State of Illinois
Illinois Emergency Management Agency

2020 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.

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 2020, 323 environmental samples were collected and analyzed for radioactivity. The samples collected by IEMA included water, sediment, soil, air, vegetation and fish. In addition, 1177 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.

Due to COVID-19 employee safety mandates in place during a portion of 2020, IEMA's Division of Nuclear Safety's Radiological Field Services Unit (RFS) staff was temporarily unavailable to perform the duties associated with the radiological environmental monitoring programs. This resulted in some scheduled sampling and monitoring activities not being completed.

In 2020, 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. 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 and air monitoring samples are collected in Springfield, Marion, and West Chicago, Illinois. Background location information and sample results can be found on pages 132-143.

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 2020 through December 2020 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.

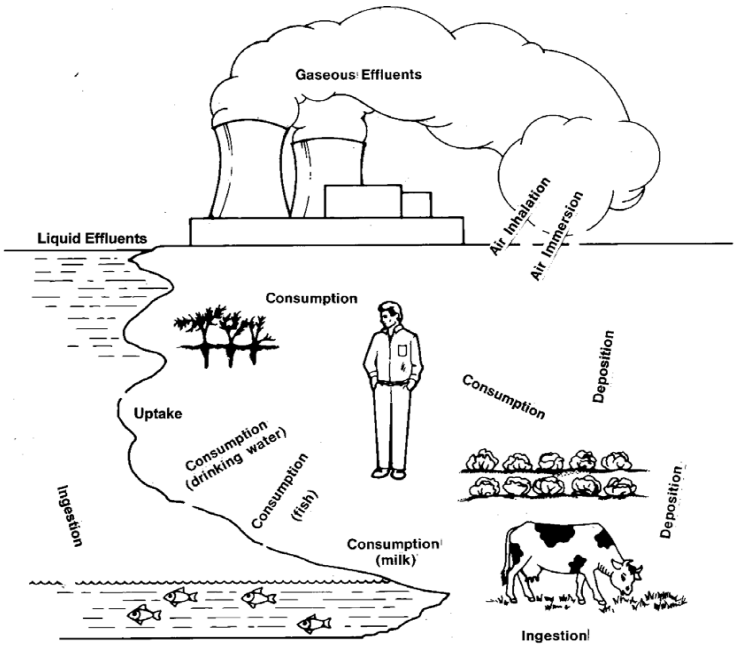
IEMA Radiological Environmental Monitoring Program

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 2020, 323 samples were collected and analyzed, and 1177 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 1. 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.

Air Sampling

Due to decommissioning activities at the Zion NPS, which permanently ceased operation in February 1998, IEMA maintained a network of air monitoring stations around the Zion site. Air samples were collected continuously, with the air filters being changed and analyzed weekly. Following the completion of large-scale invasive activities associated with the Zion NPS decommissioning project, air sampling activities were discontinued in February 2020.

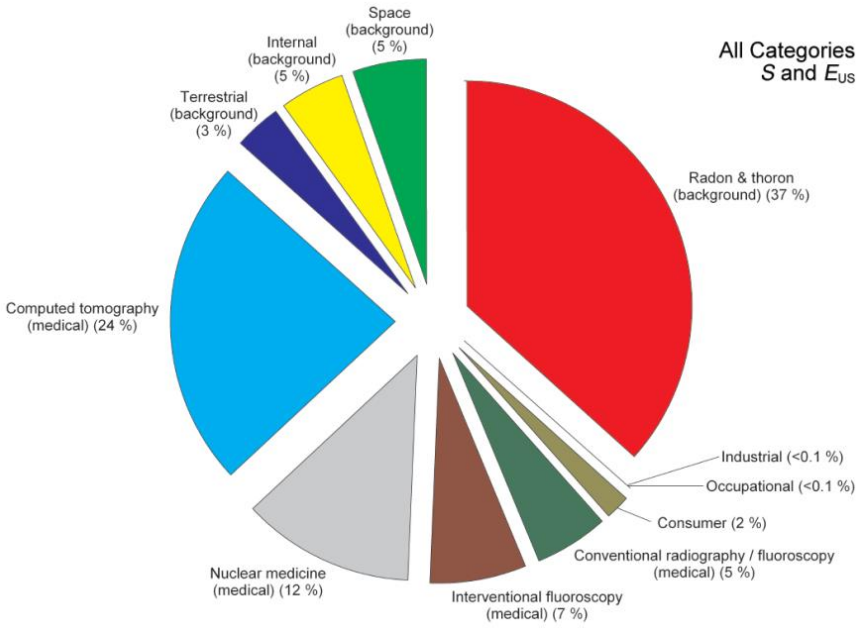
Direct Radiation Monitoring

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 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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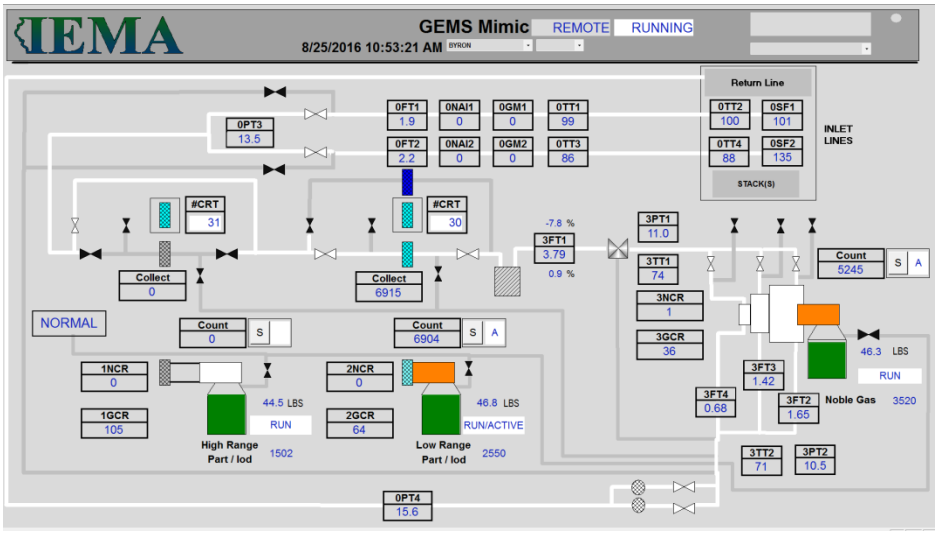
Gaseous Effluent Monitoring System (GEMS)

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

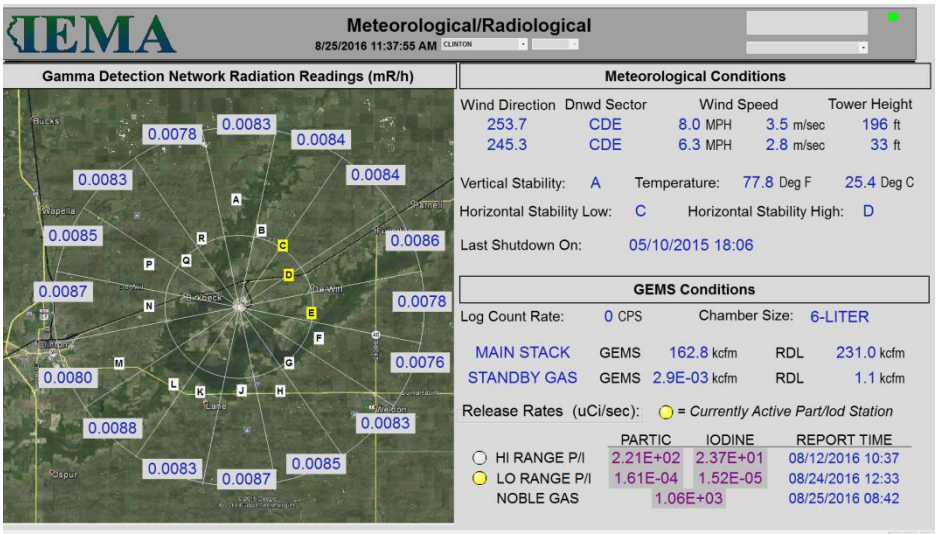


Figure 5. Typical IEMA GDN Field Installation

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 air 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 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 U.S. NRC operating license to waterways, per the station's National Pollutant Discharge Elimination System 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 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 National Pollutant Discharge Elimination System permit, which is issued by the IEPA.

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 gas proportional 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.

Gross Alpha/ Gross Beta Analysis (Air)

Air particulate filters are analyzed for airborne radioactivity through gross alpha and beta analysis using a gas proportional counter. Since many radionuclides associated with nuclear power production emit either alpha or beta particles, analysis of air particulate samples for gross alpha/beta activity provides a good method of screening for the presence of radioactive materials. Gross alpha/beta results for air samples are included within the Zion NPS specific information provided in this report.

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 2020 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 in Springfield, Marion, Kincaid, and West Chicago. Background location information and sample results can be found on pages 130-143.

Results at a Glance

Federal regulations establish standards for protection of the public against ionizing radiation resulting from activities conducted under U.S. 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 LaSalle and Braidwood stations and in one sample near the Byron station. The elevated levels found are likely attributable to the liquid effluent releases from the Braidwood and Byron stations. 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, IEMA continues to analyze 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 were consistently found in the groundwater split samples from location MW-4. The concentrations detected were well below the US EPA limit for tritium in drinking water.

Cesium-137 in concentrations greater than the established MDC was detected near all 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. All other gamma spectroscopy results for radionuclides of interest were below their established MDCs.

Results from total strontium analysis of the third quarter sample collected from the Mississippi River at Rapids City were slightly above the established MDC. Although detectable, the concentration seen was well below the US EPA drinking water standard which sets the limit for strontium-90 at 8 pCi/L.

Gross beta analysis indicated that many sampling locations had slightly elevated levels of beta contamination. These slightly elevated levels of gross beta are consistent with concentrations found in background samples collected.

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

In 2020, 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 Exelon Corporation 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 National Pollutant Discharge Elimination System permit.

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, IEMA continues to analyze split water samples collected by Exelon from two locations on site. One sample is collected from a groundwater well (MW-4) located near the turbine building and the other is a surface water sample collected from F-ditch (DS-2). Detectable levels of tritium were consistently found in the groundwater split samples from location MW-4.

All tritium levels detected were below the 20,000 pCi/L drinking water limit set by the US EPA and IEPA.

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 2020

Due to COVID-19 employee safety mandates in place during a portion of 2020, IEMA's Division of Nuclear Safety's Radiological Field Services Unit (RFS) staff was temporarily unavailable to perform the duties associated with the radiological environmental monitoring programs. This resulted in some scheduled sampling and monitoring activities not being completed.

Braidwood Sampling and Monitoring Results

Water Sampling Results

A detectable level of tritium was found in a surface water sample taken from the Kankakee River at the Des Plaines Conservation Area boat launch during the third quarter sampling. This elevated concentration is likely attributable to the liquid effluent releases from the stations. 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.

Strontium analysis was scheduled for second quarter. Due to COVID-19 employee safety mandates, second quarter sampling was suspended; therefore, strontium analysis results were not obtained.

Results from gross beta analysis indicated that the established MDC was met at some sampling locations and are likely attributable to the routine liquid effluent releases from the Braidwood station.

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 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

Due to COVID-19 employee safety mandates in place during a portion of 2020, fish samples were unobtainable for 2020.

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

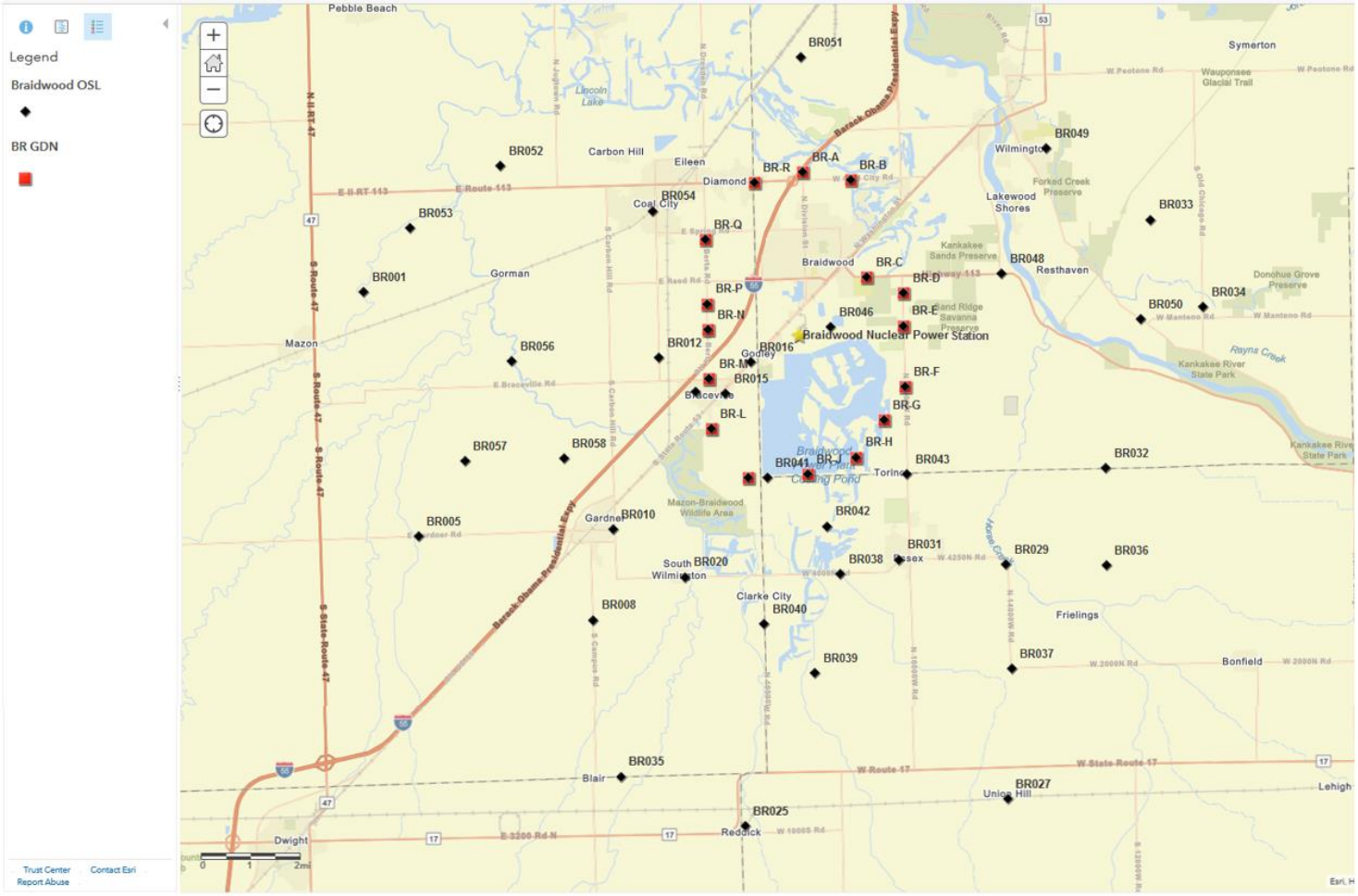


Figure 7. OSL and GDN Monitoring Locations- Braidwood (continued)

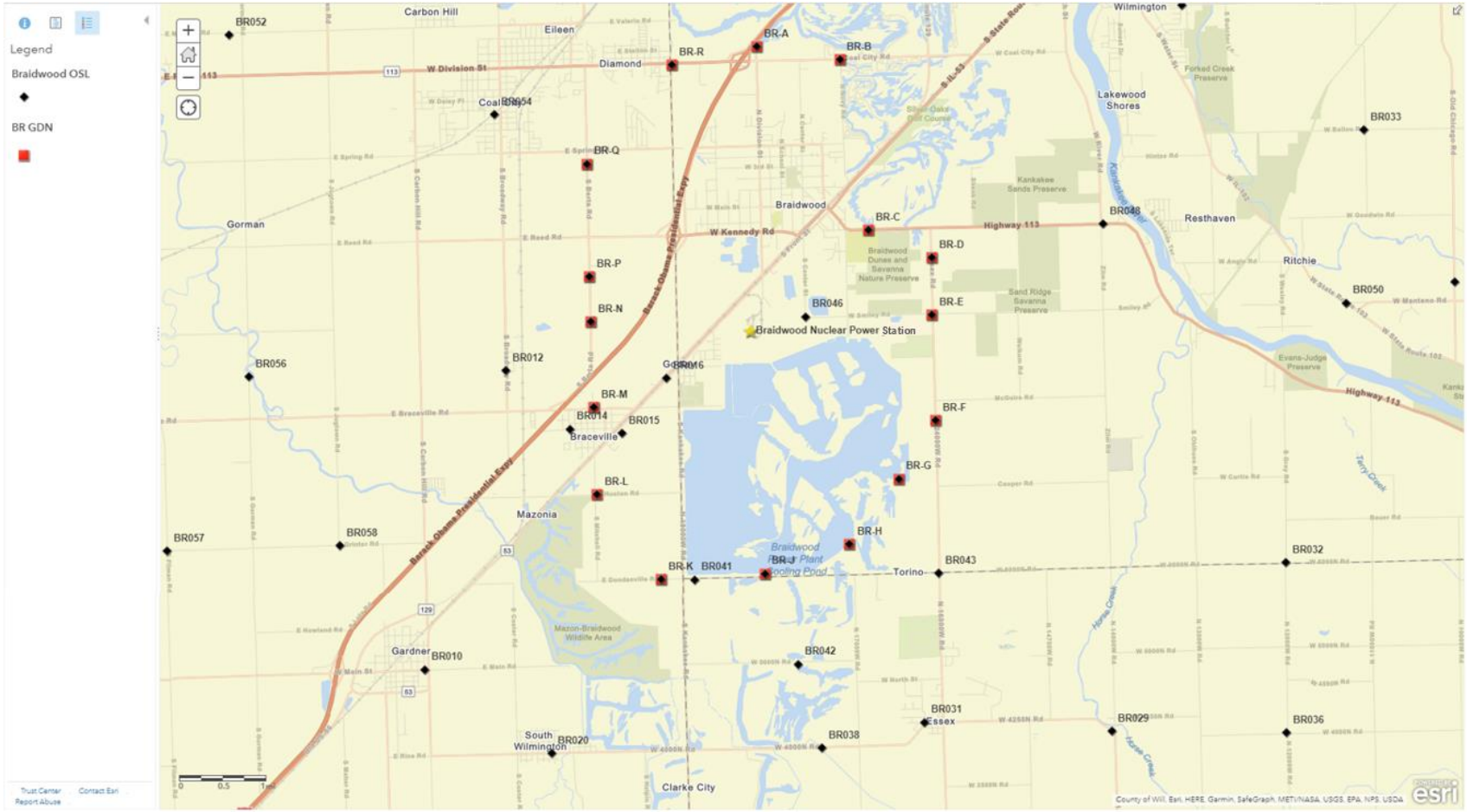
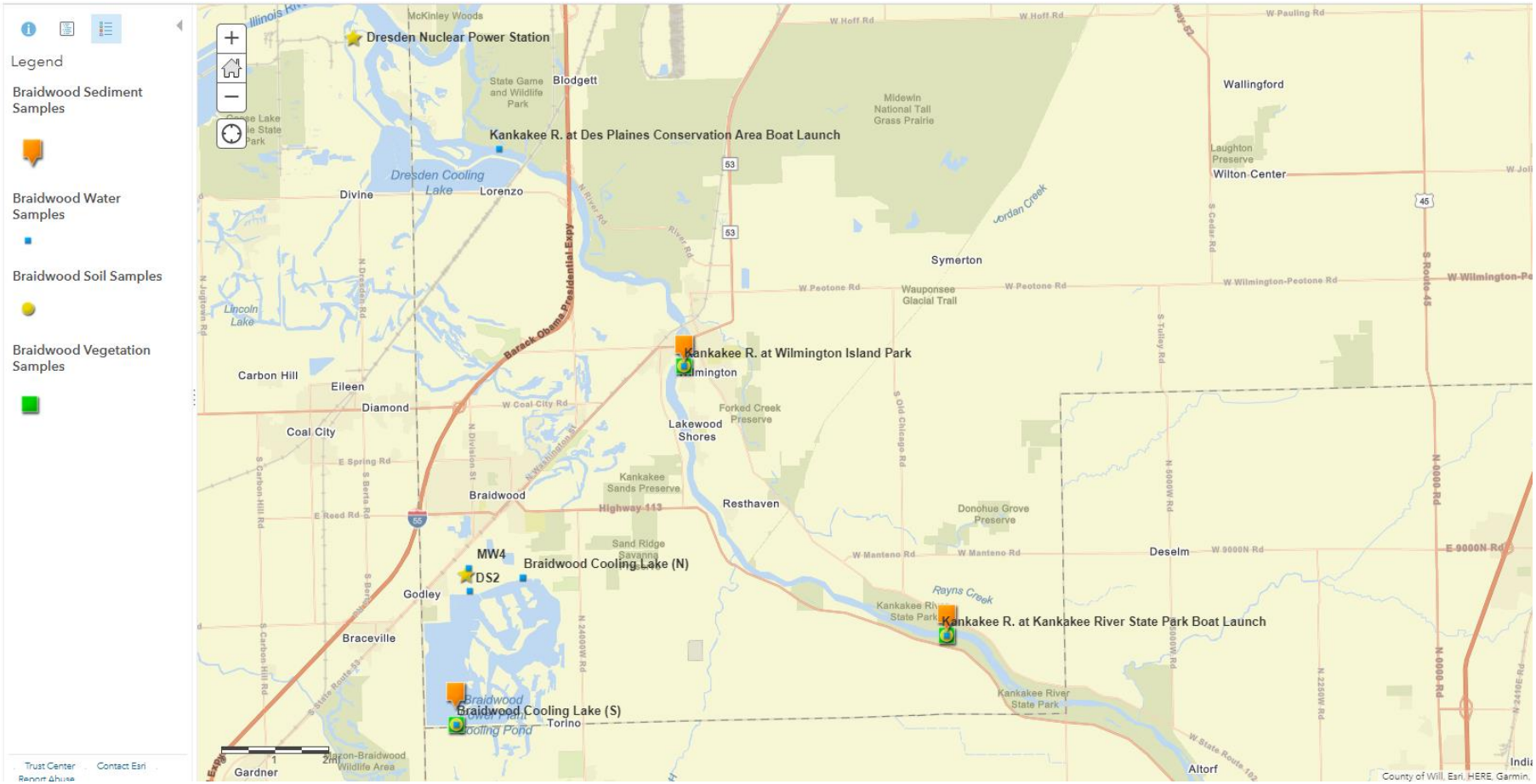


Figure 8. Environmental Sampling Locations – Braidwood

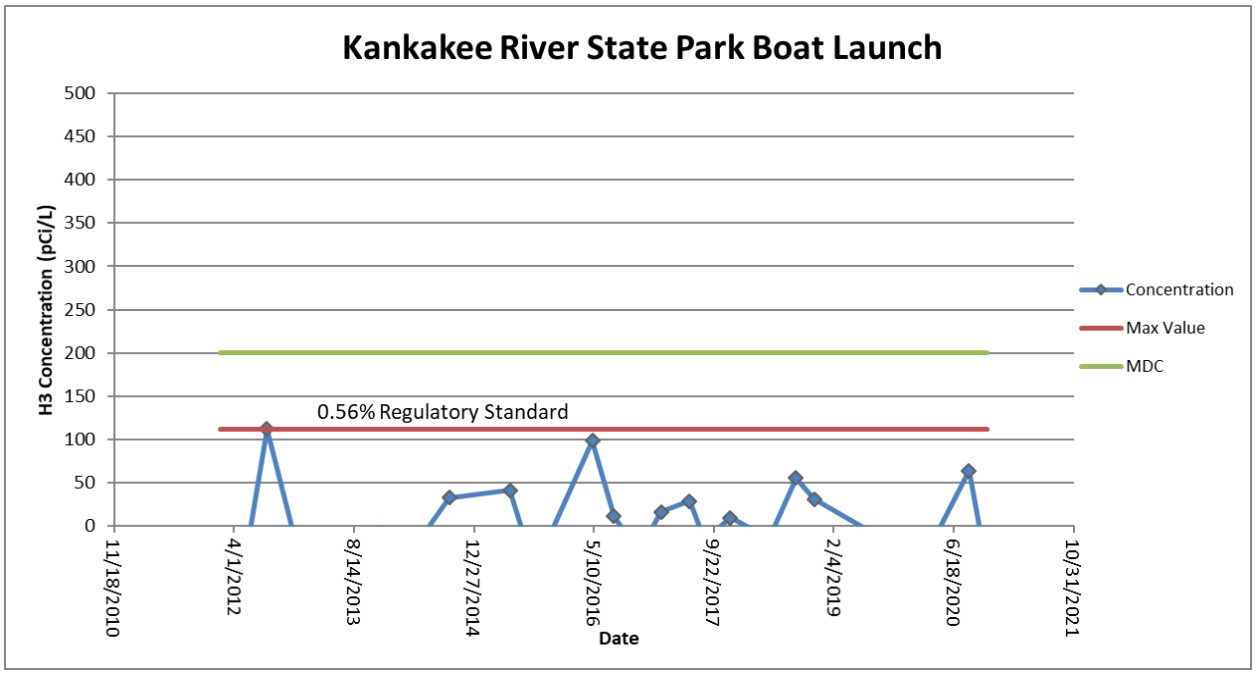


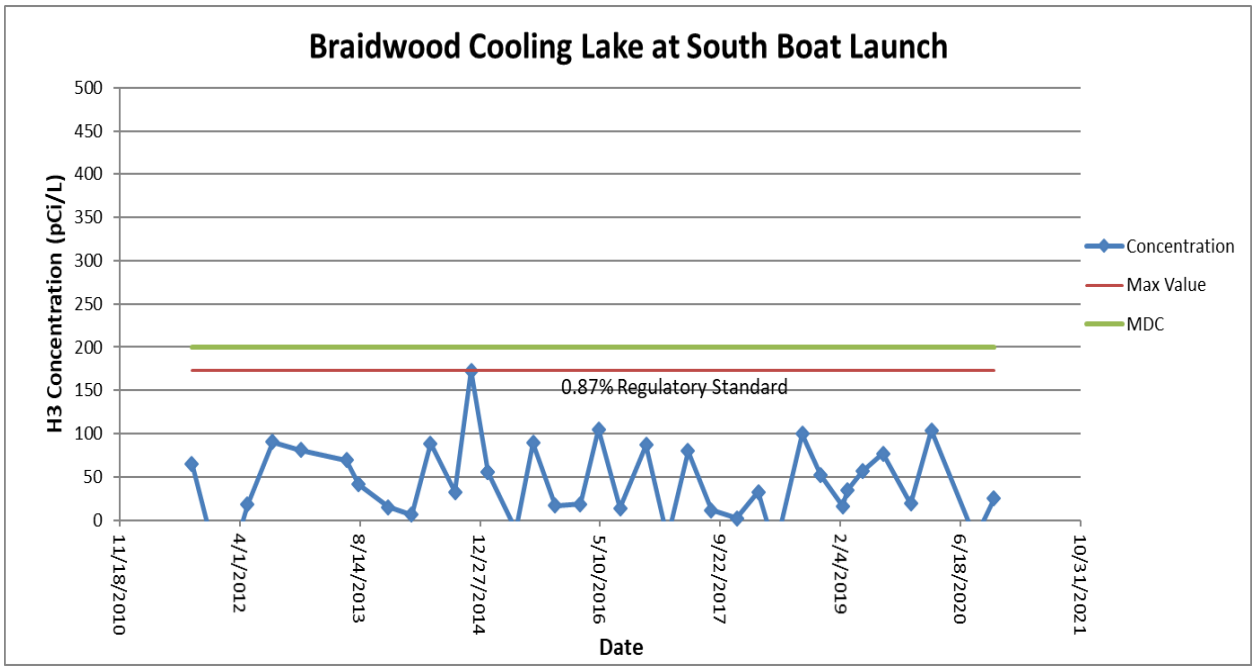
Braidwood Sample Result Tables and Graphs

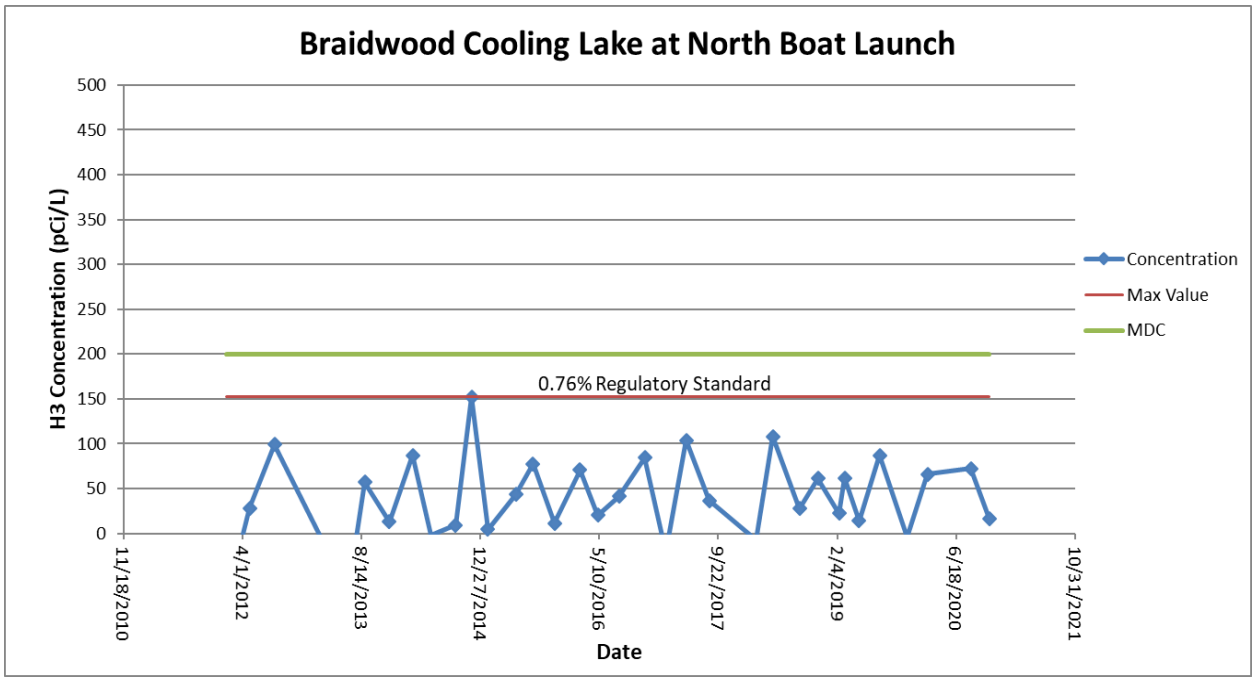
Tritium (H-3) in Water Results - Braidwood
Results are in picocuries per liter (pCi/L)

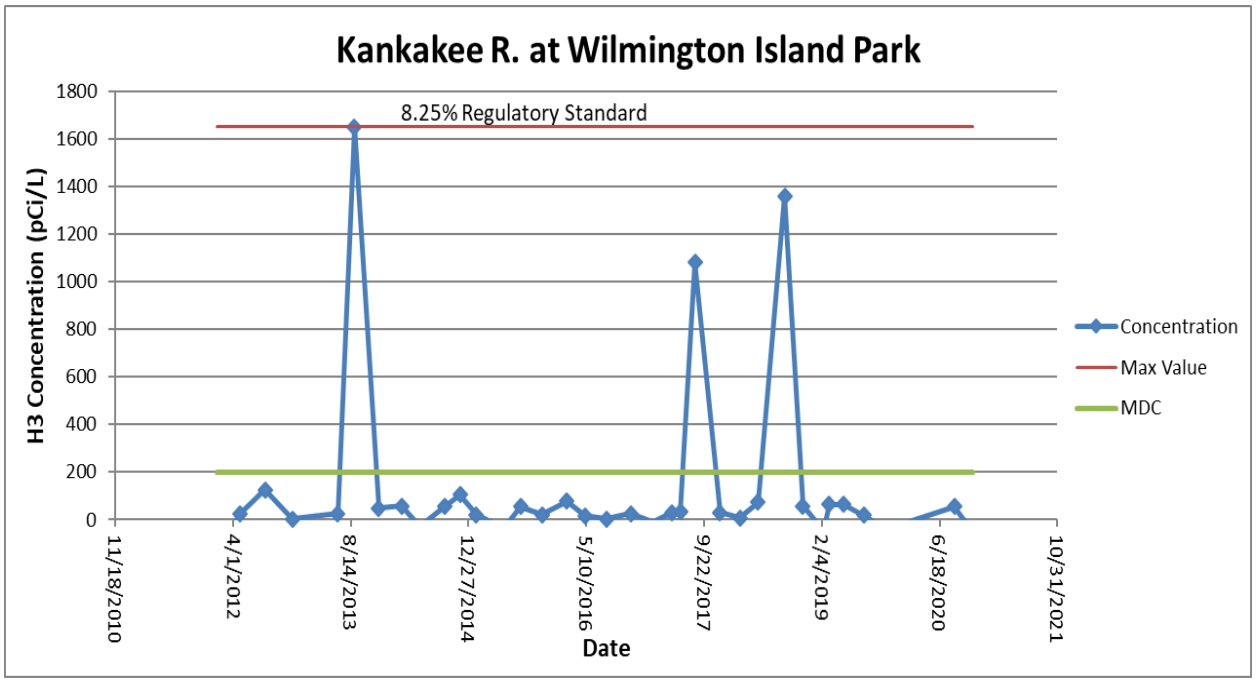
Location	H-3	
Date	Result	MDC
DS-2		
3/5/2020	<MDC	200
3/24/2020	<MDC	200
4/22/2020	<MDC	200
8/19/2020	<MDC	200
10/26/2020	<MDC	200
MW-4		
3/6/2020	397	200
3/23/2020	429	200
4/16/2020	394	200
8/26/2020	440	200
11/9/2020	264	200
Braidwood Cooling Lake (N)		
2/18/2020	<MDC	200
8/19/2020	<MDC	200
11/4/2020	<MDC	200
Braidwood Cooling Lake (S)		
2/18/2020	<MDC	200
8/19/2020	<MDC	200
11/4/2020	<MDC	200
Kankakee R. at Des Plaines Conservation Area Boat Launch		
2/18/2020	<MDC	200
8/19/2020	1050	200
11/4/2020	<MDC	200
Kankakee R. at Kankakee R. State Park Boat Launch		
2/18/2020	<MDC	200
8/19/2020	<MDC	200
11/4/2020	<MDC	200
Kankakee R. at Wilmington Island Park		
2/18/2020	<MDC	200
8/19/2020	<MDC	200
11/4/2020	<MDC	200

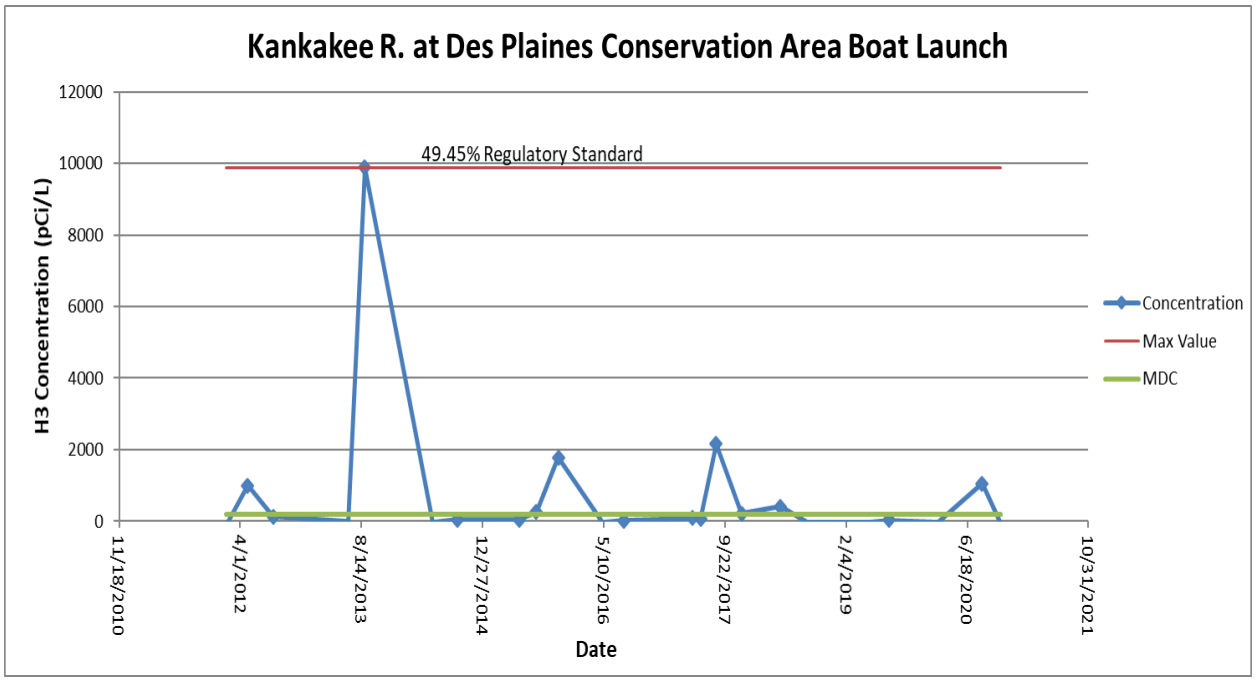
Trending Graphs for Tritium (H-3) in Water - Braidwood
(Max value compared to IEPA and US EPA regulatory standard of 20,000 pCi/L)

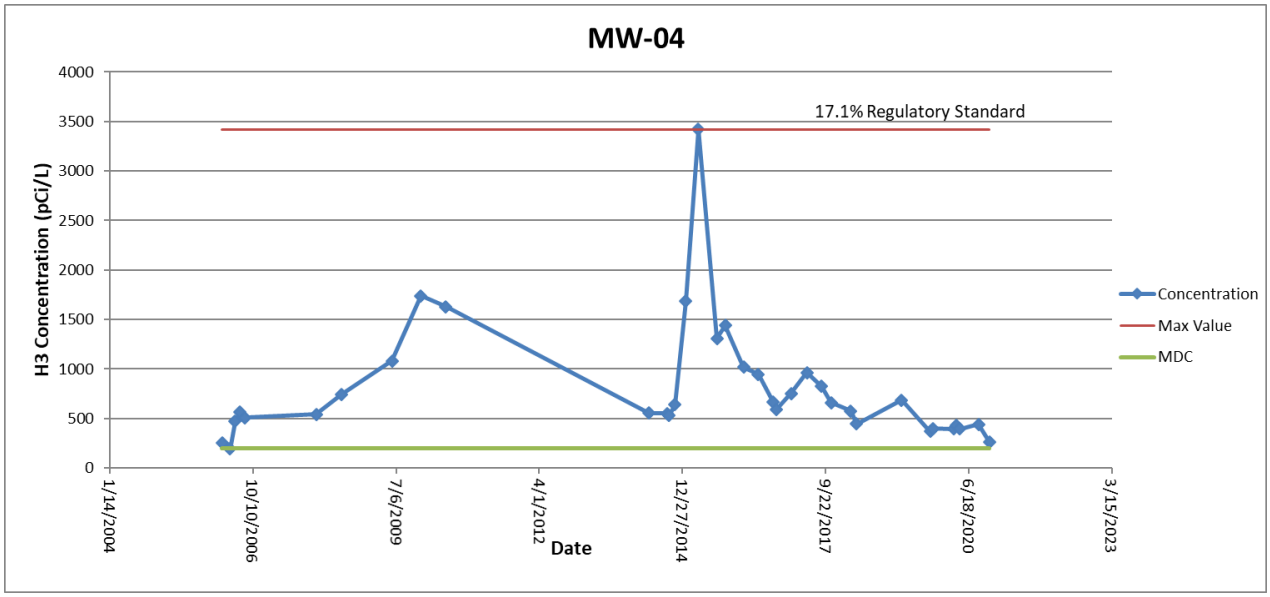


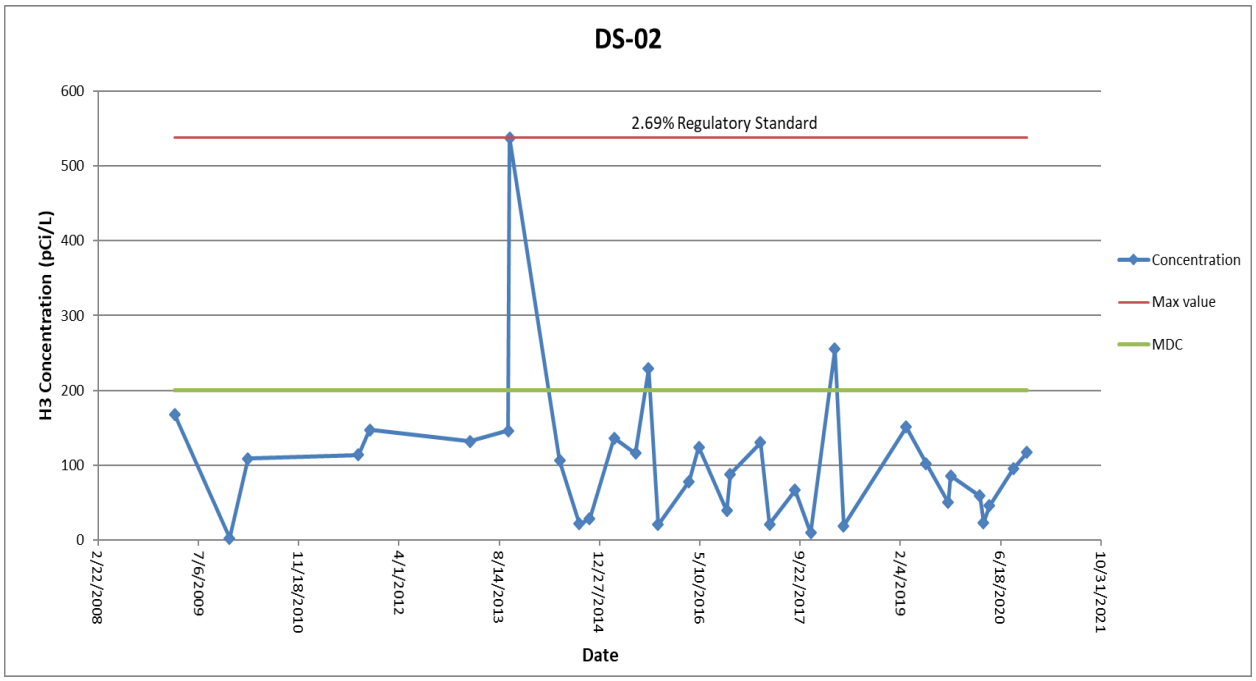



Braidwood Cooling Lake at North Boat Launch
H3 Concentration (pCi/L)
500
450
400
350
300
250
200
150
100
50
0
0.76% Regulatory Standard
11/18/2010
4/1/2012
8/14/2013
12/27/2014
5/10/2016
9/22/2017
2/4/2019
6/18/2020
10/31/2021
Date
Concentration
Max Value
MDC


Kankakee R. at Wilmington Island Park
H3 Concentration (pCi/L)
1800
1600
1400
1200
1000
800
600
400
200
0
8.25% Regulatory Standard
11/18/2010
4/1/2012
8/14/2013
12/27/2014
5/10/2016
9/22/2017
2/4/2019
6/18/2020
10/31/2021
Date
Concentration
Max Value
MDC


Kankakee R. at Des Plaines Conservation Area Boat Launch
12000
10000
8000
6000
4000
2000
0
H3 Concentration (pCi/L)
49.45% Regulatory Standard
11/18/2010
4/1/2012
8/14/2013
12/27/2014
5/10/2016
9/22/2017
2/4/2019
6/18/2020
10/31/2021
Date
Concentration
Max Value
MDC


MW-04
4000
3500
3000
2500
2000
1500
1000
500
0
H3 Concentration (pCi/L)
17.1% Regulatory Standard
1/14/2004
10/10/2006
7/6/2009
4/1/2012
12/27/2014
9/22/2017
6/18/2020
3/15/2023
Date
Concentration
Max Value
MDC


DS-02
2.69% Regulatory Standard
H3 Concentration (pCi/L)
600
500
400
300
200
100
0
2/22/2008
7/6/2009
11/18/2010
4/1/2012
8/14/2013
12/27/2014
5/10/2016
9/22/2017
2/4/2019
6/18/2020
10/31/2021
Date
Concentration
Max value
MDC

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

Strontium analysis was scheduled for second quarter of 2020. Due to COVID-19 employee safety mandates, second quarter sampling was suspended. Therefore, strontium analysis results were not obtained.

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

Location	Beta	
Date	Result	MDC
Braidwood Cooling Lake (N)		
2/18/2020	8.6	3.7
8/19/2020	7.1	3.7
11/4/2020	8.0	3.7
Braidwood Cooling Lake (S)		
2/18/2020	8.1	3.7
8/19/2020	6.1	3.7
11/4/2020	7.4	3.7
Kankakee R. at Des Plaines Conserv. Area		
2/18/2020	4.2	3.7
8/19/2020	<MDC	3.7
11/4/2020	<MDC	3.7
Kankakee R. at Kankakee R. State Park Boat Launch		
2/18/2020	<MDC	3.7
8/19/2020	<MDC	3.7
11/4/2020	4.1	3.7
Kankakee R. at Wilmington Island Park		
2/18/2020	<MDC	3.7
8/19/2020	4.1	3.7
11/4/2020	4.2	3.7

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)																								
2/18/2020	<MDC	15.6	<MDC	360.0	<MDC	3.5	<MDC	3.9	<MDC	3.9	<MDC	3.9	<MDC	6.8	<MDC	5.7	<MDC	4.0	<MDC	4.0	<MDC	7.1	<MDC	6.5
8/19/2020	<MDC	15.6	<MDC	360.0	<MDC	3.5	<MDC	3.9	<MDC	3.9	<MDC	3.9	<MDC	6.8	<MDC	5.7	<MDC	4.0	<MDC	4.0	<MDC	7.1	<MDC	6.5
11/4/2020	<MDC	15.6	<MDC	360.0	<MDC	3.5	<MDC	3.9	<MDC	3.9	<MDC	3.9	<MDC	6.8	<MDC	5.7	<MDC	4.0	<MDC	4.0	<MDC	7.1	<MDC	6.5
Braidwood Cooling Lake (S)																								
2/18/2020	<MDC	15.6	<MDC	360.0	<MDC	3.5	<MDC	3.9	<MDC	3.9	<MDC	3.9	<MDC	6.8	<MDC	5.7	<MDC	4.0	<MDC	4.0	<MDC	7.1	<MDC	6.5
8/19/2020	<MDC	15.6	<MDC	360.0	<MDC	3.5	<MDC	3.9	<MDC	3.9	<MDC	3.9	<MDC	6.8	<MDC	5.7	<MDC	4.0	<MDC	4.0	<MDC	7.1	<MDC	6.5
11/4/2020	<MDC	15.6	<MDC	360.0	<MDC	3.5	<MDC	3.9	<MDC	3.9	<MDC	3.9	<MDC	6.8	<MDC	5.7	<MDC	4.0	<MDC	4.0	<MDC	7.1	<MDC	6.5
Kankakee R. at Des Plaines Conservation Area Boat Launch																								
2/18/2020	<MDC	15.6	<MDC	360.0	<MDC	3.5	<MDC	3.9	<MDC	3.9	<MDC	3.9	<MDC	6.8	<MDC	5.7	<MDC	4.0	<MDC	4.0	<MDC	7.1	<MDC	6.5
8/19/2020	<MDC	15.6	<MDC	360.0	<MDC	3.5	<MDC	3.9	<MDC	3.9	<MDC	3.9	<MDC	6.8	<MDC	5.7	<MDC	4.0	<MDC	4.0	<MDC	7.1	<MDC	6.5
11/4/2020	<MDC	15.6	<MDC	360.0	<MDC	3.5	<MDC	3.9	<MDC	3.9	<MDC	3.9	<MDC	6.8	<MDC	5.7	<MDC	4.0	<MDC	4.0	<MDC	7.1	<MDC	6.5
Kankakee R. at Kankakee R. State Park Boat Launch																								
2/18/2020	<MDC	15.6	<MDC	360.0	<MDC	3.5	<MDC	3.9	<MDC	3.9	<MDC	3.9	<MDC	6.8	<MDC	5.7	<MDC	4.0	<MDC	4.0	<MDC	7.1	<MDC	6.5
8/19/2020	<MDC	15.6	<MDC	360.0	<MDC	3.5	<MDC	3.9	<MDC	3.9	<MDC	3.9	<MDC	6.8	<MDC	5.7	<MDC	4.0	<MDC	4.0	<MDC	7.1	<MDC	6.5
11/4/2020	<MDC	15.6	<MDC	360.0	<MDC	3.5	<MDC	3.9	<MDC	3.9	<MDC	3.9	<MDC	6.8	<MDC	5.7	<MDC	4.0	<MDC	4.0	<MDC	7.1	<MDC	6.5
Kankakee R. at Wilmington Island Park																								
2/18/2020	<MDC	15.6	<MDC	360.0	<MDC	3.5	<MDC	3.9	<MDC	3.9	<MDC	3.9	<MDC	6.8	<MDC	5.7	<MDC	4.0	<MDC	4.0	<MDC	7.1	<MDC	6.5
8/19/2020	<MDC	15.6	<MDC	360.0	<MDC	3.5	<MDC	3.9	<MDC	3.9	<MDC	3.9	<MDC	6.8	<MDC	5.7	<MDC	4.0	<MDC	4.0	<MDC	7.1	<MDC	6.5
11/4/2020	<MDC	15.6	<MDC	360.0	<MDC	3.5	<MDC	3.9	<MDC	3.9	<MDC	3.9	<MDC	6.8	<MDC	5.7	<MDC	4.0	<MDC	4.0	<MDC	7.1	<MDC	6.5

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	Result	MDC
Braidwood Cooling Lake (S)																						
8/19/2020	<MDC	960000	<MDC	0.36	<MDC	0.43	<MDC	0.04	<MDC	0.03	<MDC	0.03	<MDC	5.00	<MDC	0.06	<MDC	9.50	<MDC	0.16	<MDC	1.03
Kankakee R. at Kankakee R. State Park Boat Launch																						
8/19/2020	<MDC	960000	<MDC	0.36	<MDC	0.43	<MDC	0.04	<MDC	0.03	0.06	0.03	<MDC	5.00	<MDC	0.06	<MDC	9.50	<MDC	0.16	<MDC	1.03
Kankakee R. at Wilmington Island Park																						
8/19/2020	<MDC	960000	<MDC	0.36	<MDC	0.43	<MDC	0.04	<MDC	0.03	0.07	0.03	<MDC	5.00	<MDC	0.06	<MDC	9.50	<MDC	0.16	<MDC	1.03

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	Result	MDC
Braidwood Cooling Lake (S)																						
8/19/2020	<MDC	890000	<MDC	0.32	<MDC	0.36	<MDC	0.03	<MDC	0.03	<MDC	0.03	<MDC	4.40	<MDC	0.052	<MDC	8.90	<MDC	0.13	<MDC	0.91
Kankakee R. at Kankakee R. State Park Boat Launch																						
8/19/2020	<MDC	890000	<MDC	0.32	<MDC	0.36	<MDC	0.03	<MDC	0.03	0.03	0.03	<MDC	4.40	<MDC	0.052	<MDC	8.90	<MDC	0.13	<MDC	0.91
Kankakee R. at Wilmington Island Park																						
8/19/2020	<MDC	890000	<MDC	0.32	<MDC	0.36	<MDC	0.03	<MDC	0.03	0.07	0.03	<MDC	4.40	<MDC	0.052	<MDC	8.90	<MDC	0.13	<MDC	0.91

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)																						
8/19/2020	<MDC	1E+06	<MDC	0.38	<MDC	0.45	<MDC	0.04	<MDC	0.03	<MDC	0.04	<MDC	6.30	<MDC	0.06	<MDC	13.10	<MDC	0.18	<MDC	1.37
Kankakee R. at Kankakee R. State Park Boat Launch																						
8/25/2020	<MDC	1E+06	<MDC	0.38	<MDC	0.45	<MDC	0.04	<MDC	0.03	<MDC	0.04	<MDC	6.30	<MDC	0.06	<MDC	13.10	<MDC	0.18	<MDC	1.37
Kankakee R. at Wilmington Island Park																						
8/19/2020	<MDC	1E+06	<MDC	0.38	<MDC	0.45	<MDC	0.04	<MDC	0.03	0.05	0.04	<MDC	6.30	<MDC	0.06	<MDC	13.10	<MDC	0.18	<MDC	1.37

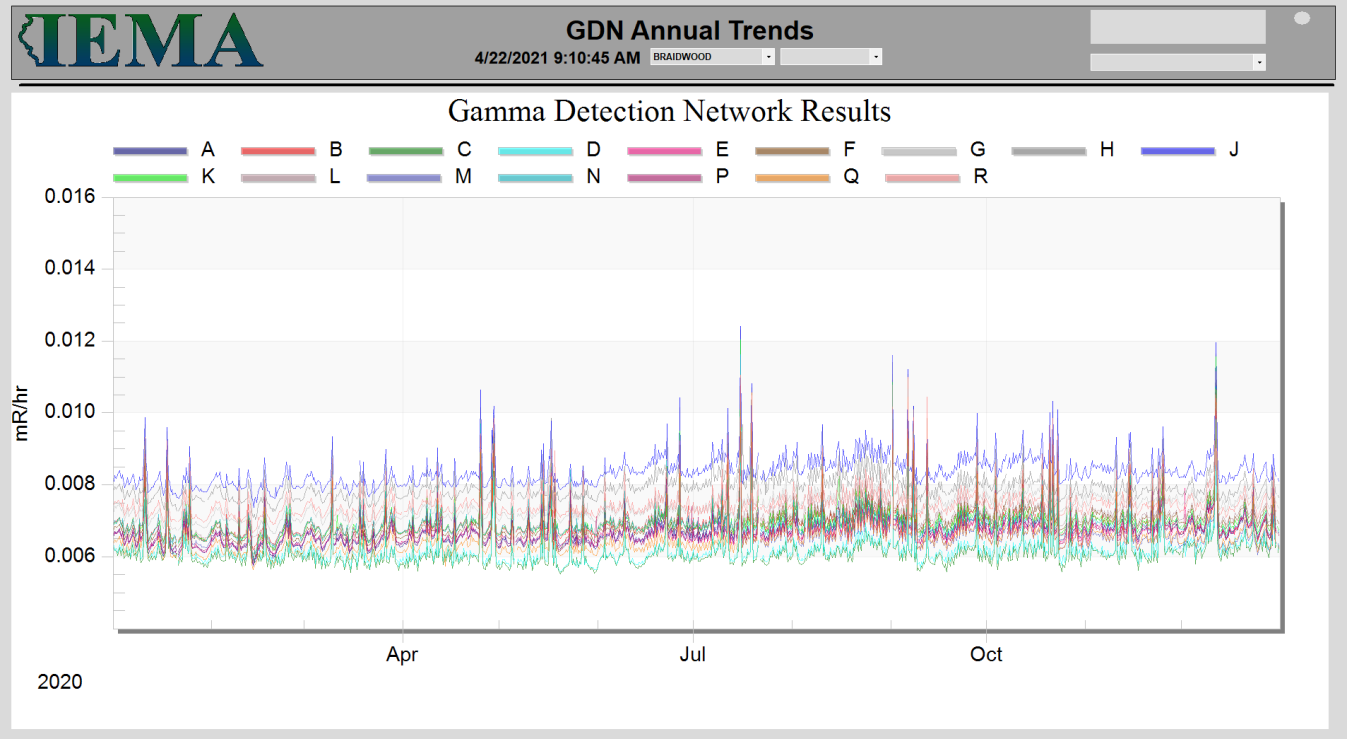
Gamma Spectroscopy Results for Radionuclides in Vegetation - Braidwood
Results are in picocuries per gram (pCi/g)

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)																								
8/19/2020	<MDC	6500	<MDC	0.20	<MDC	0.25	<MDC	0.04	<MDC	0.04	<MDC	0.04	<MDC	2.01	<MDC	1E+06	<MDC	0.06	<MDC	1.99	<MDC	0.18	<MDC	0.55
Kankakee R. at Kankakee R. State Park Boat Launch																								
8/19/2020	<MDC	6500	<MDC	0.20	<MDC	0.25	<MDC	0.04	<MDC	0.04	<MDC	0.04	<MDC	2.01	<MDC	1E+06	<MDC	0.06	<MDC	1.99	<MDC	0.18	<MDC	0.55
Kankakee R. at Wilmington Island Park																								
8/19/2020	<MDC	6500	<MDC	0.20	<MDC	0.25	<MDC	0.04	<MDC	0.04	<MDC	0.04	<MDC	2.01	<MDC	1E+06	<MDC	0.06	<MDC	1.99	<MDC	0.18	<MDC	0.55

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

Due to COVID-19 employee safety mandates in place during a portion of 2020, fish samples were unobtainable for 2020.

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
BR001	10.9	10.8	10.1	11.8	43.5
BR005	7.5	8.9	8.7	10.6	35.6
BR008	10.4	9.6	14.8	10.1	44.9
BR010	8.4	8.4	6.4	9.7	32.9
BR012	7.3	6.7	6.3	7.9	28.2
BR014	5.9	4.4	7.0	7.3	24.6
BR015	6.6	5.0	4.0	8.2	23.8
BR016	6.6	6.5	7.2	7.4	27.7
BR020	6.5	6.1	9.0	8.6	30.3
BR025	6.7	6.8	9.7	10.9	34.0
BR027	6.4	5.6	5.7	6.9	24.6
BR029	6.4	6.7	7.5	9.7	30.3
BR031	5.4	5.7	4.3	8.0	23.4
BR032	7.3	4.8	5.9	7.5	25.6
BR033	6.8	7.5	6.8	8.8	29.9
BR034	9.5	8.9	10.8	8.7	37.8
BR035	10.4	8.8	13.0	11.4	43.6
BR036	5.2	4.5	5.3	6.7	21.7
BR037	5.7	6.8	9.1	8.2	29.7
BR038	6.8	7.4	7.8	9.2	31.2
BR039	8.7	8.7	10.3	11.0	38.6
BR040	9.3		10.3	12.7	43.1
BR041	6.8	7.6	6.1	9.2	29.7
BR042	9.1	9.6	10.1	11.8	40.6
BR043	5.8	5.6	5.1	6.6	23.2
BR046	5.7	4.9	8.8	6.5	25.9

Location	Quarter 1 mR/quarter	Quarter 2/3 mR/quarter	Quarter 4 mR/quarter	Annual Exposure mR/year
BR001	11.3	11.8	11.8	46.8
BR005	7.7		13.7	42.9
BR008	7.3	11.9	12.9	43.9
BR010	5.9	7.4	8.8	29.5
BR012	4.5	5.4	8.3	23.6
BR014	6.1	4.9	7.7	23.6
BR015	4.2	5.3	7.7	22.5

BR016	6.5	6.7	7.3	27.2
BR020	4.2	7.6	7.0	26.4
BR025	7.0	7.8	6.3	28.8
BR027	6.1	6.4	8.9	27.9
BR029	3.1	7.9	8.2	27.0
BR031	6.0	6.0	6.3	24.3
BR032	4.4	5.8	5.7	21.7
BR033	5.8	8.1	10.3	32.4
BR034	8.0	9.9	8.6	36.4
BR035	7.6	11.1	12.4	42.2
BR036	6.0		5.9	23.8
BR037	5.1	8.6	9.7	32.0
BR038	4.7	7.7	8.5	28.5
BR039	8.3	10.5	9.9	39.2
BR040	7.2	12.4	14.0	46.1
BR041	5.0	8.0	6.6	27.6
BR042	9.6	10.1	11.6	41.5
BR043	4.1	5.8	4.6	20.4
BR046	5.3	6.2	8.4	26.0

Summary of Ambient Gamma Results – Braidwood (Continued)

Location	Quarter 1 mR/quarter	Quarter 2/3 mR/quarter	Quarter 4 mR/quarter	Annual Exposure mR/year
BR048	4.8	5.7	6.3	22.4
BR049	5.0	6.2	7.9	25.2
BR050	7.0	7.2	8.6	29.9
BR051	4.2	5.4	5.8	20.8
BR052	5.3	7.3	9.9	29.9
BR053	8.8			35.1
BR054	4.4	5.6	8.0	23.6
BR056	7.0	7.5	9.7	31.7
BR057	8.7	9.0	11.2	37.9
BR058	8.9	9.8	11.5	40.0
BR-RSA	4.9		10.4	30.6
BR-RSB	4.8	6.7	8.4	26.6
BR-RSC	6.3	5.4	6.9	23.9
BR-RSD	2.7	7.1	8.0	24.9
BR-RSE	6.4	5.2	8.0	24.8
BR-RSF	4.6	6.2		22.8
BR-RSG	9.3			37.2
BR-RSH	10.0			40.2
BR-RSJ	12.1	9.3	9.4	40.1
BR-RSK	5.9	5.9	6.9	24.5
BR-RSL	4.6	7.1	10.1	28.9
BR-RSM	3.5	5.0	5.5	19.0
BR-RSN	4.4	7.0	7.2	25.6
BR-RSP	2.9	4.0	8.6	19.6
BR-RSQ	4.9	5.6	7.0	23.1
BR-RSR	11.8	8.7		38.8

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. NPS OSLs were not collected in the 2nd quarter due to the COVID-19 emergency; therefore, results from quarters 2 and 3 are a combined average.

Byron Nuclear Power Station

The Byron NPS, consisting of two approximately 1,250 Megawatt PWRs, is owned and operated by the Exelon Corporation 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 National Pollutant Discharge Elimination System permit.

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 2020

Due to COVID-19 employee safety mandates in place during a portion of 2020, IEMA's Division of Nuclear Safety's Radiological Field Services Unit (RFS) staff was temporarily unavailable to perform the duties associated with the radiological environmental monitoring programs. This resulted in some scheduled sampling and monitoring activities not being completed.

Sampling and Monitoring Results

Water Sampling Results

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

Results from tritium analysis indicated that the established MDC was met at the Oregon Park East sampling location in January. The elevated tritium concentration can be attributed to the routine liquid effluent releases from the Byron station.

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.

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

Due to COVID-19 employee safety mandates in place during a portion of 2020, fish samples were unobtainable for 2020.

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

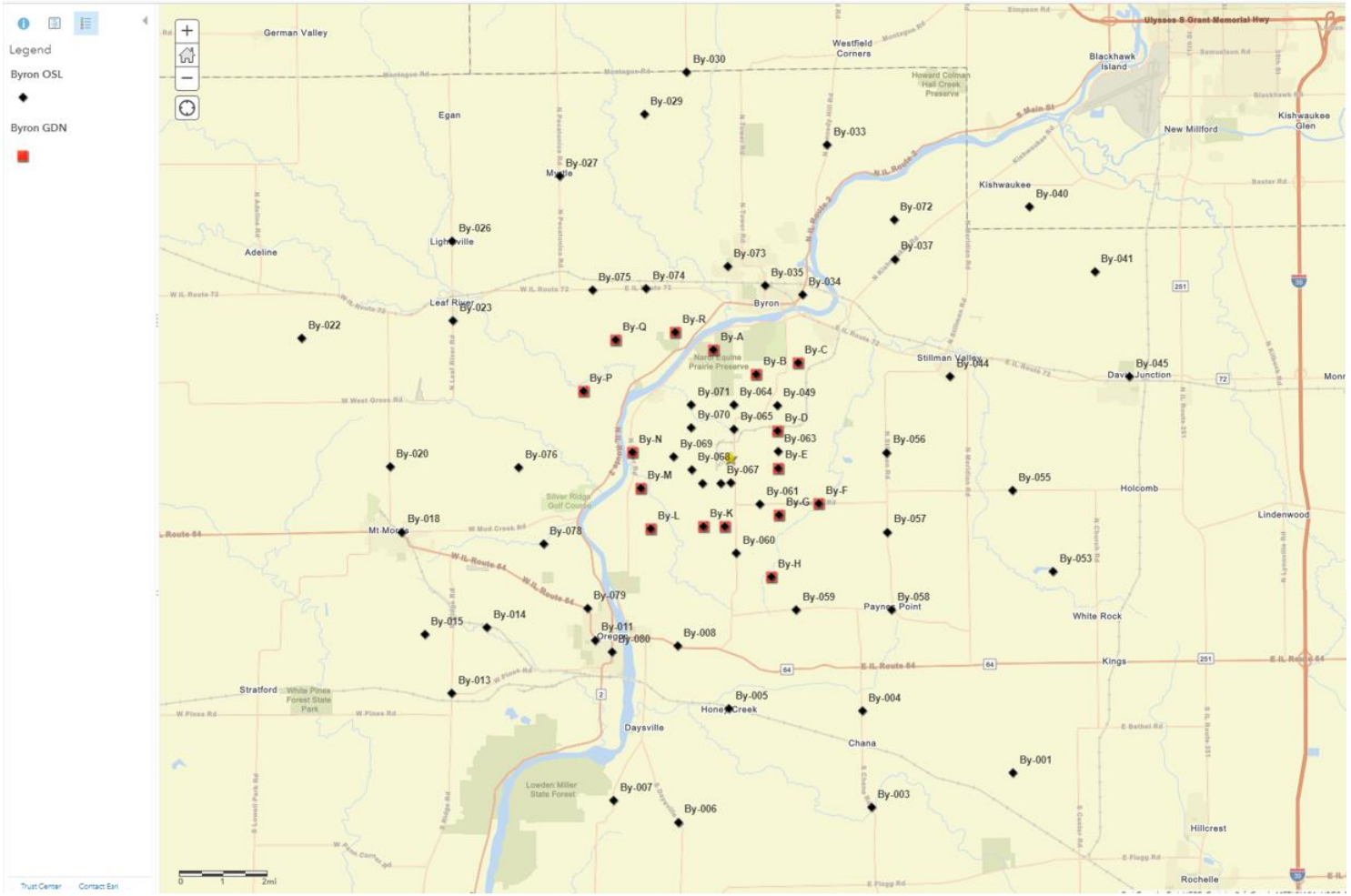


Figure 10. OSL and GDN Monitoring Locations- Byron (continued)

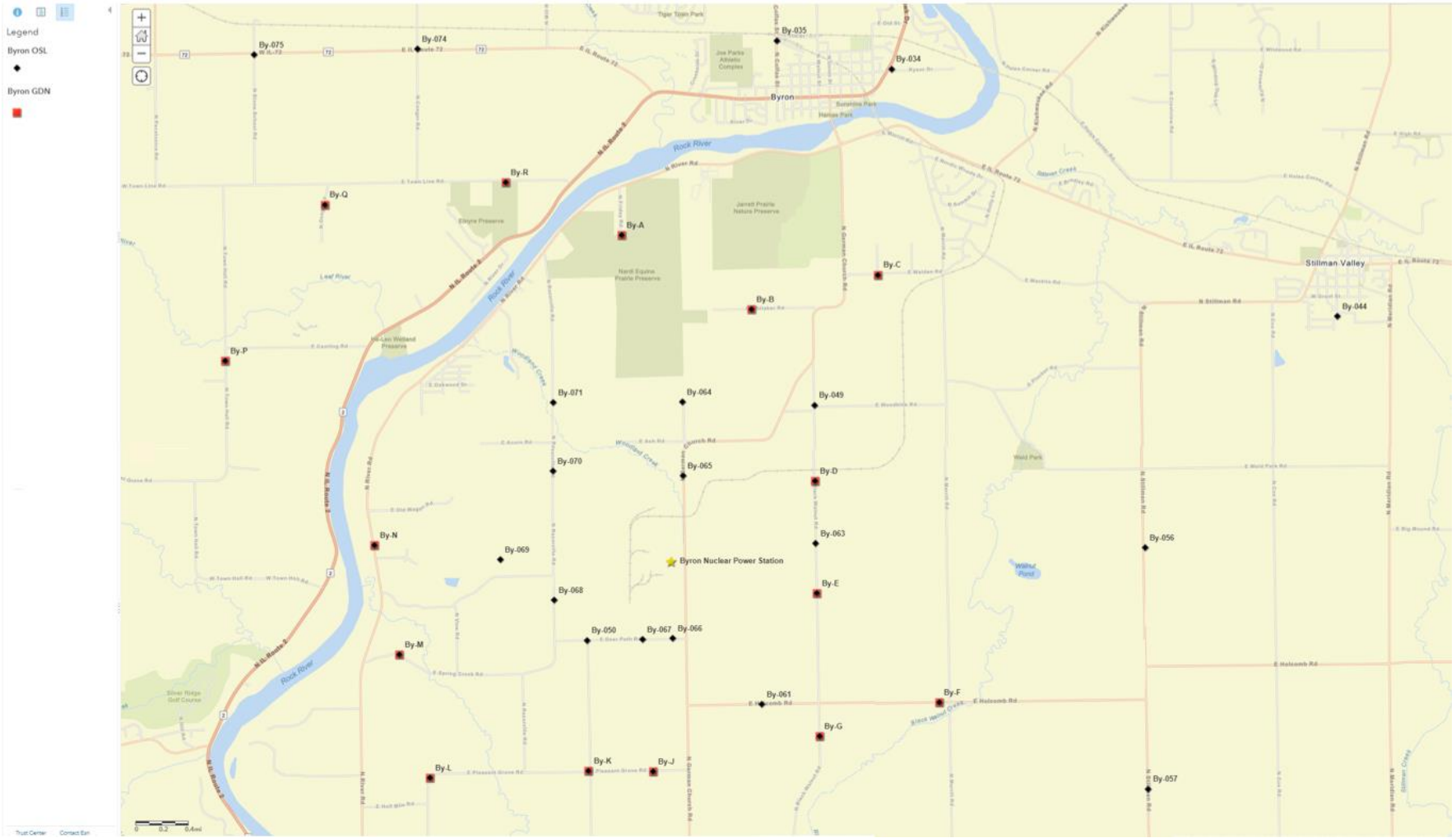
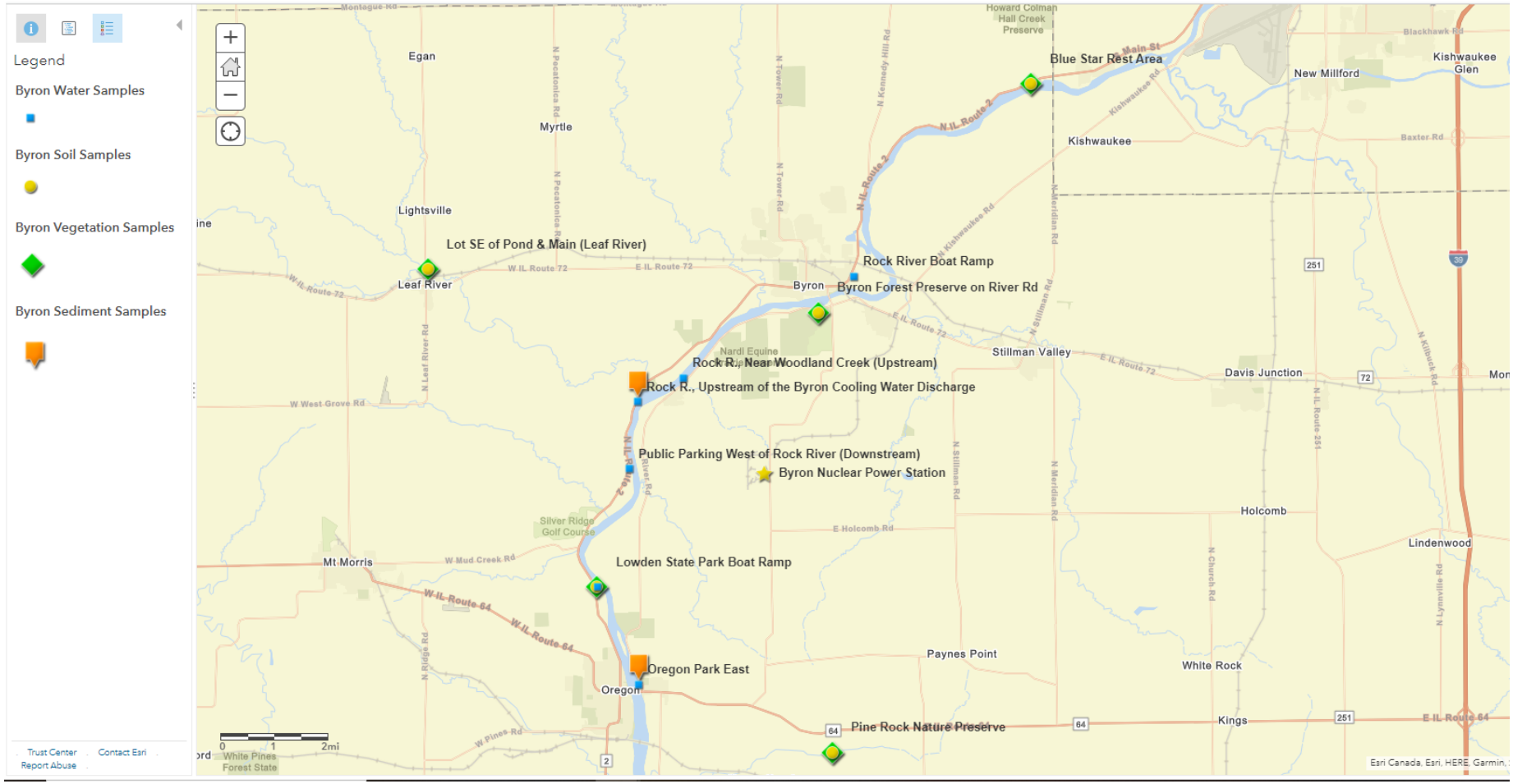


Figure 11. Environmental Sampling Locations- Byron

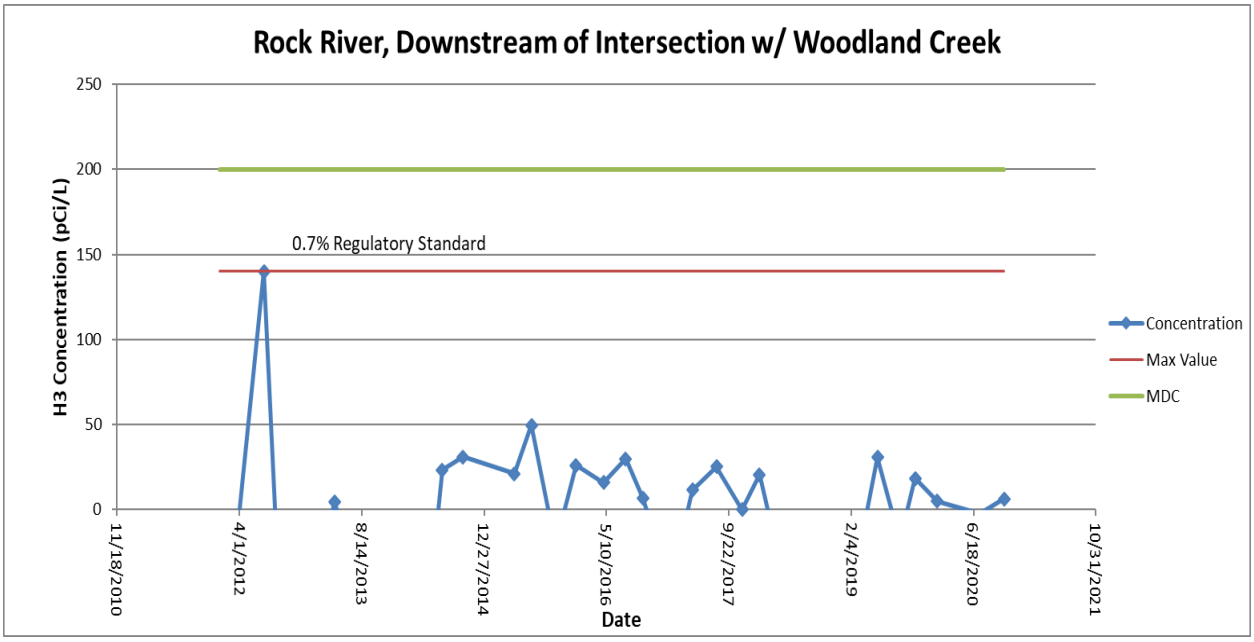


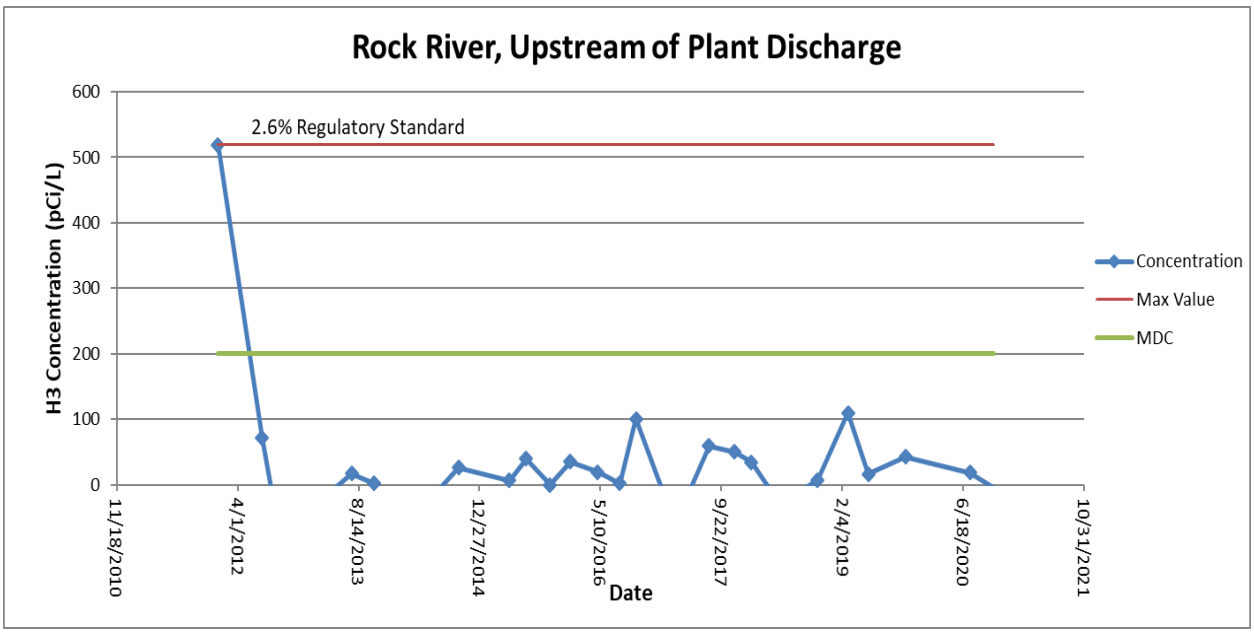
Byron Sample Result Tables and Graphs

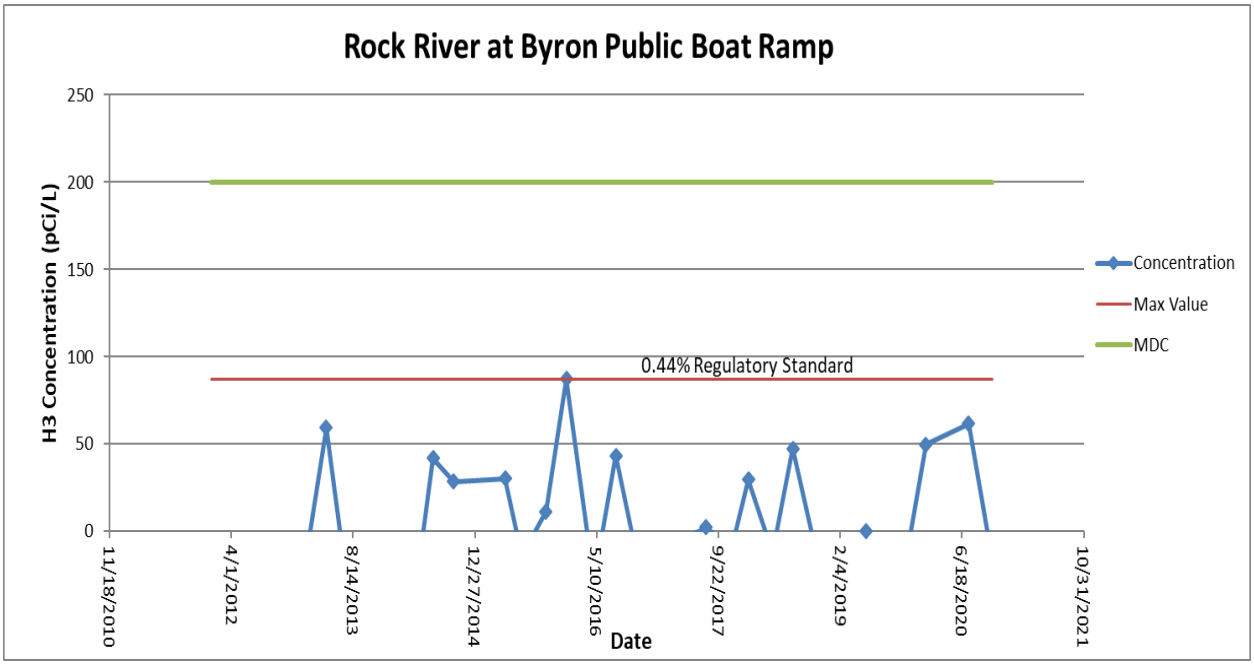
Tritium (H-3) in Water Results - Byron
Results are in picocuries per liter (pCi/L)

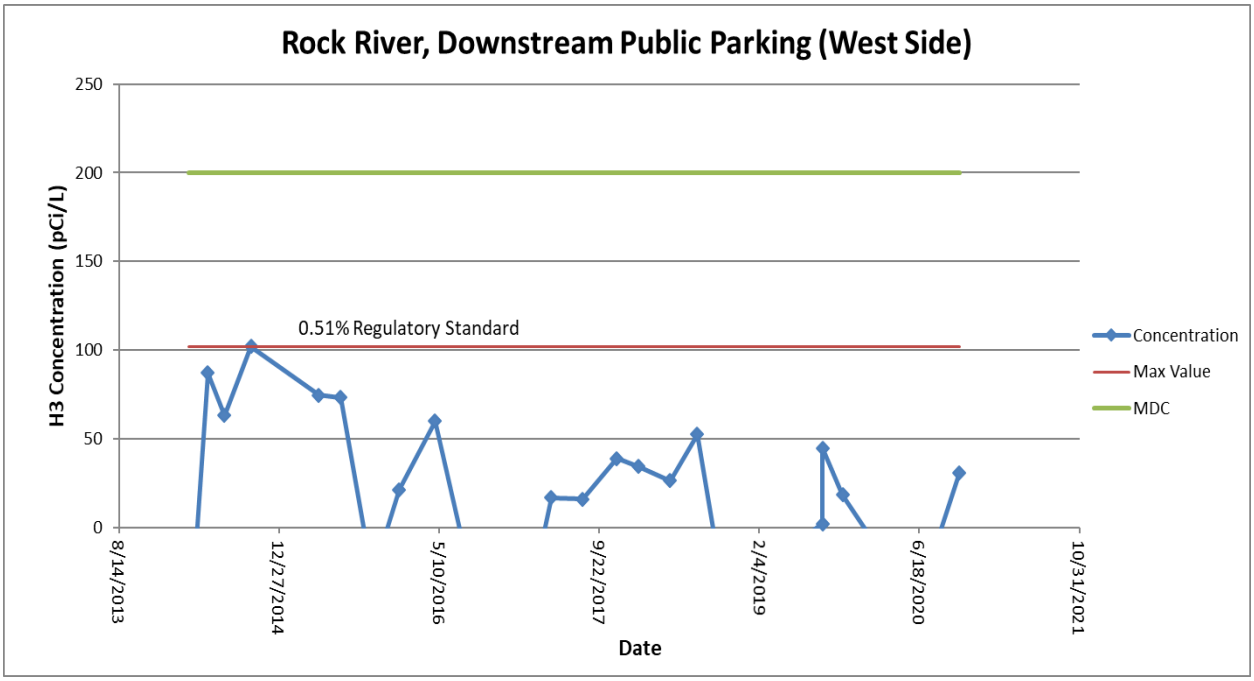
Location	H-3	
Date	Result	MDC
Lowden State Park Boat Ramp		
1/22/2020	<MDC	200
7/15/2020	<MDC	200
10/21/2020	<MDC	200
Oregon Park East		
1/22/2020	16400	200
7/15/2020	<MDC	200
10/21/2020	<MDC	200
Public Parking W. of Rock River		
1/22/2020	<MDC	200
7/15/2020	<MDC	200
10/21/2020	<MDC	200
Rock R. Byron Boat Ramp		
1/22/2020	<MDC	200
7/16/2020	<MDC	200
10/21/2020	<MDC	200
Rock R. UpS of the Byron Cooling Water Discharge		
7/15/2020	<MDC	200
10/21/2020	<MDC	200
Rock R. near Woodland Creek		
1/22/2020	<MDC	200
7/15/2020	<MDC	200
10/21/2020	<MDC	200

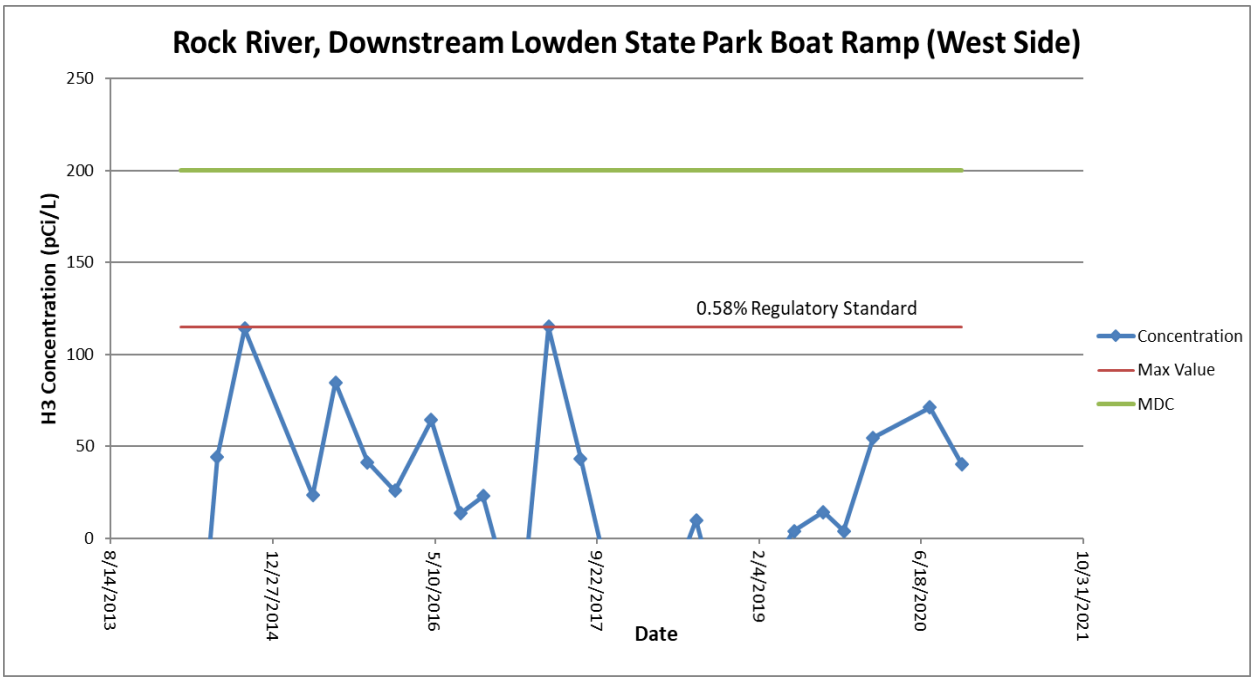
Trending Graphs for Tritium (H-3) in Water - Byron
(Max value compared to IEPA and US EPA regulatory standard of 20,000 pCi/L)

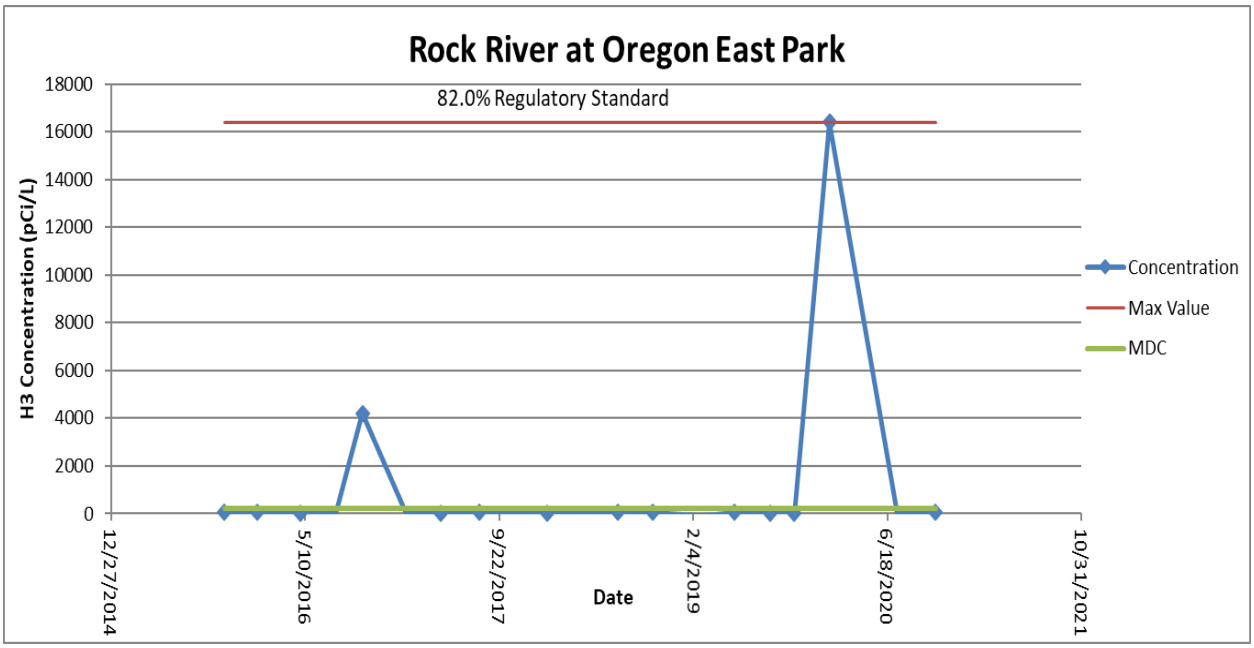





Rock River at Byron Public Boat Ramp
H3 Concentration (pCi/L)
250
200
150
100
50
0
0.44% Regulatory Standard
11/18/2010
4/1/2012
8/14/2013
12/27/2014
5/10/2016
9/22/2017
2/4/2019
6/18/2020
10/31/2021
Date
Concentration
Max Value
MDC


Rock River, Downstream Public Parking (West Side)
H3 Concentration (pCi/L)
250
200
150
100
50
0
0.51% Regulatory Standard
8/14/2013
12/27/2014
5/10/2016
9/22/2017
2/4/2019
6/18/2020
10/31/2021
Date
Concentration
Max Value
MDC


Rock River, Downstream Lowden State Park Boat Ramp (West Side)
H3 Concentration (pCi/L)
250
200
150
100
50
0
0.58% Regulatory Standard
8/14/2013
12/27/2014
5/10/2016
9/22/2017
2/4/2019
6/18/2020
10/31/2021
Date
Concentration
Max Value
MDC


Rock River at Oregon East Park
H3 Concentration (pCi/L)
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
82.0% Regulatory Standard
12/27/2014
5/10/2016
9/22/2017
2/4/2019
6/18/2020
10/31/2021
Date
Concentration
Max Value
MDC

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

Location	Strontium	
Date	Result	MDC
Lowden State Park Boat Ramp		
7/15/2020	<MDC	0.4
Public Parking W. of Rock River		
7/15/2020	<MDC	0.4

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

Location	Beta	
Date	Result	MDC
Lowden State Park Boat Ramp		
1/22/2020	<MDC	3.82
7/15/2020	<MDC	3.82
10/21/2020	<MDC	3.82
Oregon Park East		
1/22/2020	<MDC	3.82
7/15/2020	<MDC	3.82
10/21/2020	<MDC	3.82
Public Parking W. of Rock River		
1/22/2020	<MDC	3.82
7/15/2020	<MDC	3.82
10/21/2020	<MDC	3.82
Rock R. Byron Boat Ramp		
1/22/2020	<MDC	3.82
7/15/2020	<MDC	3.82
10/21/2020	<MDC	3.82
Rock R. UpS the Byron Cooling Discharge		
7/15/2020	<MDC	3.82
10/21/2020	<MDC	3.82
Rock R., near Woodland Creek		
1/22/2020	<MDC	3.82
7/15/2020	<MDC	3.82
10/21/2020	<MDC	3.82

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		La-140		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
Lowden State Park Boat Ramp																										
1/22/2020	<MDC	21.5	<MDC	340	<MDC	3.6	<MDC	3.8	<MDC	4.0	<MDC	3.7	<MDC	7.6	<MDC	9.4	<MDC	8.9	<MDC	3.9	<MDC	4.2	<MDC	7.6	<MDC	6.5
7/15/2020	<MDC	21.5	<MDC	340	<MDC	3.6	<MDC	3.8	<MDC	4.0	<MDC	3.7	<MDC	7.6	<MDC	9.4	<MDC	8.9	<MDC	3.9	<MDC	4.2	<MDC	7.6	<MDC	6.5
10/21/2020	<MDC	21.5	<MDC	340	<MDC	3.6	<MDC	3.8	<MDC	4.0	<MDC	3.7	<MDC	7.6	<MDC	9.4	<MDC	8.9	<MDC	3.9	<MDC	4.2	<MDC	7.6	<MDC	6.5
Oregon Park East																										
1/22/2020	<MDC	21.5	<MDC	340	<MDC	3.6	<MDC	3.8	<MDC	4.0	<MDC	3.7	<MDC	7.6	<MDC	9.4	<MDC	8.9	<MDC	3.9	<MDC	4.2	<MDC	7.6	<MDC	6.5
7/15/2020	<MDC	21.5	<MDC	340	<MDC	3.6	<MDC	3.8	<MDC	4.0	<MDC	3.7	<MDC	7.6	<MDC	9.4	<MDC	8.9	<MDC	3.9	<MDC	4.2	<MDC	7.6	<MDC	6.5
10/21/2020	<MDC	21.5	<MDC	340	<MDC	3.6	<MDC	3.8	<MDC	4.0	<MDC	3.7	<MDC	7.6	<MDC	9.4	<MDC	8.9	<MDC	3.9	<MDC	4.2	<MDC	7.6	<MDC	6.5
Public Parking W. of Rock River																										
1/22/2020	<MDC	21.5	<MDC	340	<MDC	3.6	<MDC	3.8	<MDC	4.0	<MDC	3.7	<MDC	7.6	<MDC	9.4	<MDC	8.9	<MDC	3.9	<MDC	4.2	<MDC	7.6	<MDC	6.5
7/15/2020	<MDC	21.5	<MDC	340	<MDC	3.6	<MDC	3.8	<MDC	4.0	<MDC	3.7	<MDC	7.6	<MDC	9.4	<MDC	8.9	<MDC	3.9	<MDC	4.2	<MDC	7.6	<MDC	6.5
10/21/2020	<MDC	21.5	<MDC	340	<MDC	3.6	<MDC	3.8	<MDC	4.0	<MDC	3.7	<MDC	7.6	<MDC	9.4	<MDC	8.9	<MDC	3.9	<MDC	4.2	<MDC	7.6	<MDC	6.5
Rock R. Byron Boat Ramp																										
1/22/2020	<MDC	21.5	<MDC	340	<MDC	3.6	<MDC	3.8	<MDC	4.0	<MDC	3.7	<MDC	7.6	<MDC	9.4	<MDC	8.9	<MDC	3.9	<MDC	4.2	<MDC	7.6	<MDC	6.5
7/15/2020	<MDC	21.5	<MDC	340	<MDC	3.6	<MDC	3.8	<MDC	4.0	<MDC	3.7	<MDC	7.6	<MDC	9.4	<MDC	8.9	<MDC	3.9	<MDC	4.2	<MDC	7.6	<MDC	6.5
10/21/2020	<MDC	21.5	<MDC	340	<MDC	3.6	<MDC	3.8	<MDC	4.0	<MDC	3.7	<MDC	7.6	<MDC	9.4	<MDC	8.9	<MDC	3.9	<MDC	4.2	<MDC	7.6	<MDC	6.5
Rock R., UpS of the Byron Cooling Water Discharge																										
7/15/2020	<MDC	21.5	<MDC	340	<MDC	3.6	<MDC	3.8	<MDC	4.0	<MDC	3.7	<MDC	7.6	<MDC	9.4	<MDC	8.9	<MDC	3.9	<MDC	4.2	<MDC	7.6	<MDC	6.5
10/21/2020	<MDC	21.5	<MDC	340	<MDC	3.6	<MDC	3.8	<MDC	4.0	<MDC	3.7	<MDC	7.6	<MDC	9.4	<MDC	8.9	<MDC	3.9	<MDC	4.2	<MDC	7.6	<MDC	6.5
Rock R., near Woodland Creek																										
1/22/2020	<MDC	21.5	<MDC	340	<MDC	3.6	<MDC	3.8	<MDC	4.0	<MDC	3.7	<MDC	7.6	<MDC	9.4	<MDC	8.9	<MDC	3.9	<MDC	4.2	<MDC	7.6	<MDC	6.5
7/15/2020	<MDC	21.5	<MDC	340	<MDC	3.6	<MDC	3.8	<MDC	4.0	<MDC	3.7	<MDC	7.6	<MDC	9.4	<MDC	8.9	<MDC	3.9	<MDC	4.2	<MDC	7.6	<MDC	6.5
10/21/2020	<MDC	21.5	<MDC	340	<MDC	3.6	<MDC	3.8	<MDC	4.0	<MDC	3.7	<MDC	7.6	<MDC	9.4	<MDC	8.9	<MDC	3.9	<MDC	4.2	<MDC	7.6	<MDC	6.5

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

Location	Ba-140		Ce-144		Co-57		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	Result	MDC
Forest preserve on River Rd.																								
7/16/2020	<MDC	810000	<MDC	0.32	<MDC	0.04	<MDC	0.36	<MDC	0.03	<MDC	0.03	0.08	0.03	<MDC	4.40	<MDC	0.04	<MDC	9.10	<MDC	0.12	<MDC	0.95
Lot SE Pond & Main (Leaf River)																								
7/16/2020	<MDC	810000	<MDC	0.32	<MDC	0.04	<MDC	0.36	<MDC	0.03	<MDC	0.03	0.07	0.03	<MDC	4.40	<MDC	0.04	<MDC	9.10	<MDC	0.12	0.96	0.95
Lowden State Park Boat Ramp																								
7/15/2020	<MDC	810000	<MDC	0.32	<MDC	0.04	<MDC	0.36	<MDC	0.03	<MDC	0.03	0.03	0.03	<MDC	4.40	<MDC	0.04	<MDC	9.10	<MDC	0.12	<MDC	0.95
Pine Rock Nature Preserve																								
7/15/2020	<MDC	810000	<MDC	0.32	<MDC	0.04	<MDC	0.36	<MDC	0.03	<MDC	0.03	<MDC	0.03	<MDC	4.40	<MDC	0.04	<MDC	9.10	<MDC	0.12	<MDC	0.95
Blue Star Rest Area																								
7/16/2020	<MDC	810000	<MDC	0.32	<MDC	0.04	<MDC	0.36	<MDC	0.03	<MDC	0.03	0.22	0.03	<MDC	4.40	<MDC	0.04	<MDC	9.10	<MDC	0.12	<MDC	0.95

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.																						
7/16/2020	<MDC	920000	<MDC	0.36	<MDC	0.45	<MDC	0.04	<MDC	0.03	0.12	0.04	<MDC	6.00	<MDC	0.05	<MDC	11.60	<MDC	0.15	<MDC	1.30
Lot SE of intersection of W Pond & N Main (Leaf River)																						
7/16/2020	<MDC	920000	<MDC	0.36	<MDC	0.45	<MDC	0.04	<MDC	0.03	0.08	0.04	<MDC	6.00	<MDC	0.05	<MDC	11.60	<MDC	0.15	<MDC	1.30
Lowden State Park Boat Ramp																						
7/15/2020	<MDC	920000	<MDC	0.36	<MDC	0.45	<MDC	0.04	<MDC	0.03	<MDC	0.04	<MDC	6.00	<MDC	0.05	<MDC	11.60	<MDC	0.15	<MDC	1.30
Pine Rock Nature Preserve																						
7/15/2020	<MDC	920000	<MDC	0.36	<MDC	0.45	<MDC	0.04	<MDC	0.03	<MDC	0.04	<MDC	6.00	<MDC	0.05	<MDC	11.60	<MDC	0.15	<MDC	1.30
Blue Star Rest Area																						
7/16/2020	<MDC	920000	<MDC	0.36	<MDC	0.45	<MDC	0.04	<MDC	0.03	0.20	0.04	<MDC	6.00	<MDC	0.05	<MDC	11.60	<MDC	0.15	<MDC	1.30

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																						
7/15/2020	<MDC	390000	<MDC	0.12	<MDC	0.21	<MDC	0.02	<MDC	0.01	<MDC	0.01	<MDC	2.70	<MDC	0.02	<MDC	4.10	<MDC	0.07	<MDC	0.50
Rock R., UpS of the Byron Cooling Water Discharge																						
7/15/2020	<MDC	390000	<MDC	0.12	<MDC	0.21	<MDC	0.02	<MDC	0.01	<MDC	0.01	<MDC	2.70	<MDC	0.02	<MDC	4.10	<MDC	0.07	<MDC	0.50

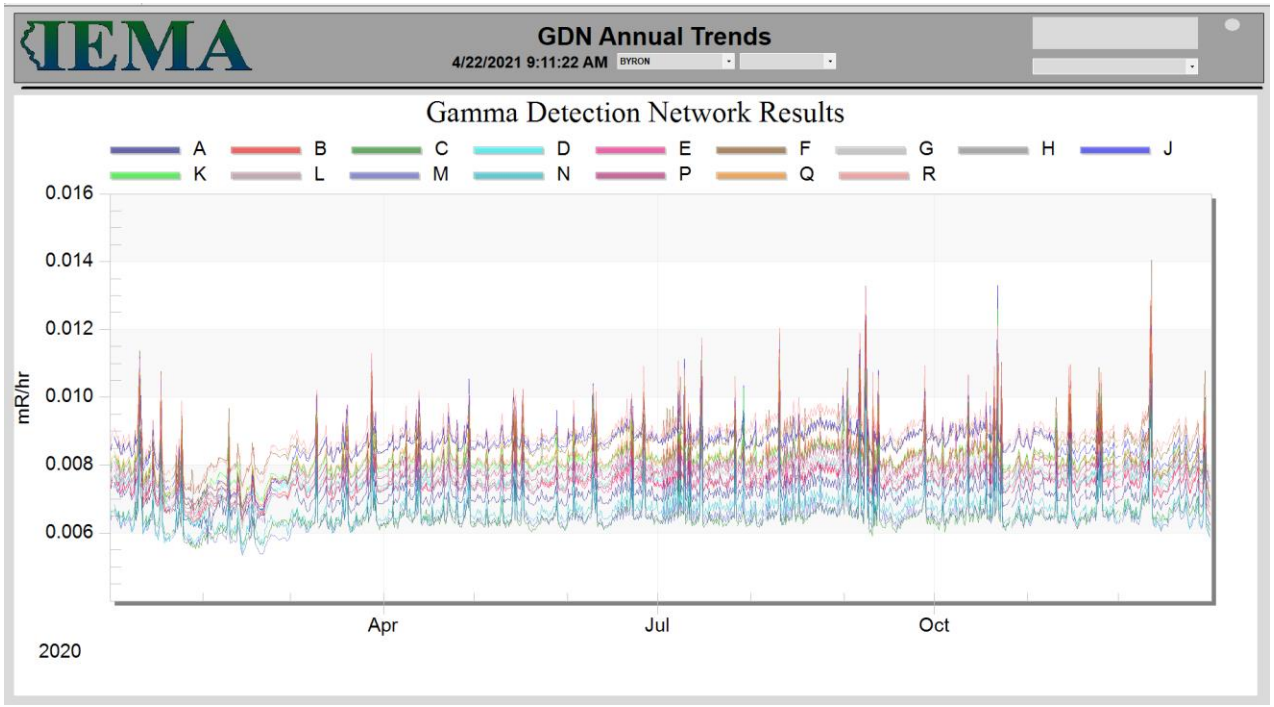
Gamma Spectroscopy Results for Radionuclides in Vegetation - Byron
Results are in picocuries per gram (pCi/g)

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	Result	Result	MDC	Result	MDC
Forest preserve on River Rd.																								
7/16/2020	<MDC	27500	<MDC	0.52	<MDC	0.52	<MDC	0.09	<MDC	0.08	<MDC	0.07	<MDC	3.80	<MDC	8E+06	<MDC	0.11	<MDC	4.70	<MDC	0.30	<MDC	1.13
Lot SE of intersection of W Pond and N Main (Leaf River)																								
7/16/2020	<MDC	27500	<MDC	0.52	<MDC	0.52	<MDC	0.09	<MDC	0.08	<MDC	0.07	<MDC	3.80	<MDC	8E+06	<MDC	0.11	<MDC	4.70	<MDC	0.30	<MDC	1.13
Lowden State Park Boat Ramp																								
7/15/2020	<MDC	27500	<MDC	0.52	<MDC	0.52	<MDC	0.09	<MDC	0.08	<MDC	0.07	<MDC	3.80	<MDC	8E+06	<MDC	0.11	<MDC	4.70	<MDC	0.30	<MDC	1.13
Pine Rock Nature Preserve																								
7/15/2020	<MDC	27500	<MDC	0.52	<MDC	0.52	<MDC	0.09	<MDC	0.08	<MDC	0.07	<MDC	3.80	<MDC	8E+06	<MDC	0.11	<MDC	4.70	<MDC	0.30	<MDC	1.13
Blue Star Rest Area																								
7/16/2020	<MDC	27500	<MDC	0.52	<MDC	0.52	<MDC	0.09	<MDC	0.08	<MDC	0.07	<MDC	3.80	<MDC	8E+06	<MDC	0.11	<MDC	4.70	<MDC	0.30	<MDC	1.13

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

Due to COVID-19 employee safety mandates in place during a portion of 2020, fish samples were unobtainable for 2020.

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



Summary of Ambient Gamma Results - Byron

Location	Quarter 1/2 mR/quarter	Quarter 3 mR/quarter	Quarter 4 mR/quarter	Annual Exposure mR/year
BY001		5.6	5.5	22.2
BY003	7.6	5.3	5.3	25.8
BY004	8.2	7.2	7.4	31.0
BY005	8.5	7.2	6.0	30.2
BY006	6.2	7.2	5.8	25.4
BY007	7.3	5.7	5.3	25.7
BY008	7.9	10.4	5.6	31.9
BY011	7.0	7.2	6.5	27.7
BY013	10.4	11.5	8.3	40.6
BY014	6.3	8.2	6.8	27.7
BY015	7.7	9.1	8.8	33.2
BY018	6.4	5.3	6.3	24.4
BY020	10.2	8.0	6.4	34.7
BY022	9.4	12.1	8.6	39.4
BY023	7.4	8.3	9.1	32.2
BY026	7.2	8.1	5.6	28.2
BY027	8.7	9.5	9.4	36.2
BY029	8.5	7.3	8.4	32.6
BY030	9.7	8.7	7.1	35.1
BY033	8.7	8.1	8.3	33.9
BY034	8.3	7.4	6.6	30.6
BY035	5.0	6.3	5.1	21.4
BY037	6.6	4.4	8.7	26.3
BY040	9.8	9.7	7.8	37.1
BY041	7.4	5.8		27.4
BY044	5.8	6.2	7.4	25.2
BY045	8.0	7.8	5.9	29.8
BY049	7.5	5.7	7.5	28.4
BY050	8.0	7.4	8.2	31.7
BY053	8.3	7.1	8.3	32.0
BY055	9.2	7.8	7.6	33.8
BY056	7.6	8.7	8.6	32.6
BY057	9.8	8.0	8.7	36.3
BY058	8.0	7.7	8.0	31.7
BY059	8.6	10.1	8.8	36.2
BY060	9.4	10.1		38.6
BY061	6.7	8.1	6.0	27.6

Location	Quarter 1/2 mR/quarter	Quarter 3 mR/quarter	Quarter 4 mR/quarter	Annual Exposure mR/year
BY063	7.6	10.3		34.0
BY064	10.1	9.5	10.1	39.8
BY065		7.3	6.5	27.6
BY066	6.5	8.5	7.7	29.3
BY067	7.3	8.9	8.3	31.8
BY068	8.7	7.7	8.8	34.0
BY069	9.5	9.5		38.0
BY070	10.4	8.4	8.3	37.4
BY071	5.6	5.8	4.0	21.1
BY072	8.8	9.4	9.8	36.8
BY073	10.6	7.2	9.5	38.0
BY074	6.9	7.8	7.4	29.0
BY075	7.7	7.5	6.3	29.1
BY076	9.1	8.4	7.3	34.0
BY078		5.2	6.5	23.4
BY079		7.1	4.5	23.1
BY080	6.9	4.9	6.1	24.7
BY-RSA	6.4	5.7	7.1	25.5
BY-RSB	9.8	7.4	7.2	34.2
BY-RSC	6.6	5.1	6.3	24.6
BY-RSD	9.1	9.0	8.3	35.6
BY-RSE	8.1	7.3	5.0	28.5
BY-RSF	10.2	8.9	8.3	37.7
BY-RSG	8.0	9.2	8.2	33.4
BY-RSH	8.8	5.6	6.1	29.4
BY-RSJ	8.1	7.0	7.2	30.3
BY-RSK	9.7	9.0	7.2	35.5
BY-RSL	7.2	7.9	7.4	29.7
BY-RSM	5.1	2.4	5.0	17.5
BY-RSN	4.9	5.4	5.2	20.4
BY-RSP	8.4	8.2	8.8	33.9
BY-RSQ	8.0	8.6	8.6	33.2
BY-RSR	9.8	9.3	8.3	37.3

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. NPS OSLs were not collected in the 2nd quarter due to the COVID-19 emergency; therefore, results from quarters 1 and 2 are a combined average.

Clinton Nuclear Power Station

The Clinton NPS, consisting of one approximately 1,140 Megawatt boiling water reactor (BWR), is owned and operated by the Exelon Corporation 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 National Pollutant Discharge Elimination System permit. No liquid effluents were discharged in 2020.

The outflow from Clinton Lake falls into Salt Creek, a tributary of the Sangamon River.

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 2020

Due to COVID-19 employee safety mandates in place during a portion of 2020, IEMA's Division of Nuclear Safety's Radiological Field Services Unit (RFS) staff was temporarily unavailable to perform the duties associated with the radiological environmental monitoring programs. This resulted in some scheduled sampling and monitoring activities not being completed.

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 several sampling locations. Although above the established MDC, the sample results for gross beta remained well below the established US EPA and IEPA standards and are consistent with concentrations found at the background sampling location.

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

Gamma spectroscopy results for sediment samples indicated no concentrations of reactor-produced radionuclides above background.

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.

Clinton Maps of Monitoring and Sampling Locations

Figure 12. OSL and GDN Monitoring Locations- Clinton

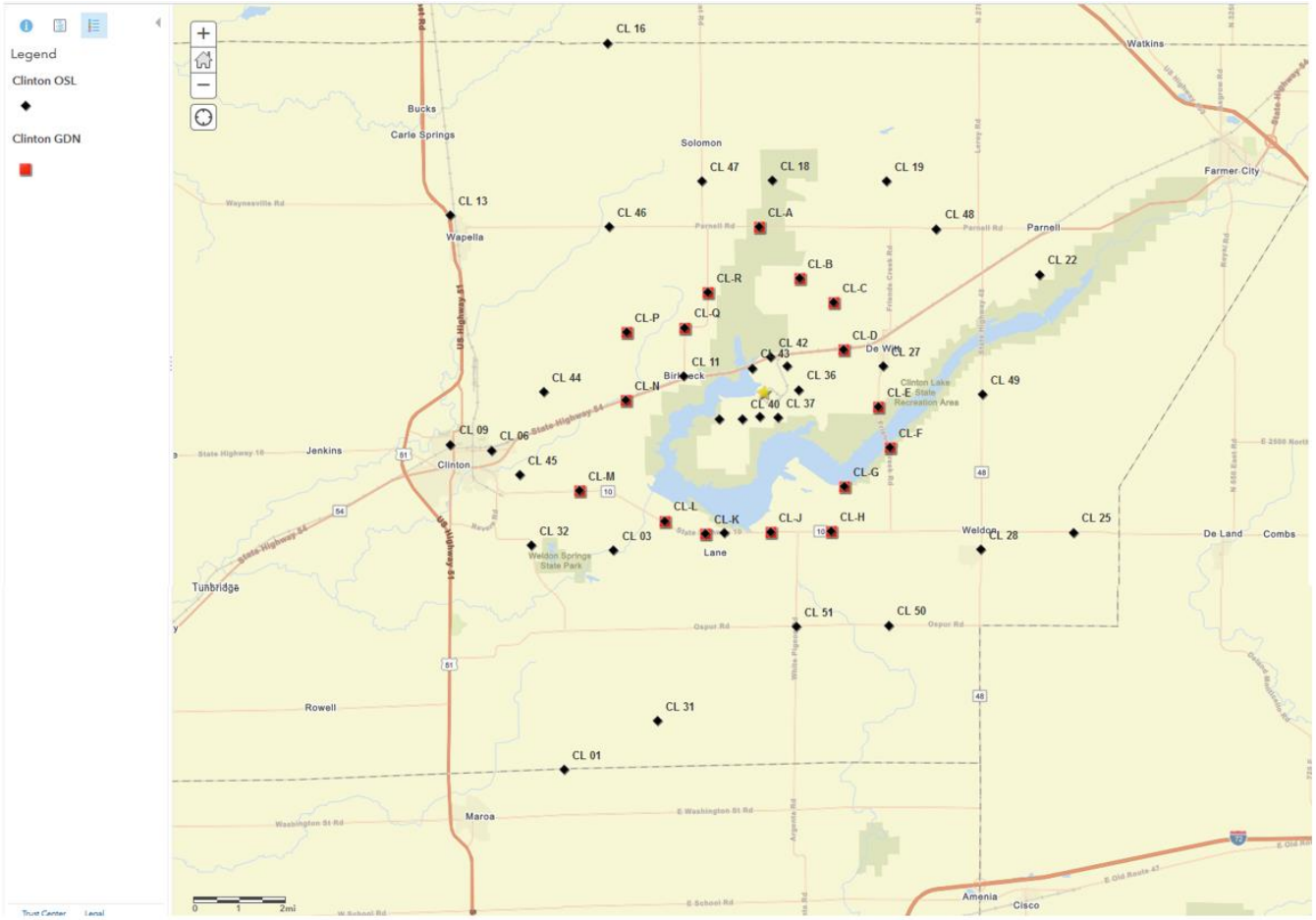


Figure 13. OSL and GDN Monitoring Locations (continued) - Clinton

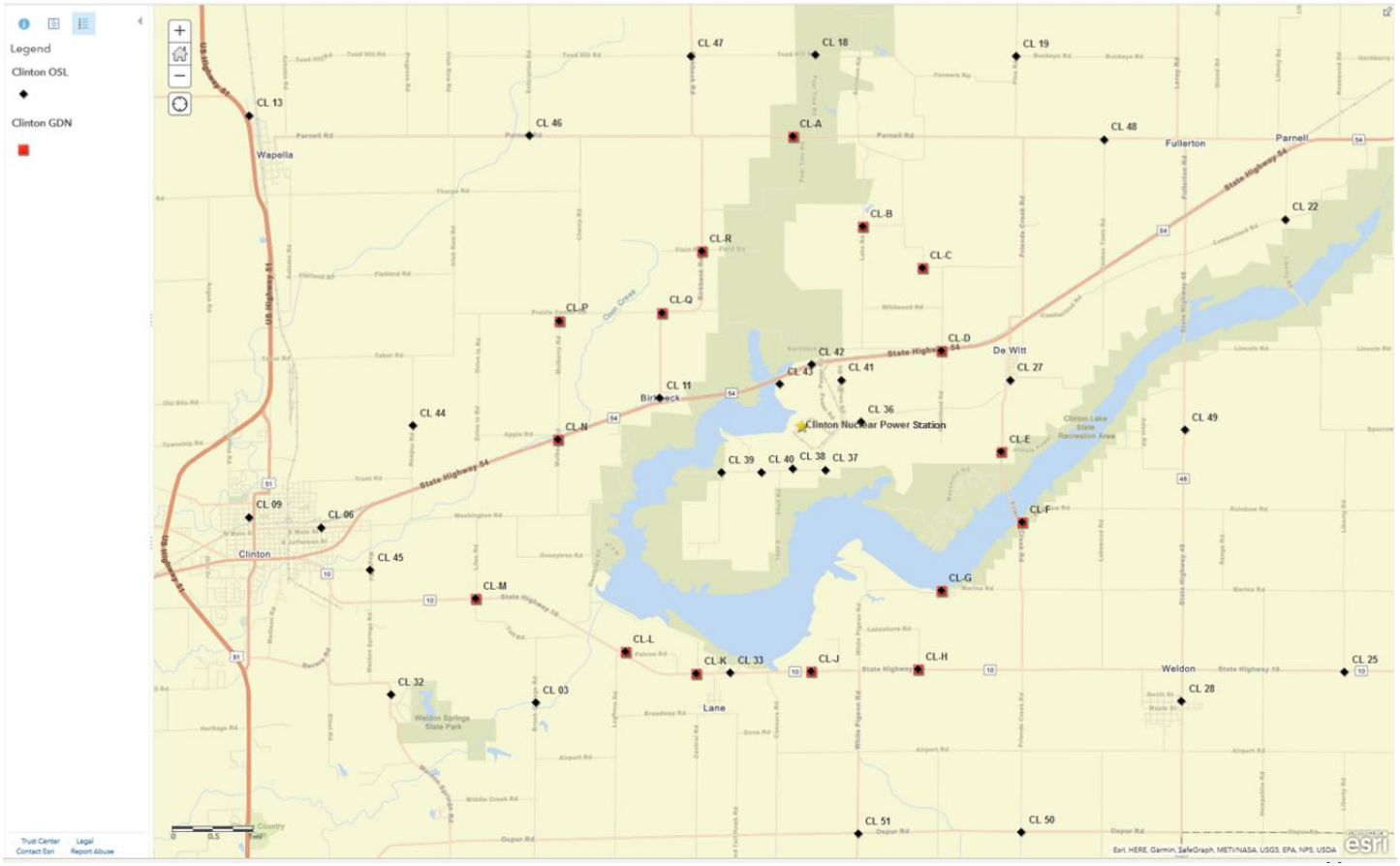
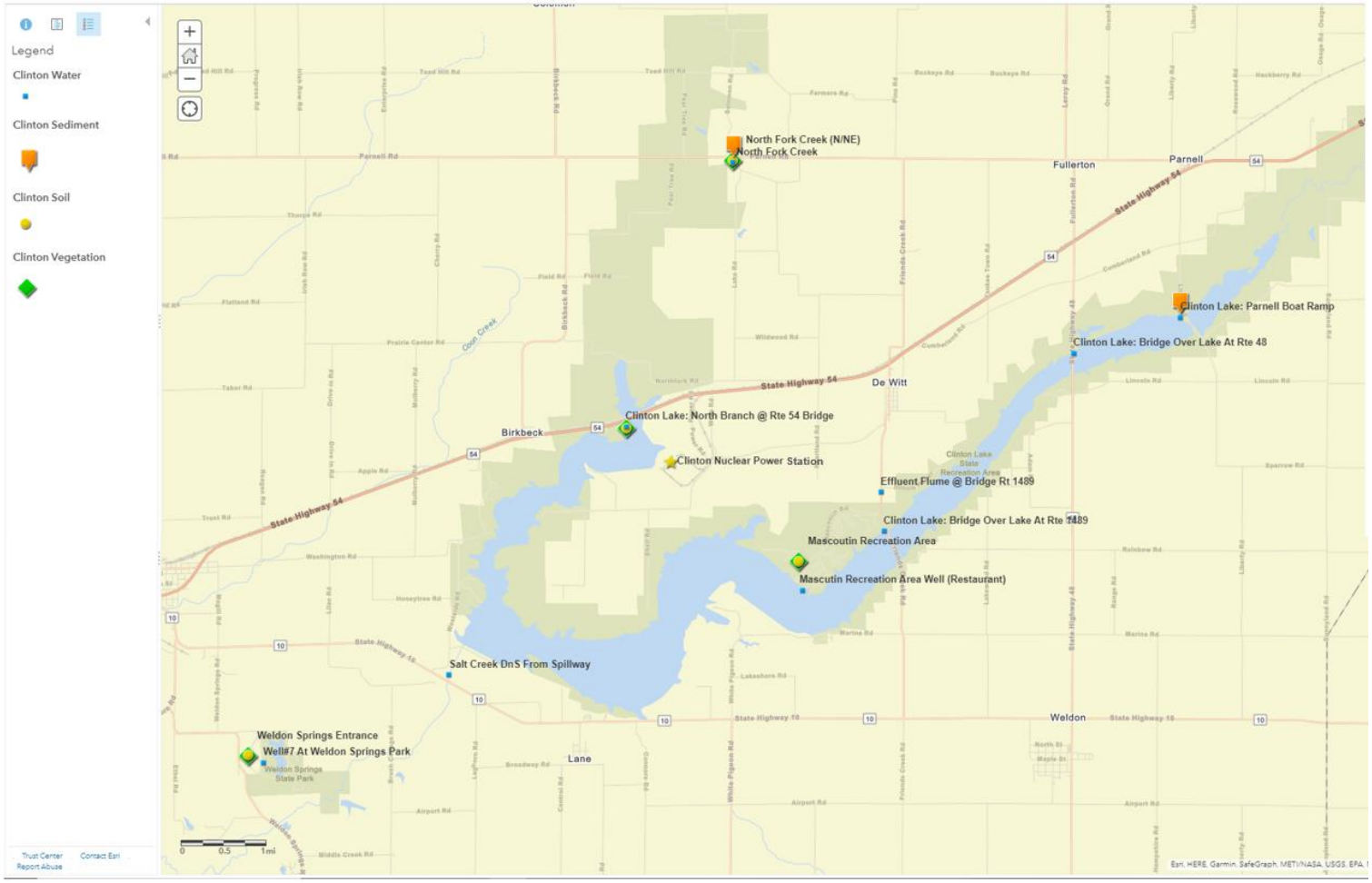


Figure 14. Environmental Sampling Locations - Clinton

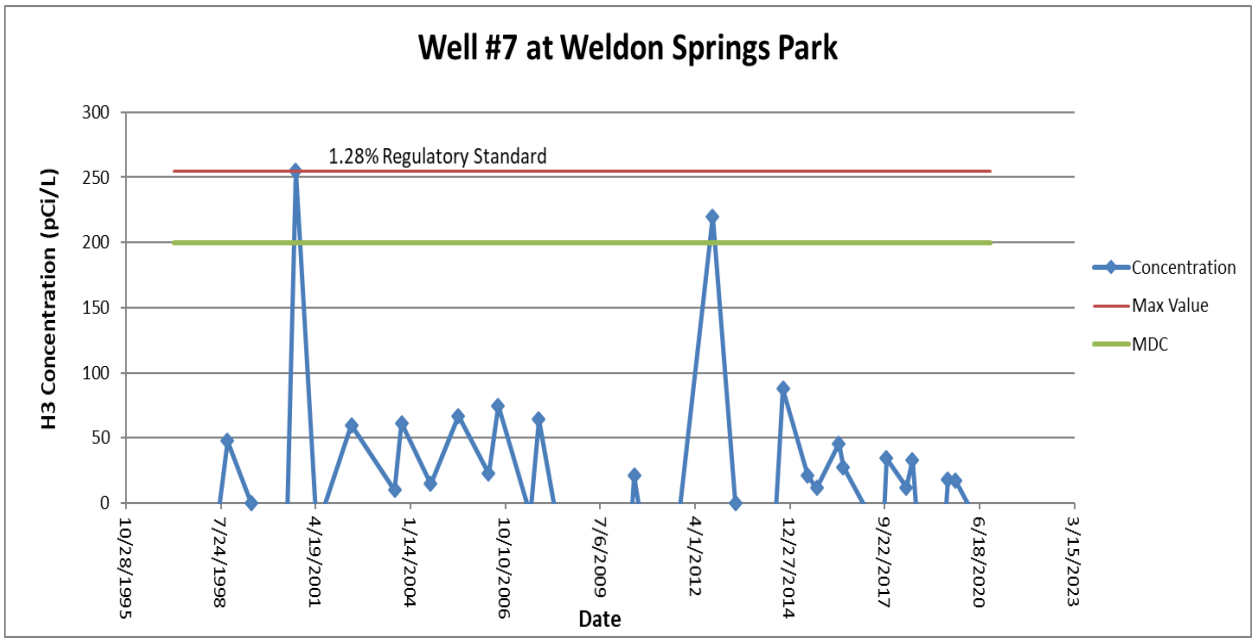


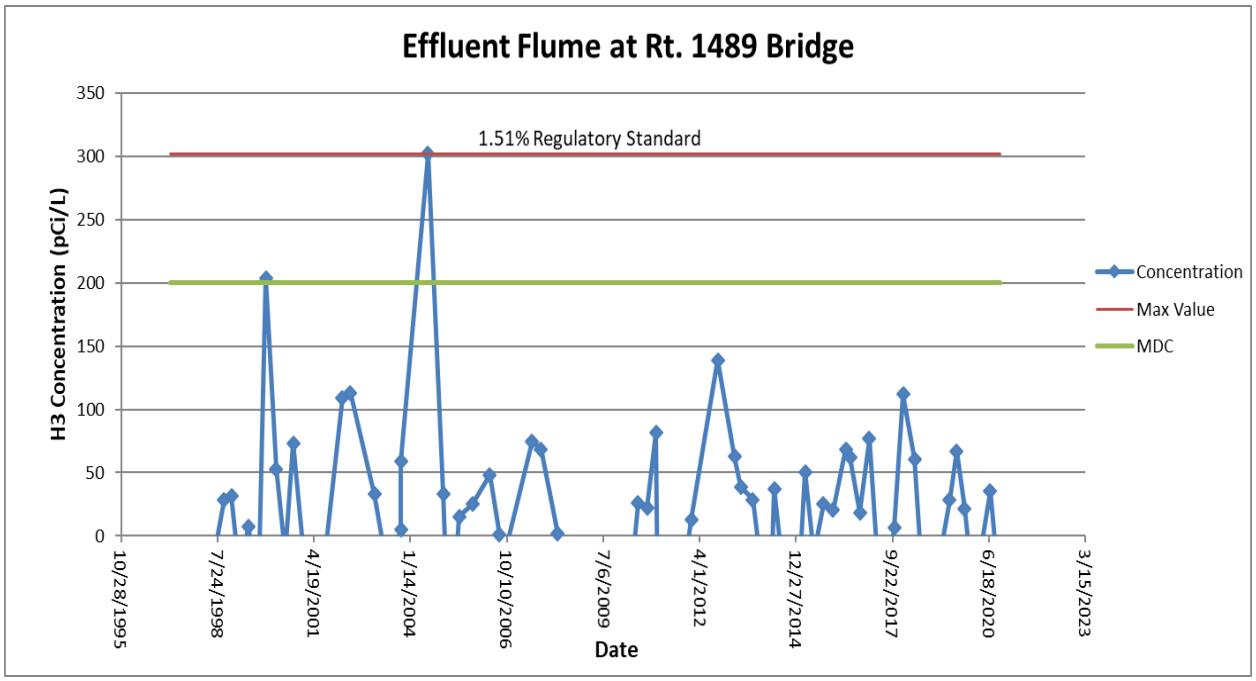
Clinton Sample Result Tables and Graphs

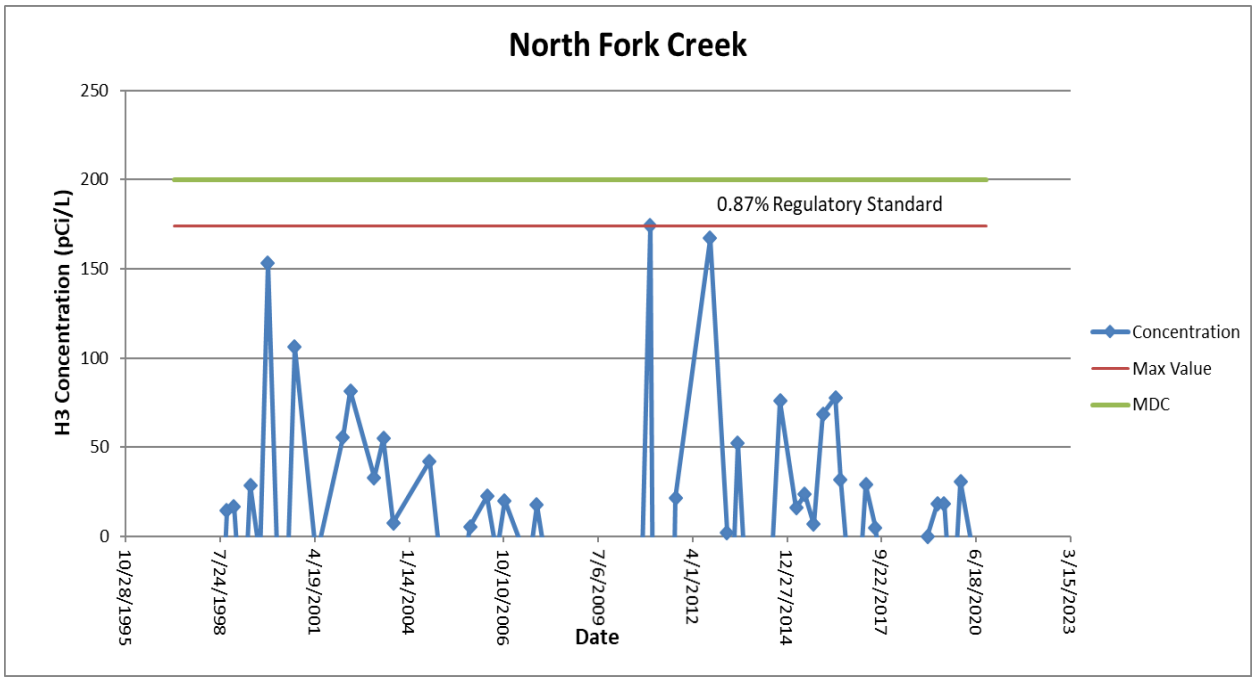
Tritium (H-3) in Water Results– Clinton
Results are in picocuries per liter (pCi/L)

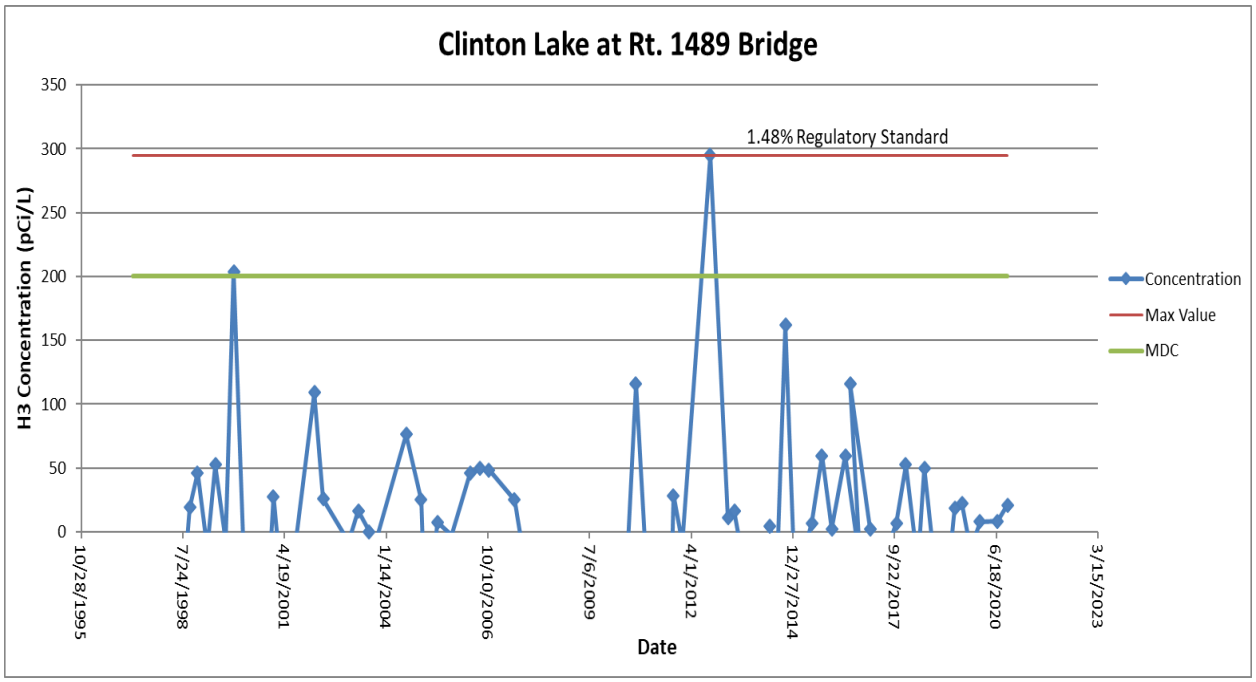
Location	H-3	
Date	Result	MDC
Bridge Over Lake At Rte 1489		
1/8/2020	<MDC	200
7/1/2020	<MDC	200
10/7/2020	<MDC	200
Bridge Over Lake At Rte 48		
1/8/2020	<MDC	200
7/1/2020	<MDC	200
10/7/2020	<MDC	200
Effluent Flume at Bridge Rt 1489		
1/8/2020	<MDC	200
7/1/2020	<MDC	200
10/7/2020	<MDC	200
Mascutin Recreation Area (restaurant)		
7/1/2020	<MDC	200
10/7/2020	<MDC	200
North Branch at Rte 54 Bridge		
1/8/2020	<MDC	200
7/1/2020	<MDC	200
10/7/2020	<MDC	200
North Fork Creek		
1/8/2020	<MDC	200
7/1/2020	<MDC	200
10/7/2020	<MDC	200
Parnell Boat Ramp		
1/8/2020	<MDC	200
7/1/2020	<MDC	200
10/7/2020	<MDC	200
Salt Creek DnS from Spillway		
1/8/2020	<MDC	200
7/1/2020	<MDC	200
10/7/2020	<MDC	200
Well#7 at Weldon Springs Park		
10/7/2020	<MDC	200

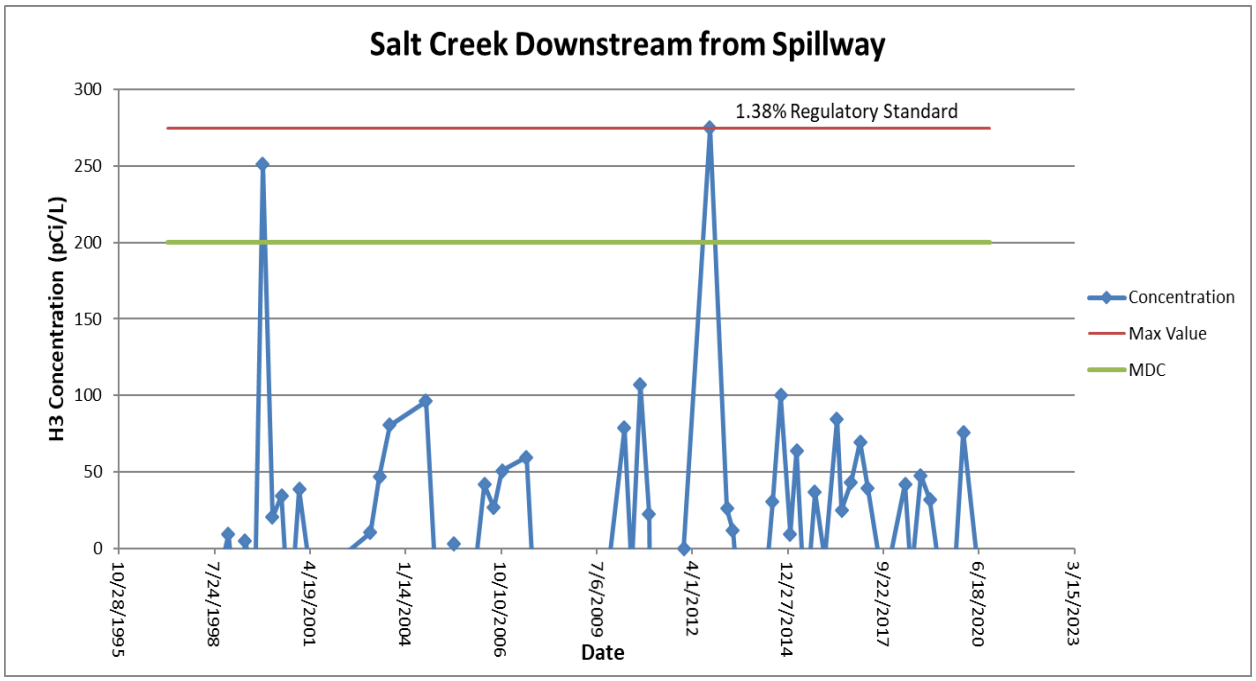
Trending Graphs for Tritium (H-3) in Water - Clinton
(Max value compared to IEPA and US EPA regulatory standard of 20,000 pCi/L)

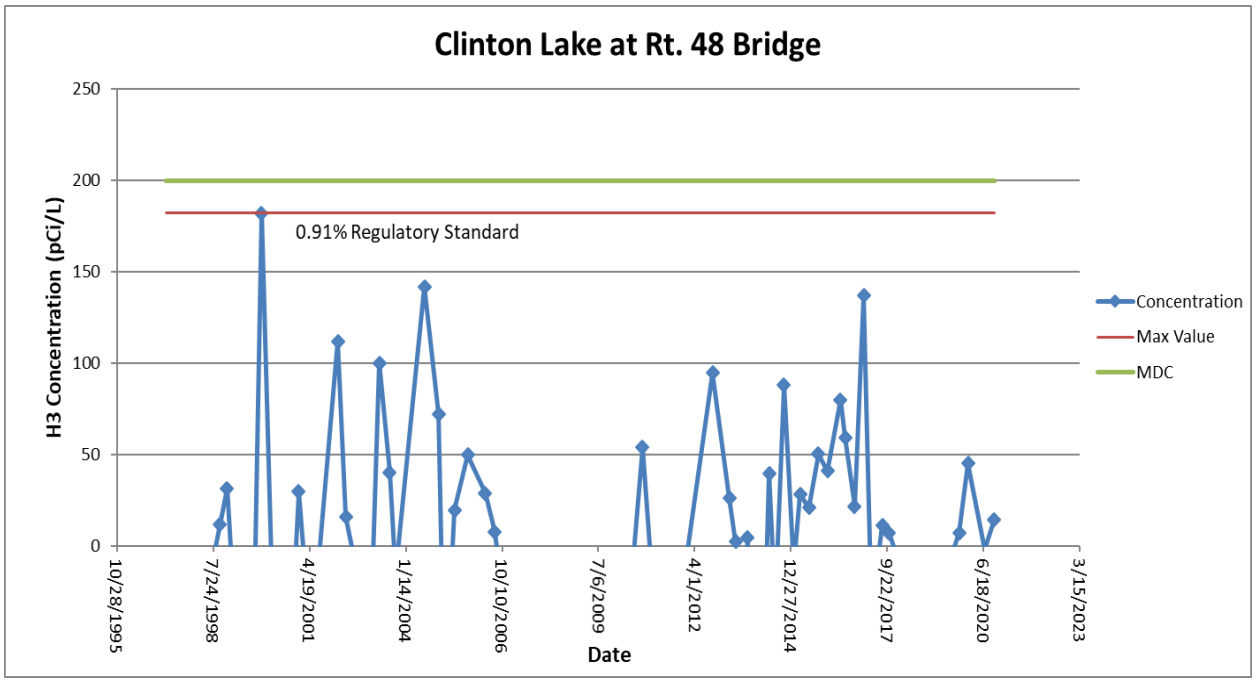


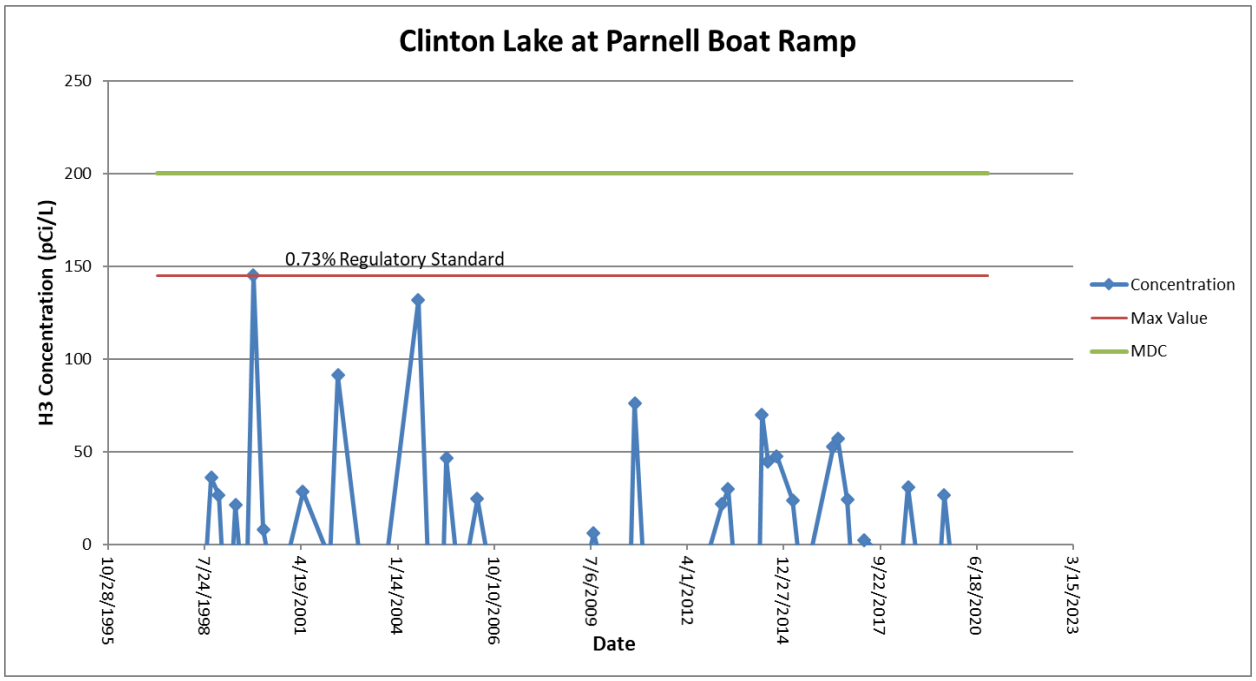


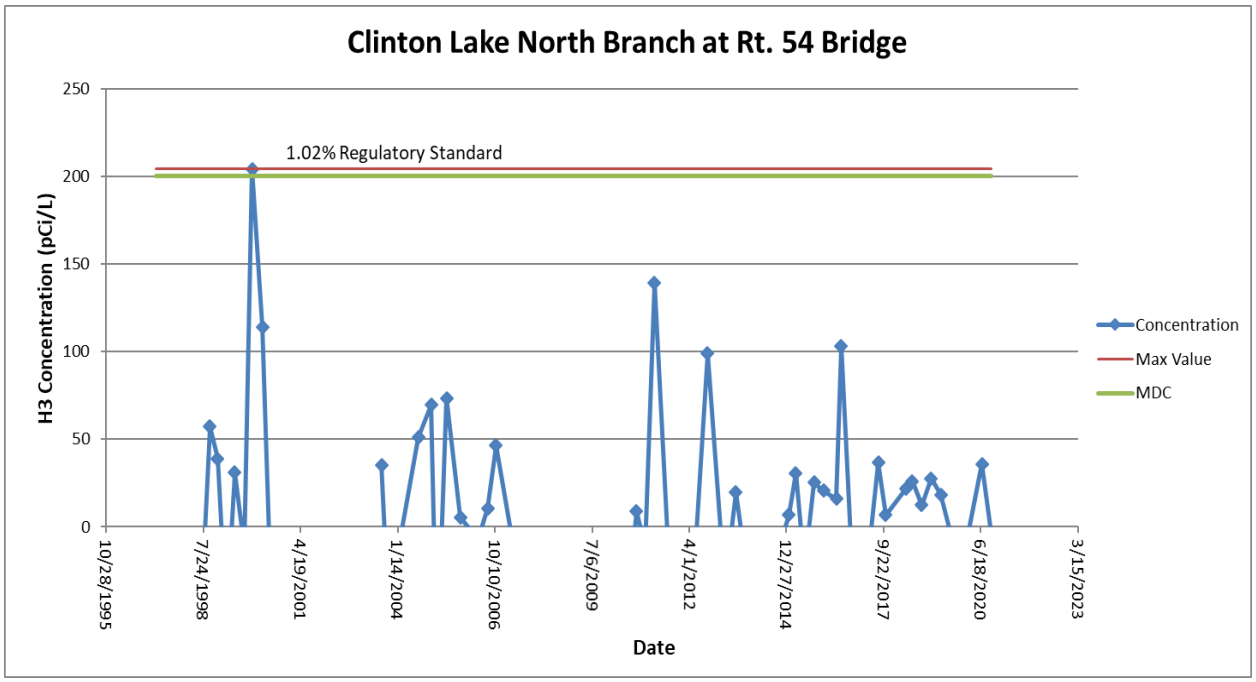

North Fork Creek
250
200
150
100
50
0
H3 Concentration (pCi/L)
0.87% Regulatory Standard
Concentration
Max Value
MDC
10/28/1995
7/24/1998
4/19/2001
1/14/2004
10/10/2006
7/6/2009
4/1/2012
12/27/2014
9/22/2017
6/18/2020
3/15/2023
Date

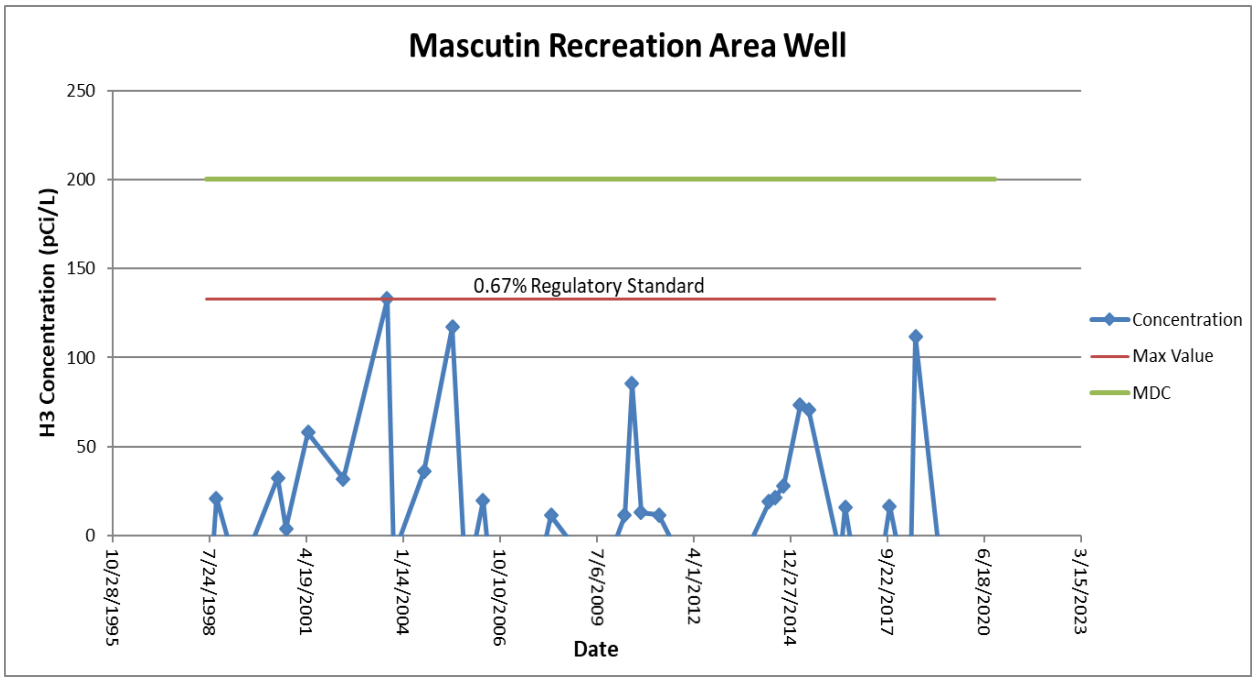

Clinton Lake at Rt. 1489 Bridge
350
300
250
200
150
100
50
0
H3 Concentration (pCi/L)
1.48% Regulatory Standard
Concentration
Max Value
MDC
10/28/1995
7/24/1998
4/19/2001
1/14/2004
10/10/2006
7/6/2009
4/1/2012
12/27/2014
9/22/2017
6/18/2020
3/15/2023
Date


Salt Creek Downstream from Spillway
1.38% Regulatory Standard
H3 Concentration (pCi/L)
300
250
200
150
100
50
0
10/28/1995
7/24/1998
4/19/2001
1/14/2004
10/10/2006
7/6/2009
4/1/2012
12/27/2014
9/22/2017
6/18/2020
3/15/2023
Date
Concentration
Max Value
MDC


Clinton Lake at Rt. 48 Bridge
0.91% Regulatory Standard
H3 Concentration (pCi/L)
250
200
150
100
50
0
10/28/1995
7/24/1998
4/19/2001
1/14/2004
10/10/2006
7/6/2009
4/1/2012
12/27/2014
9/22/2017
6/18/2020
3/15/2023
Date
Concentration
Max Value
MDC


Clinton Lake at Parnell Boat Ramp
250
200
150
100
50
0
H3 Concentration (pCi/L)
0.73% Regulatory Standard
10/28/1995
7/24/1998
4/19/2001
1/14/2004
10/10/2006
7/6/2009
4/1/2012
12/27/2014
9/22/2017
6/18/2020
3/15/2023
Date
Concentration
Max Value
MDC


Clinton Lake North Branch at Rt. 54 Bridge
250
200
150
100
50
0
H3 Concentration (pCi/L)
1.02% Regulatory Standard
10/28/1995
7/24/1998
4/19/2001
1/14/2004
10/10/2006
7/6/2009
4/1/2012
12/27/2014
9/22/2017
6/18/2020
3/15/2023
Date
Concentration
Max Value
MDC


Mascutin Recreation Area Well
H3 Concentration (pCi/L)
250
200
150
100
50
0
0.67% Regulatory Standard
10/28/1995
7/24/1998
4/19/2001
1/14/2004
10/10/2006
7/6/2009
4/1/2012
12/27/2014
9/22/2017
6/18/2020
3/15/2023
Date
Concentration
Max Value
MDC

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

Location / Date	Strontium Result	Strontium MDC
Bridge Over Lake at Rte 48		
1/8/2020	<MDC	0.5
10/7/2020	<MDC	0.5
Effluent Flume at Bridge Rt 1489		
1/8/2020	<MDC	0.5

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

Location	Beta	
Date	Result	MDC
Bridge Over Lake at Rte 1489		
1/8/2020	4.8	3.7
7/1/2020	4.0	3.7
10/7/2020	<MDC	3.7
Bridge Over Lake at Rte 48		
1/8/2020	<MDC	3.7
7/1/2020	<MDC	3.7
10/7/2020	<MDC	3.7
Effluent Flume at Bridge Rt 1489		
1/8/2020	<MDC	3.7
7/1/2020	<MDC	3.7
10/7/2020	<MDC	3.7
Mascutin Recreation Area (Restaurant)		
7/1/2020	<MDC	3.7
10/7/2020	<MDC	3.7
North Branch at Rte 54 Bridge		
1/8/2020	<MDC	3.7
7/1/2020	4.5	3.7
10/7/2020	<MDC	3.7
North Fork Creek		
1/8/2020	<MDC	3.7
7/1/2020	<MDC	3.7
10/7/2020	4.5	3.7
Parnell Boat Ramp		
1/8/2020	<MDC	3.7
7/1/2020	<MDC	3.7
10/7/2020	<MDC	3.7
Salt Creek DnS from Spillway		
1/8/2020	<MDC	3.7
7/1/2020	4.0	3.7
10/7/2020	<MDC	3.7
Well#7 at Weldon Springs Park		
10/7/2020	<MDC	3.7

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

Location	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
Bridge Over Lake at Rte 1489																						
1/8/2020	<MDC	1300	<MDC	13.8	<MDC	16.2	<MDC	14.8	<MDC	14.0	<MDC	26.7	<MDC	16.4	<MDC	14.3	<MDC	12.8	<MDC	29.5	<MDC	22.5
7/1/2020	<MDC	1300	<MDC	13.8	<MDC	16.2	<MDC	14.8	<MDC	14.0	<MDC	26.7	<MDC	16.4	<MDC	14.3	<MDC	12.8	<MDC	29.5	<MDC	22.5
10/7/2020	<MDC	1300	<MDC	13.8	<MDC	16.2	<MDC	14.8	<MDC	14.0	<MDC	26.7	<MDC	16.4	<MDC	14.3	<MDC	12.8	<MDC	29.5	<MDC	22.5
Bridge Over Lake at Rte 48																						
1/8/2020	<MDC	1300	<MDC	13.8	<MDC	16.2	<MDC	14.8	<MDC	14.0	<MDC	26.7	<MDC	16.4	<MDC	14.3	<MDC	12.8	<MDC	29.5	<MDC	22.5
7/1/2020	<MDC	1300	<MDC	13.8	<MDC	16.2	<MDC	14.8	<MDC	14.0	<MDC	26.7	<MDC	16.4	<MDC	14.3	<MDC	12.8	<MDC	29.5	<MDC	22.5
10/7/2020	<MDC	1300	<MDC	13.8	<MDC	16.2	<MDC	14.8	<MDC	14.0	<MDC	26.7	<MDC	16.4	<MDC	14.3	<MDC	12.8	<MDC	29.5	<MDC	22.5
Effluent Flume at Bridge Rt 1489																						
1/8/2020	<MDC	1300	<MDC	13.8	<MDC	16.2	<MDC	14.8	<MDC	14.0	<MDC	26.7	<MDC	16.4	<MDC	14.3	<MDC	12.8	<MDC	29.5	<MDC	22.5
7/1/2020	<MDC	1300	<MDC	13.8	<MDC	16.2	<MDC	14.8	<MDC	14.0	<MDC	26.7	<MDC	16.4	<MDC	14.3	<MDC	12.8	<MDC	29.5	<MDC	22.5
10/7/2020	<MDC	1300	<MDC	13.8	<MDC	16.2	<MDC	14.8	<MDC	14.0	<MDC	26.7	<MDC	16.4	<MDC	14.3	<MDC	12.8	<MDC	29.5	<MDC	22.5
Mascutin Recreation Area (Restaurant)																						
7/1/2020	<MDC	1300	<MDC	13.8	<MDC	16.2	<MDC	14.8	<MDC	14.0	<MDC	26.7	<MDC	16.4	<MDC	14.3	<MDC	12.8	<MDC	29.5	<MDC	22.5
10/7/2020	<MDC	1300	<MDC	13.8	<MDC	16.2	<MDC	14.8	<MDC	14.0	<MDC	26.7	<MDC	16.4	<MDC	14.3	<MDC	12.8	<MDC	29.5	<MDC	22.5
North Branch at Rte 54 Bridge																						
1/8/2020	<MDC	1300	<MDC	13.8	<MDC	16.2	<MDC	14.8	<MDC	14.0	<MDC	26.7	<MDC	16.4	<MDC	14.3	<MDC	12.8	<MDC	29.5	<MDC	22.5
7/1/2020	<MDC	1300	<MDC	13.8	<MDC	16.2	<MDC	14.8	<MDC	14.0	<MDC	26.7	<MDC	16.4	<MDC	14.3	<MDC	12.8	<MDC	29.5	<MDC	22.5
10/7/2020	<MDC	1300	<MDC	13.8	<MDC	16.2	<MDC	14.8	<MDC	14.0	<MDC	26.7	<MDC	16.4	<MDC	14.3	<MDC	12.8	<MDC	29.5	<MDC	22.5
North Fork Creek																						
1/8/2020	<MDC	1300	<MDC	13.8	<MDC	16.2	<MDC	14.8	<MDC	14.0	<MDC	26.7	<MDC	16.4	<MDC	14.3	<MDC	12.8	<MDC	29.5	<MDC	22.5
7/1/2020	<MDC	1300	<MDC	13.8	<MDC	16.2	<MDC	14.8	<MDC	14.0	<MDC	26.7	<MDC	16.4	<MDC	14.3	<MDC	12.8	<MDC	29.5	<MDC	22.5
10/7/2020	<MDC	1300	<MDC	13.8	<MDC	16.2	<MDC	14.8	<MDC	14.0	<MDC	26.7	<MDC	16.4	<MDC	14.3	<MDC	12.8	<MDC	29.5	<MDC	22.5
Parnell Boat Ramp																						
1/8/2020	<MDC	1300	<MDC	13.8	<MDC	16.2	<MDC	14.8	<MDC	14.0	<MDC	26.7	<MDC	16.4	<MDC	14.3	<MDC	12.8	<MDC	29.5	<MDC	22.5
7/1/2020	<MDC	1300	<MDC	13.8	<MDC	16.2	<MDC	14.8	<MDC	14.0	<MDC	26.7	<MDC	16.4	<MDC	14.3	<MDC	12.8	<MDC	29.5	<MDC	22.5
10/7/2020	<MDC	1300	<MDC	13.8	<MDC	16.2	<MDC	14.8	<MDC	14.0	<MDC	26.7	<MDC	16.4	<MDC	14.3	<MDC	12.8	<MDC	29.5	<MDC	22.5
Salt Creek DnS from Spillway																						
1/8/2020	<MDC	1300	<MDC	13.8	<MDC	16.2	<MDC	14.8	<MDC	14.0	<MDC	26.7	<MDC	16.4	<MDC	14.3	<MDC	12.8	<MDC	29.5	<MDC	22.5
7/1/2020	<MDC	1300	<MDC	13.8	<MDC	16.2	<MDC	14.8	<MDC	14.0	<MDC	26.7	<MDC	16.4	<MDC	14.3	<MDC	12.8	<MDC	29.5	<MDC	22.5
10/7/2020	<MDC	1300	<MDC	13.8	<MDC	16.2	<MDC	14.8	<MDC	14.0	<MDC	26.7	<MDC	16.4	<MDC	14.3	<MDC	12.8	<MDC	29.5	<MDC	22.5
Well#7 at Weldon Springs Park																						
10/7/2020	<MDC	1300	<MDC	13.8	<MDC	16.2	<MDC	14.8	<MDC	14.0	<MDC	26.7	<MDC	16.4	<MDC	14.3	<MDC	12.8	<MDC	29.5	<MDC	22.5

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																						
7/1/2020	<MDC	215000	<MDC	0.38	<MDC	0.38	<MDC	0.03	<MDC	0.03	0.04	0.03	<MDC	3.60	<MDC	0.05	<MDC	6.70	<MDC	0.14	<MDC	0.98
North Branch at Rte 54 Bridge																						
7/1/2020	<MDC	215000	<MDC	0.38	<MDC	0.38	<MDC	0.03	<MDC	0.03	0.04	0.03	<MDC	3.60	<MDC	0.05	<MDC	6.70	<MDC	0.14	<MDC	0.98
North Fork Creek																						
7/1/2020	<MDC	215000	<MDC	0.38	<MDC	0.38	<MDC	0.03	<MDC	0.03	0.08	0.03	<MDC	3.60	<MDC	0.05	<MDC	6.70	<MDC	0.14	<MDC	0.98
Weldon Springs Entrance																						
7/1/2020	<MDC	215000	<MDC	0.38	<MDC	0.38	<MDC	0.03	<MDC	0.03	<MDC	0.03	<MDC	3.60	<MDC	0.05	<MDC	6.70	<MDC	0.14	<MDC	0.98

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	MDC
Mascoutin Recreation Area																						
7/1/2020	<MDC	209000	<MDC	0.34	<MDC	0.37	<MDC	0.04	<MDC	0.03	<MDC	0.04	<MDC	3.70	<MDC	0.05	<MDC	6.80	<MDC	0.15	<MDC	0.89
North Branch at Rte 54 Bridge																						
7/1/2020	<MDC	209000	<MDC	0.34	<MDC	0.37	<MDC	0.04	<MDC	0.03	0.06	0.04	<MDC	3.70	<MDC	0.05	<MDC	6.80	<MDC	0.15	<MDC	0.89
North Fork Creek																						
7/1/2020	<MDC	209000	<MDC	0.34	<MDC	0.37	<MDC	0.04	<MDC	0.03	0.08	0.04	<MDC	3.70	<MDC	0.05	<MDC	6.80	<MDC	0.15	<MDC	0.89
Weldon Springs Entrance																						
7/1/2020	<MDC	209000	<MDC	0.34	<MDC	0.37	<MDC	0.04	<MDC	0.03	<MDC	0.04	<MDC	3.70	<MDC	0.05	<MDC	6.80	<MDC	0.15	<MDC	0.89

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	MDC
North Fork Creek																						
7/1/2020	<MDC	115000	<MDC	0.18	<MDC	0.19	<MDC	0.02	<MDC	0.02	<MDC	0.02	<MDC	2.28	<MDC	0.03	<MDC	3.90	<MDC	0.09	<MDC	0.49
Parnell Boat Ramp																						
7/1/2020	<MDC	115000	<MDC	0.18	<MDC	0.19	<MDC	0.02	<MDC	0.02	<MDC	0.02	<MDC	2.28	<MDC	0.03	<MDC	3.90	<MDC	0.09	<MDC	0.49

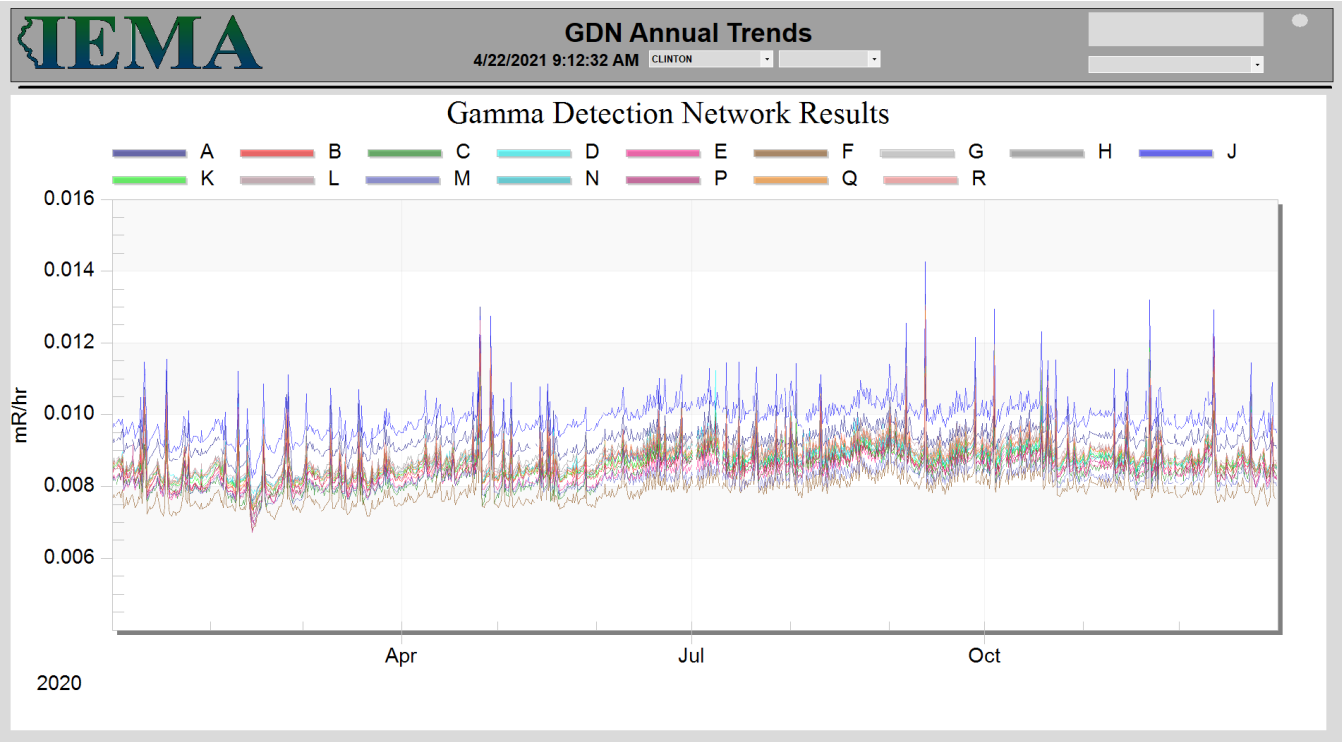
Gamma Spectroscopy Results for Radionuclides in Vegetation- Clinton
Results are in picocuries per gram (pCi/g)

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																								
7/1/2020	<MDC	22600	<MDC	0.36	<MDC	0.45	<MDC	0.06	<MDC	0.06	<MDC	0.06	<MDC	3.20	<MDC	6E+06	<MDC	0.10	<MDC	3.90	<MDC	0.24	<MDC	0.96
North Branch at Rte 54 Bridge																								
7/1/2020	<MDC	22600	<MDC	0.36	<MDC	0.45	<MDC	0.06	<MDC	0.06	<MDC	0.06	<MDC	3.20	<MDC	6E+06	<MDC	0.10	<MDC	3.90	<MDC	0.24	<MDC	0.96
North Fork Creek																								
7/1/2020	<MDC	22600	<MDC	0.36	<MDC	0.45	<MDC	0.06	<MDC	0.06	<MDC	0.06	<MDC	3.20	<MDC	6E+06	<MDC	0.10	<MDC	3.90	<MDC	0.24	<MDC	0.96
Weldon Springs Entrance																								
7/1/2020	<MDC	22600	<MDC	0.36	<MDC	0.45	<MDC	0.06	<MDC	0.06	<MDC	0.06	<MDC	3.20	<MDC	6E+06	<MDC	0.10	<MDC	3.90	<MDC	0.24	<MDC	0.96

Gamma Spectroscopy Results for Radionuclides in Fish- Clinton
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
Clinton Lake (fish)																								
9/30/2020	<MDC	740.0	<MDC	154.0	<MDC	74.0	<MDC	70.0	<MDC	53.6	<MDC	60.8	<MDC	172.0	<MDC	448.0	<MDC	62.0	<MDC	94.0	<MDC	152.0	<MDC	132.0

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



Summary of Ambient Gamma Results - Clinton

Location	Quarter 1/2 mR/quarter	Quarter 3 mR/quarter	Quarter 4 mR/quarter	Annual Exposure mR/year
CL001	11.5	8.3		41.6
CL003	10.9	11.0	10.9	43.8
CL006	8.2			32.7
CL009	9.5	5.5		32.6
CL011	9.7	10.2	10.9	40.5
CL013		5.7	5.6	22.5
CL016	12.5	8.7		44.8
CL018	13.8	11.1	12.7	51.4
CL019	12.1	9.9	13.6	47.6
CL022	11.4	8.8	10.6	42.2
CL025	11.8	11.1		46.2
CL027	10.9	8.3	5.7	35.8
CL028	10.3	11.0	9.7	41.3
CL031	11.2	11.3	9.5	43.3
CL032	11.5	9.3	10.4	42.7
CL033	9.6	8.9	8.6	36.9
CL036	10.9	9.9	8.9	40.5
CL037	10.8	10.5	11.1	43.2
CL038	9.8	9.6		39.0
CL039			8.8	35.2
CL040	10.0	8.4	6.8	35.3
CL041	11.1	10.4	10.8	43.4
CL042	9.8	9.6		38.9
CL043	10.5	8.3	8.8	38.1

Summary of Ambient Gamma Results – Clinton (Continued)

Location	Quarter 1/2 mR/quarter	Quarter 3 mR/quarter	Quarter 4 mR/quarter	Annual Exposure mR/year
CL044	10.6	10.9	8.1	40.3
CL045	9.7	11.4	9.4	40.2
CL046		9.8	9.6	38.8
CL047	12.2	7.9	11.5	43.7
CL048		11.2	7.8	38.1
CL049	10.2	10.9	9.1	40.4
CL050	10.5	8.4	8.8	38.2
CL051	10.3	11.0	9.1	40.6
CL-RSA		10.0	9.6	39.3
CL-RSB	9.8	7.5	9.3	36.4
CL-RSC	10.5	7.4		37.8
CL-RSD	11.4	7.1	9.9	39.9
CL-RSE	8.6	6.5	9.9	33.5
CL-RSF	8.8	5.2	7.3	30.1
CL-RSG	11.3	7.8	11.5	42.0
CL-RSH	9.5	8.6	7.6	35.2
CL-RSJ	10.5	8.7	8.1	37.7
CL-RSK	10.6	9.3		40.7
CL-RSL	9.9	10.6	8.9	39.4
CL-RSM	12.4	10.1	8.4	43.3
CL-RSN	11.8	8.5	12.1	44.2
CL-RSP	11.2	8.8	7.2	38.3
CL-RSQ		11.7	11.6	46.6
CL-RSR	10.0	8.3	10.3	38.6

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. NPS OSLs were not collected in the 2nd quarter due to the COVID-19 emergency; therefore, results from quarters 1 and 2 are a combined average.

Dresden Nuclear Power Station

The Dresden NPS, consisting of one retired reactor and two operating 867 Megawatt BWRs, is owned and operated by the Exelon Corporation 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 National Pollutant Discharge Elimination System permit. No liquid effluents were discharged in 2020.

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 2020

Due to COVID-19 employee safety mandates in place during a portion of 2020, IEMA's Division of Nuclear Safety's Radiological Field Services Unit (RFS) staff was temporarily unavailable to perform the duties associated with the radiological environmental monitoring programs. This resulted in some scheduled sampling and monitoring activities not being completed.

Sampling and Monitoring Results

Water Sampling Results

Results from tritium analysis indicated no concentrations above the established MDCs.

Results from gross beta analysis indicated that the established MDC was met at some surface water sampling locations. These concentrations are consistent with results found in background samples collected. 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.

Strontium analysis was scheduled for second quarter. Due to the COVID-19 pandemic, second quarter sampling was suspended; therefore, strontium analysis results were not obtained.

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 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

Due to COVID-19 employee safety mandates in place during a portion of 2020, fish samples were unobtainable for 2020.

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

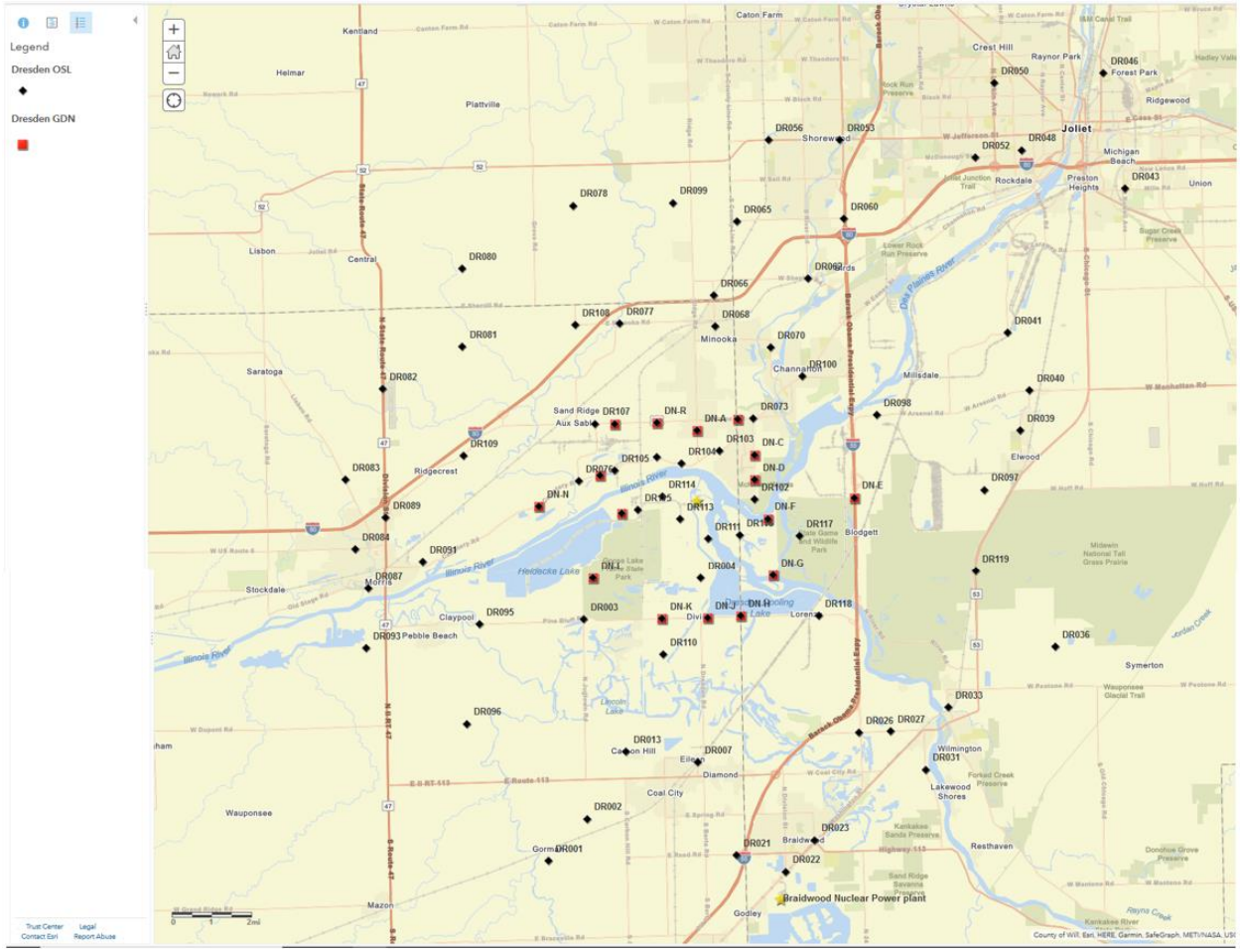


Figure 16. OSL and GDN Monitoring Locations - Dresden (continued)

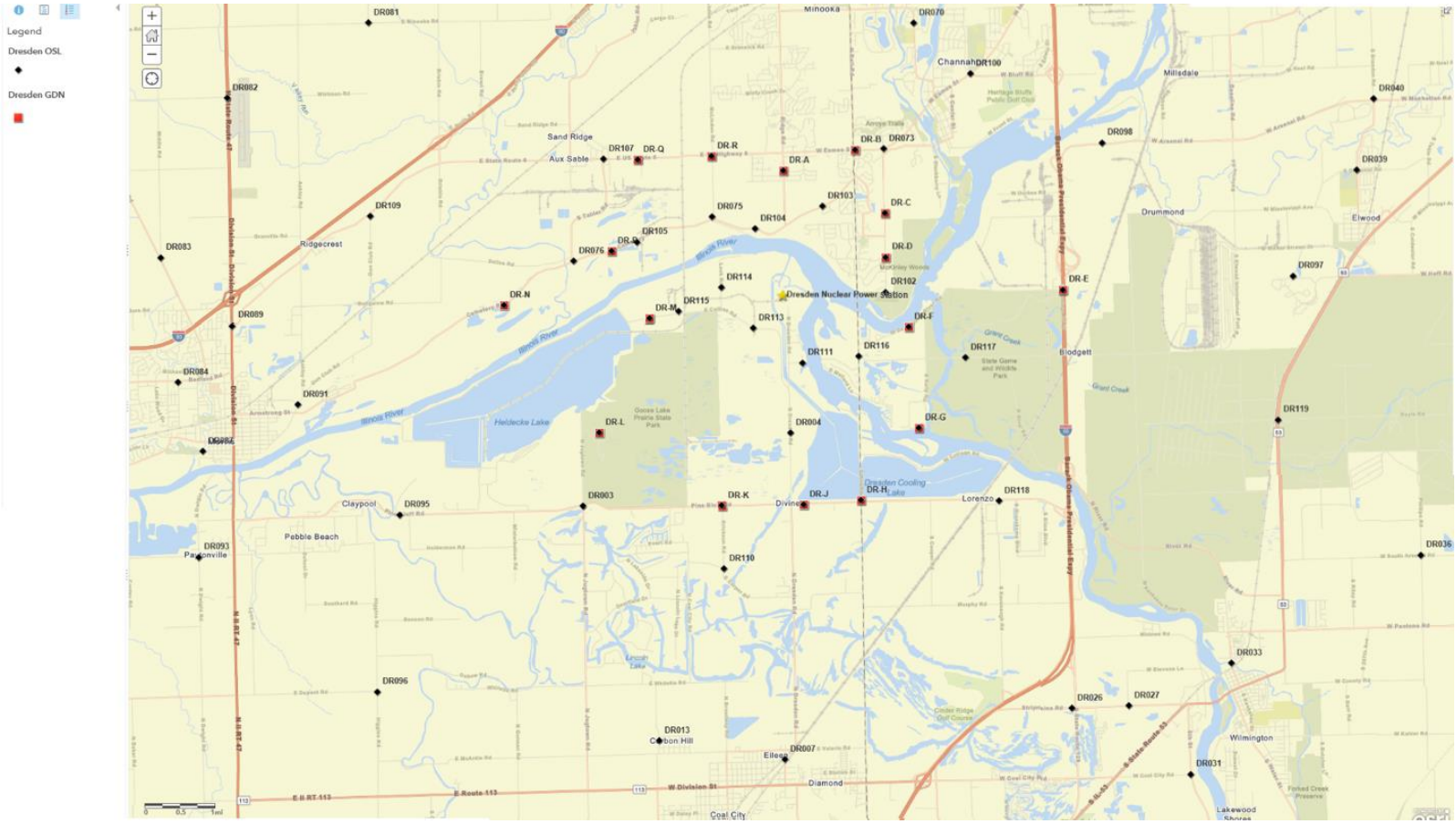
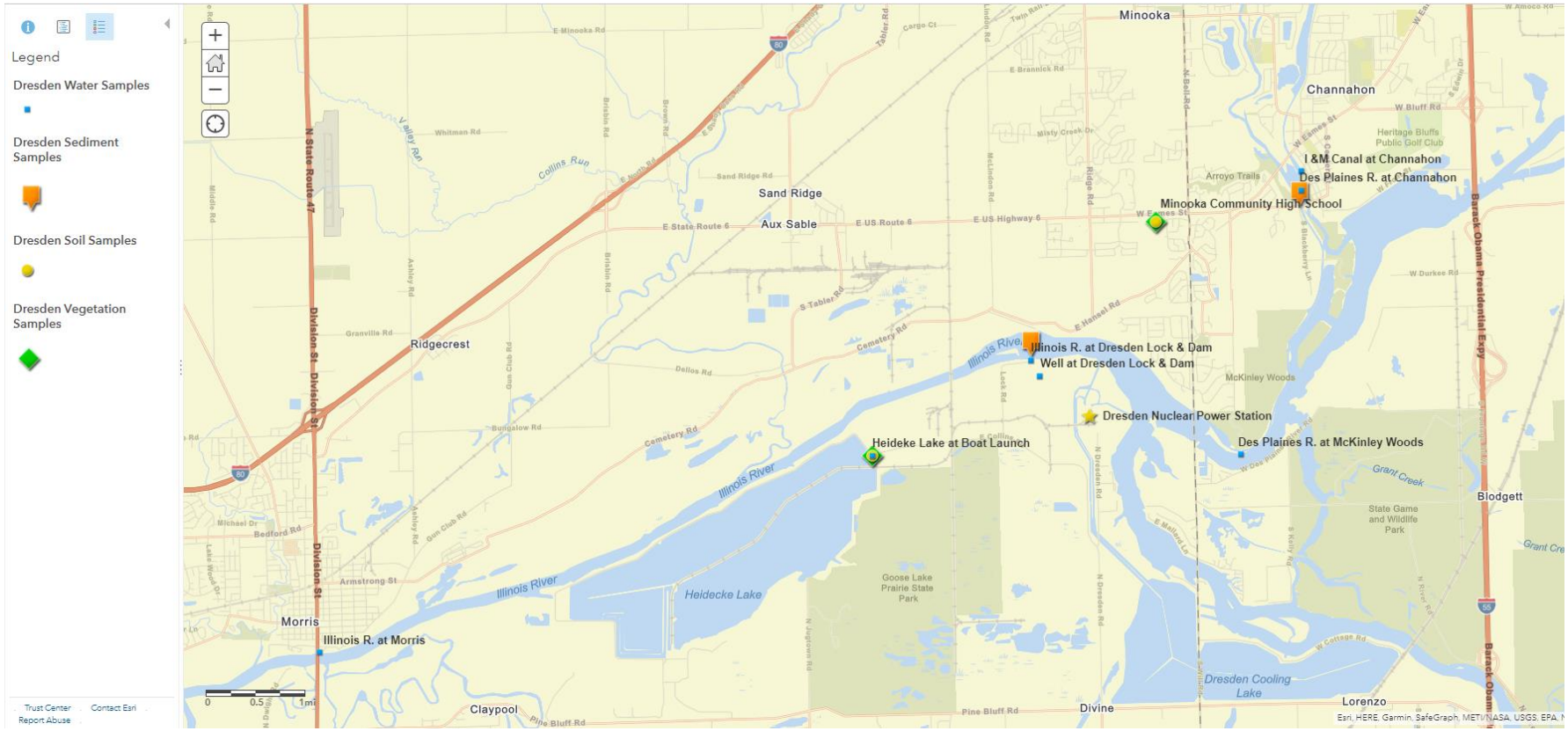


Figure 17. Environmental Sampling Locations - Dresden

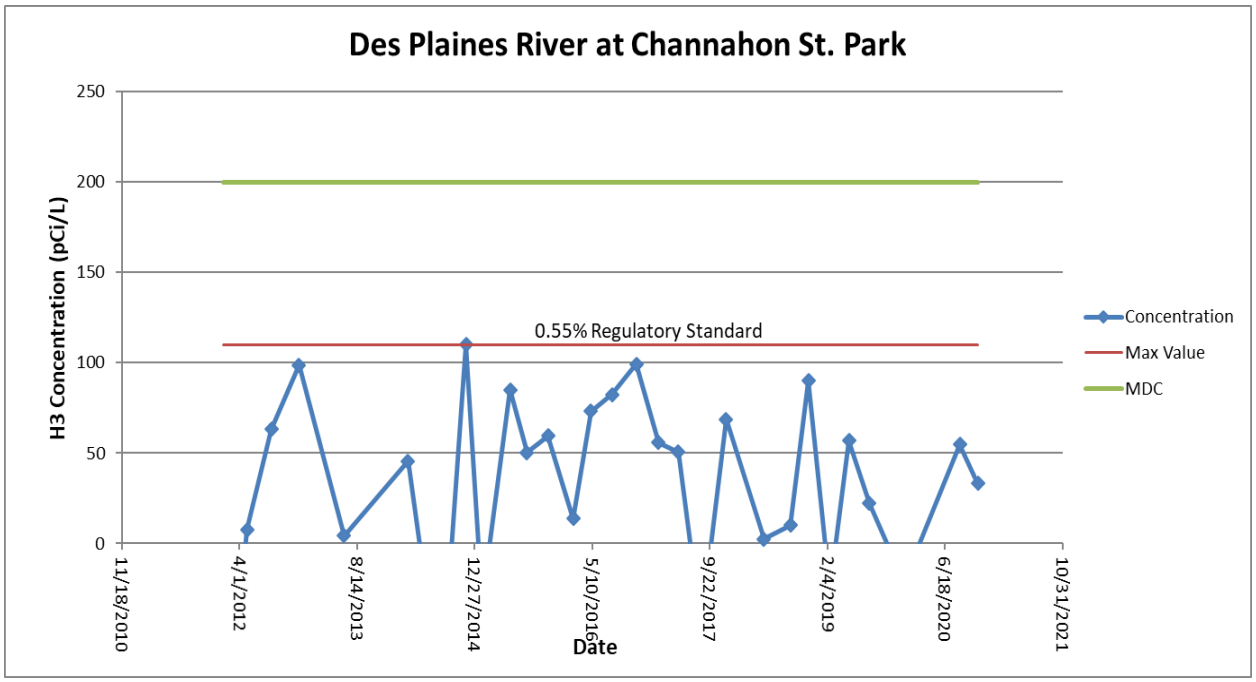


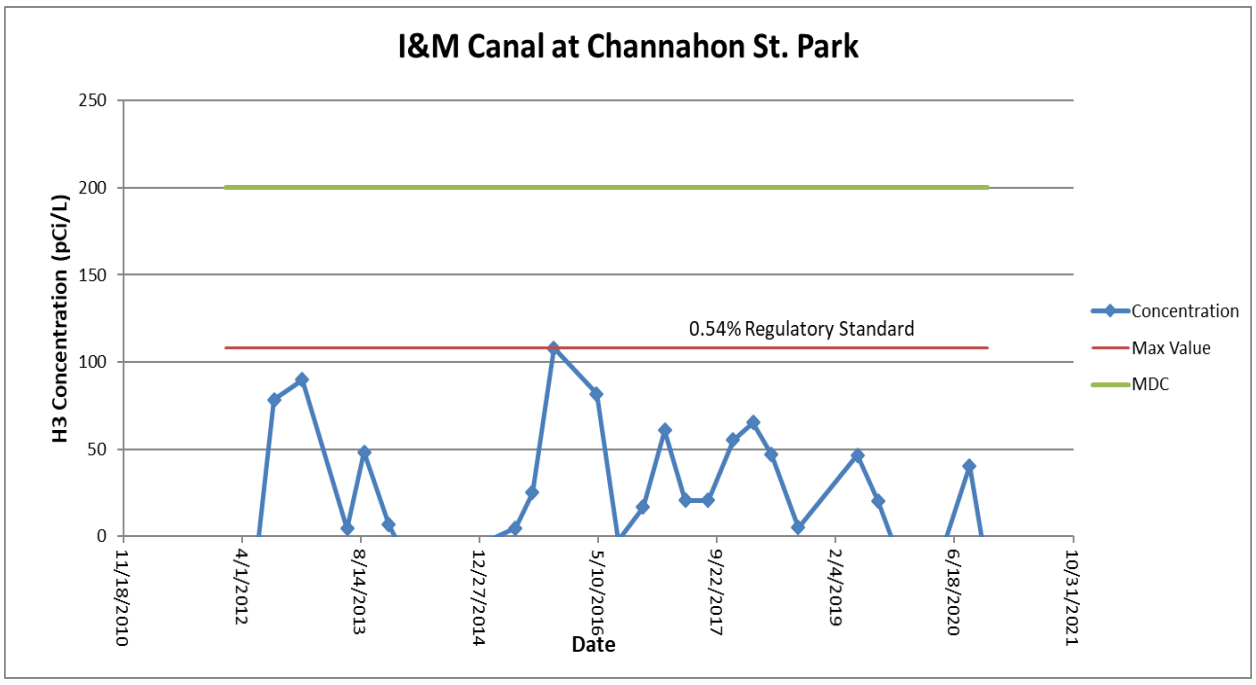
Dresden Sample Result Tables and Graphs

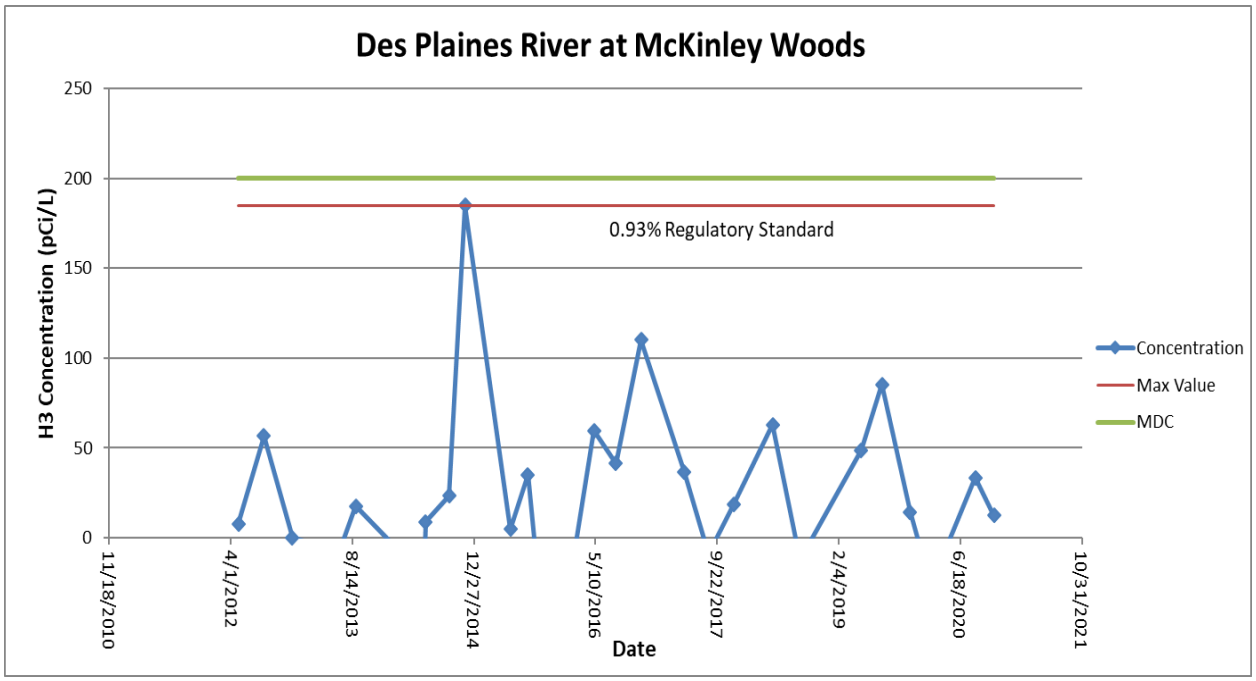
Tritium (H-3) in Water - Dresden
Results are in picocuries per liter (pCi/L)

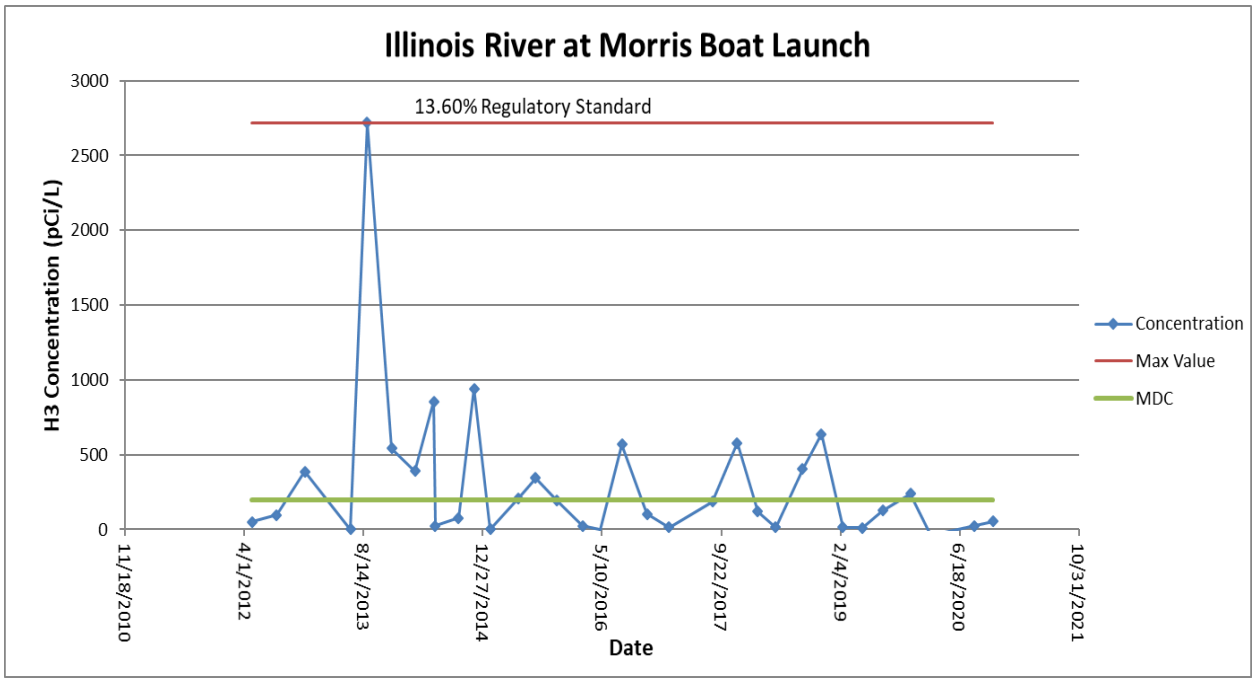
Location	H-3	
Date	Result	MDC
Des Plaines R. at Channahon		
2/18/2020	<MDC	200
8/19/2020	<MDC	200
11/4/2020	<MDC	200
Des Plaines R. at McKinley Woods		
2/18/2020	<MDC	200
8/19/2020	<MDC	200
11/4/2020	<MDC	200
Heideke Lake		
2/18/2020	<MDC	200
8/19/2020	<MDC	200
11/4/2020	<MDC	200
I & M Canal at Channahon		
2/18/2020	<MDC	200
8/19/2020	<MDC	200
11/4/2020	<MDC	200
Illinois R. at Dresden Lock & Dam		
2/18/2020	<MDC	200
8/19/2020	<MDC	200
11/4/2020	<MDC	200
Illinois R. at Morris		
2/18/2020	<MDC	200
8/19/2020	<MDC	200
11/4/2020	<MDC	200
Well at Dresden Lock & Dam		
8/19/2020	<MDC	200
11/4/2020	<MDC	200

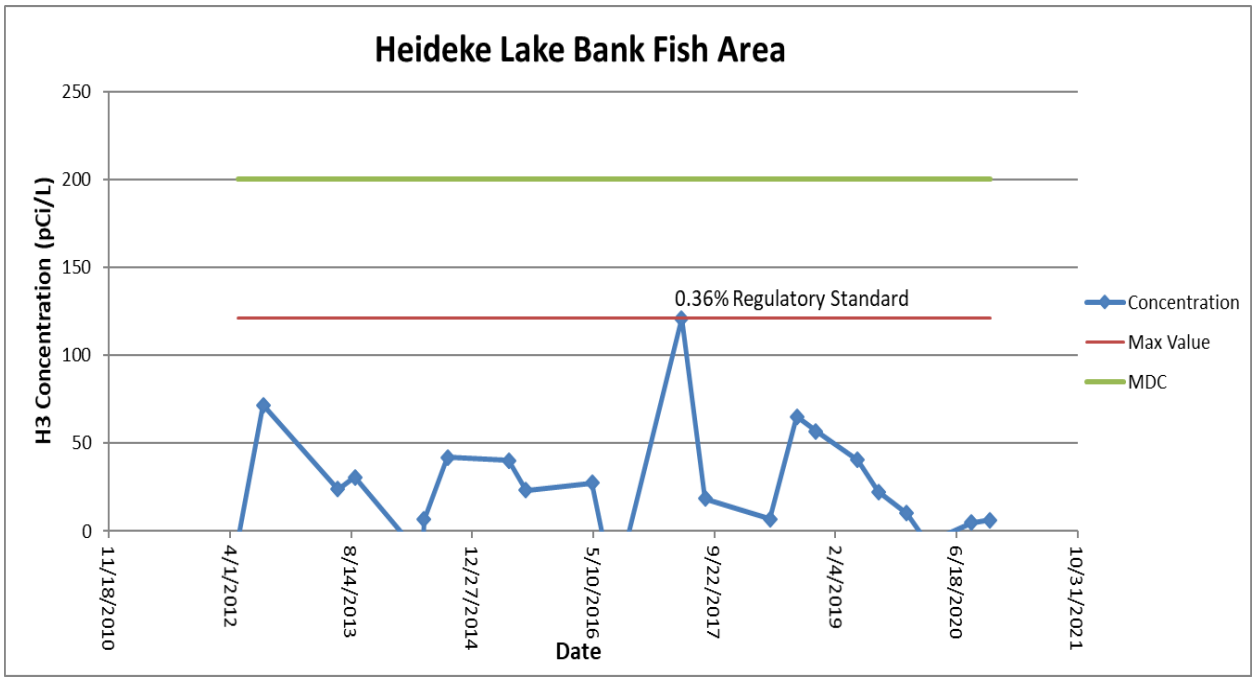
Trending Graphs for Tritium (H-3) in Water - Dresden Area
(Max value compared to IEPA and US EPA regulatory standard of 20,000 pCi/L)

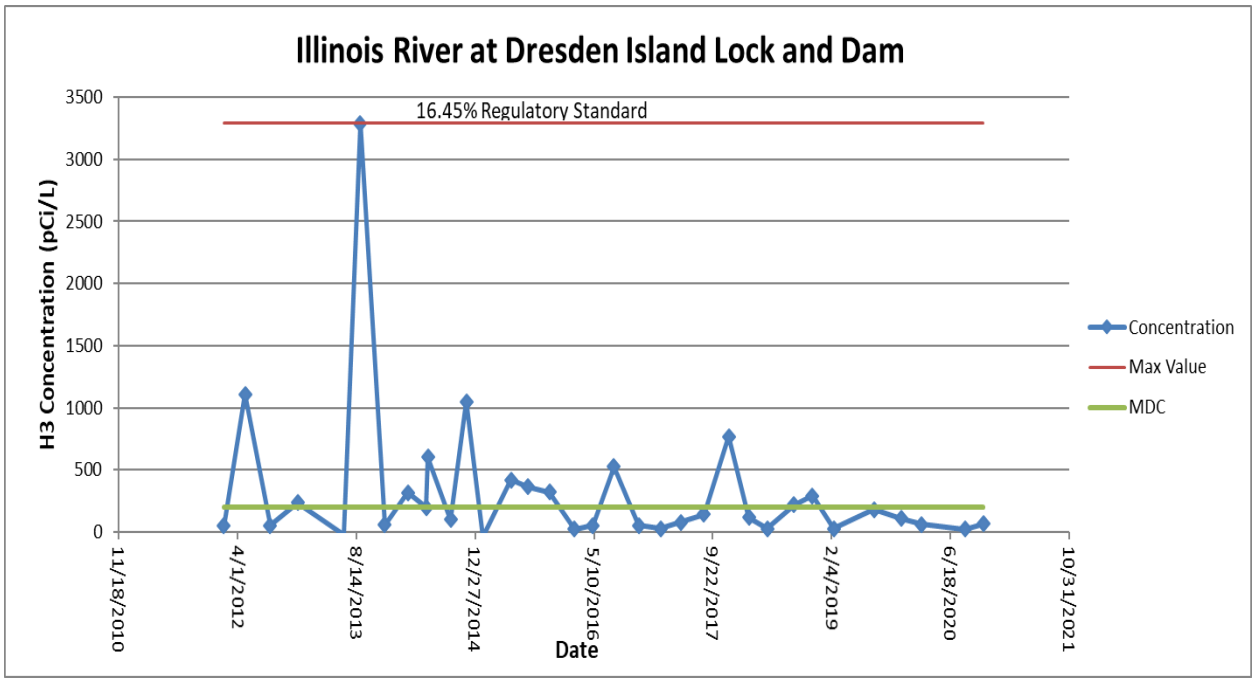


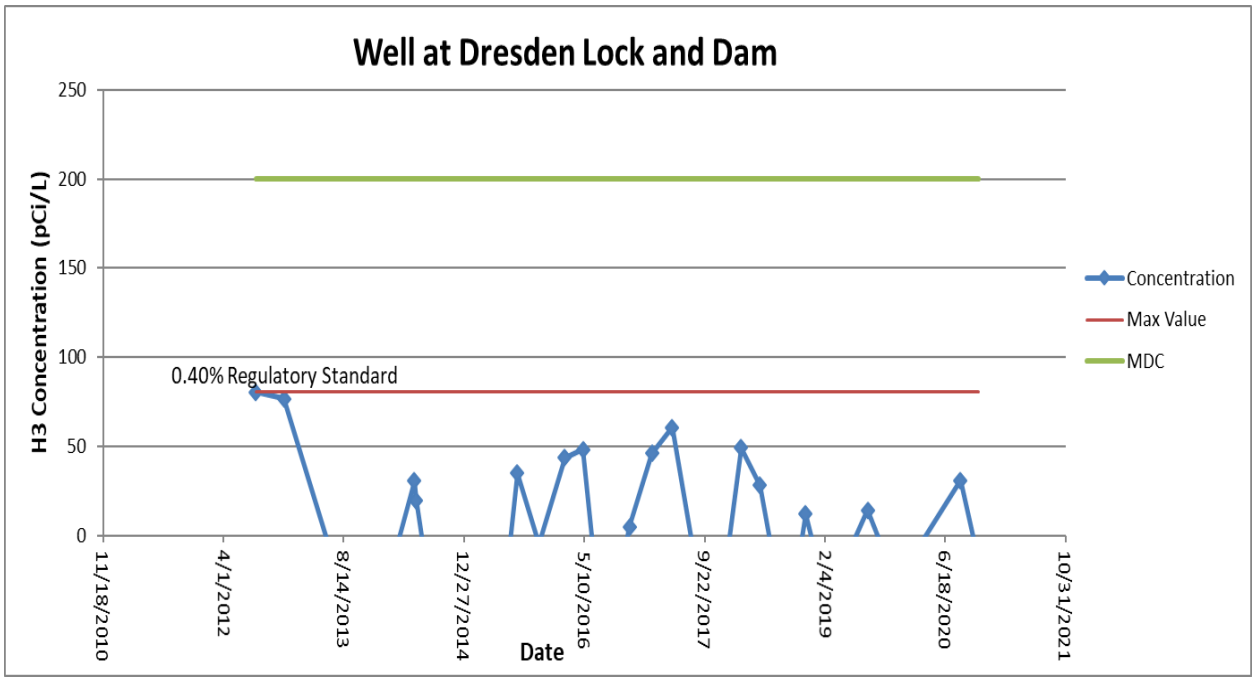



Des Plaines River at McKinley Woods
250
200
150
100
50
0
H3 Concentration (pCi/L)
0.93% Regulatory Standard
11/18/2010
4/1/2012
8/14/2013
12/27/2014
5/10/2016
9/22/2017
2/4/2019
6/18/2020
10/31/2021
Date
Concentration
Max Value
MDC


Illinois River at Morris Boat Launch
3000
2500
2000
1500
1000
500
0
H3 Concentration (pCi/L)
13.60% Regulatory Standard
11/18/2010
4/1/2012
8/14/2013
12/27/2014
5/10/2016
9/22/2017
2/4/2019
6/18/2020
10/31/2021
Date
Concentration
Max Value
MDC


Heideke Lake Bank Fish Area
H3 Concentration (pCi/L)
250
200
150
100
50
0
0.36% Regulatory Standard
11/18/2010
4/1/2012
8/14/2013
12/27/2014
5/10/2016
9/22/2017
2/4/2019
6/18/2020
10/31/2021
Date
Concentration
Max Value
MDC


Illinois River at Dresden Island Lock and Dam
H3 Concentration (pCi/L)
3500
3000
2500
2000
1500
1000
500
0
16.45% Regulatory Standard
11/18/2010
4/1/2012
8/14/2013
12/27/2014
5/10/2016
9/22/2017
2/4/2019
6/18/2020
10/31/2021
Date
Concentration
Max Value
MDC



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

Due to COVID-19 employee safety mandates in place during a portion of 2020, analyses were unobtainable for 2020.

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

Location	Beta	
Date	Result	MDC
Des Plaines R. at Channahon		
2/18/2020	6.2	3.5
8/19/2020	6.7	3.5
11/4/2020	4.4	3.5
Des Plaines R. at McKinley Woods		
2/18/2020	6.0	3.5
8/19/2020	6.8	3.5
11/4/2020	4.6	3.5
Heideke Lake		
2/18/2020	<MDC	3.5
8/19/2020	4.7	3.5
11/4/2020	<MDC	3.5
I & M Canal at Channahon		
2/18/2020	5.6	3.5
8/19/2020	3.8	3.5
11/4/2020	5.1	3.5
Illinois R. at Dresden Lock & Dam		
2/18/2020	6.9	3.5
8/19/2020	6.0	3.5
11/4/2020	5.5	3.5
Illinois R. at Morris		
2/18/2020	5.3	3.5
8/19/2020	5.2	3.5
11/4/2020	<MDC	3.5
Well at Dresden Lock & Dam		
8/19/2020	14.4	3.5
11/4/2020	13.1	3.5

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																								
2/18/2020	<MDC	22.7	<MDC	360.0	<MDC	3.6	<MDC	4.1	<MDC	4.0	<MDC	3.8	<MDC	7.9	<MDC	9.9	<MDC	3.8	<MDC	4.4	<MDC	7.9	<MDC	6.5
8/19/2020	<MDC	22.7	<MDC	360.0	<MDC	3.6	<MDC	4.1	<MDC	4.0	<MDC	3.8	<MDC	7.9	<MDC	9.9	<MDC	3.8	<MDC	4.4	<MDC	7.9	<MDC	6.5
11/4/2020	<MDC	22.7	<MDC	360.0	<MDC	3.6	<MDC	4.1	<MDC	4.0	<MDC	3.8	<MDC	7.9	<MDC	9.9	<MDC	3.8	<MDC	4.4	<MDC	7.9	<MDC	6.5
Des Plaines R. at McKinley Woods																								
2/18/2020	<MDC	22.7	<MDC	360.0	<MDC	3.6	<MDC	4.1	<MDC	4.0	<MDC	3.8	<MDC	7.9	<MDC	9.9	<MDC	3.8	<MDC	4.4	<MDC	7.9	<MDC	6.5
8/19/2020	<MDC	22.7	<MDC	360.0	<MDC	3.6	<MDC	4.1	<MDC	4.0	<MDC	3.8	<MDC	7.9	<MDC	9.9	<MDC	3.8	<MDC	4.4	<MDC	7.9	<MDC	6.5
11/4/2020	<MDC	22.7	<MDC	360.0	<MDC	3.6	<MDC	4.1	<MDC	4.0	<MDC	3.8	<MDC	7.9	<MDC	9.9	<MDC	3.8	<MDC	4.4	<MDC	7.9	<MDC	6.5
Heideke Lake																								
2/18/2020	<MDC	22.7	<MDC	360.0	<MDC	3.6	<MDC	4.1	<MDC	4.0	<MDC	3.8	<MDC	7.9	<MDC	9.9	<MDC	3.8	<MDC	4.4	<MDC	7.9	<MDC	6.5
8/19/2020	<MDC	22.7	<MDC	360.0	<MDC	3.6	<MDC	4.1	<MDC	4.0	<MDC	3.8	<MDC	7.9	<MDC	9.9	<MDC	3.8	<MDC	4.4	<MDC	7.9	<MDC	6.5
11/4/2020	<MDC	22.7	<MDC	360.0	<MDC	3.6	<MDC	4.1	<MDC	4.0	<MDC	3.8	<MDC	7.9	<MDC	9.9	<MDC	3.8	<MDC	4.4	<MDC	7.9	<MDC	6.5
I & M Canal at Channahon																								
2/18/2020	<MDC	22.7	<MDC	360.0	<MDC	3.6	<MDC	4.1	<MDC	4.0	<MDC	3.8	<MDC	7.9	<MDC	9.9	<MDC	3.8	<MDC	4.4	<MDC	7.9	<MDC	6.5
8/19/2020	<MDC	22.7	<MDC	360.0	<MDC	3.6	<MDC	4.1	<MDC	4.0	<MDC	3.8	<MDC	7.9	<MDC	9.9	<MDC	3.8	<MDC	4.4	<MDC	7.9	<MDC	6.5
11/4/2020	<MDC	22.7	<MDC	360.0	<MDC	3.6	<MDC	4.1	<MDC	4.0	<MDC	3.8	<MDC	7.9	<MDC	9.9	<MDC	3.8	<MDC	4.4	<MDC	7.9	<MDC	6.5
Illinois R. at Dresden Lock & Dam																								
2/18/2020	<MDC	22.7	<MDC	360.0	<MDC	3.6	<MDC	4.1	<MDC	4.0	<MDC	3.8	<MDC	7.9	<MDC	9.9	<MDC	3.8	<MDC	4.4	<MDC	7.9	<MDC	6.5
8/19/2020	<MDC	22.7	<MDC	360.0	<MDC	3.6	<MDC	4.1	<MDC	4.0	<MDC	3.8	<MDC	7.9	<MDC	9.9	<MDC	3.8	<MDC	4.4	<MDC	7.9	<MDC	6.5
11/4/2020	<MDC	22.7	<MDC	360.0	<MDC	3.6	<MDC	4.1	<MDC	4.0	<MDC	3.8	<MDC	7.9	<MDC	9.9	<MDC	3.8	<MDC	4.4	<MDC	7.9	<MDC	6.5
Illinois R. at Morris																								
2/18/2020	<MDC	22.7	<MDC	360.0	<MDC	3.6	<MDC	4.1	<MDC	4.0	<MDC	3.8	<MDC	7.9	<MDC	9.9	<MDC	3.8	<MDC	4.4	<MDC	7.9	<MDC	6.5
8/19/2020	<MDC	22.7	<MDC	360.0	<MDC	3.6	<MDC	4.1	<MDC	4.0	<MDC	3.8	<MDC	7.9	<MDC	9.9	<MDC	3.8	<MDC	4.4	<MDC	7.9	<MDC	6.5
11/4/2020	<MDC	22.7	<MDC	360.0	<MDC	3.6	<MDC	4.1	<MDC	4.0	<MDC	3.8	<MDC	7.9	<MDC	9.9	<MDC	3.8	<MDC	4.4	<MDC	7.9	<MDC	6.5
Well at Dresden Lock & Dam																								
8/19/2020	<MDC	22.7	<MDC	360.0	<MDC	3.6	<MDC	4.1	<MDC	4.0	<MDC	3.8	<MDC	7.9	<MDC	9.9	<MDC	3.8	<MDC	4.4	<MDC	7.9	<MDC	6.5
11/4/2020	<MDC	22.7	<MDC	360.0	<MDC	3.6	<MDC	4.1	<MDC	4.0	<MDC	3.8	<MDC	7.9	<MDC	9.9	<MDC	3.8	<MDC	4.4	<MDC	7.9	<MDC	6.5

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	MDC
Heideke Lake																						
8/19/2020	<MDC	3E+06	<MDC	0.44	<MDC	0.59	<MDC	0.04	<MDC	0.04	0.11	0.04	<MDC	8.70	<MDC	0.07	<MDC	18.60	<MDC	0.17	<MDC	1.70
Minooka Community High School																						
8/19/2020	<MDC	3E+06	<MDC	0.44	<MDC	0.59	<MDC	0.04	<MDC	0.04	<MDC	0.04	<MDC	8.70	<MDC	0.07	<MDC	18.60	<MDC	0.17	<MDC	1.70

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	MDC
Heideke Lake																						
8/19/2020	<MDC	3E+06	<MDC	0.44	<MDC	0.64	<MDC	0.04	<MDC	0.03	0.10	0.04	<MDC	8.50	<MDC	0.06	<MDC	17.20	<MDC	0.17	<MDC	1.66
Minooka Community High School																						
8/19/2020	<MDC	3E+06	<MDC	0.44	<MDC	0.64	<MDC	0.04	<MDC	0.03	<MDC	0.04	<MDC	8.50	<MDC	0.06	<MDC	17.20	<MDC	0.17	<MDC	1.66

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																						
8/19/2020	<MDC	1E+06	<MDC	0.22	<MDC	0.34	<MDC	0.03	<MDC	0.02	<MDC	0.02	<MDC	4.70	<MDC	0.04	<MDC	8.00	<MDC	0.11	<MDC	0.90
Illinois R. at Dresden Lock & Dam																						
8/19/2020	<MDC	1E+06	<MDC	0.22	<MDC	0.34	<MDC	0.03	<MDC	0.02	0.05	0.02	<MDC	4.70	<MDC	0.04	<MDC	8.00	<MDC	0.11	<MDC	0.90

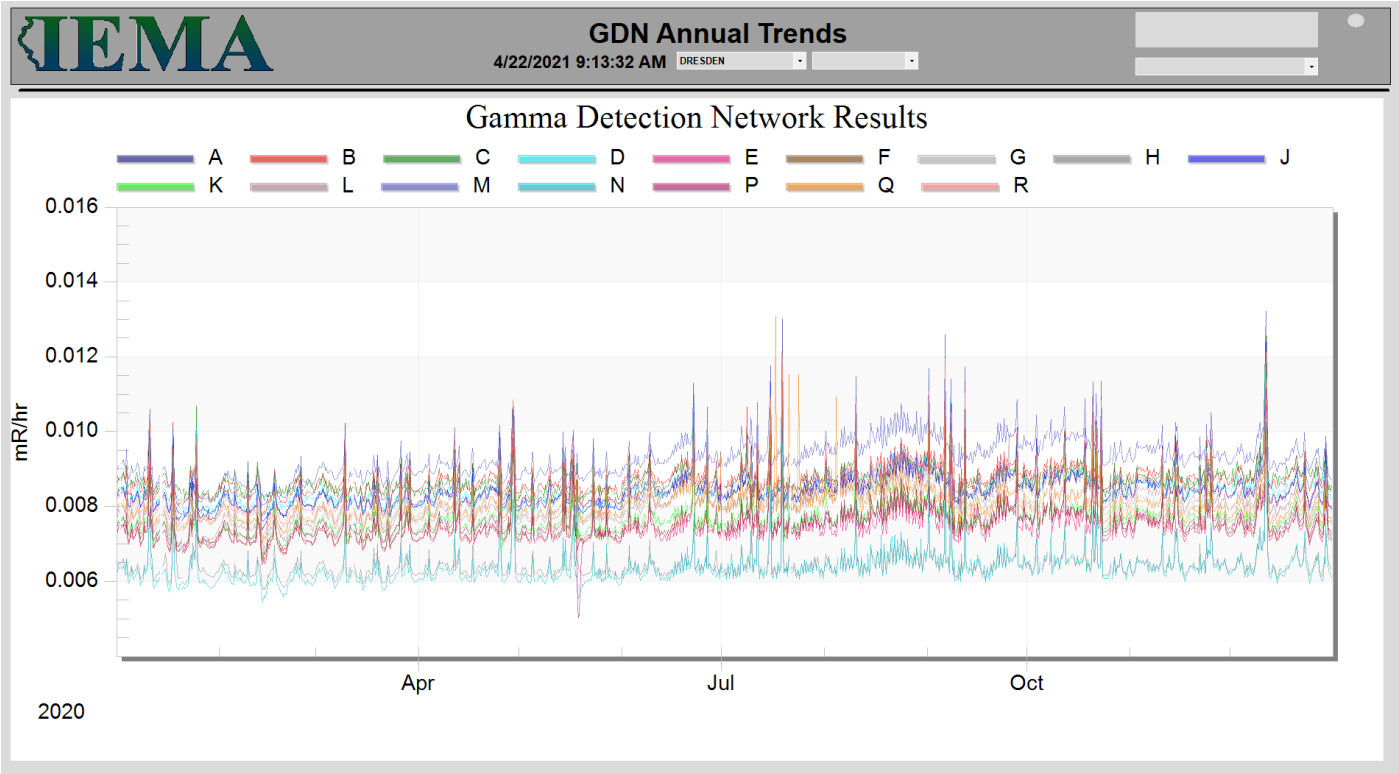
Gamma Spectroscopy Results for Radionuclides in Vegetation - Dresden
Results are in picocuries per gram (pCi/g)

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																								
8/19/2020	<MDC	5600	<MDC	0.15	<MDC	0.19	<MDC	0.04	<MDC	0.03	<MDC	0.03	<MDC	1.37	<MDC	860000	<MDC	0.04	<MDC	1.46	<MDC	0.13	<MDC	0.44
Minooka Community High School																								
8/19/2020	<MDC	5600	<MDC	0.15	<MDC	0.19	<MDC	0.04	<MDC	0.03	<MDC	0.03	<MDC	1.37	<MDC	860000	<MDC	0.04	<MDC	1.46	<MDC	0.13	<MDC	0.44

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

Due to COVID-19 employee safety mandates in place during a portion of 2020, fish samples were unobtainable for 2020.

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



Summary of Ambient Gamma Results - Dresden

Location	Quarter 1 mR/quarter	Quarter 2/3 mR/quarter	Quarter 4 mR/quarter	Annual Exposure mR/year
DR001	3.5	7.9	6.5	25.9
DR002	4.4	6.8	8.9	26.9
DR003	4.4		9.1	26.8
DR004	5.9	8.9	10.3	34.0
DR007	5.4	7.4	7.6	27.8
DR013	5.8	7.2	8.8	29.1
DR021	3.0	6.5		21.4
DR022	3.4	7.1	8.0	25.6
DR023	6.1	6.2	7.0	25.5
DR026	3.5	5.3	9.8	23.9
DR027	3.2	5.8	8.0	22.8
DR031	4.8	6.3	10.4	27.8
DR033	4.5	6.2	7.2	24.0
DR036	8.7	8.5	9.9	35.6
DR039	6.6		10.8	34.8
DR040	5.2		11.8	34.0
DR041	6.4		9.9	32.6
DR043	8.8	9.4	8.9	36.4
DR046		5.1		20.4
DR048	6.3	9.4	12.5	37.7
DR050	5.2	6.6	7.3	25.7
DR052	10.5	9.7	13.0	43.0
DR053	1.7	6.6	8.9	23.8
DR056	9.1	10.5	10.9	40.9
DR060	3.3	9.2	8.1	29.8
DR062	3.5	7.7	11.1	30.0
DR065	8.9	11.3	12.3	43.8
DR066	7.3	6.0	10.2	29.4
DR068	8.5		9.8	36.5
DR070	5.8	8.3	7.8	30.2
DR073	6.9	8.3		31.2
DR075	6.6	9.2	10.2	35.2
DR076	4.7		8.7	26.8

Summary of Ambient Gamma Results – Dresden (Continued)

Location	Quarter 1 mR/quarter	Quarter 2/3 mR/quarter	Quarter 4 mR/quarter	Annual Exposure mR/year
DR077	6.8	7.7	9.1	31.4
DR078	8.7		11.3	40.1
DR080	7.5	10.8	14.6	43.7
DR081	7.5		11.5	37.8
DR082	6.2	9.6	10.2	35.6
DR083	4.3	8.1	9.8	30.3
DR084	6.4	8.9	8.5	32.6
DR087	8.1	8.7	8.9	34.3
DR089	5.3	7.5	9.4	29.7
DR091	6.6	7.0		27.3
DR093	4.9	7.9	9.2	29.9
DR095	6.5	7.6	9.8	31.4
DR096	5.9	8.9	9.1	32.7
DR097	6.4	10.3	11.7	38.8
DR098			8.7	34.9
DR099	9.0	10.1	14.1	43.2
DR100	7.2	9.0	10.0	35.1
DR102	5.4	9.9	10.4	35.5
DR103	9.2	11.4	11.6	43.7
DR104	11.7	10.6	11.7	44.7
DR105	5.1	7.1	10.4	29.6
DR107	3.5	6.9	6.2	23.5
DR108	7.4	10.5	14.3	42.6
DR109	10.2	11.0		42.8
DR110	2.7	5.1	6.6	19.4
DR111	2.7	6.8	11.8	28.1
DR113	7.4	10.8	11.4	40.3
DR114	8.4	10.8	12.1	42.0
DR115	9.8	9.4	8.9	37.4
DR116	1.9	6.1	6.9	21.0
DR117	3.9	8.6	10.0	31.3
DR118			9.1	36.5
DR119	6.5	7.9	8.7	31.0

Location	Quarter 1 mR/day	Quarter 2 mR/day	Quarter 3 mR/day	Quarter 4 mR/day	Annual Exposure mR/year
DR077	7.8	6.8	7.4	7.4	29.3
DR078	9.8	10.8	7.7	13.3	41.5
DR080	10.0	9.0	9.1	9.6	37.8
DR081	10.0	8.4	8.8	8.3	35.5
DR082		8.8	8.2	7.3	32.4
DR083	8.1	7.4	7.4	6.5	29.4
DR084	8.2	7.6	9.3	8.3	33.4
DR087	8.7	8.5	7.9	9.2	34.3
DR089	8.1	8.0	7.8	8.3	32.2
DR091	8.3	6.9	7.9	7.0	30.2
DR093	8.4	6.1	7.9	9.0	31.5
DR095	8.2	8.4	8.1	8.5	33.2
DR096	8.4	9.2	9.9	8.7	36.2
DR097	9.9	9.9	7.5	12.0	39.3
DR098	6.5	9.3	6.3		29.4
DR099	9.8	11.7	12.8	8.6	42.8
DR100	8.9	7.4	8.0	8.0	32.3
DR102	8.9	9.7	15.2	9.1	42.8
DR103	10.9	10.4	12.0	11.0	44.3
DR104	12.4	10.4	11.3	8.9	43.0
DR105	5.7	4.7	6.9	6.3	23.8
DR107	8.3	8.4	7.6	8.4	32.7
DR108	8.9	9.6	8.6	10.4	37.5
DR109	11.9	11.9			47.5
DR110	5.7	4.7	4.5	2.6	17.5
DR111	6.7	5.2	6.2	5.4	23.5
DR113	9.9		10.4	10.0	40.3
DR114	10.7	10.5	9.9	12.6	43.6
DR115	10.8	9.6	9.9	11.3	41.6
DR116	6.9	5.9	7.2	6.4	26.4
DR117	7.9	7.4	9.9	8.1	33.4
DR118	6.2	6.2	5.8	7.8	26.1
DR119	8.3	8.5	9.8	7.9	34.5

Summary of Ambient Gamma Results – Dresden (Continued)

Location	Quarter 1 mR/quarter	Quarter 2/3 mR/quarter	Quarter 4 mR/quarter	Annual Exposure mR/year

DR-RSA	3.4	9.4	11.1	33.4
DR-RSB	5.8	10.0	13.2	39.1
DR-RSC	8.0		12.9	41.9
DR-RSD	10.1	11.3	13.9	46.6
DR-RSE	3.3	8.3	10.9	30.7
DR-RSF	6.7	6.7	7.8	27.9
DR-RSG	4.1	8.1	8.7	28.9
DR-RSH	3.0	5.9	6.1	20.9
DR-RSJ	8.1	10.7	10.8	40.3
DR-RSK	6.9	7.7	9.8	32.0
DR-RSL	5.8	9.6	10.4	35.4
DR-RSM	7.5	11.8	14.3	45.4
DR-RSN	3.2	6.2	6.5	22.0
DR-RSP	2.7	7.3	9.4	26.7
DR-RSQ	4.2	6.5	9.6	26.8
DR-RSR	5.6	11.2	13.2	41.2

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. NPS OSLs were not collected in the 2nd quarter due to the COVID-19 emergency; therefore, results from quarters 2 and 3 are a combined average.

LaSalle Nuclear Power Station

The LaSalle NPS, consisting of two 3,546 Megawatt BWRs, is owned and operated by the Exelon Corporation 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 National Pollutant Discharge Elimination System 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 2020.

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 2020

A water sample was collected from LaSalle Lake State Fish and Wildlife Area in an effort to explore a new sampling location. However, due to limited accessibility, this location will not remain part of the permanent sampling plan.

Due to COVID-19 employee safety mandates in place during a portion of 2020, IEMA's Division of Nuclear Safety's Radiological Field Services Unit (RFS) staff was temporarily unavailable to perform the duties associated with the radiological environmental monitoring programs. This resulted in some scheduled sampling and monitoring activities not being completed.

Sampling and Monitoring Results

Water Sampling Results

Detectable levels of tritium were found in several surface water samples taken in July 2020. 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 indicated that the established MDC was met at several sampling locations and can likely be attributed to the routine liquid effluent releases from the Braidwood station.

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

Sediment Sampling Results

Cesium-137 at a concentration equal to the established MDC was detected at one sampling location but was consistent with soil concentrations historically found from atmospheric nuclear weapons testing. 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.

Figure 18. OSL and GDN Monitoring Locations – LaSalle

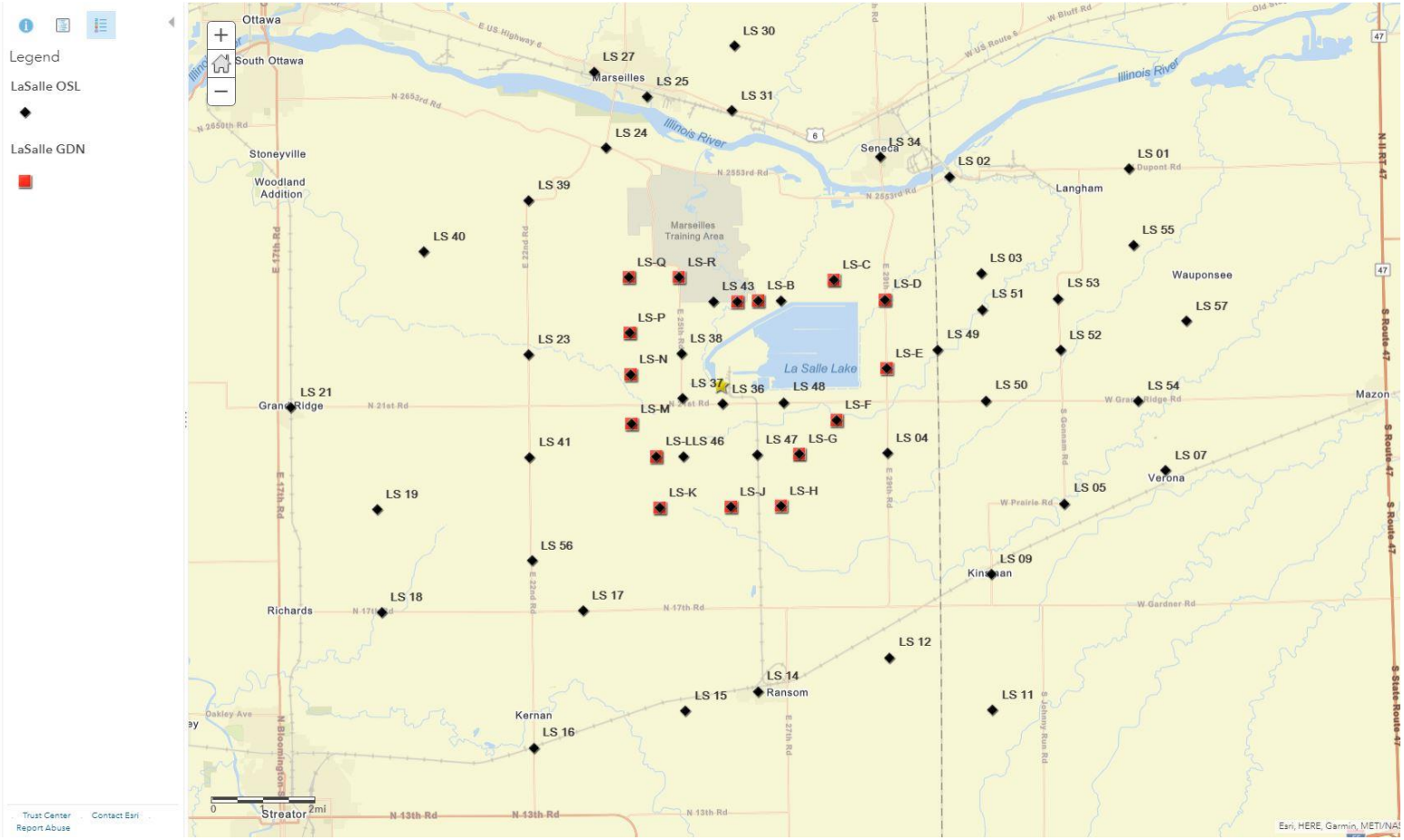


Figure 19. OSL and GDN Monitoring Locations (continued) – LaSalle

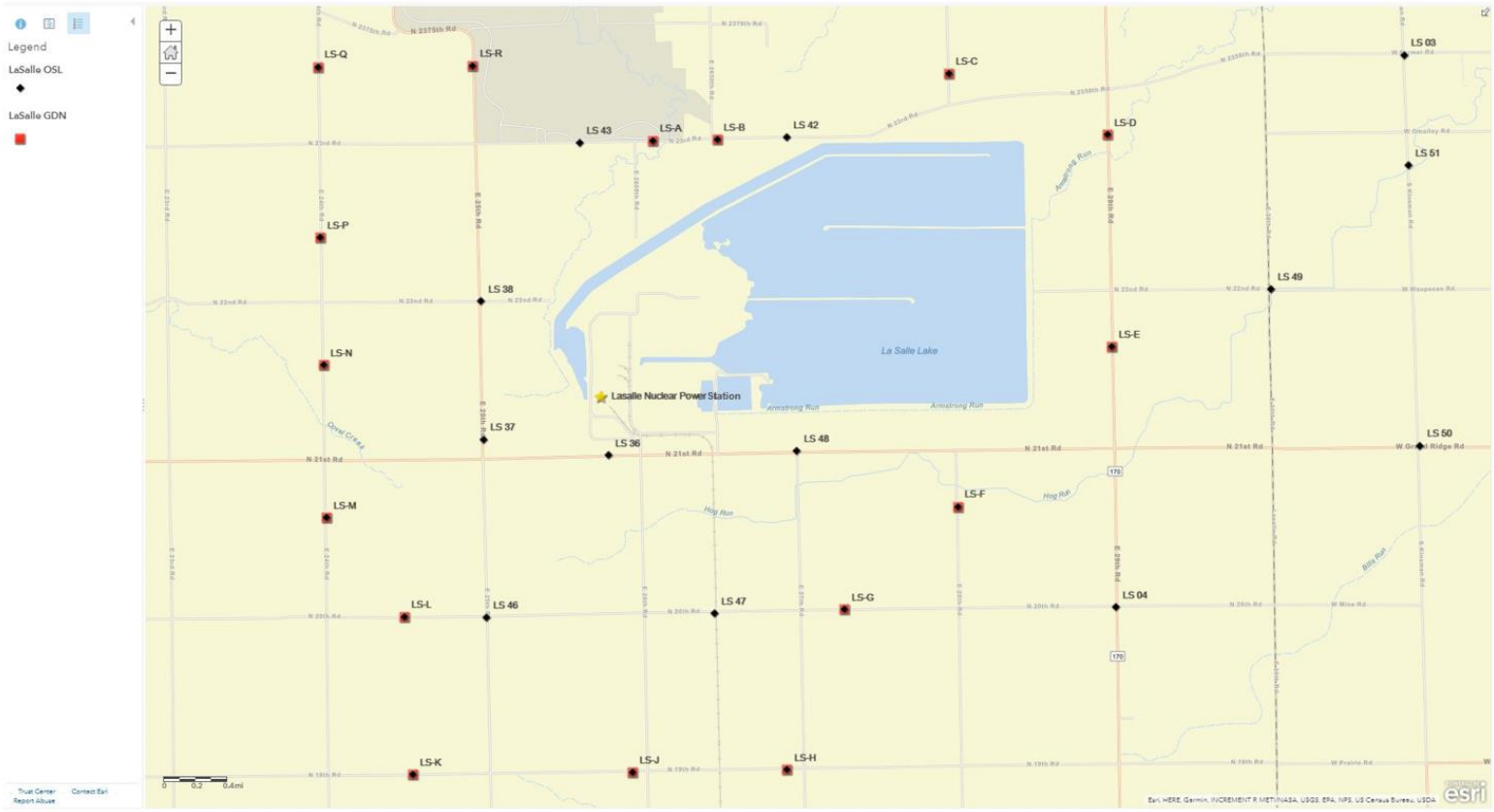
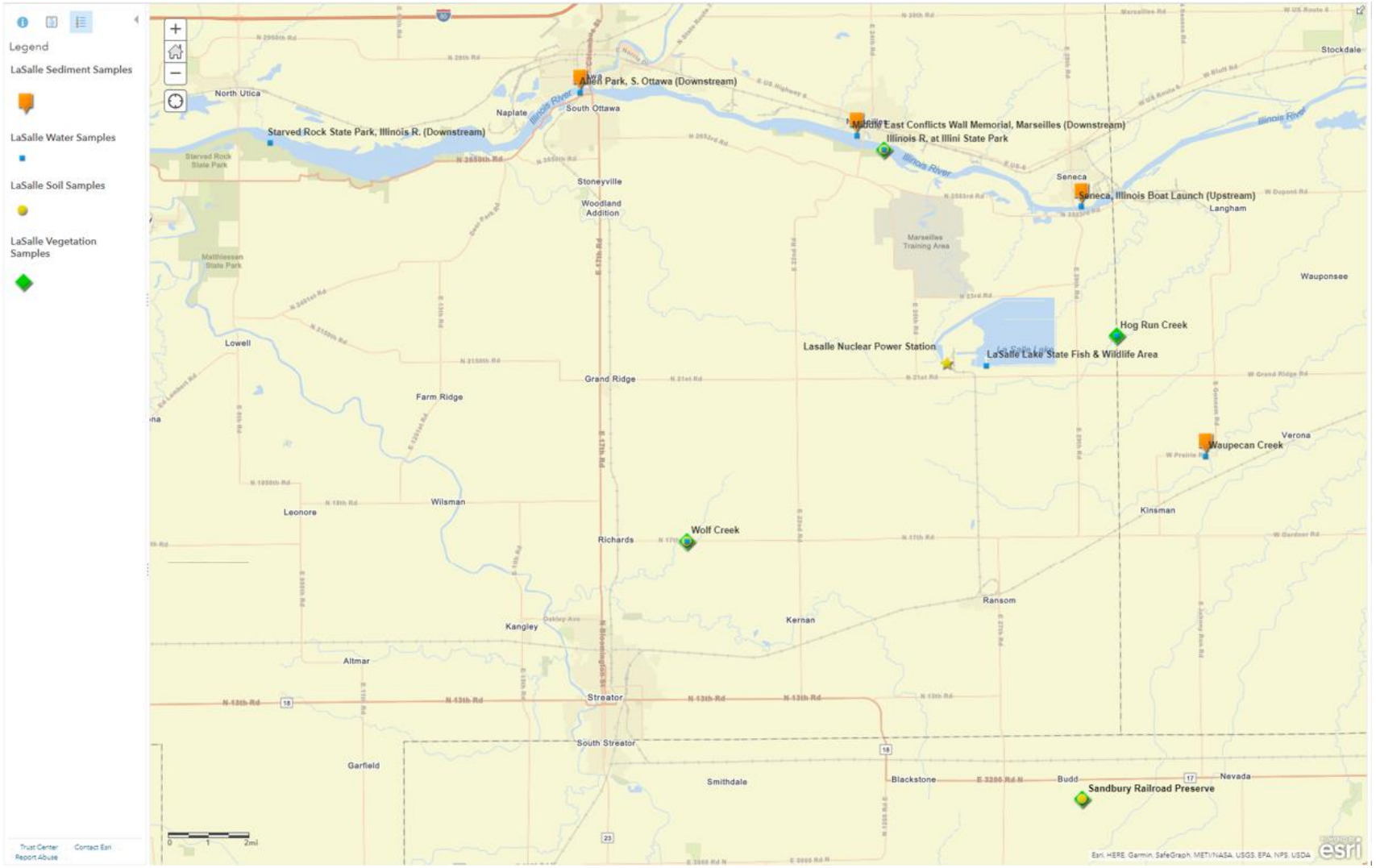


Figure 20. Environmental Sampling Locations - LaSalle



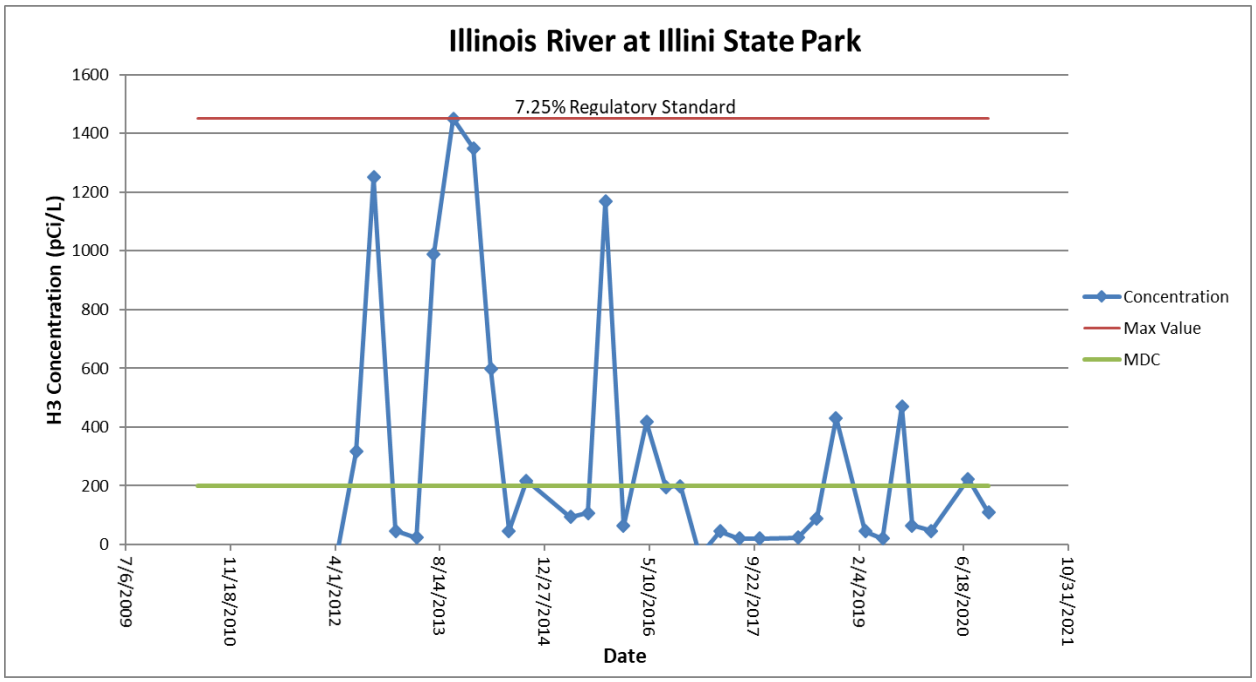
LaSalle Sample Result Tables and Graphs

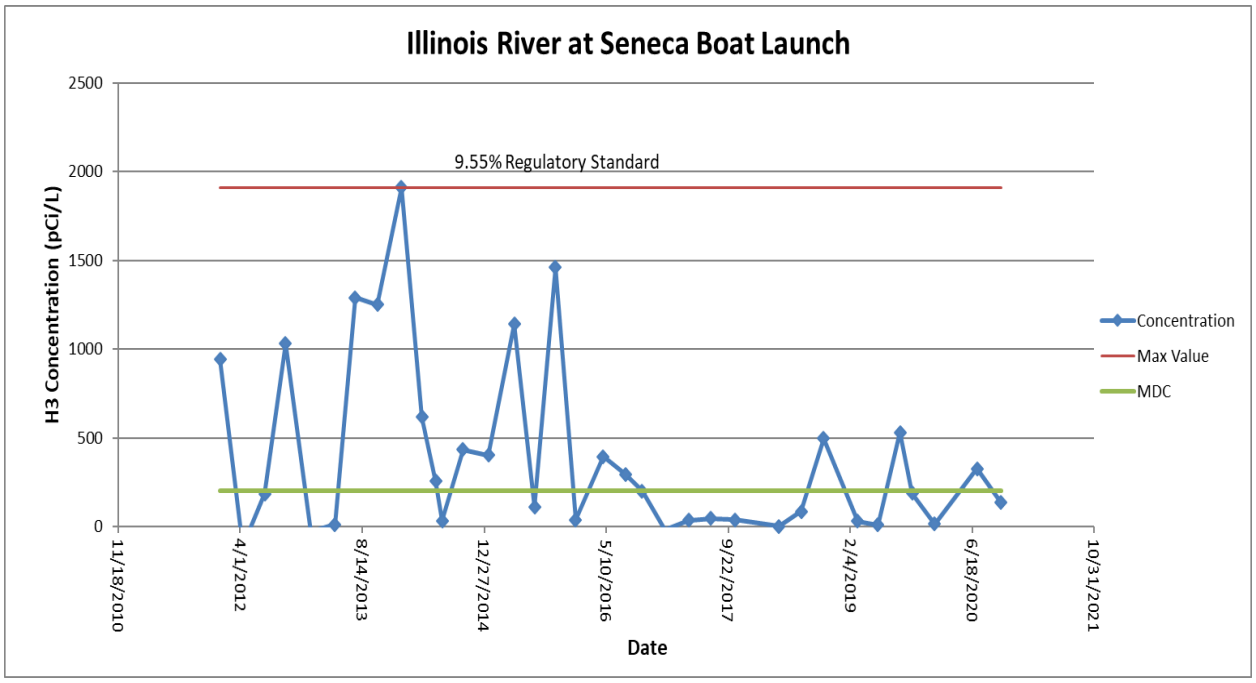
Tritium (H-3) in Water Results - LaSalle

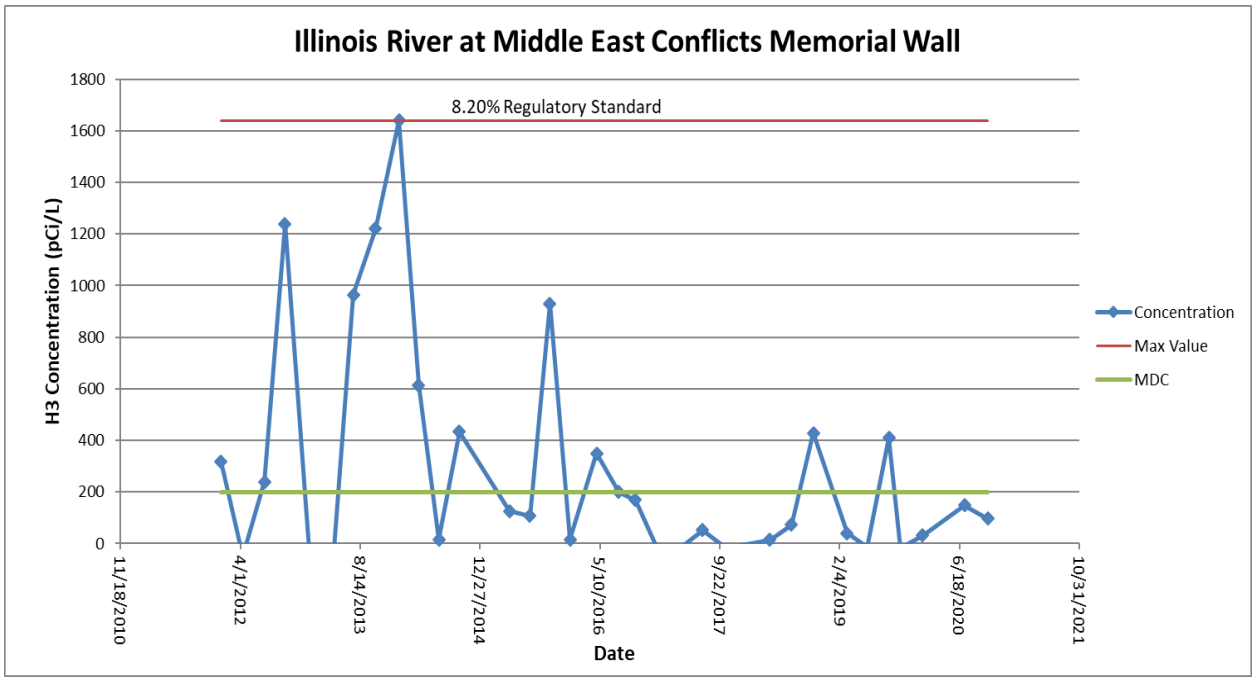
Results are in picocuries per liter (pCi/L)

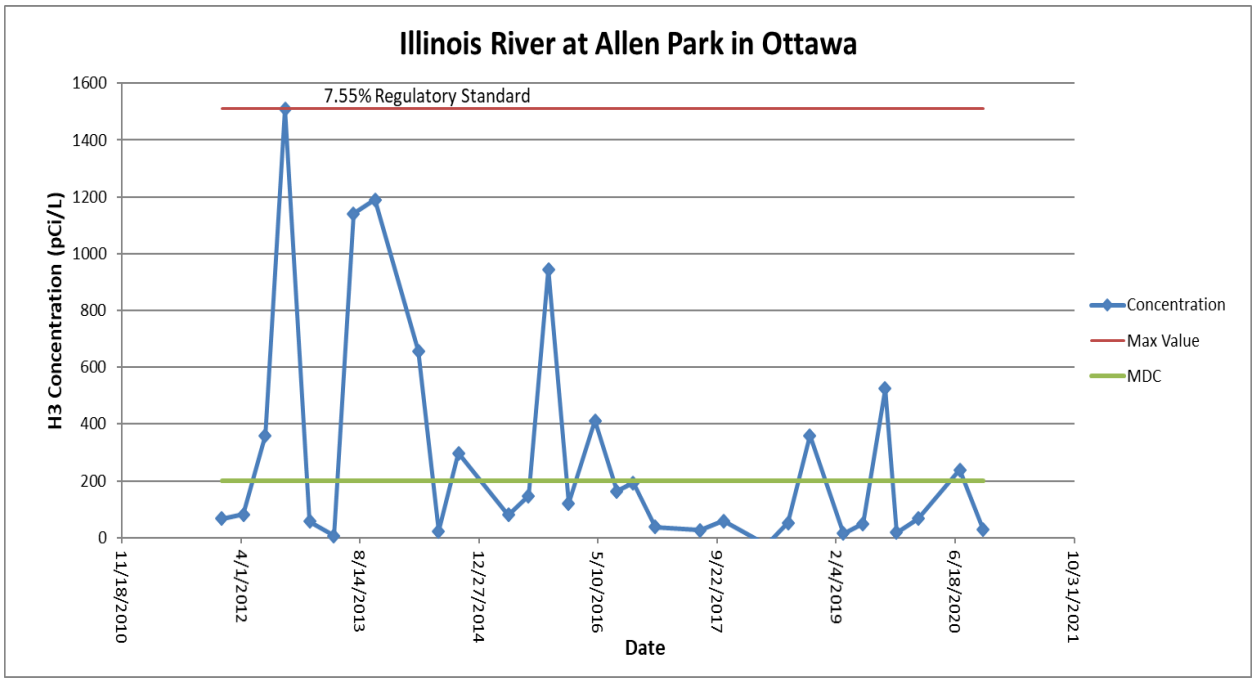
Location	H-3	
Date	Result	MDC
LaSalle Lake State Fish & Wildlife Area		
7/8/2020	<MDC	200
Allen Park, South Ottawa		
1/15/2020	<MDC	200
7/8/2020	239	200
10/14/2020	<MDC	200
Hog Run Creek		
1/15/2020	<MDC	200
7/8/2020	<MDC	200
Illinois R. at Illini State Park		
1/15/2020	<MDC	200
7/8/2020	224	200
10/14/2020	<MDC	200
Middle East Conflicts Wall Memorial, Marseilles		
1/15/2020	<MDC	200
7/8/2020	<MDC	200
10/14/2020	<MDC	200
Seneca, Illinois Boat Launch		
1/15/2020	<MDC	200
7/8/2020	327	200
10/14/2020	<MDC	200
Starved Rock State Park		
1/15/2020	<MDC	200
7/8/2020	<MDC	200
10/14/2020	<MDC	200
Waupecan Creek		
1/15/2020	<MDC	200
7/8/2020	<MDC	200
10/14/2020	<MDC	200
Wolf Creek		
1/15/2020	<MDC	200
7/8/2020	<MDC	200

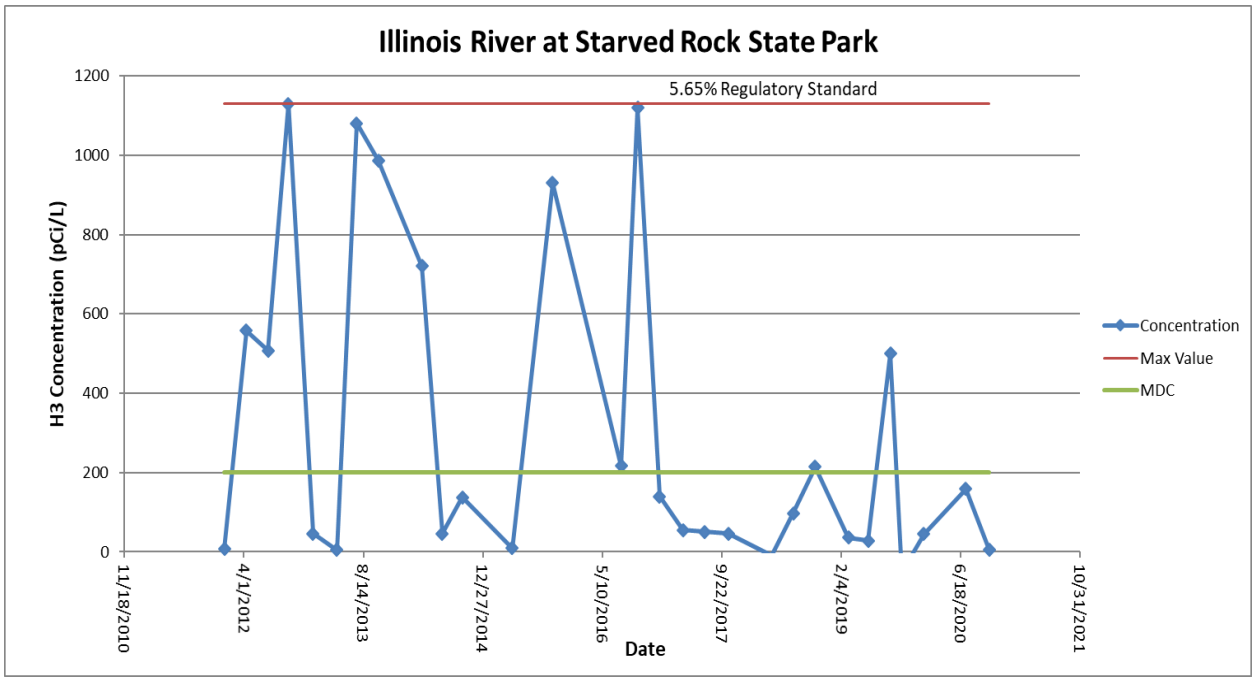
Trending Graphs for Tritium (H-3) in Water - LaSalle
(Max value compared to IEPA and US EPA Class regulatory standard of 20,000 pCi/L)

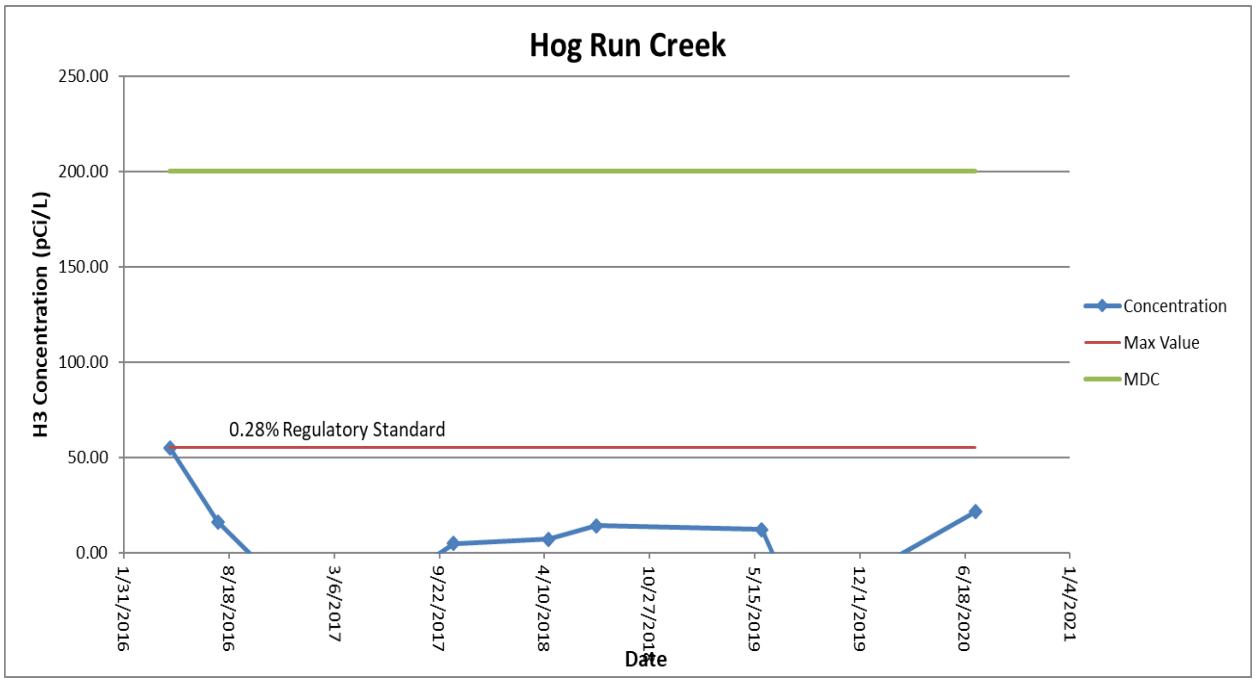


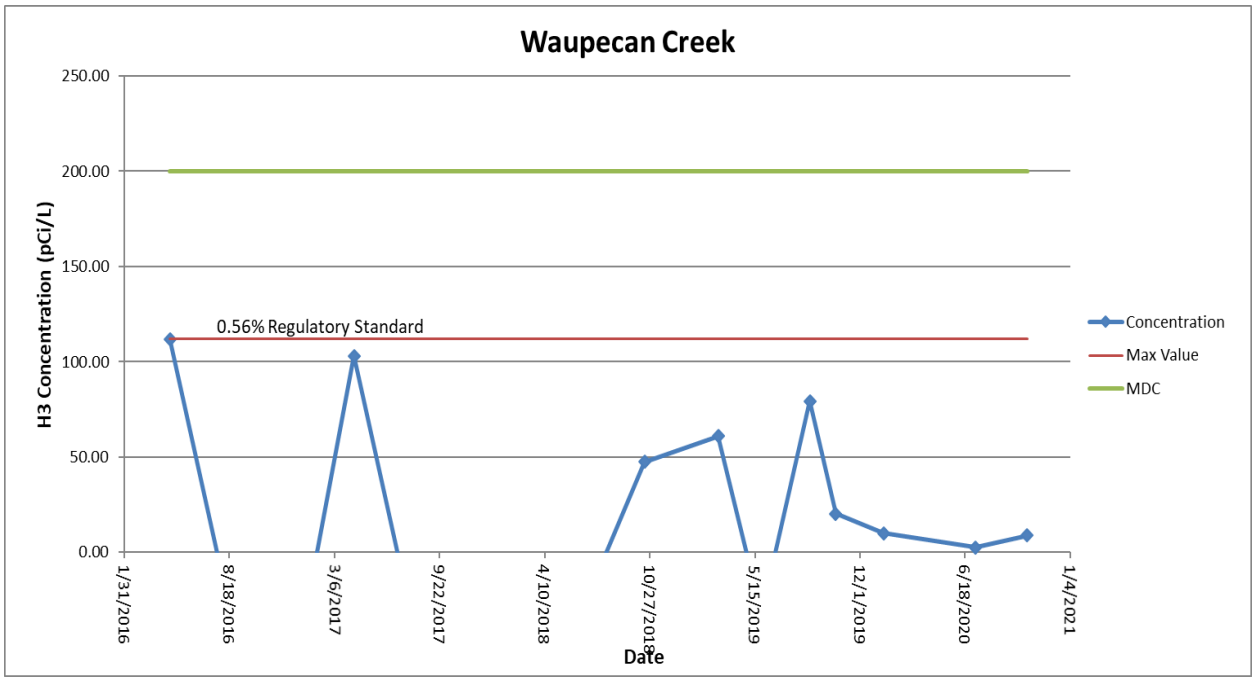


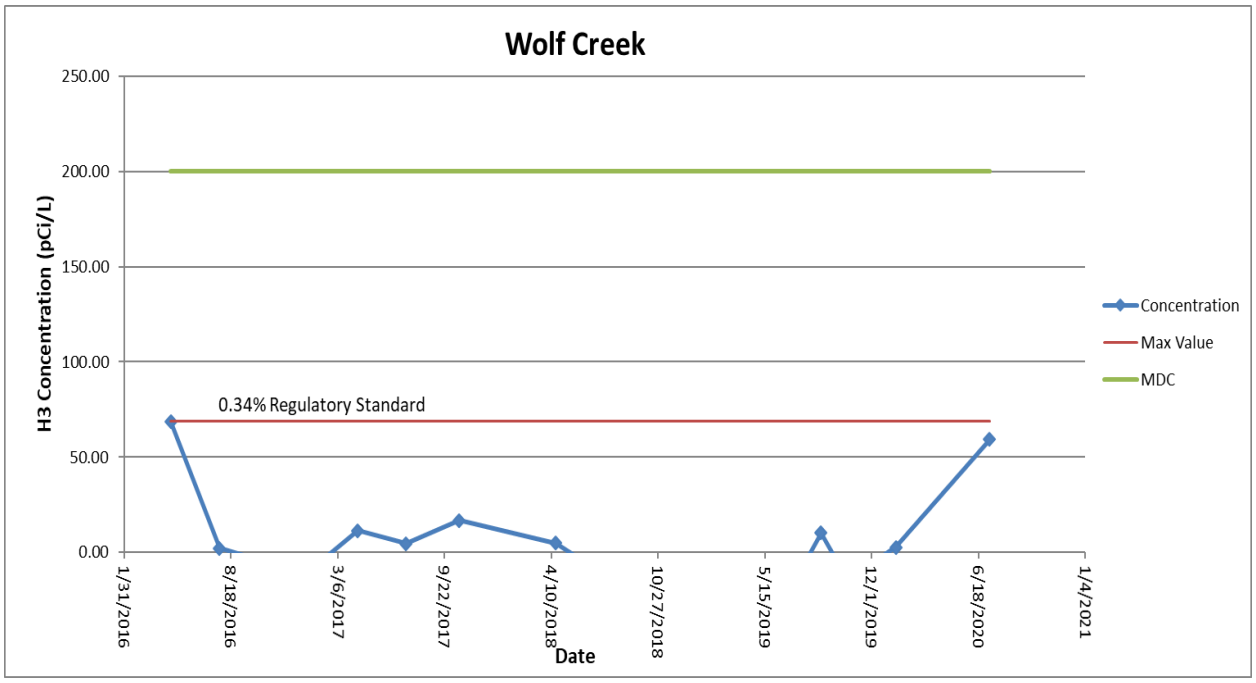

Illinois River at Middle East Conflicts Memorial Wall
8.20% Regulatory Standard
H3 Concentration (pCi/L)
1800
1600
1400
1200
1000
800
600
400
200
0
11/18/2010
4/1/2012
8/14/2013
12/27/2014
5/10/2016
9/22/2017
2/4/2019
6/18/2020
10/31/2021
Date
Concentration
Max Value
MDC


Illinois River at Allen Park in Ottawa
7.55% Regulatory Standard
H3 Concentration (pCi/L)
1600
1400
1200
1000
800
600
400
200
0
11/18/2010
4/1/2012
8/14/2013
12/27/2014
5/10/2016
9/22/2017
2/4/2019
6/18/2020
10/31/2021
Date
Concentration
Max Value
MDC


Illinois River at Starved Rock State Park
5.65% Regulatory Standard
H3 Concentration (pCi/L)
1200
1000
800
600
400
200
0
11/18/2010
4/1/2012
8/14/2013
12/27/2014
5/10/2016
9/22/2017
2/4/2019
6/18/2020
10/31/2021
Date
Concentration
Max Value
MDC


Hog Run Creek
0.28% Regulatory Standard
H3 Concentration (pCi/L)
250.00
200.00
150.00
100.00
50.00
0.00
1/31/2016
8/18/2016
3/6/2017
9/22/2017
4/10/2018
10/27/2018
5/15/2019
12/1/2019
6/18/2020
1/4/2021
Date
Concentration
Max Value
MDC


Waupecan Creek
250.00
200.00
150.00
100.00
50.00
0.00
H3 Concentration (pCi/L)
0.56% Regulatory Standard
1/31/2016
8/18/2016
3/6/2017
9/22/2017
4/10/2018
10/27/2018
5/15/2019
12/1/2019
6/18/2020
1/4/2021
Date
Concentration
Max Value
MDC


Wolf Creek
250.00
200.00
150.00
100.00
50.00
0.00
H3 Concentration (pCi/L)
0.34% Regulatory Standard
1/31/2016
8/18/2016
3/6/2017
9/22/2017
4/10/2018
10/27/2018
5/15/2019
12/1/2019
6/18/2020
1/4/2021
Date
Concentration
Max Value
MDC

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		
7/8/2020	<MDC	0.4

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

Location	Beta	
Date	Result	MDC
LaSalle Lake State Fish & Wildlife Area		
7/8/2020	7.3	3.6
Allen Park, South Ottawa		
1/15/2020	5.0	3.6
7/8/2020	4.7	3.6
10/14/2020	7.4	3.6
Hog Run Creek		
1/15/2020	<MDC	3.6
7/8/2020	4.0	3.6
Illinois R. at Illini State Park		
1/15/2020	5.9	3.6
7/8/2020	4.1	3.6
10/14/2020	8.1	3.6
Middle East Conflicts Wall Memorial, Marseilles		
1/15/2020	5.7	3.6
7/8/2020	4.9	3.6
10/14/2020	7.8	3.6
Seneca, Illinois Boat Launch		
1/15/2020	<MDC	3.6
7/8/2020	3.7	3.6
10/14/2020	8.1	3.6
Starved Rock State Park		
1/15/2020	5.0	3.6
7/8/2020	5.5	3.6
10/14/2020	6.6	3.6
Waupecan Creek		
1/15/2020	<MDC	3.6
7/8/2020	4.1	3.6
10/14/2020	<MDC	3.6
Wolf Creek		
1/15/2020	<MDC	3.6
7/8/2020	<MDC	3.6

Gamma Spectroscopy Results for Other Radionuclides in Water - LaSalle
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
LaSalle Lake State Fish & Wildlife Area																								
7/8/2020	<MDC	18.5	<MDC	350.0	<MDC	3.7	<MDC	4.1	<MDC	4.1	<MDC	3.8	<MDC	7.5	<MDC	6.2	<MDC	3.7	<MDC	4.0	<MDC	8.2	<MDC	7.1
Allen Park, South Ottawa																								
1/15/2020	<MDC	18.5	<MDC	350.0	<MDC	3.7	<MDC	4.1	<MDC	4.1	<MDC	3.8	<MDC	7.5	<MDC	6.2	<MDC	3.7	<MDC	4.0	<MDC	8.2	<MDC	7.1
7/8/2020	<MDC	18.5	<MDC	350.0	<MDC	3.7	<MDC	4.1	<MDC	4.1	<MDC	3.8	<MDC	7.5	<MDC	6.2	<MDC	3.7	<MDC	4.0	<MDC	8.2	<MDC	7.1
10/14/2020	<MDC	18.5	<MDC	350.0	<MDC	3.7	<MDC	4.1	<MDC	4.1	<MDC	3.8	<MDC	7.5	<MDC	6.2	<MDC	3.7	<MDC	4.0	<MDC	8.2	<MDC	7.1
Hog Run Creek																								
1/15/2020	<MDC	18.5	<MDC	350.0	<MDC	3.7	<MDC	4.1	<MDC	4.1	<MDC	3.8	<MDC	7.5	<MDC	6.2	<MDC	3.7	<MDC	4.0	<MDC	8.2	<MDC	7.1
7/8/2020	<MDC	18.5	<MDC	350.0	<MDC	3.7	<MDC	4.1	<MDC	4.1	<MDC	3.8	<MDC	7.5	<MDC	6.2	<MDC	3.7	<MDC	4.0	<MDC	8.2	<MDC	7.1
Illinois R. at Illini State Park																								
1/15/2020	<MDC	18.5	<MDC	350.0	<MDC	3.7	<MDC	4.1	<MDC	4.1	<MDC	3.8	<MDC	7.5	<MDC	6.2	<MDC	3.7	<MDC	4.0	<MDC	8.2	<MDC	7.1
7/8/2020	<MDC	18.5	<MDC	350.0	<MDC	3.7	<MDC	4.1	<MDC	4.1	<MDC	3.8	<MDC	7.5	<MDC	6.2	<MDC	3.7	<MDC	4.0	<MDC	8.2	<MDC	7.1
10/14/2020	<MDC	18.5	<MDC	350.0	<MDC	3.7	<MDC	4.1	<MDC	4.1	<MDC	3.8	<MDC	7.5	<MDC	6.2	<MDC	3.7	<MDC	4.0	<MDC	8.2	<MDC	7.1
Middle East Conflicts Wall Memorial, Marseilles																								
1/15/2020	<MDC	18.5	<MDC	350.0	<MDC	3.7	<MDC	4.1	<MDC	4.1	<MDC	3.8	<MDC	7.5	<MDC	6.2	<MDC	3.7	<MDC	4.0	<MDC	8.2	<MDC	7.1
7/8/2020	<MDC	18.5	<MDC	350.0	<MDC	3.7	<MDC	4.1	<MDC	4.1	<MDC	3.8	<MDC	7.5	<MDC	6.2	<MDC	3.7	<MDC	4.0	<MDC	8.2	<MDC	7.1
10/14/2020	<MDC	18.5	<MDC	350.0	<MDC	3.7	<MDC	4.1	<MDC	4.1	<MDC	3.8	<MDC	7.5	<MDC	6.2	<MDC	3.7	<MDC	4.0	<MDC	8.2	<MDC	7.1
Seneca, Illinois Boat Launch																								
1/15/2020	<MDC	18.5	<MDC	350.0	<MDC	3.7	<MDC	4.1	<MDC	4.1	<MDC	3.8	<MDC	7.5	<MDC	6.2	<MDC	3.7	<MDC	4.0	<MDC	8.2	<MDC	7.1
7/8/2020	<MDC	18.5	<MDC	350.0	<MDC	3.7	<MDC	4.1	<MDC	4.1	<MDC	3.8	<MDC	7.5	<MDC	6.2	<MDC	3.7	<MDC	4.0	<MDC	8.2	<MDC	7.1
10/14/2020	<MDC	18.5	<MDC	350.0	<MDC	3.7	<MDC	4.1	<MDC	4.1	<MDC	3.8	<MDC	7.5	<MDC	6.2	<MDC	3.7	<MDC	4.0	<MDC	8.2	<MDC	7.1

Gamma Spectroscopy Results for Other Radionuclides in Water - LaSalle (Continued)
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
Starved Rock State Park																								
1/15/2020	<MDC	18.5	<MDC	350.0	<MDC	3.7	<MDC	4.1	<MDC	4.1	<MDC	3.8	<MDC	7.5	<MDC	6.2	<MDC	3.7	<MDC	4.0	<MDC	8.2	<MDC	7.1
7/8/2020	<MDC	18.5	<MDC	350.0	<MDC	3.7	<MDC	4.1	<MDC	4.1	<MDC	3.8	<MDC	7.5	<MDC	6.2	<MDC	3.7	<MDC	4.0	<MDC	8.2	<MDC	7.1
10/14/2020	<MDC	18.5	<MDC	350.0	<MDC	3.7	<MDC	4.1	<MDC	4.1	<MDC	3.8	<MDC	7.5	<MDC	6.2	<MDC	3.7	<MDC	4.0	<MDC	8.2	<MDC	7.1
Waupecan Creek																								
1/15/2020	<MDC	18.5	<MDC	350.0	<MDC	3.7	<MDC	4.1	<MDC	4.1	<MDC	3.8	<MDC	7.5	<MDC	6.2	<MDC	3.7	<MDC	4.0	<MDC	8.2	<MDC	7.1
7/8/2020	<MDC	18.5	<MDC	350.0	<MDC	3.7	<MDC	4.1	<MDC	4.1	<MDC	3.8	<MDC	7.5	<MDC	6.2	<MDC	3.7	<MDC	4.0	<MDC	8.2	<MDC	7.1
10/14/2020	<MDC	18.5	<MDC	350.0	<MDC	3.7	<MDC	4.1	<MDC	4.1	<MDC	3.8	<MDC	7.5	<MDC	6.2	<MDC	3.7	<MDC	4.0	<MDC	8.2	<MDC	7.1
Wolf Creek																								
1/15/2020	<MDC	18.5	<MDC	350.0	<MDC	3.7	<MDC	4.1	<MDC	4.1	<MDC	3.8	<MDC	7.5	<MDC	6.2	<MDC	3.7	<MDC	4.0	<MDC	8.2	<MDC	7.1
7/8/2020	<MDC	18.5	<MDC	350.0	<MDC	3.7	<MDC	4.1	<MDC	4.1	<MDC	3.8	<MDC	7.5	<MDC	6.2	<MDC	3.7	<MDC	4.0	<MDC	8.2	<MDC	7.1

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	Result	MDC
Illini State Park																						
7/8/2020	<MDC	640000	<MDC	0.39	<MDC	0.45	<MDC	0.04	<MDC	0.03	0.08	0.04	<MDC	5.30	<MDC	0.05	<MDC	11.00	<MDC	0.15	<MDC	1.03
Sanbury Railroad Preserve																						
7/8/2020	<MDC	640000	<MDC	0.39	<MDC	0.45	<MDC	0.04	<MDC	0.03	0.23	0.04	<MDC	5.30	<MDC	0.05	<MDC	11.00	<MDC	0.15	<MDC	1.03
Wolf Creek																						
7/8/2020	<MDC	640000	<MDC	0.39	<MDC	0.45	<MDC	0.04	<MDC	0.03	0.10	0.04	<MDC	5.30	<MDC	0.05	<MDC	11.00	<MDC	0.15	<MDC	1.03

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	Result	MDC
Illini State Park																						
7/8/2020	<MDC	590000	<MDC	0.35	<MDC	0.40	<MDC	0.03	<MDC	0.03	0.06	0.04	<MDC	4.60	<MDC	0.05	<MDC	8.90	<MDC	0.13	<MDC	0.99
Sanbury Railroad Preserve																						
7/8/2020	<MDC	590000	<MDC	0.35	<MDC	0.40	<MDC	0.03	<MDC	0.03	0.22	0.04	<MDC	4.60	<MDC	0.05	<MDC	8.90	<MDC	0.13	<MDC	0.99
Wolf Creek																						
7/8/2020	<MDC	590000	<MDC	0.35	<MDC	0.40	<MDC	0.03	<MDC	0.03	0.12	0.04	<MDC	4.60	<MDC	0.05	<MDC	8.90	<MDC	0.13	<MDC	0.99

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																						
7/8/2020	<MDC	800000	<MDC	0.34	<MDC	0.43	<MDC	0.03	<MDC	0.03	<MDC	0.04	<MDC	5.50	<MDC	0.06	<MDC	11.00	<MDC	0.15	<MDC	1.22
Middle East Conflicts Wall Memorial, Marseilles																						
7/8/2020	<MDC	800000	<MDC	0.34	<MDC	0.43	<MDC	0.03	<MDC	0.03	<MDC	0.04	<MDC	5.50	<MDC	0.06	<MDC	11.00	<MDC	0.15	<MDC	1.22
Seneca, Illinois Boat Launch																						
7/8/2020	<MDC	800000	<MDC	0.34	<MDC	0.43	<MDC	0.03	<MDC	0.03	<MDC	0.04	<MDC	5.50	<MDC	0.06	<MDC	11.00	<MDC	0.15	<MDC	1.22
Waupecan Creek																						
7/8/2020	<MDC	800000	<MDC	0.34	<MDC	0.43	<MDC	0.03	<MDC	0.03	0.04	0.04	<MDC	5.50	<MDC	0.06	<MDC	11.00	<MDC	0.15	<MDC	1.22

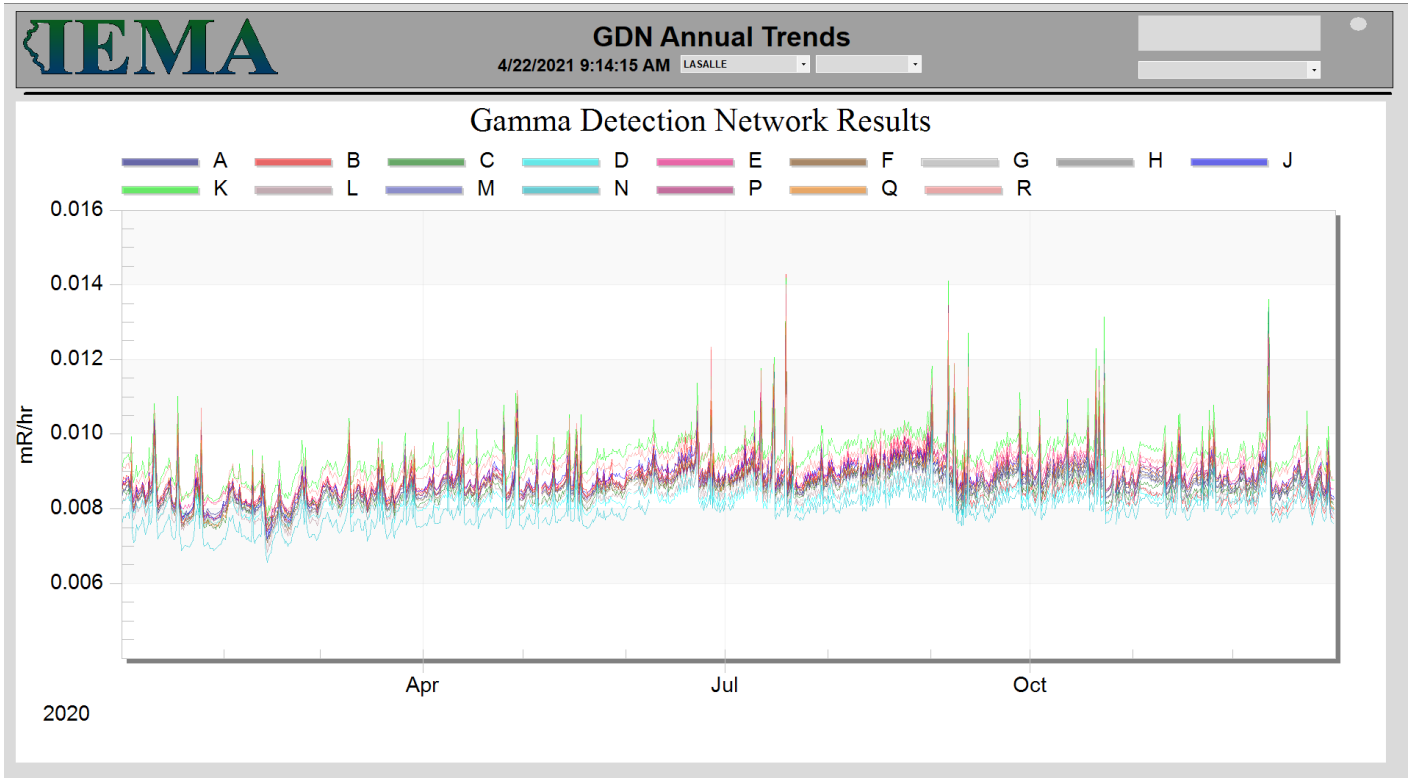
Gamma Spectroscopy Results for Radionuclides in Vegetation - LaSalle
Results are in picocuries per gram (pCi/g)

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
Illini State Park																								
7/8/2020	<MDC	79000	<MDC	0.26	<MDC	0.45	<MDC	0.05	<MDC	0.05	<MDC	0.05	<MDC	4.30	<MDC	4E+07	<MDC	0.07	<MDC	5.00	<MDC	0.24	<MDC	1.08
Sanbury Railroad Preserve																								
7/8/2020	<MDC	79000	<MDC	0.26	<MDC	0.45	<MDC	0.05	<MDC	0.05	<MDC	0.05	<MDC	4.30	<MDC	4E+07	<MDC	0.07	<MDC	5.00	<MDC	0.24	<MDC	1.08
Wolf Creek																								
7/8/2020	<MDC	79000	<MDC	0.26	<MDC	0.45	<MDC	0.05	<MDC	0.05	<MDC	0.05	<MDC	4.30	<MDC	4E+07	<MDC	0.07	<MDC	5.00	<MDC	0.24	<MDC	1.08

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																								
10/21/2020	<MDC	348.0	<MDC	266.0	<MDC	66.0	<MDC	78.0	<MDC	61.4	<MDC	70.0	<MDC	136.0	<MDC	100.0	<MDC	70.0	<MDC	70.0	<MDC	168.0	<MDC	118.0

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



Summary of Ambient Gamma Results - LaSalle

Location	Quarter 1 mR/quarter	Quarter 2 mR/quarter	Quarter 3 mR/quarter	Quarter 4 mR/quarter	Annual Exposure mR/year
LS001	13.0	10.5	8.4	9.5	41.4
LS002	8.0	10.9	13.5	9.3	41.7
LS003	12.1	8.7	10.9	10.3	42.0
LS004		11.9	11.7	9.2	43.7
LS005	6.9	7.7	9.1	8.9	32.7
LS007	9.2	8.0	8.7	10.8	36.8
LS009	10.2	7.2	9.5	8.0	34.9
LS011	10.3	9.9	13.2	12.7	46.1
LS012	7.1	8.8	8.3	8.4	32.6
LS014	8.2	9.3	10.0		36.7
LS015	11.8	7.6	11.0	10.2	40.6
LS016	7.6	6.9	9.7	9.9	34.1
LS017	8.6	10.5	8.4	12.5	40.0
LS018	11.0	7.8	10.5	11.0	40.3
LS019	7.2	10.4	14.7	13.0	45.3
LS021	7.8	9.9	10.8	8.9	37.5
LS023	11.2	10.6	14.5	11.4	47.7
LS024	11.0	9.1	12.6	11.9	44.6
LS025	6.5	12.8	10.2	10.5	40.0
LS027	10.1	7.6	11.6	7.5	36.8
LS030	10.0	11.0	9.9	10.4	41.4
LS031	5.8	8.1		9.5	31.3
LS034		6.8	6.2	9.1	29.6
LS036	9.4		12.7		44.2
LS037	10.6	11.3	14.8	12.6	49.3
LS038	6.4	8.5	10.1		33.3
LS039	6.6	7.7	9.0	8.6	31.9
LS040	9.8	9.0	8.3	9.2	36.3
LS041	8.8	11.3	10.9	8.8	39.7
LS042	8.6	8.9	12.1	11.3	40.9

Location	Quarter 1/2 mR/quarter	Quarter 3 mR/quarter	Quarter 4 mR/quarter	Annual Exposure mR/year
LS001	10.0	10.8	8.5	39.2
LS002	10.0	11.6	8.7	40.3
LS003	8.2	12.3	9.3	38.1

LS004	9.4	11.9		40.8
LS005	7.3	8.7	7.1	30.4
LS007	10.3	10.9	8.2	39.7
LS009	7.1	7.2	6.7	28.1
LS011	8.0		9.5	34.1
LS012	9.1	9.3		36.7
LS014	7.2	11.0	6.1	31.5
LS015	10.6	12.2	7.5	40.9
LS016	6.4	7.6		27.3
LS017	10.1	14.0	9.9	44.1
LS018	10.5	12.4	9.1	42.5
LS019	9.6	10.7		39.9
LS021	6.7	8.7		29.5
LS023	8.8	9.9	7.8	35.3
LS024	10.0	10.4	8.4	38.7
LS025	8.6	13.7	7.0	37.9
LS027	7.1	6.9	6.4	27.6
LS030	9.2	10.6	7.8	36.9
LS031	7.8	9.8	6.6	32.0
LS034	6.5	7.3	4.2	24.6
LS036	10.2	11.3		42.2
LS037		12.1	8.6	41.3
LS038	9.4	13.0	10.0	41.8
LS039	7.4		6.9	29.0
LS040	7.9	10.2	7.4	33.3
LS041	8.3	11.6	7.5	35.8
LS042	9.0	11.3	11.0	40.2

Summary of Ambient Gamma Results – LaSalle (Continued)

Location	Quarter 1/2 mR/quarter	Quarter 3 mR/quarter	Quarter 4 mR/quarter	Annual Exposure mR/year
LS043	9.7	12.9	8.6	40.8
LS046	10.6	11.1	6.7	39.0
LS047	9.2	11.1	8.7	38.2

LS048	10.0	9.3	8.9	38.3
LS049	8.4	10.7	10.2	37.6
LS050	7.3	13.4		37.2
LS051	7.9	12.4	9.1	37.4
LS052	8.1	10.3	5.2	31.6
LS053	9.2	8.2	8.5	35.0
LS054	7.7	9.4	5.3	30.0
LS055			10.9	43.5
LS056	10.0	9.1	6.7	35.6
LS057	10.3	10.8	9.5	41.0
LS-RSA	8.8	10.2	8.7	36.5
LS-RSB	9.4	10.7	6.9	36.4
LS-RSC	8.5	11.9	8.9	37.9
LS-RSD	7.5	8.3	7.6	30.9
LS-RSE	7.8	7.7	6.1	29.3
LS-RSF	9.3	10.3	8.3	37.1
LS-RSG	7.7	10.8	6.3	32.5
LS-RSH	8.5	10.0	8.1	35.0
LS-RSJ	9.4	10.7	6.5	35.9
LS-RSK	11.0	13.3	8.8	44.1
LS-RSL	9.4	9.9	8.1	36.9
LS-RSM		13.5	14.4	55.8
LS-RSN	6.8	11.2	8.8	33.7
LS-RSP	10.0	11.2	7.7	39.0
LS-RSQ	8.7	9.9	4.2	31.6
LS-RSR	9.8	8.2	9.1	37.0

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. NPS OSLs were not collected in the 2nd quarter due to the COVID-19 emergency; therefore, results from quarters 1 and 2 are a combined average.

Quad Cities Nuclear Power Station

The Quad Cities NPS, consisting of two 2,957 Megawatt BWRs, is owned and operated by the Exelon Corporation 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 National Pollutant Discharge Elimination System permit. There were some minor releases from the Quad Cities station in 2020, including batch releases in the 1st quarter of the year.

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 2020

Due to COVID-19 employee safety mandates in place during a portion of 2020, IEMA's Division of Nuclear Safety's Radiological Field Services Unit (RFS) staff was temporarily unavailable to perform the duties associated with the radiological environmental monitoring programs. This resulted in some scheduled sampling and monitoring activities not being completed.

Sampling and Monitoring Results

Water Sampling Results

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

Results from gross beta analysis indicated that the established MDC was met at some surface water sampling locations. These concentrations are consistent with results found in background samples collected.

Results from total strontium analysis of the third quarter sample collected from the Mississippi River at Rapids City were slightly above the established MDC. Although detectable, the concentration seen was well below the US EPA drinking water standard which sets the limit for strontium-90 at 8 pCi/L.

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

Sediment Sampling Results

Cesium-137 at a concentration equal to the established MDC was detected but was consistent with soil concentrations historically found from atmospheric nuclear weapons testing. 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.

Maps of Monitoring and Sampling Locations – Quad Cities

Figure 21. OSL and GDN Monitoring Locations - Quad Cities

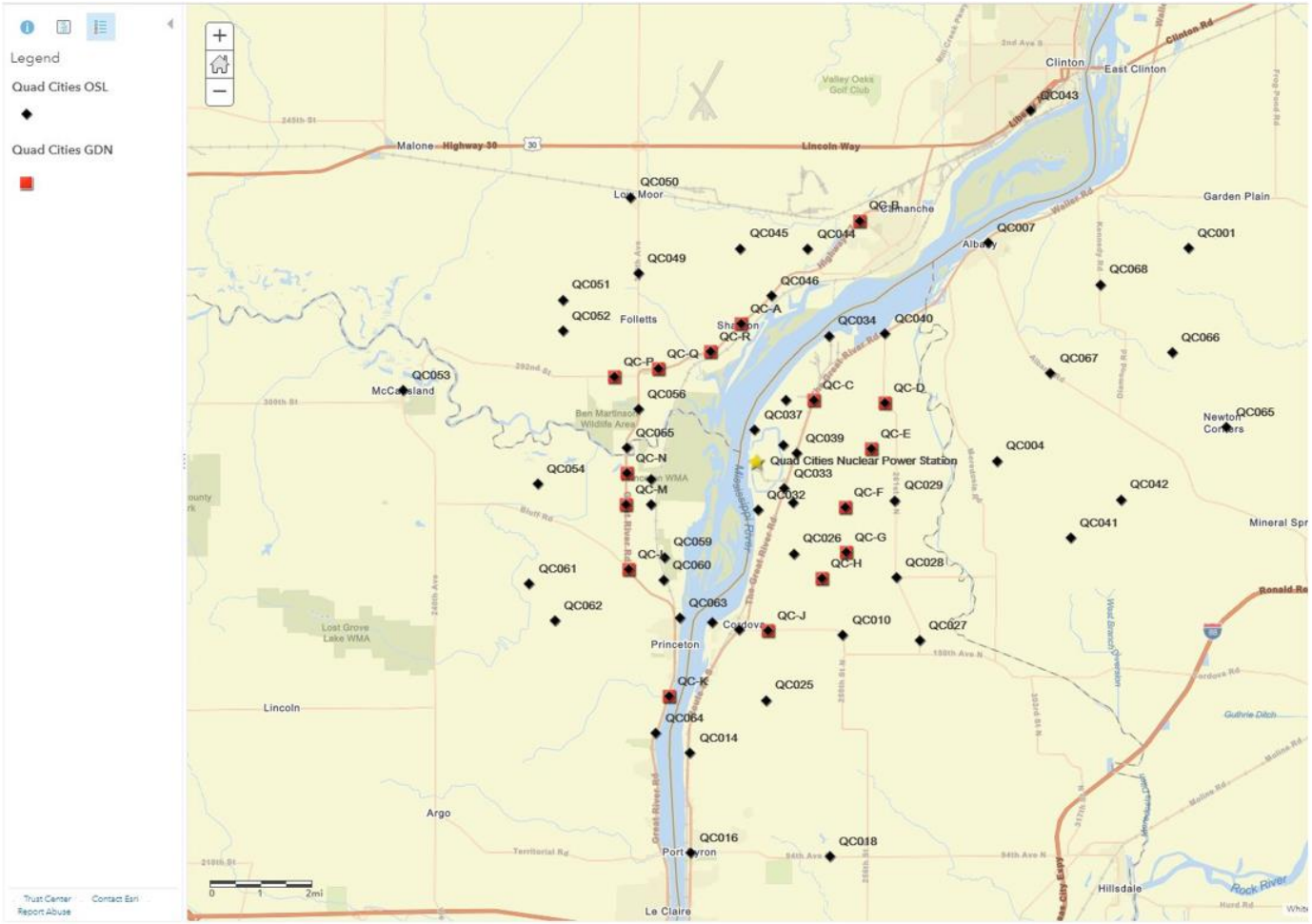


Figure 22. OSL and GDN Monitoring Locations (continued) - Quad Cities

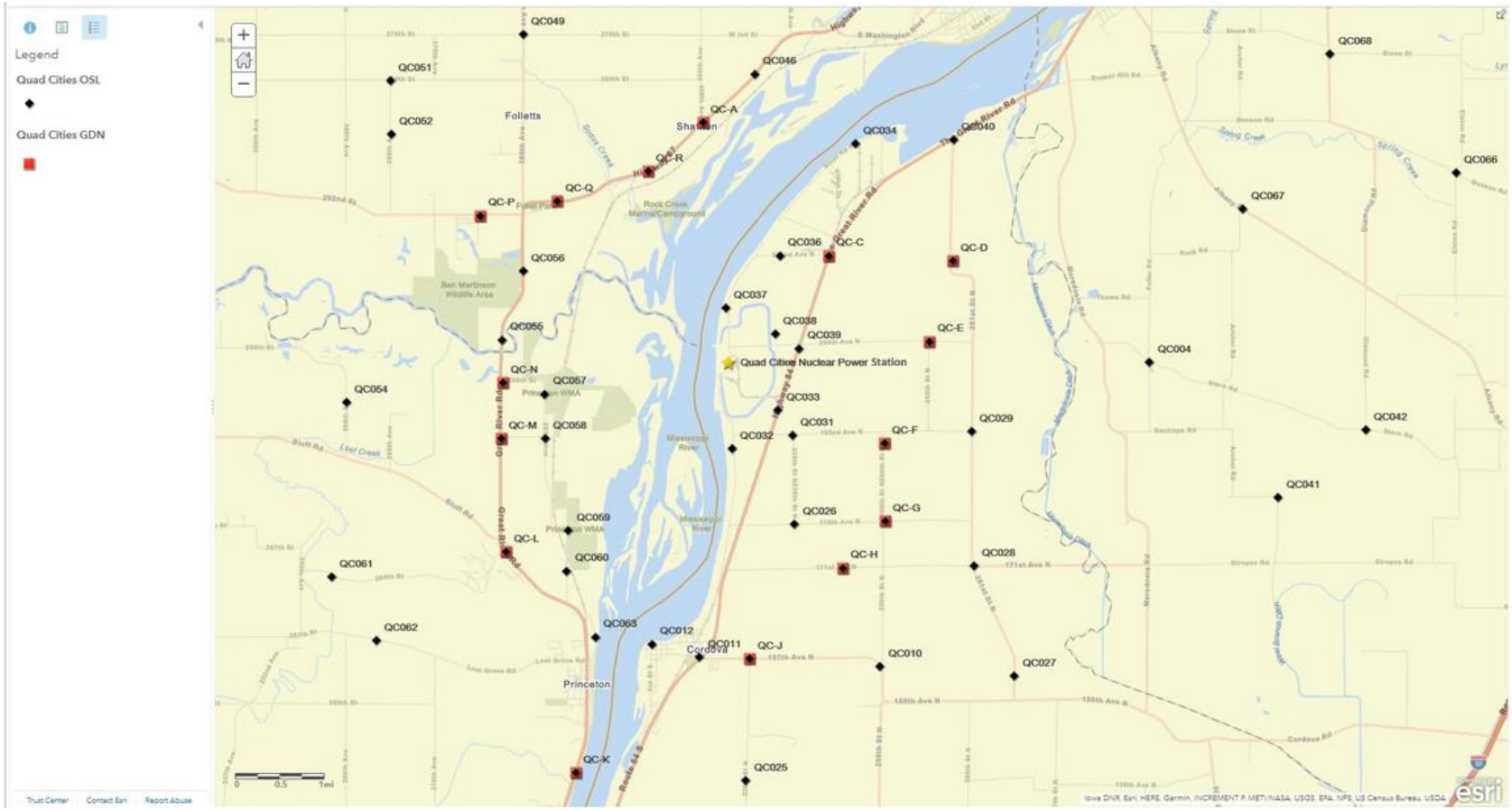
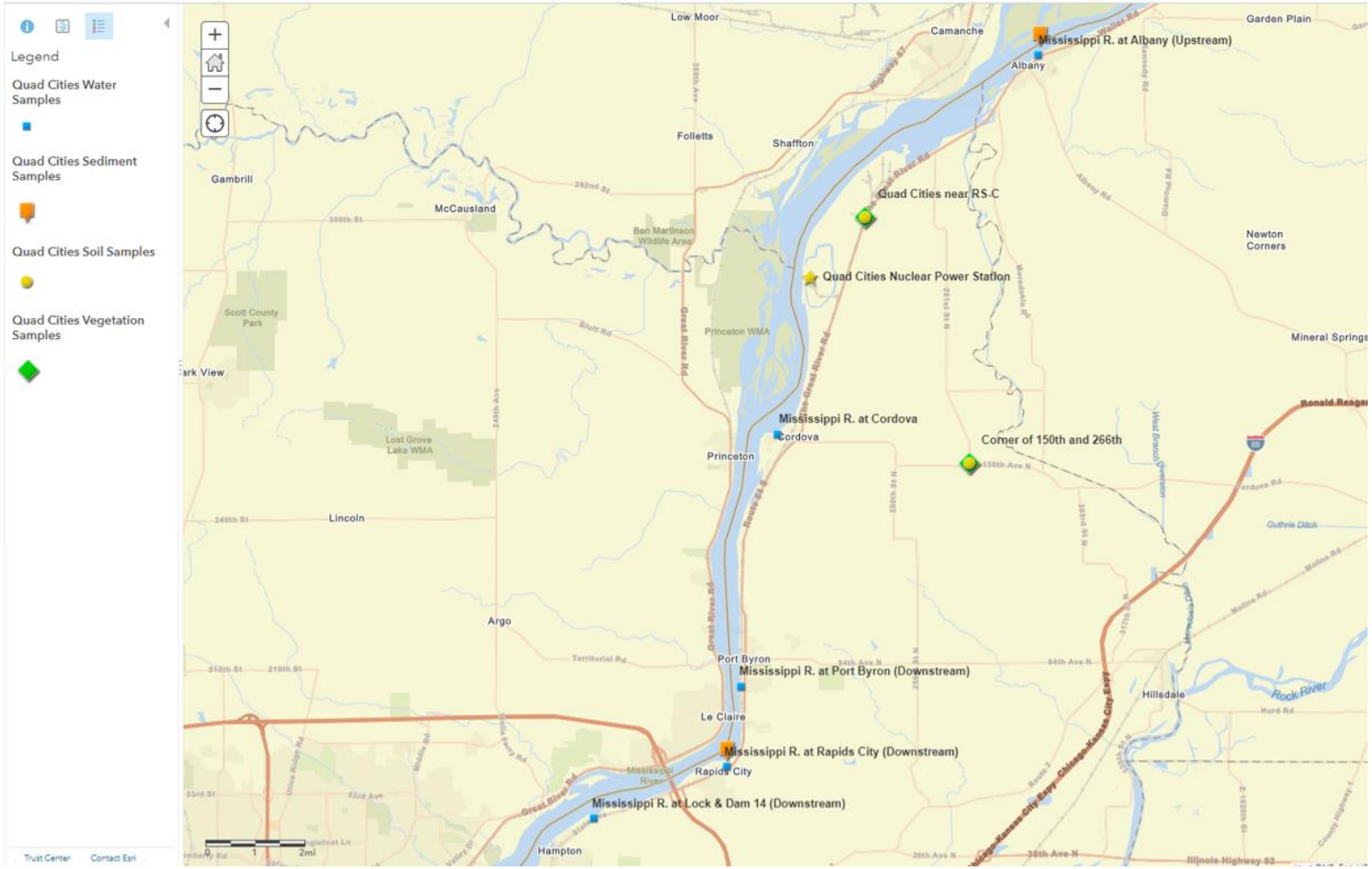


Figure 23. Environmental Sampling Locations – Quad Cities

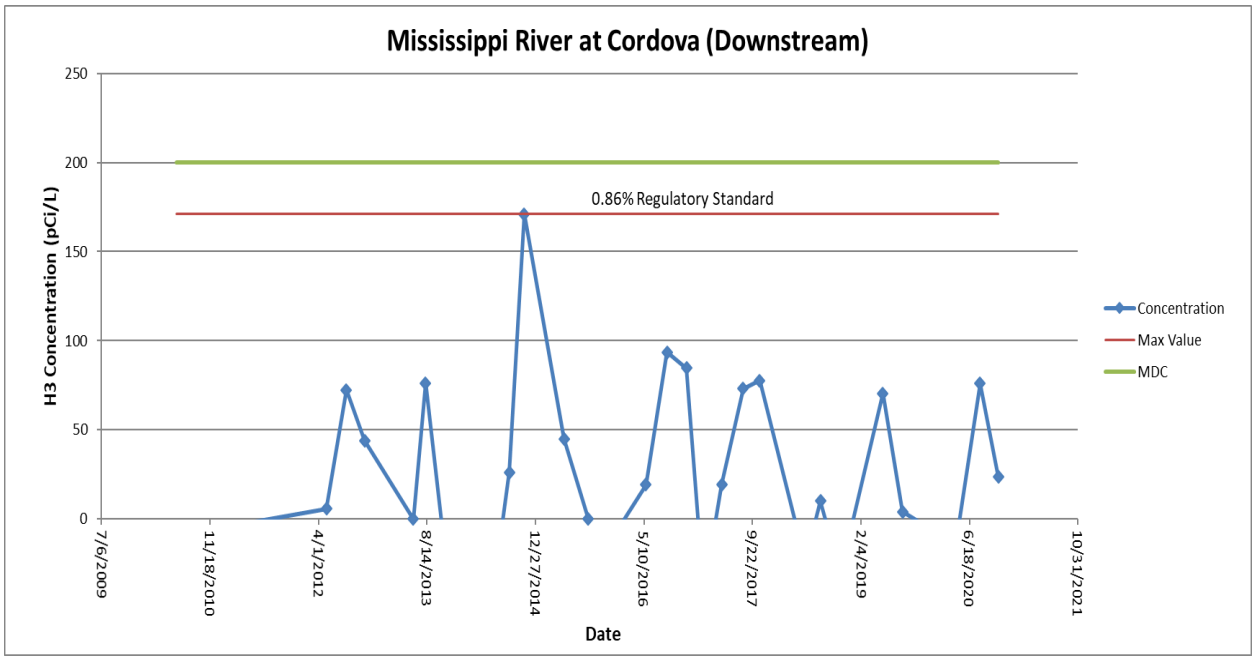


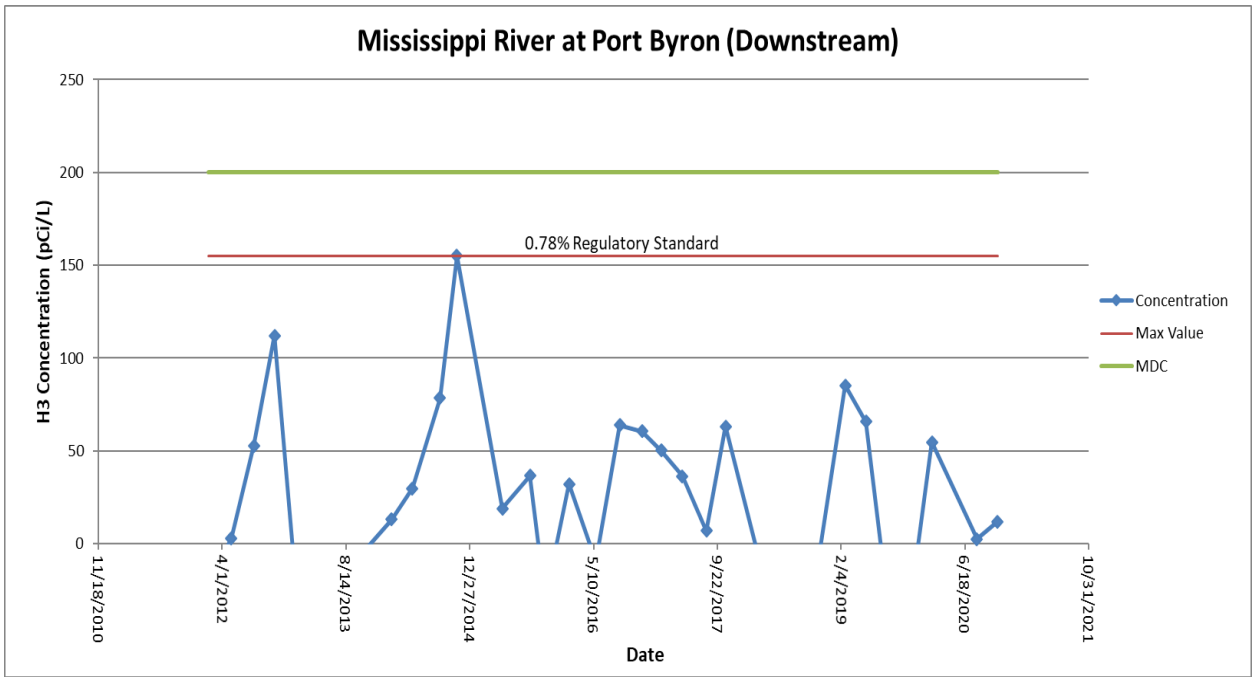
Quad Cities Sample Results

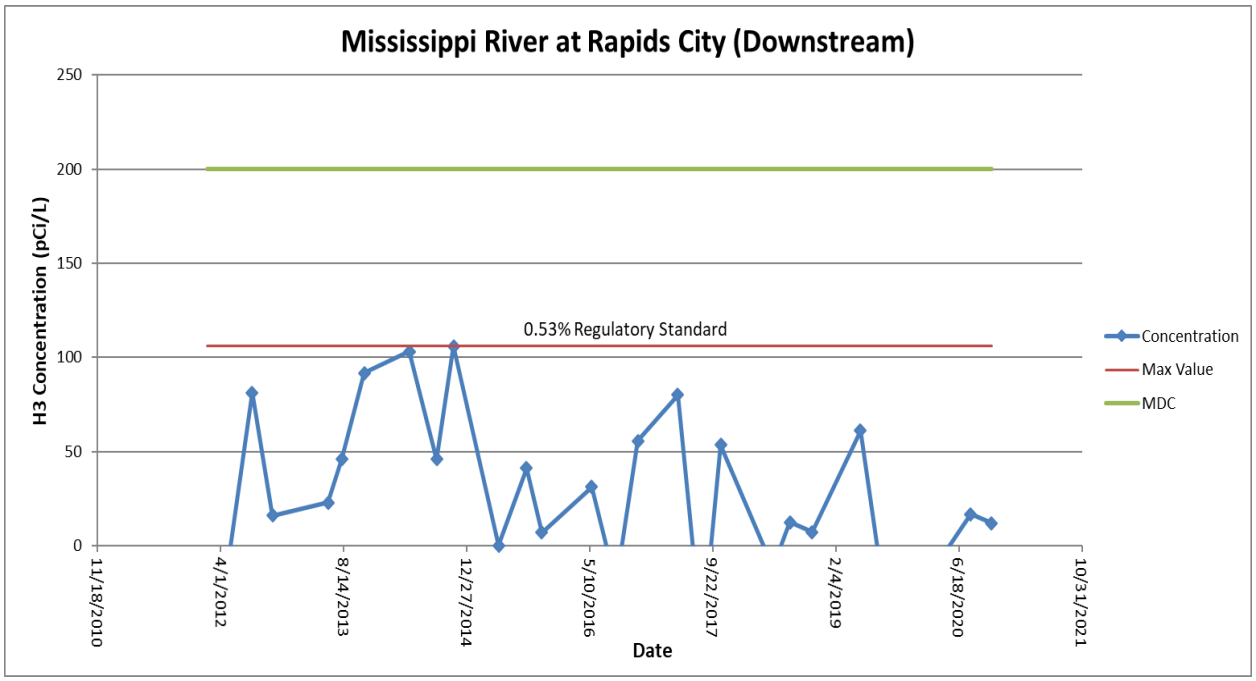
Tritium (H-3) in Water Sample Results - Quad Cities
Results are in picocuries per liter (pCi/L)

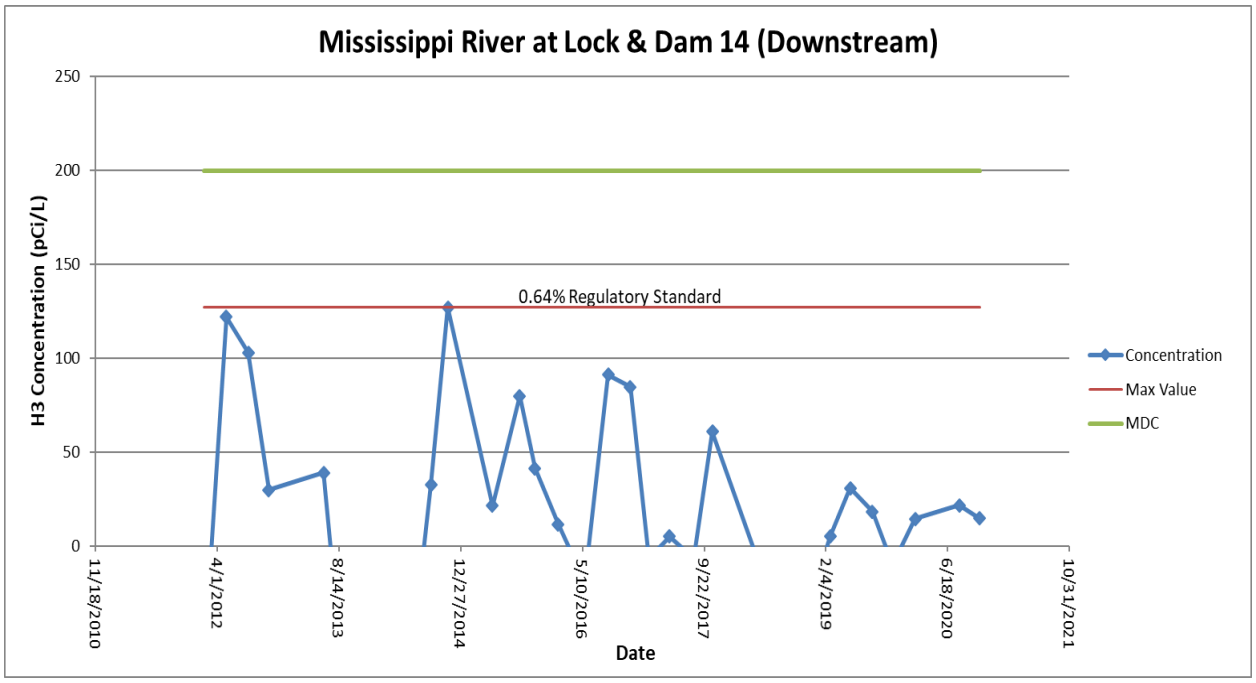
Location	H-3	
Date	Result	MDC
Mississippi R. at Albany		
2/5/2020	<MDC	200
8/5/2020	<MDC	200
10/28/2020	<MDC	200
Mississippi R. at Cordova		
2/5/2020	<MDC	200
8/5/2020	<MDC	200
10/28/2020	<MDC	200
Mississippi R. at Lock&Dam 14		
2/5/2020	<MDC	200
8/5/2020	<MDC	200
10/28/2020	<MDC	200
Mississippi R. at Port Byron		
2/5/2020	<MDC	200
8/5/2020	<MDC	200
10/28/2020	<MDC	200
Mississippi R.at Rapid City		
2/5/2020	<MDC	200
8/5/2020	<MDC	200
10/28/2020	<MDC	200

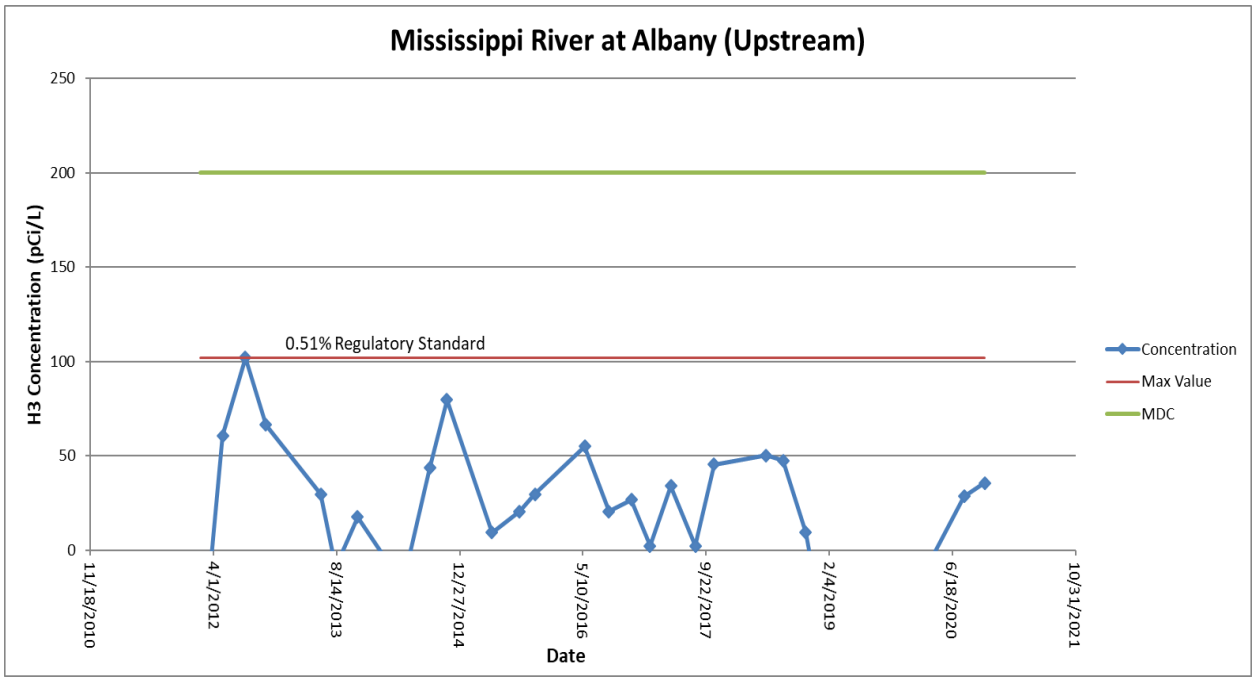
Trending Graphs for Tritium (H-3) in Water - Quad Cities
(Max value compared to IEPA and US EPA Class regulatory standard of 20,000 pCi/L)






Mississippi River at Rapids City (Downstream)
H3 Concentration (pCi/L)
250
200
150
100
50
0
0.53% Regulatory Standard
11/18/2010
4/1/2012
8/14/2013
12/27/2014
5/10/2016
9/22/2017
2/4/2019
6/18/2020
10/31/2021
Date
Concentration
Max Value
MDC


Mississippi River at Lock & Dam 14 (Downstream)
H3 Concentration (pCi/L)
250
200
150
100
50
0
0.64% Regulatory Standard
11/18/2010
4/1/2012
8/14/2013
12/27/2014
5/10/2016
9/22/2017
2/4/2019
6/18/2020
10/31/2021
Date
Concentration
Max Value
MDC


Mississippi River at Albany (Upstream)
250
200
150
100
50
0
H3 Concentration (pCi/L)
0.51% Regulatory Standard
11/18/2010
4/1/2012
8/14/2013
12/27/2014
5/10/2016
9/22/2017
2/4/2019
6/18/2020
10/31/2021
Date
Concentration
Max Value
MDC

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

Location	Strontium	
Date	Result	MDC
Mississippi R. at Rapids City		
8/5/2020	0.6	0.4

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

Location	Beta	
Date	Result	MDC
Mississippi R. at Albany		
2/5/2020	<MDC	3.6
8/5/2020	4.5	3.6
10/28/2020	4.0	3.6
Mississippi R. at Cordova		
2/5/2020	3.8	3.6
8/5/2020	<MDC	3.6
10/28/2020	5.4	3.6
Mississippi R. at Lock & Dam 14		
2/5/2020	<MDC	3.6
8/5/2020	<MDC	3.6
10/28/2020	5.3	3.6
Mississippi R. at Port Byron		
2/5/2020	<MDC	3.6
8/5/2020	<MDC	3.6
10/28/2020	<MDC	3.6
Mississippi R. at Rapid City		
2/5/2020	<MDC	3.6
8/5/2020	<MDC	3.6
10/28/2020	4.8	3.6

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																								
2/5/2020	<MDC	18.0	<MDC	350.0	<MDC	3.5	<MDC	3.6	<MDC	3.8	<MDC	3.6	<MDC	7.6	<MDC	7.0	<MDC	3.4	<MDC	4.2	<MDC	7.0	<MDC	7.3
8/5/2020	<MDC	18.0	<MDC	350.0	<MDC	3.5	<MDC	3.6	<MDC	3.8	<MDC	3.6	<MDC	7.6	<MDC	7.0	<MDC	3.4	<MDC	4.2	<MDC	7.0	<MDC	7.3
10/28/2020	<MDC	18.0	<MDC	350.0	<MDC	3.5	<MDC	3.6	<MDC	3.8	<MDC	3.6	<MDC	7.6	<MDC	7.0	<MDC	3.4	<MDC	4.2	<MDC	7.0	<MDC	7.3
Mississippi R. at Cordova																								
2/5/2020	<MDC	18.0	<MDC	350.0	<MDC	3.5	<MDC	3.6	<MDC	3.8	<MDC	3.6	<MDC	7.6	<MDC	7.0	<MDC	3.4	<MDC	4.2	<MDC	7.0	<MDC	7.3
8/5/2020	<MDC	18.0	<MDC	350.0	<MDC	3.5	<MDC	3.6	<MDC	3.8	<MDC	3.6	<MDC	7.6	<MDC	7.0	<MDC	3.4	<MDC	4.2	<MDC	7.0	<MDC	7.3
10/28/2020	<MDC	18.0	<MDC	350.0	<MDC	3.5	<MDC	3.6	<MDC	3.8	<MDC	3.6	<MDC	7.6	<MDC	7.0	<MDC	3.4	<MDC	4.2	<MDC	7.0	<MDC	7.3
Mississippi R. at Lock & Dam 14																								
2/5/2020	<MDC	18.0	<MDC	350.0	<MDC	3.5	<MDC	3.6	<MDC	3.8	<MDC	3.6	<MDC	7.6	<MDC	7.0	<MDC	3.4	<MDC	4.2	<MDC	7.0	<MDC	7.3
8/5/2020	<MDC	18.0	<MDC	350.0	<MDC	3.5	<MDC	3.6	<MDC	3.8	<MDC	3.6	<MDC	7.6	<MDC	7.0	<MDC	3.4	<MDC	4.2	<MDC	7.0	<MDC	7.3
10/28/2020	<MDC	18.0	<MDC	350.0	<MDC	3.5	<MDC	3.6	<MDC	3.8	<MDC	3.6	<MDC	7.6	<MDC	7.0	<MDC	3.4	<MDC	4.2	<MDC	7.0	<MDC	7.3
Mississippi R. at Port Byron																								
2/5/2020	<MDC	18.0	<MDC	350.0	<MDC	3.5	<MDC	3.6	<MDC	3.8	<MDC	3.6	<MDC	7.6	<MDC	7.0	<MDC	3.4	<MDC	4.2	<MDC	7.0	<MDC	7.3
8/5/2020	<MDC	18.0	<MDC	350.0	<MDC	3.5	<MDC	3.6	<MDC	3.8	<MDC	3.6	<MDC	7.6	<MDC	7.0	<MDC	3.4	<MDC	4.2	<MDC	7.0	<MDC	7.3
10/28/2020	<MDC	18.0	<MDC	350.0	<MDC	3.5	<MDC	3.6	<MDC	3.8	<MDC	3.6	<MDC	7.6	<MDC	7.0	<MDC	3.4	<MDC	4.2	<MDC	7.0	<MDC	7.3
Mississippi R. at Rapid City																								
2/5/2020	<MDC	18.0	<MDC	350.0	<MDC	3.5	<MDC	3.6	<MDC	3.8	<MDC	3.6	<MDC	7.6	<MDC	7.0	<MDC	3.4	<MDC	4.2	<MDC	7.0	<MDC	7.3
8/5/2020	<MDC	18.0	<MDC	350.0	<MDC	3.5	<MDC	3.6	<MDC	3.8	<MDC	3.6	<MDC	7.6	<MDC	7.0	<MDC	3.4	<MDC	4.2	<MDC	7.0	<MDC	7.3
10/28/2020	<MDC	18.0	<MDC	350.0	<MDC	3.5	<MDC	3.6	<MDC	3.8	<MDC	3.6	<MDC	7.6	<MDC	7.0	<MDC	3.4	<MDC	4.2	<MDC	7.0	<MDC	7.3

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	MDC
Corner of 150th and 266th																						
8/5/2020	<MDC	350000	<MDC	0.27	<MDC	0.34	<MDC	0.02	<MDC	0.02	0.14	0.03	<MDC	3.30	<MDC	0.04	<MDC	6.20	<MDC	0.11	<MDC	0.71
Near RS-C																						
8/5/2020	<MDC	350000	<MDC	0.27	<MDC	0.34	<MDC	0.02	<MDC	0.02	0.23	0.03	<MDC	3.30	<MDC	0.04	<MDC	6.20	<MDC	0.11	<MDC	0.71

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	MDC
Corner of 150th and 266th																						
8/5/2020	<MDC	321000	<MDC	0.24	<MDC	0.26	<MDC	0.02	<MDC	0.02	0.13	0.03	<MDC	3.00	<MDC	0.03	<MDC	5.13	<MDC	0.10	<MDC	0.63
Near RS-C																						
8/5/2020	<MDC	321000	<MDC	0.24	<MDC	0.26	<MDC	0.02	<MDC	0.02	0.55	0.03	<MDC	3.00	<MDC	0.03	<MDC	5.13	<MDC	0.10	<MDC	0.63

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	MDC
Mississippi R. at Rapid City																						
8/5/2020	<MDC	292000	<MDC	0.19	<MDC	0.27	<MDC	0.02	<MDC	0.02	0.02	0.02	<MDC	2.98	<MDC	0.04	<MDC	5.10	<MDC	0.10	<MDC	0.65

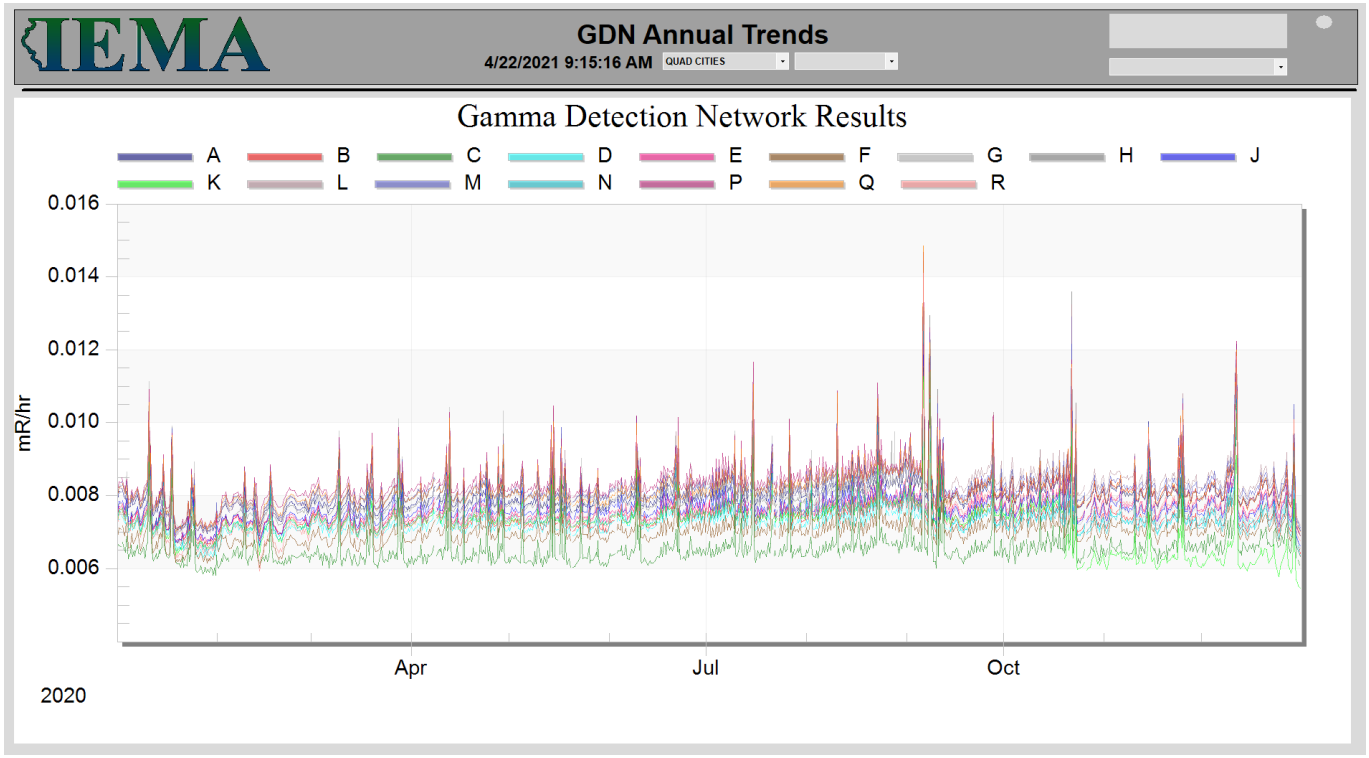
Gamma Spectroscopy Results for Radionuclides in Vegetation- Quad Cities
Results are in picocuries per gram (pCi/g)

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	MDC
Corner of 150th and 266th																								
8/5/2020	<MDC	5800	<MDC	0.15	<MDC	0.16	<MDC	0.03	<MDC	0.03	<MDC	0.03	<MDC	1.34	<MDC	1E+06	<MDC	0.04	<MDC	1.35	<MDC	0.11	<MDC	0.39
Near RS-C																								
8/5/2020	<MDC	5800	<MDC	0.15	<MDC	0.16	<MDC	0.03	<MDC	0.03	<MDC	0.03	<MDC	1.34	<MDC	1E+06	<MDC	0.04	<MDC	1.35	<MDC	0.11	<MDC	0.39

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)																								
9/2/2020	<MDC	2350	<MDC	196	<MDC	55	<MDC	38	<MDC	38	<MDC	38	<MDC	157	<MDC	4000	<MDC	39	<MDC	95	<MDC	85	<MDC	110
Mississippi R. (Top Feeder)																								
9/2/2020	<MDC	2350	<MDC	196	<MDC	55	<MDC	38	<MDC	38	<MDC	38	<MDC	157	<MDC	4000	<MDC	39	<MDC	95	<MDC	85	<MDC	110

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



Summary of Ambient Gamma Results - Quad Cities

Location	Quarter 1/2 mR/quarter	Quarter 3 mR/quarter	Quarter 4 mR/quarter	Annual Exposure mR/year
QC001	10.1	10.4		40.7
QC004	6.3	8.9	9.7	31.2
QC007	8.6	8.1	9.6	34.9
QC010	5.9	5.8	9.5	27.1
QC011	5.3	6.2	6.5	23.2
QC012	7.6	4.1	7.4	26.7
QC014	6.3	6.3		25.1
QC016	4.9	6.1	7.3	23.3
QC018	11.2	11.6	8.8	43.0
QC025	10.8	9.5	10.5	41.6
QC026	8.7	6.9	10.1	34.3
QC027	6.3	7.3	9.3	29.2
QC028		6.4	8.9	30.8
QC029	8.7	9.1	7.7	34.1
QC031		6.4	7.8	28.3
QC032	8.1	7.7	7.9	31.7
QC033	6.9	7.3	9.2	30.3
QC034	5.6	6.5	9.6	27.3
QC036	8.8	10.4	8.1	36.0
QC037	5.1	6.1	7.2	23.5
QC038	6.3	9.2	10.9	32.8
QC039	4.7	7.4		22.4
QC040	8.1	10.0	10.7	36.9
QC041	8.3	7.5	11.0	35.1
QC042	8.3	11.1	9.2	36.8
QC043	7.7	6.6	8.1	29.9
QC044		6.2	10.3	33.1
QC045	7.1	10.0	10.7	35.0
QC046	7.7	8.3	10.3	34.1
QC049		7.4	9.2	33.1
QC050		7.8	8.5	32.6
QC051	7.3	11.3	8.9	34.8
QC052		10.2	10.7	41.8

Location	Quarter 1 mR/quarter	Quarter 2 mR/quarter	Quarter 3 mR/quarter	Quarter 4 mR/quarter	Annual Exposure mR/year
QC053	6.4	6.9	5.4	9.1	27.8
QC054	7.2	7.1	6.4	10.1	30.8
QC055	6.3	7.7	8.2	7.7	29.8
QC056	4.4	6.1	6.8	4.3	21.6
QC057	5.8	6.0	5.6	7.5	24.9
QC058	8.1	7.7	8.0	6.0	29.9
QC059	5.3	6.1	7.3	5.2	23.9
QC060	4.3	7.6	6.2	4.8	22.9
QC061	5.8	7.0	4.7	6.2	23.7
QC062	10.3	11.2	10.9	9.0	41.4
QC063	5.7	7.9	7.0	5.7	26.3
QC064		5.5	6.8	7.4	26.2
QC065	7.0	9.3	7.3	8.8	32.4
QC066		10.7	8.1	8.9	36.9
QC067	10.3	9.7	8.9	10.2	39.1
QC068	9.4	8.9	9.7	9.1	37.1
QC-RSA	11.6	6.4	10.7	6.7	35.3
QC-RSB	9.9	10.4	6.2	8.9	35.3
QC-RSC	8.2	7.7	7.2	4.8	27.9
QC-RSD	6.9	7.8	4.1	7.0	25.7
QC-RSE	7.5	8.0	6.7	6.5	28.7
QC-RSF	5.1	6.5	7.4	7.2	26.2
QC-RSG	6.4	6.9	7.7	5.5	26.5
QC-RSH	6.3	10.4	8.4	8.0	33.1
QC-RSJ	7.0	8.4	6.1	8.3	29.9
QC-RSK	7.2	5.6	6.5	7.9	27.2
QC-RSL	6.1	10.5	9.3	7.9	33.9
QC-RSM	6.1	9.4	5.2	6.9	27.6
QC-RSN	7.3	5.6	6.8	8.2	27.9
QC-RSP	9.5	11.0	8.0	8.7	37.2
QC-RSQ	9.0	8.3	9.0	6.5	32.9
QC-RSR	7.7	6.8	7.1	5.8	27.3

Summary of Ambient Gamma Results – Quad Cities (Continued)

Location	Quarter 1/2 mR/quarter	Quarter 3 mR/quarter	Quarter 4 mR/quarter	Annual Exposure mR/year
QC053	6.4	3.8	7.9	24.5

QC054	7.9		9.2	33.4
QC055	8.2	9.4	10.1	36.0
QC056	5.8	6.9	8.2	26.7
QC057	6.0	6.9	10.3	29.1
QC058	6.6	7.8		28.1
QC059	6.6	7.7	7.8	28.7
QC060	8.3	6.3	8.2	31.2
QC061	5.5	6.3	9.4	26.7
QC062	8.6	10.4	6.9	34.4
QC063	6.9	6.2	10.1	30.1
QC064	8.0	6.3	8.5	30.8
QC065	9.3	9.2	10.0	37.7
QC066	8.3	9.2	9.5	35.3
QC067	8.3	8.8	9.9	35.3
QC068	10.0	10.5	3.0	33.5
QC-RSA	8.1		8.7	33.2
QC-RSB	6.7	8.8	9.2	31.4
QC-RSC	6.2	6.1	8.7	27.2
QC-RSD	6.5	8.5	8.4	30.0
QC-RSE	7.7	8.2	8.1	31.6
QC-RSF		6.7	6.5	26.4
QC-RSG	8.1	5.7	10.1	32.0
QC-RSH	7.5	7.0	9.8	31.7
QC-RSJ	9.3	7.9	7.8	34.3
QC-RSK	7.1	8.5	8.2	31.0
QC-RSL	7.8	10.9	7.9	34.3
QC-RSM	6.8	7.8	10.4	31.8
QC-RSN	10.0	3.0	8.4	31.5
QC-RSP	9.0	7.5	8.3	33.8
QC-RSQ	8.8	9.4	9.2	36.2
QC-RSR	6.2	8.1	7.7	28.2

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. NPS OSLs were not collected in the 2nd quarter due to the COVID-19 emergency; therefore, results from quarters 1 and 2 are a combined average.

Zion Nuclear Power Station

Zion NPS consisted of two PWRs that were owned and operated by the Exelon Corporation 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 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 four 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 2020

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. Air samples continued to be collected and analyzed until February, this corresponded to the elimination of air sampling activities conducted by the licensee.

OSLs will continue to be deployed for as long as there is an independent spent fuel storage installation (ISFSI) on site. However, the number of OSLs deployed was reduced from 24 to 13 in 2020, with a focus on monitoring for exposures near the ISFSI.

Due to COVID-19 employee safety mandates in place during a portion of 2020, IEMA's Division of Nuclear Safety's Radiological Field Services Unit (RFS) staff was temporarily unavailable to perform the duties associated with the radiological environmental monitoring programs. This resulted in some scheduled sampling and monitoring activities not being completed.

Sampling and Monitoring Results

Air Sampling Results

Results are comparable to those obtained from background EMSs located in Marion, Springfield, and West Chicago, Illinois and are consistent with data previously collected by IEMA as part of its radiological environmental monitoring program.

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

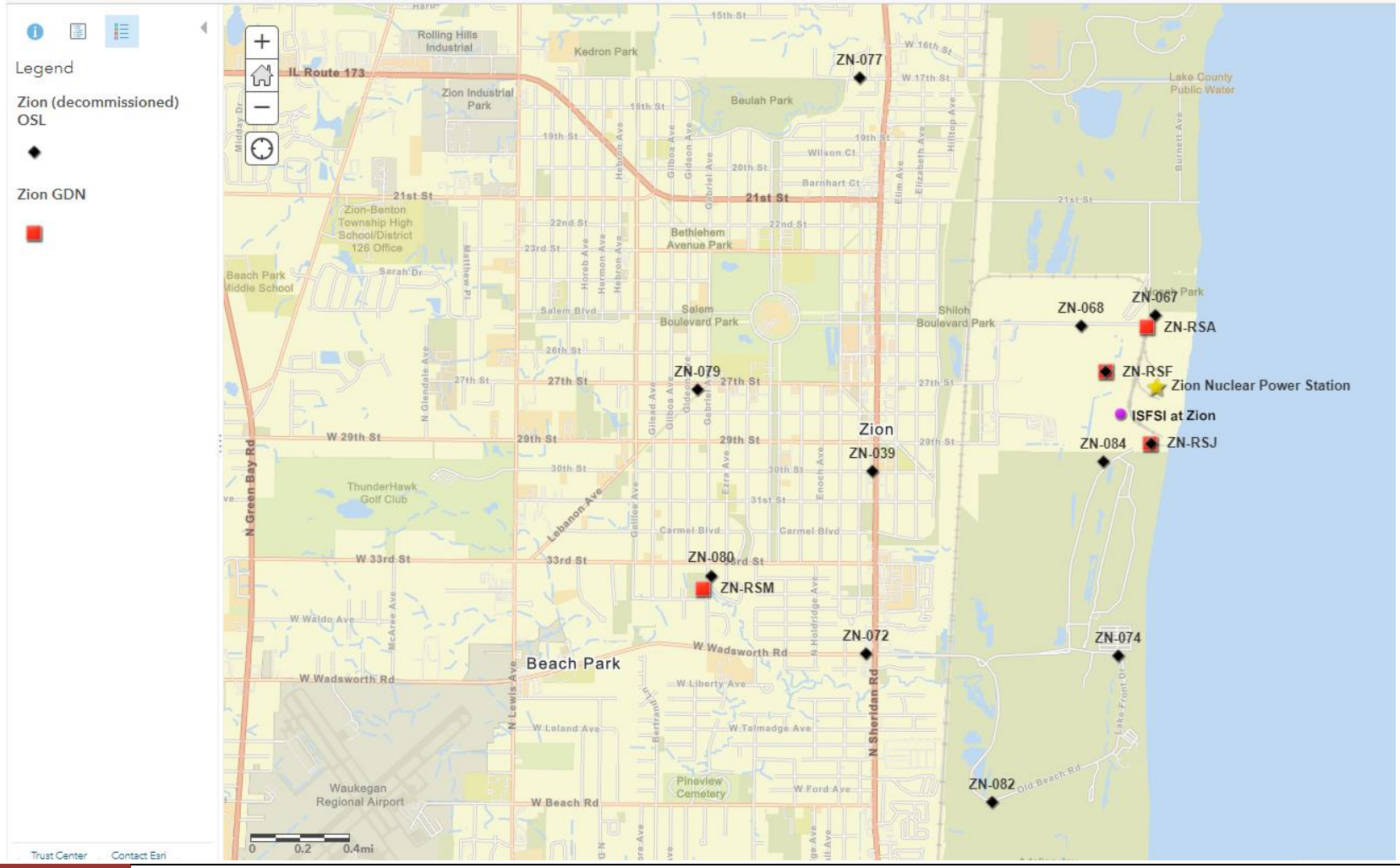
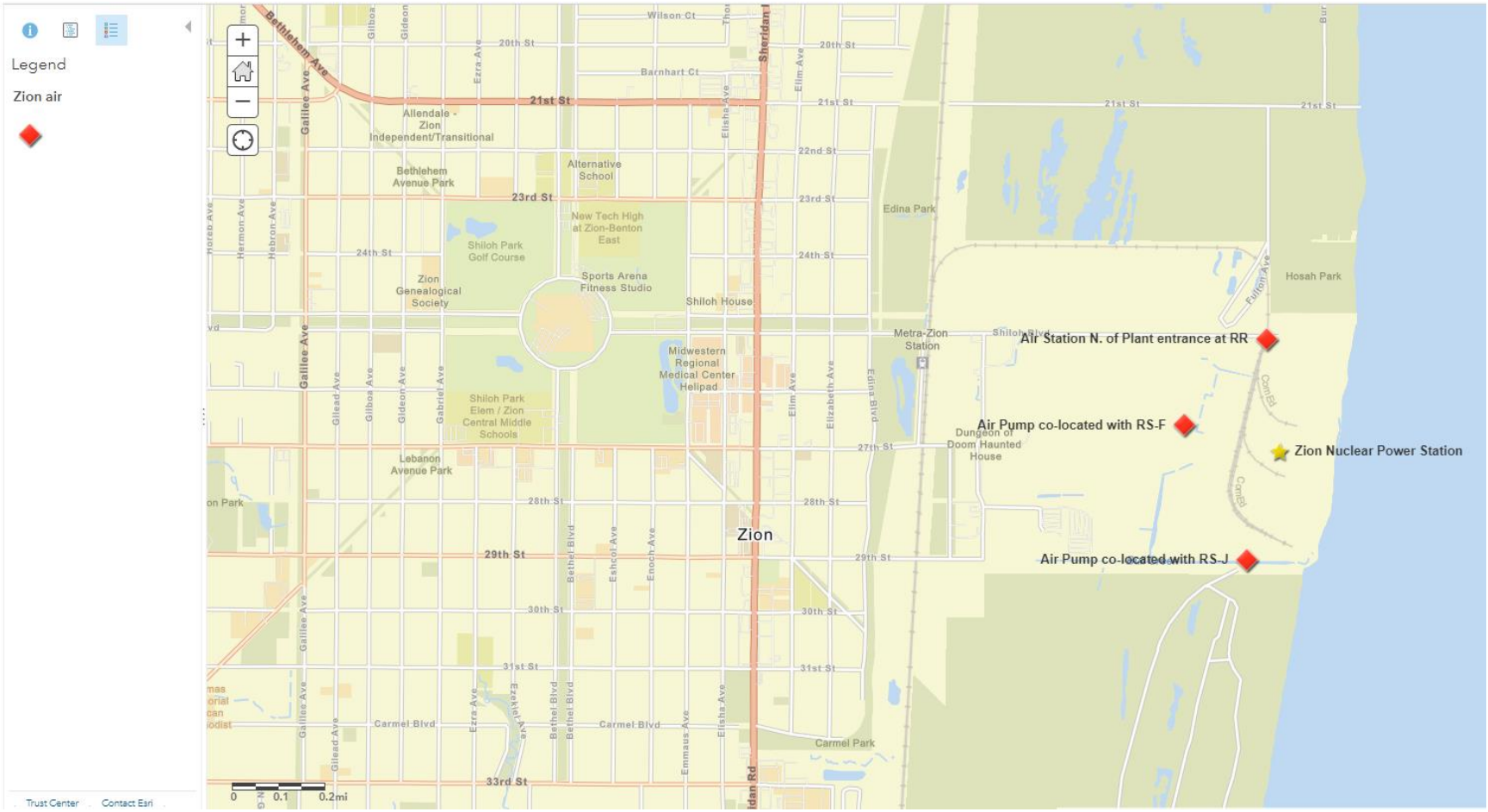


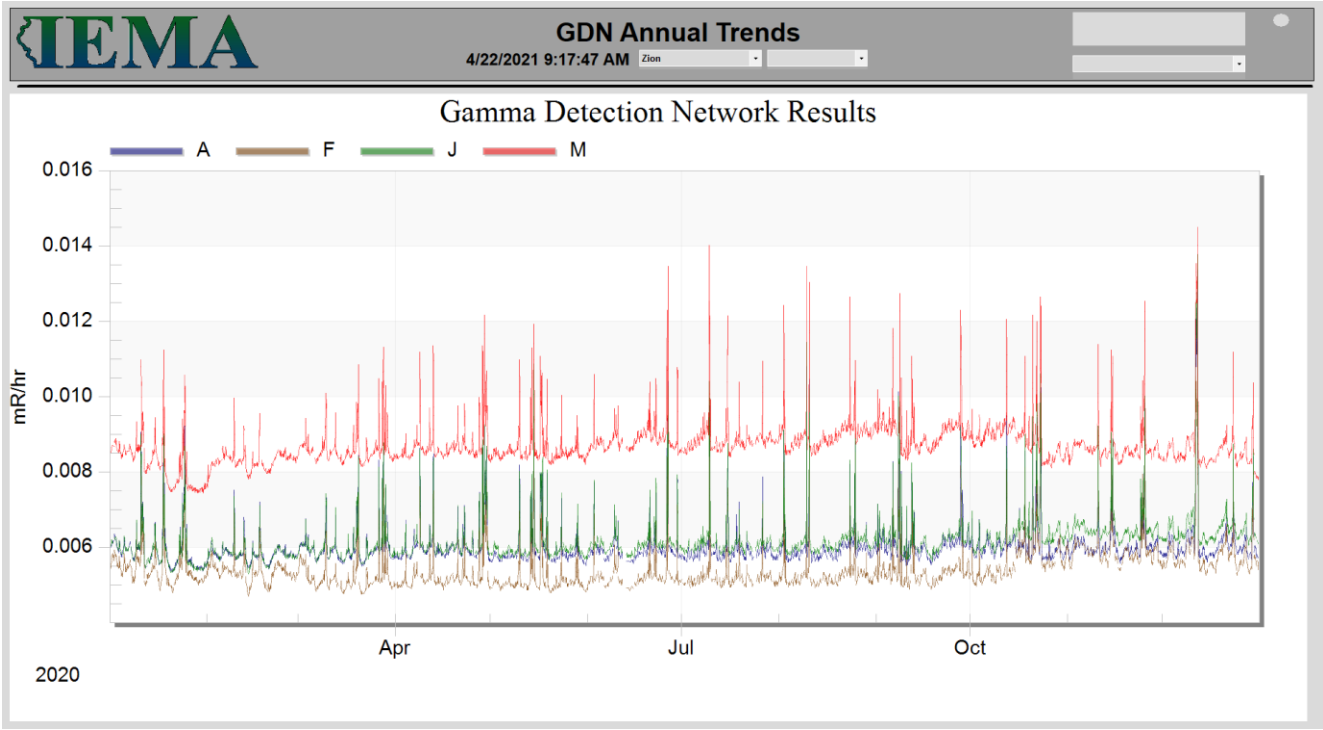
Figure 25. Air Sampling Locations – Zion



Alpha /Beta Screening Results for Air Samples - Zion
Results are in femtocuries per cubic meter (fCi/m^3)

Location	Alpha		Beta	
Date	Result	MDC	Result	MDC
Co-located with RS-F				
1/6/2020	3.1	2.7	29.5	3.8
1/14/2020	<MDC	2.7	19.0	3.8
1/22/2020	3.3	2.7	33.4	3.8
1/28/2020	<MDC	2.7	18.6	3.8
2/4/2020	<MDC	2.7	16.2	3.8
Co-located with RS-J				
1/6/2020	3.6	2.7	30.2	3.8
1/14/2020	<MDC	2.7	20.8	3.8
1/22/2020	<MDC	2.7	15.2	3.8
1/28/2020	<MDC	2.7	24.9	3.8
2/4/2020	<MDC	2.7	20.8	3.8
N. of Plant entrance at RR				
1/6/2020	3.7	2.7	31.0	3.8
1/14/2020	<MDC	2.7	23.1	3.8
1/22/2020	2.9	2.7	28.7	3.8
1/28/2020	<MDC	2.7	21.2	3.8
2/4/2020	<MDC	2.7	20.1	3.8

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



Summary of Ambient Gamma Results - Zion

Location	Quarter 1/2 mR/quarter	Quarter 3 mR/quarter	Quarter 4 mR/quarter	Annual Exposure mR/year
ZN039		7.6	6.5	28.2
ZN045	3.8	7.1	6.8	21.5
ZN067	3.6	5.8	7.3	20.3
ZN068		6.7	7.1	27.7
ZN072	5.4	5.4	8.9	25.1
ZN074			4.1	16.4
ZN077	8.3	9.5	8.1	34.3
ZN079	6.9	6.7	7.3	27.7
ZN080		8.5	10.0	37.0
ZN082		5.9	3.9	19.5
ZN084	4.5	6.3	7.0	22.3
ZN-RSJC	4.6	5.6	6.3	21.0
ZN-RSNC	3.7	6.5	5.8	19.6

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. NPS OSLs were not collected in the 2nd quarter due to the COVID-19 emergency; therefore, results from quarters 1 and 2 are a combined average.

Background Sampling Locations

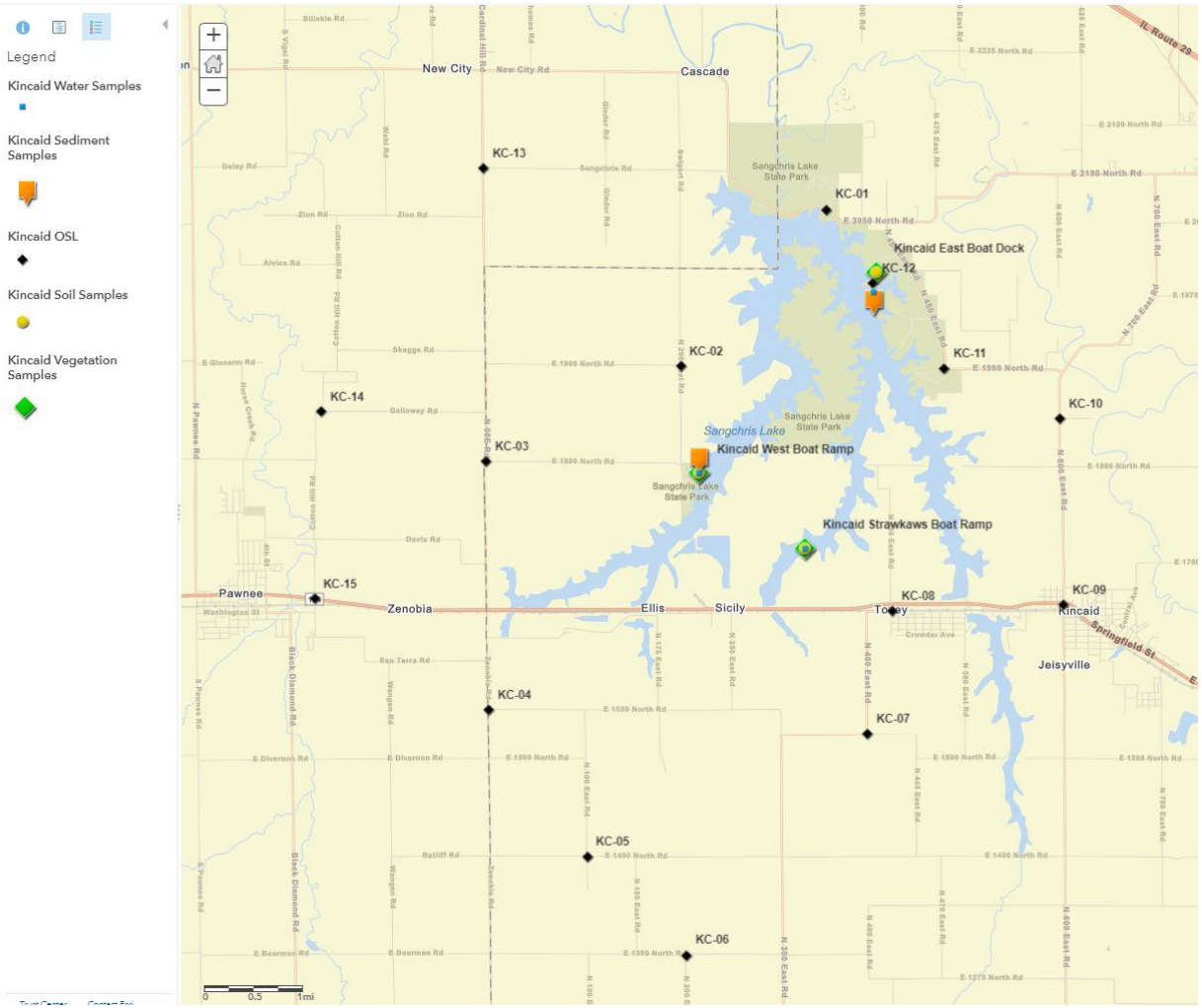
IEMA has established the environs of Sangchris Lake State Park, a cooling lake for a coal-fired power station near Kincaid, Illinois, as a background sampling location. To establish "background" radiation levels, water, soil, sediment, vegetation, and fish samples are collected and analyzed utilizing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

Up until February 2020, following the completion of the decommissioning of the Zion NPS, IEMA routinely collected air samples around the Zion NPS site. Background sampling locations for air samples have been established, and are located in Springfield, Marion, and West Chicago, Illinois. Consistent with the procedure for the Zion site, samples are collected and analyzed weekly.

Figure 26 is 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 2020 background environmental monitoring locations can be found on pages 132-143.

Sangchris Lake State Park Maps of Monitoring and Sampling Locations

Figure 26. Monitoring and Sampling Locations - Sangchris Lake State Park

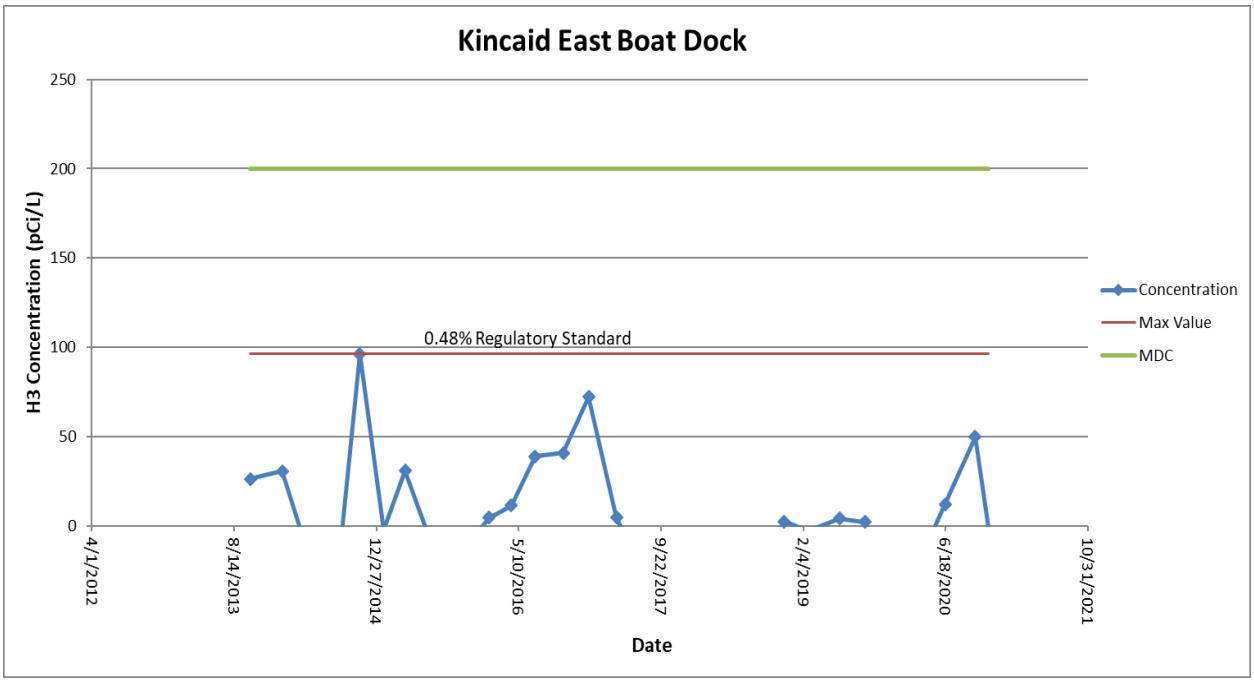


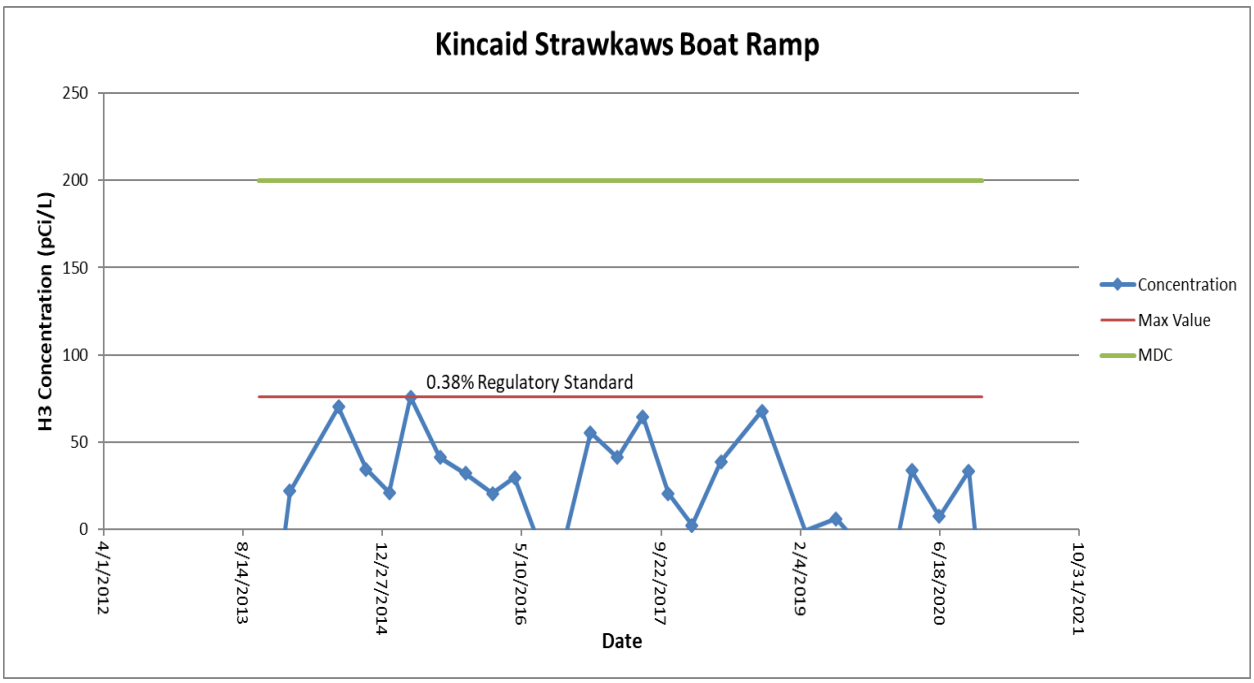
Sangchris Lake State Park Result Tables and Graphs

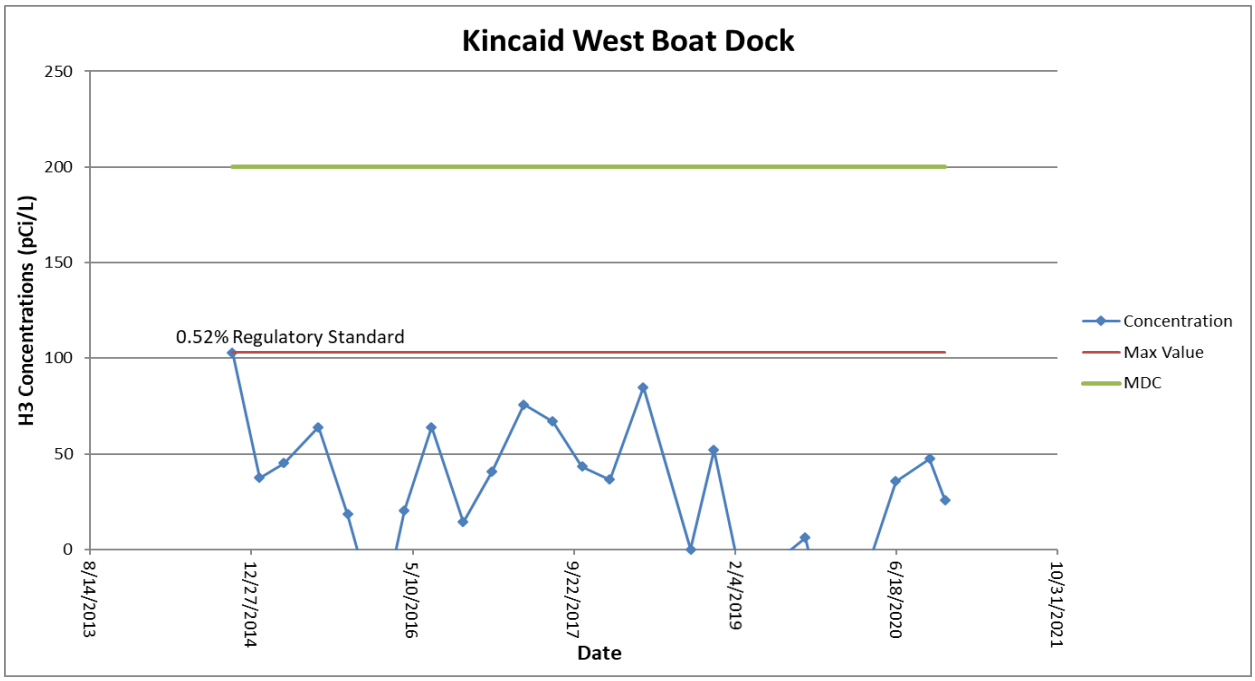
Tritium (H-3) in Water Results - Sangchris Lake State Park
Results are in picocuries per liter (pCi/L)

Location	H-3	
Date	Result	MDC
East Boat Dock		
3/9/2020	<MDC	200
6/16/2020	<MDC	200
9/29/2020	<MDC	200
11/16/2020	<MDC	200
Strawkaws Boat Ramp		
3/9/2020	<MDC	200
6/16/2020	<MDC	200
9/29/2020	<MDC	200
11/16/2020	<MDC	200
West Boat Ramp		
3/9/2020	<MDC	200
6/16/2020	<MDC	200
9/29/2020	<MDC	200
11/16/2020	<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)






Kincaid West Boat Dock
250
200
150
100
50
0
H3 Concentrations (pCi/L)
0.52% Regulatory Standard
8/14/2013
12/27/2014
5/10/2016
9/22/2017
2/4/2019
6/18/2020
10/31/2021
Date
Concentration
Max Value
MDC

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 Ramp		
6/16/2020	<MDC	0.6
Strawkaws Boat Ramp		
3/9/2020	<MDC	0.6
11/16/2020	<MDC	0.6
West Boat Ramp		
9/29/2020	<MDC	0.6

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

Location	Beta	
Date	Result	MDC
East Boat Dock		
3/9/2020	<MDC	3.5
6/16/2020	<MDC	3.5
9/29/2020	<MDC	3.5
11/16/2020	<MDC	3.5
Strawkaws Boat Ramp		
3/9/2020	<MDC	3.5
6/16/2020	4.5	3.5
9/29/2020	<MDC	3.5
11/16/2020	<MDC	3.5
West Boat Ramp		
3/9/2020	4.3	3.5
6/16/2020	4.6	3.5
9/29/2020	<MDC	3.5
11/16/2020	<MDC	3.5

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																								
3/9/2020	<MDC	18.4	<MDC	350	<MDC	3.7	<MDC	3.8	<MDC	4.1	<MDC	4	<MDC	7	<MDC	7	<MDC	3.7	<MDC	4.1	<MDC	7	<MDC	6.6
6/16/2020	<MDC	18.4	<MDC	350	<MDC	3.7	<MDC	3.8	<MDC	4.1	<MDC	4	<MDC	7	<MDC	7	<MDC	3.7	<MDC	4.1	<MDC	7	<MDC	6.6
9/29/2020	<MDC	18.4	<MDC	350	<MDC	3.7	<MDC	3.8	<MDC	4.1	<MDC	4	<MDC	7	<MDC	7	<MDC	3.7	<MDC	4.1	<MDC	7	<MDC	6.6
11/16/2020	<MDC	18.4	<MDC	350	<MDC	3.7	<MDC	3.8	<MDC	4.1	<MDC	4	<MDC	7	<MDC	7	<MDC	3.7	<MDC	4.1	<MDC	7	<MDC	6.6
Strawkaws Boat Ramp																								
3/9/2020	<MDC	18.4	<MDC	350	<MDC	3.7	<MDC	3.8	<MDC	4.1	<MDC	4	<MDC	7	<MDC	7	<MDC	3.7	<MDC	4.1	<MDC	7	<MDC	6.6
6/16/2020	<MDC	18.4	<MDC	350	<MDC	3.7	<MDC	3.8	<MDC	4.1	<MDC	4	<MDC	7	<MDC	7	<MDC	3.7	<MDC	4.1	<MDC	7	<MDC	6.6
9/29/2020	<MDC	18.4	<MDC	350	<MDC	3.7	<MDC	3.8	<MDC	4.1	<MDC	4	<MDC	7	<MDC	7	<MDC	3.7	<MDC	4.1	<MDC	7	<MDC	6.6
11/16/2020	<MDC	18.4	<MDC	350	<MDC	3.7	<MDC	3.8	<MDC	4.1	<MDC	4	<MDC	7	<MDC	7	<MDC	3.7	<MDC	4.1	<MDC	7	<MDC	6.6
West Boat Ramp																								
3/9/2020	<MDC	18.4	<MDC	350	<MDC	3.7	<MDC	3.8	<MDC	4.1	<MDC	4	<MDC	7	<MDC	7	<MDC	3.7	<MDC	4.1	<MDC	7	<MDC	6.6
6/16/2020	<MDC	18.4	<MDC	350	<MDC	3.7	<MDC	3.8	<MDC	4.1	<MDC	4	<MDC	7	<MDC	7	<MDC	3.7	<MDC	4.1	<MDC	7	<MDC	6.6
9/29/2020	<MDC	18.4	<MDC	350	<MDC	3.7	<MDC	3.8	<MDC	4.1	<MDC	4	<MDC	7	<MDC	7	<MDC	3.7	<MDC	4.1	<MDC	7	<MDC	6.6
11/16/2020	<MDC	18.4	<MDC	350	<MDC	3.7	<MDC	3.8	<MDC	4.1	<MDC	4	<MDC	7	<MDC	7	<MDC	3.7	<MDC	4.1	<MDC	7	<MDC	6.6

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	MDC
East Boat Dock																						
6/16/2020	<MDC	370000	<MDC	0.35	<MDC	0.37	<MDC	0.03	<MDC	0.03	0.13	0.04	<MDC	4.3	<MDC	0.06	<MDC	7.8	<MDC	0.14	<MDC	1.07
9/29/2020	<MDC	370000	<MDC	0.35	<MDC	0.37	<MDC	0.03	<MDC	0.03	0.04	0.04	<MDC	4.3	<MDC	0.06	<MDC	7.8	<MDC	0.14	<MDC	1.07
Strawkaws Boat Ramp																						
6/16/2020	<MDC	370000	<MDC	0.35	<MDC	0.37	<MDC	0.03	<MDC	0.03	0.08	0.04	<MDC	4.3	<MDC	0.06	<MDC	7.8	<MDC	0.14	<MDC	1.07
9/29/2020	<MDC	370000	<MDC	0.35	<MDC	0.37	<MDC	0.03	<MDC	0.03	0.06	0.04	<MDC	4.3	<MDC	0.06	<MDC	7.8	<MDC	0.14	<MDC	1.07
West Boat Ramp																						
6/18/2020	<MDC	370000	<MDC	0.35	<MDC	0.37	<MDC	0.03	<MDC	0.03	0.04	0.04	<MDC	4.3	<MDC	0.06	<MDC	7.8	<MDC	0.14	<MDC	1.07
9/29/2020	<MDC	370000	<MDC	0.35	<MDC	0.37	<MDC	0.03	<MDC	0.03	0.09	0.04	<MDC	4.3	<MDC	0.06	<MDC	7.8	<MDC	0.14	<MDC	1.07

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	MDC
East Boat Dock																						
6/16/2020	<MDC	380000	<MDC	0.39	<MDC	0.44	<MDC	0.04	<MDC	0.04	0.12	0.04	<MDC	4.9	<MDC	0.06	<MDC	9.1	<MDC	0.15	<MDC	1.14
9/29/2020	<MDC	380000	<MDC	0.39	<MDC	0.44	<MDC	0.04	<MDC	0.04	<MDC	0.04	<MDC	4.9	<MDC	0.06	<MDC	9.1	<MDC	0.15	<MDC	1.14
Strawkaws Boat Ramp																						
6/16/2020	<MDC	380000	<MDC	0.39	<MDC	0.44	<MDC	0.04	<MDC	0.04	0.10	0.04	<MDC	4.9	<MDC	0.06	<MDC	9.1	<MDC	0.15	<MDC	1.14
9/29/2020	<MDC	380000	<MDC	0.39	<MDC	0.44	<MDC	0.04	<MDC	0.04	0.07	0.04	<MDC	4.9	<MDC	0.06	<MDC	9.1	<MDC	0.15	<MDC	1.14
West Boat Ramp																						
6/18/2020	<MDC	380000	<MDC	0.39	<MDC	0.44	<MDC	0.04	<MDC	0.04	0.06	0.04	<MDC	4.9	<MDC	0.06	<MDC	9.1	<MDC	0.15	<MDC	1.14
9/29/2020	<MDC	380000	<MDC	0.39	<MDC	0.44	<MDC	0.04	<MDC	0.04	0.08	0.04	<MDC	4.9	<MDC	0.06	<MDC	9.1	<MDC	0.15	<MDC	1.14

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
Strawkaws Boat Ramp																						
9/29/2020	<MDC	291000	<MDC	0.22	<MDC	0.25	<MDC	0.03	<MDC	0.03	<MDC	0.03	<MDC	3.5	<MDC	0.04	<MDC	6	<MDC	0.12	<MDC	0.67
West Boat Ramp																						
6/16/2020	<MDC	291000	<MDC	0.22	<MDC	0.25	<MDC	0.03	<MDC	0.03	0.03	0.03	<MDC	3.5	<MDC	0.04	8.7	6	<MDC	0.12	<MDC	0.67
9/29/2020	<MDC	291000	<MDC	0.22	<MDC	0.25	<MDC	0.03	<MDC	0.03	0.03	0.03	<MDC	3.5	<MDC	0.04	<MDC	6	<MDC	0.12	<MDC	0.67

Gamma Spectroscopy Results for Radionuclides in Vegetation - 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		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																								
6/16/2020	<MDC	97000	<MDC	0.16	<MDC	0.25	<MDC	0.04	<MDC	0.03	<MDC	0.03	<MDC	2.8	<MDC	1E+08	<MDC	0.04	<MDC	3.5	<MDC	0.13	<MDC	0.53
9/29/2020	<MDC	97000	<MDC	0.16	<MDC	0.25	<MDC	0.04	<MDC	0.03	<MDC	0.03	<MDC	2.8	<MDC	1E+08	<MDC	0.04	<MDC	3.5	<MDC	0.13	<MDC	0.53
Strawkaws Boat Ramp																								
6/16/2020	<MDC	97000	<MDC	0.16	<MDC	0.25	<MDC	0.04	<MDC	0.03	<MDC	0.03	<MDC	2.8	<MDC	1E+08	<MDC	0.04	<MDC	3.5	<MDC	0.13	<MDC	0.53
9/29/2020	<MDC	97000	<MDC	0.16	<MDC	0.25	<MDC	0.04	<MDC	0.03	<MDC	0.03	<MDC	2.8	<MDC	1E+08	<MDC	0.04	<MDC	3.5	<MDC	0.13	<MDC	0.53
West Boat Ramp																								
6/16/2020	<MDC	97000	<MDC	0.16	<MDC	0.25	<MDC	0.04	<MDC	0.03	<MDC	0.03	<MDC	2.8	<MDC	1E+08	<MDC	0.04	<MDC	3.5	<MDC	0.13	<MDC	0.53
9/29/2020	<MDC	97000	<MDC	0.16	<MDC	0.25	<MDC	0.04	<MDC	0.03	<MDC	0.03	<MDC	2.8	<MDC	1E+08	<MDC	0.04	<MDC	3.5	<MDC	0.13	<MDC	0.53

Gamma Spectroscopy Results for Radionuclides in Fish - Sangchris Lake State Park
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
Sangchris Lake (Bottom Feeder)																								
10/15/2020	<MDC	198	<MDC	77	<MDC	33	<MDC	34	<MDC	26.4	<MDC	30.3	<MDC	72	<MDC	66	<MDC	32	<MDC	36	<MDC	68	<MDC	60
Sangchris Lake (Top Feeder)																								
10/15/2020	<MDC	198	<MDC	77	<MDC	33	<MDC	34	<MDC	26.4	<MDC	30.3	<MDC	72	<MDC	66	<MDC	32	<MDC	36	<MDC	68	<MDC	60

Alpha / Beta Screening Results for Air Samples - Springfield
Results are in picocuries per liter (pCi/L)

Location	Alpha		Beta	
Date	Result	MDC	Result	MDC
Knotts Street Air Sampler				
1/6/2020	<MDC	3.2	23.9	4.9
1/14/2020	<MDC	3.2	15.3	4.9
1/21/2020	<MDC	3.2	28.8	4.9
1/27/2020	<MDC	3.2	30.7	4.9
2/4/2020	<MDC	3.2	21.0	4.9
2/11/2020	<MDC	3.2	20.6	4.9
2/18/2020	<MDC	3.2	26.1	4.9
2/24/2020	<MDC	3.2	31.7	4.9
3/3/2020	3.6	3.2	18.5	4.9
3/10/2020	<MDC	3.2	13.5	4.9
3/16/2020	6.7	3.2	20.4	4.9
3/23/2020	4.9	3.2	18.9	4.9
3/28/2020	3.4	3.2	19.8	4.9
4/9/2020	3.6	3.2	22.0	4.9
6/23/2020	3.6	3.2	32.0	4.9
6/30/2020	<MDC	3.2	22.1	4.9
7/7/2020	<MDC	3.2	34.4	4.9
7/14/2020	<MDC	3.2	25.0	4.9
7/21/2020	<MDC	3.2	30.2	4.9
7/28/2020	<MDC	3.2	19.7	4.9
8/4/2020	<MDC	3.2	25.6	4.9

Location	Alpha		Beta	
Date	Result	MDC	Result	MDC
Knotts Street Air Sampler				
8/11/2020	<MDC	3.2	22.4	4.9
8/18/2020	6.8	3.2	42.0	4.9
8/25/2020	3.6	3.2	26.2	4.9
8/31/2020	4.7	3.2	34.9	4.9
9/8/2020	3.7	3.2	34.1	4.9
9/15/2020	4.0	3.2	29.0	4.9
9/22/2020	5.6	3.2	42.1	4.9
9/29/2020	4.6	3.2	33.9	4.9
10/6/2020	<MDC	3.2	15.4	4.9
10/13/2020	5.6	3.2	39.1	4.9
10/20/2020	3.3	3.2	28.8	4.9
10/27/2020	<MDC	3.2	21.7	4.9
11/2/2020	4.0	3.2	31.6	4.9
11/9/2020	4.1	3.2	41.4	4.9
11/17/2020	<MDC	3.2	21.2	4.9
11/24/2020	<MDC	3.2	30.9	4.9
12/1/2020	<MDC	3.2	24.2	4.9
12/8/2020	6.4	3.2	37.2	4.9
12/15/2020	8.3	3.2	54.8	4.9
12/22/2020	5.8	3.2	51.5	4.9
12/29/2020	4.2	3.2	36.1	4.9

Alpha / Beta Screening Results for Air Samples - Marion
Results are in picocuries per liter (pCi/L)

Location	Alpha		Beta	
Date	Result	MDC	Result	MDC
Marion Office				
1/7/2020	<MDC	4.1	22.1	6.4
1/13/2020	<MDC	4.1	18.4	6.4
1/28/2020	<MDC	4.1	30.6	6.4
2/3/2020	<MDC	4.1	24.3	6.4
2/10/2020	<MDC	4.1	20.5	6.4
2/18/2020	6.3	4.1	22.6	6.4
3/4/2020	4.5	4.1	19.5	6.4
3/9/2020	<MDC	4.1	12.9	6.4
3/16/2020	5.5	4.1	18.1	6.4
7/8/2020	<MDC	4.1	27.1	6.4
7/15/2020	<MDC	4.1	33.1	6.4
7/22/2020	<MDC	4.1	25.5	6.4
7/28/2020	<MDC	4.1	18.3	6.4
8/6/2020	<MDC	4.1	18.6	6.4
8/11/2020	4.6	4.1	39.0	6.4
8/19/2020	5.0	4.1	31.5	6.4

Location	Alpha		Beta	
Date	Result	MDC	Result	MDC
Marion Office				
8/26/2020	7.3	4.1	41.7	6.4
9/1/2020	4.8	4.1	25.5	6.4
9/9/2020	5.2	4.1	31.6	6.4
9/15/2020	6.0	4.1	49.3	6.4
9/23/2020	6.2	4.1	36.9	6.4
9/29/2020	4.7	4.1	28.2	6.4
10/7/2020	<MDC	4.1	21.2	6.4
10/13/2020	6.5	4.1	50.4	6.4
10/20/2020	<MDC	4.1	21.9	6.4
10/27/2020	<MDC	4.1	19.5	6.4
11/2/2020	4.2	4.1	31.1	6.4
11/10/2020	<MDC	4.1	35.2	6.4
11/23/2020	<MDC	4.1	24.9	6.4
11/30/2020	<MDC	4.1	26.9	6.4
12/8/2020	7.0	4.1	42.6	6.4
12/22/2020	6.8	4.1	48.1	6.4
12/29/2020	4.1	4.1	33.4	6.4

Alpha / Beta Screening Results for Air Samples – West Chicago
Results are in picocuries per liter (pCi/L)

Location	Alpha		Beta	
Date	Result	MDC	Result	MDC
West Chicago				
1/6/2020	2.6	2.5	28.7	3.9
1/14/2020	<MDC	2.5	19.9	3.9
1/21/2020	3.9	2.5	39.3	3.9
1/30/2020	<MDC	2.5	25.0	3.9
2/5/2020	<MDC	2.5	22.3	3.9
2/11/2020	<MDC	2.5	20.5	3.9
2/18/2020	<MDC	2.5	24.1	3.9
2/25/2020	7.1	2.5	27.9	3.9
3/3/2020	4.8	2.5	18.9	3.9
3/11/2020	4.1	2.5	15.7	3.9
3/17/2020	4.6	2.5	26.1	3.9
3/24/2020	6.0	2.5	17.6	3.9
6/23/2020	4.3	2.5	40.8	3.9
7/1/2020	<MDC	2.5	39.0	3.9
7/7/2020	<MDC	2.5	27.9	3.9
7/14/2020	3.1	2.5	29.0	3.9
7/28/2020	<MDC	2.5	23.9	3.9
8/11/2020	4.8	2.5	26.2	3.9
8/18/2020	4.5	2.5	28.5	3.9

Location	Alpha		Beta	
Date	Result	MDC	Result	MDC
West Chicago				
8/25/2020	5.7	2.5	44.2	3.9
9/1/2020	5.2	2.5	30.4	3.9
9/8/2020	4.4	2.5	25.0	3.9
9/16/2020	4.4	2.5	22.8	3.9
9/24/2020	6.4	2.5	37.7	3.9
9/29/2020	11.8	2.5	38.5	3.9
10/7/2020	<MDC	2.5	16.1	3.9
10/13/2020	5.3	2.5	32.5	3.9
10/20/2020	6.8	2.5	22.5	3.9
10/28/2020	3.9	2.5	24.7	3.9
11/2/2020	3.8	2.5	44.9	3.9
11/9/2020	4.5	2.5	45.6	3.9
11/17/2020	<MDC	2.5	36.3	3.9
11/23/2020	<MDC	2.5	29.2	3.9
11/30/2020	<MDC	2.5	23.2	3.9
12/8/2020	7.0	2.5	33.8	3.9
12/15/2020	5.9	2.5	36.5	3.9
12/22/2020	6.2	2.5	46.3	3.9
12/29/2020	<MDC	2.5	17.4	3.9

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	11.0	7.3	12.8	10.7	41.8
KC-02	11.5		10.1	12.9	45.9
KC-03	9.6	12.1	14.8	10.3	46.8
KC-04	8.5	9.9	10.4	12.5	41.3
KC-05	11.9	8.9	13.8	12.5	47.2
KC-06	11.5	11.5	10.7	11.0	44.7
KC-07	10.3		13.3		47.2
KC-08	9.7	11.5	8.8		40.0
KC-09	9.1	9.7		8.4	36.4
KC-10	10.7	11.3	13.2	14.0	49.2
KC-11	13.2	11.4		13.8	51.1
KC-12	10.3	12.2	13.7	10.8	47.1
KC-13	10.0	8.1	12.9	13.1	44.2
KC-14	9.9	13.8	13.8	10.5	48.0
KC-15		10.9	12.2	11.7	46.5

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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