57	< 58	< 57	< 58
10/22/20 - 10/29/20	< 23	< 53	< 18	< 53	< 53	< 53	< 50
10/29/20 - 11/06/20	< 19	< 23	< 9	< 22	< 22	< 22	< 22
11/06/20 - 11/12/20	< 20	< 20	< 15	< 36	< 36	< 36	< 37
11/12/20 - 11/19/20	< 18	< 34	< 17	< 45	< 45	< 45	< 46
11/19/20 - 11/25/20	< 21	< 33	< 24	< 26	< 26	< 26	< 27
11/25/20 - 12/03/20	< 24	< 28	< 18	< 28	< 28	< 28	< 20
12/03/20 - 12/09/20	< 38	< 38	< 40	< 44	< 44	< 45	< 19
12/09/20 - 12/16/20	< 27	< 27	< 13	< 31	< 30	< 31	< 31
12/16/20 - 12/23/20	< 26	< 25	< 18	< 25	< 25	< 25	< 16
12/23/20 - 12/29/20	< 22	< 25	< 28	< 30	< 30	< 30	< 30
MEAN	-	-	-	-	-	-	-

TABLE C-VIII.1 **CONCENTRATIONS OF I-131 IN MILK SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2020**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION	CONTROL FARM	INDICATOR FARMS		
PERIOD	K15-3	F4-1	G2-1	P4-1
01/15/20	< 0.9	< 0.8	< 0.8	< 0.9
02/12/20	< 0.7	< 0.8	< 0.8	< 0.9
03/11/20	< 0.8	< 0.7	< 0.7	< 0.6
03/25/20	< 0.6	< 0.6	< 0.6	< 0.6
04/08/20	< 0.7	< 0.8	< 0.7	< 0.7
04/23/20	< 0.6	< 0.9	< 0.9	< 0.7
05/07/20	< 0.7	< 0.8	< 0.7	< 0.7
05/20/20	< 0.6	< 0.7	< 0.6	< 0.6
06/03/20	< 0.6	< 0.7	< 0.6	< 0.7
06/17/20	< 0.9	< 0.5	< 0.4	< 0.7
07/01/20	< 0.7	< 0.8	< 0.6	< 0.7
07/15/20	< 0.8	< 0.9	< 0.7	< 0.7
07/29/20	< 0.8	< 0.7	< 0.8	< 0.7
08/12/20	< 0.9	< 0.7	< 0.8	< 0.9
08/26/20	< 0.5	< 0.7	< 0.8	< 0.8
09/09/20	< 0.8	< 0.7	< 0.8	< 0.8
09/23/20	< 0.9	< 0.4	< 0.9	< 0.6
10/07/20	< 0.8	< 0.9	< 0.8	< 0.9
10/22/20	< 0.9	< 0.8	< 0.9	< 0.8
11/04/20	< 0.9	< 0.9	< 0.9	< 0.8
11/18/20	< 0.9	< 0.8	< 0.7	< 0.9
12/09/20	< 0.9	< 0.8	< 0.9	< 0.8
MEAN	-	-	-	-

Table C-VIII.2 **CONCENTRATIONS OF STRONTIUM IN MILK SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2020**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

COLLECTION	CONTROL FARM		INDICATOR FARMS					
	K15-3		F4-1		G2-1		P4-1	
PERIOD	Sr-89	Sr-90	Sr-89	Sr-90	Sr-89	Sr-90	Sr-89	Sr-90
01/15/20 - 03/25/20	< 3.8	< 0.9	< 3.3	< 0.5	< 4.6	< 0.9	< 3.7	< 0.8
04/08/20 - 06/17/20	< 3.9	< 0.9	< 4.2	< 0.7	< 3.4	< 0.9	< 4.6	< 0.9
07/01/20 - 09/23/20	< 3.5	< 0.8	< 4.5	< 0.7	< 4.2	< 1.0	< 3.4	< 0.8
10/07/20 - 12/09/20	< 4.0	< 0.8	< 4.8	< 0.7	< 4.5	< 0.7	< 4.3	< 0.7
MEAN ± 2 STD DEV	-	-	-	-	-	-	-	-

Table C-VIII.3 CONCENTRATIONS OF GAMMA EMITTERS IN MILK SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2020

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	K-40	Cs-134	Cs-137	Ba-140	La-140
F4-1	01/15/20	1310 ± 140	< 8	< 6	< 22	< 6
	02/12/20	1198 ± 138	< 5	< 6	< 20	< 6
	03/11/20	1382 ± 182	< 9	< 8	< 30	< 9
	03/25/20	1329 ± 179	< 9	< 9	< 31	< 9
	04/08/20	1161 ± 120	< 6	< 5	< 20	< 6
	04/23/20	1337 ± 183	< 8	< 7	< 31	< 9
	05/06/20	1290 ± 131	< 4	< 5	< 23	< 6
	05/20/20	1194 ± 156	< 9	< 9	< 39	< 10
	06/03/20	1356 ± 240	< 11	< 7	< 31	< 8
	06/17/20	1152 ± 150	< 10	< 8	< 33	< 14
	07/01/20	1112 ± 167	< 9	< 7	< 23	< 7
	07/15/20	1418 ± 158	< 8	< 6	< 29	< 9
	07/29/20	1625 ± 190	< 9	< 7	< 29	< 11
	08/12/20	1354 ± 217	< 11	< 7	< 34	< 9
	08/26/20	1249 ± 191	< 9	< 9	< 30	< 6
	09/09/20	1241 ± 184	< 8	< 7	< 34	< 7
	09/23/20	1618 ± 180	< 9	< 8	< 32	< 9
	10/07/20	1272 ± 168	< 9	< 8	< 26	< 11
	10/22/20	1446 ± 167	< 9	< 9	< 32	< 14
	11/04/20	1182 ± 171	< 10	< 8	< 37	< 14
	11/18/20	1380 ± 152	< 7	< 7	< 35	< 9
	12/09/20	1293 ± 177	< 8	< 9	< 31	< 9
	MEAN ± 2 STD DEV	1314 ± 269	-	-	-	-
G2-1	01/15/20	777 ± 129	< 8	< 7	< 23	< 8
	02/12/20	1214 ± 119	< 6	< 6	< 24	< 6
	03/11/20	1292 ± 191	< 7	< 9	< 33	< 8
	03/25/20	1176 ± 206	< 8	< 7	< 30	< 14
	04/08/20	1119 ± 156	< 7	< 7	< 26	< 7
	04/23/20	1260 ± 177	< 8	< 8	< 35	< 9
	05/06/20	1272 ± 114	< 5	< 5	< 23	< 6
	05/20/20	1196 ± 174	< 9	< 7	< 37	< 12
	06/03/20	1145 ± 176	< 10	< 9	< 33	< 10
	06/17/20	1179 ± 201	< 10	< 9	< 36	< 7
	07/01/20	1327 ± 193	< 9	< 8	< 26	< 7
	07/15/20	1069 ± 162	< 7	< 8	< 36	< 11
	07/29/20	1169 ± 180	< 10	< 9	< 32	< 10
	08/12/20	1063 ± 165	< 6	< 6	< 27	< 7
	08/26/20	1084 ± 177	< 10	< 10	< 31	< 9
	09/09/20	1356 ± 220	< 8	< 5	< 33	< 14
	09/23/20	1316 ± 198	< 10	< 7	< 31	< 7
	10/07/20	1172 ± 144	< 8	< 7	< 26	< 6
	10/22/20	1121 ± 179	< 8	< 8	< 34	< 10
	11/04/20	1045 ± 172	< 9	< 9	< 42	< 9
	11/18/20	1365 ± 189	< 7	< 9	< 27	< 11
	12/09/20	1166 ± 178	< 9	< 8	< 31	< 10
	MEAN ± 2 STD DEV	1176 ± 261	-	-	-	-

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

Table C-VIII.3 CONCENTRATIONS OF GAMMA EMITTERS IN MILK SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2020

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	K-40	Cs-134	Cs-137	Ba-140	La-140
K15-3	01/15/20	984 ± 161	< 8	< 6	< 25	< 7
	02/12/20	1220 ± 108	< 5	< 5	< 19	< 5
	03/11/20	1206 ± 176	< 9	< 8	< 35	< 8
	03/25/20	1133 ± 202	< 8	< 8	< 40	< 9
	04/08/20	1082 ± 141	< 6	< 6	< 20	< 5
	04/23/20	922 ± 168	< 6	< 7	< 32	< 13
	05/06/20	1023 ± 135	< 5	< 6	< 25	< 7
	05/20/20	1040 ± 136	< 8	< 7	< 33	< 8
	06/03/20	1053 ± 198	< 9	< 9	< 29	< 6
	06/17/20	877 ± 147	< 8	< 7	< 30	< 9
	07/01/20	1044 ± 136	< 8	< 7	< 24	< 7
	07/15/20	961 ± 136	< 7	< 7	< 27	< 7
	07/29/20	1077 ± 193	< 8	< 7	< 28	< 12
	08/12/20	1173 ± 159	< 8	< 7	< 30	< 10
	08/26/20	934 ± 159	< 8	< 8	< 26	< 9
	09/09/20	1096 ± 170	< 8	< 9	< 29	< 11
	09/23/20	1131 ± 194	< 7	< 9	< 36	< 13
	10/07/20	852 ± 137	< 8	< 7	< 25	< 6
	10/22/20	1152 ± 150	< 8	< 7	< 30	< 10
	11/04/20	1188 ± 188	< 9	< 11	< 37	< 13
	11/18/20	1202 ± 179	< 8	< 10	< 39	< 7
	12/09/20	1152 ± 177	< 8	< 8	< 30	< 5
	MEAN ± 2 STD DEV	1068 ± 220	-	-	-	-
P4-1	01/15/20	1346 ± 177	< 8	< 7	< 22	< 5
	02/12/20	1394 ± 146	< 6	< 6	< 21	< 7
	03/11/20	1426 ± 165	< 8	< 8	< 36	< 12
	03/25/20	1367 ± 166	< 9	< 9	< 31	< 13
	04/08/20	1559 ± 142	< 5	< 5	< 18	< 7
	04/23/20	1365 ± 161	< 9	< 8	< 28	< 11
	05/07/20	1436 ± 184	< 9	< 10	< 39	< 12
	05/20/20	1197 ± 173	< 8	< 8	< 29	< 9
	06/03/20	1141 ± 162	< 10	< 9	< 33	< 11
	06/17/20	1582 ± 234	< 9	< 7	< 28	< 10
	07/01/20	1272 ± 178	< 9	< 7	< 23	< 8
	07/15/20	1211 ± 150	< 6	< 6	< 24	< 7
	07/29/20	1388 ± 198	< 11	< 8	< 36	< 13
	08/12/20	1443 ± 179	< 8	< 8	< 28	< 7
	08/26/20	1287 ± 178	< 7	< 8	< 34	< 9
	09/09/20	1218 ± 160	< 6	< 8	< 34	< 11
	09/23/20	1466 ± 170	< 7	< 7	< 28	< 8
	10/07/20	1420 ± 138	< 7	< 7	< 23	< 7
	10/22/20	1423 ± 156	< 7	< 7	< 23	< 9
	11/04/20	1526 ± 217	< 9	< 8	< 40	< 11
	11/18/20	1369 ± 198	< 8	< 8	< 34	< 10
	12/09/20	1208 ± 197	< 9	< 10	< 29	< 12
	MEAN ± 2 STD DEV	1366 ± 242	-	-	-	-

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

Table C-IX.1 **CONCENTRATIONS OF STRONTIUM AND GAMMA EMITTERS IN FOOD PRODUCT SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2020**

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

SITE	COLLECTION PERIOD	Sr-90	Be-7	K-40	-131	Cs-134	Cs-137
B10-2							
Kale Leaves	06/25/20		< 196	4238 ± 562	< 29	< 26	< 25
Collard Leaves	06/25/20		< 225	3776 ± 479	< 27	< 25	< 18
Bok Choy Leaves	06/25/20		< 226	3992 ± 544	< 26	< 23	< 21
Cabbage Leaves	07/23/20		< 245	3182 ± 551	< 28	< 29	< 27
Cauliflower Leaves	07/23/20		< 272	4766 ± 610	< 35	< 34	< 24
Kale Leaves	07/23/20		< 267	5763 ± 699	< 35	< 32	< 31
Tomato	07/23/20	< 3.8	< 255	1577 ± 448	< 41	< 35	< 30
Sunflower Leaves	08/26/20		882 ± 269	6623 ± 865	< 32	< 44	< 35
Cucumber Leaves	08/26/20		820 ± 284	4034 ± 603	< 30	< 29	< 31
Kale Leaves	08/26/20		< 307	3864 ± 767	< 36	< 47	< 33
Corn	08/26/20	< 4.6	< 160	1914 ± 386	< 19	< 16	< 16
Potatoes	08/26/20	< 4.0	< 133	2337 ± 364	< 20	< 23	< 16
Sunflower Leaves	09/24/20		928 ± 458	7134 ± 944	< 46	< 41	< 40
Collard Leaves	09/24/20		< 296	4292 ± 783	< 45	< 44	< 34
Cabbage Leaves	09/24/20		< 296	3151 ± 650	< 34	< 29	< 30
MEAN ± 2 STD DEV		-	876 ± 109	4043 ± 3160	-	-	-
E1-2							
Cabbage Leaves	06/25/20		< 310	2688 ± 566	< 19	< 28	< 33
Swiss Chard Leaves	06/25/20		710 ± 253	8717 ± 862	< 32	< 30	< 33
Brussels Sprout Leaves	06/25/20		< 279	2757 ± 519	< 39	< 35	< 31
Brussels Sprout Leaves	07/23/20		496 ± 218	3463 ± 622	< 33	< 31	< 33
Cabbage Leaves	07/23/20		< 392	3717 ± 583	< 37	< 32	< 35
Swiss Chard Leaves	07/23/20		545 ± 290	6838 ± 915	< 49	< 46	< 35
Tomato	07/23/20	< 3.3	< 167	1310 ± 321	< 25	< 23	< 20
Swiss Chard Leaves	08/26/20		518 ± 244	5630 ± 731	< 25	< 24	< 25
Collard Leaves	08/26/20		< 315	3430 ± 574	< 34	< 35	< 34
Kale Leaves	08/26/20		< 385	6168 ± 869	< 41	< 40	< 39
Corn	08/26/20	< 4.4	< 192	2803 ± 409	< 24	< 30	< 22
Potatoes	08/26/20	< 3.2	< 189	4425 ± 717	< 36	< 33	< 30
Cabbage Leaves	09/23/20		< 384	3208 ± 644	< 44	< 35	< 35
Collard Leaves	09/23/20		1004 ± 264	3974 ± 665	< 45	< 30	< 34
Swiss Chard Leaves	09/23/20		< 357	5806 ± 796	< 45	< 39	< 31
MEAN ± 2 STD DEV		-	655 ± 426	4329 ± 3882	-	-	-
H1-2							
Yellow Squash Leaves	06/25/20		< 341	4348 ± 580	< 39	< 29	< 29
Cucumber Leaves	06/25/20		471 ± 218	3098 ± 529	< 41	< 30	< 31
Watermelon Leaves	06/25/20		< 344	3553 ± 582	< 44	< 38	< 33
Yellow Squash Leaves	07/23/20		910 ± 226	4045 ± 669	< 41	< 33	< 29
Watermelon Leaves	07/23/20		1093 ± 285	4271 ± 583	< 29	< 34	< 24
Cucumber Leaves	07/23/20		722 ± 260	3076 ± 513	< 34	< 35	< 31
Yellow Squash Leaves	08/26/20		1468 ± 350	2995 ± 701	< 35	< 41	< 37
Cucumber Leaves	08/26/20		444 ± 364	3288 ± 596	< 30	< 37	< 24
Pumpkin Leaves	08/26/20		1527 ± 369	3612 ± 626	< 31	< 28	< 39
Pumpkin Leaves	09/23/20		< 360	1670 ± 497	< 52	< 42	< 30
Yellow Squash Leaves	09/23/20		< 303	4833 ± 775	< 46	< 36	< 36
Cucumber Leaves	09/23/20		< 287	3222 ± 624	< 40	< 33	< 32
MEAN ± 2 STD DEV			948 ± 880	3501 ± 1648	-	-	-

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, 2020

RESULTS IN UNITS OF MILLIREM/QUARTER

STATION CODE	MEAN ± 2 S.D.	JAN - MAR	APR - JUN	JUL - SEP	OCT - DEC
A1-4	15.0 ± 2.2	13.7	14.8	15.1	16.4
A3-1	14.0 ± 2.8	14.8	13.5	15.3	12.2
A5-1	18.5 ± 2.6	18.7	16.9	18.4	20.1
A9-3	15.4 ± 1.4	16.1	15.0	15.9	14.6
B1-1	16.5 ± 3.2	14.4	15.9	17.8	17.7
B1-2	15.5 ± 3.1	13.5	15.1	16.9	16.6
B2-1	15.4 ± 2.5	16.6	16.2	14.7	13.9
B5-1	17.7 ± 1.1	17.6	17.3	17.5	18.5
C1-1	17.8 ± 3.5	18.5	17.1	19.8	15.8
C1-2	15.2 ± 3.1	13.3	15.0	15.4	17.1
C2-1	17.0 ± 2.9	18.0	16.0	18.4	15.5
C5-1	18.1 ± 1.9	19.2	18.2	18.1	16.9
C8-1	18.5 ± 2.1	18.5	19.1	19.3	17.0
D1-1	15.8 ± 2.3	14.2	15.9	16.3	16.9
D1-2	16.4 ± 2.4	16.5	16.9	17.4	14.7
D2-2	21.6 ± 1.3	21.9	21.1	22.3	21.0
D6-1	20.0 ± 2.4	20.7	18.8	21.3	19.2
E1-2	16.3 ± 2.7	17.1	15.2	17.7	15.0
E1-4	16.3 ± 2.5	14.7	16.8	17.6	16.0
E2-3	19.7 ± 2.6	20.3	18.9	21.1	18.3
E5-1	20.0 ± 2.2	21.3	19.4	20.5	18.9
E7-1	17.8 ± 1.6	18.8	17.0	17.9	17.4
F1-1	17.0 ± 2.2	17.8	16.9	17.7	15.4
F1-2	16.5 ± 1.9	15.5	16.0	17.0	17.6
F1-4	15.3 ± 4.0	12.4	15.4	16.4	16.9
F2-1	19.7 ± 2.4	20.7	19.0	20.6	18.3
F5-1	20.2 ± 2.4	21.2	19.4	21.3	19.0
G1-2	18.1 ± 4.1	19.0	16.9	20.6	16.0
G1-3	15.4 ± 2.7	13.5	16.1	15.5	16.6
G1-5	15.0 ± 3.9	12.8	16.4	16.9	14.0
G1-6	15.8 ± 2.1	14.4	16.0	15.7	16.9
G2-4	21.5 ± 2.9	23.1	21.4	21.8	19.6
G5-1	17.0 ± 2.9	17.5	16.8	18.6	15.1
H1-1	18.1 ± 3.3	15.6	19.1	18.6	18.9
H3-1	13.8 ± 2.2	15.4	13.8	12.9	13.2
H5-1	12.9 ± 2.4	13.6	11.1	13.5	13.4
H8-1	28.3 ± 3.9	27.8	27.4	31.1	26.7
J1-1	15.1 ± 2.4	13.4	16.0	15.1	15.9
J1-3	13.8 ± 1.9	12.8	13.5	13.6	15.1
J3-1	16.6 ± 1.7	16.8	15.9	15.9	17.7
J5-1	19.1 ± 2.1	19.2	17.6	19.3	20.1
J7-1	20.0 ± 2.2	20.2	19.1	19.3	21.5
K1-4	15.7 ± 3.3	13.3	16.9	16.1	16.6
K2-1	20.2 ± 1.9	19.3	19.8	20.2	*21.5*
K3-1	14.4 ± 2.0	15.0	12.9	14.6	15.0
K5-1	19.2 ± 2.8	19.3	17.2	20.5	19.7
K8-1	16.9 ± 1.8	17.8	16.1	16.2	17.6

Table C-X.1 QUARTERLY OSLD RESULTS FOR THREE MILE ISLAND NUCLEAR STATION, 2020

RESULTS IN UNITS OF MILLIREM/QUARTER

STATION CODE	MEAN ± 2 S.D.	JAN - MAR	APR - JUN	JUL - SEP	OCT - DEC
L1-1	16.7 ± 3.3	14.7	16.2	18.6	17.2
L1-2	14.9 ± 2.3	14.0	16.1	13.8	*15.6*
L2-1	16.4 ± 2.2	15.7	15.3	17.2	17.5
L5-1	15.1 ± 2.0	16.2	13.8	15.5	15.0
L8-1	16.2 ± 1.0	16.1	15.5	16.6	16.4
M1-1	15.8 ± 3.1	13.6	16.2	16.0	17.2
M1-2	18.3 ± 2.2	17.7	19.6	17.1	18.8
M2-1	14.3 ± 2.7	15.6	12.9	13.5	15.3
M5-1	16.5 ± 1.3	17.0	15.7	17.1	16.3
M9-1	22.0 ± 5.4	20.7	20.0	26.0	21.3
N1-1	17.2 ± 3.8	15.1	*19.7*	*16.9*	17.2
N1-3	15.8 ± 3.7	13.4	15.5	16.4	17.8
N2-1	17.5 ± 1.0	18.1	16.9	17.5	17.4
N5-1	14.2 ± 1.0	14.0	13.7	14.0	14.9
N8-1	18.8 ± 1.7	18.8	17.8	19.9	18.6
P1-1	16.0 ± 1.2	16.7	16.2	15.6	15.3
P1-2	16.5 ± 4.6	14.7	15.3	16.0	19.8
P2-1	19.6 ± 1.3	20.2	18.8	19.3	20.1
P5-1	16.4 ± 1.7	15.7	15.7	17.4	16.7
P8-1	13.8 ± 0.9	14.1	13.2	14.2	13.7
Q1-1	17.5 ± 3.8	16.5	16.7	16.4	20.3
Q1-2	13.9 ± 2.3	12.6	13.9	13.8	15.4
Q2-1	14.6 ± 2.8	13.8	13.1	16.3	15.1
Q5-1	15.6 ± 1.8	15.7	14.4	15.6	16.6
Q9-1	16.5 ± 1.4	17.0	15.8	17.1	15.9
R1-1	14.8 ± 2.4	13.3	14.5	15.0	16.2
R1-2	15.5 ± 3.0	14.1	17.1	14.3	16.4
R3-1	20.7 ± 2.7	21.1	19.7	22.4	19.5
R5-1	18.2 ± 0.5	18.5	18.3	17.9	18.1
R9-1	18.6 ± 2.0	19.2	17.4	19.6	18.0
B10-1	18.2 ± 3.1	19.3	17.2	19.7	16.6
D15-1	17.9 ± 1.1	18.0	17.6	18.6	17.3
F10-1	21.5 ± 1.8	21.8	21.0	22.6	20.6
F25-1	18.4 ± 1.8	19.4	18.4	18.7	17.2
G10-1	26.2 ± 3.8	27.9	25.0	27.7	24.2
G15-1	23.2 ± 2.4	23.5	24.0	23.9	21.4
H15-1	17.3 ± 1.5	17.0	16.5	18.3	17.3
J15-1	20.4 ± 3.0	20.6	18.3	20.9	21.8
K15-1	16.7 ± 3.3	17.3	14.3	16.9	18.1
L15-1	17.0 ± 1.6	16.3	16.3	17.6	17.8
N15-2	19.1 ± 2.2	19.6	17.7	20.2	18.8
Q15-1	18.0 ± 2.2	18.9	17.1	16.9	18.9
R15-1	16.5 ± 3.3	17.6	16.5	17.8	*14.2*

TABLE C-X.2 **MEAN QUARTERLY OSLD RESULTS FOR THE SITE BOUNDARY, INDICATOR AND CONTROL LOCATIONS FOR THREE MILE ISLAND NUCLEAR STATION, 2020**

RESULTS IN UNITS OF MILLIREM/QUARTER
± 2 STANDARD DEVIATIONS OF THE STATION DATA

COLLECTION PERIOD	SITE BOUNDARY ± 2 STD DEV	INDICATOR	CONTROL
JAN-MAR	13.8 ± 1.9	17.8 ± 5.5	19.6 ± 6.8
APR-JUN	15.7 ± 2.5	17.0 ± 5.3	18.3 ± 6.5
JUL-SEP	16.2 ± 2.7	18.1 ± 6.4	19.8 ± 6.7
OCT-DEC	16.8 ± 2.6	17.3 ± 5.1	18.8 ± 5.5

TABLE C-X.3 **SUMMARY OF THE AMBIENT DOSIMETRY PROGRAM FOR THREE MILE ISLAND NUCLEAR STATION, 2020**

RESULTS IN UNITS OF MILLIREMQUARTER

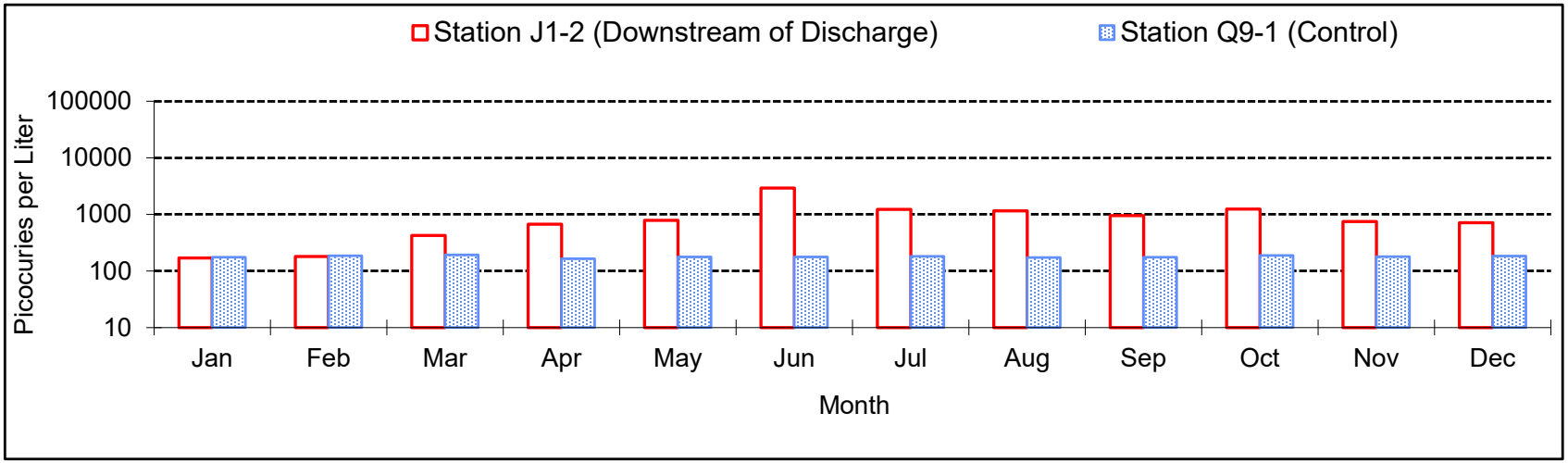
LOCATION	SAMPLES ANALYZED	PERIOD MINIMUM	PERIOD MAXIMUM	PERIOD MEAN ± 2 STD DEV
SITE BOUNDARY	76	12.4	19.8	15.6 ± 3.3
INDICATOR	240	11.1	31.1	17.6 ± 5.6
CONTROL	44	14.2	27.9	19.1 ± 6.3

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, 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, K15-1, L15-1, N15-1, Q15-1, R15-1

FIGURE C-1
Monthly Tritium Concentrations in Surface Water and Effluent Water
Three Mile Island Nuclear Station, 2020



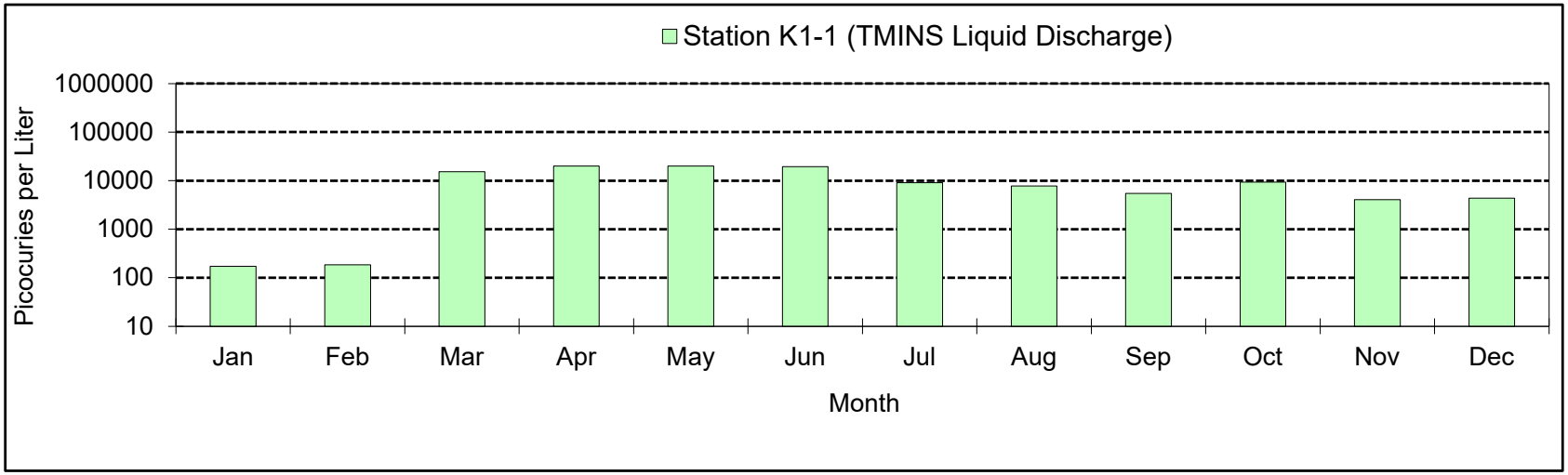


FIGURE C-2
Mean Quarterly Tritium Concentrations in Surface Water
Three Mile Island Nuclear Station, 1974 - 2020

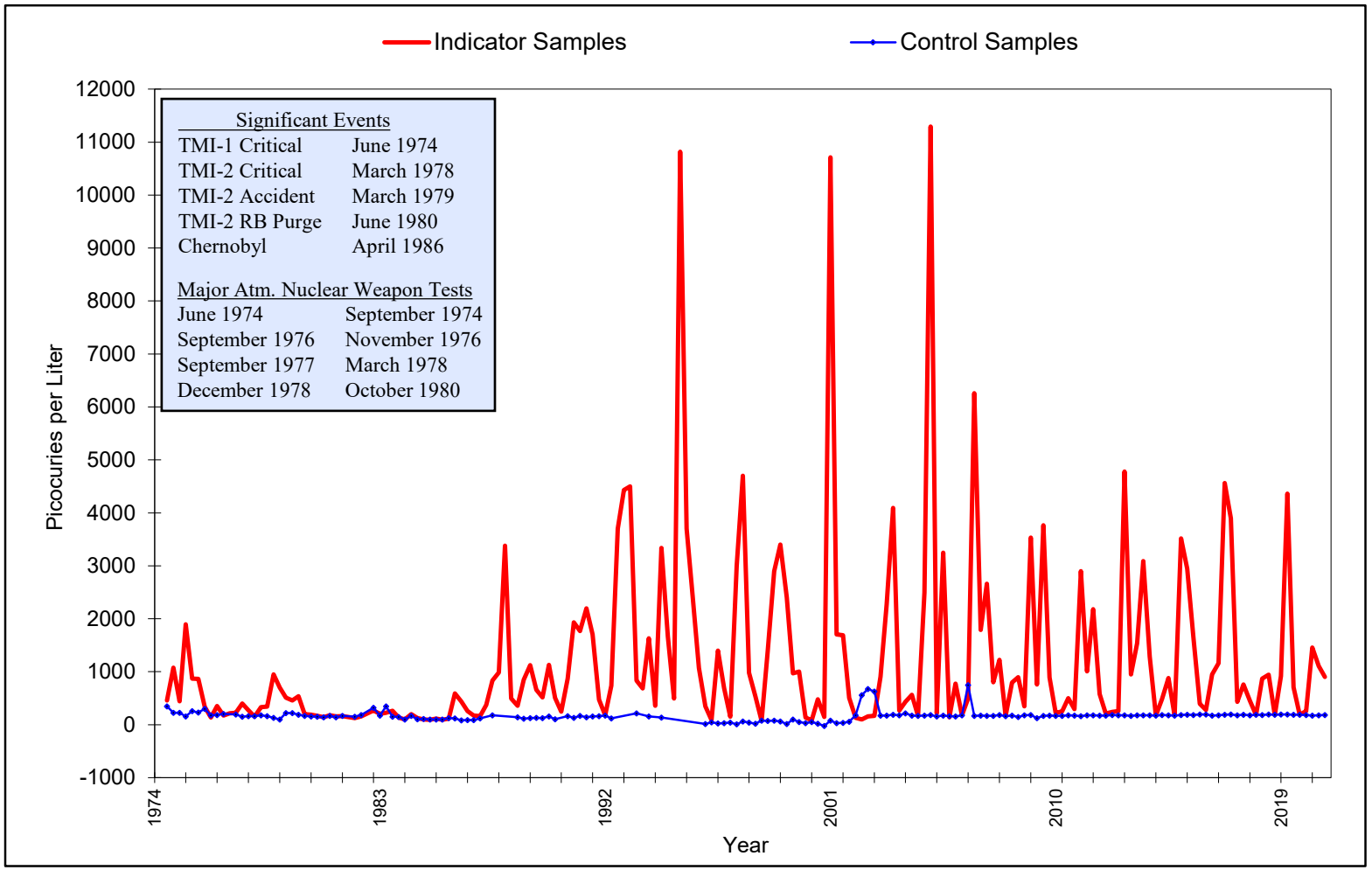


FIGURE C-3
Mean Monthly Gross Beta Concentrations in Drinking Water
Three Mile Island Nuclear Station, 2020

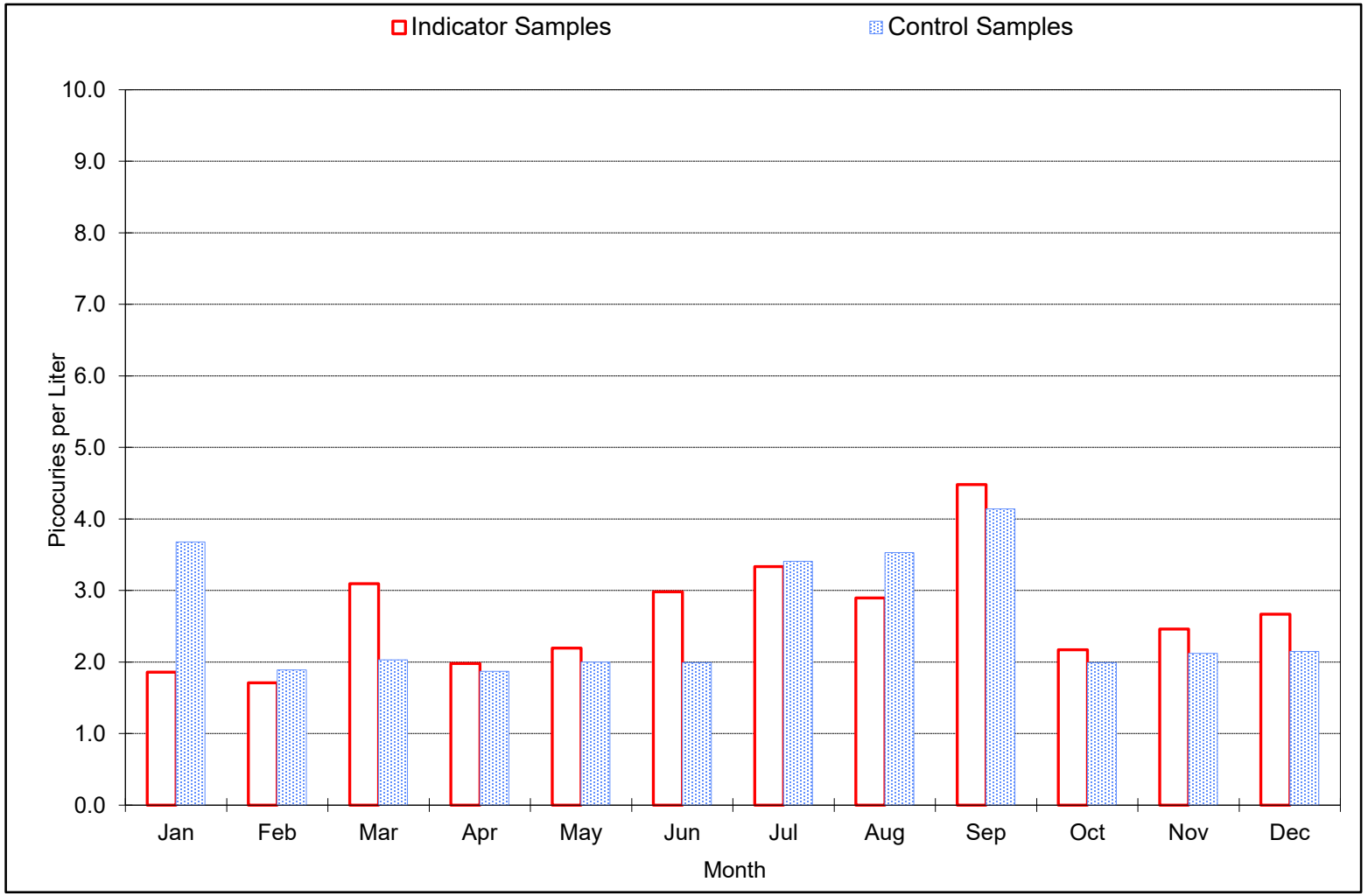
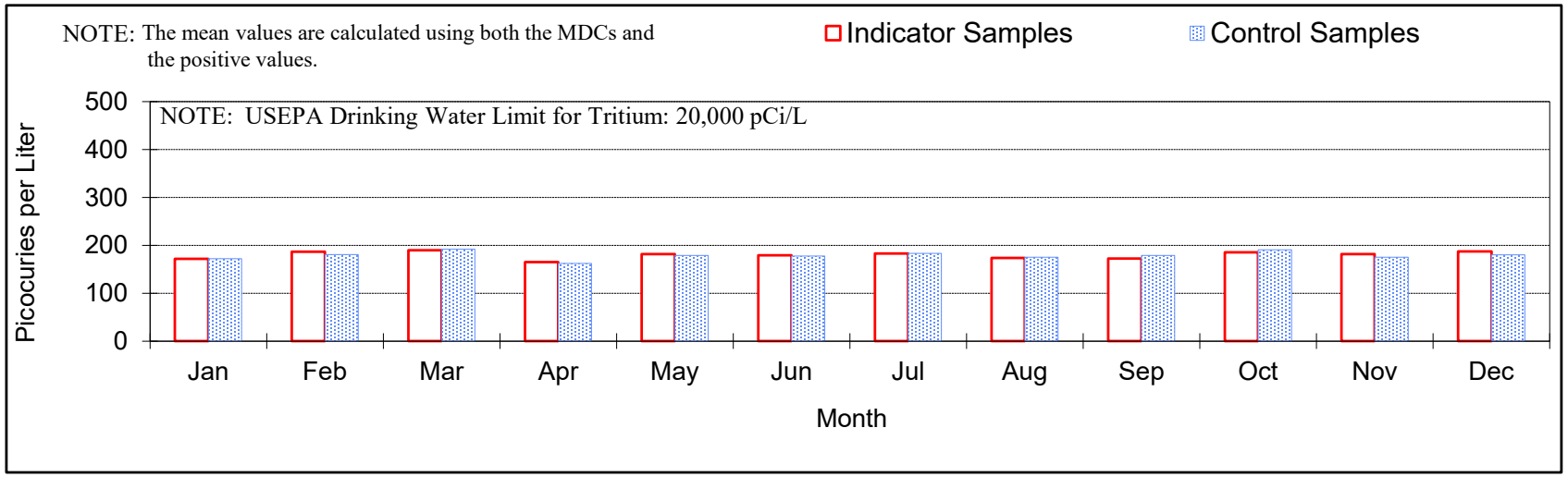


FIGURE C-4
Mean Monthly Tritium Concentrations in Drinking Water and Effluent Water
Three Mile Island Nuclear Station, 2020



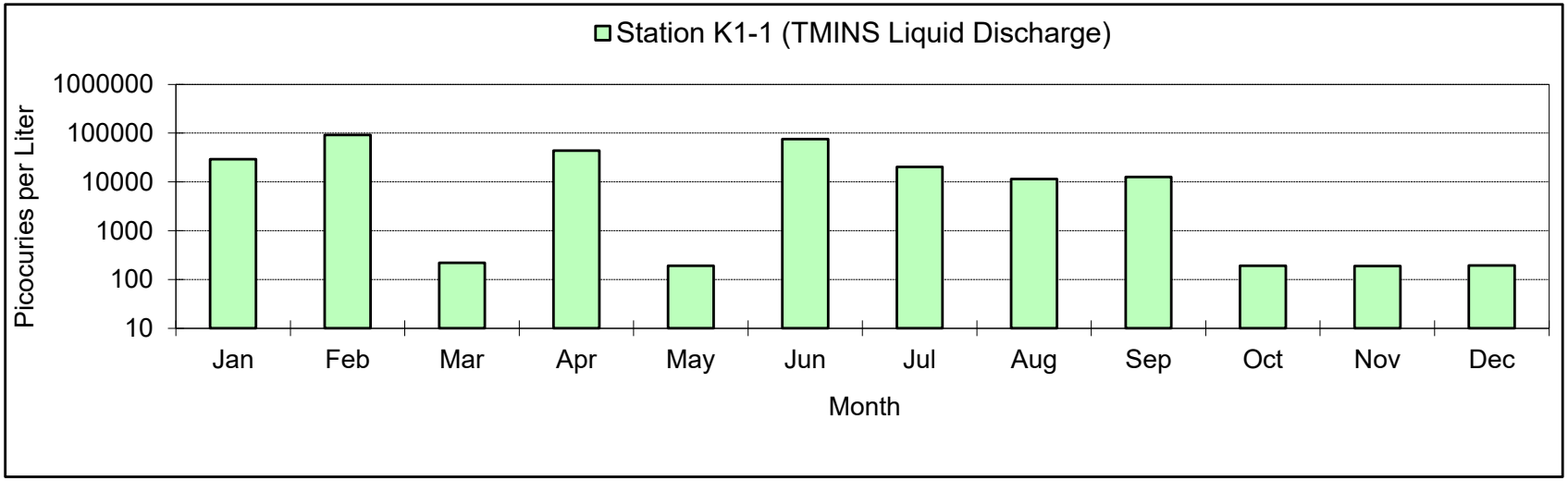


FIGURE C-5
Mean Cesium-137 Concentrations in Aquatic Sediments
Three Mile Island Nuclear Station, 1984 – 2020

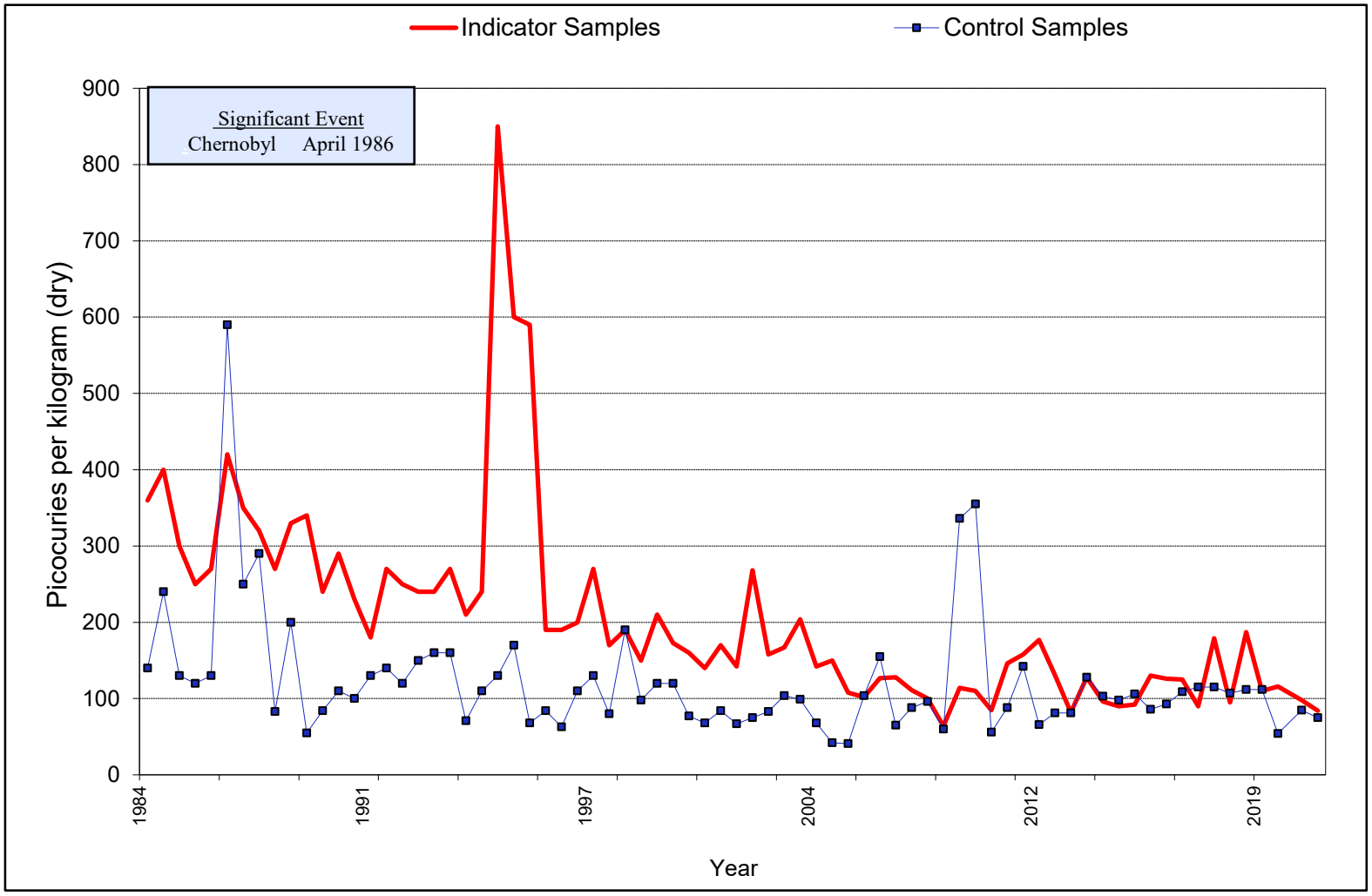


FIGURE C-6
Mean Quarterly Gross Beta Concentrations in Air Particulates
Three Mile Island Nuclear Station, 1972 - 2020

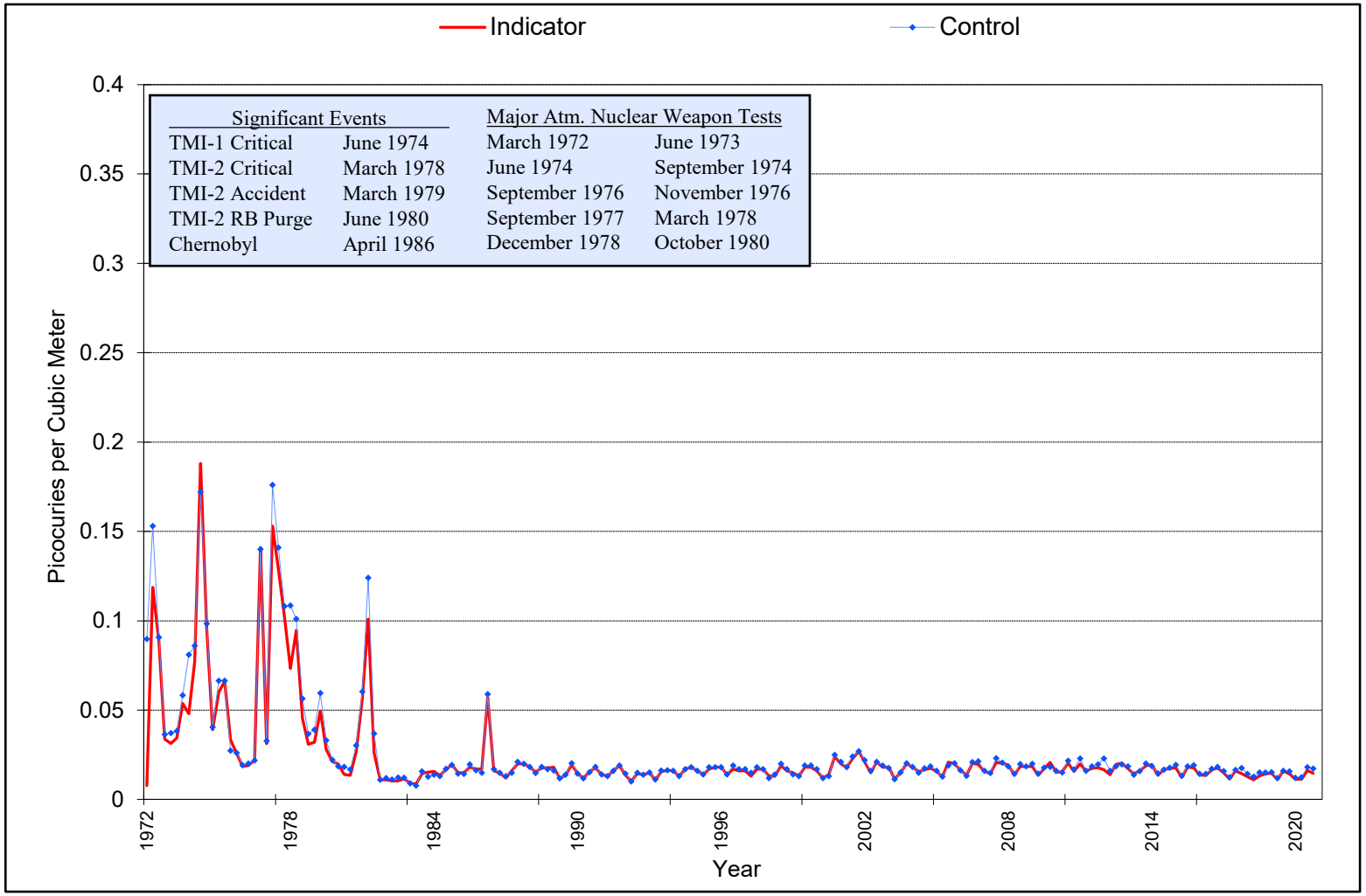
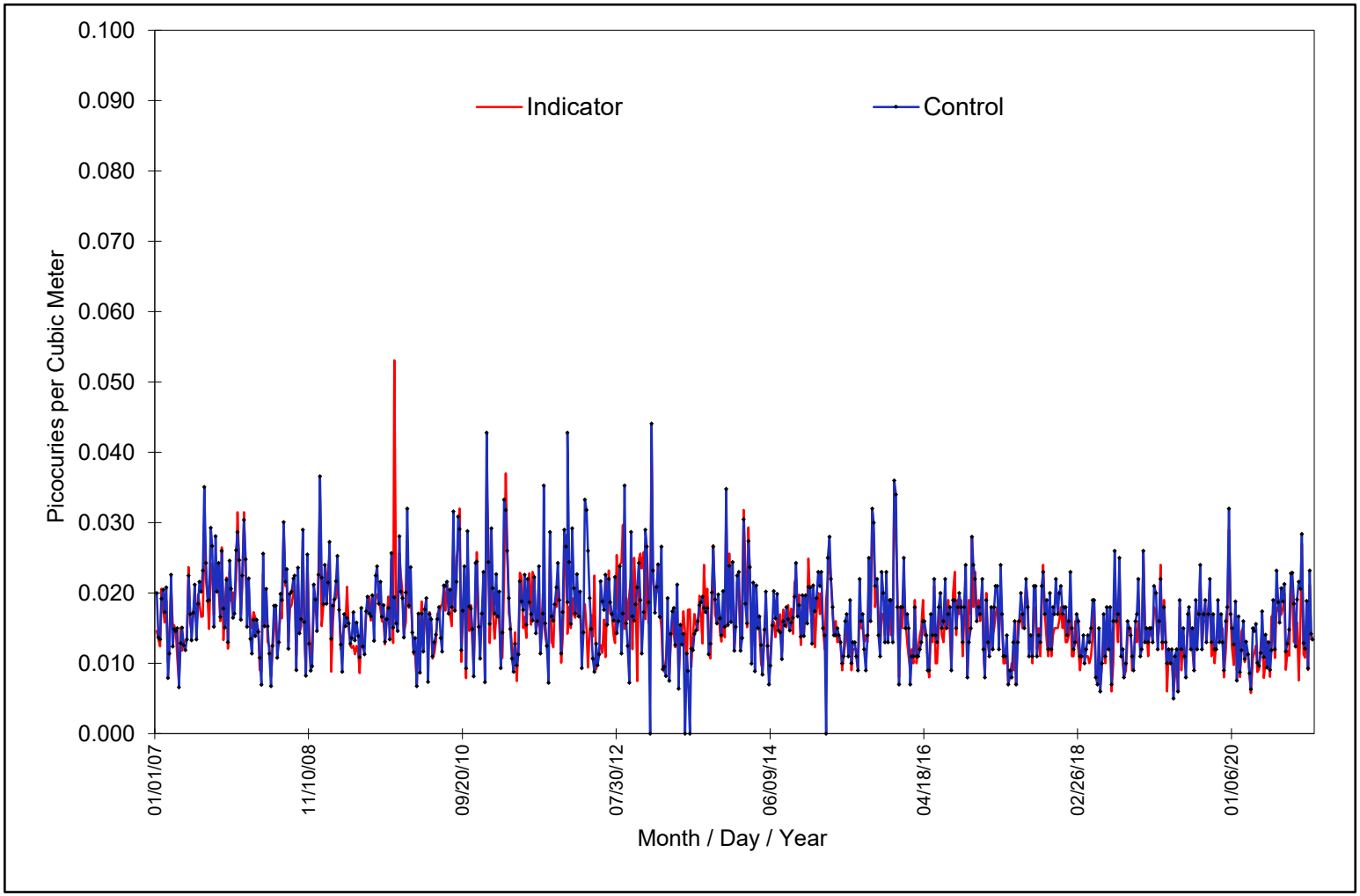
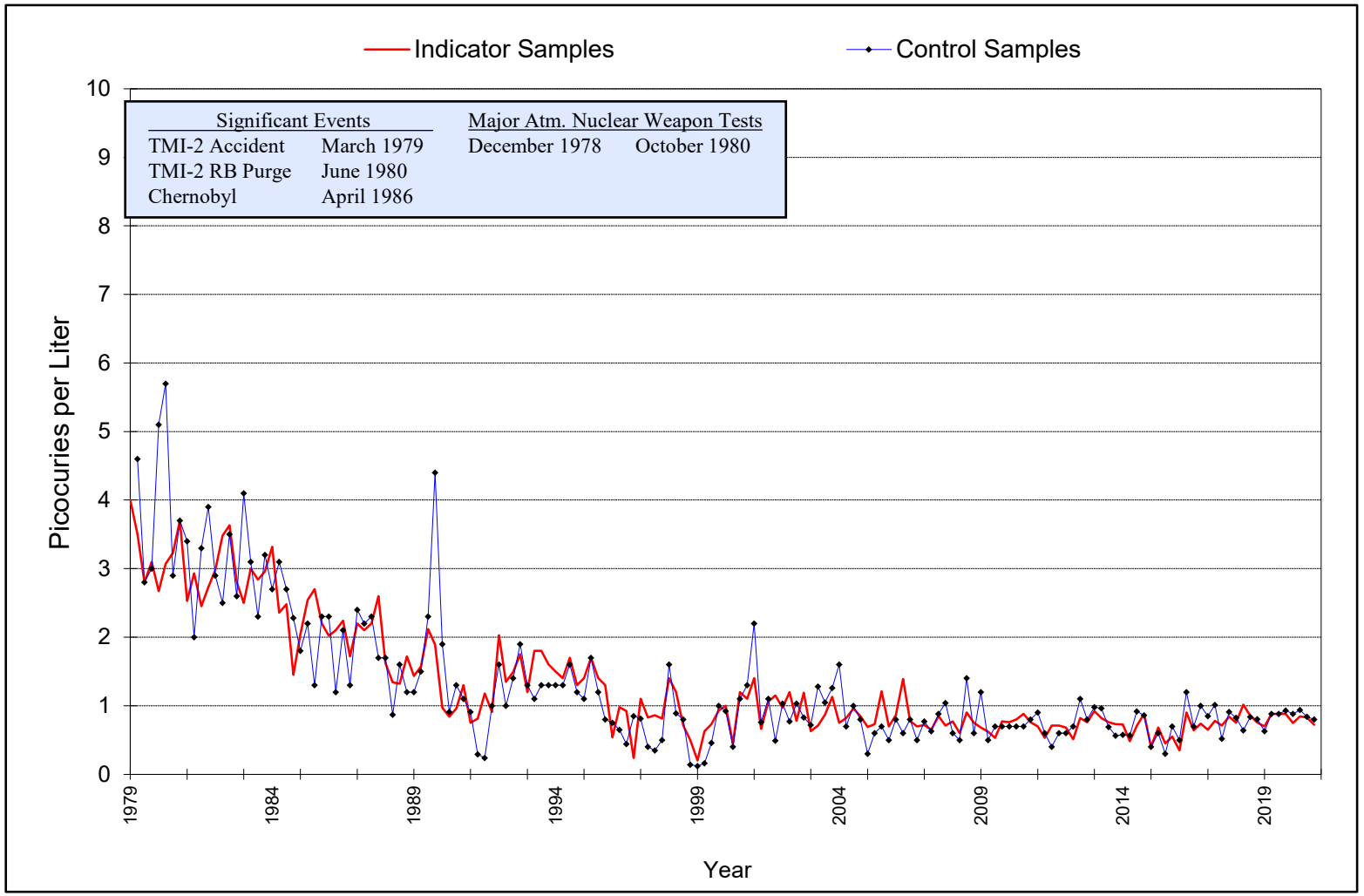


FIGURE C-7
Mean Weekly Gross Beta Concentrations in Air Particulates
Three Mile Island Nuclear Station, 2007 - 2020



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 - 2020



Intentionally left blank

APPENDIX D

DATA TABLES AND FIGURES
COMPARISON LABORATORIES

Intentionally left blank

The following section presents the results of data analysis performed by the QC laboratories, Exelon Industrial Services (EIS) and GEL Laboratories (GEL). Duplicate samples were obtained from several locations and media and were split with the primary laboratory, Teledyne Brown Engineering (TBE). Comparison of the results for most media were within expected ranges.

Intentionally left blank

TABLE D-I.1 CONCENTRATIONS OF GROSS BETA IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2020

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

LAB	COLLECTION PERIOD	Q9-1Q
EIS	01/02/20 - 01/30/20	1.7 ± 0.7
	01/30/20 - 02/27/20	0.9 ± 0.6
	02/27/20 - 04/01/20	1.4 ± 0.6
	04/01/20 - 04/29/20	1.7 ± 0.6
	04/29/20 - 05/28/20	1.9 ± 0.7
	05/28/20 - 06/30/20	1.5 ± 0.6
	06/30/20 - 07/30/20	1.8 ± 0.7
	07/30/20 - 09/02/20	2.1 ± 0.7
	09/02/20 - 10/01/20	3.1 ± 0.8
	10/01/20 - 10/29/20	2.0 ± 0.7
	10/29/20 - 12/03/20	1.6 ± 0.6
	12/03/20 - 12/29/20	1.7 ± 0.7
	MEAN ± 2 STD DEV	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, 2020

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

LAB	COLLECTION PERIOD	Q9-1Q
GEL	01/02/20 - 04/01/20	< 136
	04/01/20 - 06/30/20	< 137
	06/30/20 - 10/04/20	< 118
	10/04/20 - 12/29/20	< 158
	MEAN	-

TABLE D-I.3 CONCENTRATIONS OF IODINE-131 IN DRINKING WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2020

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

LAB	COLLECTION PERIOD	Q9-1Q
EIS	01/02/20 - 01/30/20	< 0.7
	01/30/20 - 02/27/20	< 0.7
	02/27/20 - 04/01/20	< 0.5
	04/01/20 - 04/29/20	< 0.7
	04/29/20 - 05/28/20	< 0.6
	05/28/20 - 06/30/20	< 0.9
	06/30/20 - 07/30/20	< 0.8
	07/30/20 - 09/02/20	< 0.9
	09/02/20 - 10/01/20	< 0.6
	10/01/20 - 10/29/20	< 0.8
	10/29/20 - 12/03/20	< 0.7
	12/03/20 - 12/29/20	< 0.8
	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, 2020

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

LAB	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
EIS	Q9-1Q	01/02/20 - 01/30/20	< 3	< 3	< 6	< 3	< 6	< 3	< 5	< 3	< 3	< 11	< 4
		01/30/20 - 02/27/20	< 4	< 5	< 9	< 5	< 9	< 5	< 7	< 5	< 5	< 17	< 8
		02/27/20 - 04/01/20	< 4	< 5	< 9	< 4	< 9	< 4	< 8	< 4	< 5	< 18	< 6
		04/01/20 - 04/29/20	< 4	< 5	< 9	< 5	< 8	< 4	< 8	< 4	< 5	< 20	< 8
		04/29/20 - 05/28/20	< 5	< 6	< 13	< 6	< 11	< 6	< 8	< 5	< 6	< 26	< 10
		05/28/20 - 06/30/20	< 5	< 5	< 9	< 5	< 10	< 5	< 7	< 4	< 5	< 24	< 9
		06/30/20 - 07/30/20	< 4	< 4	< 7	< 5	< 9	< 4	< 7	< 4	< 4	< 17	< 6
		07/30/20 - 09/02/20	< 4	< 4	< 8	< 4	< 7	< 4	< 6	< 4	< 4	< 14	< 5
		09/02/20 - 10/01/20	< 4	< 4	< 8	< 4	< 8	< 4	< 6	< 4	< 4	< 15	< 5
		10/01/20 - 10/29/20	< 4	< 4	< 9	< 4	< 10	< 5	< 7	< 5	< 5	< 23	< 8
		10/29/20 - 12/03/20	< 6	< 6	< 14	< 6	< 8	< 5	< 7	< 5	< 6	< 26	< 11
		12/03/20 - 12/29/20	< 6	< 6	< 12	< 6	< 14	< 6	< 9	< 5	< 6	< 26	< 12
		MEAN	-	-	-	-	-	-	-	-	-	-	-

TABLE D-II.1

CONCENTRATIONS OF STRONTIUM AND GAMMA EMITTERS IN FISH SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2020

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

LAB	SITE	COLLECTION PERIOD	Sr-89	Sr-90	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Cs-134	Cs-137
EIS	INDP	11/20/20			3850 ± 317	< 14	< 15	< 42	< 14	< 36	< 14	< 12
GEL	INDP	11/20/20	< 24	< 8.9								

TABLE D-III.1 CONCENTRATIONS OF GAMMA EMITTERS IN SEDIMENT SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2020

LAB	SITE	COLLECTION PERIOD	K-40	Cs-134	Cs-137
EIS	J2-1	12/01/20	13600 ± 1770	< 121	< 134

TABLE D-IV.1 CONCENTRATIONS OF GAMMA EMITTERS AND STRONTIUM IN FOOD PRODUCT SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2020

RESULTS IN UNITS OF PCI/KG WET ± 2 SIGMA

LAB	SITE	TYPE	COLLECTION PERIOD	Be-7	K-40	I-131	Cs-134	Cs-137	Sr-89	Sr-90
EIS	B10-2Q	Cabbage	07/23/20	< 183	2590 ± 339	< 31	< 22	< 21		
GEL	B10-2Q	Cabbage	07/23/20						< 15.9	24 ± 4.9
EIS	H1-2Q	Squash	06/25/20	246 ± 120	3750 ± 389	< 57	< 23	< 25		
EIS	H1-2Q	Squash	07/23/20	734 ± 135	3760 ± 388	< 27	< 24	< 22		
EIS	H1-2Q	Squash	08/26/20	1190 ± 156	3840 ± 373	< 32	< 17	< 19		
EIS	H1-2Q	Squash	09/23/20	< 271	2160 ± 390	< 45	< 32	< 34		

TABLE D-V.1 CONCENTRATIONS OF GROSS BETA IN AIR PARTICULATE AND I-131 IN AIR IODINE SAMPLES COLLECED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2020

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

LAB	COLLECTION PERIOD	E1-2Q GROSS BETA	E1-2Q I-131
EIS	01/02/20 - 01/09/20	19 ± 2	< 11
	01/09/20 - 01/16/20	18 ± 2	< 9
	01/16/20 - 01/23/20	26 ± 2	< 8
	01/23/20 - 01/30/20	16 ± 2	< 10
	01/30/20 - 02/06/20	20 ± 2	< 11
	02/06/20 - 02/13/20	15 ± 2	< 8
	02/13/20 - 02/20/20	25 ± 2	< 12
	02/20/20 - 02/27/20	24 ± 2	< 11
	02/27/20 - 03/05/20	18 ± 2	< 12
	03/05/20 - 03/11/20	15 ± 2	< 16
	03/11/20 - 03/19/20	19 ± 2	< 18
	03/19/20 - 03/26/20	16 ± 2	< 23
	03/26/20 - 04/01/20	13 ± 2	< 19
	04/01/20 - 04/09/20	16 ± 2	< 19
	04/09/20 - 04/16/20	20 ± 2	< 20
	04/16/20 - 04/23/20	23 ± 2	< 17
	04/23/20 - 04/29/20	12 ± 2	< 18
	04/29/20 - 05/07/20	15 ± 2	< 15
	05/07/20 - 05/14/20	16 ± 2	< 19
	05/14/20 - 05/21/20	20 ± 2	< 16
	05/21/20 - 05/28/20	11 ± 2	< 19
	05/28/20 - 06/04/20	17 ± 2	< 14
	06/04/20 - 06/11/20	19 ± 2	< 19
	06/11/20 - 06/18/20	14 ± 2	< 20
	06/18/20 - 06/24/20	17 ± 2	< 18
	06/24/20 - 06/30/20	23 ± 3	< 28
	06/30/20 - 07/08/20	23 ± 2	< 10
	07/08/20 - 07/16/20	19 ± 2	< 15
	07/16/20 - 07/23/20	25 ± 2	< 11
	07/23/20 - 07/30/20	30 ± 2	< 11
	07/30/20 - 08/05/20	25 ± 3	< 15
	08/05/20 - 08/13/20	32 ± 2	< 20
	08/13/20 - 08/20/20	29 ± 2	< 22
	08/20/20 - 08/27/20	32 ± 3	< 25
	08/27/20 - 09/02/20	18 ± 2	< 17
	09/02/20 - 09/10/20	27 ± 2	< 11
	09/10/20 - 09/17/20	18 ± 2	< 26
	09/17/20 - 09/24/20	32 ± 3	< 14
	09/24/20 - 10/01/20	35 ± 3	< 17
	10/01/20 - 10/08/20	24 ± 2	< 17
	10/08/20 - 10/15/20	23 ± 2	< 15
	10/15/20 - 10/22/20	22 ± 2	< 15
	10/22/20 - 10/29/20	16 ± 2	< 24
	10/29/20 - 11/06/20	30 ± 2	< 18
	11/06/20 - 11/12/20	44 ± 3	< 21
	11/12/20 - 11/19/20	26 ± 2	< 23
	11/19/20 - 11/25/20	32 ± 3	< 38
	11/25/20 - 12/03/20	24 ± 2	< 16
	12/03/20 - 12/09/20	18 ± 2	< 33
	12/09/20 - 12/16/20	53 ± 3	< 21
	12/16/20 - 12/23/20	24 ± 2	< 22
	12/23/20 - 12/29/20	30 ± 3	< 28
	MEAN ± 2 STD DEV	23 ± 16	-

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

TABLE D-V.2 CONCENTRATIONS OF GAMMA EMITTERS IN AIR PARTICULATE SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2020

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

LAB	SITE	COLLECTION PERIOD	Be-7	Cs-134	Cs-137
EIS	E1-2Q	01/02/20 - 04/01/20	82 ± 13	< 1.1	< 1.0
		04/01/20 - 06/30/20	68 ± 12	< 1.3	< 1.2
		06/30/20 - 10/01/20	80 ± 13	< 1.3	< 1.5
		10/01/20 - 12/29/20	53 ± 11	< 1.2	< 1.3
		MEAN ± 2 STD DEV	71 ± 26	-	-

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, 2020

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

LAB	SITE	COLLECTION DATE	I-131	K-40	Cs-134	Cs-137	Ba-140	La-140	Sr-89	Sr-90
EIS	G2-1Q	01/15/20	< 0.8	967 ± 74	< 5	< 6	< 25	< 8		
EIS		02/12/20	< 0.6	1190 ± 107	< 5	< 6	< 19	< 6		
EIS		03/11/20	< 0.5	1430 ± 87	< 3	< 4	< 17	< 5		
EIS		03/25/20	< 0.9	1220 ± 82	< 4	< 4	< 22	< 6		
GEL		01/15/20 - 03/25/20							< 3.3	< 1.7
EIS		04/08/20	< 0.7	1370 ± 106	< 5	< 5	< 23	< 7		
EIS		04/23/20	< 0.6	1370 ± 86	< 4	< 4	< 19	< 7		
EIS		05/06/20	< 0.7	1410 ± 106	< 4	< 5	< 22	< 5		
EIS		05/20/20	< 0.4	1450 ± 942	< 4	< 4	< 15	< 5		
EIS		06/03/20	< 0.5	1460 ± 108	< 5	< 5	< 20	< 8		
EIS		06/17/20	< 0.6	1290 ± 102	< 5	< 5	< 22	< 7		
GEL		04/08/20 - 06/17/20							< 2.3	< 1.8
EIS		07/01/20	< 0.6	1410 ± 106	< 5	< 5	< 20	< 7		
EIS		07/15/20	< 0.8	1320 ± 101	< 6	< 7	< 25	< 8		
EIS		07/29/20	< 0.7	1330 ± 104	< 5	< 5	< 20	< 6		
EIS		08/12/20	< 0.7	1300 ± 101	< 6	< 5	< 23	< 6		
EIS		08/26/20	< 0.8	1210 ± 103	< 6	< 7	< 24	< 8		
EIS		09/09/20	< 0.6	1240 ± 99	< 4	< 6	< 22	< 7		
EIS		09/23/20	< 0.8	1460 ± 108	< 5	< 5	< 21	< 6		
GEL		07/01/20 - 09/23/20							< 2.6	< 1.8
EIS		10/07/20	< 0.8	1410 ± 107	< 4	< 5	< 20	< 9		
EIS		10/22/20	< 0.6	1470 ± 110	< 4	< 5	< 25	< 7		
EIS		11/04/20	< 0.8	1120 ± 98	< 6	< 5	< 24	< 9		
EIS		11/18/20	< 0.7	1250 ± 101	< 5	< 5	< 21	< 6		
EIS		12/09/20	< 0.8	1140 ± 98	< 5	< 5	< 20	< 6		
GEL		10/07/20 - 12/09/20							< 3.4	< 1.5
		MEAN ± 2 STD DEV		1310 ± 264	-	-	-	-	-	-

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

FIGURE D-1
MONTHLY GROSS BETA CONCENTRATIONS IN DRINKING WATER SAMPLES COLLECTED FROM TMINS LOCATION Q9-1Q, 2020

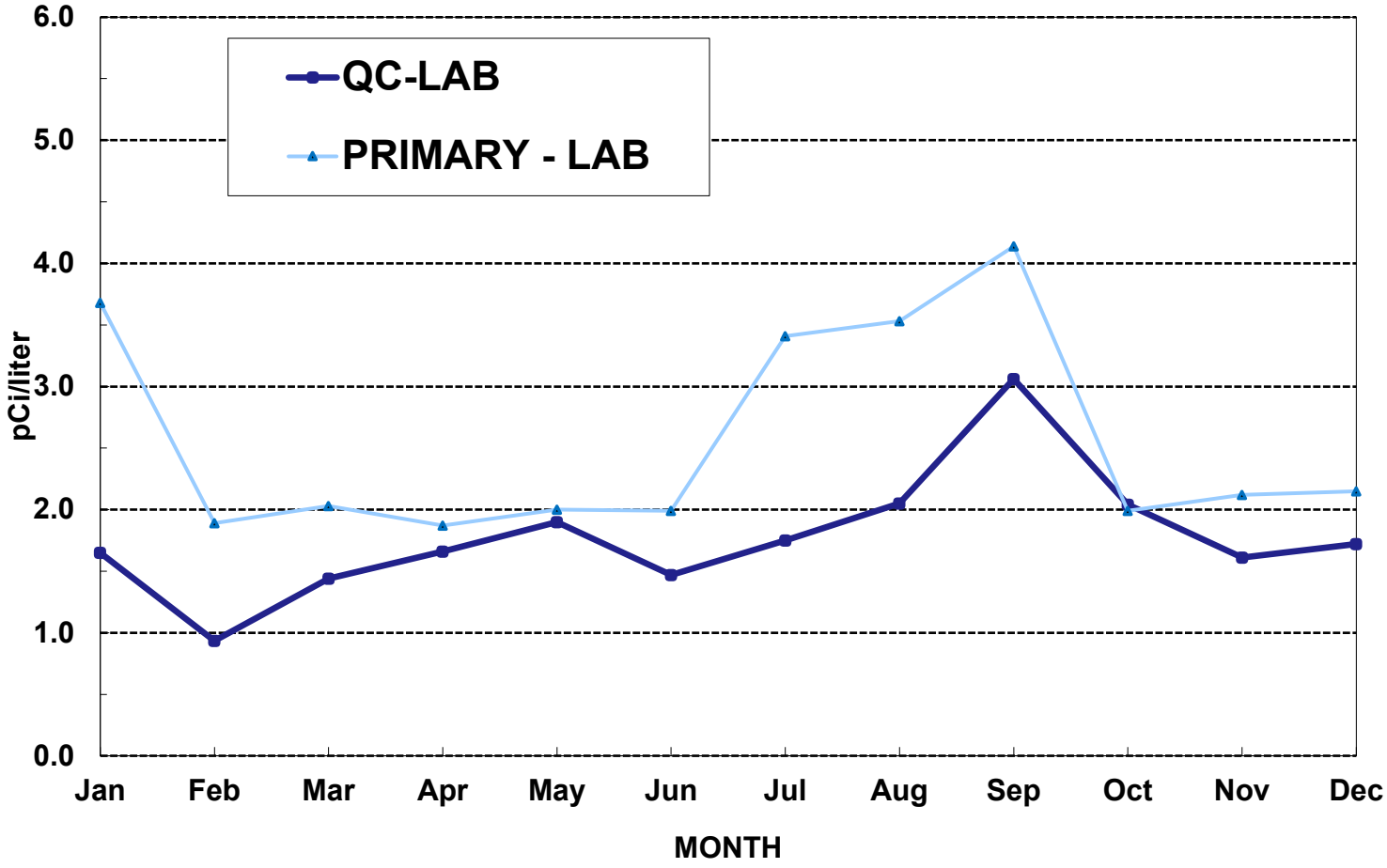
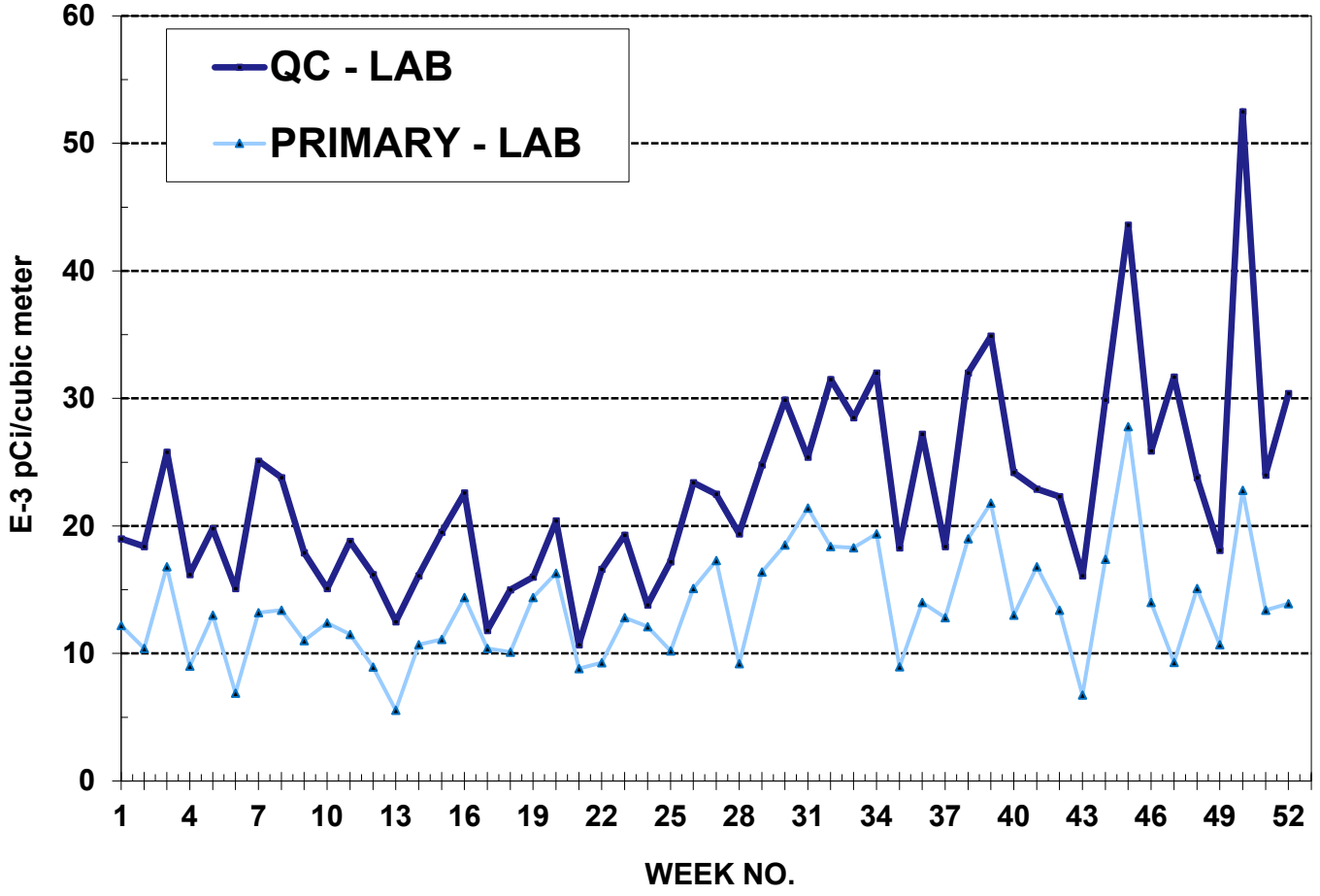


FIGURE D-2
WEEKLY GROSS BETA CONCENTRATIONS IN AIR PARTICULATE SAMPLES COLLECTED FROM TMINS LOCATION E1-2Q, 2020



APPENDIX E

INTER-LABORATORY COMPARISON PROGRAM

Intentionally left blank

Table E.1 **Analytics Environmental Radioactivity Cross Check Program**
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Value	Known Value [(a)]	Ratio of TBE to Known Result	Evaluation [(b)]
September 2020	E13247	Milk	Sr-89	pCi/L	62.8	95.4	0.66	N[(1)]
			Sr-90	pCi/L	12.0	12.8	0.94	A
	E13248	Milk	Ce-141	pCi/L	156	150	1.04	A
			Co-58	pCi/L	172	180	0.96	A
			Co-60	pCi/L	369	379	0.97	A
			Cr-51	pCi/L	372	372	1.00	A
			Cs-134	pCi/L	171	200	0.85	A
			Cs-137	pCi/L	241	250	0.96	A
			Fe-59	pCi/L	217	200	1.08	A
			I-131	pCi/L	84.6	95.0	0.89	A
			Mn-54	pCi/L	175	180	0.97	A
			Zn-65	pCi/L	252	270	0.93	A
	E13249	Charcoal	I-131	pCi	70.2	75.8	0.93	A
	E13250	AP	Ce-141	pCi	101	101	1.00	A
			Co-58	pCi	111	120	0.92	A
			Co-60	pCi	249	254	0.98	A
			Cr-51	pCi	287	249	1.15	A
			Cs-134	pCi	114	134	0.85	A
			Cs-137	pCi	159	168	0.95	A
			Fe-59	pCi	127	134	0.95	A
			Mn-54	pCi	114	121	0.94	A
			Zn-65	pCi	168	181	0.93	A
	E13251	Soil	Ce-141	pCi/g	0.241	0.191	1.26	W
			Co-58	pCi/g	0.211	0.228	0.93	A
			Co-60	pCi/g	0.466	0.481	0.97	A
			Cr-51	pCi/g	0.450	0.472	0.95	A
			Cs-134	pCi/g	0.273	0.254	1.07	A
			Cs-137	pCi/g	0.370	0.390	0.95	A
			Fe-59	pCi/g	0.233	0.254	0.92	A
			Mn-54	pCi/g	0.217	0.229	0.95	A
			Zn-65	pCi/g	0.368	0.343	1.07	A
	E13252	AP	Sr-89	pCi	79.9	100.0	0.80	A
			Sr-90	pCi	12.1	13.4	0.90	A

(a) 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

(b) 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

*(1) See **NCR 20-19***

Analytics Environmental Radioactivity Cross Check Program

Table E.1 **Teledyne Brown Engineering Environmental Services**

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Value	Known Value [(a)]	Ratio of TBE to Known Result	Evaluation [(b)]
December 2020	E13254	Milk	Sr-89	pCi/L	82.2	89.7	0.92	A
			Sr-90	pCi/L	12.4	13.0	0.96	A
	E13255	Milk	Ce-141	pCi/L	91.1	100	0.91	A
			Co-58	pCi/L	77.5	84.3	0.92	A
			Co-60	pCi/L	147	152	0.97	A
			Cr-51	pCi/L	259	253	1.02	A
			Cs-134	pCi/L	97.1	108	0.90	A
			Cs-137	pCi/L	117	127	0.92	A
			Fe-59	pCi/L	114	112	1.02	A
			I-131	pCi/L	84.3	91.9	0.92	A
			Mn-54	pCi/L	137	143	0.96	A
			Zn-65	pCi/L	175	190	0.92	A
	E13256	Charcoal	I-131	pCi	70.2	78.2	0.90	A
	E13257A	AP	Ce-141	pCi	67.4	74.6	0.90	A
			Co-58	pCi	57.9	62.9	0.92	A
			Co-60	pCi	108	113	0.95	A
			Cr-51	pCi	162	189	0.86	A
			Cs-134	pCi	68.1	80.4	0.85	A
			Cs-137	pCi	82.4	95.0	0.87	A
			Fe-59	pCi	80.5	83.7	0.96	A
			Mn-54	pCi	102	107	0.95	A
			Zn-65	pCi	115	142	0.81	A
	E13258	Soil	Ce-141	pCi/g	0.167	0.170	0.98	A
			Co-58	pCi/g	0.125	0.143	0.87	A
			Co-60	pCi/g	0.245	0.257	0.95	A
			Cr-51	pCi/g	0.393	0.429	0.92	A
			Cs-134	pCi/g	0.147	0.183	0.80	A
			Cs-137	pCi/g	0.260	0.288	0.90	A
			Fe-59	pCi/g	0.199	0.190	1.05	A
			Mn-54	pCi/g	0.229	0.243	0.94	A
			Zn-65	pCi/g	0.320	0.322	0.99	A
	E13259	AP	Sr-89	pCi	85.0	78.6	1.08	A
			Sr-90	pCi	13.1	11.4	1.15	A

(a) 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

(b) 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

DOE's Mixed Analyte Performance Evaluation Program (MAPEP)
Teledyne Brown Engineering Environmental Services

Table E.2

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Value	Known Value [a]	Acceptance Range	Evaluation [b]
February 2020	20-GrF42	AP	Gross Alpha	Bq/sample	0.676	1.24	0.37 - 2.11	A
			Gross Beta	Bq/sample	2.03	2.00	1.00 - 3.00	A
	20-MaS42	Soil	Ni-63	Bq/kg	0.01		*(1)*	A
			Sr-90	Bq/kg	348	340	238 - 442	A
	20-MaW42	Water	Ni-63	Bq/L	11.6	11.1	7.8 - 14.4	A
			Pu-238	Bq/L	0.926	0.94	0.66 - 1.22	A
			Pu-239/240	Bq/L	0.712	0.737	0.516 - 0.958	A
	20-RdF42	AP	U-234/233	Bq/sample	0.0416	0.075	0.053 - 0.098	N[3]
			U-238	Bq/sample	0.0388	0.078	0.055 - 0.101	N[3]
	20-RdV42	Vegetation	Cs-134	Bq/sample	3.23	3.82	2.67 - 4.97	A
			Cs-137	Bq/sample	2.64	2.77	1.94 - 3.60	A
			Co-57	Bq/sample	0.0281		*(1)*	A
			Co-60	Bq/sample	2.62	2.79	1.95 - 3.63	A
			Mn-54	Bq/sample	4.3	4.58	3.21 - 5.95	A
			Sr-90	Bq/sample	0.396	0.492	0.344 - 0.640	A
			Zn-65	Bq/sample	3.93	3.79	2.65 - 4.93	A
August 2020	20-GrF43	AP	Gross Alpha	Bq/sample	0.267	0.528	0.158 - 0.989	A
			Gross Beta	Bq/sample	0.939	0.915	0.458 - 1.373	A
	20-MaS43	Soil	Ni-63	Bq/kg	438	980	686 - 1274	N[4]
			Tc-99	Bq/kg	1.11		*(1)*	A
	20-MaW43	Water	Ni-63	Bq/L	0.175		*(1)*	A
			Tc-99	Bq/L	8.8	9.4	6.6 - 12.2	A
	20-RdV43	Vegetation	Cs-134	Bq/sample	3.635	4.94	3.46 - 6.42	W
			Cs-137	Bq/sample	0.0341		*(1)*	A
			Co-57	Bq/sample	5.855	6.67	4.67 - 8.67	W
			Co-60	Bq/sample	3.122	4.13	2.89 - 5.37	W
			Mn-54	Bq/sample	4.524	5.84	4.09 - 7.59	A
			Sr-90	Bq/sample	1.01	1.39	0.97 - 1.81	W
			Zn-65	Bq/sample	4.706	6.38	4.47 - 8.29	W

(a) 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

(b) DOE/MAPEP evaluation:

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

(1) False positive test

(2) Sensitivity evaluation

*(3) See **NCR 20-13***

*(4) See **NCR 20-20***

Table E.3

ERA Environmental Radioactivity Cross Check Program
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Value	Known Value [(a)]	Acceptance Limits	Evaluation [(b)]
March 2020	MRAD-32	Water	Am-241	pCi/L	52.5	45.3	31.1 - 57.9	A
			Fe-55	pCi/L	155	152	89.3 - 221	A
			Pu-238	pCi/L	34.0	36.4	21.9 - 47.2	A
			Pu-239	pCi/L	30.9	33.6	20.8 - 41.4	A
April 2020	RAD-121	Water	Ba-133	pCi/L	41.8	41.8	34.0- 46.7	A
			Cs-134	pCi/L	42.9	46.3	37.1 - 50.9	A
			Cs-137	pCi/L	226	234	211 - 259	A
			Co-60	pCi/L	52.4	50.3	45.3 - 57.9	A
			Zn-65	pCi/L	83.3	86.8	78.1 - 104	A
			GR-A	pCi/L	20.1	23.6	11.9 - 31.6	A
			GR-B	pCi/L	45.6	60.5	41.7 - 67.2	A
			U-Nat	pCi/L	18.45	18.6	14.9 - 20.9	A
			H-3	pCi/L	14200	14100	12300 - 15500	A
			Sr-89	pCi/L	58.0	60.1	48.3 - 67.9	A
			Sr-90	pCi/L	34.1	44.7	33.0 - 51.2	A
			I-131	pCi/L	27.4	28.9	24.1 - 33.8	A
September 2020	MRAD-33	Soil	Sr-90	pCi/Kg	4360	4980	1550 - 7760	A
		AP	Fe-55	pCi/Filter	189	407	149 - 649	A
			U-234	pCi/Filter	17.9	18.3	13.6 - 21.4	A
			U-238	pCi/Filter	19.1	18.1	13.7 - 21.6	A
		Water	Am-241	pCi/L	160	176	121 - 225	A
			Fe-55	pCi/L	299	298	175 - 433	A
			Pu-238	pCi/L	200	191	115 - 247	A
			Pu-239	pCi/L	105	100	61.9 - 123	A
October 2020	RAD-123	Water	Ba-133	pCi/L	37.1	37.0	29.8 - 41.6	A
			Cs-134	pCi/L	50.6	52.7	42.5 - 58.0	A
			Cs-137	pCi/L	131	131	118 - 146	A
			Co-60	pCi/L	62.9	60.5	54.4 - 69.1	A
			Zn-65	pCi/L	167	162	146 - 191	A
			GR-A	pCi/L	40.0	26.2	13.3 - 34.7	N[(1)]
			GR-B	pCi/L	47.5	69.1	48.0 - 76.0	N[(1)]
			U-Nat	pCi/L	17.2	20.3	16.3 - 22.7	A
			H-3	pCi/L	23800	23200	20,300 - 25,500	A
			Sr-89	pCi/L	41.1	43.3	33.4 - 50.5	A
			Sr-90	pCi/L	28.5	30.2	22.0 - 35.0	A
			I-131	pCi/L	22.9	28.2	23.5 - 33.1	N[(2)]
November 2020	QR111920K	Water	GR-A	pCi/L	50.7	52.4	27.3 - 65.6	A
			GR-B	pCi/L	24.9	24.3	15.0 - 32.3	A

(a) 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.

(b) ERA evaluation:

A = Acceptable - Reported value falls within the Acceptance Limits

N = Not Acceptable - Reported value falls outside of the Acceptance Limits

*(1) See **NCR 20-18***

*(2) See **NCR 20-17***

TABLE E.4 **Analytics Environmental Radioactivity Cross Check Program**
Exelon Industrial Services (2020)

Month/Year	Identification Number	Matrix	Nuclide	Units	EIS Reported Value	Known Value [(a)]	Ratio of Analytics to EIS Result	Evaluation [(b)]
June 2020	E13065 Detector 2	AP	Ce-141	pCi/Filter	71.5	75.5	95	Pass
			Co-58	pCi/Filter	60.7	65.4	93	Pass
			Co-60	pCi/Filter	125	127	98	Pass
			Cr-51	pCi/Filter	115	167	69	Pass
			Cs-134	pCi/Filter	82.9	95.2	87	Pass
			Cs-137	pCi/Filter	64.0	67.5	95	Pass
			Fe-59	pCi/Filter	65.8	65.7	100	Pass
			Mn-54	pCi/Filter	87.3	87.0	100	Pass
			Zn-65	pCi/Filter	136	146	93	Pass
	E13065 Detector 3	AP	Ce-141	pCi/Filter	68.0	75.5	90	Pass
			Co-58	pCi/Filter	67.3	65.4	103	Pass
			Co-60	pCi/Filter	125	127	99	Pass
			Cr-51	pCi/Filter	135	167	81	Pass
			Cs-134	pCi/Filter	83.9	95.2	88	Pass
			Cs-137	pCi/Filter	70.9	67.5	105	Pass
			Fe-59	pCi/Filter	72.4	65.7	110	Pass
			Mn-54	pCi/Filter	91.8	87.0	106	Pass
			Zn-65	pCi/Filter	154	146	106	Pass
	E13065 Detector 4	AP	Ce-141	pCi/Filter	82.8	75.5	110	Pass
			Co-58	pCi/Filter	55.0	65.4	84	Pass
			Co-60	pCi/Filter	124	127	98	Pass
			Cr-51	pCi/Filter	159	167	95	Pass
			Cs-134	pCi/Filter	75.8	95.2	80	Pass
			Cs-137	pCi/Filter	64.2	67.5	95	Pass
			Fe-59	pCi/Filter	82.9	65.7	126	Pass
			Mn-54	pCi/Filter	88.3	87.0	102	Pass
			Zn-65	pCi/Filter	153	146	105	Pass
	E13065 Detector 5	AP	Ce-141	pCi/Filter	79.4	75.5	105	Pass
			Co-58	pCi/Filter	62.1	65.4	95	Pass
			Co-60	pCi/Filter	136	127	107	Pass
			Cr-51	pCi/Filter	179	167	107	Pass
			Cs-134	pCi/Filter	81.4	95.2	86	Pass
			Cs-137	pCi/Filter	71.8	67.5	106	Pass
			Fe-59	pCi/Filter	71.7	65.7	109	Pass
			Mn-54	pCi/Filter	94.1	87.0	108	Pass
			Zn-65	pCi/Filter	152	146	104	Pass
June 2020	E13062 Detectors 2,3,4,5	AP	I-131	pCi/Filter	82.5	91.7	90	Pass
			I-131	pCi/Filter	87.6	91.7	96	Pass
			I-131	pCi/Filter	88.1	91.7	96	Pass
			I-131	pCi/Filter	86.2	91.7	94	Pass
	E13063	Water	Gr-B	pCi/L	273	272	100	Pass
	E13060 Detector 2	Milk	I-131	pCi/L	80.8	81.5	99	Pass
			Ce-141	pCi/L	107	116	92	Pass
			Co-58	pCi/L	107	100	107	Pass
			Co-60	pCi/L	200	195	103	Pass
			Cr-51	pCi/L	223	256	87	Pass
			Cs-134	pCi/L	142	146	97	Pass
			Cs-137	pCi/L	97.9	104	94	Pass
			Fe-59	pCi/L	96.0	101	95	Pass
			Mn-54	pCi/L	154	134	115	Pass
			Zn-65	pCi/L	225	225	100	Pass

(a) 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

(b) Analytics evaluation based on EIS internal QC limits in accordance with the NRC Resolution Test criteria

TABLE E.4 **Analytics Environmental Radioactivity Cross Check Program**
Exelon Industrial Services (2020)

Month/Year	Identification Number	Matrix	Nuclide	Units	EIS Reported Value	Known Value [a]	Ratio of Analytics to EIS Result	Evaluation [b]
	E13060	Milk	I-131	pCi/L	81.2	81.5	100	Pass
	Detector 3		Ce-141	pCi/L	106	116	91	Pass
			Co-58	pCi/L	101	100	101	Pass
			Co-60	pCi/L	195	195	100	Pass
			Cr-51	pCi/L	250	256	98	Pass
			Cs-134	pCi/L	131	146	90	Pass
			Cs-137	pCi/L	102	104	98	Pass
			Fe-59	pCi/L	99.1	101	98	Pass
			Mn-54	pCi/L	133	134	99	Pass
			Zn-65	pCi/L	189	225	84	Pass
	E13060	Milk	I-131	pCi/L	71.4	81.5	88	Pass
	Detector 4		Ce-141	pCi/L	114	116	98	Pass
			Co-58	pCi/L	99.2	100	99	Pass
			Co-60	pCi/L	199	195	102	Pass
			Cr-51	pCi/L	251	256	98	Pass
			Cs-134	pCi/L	125	146	86	Pass
			Cs-137	pCi/L	98.9	104	95	Pass
			Fe-59	pCi/L	104	101	103	Pass
			Mn-54	pCi/L	124	134	92	Pass
			Zn-65	pCi/L	211	225	94	Pass
	E13060	Milk	I-131	pCi/L	87.3	81.5	107	Pass
	Detector 5		Ce-141	pCi/L	118	116	102	Pass
			Co-58	pCi/L	94.9	100	95	Pass
			Co-60	pCi/L	181	195	93	Pass
			Cr-51	pCi/L	231	256	90	Pass
			Cs-134	pCi/L	128	146	88	Pass
			Cs-137	pCi/L	101	104	97	Pass
			Fe-59	pCi/L	106	101	105	Pass
			Mn-54	pCi/L	130	134	97	Pass
			Zn-65	pCi/L	200	225	89	Pass
	E13064	Water	I-131	pCi/L	63.9	80.5	79	Pass
	Detector 2		Ce-141	pCi/L	116	117	99	Pass
			Co-58	pCi/L	91.4	102	90	Pass
			Co-60	pCi/L	201	198	101	Pass
			Cr-51	pCi/L	208	259	80	Pass
			Cs-134	pCi/L	150	148	101	Pass
			Cs-137	pCi/L	109	105	104	Pass
			Fe-59	pCi/L	116	102	114	Pass
			Mn-54	pCi/L	129	135	95	Pass
			Zn-65	pCi/L	218	227	96	Pass
	E13064	Water	I-131	pCi/L	67.4	80.5	84	Pass
	Detector 4		Ce-141	pCi/L	126	117	107	Pass
			Co-58	pCi/L	100	102	98	Pass
			Co-60	pCi/L	204	198	103	Pass
			Cr-51	pCi/L	216	259	83	Pass
			Cs-134	pCi/L	150	148	102	Pass
			Cs-137	pCi/L	106	105	101	Pass
			Fe-59	pCi/L	119	102	116	Pass
			Mn-54	pCi/L	159	135	117	Pass
			Zn-65	pCi/L	211	227	93	Pass

(a) 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

(b) Analytics evaluation based on EIS internal QC limits in accordance with the NRC Resolution Test criteria

TABLE E.4 **Analytics Environmental Radioactivity Cross Check Program**
Exelon Industrial Services (2020)

Month/Year	Identification Number	Matrix	Nuclide	Units	EIS Reported Value	Known Value [a]	Ratio of Analytics to EIS Result	Evaluation [b]
	E13064	Water	I-131	pCi/L	90.2	80.5	112	Pass
			Ce-141	pCi/L	119	117	102	Pass
			Co-58	pCi/L	110	102	108	Pass
			Co-60	pCi/L	188	198	95	Pass
			Cr-51	pCi/L	229	259	89	Pass
			Cs-134	pCi/L	141	148	95	Pass
			Cs-137	pCi/L	105	105	100	Pass
			Fe-59	pCi/L	106	102	104	Pass
			Mn-54	pCi/L	150	135	111	Pass
			Zn-65	pCi/L	221	227	97	Pass
September 2020	E13066	AP	Gr-B	pCi	174	162	107	Pass
			Gr-B	pCi	175	162	108	Pass
December 2020	E13067	AP	Ce-141	pCi/Filter	77.1	78.4	98.3	Pass
	Detector 2		Co-58	pCi/Filter	64.3	66.1	97.2	Pass
			Co-60	pCi/Filter	117	119	98.3	Pass
			Cr-51	pCi/Filter	184	199	92.3	Pass
			Cs-134	pCi/Filter	79.3	84.5	93.8	Pass
			Cs-137	pCi/Filter	92.3	99.9	92.4	Pass
			Fe-59	pCi/Filter	101	87.9	115	Pass
			Mn-54	pCi/Filter	109	112	97.5	Pass
			Zn-65	pCi/Filter	105	149	70.6	Fail(1)
December 2020	E13067	AP	Ce-141	pCi/Filter	83.9	78.4	107	Pass
	Detector 5		Co-58	pCi/Filter	63.0	66.1	95.3	Pass
			Co-60	pCi/Filter	124	119	104	Pass
			Cr-51	pCi/Filter	197	199	98.9	Pass
			Cs-134	pCi/Filter	72.2	85	85.5	Pass
			Cs-137	pCi/Filter	95.0	99.9	95.1	Pass
			Fe-59	pCi/Filter	111	87.9	126	Pass
			Mn-54	pCi/Filter	125	112	112	Pass
			Zn-65	pCi/Filter	111	149	74.7	Fail(1)
December 2020	E13068	Water	Gr-B	pCi/L	300	277	108	Pass
	E13070	Cartridge	I-131	pCi	73.4	78.3	93.7	Pass
	Detector 2, 5			pCi	79.4	78.3	101	Pass
	E13070	Milk	I-131	pCi/L	83.3	91.9	90.6	Pass
			Ce-141	pCi/L	106	100	106	Pass
			Co-58	pCi/L	72.7	84.3	86.3	Pass
			Co-60	pCi/L	150	152	98.8	Pass
			Cr-51	pCi/L	231	253	91.4	Pass
			Cs-134	pCi/L	89.6	108	83.0	Pass
			Cs-137	pCi/L	120	127	94.6	Pass
			Fe-59	pCi/L	116	112	103	Pass
			Mn-54	pCi/L	146	143	102	Pass
			Zn-65	pCi/L	135	190	71.2	Fail(1)

(a) 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

(b) Analytics evaluation based on EIS internal QC limits in accordance with the NRC Resolution Test criteria

(1) Failures caused by clerical error in calculation spreadsheet

TABLE E.5 ERA Environmental Radioactivity Cross Check Program
Exelon Industrial Services (2020)

Month/Year	ID Number	Matrix	Nuclide	Units	EIS Reported Value	Known Value [a]	Acceptance Ratio of ERA to EIS Result	Evaluation [b]
April 2020	RAD-121	Water	Ba-133	pCi/L	40.1	41.8	96	Pass
			Cs-134	pCi/L	46.5	46.3	100	Pass
			Cs-137	pCi/L	225	234	96	Pass
			Co-60	pCi/L	50.7	50.3	101	Pass
			Zn-65	pCi/L	87.8	86.8	101	Pass
			I-131	pCi/L	29.7	28.9	103	Pass
			GR-B	pCi/L	43.3	60.5	72	Fail(2)
September 2020	MRAD-33	AP	Am-241	pCi/Filter	26.1	22.2	118	Pass
			Cs-134	pCi/Filter	270	296	91	Pass
			Cs-137	pCi/Filter	439	413	106	Pass
			Co-60	pCi/Filter	528	497	106	Pass
			Zn-65	pCi/Filter	528	500	106	Pass
October 2020	RAD-123	Water	Ba-133	pCi/L	33.3	37.0	90	Pass
	Detector 2		Cs-134	pCi/L	53.7	52.7	102	Pass
			Cs-137	pCi/L	136	131	104	Pass
			Co-60	pCi/L	68.8	60.6	114	Pass
			Zn-65	pCi/L	150	162	93	Pass
			I-131	pCi/L	27.5	28.2	97	Pass

(a) 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.

(b) ERA evaluation based on EIS internal QC limits in accordance with the NRC Resolution Test criteria

(2) Passed vendor acceptance criteria, but failed NRC Resolution Test criteria

TABLE E.6 **DOE's Mixed Analyte Performance Evaluation Program (MAPEP)**
GEL Laboratories (Gamma, Gross Alpha/Beta, H-3 & Sr-90)

Quarter/Year	Identification Number	Matrix	Nuclide	Units	Reported Value	Known Value [a]	Acceptance Range	Evaluation [b]
2nd/2020	20-GrW42	Water	Gr-A	Bq/L	1.01	1.03	0.31 - 1.75	A
			Gr-B	Bq/L	4.18	4.24	2.12- 6.36	A
	20-MaW42	Water	H-3	Bq/L	193	196	137 - 255	A
			Sr-90	Bq/L	0.0122		False Positive Test	A
			Cs-134	Bq/L	17	18.5	13.0 - 24.1	A
			Cs-137	Bq/L	12	11.3	7.9 - 14.7	A
			Co-60	Bq/L	11	10.6	7.4 - 13.8	A
			Fe-55	Bq/L	18.2	17.8	12.5 - 23.1	A
			K-40	Bq/L	-0.0485		False Positive Test	A
			Mn-54	Bq/L	20.6	19.6	13.7 - 25.5	A
			Zn-65	Bq/L	23.9	22.2	15.5 - 28.9	A
4th/2020	20-MaW43	Water	H-3	Bq/L	330	360	252 - 468	A
			Sr-90	Bq/L	9.97	11.6	8.1 - 15.1	A
			Cs-134	Bq/L	13.9	15.2	10.6 - 19.8	A
			Cs-137	Bq/L	15.1	14.3	10.0 - 18.6	A
			Co-60	Bq/L	12.9	12.2	8.5 - 15.9	A
			Fe-55	Bq/L	29.2	32.9	23.0 - 42.8	A
			K-40	Bq/L	-0.763		False Positive Test	A
			Mn-54	Bq/L	-0.0032		False Positive Test	A
			Zn-65	Bq/L	18.9	16.9	11.8 - 22	A

(a) 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

(b) DOE/MAPEP evaluation:

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.7 **ERA Environmental Radioactivity Cross Check Program**
GEL Laboratories (Gamma, Gross Alpha/Beta, H-3 & Sr-89/90)

Quarter/Year	Identification Number	Matrix	Nuclide	Units	Reported Value	Known Value [a]	Acceptance Limits	Evaluation [b]
1st/2020	RAD-120	Water	Cs-134	pCi/L	21.5	22.9	17.5 - 25.6	A
			Cs-137	pCi/L	217	220	198 - 244	A
			Co-60	pCi/L	97.7	91.2	82.1 - 103	A
			I-131	pCi/L	23.7	29.9	24.9 - 34.9	N(1)
			I-131	pCi/L	31.8	29.9	24.9 - 34.9	A
			Zn-65	pCi/L	332	298	268 - 348	A
			Gr-A	pCi/L	67.1	58.9	30.8 - 73.3	A
			Gr-A	pCi/L	55.4	58.9	30.8 - 73.3	A
			Gr-B	pCi/L	20.0	21.0	12.6 - 29.1	A
			H-3	pCi/L	15,200	17,800	15,600 - 19,600	N(1)
			H-3	pCi/L	17,700	17,800	15,600 - 19,600	A
			Sr-89	pCi/L	73.3	59.3	47.6 - 67.1	N(1)
			Sr-89	pCi/L	70.8	59.3	47.6 - 67.1	N(1)
			Sr-90	pCi/L	38.3	36.5	26.8 - 42.1	A
			Sr-90	pCi/L	30.6	36.5	26.8 - 42.1	A
2nd/2020	MRAD-32	Water	Cs-134	pCi/L	1,420	1,520	1,150 - 1,670	A
			Cs-137	pCi/L	2,440	2,390	2,050 - 2,720	A
			Co-60	pCi/L	2,890	2,760	2,380 - 3,170	A
			Fe-55	pCi/L	140	152	89.3 - 221	A
			Mn-54	pCi/L	<6.25	<100	<100	A
			Zn-65	pCi/L	1,330	1,190	1,060 - 1,500	A
			Sr-90	pCi/L	426	447	322 - 552	A
			Gr-A	pCi/L	67.6	165	60.2 - 228	A
			Gr-B	pCi/L	143	158	79.0 - 217	A
			H-3	pCi/L	5,990	6,280	4,730 - 7,640	A
	RAD-121	Water	I-131	pCi/L	27.5	28.9	24.1 - 33.8	A
			Sr-89	pCi/L	68.8	60.1	48.3 - 67.9	N(2)
			Sr-89	pCi/L	71.6	60.1	48.3 - 67.9	N(2)
			H-3	pCi/L	13,100	14,100	12,300 - 15,500	A
3rd/2020	RAD-122	Water	Cs-134	pCi/L	23.0	22.3	17.0 - 25.0	A
			Cs-137	pCi/L	76.5	73.0	65.7 - 83.0	A
			Co-60	pCi/L	97.9	86.1	77.5 - 97.0	N(3)
			I-131	pCi/L	29.9	26.1	21.7 - 30.8	A
			Zn-65	pCi/L	96.3	82.9	74.6 - 99.6	A
			Gr-A	pCi/L	54.3	52.4	27.3 - 65.6	A
			Gr-B	pCi/L	24.7	24.3	15.0 - 32.3	A
			H-3	pCi/L	17,800	20,300	17,800 - 22,300	A
			H-3	pCi/L	20,200	20,300	17,800 - 22,300	A
			Sr-89	pCi/L	61.7	68.9	56.2 - 77.1	A
			Sr-90	pCi/L	18.2	19.5	13.9 - 23.1	A
4th/2020	MRAD-31	Water	Cs-134	pCi/L	849	911	688 - 1,000	A
			Cs-137	pCi/L	1,540	1,510	1,290 - 1,720	A
			Co-60	pCi/L	1,660	1,560	1,350 - 1,790	A
			Fe-55	pCi/L	267	298	175 - 433	A
			Mn-54	pCi/L	<4.61	<100	<100	A
			Zn-65	pCi/L	1,010	917	816 - 1,160	A
			Sr-90	pCi/L	917	787	567 - 973	A
			Gr-A	pCi/L	100	111	40.5 - 153	A
			Gr-B	pCi/L	181	194	97.0 - 267	A
			H-3	pCi/L	11,600	12,000	9,040 - 14,600	A

(a) 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.

(b) ERA evaluation: A = Acceptable - Reported value falls within the Acceptance Limits
N = Not Acceptable - Reported value falls outside of the Acceptance Limits

(1) ***CARR200224-1274*** *(2)* ***No Information*** *(3)* ***CARR200902-1287***

TABLE E.8 **Analytics Environmental Radioactivity Cross Check Program**
GEL Laboratories (Gamma and Sr-89/90 only)

Quarter/Year	Identification Number	Matrix	Nuclide	Units	Reported Value	Known Value [(a)]	Acceptance Limits	Evaluation [(b)]
1st/2020	E13170	Water	Cs-134	pCi/L	153	154	0.99	A
			Cs-137	pCi/L	208	185	1.12	A
			Co-58	pCi/L	221	196	1.13	A
			Co-60	pCi/L	259	236	1.10	A
			Fe-59	pCi/L	179	168	1.06	A
			I-131	pCi/L	102	93	1.10	A
			Mn-54	pCi/L	248	216	1.15	A
			Zn-65	pCi/L	305	261	1.17	A
2nd/2020	E13174	Water	Cs-134	pCi/L	136	148	0.92	A
			Cs-137	pCi/L	104	105	0.99	A
			Co-58	pCi/L	105	102	1.03	A
			Co-60	pCi/L	205	198	1.04	A
			Fe-59	pCi/L	91	81	1.13	A
			I-131	pCi/L	105	102	1.03	A
			Mn-54	pCi/L	147	135	1.09	A
			Zn-65	pCi/L	249	227	1.10	A
3rd/2020	E13178	Water	Cs-134	pCi/L	181	201	0.90	A
			Cs-137	pCi/L	263	251	1.05	A
			Co-58	pCi/L	190	180	1.05	A
			Co-60	pCi/L	404	380	1.06	A
			Fe-59	pCi/L	226	201	1.12	A
			I-131	pCi/L	98	98	1.00	A
			Mn-54	pCi/L	206	181	1.14	A
			Zn-65	pCi/L	302	271	1.12	A
4th/2020	E13182	Water	Cs-134	pCi/L	114	114	1.00	A
			Cs-137	pCi/L	137	135	1.02	A
			Co-58	pCi/L	95.4	89.2	1.07	A
			Co-60	pCi/L	174	161	1.08	A
			Fe-59	pCi/L	137	119	1.16	A
			I-131	pCi/L	97	96	1.02	A
			Mn-54	pCi/L	165	151	1.09	A
			Zn-65	pCi/L	229	201	1.14	A

(a) 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.

(b) Analytics evaluation based on laboratory's internal acceptance criteria of 75% - 125%:
A = Acceptable - Reported value falls within the Acceptance Limits
N = Not Acceptable - Reported value falls outside of the Acceptance Limits

Intentionally left blank

APPENDIX F

ANNUAL RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM REPORT (ARGPPR)

Intentionally left blank

Docket No: 50-289
50-320

THREE MILE ISLAND NUCLEAR STATION
UNITS 1 AND 2

Annual Radiological Groundwater
Protection Program Report (ARGPPR)

1 January through 31 December 2020

Prepared By
Teledyne Brown Engineering
Environmental Services

Three Mile Island Nuclear Station
Middletown, PA 17057

April 2021

Intentionally left blank

Table Of Contents

Intentionally left blank

Appendices

I. Summary and Conclusions

In 2006, Exelon instituted a comprehensive program to evaluate the impact of station operations on groundwater and surface water in the vicinity of Three Mile Island Nuclear Station. This report covers groundwater, surface water, storm water, and precipitation samples collected from the environment, both on and off station property in 2020. During that time period 307 analyses were performed on 145 samples from 60 locations.

In assessing all the data gathered for this report, it was concluded that the operation of Three Mile Island Nuclear Station had no adverse radiological impact on the environment.

Gamma-emitting radionuclides associated with licensed plant operations were not detected at concentrations greater than their respective Lower Limits of Detection (LLDs) as specified in the Offsite Dose Calculation Manual (ODCM) in any of the groundwater, surface water, storm water, and precipitation samples. In the case of tritium, Exelon specified that its laboratories achieve a lower limit of detection 10 times lower than that required by federal regulation.

Strontium-89 (Sr-89) and Strontium-90 (Sr-90) were not detected at a concentration greater than their respective LLD of 10 and 1 picocurie per liter (pCi/L) in the groundwater samples tested.

Tritium was not detected in any ground water, surface water, storm water or precipitation water samples at concentrations greater than the United States Environmental Protection Agency (USEPA) drinking water standard (and the Nuclear Regulatory Commission Reporting Limit) of 20,000 pCi/L. Low levels of tritium were detected at concentrations greater than the LLD of 200 pCi/L in 32 of 50 groundwater monitoring locations. The groundwater tritium concentrations ranged from 187 ± 117 pCi/L to 2,770 ± 337 pCi/L. Tritium that was detected in groundwater at the Station is believed to be the result of previous tank leakage, historical releases, the recapture of gaseous tritium releases via rainwater, and/or background from external sources greater than 200 pCi/L**.** Tritium was not detected at any surface water or stormwater location. Tritium was detected in 4 of 8 precipitation water locations. The concentrations ranged from 198 ± 123 to 714 ± 151 pCi/L.

Gross Alpha in the dissolved and suspended fractions were performed on 21 groundwater samples during the second quarter sampling in 2020. Gross Alpha (dissolved) was not detected at any of the 21 groundwater locations. Gross Alpha (suspended) was detected at 1 of the 21 groundwater locations at a concentration of 3.0 ± 1.1 pCi/L.

Hard-To-Detect analyses include Fe-55, Ni-63, Am-241, Cm-242, Cm-243/244, Pu-238, Pu-239/240, U-234, U-235 and U-238. Only Fe-55 and Ni-63 were analyzed in 2020. Action levels trigger monitoring requirements for these analyses.

Intentionally left blank

II. Introduction

The Three Mile Island Nuclear Station (TMINS) established a revised and more comprehensive groundwater monitoring program in 2006 as part of an Exelon Nuclear fleetwide assessment.

Conestoga Rovers & Associates (CRA) performed the initial assessment. CRA prepared a Hydrogeologic Investigation Report (HIR) for Exelon to determine whether groundwater at and near TMINS has been adversely impacted by any releases of radionuclides. The CRA report documents the results of the May 2006 Hydrogeologic Investigation Work Plan. CRA assessed groundwater quality at the Station and identified locations designated as Areas for Further Evaluation. The results and conclusions of this Phase 1 study were made available to state and federal regulators, as well as the public on an Exelon web site for station specific reports.

As a result of the Phase 1 study, the Radiological Groundwater Protection Program (RGPP) was revised to a long term monitoring program. This report covers those analyses performed by Teledyne Brown Engineering (TBE) and Exelon Industrial Services (EIS)/GEL Laboratories on well water, surface water, storm water, and precipitation water samples collected in 2020. TMINS groundwater movement is into the Susquehanna River which surrounds the station on all sides.

In September 2015, GHD completed an additional five-year update hydrogeologic investigation report for the Station (*NEI 07-07, Hydrogeologic Investigation Report*). The referenced report summarized station activities since the 2006 hydrogeologic investigation report, including changes at the Station as well as RGPP sampling activities and groundwater flow. Relevant conclusions from the report are:

- None of the AFEs identified in 2006 indicate current impacts to groundwater and are no longer considered AFEs.
- One new AFE, AFE-TMI-6-BWST, was identified based on laboratory analytical data.
- In July 2012, elevated tritium concentrations were noted for a sample collected from an electric vault west of MS-22. The source of this elevated tritium concentration was believed to be the BWST.
- Tritium is not migrating off of the Station property at concentrations greater than the USEPA Drinking Water Standard of 20,000 pCi/L.
- Gamma-emitting radionuclides associated with licensed plant operations were not detected at concentrations greater than their respective LLDs.
- Strontium 89 or 90 were not detected at concentrations greater than their respective LLDs.

In December 2019, GHD completed an additional five-year update hydrogeologic investigation report for the Station (NEI 07-07, Hydrogeologic Investigation Report). The referenced report summarized station activities since the 2015

hydrogeologic investigation report, including changes at the Station as well as RGPP sampling activities and groundwater flow. Relevant conclusions from the report are:

- AFE-TMI-6-BWST, 1 BWST is retained as an Area of Further Evaluation (AFE)

This report covers those analyses performed by Teledyne Brown Engineering (TBE) and Gel Laboratories (subcontracted from Exelon Industrial Services) on samples collected in 2020.

A. Objectives of the RGPP

The long-term objectives of the Radiological Groundwater Protection Program (RGPP) are as follows:

1. Identify suitable locations to monitor and evaluate potential impacts from station operations before significant radiological impact to the environment and potential drinking water sources.
2. Understand the local hydrogeologic regime in the vicinity of the station and maintain up-to-date knowledge of flow patterns on the surface and shallow subsurface.
3. Perform routine water sampling and radiological analysis of water from selected locations.
4. Notify stakeholders in a timely manner for new leaks, spills, or other detections with potential radiological significance.
5. Regularly assess analytical results to identify adverse trends.
6. Take necessary corrective actions to protect groundwater resources.

B. Implementation of the Objectives

The objectives identified have been implemented at Three Mile Island Nuclear Station as discussed below:

1. Three Mile Island Nuclear Station continues to sample and monitor the groundwater at the station in accordance with station procedures. Sample frequencies and locations are adjusted based on monitoring results and investigations.
2. The Three Mile Island Nuclear Station reports describe the local hydrogeologic regime. Periodically, the flow patterns on the surface and shallow subsurface are updated based on ongoing measurements.
3. Three Mile Island Nuclear Station will continue to perform routine sampling and radiological analysis of water from selected locations.
4. Three Mile Island Nuclear Station has implemented procedures to identify and report leaks, spills, or other detections with potential radiological significance in a timely manner.

5. Three Mile Island Nuclear Station staff and consulting hydrogeologist assess analytical results on an ongoing basis to identify adverse trends.

C. Program Description

1. Sample Collection

Sample locations can be found in Table A-1 and Figures A-1 and A-2, Appendix A.

Groundwater, Surface Water, Storm Water, and Precipitation

Samples of water are collected, managed, transported and analyzed in accordance with approved procedures. Groundwater, surface water, storm water and precipitation are collected. Sample locations, sample collection frequencies and analytical frequencies are controlled in accordance with approved station procedures. Contractor and/or station personnel are trained in the collection, preservation management and shipment of samples, as well as in documentation of sampling events. For split samples, collectors will periodically collect samples that are sent to Exelon Industrial Services/GEL Laboratories to confirm that TBE is producing comparable data. Analytical laboratories are subject to internal quality assurance programs, industry cross-check programs, as well as nuclear industry audits. Station personnel review and evaluate all analytical data deliverables as data are received.

Analytical data results are reviewed by both station personnel and an independent hydrogeologist for adverse trends or changes to hydrogeologic conditions.

D. Characteristics of Tritium (H-3)

Tritium (chemical symbol H-3) is a radioactive isotope of hydrogen. The most common form of tritium is tritium oxide, which is also called "tritiated water." Tritiated water behaves chemically and physically like non-tritiated water in the subsurface, and therefore tritiated water will travel at the same velocity as the average groundwater velocity.

Tritium is created in the environment from naturally-occurring processes both cosmic and subterranean, as well as from anthropogenic (i.e., man-made) sources. Tritium is produced naturally in the upper atmosphere when cosmic rays strike air molecules. This “cosmogenic” tritium combines with oxygen to form tritiated water, which will then enter the hydrologic cycle. Below ground, “lithogenic” tritium is produced by the bombardment of natural lithium present in crystalline rocks by neutrons produced by the radioactive decay of naturally abundant uranium and thorium. Lithogenic production of tritium is usually negligible compared to other sources due to the limited abundance of lithium in rock. The

lithogenic tritium is introduced directly to groundwater.

A major anthropogenic source of tritium and strontium-90 comes from the former atmospheric testing of thermonuclear weapons. Levels of tritium in precipitation increased significantly during the 1950s and early 1960s and later with additional testing, resulting in the release of significant amounts of tritium to the atmosphere. The Canadian heavy water nuclear power reactors, other commercial power reactors, nuclear research and weapons production continue to influence tritium concentrations in the environment.

The chemical properties of tritium are essentially those of ordinary hydrogen. Tritium can be taken into the body by drinking water, breathing air, eating food, or absorption through skin. Once tritium enters the body, it disperses quickly and is uniformly distributed throughout the body. Tritium is excreted primarily through urine with a clearance rate characterized by an effective biological half-life of about 14 days. Within one month or so after ingestion, all tritium is essentially cleared. Organically bound tritium (tritium that is incorporated in organic compounds) can remain in the body for a longer period.

Tritium has a radiological half-life of approximately 12.3 years. It decays spontaneously to Helium-3 (He-3). This radioactive decay releases a beta particle (low-energy electron). The radioactive decay of tritium is the source of the health risk from exposure to tritium. Tritium is one of the least dangerous radionuclides, because it emits very weak radiation and leaves the body relatively quickly. Since tritium is almost always found as water, it goes directly into soft tissues and organs. The associated dose to these tissues is generally uniform and is dependent on the water content of the specific tissue.

III. Program Description

A. Sample Analysis

This section describes the general analytical methodologies used by TBE and Exelon Industrial Services (EIS)/GEL Laboratories to analyze the environmental samples for radioactivity for the Three Mile Island Nuclear Station RGPP in 2020.

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

1. Concentrations of gamma-emitters in groundwater and storm water
2. Concentrations of strontium in groundwater
3. Concentrations of tritium in groundwater, surface water, precipitation water and storm water
4. Concentrations of Am-241 in groundwater
5. Concentrations of Cm-242 and Cm-243/244 in groundwater
6. Concentrations of Pu-238 and PU-239/240 in groundwater
7. Concentrations of U-234, U-235 and U-238 in groundwater
8. Concentrations of Fe-55 in groundwater
9. Concentrations of Ni-63 in groundwater
10. Concentrations of Gross Alpha (Dissolved and Suspended) in groundwater

B. Data Interpretation

1. Lower Limit of Detection and Minimum Detectable Concentration

The lower limit of detection (LLD) is specified by federal regulation as a minimum sensitivity value that must be achieved routinely by the analytical parameter.

2. Laboratory Measurements Uncertainty

The estimated uncertainty in measurement of tritium in environmental samples is frequently on the order of 50% of the measurement value. Statistically, the exact value of a measurement is expressed as a range with a stated level of confidence. The convention is to report results with a 95% level of confidence. The uncertainty comes from calibration standards, sample volume or weight measurements, sampling uncertainty and other factors. Exelon reports the uncertainty of a measurement created by statistical process (counting error).

Analytical uncertainties are reported at the 95% confidence level in this report for reporting consistency with the AREOR.

Gamma spectroscopy results for each type of sample were grouped as follows:

> For groundwater, surface water, and storm water 13 nuclides, Be-7, K-40, 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.

The radio-analytical laboratory counts tritium results to an LLD of 200 pCi/L. Typically, the lowest positive measurement will be reported within a range of 40 – 240 pCi/L or 140 ± 100 pCi/L. Clearly, these sample results cannot be distinguished as different from background at this concentration.

IV. Results and Discussion

A. Groundwater Results

Samples were collected from on and off-site wells in accordance with the station radiological groundwater protection program. Analytical results and anomalies are discussed below.

Tritium

Samples from 50 locations were analyzed for tritium activity. Tritium values ranged from the detection limit to 2,770 pCi/L.
(Table B-I.1, Appendix B)

Tritium Split Samples

Samples from 9 locations were analyzed for tritium activity. Tritium values ranged from the detection limit to 535 pCi/L.
(Table C-I.1, Appendix C)

Strontium

Sr-89 and Sr-90 were not detected above their required detection limits of 10 and 1.0 pCi/L, respectively. (Table B-I.1, Appendix B)

Strontium Split Samples

Sr-89 and Sr-90 were not detected above their required detection limits of 10 and 1.0 pCi/L, respectively. (Table C-I.1, Appendix C)

Gross Alpha (dissolved and suspended)

Gross Alpha analysis in the dissolved and suspended fractions were performed on 21 groundwater samples during the third quarter sampling in 2020. Gross Alpha (dissolved) was not detected at any of the groundwater locations. Gross Alpha (suspended) was detected at one of the groundwater locations at a concentration of 3.0 pCi/L.
(Table B-I.1, Appendix B)

Gross Alpha (total) Split Samples

Gross Alpha was analyzed on one split sample in 2020. Gross Alpha (total) was not detected at this location. (Table C-I.1, Appendix C)

Gamma Emitters

Gamma-emitting nuclides were analyzed at 50 locations in 2020. Naturally-occurring K-40 was detected in 1 sample at a concentration of 36 ± 24 pCi/L. No other gamma-emitting nuclides were detected.
(Table B-I.2, Appendix B)

Gamma Emitters Split Samples

Gamma-emitting nuclides were analyzed at 5 locations in 2020. No gamma-emitting nuclides were detected in this sample. (Table C-I.2, Appendix C)

Hard-To-Detect

Only Fe55 and Ni-63 from the Hard-To-Detect analyses list (including Am-241, Cm-242, Cm-243/244, Pu-238, Pu-239/240, U-234, U-235, U-238), were analyzed at 7 locations in 2020. Neither Fe-55 nor Ni-63 were detected in any sample. (Table B-I.3, Appendix B)

Hard-To-Detect Split Samples

Hard to detects were not analyzed on any split samples in 2020. (Table C-I.3, Appendix C)

B. Surface Water Results

Samples were collected from surface water locations in accordance with the station radiological groundwater protection program. Analytical results and anomalies are discussed below.

Tritium

Three locations analyzed for tritium in 2020. Tritium was not detected above the required detection limit of 200 pCi/L in any of the 5 samples analyzed. (Table B-II.1, Appendix B)

Tritium Split Samples

Two locations analyzed for tritium in 2020. Tritium was not detected above the required detection limit of 200 pCi/L in either sample analyzed. (Table C-II.1, Appendix C)

C. Storm Water Results

Samples were collected from storm water locations in accordance with the station radiological groundwater protection program. Analytical results and anomalies are discussed below.

Tritium

One location analyzed for tritium. Tritium was not detected in any of the 4 samples. (Table B–III.1, Appendix B)

Gamma Emitters

Four samples from one location were analyzed for gamma-emitting nuclides. No gamma-emitting nuclides were detected. (Table B–III.2, Appendix B)

D. Precipitation Water Results

Samples were collected at 8 locations. The following analyses were performed:

Tritium

Samples from 8 locations were analyzed for tritium activity. Tritium activity was detected at 4 of 8 locations. The concentrations ranged from 198 to 714 pCi/L. (Table B–IV.1, Appendix B)

Tritium Split Samples

Samples from one location were analyzed for tritium activity. Tritium was detected in 2 of the 3 samples. The concentrations ranged from 189 to 539 pCi/L. (Table C–III.1, Appendix C).

E. Leaks, Spills, and Releases

There were no leaks, spills or releases in 2020.

F. Actions Taken

There were no compensatory/corrective actions taken in 2020.

G. Missed Samples

The 2020 second quarter RGPP well sampling event was cancelled due to the Covid-19 pandemic. The decision to cancel the sampling event was approved by the Plant Management Committee and recommended by Corporate Environmental. It was determined that missing one quarter of sampling would be low risk, low impact. Sample collection resumed on schedule during the third quarter 2020.

No precipitation samples were taken during the 3rd quarter of 2020. This was a procedural gap that had no regulatory impact and AR 04415986 documents the nonconformance to procedural requirements.

Intentionally left blank

APPENDIX A

LOCATION DESIGNATION & DISTANCE

Intentionally left blank

TABLE A-1: Radiological Groundwater Protection Program - Sampling Locations, Three Mile Island Nuclear Station, 2020

Site	Site Type
48S	Production Potable Well
EDCB	Storm Water
MS-1	Monitoring Well
MS-2	Monitoring Well
MS-3	Monitoring Well
MS-4	Monitoring Well
MS-5	Monitoring Well
MS-7	Monitoring Well
MS-8	Monitoring Well
MS-20	Monitoring Well
MS-21	Monitoring Well
MS-22	Monitoring Well
MW-1	Monitoring Well
MW-2	Monitoring Well
MW-TMI-1D	Monitoring Well
MW-TMI-2D	Monitoring Well
MW-TMI-3I	Monitoring Well
MW-TMI-4I	Monitoring Well
MW-TMI-4S	Monitoring Well
MW-TMI-6D	Monitoring Well
MW-TMI-6I	Monitoring Well
MW-TMI-7S	Monitoring Well
MW-TMI-8S	Monitoring Well
MW-TMI-9I	Monitoring Well
MW-TMI-9S*	Monitoring Well
MW-TMI-10D	Monitoring Well
MW-TMI-10I	Monitoring Well
MW-TMI-10S	Monitoring Well
MW-TMI-12S	Monitoring Well
MW-TMI-13I	Monitoring Well
MW-TMI-14D	Monitoring Well
MW-TMI-14I	Monitoring Well
MW-TMI-16D	Monitoring Well
MW-TMI-18D	Monitoring Well
MW-TMI-19I	Monitoring Well
MW-TMI-20I	Monitoring Well
MW-TMI-21D	Monitoring Well
MW-TMI-21I	Monitoring Well
MW-TMI-21S	Monitoring Well
MW-TMI-22D	Monitoring Well
MW-TMI-22I	Monitoring Well
MW-TMI-22S	Monitoring Well
NW-A	Production Well
NW-B	Production Well
NW-C	Production Well
NW-CW	Clearwell
OS-14	Monitoring Well
OS-16	Monitoring Well
OS-18	Monitoring Well
OSF	Production Potable Well
RW-1	Monitoring Well
SW-E-1	Surface Water
SW-E-2	Surface Water
SW-E-3	Surface Water
TRAINING CENTER	Offsite Monitoring Well
TM-PR-EDCB	Precipitation Water
TM-PR-ESE	Precipitation Water
TM-PR-MS-1	Precipitation Water
TM-PR-MS-2	Precipitation Water
TM-PR-MS-4	Precipitation Water
TM-PR-MS-8	Precipitation Water
TM-PR-MS-20	Precipitation Water
TM-PR-MS-22	Precipitation Water
TM-PR-MW-22S	Precipitation Water
TM-PR-RW-1	Precipitation Water

** NO WATER PRESENT TO SAMPLE*

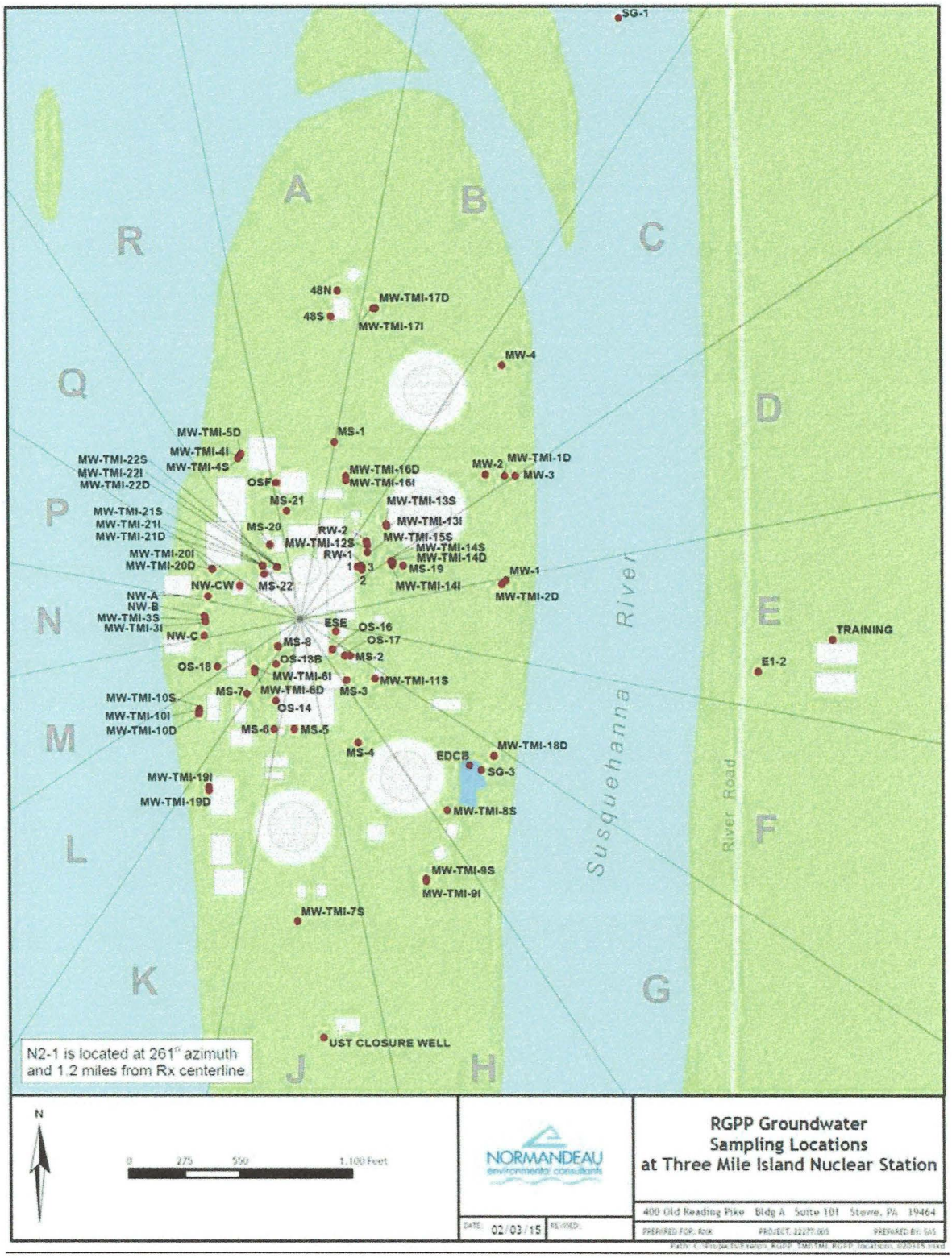


Figure A – 1
Sampling Locations at the Three Mile Island Nuclear Station, 2020

APPENDIX B

DATA TABLES

Intentionally left blank

TABLE B-I.1 CONCENTRATIONS OF TRITIUM, STRONTIUM, AND GROSS ALPHA IN GROUNDWATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICALGROUNDWATER PROTECTION PROGRAM, THREE MILE ISLAND NUCLEAR STATION, 2020

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE		H-3	Sr-89	Sr-90	Gr-A (Dis)	Gr-A (Sus)
48S	02/06/20		< 174				
48S	08/20/20		< 189	< 6.5	< 0.8	< 2.0	< 1.0
48S	11/17/20		< 196				
MS-1	02/04/20		< 189				
MS-1	02/04/20	*NP*	< 195				
MS-1	08/21/20		< 176				
MS-2	02/05/20		403 ± 138				
MS-2	08/19/20		216 ± 118	< 6.0	< 0.8	< 0.4	< 0.6
MS-2	11/13/20		< 189				
MS-3	02/05/20		315 ± 131				
MS-3	08/19/20		305 ± 122	< 6.9	< 0.7	< 0.6	< 0.6
MS-3	11/13/20		< 183				
MS-4	08/19/20		< 169				
MS-5	02/05/20		< 192				
MS-5	08/18/20		< 173	< 7.0	< 0.7	< 1.5	< 0.6
MS-5	11/13/20		< 186				
MS-7	02/05/20		< 194				
MS-7	08/19/20		< 172	< 7.4	< 0.8	< 0.4	< 0.9
MS-7	11/11/20		< 172				
MS-7	11/11/20	*DUP*	< 193				
MS-8	02/05/20		244 ± 129				
MS-8	08/18/20		252 ± 121	< 4.9	< 0.7	< 0.5	3.0 ± 1.1
MS-8	11/13/20		230 ± 125				
MS-20	02/04/20		496 ± 143				
MS-20	02/04/20	*DUP*	382 ± 130				
MS-20	08/18/20		304 ± 122	< 7.5	< 0.9	< 0.4	< 0.9
MS-20	11/13/20		250 ± 127				
MS-21	02/04/20		< 195				
MS-21	08/18/20		240 ± 119	< 6.7	< 0.9	< 0.2	< 0.9
MS-21	11/13/20		< 195				
MS-22	02/04/20		1110 ± 180				
MS-22	02/04/20	*NP*	1100 ± 179				
MS-22	08/18/20		1180 ± 189	< 5.9	< 0.7	< 0.7	< 0.6
MS-22	11/13/20		805 ± 169				
MW-1	08/21/20		< 177				
MW-2	08/21/20		< 176				
MW-TMI-1D	08/21/20		189 ± 116				
MW-TMI-2D	08/21/20		< 173				
MW-TMI-3I	02/04/20		323 ± 129				
MW-TMI-3I	08/21/20		399 ± 124	< 6.3	< 0.6	< 2.1	< 4.0
MW-TMI-3I	08/21/20	*DUP*	431 ± 131	< 6.1	< 0.9	< 1.6	< 1.8
MW-TMI-3I	11/11/20		310 ± 122				
MW-TMI-3I	11/11/20	*DUP*	257 ± 129				
MW-TMI-4I	08/21/20		206 ± 120				
MW-TMI-4I	08/21/20	*DUP*	< 177				
MW-TMI-4S	08/21/20		248 ± 119				
MW-TMI-6D	02/05/20		< 189				
MW-TMI-6D	08/19/20		301 ± 123	< 5.1	< 0.9	< 0.6	< 0.9
MW-TMI-6D	11/11/20		< 177				
MW-TMI-6I	02/05/20		< 191				

NP = Non-purge study samples

TABLE B-I.1 CONCENTRATIONS OF TRITIUM, STRONTIUM, AND GROSS ALPHA IN GROUNDWATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICALGROUNDWATER PROTECTION PROGRAM, THREE MILE ISLAND NUCLEAR STATION, 2020

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE		H-3	Sr-89	Sr-90	Gr-A (Dis)	Gr-A (Sus)
MW-TMI-6I	08/19/20		200 ± 117	< 7.1	< 0.7	< 0.6	< 1.0
MW-TMI-6I	11/11/20		< 176				
MW-TMI-7S	08/19/20		199 ± 116				
MW-TMI-8S	08/21/20		< 171				
MW-TMI-9I	08/19/20		< 183				
MW-TMI-10D	08/19/20		298 ± 121				
MW-TMI-10I	02/05/20		533 ± 142				
MW-TMI-10I	02/05/20	*NP*	508 ± 140				
MW-TMI-10I	08/19/20		717 ± 144				
MW-TMI-10I	08/19/20	*DUP*	534 ± 131				
MW-TMI-10S	02/05/20		375 ± 132				
MW-TMI-10S	02/05/20	*NP*	371 ± 134				
MW-TMI-10S	08/19/20		622 ± 137				
MW-TMI-12S	02/04/20		< 197				
MW-TMI-12S	08/19/20		< 176	< 4.1	< 0.7	< 0.3	< 0.6
MW-TMI-12S	11/13/20		< 186				
MW-TMI-13I	02/05/20		< 194				
MW-TMI-13I	08/21/20		< 182				
MW-TMI-13I	08/21/20	*DUP*	< 173				
MW-TMI-14D	02/05/20		< 192				
MW-TMI-14D	08/21/20		241 ± 120				
MW-TMI-14I	02/05/20		< 194				
MW-TMI-14I	02/05/20	*DUP*	< 190				
MW-TMI-14I	08/21/20		< 179				
MW-TMI-14I	08/21/20	*DUP*	< 181				
MW-TMI-16D	08/21/20		583 ± 137				
MW-TMI-18D	08/21/20		< 177				
MW-TMI-19I	08/21/20		< 179				
MW-TMI-20I	08/19/20		510 ± 130				
MW-TMI-21D	02/04/20		2770 ± 337				
MW-TMI-21D	02/04/20	*NP*	2830 ± 344				
MW-TMI-21D	08/18/20		2290 ± 291				
MW-TMI-21I	02/04/20		961 ± 166				
MW-TMI-21I	02/04/20	*NP*	893 ± 159				
MW-TMI-21I	08/18/20		860 ± 159				
MW-TMI-21S	02/04/20		752 ± 147				
MW-TMI-21S	02/04/20	*NP*	797 ± 151				
MW-TMI-21S	08/18/20		687 ± 144	< 6.9	< 0.8	< 0.6	< 0.6
MW-TMI-21S	11/13/20		371 ± 125				
MW-TMI-22D	02/04/20	*NP*	1890 ± 252				
MW-TMI-22D	02/04/20		2160 ± 277				
MW-TMI-22D	08/18/20		2020 ± 264				
MW-TMI-22I	02/04/20	*NP*	1140 ± 182				
MW-TMI-22I	02/04/20		987 ± 169				
MW-TMI-22I	08/18/20		757 ± 150				
MW-TMI-22S	02/04/20	*NP*	759 ± 148				
MW-TMI-22S	02/04/20		844 ± 155				
MW-TMI-22S	08/18/20		599 ± 137	< 7.3	< 0.8	< 0.8	< 0.6
MW-TMI-22S	11/13/20		608 ± 144				
NW-A	02/11/20		248 ± 119				

NP = Non-purge study samples

TABLE B-I.1 CONCENTRATIONS OF TRITIUM, STRONTIUM, AND GROSS ALPHA IN GROUNDWATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICALGROUNDWATER PROTECTION PROGRAM, THREE MILE ISLAND NUCLEAR STATION, 2020

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE	H-3	Sr-89	Sr-90	Gr-A (Dis)	Gr-A (Sus)
NW-A	08/26/20	397 ± 131				
NW-B	02/11/20	187 ± 117				
NW-B	08/26/20	370 ± 129	< 5.4	< 0.7	< 0.8	< 1.0
NW-B	11/18/20	< 194				
NW-C	02/11/20	553 ± 134				
NW-C	08/26/20	344 ± 129				
NW-CW	02/06/20	< 183				
OS-14	02/05/20	< 192				
OS-14	08/18/20	< 176	< 6.3	< 0.8	< 0.6	< 0.6
OS-14	11/13/20	< 189				
OS-16	02/05/20	336 ± 134				
OS-16	08/18/20	248 ± 123	< 4.5	< 0.9	< 0.4	< 1.4
OS-16	11/13/20	< 188	< 9.5	< 0.8		
OS-18	08/19/20	209 ± 118				
OSF	02/06/20	368 ± 123				
OSF	08/20/20	361 ± 132	< 9.9	< 0.8	< 1.1	< 1.0
OSF	11/17/20	282 ± 130				
RW-1	02/04/20	< 192				
RW-1	08/19/20	204 ± 119	< 6.4	< 0.8	< 0.3	< 1.0
RW-1	11/13/20	< 188				

NP = Non-purge study samples

TABLE B-I.2

CONCENTRATIONS OF GAMMA EMITTERS IN GROUNDWATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2020

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE		COLLECTION DATE	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
48S		08/20/20	< 14	< 34	< 1	< 1	< 3	< 1	< 2	< 2	< 3	< 1	< 1	< 14	< 5
MS-1		08/21/20	< 17	< 33	< 2	< 2	< 4	< 2	< 4	< 2	< 4	< 2	< 2	< 12	< 4
MS-2		08/19/20	< 21	< 22	< 2	< 2	< 5	< 3	< 4	< 2	< 4	< 2	< 2	< 15	< 5
MS-3		02/05/20	< 32	< 57	< 4	< 4	< 7	< 4	< 8	< 4	< 7	< 4	< 4	< 17	< 6
MS-3		08/19/20	< 17	< 18	< 2	< 2	< 4	< 2	< 4	< 2	< 4	< 2	< 2	< 14	< 5
MS-4		08/19/20	< 20	< 46	< 2	< 2	< 4	< 2	< 4	< 2	< 4	< 2	< 2	< 15	< 5
MS-5		02/05/20	< 26	< 56	< 3	< 3	< 6	< 3	< 6	< 4	< 5	< 3	< 3	< 15	< 5
MS-5		08/18/20	< 15	< 30	< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 2	< 2	< 11	< 4
MS-7		08/19/20	< 21	< 16	< 2	< 2	< 4	< 2	< 4	< 2	< 4	< 2	< 2	< 15	< 5
MS-8		02/05/20	< 30	< 31	< 3	< 3	< 7	< 4	< 7	< 4	< 6	< 4	< 4	< 15	< 5
MS-8		08/18/20	< 17	< 18	< 2	< 2	< 4	< 2	< 4	< 2	< 3	< 2	< 2	< 11	< 3
MS-20		08/18/20	< 16	< 15	< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 2	< 2	< 11	< 4
MS-21		08/18/20	< 17	< 17	< 2	< 2	< 4	< 2	< 4	< 2	< 4	< 2	< 2	< 13	< 5
MS-22		08/18/20	< 17	< 28	< 2	< 2	< 5	< 2	< 3	< 2	< 3	< 2	< 2	< 24	< 9
MW-1		08/21/20	< 22	< 21	< 2	< 2	< 5	< 3	< 4	< 2	< 4	< 3	< 2	< 15	< 5
MW-2		08/21/20	< 15	< 24	< 1	< 2	< 3	< 2	< 3	< 2	< 3	< 2	< 2	< 11	< 4
MW-TMI-1D		08/21/20	< 21	< 41	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 15	< 5
MW-TMI-2D		08/21/20	< 18	< 38	< 2	< 2	< 4	< 2	< 4	< 2	< 4	< 2	< 2	< 13	< 4
MW-TMI-3I		08/21/20	< 16	< 27	< 2	< 2	< 4	< 2	< 4	< 2	< 3	< 2	< 2	< 11	< 3
MW-TMI-3I	*DUP*	08/21/20	< 20	< 37	< 2	< 2	< 6	< 2	< 5	< 3	< 4	< 3	< 2	< 15	< 5
MW-TMI-4I		08/21/20	< 21	< 47	< 2	< 2	< 5	< 2	< 5	< 3	< 4	< 2	< 2	< 15	< 5
MW-TMI-4I	*DUP*	08/21/20	< 18	< 28	< 2	< 2	< 4	< 2	< 4	< 2	< 3	< 2	< 2	< 13	< 4
MW-TMI-4S		08/21/20	< 24	< 24	< 3	< 2	< 6	< 3	< 6	< 3	< 5	< 3	< 3	< 14	< 5
MW-TMI-6D		08/19/20	< 20	< 19	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 15	< 6
MW-TMI-6I		08/19/20	< 17	< 34	< 2	< 2	< 4	< 2	< 4	< 2	< 4	< 2	< 2	< 13	< 5
MW-TMI-7S		08/19/20	< 18	< 18	< 2	< 2	< 5	< 2	< 4	< 2	< 3	< 2	< 2	< 13	< 5
MW-TMI-8S		08/21/20	< 22	< 22	< 2	< 2	< 5	< 3	< 5	< 3	< 4	< 2	< 2	< 15	< 5
MW-TMI-9I		08/19/20	< 20	< 37	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 14	< 4
MW-TMI-10D		08/19/20	< 18	< 17	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 15	< 4
MW-TMI-10I		08/19/20	< 17	< 17	< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 2	< 2	< 13	< 4
MW-TMI-10I	*DUP*	08/19/20	< 19	< 32	< 2	< 2	< 5	< 2	< 4	< 2	< 3	< 2	< 2	< 15	< 5
MW-TMI-10S		08/19/20	< 20	< 19	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 14	< 5
MW-TMI-12S		08/19/20	< 20	< 36	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 15	< 4
MW-TMI-13I		08/21/20	< 21	< 39	< 2	< 2	< 5	< 3	< 5	< 3	< 4	< 3	< 2	< 14	< 5
MW-TMI-13I	*DUP*	08/21/20	< 18	< 27	< 2	< 2	< 4	< 2	< 4	< 2	< 3	< 2	< 2	< 13	< 5
MW-TMI-14D		08/21/20	< 18	< 32	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 13	< 4
MW-TMI-14I		08/21/20	< 16	< 31	< 2	< 2	< 4	< 2	< 4	< 2	< 3	< 2	< 2	< 12	< 4
MW-TMI-14I	*DUP*	08/21/20	< 15	< 27	< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 2	< 2	< 12	< 4

TABLE B-I.2

CONCENTRATIONS OF GAMMA EMITTERS IN GROUNDWATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2020

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
MW-TMI-16D	08/21/20	< 15	< 13	< 2	< 2	< 3	< 2	< 3	< 2	< 3	< 2	< 2	< 11	< 4
MW-TMI-18D	08/21/20	< 23	< 50	< 3	< 3	< 5	< 3	< 5	< 3	< 5	< 3	< 3	< 15	< 4
MW-TMI-19I	08/21/20	< 13	< 25	< 1	< 1	< 3	< 2	< 2	< 1	< 2	< 1	< 1	< 9	< 3
MW-TMI-20I	08/19/20	< 20	< 23	< 2	< 2	< 5	< 3	< 5	< 3	< 4	< 2	< 2	< 15	< 4
MW-TMI-21D	08/18/20	< 20	< 18	< 2	< 2	< 6	< 2	< 4	< 2	< 4	< 2	< 2	< 27	< 10
MW-TMI-21I	08/18/20	< 19	< 27	< 2	< 2	< 5	< 2	< 3	< 2	< 4	< 2	< 2	< 24	< 9
MW-TMI-21S	08/18/20	< 17	< 14	< 1	< 2	< 4	< 2	< 3	< 2	< 3	< 1	< 1	< 22	< 7
MW-TMI-22D	08/18/20	< 18	36 ± 24	< 2	< 2	< 5	< 2	< 3	< 2	< 4	< 2	< 2	< 26	< 9
MW-TMI-22I	08/18/20	< 20	< 16	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 26	< 9
MW-TMI-22S	08/18/20	< 20	< 16	< 2	< 2	< 5	< 2	< 4	< 2	< 4	< 2	< 2	< 29	< 9
NW-A	08/26/20	< 15	< 26	< 2	< 2	< 4	< 2	< 3	< 2	< 3	< 2	< 2	< 13	< 4
NW-B	08/26/20	< 17	< 34	< 2	< 2	< 4	< 2	< 4	< 2	< 3	< 2	< 2	< 14	< 5
NW-C	08/26/20	< 18	< 29	< 2	< 2	< 4	< 2	< 4	< 2	< 3	< 2	< 2	< 13	< 5
OS-14	02/05/20	< 31	< 59	< 3	< 4	< 7	< 4	< 8	< 4	< 6	< 4	< 4	< 17	< 7
OS-14	08/18/20	< 18	< 17	< 2	< 2	< 4	< 2	< 4	< 2	< 4	< 2	< 2	< 13	< 4
OS-16	02/05/20	< 35	< 81	< 4	< 4	< 10	< 4	< 9	< 4	< 6	< 5	< 4	< 19	< 6
OS-16	08/18/20	< 16	< 15	< 2	< 2	< 4	< 2	< 4	< 2	< 3	< 2	< 2	< 10	< 3
OS-18	08/19/20	< 20	< 23	< 2	< 2	< 6	< 3	< 5	< 3	< 4	< 3	< 2	< 14	< 5
OSF	08/20/20	< 14	< 29	< 1	< 2	< 4	< 1	< 3	< 2	< 3	< 2	< 1	< 14	< 5
RW-1	08/19/20	< 18	< 37	< 2	< 2	< 4	< 2	< 4	< 2	< 4	< 2	< 2	< 14	< 5

TABLE B-I.3 CONCENTRATIONS OF HARD TO DETECTS IN GROUNDWATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM THREE MILE ISLAND NUCLEAR STATION, 2020

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE	Am-241	Cm-242	Cm-243/244	Pu-238	Pu-239/240	U-234	U-235	U-238	Fe-55	Ni-63
MS-3	08/19/20									< 68	< 4.2
MS-5	08/18/20									< 88	< 4.9
MS-8	08/18/20									< 67	< 4.6
MW-TMI-6D	08/19/20									< 66	< 4.4
MW-TMI-6I	08/19/20									< 89	< 4.5
OS-14	08/18/20									< 107	< 4.5
OS-16	11/13/20									< 73	< 4.5

TABLE B-II.1 CONCENTRATIONS OF TRITIUM IN SURFACE WATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM THREE MILE ISLAND NUCLEAR STATION, 2020

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE		COLLECTION DATE	H-3
SW-E-1		02/05/20	< 194
SW-E-1	*DUP*	02/05/20	< 189
SW-E-2		02/05/20	< 192
SW-E-3		02/05/20	< 191
SW-E-3	*DUP*	02/05/20	< 189

TABLE B-III.1 CONCENTRATIONS OF TRITIUM IN STORM WATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM - THREE MILE ISLAND NUCLEAR STATION, 2020

RESULTS IN UNITS OF PCI/LITER + 2 SIGMA

SITE	COLLECTION DATES	H-3
EDCB	01/30/20 - 04/01/20	< 185
EDCB	04/29/20 - 06/30/20	< 184
EDCB	07/30/20 - 10/01/20	< 177
EDCB	10/29/20 - 12/29/20	< 182

TABLE B-III.2

CONCENTRATIONS OF GAMMA EMITTERS IN STORM WATER SAMPLES COLLECTED IN THE VICINITY OF THREE MILE ISLAND NUCLEAR STATION, 2020

RESULTS IN UNITS OF PCI/LITER + 2 SIGMA

SITE	COLLECTION DATES	Be-7	K-40	Mn-54	Co-58	Fe-59	Co-60	Zn-65	Nb-95	Zr-95	Cs-134	Cs-137	Ba-140	La-140
EDCB	01/30/20 - 04/01/20	< 66	< 157	< 8	< 7	< 8	< 8	< 11	< 7	< 16	< 8	< 8	< 35	< 10
EDCB	04/29/20 - 06/30/20	< 59	< 95	< 5	< 6	< 13	< 7	< 13	< 4	< 11	< 6	< 6	< 29	< 7
EDCB	07/30/20 - 10/01/20	< 14	< 15	< 2	< 2	< 3	< 2	< 3	< 2	< 3	< 2	< 2	< 7	< 2
EDCB	10/29/20 - 12/29/20	< 20	< 22	< 2	< 2	< 5	< 3	< 4	< 2	< 4	< 3	< 2	< 11	< 3

TABLE B-IV.1 CONCENTRATIONS OF TRITIUM IN PRECIPITATION WATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM THREE MILE ISLAND NUCLEAR STATION, 2020

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION DATE	H-3
TM-PR-EDCB	12/29/20	< 191
TM-PR-ESE	02/04/20	419 ± 133
TM-PR-ESE	04/29/20	< 179
TM-PR-ESE	11/11/20	< 190
TM-PR-MS-1	02/04/20	< 192
TM-PR-MS-1	04/29/20	< 176
TM-PR-MS-1	11/11/20	< 183
TM-PR-MS-2	02/04/20	408 ± 132
TM-PR-MS-2	04/29/20	< 198
TM-PR-MS-2	11/11/20	< 189
TM-PR-MS-4	02/04/20	< 186
TM-PR-MS-4	04/29/20	< 190
TM-PR-MS-4	11/11/20	< 188
TM-PR-MS-8	11/11/20	198 ± 123
TM-PR-MW-22S	11/11/20	714 ± 151
TM-PR-RW-1	11/11/20	< 189

APPENDIX C

DATA TABLES

COMPARISON LAB

Intentionally left blank

TABLE C-I.1 CONCENTRATIONS OF TRITIUM, STRONTIUM AND GROSS ALPHA IN GROUNDWATER SPLIT SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM, THREE MILE ISLAND NUCLEAR STATION, 2020

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

LAB	SITE	COLLECTION DATE	H-3	Sr-89	Sr-90	Gross Alpha
GEL	MS-7	11/11/20	< 152			
	MS-20	02/04/20	420 ± 132			
	MW-TMI-3I	08/21/20	387 ± 106	< 0.8	< 0.8	< 6.6
	MW-TMI-3I	11/11/20	363 ± 109			
	MW-TMI-4I	08/21/20	< 159			
	MW-TMI-10I	08/21/20	535 ± 132			
	MW-TMI-13I	08/21/20	< 141			
	MW-TMI-14I	02/05/20	< 159			
	MW-TMI-14I	08/21/20	< 146			

TABLE C-I.2 CONCENTRATIONS OF GAMMA EMITTERS IN GROUNDWATER SPLIT SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM, THREE MILE ISLAND NUCLEAR STATION, 2020

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

LAB	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
GEL	MW-TMI-3I	08/21/20	< 2	< 4	< 2	< 2	< 4	< 3	< 2	< 2	< 2	< 9	< 3
	MW-TMI-4I	08/21/20	< 2	< 4	< 1	< 2	< 4	< 3	< 2	< 2	< 2	< 8	< 3
	MW-TMI-10I	08/21/20	< 2	< 4	< 2	< 2	< 5	< 3	< 2	< 2	< 2	< 9	< 4
	MW-TMI-13I	08/21/20	< 2	< 3	< 2	< 2	< 4	< 3	< 2	< 2	< 2	< 9	< 3
	MW-TMI-14I	08/21/20	< 2	< 4	< 2	< 2	< 4	< 3	< 2	< 2	< 2	< 9	< 4

TABLE C-I.3 **CONCENTRATIONS OF HARD TO DETECTS IN GROUNDWATER SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM, THREE MILE ISLAND NUCLEAR STATION, 2020**

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

SITE	COLLECTION PERIOD	Am-241	Cm-242	Cm-243/244	Pu-238	Pu-239/240	U-233/234	U-235	U-238	Fe-55	Ni-63

There were no hard to detects analyzed in 2020

TABLE C-II.1 CONCENTRATIONS OF TRITIUM IN SURFACE WATER SPLIT SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM, THREE MILE ISLAND NUCLEAR STATION, 2020

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

LAB	SITE	COLLECTION DATE	H-3
GEL	SW-E-1	02/05/20	< 161
	SW-E-3	02/05/20	< 159

TABLE C-III.1 CONCENTRATIONS OF TRITIUM IN PRECIPITATION WATER SPLIT SAMPLES COLLECTED AS PART OF THE RADIOLOGICAL GROUNDWATER PROTECTION PROGRAM, THREE MILE ISLAND NUCLEAR STATION, 2020

RESULTS IN UNITS OF PCI/LITER ± 2 SIGMA

LAB	SITE	COLLECTION DATES	H-3
GEL	TM-PR-MS-2Q	02/04/20 - 03/24/20	539 ± 137
		04/29/20 - 06/09/20	< 149
		11/11/20 - 12/29/20	189 ± 90

Intentionally left blank