ONTARIOPOWER GENERATION

Report

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Title:
2020 DARLINGTON NUCLEAR GROUNDWATER MONITORING PROGRAM RESULTS

2020 Darlington Nuclear Groundwater Monitoring Program Results

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Executive Summary

Darlington Nuclear Generating Station (DNGS) has a mature and robust groundwater monitoring program in place to address the following primary objectives:

1. Confirm predominant on-site groundwater flow characteristics at the DNGS site;
2. Monitor changes to on-site groundwater quality to ensure timely detection of inadvertent releases to groundwater; and
3. Ensure that there are no adverse off-site impacts from DNGS groundwater.

In 2020, groundwater samples were collected as per the Sampling and Analysis Plan (SAP) developed for the site, from a total of 81 sampling locations.

The findings with respect to the above objectives are:

- The predominant shallow groundwater flow patterns remain unchanged in 2020 from the original site groundwater flow interpretations. Outside the protected area, groundwater generally flows from the north towards the Lake. Inside the protected area (in the vicinity of the powerhouse), the groundwater flows northwest towards the Forebay. Further south of the powerhouse, there is a component of groundwater flow that is directed towards Lake Ontario.
- The groundwater data collected from key areas at DNGS indicate that tritium concentrations have remained relatively constant over time, which points to stable environmental performance. Groundwater monitoring will continue in these areas.
- In 2020, there were no indications of adverse off-site impacts from DNGS groundwater. Tritium concentrations at perimeter groundwater monitoring locations remained very low. Municipal drinking water samples collected from downstream Water Supply Plants (WSP), as part of the annual Ontario Power Generation (OPG) DNGS Environmental Monitoring Program (EMP), were well below the Ontario Drinking Water Quality Standard (ODWQS) for tritium of 7,000 Bq/L.

1.0 INTRODUCTION

Ontario Power Generation (OPG), Darlington Nuclear Generating Station (DNGS), has a mature and robust annual groundwater monitoring program in place. The program examines the chemical, radiological, and physical characteristics of the groundwater beneath the site.

The specific objectives of this program are:

1. **Objective 1**: Confirm predominant on-site groundwater flow characteristics at the DNGS site;

2. **Objective 2:** Monitor changes to on-site groundwater quality to ensure timely detection of inadvertent releases to groundwater; and

3. **Objective 3:** Ensure that there are no adverse off-site impacts from DNGS groundwater.

This report presents groundwater data collected at DNGS for the period from January 1st to December 31st, 2020, along with applicable data from Q1 & Q2 2021, and the associated interpretation of this data.

2.0 PROGRAM DESIGN

The design of the DNGS groundwater monitoring program is risk-based in nature. The 2020 groundwater Sampling and Analysis Plan (SAP) was developed to meet the three objectives listed above.

The 2020 SAP specified the sampling locations, the frequency of sampling, (e.g. quarterly, annually), and the parameters for analysis.

The methodology used to collect data and subsequently draw conclusions for each objective is discussed in further detail below.

2.1 Objective 1 Methodology

Groundwater flow interpretations for DNGS were first established in 2010. On an annual basis, a set of water levels was collected from specific groundwater monitoring wells in order to verify that the original interpretations have not changed, and that OPG continues to have a sound understanding of groundwater flow patterns at the site. In the second quarter of 2020 (Q2 2020), water level readings were collected from selected monitoring locations. The data was subsequently used to calculate the groundwater elevation at each monitoring well and generate contour illustrations to visually verify the flow patterns.

2.2 Objective 2 Methodology

In 2020, groundwater samples were collected from a total of 81 monitoring wells, as shown on Figures 1 and 2. The monitoring wells are distinguished by location; protected area (near the reactor buildings), controlled area (farther away from the reactor buildings but within the fence), and the site perimeter.

Groundwater samples were collected by qualified technicians. Prior to sample collection, each monitoring well was purged to remove standing water, ensuring that representative groundwater flowed into the well. Collected samples were predominantly analyzed for tritium. Selected samples were analyzed for petroleum hydrocarbons (PHCs) and benzene / toluene / ethylbenzene / xylenes (BTEX). Groundwater samples in 2020 were analyzed by OPG DNGS Chemistry Laboratory (for tritium) and Kinectrics (for conventional analysis). Samples in 2021 were analyzed by Bureau Veritas and this was for tritium only.

The groundwater data generated from the sampling program was subsequently analyzed to either support previous conclusions, identify adverse trends, or to demonstrate no adverse off-site impacts.

2.3 Objective 3 Methodology

The sampling of monitoring wells at the site boundary was performed in order to confirm that there are no adverse off-site impacts from DNGS groundwater. These locations can also be seen on Figure 1. The methodology for groundwater collection and analysis, as well as for data evaluation, was the same for the site perimeter wells as what is described above for Objective 2.

Figure 1: 2020 Groundwater Monitoring Locations

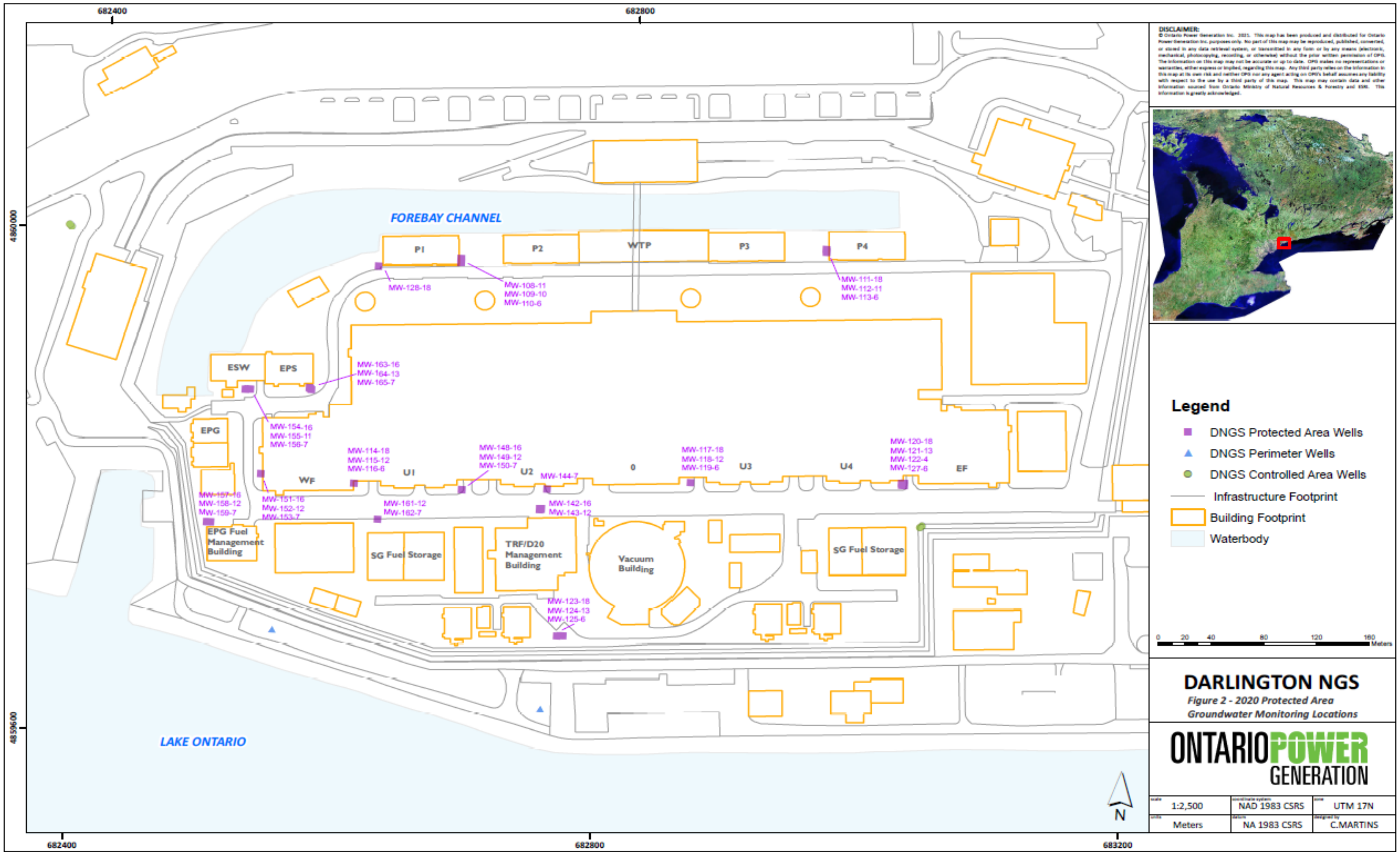


Figure 2: 2020 Protected Area Groundwater Monitoring Locations

3.0 2020 PROGRAM RESULTS

3.1 Objective 1 Results

The predominant groundwater flow patterns remain unchanged in 2020 from the original site groundwater flow interpretations made in 2010.

DNGS's groundwater flow systems are categorized into three hydrostratigraphic units (HU) based on previous hydrogeological investigations:

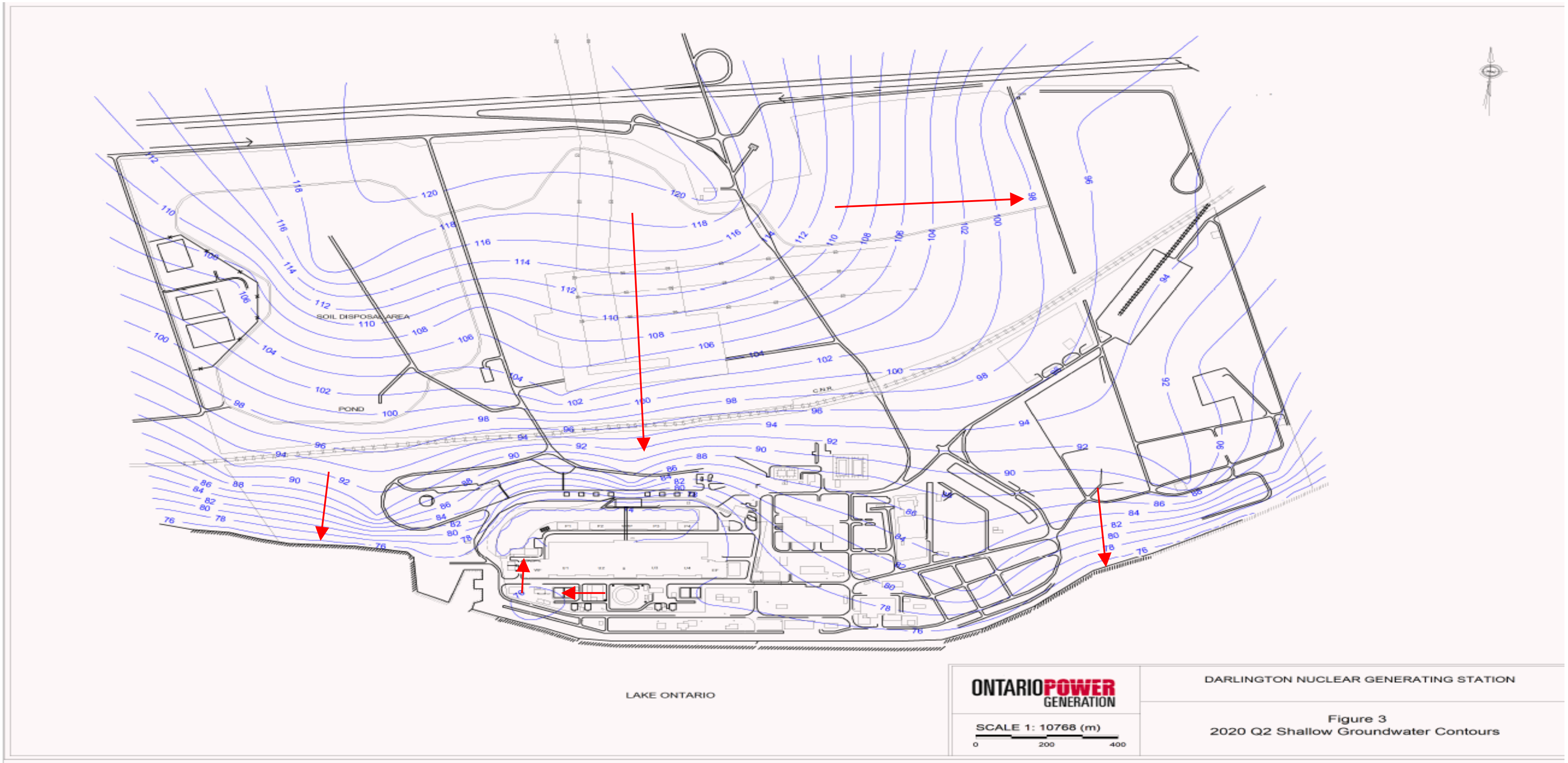
- Shallow/Water Table;
- Interglacial Deposits; and
- Shallow Bedrock.

Groundwater level measurements collected from the wells installed in each HU were used to confirm the groundwater flow directions. Figure 3 shows the shallow groundwater contours. Groundwater flow directions are interpreted to be perpendicular to the contour lines.

The predominant groundwater flow patterns are summarized as follows:

- In general, groundwater on the site flows from the north and discharges toward Lake Ontario.
- The eastern half of the DNGS site has a component of groundwater flow directed to the east from the north, and then south towards Lake Ontario.
- General flow in the interglacial deposits HU and the shallow bedrock HU are similar to that of water table HU described above. Vertically, groundwater flows predominantly downward from the water table (shallow groundwater) to interglacial deposits or to shallow bedrock.
- Groundwater flow direction is complex inside the protected area due to anthropogenic subsurface features as detailed below:
- The powerhouse extends to bedrock and acts as a barrier to groundwater flow; therefore, groundwater flow at the water table on the north side of the powerhouse may not be connected or poorly connected to groundwater flow at the water table on the south side of the powerhouse.
- Groundwater on the north side of the powerhouse discharges into the Forebay Channel as the Condenser Cooling Water pumps lower the Forebay Channel water level, creating a hydraulic gradient directed to the Forebay Channel.

- On the south side of the powerhouse, groundwater flows from the east to the Forebay Channel; however, a component of that groundwater flow is directed to the lake.



Inferred Shallow Groundwater Flow Direction.

Figure 3: 2020 Q2 Shallow Groundwater Contours

3.2 Objective 2 Results

The groundwater data collected from the key areas at DNGS indicate that tritium concentrations have remained constant over time, which points to stable environmental performance. Any areas that displayed an increase in tritium concentrations in the initial sampling were resampled in Q1and Q2 of 2021. Results of the resampled wells were in line with expected and historical values, which further validates stable environmental performance.

In 2020, Darlington Groundwater Monitoring Program showed slightly elevated tritium results at some of the sampled monitoring wells. As is typically done, an investigation was conducted to determine new sources of tritium potentially impacting the groundwater as well as the resampling of the impacted wells. The tritium results of the resampled wells were in line with expected and historical values.

Upon evaluation of the outcome and taking into account the groundwater characteristics, it is believed that the higher tritium values were due to contamination either in the samples or associated with the analyses. Subsequent analysis of the samples taken in 2021 showed results in line with 2019 results and did not exhibit any contamination associated with the sampling and analytical process. Additional steps are being taken, however, to understand potential sources of contamination throughout the sampling and analytical process to eliminate or minimize recurrence. The 2020 data along with data from Q1 & Q2 2021 data are included in this report for completeness. OPG is confident that there is no new source of tritium impacting the groundwater associated with these monitoring wells.

Sampling and Analysis Changes

Due to emerging issues and field conditions, changes to the sampling and analysis plan can occur. In 2020, the following changes occurred:

- Samples could not be collected for MW148 as this well has a history of high pH readings and required splash proof chemical protective suits when sampling. Due to Covid 19, there was a shortage of personal protective equipment at the lab which led to MW148 not being sampled. Sampling was conducted in Q2 2021 and the results are as per historical readings.

- MW020C could not be sampled in 2020 as a result of the well not producing sufficient water for the collection of PHC/BTEX samples.

3.2.1 Protected Area Groundwater Quality

In 2020, 38 monitoring wells were sampled in the protected area to assess tritium concentrations and trends.

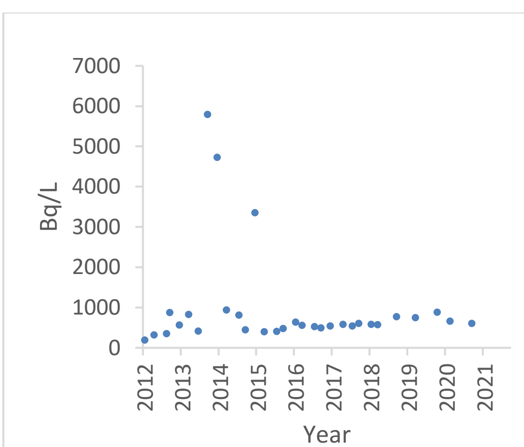
The presence of elevated tritium in groundwater in the protected area is attributed to the Injection Water Storage Tank (IWST) spill, which occurred southwest of Unit 0 in December 2009. Overall, at these locations, the highest tritium concentrations have declined since the spill, confirming that there are no new sources of tritium in groundwater. At other locations, slight increases in tritium concentrations were observed in 2019. This includes MW-120-18 and MW-121-13 in the area of Unit 4. At these locations, the highest tritium concentration has decreased, ranging from 4.81 x 10^2 Bq/L (0.013 µCi/L) to 8.51 x 10^2 Bq/L (0.023 µCi/L) in 2020. Groundwater monitoring wells within the protected area will continue to be monitored to verify the tritium concentration trends.

The results are further discussed below, and presented on Figure 4 and Table A-1 (Appendix A). For Figure 4, to simplify the presentation of data, and maintain a conservative approach, the annual maximum tritium concentration at each monitoring well cluster/nest is presented.

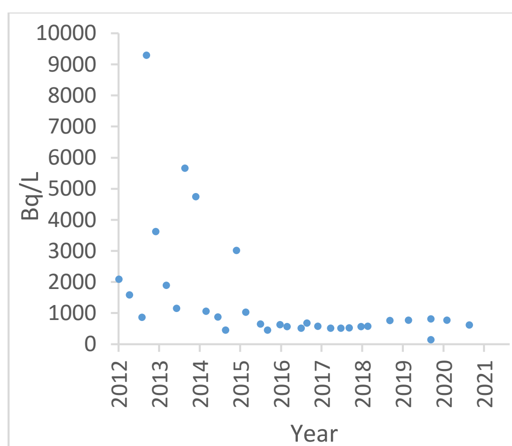
For the ease of discussion, the protected area groundwater results are sub-divided into five smaller areas: Unit 2 (U2) area, West Fueling Facility Auxiliary (WFFA) area, Emergency Power Generator (EPG) Fuel Management Building area, Emergency Power Service (EPS) Building area and the northern side of the powerhouse. These areas are also shown in Figure 4.

<u>U2 Area</u>

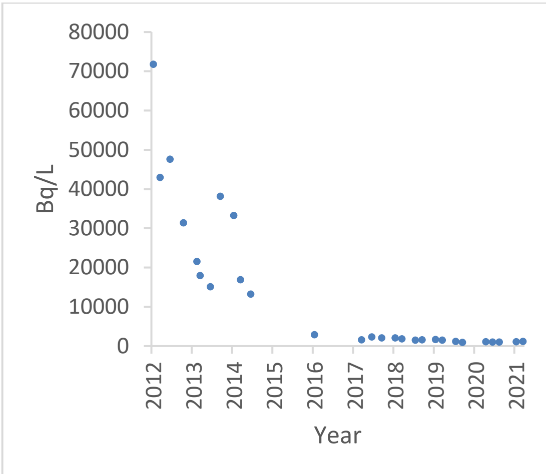
Tritium concentrations at the core of the IWST spill plume, found in the area southwest of Unit 0 and in the vicinity of U2, are declining. In 2020, the highest tritium concentration seen at the monitoring well nest consisting of MW-142-16, MW-143-12 and MW-144-7 was 1.11 x 10^3 Bq/L (0.03 µCi/L). As in past years, at discrete monitoring locations, tritium concentrations may fluctuate during the year as the tritium in groundwater migrates. Overall, the tritium concentration in this area is expected to continue to show a declining trend. Monitoring will continue. Graphs 1 to 3 depict the data for these monitoring wells.



Graph 1: MW-142-16 Tritium Data



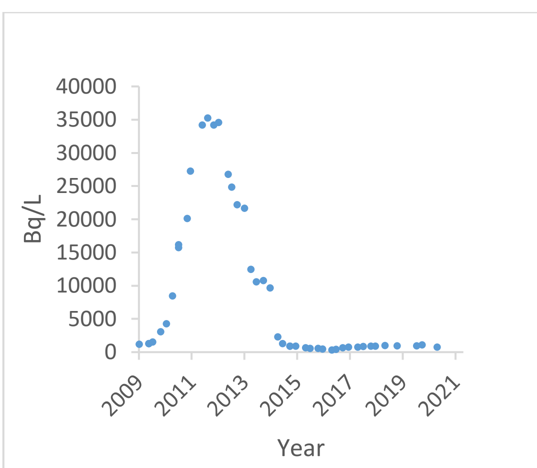
Graph 2: MW-143-12 Tritium Data



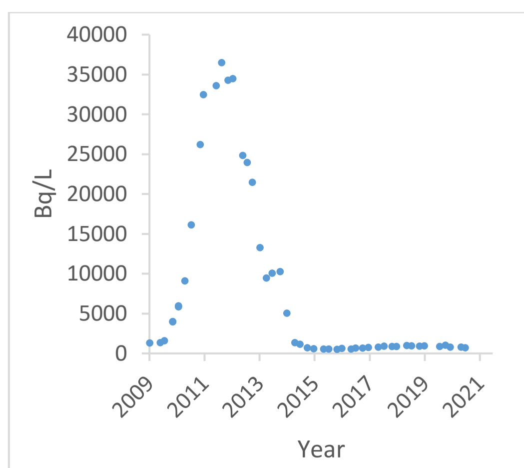
Graph 3: MW-144-7 Tritium Data

WFFA Area

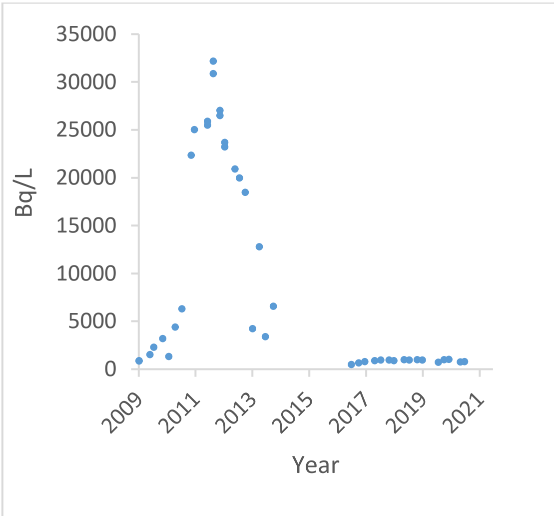
The tritiated groundwater from the IWST spill area has flowed along the southern wall of the powerhouse to the west. The monitoring well cluster consisting of MW-114A-18, MW-115-12 and MW-116-6, located in the vicinity of the WFFA, had tritium concentrations ranging from 7.40 x 10^2 Bq/L (0.020 µCi/L) to 1.11 x 10^3 Bq/L (0.030 µCi/L) in 2020. Tritium concentrations peaked in 2012 and the concentrations have been generally decreasing since then (Graphs 4 to 6). This decline in tritium concentrations is expected to continue. Similar trends are observed in monitoring well cluster further west, consisting of MW-151-16, MW-152-12 and MW-153-7, with tritium concentrations ranging from 5.55 x 10^2 Bq/L (0.015 µCi/L) to 1.22 x 10^3 Bq/L (0.033 µCi/L) in 2020 results. Sampling conducted in Q2 2021 shows results are as per historical readings. Monitoring will continue in these locations.



Graph 4: MW-114A-18 Tritium Data



Graph 5: MW-115-12 Tritium Data



Graph 6: MW-116-6 Tritium Data

EPG Fuel Management Building Area

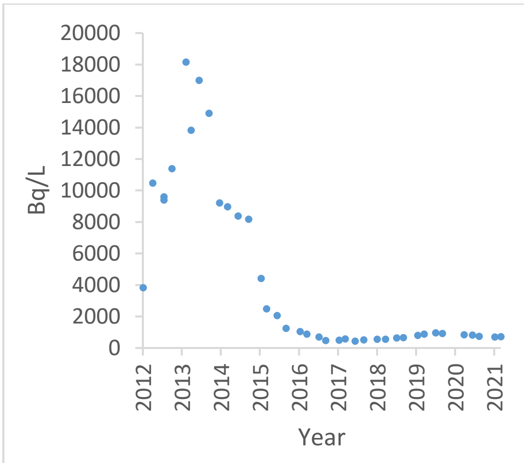
A small component of the tritium in groundwater has migrated west towards the EPG area.

At MW-157-16, an overall downward trend is apparent (Graph 7). In 2020, concentrations ranged from 7.40 x 10^2 Bq/L (0.02µCi/L) to 8.51 x 10^2 Bq/L (0.023 µCi/L).

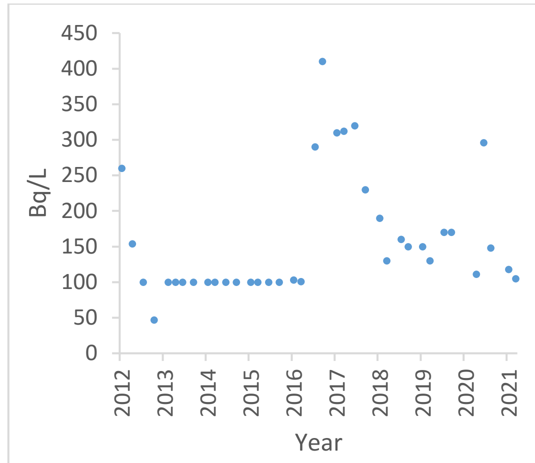
The adjacent deep overburden monitoring well (MW-158-12) has historically shown tritium concentrations at less than the method detection limit of 100 Bq/L (0.027 µCi/L). In 2016, there was a slight increase in tritium concentrations at this well. In 2020, the concentrations were still above the method detection limit, but have decreased as compared to 2016, with the 2020 to Q2 2021 results ranging from 1.05 x 10^2 Bq/L (0.0028 µCi/L) to 2.96 x 10^2 Bq/L (0.008 µCi/L). The results are seen in Graph 8.

The adjacent shallow overburden monitoring well (MW-159-7) has shown a declining trend in tritium concentrations with fluctuations (Graph 9). In 2020, concentrations ranged from 1.48 x 10^2 Bq/L (0.004 µCi/L) to 8.14 x 10^2 Bq/L (0.022 µCi/L).

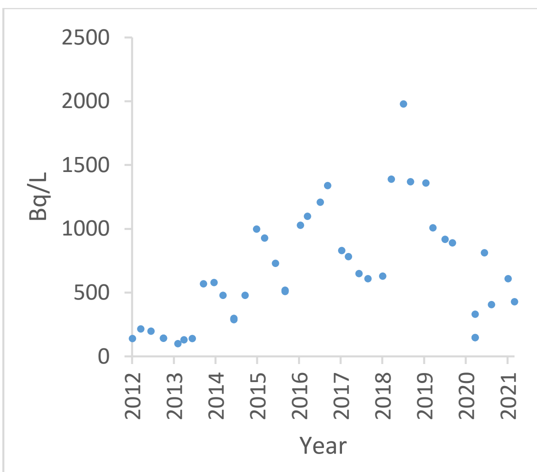
Surveillance will continue in order to track the movement of the tritium plume in the EPG area.



Graph 7: MW-157-16 Tritium Data



Graph 8: MW-158-12 Tritium Data

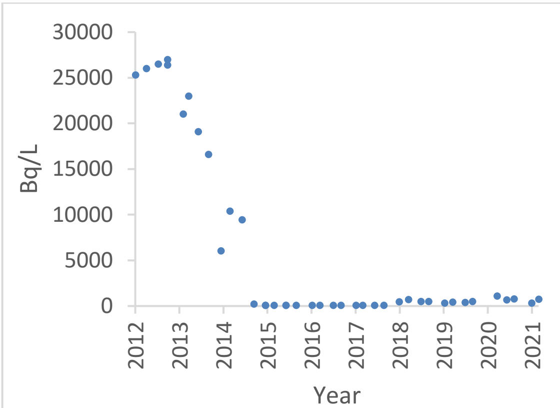


Graph 9: MW-159-7 Tritium Data

<u>EPS Building Area</u>

The majority of the tritium in groundwater from the WFFA area has historically flowed downgradient towards the EPS building area and discharged into the Forebay Channel. Results from MW-154-16, which is located closest to the Forebay, showed a slight increase in tritium concentrations since 2018, with 2020 results ranging from 6.66 x 10^2 Bq/L (0.018 μCi/L) to 1.11x 10^3 Bq/L (0.03 μCi/L), likely due to migration of tritium toward the Forebay. Overall, a declining trend is still apparent, as compared to concentrations seen historically (Graph 10).

The slow discharge of groundwater into the Forebay Channel is diluted by the large inflow of lake water and this Forebay water is monitored before it is discharged back to the lake.



Graph 10: MW-154-16 Tritium Data

Northern Side of Powerhouse

On the northern side of the Powerhouse, in the 2020 sampling, tritium concentrations ranged from <1.11 x 10^2 Bq/L (0.003µCi/L) to 6.29 x 10^2 Bq/L (0.017 µCi/L). As typically done when there are slightly elevated tritium results at some of the sampled monitoring wells, an investigation was conducted to determine new sources of tritium potentially impacting the groundwater. These wells were resampled in Q1/Q2 2021 and concentrations were ranging from <100 Bq/L (0.0027 µCi/L) to a maximum of 2.20 x 10^2 Bq/L (0.0059 µCi/L). These concentrations are within the expected tritium concentrations that may result from the infiltration of precipitation. A previous precipitation study indicated that the tritium in precipitation ranged from not detectable to a maximum of 1.92 x 10^3 Bq/L (0.052 µCi/L), with a maximum average of 5.14 x 10^2 Bq/L (0.014 µCi/L).

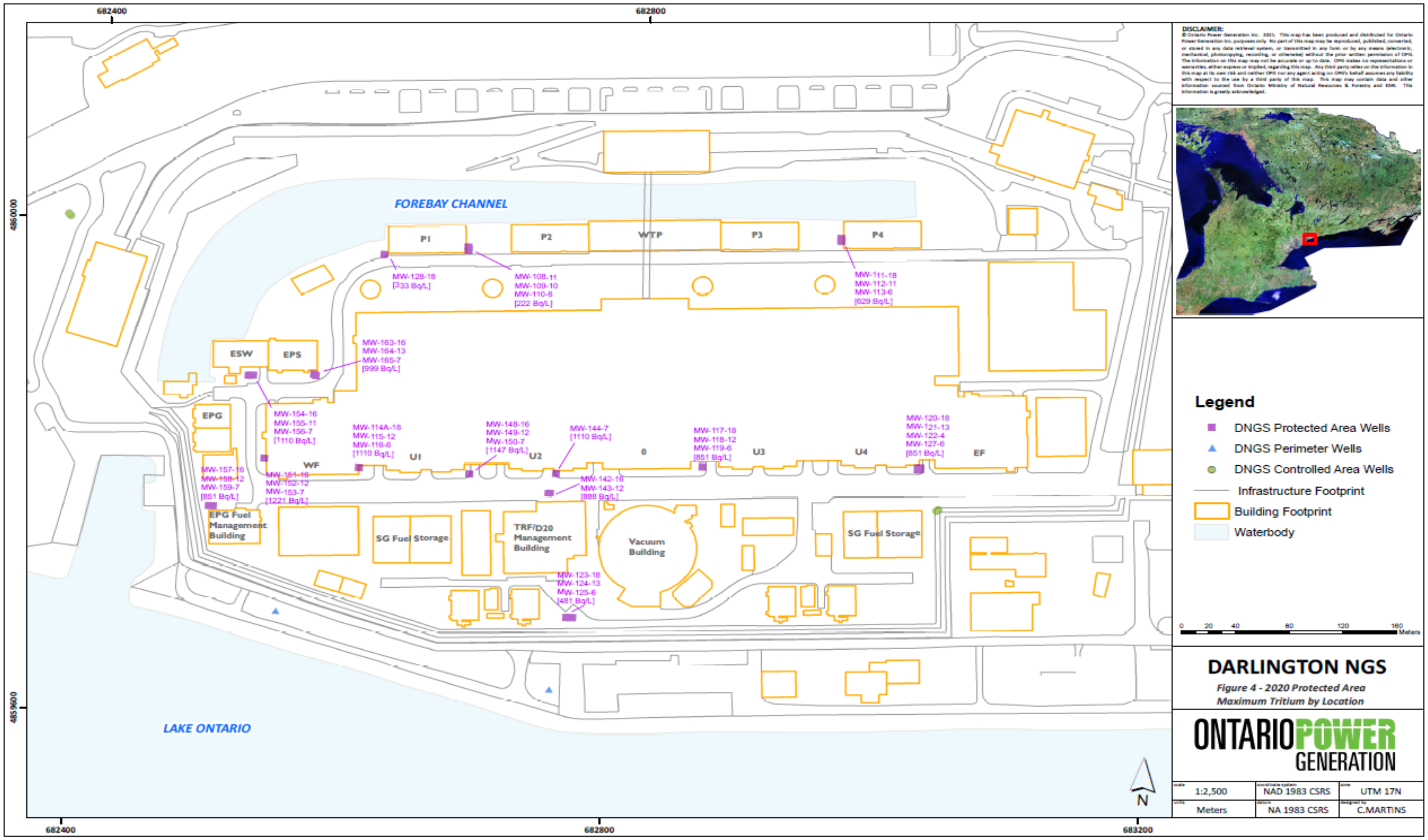


Figure 4: 2020 Protected Area Annual Maximum Tritium by Location

3.2.2 Controlled Area Groundwater Quality

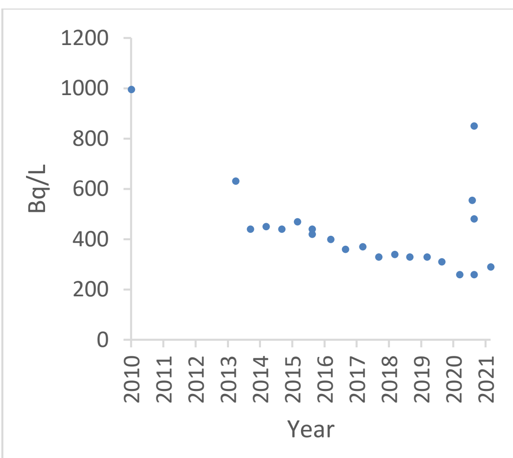
In 2020, 11 monitoring wells were sampled in the controlled area to assess tritium concentrations and trends.

Tritium concentrations in the controlled area wells were slightly elevated in 2020, ranging from <111 Bq/L (<0.003 µCi/L) to a maximum of 1.59 x 10^3Bq/L (0.043 µCi/L) at MW-020C-3. It was suspected that this monitoring well was one of those affected by contamination, either in the samples or the analysis. Results of resampling done in Q2 2021 at MW-020C-3 has shown a significant decrease in tritium concentrations which are in line with monitoring expectation based on historical and operational knowledge.

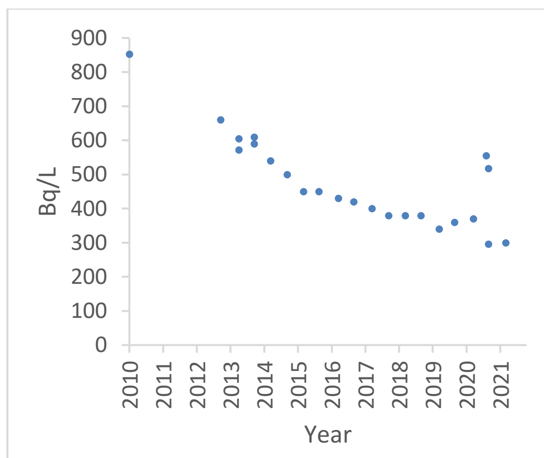
The presence of tritium at MW-003-7 and MW-025-8 is mainly attributed to a past spill from the building effluent lagoon in 2001. Corrective actions to address this spill were implemented. Groundwater monitoring results indicate that tritium concentrations have been declining (Graphs 11 and 12).

Monitoring of groundwater in the controlled area will continue. In particular, surveillance of the lagoon area will continue to ensure due diligence is applied.

The results are further presented in Figure 5 and Table A-2 (Appendix A). Again, for Figure 5, the annual maximum tritium concentration is presented for each monitoring well cluster.



Graph 11: MW-003-7 Tritium Data



Graph 12: MW-025-8 Tritium Data

3.2.3 Petroleum Hydrocarbons and BTEX in Groundwater

In 2020, groundwater monitoring was conducted in the vicinity or downgradient of the Emergency Power Generators, Standby Generators and the Construction Boilerhouse to detect underground fuel oil piping leaks.

Eight monitoring wells were sampled for PHCs and BTEX and their analytical results were compared to the Ministry of the Environment, Conservation and Parks (MECP) Table 3 Standard: “Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act” for 2011, Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition. This comparison was conducted for assessment purposes only, because the Standards are used as a best management practice in this case.

In 2020, there were two results that exceeded the MECP Table 3 standards for PHCs and BTEX. The majority of results were non-detectable.

At MW-143-12, two parameters were detected at concentrations above the Standards in 2020. Sampling done in Q2 2021 however has shown a decline in levels and results are now well below the established standards. This monitoring well had shown some exceedances for PHC parameters in past years (2015 and 2016). This monitoring well was repaired in 2015 due to well integrity issues identified at that time (MW-143-12 did not appear to have an adequate seal at surface and may have been experiencing some surface water infiltration). The results indicate that concentrations have declined following the repairs.

The analytical results for PHCs and BTEX are presented in Table A-4 (Appendix A).

3.3 Objective 3 Results

In 2020, 30 monitoring wells located at the property boundary were sampled.

The 2020 results showed that the level of tritium in 11 monitoring wells were above the method detection limit. Additional samples were collected in Q1 and Q2 of 2021, with the exception of MW-016C-4 and MW-033-8, all samples from perimeter monitoring wells had tritium concentrations of less than 100 Bq/L (0.0027 μCi/L) when they were resampled in Q1/Q2 of 2021. Overall, low tritium concentrations at site-perimeter locations indicated that there are no adverse off-site impacts from DNGS groundwater.

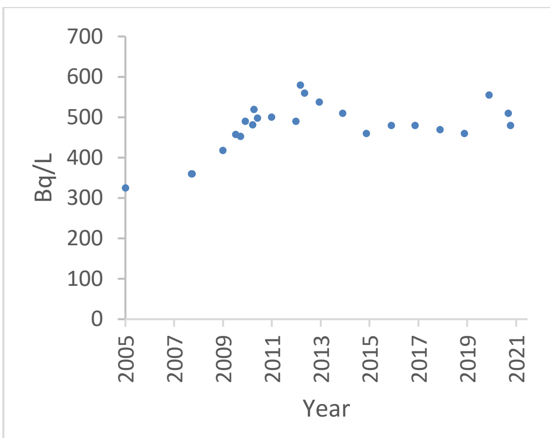
MW-016C-4, located at the southern perimeter of the station, had a 2020 tritium concentration of 5.55×10^2 Bq/L (0.015 μCi/L) and 5.10×10^2 (0.014 μCi/L) in Q1 2021. An increasing tritium trend was observed at this well beginning in 2009 (Graph 13). The increase was attributed to a small portion of tritium migrating from the IWST spill area that occurred in December 2009, and this decrease is expected to continue over time as the source term diminishes. This MW will continue to be monitored.

MW-033-8, located at the western perimeter of the station, had a 2020 concentration of 4.07×10^2 Bq/L (0.011 μCi/L) in 2020, and 2.00×10^2 Bq/L (0.005 μCi/L) when resampled in Q2 2021. This monitoring well will continue to be monitored.

MW-052-15, located to the southeast of the property had a 2020 tritium concentration of 11.47×10^2 Bq/L (0.031 μCi/L). The 2020 field duplicate sample indicated a tritium result of less than the method detection limit. This monitoring location was resampled in Q2 2021, and indicated a tritium concentration of <100 Bq/L (0.0027 μCi/L). This confirmed the tritium concentration at this monitoring well remained low.

As part of the annual OPG DNGS Environmental Monitoring Program, municipal drinking water samples are collected from the downstream Water Supply Plants (WSPs). In 2020, the data from this sampling demonstrated that the annual average tritium concentration at each WSP was well below the Ontario Drinking Water Quality Standard (ODWQS) for tritium of 7,000 Bq/L. This further supports that there were no indications of adverse off-site impacts from DNGS groundwater.

The 2020 data for all of the perimeter groundwater monitoring locations are presented in Figure 5 and Table A-3 (Appendix A).



Graph 13: MW-016C-4 Tritium Data

Figure 5: 2020 Controlled Area and Site Perimeter Maximum Tritium by Location.

4.0 QUALITY ASSURANCE AND QUALITY CONTROL

The Quality Assurance and Quality Control for the groundwater monitoring program encompasses all activities in field sample collection, laboratory analysis and laboratory quality control. The objective is to provide confidence in the interpretation of the DNGS groundwater monitoring data through a systematic and documented process.

4.1 Quality Assurance Program for Laboratories

Kinectrics is accredited to International Organization for Standardization (ISO) 17025 by the Standards Council of Canada for environmental tests. The laboratory is also ISO 9001 registered. Many of the conventional contaminants are governed by criteria established in Ministry of Environment, Conservation and Parks (MCEP) “Guidelines for Use at Contaminated Sites in Ontario” and a companion document entitled “Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario”. Kinectrics has developed their analytical protocols to meet the recommended analytical protocols documented in these publications.

Bureau Veritas is accredited to ISO 17025 by the Standards Council of Canada for environmental tests. Many of the conventional parameters are governed by criteria established in MECP’s “Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act”. Bureau Veritas has a Quality Assurance Department, which routinely monitors procedures and processes by way of compliance audits, quality system audits and method audits to ensure compliance with accreditation and regulatory requirements. Bureau Veritas is also accredited by the Standards Council of Canada for radiological tests.

4.2 Quality Control Results

Duplicates, field blanks, and travel blanks were collected at a prescribed frequency to measure sampling and analytical performance.

In 2020, field duplicate samples were collected from 10 monitoring locations. The analytical results and calculated relative percentage differences (RPD) were evaluated to understand the sampling precision. The RPD values were less than 20 percent in most samples, ranging from zero to 170 percent, resulting in 66 percent of the duplicate sample pairs within acceptable variation. In 2021, the RPD values were less than 20 percent for all samples, ranging from zero to seven percent.

All field blank results were non-detectable. Therefore, no significant contamination of those samples occurred during the sample collection process.

Similarly, all travel blank results were non-detectable as well, indicating that there was no contamination of the samples during handling and transportation.

The sample results discussed above are presented in Tables A-5 and A-6 (Appendix A).

5.0 SUPPLEMENTARY STUDIES AND AUDITS

There were no supplementary studies related to DNGS groundwater initiated in 2020. There were no audits completed on the DNGS groundwater program in 2020.

6.0 CSA N288.7 UPDATE

OPG has committed to the Canadian Nuclear Safety Commission (CNSC) to be compliant with Canadian Standards Association (CSA) N288.7, "Groundwater Protection Programs at Class I Nuclear Facilities and Uranium Mines and Mills", for the Darlington site by December 31, 2022. A gap analysis was completed in 2017. In 2018, OPG retained a vendor to assist with the implementation of the standard at all of the nuclear facilities, and this work continued into 2020. OPG will provide another update in the 2021 report.

7.0 ACRONYMS

µCi/L	*Micro-curie per Litre*
Bq/L	*Becquerel per Litre*
BTEX	*Benzene / Toluene / Ethylbenzene / Xylenes*
CSA	*Canadian Standards Association*
CNSC	*Canadian Nuclear Safety Commission*
DNGS	*Darlington Nuclear Generating Station*
EMP	*Environmental Monitoring Program*
EPG	*Emergency Power Generator*
EPS	*Emergency Power Service*
HU	*Hydrostratigraphic Unit*
IWST	*Injection Water Storage Tank*
MECP	*Ministry of the Environment, Conservation and Parks*
MW	*Monitoring Well*
ODWQS	*Ontario Drinking Water Quality Standard*
OPG	*Ontario Power Generation*
PHC	*Petroleum Hydrocarbon*
RPD	*Relative Percentage Difference*
SAP	*Sampling and Analysis Plan*
WFFA	*West Fueling Facility Auxiliary*
WSP	*Water Supply Plant*

Appendix A: Tables A-1 to A- 6

Table A – 1

2020 DNGS Protected Area Tritium Results

Sample Location Name	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Q 1- 2021	Q 2 - 2021
0-10140-MW-108-11	Bq/L	--	< 111	--	111	--	108
0-10140-MW-109-10	Bq/L	--	222	--	< 111	--	<100
0-10140-MW-110-6	Bq/L	--	185	< 111	< 111	<100	<100
0-10140-MW-111-18	Bq/L	--	629	--	259	--	118
0-10140-MW-112-11	Bq/L	--	370	--	370	--	220
0-10140-MW-113-6	Bq/L	--	333	< 111	222	--	170
0-10140-MW-114A-18	Bq/L	--	999	1110	--	790	--
0-10140-MW-115-12	Bq/L	--	888	1036	814	830	750
0-10140-MW-116-6	Bq/L	--	740	999	1036	770	810
0-10140-MW-117-18	Bq/L	--	555	629	--	560	--
0-10140-MW-118-12	Bq/L	--	740	666	851	850	920
0-10140-MW-119-6	Bq/L	--	740	592	703	750	1040
0-10140-MW-120-18	Bq/L	--	703	--	481	--	540
0-10140-MW-121-13	Bq/L	--	851	--	703	--	780
0-10140-MW-122-4	Bq/L	--	407	--	518	--	420
0-10140-MW-123-18	Bq/L	--	333	444	370	230	210
0-10140-MW-124-13	Bq/L	--	148	259	222	<100	<100
0-10140-MW-125-6	Bq/L	--	481	444	481	250	260
0-10140-MW-127-6	Bq/L	--	481	--	592	--	470
0-10140-MW-128-18	Bq/L	--	333	--	222	--	<100
0-10140-MW-142-16	Bq/L	--	888	--	666	--	610
0-10140-MW-143-12	Bq/L	--	814	--	777	--	620
0-10140-MW-144-7	Bq/L	--	1110	1036	1073	1160	1180
0-10140-MW-148-16	Bq/L	--	N/A	851	814	--	980
0-10140-MW-149-12	Bq/L	--	629	1110	962	700	770
0-10140-MW-150-7	Bq/L	--	814	1147	777	740	670
0-10140-MW-151-16	Bq/L	--	1184	1221	1147	830	--
0-10140-MW-152-12	Bq/L	--	925	1036	1073	800	780
0-10140-MW-153-7	Bq/L	--	740	555	666	520	630
0-10140-MW-154-16	Bq/L	--	1110	666	777	330	740
0-10140-MW-155-11	Bq/L	--	481	703	555	580	550
0-10140-MW-156-7	Bq/L	--	555	518	518	490	620
0-10140-MW-157-16	Bq/L	--	851	814	740	710	720
0-10140-MW-158-12	Bq/L	--	< 111	296	148	118	105
0-10140-MW-159-7	Bq/L	--	333	814	407	610	430
0-10140-MW-163-16	Bq/L	--	925	111	148	<100	450
0-10140-MW-164-13	Bq/L	--	592	444	185	160	490
0-10140-MW-165-7	Bq/L	--	962	999	814	800	770

Notes:

NA denotes that sample could not be collected and result is not available.
--- denotes that samples were not required.
< denotes that result is below the laboratory method detection limit.

Table A-2

2020 DNGS Controlled Area Tritium Results.

Sample Location Name	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Q 2 - 2021
0-10140-MW-003-7	Bq/L	--	259	--	851	290
0-10140-MW-013B-18	Bq/L	--	< 111	--	296	<100
0-10140-MW-014A-12	Bq/L	--	< 111	--	259	<100
0-10140-MW-014B-8	Bq/L	--	< 111	--	259	<100
0-10140-MW-014C-5	Bq/L	--	< 111	--	296	<100
0-10140-MW-019A-19	Bq/L	--	185	--	259	<100
0-10140-MW-019B-14	Bq/L	--	148	--	296	***
0-10140-MW-020A-11	Bq/L	--	148	--	222	<100
0-10140-MW-020B-7	Bq/L	--	370	--	481	210
0-10140-MW-020C-3	Bq/L	--	407	--	1591	180
0-10140-MW-025-8	Bq/L	--	370	--	555	310

Notes:

-- denotes that samples were not required.
< denotes that result is below the laboratory method detection limit.
*** denotes dry well.

Table A – 3

2020 DNGS Perimeter Tritium Results

Sample Location Name	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Q 1 - 2021	Q 2 - 2021
0-10140-MW-006-9	Bq/L	--	< 111	--	--	<100	<100
0-10140-MW-007-2	Bq/L	--	< 111	--	--	<100	<100
0-10140-MW-008-20	Bq/L	--	< 111	--	--	<100	<100
0-10140-MW-015A-19	Bq/L	--	111	--	--	<100	<100
0-10140-MW-016A-10	Bq/L	--	< 111	--	--	<100	<100
0-10140-MW-016C-4	Bq/L	--	555	--	--	510	480
0-10140-MW-017B-15	Bq/L	--	< 111	--	--	--	<100
0-10140-MW-018A-11	Bq/L	--	< 111	--	--	--	<100
0-10140-MW-018C-4	Bq/L	--	< 111	--	--	--	<100
0-10140-MW-032-13	Bq/L	--	148	--	--	--	<100
0-10140-MW-033-8	Bq/L	--	407	--	--	--	200
0-10140-MW-042-20	Bq/L	--	< 111	--	--	--	<100
0-10140-MW-043-8	Bq/L	--	< 111	--	--	--	<100
0-10140-MW-045-10	Bq/L	--	< 111	--	--	--	<100
0-10140-MW-046-6	Bq/L	--	< 111	--	--	--	<100
0-10140-MW-052-15	Bq/L	--	1147	--	--	--	<100
0-10140-MW-058-6	Bq/L	--	222	--	--	--	<100
0-10140-MW-059-12	Bq/L	--	296	--	--	--	<100
0-10140-MW-078-18	Bq/L	--	222	--	--	<100	<100
0-10140-MW-079-4	Bq/L	--	< 111	--	--	133	<100
0-10140-MW-081-17	Bq/L	--	111	--	--	--	<100
0-10140-MW-082-6	Bq/L	--	111	--	--	--	<100
0-10140-MW-095-13	Bq/L	--	< 111	--	--	<100	<100
0-10140-MW-096-6	Bq/L	--	185	--	--	<100	<100
0-10140-MW-170-34	Bq/L	--	185	--	--	--	<100
0-10140-MW-171-13	Bq/L	--	148	--	--	--	<100
0-10140-MW-172-6	Bq/L	--	< 111	--	--	--	<100
0-10140-MW-174-56	Bq/L	--	< 111	--	--	--	<100
0-10140-MW-175-41	Bq/L	--	< 111	--	--	--	<100
0-10140-MW-176-03	Bq/L	--	148	--	--	--	<100

Notes:

-- denotes that samples were not required.
< denotes that result is below the laboratory method detection limit

Table A – 4

2020 DNGS BTEX and Petroleum Hydrocarbon Results

Parameter	Units	MECP Table 3 Standard	0-10140-MW-020A-11	0-10140-MW-020B-7	0-10140-MW-020C-3	0-10140-MW-143-12	
Benzene	ug/L	44	< 0.5	< 0.5	N/A	38.6	
Toluene	ug/L	18000	< 0.5	< 0.5	N/A	1.06	
Ethylbenzene	ug/L	2300	< 0.5	< 0.5	N/A	0.8	
M&p-xylenes	ug/L	--	< 0.4	< 0.4	N/A	34.6	
O-Xylene	ug/L	--	< 0.3	< 0.3	N/A	0.4	
Total Xylenes	ug/L	4200	< 0.7	< 0.7	N/A	35.0	
PHC F1 C06-C10	ug/L	750	< 25	< 25	N/A	466	
PHC F2 C10-C16	ug/L	150	< 100	< 100	N/A	604	
PHC F3 C16-C34	ug/L	500	< 100	< 100	N/A	1750	
PHC F4 C34-C50	ug/L	500	< 100	< 100	N/A	429	
Parameter	**Units**	**MECP Table 3 Standard**	**0-10140-MW-144-7**	**0-10140-MW-158-12**	**0-10140-MW-159-7**	**0-10140-MW-161-12**	**0-10140-MW-162-7**
Benzene	ug/L	44	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Toluene	ug/L	18000	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ethylbenzene	ug/L	2300	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
M&p-xylenes	ug/L	--	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
O-Xylene	ug/L	--	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Total Xylenes	ug/L	4200	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7
PHC F1 C06-C10	ug/L	750	< 25	< 25	< 25	< 25	< 25
PHC F2 C10-C16	ug/L	150	< 100	< 100	< 100	< 100	< 100
PHC F3 C16-C34	ug/L	500	< 100	< 100	< 100	< 100	< 100
PHC F4 C34-C50	ug/L	500	< 100	< 100	< 100	< 100	< 100

Notes:

< denotes that result is below the laboratory method detection limit.
All samples collected in quarter 2.

Table A – 5

2020 DNGS Quality Control Results - Blanks

QA/QC Sample Type Sample ID	Sample Date	Parameter	Units	Result
Field Blank- MW-020A-11 (FB#1)	6/4/2020	Benzene	ug/L	< 0.5
	6/4/2020	Toluene	ug/L	< 0.5
	6/4/2020	Ethylbenzene	ug/L	< 0.5
	6/4/2020	M&p-xylenes	ug/L	< 0.4
	6/4/2020	O-Xylene	ug/L	< 0.3
	6/4/2020	Total Xylenes	ug/L	< 0.7
Field Blank - MW-159-7 (FB#2)	6/2/2020	Benzene	ug/L	< 0.5
	6/2/2020	Toluene	ug/L	< 0.5
	6/2/2020	Ethylbenzene	ug/L	< 0.5
	6/2/2020	M&p-xylenes	ug/L	< 0.4
	6/2/2020	O-Xylene	ug/L	< 0.3
	6/2/2020	Total Xylenes	ug/L	< 0.7
Trip Blank - MW-020A-11 (TB#1)	6/4/2020	Benzene	ug/L	< 0.5
	6/4/2020	Toluene	ug/L	< 0.5
	6/4/2020	Ethylbenzene	ug/L	< 0.5
	6/4/2020	M&p-xylenes	ug/L	< 0.4
	6/4/2020	O-Xylene	ug/L	< 0.3
	6/4/2020	Total Xylenes	ug/L	< 0.7
Trip Blank-MW-159-7 (TB#2)	6/2/2020	Benzene	ug/L	< 0.5
	6/2/2020	Toluene	ug/L	< 0.5
	6/2/2020	Ethylbenzene	ug/L	< 0.5
	6/2/2020	M&p-xylenes	ug/L	< 0.4
	6/2/2020	O-Xylene	ug/L	< 0.3
	6/2/2020	Total Xylenes	ug/L	< 0.7

Note:

< denotes that result is below the laboratory method detection limit.

Table A – 6

2020 DNGS Quality Control Results – Duplicates.

Sample Location Name and Type	Sample Date	Parameter	Units	Qualifer	Results Bq/L	Relative Percentage Difference
0-10140-MW-052-15 Field Duplicate	06/08/2020	H3	Bq/L	<	111	165%
0-10140-MW-052-15 Regular Sample	06/08/2020	H3	Bq/L		1147	
0-10140-MW-079-4 Field Duplicate	06/02/2020	H3	Bq/L	<	111	0%
0-10140-MW-079-4 Regular Sample	06/02/2020	H3	Bq/L	<	111	
0-10140-MW-111-18 Field Duplicate	06/04/2020	H3	Bq/L		185	109%
0-10140-MW-111-18 Regular Sample	06/04/2020	H3	Bq/L		629	
0-10140-MW-111-18 Field Duplicate	10/21/2020	H3	Bq/L		259	0%
0-10140-MW-111-18 Regular Sample	10/21/2020	H3	Bq/L		259	
0-10140-MW-118-12 Field Duplicate	06/05/2020	H3	Bq/L		481	42%
0-10140-MW-118-12 Regular Sample	06/05/2020	H3	Bq/L		740	
0-10140-MW-118-12 Field Duplicate	08/21/2020	H3	Bq/L		1036	43%
0-10140-MW-118-12 Regular Sample	08/21/2020	H3	Bq/L		666	
0-10140-MW-118-12 Field Duplicate	10/22/2020	H3	Bq/L		777	9%
0-10140-MW-118-12 Regular Sample	10/22/2020	H3	Bq/L		851	
0-10140-MW-121-13 Field Duplicate	06/052020	H3	Bq/L		851	0%
0-10140-MW-121-13 Regular Sample	06/052020	H3	Bq/L		851	
0-10140-MW-121-13 Field Duplicate	10/23/2020	H3	Bq/L		1332	62%
0-10140-MW-121-13 Regular Sample	10/23/2020	H3	Bq/L		703	
0-10140-MW-149-12 Field Duplicate	06/08/2020	H3	Bq/L		1073	52%
0-10140-MW-149-12 Regular Sample	06/08/2020	H3	Bq/L		629	
0-10140-MW-149-12 Field Duplicate	08/21/2020	H3	Bq/L		1147	3%
0-10140-MW-149-12 Regular Sample	08/21/2020	H3	Bq/L		1110	
0-10140-MW-149-12 Field Duplicate	10/22/2020	H3	Bq/L		1036	7%
0-10140-MW-149-12 Regular Sample	10/22/2020	H3	Bq/L		962	
0-10140-MW-151-16 Field Duplicate	06/02/2020	H3	Bq/L		1147	3%
0-10140-MW-151-16 Regular Sample	06/02/2020	H3	Bq/L		1184	
0-10140-MW-151-16 Field Duplicate	08/121/2020	H3	Bq/L		1036	16%

Notes:

< denotes that result is below the laboratory method detection limit.

Sample Location Name and Type	Sample Date	Parameter	Units	Qualifer	Results Bq/L	Relative Percentage Difference
0-10140-MW-151-16 Regular Sample	08/121/2020	H3	Bq/L		1221	
0-10140-MW-162-7 Field Duplicate	06/02/2020	Benzene	ug/L	<	0.5	0%
0-10140-MW-162-7 Regular Sample	06/02/2020	Benzene	ug/L	<	0.5	
0-10140-MW-162-7 Field Duplicate	06/02/2020	Toluene	ug/L	<	0.5	0%
0-10140-MW-162-7 Regular Sample	06/02/2020	Toluene	ug/L	<	0.5	
0-10140-MW-162-7 Field Duplicate	06/02/2020	Ethylbenzene	ug/L	<	0.5	0%
0-10140-MW-162-7 Regular Sample	06/02/2020	Ethylbenzene	ug/L	<	0.5	
0-10140-MW-162-7 Field Duplicate	06/02/2020	M&p-xylenes	ug/L	<	0.4	0%
0-10140-MW-162-7 Regular Sample	06/02/2020	M&p-xylenes	ug/L	<	0.4	
0-10140-MW-162-7 Field Duplicate	06/02/2020	O-Xylene	ug/L	<	0.3	0%
0-10140-MW-162-7 Regular Sample	06/02/2020	O-Xylene	ug/L	<	0.3	
0-10140-MW-162-7 Field Duplicate	06/02/2020	Total Xylenes	ug/L	<	0.7	0%
0-10140-MW-162-7 Regular Sample	06/02/2020	Total Xylenes	ug/L	<	0.7	
0-10140-MW-162-7 Field Duplicate	06/02/2020	PHC F1 C06-C10	ug/L	<	25	0%
0-10140-MW-162-7 Regular Sample	06/02/2020	PHC F1 C06-C10	ug/L	<	25	
0-10140-MW-162-7 Field Duplicate	06/02/2020	PHC F2 C10-C16	ug/L	<	100	0%
0-10140-MW-162-7 Regular Sample	06/02/2020	PHC F2 C10-C16	ug/L	<	100	
0-10140-MW-162-7 Field Duplicate	06/02/2020	PHC F3 C16-C34	ug/L	<	100	0%
0-10140-MW-162-7 Regular Sample	06/02/2020	PHC F3 C16-C34	ug/L	<	100	
0-10140-MW-162-7 Field Duplicate	06/02/2020	PHC F4 C34-C50	ug/L	<	100	0%
0-10140-MW-162-7 Regular Sample	06/02/2020	PHC F4 C34-C50	ug/L	<	100	
0-10140-MW-171-13 Field Duplicate	06/11/2020	H3	Bq/L		1850	170%
0-10140-MW-171-13 Regular Sample	06/11/2020	H3	Bq/L		148	
0-10140-MW-175-41 Field Duplicate	06/11/2020	H3	Bq/L		370	108%
0-10140-MW-175-41 Regular Sample	06/11/2020	H3	Bq/L		111	

< denotes that result is below the laboratory method detection limit.