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Subject: **COLUMBIA GENERATING STATION, DOCKET NO. 50-397
INDEPENDENT SPENT FUEL STORAGE INSTALLATION, DOCKET NO. 72-35
2018 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT**

References: 1. Columbia Generating Station Technical Specification 5.6.1
2. Independent Spent Fuel Storage Installation Technical Specification 5.4.c
3. EFSEC Resolution No. 332, February 21, 2012

Dear Sir or Madam:

In accordance with the requirements of References 1-3, the subject report is submitted as an enclosure to this letter. This letter contains no regulatory commitments. If you have questions regarding this information, please contact R.L. Phillips at (509) 377-5350.

Executed on this 9TH day of MAY, 2019.

Respectfully,

 FOR RE SCHUETZ

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Vice President, Operations

Enclosure – as stated

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COLUMBIA GENERATING STATION

2018 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT FOR THE COLUMBIA GENERATING STATION





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COLUMBIA GENERATING STATION

**RADIOLOGICAL ENVIRONMENTAL
MONITORING PROGRAM**

**2018 ANNUAL RADIOLOGICAL
ENVIRONMENTAL OPERATING REPORT**

For Calendar Year 2018

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1.0 EXECUTIVE SUMMARY

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The primary purpose of the Energy Northwest Radiological Environmental Monitoring Program (REMP) is to evaluate the radiological impact that Columbia Generating Station (CGS) operation may have on the environment. Sampling is performed as specified in the Offsite Dose Calculation Manual (ODCM) and agreements made with the State of Washington Energy Facility Site Evaluation Council (EFSEC). Additional sampling is also performed to meet Nuclear Energy Institute (NEI) guidelines or as an Energy Northwest initiative. The program serves to validate CGS effluent measurements and exposure pathway models and to provide a documented, historical record of CGS impact on the environment. This report serves to document and communicate the program results and findings for calendar year 2018.

A variety of environmental samples are routinely collected and analyzed by the REMP. The types of samples collected include air, water, soil, sediment, milk, fish, and garden produce. Additionally, the program continuously monitors direct radiation at numerous locations surrounding CGS. Analysis results are trended and compared to results from control locations, results obtained in previous operational and pre-operational periods, and regulatory limits.

The results contained in this report show that all identified radiological impact to the environment attributable to CGS operation was limited to areas within the CGS controlled area. All routine sample results were consistent with the results obtained from control locations, results from the preoperational period, and historical results collected since CGS began commercial operation. All activity identified within the controlled area is attributed to rain-washout (recapture) of gaseous activity released from CGS via an approved and monitored effluent pathway. All radioactive material identified outside the CGS controlled area was of natural origin or known to be present in the environment around CGS in the quantities identified. No radioactive material related to CGS operation was identified beyond the CGS controlled area. The results are consistent with and verify CGS effluent measurements and modeling of the exposure pathways. Direct radiation, airborne, ingestion, and waterborne are the four exposure pathways that are sampled. Below is a summary of the 2018 results by exposure pathway:

Direct Radiation - No impact was identified at locations beyond the CGS controlled area. Within the controlled area, the only impact identified was at locations known to be influenced by the Independent Spent Fuel Storage Installation (ISFSI) or radiation from the turbine building during operation.

Airborne - No impact due to CGS operation was identified. No radioiodines or other radionuclides related to CGS operation were identified in any of the environmental air samples.

Ingestion - No impact due to CGS operation was identified in any of the milk, fish, or food product sample results. Carbon-14 activities in local fruit samples were below the level of detection.

Waterborne - No impact was identified at surface/drinking water locations outside the CGS controlled area. Low level tritium activity was identified in evaporation pond and storm drain water and radionuclides related to CGS operation were identified at low levels in evaporation pond and cooling tower sediment. The activity identified at these locations is due to recapture and concentration of CGS effluent activity; the activity levels observed are consistent with levels historically identified. Tritium activity identified in groundwater samples was at levels historically observed and consistent with levels known to exist in Hanford groundwater. No

evidence that CGS operation contributed to groundwater tritium levels was identified. Radionuclide activity identified in river sediment is consistent with activity levels known to exist in Hanford area sediment and soils.

2.0 DEFINITIONS

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a priori: refers to a “before the fact” limit that represent the capabilities of a measurement system and not a limit for a particular measurement.

a posteriori: refers to an “after the fact” limit determined for a particular measurement and not a limit for a measurement system.

Airborne Activity Sampling: Continuous sampling of air through the collection of particulates and radionuclides on filter media. Periodic soil samples are collected for gamma isotopic analysis to provide information on deposition to the soil from airborne releases.

Alpha Particle (α): A charged particle emitted from the nucleus of an atom having a mass and charge equal in magnitude of a helium nucleus.

Becquerel (Bq): One disintegration per second. One picocurie (pCi) equals 0.037 becquerel.

Beta Particle (β): Charged particle emitted from the nucleus of an atom with a mass and charge equal in magnitude to that of an electron.

Blank Sample: A sample of the same media as the field sample being analyzed but without any radionuclide(s) being measured. It enables correction for the inherent sample background.

CGS: Columbia Generating Station, formerly referred to as WNP-2.

CGS Controlled Area: The area within a 1.2 mile radius of the CGS reactor building and a narrow corridor extending from CGS east to the Columbia River.

CGS Protected Area: The area within the security fence surrounding CGS. Access to this area requires a security badge or escort.

Composite Sample: A series of single collected portions (aliquots) analyzed as one sample. The aliquots making up the sample are collected at time intervals that are very short compared to the composite period.

Control Station: A sampling station in a location not likely to be affected by plant effluents due to its distance and/or direction from the Columbia Generating Station.

Counting Error: An estimate of the two-sigma uncertainty associated with the sample results based on respective count times.

$$+/-2\sqrt{(SampleCPM/CountTime + BkgCPM/CountTime)}$$

Curie (Ci): A measure of radioactivity; equal to 3.7×10^{10} disintegrations per second, or 2.22×10^{12} disintegrations per minute.

Direct Radiation Monitoring: The measurement of radiation dose at various distances from the plant is assessed using thermoluminescent dosimeters and pressurized ionization chambers.

DOE: U.S. Department of Energy.

EFSEC: Energy Facility Site Evaluation Council.

HEDP: Hanford External Dosimetry Program. Supplier of environmental TLDs for the CGS REMP

FFTF: Fast Flux Test Facility. This facility is referred to as the DOE 400 area throughout this report.

Flow Proportional Sampling: Sample collection volume or frequency determined as a function of the flow rate of the water being sampled.

Grab Sample: A single discrete sample drawn at one point in time.

IDC: Energy Northwest Industrial Development Complex, formerly referred to as the WNP-1 and WNP-4 sites.

Indicator Station: A sampling location that is likely to be affected by plant effluents due to its proximity and/or direction from the Columbia Generating Station.

Ingestion Pathway Monitoring: The ingestion pathway includes milk, fish, and garden produce. Also sampled (under special circumstances) are other media such as vegetation and animal products such as eggs and meat when additional information about particular radionuclides is needed.

ISFSI: Independent Spent Fuel Storage Installation.

Lower Limit of Detection (LLD): The smallest concentration of radioactive material in a sample that will yield a net count (above system background) that will be detected with 95% probability with a 5% probability of a false conclusion that a blank observation represents "real" signal.

Mean: The average, i.e., the sum of results divided by the number of results.

Microcurie: 3.7×10^4 disintegrations per second, or 2.22×10^6 disintegrations per minute.

Milliroentgen (mR): 1/1000 Roentgen; a unit of exposure to X or gamma radiation.

MDA: Minimum Detectable Activity.

MSA: Mission Support Alliance.

MDC: Minimum Detectable Concentration.

NEI: Nuclear Energy Institute

NIST: National Institute of Standards and Technology.

NPDES: National Pollutant Discharge Elimination System.

NRC: U.S. Nuclear Regulatory Commission.

ODCM: Offsite Dose Calculation Manual. Licensing document that contains the NRC mandated effluent and offsite radiological monitoring requirements.

Picocurie (pCi): 1×10^{-12} Curie or one millionth of a microcurie. 1 picocurie equal 0.037 becquerel or 2.22 disintegrations per minute

Protected Area: The fenced area immediately surrounding CGS. Access to the protected area requires a security badge or escort.

Radioiodine: Radioisotopes of iodine. For commercial nuclear reactors, iodine-131 to iodine-135 are the principle radioiodines of concern. Due to its longer half-life, iodine-131 is the most probable radioiodine identifiable in the environment.

REMP: Radiological Environmental Monitoring Program.

Range: The difference between the smallest and largest results.

Restricted Area: Any area where access is controlled for the purpose of protecting individuals from exposure to radiation or radioactive materials.

Roentgen: Unit of exposure to ionizing radiation in air.

Site Certification Agreement (SCA): The initial Columbia Generating Station licensing agreement with the State of Washington. The REMF sampling commitments in the SCA have been modified by EFSEC agreements.

Spiked Sample: A sample that has had a known quantity of radionuclide(s) added for the purposes of assessing analytical performance.

Standard Deviation: A measure of the scatter of a set of observations (or samples) around their mean value. Indicated by " σ ".

Standard Error of the Mean: An estimate of the uncertainty associated with the mean of observation (or sample) averages. Also known as the standard deviation.

$$SE = \sqrt{\frac{S^2}{n}}$$

where S^2 , the variance is

$$S_m^2 = \frac{1}{(n-1)} \sum^n (X_i - \bar{X})^2$$

SWTF: Sanitary Waste Treatment Facility. The sanitary waste processing facility for the Columbia Generating Station and other ENW facility near the CGS site.

TEDA: triethylene diamine. A compound used in charcoal cartridge filters to collect radioiodine.

Thermoluminescent Dosimeter (TLD): A device used to measure the amount of exposure to radiation. A crystal phosphor that stores energy proportional to the amount of exposure; the exposure level is determined by heating the crystal and reading the amount of emitted light.

TMU: Tower Make Up.

WaDOH: Washington State Department of Health.

WSU: Washington State University.

3.0 INTRODUCTION

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3.1 Site Description

The Columbia Generating Station (CGS) is a 1230 MWe commercial nuclear power plant that achieved initial criticality on January 19, 1984. The plant is located in a sparsely populated shrub-steppe region within the Department of Energy (DOE) Hanford Site in southeastern Washington. The plant is approximately three miles west of the Columbia River and is surrounded on all sides by uninhabited desert land. The nearest large population centers are Richland, Pasco and Kennewick, which are 12 miles south, 18 miles southeast, and 21 miles southeast, respectively. The nearest privately owned lands are located approximately four miles east-northeast of the plant, across the Columbia River. The site has a bimodal wind pattern with winds primarily from the northwest and south.⁽¹⁾ The primary region of focus for REMP sampling is the farming region east of the plant.

Naturally occurring radionuclides exist in detectable quantities throughout the world and are seen in many of the samples collected for the REMP. Some examples of naturally occurring radionuclides that are frequently seen in samples are potassium-40, beryllium-7, actinium-228 (present as a decay product of radium-228), and radium-226. Additionally, some relatively long lived anthropogenic radioisotopes, such as strontium-90 and cesium-137, are also seen in some REMP samples; these radionuclides exist in measurable quantities throughout the world as a result of fallout from atmospheric nuclear weapons testing.^(2, 3)

Due to the location of CGS on the Hanford Site, there are other sources of reactor produced radionuclides in close proximity to the plant. CGS is unique in the U.S. commercial nuclear power industry in this respect. Hanford related radionuclides, most notably tritium, are identified in some CGS REMP samples. Though the presence of these radionuclides in the vicinity of CGS are not necessarily reflective of CGS activity, changes in the levels of these radionuclides are monitored to assess any contribution that CGS may be making to the established background. The DOE has an active environmental monitoring program for the Hanford Site that overlaps the CGS REMP.

3.2 Program Background

The CGS REMP is designed to conform to the Nuclear Regulatory Commission (NRC) Regulatory Guide 4.1,⁽⁴⁾ NUREG 1302,⁽⁵⁾ and the 1979 NRC Branch Technical Position.⁽⁶⁾ In addition, the REMP also meets the requirements of 10 CFR 72.44(d)(2)⁽²⁰⁾ for coverage of the ISFSI.

The quality assurance aspects of the sampling program and the thermoluminescent dosimetry are conducted in accordance with Regulatory Guides 4.15⁽⁷⁾ and 4.13.⁽⁸⁾ The REMP also adheres to the requirements of the State of Washington Energy Facility Site Evaluation Council (EFSEC),⁽⁹⁾ CGS Technical Specifications,⁽¹⁰⁾ and the CGS Offsite Dose Calculation Manual (ODCM).⁽¹¹⁾ These requirements cover the environmental sampling and sample analysis aspects of the program, and also the reporting and quality assurance requirements.

The preoperational phase of the program, which lasted from March 1978 until initial criticality in January 1984, provided a baseline of background environmental data. Variability in the background levels of radioactivity over time is due to differences in geologic composition, meteorological conditions, decay of

nuclear testing fallout material in the environment, and seasonal changes. Variability in results may also have been introduced by changing analytical contractors and the use of different correction factors over the years.

In addition to evaluating environmental concentrations against regulatory limits, the REMP also compares some results to standards set by the State of Washington.^(12, 13) Results may also be evaluated by comparing them to similar measurements made during the preoperational and previous operational periods and to the detection capabilities associated with the current methods of analysis.

All CGS REMP samples were collected by Energy Northwest Environmental Services personnel in 2018. Thermoluminescent dosimeters (TLDs) were analyzed by the Hanford External Dosimetry Program (HEDP) operated by Mission Support Alliance (MSA). Carbon-14 analysis was performed by the Washington State Department of Health Laboratory in Shoreline, WA. All other REMP sample analyses were performed by the Energy Northwest Environmental Services Laboratory located in Richland, WA.

3.3 Program Objectives

The REMP provides an independent mechanism for determining the levels of radioactivity in the plant environs in order to empirically quantify and qualify any radiological effect plant operation may be making on the environment. The program serves to ensure that any accumulation of radionuclides in the environment resulting from station operation will be identified promptly and before they become significant or exceed established limits.

While in-plant monitoring programs are used to ensure that 10 CFR 20⁽¹⁴⁾ and 10 CFR 50⁽¹⁵⁾ criteria for releases of radioactive effluents are met, the REMP further verifies that the measured concentrations of radioactive material and levels of radiation observed in the environment are not higher than expected based on CGS effluent measurements and modeling of the exposure pathways.

4.0 PROGRAM DESCRIPTION

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The ODCM contains the CGS licensing based sampling requirements for the REMP. Additional sampling requirements are specified in Resolutions or Council Orders issued by the State of Washington Energy Facility Site Evaluation Council (EFSEC). Some sampling is also performed as a CGS initiative in response to site specific or industry wide concerns. The sampling plan presented in Table 4-1 gives an overview of the REMP sampling routine, a summary of the sample locations, the specified collection frequency, and the types of analyses to be performed. The methods of sampling and sampling frequencies utilized in the program are mostly dictated by regulatory requirements. Factors such as nuclide half-lives and the major exposure pathways for the radionuclides potentially released from the plant have been taken into account in determining the sampling methodology.

4.1 Sample Locations

One hundred and fifteen sampling locations (referred to as ‘stations’) were included in the monitoring program during 2018. More than one sample type may be collected at a sample station. One hundred and five indicator and three control stations were located within a 10-mile radius of CGS. Seven additional stations were located beyond the ten mile radius of the plant, three were indicator locations and four were control locations. Sample stations are listed in Tables 4-1 and 4-2. Most station locations are shown in Figures 4-1 to 4-4.

The locations of most sample stations have been selected on the basis of an exposure pathway analysis. The exposure pathway analysis was based on factors such as weather patterns, anticipated emissions, likely receptors, and land use in the surrounding areas. Samples collected from stations located in areas that potentially could be influenced by CGS operation are used as indicators. Samples collected from locations that are not likely to be influenced by CGS operation serve as controls. Results from indicator stations are compared to the results from control stations and results obtained during the previous operational and preoperational years of the program in order to assess the impact CGS operation may be having on the environment.

4.2 Independent Spent Fuel Storage Installation (ISFSI)

The Independent Spent Fuel Storage Installation (ISFSI) is a fenced, secured area constructed to provide a storage location for spent nuclear fuel. The spent fuel is stored in HI-STORM dry storage casks which are placed on concrete pads inside the facility. The pads are 30-feet wide by 147-feet long and each pad can hold up to 18 casks. The ISFSI is located approximately 500 meters north-northwest of the reactor building. Radiological exposure rates inside the ISFSI security fence line are elevated and access to the area requires radiological dosimetry and security notification. In addition to the TLD monitoring program, quarterly radiological surveys of the ISFSI are conducted by the CGS Radiation Protection Department.

Direct radiation monitoring of the ISFSI is performed using TLDs placed at 12 locations on the second of three security fences that surround the facility. The TLDs are exchanged quarterly. Two additional TLD locations, Station 121 located approximately 200 meters north of the turbine building, and Station 122 located approximately 100 meters north of the ISFSI, were established prior to ISFSI operation to specifically monitor ISFSI direct radiation. In the first quarter 2016, the REMP added two additional TLDs near the ISFSI in order to further aid in monitoring ISFSI direct radiation. These locations are

Station 155, located WNW of the ISFSI, and Station 156, located to the NW of the ISFSI. Figure 4-1 shows the ISFSI location in relation to CGS and the position of these additional TLD locations.

In 2016, a third spent fuel storage pad was added to the CGS ISFSI. In order to monitor dose rates from the new pad, two additional TLD locations were added to the ISFSI fence line in the first quarter of 2017. These locations are Stations 130, located west of the new pad, and Station 131, located east of the new pad. Figure 4-4 shows the updated ISFSI facility, the location of the new pad, and the locations of all ISFSI fence line TLD stations. This arrangement of TLDs in conjunction with the radiological surveys conducted by the CGS Radiation Protection Department serves as the radiological monitoring program for the ISFSI.

4.3 Land Use Census

A land use census covering the areas within a five mile radius of CGS is performed annually. The objective of the land use census is to identify the locations of the nearest milk animal, residence, and garden greater than 500 ft² producing broadleaf vegetation. This information is used to determine whether any site located during the census has a calculated dose or dose commitment greater than the sites currently monitored for the same exposure pathway. If a new location with a higher dose commitment was found, routine sampling of that dose pathway would be initiated at that new site. The results of the 2018 five miles land use census are presented in Table 4-3.

4.4 Sampling Methods

Environmental samples are collected by Energy Northwest personnel in accordance with the program plan outlined in Table 4-1. Methods of sample collection and TLD handling are specified in REMP specific procedures. A general overview of the sampling methods used in the REMP is given below. Generic descriptions of the REMP sample analysis methods are given in section 4.6.

4.4.1 Direct Radiation

Direct radiation dose levels are monitored with Harshaw Model 8807 thermoluminescent dosimeters (TLDs). The TLDs are placed in the field between three and five feet above the ground. TLDs are wrapped in aluminum foil and sealed in plastic bags to prevent damage. TLDs are exchanged on a quarterly basis.

The locations of the TLD stations are listed in Table 4-2 and are shown in Figures 4-1 through 4-4. Station 9A near Sunnyside, WA serves as the environmental TLD control location. Station 119C serves as the control for Station 119B (the cooling system sediment disposal basin). The remaining TLDs deployed in the field serve as indicator TLDs. The TLDs are arranged in a series of rings that encircle CGS. The innermost ring of TLD stations, referred to as the “S” stations, are located inside the CGS site boundary at distances that range from 0.3-0.8 miles from the reactor building centerline. The second ring of TLDs, referred to as the “near plant” stations, are located at distances ranging from 0.9 to 2.1 miles from the reactor building. The outer ring of TLDs are located at distances that range from a little under three miles to around ten miles. Direct radiation is also monitored by TLDs at the ISFSI and at a number of miscellaneous locations at CGS

initiative. A MicroRem dose rate meter is available as a backup device and to take real time readings as needed.

4.4.2 Airborne - Particulate/Iodine

Weekly air particulate and radioiodine (iodine -131) samples are obtained through the use of low volume (1.5 cfm), constant flow-rate sampling units located at 12 locations. The samples collected at Station 9A (Figure 4-3) serve as controls, the samples collected at all other locations (Figures 4-1, 4-2, and 4-3) are indicators. Air particulate samples are collected using 47mm diameter glass fiber filters, air iodine samples are collected using Radeco CP-100 TEDA impregnated charcoal cartridges. The air particulate filter and charcoal cartridge are placed in tandem, particulate filter first, in a holder that attaches to the air inlet of the sampler unit. The sampler units are placed in ventilated metal weatherproof housings mounted on elevated platforms at each air sample location. The filter media are changed weekly. Four additional air sample monitor locations are available to monitor work at the DOE 618-11 burial site if needed.

4.4.3 Water

Water sampling is performed to meet ODCM and State of Washington EFSEC requirements, to comply with NEI guidelines, or as a CGS initiative. REMP water sampling can be categorized as follows:

- Intake-River/Drinking Water; two locations (Stations 26 and 29)
- Deep Groundwater; three locations (Stations 31, 32, and 52)
- Shallow Groundwater; nine locations (MW-3, 5, 6 and MW-9 through MW-14)
- Plant Discharge Water; one location (Station 27)
- Storm Drain Water; one location (Station 101B)
- Sanitary Wastewater; one location (Station 102B)

The sample at Station 26 is obtained using a composite sampler that draws water from the plant intake water system (TMU). The source of this water is the Columbia River. The station serves as a control location, as it is upstream of the plant discharge location, and also as a drinking water location as drinking water for CGS comes from this source. Station 29 is a composite sampler located at the City of Richland Water Treatment Plant located 11 miles downstream of the plant discharge. Station 29 is an indicator station for both river and drinking water.

The ODCM requirement for a downstream water sample is conservatively met by Station 27, a composite sampler that collects water from the cooling tower discharge line just prior to final discharge into the Columbia River. This sample reflects the radioactivity present in the plant discharge prior to any river dilution, rather than the concentrations that would be found after dilution in the mixing zone. Composite samples from Stations 26, 27, and 29 are collected monthly and analyzed for gamma emitting radionuclides, gross beta, and tritium.

Three drinking water wells on Energy Northwest property are used to provide deep groundwater samples. These wells are greater than 400 feet deep and provide samples from the confined aquifer under CGS. Station 31 and 32 are deep wells at the IDC (ENW Industrial Development Complex) located 1.2 miles down gradient from CGS. Station 52 is a deep well located 0.1 mile north of the CGS reactor building. The IDC wells supply water for drinking and fire protection at the IDC site. Water from Station 52 can be used as a backup source for drinking water and fire protection. All of these wells are considered indicator locations. Quarterly grab samples are collected from each well and analyzed for gamma emitting radionuclides and tritium.

The composite sampler at Station 101B collects samples of wastewater discharged to two evaporation ponds located on the CGS site. The water collected is storm drain, air wash, and non-radioactive system wastewater originating from within the CGS protected area. Samples are collected monthly on a flow proportional basis and analyzed for gross beta, gamma emitting radionuclides, and tritium. Sampling and analysis requirements for Station 101B are given in EFSEC Resolution 332⁽⁹⁾ and EFSEC Council Order 874.⁽²³⁾ Process wastewater originating outside of the CGS protected area is typically discharged to three additional evaporation ponds; the water discharged to these ponds is not sampled by the Station 101B composite sampler. Annual grab samples are collected from these three evaporation ponds and analyzed for gamma emitting radionuclides and tritium as specified by EFSEC Council Order 874.⁽²³⁾

The Sanitary Waste Treatment Facility (SWTF) receives sanitary waste water from CGS, the IDC (ENW Industrial Development Complex), and the Kootenai Building. Discharge standards and monitoring requirements for the SWTF are established in EFSEC Resolution No. 300.⁽¹⁶⁾ The Station 102B composite sampler collects a representative sample of water flowing into the head works at the SWTF. Monthly samples are collected and analyzed for gross alpha, gross beta, tritium, and gamma emitting radionuclides.

Routine quarterly grab samples are taken as part of the REMP from nine shallow ground water monitoring wells surrounding CGS. The monitoring well locations are shown in Figure 4-1. The shallow groundwater wells are all less than 100 feet deep and allow samples to be obtained from the unconfined aquifer under CGS. None of the wells are used for drinking water. Sampling from these locations is performed to meet NEI 07-07 guidelines⁽¹⁷⁾ and requirements in the CGS NPDES permit.

4.4.4 Soil

Annual soil samples are a requirement of EFSEC Resolution No. 332.⁽⁹⁾ For 2018, two soil samples were collected from locations near CGS, two samples from farmland in Franklin County east of CGS, and one sample from a control location near Sunnyside, WA. Each sample was collected from an area of approximately one square foot to a depth of approximately one inch. Approximately one to two kilograms of soil is collected from each location. Soil samples are analyzed for gamma activity on a dry weight basis.

4.4.5 Sediment

River sediment samples are collected semiannually as required by the ODCM and EFSEC Resolution No. 332.⁽⁹⁾ The upstream sediment sample location (Station 33) is approximately two miles upriver from the plant discharge. The downstream sample (Station 34) is collected approximately one mile downstream from the plant discharge. Each sample consists of approximately two kilograms of shallow surface sediment scooped from areas known to be underwater during high water periods and where the potential for sediment accumulation is likely. Sediment samples are dried in an oven and then analyzed for gamma emitting radionuclides on a dry weight basis.

Cooling system sediment samples are collected and analyzed whenever cooling system sediment is added to the disposal cells (Station 119B, Figure 4-1). Disposal of cooling system sediment is made in accordance with EFSEC Resolution No. 299.⁽¹⁸⁾ Pre-disposal samples are collected and analyzed prior to transfer to ensure the material will be within the limits specified in the EFSEC resolution. Following transfer, the material is allowed to dry and a post-disposal sample is collected and analyzed.

Sediment samples from the two evaporation ponds that receive wastewater originating from within the CGS protected area (ponds 3 and 4) are collected annually and analyzed for gamma emitting radionuclides. This sampling and analysis is performed to meet EFSEC Council Order 874⁽²³⁾ requirements. Sediment samples from the other three evaporation ponds may be collected as a CGS initiative as conditions allow.

4.4.6 Fish

Annual fish sampling is usually performed in the fall. Fish samples collected from the Columbia River (Station 30) serve as indicator samples, whereas fish collected on the Snake River (Station 38) serve as control samples. Only edible portions of the fish are used to prepare the samples for analysis. Fish samples are analyzed for gamma emitting radionuclides on a wet weight basis. Three species of fish are collected; an anadromous species (salmon or steelhead), and two other resident species generally considered edible or potentially edible (typically carp, bass, perch, walleye, sucker, or whitefish). The same species are collected at each location.

Anadromous species are obtained from local fish hatcheries through arrangements made with the State of Washington Department of Fish and Wildlife. Resident species have been collected using traditional hook and line fishing for the past six years.

4.4.7 Milk

Milk samples are collected monthly during the fall and winter months (October through March). During the spring and summer months when cows are more likely to be grazing or on fresh feed, milk samples are collected twice per month. Raw milk samples are collected within a few hours of milking and the samples are normally prepared and analyzed within four days. Milk samples are collected from both indicator and control locations. Station 36 in Franklin County serves as the primary indicator location and is the only known dairy within a ten mile radius of CGS. Control milk samples

(Station 9B) were collected from a dairy in the lower Yakima Valley near Prosser, WA.

The ODCM allows the option to collect the second monthly indicator milk sample from a location where the milking animal was known to have been on pasture, if available. In July 2018, CGS REMP identified a location 6.2 miles ESE of CGS with goats and obtained three goat milk samples from this location. The location was designated as Station 36B.

4.4.8 Garden Produce

Samples of local garden produce are collected during the growing season when the produce is readily available. Three types of garden produce are typically collected; root crops, fruits, and leafy vegetables. Control samples (Station 9C) are usually obtained from the lower Yakima Valley. Indicator samples are collected from areas downstream of the CGS discharge where crops are irrigated with Columbia River water or from locations that potentially could be impacted by CGS gaseous emissions. The Riverview and Ringold areas of Pasco are the principle collection locations for fruit crop. Root crop is primarily collected from a garden located near WSU Tri-Cities SSE of CGS. Historically, root crops were obtained in the Riverview area of Pasco. Collection of leafy vegetables is primarily made from gardens and farms located east of CGS. Vegetation samples may also be collected from locations closer to CGS; however none were collected in 2018. Garden and vegetable samples are typically puréed in a food processor and then analyzed for gamma emitting radionuclides on a wet weight basis. Only edible portions are used for analysis.

4.5 Split Sample Program

In addition to the sample analyses performed by the Energy Northwest Environmental Services laboratory, a number of the samples collected are split and independently analyzed by the Washington State Department of Health (WaDOH). CGS REMP personnel typically collects these samples, ships a representative portion to the WaDOH laboratory, then separately analyzes another portion of the sample. For media such as air particulates or TLDs where sample splitting is not feasible, the WaDOH co-locates a TLD or air sampler at the sample location. The following split samples are typically provided: Monthly surface water samples from three locations, annual ground water samples from three locations, weekly air iodine and particulate filters from two locations, bi-annual vegetable samples from one location, monthly indicator milk samples from one location, quarterly control milk samples from one location, annual resident fish from one location, annual soil samples from three locations, annual sediment samples from two locations.

4.6 Sample Analyses

General descriptions of the procedures used to analyze REMP samples are provided in the following sections. All REMP TLDs in 2018 were processed at the Hanford External Dosimetry Program (HEDP) laboratory located on the Hanford site. The HEDP is operated by Mission Support Alliance (MSA). Carbon-14 analysis of apples was performed by the Washington State Department of Health (WaDOH) in 2018. All additional REMP samples were collected and analyzed by Energy Northwest Environmental Services. Samples are normally collected and analyzed within a short time period to ensure required detection sensitivities are met and to provide timely results. Sample count times are

conservatively calculated to ensure required *a priori* LLDs are achieved. Table 4-4 lists the ODCM required LLDs and the nominal target LLD used in the Energy Northwest REMP program.

4.6.1 Analysis of TLDs

REMP TLDs are analyzed on a Harshaw Model 8800 hot gas reader. The reader is calibrated immediately prior to processing the environmental TLDs. The reader is calibrated with TLDs that have been given a known exposure from a cesium-137 source. Each group of environmental TLDs is processed with blank (freshly annealed) TLDs and spiked TLDs that have been given a known exposure. Exposure received by the field TLDs during transport is monitored with a set of 'trip' control dosimeters that accompany the field dosimeters to and from the field locations and while in storage. Another set of TLDs, the building controls, are used to determine the exposure of the TLDs at the storage location. The TLD exposure during transport to and from the field was determined from the difference between the building control results and the trip control results.

4.6.2 Gross Beta Activity on Air Particulate Filters

Air particulate filters are counted directly in a gas flow proportional counter after a delay of several days to allow for the decay of radon and its progeny. Samples were counted using a Protean WPC-9550 instrument which allows automated sample counting and simultaneous alpha/beta determination. If gross beta activity is identified significantly above the mean of the control, gamma isotopic analysis is performed on the individual samples.

4.6.3 Measurement of Gamma Emitting Radionuclides

Gamma isotopic analysis allows identification and quantification of gamma-emitting radionuclides that may be attributable to CGS effluents. Shielded, high purity germanium (HPGe) detectors are used to assay environmental samples for gamma emitting radionuclides. All samples are counted in standardized, calibrated geometries.

- **Liquids** – Measured aliquots of the liquid samples are poured into appropriately sized Marinelli beakers or plastic container. Sample results are corrected for decay during the collection period if applicable. Results are reported in pCi/liter.
- **Solids** – Soil, sludge, and sediment samples are dried and ground as needed. Foodstuff, biota (fish), and vegetation, are chopped finely or pureed and then analyzed wet (no drying is done). For foodstuff (including fish), only the edible portion of the sample is used. Sample aliquots are placed in tared containers and weighed. Results are reported in pCi/kg.
- **Charcoal Cartridges** – Typically four charcoal cartridges are counted simultaneously using a cartridge holding jig that positions the cartridges in a standardized geometry to the side of the detector. Detector calibration files are maintained for both face count and side count positions. If radioiodines are identified in the assay of a group, each charcoal cartridge in the group is assayed separately. Results are corrected for decay during the sample collection period.

Results are reported in pCi/m³.

- **Air Particulate Filters** – At the end of each quarter, air particulate filters are composited on a station by station basis. The filters are stacked in a Petri dish and analyzed by gamma spectroscopy. Results are reported in pCi/m³ and represent the total quarterly gamma activity collected at each station. Results are decay corrected to the midpoint of the sample collection period. If a radionuclide related to CGS operation is positively identified, the filters are separated and counted individually.

4.6.4 Gross Alpha and Gross Beta Activity in Water

A measured aliquot of each sample is evaporated to a small volume then quantitatively transferred to a ribbed, stainless steel planchet. Final evaporation is normally done under a heat lamp. Residue mass is determined by weighing the planchet before and after mounting the sample. The planchet is counted for gross alpha and beta activity using a Protean WPC-9550 automatic gas flow proportional counter which allows automated sample counting and simultaneous alpha/beta determination. Results are corrected for sample self-absorption using the sample residue mass values. Results are reported in pCi/liter.

4.6.5 Tritium in Water

The sample is distilled, then 8.0mL of the distillate is mixed with 12.0mL of scintillation cocktail. The sample mixture is analyzed on a Packard Tri-Carb 2900TR automatic liquid scintillation counter. Results are reported in pCi/liter.

4.6.6 Low Level Radioiodine in Milk and Water

Four liters of sample are first equilibrated with stable iodide carrier. Anion exchange resin is then added and mixed for a period sufficient to allow any iodine present in the sample to be captured by the resin. The resin is then isolated from the liquid sample and transferred to a small counting container. The radioiodine content is determined by gamma spectroscopy analysis. Results are reported in pCi/liter.

4.6.7 Carbon-14

Carbon-14 levels in the environment around CGS are evaluated by comparison of carbon-14 content in apples obtained from local orchards to apples obtained from control locations. The analysis method used involves sample oxidation, capture of the resulting carbon dioxide, then liquid scintillation counting. Final results are calculated on a wet weight basis. Sample analysis is performed by an outside laboratory.

4.6.8 Strontium-89/90, Iron-55, and Nickel-63

These “hard to detect” analytes are not routinely analyzed as part of the CGS REMP. When needed, these analyses are performed under contract by Teledyne- Brown Environmental Services Laboratory located in Knoxville, TN using the vendor’s standard analysis procedures.

4.7 Data Analysis Methods

Counting results for low level samples are often within the counting error of the background determination; consequently results for these samples can be positive or negative values. Though most REMP analytical results are below the detection limit, an actual calculated value has been reported. In some cases the reported value is zero or a negative number. Reporting results in this manner is the preferred practice for low level environmental analyses as it gives an indication of positive or negative biases that may be present and prevents loss of individual results inherent in the use of "less than" (<) values. Also reported in most cases are the *a posteriori* MDA values. A nuclide is flagged as positively identified if its calculated value is greater than the MDA. A listing of the Energy Northwest nominal target LLDs (*a priori*) for each sample type is provided in Table 4-4; the ODCM required LLDs are also included for a comparison.

Data is trended following analysis for many of the sample types analyzed. For analyses such as gross beta on air particulate filters where results are normally above the detection limit, indicator results are plotted with the control results for better comparison. Analysis results that are normally below detection limits are plotted against historical data to monitor if trends may be evident.

Thermoluminescent dosimeter (TLD) data is presented in both units of mR/day and mR/standard quarter. TLD results in mR/day are calculated by taking the total exposure (in mR) determined for each TLD, correcting for storage background and any transit (or trip) exposure received during distribution and retrieval, then dividing by the number of days the TLD was in the field. The mR/standard quarter values are calculated by multiplying the mR/day value by 91.25 days (365/4). All TLD results are reported in units of exposure (Roentgen) and not in units of dose (Rem).

4.8 Changes to the Sampling Program in 2018

The following is a synopsis of changes made to the sampling program in 2018.

ODCM amendment 58, issue date 09/20/2018, made changes to ODCM section 5.0 and Table 6.3.1-1. Changes made including removing and replacing references to Regulatory Guide 4.8 with the Radiological Assessment Branch Technical Position.

The air sampler Station 21 was moved to a new location in December 2017. The sampler was re-designated as Station 21B in order to differentiate the results for the two different air locations.

Root crops were obtained from a garden located near Washington State University branch campus located in Richland, WA. This location is irrigated with Columbia River water. The location was designated as Station 37B.

A milk sample location was added in July 2018. Refer to section 4.4.7 for details.

TABLE 4-1
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SAMPLING PLAN

SAMPLE TYPE ^(a)	SAMPLE STATION ^(b) NUMBER	SAMPLE METHOD AND COLLECTION FREQUENCY ^(c)	TYPE AND FREQUENCY OF ANALYSIS
AIRBORNE			
Particulates and Radioiodine ^(d) (6/12)	1, 4-8, <u>9A</u> , 21B, 23, 40, 48, and 57	Continuous sampling; weekly collection.	Weekly air filters gross beta and iodine cartridge gamma isotopic. Quarterly air filter composite gamma isotopic.
DIRECT RADIATION			
TLD ^(g) (34/80)	1-8, <u>9A</u> , 10-25, 40-47, 49-51, 53-56, 58, 65, 71-86, 88-89, 119B, <u>119C</u> , 121-131, 136-138, 150, 151, 155, 156.	Continuous monitoring, quarterly collection.	Radiation exposure monitoring processed on a quarterly frequency.
WATERBORNE			
River/Drinking Water ^(h) (3/3)	<u>26</u> , 27 and 29	Composite aliquots ⁽ⁱ⁾ ; monthly collection.	Monthly gamma isotopic, gross beta, and tritium. Iodine-131 ^(j) as required.
Storm Drain Water ^(s) (0/1)	101B	Composite aliquots ⁽ⁱ⁾ ; monthly collection.	Monthly gamma isotopic, tritium, and gross beta.
Sanitary Waste Treatment Facility Water ^(r) (0/1)	102B	Composite aliquots ⁽ⁱ⁾ ; monthly collection.	Monthly gamma isotopic, gross beta, gross alpha, and tritium.
Ground Water ^(k) (2/3)	31, 32, and 52	Grab sample performed quarterly.	Quarterly gamma isotopic and tritium.
Ground Water Monitoring ^(e) (0/9)	MW-3, 5, 6, 9-14	Grab sample performed quarterly.	Quarterly gamma isotopic and tritium.
Evaporation Pond Water ^(q) (0/5)	EVP-1A, 1B, 2, 3, 4	Grab sample performed annually	Annual gamma isotopic and tritium.
SOIL AND SEDIMENT			
Soil ^(l) (0/9)	1, 5, 7, 8, <u>9A</u> , 21, 23, 37, 48	Grab sample performed at five of the locations annually.	Annual gamma isotopic. Strontium-90 ^(f) as required.
River Sediment ^(l) (1/2)	<u>33</u> and 34	Grab sample performed semiannually.	Semiannual gamma isotopic.
Cooling System Sediment Disposal Area ^(t) (0/2)	119B, <u>119C</u>	Grab sample of dried sediment within 30 days of disposal date.	Gamma Isotopic. After disposal.
Evaporation Pond Sediment ^(q) (0/2)	EVP-3, 4	Grab sample performed annually	Annual gamma isotopic
INGESTION			
Milk ^(m) (2/3)	<u>9B</u> , 36, 36B	Grab sample collected semimonthly during grazing season, monthly at other times.	Gamma isotopic, Iodine-131 each sample. Strontium-90. ⁽ⁿ⁾ as required
Fish ^(o) (2/2)	30, <u>38</u>	Grab samples collected annually.	Gamma isotopic each sample.
Garden Produce ^(p) (3/5)	<u>9C</u> , 37, 48G, 104, 37B	Grab samples collected monthly or at time of harvest.	Gamma isotopic each sample.

TABLE 4-1 FOOTNOTES:

- (a) The fraction in parentheses for each sample type indicates the ratio of ODCM-required sample locations to the total number of sample locations currently established in the surveillance program. Additional sampling is performed to meet EFSEC requirements or as an ENW initiative.
- (b) The underlined sample location designates a control station.
- (c) Sample collection is performed at a frequency specified in the ODCM and EFSEC resolutions. Some sampling referenced in Table 4-1 is performed at CGS initiative. Sample deviations are permitted if samples are unobtainable due to hazardous conditions, seasonal availability, malfunction of automatic sampling equipment, or other legitimate reasons.
- (d) The ODCM specifies six air sample locations and EFSEC Resolution 332 specifies nine. Two of the air sample stations are maintained at CGS initiative and are not requirements of either the ODCM or EFSEC Resolution 332.
- (e) Shallow ground water sampling is performed to meet NEI 07-07 guidelines and NPDES requirements.
- (f) Soil samples are collected annually from five of the locations listed in Table 4-1 to satisfy EFSEC Resolution 332 requirements. Two samples are collected from locations near CGS, two from locations in Franklin County, and one collected from a control location. EFSEC 332 requires strontium-90 analysis be performed if gamma analysis results are greater than a specified threshold.
- (g) TLD Stations 71-86 are not included among the 34 TLD stations required by the ODCM. Alternate designations for these stations are 1S-16S. EFSEC Resolution 332 requires 25 or more TLD stations to be located within a 10-mile radius of CGS.
- (h) The term "river/drinking water" is used as Columbia River water is also used as a source of drinking water. Station 26 samples CGS makeup water drawn from the Columbia River. This sample is both a control upstream water sample and a drinking water sample. Station 29 is a downstream drinking water sample location. Station 27 samples plant discharge water immediately before discharge to the Columbia River. EFSEC Resolution 332 requires samples from at least one downstream drinking water location and samples from the plant intake and discharge water systems.
- (i) Composite samples are collected on a flow proportional or timed interval basis using automatic sampling equipment. When timed interval sampling is used, the interval period is short (e.g. hourly) relative to the compositing period (e.g. monthly).
- (j) When the dose calculated via ODCM methodology for consumption of water exceeds 1 mrem per year, low level iodine-131 analyses are performed on the drinking water samples.
- (k) Sampling from these locations fulfills ODCM table 6.3.1-1 3b requirements. EFSEC Resolution 332 requires sampling from at least one deep well used for fire protection and/or as a backup drinking water source.
- (l) Downstream sampling fulfills ODCM table 6.3.1-1 3d requirements. EFSEC Resolution 332 requires annual sediment samples upstream and downstream of the plant discharge.
- (m) ODCM table 6.3.1-1 4a milk collection requirements take into account site characteristics and the proximity of milking animals to CGS. Milk samples are collected from the nearest dairy potentially impacted by CGS operation and also from a control location at the frequency specified in the ODCM. EFSEC Resolution 332 specifies sampling from at least one milk location within the 10-mile radius of CGS and also from a control location. Some milk samples were collected from a new location in 2018 where milking animals are known to be on pasture.
- (n) ODCM table 6.3.1-1 (k) requires that if cesium-134 or cesium-137 is measured in an individual milk sample in excess of 30 pCi/liter, then a strontium-90 analysis will also be performed.
- (o) Station 30 is the Columbia River and station 38 is the Snake River. If an impact is indicated, sampling will be conducted semiannually per ODCM table 6.3.1-1 (i). There are no species fished commercially in the Hanford Reach of the Columbia River. The most recreationally important species in the area are anadromous, which ascend rivers from the ocean for breeding. Anadromous fish species are normally obtained from hatcheries; Snake River samples are obtained from the Lyons Ferry Fish Hatchery, and Columbia River samples are obtained at the Ringold Fish Hatchery.
- (p) Garden produce is obtained from farms or gardens that use Columbia River water for irrigation. One sample of a root crop, leafy vegetable, and a fruit is typically collected each sample period, when available. EFSEC Resolution 332 further specifies fruit and vegetable sampling from locations potentially impacted by CGS gaseous emissions.
- (q) Annual sediment samples from evaporation ponds 3 and 4 and annual water grab samples from ponds 1A, 1B, and 2 are specified in EFSEC Council Order 874. Annual water grab samples from ponds 3 and 4 were taken at ENW initiative.
- (r) Sample requirements for the Sanitary Waste Treatment Facility are specified in EFSEC Resolution 300.
- (s) Monthly Station 101B sampling is specified in EFSEC Resolution 332 and EFSEC Council Order 874.
- (t) Disposal, sampling, and monitoring of cooling system sediment is specified in EFSEC Resolution 299.

TABLE 4-2
REMP SAMPLE STATIONS AND REQUIREMENTS

SECTOR^(a)	STATION NUMBER^(b)	DISTANCE MILES^(c)	ODCM^(d)	STATE^(e)	OTHER^(f)
N (1)	52	0.07	DGW	DGW	
	71(1S)	0.28			TLD
	47	0.70		TLD	
	57	0.70	AP/AI		
	18	1.16	TLD	TLD	
	53	7.54	TLD		
NNE (2)	72(2S)	0.32			TLD
	2	1.45	TLD	TLD	
	54	6.08	TLD		
	EVP-1A	0.31		Dis W	
NE (3)	73(3S)	0.54			TLD
	19	1.74	TLD	TLD	
	48	4.59	AP/AI	AP/AI, SO	
	48G ^(k)	4.63	GP		
	46	4.99	TLD		
	MW-9	0.22		SGW	SGW
	EVP-1B	0.25		Dis W	
	EVP-2	0.35		Dis W	
	EVP-3	0.43		SE	
ENE (4)	74(4S)	0.38			TLD
	21	1.45		TLD, SO	
	20	1.93	TLD	TLD	
	11	3.16		TLD	
	33	3.44		SE	
	45	4.45	TLD		
	44	5.90	TLD		
	101B	0.22		Dis W	
	MW-11	0.10		SGW	SGW
	EVP-4	0.60		SE	
E (5)	75(5S)	0.37			TLD
	22	2.08	TLD		
	10	3.16	TLD	TLD	
	26	3.19	SW, DW	SW	
	27	3.19	SW	Dis W	
	30 ^(g)	3.5	FI	FI	
	43	5.63	TLD		
	104 ^(k)	5.08			GP
	151 (Site 4)	0.83			TLD
	MW-12	0.12		SGW	SGW

TABLE 4-2
REMP SAMPLE STATIONS AND REQUIREMENTS

SECTOR^(a)	STATION NUMBER^(b)	DISTANCE MILES^(c)	ODCM^(d)	STATE^(e)	OTHER^(f)
ESE (6)	76(6S)	0.42			TLD
	31	1.06	DGW		
	32	1.27			DGW
	51	2.14	TLD		
	34	3.32	SE	SE	
	23	3.03		TLD, AP/AI, SO	
	8	4.39	TLD, AP/AI	TLD, AP/AI, SO	
	42	5.85	TLD		
	36	7.33	MI	MI	
	36B ⁽ⁿ⁾	6.2	MI	MI	
	5	7.72	TLD	SO	AP/AI
	38 ^(g)	26	FI	FI	
	21B	1.1			AP/AI
	150 (Site 1)	0.90			TLD
SE (7)	77(7S)	0.57			TLD
	24	1.87	TLD	TLD	
	3	2.06		TLD	
	41	5.79	TLD		
	40	6.51	TLD, AP/AI	AP/AI	
	MW-14	0.58		SGW	SGW
SSE (8)	119C	0.28		TLD	
	102B	0.50		SFW	
	78(8S)	0.81			TLD
	25	1.50	TLD	TLD	
	55	6.05	TLD		
	4	9.57	TLD, AP/AI	TLD, AP/AI	
	29	11.57	DW	DW	
	37 ^(h)	16	GP	GP,SO	
	37B ^(h)	10.1	GP	GP	
	MW-6	0.33		SGW	SGW
	MW-13	0.52		SGW	SGW
S (9)	119B	0.31		TLD, SE	
	79(9S)	0.76			TLD
	1	1.25	TLD	TLD, AP/AI, SO	
	6	7.72	TLD	TLD, AP/AI	
	65	8.87			TLD
SSW (10)	80(10S)	0.83			TLD
	50	1.26	TLD	TLD	
	56	6.65	TLD		
	MW-3	0.31		SGW	SGW

TABLE 4-2
REMP SAMPLE STATIONS AND REQUIREMENTS

SECTOR^(a)	STATION NUMBER^(b)	DISTANCE MILES^(c)	ODCM^(d)	STATE^(e)	OTHER^(f)
SW (11)	81(11S)	0.74			TLD
	MW-5	0.43		SGW	SGW
	13	1.26	TLD	TLD	
	9B	23.2	MI	MI	
WSW (12)	82(12S)	0.57			TLD
	14	1.26	TLD	TLD	
	9A	28.35	TLD, AP/AI	TLD, AP/AI, SO	
	9C ⁽ⁱ⁾	32	GP	GP	
	89 ^(j)	0.23			TLD
	58	0.44			TLD
W (13)	83(13S)	0.52			TLD
	15	1.24	TLD	TLD	
WNW (14)	84(14S)	0.55			TLD
	16	1.21	TLD	TLD	
	7	2.83	TLD	TLD, AP/AI, SO	
	88 ^(j)	0.17			TLD
	MW-10	0.07		SGW	SGW
NW (15)	85 (15S)	0.43			TLD
	130	0.24			TLD
	49	1.19	TLD	TLD	
	155	0.30			TLD
NNW (16)	121	0.12			TLD
	122	0.31			TLD
	123	0.29			TLD
	124 ^(m)	0.28		TLD	TLD
	125	0.28			TLD
	126	0.28			TLD
	127	0.26			TLD
	128 ^(m)	0.25		TLD	TLD
	129 ^(m)	0.17		TLD	TLD
	131	0.21			TLD
	136B	0.29			TLD
	137B ^(m)	0.24		TLD	TLD
	138B	0.17			TLD
	86 (16S)	0.31			TLD
	17	1.19	TLD	TLD	
	12	6.74		TLD	
	156	0.33			TLD

TABLE 4-2 SAMPLE TYPE KEY

AP/AI - Air Particulate/Air Iodine	DW - Drinking Water
Dis W - Discharge Water	FI - Fish
GP - Garden/Orchard Produce	DGW - Deep Ground Water
MI - Milk	SE - Sediment
SFW - Sanitation Facility Water	SO - Soil
SW - Surface Water	TLD - Thermoluminescent Dosimeter
VE - Vegetation	SGW - Shallow Ground Water

TABLE 4-2 FOOTNOTES:

- (a) The area in the vicinity of CGS is separated into 16 sectors for reporting purposes. The 16 sectors cover 360 degrees in equal 22.5 degree sections, beginning with sector 1 (N) at 348.75 to 11.25 degrees and continuing clockwise through sector 16 (NNW).
- (b) Alternate designations for some sample stations are given in parentheses; i.e., TLD Stations 71-86 are also referred to as 1S-16S.
- (c) Distance and sector indications are relative to the center of the CGS reactor building and were determined using GPS coordinate readings. Distance and sector indication for the Evaporation Ponds is to the center of each pond.
- (d) ODCM - Offsite Dose Calculation Manual Table 6.3.1-1 requirement.
- (e) STATE - State of Washington EFSEC requirement. Station 102B is an EFSEC Resolution 300 requirement. Stations 119B and 119C are EFSEC Resolution 299 requirements. Sampling at Evaporation Ponds 1A, 1B, 2, 3, and 4 is specified in EFSEC Council Order 874. All other State required samples are specified in EFSEC Resolution 332. Only five of the nine listed soil stations are sampled each year.
- (f) OTHER -Special study stations. TLD Stations 121 through 131 and 136 through 138 satisfy ISFSI monitoring requirements 10CFR72.44(d)(2). Sampling at MW locations is performed to meet NEI 07-07 guidelines and NPDES requirements.
- (g) Station 30 is the Columbia River at the vicinity of the plant discharge. Actual distance of fish collection locations from plant are variable, distance listed is approximation. Station 38 is the Snake River. Control resident fish are typically collected at variable locations in area below Ice Harbor Dam, distance listed is approximation. Control anadromous fish are typically collected at Lyons Ferry Fish Hatchery.
- (h) Fruit and Vegetable indicator samples are typically collected from farms and gardens in the Riverview area of Pasco. Distance listed here is general distance of Riverview area to CGS. Station 37 designation is also used for any samples collected in Franklin County that could potentially be affected by CGS liquid or gaseous effluents. Station 37B is the designation given for a garden located at the Washington State University branch campus in Richland, WA.
- (i) Station 9C is the designation given for control fruits and vegetables. Distance listed is general distance to the Sunnyside-Grandview area where the majority of the control fruits and vegetables are obtained.
- (j) Stations 88-89 were installed at CGS initiative to monitor remediation work at the DOE 618-11 burial ground. No remediation work was performed at the burial ground in 2018. Quarterly TLDs were deployed at both stations in 2018. No air samples were collected from any of these locations in 2018.
- (k) Station 48G is listed in ODCM table 5-1 as an alternate (garden produce) location for atmospheric deposition. This location consists of a small garden near the Ringold Fish Hatchery. Station 104, though outside the 5 mile radius of CGS, is the garden location with the highest projected dose commitment. CGS obtained a broad leaf vegetable sample from station 104 in 2018.
- (l) MW-3, 5, 6, 9-14 are all listed as State required shallow groundwater monitoring stations. Actual EFSEC 332 requirement is to obtain 2 shallow ground water samples quarterly from any of these locations.
- (m) Stations 124, 128, 129 and 137 are ISFSI TLD stations listed as state requirements. Actual EFSEC 332 requirement is to have 4 or more TLDs located on the ISFSI security fence. Any 4 of the 12 TLD stations CGS has established on the ISFSI fence line can satisfy this requirement.
- (n) Station 36B is the designation given for second monthly indicator milk sample from a location where the milking animal was known to have been on pasture, if available.

TABLE 4-3
2018 FIVE MILE LAND USE CENSUS RESULTS

SECTOR ^(a)	NEAREST RESIDENT ^(b)	GARDEN ^(d) (>500 ft ²)	DAIRY ANIMALS	LIVESTOCK ^(b,c)
NE	4.50	4.63	none	4.63
ENE	3.88	none	none	4.95
E	4.64	5.08	none	4.64
ESE	4.26	none	none	4.49
SE	none	none	none	none

FOOTNOTES

- (a) Within a five-mile radius of the plant, only the five sectors listed above contain activities related to land use census requirements. The other eleven sectors lay fully within the federally owned Hanford Site. Only those sectors containing potential land use census activities are presented here.
- (b) Estimated distances in miles from CGS Reactor Building based on GPS readings.
- (c) Twenty to thirty beef cattle were identified in a pasture in the ENE sector. The western edge of the pasture is just within the 5-mile radius of CGS. Additional feed appears to be provided at this location. Two horses, one cow, and numerous chickens were observed at a residence in the E sector, there is no pasture at this location and the cattle are fed hay. A single horse was observed in the ESE and NE sector, there is little pasture at these locations and the animals appear to be fed mostly hay.
- (d) The garden in the NE sector is located approximately 200 yards from the Station 48 air sampler and is irrigated using water from a local spring. The garden in the E sector, though technically outside the 5 mile radius of CGS, was included as dose projections indicated higher deposition potential at this location than at any other garden identified. CGS REMP obtained a broad leaf vegetable sample from the garden in the E sector in 2018. In addition to the 2 gardens, commercial agriculture is extensively practiced in some parts of the sectors listed in Table 4-3. Agricultural activities observed were primarily apple and soft fruit orchards, corn, alfalfa, and grape vineyards.

TABLE 4-4
COMPARISON OF LABORATORY NOMINAL LOWER LIMITS OF DETECTION WITH
OFFSITE DOSE CALCULATION MANUAL REQUIREMENTS

MEDIA (UNITS)	ANALYSIS	ENERGY	ODCM REQUIRED
		NORTHWEST LLDs^(a)	LLDs
Air (pCi/m³)	Gross Beta	0.002	0.01
	Cs-134	0.001	0.05
	Cs-137	0.001	0.06
	I-131	0.03	0.07
Water: (pCi/liter)	Gross Beta	2.4	4
	Tritium	300	2000 ^(b)
	Sr-90	1	---
	Ni-63	5	---
	Fe-55	200	---
	I-131 ^(c)	1	---
	Mn-54	7	15
	Fe-59	10	30
	Co-58	7	15
	Co-60	7	15
	Zn-65	10	30
	Zr-Nb-95	7	15
	Cs-134	7	15
	Cs-137	7	18
	Ba-La-140	10	15
Soil/Sediment: (pCi/kg dry)	Mn-54	20	---
	Co-60	20	---
	Zn-65	30	---
	Cs-134	20	150
	Cs-137	20	180
	Sr-90	10	---
Fish: (pCi/kg wet)	Mn-54	25	130
	Fe-59	100	260
	Co-58	35	130
	Co-60	25	130
	Zn-65	50	260
	Cs-134	30	130
	Cs-137	25	150
Milk: (pCi/liter)	I-31 ^(c)	0.5	1
	Cs-134	8	15
	Cs-137	8	18
	Ba-La-140	10	15
	Sr-90	1	---
Garden Produce: (pCi/kg wet)	Cs-134	20	60
	Cs-137	20	80
	I-131	20	60

^(a) These are the nominal target LLDs (a priori) for analyses performed in the Energy Northwest Environmental Services Laboratory and are based on conservative assumptions. These calculations included corrections for decay during the collection period and delay prior to analysis using factors that are normally encountered for the different media types. Actual LLDs (a posteriori) may be higher or lower for specific samples.

^(b) If no drinking water pathway exists, a value of 3,000 pCi/liter may be used.

^(c) This ENW Iodine-131 LLD achieved by anion resin separation and does not represent a direct analysis of the sample media.

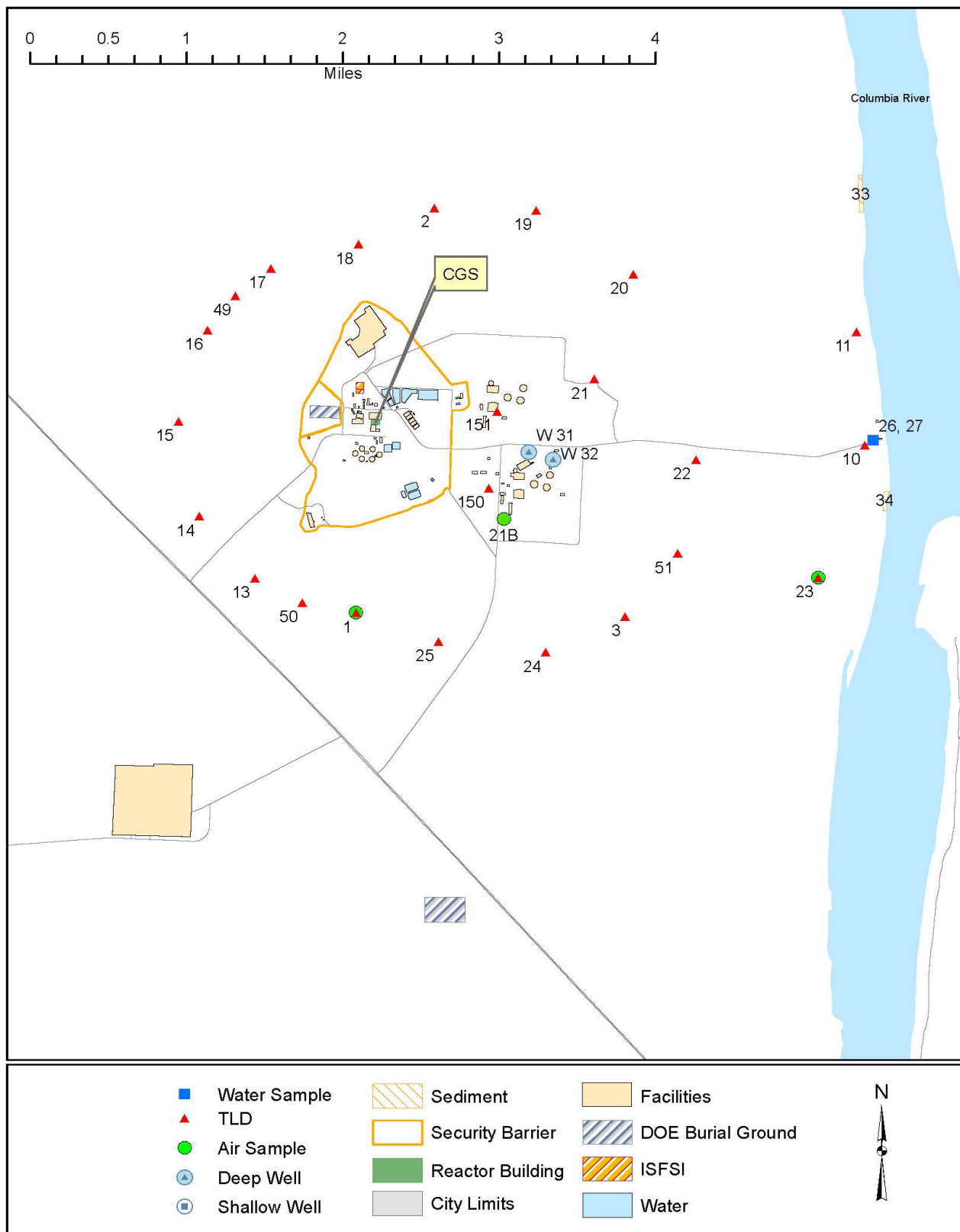


FIGURE 4-2 SELECT REMP SAMPLING LOCATIONS BETWEEN 0.8 AND 2.8 MILES

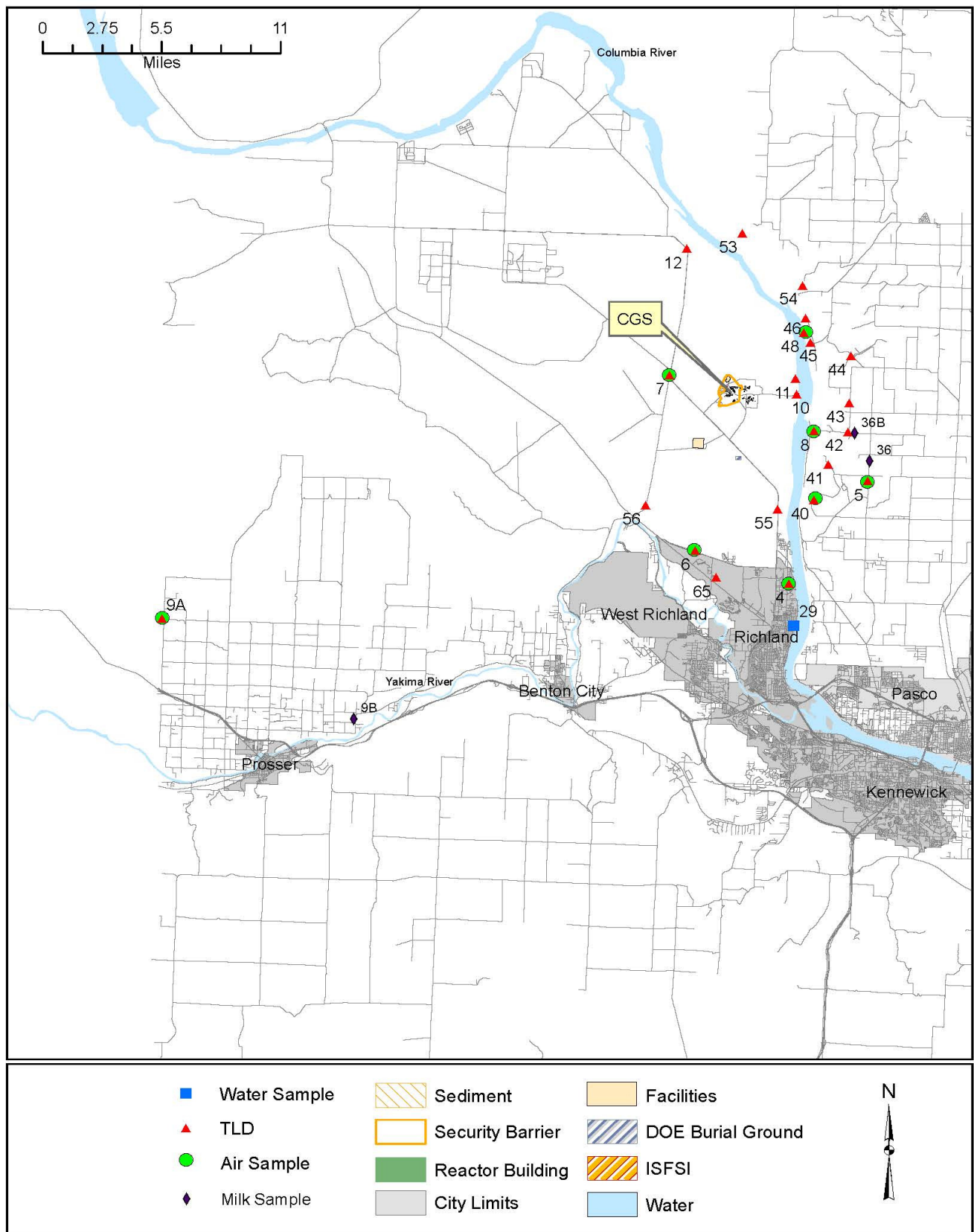


FIGURE 4-3 SELECT REMP SAMPLING LOCATIONS BEYOND 2.8 MILES

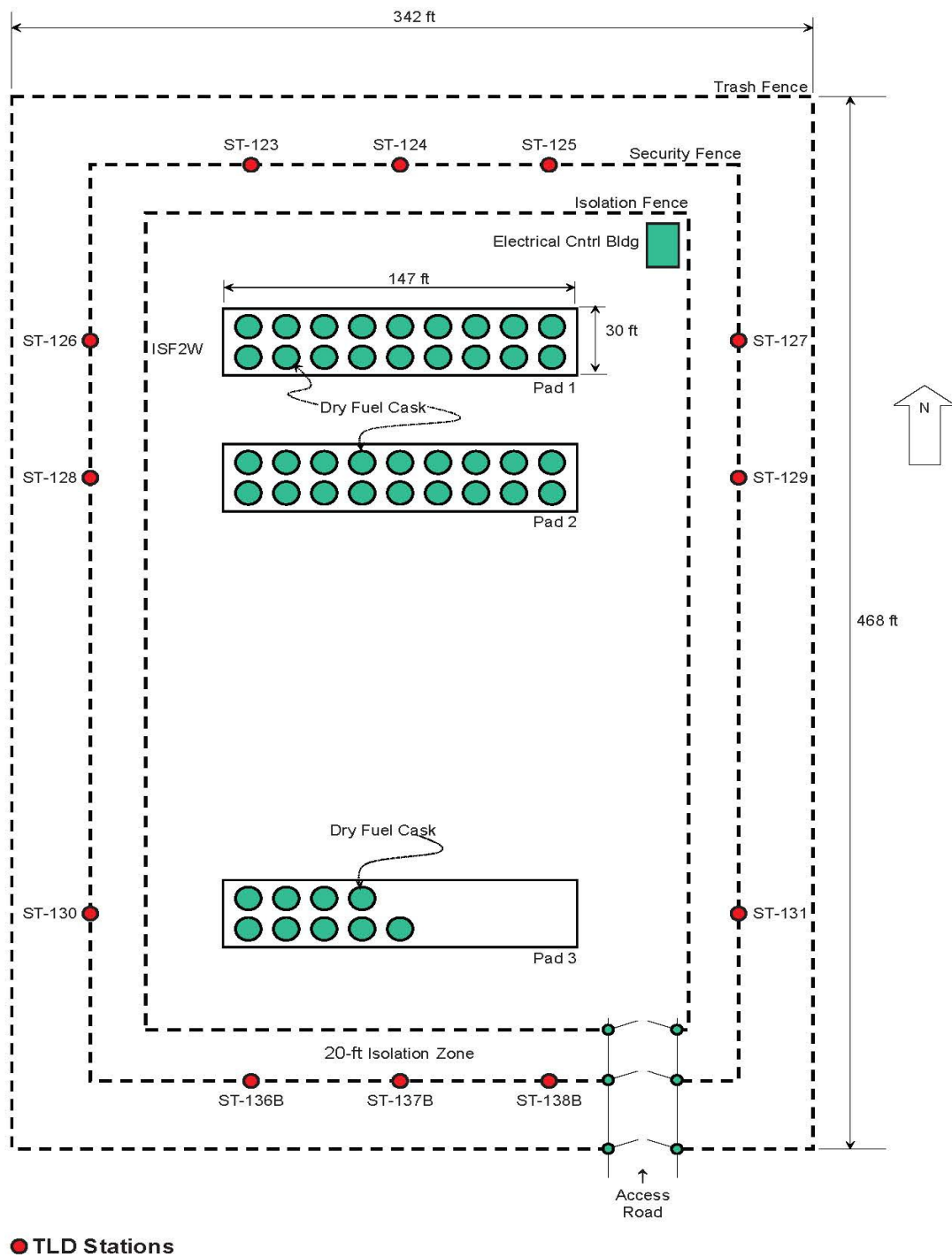


FIGURE 4-4 ISFSI TLD STATION LAYOUT

5.0 RESULTS AND DISCUSSION

5.0 RESULTS AND DISCUSSION

The Columbia Generating Station environmental TLDs were collected by Energy Northwest Environmental Services personnel and analyzed by the Hanford External Dosimetry Program (HEDP) operated by Mission Support Alliance (MSA). All other CGS REMP samples were collected and analyzed by the Energy Northwest Environmental Services Laboratory located in Richland, WA with the exception of carbon-14 analysis which was performed by the Washington State Department of Health Laboratory in Shoreline, WA. Table 5-2 provides a summary of the ODCM required REMP sample and CGS groundwater monitoring analysis results in the format specified by the NRC.^(5,6) Results for naturally occurring radionuclides that are not related to CGS operations have not been included in the summary table. The lower limit of detection (LLD) values listed in Table 5-2 are the ODCM required detection limits and are not the method detection limits listed in Table 4-4. Analytical results for all REMP samples are presented in Appendix A of this volume.

5.1 Direct Radiation

Direct radiation is monitored at 80 TLD locations surrounding CGS. TLDs are exchanged on a quarterly frequency at all locations. The 16 locations designated as "S" stations are located between 0.3 and 0.8 miles from the CGS reactor building and all are inside the property boundary, see Figure 4-1 for station locations. Figure 5-1 shows the 2018 "S" station mean quarterly TLD results separated into 16 geographical sectors around the plant. Figure 5-1 also shows the pre-operational mean and the high, low, and mean results in each sector for the 1984 - 2017 operational period for comparison. The 2018 "S" station TLD results were lower than the pre-operational mean in 11 of the 16 sectors and lower than the operational mean in 13 of the 16 sectors. TLD results from the N, NNE, and NNW sectors are slightly higher than the other "S" station locations as a result of being physically closer to the ISFSI and the CGS turbine building. TLD results for the NE sector (Station 73) have been slightly elevated since the 4th quarter 2013 due to a mound of excavation dirt piled near the TLD station that increased the natural background at this location.

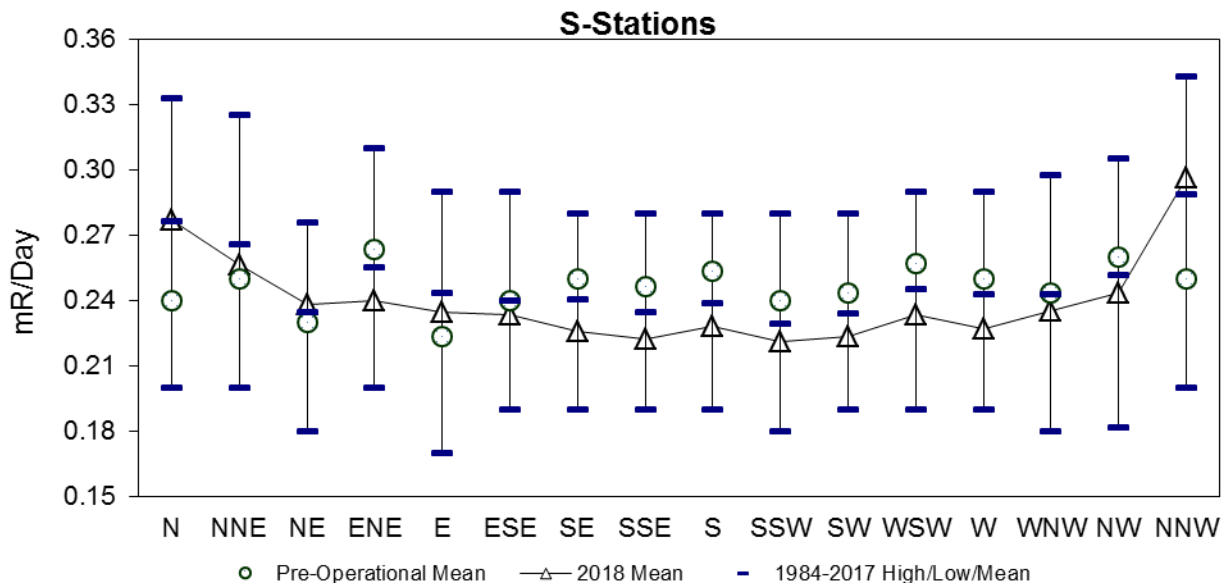


Figure 5-1 "S" Stations Quarterly TLDs 1984-2017 Hi/Low/Mean and 2018 Mean by Sector

Excluding the NNW sector, the average deviation relative to the operational period was -3.85%; in 2017 the average deviation was -8.21%. The NNW sector is the closest “S” station to the ISFSI and the higher result here is attributed to the stations close proximity to this facility.

The 19 locations designated as near plant stations are located at distances between 0.9 and 2.1 miles from the CGS reactor building, see Figure 4-2 for station locations. Figure 5-2 shows the exposure rates for the near plant TLD locations separated into sixteen geographical sectors around the plant. Figure 5-2 also shows the pre-operational mean and the high, low, and mean results in each sector for the 1984-2017 operational period for comparison. The 2018 near plant TLD results were lower than both the pre-operational and operation period means in 15 of the 16 sectors. The average deviation relative to the operational period was -5.0%, in 2017 the average deviation was -8.8%.

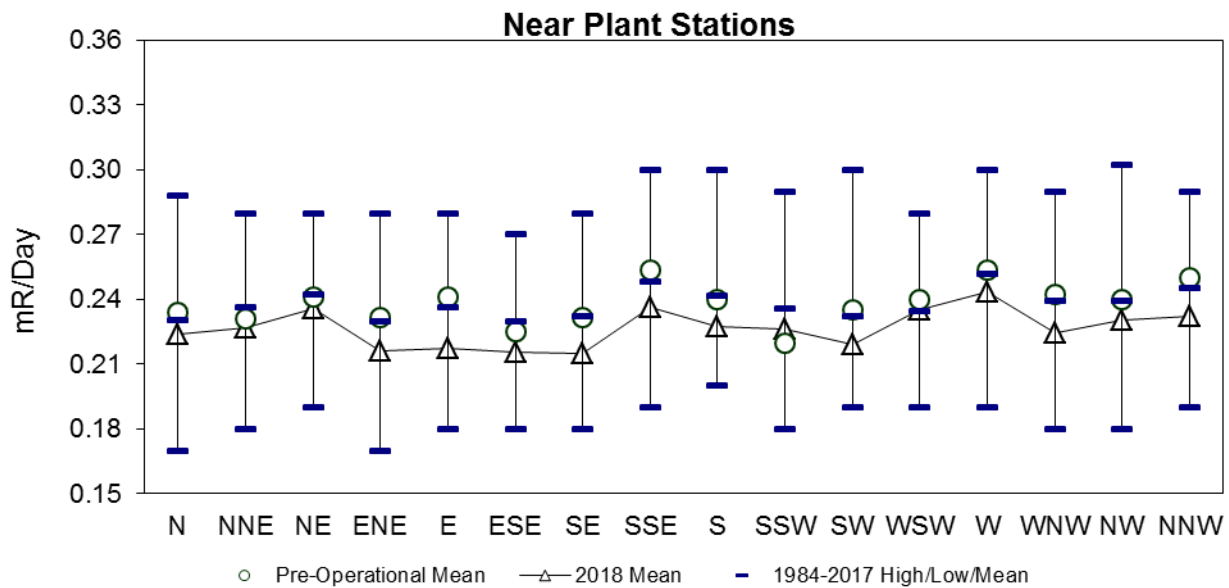


Figure 5-2 Near Plant Stations Quarterly TLDs 1984-2017 Hi/Low/Mean and 2018 Mean by Sector

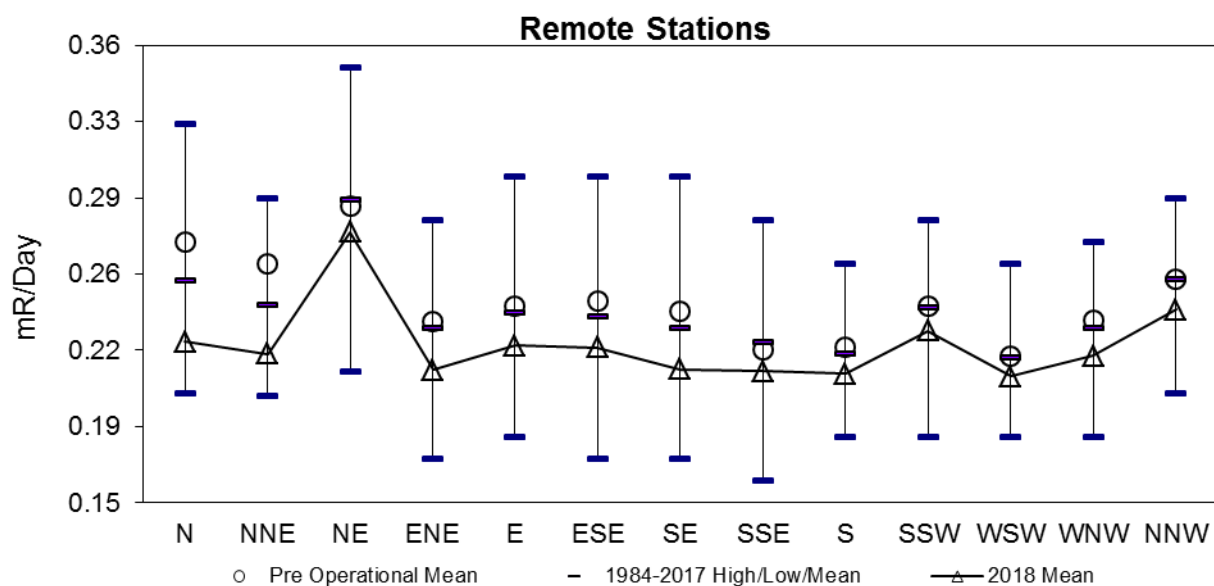


Figure 5-3 Remote Stations Quarterly TLDs 1984-2017 Hi/Low/Mean and 2018 Mean By Sector

The 22 TLD locations designated as remote locations are located between 2.83 and 28.35 miles from the CGS reactor building; see Figure 4-3 for station locations. Figure 5-3 shows the exposure rates for the remote TLD locations separated into geographical sectors around the plant. Figure 5-3 also shows the pre-operational mean and the high, low, and mean results by sector for the 1984-2017 operational period for comparison. The 2018 remote TLD results were lower than both the pre-operational mean and the operational mean in all 16 sectors. Station 46 in the Wahluke Reserve (NE sector) remained the remote location with the highest exposure rate. This has been the case since the pre-operational measurement phase and is attributed to differences in the underlying rock and soil composition in this area. The 2018 average deviation relative to the operational period was -7.0%; the average deviation in 2017 was -9.8%.

Offsite direct radiation monitoring results are consistent with previous years. The 2018 results indicate no observable dose contributions due to plant operations at locations outside the CGS controlled area. Dose contributions inside the CGS controlled area were limited to those locations known to be influenced by the Independent Spent Fuel Storage Installation (ISFSI) and/or radiation from the turbine building during operation. Environmental radiation exposure rates for 2018, the pre-operational period, and the long term operational period are summarized in Table 5-3. See also Appendix A, Tables A-1.1 and B-1.1 for the 2018 quarterly TLD results. TLD results for special interest locations are discussed in further detail in Section 5.9.

5.2 Airborne Particulate/Iodine

Air samples are collected weekly from 11 sample stations located around CGS. Additionally, an air sample station located 28 miles WSW of CGS is used as a control for comparison. Air particulate filters are analyzed for gross beta and iodine cartridges for radioiodines on a weekly basis. Air filters are also composited and analyzed for gamma emitting radionuclides quarterly.

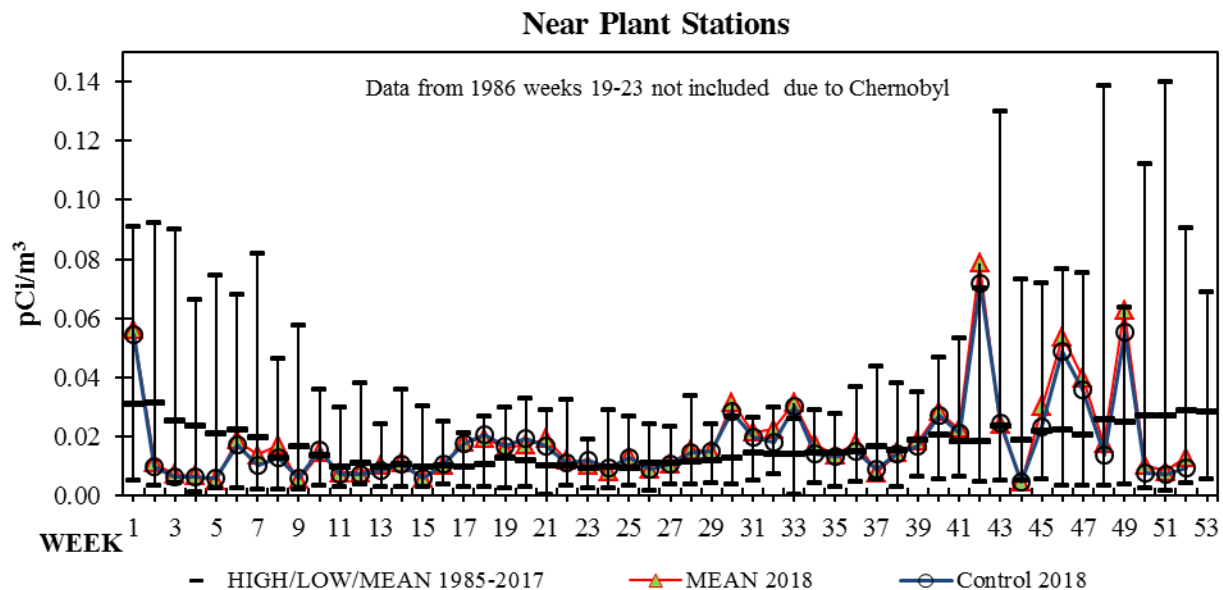


Figure 5-4 1985-2017 Weekly Hi/Low/Mean and 2018 Weekly Mean Gross Beta in Air - Near Plant Stations

The 2018 mean weekly particulate filter gross beta results for the five stations located within three miles of CGS are plotted in Figure 5-4 (See also Appendix A, Tables A-2.1, A-2.2). Results for the near plant stations are similar to results from the remote locations and follow the trend of the control location.

Figure 5-5 is a plot of the 2018 mean weekly particulate filter gross beta results for the 6 sample stations located between 3 and 9.6 miles from CGS (See also Appendix A, Tables A-2.1, A-2.2). Results for these remote stations are similar to results from the near plant stations and follow the trend of the control location. No correlation between air gross beta activity and proximity to CGS was observed.

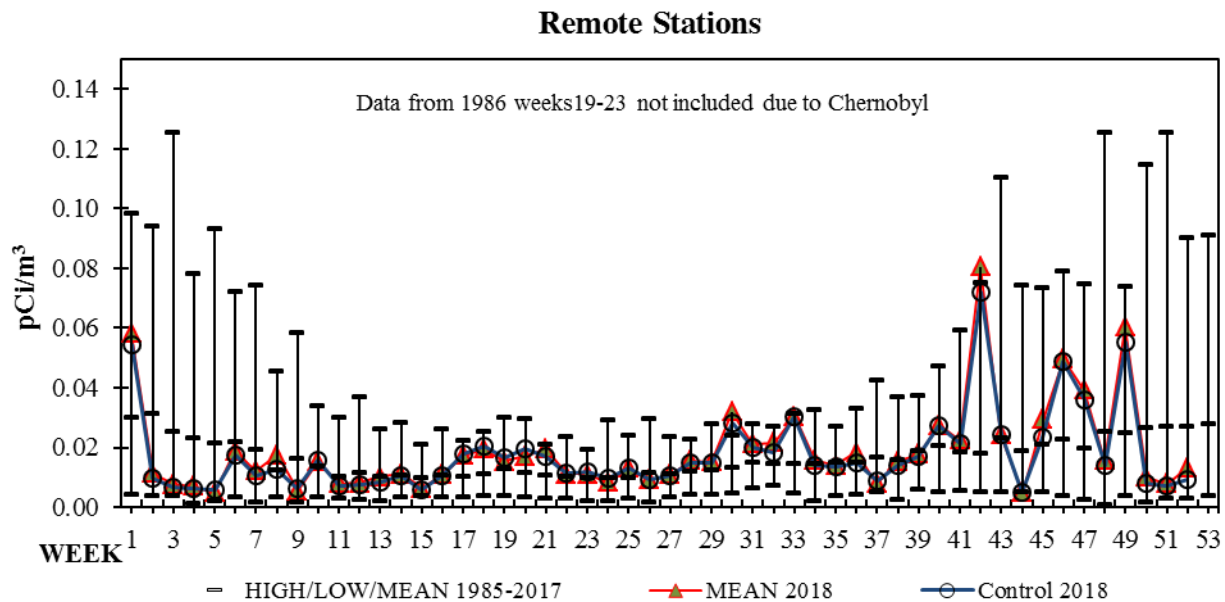


Figure 5-5 1985-2017 Weekly Hi/Low/Mean and 2018 Weekly Mean Gross Beta in Air - Remote Stations

For both the near plant and remote air station locations, higher results and greater variability in air gross beta activity have historically been observed during fall and winter months due to weather induced background fluctuations. Gross beta levels typically increase during periods of inversion due to natural decay products being trapped near the earth surface. Gross beta results plotted over a period of several years typically show a cyclical pattern with higher results observed in the fall and winter compared to the spring and summer. Gross beta results were observed above the average trend range were observed in January, October, November, and December. The increases observed during these periods occurred at all sample locations including the control and are attributed to weather phenomena and not the result of CGS operation. The highest particulate filter gross beta results for the year occurred during week 42; weather conditions for the week were characterized by air stagnation and fog. The control results, though slightly lower, are still elevated and support that the increase is not plant related but due to weather phenomena. Results for weeks 30 and 33 were near the historic maximums observed for these periods at both the control, near plant, and remote sample locations. These weeks were characterized by significant smoke throughout Eastern Washington due to wildfires. No significant differences were observed during any weekly period between the control location and the near plant and remote locations air particulate gross beta results in 2018.

Quarterly gamma isotopic analysis of the air particulate filters identified the presence of beryllium-7 in all the control and indicator composite samples (See Appendix A, Tables A-3.1, A-3.2). Beryllium-7 is a naturally occurring radionuclide formed in the upper atmosphere by interaction with cosmic radiation and is not a radionuclide associated with CGS operation. Naturally occurring potassium-40 was also identified in some of the indicator and control samples. No radioisotopes associated with CGS operation were identified in any of the quarterly air particulate gamma isotopic sample results.

The 2018 weekly iodine cartridge isotopic results showed no indication of radioiodines in any of the samples. Results for iodine-131 were in all cases below the lower limit of detection (See Appendix A, Tables A-4.1, A-4.2). The 2018 air particulate and iodine sample results show no evidence of measurable environmental radiological air quality impact that can be attributed to CGS plant operation.

5.3 Water

5.3.1 Surface Water

Composite water samples are collected from five surface water locations monthly and analyzed for tritium, gross beta, and gamma emitting radionuclides. A plot of the 2018 gross beta results for the plant intake, plant discharge, and river/drinking water stations are shown in Figure 5-6.

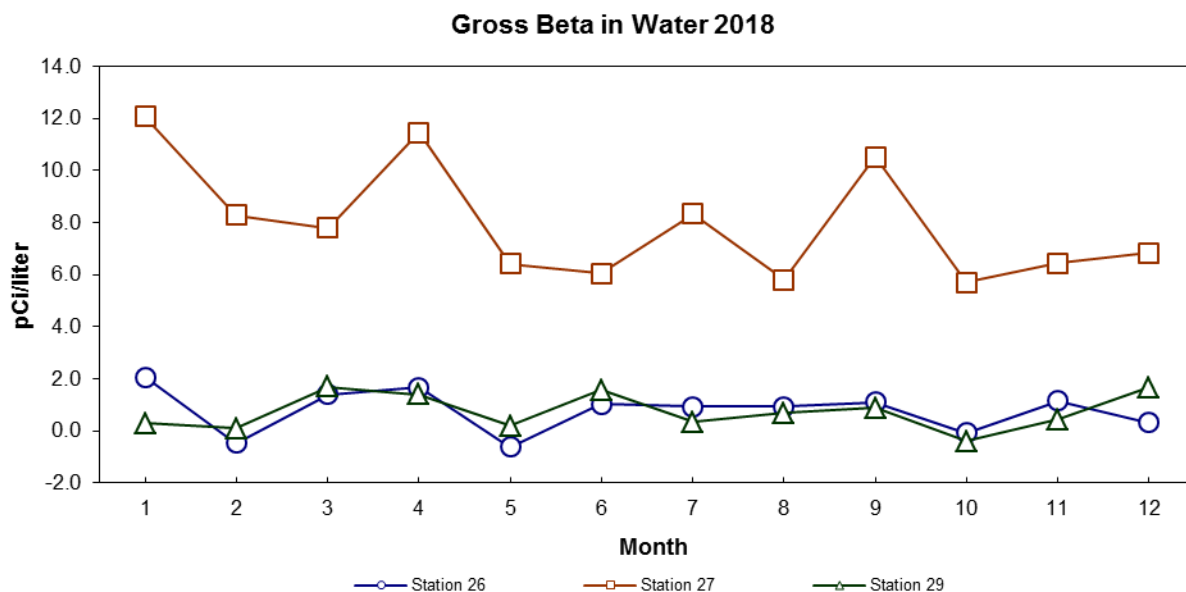


Figure 5-6 Gross Beta in River/Drinking (Stations 26 & 29) and Plant Discharge Water (Station 27) for 2018

All drinking and river water (Stations 26 and 29) gross beta results were below the analysis detection limits (See Appendix A, Tables A-5.1, A-5.2). Gross beta levels in the plant discharge water (Station 27) were above the detection limits in all twelve samples. Positive results for this location are expected due to concentration of natural radioactivity in the water by evaporative loss and the scrubbing action of the cooling towers which incorporates atmospheric particulate material into the discharge water. Historically, higher gross beta results at Station 27 can be correlated to the level of calcium concentration in the CGS

circulating water. The Station 27 sample results are representative of the radioactivity present in plant discharge water before any mixing with river water occurs.

Monthly tritium results for all plant intake, plant discharge, and river/drinking water samples were below the analysis method *a priori* LLD. Tritium results for the three sample locations are plotted in Figure 5-7; quarterly averages for the locations are listed in Appendix A, Tables A-6.1, A-6.2.

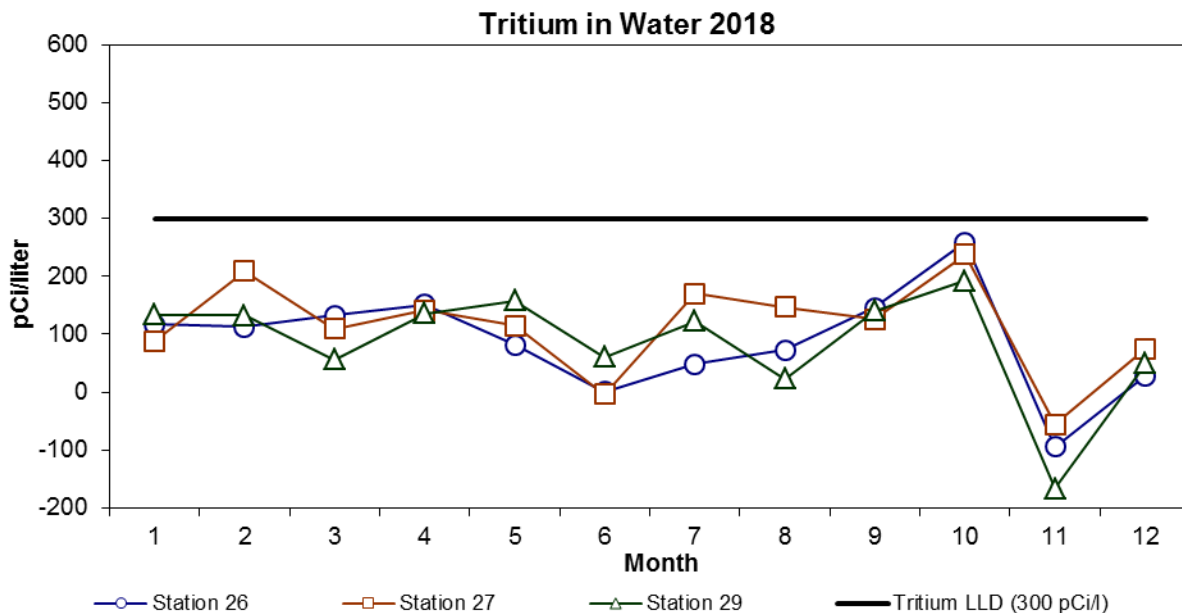


Figure 5-7 Tritium in River/Drinking (Stations 26 & 29) and Plant Discharge Water (Station 27) for 2018

Gamma spectroscopy results for all plant intake, plant discharge, and river/drinking water samples identified only naturally occurring radionuclides; no gamma-emitting radionuclides related to CGS operation were positively identified in these samples (See Appendix A, Tables A-7.1, A-7.2, A-13.1, A-13.2).

Analysis results for the plant intake, plant discharge, and river/drinking water samples showed no measurable impact to the environment due to CGS plant operations in 2018. Composite water samples are also taken from a sanitary waste and storm drain location. Analysis results for these samples are discussed in further detail in Section 5.9.

5.3.2 Ground Water

Samples from 3 deep wells were collected quarterly to meet ODCM and EFSEC Resolution No. 332⁽⁹⁾ requirements. Quarterly samples were also collected from nine shallow groundwater monitoring wells located near CGS as part of the CGS groundwater monitoring program. All well samples were analyzed for tritium and gamma emitting radionuclides. Well locations sampled are shown in Figures 4-1 and 4-2.

Analytical results for the three deep water wells were consistent with results seen in previous years. Tritium results were below detection limits and no gamma emitting radionuclides related to CGS operation were identified in any samples (See Appendix A, Tables A-6.1, A-6.2, A-14.1, and A-14.2).

The CGS groundwater monitoring program is conducted to meet the Nuclear Energy Institute (NEI) Groundwater Protection Initiative (NEI 07-07)⁽¹⁷⁾ guidelines and to support NPDES requirements. Water samples from the unconfined aquifer are collected quarterly from nine shallow monitoring wells located around the CGS site. None of these monitoring wells are used as a source of drinking water. CGS is unique in the commercial nuclear power industry in that it is located in an area where the unconfined aquifer under the site is known to be contaminated with tritium as a result of past DOE activities on the Hanford Site.⁽¹⁹⁾ The CGS groundwater program is intended to assess any contribution CGS may be making to the known groundwater contamination issue.

Gamma Spectroscopy results for the nine shallow monitoring wells identified only natural occurring radionuclides (See Appendix A, Tables B-10.1, and B-10.2). The 2018 groundwater sample results show no evidence that CGS made a measurable radiological impact on groundwater.

Tritium results for the nine shallow monitoring wells ranged from < LLD to 13,700 pCi/liter (See Appendix A, Table B-11.1). Tritium results from each well were consistent during the year and within the trend range observed in previous years with the exception of MW-3 which showed a marked decrease in tritium concentration starting in the 2nd quarter of 2017 and remained at below its historic trend level during 2018. The highest tritium concentrations were measured at MW-5 which is hydraulically up-gradient of CGS. The tritium identified in the shallow monitoring well samples is the result of past DOE activities on the Hanford site and is not attributable to CGS operation. Historically, the only identified impact that CGS operation has had on ground water tritium concentrations was through the discharge of storm drain water. With the establishment of lined evaporation ponds in 2014, this pathway was effectively eliminated. All storm drain water from the CGS site was directed to the lined evaporation ponds in 2018.

5.4 Soil

Gamma spectroscopy analysis was performed on soil samples from five different locations in 2018 (See Appendix A, Tables A-8.1, A-8.2). Two samples were collected from locations near CGS, two samples were collected for locations east of CGS in Franklin County, and one sample was collected from a control location. Naturally occurring radionuclides were identified in all samples. Cesium-137 was identified at one indicator location near CGS. The level of cesium-137 identified was slightly higher than normally observed for this location but within the range typically identified in Hanford area soils.^(21,22) The cesium-137 activity identified was below the level that would require strontium-90 analysis to be performed.⁽⁹⁾ The soil sample results indicate no measurable impact from CGS plant operation.

5.5 River Sediment

Gamma spectroscopy results of river sediment identified naturally occurring radionuclides and cesium-137 (See Appendix A, Tables A-9.1, 9.2). Relative to the circulating water discharge point, cesium-137 was detected in both the downstream samples (Station 34) and the upstream samples (Station 33). The downstream cesium-137 activity levels were higher than the upstream levels. All cesium-137 results were within the range identified in previous years and within the range known to be present in Hanford area sediment and soil.^(21,24) Cesium-137 was not identified in any samples of plant cooling water discharged to the Columbia River. CGS has not made a radioactive discharge to the Columbia River since 1998. The sediment sample results indicate no measurable impact from CGS plant operation.

5.6 Fish

The gamma spectroscopy results of fish samples collected at both the indicator location (Columbia River) and the control location (Snake River) identified only the presence of naturally occurring radionuclides (See Appendix A, Tables A-10.1, 10.2). The same three species; walleye, bass, and salmon, were collected at both the indicator and control locations. No radiological impact attributable to CGS operation was identified in the 2018 fish sample results.

5.7 Milk

No radioiodine activity was identified in any of the milk samples collected in 2018 (See Appendix A, Tables A-11.1, A-11.2). Gamma spectroscopy results of milk radionuclides other than radioiodine did not identify the presence of any radionuclides of interest (See Appendix A, Tables A-12.1, A-12.2). Naturally occurring potassium-40 was identified in all milk samples. The 2018 milk analysis results indicate no measurable impact due to CGS plant operation.

5.8 Garden Produce

Gamma analysis was performed on thirty four samples of fruits, vegetables, and root crops in 2018 (See Appendix A, Tables A-15.1, A-15.2, A-16.1, A-16.2, A-17.1, A-17.2). No radionuclides related to CGS operation were identified in any of the samples. Naturally occurring potassium-40 was identified in all samples.

5.9 Special Interest Stations

Sampling and analysis is performed at the locations covered in this section to comply with EFSEC requirements or as a CGS initiative. Sanitary Waste Treatment Facility (SWTF) and storm drain water sampling were incorporated into the routine sampling schedule in 1992. In 1995, the cooling tower sediment disposal area was added. TLDs were placed at the spray pond drain field (Station 120) in June 1995. TLD monitoring in the vicinity of the planned Independent Spent Fuel Storage Installation (ISFSI) was first performed in 1998 to collect background data and TLD monitoring was established on the ISFSI fence line after construction was completed in 2002. Additional TLD locations were established in 2008/2009 to monitor potential remediation work at the DOE 618-11 burial ground west of CGS. Discussion of the results from each of these locations is given in the following sections.

5.9.1 Evaporation Pond (Station 101B)

The Station 101B composite sampler samples storm drain, air wash, and non-radioactive system wastewater originating from within the CGS protected area. Water from these sources has been directed to two lined evaporation ponds since November 2014. Wastewater originating outside the CGS protected area is typically directed to three other lined evaporation ponds that are not sampled by the Station 101B sampler. Figure 4-1 shows the location of the five evaporation ponds; Station 101B samples water flowing into ponds 3 and 4. Sampling and analysis at this location is specified in EFSEC Resolutions.^(9,23) Historically, the water directed to the evaporation ponds was discharged to an unlined storm drain pond. Remediation of the historic storm drain pond was completed in 2016.

Monthly composite water samples were analyzed for gamma emitting radionuclides, tritium, and gross beta. Gamma spectroscopy results identified only the presence of naturally occurring radionuclides (See Appendix A, Tables B-2.1, B-2.2). Gross beta was identified above background in 2 of the 12

monthly samples (See Appendix A, Tables B-3.1, B-3.2). Tritium was detected in all twelve monthly samples (See Appendix A, Tables B-4.1, B-4.2). The samples with higher tritium levels were all from colder, wetter months which is consistent with results seen in previous years. The source of the tritium in storm drain water is attributed to recapture of tritium from CGS gaseous effluents which is more likely to occur during cooler, rainier periods. The total amount of tritium calculated to have been recaptured in CGS storm drain water during the year was slightly higher than the amount determined for 2017 but less than 1% of the total tritium released in CGS gaseous effluents in 2018.

Water grab samples were taken from all five ponds in May and analyzed for tritium, gross beta, and gamma emitting radionuclides. Gamma analysis did not identify any radionuclides related to CGS operation (See Appendix A, Table B-12.1). Gross beta was detected in one of the five ponds. Tritium was detected above the detection limit in two of the five ponds (See Appendix A, Tables B-14.1, B-15.1).

Sediment samples were collected in August from evaporation ponds 3 and 4 and analyzed for gamma emitting radionuclides. Due to the amount of water remaining in the ponds, the samples were taken from locations near the side of the ponds and below the water line. Cobalt-60 was identified in pond 3 and cesium-137 was identified in pond 4 at concentration similar to those identified in the previous years. (See Appendix A, Table B-13.1). Recapture of CGS gaseous effluents in storm drain water has historically been identified as the source of the low level cobalt-60 activity in storm drain pond sediment and soil. The level of Cs-137 identified in pond 4 is within the range known to exist in Hanford area soils. ^(21, 22)

5.9.2 Sanitary Waste Treatment Facility (Station 102B)

The Sanitary Waste Treatment Facility (SWTF) is located approximately 0.5 miles south-southeast of CGS. The facility processes sanitary wastewater from CGS, the ENW Industrial Development Complex (formerly referred to as WNP-1 and WNP-4), and the Kootenai Building. The Station 102B composite sampler collects wastewater as it enters the SWTF head works. Discharge standards and monitoring requirements for the SWTF are established in EFSEC Resolution No. 300.⁽¹⁶⁾

Low level gross beta was identified in all twelve Station 102B samples. The levels identified were consistent with levels identified in previous years. Gross alpha was not positively identified in any of the Station 102B samples (See Appendix A, Tables B-5.1, B-5.2, B-6.1, and B-6.2).

Gamma spectroscopy results of the monthly Station 102B samples identified only naturally occurring radionuclides (See Appendix A, Tables B-7.1, B-7.2).

No tritium activity was identified in any of the Station 102B samples in 2018 (See Appendix A, Tables B-8.1, B-8.2). Tritium activity has not been identified in the Station 102B samples since processing of DOE 400 area wastewater was terminated in 2013.

5.9.3 Cooling System Sediment Disposal Area (Station 119)

EFSEC Resolution No. 299⁽¹⁸⁾ authorizes the onsite disposal of sediments from plant cooling systems containing low levels of radionuclides. The disposal area for these sediments is located just south of the CGS cooling towers. EFSEC Resolution No. 299⁽¹⁸⁾ requires direct radiation monitoring using quarterly TLDs in the vicinity of the disposal cells and the collection and analysis of a dry composite sediment sample from the disposal cell within thirty days following each cleaning in order to confirm that the disposal criteria outlined in the resolution have not been exceeded.

The source of the radioactivity identified in cooling tower sediment is attributed to incorporation of radionuclides present in the general environment (cesium-137) or recapture of radionuclides in CGS gaseous effluents (cobalt-60). As air is pulled through the cooling towers, atmospheric particles are incorporated into the cooling water. Algae and other biological organisms present in the cooling tower environment actively assimilate the radionuclides resulting in concentrated and measurable levels of the radionuclides in these biological materials. The material removed during cleaning and referred to as sediment is composed in large part of algae and other biological organisms that exist in the cooling tower environment.

Cleaning of the CGS cooling towers was performed in April and October 2018. Both cleanings were limited to the upper tower decks; the tower basins were not cleaned. Disposal of the material removed resulted in an estimated 18.4 cubic meters of dry sediment being added to the disposal cells. ENW also completed transfer of Standby Service Water (SSW) sediment to the disposal cell in October 2018. Transfer of this material resulted in an estimated 60.8 cubic meters of dry sediment being added to the disposal cell.

A summary of the estimated mass and radionuclide content of all transfers to the disposal cell area in 2018 is presented in Figure 5-8. For those isotopes listed in the table that were not positively identified, the MDA value obtained from the sample analysis was used in the table calculations. As such, the total activity reported is a conservative estimate.

As shown in Figure 5-8, all material transferred to the disposal cell area in 2018 was considerably below the disposal concentration limits specified in EFSEC Resolution No. 299.⁽¹⁸⁾ The cobalt-60 and cesium-137 activity levels identified were within the range historically observed for cooling tower sediment. Cesium-137 levels were within the range typically observed in Hanford area soils.

Measurements of direct radiation at the disposal pit area were taken using TLDs. Two locations were used, an indicator location by the collection area (Station 119B) and a control location approximately 200 yards to the east (Station 119Ctrl). The negligible difference between the indicator and the control TLDs indicate that there was no measureable dose contribution above background due to material in the disposal cells (See Tables 5.3 and Appendix A, Tables B-1.1).

2018 Cooling System Sediment Disposal Data					
	Disposal Date	Apr-18	Oct-18	Oct-18	
	Discription:	Spring Cleaning	Fall Cleaning	SSW	
	Pit ID:	2006 Pit	2007 Pit	2007 Pit	
	Mass, kg	9,345	3,602	27,891	
	Density, g/cc	0.73	0.65	0.46	
	*Unity Calculation	6.25E-02	2.24E-02	8.62E-02	
Nuclide	Limit (pCi/kg)	Analytical Result (pCi/kg)	Analytical Result (pCi/kg)	Analytical Result (pCi/kg)	Total Activity (Curie)
Co-60	5.00E+03	2.4E+02	< 4.2E+01	3.8E+02	1.3E-05
Mn-54	3.00E+04	< 3.6E+01	< 3.9E+01	< 3.9E+01	1.6E-06
Zn-65	5.00E+04	<6.2E+01	< 8.3E+01	< 8.0E+01	3.1E-06
Cs-134	1.00E+04	<3.6E+01	< 3.5E+01	< 3.7E+01	1.5E-06
Cs-137	2.00E+04	1.7E+02	1.5E+02	7.1E+01	4.1E-06
Total:					2.3E-05

* The sum of the fractions of maximum concentration for each nuclide does not exceed 1 in according to EFSEC resolution 299, Attachment 1 section 3b.

Figure 5-8 Cooling System Sediment Activity Levels For Disposals Made In 2018

5.9.4 Independent Spent Fuel Storage Installation

The Independent Spent Fuel Storage Installation (ISFSI) is a fenced, secured area north northwest of CGS. Twelve TLD stations are located on the second of three security fences that surround the ISFSI. Four other TLD locations; Stations 121, 122, 155, and 156, are located near the ISFSI to provided additional monitoring of ISFSI direct radiation. The ISFSI was expanded in 2016 and a new pad installed; refer to section 4.2 for further details and to Figure 4-4 for a map showing ISFSI TLD locations.

Nine new spent fuel casks were added to the ISFSI in the second quarter of 2018. As shown in Figure 5-9, exposure rates at the ISFSI fence line showed a step change increase at this time with those TLDs located close to pad 3 showing the greatest increase.

TLD results from Stations 122, 155, and 156 show mostly a flat trend line for the year. Results from these locations are slightly above background as expected due to their close proximity to the ISFSI. Station 121 TLD results in 2018 were within the expected range. Long term Station 121 results show large decreases during periods when CGS is shut down. This location has predominately been influenced by turbine building radiation levels and not the ISFSI (See Table 5-3 and Appendix A, Tables B-1.1, B-1.2).

5.10 2018 Sample Deviations

A summary of REMP sample deviations encountered in 2018 is listed below in Table 5-1a through 5-1c. All known deviations from the sampling schedule (i.e. sample was not obtained) or analyses where the ODCM specified lower limit of detection was not achieved are included. For ODCM or EFSEC specified locations where composite or continuous samples are collected, any known period greater than 24 hours during which samples were not collected have been included. Inclusion of ODCM related sample deviations in Tables 5-1a and 5-1c serves to meet the required compensatory measure listed in ODCM RFO 6.3.1 A.1. Table 5-1d lists information regarding air sampling station requirements. Table 5-1e lists information regarding water sample station sampling requirements.

TABLE 5-1a (ODCM ONLY)
REMP Sample Deviations for 2018

SAMPLE MEDIA	DATE	LOCATION	CR/WO	PROBLEM	PLANS FOR PREVENTING RECURRENCE
NA	NA	NA	NA	NA	NA

TABLE 5-1b (EFSEC ONLY)
REMP Sample Deviations for 2018

SAMPLE MEDIA	DATE	LOCATION	CR/WO	PROBLEM	PLANS FOR PREVENTING RECURRENCE
TLD	4 th Q 2018	Station 12	388316	TLD missing in field – probable cause was animal predation	Corrective actions are deemed not possible due to the remote nature of the sample station.

TABLE 5-1c (ODCM & EFSEC)
REMP Sample Deviations for 2018

SAMPLE MEDIA	DATE	LOCATION	CR/WO	PROBLEM	PLANS FOR PREVENTING RECURRENCE
Air Sampler	1/2/18 to 1/9/18	Station 48	375618	Station was out of service with 19 minutes on timer due to defective fuse apparatus.	Replaced pump and repaired fuse holder.

Table 5-1d below shows the percent in service time for the 12 air sample locations. The table shows overall availability for all ODCM required locations was 97.9% or greater.

TABLE 5-1d CGS REMP Air Sample Percent in Service Time for 2018			
Station ID	ODCM Required	EFSEC Required	Percent Time in Service
1		x	99.9%
4	x	x	99.9%
5			99.8%
6		x	99.9%
7		x	99.7%
8	x	x	99.8%
9	x	x	99.9%
21B			99.7%
23		x	99.9%
40	x	x	99.8%
48	x	x	97.9%
57	x		99.7%

Table 5-1e below shows the percent in service time for the five water locations. The table shows overall availability for all ODCM required locations was 100%.

TABLE 5-1e CGS REMP Water Sample Percent in Service Time for 2018			
Station ID	ODCM Required	EFSEC Required	Percent Time in Service
26	x	x	100.0%
27	x	x	100.0%
29	x	x	100.0%
101B		x	99.8%
102B		x	100.0%

TABLE 5-2							
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY COLUMBIA GENERATING STATION Benton County, Washington							
DOCKET NO. 50-397 Calendar Year 2018 mR/std. Units: quarter							
Medium: Environmental Direct Radiation (TLD)							
Analysis Type	Total Analyses Performed	Lower Limit of Detection (LLD)	Indicator Locations Mean (f) ^a Range	Location With Highest Annual Mean		Control Locations Mean (f) ^a Range	Number of Nonroutine Measurements
				Location Information	Mean (f) ^a Range		
TLD Quarterly	227	---	20.8 (223 / 223) (17.0-27.7)	86 NNW 0.3 miles	27.1 (4/4) (26.4-27.7)	19.0 (4/4) (18.5-19.7)	0
a. (f) is the number of positive measurements / total measurements at specified location.							
Reference Appendix A, Tables A-1.1, A-1.2							
The TLD at Station 12 in the 4 th quarter was lost in the field.							

TABLE 5-2 (cont.)							
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY COLUMBIA GENERATING STATION Benton County, Washington							
DOCKET NO. 50-397 Calendar Year 2018 mR/std. Units: quarter							
Medium: ISFSI Direct Radiation (TLD)							
Analysis Type	Total Analyses Performed	Lower Limit of Detection (LLD)	Indicator Locations Mean (f) ^a Range	Location With Highest Annual Mean		Control Locations Mean (f) ^a Range	Number of Nonroutine Measurements
				Location Information	Mean (f) ^a Range		
TLD Quarterly	48	---	107.3 (48 / 48) (47.5-206.9)	136B NNW 0.29 miles	156.1 (4 / 4) (51.4-206.9)	--- (0 / 0)	0
a. (f) is the number of positive measurements / total measurements at specified location.							
Reference Appendix A, Tables B-1.1, B-1.2							
ISFSI TLDs are Stations 123 to 131, and 136B to 138B. Station 130 and 131 were added in the 1 st quarter 2017.							

TABLE 5-2 (cont.) RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY COLUMBIA GENERATING STATION Benton County, Washington							
				DOCKET NO. 50-397 Calendar Year 2018			
Medium: Air Particulate/Air Radioiodine				Units: pCi/m ³			
Analysis Type	Total Analyses Performed	Lower Limit of Detection (LLD) ^b	Indicator Locations Mean (f) ^a Range	Location With Highest Annual Mean		Control Locations Mean (f) ^a Range	Number of Nonroutine Measurements
				Location Information	Mean (f) ^a Range		
Gross Beta	623	0.01	0.0188 (571/571) (0.0042-0.0828)	57 N 0.70 miles	0.0194 (52/52) (0.0045 - 0.0802)	0.0176(52/52) (0.0048 - 0.0718)	0
I-131	623	0.07	--- (0 / 571)	---	---	--- (0 / 52)	0
Cs-134	48	0.05	--- (0 / 44)	---	---	--- (0 / 4)	0
Cs-137	48	0.06	--- (0 / 44)	---	---	--- (0 / 4)	0
a. (f) is the number of positive measurements / total measurements at specified location.							
b. These are the ODCM specified LLDs, actual method LLDs will be lower. See Table 4-4.							
Reference Appendix A, Tables A-2.1, A-2.2, Tables A-3.1, A-3.2, and Tables A- 4.1, A-4.2.							

TABLE 5-2 (cont.) RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY COLUMBIA GENERATING STATION Benton County, Washington							
				DOCKET NO. 50-397 Calendar Year 2018			
Medium: Water-River/Drinking				Units: pCi/L			
Analysis Type	Total Analyses Performed	Lower Limit of Detection (LLD) ^c	Indicator Locations Mean (f) ^a Range	Location With Highest Annual Mean		Control Locations Mean (f) ^a Range	Number of Nonroutine Measurements
				Location Information	Mean (f) ^a Range		
Gross Beta	24	4.0	--- (0/24) ^(b)	---	---	--- (0 / 12)	0
H-3	8	2000	--- (0 / 8) ^(b)	---	---	--- (0 / 4)	0
Mn-54	24	15	--- (0 / 24) ^(b)	---	---	--- (0 / 12)	0
Fe-59	24	30	--- (0 / 24) ^(b)	---	---	--- (0 / 12)	0
Co-58	24	15	--- (0 / 24) ^(b)	---	---	--- (0 / 12)	0
Co-60	24	15	--- (0 / 24) ^(b)	---	---	--- (0 / 12)	0
Zn-65	24	30	--- (0 / 24) ^(b)	---	---	--- (0 / 12)	0
Zr/Nb-95	24	15	--- (0 / 24) ^(b)	---	---	--- (0 / 12)	0
Cs-134	24	15	--- (0 / 24) ^(b)	---	---	--- (0 / 12)	0
Cs-137	24	18	--- (0 / 24) ^(b)	---	---	--- (0 / 12)	0
Ba/La-140	24	15	--- (0 / 24) ^(b)	---	---	--- (0 / 12)	0
a. (f) is the number of positive measurements / total measurements at specified location.							
b. This includes the control sample for this group; the control (Station 26) is also a drinking water sample.							
c. These are the ODCM specified LLDs, actual method LLDs will be lower. See Table 4-4.							
Reference Appendix A, Tables A-5.1, A-5.2, Tables A-6.1, A-6.2, and Tables A-7.1, A-7.2							

<p align="center">TABLE 5-2 (cont.) RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY COLUMBIA GENERATING STATION Benton County, Washington DOCKET NO. 50-397 Calendar Year 2018 </p>							
Medium: Water-Discharge				Units: pCi/L			
Analysis Type	Total Analyses Performed	Lower Limit of Detection (LLD) ^b	Indicator Locations Mean (f) ^a Range	Location With Highest Annual Mean		Control Locations Mean (f) ^a Range	Number of Nonroutine Measurements
				Location Information	Mean (f) ^a Range		
Gross Beta	12	4.0	7.97 (12/12) (5.70-12.1)	27 E 3.2 miles	7.97 (12/12) (5.70-12.1)	---(0 / 0)	0
H-3	4	2000	--- (0 / 4)	---	---	--- (0 / 0)	0
Mn-54	12	15	--- (0 / 12)	---	---	--- (0 / 0)	0
Fe-59	12	30	--- (0 / 12)	---	---	--- (0 / 0)	0
Co-58	12	15	--- (0 / 12)	---	---	--- (0 / 0)	0
Co-60	12	15	--- (0 / 12)	---	---	--- (0 / 0)	0
Zn-65	12	30	--- (0 / 12)	---	---	--- (0 / 0)	0
Zr/Nb-95	12	15	--- (0 / 12)	---	---	--- (0 / 0)	0
Cs-134	12	15	--- (0 / 12)	---	---	--- (0 / 0)	0
Cs-137	12	18	--- (0 / 12)	---	---	--- (0 / 0)	0
Ba/La-140	12	15	--- (0 / 12)	---	---	--- (0 / 0)	0
a. (f) is the number of positive measurements / total measurements at specified location.							
b. These are the ODCM specified LLDs, actual method LLDs will be lower. See Table 4-4.							
Reference Appendix A, Tables A-5.1,A-5.2, Tables A-6.1, A-6.2, and Tables A-13.1, A-13.2							

TABLE 5-2 (cont.) RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY COLUMBIA GENERATING STATION Benton County, Washington							
				DOCKET NO. 50-397 Calendar Year 2018			
Medium: Water- Deep Ground				Units: pCi/L			
Analysis Type	Total Analyses Performed	Lower Limit of Detection (LLD) ^b	Indicator Locations Mean (f) ^a Range	Location With Highest Annual Mean		Control Locations Mean (f) ^a Range	Number of Nonroutine Measurements
				Location Information	Mean (f) ^a Range		
H-3	12	2000	--- (0 / 12)	---	---	--- (0 / 0)	0
Mn-54	12	15	--- (0 / 12)	---	---	--- (0 / 0)	0
Fe-59	12	30	--- (0 / 12)	---	---	--- (0 / 0)	0
Co-58	12	15	--- (0 / 12)	---	---	--- (0 / 0)	0
Co-60	12	15	--- (0 / 12)	---	---	--- (0 / 0)	0
Zn-65	12	30	--- (0 / 12)	---	---	--- (0 / 0)	0
Zr/Nb-95	12	15	--- (0 / 12)	---	---	--- (0 / 0)	0
Cs-134	12	15	--- (0 / 12)	---	---	--- (0 / 0)	0
Cs-137	12	18	--- (0 / 12)	---	---	--- (0 / 0)	0
Ba/La-140	12	15	--- (0 / 12)	---	---	--- (0 / 0)	0
a. (f) is the number of positive measurements / total measurements at specified location.							
b. These are the ODCM specified LLDs, actual method LLDs will be lower. See Table 4-4.							
Reference Appendix A, Tables A-6.1, A-6.2, and Tables A-14.1, A-14.2							

TABLE 5-2 (cont.) RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY COLUMBIA GENERATING STATION Benton County, Washington							
				DOCKET NO. 50-397 Calendar Year 2018			
Medium: Water- Shallow Ground				Units: pCi/L			
Analysis Type	Total Analyses Performed	Lower Limit of Detection (LLD) ^b	Indicator Locations Mean (f) ^a Range	Location With Highest Annual Mean		Control Locations Mean (f) ^a Range	Number of Nonroutine Measurements
				Location Information	Mean (f) ^a Range		
H-3	36	2000	3460 (27 / 36) (147-13,700)	MW-5 SW 0.43 miles	12,900 (4 / 4) (12,400-13,700)	--- (0 / 0)	0
Mn-54	36	15	--- (0 / 36)	---	---	--- (0 / 0)	0
Fe-59	36	30	--- (0 / 36)	---	---	--- (0 / 0)	0
Co-58	36	15	--- (0 / 36)	---	---	--- (0 / 0)	0
Co-60	36	15	--- (0 / 36)	---	---	--- (0 / 0)	0
Zn-65	36	30	--- (0 / 36)	---	---	--- (0 / 0)	0
Zr/Nb-95	36	15	--- (0 / 36)	---	---	--- (0 / 0)	0
Cs-134	36	15	--- (0 / 36)	---	---	--- (0 / 0)	0
Cs-137	36	18	--- (0 / 36)	---	---	--- (0 / 0)	0
Ba/La-140	36	15	--- (0 / 36)	---	---	--- (0 / 0)	0
a. (f) is the number of positive measurements / total measurements at specified location.							
b. These are the ODCM specified LLDs, actual method LLDs will be lower. See Table 4-4.							
Reference Appendix A, Tables B-10.1, B-10.2, and B-11.1.							

TABLE 5-2 (cont.) RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY COLUMBIA GENERATING STATION Benton County, Washington							
				DOCKET NO. 50-397 Calendar Year 2018			
Medium: River Sediment				Units: pCi/kg			
Analysis Type	Total Analyses Performed	Lower Limit of Detection (LLD) ^b	Indicator Locations Mean (f) ^a Range	Location With Highest Annual Mean		Control Locations Mean (f) ^a Range	Number of Nonroutine Measurements
				Location Information	Mean (f) ^a Range		
Cs-134	4	150	--- (0 / 2)	---	---	--- (0 / 2)	0
Cs-137	4	180	99.9 (2 / 2) (70.8-129)	34 ESE 3.32 Miles	99.9 (2 / 2) (70.8-129)	70.2 (2 / 2) (63.6-76.8)	0
Co-60	4	---	--- (0 / 2)	---	---	--- (0 / 2)	0
a. (f) is the number of positive measurements / total measurements at specified location.							
b. These are the ODCM specified LLDs, actual method LLDs will be lower. See Table 4-4.							
Reference Appendix A, Tables A-9.1, A-9.2.							

TABLE 5-2 (cont.) RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY COLUMBIA GENERATING STATION Benton County, Washington							
				DOCKET NO. 50-397 Calendar Year 2018			
Medium: Roots				Units: pCi/kg			
Analysis Type	Total Analyses Performed	Lower Limit of Detection (LLD) ^b	Indicator Locations Mean (f) ^a Range	Location With Highest Annual Mean		Control Locations Mean (f) ^a Range	Number of Nonroutine Measurements
				Location Information	Mean (f) ^a Range		
I-131	13	60	--- (0 / 10)	---	---	--- (0/3)	0
Cs-134	13	60	--- (0 / 10)	---	---	--- (0/3)	0
Cs-137	13	80	--- (0 / 10)	---	---	--- (0/3)	0
a. (f) is the number of positive measurements / total measurements at specified location.							
b. These are the ODCM specified LLDs, actual method LLDs will be lower. See Table 4-4.							
Reference Appendix A, Tables A-15.1, A-15.2.							

TABLE 5-2 (cont.) RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY COLUMBIA GENERATING STATION Benton County, Washington							
				DOCKET NO. 50-397 Calendar Year 2018			
Medium: Fruits				Units: pCi/kg			
Analysis Type	Total Analyses Performed	Lower Limit of Detection (LLD) ^b	Indicator Locations Mean (f) ^a Range	Location With Highest Annual Mean		Control Locations Mean (f) ^a Range	Number of Nonroutine Measurements
				Location Information	Mean (f) ^a Range		
I-131	8	60	--- (0 / 6)	---	---	--- (0 / 2)	0
Cs-134	8	60	--- (0 / 6)	---	---	--- (0 / 2)	0
Cs-137	8	80	--- (0 / 6)	---	---	--- (0 / 2)	0
a. (f) is the number of positive measurements / total measurements at specified location.							
b. These are the ODCM specified LLDs, actual method LLDs will be lower. See Table 4-4.							
Reference Appendix A, Table A-16.1, A-16.2.							

TABLE 5-2 (cont.)							
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY							
COLUMBIA GENERATING STATION				DOCKET NO. 50-397			
Benton County, Washington				Calendar Year 2018			
Medium: Vegetables and Vegetation				Units: pCi/kg			
Analysis Type	Total Analyses Performed	Lower Limit of Detection (LLD) ^b	Indicator Locations Mean (f) ^a Range	Location With Highest Annual Mean		Control Locations Mean (f) ^a Range	Number of Nonroutine Measurements
				Location Information	Mean (f) ^a Range		
I-131	13	60	--- (0 / 11)	---	---	--- (0 / 2)	0
Cs-134	13	60	--- (0 / 11)	---	---	--- (0 / 2)	0
Cs-137	13	80	--- (0 / 11)	---	---	--- (0 / 2)	0
a. (f) is the number of positive measurements / total measurements at specified location.							
b. These are the ODCM specified LLDs, actual method LLDs will be lower. See Table 4-4.							
Reference Appendix A, Table A-17.1, A-17.2.							

TABLE 5-2 (cont.)							
RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY						DOCKET NO. 50-397	
COLUMBIA GENERATING STATION						Calendar Year 2018	
Benton County, Washington							
Medium: Fish				Units: pCi/kg			
Analysis Type	Total Analyses Performed	Lower Limit of Detection (LLD) ^b	Indicator Locations Mean (f) ^a Range	Location With Highest Annual Mean		Control Locations Mean (f) ^a Range	Number of Nonroutine Measurements
				Location Information	Mean (f) ^a Range		
Mn-54	6	130	--- (0 / 3)	---	---	--- (0 / 3)	0
Fe-59	6	260	--- (0 / 3)	---	---	--- (0 / 3)	0
Co-58	6	130	--- (0 / 3)	---	---	--- (0 / 3)	0
Co-60	6	130	--- (0 / 3)	---	---	--- (0 / 3)	0
Zn-65	6	260	--- (0 / 3)	---	---	--- (0 / 3)	0
Cs-134	6	130	--- (0 / 3)	---	---	--- (0 / 3)	0
Cs-137	6	150	--- (0 / 3)	---	---	--- (0 / 3)	0
a. (f) is the number of positive measurements / total measurements at specified location.							
b. These are the ODCM specified LLDs, actual method LLDs will be lower. See Table 4-4.							
Reference Appendix A, Table A-10.1, A-10.2.							

TABLE 5-2 (cont.) RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY COLUMBIA GENERATING STATION Benton County, Washington							
				DOCKET NO. 50-397 Calendar Year 2018			
Medium: Milk				Units: pCi/L			
Analysis Type	Total Analyses Performed	Lower Limit of Detection (LLD) ^b	Indicator Locations Mean (f) ^a Range	Location With Highest Annual Mean		Control Locations Mean (f) ^a Range	Number of Nonroutine Measurements
				Location Information	Mean (f) ^a Range		
I-131	36	1.0	--- (0 / 18)	---	---	--- (0 / 18)	0
Cs-134	36	15	--- (0 / 18)	---	---	--- (0 / 18)	0
Cs-137	36	18	--- (0 / 18)	---	---	--- (0 / 18)	0
Ba/La-140	36	15	--- (0 / 18)	---	---	--- (0 / 18)	0
a. (f) is the number of positive measurements / total measurements at specified location.							
b. These are the ODCM specified LLDs, actual method LLDs will be lower. See Table 4-4.							
Reference Appendix A, Tables A-11.1, A-11.2, Tables A-12.1, A-12.2.							

TABLE 5-3
QUARTERLY TLD DATA SUMMARY WITH COMPARISON TO
PREOPERATIONAL AND OPERATIONAL PERIODS
 Results in mR/Standard Quarter

Station	Pre-Operational				Operational to 2017				2018 Operational			
	Min	Max	Std Dev	Mean	Min	Max	Std Dev	Mean	Min	Max	Std Dev	Mean
1	19.16	23.73	2.07	21.90	18.25	27.38	1.61	22.03	20.59	21.25	0.32	20.78
2	17.34	22.81	2.09	21.10	16.43	25.55	1.51	21.55	20.46	21.04	0.25	20.69
3	18.25	21.90	1.46	20.42	16.43	24.64	1.64	20.75	19.08	20.22	0.52	19.69
4	15.51	23.73	2.65	19.96	14.60	22.81	1.59	19.47	17.96	18.71	0.36	18.26
5	18.25	22.81	1.74	20.76	16.43	23.73	1.57	19.94	18.44	19.39	0.41	18.80
6	18.25	21.90	1.50	20.19	16.43	23.73	1.52	20.02	18.11	19.03	0.43	18.75
7	19.16	22.81	1.69	21.33	16.43	24.64	1.66	21.00	19.56	20.19	0.33	19.85
8	21.90	25.55	1.50	23.84	15.51	27.38	1.88	23.18	21.55	22.15	0.25	21.83
9	15.51	21.90	2.00	19.85	16.43	23.73	1.59	19.79	18.45	19.72	0.56	18.98
10	19.16	22.81	1.38	20.99	16.43	24.64	1.58	20.91	19.17	20.14	0.40	19.64
11	19.16	22.81	1.38	21.44	16.43	24.64	1.40	21.48	19.80	20.50	0.32	20.03
12	20.99	24.64	1.60	23.04	18.25	26.46	1.63	23.04	21.15	22.50	0.68	21.78
13	19.16	22.81	1.54	21.44	17.34	27.38	1.70	21.22	19.10	20.62	0.67	20.02
14	19.16	24.64	2.07	21.90	17.34	25.55	1.46	21.38	19.84	23.49	1.54	21.44
15	20.99	25.55	1.37	23.15	17.34	27.38	1.65	22.96	21.08	23.21	1.02	22.20
16	20.08	23.73	1.52	22.13	16.43	26.46	1.73	21.84	19.09	22.83	1.62	20.48
17	19.16	23.73	1.62	22.81	17.34	26.46	1.56	22.40	20.32	21.90	0.70	21.21
18	20.08	23.73	1.27	22.13	16.43	25.55	1.59	21.95	19.84	23.68	1.69	21.40
19	20.08	23.73	1.24	22.01	17.34	25.55	1.54	22.10	20.05	23.30	1.55	21.50
20	19.16	23.73	1.76	21.44	15.62	25.55	1.67	21.71	19.37	21.97	1.20	20.44
21	19.16	21.90	1.25	20.68	15.51	23.73	1.41	20.22	18.52	19.33	0.36	19.05
22	19.16	23.73	1.58	22.01	16.43	25.55	1.49	21.56	19.18	20.43	0.58	19.86
23	20.08	23.73	1.49	21.60	17.34	25.55	1.60	21.10	19.79	20.36	0.24	20.05
24	20.99	23.73	1.09	21.90	16.74	50.50	3.04	21.90	18.03	20.71	1.38	19.50
25	20.99	24.64	1.46	23.15	17.34	27.38	1.84	22.66	20.88	22.20	0.54	21.58
40	17.34	21.90	1.70	19.94	15.51	24.64	1.74	19.81	17.04	18.46	0.65	18.00
41	20.08	25.55	2.00	23.73	17.34	27.38	1.97	22.24	20.24	21.16	0.43	20.56
42	20.08	23.73	1.61	22.36	17.34	26.46	1.91	21.77	19.82	20.18	0.16	20.06
43	20.99	24.64	1.49	23.12	16.43	27.38	2.04	22.42	20.06	22.07	0.84	20.90
44	19.16	22.81	1.34	21.12	15.51	24.64	1.95	20.52	17.87	18.64	0.33	18.34
45	19.16	22.81	1.37	21.25	16.43	25.55	1.76	20.99	19.23	19.68	0.20	19.41
46	22.81	28.29	2.10	26.10	19.16	31.94	2.06	26.41	23.69	25.72	0.91	25.03
47	17.34	20.99	1.73	19.85	15.51	26.28	1.63	20.14	19.03	19.96	0.39	19.44
49	21.90	21.90	-	21.90	16.43	27.57	1.60	21.85	19.96	22.28	1.19	21.04
50	20.08	20.08	-	20.08	16.43	26.46	1.67	21.51	20.23	21.48	0.57	20.67
51	19.16	21.90	1.18	20.53	16.43	24.64	1.57	20.96	18.83	20.50	0.73	19.66
53	24.64	24.64	-	24.64	18.25	29.57	2.07	23.02	20.15	20.78	0.26	20.44
54	23.73	23.73	-	23.73	18.18	26.46	1.90	21.97	19.69	20.14	0.19	19.92
55	20.99	20.99	-	20.99	16.43	25.55	1.44	21.38	19.79	20.24	0.22	20.12
56	21.90	21.90	-	21.90	16.43	25.55	1.67	21.88	20.10	21.41	0.64	20.89
58	-	-	-	-	17.83	24.35	1.50	19.84	18.38	21.17	1.15	19.70
65	-	-	-	-	17.73	22.72	1.13	19.83	19.06	20.23	0.53	19.45

TABLE 5-3 (Cont.)
QUARTERLY TLD DATA SUMMARY WITH COMPARISON TO
PREOPERATIONAL AND OPERATIONAL PERIODS
 Results in mR/Standard Quarter

Station	Pre-Operational				Operational to 2017				2018 Operational			
	Min	Max	Std Dev	Mean	Min	Max	Std Dev	Mean	Min	Max	Std Dev	Mean
71(1S)	20.08	22.81	1.58	21.90	18.25	30.39	2.36	25.21	24.64	26.32	0.79	25.28
72(2S)	21.90	23.73	0.91	22.81	18.25	29.65	1.96	24.24	22.99	23.93	0.45	23.41
73(3S)	20.08	21.90	0.91	20.99	16.43	25.15	1.57	21.42	21.29	22.29	0.45	21.71
74(4S)	23.73	24.64	0.53	24.03	18.25	28.29	1.81	23.28	21.73	22.12	0.16	21.92
75(5S)	19.16	21.90	1.39	20.38	15.51	26.46	1.79	22.19	20.72	21.77	0.48	21.43
76(6S)	20.99	22.81	0.91	21.90	17.34	26.46	1.73	21.89	20.58	22.33	0.74	21.32
77(7S)	21.90	23.73	0.91	22.81	17.34	25.55	1.55	21.92	20.37	21.00	0.28	20.60
78(8S)	21.90	23.73	1.05	22.51	17.34	25.55	1.53	21.40	18.88	21.47	1.09	20.29
79(9S)	22.81	23.73	0.53	23.12	17.34	25.55	1.58	21.77	19.70	21.65	0.85	20.84
80(10S)	20.99	22.81	0.91	21.90	16.43	25.55	1.68	20.93	19.26	20.71	0.63	20.18
81(11S)	20.08	23.73	1.90	22.20	17.34	25.55	1.48	21.38	19.92	20.75	0.35	20.37
82(12S)	21.90	24.64	1.39	23.42	17.34	26.46	1.50	22.36	21.18	21.43	0.13	21.30
83(13S)	21.90	23.73	0.91	22.81	17.34	26.46	1.79	22.13	20.16	21.05	0.41	20.74
84(14S)	20.99	22.81	1.05	22.20	16.43	27.17	1.73	22.18	20.77	22.42	0.69	21.49
85(15S)	21.90	24.64	1.58	23.73	16.58	27.83	1.86	22.99	21.65	23.15	0.64	22.22
86(16S)	21.90	23.73	0.91	22.81	18.25	31.28	2.52	26.36	26.45	27.72	0.56	27.05
87	-	-	-	-	19.34	34.34	3.68	28.67	-	-	-	-
88	-	-	-	-	17.05	31.67	3.44	25.18	25.36	27.12	0.75	26.09
89	-	-	-	-	19.25	29.38	2.32	25.82	26.97	27.59	0.27	27.23
90	-	-	-	-	16.79	21.02	0.83	18.99	-	-	-	-
119B	-	-	-	-	19.24	25.64	1.42	21.99	20.91	21.66	0.37	21.34
119Ctrl	-	-	-	-	19.53	26.55	1.29	21.82	22.56	23.16	0.25	22.82
121 (ISFSI)	-	-	-	-	19.52	130.27	21.83	73.73	64.92	81.88	7.18	75.01
122 (ISFSI)	-	-	-	-	19.62	42.49	6.60	31.96	33.19	35.98	1.22	34.87
123 (ISFSI)	-	-	-	-	24.99	160.33	33.04	110.94	81.29	85.89	2.11	84.14
124 (ISFSI)	-	-	-	-	26.89	201.05	42.63	135.60	96.35	102.16	2.65	99.67
125 (ISFSI)	-	-	-	-	26.46	135.52	25.69	97.30	74.27	78.09	1.69	75.80
126 (ISFSI)	-	-	-	-	26.00	145.68	31.89	95.34	111.54	116.26	2.02	114.27
127 (ISFSI)	-	-	-	-	28.97	109.16	20.84	73.39	86.52	90.52	1.72	88.94
128 (ISFSI)	-	-	-	-	25.64	187.25	44.82	112.62	126.67	141.01	6.82	136.81
129 (ISFSI)	-	-	-	-	30.16	138.08	30.39	87.94	100.02	108.29	3.52	103.66
130 (ISFSI)	-	-	-	-	44.04	48.07	1.86	46.63	60.98	161.87	48.39	133.40
131 (ISFSI)	-	-	-	-	42.30	51.64	4.29	48.67	52.21	68.07	7.11	62.17
136A (ISFSI)	-	-	-	-	28.99	205.64	60.07	115.48	-	-	-	-
137A (ISFSI)	-	-	-	-	29.47	324.49	82.76	139.11	-	-	-	-
138A (ISFSI)	-	-	-	-	28.28	224.87	63.34	113.66	-	-	-	-
136B (ISFSI)	-	-	-	-	35.48	45.92	3.75	41.81	51.45	206.85	72.05	156.05
137B (ISFSI)	-	-	-	-	37.52	46.50	3.03	42.36	49.58	198.32	69.42	148.33
138B (ISFSI)	-	-	-	-	36.88	47.68	3.67	43.43	47.47	104.19	26.27	84.72
Site 1	-	-	-	-	11.92	20.19	1.20	18.29	18.13	19.59	0.63	19.04
Site 4	-	-	-	-	15.70	20.24	1.05	18.56	17.63	19.00	0.59	18.42
155	-	-	-	-	22.78	26.88	1.41	24.30	24.63	27.54	1.26	25.80
156	-	-	-	-	24.56	28.83	1.56	26.87	26.37	29.14	1.15	27.85

TABLE 5-3 NOTES: The preoperational period was from 1982 to 1983. The operational period started in the 1st quarter 1984. Station 65 was added in 1997. Stations 119B and 119Ctrl were added in 1995. Stations 121 and 122 were added in 1998. Stations 123-129 and 136A-138A were added in the 2nd quarter of 2002. Stations Site 1 and Site 4 were added in 2006. Stations 58 and 87 to 90 were added in 2008 to monitor remediation work at the DOE 618-11 burial site. Stations 87 and 90 were removed from service in the 1st quarter of 2017. Stations 136A-138A were relocated in the 3rd quarter 2016 and designated as stations 136B-138B. Stations 155 and 156 were added in the 1st quarter 2016. Stations 130 and 131 were added in the 1st quarter 2017.

6.0 QUALITY ASSURANCE AND QUALITY CONTROL

6.0 QUALITY ASSURANCE AND QUALITY CONTROL

The REMP is designed to meet the quality assurance (QA) and quality control (QC) criteria of the NRC Regulatory Guide 4.15⁽⁷⁾ and 10 CFR 50 Appendix B⁽¹⁵⁾. The laboratories performing sample analysis, Energy Northwest Environmental Services and Hanford External Dosimetry Program (HEDP), maintain quality control programs to ensure that analytical results are accurate, precise, and defensible. The following sections summarize the quality assurance and quality control aspects of the TLD, sample collection, and sample analysis components of the REMP.

6.1 Quality Control for the Energy Northwest Environmental TLD Program

The Quality Control program for the environmental TLD program covers the preparation, transportation, deployment, collection, storage, processing, and evaluation of the environmental TLDs and is designed to meet the requirements of NRC Regulatory Guides 4.13⁽⁸⁾ and 4.15.⁽⁷⁾

From the time the TLDs are annealed to the time they are placed in the field, they are stored and transported with control TLDs. Two sets of control TLDs are used, the building controls and the transportation (trip) controls. The building controls monitor the exposure that the TLDs receive while being transported to and from the TLD vendor and while in storage awaiting deployment and analysis. The trip controls accompany the field TLDs when transported to and from the vendor and also during deployment and collection in the field. The building controls and trip controls are stored in a low background lead shield while the field TLDs are deployed. If the trip control results are greater than the building control results, the difference between the two is subtracted from the field dosimeters to account for exposure during transit.

Reader QC dosimeters serve as checks that the dosimeter reader calibration is satisfactory and that the TLDs were processed correctly. These TLDs are annealed and then given a known exposure (typically 100 mR) to a cesium-137 source. The number of QC dosimeters used during each processing is generally 10% of the number of field dosimeters. Evaluation of the 2018 reader QC dosimeter results indicated satisfactory agreement for all periods. The quarterly average reader QC results are presented in Table 6-1.

TLDs designated as spikes are prepared by the Energy Northwest Radiation Protection Department by exposing the TLDs to a calibrated source to produce a known exposure. The spiked dosimeters are submitted and processed with the field dosimeters to further verify the accuracy and precision of the environmental TLD results. Quarterly spikes receive a target exposure of 22 mR. Additional spiked TLDs were prepared started in the 2nd quarter to test the bias and variability in the results. Evaluation of the 2018 spiked dosimeter results indicated satisfactory agreement for all periods. Spiked TLD results are presented in Table 6-1.

6.2 Quality Control for the Environmental Sample Program

Quality control for the environmental sample program encompasses both the sample collection and sample analysis processes. Results are reviewed for correctness, reasonableness, and data entry errors. Sample results that are suspect are normally investigated. A crosscheck program utilizing blind samples supplied by an outside vendor is maintained for all sample media routinely analyzed.

6.2.1 Sample Collection Quality Control

Duplicate samples are collected and submitted for analysis when practical. The duplicate samples are used to assess the repeatability of the sample collection process and the precision of the analytical method.

6.2.2 Laboratory Instruments Quality Control

Analytical Balances - Analytical balances used in the laboratory for sample preparations are calibrated annually. Performance checks are performed prior to use and span the range of intended use. Performance check results are documented on the sample preparation forms and kept with the analytical results.

Analytical Instruments – Analytical instruments used for determining radioactive emissions in samples are calibrated for efficiency annually using standard reference material traceable to the National Institute of Standards and Technology (NIST). Below is a summary of the routine QC practices for the different analytical instruments.

- **Gas-flow Proportional Counter:** Background and performance checks are performed daily when in use. Control charts are maintained with two and three-sigma limits specified; the checks must fall within the two-sigma warning limits prior to use. Mid-batch QC and end of batch performance checks are typically performed.
- **Gamma Spectrometers:** Performance checked daily for efficiency, energy per channel relationship, peak resolution, and background when in use. The checks are performed and plotted for both a low and high energy peak. Efficiency checks are held within two-sigma control limits. Long duration background checks are performed quarterly. A low level batch QC check is typically analyzed with each set of samples.
- **Liquid Scintillation Counter:** Background and performance checks are performed daily when in use. A performance check standard of the same matrix as the samples is analyzed and results trended. A control chart with acceptance limits specified is maintained. A low level batch QC check is typically analyzed with each set of samples.

6.2.3 Sample Batch Quality Control

Sample batch analysis is normally performed with sample blanks and known-addition samples (or spiked samples) included. The type of known addition sample used is dictated by the sample media being analyzed, the primary analytes of interest, and the method being used. The following is a summary of sample batch QC activities.

Iodine-131 Cartridges - At least one known-addition sample is analyzed with each batch. A charcoal cartridge of the same type used for sample collection but spiked with barium-133 is used. The 356 keV peak of barium-133 serves as a proxy for the 364 keV peak of iodine-131. Samples from the control location serve as blanks.

Gross Beta Filters - At least one unused blank air particulate filter and at least one known-addition air particulate filter is analyzed with each batch.

Aqueous Samples – In most cases, samples collected from the control locations are analyzed as blanks. A known-addition sample is typically analyzed with each batch of samples.

Gross Alpha/Beta in Water - Blank samples were prepared from reagent grade water and analyzed with each batch of samples. One known addition sample and one replicate sample is normally analyzed with each batch.

Tritium in Water – A blank and a low level known addition sample is typically analyzed with each batch. A replicate sample is prepared and analyzed inside of each batch when necessary.

6.3 Laboratory Intercomparison Program Participation and Results

Participation in cross check intercomparison studies is mandatory for laboratories performing analyses of CGS REMP samples. Intercomparison studies provide a consistent and effective means to evaluate the accuracy and precision of analyses performed by a laboratory. Study results should fall within specified control limits. Results that fall outside the control limits are investigated and corrective action taken.

The Energy Northwest Environmental Services Laboratory participated in three proficiency testing studies involving radioactive measurements provided by Environmental Resource Associates (ERA) during 2018. The Laboratory's intercomparison program was further supplemented by additional cross check media provided by ERA. The Laboratory's intercomparison program results for 2018 are shown in Table 6-2. All 2018 Laboratory intercomparison program results were within acceptable limits. Participation in the ERA studies serves to meet the intercomparison program requirements specified in the ODCM.

In addition to the studies noted above, the CGS REMP maintains a split sample program with the State of Washington Department of Health. Split samples are sent to the State of Washington Department of Health Lab on a scheduled frequency where they are independently analyzed. This program provides an additional check on the accuracy and precision of the results reported in this document.

6.4 Laboratory Quality Control Program Problems and Improvements

No problems were identified by the QC and intercomparison programs in 2018.

TABLE 6-1
2018 ENVIRONMENTAL SPIKED DOSIMETER RESULTS

PERIOD	SPIKE ID	KNOWN EXPOSURE (mR)	REPORTED EXPOSURE (mR)	BIAS (%)
1st Quarter	ENW Spike	22	22.3	+1.4%
	ENW Spike	22	21.9	-0.5%
	ENW Spike	22	21.5	-2.3%
	HEDP Avg. Reader	100	99.1	-0.9%
2nd Quarter	ENW Spike	22	21.6	-1.8%
	ENW Spike	22	22.0	0.0%
	ENW Spike	22	21.5	-2.3%
	ENW Spike	22	21.7	-1.4%
	ENW Spike	22	21.9	-0.5%
	ENW Spike	22	22.0	0.0%
	HEDP Avg. Reader	100	99.0	-1.0%
3rd Quarter	ENW Spike	22	22.0	0.0%
	ENW Spike	22	22.1	+0.5%
	ENW Spike	22	21.8	-0.9%
	ENW Spike	22	21.8	-0.9%
	ENW Spike	22	21.1	-4.1%
	ENW Spike	22	23.7	+7.7%
	HEDP Avg. Reader	100	98.8	-1.2%
4th Quarter	ENW Spike	22	21.2	-3.6%
	ENW Spike	22	21.5	-2.3%
	ENW Spike	22	21.8	+0.9%
	ENW Spike	22	21.0	-4.5%
	ENW Spike	22	21.4	-2.7%
	ENW Spike	22	21.4	-2.7%
	HEDP Avg. Reader	100	99.0	-1.0%

TABLE 6-2
ENW REMP PROGRAM CROSS CHECK PERFORMANCE RESULTS

ERA MRAD-28 Results Spring 2018					
Standard/Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation
Air Filter Radionuclides					
Americium-241 ^a	pCi/Filter	< 60	7.86	5.61 - 10.5	Acceptable
Cesium-134	pCi/Filter	175	204	132 - 250	Acceptable
Cesium-137	pCi/Filter	1010	865	710 - 1130	Acceptable
Cobalt-60	pCi/Filter	690	665	565 - 845	Acceptable
Manganese-54	pCi/Filter	< 20	< 50.0	0.00 - 50.0	Acceptable
Zinc-65	pCi/Filter	830	668	548 - 1020	Acceptable
Air Filter Gross Alpha/Beta					
Gross Alpha	pCi/Filter	57	43.4	22.7 - 71.5	Acceptable
Gross Beta	pCi/Filter	52	52.0	31.5 - 78.6	Acceptable
Water Radionuclides					
Americium-241	pCi/L	100	103	70.7 - 132	Acceptable
Cesium-134	pCi/L	1200	1330	1000 - 1460	Acceptable
Cesium-137	pCi/L	340	328	281 - 373	Acceptable
Cobalt-60	pCi/L	1470	1480	1280 - 1700	Acceptable
Manganese-54	pCi/L	< 15	< 100	0.00 - 100	Acceptable
Zinc-65	pCi/L	1440	1300	1160 - 1640	Acceptable
Water Gross Alpha/Beta					
Gross Alpha	pCi/L	33	29.0	10.6 - 40.0	Acceptable
Gross Beta	pCi/L	56	73.1	36.6 - 101	Acceptable
Water Tritium					
Tritium	pCi/L	21600	21700	16400 - 26400	Acceptable
Soil Radionuclides					
Actinium-228	pCi/kg	1240	1240	818 - 1560	Acceptable
Americium-241 ^a	pCi/kg	< 100	74.7	40.3 - 106	Acceptable
Bismuth-212	pCi/kg	975	1240	355 - 1850	Acceptable
Bismuth-214	pCi/kg	1760	1760	845 - 2620	Acceptable
Cesium-134	pCi/kg	4980	5330	3640 - 6370	Acceptable
Cesium-137	pCi/kg	4410	4210	3180 - 5320	Acceptable
Cobalt-60	pCi/kg	8050	8060	6350 - 9950	Acceptable
Lead-212	pCi/kg	1210	1240	865 - 1570	Acceptable
Lead-214	pCi/kg	1910	1850	777 - 2910	Acceptable
Manganese-54	pCi/kg	< 100	< 1000	0.00 - 1000	Acceptable
Potassium-40	pCi/kg	10400	10600	7300 - 12700	Acceptable
Zinc-65	pCi/kg	2160	1990	1590 - 2710	Acceptable

a- Assigned value was below the analysis method MDA for this isotope.

TABLE 6-2 (Cont.)
ENW REMP PROGRAM CROSS CHECK PERFORMANCE RESULTS

ERA MRAD-29 Results Fall 2018					
Standard/Analyte	Units	Reported Value	Assigned Value	Acceptance Limits	Performance Evaluation
Air Filter Radionuclides					
Americium-241	pCi/Filter	64	64.1	45.8 - 85.5	Acceptable
Cesium-134	pCi/Filter	806	921	597 - 1130	Acceptable
Cesium-137	pCi/Filter	438	373	306 - 489	Acceptable
Cobalt-60	pCi/Filter	1182	1130	960 - 1440	Acceptable
Manganese-54	pCi/Filter	< 20	< 50.0	0.00 - 50.0	Acceptable
Zinc-65	pCi/Filter	826	660	541 - 1010	Acceptable
Air Filter Gross Alpha/Beta					
Gross Alpha	pCi/Filter	59.5	55.3	28.9 - 91.1	Acceptable
Gross Beta	pCi/Filter	82.4	86.5	52.4 - 131	Acceptable
Water Radionuclides					
Americium-241	pCi/L	144	172	118 - 220	Acceptable
Cesium-134	pCi/L	2080	2310	1740 - 2540	Acceptable
Cesium-137	pCi/L	922	898	769 - 1020	Acceptable
Cobalt-60	pCi/L	1502	1510	1300 - 1730	Acceptable
Manganese-54	pCi/L	< 100	< 100	0.00 - 100	Acceptable
Zinc-65	pCi/L	1938	1790	1590 - 2260	Acceptable
Water Gross Alpha/Beta					
Gross Alpha	pCi/L	197.7	183	66.8 - 252	Acceptable
Gross Beta	pCi/L	78.8	99.4	49.7 - 137	Acceptable
Water Tritium					
Tritium	pCi/L	3091	3020	2280 - 3680	Acceptable
Soil Radionuclides					
Actinium-228	pCi/kg	3018	3280	2030 - 4540	Acceptable
Americium-241 ^a	pCi/kg	< 800	937	459 - 1420	Acceptable
Bismuth-212	pCi/kg	2206	3400	1810 - 4990	Acceptable
Bismuth-214	pCi/kg	1300	1370	841 - 1900	Acceptable
Cesium-134	pCi/kg	4963	5400	3200 - 7600	Acceptable
Cesium-137	pCi/kg	3634	3910	2340 - 5480	Acceptable
Cobalt-60	pCi/kg	4465	4890	3410 - 6370	Acceptable
Lead-212	pCi/kg	3201	3380	2050 - 4720	Acceptable
Lead-214	pCi/kg	1391	1450	883 - 2020	Acceptable
Manganese-54	pCi/kg	< 100	< 1000	0.00 - 1000	Acceptable
Potassium-40	pCi/kg	24342	24300	17300 - 31400	Acceptable
Zinc-65	pCi/kg	3720	4020	2650 - 5380	Acceptable

a- Assigned value was below the analysis method MDA for this isotope.

TABLE 6-2 (Cont)
ENW REMP PROGRAM CROSS CHECK PERFORMANCE RESULTS

2018 ERA Crosscheck Result Iodine-131 Charcoal Cartridge						
Sample ID	Analysis	Units	Result	Ref Value	Acceptance Limits	Performance Evaluation
12271701A	Iodine-131	pCi/Filter	508.5	460	385-552	Acceptable
12271702A	Iodine-131	pCi/Filter	489	415	348-498	Acceptable

2018 ERA RAD Results Iodine-131 in Milk						
Sample ID	Analysis	Units	Result	Ref Value	Acceptance Limits	Performance Evaluation
RAD-114	Iodine-131	pCi/L	25.7	28.1	23.4-33.0	Acceptable

7.0 REFERENCES

7.0 REFERENCES

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24. PNNL, 2007, "Summary of Radiological Monitoring of Columbia and Snake River Sediment, 1998 through 2004", PNNL-16990, Pacific Northwest National Laboratory, Richland, WA.

8.0 ERRATA

8.0 ERRATA

Errors or omissions identified in previous year's reports are identified below.

ST-26 sample should have been listed in the deviations section of the 2017 report.

SAMPLE MEDIA	DATE	LOCATION	CR/WO	PROBLEM / ACTIONS TAKEN
Water	2/2/17 To 3/1/17	Station 26	361609	TMU-SR-1 sample carboy found overflowing. It appears the sampler was not operating to the Instrument Master Data Sheet (IMDS) specifications. Investigated sampler and restored to IMDS parameters.

In the 2017 AREOR, Table B-1.1, the Station ID for 151 (site 2) was listed incorrectly. The Station ID should have been listed as 151 (site 4).



APPENDIX A

2018 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT COLUMBIA GENERATING STATION

DATA TABLES A and B

Sample Collection Period Calendar Year 2018

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Prepared by:

**Energy Northwest - Environmental Services Staff
Richland, WA**

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FORWARD

Since mid-1984, the results of the REMP analyses have been presented as net results calculated from total counts minus the observed background counts of the detection method. Counting results for low level samples are often within the counting error of the background determination; consequently results can range from negative to positive values in these samples. Though most of the analytical results presented in this Appendix are below the detection limit, listing the actual calculated value, even when it is negative or below the detection limit, prevents positive biases and loss of individual results inherent in the use of "less than" (<) values. It is recommended practice to report radiological environmental data in this manner.

Most results listed in this Appendix are accompanied by a plus or minus (\pm) error value. In most cases the error value represents the two sigma counting uncertainty determined for that particular analysis. These error values are in the same units as the listed activity values. The two sigma error value represents the range that a recount of the same sample would be expected to fall within 95% of the time, based on the statistics encountered in the original count.

Also included in most cases are the analysis specific, minimum detectable activity (MDA) values. Though similar in concept to the LLD, these values are based on the statistics encountered in the specific sample count itself and not a blank determination. As such, they are a *a posteriori* (after the fact) determination where the LLD is a *a priori* (before the fact) determination. These values were included as they represent the level of activity that would have needed to be present in the sample for a positive identification to be made.

TABLE A-1.1
2018 QUARTERLY TLD RESULTS
 Results in milli-Roentgen (mR) per Standard Quarter

Station ID	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Quarterly Sum
1	20.6	20.6	20.7	21.2	83.1
2	20.6	20.6	20.5	21.0	82.8
3	19.4	20.2	19.1	20.0	78.8
4	18.7	18.4	18.0	18.0	73.0
5	19.4	18.7	18.4	18.7	75.2
6	18.9	19.0	18.1	19.0	75.0
7	20.1	20.2	19.6	19.6	79.4
8	21.9	21.6	21.7	22.1	87.3
9	19.7	18.5	19.1	18.7	75.9
10	19.6	20.1	19.2	19.7	78.6
11	19.8	20.5	19.9	19.9	80.1
12	21.7	22.5	21.1	NA	87.1
13	20.0	20.4	19.1	20.6	80.1
14	20.9	23.5	19.8	21.6	85.8
15	21.6	22.9	21.1	23.2	88.8
16	20.1	19.1	19.9	22.8	81.9
17	21.0	21.6	20.3	21.9	84.8
18	20.5	23.7	19.8	21.6	85.6
19	20.4	23.3	20.0	22.3	86.0
20	19.6	20.8	19.4	22.0	81.8
21	19.1	19.2	18.5	19.3	76.2
22	19.6	20.4	19.2	20.2	79.4
23	20.0	19.8	20.0	20.4	80.2
24	18.6	20.7	18.0	20.7	78.0
25	21.6	22.2	20.9	21.7	86.3
40	18.3	18.2	17.0	18.5	72.0
41	21.2	20.2	20.6	20.2	82.3
42	20.2	19.8	20.2	20.1	80.2
43	22.1	20.8	20.1	20.6	83.6
44	18.3	18.6	17.9	18.5	73.4
45	19.5	19.3	19.2	19.7	77.7
46	23.7	25.4	25.3	25.7	100.1
47	19.4	19.4	19.0	20.0	77.7
49	20.1	21.8	20.0	22.3	84.2
50	20.2	21.5	20.3	20.6	82.7
51	19.3	20.5	18.8	20.0	78.6
53	20.5	20.4	20.1	20.8	81.8
54	20.0	20.1	19.7	19.9	79.7
55	20.2	19.8	20.2	20.2	80.5
56	20.7	21.4	20.1	21.4	83.6
65	19.1	19.3	20.2	19.2	77.8
71	24.7	24.6	25.5	26.3	101.1
72	23.0	23.6	23.1	23.9	93.7

TABLE A-1.1
2018 QUARTERLY TLD RESULTS
 Results in milli-Roentgen (mR) per Standard Quarter

Station ID	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Quarterly Sum
73	21.3	22.3	21.4	21.8	86.8
74	21.7	22.1	21.9	21.9	87.7
75	20.7	21.6	21.6	21.8	85.7
76	21.1	20.6	21.3	22.3	85.3
77	20.4	21.0	20.4	20.6	82.4
78	20.2	21.5	18.9	20.6	81.2
79	20.7	21.6	19.7	21.3	83.4
80	20.4	20.7	19.3	20.4	80.7
81	20.8	20.5	19.9	20.3	81.5
82	21.4	21.4	21.2	21.2	85.2
83	21.1	21.0	20.2	20.7	83.0
84	21.3	21.5	20.8	22.4	85.9
85	21.7	22.0	22.0	23.1	88.9
86	26.4	27.3	26.8	27.7	108.2

The TLD at Station 12 in the 4th quarter was lost in the field.
 The reported quarterly sum for this location is a normalized annual value based on the available 3 quarters of data.

TABLE A-1.2
2018 QUARTERLY TLD RESULTS- SUMMARY
 Results in milli-Roentgen (mR) per Standard Quarter

Location	Average Activity	Activity Low	Activity High	Number of Samples
Quarterly Indicator TLDs	20.8	17.0	27.7	223
Quarterly Control TLDs	19.0	18.5	19.7	4

TABLE A-2.1
GROSS BETA ON AIR PARTICULATE FILTERS

Results in pCi per Cubic Meter

Collection Period	Station 01		Station 04		Station 05	
	Result	Error	Result	Error	Result	Error
01/02/18 - 01/09/18	6.00E-02	± 1.55E-03	5.83E-02	± 1.44E-03	5.85E-02	± 1.49E-03
01/09/18 - 01/16/18	1.10E-02	± 7.10E-04	1.19E-02	± 6.72E-04	1.12E-02	± 6.60E-04
01/16/18 - 01/23/18	8.13E-03	± 6.19E-04	7.82E-03	± 5.61E-04	6.81E-03	± 5.41E-04
01/23/18 - 01/30/18	6.60E-03	± 5.72E-04	6.99E-03	± 5.37E-04	6.23E-03	± 5.15E-04
01/30/18 - 02/06/18	4.38E-03	± 4.85E-04	4.23E-03	± 4.39E-04	4.59E-03	± 4.52E-04
02/06/18 - 02/13/18	1.86E-02	± 8.57E-04	1.83E-02	± 8.15E-04	1.86E-02	± 8.26E-04
02/13/18 - 02/20/18	1.49E-02	± 7.63E-04	1.31E-02	± 7.00E-04	1.23E-02	± 7.10E-04
02/20/18 - 02/27/18	1.71E-02	± 8.21E-04	1.69E-02	± 7.91E-04	1.78E-02	± 8.32E-04
02/27/18 - 03/06/18	5.46E-03	± 5.21E-04	5.33E-03	± 4.91E-04	5.10E-03	± 5.06E-04
03/06/18 - 03/13/18	1.50E-02	± 8.11E-04	1.51E-02	± 7.73E-04	1.59E-02	± 8.21E-04
03/13/18 - 03/20/18	8.79E-03	± 6.30E-04	7.78E-03	± 5.68E-04	8.08E-03	± 6.07E-04
03/20/18 - 03/27/18	8.44E-03	± 6.31E-04	8.69E-03	± 5.74E-04	7.00E-03	± 5.78E-04
03/27/18 - 04/03/18	1.06E-02	± 6.97E-04	9.70E-03	± 6.14E-04	1.12E-02	± 7.06E-04
04/03/18 - 04/10/18	1.13E-02	± 7.26E-04	1.26E-02	± 6.90E-04	1.08E-02	± 6.95E-04
04/10/18 - 04/17/18	6.36E-03	± 5.18E-04	7.34E-03	± 5.36E-04	7.17E-03	± 5.31E-04
04/17/18 - 04/24/18	1.12E-02	± 6.55E-04	1.10E-02	± 6.36E-04	1.08E-02	± 6.33E-04
04/24/18 - 05/01/18	1.91E-02	± 8.60E-04	1.77E-02	± 8.12E-04	1.74E-02	± 8.12E-04
05/01/18 - 05/08/18	1.86E-02	± 8.59E-04	1.87E-02	± 8.34E-04	2.06E-02	± 8.80E-04
05/08/18 - 05/15/18	1.46E-02	± 7.78E-04	1.41E-02	± 7.43E-04	1.48E-02	± 7.70E-04
05/15/18 - 05/22/18	1.72E-02	± 8.47E-04	1.75E-02	± 8.25E-04	1.80E-02	± 8.47E-04
05/22/18 - 05/29/18	1.97E-02	± 8.93E-04	2.14E-02	± 8.99E-04	1.95E-02	± 8.63E-04
05/29/18 - 06/05/18	1.19E-02	± 7.05E-04	1.22E-02	± 6.88E-04	1.15E-02	± 6.64E-04
06/05/18 - 06/12/18	1.11E-02	± 6.83E-04	1.08E-02	± 6.59E-04	1.02E-02	± 6.43E-04
06/12/18 - 06/19/18	8.83E-03	± 6.38E-04	1.01E-02	± 6.50E-04	7.51E-03	± 5.86E-04
06/19/18 - 06/26/18	1.40E-02	± 7.61E-04	1.42E-02	± 7.41E-04	1.29E-02	± 7.13E-04
06/26/18 - 07/03/18	9.66E-03	± 6.54E-04	1.01E-02	± 6.43E-04	8.72E-03	± 6.08E-04
07/03/18 - 07/10/18	1.10E-02	± 6.79E-04	1.14E-02	± 6.69E-04	9.95E-03	± 6.30E-04
07/10/18 - 07/17/18	1.37E-02	± 7.56E-04	1.65E-02	± 8.01E-04	1.64E-02	± 7.99E-04
07/17/18 - 07/24/18	1.51E-02	± 8.07E-04	1.50E-02	± 7.79E-04	1.50E-02	± 7.96E-04
07/24/18 - 07/31/18	3.07E-02	± 1.12E-03	3.05E-02	± 1.09E-03	2.96E-02	± 1.09E-03
07/31/18 - 08/07/18	2.07E-02	± 9.21E-04	2.04E-02	± 8.92E-04	2.38E-02	± 9.80E-04
08/07/18 - 08/14/18	2.09E-02	± 9.43E-04	2.18E-02	± 9.47E-04	2.14E-02	± 9.49E-04
08/14/18 - 08/21/18	2.96E-02	± 1.14E-03	2.98E-02	± 1.14E-03	2.84E-02	± 1.13E-03
08/21/18 - 08/28/18	1.69E-02	± 8.36E-04	1.42E-02	± 7.61E-04	1.52E-02	± 8.07E-04
08/28/18 - 09/04/18	1.44E-02	± 7.56E-04	1.46E-02	± 7.52E-04	1.28E-02	± 7.62E-04
09/04/18 - 09/11/18	1.80E-02	± 8.51E-04	1.86E-02	± 8.71E-04	1.92E-02	± 8.58E-04
09/11/18 - 09/18/18	7.83E-03	± 5.92E-04	7.99E-03	± 5.96E-04	9.10E-03	± 6.17E-04
09/18/18 - 09/25/18	1.47E-02	± 7.53E-04	1.50E-02	± 7.58E-04	1.65E-02	± 7.89E-04
09/25/18 - 10/02/18	1.86E-02	± 8.63E-04	1.82E-02	± 8.48E-04	1.68E-02	± 8.13E-04
10/02/18 - 10/09/18	2.76E-02	± 1.04E-03	2.65E-02	± 1.01E-03	2.73E-02	± 1.02E-03
10/09/18 - 10/16/18	2.43E-02	± 9.58E-04	2.33E-02	± 9.30E-04	2.30E-02	± 9.24E-04
10/16/18 - 10/23/18	7.78E-02	± 1.74E-03	7.96E-02	± 1.76E-03	7.79E-02	± 1.74E-03
10/23/18 - 10/30/18	2.52E-02	± 9.73E-04	2.66E-02	± 9.99E-04	2.15E-02	± 9.01E-04
10/30/18 - 11/06/18	5.33E-03	± 4.73E-04	5.10E-03	± 4.70E-04	5.17E-03	± 4.65E-04
11/06/18 - 11/13/18	2.90E-02	± 1.01E-03	2.88E-02	± 1.02E-03	2.91E-02	± 1.03E-03
11/13/18 - 11/20/18	5.25E-02	± 1.36E-03	5.07E-02	± 1.34E-03	4.70E-02	± 1.33E-03
11/20/18 - 11/27/18	3.85E-02	± 1.17E-03	4.15E-02	± 1.22E-03	4.09E-02	± 1.26E-03
11/27/18 - 12/04/18	1.77E-02	± 7.94E-04	1.68E-02	± 7.77E-04	1.38E-02	± 7.34E-04
12/04/18 - 12/11/18	6.13E-02	± 1.49E-03	5.89E-02	± 1.44E-03	6.14E-02	± 1.52E-03
12/11/18 - 12/18/18	8.95E-03	± 5.96E-04	1.23E-02	± 6.82E-04	8.95E-03	± 6.16E-04
12/18/18 - 12/26/18	7.25E-03	± 4.73E-04	7.90E-03	± 4.85E-04	7.30E-03	± 4.87E-04
12/26/18 - 01/02/19	1.25E-02	± 6.66E-04	1.29E-02	± 6.70E-04	1.26E-02	± 7.03E-04

TABLE A-2.1
GROSS BETA ON AIR PARTICULATE FILTERS

Results in pCi per Cubic Meter

Collection Period	Station 06		Station 07		Station 08	
	Result	Error	Result	Error	Result	Error
01/02/18 - 01/09/18	5.76E-02	± 1.41E-03	5.53E-02	± 1.43E-03	5.96E-02	± 1.52E-03
01/09/18 - 01/16/18	1.18E-02	± 6.84E-04	1.18E-02	± 6.97E-04	1.14E-02	± 6.67E-04
01/16/18 - 01/23/18	7.71E-03	± 5.54E-04	6.88E-03	± 5.49E-04	7.46E-03	± 5.68E-04
01/23/18 - 01/30/18	7.58E-03	± 5.51E-04	6.67E-03	± 5.48E-04	7.25E-03	± 5.63E-04
01/30/18 - 02/06/18	4.76E-03	± 4.61E-04	5.94E-03	± 5.13E-04	5.58E-03	± 5.06E-04
02/06/18 - 02/13/18	1.78E-02	± 8.06E-04	2.20E-02	± 9.33E-04	1.88E-02	± 8.53E-04
02/13/18 - 02/20/18	1.12E-02	± 6.52E-04	1.27E-02	± 7.18E-04	1.11E-02	± 6.98E-04
02/20/18 - 02/27/18	1.76E-02	± 8.01E-04	1.66E-02	± 8.12E-04	1.80E-02	± 8.66E-04
02/27/18 - 03/06/18	5.48E-03	± 4.93E-04	5.93E-03	± 5.39E-04	5.85E-03	± 5.50E-04
03/06/18 - 03/13/18	1.55E-02	± 7.85E-04	1.70E-02	± 8.51E-04	1.41E-02	± 8.10E-04
03/13/18 - 03/20/18	8.06E-03	± 5.80E-04	6.40E-03	± 5.52E-04	7.62E-03	± 5.59E-04
03/20/18 - 03/27/18	7.86E-03	± 5.80E-04	7.22E-03	± 5.88E-04	9.62E-03	± 6.11E-04
03/27/18 - 04/03/18	1.00E-02	± 6.42E-04	9.48E-03	± 6.55E-04	9.92E-03	± 6.24E-04
04/03/18 - 04/10/18	1.15E-02	± 6.87E-04	1.08E-02	± 6.96E-04	1.05E-02	± 6.44E-04
04/10/18 - 04/17/18	5.50E-03	± 4.81E-04	5.71E-03	± 4.86E-04	6.21E-03	± 5.04E-04
04/17/18 - 04/24/18	1.01E-02	± 6.33E-04	1.09E-02	± 6.34E-04	1.07E-02	± 6.35E-04
04/24/18 - 05/01/18	1.68E-02	± 8.11E-04	1.86E-02	± 8.33E-04	1.91E-02	± 8.59E-04
05/01/18 - 05/08/18	1.88E-02	± 8.56E-04	2.21E-02	± 8.98E-04	2.05E-02	± 8.86E-04
05/08/18 - 05/15/18	1.47E-02	± 7.79E-04	1.77E-02	± 8.28E-04	1.67E-02	± 8.22E-04
05/15/18 - 05/22/18	1.60E-02	± 8.24E-04	1.82E-02	± 8.41E-04	1.76E-02	± 8.47E-04
05/22/18 - 05/29/18	2.07E-02	± 9.24E-04	2.02E-02	± 8.64E-04	1.92E-02	± 8.64E-04
05/29/18 - 06/05/18	1.15E-02	± 6.90E-04	1.27E-02	± 6.81E-04	1.06E-02	± 6.49E-04
06/05/18 - 06/12/18	1.09E-02	± 6.76E-04	9.27E-03	± 5.91E-04	1.28E-02	± 7.13E-04
06/12/18 - 06/19/18	6.70E-03	± 5.70E-04	8.70E-03	± 6.01E-04	8.42E-03	± 6.29E-04
06/19/18 - 06/26/18	1.40E-02	± 7.58E-04	1.49E-02	± 7.48E-04	1.19E-02	± 6.99E-04
06/26/18 - 07/03/18	1.03E-02	± 6.67E-04	8.53E-03	± 5.90E-04	8.51E-03	± 6.10E-04
07/03/18 - 07/10/18	9.75E-03	± 6.45E-04	1.13E-02	± 6.53E-04	1.07E-02	± 6.58E-04
07/10/18 - 07/17/18	1.53E-02	± 8.00E-04	1.74E-02	± 8.01E-04	1.50E-02	± 7.81E-04
07/17/18 - 07/24/18	1.44E-02	± 7.91E-04	1.54E-02	± 7.79E-04	1.53E-02	± 8.19E-04
07/24/18 - 07/31/18	3.20E-02	± 1.15E-03	3.17E-02	± 1.09E-03	3.44E-02	± 1.19E-03
07/31/18 - 08/07/18	1.95E-02	± 9.03E-04	2.36E-02	± 9.42E-04	2.27E-02	± 9.66E-04
08/07/18 - 08/14/18	2.23E-02	± 9.77E-04	2.33E-02	± 9.54E-04	2.03E-02	± 9.31E-04
08/14/18 - 08/21/18	3.05E-02	± 1.17E-03	3.07E-02	± 1.14E-03	3.16E-02	± 1.17E-03
08/21/18 - 08/28/18	1.56E-02	± 8.13E-04	1.77E-02	± 9.04E-04	1.66E-02	± 8.29E-04
08/28/18 - 09/04/18	1.63E-02	± 8.04E-04	1.28E-02	± 6.84E-04	1.52E-02	± 7.73E-04
09/04/18 - 09/11/18	1.89E-02	± 8.81E-04	1.68E-02	± 7.93E-04	1.78E-02	± 8.37E-04
09/11/18 - 09/18/18	6.78E-03	± 5.60E-04	8.03E-03	± 5.69E-04	7.43E-03	± 5.76E-04
09/18/18 - 09/25/18	1.51E-02	± 7.64E-04	1.53E-02	± 7.36E-04	1.55E-02	± 7.76E-04
09/25/18 - 10/02/18	1.75E-02	± 8.46E-04	1.87E-02	± 8.39E-04	1.85E-02	± 8.58E-04
10/02/18 - 10/09/18	2.95E-02	± 1.08E-03	2.79E-02	± 1.01E-03	2.69E-02	± 1.02E-03
10/09/18 - 10/16/18	2.40E-02	± 9.63E-04	2.21E-02	± 8.83E-04	2.10E-02	± 8.88E-04
10/16/18 - 10/23/18	8.09E-02	± 1.80E-03	7.85E-02	± 1.71E-03	8.03E-02	± 1.72E-03
10/23/18 - 10/30/18	2.64E-02	± 1.00E-03	2.38E-02	± 9.24E-04	2.32E-02	± 8.94E-04
10/30/18 - 11/06/18	4.23E-03	± 4.39E-04	5.11E-03	± 4.41E-04	5.11E-03	± 4.33E-04
11/06/18 - 11/13/18	2.64E-02	± 9.77E-04	2.85E-02	± 1.03E-03	3.15E-02	± 1.09E-03
11/13/18 - 11/20/18	5.29E-02	± 1.38E-03	5.10E-02	± 1.37E-03	5.23E-02	± 1.44E-03
11/20/18 - 11/27/18	3.99E-02	± 1.20E-03	3.65E-02	± 1.17E-03	4.09E-02	± 1.28E-03
11/27/18 - 12/04/18	1.71E-02	± 7.96E-04	1.78E-02	± 8.19E-04	1.58E-02	± 8.02E-04
12/04/18 - 12/11/18	6.16E-02	± 1.50E-03	6.33E-02	± 1.54E-03	6.03E-02	± 1.54E-03
12/11/18 - 12/18/18	1.15E-02	± 6.67E-04	1.15E-02	± 6.84E-04	8.13E-03	± 6.06E-04
12/18/18 - 12/26/18	8.02E-03	± 4.96E-04	8.08E-03	± 5.09E-04	8.25E-03	± 5.30E-04
12/26/18 - 01/02/19	1.32E-02	± 6.90E-04	1.24E-02	± 6.85E-04	1.46E-02	± 7.72E-04

TABLE A-2.1
GROSS BETA ON AIR PARTICULATE FILTERS

Results in pCi per Cubic Meter

Collection Period	Station 09		Station 21B		Station 23	
	Result	Error	Result	Error	Result	Error
01/02/18 - 01/09/18	5.45E-02	± 1.39E-03	5.20E-02	± 1.36E-03	5.77E-02	± 1.48E-03
01/09/18 - 01/16/18	9.82E-03	± 6.25E-04	1.05E-02	± 6.49E-04	1.22E-02	± 7.16E-04
01/16/18 - 01/23/18	6.50E-03	± 5.20E-04	6.66E-03	± 5.30E-04	6.90E-03	± 5.58E-04
01/23/18 - 01/30/18	6.39E-03	± 5.17E-04	7.86E-03	± 5.66E-04	6.43E-03	± 5.42E-04
01/30/18 - 02/06/18	5.84E-03	± 4.92E-04	4.56E-03	± 4.41E-04	5.77E-03	± 5.08E-04
02/06/18 - 02/13/18	1.75E-02	± 8.05E-04	1.97E-02	± 8.67E-04	1.75E-02	± 8.47E-04
02/13/18 - 02/20/18	1.04E-02	± 6.41E-04	1.31E-02	± 7.09E-04	1.33E-02	± 7.30E-04
02/20/18 - 02/27/18	1.29E-02	± 7.09E-04	1.73E-02	± 8.01E-04	1.56E-02	± 7.89E-04
02/27/18 - 03/06/18	6.13E-03	± 5.31E-04	5.55E-03	± 5.04E-04	5.20E-03	± 5.10E-04
03/06/18 - 03/13/18	1.57E-02	± 8.02E-04	1.39E-02	± 7.60E-04	1.14E-02	± 7.15E-04
03/13/18 - 03/20/18	7.29E-03	± 5.73E-04	8.01E-03	± 5.86E-04	7.66E-03	± 5.86E-04
03/20/18 - 03/27/18	7.52E-03	± 5.87E-04	8.06E-03	± 5.91E-04	8.48E-03	± 6.21E-04
03/27/18 - 04/03/18	8.44E-03	± 6.15E-04	1.05E-02	± 6.62E-04	1.01E-02	± 6.60E-04
04/03/18 - 04/10/18	1.07E-02	± 6.85E-04	1.22E-02	± 7.14E-04	1.14E-02	± 6.99E-04
04/10/18 - 04/17/18	5.97E-03	± 5.06E-04	6.52E-03	± 5.42E-04	5.15E-03	± 4.90E-04
04/17/18 - 04/24/18	1.06E-02	± 6.33E-04	9.78E-03	± 6.37E-04	8.74E-03	± 5.99E-04
04/24/18 - 05/01/18	1.77E-02	± 8.27E-04	1.68E-02	± 8.32E-04	1.79E-02	± 8.52E-04
05/01/18 - 05/08/18	2.05E-02	± 8.94E-04	1.92E-02	± 8.33E-04	1.74E-02	± 7.82E-04
05/08/18 - 05/15/18	1.67E-02	± 8.21E-04	1.45E-02	± 7.60E-04	1.63E-02	± 7.76E-04
05/15/18 - 05/22/18	1.95E-02	± 8.87E-04	1.81E-02	± 8.57E-04	1.63E-02	± 7.75E-04
05/22/18 - 05/29/18	1.70E-02	± 8.23E-04	2.00E-02	± 8.81E-04	1.75E-02	± 7.88E-04
05/29/18 - 06/05/18	1.14E-02	± 6.86E-04	1.14E-02	± 6.77E-04	1.25E-02	± 6.67E-04
06/05/18 - 06/12/18	1.19E-02	± 7.07E-04	1.07E-02	± 6.61E-04	1.12E-02	± 6.39E-04
06/12/18 - 06/19/18	9.52E-03	± 6.63E-04	8.30E-03	± 6.11E-04	7.87E-03	± 5.64E-04
06/19/18 - 06/26/18	1.30E-02	± 7.43E-04	1.27E-02	± 7.20E-04	1.31E-02	± 6.89E-04
06/26/18 - 07/03/18	9.15E-03	± 6.48E-04	8.71E-03	± 6.20E-04	9.69E-03	± 6.06E-04
07/03/18 - 07/10/18	1.07E-02	± 6.73E-04	1.26E-02	± 7.11E-04	9.75E-03	± 6.01E-04
07/10/18 - 07/17/18	1.48E-02	± 7.93E-04	1.51E-02	± 7.79E-04	1.53E-02	± 7.44E-04
07/17/18 - 07/24/18	1.49E-02	± 8.19E-04	1.48E-02	± 7.95E-04	1.47E-02	± 7.46E-04
07/24/18 - 07/31/18	2.84E-02	± 1.10E-03	3.38E-02	± 1.17E-03	3.01E-02	± 1.04E-03
07/31/18 - 08/07/18	1.99E-02	± 9.16E-04	2.07E-02	± 9.16E-04	2.06E-02	± 8.54E-04
08/07/18 - 08/14/18	1.82E-02	± 9.00E-04	2.50E-02	± 1.10E-03	2.05E-02	± 8.63E-04
08/14/18 - 08/21/18	3.03E-02	± 1.19E-03	3.40E-02	± 1.39E-03	3.10E-02	± 1.11E-03
08/21/18 - 08/28/18	1.42E-02	± 7.90E-04	1.69E-02	± 8.22E-04	1.53E-02	± 7.38E-04
08/28/18 - 09/04/18	1.36E-02	± 7.53E-04	1.43E-02	± 7.64E-04	1.36E-02	± 7.29E-04
09/04/18 - 09/11/18	1.49E-02	± 7.90E-04	1.69E-02	± 8.36E-04	1.77E-02	± 8.46E-04
09/11/18 - 09/18/18	9.04E-03	± 6.36E-04	7.82E-03	± 6.01E-04	7.81E-03	± 5.98E-04
09/18/18 - 09/25/18	1.42E-02	± 7.52E-04	1.45E-02	± 7.59E-04	1.46E-02	± 7.58E-04
09/25/18 - 10/02/18	1.70E-02	± 8.46E-04	1.88E-02	± 8.83E-04	1.83E-02	± 8.78E-04
10/02/18 - 10/09/18	2.73E-02	± 1.04E-03	2.77E-02	± 1.06E-03	2.91E-02	± 1.10E-03
10/09/18 - 10/16/18	2.14E-02	± 9.12E-04	2.41E-02	± 9.76E-04	2.20E-02	± 9.36E-04
10/16/18 - 10/23/18	7.18E-02	± 1.70E-03	8.28E-02	± 1.85E-03	7.41E-02	± 1.73E-03
10/23/18 - 10/30/18	2.44E-02	± 9.84E-04	2.30E-02	± 9.57E-04	2.35E-02	± 9.64E-04
10/30/18 - 11/06/18	4.81E-03	± 4.60E-04	4.61E-03	± 4.85E-04	4.28E-03	± 4.57E-04
11/06/18 - 11/13/18	2.35E-02	± 9.14E-04	3.11E-02	± 1.08E-03	3.10E-02	± 1.08E-03
11/13/18 - 11/20/18	4.88E-02	± 1.31E-03	5.21E-02	± 1.40E-03	5.38E-02	± 1.41E-03
11/20/18 - 11/27/18	3.58E-02	± 1.12E-03	4.02E-02	± 1.24E-03	3.87E-02	± 1.20E-03
11/27/18 - 12/04/18	1.39E-02	± 7.04E-04	1.51E-02	± 7.62E-04	1.81E-02	± 8.24E-04
12/04/18 - 12/11/18	5.53E-02	± 1.40E-03	5.99E-02	± 1.50E-03	6.39E-02	± 1.55E-03
12/11/18 - 12/18/18	7.94E-03	± 5.67E-04	1.10E-02	± 6.72E-04	1.03E-02	± 6.57E-04
12/18/18 - 12/26/18	7.19E-03	± 4.69E-04	9.10E-03	± 5.42E-04	7.91E-03	± 5.00E-04
12/26/18 - 01/02/19	9.39E-03	± 5.89E-04	1.41E-02	± 7.31E-04	1.28E-02	± 6.86E-04

TABLE A-2.1
GROSS BETA ON AIR PARTICULATE FILTERS

Results in pCi per Cubic Meter

Collection Period	Station 40		Station 48		Station 57	
	Result	Error	Result	Error	Result	Error
01/02/18 - 01/09/18	5.65E-02	± 1.44E-03	NVS	± NVS	5.67E-02	± 1.45E-03
01/09/18 - 01/16/18	1.08E-02	± 6.37E-04	1.12E-02	± 6.47E-04	9.92E-03	± 6.43E-04
01/16/18 - 01/23/18	8.06E-03	± 5.62E-04	7.72E-03	± 5.71E-04	7.21E-03	± 5.60E-04
01/23/18 - 01/30/18	5.80E-03	± 4.97E-04	8.17E-03	± 5.85E-04	6.17E-03	± 5.31E-04
01/30/18 - 02/06/18	4.97E-03	± 4.65E-04	5.57E-03	± 4.93E-04	5.34E-03	± 4.84E-04
02/06/18 - 02/13/18	1.95E-02	± 8.28E-04	1.99E-02	± 8.52E-04	1.72E-02	± 8.19E-04
02/13/18 - 02/20/18	1.10E-02	± 6.54E-04	1.41E-02	± 7.50E-04	1.54E-02	± 7.89E-04
02/20/18 - 02/27/18	1.80E-02	± 8.19E-04	1.73E-02	± 8.22E-04	1.88E-02	± 8.57E-04
02/27/18 - 03/06/18	5.30E-03	± 4.93E-04	5.61E-03	± 5.23E-04	5.58E-03	± 5.19E-04
03/06/18 - 03/13/18	1.61E-02	± 8.03E-04	1.62E-02	± 8.35E-04	1.56E-02	± 8.18E-04
03/13/18 - 03/20/18	7.44E-03	± 5.70E-04	8.03E-03	± 6.04E-04	7.96E-03	± 6.01E-04
03/20/18 - 03/27/18	6.35E-03	± 5.36E-04	9.62E-03	± 6.54E-04	7.12E-03	± 5.81E-04
03/27/18 - 04/03/18	1.16E-02	± 6.90E-04	9.09E-03	± 6.41E-04	1.00E-02	± 6.71E-04
04/03/18 - 04/10/18	1.18E-02	± 7.00E-04	9.78E-03	± 6.70E-04	1.06E-02	± 6.93E-04
04/10/18 - 04/17/18	6.41E-03	± 5.24E-04	5.52E-03	± 4.79E-04	5.81E-03	± 4.84E-04
04/17/18 - 04/24/18	1.19E-02	± 6.86E-04	1.12E-02	± 6.43E-04	1.03E-02	± 6.05E-04
04/24/18 - 05/01/18	1.71E-02	± 8.38E-04	1.63E-02	± 7.93E-04	1.72E-02	± 7.94E-04
05/01/18 - 05/08/18	1.90E-02	± 8.79E-04	1.95E-02	± 8.61E-04	2.02E-02	± 8.62E-04
05/08/18 - 05/15/18	1.51E-02	± 8.01E-04	1.68E-02	± 8.15E-04	1.76E-02	± 8.19E-04
05/15/18 - 05/22/18	1.67E-02	± 8.50E-04	1.74E-02	± 8.32E-04	1.66E-02	± 8.04E-04
05/22/18 - 05/29/18	1.82E-02	± 8.64E-04	1.81E-02	± 8.32E-04	1.87E-02	± 8.38E-04
05/29/18 - 06/05/18	1.03E-02	± 6.59E-04	1.04E-02	± 6.39E-04	1.14E-02	± 6.61E-04
06/05/18 - 06/12/18	1.19E-02	± 7.22E-04	1.05E-02	± 6.53E-04	9.85E-03	± 6.23E-04
06/12/18 - 06/19/18	9.17E-03	± 6.61E-04	8.30E-03	± 6.14E-04	8.20E-03	± 5.71E-04
06/19/18 - 06/26/18	1.21E-02	± 7.22E-04	1.31E-02	± 7.26E-04	1.31E-02	± 7.08E-04
06/26/18 - 07/03/18	7.98E-03	± 6.16E-04	9.75E-03	± 6.45E-04	8.47E-03	± 5.96E-04
07/03/18 - 07/10/18	1.19E-02	± 6.88E-04	1.17E-02	± 6.81E-04	9.68E-03	± 6.15E-04
07/10/18 - 07/17/18	1.48E-02	± 7.73E-04	1.56E-02	± 7.97E-04	1.64E-02	± 7.91E-04
07/17/18 - 07/24/18	1.54E-02	± 8.04E-04	1.58E-02	± 8.34E-04	1.54E-02	± 7.80E-04
07/24/18 - 07/31/18	3.27E-02	± 1.14E-03	3.26E-02	± 1.17E-03	3.18E-02	± 1.09E-03
07/31/18 - 08/07/18	1.94E-02	± 8.87E-04	2.15E-02	± 9.50E-04	2.13E-02	± 8.94E-04
08/07/18 - 08/14/18	2.26E-02	± 9.79E-04	2.18E-02	± 9.75E-04	2.36E-02	± 9.60E-04
08/14/18 - 08/21/18	3.11E-02	± 1.19E-03	3.14E-02	± 1.19E-03	3.20E-02	± 1.18E-03
08/21/18 - 08/28/18	1.75E-02	± 8.60E-04	1.47E-02	± 8.09E-04	2.12E-02	± 9.68E-04
08/28/18 - 09/04/18	1.33E-02	± 7.23E-04	1.25E-02	± 6.99E-04	1.40E-02	± 7.17E-04
09/04/18 - 09/11/18	1.75E-02	± 8.25E-04	1.80E-02	± 8.38E-04	1.94E-02	± 8.49E-04
09/11/18 - 09/18/18	8.00E-03	± 5.93E-04	8.04E-03	± 5.93E-04	7.67E-03	± 5.69E-04
09/18/18 - 09/25/18	1.43E-02	± 7.47E-04	1.56E-02	± 7.70E-04	1.42E-02	± 7.34E-04
09/25/18 - 10/02/18	1.86E-02	± 8.63E-04	1.75E-02	± 8.36E-04	1.73E-02	± 8.19E-04
10/02/18 - 10/09/18	2.70E-02	± 1.02E-03	2.73E-02	± 1.02E-03	2.98E-02	± 1.08E-03
10/09/18 - 10/16/18	2.19E-02	± 9.03E-04	2.17E-02	± 8.97E-04	2.14E-02	± 9.09E-04
10/16/18 - 10/23/18	8.19E-02	± 1.79E-03	8.18E-02	± 1.78E-03	8.02E-02	± 1.81E-03
10/23/18 - 10/30/18	2.29E-02	± 9.29E-04	2.47E-02	± 9.65E-04	2.50E-02	± 9.88E-04
10/30/18 - 11/06/18	4.65E-03	± 4.40E-04	4.42E-03	± 4.38E-04	4.49E-03	± 4.62E-04
11/06/18 - 11/13/18	2.94E-02	± 1.00E-03	3.10E-02	± 1.06E-03	3.23E-02	± 1.11E-03
11/13/18 - 11/20/18	4.44E-02	± 1.24E-03	5.01E-02	± 1.35E-03	5.93E-02	± 1.50E-03
11/20/18 - 11/27/18	3.78E-02	± 1.19E-03	3.45E-02	± 1.12E-03	4.42E-02	± 1.31E-03
11/27/18 - 12/04/18	1.46E-02	± 7.44E-04	1.57E-02	± 7.57E-04	1.94E-02	± 8.67E-04
12/04/18 - 12/11/18	6.01E-02	± 1.49E-03	5.99E-02	± 1.48E-03	6.60E-02	± 1.62E-03
12/11/18 - 12/18/18	1.03E-02	± 6.44E-04	9.33E-03	± 6.10E-04	1.02E-02	± 6.58E-04
12/18/18 - 12/26/18	6.95E-03	± 4.69E-04	8.52E-03	± 5.11E-04	9.22E-03	± 5.40E-04
12/26/18 - 01/02/19	1.37E-02	± 7.16E-04	1.25E-02	± 6.84E-04	1.36E-02	± 7.01E-04

NVS = Valid sample not obtained due to sampler failure.
Average MDA for analyses in Table A-2.1 was 9.01 E-04.

TABLE A-2.2
GROSS BETA ON AIR PARTICULATE FILTERS - SUMMARY

Results in pCi per cubic meter

LOCATION	Average Activity	Activity Low	Activity High	Number of Samples	Number of Positive IDs
Gross Beta Indicators	1.88E-02	4.23E-03	8.28E-02	571	571
Gross Beta Controls	1.76E-02	4.81E-03	7.18E-02	52	52

TABLE A-3.1

GAMMA SPECTROMETRY RESULTS OF AIR PARTICULATE FILTERS

Results in pCi/cubic meter, results decay corrected for decay during sample collection period

Location and Quarter			Station 1	1st Q 2018
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.15E-01 ±	1.80E-02	1.13E-02
K-40		0.00E+00 ±	2.35E-02	2.95E-02
MN-54		2.98E-04 ±	7.61E-04	1.04E-03
FE-59		3.41E-03 ±	3.94E-03	4.82E-03
CO-60		-2.32E-04 ±	9.70E-04	1.32E-03
ZN-65		-2.85E-04 ±	1.70E-03	2.38E-03
ZRNB-95		1.00E-03 ±	7.57E-04	1.05E-03
CS-134		-9.61E-05 ±	6.81E-04	9.91E-04
CS-137		2.84E-04 ±	4.00E-04	5.46E-04
BALA140		0.00E+00 ±	3.23E-03	4.63E-02
RU-106		1.86E-03 ±	5.03E-03	7.36E-03

Location and Quarter			Station 1	2nd Q 2018
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.51E-01 ±	1.92E-02	9.03E-03
K-40		5.39E-03 ±	1.21E-02	1.51E-02
MN-54		0.00E+00 ±	3.65E-04	1.14E-03
FE-59		1.16E-04 ±	4.27E-03	5.96E-03
CO-60		-3.24E-05 ±	9.20E-04	1.28E-03
ZN-65		-5.53E-04 ±	2.32E-03	3.11E-03
ZRNB-95		-8.11E-04 ±	2.45E-03	3.39E-03
CS-134		-5.62E-05 ±	5.59E-04	8.32E-04
CS-137		-7.51E-06 ±	7.18E-04	1.04E-03
BALA140		0.00E+00 ±	2.67E-03	2.81E-02
RU-106		2.01E-04 ±	5.94E-03	8.92E-03

Location and Quarter			Station 1	3rd Q 2018
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.74E-01 ±	2.22E-02	1.41E-02
K-40		1.93E-03 ±	9.71E-03	1.28E-02
MN-54		2.57E-04 ±	4.69E-04	6.50E-04
FE-59		-2.36E-04 ±	4.39E-03	6.10E-03
CO-60		8.49E-05 ±	6.51E-04	9.43E-04
ZN-65		0.00E+00 ±	2.79E-04	2.77E-03
ZRNB-95		8.95E-04 ±	1.84E-03	2.55E-03
CS-134		0.00E+00 ±	3.54E-04	1.14E-03
CS-137		0.00E+00 ±	9.08E-05	1.29E-03
BALA140		0.00E+00 ±	2.84E-03	3.00E-02
RU-106		0.00E+00 ±	3.24E-03	1.11E-02

Location and Quarter			Station 1	4th Q 2018
Nuclide	RQ	Activity	Error	MDA
BE-7	+	5.84E-02 ±	1.28E-02	1.11E-02
K-40		-1.62E-03 ±	1.05E-02	1.36E-02
MN-54		3.16E-04 ±	5.68E-04	7.67E-04
FE-59		0.00E+00 ±	8.75E-04	7.93E-03
CO-60		0.00E+00 ±	1.30E-04	1.33E-03
ZN-65		-3.11E-04 ±	1.80E-03	2.47E-03
ZRNB-95		0.00E+00 ±	4.84E-04	3.03E-03
CS-134		6.76E-05 ±	5.53E-04	8.13E-04
CS-137		1.08E-04 ±	5.93E-04	8.52E-04
BALA140		3.49E-03 ±	4.03E-03	8.57E-03
RU-106		3.98E-03 ±	5.34E-03	7.29E-03

Location and Quarter			Station 4	1st Q 2018
Nuclide	RQ	Activity	Error	MDA
BE-7	+	9.99E-02 ±	1.61E-02	1.67E-02
K-40		7.00E-03 ±	5.81E-03	1.46E-02
MN-54		6.29E-04 ±	3.49E-04	7.74E-04
FE-59		0.00E+00 ±	4.99E-03	1.03E-02
CO-60		2.96E-05 ±	4.90E-04	1.33E-03
ZN-65		0.00E+00 ±	2.54E-03	4.89E-03
ZRNB-95		3.40E-04 ±	9.86E-04	3.67E-03
CS-134		-1.54E-04 ±	5.01E-04	1.27E-03
CS-137		0.00E+00 ±	7.55E-04	1.87E-03
BALA140		3.84E-03 ±	7.79E-03	4.04E-02
RU-106		1.47E-03 ±	5.08E-03	1.13E-02

Location and Quarter			Station 4	2nd Q 2018
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.36E-01 ±	1.93E-02	1.84E-02
K-40		0.00E+00 ±	1.41E-02	2.55E-02
MN-54		-1.81E-04 ±	7.76E-04	1.60E-03
FE-59		0.00E+00 ±	6.50E-04	1.01E-02
CO-60		2.71E-04 ±	2.71E-04	1.08E-03
ZN-65		0.00E+00 ±	8.19E-04	3.46E-03
ZRNB-95		0.00E+00 ±	2.53E-04	4.31E-03
CS-134		1.75E-04 ±	4.88E-04	1.07E-03
CS-137		0.00E+00 ±	3.37E-04	1.44E-03
BALA140		0.00E+00 ±	2.51E-03	3.50E-02
RU-106		4.51E-03 ±	4.37E-03	9.39E-03

Location and Quarter			Station 4	3rd Q 2018
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.70E-01 ±	2.02E-02	9.01E-03
K-40		5.27E-03 ±	1.18E-02	1.48E-02
MN-54		1.45E-04 ±	4.26E-04	6.24E-04
FE-59		0.00E+00 ±	6.87E-04	5.91E-03
CO-60		3.53E-04 ±	3.16E-04	5.20E-04
ZN-65		2.70E-04 ±	1.60E-03	2.25E-03
ZRNB-95		-6.61E-04 ±	2.38E-03	3.31E-03
CS-134		4.34E-04 ±	5.39E-04	7.29E-04
CS-137		-1.30E-04 ±	7.73E-04	1.09E-03
BALA140		5.55E-03 ±	5.56E-03	1.02E-02
RU-106		-1.55E-03 ±	6.46E-03	9.35E-03

Location and Quarter			Station 4	4th Q 2018
Nuclide	RQ	Activity	Error	MDA
BE-7	+	7.61E-02 ±	1.44E-02	1.11E-02
K-40		0.00E+00 ±	2.11E-02	2.59E-02
MN-54		-2.37E-05 ±	6.30E-04	9.09E-04
FE-59		0.00E+00 ±	8.82E-04	5.36E-03
CO-60		0.00E+00 ±	3.18E-04	1.33E-03
ZN-65		0.00E+00 ±	2.49E-04	3.35E-03
ZRNB-95		5.67E-04 ±	1.81E-03	2.55E-03
CS-134		5.73E-04 ±	5.24E-04	6.79E-04
CS-137		0.00E+00 ±	2.29E-04	1.16E-03
BALA140		-1.60E-03 ±	1.59E-02	2.13E-02
RU-106		5.42E-04 ±	4.22E-03	6.44E-03

RQ = Results Qualifier. If blank, result is less than detection limit. If "+", result is above detection limit.

TABLE A-3.1

GAMMA SPECTROMETRY RESULTS OF AIR PARTICULATE FILTERS

Results in pCi/cubic meter, results decay corrected for decay during sample collection period

Location and Quarter			Station 5	1st Q 2018
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.09E-01 ±	1.72E-02	1.19E-02
K-40		7.42E-03 ±	6.16E-03	8.61E-03
MN-54		1.96E-04 ±	4.40E-04	6.26E-04
FE-59		4.69E-04 ±	4.40E-03	6.06E-03
CO-60		3.45E-04 ±	5.90E-04	7.89E-04
ZN-65		0.00E+00 ±	2.70E-04	3.03E-03
ZRNB-95		-2.03E-04 ±	1.70E-03	2.50E-03
CS-134		1.45E-04 ±	5.00E-04	7.32E-04
CS-137		-5.81E-05 ±	6.28E-04	9.13E-04
BALA140		0.00E+00 ±	4.35E-03	2.72E-02
RU-106		1.56E-03 ±	3.96E-03	5.88E-03

Location and Quarter			Station 5	2nd Q 2018
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.43E-01 ±	1.96E-02	2.25E-02
K-40		3.20E-03 ±	5.05E-03	1.52E-02
MN-54		3.34E-04 ±	6.00E-04	1.31E-03
FE-59		0.00E+00 ±	6.41E-03	1.22E-02
CO-60		3.11E-04 ±	2.08E-04	1.10E-03
ZN-65		0.00E+00 ±	1.86E-03	3.98E-03
ZRNB-95		-1.72E-04 ±	1.86E-03	4.06E-03
CS-134		1.43E-04 ±	4.91E-04	1.09E-03
CS-137		6.50E-04 ±	4.10E-04	9.29E-04
BALA140		9.09E-03 ±	5.52E-03	2.05E-02
RU-106		-3.82E-04 ±	6.22E-03	1.34E-02

Location and Quarter			Station 5	3rd Q 2018
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.77E-01 ±	2.23E-02	2.00E-02
K-40		9.89E-03 ±	8.47E-03	1.65E-02
MN-54		8.75E-04 ±	5.84E-04	1.15E-03
FE-59		2.51E-03 ±	3.58E-03	7.99E-03
CO-60		0.00E+00 ±	1.44E-04	1.15E-03
ZN-65		0.00E+00 ±	2.74E-04	3.67E-03
ZRNB-95		-8.08E-04 ±	2.44E-03	4.89E-03
CS-134		0.00E+00 ±	7.36E-05	1.50E-03
CS-137		-1.03E-04 ±	6.44E-04	1.40E-03
BALA140		0.00E+00 ±	2.85E-03	5.92E-02
RU-106		-7.91E-04 ±	6.48E-03	1.39E-02

Location and Quarter			Station 5	4th Q 2018
Nuclide	RQ	Activity	Error	MDA
BE-7	+	7.80E-02 ±	1.39E-02	9.25E-03
K-40		1.68E-03 ±	1.09E-02	1.41E-02
MN-54		0.00E+00 ±	3.12E-04	1.28E-03
FE-59		-2.19E-04 ±	4.08E-03	5.66E-03
CO-60		2.82E-04 ±	6.49E-04	8.76E-04
ZN-65		4.54E-04 ±	1.16E-03	1.63E-03
ZRNB-95		9.36E-04 ±	1.46E-03	1.99E-03
CS-134		-1.40E-04 ±	5.83E-04	8.44E-04
CS-137		9.83E-05 ±	4.43E-04	6.58E-04
BALA140		0.00E+00 ±	2.63E-03	2.33E-02
RU-106		3.95E-03 ±	3.48E-03	4.30E-03

Location and Quarter			Station 6	1st Q 2018
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.13E-01 ±	1.86E-02	1.43E-02
K-40		3.19E-03 ±	6.73E-03	8.78E-03
MN-54		-1.87E-04 ±	8.54E-04	1.17E-03
FE-59		1.06E-03 ±	3.14E-03	4.34E-03
CO-60		2.98E-05 ±	4.93E-04	7.50E-04
ZN-65		0.00E+00 ±	2.56E-04	3.18E-03
ZRNB-95		0.00E+00 ±	3.64E-04	2.97E-03
CS-134		1.21E-04 ±	5.25E-04	7.66E-04
CS-137		2.07E-05 ±	5.14E-04	7.67E-04
BALA140		-3.43E-03 ±	1.96E-02	2.60E-02
RU-106		0.00E+00 ±	7.43E-04	1.02E-02

Location and Quarter			Station 6	2nd Q 2018
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.74E-01 ±	2.08E-02	1.81E-02
K-40		4.95E-04 ±	1.17E-02	2.32E-02
MN-54		0.00E+00 ±	1.19E-03	2.26E-03
FE-59		1.08E-03 ±	3.21E-03	7.80E-03
CO-60		1.54E-04 ±	6.52E-04	1.62E-03
ZN-65		3.40E-04 ±	1.19E-03	3.05E-03
ZRNB-95		8.44E-04 ±	1.50E-03	3.41E-03
CS-134		-3.69E-05 ±	4.92E-04	1.13E-03
CS-137		2.22E-05 ±	4.30E-04	1.28E-03
BALA140		1.13E-02 ±	6.83E-03	2.13E-02
RU-106		1.98E-04 ±	4.55E-03	1.11E-02

Location and Quarter			Station 6	3rd Q 2018
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.65E-01 ±	1.94E-02	1.01E-02
K-40		1.99E-03 ±	5.39E-03	9.56E-03
MN-54		-1.67E-04 ±	6.58E-04	9.26E-04
FE-59		0.00E+00 ±	6.21E-04	5.34E-03
CO-60		0.00E+00 ±	1.54E-04	9.36E-04
ZN-65		-4.26E-04 ±	1.79E-03	2.39E-03
ZRNB-95		5.11E-04 ±	1.48E-03	2.10E-03
CS-134		-1.97E-04 ±	5.45E-04	7.70E-04
CS-137		-1.34E-04 ±	5.57E-04	8.06E-04
BALA140		0.00E+00 ±	5.38E-03	3.37E-02
RU-106		1.98E-03 ±	3.81E-03	5.43E-03

Location and Quarter			Station 6	4th Q 2018
Nuclide	RQ	Activity	Error	MDA
BE-7	+	7.55E-02 ±	1.36E-02	9.29E-03
K-40		7.82E-03 ±	7.60E-03	8.79E-03
MN-54		1.21E-04 ±	6.60E-04	9.31E-04
FE-59		1.62E-04 ±	4.89E-03	6.62E-03
CO-60		2.22E-05 ±	8.20E-04	1.14E-03
ZN-65		7.01E-04 ±	1.20E-03	1.61E-03
ZRNB-95		0.00E+00 ±	5.03E-04	2.90E-03
CS-134		-3.28E-04 ±	7.83E-04	1.09E-03
CS-137		1.17E-04 ±	6.74E-04	9.58E-04
BALA140		0.00E+00 ±	2.60E-03	2.30E-02
RU-106		1.85E-03 ±	5.15E-03	7.46E-03

RQ = Results Qualifier. If blank, result is less than detection limit. If "+", result is above detection limit.

TABLE A-3.1

GAMMA SPECTROMETRY RESULTS OF AIR PARTICULATE FILTERS

Results in pCi/cubic meter, results decay corrected for decay during sample collection period

Location and Quarter		Station 7 1st Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.05E-01 ±	1.68E-02	1.88E-02
K-40		6.76E-03 ±	8.95E-03	1.93E-02
MN-54		5.07E-04 ±	6.54E-04	1.37E-03
FE-59		0.00E+00 ±	5.43E-03	1.12E-02
CO-60		5.13E-04 ±	3.63E-04	1.03E-03
ZN-65		2.07E-04 ±	1.18E-03	3.09E-03
ZRNB-95		2.87E-04 ±	1.29E-03	3.99E-03
CS-134		0.00E+00 ±	7.74E-04	1.58E-03
CS-137		2.97E-05 ±	4.99E-04	1.41E-03
BALA140		0.00E+00 ±	2.06E-02	4.41E-02
RU-106		4.60E-03 ±	3.44E-03	8.50E-03

Location and Quarter		Station 7 2nd Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.54E-01 ±	2.02E-02	1.31E-02
K-40		5.24E-03 ±	7.21E-03	8.89E-03
MN-54		7.37E-05 ±	6.61E-04	9.43E-04
FE-59		0.00E+00 ±	1.61E-03	8.42E-03
CO-60		2.71E-04 ±	5.55E-04	7.59E-04
ZN-65		0.00E+00 ±	6.32E-04	3.48E-03
ZRNB-95		1.19E-03 ±	1.50E-03	1.99E-03
CS-134		2.62E-04 ±	5.49E-04	7.75E-04
CS-137		2.31E-04 ±	5.53E-04	7.76E-04
BALA140		3.98E-03 ±	4.60E-03	9.78E-03
RU-106		-1.50E-03 ±	6.23E-03	9.02E-03

Location and Quarter		Station 7 3rd Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.75E-01 ±	1.91E-02	8.60E-03
K-40	+	6.60E-03 ±	5.68E-03	6.49E-03
MN-54		1.67E-04 ±	4.84E-04	6.88E-04
FE-59		0.00E+00 ±	1.63E-03	4.95E-03
CO-60		1.68E-05 ±	6.22E-04	8.67E-04
ZN-65		0.00E+00 ±	7.89E-04	1.96E-03
ZRNB-95		2.63E-04 ±	1.34E-03	1.95E-03
CS-134		0.00E+00 ±	1.48E-04	7.90E-04
CS-137		1.55E-05 ±	4.59E-04	6.89E-04
BALA140		-2.06E-03 ±	1.67E-02	2.35E-02
RU-106		-8.48E-04 ±	4.67E-03	6.80E-03

Location and Quarter		Station 7 4th Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	8.07E-02 ±	1.43E-02	1.02E-02
K-40		8.39E-03 ±	7.63E-03	8.69E-03
MN-54		2.24E-04 ±	5.58E-04	7.76E-04
FE-59		1.07E-04 ±	3.95E-03	5.51E-03
CO-60		0.00E+00 ±	1.31E-04	1.34E-03
ZN-65		6.30E-04 ±	5.64E-04	9.29E-04
ZRNB-95		3.32E-04 ±	1.81E-03	2.61E-03
CS-134		3.41E-05 ±	4.54E-04	6.87E-04
CS-137		8.20E-05 ±	7.24E-04	1.03E-03
BALA140		7.73E-03 ±	6.32E-03	9.49E-03
RU-106		-3.66E-04 ±	5.95E-03	8.81E-03

Location and Quarter		Station 8 1st Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.15E-01 ±	1.49E-02	7.63E-03
K-40		9.58E-04 ±	6.69E-03	1.08E-02
MN-54		8.78E-05 ±	3.96E-04	5.88E-04
FE-59		7.89E-04 ±	9.11E-04	1.94E-03
CO-60		9.25E-05 ±	1.31E-04	3.41E-04
ZN-65		4.98E-05 ±	1.41E-03	1.97E-03
ZRNB-95		-4.16E-04 ±	1.64E-03	2.31E-03
CS-134		-4.01E-05 ±	4.70E-04	6.89E-04
CS-137		-4.80E-05 ±	4.78E-04	7.10E-04
BALA140		0.00E+00 ±	3.35E-03	2.49E-02
RU-106		-1.01E-03 ±	5.12E-03	7.41E-03

Location and Quarter		Station 8 2nd Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.49E-01 ±	1.65E-02	6.73E-03
K-40	+	7.69E-03 ±	3.98E-03	3.78E-03
MN-54		4.94E-05 ±	3.82E-04	5.78E-04
FE-59		4.15E-05 ±	2.17E-03	3.23E-03
CO-60		5.27E-04 ±	4.86E-04	5.77E-04
ZN-65		3.42E-04 ±	8.78E-04	1.23E-03
ZRNB-95		2.39E-04 ±	1.22E-03	1.77E-03
CS-134		1.58E-04 ±	3.71E-04	5.32E-04
CS-137		0.00E+00 ±	8.96E-05	8.17E-04
BALA140		-1.67E-04 ±	9.26E-03	1.33E-02
RU-106		1.56E-03 ±	3.49E-03	5.04E-03

Location and Quarter		Station 8 3rd Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.97E-01 ±	2.48E-02	1.40E-02
K-40	+	1.37E-02 ±	6.28E-03	5.30E-03
MN-54		-2.08E-04 ±	9.49E-04	1.30E-03
FE-59		0.00E+00 ±	8.36E-04	7.19E-03
CO-60		-2.54E-04 ±	1.13E-03	1.49E-03
ZN-65		2.15E-04 ±	1.22E-03	1.80E-03
ZRNB-95		-3.08E-04 ±	2.72E-03	3.86E-03
CS-134		2.84E-04 ±	3.25E-04	4.33E-04
CS-137		-5.27E-05 ±	7.25E-04	1.04E-03
BALA140		-6.02E-03 ±	3.45E-02	4.57E-02
RU-106		-4.11E-04 ±	6.69E-03	9.90E-03

Location and Quarter		Station 8 4th Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	7.23E-02 ±	1.39E-02	1.03E-02
K-40		1.02E-03 ±	1.09E-02	1.43E-02
MN-54		8.29E-05 ±	5.52E-04	8.04E-04
FE-59		1.39E-03 ±	3.19E-03	4.31E-03
CO-60		0.00E+00 ±	4.31E-04	1.17E-03
ZN-65		2.61E-04 ±	1.55E-03	2.18E-03
ZRNB-95		8.17E-04 ±	1.45E-03	2.01E-03
CS-134		2.65E-04 ±	5.55E-04	7.85E-04
CS-137		3.96E-04 ±	5.00E-04	6.63E-04
BALA140		0.00E+00 ±	3.79E-03	1.78E-02
RU-106		0.00E+00 ±	2.15E-03	1.10E-02

RQ = Results Qualifier. If blank, result is less than detection limit. If "+", result is above detection limit.

TABLE A-3.1

GAMMA SPECTROMETRY RESULTS OF AIR PARTICULATE FILTERS

Results in pCi/cubic meter, results decay corrected for decay during sample collection period

Location and Quarter		Station 9 1st Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.10E-01 ±	1.47E-02	9.13E-03
K-40	+	6.56E-03 ±	5.64E-03	6.45E-03
MN-54		4.83E-05 ±	3.74E-04	5.66E-04
FE-59		-4.22E-04 ±	3.18E-03	4.36E-03
CO-60		2.67E-04 ±	2.18E-04	3.28E-04
ZN-65		0.00E+00 ±	3.83E-04	1.90E-03
ZRNB-95		0.00E+00 ±	1.92E-04	2.41E-03
CS-134		1.54E-04 ±	3.62E-04	5.18E-04
CS-137		-1.54E-05 ±	4.56E-04	6.84E-04
BALA140		0.00E+00 ±	2.29E-03	2.41E-02
RU-106		0.00E+00 ±	1.11E-03	5.58E-03

Location and Quarter		Station 9 2nd Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.53E-01 ±	1.96E-02	1.54E-02
K-40		5.44E-03 ±	5.78E-03	1.58E-02
MN-54		1.31E-04 ±	7.14E-04	1.55E-03
FE-59		-5.54E-04 ±	5.63E-03	1.14E-02
CO-60		4.43E-06 ±	2.12E-05	1.95E-03
ZN-65		3.46E-04 ±	1.21E-03	3.10E-03
ZRNB-95		1.97E-03 ±	1.06E-03	2.25E-03
CS-134		1.86E-05 ±	5.49E-04	1.22E-03
CS-137		1.56E-04 ±	4.58E-04	1.28E-03
BALA140		4.88E-03 ±	7.35E-03	5.48E-02
RU-106		5.00E-03 ±	5.37E-03	1.12E-02

Location and Quarter		Station 9 3rd Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.70E-01 ±	1.93E-02	6.89E-03
K-40		2.22E-03 ±	8.76E-03	1.30E-02
MN-54		1.43E-04 ±	5.27E-04	7.58E-04
FE-59		1.59E-03 ±	1.42E-03	2.34E-03
CO-60		6.48E-05 ±	4.97E-04	7.20E-04
ZN-65		5.44E-04 ±	4.87E-04	8.02E-04
ZRNB-95		0.00E+00 ±	4.65E-04	2.68E-03
CS-134		0.00E+00 ±	2.82E-04	8.30E-04
CS-137		2.73E-04 ±	3.73E-04	5.14E-04
BALA140		0.00E+00 ±	5.52E-03	3.46E-02
RU-106		2.03E-03 ±	2.60E-03	3.56E-03

Location and Quarter		Station 9 4th Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	8.65E-02 ±	1.56E-02	1.16E-02
K-40		2.40E-03 ±	8.90E-03	1.16E-02
MN-54		2.43E-05 ±	6.47E-04	9.33E-04
FE-59		2.40E-03 ±	1.81E-03	2.53E-03
CO-60		2.64E-04 ±	2.64E-04	4.87E-04
ZN-65		5.76E-04 ±	1.18E-03	1.61E-03
ZRNB-95		-1.96E-04 ±	1.64E-03	2.41E-03
CS-134		4.98E-04 ±	3.46E-04	7.31E-04
CS-137		-1.37E-04 ±	6.04E-04	8.62E-04
BALA140		0.00E+00 ±	3.23E-03	3.40E-02
RU-106		-1.11E-03 ±	5.05E-03	7.46E-03

Location and Quarter		Station 21B 1st Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.08E-01 ±	1.83E-02	2.02E-02
K-40		2.24E-04 ±	1.24E-02	2.35E-02
MN-54		0.00E+00 ±	2.82E-04	1.74E-03
FE-59		3.12E-03 ±	2.08E-03	5.54E-03
CO-60		1.21E-04 ±	7.22E-04	1.63E-03
ZN-65		3.28E-04 ±	1.15E-03	2.94E-03
ZRNB-95		4.19E-04 ±	1.05E-03	2.87E-03
CS-134		-2.11E-04 ±	6.79E-04	1.37E-03
CS-137		0.00E+00 ±	1.19E-04	1.44E-03
BALA140		1.41E-02 ±	9.45E-03	2.51E-02
RU-106		3.79E-03 ±	4.27E-03	9.47E-03

Location and Quarter		Station 21B 2nd Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.54E-01 ±	2.07E-02	1.27E-02
K-40		4.10E-03 ±	7.30E-03	9.35E-03
MN-54		2.43E-04 ±	6.06E-04	8.42E-04
FE-59		4.89E-04 ±	4.58E-03	6.31E-03
CO-60		6.34E-05 ±	7.43E-04	1.06E-03
ZN-65		1.37E-04 ±	1.61E-03	2.29E-03
ZRNB-95		8.61E-04 ±	1.21E-03	1.65E-03
CS-134		1.84E-04 ±	6.16E-04	8.86E-04
CS-137		2.87E-04 ±	5.88E-04	8.16E-04
BALA140		-4.02E-03 ±	2.30E-02	3.05E-02
RU-106		-3.97E-04 ±	5.29E-03	7.99E-03

Location and Quarter		Station 21B 3rd Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.90E-01 ±	2.49E-02	1.54E-02
K-40		-2.48E-04 ±	9.72E-03	1.32E-02
MN-54		5.54E-04 ±	3.89E-04	8.86E-04
FE-59		5.06E-04 ±	3.88E-03	5.61E-03
CO-60		0.00E+00 ±	1.50E-04	1.54E-03
ZN-65		-2.96E-04 ±	1.76E-03	2.47E-03
ZRNB-95		-1.86E-04 ±	2.56E-03	3.69E-03
CS-134		0.00E+00 ±	7.84E-05	1.13E-03
CS-137		9.34E-05 ±	8.24E-04	1.17E-03
BALA140		0.00E+00 ±	5.38E-03	5.67E-02
RU-106		8.51E-04 ±	5.74E-03	8.57E-03

Location and Quarter		Station 21B 4th Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	7.98E-02 ±	1.48E-02	9.88E-03
K-40		8.99E-03 ±	4.99E-03	8.57E-03
MN-54		-2.56E-05 ±	6.82E-04	9.83E-04
FE-59		1.81E-03 ±	1.62E-03	2.67E-03
CO-60		4.88E-04 ±	3.69E-04	5.13E-04
ZN-65		0.00E+00 ±	2.70E-04	2.68E-03
ZRNB-95		2.29E-04 ±	1.99E-03	2.88E-03
CS-134		0.00E+00 ±	3.07E-04	9.91E-04
CS-137		0.00E+00 ±	3.68E-04	1.30E-03
BALA140		1.03E-02 ±	8.39E-03	1.26E-02
RU-106		-1.95E-03 ±	6.54E-03	9.40E-03

RQ = Results Qualifier. If blank, result is less than detection limit. If "+", result is above detection limit.

TABLE A-3.1

GAMMA SPECTROMETRY RESULTS OF AIR PARTICULATE FILTERS

Results in pCi/cubic meter, results decay corrected for decay during sample collection period

Location and Quarter		Station 23 1st Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.14E-01 ±	1.55E-02	9.29E-03
K-40		4.49E-04 ±	6.73E-03	1.10E-02
MN-54		8.94E-05 ±	4.03E-04	5.98E-04
FE-59		8.04E-04 ±	9.29E-04	1.98E-03
CO-60		2.62E-05 ±	3.12E-04	9.76E-04
ZN-65		0.00E+00 ±	4.96E-04	2.51E-03
ZRNB-95		1.03E-03 ±	9.72E-04	1.20E-03
CS-134		2.58E-04 ±	3.53E-04	4.84E-04
CS-137		-1.63E-05 ±	3.74E-04	5.80E-04
BALA140		-1.42E-03 ±	1.15E-02	1.61E-02
RU-106		1.32E-03 ±	4.49E-03	6.50E-03

Location and Quarter		Station 23 2nd Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.50E-01 ±	2.01E-02	1.22E-02
K-40		3.19E-03 ±	6.73E-03	8.77E-03
MN-54		-3.26E-05 ±	7.51E-04	1.06E-03
FE-59		4.02E-04 ±	3.08E-03	4.46E-03
CO-60		-2.68E-04 ±	1.12E-03	1.48E-03
ZN-65		1.93E-04 ±	1.10E-03	1.62E-03
ZRNB-95		-3.06E-04 ±	1.91E-03	2.75E-03
CS-134		-1.55E-04 ±	5.30E-04	7.67E-04
CS-137		-1.31E-04 ±	6.74E-04	9.56E-04
BALA140		4.60E-03 ±	1.59E-02	2.16E-02
RU-106		2.05E-03 ±	4.59E-03	6.63E-03

Location and Quarter		Station 23 3rd Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.63E-01 ±	1.88E-02	9.58E-03
K-40		7.02E-03 ±	5.70E-03	1.13E-02
MN-54		1.84E-05 ±	4.56E-04	6.80E-04
FE-59		0.00E+00 ±	8.08E-04	5.84E-03
CO-60		2.57E-04 ±	4.89E-04	6.46E-04
ZN-65		8.30E-04 ±	9.79E-04	1.23E-03
ZRNB-95		3.65E-04 ±	1.34E-03	1.93E-03
CS-134		0.00E+00 ±	5.16E-05	7.06E-04
CS-137		0.00E+00 ±	1.50E-04	7.38E-04
BALA140		-2.94E-04 ±	1.63E-02	2.35E-02
RU-106		5.59E-04 ±	3.77E-03	5.63E-03

Location and Quarter		Station 23 4th Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	7.90E-02 ±	1.50E-02	1.12E-02
K-40		7.28E-03 ±	9.94E-03	1.21E-02
MN-54		3.88E-04 ±	6.14E-04	8.18E-04
FE-59		-1.79E-04 ±	5.39E-03	7.30E-03
CO-60		-1.03E-04 ±	1.05E-03	1.41E-03
ZN-65		0.00E+00 ±	5.33E-04	2.22E-03
ZRNB-95		9.06E-05 ±	1.95E-03	2.85E-03
CS-134		3.57E-05 ±	4.76E-04	7.20E-04
CS-137		0.00E+00 ±	2.97E-04	1.41E-03
BALA140		-2.82E-04 ±	1.56E-02	2.25E-02
RU-106		-1.73E-03 ±	5.91E-03	8.56E-03

Location and Quarter		Station 40 1st Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	8.48E-02 ±	1.43E-02	1.33E-02
K-40		-2.32E-03 ±	1.09E-02	2.10E-02
MN-54		2.78E-04 ±	5.80E-04	1.29E-03
FE-59		0.00E+00 ±	2.16E-03	9.35E-03
CO-60		2.70E-04 ±	5.52E-04	1.34E-03
ZN-65		0.00E+00 ±	2.59E-04	3.46E-03
ZRNB-95		4.36E-05 ±	1.32E-03	3.35E-03
CS-134		0.00E+00 ±	9.83E-05	1.47E-03
CS-137		0.00E+00 ±	2.64E-04	1.76E-03
BALA140		0.00E+00 ±	3.11E-03	3.60E-02
RU-106		2.81E-03 ±	4.74E-03	1.05E-02

Location and Quarter		Station 40 2nd Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.31E-01 ±	1.96E-02	1.41E-02
K-40		2.29E-03 ±	1.29E-02	1.65E-02
MN-54		3.91E-04 ±	6.20E-04	8.25E-04
FE-59		0.00E+00 ±	1.02E-03	9.22E-03
CO-60		-1.55E-04 ±	9.01E-04	1.23E-03
ZN-65		7.39E-04 ±	1.27E-03	1.69E-03
ZRNB-95		-1.83E-04 ±	1.97E-03	2.87E-03
CS-134		0.00E+00 ±	3.06E-04	1.27E-03
CS-137		-7.20E-06 ±	6.88E-04	9.98E-04
BALA140		1.02E-02 ±	8.33E-03	1.25E-02
RU-106		7.78E-04 ±	5.24E-03	7.83E-03

Location and Quarter		Station 40 3rd Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.94E-01 ±	2.43E-02	1.34E-02
K-40		5.95E-04 ±	6.70E-03	9.50E-03
MN-54		3.05E-04 ±	6.35E-04	8.69E-04
FE-59		2.98E-03 ±	4.25E-03	5.39E-03
CO-60		-6.01E-05 ±	6.40E-04	9.34E-04
ZN-65		-7.11E-05 ±	2.02E-03	2.82E-03
ZRNB-95		1.84E-03 ±	1.53E-03	3.28E-03
CS-134		0.00E+00 ±	1.07E-04	9.06E-04
CS-137		4.71E-04 ±	6.24E-04	8.30E-04
BALA140		1.30E-02 ±	1.16E-02	1.91E-02
RU-106		1.84E-03 ±	3.20E-03	4.67E-03

Location and Quarter		Station 40 4th Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	8.71E-02 ±	1.46E-02	9.10E-03
K-40		-1.09E-03 ±	1.22E-02	1.57E-02
MN-54		3.81E-04 ±	4.61E-04	5.95E-04
FE-59		3.82E-03 ±	2.30E-03	5.51E-03
CO-60		2.09E-04 ±	6.20E-04	8.56E-04
ZN-65		1.41E-03 ±	8.52E-04	2.05E-03
ZRNB-95		1.07E-03 ±	1.20E-03	1.56E-03
CS-134		-3.44E-05 ±	5.59E-04	8.27E-04
CS-137		-2.06E-04 ±	7.40E-04	1.03E-03
BALA140		2.82E-03 ±	2.24E-02	2.99E-02
RU-106		1.67E-03 ±	4.51E-03	6.60E-03

RQ = Results Qualifier. If blank, result is less than detection limit. If "+", result is above detection limit.

TABLE A-3.1

GAMMA SPECTROMETRY RESULTS OF AIR PARTICULATE FILTERS

Results in pCi/cubic meter, results decay corrected for decay during sample collection period

Location and Quarter		Station 48 1st Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.15E-01 ±	1.65E-02	1.10E-02
K-40	+	1.18E-02 ±	7.09E-03	7.24E-03
MN-54		-2.71E-05 ±	4.15E-04	6.36E-04
FE-59		3.32E-04 ±	2.55E-03	3.69E-03
CO-60		5.00E-05 ±	5.86E-04	8.35E-04
ZN-65		3.77E-04 ±	9.66E-04	1.36E-03
ZRNB-95		4.68E-04 ±	1.18E-03	1.69E-03
CS-134		-2.60E-04 ±	6.26E-04	8.74E-04
CS-137		0.00E+00 ±	6.92E-05	7.68E-04
BALA140		6.46E-03 ±	5.79E-03	9.52E-03
RU-106		-4.66E-04 ±	4.64E-03	6.90E-03

Location and Quarter		Station 48 2nd Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.45E-01 ±	1.98E-02	1.19E-02
K-40		6.77E-03 ±	7.67E-03	9.16E-03
MN-54		1.87E-04 ±	5.85E-04	8.25E-04
FE-59		-2.40E-04 ±	4.46E-03	6.20E-03
CO-60		0.00E+00 ±	1.24E-04	1.40E-03
ZN-65		6.72E-05 ±	1.91E-03	2.67E-03
ZRNB-95		-3.20E-04 ±	1.99E-03	2.87E-03
CS-134		0.00E+00 ±	7.21E-05	9.87E-04
CS-137		1.01E-04 ±	4.54E-04	6.74E-04
BALA140		0.00E+00 ±	3.41E-03	4.07E-02
RU-106		1.75E-03 ±	4.73E-03	6.93E-03

Location and Quarter		Station 48 3rd Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.66E-01 ±	1.89E-02	7.26E-03
K-40		8.40E-03 ±	6.50E-03	9.47E-03
MN-54		2.18E-04 ±	5.23E-04	7.35E-04
FE-59		6.69E-04 ±	2.83E-03	4.00E-03
CO-60		2.15E-04 ±	2.16E-04	3.97E-04
ZN-65		5.27E-05 ±	8.74E-04	1.33E-03
ZRNB-95		4.70E-04 ±	9.25E-04	1.34E-03
CS-134		1.39E-04 ±	3.88E-04	5.61E-04
CS-137		0.00E+00 ±	9.37E-05	7.97E-04
BALA140		0.00E+00 ±	3.83E-03	4.03E-02
RU-106		-1.36E-03 ±	5.42E-03	7.79E-03

Location and Quarter		Station 48 4th Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	6.55E-02 ±	1.28E-02	8.75E-03
K-40		6.22E-03 ±	7.74E-03	1.12E-02
MN-54		5.18E-04 ±	6.13E-04	7.85E-04
FE-59		2.43E-03 ±	1.84E-03	2.56E-03
CO-60		1.43E-04 ±	6.04E-04	8.54E-04
ZN-65		0.00E+00 ±	2.56E-04	2.54E-03
ZRNB-95		7.23E-04 ±	1.73E-03	2.43E-03
CS-134		8.57E-05 ±	5.17E-04	7.61E-04
CS-137		-9.57E-05 ±	5.97E-04	8.60E-04
BALA140		-2.26E-03 ±	2.24E-02	3.00E-02
RU-106		0.00E+00 ±	3.62E-03	7.45E-03

Location and Quarter		Station 57 1st Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.02E-01 ±	1.70E-02	1.79E-02
K-40		3.29E-03 ±	9.66E-03	1.96E-02
MN-54		0.00E+00 ±	1.47E-04	1.69E-03
FE-59		0.00E+00 ±	1.03E-03	1.12E-02
CO-60		6.36E-04 ±	4.03E-04	1.02E-03
ZN-65		1.37E-04 ±	1.61E-03	3.67E-03
ZRNB-95		1.02E-03 ±	1.59E-03	3.55E-03
CS-134		3.32E-04 ±	5.34E-04	1.13E-03
CS-137		-1.77E-04 ±	7.90E-04	1.60E-03
BALA140		3.03E-03 ±	1.59E-02	3.83E-02
RU-106		2.18E-03 ±	4.90E-03	1.11E-02

Location and Quarter		Station 57 2nd Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.37E-01 ±	1.83E-02	1.62E-02
K-40		8.98E-04 ±	9.68E-03	2.07E-02
MN-54		-1.81E-04 ±	7.79E-04	1.60E-03
FE-59		3.14E-03 ±	2.10E-03	5.59E-03
CO-60		7.39E-04 ±	4.46E-04	1.08E-03
ZN-65		-2.61E-04 ±	1.55E-03	3.49E-03
ZRNB-95		7.31E-04 ±	1.75E-03	3.82E-03
CS-134		3.49E-05 ±	4.66E-04	1.07E-03
CS-137		-5.58E-05 ±	4.73E-04	1.32E-03
BALA140		-5.74E-04 ±	2.91E-03	3.83E-02
RU-106		-1.13E-03 ±	5.05E-03	1.32E-02

Location and Quarter		Station 57 3rd Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	1.81E-01 ±	2.31E-02	1.32E-02
K-40		-1.72E-03 ±	1.12E-02	1.45E-02
MN-54		3.98E-04 ±	6.30E-04	8.38E-04
FE-59		4.05E-03 ±	2.57E-03	6.49E-03
CO-60		4.17E-04 ±	3.41E-04	5.12E-04
ZN-65		4.12E-04 ±	4.76E-04	1.01E-03
ZRNB-95		2.11E-03 ±	1.54E-03	3.22E-03
CS-134		-1.09E-04 ±	5.99E-04	8.73E-04
CS-137		0.00E+00 ±	1.22E-04	1.08E-03
BALA140		-6.04E-03 ±	3.46E-02	4.58E-02
RU-106		9.85E-04 ±	5.94E-03	8.75E-03

Location and Quarter		Station 57 4th Q 2018		
Nuclide	RQ	Activity	Error	MDA
BE-7	+	8.76E-02 ±	1.80E-02	1.54E-02
K-40		8.68E-03 ±	6.38E-03	1.52E-02
MN-54		1.78E-04 ±	6.99E-04	9.76E-04
FE-59		2.18E-03 ±	1.78E-03	2.68E-03
CO-60		4.14E-04 ±	3.38E-04	5.09E-04
ZN-65		0.00E+00 ±	2.68E-04	2.66E-03
ZRNB-95		-7.11E-04 ±	2.28E-03	3.18E-03
CS-134		1.44E-04 ±	4.94E-04	7.23E-04
CS-137		4.44E-04 ±	5.13E-04	6.71E-04
BALA140		0.00E+00 ±	3.56E-03	4.26E-02
RU-106		1.55E-03 ±	5.33E-03	7.81E-03

RQ = Results Qualifier. If blank, result is less than detection limit. If "+", result is above detection limit.

TABLE A-3.2
GAMMA SPECTROMETRY RESULTS OF AIR PARTICULATE FILTERS - SUMMARY
 Results in pCi/cubic meter, corrected for decay during collection period

Nuclide		Average Activity	Activity Low	Activity High	Average MDA	Number of Samples	Number of Positive IDs
BE-7	Ind	1.27E-01	5.84E-02	1.97E-01	1.27E-02	44	44
BE-7	Cntl	1.30E-01	8.65E-02	1.70E-01	1.08E-02	4	4
K-40	Ind	4.06E-03	-2.32E-03	1.37E-02	1.37E-02	44	4
K-40	Cntl	4.16E-03	2.22E-03	6.56E-03	1.17E-02	4	1
MN-54	Ind	1.70E-04	-2.08E-04	8.75E-04	9.88E-04	44	0
MN-54	Cntl	8.68E-05	2.43E-05	1.43E-04	9.52E-04	4	0
FE-59	Ind	8.41E-04	-2.40E-04	4.05E-03	6.15E-03	44	0
FE-59	Cntl	7.53E-04	-5.54E-04	2.40E-03	5.17E-03	4	0
CO-60	Ind	1.42E-04	-2.68E-04	7.39E-04	1.03E-03	44	0
CO-60	Cntl	1.50E-04	4.43E-06	2.67E-04	8.71E-04	4	0
ZN-65	Ind	1.35E-04	-5.53E-04	1.41E-03	2.51E-03	44	0
ZN-65	Cntl	3.66E-04	0.00E+00	5.76E-04	1.85E-03	4	0
ZRNB-95	Ind	3.32E-04	-8.11E-04	2.11E-03	2.78E-03	44	0
ZRNB-95	Cntl	4.44E-04	-1.96E-04	1.97E-03	2.44E-03	4	0
CS-134	Ind	4.68E-05	-3.28E-04	5.73E-04	9.15E-04	44	0
CS-134	Cntl	1.68E-04	0.00E+00	4.98E-04	8.26E-04	4	0
CS-137	Ind	5.07E-05	-2.06E-04	6.50E-04	1.02E-03	44	0
CS-137	Cntl	6.91E-05	-1.37E-04	2.73E-04	8.35E-04	4	0
BALA140	Ind	1.85E-03	-6.04E-03	1.41E-02	2.80E-02	44	0
BALA140	Cntl	1.22E-03	0.00E+00	4.88E-03	3.69E-02	4	0
RU-106	Ind	8.30E-04	-1.95E-03	4.60E-03	8.44E-03	44	0
RU-106	Cntl	1.48E-03	-1.11E-03	5.00E-03	6.95E-03	4	0

TABLE A-4.1
GAMMA SPECTROMETRY RESULTS OF IODINE-131 ON CHARCOAL FILTERS

Results in pCi/cubic meter, corrected for decay during collection period

Collection Period	Station 1				Station 9			
	RQ	Activity	Error	MDA	RQ	Activity	Error	MDA
1/2/2018 - 1/9/2018		-5.40E-03	± 1.20E-02	1.79E-02		0.00E+00	± 4.69E-03	1.74E-02
1/9/2018 - 1/16/2018		3.16E-04	± 1.05E-02	1.66E-02		-4.61E-04	± 8.15E-03	1.30E-02
1/16/2018 - 1/23/2018		0.00E+00	± 4.25E-03	2.03E-02		-1.87E-03	± 9.08E-03	1.40E-02
1/23/2018 - 1/30/2018		4.36E-03	± 1.24E-02	1.86E-02		0.00E+00	± 3.41E-03	1.73E-02
1/30/2018 - 2/6/2018		2.06E-04	± 9.67E-03	1.54E-02		5.63E-04	± 1.09E-02	1.68E-02
2/6/2018 - 2/13/2018		5.54E-03	± 1.03E-02	1.53E-02		1.75E-03	± 1.12E-02	1.71E-02
2/13/2018 - 2/20/2018		-5.53E-03	± 1.30E-02	1.92E-02		5.16E-03	± 8.49E-03	1.26E-02
2/20/2018 - 2/27/2018		0.00E+00	± 3.69E-03	1.93E-02		3.13E-03	± 9.83E-03	1.49E-02
2/27/2018 - 3/6/2018		1.81E-03	± 1.18E-02	1.81E-02		4.94E-03	± 1.02E-02	1.53E-02
3/6/2018 - 3/13/2018		3.91E-03	± 8.91E-03	1.36E-02		1.07E-04	± 9.41E-03	1.51E-02
3/13/2018 - 3/20/2018		7.59E-03	± 1.01E-02	1.46E-02		-2.42E-03	± 1.18E-02	1.81E-02
3/20/2018 - 3/27/2018		0.00E+00	± 1.26E-03	1.38E-02		3.02E-04	± 1.01E-02	1.59E-02
3/27/2018 - 4/3/2018		2.00E-03	± 1.28E-02	1.96E-02		-3.52E-03	± 1.24E-02	1.87E-02
4/3/2018 - 4/10/2018		5.72E-03	± 8.90E-03	1.31E-02		1.32E-03	± 9.11E-03	1.43E-02
4/10/2018 - 4/17/2018		7.38E-03	± 8.72E-03	1.24E-02		1.50E-03	± 6.49E-03	1.04E-02
4/17/2018 - 4/24/2018		4.21E-03	± 9.81E-03	1.47E-02		0.00E+00	± 3.51E-03	1.38E-02
4/24/2018 - 5/1/2018		-7.67E-04	± 1.02E-02	1.58E-02		4.27E-03	± 9.95E-03	1.49E-02
5/1/2018 - 5/8/2018		-5.95E-04	± 8.15E-03	1.30E-02		1.66E-03	± 7.50E-03	1.18E-02
5/8/2018 - 5/15/2018		-6.86E-03	± 1.40E-02	2.06E-02		-5.87E-03	± 1.25E-02	1.85E-02
5/15/2018 - 5/22/2018		-3.03E-04	± 1.01E-02	1.59E-02		6.04E-03	± 9.48E-03	1.39E-02
5/22/2018 - 5/29/2018		8.27E-03	± 8.06E-03	1.11E-02		-6.95E-04	± 1.10E-02	1.71E-02
5/29/2018 - 6/5/2018		3.03E-03	± 8.63E-03	1.33E-02		4.34E-03	± 9.79E-03	1.47E-02
6/5/2018 - 6/12/2018		-3.19E-03	± 1.08E-02	1.64E-02		0.00E+00	± 4.54E-03	1.88E-02
6/12/2018 - 6/19/2018		-7.01E-04	± 1.11E-02	1.73E-02		-1.53E-03	± 1.03E-02	1.60E-02
6/19/2018 - 6/26/2018		2.62E-03	± 9.77E-03	1.50E-02		-1.23E-03	± 1.19E-02	1.84E-02
6/26/2018 - 7/3/2018		-1.29E-03	± 1.11E-02	1.71E-02		1.00E-03	± 1.06E-02	1.66E-02
7/3/2018 - 7/10/2018		-4.09E-03	± 1.23E-02	1.85E-02		8.56E-04	± 1.02E-02	1.60E-02
7/10/2018 - 7/17/2018		-3.63E-03	± 1.20E-02	1.81E-02		0.00E+00	± 3.03E-03	1.92E-02
7/17/2018 - 7/24/2018		-3.48E-03	± 1.30E-02	1.97E-02		0.00E+00	± 4.04E-03	2.05E-02
7/24/2018 - 7/31/2018		0.00E+00	± 1.75E-03	1.92E-02		-3.23E-04	± 1.08E-02	1.70E-02
7/31/2018 - 8/7/2018		4.70E-03	± 1.12E-02	1.69E-02		-1.59E-03	± 1.08E-02	1.67E-02
8/7/2018 - 8/14/2018		3.09E-03	± 1.22E-02	1.85E-02		5.70E-03	± 8.86E-03	1.31E-02
8/14/2018 - 8/21/2018		-5.77E-03	± 1.36E-02	2.03E-02		1.24E-03	± 1.32E-02	2.05E-02
8/21/2018 - 8/28/2018		-1.90E-03	± 1.12E-02	1.72E-02		0.00E+00	± 4.98E-03	1.71E-02
8/28/2018 - 9/4/2018		3.57E-03	± 8.94E-03	1.36E-02		0.00E+00	± 4.17E-03	1.93E-02
9/4/2018 - 9/11/2018		5.26E-04	± 1.16E-02	1.81E-02		-9.76E-04	± 1.09E-02	1.71E-02
9/11/2018 - 9/18/2018		-1.46E-03	± 1.26E-02	1.93E-02		-2.50E-03	± 1.13E-02	1.72E-02
9/18/2018 - 9/25/2018		-3.19E-03	± 1.00E-02	1.52E-02		-1.18E-03	± 9.60E-03	1.51E-02
9/25/2018 - 10/2/2018		7.05E-03	± 8.95E-03	1.29E-02		6.13E-03	± 9.17E-03	1.34E-02
10/2/2018 - 10/9/2018		0.00E+00	± 3.32E-03	1.82E-02		8.98E-04	± 1.00E-02	1.57E-02
10/9/2018 - 10/16/2018		-7.06E-03	± 1.66E-02	2.37E-02		6.48E-03	± 1.31E-02	1.88E-02
10/16/2018 - 10/23/2018		-3.94E-03	± 1.36E-02	2.03E-02		-4.56E-03	± 1.28E-02	1.91E-02
10/23/2018 - 10/30/2018		3.93E-03	± 8.17E-03	1.23E-02		1.09E-03	± 1.10E-02	1.71E-02
10/30/2018 - 11/6/2018		4.81E-03	± 1.22E-02	1.77E-02		-1.62E-03	± 1.59E-02	2.35E-02
11/6/2018 - 11/13/2018		2.17E-03	± 1.47E-02	2.16E-02		7.64E-03	± 1.26E-02	1.79E-02
11/13/2018 - 11/20/2018		0.00E+00	± 4.89E-03	2.43E-02		3.19E-03	± 1.27E-02	1.87E-02
11/20/2018 - 11/27/2018		2.86E-03	± 8.74E-03	1.33E-02		-4.40E-03	± 1.03E-02	1.55E-02
11/27/2018 - 12/4/2018		-4.50E-04	± 1.08E-02	1.67E-02		3.56E-04	± 9.38E-03	1.47E-02
12/4/2018 - 12/11/2018		2.84E-03	± 8.70E-03	1.33E-02		-1.43E-03	± 8.55E-03	1.33E-02
12/11/2018 - 12/18/2018		-1.80E-03	± 1.29E-02	1.91E-02		1.06E-03	± 1.11E-02	1.67E-02
12/18/2018 - 12/26/2018		4.84E-04	± 1.27E-02	1.89E-02		1.16E-03	± 1.23E-02	1.82E-02
12/26/2018 - 1/2/2019		-7.59E-03	± 1.74E-02	2.47E-02		-1.56E-03	± 1.48E-02	2.17E-02

NVS = Valid sample not obtained due to sampler failure.

RQ= Results Qualifier. If blank, result is less than detection limit. If "+", result is above detection limit.

TABLE A-4.1
GAMMA SPECTROMETRY RESULTS OF IODINE-131 ON CHARCOAL FILTERS

Results in pCi/cubic meter, corrected for decay during collection period

Collection Period	Station 4				Station 21B			
	RQ	Activity	Error	MDA	RQ	Activity	Error	MDA
1/2/2018 - 1/9/2018		-4.76E-03	± 1.06E-02	1.58E-02		0.00E+00	± 4.73E-03	1.75E-02
1/9/2018 - 1/16/2018		2.71E-04	± 9.02E-03	1.42E-02		-4.67E-04	± 8.26E-03	1.31E-02
1/16/2018 - 1/23/2018		0.00E+00	± 3.69E-03	1.76E-02		-1.89E-03	± 9.19E-03	1.42E-02
1/23/2018 - 1/30/2018		3.79E-03	± 1.08E-02	1.62E-02		0.00E+00	± 3.45E-03	1.75E-02
1/30/2018 - 2/6/2018		1.80E-04	± 8.49E-03	1.35E-02		5.55E-04	± 1.07E-02	1.66E-02
2/6/2018 - 2/13/2018		5.12E-03	± 9.54E-03	1.41E-02		1.80E-03	± 1.15E-02	1.77E-02
2/13/2018 - 2/20/2018		-5.23E-03	± 1.23E-02	1.82E-02		5.06E-03	± 8.33E-03	1.23E-02
2/20/2018 - 2/27/2018		0.00E+00	± 3.48E-03	1.82E-02		3.06E-03	± 9.60E-03	1.46E-02
2/27/2018 - 3/6/2018		1.67E-03	± 1.09E-02	1.67E-02		4.86E-03	± 1.01E-02	1.50E-02
3/6/2018 - 3/13/2018		3.58E-03	± 8.15E-03	1.24E-02		1.06E-04	± 9.35E-03	1.50E-02
3/13/2018 - 3/20/2018		6.89E-03	± 9.19E-03	1.33E-02		-2.35E-03	± 1.15E-02	1.76E-02
3/20/2018 - 3/27/2018		0.00E+00	± 1.05E-03	1.15E-02		2.93E-04	± 9.78E-03	1.54E-02
3/27/2018 - 4/3/2018		1.70E-03	± 1.09E-02	1.67E-02		-3.41E-03	± 1.20E-02	1.81E-02
4/3/2018 - 4/10/2018		4.81E-03	± 7.47E-03	1.10E-02		1.29E-03	± 8.92E-03	1.40E-02
4/10/2018 - 4/17/2018		7.07E-03	± 8.35E-03	1.19E-02		1.61E-03	± 6.96E-03	1.11E-02
4/17/2018 - 4/24/2018		4.02E-03	± 9.37E-03	1.41E-02		0.00E+00	± 3.77E-03	1.48E-02
4/24/2018 - 5/1/2018		-7.32E-04	± 9.69E-03	1.51E-02		4.54E-03	± 1.06E-02	1.59E-02
5/1/2018 - 5/8/2018		-5.59E-04	± 7.66E-03	1.23E-02		1.55E-03	± 7.03E-03	1.11E-02
5/8/2018 - 5/15/2018		-6.46E-03	± 1.32E-02	1.94E-02		-5.74E-03	± 1.22E-02	1.81E-02
5/15/2018 - 5/22/2018		-2.85E-04	± 9.48E-03	1.49E-02		5.99E-03	± 9.41E-03	1.38E-02
5/22/2018 - 5/29/2018		7.76E-03	± 7.56E-03	1.04E-02		-6.77E-04	± 1.07E-02	1.67E-02
5/29/2018 - 6/5/2018		2.82E-03	± 8.06E-03	1.24E-02		4.24E-03	± 9.58E-03	1.44E-02
6/5/2018 - 6/12/2018		-3.03E-03	± 1.03E-02	1.57E-02		0.00E+00	± 4.37E-03	1.81E-02
6/12/2018 - 6/19/2018		-6.58E-04	± 1.04E-02	1.62E-02		-1.46E-03	± 9.87E-03	1.53E-02
6/19/2018 - 6/26/2018		2.47E-03	± 9.23E-03	1.42E-02		-1.18E-03	± 1.14E-02	1.76E-02
6/26/2018 - 7/3/2018		-1.22E-03	± 1.04E-02	1.61E-02		9.74E-04	± 1.03E-02	1.61E-02
7/3/2018 - 7/10/2018		-3.85E-03	± 1.16E-02	1.75E-02		8.33E-04	± 9.88E-03	1.56E-02
7/10/2018 - 7/17/2018		-3.44E-03	± 1.13E-02	1.71E-02		0.00E+00	± 2.92E-03	1.85E-02
7/17/2018 - 7/24/2018		-3.31E-03	± 1.24E-02	1.87E-02		0.00E+00	± 3.86E-03	1.95E-02
7/24/2018 - 7/31/2018		0.00E+00	± 1.66E-03	1.81E-02		-3.08E-04	± 1.02E-02	1.61E-02
7/31/2018 - 8/7/2018		4.47E-03	± 1.07E-02	1.60E-02		-1.52E-03	± 1.03E-02	1.60E-02
8/7/2018 - 8/14/2018		3.00E-03	± 1.18E-02	1.79E-02		6.28E-03	± 9.76E-03	1.44E-02
8/14/2018 - 8/21/2018		-5.80E-03	± 1.37E-02	2.04E-02		1.49E-03	± 1.59E-02	2.47E-02
8/21/2018 - 8/28/2018		-1.82E-03	± 1.07E-02	1.65E-02		0.00E+00	± 4.66E-03	1.60E-02
8/28/2018 - 9/4/2018		3.47E-03	± 8.71E-03	1.32E-02		0.00E+00	± 4.15E-03	1.92E-02
9/4/2018 - 9/11/2018		5.34E-04	± 1.18E-02	1.84E-02		-9.71E-04	± 1.09E-02	1.70E-02
9/11/2018 - 9/18/2018		-1.45E-03	± 1.25E-02	1.92E-02		-2.50E-03	± 1.13E-02	1.73E-02
9/18/2018 - 9/25/2018		-3.15E-03	± 9.88E-03	1.50E-02		-1.18E-03	± 9.57E-03	1.51E-02
9/25/2018 - 10/2/2018		6.95E-03	± 8.82E-03	1.27E-02		6.10E-03	± 9.12E-03	1.34E-02
10/2/2018 - 10/9/2018		0.00E+00	± 3.30E-03	1.81E-02		9.24E-04	± 1.03E-02	1.62E-02
10/9/2018 - 10/16/2018		-6.96E-03	± 1.64E-02	2.34E-02		6.62E-03	± 1.34E-02	1.92E-02
10/16/2018 - 10/23/2018		-3.89E-03	± 1.34E-02	2.00E-02		-4.58E-03	± 1.28E-02	1.92E-02
10/23/2018 - 10/30/2018		3.94E-03	± 8.19E-03	1.23E-02		1.09E-03	± 1.11E-02	1.71E-02
10/30/2018 - 11/6/2018		4.81E-03	± 1.22E-02	1.77E-02		-1.79E-03	± 1.75E-02	2.58E-02
11/6/2018 - 11/13/2018		2.20E-03	± 1.50E-02	2.19E-02		8.19E-03	± 1.36E-02	1.92E-02
11/13/2018 - 11/20/2018		0.00E+00	± 4.90E-03	2.44E-02		3.39E-03	± 1.35E-02	1.98E-02
11/20/2018 - 11/27/2018		2.86E-03	± 8.74E-03	1.33E-02		-4.78E-03	± 1.12E-02	1.68E-02
11/27/2018 - 12/4/2018		-4.50E-04	± 1.08E-02	1.67E-02		3.86E-04	± 1.02E-02	1.59E-02
12/4/2018 - 12/11/2018		2.80E-03	± 8.56E-03	1.31E-02		-1.50E-03	± 9.00E-03	1.40E-02
12/11/2018 - 12/18/2018		-1.79E-03	± 1.29E-02	1.91E-02		1.12E-03	± 1.17E-02	1.77E-02
12/18/2018 - 12/26/2018		4.81E-04	± 1.26E-02	1.88E-02		1.24E-03	± 1.31E-02	1.95E-02
12/26/2018 - 1/2/2019		-7.59E-03	± 1.74E-02	2.47E-02		-1.65E-03	± 1.56E-02	2.30E-02

NVS = Valid sample not obtained due to sampler failure.

RQ= Results Qualifier. If blank, result is less than detection limit. If "+", result is above detection limit.

TABLE A-4.1
GAMMA SPECTROMETRY RESULTS OF IODINE-131 ON CHARCOAL FILTERS

Results in pCi/cubic meter, corrected for decay during collection period

Collection Period	Station 5				Station 23			
	RQ	Activity	Error	MDA	RQ	Activity	Error	MDA
1/2/2018 - 1/9/2018		-5.05E-03	± 1.13E-02	1.68E-02		-2.98E-04	± 9.93E-03	1.56E-02
1/9/2018 - 1/16/2018		2.75E-04	± 9.15E-03	1.44E-02		1.99E-03	± 9.61E-03	1.49E-02
1/16/2018 - 1/23/2018		0.00E+00	± 3.81E-03	1.82E-02		-3.99E-03	± 1.32E-02	1.99E-02
1/23/2018 - 1/30/2018		3.82E-03	± 1.09E-02	1.63E-02		0.00E+00	± 3.71E-03	1.88E-02
1/30/2018 - 2/6/2018		1.82E-04	± 8.56E-03	1.36E-02		3.16E-03	± 9.37E-03	1.43E-02
2/6/2018 - 2/13/2018		5.16E-03	± 9.61E-03	1.42E-02		-8.52E-04	± 1.13E-02	1.76E-02
2/13/2018 - 2/20/2018		-5.64E-03	± 1.32E-02	1.96E-02		1.79E-03	± 1.16E-02	1.78E-02
2/20/2018 - 2/27/2018		0.00E+00	± 3.68E-03	1.92E-02		0.00E+00	± 6.40E-03	2.26E-02
2/27/2018 - 3/6/2018		1.80E-03	± 1.17E-02	1.80E-02		-1.01E-04	± 1.11E-02	1.74E-02
3/6/2018 - 3/13/2018		3.83E-03	± 8.73E-03	1.33E-02		0.00E+00	± 4.20E-03	2.20E-02
3/13/2018 - 3/20/2018		7.58E-03	± 1.01E-02	1.46E-02		-4.70E-03	± 1.31E-02	1.97E-02
3/20/2018 - 3/27/2018		0.00E+00	± 1.21E-03	1.33E-02		3.33E-03	± 9.87E-03	1.51E-02
3/27/2018 - 4/3/2018		1.94E-03	± 1.24E-02	1.90E-02		-5.39E-03	± 1.20E-02	1.79E-02
4/3/2018 - 4/10/2018		5.49E-03	± 8.53E-03	1.26E-02		1.51E-03	± 1.02E-02	1.58E-02
4/10/2018 - 4/17/2018		7.05E-03	± 8.33E-03	1.19E-02		0.00E+00	± 6.36E-03	2.05E-02
4/17/2018 - 4/24/2018		4.04E-03	± 9.43E-03	1.42E-02		1.08E-03	± 1.10E-02	1.70E-02
4/24/2018 - 5/1/2018		-7.47E-04	± 9.88E-03	1.54E-02		-1.30E-03	± 1.12E-02	1.73E-02
5/1/2018 - 5/8/2018		-5.63E-04	± 7.71E-03	1.23E-02		2.29E-03	± 8.57E-03	1.32E-02
5/8/2018 - 5/15/2018		-6.55E-03	± 1.34E-02	1.97E-02		-1.44E-03	± 9.75E-03	1.52E-02
5/15/2018 - 5/22/2018		-2.92E-04	± 9.72E-03	1.53E-02		2.80E-03	± 8.31E-03	1.27E-02
5/22/2018 - 5/29/2018		7.80E-03	± 7.60E-03	1.05E-02		2.05E-03	± 6.94E-03	1.08E-02
5/29/2018 - 6/5/2018		2.76E-03	± 7.88E-03	1.21E-02		2.90E-03	± 9.09E-03	1.38E-02
6/5/2018 - 6/12/2018		-3.05E-03	± 1.03E-02	1.57E-02		-3.73E-04	± 8.79E-03	1.39E-02
6/12/2018 - 6/19/2018		-6.69E-04	± 1.06E-02	1.65E-02		-1.86E-03	± 9.03E-03	1.39E-02
6/19/2018 - 6/26/2018		2.49E-03	± 9.30E-03	1.43E-02		-1.23E-03	± 1.06E-02	1.64E-02
6/26/2018 - 7/3/2018		-1.22E-03	± 1.05E-02	1.62E-02		-2.28E-03	± 9.45E-03	1.45E-02
7/3/2018 - 7/10/2018		-3.85E-03	± 1.16E-02	1.74E-02		1.03E-02	± 5.77E-03	1.16E-02
7/10/2018 - 7/17/2018		-3.45E-03	± 1.14E-02	1.72E-02		-6.58E-03	± 1.29E-02	1.90E-02
7/17/2018 - 7/24/2018		-3.41E-03	± 1.28E-02	1.93E-02		8.60E-04	± 9.62E-03	1.51E-02
7/24/2018 - 7/31/2018		0.00E+00	± 1.71E-03	1.87E-02		-4.20E-03	± 1.05E-02	1.58E-02
7/31/2018 - 8/7/2018		4.63E-03	± 1.11E-02	1.66E-02		-2.94E-03	± 1.08E-02	1.64E-02
8/7/2018 - 8/14/2018		3.09E-03	± 1.22E-02	1.85E-02		-2.15E-03	± 1.05E-02	1.60E-02
8/14/2018 - 8/21/2018		-5.87E-03	± 1.38E-02	2.06E-02		-2.89E-03	± 1.10E-02	1.69E-02
8/21/2018 - 8/28/2018		-1.91E-03	± 1.13E-02	1.73E-02		5.62E-03	± 7.27E-03	1.60E-02
8/28/2018 - 9/4/2018		3.94E-03	± 9.89E-03	1.50E-02		-1.62E-03	± 1.15E-02	1.77E-02
9/4/2018 - 9/11/2018		5.08E-04	± 1.12E-02	1.75E-02		4.03E-03	± 1.05E-02	1.59E-02
9/11/2018 - 9/18/2018		-1.42E-03	± 1.23E-02	1.88E-02		4.38E-03	± 8.60E-03	1.30E-02
9/18/2018 - 9/25/2018		-3.14E-03	± 9.84E-03	1.50E-02		0.00E+00	± 3.63E-03	2.25E-02
9/25/2018 - 10/2/2018		6.91E-03	± 8.77E-03	1.26E-02		9.26E-04	± 1.04E-02	1.62E-02
10/2/2018 - 10/9/2018		0.00E+00	± 3.22E-03	1.76E-02		-3.85E-03	± 1.19E-02	1.80E-02
10/9/2018 - 10/16/2018		-6.92E-03	± 1.63E-02	2.33E-02		3.29E-03	± 1.24E-02	1.84E-02
10/16/2018 - 10/23/2018		-3.93E-03	± 1.35E-02	2.02E-02		3.05E-03	± 1.19E-02	1.81E-02
10/23/2018 - 10/30/2018		3.93E-03	± 8.17E-03	1.23E-02		1.49E-03	± 1.01E-02	1.56E-02
10/30/2018 - 11/6/2018		4.75E-03	± 1.20E-02	1.75E-02		1.84E-03	± 1.36E-02	2.03E-02
11/6/2018 - 11/13/2018		2.23E-03	± 1.51E-02	2.22E-02		-1.29E-03	± 1.43E-02	2.13E-02
11/13/2018 - 11/20/2018		0.00E+00	± 5.24E-03	2.61E-02		-6.15E-03	± 1.57E-02	2.26E-02
11/20/2018 - 11/27/2018		3.11E-03	± 9.52E-03	1.45E-02		-2.18E-03	± 1.16E-02	1.76E-02
11/27/2018 - 12/4/2018		-4.82E-04	± 1.16E-02	1.79E-02		2.02E-03	± 9.72E-03	1.51E-02
12/4/2018 - 12/11/2018		2.98E-03	± 9.13E-03	1.39E-02		7.44E-03	± 9.24E-03	1.33E-02
12/11/2018 - 12/18/2018		-1.90E-03	± 1.37E-02	2.03E-02		-3.50E-03	± 1.51E-02	2.21E-02
12/18/2018 - 12/26/2018		5.17E-04	± 1.36E-02	2.02E-02		-8.51E-04	± 1.45E-02	2.15E-02
12/26/2018 - 1/2/2019		-8.41E-03	± 1.93E-02	2.74E-02		8.14E-03	± 1.19E-02	1.68E-02

NVS = Valid sample not obtained due to sampler failure.

RQ= Results Qualifier. If blank, result is less than detection limit. If "+", result is above detection limit.

TABLE A-4.1
GAMMA SPECTROMETRY RESULTS OF IODINE-131 ON CHARCOAL FILTERS

Results in pCi/cubic meter, corrected for decay during collection period

Collection Period	Station 6				Station 40			
	RQ	Activity	Error	MDA	RQ	Activity	Error	MDA
1/2/2018 - 1/9/2018		-4.60E-03 ±	1.03E-02	1.53E-02		-2.89E-04 ±	9.61E-03	1.51E-02
1/9/2018 - 1/16/2018		2.81E-04 ±	9.35E-03	1.47E-02		1.77E-03 ±	8.52E-03	1.32E-02
1/16/2018 - 1/23/2018		0.00E+00 ±	3.64E-03	1.74E-02		-3.66E-03 ±	1.21E-02	1.82E-02
1/23/2018 - 1/30/2018		3.73E-03 ±	1.06E-02	1.59E-02		0.00E+00 ±	3.40E-03	1.73E-02
1/30/2018 - 2/6/2018		1.80E-04 ±	8.46E-03	1.34E-02		2.97E-03 ±	8.80E-03	1.35E-02
2/6/2018 - 2/13/2018		5.13E-03 ±	9.57E-03	1.42E-02		-7.39E-04 ±	9.78E-03	1.52E-02
2/13/2018 - 2/20/2018		-5.21E-03 ±	1.22E-02	1.82E-02		1.70E-03 ±	1.11E-02	1.70E-02
2/20/2018 - 2/27/2018		0.00E+00 ±	3.45E-03	1.81E-02		0.00E+00 ±	5.98E-03	2.11E-02
2/27/2018 - 3/6/2018		1.66E-03 ±	1.08E-02	1.65E-02		-9.50E-05 ±	1.05E-02	1.64E-02
3/6/2018 - 3/13/2018		3.59E-03 ±	8.18E-03	1.25E-02		0.00E+00 ±	3.95E-03	2.07E-02
3/13/2018 - 3/20/2018		6.98E-03 ±	9.30E-03	1.35E-02		-4.57E-03 ±	1.28E-02	1.91E-02
3/20/2018 - 3/27/2018		0.00E+00 ±	1.14E-03	1.25E-02		3.13E-03 ±	9.29E-03	1.42E-02
3/27/2018 - 4/3/2018		1.80E-03 ±	1.15E-02	1.76E-02		-5.24E-03 ±	1.17E-02	1.74E-02
4/3/2018 - 4/10/2018		5.13E-03 ±	7.97E-03	1.18E-02		1.47E-03 ±	9.95E-03	1.55E-02
4/10/2018 - 4/17/2018		7.21E-03 ±	8.51E-03	1.22E-02		0.00E+00 ±	6.15E-03	1.98E-02
4/17/2018 - 4/24/2018		4.24E-03 ±	9.88E-03	1.48E-02		1.06E-03 ±	1.08E-02	1.67E-02
4/24/2018 - 5/1/2018		-7.68E-04 ±	1.02E-02	1.58E-02		-1.31E-03 ±	1.12E-02	1.73E-02
5/1/2018 - 5/8/2018		-5.85E-04 ±	8.01E-03	1.28E-02		2.64E-03 ±	9.86E-03	1.52E-02
5/8/2018 - 5/15/2018		-6.83E-03 ±	1.39E-02	2.05E-02		-1.63E-03 ±	1.10E-02	1.71E-02
5/15/2018 - 5/22/2018		-3.03E-04 ±	1.01E-02	1.59E-02		3.23E-03 ±	9.59E-03	1.47E-02
5/22/2018 - 5/29/2018		8.18E-03 ±	7.97E-03	1.10E-02		2.37E-03 ±	8.02E-03	1.25E-02
5/29/2018 - 6/5/2018		2.97E-03 ±	8.49E-03	1.30E-02		3.30E-03 ±	1.04E-02	1.58E-02
6/5/2018 - 6/12/2018		-3.19E-03 ±	1.08E-02	1.65E-02		-4.40E-04 ±	1.04E-02	1.64E-02
6/12/2018 - 6/19/2018		-6.92E-04 ±	1.10E-02	1.70E-02		-2.18E-03 ±	1.06E-02	1.64E-02
6/19/2018 - 6/26/2018		2.60E-03 ±	9.72E-03	1.50E-02		-1.43E-03 ±	1.23E-02	1.90E-02
6/26/2018 - 7/3/2018		-1.28E-03 ±	1.09E-02	1.69E-02		-2.64E-03 ±	1.10E-02	1.68E-02
7/3/2018 - 7/10/2018		-4.08E-03 ±	1.23E-02	1.85E-02		1.12E-02 ±	6.27E-03	1.26E-02
7/10/2018 - 7/17/2018		-3.67E-03 ±	1.21E-02	1.83E-02		-7.19E-03 ±	1.41E-02	2.07E-02
7/17/2018 - 7/24/2018		-3.50E-03 ±	1.31E-02	1.98E-02		9.54E-04 ±	1.07E-02	1.67E-02
7/24/2018 - 7/31/2018		0.00E+00 ±	1.77E-03	1.94E-02		-4.69E-03 ±	1.17E-02	1.76E-02
7/31/2018 - 8/7/2018		4.77E-03 ±	1.14E-02	1.71E-02		-3.35E-03 ±	1.23E-02	1.86E-02
8/7/2018 - 8/14/2018		3.14E-03 ±	1.23E-02	1.87E-02		-2.51E-03 ±	1.23E-02	1.88E-02
8/14/2018 - 8/21/2018		-5.89E-03 ±	1.39E-02	2.07E-02		-3.27E-03 ±	1.24E-02	1.91E-02
8/21/2018 - 8/28/2018		-1.89E-03 ±	1.12E-02	1.71E-02		6.61E-03 ±	8.55E-03	1.88E-02
8/28/2018 - 9/4/2018		3.61E-03 ±	9.06E-03	1.37E-02		-1.62E-03 ±	1.15E-02	1.77E-02
9/4/2018 - 9/11/2018		5.36E-04 ±	1.19E-02	1.85E-02		3.89E-03 ±	1.01E-02	1.53E-02
9/11/2018 - 9/18/2018		-1.47E-03 ±	1.27E-02	1.95E-02		4.21E-03 ±	8.27E-03	1.25E-02
9/18/2018 - 9/25/2018		-3.22E-03 ±	1.01E-02	1.54E-02		0.00E+00 ±	3.57E-03	2.21E-02
9/25/2018 - 10/2/2018		7.14E-03 ±	9.06E-03	1.30E-02		8.85E-04 ±	9.90E-03	1.55E-02
10/2/2018 - 10/9/2018		0.00E+00 ±	3.37E-03	1.85E-02		-3.57E-03 ±	1.10E-02	1.66E-02
10/9/2018 - 10/16/2018		-7.23E-03 ±	1.70E-02	2.43E-02		3.07E-03 ±	1.16E-02	1.72E-02
10/16/2018 - 10/23/2018		-4.01E-03 ±	1.38E-02	2.06E-02		2.89E-03 ±	1.13E-02	1.72E-02
10/23/2018 - 10/30/2018		3.98E-03 ±	8.27E-03	1.25E-02		1.42E-03 ±	9.61E-03	1.49E-02
10/30/2018 - 11/6/2018		4.91E-03 ±	1.24E-02	1.81E-02		1.67E-03 ±	1.23E-02	1.84E-02
11/6/2018 - 11/13/2018		2.20E-03 ±	1.50E-02	2.19E-02		-1.17E-03 ±	1.29E-02	1.93E-02
11/13/2018 - 11/20/2018		0.00E+00 ±	4.98E-03	2.48E-02		-5.79E-03 ±	1.48E-02	2.12E-02
11/20/2018 - 11/27/2018		2.90E-03 ±	8.88E-03	1.36E-02		-2.18E-03 ±	1.16E-02	1.76E-02
11/27/2018 - 12/4/2018		-4.65E-04 ±	1.12E-02	1.73E-02		2.02E-03 ±	9.72E-03	1.51E-02
12/4/2018 - 12/11/2018		2.89E-03 ±	8.84E-03	1.35E-02		7.32E-03 ±	9.09E-03	1.30E-02
12/11/2018 - 12/18/2018		-1.82E-03 ±	1.31E-02	1.94E-02		-3.42E-03 ±	1.48E-02	2.16E-02
12/18/2018 - 12/26/2018		4.91E-04 ±	1.29E-02	1.92E-02		-8.53E-04 ±	1.46E-02	2.16E-02
12/26/2018 - 1/2/2019		-7.81E-03 ±	1.79E-02	2.55E-02		8.34E-03 ±	1.22E-02	1.72E-02

NVS = Valid sample not obtained due to sampler failure.

RQ= Results Qualifier. If blank, result is less than detection limit. If "+", result is above detection limit.

TABLE A-4.1
GAMMA SPECTROMETRY RESULTS OF IODINE-131 ON CHARCOAL FILTERS

Results in pCi/cubic meter, corrected for decay during collection period

Collection Period	Station 7				Station 48			
	RQ	Activity	Error	MDA	RQ	Activity	Error	MDA
1/2/2018 - 1/9/2018		0.00E+00	± 4.96E-03	1.84E-02		NVS		
1/9/2018 - 1/16/2018		-4.83E-04	± 8.55E-03	1.36E-02		1.78E-03	± 8.58E-03	1.33E-02
1/16/2018 - 1/23/2018		-1.98E-03	± 9.62E-03	1.48E-02		-3.85E-03	± 1.27E-02	1.92E-02
1/23/2018 - 1/30/2018		0.00E+00	± 3.64E-03	1.85E-02		0.00E+00	± 3.56E-03	1.81E-02
1/30/2018 - 2/6/2018		6.01E-04	± 1.16E-02	1.80E-02		3.06E-03	± 9.07E-03	1.39E-02
2/6/2018 - 2/13/2018		1.88E-03	± 1.20E-02	1.84E-02		-7.68E-04	± 1.02E-02	1.58E-02
2/13/2018 - 2/20/2018		5.36E-03	± 8.83E-03	1.31E-02		1.79E-03	± 1.16E-02	1.78E-02
2/20/2018 - 2/27/2018		3.26E-03	± 1.02E-02	1.55E-02		0.00E+00	± 6.31E-03	2.23E-02
2/27/2018 - 3/6/2018		5.17E-03	± 1.07E-02	1.60E-02		-1.01E-04	± 1.11E-02	1.74E-02
3/6/2018 - 3/13/2018		1.11E-04	± 9.80E-03	1.57E-02		0.00E+00	± 4.23E-03	2.21E-02
3/13/2018 - 3/20/2018		-2.49E-03	± 1.22E-02	1.86E-02		-4.81E-03	± 1.34E-02	2.01E-02
3/20/2018 - 3/27/2018		3.10E-04	± 1.03E-02	1.63E-02		3.34E-03	± 9.90E-03	1.52E-02
3/27/2018 - 4/3/2018		-3.60E-03	± 1.27E-02	1.91E-02		-5.55E-03	± 1.24E-02	1.84E-02
4/3/2018 - 4/10/2018		1.35E-03	± 9.31E-03	1.46E-02		1.58E-03	± 1.07E-02	1.66E-02
4/10/2018 - 4/17/2018		1.46E-03	± 6.33E-03	1.01E-02		0.00E+00	± 5.74E-03	1.85E-02
4/17/2018 - 4/24/2018		0.00E+00	± 3.43E-03	1.35E-02		9.88E-04	± 1.00E-02	1.55E-02
4/24/2018 - 5/1/2018		4.16E-03	± 9.70E-03	1.46E-02		-1.22E-03	± 1.05E-02	1.62E-02
5/1/2018 - 5/8/2018		1.57E-03	± 7.11E-03	1.12E-02		2.48E-03	± 9.28E-03	1.43E-02
5/8/2018 - 5/15/2018		-5.65E-03	± 1.20E-02	1.78E-02		-1.54E-03	± 1.04E-02	1.62E-02
5/15/2018 - 5/22/2018		5.82E-03	± 9.13E-03	1.34E-02		3.03E-03	± 8.98E-03	1.37E-02
5/22/2018 - 5/29/2018		-6.50E-04	± 1.03E-02	1.60E-02		2.22E-03	± 7.52E-03	1.17E-02
5/29/2018 - 6/5/2018		3.96E-03	± 8.94E-03	1.34E-02		3.12E-03	± 9.79E-03	1.49E-02
6/5/2018 - 6/12/2018		0.00E+00	± 4.03E-03	1.67E-02		-4.06E-04	± 9.58E-03	1.52E-02
6/12/2018 - 6/19/2018		-1.38E-03	± 9.32E-03	1.45E-02		-2.06E-03	± 1.00E-02	1.54E-02
6/19/2018 - 6/26/2018		-1.12E-03	± 1.08E-02	1.67E-02		-1.36E-03	± 1.16E-02	1.80E-02
6/26/2018 - 7/3/2018		9.09E-04	± 9.65E-03	1.50E-02		-2.51E-03	± 1.04E-02	1.59E-02
7/3/2018 - 7/10/2018		7.76E-04	± 9.20E-03	1.45E-02		1.12E-02	± 6.28E-03	1.26E-02
7/10/2018 - 7/17/2018		0.00E+00	± 2.72E-03	1.72E-02		-7.36E-03	± 1.44E-02	2.12E-02
7/17/2018 - 7/24/2018		0.00E+00	± 3.58E-03	1.82E-02		9.94E-04	± 1.11E-02	1.74E-02
7/24/2018 - 7/31/2018		-2.85E-04	± 9.48E-03	1.49E-02		-4.96E-03	± 1.24E-02	1.86E-02
7/31/2018 - 8/7/2018		-1.42E-03	± 9.61E-03	1.49E-02		-3.49E-03	± 1.28E-02	1.94E-02
8/7/2018 - 8/14/2018		5.08E-03	± 7.89E-03	1.16E-02		-2.56E-03	± 1.25E-02	1.91E-02
8/14/2018 - 8/21/2018		1.13E-03	± 1.20E-02	1.87E-02		-3.24E-03	± 1.23E-02	1.89E-02
8/21/2018 - 8/28/2018		0.00E+00	± 5.29E-03	1.82E-02		6.82E-03	± 8.82E-03	1.94E-02
8/28/2018 - 9/4/2018		0.00E+00	± 3.68E-03	1.70E-02		-1.61E-03	± 1.15E-02	1.76E-02
9/4/2018 - 9/11/2018		-8.75E-04	± 9.79E-03	1.53E-02		3.94E-03	± 1.02E-02	1.55E-02
9/11/2018 - 9/18/2018		-2.25E-03	± 1.01E-02	1.55E-02		4.20E-03	± 8.25E-03	1.24E-02
9/18/2018 - 9/25/2018		-1.07E-03	± 8.65E-03	1.36E-02		0.00E+00	± 3.51E-03	2.18E-02
9/25/2018 - 10/2/2018		5.55E-03	± 8.31E-03	1.22E-02		8.79E-04	± 9.83E-03	1.54E-02
10/2/2018 - 10/9/2018		8.28E-04	± 9.26E-03	1.45E-02		-3.53E-03	± 1.09E-02	1.65E-02
10/9/2018 - 10/16/2018		5.89E-03	± 1.19E-02	1.71E-02		3.05E-03	± 1.15E-02	1.71E-02
10/16/2018 - 10/23/2018		-4.12E-03	± 1.15E-02	1.72E-02		2.88E-03	± 1.12E-02	1.71E-02
10/23/2018 - 10/30/2018		9.95E-04	± 1.01E-02	1.56E-02		1.42E-03	± 9.61E-03	1.49E-02
10/30/2018 - 11/6/2018		-1.46E-03	± 1.43E-02	2.12E-02		1.69E-03	± 1.25E-02	1.86E-02
11/6/2018 - 11/13/2018		8.03E-03	± 1.33E-02	1.88E-02		-1.25E-03	± 1.38E-02	2.05E-02
11/13/2018 - 11/20/2018		3.30E-03	± 1.31E-02	1.93E-02		-6.08E-03	± 1.55E-02	2.23E-02
11/20/2018 - 11/27/2018		-4.62E-03	± 1.09E-02	1.62E-02		-2.14E-03	± 1.13E-02	1.73E-02
11/27/2018 - 12/4/2018		3.80E-04	± 1.00E-02	1.57E-02		1.95E-03	± 9.40E-03	1.46E-02
12/4/2018 - 12/11/2018		-1.50E-03	± 9.00E-03	1.40E-02		7.19E-03	± 8.92E-03	1.28E-02
12/11/2018 - 12/18/2018		1.12E-03	± 1.17E-02	1.76E-02		-3.32E-03	± 1.43E-02	2.09E-02
12/18/2018 - 12/26/2018		1.24E-03	± 1.32E-02	1.95E-02		-8.32E-04	± 1.42E-02	2.11E-02
12/26/2018 - 1/2/2019		-1.63E-03	± 1.55E-02	2.28E-02		8.20E-03	± 1.20E-02	1.69E-02

NVS = Valid sample not obtained due to sampler failure.

RQ= Results Qualifier. If blank, result is less than detection limit. If "+", result is above detection limit.

TABLE A-4.1
GAMMA SPECTROMETRY RESULTS OF IODINE-131 ON CHARCOAL FILTERS

Results in pCi/cubic meter, corrected for decay during collection period

Collection Period	Station 8				Station 57			
	RQ	Activity	Error	MDA	RQ	Activity	Error	MDA
1/2/2018 - 1/9/2018		0.00E+00 ±	5.14E-03	1.90E-02		-2.93E-04 ±	9.76E-03	1.54E-02
1/9/2018 - 1/16/2018		-4.63E-04 ±	8.19E-03	1.30E-02		1.93E-03 ±	9.29E-03	1.44E-02
1/16/2018 - 1/23/2018		-1.96E-03 ±	9.54E-03	1.47E-02		-3.90E-03 ±	1.29E-02	1.94E-02
1/23/2018 - 1/30/2018		0.00E+00 ±	3.62E-03	1.84E-02		0.00E+00 ±	3.63E-03	1.84E-02
1/30/2018 - 2/6/2018		6.05E-04 ±	1.17E-02	1.81E-02		3.04E-03 ±	9.03E-03	1.38E-02
2/6/2018 - 2/13/2018		1.82E-03 ±	1.17E-02	1.78E-02		-8.09E-04 ±	1.07E-02	1.67E-02
2/13/2018 - 2/20/2018		5.69E-03 ±	9.37E-03	1.39E-02		1.82E-03 ±	1.18E-02	1.81E-02
2/20/2018 - 2/27/2018		3.41E-03 ±	1.07E-02	1.63E-02		0.00E+00 ±	6.35E-03	2.24E-02
2/27/2018 - 3/6/2018		5.40E-03 ±	1.12E-02	1.67E-02		-1.00E-04 ±	1.11E-02	1.73E-02
3/6/2018 - 3/13/2018		1.18E-04 ±	1.04E-02	1.66E-02		0.00E+00 ±	4.23E-03	2.21E-02
3/13/2018 - 3/20/2018		-2.24E-03 ±	1.10E-02	1.67E-02		-4.77E-03 ±	1.33E-02	1.99E-02
3/20/2018 - 3/27/2018		2.74E-04 ±	9.13E-03	1.44E-02		3.35E-03 ±	9.95E-03	1.52E-02
3/27/2018 - 4/3/2018		-3.17E-03 ±	1.12E-02	1.69E-02		-5.57E-03 ±	1.24E-02	1.85E-02
4/3/2018 - 4/10/2018		1.21E-03 ±	8.35E-03	1.31E-02		1.58E-03 ±	1.07E-02	1.66E-02
4/10/2018 - 4/17/2018		1.47E-03 ±	6.36E-03	1.01E-02		0.00E+00 ±	5.75E-03	1.85E-02
4/17/2018 - 4/24/2018		0.00E+00 ±	3.48E-03	1.37E-02		9.69E-04 ±	9.80E-03	1.52E-02
4/24/2018 - 5/1/2018		4.29E-03 ±	1.00E-02	1.50E-02		-1.18E-03 ±	1.01E-02	1.56E-02
5/1/2018 - 5/8/2018		1.63E-03 ±	7.39E-03	1.17E-02		2.41E-03 ±	9.01E-03	1.38E-02
5/8/2018 - 5/15/2018		-5.87E-03 ±	1.25E-02	1.85E-02		-1.49E-03 ±	1.00E-02	1.56E-02
5/15/2018 - 5/22/2018		6.08E-03 ±	9.55E-03	1.40E-02		2.94E-03 ±	8.71E-03	1.33E-02
5/22/2018 - 5/29/2018		-6.83E-04 ±	1.08E-02	1.68E-02		2.17E-03 ±	7.36E-03	1.15E-02
5/29/2018 - 6/5/2018		4.20E-03 ±	9.49E-03	1.43E-02		3.06E-03 ±	9.60E-03	1.46E-02
6/5/2018 - 6/12/2018		0.00E+00 ±	4.36E-03	1.81E-02		-3.95E-04 ±	9.33E-03	1.48E-02
6/12/2018 - 6/19/2018		-1.52E-03 ±	1.03E-02	1.60E-02		-1.85E-03 ±	9.01E-03	1.39E-02
6/19/2018 - 6/26/2018		-1.17E-03 ±	1.14E-02	1.75E-02		-1.29E-03 ±	1.11E-02	1.72E-02
6/26/2018 - 7/3/2018		9.58E-04 ±	1.02E-02	1.58E-02		-2.42E-03 ±	1.00E-02	1.53E-02
7/3/2018 - 7/10/2018		8.23E-04 ±	9.76E-03	1.54E-02		1.08E-02 ±	6.07E-03	1.22E-02
7/10/2018 - 7/17/2018		0.00E+00 ±	2.93E-03	1.85E-02		-6.91E-03 ±	1.35E-02	1.99E-02
7/17/2018 - 7/24/2018		0.00E+00 ±	3.91E-03	1.98E-02		8.97E-04 ±	1.00E-02	1.57E-02
7/24/2018 - 7/31/2018		-3.13E-04 ±	1.04E-02	1.64E-02		-4.41E-03 ±	1.10E-02	1.65E-02
7/31/2018 - 8/7/2018		-1.55E-03 ±	1.05E-02	1.63E-02		-3.12E-03 ±	1.14E-02	1.74E-02
8/7/2018 - 8/14/2018		5.52E-03 ±	8.58E-03	1.27E-02		-2.31E-03 ±	1.13E-02	1.73E-02
8/14/2018 - 8/21/2018		1.17E-03 ±	1.24E-02	1.93E-02		-3.14E-03 ±	1.20E-02	1.83E-02
8/21/2018 - 8/28/2018		0.00E+00 ±	4.79E-03	1.65E-02		7.08E-03 ±	9.16E-03	2.01E-02
8/28/2018 - 9/4/2018		0.00E+00 ±	4.02E-03	1.86E-02		-1.53E-03 ±	1.09E-02	1.67E-02
9/4/2018 - 9/11/2018		-9.31E-04 ±	1.04E-02	1.63E-02		3.78E-03 ±	9.81E-03	1.49E-02
9/11/2018 - 9/18/2018		-2.41E-03 ±	1.09E-02	1.66E-02		4.07E-03 ±	8.00E-03	1.21E-02
9/18/2018 - 9/25/2018		-1.15E-03 ±	9.36E-03	1.48E-02		0.00E+00 ±	3.49E-03	2.16E-02
9/25/2018 - 10/2/2018		5.88E-03 ±	8.80E-03	1.29E-02		8.70E-04 ±	9.73E-03	1.52E-02
10/2/2018 - 10/9/2018		8.70E-04 ±	9.73E-03	1.52E-02		-3.68E-03 ±	1.13E-02	1.71E-02
10/9/2018 - 10/16/2018		6.24E-03 ±	1.26E-02	1.81E-02		3.19E-03 ±	1.21E-02	1.79E-02
10/16/2018 - 10/23/2018		-4.08E-03 ±	1.14E-02	1.71E-02		3.03E-03 ±	1.18E-02	1.80E-02
10/23/2018 - 10/30/2018		9.54E-04 ±	9.65E-03	1.49E-02		1.47E-03 ±	9.96E-03	1.55E-02
10/30/2018 - 11/6/2018		-1.40E-03 ±	1.37E-02	2.03E-02		1.84E-03 ±	1.36E-02	2.03E-02
11/6/2018 - 11/13/2018		8.16E-03 ±	1.35E-02	1.91E-02		-1.29E-03 ±	1.43E-02	2.13E-02
11/13/2018 - 11/20/2018		3.57E-03 ±	1.42E-02	2.09E-02		-6.26E-03 ±	1.60E-02	2.29E-02
11/20/2018 - 11/27/2018		-4.96E-03 ±	1.17E-02	1.74E-02		-2.26E-03 ±	1.20E-02	1.83E-02
11/27/2018 - 12/4/2018		4.08E-04 ±	1.07E-02	1.68E-02		2.09E-03 ±	1.01E-02	1.56E-02
12/4/2018 - 12/11/2018		-1.58E-03 ±	9.47E-03	1.48E-02		7.85E-03 ±	9.75E-03	1.40E-02
12/11/2018 - 12/18/2018		1.17E-03 ±	1.22E-02	1.84E-02		-3.56E-03 ±	1.54E-02	2.25E-02
12/18/2018 - 12/26/2018		1.31E-03 ±	1.39E-02	2.06E-02		-8.51E-04 ±	1.45E-02	2.15E-02
12/26/2018 - 1/2/2019		-1.78E-03 ±	1.69E-02	2.48E-02		8.03E-03 ±	1.18E-02	1.66E-02

NVS = Valid sample not obtained due to sampler failure.

RQ= Results Qualifier. If blank, result is less than detection limit. If "+", result is above detection limit.

TABLE A-4.2

GAMMA SPECTROMETRY RESULTS OF IODINE-131 ON CHARCOAL FILTERS - SUMMARY

Results in pCi per cubic meter, corrected for decay during collection period

Nuclide		Average Activity	Activity Low	Activity High	Average MDA	Number of Samples	Number of Positive IDs
I-131	Ind	4.40E-04	-8.41E-03	1.12E-02	1.68E-02	571	0
I-131	Cntl	6.57E-04	-5.87E-03	7.64E-03	1.65E-02	52	0

TABLE A-5.1
GROSS BETA IN WATER
Results in pCi per liter

Collection Period	ST- 26 River/Drinking Cntl				ST- 29 River/Drinking Ind			
	RQ	Activity	Error	MDA	RQ	Activity	Error	MDA
01/02/18 - 02/01/18		2.07E+00 ±	7.45E-01	2.24E+00		2.82E-01 ±	6.34E-01	2.25E+00
02/01/18 - 03/01/18		-4.75E-01 ±	7.11E-01	2.47E+00		8.00E-02 ±	6.96E-01	2.49E+00
03/01/18 - 04/02/18		1.40E+00 ±	6.12E-01	1.89E+00		1.70E+00 ±	6.34E-01	1.90E+00
04/02/18 - 05/01/18		1.67E+00 ±	7.46E-01	2.24E+00		1.39E+00 ±	7.07E-01	2.26E+00
05/01/18 - 05/31/18		-6.30E-01 ±	6.83E-01	2.26E+00		1.81E-01 ±	6.83E-01	2.38E+00
05/31/18 - 07/02/18		1.04E+00 ±	6.77E-01	2.15E+00		1.57E+00 ±	7.16E-01	2.24E+00
07/02/18 - 08/01/18		9.26E-01 ±	6.38E-01	2.10E+00		3.34E-01 ±	6.09E-01	2.14E+00
08/01/18 - 08/30/18		9.26E-01 ±	6.14E-01	1.95E+00		6.80E-01 ±	5.88E-01	1.97E+00
08/30/18 - 10/01/18		1.09E+00 ±	6.66E-01	2.14E+00		8.67E-01 ±	6.50E-01	2.15E+00
10/01/18 - 11/01/18		-8.71E-02 ±	7.02E-01	2.45E+00		-3.99E-01 ±	8.11E-01	2.82E+00
11/01/18 - 12/03/18		1.14E+00 ±	6.95E-01	2.26E+00		4.26E-01 ±	6.84E-01	2.36E+00
12/03/18 - 12/31/18		3.06E-01 ±	6.54E-01	2.31E+00		1.67E+00 ±	7.32E-01	2.31E+00

Collection Period	ST- 27 CW Discharge			
	RQ	Activity	Error	MDA
01/02/18 - 02/01/18	+	1.21E+01 ±	1.40E+00	2.93E+00
02/01/18 - 03/01/18	+	8.27E+00 ±	1.31E+00	3.23E+00
03/01/18 - 04/02/18	+	7.78E+00 ±	1.13E+00	2.45E+00
04/02/18 - 05/01/18	+	1.15E+01 ±	1.35E+00	2.83E+00
05/01/18 - 05/31/18	+	6.41E+00 ±	1.16E+00	2.90E+00
05/31/18 - 07/02/18	+	6.04E+00 ±	1.13E+00	2.81E+00
07/02/18 - 08/01/18	+	8.32E+00 ±	1.21E+00	2.77E+00
08/01/18 - 08/30/18	+	5.80E+00 ±	1.05E+00	2.51E+00
08/30/18 - 10/01/18	+	1.05E+01 ±	1.52E+00	3.43E+00
10/01/18 - 11/01/18	+	5.70E+00 ±	1.16E+00	3.05E+00
11/01/18 - 12/03/18	+	6.44E+00 ±	1.09E+00	2.71E+00
12/03/18 - 12/31/18	+	6.83E+00 ±	1.06E+00	2.51E+00

TABLE A-5.2
GROSS BETA IN WATER - SUMMARY
Results in pCi per liter

Location	Average Activity	Activity Low	Activity High	Number of Samples	Number of Positive IDs
ST- 26 Control	7.81E-01	-6.30E-01	2.07E+00	12	0
ST- 29 Indicator	7.32E-01	-3.99E-01	1.70E+00	12	0
ST- 27 Discharge	7.97E+00	5.70E+00	1.21E+01	12	12

TABLE A-6.1
TRITIUM IN WATER

Results in pCi per liter, MDA for all samples is 300 pCi/l

Station	Description	Collection Period	RQ	Activity	Error
26	River/Drinking Control	01/02/18 - 04/02/18		1.21E+02	± 9.01E+01
		04/02/18 - 07/02/18		7.83E+01	± 8.20E+01
		07/02/18 - 10/01/18		8.93E+01	± 9.35E+01
		10/01/18 - 12/31/18		6.44E+01	± 9.40E+01
29	River/Drinking Indicator	01/02/18 - 04/02/18		1.07E+02	± 8.99E+01
		04/02/18 - 07/02/18		1.18E+02	± 9.33E+01
		07/02/18 - 10/01/18		9.52E+01	± 9.49E+01
		10/01/18 - 12/31/18		2.55E+01	± 9.27E+01
27	Plant Discharge	01/02/18 - 04/02/18		1.36E+02	± 9.03E+01
		04/02/18 - 07/02/18		8.41E+01	± 9.72E+01
		07/02/18 - 10/01/18		1.48E+02	± 9.57E+01
		10/01/18 - 12/31/18		8.60E+01	± 9.57E+01
31	Ground Water Well 1	02/22/18		1.13E+02	± 8.81E+01
		06/13/18		1.79E+02	± 9.33E+01
		08/08/18		5.97E+01	± 9.19E+01
		12/03/18		-1.10E+02	± 9.77E+01
32	Ground Water Well 2	02/22/18		6.42E+01	± 8.79E+01
		06/13/18		1.42E+02	± 9.32E+01
		08/08/18		8.28E+01	± 9.43E+01
		12/03/18		-1.38E+02	± 9.85E+01
52	Ground Water Well 3	02/21/18		1.07E+02	± 8.83E+01
		06/13/18		1.28E+02	± 9.24E+01
		08/08/18		9.80E+01	± 9.32E+01
		12/04/18		-8.00E+01	± 9.88E+01

TABLE A-6.2
TRITIUM IN WATER - Summary

Results in pCi per liter

Location Description	Average Activity	Activity Low	Activity High	Number of Samples	Number of Positive IDs
River/Drinking Control	8.83E+01	6.44E+01	1.21E+02	4	0
River/Drinking Indicator	8.65E+01	2.55E+01	1.18E+02	4	0
Discharge Indicator	1.13E+02	8.41E+01	1.48E+02	4	0
Ground Water Indicator	5.39E+01	-1.38E+02	1.79E+02	12	0

Quarterly tritium values reported for ST-26, 27, and 29 are average of monthly analysis values.

RQ=Results Qualifier. If blank, result is less than detection limit. If "+", result is above the detection limit.

Table A-7.1

GAMMA SPECTROMETRY RESULTS OF RIVER/DRINKING WATER**Station 26 - Control Station 29 - Indicator**

Results in pCi/liter, corrected for decay during collection period

Location ST-26 collected 2/1/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	4.73E+01	± 3.85E+01	4.49E+01
CR-51		1.03E+00	± 2.84E+01	4.22E+01
MN-54		8.19E-01	± 2.54E+00	3.45E+00
CO-58		2.54E+00	± 2.76E+00	3.56E+00
FE-59		6.79E+00	± 9.14E+00	1.14E+01
CO-60		2.27E+00	± 3.01E+00	3.75E+00
ZN-65		4.26E+00	± 6.65E+00	8.35E+00
ZRNB-95		-1.70E+00	± 6.21E+00	8.38E+00
I-131		2.70E+00	± 8.34E+00	1.23E+01
CS-134		0.00E+00	± 7.35E-01	4.64E+00
CS-137		-1.05E+00	± 3.35E+00	4.62E+00
BALA140		0.00E+00	± 1.21E+00	1.22E+01
BI-214		1.02E+00	± 4.49E+00	1.08E+01

Location ST-26 collected 3/1/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		2.90E+00	± 3.62E+01	5.26E+01
CR-51		-6.84E+00	± 2.80E+01	3.99E+01
MN-54		-5.85E-01	± 3.19E+00	4.20E+00
CO-58		3.01E-01	± 3.24E+00	4.32E+00
FE-59		7.92E+00	± 9.14E+00	1.10E+01
CO-60		8.98E-01	± 1.71E+00	3.43E+00
ZN-65		-1.59E+00	± 6.74E+00	8.68E+00
ZRNB-95		-3.17E+00	± 6.19E+00	8.21E+00
I-131		4.22E+00	± 5.20E+00	1.31E+01
CS-134		-9.31E-01	± 2.95E+00	3.93E+00
CS-137		-1.48E+00	± 2.62E+00	4.40E+00
BALA140		2.54E+00	± 3.71E+00	1.18E+01
BI-214		6.55E+00	± 4.39E+00	1.09E+01

Location ST-26 collected 4/2/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		7.08E+00	± 4.01E+01	5.91E+01
CR-51		-5.24E+00	± 2.97E+01	4.38E+01
MN-54		-8.33E-01	± 2.63E+00	3.57E+00
CO-58		7.73E-02	± 3.31E+00	4.55E+00
FE-59		3.29E+00	± 7.10E+00	9.24E+00
CO-60		2.85E+00	± 2.87E+00	3.49E+00
ZN-65		7.69E-01	± 5.98E+00	7.86E+00
ZRNB-95		-6.77E-01	± 5.83E+00	7.97E+00
I-131		-3.80E+00	± 8.13E+00	1.18E+01
CS-134		-1.52E+00	± 3.09E+00	4.20E+00
CS-137		1.10E+00	± 2.87E+00	3.96E+00
BALA140		2.89E+00	± 5.33E+00	6.66E+00
BI-214		7.94E-02	± 7.14E+00	1.04E+01

Location ST-26 collected 5/1/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		1.63E+01	± 3.47E+01	5.31E+01
CR-51		1.41E+01	± 2.60E+01	3.77E+01
MN-54		3.58E+00	± 2.53E+00	4.38E+00
CO-58		-1.59E+00	± 3.66E+00	4.87E+00
FE-59		2.42E+00	± 8.32E+00	1.09E+01
CO-60		8.43E-01	± 3.24E+00	4.20E+00
ZN-65		-2.56E-01	± 7.24E+00	9.44E+00
ZRNB-95		-6.69E-02	± 5.72E+00	7.87E+00
I-131		7.92E-01	± 6.62E+00	9.86E+00
CS-134		-1.52E+00	± 2.79E+00	3.79E+00
CS-137		-9.98E-01	± 3.15E+00	4.35E+00
BALA140		3.60E-01	± 8.15E+00	1.03E+01
BI-214		2.14E+00	± 6.68E+00	9.69E+00

Location ST-26 collected 5/31/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		5.35E+00	± 3.84E+01	5.46E+01
CR-51		1.13E+01	± 3.00E+01	4.23E+01
MN-54		1.29E+00	± 2.86E+00	3.72E+00
CO-58		-1.90E-02	± 3.14E+00	4.21E+00
FE-59		2.14E+00	± 1.00E+01	1.27E+01
CO-60		-9.04E-01	± 3.45E+00	4.33E+00
ZN-65		-3.07E+00	± 6.86E+00	8.71E+00
ZRNB-95		2.67E+00	± 5.53E+00	7.38E+00
I-131		-4.20E+00	± 9.84E+00	1.39E+01
CS-134		9.05E-01	± 2.60E+00	3.48E+00
CS-137		2.05E+00	± 2.64E+00	3.44E+00
BALA140		1.27E+00	± 8.38E+00	1.06E+01
BI-214		7.00E+00	± 7.25E+00	1.01E+01

Location ST-26 collected 7/2/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		1.31E+01	± 4.09E+01	5.65E+01
CR-51		-8.95E+00	± 3.51E+01	4.97E+01
MN-54		9.29E-01	± 2.64E+00	3.47E+00
CO-58		0.00E+00	± 1.25E+00	5.35E+00
FE-59		2.13E+00	± 9.25E+00	1.18E+01
CO-60		2.08E+00	± 2.60E+00	3.16E+00
ZN-65		-1.74E+00	± 6.53E+00	8.42E+00
ZRNB-95		-4.17E+00	± 7.51E+00	9.89E+00
I-131		6.86E+00	± 1.21E+01	1.69E+01
CS-134		7.35E-01	± 2.89E+00	3.87E+00
CS-137		-1.84E+00	± 3.48E+00	4.59E+00
BALA140		0.00E+00	± 3.89E+00	1.68E+01
BI-214		9.55E-01	± 8.00E+00	1.13E+01

Table A-7.1

GAMMA SPECTROMETRY RESULTS OF RIVER/DRINKING WATER**Station 26 - Control Station 29 - Indicator**

Results in pCi/liter, corrected for decay during collection period

Location ST-26 collected 8/1/2018			
Nuclide	RQ	Activity	Error MDA
K-40		3.45E+01 ±	3.83E+01 6.94E+01
CR-51		-9.16E+00 ±	3.28E+01 6.05E+01
MN-54		1.29E+00 ±	2.87E+00 5.07E+00
CO-58		-1.63E+00 ±	3.92E+00 6.78E+00
FE-59		6.80E+00 ±	7.83E+00 1.39E+01
CO-60		1.40E+00 ±	1.99E+00 5.64E+00
ZN-65		-1.23E-01 ±	6.67E+00 1.20E+01
ZRNB-95		-4.86E+00 ±	7.33E+00 1.27E+01
I-131		-5.10E+00 ±	1.14E+01 2.09E+01
CS-134		-1.47E+00 ±	3.39E+00 5.84E+00
CS-137		-1.48E+00 ±	2.62E+00 5.86E+00
BALA140		2.91E+00 ±	7.91E+00 1.48E+01
BI-214		1.26E+01 ±	6.73E+00 8.23E+00

Location ST-26 collected 8/30/2018			
Nuclide	RQ	Activity	Error MDA
K-40		5.83E+00 ±	4.18E+01 5.71E+01
CR-51		-2.06E+01 ±	3.60E+01 5.18E+01
MN-54		-3.32E-01 ±	3.10E+00 4.23E+00
CO-58		-8.02E-01 ±	3.26E+00 4.43E+00
FE-59		1.96E+00 ±	1.08E+01 1.41E+01
CO-60		4.28E-01 ±	3.07E+00 3.97E+00
ZN-65		0.00E+00 ±	2.84E+00 6.97E+00
ZRNB-95		2.92E+00 ±	5.23E+00 6.97E+00
I-131		5.80E+00 ±	8.86E+00 1.28E+01
CS-134		2.06E+00 ±	2.56E+00 3.43E+00
CS-137		2.20E+00 ±	2.28E+00 3.02E+00
BALA140		0.00E+00 ±	1.87E+00 1.91E+01
BI-214		3.37E-01 ±	7.06E+00 1.03E+01

Location ST-26 collected 10/1/2018			
Nuclide	RQ	Activity	Error MDA
K-40		2.91E+01 ±	3.61E+01 6.41E+01
CR-51		2.45E+01 ±	2.79E+01 3.84E+01
MN-54		3.01E-01 ±	2.68E+00 3.58E+00
CO-58		1.59E+00 ±	3.13E+00 4.05E+00
FE-59		-1.00E+00 ±	1.05E+01 1.34E+01
CO-60		2.22E+00 ±	2.30E+00 2.76E+00
ZN-65		1.84E+00 ±	6.15E+00 7.94E+00
ZRNB-95		-1.03E+00 ±	5.94E+00 8.07E+00
I-131		-3.50E+00 ±	9.30E+00 1.31E+01
CS-134		-7.99E-01 ±	3.15E+00 4.21E+00
CS-137		1.50E+00 ±	2.77E+00 3.68E+00
BALA140		1.25E+00 ±	8.22E+00 1.04E+01
BI-214		3.41E-01 ±	8.65E+00 1.22E+01

Location ST-26 collected 11/1/2018			
Nuclide	RQ	Activity	Error MDA
K-40		2.59E+01 ±	3.58E+01 5.05E+01
CR-51		1.84E+01 ±	2.89E+01 4.02E+01
MN-54		5.55E-01 ±	3.02E+00 3.99E+00
CO-58		3.34E+00 ±	2.65E+00 4.58E+00
FE-59		7.29E+00 ±	7.96E+00 9.57E+00
CO-60		-6.29E-01 ±	3.36E+00 4.27E+00
ZN-65		-2.96E+00 ±	7.18E+00 9.11E+00
ZRNB-95		-2.38E+00 ±	6.64E+00 8.88E+00
I-131		8.40E+00 ±	9.80E+00 1.35E+01
CS-134		-1.67E+00 ±	3.25E+00 4.28E+00
CS-137		2.58E-01 ±	2.77E+00 3.79E+00
BALA140		-3.65E-01 ±	9.06E+00 1.16E+01
BI-214		0.00E+00 ±	6.32E+00 1.40E+01

Location ST-26 collected 12/3/2018			
Nuclide	RQ	Activity	Error MDA
K-40		2.57E+01 ±	4.45E+01 5.51E+01
CR-51		-2.16E+01 ±	4.00E+01 5.79E+01
MN-54		-1.24E+00 ±	3.91E+00 5.29E+00
CO-58		1.23E+00 ±	3.71E+00 5.06E+00
FE-59		2.88E+00 ±	1.25E+01 1.60E+01
CO-60		3.31E-02 ±	4.56E+00 5.92E+00
ZN-65		1.60E+00 ±	7.83E+00 1.03E+01
ZRNB-95		-2.57E+00 ±	8.39E+00 1.13E+01
I-131		2.33E+00 ±	1.07E+01 1.53E+01
CS-134		-5.60E-01 ±	3.17E+00 4.45E+00
CS-137		-6.83E-02 ±	3.25E+00 4.66E+00
BALA140		5.11E+00 ±	9.20E+00 1.13E+01
BI-214		9.98E+00 ±	7.73E+00 1.00E+01

Location ST-26 collected 12/31/2018			
Nuclide	RQ	Activity	Error MDA
K-40		7.09E+00 ±	4.55E+01 6.16E+01
CR-51		2.17E+01 ±	2.73E+01 3.77E+01
MN-54		9.62E-01 ±	2.91E+00 3.81E+00
CO-58		0.00E+00 ±	9.95E-01 5.03E+00
FE-59		5.11E+00 ±	9.36E+00 1.16E+01
CO-60		4.47E-02 ±	3.29E+00 4.25E+00
ZN-65		-1.46E+00 ±	6.38E+00 8.24E+00
ZRNB-95		1.99E+00 ±	5.16E+00 6.95E+00
I-131		8.32E+00 ±	7.81E+00 1.06E+01
CS-134		1.32E-02 ±	2.82E+00 3.84E+00
CS-137		-6.25E-01 ±	3.17E+00 4.28E+00
BALA140		-5.40E+00 ±	1.15E+01 1.38E+01
BI-214		6.60E+00 ±	7.62E+00 1.03E+01

Table A-7.1

GAMMA SPECTROMETRY RESULTS OF RIVER/DRINKING WATER**Station 26 - Control Station 29 - Indicator**

Results in pCi/liter, corrected for decay during collection period

Location ST-29 collected 2/1/2018					Location ST-29 collected 3/1/2018				
Nuclide	RQ	Activity	Error	MDA	Nuclide	RQ	Activity	Error	MDA
K-40	+	5.04E+01	± 3.34E+01	4.60E+01	K-40		2.96E+01	± 3.82E+01	5.26E+01
CR-51		-1.30E+00	± 2.99E+01	4.29E+01	CR-51		4.94E+00	± 3.02E+01	4.30E+01
MN-54		8.71E-01	± 2.93E+00	3.85E+00	MN-54		-7.37E-01	± 3.48E+00	4.55E+00
CO-58		-3.79E-01	± 3.28E+00	4.36E+00	CO-58		-8.17E-01	± 3.20E+00	4.22E+00
FE-59		3.15E+00	± 8.12E+00	1.03E+01	FE-59		0.00E+00	± 2.28E+00	1.41E+01
CO-60		6.16E-02	± 3.22E+00	4.12E+00	CO-60		1.64E-01	± 3.04E+00	3.91E+00
ZN-65		2.45E+00	± 5.14E+00	6.60E+00	ZN-65		-1.10E+00	± 6.09E+00	7.94E+00
ZRNB-95		-7.01E-01	± 5.57E+00	7.62E+00	ZRNB-95		-2.14E+00	± 6.51E+00	8.72E+00
I-131		-2.36E+00	± 1.04E+01	1.47E+01	I-131		5.25E+00	± 9.45E+00	1.32E+01
CS-134		-1.85E+00	± 3.45E+00	4.53E+00	CS-134		-2.30E+00	± 3.28E+00	4.28E+00
CS-137		-1.56E+00	± 3.39E+00	4.49E+00	CS-137		1.45E-01	± 2.67E+00	3.68E+00
BALA140		4.01E-01	± 9.08E+00	1.15E+01	BALA140		7.03E+00	± 5.15E+00	9.43E+00
BI-214		3.24E+00	± 5.85E+00	1.04E+01	BI-214		1.01E+00	± 7.64E+00	1.09E+01

Location ST-29 collected 4/2/2018					Location ST-29 collected 5/1/2018				
Nuclide	RQ	Activity	Error	MDA	Nuclide	RQ	Activity	Error	MDA
K-40		6.31E+01	± 3.71E+01	6.56E+01	K-40		2.32E+01	± 3.56E+01	5.05E+01
CR-51		-2.62E+01	± 3.72E+01	6.64E+01	CR-51		1.49E+01	± 2.39E+01	3.34E+01
MN-54		-1.64E+00	± 3.53E+00	6.05E+00	MN-54		9.99E-01	± 2.72E+00	3.56E+00
CO-58		1.76E+00	± 2.76E+00	4.96E+00	CO-58		1.02E+00	± 2.89E+00	3.80E+00
FE-59		1.06E+01	± 6.43E+00	1.10E+01	FE-59		0.00E+00	± 7.72E-01	1.22E+01
CO-60		1.01E+00	± 2.92E+00	5.16E+00	CO-60		-1.62E+00	± 3.66E+00	4.52E+00
ZN-65		-8.58E-01	± 6.07E+00	1.10E+01	ZN-65		2.43E-01	± 5.64E+00	7.47E+00
ZRNB-95		2.67E-01	± 5.35E+00	1.01E+01	ZRNB-95		-2.08E+00	± 6.33E+00	8.48E+00
I-131		-5.27E+00	± 1.02E+01	1.85E+01	I-131		5.95E+00	± 7.60E+00	1.05E+01
CS-134		1.46E+00	± 2.63E+00	4.65E+00	CS-134		2.19E+00	± 2.73E+00	3.55E+00
CS-137		5.32E-01	± 2.50E+00	5.74E+00	CS-137		2.42E-01	± 2.68E+00	3.68E+00
BALA140		2.37E+00	± 5.93E+00	1.50E+01	BALA140		1.81E+00	± 7.38E+00	9.25E+00
BI-214		1.21E+01	± 7.42E+00	1.29E+01	BI-214		6.20E-01	± 7.99E+00	1.13E+01

Location ST-29 collected 5/31/2018					Location ST-29 collected 7/2/2018				
Nuclide	RQ	Activity	Error	MDA	Nuclide	RQ	Activity	Error	MDA
K-40		3.21E+01	± 4.46E+01	5.27E+01	K-40		0.00E+00	± 3.56E+01	6.63E+01
CR-51		-1.29E+01	± 3.24E+01	4.57E+01	CR-51		1.43E+01	± 3.20E+01	4.69E+01
MN-54		-2.04E+00	± 3.55E+00	4.55E+00	MN-54		-9.82E-01	± 3.21E+00	4.32E+00
CO-58		0.00E+00	± 5.59E-01	5.04E+00	CO-58		1.67E+00	± 3.11E+00	4.15E+00
FE-59		4.10E+00	± 9.62E+00	1.20E+01	FE-59		9.77E+00	± 6.03E+00	1.12E+01
CO-60		-1.48E+00	± 3.80E+00	4.71E+00	CO-60		0.00E+00	± 2.46E+00	5.52E+00
ZN-65		3.93E+00	± 5.29E+00	6.61E+00	ZN-65		-2.66E+00	± 8.29E+00	1.06E+01
ZRNB-95		-1.98E+00	± 6.36E+00	8.54E+00	ZRNB-95		1.95E+00	± 6.36E+00	8.60E+00
I-131		-1.32E-01	± 9.99E+00	1.44E+01	I-131		-1.23E+01	± 2.29E+01	3.33E+01
CS-134		-1.61E+00	± 3.44E+00	4.53E+00	CS-134		2.90E-01	± 2.64E+00	3.69E+00
CS-137		-3.87E-01	± 2.94E+00	4.01E+00	CS-137		-9.49E-01	± 3.08E+00	4.26E+00
BALA140		-6.04E+00	± 1.28E+01	1.54E+01	BALA140		5.31E+00	± 1.76E+01	2.17E+01
BI-214		3.67E+00	± 3.98E+00	9.86E+00	BI-214		4.17E+00	± 7.99E+00	1.08E+01

Table A-7.1

GAMMA SPECTROMETRY RESULTS OF RIVER/DRINKING WATER**Station 26 - Control Station 29 - Indicator**

Results in pCi/liter, corrected for decay during collection period

Location ST-29 collected 8/1/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		1.34E+01 ±	3.90E+01	5.46E+01
CR-51		-3.23E+01 ±	3.66E+01	5.03E+01
MN-54		-1.23E+00 ±	3.43E+00	4.46E+00
CO-58		-7.75E-01 ±	3.60E+00	4.74E+00
FE-59		1.32E+00 ±	9.66E+00	1.24E+01
CO-60		4.95E-01 ±	2.40E+00	3.13E+00
ZN-65		4.81E+00 ±	5.00E+00	6.12E+00
ZRNB-95		-1.95E+00 ±	5.79E+00	7.80E+00
I-131		1.04E+01 ±	1.04E+01	1.42E+01
CS-134		4.27E-01 ±	3.24E+00	4.35E+00
CS-137		2.40E+00 ±	2.48E+00	3.19E+00
BALA140		2.78E+00 ±	9.55E+00	1.19E+01
BI-214		0.00E+00 ±	5.24E+00	1.00E+01

Location ST-29 collected 8/30/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		3.97E+01 ±	3.25E+01	4.60E+01
CR-51		4.54E+00 ±	3.15E+01	4.50E+01
MN-54		-1.63E+00 ±	3.46E+00	4.46E+00
CO-58		7.96E-01 ±	3.27E+00	4.31E+00
FE-59		0.00E+00 ±	3.54E+00	1.59E+01
CO-60		1.03E+00 ±	2.46E+00	3.13E+00
ZN-65		-2.35E+00 ±	6.85E+00	8.76E+00
ZRNB-95		1.92E+00 ±	5.61E+00	7.57E+00
I-131		1.66E+00 ±	1.16E+01	1.66E+01
CS-134		2.14E+00 ±	2.42E+00	3.14E+00
CS-137		-1.13E-01 ±	2.84E+00	3.90E+00
BALA140		-9.17E-01 ±	1.04E+01	1.31E+01
BI-214		4.08E+00 ±	7.40E+00	1.04E+01

Location ST-29 collected 10/1/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		2.27E+01 ±	3.96E+01	5.46E+01
CR-51		1.20E+01 ±	3.00E+01	4.23E+01
MN-54		2.68E-01 ±	2.89E+00	3.85E+00
CO-58		-1.46E+00 ±	3.68E+00	4.77E+00
FE-59		-3.82E+00 ±	1.08E+01	1.34E+01
CO-60		2.20E+00 ±	1.98E+00	2.32E+00
ZN-65		3.56E+00 ±	4.85E+00	6.09E+00
ZRNB-95		-3.54E+00 ±	6.59E+00	8.72E+00
I-131		3.91E+00 ±	8.79E+00	1.24E+01
CS-134		-4.39E-01 ±	2.98E+00	4.00E+00
CS-137		6.12E-01 ±	2.62E+00	3.56E+00
BALA140		0.00E+00 ±	7.93E-01	1.37E+01
BI-214		5.05E+00 ±	6.21E+00	9.92E+00

Location ST-29 collected 11/1/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		3.06E+01 ±	3.78E+01	5.19E+01
CR-51		3.19E+01 ±	3.53E+01	4.84E+01
MN-54		1.85E+00 ±	2.59E+00	3.31E+00
CO-58		2.37E+00 ±	2.98E+00	3.79E+00
FE-59		-2.46E+00 ±	1.19E+01	1.50E+01
CO-60		-6.23E-01 ±	3.33E+00	4.23E+00
ZN-65		2.72E+00 ±	5.22E+00	6.67E+00
ZRNB-95		7.47E+00 ±	3.98E+00	6.79E+00
I-131		-8.10E+00 ±	2.03E+01	2.86E+01
CS-134		-2.57E+00 ±	3.42E+00	4.44E+00
CS-137		3.02E-01 ±	2.98E+00	4.06E+00
BALA140		0.00E+00 ±	2.42E+00	2.09E+01
BI-214		2.38E+00 ±	6.09E+00	9.88E+00

Location ST-29 collected 12/3/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		4.54E-01 ±	4.27E+01	6.19E+01
CR-51		1.48E+01 ±	2.92E+01	4.23E+01
MN-54		8.92E-01 ±	2.99E+00	4.03E+00
CO-58		4.43E-01 ±	2.76E+00	3.81E+00
FE-59		7.42E+00 ±	5.91E+00	1.10E+01
CO-60		1.50E+00 ±	2.61E+00	3.26E+00
ZN-65		5.96E+00 ±	4.35E+00	7.67E+00
ZRNB-95		4.39E-01 ±	5.23E+00	7.22E+00
I-131		-9.46E-01 ±	8.66E+00	1.28E+01
CS-134		-6.07E-01 ±	2.90E+00	4.02E+00
CS-137		-1.97E-01 ±	2.91E+00	4.10E+00
BALA140		0.00E+00 ±	1.58E+00	1.36E+01
BI-214		6.08E+00 ±	7.90E+00	1.05E+01

Location ST-29 collected 12/31/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		1.70E+01 ±	4.08E+01	5.61E+01
CR-51		-1.07E+01 ±	3.52E+01	4.97E+01
MN-54		1.29E+00 ±	2.86E+00	3.71E+00
CO-58		-2.38E+00 ±	4.19E+00	5.37E+00
FE-59		-6.23E-01 ±	1.09E+01	1.39E+01
CO-60		-6.47E-01 ±	3.13E+00	3.99E+00
ZN-65		3.19E+00 ±	4.38E+00	5.51E+00
ZRNB-95		2.32E+00 ±	5.62E+00	7.54E+00
I-131		4.91E+00 ±	1.25E+01	1.76E+01
CS-134		1.07E+00 ±	2.66E+00	3.54E+00
CS-137		4.32E-01 ±	2.68E+00	3.65E+00
BALA140		0.00E+00 ±	2.94E+00	1.68E+01
BI-214		0.00E+00 ±	5.02E+00	1.29E+01

TABLE A-7.2
GAMMA SPECTROMETRY RESULTS OF RIVER/DRINKING WATER - SUMMARY

Station 26 - Control Station 29 - Indicator

Results in pCi/liter, corrected for decay during collection period

Nuclide		Average Activity	Activity Low	Activity High	Average MDA	Number of Samples	Number of Positive IDs
K-40	Ind	2.68E+01	0.00E+00	6.31E+01	5.49E+01	12	1
K-40	Cntl	1.83E+01	2.90E+00	4.73E+01	5.66E+01	12	1
CR-51	Ind	1.17E+00	-3.23E+01	3.19E+01	4.63E+01	12	0
CR-51	Cntl	1.55E+00	-2.16E+01	2.45E+01	4.52E+01	12	0
MN-54	Ind	-1.75E-01	-2.04E+00	1.85E+00	4.23E+00	12	0
MN-54	Cntl	5.61E-01	-1.24E+00	3.58E+00	4.06E+00	12	0
CO-58	Ind	1.87E-01	-2.38E+00	2.37E+00	4.44E+00	12	0
CO-58	Cntl	4.21E-01	-1.63E+00	3.34E+00	4.73E+00	12	0
FE-59	Ind	2.45E+00	-3.82E+00	1.06E+01	1.27E+01	12	0
FE-59	Cntl	3.98E+00	-1.00E+00	7.92E+00	1.21E+01	12	0
CO-60	Ind	1.74E-01	-1.62E+00	2.20E+00	4.00E+00	12	0
CO-60	Cntl	9.62E-01	-9.04E-01	2.85E+00	4.10E+00	12	0
ZN-65	Ind	1.66E+00	-2.66E+00	5.96E+00	7.58E+00	12	0
ZN-65	Cntl	-2.27E-01	-3.07E+00	4.26E+00	8.83E+00	12	0
ZRNB-95	Ind	7.56E-01	-2.14E+00	7.47E+00	7.92E+00	12	0
ZRNB-95	Cntl	-8.48E-01	-4.86E+00	2.92E+00	8.70E+00	12	0
I-131	Ind	2.48E-01	-1.23E+01	1.04E+01	1.72E+01	12	0
I-131	Cntl	1.90E+00	-5.10E+00	8.40E+00	1.37E+01	12	0
CS-134	Ind	-1.50E-01	-2.57E+00	2.19E+00	4.06E+00	12	0
CS-134	Cntl	-3.95E-01	-1.67E+00	2.06E+00	4.16E+00	12	0
CS-137	Ind	1.22E-01	-1.56E+00	2.40E+00	4.03E+00	12	0
CS-137	Cntl	-3.71E-02	-1.84E+00	2.20E+00	4.22E+00	12	0
BALA140	Ind	1.06E+00	-6.04E+00	7.03E+00	1.44E+01	12	0
BALA140	Cntl	8.80E-01	-5.40E+00	5.11E+00	1.24E+01	12	0
BI-214	Ind	3.54E+00	0.00E+00	1.21E+01	1.08E+01	12	0
BI-214	Cntl	3.97E+00	0.00E+00	1.26E+01	1.07E+01	12	0

TABLE A-8.1
GAMMA SPECTROMETRY RESULTS OF SOIL

Results in pCi/kilogram

Location and Date			Station 1	6/12/2018
Nuclide	RQ	Activity	Error	MDA
BE-7	+	3.91E+02 ±	1.86E+02	3.66E+02
K-40	+	1.51E+04 ±	1.05E+03	4.24E+02
CR-51		2.85E+01 ±	2.38E+02	4.68E+02
MN-54		0.00E+00 ±	2.79E+01	5.34E+01
CO-58		-3.90E-01 ±	2.63E+01	5.14E+01
FE-59		3.22E+01 ±	6.12E+01	1.17E+02
CO-60		9.43E+00 ±	1.45E+01	6.89E+01
ZN-65		-1.76E+01 ±	6.77E+01	1.21E+02
ZRNB-95		-5.11E+00 ±	5.67E+01	1.06E+02
CS-134		-1.31E+01 ±	2.43E+01	5.46E+01
CS-137	+	3.12E+02 ±	4.46E+01	5.46E+01
BALA140		1.40E+01 ±	1.92E+01	1.15E+02
BI-214	+	6.35E+02 ±	8.73E+01	9.77E+01

Location and Date			Station 37	6/12/2018
Nuclide	RQ	Activity	Error	MDA
BE-7		2.03E+02 ±	2.94E+02	4.10E+02
K-40	+	1.79E+04 ±	1.30E+03	4.37E+02
CR-51		2.66E+02 ±	2.21E+02	3.05E+02
MN-54		3.63E+01 ±	3.36E+01	4.28E+01
CO-58		-7.35E+00 ±	3.68E+01	5.04E+01
FE-59		3.73E+01 ±	9.63E+01	1.22E+02
CO-60		0.00E+00 ±	2.55E+01	5.82E+01
ZN-65		-1.36E+01 ±	8.87E+01	1.15E+02
ZRNB-95		3.42E+01 ±	5.50E+01	7.32E+01
CS-134		3.23E+01 ±	2.63E+01	3.39E+01
CS-137		1.43E+01 ±	3.64E+01	5.05E+01
BALA140		0.00E+00 ±	1.28E+01	9.17E+01
BI-214	+	6.58E+02 ±	1.01E+02	8.70E+01

Location and Date			Station 5	6/12/2018
Nuclide	RQ	Activity	Error	MDA
BE-7		1.50E+02 ±	5.26E+02	7.28E+02
K-40	+	1.60E+04 ±	1.14E+03	3.25E+02
CR-51		3.81E+02 ±	8.99E+02	1.27E+03
MN-54		1.40E+01 ±	4.01E+01	5.25E+01
CO-58		1.76E+01 ±	4.55E+01	6.02E+01
FE-59		-9.24E+01 ±	2.31E+02	2.86E+02
CO-60		-2.47E+01 ±	5.50E+01	6.75E+01
ZN-65		3.43E+01 ±	7.19E+01	9.24E+01
ZRNB-95		6.81E+00 ±	1.03E+02	1.37E+02
CS-134		3.19E+00 ±	3.32E+01	4.54E+01
CS-137		3.17E+01 ±	4.27E+01	5.58E+01
BALA140		1.42E+02 ±	4.12E+02	5.17E+02
BI-214	+	7.84E+02 ±	1.21E+02	1.14E+02

Location and Date			Station 9a	6/12/2018
Nuclide	RQ	Activity	Error	MDA
BE-7	+	3.29E+02 ±	2.51E+02	3.26E+02
K-40	+	1.30E+04 ±	9.40E+02	3.73E+02
CR-51		-2.10E+01 ±	2.82E+02	4.02E+02
MN-54		2.79E+01 ±	2.42E+01	2.98E+01
CO-58		4.87E+00 ±	2.30E+01	3.09E+01
FE-59		-4.94E+01 ±	1.02E+02	1.26E+02
CO-60		-1.20E+01 ±	3.91E+01	4.85E+01
ZN-65		-4.03E+01 ±	8.87E+01	1.11E+02
ZRNB-95		1.71E+01 ±	5.70E+01	7.45E+01
CS-134		8.45E-01 ±	2.95E+01	4.01E+01
CS-137		-6.82E+00 ±	3.30E+01	4.45E+01
BALA140		-1.41E+01 ±	4.85E+01	5.90E+01
BI-214	+	7.37E+02 ±	9.18E+01	7.63E+01

Location and Date			Station 21	6/12/2018
Nuclide	RQ	Activity	Error	MDA
BE-7		1.69E+02 ±	2.28E+02	3.07E+02
K-40	+	1.40E+04 ±	9.20E+02	2.51E+02
CR-51		6.10E+00 ±	2.03E+02	2.94E+02
MN-54		6.20E+00 ±	2.70E+01	3.56E+01
CO-58		0.00E+00 ±	1.49E+01	3.81E+01
FE-59		4.56E+01 ±	6.88E+01	8.44E+01
CO-60		7.53E-01 ±	3.11E+01	3.97E+01
ZN-65		9.85E+00 ±	5.44E+01	7.08E+01
ZRNB-95		4.10E+01 ±	4.40E+01	5.53E+01
CS-134		4.81E+00 ±	2.04E+01	2.78E+01
CS-137		1.90E+01 ±	2.57E+01	3.36E+01
BALA140		0.00E+00 ±	7.98E+00	5.42E+01
BI-214	+	3.99E+02 ±	7.85E+01	8.39E+01

TABLE A-8.2
GAMMA SPECTROMETRY RESULTS OF SOIL - SUMMARY

Results in pCi/kilogram

Nuclide		Average Activity	Activity Low	Activity High	Average MDA	Number of Samples	Number of Positive IDs
BALA140	Ind	3.91E+01	0.00E+00	1.42E+02	1.94E+02	4	0
BALA140	Cntl	-1.41E+01	-1.41E+01	-1.41E+01	5.90E+01	1	0
BE-7	Ind	2.28E+02	1.50E+02	3.91E+02	4.53E+02	4	1
BE-7	Cntl	3.29E+02	3.29E+02	3.29E+02	3.26E+02	1	1
BI-214	Ind	6.19E+02	3.99E+02	7.84E+02	9.55E+01	4	4
BI-214	Cntl	7.37E+02	7.37E+02	7.37E+02	7.63E+01	1	1
CO-58	Ind	2.47E+00	-7.35E+00	1.76E+01	5.00E+01	4	0
CO-58	Cntl	4.87E+00	4.87E+00	4.87E+00	3.09E+01	1	0
CO-60	Ind	-3.62E+00	-2.47E+01	9.43E+00	5.86E+01	4	0
CO-60	Cntl	-1.20E+01	-1.20E+01	-1.20E+01	4.85E+01	1	0
CR-51	Ind	1.70E+02	6.10E+00	3.81E+02	5.83E+02	4	0
CR-51	Cntl	-2.10E+01	-2.10E+01	-2.10E+01	4.02E+02	1	0
CS-134	Ind	6.80E+00	-1.31E+01	3.23E+01	4.04E+01	4	0
CS-134	Cntl	8.45E-01	8.45E-01	8.45E-01	4.01E+01	1	0
CS-137	Ind	9.43E+01	1.43E+01	3.12E+02	4.86E+01	4	1
CS-137	Cntl	-6.82E+00	-6.82E+00	-6.82E+00	4.45E+01	1	0
FE-59	Ind	5.67E+00	-9.24E+01	4.56E+01	1.53E+02	4	0
FE-59	Cntl	-4.94E+01	-4.94E+01	-4.94E+01	1.26E+02	1	0
K-40	Ind	1.58E+04	1.40E+04	1.79E+04	3.59E+02	4	4
K-40	Cntl	1.30E+04	1.30E+04	1.30E+04	3.73E+02	1	1
MN-54	Ind	1.41E+01	0.00E+00	3.63E+01	4.61E+01	4	0
MN-54	Cntl	2.79E+01	2.79E+01	2.79E+01	2.98E+01	1	0
ZN-65	Ind	3.24E+00	-1.76E+01	3.43E+01	1.00E+02	4	0
ZN-65	Cntl	-4.03E+01	-4.03E+01	-4.03E+01	1.11E+02	1	0
ZRNB-95	Ind	1.92E+01	-5.11E+00	4.10E+01	9.29E+01	4	0
ZRNB-95	Cntl	1.71E+01	1.71E+01	1.71E+01	7.45E+01	1	0

TABLE A-9.1
GAMMA SPECTROMETRY RESULTS OF SEDIMENT

Results in pCi/kilogram dry material

Station 34 Downstream Indicator

Location & Date					Location & Date				
Station 34 4/2/2018					Station 34 10/22/2018				
Nuclide	RQ	Activity	Error	MDA	Nuclide	RQ	Activity	Error	MDA
BE-7		2.16E+02 ±	2.42E+02	3.32E+02	BE-7		-6.72E+01 ±	1.80E+02	2.45E+02
K-40	+	1.64E+04 ±	1.00E+03	4.15E+02	K-40	+	1.57E+04 ±	8.02E+02	2.53E+02
CR-51		-1.22E+02 ±	2.78E+02	4.02E+02	CR-51		-5.66E+01 ±	1.82E+02	2.56E+02
MN-54		8.19E+00 ±	2.89E+01	3.87E+01	MN-54		1.07E+01 ±	2.02E+01	2.59E+01
CO-58		-1.19E+01 ±	3.23E+01	4.30E+01	CO-58		5.35E-01 ±	2.01E+01	2.64E+01
FE-59		1.47E+01 ±	8.98E+01	1.12E+02	FE-59		-4.10E+01 ±	7.26E+01	8.79E+01
CO-60		1.84E+01 ±	3.24E+01	4.06E+01	CO-60		-4.50E-01 ±	2.19E+01	2.77E+01
ZN-65		-1.09E+01 ±	8.16E+01	1.04E+02	ZN-65		-3.63E+01 ±	5.39E+01	6.66E+01
ZRNB-95		1.45E+01 ±	5.72E+01	7.65E+01	ZRNB-95		5.79E+00 ±	3.89E+01	5.06E+01
CS-134		7.88E+00 ±	2.30E+01	3.17E+01	CS-134		1.66E+01 ±	1.68E+01	2.16E+01
CS-137	+	7.08E+01 ±	2.75E+01	3.52E+01	CS-137	+	1.29E+02 ±	2.23E+01	2.15E+01
BALA140		0.00E+00 ±	4.04E+00	7.64E+01	BALA140		4.59E+00 ±	2.77E+01	3.38E+01
BI-214	+	7.77E+02 ±	9.01E+01	7.41E+01	BI-214	+	5.34E+02 ±	5.89E+01	5.08E+01

Station 33 Upstream Control

Location & Date					Location & Date				
Station 33 4/2/2018					Station 33 10/22/2018				
Nuclide	RQ	Activity	Error	MDA	Nuclide	RQ	Activity	Error	MDA
BE-7		1.06E+02 ±	2.02E+02	2.83E+02	BE-7		1.22E+02 ±	3.03E+02	4.27E+02
K-40	+	1.46E+04 ±	9.00E+02	3.84E+02	K-40	+	1.74E+04 ±	1.06E+03	3.93E+02
CR-51		4.44E+01 ±	2.17E+02	3.17E+02	CR-51		6.80E+01 ±	3.72E+02	5.46E+02
MN-54		5.71E+00 ±	2.82E+01	3.78E+01	MN-54		-5.15E+00 ±	3.49E+01	4.69E+01
CO-58		1.22E+01 ±	2.38E+01	3.16E+01	CO-58		7.38E+00 ±	3.20E+01	4.34E+01
FE-59		4.95E+00 ±	7.48E+01	9.46E+01	FE-59		3.35E+01 ±	1.34E+02	1.67E+02
CO-60		1.21E+01 ±	2.90E+01	3.67E+01	CO-60		-9.69E+00 ±	3.71E+01	4.63E+01
ZN-65		-3.47E+00 ±	6.36E+01	8.15E+01	ZN-65		-2.25E+00 ±	6.90E+01	8.95E+01
ZRNB-95		2.36E+01 ±	4.59E+01	6.07E+01	ZRNB-95		-2.49E+01 ±	7.27E+01	9.69E+01
CS-134		1.50E+00 ±	2.21E+01	3.07E+01	CS-134		-3.77E+00 ±	2.46E+01	3.42E+01
CS-137	+	6.36E+01 ±	2.63E+01	3.27E+01	CS-137	+	7.68E+01 ±	3.01E+01	3.61E+01
BALA140		0.00E+00 ±	1.31E+01	5.73E+01	BALA140		0.00E+00 ±	1.05E+01	1.50E+02
BI-214	+	7.14E+02 ±	8.08E+01	6.82E+01	BI-214	+	6.05E+02 ±	9.00E+01	8.32E+01

TABLE A-9.2
GAMMA SPECTROMETRY RESULTS OF SEDIMENT - SUMMARY

Results in pCi/kilogram dry material

Nuclide		Average Activity	Activity Low	Activity High	Average MDA	Number of Samples	Number of Positive IDs
BALA140	Ind	2.29E+00	0.00E+00	4.59E+00	5.51E+01	2	0
BALA140	Cntl	0.00E+00	0.00E+00	0.00E+00	1.04E+02	2	0
BE-7	Ind	7.46E+01	-6.72E+01	2.16E+02	2.89E+02	2	0
BE-7	Cntl	1.14E+02	1.06E+02	1.22E+02	3.55E+02	2	0
BI-214	Ind	6.55E+02	5.34E+02	7.77E+02	6.24E+01	2	2
BI-214	Cntl	6.60E+02	6.05E+02	7.14E+02	7.57E+01	2	2
CO-58	Ind	-5.69E+00	-1.19E+01	5.35E-01	3.47E+01	2	0
CO-58	Cntl	9.79E+00	7.38E+00	1.22E+01	3.75E+01	2	0
CO-60	Ind	8.98E+00	-4.50E-01	1.84E+01	3.41E+01	2	0
CO-60	Cntl	1.19E+00	-9.69E+00	1.21E+01	4.15E+01	2	0
CR-51	Ind	-8.94E+01	-1.22E+02	-5.66E+01	3.29E+02	2	0
CR-51	Cntl	5.62E+01	4.44E+01	6.80E+01	4.32E+02	2	0
CS-134	Ind	1.22E+01	7.88E+00	1.66E+01	2.67E+01	2	0
CS-134	Cntl	-1.14E+00	-3.77E+00	1.50E+00	3.25E+01	2	0
CS-137	Ind	9.99E+01	7.08E+01	1.29E+02	2.83E+01	2	2
CS-137	Cntl	7.02E+01	6.36E+01	7.68E+01	3.44E+01	2	2
FE-59	Ind	-1.32E+01	-4.10E+01	1.47E+01	1.00E+02	2	0
FE-59	Cntl	1.92E+01	4.95E+00	3.35E+01	1.31E+02	2	0
K-40	Ind	1.60E+04	1.57E+04	1.64E+04	3.34E+02	2	2
K-40	Cntl	1.60E+04	1.46E+04	1.74E+04	3.88E+02	2	2
MN-54	Ind	9.45E+00	8.19E+00	1.07E+01	3.23E+01	2	0
MN-54	Cntl	2.80E-01	-5.15E+00	5.71E+00	4.23E+01	2	0
ZN-65	Ind	-2.36E+01	-3.63E+01	-1.09E+01	8.51E+01	2	0
ZN-65	Cntl	-2.86E+00	-3.47E+00	-2.25E+00	8.55E+01	2	0
ZRNB-95	Ind	1.01E+01	5.79E+00	1.45E+01	6.36E+01	2	0
ZRNB-95	Cntl	-6.79E-01	-2.49E+01	2.36E+01	7.88E+01	2	0

TABLE A-10.1
GAMMA SPECTROMETRY RESULTS OF FISH
Station 30 Columbia River - Station 38 Snake River
Results in pCi/kilogram (wet)

Location & Species	Collection Date	Nuclide	RQ	Activity	Error	MDA
Walleye Station 30 Indicator	05/01/18	K-40	+	3.55E+03	±	3.68E+02
		MN-54		3.66E-01	±	1.24E+01
		CO-58		-5.14E+00	±	1.97E+01
		FE-59		2.38E+01	±	6.15E+01
		CO-60		-2.57E+00	±	1.98E+01
		ZN-65		4.07E+00	±	3.17E+01
		ZRNB-95		-9.72E+00	±	3.28E+01
		CS-134		7.63E+00	±	1.17E+01
		CS-137		1.00E+01	±	1.14E+01
Bass Station 30 Indicator	08/17/18	Bi-214		2.90E+01	±	2.56E+01
		K-40	+	3.75E+03	±	3.76E+02
		MN-54		-2.08E+00	±	1.73E+01
		CO-58		1.42E+00	±	1.67E+01
		FE-59		-2.16E+01	±	6.95E+01
		CO-60		1.87E+00	±	1.24E+01
		ZN-65		-3.94E+00	±	3.42E+01
		ZRNB-95		4.27E+00	±	2.66E+01
		CS-134		-3.49E+00	±	1.54E+01
Salmon Station 30 Indicator	11/06/18	CS-137		3.83E+00	±	1.42E+01
		Bi-214		2.57E+01	±	3.43E+01
		K-40	+	3.37E+03	±	4.01E+02
		MN-54		4.59E+00	±	1.53E+01
		CO-58		-4.47E+00	±	1.94E+01
		FE-59		-2.75E+00	±	5.86E+01
		CO-60		1.02E+01	±	1.26E+01
		ZN-65		4.96E+00	±	3.86E+01
		ZRNB-95		-3.26E+00	±	3.17E+01
		CS-134		1.11E+00	±	1.69E+01
		CS-137		8.04E+00	±	1.71E+01
		Bi-214		2.18E+01	±	4.10E+01
						5.83E+01

TABLE A-10.1
GAMMA SPECTROMETRY RESULTS OF FISH
Station 30 Columbia River - Station 38 Snake River
Results in pCi/kilogram (wet)

Location & Species	Collection Date	Nuclide	RQ	Activity	Error	MDA
Bass Station 38 Control	09/08/18	K-40	+	3.95E+03	±	4.82E+02
		MN-54		8.43E+00	±	1.84E+01
		CO-58		-2.55E+00	±	2.33E+01
		FE-59		0.00E+00	±	1.73E+01
		CO-60		9.24E+00	±	1.69E+01
		ZN-65		-1.67E+01	±	5.60E+01
		ZRNB-95		3.06E+00	±	2.70E+01
		CS-134		0.00E+00	±	9.02E+00
		CS-137		3.61E+00	±	2.25E+01
		Bi-214		5.09E+00	±	5.98E+01
Walleye Station 38 Control	10/26/18	K-40	+	3.74E+03	±	3.77E+02
		MN-54		-5.65E+00	±	1.66E+01
		CO-58		-6.48E+00	±	1.80E+01
		FE-59		6.92E+01	±	4.34E+01
		CO-60		9.24E+00	±	9.07E+00
		ZN-65		-4.63E+00	±	4.02E+01
		ZRNB-95		-9.03E-01	±	2.74E+01
		CS-134		-9.17E+00	±	1.65E+01
		CS-137		-3.59E+00	±	1.61E+01
		Bi-214		2.75E+01	±	3.81E+01
Salmon Station 38 Control	11/06/18	K-40	+	3.31E+03	±	3.70E+02
		MN-54		7.82E+00	±	1.19E+01
		CO-58		5.18E+00	±	1.44E+01
		FE-59		2.97E+01	±	4.27E+01
		CO-60		7.42E+00	±	1.71E+01
		ZN-65		0.00E+00	±	1.58E+01
		ZRNB-95		2.08E+01	±	2.33E+01
		CS-134		4.51E+00	±	1.51E+01
		CS-137		5.21E+00	±	1.70E+01
		Bi-214		2.43E+01	±	4.15E+01

TABLE A-10.2
GAMMA SPECTROMETRY RESULTS OF FISH - SUMMARY
 Results in pCi/kilogram (wet)

Nuclide		Average Activity	Activity Low	Activity High	Average MDA	Number of Samples	Number of Positive IDs
Bi-214	Ind	2.55E+01	2.18E+01	2.90E+01	4.55E+01	3	0
Bi-214	Cntl	1.90E+01	5.09E+00	2.75E+01	6.60E+01	3	0
CO-58	Ind	-2.73E+00	-5.14E+00	1.42E+00	2.50E+01	3	0
CO-58	Cntl	-1.28E+00	-6.48E+00	5.18E+00	2.48E+01	3	0
CO-60	Ind	3.17E+00	-2.57E+00	1.02E+01	1.91E+01	3	0
CO-60	Cntl	8.63E+00	7.42E+00	9.24E+00	1.80E+01	3	0
CS-134	Ind	1.75E+00	-3.49E+00	7.63E+00	1.99E+01	3	0
CS-134	Cntl	-1.55E+00	-9.17E+00	4.51E+00	2.53E+01	3	0
CS-137	Ind	7.30E+00	3.83E+00	1.00E+01	1.91E+01	3	0
CS-137	Cntl	1.74E+00	-3.59E+00	5.21E+00	2.53E+01	3	0
FE-59	Ind	-1.86E-01	-2.16E+01	2.38E+01	8.03E+01	3	0
FE-59	Cntl	3.30E+01	0.00E+00	6.92E+01	7.09E+01	3	0
K-40	Ind	3.56E+03	3.37E+03	3.75E+03	2.43E+02	3	3
K-40	Cntl	3.67E+03	3.31E+03	3.95E+03	2.29E+02	3	3
MN-54	Ind	9.56E-01	-2.08E+00	4.59E+00	2.02E+01	3	0
MN-54	Cntl	3.54E+00	-5.65E+00	8.43E+00	2.06E+01	3	0
ZN-65	Ind	1.70E+00	-3.94E+00	4.96E+00	4.57E+01	3	0
ZN-65	Cntl	-7.12E+00	-1.67E+01	0.00E+00	5.91E+01	3	0
ZRNB-95	Ind	-2.90E+00	-9.72E+00	4.27E+00	4.18E+01	3	0
ZRNB-95	Cntl	7.64E+00	-9.03E-01	2.08E+01	3.59E+01	3	0

TABLE A-11.1
IODINE-131 IN MILK

Results in pCi/liter, decay corrected to sample collection time

Stations 36 & 36B Indicators					Station 9B Control				
Collection Date	RQ	I-131 Activity	Error	I-131 MDA	Collection Date	RQ	I-131 Activity	Error	I-131 MDA
01/09/18		-6.19E-02	± 2.22E-01	3.22E-01	01/09/18		-6.07E-02	± 1.89E-04	3.50E-01
02/06/18		2.91E-02	± 2.16E-01	3.14E-01	02/06/18		4.28E-02	± 1.21E-04	3.30E-01
03/13/18		6.35E-02	± 1.97E-01	2.86E-01	03/13/18		-1.49E-01	± 4.25E-04	3.31E-01
04/03/18		1.55E-01	± 2.00E-01	2.85E-01	04/03/18		3.93E-02	± 1.11E-04	3.30E-01
04/17/18		1.80E-02	± 2.74E-01	3.21E-01	04/17/18		1.02E-01	± 1.91E-04	2.69E-01
05/08/18		1.66E-01	± 2.63E-01	3.04E-01	05/08/18		5.93E-02	± 1.14E-04	2.78E-01
05/22/18		8.06E-02	± 1.86E-01	2.69E-01	05/22/18		7.53E-02	± 1.96E-04	3.03E-01
06/05/18		2.03E-02	± 1.83E-01	2.66E-01	06/05/18		7.52E-02	± 1.93E-04	2.99E-01
06/19/18		7.88E-02	± 2.52E-01	2.94E-01	06/19/18		-2.78E-02	± 5.86E-05	3.07E-01
07/10/18		2.13E-02	± 2.50E-01	2.94E-01	07/10/18		-7.75E-02	± 1.61E-04	3.00E-01
07/24/18**		-2.52E-02	± 3.60E-01	4.22E-01	07/24/18		-1.27E-01	± 3.55E-04	3.25E-01
08/07/18		-1.32E-01	± 2.10E-01	3.01E-01	08/07/18		-8.52E-02	± 2.28E-04	3.12E-01
08/21/18**		8.39E-02	± 2.66E-01	3.10E-01	08/21/18		3.97E-02	± 7.54E-05	2.76E-01
09/04/18		-1.15E-01	± 3.40E-01	3.96E-01	09/04/18		5.04E-02	± 1.42E-04	3.29E-01
09/14/18**		1.58E-02	± 3.81E-01	4.47E-01	09/18/18		1.01E-01	± 2.84E-04	3.28E-01
10/02/18		2.15E-01	± 2.59E-01	2.98E-01	10/02/18		-1.15E-01	± 2.42E-04	3.01E-01
11/06/18		0.00E+00	± 1.00E-01	3.41E-01	11/06/18		-6.37E-02	± 1.37E-04	3.12E-01
12/11/18		1.03E-01	± 1.92E-01	2.76E-01	12/11/18		-1.70E-01	± 4.99E-04	3.40E-01

**Samples collected from ST-36B

TABLE A-11.2
IODINE-131 IN MILK - SUMMARY

Results in pCi/liter, decay corrected to sample collection time

Station	Average Activity	Activity Low	Activity High	Average MDA	Number Samples	Number Positive IDs
Indicator- ST- 36 & 36B	3.98E-02	-1.32E-01	2.15E-01	3.19E-01	18	0
Control - ST- 9B	-1.62E-02	-1.70E-01	1.02E-01	3.12E-01	18	0

TABLE A-12.1
GAMMA SPECTROMETRY RESULTS OF MILK
STATION 36 & 36B - Indicators

Results in pCi per liter

Location & Date		Station 36		1/9/2018
Nuclide	RQ	Activity	Error	MDA
BA-133		1.72E+00 ±	4.76E+00	7.09E+00
CO-60		4.33E+00 ±	4.23E+00	5.39E+00
ZN-65		0.00E+00 ±	1.33E+01	1.76E+01
MN-54		1.01E+00 ±	4.86E+00	6.72E+00
CS-134		2.60E+00 ±	3.80E+00	5.18E+00
CS-137		5.54E-01 ±	3.18E+00	5.71E+00
BALA140		2.57E+00 ±	4.50E+00	7.14E+00
K-40	+	1.38E+03 ±	1.48E+02	8.57E+01
FE-59		2.54E+00 ±	1.35E+01	1.80E+01
ZRNB-95		2.10E+00 ±	5.74E+00	1.03E+01
BE-7		0.00E+00 ±	3.70E+01	5.45E+01

Location & Date		Station 36		2/6/2018
Nuclide	RQ	Activity	Error	MDA
BA-133		1.44E+00 ±	4.72E+00	1.09E+01
CO-60		1.43E-01 ±	7.03E+00	9.28E+00
ZN-65		5.18E+00 ±	1.05E+01	1.96E+01
MN-54		5.22E-01 ±	4.55E+00	9.02E+00
CS-134		-1.17E+00 ±	4.36E+00	8.44E+00
CS-137		0.00E+00 ±	4.06E+00	1.01E+01
BALA140		6.99E-01 ±	2.11E+00	1.13E+01
K-40	+	1.38E+03 ±	1.44E+02	1.15E+02
FE-59		-6.52E+00 ±	1.73E+01	3.11E+01
ZRNB-95		9.85E-01 ±	4.40E+00	1.39E+01
BE-7		-4.08E+00 ±	3.63E+01	7.24E+01

Location & Date		Station 36		3/13/2018
Nuclide	RQ	Activity	Error	MDA
BA-133		-3.52E-01 ±	8.47E-01	8.42E+00
CO-60		4.60E+00 ±	5.61E+00	6.82E+00
ZN-65		9.51E+00 ±	1.02E+01	1.26E+01
MN-54		6.95E-01 ±	4.41E+00	6.03E+00
CS-134		1.54E+00 ±	3.71E+00	5.06E+00
CS-137		6.96E-01 ±	3.25E+00	5.81E+00
BALA140		4.00E+00 ±	4.53E+00	5.40E+00
K-40	+	1.55E+03 ±	1.51E+02	6.66E+01
FE-59		-4.31E+00 ±	1.73E+01	2.20E+01
ZRNB-95		-2.52E+00 ±	9.18E+00	1.26E+01
BE-7		-4.58E+00 ±	4.05E+01	5.73E+01

Location & Date		Station 36		4/3/2018
Nuclide	RQ	Activity	Error	MDA
BA-133		-9.45E-01 ±	5.82E+00	8.42E+00
CO-60		1.71E+00 ±	5.88E+00	7.53E+00
ZN-65		0.00E+00 ±	1.58E+00	1.72E+01
MN-54		1.93E+00 ±	5.75E+00	7.60E+00
CS-134		-7.54E-01 ±	4.71E+00	6.47E+00
CS-137		1.08E+00 ±	5.31E+00	7.32E+00
BALA140		2.70E-01 ±	5.30E+00	7.15E+00
K-40	+	1.37E+03 ±	1.45E+02	7.35E+01
FE-59		1.84E+00 ±	1.13E+01	1.51E+01
ZRNB-95		-2.19E+00 ±	8.69E+00	1.20E+01
BE-7		-2.29E+00 ±	3.91E+01	5.56E+01

Location & Date		Station 36		4/17/2018
Nuclide	RQ	Activity	Error	MDA
BA-133		7.09E-01 ±	4.81E+00	7.05E+00
CO-60		1.71E+00 ±	5.88E+00	7.53E+00
ZN-65		0.00E+00 ±	5.92E+00	1.90E+01
MN-54		9.27E-01 ±	4.43E+00	6.03E+00
CS-134		1.73E+00 ±	3.73E+00	5.06E+00
CS-137		0.00E+00 ±	9.27E-01	8.25E+00
BALA140		0.00E+00 ±	8.09E-01	7.15E+00
K-40	+	1.37E+03 ±	1.44E+02	7.19E+01
FE-59		-4.92E+00 ±	1.85E+01	2.34E+01
ZRNB-95		1.52E+00 ±	6.52E+00	9.19E+00
BE-7		1.14E+01 ±	3.43E+01	4.82E+01

Location & Date		Station 36		5/8/2018
Nuclide	RQ	Activity	Error	MDA
BA-133		1.82E+00 ±	4.66E+00	1.02E+01
CO-60		3.72E+00 ±	5.52E+00	1.00E+01
ZN-65		5.60E-01 ±	1.30E+01	2.40E+01
MN-54		1.55E-01 ±	5.02E+00	9.65E+00
CS-134		1.54E+00 ±	3.71E+00	7.24E+00
CS-137		-2.36E+00 ±	4.51E+00	1.06E+01
BALA140		6.08E+00 ±	3.15E+00	6.48E+00
K-40	+	1.25E+03 ±	1.41E+02	1.16E+02
FE-59		6.27E+00 ±	1.19E+01	2.29E+01
ZRNB-95		-1.33E-01 ±	8.96E+00	1.75E+01
BE-7		-6.10E+00 ±	3.81E+01	7.38E+01

TABLE A-12.1
GAMMA SPECTROMETRY RESULTS OF MILK
STATION 36 & 36B - Indicators

Results in pCi per liter

Location & Date		Station 36 5/22/2018		
Nuclide	RQ	Activity	Error	MDA
BA-133		-4.15E+00 ±	6.64E+00	9.27E+00
CO-60		0.00E+00 ±	2.20E+00	9.83E+00
ZN-65		1.40E+00 ±	1.22E+01	1.61E+01
MN-54		1.85E+00 ±	4.53E+00	6.03E+00
CS-134		-5.34E-01 ±	4.88E+00	6.72E+00
CS-137		-1.16E+00 ±	5.81E+00	7.96E+00
BALA140		4.78E+00 ±	4.64E+00	5.37E+00
K-40	+	1.28E+03 ±	1.40E+02	7.26E+01
FE-59		1.49E+01 ±	9.22E+00	1.68E+01
ZRNB-95		-2.65E-01 ±	8.03E+00	1.13E+01
BE-7		1.22E+01 ±	2.97E+01	4.17E+01

Location & Date		Station 36 6/5/2018		
Nuclide	RQ	Activity	Error	MDA
BA-133		4.99E+00 ±	4.02E+00	5.30E+00
CO-60		0.00E+00 ±	5.88E-01	9.31E+00
ZN-65		-5.87E+00 ±	1.42E+01	1.81E+01
MN-54		-7.34E-01 ±	4.75E+00	6.46E+00
CS-134		-1.57E+00 ±	5.48E+00	7.39E+00
CS-137		-2.70E+00 ±	6.37E+00	8.54E+00
BALA140		0.00E+00 ±	2.28E+00	8.50E+00
K-40	+	1.18E+03 ±	1.38E+02	8.40E+01
FE-59		-5.78E+00 ±	1.74E+01	2.20E+01
ZRNB-95		4.64E-01 ±	7.53E+00	1.07E+01
BE-7		1.29E+01 ±	3.44E+01	4.82E+01

Location & Date		Station 36 6/19/2018		
Nuclide	RQ	Activity	Error	MDA
BA-133		2.49E+00 ±	4.09E+00	1.06E+01
CO-60		5.97E-01 ±	1.02E+00	1.41E+01
ZN-65		0.00E+00 ±	1.44E+01	2.62E+01
MN-54		-7.73E-02 ±	5.01E+00	9.65E+00
CS-134		-5.34E-01 ±	2.84E+00	7.24E+00
CS-137		7.34E-01 ±	3.50E+00	8.90E+00
BALA140		6.78E-01 ±	5.40E+00	1.13E+01
K-40	+	1.31E+03 ±	1.39E+02	1.00E+02
FE-59		1.48E+00 ±	1.59E+01	2.92E+01
ZRNB-95		1.26E+00 ±	7.63E+00	1.53E+01
BE-7		7.63E+00 ±	3.55E+01	6.95E+01

Location & Date		Station 36 7/10/2018		
Nuclide	RQ	Activity	Error	MDA
BA-133		1.25E+00 ±	2.48E+00	7.67E+00
CO-60		1.42E+00 ±	5.85E+00	7.53E+00
ZN-65		-5.59E+00 ±	1.49E+01	1.90E+01
MN-54		-2.32E-01 ±	4.36E+00	6.03E+00
CS-134		0.00E+00 ±	4.18E+00	7.39E+00
CS-137		-1.20E+00 ±	4.39E+00	7.64E+00
BALA140		2.18E-01 ±	7.64E-01	9.67E+00
K-40	+	1.35E+03 ±	1.41E+02	6.66E+01
FE-59		7.87E+00 ±	1.37E+01	1.71E+01
ZRNB-95		6.23E+00 ±	5.64E+00	9.20E+00
BE-7		-1.45E+01 ±	3.46E+01	4.82E+01

Location & Date		Station 36B 7/24/2018		
Nuclide	RQ	Activity	Error	MDA
BA-133		2.70E-01 ±	4.10E+00	7.26E+00
CO-60		1.64E+00 ±	4.44E+00	7.45E+00
ZN-65		0.00E+00 ±	1.77E+01	2.29E+01
MN-54		1.51E+00 ±	5.44E+00	7.24E+00
CS-134		-1.70E+00 ±	4.78E+00	6.47E+00
CS-137		1.66E+00 ±	4.54E+00	6.22E+00
BALA140		1.23E+00 ±	3.33E+00	8.52E+00
K-40	+	1.97E+03 ±	1.72E+02	6.66E+01
FE-59		5.60E+00 ±	8.08E+00	1.51E+01
ZRNB-95		1.70E+00 ±	1.94E+00	1.37E+01
BE-7		-1.22E+01 ±	4.35E+01	6.05E+01

Location & Date		Station 36 8/7/2018		
Nuclide	RQ	Activity	Error	MDA
BA-133		4.05E-01 ±	5.24E+00	7.67E+00
CO-60		0.00E+00 ±	3.43E+00	1.08E+01
ZN-65		6.15E+00 ±	7.45E+00	9.34E+00
MN-54		1.89E+00 ±	4.17E+00	5.56E+00
CS-134		4.24E+00 ±	4.41E+00	5.67E+00
CS-137		2.40E+00 ±	4.90E+00	6.61E+00
BALA140		6.75E-01 ±	5.38E+00	7.16E+00
K-40	+	1.44E+03 ±	1.48E+02	7.33E+01
FE-59		0.00E+00 ±	1.48E+00	2.20E+01
ZRNB-95		7.96E-01 ±	7.02E+00	9.97E+00
BE-7		1.75E+01 ±	3.49E+01	4.82E+01

TABLE A-12.1
GAMMA SPECTROMETRY RESULTS OF MILK
STATION 36 & 36B - Indicators

Results in pCi per liter

Location & Date		Station 36B 8/21/2018		
Nuclide	RQ	Activity	Error	MDA
BA-133		-1.08E+00 ±	4.69E+00	6.83E+00
CO-60		-1.07E+00 ±	5.70E+00	7.45E+00
ZN-65		7.27E+00 ±	9.98E+00	1.26E+01
MN-54		3.17E+00 ±	3.03E+00	3.75E+00
CS-134		1.26E+00 ±	4.35E+00	5.95E+00
CS-137		1.43E+00 ±	4.51E+00	6.22E+00
BALA140		-1.01E+00 ±	6.58E+00	8.52E+00
K-40	+	1.52E+03 ±	1.50E+02	6.66E+01
FE-59		1.29E+01 ±	1.27E+01	1.51E+01
ZRNB-95		-3.91E+00 ±	1.05E+01	1.42E+01
BE-7		3.81E+00 ±	3.36E+01	4.82E+01

Location & Date		Station 36 9/4/2018		
Nuclide	RQ	Activity	Error	MDA
BA-133		2.28E+00 ±	3.96E+00	5.81E+00
CO-60		1.66E+00 ±	2.35E+00	9.72E+00
ZN-65		-4.09E+00 ±	1.50E+01	1.93E+01
MN-54		2.35E+00 ±	3.11E+00	4.14E+00
CS-134		0.00E+00 ±	1.24E+00	6.75E+00
CS-137		7.75E-01 ±	4.46E+00	6.39E+00
BALA140		2.39E+00 ±	1.96E+00	2.94E+00
K-40	+	1.14E+03 ±	1.39E+02	9.05E+01
FE-59		0.00E+00 ±	6.77E+00	2.21E+01
ZRNB-95		0.00E+00 ±	1.87E+00	1.21E+01
BE-7		1.12E+01 ±	3.24E+01	4.68E+01

Location & Date		Station 36B 9/14/2018		
Nuclide	RQ	Activity	Error	MDA
BA-133		9.70E-01 ±	4.61E+00	6.93E+00
CO-60		1.47E+00 ±	5.64E+00	7.31E+00
ZN-65		0.00E+00 ±	2.69E+00	2.03E+01
MN-54		-2.51E+00 ±	5.52E+00	7.42E+00
CS-134		0.00E+00 ±	2.65E+00	8.02E+00
CS-137		-1.44E+00 ±	5.38E+00	7.56E+00
BALA140		8.73E-01 ±	4.57E+00	6.33E+00
K-40	+	1.63E+03 ±	1.60E+02	8.07E+01
FE-59		-3.42E+00 ±	1.67E+01	2.19E+01
ZRNB-95		-3.23E+00 ±	9.61E+00	1.31E+01
BE-7		-1.75E+00 ±	3.29E+01	4.88E+01

Location & Date		Station 36 10/2/2018		
Nuclide	RQ	Activity	Error	MDA
BA-133		2.97E+00 ±	4.85E+00	6.83E+00
CO-60		2.30E+00 ±	3.28E+00	4.16E+00
ZN-65		0.00E+00 ±	3.54E+00	1.90E+01
MN-54		0.00E+00 ±	9.27E-01	8.58E+00
CS-134		3.46E-01 ±	4.48E+00	6.22E+00
CS-137		-1.55E-01 ±	4.68E+00	6.61E+00
BALA140		3.38E-01 ±	3.80E+00	5.39E+00
K-40	+	1.39E+03 ±	1.56E+02	9.76E+01
FE-59		6.15E-01 ±	1.44E+01	1.89E+01
ZRNB-95		1.19E+00 ±	7.07E+00	9.97E+00
BE-7		1.07E+01 ±	3.57E+01	5.02E+01

Location & Date		Station 36 11/6/2018		
Nuclide	RQ	Activity	Error	MDA
BA-133		3.98E+00 ±	4.74E+00	6.55E+00
CO-60		-1.66E+00 ±	6.41E+00	8.23E+00
ZN-65		0.00E+00 ±	6.13E+00	2.22E+01
MN-54		-2.70E-01 ±	4.71E+00	6.46E+00
CS-134		-1.89E-01 ±	4.66E+00	6.47E+00
CS-137		2.94E+00 ±	3.69E+00	4.86E+00
BALA140		1.49E+00 ±	5.52E+00	7.19E+00
K-40	+	1.43E+03 ±	1.55E+02	8.98E+01
FE-59		-1.23E-01 ±	1.44E+01	1.89E+01
ZRNB-95		2.19E+00 ±	8.70E+00	1.20E+01
BE-7		-2.75E+01 ±	4.68E+01	6.36E+01

Location & Date		Station 36 12/11/2018		
Nuclide	RQ	Activity	Error	MDA
BA-133		-3.38E+00 ±	4.63E+00	6.42E+00
CO-60		-1.96E+00 ±	5.13E+00	6.41E+00
ZN-65		1.00E+01 ±	6.25E+00	1.07E+01
MN-54		-1.51E+00 ±	4.28E+00	5.59E+00
CS-134		-5.54E-01 ±	4.34E+00	5.85E+00
CS-137		-1.34E+00 ±	4.37E+00	5.89E+00
BALA140		-6.83E-01 ±	4.79E+00	6.12E+00
K-40	+	1.48E+03 ±	1.25E+02	6.64E+01
FE-59		0.00E+00 ±	1.86E+00	1.78E+01
ZRNB-95		4.26E+00 ±	4.84E+00	6.29E+00
BE-7		-1.44E+00 ±	3.05E+01	4.28E+01

TABLE A-12.1
GAMMA SPECTROMETRY RESULTS OF MILK
STATION 9B - Control
 Results in pCi per liter

Collection Date: 1/9/2018				
Nuclide	RQ	Activity	Error	MDA
BA-133		-9.01E-01 ±	5.50E+00	7.74E+00
CO-60		3.92E-01 ±	7.26E+00	9.32E+00
ZN-65		1.68E+00 ±	1.21E+01	1.56E+01
MN-54		-3.48E-01 ±	5.35E+00	7.25E+00
CS-134		-1.38E+00 ±	5.45E+00	7.38E+00
CS-137		1.78E+00 ±	5.16E+00	6.86E+00
BALA140		2.02E+00 ±	5.84E+00	7.33E+00
K-40	+	1.41E+03 ±	1.47E+02	7.67E+01
FE-59		3.69E+00 ±	1.60E+01	2.05E+01
ZRNB-95		5.24E+00 ±	7.39E+00	9.55E+00
BE-7		1.36E+01 ±	3.84E+01	5.20E+01

Collection Date: 2/6/2018				
Nuclide	RQ	Activity	Error	MDA
BA-133		3.70E+00 ±	4.29E+00	8.26E+00
CO-60		1.82E+00 ±	2.25E+00	1.30E+01
ZN-65		0.00E+00 ±	1.29E+01	2.40E+01
MN-54		1.89E+00 ±	4.18E+00	8.12E+00
CS-134		-1.54E+00 ±	4.58E+00	8.60E+00
CS-137		-2.55E+00 ±	4.71E+00	1.09E+01
BALA140		5.58E+00 ±	3.37E+00	6.53E+00
K-40	+	1.57E+03 ±	1.52E+02	1.00E+02
FE-59		-3.16E-01 ±	9.50E-01	2.92E+01
ZRNB-95		9.30E-01 ±	8.11E+00	1.61E+01
BE-7		2.37E+01 ±	2.92E+01	5.67E+01

Collection Date: 3/13/2018				
Nuclide	RQ	Activity	Error	MDA
BA-133		1.32E+00 ±	4.86E+00	7.05E+00
CO-60		-1.37E+00 ±	7.33E+00	9.32E+00
ZN-65		7.01E+00 ±	1.10E+01	1.39E+01
MN-54		3.87E-01 ±	5.05E+00	6.88E+00
CS-134		0.00E+00 ±	1.51E+00	7.61E+00
CS-137		2.32E+00 ±	4.30E+00	5.81E+00
BALA140		1.99E+00 ±	5.86E+00	7.56E+00
K-40	+	1.44E+03 ±	1.47E+02	7.21E+01
FE-59		-7.24E+00 ±	1.90E+01	2.37E+01
ZRNB-95		-6.70E-01 ±	8.16E+00	1.15E+01
BE-7		-9.26E+00 ±	4.14E+01	5.80E+01

Collection Date: 4/3/2018				
Nuclide	RQ	Activity	Error	MDA
BA-133		-2.66E+00 ±	5.17E+00	7.57E+00
CO-60		1.15E+00 ±	5.84E+00	7.72E+00
ZN-65		8.17E-01 ±	1.00E+01	1.35E+01
MN-54		2.61E-01 ±	4.23E+00	6.00E+00
CS-134		1.71E+00 ±	4.08E+00	5.68E+00
CS-137		1.22E+00 ±	4.50E+00	6.39E+00
BALA140		0.00E+00 ±	8.00E-01	8.43E+00
K-40	+	1.25E+03 ±	1.45E+02	9.24E+01
FE-59		0.00E+00 ±	6.46E+00	2.09E+01
ZRNB-95		-3.25E+00 ±	8.46E+00	1.15E+01
BE-7		-8.38E+00 ±	3.66E+01	5.30E+01

Collection Date: 4/17/2018				
Nuclide	RQ	Activity	Error	MDA
BA-133		-4.06E-01 ±	4.31E+00	6.58E+00
CO-60		4.30E+00 ±	6.15E+00	7.72E+00
ZN-65		2.72E+00 ±	1.28E+01	1.67E+01
MN-54		-1.01E+00 ±	4.86E+00	6.72E+00
CS-134		-2.96E+00 ±	5.61E+00	7.66E+00
CS-137		-1.11E+00 ±	4.72E+00	6.71E+00
BALA140		0.00E+00 ±	2.78E+00	9.58E+00
K-40	+	1.33E+03 ±	1.45E+02	8.07E+01
FE-59		7.23E-01 ±	1.45E+01	1.95E+01
ZRNB-95		3.00E+00 ±	6.45E+00	8.84E+00
BE-7		1.82E+01 ±	2.67E+01	3.76E+01

Collection Date: 5/8/2018				
Nuclide	RQ	Activity	Error	MDA
BA-133		2.06E+00 ±	4.58E+00	6.75E+00
CO-60		2.87E+00 ±	6.01E+00	7.72E+00
ZN-65		0.00E+00 ±	5.56E+00	2.23E+01
MN-54		0.00E+00 ±	4.47E-01	6.72E+00
CS-134		3.86E+00 ±	3.13E+00	3.99E+00
CS-137		-8.86E-01 ±	4.70E+00	6.71E+00
BALA140		0.00E+00 ±	1.14E+00	8.48E+00
K-40	+	1.32E+03 ±	1.45E+02	8.46E+01
FE-59		-6.15E+00 ±	1.62E+01	2.09E+01
ZRNB-95		-1.28E-01 ±	8.62E+00	1.21E+01
BE-7		1.61E+01 ±	3.05E+01	4.35E+01

TABLE A-12.1
GAMMA SPECTROMETRY RESULTS OF MILK
STATION 9B - Control
 Results in pCi per liter

Collection Date: 5/22/2018				
Nuclide	RQ	Activity	Error	MDA
BA-133		1.93E+00 ±	3.08E+00	1.02E+01
CO-60		2.48E+00 ±	2.86E+00	1.09E+01
ZN-65		-8.39E-01 ±	1.22E+01	2.28E+01
MN-54		0.00E+00 ±	5.87E+00	1.09E+01
CS-134		-1.23E+00 ±	4.16E+00	9.74E+00
CS-137		6.18E-01 ±	5.27E+00	1.02E+01
BALA140		1.48E-01 ±	4.39E-01	1.29E+01
K-40	+	1.37E+03 ±	1.49E+02	1.23E+02
FE-59		4.60E+00 ±	1.07E+01	2.92E+01
ZRNB-95		-2.19E+00 ±	8.70E+00	1.68E+01
BE-7		6.11E+00 ±	3.81E+01	7.39E+01

Collection Date: 6/5/2018				
Nuclide	RQ	Activity	Error	MDA
BA-133		-9.11E-01 ±	5.69E+00	8.24E+00
CO-60		0.00E+00 ±	1.44E+00	1.08E+01
ZN-65		-3.08E+00 ±	1.24E+01	1.62E+01
MN-54		-1.66E+00 ±	4.85E+00	6.46E+00
CS-134		0.00E+00 ±	2.39E+00	8.58E+00
CS-137		2.05E+00 ±	3.94E+00	5.36E+00
BALA140		1.97E+00 ±	4.17E+00	5.43E+00
K-40	+	1.69E+03 ±	1.63E+02	8.19E+01
FE-59		1.97E+00 ±	1.31E+01	1.72E+01
ZRNB-95		-1.99E-01 ±	8.52E+00	1.20E+01
BE-7		3.59E+01 ±	3.36E+01	4.41E+01

Collection Date: 6/19/2018				
Nuclide	RQ	Activity	Error	MDA
BA-133		3.17E+00 ±	3.82E+00	5.30E+00
CO-60		-1.96E-01 ±	7.23E+00	9.31E+00
ZN-65		-7.00E+00 ±	1.57E+01	1.99E+01
MN-54		1.35E+00 ±	4.82E+00	6.46E+00
CS-134		-6.29E-01 ±	4.30E+00	5.95E+00
CS-137		-3.09E-01 ±	5.24E+00	7.32E+00
BALA140		1.98E+00 ±	4.19E+00	5.46E+00
K-40	+	1.35E+03 ±	1.51E+02	9.09E+01
FE-59		2.72E+00 ±	1.32E+01	1.72E+01
ZRNB-95		1.53E+00 ±	6.54E+00	9.22E+00
BE-7		9.17E+00 ±	3.27E+01	4.63E+01

Collection Date: 7/10/2018				
Nuclide	RQ	Activity	Error	MDA
BA-133		-2.02E+00 ±	5.36E+00	7.67E+00
CO-60		9.80E-01 ±	7.30E+00	9.31E+00
ZN-65		9.51E+00 ±	1.02E+01	1.26E+01
MN-54		-2.20E+00 ±	5.50E+00	7.24E+00
CS-134		-1.60E+00 ±	5.31E+00	7.18E+00
CS-137		2.09E+00 ±	4.27E+00	5.81E+00
BALA140		1.16E+00 ±	4.00E+00	5.43E+00
K-40	+	1.40E+03 ±	1.46E+02	7.28E+01
FE-59		0.00E+00 ±	3.62E+00	2.21E+01
ZRNB-95		0.00E+00 ±	2.52E+00	1.47E+01
BE-7		-3.82E+00 ±	3.66E+01	5.21E+01

Collection Date: 7/24/2018				
Nuclide	RQ	Activity	Error	MDA
BA-133		-1.35E+00 ±	5.02E+00	7.26E+00
CO-60		-3.33E+00 ±	8.31E+00	1.03E+01
ZN-65		-1.68E+00 ±	1.14E+01	1.51E+01
MN-54		1.58E+00 ±	4.84E+00	6.46E+00
CS-134		2.92E+00 ±	4.29E+00	5.67E+00
CS-137		2.09E+00 ±	4.27E+00	5.81E+00
BALA140		-2.04E-01 ±	6.53E+00	8.59E+00
K-40	+	1.30E+03 ±	1.43E+02	8.05E+01
FE-59		-2.84E+00 ±	1.72E+01	2.21E+01
ZRNB-95		-1.99E+00 ±	7.17E+00	9.99E+00
BE-7		1.83E+01 ±	3.35E+01	4.62E+01

Collection Date: 8/7/2018				
Nuclide	RQ	Activity	Error	MDA
BA-133		2.29E+00 ±	4.94E+00	8.57E+00
CO-60		1.90E+00 ±	3.98E+00	8.78E+00
ZN-65		4.76E+00 ±	8.56E+00	1.69E+01
MN-54		0.00E+00 ±	6.38E+00	1.17E+01
CS-134		5.28E+00 ±	3.85E+00	6.84E+00
CS-137		4.64E-01 ±	3.21E+00	8.41E+00
BALA140		1.94E+00 ±	4.11E+00	9.45E+00
K-40	+	1.43E+03 ±	1.51E+02	1.20E+02
FE-59		5.36E+00 ±	5.30E+00	2.92E+01
ZRNB-95		1.43E+00 ±	4.94E+00	2.06E+01
BE-7		1.99E+01 ±	3.66E+01	6.95E+01

TABLE A-12.1
GAMMA SPECTROMETRY RESULTS OF MILK
STATION 9B - Control
 Results in pCi per liter

Collection Date: 8/21/2018				
Nuclide	RQ	Activity	Error	MDA
BA-133		1.35E-01 ±	3.83E+00	9.42E+00
CO-60		1.12E+00 ±	4.98E+00	9.95E+00
ZN-65		2.24E+00 ±	9.41E+00	1.86E+01
MN-54		4.21E+00 ±	4.43E+00	8.12E+00
CS-134		2.20E+00 ±	2.98E+00	5.95E+00
CS-137		5.02E+00 ±	3.36E+00	7.31E+00
BALA140		-9.52E-01 ±	5.46E+00	1.14E+01
K-40	+	1.42E+03 ±	1.48E+02	1.15E+02
FE-59		3.57E+00 ±	1.47E+01	2.73E+01
ZRNB-95		2.06E+00 ±	7.72E+00	1.53E+01
BE-7		-7.64E-01 ±	3.34E+01	6.72E+01

Collection Date: 9/4/2018				
Nuclide	RQ	Activity	Error	MDA
BA-133		-1.69E-01 ±	5.90E+00	8.60E+00
CO-60		-1.66E+00 ±	6.41E+00	8.23E+00
ZN-65		0.00E+00 ±	5.71E+00	2.07E+01
MN-54		3.28E+00 ±	4.33E+00	5.56E+00
CS-134		-1.26E+00 ±	5.11E+00	6.95E+00
CS-137		8.50E-01 ±	5.29E+00	7.32E+00
BALA140		0.00E+00 ±	8.14E-01	1.17E+01
K-40	+	1.26E+03 ±	1.42E+02	8.46E+01
FE-59		1.97E+00 ±	1.31E+01	1.71E+01
ZRNB-95		1.13E+00 ±	6.48E+00	9.20E+00
BE-7		1.53E+00 ±	4.03E+01	5.74E+01

Collection Date: 9/18/2018				
Nuclide	RQ	Activity	Error	MDA
BA-133		-2.53E+00 ±	5.80E+00	8.24E+00
CO-60		0.00E+00 ±	2.73E+00	8.93E+00
ZN-65		0.00E+00 ±	5.01E+00	2.07E+01
MN-54		3.59E+00 ±	3.57E+00	4.45E+00
CS-134		-1.10E+00 ±	4.92E+00	6.72E+00
CS-137		-6.18E-01 ±	4.73E+00	6.61E+00
BALA140		1.97E+00 ±	4.15E+00	5.41E+00
K-40	+	1.39E+03 ±	1.45E+02	5.68E+01
FE-59		0.00E+00 ±	2.96E+00	2.20E+01
ZRNB-95		1.33E+00 ±	8.14E+00	1.14E+01
BE-7		0.00E+00 ±	1.67E+01	6.36E+01

Collection Date: 10/2/2018				
Nuclide	RQ	Activity	Error	MDA
BA-133		1.82E+00 ±	5.35E+00	7.67E+00
CO-60		4.28E-01 ±	4.02E+00	5.53E+00
ZN-65		9.52E+00 ±	7.94E+00	1.49E+01
MN-54		3.01E+00 ±	4.65E+00	6.03E+00
CS-134		-2.83E-01 ±	5.22E+00	7.18E+00
CS-137		0.00E+00 ±	1.47E+00	8.25E+00
BALA140		1.98E+00 ±	4.17E+00	5.44E+00
K-40	+	1.32E+03 ±	1.43E+02	7.79E+01
FE-59		-5.18E+00 ±	1.62E+01	2.06E+01
ZRNB-95		1.20E+00 ±	7.08E+00	9.99E+00
BE-7		-2.52E+01 ±	4.56E+01	6.22E+01

Collection Date: 11/6/2018				
Nuclide	RQ	Activity	Error	MDA
BA-133		-1.88E+00 ±	4.56E+00	6.75E+00
CO-60		-9.97E-01 ±	6.21E+00	8.07E+00
ZN-65		0.00E+00 ±	2.19E+00	1.86E+01
MN-54		-5.60E-01 ±	4.83E+00	6.74E+00
CS-134		1.80E+00 ±	4.26E+00	5.91E+00
CS-137		1.22E+00 ±	4.50E+00	6.39E+00
BALA140		0.00E+00 ±	1.19E+00	1.01E+01
K-40	+	1.31E+03 ±	1.45E+02	8.57E+01
FE-59		-2.93E+00 ±	1.50E+01	1.98E+01
ZRNB-95		5.93E+00 ±	4.93E+00	6.03E+00
BE-7		-2.18E+00 ±	3.43E+01	5.07E+01

Collection Date: 12/11/2018				
Nuclide	RQ	Activity	Error	MDA
BA-133		1.20E+00 ±	3.66E+00	5.44E+00
CO-60		8.66E-01 ±	4.20E+00	5.48E+00
ZN-65		0.00E+00 ±	4.91E+00	1.45E+01
MN-54		0.00E+00 ±	1.34E+00	6.95E+00
CS-134		2.09E+00 ±	3.37E+00	4.60E+00
CS-137		3.24E+00 ±	3.60E+00	4.80E+00
BALA140		1.51E-01 ±	4.84E+00	6.37E+00
K-40	+	1.16E+03 ±	1.19E+02	7.09E+01
FE-59		0.00E+00 ±	3.76E+00	2.08E+01
ZRNB-95		7.66E+00 ±	5.06E+00	9.07E+00
BE-7		-7.56E+00 ±	3.26E+01	4.68E+01

TABLE A-12.2
GAMMA SPECTROMETRY RESULTS OF MILK - SUMMARY
 Results in pCi per liter

Nuclide		Average Activity	Activity Low	Activity High	Average MDA	Number of Samples	Number of Positive IDs
BA-133	Ind	8.55E-01	-4.15E+00	4.99E+00	7.33E+00	18	0
BA-133	Cntl	2.67E-01	-2.66E+00	3.70E+00	7.23E+00	18	0
BALA140	Ind	1.37E+00	-1.01E+00	6.08E+00	6.93E+00	18	0
BALA140	Cntl	1.10E+00	-9.52E-01	5.58E+00	7.66E+00	18	0
BE-7	Ind	7.27E-01	-2.75E+01	1.75E+01	5.15E+01	18	0
BE-7	Cntl	5.85E+00	-2.52E+01	3.59E+01	5.16E+01	18	0
CO-60	Ind	1.15E+00	-1.96E+00	4.60E+00	7.84E+00	18	0
CO-60	Cntl	5.97E-01	-3.33E+00	4.30E+00	8.44E+00	18	0
CS-134	Ind	3.48E-01	-1.70E+00	4.24E+00	6.19E+00	18	0
CS-134	Cntl	4.38E-01	-2.96E+00	5.28E+00	6.43E+00	18	0
CS-137	Ind	1.06E-01	-2.70E+00	2.94E+00	6.90E+00	18	0
CS-137	Cntl	9.71E-01	-2.55E+00	5.02E+00	6.68E+00	18	0
FE-59	Ind	1.61E+00	-6.52E+00	1.49E+01	1.94E+01	18	0
FE-59	Cntl	-3.00E-03	-7.24E+00	5.36E+00	2.10E+01	18	0
K-40	Ind	1.41E+03	1.14E+03	1.97E+03	7.81E+01	18	18
K-40	Cntl	1.37E+03	1.16E+03	1.69E+03	8.25E+01	18	18
MN-54	Ind	5.93E-01	-2.51E+00	3.17E+00	6.42E+00	18	0
MN-54	Cntl	7.67E-01	-2.20E+00	4.21E+00	6.78E+00	18	0
ZN-65	Ind	1.36E+00	-5.87E+00	1.00E+01	1.71E+01	18	0
ZN-65	Cntl	1.43E+00	-7.00E+00	9.52E+00	1.67E+01	18	0
ZRNB-95	Ind	5.81E-01	-3.91E+00	6.23E+00	1.12E+01	18	0
ZRNB-95	Cntl	1.28E+00	-3.25E+00	7.66E+00	1.12E+01	18	0

Table A-13.1

GAMMA SPECTROMETRY RESULTS OF PLANT DISCHARGE WATER**STATION 27 - Plant Discharge Water Indicator**

Results in pCi/liter, corrected for decay during collection period

Location ST-27 collected 2/1/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		3.85E+01 ±	4.25E+01	5.65E+01
CR-51		-1.92E+01 ±	3.46E+01	4.83E+01
MN-54		-2.38E+00 ±	3.74E+00	4.77E+00
CO-58		-1.51E+00 ±	3.92E+00	5.08E+00
FE-59		-4.62E+00 ±	1.15E+01	1.43E+01
CO-60		6.37E-01 ±	2.89E+00	3.68E+00
ZN-65		1.35E+00 ±	5.43E+00	7.10E+00
ZRNB-95		1.15E+00 ±	5.84E+00	7.93E+00
I-131		3.12E+00 ±	1.02E+01	1.45E+01
CS-134		-6.66E-01 ±	3.05E+00	4.08E+00
CS-137		1.32E+00 ±	2.84E+00	3.79E+00
BALA140		9.14E-01 ±	8.78E+00	1.11E+01
BI-214		2.70E+00 ±	4.53E+00	1.01E+01

Location ST-27 collected 3/1/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		2.24E-01 ±	4.15E+01	6.10E+01
CR-51		-5.31E+00 ±	2.94E+01	4.33E+01
MN-54		2.02E+00 ±	2.29E+00	2.98E+00
CO-58		0.00E+00 ±	8.14E-01	4.87E+00
FE-59		0.00E+00 ±	3.75E+00	1.43E+01
CO-60		6.49E-02 ±	3.18E+00	4.20E+00
ZN-65		-1.03E+00 ±	6.72E+00	8.74E+00
ZRNB-95		9.62E-01 ±	4.72E+00	6.50E+00
I-131		3.06E+00 ±	7.97E+00	1.17E+01
CS-134		-5.34E-01 ±	2.94E+00	4.08E+00
CS-137		1.05E+00 ±	2.27E+00	3.16E+00
BALA140		6.21E-01 ±	6.68E+00	8.72E+00
BI-214	+	1.39E+01 ±	5.02E+00	8.68E+00

Location ST-27 collected 4/2/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		1.51E+01 ±	3.53E+01	5.43E+01
CR-51		-1.15E+00 ±	2.86E+01	4.25E+01
MN-54		-1.39E-01 ±	2.99E+00	4.10E+00
CO-58		-3.55E-01 ±	3.59E+00	4.90E+00
FE-59		0.00E+00 ±	5.49E+00	1.74E+01
CO-60		2.27E+00 ±	2.61E+00	3.22E+00
ZN-65		4.00E+00 ±	5.93E+00	7.44E+00
ZRNB-95		1.66E+00 ±	5.24E+00	7.12E+00
I-131		2.76E+00 ±	7.79E+00	1.15E+01
CS-134		3.29E-01 ±	2.56E+00	3.58E+00
CS-137		5.49E-01 ±	2.59E+00	3.64E+00
BALA140		0.00E+00 ±	1.18E+00	1.29E+01
BI-214		1.45E+00 ±	7.20E+00	1.04E+01

Location ST-27 collected 5/1/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		1.09E+01 ±	3.64E+01	7.47E+01
CR-51		-6.05E+00 ±	2.76E+01	5.30E+01
MN-54		-2.12E+00 ±	3.60E+00	6.30E+00
CO-58		0.00E+00 ±	3.67E+00	6.72E+00
FE-59		2.27E+00 ±	5.47E+00	1.66E+01
CO-60		2.28E-03 ±	4.56E-02	6.62E+00
ZN-65		0.00E+00 ±	5.91E+00	1.10E+01
ZRNB-95		-1.99E+00 ±	6.40E+00	1.15E+01
I-131		6.03E+00 ±	8.73E+00	1.37E+01
CS-134		1.52E+00 ±	2.57E+00	4.68E+00
CS-137		7.98E-01 ±	2.05E+00	4.83E+00
BALA140		2.38E+00 ±	2.84E+00	1.52E+01
BI-214		4.58E+00 ±	7.49E+00	1.30E+01

Location ST-27 collected 5/31/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		1.67E+01 ±	3.87E+01	5.30E+01
CR-51		-1.65E+01 ±	3.18E+01	4.60E+01
MN-54		2.23E+00 ±	2.32E+00	2.98E+00
CO-58		-5.73E-01 ±	3.09E+00	4.22E+00
FE-59		-6.38E-01 ±	9.25E+00	1.23E+01
CO-60		0.00E+00 ±	2.13E+00	4.20E+00
ZN-65		3.87E+00 ±	4.66E+00	5.80E+00
ZRNB-95		1.91E+00 ±	6.58E+00	8.84E+00
I-131		6.11E-01 ±	8.23E+00	1.23E+01
CS-134		2.05E-01 ±	2.49E+00	3.50E+00
CS-137		4.99E-02 ±	2.71E+00	3.86E+00
BALA140		0.00E+00 ±	1.22E+00	1.48E+01
BI-214	+	1.28E+01 ±	4.69E+00	5.94E+00

Location ST-27 collected 7/2/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		8.02E+00 ±	3.86E+01	5.46E+01
CR-51		7.43E+00 ±	2.98E+01	4.25E+01
MN-54		2.08E+00 ±	2.50E+00	3.17E+00
CO-58		2.27E+00 ±	3.17E+00	4.06E+00
FE-59		7.12E-02 ±	9.81E+00	1.27E+01
CO-60		2.82E+00 ±	2.67E+00	3.16E+00
ZN-65		0.00E+00 ±	1.72E+00	1.02E+01
ZRNB-95		-1.64E+00 ±	6.59E+00	8.88E+00
I-131		-1.17E+00 ±	1.42E+01	2.03E+01
CS-134		-5.88E-01 ±	3.05E+00	4.09E+00
CS-137		2.77E+00 ±	2.41E+00	3.05E+00
BALA140		-5.58E+00 ±	1.32E+01	1.61E+01
BI-214		0.00E+00 ±	7.49E+00	1.49E+01

Table A-13.1

GAMMA SPECTROMETRY RESULTS OF PLANT DISCHARGE WATER**STATION 27 - Plant Discharge Water Indicator**

Results in pCi/liter, corrected for decay during collection period

Location ST-27 collected 8/1/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		3.47E+01 ±	3.61E+01	4.85E+01
CR-51		5.56E+00 ±	3.07E+01	4.53E+01
MN-54		-5.94E-01 ±	2.84E+00	3.86E+00
CO-58		-1.40E-01 ±	2.84E+00	3.95E+00
FE-59		3.46E+00 ±	7.46E+00	9.71E+00
CO-60		4.04E-01 ±	2.81E+00	3.65E+00
ZN-65		2.46E+00 ±	7.18E+00	9.18E+00
ZRNB-95		4.91E-01 ±	5.64E+00	7.75E+00
I-131		2.75E+00 ±	1.01E+01	1.49E+01
CS-134		-8.22E-01 ±	2.59E+00	3.59E+00
CS-137		-2.99E-01 ±	2.65E+00	3.75E+00
BALA140		-2.65E+00 ±	9.60E+00	1.20E+01
BI-214		5.76E+00 ±	6.62E+00	8.81E+00

Location ST-27 collected 8/30/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		1.81E+01 ±	3.88E+01	5.30E+01
CR-51		2.53E+01 ±	2.84E+01	4.04E+01
MN-54		1.07E+00 ±	2.78E+00	3.74E+00
CO-58		3.23E-01 ±	2.76E+00	3.83E+00
FE-59		-8.82E-01 ±	1.03E+01	1.35E+01
CO-60		-3.80E-01 ±	3.53E+00	4.52E+00
ZN-65		3.90E-01 ±	5.64E+00	7.50E+00
ZRNB-95		-1.07E-01 ±	5.89E+00	8.12E+00
I-131		4.31E+00 ±	1.04E+01	1.52E+01
CS-134		1.28E+00 ±	2.79E+00	3.81E+00
CS-137		6.99E-01 ±	2.52E+00	3.53E+00
BALA140		6.70E+00 ±	7.34E+00	8.67E+00
BI-214		5.07E+00 ±	7.20E+00	1.02E+01

Location ST-27 collected 10/1/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		3.62E+01 ±	3.63E+01	5.31E+01
CR-51		-1.28E-01 ±	2.92E+01	4.34E+01
MN-54		1.83E+00 ±	2.40E+00	3.15E+00
CO-58		-1.99E+00 ±	3.79E+00	5.02E+00
FE-59		0.00E+00 ±	2.08E+00	1.62E+01
CO-60		1.83E+00 ±	2.95E+00	3.65E+00
ZN-65		5.03E+00 ±	4.30E+00	5.11E+00
ZRNB-95		3.46E+00 ±	4.97E+00	6.55E+00
I-131		1.28E+00 ±	7.72E+00	1.15E+01
CS-134		-8.62E-01 ±	2.86E+00	3.94E+00
CS-137		4.49E-01 ±	2.58E+00	3.64E+00
BALA140		-2.03E+00 ±	8.83E+00	1.11E+01
BI-214		7.56E+00 ±	7.05E+00	9.81E+00

Location ST-27 collected 11/1/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		3.16E+01 ±	4.17E+01	5.61E+01
CR-51		-1.97E+00 ±	3.40E+01	4.86E+01
MN-54		7.87E-01 ±	2.82E+00	3.72E+00
CO-58		4.09E-01 ±	3.49E+00	4.63E+00
FE-59		1.68E+00 ±	9.11E+00	1.17E+01
CO-60		0.00E+00 ±	3.79E-01	4.24E+00
ZN-65		-1.97E+00 ±	7.09E+00	9.08E+00
ZRNB-95		4.82E-01 ±	5.53E+00	7.61E+00
I-131		-6.57E+00 ±	1.30E+01	1.82E+01
CS-134		0.00E+00 ±	8.11E-01	4.32E+00
CS-137		2.48E+00 ±	2.47E+00	3.16E+00
BALA140		-6.00E+00 ±	1.37E+01	1.66E+01
BI-214		6.71E+00 ±	6.58E+00	9.77E+00

Location ST-27 collected 12/3/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		5.99E+00 ±	4.38E+01	5.99E+01
CR-51		2.13E+00 ±	3.20E+01	4.57E+01
MN-54		-6.98E-01 ±	3.28E+00	4.30E+00
CO-58		-5.61E-01 ±	3.01E+00	4.00E+00
FE-59		-3.02E+00 ±	9.91E+00	1.25E+01
CO-60		-2.90E-01 ±	2.63E+00	3.43E+00
ZN-65		-9.74E-01 ±	6.95E+00	8.99E+00
ZRNB-95		6.90E-01 ±	5.48E+00	7.50E+00
I-131		5.63E+00 ±	7.41E+00	1.03E+01
CS-134		-9.00E-01 ±	3.04E+00	4.05E+00
CS-137		-4.81E-02 ±	3.14E+00	4.28E+00
BALA140		0.00E+00 ±	1.50E+00	1.22E+01
BI-214		5.14E+00 ±	7.69E+00	1.07E+01

Location ST-27 collected 12/31/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		8.60E+00 ±	4.05E+01	5.31E+01
CR-51		-1.91E+00 ±	2.82E+01	4.07E+01
MN-54		-4.04E-01 ±	3.29E+00	4.34E+00
CO-58		-1.36E-01 ±	3.21E+00	4.30E+00
FE-59		6.57E+00 ±	8.71E+00	1.06E+01
CO-60		-1.37E+00 ±	3.98E+00	4.95E+00
ZN-65		2.84E+00 ±	5.58E+00	7.12E+00
ZRNB-95		-4.30E+00 ±	7.38E+00	9.71E+00
I-131		-5.24E+00 ±	1.23E+01	1.73E+01
CS-134		1.05E+00 ±	2.55E+00	3.40E+00
CS-137		8.06E-02 ±	2.84E+00	3.90E+00
BALA140		3.41E+00 ±	7.66E+00	9.57E+00
BI-214		2.12E+00 ±	4.13E+00	1.03E+01

TABLE A-13.2

GAMMA SPECTROMETRY RESULTS OF PLANT DISCHARGE WATER - SUMMARY

Results in pCi/liter, corrected for decay during collection period

Nuclide	Average Activity	Activity Low	Activity High	Average MDA	Number of Samples	Number of Positive IDs
K-40	1.87E+01	2.24E-01	3.85E+01	5.65E+01	12	0
CR-51	-9.85E-01	-1.92E+01	2.53E+01	4.50E+01	12	0
MN-54	3.07E-01	-2.38E+00	2.23E+00	3.95E+00	12	0
CO-58	-1.89E-01	-1.99E+00	2.27E+00	4.63E+00	12	0
FE-59	4.08E-01	-4.62E+00	6.57E+00	1.35E+01	12	0
CO-60	4.99E-01	-1.37E+00	2.82E+00	4.13E+00	12	0
ZN-65	1.33E+00	-1.97E+00	5.03E+00	8.10E+00	12	0
ZRNB-95	3.61E-01	-4.30E+00	5.03E+00	8.05E+00	12	0
I-131	1.38E+00	-6.57E+00	6.03E+00	1.43E+01	12	0
CS-134	5.48E-04	-9.00E-01	1.52E+00	3.93E+00	12	0
CS-137	8.25E-01	-2.99E-01	2.77E+00	3.72E+00	12	0
BALA140	-1.86E-01	-6.00E+00	6.70E+00	1.24E+01	12	0
BI-214	5.65E+00	0.00E+00	1.39E+01	1.02E+01	12	2

Table A-14.1

GAMMA SPECTROMETRY RESULTS OF DEEP GROUND WATER**Deep Ground Water Wells - Stations 31, 32, and 52**

Results in pCi/liter

Location ST-31 collected 2/22/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		9.48E+01 ±	8.21E+01	1.09E+02
CR-51		4.51E+01 ±	4.83E+01	6.61E+01
MN-54		-2.97E+00 ±	7.92E+00	1.02E+01
CO-58		-1.41E+00 ±	6.66E+00	8.69E+00
FE-59		-9.55E+00 ±	2.12E+01	2.59E+01
CO-60		-1.41E+00 ±	6.69E+00	8.40E+00
ZN-65		8.52E+00 ±	1.14E+01	1.41E+01
ZRNB-95		3.14E+00 ±	1.11E+01	1.48E+01
I-131		2.71E-01 ±	6.05E+00	8.63E+00
CS-134		3.68E+00 ±	7.15E+00	9.38E+00
CS-137		-3.32E+00 ±	7.92E+00	1.05E+01
BALA140		5.08E+00 ±	8.82E+00	1.03E+01
BI-214	+	2.90E+02 ±	2.74E+01	2.48E+01

Location ST-31 collected 6/13/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	1.76E+02 ±	9.44E+01	1.47E+02
CR-51		6.48E+00 ±	4.92E+01	9.01E+01
MN-54		3.10E-01 ±	6.38E+00	1.12E+01
CO-58		-1.20E+00 ±	6.55E+00	1.14E+01
FE-59		-7.87E+00 ±	1.83E+01	3.05E+01
CO-60		1.44E+00 ±	3.50E+00	1.37E+01
ZN-65		1.10E+00 ±	9.56E+00	1.78E+01
ZRNB-95		-6.98E-01 ±	1.10E+01	1.99E+01
I-131		6.97E+00 ±	8.18E+00	1.11E+01
CS-134		-1.30E+00 ±	7.05E+00	1.22E+01
CS-137		5.31E+00 ±	6.07E+00	1.06E+01
BALA140		-1.37E+00 ±	9.89E+00	1.60E+01
BI-214	+	1.69E+02 ±	2.13E+01	2.97E+01

Location ST-31 collected 8/8/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	1.40E+02 ±	7.86E+01	1.02E+02
CR-51		-1.89E+01 ±	5.48E+01	7.69E+01
MN-54		0.00E+00 ±	2.88E+00	1.08E+01
CO-58		8.95E-01 ±	6.22E+00	8.18E+00
FE-59		-2.85E+00 ±	1.73E+01	2.17E+01
CO-60		-2.64E+00 ±	8.19E+00	1.01E+01
ZN-65		-2.85E+00 ±	1.49E+01	1.90E+01
ZRNB-95		-2.95E+00 ±	1.12E+01	1.50E+01
I-131		3.97E+00 ±	6.26E+00	8.70E+00
CS-134		3.73E+00 ±	6.25E+00	8.19E+00
CS-137		-4.71E+00 ±	7.75E+00	1.02E+01
BALA140		3.04E+00 ±	8.59E+00	1.02E+01
BI-214	+	2.30E+02 ±	2.73E+01	2.64E+01

Location ST-31 collected 12/3/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		1.93E+01 ±	7.82E+01	1.15E+02
CR-51		-1.27E+01 ±	4.90E+01	7.16E+01
MN-54		6.58E-01 ±	6.32E+00	8.59E+00
CO-58		-2.31E+00 ±	7.32E+00	9.76E+00
FE-59		6.28E-01 ±	1.63E+01	2.13E+01
CO-60		3.48E+00 ±	6.01E+00	7.44E+00
ZN-65		-3.53E+00 ±	1.41E+01	1.81E+01
ZRNB-95		-4.25E+00 ±	1.17E+01	1.57E+01
I-131		-1.23E+00 ±	6.75E+00	9.94E+00
CS-134		-3.82E+00 ±	6.71E+00	9.07E+00
CS-137		-3.58E+00 ±	7.14E+00	9.72E+00
BALA140		-2.34E+00 ±	1.01E+01	1.24E+01
BI-214	+	1.70E+02 ±	2.37E+01	2.39E+01

Location ST-32 collected 2/22/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		5.30E+01 ±	9.28E+01	1.28E+02
CR-51		-2.32E+01 ±	6.29E+01	9.11E+01
MN-54		4.20E+00 ±	6.41E+00	8.42E+00
CO-58		0.00E+00 ±	3.56E+00	1.17E+01
FE-59		-7.41E+00 ±	1.95E+01	2.47E+01
CO-60		2.83E+00 ±	7.44E+00	9.45E+00
ZN-65		-4.26E+00 ±	1.57E+01	2.00E+01
ZRNB-95		-3.39E+00 ±	1.43E+01	1.91E+01
I-131		-1.00E+00 ±	9.48E+00	1.39E+01
CS-134		5.54E+00 ±	6.54E+00	8.72E+00
CS-137		3.78E+00 ±	6.39E+00	8.68E+00
BALA140		-3.62E+00 ±	1.33E+01	1.61E+01
BI-214	+	5.61E+02 ±	3.86E+01	2.69E+01

Location ST-32 collected 6/13/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		5.30E+01 ±	9.13E+01	1.20E+02
CR-51		4.36E+01 ±	5.91E+01	8.44E+01
MN-54		2.59E+00 ±	7.15E+00	9.52E+00
CO-58		3.85E+00 ±	6.75E+00	8.90E+00
FE-59		6.77E+00 ±	1.48E+01	1.89E+01
CO-60		-2.21E+00 ±	9.10E+00	1.15E+01
ZN-65		-7.04E+00 ±	1.91E+01	2.40E+01
ZRNB-95		4.92E+00 ±	1.28E+01	1.70E+01
I-131		5.14E+00 ±	7.33E+00	1.05E+01
CS-134		1.30E+00 ±	7.16E+00	9.83E+00
CS-137		2.59E+00 ±	7.08E+00	9.72E+00
BALA140		3.51E+00 ±	9.49E+00	1.15E+01
BI-214	+	7.93E+02 ±	4.61E+01	2.62E+01

Table A-14.1

GAMMA SPECTROMETRY RESULTS OF DEEP GROUND WATER**Deep Ground Water Wells - Stations 31, 32, and 52**

Results in pCi/liter

Location ST-32 collected 8/8/2018			
Nuclide	RQ	Activity	Error MDA
K-40		1.13E+01 ±	9.61E+01 1.34E+02
CR-51		-2.51E+01 ±	6.46E+01 9.33E+01
MN-54		6.89E-01 ±	7.31E+00 9.87E+00
CO-58		3.42E+00 ±	6.58E+00 8.71E+00
FE-59		0.00E+00 ±	7.38E+00 2.44E+01
CO-60		5.97E+00 ±	7.04E+00 8.48E+00
ZN-65		7.04E-01 ±	1.76E+01 2.25E+01
ZRNB-95		-5.60E+00 ±	1.53E+01 2.03E+01
I-131		3.21E+00 ±	7.56E+00 1.09E+01
CS-134		-2.44E-01 ±	8.37E+00 1.15E+01
CS-137		-4.58E+00 ±	9.09E+00 1.23E+01
BALA140		2.28E+00 ±	1.12E+01 1.37E+01
BI-214	+	9.25E+02 ±	5.15E+01 2.75E+01

Location ST-32 collected 12/3/2018			
Nuclide	RQ	Activity	Error MDA
K-40		2.51E+01 ±	8.20E+01 1.18E+02
CR-51		-4.38E+01 ±	6.60E+01 9.46E+01
MN-54		1.40E+00 ±	7.03E+00 9.46E+00
CO-58		2.07E+00 ±	6.40E+00 8.59E+00
FE-59		-5.74E+00 ±	1.87E+01 2.40E+01
CO-60		4.11E+00 ±	6.91E+00 8.50E+00
ZN-65		-8.83E+00 ±	1.75E+01 2.19E+01
ZRNB-95		-4.65E+00 ±	1.31E+01 1.75E+01
I-131		-7.08E+00 ±	1.15E+01 1.66E+01
CS-134		6.37E+00 ±	5.66E+00 7.42E+00
CS-137		-1.49E+00 ±	6.90E+00 9.55E+00
BALA140		-6.02E+00 ±	1.52E+01 1.83E+01
BI-214	+	2.86E+02 ±	2.82E+01 2.40E+01

Location ST-52 collected 2/21/2018			
Nuclide	RQ	Activity	Error MDA
K-40		2.24E+01 ±	8.18E+01 1.18E+02
CR-51		2.63E+01 ±	3.87E+01 5.57E+01
MN-54		-6.56E-02 ±	5.61E+00 7.72E+00
CO-58		5.86E-01 ±	4.86E+00 6.71E+00
FE-59		-6.76E+00 ±	1.64E+01 2.09E+01
CO-60		3.81E+00 ±	6.33E+00 7.96E+00
ZN-65		2.58E+00 ±	1.17E+01 1.52E+01
ZRNB-95		-2.09E+00 ±	1.01E+01 1.37E+01
I-131		-1.54E+00 ±	6.34E+00 9.29E+00
CS-134		-3.49E+00 ±	7.02E+00 9.51E+00
CS-137		9.95E-01 ±	5.63E+00 7.90E+00
BALA140		2.06E+00 ±	7.06E+00 8.80E+00
BI-214		4.07E+00 ±	1.49E+01 2.14E+01

Location ST-52 collected 6/13/2018			
Nuclide	RQ	Activity	Error MDA
K-40		9.12E+00 ±	6.97E+01 1.45E+02
CR-51		-2.87E+01 ±	4.75E+01 6.84E+01
MN-54		2.00E+00 ±	5.21E+00 7.01E+00
CO-58		6.20E-01 ±	5.07E+00 6.97E+00
FE-59		6.78E+00 ±	1.09E+01 1.38E+01
CO-60		2.95E+00 ±	5.93E+00 7.55E+00
ZN-65		1.41E+00 ±	1.10E+01 1.44E+01
ZRNB-95		3.62E+00 ±	9.92E+00 1.33E+01
I-131		1.56E+00 ±	5.23E+00 7.69E+00
CS-134		-2.36E+00 ±	6.45E+00 8.82E+00
CS-137		0.00E+00 ±	9.75E-01 1.03E+01
BALA140		0.00E+00 ±	3.68E+00 1.03E+01
BI-214		1.17E+01 ±	1.49E+01 2.10E+01

Location ST-52 collected 8/8/2018			
Nuclide	RQ	Activity	Error MDA
K-40		7.73E+01 ±	8.41E+01 1.12E+02
CR-51		0.00E+00 ±	1.83E+01 8.70E+01
MN-54		5.64E+00 ±	5.38E+00 6.70E+00
CO-58		-3.75E+00 ±	7.82E+00 1.00E+01
FE-59		-2.12E+00 ±	1.59E+01 2.02E+01
CO-60		-2.14E+00 ±	6.25E+00 7.84E+00
ZN-65		-3.10E+00 ±	1.17E+01 1.50E+01
ZRNB-95		3.14E+00 ±	9.18E+00 1.24E+01
I-131		-3.07E+00 ±	8.73E+00 1.23E+01
CS-134		-7.28E-01 ±	6.87E+00 9.20E+00
CS-137		-2.28E+00 ±	6.75E+00 9.00E+00
BALA140		0.00E+00 ±	5.10E+00 1.40E+01
BI-214		1.15E+01 ±	1.82E+01 2.50E+01

Location ST-52 collected 12/4/2018			
Nuclide	RQ	Activity	Error MDA
K-40		7.53E+01 ±	8.09E+01 1.09E+02
CR-51		-3.78E+00 ±	5.08E+01 7.25E+01
MN-54		-1.48E+00 ±	6.98E+00 9.10E+00
CO-58		3.08E+00 ±	5.58E+00 7.20E+00
FE-59		-9.74E+00 ±	1.99E+01 2.44E+01
CO-60		3.26E+00 ±	5.96E+00 7.38E+00
ZN-65		8.00E+00 ±	1.09E+01 1.36E+01
ZRNB-95		3.23E+00 ±	9.61E+00 1.29E+01
I-131		2.75E+00 ±	9.52E+00 1.35E+01
CS-134		8.59E-01 ±	5.82E+00 7.83E+00
CS-137		7.91E-01 ±	5.94E+00 8.06E+00
BALA140		-1.00E+00 ±	1.04E+01 1.27E+01
BI-214	+	3.09E+01 ±	1.76E+01 2.32E+01

TABLE A-14.2
GAMMA SPECTROMETRY RESULTS OF DEEP GROUND WATER - SUMMARY
 Results in pCi/liter

Nuclide	Average Activity	Activity Low	Activity High	Average MDA	Number of Samples	Number of Positive IDs
K-40	6.31E+01	9.12E+00	1.76E+02	1.22E+02	12	2
CR-51	-2.89E+00	-4.38E+01	4.51E+01	7.93E+01	12	0
MN-54	1.08E+00	-2.97E+00	5.64E+00	9.05E+00	12	0
CO-58	4.88E-01	-3.75E+00	3.85E+00	8.91E+00	12	0
FE-59	-3.15E+00	-9.74E+00	6.78E+00	2.26E+01	12	0
CO-60	1.62E+00	-2.64E+00	5.97E+00	9.03E+00	12	0
ZN-65	-6.09E-01	-8.83E+00	8.52E+00	1.80E+01	12	0
ZRNB-95	-7.52E-02	-5.60E+00	4.92E+00	1.61E+01	12	0
I-131	8.29E-01	-7.08E+00	6.97E+00	1.11E+01	12	0
CS-134	7.95E-01	-3.82E+00	6.37E+00	9.31E+00	12	0
CS-137	-5.41E-01	-4.71E+00	5.31E+00	9.70E+00	12	0
BALA140	1.36E-01	-6.02E+00	5.08E+00	1.29E+01	12	0
BI-214	2.90E+02	4.07E+00	9.25E+02	2.50E+01	12	9

TABLE A-15.1
GAMMA SPECTROMETRY RESULTS OF ROOT CROPS

Results in pCi/ kilogram (wet)

Station 37B is Indicator - Station 9C is Control

Station 37B Potato collected 8/1/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	3.43E+03 ±	2.79E+02	9.12E+01
MN-54		2.85E+00 ±	6.27E+00	8.35E+00
CO-58		4.38E+00 ±	4.48E+00	5.59E+00
FE-59		5.55E+00 ±	2.41E+01	3.09E+01
CO-60		2.17E+00 ±	7.55E+00	9.88E+00
ZN-65		1.30E+01 ±	1.36E+01	1.67E+01
ZRNB-95		-9.98E-02 ±	9.54E+00	1.38E+01
I-131		-5.62E-01 ±	5.72E+00	8.46E+00
CS-134		-1.94E+00 ±	7.42E+00	1.01E+01
CS-137		1.97E+00 ±	5.23E+00	7.30E+00
BALA140		-1.43E+00 ±	8.18E+00	1.08E+01

Station 37B Beet roots collected 8/1/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	3.98E+03 ±	3.75E+02	3.27E+02
MN-54		-1.12E+01 ±	1.84E+01	3.09E+01
CO-58		1.05E+01 ±	1.09E+01	1.93E+01
FE-59		-1.69E+01 ±	4.82E+01	8.02E+01
CO-60		3.78E+00 ±	1.38E+01	2.49E+01
ZN-65		3.10E+01 ±	2.81E+01	4.74E+01
ZRNB-95		-3.89E+00 ±	2.52E+01	4.58E+01
I-131		-1.83E+00 ±	4.71E+00	2.83E+01
CS-134		1.62E+01 ±	1.08E+01	1.82E+01
CS-137		-8.89E+00 ±	1.37E+01	3.02E+01
BALA140		8.79E+00 ±	1.47E+01	2.57E+01

Station 37B Onion collected 8/1/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	1.74E+03 ±	2.84E+02	2.55E+02
MN-54		1.11E+01 ±	1.20E+01	1.55E+01
CO-58		4.94E+00 ±	1.23E+01	1.66E+01
FE-59		1.12E+01 ±	3.30E+01	4.20E+01
CO-60		-2.46E+00 ±	1.76E+01	2.28E+01
ZN-65		4.74E+00 ±	3.10E+01	4.03E+01
ZRNB-95		-1.51E+01 ±	3.00E+01	3.97E+01
I-131		-5.68E+00 ±	1.83E+01	2.69E+01
CS-134		-1.25E+01 ±	1.62E+01	2.16E+01
CS-137		2.68E+00 ±	1.27E+01	1.78E+01
BALA140		-5.09E+00 ±	2.22E+01	2.78E+01

Station 37B Rutabaga roots collected 8/1/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	3.91E+03 ±	4.68E+02	2.50E+02
MN-54		1.24E+00 ±	1.04E+01	1.53E+01
CO-58		0.00E+00 ±	3.28E+00	1.72E+01
FE-59		0.00E+00 ±	1.85E+01	6.02E+01
CO-60		2.65E+00 ±	1.53E+01	2.10E+01
ZN-65		1.01E+01 ±	2.49E+01	3.36E+01
ZRNB-95		3.54E+00 ±	1.80E+01	2.62E+01
I-131		-1.79E+00 ±	1.17E+01	1.79E+01
CS-134		4.31E+00 ±	8.29E+00	1.18E+01
CS-137		0.00E+00 ±	3.27E+00	2.69E+01
BALA140		4.23E+00 ±	1.46E+01	1.99E+01

Station 37B Onion collected 9/10/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	1.82E+03 ±	3.10E+02	2.30E+02
MN-54		3.81E+00 ±	9.13E+00	1.28E+01
CO-58		7.05E+00 ±	8.15E+00	1.07E+01
FE-59		0.00E+00 ±	4.43E+00	5.50E+01
CO-60		2.12E+00 ±	8.96E+00	1.27E+01
ZN-65		1.60E+01 ±	1.73E+01	2.13E+01
ZRNB-95		7.65E+00 ±	1.57E+01	2.18E+01
I-131		-8.48E-01 ±	6.88E+00	1.08E+01
CS-134		2.79E-01 ±	9.74E+00	1.44E+01
CS-137		2.75E+00 ±	9.47E+00	1.39E+01
BALA140		9.52E+00 ±	6.75E+00	1.91E+01

Station 37B Potato collected 9/10/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	3.87E+03 ±	3.43E+02	1.35E+02
MN-54		0.00E+00 ±	4.72E+00	1.58E+01
CO-58		4.56E-01 ±	8.59E+00	1.19E+01
FE-59		9.48E+00 ±	2.32E+01	2.98E+01
CO-60		3.21E-01 ±	9.70E+00	1.31E+01
ZN-65		0.00E+00 ±	1.38E+01	3.61E+01
ZRNB-95		-2.37E+00 ±	1.40E+01	1.98E+01
I-131		-1.18E+00 ±	6.28E+00	9.30E+00
CS-134		-3.39E+00 ±	9.55E+00	1.29E+01
CS-137		0.00E+00 ±	4.35E+00	1.16E+01
BALA140		0.00E+00 ±	1.56E+00	1.86E+01

Station 37B Rutabaga roots collected 9/10/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	4.05E+03 ±	3.83E+02	1.60E+02
MN-54		3.98E+00 ±	7.16E+00	9.83E+00
CO-58		3.51E+00 ±	7.97E+00	1.10E+01
FE-59		2.15E+01 ±	1.86E+01	2.17E+01
CO-60		0.00E+00 ±	2.11E+00	1.92E+01
ZN-65		-7.12E+00 ±	2.86E+01	3.74E+01
ZRNB-95		0.00E+00 ±	2.57E+00	2.74E+01
I-131		-1.02E+00 ±	8.00E+00	1.22E+01
CS-134		-2.13E+00 ±	9.09E+00	1.29E+01
CS-137		-2.89E+00 ±	9.50E+00	1.36E+01
BALA140		-3.19E-01 ±	1.25E+01	1.69E+01

Station 37B Beet roots collected 9/10/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	3.03E+03 ±	4.02E+02	3.26E+02
MN-54		-1.12E+01 ±	2.33E+01	3.00E+01
CO-58		3.13E-01 ±	1.85E+01	2.48E+01
FE-59		2.28E+00 ±	4.51E+01	5.82E+01
CO-60		1.00E+01 ±	1.61E+01	2.00E+01
ZN-65		-3.77E+00 ±	4.11E+01	5.35E+01
ZRNB-95		5.62E+00 ±	2.83E+01	3.87E+01
I-131		-2.88E+00 ±	1.72E+01	2.45E+01
CS-134		4.92E+00 ±	1.94E+01	2.59E+01
CS-137		-5.16E+00 ±	2.28E+01	3.06E+01
BALA140		0.00E+00 ±	5.02E+00	4.16E+01

TABLE A-15.1
GAMMA SPECTROMETRY RESULTS OF ROOT CROPS

Results in pCi/ kilogram (wet)

Station 37B is Indicator - Station 9C is Control

Station 37B Onion collected 10/4/2018					Station 37B Potato collected 10/4/2018				
Nuclide	RQ	Activity	Error	MDA	Nuclide	RQ	Activity	Error	MDA
K-40	+	1.68E+03 ±	2.52E+02	1.63E+02	K-40	+	3.41E+03 ±	3.31E+02	1.50E+02
MN-54		-1.01E+00 ±	1.05E+01	1.48E+01	MN-54		6.54E+00 ±	4.79E+00	1.00E+01
CO-58		2.80E+00 ±	4.57E+00	6.41E+00	CO-58		4.85E+00 ±	7.12E+00	9.53E+00
FE-59		5.27E+00 ±	2.12E+01	2.93E+01	FE-59		2.06E+01 ±	1.11E+01	2.36E+01
CO-60		2.46E+00 ±	7.29E+00	1.01E+01	CO-60		6.63E+00 ±	7.02E+00	8.44E+00
ZN-65		2.68E+01 ±	1.20E+01	2.15E+01	ZN-65		0.00E+00 ±	7.12E+00	3.03E+01
ZRNB-95		7.63E+00 ±	8.53E+00	1.11E+01	ZRNB-95		0.00E+00 ±	2.22E+00	2.47E+01
I-131		1.45E+00 ±	5.13E+00	7.97E+00	I-131		3.29E+00 ±	5.92E+00	8.72E+00
CS-134		3.54E+00 ±	6.35E+00	8.92E+00	CS-134		3.72E-01 ±	6.04E+00	8.94E+00
CS-137		1.64E+00 ±	9.02E+00	1.32E+01	CS-137		0.00E+00 ±	2.60E+00	1.32E+01
BALA140		5.64E+00 ±	4.61E+00	6.92E+00	BALA140		0.00E+00 ±	1.57E+00	1.39E+01

Station 9C Onion collected 7/24/2018					Station 9C Onion collected 8/25/2018				
Nuclide	RQ	Activity	Error	MDA	Nuclide	RQ	Activity	Error	MDA
K-40	+	9.86E+02 ±	2.35E+02	2.51E+02	K-40	+	1.23E+03 ±	1.87E+02	1.69E+02
MN-54		-6.14E+00 ±	1.52E+01	2.04E+01	MN-54		4.45E-01 ±	1.02E+01	1.36E+01
CO-58		-3.63E+00 ±	1.31E+01	1.78E+01	CO-58		-3.79E+00 ±	1.16E+01	1.51E+01
FE-59		1.82E+01 ±	3.16E+01	3.95E+01	FE-59		1.60E+01 ±	2.56E+01	3.14E+01
CO-60		0.00E+00 ±	8.74E+00	2.07E+01	CO-60		-4.66E+00 ±	1.27E+01	1.58E+01
ZN-65		1.04E+01 ±	2.73E+01	3.52E+01	ZN-65		0.00E+00 ±	8.41E+00	4.06E+01
ZRNB-95		-1.02E+01 ±	2.64E+01	3.54E+01	ZRNB-95		1.71E+01 ±	1.33E+01	2.35E+01
I-131		4.42E+00 ±	1.70E+01	2.52E+01	I-131		6.22E+00 ±	1.04E+01	1.45E+01
CS-134		7.98E+00 ±	1.17E+01	1.58E+01	CS-134		-5.95E+00 ±	1.26E+01	1.65E+01
CS-137		4.51E+00 ±	1.35E+01	1.88E+01	CS-137		1.75E+00 ±	1.06E+01	1.44E+01
BALA140		1.34E+01 ±	7.78E+00	1.79E+01	BALA140		0.00E+00 ±	3.37E+00	1.88E+01

Station 9C Potato collected 9/8/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	4.41E+03 ±	3.82E+02	1.34E+02
MN-54		-8.96E-01 ±	9.30E+00	1.31E+01
CO-58		-3.18E+00 ±	1.07E+01	1.47E+01
FE-59		8.82E+00 ±	2.39E+01	3.18E+01
CO-60		0.00E+00 ±	1.94E+00	1.91E+01
ZN-65		-8.35E+00 ±	2.83E+01	3.66E+01
ZRNB-95		1.97E+00 ±	1.72E+01	2.41E+01
I-131		1.71E+00 ±	6.52E+00	9.99E+00
CS-134		8.83E+00 ±	6.88E+00	1.29E+01
CS-137		0.00E+00 ±	4.74E+00	1.46E+01
BALA140		2.62E+00 ±	9.06E+00	1.23E+01

TABLE A - 15.2
GAMMA SPECTROMETRY RESULTS OF ROOT CROPS - SUMMARY
 Results in pCi/ kilogram (wet)

Nuclide		Average Activity	Activity Low	Activity High	Average MDA	Number of Samples	Number of Positive IDs
K-40	Ind	3.09E+03	1.68E+03	4.05E+03	2.09E+02	10	10
K-40	Cntl	2.21E+03	9.86E+02	4.41E+03	1.85E+02	3	3
MN-54	Ind	6.09E-01	-1.12E+01	1.11E+01	1.63E+01	10	0
MN-54	Cntl	-2.20E+00	-6.14E+00	4.45E-01	1.57E+01	3	0
CO-58	Ind	3.88E+00	0.00E+00	1.05E+01	1.33E+01	10	0
CO-58	Cntl	-3.53E+00	-3.79E+00	-3.18E+00	1.59E+01	3	0
FE-59	Ind	5.90E+00	-1.69E+01	2.15E+01	4.31E+01	10	0
FE-59	Cntl	1.43E+01	8.82E+00	1.82E+01	3.42E+01	3	0
CO-60	Ind	2.77E+00	-2.46E+00	1.00E+01	1.62E+01	10	0
CO-60	Cntl	-1.55E+00	-4.66E+00	0.00E+00	1.86E+01	3	0
ZN-65	Ind	9.08E+00	-7.12E+00	3.10E+01	3.38E+01	10	0
ZN-65	Cntl	6.71E-01	-8.35E+00	1.04E+01	3.75E+01	3	0
ZRNB-95	Ind	2.94E-01	-1.51E+01	7.65E+00	2.69E+01	10	0
ZRNB-95	Cntl	2.93E+00	-1.02E+01	1.71E+01	2.77E+01	3	0
I-131	Ind	-1.11E+00	-5.68E+00	3.29E+00	1.55E+01	10	0
I-131	Cntl	4.12E+00	1.71E+00	6.22E+00	1.66E+01	3	0
CS-134	Ind	9.64E-01	-1.25E+01	1.62E+01	1.46E+01	10	0
CS-134	Cntl	3.62E+00	-5.95E+00	8.83E+00	1.51E+01	3	0
CS-137	Ind	-7.89E-01	-8.89E+00	2.75E+00	1.78E+01	10	0
CS-137	Cntl	2.08E+00	0.00E+00	4.51E+00	1.59E+01	3	0
BALA140	Ind	2.13E+00	-5.09E+00	9.52E+00	2.01E+01	10	0
BALA140	Cntl	5.35E+00	0.00E+00	1.34E+01	1.63E+01	3	0

TABLE A-16.1
GAMMA SPECTROMETRY RESULTS OF FRUITS

Results in pCi/ kilogram (wet)

Station 37 is Indicator - Station 9C is Control

Station 37 Apricots collected 7/4/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	3.13E+03 ±	2.92E+02	1.85E+02
MN-54		-1.98E+00 ±	1.07E+01	1.45E+01
CO-58		-1.29E+00 ±	1.02E+01	1.40E+01
FE-59		2.00E+01 ±	2.68E+01	3.27E+01
CO-60		9.35E+00 ±	1.05E+01	1.32E+01
ZN-65		1.74E+01 ±	1.49E+01	1.77E+01
ZRNB-95		0.00E+00 ±	2.13E+01	2.90E+01
I-131		6.68E+00 ±	9.09E+00	1.41E+01
CS-134		5.28E+00 ±	9.46E+00	1.29E+01
CS-137		-1.67E+00 ±	1.13E+01	1.58E+01
BALA140		9.53E+00 ±	8.47E+00	1.55E+01

Station 37 Watermelon collected 7/24/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	1.13E+03 ±	2.06E+02	1.48E+02
MN-54		-1.69E+00 ±	8.72E+00	1.24E+01
CO-58		7.94E-01 ±	6.65E+00	9.79E+00
FE-59		1.63E+01 ±	2.39E+01	3.00E+01
CO-60		2.77E+00 ±	8.46E+00	1.16E+01
ZN-65		-5.26E+00 ±	2.21E+01	2.95E+01
ZRNB-95		5.62E+00 ±	7.91E+00	1.08E+01
I-131		4.02E+00 ±	5.95E+00	8.42E+00
CS-134		-6.40E-01 ±	7.51E+00	1.10E+01
CS-137		0.00E+00 ±	3.34E+00	1.60E+01
BALA140		6.72E+00 ±	5.09E+00	7.07E+00

Station 37 Apples collected 8/15/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	1.25E+03 ±	2.27E+02	1.58E+02
MN-54		0.00E+00 ±	4.22E+00	1.58E+01
CO-58		2.62E+00 ±	9.57E+00	1.31E+01
FE-59		0.00E+00 ±	5.50E+00	4.51E+01
CO-60		6.30E+00 ±	2.82E+00	1.96E+01
ZN-65		0.00E+00 ±	7.20E+00	4.51E+01
ZRNB-95		0.00E+00 ±	2.96E+00	2.62E+01
I-131		-6.09E-01 ±	7.90E+00	1.19E+01
CS-134		-9.08E-01 ±	9.41E+00	1.33E+01
CS-137		-1.93E+00 ±	9.92E+00	1.41E+01
BALA140		0.00E+00 ±	2.15E+00	1.90E+01

Station 37 Cantaloupe collected 9/15/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	2.61E+03 ±	2.80E+02	1.40E+02
MN-54		2.98E+00 ±	7.30E+00	1.01E+01
CO-58		-1.31E+00 ±	7.75E+00	1.09E+01
FE-59		0.00E+00 ±	9.92E+00	3.55E+01
CO-60		3.27E+00 ±	8.04E+00	1.05E+01
ZN-65		2.07E+01 ±	1.28E+01	2.39E+01
ZRNB-95		7.03E+00 ±	8.87E+00	1.18E+01
I-131		2.51E+00 ±	5.68E+00	8.54E+00
CS-134		6.99E-01 ±	6.59E+00	9.57E+00
CS-137		6.47E-01 ±	6.44E+00	9.57E+00
BALA140		1.66E+00 ±	2.35E+00	6.11E+00

Station 37 red wine grapes collected 9/18/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	2.82E+03 ±	2.49E+02	1.05E+02
MN-54		7.24E+00 ±	6.38E+00	7.84E+00
CO-58		2.40E+00 ±	5.30E+00	7.11E+00
FE-59		1.71E+01 ±	1.25E+01	2.41E+01
CO-60		2.49E+00 ±	7.12E+00	9.25E+00
ZN-65		-6.32E+00 ±	1.88E+01	2.42E+01
ZRNB-95		-1.60E+00 ±	1.08E+01	1.52E+01
I-131		2.30E+00 ±	4.80E+00	6.93E+00
CS-134		1.59E+00 ±	4.81E+00	6.65E+00
CS-137		3.37E+00 ±	3.89E+00	5.09E+00
BALA140		0.00E+00 ±	1.21E+00	1.27E+01

Station 37 white wine grapes collected 9/18/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	2.32E+03 ±	2.36E+02	1.08E+02
MN-54		0.00E+00 ±	3.16E+00	1.06E+01
CO-58		-1.12E+00 ±	5.76E+00	8.17E+00
FE-59		0.00E+00 ±	2.32E+00	2.88E+01
CO-60		0.00E+00 ±	2.44E+00	1.27E+01
ZN-65		9.50E+00 ±	5.73E+00	1.38E+01
ZRNB-95		4.07E-01 ±	8.75E+00	1.28E+01
I-131		-5.52E-01 ±	5.34E+00	8.24E+00
CS-134		2.13E+00 ±	4.46E+00	6.30E+00
CS-137		4.55E+00 ±	5.26E+00	7.05E+00
BALA140		-7.81E-01 ±	6.33E+00	8.90E+00

Station 9C Peaches collected 7/24/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	1.54E+03 ±	2.22E+02	1.90E+02
MN-54		-2.58E-01 ±	1.03E+01	1.43E+01
CO-58		1.35E+00 ±	8.33E+00	1.16E+01
FE-59		-2.25E+00 ±	2.84E+01	3.66E+01
CO-60		1.13E+01 ±	1.09E+01	1.32E+01
ZN-65		-7.47E+00 ±	2.90E+01	3.71E+01
ZRNB-95		-7.21E+00 ±	1.76E+01	2.37E+01
I-131		7.12E+00 ±	9.09E+00	1.30E+01
CS-134		1.11E+00 ±	9.15E+00	1.29E+01
CS-137		0.00E+00 ±	4.79E+00	1.62E+01
BALA140		3.25E+00 ±	6.86E+00	8.94E+00

Station 9C Cantaloupe collected 8/25/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	2.67E+03 ±	3.14E+02	1.81E+02
MN-54		3.25E+00 ±	5.77E+00	8.01E+00
CO-58		1.79E+00 ±	6.60E+00	9.48E+00
FE-59		1.43E+01 ±	1.69E+01	2.12E+01
CO-60		0.00E+00 ±	4.56E+00	2.01E+01
ZN-65		0.00E+00 ±	9.37E+00	2.81E+01
ZRNB-95		-2.07E+00 ±	1.29E+01	1.85E+01
I-131		-3.50E+00 ±	8.24E+00	1.23E+01
CS-134		1.44E+00 ±	7.34E+00	1.06E+01
CS-137		5.08E-01 ±	8.25E+00	1.22E+01
BALA140		2.89E+00 ±	3.34E+00	7.11E+00

TABLE A - 16.2
GAMMA SPECTROMETRY RESULTS OF FRUITS - SUMMARY
 Results in pCi/ kilogram (wet)

Nuclide		Average Activity	Activity Low	Activity High	Average MDA	Number of Samples	Number of Positive IDs
K-40	Ind	2.21E+03	1.13E+03	3.13E+03	1.41E+02	6	6
K-40	Cntl	2.11E+03	1.54E+03	2.67E+03	1.85E+02	2	2
MN-54	Ind	1.09E+00	-1.98E+00	7.24E+00	1.19E+01	6	0
MN-54	Cntl	1.50E+00	-2.58E-01	3.25E+00	1.11E+01	2	0
CO-58	Ind	3.49E-01	-1.31E+00	2.62E+00	1.05E+01	6	0
CO-58	Cntl	1.57E+00	1.35E+00	1.79E+00	1.05E+01	2	0
FE-59	Ind	8.89E+00	0.00E+00	2.00E+01	3.27E+01	6	0
FE-59	Cntl	6.01E+00	-2.25E+00	1.43E+01	2.89E+01	2	0
CO-60	Ind	4.03E+00	0.00E+00	9.35E+00	1.28E+01	6	0
CO-60	Cntl	5.64E+00	0.00E+00	1.13E+01	1.66E+01	2	0
ZN-65	Ind	6.01E+00	-6.32E+00	2.07E+01	2.57E+01	6	0
ZN-65	Cntl	-3.73E+00	-7.47E+00	0.00E+00	3.26E+01	2	0
ZRNB-95	Ind	1.91E+00	-1.60E+00	7.03E+00	1.76E+01	6	0
ZRNB-95	Cntl	-4.64E+00	-7.21E+00	-2.07E+00	2.11E+01	2	0
I-131	Ind	2.39E+00	-6.09E-01	6.68E+00	9.69E+00	6	0
I-131	Cntl	1.81E+00	-3.50E+00	7.12E+00	1.26E+01	2	0
CS-134	Ind	1.36E+00	-9.08E-01	5.28E+00	9.95E+00	6	0
CS-134	Cntl	1.27E+00	1.11E+00	1.44E+00	1.17E+01	2	0
CS-137	Ind	8.28E-01	-1.93E+00	4.55E+00	1.13E+01	6	0
CS-137	Cntl	2.54E-01	0.00E+00	5.08E-01	1.42E+01	2	0
BALA140	Ind	2.85E+00	-7.81E-01	9.53E+00	1.16E+01	6	0
BALA140	Cntl	3.07E+00	2.89E+00	3.25E+00	8.03E+00	2	0

TABLE A-17.1
GAMMA SPECTROMETRY RESULTS OF VEGETABLES

Results in pCi/ kilogram (wet)

Stations 37 and 104 are Indicators - Station 9C is Control

Station 37 Broad Leaf Vegetable collected 6/29/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	4.25E+03 ±	5.27E+02	4.43E+02
MN-54		0.00E+00 ±	2.10E+01	4.16E+01
CO-58		-1.98E+00 ±	1.75E+01	3.60E+01
FE-59		-1.97E+00 ±	5.82E+00	1.18E+02
CO-60		6.30E+00 ±	2.13E+01	4.19E+01
ZN-65		1.56E+01 ±	2.32E+01	5.39E+01
ZRNB-95		1.23E+01 ±	1.53E+01	3.71E+01
I-131		-2.62E+00 ±	1.55E+01	3.36E+01
CS-134		-1.58E+00 ±	1.20E+01	3.08E+01
CS-137		-6.32E+00 ±	1.45E+01	3.61E+01
BALA140		3.87E+00 ±	1.14E+01	5.44E+01

Station 37 Broad Leaf Vegetable collected 7/10/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	4.95E+03 ±	4.61E+02	2.96E+02
MN-54		-7.25E+00 ±	1.88E+01	2.43E+01
CO-58		-4.45E+00 ±	1.82E+01	2.38E+01
FE-59		-2.50E+01 ±	6.10E+01	7.52E+01
CO-60		0.00E+00 ±	9.80E+00	2.97E+01
ZN-65		2.43E+01 ±	3.41E+01	4.25E+01
ZRNB-95		-1.03E+01 ±	3.37E+01	4.52E+01
I-131		1.54E+01 ±	2.11E+01	2.93E+01
CS-134		6.51E+00 ±	1.86E+01	2.47E+01
CS-137		6.54E+00 ±	1.66E+01	2.23E+01
BALA140		-9.08E+00 ±	3.19E+01	3.83E+01

Station 37 Corn collected 7/24/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	2.54E+03 ±	3.62E+02	3.06E+02
MN-54		-4.52E+00 ±	1.79E+01	2.42E+01
CO-58		1.83E+00 ±	1.52E+01	2.10E+01
FE-59		0.00E+00 ±	2.27E+01	7.14E+01
CO-60		-6.63E+00 ±	2.34E+01	2.99E+01
ZN-65		1.56E+01 ±	3.35E+01	4.28E+01
ZRNB-95		-6.34E+00 ±	3.23E+01	4.38E+01
I-131		-1.78E+00 ±	1.49E+01	2.22E+01
CS-134		6.03E+00 ±	1.52E+01	2.10E+01
CS-137		-1.21E+01 ±	1.94E+01	2.64E+01
BALA140		0.00E+00 ±	6.69E+00	3.65E+01

Station 37 Cucumber collected 7/26/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	1.60E+03 ±	2.61E+02	2.33E+02
MN-54		2.24E+00 ±	1.49E+01	1.97E+01
CO-58		-6.26E+00 ±	1.77E+01	2.30E+01
FE-59		-2.13E+01 ±	4.80E+01	5.93E+01
CO-60		-4.74E+00 ±	2.04E+01	2.53E+01
ZN-65		2.38E+00 ±	3.08E+01	4.03E+01
ZRNB-95		2.36E+00 ±	2.53E+01	3.47E+01
I-131		-7.10E+00 ±	1.88E+01	2.66E+01
CS-134		-1.35E+01 ±	1.87E+01	2.43E+01
CS-137		-2.43E+00 ±	1.57E+01	2.13E+01
BALA140		1.98E+00 ±	1.95E+01	2.44E+01

Station 37 Tomatoes collected 7/26/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	2.42E+03 ±	2.77E+02	2.17E+02
MN-54		-6.62E+00 ±	1.48E+01	1.90E+01
CO-58		-6.55E+00 ±	1.41E+01	1.81E+01
FE-59		4.27E-01 ±	3.15E+01	4.06E+01
CO-60		1.22E+01 ±	1.15E+01	1.35E+01
ZN-65		-8.43E+00 ±	2.48E+01	3.18E+01
ZRNB-95		-2.68E+00 ±	2.18E+01	2.97E+01
I-131		-1.06E+01 ±	1.66E+01	2.31E+01
CS-134		-3.68E+00 ±	1.37E+01	1.82E+01
CS-137		-1.52E+00 ±	1.24E+01	1.68E+01
BALA140		0.00E+00 ±	2.24E+00	3.09E+01

Station 37 Broad Leaf Vegetable collected 8/15/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	4.40E+03 ±	4.34E+02	1.93E+02
MN-54		2.80E+00 ±	8.11E+00	1.15E+01
CO-58		8.23E-01 ±	6.37E+00	9.63E+00
FE-59		8.05E+00 ±	3.38E+01	4.53E+01
CO-60		3.80E+00 ±	1.14E+01	1.51E+01
ZN-65		-7.58E-01 ±	2.78E+01	3.76E+01
ZRNB-95		1.56E+01 ±	1.72E+01	2.23E+01
I-131		4.16E+00 ±	7.49E+00	1.11E+01
CS-134		-4.50E+00 ±	1.08E+01	1.51E+01
CS-137		6.17E-01 ±	1.00E+01	1.48E+01
BALA140		1.86E+00 ±	1.48E+01	1.98E+01

Station 104 Broad Leaf Vegetable collected 8/15/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	3.71E+03 ±	3.51E+02	1.37E+02
MN-54		4.30E-01 ±	1.05E+01	1.44E+01
CO-58		4.35E+00 ±	7.40E+00	9.82E+00
FE-59		1.18E+01 ±	1.68E+01	2.13E+01
CO-60		5.72E+00 ±	4.05E+00	1.14E+01
ZN-65		6.22E-01 ±	2.28E+01	3.09E+01
ZRNB-95		1.18E+00 ±	1.79E+01	2.52E+01
I-131		-1.97E+00 ±	8.53E+00	1.25E+01
CS-134		4.89E-01 ±	7.95E+00	1.13E+01
CS-137		-3.78E+00 ±	1.19E+01	1.63E+01
BALA140		6.20E+00 ±	4.10E+00	2.38E+01

Station 37 Broad Leaf Vegetable collected 9/15/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	4.01E+03 ±	4.89E+02	2.23E+02
MN-54		1.61E-01 ±	1.65E+01	2.32E+01
CO-58		1.29E+00 ±	1.50E+01	2.10E+01
FE-59		1.67E+01 ±	4.11E+01	5.38E+01
CO-60		9.36E+00 ±	7.08E+00	9.86E+00
ZN-65		0.00E+00 ±	4.67E+00	6.29E+01
ZRNB-95		-6.71E+00 ±	3.00E+01	4.20E+01
I-131		7.11E+00 ±	1.27E+01	1.82E+01
CS-134		6.94E+00 ±	1.33E+01	1.82E+01
CS-137		3.70E+00 ±	1.58E+01	2.23E+01
BALA140		7.20E+00 ±	7.21E+00	1.33E+01

TABLE A-17.1
GAMMA SPECTROMETRY RESULTS OF VEGETABLES

Results in pCi/ kilogram (wet)

Stations 37 and 104 are Indicators - Station 9C is Control

Station 37 Broad Leaf Vegetable collected 9/21/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	4.41E+03 ±	3.90E+02	2.34E+02
MN-54		4.77E-01 ±	1.55E+01	2.06E+01
CO-58		2.17E+00 ±	1.44E+01	1.91E+01
FE-59		-1.96E+01 ±	4.91E+01	6.07E+01
CO-60		0.00E+00 ±	1.01E+01	2.46E+01
ZN-65		1.14E+01 ±	3.29E+01	4.20E+01
ZRNB-95		1.61E+01 ±	2.28E+01	2.99E+01
I-131		1.22E+01 ±	1.32E+01	1.81E+01
CS-134		9.54E+00 ±	1.46E+01	1.91E+01
CS-137		3.69E+00 ±	1.40E+01	1.89E+01
BALA140		0.00E+00 ±	6.28E+00	3.05E+01

Station 37 Tomatoes collected 9/21/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	2.26E+03 ±	2.85E+02	1.51E+02
MN-54		-4.58E-01 ±	1.04E+01	1.47E+01
CO-58		9.23E-01 ±	8.00E+00	1.16E+01
FE-59		0.00E+00 ±	5.17E+00	4.11E+01
CO-60		0.00E+00 ±	1.54E+00	1.97E+01
ZN-65		6.71E-01 ±	1.91E+01	2.66E+01
ZRNB-95		1.01E+01 ±	1.33E+01	1.77E+01
I-131		2.58E+00 ±	8.10E+00	1.23E+01
CS-134		0.00E+00 ±	2.49E+00	1.45E+01
CS-137		-2.71E-01 ±	8.02E+00	1.20E+01
BALA140		2.02E+00 ±	1.06E+01	1.46E+01

Station 37 Broad Leaf Vegetable collected 10/13/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	4.23E+03 ±	4.59E+02	3.29E+02
MN-54		-2.77E+00 ±	2.17E+01	2.85E+01
CO-58		-1.54E+01 ±	2.36E+01	3.01E+01
FE-59		-2.63E+00 ±	5.43E+01	6.92E+01
CO-60		7.35E+00 ±	1.69E+01	2.13E+01
ZN-65		-1.47E+01 ±	4.58E+01	5.83E+01
ZRNB-95		-8.48E+00 ±	3.41E+01	4.60E+01
I-131		-8.91E+00 ±	2.38E+01	3.35E+01
CS-134		1.36E+01 ±	1.78E+01	2.32E+01
CS-137		3.32E+00 ±	1.68E+01	2.29E+01
BALA140		0.00E+00 ±	6.54E+00	3.89E+01

Station 9C Broad Leaf Vegetable collected 8/25/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	5.42E+03 ±	5.23E+02	2.09E+02
MN-54		0.00E+00 ±	5.26E+00	2.40E+01
CO-58		0.00E+00 ±	1.52E+00	2.60E+01
FE-59		1.99E+01 ±	4.29E+01	5.59E+01
CO-60		5.52E+00 ±	1.05E+01	1.38E+01
ZN-65		-9.27E-01 ±	3.39E+01	4.60E+01
ZRNB-95		0.00E+00 ±	2.62E+00	3.74E+01
I-131		9.44E+00 ±	9.76E+00	1.37E+01
CS-134		0.00E+00 ±	5.97E+00	1.76E+01
CS-137		1.50E+00 ±	1.01E+01	1.51E+01
BALA140		1.14E+01 ±	8.08E+00	2.28E+01

Station 9C Broad Leaf Vegetable collected 9/8/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	4.65E+03 ±	4.80E+02	2.31E+02
MN-54		-2.28E+00 ±	1.18E+01	1.67E+01
CO-58		0.00E+00 ±	2.04E+00	2.06E+01
FE-59		-1.78E+01 ±	5.28E+01	6.84E+01
CO-60		1.52E+01 ±	7.87E+00	1.62E+01
ZN-65		1.85E+01 ±	2.74E+01	3.49E+01
ZRNB-95		-1.45E+00 ±	2.00E+01	2.88E+01
I-131		2.27E+00 ±	1.11E+01	1.69E+01
CS-134		4.34E+00 ±	1.06E+01	1.49E+01
CS-137		-2.50E+00 ±	1.08E+01	1.58E+01
BALA140		3.88E+00 ±	1.34E+01	1.82E+01

TABLE A - 17.2
GAMMA SPECTROMETRY RESULTS OF VEGETABLES - SUMMARY

Results in pCi/ kilogram (wet)

Nuclide		Average Activity	Activity Low	Activity High	Average MDA	Number of Samples	Number of Positive IDs
K-40	Ind	3.52E+03	1.60E+03	4.95E+03	2.51E+02	11	11
K-40	Cntl	5.04E+03	4.65E+03	5.42E+03	2.20E+02	2	2
MN-54	Ind	-1.41E+00	-7.25E+00	2.80E+00	2.20E+01	11	0
MN-54	Cntl	-1.14E+00	-2.28E+00	0.00E+00	2.03E+01	2	0
CO-58	Ind	-2.12E+00	-1.54E+01	4.35E+00	2.03E+01	11	0
CO-58	Cntl	0.00E+00	0.00E+00	0.00E+00	2.33E+01	2	0
FE-59	Ind	-3.06E+00	-2.50E+01	1.67E+01	5.96E+01	11	0
FE-59	Cntl	1.06E+00	-1.78E+01	1.99E+01	6.21E+01	2	0
CO-60	Ind	3.03E+00	-6.63E+00	1.22E+01	2.20E+01	11	0
CO-60	Cntl	1.04E+01	5.52E+00	1.52E+01	1.50E+01	2	0
ZN-65	Ind	4.24E+00	-1.47E+01	2.43E+01	4.27E+01	11	0
ZN-65	Cntl	8.78E+00	-9.27E-01	1.85E+01	4.04E+01	2	0
ZRNB-95	Ind	2.10E+00	-1.03E+01	1.61E+01	3.40E+01	11	0
ZRNB-95	Cntl	-7.27E-01	-1.45E+00	0.00E+00	3.31E+01	2	0
I-131	Ind	7.77E-01	-1.06E+01	1.54E+01	2.19E+01	11	0
I-131	Cntl	5.85E+00	2.27E+00	9.44E+00	1.53E+01	2	0
CS-134	Ind	1.81E+00	-1.35E+01	1.36E+01	2.00E+01	11	0
CS-134	Cntl	2.17E+00	0.00E+00	4.34E+00	1.63E+01	2	0
CS-137	Ind	-7.73E-01	-1.21E+01	6.54E+00	2.09E+01	11	0
CS-137	Cntl	-4.97E-01	-2.50E+00	1.50E+00	1.55E+01	2	0
BALA140	Ind	1.28E+00	-9.08E+00	7.20E+00	2.96E+01	11	0
BALA140	Cntl	7.64E+00	3.88E+00	1.14E+01	2.05E+01	2	0

TABLE B-1.1
2018 QUARTERLY SPECIAL INTEREST TLD RESULTS
 Results in milli-Roentgen (mR) per Standard Quarter

Station ID	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Quarterly Sum
58	21.2	19.4	18.4	19.8	78.8
88	25.8	25.4	26.1	27.1	104.4
89	27.6	27.2	27.1	27.0	108.9
119B	21.2	21.6	20.9	21.7	85.4
119Ctrl	22.6	23.2	22.8	22.8	91.3
121	77.1	64.9	76.1	81.9	300.0
122	33.2	35.5	34.8	36.0	139.5
123 (ISFSI)	85.9	85.6	81.3	83.8	336.5
124 (ISFSI)	101.4	102.2	96.3	98.8	398.7
125 (ISFSI)	78.1	74.3	74.8	76.0	303.2
126 (ISFSI)	111.5	115.2	116.3	114.1	457.1
127 (ISFSI)	86.5	89.7	90.5	89.0	355.8
128 (ISFSI)	126.7	141.0	140.7	138.9	547.3
129 (ISFSI)	100.0	102.2	108.3	104.2	414.6
130 (ISFSI)	61.0	161.9	156.1	154.7	533.6
131 (ISFSI)	52.2	62.0	66.4	68.1	248.7
136B(ISFSI)	51.4	165.6	206.9	200.3	624.2
137B (ISFSI)	49.6	150.1	198.3	195.3	593.3
138B (ISFSI)	47.5	85.1	104.2	102.1	338.9
150 (Site 1)	19.3	19.2	18.1	19.6	76.2
151 (Site 4)	18.3	18.7	17.6	19.0	73.7
155	24.6	25.8	25.2	27.5	103.2
156	26.4	28.2	27.7	29.1	111.4

TABLE B-1.2
2018 QUARTERLY SPECIAL INTEREST TLD RESULTS- SUMMARY
 Results in milli-Roentgen (mR) per Standard Quarter

Location	Average Activity	Activity Low	Activity High	Number of Samples
ISFSI Quarterly Ind	107.3	47.5	206.9	48
SITE 1 & 4 Quarterly Ind	18.7	17.6	19.6	8
Quarterly Control TLDs	19.0	18.5	19.7	4

Stations 58, 88, and 89 were established in 2009 to monitor exposure from remediation work at the DOE 618-11 burial site.
 Station 121 results high due to location being near transformer yard. Station 122 results influenced by ISFSI.
 Quarterly Control TLD location is ST-9. See Table A-1.1.
 Stations 130 and 131 were added to the ISFSI fence in the 1st quarter 2017.

Table B - 2.1

**GAMMA SPECTROMETRY RESULTS OF STORM DRAIN WATER
STATION 101B**

Results in pCi/liter, corrected for decay during collection period

Location ST-101B collected 2/1/2018			
Nuclide	RQ	Activity	Error
K-40		2.79E+01 ±	4.09E+01
CR-51		3.89E-01 ±	2.69E+01
MN-54		-7.85E-01 ±	2.94E+00
CO-58		-7.92E-01 ±	3.22E+00
FE-59		-3.84E+00 ±	1.02E+01
CO-60		1.82E+00 ±	2.77E+00
ZN-65		-6.45E-01 ±	5.63E+00
ZRNB-95		6.95E-01 ±	5.60E+00
I-131		-2.03E+00 ±	9.16E+00
CS-134		4.93E-01 ±	2.57E+00
CS-137		2.49E-01 ±	2.73E+00
BALA140		4.05E+00 ±	8.42E+00
BI-214		1.43E+00 ±	4.18E+00

Location ST-101B collected 3/1/2018			
Nuclide	RQ	Activity	Error
K-40		1.78E+00 ±	3.17E+01
CR-51		1.32E+01 ±	2.68E+01
MN-54		7.48E-01 ±	2.73E+00
CO-58		5.67E-01 ±	2.81E+00
FE-59		-2.09E-01 ±	1.03E+01
CO-60		2.00E+00 ±	9.12E-01
ZN-65		2.19E+00 ±	5.75E+00
ZRNB-95		6.51E-01 ±	5.32E+00
I-131		1.63E+00 ±	2.60E+00
CS-134		-2.22E+00 ±	3.35E+00
CS-137		-1.05E+00 ±	2.27E+00
BALA140		2.39E+00 ±	5.30E+00
BI-214		2.74E+00 ±	6.69E+00

Location ST-101B collected 4/2/2018			
Nuclide	RQ	Activity	Error
K-40		4.34E+01 ±	3.66E+01
CR-51		8.12E+00 ±	3.14E+01
MN-54		4.50E-01 ±	2.99E+00
CO-58		-2.61E-01 ±	3.21E+00
FE-59		0.00E+00 ±	7.79E-01
CO-60		2.92E-01 ±	3.12E+00
ZN-65		2.93E+00 ±	5.88E+00
ZRNB-95		-6.86E-01 ±	5.45E+00
I-131		1.37E+00 ±	7.43E+00
CS-134		4.92E-01 ±	2.86E+00
CS-137		-1.42E+00 ±	3.16E+00
BALA140		-1.13E+00 ±	8.78E+00
BI-214		0.00E+00 ±	1.55E+01

Location ST-101B collected 5/1/2018			
Nuclide	RQ	Activity	Error
K-40		2.90E+00 ±	4.41E+01
CR-51		-5.00E+00 ±	3.02E+01
MN-54		3.82E-01 ±	2.77E+00
CO-58		2.94E+00 ±	2.64E+00
FE-59		-1.97E+00 ±	1.11E+01
CO-60		1.99E+00 ±	3.00E+00
ZN-65		-3.16E+00 ±	7.09E+00
ZRNB-95		-2.09E+00 ±	6.12E+00
I-131		3.41E+00 ±	6.35E+00
CS-134		1.09E+00 ±	3.06E+00
CS-137		-1.51E+00 ±	3.17E+00
BALA140		0.00E+00 ±	1.34E+00
BI-214		9.96E+00 ±	6.23E+00

Location ST-101B collected 5/31/2018			
Nuclide	RQ	Activity	Error
K-40	+	4.62E+01 ±	2.81E+01
CR-51		-7.05E+00 ±	3.13E+01
MN-54		1.52E+00 ±	2.37E+00
CO-58		-1.18E+00 ±	3.01E+00
FE-59		-4.23E+00 ±	1.23E+01
CO-60		6.49E-02 ±	3.18E+00
ZN-65		-2.71E+00 ±	7.77E+00
ZRNB-95		2.14E+00 ±	5.68E+00
I-131		-4.32E+00 ±	9.35E+00
CS-134		8.21E-01 ±	2.59E+00
CS-137		9.98E-01 ±	2.54E+00
BALA140		6.13E+00 ±	7.48E+00
BI-214		1.03E+00 ±	7.09E+00

Location ST-101B collected 7/2/2018			
Nuclide	RQ	Activity	Error
K-40		3.23E+01 ±	3.83E+01
CR-51		-5.58E+00 ±	3.12E+01
MN-54		-8.21E-01 ±	2.83E+00
CO-58		2.85E-01 ±	3.39E+00
FE-59		-6.04E-01 ±	1.05E+01
CO-60		-1.25E+00 ±	3.64E+00
ZN-65		-1.96E+00 ±	7.08E+00
ZRNB-95		-2.21E+00 ±	6.20E+00
I-131		-2.11E-01 ±	9.11E+00
CS-134		-1.41E+00 ±	3.29E+00
CS-137		4.84E-02 ±	2.67E+00
BALA140		-2.80E+00 ±	9.27E+00
BI-214		1.01E+00 ±	7.64E+00

Table B - 2.1

GAMMA SPECTROMETRY RESULTS OF STORM DRAIN WATER
STATION 101B

Results in pCi/liter, corrected for decay during collection period

Location ST-101B collected 8/1/2018			
Nuclide	RQ	Activity	Error MDA
K-40		2.45E+01 ±	3.30E+01 6.38E+01
CR-51		-6.09E+00 ±	2.86E+01 5.48E+01
MN-54		-4.16E-01 ±	3.16E+00 5.78E+00
CO-58		6.71E-01 ±	2.77E+00 5.24E+00
FE-59		-3.45E+00 ±	1.12E+01 1.97E+01
CO-60		4.02E-01 ±	1.39E+00 6.22E+00
ZN-65		-1.66E+00 ±	7.04E+00 1.24E+01
ZRNB-95		1.37E+00 ±	4.86E+00 9.17E+00
I-131		6.03E+00 ±	7.19E+00 1.47E+01
CS-134		-8.19E-01 ±	3.10E+00 5.60E+00
CS-137		-9.98E-01 ±	3.01E+00 5.59E+00
BALA140		-1.69E+00 ±	3.62E+00 1.56E+01
BI-214		9.59E+00 ±	6.58E+00 1.13E+01

Location ST-101B collected 8/30/2018			
Nuclide	RQ	Activity	Error MDA
K-40		3.07E+01 ±	4.02E+01 5.46E+01
CR-51		-4.87E+00 ±	3.17E+01 4.51E+01
MN-54		5.03E-02 ±	2.98E+00 3.98E+00
CO-58		1.64E+00 ±	2.90E+00 3.76E+00
FE-59		3.18E+00 ±	8.20E+00 1.04E+01
CO-60		6.96E-01 ±	3.16E+00 4.02E+00
ZN-65		-7.37E-01 ±	6.40E+00 8.35E+00
ZRNB-95		-2.55E+00 ±	6.58E+00 8.78E+00
I-131		-6.26E+00 ±	1.09E+01 1.52E+01
CS-134		-3.60E-01 ±	2.97E+00 4.01E+00
CS-137		1.85E+00 ±	2.62E+00 3.44E+00
BALA140		6.96E-02 ±	8.60E+00 1.10E+01
BI-214		6.80E+00 ±	6.13E+00 9.80E+00

Location ST-101B collected 10/1/2018			
Nuclide	RQ	Activity	Error MDA
K-40	+	6.54E+01 ±	5.36E+01 4.40E+01
CR-51		1.42E+01 ±	2.75E+01 3.99E+01
MN-54		7.14E-01 ±	2.52E+00 3.44E+00
CO-58		0.00E+00 ±	1.45E+00 4.73E+00
FE-59		5.44E+00 ±	7.47E+00 9.41E+00
CO-60		-3.80E-01 ±	3.53E+00 4.52E+00
ZN-65		1.29E+00 ±	6.05E+00 7.89E+00
ZRNB-95		3.33E+00 ±	5.53E+00 7.33E+00
I-131		5.04E-01 ±	8.46E+00 1.26E+01
CS-134		-2.46E-01 ±	3.07E+00 4.27E+00
CS-137		2.99E-01 ±	2.96E+00 4.16E+00
BALA140		1.27E+00 ±	8.41E+00 1.06E+01
BI-214		3.26E+00 ±	7.72E+00 1.09E+01

Location ST-101B collected 11/1/2018			
Nuclide	RQ	Activity	Error MDA
K-40		1.43E+01 ±	3.81E+01 5.32E+01
CR-51		2.61E+01 ±	2.96E+01 4.07E+01
MN-54		1.41E+00 ±	2.49E+00 3.22E+00
CO-58		1.35E+00 ±	3.08E+00 4.02E+00
FE-59		2.20E+00 ±	1.06E+01 1.34E+01
CO-60		-1.27E+00 ±	3.33E+00 4.16E+00
ZN-65		3.36E+00 ±	5.83E+00 7.36E+00
ZRNB-95		-1.49E+00 ±	5.58E+00 7.55E+00
I-131		1.51E+00 ±	1.01E+01 1.44E+01
CS-134		-1.38E+00 ±	3.21E+00 4.24E+00
CS-137		1.96E+00 ±	2.90E+00 3.80E+00
BALA140		2.18E+00 ±	8.91E+00 1.12E+01
BI-214		6.59E-01 ±	7.43E+00 1.06E+01

Location ST-101B collected 12/3/2018			
Nuclide	RQ	Activity	Error MDA
K-40		1.26E+01 ±	4.42E+01 5.99E+01
CR-51		1.23E-01 ±	2.87E+01 4.13E+01
MN-54		3.65E-01 ±	2.87E+00 3.82E+00
CO-58		3.71E-02 ±	3.41E+00 4.54E+00
FE-59		2.27E+00 ±	7.79E+00 9.98E+00
CO-60		2.66E+00 ±	2.86E+00 3.43E+00
ZN-65		-6.07E-01 ±	5.30E+00 7.01E+00
ZRNB-95		-4.37E+00 ±	6.79E+00 8.91E+00
I-131		-4.67E-01 ±	7.97E+00 1.15E+01
CS-134		2.41E+00 ±	2.67E+00 3.45E+00
CS-137		0.00E+00 ±	1.39E+00 4.38E+00
BALA140		4.21E-01 ±	7.46E+00 9.52E+00
BI-214		5.97E+00 ±	7.73E+00 1.07E+01

Location ST-101B collected 12/31/2018			
Nuclide	RQ	Activity	Error MDA
K-40		1.92E+01 ±	3.53E+01 5.05E+01
CR-51		1.88E+01 ±	2.79E+01 3.88E+01
MN-54		-1.10E+00 ±	3.30E+00 4.30E+00
CO-58		4.44E-01 ±	2.97E+00 3.96E+00
FE-59		3.73E+00 ±	7.12E+00 8.96E+00
CO-60		-2.02E-01 ±	3.52E+00 4.50E+00
ZN-65		1.34E+00 ±	5.38E+00 7.03E+00
ZRNB-95		-6.82E-01 ±	5.42E+00 7.41E+00
I-131		8.12E-01 ±	7.85E+00 1.13E+01
CS-134		8.63E-01 ±	2.77E+00 3.70E+00
CS-137		2.00E+00 ±	2.35E+00 3.05E+00
BALA140		2.94E-01 ±	8.61E+00 1.08E+01
BI-214		6.72E+00 ±	7.43E+00 1.03E+01

TABLE B-2.2
GAMMA SPECTROMETRY RESULTS OF STORM DRAIN WATER - SUMMARY
STATION 101B

Results in pCi/liter, corrected for decay during collection period

Nuclide	Average Activity	Activity Low	Activity High	Average MDA	Number of Samples	Number of Positive IDs
K-40	2.68E+01	1.78E+00	6.54E+01	5.19E+01	12	2
CR-51	4.37E+00	-7.05E+00	2.61E+01	4.31E+01	12	0
MN-54	2.09E-01	-1.10E+00	1.52E+00	3.90E+00	12	0
CO-58	4.75E-01	-1.18E+00	2.94E+00	4.22E+00	12	0
FE-59	2.11E-01	-4.23E+00	5.44E+00	1.30E+01	12	0
CO-60	5.68E-01	-1.27E+00	2.66E+00	4.33E+00	12	0
ZN-65	-3.16E-02	-3.16E+00	3.36E+00	8.36E+00	12	0
ZRNB-95	-6.61E-01	-4.37E+00	2.14E+00	8.03E+00	12	0
I-131	1.65E-01	-6.26E+00	6.03E+00	1.27E+01	12	0
CS-134	-2.21E-02	-2.22E+00	2.41E+00	4.10E+00	12	0
CS-137	2.03E-01	-1.51E+00	2.00E+00	3.98E+00	12	0
BALA140	9.33E-01	-2.80E+00	6.13E+00	1.12E+01	12	0
BI-214	4.10E+00	0.00E+00	9.96E+00	1.09E+01	12	0

TABLE B-3.1
GROSS BETA IN STORM DRAIN WATER

Results in pCi per liter

Location	Collection Period	RQ	Activity	Error	MDA
ST-101B	01/02/18 - 02/01/18		1.83E+00	± 7.10E-01	2.19E+00
	02/01/18 - 03/01/18		1.69E+00	± 7.64E-01	2.42E+00
	03/01/18 - 04/02/18		2.09E+00	± 7.37E-01	2.15E+00
	04/02/18 - 05/01/18	+	5.64E+00	± 1.00E+00	2.28E+00
	05/01/18 - 05/31/18		6.07E-02	± 6.33E-01	2.29E+00
	05/31/18 - 07/02/18		1.44E+00	± 6.98E-01	2.18E+00
	07/02/18 - 08/01/18		-1.99E-01	± 6.05E-01	2.17E+00
	08/01/18 - 08/30/18		1.56E+00	± 6.59E-01	2.01E+00
	08/30/18 - 10/01/18		1.95E+00	± 7.39E-01	2.24E+00
	10/01/18 - 11/01/18	+	4.39E+00	± 9.98E-01	2.53E+00
	11/01/18 - 12/03/18		1.56E+00	± 7.71E-01	2.40E+00
	12/03/18 - 12/31/18		2.99E-01	± 6.37E-01	2.25E+00

TABLE B-3.2
GROSS BETA IN STORM DRAIN WATER - SUMMARY

Results in pCi per liter

Average Activity	Activity Low	Activity High	Number of Samples	Number of Positive IDs
1.86E+00	-1.99E-01	5.64E+00	12	2

TABLE B-4.1
TRITIUM IN STORM DRAIN WATER

Results in pCi per liter

Location	Collection Period	RQ	Activity	Error
ST-101B	01/02/18 - 02/01/18	+	1.16E+04	± 2.63E+02
	02/01/18 - 03/01/18	+	1.42E+04	± 2.88E+02
	03/01/18 - 04/02/18	+	1.28E+04	± 2.77E+02
	04/02/18 - 05/01/18	+	3.70E+03	± 1.66E+02
	05/01/18 - 05/31/18	+	6.37E+02	± 1.08E+02
	05/31/18 - 07/02/18	+	5.11E+02	± 1.05E+02
	07/02/18 - 08/01/18	+	1.90E+03	± 1.35E+02
	08/01/18 - 08/30/18	+	1.32E+03	± 1.25E+02
	08/30/18 - 10/01/18	+	9.63E+02	± 1.17E+02
	10/01/18 - 11/01/18	+	9.88E+02	± 1.14E+02
	11/01/18 - 12/03/18	+	9.48E+03	± 2.47E+02
	12/03/18 - 12/31/18	+	1.45E+04	± 2.95E+02

TABLE B-4.2
TRITIUM IN STORM DRAIN WATER - SUMMARY

Results in pCi per liter

Average Activity	Activity Low	Activity High	Number of Samples	Number of Positive IDs
6.05E+03	5.11E+02	1.45E+04	12	12

TABLE B-5.1
GROSS ALPHA IN SANITARY WASTE TREATMENT WATER

Results in pCi per liter
STATION 102B - SWTF Headworks

Collection Period	RQ	Activity	Error	MDA
01/02/18 - 02/01/18		-2.36E+00 ±	2.86E+00	1.08E+01
02/01/18 - 03/01/18		-1.58E+00 ±	2.27E+00	8.67E+00
03/01/18 - 04/02/18		-1.94E+00 ±	2.86E+00	1.12E+01
04/02/18 - 05/01/18		1.18E+00 ±	2.13E+00	8.81E+00
05/01/18 - 05/31/18		-1.10E+00 ±	2.16E+00	8.86E+00
05/31/18 - 07/02/18		2.21E+00 ±	1.85E+00	6.60E+00
07/02/18 - 08/01/18		5.10E+00 ±	3.03E+00	9.81E+00
08/01/18 - 08/30/18		5.11E+00 ±	2.60E+00	7.67E+00
08/30/18 - 10/01/18		-2.81E+00 ±	2.91E+00	1.08E+01
10/01/18 - 11/01/18		2.93E+00 ±	2.93E+00	1.07E+01
11/01/18 - 12/03/18		-2.79E+00 ±	1.32E+00	4.58E+00
12/03/18 - 12/31/18		-5.91E-01 ±	1.16E+00	4.77E+00

TABLE B-5.2
GROSS ALPHA IN SANITARY WASTE TREATMENT WATER - SUMMARY

Results in pCi per liter

Location	Average Activity	Activity Low	Activity High	Number of Samples	Number of Positive IDs
ST-102B	2.81E-01	-2.81E+00	5.11E+00	12	0

TABLE B-6.1
GROSS BETA IN SANITARY WASTE TREATMENT WATER

Results in pCi per liter
STATION 102B - SWTF Headworks

Collection Period	RQ	Activity	Error	MDA
01/02/18 - 02/01/18	+	2.23E+01 ±	1.92E+00	3.46E+00
02/01/18 - 03/01/18	+	2.04E+01 ±	1.94E+00	3.89E+00
03/01/18 - 04/02/18	+	2.41E+01 ±	2.05E+00	3.32E+00
04/02/18 - 05/01/18	+	2.20E+01 ±	2.04E+00	3.82E+00
05/01/18 - 05/31/18	+	2.29E+01 ±	2.07E+00	3.88E+00
05/31/18 - 07/02/18	+	2.45E+01 ±	2.07E+00	3.61E+00
07/02/18 - 08/01/18	+	2.72E+01 ±	2.37E+00	4.15E+00
08/01/18 - 08/30/18	+	2.54E+01 ±	2.18E+00	3.60E+00
08/30/18 - 10/01/18	+	2.47E+01 ±	2.05E+00	3.53E+00
10/01/18 - 11/01/18	+	2.14E+01 ±	2.09E+00	4.12E+00
11/01/18 - 12/03/18	+	1.16E+01 ±	1.04E+00	2.44E+00
12/03/18 - 12/31/18	+	1.47E+01 ±	1.83E+00	4.02E+00

TABLE B-6.2
GROSS BETA IN SANITARY WASTE TREATMENT WATER - SUMMARY

Results in pCi per liter

Location	Average Activity	Activity Low	Activity High	Number of Samples	Number of Positive IDs
ST-102B	2.18E+01	1.16E+01	2.72E+01	12	12

Table B-7.1

**GAMMA SPECTROMETRY RESULTS OF SANITARY WASTE TREATMENT WATER
STATION 102B**

Results in pCi/liter, corrected for decay during collection period

Location ST-102B collected 2/1/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	1.06E+02 ±	4.94E+01	6.19E+01
CR-51		-2.42E+01 ±	4.52E+01	6.26E+01
MN-54		2.94E+00 ±	3.66E+00	4.61E+00
CO-58		-1.92E+00 ±	4.33E+00	5.51E+00
FE-59		3.65E+00 ±	1.10E+01	1.35E+01
CO-60		-1.70E+00 ±	4.23E+00	5.14E+00
ZN-65		7.25E+00 ±	6.68E+00	8.08E+00
ZRNB-95		-4.63E+00 ±	8.16E+00	1.06E+01
I-131		-4.99E+00 ±	1.36E+01	1.89E+01
CS-134		1.90E+00 ±	3.82E+00	4.99E+00
CS-137		1.10E+00 ±	3.81E+00	5.02E+00
BALA140		-5.38E+00 ±	1.14E+01	1.32E+01
BI-214		2.85E+00 ±	5.43E+00	1.42E+01

Location ST-102B collected 3/1/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	1.10E+02 ±	4.64E+01	5.87E+01
CR-51		2.24E+01 ±	3.94E+01	5.46E+01
MN-54		-4.95E-01 ±	3.93E+00	5.06E+00
CO-58		-1.05E+00 ±	4.29E+00	5.51E+00
FE-59		-1.18E+00 ±	1.19E+01	1.47E+01
CO-60		3.47E+00 ±	3.29E+00	3.90E+00
ZN-65		-1.97E+00 ±	7.90E+00	9.91E+00
ZRNB-95		-2.50E+00 ±	7.24E+00	9.53E+00
I-131		3.78E+00 ±	1.16E+01	1.62E+01
CS-134		1.79E+00 ±	3.56E+00	4.64E+00
CS-137		2.22E+00 ±	3.57E+00	4.65E+00
BALA140		0.00E+00 ±	1.58E+00	1.41E+01
BI-214		3.39E+00 ±	5.13E+00	1.32E+01

Location ST-102B collected 4/2/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	6.93E+01 ±	4.99E+01	6.46E+01
CR-51		1.10E+00 ±	3.92E+01	5.51E+01
MN-54		2.00E+00 ±	3.49E+00	4.44E+00
CO-58		-7.60E-01 ±	4.08E+00	5.25E+00
FE-59		1.13E+01 ±	9.87E+00	1.16E+01
CO-60		1.03E+00 ±	3.76E+00	4.60E+00
ZN-65		-2.62E+00 ±	8.13E+00	1.02E+01
ZRNB-95		-1.07E+00 ±	7.62E+00	1.01E+01
I-131		2.84E+00 ±	1.00E+01	1.40E+01
CS-134		-6.76E-01 ±	3.95E+00	5.19E+00
CS-137		2.25E+00 ±	3.66E+00	4.78E+00
BALA140		0.00E+00 ±	5.01E+00	1.36E+01
BI-214		8.19E-01 ±	5.27E+00	1.34E+01

Location ST-102B collected 5/1/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	1.34E+02 ±	4.78E+01	5.87E+01
CR-51		-2.31E+01 ±	4.12E+01	5.69E+01
MN-54		-8.93E-01 ±	3.89E+00	4.99E+00
CO-58		1.37E+00 ±	3.83E+00	4.90E+00
FE-59		-2.61E+00 ±	1.17E+01	1.44E+01
CO-60		2.14E+00 ±	3.60E+00	4.35E+00
ZN-65		4.81E+00 ±	7.39E+00	9.13E+00
ZRNB-95		-1.30E+00 ±	7.20E+00	9.54E+00
I-131		2.21E+00 ±	9.94E+00	1.39E+01
CS-134		4.97E-01 ±	4.15E+00	5.46E+00
CS-137		3.51E-01 ±	3.78E+00	5.02E+00
BALA140		-2.96E+00 ±	9.43E+00	1.10E+01
BI-214		3.55E+00 ±	5.99E+00	1.36E+01

Location ST-102B collected 5/31/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		2.40E+01 ±	5.44E+01	7.27E+01
CR-51		-1.19E+01 ±	3.90E+01	5.64E+01
MN-54		-1.05E+00 ±	3.58E+00	4.73E+00
CO-58		-3.08E+00 ±	4.46E+00	5.80E+00
FE-59		-7.77E+00 ±	1.28E+01	1.58E+01
CO-60		2.75E+00 ±	3.38E+00	4.30E+00
ZN-65		2.65E-01 ±	8.28E+00	1.05E+01
ZRNB-95		8.73E+00 ±	6.91E+00	8.76E+00
I-131		-9.81E-02 ±	1.11E+01	1.63E+01
CS-134		3.60E+00 ±	3.29E+00	4.34E+00
CS-137		-2.20E+00 ±	3.89E+00	5.23E+00
BALA140		7.65E+00 ±	8.04E+00	9.37E+00
BI-214		4.00E+00 ±	9.70E+00	1.28E+01

Location ST-102B collected 7/2/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	7.92E+01 ±	4.95E+01	6.45E+01
CR-51		-1.79E+01 ±	4.42E+01	6.37E+01
MN-54		1.87E+00 ±	3.32E+00	4.35E+00
CO-58		8.48E-01 ±	3.67E+00	4.89E+00
FE-59		-6.10E+00 ±	1.25E+01	1.56E+01
CO-60		1.92E+00 ±	2.04E+00	5.18E+00
ZN-65		-5.08E+00 ±	9.06E+00	1.12E+01
ZRNB-95		-6.47E+00 ±	8.52E+00	1.10E+01
I-131		-4.15E-02 ±	8.65E-02	2.44E+01
CS-134		-1.66E+00 ±	3.83E+00	5.16E+00
CS-137		1.85E+00 ±	2.91E+00	4.83E+00
BALA140		-1.80E+00 ±	7.11E+00	1.66E+01
BI-214		4.24E+00 ±	1.06E+01	1.36E+01

Table B-7.1

**GAMMA SPECTROMETRY RESULTS OF SANITARY WASTE TREATMENT WATER
STATION 102B**

Results in pCi/liter, corrected for decay during collection period

Location ST-102B collected 8/1/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	1.29E+02 ±	4.57E+01	5.85E+01
CR-51		-2.35E+01 ±	4.69E+01	6.50E+01
MN-54		-3.70E-01 ±	3.76E+00	4.86E+00
CO-58		-3.05E-01 ±	3.90E+00	5.06E+00
FE-59		2.95E+00 ±	4.87E+00	1.51E+01
CO-60		1.79E+00 ±	2.69E+00	4.21E+00
ZN-65		6.77E+00 ±	6.67E+00	8.11E+00
ZRNB-95		-1.06E+00 ±	5.94E+00	1.01E+01
I-131		1.44E+01 ±	1.75E+01	1.93E+01
CS-134		-2.75E+00 ±	4.18E+00	5.41E+00
CS-137		-2.77E+00 ±	3.45E+00	5.69E+00
BALA140		-8.88E-01 ±	2.10E+00	1.46E+01
BI-214		7.80E+00 ±	1.01E+01	1.35E+01

Location ST-102B collected 8/30/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		4.54E+01 ±	4.93E+01	6.63E+01
CR-51		1.38E+01 ±	4.06E+01	5.86E+01
MN-54		4.90E-02 ±	3.55E+00	4.75E+00
CO-58		2.11E-01 ±	3.76E+00	5.04E+00
FE-59		-1.62E+00 ±	1.16E+01	1.48E+01
CO-60		3.67E+00 ±	3.24E+00	3.82E+00
ZN-65		4.08E+00 ±	7.29E+00	9.07E+00
ZRNB-95		-1.62E+00 ±	7.50E+00	9.95E+00
I-131		-3.82E-01 ±	1.33E+01	1.95E+01
CS-134		3.66E+00 ±	3.20E+00	4.22E+00
CS-137		-7.11E-02 ±	3.69E+00	5.08E+00
BALA140		-2.26E+00 ±	1.06E+01	1.29E+01
BI-214		4.87E+00 ±	9.45E+00	1.24E+01

Location ST-102B collected 10/1/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		5.63E+01 ±	4.76E+01	6.40E+01
CR-51		-1.91E+01 ±	3.83E+01	5.51E+01
MN-54		-2.56E-01 ±	3.50E+00	4.67E+00
CO-58		2.34E-01 ±	3.77E+00	5.04E+00
FE-59		-1.28E+00 ±	1.12E+01	1.42E+01
CO-60		-8.49E-01 ±	4.21E+00	5.19E+00
ZN-65		5.99E+00 ±	7.05E+00	8.64E+00
ZRNB-95		2.30E+00 ±	6.23E+00	8.24E+00
I-131		2.77E+00 ±	1.05E+01	1.52E+01
CS-134		-1.24E+00 ±	3.88E+00	5.25E+00
CS-137		1.35E+00 ±	3.50E+00	4.75E+00
BALA140		6.23E+00 ±	9.02E+00	1.07E+01
BI-214		1.38E+00 ±	1.01E+01	1.32E+01

Location ST-102B collected 11/1/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		4.37E+01 ±	7.85E+01	1.12E+02
CR-51		-4.55E+00 ±	6.24E+01	9.26E+01
MN-54		4.55E+00 ±	4.55E+00	5.83E+00
CO-58		-3.71E-01 ±	5.96E+00	8.21E+00
FE-59		-3.89E+00 ±	1.59E+01	2.09E+01
CO-60		3.77E+00 ±	5.30E+00	6.50E+00
ZN-65		-3.98E+00 ±	1.40E+01	1.79E+01
ZRNB-95		-5.25E-01 ±	1.12E+01	1.54E+01
I-131		6.51E+00 ±	2.00E+01	2.94E+01
CS-134		-7.79E-02 ±	5.14E+00	7.22E+00
CS-137		9.38E-02 ±	5.67E+00	8.01E+00
BALA140		6.14E+00 ±	1.38E+01	1.72E+01
BI-214		3.67E+00 ±	1.36E+01	1.96E+01

Location ST-102B collected 12/3/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	1.21E+02 ±	4.33E+01	5.60E+01
CR-51		-9.04E+00 ±	4.22E+01	5.89E+01
MN-54		9.91E-01 ±	3.62E+00	4.65E+00
CO-58		1.64E+00 ±	3.93E+00	5.03E+00
FE-59		8.63E+00 ±	9.88E+00	1.18E+01
CO-60		1.94E+00 ±	3.29E+00	3.99E+00
ZN-65		-8.22E+00 ±	9.39E+00	1.15E+01
ZRNB-95		2.00E+00 ±	7.09E+00	9.37E+00
I-131		5.89E+00 ±	1.08E+01	1.50E+01
CS-134		4.04E-01 ±	3.96E+00	5.22E+00
CS-137		-5.09E-01 ±	4.03E+00	5.33E+00
BALA140		-2.96E+00 ±	1.09E+01	1.27E+01
BI-214		7.74E+00 ±	7.36E+00	1.36E+01

Location ST-102B collected 12/31/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		3.94E+01 ±	7.85E+01	1.06E+02
CR-51		-2.09E+01 ±	7.64E+01	1.08E+02
MN-54		-1.71E+00 ±	6.40E+00	8.33E+00
CO-58		-1.22E+00 ±	6.67E+00	8.77E+00
FE-59		2.88E+00 ±	1.56E+01	2.00E+01
CO-60		-2.14E+00 ±	6.46E+00	8.06E+00
ZN-65		5.15E+00 ±	1.03E+01	1.32E+01
ZRNB-95		4.08E+00 ±	1.15E+01	1.54E+01
I-131		1.48E+01 ±	2.52E+01	3.52E+01
CS-134		3.07E+00 ±	5.85E+00	7.70E+00
CS-137		-2.75E+00 ±	6.51E+00	8.63E+00
BALA140		0.00E+00 ±	5.53E+00	3.24E+01
BI-214		1.28E+01 ±	1.39E+01	2.08E+01

TABLE B-7.2
GAMMA SPECTROMETRY RESULTS OF SANITARY WASTE TREATMENT WATER - SUMMARY
STATION 102B

Results in pCi/liter, corrected for decay during collection period

Nuclide	Average Activity	Activity Low	Activity High	Average MDA	Number of Samples	Number of Positive IDs
K-40	7.98E+01	2.40E+01	1.34E+02	7.03E+01	12	7
CR-51	-9.75E+00	-2.42E+01	2.24E+01	6.56E+01	12	0
MN-54	6.36E-01	-1.71E+00	4.55E+00	5.10E+00	12	0
CO-58	-3.67E-01	-3.08E+00	1.64E+00	5.75E+00	12	0
FE-59	4.15E-01	-7.77E+00	1.13E+01	1.52E+01	12	0
CO-60	1.48E+00	-2.14E+00	3.77E+00	4.94E+00	12	0
ZN-65	1.04E+00	-8.22E+00	7.25E+00	1.06E+01	12	0
ZRNB-95	1.36E-01	-6.47E+00	8.73E+00	1.07E+01	12	0
I-131	3.98E+00	-4.99E+00	1.48E+01	1.98E+01	12	0
CS-134	7.10E-01	-2.75E+00	3.66E+00	5.40E+00	12	0
CS-137	7.56E-02	-2.77E+00	2.25E+00	5.58E+00	12	0
BALA140	3.15E-01	-5.38E+00	7.65E+00	1.49E+01	12	0
BI-214	4.76E+00	8.19E-01	1.28E+01	1.45E+01	12	0

TABLE B-8.1
TRITIUM IN SANITARY WASTE TREATMENT WATER
 Results in pCi per liter, MDA for all samples is 300 pCi/l

Station	Description	Collection Period	RQ	Activity	Error
102B	SWTF Headworks	01/02/18 - 02/01/18		1.49E+02	± 9.31E+01
		02/01/18 - 03/01/18		7.38E+01	± 8.76E+01
		03/01/18 - 04/02/18		1.02E+02	± 8.91E+01
		04/02/18 - 05/01/18		1.28E+02	± 9.15E+01
		05/01/18 - 05/31/18		1.35E+02	± 9.42E+01
		05/31/18 - 07/02/18		4.50E+00	± 8.17E+01
		07/02/18 - 08/01/18		9.52E+01	± 9.29E+01
		08/01/18 - 08/30/18		1.24E+02	± 9.58E+01
		08/30/18 - 10/01/18		1.69E+02	± 9.65E+01
		10/01/18 - 11/01/18		2.35E+02	± 9.37E+01
		11/01/18 - 12/03/18		-6.70E+01	± 1.00E+02
		12/03/18 - 12/31/18		2.53E+01	± 8.96E+01

TABLE B-8.2
TRITIUM IN SANITARY WASTE TREATMENT WATER - SUMMARY
 Results in pCi per liter

Station	Description	Average Activity	Activity Low	Activity High	Number of Samples	Number of Positive IDs
102B	SWTF Headworks	9.78E+01	-6.70E+01	2.35E+02	12	0

TABLE B-10.1

GAMMA SPECTROMETRY RESULTS OF GROUNDWATER MONITORING WELL SAMPLES

Results in pCi per liter

Station MW-3 collected 1/31/2018					Station MW-10 collected 2/7/2018				
Nuclide	RQ	Activity	Error	MDA	Nuclide	RQ	Activity	Error	MDA
K-40		6.63E+01 ±	9.20E+01	1.20E+02	K-40		1.80E+01 ±	8.78E+01	1.25E+02
MN-54		1.61E+00 ±	6.21E+00	8.37E+00	MN-54		1.32E+00 ±	5.74E+00	7.79E+00
CO-58		5.12E+00 ±	6.39E+00	8.32E+00	CO-58		-1.69E-01 ±	5.22E+00	7.23E+00
FE-59		4.31E+00 ±	1.62E+01	2.09E+01	FE-59		-2.28E+00 ±	1.78E+01	2.32E+01
CO-60		3.57E+00 ±	6.92E+00	8.73E+00	CO-60		1.23E-01 ±	6.04E+00	7.97E+00
ZN-65		-1.64E+00 ±	1.39E+01	1.80E+01	ZN-65		-2.14E+00 ±	1.30E+01	1.68E+01
ZRNB-95		6.91E+00 ±	1.12E+01	1.48E+01	ZRNB-95		-3.54E+00 ±	1.09E+01	1.47E+01
I-131		5.26E-01 ±	6.63E+00	9.77E+00	I-131		1.28E+00 ±	7.08E+00	1.05E+01
CS-134		8.12E-01 ±	6.97E+00	9.62E+00	CS-134		2.85E+00 ±	5.54E+00	7.55E+00
CS-137		5.07E+00 ±	6.06E+00	8.10E+00	CS-137		-2.69E+00 ±	6.72E+00	9.21E+00
BALA140		0.00E+00 ±	4.24E+00	1.47E+01	BALA140		2.54E+00 ±	8.72E+00	1.09E+01
BI-214	+	5.51E+02 ±	3.77E+01	2.54E+01	BI-214	+	1.03E+02 ±	1.95E+01	2.16E+01

Station MW-5 collected 1/31/2018					Station MW-11 collected 2/7/2018				
Nuclide	RQ	Activity	Error	MDA	Nuclide	RQ	Activity	Error	MDA
K-40	+	1.40E+02 ±	7.86E+01	1.02E+02	K-40		3.62E+01 ±	8.58E+01	1.22E+02
MN-54		5.78E+00 ±	6.39E+00	8.02E+00	MN-54		1.86E+00 ±	6.44E+00	8.65E+00
CO-58		1.83E+00 ±	6.29E+00	8.20E+00	CO-58		4.76E-01 ±	5.46E+00	7.51E+00
FE-59		-7.05E+00 ±	2.02E+01	2.50E+01	FE-59		0.00E+00 ±	1.86E+00	2.61E+01
CO-60		2.18E+00 ±	6.13E+00	7.66E+00	CO-60		4.68E+00 ±	6.08E+00	7.56E+00
ZN-65		-1.32E+00 ±	1.25E+01	1.62E+01	ZN-65		2.14E+00 ±	1.30E+01	1.69E+01
ZRNB-95		-7.81E+00 ±	1.28E+01	1.68E+01	ZRNB-95		-3.55E+00 ±	1.10E+01	1.47E+01
I-131		1.84E+00 ±	6.61E+00	9.33E+00	I-131		1.22E+00 ±	8.15E+00	1.20E+01
CS-134		-3.60E+00 ±	7.73E+00	1.01E+01	CS-134		5.38E+00 ±	4.93E+00	6.47E+00
CS-137		1.39E+00 ±	6.96E+00	9.34E+00	CS-137		-4.18E+00 ±	6.93E+00	9.38E+00
BALA140		-2.16E+00 ±	9.63E+00	1.15E+01	BALA140		-4.84E+00 ±	1.20E+01	1.45E+01
BI-214	+	2.57E+02 ±	2.75E+01	2.56E+01	BI-214	+	1.54E+02 ±	2.22E+01	2.18E+01

Station MW-6 collected 1/31/2018					Station MW-12 collected 2/7/2018				
Nuclide	RQ	Activity	Error	MDA	Nuclide	RQ	Activity	Error	MDA
K-40		3.62E+01 ±	8.58E+01	1.22E+02	K-40		7.89E+01 ±	7.12E+01	9.88E+01
MN-54		-2.63E-01 ±	5.63E+00	7.73E+00	MN-54		1.25E-01 ±	6.43E+00	8.51E+00
CO-58		-2.65E+00 ±	7.40E+00	9.84E+00	CO-58		-1.96E+00 ±	6.54E+00	8.53E+00
FE-59		8.04E+00 ±	1.50E+01	1.90E+01	FE-59		-4.96E+00 ±	1.78E+01	2.23E+01
CO-60		4.18E+00 ±	6.03E+00	7.55E+00	CO-60		2.14E+00 ±	5.80E+00	7.27E+00
ZN-65		9.40E-01 ±	1.22E+01	1.60E+01	ZN-65		8.87E-01 ±	1.15E+01	1.51E+01
ZRNB-95		-4.32E+00 ±	1.26E+01	1.68E+01	ZRNB-95		-5.06E-01 ±	1.10E+01	1.50E+01
I-131		-1.21E+00 ±	7.02E+00	1.03E+01	I-131		4.21E-01 ±	8.29E+00	1.19E+01
CS-134		-2.44E-01 ±	6.52E+00	9.06E+00	CS-134		3.90E-01 ±	6.95E+00	9.32E+00
CS-137		7.96E-01 ±	6.98E+00	9.72E+00	CS-137		2.06E+00 ±	6.60E+00	8.82E+00
BALA140		5.11E+00 ±	8.12E+00	9.76E+00	BALA140		-4.98E+00 ±	1.21E+01	1.43E+01
BI-214	+	3.59E+02 ±	2.98E+01	2.22E+01	BI-214	+	1.54E+02 ±	2.41E+01	2.47E+01

Station MW-9 collected 2/7/2018					Station MW-13 collected 1/31/2018				
Nuclide	RQ	Activity	Error	MDA	Nuclide	RQ	Activity	Error	MDA
K-40		6.01E+00 ±	9.58E+01	1.34E+02	K-40		1.01E+02 ±	8.84E+01	1.15E+02
MN-54		4.92E-01 ±	6.45E+00	8.77E+00	MN-54		-2.12E+00 ±	7.38E+00	9.56E+00
CO-58		2.15E+00 ±	6.04E+00	8.10E+00	CO-58		-3.87E+00 ±	7.75E+00	9.93E+00
FE-59		0.00E+00 ±	6.96E+00	2.88E+01	FE-59		1.54E+00 ±	1.60E+01	2.03E+01
CO-60		2.71E+00 ±	7.69E+00	9.77E+00	CO-60		5.84E+00 ±	6.40E+00	7.66E+00
ZN-65		0.00E+00 ±	5.79E+00	2.35E+01	ZN-65		-9.67E+00 ±	1.58E+01	1.96E+01
ZRNB-95		2.88E+00 ±	1.12E+01	1.51E+01	ZRNB-95		-1.14E+00 ±	1.07E+01	1.45E+01
I-131		2.56E+00 ±	5.90E+00	8.58E+00	I-131		6.40E+00 ±	7.02E+00	9.63E+00
CS-134		3.17E+00 ±	6.67E+00	9.05E+00	CS-134		-1.56E-01 ±	6.65E+00	8.94E+00
CS-137		-3.28E+00 ±	8.13E+00	1.11E+01	CS-137		0.00E+00 ±	3.31E+00	1.17E+01
BALA140		4.89E+00 ±	9.06E+00	1.09E+01	BALA140		-5.00E+00 ±	1.16E+01	1.36E+01
BI-214	+	4.49E+02 ±	3.30E+01	2.31E+01	BI-214	+	3.90E+02 ±	3.13E+01	2.41E+01

RQ = Results Qualifier. If blank, result is less than detection limit. If "+", result is above detection limit.

TABLE B-10.1

GAMMA SPECTROMETRY RESULTS OF GROUNDWATER MONITORING WELL SAMPLES

Results in pCi per liter

Station MW-14 collected 1/31/2018					Station MW-9 collected 5/22/2018				
Nuclide	RQ	Activity	Error	MDA	Nuclide	RQ	Activity	Error	MDA
K-40		5.76E+01 ±	7.72E+01	9.34E+01	K-40	+	1.13E+02 ±	7.69E+01	1.02E+02
MN-54		-8.88E-01 ±	6.49E+00	8.79E+00	MN-54		3.73E-01 ±	7.00E+00	9.20E+00
CO-58		3.33E+00 ±	6.02E+00	7.97E+00	CO-58		-4.05E-01 ±	7.98E+00	1.04E+01
FE-59		-1.56E+00 ±	1.54E+01	2.02E+01	FE-59		-3.37E+00 ±	1.83E+01	2.29E+01
CO-60		3.81E+00 ±	6.33E+00	7.97E+00	CO-60		-3.47E+00 ±	8.39E+00	1.03E+01
ZN-65		-4.00E+00 ±	1.51E+01	1.93E+01	ZN-65		6.81E+00 ±	1.34E+01	1.69E+01
ZRNB-95		-5.21E+00 ±	1.34E+01	1.78E+01	ZRNB-95		8.85E+00 ±	1.07E+01	1.38E+01
I-131		5.46E-02 ±	6.78E+00	1.01E+01	I-131		4.80E+00 ±	6.94E+00	9.62E+00
CS-134		1.22E+00 ±	6.22E+00	8.58E+00	CS-134		-9.34E-01 ±	7.21E+00	9.62E+00
CS-137		-3.08E+00 ±	7.23E+00	9.88E+00	CS-137		1.74E+00 ±	7.60E+00	1.02E+01
BALA140		-8.26E-01 ±	9.28E+00	1.16E+01	BALA140		8.06E-01 ±	1.04E+01	1.26E+01
BI-214	+	3.23E+02 ±	2.93E+01	2.33E+01	BI-214	+	4.17E+02 ±	3.41E+01	2.81E+01

Station MW-3 collected 5/23/2018					Station MW-10 collected 5/22/2018				
Nuclide	RQ	Activity	Error	MDA	Nuclide	RQ	Activity	Error	MDA
K-40		0.00E+00 ±	6.33E+01	1.84E+02	K-40	+	1.45E+02 ±	5.63E+01	5.44E+01
MN-54		3.39E+00 ±	6.34E+00	1.12E+01	MN-54		-7.22E-01 ±	6.31E+00	8.57E+00
CO-58		2.90E+00 ±	5.83E+00	1.05E+01	CO-58		-2.35E+00 ±	6.97E+00	9.30E+00
FE-59		2.82E+00 ±	1.56E+01	2.81E+01	FE-59		0.00E+00 ±	1.75E+00	2.28E+01
CO-60		5.61E-02 ±	8.02E+00	1.42E+01	CO-60		1.97E+00 ±	7.09E+00	9.09E+00
ZN-65		1.51E+01 ±	9.36E+00	1.57E+01	ZN-65		1.01E+01 ±	1.10E+01	1.36E+01
ZRNB-95		0.00E+00 ±	4.67E+00	2.38E+01	ZRNB-95		5.73E+00 ±	1.04E+01	1.37E+01
I-131		1.38E+00 ±	6.94E+00	1.32E+01	I-131		0.00E+00 ±	4.52E+00	9.25E+00
CS-134		0.00E+00 ±	3.05E+00	1.40E+01	CS-134		-2.27E+00 ±	6.71E+00	9.17E+00
CS-137		-1.99E+00 ±	6.80E+00	1.24E+01	CS-137		2.09E+00 ±	6.42E+00	8.86E+00
BALA140		5.00E+00 ±	8.48E+00	1.45E+01	BALA140		0.00E+00 ±	3.18E+00	1.39E+01
BI-214	+	3.49E+02 ±	3.06E+01	3.25E+01	BI-214	+	2.03E+02 ±	2.47E+01	2.33E+01

Station MW-5 collected 5/23/2018					Station MW-11 collected 5/22/2018				
Nuclide	RQ	Activity	Error	MDA	Nuclide	RQ	Activity	Error	MDA
K-40		1.00E+02 ±	7.61E+01	1.02E+02	K-40		6.46E+01 ±	7.95E+01	1.42E+02
MN-54		1.96E+00 ±	6.65E+00	8.65E+00	MN-54		5.72E+00 ±	6.33E+00	1.10E+01
CO-58		9.37E-01 ±	6.13E+00	8.07E+00	CO-58		7.18E+00 ±	4.64E+00	7.97E+00
FE-59		-6.38E+00 ±	1.79E+01	2.22E+01	FE-59		6.26E+00 ±	9.44E+00	2.68E+01
CO-60		9.55E-01 ±	7.23E+00	9.08E+00	CO-60		2.23E+00 ±	3.36E+00	1.37E+01
ZN-65		-5.50E+00 ±	1.42E+01	1.80E+01	ZN-65		-6.83E+00 ±	1.62E+01	2.74E+01
ZRNB-95		-5.44E+00 ±	1.21E+01	1.61E+01	ZRNB-95		3.60E+00 ±	6.15E+00	2.20E+01
I-131		-5.15E-01 ±	6.92E+00	9.88E+00	I-131		5.94E+00 ±	9.30E+00	1.24E+01
CS-134		2.36E+00 ±	6.28E+00	8.33E+00	CS-134		5.45E+00 ±	5.68E+00	1.00E+01
CS-137		0.00E+00 ±	3.44E+00	1.06E+01	CS-137		2.98E-01 ±	5.49E+00	1.26E+01
BALA140		0.00E+00 ±	1.84E+00	1.27E+01	BALA140		2.80E-01 ±	8.00E-01	1.60E+01
BI-214	+	1.67E+02 ±	2.28E+01	2.37E+01	BI-214	+	3.73E+02 ±	2.82E+01	2.34E+01

Station MW-6 collected 5/23/2018					Station MW-12 collected 5/22/2018				
Nuclide	RQ	Activity	Error	MDA	Nuclide	RQ	Activity	Error	MDA
K-40		1.98E+01 ±	8.16E+01	1.18E+02	K-40		3.13E+01 ±	9.56E+01	1.27E+02
MN-54		1.29E+00 ±	5.58E+00	7.58E+00	MN-54		-4.20E+00 ±	7.62E+00	9.73E+00
CO-58		-3.19E+00 ±	6.90E+00	9.15E+00	CO-58		-5.12E+00 ±	8.33E+00	1.06E+01
FE-59		1.06E+01 ±	1.21E+01	1.50E+01	FE-59		1.27E+01 ±	1.35E+01	1.61E+01
CO-60		2.46E-01 ±	6.99E+00	9.11E+00	CO-60		-1.91E+00 ±	8.07E+00	1.00E+01
ZN-65		7.86E+00 ±	1.23E+01	1.54E+01	ZN-65		8.13E+00 ±	1.25E+01	1.56E+01
ZRNB-95		5.38E-01 ±	9.92E+00	1.36E+01	ZRNB-95		2.50E+00 ±	1.10E+01	1.49E+01
I-131		6.57E-01 ±	9.37E+00	1.39E+01	I-131		6.60E+00 ±	6.75E+00	9.23E+00
CS-134		3.84E+00 ±	5.81E+00	7.84E+00	CS-134		2.85E-01 ±	7.10E+00	9.51E+00
CS-137		2.89E+00 ±	6.47E+00	8.86E+00	CS-137		7.59E-01 ±	7.43E+00	1.00E+01
BALA140		0.00E+00 ±	1.76E+00	1.74E+01	BALA140		-2.60E+00 ±	1.11E+01	1.32E+01
BI-214	+	1.60E+02 ±	2.22E+01	2.21E+01	BI-214	+	3.04E+02 ±	2.84E+01	2.56E+01

RQ = Results Qualifier. If blank, result is less than detection limit. If "+", result is above detection limit.

TABLE B-10.1

GAMMA SPECTROMETRY RESULTS OF GROUNDWATER MONITORING WELL SAMPLES

Results in pCi per liter

Station MW-13 collected 5/23/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		1.18E+01 ±	9.64E+01	1.63E+02
MN-54		2.01E+00 ±	6.55E+00	1.13E+01
CO-58		2.92E-01 ±	5.78E+00	1.04E+01
FE-59		1.28E+01 ±	1.32E+01	2.27E+01
CO-60		-3.33E+00 ±	7.91E+00	1.30E+01
ZN-65		5.11E+00 ±	1.01E+01	1.81E+01
ZRNB-95		2.27E+00 ±	1.15E+01	2.06E+01
I-131		-3.76E-01 ±	9.29E+00	1.73E+01
CS-134		2.16E+00 ±	4.80E+00	1.06E+01
CS-137		-1.52E+00 ±	5.26E+00	1.19E+01
BALA140		6.31E+00 ±	5.49E+00	1.85E+01
BI-214	+	1.15E+02 ±	1.91E+01	2.92E+01

Station MW-6 collected 8/14/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		2.20E+01 ±	8.00E+01	1.09E+02
MN-54		-1.33E-01 ±	6.34E+00	8.67E+00
CO-58		2.43E+00 ±	5.06E+00	6.78E+00
FE-59		1.33E+00 ±	1.55E+01	2.04E+01
CO-60		2.41E+00 ±	5.92E+00	7.45E+00
ZN-65		8.10E+00 ±	1.17E+01	1.46E+01
ZRNB-95		-4.13E+00 ±	1.19E+01	1.60E+01
I-131		-3.06E+00 ±	8.99E+00	1.31E+01
CS-134		2.37E+00 ±	5.08E+00	6.96E+00
CS-137		-4.48E+00 ±	7.31E+00	9.88E+00
BALA140		-4.12E+00 ±	1.18E+01	1.44E+01
BI-214	+	1.06E+02 ±	2.08E+01	2.19E+01

Station MW-14 collected 5/23/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		9.58E+00 ±	8.25E+01	1.13E+02
MN-54		3.52E+00 ±	4.79E+00	6.29E+00
CO-58		-3.13E+00 ±	6.26E+00	8.32E+00
FE-59		1.37E+01 ±	1.75E+01	2.16E+01
CO-60		3.70E+00 ±	7.23E+00	9.11E+00
ZN-65		-5.24E+00 ±	1.38E+01	1.76E+01
ZRNB-95		-6.00E-01 ±	1.15E+01	1.57E+01
I-131		-9.12E+00 ±	1.05E+01	1.49E+01
CS-134		1.55E+00 ±	6.07E+00	8.37E+00
CS-137		2.39E+00 ±	6.02E+00	8.30E+00
BALA140		-5.23E-01 ±	1.10E+01	1.38E+01
BI-214	+	1.17E+02 ±	2.11E+01	2.22E+01

Station MW-9 collected 8/15/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		4.02E+01 ±	7.62E+01	1.12E+02
MN-54		-5.66E-01 ±	6.23E+00	8.48E+00
CO-58		7.01E+00 ±	5.28E+00	9.10E+00
FE-59		0.00E+00 ±	8.37E+00	2.51E+01
CO-60		3.49E+00 ±	6.02E+00	7.46E+00
ZN-65		4.78E+00 ±	1.00E+01	1.29E+01
ZRNB-95		0.00E+00 ±	4.12E+00	1.79E+01
I-131		-5.72E+00 ±	1.03E+01	1.48E+01
CS-134		3.19E+00 ±	6.17E+00	8.37E+00
CS-137		-3.28E+00 ±	7.48E+00	1.02E+01
BALA140		-2.13E+00 ±	1.32E+01	1.63E+01
BI-214	+	6.92E+01 ±	1.89E+01	2.26E+01

Station MW-3 collected 8/14/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	1.16E+02 ±	8.64E+01	1.12E+02
MN-54		-4.66E-01 ±	7.42E+00	9.72E+00
CO-58		-5.42E+00 ±	8.15E+00	1.03E+01
FE-59		-5.91E+00 ±	2.02E+01	2.50E+01
CO-60		-3.17E+00 ±	7.94E+00	9.80E+00
ZN-65		0.00E+00 ±	7.23E+00	2.20E+01
ZRNB-95		1.89E+00 ±	1.11E+01	1.50E+01
I-131		-3.26E-01 ±	7.13E+00	1.01E+01
CS-134		1.32E+00 ±	7.48E+00	9.94E+00
CS-137		1.68E+00 ±	7.36E+00	9.84E+00
BALA140		7.28E+00 ±	8.53E+00	9.80E+00
BI-214	+	4.21E+02 ±	3.34E+01	2.79E+01

Station MW-10 collected 8/15/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	1.70E+02 ±	7.44E+01	9.43E+01
MN-54		2.27E+00 ±	6.27E+00	8.15E+00
CO-58		-4.96E-01 ±	5.91E+00	7.85E+00
FE-59		-8.78E+00 ±	2.04E+01	2.52E+01
CO-60		4.62E+00 ±	4.81E+00	5.75E+00
ZN-65		-5.36E+00 ±	1.49E+01	1.89E+01
ZRNB-95		8.17E+00 ±	1.02E+01	1.32E+01
I-131		-2.42E+00 ±	1.14E+01	1.62E+01
CS-134		3.26E+00 ±	6.74E+00	8.87E+00
CS-137		-2.41E+00 ±	7.02E+00	9.35E+00
BALA140		-3.35E+00 ±	1.18E+01	1.41E+01
BI-214	+	4.05E+01 ±	1.69E+01	2.26E+01

Station MW-5 collected 8/14/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	1.53E+02 ±	7.27E+01	9.27E+01
MN-54		5.46E+00 ±	5.38E+00	6.71E+00
CO-58		2.40E+00 ±	6.09E+00	7.92E+00
FE-59		1.72E+01 ±	1.46E+01	2.42E+01
CO-60		5.16E+00 ±	5.31E+00	6.34E+00
ZN-65		1.11E+00 ±	9.69E+00	1.28E+01
ZRNB-95		7.76E+00 ±	1.05E+01	1.37E+01
I-131		5.22E+00 ±	8.84E+00	1.23E+01
CS-134		-4.76E+00 ±	7.65E+00	9.98E+00
CS-137		3.07E+00 ±	6.08E+00	8.06E+00
BALA140		0.00E+00 ±	2.98E+00	1.79E+01
BI-214	+	6.40E+01 ±	1.87E+01	2.34E+01

Station MW-11 collected 8/15/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		6.40E+01 ±	7.59E+01	1.02E+02
MN-54		-1.48E+00 ±	6.82E+00	9.18E+00
CO-58		-1.13E+00 ±	6.47E+00	8.79E+00
FE-59		2.19E+00 ±	1.22E+01	1.64E+01
CO-60		8.06E-01 ±	5.79E+00	7.47E+00
ZN-65		3.88E+00 ±	1.15E+01	1.49E+01
ZRNB-95		3.06E+00 ±	1.17E+01	1.58E+01
I-131		-2.27E+00 ±	1.42E+01	2.10E+01
CS-134		3.28E+00 ±	5.05E+00	6.84E+00
CS-137		0.00E+00 ±	2.93E+00	9.72E+00
BALA140		2.03E-01 ±	1.12E+01	1.46E+01
BI-214	+	3.43E+01 ±	1.55E+01	2.03E+01

TABLE B-10.1

GAMMA SPECTROMETRY RESULTS OF GROUNDWATER MONITORING WELL SAMPLES

Results in pCi per liter

Station MW-12 collected 8/15/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		2.93E+01 ±	9.28E+01	1.24E+02
MN-54		-6.38E-01 ±	6.57E+00	8.65E+00
CO-58		-2.08E-01 ±	6.76E+00	8.97E+00
FE-59		3.76E+00 ±	1.81E+01	2.29E+01
CO-60		1.53E+00 ±	5.83E+00	7.40E+00
ZN-65		6.35E+00 ±	1.22E+01	1.54E+01
ZRNB-95		1.34E+00 ±	1.23E+01	1.67E+01
I-131		-6.23E+00 ±	1.77E+01	2.50E+01
CS-134		2.46E+00 ±	6.05E+00	8.01E+00
CS-137		-2.15E+00 ±	7.26E+00	9.68E+00
BALA140		-4.67E+00 ±	1.64E+01	1.96E+01
BI-214	+	7.78E+01 ±	2.20E+01	2.55E+01

Station MW-5 collected 10/31/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		5.57E+01 ±	7.97E+01	1.09E+02
MN-54		1.66E+00 ±	6.36E+00	8.31E+00
CO-58		1.03E+00 ±	5.98E+00	7.88E+00
FE-59		4.06E-01 ±	1.68E+01	2.14E+01
CO-60		-4.17E+00 ±	8.01E+00	9.81E+00
ZN-65		-1.77E+00 ±	1.37E+01	1.76E+01
ZRNB-95		4.11E+00 ±	8.98E+00	1.20E+01
I-131		3.35E+00 ±	8.76E+00	1.23E+01
CS-134		3.10E+00 ±	6.14E+00	8.09E+00
CS-137		-4.43E-01 ±	7.17E+00	9.68E+00
BALA140		0.00E+00 ±	3.46E+00	1.51E+01
BI-214	+	7.71E+01 ±	2.05E+01	2.45E+01

Station MW-13 collected 8/14/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		1.30E+01 ±	8.81E+01	1.20E+02
MN-54		1.76E+00 ±	5.96E+00	8.03E+00
CO-58		-2.03E+00 ±	6.52E+00	8.75E+00
FE-59		9.01E+00 ±	1.52E+01	1.93E+01
CO-60		3.22E+00 ±	6.00E+00	7.45E+00
ZN-65		9.77E+00 ±	9.71E+00	1.18E+01
ZRNB-95		-2.58E+00 ±	1.07E+01	1.45E+01
I-131		-2.12E+00 ±	9.13E+00	1.34E+01
CS-134		2.45E-01 ±	6.00E+00	8.37E+00
CS-137		-6.96E-01 ±	7.10E+00	9.88E+00
BALA140		0.00E+00 ±	6.03E+00	1.27E+01
BI-214	+	1.11E+02 ±	2.11E+01	2.33E+01

Station MW-6 collected 10/31/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		2.97E+01 ±	7.71E+01	1.05E+02
MN-54		-3.98E-01 ±	6.03E+00	8.23E+00
CO-58		5.75E+00 ±	4.41E+00	7.83E+00
FE-59		0.00E+00 ±	3.22E+00	2.69E+01
CO-60		-1.34E-01 ±	6.99E+00	8.96E+00
ZN-65		-5.70E+00 ±	1.38E+01	1.76E+01
ZRNB-95		1.60E+00 ±	9.91E+00	1.35E+01
I-131		1.80E-01 ±	8.71E+00	1.29E+01
CS-134		2.53E+00 ±	5.93E+00	8.10E+00
CS-137		-4.78E+00 ±	7.44E+00	1.00E+01
BALA140		4.00E+00 ±	7.21E+00	8.87E+00
BI-214	+	1.15E+02 ±	2.01E+01	2.10E+01

Station MW-14 collected 8/14/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	1.48E+02 ±	7.02E+01	9.36E+01
MN-54		1.98E+00 ±	6.71E+00	8.73E+00
CO-58		-2.24E+00 ±	6.96E+00	9.04E+00
FE-59		1.16E+01 ±	1.31E+01	1.58E+01
CO-60		2.06E+00 ±	6.25E+00	7.84E+00
ZN-65		-4.23E+00 ±	1.34E+01	1.71E+01
ZRNB-95		1.93E+00 ±	1.15E+01	1.55E+01
I-131		-1.51E+00 ±	9.51E+00	1.35E+01
CS-134		1.04E+00 ±	6.53E+00	8.74E+00
CS-137		1.90E-01 ±	6.63E+00	9.00E+00
BALA140		1.22E+00 ±	1.13E+01	1.37E+01
BI-214	+	1.08E+02 ±	2.19E+01	2.49E+01

Station MW-9 collected 11/7/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		7.08E+01 ±	7.75E+01	1.06E+02
MN-54		1.54E+00 ±	6.02E+00	7.88E+00
CO-58		8.38E-01 ±	6.97E+00	9.15E+00
FE-59		0.00E+00 ±	2.98E+00	3.02E+01
CO-60		-3.18E+00 ±	7.95E+00	9.81E+00
ZN-65		4.66E+00 ±	1.00E+01	1.28E+01
ZRNB-95		-5.52E+00 ±	1.16E+01	1.54E+01
I-131		-6.60E+00 ±	1.03E+01	1.43E+01
CS-134		-3.41E+00 ±	7.43E+00	9.76E+00
CS-137		-1.58E+00 ±	7.23E+00	9.68E+00
BALA140		0.00E+00 ±	2.18E+00	1.30E+01
BI-214	+	1.11E+02 ±	2.15E+01	2.48E+01

Station MW-3 collected 10/31/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		8.50E+01 ±	9.84E+01	1.27E+02
MN-54		-2.17E+00 ±	8.39E+00	1.08E+01
CO-58		1.14E+00 ±	6.86E+00	8.97E+00
FE-59		4.09E+00 ±	1.81E+01	2.26E+01
CO-60		-3.62E+00 ±	8.25E+00	1.01E+01
ZN-65		-7.89E+00 ±	1.72E+01	2.15E+01
ZRNB-95		-8.13E+00 ±	1.28E+01	1.67E+01
I-131		1.11E+00 ±	7.52E+00	1.06E+01
CS-134		-1.74E+00 ±	8.56E+00	1.13E+01
CS-137		-1.49E+00 ±	7.59E+00	1.02E+01
BALA140		7.99E+00 ±	7.98E+00	9.06E+00
BI-214	+	4.25E+02 ±	3.43E+01	2.91E+01

Station MW-10 collected 11/7/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		4.56E+01 ±	8.22E+01	1.12E+02
MN-54		-2.54E+00 ±	6.74E+00	8.72E+00
CO-58		-6.81E-01 ±	6.85E+00	9.01E+00
FE-59		-6.87E+00 ±	1.82E+01	2.26E+01
CO-60		0.00E+00 ±	9.90E-01	9.81E+00
ZN-65		1.78E+00 ±	1.27E+01	1.64E+01
ZRNB-95		2.61E+00 ±	9.86E+00	1.33E+01
I-131		-9.40E-01 ±	9.01E+00	1.29E+01
CS-134		-4.43E-01 ±	6.21E+00	8.36E+00
CS-137		1.36E+00 ±	5.97E+00	8.06E+00
BALA140		6.40E+00 ±	6.37E+00	7.27E+00
BI-214	+	5.73E+01 ±	2.03E+01	2.50E+01

TABLE B-10.1

GAMMA SPECTROMETRY RESULTS OF GROUNDWATER MONITORING WELL SAMPLES

Results in pCi per liter

Station MW-11 collected 11/7/2018					Station MW-13 collected 10/31/2018				
Nuclide	RQ	Activity	Error	MDA	Nuclide	RQ	Activity	Error	MDA
K-40	+	1.41E+02	± 6.98E+01	9.28E+01	K-40		1.95E+01	± 9.23E+01	1.24E+02
MN-54		1.29E+00	± 6.36E+00	8.34E+00	MN-54		-2.88E+00	± 7.47E+00	9.63E+00
CO-58		-3.28E-01	± 6.04E+00	8.03E+00	CO-58		1.61E-01	± 6.43E+00	8.52E+00
FE-59		-2.61E+00	± 1.82E+01	2.30E+01	FE-59		2.12E+00	± 1.60E+01	2.03E+01
CO-60		0.00E+00	± 4.08E+00	1.05E+01	CO-60		0.00E+00	± 1.71E+00	1.14E+01
ZN-65		2.01E+00	± 1.22E+01	1.58E+01	ZN-65		-1.11E+00	± 1.21E+01	1.57E+01
ZRNB-95		4.02E-01	± 1.07E+01	1.47E+01	ZRNB-95		-7.19E+00	± 1.17E+01	1.53E+01
I-131		2.85E+00	± 9.80E+00	1.39E+01	I-131		-6.66E+00	± 1.00E+01	1.39E+01
CS-134		4.93E+00	± 6.04E+00	7.84E+00	CS-134		1.77E+00	± 7.44E+00	9.87E+00
CS-137		4.84E+00	± 5.57E+00	7.22E+00	CS-137		-1.52E+00	± 7.47E+00	1.00E+01
BALA140		0.00E+00	± 8.57E-01	1.52E+01	BALA140		5.72E+00	± 7.99E+00	9.37E+00
BI-214	+	8.20E+01	± 2.01E+01	2.36E+01	BI-214	+	1.05E+02	± 2.09E+01	2.46E+01

Station MW-12 collected 11/7/2018					Station MW-14 collected 10/31/2018				
Nuclide	RQ	Activity	Error	MDA	Nuclide	RQ	Activity	Error	MDA
K-40		8.42E+01	± 6.79E+01	9.51E+01	K-40		6.85E+01	± 7.11E+01	1.04E+02
MN-54		7.22E+00	± 5.34E+00	8.91E+00	MN-54		-2.79E+00	± 6.19E+00	8.25E+00
CO-58		8.27E-01	± 6.30E+00	8.32E+00	CO-58		1.71E+00	± 5.59E+00	7.57E+00
FE-59		9.51E+00	± 1.44E+01	1.76E+01	FE-59		3.32E+00	± 1.36E+01	1.79E+01
CO-60		-2.27E+00	± 7.29E+00	9.09E+00	CO-60		2.19E+00	± 6.35E+00	7.99E+00
ZN-65		-4.25E+00	± 1.34E+01	1.71E+01	ZN-65		1.05E+01	± 1.05E+01	1.28E+01
ZRNB-95		-3.77E+00	± 1.10E+01	1.48E+01	ZRNB-95		-2.39E+00	± 1.15E+01	1.56E+01
I-131		2.50E+00	± 1.04E+01	1.48E+01	I-131		-4.70E+00	± 9.29E+00	1.35E+01
CS-134		5.82E+00	± 5.89E+00	7.56E+00	CS-134		4.90E-01	± 5.91E+00	8.23E+00
CS-137		-7.59E-01	± 6.66E+00	9.00E+00	CS-137		2.98E-01	± 5.74E+00	8.10E+00
BALA140		1.11E+00	± 1.15E+01	1.41E+01	BALA140		0.00E+00	± 4.46E+00	1.85E+01
BI-214	+	8.97E+01	± 2.14E+01	2.53E+01	BI-214	+	9.81E+01	± 2.03E+01	2.24E+01

Table B-10.2

GAMMA SPECTROMETRY RESULTS OF GROUNDWATER MONITORING WELL SAMPLES - SUMMARY

Results in pCi/liter

Nuclide	Average Activity	Activity Low	Activity High	Average MDA	Number of Samples	Number of Positive IDs
K-40	6.64E+01	0.00E+00	1.70E+02	1.13E+02	36	8
MN-54	8.44E-01	-4.20E+00	7.22E+00	8.76E+00	36	0
CO-58	3.37E-01	-5.42E+00	7.18E+00	8.70E+00	36	0
FE-59	2.44E+00	-8.78E+00	1.72E+01	2.22E+01	36	0
CO-60	1.07E+00	-4.17E+00	5.84E+00	9.00E+00	36	0
ZN-65	1.20E+00	-9.67E+00	1.51E+01	1.69E+01	36	0
ZRNB-95	1.02E-02	-8.13E+00	8.85E+00	1.57E+01	36	0
I-131	-1.35E-01	-9.12E+00	6.60E+00	1.28E+01	36	0
CS-134	1.32E+00	-4.76E+00	5.82E+00	8.93E+00	36	0
CS-137	-2.61E-01	-4.78E+00	5.07E+00	9.68E+00	36	0
BALA140	6.58E-01	-5.00E+00	7.99E+00	1.35E+01	36	0
BI-214	1.98E+02	3.43E+01	5.51E+02	2.43E+01	36	36

TABLE B-11.1
TRITIUM IN GROUNDWATER MONITORING WELL SAMPLES

Results in pCi per liter

Location	Collection Date	RQ	Activity	Error
MW-3	01/31/18	+	6.73E+02	± 1.06E+02
	05/23/18	+	5.73E+02	± 1.10E+02
	08/14/18	+	8.81E+02	± 1.14E+02
	10/31/18	+	8.76E+02	± 1.11E+02
MW-5	01/31/18	+	1.37E+04	± 2.84E+02
	05/23/18	+	1.29E+04	± 2.81E+02
	08/14/18	+	1.26E+04	± 2.75E+02
	10/31/18	+	1.24E+04	± 2.72E+02
MW-6	01/31/18	+	4.60E+03	± 1.79E+02
	05/23/18	+	4.54E+03	± 1.83E+02
	08/14/18	+	4.88E+03	± 1.85E+02
	10/31/18	+	4.78E+03	± 1.82E+02
MW-9	02/07/18		1.94E+02	± 9.59E+01
	05/22/18		1.47E+02	± 9.97E+01
	08/15/18		2.29E+02	± 9.73E+01
	11/07/18	+	3.01E+02	± 9.34E+01
MW-10	02/07/18	+	3.34E+02	± 9.69E+01
	05/22/18		2.18E+02	± 1.01E+02
	08/15/18		3.25E+02	± 9.97E+01
	11/07/18	+	3.41E+02	± 9.47E+01
MW-11	02/07/18	+	1.19E+03	± 1.18E+02
	05/22/18	+	1.01E+03	± 1.20E+02
	08/15/18	+	1.05E+03	± 1.17E+02
	11/07/18	+	9.98E+02	± 1.12E+02
MW-12	02/07/18	+	6.00E+02	± 1.04E+02
	05/22/18	+	4.00E+02	± 1.06E+02
	08/15/18	+	4.81E+02	± 1.04E+02
	11/07/18	+	4.54E+02	± 9.82E+01
MW-13	01/31/18	+	1.11E+04	± 2.59E+02
	05/23/18	+	1.07E+04	± 2.63E+02
	08/14/18	+	1.05E+04	± 2.54E+02
	10/31/18	+	9.96E+03	± 2.46E+02
MW-14	01/31/18		2.03E+02	± 9.33E+01
	05/23/18		1.54E+02	± 9.99E+01
	08/14/18		2.10E+02	± 9.63E+01
	10/31/18		1.98E+02	± 9.15E+01

Table B-12.1

GAMMA SPECTROMETRY RESULTS OF EVAPORATION POND WATER

Results in pCi/liter

Location EVP-1A collected 5/25/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		6.71E+01 ±	8.65E+01	1.15E+02
CR-51		4.27E+00 ±	5.01E+01	7.14E+01
MN-54		-4.17E+00 ±	7.39E+00	9.45E+00
CO-58		1.03E+00 ±	5.95E+00	7.85E+00
FE-59		4.04E-01 ±	1.67E+01	2.13E+01
CO-60		-1.15E+00 ±	6.97E+00	8.76E+00
ZN-65		-1.99E+00 ±	1.32E+01	1.70E+01
ZRNB-95		-5.05E-01 ±	1.10E+01	1.50E+01
I-131		7.58E-01 ±	8.34E+00	1.19E+01
CS-134		-3.46E+00 ±	7.26E+00	9.54E+00
CS-137		2.34E+00 ±	6.18E+00	8.26E+00
BALA140		-2.27E+00 ±	9.21E+00	1.12E+01
BI-214		8.35E+00 ±	1.84E+01	2.54E+01

Location EVP-1B collected 5/25/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		2.02E+00 ±	6.59E+01	1.04E+02
CR-51		1.15E+01 ±	3.90E+01	5.75E+01
MN-54		-7.95E-01 ±	6.05E+00	8.23E+00
CO-58		-1.16E+00 ±	5.51E+00	7.52E+00
FE-59		1.31E+01 ±	1.22E+01	1.48E+01
CO-60		9.86E-01 ±	5.02E+00	6.63E+00
ZN-65		-6.41E+00 ±	1.44E+01	1.82E+01
ZRNB-95		-4.15E-01 ±	1.05E+01	1.43E+01
I-131		-8.64E-01 ±	7.79E+00	1.16E+01
CS-134		3.34E+00 ±	5.57E+00	7.55E+00
CS-137		2.69E+00 ±	5.60E+00	7.69E+00
BALA140		0.00E+00 ±	2.92E+00	1.38E+01
BI-214		3.20E+00 ±	1.54E+01	2.21E+01

Location EVP-2 collected 5/25/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	1.80E+02 ±	7.63E+01	7.97E+01
CR-51		-2.09E+01 ±	5.26E+01	7.39E+01
MN-54		-3.57E+00 ±	7.22E+00	9.27E+00
CO-58		-3.22E+00 ±	7.10E+00	9.14E+00
FE-59		-2.23E+00 ±	1.51E+01	1.93E+01
CO-60		1.11E+00 ±	6.68E+00	8.41E+00
ZN-65		4.43E-01 ±	1.26E+01	1.64E+01
ZRNB-95		1.86E+00 ±	9.43E+00	1.28E+01
I-131		4.12E+00 ±	8.80E+00	1.23E+01
CS-134		-3.98E+00 ±	7.61E+00	9.98E+00
CS-137		3.61E+00 ±	5.96E+00	7.86E+00
BALA140		-1.15E+00 ±	1.07E+01	1.29E+01
BI-214		5.57E+00 ±	9.07E+00	2.39E+01

Location EVP-3 collected 5/25/2018				
Nuclide	RQ	Activity	Error	MDA
K-40	+	1.64E+02 ±	7.34E+01	9.40E+01
CR-51		-4.00E+01 ±	6.17E+01	8.54E+01
MN-54		1.88E+00 ±	6.22E+00	8.11E+00
CO-58		-6.81E-01 ±	6.85E+00	9.01E+00
FE-59		6.35E+00 ±	1.56E+01	1.95E+01
CO-60		-1.15E-01 ±	7.72E+00	9.72E+00
ZN-65		-2.44E+00 ±	1.42E+01	1.82E+01
ZRNB-95		-1.20E+01 ±	1.47E+01	1.90E+01
I-131		-7.89E-01 ±	9.80E+00	1.40E+01
CS-134		6.35E+00 ±	5.58E+00	7.11E+00
CS-137		5.44E+00 ±	6.65E+00	8.64E+00
BALA140		-1.60E+00 ±	1.24E+01	1.49E+01
BI-214	+	1.90E+02 ±	2.33E+01	2.32E+01

Location EVP-4 collected 5/25/2018				
Nuclide	RQ	Activity	Error	MDA
K-40		3.80E+00 ±	8.06E+01	1.18E+02
CR-51		-9.47E+00 ±	5.27E+01	7.73E+01
MN-54		3.32E-02 ±	6.18E+00	8.46E+00
CO-58		2.16E+00 ±	5.81E+00	7.82E+00
FE-59		2.66E+00 ±	3.51E+00	2.36E+01
CO-60		2.77E+00 ±	6.56E+00	8.61E+00
ZN-65		8.57E+00 ±	1.03E+01	1.28E+01
ZRNB-95		1.19E-01 ±	1.14E+01	1.56E+01
I-131		1.15E-01 ±	9.10E+00	1.35E+01
CS-134		-6.53E-01 ±	5.50E+00	9.44E+00
CS-137		4.97E-01 ±	4.87E+00	8.49E+00
BALA140		2.84E+00 ±	6.30E+00	1.59E+01
BI-214	+	2.58E+02 ±	2.63E+01	2.29E+01

TABLE B-13.1
GAMMA SPECTROMETRY RESULTS OF EVAPORATION POND SEDIMENT

Results in pCi/kilogram dry material

Evap Pond 3 8/29/2018					Evap Pond 4 8/29/2018				
Location & Date					Location & Date				
Nuclide	RQ	Activity	Error	MDA	Nuclide	RQ	Activity	Error	MDA
BE-7	+	4.02E+03 ±	4.87E+02	3.91E+02	BE-7	+	8.64E+02 ±	2.38E+02	2.68E+02
K-40	+	1.12E+04 ±	1.00E+03	5.94E+02	K-40	+	1.48E+04 ±	9.04E+02	2.66E+02
CR-51		7.72E+00 ±	2.96E+02	4.41E+02	CR-51		-6.83E+01 ±	2.10E+02	3.06E+02
MN-54		-1.39E+01 ±	4.19E+01	5.60E+01	MN-54		2.50E+00 ±	2.34E+01	3.18E+01
CO-58		-4.66E+00 ±	3.42E+01	4.68E+01	CO-58		1.21E+01 ±	2.02E+01	2.67E+01
FE-59		0.00E+00 ±	5.21E+01	1.57E+02	FE-59		-1.47E+01 ±	7.49E+01	9.39E+01
CO-60	+	1.18E+02 ±	2.77E+01	4.11E+01	CO-60		8.00E+00 ±	2.42E+01	3.04E+01
ZN-65		1.47E+00 ±	5.38E+01	7.30E+01	ZN-65		5.98E+00 ±	5.78E+01	7.43E+01
ZRNB-95		2.48E+01 ±	5.88E+01	7.90E+01	ZRNB-95		3.30E+01 ±	3.62E+01	4.67E+01
CS-134		2.85E+01 ±	3.04E+01	4.04E+01	CS-134		2.65E+00 ±	1.88E+01	2.62E+01
CS-137		2.78E+01 ±	3.92E+01	5.28E+01	CS-137	+	4.72E+01 ±	2.22E+01	2.69E+01
BALA140		6.40E+00 ±	5.12E+01	6.55E+01	BALA140		0.00E+00 ±	3.57E+00	7.30E+01
BI-214	+	4.65E+02 ±	9.73E+01	1.06E+02	BI-214	+	4.90E+02 ±	7.46E+01	6.91E+01

TABLE B-14.1
GROSS BETA IN EVAPORATION POND WATER
 Results in pCi per liter

Location	Collection		RQ	Activity	Error	MDA
	Date					
Evaporation Pond 1A	05/25/18			4.46E-01 ±	6.49E-01	2.18E+00
Evaporation Pond 1B	05/25/18			1.31E+00 ±	7.32E-01	2.31E+00
Evaporation Pond 2	05/25/18			1.29E+00 ±	6.97E-01	2.24E+00
Evaporation Pond 3	05/25/18			4.77E-01 ±	6.49E-01	2.25E+00
Evaporation Pond 4	05/25/18	+		1.03E+01 ±	1.24E+00	2.63E+00

TABLE B-15.1
TRITIUM IN EVAPORATION POND WATER
 Results in pCi per liter, LLD is 300 pCi per liter

Location	Collection		RQ	Activity	Error
	Date				
Evaporation Pond 1A	05/25/18			3.60E+01 ±	9.01E+01
Evaporation Pond 1B	05/25/18			1.56E+02 ±	9.57E+01
Evaporation Pond 2	05/25/18			1.07E+02 ±	9.40E+01
Evaporation Pond 3	05/25/18	+		5.04E+02 ±	1.05E+02
Evaporation Pond 4	05/25/18	+		1.18E+03 ±	1.21E+02

TABLE B-17.1
CARBON 14 IN APPLES
 Results in pCi per Kg wet mass

Location	Distance from CGS, miles	Sector from CGS	Sample Type	Collection Date	RQ	Activity	Error	MDA	
St-37	4.3	ESE	Ind	8/15/2018		4.70E+02	±	3.40E+02	1.10E+03
St-37	4.3	ESE	Ind	8/15/2018		3.50E+02	±	3.40E+02	1.10E+03
Kennewick	23	SSE	Cntl	9/8/2018		1.70E+02	±	3.30E+02	1.10E+03
Basin City	12	NE	Ind	9/15/2018		3.80E+02	±	3.40E+02	1.10E+03
Mattawa	34.5	WNW	Cntl	9/15/2018		3.80E+02	±	3.30E+02	1.10E+03
Basin City	12	NE	Ind	9/21/2018		5.70E+02	±	3.40E+02	1.10E+03

The first two sample results were a duplicate analysis of the same sample.

Ind = Indicator location. Cntl = Control location.

RQ=Results Qualifier. If blank, results is less than detection limit. If "+", result is above the detection limit.