



State of Illinois
Illinois Emergency Management Agency

2021 Radiological Environmental Monitoring Report for Illinois Nuclear Power Stations



IEMA

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Executive Summary

The Illinois Emergency Management Agency (IEMA) is mandated with protecting public health and safety and the environment from the potentially harmful effects of ionizing radiation. In support of that mission, IEMA conducts radiological environmental monitoring around Illinois' six operating nuclear power stations (NPS) and the Zion NPS which ceased operation in 1998 and is anticipated to complete the decommissioning process in 2022. The remaining spent fuel for the power station is stored in an on-site Independent Spent Fuel Storage Installation (ISFSI).

IEMA's radiological environmental monitoring program has three primary functions: 1) collection of diverse samples from carefully chosen locations on a routine basis, including simultaneous field surveillance; 2) analyzing samples for radionuclides; and 3) evaluation of test results on both an annual and historical basis.

Federal regulations establish standards for protection of the public against ionizing radiation from activities conducted under U.S. Nuclear Regulatory Commission (US NRC) licenses, such as operation of NPSs. The U.S. Environmental Protection Agency (US EPA) and the Illinois Environmental Protection Agency (IEPA) set drinking water and Class I groundwater standards for several types of radioactive contaminants; the limit for tritium in both drinking water and Class I groundwater, 20,000 picocuries per liter, is used for comparison purposes within this report.

In 2021, 437 environmental samples were collected and analyzed for radioactivity. The samples collected by IEMA included water, sediment, soil, air, vegetation, and fish. In addition, 1504 environmental dosimeters (Optically Stimulated Luminescence Dosimeters, or OSLs) were strategically deployed around the NPS sites to measure direct radiation. Environmental dosimetry results provide a baseline of ambient gamma radiation levels within a 10-mile radius of each NPS and other background reference locations across the state.

In 2021, all test results for samples collected as part of IEMA's environmental monitoring program for NPSs were below federal and state safety standards and guidelines.

Introduction

With 11 operating reactors at six nuclear power stations (NPS), Illinois is home to more commercial nuclear power generation than any other state in the country. Although direct regulatory authority for the operation of U.S. NPSs resides with the U.S. Nuclear Regulatory Commission (US NRC), the Illinois Emergency Management Agency (IEMA) is mandated with protecting public health and safety and the environment from the potentially harmful effects of ionizing radiation. In support of that mission, IEMA conducts radiological environmental monitoring in the environs of each operating NPS within Illinois. IEMA also maintains a radiological environmental monitoring program at Zion NPS, which ceased operation in 1998 and is anticipated to complete the decommissioning process in 2022. Control “background” sample locations are chosen in areas where the samples are not influenced by station operations. Background samples are collected and analyzed quarterly, and the results are compared to the sample results collected for each NPS. Background environmental samples are taken from Sangchris Lake State Park near Kincaid, Illinois. Background location information and sample results can be found on pages 129-138.

In addition to “traditional” radiological environmental monitoring, IEMA has a Remote Monitoring System (RMS) around each NPS. IEMA’s RMS is an advanced, integrated computer-based system that continually monitors selected station operational parameters at each facility and is capable of identifying and measuring the presence of radioactive materials in station effluents and direct radiation in the surrounding environment. This one-of-a-kind system consists of three separate subsystems: the Reactor Data Link (RDL), the Gaseous Effluent Monitoring System (GEMS) and the Gamma Detection Network (GDN).

IEMA has developed software that continually monitors and analyzes data collected through the RMS. Additionally; the software provides notification of unusual occurrences to on-call IEMA personnel.

This report details IEMA’s radiological environmental monitoring program, including data from the RMS, for the period January 2021 through December 2021 for the six operating NPSs in Illinois, the now decommissioned NPS at Zion, and the background sampling locations in Kincaid, Marion, Springfield, and West Chicago.

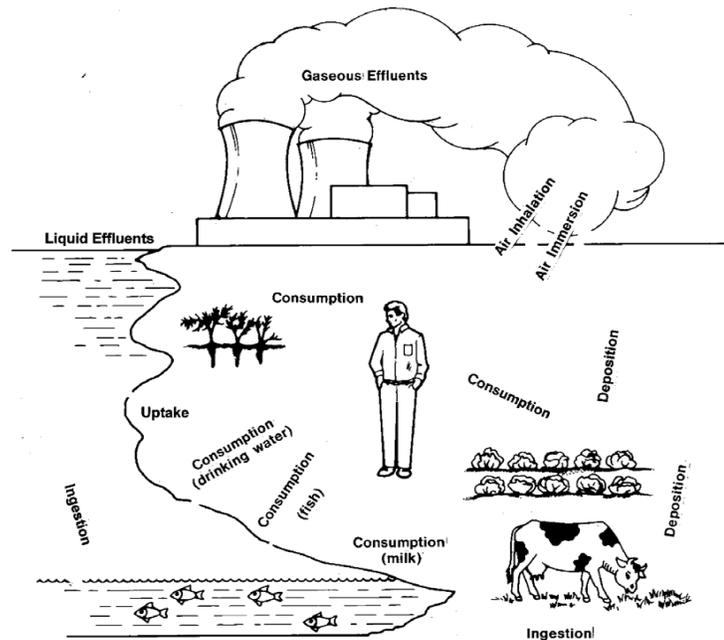
Note - All of Illinois’ NPSs are now owned and operated by Constellation Energy Corporation. This corporation was formed in 2022 by the separation of Constellation and Exelon Generation from their former parent company, Exelon Corporation.

IEMA Radiological Environmental Monitoring Program

The IEMA Radiological Environmental Monitoring Program for Illinois NPSs is designed to evaluate the environs of all Illinois NPSs by monitoring the movement, or lack of movement, of radionuclides, and subsequently determine any potential for public exposure. Critical pathways for potential radiation exposure to the public include direct radiation, airborne, waterborne, aquatic, and ingestion. Figure 1 depicts the different exposure pathways through which people may be exposed to radiation or may ingest radioactive material. IEMA has strategically identified sampling locations that provide early indication of any potential public health and safety issues regarding Illinois NPS operation. Data from the program is also used to establish a baseline data set that can be used to perform exposure assessments in the event of a significant release from an NPS.

IEMA collects samples from designated sampling locations on a routine basis. These samples are then analyzed for the presence of radionuclides and the results are evaluated on both an annual and historical basis. Sample matrices monitored by IEMA include soil, vegetation, and air, as well as water, sediment, and fish from nearby waterways. Additionally, IEMA deploys an array of radiological environmental dosimeters around each NPS to measure direct radiation from all sources. In 2021, 437 samples were collected and analyzed, and 1504 radiological environmental dosimeters were deployed. A description of IEMA Radiological Environmental Monitoring Program for Illinois NPS's sample collection and analysis follows. Maps containing sample collection and monitoring locations, as well as tables containing sample and monitoring results are included within the site-specific information provided in this report.

Figure I. Radiation Exposure Pathways to Humans



Sampling and Monitoring Activities

Water Sampling

NPSs require large volumes of water to operate, and sometimes discharge a portion of this water to rivers and lakes. This discharge is regulated by the US NRC and the IEPA. Samples are collected and analyzed from potentially impacted bodies of water on a quarterly basis.

Station operations can also impact groundwater. Therefore, samples are collected and analyzed quarterly from potentially impacted wells at or around NPSs.

Water samples are collected to ensure that there are no adverse radiological impacts to local water supplies. The Public Water Supply (PWS) limits for radionuclides are based upon the EPA and

IEPA's drinking water standards; IEMA's purpose for sampling private wells and public water supplies is solely to screen for the presence of radionuclides in drinking water.

Soil Sampling

Soil samples are collected during the second and third quarters of the year and analyzed for radionuclides that may have been released into the atmosphere and deposited on the ground downwind from the NPS. Soil is sampled at a depth of one inch to monitor for deposition of radionuclides on the soil surface and at six inches to monitor the migration of radionuclides away from the soil surface.

Vegetation Sampling

Vegetation samples are collected during the second and third quarters of the year and analyzed for radionuclides that may have been released into the atmosphere and deposited on plant tissue or on the ground and subsequently taken up by the plant via the root system.

Sediment Sampling

Sediment samples are collected during the second and third quarters of the year and analyzed for radionuclides that may have been released from an NPS into a surrounding body of water. Radionuclides released into surrounding bodies of water would be expected to accumulate in sediments downstream of an NPS.

Fish Sampling

Fish are excellent bio-accumulators of radionuclides. Fish samples are collected from rivers and lakes near NPS discharge points during the second and third quarter of the year. Edible portions of the fish are then harvested and submitted for analysis. Both "top-feeders" and "bottom feeders" are collected from each sampling location and are analyzed separately.

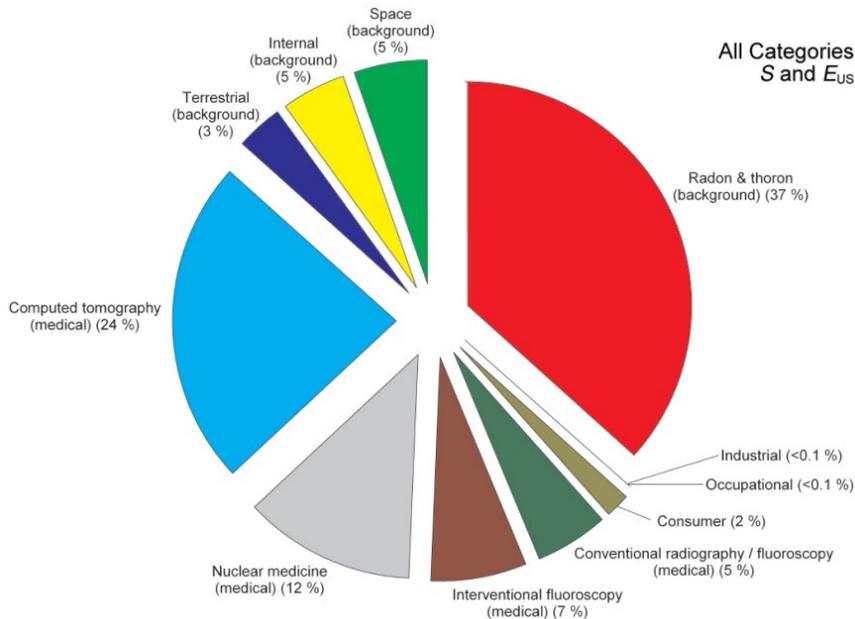
Direct Radiation Monitoring

IEMA maintains a network of 389 environmental dosimeters around the six operating NPSs and the independent spent fuel storage installation located at the decommissioned Zion NPS. Unlike the environmental samples described previously, dosimeters do not provide information about what radionuclides are found in the environment. Instead, the dosimeters are used to monitor for small changes in ambient background levels of gamma radiation around each NPS during normal operations, as well as to determine the extent and magnitude of radiation dose to the public following a significant release of radioactive materials into the environment or from exposure to large quantities of stored material onsite.

Dosimeters provide a direct measurement of the total dose produced by all sources of gamma radiation, including naturally occurring radionuclides and cosmic rays, integrated over time. The dosimeters are arrayed within a 10-mile radius of each station and are exchanged and analyzed quarterly by IEMA.

In addition to the quarterly results, the approximate exposure per year an individual would receive at that location has been calculated. Those numbers can be compared to the average radiation dose to an individual of 620 millirem per year (mrem/year) from various sources (according to the 2009 National Council on Radiation Protection’s Report 160, Figure 2.). Approximately 8% (49.6 mrem/year) of that dose is from terrestrial and cosmic radiation (background radiation).

Figure 2. Sources of Radiation Exposure to Man

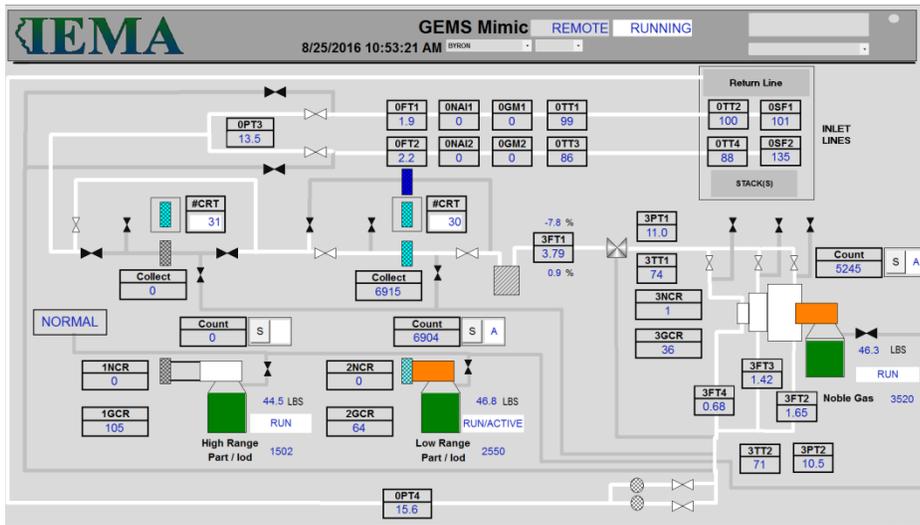


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Gaseous Effluent Monitoring System (GEMS)

IEMA continuously monitors gaseous effluents from all operating NPSs with GEMS. The GEMS provides automatic, online, continuous sampling of each NPS effluent stack. The GEMS is capable of measurement and identification of particulates, noble gases and iodines over a wide range of concentrations, from background levels to releases under emergency conditions. The GEMS can be controlled remotely during NPS emergencies to provide flexibility in sampling (Figure 3).

Figure 3. Computer Display of GEMS Data



Gamma Detection Network (GDN)

In addition to placing dosimeters around the NPSs, IEMA manages a GDN. The GDN consists of a network of Reuter-Stokes (RS) gamma detectors placed radially around each of the NPSs to detect gamma radiation levels in the environment. Each of the 16 detectors for each site is placed approximately two to five miles from the station. This system is capable of detecting gamma radiation in the range of background levels up to 10 roentgens (R) per hour.

Figure 4 is an analytical display for the Clinton NPS with meteorological, GDN, and GEMS radiation information. During an incident at one of the stations, the information would be used by health physics experts in IEMA's Radiological Emergency Assessment Center to evaluate environmental impacts of a release.

Figure 4. Display of Gamma Detection Network around Clinton NPS

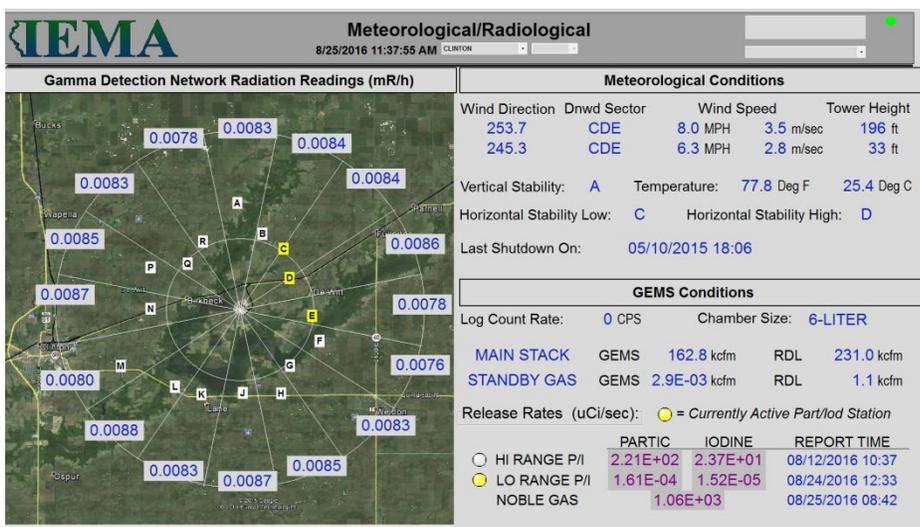


Figure 5. Typical IEMA GDN Field Installation



General Sampling and Monitoring Information

Every effort is made to collect all scheduled environmental samples; however, occasionally samples are unobtainable due to weather conditions, equipment malfunctions, water levels, or obstructed access.

Laboratory Analysis

Soil, sediment, vegetation, water, and fish samples are analyzed by the IEMA Radiochemistry Laboratory located in Springfield, Illinois. The laboratory participates in semi-annual proficiency testing programs through Environmental Resource Associates, an accredited proficiency testing provider, and the Department of Energy (DOE) Radiological and Environmental Science Laboratory's Mixed Analyte Performance Evaluation Program (MAPEP). OSLs are analyzed by Radiological Field Services (RFS) staff using a Landauer - In Light System Auto Reader.

Tritium Analysis (Water)

Tritium is the primary radionuclide released in the effluent stream of NPSs. Liquid effluents from the NPSs are released in accordance with the station's US NRC operating license to waterways, per the station's National Pollutant Discharge Elimination System (NPDES) permit, which is issued by the IEPA.

The US EPA drinking water standard (National Primary Drinking Water Regulations: Maximum Contaminant Levels and Maximum Residual Disinfectant Levels, 2000) and the IEPA groundwater standard (Groundwater Quality Standards for Class I: Potable Resource Groundwater, 2013) both set the limit for tritium in groundwater at 20,000 picocuries per liter (pCi/L). Drinking Water Standards are regulated by the US EPA and IEPA. IEMA's purpose for sampling private wells and public water supplies is solely to screen for the presence of radionuclides in drinking water.

Tritium emits a low energy beta particle. This beta energy is too low to be detected by ordinary analytical methodologies for evaluating gross beta activity. Therefore, to measure the concentration of tritium, water samples are analyzed using liquid scintillation counting; a technique that is capable of measuring radioactive emissions at very low energies and very low concentrations. Tritium results for water samples are included within the NPS specific information provided in this report.

Total Strontium Analysis (Water)

Strontium is another radionuclide released in the effluent stream of NPSs. Liquid effluents from the NPSs are released in accordance with the station's U.S. NRC operating license to waterways, per the station's IEPA NPDES permit.

Strontium results are compared to historical data, data collected from the background reference location, and to the US EPA drinking water standard (National Primary Drinking Water Regulations: Maximum Contaminant Levels and Maximum Residual Disinfectant Levels, 2000), as well as the IEPA's groundwater standard (Groundwater Quality Standards for Class I: Potable Resource Groundwater, 2013) which both set a limit for strontium-90 at 8 pCi/L.

Strontium is easily masked by other radionuclides, including those which are naturally occurring. Therefore, samples being analyzed for total strontium undergo preliminary chemical separation so that the strontium may be isolated for analysis. Sample analysis for total strontium is performed using a low-background gas proportional counter. Strontium results for water samples are included within the NPS specific information provided in this report.

Gross Beta Analysis (Water)

Water samples are analyzed for radioactivity through gross beta analysis using a liquid scintillation counter. Since many radionuclides associated with nuclear power production emit beta particles, analysis of water samples for gross beta activity provides a good method of screening for the presence of radioactive materials. Gross beta results for water samples are included within the NPS specific information provided in this report.

Gamma Analysis (Water, Soil, Sediment, Vegetation, and Fish)

Water, soil, sediment, vegetation, and fish samples are analyzed to determine the concentration of individual radionuclides using a high-purity germanium detector in a process called gamma spectroscopy. Gamma spectroscopy results for all sample types are included within the NPS specific information provided in this report.

Note- Historically, environmental soil and sediment samples contain Cesium-137 concentrations ranging between 0.1 – 0.2 picocurie per gram (pCi/g) as a result of atmospheric nuclear weapons testing.

Ambient Gamma Analysis

OSLs are analyzed by RFS staff using a Landauer In Light System Auto Reader. Results are expressed as the average milliroentgen (mR) per quarter and are also calculated to the approximate mR per year that would have been accrued by an individual at that location for an entire year. Results for environmental dosimeters analyzed during 2021 are included in the site-specific sections of this report.

Limits of Detection

All analytical methods have limitations: amounts that are too small to be detected. The Minimum Detectable Concentration (MDC) is an “a priori” measure of that limitation – an estimate of the lower limit of detection. It is defined as the smallest quantity that an analytical method has 95% likelihood of detecting. For example, the MDC for IEMA’s method for tritium in water is 200 picocuries per liter (pCi/L). Given a sample with a tritium concentration of 200 pCi/L, our laboratory would detect that tritium approximately 95 times out of 100. Samples with less than 200 pCi/L could be detected, but with less certainty. Conversely, samples with more than 200 pCi/L would be more likely to be detected, approaching 100% as concentrations increase. Analytical methods are chosen, in part, on their MDC. As a general rule, methods are chosen such that their MDC is less than 10% of any applicable regulatory limit.

Background Reference Areas

For comparison, samples are collected and analyzed from background reference areas located near Kincaid, IL. Background location information and sample results can be found on pages 129-138.

Results at a Glance

Federal regulations establish standards for protection of the public against ionizing radiation resulting from activities conducted under US NRC licenses, such as operation of NPSs. The US EPA sets drinking water standards for several types of radioactive contaminants; the standard for tritium in drinking water is used for comparison purposes within this report.

Detectable levels of tritium were found in several surface water samples taken near the Braidwood, Dresden, and LaSalle stations. The elevated levels found near all three stations are likely attributable to the liquid effluent releases from the Braidwood station. Tritium is a normal part of the effluent stream of NPSs, and its presence in nearby surface water sources is expected. The concentrations detected were well below the US EPA limit for tritium in drinking water.

Detectable levels of tritium were also found in groundwater samples taken from a well located at the Braidwood station. In 2005, it was discovered that a leak in the line that transported effluents to the

Kankakee River had allowed for the unpermitted release of effluents to groundwater. Subsequently, tritium was found in groundwater and a pond outside the boundaries of the station. As a result, a Consent Order was put in place that required the Exelon Corporation (now Constellation Energy) to conduct groundwater studies to determine the extent of on-site contamination and to make modifications to their systems to prevent further releases to groundwater and to provide remote monitoring equipment to warn operators if a release does occur. IEMA collected and analyzed split groundwater samples collected by Exelon from two locations on site. Sample MW-4 is taken near the turbine building and sample DS-2 taken from F-ditch. Detectable levels of tritium have consistently been found in the groundwater split samples from location MW-4. However, concentrations detected have been well below the US EPA limit for tritium in drinking water.

In March of 2020, the Illinois EPA determined that Exelon had completed the actions required by the Consent Order, and on May 14, 2020 the Consent Order was terminated by the filing of a Joint Notice of Termination of the Consent Order with the Will County Court. Exelon voluntarily agreed to continue to provide split samples to IEMA through the second quarter of 2021. Beginning with the third quarter of 2021, split samples for on-site monitoring wells DS-2 and MW-4 are no longer collected and analyzed.

Cesium-137 in concentrations greater than the established MDC was detected in soil and sediment samples near most NPSs; however, the concentrations seen were consistent with soil concentrations historically found from atmospheric nuclear weapons testing and with concentrations found at background sampling locations.

Results from the second quarter soil sampling at Illini State Park near the LaSalle station indicated the presence of Niobium-95 in a concentration greater than the established MDC. A second quarter soil sample collected from the Pine Rock Nature Preserve near the Byron station indicated the presence of Manganese-54 at a concentration equivalent to the established MDC. Results from soil samples collected at both location during the third quarter sampling were below the established MDC for all radionuclides. Additionally, Zirconium-95 in concentrations slightly greater than the established MDC was seen in a soil sample collected during the third quarter from the corner of 150th Avenue and 266th Street sampling location for the Quad Cities station. IEMA will continue to monitor this location for the presence of this and other gamma emitting radionuclides.

Results from total strontium analyses for all NPSs indicate no concentrations above the established MDCs.

Results from gross beta analysis indicate that the established MDC was met at many water sampling locations. Concentrations above MDC are routinely found in background samples collected, and most concentrations found were consistent with background levels. However, concentrations found at some locations were above typical background levels and can likely be attributed to the routine liquid effluent releases. All sample results for gross beta remained well below the established US EPA and IEPA standards.

Ambient gamma results were comparable to historical and background levels for all NPSs.

In 2021, all results for samples collected as part of IEMA's radiological environmental monitoring program for NPSs were below federal and state safety standards and guidelines.

Braidwood Nuclear Power Station

The Braidwood NPS, consisting of two 3,587 Megawatt (MW) pressurized water reactors (PWR), is owned and operated by Constellation Energy and located in Will County, Illinois. Unit 1 began operation on May 29, 1987 and Unit 2 on March 8, 1988. The site is located in northeastern Illinois, approximately 15 miles south-southwest of Joliet and 60 miles southwest of Chicago, near the Kankakee River.



Liquid effluents from the Braidwood station are released in controlled batches to the Kankakee River in accordance with release limits governed by the station's license with the NRC and the station's IEPA NPDES permit. In 2021, there were 90 liquid effluent batch releases from the Braidwood station.

In 2005, it was discovered that a leak in the line that transported effluents to the Kankakee River had allowed for the unpermitted release of effluents to groundwater. Subsequently, tritium was found in groundwater and in a pond outside the boundaries of the station. As a result, a Consent Order was put in place that required the Exelon Corporation (now Constellation Energy) to conduct groundwater studies to determine the extent of on-site contamination and to make modifications to their systems to prevent further releases to groundwater and to provide remote monitoring equipment to warn operators if a release does occur. As part of these studies, Exelon collected groundwater from well (MW-4) located near the turbine building and the other is a surface water sample collected from F-ditch (DS-2) and provided IEMA a split sample from each collection for Agency analysis. In March of 2020, the Illinois EPA determined that Exelon had completed the actions required by the Consent Order, and on May 14, 2020 the Consent Order was terminated by the filing of a Joint Notice of Termination of the Consent Order with the Will County Court. Exelon voluntarily agreed to continue to provide split samples to IEMA through the second quarter of 2021.

Maps of the monitoring and sampling locations for the Braidwood NPS provided in this section (Figures 6-8) provide an overview of all sampling and monitoring locations in the vicinity of the Braidwood NPS (yellow star in the center). The second yellow star near the top of Figure 8 represents the Dresden NPS.

Significant Events or Changes for 2021

Beginning with the third quarter of 2021, split samples for on-site monitoring wells DS-2 and MW-4 were no longer collected and analyzed.

Braidwood Sampling and Monitoring Results

Water Sampling Results

Detectable levels of tritium were found in surface water samples taken from the Kankakee River at the Des Plaines Conservation Area boat launch during second and fourth quarter sampling. These elevated concentrations are likely attributable to the liquid effluent releases from the station. Detectable levels of tritium were also found in groundwater samples collected from monitoring Well MW-4 at the Braidwood station. Elevated levels of tritium are known to exist in this well and are due to the 2005 groundwater tritium leak. All tritium levels were well below the Drinking Water Standards established by the US EPA and IEPA.

Results from gross beta analysis indicated that the established MDC was met at some sampling locations. Concentrations above MDC are routinely found in background samples collected. The concentrations seen at many water sampling locations for the Braidwood NPS were consistent with background levels. However, concentrations found at some locations were above typical background levels and can likely be attributed to the routine liquid effluent releases from the Braidwood station. All sample results for gross beta remained well below the established US EPA and IEPA standards.

Water sample analysis for total strontium and gamma spectroscopy indicated no concentrations above the established MDCs.

Soil Sampling Results

Cesium-137 in concentrations greater than the established MDC was detected but was consistent with soil concentrations historically found from atmospheric nuclear weapons testing and with concentrations found at background sampling locations. All other gamma spectroscopy results for soil samples were below the established MDC.

Sediment Sampling Results

Cesium-137 at a concentration greater than the established MDC was detected but was consistent with soil concentrations historically found from atmospheric nuclear weapons testing and with concentrations found at background sampling locations. All other gamma spectroscopy results for sediment samples were below the established MDC.

Vegetation Sampling Results

Gamma spectroscopy results for vegetation samples indicated no concentrations above the established MDC.

Fish Sampling Results

Gamma spectroscopy results for fish samples indicated no concentrations above the established MDC.

Direct Radiation Monitoring Results

The ambient gamma monitoring results from deployed OSLs were comparable to historical data and to results found at the background monitoring locations at Sangchris Lake State Park near Kincaid, Illinois.

GDN network results were consistent with historical data.

Braidwood Maps of Monitoring and Sampling Locations

Figure 6. OSL and GDN Monitoring Locations- Braidwood

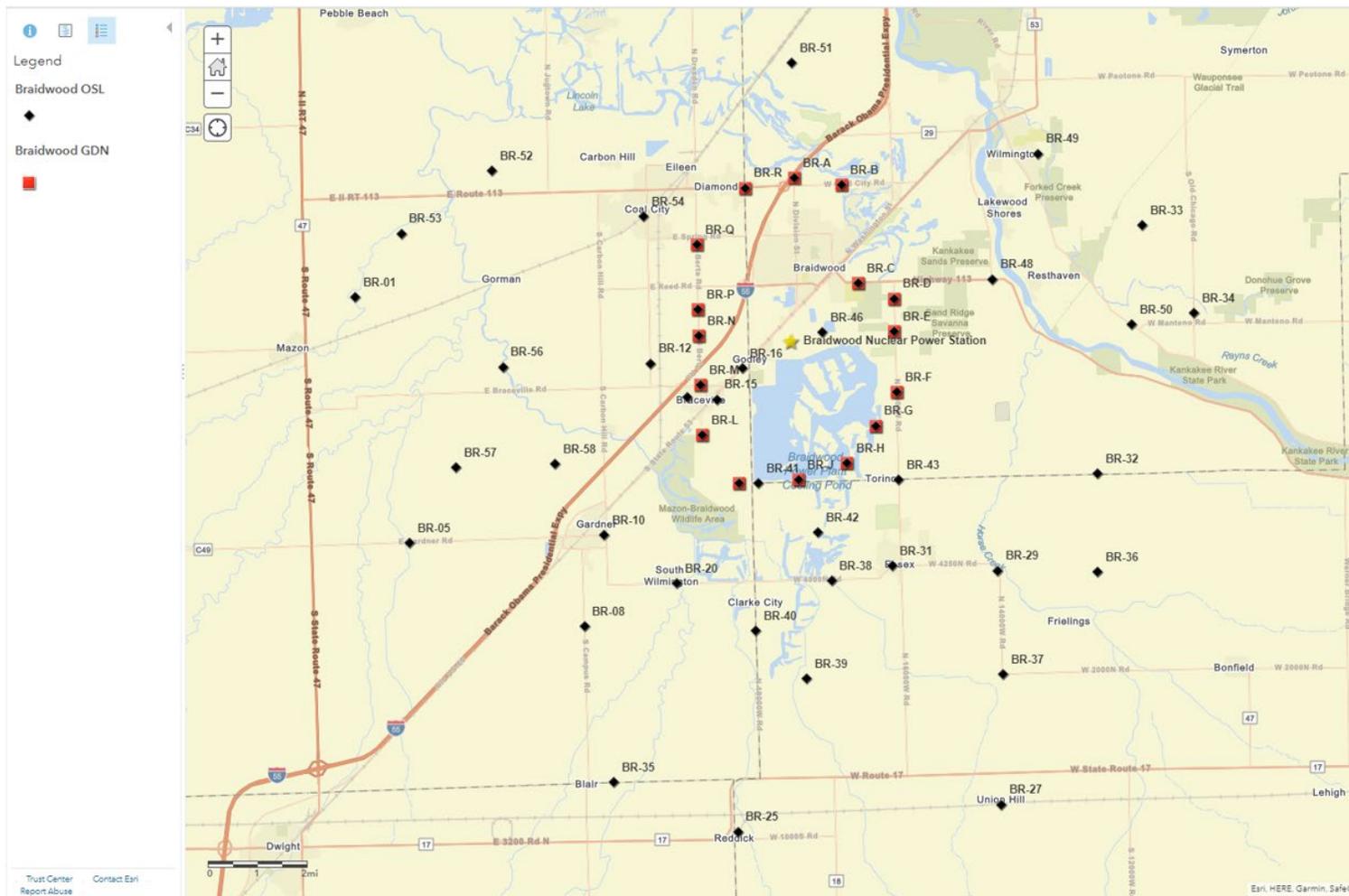


Figure 7. OSL and GDN Monitoring Locations- Braidwood (continued)

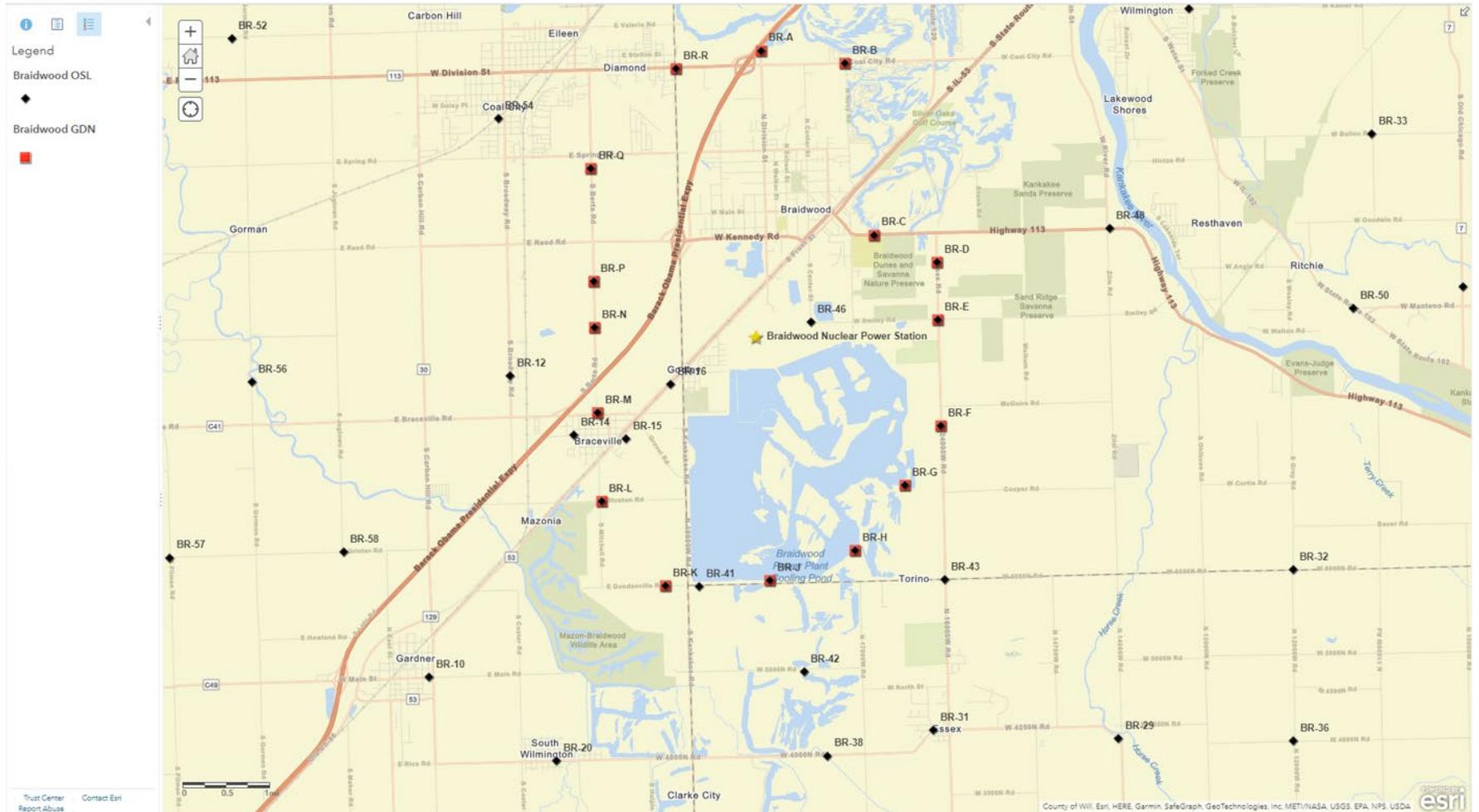
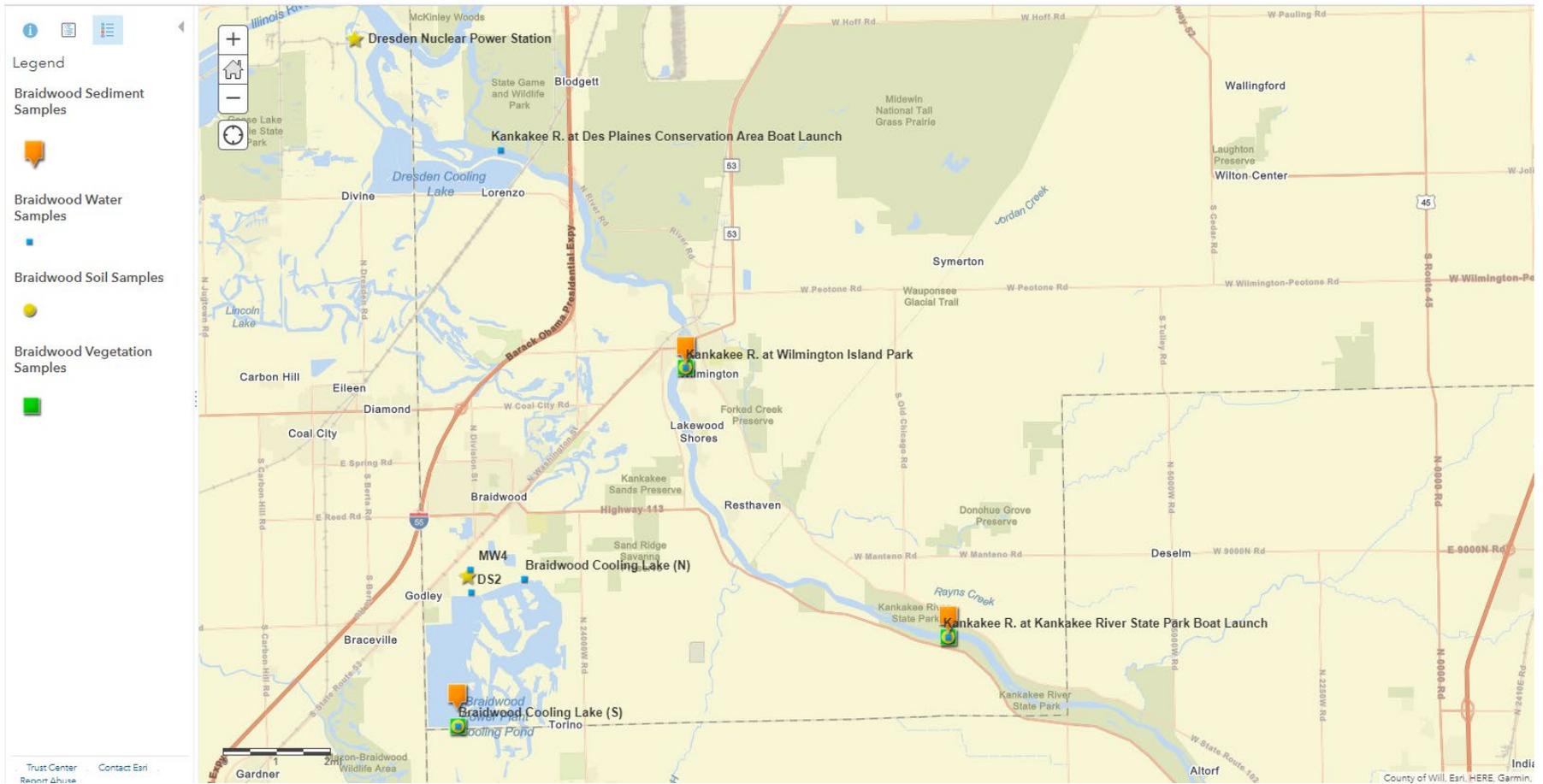


Figure 8. Environmental Sampling Locations – Braidwood

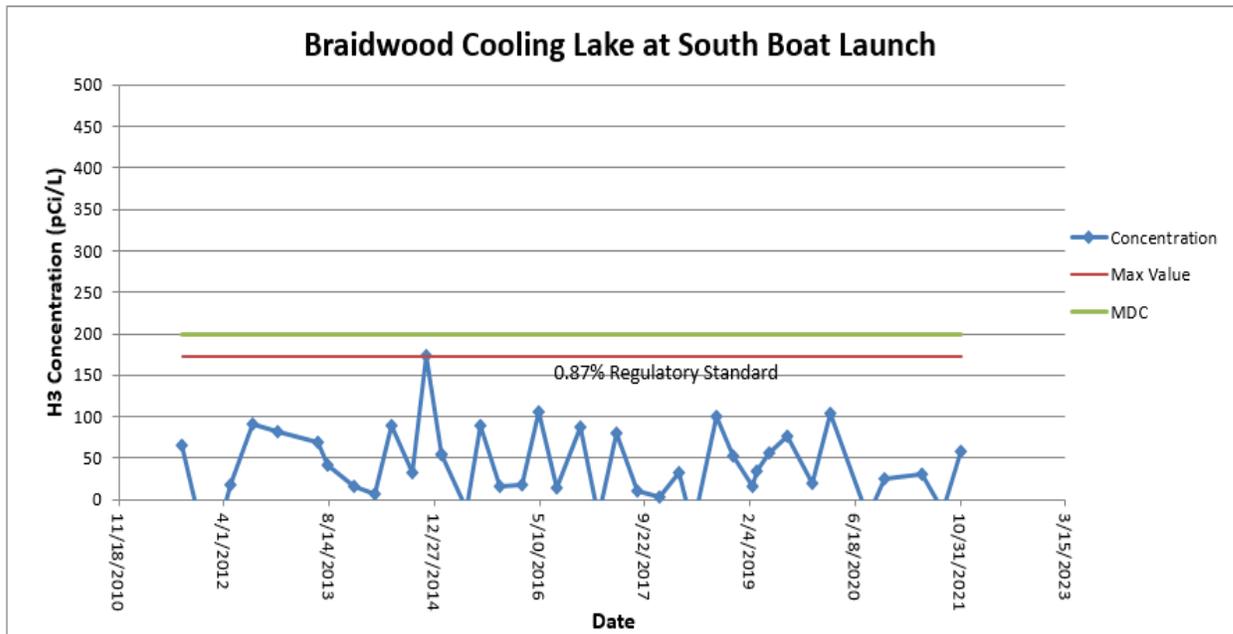
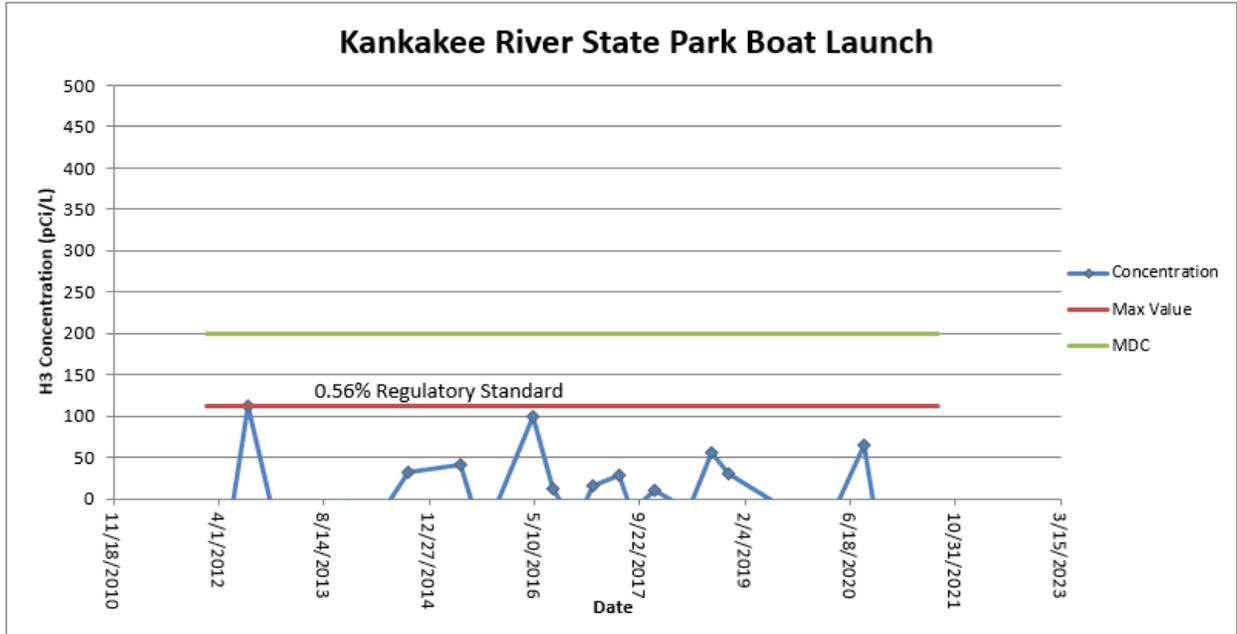


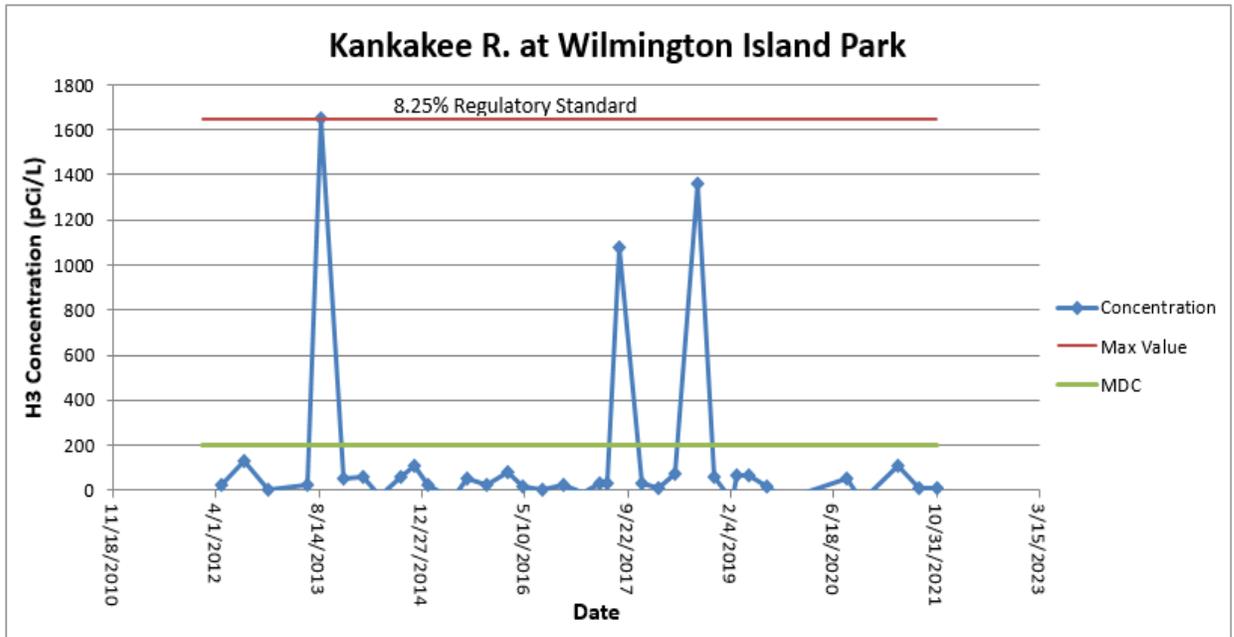
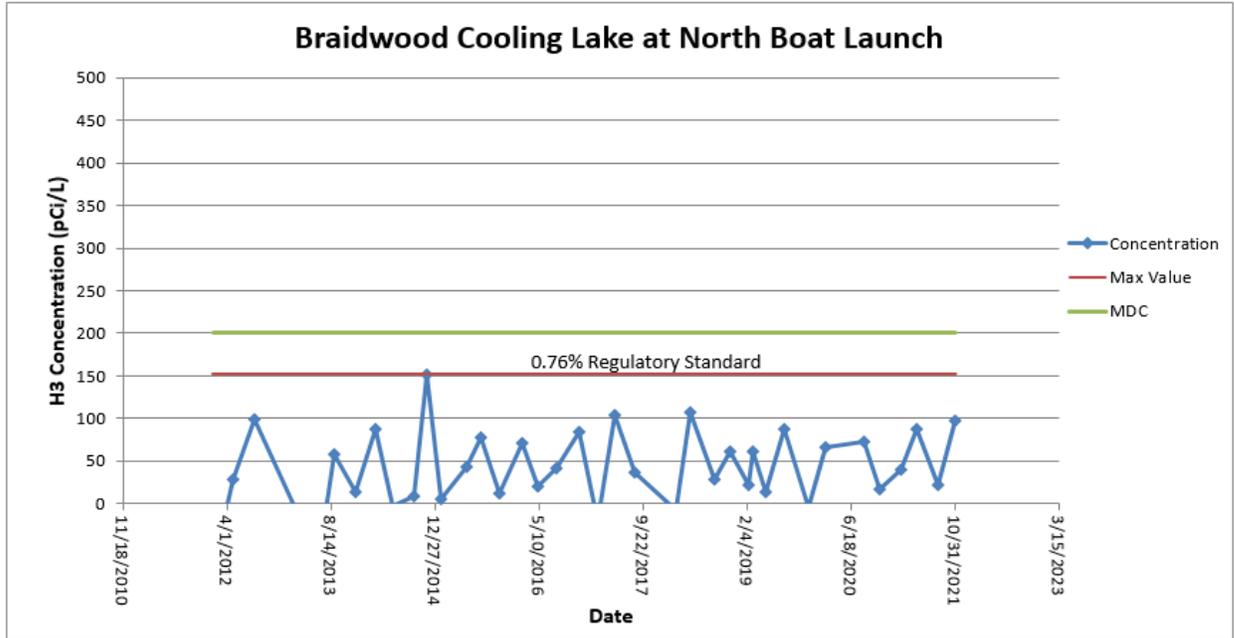
Braidwood Sample Result Tables and Graphs

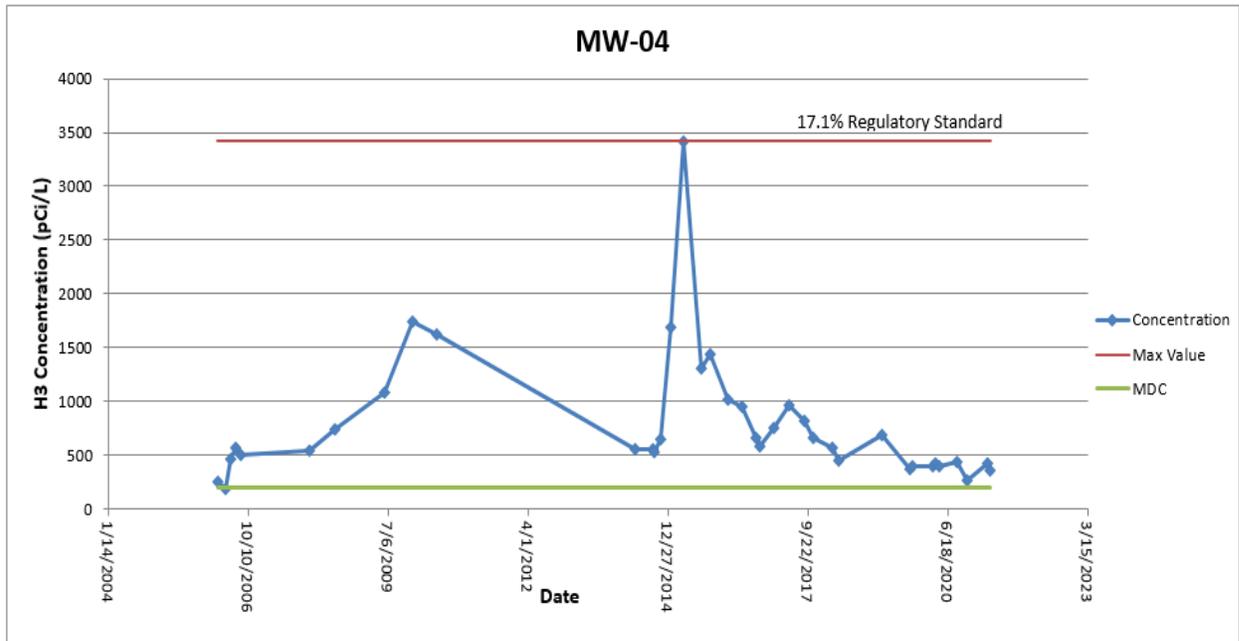
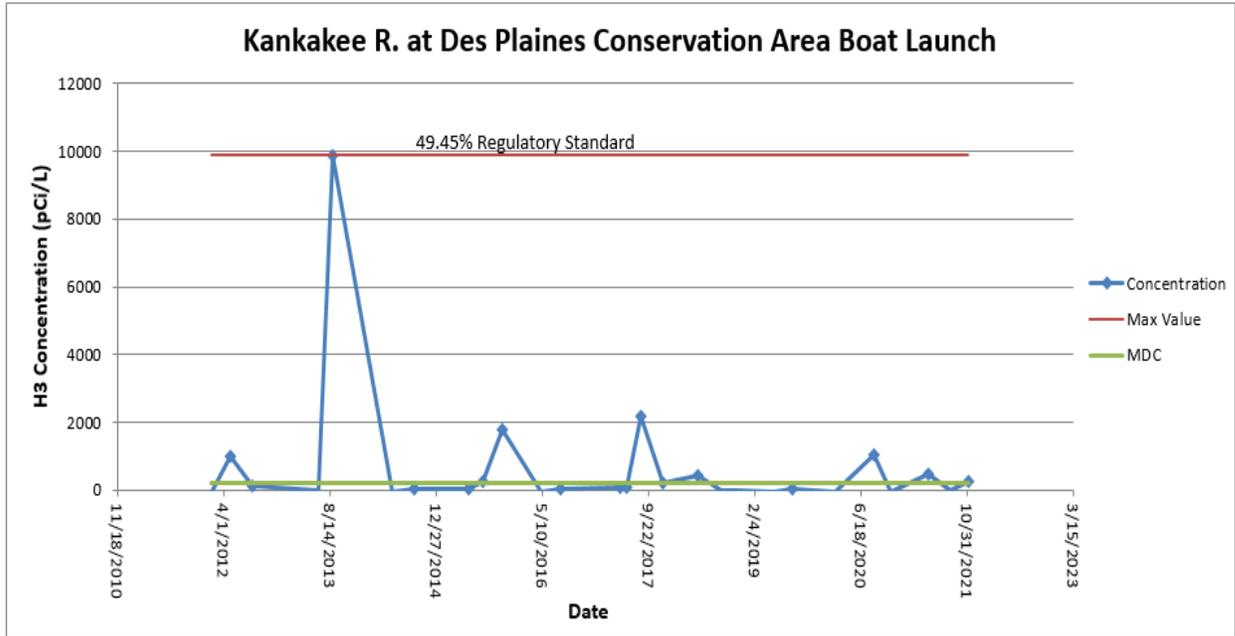
Tritium (H-3) in Water Results - Braidwood
Results are in picocuries per liter (pCi/L)

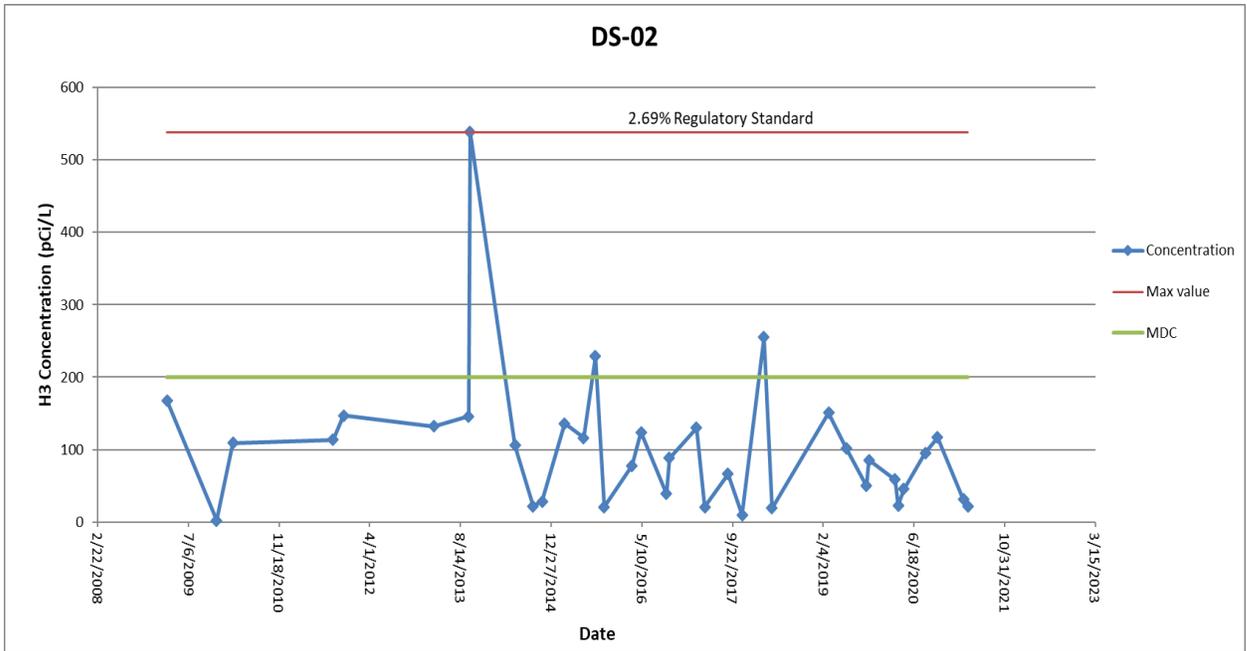
Location Date	H-3	
	Result	MDC
DS-2		
3/17/2021	<MDC	133
4/11/2021	<MDC	133
MW-4		
3/29/2021	431	133
4/18/2021	365	133
Braidwood Cooling Lake (N)		
2/10/2021	<MDC	133
4/28/2021	<MDC	133
8/11/2021	<MDC	133
11/3/2021	<MDC	133
Braidwood Cooling Lake (S)		
4/28/2021	<MDC	133
8/11/2021	<MDC	133
11/3/2021	<MDC	133
Kankakee R. at Des Plaines Conservation Area Boat Launch		
4/28/2021	455	133
8/11/2021	<MDC	133
11/3/2021	250	133
Kankakee R. at Kankakee R. State Park Boat Launch		
4/28/2021	<MDC	133
8/11/2021	<MDC	133
Kankakee R. at Wilmington Island Park		
4/28/2021	<MDC	133
8/11/2021	<MDC	133
11/3/2021	<MDC	133

Trending Graphs for Tritium (H-3) in Water - Braidwood
 (Max value compared to IEPA and US EPA regulatory standard of 20,000 pCi/L)









Total Strontium Results in Water - Braidwood
Results are in picocuries per liter (pCi/L)

Location Date	Strontium	
	Result	MDC
Kankakee R. at Des Plaines Conservation Area Boat Launch		
4/28/2021	<MDC	0.5
Braidwood Cooling Lake (S)		
4/28/2021	<MDC	0.5

Results for Gross Beta Screening of Water - Braidwood Area
Results are in picocuries per liter (pCi/L)

Location Date	Beta	
	Result	MDC
Braidwood Cooling Lake (N)		
2/10/2021	8.0	3.6
4/28/2021	6.0	3.6
8/11/2021	7.5	3.6
11/3/2021	8.6	3.6
Braidwood Cooling Lake (S)		
4/28/2021	5.8	3.6
8/11/2021	6.6	3.6
11/3/2021	6.8	3.6
Kankakee R. at Des Plaines Conserv. Area		
4/28/2021	<MDC	3.6
8/11/2021	<MDC	3.6
11/3/2021	<MDC	3.6
Kankakee R. at Kankakee R. State Park Boat Launch		
4/28/2021	<MDC	3.6
8/11/2021	<MDC	3.6
Kankakee R. at Wilmington Island Park		
4/28/2021	<MDC	3.6
8/11/2021	4.4	3.6
11/3/2021	6.2	3.6

Gamma Spectroscopy Results for Other Radionuclides in Water - Braidwood
Results are in picocuries per liter (pCi/L)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		I-131		Mn-54		Nb-95		Zn-65		Zr-95	
Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC
Braidwood Cooling Lake (N)																								
2/10/2021	<MDC	16.6	<MDC	20.3	<MDC	3.5	<MDC	4.1	<MDC	4.0	<MDC	3.7	<MDC	7.2	<MDC	5.7	<MDC	3.5	<MDC	4.1	<MDC	7.5	<MDC	6.3
4/28/2021	<MDC	16.6	<MDC	20.3	<MDC	3.5	<MDC	4.1	<MDC	4.0	<MDC	3.7	<MDC	7.2	<MDC	5.7	<MDC	3.5	<MDC	4.1	<MDC	7.5	<MDC	6.3
8/11/2021	<MDC	16.6	<MDC	20.3	<MDC	3.5	<MDC	4.1	<MDC	4.0	<MDC	3.7	<MDC	7.2	<MDC	5.7	<MDC	3.5	<MDC	4.1	<MDC	7.5	<MDC	6.3
11/3/2021	<MDC	16.6	<MDC	20.3	<MDC	3.5	<MDC	4.1	<MDC	4.0	<MDC	3.7	<MDC	7.2	<MDC	5.7	<MDC	3.5	<MDC	4.1	<MDC	7.5	<MDC	6.3
Braidwood Cooling Lake (S)																								
4/28/2021	<MDC	16.6	<MDC	20.3	<MDC	3.5	<MDC	4.1	<MDC	4.0	<MDC	3.7	<MDC	7.2	<MDC	5.7	<MDC	3.5	<MDC	4.1	<MDC	7.5	<MDC	6.3
8/11/2021	<MDC	16.6	<MDC	20.3	<MDC	3.5	<MDC	4.1	<MDC	4.0	<MDC	3.7	<MDC	7.2	<MDC	5.7	<MDC	3.5	<MDC	4.1	<MDC	7.5	<MDC	6.3
11/3/2021	<MDC	16.6	<MDC	20.3	<MDC	3.5	<MDC	4.1	<MDC	4.0	<MDC	3.7	<MDC	7.2	<MDC	5.7	<MDC	3.5	<MDC	4.1	<MDC	7.5	<MDC	6.3
Kankakee R. at Des Plaines Conservation Area Boat Launch																								
4/28/2021	<MDC	16.6	<MDC	20.3	<MDC	3.5	<MDC	4.1	<MDC	4.0	<MDC	3.7	<MDC	7.2	<MDC	5.7	<MDC	3.5	<MDC	4.1	<MDC	7.5	<MDC	6.3
8/11/2021	<MDC	16.6	<MDC	20.3	<MDC	3.5	<MDC	4.1	<MDC	4.0	<MDC	3.7	<MDC	7.2	<MDC	5.7	<MDC	3.5	<MDC	4.1	<MDC	7.5	<MDC	6.3
11/3/2021	<MDC	16.6	<MDC	20.3	<MDC	3.5	<MDC	4.1	<MDC	4.0	<MDC	3.7	<MDC	7.2	<MDC	5.7	<MDC	3.5	<MDC	4.1	<MDC	7.5	<MDC	6.3
Kankakee R. at Kankakee R. State Park Boat Launch																								
4/28/2021	<MDC	16.6	<MDC	20.3	<MDC	3.5	<MDC	4.1	<MDC	4.0	<MDC	3.7	<MDC	7.2	<MDC	5.7	<MDC	3.5	<MDC	4.1	<MDC	7.5	<MDC	6.3
8/11/2021	<MDC	16.6	<MDC	20.3	<MDC	3.5	<MDC	4.1	<MDC	4.0	<MDC	3.7	<MDC	7.2	<MDC	5.7	<MDC	3.5	<MDC	4.1	<MDC	7.5	<MDC	6.3
Kankakee R. at Wilmington Island Park																								
4/28/2021	<MDC	16.6	<MDC	20.3	<MDC	3.5	<MDC	4.1	<MDC	4.0	<MDC	3.7	<MDC	7.2	<MDC	5.7	<MDC	3.5	<MDC	4.1	<MDC	7.5	<MDC	6.3
8/11/2021	<MDC	16.6	<MDC	20.3	<MDC	3.5	<MDC	4.1	<MDC	4.0	<MDC	3.7	<MDC	7.2	<MDC	5.7	<MDC	3.5	<MDC	4.1	<MDC	7.5	<MDC	6.3
11/3/2021	<MDC	16.6	<MDC	20.3	<MDC	3.5	<MDC	4.1	<MDC	4.0	<MDC	3.7	<MDC	7.2	<MDC	5.7	<MDC	3.5	<MDC	4.1	<MDC	7.5	<MDC	6.3

Gamma Spectroscopy Results for Radionuclides in Soil (Migration) - Braidwood
Results are in picocuries per gram (pCi/g)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		Mn-54		Nb-95		Zn-65		Zr-95	
	Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	
Braidwood Cooling Lake (S)																						
4/28/2021	<MDC	23.80	<MDC	0.21	<MDC	0.07	<MDC	0.03	<MDC	0.04	<MDC	0.03	<MDC	0.29	<MDC	0.04	<MDC	0.25	<MDC	0.10	<MDC	0.17
8/11/2021	<MDC	23.80	<MDC	0.21	<MDC	0.07	<MDC	0.03	<MDC	0.04	<MDC	0.03	<MDC	0.29	<MDC	0.04	<MDC	0.25	<MDC	0.10	<MDC	0.17
Kankakee R. at Kankakee R. State Park Boat Launch																						
4/28/2021	<MDC	23.80	<MDC	0.21	<MDC	0.07	<MDC	0.03	<MDC	0.04	0.04	0.03	<MDC	0.29	<MDC	0.04	<MDC	0.25	<MDC	0.10	<MDC	0.17
8/11/2021	<MDC	23.80	<MDC	0.21	<MDC	0.07	<MDC	0.03	<MDC	0.04	0.03	0.03	<MDC	0.29	<MDC	0.04	<MDC	0.25	<MDC	0.10	<MDC	0.17
Kankakee R. at Wilmington Island Park																						
4/28/2021	<MDC	23.80	<MDC	0.21	<MDC	0.07	<MDC	0.03	<MDC	0.04	0.09	0.03	<MDC	0.29	<MDC	0.04	<MDC	0.25	<MDC	0.10	<MDC	0.17
8/11/2021	<MDC	23.80	<MDC	0.21	<MDC	0.07	<MDC	0.03	<MDC	0.04	0.08	0.03	<MDC	0.29	<MDC	0.04	<MDC	0.25	<MDC	0.10	<MDC	0.17

Gamma Spectroscopy Results for Radionuclides in Soil (Deposition) - Braidwood
Results are in picocuries per gram (pCi/g)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		Mn-54		Nb-95		Zn-65		Zr-95	
	Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	
Braidwood Cooling Lake (S)																						
4/28/2021	<MDC	26.00	<MDC	0.24	<MDC	0.07	<MDC	0.04	<MDC	0.03	<MDC	0.03	<MDC	0.29	<MDC	0.04	<MDC	0.29	<MDC	0.10	<MDC	0.17
8/11/2021	<MDC	26.00	<MDC	0.24	<MDC	0.07	<MDC	0.04	<MDC	0.03	<MDC	0.03	<MDC	0.29	<MDC	0.04	<MDC	0.29	<MDC	0.10	<MDC	0.17
Kankakee R. at Kankakee R. State Park Boat Launch																						
4/28/2021	<MDC	26.00	<MDC	0.24	<MDC	0.07	<MDC	0.04	<MDC	0.03	0.05	0.03	<MDC	0.29	<MDC	0.04	<MDC	0.29	<MDC	0.10	<MDC	0.17
8/11/2021	<MDC	26.00	<MDC	0.24	<MDC	0.07	<MDC	0.04	<MDC	0.03	0.04	0.03	<MDC	0.29	<MDC	0.04	<MDC	0.29	<MDC	0.10	<MDC	0.17
Kankakee R. at Wilmington Island Park																						
4/28/2021	<MDC	26.00	<MDC	0.24	<MDC	0.07	<MDC	0.04	<MDC	0.03	0.08	0.03	<MDC	0.29	<MDC	0.04	<MDC	0.29	<MDC	0.10	<MDC	0.17
8/11/2021	<MDC	26.00	<MDC	0.24	<MDC	0.07	<MDC	0.04	<MDC	0.03	0.08	0.03	<MDC	0.29	<MDC	0.04	<MDC	0.29	<MDC	0.10	<MDC	0.17

Gamma Spectroscopy Results for Radionuclides in Sediment– Braidwood
Results are in picocuries per gram (pCi/g)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		Mn-54		Nb-95		Zn-65		Zr-95			
	Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	
Braidwood Cooling Lake (N)																								
8/11/2021	<MDC	7.70	<MDC	0.15	<MDC	0.05	<MDC	0.03	<MDC	0.02	<MDC	0.03	<MDC	0.18	<MDC	0.03	<MDC	0.15	<MDC	0.07	<MDC	0.11		
Kankakee R. at Kankakee R. State Park Boat Launch																								
4/28/2021	<MDC	7.70	<MDC	0.15	<MDC	0.05	<MDC	0.03	<MDC	0.02	0.05	0.03	<MDC	0.18	<MDC	0.03	<MDC	0.15	<MDC	0.07	<MDC	0.11		
8/11/2021	<MDC	7.70	<MDC	0.15	<MDC	0.05	<MDC	0.03	<MDC	0.02	<MDC	0.03	<MDC	0.18	<MDC	0.03	<MDC	0.15	<MDC	0.07	<MDC	0.11		
Kankakee R. at Wilmington Island Park																								
4/28/2021	<MDC	7.70	<MDC	0.15	<MDC	0.05	<MDC	0.03	<MDC	0.02	0.05	0.03	<MDC	0.18	<MDC	0.03	<MDC	0.15	<MDC	0.07	<MDC	0.11		
8/11/2021	<MDC	7.70	<MDC	0.15	<MDC	0.05	<MDC	0.03	<MDC	0.02	0.08	0.03	<MDC	0.18	<MDC	0.03	<MDC	0.15	<MDC	0.07	<MDC	0.11		

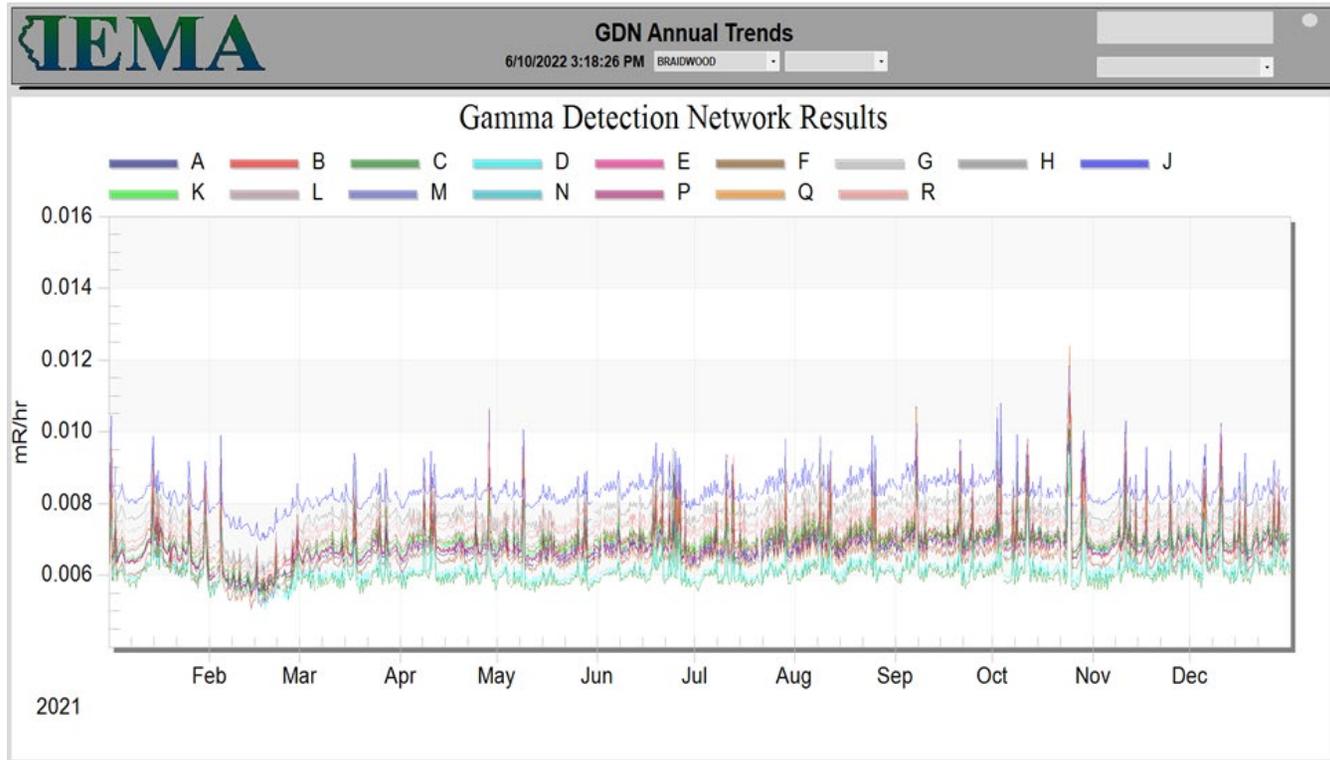
Gamma Spectroscopy Results for Radionuclides in Vegetation - Braidwood
Results are in picocuries per gram (pCi/g)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		I-131		Mn-54		Nb-95		Zn-65		Zr-95		
	Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC
Braidwood Cooling Lake (S)																									
4/28/2021	<MDC	18.0	<MDC	0.4	<MDC	0.2	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.5	<MDC	60.0	<MDC	0.1	<MDC	0.4	<MDC	0.2	<MDC	0.3	
8/11/2021	<MDC	18.0	<MDC	0.4	<MDC	0.2	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.5	<MDC	60.0	<MDC	0.1	<MDC	0.4	<MDC	0.2	<MDC	0.3	
Kankakee R. at Kankakee R. State Park Boat Launch																									
4/28/2021	<MDC	18.0	<MDC	0.4	<MDC	0.2	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.5	<MDC	60.0	<MDC	0.1	<MDC	0.4	<MDC	0.2	<MDC	0.3	
8/11/2021	<MDC	18.0	<MDC	0.4	<MDC	0.2	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.5	<MDC	60.0	<MDC	0.1	<MDC	0.4	<MDC	0.2	<MDC	0.3	
Kankakee R. at Wilmington Island Park																									
4/28/2021	<MDC	18.0	<MDC	0.4	<MDC	0.2	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.5	<MDC	60.0	<MDC	0.1	<MDC	0.4	<MDC	0.2	<MDC	0.3	
8/11/2021	<MDC	18.0	<MDC	0.4	<MDC	0.2	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.5	<MDC	60.0	<MDC	0.1	<MDC	0.4	<MDC	0.2	<MDC	0.3	

Gamma Spectroscopy Results for Radionuclides in Fish - Braidwood
Results are in picocuries per kilogram (pCi/kg)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		I-131		Mn-54		Nb-95		Zn-65		Zr-95			
	Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	
Kankakee R. (Bottom Feeder)																										
7/21/2021	<MDC	6900.0	<MDC	95.0	<MDC	27.2	<MDC	20.9	<MDC	19.3	<MDC	19.3	<MDC	89.0	<MDC	43000.0	<MDC	20.1	<MDC	69.0	<MDC	45.0	<MDC	56.0		
11/3/2021	<MDC	6900.0	<MDC	95.0	<MDC	27.2	<MDC	20.9	<MDC	19.3	<MDC	19.3	<MDC	89.0	<MDC	43000.0	<MDC	20.1	<MDC	69.0	<MDC	45.0	<MDC	56.0		
Kankakee R. (Top Feeder)																										
7/21/2021	<MDC	6900.0	<MDC	95.0	<MDC	27.2	<MDC	20.9	<MDC	19.3	<MDC	19.3	<MDC	89.0	<MDC	43000.0	<MDC	20.1	<MDC	69.0	<MDC	45.0	<MDC	56.0		
11/3/2021	<MDC	6900.0	<MDC	95.0	<MDC	27.2	<MDC	20.9	<MDC	19.3	<MDC	19.3	<MDC	89.0	<MDC	43000.0	<MDC	20.1	<MDC	69.0	<MDC	45.0	<MDC	56.0		

Braidwood Gamma Detection Network Results- Braidwood
Results are in milliroentgen per hour (mR/hr)



Summary of Ambient Gamma Results - Braidwood

Location	Quarter 1 mR/quarter	Quarter 2 mR/quarter	Quarter 3 mR/quarter	Quarter 4 mR/quarter	Annual Exposure mR/year
BR-01		16.0	7.4	13.1	48.7
BR-05	6.6	12.5	7.1	13.4	39.6
BR-08			11.5	8.8	40.7
BR-10	8.7	9.3	6.6	10.5	35.1
BR-12	6.0	10.0	3.5	8.1	27.7
BR-14	6.5		7.1	7.5	28.1
BR-15	6.2		3.5	7.3	22.7
BR-16	4.0	12.3	5.9	7.8	30.0
BR-20	7.7	7.7	7.3	8.2	30.9
BR-25	8.4	12.4	11.3	8.3	40.4
BR-27	6.9	8.4	6.8	5.7	27.9
BR-29	8.6	11.7	5.6	7.5	33.4
BR-31	5.3	12.2	8.2	8.5	34.1
BR-32	7.7	3.8	3.0	8.2	22.6
BR-33	9.5	9.5	5.9	6.6	31.5
BR-34		14.5	9.3	8.5	43.2
BR-35	4.5	16.2	10.3	10.3	41.3
BR-36	6.2	7.3	4.0	7.2	24.7
BR-37	7.3	8.6		7.3	30.9
BR-38	9.6	9.0	5.5	8.2	32.4
BR-39	11.8	14.6	9.4	11.4	47.2
BR-40	6.8	10.4	9.4	13.0	39.6
BR-41	6.9	10.7	6.7	8.8	33.2
BR-42	6.7	15.6	12.4	10.6	45.3
BR-43		11.9	4.5	8.0	32.5
BR-46	6.5	8.7	6.7	6.1	28.0

Summary of Ambient Gamma Results – Braidwood (Continued)

Location	Quarter 1 mR/quarter	Quarter 2 mR/quarter	Quarter 3 mR/quarter	Quarter 4 mR/quarter	Annual Exposure mR/year
BR-48		11.6		5.0	33.4
BR-49	8.4	9.2	7.0	7.1	31.7
BR-50	5.1	12.2	6.4	7.9	31.7
BR-51	7.8	12.8			41.3
BR-52	8.0	10.2	5.3	5.0	28.6
BR-53	6.0	10.4	9.1	8.7	34.2
BR-54	6.2	5.8	6.8	5.8	24.6
BR-56	10.0		6.2	10.4	35.3
BR-57	9.0	8.2	8.4	11.4	37.0
BR-58	2.2	7.0	9.8	11.9	30.9
BR-A	5.2	10.3	4.7	4.8	24.9
BR-B	7.6	11.4	4.2	6.7	29.9
BR-C	7.3	10.6	4.6	7.8	30.3
BR-D	6.0	9.1	1.5	5.0	21.5
BR-E	6.9	7.8	5.4	7.4	27.6
BR-F	7.3	9.2	4.1	6.9	27.4
BR-G			7.2	4.7	23.8
BR-H			7.2	10.6	35.6
BR-J			5.8	10.0	31.5
BR-K	6.9	6.4	5.0	7.5	25.9
BR-L		10.3	5.9	7.1	31.0
BR-M	5.1	7.7	5.7	6.0	24.5
BR-N	5.2	9.9	6.0	7.2	28.3
BR-P	4.3	9.7	5.2	5.7	24.9
BR-Q	4.7	9.5	1.8	7.3	23.2
BR-R			9.3	6.0	30.6

Blanks in the table indicate dosimeters that were missing at the end of the quarter. Annual Exposure column based on averages of all available data. Quarter length is estimated to be 91.25 days.

Byron Nuclear Power Station

The Byron NPS, consisting of two approximately 1,250 Megawatt PWRs, is owned and operated by Constellation Energy and located in Ogle County, Illinois. Unit 1 began operation on February 2, 1985, and Unit 2 on January 9, 1987. The site is located approximately three miles southwest of Byron, Illinois and about two miles east of the Rock River.



Liquid effluents from the Byron station are released to the Rock River in accordance to release limits governed by the station's license with the NRC and the station's IEPA NPDES permit. In 2021, there were 88 liquid effluent batch releases from the Byron station.

Figures 9 through 11 provide an overview of all sampling and monitoring locations in the vicinity of the Byron NPS (yellow star).

Significant Events or Changes for 2021

No significant events or changes for 2021.

Sampling and Monitoring Results

Water Sampling Results

Water sample analysis for tritium, total strontium, and gamma spectroscopy indicated no concentrations above the established MDCs.

Results from gross beta analysis indicated that the established MDC was met at some sampling locations, however the concentrations found were consistent with levels found at background sampling locations.

Soil Sampling Results

Gamma spectroscopy results for some soil samples indicated the presence of Cesium-137 in concentrations above the established MDC. Although above MDC, the concentrations present were consistent with concentrations historically found from atmospheric nuclear weapons testing and with concentrations found at background sampling locations.

A deposition soil sample containing manganese-54 at a concentration equal to the established MDC was discovered at the Pine Rock Nature Preserve sampling location during the second quarter sampling. The analytical result from the sample collected at that location in the third quarter was below the established MDC.

All other Gamma spectroscopy results for soil samples indicated no concentrations above the established MDC.

Sediment Sampling Results

Gamma spectroscopy results for sediment samples indicated no concentrations above the established MDC.

Vegetation Sampling Results

Gamma spectroscopy results for vegetation samples indicated no concentrations above the established MDC.

Fish Sampling Results

Gamma spectroscopy results for fish samples indicated no concentrations above the established MDC.

Direct Radiation Monitoring Results

The ambient gamma monitoring results from deployed OSLs were comparable to historical data and to results found at the background monitoring locations at Sangchris Lake State Park near Kincaid, Illinois.

GDN network results were consistent with historical data.

Byron Maps of Monitoring and Sampling Locations

Figure 9. OSL and GDN Monitoring Locations- Byron

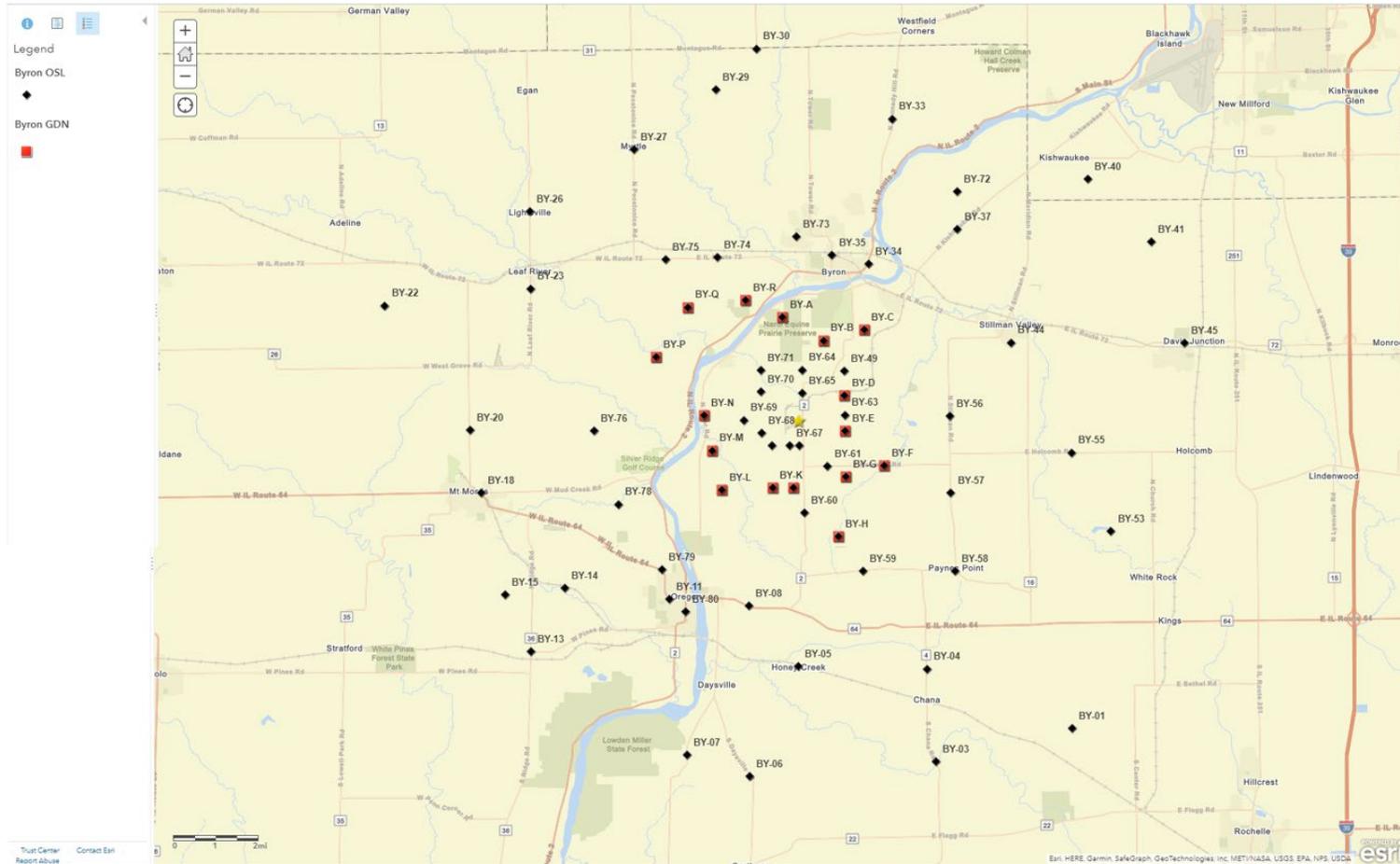


Figure 10. OSL and GDN Monitoring Locations- Byron (continued)

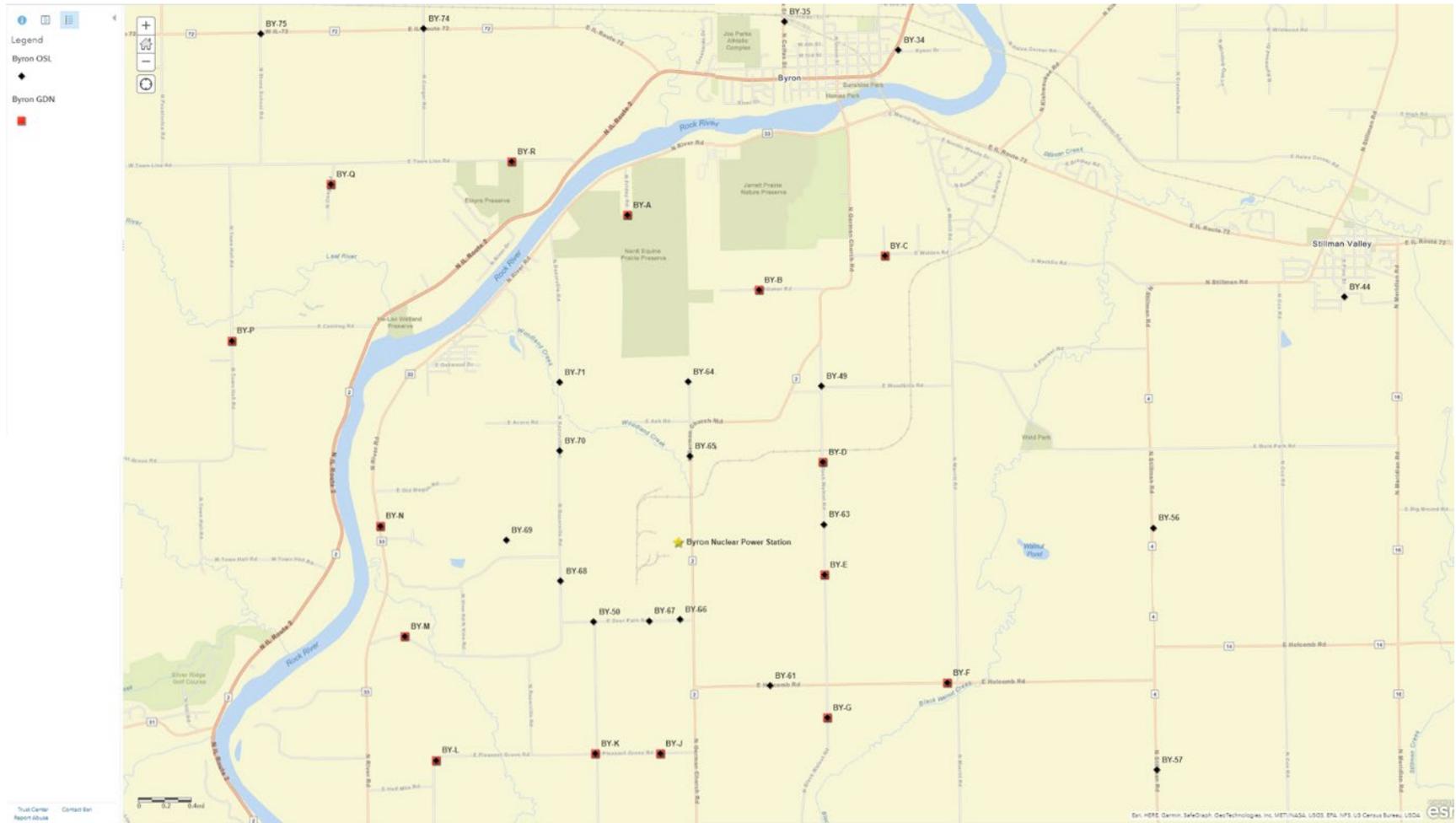
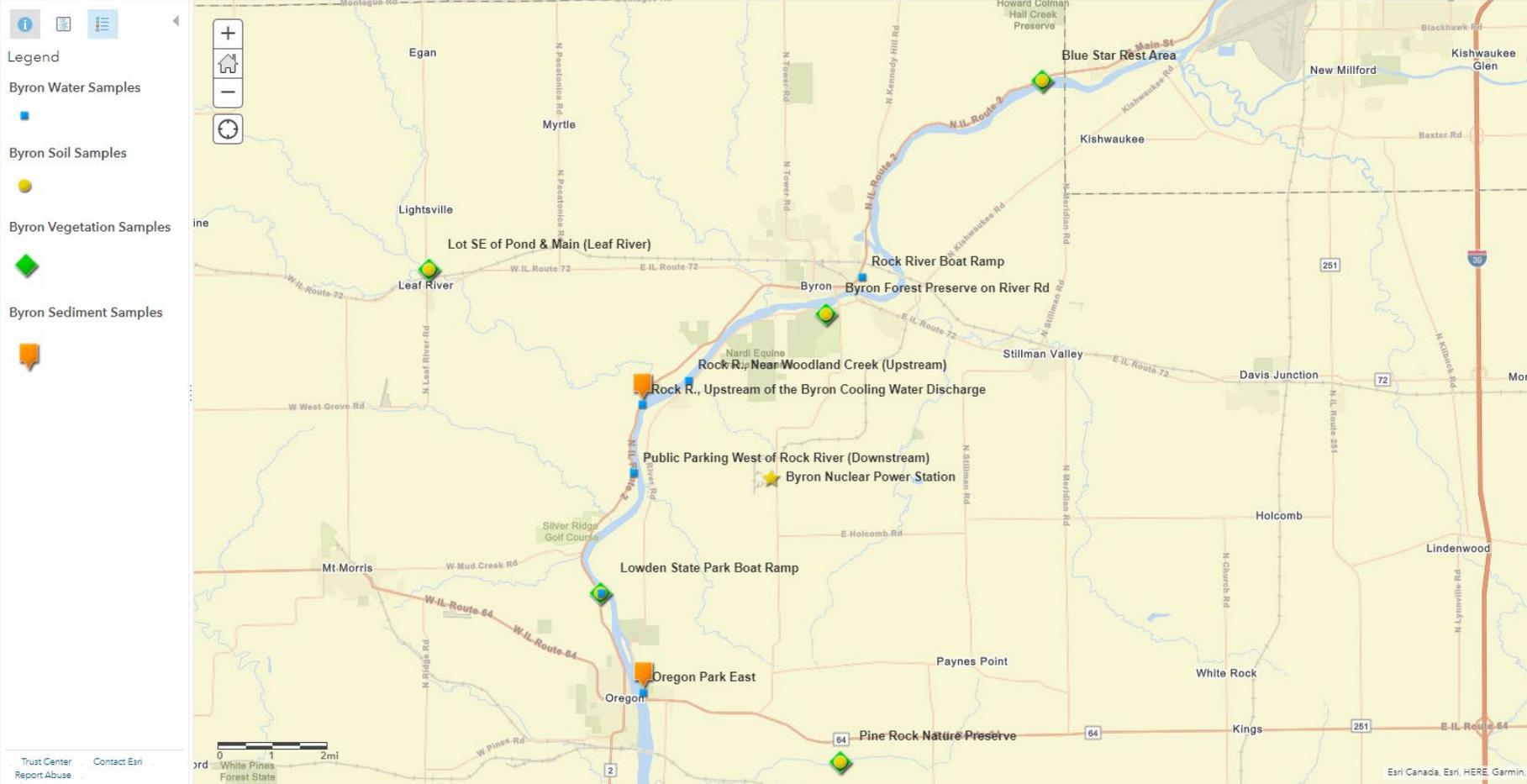


Figure 11. Environmental Sampling Locations- Byron

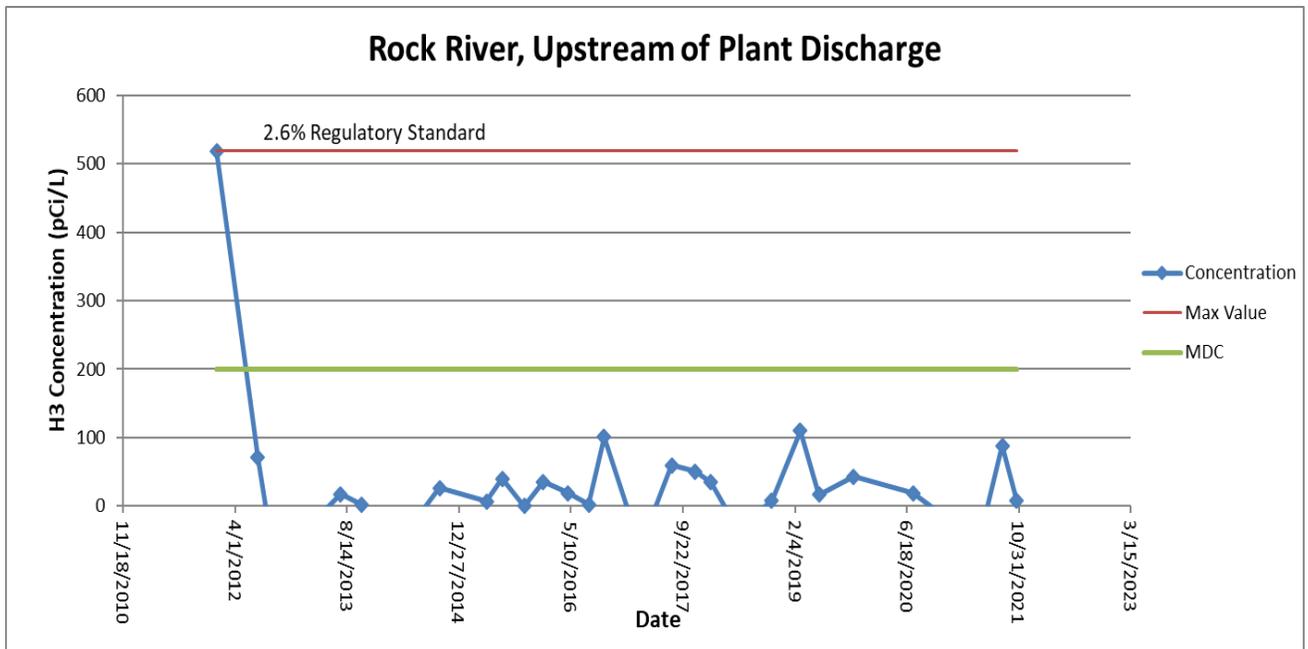
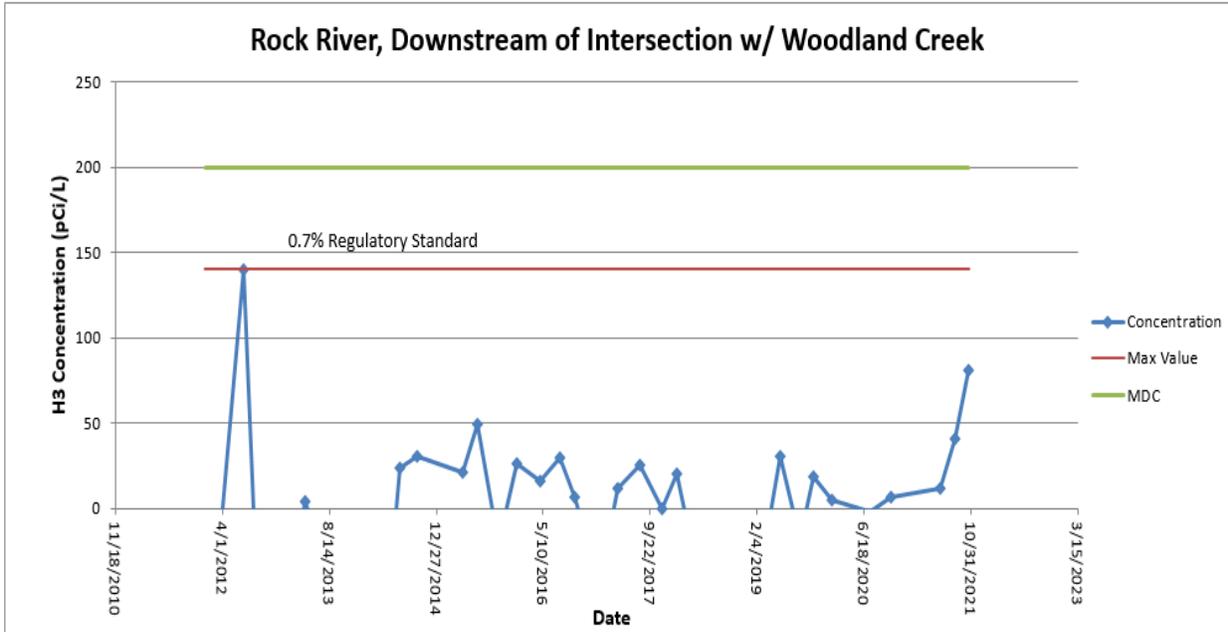


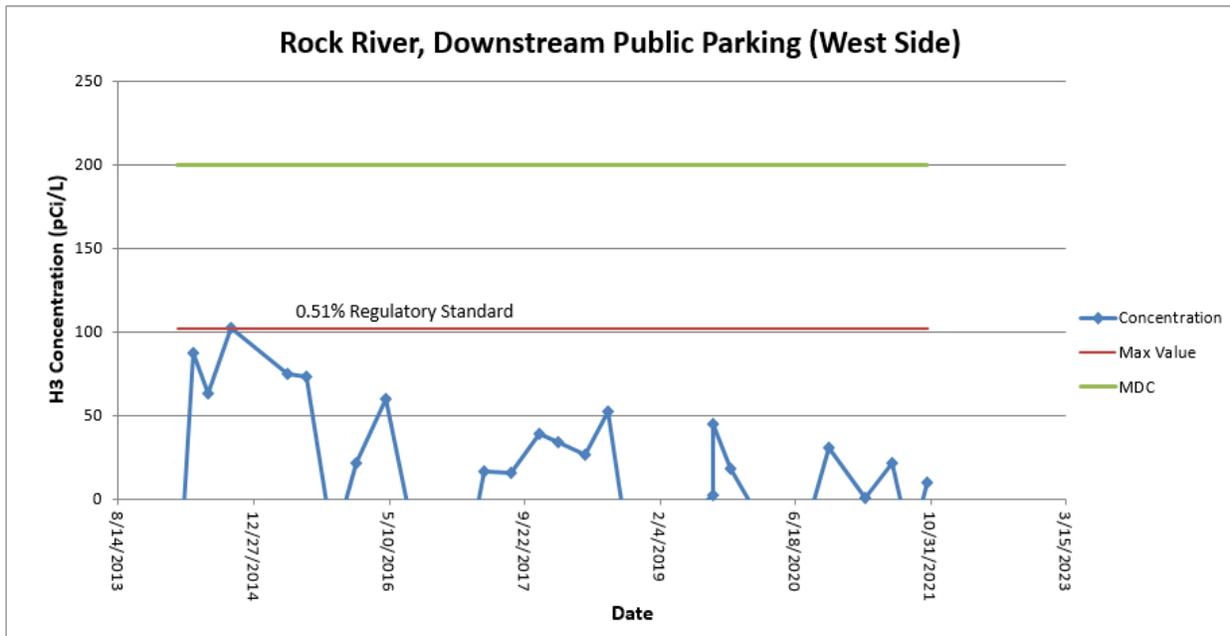
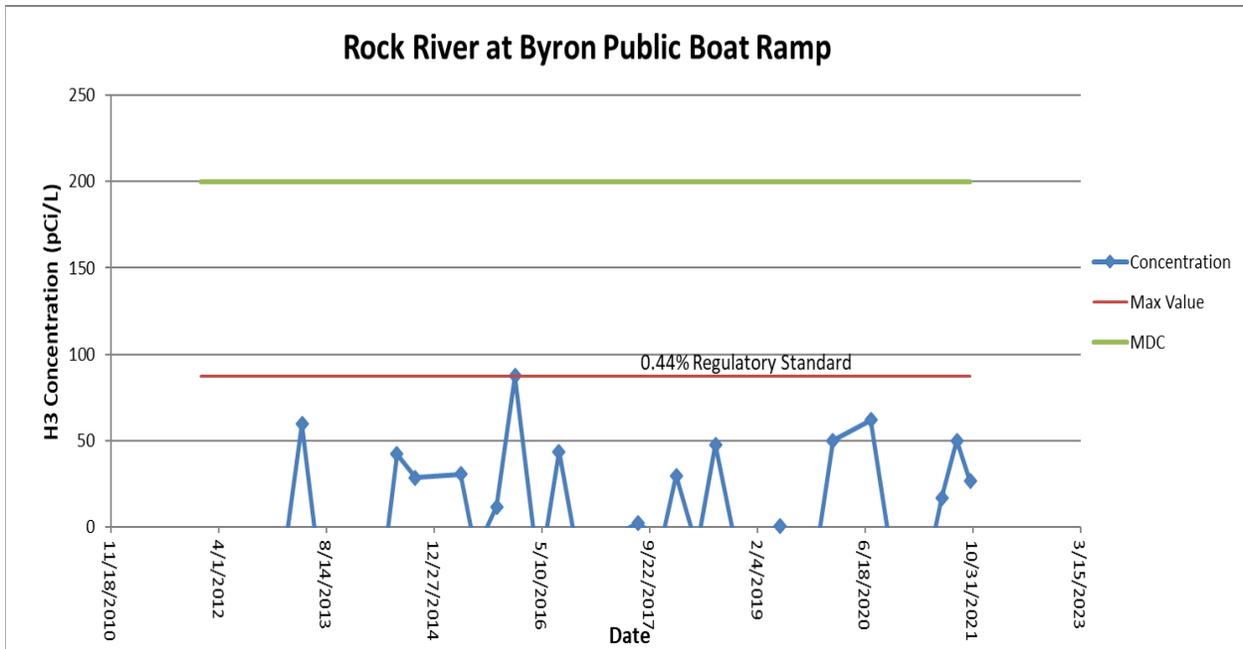
Byron Sample Result Tables and Graphs

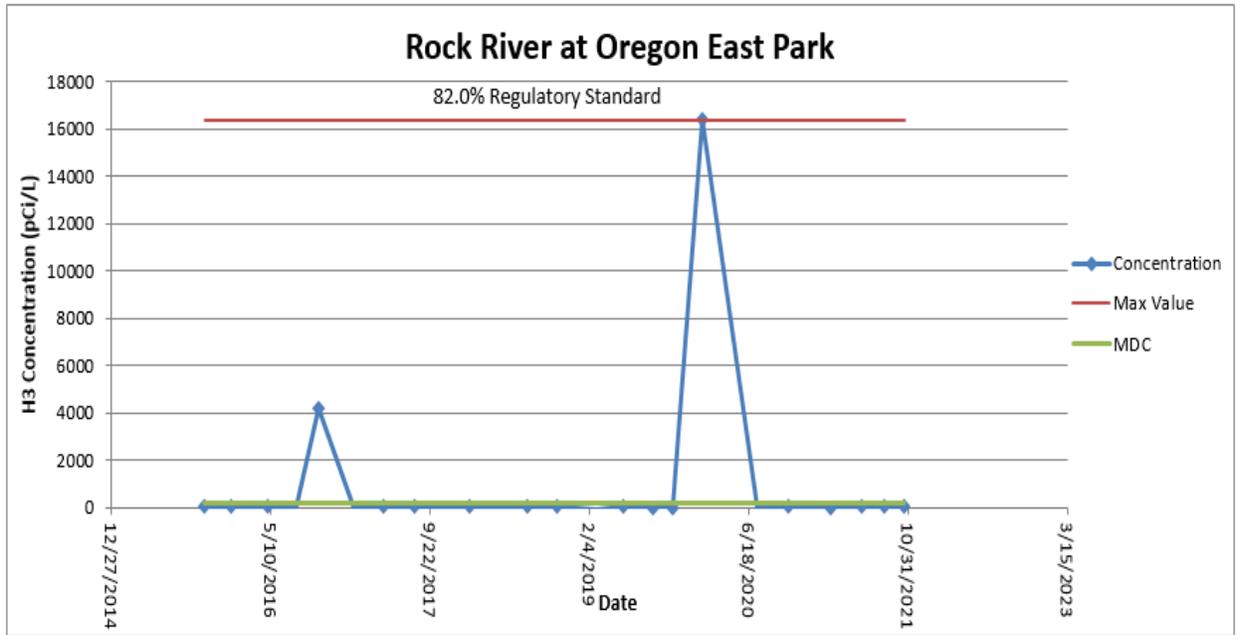
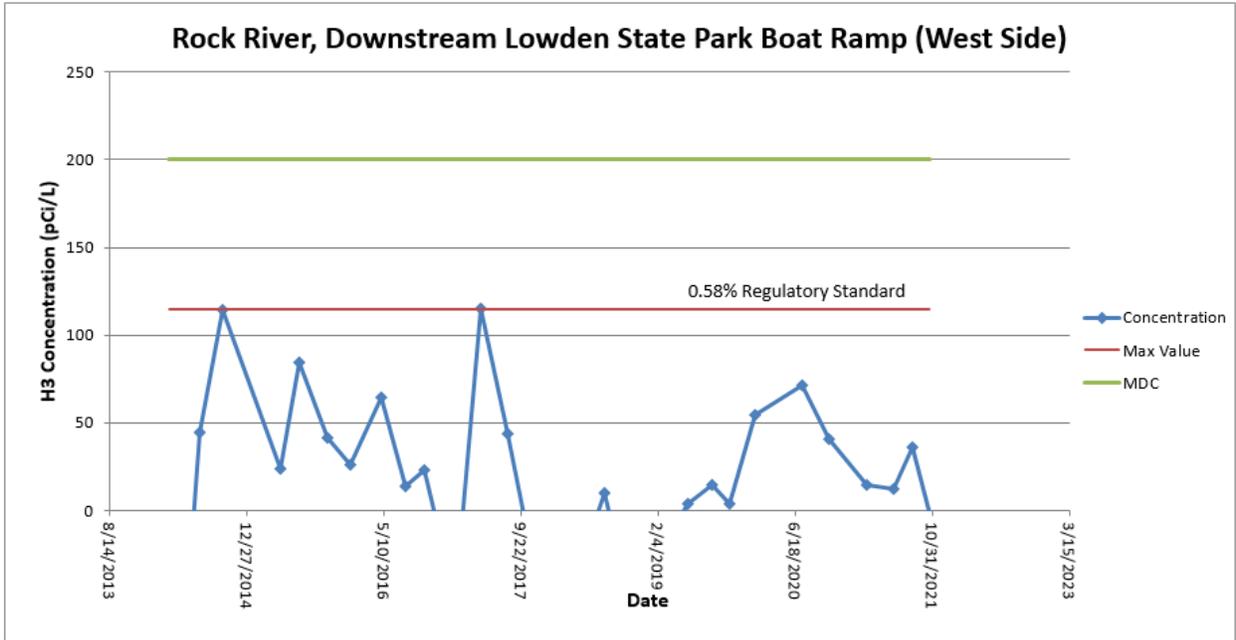
Tritium (H-3) in Water Results - Byron
Results are in picocuries per liter (pCi/L)

Location Date	H-3	
	Result	MDC
Lowden State Park Boat Ramp		
3/3/2021	<MDC	133
6/9/2021	<MDC	133
8/18/2021	<MDC	133
10/20/2021	<MDC	133
Oregon Park East		
3/3/2021	<MDC	133
6/9/2021	<MDC	133
8/18/2021	<MDC	133
10/20/2021	<MDC	133
Public Parking W. of Rock R.		
3/3/2021	<MDC	133
6/9/2021	<MDC	133
8/18/2021	<MDC	133
10/20/2021	<MDC	133
Rock R. Byron Boat Ramp		
3/3/2021	<MDC	133
6/9/2021	<MDC	133
8/18/2021	<MDC	133
10/20/2021	<MDC	133
Rock R. UpS of the Byron Cooling Water Discharge		
3/3/2021	<MDC	133
6/9/2021	<MDC	133
8/18/2021	<MDC	133
10/20/2021	<MDC	133
Rock R., near Woodland Creek		
6/9/2021	<MDC	133
8/18/2021	<MDC	133
10/20/2021	<MDC	133

Trending Graphs for Tritium (H-3) in Water - Byron
 (Max value compared to IEPA and US EPA regulatory standard of 20,000 pCi/L)







Total Strontium in Water Results - Byron
Results in picocuries per liter (pCi/L)

Location	Strontium	
Date	Result	MDC
Public Parking W. of Rock R.		
6/9/2021	<MDC	0.7
Lowden State Park Boat Ramp		
6/9/2021	<MDC	0.7

Results for Gross Beta Screening of Water - Byron
Results are in picocuries per liter (pCi/L)

Location	Beta	
Date	Result	MDC
Lowden State Park Boat Ramp		
3/3/2021	<MDC	3.7
6/9/2021	<MDC	3.7
8/18/2021	4.5	3.7
10/20/2021	5.0	3.7
Oregon Park East		
3/3/2021	3.8	3.7
6/9/2021	<MDC	3.7
8/18/2021	<MDC	3.7
10/20/2021	4.5	3.7
Public Parking W. of Rock R.		
3/3/2021	<MDC	3.7
6/9/2021	<MDC	3.7
8/18/2021	4.7	3.7
10/20/2021	<MDC	3.7
Rock R. Byron Boat Ramp		
3/3/2021	4.1	3.7
6/9/2021	<MDC	3.7
8/18/2021	4.5	3.7
10/20/2021	5.0	3.7
Rock R. UpS the Byron Cooling Discharge		
3/3/2021	<MDC	3.7
6/9/2021	3.8	3.7
8/18/2021	4.6	3.7
10/20/2021	<MDC	3.7
Rock R., near Woodland Creek		
6/9/2021	<MDC	3.7
8/18/2021	<MDC	3.7
10/20/2021	4.9	3.7

Gamma Spectroscopy Results for Other Radionuclides in Water - Byron
Results are in picocuries per liter (pCi/L)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		I-131		Mn-54		Nb-95		Zn-65		Zr-95	
Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC
Lowden State Park Boat Ramp																								
3/3/2021	<MDC	17.6	<MDC	20.3	<MDC	3.6	<MDC	4.1	<MDC	3.8	<MDC	3.7	<MDC	7.2	<MDC	7.8	<MDC	3.5	<MDC	3.9	<MDC	7.2	<MDC	6.2
6/9/2021	<MDC	17.6	<MDC	20.3	<MDC	3.6	<MDC	4.1	<MDC	3.8	<MDC	3.7	<MDC	7.2	<MDC	7.8	<MDC	3.5	<MDC	3.9	<MDC	7.2	<MDC	6.2
8/18/2021	<MDC	17.6	<MDC	20.3	<MDC	3.6	<MDC	4.1	<MDC	3.8	<MDC	3.7	<MDC	7.2	<MDC	7.8	<MDC	3.5	<MDC	3.9	<MDC	7.2	<MDC	6.2
10/20/2021	<MDC	17.6	<MDC	20.3	<MDC	3.6	<MDC	4.1	<MDC	3.8	<MDC	3.7	<MDC	7.2	<MDC	7.8	<MDC	3.5	<MDC	3.9	<MDC	7.2	<MDC	6.2
Oregon Park East																								
3/3/2021	<MDC	17.6	<MDC	20.3	<MDC	3.6	<MDC	4.1	<MDC	3.8	<MDC	3.7	<MDC	7.2	<MDC	7.8	<MDC	3.5	<MDC	3.9	<MDC	7.2	<MDC	6.2
6/9/2021	<MDC	17.6	<MDC	20.3	<MDC	3.6	<MDC	4.1	<MDC	3.8	<MDC	3.7	<MDC	7.2	<MDC	7.8	<MDC	3.5	<MDC	3.9	<MDC	7.2	<MDC	6.2
8/18/2021	<MDC	17.6	<MDC	20.3	<MDC	3.6	<MDC	4.1	<MDC	3.8	<MDC	3.7	<MDC	7.2	<MDC	7.8	<MDC	3.5	<MDC	3.9	<MDC	7.2	<MDC	6.2
10/20/2021	<MDC	17.6	<MDC	20.3	<MDC	3.6	<MDC	4.1	<MDC	3.8	<MDC	3.7	<MDC	7.2	<MDC	7.8	<MDC	3.5	<MDC	3.9	<MDC	7.2	<MDC	6.2
Public Parking W. of Rock River																								
3/3/2021	<MDC	17.6	<MDC	20.3	<MDC	3.6	<MDC	4.1	<MDC	3.8	<MDC	3.7	<MDC	7.2	<MDC	7.8	<MDC	3.5	<MDC	3.9	<MDC	7.2	<MDC	6.2
6/9/2021	<MDC	17.6	<MDC	20.3	<MDC	3.6	<MDC	4.1	<MDC	3.8	<MDC	3.7	<MDC	7.2	<MDC	7.8	<MDC	3.5	<MDC	3.9	<MDC	7.2	<MDC	6.2
8/18/2021	<MDC	17.6	<MDC	20.3	<MDC	3.6	<MDC	4.1	<MDC	3.8	<MDC	3.7	<MDC	7.2	<MDC	7.8	<MDC	3.5	<MDC	3.9	<MDC	7.2	<MDC	6.2
10/20/2021	<MDC	17.6	<MDC	20.3	<MDC	3.6	<MDC	4.1	<MDC	3.8	<MDC	3.7	<MDC	7.2	<MDC	7.8	<MDC	3.5	<MDC	3.9	<MDC	7.2	<MDC	6.2
Rock R. Byron Boat Ramp																								
3/3/2021	<MDC	17.6	<MDC	20.3	<MDC	3.6	<MDC	4.1	<MDC	3.8	<MDC	3.7	<MDC	7.2	<MDC	7.8	<MDC	3.5	<MDC	3.9	<MDC	7.2	<MDC	6.2
6/9/2021	<MDC	17.6	<MDC	20.3	<MDC	3.6	<MDC	4.1	<MDC	3.8	<MDC	3.7	<MDC	7.2	<MDC	7.8	<MDC	3.5	<MDC	3.9	<MDC	7.2	<MDC	6.2
8/18/2021	<MDC	17.6	<MDC	20.3	<MDC	3.6	<MDC	4.1	<MDC	3.8	<MDC	3.7	<MDC	7.2	<MDC	7.8	<MDC	3.5	<MDC	3.9	<MDC	7.2	<MDC	6.2
10/20/2021	<MDC	17.6	<MDC	20.3	<MDC	3.6	<MDC	4.1	<MDC	3.8	<MDC	3.7	<MDC	7.2	<MDC	7.8	<MDC	3.5	<MDC	3.9	<MDC	7.2	<MDC	6.2
Rock R. UpS of the Byron Cooling Water Discharge																								
3/3/2021	<MDC	17.6	<MDC	20.3	<MDC	3.6	<MDC	4.1	<MDC	3.8	<MDC	3.7	<MDC	7.2	<MDC	7.8	<MDC	3.5	<MDC	3.9	<MDC	7.2	<MDC	6.2
6/9/2021	<MDC	17.6	<MDC	20.3	<MDC	3.6	<MDC	4.1	<MDC	3.8	<MDC	3.7	<MDC	7.2	<MDC	7.8	<MDC	3.5	<MDC	3.9	<MDC	7.2	<MDC	6.2
8/18/2021	<MDC	17.6	<MDC	20.3	<MDC	3.6	<MDC	4.1	<MDC	3.8	<MDC	3.7	<MDC	7.2	<MDC	7.8	<MDC	3.5	<MDC	3.9	<MDC	7.2	<MDC	6.2
10/20/2021	<MDC	17.6	<MDC	20.3	<MDC	3.6	<MDC	4.1	<MDC	3.8	<MDC	3.7	<MDC	7.2	<MDC	7.8	<MDC	3.5	<MDC	3.9	<MDC	7.2	<MDC	6.2
Rock R., near Woodland Creek																								
6/9/2021	<MDC	17.6	<MDC	20.3	<MDC	3.6	<MDC	4.1	<MDC	3.8	<MDC	3.7	<MDC	7.2	<MDC	7.8	<MDC	3.5	<MDC	3.9	<MDC	7.2	<MDC	6.2
8/18/2021	<MDC	17.6	<MDC	20.3	<MDC	3.6	<MDC	4.1	<MDC	3.8	<MDC	3.7	<MDC	7.2	<MDC	7.8	<MDC	3.5	<MDC	3.9	<MDC	7.2	<MDC	6.2
10/20/2021	<MDC	17.6	<MDC	20.3	<MDC	3.6	<MDC	4.1	<MDC	3.8	<MDC	3.7	<MDC	7.2	<MDC	7.8	<MDC	3.5	<MDC	3.9	<MDC	7.2	<MDC	6.2

Gamma Spectroscopy Results for Radionuclides in Soil (Migration) - Byron
Results are in picocuries per gram (pCi/g)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		Mn-54		Nb-95		Zn-65		Zr-95	
Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC
Forest preserve on River Rd.																						
6/9/2021	<MDC	25.50	<MDC	0.22	<MDC	0.06	<MDC	0.03	<MDC	0.03	0.12	0.04	<MDC	0.21	<MDC	0.03	<MDC	0.20	<MDC	0.08	<MDC	0.12
8/18/2021	<MDC	25.50	<MDC	0.22	<MDC	0.06	<MDC	0.03	<MDC	0.03	0.10	0.04	<MDC	0.21	<MDC	0.03	<MDC	0.20	<MDC	0.08	<MDC	0.12
Lot SE of Pond & Main (Leaf River)																						
6/9/2021	<MDC	25.50	<MDC	0.22	<MDC	0.06	<MDC	0.03	<MDC	0.03	0.05	0.04	<MDC	0.21	<MDC	0.03	<MDC	0.20	<MDC	0.08	<MDC	0.12
8/18/2021	<MDC	25.50	<MDC	0.22	<MDC	0.06	<MDC	0.03	<MDC	0.03	<MDC	0.04	<MDC	0.21	<MDC	0.03	<MDC	0.20	<MDC	0.08	<MDC	0.12
Lowden State Park Boat Ramp																						
6/9/2021	<MDC	25.50	<MDC	0.22	<MDC	0.06	<MDC	0.03	<MDC	0.03	<MDC	0.04	<MDC	0.21	<MDC	0.03	<MDC	0.20	<MDC	0.08	<MDC	0.12
8/18/2021	<MDC	25.50	<MDC	0.22	<MDC	0.06	<MDC	0.03	<MDC	0.03	0.05	0.04	<MDC	0.21	<MDC	0.03	<MDC	0.20	<MDC	0.08	<MDC	0.12
Pine Rock Nature Preserve																						
6/9/2021	<MDC	25.50	<MDC	0.22	<MDC	0.06	<MDC	0.03	<MDC	0.03	0.12	0.04	<MDC	0.21	<MDC	0.03	<MDC	0.20	<MDC	0.08	<MDC	0.12
Blue Star Rest Area																						
6/9/2021	<MDC	25.50	<MDC	0.22	<MDC	0.06	<MDC	0.03	<MDC	0.03	0.18	0.04	<MDC	0.21	<MDC	0.03	<MDC	0.20	<MDC	0.08	<MDC	0.12
8/18/2021	<MDC	25.50	<MDC	0.22	<MDC	0.06	<MDC	0.03	<MDC	0.03	0.05	0.04	<MDC	0.21	<MDC	0.03	<MDC	0.20	<MDC	0.08	<MDC	0.12

Gamma Spectroscopy Results for Radionuclides in Soil (Deposition) - Byron
Results are in picocuries per gram (pCi/g)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		Mn-54		Nb-95		Zn-65		Zr-95	
Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC
Forest preserve on River Rd.																						
6/9/2021	<MDC	29.70	<MDC	0.18	<MDC	0.05	<MDC	0.02	<MDC	0.02	0.09	0.03	<MDC	0.24	<MDC	0.03	<MDC	0.20	<MDC	0.07	<MDC	0.12
8/18/2021	<MDC	29.70	<MDC	0.18	<MDC	0.05	<MDC	0.02	<MDC	0.02	0.08	0.03	<MDC	0.24	<MDC	0.03	<MDC	0.20	<MDC	0.07	<MDC	0.12
Lot SE of Pond & Main (Leaf River)																						
6/9/2021	<MDC	29.70	<MDC	0.18	<MDC	0.05	<MDC	0.02	<MDC	0.02	0.05	0.03	<MDC	0.24	<MDC	0.03	<MDC	0.20	<MDC	0.07	<MDC	0.12
8/18/2021	<MDC	29.70	<MDC	0.18	<MDC	0.05	<MDC	0.02	<MDC	0.02	0.03	0.03	<MDC	0.24	<MDC	0.03	<MDC	0.20	<MDC	0.07	<MDC	0.12
Lowden State Park Boat Ramp																						
6/9/2021	<MDC	29.70	<MDC	0.18	<MDC	0.05	<MDC	0.02	<MDC	0.02	<MDC	0.03	<MDC	0.24	<MDC	0.03	<MDC	0.20	<MDC	0.07	<MDC	0.12
8/18/2021	<MDC	29.70	<MDC	0.18	<MDC	0.05	<MDC	0.02	<MDC	0.02	0.05	0.03	<MDC	0.24	<MDC	0.03	<MDC	0.20	<MDC	0.07	<MDC	0.12
Pine Rock Nature Preserve																						
6/9/2021	<MDC	29.70	<MDC	0.18	<MDC	0.05	<MDC	0.02	<MDC	0.02	0.07	0.03	<MDC	0.24	0.03	0.03	<MDC	0.20	<MDC	0.07	<MDC	0.12
8/18/2021	<MDC	29.70	<MDC	0.18	<MDC	0.05	<MDC	0.02	<MDC	0.02	0.05	0.03	<MDC	0.24	<MDC	0.03	<MDC	0.20	<MDC	0.07	<MDC	0.12
Blue Star Rest Area																						
6/9/2021	<MDC	29.70	<MDC	0.18	<MDC	0.05	<MDC	0.02	<MDC	0.02	0.12	0.03	<MDC	0.24	<MDC	0.03	<MDC	0.20	<MDC	0.07	<MDC	0.12
8/18/2021	<MDC	29.70	<MDC	0.18	<MDC	0.05	<MDC	0.02	<MDC	0.02	<MDC	0.03	<MDC	0.24	<MDC	0.03	<MDC	0.20	<MDC	0.07	<MDC	0.12

Gamma Spectroscopy Results for Radionuclides in Sediment - Byron
Results are in picocuries per gram (pCi/g)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		Mn-54		Nb-95		Zn-65		Zr-95	
Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC
Oregon Park East																						
6/9/2021	<MDC	21.70	<MDC	0.20	<MDC	0.05	<MDC	0.03	<MDC	0.03	<MDC	0.04	<MDC	0.19	<MDC	0.03	<MDC	0.17	<MDC	0.07	<MDC	0.10
8/18/2021	<MDC	21.70	<MDC	0.20	<MDC	0.05	<MDC	0.03	<MDC	0.03	<MDC	0.04	<MDC	0.19	<MDC	0.03	<MDC	0.17	<MDC	0.07	<MDC	0.10
Rock R. UpS of the Byron Cooling Water Discharge																						
6/9/2021	<MDC	21.70	<MDC	0.20	<MDC	0.05	<MDC	0.03	<MDC	0.03	<MDC	0.04	<MDC	0.19	<MDC	0.03	<MDC	0.17	<MDC	0.07	<MDC	0.10
8/18/2021	<MDC	21.70	<MDC	0.20	<MDC	0.05	<MDC	0.03	<MDC	0.03	<MDC	0.04	<MDC	0.19	<MDC	0.03	<MDC	0.17	<MDC	0.07	<MDC	0.10

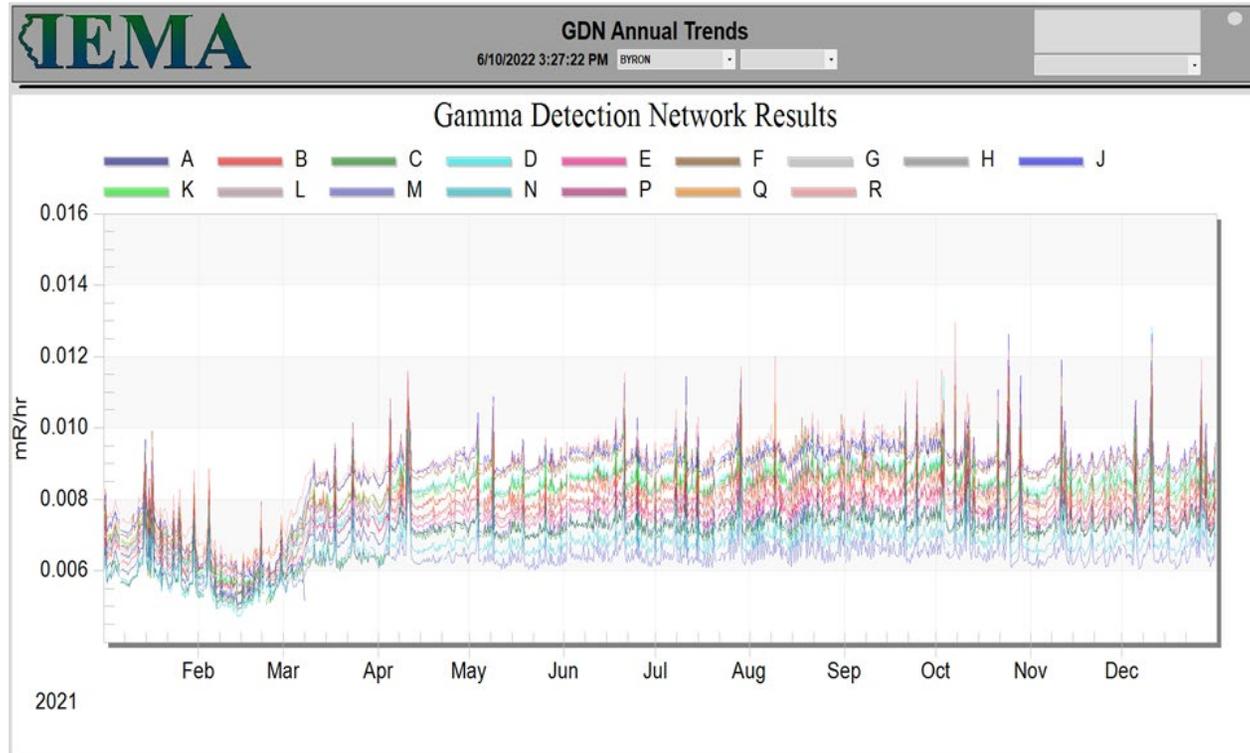
Gamma Spectroscopy Results for Radionuclides in Vegetation - Byron
Results are in picocuries per gram (pCi/g)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		I-131		Mn-54		Nb-95		Zn-65		Zr-95	
Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC
Forest preserve on River Rd.																								
6/9/2021	<MDC	210.0	<MDC	0.5	<MDC	0.3	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	1.1	<MDC	3200.0	<MDC	0.1	<MDC	0.9	<MDC	0.3	<MDC	0.6
8/18/2021	<MDC	210.0	<MDC	0.5	<MDC	0.3	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	1.1	<MDC	3200.0	<MDC	0.1	<MDC	0.9	<MDC	0.3	<MDC	0.6
Lot SE of Pond & Main (Leaf River)																								
6/9/2021	<MDC	210.0	<MDC	0.5	<MDC	0.3	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	1.1	<MDC	3200.0	<MDC	0.1	<MDC	0.9	<MDC	0.3	<MDC	0.6
8/18/2021	<MDC	210.0	<MDC	0.5	<MDC	0.3	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	1.1	<MDC	3200.0	<MDC	0.1	<MDC	0.9	<MDC	0.3	<MDC	0.6
Lowden State Park Boat Ramp																								
6/9/2021	<MDC	210.0	<MDC	0.5	<MDC	0.3	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	1.1	<MDC	3200.0	<MDC	0.1	<MDC	0.9	<MDC	0.3	<MDC	0.6
8/18/2021	<MDC	210.0	<MDC	0.5	<MDC	0.3	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	1.1	<MDC	3200.0	<MDC	0.1	<MDC	0.9	<MDC	0.3	<MDC	0.6
Pine Rock Nature Preserve																								
6/9/2021	<MDC	210.0	<MDC	0.5	<MDC	0.3	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	1.1	<MDC	3200.0	<MDC	0.1	<MDC	0.9	<MDC	0.3	<MDC	0.6
8/18/2021	<MDC	210.0	<MDC	0.5	<MDC	0.3	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	1.1	<MDC	3200.0	<MDC	0.1	<MDC	0.9	<MDC	0.3	<MDC	0.6
Blue Star Rest Area																								
6/9/2021	<MDC	210.0	<MDC	0.5	<MDC	0.3	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	1.1	<MDC	3200.0	<MDC	0.1	<MDC	0.9	<MDC	0.3	<MDC	0.6
8/18/2021	<MDC	210.0	<MDC	0.5	<MDC	0.3	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	1.1	<MDC	3200.0	<MDC	0.1	<MDC	0.9	<MDC	0.3	<MDC	0.6

Gamma Spectroscopy Results for Radionuclides in Fish - Byron
Results are in picocuries per kilogram (pCi/kg)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		I-131		Mn-54		Nb-95		Zn-65		Zr-95	
Date	Result	MDC																						
Rock R. (Bottom Feeder)																								
10/20/2021	<MDC	160	<MDC	179	<MDC	34	<MDC	38	<MDC	37	<MDC	38	<MDC	76	<MDC	55	<MDC	36	<MDC	38	<MDC	75	<MDC	64
Rock R. (Top Feeder)																								
10/20/2021	<MDC	160	<MDC	179	<MDC	34	<MDC	38	<MDC	37	<MDC	38	<MDC	76	<MDC	55	<MDC	36	<MDC	38	<MDC	75	<MDC	64

Gamma Detection Network Results - Byron
Results are in milliroentgen per hour (mR/hr)



Summary of Ambient Gamma Results – Byron

	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual Exposure
Location	mR/quarter	mR/quarter	mR/quarter	mR/quarter	mR/year
BY-01	8.4	11.0	6.7	6.2	32.3
BY-03	3.8	8.1	8.8	5.1	25.8
BY-04	5.1	12.3	7.8	6.7	31.9
BY-05	5.6	8.4	7.9	7.2	29.1
BY-06		6.9	7.2	7.8	29.1
BY-07	8.9	8.9	8.1	8.3	34.1
BY-08		7.4	6.4	7.1	27.9
BY-11	7.4	10.7	9.5	5.7	33.4
BY-13	9.2	8.4	9.8	9.8	37.2
BY-14	6.7	7.8	3.8	6.3	24.7
BY-15	8.9	9.9	12.4	8.4	39.7
BY-18	6.6	10.4	5.7	2.7	25.3
BY-20	8.7	11.2	10.5	8.8	39.2
BY-22	11.2	10.1			42.6
BY-23	7.4	11.4	11.4	6.2	36.4
BY-26	8.1	9.6	6.7	5.7	30.1
BY-27	10.5	11.4	11.5	11.1	44.5
BY-29	9.9	13.2	9.7	8.1	40.9
BY-30	7.9	13.1	7.5	6.8	35.3
BY-33	9.0	9.6	9.4	6.9	34.9
BY-34	7.2	6.6	8.1	4.7	26.6
BY-35	6.1	7.0	3.4	3.5	20.0
BY-37	7.1	6.6	7.1	4.6	25.4
BY-40	14.9	11.5	11.4	4.6	42.4
BY-41	9.3	11.1	6.5	8.5	35.4
BY-44	6.0	8.4	5.3	8.6	28.3
BY-45	5.3	8.4	7.1	6.2	27.0
BY-49	6.9		6.7	5.1	24.9
BY-50	9.9	8.0	12.0	5.9	35.8
BY-53	7.7	11.4	6.7	9.6	35.4
BY-55	11.6	11.8	14.8	8.7	46.9
BY-56	6.9	10.0	8.2	5.8	30.9
BY-57	7.6	8.0	10.2	7.7	33.6
BY-58	10.6	12.9	11.4	7.9	42.8
BY-59	7.7	13.2	10.3	8.3	39.5
BY-60	6.8	10.2	10.9	8.2	36.1

Summary of Ambient Gamma Results – Byron (Continued)

	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual Exposure
Location	mR/quarter	mR/quarter	mR/quarter	mR/quarter	mR/year
BY-61	6.6	11.2	6.8	5.9	30.5
BY-63	11.9	14.9	8.6	9.4	44.8
BY-64	10.7	11.3	12.9	8.8	43.7
BY-65	8.6	14.2	7.7	7.6	38.0
BY-66	8.1	11.1	10.9	8.3	38.4
BY-67	10.1	8.5	7.2	8.7	34.6
BY-68	7.4	10.5	9.5	7.8	35.1
BY-69	9.6	12.7	10.7	7.6	40.5
BY-70	8.1	11.7	8.4	7.7	36.0
BY-71	6.4	5.3	6.5	4.4	22.7
BY-72	9.5	9.4	11.2	7.8	37.9
BY-73		11.5	10.5	8.8	41.1
BY-74	9.9	13.0	12.0	8.3	43.2
BY-75	9.9	12.7	9.5	7.5	39.7
BY-76	8.0	8.9	7.7	6.4	31.0
BY-78	5.4	6.4	11.1	5.0	27.8
BY-79	6.5	9.7	8.8	6.9	31.9
BY-80	6.3	5.3	8.2	4.1	23.9
BY-A	9.2	8.7	6.0	4.9	28.9
BY-B	13.1	13.0	8.1	8.0	42.1
BY-C	9.4	8.7	4.0	6.8	29.0
BY-D	8.3	9.5	9.6	7.7	35.1
BY-E	11.9	8.7	5.8	4.8	31.3
BY-F	13.1	9.3	10.8	8.0	41.2
BY-G	10.2	9.6	5.8	7.4	32.9
BY-H	9.6	9.1	8.0	7.5	34.3
BY-J	12.0	8.1	7.8	7.2	35.1
BY-K	8.5	9.9	11.0	6.1	35.5
BY-L	12.1	8.3	6.4	7.4	34.2
BY-M	6.4	5.3	4.7	6.9	23.3
BY-N	6.0	11.1	5.9	5.7	28.6
BY-P	9.7	11.4	8.2	7.9	37.1
BY-Q	10.8	8.5	9.3	5.6	34.2
BY-R	14.7	12.8	10.6	10.9	49.0

Blanks in the table indicate that dosimeters were missing at the end of the quarter.
 Annual Exposure column based on averages of all available data.
 Quarter length is estimated to be 91.25 days.

Clinton Nuclear Power Station

The Clinton NPS, consisting of one approximately 1,140 Megawatt boiling water reactor (BWR), is owned and operated by Constellation Energy and located in DeWitt County, Illinois. The station began operations on February 15, 1987. The site is approximately six miles east of the city of Clinton, Illinois.



Liquid effluents from the Clinton station are permitted to be released into the eastern arm of Clinton Lake, a 4,900-acre man-made cooling lake, in accordance to release limits governed by the station's license with the NRC and the station's IEPA NPDES permit. The outflow from Clinton Lake falls into Salt Creek, a tributary of the Sangamon River. No liquid effluents were discharged in 2021.

Figures 12 through 14 provide an overview of all sampling and monitoring locations in the vicinity of the Clinton NPS (yellow star).

Significant Events or Changes for 2021

No significant events or changes for 2021.

Sampling and Monitoring Results

Water Sampling Results

Water sample analysis for tritium, total strontium, and gamma spectroscopy indicated no concentrations above the established MDCs.

Results from gross beta analysis indicated that the established MDC was met at some sampling locations, however the concentrations found were consistent with levels found at background sampling locations.

Soil Sampling Results

Cesium-137 in concentrations greater than the established MDC was detected but was consistent with soil concentrations historically found from atmospheric nuclear weapons testing and with concentrations found at background sampling locations. All other gamma spectroscopy results for soil samples were below the established MDC.

Sediment Sampling Results

Cesium-137 at a concentration greater than the established MDC was detected but was consistent with sediment concentrations historically found from atmospheric nuclear weapons testing and with concentrations found at background sampling locations. All other gamma spectroscopy results for sediment samples were below the established MDC.

Vegetation Sampling Results

Gamma spectroscopy results for vegetation samples indicated no concentrations above the established MDC.

Fish Sampling Results

Unable to coordinate the collection of fish with the Illinois Department of Natural Resources (IDNR); therefore, fish samples were not analyzed at this location for 2021.

Direct Radiation Monitoring Results

The ambient gamma monitoring results from deployed OSLs were comparable to historical data and to results found at the background monitoring locations at Sangchris Lake State Park near Kincaid, Illinois.

GDN network results were consistent with historical data.

Clinton Maps of Monitoring and Sampling Locations

Figure 12. OSL and GDN Monitoring Locations- Clinton

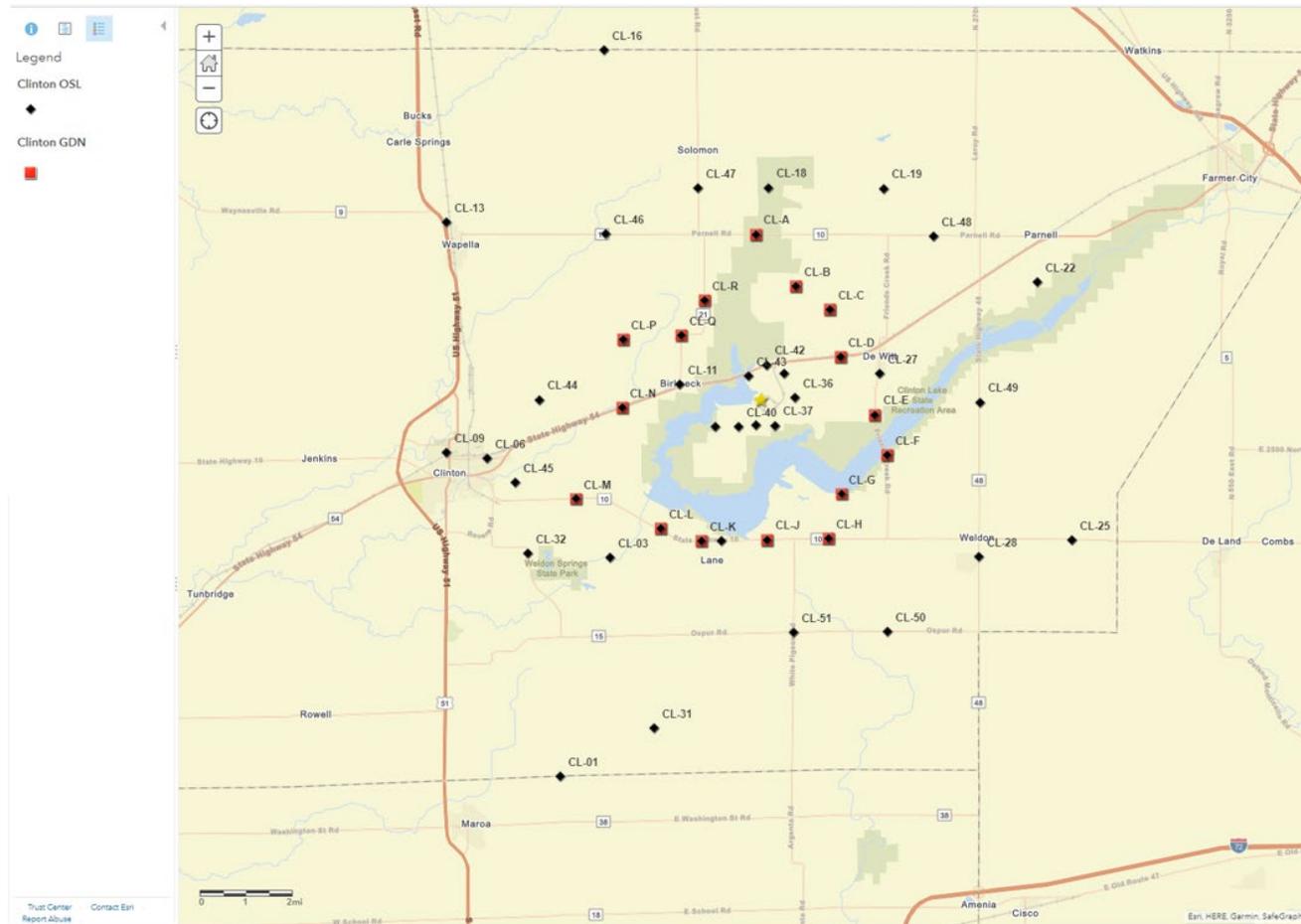


Figure 13. OSL and GDN Monitoring Locations (continued) - Clinton

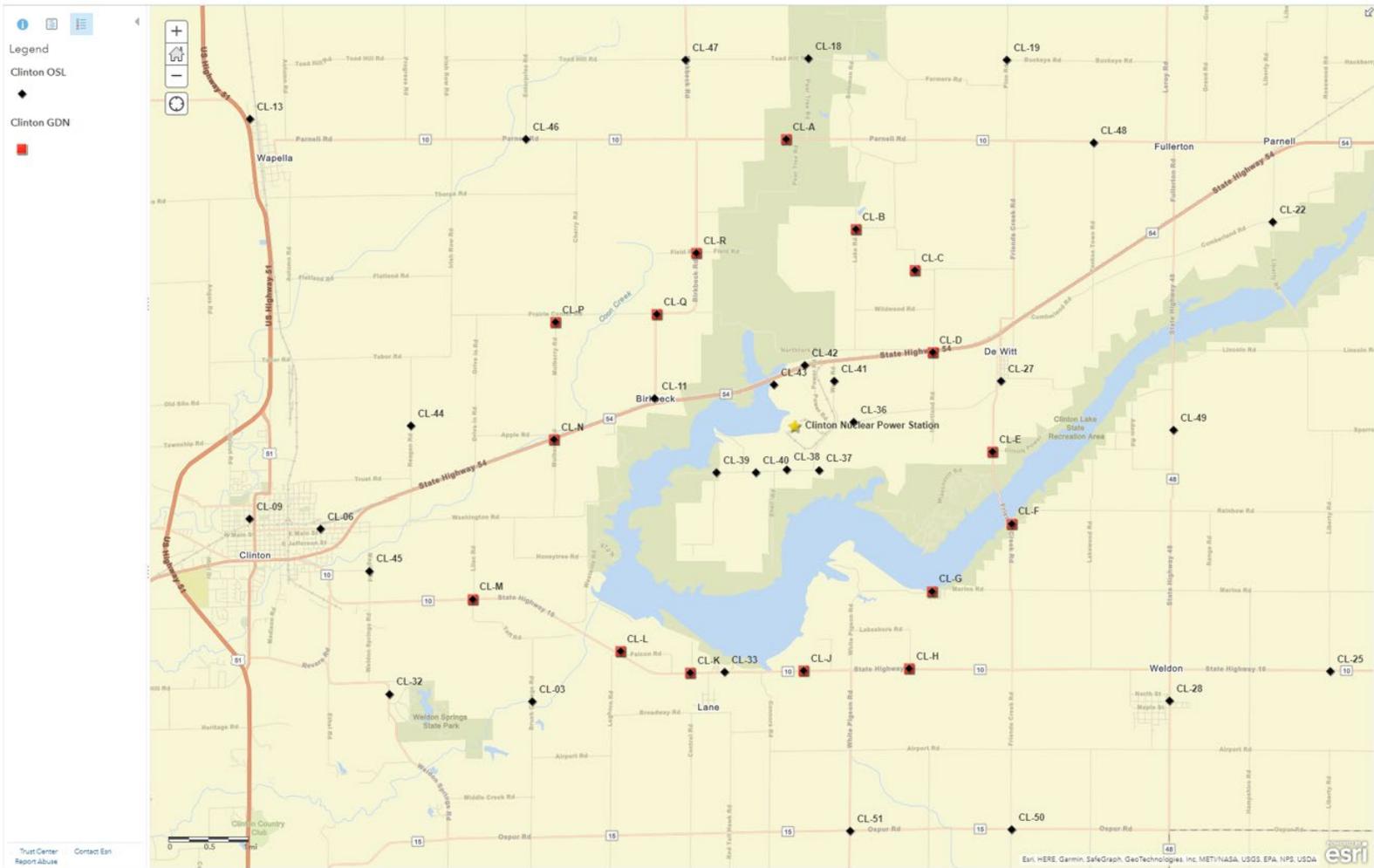
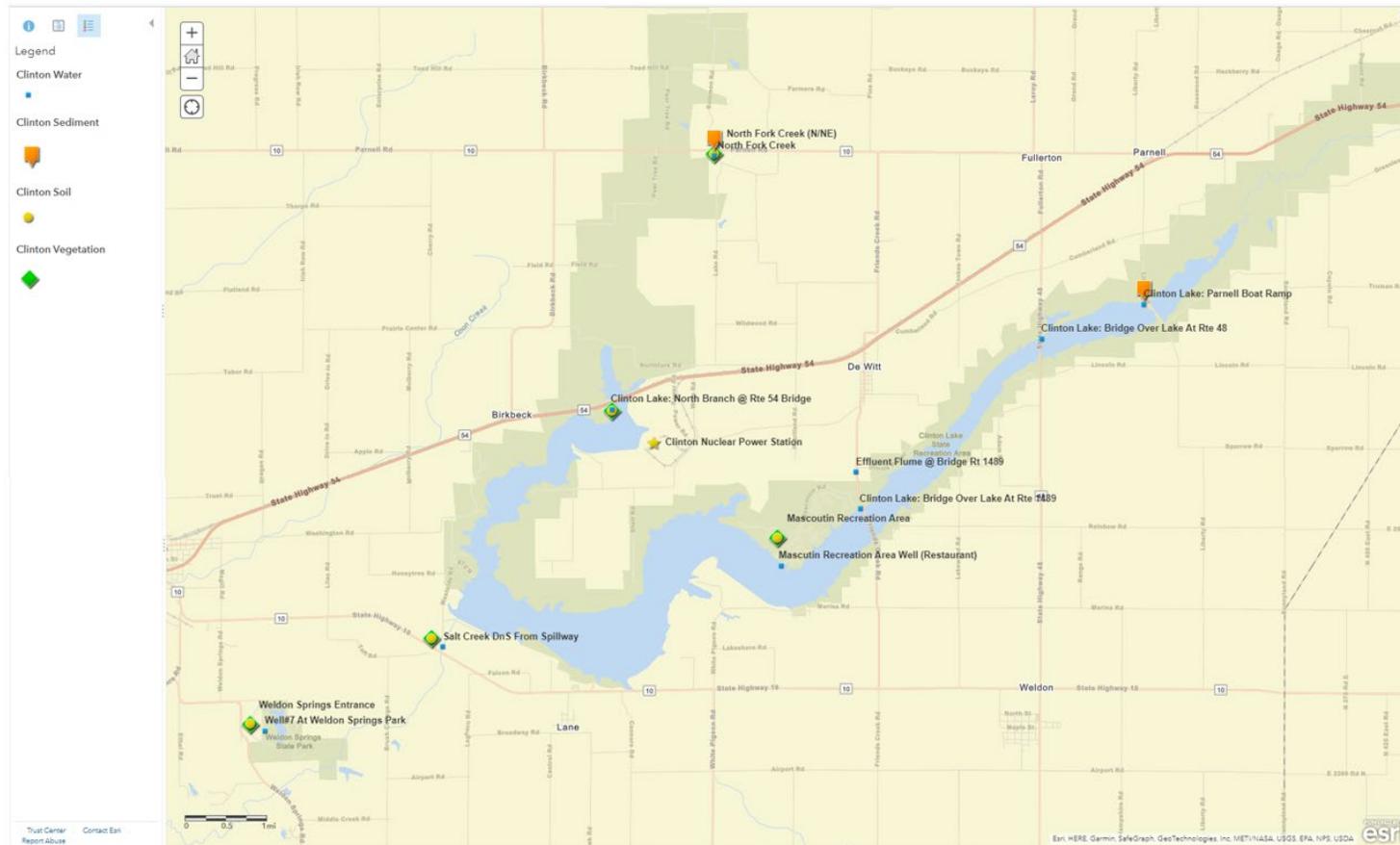


Figure 14. Environmental Sampling Locations - Clinton

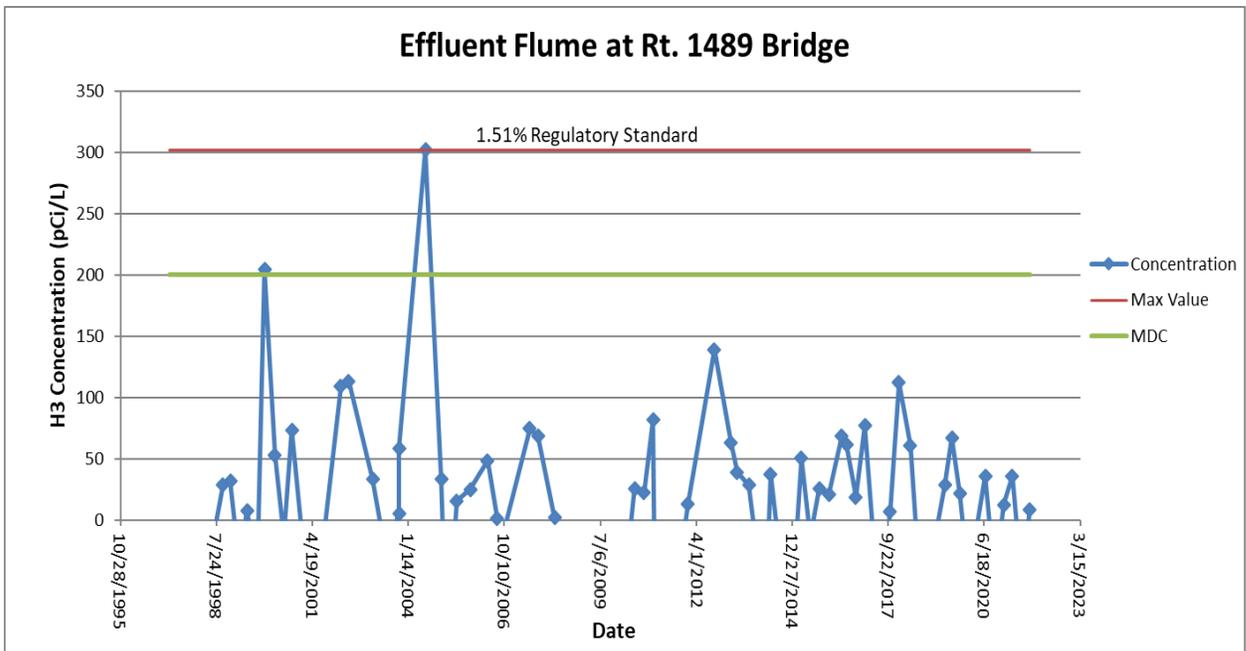
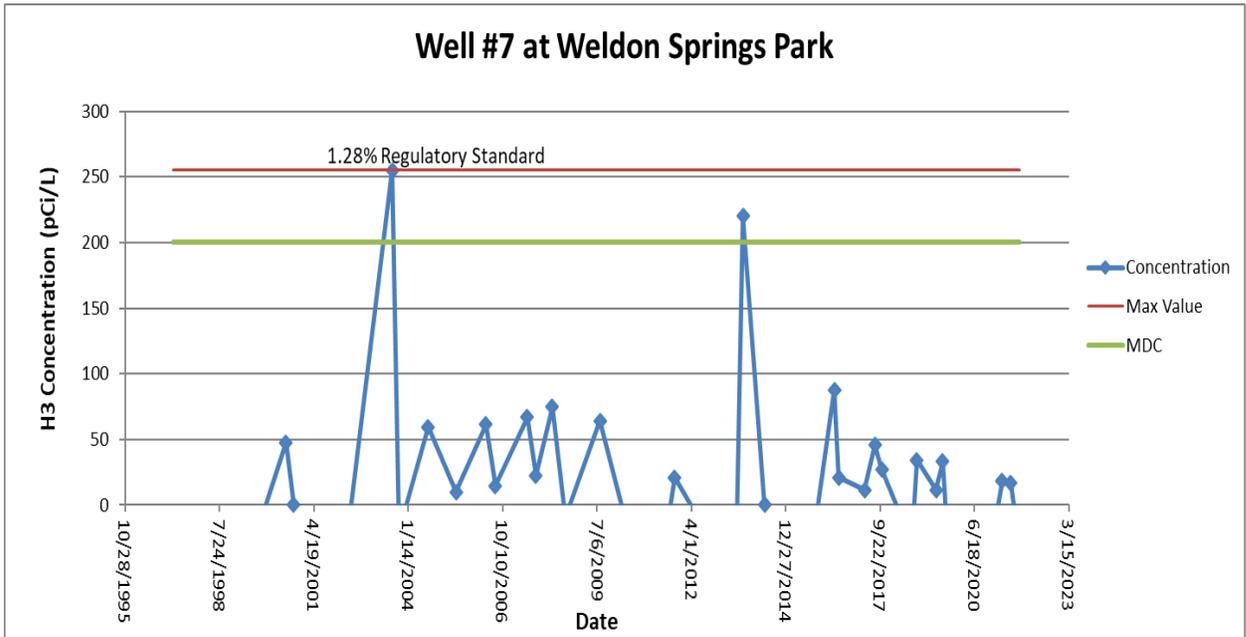


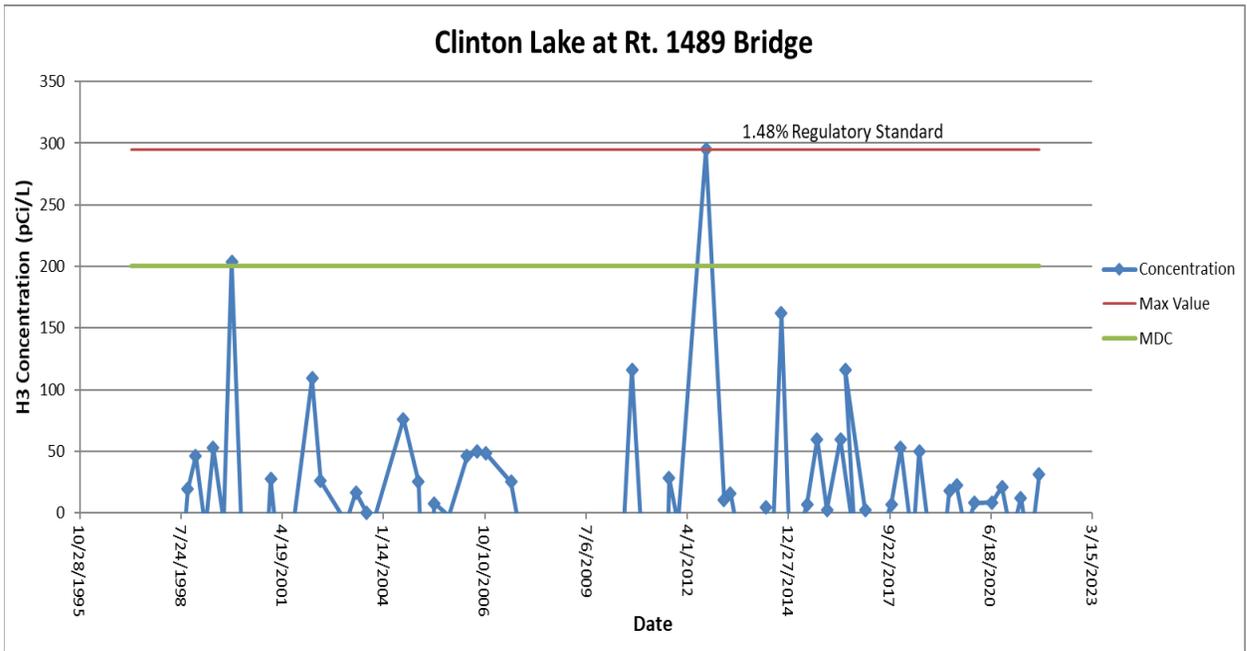
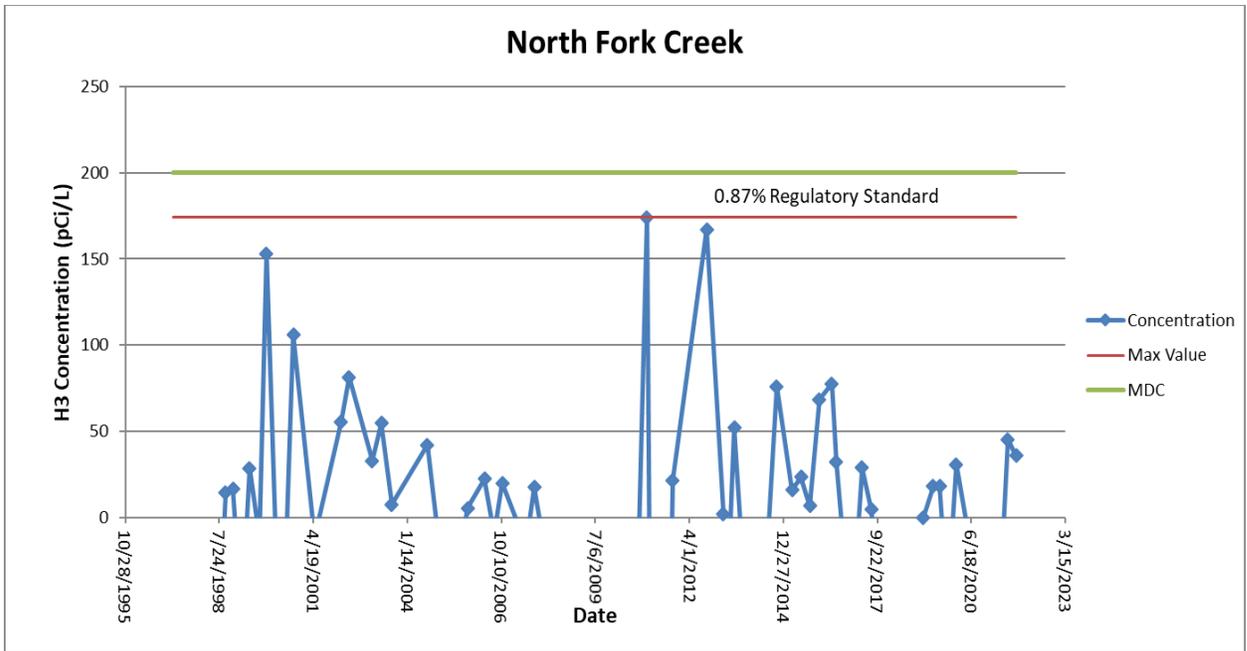
Clinton Sample Result Tables and Graphs

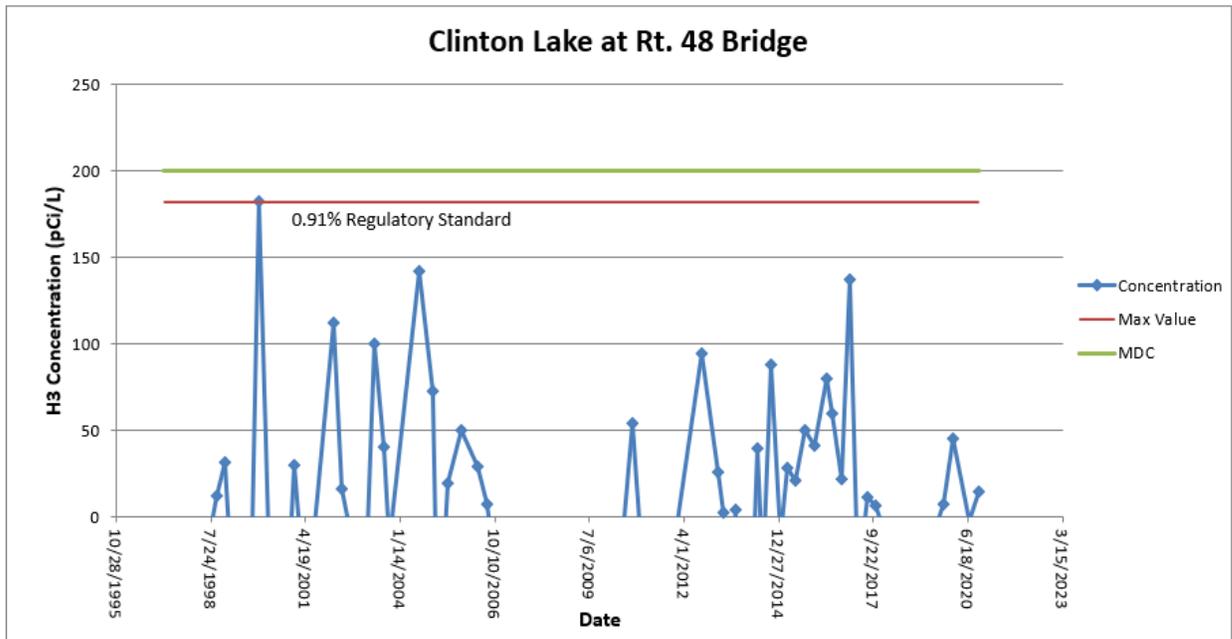
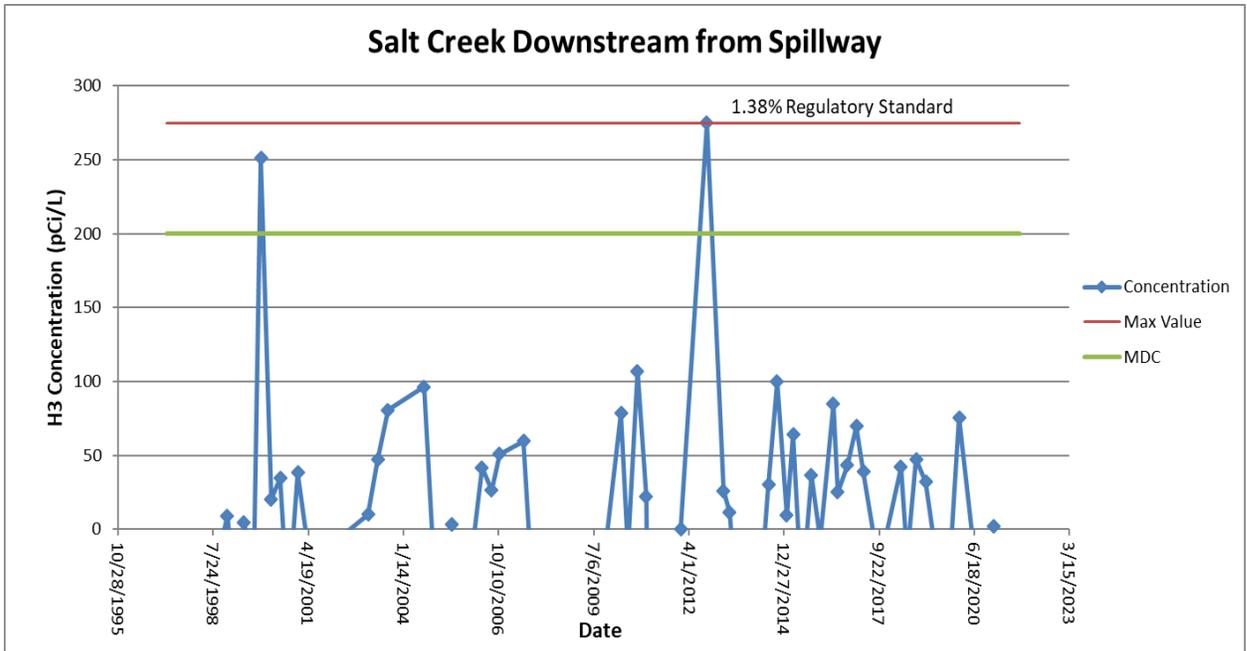
Tritium (H-3) in Water Results– Clinton
Results are in picocuries per liter (pCi/L)

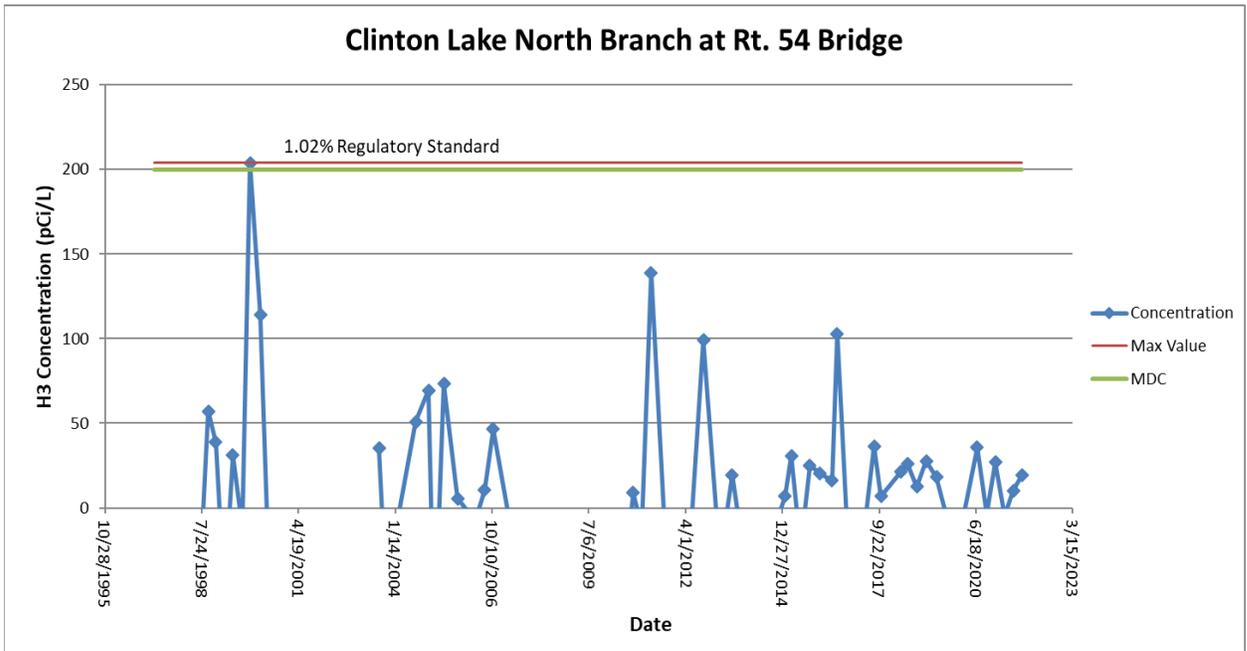
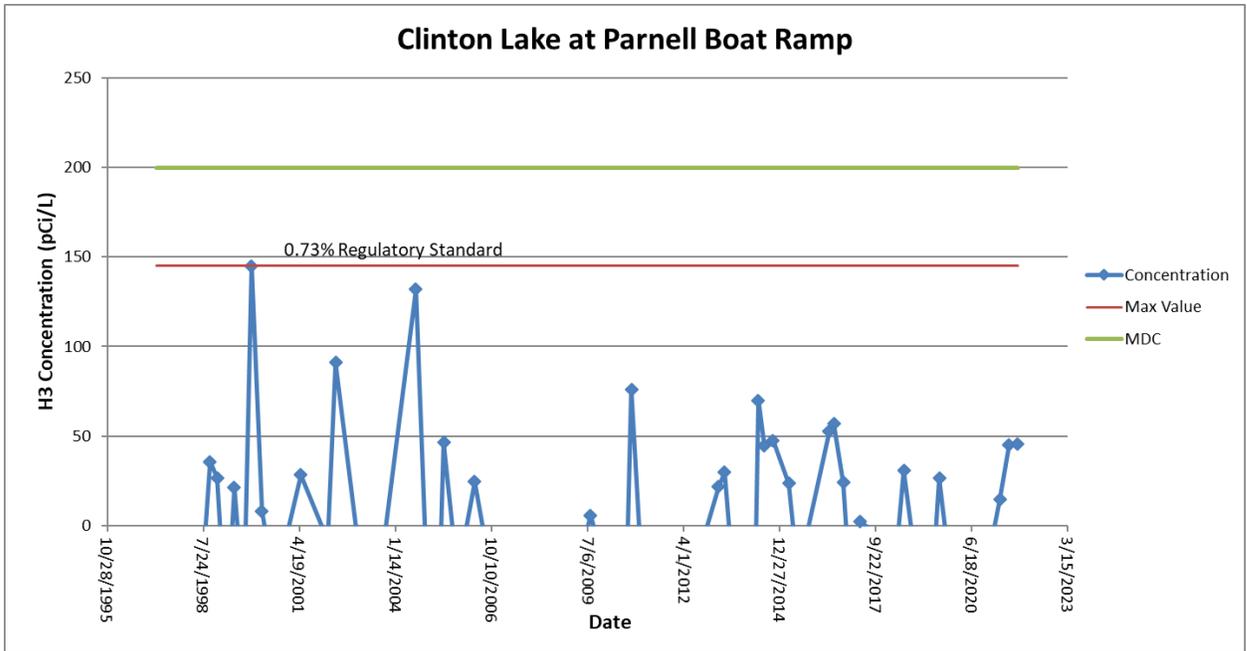
Location	H-3		Location	H-3	
Date	Result	MDC	Date	Result	MDC
Bridge over Lake at Rt 1489			North Fork Creek		
1/6/2021	<MDC	200	4/7/2021	<MDC	200
4/7/2021	<MDC	200	7/8/2021	<MDC	200
7/8/2021	<MDC	200	10/6/2021	<MDC	200
10/6/2021	<MDC	200	Parnell Boat Ramp		
Bridge over Lake at Rt 48			1/6/2021	<MDC	200
1/6/2021	<MDC	200	4/7/2021	<MDC	200
4/7/2021	<MDC	200	7/8/2021	<MDC	200
7/8/2021	<MDC	200	10/6/2021	<MDC	200
10/6/2021	<MDC	200	Salt Creek DnS From Spillway		
Effluent Flume at Bridge Rt 1489			1/6/2021	<MDC	200
1/6/2021	<MDC	200	4/7/2021	<MDC	200
4/7/2021	<MDC	200	7/8/2021	<MDC	200
7/8/2021	<MDC	200	10/6/2021	<MDC	200
10/6/2021	<MDC	200	Well #7 at Weldon Springs Park		
Mascutin Recreation Area (Restaurant)			4/7/2021	<MDC	200
4/7/2021	<MDC	200	7/8/2021	<MDC	200
7/8/2021	<MDC	200	10/6/2021	<MDC	200
10/6/2021	<MDC	200	North Branch Rt 54 Bridge		
North Branch Rt 54 Bridge			1/6/2021	<MDC	200
1/6/2021	<MDC	200	4/7/2021	<MDC	200
4/7/2021	<MDC	200	7/8/2021	<MDC	200
7/8/2021	<MDC	200	10/6/2021	<MDC	200
10/6/2021	<MDC	200			

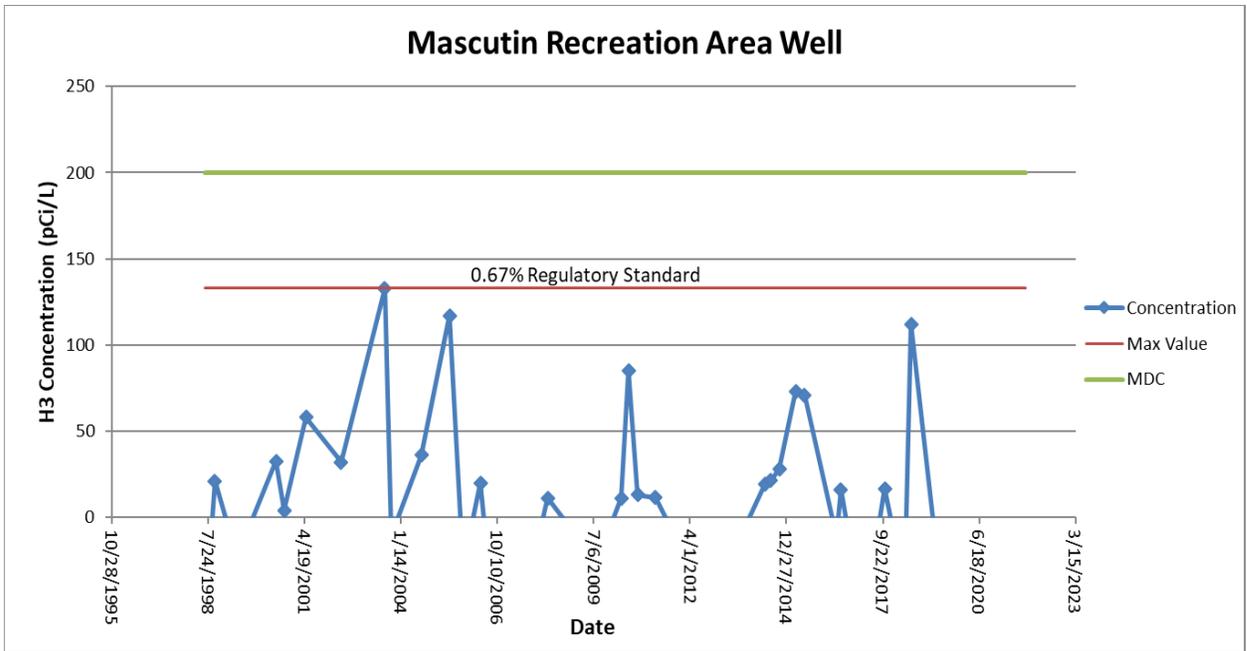
Trending Graphs for Tritium (H-3) in Water - Clinton
 (Max value compared to IEPA and US EPA regulatory standard of 20,000 pCi/L)











Total Strontium in Water Results - Clinton
Results are in picocuries per liter (pCi/L)

Location	Strontium	
Date	Result	MDC
Bridge over Lake at Rt 48		
1/6/2021	<MDC	0.5
4/7/2021	<MDC	0.5
10/6/2021	<MDC	0.5
Effluent Flume at Bridge Rt 1489		
1/6/2021	<MDC	0.5

Results for Gross Beta Screening of Water - Clinton
Results are in picocuries per liter (pCi/L)

Location	Beta		Location	Beta	
Date	Result	MDC	Date	Result	MDC
Bridge over Lake at Rt 1489			North Fork Creek		
1/6/2021	<MDC	3.5	4/7/2021	<MDC	3.5
4/7/2021	4.2	3.5	7/8/2021	4.1	3.5
7/8/2021	<MDC	3.5	10/6/2021	4.1	3.5
10/6/2021	<MDC	3.5	Parnell Boat Ramp		
Bridge over Lake at Rt 48			1/6/2021	<MDC	3.5
1/6/2021	<MDC	3.5	4/7/2021	4.1	3.5
4/7/2021	3.9	3.5	7/8/2021	<MDC	3.5
7/8/2021	<MDC	3.5	10/6/2021	<MDC	3.5
10/6/2021	<MDC	3.5	Salt Creek Dn S from Spillway		
Effluent Flume at Bridge Rt 1489			1/6/2021	<MDC	3.5
1/6/2021	3.7	3.5	4/7/2021	<MDC	3.5
4/7/2021	4.8	3.5	7/8/2021	4.9	3.5
7/8/2021	<MDC	3.5	10/6/2021	<MDC	3.5
10/6/2021	<MDC	3.5	Well #7 at Weldon Springs Park		
Mascutin Recreation Area (Restaurant)			4/7/2021	<MDC	3.5
4/7/2021	<MDC	3.5	7/8/2021	<MDC	3.5
7/8/2021	<MDC	3.5	10/6/2021	<MDC	3.5
10/6/2021	<MDC	3.5	North Branch at Rt 54 Bridge		
North Branch at Rt 54 Bridge			1/6/2021	<MDC	3.5
1/6/2021	<MDC	3.5	4/7/2021	<MDC	3.5
4/7/2021	<MDC	3.5	7/8/2021	<MDC	3.5
7/8/2021	<MDC	3.5	10/6/2021	<MDC	3.5
10/6/2021	<MDC	3.5			

Gamma Spectroscopy Results for Radionuclides in Soil (Migration) - Clinton
Results are in picocuries per gram (pCi/g)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		Mn-54		Nb-95		Zn-65		Zr-95	
Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC
Mascoutin Recreation Area																						
4/7/2021	<MDC	22.50	<MDC	0.26	<MDC	0.07	<MDC	0.03	<MDC	0.03	0.07	0.04	<MDC	0.27	<MDC	0.04	<MDC	0.21	<MDC	0.09	<MDC	0.14
7/8/2021	<MDC	22.50	<MDC	0.26	<MDC	0.07	<MDC	0.03	<MDC	0.03	<MDC	0.04	<MDC	0.27	<MDC	0.04	<MDC	0.21	<MDC	0.09	<MDC	0.14
North Branch at Rt 54 Bridge																						
4/7/2021	<MDC	22.50	<MDC	0.26	<MDC	0.07	<MDC	0.03	<MDC	0.03	<MDC	0.04	<MDC	0.27	<MDC	0.04	<MDC	0.21	<MDC	0.09	<MDC	0.14
7/8/2021	<MDC	22.50	<MDC	0.26	<MDC	0.07	<MDC	0.03	<MDC	0.03	<MDC	0.04	<MDC	0.27	<MDC	0.04	<MDC	0.21	<MDC	0.09	<MDC	0.14
North Fork Creek																						
4/7/2021	<MDC	22.50	<MDC	0.26	<MDC	0.07	<MDC	0.03	<MDC	0.03	<MDC	0.04	<MDC	0.27	<MDC	0.04	<MDC	0.21	<MDC	0.09	<MDC	0.14
7/8/2021	<MDC	22.50	<MDC	0.26	<MDC	0.07	<MDC	0.03	<MDC	0.03	<MDC	0.04	<MDC	0.27	<MDC	0.04	<MDC	0.21	<MDC	0.09	<MDC	0.14
Salt Creek Dn S From Spillway																						
4/7/2021	<MDC	22.50	<MDC	0.26	<MDC	0.07	<MDC	0.03	<MDC	0.03	0.06	0.04	<MDC	0.27	<MDC	0.04	<MDC	0.21	<MDC	0.09	<MDC	0.14
Weldon Springs Entrance																						
7/8/2021	<MDC	22.50	<MDC	0.26	<MDC	0.07	<MDC	0.03	<MDC	0.03	<MDC	0.04	<MDC	0.27	<MDC	0.04	<MDC	0.21	<MDC	0.09	<MDC	0.14

Gamma Spectroscopy Results for Radionuclides in Soil (Deposition) - Clinton
Results are in picocuries per gram (pCi/g)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		Mn-54		Nb-95		Zn-65		Zr-95	
	Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result
Mascoutin Recreation Area																						
4/7/2021	<MDC	19.90	<MDC	0.23	<MDC	0.06	<MDC	0.03	<MDC	0.03	<MDC	0.03	<MDC	0.25	<MDC	0.03	<MDC	0.23	<MDC	0.09	<MDC	0.14
7/8/2021	<MDC	19.90	<MDC	0.23	<MDC	0.06	<MDC	0.03	<MDC	0.03	<MDC	0.03	<MDC	0.25	<MDC	0.03	<MDC	0.23	<MDC	0.09	<MDC	0.14
North Branch at Rt 54 Bridge																						
4/7/2021	<MDC	19.90	<MDC	0.23	<MDC	0.06	<MDC	0.03	<MDC	0.03	0.05	0.03	<MDC	0.25	<MDC	0.03	<MDC	0.23	<MDC	0.09	<MDC	0.14
7/8/2021	<MDC	19.90	<MDC	0.23	<MDC	0.06	<MDC	0.03	<MDC	0.03	<MDC	0.03	<MDC	0.25	<MDC	0.03	<MDC	0.23	<MDC	0.09	<MDC	0.14
North Fork Creek																						
4/7/2021	<MDC	19.90	<MDC	0.23	<MDC	0.06	<MDC	0.03	<MDC	0.03	<MDC	0.03	<MDC	0.25	<MDC	0.03	<MDC	0.23	<MDC	0.09	<MDC	0.14
7/8/2021	<MDC	19.90	<MDC	0.23	<MDC	0.06	<MDC	0.03	<MDC	0.03	0.04	0.03	<MDC	0.25	<MDC	0.03	<MDC	0.23	<MDC	0.09	<MDC	0.14
Salt Creek DnS From Spillway																						
4/7/2021	<MDC	19.90	<MDC	0.23	<MDC	0.06	<MDC	0.03	<MDC	0.03	0.05	0.03	<MDC	0.25	<MDC	0.03	<MDC	0.23	<MDC	0.09	<MDC	0.14
Weldon Springs Entrance																						
7/8/2021	<MDC	19.90	<MDC	0.23	<MDC	0.06	<MDC	0.03	<MDC	0.03	<MDC	0.03	<MDC	0.25	<MDC	0.03	<MDC	0.23	<MDC	0.09	<MDC	0.14

Gamma Spectroscopy Results for Radionuclides in Sediment - Clinton
Results are in picocuries per gram (pCi/g)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		Mn-54		Nb-95		Zn-65		Zr-95	
	Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result
North Fork Creek																						
4/7/2021	<MDC	18.30	<MDC	0.20	<MDC	0.06	<MDC	0.02	<MDC	0.02	0.06	0.03	<MDC	0.24	<MDC	0.03	<MDC	0.19	<MDC	0.08	<MDC	0.12
7/8/2021	<MDC	18.30	<MDC	0.20	<MDC	0.06	<MDC	0.02	<MDC	0.02	<MDC	0.03	<MDC	0.24	<MDC	0.03	<MDC	0.19	<MDC	0.08	<MDC	0.12
Parnell Boat Ramp																						
4/7/2021	<MDC	18.30	<MDC	0.20	<MDC	0.06	<MDC	0.02	<MDC	0.02	<MDC	0.03	<MDC	0.24	<MDC	0.03	<MDC	0.19	<MDC	0.08	<MDC	0.12
7/8/2021	<MDC	18.30	<MDC	0.20	<MDC	0.06	<MDC	0.02	<MDC	0.02	<MDC	0.03	<MDC	0.24	<MDC	0.03	<MDC	0.19	<MDC	0.08	<MDC	0.12

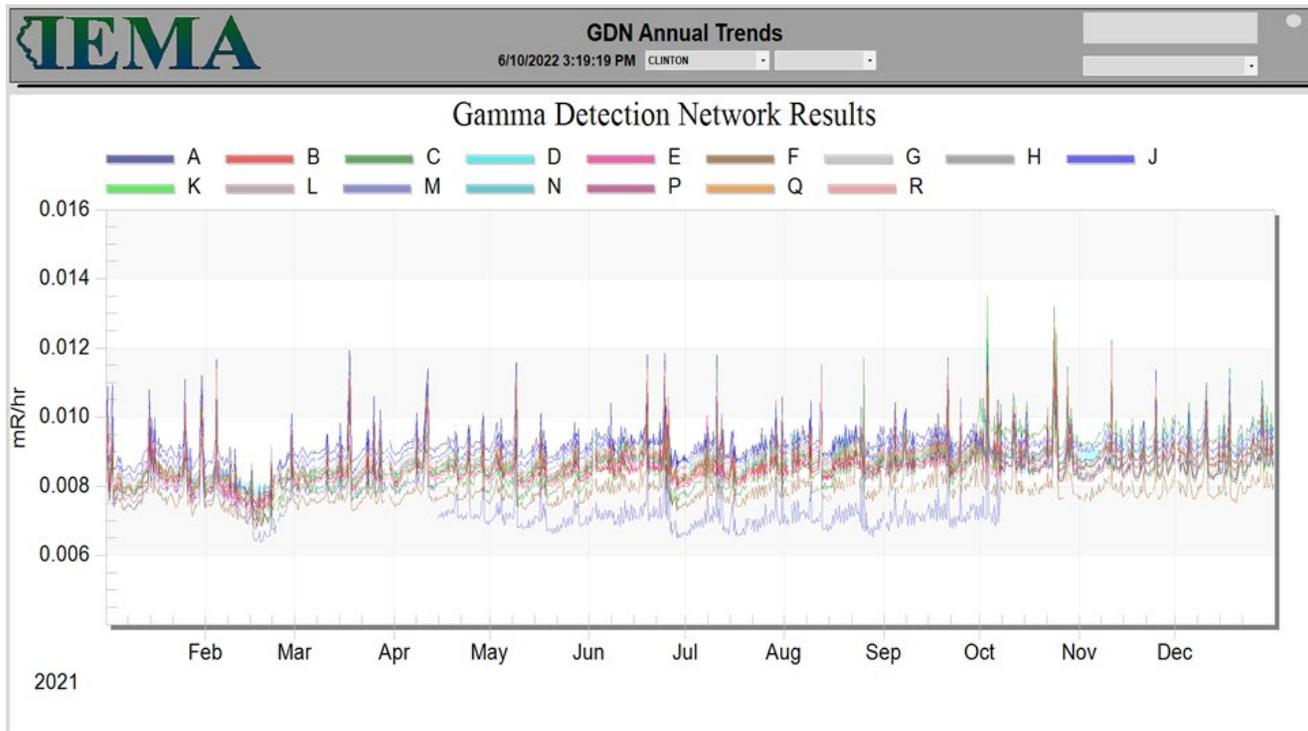
Gamma Spectroscopy Results for Radionuclides in Vegetation- Clinton
Results are in picocuries per gram (pCi/g)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		I-131		Mn-54		Nb-95		Zn-65		Zr-95			
	Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	
Mascoutin Recreation Area																										
4/7/2021	<MDC	3.9	<MDC	0.3	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.3	<MDC	7.9	<MDC	0.1	<MDC	0.2	<MDC	0.2	<MDC	0.2	<MDC	0.2
7/8/2021	<MDC	3.9	<MDC	0.3	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.3	<MDC	7.9	<MDC	0.1	<MDC	0.2	<MDC	0.2	<MDC	0.2	<MDC	0.2
North Branch at Rt 54 Bridge																										
4/7/2021	<MDC	3.9	<MDC	0.3	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.3	<MDC	7.9	<MDC	0.1	<MDC	0.2	<MDC	0.2	<MDC	0.2	<MDC	0.2
7/8/2021	<MDC	3.9	<MDC	0.3	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.3	<MDC	7.9	<MDC	0.1	<MDC	0.2	<MDC	0.2	<MDC	0.2	<MDC	0.2
North Fork Creek																										
4/7/2021	<MDC	3.9	<MDC	0.3	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.3	<MDC	7.9	<MDC	0.1	<MDC	0.2	<MDC	0.2	<MDC	0.2	<MDC	0.2
7/8/2021	<MDC	3.9	<MDC	0.3	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.3	<MDC	7.9	<MDC	0.1	<MDC	0.2	<MDC	0.2	<MDC	0.2	<MDC	0.2
Salt Creek DnS From Spillway																										
4/7/2021	<MDC	3.9	<MDC	0.3	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.3	<MDC	7.9	<MDC	0.1	<MDC	0.2	<MDC	0.2	<MDC	0.2	<MDC	0.2
Weldon Springs Entrance																										
7/8/2021	<MDC	3.9	<MDC	0.3	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.3	<MDC	7.9	<MDC	0.1	<MDC	0.2	<MDC	0.2	<MDC	0.2	<MDC	0.2

Gamma Spectroscopy Results for Radionuclides in Fish- Clinton
Results are in picocuries per kilogram (pCi/kg)

No fish samples collected in 2021 from Clinton Lake.

Gamma Detection Network Results – Clinton
Results are in milliroentgen per hour (mR/hr)



Summary of Ambient Gamma Results - Clinton

Location	Quarter 1 mR/quarter	Quarter 2 mR/quarter	Quarter 3 mR/quarter	Quarter 4 mR/quarter	Annual Exposure mR/year
CL-01	10.2	9.4	10.3	10.0	39.9
CL-03	8.2	9.6	10.6	7.5	35.9
CL-06	5.5		10.4	6.7	30.1
CL-09		8.5	5.7	5.5	26.3
CL-11	9.9	11.4	10.6	8.1	40.0
CL-13	8.9	6.7	8.1	2.5	26.2
CL-16	9.0	13.6	12.7	11.9	47.2
CL-18	12.0		13.3	11.0	48.4
CL-19	11.4	10.5	12.4	7.9	42.2
CL-22	9.9	10.0	10.0	6.2	36.2
CL-25	12.9	11.1	11.5	7.7	43.2
CL-27	8.2	11.1	9.8	6.7	35.7
CL-28	11.2		9.4	8.5	38.8
CL-31	9.6	11.6	12.5	8.9	42.6
CL-32	10.2	10.0	10.8	8.5	39.5
CL-33	8.4	9.1	6.4	6.8	30.7
CL-36	9.2	11.2	11.8	7.1	39.2
CL-37	11.4	9.3	16.5	9.6	46.8
CL-38	8.1	10.8	9.9	8.4	37.2
CL-39			11.6	9.8	42.8
CL-40	8.2	10.7	9.2	7.8	35.8
CL-41	8.2	10.7	9.7	11.7	40.3
CL-42		12.1	9.6	9.6	41.8
CL-43	10.3	10.6	11.9	7.2	40.0

Summary of Ambient Gamma Results - Clinton (Continued)

Location	Quarter 1 mR/quarter	Quarter 2 mR/quarter	Quarter 3 mR/quarter	Quarter 4 mR/quarter	Annual Exposure mR/year
CL-44	13.2	8.8	12.6	8.8	43.5
CL-45	10.1	12.6	12.4	8.5	43.6
CL-46	13.6	12.0	10.2	9.7	45.5
CL-47		12.6	11.3	9.3	44.2
CL-48	7.8	11.6	15.2	8.9	43.5
CL-49	9.7	9.5	9.7	11.7	40.5
CL-50	10.2	10.0	11.7	7.7	39.6
CL-51	11.0	12.3	12.5	11.2	47.1
CL-A	8.3	13.1	8.0	9.6	39.0
CL-B	12.0	11.9	10.3	9.3	43.6
CL-C		13.0	7.4	9.7	40.1
CL-D	13.1	11.1	13.5	11.7	49.4
CL-E	8.0	13.3	10.3	8.2	39.9
CL-F	8.9	11.2	11.3	6.1	37.5
CL-G	7.7	8.2	9.0	7.7	32.6
CL-H	10.6	12.6	9.6	9.9	42.6
CL-J	10.0	9.9	10.4	9.4	39.6
CL-K	8.3	12.5	11.3	8.5	40.6
CL-L	11.8	11.0	13.1	9.4	45.3
CL-M	11.4	9.9	12.5	8.8	42.6
CL-N	10.3	9.4	10.3	10.5	40.5
CL-P	9.2	10.0	8.8	8.5	36.5
CL-Q	9.7	10.3	8.1	6.9	35.0
CL-R	8.2	9.8	11.6	8.9	38.5

Blanks in the table indicate that dosimeters were missing at the end of the quarter.
 Annual Exposure column based on averages of all available data.
 Quarter length is estimated to be 91.25 days.

Dresden Nuclear Power Station

The Dresden NPS, consisting of one retired reactor and two operating 867 Megawatt BWRs, is owned and operated by Constellation Energy and located in Grundy County, Illinois. Dresden unit 1 was activated in 1960 and retired in 1978. Dresden units 2 and 3 began operations in 1970. The site is located approximately 12 miles southwest of Joliet, Illinois at the confluence of the Des Plaines and Kankakee Rivers where they form the Illinois River.



Liquid effluents from the Dresden station are permitted to be released to the Rock River in accordance to release limits governed by the station's license with the NRC and the station's IEPA NPDES permit. No liquid effluents were discharged in 2021.

Figures 15 through 17 provide an overview of all sampling and monitoring locations in the vicinity of the Dresden NPS (yellow star in the middle of the map). The second yellow star near the bottom of Figure 15 is the Braidwood NPS.

Significant Events or Changes for 2021

No significant events or changes for 2021.

Sampling and Monitoring Results

Water Sampling Results

Detectable levels of tritium were found in surface water samples taken from the Illinois River at the Dresden Lock and Dam and Illinois River at Morris. The elevated levels are likely attributable to the liquid effluent releases from the Braidwood Station. All tritium levels were well below the Drinking Water Standards established by the US EPA and IEPA.

Results from gross beta analysis indicate that the established MDC was met at most surface water sampling locations. Concentrations above MDC are routinely found in background samples collected. The concentrations seen at many of the surface water sampling locations for the Dresden NPS were consistent with background levels. However, concentrations found at some locations were above typical background levels and can likely be attributed to the routine liquid effluent releases from the Braidwood station. All sample results for gross beta remained well below the established US EPA and IEPA standards. Gross beta results for groundwater samples collected from a well located at the Dresden Lock and Dam were also above the established MDC. However, due to the presence of dissolved naturally occurring radionuclides; it is not unusual to see elevated gross beta results in groundwater samples.

Results from total strontium analysis indicated no concentrations above the established MDCs.

Gamma spectroscopy results for water samples indicated no concentrations above the established MDCs.

Soil Sampling Results

Cesium-137 in concentrations greater than the established MDC was detected but was consistent with soil concentrations historically found from atmospheric nuclear weapons testing and with concentrations found at background sampling locations. All other gamma spectroscopy results for soil samples were below the established MDC.

Sediment Sampling Results

Cesium-137 in concentrations greater than the established MDC was detected but was consistent with sediment concentrations historically found from atmospheric nuclear weapons testing and with concentrations found at background sampling locations. All other gamma spectroscopy results for sediment samples were below the established MDC.

Vegetation Sampling Results

Gamma spectroscopy results for vegetation samples indicated no concentrations above the established MDC.

Fish Sampling Results

Gamma spectroscopy results for fish samples indicated no concentrations above the established MDC.

Direct Radiation Monitoring Results

The ambient gamma monitoring results from deployed OSLs were comparable to historical data and to results found at the background monitoring locations at Sangchris Lake State Park near Kincaid, Illinois.

GDN network results were consistent with historical data.

Dresden Maps of Monitoring and Sampling Locations

Figure 15. OSL and GDN Monitoring Locations - Dresden

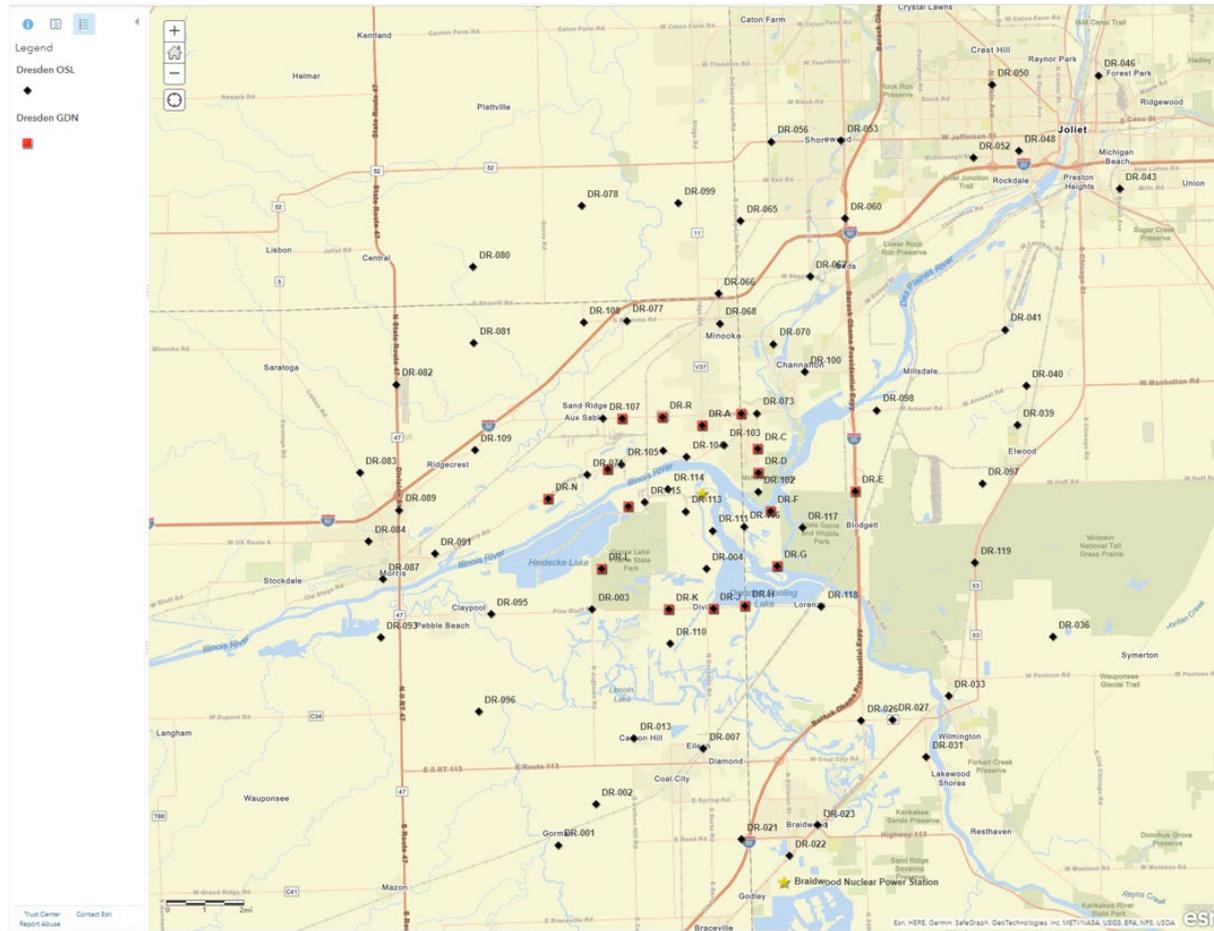


Figure 16. OSL and GDN Monitoring Locations - Dresden (continued)

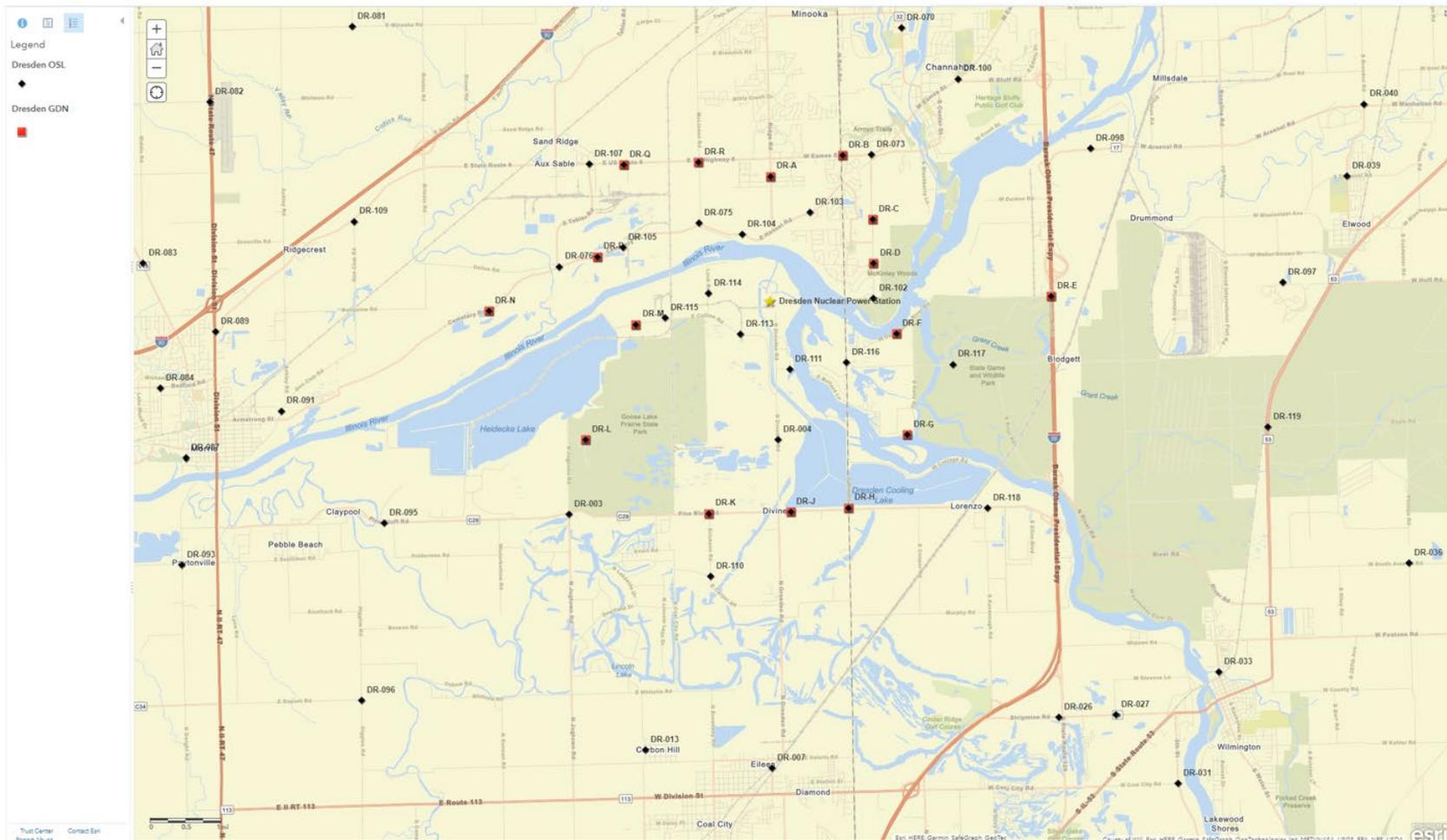
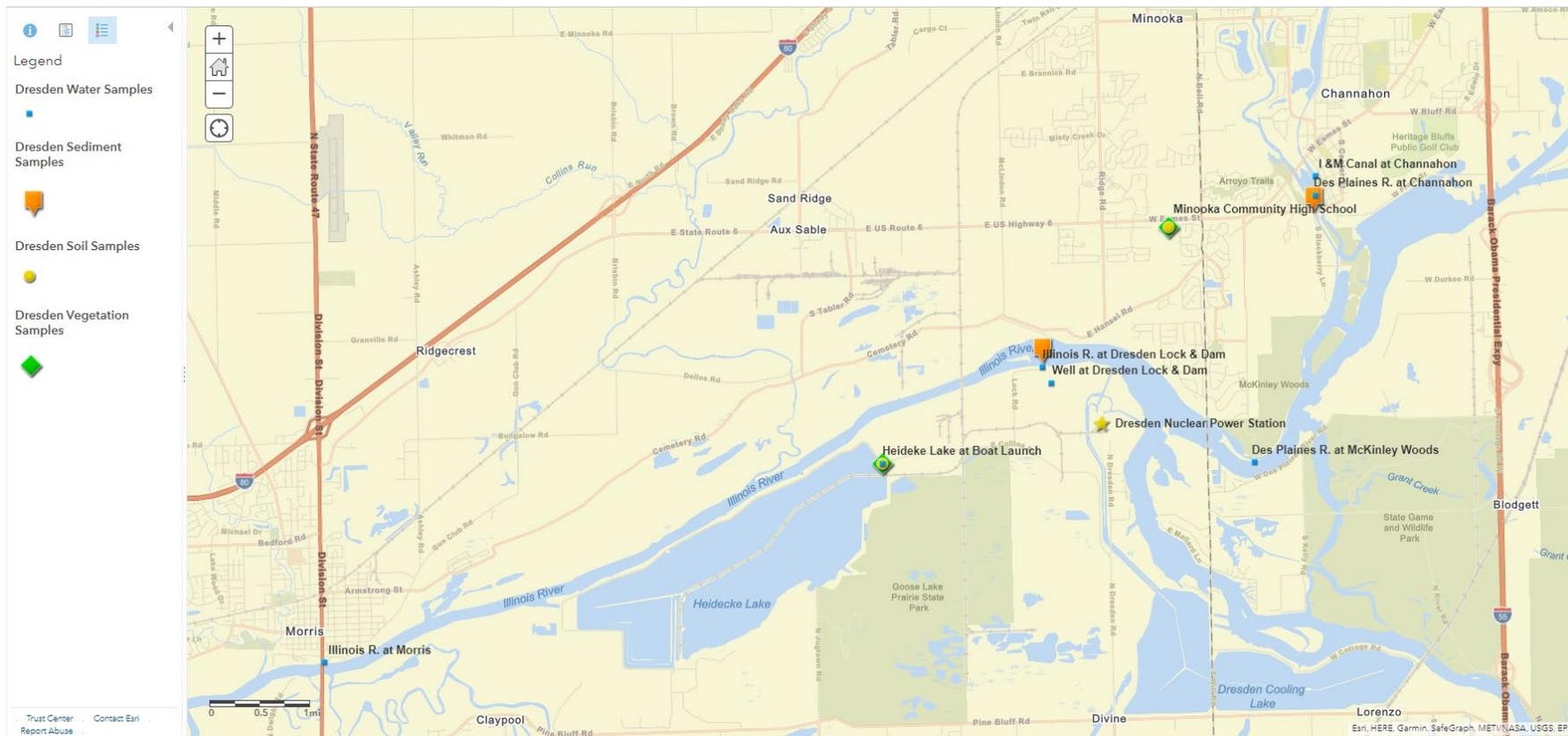


Figure 17. Environmental Sampling Locations - Dresden

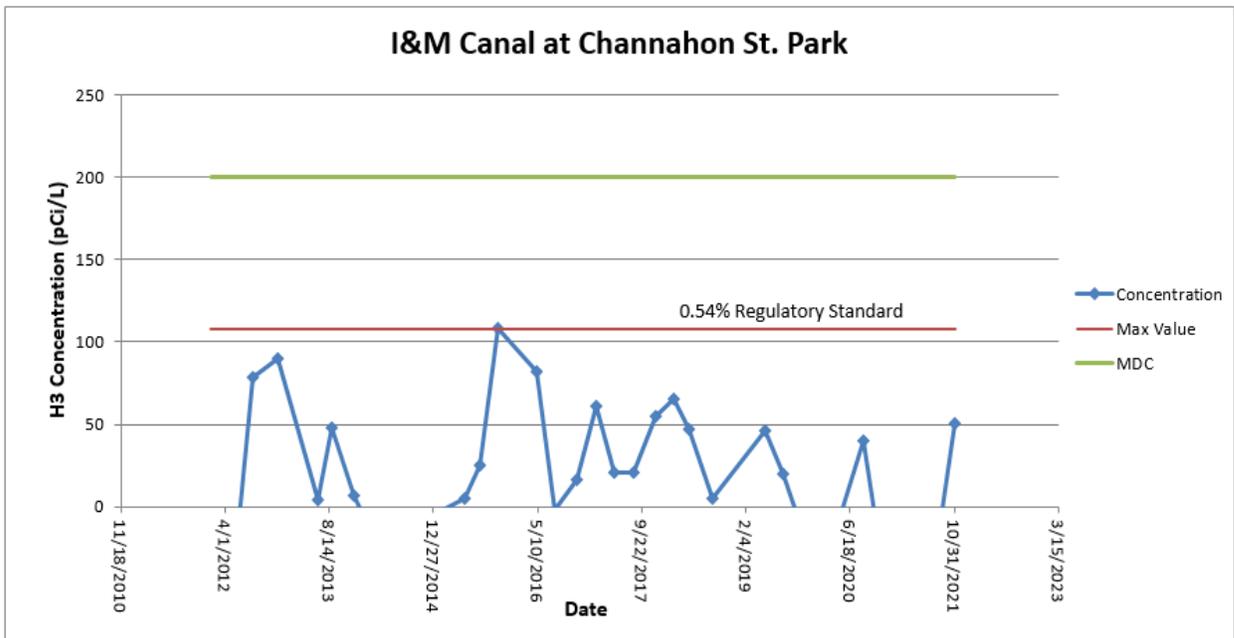
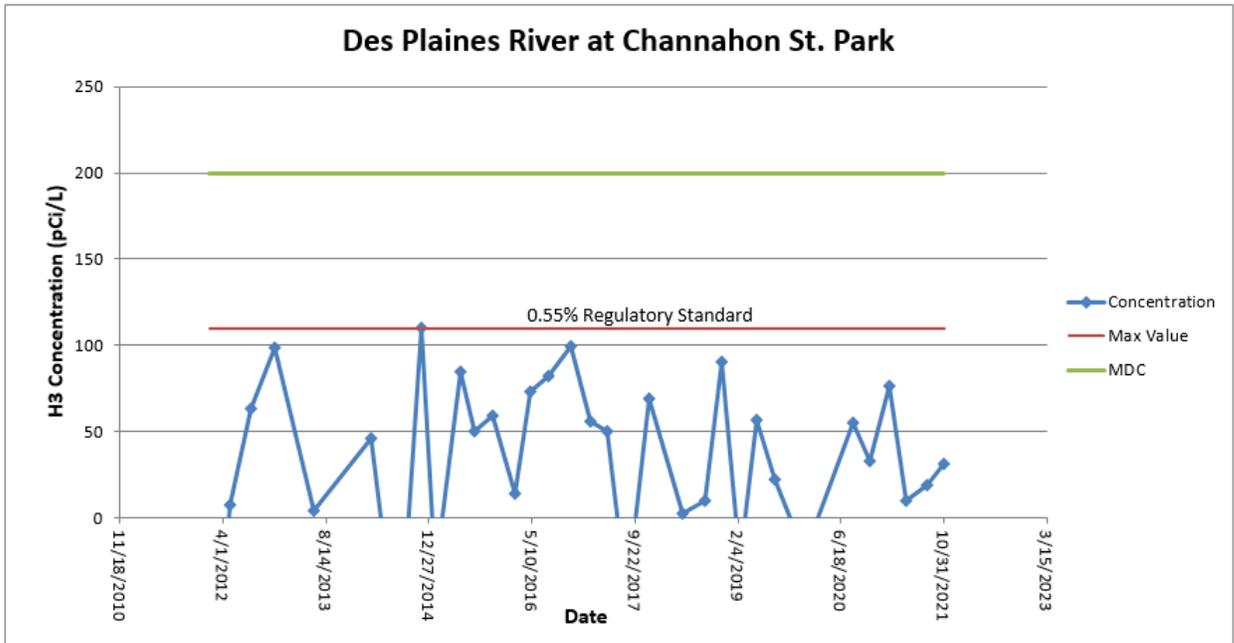


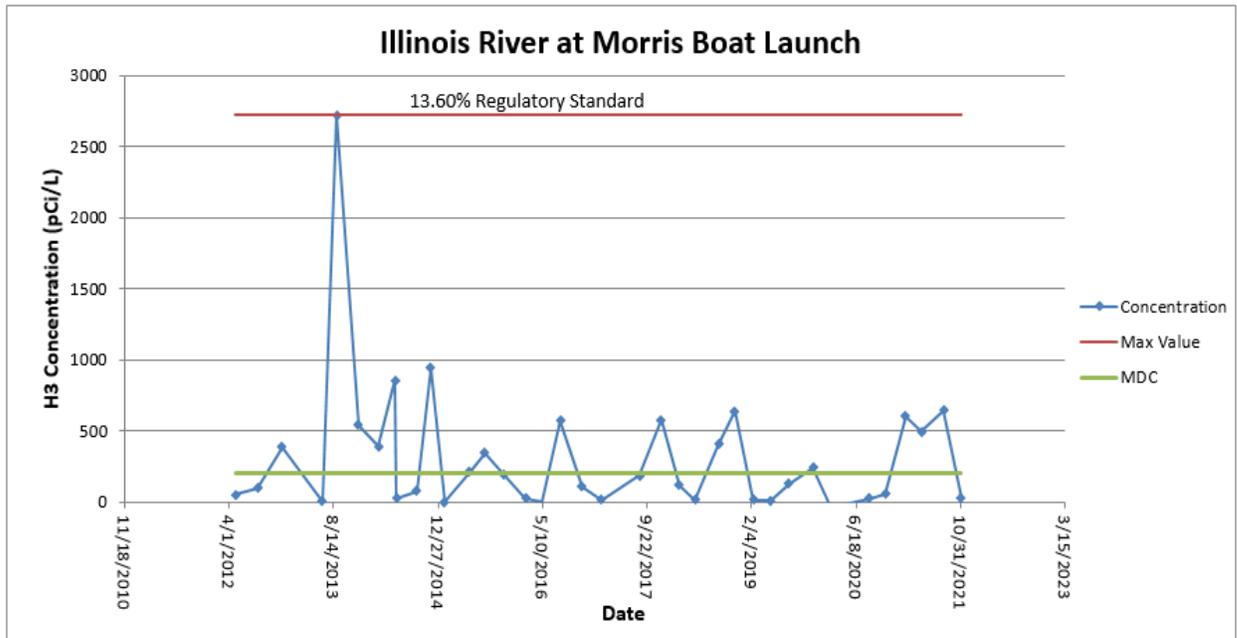
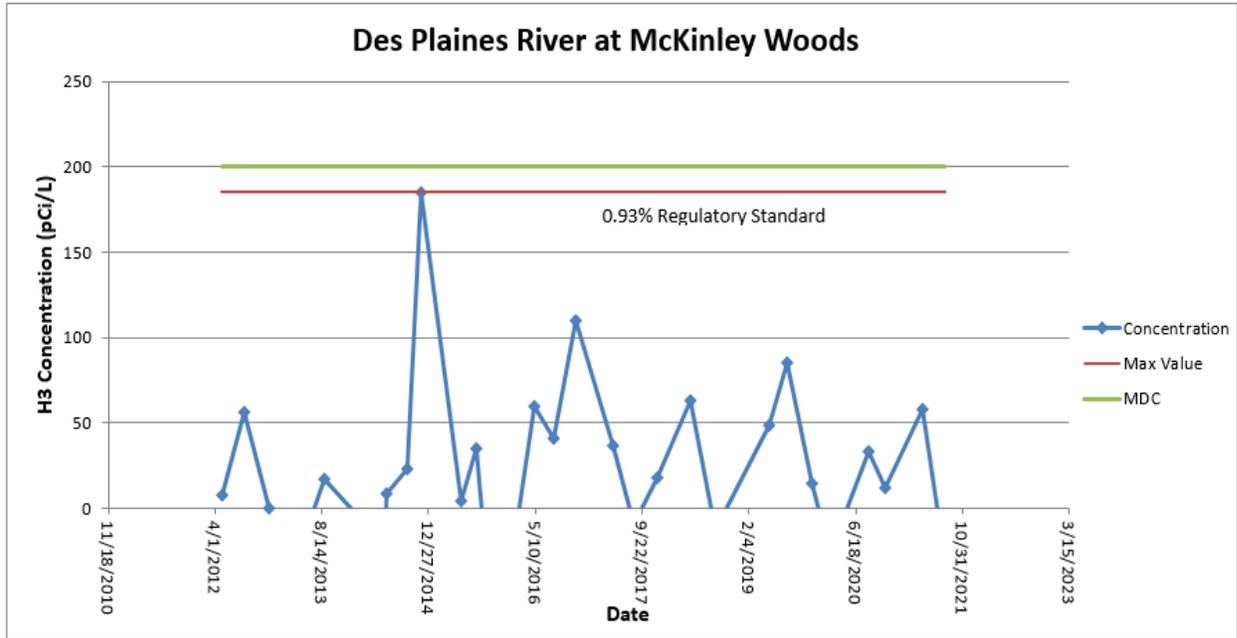
Dresden Sample Result Tables and Graphs

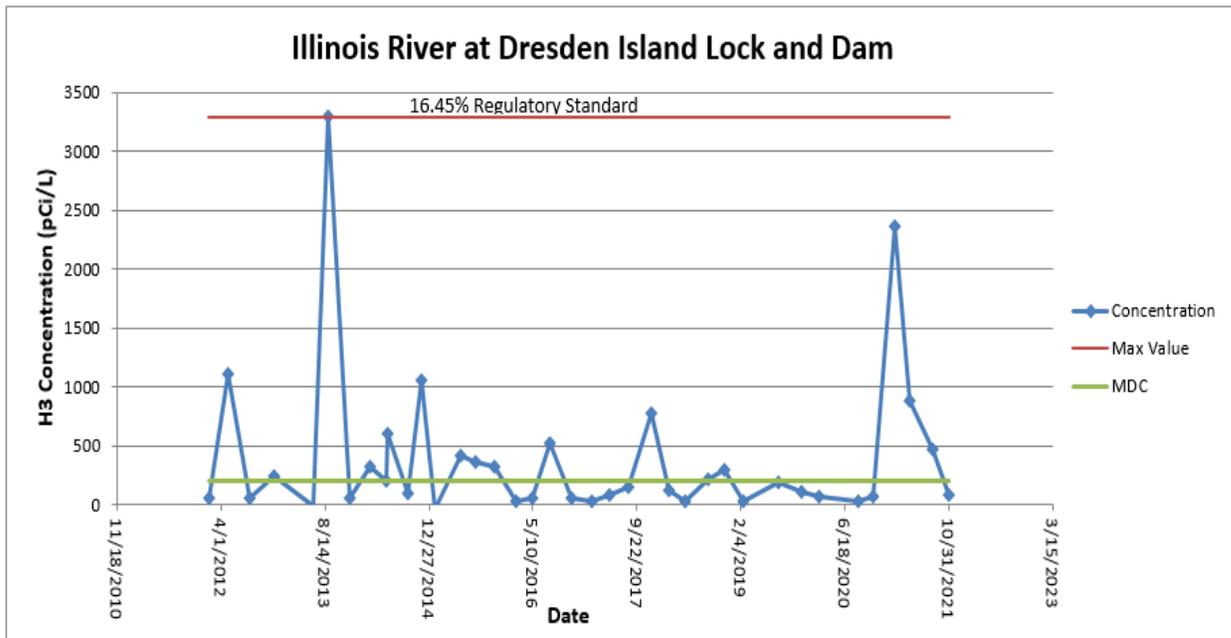
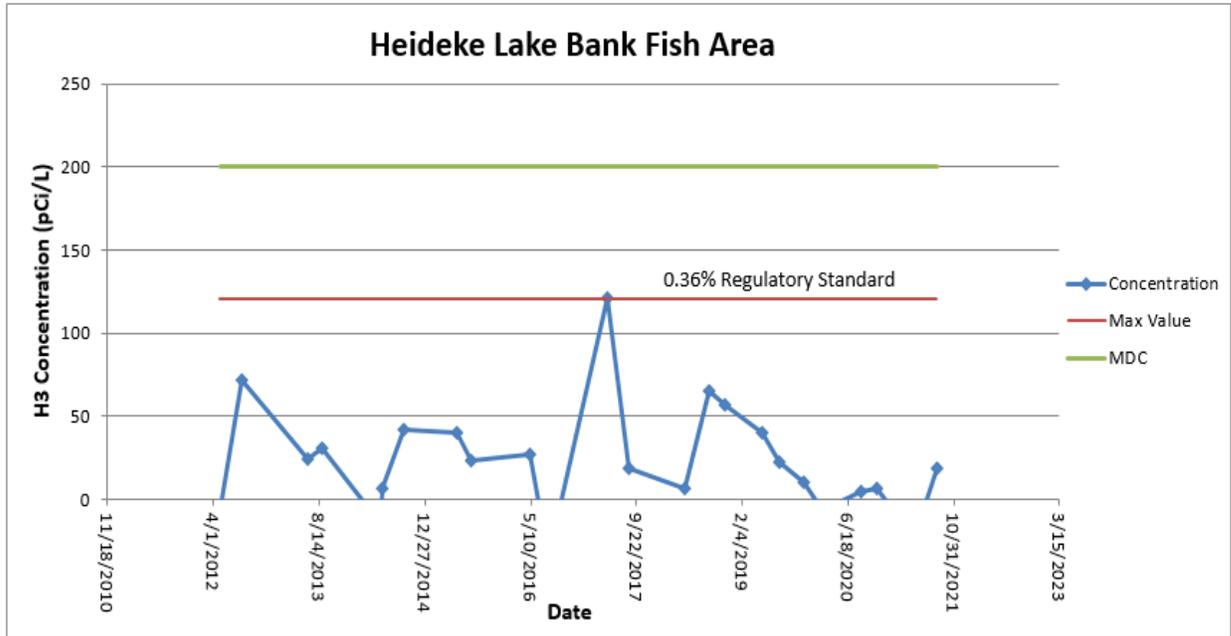
Tritium (H-3) in Water - Dresden
Results are in picocuries per liter (pCi/L)

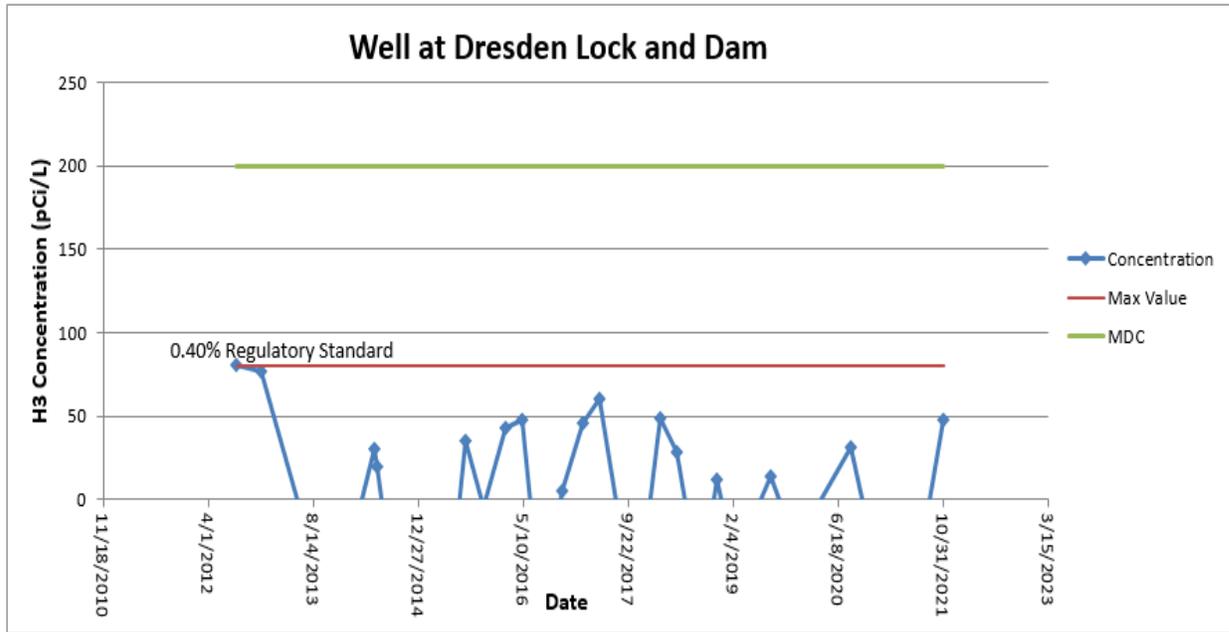
Location Date	H-3	
	Result	MDC
Des Plaines R. at Channahon		
2/10/2021	<MDC	133
4/28/2021	<MDC	133
8/11/2021	<MDC	133
11/3/2021	<MDC	133
Des Plaines R. at McKinley Woods		
4/28/2021	<MDC	133
8/11/2021	<MDC	133
Heideke Lake		
4/28/2021	<MDC	133
8/11/2021	<MDC	133
I & M Canal at Channahon		
4/28/2021	<MDC	133
8/11/2021	<MDC	133
11/3/2021	<MDC	133
Illinois R. at Dresden Lock & Dam		
2/10/2021	2360	133
4/28/2021	885	133
8/11/2021	473	133
11/3/2021	<MDC	133
Illinois R. at Morris		
2/10/2021	603	133
4/28/2021	494	133
8/11/2021	645	133
11/3/2021	<MDC	133
Well at Dresden Lock & Dam		
2/10/2021	<MDC	133
4/28/2021	<MDC	133
8/11/2021	<MDC	133
11/3/2021	<MDC	133

Trending Graphs for Tritium (H-3) in Water - Dresden Area
 (Max value compared to IEPA and US EPA regulatory standard of 20,000 pCi/L)









Total Strontium in Water Results - Dresden Area
Results are in picocuries per liter (pCi/L)

Location	Strontium	
	Date	Result MDC
Illinois R. at Dresden Lock & Dam		
	4/28/2021	<MDC 0.5
Illinois R. at Morris		
	4/28/2021	<MDC 0.5

Results for Gross Beta Screening of Water - Dresden
 Results are in picocuries per liter (pCi/L)

Location Date	Beta	
	Result	MDC
Des Plaines R. at Channahon		
2/10/2021	4.8	3.6
4/28/2021	5.7	3.6
8/11/2021	8.0	3.6
11/3/2021	3.6	3.6
Des Plaines R. at McKinley Woods		
4/28/2021	9.6	3.6
8/11/2021	6.0	3.6
Heideke Lake		
4/28/2021	4.7	3.6
8/11/2021	<MDC	3.6
I & M Canal at Channahon		
4/28/2021	4.7	3.6
8/11/2021	4.1	3.6
11/3/2021	4.6	3.6
Illinois R. at Dresden Lock & Dam		
2/10/2021	5.4	3.6
4/28/2021	4.6	3.6
8/11/2021	5.9	3.6
11/3/2021	4.8	3.6
Illinois R. at Morris		
2/10/2021	8.3	3.6
4/28/2021	6.0	3.6
8/11/2021	5.0	3.6
11/3/2021	<MDC	3.6
Well at Dresden Lock & Dam		
2/10/2021	15.3	3.6
4/28/2021	13.1	3.6
8/11/2021	14.5	3.6
11/3/2021	13.0	3.6

Gamma Spectroscopy Results for Other Radionuclides in Water - Dresden
Results are in picocuries per liter (pCi/L)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		I-131		Mn-54		Nb-95		Zn-65		Zr-95	
Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC
Des Plaines R. at Channahon																								
2/10/2021	<MDC	40.0	<MDC	28.4	<MDC	5.0	<MDC	5.1	<MDC	5.3	<MDC	5.5	<MDC	11.4	<MDC	19.3	<MDC	4.8	<MDC	7.0	<MDC	11.5	<MDC	11.3
4/28/2021	<MDC	40.0	<MDC	28.4	<MDC	5.0	<MDC	5.1	<MDC	5.3	<MDC	5.5	<MDC	11.4	<MDC	19.3	<MDC	4.8	<MDC	7.0	<MDC	11.5	<MDC	11.3
8/11/2021	<MDC	40.0	<MDC	28.4	<MDC	5.0	<MDC	5.1	<MDC	5.3	<MDC	5.5	<MDC	11.4	<MDC	19.3	<MDC	4.8	<MDC	7.0	<MDC	11.5	<MDC	11.3
11/3/2021	<MDC	40.0	<MDC	28.4	<MDC	5.0	<MDC	5.1	<MDC	5.3	<MDC	5.5	<MDC	11.4	<MDC	19.3	<MDC	4.8	<MDC	7.0	<MDC	11.5	<MDC	11.3
Des Plaines R. at McKinley Woods																								
4/28/2021	<MDC	40.0	<MDC	28.4	<MDC	5.0	<MDC	5.1	<MDC	5.3	<MDC	5.5	<MDC	11.4	<MDC	19.3	<MDC	4.8	<MDC	7.0	<MDC	11.5	<MDC	11.3
8/11/2021	<MDC	40.0	<MDC	28.4	<MDC	5.0	<MDC	5.1	<MDC	5.3	<MDC	5.5	<MDC	11.4	<MDC	19.3	<MDC	4.8	<MDC	7.0	<MDC	11.5	<MDC	11.3
Heideke Lake																								
4/28/2021	<MDC	40.0	<MDC	28.4	<MDC	5.0	<MDC	5.1	<MDC	5.3	<MDC	5.5	<MDC	11.4	<MDC	19.3	<MDC	4.8	<MDC	7.0	<MDC	11.5	<MDC	11.3
8/11/2021	<MDC	40.0	<MDC	28.4	<MDC	5.0	<MDC	5.1	<MDC	5.3	<MDC	5.5	<MDC	11.4	<MDC	19.3	<MDC	4.8	<MDC	7.0	<MDC	11.5	<MDC	11.3
I & M Canal at Channahon																								
4/28/2021	<MDC	40.0	<MDC	28.4	<MDC	5.0	<MDC	5.1	<MDC	5.3	<MDC	5.5	<MDC	11.4	<MDC	19.3	<MDC	4.8	<MDC	7.0	<MDC	11.5	<MDC	11.3
8/11/2021	<MDC	40.0	<MDC	28.4	<MDC	5.0	<MDC	5.1	<MDC	5.3	<MDC	5.5	<MDC	11.4	<MDC	19.3	<MDC	4.8	<MDC	7.0	<MDC	11.5	<MDC	11.3
11/3/2021	<MDC	40.0	<MDC	28.4	<MDC	5.0	<MDC	5.1	<MDC	5.3	<MDC	5.5	<MDC	11.4	<MDC	19.3	<MDC	4.8	<MDC	7.0	<MDC	11.5	<MDC	11.3
Illinois R. at Dresden Lock & Dam																								
2/10/2021	<MDC	40.0	<MDC	28.4	<MDC	5.0	<MDC	5.1	<MDC	5.3	<MDC	5.5	<MDC	11.4	<MDC	19.3	<MDC	4.8	<MDC	7.0	<MDC	11.5	<MDC	11.3
4/28/2021	<MDC	40.0	<MDC	28.4	<MDC	5.0	<MDC	5.1	<MDC	5.3	<MDC	5.5	<MDC	11.4	<MDC	19.3	<MDC	4.8	<MDC	7.0	<MDC	11.5	<MDC	11.3
8/11/2021	<MDC	40.0	<MDC	28.4	<MDC	5.0	<MDC	5.1	<MDC	5.3	<MDC	5.5	<MDC	11.4	<MDC	19.3	<MDC	4.8	<MDC	7.0	<MDC	11.5	<MDC	11.3
11/3/2021	<MDC	40.0	<MDC	28.4	<MDC	5.0	<MDC	5.1	<MDC	5.3	<MDC	5.5	<MDC	11.4	<MDC	19.3	<MDC	4.8	<MDC	7.0	<MDC	11.5	<MDC	11.3
Illinois R. at Morris																								
2/10/2021	<MDC	40.0	<MDC	28.4	<MDC	5.0	<MDC	5.1	<MDC	5.3	<MDC	5.5	<MDC	11.4	<MDC	19.3	<MDC	4.8	<MDC	7.0	<MDC	11.5	<MDC	11.3
4/28/2021	<MDC	40.0	<MDC	28.4	<MDC	5.0	<MDC	5.1	<MDC	5.3	<MDC	5.5	<MDC	11.4	<MDC	19.3	<MDC	4.8	<MDC	7.0	<MDC	11.5	<MDC	11.3
8/11/2021	<MDC	40.0	<MDC	28.4	<MDC	5.0	<MDC	5.1	<MDC	5.3	<MDC	5.5	<MDC	11.4	<MDC	19.3	<MDC	4.8	<MDC	7.0	<MDC	11.5	<MDC	11.3
11/3/2021	<MDC	40.0	<MDC	28.4	<MDC	5.0	<MDC	5.1	<MDC	5.3	<MDC	5.5	<MDC	11.4	<MDC	19.3	<MDC	4.8	<MDC	7.0	<MDC	11.5	<MDC	11.3
Well at Dresden Lock & Dam																								
2/10/2021	<MDC	40.0	<MDC	28.4	<MDC	5.0	<MDC	5.1	<MDC	5.3	<MDC	5.5	<MDC	11.4	<MDC	19.3	<MDC	4.8	<MDC	7.0	<MDC	11.5	<MDC	11.3
4/28/2021	<MDC	40.0	<MDC	28.4	<MDC	5.0	<MDC	5.1	<MDC	5.3	<MDC	5.5	<MDC	11.4	<MDC	19.3	<MDC	4.8	<MDC	7.0	<MDC	11.5	<MDC	11.3
8/11/2021	<MDC	40.0	<MDC	28.4	<MDC	5.0	<MDC	5.1	<MDC	5.3	<MDC	5.5	<MDC	11.4	<MDC	19.3	<MDC	4.8	<MDC	7.0	<MDC	11.5	<MDC	11.3
11/3/2021	<MDC	40.0	<MDC	28.4	<MDC	5.0	<MDC	5.1	<MDC	5.3	<MDC	5.5	<MDC	11.4	<MDC	19.3	<MDC	4.8	<MDC	7.0	<MDC	11.5	<MDC	11.3

Gamma Spectroscopy Results for Radionuclides in Soil (Migration) - Dresden
Results are in picocuries per gram (pCi/g)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		Mn-54		Nb-95		Zn-65		Zr-95	
	Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result
Heideke Lake																						
4/28/2021	<MDC	24.60	<MDC	0.24	<MDC	0.07	<MDC	0.04	<MDC	0.03	0.09	0.04	<MDC	0.31	<MDC	0.04	<MDC	0.26	<MDC	0.09	<MDC	0.15
8/11/2021	<MDC	24.60	<MDC	0.24	<MDC	0.07	<MDC	0.04	<MDC	0.03	0.06	0.04	<MDC	0.31	<MDC	0.04	<MDC	0.26	<MDC	0.09	<MDC	0.15
Minooka Community High School																						
4/28/2021	<MDC	24.60	<MDC	0.24	<MDC	0.07	<MDC	0.04	<MDC	0.03	<MDC	0.04	<MDC	0.31	<MDC	0.04	<MDC	0.26	<MDC	0.09	<MDC	0.15
8/11/2021	<MDC	24.60	<MDC	0.24	<MDC	0.07	<MDC	0.04	<MDC	0.03	0.06	0.04	<MDC	0.31	<MDC	0.04	<MDC	0.26	<MDC	0.09	<MDC	0.15

Gamma Spectroscopy Results for Radionuclides in Soil (Deposition) - Dresden
Results are in picocuries per gram (pCi/g)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		Mn-54		Nb-95		Zn-65		Zr-95	
	Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result
Heideke Lake																						
4/28/2021	<MDC	23.90	<MDC	0.23	<MDC	0.06	<MDC	0.03	<MDC	0.05	0.08	0.03	<MDC	0.26	<MDC	0.04	<MDC	0.21	<MDC	0.10	<MDC	0.14
8/11/2021	<MDC	23.90	<MDC	0.23	<MDC	0.06	<MDC	0.03	<MDC	0.05	0.07	0.03	<MDC	0.26	<MDC	0.04	<MDC	0.21	<MDC	0.10	<MDC	0.14
Minooka Community High School																						
4/28/2021	<MDC	23.90	<MDC	0.23	<MDC	0.06	<MDC	0.03	<MDC	0.05	<MDC	0.03	<MDC	0.26	<MDC	0.04	<MDC	0.21	<MDC	0.10	<MDC	0.14
8/11/2021	<MDC	23.90	<MDC	0.23	<MDC	0.06	<MDC	0.03	<MDC	0.05	0.04	0.03	<MDC	0.26	<MDC	0.04	<MDC	0.21	<MDC	0.10	<MDC	0.14

Gamma Spectroscopy Results for Radionuclides in Sediment - Dresden
Results are in picocuries per gram (pCi/g)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		Mn-54		Nb-95		Zn-65		Zr-95			
	Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	
Des Plaines R. at Channahon																								
4/28/2021	<MDC	12.80	<MDC	0.14	<MDC	0.07	<MDC	0.04	<MDC	0.03	<MDC	0.03	<MDC	0.24	<MDC	0.04	<MDC	0.21	<MDC	0.10	<MDC	0.14		
8/11/2021	<MDC	12.80	<MDC	0.14	<MDC	0.07	<MDC	0.04	<MDC	0.03	<MDC	0.03	<MDC	0.24	<MDC	0.04	<MDC	0.21	<MDC	0.10	<MDC	0.14		
Illinois R. at Dresden Lock & Dam																								
4/28/2021	<MDC	12.80	<MDC	0.14	<MDC	0.07	<MDC	0.04	<MDC	0.03	0.05	0.03	<MDC	0.24	<MDC	0.04	<MDC	0.21	<MDC	0.10	<MDC	0.14		

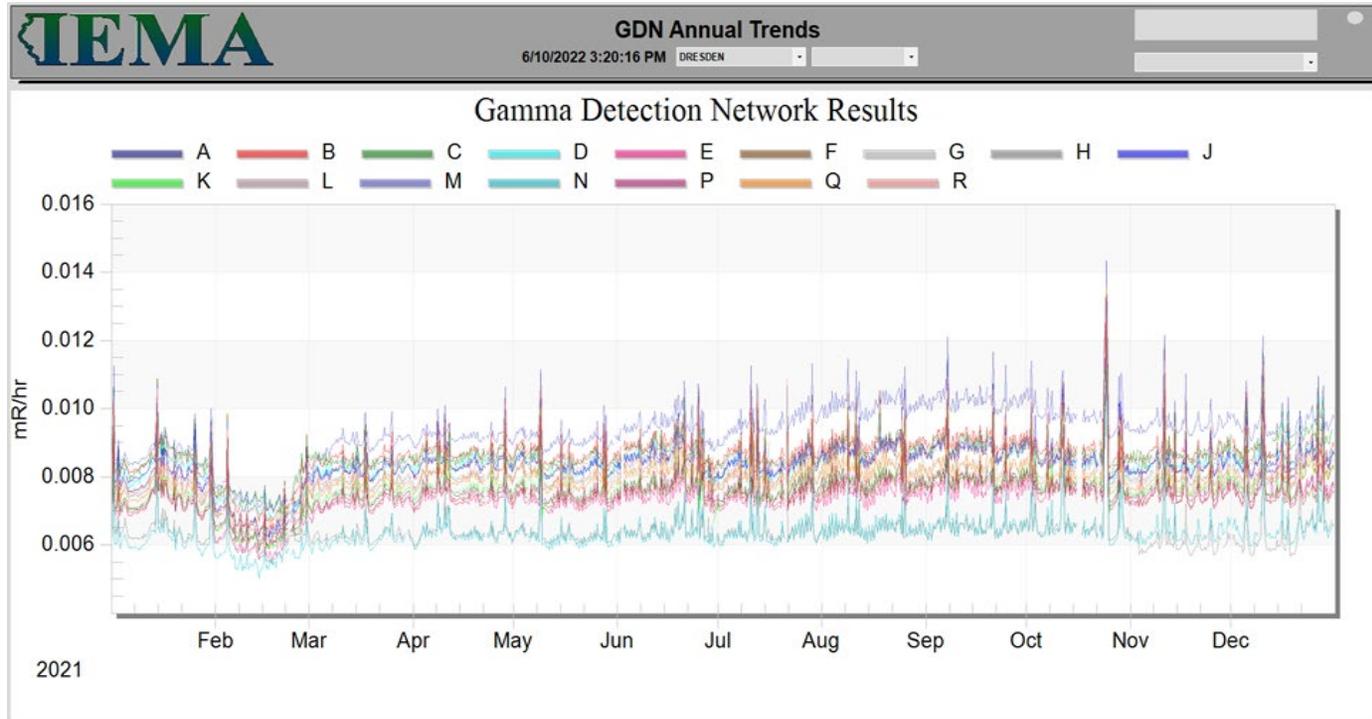
Gamma Spectroscopy Results for Radionuclides in Vegetation - Dresden
Results are in picocuries per gram (pCi/g)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		I-131		Mn-54		Nb-95		Zn-65		Zr-95			
	Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	
Heideke Lake																										
4/28/2021	<MDC	22.4	<MDC	0.3	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.5	<MDC	87.0	<MDC	0.1	<MDC	0.3	<MDC	0.2	<MDC	0.3		
8/11/2021	<MDC	22.4	<MDC	0.3	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.5	<MDC	87.0	<MDC	0.1	<MDC	0.3	<MDC	0.2	<MDC	0.3		
Minooka Community High School																										
4/28/2021	<MDC	22.4	<MDC	0.3	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.5	<MDC	87.0	<MDC	0.1	<MDC	0.3	<MDC	0.2	<MDC	0.3		
8/11/2021	<MDC	22.4	<MDC	0.3	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.5	<MDC	87.0	<MDC	0.1	<MDC	0.3	<MDC	0.2	<MDC	0.3		

Gamma Spectroscopy Results for Radionuclides in Fish - Dresden
Results are in picocuries per kilogram (pCi/kg)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		I-131		Mn-54		Nb-95		Zn-65		Zr-95			
	Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	
Illinois River (Bottom Feeder)																										
11/3/2021	<MDC	1760	<MDC	199	<MDC	55	<MDC	36	<MDC	40	<MDC	39	<MDC	142	<MDC	2200	<MDC	39	<MDC	89	<MDC	97	<MDC	104		
Illinois River (Top Feeder)																										
11/3/2021	<MDC	1760	<MDC	199	<MDC	55	<MDC	36	<MDC	40	<MDC	39	<MDC	142	<MDC	2200	<MDC	39	<MDC	89	<MDC	97	<MDC	104		

Gamma Detection Network Results – Dresden
Results are in milliroentgen per hour (mR/hr)



Summary of Ambient Gamma Results - Dresden

	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual Exposure
Location	mR/quarter	mR/quarter	mR/quarter	mR/quarter	mR/year
DR-001	6.7	7.9	10.1	8.0	32.7
DR-002	5.2	5.6	7.7	7.4	25.9
DR-003	6.4	5.0	8.4	7.5	27.3
DR-004	5.3	7.5	10.0	8.4	31.2
DR-007	6.0	7.3	7.6	6.0	26.9
DR-013	9.0	7.7	10.7	6.8	34.2
DR-021	6.5	3.7	8.8	4.2	23.2
DR-022	7.8	6.9	9.1	4.5	28.3
DR-023	4.8	3.2	7.4	7.6	23.0
DR-026	4.7	3.4	7.0	5.6	20.6
DR-027	5.7	7.2	8.0	4.1	25.0
DR-031	6.0	7.9	8.6	9.3	31.8
DR-033	3.0			4.4	14.7
DR-036	5.3	7.8	10.1	5.5	28.7
DR-039	5.5	9.3	14.2	9.8	38.9
DR-040	6.9	10.4	14.2	10.1	41.6
DR-041	6.1	8.7	10.9	7.3	33.0
DR-043	6.3	8.7	12.5	12.0	39.5
DR-046	7.5	3.1	6.7	6.7	23.9
DR-048	7.8		11.7	11.1	40.8
DR-050	4.7	6.5	8.4	7.1	26.7
DR-052	6.8	7.0	11.3	10.2	35.2
DR-053	4.0	7.5	7.5	3.7	22.8
DR-056	9.1	7.7	10.1	10.6	37.5
DR-060	6.9	7.2	10.7	5.3	30.1
DR-062	6.2	14.0	10.0	7.0	37.2
DR-065	8.6	5.2	15.0	8.8	37.7
DR-066	4.7	7.2	7.9	7.2	26.9
DR-068	5.6	7.2	9.2	9.7	31.8
DR-070	10.1	2.9	10.2	9.8	33.1
DR-073	10.4	7.1	6.6		32.2
DR-075	4.2		13.0	10.6	37.0
DR-076	4.3	6.9	7.8		25.3

Summary of Ambient Gamma Results – Dresden (Continued)

	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual Exposure
Location	mR/quarter	mR/quarter	mR/quarter	mR/quarter	mR/year
DR-077	7.5		7.7	8.1	31.1
DR-078	5.7	9.7	12.0	11.8	39.1
DR-080	8.4	7.6	12.8	11.4	40.2
DR-081	7.9	9.1	9.3	11.0	37.3
DR-082	6.1	5.9	13.0	8.0	32.9
DR-083	6.3	9.5	7.6	3.4	26.8
DR-084	4.9	6.4	10.0	5.2	26.5
DR-087	4.0	6.1			20.3
DR-089	4.7	6.6	9.6	5.8	26.6
DR-091	6.4	6.9	6.5	5.7	25.5
DR-093	9.9	6.2	8.4	6.1	30.6
DR-095	5.0	6.0	8.3	4.5	23.8
DR-096	6.6	9.5	10.3	6.5	32.8
DR-097	8.6	6.1	12.1	9.3	36.1
DR-098	8.3	9.2	8.4	3.9	29.8
DR-099	12.0	5.7	12.0	9.9	39.5
DR-100	3.5	11.3	7.9	10.0	32.7
DR-102	6.8	10.9	12.3	12.6	42.5
DR-103	11.5	8.9	13.0	11.9	45.2
DR-104	9.4	5.0	15.5	8.9	38.8
DR-105	7.2	8.2	10.1	8.5	33.9
DR-107	9.5		11.3	8.6	39.2
DR-108	7.8	7.9	14.1	10.4	40.2
DR-109	5.5	4.8	11.1	10.1	31.5
DR-110	2.7	4.5	2.2		12.4
DR-111	7.0	9.2	8.4	5.8	30.3
DR-113	8.9	10.9	15.1	10.0	45.0
DR-114	7.7	11.2	13.7	9.0	41.7
DR-115	8.5	3.7	11.1	9.8	33.0
DR-116	4.5	9.5	11.0	6.3	31.3
DR-117	6.0		8.9	5.7	27.4
DR-118		8.0	8.9		33.8
DR-119	8.1	0.0	9.3	6.5	23.9

Summary of Ambient Gamma Results – Dresden (Continued)

Location	Quarter 1 mR/quarter	Quarter 2 mR/quarter	Quarter 3 mR/quarter	Quarter 4 mR/quarter	Annual Exposure mR/year
DR-A	7.3	6.7	12.5	10.6	37.1
DR-B	6.7	8.5	11.3	9.6	36.1
DR-C	11.3	11.2	11.0	14.2	47.7
DR-D	10.0	10.2	9.4	8.7	38.2
DR-E	9.8	6.4	7.9	7.6	31.8
DR-F	6.5	5.3	10.1	7.2	29.1
DR-G	8.2	6.6	5.3	8.7	28.7
DR-H	7.0	6.9	9.2	4.7	27.8
DR-J	7.9	8.6	9.0	9.6	35.1
DR-K	5.9	5.5	10.0	7.6	28.9
DR-L	6.8	7.0	15.4	7.8	37.0
DR-M	14.4	7.6	7.6	9.2	38.9
DR-N	4.9	2.8	9.9	3.9	21.6
DR-P	5.8	7.4	9.8	5.6	28.7
DR-Q	5.0	6.7	11.6	9.5	32.8
DR-R	8.6	9.0		7.9	33.9

Blanks in the table indicate that dosimeters were missing at the end of the quarter.
 Annual Exposure column based on averages of all available data.
 Quarter length is estimated to be 91.25 days.

LaSalle Nuclear Power Station

The LaSalle NPS, consisting of two 3,546 Megawatt BWRs, is owned and operated by Constellation Energy and located in LaSalle County, Illinois. Unit 1 began operation on March 16, 1982, and unit 2 on December 2, 1983. The site is located approximately 75 miles southwest of Chicago, Illinois.



Liquid effluents from the LaSalle station are released to the LaSalle cooling lake in accordance to release limits governed by the station's license with the NRC and the station's IEPA NPDES permit, and from there to the Illinois River at a point 3.5 miles north of the station. The discharge point is approximately 20 miles downriver of the Dresden NPS, samples taken downstream of Dresden station are effectively upstream controls for the LaSalle station. No liquid effluents were discharged in 2021.

Figures 18-20 provide an overview of all sampling and monitoring locations in the vicinity of the LaSalle NPS (yellow star).

Significant Events or Changes for 2021

No significant events or changes for 2021.

Sampling and Monitoring Results

Water Sampling Results

Detectable levels of tritium were found in several surface water samples taken in the first, second, and fourth quarters of 2021. The elevated levels are likely attributable to the routine liquid effluent releases from the Braidwood station. All tritium levels were well below the Drinking Water Standards established by the US EPA and IEPA.

Results from gross beta analysis indicate that the established MDC was met at most water sampling locations. Concentrations above MDC are routinely found in background samples collected. The concentrations seen at many of the water sampling locations for the LaSalle NPS were consistent with background levels. However, concentrations found at some locations were above typical background levels and can likely be attributed to the routine liquid effluent releases from the Braidwood station. All sample results for gross beta remained well below the established US EPA and IEPA standards.

Results from total strontium and gamma spectroscopy analysis indicated no concentrations above the established MDCs.

Soil Sampling Results

Cesium-137 in concentrations greater than the established MDC was detected but was consistent with soil concentrations historically found from atmospheric nuclear weapons testing and with concentrations found at background sampling locations.

A Niobium-95 concentration above the established MDC was found in a migration soil sample at the Illini State Park sampling location during the second quarter sampling. The result from the sample collected at that location in the third quarter was below the established MDC.

All other gamma spectroscopy results for soil samples were below the established MDC.

Sediment Sampling Results

Cesium-137 in concentrations greater than the established MDC was detected but was consistent with sediment concentrations historically found from atmospheric nuclear weapons testing and with concentrations found at background sampling locations. All other gamma spectroscopy results for sediment samples were below the established MDC.

All other gamma spectroscopy results for sediment samples were below the established MDC.

Vegetation Sampling Results

Gamma spectroscopy results for vegetation samples indicated no concentrations above the established MDC.

Fish Sampling Results

Gamma spectroscopy results for fish samples indicated no concentrations above the established MDC.

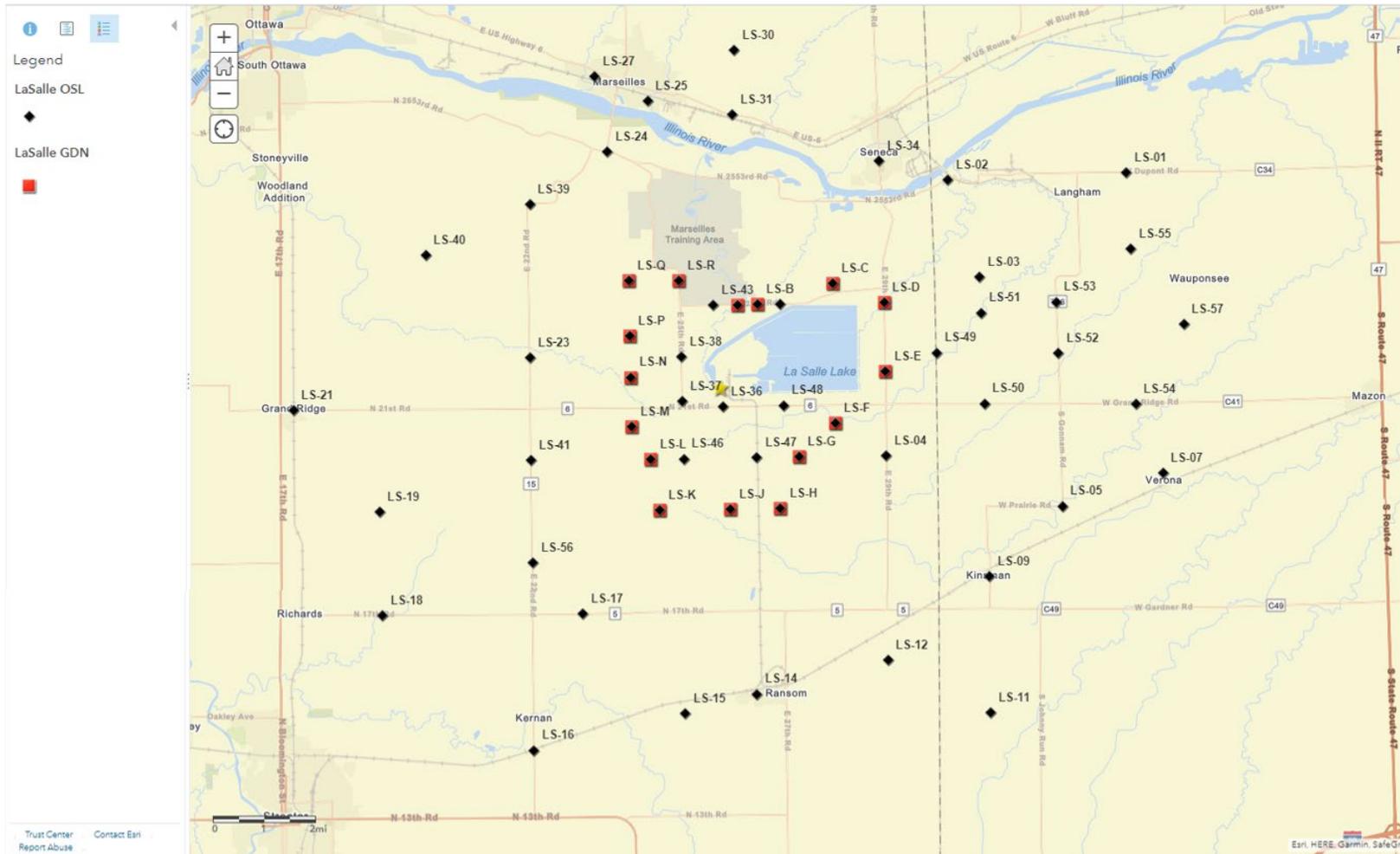
Direct Radiation Monitoring Results

The ambient gamma monitoring results from deployed OSLs were comparable to historical data and to results found at the background monitoring locations at Sangchris Lake State Park near Kincaid, Illinois.

GDN network results were consistent with historical data.

LaSalle Maps of Monitoring and Sampling Locations

Figure 18. OSL and GDN Monitoring Locations – LaSalle

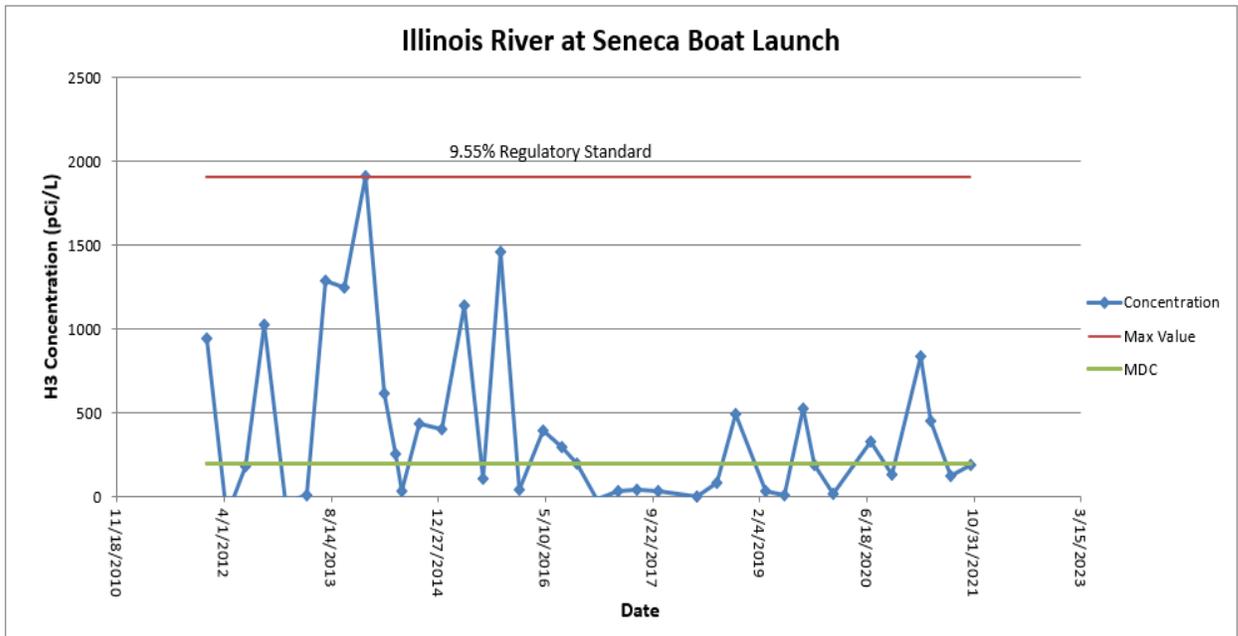
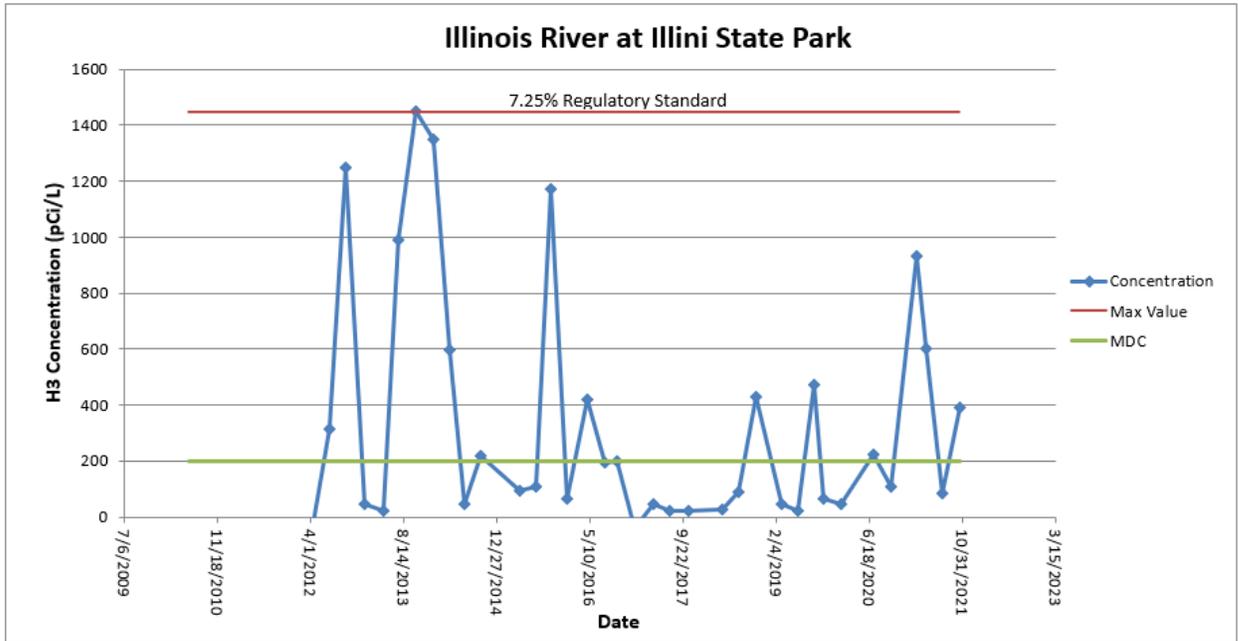


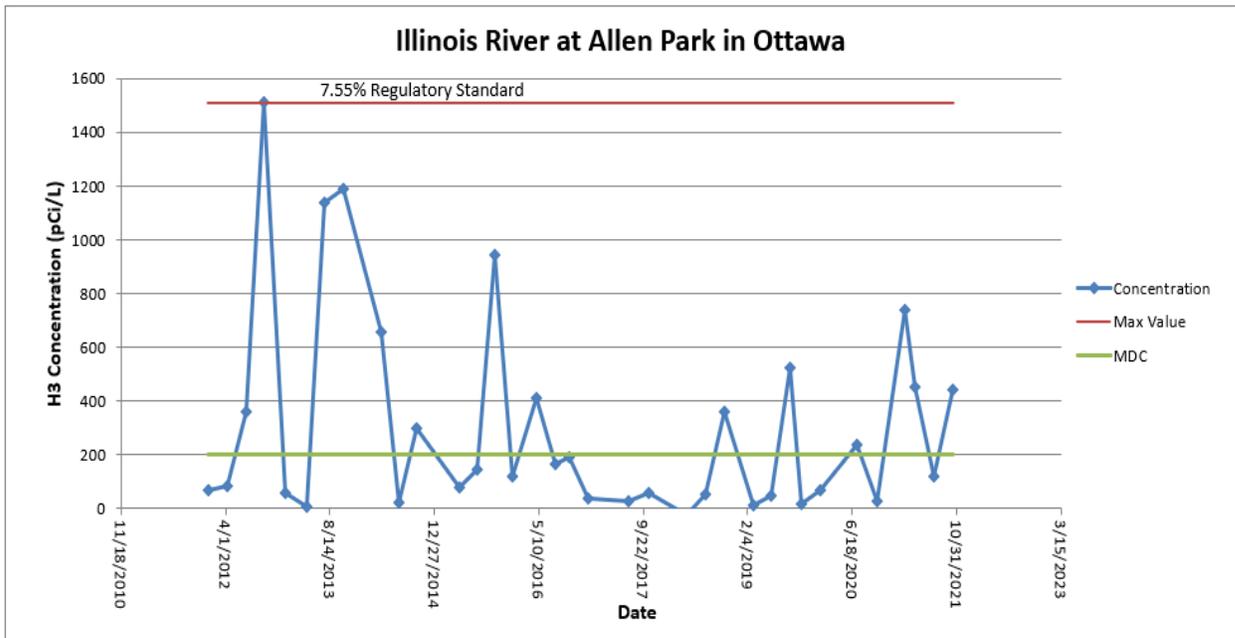
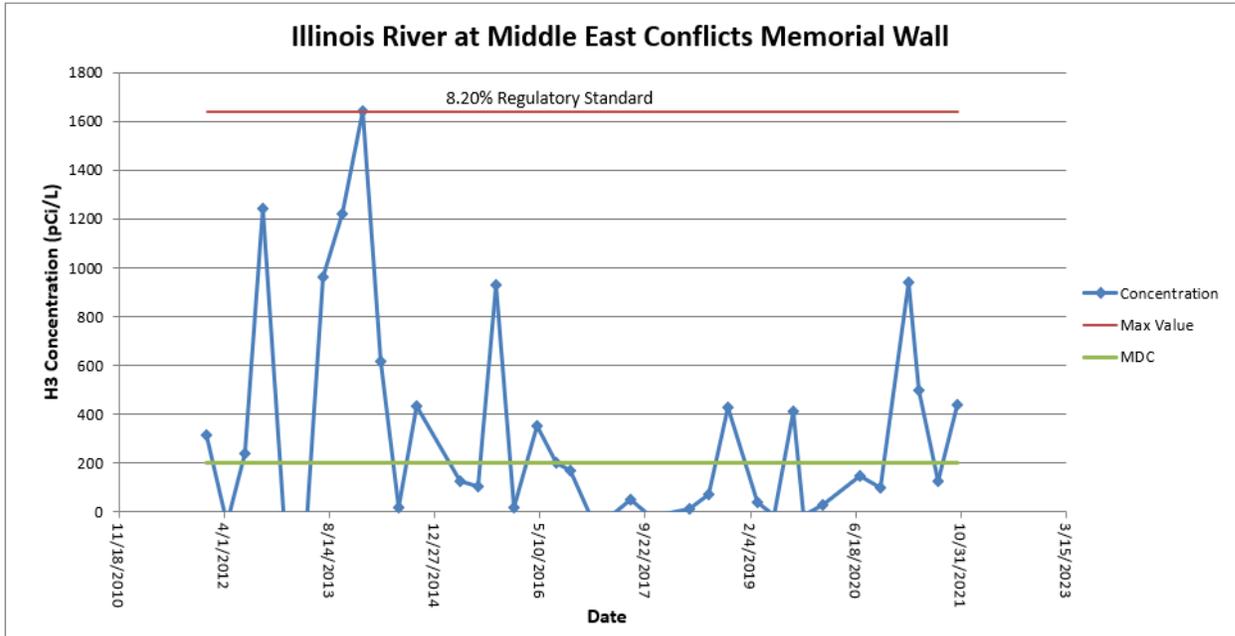
LaSalle Sample Result Tables and Graphs

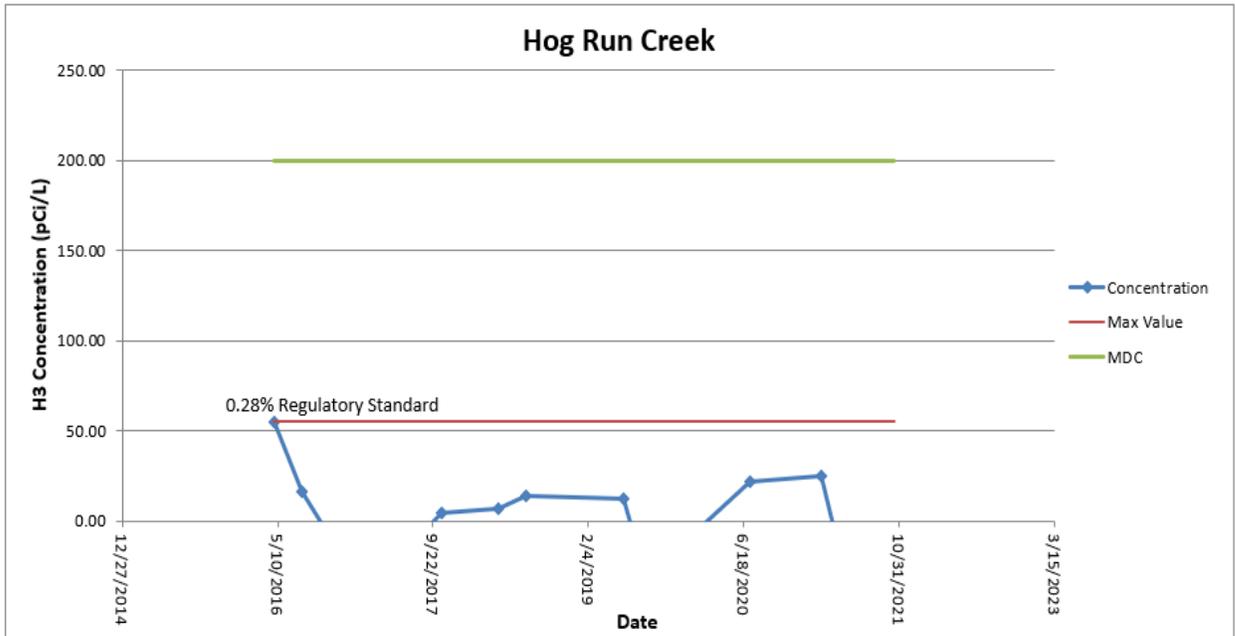
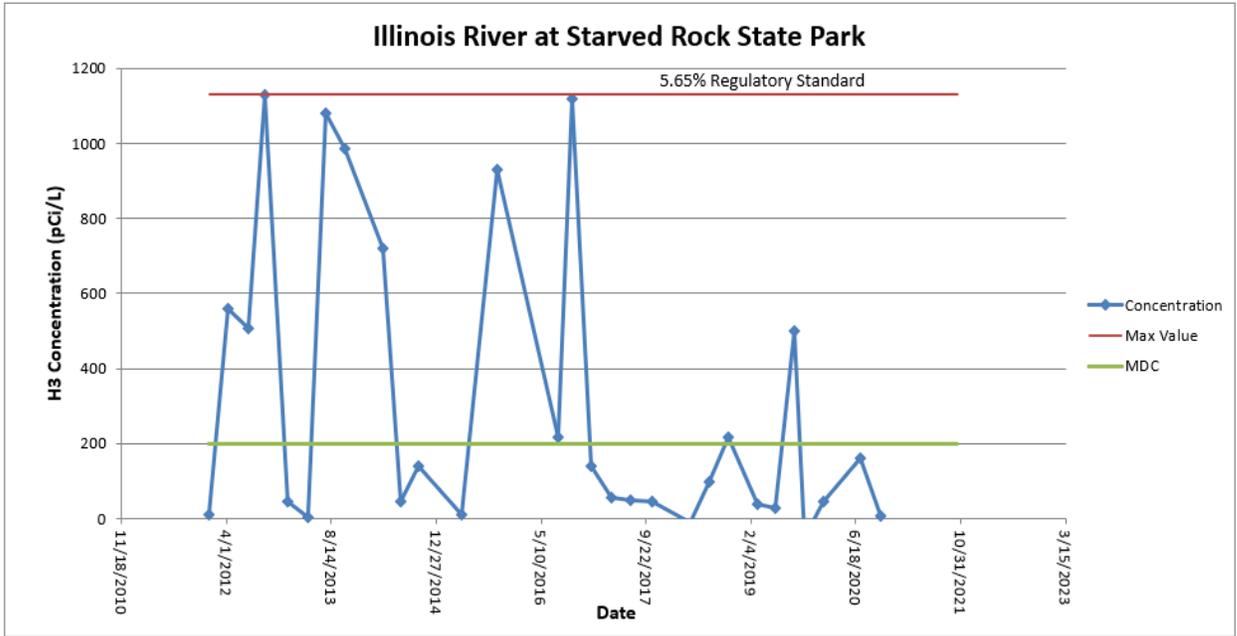
Tritium (H-3) in Water Results - LaSalle
Results are in picocuries per liter (pCi/L)

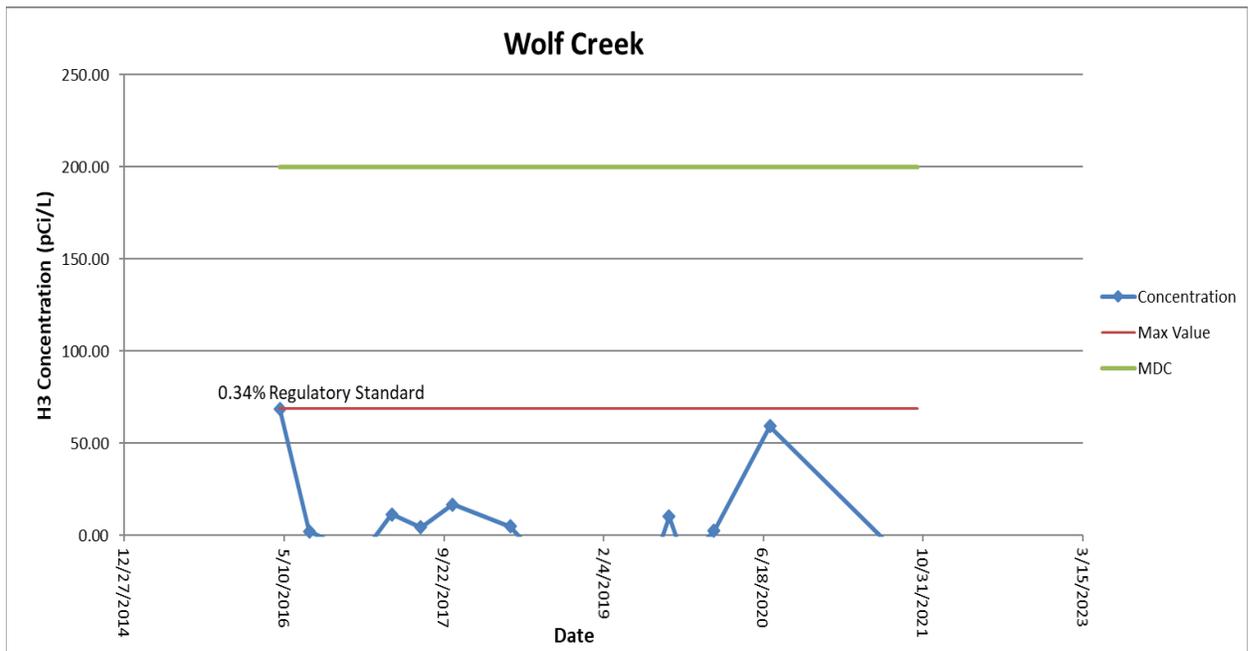
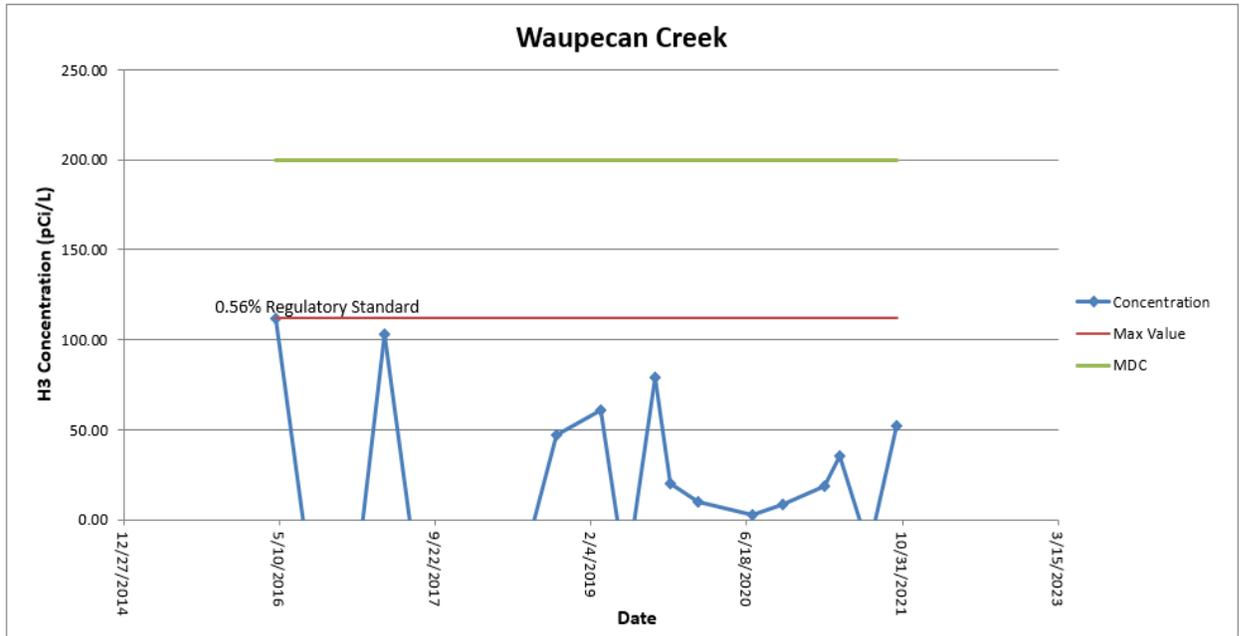
Location	H-3	
	Date	Result MDC
Allen Park, South Ottawa		
2/24/2021	740	200
4/14/2021	452	200
7/14/2021	<MDC	200
10/14/2021	444	200
Hog Run Creek near LS-49		
2/24/2021	<MDC	200
4/14/2021	<MDC	200
7/14/2021	<MDC	200
10/14/2021	<MDC	200
Illinois R. at Illini State Park		
2/24/2021	932	200
4/14/2021	602	200
7/14/2021	<MDC	200
10/14/2021	390	200
Middle East Conflicts Wall, Marseilles		
2/24/2021	939	200
4/14/2021	500	200
7/14/2021	<MDC	200
10/14/2021	439	200
Seneca, Illinois Boat Launch		
2/24/2021	841	200
4/14/2021	450	200
7/14/2021	<MDC	200
10/14/2021	<MDC	200
Starved Rock State Park		
2/24/2021	767	200
4/14/2021	<MDC	200
7/14/2021	<MDC	200
10/14/2021	226	200
Waupecan Creek near LS-5		
2/24/2021	<MDC	200
4/14/2021	<MDC	200
7/14/2021	<MDC	200
10/14/2021	<MDC	200
Wolf Creek near LS-18		
7/14/2021	<MDC	200
10/14/2021	<MDC	200

Trending Graphs for Tritium (H-3) in Water - LaSalle
 (Max value compared to IEPA and US EPA Class regulatory standard of 20,000 pCi/L)









Total Strontium in Water Results - LaSalle
Results are in picocuries per liter (pCi/L)

Location	Strontium	
	Date	Result MDC
Illinois R. at Illini State Park		
4/14/2021	<MDC	0.5

Results for Gross Beta Screening of Water - LaSalle
Results are in picocuries per liter (pCi/L)

Location	Beta	
	Date	Result MDC
Allen Park, South Ottawa		
2/24/2021	4.0	3.6
4/14/2021	6.3	3.6
7/14/2021	4.3	3.6
10/14/2021	5.3	3.6
Hog Run Creek near LS-49		
2/24/2021	<MDC	3.6
4/14/2021	<MDC	3.6
7/14/2021	<MDC	3.6
10/14/2021	<MDC	3.6
Illinois R. at Illini State Park		
2/24/2021	5.5	3.6
4/14/2021	5.0	3.6
7/14/2021	3.6	3.6
10/14/2021	5.2	3.6
Middle East Conflicts Wall Memorial, Marseilles		
2/24/2021	4.7	3.6
4/14/2021	7.4	3.6
7/14/2021	4.2	3.6
10/14/2021	4.7	3.6
Seneca, Illinois Boat Launch		
2/24/2021	5.9	3.6
4/14/2021	7.0	3.6
7/14/2021	<MDC	3.6
10/14/2021	6.1	3.6
Starved Rock State Park		
2/24/2021	5.3	3.6
4/14/2021	5.7	3.6
7/14/2021	3.8	3.6
10/14/2021	6.3	3.6
Waupecan Creek near LS-5		
2/24/2021	<MDC	3.6
4/14/2021	<MDC	3.6
7/14/2021	5.0	3.6
10/14/2021	<MDC	3.6
Wolf Creek near LS-18		
7/14/2021	<MDC	3.6
10/14/2021	<MDC	3.6

Gamma Spectroscopy Results for Radionuclides in Soil (Migration) - LaSalle
Results are in picocuries per gram (pCi/g)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		Mn-54		Nb-95		Zn-65		Zr-95	
	Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	
Illini State Park																						
4/14/2021	<MDC	26.20	<MDC	0.22	<MDC	0.07	<MDC	0.03	<MDC	0.03	0.11	0.04	<MDC	0.30	<MDC	0.04	0.41	0.27	<MDC	0.09	<MDC	0.16
7/14/2021	<MDC	26.20	<MDC	0.22	<MDC	0.07	<MDC	0.03	<MDC	0.03	0.24	0.04	<MDC	0.30	<MDC	0.04	<MDC	0.27	<MDC	0.09	<MDC	0.16
Sunbury Railroad Preserve																						
4/14/2021	<MDC	26.20	<MDC	0.22	<MDC	0.07	<MDC	0.03	<MDC	0.03	0.29	0.04	<MDC	0.30	<MDC	0.04	<MDC	0.27	<MDC	0.09	<MDC	0.16
7/14/2021	<MDC	26.20	<MDC	0.22	<MDC	0.07	<MDC	0.03	<MDC	0.03	0.33	0.04	<MDC	0.30	<MDC	0.04	<MDC	0.27	<MDC	0.09	<MDC	0.16
Wolf Creek near LS-18																						
7/14/2021	<MDC	26.20	<MDC	0.22	<MDC	0.07	<MDC	0.03	<MDC	0.03	0.09	0.04	<MDC	0.30	<MDC	0.04	<MDC	0.27	<MDC	0.09	<MDC	0.16

Gamma Spectroscopy Results for Radionuclides in Soil (Deposition) - LaSalle
Results are in picocuries per gram (pCi/g)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		Mn-54		Nb-95		Zn-65		Zr-95	
	Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	
Illini State Park																						
4/14/2021	<MDC	28.90	<MDC	0.26	<MDC	0.09	<MDC	0.04	<MDC	0.04	0.11	0.06	<MDC	0.33	<MDC	0.04	<MDC	0.31	<MDC	0.11	<MDC	0.19
7/14/2021	<MDC	28.90	<MDC	0.26	<MDC	0.09	<MDC	0.04	<MDC	0.04	0.20	0.06	<MDC	0.33	<MDC	0.04	<MDC	0.31	<MDC	0.11	<MDC	0.19
Sunbury Railroad Preserve																						
4/14/2021	<MDC	28.90	<MDC	0.26	<MDC	0.09	<MDC	0.04	<MDC	0.04	0.23	0.06	<MDC	0.33	<MDC	0.04	<MDC	0.31	<MDC	0.11	<MDC	0.19
7/14/2021	<MDC	28.90	<MDC	0.26	<MDC	0.09	<MDC	0.04	<MDC	0.04	0.31	0.06	<MDC	0.33	<MDC	0.04	<MDC	0.31	<MDC	0.11	<MDC	0.19
Wolf Creek near LS-18																						
7/14/2021	<MDC	28.90	<MDC	0.26	<MDC	0.09	<MDC	0.04	<MDC	0.04	0.09	0.06	<MDC	0.33	<MDC	0.04	<MDC	0.31	<MDC	0.11	<MDC	0.19

Gamma Spectroscopy Results for Radionuclides in Sediment- LaSalle
Results are in picocuries per gram (pCi/g)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		Mn-54		Nb-95		Zn-65		Zr-95	
Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC
Allen Park, South Ottawa																						
4/14/2021	<MDC	26.40	<MDC	0.24	<MDC	0.07	<MDC	0.03	<MDC	0.03	<MDC	0.04	<MDC	0.31	<MDC	0.03	<MDC	0.24	<MDC	0.09	<MDC	0.15
7/14/2021	<MDC	26.40	<MDC	0.24	<MDC	0.07	<MDC	0.03	<MDC	0.03	<MDC	0.04	<MDC	0.31	<MDC	0.03	<MDC	0.24	<MDC	0.09	<MDC	0.15
Middle East Conflicts Wall Memorial, Marseilles																						
4/14/2021	<MDC	26.40	<MDC	0.24	<MDC	0.07	<MDC	0.03	<MDC	0.03	<MDC	0.04	<MDC	0.31	<MDC	0.03	<MDC	0.24	<MDC	0.09	<MDC	0.15
Seneca, Illinois Boat Launch																						
4/14/2021	<MDC	26.40	<MDC	0.24	<MDC	0.07	<MDC	0.03	<MDC	0.03	<MDC	0.04	<MDC	0.31	<MDC	0.03	<MDC	0.24	<MDC	0.09	<MDC	0.15
7/14/2021	<MDC	26.40	<MDC	0.24	<MDC	0.07	<MDC	0.03	<MDC	0.03	<MDC	0.04	<MDC	0.31	<MDC	0.03	<MDC	0.24	<MDC	0.09	<MDC	0.15
Waupecan Creek near LS-5																						
4/14/2021	<MDC	26.40	<MDC	0.24	<MDC	0.07	<MDC	0.03	<MDC	0.03	<MDC	0.04	<MDC	0.31	<MDC	0.03	<MDC	0.24	<MDC	0.09	<MDC	0.15
7/14/2021	<MDC	26.40	<MDC	0.24	<MDC	0.07	<MDC	0.03	<MDC	0.03	0.05	0.04	<MDC	0.31	<MDC	0.03	<MDC	0.24	<MDC	0.09	<MDC	0.15

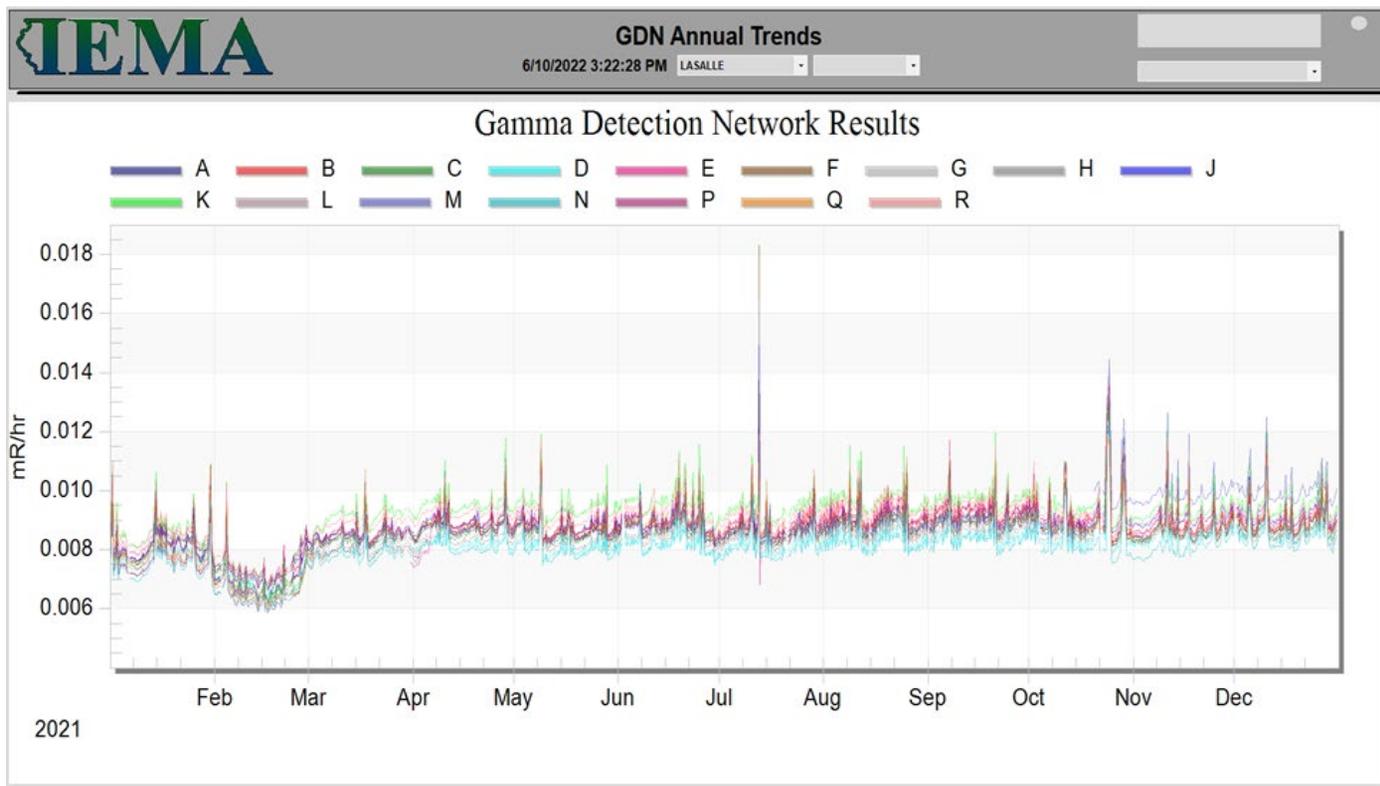
Gamma Spectroscopy Results for Radionuclides in Vegetation - LaSalle
Results are in picocuries per gram (pCi/g)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		I-131		Mn-54		Nb-95		Zn-65		Zr-95			
	Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	
Hog Run Creek near LS-49																										
4/14/2021	<MDC	6.70	<MDC	0.18	<MDC	0.06	<MDC	0.04	<MDC	0.04	<MDC	0.04	<MDC	0.22	<MDC	24.00	<MDC	0.05	<MDC	0.11	<MDC	0.11	<MDC	0.11	<MDC	0.11
7/14/2021	<MDC	6.70	<MDC	0.18	<MDC	0.06	<MDC	0.04	<MDC	0.04	<MDC	0.04	<MDC	0.22	<MDC	24.00	<MDC	0.05	<MDC	0.11	<MDC	0.11	<MDC	0.11	<MDC	0.11
Illini State Park																										
4/14/2021	<MDC	6.70	<MDC	0.18	<MDC	0.06	<MDC	0.04	<MDC	0.04	<MDC	0.04	<MDC	0.22	<MDC	24.00	<MDC	0.05	<MDC	0.11	<MDC	0.11	<MDC	0.11	<MDC	0.11
7/14/2021	<MDC	6.70	<MDC	0.18	<MDC	0.06	<MDC	0.04	<MDC	0.04	<MDC	0.04	<MDC	0.22	<MDC	24.00	<MDC	0.05	<MDC	0.11	<MDC	0.11	<MDC	0.11	<MDC	0.11
Sanbury Railroad Preserve																										
4/14/2021	<MDC	6.70	<MDC	0.18	<MDC	0.06	<MDC	0.04	<MDC	0.04	<MDC	0.04	<MDC	0.22	<MDC	24.00	<MDC	0.05	<MDC	0.11	<MDC	0.11	<MDC	0.11	<MDC	0.11
7/14/2021	<MDC	6.70	<MDC	0.18	<MDC	0.06	<MDC	0.04	<MDC	0.04	<MDC	0.04	<MDC	0.22	<MDC	24.00	<MDC	0.05	<MDC	0.11	<MDC	0.11	<MDC	0.11	<MDC	0.11
Wolf Creek near LS-18																										
7/14/2021	<MDC	6.70	<MDC	0.18	<MDC	0.06	<MDC	0.04	<MDC	0.04	<MDC	0.04	<MDC	0.22	<MDC	24.00	<MDC	0.05	<MDC	0.11	<MDC	0.11	<MDC	0.11	<MDC	0.11

Gamma Spectroscopy Results for Radionuclides in Fish - LaSalle
Results are in picocuries per kilogram (pCi/kg)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		I-131		Mn-54		Nb-95		Zn-65		Zr-95			
	Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	
LaSalle Lake Fish (Bottom Feeder)																										
5/14/2021	<MDC	5000	<MDC	224	<MDC	83	<MDC	56	<MDC	47	<MDC	51	<MDC	229	<MDC	11200	<MDC	58	<MDC	172	<MDC	112	<MDC	165	<MDC	165
LaSalle Lake Fish (Top Feeder)																										
5/14/2021	<MDC	5000	<MDC	224	<MDC	83	<MDC	56	<MDC	47	<MDC	51	<MDC	229	<MDC	11200	<MDC	58	<MDC	172	<MDC	112	<MDC	165	<MDC	165

Gamma Detection Network Results – LaSalle
Results are in milliroentgen per hour (mR/hr)



Summary of Ambient Gamma Results – LaSalle

	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual Exposure
Location	mR/quarter	mR/quarter	mR/quarter	mR/quarter	mR/year
LS-01	7.7	13.6	11.5	7.0	39.9
LS-02	13.1			9.8	45.8
LS-03	4.8	10.2	12.0	10.2	37.3
LS-04	14.7	14.7	12.8		56.4
LS-05	10.4	10.6	10.3	8.6	39.9
LS-07	14.3	12.0	10.1	9.5	45.8
LS-09	6.9	10.3	8.5	7.1	32.8
LS-11	7.6	12.4	12.5	8.9	41.4
LS-12	11.4	11.3	6.9	7.6	37.1
LS-14	9.2	11.5	8.4	6.5	35.6
LS-15	13.3		9.9	10.2	44.5
LS-16	12.5	11.6	7.0	5.8	36.9
LS-17	10.3	13.1	15.1	9.4	48.0
LS-18	9.6	12.5	19.4	6.7	48.2
LS-19	8.2	11.7	9.9	7.9	37.7
LS-21	8.6		9.4	8.2	34.9
LS-23	8.1	12.2	10.8	11.4	42.6
LS-24	6.8	13.3	9.4	10.1	39.7
LS-25	8.4	9.3	12.0	9.2	38.9
LS-27	10.5	10.5		5.8	35.7
LS-30	11.0	12.9	10.4	6.6	41.0
LS-31	8.1	11.0	8.7	4.5	32.3
LS-34	6.7	7.5	8.7	5.5	28.3
LS-36	15.3			7.4	45.4
LS-37	12.9	11.8	11.1	9.8	45.6
LS-38	11.4	11.4	13.7	8.5	44.9
LS-39	10.3	10.8	10.0	8.0	39.1
LS-40	9.2	8.7	9.9	7.7	35.4
LS-41	11.3	13.7	11.3	7.9	44.1
LS-42	11.9	13.6	12.8	10.3	48.6

Summary of Ambient Gamma Results – LaSalle (Continued)

	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual Exposure
Location	mR/quarter	mR/quarter	mR/quarter	mR/quarter	mR/year
LS-43	12.6	13.1	9.2	10.3	45.1
LS-46	13.5	14.9	11.9	7.6	47.8
LS-47	8.2	13.2	8.9	9.1	39.5
LS-48	9.8	12.6	10.7		44.1
LS-49	8.0	12.3	10.9	10.0	41.1
LS-50	6.6	10.9	10.0	10.0	37.6
LS-51	10.4	13.3	11.3	9.6	44.7
LS-52	8.1	11.2	11.2	8.7	39.2
LS-53	13.7	12.5	9.8	9.6	45.6
LS-54	13.9	13.7	9.9	7.9	45.5
LS-55	11.6	13.9	11.2	9.6	46.4
LS-56	12.3	12.2	8.6	10.5	43.5
LS-57		11.8	14.7	8.3	46.5
LS-A	14.6	11.4	13.2	6.8	45.9
LS-B	7.9	12.6	10.0	9.7	40.1
LS-C	11.9	10.5	13.1	8.9	44.4
LS-D	10.8	10.5	9.2	6.0	36.5
LS-E	8.2	8.9	6.7	7.1	30.9
LS-F	12.4	11.5	12.4	7.2	43.5
LS-G	8.0	11.9	8.9	6.8	35.7
LS-H	9.2	11.7	13.0	8.8	42.7
LS-J	12.3	10.9	10.6	8.4	42.3
LS-K	10.5	11.4	9.9	7.2	39.0
LS-L	9.3	12.5	9.6	6.5	37.9
LS-M	12.3	12.6	12.2	12.7	49.8
LS-N	11.5	12.6	11.9	8.2	44.3
LS-P	11.9	14.8	11.4	8.3	46.4
LS-Q	13.5	10.6	8.6	6.4	39.0
LS-R	11.5	9.1	12.1	9.1	41.8

Blanks in the table indicate that dosimeters were missing at the end of the quarter.

Annual Exposure column based on averages of all available data.

Quarter length is estimated to be 91.25 days.

Quad Cities Nuclear Power Station

The Quad Cities NPS, consisting of two 2,957 Megawatt BWRs, is owned and operated by Constellation Energy and located in Rock Island County, Illinois. Unit 1 began operations on March 16, 1972 and unit 2 on December 2, 1973. The site is located near Cordova, Illinois on the Mississippi River.



Liquid effluents from the Quad Cities station may be released to the adjacent Mississippi River in accordance to release limits governed by the station's license with the NRC and the station's IEPA NPDES permit. In 2021, there were 4 liquid effluent batch releases from the Quad Cities station.

Figures 21-23 provide an overview of all sampling and monitoring locations in the vicinity of the Quad Cities NPS (yellow star).

Significant Events or Changes for 2021

No significant events or changes for 2021.

Sampling and Monitoring Results

Water Sampling Results

Water sample analysis for tritium, strontium, and gamma spectroscopy indicated no concentrations above the established MDCs.

Results from gross beta analysis indicated that the established MDC was met at some sampling locations, however the concentrations found were consistent with levels found at background sampling locations.

Soil Sampling Results

Cesium-137 in concentrations greater than the established MDC was detected but was consistent with soil concentrations historically found from atmospheric nuclear weapons testing.

A Zirconium-95 concentration slightly above the established MDC was found in a migration soil sample at the Corner of 150th and 266th sampling location during the third quarter sampling. IEMA will continue to sample and monitor this location for the presence of zirconium-95.

All other gamma spectroscopy results for soil samples were below the established MDC.

Sediment Sampling Results

Gamma spectroscopy results for sediment samples indicated no concentrations above the established MDC.

Vegetation Sampling Results

Gamma spectroscopy results for vegetation samples indicated no concentrations above the established MDC.

Fish Sampling Results

Gamma spectroscopy results for fish samples indicated no concentrations above the established MDC.

Direct Radiation Monitoring Results

The ambient gamma monitoring results from deployed OSLs were comparable to historical data and to results found at the background monitoring locations at Sangchris Lake State Park near Kincaid, Illinois.

GDN network results were consistent with historical data.

Maps of Monitoring and Sampling Locations – Quad Cities

Figure 21. OSL and GDN Monitoring Locations - Quad Cities

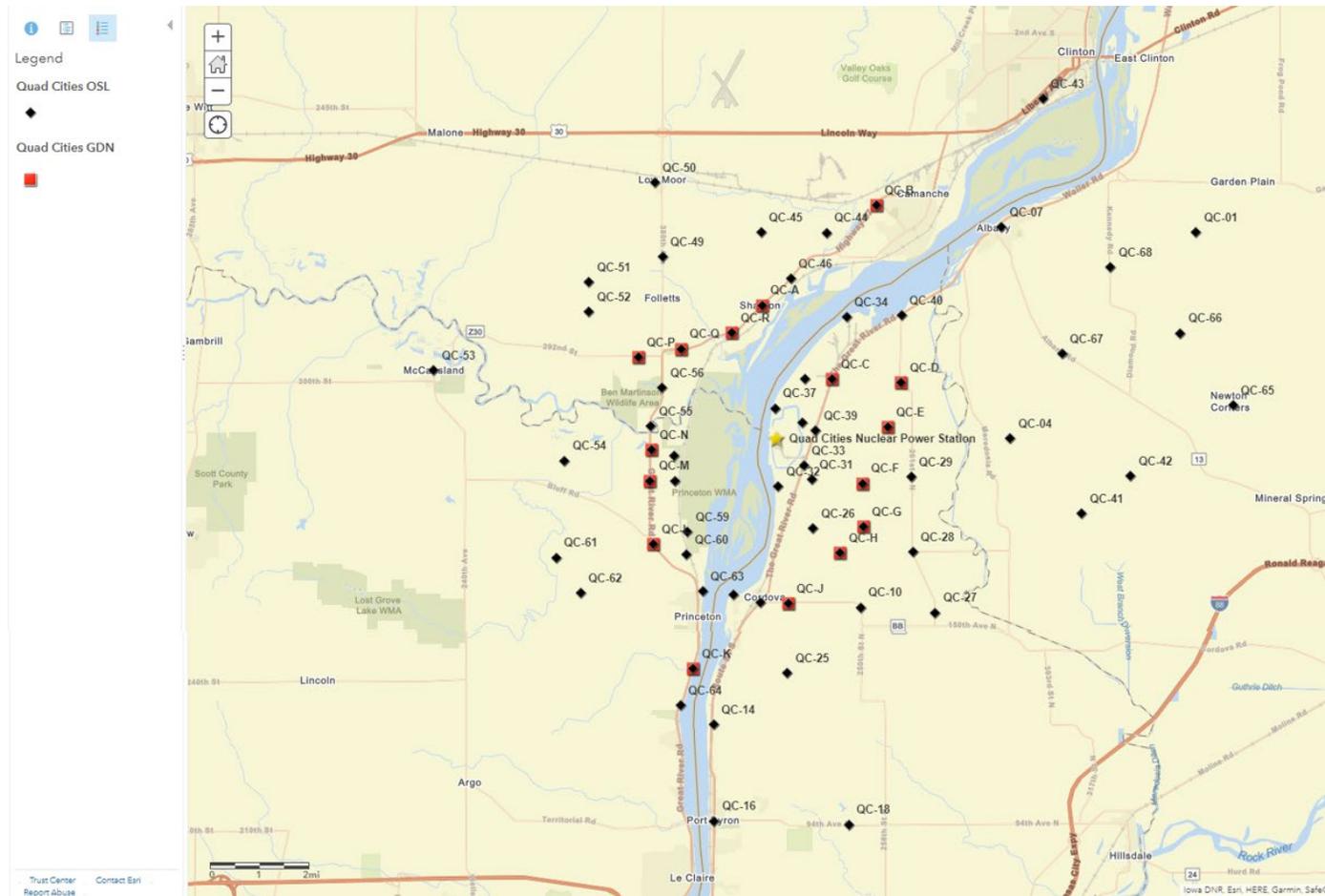
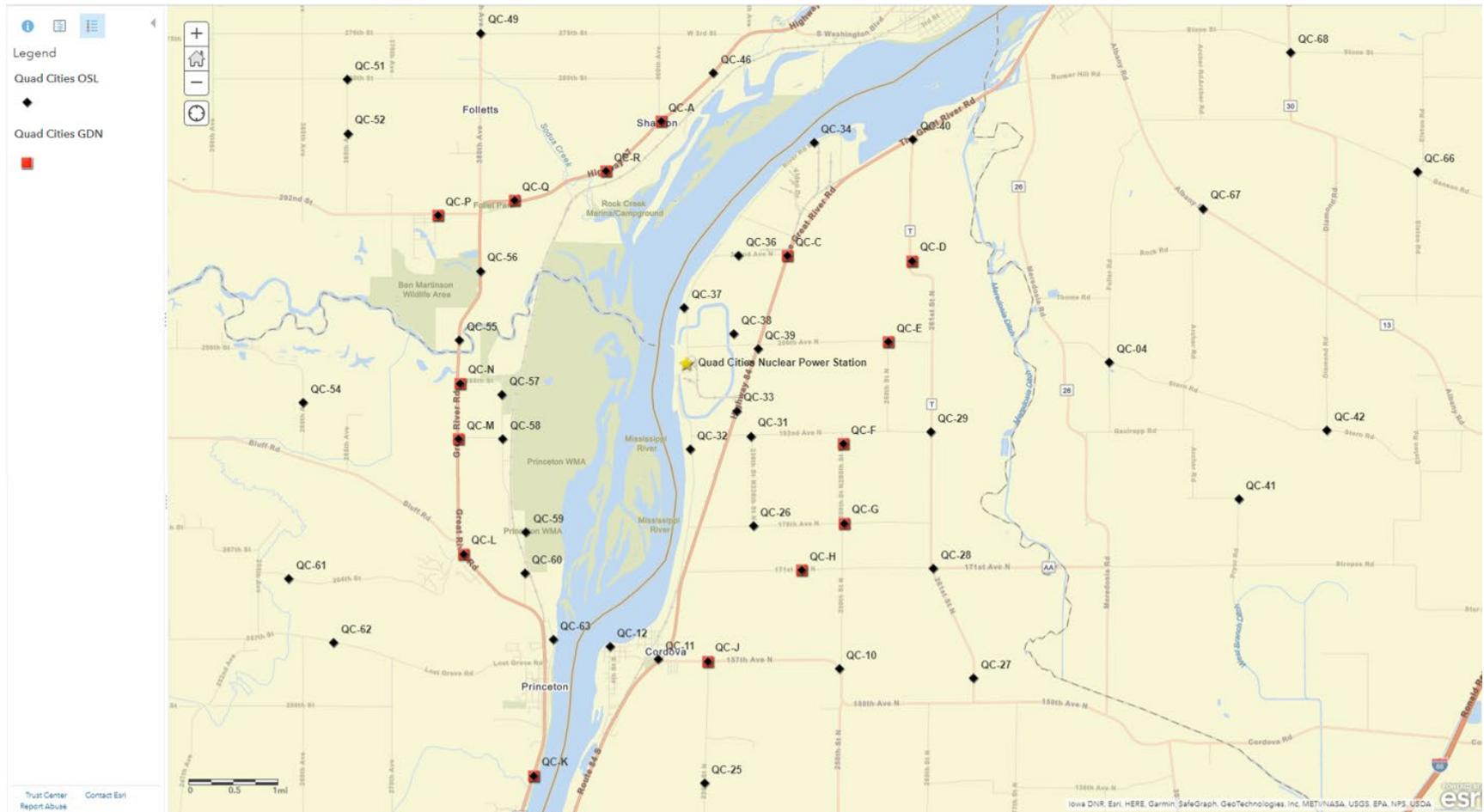


Figure 22. OSL and GDN Monitoring Locations (continued) - Quad Cities

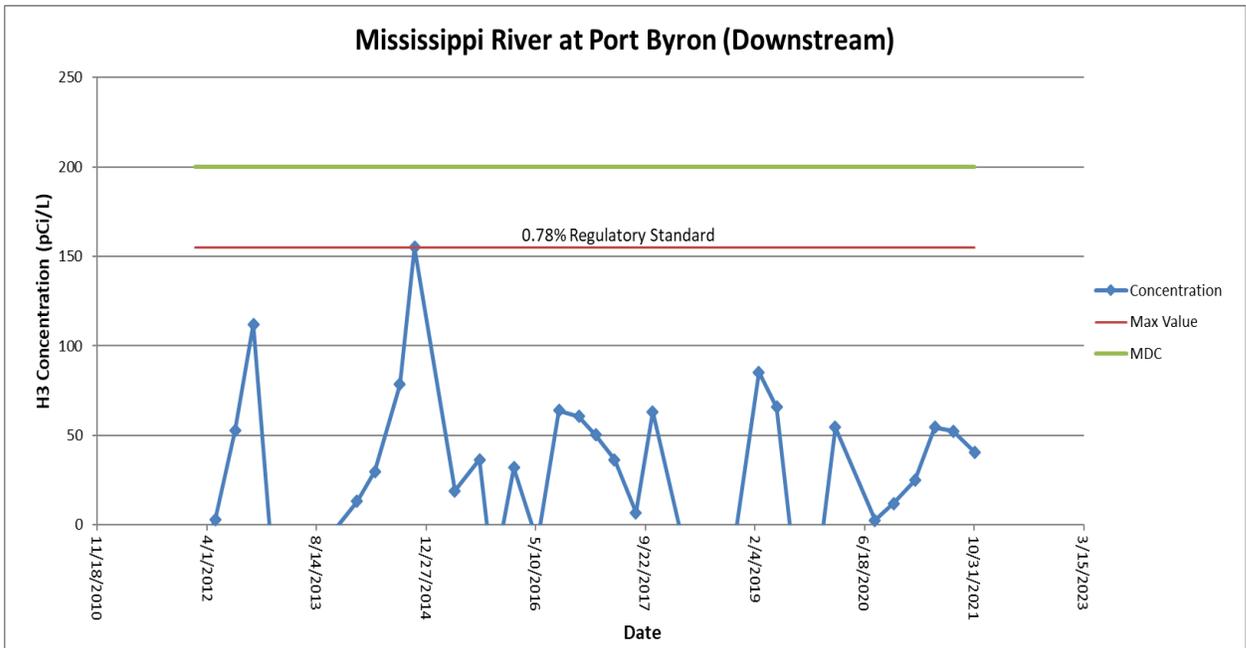
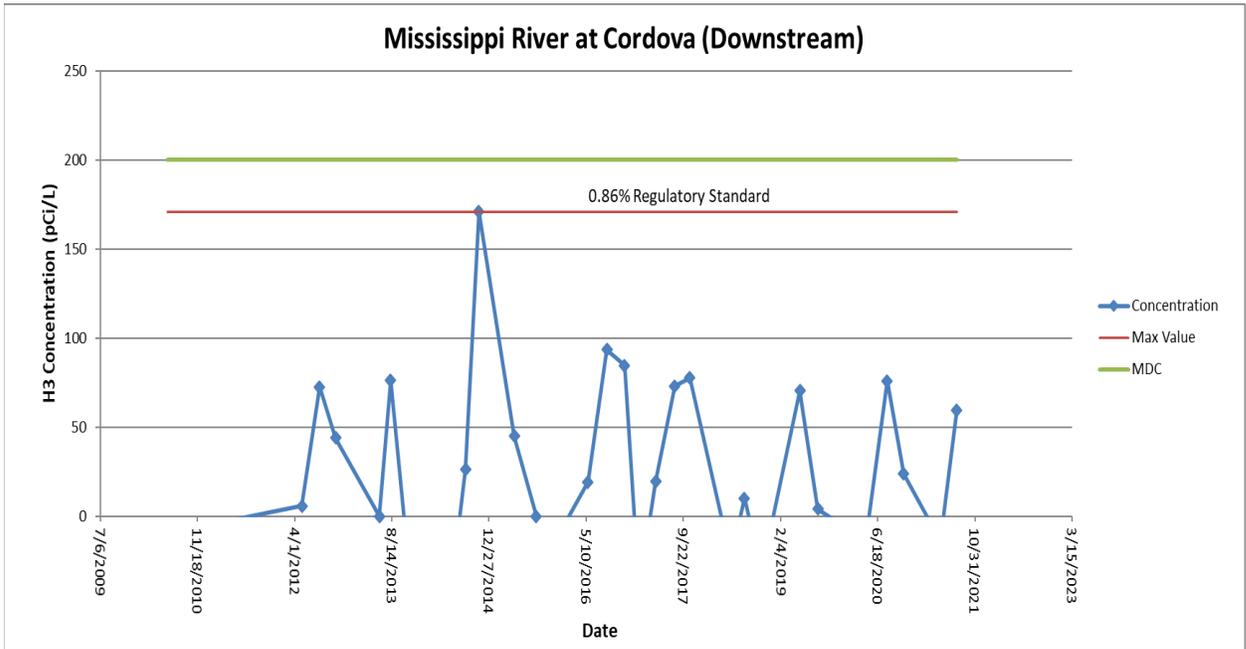


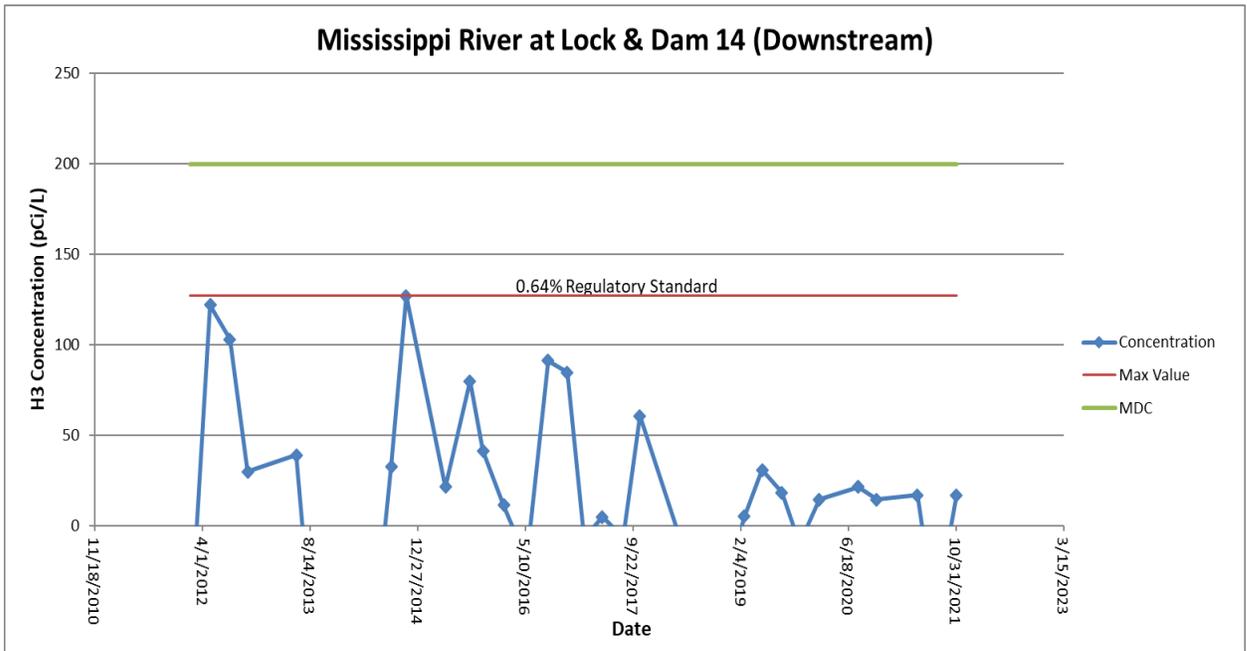
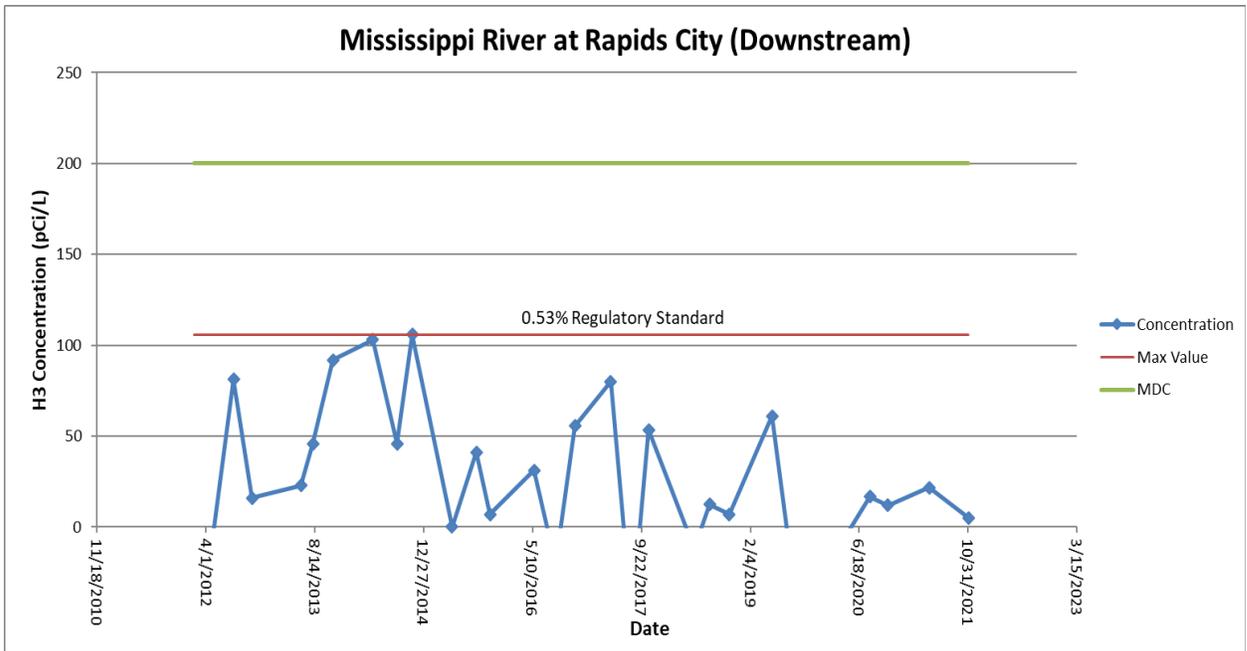
Quad Cities Sample Results

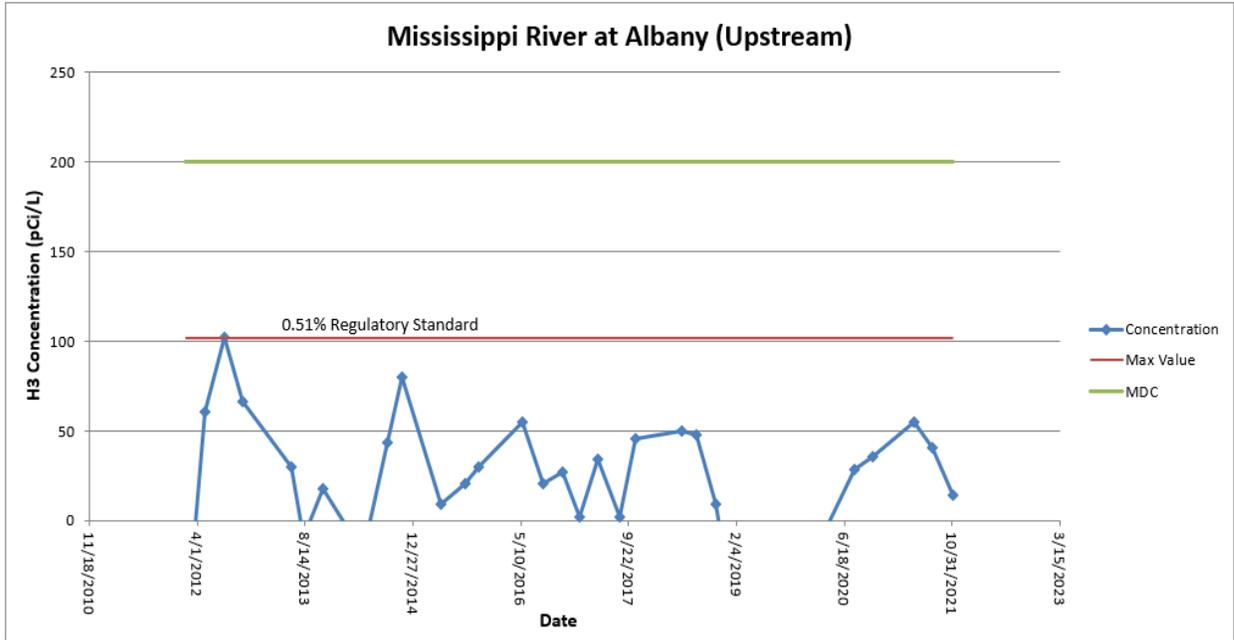
Tritium (H-3) in Water Sample Results - Quad Cities
Results are in picocuries per liter (pCi/L)

Location	H-3	
Date	Result	MDC
Mississippi R. at Albany		
5/5/2021	<MDC	133
7/28/2021	<MDC	133
11/2/2021	<MDC	133
Mississippi R. at Cordova		
5/5/2021	<MDC	133
7/28/2021	<MDC	133
Mississippi R. at Lock & Dam 14		
5/5/2021	<MDC	133
7/28/2021	<MDC	133
11/2/2021	<MDC	133
Mississippi R. at Port Byron		
2/3/2021	<MDC	133
5/5/2021	<MDC	133
7/28/2021	<MDC	133
11/2/2021	<MDC	133
Mississippi R. at Rapid City		
5/5/2021	<MDC	133
11/2/2021	<MDC	133

Trending Graphs for Tritium (H-3) in Water - Quad Cities
 (Max value compared to IEPA and US EPA Class regulatory standard of 20,000 pCi/L)







Total Strontium in Water Results - Quad Cities
Results in picocuries per liter (pCi/L)

Location	Strontium	
Date	Result	MDC
Mississippi R. at Cordova		
5/5/2021	<MDC	0.6
Mississippi R. at Rapid City		
5/5/2021	<MDC	0.6

Results for Gross Beta Screening of Water - Quad Cities
Results are in picocuries per liter (pCi/L)

Location	Beta	
Date	Result	MDC
Mississippi R. at Albany		
5/5/2021	<MDC	3.7
7/28/2021	<MDC	3.7
11/2/2021	<MDC	3.7
Mississippi R. at Cordova		
5/5/2021	<MDC	3.7
7/28/2021	<MDC	3.7
Mississippi R. at Lock & Dam 14		
5/5/2021	<MDC	3.7
7/28/2021	4.5	3.7
11/2/2021	4.3	3.7
Mississippi R. at Port Byron		
2/3/2021	4.6	3.7
5/5/2021	<MDC	3.7
7/28/2021	<MDC	3.7
11/2/2021	<MDC	3.7
Mississippi R. at Rapid City		
5/5/2021	<MDC	3.7
11/2/2021	<MDC	3.7

Gamma Spectroscopy Results for Other Radionuclides in Water - Quad Cities
Results are in picocuries per liter (pCi/L)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		I-131		Mn-54		Nb-95		Zn-65		Zr-95	
Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC
Mississippi R. at Albany																								
5/5/2021	<MDC	15.8	<MDC	19.8	<MDC	3.2	<MDC	3.9	<MDC	4.0	<MDC	4.0	<MDC	7.1	<MDC	5.7	<MDC	3.5	<MDC	3.5	<MDC	7.0	<MDC	6.1
7/28/2021	<MDC	15.8	<MDC	19.8	<MDC	3.2	<MDC	3.9	<MDC	4.0	<MDC	4.0	<MDC	7.1	<MDC	5.7	<MDC	3.5	<MDC	3.5	<MDC	7.0	<MDC	6.1
11/2/2021	<MDC	15.8	<MDC	19.8	<MDC	3.2	<MDC	3.9	<MDC	4.0	<MDC	4.0	<MDC	7.1	<MDC	5.7	<MDC	3.5	<MDC	3.5	<MDC	7.0	<MDC	6.1
Mississippi R. at Cordova																								
5/5/2021	<MDC	15.8	<MDC	19.8	<MDC	3.2	<MDC	3.9	<MDC	4.0	<MDC	4.0	<MDC	7.1	<MDC	5.7	<MDC	3.5	<MDC	3.5	<MDC	7.0	<MDC	6.1
7/28/2021	<MDC	15.8	<MDC	19.8	<MDC	3.2	<MDC	3.9	<MDC	4.0	<MDC	4.0	<MDC	7.1	<MDC	5.7	<MDC	3.5	<MDC	3.5	<MDC	7.0	<MDC	6.1
Mississippi R. at Lock & Dam 14																								
5/5/2021	<MDC	15.8	<MDC	19.8	<MDC	3.2	<MDC	3.9	<MDC	4.0	<MDC	4.0	<MDC	7.1	<MDC	5.7	<MDC	3.5	<MDC	3.5	<MDC	7.0	<MDC	6.1
7/28/2021	<MDC	15.8	<MDC	19.8	<MDC	3.2	<MDC	3.9	<MDC	4.0	<MDC	4.0	<MDC	7.1	<MDC	5.7	<MDC	3.5	<MDC	3.5	<MDC	7.0	<MDC	6.1
11/2/2021	<MDC	15.8	<MDC	19.8	<MDC	3.2	<MDC	3.9	<MDC	4.0	<MDC	4.0	<MDC	7.1	<MDC	5.7	<MDC	3.5	<MDC	3.5	<MDC	7.0	<MDC	6.1
Mississippi R. at Port Byron																								
2/3/2021	<MDC	15.8	<MDC	19.8	<MDC	3.2	<MDC	3.9	<MDC	4.0	<MDC	4.0	<MDC	7.1	<MDC	5.7	<MDC	3.5	<MDC	3.5	<MDC	7.0	<MDC	6.1
5/5/2021	<MDC	15.8	<MDC	19.8	<MDC	3.2	<MDC	3.9	<MDC	4.0	<MDC	4.0	<MDC	7.1	<MDC	5.7	<MDC	3.5	<MDC	3.5	<MDC	7.0	<MDC	6.1
7/28/2021	<MDC	15.8	<MDC	19.8	<MDC	3.2	<MDC	3.9	<MDC	4.0	<MDC	4.0	<MDC	7.1	<MDC	5.7	<MDC	3.5	<MDC	3.5	<MDC	7.0	<MDC	6.1
11/2/2021	<MDC	15.8	<MDC	19.8	<MDC	3.2	<MDC	3.9	<MDC	4.0	<MDC	4.0	<MDC	7.1	<MDC	5.7	<MDC	3.5	<MDC	3.5	<MDC	7.0	<MDC	6.1
Mississippi R. at Rapid City																								
5/5/2021	<MDC	15.8	<MDC	19.8	<MDC	3.2	<MDC	3.9	<MDC	4.0	<MDC	4.0	<MDC	7.1	<MDC	5.7	<MDC	3.5	<MDC	3.5	<MDC	7.0	<MDC	6.1
11/2/2021	<MDC	15.8	<MDC	19.8	<MDC	3.2	<MDC	3.9	<MDC	4.0	<MDC	4.0	<MDC	7.1	<MDC	5.7	<MDC	3.5	<MDC	3.5	<MDC	7.0	<MDC	6.1

Gamma Spectroscopy Results for Radionuclides in Soil (Migration) - Quad Cities
Results are in picocuries per gram (pCi/g)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		Mn-54		Nb-95		Zn-65		Zr-95	
	Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result
Corner of 150th and 266th																						
5/5/2021	<MDC	12.40	<MDC	0.17	<MDC	0.05	<MDC	0.02	<MDC	0.02	0.06	0.03	<MDC	0.23	<MDC	0.03	<MDC	0.16	<MDC	0.07	<MDC	0.11
7/28/2021	<MDC	12.40	<MDC	0.17	<MDC	0.05	<MDC	0.02	<MDC	0.02	0.14	0.03	<MDC	0.23	<MDC	0.03	<MDC	0.16	<MDC	0.07	0.12	0.11
Near RS-C																						
5/5/2021	<MDC	12.40	<MDC	0.17	<MDC	0.05	<MDC	0.02	<MDC	0.02	0.26	0.03	<MDC	0.23	<MDC	0.03	<MDC	0.16	<MDC	0.07	<MDC	0.11
7/28/2021	<MDC	12.40	<MDC	0.17	<MDC	0.05	<MDC	0.02	<MDC	0.02	0.17	0.03	<MDC	0.23	<MDC	0.03	<MDC	0.16	<MDC	0.07	<MDC	0.11

Gamma Spectroscopy Results for Radionuclides in Soil (Deposition) - Quad Cities
Results are in picocuries per gram (pCi/g)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		Mn-54		Nb-95		Zn-65		Zr-95	
	Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result
Corner of 150th and 266th																						
5/5/2021	<MDC	12.10	<MDC	0.15	<MDC	0.05	<MDC	0.02	<MDC	0.02	0.05	0.03	<MDC	0.20	<MDC	0.02	<MDC	0.14	<MDC	0.07	<MDC	0.10
7/28/2021	<MDC	12.10	<MDC	0.15	<MDC	0.05	<MDC	0.02	<MDC	0.02	0.12	0.03	<MDC	0.20	<MDC	0.02	<MDC	0.14	<MDC	0.07	<MDC	0.10
Near RS-C																						
5/5/2021	<MDC	12.10	<MDC	0.15	<MDC	0.05	<MDC	0.02	<MDC	0.02	0.37	0.03	<MDC	0.20	<MDC	0.02	<MDC	0.14	<MDC	0.07	<MDC	0.10
7/28/2021	<MDC	12.10	<MDC	0.15	<MDC	0.05	<MDC	0.02	<MDC	0.02	0.63	0.03	<MDC	0.20	<MDC	0.02	<MDC	0.14	<MDC	0.07	<MDC	0.10

Gamma Spectroscopy Results for Radionuclides in Sediment - Quad Cities
Results are in picocuries per gram (pCi/g)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		Mn-54		Nb-95		Zn-65		Zr-95	
	Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result
Mississippi R. at Rapid City																						
5/5/2021	<MDC	10.90	<MDC	0.14	<MDC	0.04	<MDC	0.02	<MDC	0.02	<MDC	0.02	<MDC	0.15	<MDC	0.02	<MDC	0.12	<MDC	0.06	<MDC	0.09

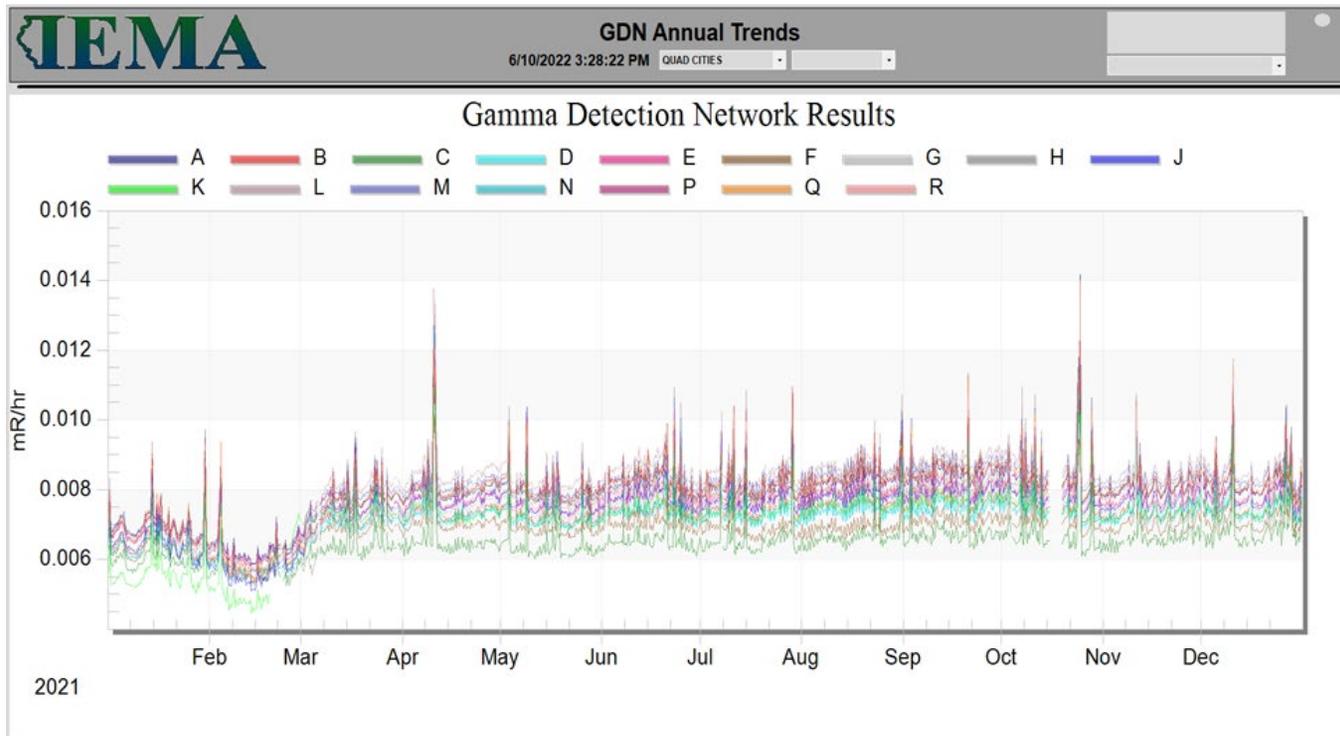
Gamma Spectroscopy Results for Radionuclides in Vegetation- Quad Cities
Results are in picocuries per gram (pCi/g)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		I-131		Mn-54		Nb-95		Zn-65		Zr-95	
	Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result
Corner of 150th and 266th																								
5/5/2021	<MDC	2.42	<MDC	0.08	<MDC	0.03	<MDC	0.02	<MDC	0.02	<MDC	0.02	<MDC	0.11	<MDC	5.80	<MDC	0.02	<MDC	0.06	<MDC	0.06	<MDC	0.07
7/28/2021	<MDC	2.42	<MDC	0.08	<MDC	0.03	<MDC	0.02	<MDC	0.02	<MDC	0.02	<MDC	0.11	<MDC	5.80	<MDC	0.02	<MDC	0.06	<MDC	0.06	<MDC	0.07
Near RS-C																								
5/5/2021	<MDC	2.42	<MDC	0.08	<MDC	0.03	<MDC	0.02	<MDC	0.02	<MDC	0.02	<MDC	0.11	<MDC	5.80	<MDC	0.02	<MDC	0.06	<MDC	0.06	<MDC	0.07
7/28/2021	<MDC	2.42	<MDC	0.08	<MDC	0.03	<MDC	0.02	<MDC	0.02	<MDC	0.02	<MDC	0.11	<MDC	5.80	<MDC	0.02	<MDC	0.06	<MDC	0.06	<MDC	0.07

Gamma Spectroscopy Results for Radionuclides in Fish - Quad Cities
Results are in picocuries per kilogram (pCi/kg)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		I-131		Mn-54		Nb-95		Zn-65		Zr-95			
	Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	
Mississippi R. (Bottom Feeder)																										
5/14/2021	<MDC	2450.0	<MDC	85.0	<MDC	45.0	<MDC	38.0	<MDC	28.2	<MDC	29.7	<MDC	147.0	<MDC	4300.0	<MDC	31.0	<MDC	86.0	<MDC	76.0	<MDC	93.0		
Mississippi R. (Top Feeder)																										
5/14/2021	<MDC	2450.0	<MDC	85.0	<MDC	45.0	<MDC	38.0	<MDC	28.2	<MDC	29.7	<MDC	147.0	<MDC	4300.0	<MDC	31.0	<MDC	86.0	<MDC	76.0	<MDC	93.0		

Gamma Detection Network Results - Quad Cities
Results are in milliroentgen per hour (mR/hr)



Summary of Ambient Gamma Results - Quad Cities

	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual Exposure
Location	mR/quarter	mR/quarter	mR/quarter	mR/quarter	mR/year
QC-01	8.7	9.4	6.9	9.3	34.2
QC-04	7.1	7.6	5.9	5.4	26.0
QC-07	7.4	7.5	7.2	6.7	28.7
QC-10	4.9	4.1	6.5	5.9	21.5
QC-11		4.5	3.9	3.4	15.9
QC-12	4.9	5.0	4.5	4.8	19.2
QC-14	5.7	7.7	3.7		22.7
QC-16	3.5	8.0	3.8		20.4
QC-18	9.4	11.6	10.4	8.8	40.1
QC-25	8.3	12.4	7.9	8.7	37.3
QC-26	7.3	7.5	7.0	5.9	27.7
QC-27	7.7	8.2	5.9	6.3	28.1
QC-28	7.1	9.1	5.8	6.8	28.8
QC-29	6.1	9.4	7.4	6.3	29.2
QC-31	5.4	9.9	5.2	8.0	28.6
QC-32	5.6	6.1	3.9	6.9	22.5
QC-33	7.1	7.5	5.5	5.7	25.7
QC-34	6.1	6.9	7.2	6.4	26.5
QC-36	10.1	7.3	6.8	7.5	31.7
QC-37	4.6	8.7	3.2	5.0	21.5
QC-38	8.0	6.6	7.2	4.9	26.7
QC-39	7.2	4.0	4.3	4.0	19.5
QC-40	7.8	8.7	7.9	7.6	32.0
QC-41	6.9	7.2	6.8	4.3	25.2
QC-42	9.3	9.3	5.8	9.2	33.5
QC-43	6.9	8.6	8.6	9.2	33.3
QC-44	7.8	8.0	5.9	6.6	28.2
QC-45	6.4	9.3	6.9	7.4	30.0
QC-46	8.2	9.3	7.1	9.0	33.6
QC-49	6.2	7.8	5.9	6.2	26.1
QC-50	6.4	7.7	6.5	7.6	28.2
QC-51	5.8	6.4	7.7	9.0	28.8
QC-52	7.9	7.9	8.6	8.1	32.5

Summary of Ambient Gamma Results - Quad Cities (Continued)

	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Annual Exposure
Location	mR/quarter	mR/quarter	mR/quarter	mR/quarter	mR/year
QC-53	6.9	7.0		7.2	28.3
QC-54	5.6	7.9	5.8	5.0	24.3
QC-55	7.4	8.1	8.2	8.6	32.3
QC-56	6.3	7.4	4.8	6.0	24.5
QC-57	4.3	7.9	4.5	6.7	23.4
QC-58	8.2	5.5	5.7	3.9	23.3
QC-59	6.0	8.9	4.2	6.6	25.7
QC-60	6.8	8.3	7.5	5.7	28.3
QC-61		10.6	7.2	8.5	35.1
QC-62	11.5			8.6	40.1
QC-63	7.4	7.3	6.1	9.4	30.2
QC-64	7.6	8.2	6.0	5.7	27.4
QC-65	7.5	7.8	8.5	7.2	31.0
QC-66	7.2	8.6	9.6	9.9	35.3
QC-67	8.5	12.3	6.8	6.3	33.8
QC-68	10.0	13.1	9.3	9.2	41.6
QC-A	7.2	7.5	8.0	4.2	26.9
QC-B	7.4	9.3	6.8	8.6	32.0
QC-C	6.7	5.7	6.9	6.1	25.3
QC-D	8.0	8.2	5.5	4.7	26.4
QC-E	8.0	9.4	4.6	4.8	26.8
QC-F	6.2	8.0	5.6	6.7	26.5
QC-G	7.9	8.2	6.7	7.7	30.4
QC-H	6.0	10.2	5.2	5.1	26.5
QC-J	7.3	7.3	6.9	7.4	28.9
QC-K	6.8	9.0	5.7	6.4	27.8
QC-L	9.8	11.2	6.2	6.3	33.4
QC-M	8.3	8.2	7.1	4.4	27.9
QC-N	7.4	6.8	3.5	7.0	24.7
QC-P	9.4	9.6	5.0	7.3	31.3
QC-Q	6.5	11.3	9.2	7.3	34.3
QC-R	9.3	9.1	6.0	6.3	30.7

Blanks in the table indicate that dosimeters were missing at the end of the quarter.
 Annual Exposure column based on averages of all available data.
 Quarter length is estimated to be 91.25 days.

Zion Nuclear Power Station

Zion NPS consisted of two PWRs that were owned and operated by Constellation Energy and located in Lake County, Illinois. The site is located near Zion, Illinois approximately 40 miles north of Chicago and adjacent to Lake Michigan. The station ceased operation permanently in February 1998 and was defueled soon thereafter. In September 2010, the facility license was transferred from Exelon (now Constellation) to Zion Solutions for the express purpose of expediting the decommissioning of the site. The decommissioning process is anticipated to be completed in 2022. The site continues to store 61 dry casks that store spent nuclear fuel as well as 4 dry casks that contain greater than Class C waste. These 65 casks are stored in an Independent Spent Fuel Storage Installation (ISFSI).



Zion station prior to decommissioning



Zion station post decommissioning

Figures 24 – 25 provide an overview of all sampling and monitoring locations in the vicinity of the Zion NPS (yellow star).

Significant Events or Changes for 2021

With the completion of large-scale invasive activities associated with the Zion decommissioning project in December of 2019, IEMA's radiological environmental monitoring activities for the site were scaled back beginning in January 2020. All soil, sediment, vegetation, and water sampling activities ceased at that time. IEMA has continued to monitor for direct radiation, and OSLs will be deployed for as long as there is an independent spent fuel storage installation (ISFSI) on site.

Sampling and Monitoring Results

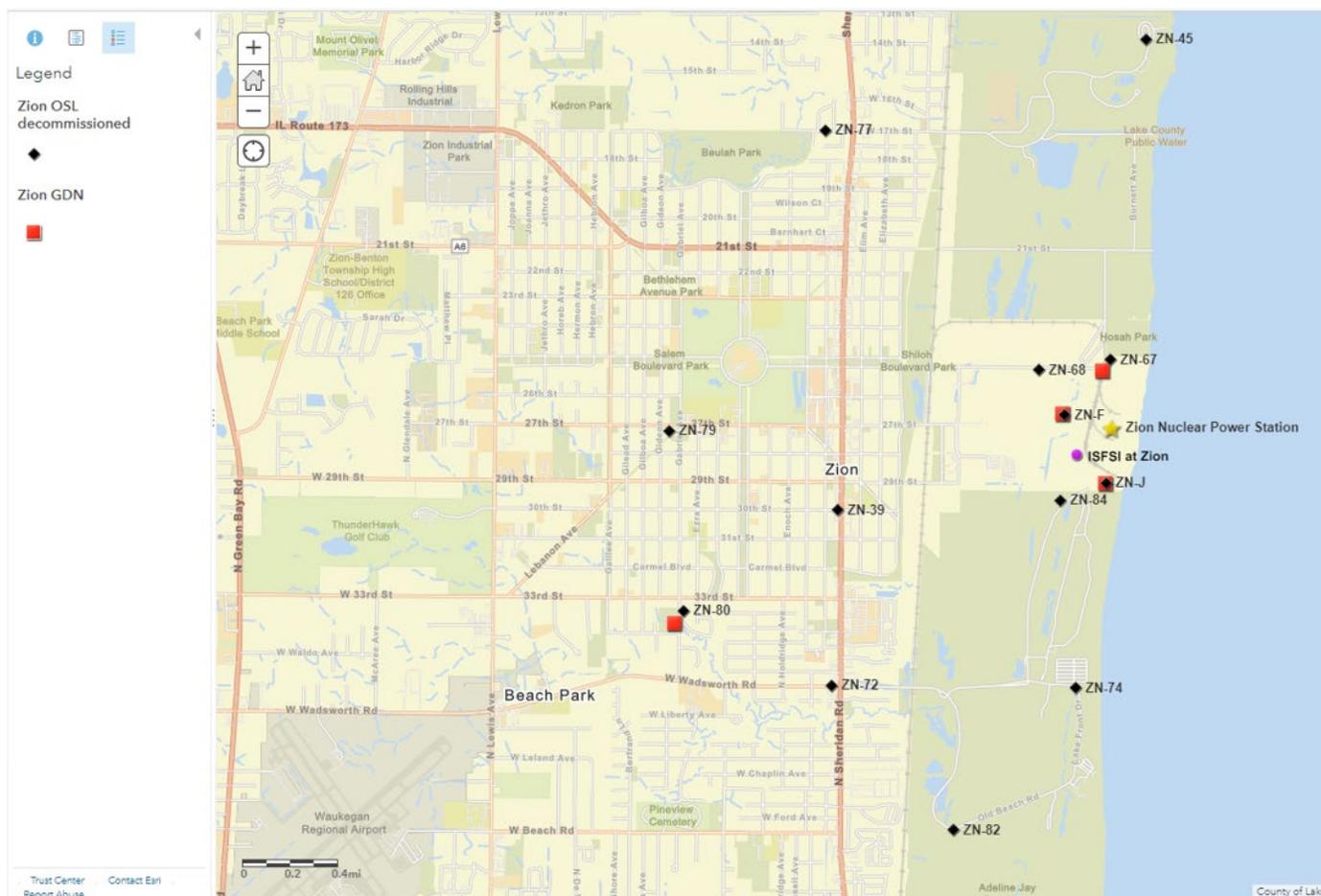
Direct Radiation Monitoring Results

The ambient gamma monitoring results from deployed OSLs were comparable to historical data and to results found at the background monitoring locations at Sangchris Lake State Park near Kincaid, Illinois.

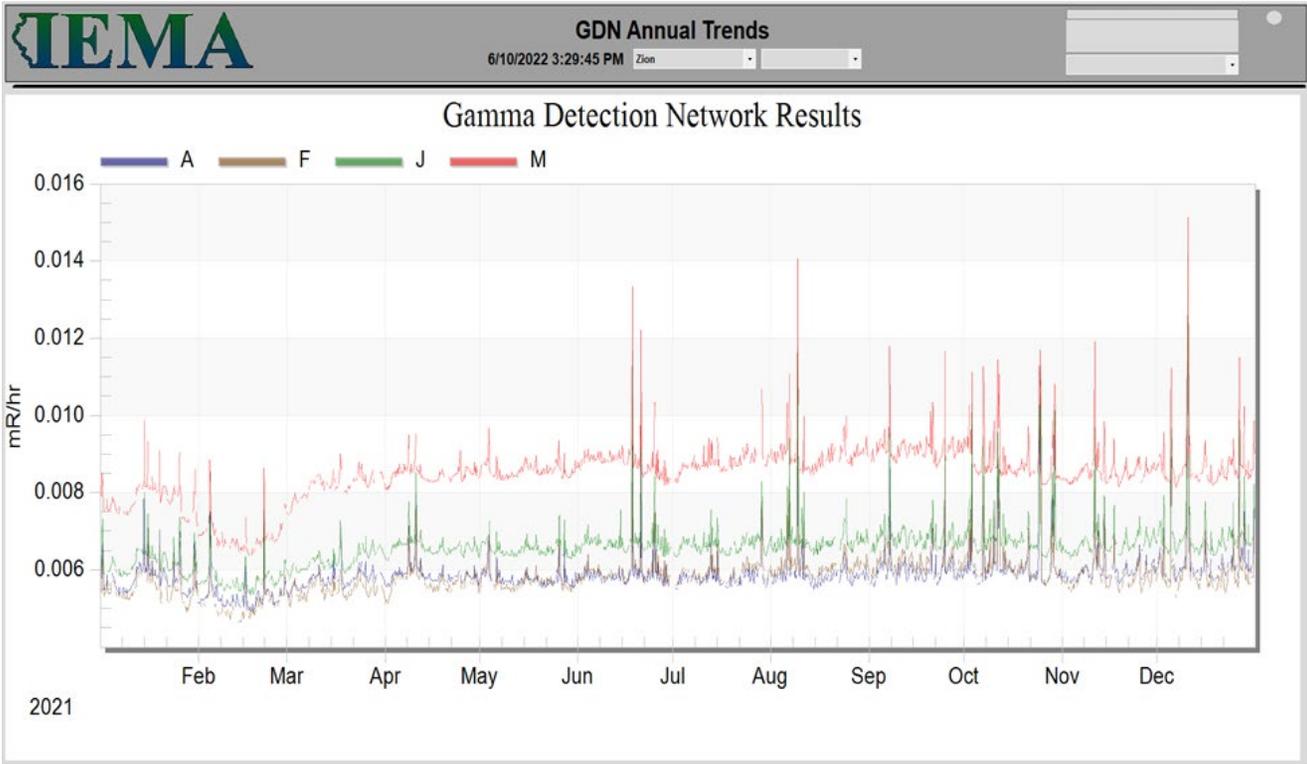
GDN network results were consistent with historical data.

Zion Maps of Monitoring and Sampling Locations

Figure 24. OSL and GDN Monitoring Locations- Zion



Gamma Detection Network Results – Zion
Results are in milliroentgen per hour (mR/hr)



Summary of Ambient Gamma Results - Zion

Location	Quarter 1 mR/quarter	Quarter 2 mR/quarter	Quarter 3 mR/quarter	Quarter 4 mR/quarter	Annual Exposure mR/year
ZN-39	5.8	7.8	5.3	6.3	25.2
ZN-45	3.8	6.8	4.5	6.0	21.0
ZN-67	2.9	7.8	3.1	5.7	19.4
ZN-68	3.1	8.9	6.0	9.0	26.9
ZN-72	2.7	7.4	7.1	8.4	25.6
ZN-74	1.9	6.4	4.8	6.9	20.0
ZN-77	5.5	10.5	6.0	9.7	31.7
ZN-79	5.4	11.8	4.5	7.4	29.1
ZN-80	7.6	13.6	9.1	8.4	38.7
ZN-82	5.2	8.0	5.7	4.7	23.7
ZN-84	1.0	6.9	6.6	7.0	21.5
ZN-J	1.3	7.0	4.6	7.4	20.4
ZN-F	2.3	6.4	5.9	4.6	19.1

Blanks in the table indicate that dosimeters were missing at the end of the quarter.

Annual Exposure column based on averages of all available data.

Quarter length is estimated to be 91.25 days.

Background Sampling Locations

IEMA has established the environs of Sangchris Lake State Park, a cooling lake for a coal-fired power station near Kincaid, Illinois, as a background sampling location. To establish “background” radiation levels, water, soil, sediment, vegetation, and fish samples are collected and analyzed utilizing the same procedures and methodologies used for NPS samples. In addition, there is an array of environmental dosimeters around the coal-fired power station, similar to what can be found around each NPS.

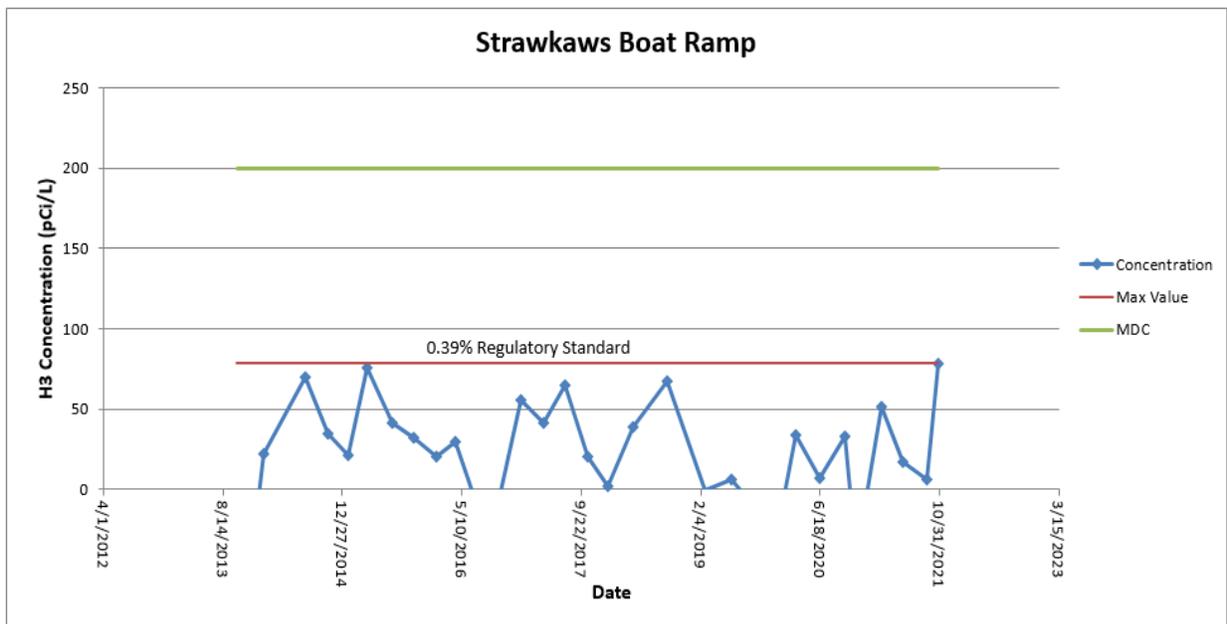
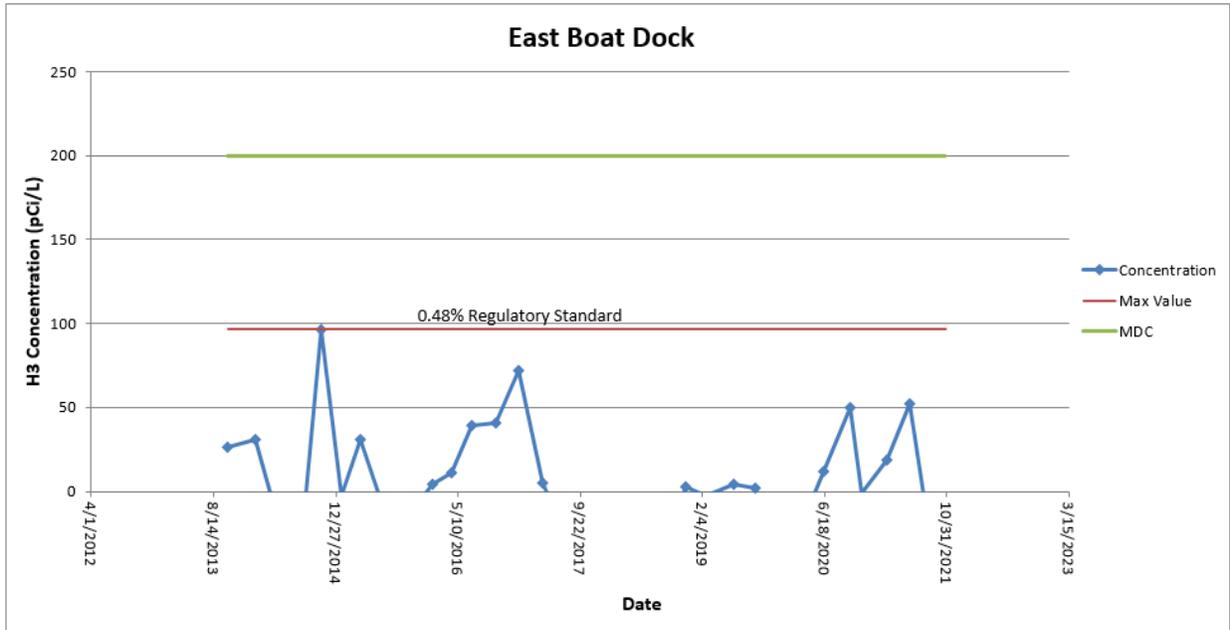
Figure 25 provides an overview of all sampling and monitoring locations in the vicinity of Sangchris Lake State Park. Tables and graphs containing the analytical results for the 2021 background environmental monitoring locations can be found on pages 131-138.

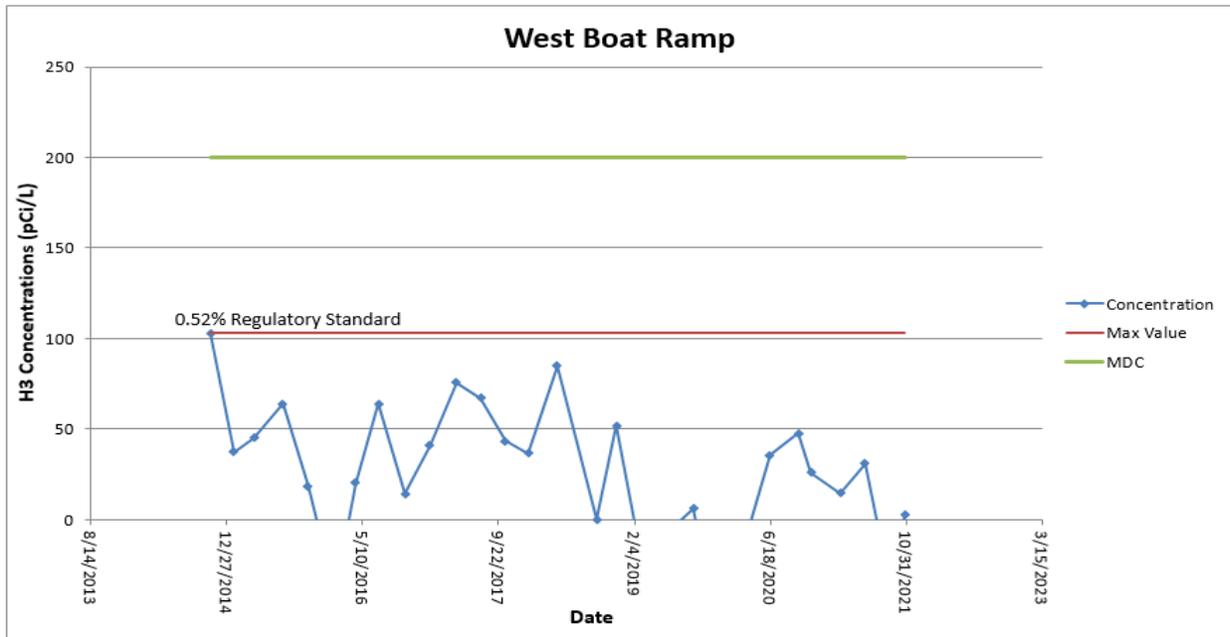
Sangchris Lake State Park Result Tables and Graphs

Tritium (H-3) in Water Results - Sangchris Lake State Park
Results are in picocuries per liter (pCi/L)

Location	H-3	
	Date	Result MDC
East Boat Dock		
3/2/2021	<MDC	200
6/1/2021	<MDC	200
9/8/2021	<MDC	200
10/26/2021	<MDC	200
Strawkaws Boat Ramp		
3/2/2021	<MDC	200
6/1/2021	<MDC	200
9/8/2021	<MDC	200
10/26/2021	<MDC	200
West Boat Ramp		
3/2/2021	<MDC	200
6/1/2021	<MDC	200
9/8/2021	<MDC	200
10/26/2021	<MDC	200

Trending Graphs for Tritium (H-3) in Water - Sangchris Lake State Park
 (Max value compared to IEPA and US EPA regulatory standard of 20,000 pCi/L)





Results for Total Strontium in Water - Sangchris Lake State Park
Results are in picocuries per liter (pCi/L)

Location	Strontium	
Date	Result	MDC
East Boat Dock		
6/1/2021	<MDC	0.6
Strawkaws Boat Ramp		
3/2/2021	<MDC	0.6
10/26/2021	<MDC	0.6
West Boat Ramp		
9/8/2021	0.9	0.6

Results for Gross Beta Screening of Water - Sangchris Lake State Park
Results are in picocuries per liter (pCi/L)

Location	Beta	
Date	Result	MDC
East Boat Dock		
3/2/2021	<MDC	3.7
6/1/2021	4.5	3.7
9/8/2021	<MDC	3.7
10/26/2021	<MDC	3.7
Strawkaws Boat Ramp		
3/2/2021	<MDC	3.7
6/1/2021	<MDC	3.7
9/8/2021	<MDC	3.7
10/26/2021	<MDC	3.7
West Boat Ramp		
3/2/2021	<MDC	3.7
6/1/2021	4.0	3.7
9/8/2021	<MDC	3.7
10/26/2021	<MDC	3.7

Gamma Spectroscopy Results for Other Radionuclides in Water - Sangchris Lake State Park
Results are in picocuries per liter (pCi/L)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		I-131		Mn-54		Nb-95		Zn-65		Zr-95		
	Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC
East Boat Dock																									
3/2/2021	<MDC	12.7	<MDC	20.4	<MDC	3.3	<MDC	3.7	<MDC	3.9	<MDC	3.6	<MDC	5.9	<MDC	4.3	<MDC	3.3	<MDC	3.6	<MDC	7.1	<MDC	6.3	
6/1/2021	<MDC	12.7	<MDC	20.4	<MDC	3.3	<MDC	3.7	<MDC	3.9	<MDC	3.6	<MDC	5.9	<MDC	4.3	<MDC	3.3	<MDC	3.6	<MDC	7.1	<MDC	6.3	
9/8/2021	<MDC	12.7	<MDC	20.4	<MDC	3.3	<MDC	3.7	<MDC	3.9	<MDC	3.6	<MDC	5.9	<MDC	4.3	<MDC	3.3	<MDC	3.6	<MDC	7.1	<MDC	6.3	
10/26/2021	<MDC	12.7	<MDC	20.4	<MDC	3.3	<MDC	3.7	<MDC	3.9	<MDC	3.6	<MDC	5.9	<MDC	4.3	<MDC	3.3	<MDC	3.6	<MDC	7.1	<MDC	6.3	
Strawkaws Boat Ramp																									
3/2/2021	<MDC	12.7	<MDC	20.4	<MDC	3.3	<MDC	3.7	<MDC	3.9	<MDC	3.6	<MDC	5.9	<MDC	4.3	<MDC	3.3	<MDC	3.6	<MDC	7.1	<MDC	6.3	
6/1/2021	<MDC	12.7	<MDC	20.4	<MDC	3.3	<MDC	3.7	<MDC	3.9	<MDC	3.6	<MDC	5.9	<MDC	4.3	<MDC	3.3	<MDC	3.6	<MDC	7.1	<MDC	6.3	
9/8/2021	<MDC	12.7	<MDC	20.4	<MDC	3.3	<MDC	3.7	<MDC	3.9	<MDC	3.6	<MDC	5.9	<MDC	4.3	<MDC	3.3	<MDC	3.6	<MDC	7.1	<MDC	6.3	
10/26/2021	<MDC	12.7	<MDC	20.4	<MDC	3.3	<MDC	3.7	<MDC	3.9	<MDC	3.6	<MDC	5.9	<MDC	4.3	<MDC	3.3	<MDC	3.6	<MDC	7.1	<MDC	6.3	
West Boat Ramp																									
3/2/2021	<MDC	12.7	<MDC	20.4	<MDC	3.3	<MDC	3.7	<MDC	3.9	<MDC	3.6	<MDC	5.9	<MDC	4.3	<MDC	3.3	<MDC	3.6	<MDC	7.1	<MDC	6.3	
6/1/2021	<MDC	12.7	<MDC	20.4	<MDC	3.3	<MDC	3.7	<MDC	3.9	<MDC	3.6	<MDC	5.9	<MDC	4.3	<MDC	3.3	<MDC	3.6	<MDC	7.1	<MDC	6.3	
9/8/2021	<MDC	12.7	<MDC	20.4	<MDC	3.3	<MDC	3.7	<MDC	3.9	<MDC	3.6	<MDC	5.9	<MDC	4.3	<MDC	3.3	<MDC	3.6	<MDC	7.1	<MDC	6.3	
10/26/2021	<MDC	12.7	<MDC	20.4	<MDC	3.3	<MDC	3.7	<MDC	3.9	<MDC	3.6	<MDC	5.9	<MDC	4.3	<MDC	3.3	<MDC	3.6	<MDC	7.1	<MDC	6.3	

Gamma Spectroscopy Results for Radionuclides in Soil (Migration) - Sangchris Lake State Park
Results are in picocuries per gram (pCi/g)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		Mn-54		Nb-95		Zn-65		Zr-95	
	Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result
East Boat Dock																						
6/1/2021	<MDC	410.00	<MDC	0.30	<MDC	0.13	<MDC	0.03	<MDC	0.03	0.08	0.05	<MDC	0.66	<MDC	0.04	<MDC	0.74	<MDC	0.11	<MDC	0.29
9/8/2021	<MDC	410.00	<MDC	0.30	<MDC	0.13	<MDC	0.03	<MDC	0.03	0.09	0.05	<MDC	0.66	<MDC	0.04	<MDC	0.74	<MDC	0.11	<MDC	0.29
Strawkaws Boat Ramp																						
6/1/2021	<MDC	410.00	<MDC	0.30	<MDC	0.13	<MDC	0.03	<MDC	0.03	0.07	0.05	<MDC	0.66	<MDC	0.04	<MDC	0.74	<MDC	0.11	<MDC	0.29
9/8/2021	<MDC	410.00	<MDC	0.30	<MDC	0.13	<MDC	0.03	<MDC	0.03	<MDC	0.05	<MDC	0.66	<MDC	0.04	<MDC	0.74	<MDC	0.11	<MDC	0.29
West Boat Ramp																						
6/1/2021	<MDC	410.00	<MDC	0.30	<MDC	0.13	<MDC	0.03	<MDC	0.03	0.09	0.05	<MDC	0.66	<MDC	0.04	<MDC	0.74	<MDC	0.11	<MDC	0.29
9/8/2021	<MDC	410.00	<MDC	0.30	<MDC	0.13	<MDC	0.03	<MDC	0.03	0.10	0.05	<MDC	0.66	<MDC	0.04	<MDC	0.74	<MDC	0.11	<MDC	0.29

Gamma Spectroscopy Results for Radionuclides in Soil (Deposition) - Sangchris Lake State Park
Results are in picocuries per gram (pCi/g)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		Mn-54		Nb-95		Zn-65		Zr-95	
	Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result
East Boat Dock																						
6/1/2021	<MDC	400.00	<MDC	0.27	<MDC	0.11	<MDC	0.04	<MDC	0.03	0.08	0.04	<MDC	0.64	<MDC	0.04	<MDC	0.72	<MDC	0.11	<MDC	0.27
9/8/2021	<MDC	400.00	<MDC	0.27	<MDC	0.11	<MDC	0.04	<MDC	0.03	0.09	0.04	<MDC	0.64	<MDC	0.04	<MDC	0.72	<MDC	0.11	<MDC	0.27
Strawkaws Boat Ramp																						
6/1/2021	<MDC	400.00	<MDC	0.27	<MDC	0.11	<MDC	0.04	<MDC	0.03	0.05	0.04	<MDC	0.64	<MDC	0.04	<MDC	0.72	<MDC	0.11	<MDC	0.27
9/8/2021	<MDC	400.00	<MDC	0.27	<MDC	0.11	<MDC	0.04	<MDC	0.03	<MDC	0.04	<MDC	0.64	<MDC	0.04	<MDC	0.72	<MDC	0.11	<MDC	0.27
West Boat Ramp																						
6/1/2021	<MDC	400.00	<MDC	0.27	<MDC	0.11	<MDC	0.04	<MDC	0.03	0.06	0.04	<MDC	0.64	<MDC	0.04	<MDC	0.72	<MDC	0.11	<MDC	0.27
9/8/2021	<MDC	400.00	<MDC	0.27	<MDC	0.11	<MDC	0.04	<MDC	0.03	0.07	0.04	<MDC	0.64	<MDC	0.04	<MDC	0.72	<MDC	0.11	<MDC	0.27

Gamma Spectroscopy Results for Radionuclides in Sediment - Sangchris Lake State Park
Results are in picocuries per gram (pCi/g)

Location	Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		Mn-54		Nb-95		Zn-65		Zr-95	
Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC
Access Area 3																						
9/9/2021	<MDC	340.00	<MDC	0.20	<MDC	0.10	<MDC	0.03	<MDC	0.02	<MDC	0.03	<MDC	0.52	<MDC	0.03	<MDC	0.58	<MDC	0.08	<MDC	0.23
Strawkaws Boat Ramp																						
6/1/2021	<MDC	340.00	<MDC	0.20	<MDC	0.10	<MDC	0.03	<MDC	0.02	<MDC	0.03	<MDC	0.52	<MDC	0.03	<MDC	0.58	<MDC	0.08	<MDC	0.23
West Boat Ramp																						
6/1/2021	<MDC	340.00	<MDC	0.20	<MDC	0.10	<MDC	0.03	<MDC	0.02	0.04	0.03	<MDC	0.52	<MDC	0.03	<MDC	0.58	<MDC	0.08	<MDC	0.23
9/8/2021	<MDC	340.00	<MDC	0.20	<MDC	0.10	<MDC	0.03	<MDC	0.02	<MDC	0.03	<MDC	0.52	<MDC	0.03	<MDC	0.58	<MDC	0.08	<MDC	0.23

Gamma Spectroscopy Results for Radionuclides in Vegetation - Sangchris Lake State Park
Results are in picocuries per gram (pCi/g)

Location	Am-241		Ba-140		Ce-144		Co-58		Co-60		Cs-134		Cs-137		Fe-59		I-131		Mn-54		Nb-95		Zn-65		Zr-95	
Date	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC	Result	MDC
East Boat Dock																										
6/1/2021	<MDC	0.6	<MDC	36.0	<MDC	0.4	<MDC	0.2	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.6	<MDC	184.0	<MDC	0.1	<MDC	0.5	<MDC	0.2	<MDC	0.4
9/8/2021	<MDC	0.6	<MDC	36.0	<MDC	0.4	<MDC	0.2	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.6	<MDC	184.0	<MDC	0.1	<MDC	0.5	<MDC	0.2	<MDC	0.4
Strawkaws Boat Ramp																										
6/1/2021	<MDC	0.6	<MDC	36.0	<MDC	0.4	<MDC	0.2	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.6	<MDC	184.0	<MDC	0.1	<MDC	0.5	<MDC	0.2	<MDC	0.4
9/8/2021	<MDC	0.6	<MDC	36.0	<MDC	0.4	<MDC	0.2	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.6	<MDC	184.0	<MDC	0.1	<MDC	0.5	<MDC	0.2	<MDC	0.4
West Boat Ramp																										
6/1/2021	<MDC	0.6	<MDC	36.0	<MDC	0.4	<MDC	0.2	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.6	<MDC	184.0	<MDC	0.1	<MDC	0.5	<MDC	0.2	<MDC	0.4
9/8/2021	<MDC	0.6	<MDC	36.0	<MDC	0.4	<MDC	0.2	<MDC	0.1	<MDC	0.1	<MDC	0.1	<MDC	0.6	<MDC	184.0	<MDC	0.1	<MDC	0.5	<MDC	0.2	<MDC	0.4

Gamma Spectroscopy Results for Radionuclides in Fish - Sangchris Lake State Park
Results are in picocuries per kilogram (pCi/kg)

We were unable to coordinate the collection of fish with IDNR; therefore, no fish samples were analyzed at this location for 2021.

Summary of Ambient Gamma Results - Sangchris Lake State Park

Location	Quarter 1 mR/quarter	Quarter 2 mR/quarter	Quarter 3 mR/quarter	Quarter 4 mR/quarter	Annual Exposure mR/year
KC-01	10.0	11.8	7.9	12.8	42.6
KC-02	7.9	11.4	6.5	12.7	38.6
KC-03	7.2		6.9	8.6	30.2
KC-04	10.6	13.2	4.0	9.6	37.4
KC-05	10.5	11.9	7.4	10.1	40.0
KC-06	6.3		7.9	9.3	31.4
KC-07	10.5	10.6	5.7		35.7
KC-08	8.5	13.7	5.8		37.3
KC-09		11.7	4.3	8.3	32.4
KC-10	7.9	13.0	9.9		41.1
KC-11	10.6	17.4	6.9	11.9	46.8
KC-12	10.5	11.4	6.7	11.3	40.0
KC-13	10.7	12.6	7.4	8.6	39.2
KC-14	12.2	12.0	4.9	10.7	39.9
KC-15	9.9	10.5	7.5	10.6	38.5

Blanks in the table indicate that dosimeters were missing at the end of the quarter.

Annual Exposure column based on averages of all available data.

Quarter length is estimated to be 91.25 days.

Appendix A

Radionuclide Abbreviations in this Report

Ba-140 Barium-140
Ce-144 Cerium-144
Co-58 Cobalt-58
Co-60 Cobalt-60
Cs-134 Cesium-134
Cs-137 Cesium-137
Fe-59 Iron-59
I-131 Iodine-131
Mn-54 Manganese-54
Nb-95 Niobium-95
Zn-65 Zinc-65
Zr-95 Zirconium-95

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