ONTARIOPOWER GENERATION

Report

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DARLINGTON NEW NUCLEAR PROJECT SUPPORTING ENVIRONMENT STUDIES - ENVIRONMENT

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DARLINGTON NEW NUCLEAR PROJECT SUPPORTING ENVIRONMENT STUDIES - ENVIRONMENT

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NK054-REP-01210-0001	14 May 2020	Original Issue
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EXECUTIVE SUMMARY

Ontario Power Generation Inc. (OPG) currently maintains a Nuclear Power Reactor Site Preparation Licence (PRSL) 18.00/2022, issued by the Canadian Nuclear Safety Commission (CNSC) in August 2012, for the Darlington New Nuclear Project (DNNP). The DNNP site is located within the Darlington Nuclear (DN) site in the Municipality of Clarington, in the Region of Durham, approximately 70 km east of the city of Toronto.

The DNNP PRSL allows OPG to conduct site preparation activities for the future construction and operation of a new nuclear generating station on the DNNP site adjacent to the existing Darlington Nuclear Generating station (DNGS).

To fulfill OPG's *Application for a Licence to Prepare Site for the Future Construction of OPG New Nuclear at Darlington* that OPG submitted in 2009, (hereinafter referred to as the 2009 application) and to support DNNP's environmental assessment (EA), OPG undertook extensive studies and thorough consultations to complete the site evaluation, assessment of effects of the environment on the project and assessment of effects of the project on the environment over the lifecycle of the DNNP facility. Additionally, OPG has made a number of commitments that must be addressed to ensure regulatory compliance associated with DNNP activities, which are listed in the *Darlington New Nuclear Project Commitments Report* (DNNP Commitments Report) (OPG 2019c).

The current PRSL expires on August 17, 2022; as such OPG is applying to renew the licence for another 10 years. The process and methodology for application renewal is described in the *Darlington New Nuclear Project Power Reactor Site Preparation Licence Renewal Plan* (DNNP PRSL Renewal Plan) (OPG 2019a) which describes the development of discipline specific Licence Renewal Activity Reports.

In 2009, initial application materials were prepared in compliance with RD-346 *Site Evaluation for Nuclear Power Plants* and all applicable codes and standards at that time; however, RD-346 was replaced in 2019 with REGDOC 1.1.1 *Site Evaluation and Site Preparation for New Reactor Facilities*. Therefore, as identified in the DNNP PRSL Renewal Plan, the requirements of REGDOC 1.1.1 will be addressed and relevant baseline information will be updated. This report is a supporting document to the *DNNP – Site Preparation Licence Renewal Activity Report - Environment* (Licence Renewal Activity Report – Environment), and addresses the following activities identified in the DNNP PRSL Renewal Plan as it pertains to environmental components of the DNNP site evaluation:

1. Addressing REGDOC 1.1.1 requirements and guidance which includes:
    a) A review of 2009 application materials against REGDOC 1.1.1 requirements and guidance and addressing any gaps that are identified, and

b) Addressing the passage of time since the 2009 application submission through;

   i. a review of current codes, standards and practices referenced in the Licensing Basis and those associated with REGDOC 1.1.1.

   ii. updating or reviewing selected baseline data associated with the site.

The following environmental components were considered in this review:

- Climate, Meteorology and Air Quality;
- Geology and Hydrogeology;
- Hydrology, Surface Water and Sediment Quality;
- Aquatic Communities;
- Terrestrial Communities; and
- Radiation and radioactivity (discussed within each of the environmental components listed above).

Six sections of REGDOC 1.1.1 containing potential gaps were identified. Review of these gaps against studies and reports conducted since the 2009 application for the DNNP PRSL, as well as the DNNP Commitments Report (OPG 2019c), demonstrated that the intent of REGDOC 1.1.1 has been satisfied.

Seven updated environmental standards were identified from review of REGDOC 1.1.1. An evaluation of these standards identified two containing potential gaps, the updated environmental quality guidelines and Canadian Climate Normals. Additionally, subject matter experts identified updated standards relevant to environment that are not referenced in REGDOC 1.1.1 and therefore were not included in the DNNP PRSL renewal plan (OPG 2019a). Application of these updated standards to baseline data does not alter the original conclusions regarding residual adverse effects of the project or site evaluation.

Review of additional baseline data collected since submission of the 2009 application identified that some baseline conditions had changed. The IWST spill caused an increase in localized concentrations of tritium in groundwater within the DNGS protected area. Sediment at Coot's Pond and Treefrog Pond had elevated levels of some parameters. Ecological land classification had changed due to natural community succession and infrastructure development. New terrestrial Species at Risk (SAR) species have been observed on site. Additionally, other species that previously existed on the site are now a SAR species. Mitigation and commitments documented in the DNNP Commitments Report (OPG 2019c) were developed to reduce, control or eliminate adverse effects. These mitigation and commitments were developed to be adaptable and will be scaled appropriately to address identified changes to baseline as well as to conform to any permitting requirements. All but one change to baseline conditions was adequately addressed by existing commitments. The one exception was the observation of a new retainable Butternut tree. Therefore, an update to commitment D-P-3.7 is proposed to include Butternut in site planting plans through the ESA Notice of Activity process for new Butternut.

It was determined that radioactivity documented in the 2009 supporting documents for air, soil, groundwater, surface water, sediment, aquatic and terrestrial species was similar to current baseline data.

In addition to studies completed since the 2009 application for the DNNP PRSL, field studies were conducted in 2019 to update baseline information and progress DNNP commitments. The following studies are presented for the first time in this supporting document:

1. Lake Ontario Sediment Sampling
2. Nearshore Baseline Gillnetting Study
3. Lake Ontario Water Sampling
4. Darlington Creek Baseflow Monitoring
5. Darlington Creek Tributaries Fish Habitat Assessment
6. Water Sampling in Coot's and Treefrog Ponds
7. Sediment Sampling in Coot's and Treefrog Ponds
8. Soil Quality
9. Air Quality
10. Underwater Video Data Collection in the Infill Area

In general, these studies found that: air, surface water, soil, and sediment quality are of acceptable quality relative to the regulatory requirements of the DNNP activities; fish and fish habitat is well characterized for the DNNP Site Study Area; and any temporal variation in baseline conditions was attributed to natural variation. These findings indicate that the conclusions of the 2009 application supporting documents remain valid.

In conclusion, the DNNP 2009 application and 2009 supporting documents has been reviewed against REGDOC 1.1.1, current codes, standards and practices as well as current site baseline data. While changes have been identified and assessed, their resulting impacts do not change the residual adverse effects of the project, nor the conclusions regarding site evaluation.

TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

ACRONYMS AND ABBREVIATIONS

AAQC	Ambient Air Quality Criteria
ADCP	Acoustic Doppler Current Profiler
AERMOD	Air Dispersion Modelling System
ALARA	As Low as Reasonably Achievable
ANOVA	Analysis of Variance
AQHI	Air Quality Health Index
AQI	Air Quality Index
BACI	Before After Control Impact
BaP	Benzo(a)pyrene
BATEA	Best Available Technology Economically Achievable
BB	Breeding Bird
B-C	Bray-Curtis Dissimilarity Index
BEM	Biological Effects Monitoring
BHA	Butternut Health Assessment
BLM	Biomass Loss Model
BPUE	Biomass Per Unit Effort
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
BV	Benchmark Value
BVL	Bureau Veritas Laboratories
CAAQS	Canadian Ambient Air Quality Standards
CABIN	Canadian Biomonitoring Network
CCME	Canadian Council of Ministers of the Environment
CEAA	Canadian Environmental Assessment Act
CEPA	Canadian Environmental Protection Act
CLOCA	Central Lake Ontario Conservation Authority
CNSC	Canadian Nuclear Safety Commission
COPC	Contaminant of Potential Concern
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
COSSARO	Committee on the Status of Species at Risk in Ontario
CPUE	Catch Per Unit Effort
CSA	Canadian Standards Association
CSQGs	Canadian Sediment Quality Guidelines
CTM	Critical Thermal Methods
CWQG	Canadian Water Quality Guideline
D	Simpson’s Diversity
D/F	Dioxins and Furans
DN	Darlington Nuclear
DNGS	Darlington Nuclear Generating Station
DNNP	Darlington New Nuclear Project
DQOs	Data Quality Objectives
DYEC	Durham-York Energy Centre

E	Evenness
EA	Environmental Assessment
EAM	Equivalent Adult Model
EC	Environment Canada
EcoRA	Ecological Risk Assessment
EIS	Environmental Impact Statement
ELC	Ecological Land Classification
ECCC	Environment and Climate Change Canada
EMP	Environmental Monitoring Program
EMS	Environmental Management System
EPA	Environmental Protection Act
ERA	Environmental Risk Assessment
ESA	Endangered Species Act
EYM	Equivalent Yield Model
GO	Growth Optimum
GTA	Greater Toronto Area
HC DWQG	Health Canada Drinking Water Quality Guidelines
HC FTP CDW	Health Canada Federal-Provincial-Territorial Committee on Drinking Water
HBI	Hilsenhoff Biotic Index
HHRA	Human Health Risk Assessment
HTO	Tritium Oxide
HU	Hydrostratigraphic Units
ILT	Incipient Lethal Temperatures
ind./L	Individuals per Litre
IPWQO	Interim Provincial Water Quality Objectives
IWST	Injection Water Storage Tank
JRP	Joint Review Panel
LEL	Lowest Effect Level
MDL	Method Detection Limit
MECP	Ministry of Environment, Conservation and Parks
MNRF	Ministry of Natural Resources and Forestry
MOE	Ministry of the Environment
MTE	Maximum Temperature for Embryos
MTO	Ministry of Transportation
MWAT	Mean Weekly Average Temperature
NAPS	National Air Pollution Surveillance Program
ND	No Data
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NOEL	No Observable Effects Level
NTU	Nephelometric Turbidity Units
ODWQS	Ontario Drinking Water Quality Standards
OPG	Ontario Power Generation

PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated biphenyl
PHC	Petroleum Hydrocarbons
PM	Particulate Matter
PNGS	Pickering Nuclear Generating Station
PPE	Plant Parameters Envelope
PRSL	Power Reactor Site Preparation Licence
PSQG	Provincial Sediment Quality Guidelines
PWQO	Provincial Water Quality Objectives
QA/QC	Quality Assurance / Quality Control
RBE	Relative Biological Effectiveness
RAIS	Risk Assessment Information System
RPD	Relative Percent Difference
SAHA	Smog and Air Health Advisories
SAQS	Special Air Quality Standards
SAR	Species at Risk
SARA	Species at Risk Act
SARO	Species at Risk Ontario
SHARP	Synchronized Hybrid Ambient Real-time Particulate
SLC	Screening Level Concentration
SMC	St Marys Cement
SO_2	Sulfur Dioxide
SQGs	Soil Quality Guidelines
TDS	Total Dissolved Solids
TEOM	Tapered Element Oscillating Microbalance
THM	Trihalomethanes
TKN	Total Kjeldahl Nitrogen
TOC	Total Organic Carbon
TRC	Total Residual Chlorine
TSD	Technical Support Document
TSP	Total Suspended Particulate
TSS	Total Suspended Solids
USCS	Unified Soil Classification System
US EPA	Environmental Protection Agency (United States)
UCL	Upper Confidence Limit
UILT	Upper Incipient Lethal Temperature
UTM	Universal Transverse Mercator
VOC	Volatile Organic Compound
VTE	Vulnerable, threatened, or endangered
WHO	World Health Organization
WPCP	Water Pollution Control Plant
WSC	Water Survey of Canada
WSP	Water Supply Plant

1.0 INTRODUCTION

1.1 Background

Ontario Power Generation Inc. (OPG) currently maintains a *Nuclear Power Reactor Site Preparation Licence* (PRSL) *18.00/2022* for the Darlington New Nuclear Project (DNNP). The site is located in the Municipality of Clarington, in the Region of Durham, approximately 70 km east of the city of Toronto.

The PRSL allows OPG to conduct site preparation activities for the future construction and operation of a new nuclear generating station.

To fulfill OPG's *Application for a Licence to Prepare Site for the Future Construction of OPG New Nuclear at Darlington* that OPG submitted in 2009, (hereinafter referred to as the 2009 application) and support DNNP's environmental assessment (EA), OPG undertook extensive studies and thorough consultations to complete the site evaluation, assessments of effects of the environment on the project and assessment of effects of the project on the environment over the lifecycle of the DNNP facility.

The current PRSL expires on August 17, 2022; as such OPG is applying to renew the licence for another 10 years. OPG is seeking an early renewal and has requested a licence term for the renewed PRSL starting from August 2021. The process and methodology for application for renewal is described in the *Darlington New Nuclear Project Power Reactor Site Preparation Licence Renewal Plan* (PRSL Renewal Plan) (OPG 2019a), which describes the development of discipline specific Licence Renewal Activity Reports.

EcoMetrix Incorporated (EcoMetrix) was retained by OPG to prepare a *DNNP – Site Preparation Licence Renewal Activity Report - Environment* (Licence Renewal Activity Report – Environment) (OPG 2020) pertaining to the environment that will support the DNNP PRSL renewal in 2021. Ultimately, the Licence Renewal Activity Report - Environment will be submitted to the CNSC along with other discipline specific Licence Renewal Activity Reports in support of DNNP PRSL renewal.

1.2 Purpose of this Report

This report is a supporting document to the Licence Renewal Activity Report – Environment (OPG 2020). The objective of this document is to address the three main licence renewal activities outlined in the PRSL Renewal Plan (OPG 2019a) from an environmental perspective. The details of this objective are described in Section 3.0.

2.0 THE PROJECT

The project scope (description and bounding scenario) remains unchanged from the 2009 application (OPG 2009a).

As described in *Site Evaluation for OPG New Nuclear at Darlington – Nuclear Safety Considerations* (OPG 2009b), the project involves the construction of up to 4800 MW of new nuclear generation. The site evaluation was performed using a technology neutral approach by looking at the bounding impact based on the Plant Parameter Envelope (PPE) (OPG 2009c). The PPE was developed considering four different reactor technologies.

The site evaluation studies were part of the 2009 application for the DNNP PRSL required under the Canadian Nuclear Safety Commission (CNSC) regulatory document RD-346. There are many site evaluation studies, each focusing on a particular aspect of nuclear power reactor site development.

3.0 ASSESSMENT METHODOLOGY

The PRSL Renewal Plan (OPG 2019a) identifies three main licence renewal activity components related to REGDOC 1.1.1. These are: 1) compliance review of the 2009 application materials against REGDOC 1.1.1, 2) address current codes, standards and practices, and 3) revisit baseline data (Figure 3-1).

1) **Compliance review of the 2009 application materials against REGDOC 1.1.1.** Compliance is first addressed in *Compliance Assessment of Darlington New Nuclear Project Site Preparation Licence Materials against REGDOC 1.1.1*, Compliance Assessment) (Kinectrics 2019). Within the compliance review, twenty sections within REGDOC 1.1.1 containing potential gaps were identified (Table 3-1), six of which are relevant to environmental site baseline data and effects of the project on the environment. Each of these is dispositioned in the appropriate sections of this report.

2) **Address current codes, standards and practices.** The environmental subset of codes, standards and practices identified in Table 1 of the PRSL Renewal Plan applicable to site evaluation are evaluated. Any identified relevant codes, standards and practices referenced in REGDOC 1.1.1 were reviewed for updates since the 2009 application and 2009 application supporting documents were published (2009). The detailed review of codes and standards is presented in Appendix A. Potential gaps are identified for two of the seven updated codes and standards relevant to the environment (Table 3-2). In addition, subject matter experts identified updated standards relevant to environment that are not referenced in REGDOC 1.1.1 and therefore were not included in the DNNP PRSL renewal plan (OPG 2019a) (Table 3-3). These potential gaps are evaluated within the relevant chapters of this report.

3) **Revisit baseline data.** This involves evaluation of additional baseline data collected since the 2009 application (OPG 2009a) to determine if the updated data has changed from what was previously reported.

For each of these components, changes or gaps are evaluated to determine if they have the potential to alter the environmental impact conclusions reached in 2009 with respect to effects of the project on the environment after the consideration of mitigation measures that are planned or in place (i.e. residual adverse effects). If there is no change to the residual adverse effects of the project on the environment, then there would be no impacts to the conclusions of the site evaluation.

Potential gaps that could affect residual adverse effects of the project (effects that remain after mitigation) identified in the *Environmental Impact Statement New Nuclear - Darlington*

Environmental Assessment (EIS) (SENES and MMM 2009) or the conclusions of the site evaluation may require updates to existing commitments or new commitments to capture additional or revised requirements.

Within this report, specific components of the environment are addressed within a single chapter. Each of these chapters are structured identically and have the following sections:

- Compliance with REGDOC 1.1.1
- Changes to Codes, Standards and Practices
- Baseline Characterization
  - Study Areas
  - Summary of Baseline Data
- Identification of Changes to Baseline or Standards
- Assessment of Changes
  - Potential for Change in Conclusions of Site Evaluation
  - Additional Commitments (if Required)
    - Mitigating Action
    - Follow-up Monitoring
  - Conclusions

The environmental components (site-specific and regional) addressed in this report include:

- Climate, Meteorology and Air Quality (Chapter 4.0);
- Geology and Hydrogeology (Chapter 5.0);
- Hydrology, Surface Water, and Sediment Quality (Chapter 6.0);
- Aquatic Communities (Chapter 7.0);
- Terrestrial Communities (Chapter 8.0); and,
- Radiation and Radioactivity (throughout Chapters 4.0 to 8.0).

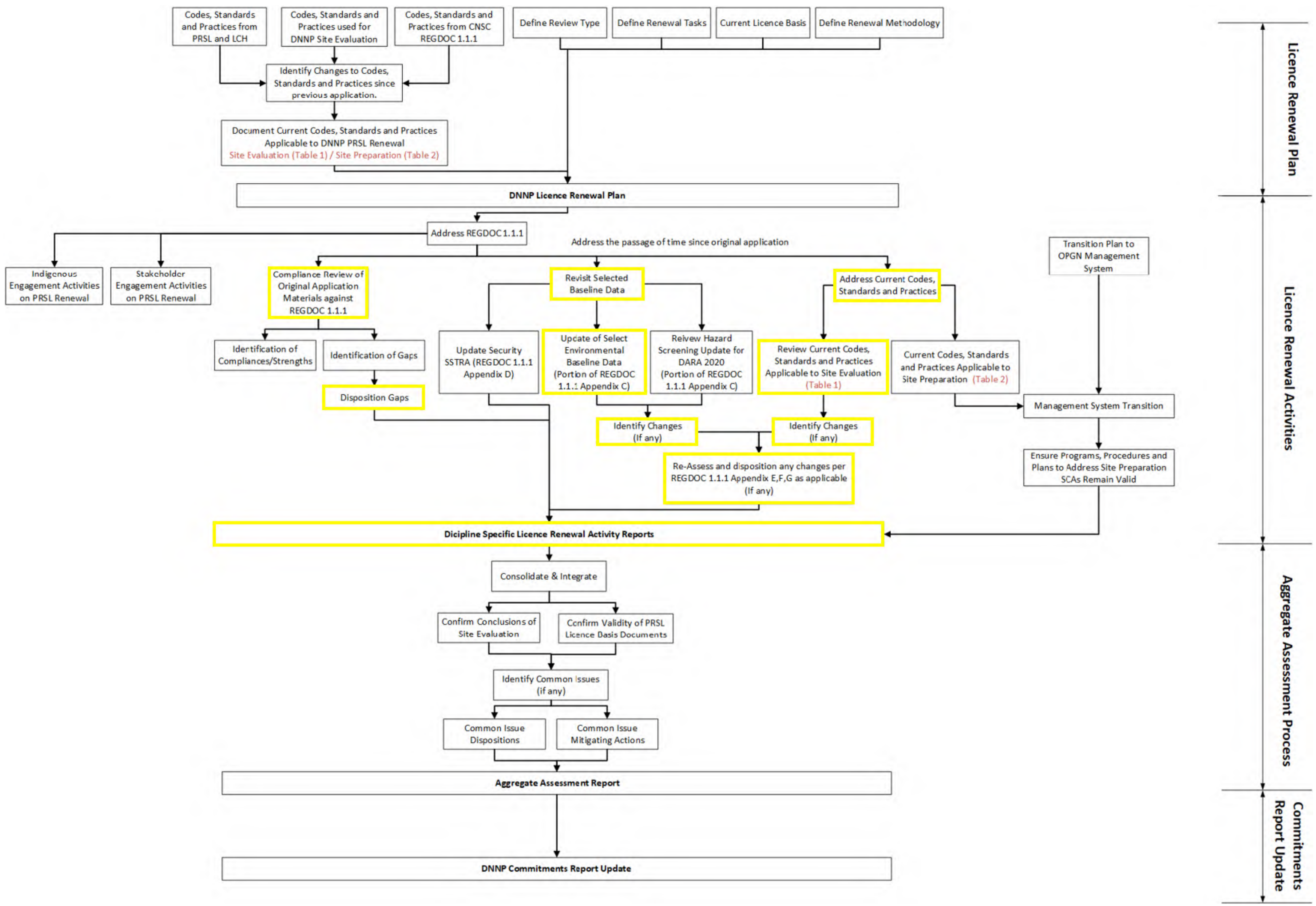

Figure 3-1: Licence Renewal Elements Flow Chart - Taken from PRSL Renewal Plan (OPG 2019a).
Note: Yellow box indicates licence renewal activities associated with this report.

Table 3-1: Sections of REGDOC 1.1.1 Containing Potential Environment Related Gaps Identified in Compliance Assessment

REGDOC 1.1.1 Clause	Title of Clause	Subject for Potential Gap	Environmental Component and Discussion Section
Generic Gap	-	New and updated codes and standards.	See Table 3-2
C.5.4	Baseline hydrogeology and groundwater quality	Rate of transfer between aquifers, and capture zones of wells.	Geology and Hydrogeology (Section 5.5)
C.6	Baseline terrestrial flora, fauna and food chain data	Description of natural and human-induced pre-existing environmental stresses and the current ecological conditions that indicate such stresses.	Terrestrial Communities (Section 8.5)
C.7.1	Baseline aquatic biota and habitat	Multiple Potential Gaps (see Section 7.1).	Aquatic Communities (Section 7.5)
C.7.2	Baseline food chain data	Aquatic reference locations sampled over multiple years to understand year-to-year variability.	Aquatic Communities (Section 7.5)
G.5.4	Effects of thermal plume on the aquatic environment	Model thermal plume, list of susceptible species, potential of gas-bubble disease.	Aquatic Communities (Section 7.5)

Table 3-2: Updated Codes and Standards in REGDOC 1.1.1 Applicable to Environment (OPG 2019a)

Document Number	Document Title	Type of Review	Potential Gap?	Environmental Component and Discussion Section
REGDOC 2.9.1	Environmental Protection: Environmental Principles, Assessments and Protection Measures	Incremental High Level	No (OPG DNNP documents meet the clause requirements)	-
CSA N288.1	Guidelines for Calculating Derived Release Limits for Radioactive Material in Airborne and Liquid Effluents for Normal Operation of Nuclear Facilities	Incremental High Level	No (OPG DNNP documents meet the clause requirements)	-
CSA N288.4	Environmental Monitoring Programs at Class I Nuclear Facilities and Uranium mines and Mills	High Level	No (OPG DNNP documents meet the clause requirements)	-
CSA N288.5	Effluent Monitoring Programs at Class I Nuclear Facilities and Uranium Mines and Mills	High Level	No (OPG DNNP documents meet the clause requirements)	-
CSA N288.6	Environmental Risk Assessment at Class I Nuclear Facilities and Uranium Mines and Mills	Clause by Clause	No (OPG DNNP documents meet the clause requirements)	-
CCME	Canadian Environmental Quality Guidelines	Incremental High Level	Yes (New Canadian Ambient Air Quality Standards)	Climate, Meteorology and Air Quality (Section 4.4.2)
CCME	Canadian Environmental Quality Guidelines	Incremental High Level	Yes (Changes to Soil Quality Guidelines)	Geology and Hydrogeology (Section 5.4.1)

Document Number	Document Title	Type of Review	Potential Gap?	Environmental Component and Discussion Section
CCME	Canadian Environmental Quality Guidelines	Incremental High Level	Yes (Changes to Canadian Water Quality Guidelines)	Hydrology, Surface Water and Sediment Quality (Section 6.4.2)
Government of Canada	Canadian Climate Normals	Incremental Clause by Clause	Yes (Climate Normals Updated)	Climate, Meteorology and Air Quality (Section 4.4.1)

Note: Full evaluation of these codes and standards cited within REGDOC 1.1.1 is presented in Appendix A.

Table 3-3: Updated Codes and Standards, Applicable to Environment that are not in REGDOC 1.1.1

Provincial/ Federal	Code/Standard	Potential Gap?	Environmental Component and Discussion Section
Province of Ontario	Ambient Air Quality Criteria	Yes (Changes to Guidelines)	Climate, Meteorology and Air Quality (Section 4.5.1)
Province of Ontario	Table 3 Full Depth Generic Site Conditions Standards in a Non Potable Ground Water Condition – (Non-Potable Groundwater)	Yes (Changes to Guidelines)	Geology and Hydrogeology (Section 5.5.1)
Province of Ontario	Ontario Drinking Water Quality Standards	No (Guidelines have not changed)	Geology and Hydrogeology (Section 5.2)

Provincial/ Federal	Code/Standard	Potential Gap?	Environmental Component and Discussion Section
Province of Ontario	Table 3 Full Depth Generic Site Conditions Standards in a Non Potable Ground Water Condition – Soil Standards other than Sediment (Industrial / Commercial / Community Property Use)	Yes (Changes to Guidelines)	Geology and Hydrogeology (Section 5.5.1)
Government of Canada	Health Canada's Guidelines for Canadian Drinking Water Quality	Yes (Changes to Guidelines)	Hydrology, Surface Water and Sediment (Section 6.5.1)
Province of Ontario	Provincial Water Quality Objectives, including Interim Objectives	Yes (Changes to Guidelines)	Hydrology, Surface Water and Sediment (Section 6.5.1)
Province of Ontario	Provincial Sediment Quality Guidelines (Lowest Effect Level)	No (Guidelines have not changed)	Hydrology, Surface Water and Sediment (Section 6.4.3.2)
Province of Ontario	*Endangered Species Act*	Yes (Changes to Species List)	Aquatic Communities (Section 7.5.1) Terrestrial Communities (Section 8.5.1)
Government of Canada	*Species at Risk Act*	Yes (Changes to Species List)	Aquatic Communities (Section 7.5.1) Terrestrial Communities (Section 8.5.1)

4.0 BASELINE CLIMATE, METEOROLOGY AND AIR QUALITY

4.1 Compliance with REGDOC 1.1.1

Kinectrics (2019) did not identify any gaps associated with REGDOC 1.1.1 with respect to climate, meteorological data, and air quality. Baseline information for climate, meteorological data, and air quality was found to be compliant with REGDOC 1.1.1.

The current regional and local air quality data presented in this report are sufficient to characterize background conditions for the purposes of licence renewal. Supplemental on-site air quality monitoring stations will be commissioned prior to site preparation activities and will operate for the duration of the project as per commitment D-P-12.2 of the *Darlington New Nuclear Project Commitments Report* (DNNP Commitments Report) (OPG 2019c).

4.2 Changes to Codes, Standards and Practices

Since the 2009 application, the following three applicable codes and standards have been updated or introduced:

- Canadian Climate Normals (updated);
- Ontario Ambient Air Quality Criteria (AAQC) for acrolein (updated) and benzo(a)pyrene (updated); and,
- Canadian Council of Ministers of the Environment (CCME) Canadian Ambient Air Quality Standards (CAAQS) (new).

As identified in Appendix A, the Canadian Climate Normals have been updated since the 2009 application. At that time, the most recent Canadian Climate Normals available were 1971-2000. This information is used for air modeling purposes and is used within the *Atmospheric Environment- Assessment of Environmental Effects Technical Support Document, New Nuclear – Darlington Environmental Assessment* (Atmospheric Environment Environmental Effects TSD) (SENES 2009a), as well as the – *Site Evaluation of the OPG New Nuclear at Darlington – Part 4: Evaluation of Meteorological Events* (Site Evaluation Of Meteorological Events) (AMEC NSS 2009a). This same information is also used to characterize baseline climate and meteorological conditions described in the *Atmospheric Environment - Existing Environmental Conditions Technical Support Document, New Nuclear – Darlington Environmental Assessment* (Atmospheric Environment Existing Conditions TSD) (SENES 2009b). The updated Canadian Climate Normals for the DNNP Local Study Area are presented below in Section 4.3.2.1.1 and discussed further in Section 4.4.1.1.

Also identified in Appendix A, were changes to acrolein and benzo(a)pyrene (BaP) guidelines. The volatile organic compound (VOC), acrolein, was used as surrogate for all VOCs and all polycyclic aromatic hydrocarbons (PAHs) combined in the assessment of effects on air quality (SENES 2009a) as this was the most restrictive contaminant overall. The 24-hr Ontario Ambient Air Quality Criteria (AAQC) for acrolein has increased from 0.08 µg/m³ to 0.4 µg/m³ (MECP 2018a) since reporting of the two Atmospheric Environment TSDs (SENES 2009a and b). Acrolein remains the most restrictive VOC but it is no longer the most restrictive contaminant for VOCs and PAHs combined. The current AAQC for the PAH BaP is very low at 0.00005 µg/m³, which makes this PAH the most restrictive contaminant overall (i.e., all VOCs and PAHs combined) (MECP 2018b). This change is discussed further in sections 4.4 and 4.5.

Following the submission of the Atmospheric Environment Existing Conditions TSD and Atmospheric Environment Environmental Effects TSD, the Canadian Council of Ministers of the Environment (CCME) established the Canadian Ambient Air Quality Standards (CAAQS) in May 2013. The CAAQS were initially established as non-binding target levels for air quality across Canada. Since this time, however, Environment and Climate Change Canada (ECCC) has adopted and begun to enforce these standards. The enforcement of these standards by ECCC is being carried out in three phases. The first phase was completed in 2015 and phases two and three are expected in 2020 and 2025, respectively. The implications of these expected changes are addressed in sections 4.4 and 4.5.

4.3 Baseline Characterization

This section provides an overview of the current baseline for climate, meteorology and air quality as required by REGDOC 1.1.1. Baseline data collected in support of the 2009 application for the DNNP PRSL is described in the Atmospheric Environment - Existing Environmental Conditions TSD (SENES 2009b).

4.3.1 Study Areas

The Regional, Local, and Site Study Area boundaries are consistent with those in the Atmospheric Environment Existing Environmental Conditions TSD (SENES 2009b), as shown in Figure 4-1 (Site and Local Study Areas) and Figure 4-2 (Regional Study Area).

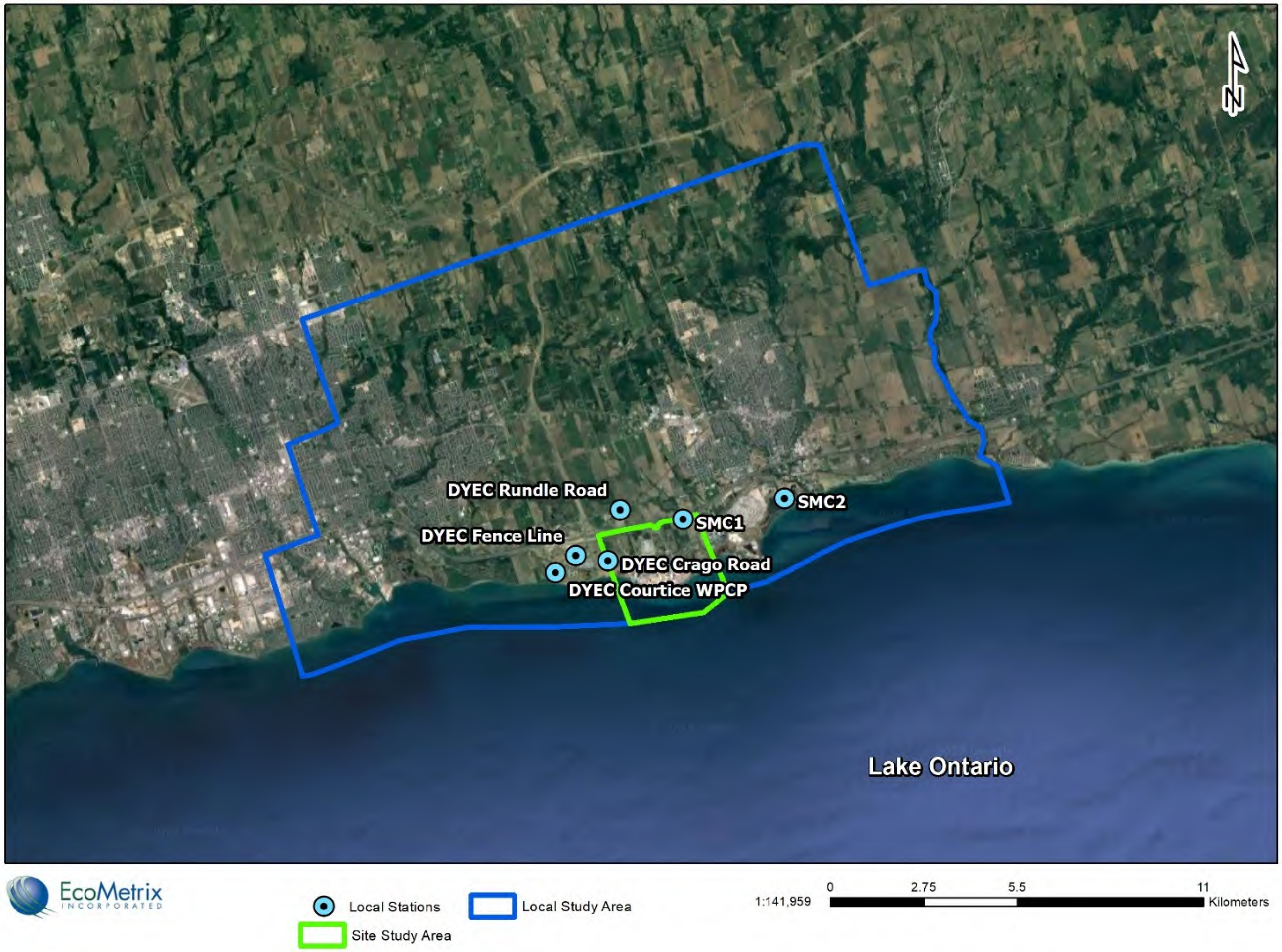

Figure 4-1: DNNP Local and Site Study Areas Air Quality Monitoring Stations

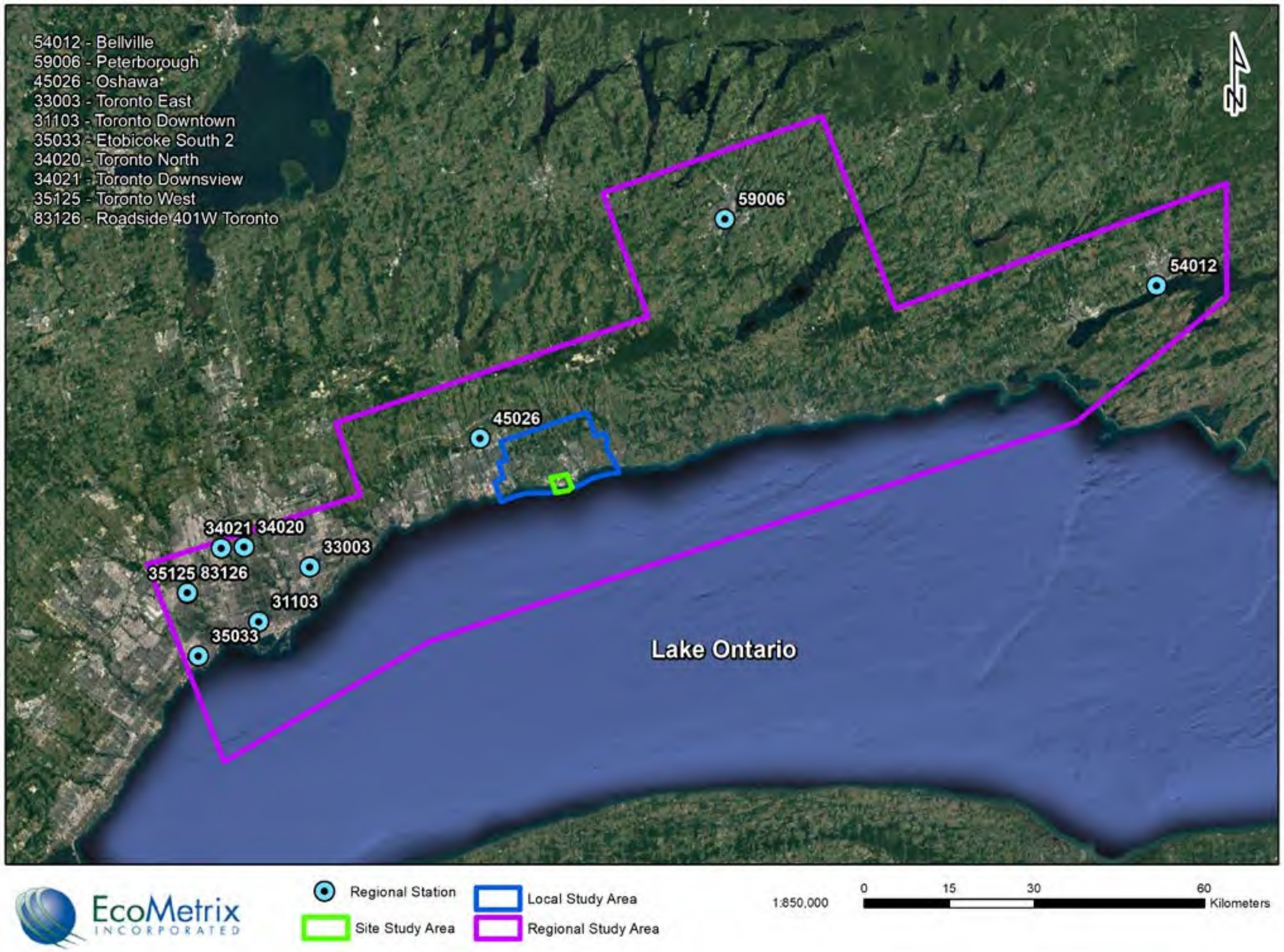

Figure 4-2: DNNP Regional Study Area Air Quality Monitoring Stations

4.3.2 Summary of Baseline Data

Updated data for meteorology, climate and air quality relevant to the Local and Regional Study Areas are described in the following sections.

4.3.2.1 Meteorology and Climate

The DNNP lands are located in southern Ontario on the north shore of Lake Ontario. This area displays a humid continental climate with four distinct seasons. In Southern Ontario, the climate is highly modified by the influence of the Great Lakes which results in uniform precipitation amounts year-round, delayed spring and autumn, and moderated temperatures in winter and summer (ECCC, 1997, cited in SENES and MMM, 2011).

4.3.2.1.1 Temperature and Precipitation

The most recent Canadian Climate Normals available from ECCC span the 1981-2010 period (ECCC, 2019). The meteorological stations at Oshawa and Bowmanville represent the local climate conditions of the DNNP lands (Figure 4-1) while the meteorological station at Toronto's Pearson Airport represents the regional conditions (Figure 4 2). Table 4-1 displays monthly average temperatures and demonstrates that the highest mean temperatures, both regionally and locally, occurred in July, and the lowest mean temperatures occurred in January. Table 4-2 displays mean monthly precipitation and demonstrates that regional mean precipitation was highest in August and lowest in February. Locally, mean precipitation was highest in September and lowest in March (Oshawa) and February (Bowmanville; Table 4-2).

4.3.2.1.2 Wind

The DNNP Site Study Area has a 50 m meteorological tower that measures wind speed and wind direction at 10 m and 50 m levels. The most recent wind data for the DNNP Site Study Area meteorological station is presented in Figure 4-3 as a wind rose (a graphical representation of the frequency of winds from each direction) for the period 2013-2018. The DNNP Site Study Area meteorological tower was not available for much of 2018; therefore, data from OPG's Pickering Nuclear Generating Station was used for that year. The average wind speed measured at a height of 10 m was approximately 2.8 m/s, and calms were reported 16.46% of the time. The prevailing winds blow from the north-west sector. The dominant wind direction is west (8.8% of the time), followed by the west-northwest direction (8.5% of the time).

Table 4-1: Current Temperature Normals for the DNNP Regional and Local Study Areas

Month	Daily Mean (°C)			Mean Daily Maximum (°C)			Mean Daily Minimum (°C)		
	Regional Study Area	Local Study Area		Regional Study Area	Local Study Area		Regional Study Area	Local Study Area	
	TOR[1]	OSH[2]	BOW[3]	TOR[1]	OSH[2]	BOW[3]	TOR[1]	OSH[2]	BOW[3]
January	-5.5	-4.8	-5.6	-1.5	-1.1	-1.4	-9.4	-8.5	-9.9
February	-4.5	-3.6	-4.4	-0.4	0.1	0	-8.7	-7.3	-8.8
March	0.1	0.4	-0.2	4.6	4.2	4.3	-4.5	-3.5	-4.6
April	7.1	6.6	6.4	12.2	10.8	11.3	1.9	2.5	1.5
May	13.1	12.3	12.4	18.8	16.9	18	7.4	7.7	6.8
June	18.6	17.6	17.5	24.2	22.3	23.1	13	12.9	11.8
July	21.5	20.6	20	27.1	25.1	25.8	15.8	15.9	14.3
August	20.6	20	19.2	26	24.3	24.8	15.1	15.6	13.5
September	16.2	15.9	15	21.6	20.2	20.4	10.8	11.7	9.5
October	9.5	9.5	8.7	14.3	13.3	13.7	4.6	5.6	3.6
November	3.7	4.2	3.4	7.6	7.4	7.2	-0.2	1	-0.4
December	-2.2	-1.2	-2.2	1.4	2.1	1.6	-5.8	-4.4	-6
Year	8.2	8.1	7.5	13	12.1	12.4	3.3	4.1	2.6

[1]Toronto Lester B. Pearson International Airport, 1981-2010 (ECCC 2019).

[2]Oshawa OPCP, 1981-2010 (ECCC 2019).

[3]Bowmanville Mostert, 1981-2010 (ECCC 2019).

Table 4-2: Current Precipitation Normals for the DNNP Regional and Local Study Areas

Month	Mean Precipitation Normals (mm)		
	Regional Study Area	Local Study Area	
	TOR[1]	OSH[2]	BOW[3]
January	51.8	65.6	63.1
February	47.7	56.6	50.5
March	49.8	54.2	55
April	68.5	72.7	70.6
May	74.3	78.9	75.9
June	71.5	73.9	83.8
July	75.7	73.1	63.2
August	78.1	77.4	78.1
September	74.5	94	98.7
October	61.1	70.1	70.8
November	75.1	84.8	88.6
December	57.9	70.7	68.1
Year	785.9	871.9	866.5

[1]Toronto Lester B. Pearson International Airport, 1971-2000 and 1981-2010 (ECCC 20

[2]Oshawa OPCP, 1971-2000 and 1981-2010 (ECCC 2019).

[3]Bowmanville Mostert, 1971-2000 and 1981-2010 (ECCC 2019).

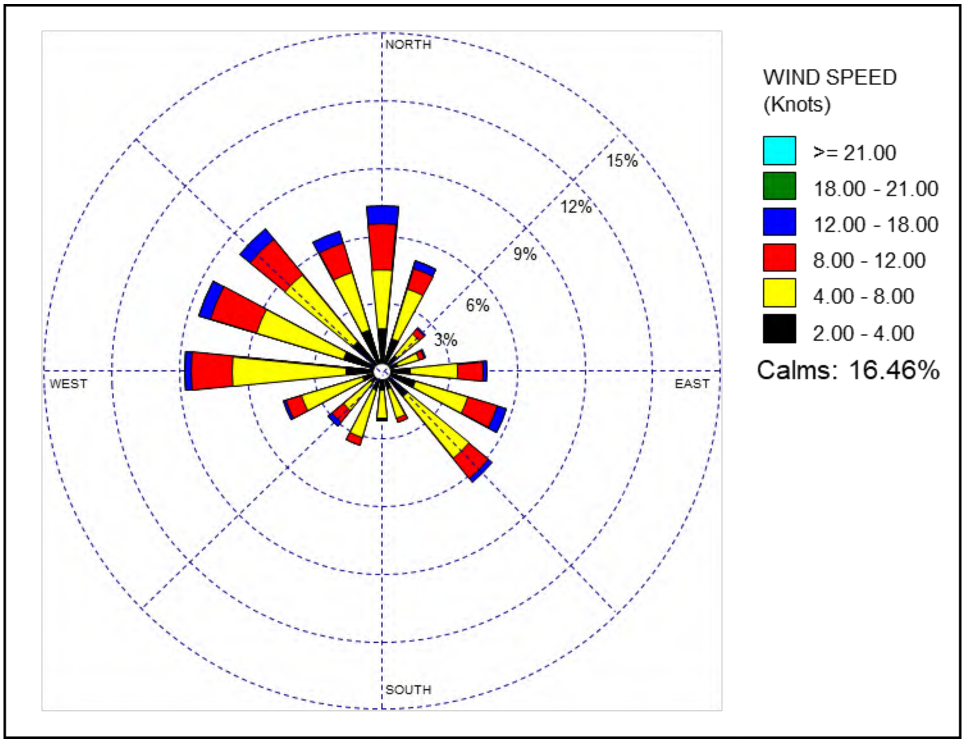

Figure 4-3: Wind Rose at DNNP Site Study Area (2013 to 2018)
Note: Direction is where wind blows from.

4.3.2.2 Local and Regional Air Quality

Air quality monitoring has recently been completed in the Local Study Area at the Durham-York Energy Centre (DYEC) located on Energy Drive east of DNNP. Monitoring was completed at four (4) stations, a downwind location at Crago and Osborne Road (2014-2018), an upwind location at the Courtice Water Pollution Control Plant (WPCP) (2013-2018), a fence line location (2016-2018), and an upwind location at Rundle Road south of Baseline Road (2013-2018; Figure 4-1). These stations satisfy the conditions of the DYEC Environmental Compliance Approval, the commitments set out in their environmental assessment, as well as the Regional Municipality of Durham (the Region) Council's mandate to provide monitoring in the area for a three-year period.

Table 4-3 provides a summary of the DYEC local monitoring stations and a list of contaminants of potential concern (COPCs) that are monitored. The DYEC air quality monitoring includes the key COPCs identified in the DNNP Commitments Report (OPG 2019c), except for acrolein and particulate matter (PM_{10}).

Nitrogen oxides (NO_x), nitric oxide (NO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and $PM_{2.5}$ are continuously monitored, whereas total suspended particulate (TSP), metals, PAH and dioxins and furans (D/F) are monitored non-continuously. It should be noted that non-continuous sampling was stopped temporarily from approximately July 2014 until February 2016 when the DYEC was being commissioned; therefore, the non-continuous data set has less than five years of data.

Monitoring data from the St Marys Cement (SMC) facility (located east of and adjacent to DNNP) was provided for the 2014 to 2018 monitoring years and included PM_{10} sampling. The air quality monitoring program uses real-time continuous (beta attenuation monitors) and non-continuous measurement methods to measure PM_{10} (Table 4-4; SMC 2018). Detailed monitoring data was compiled for two (2) (key) locations (SMC1 and SMC2), which included one location along the SMC south-west property boundary (adjoining the DNNP property boundary) and a farther upwind location on SMC’s north-east boundary.

Supplemental local air monitoring data were also sought from the Ministry of Transportation (MTO) 407 ETR East Phase 2 Design and Construction Project. While air quality monitoring was completed as part of MTO’s 407 East Phase 2 Project, no data was publicly available for review. According to the 407 ETR East Phase 2 Design and Construction Report (Blackbird Infrastructure 407 General Partnership, 2018) and the 2016 Annual Ambient Air Quality Monitoring Report for the DYEC (Stantec 2017), PM_{10}, $PM_{2.5}$ and NO_x monitoring was completed for one (1) year during construction beginning in the spring of 2016. Monitoring results were reportedly provided to the Ministry of Environment, Conservation, and Parks (MECP) on a quarterly basis with an annual summary provided at the end of the program. Given that the monitoring was completed during construction it may overstate particulate levels in the area and is not likely representative of typical baseline conditions (i.e., higher emissions due to construction activities).

From a regional perspective, continuous monitoring data were compiled from the MECP (MECP 2018a) and ECCC’s National Air Pollution Surveillance Program (NAPS) (ECCC 2018) for the same monitoring stations that characterized baseline described in the Atmospheric Environment Existing Environmental Conditions TSD (SENES 2009b). Data, up to and including the year 2017, is currently available from the MECP. Data for 2018 have not been published.

When compiling the regional data, particular attention was paid to establishing whether acrolein, NO_2, SO_2, TSP, $PM_{2.5}$ and PM_{10} monitoring data were available at these stations, since these were the critical COPCs identified in the DNNP Commitments Report (OPG 2019c). Table 4-5 provides a summary of the regional monitoring stations and the current list of conventional COPCs that are monitored at each station.

Table 4-3: Summary of DYEC (Local) Air Quality Monitoring Stations and COPCs

Station Descriptor	Start Year	Measured COPCs								
		NO	NO_2	NO_x	SO_2	TSP	$PM_{2.5}$	Metals	PAH	D/F
Courtice WPCP	2013	■	■	■	■	■	■	■	■	■
Rundle Road	2013	■	■	■	■	■	■	■	■	■
Fence line	2016					■		■		
Crago Road	2014	■	■	■	■	■	■	■	■	■

Table 4-4: Summary of SMC (Local) Air Quality Monitoring Stations and COPC

Station Descriptor	Year	Measured COPC
		PM_{10}
SMC1 (MECP STN45052)	2014	■
SMC2 (MECP STN45053)	2014	■
SMC1 (MECP STN45052)	2015	■
SMC2 (MECP STN45053)	2015	■
SMC1 (MECP STN45052)	2016	■
SMC2 (MECP STN45053)	2016	■
SMC1 (MECP STN45052)	2017	■
SMC2 (MECP STN45053)	2017	■
SMC1 (MECP STN45052)	2018	■
SMC2 (MECP STN45053)	2018	■

Of note, TSP and PM_{10} are not currently monitored at any of the MECP and ECCC regional stations and SO_2, CO, VOCs and PAHs are monitored at only a few locations (Table 4-5). Furthermore, none of the MECP and ECCC regional monitoring stations noted below are inside the DNNP Local Study Area. Oshawa, Peterborough and Belleville remain the most representative locations for OPG within the regional air quality monitoring network.

With respect to $PM_{2.5}$, the MECP replaced its Tapered Element Oscillating Microbalance (TEOM) $PM_{2.5}$ monitors with Synchronized Hybrid Ambient Real-time Particulate (SHARP) $PM_{2.5}$ monitors in 2013. The MECP reported that the TEOM instruments did not perform as well as SHARP monitors, particularly during the winter months (Larken 2018). Overall, the SHARP 5030 reports higher $PM_{2.5}$ concentrations than TEOM during cold weather. The MECP noted that this is not an indication that the air quality has changed; only that the measurements are more accurate. As a result, historical TEOM and 2013-2017 SHARP data are not directly comparable.

Table 4-5: Summary of the Regional Air Quality Monitoring Stations and COPCs

Station Descriptor	MECP ID	NAPS ID	Start Year	Measured COPCs								
				NO	NO_2	NO_x	SO_2	O_3	$PM_{2.5}$	CO	VOC	PAH
Toronto Downtown	31103	60433	2003	■	■	■	■	■	■	■		
Toronto East	33003	60410	1974	■	■	■		■	■			
Toronto North	34020	60421	1988	■	■	■		■	■			
Toronto Downsview	34021	60440	2017	■	■	■		■	■			■
Toronto West	35125	60430	2000	■	■	■		■	■			■
Roadside 401W-Toronto	83126	60438	2010	■	■	■	■	■	■	■		■
Etobicoke South-2	35033	60435	2017	■	■	■		■	■		■	■
Oshawa	45026	61702	2005	■	■	■		■	■			
Belleville	54012	65401	2002	■	■	■		■	■			
Peterborough	59006	61104	1998	■	■	■		■	■			

A complete summary of the air quality data collected is provided in Appendix B, including a summary of the key MECP, DYEC and SMC data and re-produces data for the balance of the previous list of regional stations, including changes to the broader monitoring network that have been implemented since the previous baseline study report was completed.

4.3.2.2.1 Smog

In the DNNP Local Study Area, smog is formed by releases of particulate ($PM_{2.5}$), NO_x and ozone (O_3) from local traffic (Highway 401 in particular), the Greater Toronto Area (GTA), the Golden Horseshoe and as far as the Midwestern United States. Available smog data from the closest and most representative regional station (Oshawa) was obtained from the MECP, which included the former Air Quality Index (AQI) summary data from 2003 to 2015 and the most recent Air Quality Health Index (AQHI) data from 2015 to present (MECP 2018a). A detailed tabular summary is provided in Appendix B.

The previous AQI employed a scale of 0 to 100+ (Table 4-6) with values in Oshawa in the range of 3 to 64. Between 2003 and 2015 reported AQI values fell within the “Good” air quality category 96% of the time. “Moderate” and “Poor” air quality indices were identified 3.1% and 0.3% of the time, respectively. There were no recorded AQIs that were considered “Very Poor”.

Table 4-6: Air Quality Index Values and Categories

Value	Categories
0-15	Very Good
16-31	Good
32-49	Moderate
50-99	Poor
100+	Very Poor

The current AQHI employs a more simplified scale that ranges from 1 to 10+ divided into four health risk categories: low, moderate, high, and very high risk (Table 4-7). From 2015 to 2018, the AQHI values in Oshawa typically fell within the range of 1 to 5, which represent “Low” and “Moderate” air quality health risk categories. AQHI values in the “Low” category occurred 90.9% of the time, while values in the “Moderate” health risk category was 9.1%. There were no recorded AQHI values in the “High” or “Very High” health risk category in the 2015-2018 period.

Table 4-7: AQHI Value and Categories

Value	Category
1-3	Low
4-6	Moderate
7-10	High
10+	Very High

ECCC and MECP also jointly issue Special Air Quality Statements (SAQSs) and Smog and Air Health Advisories (SAHA) (MECP 2018a). SAQSs are issued when the AQHI is forecast to reach, or has reached, the high-risk category (value of 7-10) for one to two hours. A SAQS can also be issued if the AQHI value has not reached the high-risk category, but there is an air quality concern for a particular area that is expected to last for at least three hours. Since 2015, there have been no SAHAs and a total of three SAQS (2015-2017) issued in York-Durham Region (Table 4-8).

Table 4-8: York-Durham SAQS and SAHA (2015-2018)

Station	SAQS 2018*	SAHA 2018*	SAQS 2017	SAHA 2017	SAQS 2016	SAHA 2016	SAQS 2015	SAHA 2015
York - Durham	0	0	1	0	1	0	1	0
NOTES: *As of December 3, 2018								

Despite the area having low to moderate AQHI values, and no SAHAs and limited SAQSs issued to date, OPG is committed to developing “a smog alert action plan for days when there are air quality or smog alerts” (as part of commitment D-P-3.10; OPG 2019c).

4.3.2.2.2 Radionuclides

The *Radioactivity Environment Existing Environmental Conditions Technical Support Document New Nuclear – Darlington Environmental Assessment* (AMEC NSS 2009b), presents baseline concentrations for the following parameters: tritium in air; tritium in precipitation; radioactive particulate in air (including gross beta, Be-7, K-40, Cr-51, Mn-54, Fe-59, Co-57, Co-58, Co-60, Zn-65, Se-75, Zr-95, Nb-95, Ru-103, Ru-106, Ag-110m, Sb-124, Sb-125, Cs-134, Cs-137, Ba-140, La-140, Ce-141, Ce-144, Eu-154, Eu-155, Sr-89, Sr-90); carbon-14 in air; and air kerma due to noble gases and I-131 in air and skyshine at the Regional, Local, and Site Study Area.

Radiological air dispersion modeling was conducted and described in the Atmospheric Environment Existing Environmental Conditions TSD (SENES 2009b). The U.S. Environmental Protection Agency (EPA) air dispersion modelling system (AERMOD) was used to predict atmospheric concentrations of radiological contaminants based on a unit emission rates approach. AERMOD derived dilution factors were developed, which were used to predict elemental tritium concentrations at key receptor locations. The predicted concentrations were within 20% of the observed (measured) value at each location (Table 4-9), which is well within expected model performance (AMEC NSS 2009b).

Table 4-9: Predicted Tritium Concentrations and Observed (Measured) Concentrations

Station ID	Observation (Bq/m^3)	Prediction (Bq/m^3)
REMP1	1.8	2.0
REMP2	1.6	1.0
REMP3	0.9	0.5
REMP4	0.6	0.5
REMP5	0.5	0.8
REMP6	0.4	0.6
REMP7	0.2	0.1
REMP8	0.6	0.3
Average	0.83	0.72
Ratio Predicted/Observed		0.87

Taken from (SENES 2009a).

Since the Atmospheric Environment Existing Conditions TSD (SENES 2009b) was published, OPG has monitored and reported atmospheric radionuclide concentrations at the DNNP Site Study Area for tritium oxide (HTO), C-14, and noble gases (Ar-41, Xe-133, Xe-135, and Ir-192). The latest Environmental Monitoring Program (EMP) report demonstrated that all levels of radionuclides monitored have remained stable since 2009 (OPG 2019d). Graphs of tritium oxide (Figure 4-4) and C-14 (Figure 4-5) measured at the DNNP Site Study Area boundary are presented. Noble Gas parameters measured at the DNNP Site Study Area boundary have average dose rates that are typically below detection limits (OPG 2019d). For both HTO and C-14, a Mann-Kendall trend analysis at the 95% confidence level does not indicate any statistically significant trend over the past 10 years.

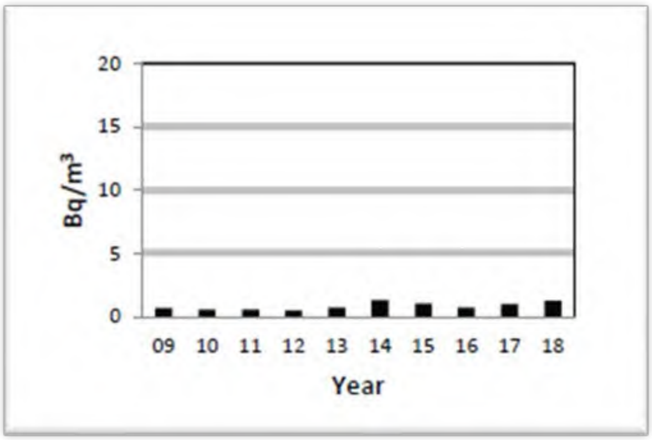

Figure 4-4: Annual average tritium oxide in air

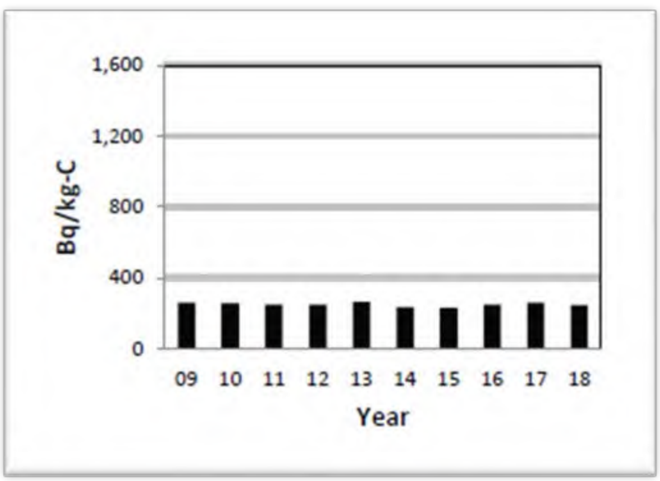

Figure 4-5: Annual average C-14 in air

4.4 Identification of Changes to Baseline or Standards

Changes since 2009 with respect to baseline conditions and/or environmental standards for meteorology, climate and air quality are identified in the following sections. Changes that are considered to warrant assessment of their impact on the conclusions reached previously in 2009 with respect to residual adverse effects of the project on the environment are assessed in Section 4.5.

4.4.1 Meteorology and Climate

4.4.1.1 Temperature and Precipitation

The Atmospheric Environment Existing Conditions TSD (SENES 2009b) presented 1971-2000 temperature and precipitation normals to describe the climate conditions for the DNNP Regional and Local Study Areas. As stated in section 4.3.2.1.1, the most recent Canadian Climate Normals cover the period 1981-2010.

Table 4-10 displays the average monthly temperature for both sets of climate normals. As shown in Figure 4-6, the regional mean temperature (Toronto Pearson Airport) is approximately 2 ^{0}C higher for the recent data in summer and winter months, while the local mean temperature is approximately 0.4 ^{0}C higher for the recent data in summer months and approximately 1 ^{0}C higher for the recent data in winter months. Such increases in temperature were included in the Site Evaluation of Meteorological Events (AMEC NSS 2009a); therefore, the conclusions of the 2009 application supporting documents remain valid and no further assessment is required.

Table 4-11 displays the average monthly precipitation for both sets of climate normals. As shown in Figure 4-7, the difference in regional and local mean precipitation between the recent data set and the previous data set presented in the Atmospheric Environment Existing Conditions TSD (SENES 2009b) is minor. This minor difference in precipitation is accounted for in the Site Evaluation of Meteorological Events (AMEC NSS 2009a); therefore, the conclusions of the 2009 application supporting documents remain valid and no further assessment is required.

4.4.1.2 Wind

The Atmospheric Environment Existing Conditions TSD used wind data from the DNNP Site Study Area meteorological tower from 1996-2000, presented as a wind rose (SENES 2009b). Comparison of the wind rose using 1996-2000 data with a wind rose using the most current data (2013-2018: Figure 4-8) demonstrates that the prevailing winds continue to be from the north-west quadrant. There is a slight increase in average wind speed from that reported in the 2009 Atmospheric Environment Existing Conditions TSD with 1996-2000 and 2013-2018 average wind speeds of 2.6 and 2.8 m/s, respectively. Southerly winds tended to be from the south-west in 1996-2000 and from the south-east in 2013-2018

(Figure 4-8). Calms were reported 7.9% of the time in 1996-2000 and 16.5% of the time in 2013-2018. These wind conditions are encompassed within the Site Evaluation of Meteorological Events (AMEC NSS 2009a); therefore, the conclusions of the 2009 application supporting documents remain valid and no further assessment is required.

Table 4-10: Temperature Normals for the DNNP Regional and Local Study Areas, 1971-2000 and 1981-2010

Month	Daily Mean (°C)						Mean Daily Maximum (°C)						Mean Daily Minimum (°C)					
	Regional Study Area		Local Study Area				Regional Study Area		Local Study Area				Regional Study Area		Local Study Area			
	TOR[1]		OSH[2]		BOW[3]		TOR[1]		OSH[2]		BOW[3]		TOR[1]		OSH[2]		BOW[3]	
	1971-2000	1981-2010	1971-2000	1981-2010	1971-2000	1981-2010	1971-2000	1981-2010	1971-2000	1981-2010	1971-2000	1981-2010	1971-2000	1981-2010	1971-2000	1981-2010	1971-2000	1981-2010
January	-6.3	-5.5	-5.3	-4.8	-6.3	-5.6	-2.1	-1.5	-1.4	-1.1	-1.9	-1.4	-10.5	-9.4	-9.2	-8.5	-10.7	-9.9
February	-5.4	-4.5	-4.4	-3.6	-5.3	-4.4	-1.1	-0.4	-0.6	0.1	-0.9	0	-9.7	-8.7	-8.2	-7.3	-9.7	-8.8
March	-0.4	0.1	0.1	0.4	-0.5	-0.2	4.1	4.6	4.1	4.2	4	4.3	-5	-4.5	-3.8	-3.5	-4.9	-4.6
April	6.3	7.1	6.3	6.6	6	6.4	11.5	12.2	10.5	10.8	10.9	11.3	1	1.9	2	2.5	1.1	1.5
May	12.9	13.1	12.3	12.3	12.2	12.4	18.8	18.8	17	16.9	17.8	18	6.9	7.4	7.6	7.7	6.6	6.8
June	17.8	18.6	17.2	17.6	17.1	17.5	23.7	24.2	21.9	22.3	22.8	23.1	11.9	13	12.4	12.9	11.3	11.8
July	20.8	21.5	20.3	20.6	19.8	20	26.8	27.1	25	25.1	25.5	25.8	14.8	15.8	15.5	15.9	14	14.3
August	19.9	20.6	19.6	20	18.9	19.2	25.6	26	24	24.3	24.5	24.8	14	15.1	15.2	15.6	13.2	13.5
September	15.3	16.2	15.5	15.9	14.7	15	21	21.6	19.7	20.2	20.2	20.4	9.6	10.8	11.2	11.7	9.2	9.5
October	8.9	9.5	9.2	9.5	8.4	8.7	13.9	14.3	13.1	13.3	13.4	13.7	3.9	4.6	5.2	5.6	3.4	3.6
November	3.2	3.7	4	4.2	3.1	3.4	7	7.6	7.2	7.4	6.9	7.2	-0.7	-0.2	0.7	1	-0.7	-0.4
December	-2.9	-2.2	-2	-1.2	-2.7	-2.2	0.9	1.4	1.5	2.1	1.2	1.6	-6.7	-5.8	-5.4	-4.4	-6.6	-6
Year	7.5	8.2	7.7	8.1	7.1	7.5	12.5	13	11.8	12.1	12	12.4	2.5	3.3	3.6	4.1	2.2	2.6

[1]Toronto Lester B. Pearson International Airport, 1971-2000 and 1981-2010 (ECCC 2019)

[2]Oshawa OPCP, 1971-2000 and 1981-2010 (ECCC 2019)

[3]Bowmanville Mostert, 1971-2000 and 1981-2010 (ECCC 2019)

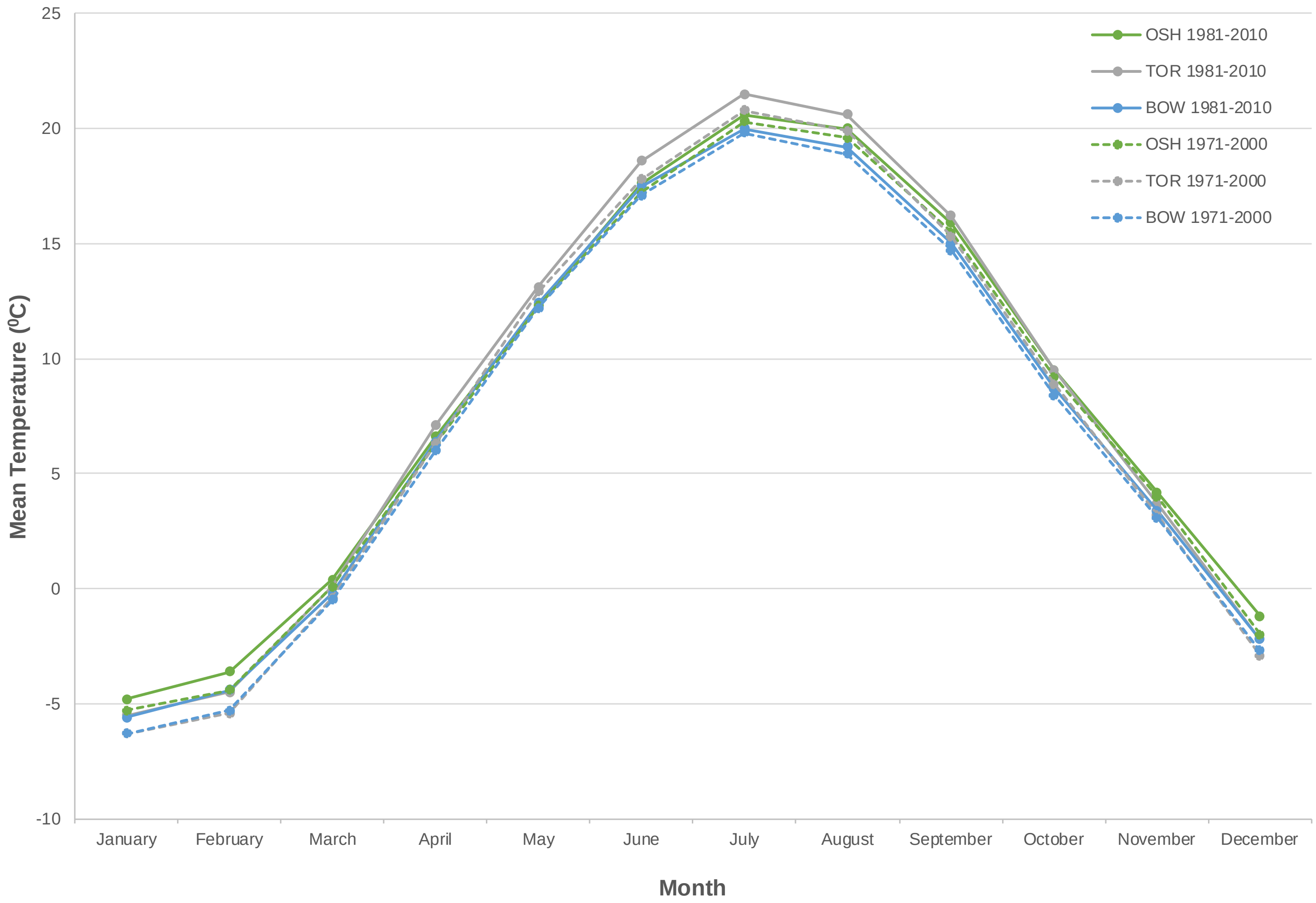

Figure 4-6: Mean Temperature Normals for the DNNP Site Study Area, 1971-2000 and 1981 to 2010

Table 4-11: Precipitation Normals for the DNNP Regional and Local Study Areas, 1971-2000 and 1981-2010

Month	Mean Precipitation Normals (mm)					
	Regional Study Area		Local Study Area			
	TOR[1]		OSH[2]		BOW[3]	
	1971-2000	1981-2010	1971-2000	1981-2010	1971-2000	1981-2010
January	52.2	51.8	71	65.6	63.1	63.1
February	42.6	47.7	52.7	56.6	47.2	50.5
March	57.1	49.8	62.3	54.2	60.7	55
April	68.4	68.5	73.1	72.7	72.9	70.6
May	72.5	74.3	74.7	78.9	73.7	75.9
June	74.2	71.5	80.6	73.9	81.5	83.8
July	74.4	75.7	67.3	73.1	63.7	63.2
August	79.6	78.1	83.3	77.4	81	78.1
September	77.5	74.5	87.9	94	90.5	98.7
October	64.1	61.1	66.3	70.1	67.9	70.8
November	69.3	75.1	79.9	84.8	84	88.6
December	60.9	57.9	78.7	70.7	71.6	68.1
Year	792.7	785.9	877.9	871.9	857.9	866.5

[1]Toronto Lester B. Pearson International Airport, 1971-2000 and 1981-2010 (ECCC 2019)

[2]Oshawa OPCP, 1971-2000 and 1981-2010 (ECCC 2019)

[3]Bowmanville Mostert, 1971-2000 and 1981-2010 (ECCC 2019)

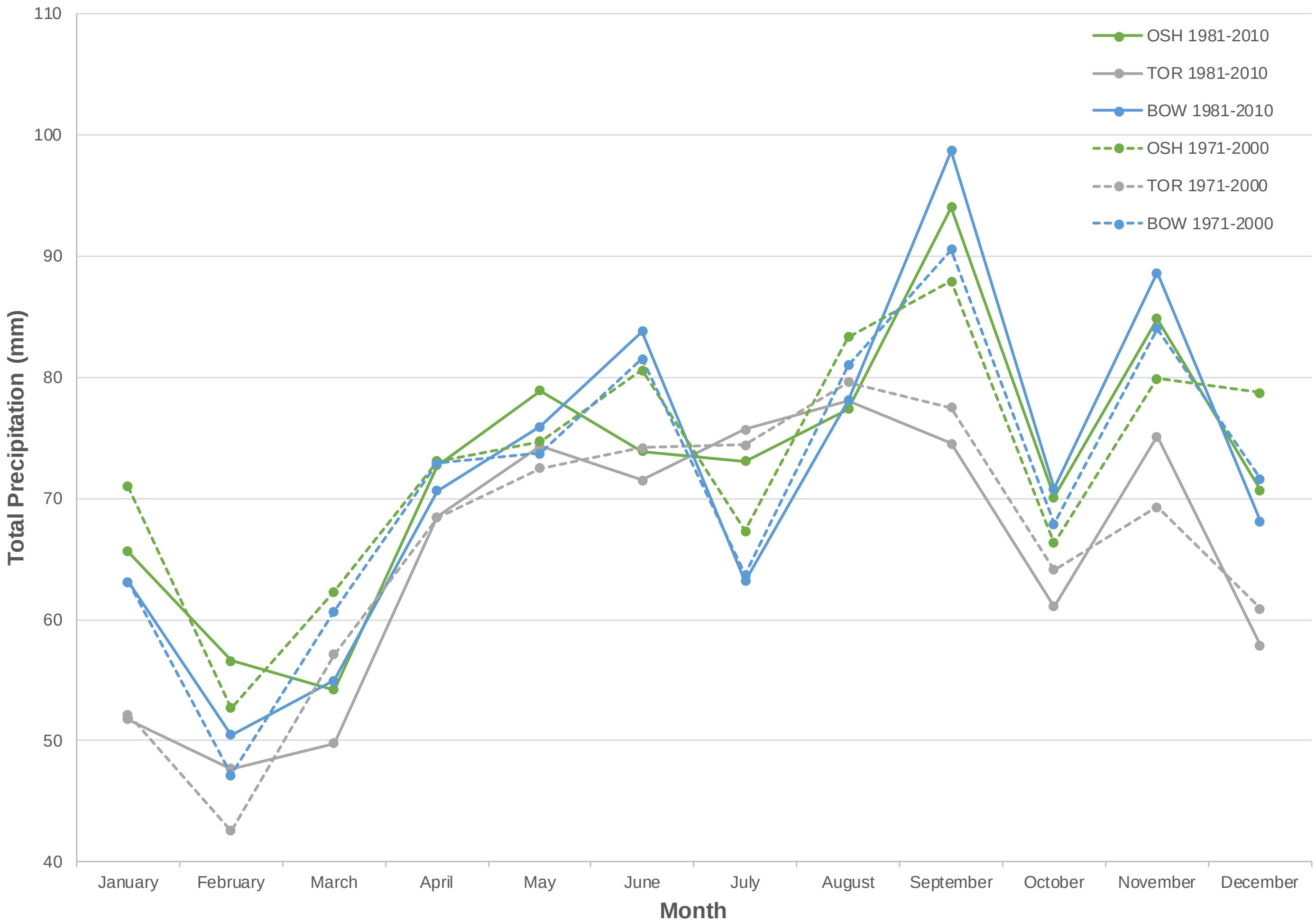

Figure 4-7: Mean Precipitation Normals for the Site Study Area, 1971-2000 and 1981-2010

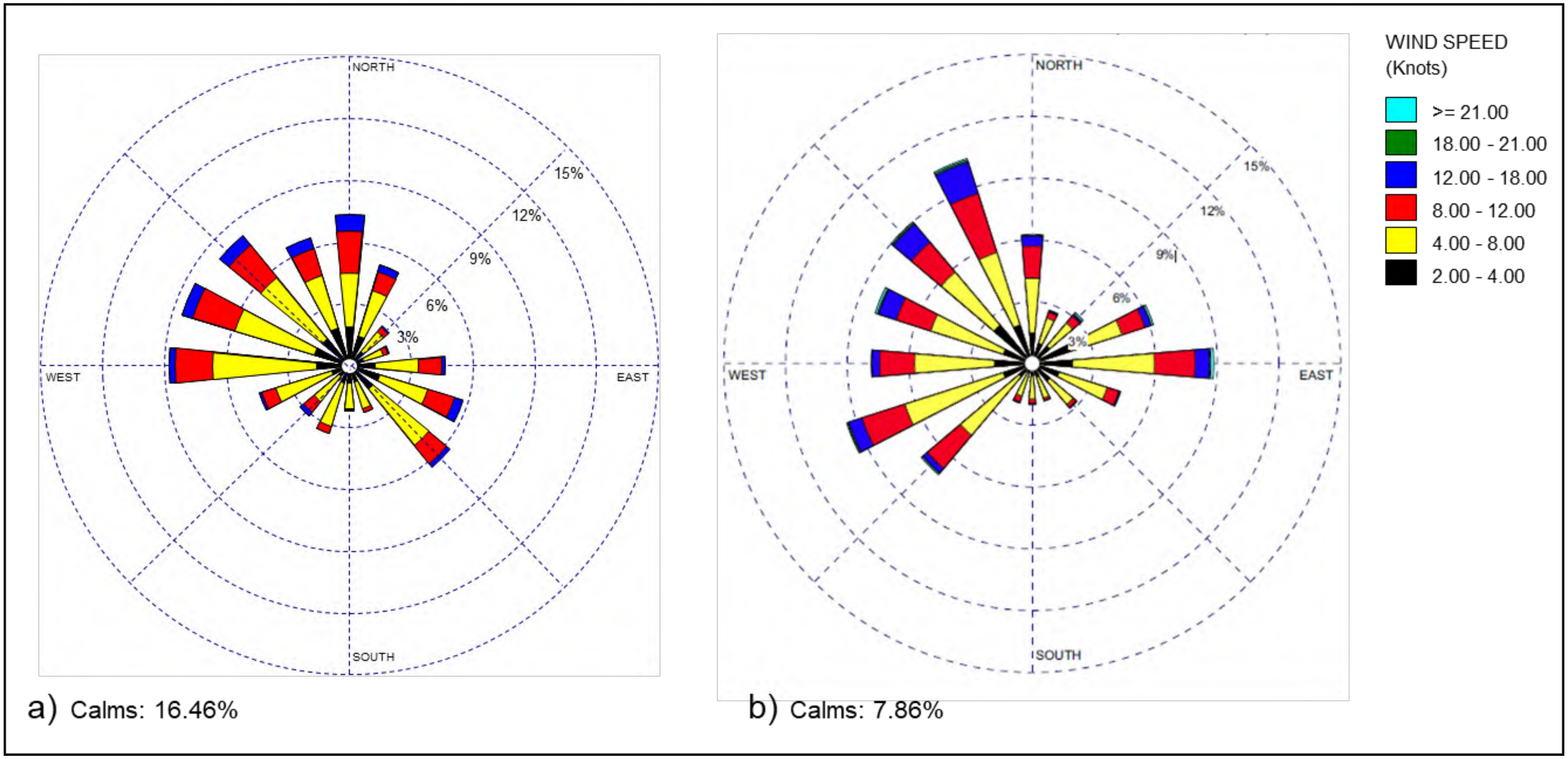

Figure 4-8: Wind Rose at the Site Study Area, a) 2013-2018 and b) 1996-2000

Note: data was unavailable for the DNNP Site Study Area station in 2018; therefore, data from the Pickering Nuclear meteorological station was used for that year.

4.4.2 Air Quality

4.4.2.1 Changes to Baseline

Table 4-12 to Table 4-14 provide an analysis of the previous baseline information and more recent air quality monitoring completed in the Local Study Area. Overall, there has been a reduction in the mean 1-hr and 24-hr NO_2 and SO_2 in the intervening period since the 2009 application supporting documents. The results for the 24-hr and 1-hr NO_2 and SO_2 means are identical and only the results for the 24-hr means are presented in Table 4-12.

Table 4-12 shows the mean 24-hr changes in NO_2 and SO_2, which are presented based on the previous baseline data and the current MECP (Oshawa, Belleville, and Peterborough) and DYEC air quality data. Both the MECP and DYEC show a similar reduction in NO_2 emissions within the 2009-2018 period. A 69% reduction in SO_2 emissions was also noted in the DYEC data between the 2000-2008 and 2009-2018 period.

Table 4-12: Changes in NO_2 and SO_2 Emissions

Metric	Description	Year	NO_2	SO_2
			24hr[2]	24hr[2]
			ppb	ppb
Mean	Previous Regional Data (MECP)	2000-2008	18.5	3.6
	Current Regional Data (MECP)	2009-2017	5.5	ND
	Current Local Data (DYEC)	2014-2018[1]	6.0	1.1
Regional Data		Difference	-13.0	ND
		% Change	-70%	ND
Local Data		Difference	-12.4	-2.5
		% Change	-67%	-69%

[1] Monitoring at DYEC began in 2014; ND = No data available.
[2] Results for 24-hr and 1-hr mean are identical. Only 24-hour results are presented.

Changes in TSP, PM_{10} and $PM_{2.5}$ in the Local Study Area are presented in Table 4-13 and Table 4-14. A 45% reduction of $PM_{2.5}$ was observed. 24-hr TSP and PM_{10} were only slightly higher (+0.2% and +4%) during the 2014-2018 period and were within the range of natural variability recorded at the DYEC and SMC1 stations located in the Local Study Area (TSP ranged from 24.3 to 53.0 µg/m^3; PM_{10} ranged from 9.4 to 17.8 µg/m^3). Previous station locations are displayed in Figure 4-9 and Figure 4-10.

Table 4-13: Changes in TSP and $PM_{2.5}$ (D5/Hepcoe)

Metric	Description	Year	TSP	$PM_{2.5}$
			24hr	24hr
			µg/m³	µg/m³
Mean	Previous Local	2008	31.5	13.5
	Current Local	2014-2018	31.6	7.5

Difference	0.1	-6.0
% Change	0.2%	-45%

Table 4-14: Changes in PM_{10} (D2)

Metric	Description	Year	PM_{10}
			24hr
			µg/m³
Mean	Previous Local	2008	14.2
	Current Local	2014-2018	14.8

Difference	0.6
% Change	4%

Figure 4-9: Previous Local Monitoring Stations for Air Quality Program
Note: Figure taken from Atmospheric Environment Existing Conditions TSD (SENES 2009b).

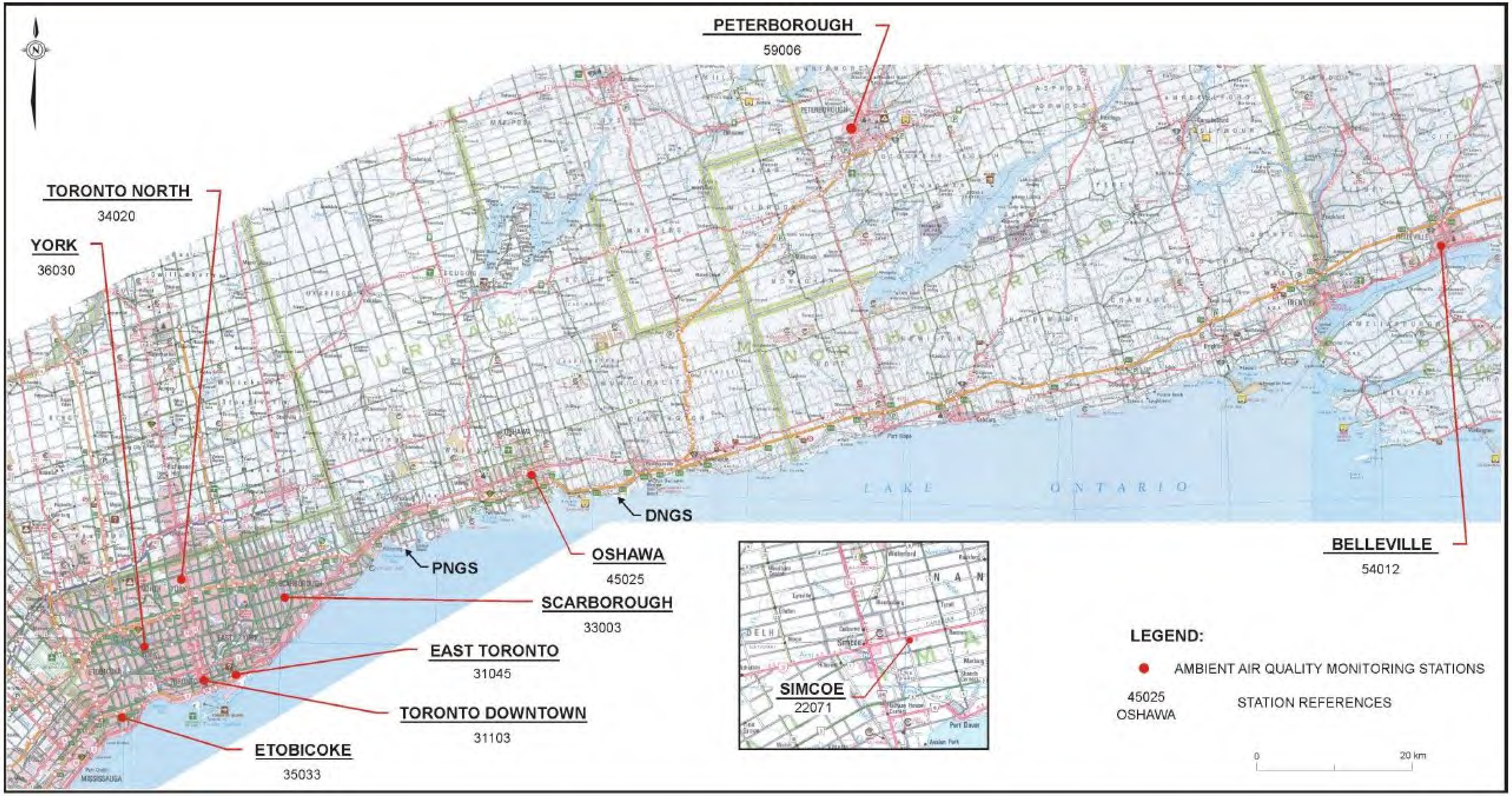

Figure 4-10: Previous Regional Monitoring Stations for Air Quality Program
Note: Figure taken from Atmospheric Environment Existing Conditions TSD (SENES 2009b).

4.4.2.1.1 Radionuclides

As indicated in Section 4.3.2.2.2, the concentrations of tritium oxide, C-14, and noble gases (Ar-41, Xe-133, Xe-135, and Ir-192) have been monitored at the DNNP Site Study Area since before the Atmospheric Environmental Existing Conditions TSD (SENES 2009b) was published.

Mann-Kendall trend analysis at the 95% confidence level did not indicate significant trends for tritium oxide or C-14 in air (OPG 2019d) demonstrating that concentrations have remained relatively constant since 2009. A similar analysis was not conducted for noble gas parameters, as concentrations measured at the DNNP Site Study Area boundary had average dose rates that were typically below detection limits (OPG 2019d).

Due to the fact that the concentration of atmospheric radionuclides has remained relatively constant since 2009, the conclusions of the 2009 application supporting documents remain valid and no further assessment is required.

4.4.2.2 Changes to Standards

4.4.2.2.1 Acrolein and Benzo(a)pyrene

In the previous air quality assessment, the VOC acrolein was found to be the most restrictive contaminant for emissions of VOCs and PAHs from both fixed diesel engines and transportation sources and it was assessed as a surrogate for all VOCs and PAH contaminants. However, the 24-hr Ontario AAQC for acrolein has increased from 0.08 µg/m³ to 0.4 µg/m³ (MECP 2018a). Acrolein remains the most restrictive VOC but it is no longer the most restrictive contaminant for VOCs and PAHs combined. VOC data are collected at one (1) station (Etobicoke South-2) in the Regional Study Area (see Appendix B). VOC data collection were not part of the DYEC or SMC monitoring programs.

The current AAQC for benzo(a)pyrene (BaP) is very low at 0.00005 µg/m^3, (formerly 0.0011 µg/m^3) which makes this PAH the most restrictive contaminant for PAHs and the most restrictive contaminant overall (i.e., all VOCs and PAHs combined) (MECP 2018b). The DYEC monitoring data includes ongoing sampling (24-hour samples every 12 days) for a number of PAHs, including BaP, from 2013-2017 at the Courtice WPCP and Rundle Road stations and from 2016-2017 at the Crago Road Station. It should be noted PAH monitoring in the Regional Study Area also occurs on a 24-hour basis with a relatively small number of samples collected at a limited number of stations (see Appendix B).

4.4.2.2.2 CAAQS for $PM_{2.5}$, NO_2 and SO_2

The air quality standards that were used in the Atmospheric Environment Existing Conditions TSD and Atmospheric Environment Environmental Effects TSD were based on the Ontario AAQC and the CCME Canada Wide Standards that were applicable at the time.

In May 2013, following the preparation of the two Atmospheric Environment TSDs, the CCME established the CAAQS. The CAAQS were initially established as non-binding target levels for air quality across Canada. Since this time, however, ECCC has adopted and begun to enforce these standards. Although many of the CAAQS are not yet in force, they are expected to be applied in two phases, the first phase in 2020 and the second in 2025. Table 4-15 provides a summary of the key changes to the CAAQS for COPCs that are predicted to result in some measurable increase in background concentrations at on-site and off-site receptor locations during site preparation and construction of the DNNP (SENES and MMM, 2009). Receptor locations remain the same as those used in the 2009 application as there are no sensitive receptors that are closer than those previously considered (Table 4-16 and Figure 4-11).

Table 4-15: Changes to Canadian Ambient Air Quality Standards (CAAQS)

Contaminants	Averaging Period	Previous AAQC[7]	CAAQS		
			Apply in 2015	Apply in 2020	Apply in 2025
$PM_{2.5}$	24-hour[1]	30 µg/m³	28 µg/m³	27 µg/m³	~
	Annual[2]	NA	10 µg/m³	8.8 µg/m³	~
NO_2	1-hour[3]	400 ppb	~	60 ppb	42 ppb
	Annual[4]	100 ppb	~	17 ppb	12 ppb
SO_2	1-hour[5]	690 ppb	~	70 ppb	65 ppb
	Annual[6]	60 ppb		5 ppb	4 ppb

NOTES:
[1] Calculated as the 3-year average of the annual 98th percentile of the daily 24-hour average concentrations
[2] Calculated as the 3-year average of the annual average of all 1-hour concentrations
[3] Calculated as the 3-year average of the annual 99th percentile of the SO_2 daily maximum 1-hour average concentrations
[4] Calculated as the average over a single calendar year of all 1-hour average SO_2 concentrations
[5] Calculated as the 3-year average of the annual 98th percentile of the daily maximum 1-hour average concentrations
[6] Calculated as the average over a single calendar year of all 1-hour average concentrations
[7] Ambient air quality criteria used in the previous assessment included Ontario Ministry of the Environment and Environment Canada and Climate Change
[8] CAAQS http ://airquality-qualitedelair.ccme.ca/en/

Table 4-16: Air Quality Receptor Summary

Sub-Component	Receptor ID	Description
Socio-Economic Community Services	R1	Dr. Ross Tilley Public School
	R2	Holy Family Catholic Elementary
	R3	Bowmanville Sports Field
	R4	Upper Soccer Fields
	R5	Lower Soccer Fields
	R6	OPG Baseball Diamond
	R7	Oshawa General Racing Pigeon Club
	R8	Darlington Provincial Park
	R9	Port Darlington Marina
	R10	Oshawa Second Marsh / MacLaughlin Bay
	R11	Bowmanville Trail at Spry Avenue in Bowmanville
	R12	Waterfront Trail Entrance West off Solina Road
	R13	Waterfront Trail Entrance Northeast off South Service Road at unopened road allowance (Maple Grove Road)
	R14	Durham Regional Police Fleet /Property Bureau on Courtice Court south of Baseline Road
Socio-Economic Residents and Communities (Existing Conditions)	R15	Nearest Existing Resident (West) on Solina Road
	R16	Nearest Existing Resident (East) on Waverly Road
	R17	Nearest Existing Resident (Northeast) on Maple Grove Road
	R18	Nearest Existing Resident (North) on Holt Road
	R19	Nearest Existing Resident (Northwest) on Rundle Road
	R20	Nearest Existing Resident (East) on South Service Road
	R21	Nearest Existing Resident (East) on Green Road north of 401
	R22	Nearest Existing Resident (East) at base of Waverly Road
	R23	Almet Farms Limited on Holt Road North of Baseline Road
Socio-Economic Residents and Communities (Future Conditions)	R24	Nearest Future Resident (Courtice)
	R25	Nearest Future Resident (Bowmanville)
Terrestrial Receptors	T1	Terrestrial Receptor 1
	T2	Terrestrial Receptor 2
	T3	Terrestrial Receptor 3
	T4	Terrestrial Receptor 4
	T5	Terrestrial Receptor 5
	T6	Terrestrial Receptor 6
	T7	Terrestrial Receptor 7
	T8	Terrestrial Receptor 8
	T9	Terrestrial Receptor 9
	T10	Terrestrial Receptor 10
	T11	Terrestrial Receptor 11
	T12	Terrestrial Receptor 12
	T13	Terrestrial Receptor 13

Sub-Component	Receptor ID	Description
	T14	Terrestrial Receptor 14
	T15	Terrestrial Receptor 15
Ecological Risk – Onsite Receptors	RK1	Risk Receptor 1
	RK2	Risk Receptor 2
	RK3	Risk Receptor 3
	RK4	Risk Receptor 4
	RK5	Risk Receptor 5
	RK6	Risk Receptor 6
	RK7	Risk Receptor 7
	RK8	Risk Receptor 8
Air Quality Monitoring Stations	D2	Air Quality Monitoring Station D2
	Hepcoe	Air Quality Monitoring Station Hepcoe
	D5	Air Quality Monitoring Station D5
	EFW	Air Quality Monitoring Station Energy From Waste

Note: Table taken from Atmospheric Environment Existing Conditions TSD (SENES 2009b).

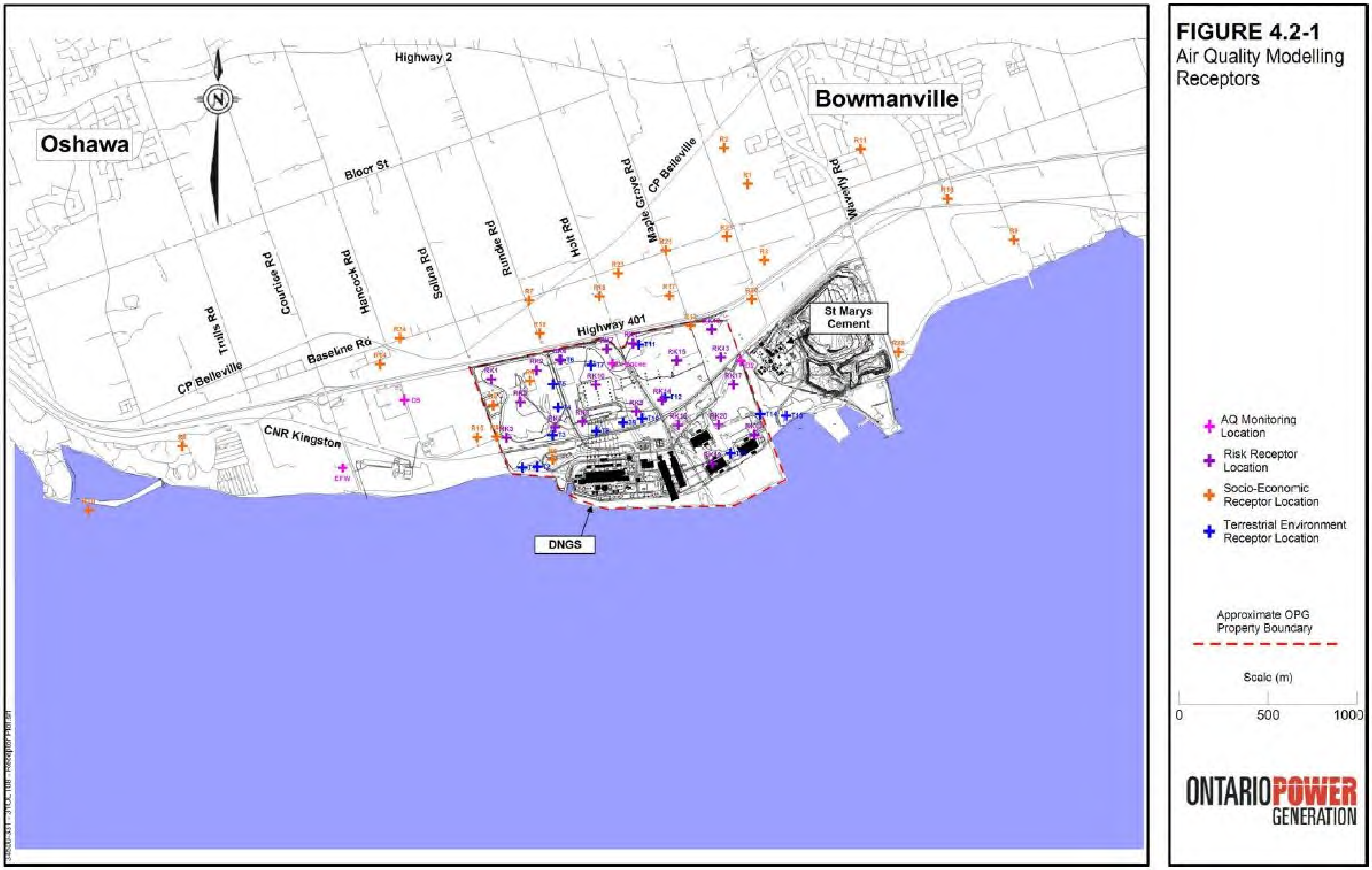

Figure 4-11: Air Quality Modeling Receptors

Note: Figure taken from Atmospheric Environment Existing Conditions TSD (SENES 2009b).

4.5 Assessment of Changes

This section provides an assessment of the changes that were described in Section 4.4, and their potential to alter the conclusions described in the Atmospheric Environment Environmental Effects TSD (SENES 2009a) prepared in support of the 2009 application.

4.5.1 Potential for Change in Conclusions of Site Evaluation

4.5.1.1 Air Quality

4.5.1.1.1 Effect of Changes to Baseline Air Quality

Baseline air quality has generally improved or is within the natural variability experienced in the area as compared to conditions in 2009. As such, there is no direct impact on the conclusions of the site evaluation and no further actions are required. As the site preparation phase of the project is initiated, air quality monitoring (D-P-12.2; OPG 2019c) will be used to establish current COPC concentrations and will be evaluated against relevant air quality criteria.

4.5.1.1.2 Effect of Changes to $PM_{2.5}$ and its CAAQS

The Atmospheric Environment Environmental Effects TSD (SENES 2009a) indicated that during the site preparation phase the maximum $PM_{2.5}$ concentrations were predicted to slightly exceed the 24-hour limit of 30 µg/m^3 at two receptor locations (R15 and R17)[1]. However, the frequency of exceedances was expected to be less than 0.05% of the time or approximately <1 day per year, which was not considered significant. The lowering of the CAAQS 24-hour limit for $PM_{2.5}$ from 30 µg/m^3 to 28 µg/m^3 in 2015 and 27 µg/m^3 in 2020 will result in a slightly higher frequency of predicted exceedances for $PM_{2.5}$ at these two receptors. All other receptors are expected to remain below the revised CAAQS 24-hour limit for $PM_{2.5}$. Changes to the annual $PM_{2.5}$ CAAQS do not alter the conclusions of the previous analysis as all receptors remain below the current (2015) and revised (2020) CAAQS.

Changes to CAAQS for $PM_{2.5}$ will be factored into the development of the Nuisances Effects Management Plan(s) and Dust Management Plan as outlined in D-P-3.2 and D-P-12.2 of the DNNP Commitments Report (OPG 2019c). This is further discussed in Section 4.5.2 below.

[1] R15 - Nearest Existing Resident (west) on Solina Road.
R17 - Nearest Existing Resident (northeast) on Maple Grove Road.

4.5.1.1.3 Future Changes to the CAAQS for NO_2 and SO_2

As noted above, the CCME has proposed future changes to the CAAQS for NO_2 and SO_2 that are expected to take effect in 2020 and 2025. Of particular relevance to the project is the reduction in the 1-hour standards for NO_2 and SO_2 and the annual NO_2 standard.

In the Atmospheric Environment Environmental Effects TSD, the maximum 1-hour average NO_2 concentrations during site preparation were predicted to be slightly above criteria at two receptors (R17 and R20). The frequency analysis suggested that these receptors would be exposed to these levels for less than 0.002% of the time (or less than 1 hour per year), which was not considered significant. The shift in the 1-hour NO_2 criteria from 400 µg/m^3 to 113 µg/m^3 (or 60 ppb) in 2020 and 79 µg/m^3 (or 42 ppb) in 2025 will result in an increase in the number of receptors that will be exposed to short-term concentrations that exceed these new criteria. All twenty-five modelled receptors from the 2009 assessment (SENES 2009a) are expected to exceed the 2020 and 2025 1-hour NO_2 CAAQS. The annual NO_2 concentrations are expected to remain below the 2020 criteria at all but one receptor and are expected to exceed the 2025 criteria at all receptors.

During site preparation, the maximum 1-hour concentrations of SO_2 were predicted to be below the air quality standards at all residential receptors. The shift in the 1-hour SO_2 criteria from 690 µg/m^3 to 183 µg/m^3 (or 70 ppb) in 2020 and 170 µg/m^3 (or 65 ppb) in 2025 will result in a significant increase in the number of receptors that will be exposed to short-term concentrations that exceed these new criteria. In fact, all but one of the twenty-five modelled receptors noted in the previous assessment are expected to exceed the 2020 and 2025 1-hour SO_2 CAAQS. The annual SO_2 concentrations are expected to remain below the 2020 and 2025 criteria at all receptors.

Ongoing review and assessment of NO_2 and SO_2 concentrations against these future standards will be required during the development and implementation of the air quality monitoring program (D-P-12.2; OPG 2019c). Supplemental mitigation measures may need to be implemented to address potential gaps (see Section 4.5.2 Additional Commitments).

4.5.1.1.4 Effects of Changes to Acrolein and BaP Standards

In the previous air quality assessment, acrolein was found to be the most restrictive contaminant for emissions from both fixed diesel engines and transportation sources and it was assessed as a surrogate for all other volatile organic compounds (VOCs) and PAH constituents. However, the Ontario AAQC for acrolein has since increased from 0.08 µg/m^3 to 0.4 µg/m^3, which makes this contaminant no longer the most restrictive for both VOCs or PAHs. The current AAQC for BaP is very low at 0.00005 µg/m^3, which makes this contaminant the most restrictive PAH and contaminant overall. Further, it may be more appropriate to consider PAHs independent of VOCs given (a) fixed diesel engines and transportation sources emit both VOCs and PAHs, (b) the noted changes in the AAQC standards, and the order of magnitude differences between some of the current PAH and VOC standards.

These changes will affect commitments made under D-P-12.2. The air quality monitoring program will be developed to address the updated standards and will include both acrolein (VOC) and BaP (PAH). This change does not alter the conclusions of the 2009 application supporting documents regarding residual adverse effects of the project and no further actions are necessary.

4.5.2 Additional Commitments (if Required)

4.5.2.1 Mitigating Action

As the CAAQS come into effect in 2020 and 2025, it will be imperative that the mitigation measures proposed in the Atmospheric Environment Effects TSD are implemented to reduce the potential occurrence of $PM_{2.5}$, NO_2, and SO_2 exceedances at the modelled receptor locations. The Atmospheric Environment Effects TSD identified the following mitigation measures (Table 4-17):

Table 4-17: Mitigation Options Identified in Effects TSD

Likely Environmental Effect	Mitigation Measures
Dust generated from site preparation	▪ Development of dust management plan ▪ Watering (or other dust suppressant) frequency for dust control ▪ Use of paved versus unpaved roads ▪ Use of different aggregate grades for roads construction (i.e., low silt, washed stone) ▪ Slope stabilization (e.g., hydro seeding)
Fuel combustion emissions from vehicles and fuel fired equipment during site preparation	▪ Limiting hours of operation for site preparation activities (2 x 10-hour shifts) ▪ Vehicles and other fuel combustion equipment is properly maintained ▪ Minimal idling time for vehicles ▪ Limiting site traffic to established haul routes

To support the mitigation actions outlined above, OPG committed to develop a comprehensive and adaptive air quality monitoring/management plan for the site preparation phase (D-P-12.2; OPG 2019c). This plan will consider a hierarchy of approaches and strategies (i.e., administrative) similar to those outlined in Environment and Climate Change Canada's guide to "*Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities" (ChemInfo 2005)*, This best practice document offers a number of specific mitigation measures that address emissions of particulates and VOCs, as well as methods to reduce emissions of sulphur oxides, NO_x and greenhouse gases. These measures will address the commitments outlined above and in D-P-3.2 of the

Commitments Report relating to dust management. Further, they will enhance the specific measures to control releases of NO_2, and SO_2 during site preparation, which are only partially addressed under D-P-3.2 (under Noise) and D-P-12.2.

No new or modified commitments are required. Existing commitments address updated standards and changes to baseline. The conclusions of the site evaluation remain valid.

4.5.2.2 Follow-up Monitoring

No additional follow up monitoring is needed, as OPG is already committed to completing air quality monitoring during site preparation as part of the D-P-12.2 and D-P-3.2. The air quality monitoring plan will consider changes to the AAQC and CAAQS and the inclusion of BaP as a surrogate for total PAHs and acrolein as a surrogate for VOCs. Some recommendations for the air quality monitoring plan are provided below.

Considering the reduction in CAAQS in 2020 and 2025, ongoing air quality monitoring is highly recommended, particularly for $PM_{2.5}$, NO_2, and SO_2. A real-time/continuous (or close to real-time) monitoring approach should be employed (where practical) that is focused on the critical averaging periods (i.e., 1-hour and 24-hour) and representative monitoring locations that will inform the decision-making process around the implementation of any mitigation actions.

Further, it is recommended that air quality “Action Levels” are established that define administrative parameters or concentration thresholds (typically below established regulatory limits) where the implementation of mitigation actions would be completed. Examples are presented in Table 4-18 below.

Table 4-18: Example Mitigation Action Criteria

Parameter	Regulatory Limit	Mitigation Actions Criteria			
		Action Level	Monitoring Location	Averaging Period	Action Required If Level Exceeded
Dust Plumes generated during site preparation activities	NA	Visible dust plumes	Within work area	Not applicable	Apply water or dust suppressants to roads and other surfaces; Modify contractor work practices during high winds; Implement corrective actions and review work modifications and complete visual monitoring
$PM_{2.5}$	27 µg/m^3 (24-hour basis) (2020 CAAQS)	22 µg/m^3 (80% of CAAQS)	Downwind of work area (surrogate location for residential exposure)	1-hour	Identify the dominant source(s) of air quality concerns; Identify the circumstances leading to elevated levels (i.e., equipment operating issues, specific activities, etc.); Determine if there is administrative or physical control measure that can be applied to the source; Implement corrective actions and review work modifications/control and continue monitoring

4.5.2.3 Conclusion

Overall, there has been a reduction in the mean 1-hr and 24-hr NO_2 and SO_2 in the intervening period since the 2009 application and 2009 application supporting documents. Concentrations for 24-hr TSP and PM_{10} at the monitoring stations in the Local Study Area were only slightly higher (+0.2% and +4%) during the 2014-2018 period and were within the range of natural variability.

With regard to OPG's planned air monitoring program, it will be necessary to consider the changing air quality standards for key contaminants that were part of the previous baseline program and formed the basis of Commitments D-P-3.2 and D-P-12.2 . For conventional contaminants, like $PM_{2.5}$, NO_2, and SO_2, the reduction in air standards over the next five (5) years may result in frequent exceedances of contaminant emissions during site preparation. A continuous monitoring approach should be employed to inform the decision-making process around the implementation of any mitigation measures (examples are provided in Table 4-18).

Further, the air quality standards for BaP have changed significantly since 2009, which has, in turn, redefined the contaminants that are the most restrictive VOC and the most restrictive PAH in relation to both fixed diesel engines and transportation sources. Future air quality monitoring should consider including BaP as a surrogate for total PAHs and acrolein a surrogate for VOCs.

Planned mitigation measures outlined in the DNNP Commitments Report (D-P-3.2 and D-P-12.2; OPG 2019c) will adhere to the hierarchy of approaches and strategies outlined in the "*Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities"* (ChemInfo 2005). These best practices will inform the development of the Nuisances Effects Management Plan(s) and Dust Management Plan and help define other specific measures that may be needed to control releases of NO_2 and SO_2 during site preparation. As such the conclusions of the 2009 application supporting documents remain valid and no further assessment is required.

The current baseline data and regulatory guidelines do not alter the conclusions of the 2009 supporting documents regarding residual adverse effects of the project and no further actions are necessary to address the DNNP.

5.0 BASELINE GEOLOGY AND HYDROGEOLOGY

5.1 Compliance with REGDOC 1.1.1

One section within REGDOC 1.1.1 was identified to contain a potential gap with respect to geology and hydrogeology (Table 3-1; Kinectrics 2019). Within Section C.5.4 of REGDOC 1.1.1, the rate of transfer between aquifers, and capture zones of wells, is required. This work is discussed further in Section 5.5.1 (Potential for Change in Conclusions of Site Evaluation).

The current data are sufficient to characterize background conditions for the purposes of licence renewal. For parameters that are expected to demonstrate yearly variation, REGDOC 1.1.1 states that baseline data should be of sufficient sample size and duration to obtain a basic understanding of within-year and between-year variation. Where available, the most recent three years of data were considered in an effort to capture within-year and between-year variation.

5.2 Changes to Codes, Standards and Practices

As identified in Appendix A, applicable soil and groundwater quality guidelines have been updated since the *Geological and Hydrogeological Environment Existing Environmental Conditions Technical Support Document New Nuclear – Darlington Environmental Assessment* (Geological and Hydrogeological Environment Existing Environmental Conditions TSD) (CH2M HILL and Kinectrics 2009) was published in 2009.

Soil sampling reported in the Geological and Hydrogeological Environment Existing Environmental Conditions TSD was carried out from December 2007 to April 2008 (CH2M HILL and Kinectrics 2009). Analytical results were compared to the Ontario Ministry of the Environment (MOE), now Ontario Ministry of the Environment, Conservation and Parks (MECP), *Environmental Protection Act (EPA) (Part XV.1)* Ontario Table 3 Full Depth Generic Site Condition Standards in a Non-Potable Groundwater Condition (2004). For radionuclides, specific soil standards have not been developed.

Soil data were also tabulated against federal guidelines within the *Ecological Risk Assessment and Assessment of Effects on Non-Human Biota Technical Support Document New Nuclear – Darlington Environmental Assessment* (EcoRA TSD) (SENES 2009c). Specifically, soil data were compared to the CCME Soil Quality Guidelines (SQGs) (residential/parkland, commercial, and industrial) (CCME 2007) as part of selection of COPCs. Updates to CCME SQGs for specific parameters have occurred since the 2007 CCME guidelines were used.

Soil parameters considered in the Geological and Hydrogeological Environment Existing Environmental Conditions TSD and/or the EcoRA TSD included the following:

- Metals (including boron (Hot Water Extraction) and mercury).
- Radionuclides – Tritium, C-14, gamma scan (Be-7, K-40, Cr-51, Mn-54, Fe-59, Co-57, Co-58, Co-60, Zn-65, Se-75, Zr-95, Nb-95, Ru-103, Ru-106, Ag-110m, Sb-124, Sb-125, I-131, Cs-134, Cs-137, Ba-140, La-140, Ce-141, Ce-144, Eu-154, Eu-155, U-Series, Th-Series), and Sr-90.

The 2004 MECP Table 3 soil guidelines were updated in 2011. Comparison of the 2004 soil guidelines to the current 2011 soil guidelines (MECP Table 3 Full Depth Generic Condition Standards in a Non-Potable Groundwater Condition) reveals that guidelines have become more restrictive for most parameters. New soil guidelines have been added for boron and uranium. Parameters for which the applicable MECP Table 3 guideline has decreased to become more stringent include the following parameters: arsenic, barium, cadmium, chromium, lead, mercury, selenium, thallium, vanadium, and zinc.

The CCME SQGs have not changed substantially from 2009. New commercial and industrial soil guidelines have been published for beryllium. A commercial/industrial soil guideline for silver existed but was not applied in 2009 for silver. In both cases (for beryllium and silver) a more restrictive residential/parkland guideline was applied in 2009. Lastly, the nickel guideline (residential/parkland) has decreased to become slightly more stringent.

Comparisons between applicable former and current soil guidelines are presented in Section 5.4.1.2.

Groundwater monitoring reported in the Geological and Hydrogeological Environment Existing Environmental Conditions TSD (CH2M HILL and Kinectrics 2009) was conducted throughout 2008 and chemical concentrations were compared to two provincial guidelines:

- MECP Table 3 Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition (2004), for non-radiological parameters.
- The Ontario Drinking Water Quality Standards (ODWQS) Reg 169/03 for radiological parameters, with recognition that the DNNP Site Study Area was not used as a potable drinking water source.

Although groundwater data were compared to the ODWQS in 2009, it is understood, both in the Geological and Hydrogeological Environment Existing Environmental Conditions TSD (CH2M HILL and Kinectrics 2009) and currently, that the DNNP Site Study Area is not used for potable drinking water. Considering this, for the purpose of this baseline assessment, the ODWQS are not applicable. The ODWQS Guidelines have not changed since the 2009 application.

Groundwater parameters considered in the 2009 Geological and Hydrogeological Environment Existing Environmental Conditions TSD included the following:

- Metals (aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, calcium, cesium, chromium (total), cobalt, copper, iron, lead, lithium, magnesium, manganese, molybdenum, nickel, phosphorus, potassium, selenium, silver, sodium, strontium, thallium, thorium, tin, titanium, tungsten, uranium, vanadium, zinc, zirconium).
- Anions (chloride, sulphate, bromide, fluoride, nitrate, nitrite, phosphate).
- Alkalinity.
- Organics (base neutral and acid extractible which includes polycyclic aromatic hydrocarbons and phenolics).
- Petroleum hydrocarbons (PHCs) (Fractions F1 (C6 to C10), F2 (>C10 to C16), F3 (>C16 to C34), and F4 (>C34).
- Benzene, Toluene, Ethylbenzene, Xylene (BTEX).
- Polychlorinated biphenyls (PCBs).
- Radionuclides (Tritium, Sr-90, C-14, Cs-134, Cs-137, Co-60, K-40, Th-series, U-series).

The 2004 MECP Table 3 groundwater guidelines were updated in 2011. Parameters for which the applicable MECP Table 3 groundwater guideline has decreased (become more stringent) include the following: metals (boron, cadmium, chromium, cobalt, lead, nickel); PAHs (acenaphthene, acenaphthylene, anthracene, benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, chrysene, indeno[1 2 3-cd]pyrene, 2-(1-)methlynaphthalene, and naphthalene); and benzene, 1,1'-biphenyl, 2-chlorophenol, 1,2-dichlorobenzene, 1,4-dichlorobenzene, 3,3'-dichlorobenzidine, ethylbenzene, hexachlorobutadiene, pentachlorophenol, phenol, 1,2,4-trichlorobenzene, 2,4,6-trichlorophenol, and xylenes. There were no PHC guidelines during the 2009 assessment, but guidelines were implemented for hydrocarbon fractions in 2011. Similarly, guidelines were implemented for sodium and chloride in 2011. Comparisons between applicable former and current groundwater guidelines are presented in Section 5.4.2.2.

5.3 Baseline Characterization

This section provides an overview of the current baseline for geology and hydrogeology as required by REGDOC 1.1.1. Baseline data collected in support of the 2009 application is described in the Geological and Hydrogeological Environment Existing Environmental Conditions TSD (CH2M HILL and Kinectrics 2009).

5.3.1 Study Areas

The Regional, Local, and Site (Figure 5-1) Study Area boundaries are consistent with those described in the Geological and Hydrogeological Environment Existing Environmental Conditions TSD (CH2M HILL and Kinectrics 2009).

Figure 5-1: DNNP Site Study Area for Geology and Hydrogeology

5.3.2 Summary of Baseline Data

REGDOC 1.1.1 states that baseline data should be of sufficient duration to obtain a basic understanding of within-year and between-year variation. As such, the past three years (2016 – 2018) of groundwater and soil data and reports were reviewed. If data were unavailable for a specific parameter within the last three years, the most recent three years available where that parameter was measured was reviewed.

Bedrock, surficial geology, and hydrogeology characteristics are described to provide context, and although generally static, any modifications are identified.

5.3.2.1 Bedrock and Surficial Geology

Bedrock and surficial geology are described in the Geological and Hydrogeological Environment Existing Environmental Conditions TSD (CH2M HILL and Kinectrics 2009). Due to the time required for bedrock and surficial geology to develop, these parameters have not changed since the 2009 application supporting documents were submitted.

Regional and site geology is characterized by upper and lower till layers with predominant glacial deposits between the upper and lower till layers, overlaying bedrock. The glacial deposits are associated with the Oak Ridges Moraine.

The DNNP Site Study Area consists of surficial till layers that include upper Newmarket Till (silt till) of 0 to 15 meters depth, followed by the lower Sunnybrook Till (fine sandy silt till with medium to coarse sand and clay and trace fine gravel) which is situated above bedrock. The glacial deposits spanning between the till layers consists of interglacial deposits of fine sand and silt layers known as the Thorncliffe Formation (15 to 20 meters thick). Interglacial deposits also reside beneath the lower till layer, likely corresponding to the Scarborough Formation.

Bedrock originates from Ordovician-age sedimentary sequences which consists of shale and limestone associated with, in order of increasing depth, the Blue Mountain Formation, Lindsay Formation, Verulam Formation, Bobcaygeon Formation and Gull River Formation. Finally, the Shadow Lake Formation, a sandstone and shale unit, is situated above the Precambrian Basement.

The St. Marys Quarry located directly to the east of the DNNP lands, is a significant topographical feature within the Local Study Area. Overburden has been removed down to bedrock. The Geological and Hydrogeological Environment Existing Environmental Conditions TSD reported that the St. Marys Quarry was excavated to an elevation of about 11 metres above sea level (i.e., 64 meters below lake level), exposing the Lindsay Formation. Since that time, the quarry has expanded northeastward. The current depth is unknown.

5.3.2.2 Soil Quality

Baseline soil quality is summarized first from the Geological and Hydrogeological Environment Existing Environmental Conditions TSD (CH2M HILL and Kinectrics 2009) which describes the results of the 2007 to 2008 soil sampling program. Updates to baseline soil quality are then summarized based on the recent soil sampling program carried out in 2019. Soil sample locations for both the 2007-2008 (CH2M HILL and Kinectrics 2009) and 2019 sampling programs are illustrated in Figure 5-2; any exceedances are also shown.

2009 Environment Existing Environmental Conditions TSD

The Geological and Hydrogeological Environment Existing Environmental Conditions TSD (CH2M HILL and Kinectrics 2009) was reviewed to summarize the baseline soil conditions that were established in support of the 2009 application.

As previously outlined in Section 5.2, soil parameters measured as part of the 2007-2008 sampling program included metals and radionuclides. Soil samples were collected from five boreholes (DN-44, DN-48, DN-63, DN-83 and DN-73), four of which were located on DNNP lands (Figure 5-2). Depths ranged from surface down to bedrock. Results were compared to 2004 MECP Table 3 guidelines. In addition, the soil quality data were used in the 2009 EcoRA (SENES 2009c) and compared to the 2007 CCME SQGs (residential/parkland, commercial, and industrial).

Results from the Geological and Hydrogeological Environment Existing Environmental Conditions TSD indicated that soil across the DNNP Site Study Area was generally of good quality and did not exceed 2004 MECP Table 3 guidelines with a few exceptions (CH2M HILL and Kinectrics 2009). Beryllium was the only metal to exceed the 2004 MECP Table 3 guideline of 1.2 µg/g. All exceedances were marginal for beryllium and were found within all five boreholes (eleven samples) at various depths. Beryllium concentration decreased with depth. Given the consistency across the site, it was determined to be representative of background concentrations. Further, the current updated guideline for beryllium has increased to 8.0 µg/g, meaning these data do not exceed the current guideline. All other metals were below the 2004 MECP Table 3 soil quality guidelines.

Radionuclides were detected within soil samples for cesium-137 (Cs-137), potassium-40 (K-40), tritium and carbon-14 (C-14). Cs-137 was detected in two surface samples, from boreholes DN-48 and DN-83. Both of these are located within the DNNP lands. K-40 was present within every soil sample across the DNNP Site Study Area ranging from 250 to 500 Bq/kg, however; K-40 is known to be naturally occurring within rocks and soil. Tritium was detected in several surface soil samples (soil pore water) within boreholes DN-63, DN-48 and DN-83, all located within DNNP lands. Tritium was measured in soil pore water at concentrations ranging from 20 to 27 Bq/kg. The soil pore water represents the water within the moisture content of the soils. C-14 was detected just above the method detection limit

(MDL) of 225 Bq/kg-C in two surface samples at locations DN-48 (230 Bq/kg-C) and DN-83 (247 Bq/kg-C). All other samples were below the MDL for C-14.

The Geological and Hydrogeological Environment Existing Environmental Conditions TSD indicated three areas of potentially contaminated soils within the DNNP lands, based on visual inspection and previous use; these are: the spoils disposal area, the cement plant area, and the asphalt storage area (CH2M HILL and Kinectrics 2009). OPG proposed removal of potentially impacted soils before construction.

Results from the 2009 EcoRA indicated that all soil parameters were below the applicable 2007 CCME SQGs (residential/parkland, commercial, and industrial) (SENES 2009c). Although there were no CCME guidelines for strontium and zirconium, these metals were carried forward as COPCs in the EcoRA, based on exceeding background concentrations.

2019 Soil Sampling Program

In April 2019, a soil sampling program was carried out by Golder Associates Ltd. (Golder) and EcoMetrix in order to provide chemical characterization of shallow soils.

Sampling locations within the DNNP lands included: the potentially impacted soils in the areas OPG identifies as the spoils disposal area, the cement plant area, and the asphalt storage area; locations sampled in 2009; and additional locations across the DNNP Site Study Area. Additional locations were sampled across the DNNP Site Study Area to obtain horizontal coverage necessary for baseline characterization. All samples were collected at a depth of approximately 20 cm below ground surface. The 2019 soil data will form part of baseline for the next update of the DN Environmental Risk Assessment (ERA). A list of sampling locations and descriptions is provided in Table 5-1.

The sampling plan consisted of the following:

- Soil samples were collected from twelve areas on the DNNP site (DN1 to DN8, and DN15 to DN18; Table 5-1) with three samples at each area (i.e., a sample at the location specified and two additional samples separated by 15 m from the location). The exception is at DN18 (snow dump area) where two samples were collected as well as, DN15 and DN16 where one sample was taken; and,

- Soil samples were collected from six locations across the DN site (DN9 to DN14; Table 5-1) with one sample collected at each location.

Radiological and non-radiological analytical parameters included the following:

- Radiological: tritium, C-14, beta-gamma emitters (Cs-137, Cs-134, Co-60, K-40, I-131); and,

- Non-radiological: metals and inorganics, petroleum hydrocarbons (PHCs), polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), total organic carbon (TOC).

Analytical results were compared to the 2011 MECP Table 3 (coarse grained, Industrial/Commercial/Community) Full Depth Generic Site Condition Standards in a Non-Potable Groundwater Condition, as well as the CCME SQGs (residential/parkland, commercial, and industrial).

Sampling results are provided in Appendix C, Table C-1.

Table 5-1: 2019 Soil Sample Location Descriptions

Location ID	Location Description
DNNP Lands (potentially impacted soils)	
DN1	Zebra Mussel waste compost pile F12 south
DN1A	
DN1B	
DN2	Emergency Vehicle (Fire Training) Garage (Bldg. F432) & surrounding soils
DN2A	
DN2B	
DN3	Drainage ditch north of FI (runoff area for water treatment chemicals & black beauty temporary storage/drying area) (F1)
DN3A	
DN3B	
DN4	Drainage ditch north of FI (runoff area for water treatment chemicals & black beauty temporary storage/drying area) (F1)
DN4A	
DN4B	
DN5	Excavated soil from DWMF Excavation (F4 north)
DN5A	
DN5B	
DN6	Yard waste and building materials dump site (F15). Remediation planned for summer 2018
DN6A	
DN6B	
DN7	Refurbishment soil storage areas (F16 north and F3 north)
DN7A	
DN7B	
DN8	West area emergency vehicle garage and laydown areas (F3 south) cleaned up in 2017
DN8A	
DN8B	
DN17	F1 area as shallow soils have not been analyzed for a full suite of parameters
DN17A	
DN17B	
DN18	F3 at the location of a snow dump area
DN18A	
Across the DNNP Site Study Area (for baseline update)	
DN9	Locations across the DNNP Site Study Area to obtain horizontal coverage
DN10	
DN11	
DN12	
DN13	
DN14	
DN15	Locations across the DNNP-lands to obtain horizontal coverage
DN16	

The results indicated that the parameters listed below exceeded 2011 MECP Table 3 Standards or CCME SQG at one or more locations. In general, these exceedances were identified at DN6 and DN6A (approximately 15 m southwest of DN6). Both of these locations were within the yard waste and building materials dump site. One additional cyanide exceedance was identified at DN12 west of the switchyard. Out of the forty-one samples collected (inclusive of three duplicate samples), only three samples (i.e., DN6, DN6A and DN12) had exceedances of one or more parameters. Results for all measured parameters for the remaining 38 samples across the site were below both guidelines. Specific parameters that exceeded within DN6, DN6A or DN12 are:

- cyanide (DN6, DN12);
- arsenic (DN6);
- cadmium (DN6);
- chromium (DN6);
- cobalt (DN6);
- copper (DN6, DN6A);
- lead (DN6);
- molybdenum (DN6);
- nickel (DN6);
- selenium (DN6);
- tin (DN6);
- zinc (DN6, DN6A);
- PHCs F4G (DN6).

In general, these results indicated that only one of the three identified areas of potential concern had elevated concentrations of the contaminants listed above. Soil quality from the yard waste and building materials dump site (DN6) exceeds the MECP Table 3 and CCME guidelines for several metals, cyanide and PHC F4G, and two of the three samples in this area were impacted. The sample 15 m east from DN6 (i.e., DN6A) showed lower concentrations of metal contaminants of concern, with only copper and zinc exceeding the 2011 MECP Table 3 and/or CCME guideline at DN6A. PHC F4G exceeded the 2011 MECP Table 3 and CCME guidelines at DN6A only and not DN6. DN6B, located 15 m northeast from DN6, did not exceed 2011 MECP Table 3 of CCME guidelines for any contaminants of concern. The presence of impacted soil was confirmed based on exceedances at DN6 and DN6A, but the horizontal and vertical extent of the impacted area associated with DN6 and DN6A was not fully delineated with additional sampling. The cyanide concentration at DN12 was found to be marginally above the MECP Table 3 Standards.

There are no specific soil standards for radionuclides. Of the seven measured parameters, six had detectable activity. Table 5-2 compares maximum detectable concentrations to available background information. Background information was referenced from either the 2017 Results of Environmental Monitoring Program report (OPG 2018b), or the Review of Environmental Radioactivity in Canada report (Sheppard, Sheppard & Sanipelli 2011). H-3, C-14, and Co-60 in soil were detected above background. In the absence of guidelines, comparison to background is only to provide additional context. Concentrations above background can be expected, due to influence from DNGS, and were noted also in 2007-2008 sampling.

Table 5-2: Comparison of Maximum Detectable Radionuclide Concentration in Soil to Background

Radionuclide	Maximum Concentration (Bq/kg unless otherwise noted)	Location (maximum)	Background		Maximum > Background
			Value (Bq/kg unless otherwise noted)	Source	
H-3 [4]	302 Bq/L	DN11 (DUP-1)	3.2 Bq/L	(Sheppard, Sheppard & Sanipelli 2011)[2]	Yes
C-14	259 Bq/kg-C	DN15	239 Bq/kg-C	(Sheppard, Sheppard & Sanipelli 2011)[2]	Yes
Co-60 [1]	0.6	DN2	<0.1 - <0.2	(OPG 2018b)[3]	Yes
Cs-134 [1]	<0.1 - <1.0	-	<0.2 - <0.3	(OPG 2018b)[3]	-
Cs-137	6.3	DN15	1.7 – 9.0	(OPG 2018b)[3]	No
I-131	2.5	DN11 (DUP-1)	Not Available	-	-
K-40	637	DN10	394 - 761	(OPG 2018b)[3]	No

1 - Co-60 and Cs-134, if detected, would be a result of emissions from DN (OPG 2018b).

2 – Review of Environmental Radioactivity in Canada (Sheppard, Sheppard & Sanipelli 2011).

3 – 2017 Results of Environmental Monitoring Programs (OPG 2018b).

4 – H-3 is measured in water extracted from the soil.

DN6 Exceedance		
Parameter	Value (µg/g)	Guideline Exceeded
Cyanide (free)	0.33	Tabe 3 (0.051)
Arsenic	133	Table 3 (18) CCME (12)
Cadmium	3.75	Table 3 (1.9)
Chromium	74.8	CCME (64)
Cobalt	159	Table 3 (80) CCME (50)
Copper	2230	Table 3 (230) CCME (63)
Lead	589	Table 3 (120) CCME (140)
Molybdenum	42.3	Table 3 (40) CCME (10)
Nickel	129	CCME (45)
Selenium	6.12	Table 3 (5.5) CCME (1)
Tin	108	CCME (50)
Zinc	9320	Table 3 (340) CCME (250)

DN6-A Exceedance		
Parameter	Value (µg/g)	Guideline Exceeded
Copper	76.2	CCME (63)
Zinc	385	Table 3 (340) CCME (250)
PHC - F4 Gravimetric	3900	Table 3 (3300) CCME (2800)

Note:
In 2007/2008, DN-44, DN-48, DN-73, and DN-83 exceeded for beryllium at surface, but does not exceed the updated Table 3 guideline. All other metals were below the 2004 MECP Table 3 SQGs.

Figure 5-2: 2007-08 and 2019 Soil Sample Locations with Exceedances Identified

5.3.2.3 Hydrogeology

Hydrogeological conditions were originally described in the Geological and Hydrogeological Environment Existing Environmental Conditions TSD (CH2M HILL and Kinectrics 2009). Groundwater flow patterns have remained unchanged (CH2M HILL 2012; OPG 2019e). Groundwater flow is described below based on the similar interpretations made recently and in 2009.

Groundwater aquifers at the DNNP Site Study Area have been categorized into three hydrostratigraphic units (HU): Shallow/Water Table (Figure 5-3); Interglacial Deposits (Figure 5-4); and Shallow Bedrock (Figure 5-5; OPG 2019e). In 2009, hydraulic gradients and hydraulic conductivities were described (Table 5-3), which were not measured as part of recent groundwater assessments (OPG 2019e).

Table 5-3: Hydrogeologic Parameters Measured in 2009

HU	Horizontal Gradient	Hydraulic Conductivity (m/s)
Shallow/Water Table	-	Variable (10^{-8} – 10^{-5})
Interglacial Deposits	0.02 m/m	10^{-6}
Shallow Bedrock	0.02 m/m	10^{-8} - 10^{-5}

Within the Shallow/Water Table HU, groundwater flows from north to south approaching Lake Ontario. Within the northeast extent of DNNP which lies north of the CN railway, inferred groundwater flow is toward the east. General flow patterns within the interglacial deposits HU and shallow bedrock HU are similar to the shallow/water table HU. From the Shallow/Water Table HU, there is a downward vertical hydraulic gradient to the lower interglacial deposits and shallow bedrock HUs that was not identified in 2009.

Inside the protected area at DNGS (higher security area encompassing DNGS), groundwater flow is further influenced by anthropogenic subsurface features such as foundations, drain systems and sumps, and the vacuum building. Within the protected area, groundwater flows to the northwest toward the forebay. However, to the south of the powerhouse, there is groundwater flow from the east toward the forebay as well as southerly flow toward Lake Ontario. This likely occurs since the powerhouse extends to bedrock, inhibiting connection between groundwater flows at the north and south of the structure (OPG 2019e).

Groundwater levels within the protected area were influenced by dewatering activities for building construction, especially the new Heavy Water Management Building south of Unit 2), as part of the Darlington Refurbishment Project. From 2013 to 2016, a lowering of groundwater levels was observed which began to recover in 2017. Flow patterns were slightly altered, with some groundwater in the protected area shifting flow direction back toward the building excavation rather than toward the forebay. Groundwater has since returned to previous levels as a result of discontinued dewatering activities (OPG 2019e).

Overall, groundwater flow patterns have not changed since the 2009 application.

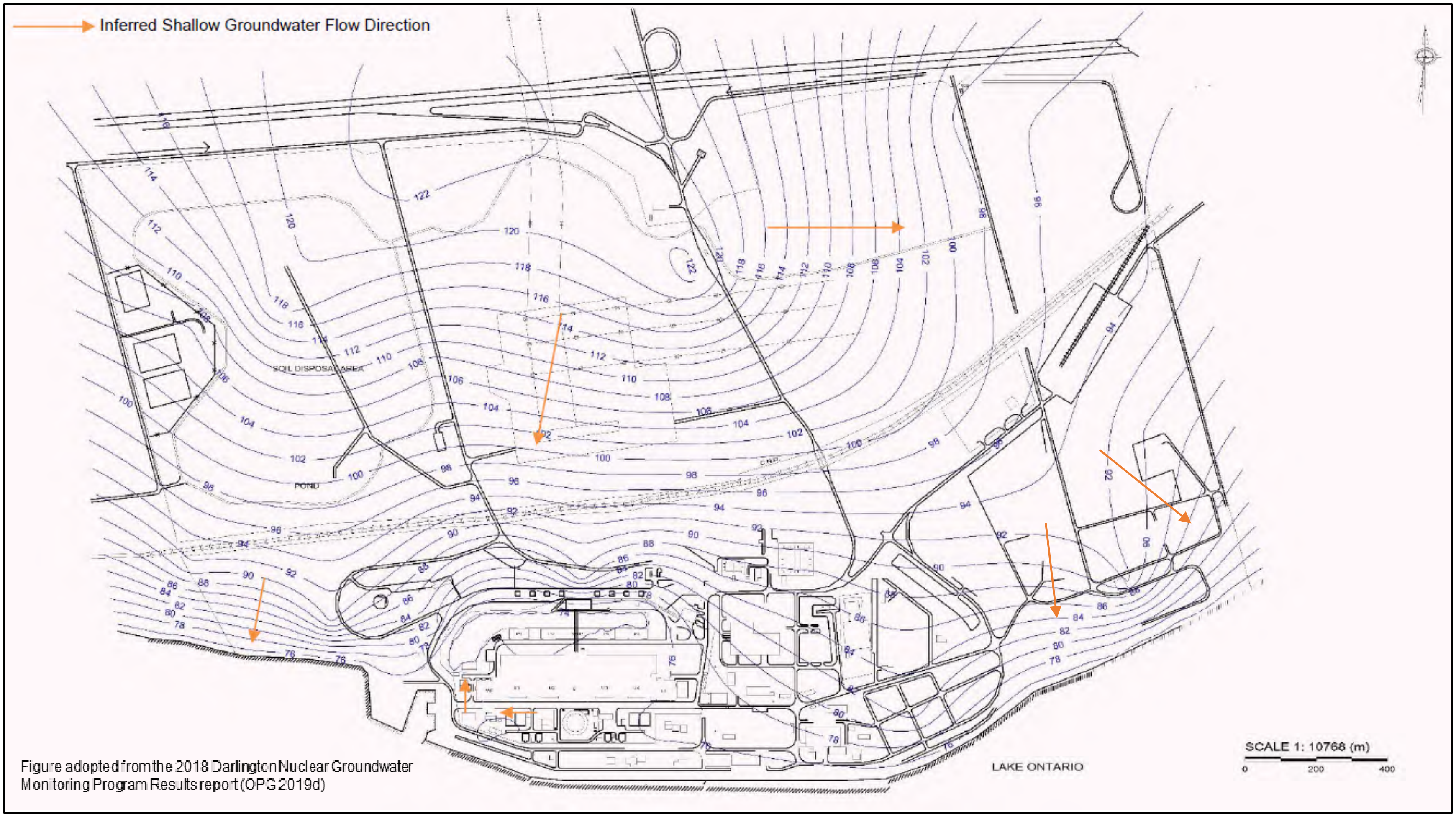

Figure adopted from the 2018 Darlington Nuclear Groundwater Monitoring Program Results report (OPG 2019d)

Figure 5-3: DNNP Site Study Area 2018 Q2 Shallow Groundwater Contours

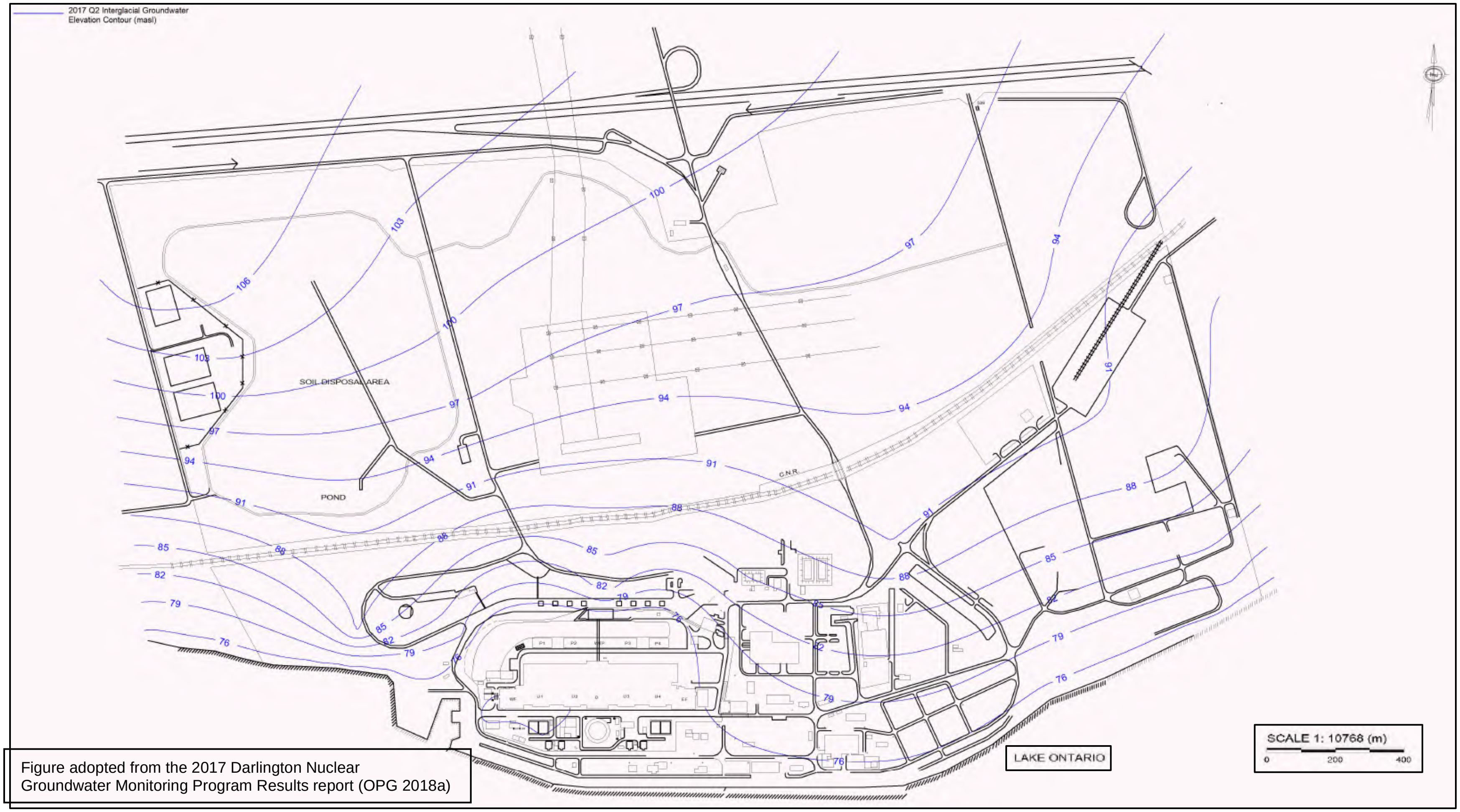

Figure 5-4: DNNP Site Study Area 2017 Q2 Interglacial Groundwater Contours

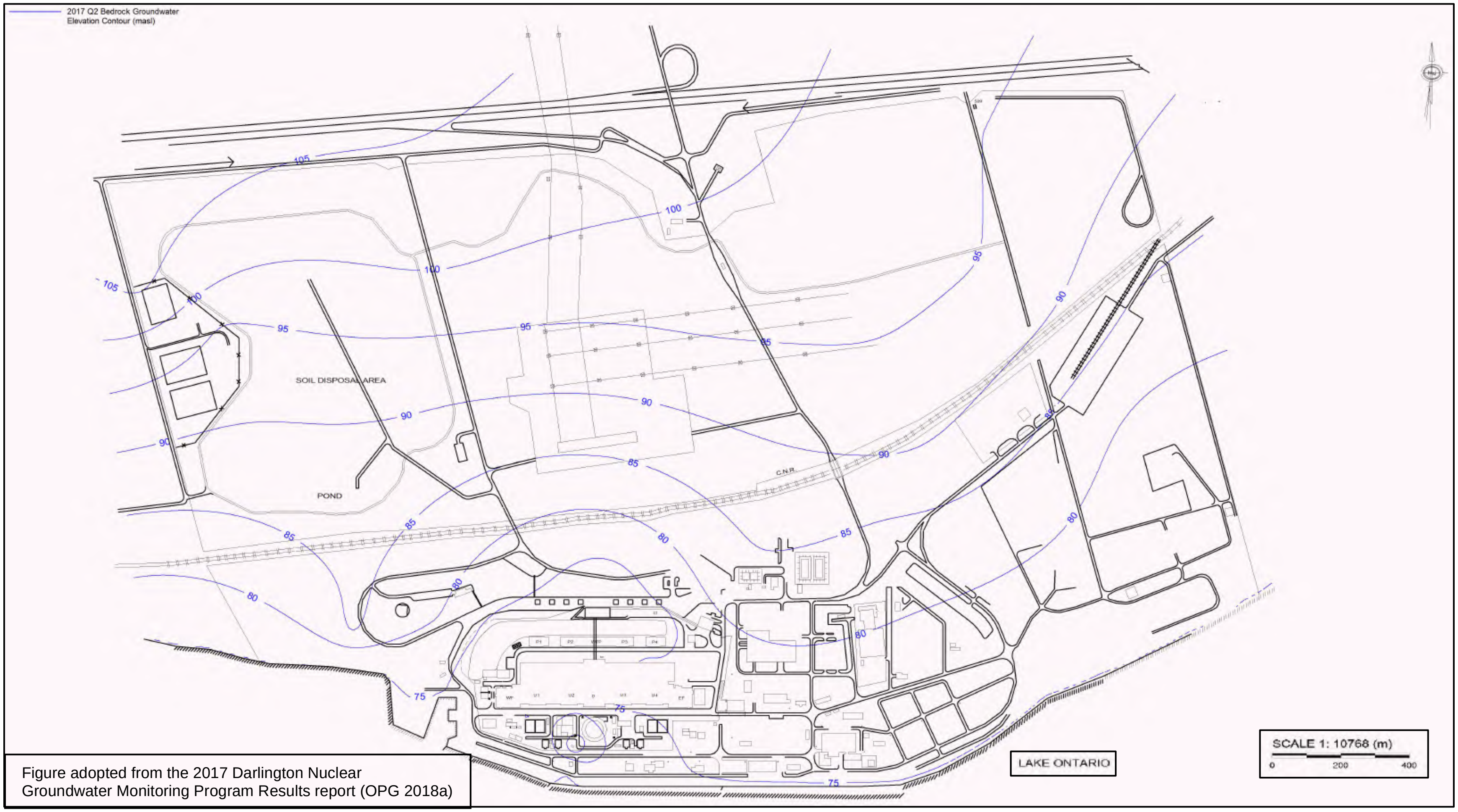

Figure adopted from the 2017 Darlington Nuclear Groundwater Monitoring Program Results report (OPG 2018a)

Figure 5-5: DNNP Site Study Area 2017 Q2 Bedrock Groundwater Contours

5.3.2.4 Groundwater Quality

Baseline groundwater quality is summarized first for the Geological and Hydrogeological Environment Existing Environmental Conditions TSD (CH2M HILL and Kinectrics 2009). Updates to baseline groundwater quality are then summarized based on recent annual groundwater monitoring reports.

DNGS has a comprehensive groundwater monitoring program (Figure 5-6) that examines the radiological, non-radiological, and physical characteristics of groundwater for the DNNP Site Study Area. Annual groundwater monitoring reports were reviewed for the years 2016 to 2018 (inclusive) for tritium, PHCs, and BTEX. These were the only parameters measured in 2016 to 2018 to meet the specific objectives of the groundwater monitoring program. Some parameters (i.e., metals including sodium and chloride, and VOCs) were not measured in 2016 to 2018 since results from earlier years did not indicate any issues (metals including sodium and chloride) (OPG 2015a) or were considered naturally elevated in shallow bedrock wells (VOCs) (OPG 2014a). Therefore, earlier annual reports (2012, 2013, and 2014) were reviewed in order to provide the most recent baseline data for those parameters. PHCs and BTEX results for 2012 to 2014 are also discussed since they were monitored at additional locations during these earlier years compared to 2016 to 2018.

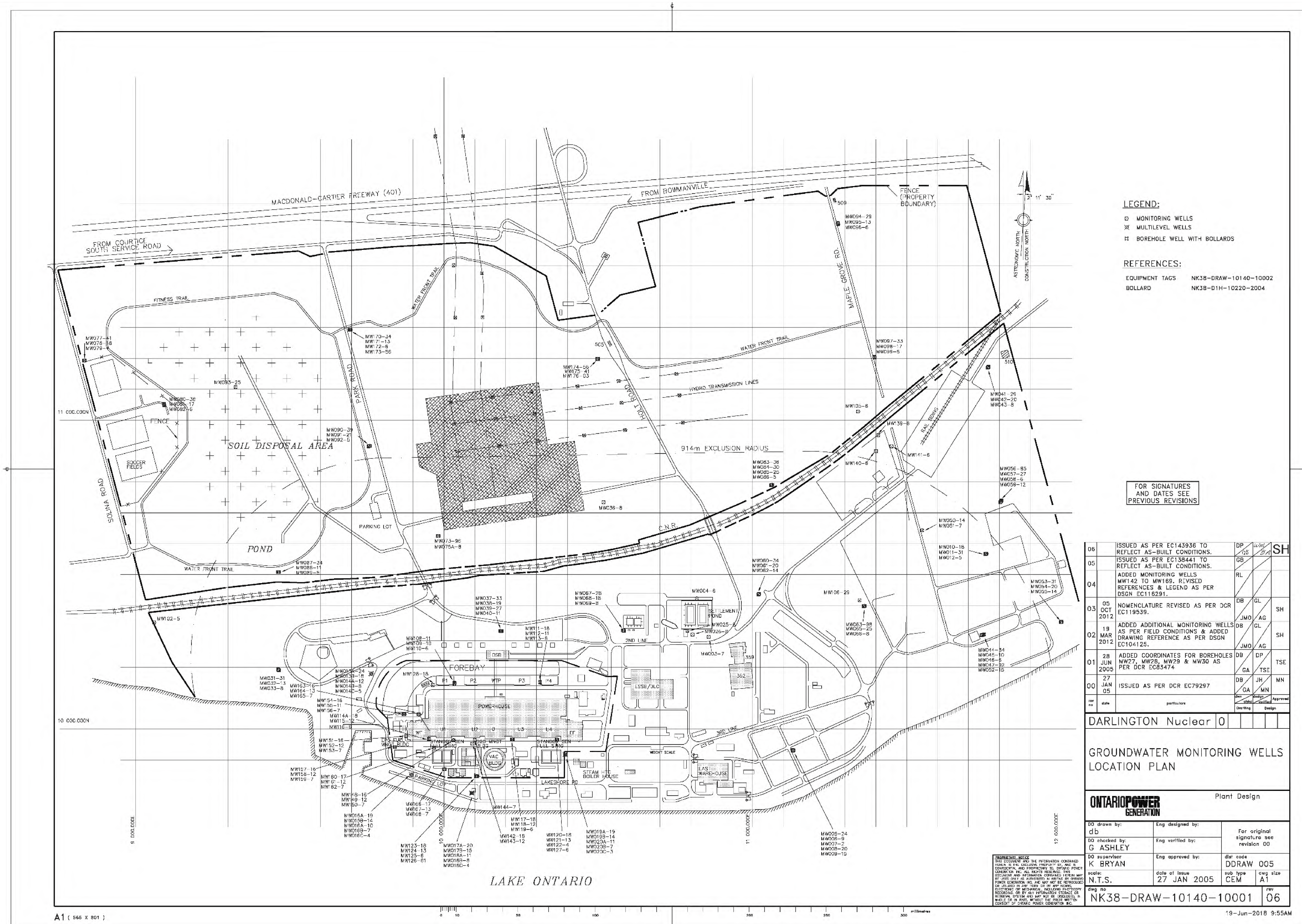

Figure 5-6: DNNP Site Study Area Groundwater Monitoring Wells Location Plan

Geological and Hydrogeological Environment Existing Environmental Conditions TSD (CH2M HILL and Kinectrics 2009) (NK054-REP-07730-00005-R000)

The 2009 Geological and Hydrogeological Environment Existing Environmental Conditions TSD (CH2M HILL and Kinectrics 2009) was reviewed to summarize the baseline groundwater conditions that were established in support of the 2009 application for the DNNP PRSL.

In general, groundwater within the upper shallow and interglacial deposit HUs was found to be relatively newer fresh water, indicated by low total dissolved solids (TDS). Deeper groundwater was occasionally saline, indicative of older groundwater that has undergone natural evolution in association with the bedrock.

As previously outlined in Section 5.2, groundwater parameters measured as part of the 2009 investigation included metals, anions, alkalinity, PAHs, phenols, PHCs, BTEX, PCBs, and radionuclides. Results were compared to ODWQS and 2004 MECP Table 3 guidelines, but are only summarized here for 2004 MECP Table 3 comparisons as deemed applicable.

Radionuclides do not have 2004 MECP Table 3 guidelines. Tritium was detected in a number of shallow wells. The maximum tritium concentration was 501 Bq/L within the protected area (MW-20C-3). MW-20C-3 is located south of reactor Unit 4, adjacent to the standby generators. Tritium concentrations within the DNNP lands ranged from non-detectable (15 Bq/L) to 68 Bq/L. Other radionuclides were non-detectable, with the exception of K-40, which is a naturally occurring radionuclide, that had a value of 66 Bq/L within one sample collected from MW-42-20; the second sampling event was non-detectable.

Nitrate was detected within a number of wells located in agricultural fields within the DNNP lands; however, there were no 2004 MECP Table 3 guidelines for nitrate. PAHs and phenols did not exceed applicable guidelines. Benzene, toluene, ethylbenzene, and xylene (BTEX) were detected within some bedrock groundwater samples at levels below 2004 MECP Table 3 guidelines; however, the bedrock is known to be petroliferous, and thus the trace levels were considered to be representative of naturally occurring hydrocarbon parameters. Although there were no 2004 MECP Table 3 guidelines for PHCs at the time of the 2009 report, PHCs were detected within a number of wells at levels below, but within the same order of magnitude, as the current MECP Table 3 guidelines. Further, there was one monitoring well, MW-53-31, which would have exceeded the current MECP Table 3 guideline for PHC F3 (522 µg/L measured > 500 µg/L MECP Table 3 guideline). MW-53-31 is located within the southeast corner of the DNNP lands.

Metals were discussed in comparison to the 2004 MECP Table 3 guidelines. With respect to MECP Table 3 guidelines, selenium occasionally exceeded the 2004 MECP Table 3 guideline of 0.05 mg/L within bedrock groundwater; however, it was deemed to be representative of natural background within bedrock. With the exception of selenium, metals concentrations were below the 2004 Table 3 guidelines, aside from an occasional, non-reproducible exceedance (CH2M HILL and Kinectrics 2009).

2012, 2013, and 2014 Darlington Nuclear Groundwater Monitoring Program Results (NK38-REP-10140-10017 –R000, NK38-REP-10140-10018-R000, and NK38-REP-10140-10022-R000)

Annual reports for 2012, 2013, and 2014 were reviewed for the most recent information on groundwater quality related to metals, chloride, sodium, and VOCs, which were not measured after 2014. PHC and BTEX monitoring is also discussed since monitoring includes wells not assessed in 2016 to 2018.

In 2012, PHCs, benzene, and VOC (1,1,2-Trichloroethane and 1,2- Dichloroethane only) analysis was conducted (OPG 2013a). PHCs and VOCs (full scan) were also measured in 2013, and PHCs and BTEX in 2014. PHCs and benzene exceeded the 2011 MECP Table 3 guidelines within six bedrock wells in 2012, and benzene exceeded the 2011 MECP Table 3 guideline of 44 µg/L within three bedrock wells in 2013: MW-017B-15, MW-070-55 and MW-120-18. Benzene similarly exceeded the 2011 MECP Table 3 guideline within bedrock monitoring well MW-017B-15 in 2014. However, groundwater quality assessments conducted in 2010 and 2011 confirmed this occurs due to petroliferous bedrock. In 2013, PHC F2 measuring 170 µg/L within MW-157-16 marginally exceeded the 2011 MECP Table 3 guideline of 150 µg/L. Two shallower wells clustered with MW-157-16 illustrated non-detectable PHC F2 levels, and therefore it was determined that the exceedance was not attributed to DNGS operations. BTEX and PHC monitoring were discontinued within these wells post-2013 (MW-070-55, MW-120-18, and MW-157-16) and 2014 (MW-017B-15). VOC (not including BTEX) were mainly non-detectable or below 2011 MECP Table 3 standards; monitoring was discontinued at the DNNP Site Study Area after 2013. PHCs and VOCs were removed from the monitoring program within bedrock wells as they naturally occur in petroliferous bedrock.

Sodium and chloride were measured within select site perimeter wells in 2012 (OPG 2013a) with metals added to monitoring within site boundary (perimeter) wells in 2013 in order to establish background (OPG 2014a). Consistent with findings of the 2009 Geological and Hydrogeological Environment Existing Environmental Conditions TSD, bedrock groundwater contained elevated concentrations of sodium and chloride in 2012, 2013, and 2014. Located within the DNNP lands, a deep bedrock well, MW-047-92, contained sodium and chloride concentrations of 1.60×10^8 µg/L and 4.70×10^7 µg/L, respectively, in 2013, and of 1.60×10^8 µg/L and 5.10×10^7 µg/L, respectively, in 2014, exceeding the 2011 MECP Table 3 guideline value of 2.30×10^6 µg/L. MW-047-92 also exceeded for lead (630 µg/L (2013) and 480 (2014) > 25 µg/L Table 3 guideline). MW-047-92 is located within the southern extent of the DNNP lands, approximately 150 metres from Lake Ontario. Regarding lead, samples from shallower wells (MW-045-10, MW-046-6 and MW-052-15) clustered with MW-047-92, all returned non-detectable results. As such, it was recognized that it is very unlikely for site activities to have impacted bedrock groundwater quality and that the elevated lead value is representative of natural background. Chloride similarly exceeded at bedrock well locations (MW-117-18, MW-015A-19, MW-019A-19, and MW-047-92) in 2013. In 2014, several bedrock wells (MW-015A-19, MW-019A-19, MW-047-92, MW-070-55, MW-117-18, MW-160-17, and MW-163-16) exceeded the 2011 MECP Table 3 guideline for either chloride, sodium, or both (OPG 2015a). Sodium and chloride exceedances were deemed to be representative of old, brackish water quality associated with bedrock.

Metal results within all remaining monitoring wells in 2014 were below the 2011 MECP Table 3 guidelines. The 2014 annual report indicated that "Multiple years of metals results do not indicate any concerns in groundwater at the site and therefore, sampling requirements for metals were removed (OPG 2015a)."

2016, 2017 and 2018 Darlington Nuclear Groundwater Monitoring Program Results (NK38-REP-10140-10024-R000, NK38-REP-10140-10027-R000 and NK38-REP-10140-10028-R000)

Tritium, PHCs and BTEX were measured in 2016, 2017 as well as 2018 (OPG 2017a; OPG 2018a, OPG 2019e). Tritium was measured across the site, while PHCs and BTEX were only measured within the protected area.

In December 2009, a spill occurred within the protected area due to the Injection Water Storage Tank (IWST), south of reactor Unit 0. To assess the plume, the IWST Spill Phase II Environmental Site Assessment (ESA) was completed from 2011 to 2013. As part of the IWST Spill Phase II ESA, the highest concentration reported within the plume was 7.18 x 10^4 Bq/L during 2012. Following the spill, plume migration was to the west toward the forebay.

Tritium results within annual groundwater monitoring reports are generally discussed in terms of trends and fluctuations. Results for tritium in groundwater indicated that in general, tritium concentrations at DNGS have remained relatively constant or have decreased, demonstrating stable trends over time. In general, elevated tritium concentrations due to the 2009 IWST spill show a declining trend. Slight increases in tritium concentrations were observed at some locations within the protected area. The 2018 annual report indicates that these are likely due to the stabilization of groundwater levels following the dewatering activities discussed in Section 5.3.2.3.

Maximum tritium concentrations at the DNNP Site Study Area, in all three years reviewed (2016-2018), occurred within MW-144-7, located within the IWST spill plume proximate to reactor Unit 0 and reactor Unit 2. The tritium concentration within MW-144-7 continues to show a declining trend in recent years, measuring 2.92 x 10^3 Bq/L (2016), 2.32 x 10^3 Bq/L (2017) and 2.14 x 10^3 Bq/L (2018). Figure 5-7 shows the declining trend in tritium at MW-144-7.

The maximum tritium concentration within the controlled area (lands on the DN site under OPG ownership outside of the protected area for DNGS) was found within MW-025-8, also showing a declining trend measuring 430 Bq/L (2016), 400 Bq/L (2017) and 340 Bq/L (2018). Tritium concentrations remained below detection (<100 Bq/L) within all perimeter monitoring wells with the exception of MW-016C-4 which had relatively constant levels ranging from 480 Bq/L to 470 Bq/L from 2016 to 2018. Located at the southern perimeter of the station, elevated concentrations at MW-016C-4 are attributed to migration from the Injection Water Storage Tank (IWST) spill area (OPG 2019e). Tritium concentrations within this well showed an increasing trend from 2009 to 2012, followed by a decreasing trend from 2012 to 2015, and has since remained relatively constant. All samples collected from wells within the DNNP lands were non-detectable for tritium (<100 Bq/L) from 2016 to 2018.

PHCs and BTEX results, which are measured annually within the protected area, were demonstrated to be at non-detectable to negligible levels from 2016 to 2018, therefore well below the 2011 MECP Table 3 guidelines. One exception is within MW-143-12, which exceeded for PHC F2 in 2016; concentrations declined after issues with the well's surface seal were repaired. PHCs and BTEX were not measured within the DNNP lands.

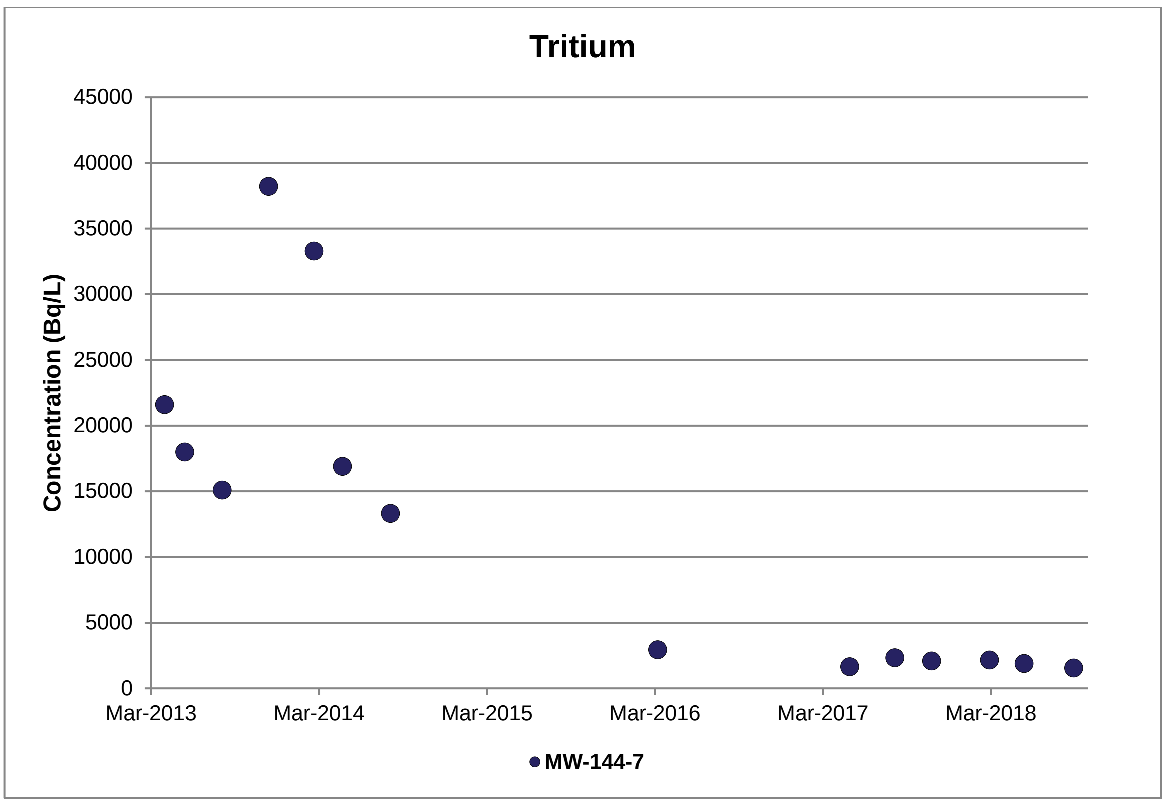

Figure 5-7: Tritium concentrations within MW-144-7 located within the IWST spill plume

5.4 Identification of Changes to Baseline or Standards

Changes since 2009 with respect to baseline conditions and/or environmental standards for soil and groundwater quality are identified in the following sections. Changes that are considered to warrant assessment of their impact on the conclusions reached previously in 2009 with respect to residual adverse effects of the project on the environment are assessed in Section 5.4. As stated in Sections 5.3.2.1 and 5.3.2.3, bedrock, surficial geology, and groundwater flow have not changed since the 2009 application.

5.4.1 Soil

5.4.1.1 Changes to Baseline

Differences Between 2009 and 2019 Sampling Programs

Soil assessments from the 2009 Geological and Hydrogeological Environment Existing Environmental Conditions TSD (CH2M HILL and Kinectrics 2009) and the recent 2019 sampling program (EcoMetrix 2019a), both focus mainly on DNNP lands as this is where soil excavation during site preparation will occur. The 2019 assessment had more locations compared to 2007/2008. More locations were necessary to characterize potentially contaminated soils and to provide expanded horizontal coverage. In 2007/2008, five boreholes included soil sampling, four of which were in the DNNP lands. In 2019, there were eighteen sampling locations. The 2007/2008 assessment entailed borehole drilling for soil collection at greater depths, while the 2019 program sampled surface soils (20 cm depth). Surficial soils are considered more relevant for assessment of potential effects on ecological receptors.

The parameter list was expanded in 2019, to fully assess the three areas of visually identified suspect soils (see section 5.3.2.2). Metals and radionuclides were measured in both 2007/2008 and 2019. PHCs, PAHs, VOCs, and TOC were additionally included for analysis in the 2019 assessment of soils.

Direct comparison of overlapping locations DN-83 (2007/2008) and DN15 (2019) is discussed below, followed by a general comparison of the overall sampling program results for the site in the context of applicable guidelines.

Direct Comparison of Overlapping Location DN-83 (2007/2008) and DN15 (2019)

Based on their similar locations on DNNP lands, direct comparison could be made between DN-83 (2007/2008) and DN15 (2019). Table 5-4 shows a comparison of surface metals and radionuclides data between DN-83 (2007/2008) and DN15 (2019) located on DNNP lands, north of the railway. In general, metal constituents at this location had lower concentrations in 2019. Calcium, silver, thorium, and tungsten concentrations were greater in 2019 than in

2007/2008. Radionuclides were all within the same order of magnitude between 2007/2008 and 2019. Radionuclides measured only in 2009 are not included in Table 5-4.

Table 5-4: Comparison of surface metals soil data for DN-83 (2007/2008) and DN15 (2019)

	Parameter	Unit	DN-83 (2009)	DN15 (2019)
Metals	Aluminum	µg/g	13094	8760
	Antimony	µg/g	0.3	0.13
	Arsenic	µg/g	4.18	2
	Barium	µg/g	599	54.4
	Beryllium	µg/g	1.51	0.38
	Bismuth	µg/g	<0.5	0.075
	Boron	µg/g	30	6.6
	Boron (hot water)	µg/g	0.42	0.44
	Cadmium	µg/g	0.501	0.274
	Calcium	µg/g	38218	57300
	Cesium	µg/g	0.924	0.364
	Chromium	µg/g	48.1	14.3
	Cobalt	µg/g	12.21	4.19
	Copper	µg/g	19.9	14.9
	Iron	µg/g	35958	14000
	Lead	µg/g	22.24	9.83
	Lithium	µg/g	21.5	7.9
	Magnesium	µg/g	5169	4130
	Manganese	µg/g	1232	446
	Mercury	µg/g	<0.05	0.045
	Molybdenum	µg/g	0.795	0.95
	Nickel	µg/g	22.2	8.5
	Phosphorus	µg/g	1021.04	782
	Potassium	µg/g	12825	1240
	Selenium	µg/g	<0.5	0.29382
	Silver	µg/g	0.156	0.553
	Sodium	µg/g	12570	117
	Strontium	µg/g	281.1	95.4
	Thallium	µg/g	0.4	0.1
	Thorium	µg/g	1.41	1.76
	Tin	µg/g	2.03	0.64

	Parameter	Unit	DN-83 (2009)	DN15 (2019)
	Titanium	µg/g	2468	264
	Tungsten	µg/g	0.29	7.04
	Uranium	µg/g	1.491	0.583
	Vanadium	µg/g	72.3	21.5
	Zinc	µg/g	106.2	53.3
	Zirconium	µg/g	97.99	0.62
Radionuclides	H-3	Bq/kg	27	30
Radionuclides	C-14	Bq/g-C	0.247	0.259
Radionuclides	Co-60	Bq/kg	<1	0
Radionuclides	Cs-134	Bq/kg	<1	0.1
Radionuclides	Cs-137	Bq/kg	5.1	6.3
Radionuclides	I-131	Bq/kg	<3	0.3
Radionuclides	K-40	Bq/kg	422	514
Radionuclides	Th-Series	Bq/kg	17	22.7
Radionuclides	U-Series	Bq/kg	19	16.4

Data value increased
Data value decreased

Supporting documents:

NK054-REP-07730-00005-R000: Geological and Hydrogeological Environment Existing Environmental Conditions Technical Support Document New Nuclear - Darlington Environmental Assessment

General Comparison of Overall Sampling Program Results

The only exceedance identified in the 2009 Geological and Hydrogeological Environment Existing Environmental Conditions TSD was for beryllium at all five sampled locations (CH2M HILL and Kinectrics 2009). The 2019 assessment did not show any exceedances of beryllium. In 2007/2008, the concentration of beryllium ranged from 0.53 to 1.9 µg/g, compared to 0.20 to 0.68 µg/g in 2019. Additionally, the MECP Table 3 guideline for beryllium increased (less stringent) from 1.2 µg/g to 8.0 µg/g since the 2009 application.

In 2019, the yard waste and building materials dump was included as a new location not previously sampled in 2007/2008; therefore, there is no direct comparison to baseline. All but one of the identified exceedances occurred within two samples: DN6 and DN6A, which were collected within the yard waste and building materials dump site. Within DN6 and DN6A, a number of metal constituents (i.e., arsenic, cadmium, chromium, cobalt, copper, lead, molybdenum, nickel, selenium, tin, and zinc) exceeded within one or both samples. Exceedances of other parameters within DN6 and DN6A included cyanide, and PHCs.

The only exceedance not within samples DN6 and DN6A, was a marginal exceedance of cyanide in DN12, located west of the switchyard. Cyanide was not included as a measured parameter at the site in 2009. With the exception of DN6 discussed above, the measured parameters from all samples collected within the DNNP lands were below the MECP Table 3 guidelines.

For radionuclides, Cs-137, K-40, tritium and C-14 were measured above detection in 2007/2008. In 2019, Co-60, and I-131 were also detected in addition to Cs-137, K-40, tritium and C-14. Specific locations for detections of Co-60 (DN2) and I-131 (DN6, DN11, DN12, DN14, and DN18A) in 2019 were not sampled in 2007/2008. As discussed above, sample locations allow limited comparisons between 2007/2008 and 2019.

Results of metals in soil data from the 2009 EcoRA (SENES 2009c) were also compared to the recent 2019 soil results for metals. It should be noted that the 2009 EcoRA utilized data from the Geological and Hydrogeological Environment Existing Environmental Conditions TSD. In the 2009 EcoRA, no exceedances were presented. However, strontium and zirconium, which do not have a guideline, were identified as COPCs in the EcoRA based on exceeding background data. For these parameters (strontium and zirconium) the mean concentrations in the EcoRA were 179.3 and 62.9 µg/g, respectively, and the mean concentrations in the 2019 sampling program for the DNNP lands (DN1 to DN8, and DN17 and DN18) were 268.3 and 3.0 µg/g respectively. The current strontium mean concentration is similar to the historical value; however, the zirconium mean concentration is a lot lower.

There were fundamental differences between the objectives of the 2007/2008 and 2019 sampling programs, resulting in differences in sampling effort and locations between the two programs. However, the overall results of both assessments indicate that soils generally remain of good quality. The only exception is the yard waste and building materials dump area (DN6 and DN6A) which was specifically targeted in 2019 based on visual observations that were made in 2007/2008 of potential contamination.

5.4.1.2 Changes to Standards

Soil quality guidelines used in the Geological and Hydrogeological Environment Existing Environmental Conditions TSD were based on the 2004 MECP Table 3 non-potable guidelines (industrial/commercial use in a non-potable groundwater setting) (CH2M HILL and Kinectrics 2009). The MECP Table 3 guidelines were updated in 2011 for a number of parameters. Soil quality guidelines used in the 2009 EcoRA were also based on the 2004 MECP Table 3 guidelines, in addition to the CCME SQGs (SENES 2009c). Table 5-5 provides a summary of the changes to the MECP Table 3 guidelines as well as the CCME SQGs that are relevant to the project.

Table 5-5: Comparison of soil quality guidelines used in the 2009 application supporting documents to recent guidelines.

	Parameter	Unit	MOE Table 3 (Industrial /Commercial/ Community)		CCME Soil Guidelines[3]							CCME Year of Update	Comments
			2009[1]	2019[2]	Agricultural	Residential/parkland		Commercial		Industrial			
					2019	2009	2019	2009	2019	2009	2019		
Metals	Aluminum	µg/g	-	-	-	-	-	-	-	-	-	-	
	Antimony	µg/g	40	40	20	20	20	-	-	-	-	1991	
	Arsenic	µg/g	40	18	12	12	12	12	12	12	12	1997	
	Barium	µg/g	1500	670	750	500	500	2000	2000	2000	2000	2013	
	Beryllium	µg/g	1.2	8	4	4	4	-	8	-	8	2015	CCME guidelines updated in 2015.
	Bismuth	µg/g	-	-	-	-	-	-	-	-	-	-	
	Boron	µg/g	-	120	-	-	-	-	-	-	-	1991	
	Boron (hot water)	µg/g	2	2	2	2	-	-	-	-	-	-	CCME residential/parkland does not have data for hot water extractable boron. The guideline was published in 1991.
	Cadmium	µg/g	12	1.9	1.4	10	10	22	22	22	22	1999	
	Calcium	µg/g	-	-	-	-	-	-	-	-	-	-	
	Cesium	µg/g	-	-	-	-	-	-	-	-	-	-	
	Chromium	µg/g	750	160	64	64	64	87	87	87	87	1997	
	Chromium (VI)		8	-	0.4	0.4	0.4	1.4	1.4	1.4	1.4	1999	
	Cobalt	µg/g	80	80	40	50	50	300	300	300	300	1991	
	Copper	µg/g	225	230	63	63	63	91	91	91	91	1999	
	Iron	µg/g	-	-	-	-	-	-	-	-	-	-	
	Lead	µg/g	1000	120	70	140	140	260	260	600	600	1999	
	Lithium	µg/g	-	-	-	-	-	-	-	-	-	-	
	Magnesium	µg/g	-	-	-	-	-	-	-	-	-	-	
	Manganese	µg/g	-	-	-	-	-	-	-	-	-	-	
	Mercury	µg/g	10	3.9	6.6	6.6	6.6	24	24	50	50	1999	
	Molybdenum	µg/g	40	40	5	10	10	40	40	40	40	1991	
	Nickel	µg/g	150	270	45	50	45	50	89	50	89	2015	
	Total PCBs	µg/g	25	-	0.5	1.3	1.3	33	33	33	33	1999	
	Phosphorus	µg/g	-	-	-	-	-	-	-	-	-	-	
	Potassium	µg/g	-	-	-	-	-	-	-	-	-	-	
	Selenium	µg/g	10	5.5	1	1	1	2.9	2.9	2.9	2.9	2009	
	Silver	µg/g	40	40	20	20	20	-	40	-	40	1991	In 2009 Application, the number for commercial/Industrial use was not listed.
	Sodium	µg/g	-	-	-	-	-	-	-	-	-	-	
	Strontium	µg/g	-	-	-	-	-	-	-	-	-	-	
	Thallium	µg/g	32	3.3	1	1	1	1	1	1	1	1999	
	Thorium	µg/g	-	-	-	-	-	-	-	-	-	-	
	Tin	µg/g	-	-	5	50	50	300	300	300	300	1991	
	Titanium	µg/g	-	-	-	-	-	-	-	-	-	-	

Parameter	Unit	MOE Table 3 (Industrial /Commercial/ Community) 2009[1]	MOE Table 3 2019[2]	CCME Soil Guidelines[3] Agricultural 2019	Residential/parkland 2009	Residential/parkland 2019	Commercial 2009	Commercial 2019	Industrial 2009	Industrial 2019	CCME Year of Update	Comments
Tungsten	µg/g	-	-	-	-	-	-	-	-	-	-	
Uranium	µg/g	-	33	23	23	23	33	300	300	300	2007	
Vanadium	µg/g	200	86	130	130	130	130	130	130	130	1997	
Zinc	µg/g	600	340	250	200	250	360	410	360	410	2018	Current criteria for zinc was greater after the guideline update.
Zirconium	µg/g	-	-	-	-	-	-	-	-	-	-	

Criteria value decreased

Criteria value increased

Notes:

[1] Ontario Ministry of the Environment (MOE). 2004. Soil, Groundwater and Sediment Standards for Use Under Park XV.1 of the Environmental Protection Act. March 9th.

[2] Ontario Ministry of the Environment (MOE). 2011. Soil, Groundwater and Sediment Standards for Use Under Park XV.1 of the Environmental Protection Act. July 1st. 2011.

[3] Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health

Supporting documents:

NK054-REP-07730-00005-R000: Geological and Hydrogeological Environment Existing Environmental Conditions Technical Support Document New Nuclear - Darlington Environmental Assessment, Table 2.2-3

NK054-REP-07730-00022-R000 Ecological Risk Assessment and Assessment of Effects on Non-Human Biota Technical Support Document New Nuclear - Darlington Environmental Assessment

5.4.2 Groundwater

5.4.2.1 Changes to Baseline

Changes to baseline groundwater data are discussed broadly for the DNNP Site Study Area, as well as with focus on the DNNP lands.

When comparing the 2009 baseline to the updated baseline, for parameters in groundwater, the following points are considered:

- More parameters were measured in 2009; as such the 2009 baseline for those parameters is the most recently available baseline.
  - Representative 2009 baseline for radioactive parameters include Sr-90, C-14, Cs-134, Cs-137, Co-60, K-40, Th series, and U-series. Tritium is the only radioactive parameter measured in recent annual groundwater monitoring reports, and thus included in the updated baseline.
  - Representative 2009 baseline for anions includes chloride, sulphate, bromide, fluoride, nitrate, nitrite, and phosphate. Of these, only chloride was included in recent annual groundwater monitoring reports (2012-2014), and thus included in the updated baseline.
  - PCBs, PAHs and phenolics, as well as alkalinity were measured in 2009 but not in recent annual groundwater monitoring, thus 2009 data represent the most recent baseline.
  - The metals scan completed in 2009 was more comprehensive than in recent annual groundwater reports (2013 and 2014). The following metals were measured in 2009, but not in recent annual monitoring: aluminum, barium, beryllium, bismuth, boron, cesium, chromium (total), lithium, mercury, molybdenum, potassium, silver, strontium, thallium, thorium, tin, titanium, tungsten, uranium, vanadium and zirconium. As such, 2009 data for the aforementioned metals represent the most recent baseline.

- Data from annual groundwater monitoring is encompassed to establish a new updated baseline.
  - Tritium data from 2016 to 2018 is incorporated into an updated baseline.
  - VOC data for 2012 (benzene; 1,1,2-Trichloroethane and 1,2- Dichloroethane only) and 2013 (full scan inclusive of BTEX) represents baseline. VOCs were not included in the 2009 baseline. The exception is BTEX.
  - BTEX data from 2012 (benzene only), 2013 (as part of VOC scan), 2014, and 2016 to 2018 is incorporated into an updated baseline.
  - PHC data from 2012 to 2014 and 2016 to 2018 is incorporated into an updated baseline.

  - o Sodium and chloride data from 2012, and metals data (inclusive of sodium and chloride) from 2013 and 2014 are incorporated into an updated baseline. As mentioned, the 2009 metals scan was more comprehensive. In addition to sodium and chloride, metal constituents incorporated into the updated baseline are antimony, arsenic, cadmium, calcium, cobalt, copper, iron, lead, magnesium, manganese, nickel, phosphorus, selenium, sodium and zinc.

- All groundwater parameters considered in 2009 were measured at locations within the DNNP lands. Comparatively, recent annual groundwater monitoring within the DNNP lands only includes tritium, sodium and chloride in 2012, tritium and a condensed metals scan (inclusive of sodium and chloride) in 2013 and 2014, and tritium up to the most recent monitoring in 2018.

The December 2009 IWST caused increased tritium groundwater concentrations within the DNGS protected area. The maximum measured tritium concentration considered in the 2009 baseline, which occurred within the protected area, was 501 Bq/L. Comparatively, the maximum tritium concentration reported since the 2009 baseline was established, was 7.18 x 10^4 Bq/L during 2012, within the IWST spill plume. Tritium levels have been declining, maximums reported in 2016, 2017, and 2018, all within MW-144-7 situated within the plume, were 2.92 x 10^3 Bq/L, 2.32 x 10^3 Bq/L, and 2.14 x 10^3 Bq/L, respectively.

Within the DNNP lands, tritium concentrations ranged from non-detectable to 68 Bq/L representing the 2009 baseline. Recent groundwater monitoring (2016-2018) for tritium within the DNNP lands were all non-detectable.

VOC data for 2012 and 2013 marks the most recent baseline data (exclusive of BTEX) as VOCs were not monitored in 2009. Baseline VOC data (not measured within DNNP lands) is characterized as ranging from non-detectable to levels below the 2011 MECP Table 3 guidelines.

BTEX and PHCs were consistently detected within naturally petroliferous bedrock monitoring wells in 2009, as well as in 2012 to 2014, with benzene, PHC F1, F2, and F3 often exceeding the MECP Table 3 guidelines. For shallow wells, there were no concerns for baseline BTEX data in 2009 or more recently in 2016 to 2018. Baseline BTEX and PHC data has generally not changed. Recent monitoring within the DNNP lands does not include BTEX and PHCs.

Metals, sodium and chloride data are discussed as they relate to comparisons between 2009 and recent 2012 to 2014 annual monitoring. At the time of the 2009 monitoring, there were no MECP Table 3 guidelines for chloride or sodium. Maximum sodium and chloride concentrations in 2009 were 2.4 x 10^7 µg/L and 7.9 x 10^7 µg/L, respectively, which both occurred within MW-019A-19 located south of the powerhouse, and both exceeded the current MECP Table 3 guideline of 2.30 x 10^6 µg/L. Maximums within the same well from

2013 to 2014 had similar results; 2.9 x 10^7 µg/L for sodium (2014), and 8.1 x 10^7 µg/L for chloride (2013).

Site maximums in recent monitoring occurred within MW-047-92, which was not sampled in 2009. MW-047-92 is located within the southern extent of the DNNP lands. In 2014, concentrations of sodium and chloride, within MW-047-92, were 5.1 x 10^7 µg/L and 1.6 x 10^8 µg/L, respectively. Generally, elevated sodium and chloride within bedrock was consistent when comparing 2009 to recent data and the baseline has not changed. The lead MECP Table 3 exceedances (2013 and 2014) found within MW-047-92 cannot be directly compared since this well was not sampled in 2009. This is an update to baseline, in the sense of new data, however, it is not a concern as it is deemed representative of natural background.

Selenium exceeded within nine bedrock wells during 2009 monitoring when compared to the guideline value at the time of 50 µg/L; the current guideline value of 63 µg/L is less stringent, which reduces the total number of wells in exceedance to seven. Out of the nine wells, MW-015A-19 located south of the powerhouse has been included in recent 2013 and 2014 monitoring, allowing for direct comparison. Selenium concentrations within MW-015A-19 were 214 µg/L in 2009 and non-detectable (<10 µg/L) in 2013 and 2014, a substantial decline. There were greater concentrations within other wells measured only in 2009, however it was concluded that overall, elevated selenium within bedrock wells was representative of natural background within bedrock.

5.4.2.2 Changes to Standards

Groundwater quality guidelines used in the Geological and Hydrogeological Environment Existing Environmental Conditions TSD were based on the MECP 2004 Table 3 non-potable guidelines (CH2M HILL and Kinectrics 2009). MECP Table 3 guidelines were updated in 2011 for a number of parameters. Table 5-6 provides a summary of the changes to the MECP Table 3 guidelines that are relevant to the project.

Table 5-6: Comparison of groundwater quality guidelines used in the 2009 application supporting documents to recent guidelines.

Parameter		Unit	MOE Table 3, Non-potable ground water	
			2009[1]	2019[2,3]
Metals	Antimony	µg/L	16000	20000
	Arsenic	µg/L	480	1900
	Barium	µg/L	23000	29000
	Beryllium	µg/L	53	67
	Boron	µg/L	50000	45000
	Cadmium	µg/L	11	2.7
	Chromium	µg/L	2000	810

	Parameter	Unit	MOE Table 3, Non-potable ground water	
			2009[1]	2019[2,3]
	Cobalt	µg/L	100	66
	Copper	µg/L	23	87
	Lead	µg/L	32	25
	Mercury	µg/L	0.12	0.29
	Molybdenum	µg/L	7300	9200
	Nickel	µg/L	1600	490
	Selenium	µg/L	50	63
	Silver	µg/L	1.2	1.5
	Sodium	µg/L	-	2300000
	Uranium	µg/L	-	-
	Vanadium	µg/L	200	250
	Zinc	µg/L	1100	1100
PAHs	Acenaphthene	µg/L	1700	600
	Acenaphthylene	µg/L	2000	1.8
	Anthracene	µg/L	12	2.4
	Benz[a]anthracene	µg/L	5	4.7
	Benzo[a]pyrene	µg/L	1.9	0.81
	Benzo[b]fluoranthene	µg/L	7	0.75
	Benzo[ghi]perylene	µg/L	0.2	0.2
	Benzo[k]fluoranthene	µg/L	0.4	0.4
	Chrysene	µg/L	3	1
	Dibenz[a h]anthracene	µg/L	0.25	0.52
	Fluoranthene	µg/L	130	130
	Fluorene	µg/L	290	400
	Indeno[1 2 3-cd]pyrene	µg/L	0.27	0.2
	Methlynaphthalene, 2-(1-)	µg/L	13000	1800
	Naphthalene	µg/L	5900	1400
	Phenanthrene	µg/L	63	580
	Pyrene	µg/L	40	68
Phenolics & VOCs	Benzene	µg/L	1900	44
	Biphenyl 1,1'-	µg/L	1700	1000
	Bis(2-chloroethyl)ether	µg/L	110	300000
	Bis(2-chloroisopropyl)ether	µg/L	430	20000
	Bis(2-ethylhexyl)phthalate	µg/L	30	140
	Chloroaniline p-	µg/L	100	400
	Chlorophenol, 2-	µg/L	44000	3300
	Dichlorobenzene, 1,2-	µg/L	7600	4600
	Dichlorobenzene, 1,3-	µg/L	7600	9600
	Dichlorobenzene, 1,4-	µg/L	7600	8

Parameter		Unit	MOE Table 3, Non-potable ground water	
			2009[1]	2019[2,3]
	Dichlorobenzidine, 3,3'-	µg/L	1600	640
	Dichlorophenol, 2,4-	µg/L	3700	4600
	Diethyl Phthalate	µg/L	30	38
	Dimethylphthalate	µg/L	30	38
	Dimethylphenol, 2,4-	µg/L	21000	39000
	Dinitrotoluene, 2,4 & 2,6-	µg/L	2300	2900
	Ethylbenzene	µg/L	28000	2300
	Hexachlorobenzene	µg/L	0.62	3.1
	Hexachlorobutadiene	µg/L	0.87	0.44
	Hexachloroethane	µg/L	12	94
	Pentachlorophenol	µg/L	130	62
	Phenol	µg/L	26000	12000
	Toluene	µg/L	5900	18000
	Tetrachlorophenol	µg/L	-	-
	Trichlorobenzene, 1,2,4-	µg/L	500	180
	Trichlorophenol, 2,4,5-	µg/L	630	1600
	Trichlorophenol, 2,4,6-	µg/L	9700	230
	Xylenes (o-, m-, p-)	µg/L	5600	4200
PCBs	PCB	µg/L	0.2	7.8
PHCs	PHC F1 (excluding BTEX)	µg/L	-	750
	PHC F2	µg/L	-	150
	PHC F3	µg/L	-	500
	PHC F4	µg/L	-	500
Anions	Fluoride	mg/L	-	-
	Nitrate (as nitrogen)	mg/L	-	-
	Nitrite (as nitrogen)	mg/L	2	-
	Chloride	mg/L	-	2300

Criteria value decreased (orange)
Criteria value increased (green)

Notes:
[1] Ontario Ministry of the Environment (MOE). 2004. Soil, Groundwater and Sediment Standards for Use Under Park XV.1 of the Environmental Protection Act. March 9th, 2004
[2] Ontario Ministry of the Environment (MOE). 2011. Soil, Groundwater and Sediment Standards for Use Under Park XV.1 of the Environmental Protection Act. July 1st. 2011
[3] To apply MOE Table 3, Guidelines for the coarse soil was used to keep the approach conservative.
Supporting Document:
NK054-REP-07730-00005-R000: Geological and Hydrogeological Environment Existing Environmental Conditions Technical Support Document New Nuclear - Darlington Environmental Assessment

5.5 Assessment of Changes

This section provides an assessment of the changes that were described in Section 5.3, and their potential to alter the conclusions described in the *Geological and Hydrogeological Environmental Effects Technical Support Document* (CH2M HILL 2009) prepared in support of the 2009 application.

5.5.1 Potential for Change in Conclusions of Site Evaluation

5.5.1.1 Soil

The main changes in the soil baseline between 2009 and the current site condition for DNNP lands are evaluated in the following sub-sections to assess whether those changes are likely to alter the conclusions of the 2009 application supporting documents.

5.5.1.1.1 Yard Waste and Building Materials Dump Site 2019 Exceedances

The 2009 Geological and Hydrogeological Environment Existing Environmental Conditions TSD discussed visual observations of potentially impacted soils in the spoils disposal area, cement plant area, and asphalt storage area. At that time, OPG proposed that any impacted soils would be removed prior to construction.

Based on the 2019 soil assessment, results confirmed that soils within the yard waste and building materials dump site are impacted by metals (i.e., arsenic, cadmium, chromium, cobalt, copper, lead, molybdenum, nickel, selenium, tin, and zinc), PHCs, and cyanide.

The baseline has not changed in this area since 2009; however, in 2019, quantitative data were obtained. The exceedances of soil quality guidelines will be assessed quantitatively in the next update to the DN ERA.

The conclusions in the 2009 application supporting documents, including the Geological and Hydrogeological Environment Existing Environmental Effects TSD (CH2M HILL 2009), regarding the residual adverse effects of the project on the environment do not change as a result of the updated soil quality baseline.

5.5.1.1.2 Soil Parameters: More Stringent Guidelines

Soil quality guidelines used in the 2009 Geological and Hydrogeological Environment Existing Environmental Conditions TSD as well as the 2009 Ecological Risk Assessment and Assessment of Effects on Non-Human Biota TSD were reviewed to determine if soil concentrations for parameters which now have more stringent guidelines (i.e., guideline decreased or new guideline implemented) would now exceed the updated guideline.

Table 5-7 includes a list of those parameters from Table 5-5, where the MECP Table 3 guidelines have become more stringent, screened against the respective maximum concentration measured in 2009. Any parameters which were not considered an exceedance in 2009, but now exceed a new guideline, are identified, and the implications for conclusions concerning residual adverse effects of the project are considered.

As noted in Table 5-7, barium in soil exceeds the new MECP guideline. This appears to be a natural condition, and the exceedances are only in deep soil samples, near bedrock, so receptor exposures to higher barium concentrations is unlikely. This baseline condition does not alter the original conclusions regarding residual adverse effects of the project on the environment.

In the case of the CCME SQGs applied in the 2009 Ecological Risk Assessment and Assessment of Effects on Non-Human Biota TSD, commercial/industrial guidelines were published for beryllium and silver. The residential/parkland guideline for nickel became more stringent, but the more relevant commercial/industrial guideline became less stringent. Overall, the changes to CCME guidelines do not alter the finding that soil parameters are below the applicable CCME guidelines, and therefore the changes do not impact the conclusions of the 2009 application supporting documents.

Table 5-7: Screening of 2009 maximum soil concentrations for parameters with more stringent MECP Table 3 guidelines

	Parameter	Unit	MOE Table 3 (Industrial /Commercial/ Community) 2009[1]	2019[2]	2009 G&H TSD Maximum Concentration	Description of Exceedance	Impact to 2009 Conclusions?
Metals	Arsenic	µg/g	40	18	4.2	-	-
	Barium	µg/g	1500	670	685	Two exceedances of new guideline. Samples from DN-73 (22 m bgs) and DN-83 (12-18 m bgs).	Barium is considered to occur naturally as there was consistency across the DNNP Site Study Area, similar to beryllium. Additionally, exceedances are for deep soil samples; therefore, exposure to human or ecological receptors would be unlikely. Therefore, there is no impact on the conclusions of the TSD[3].
	Boron	µg/g	-	120	44.6	-	-
	Cadmium	µg/g	12	1.9	0.52	-	-
	Chromium	µg/g	750	160	56.7	-	-
	Lead	µg/g	1000	120	23.4	-	-
	Mercury	µg/g	10	3.9	<0.05	-	-
	Selenium	µg/g	10	5.5	1.2	-	-
	Silver	µg/g	40	40	0.16	-	-
	Thallium	µg/g	32	3.3	0.61	-	-
	Uranium	µg/g	-	33	4.1	-	-
	Vanadium	µg/g	200	86	82.1	-	-
	Zinc	µg/g	600	340	106	-	-

(yellow) Concentration exceeded both old and new guidelines
(orange) Concentration exceeds new guideline

Notes:
[1] Ontario Ministry of the Environment (MOE). 2004. Soil, Groundwater and Sediment Standards for Use Under Park XV.1 of the Environmental Protection Act. March 9th.
[2] Ontario Ministry of the Environment (MOE). 2011. Soil, Groundwater and Sediment Standards for Use Under Park XV.1 of the Environmental Protection Act. July 1st. 2011.
[3.] TSD:
NK054-REP-07730-00005-R000: Geological and Hydrogeological Environment Existing Environmental Conditions Technical Support Document New Nuclear - Darlington Environmental Assessment, Table 2.2-3

5.5.1.2 Groundwater

The main changes in the groundwater baseline between 2009 and the current site condition are evaluated in the following sub-sections to assess whether those changes are likely to alter the conclusions of the 2009 application supporting documents.

5.5.1.2.1 Aquifer Rate of Transfer and Well Capture Zones

The Compliance Assessment (Kinectrics 2019) identified that the requirement in Section C.5.4 of REGDOC 1.1.1 to provide transfer rates between aquifers and the capture zone of ground water monitoring wells was not addressed as part of the 2009 application.

Assessment/Disposition

The hydraulic properties of the subsurface at the DNGS Site Study Area have been extensively characterized through monitoring and testing of wells in the existing groundwater monitoring network. The rates and direction of groundwater flow and the transfer of water between aquifers are all understood on the basis of water level, hydraulic conductivity, hydraulic gradient, transmissivity (rate of transfer), and vertical gradient information available for the Site (CH2M HILL and Kinectrics 2009). An in-depth understanding of the groundwater flow system has been developed through field investigations, involving the installation of numerous monitoring wells and observations and testing on the wells, in addition to extensive groundwater modelling that was focused on groundwater flow at and around the site. Flow gradients occur toward the DN property boundaries of Lake Ontario and Darlington Creek; therefore, determination of capture zone of wells is not applicable as any residential wells occur upgradient from the DNNP Site Study Area. Therefore, the general intent of REGDOC 1.1.1 has been met and the original conclusions regarding residual adverse effects of the project remain valid, no further actions are necessary.

5.5.1.2.2 Increased Tritium in Groundwater from the IWST Spill

The most notable change to groundwater conditions at the DNNP Site Study Area is as a result of the December 2009 IWST spill, contributing to elevated tritium concentrations proximate to the powerhouse. The 2009 application was based on 2008 data, before the spill occurred. At that time, the maximum tritium concentration was 501 Bq/L proximate to the powerhouse. Since the spill, the maximum tritium concentration of 7.18×10^4 Bq/L was recorded in 2012. The most recent 2018 maximum tritium concentration was 2.14×10^3 Bq/L, approximately four times greater than the original baseline. This maximum occurred within MW-144-7 which was installed in 2012 as part of the IWST Spill Phase II ESA. Despite increased tritium concentrations within the DNGS protected area, concentrations within the DNNP lands (Figure 5-1) remain non-detectable, which is expected based on groundwater flow directions. Thus, the new baseline condition does not affect the conclusions regarding residual adverse effects of the project on the environment.

5.5.1.2.3 New VOC Data

VOCs were not included as part of the 2009 Geological and Hydrogeological Environment Existing Environmental Conditions TSD. Although not monitored within the DNNP lands, this represents new baseline data for the Site Study Area. The new VOC baseline consists of mainly non-detectable results, and all results are well below the MECP Table 3 guidelines. Considering this is an addition of new data, there is no direct comparison to older data. The original conclusions indicate that groundwater quality is unlikely to be impacted by VOCs. This conclusion remains valid.

5.5.1.2.4 Selenium Exceedances in 2009

In 2009, selenium was detected in a number of bedrock wells above the 2004 MECP Table 3 guidelines. Only one of these wells, MW-015A-19, was monitored for selenium both for the original baseline as well as in recent 2013 and 2014 annual monitoring. MW-015A-19 had a selenium concentration of 214 µg/L in 2009, and was non-detectable (<10 µg/L) in more recent years (2013 and 2014). The 2009 Geological and Hydrogeological Environment Existing Environmental Conditions TSD concluded that elevated selenium was representative of natural background within bedrock. Specific to MW-015A-19, this well has shown a decline in selenium. Generally, the other wells were not monitored for selenium in recent years. Considering that selenium was concluded to be representative of natural background within bedrock, the updated baseline does not alter the conclusions of the 2009 application supporting documents.

5.5.1.2.5 Lead Exceedance in a Deep Bedrock Well

Consistent lead exceedances within MW-047-92 in both 2013 and 2014, which were not measured in 2009, were concluded to represent natural background. As such, this change does not impact on the conclusions of the 2009 application supporting documents.

5.5.1.2.6 Groundwater Parameters: More Stringent Guidelines

Data from the 2009 Geological and Hydrogeological Environment Existing Environmental Conditions TSD were reviewed to determine if groundwater concentrations for parameters which now have more stringent guidelines (i.e., guideline decreased or new guideline implemented) would now exceed the updated guideline. Table 5-8 includes a list of orange highlighted parameters from Table 5-6 with the previous and current MECP Table 3 guidelines, screened against the respective maximum concentration measured in 2009. Sodium, chloride, PHC F3, and chrysene, which were not considered an exceedance in 2009 but now exceed a new guideline, were deemed not to impact the conclusions of the 2009 application supporting documents regarding residual adverse effects of the project on the environment (Table 5-8). Exceedances of sodium, chloride, and PHC F3 are attributed to natural background. The exceedance of chrysene was both marginal and anomalous, as all other samples were below MDL.

Table 5-8: Screening of 2009 max groundwater concentrations for parameters with more stringent guidelines.

	Parameter	Unit	MECP Table 3, Non-potable ground water		2009 Maximum Concentration	Description of Exceedance	Impact to 2009 Conclusions?
			2009[1]	2019[2]			
Metals	Boron	µg/L	50000	45000	3200	-	-
	Cadmium	µg/L	11	2.7	0.525	-	-
	Chromium	µg/L	2000	810	0.05	-	-
	Cobalt	µg/L	100	66	150	Two anomalous exceedances of old and new guideline. All other samples below new guideline.	-
	Lead	µg/L	32	25	2.7	-	-
	Nickel	µg/L	1600	490	2330	One anomalous exceedance of both old and new guideline. All other samples below new guideline.	-
	Sodium	µg/L	-	2.3×10^6	2.4×10^7	Five exceedances of new guideline. Elevated concentrations acknowledged in 2009, and recent monitoring, to be attributed to natural highly mineralized groundwater in bedrock.	No
PAHs	Acenaphthene	µg/L	1700	600	<0.2	-	-
	Acenaphthylene	µg/L	2000	1.8	<0.2	-	-
	Anthracene	µg/L	12	2.4	<0.2	-	-
	Benz[a]anthracene	µg/L	5	4.7	<0.2	-	-
	Benzo[a]pyrene	µg/L	1.9	0.81	<0.1	-	-
	Benzo[b]fluoranthene	µg/L	7	0.75	<0.2	-	-
	Chrysene	µg/L	3	1	1.1	One marginal exceedance of new guideline. Did not exceed first round sample. All other samples at DNNP Site Study Area were below detection.	The 2009 TSD[3] found that PAHs did not exceed. This is the only PAH exceedance based on new guidelines. It did not exceed in 2009 and all other samples at the DNNP Site Study Area were below detection. This marginal chrysene exceedance does not change the conclusions regarding residual adverse effects of the project on the environment.
	Indeno[1 2 3-cd]pyrene	µg/L	0.27	0.2	<0.2	-	-
	Methlynaphthalene, 2-(1-)	µg/L	13000	1800	0.5	-	-
	Naphthalene	µg/L	5900	1400	0.4	-	-
Phenolics & VOCs	Benzene	µg/L	1900	44	21	-	-
	Biphenyl 1,1'-	µg/L	1700	1000	<0.4	-	-
	Chlorophenol, 2-	µg/L	44000	3300	<0.3	-	-
	Dichlorobenzene, 1,2-	µg/L	7600	4600	<0.4	-	-
	Dichlorobenzene, 1,4-	µg/L	7600	8	<0.4	-	-
	Dichlorobenzidine, 3,3'-	µg/L	1600	640	<0.4	-	-
	Ethylbenzene	µg/L	28000	2300	6.9	-	-
	Hexachlorobutadiene	µg/L	0.87	0.44	<0.2	-	-
	Pentachlorophenol	µg/L	130	62	<2.0	-	-
	Phenol	µg/L	26000	12000	<1.0	-	-
	Trichlorobenzene, 1,2,4-	µg/L	500	180	<0.1	-	-
	Trichlorophenol, 2,4,6-	µg/L	9700	230	<1.0	-	-
	Xylenes (o-, m-, p-)	µg/L	5600	4200	33.7	-	-
PHCs	PHC F1 (excluding BTEX)	µg/L	-	750	222	-	-
	PHC F2	µg/L	-	150	100	-	-
	PHC F3	µg/L	-	500	522	One exceedance of new guideline. Consistent with naturally petroliferous bedrock discussed in 2009 and recent assessments.	No
	PHC F4	µg/L	-	500	288	-	-
Anion	Chloride	mg/L	-	2300	79000	Ten exceedances of new guideline. Elevated concentrations presented in 2009 and recent monitoring are attributed to natural highly mineralized groundwater in bedrock.	No

Concentration exceeded both old and new guidelines

Concentration exceeds new guideline

Notes:
[1] Ontario Ministry of the Environment (MOE). 2004. Soil, Groundwater and Sediment Standards for Use Under Park XV.1 of the Environmental Protection Act. March 9th, 2004
[2] Ontario Ministry of the Environment (MOE). 2011. Soil, Groundwater and Sediment Standards for Use Under Park XV.1 of the Environmental Protection Act. July 1st. 2011
[3]. TSD:

NK054-REP-07730-00005-R000: Geological and Hydrogeological Environment Existing Environmental Conditions Technical Support Document New Nuclear - Darlington Environmental Assessment

5.5.2 Additional Commitments (if Required)

5.5.2.1 Mitigating Action

No mitigating actions for the geological and hydrogeological environment are suggested.

5.5.2.2 Follow-up Monitoring

No follow-up monitoring for the geological and hydrogeological environment is suggested.

5.5.2.3 Conclusion

The current baseline data and regulatory guidelines do not alter the conclusions of the 2009 application supporting documents regarding residual adverse effects of the project and no further actions are necessary to address the DNNP.

6.0 BASELINE HYDROLOGY, SURFACE WATER AND SEDIMENT QUALITY

6.1 Compliance with REGDOC 1.1.1

Baseline information concerning hydrology, surface water and sediment quality was found to be compliant with REGDOC 1.1.1 (Kinectrics 2019).

The current surface water and sediment data are sufficient to characterize background conditions for the purposes of licence renewal.

6.2 Changes to Codes, Standards and Practices

Appendix A identifies that applicable surface water quality guidelines have been updated, while sediment quality guidelines have remained the same since 2009. The TSDs relevant to surface water and sediment quality include:

- EcoRA (SENES 2009c): includes all relevant information (i.e., non-radiological and radiological data for both surface water and sediment)
- *Surface Water Environment Existing Environmental Conditions Technical Support Document New Nuclear – Darlington Environmental Assessment* (Surface Water Environment Existing Environmental Conditions TSD) (Golder 2009)
- *Radiation and Radioactivity Existing Environmental Conditions Technical Support Document New Nuclear – Darlington Environmental Assessment* (Radiation and Radioactivity Environment Existing Environmental Conditions TSD) (AMEC NSS 2009b): relevant information, but only for specific media or parameters.

Presented in Table 6-1, is a summary of the parameters considered, the surface water and sediment guidelines used for screening the data, as well as changes to guidelines since the 2009 for each of the three relevant TSDs listed above.

Changes to surface water guidelines (i.e., 1994 MECP PWQOs, 2007 CWQGs - Protection of Aquatic Life and Recreational, and Health Canada drinking water guidelines) entail inclusion of new guidelines, guideline increases to become less stringent, and guideline decreases to become more stringent.

Health Canada and ODWQS drinking water guidelines for radionuclides were not applied in 2009 (with the exception of the ODWQS for tritium) (AMEC NSS 2009b), but for the purposes of updating baseline, both Health Canada and ODWQS guidelines are considered for application to both the 2009 and recent 2019 radionuclide data (i.e., H-3, Cs-134, Cs-137, Co-60, I-131, Sr-90, and C-14).

In terms of sediment quality guidelines for non-radionuclides, all those applied in 2009 (i.e., the 1993 MECP PSQGs, 2002 CCME CSQGs for the protection of aquatic life, and Thompson et al. (2005) LELs) have remained the same. There were no relevant sediment quality guidelines for radionuclide constituents measured in 2009, and they have not been developed since.

Comparisons between former and current surface water and sediment guidelines are presented in Section 6.4.

Table 6-1: Relevant TSDs and Information

Data	Parameters Considered	Screening Guidelines	Changes to Screening Guidelines
Surface Water Environment Existing Environmental Conditions TSD			
Non-radiological surface water	• General chemistry (alkalinity, bicarbonate, carbonate, conductivity, hydroxide, pH, TDS, hardness, TSS, turbidity) (no guidelines) • Nutrients (ammonia, chemical oxygen demand, nitrate, nitrite, phosphorus, TKN, TOC) • Metals • Petroleum hydrocarbons (PHC fractions and BTEX) • Trihalomethanes (THMs) • Bacteria (*E. coli*, coliforms) • PCB; • Hydrazine • Morpholine	MECP PWQOs (1994)	• copper (revised) • lead (revised)
		CCME CWQGs (Protection of Aquatic Life, Recreational) (2007)	• boron (new) • silver (new) • dissolved zinc (new) • nitrite (revised) • cadmium (revised function of hardness)
Ecological Risk Assessment and Assessment of Effects on Non-Human Biota TSD			
Non-radiological surface water	• Ammonia • Metals • Petroleum hydrocarbons (PHC fractions and BTEX) • Trihalomethanes (THMs) • PCB • Hydrazine • Morpholine	MECP PWQOs (1994)	• copper (revised) • lead (revised)
		CCME CWQGs (Protection of Aquatic Life) (2007)	• boron (new) • silver (new) • dissolved zinc (new) • nitrite (revised) • cadmium (revised)
		HC FTP CDW Guidelines for Canadian drinking water quality (2008)	• aluminum (removed) • copper (revised) • iron (new) • lead (revised) • manganese (revised) • selenium (revised) • sodium (removed) • strontium (new) • zinc (removed) • PHC F1 (removed) • ethylbenzene (new) • toluene (revised) • nitrate (new)* • nitrite-N (new)* • *E. coli* 5 sample geo-mean (new)* • total coliforms (new)*
Radiological surface water	H-3, C-14, Cs-134, Cs-137, Co-60, K-40, I-129, Tc-99, Cl-36, Sr-89, Sr-90, gamma scan, gross beta	Drinking Water Criteria for Cs-137, I-131, Sr-90 and tritium (Note: regulatory body of guideline used is unclear values match MECP PWQO)	None. However, for the purposes of this assessment, Health Canada and ODWQS are considered. Considering the new regulatory bodies used for these guidelines, the following changes (in guidelines between regulatory bodies) are identified: Cs-134 (new) Cs-137 (revised) Co-60 (new) I-131 (revised) Sr-90 (revised) C-14 (new)
Non-radiological sediment	• Phosphorus • Metals (including boron-hot water and mercury) • PHC fractions • PCB	• MECP PSQGs (1993) • CCME CSQGs (Aquatic Life) (2002) • Thompson et al. LEL (2005)	None.
Radiological sediment	H-3, C-14, Cs-134, Cs-137, Co-60, K-40, I-129, Tc-99, Cl-36, Sr-89, Sr-90, gamma scan, gross beta	Summary stats only. No guideline screening.	-
Radiation and Radioactivity Environment Existing Environmental Conditions TSD			
Radiological surface water	H-3, Cs-134, Cs-137, Co-60, K-40, Sr-89, Sr-90, gamma scan, gross beta	• MECP ODWQS for tritium [7,000 Bq/L] (2003) • OPG's voluntary Commitment Level for Tritium concentrations at nearby water supply plants (WSP) [annual average <100 Bq/L] • Drinking Water Screening Level for Gross Beta [1 Bq/L]	None.
Radiological sediment	Cs-134, Cs-137, Co-60, K-40, gamma scan	There were no specific regulatory limits for the concentration of radionuclides in sediment.	-

Notes:

*Parameters were not considered in the 2009 EcoRA TSD, however since they were considered in the Surface Water TSD (but HC FTP CDW drinking water guidelines were not), the HC FTP CDW drinking water guidelines for these parameters are included for the purposes of this assessment.

Surface Water Quality Guidelines:
- Ontario Ministry of the Environment, Conservation and Parks (MECP), Provincial Water Quality Objectives (PWQOs)
- Canadian Council of Ministers of the Environment (CCME), Canadian Water Quality Guidelines (CWQGs)
- Health Canada (HC) Federal-Provincial-Territorial (FTP) Committee on Drinking Water (CDW) of the FTP Committee on Health and the Environment. Guidelines for Canadian Drinking Water Quality
- Ontario Drinking Water Quality Standards (ODWQS)

Sediment Quality Guidelines:
- MECP, Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario (PSQGs)
- CCME, Canadian Sediment Quality Guidelines (CSQGs)
- Thompson et al. LEL (Lowest Effect Level; potential to affect some sensitive water uses (sediment is clean to marginally polluted)), Sediment quality benchmarks developed by Canadian Nuclear Safety Commission (CNSC) for uranium mining and milling in Canada (Thompson et al. 2005).

6.3 Baseline Characterization

This section provides an overview of the current baseline for hydrology, surface water and sediment quality as required by REGDOC 1.1.1. Baseline data collected in support of the 2009 application for the DNNP PRSL is described in the following TSD documents: Surface Water Environment Existing Environmental Conditions TSD (Golder 2009), Radiation and Radioactivity Environment Existing Environmental Conditions TSD (AMEC NSS 2009b), and the EcoRA (SENES 2009c).

6.3.1 Study Areas

The Regional, Local, and Site Study Area boundaries (Figure 6-1) are consistent with those described in the Surface Water Environment Existing Environmental Conditions TSD (Golder 2009). The DNNP Site Study Area extends approximately 2 km from the DN site boundaries, east and west along the shoreline, as well as offshore, to encompass the existing (DNGS) and proposed intake and diffusers. Updated surface water and sediment data have been collected within the DNNP Site Study Area.

Stream flow stations as well as one surface water station were located within the Local Study Area on or near the St. Marys Cement property. In addition, surface water reference stations (two stations in 2009 and one in 2019) were located 60 km east of DN near the town of Cobourg, within the Regional Study Area.

Figure 6-1: DNNP Site Study Area for Hydrology, Sediment, and Surface Water Environment

6.3.2 Summary of Baseline Data

A summary of baseline information for hydrology, surface water quality and sediment quality are presented in the following sections.

Hydrology information pertaining to lake circulation, thermal plume monitoring, and stream base flow monitoring is available for various years. Specifically, lake circulation data are available from 2011-2012 (Golder 2012a; Golder 2012b, SENES 2012). Thermal monitoring data are available from 2011-2012 (Golder 2012a; Golder 2012b) and 2017-2018 (OPG 2018c). Stream hydrology base flow monitoring data are available from 2008 (Golder 2009) as well as 2019. Historical current and wave information from the 2009 Surface Water Environment Existing Environmental Conditions TSD (Golder 2009) is also summarized.

Surface water quality data are available from 2007/2008 (Golder 2009; AMEC NSS 2009b), 2011-2012 (SENES 2012), and 2019. Sediment quality data are available from 2007/2008 (SENES 2009c) and 2019.

6.3.2.1 Hydrology

6.3.2.1.1 2009 Surface Water Environment Existing Environmental Conditions TSD Current Direction and Velocity Information

Historical information between 1993 and 2007 indicated that current direction at the Port Darlington Acoustic Doppler Current Profiler (ADCP) was predominantly alongshore (ENE or WSW) (Golder 2009) (Figure 6-2). At location CM01, located offshore of the DNNP Site Study Area, currents flowed predominantly in a westerly direction (Golder 2009) (Figure 6-2). Average current velocity at CM01 from 1993 to 1996 was 7.9 cm/s. Average current velocity at the Port Darlington ADCP from 1997 to 2007 was 7.2 cm/s.

The diffuser discharge was noted to act as a barrier to alongshore currents (Golder 2009). Low speed alongshore currents (< 25 cm/s) are deflected offshore while higher speed currents penetrate the diffuser mixing zone but are reduced to the lee side of the diffuser (Golder 2009).

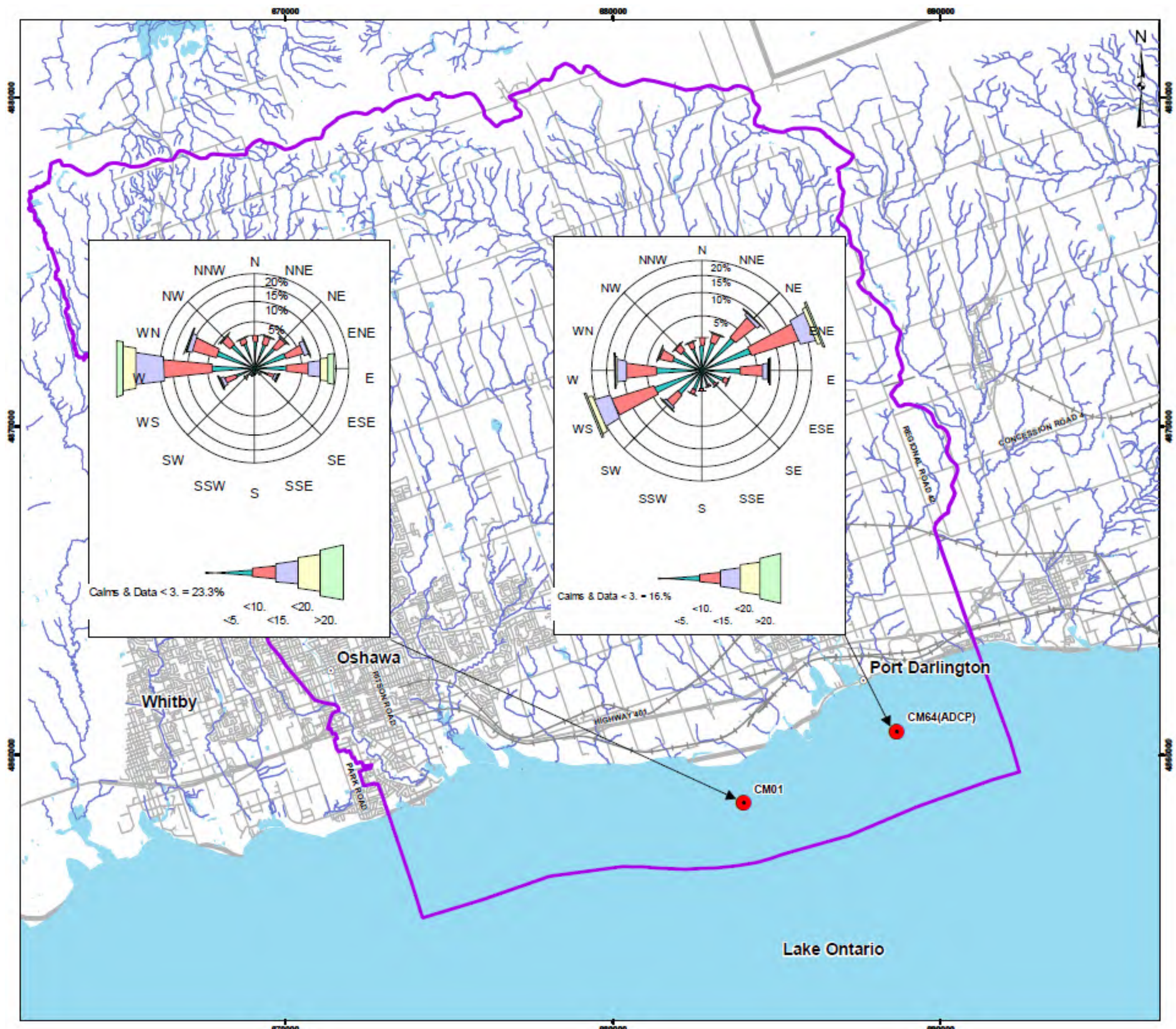

Figure 6-2: Nearshore Current Conditions Between 1993 and 2007 (Golder 2009)

6.3.2.1.2 2009 Surface Water Environment Existing Environmental Conditions TSD Thermal Monitoring Information

Ambient Temperatures

Historical temperature monitoring locations are shown in Figure 6-3. Ambient temperatures were measured at 11 locations, outside of the mixing zone, during the DNGS commissioning period from 1990 to 1992. Isothermal water temperatures were 0 ºC to 4 ºC (January to April) (Golder 2009). Stratification began in May, peaking from July to September. Isothermal conditions returned by November. Temperatures were 4 ºC in December.

Monitoring at two locations (TD05-1 and TD15-1) from 1984 to 1996 demonstrated mean monthly water temperatures between 1 ºC (January) to 18 ºC (August) (Golder 2009). There was minimal variation in the winter (January and February). Monthly mean temperature varied in the summer (July to September) from a minimum of 15.6 ºC to a maximum of 20.3 ºC (Figure 6-4; Golder 2009).

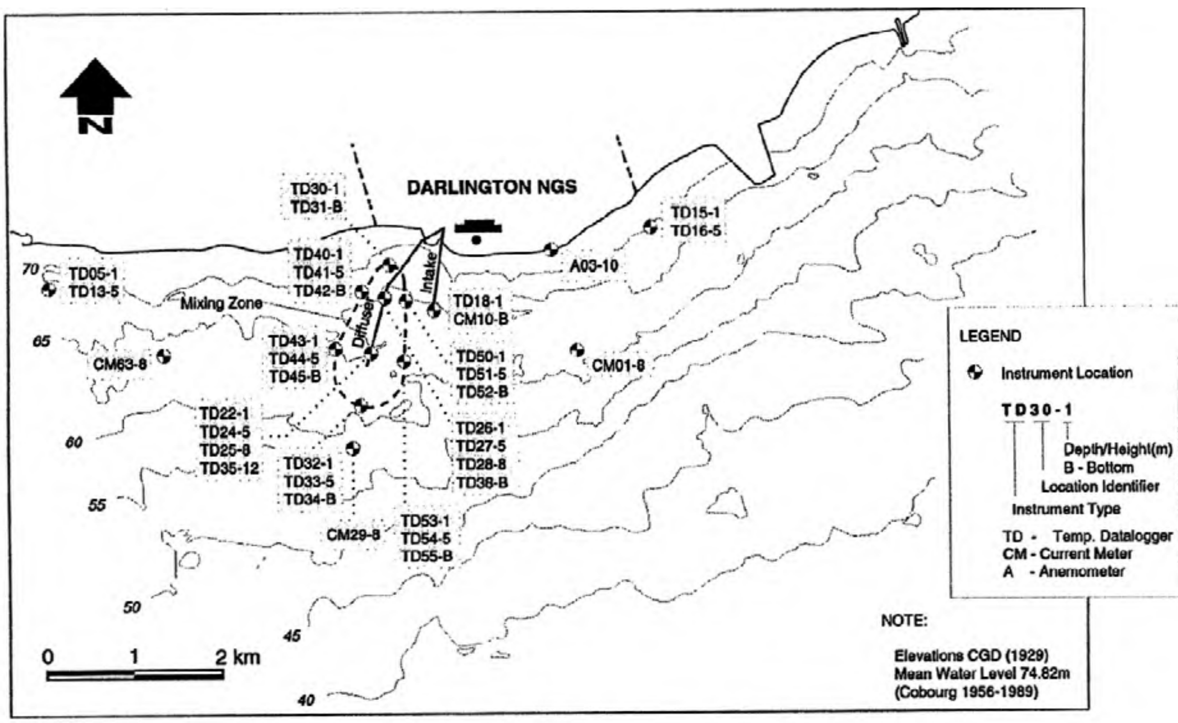

Figure 6-3: Historical Temperature Monitoring Locations

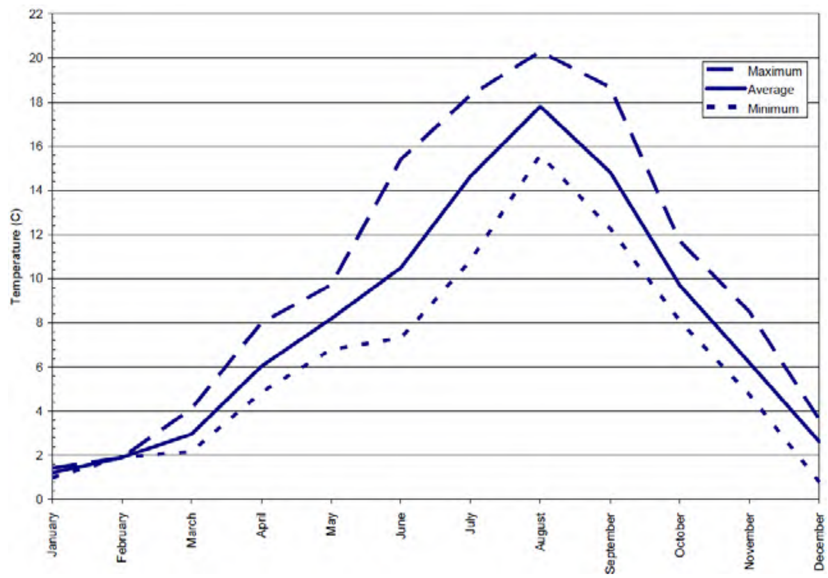

Figure 6-4: Monthly Average Water Temperatures 1984 to 1996 (TD05-1 and TD15-1)

DNGS Diffuser Temperatures

Plume temperatures were measured during the 1990-1996 Thermal Plume Study (Golder 2009). Bottom temperatures within the mixing zone exceeded 2 ºC above ambient 13% of the time (19% and 6% of the time during warm and cold weather conditions, respectively) (Golder 2009). Surface water temperatures were within 2 ºC of ambient 89% of the time. Furthermore, surface water temperatures at the edge of the mixing zone were within 2 ºC of ambient 90% of the time. During the remaining 10% of the time, surface temperatures at the edge of the mixing zone ranged from 2 ºC to 4 ºC above ambient.

6.3.2.1.3 Thermal and Current Monitoring

In 2011, a Thermal and Current Monitoring Program was completed within Lake Ontario near the DNNP Site Study Area. Following this, the CNSC requested additional investigation into the 2011 winter bottom temperature increases above ambient. In response, a technical memorandum detailing the additional analysis was completed in order to assess potential thermal effects of the existing DNGS diffuser on Round Whitefish (OPG 2014b).

Continuous data were collected for temperature at various depths (31 locations) as well as current speed and direction (3 locations) using ADCP (Figure 6-5) (Golder 2012a and Golder 2012b).

Current Direction

Currents at the Port Darlington ADCP were predominately alongshore, but were offshore near the surface (Golder 2012a). This indicates that currents are influenced by lake circulation patterns at depth and by wind at surface. Current direction 2 km east of the diffuser (CM01-15) was to the west at all depths. South of the mixing zone (CM29-17), current directions at depths above 5 metres were south and occasionally west. At depths greater than 10 metres, currents were to the west. This suggests that the offshore momentum of the diffuser may be drawing lake water from the bottom and nearshore areas into the existing discharge plume.

Temperature (Ambient)

Temperature monitoring was conducted to assess ambient conditions as a reference to the thermal plume associated with the DNGS diffuser. At ambient nearshore locations during the cooler months (January and May 2011), overall temperature differences between the surface and bottom were less than 0.1 ºC. Therefore, the nearshore water column (at least 5 metres) is well mixed during the cold-water period. During the warmer months (May to September), the water column is not well mixed, demonstrated by an average surface-bottom temperature difference of 1.8 ºC and frequently greater than differences of 5 ºC. Upwelling events occur a few times over the warmer months where deep cooler water moves to the surface, rapidly decreasing ambient surface water temperatures. The upwelling events were observed both at nearshore and offshore ambient locations.

Temperature (DNGS Diffuser)

Sinking plumes (i.e., thermal plume in contact with the lake bed as a function of increased density of warmer water) were assessed near the diffuser during the Round Whitefish egg incubation period (January to March 2011). At this time, ambient bottom temperatures were a minimum of 1-2 ºC in January. Elevated bottom temperatures were observed infrequently at one location (TD35-12), located at the offshore end of the diffuser near the bottom. Temperatures increased above 5 ºC on eight occasions (maximum = 6.47 ºC), lasting between 1- to 6-hour periods. Infrequent strong onshore/alongshore currents and current reversals coincide with the occurrence of elevated bottom temperatures at this location (Golder 2012a).

Further monitoring of bottom temperatures was carried out within a second winter monitoring period: December 13, 2011-April 13, 2012 (Golder 2012b). Results were consistent with the first winter monitoring, demonstrated by temperature increases above 7 ºC at TD35-12 and between 5-6 ºC at newly added locations DN17-B and DN18-B (offshore bottom locations within the mixing zone).

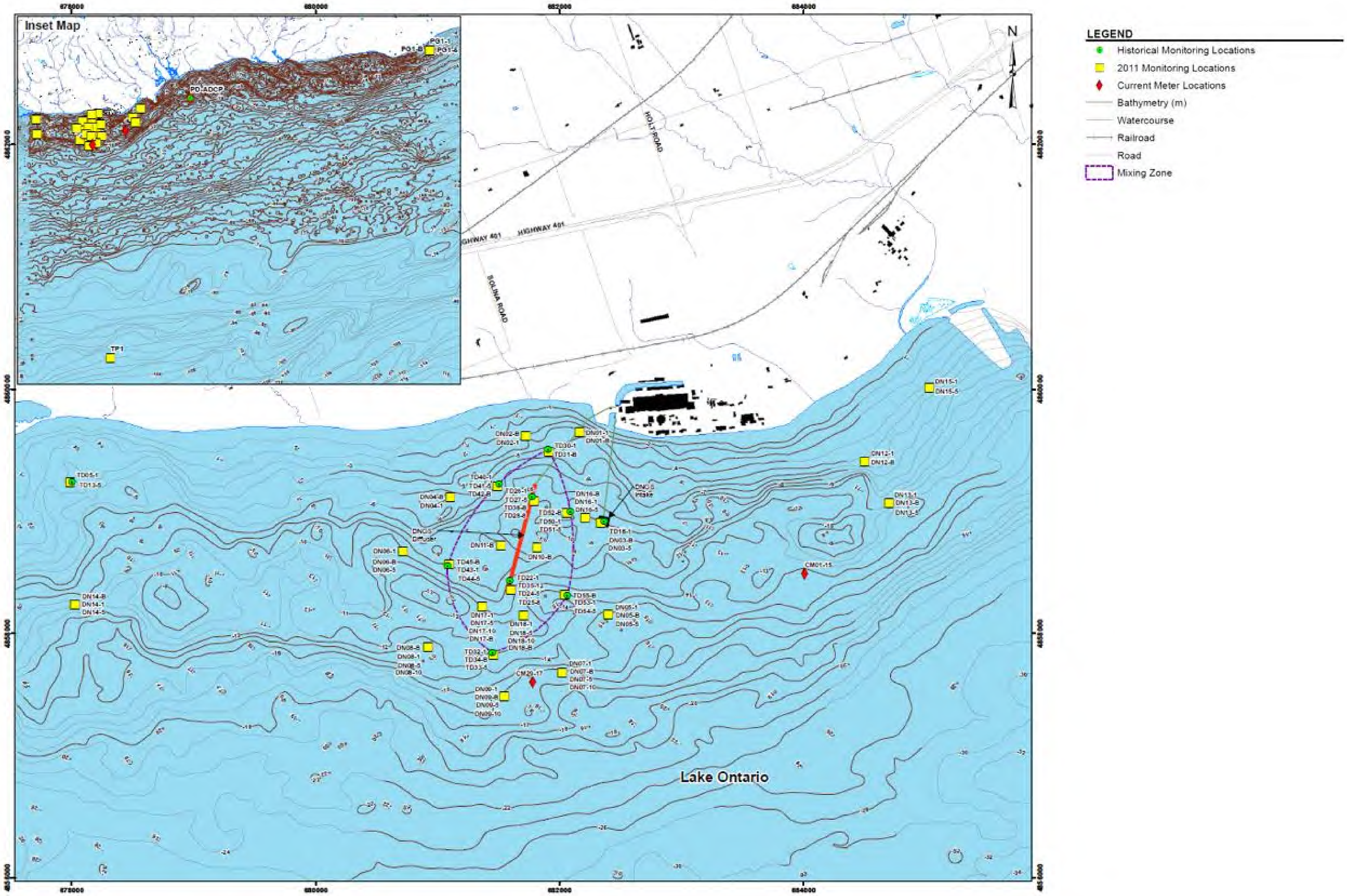

Figure 6-5: Temperature and Current Monitoring Locations in 2011/2012 (Golder 2012b)

The MECP Amended Certificate of Approval Industrial Sewage Works (No. 4720 6QALBY), issued August 17, 2006 under the *Ontario Water Resources Act*, states that the DNGS diffuser is “designed to limit the surface water temperature rise to a maximum of 2 degrees Celsius above ambient lake temperature at the edge of a one kilometre square mixing zone”.

Table 6-2 shows bottom temperature increases above ambient for the second winter period, for locations either within the diffuser mixing zone, at the edge of this zone, or outside of this zone. These data indicate that increases above ambient of 3 ºC is a rare occurrence within the mixing zone, and never occurs outside this zone.

Table 6-2: Average Bottom Water Temperatures Increases Over Ambient - Period of December 15, 2011 through April 13, 2012 (Second Winter Period)

Location	Water Depth (m)	No. of Data Points	Increase Over Ambient							
			Average	75th Percentile	95th Percentile	Frequency of Exceedance				
						1°C	2°C	3°C	4°C	5°C
Inside Mixing Zone										
TD38-B	10	1,713	-0.11	0.36	1.16	7.4%	0.0%	0.0%	0.0%	0.0%
TD35-12	12	2,903	0.69	1.26	2.20	37%	6.8%	1.7%	0.7%	0.0%
DN10-B	11	2,122	1.11	1.56	2.10	57%	7.5%	0.0%	0.0%	0.0%
DN11-B	10	1,966	0.28	0.97	1.79	24%	2.8%	0.0%	0.0%	0.0%
DN17-B	12.5	2,904	0.45	1.15	2.00	30%	5.0%	0.0%	0.0%	0.0%
DN18-B	12.5	2,904	0.54	1.36	2.04	38%	5.8%	0.2%	0.0%	0.0%
Edge of Mixing Zone (Clockwise from Nearshore – starting at TD31)										
TD31-B	6	2,904	-0.20	0.08	0.58	0.3%	0.0%	0.0%	0.0%	0.0%
TD52-B	10	1,210	0.81	1.09	1.64	31%	1.2%	0.0%	0.0%	0.0%
TD55-B	15	2,904	0.21	1.00	1.81	25%	2.9%	0.0%	0.0%	0.0%
TD34-B	14	966	-0.34	0.56	1.53	11%	1.4%	0.0%	0.0%	0.0%
TD45-B	10	2,904	0.13	0.64	1.32	12%	0.4%	0.0%	0.0%	0.0%
TD42-B	8	1,875	0.04	0.47	1.02	5.7%	0.0%	0.0%	0.0%	0.0%
Outside Regulated Mixing Zone (Clockwise from Nearshore – starting at DN01)										
DN01-B	6	1,030	-0.27	0.12	0.46	0.2%	0.0%	0.0%	0.0%	0.0%
DN03-B	11	1,694	-0.43	0.23	0.87	2.7%	0.0%	0.0%	0.0%	0.0%
DN05-B	15	2,904	0.18	0.97	1.65	24%	2.0%	0.0%	0.0%	0.0%
DN07-B	18	2,904	0.15	0.94	1.50	22%	0.8%	0.0%	0.0%	0.0%
DN09-B	18	2,365	0.01	0.84	1.50	18%	0.3%	0.0%	0.0%	0.0%
DN08-B	14	2,904	0.30	0.95	1.71	23%	2.3%	0.0%	0.0%	0.0%
DN06-B	12	1,920	0.03	0.61	1.28	11%	0.2%	0.0%	0.0%	0.0%
DN04-B	7	1,921	-0.08	0.28	0.81	3.0%	0.0%	0.0%	0.0%	0.0%
DN02-B	5	2,901	-0.18	0.08	0.59	0.5%	0.0%	0.0%	0.0%	0.0%

Source: Golder, 2012b

Follow-up thermal plume monitoring was conducted during the winter of 2017-2018 to address commitment IIP EA-012 Tasks 4 and 5 of the DNGS Integrated Implementation Plan (OPG 2015b), as part of the DNGS Refurbishment Follow-up Monitoring Program (OPG 2013b). The monitoring was completed from November 2017 to May 2018 during a refurbishment outage (OPG 2018c).

Average winter temperatures in 2017-2018 were cooler than in 2011-2012, and cooler than the long-term average (OPG 2018c). Plume temperature differences between study years were most prevalent during the time of early Round Whitefish egg development stages beginning in December (block 1) (3.9 ºC in 2011-2012 and 2.1 ºC in 2017-2018). During late egg development stages ending in March/April (block 3), plume temperature was 0.7 ºC cooler in 2017-2018 (OPG 2018c).

Consistent with previous monitoring in 2011-2012, elevated plume temperatures were observed relative to reference locations. The average of all plume locations together was approximately 0.4 ºC greater than the average of ambient locations during the period of early Round Whitefish embryo development and 0.1 ºC greater during the period of late Round Whitefish embryo development (OPG 2018c).

6.3.2.1.4 Wave and Current Monitoring

2009 Surface Water TSD Wave Information

The 2009 Surface Water TSD indicates that the DNNP Site Study Area is exposed to waves from various directions ranging from the east to the west (Golder 2009). The longest overwater fetches occur from the east and southeast with shorter fetches from the south, southwest and west (Golder 2009). Greater wave activity occurs in the winter months (November to March) concurrent with the greatest wind speeds (Golder 2009).

2011/2012 Wave and Current Monitoring

Wave and current monitoring data were collected from four ADCP locations in 2011-2012: location #1 (inside the future embayment off the mouth of Darlington Creek), #2 (area east of St. Marys pier), #3 (deepwater location in the DNNP Site Study Area), and #4 (area adjacent to the proposed lakefill) at depths of 4 m, 4 m, 15 m, and 4 m, respectively (Figure 6-6) (SENES 2012). The main objective was to collect simultaneous data, particularly at Locations 1, 3, and 4, all west of St. Marys pier. The ADCP locations were selected to provide sufficient simultaneous data that could be used for input and calibration of numerical models, and evaluation of post-project conditions. An assessment of data quality was completed based on instrument orientation (position) information recorded by the ADCPs. Seven days of simultaneous data collection was achieved for location numbers 1, 3, and 4. Overall the data were deemed sufficient for modelling coastal processes and effluent dispersion provided that some data gaps are filled (SENES 2012).

Since the main purpose of the wave and data collection was to collect simultaneous data that could be used for modeling rather than to describe the data, only limited high-level baseline descriptions were provided:

- At location #1, measured nearshore currents were generally towards east-northeast (i.e., parallel to the shoreline). High turbidity was measured corresponding to storm events when waves were greater than 0.5 m in height. An example (snapshot) of the data at this location was provided in a figure for December 2011, shown here as Figure 6-7.
- At location #3, turbidity was very low. At a depth of 15 m, near-bottom currents were weak.
- At location #4, current speed was minimal.

Figure 6-6: ADCP Locations for 2011-2012 Wave and Current Monitoring (SENES 2012)

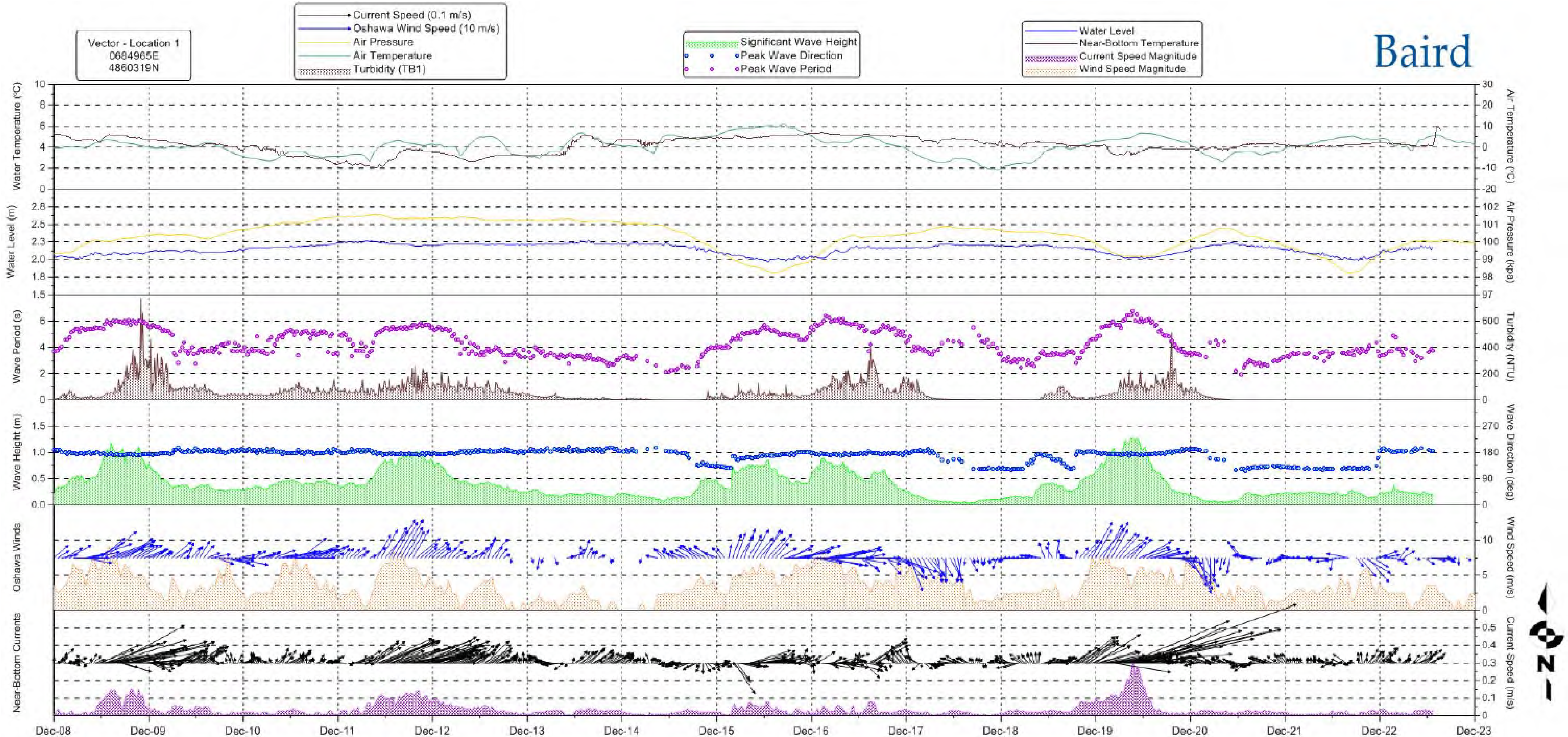

Figure 6-7: Snapshot (December 2011) of Wave, Current and Supplementary Data at Location #1 (SENES 2012)

6.3.2.1.5 Stream Flow Monitoring

2008 Stream Discharge

Stream flow was monitored at four locations (Figure 6-8) in 2008 (Golder 2009). Flow measurements were taken at four locations along Darlington Creek in September, October, and November. The station situated farthest upstream (SF1) is located in the northeast corner of the DNNP Site Study Area just south of the South Service Road, Clarington, ON. The farthest downstream station (SF4) is located near the outlet of Darlington Creek to Lake Ontario. This station (SF4) is downstream of a tributary that flows southeast from the east portion of the DNNP Site Study Area and is located on St. Marys Cement property. Any contributions from the St. Marys Cement property to the flow in the Creek were detected by the change in flow measured at this station. There were two intermediate stations. One of the intermediate stations (SF2) was used to identify contributions to the flow from a tributary feeding the Creek from the northeast portion of the DNNP Site Study Area. The other intermediate station (SF3) was used to identify the flow added by another tributary feeding the Creek from the north. The resulting discharge measurements for each location are presented in Table 6-3.

Table 6-3: Darlington Creek Stream Flow Discharge Measurements, 2008

Date	Station	Discharge (m^3/s)
September 2, 2008	SF1	0.006
	SF2	0.003
	SF3	0.011
	SF4	0.147
October 7, 2008	SF1	0.010
	SF2	0.009
	SF3	0.026
	SF4	0.160
November 5, 2008	SF1	0.028
	SF2	0.060
	SF3	0.063
	SF4	0.180

Modified from (Golder 2009).

2019 Stream Discharge

OPG (2019) committed (Commitment D-P-12.6) to confirm base flow estimates in Darlington Creek pre-construction and subsequently at the beginning of the Operation and

Maintenance phase. The timing for the base flow estimates would be prior to site preparation (to confirm baseline condition) and at completion of the site construction phase.

The objective of the 2019 Darlington Creek baseflow study was to confirm baseline discharge estimates at Darlington Creek with those measured in 2008 and reported in the Surface Water Environment Existing Environmental Conditions TSD (Golder 2009).

Base flow monitoring was undertaken at five stations in Darlington Creek (Figure 6-8). Four of these stations, SF1, SF2, SF3 and SF4, are the same as those measured in 2008 for the Surface Water Environment Existing Environmental Conditions TSD (Golder 2009). A fifth station, SF5, was added in 2019 to allow for comparison to flows that will be measured during the construction phase when this tributary (known as Tributary E) may convey surface runoff from the site.

Stream discharge measurements were undertaken at the five stations in Darlington Creek in April, June, September, and December 2019. Measurements were undertaken using the area*velocity method prescribed by the Ontario Stream Assessment Protocol (Stanfield et. al., 2017). At each station, water velocity (m/s) and depth measurements (cm) were obtained at appropriate intervals, as determined by channel width, across the entire cross-section of the stream. The water velocity and depth data were used to calculate a discharge measurement (m^3/s) at each station.

A Garmin GPS map 62s was used to obtain UTM coordinates for each station. Water velocity was measured using a Marsh-McBirney Flomate 2000 and water depth was measured using a meter stick. Channel width and discharge intervals were measured using a tape measure.

UTM coordinates and discharge measurements in Darlington Creek during 2019 are presented in Table 6-4. Discharge ranged from no flow at station SF5 to 0.619 m^3/s at station SF4 (the most downstream station in the main stem of Darlington Creek) that is located immediately upstream of the outlet to Lake Ontario. At each sampling station, sufficient velocity and depth measurements were measured at appropriate intervals across the stream to allow calculation of flow discharge on a quarterly basis in 2019.

Figure 6-8: Darlington Creek Baseflow Monitoring Stations, 2008 and 2019

Note: Station SF5 was added in 2019.

Table 6-4: Darlington Creek Stream Flow Discharge Measurements, 2019

Date	Station	UTM Coordinates (NAD83, Zone 17T)		Time (hr)	Channel Width (m)	Discharge (m^3/s)
April 4, 2019	SF1	0684079 E	4861665 N	10:15	5.4	0.226
	SF2	0684661 E	4861648 N	15:00	1.7	0.248
	SF3	0684763 E	4861589 N	14:00	3.8	0.297
	SF4	0684794 E	4860475 N	12:45	12.6	0.468
	SF5	0684537 E	4860704 N	9:30	1.3	0.019
June 27, 2019	SF1	0684079 E	4861665 N	13:40	1.9	0.005
	SF2	0684661 E	4861648 N	14:00	0.8	0.003
	SF3	0684763 E	4861589 N	12:00	2.2	0.015
	SF4	0684794 E	4860475 N	11:00	2.1	0.132
	SF5*	0684537 E	4860704 N	-	-	-
September 12, 2019	SF1	0684079 E	4861665 N	11:05	2.0	0.0005
	SF2	0684661 E	4861648 N	14:10	0.15	0.0002
	SF3	0684763 E	4861589 N	13:30	2.3	0.011
	SF4	0684794 E	4860475 N	13:00	2.4	0.242
	SF5	0684537 E	4860704 N	10:20	0.3	0.0001
December 16, 2019	SF1	0684079 E	4861665 N	10:15	5.0	0.328
	SF2	0684661 E	4861648 N	13:50	1.3	0.413
	SF3	0684763 E	4861589 N	13:30	3.5	0.302
	SF4	0684794 E	4860475 N	12:40	7.3	0.619
	SF5	0684537 E	4860704 N	10:45	1.5	0.015

*No flow at time of measurement, discharge not calculated

6.3.2.2 Surface Water Quality

Baseline surface water quality is summarized based on the 2007/2008 sampling program (Golder 2009, SENES 2009c, AMEC NSS 2009b) in support of the 2009 application for the DNNP PRSL. Updates to baseline surface water quality are then summarized based on sampling completed in 2011/2012 (SENES 2012), as well as the recent sampling program carried out in 2019. Surface water sampling locations for 2007/2008, 2011/2012 and 2019 are illustrated in Figure 6-9.

6.3.2.2.1 2007/2008 Surface Water Sampling Program

Surface water samples were collected in November 2007, May 2008, July 2008, and September 2008 (Golder 2009), representing four seasons. As previously outlined in

Section 6.2, surface water parameters measured as part of the 2007/2008 assessment included general chemistry, nutrients, metals, PHCs, THMs, bacteria, PCB, hydrazine, morpholine and radionuclides. Surface water samples within the Site Study Area were collected from Coot's Pond (SW12), Treefrog Pond (SW13), Darlington Creek (SW15), Stormwater Management Pond (SW14), and Lake Ontario (SW7 to SW11). Surface water samples were also collected from within the Regional Study Area (SW1 and SW2) which will also be compared in this assessment.

Summary statistics for 79 non-radiological constituents and 28-36 radiological parameters were provided for each area. Within both the Surface Water TSD and the EcoRA TSD, the maximum site concentrations for non-radiological constituents were compared to the lowest of the selected guideline values from the MECP PSQOs (1994), CCME CWQGs (Aquatic Life) (2007), and HC FTP CDW (2008). Additionally, the Surface Water TSD also included the recreational CCME CWQGs. The EcoRA TSD compared some radiological parameters to human health drinking water guidelines. The Radiation and Radioactivity Environment Existing Environmental Conditions TSD compared tritium concentrations to the MECP ODWQS, an OPG voluntary commitment level for nearby WSPs, a drinking water screening level for gross beta, and background levels.

Results for the Site Study Area and Regional Study Area are discussed below in relation to interpretations from each of the TSDs. The Surface Water TSD compared concentrations directly to guidelines while the EcoRA TSD utilised a screening process to identify COPCs.

Lake Ontario

Within the Surface Water TSD, exceedances were identified within Lake Ontario (Site Study Area locations SW7, SW8, SW9, SW10, SW11) for pH, nitrate, phosphorus, aluminium, boron, cobalt, copper, lead, selenium, zirconium, and *E. coli* (Golder 2009), as outlined in Table 6-5. Most of the exceedance within the Site Study Area occurred within the November 2007 campaign; only instances of pH, *E. coli*, and copper exceedances also occurred within the other campaigns (May 2008, July 2008, and September 2008). Within the Regional Study Area (SW1 and SW2), exceedances occurred for aluminium, boron and lead, only at SW1 (bottom) in the September 2008 campaign. Further, pH exceeded in the July 2008 campaign at SW1 (bottom and top) and SW2 (bottom).

Table 6-5: Lake Ontario (Site Study Area) 2007/2008 Surface Water Exceedances

Parameter	Existing Diffuser				Potential DNNP Diffuser		
	SW7		SW11	SW8	SW9		SW10
	bottom	top	bottom	bottom	bottom	top	bottom
pH		■	■	■	■	■	
Nitrate					■		
Phosphorus			■		■	■	■
Aluminium	■	■	■				■
Boron	■	■					
Cobalt	■	■	■	■	■	■	■
Copper	■	■					
Lead		■					
Selenium		■					
Zirconium	■	■					
E. coli		■			■	■	

The EcoRA screening process did not identify any COPCs in Lake Ontario surface water, with the exception of hydrazine. While exceedances of selected guidelines occurred, they did not lead to identification of COPCs as the screening process evaluated the 95% upper confidence limit (UCL) of the mean against guidelines and also considered toxicity data and background concentrations. There were no guidelines for hydrazine and the concentrations were all below the detection limit of 0.0005 mg/L. However, considering that hydrazine is of concern to the aquatic environment, an additional screening was completed against the No Observable Effects Level (NOEL) of 0.0001 mg/L for Fathead Minnow eggs, derived by the World Health Organization (WHO) (1987). Since the hydrazine detection limit used was above the NOEL, hydrazine was the only parameter identified as a COPC for Lake Ontario surface water (SENES 2009c).

For radionuclides, detectable activity occurred within Lake Ontario (Site Study Area) surface water samples SW7, SW8, SW9 and SW10 for gross beta only (note that SW11 results were not listed in the 2009 Radiation and Radioactivity Environment Existing Environmental Conditions TSD (AMEC NSS 2009b and SENES 2009c)). Within the Regional Study Area (SW1 and SW2), there were no detected radionuclides (AMEC NSS 2009b and SENES 2009c).

Coot's Pond

Within the Surface Water Environment Existing Environmental Conditions TSD (Golder 2009), exceedances of surface water quality guidelines were identified within Coot's Pond (SW12) for pH, nitrate, unionized ammonia, phosphorus, aluminum, aluminum (filtered), boron, cobalt and iron (Golder 2009), as outlined in Table 6-6.

Table 6-6: Coot's Pond 2007/2008 Surface Water Exceedances

Parameter	November 2007	May 2008	July 2008	September 2008
pH			■	
Nitrate			■	
Unionized Ammonia	■			
Phosphorus	■	■	■	■
Aluminum	■	■		■
Aluminum (filtered)	■			
Boron	■	■	■	■
Cobalt	■			
Iron	■			

The EcoRA screening process identified boron, cobalt, hydrazine, iron, manganese and strontium as COPCs within Coot's Pond. Hydrazine was similarly identified as a COPC since the detection limit was above the NOEL (SENES 2009c).

For radionuclides, detectable activity occurred within Coot's Pond surface water samples for Ba-140, gross beta, I-131 and tritium. The EcoRA TSD compared some radionuclides to drinking water criteria (Cs-137, I-131, strontium-90 and tritium), of which all concentrations were below criteria.

Treefrog Pond

Within the Surface Water Environment Existing Environmental Conditions TSD (Golder 2009), exceedances of surface water quality guidelines were identified within Treefrog Pond (SW13) for nitrate, phosphorus, aluminum, boron, cobalt, copper, iron, zirconium and *E. coli* (Golder 2009), as outlined in Table 6-7.

Table 6-7: Treefrog Pond 2007/2008 Surface Water Exceedances

Parameter	November 2007	May 2008	July 2008	September 2008
Nitrate			■	
Phosphorus	■	■	■	■
Aluminum	■			■
Boron	■			
Cobalt	■			
Copper	■			
Iron	■		■	
Zirconium	■			
E. coli				■

The EcoRA screening process identified boron, cobalt, hydrazine, iron, manganese and strontium as COPCs within Coot's Pond. Hydrazine was similarly identified as a COPC since the detection limit was above the NOEL (SENES 2009c).

For radionuclides, detectable activity occurred within Treefrog Pond surface water samples for Ba-140, gross beta, I-131 and tritium (same as Coot's Pond). The EcoRA TSD compared some radionuclides to drinking water criteria (Cs-137, I-131, strontium-90 and tritium), and all concentrations were below these criteria.

Darlington Creek

Within the Surface Water Environment Existing Environmental Conditions TSD, exceedances of surface water quality guidelines were identified within Darlington Creek (SW16) for nitrate, phosphorus, aluminium, boron, cobalt, iron, strontium, zirconium, *E. coli* and morpholine (Golder 2009).

Darlington Creek was not evaluated for COPCs through a screening process as part of the 2009 EcoRA since it only intersects a small portion of the northeast corner of the DNNP Site Study Area and changes to water quality were not expected (SENES 2009c).

For radionuclides, detectable activity occurred within Darlington Creek surface water samples for Ba-140, gross beta, I-131 and tritium (same as Coot's Pond and Treefrog Pond). The EcoRA TSD compared some radionuclides to drinking water criteria (Cs-137, I-131, strontium-90 and tritium), and all concentrations were below these criteria.

Stormwater Management Pond

Within the Surface Water Environment Existing Environmental Conditions TSD (Golder 2009), exceedances of surface water quality guidelines were identified within the Stormwater Management Pond (SW14) for pH, phosphorus, aluminium, boron, chromium, cobalt, iron, zirconium, and *E. coli* (Golder 2009).

The Stormwater Management Pond (Figure 6-12) was not evaluated for COPCs through a screening process as part of the 2009 EcoRA since it is a waste management feature and expected high levels of some constituents will not change as a result of the DNNP (SENES 2009c).

For radionuclides, detectable activity occurred within Stormwater Management Pond surface water samples for Ba-140, gross beta, I-131, and tritium (same as Coot's Pond, Treefrog Pond and Darlington Creek). The EcoRA TSD compared some radionuclides to drinking water criteria (Cs-137, I-131, strontium-90 and tritium), and all concentrations were below these criteria.

6.3.2.2.2 2011/2012 Surface Water Sampling Program

Surface water samples were collected in November 2011 and August 2012, near the mouth of Darlington Creek (SW18) and within the vicinity of the DNNP embayment zone (SW16 and SW17) and the offshore new build zone (SW10) (Figure 6-9) (SENES 2012).

Surface water parameters measured included general chemistry, nutrients, metals, PHCs and bacteria. Note that radionuclides were not included in the 2011/2012 assessment. When comparing to non-radiological parameters measured in the 2007/2008 assessment, differences include the removal of THMs, PCB, hydrazine, and morpholine, and the addition of orthophosphate, dissolved sulphate, dissolved chloride, nitrate+nitrite, dissolved bromide, chlorophyll-a, and the dissolved state for a number of metals.

Guidelines applied in the 2011/2012 assessment included the MECP PWQOs, CCME CWQGs (Aquatic Life) and Health Canada recreational guidelines (SENES 2012). During the 2011/2012 sampling program, some exceedances of applicable guidelines were identified at the mouth of Darlington Creek (SW18) and the within the embayment zone (SW16 and SW17), as shown in Table 6-8. Phosphorus and *E. coli* exceedances occurred in both November 2011 and August 2012, while the aluminum exceedance at SW18 was in August 2012 only. All parameters at the offshore location SW10 were below their respective guidelines.

Table 6-8: Lake Ontario (Site Study Area) 2011/2012 Surface Water Exceedances

Parameter	Darlington Creek	Embayment Zone				Offshore New Build Zone	
	SW18	SW16		SW17		SW10	
	Mid-depth	bottom	top	bottom	top	bottom	top
Total Phosphorus	■	■	■	■	■		
Aluminum	■						
E. coli 5 sample geo-mean	■						

Figure 6-9: 2007/2008, 2011/2012 and 2019 Surface Water Sampling Location

6.3.2.2.3 2019 Surface Water Sampling Program

The following describes the results associated with the Lake Ontario water quality sampling program carried out to support completion of OPG commitment D-P-12.3 (OPG 2019c). Sampling was conducted quarterly (spring, summer, early fall, and early winter) in 2019.

DNNP Site Study Area

The DNNP Site Study area and sampling stations for the 2019 Lake Ontario water quality sampling program are displayed in Figure 6-10. This program included nine sampling stations within DNNP Site Study Area (representing the offshore, nearshore, and the embayment) and one reference station (SW2) about 60 km east near the town of Cobourg. Detailed descriptions of these stations are provided in the sampling plan (EcoMetrix 2019a).

Figure 6-10: Lake Ontario Water Quality Sampling Program Stations, 2019

Sampling Program

Sampling occurred quarterly in 2019, following the methodology described in the sampling plan (EcoMetrix 2019a). Sampling events are documented in Table 6-9. The three DN diffuser stations (DNGS-Near, DNGS-Mid, and DNGS-Far; Figure 6-10), were sampled at three depths: near surface (0.5 m depth), mid-depth, and bottom (0.5 m off bottom) of the water column in order to capture the vertical profile since the diffuser area is a dynamic zone. For all other stations except SW18 (Darlington Creek), samples were collected at two depths: near surface (0.5 m depth) and bottom (0.5 m off bottom). The two depths are sufficient to capture the vertical profile since these stations are not in the dynamic mixing zone and any thermal plume should be at the surface at these stations. At SW18, the Darlington Creek mouth, the sample was collected at mid-depth due to its shallow depth (approximately 0.6 m depth in 2019).

Each sampling event (season) consisted of three collections. The first collection was comprised of samples collected from every station and depth specified in Table 6-9. All of the samples from this first collection were analyzed for all chemical, nutrient, biological and radiological parameters, with the exception that hydrazine was not analyzed at the Darlington Creek mouth (SW18) or the two embayment stations (SW16 and SW17). A full list of parameters and their associated detection limits is provided in Appendix D. For the embayment (SW16 and SW17) and Darlington Creek mouth (SW18) stations, a second and third collection occurred in each season, where nutrient and biological (including algal) parameters were analyzed. This additional replication of the embayment and Darlington Creek mouth samples was included to enable testing for potential seasonal variability of nutrient, algal and biological-related parameters. For all other locations (i.e., the offshore, nearshore, and reference stations), the sampling replication (i.e., one collection event per season) was sufficient for baseline characterization.

In situ water quality parameters, including: temperature, pH, conductivity, and turbidity, were measured with a YSI Multiparameter Water Quality Sonde, model number 6920. Total residual chlorine (TRC) analyses were completed on-site immediately after sample collection using a Hach Autocat Chlorine Amperometric Titrator model 9000. Physical/conventional characteristics, nutrients, microbial, metals, hydrocarbons, and other organic parameters listed in the sampling plan (EcoMetrix 2019a) were analyzed at Bureau Veritas Laboratories[2] (BVL). Radionuclides were analyzed at Kinectrics Inc. and hydrazine in water was measured by Eurofins Scientific. All water samples were delivered to their respective laboratories within the prescribed holding times.

[2] Formerly Maxxam Analytics.

Table 6-9: Sample Collection Dates, Lake Ontario Water Quality Sampling Program, 2019

Sample Area	Station ID	Sample Depths	Collection #1[a]	Collection #2[b]	Collection #3[b]	Sample (N)
Offshore	DNGS-Far	Surface Mid-depth Bottom	Apr 10[c], Jul 2, Aug 26, Dec 14 Apr 10[c], Jul 2, Aug 26, Dec 14 Apr 10[c], Jul 2, Aug 26, Dec 14	-	-	4 4 4
Offshore	DNGS-Mid	Surface Mid-depth Bottom	April 16, Jul 2, Aug 28, Dec 16 Apr 10[c], Jul 2, Aug 28, Dec 16 Apr 10[c], Jul 2, Aug 28[e], Dec 16	-	-	4 4 4
Offshore	SW11	Surface Bottom	Apr 10[c,e], Jul 3[e], Aug 20, Dec 14 Apr 10[c], Jul 2, Aug 20, Dec 14	-	-	4 4
Offshore	SW10	Surface Bottom	Apr 10[c], Jul 4, Aug 20[e], Dec 14 Apr 10[c], Jul 2, Aug 20, Dec 14	-	-	4 4
Nearshore	DNGS-Near	Surface Mid-depth Bottom	Apr 16[e], Jul 2[e], Aug 28, Dec 16 Apr 10[c], Jul 2, Aug 28, Dec 16 Apr 10[c], Jul 2, Aug 28, Dec 16[e]	-	-	4 4 4
Nearshore	SW9	Surface Bottom	Apr 10[c], Jul 4, Aug 26, Dec 14 Apr 10[c], Jul 2, Aug 26, Dec 14	-	-	4 4
Embayment	SW16[d]	Surface Bottom	Apr 10[c, e], Jul 3, Aug 26, Nov 29[e] Apr 10[c], Jul 2, Aug 26, Dec 14	Apr 15, Jul 8, Sep 3, Dec 3 Apr 15[e], Jul 8[e], Sep 3, Nov 29	Apr 22, Jul 15, Sep 9, Dec 14 Apr 22, Jul 15, Sep 9, Dec 3	12 12
Embayment	SW17[d]	Surface Bottom	Apr 10[c], Jul 3, Aug 26, Nov 29 Apr 10[c], Jul 2, Aug 26, Dec 12	Apr 15, Jul 8, Sep 3, Dec 3[e] Apr 15, Jul 8, Sep 3[e], Nov 29	Apr 22[e], Jul 15[e], Sep 9, Dec 14 Apr 22, Jul 15, Sep 9[e], Dec 3	12 12
Darlington Creek	SW18[d]	Mid-depth	Apr 10[c], Jul 3, Aug 26, Nov 29	Apr 15, Jul 8, Sep 3, Dec 3	Apr 22, Jul 15, Sep 9, Dec 14	12 12
Cobourg (reference)	SW2	Surface Bottom	Apr 16, Jul 3, Aug 20, Dec 12 Apr 10[c], Jul 2, Aug 20, Dec 12	-	-	4 4
-	Field Blank	-	Apr 10[c], Jul 3, Aug 28, Nov 29, Dec 14, Dec 16	Apr 16, Jul 8, Sep 3, Dec 3	Apr 22, Jul 15, Sep 9, Dec 14	13
-	Trip Blank	-	Apr 10, Jul 2, Aug 28, Nov 29, Dec 14, Dec 16	Apr 16, Jul 8, Sep 3, Dec 3	Apr 22, Jul 15, Sep 9, Dec 14	13

[a] Samples were analyzed for all chemical and radiological parameters as presented in Appendix D.
[b] Samples were analyzed for nutrient, biological and algal parameters only.
[c] Total residual chlorine was sampled on April 17, 2019.
[d] Hydrazine was not analyzed.
[e] Duplicate sample was collected.
- not applicable

Sample jars were obtained from the respective labs and all lab instructions were followed (e.g., hold times, preservatives, sample volumes). Water samples were collected using a Wildco® 1960-1980 Horizontal Beta™ Sampler. Upon sample collection, jars were filled and immediately placed in a cooler on ice.

All water quality data were input into EMMA™ (a data management software system) once received from the laboratories. EMMA™ was used to screen the laboratory data against pre-defined data quality objectives (DQOs) as listed in the sampling plan (EcoMetrix 2019a) including Quality Assurance / Quality Control (QA/QC) performance standards and the following relevant water quality guidelines: the Provincial Water Quality Objectives (PWQO); Interim PWQO (IPWQO), the Canadian Council of Ministers of the Environment Canadian Water Quality Guidelines (CCME CWQG), and the Health Canada Drinking Water Quality Guideline (HC DWQG).

QA/QC Performance

The sample analysis process and the results generated were compared to the DQOs. The QA/QC results suggested that most of the analyses met the DQOs, with the following few exceptions.

During the sampling events in 2019, field duplicates were collected according to the sampling plan (EcoMetrix 2019a). The relative percent difference (RPD) between replicates were within the DQO values in most cases. For selected constituents, the RPDs were greater than the DQO values occasionally (i.e., no more than 3 times in 17 duplicates). These parameters included total ammonia, non-ionized ammonia, coliform, turbidity, total suspended solids, zinc, aluminum, chlorophyll, and C-14.

EcoMetrix had requested detection limits, as listed in the sampling plan (EcoMetrix 2019a), that were confirmed acceptable and achievable by all laboratories. The detection limit was as listed for most parameters; for selected parameters, the detection limit was greater than the requested value. These parameters include total suspended solids, ammonia, boron, cadmium, molybdenum, selenium, tin, and vanadium during the spring sampling season. After communication with BVL, the detection limits for these parameters met the DQOs during the rest of the sampling program. In addition, the detection limit of I-131 was greater than the requested value of 2 Bq/kg in all samples collected on August 26, 2019 during the early fall sampling season.

Most of the QA/QC issues identified did not impact interpretation of results, with a few exceptions. These incidences are discussed below:

- All samples for TRC were below the detection limit of the HACH Autocat 9000 chlorine meter (0.0012 mg/L) in all seasons except summer. No uncensored value was available for this parameter. Therefore, most sample values were below the PWQO of 0.002 mg/L but could not be properly screened against the CCME CWQG for the protection of aquatic life (0.0005 mg/L). It should be noted that the CCME CWQG benchmark for TRC is below any available *in situ* detection limit. To date, no *in situ* field method to obtain detection limits at, or below, the CCME CWQG for TRC is available. Considering the detection limit does not represent the TRC level in Lake Ontario, the exceedances at detection limit are not discussed in the following section. During the summer sampling season, a calibration issue was observed for the TRC meter. Although values above the detection limit were observed, these values are invalid and are therefore not considered representative of the Lake Ontario water quality. Therefore, exceedances of TRC during the summer sampling event are not discussed further.

- During the spring sampling season, BVL reported that there was ammonia contamination within their laboratory; therefore, the concentrations reported during the spring sampling event are likely greater than what was actually present in the samples. This issue was resolved, and the data from the other sampling seasons were not impacted. Considering the potential impact of ammonia contamination, elevated ammonia concentrations during the spring sampling season were not considered representative of Lake Ontario water quality, and these data are not discussed further.

- During the early fall sampling event, the detection limit of I-131 was elevated for all samples collected on August 26, 2019. As noted in the Sampling Plan (EcoMetrix 2019a), detection limits for short half-life compounds may be elevated due to shipping time and count time. I-131 has a short half-life at 8 days, and therefore, the detection limit requested by EcoMetrix (2 Bq/L) was not achievable unless the samples are submitted within 48 hours after being collected. The concentrations of I-131 in water were all below the detection limits that ranged between 28-179 Bq/L. Therefore, exceedances of I-131 based on uncensored values below MDL for this particular sampling event are not considered representative of Lake Ontario water concentration, and therefore are not discussed further.

Comparison to Water Quality Guidelines

The results of the water quality analyses for the 2019 Lake Ontario water quality field program are tabulated in Appendix D.

In a few instances, the levels of measured parameters were greater than water quality guidelines (Table 6-10). These parameters were: pH, total ammonia, phosphorus, total suspended solids, and aluminum. The concentrations of dissolved zinc and *E.coli* were greater than the CCME CWQG and the PWQO value, respectively, once during the 2019 sampling events. These exceedances are discussed further in the following sections.

Table 6-10: Summary of Exceedances, Lake Ontario Water Quality Sampling Program, 2019

Environmental Guidelines	# of Exceedances	Parameters
CCME CWQG	59	Dissolved Zinc (Zn), Field pH, Total Aluminum (Al), Total Ammonia (as N), Total Suspended Solids, Total Un-ionized Ammonia
Health Canada	0	-
IPWQO	11	Total Phosphorus
PWQO	41	*Escherichia coli*, Field pH, Total Un-ionized Ammonia

Reference Area Lake Water Quality

Background lake water quality for the DNNP Site Study Area was represented by reference monitoring station SW2, located near Cobourg, Ontario.

During the 2019 sampling event, background water quality was characterized as being slightly alkaline, with the summer pH at 9.4 at the bottom of the water column, beyond the range of the CCME CWQG range of 6.5 - 9 and the PWQO range of 6.5 - 8.5. The water is moderately hard, with total hardness at both surface and bottom of the water column around 120 mg/L $CaCO_3$ in all sampling seasons. Water at the bottom of the water column had total ammonia greater than the CCME guideline during the summer sampling event. The measured ammonia concentration was 0.16 mg/L, whereas the CCME CWQG is 0.044 mg/L. Total suspended solids at station SW2 was greater than the CWQG value of 5 mg/L during the early winter sampling season, with the maximum concentration at the surface of the water column at 11 mg/L. No other parameters exceeded a water quality guideline.

DNNP Site Study Area Lake Water Quality

During the 2019 sampling program, Lake Ontario water quality, including offshore (DNGS-Mid, DNGS-Far, SW11, and SW10), nearshore (DNGS-Near and SW9), embayment area (SW16 and SW17), and Darlington Creek mouth (SW18), was characterized as being slightly alkaline, with a few measurements beyond the range of the CCME CWQG and the PWQO range. Within the DNNP Site Study Area the water is moderately hard, with total hardness around 120 mg/L $CaCO_3$ in offshore and nearshore locations. Lake water at the embayment area is slightly harder (128-140 mg/L $CaCO_3$) than the offshore and nearshore. At the Darlington Creek mouth, average water hardness was 181 mg/L $CaCO_3$. Yearly mean values of common water quality parameters for sampling areas is presented in Table 6-11.

Table 6-11: Yearly Mean Values of Common Water Quality Parameters for Lake Ontario Sampling Areas, 2019

Parameter		Units	Offshore	Nearshore	Embayment	Darlington Creek	Cobourg
Field	Temperature	°C	9.79	9.82	9.51	10.54	9.09
	pH	-	8.39	8.37	8.30	8.00	8.44
	Specific Conductance	µS/cm	296	309	317	517	295
	Dissolved Oxygen	mg/L	12.18	16.72	13.06	11.50	12.13
Lab[1]	Dissolved Organic Carbon	mg/L	1.99	2.07	2.01	2.43	1.93
	Orthophosphate	mg/L	< 0.00506	0.00488	< 0.00461	0.00488	0.00384
	Nitrate	mg/L	0.321	0.348	0.348	0.571	0.295
	Nitrite	mg/L	0.00164	0.00227	0.00127	< 0.00312	0.00118
	Chlorophyll-a	µg/l	1.41	1.65	1.65	2.61	1.12

[1] Uncensored data used for summary statistics.
Note: Samples were collected during spring, summer, early fall, and early winter; see Table 6-9.

Seven water quality parameters exceeded water quality guidelines at one or more Lake Ontario sampling locations. None of the other measured water quality parameters exceeded the predefined water quality guidelines (Appendix D).

Total Ammonia (as N)

As identified previously, ammonia concentrations for spring samples were elevated due to lab contamination. Within the other sampling seasons, total ammonia concentrations exceeded the CCME CWQG (0.033 mg/L) in 27 lake water samples. The CWQG value of 0.044 mg/L (converted from 0.053 mg/L for NH_3) was selected based on the maximum pH and possible temperature in Lake Ontario, and is deemed to be conservative. The greatest ammonia concentration in Lake Ontario was observed at the mouth of Darlington Creek and had a concentration of 0.26 mg/L.

Un-ionized Ammonia

As identified previously, ammonia concentrations for spring samples were elevated due to lab contamination. Within the other sampling seasons, un-ionized ammonia concentrations were greater than the CCME CWQG value of 0.019 µg/L and PWQO value of 0.02 µg/L in five samples. Most of these sample values were only marginally greater than the guideline, the greatest concentration observed (0.028 mg/L) was an early fall surface water sample collected at station SW11.

Total Suspended Solids (TSS)

The concentration of TSS exceeded the selected CCME CWQG water quality guideline of 5 mg/L in 17 water samples. The CCME CWQG to protect aquatic life is "narrative", which uses the average TSS concentration at the reference station plus 5 mg/L. Therefore, the selected value at 5 mg/L is conservative. The greatest TSS value was observed at the Darlington Creek mouth station SW18 at 33 mg/L. It is not unexpected that the samples at SW18 (stream outlet) would have higher TSS than the reference station (SW2 – open water lake) due to its location at the outlet of Darlington Creek. At all other locations, the observed TSS value was lower, with the greatest TSS observed from a bottom sample at station SW16 during the spring with a concentration of 15 mg/L.

Total Aluminum

Total aluminum was in exceedance of the CCME CWQG (100 µg/L) for two water samples. Specific samples where exceedances occurred were the embayment station SW16 (bottom) and the Darlington Creek station SW18 (mid-depth) during the spring season.

Dissolved Zinc

The concentration of dissolved zinc exceeded the CCME CWQG (7 µg/L) in one water sample at the offshore station DNGS-Mid during the spring sampling season.

Total Phosphorus

Total phosphorus exceeded the IPWQO value of 0.02 mg/L in eleven water samples; however, most exceedances were marginal. The highest phosphorus concentration was observed at the mouth of Darlington Creek (SW18-M) during the spring sampling event with a concentration of 0.059 mg/L. This is not unexpected, as greater concentrations of nutrients are expected in Darlington Creek during spring runoff than would be expected in open water of Lake Ontario.

E. coli

The bacteria *E. coli* was found at a concentration that exceeds the PWQO (100 CFU/100ml) in one water sample at the Darlington Creek mouth (SW18-M).

6.3.2.2.4 2019 Surface Water Sampling Program at Coot's and Treefrog Pond

DNNP Site Study Area

Two ponds were sampled on the DNNP Site Study Area during the 2019 pond water quality sampling program, Coot's and Treefrog Ponds, as depicted in Figure 6-11. Detailed descriptions of these locations are provided in the Surface Water Environment Existing Environmental Conditions TSD (Golder 2009).

Figure 6-11: Coot's Pond (SW12) and Treefrog Pond (SW13) Water Quality Sampling Program Stations, 2019

Sampling Program

Water sampling occurred quarterly in 2019, following the methodology described in the sampling plan (EcoMetrix 2019a). At Coot's Pond, water samples were collected at the surface (0.5 m depth) and bottom (0.5 m off bottom). At Treefrog Pond only a mid-depth sample was collected as the pond is shallow (~ 1.0 m).

In situ water quality parameters, including temperature, pH, conductivity and dissolved oxygen were measured with an YSI Multiparameter Water Quality Sonde, model number 6920. Physical/conventional characteristics, nutrients, microbial counts, metals, hydrocarbons, and other organic parameters were analyzed by BVL. Radionuclides were analyzed by Kinectrics. A full list of water quality parameters analyzed and their associated detection limits are listed in Appendix D.

Sample jars were obtained from the respective labs and all lab instructions were followed (e.g., hold times, preservatives, sample volumes). Water samples were collected using a Wildco® 1960-1980 Horizontal Beta™ Sampler. Upon sample collection, jars were filled and immediately placed in a cooler on ice. All water samples were delivered to their respective laboratories within the prescribed holding times.

All water quality data were input in EMMA™ (a data management software system) once received from the laboratories. EMMA™ was used to screen the laboratory data against pre-defined DQOs as listed in EcoMetrix (2019a) including QA/QC performance standards and relevant guidelines, such as the PWQO, IPWQO, and the CCME CWQG.

QA/QC Performance

The sample analysis process and the results generated were compared to DQOs. The QA/QC results suggested that most of the analyses met the DQOs, with the following exceptions:

EcoMetrix had requested detection limits, as listed in the sampling plan (EcoMetrix 2019a), that were confirmed acceptable and achievable by all laboratories. However, EcoMetrix observed that detection limits greater than the requested values were reported in a few instances, including elevated detection limits for boron, molybdenum, tin and vanadium during the spring season; bromodichloromethane and ethylbenzene during both the summer and early fall season; and calcium, magnesium, potassium, sodium, bromoform, chloroform and I-131 during the early fall season.

The RPDs between replicates were typically within the DQO control limits for most parameters, with the following exceptions: total ammonia, chlorophyll, total chemical oxygen demand, coliforms, dissolved aluminum, antimony, chromium, copper, lead, magnesium, potassium, tin and zinc.

The majority of these incidences did not impact data interpretation, with a few exceptions. These exceptions have been listed in Section 6.3.2.2.3, where QA/QC performance of Lake Ontario surface water samples was discussed. Sample values that did not meet the DQOs, and are not considered representative of the water quality within the Ponds, were found for ammonia during the spring season, TRC, and I-131 during the early fall season.

Comparison to Water Quality Guidelines and Objectives

The analysis results of water from Coot's Pond and Treefrog Pond are tabulated in Appendix D. Selected environmental guidelines were met for most of the analyses, with a few exceptions listed in Table 6-12: and detailed below.

Table 6-12: Summary of Exceedances, Pond Water Quality Sampling Program, 2019

Environmental Guidelines	# of Exceedances	Parameters
CCME CWQG	14	Field pH, Total Aluminum (Al), Total Ammonia (as NH3), Total Ammonia-N, Total Iron (Fe), Total Un-ionized Ammonia
IPWQO	18	Total Boron (B), Total Phosphorus
PWQO	8	Escherichia coli, Field pH, Total Iron (Fe), Total Un-ionized Ammonia

Water Quality at Coot's Pond

During the 2019 sampling campaign, Coot's Pond water quality ranged between neutral to alkaline. The most alkaline pH was above 9 (beyond the CCME CWQG and the PWQO pH range), which was observed during the summer at the surface and bottom of the water column. Water at Coot's Pond is hard, with an average hardness of 250 mg/L $CaCO_3$.

Six constituents had concentrations that exceeded water quality guidelines at Coot's Pond. No other parameters exceeded guideline values at this location.

Aluminum

Total aluminum concentrations at Coot's Pond exceeded the CCME CWQG guideline (100 µg/L) during the early fall season at both the surface and bottom of the water column. The greatest aluminum concentration was observed (369 µg/L) at the surface of the water column.

Total Ammonia (N)

Total ammonia concentrations at Coot's Pond exceeded the CCME CWQG guideline (0.044 mg/L) during the summer (surface) and early fall (both surface and bottom of the water column) sampling events. The greatest ammonia concentration (0.08 mg/L) was observed during the early fall sampling campaign.

Unionized ammonia

Unionized ammonia at Coot's Pond exceeded the CCME CWQG (0.019 mg/L) and PWQO (0.02 mg/L) values during the summer season at both the surface and bottom of the water column. The greatest unionized ammonia concentration was observed (0.048 mg/L) at the surface of the water column.

Iron

Total iron concentrations at Coot's Pond was greater than the CCME CWQG guideline (300 µg/L) during the early fall season at both the surface and bottom of the water column. The greatest iron concentration was observed (433 µg/L) at the surface of the water column.

Boron

Concentrations of boron at Coot's Pond marginally exceeded the IPWQO guideline (200 µg/L) during the summer (bottom) and early fall (both surface and bottom of the water column) sampling events. The greatest boron concentration (230 µg/L) was observed during the early fall sampling event at the surface of the water column.

Phosphorus

Phosphorus concentration at Coot's Pond exceeded the IPWQO (0.02 mg/L to avoid nuisance concentration of algae growth) during all sampling seasons at both water column locations (surface and bottom). The greatest concentration was observed during the early fall season – with both the surface and bottom having a concentration of 0.09 mg/L.

Water Quality at Treefrog Pond

At Treefrog Pond, neutral to slightly alkaline pH was observed and all pH values were within the range of CCME CWQG (6.5 – 9) and PWQO (6.5 – 8.5) guidelines. The total hardness was similar to Coot's Pond and had an average value of 245 mg/L $CaCO_3$.

Five constituents had concentrations that exceeded water quality guidelines at Treefrog Pond. No other parameters exceeded guideline values at this location.

Total Ammonia (N)

Total ammonia concentrations at Treefrog Pond exceeded the CCME CWQG guideline (0.044 mg/L) during the early fall and early winter sampling events. The greatest ammonia concentration (0.21 mg/L) was observed in the early fall season.

Iron

Total iron concentration at Treefrog Pond was greater than the CCME CWQG value of 300 µg/L during the early winter (surface), with a concentration of 520 µg/L.

Phosphorus

Elevated phosphorus concentration at Treefrog Pond was observed during all sampling seasons compared to the IPWQO value (0.02 mg/L to avoid nuisance concentration of algae growth). The greatest concentration was observed during the early fall season at 0.07 mg/L. Phosphorous exists in the environment as phosphate, where it acts as a nutrient rather than a toxicant.

E. coli

Elevated *E. coli* concentrations were observed at Treefrog Pond during early fall sampling only. *E. coli* was observed at 340 CFU/100 ml compared to the PWQO value of 100 CFU/100 ml.

6.3.2.3 Sediment Quality

Baseline sediment quality (non-radiological and radiological parameters) is summarized based on the 2007/2008 sampling program (SENES 2009c). Updates to baseline sediment quality are then summarized based on the recent sampling program carried out in 2019. Sediment sampling locations for both 2007/2008 and 2019 are illustrated in Figure 6-12. Note that this subsection describes sediment quality as it pertains to non-radiological and radiological parameters. Physical characteristics of sediment are described in Section 7.3.2.5.4.

6.3.2.3.1 2007/2008 Sediment Sampling Program

As previously outlined in Section 6.2, sediment parameters measured as part of the 2007/2008 assessment included phosphorus, metals, PHC fractions, PCB, and radionuclides. Sediment samples within the DNNP Site Study Area were collected from Coot's Pond (SW12), Treefrog Pond (SW13), Darlington Creek (SW15), Stormwater Management Pond (SW14), and Lake Ontario (SW7 to SW11).

Summary statistics for 42 non-radiological parameters and 34 radiological parameters were provided for each area. The maximum site concentration for 15 non-radiological parameters was compared to the lowest of the selected guideline values from the MECP PSQGs (1993), CCME CSQGs (Aquatic Life) (2002), and Thompson et al. (2005) LEL. Results are discussed below as they pertain to summary statistics for each area.

Lake Ontario

For sediment in Lake Ontario, most of the 43 non-radiological parameters were detected above the MDL, with the exception of PCBs, and PHC F1 and F2. Although 12 of 15 parameters with a guideline exceeded the guideline, arsenic, iron, manganese, nickel, phosphorous, vanadium and zinc were below background levels, and silver was not detected in greater than 90% of samples. Thus, cadmium, copper, lead, and selenium were identified as COPCs in Lake Ontario sediments as part of the 2009 EcoRA screening.

For radionuclides, detectable activity occurred within Lake Ontario sediment samples for Be-7, C-14, gross beta, and K-40.

Coot's Pond

For sediments in Coot's Pond, copper, manganese, and vanadium exceeded the selected guidelines. However, only copper was above background and therefore was identified as a COPC as part of the 2009 EcoRA screening process.

For radionuclides, detectable activity occurred within Lake Ontario sediment samples for C-14, gross beta, K-40 and H-3.

Figure 6-12: 2007/2008 and 2019 Sediment Sampling Locations

Treefrog Pond

Summary statistics for baseline sediment data collected from Treefrog Pond were provided in comparison to criteria. Chromium, copper, iron, manganese, nickel, phosphorus and vanadium exceeded criteria, however, only chromium, copper and nickel were above background.

For radionuclides, detectable activity occurred within the Treefrog Pond sediment samples for C-14, Cs-137, gross beta, K-40 and H-3.

COPCs were not identified for Treefrog Pond as part of the 2009 EcoRA (SENES 2009c). The reason for this is that Treefrog Pond will be removed during site preparation and construction (SENES 2009c) and only terrestrial ecological receptors are considered. However, there is a commitment to offset habitat loss where possible (SENES 2009c).

Darlington Creek

The Darlington Creek baseline sediment data showed exceedances of sediment quality guidelines for chromium, copper, phosphorus and vanadium, with only copper also being above background.

For radionuclides, detectable activity occurred within Darlington Creek sediment samples for C-14, Cs-137, gross beta, K-40, uranium-235 and uranium-238.

COPCs for Darlington Creek were not identified as part of the 2009 EcoRA since it only intersects a small portion of the northeast corner of the DNNP Site Study Area and changes to water quality were not expected (SENES 2009c).

Stormwater Management Pond

The Stormwater Management Pond baseline sediment data showed exceedances of sediment quality guidelines for chromium, copper, lead, phosphorus, vanadium and zinc. Only copper, lead and zinc were also above background.

For radionuclides, detectable activity occurred within the Stormwater Management Pond in sediment samples for Be-7, C-14, gross beta, K-40 and H-3.

COPCs for the Stormwater Management Pond (Figure 6-12) were not identified as part of the 2009 EcoRA since it is a waste management feature and expected high levels of some parameters will not change as a result of the DNNP (SENES 2009c).

6.3.2.3.2 2019 Lake Sediment Sampling Program

The study area and sampling stations for the 2019 Lake Ontario sediment sampling program are displayed in Figure 6-12**.** Sampling was carried out to support completion of OPG commitment D-P-12.3 (OPG 2019c). Sampling was conducted in: the embayment area (10 locations; consistent with ten embayment locations identified in 2012 as part of the DN Coastal Processes and Water Quality Study (SENES, 2012)); proposed infill area (12 locations); and offshore (one location). The offshore sampling location was at the SW10 surface water sampling station, which was also sampled for sediment in support of the 2009 application for the DNNP PRSL (Golder 2009, SENES 2009). Detailed descriptions of these stations are provided in the sampling plan (EcoMetrix 2019a).

Sampling followed the methodology described in the sampling plan (EcoMetrix 2019a; Section 1.0). Sediment sampling occurred during the late spring/ early summer season during June 17-19, 2019. One surficial sediment sample was taken from each location, except at SW10, where 5 surficial sediment samples were collected on the same day.

Physical/conventional characteristics, nutrients, metals, hydrocarbons, pesticides and other organic parameters listed in the sampling plan (EcoMetrix 2019a) were analyzed at BVL. Radionuclides were analyzed at Kinectrics Inc. All sediment samples were delivered to the respective laboratories within the prescribed holding times.

All sediment quality data were input in EMMA^{TM}, a data management software system. EMMA^{TM} was used to screen the laboratory data against pre-defined data quality objectives (DQOs) as listed in the sampling plan (EcoMetrix 2019a) including QA/QC performance standards and the following relevant guidelines: The Provincial Sediment Quality Guidelines, Lowest Effect Level (PSQG LEL) and the CCME CSQG. For parameters where no guideline is provided from the above references, values provided in Thompson et al. (2005) were used to screen sediment quality results, particularly for concentrations of molybdenum, selenium, uranium and vanadium.

QA/QC Performance

The sample analysis process and the results generated were compared to the DQOs. The QA/QC results suggested that most of the analyses met the DQOs, with the following few exceptions.

During two sampling events, the RPD between replicates exceeded the prescribed control limits for select constituents. On June 18, 2019, the RPDs for total copper, thorium, uranium and zinc ranged between 31-50%, greater than their RPD control limit of 30%. The RPD for C-14 was 84%, greater than its RPD control limit of 20%. On June 19, 2019, the RPDs for total aluminum, barium, boron, chromium, cobalt, copper, iron, lead, manganese, nickel, potassium, vanadium and zinc ranged from 30-58%, greater than their RPD control limit of 30%, and the RPDs for C-14 were 105% and 158% and for two duplicates, respectively, greater than their RPD control limit of 20%. As sediment is more heterogeneous in nature, it is within expectation that more variation could be observed among replicates. Despite relatively large RPDs, the maximum values for these parameters are all below their respective benchmarks.

In addition, EcoMetrix had requested detection limits, as listed in the sampling plan (EcoMetrix 2019a), which were confirmed acceptable and achievable by all laboratories. The requested detection limits were applied for most parameters; however, for a few parameters, the detection limit applied was greater than the requested limit.

- The detection limits of petroleum hydrocarbons and PAHs were two times the requested detection limit for one out of five replicates at SW10.
- The detection limits of Total PCBs, Cs-137 and K-40 were also 1.1-1.5 times greater than the requested detection limits listed in the sampling plan (EcoMetrix 2019a) for selected samples at the infill and embayment area.

All of the applied detection limits were lower than the respective guidelines for each parameter.

Comparison to Sediment Quality Guidelines

The results of the sediment quality analyses during the 2019 sampling program are tabulated in Appendix D.

In a few instances, the levels of measured parameters were greater than their respective sediment quality guidelines, including total Kjeldahl Nitrogen (TKN) and phosphorus. Sampling locations where exceedances were observed are listed in Table 6-13.

Lake Infill Sediment Quality

Twelve samples were collected from the lake infill area at different locations. The concentrations of all parameters, except phosphorus, were below the selected guideline values. The concentrations of total phosphorous were slightly greater than the PSQG LEL value of 600 mg/kg in samples collected from 8 of the 12 lake infill locations (Table 6-13).

Offshore Sediment Quality

At the offshore location SW10, five replicate samples were collected at the same location. The majority of parameters had concentrations below their respective environmental guidelines, except the calculated TKN and phosphorus. Four and one out of the five replicates had elevated TKN and phosphorus concentrations, respectively, with the greatest concentration less than two times the guideline (Table 6-13).

Sediment Quality in the Embayment Area

Ten samples were collected from the embayment area, with one sample at each location. The majority of parameters had concentrations below their respective environmental guideline, except the calculated TKN and phosphorus. At SD09, the concentration of calculated TKN was 20% greater than the CCME CSQG and the PSQG LEL values. The total phosphorus concentrations at two locations, SD14 and SD15, were also greater than the PSQG LEL value (Table 6-13).

Table 6-13: Instances of Exceedance of Sediment Quality Guidelines in Lake Ontario Embayment

Parameter	Location	Units	Sample Date	Sample Value	Benchmark	Benchmark Value
Calculated Total Kjeldahl Nitrogen	SD09	µg/g	19-Jun-2019	663	CCME CSQG	550
Calculated Total Kjeldahl Nitrogen	SW10	µg/g	19-Jun-2019	559	CCME CSQG	550
Calculated Total Kjeldahl Nitrogen	SW10	µg/g	19-Jun-2019	944	CCME CSQG	550
Calculated Total Kjeldahl Nitrogen	SD09	µg/g	19-Jun-2019	663	PSQG (LEL)	550
Calculated Total Kjeldahl Nitrogen	SW10	µg/g	19-Jun-2019	559	PSQG (LEL)	550
Calculated Total Kjeldahl Nitrogen	SW10	µg/g	19-Jun-2019	994	PSQG (LEL)	550
Total Phosphorus (P)	SD14	mg/kg	19-Jun-2019	1010	PSQG (LEL)	600
Total Phosphorus (P)	SD15	mg/kg	19-Jun-2019	999	PSQG (LEL)	600
Total Phosphorus (P)	SD21	mg/kg	18-Jun-2019	626	PSQG (LEL)	600
Total Phosphorus (P)	SD23	mg/kg	18-Jun-2019	613	PSQG (LEL)	600
Total Phosphorus (P)	SD24	mg/kg	18-Jun-2019	880	PSQG (LEL)	600
Total Phosphorus (P)	SD27	mg/kg	18-Jun-2019	634	PSQG (LEL)	600
Total Phosphorus (P)	SD28	mg/kg	18-Jun-2019	814	PSQG (LEL)	600
Total Phosphorus (P)	SD30	mg/kg	18-Jun-2019	682	PSQG (LEL)	600
Total Phosphorus (P)	SD31	mg/kg	18-Jun-2019	685	PSQG (LEL)	600
Total Phosphorus (P)	SD32	mg/kg	18-Jun-2019	789	PSQG (LEL)	600
Total Phosphorus (P)	SW10	mg/kg	19-Jun-2019	660	PSQG (LEL)	600

6.3.2.3.3 2019 Sediment Sampling in Coot's and Treefrog Pond

In 2019, a pond sediment sampling program was conducted for Treefrog Pond and Coot's Pond. Locations of these ponds are presented in Figure 6-13. Detailed descriptions of these locations are provided in the Section 9.2 of the sampling plan (EcoMetrix 2019a).

Sampling followed the methodology described in the sampling plan (EcoMetrix 2019a; Section 9.0). Surficial sediment sampling occurred on June 17, 2019. Five surficial sediment samples were taken from five locations in each pond using a ponar, with one additional duplicate sample collected for QA/QC purposes.

Parameter analysis and data processing were identical to the Lake Ontario sediment samples, as described in Section 6.3.2.3.2. Therefore, the same DQOs were applied for all pond sediment samples.

Figure 6-13: Sediment Sampling Stations at Coot's Pond (SW12) and Treefrog Pond (SW13), 2019

QA/QC Performance

The sample analysis process and the results generated were compared to the DQOs for sediment. The QA/QC results suggested that most of the analyses met the DQOs, with the following few exceptions.

The RPD for C-14 between duplicates was 135%, exceeding its prescribed RPD control limit of 20%. As sediment is more heterogeneous in nature, it is expected that more variation could be observed among replicates. As there were no selected guidelines to screen C-14 value, this variation does not affect data interpretation of sediment quality at Coot's Pond and Treefrog Pond. The RPD of all other parameters were all below their prescribed RPD control limit.

In addition, EcoMetrix had requested detection limits, as listed in the sampling plan (EcoMetrix 2019a), that were confirmed acceptable and achievable by all laboratories. The requested detection limits were applied for most parameters; however, for a few selected parameters, the detection limit applied was greater than the requested limit.

- The detection limit of petroleum hydrocarbons was 2-5 times greater than the requested detection limit;
- The detection limit of hot water extracted boron was two times the requested detection limit;
- The detection limit of individual PAH constituents was 2-6 times greater than the requested detection limit;
- The detection limit of K-40 was marginally greater than the requested detection limit.

All applied detection limits were lower than the respective guidelines of each parameter.

Comparison to Sediment Quality Objectives

The results of the sediment quality analyses at Coot's and Treefrog Ponds during the 2019 sampling program are tabulated in Appendix D.

In a few instances, the levels of measured parameters were greater than their respective sediment quality guidelines, including TKN, cadmium, chromium, copper, iron, manganese, nickel, phosphorus, selenium, vanadium, zinc, total organic carbon and phosphorus. Sampling locations where exceedances were observed are listed in Table 6-14, and are discussed in sections below.

Coot's Pond

At Coot's Pond, the majority of metal parameters and nutrients were above MDLs, and the majority of petroleum hydrocarbons and PAHs were below their corresponding MDLs. A few parameters exceeded their respective sediment quality guidelines, and are discussed below.

Calculated Total Kjeldahl Nitrogen

Calculated TKN exceeded both CCME CSQG and PSQG LEL levels in all samples collected from Coot's Pond. The monitored values are 4-7 times the guideline value.

Total Organic Carbon

Total organic carbon exceeded the PSQG LEL level in all samples collected from Coot's Pond. The monitored values are 2-4 times the guideline value. However, it is expected that TOC in pond locations will frequently exceed the MECP PSQG guideline, since the guideline for TOC is based on a Great Lakes data set, and no pond guidelines are available. The screening level concentration (SLC) method used by the MECP is constrained by the range of values in the data set; it cannot yield a higher guideline. Therefore, the TOC guideline is not suitable for ponds.

Total Copper

Total copper concentration exceeded the PSQG LEL level in four of the five samples collected from Coot's Pond. The monitored values ranged from marginally exceeding to twice the guideline value.

Total Nickel

The concentrations of total nickel exceeded the PSQG LEL level in three of the five samples collected from Coot's Pond. The monitored values were marginally elevated (maximum 20%) compared to the guideline value.

Total Phosphorus

Total phosphorus exceeded the PSQG LEL level in three of the five samples collected from Coot's Pond. The greatest phosphorus concentration observed was 812 mg/kg, while the sediment quality guideline is 600 mg/kg.

Other Parameters

Total cadmium, chromium, copper, iron, manganese, vanadium and zinc exceeded their respective sediment quality guidelines in 1-2 of the 5 samples collected at Coot's Pond. There were no other exceedances observed at this sampling location.

Table 6-14: Instances of Exceedance of Sediment Quality Guidelines in Coot's Pond (SW12) and Treefrog Pond (SW13)

Parameter	Location	Units	Sample Date	Sample Value	Benchmark	Benchmark Value
Calculated Total Kjeldahl Nitrogen	SW12	µg/g	17-Jun-2019	1960	CCME ISQG	550
Calculated Total Kjeldahl Nitrogen	SW12	µg/g	17-Jun-2019	3330	CCME ISQG	550
Calculated Total Kjeldahl Nitrogen	SW12	µg/g	17-Jun-2019	3780	CCME ISQG	550
Calculated Total Kjeldahl Nitrogen	SW12	µg/g	17-Jun-2019	2840	CCME ISQG	550
Calculated Total Kjeldahl Nitrogen	SW12	µg/g	17-Jun-2019	2050	CCME ISQG	550
Calculated Total Kjeldahl Nitrogen	SW13	µg/g	17-Jun-2019	15000	CCME ISQG	550
Calculated Total Kjeldahl Nitrogen	SW13	µg/g	17-Jun-2019	9460	CCME ISQG	550
Calculated Total Kjeldahl Nitrogen	SW13	µg/g	17-Jun-2019	9250	CCME ISQG	550
Calculated Total Kjeldahl Nitrogen	SW13	µg/g	17-Jun-2019	21200	CCME ISQG	550
Calculated Total Kjeldahl Nitrogen	SW13	µg/g	17-Jun-2019	7470	CCME ISQG	550
Calculated Total Kjeldahl Nitrogen	SW12	µg/g	17-Jun-2019	2840	PSQG (LEL)	550
Calculated Total Kjeldahl Nitrogen	SW12	µg/g	17-Jun-2019	3780	PSQG (LEL)	550
Calculated Total Kjeldahl Nitrogen	SW12	µg/g	17-Jun-2019	1960	PSQG (LEL)	550
Calculated Total Kjeldahl Nitrogen	SW12	µg/g	17-Jun-2019	2050	PSQG (LEL)	550
Calculated Total Kjeldahl Nitrogen	SW12	µg/g	17-Jun-2019	3330	PSQG (LEL)	550
Calculated Total Kjeldahl Nitrogen	SW13	µg/g	17-Jun-2019	9250	PSQG (LEL)	550
Calculated Total Kjeldahl Nitrogen	SW13	µg/g	17-Jun-2019	21200	PSQG (LEL)	550
Calculated Total Kjeldahl Nitrogen	SW13	µg/g	17-Jun-2019	15000	PSQG (LEL)	550
Calculated Total Kjeldahl Nitrogen	SW13	µg/g	17-Jun-2019	7470	PSQG (LEL)	550
Calculated Total Kjeldahl Nitrogen	SW13	µg/g	17-Jun-2019	9460	PSQG (LEL)	550
Total Cadmium (Cd)	SW12	mg/kg	17-Jun-2019	1.6	CCME ISQG	0.6
Total Cadmium (Cd)	SW13	mg/kg	17-Jun-2019	0.636	CCME ISQG	0.6
Total Cadmium (Cd)	SW13	mg/kg	17-Jun-2019	1.21	CCME ISQG	0.6
Total Copper (Cu)	SW12	mg/kg	17-Jun-2019	40.5	CCME ISQG	35.7
Total Copper (Cu)	SW13	mg/kg	17-Jun-2019	54.8	CCME ISQG	35.7
Total Zinc (Zn)	SW12	mg/kg	17-Jun-2019	170	CCME ISQG	123
Total Cadmium (Cd)	SW12	mg/kg	17-Jun-2019	1.6	PSQG (LEL)	0.6
Total Cadmium (Cd)	SW13	mg/kg	17-Jun-2019	0.636	PSQG (LEL)	0.6
Total Cadmium (Cd)	SW13	mg/kg	17-Jun-2019	1.21	PSQG (LEL)	0.6
Total Chromium (Cr)	SW12	mg/kg	17-Jun-2019	30.7	PSQG (LEL)	26
Total Copper (Cu)	SW12	mg/kg	17-Jun-2019	22.1	PSQG (LEL)	16
Total Copper (Cu)	SW12	mg/kg	17-Jun-2019	20.5	PSQG (LEL)	16
Total Copper (Cu)	SW12	mg/kg	17-Jun-2019	40.5	PSQG (LEL)	16
Total Copper (Cu)	SW12	mg/kg	17-Jun-2019	20.1	PSQG (LEL)	16
Total Copper (Cu)	SW13	mg/kg	17-Jun-2019	17.8	PSQG (LEL)	16
Total Copper (Cu)	SW13	mg/kg	17-Jun-2019	19.4	PSQG (LEL)	16
Total Copper (Cu)	SW13	mg/kg	17-Jun-2019	54.8	PSQG (LEL)	16
Total Copper (Cu)	SW13	mg/kg	17-Jun-2019	19.1	PSQG (LEL)	16
Total Iron (Fe)	SW12	mg/kg	17-Jun-2019	23700	PSQG (LEL)	20000
Total Iron (Fe)	SW12	mg/kg	17-Jun-2019	20900	PSQG (LEL)	20000
Total Manganese (Mn)	SW12	mg/kg	17-Jun-2019	495	PSQG (LEL)	460
Total Manganese (Mn)	SW12	mg/kg	17-Jun-2019	540	PSQG (LEL)	460
Total Nickel (Ni)	SW12	mg/kg	17-Jun-2019	16.6	PSQG (LEL)	16
Total Nickel (Ni)	SW12	mg/kg	17-Jun-2019	16.5	PSQG (LEL)	16
Total Nickel (Ni)	SW12	mg/kg	17-Jun-2019	20.2	PSQG (LEL)	16
Total Organic Carbon	SW12	mg/kg	17-Jun-2019	18000	PSQG (LEL)	10000
Total Organic Carbon	SW12	mg/kg	17-Jun-2019	16000	PSQG (LEL)	10000
Total Organic Carbon	SW12	mg/kg	17-Jun-2019	26000	PSQG (LEL)	10000
Total Organic Carbon	SW12	mg/kg	17-Jun-2019	31000	PSQG (LEL)	10000
Total Organic Carbon	SW12	mg/kg	17-Jun-2019	29000	PSQG (LEL)	10000
Total Organic Carbon	SW13	mg/kg	17-Jun-2019	93000	PSQG (LEL)	10000
Total Organic Carbon	SW13	mg/kg	17-Jun-2019	87000	PSQG (LEL)	10000
Total Organic Carbon	SW13	mg/kg	17-Jun-2019	100000	PSQG (LEL)	10000
Total Organic Carbon	SW13	mg/kg	17-Jun-2019	260000	PSQG (LEL)	10000
Total Organic Carbon	SW13	mg/kg	17-Jun-2019	180000	PSQG (LEL)	10000
Total Phosphorus (P)	SW12	mg/kg	17-Jun-2019	711	PSQG (LEL)	600
Total Phosphorus (P)	SW12	mg/kg	17-Jun-2019	812	PSQG (LEL)	600
Total Phosphorus (P)	SW12	mg/kg	17-Jun-2019	648	PSQG (LEL)	600
Total Phosphorus (P)	SW13	mg/kg	17-Jun-2019	1420	PSQG (LEL)	600
Total Phosphorus (P)	SW13	mg/kg	17-Jun-2019	1230	PSQG (LEL)	600
Total Phosphorus (P)	SW13	mg/kg	17-Jun-2019	1320	PSQG (LEL)	600
Total Phosphorus (P)	SW13	mg/kg	17-Jun-2019	881	PSQG (LEL)	600
Total Phosphorus (P)	SW13	mg/kg	17-Jun-2019	1100	PSQG (LEL)	600
Total Zinc (Zn)	SW12	mg/kg	17-Jun-2019	170	PSQG (LEL)	120
Total Selenium (Se)	SW13	mg/kg	17-Jun-2019	3.07	Thompson LEL (2005)	1.9
Total Vanadium (V)	SW12	mg/kg	17-Jun-2019	59.6	Thompson LEL (2005)	35.2
Total Vanadium (V)	SW12	mg/kg	17-Jun-2019	41.3	Thompson LEL (2005)	35.2
Total Vanadium (V)	SW13	mg/kg	17-Jun-2019	37.5	Thompson LEL (2005)	35.2
Total Vanadium (V)	SW13	mg/kg	17-Jun-2019	36.7	Thompson LEL (2005)	35.2
Total Vanadium (V)	SW13	mg/kg	17-Jun-2019	37.3	Thompson LEL (2005)	35.2

Treefrog Pond

At Treefrog Pond, the majority of metal parameters and nutrients were above MDLs, and the majority of petroleum hydrocarbons and PAHs were below their corresponding MDLs. A few parameters exceeded their respective sediment quality guidelines, and are discussed below.

Calculated Total Kjeldahl Nitrogen (TKN)

Calculated TKN exceeded both CCME CSQG and PSQG LEL level in all samples collected from Treefrog Pond. The monitored values were 14-20 times the guideline value.

Total Organic Carbon

Total organic carbon exceeded the PSQG LEL level in all samples collected from Treefrog Pond. The monitored values were 9-26 times the guideline value. However, it is expected that TOC in pond locations will frequently exceed the MECP PSQG guideline, since the guideline for TOC is based on a Great Lakes data set, and no pond guidelines are available. The screening level concentration (SLC) method used by the MECP is constrained by the range of values in the data set; it cannot yield a higher guideline. Therefore, the TOC guideline is not suitable for ponds.

Total Phosphorus

Total phosphorus exceeded the PSQG LEL level in all samples collected from Treefrog Pond. The observed phosphorus concentrations ranged between 881 to 1420 mg/kg, while the sediment quality guideline value is 600 mg/kg.

Total Copper

Total copper concentrations exceeded the PSQG LEL level in four of the five samples and exceeded the CCME CSQG value in one of the five samples collected from Treefrog Pond. The monitored values range from marginally exceeding to 3.5 times the sediment quality guideline.

Total Vanadium

The concentrations of total vanadium were greater than the LEL value published in Thompson et al. (2005) in three of the five samples collected from Treefrog Pond. All three sample values were marginally elevated (<20%) compared to the sediment quality guideline concentration.

Other Parameters

Total cadmium and selenium concentrations were elevated compared to their respective sediment quality guidelines at one or two locations in Treefrog Pond. There were no other exceedances observed at this sampling location.

6.4 Identification of Changes to Baseline or Standards

Changes since the 2009 application for the DNNP PRSL with respect to baseline conditions and/or environmental standards for surface water and sediment quality are identified in the following sections. Changes that are considered to warrant assessment of their impact on the conclusions reached previously in 2009 with respect to residual adverse effects of the project on the environment are assessed in Section 6.5.

6.4.1 Hydrology

6.4.1.1 Changes to Baseline

6.4.1.1.1 Thermal and Current Monitoring

Current Direction

Current direction was measured historically and discussed within the Surface Water Environment Existing Environmental Conditions TSD (Golder 2009). Currents were also measured as part of the 2011 Thermal and Current Monitoring Program (Golder 2012a). Both Golder (2009) and Golder (2012a) reported current direction for the Port Darlington ADCP and CM01 located offshore of the DNNP Site Study Area. The updated information on current direction (Golder 2012a) was in agreement with historical information (Golder 2009). Specifically, currents were predominately alongshore at the Port Darlington ADCP and favoured a westerly direction at CM01 offshore of the DNNP Site Study Area.

Temperature

Monitoring of ambient temperatures during the 1990s, 2011-2012 and 2017-2018 indicate that the water column was well mixed during cold water conditions (isothermal). Stratification occurs during the warm water conditions. In general, average winter temperatures in 2017-2018 were cooler than in 2011-2012, and cooler than the long-term average (OPG 2018c). All three assessments of temperature and the thermal plume observed elevated plume temperatures relative to reference locations (Golder 2009, Golder 2012a, Golder 2012b, OPG 2018c). In general, updated information on thermal baseline (OPG 2018c) is in agreement with the information presented in 2009 and 2011-2012 (Golder 2009, Golder 2012a and Golder 2012b).

6.4.1.1.2 Stream Flow Monitoring

Discharge values for Darlington Creek as measured and estimated in 2008 - presented in the Surface Water Environment Existing Environmental Conditions TSD (Golder 2009) – were compared to discharge values measured and estimated at the same locations in 2019.

Since no permanent water flow monitoring station exists on Darlington Creek, discharge was estimated from the average monthly discharge measured at the Water Survey of Canada (WSC) monitoring station on the Bowmanville River (Station # 02HD006). The average monthly value for the Bowmanville River was prorated, based on watershed areas for the Bowmanville River and Darlington Creek stations, to obtain an estimate of discharge for Darlington Creek.

This method is the same as that applied in the Surface Water Environment Existing Environmental Conditions TSD (Golder 2009), however, the water survey station used for pro-rating was changed, as the station used to pro-rate the 2008 data (Station # 02HD007) no longer exists. For this reason, the station immediately upstream (Station # 02HD006) was used to pro-rate both years (2008 and 2019) of data.

Additionally, estimates were made for Darlington Creek based on daily average values for the Bowmanville River station.

The measured and estimated discharge values (m^3/s) for Darlington Creek in 2008 at station SF4 are shown in Table 6-15. Measurements in 2008 were taken in September, October and November.

The measured and estimated discharge values (m^3/s) for Darlington Creek in 2019 at station SF4 are shown in Table 6-16. Measurements in 2019 were taken in April, June, September and December. Therefore, September values are most appropriate for direct comparison.

Monthly Pro-rated

In 2008, the difference between the measured value at station SF4 and the monthly pro-rated value ranged from 0.071 to 0.170 m^3/s (Table 6-15). In 2019, the difference between the measured value at station SF4 and the monthly pro-rated value ranged from -0.203 to 0.184 m^3/s (Table 6-16). For the month of September, 2008, the discharge measurement was lower than the estimated pro-rated monthly discharge, while the September, 2019 measurement was higher than the estimated pro-rated discharge.

Daily Pro-rated

In 2008, the difference between the measured value at station SF4 and the daily pro-rated value ranged from 0.017 to 0.059 m^3/s (Table 6-15). In 2019, the difference between the measured value at station SF4 and the daily pro-rated value ranged from -0.239 to 0.033 m^3/s (Table 6-16). For the month of September, 2008, the discharge measurement was lower than the estimated pro-rated daily discharge, while the 2019 measurement was higher than the estimated pro-rated discharge.

The estimated value using daily pro-rating was more similar to the actual measured value than was monthly pro-rating, with the exception of December 2019. This is expected as the daily average would best reflect the flow conditions on the day the actual measurement was taken.

Table 6-15: Darlington Creek Pro Rated Monthly Discharge (m^3/s) Compared to Measured Discharge (m^3/s) at Location SF4, 2008

Month	Darlington Creek 2008 Pro-Rated Monthly Discharge 02HD006	Darlington Creek 2008 Pro-Rated Daily Discharge 02HD006	Darlington Creek 2008 Measured Discharge at SF 4	Pro-Rated Monthly Discharge – Measured Discharge	Pro-Rated Daily Discharge – Measured Discharge
September	0.218	0.168	0.147	0.071	0.021
October	0.251	0.177	0.16	0.091	0.017
November	0.35	0.239	0.18	0.17	0.059

Table 6-16: Darlington Creek Pro Rated Monthly Discharge (m^3/s) Compared to Measured Discharge (m^3/s) at Location SF4, 2019

Month	Darlington Creek 2019 Pro-Rated Monthly Discharge 02HD006	Darlington Creek 2019 Pro-Rated Daily Discharge 02HD006	Darlington Creek 2019 Measured Discharge at SF 4	Pro-Rated Monthly Discharge – Measured Discharge	Pro-Rated Daily Discharge – Measured Discharge
April	0.652	0.42	0.468	0.184	-0.048
June	0.258	0.164	0.132	0.126	0.033
September	0.153	0.17	0.242	-0.089	-0.072
December	0.416	0.38	0.619	-0.203	-0.239

Between Years

The absolute percent difference of the measured value compared to the pro-rated daily value indicated that accuracy was similar between years (Table 6-17). In 2008, the absolute percent difference ranged between 10.6 and 32.8 %, and in 2019, the absolute percent difference ranged between 10.3 and 38.6 % (Table 6-17).

Table 6-17: Percent Difference (%) of Measured and Estimated Discharge Values, 2008 and 2019

Year	Month	Absolute Percent Difference of Measured Discharge Relative to Pro-Rated Daily Discharge
2008	September	14.3
	October	10.6
	November	32.8
2019	April	10.3
	June	25.0
	September	29.8
	December	38.6

Based on these data, it appears that 2019 had a higher discharge than occurred in 2008, and that the accuracy of streamflow estimates was similar between years. However, the difference between years is within the spectrum of natural variability, and the conclusions of the 2009 application and 2009 supporting documents remain valid and no further assessment is required.

6.4.2 Surface Water Quality

6.4.2.1 Changes to Baseline

Since the surface water 2007/2008 sampling program, additional sampling programs were carried out in 2011/2012 (SENES 2012) and in 2019. Changes to baseline from 2007/2008 to 2011/2012 are summarized based on comparison to baseline that was completed in the 2012 DN Coastal Engineering and Water Quality Monitoring report (SENES 2012). Changes to baseline from 2007/2008 to 2019 are then assessed.

6.4.2.1.1 Changes to Baseline from 2007/2008 to 2011/2012

Comparison of 2011/2012 results to 2007/2008 data was completed within the 2012 DN Coastal Engineering and Water Quality Monitoring report (SENES 2012). Although most sample locations differed, to assess temporal changes, comparisons were made between the following locations (bottom and top depths) which were generally in close proximity to each other and therefore results are expected to be similar: SW9 in 2007/2008 compared to SW16 and SW17 in 2011-12 (embayment zone); and offshore new build zone SW10 (same sampling station for both 2007/2008 and 2011-12) (Table 6-17).

Table 6-18: Surface Water Locations for Baseline Comparison (2007/2008 vs 2011/2012) (SENES 2012)

2007/2008 Location	2011/2012 Location (s)
SW9 (nearshore new build zone)	SW16 and SW17 (embayment zone)
SW10 (offshore new build zone)	SW10 (offshore new build zone)

Note: Sampling locations in 2007/2008 (SW9 and SW10) and 2011/2012 (SW10, SW16 and SW17) are shown in Figure 6-9.

In general, water was found to be of similar quality between SW9 (2007/2008) and SW16 and SW17 (2011/2012) (SENES 2012). However, there were exceedances of water quality guidelines for pH, *E. coli*, nitrite, phosphorus, and cobalt that occurred in 2007/2008 but not in 2011/2012 (Table 6-19). The only exceedance that occurred in 2011/2012 at SW16 and SW17 was for phosphorus (maximum = 0.015 mg/L), which also occurred at SW9 in November 2007 (maximum = 0.046 mg/L).

The results at the offshore location SW10 were generally similar between 2007/2008 and 2011/2012 with the exception of phosphorus, aluminum and cobalt results obtained during the November 2007 sampling campaign (SENES 2012; Table 6-20). Comparatively, all parameters measured at SW10 in 2011/2012 were below respective guidelines.

Overall, based on these comparisons, water quality in 2011/2012 was generally better than in 2007/2008. Given that there were no new exceedances identified in 2011/2012 (i.e., instances where a parameter exceeded in 2011/2012 but did not exceed in 2007/2008) (Table 6-19 and Table 6-20), the differences identified by SENES (2012) do not change the conclusions of the 2009 application supporting documents.

Table 6-19: Comparison of Exceedances at SW9 (2007/2008) and SW16 and SW17 (2011/2012)

Parameter	2007/2008 Exceedance		2011/2012 Exceedances			
	SW9		SW16		SW17	
	bottom	top	bottom	top	bottom	top
pH	■	■				
E. coli	■	■				
Nitrite	■					
Phosphorus	■	■	■	■	■	■
Cobalt	■	■				

Table 6-20: Comparison of Exceedances at SW10 in 2007/2008 and 2011/2012

Parameter	2007/2008 Exceedance	2011/2012 Exceedances
	SW10 (bottom)	SW10 (bottom)
Phosphorus	■	
Aluminum	■	
Cobalt	■	

6.4.2.1.2 Changes to Baseline from 2007/2008 to 2019

The assessment of changes to baseline focused on locations and parameters that were common between the 2007/2008 and 2019 surface water sampling programs. Direct comparisons between 2007/2008 and 2019 surface water data can be made for Coot's Pond (SW12), Treefrog Pond (SW13), and all stations in Lake Ontario within the DNNP Site Study Area sampled in 2007/2008 (SW7, SW8, SW9, SW10 and SW11), and Regional Study Area location SW2. In 2019, surface water sampling stations SW7 and SW8 were not sampled; however, the stations DNGS-Near and DNGS-Far, respectively, were sampled and are in close proximity to SW7 and SW8 such that general comparisons can be made as results are expected to be similar (Figure 6-6).

While samples were collected from the bottom and top of the water column for all stations in 2019, in 2007/2008 only nearshore samples (SW7 and SW9) were collected from the bottom and top. Therefore, only bottom depths are compared for SW11, SW8, SW10 and SW2. For radionuclides, only summary data (top plus bottom) were available at SW7 and SW9), from the 2009 Radiation and Radioactivity Environment Existing Environmental Conditions TSD. Therefore, for SW7 and SW9, the 2007/2008 summary data were compared to 2019 summary data encompassing the 2019 top and bottom samples. In addition, summary radionuclide data was not available for SW11.

Surface water comparison locations are summarized in Table 6-21.

Table 6-21: Surface Water Locations for Baseline Comparison (2007/2008 vs 2019)

2007/2008 Location	2019 Location
Site Study Area	
SW12 (Coot's Pond)	SW12 (Coot's Pond)
SW13 (Treefrog Pond)	SW13 (Treefrog Pond)
SW7 – bottom*	DNGS-Near – bottom*
SW7 – top*	DNGS-Near – top*
SW11 (bottom)**	SW11 (bottom)**
SW8 (bottom)	DNGS-Far (bottom)
SW9 – bottom*	SW9 – bottom*
SW9 – top*	SW9 – top*
SW10 (bottom)	SW10 (bottom)
Regional Study Area	
SW2 (bottom)	SW2 (bottom)

* For locations SW7 and SW9, 2007/2008 summary data (top plus bottom) are compared to 2019 summary data (top plus bottom)

**Summary radionuclide data were not available for SW11, therefore SW11 is compared for non-radionuclides only.

To assess changes from 2007/2008 to 2019 for non-radionuclides, first the RPD between the 2008 and 2019 means was calculated to identify parameters for which mean values have increased or decreased by more than 20%. Second, a Mann–Whitney *U* test was performed to determine if the 2007/2008 and 2019 samples were statistically different (p-value < 0.05). In 2007/2008, five replicate samples were collected in each season, while in 2019 one sample was collected per season. Therefore, the 2007/2008 data were reduced to four seasonal means prior to statistical testing.

For radionuclides, the RPD of the means was calculated, as above, to identify parameters for which mean values have increased or decreased by more than 20%. Since the radionuclide data were only available as a summary for the year (all four seasons) and means for each season were not available, a t-test was appropriate based on two means (2007/2008 and 2019). The Welch t-test of unequal variance was performed to determine if the 2007/2008 and 2019 means were statistically different (p-value < 0.05).

All parameters were assessed in terms of changes in the data. Parameters with guidelines were further assessed in terms of any exceedances in either year (primarily if an exceedance occurred in 2019 that did not occur in 2007/2008). Where guidelines do not exist and a statistical increase was evident, or a guideline is exceeded, the 2016 DN ERA was consulted for available toxicity values.

Comparison tables for each location are available in Appendix D. Comparison tables show summary statistics for both the 2007/2008 and 2019 sampling programs in relation to the lowest surface water guideline value. As well, an assessment of change from 2007/2008 to 2019 is provided for each parameter in terms of RPD and statistical difference. Samples were collected for most parameters in each season (N = 4) for both the 2007/2008 sampling program and the 2019 sampling program. If sampling was completed in two or fewer seasons for a parameter during either of the sampling programs, an assessment of change could not be completed.

Lake Ontario

Direct comparison can be made between the 2007/2008 and 2019 surface water data for Lake Ontario, at stations SW7 (bottom and top) (station DNGS-Near in 2019), SW8 (bottom) (station DNGS-Far in 2019), SW11 (bottom), SW9 (bottom and top), SW10 (bottom), and within the Regional Study Area, SW2 (bottom). Most parameters measured within Lake Ontario during both sampling programs demonstrated a statistically meaningful decrease or no statistical change from 2007/2008 to 2019.

Non-radiological parameters which demonstrated statistical increases from 2007/2008 to 2019 are displayed in Table 6-22. With the exception of TRC, all parameters shown in Table 6-22 are well below their respective guidelines in both sampling program years.

Further, the apparent increases in these instances are likely attributed to differing MDLs in each year and not real increases. In the case of TRC, exceedances were attributed to a QA/QC issue discussed in Section 6.3.2.2.3.

Parameters which exceeded in 2019 that did not previously exceed in 2007/2008 were phosphorus, unionized ammonia, and pH (field), as shown in Table 6-23. However, some of these are marginal exceedances (phosphorous and pH). Further, phosphorus and unionized ammonia are unlikely to be attributed to DNGS operations and are potentially due to agricultural inputs into Lake Ontario. Therefore, the phosphorus (DNGS-Near top), pH (SW9) and unionized ammonia (DNGS-Near and DNGS-Far) exceedances do not change the conclusions of the 2009 application supporting documents.

For radionuclides in Lake Ontario, of the seven parameters measured in both years (C-14, Co-60, Cs-134, Cs-137, I-131, K-40 and tritium), C-14 and Cs-137 had detectable activity in 2019. However due to all of these instances being below MDL in 2007/2008, and the differing MDLs between years, RPD and p-values were not calculated (Appendix D). C-14 had detectable activity in 2019 at SW2, DNGS-Far, SW9, and SW10 (maxima ranged from 0.07-0.15 Bq/L). In all cases, C-14 levels were well below the ODWQS guideline of 200 Bq/L). Cs-137 had detectable activity in 2019 at SW9 and SW10 (maxima ranged from 0.21-0.73 Bq/L). In all cases, Cs-137 levels were well below the ODWQS and Health Canada drinking water guideline of 10 Bq/L). Considering C-14 and Cs-137 were well below guidelines, the detections do not change the conclusions of the 2009 application supporting documents.

Table 6-22: Statistical Increases in Non-Radionuclide Parameters within Lake Ontario

Parameter	Units	Criteria	2007/2008 Sampling Program [b]								2019 Sampling Program[c]								Assessment of Change		
			N_{means}	MDL	% above MDL	Median	Grand Mean	Std Dev	Min	Max	N	MDL	% above MDL	Median	Mean	Std Dev	Min	Max	RPD (means)	Mann–Whitney *U* test (p-value)	Note[d]
SW7 (bottom) (2007/2008) and DNGS-Near (bottom) (2019)																					
No Statistically Meaningful Increases																					
SW7 (top) (2007/2008) and DNGS-Near (top) (2019)																					
Total Residual Chlorine	mg/L	0.0005	3	0.002	0%	0.001	0.001	0	0.001	0.001	4	0.0012	25%	0.001	0.004	0.006	0.001	0.01	122	0.009	e
SW8 (bottom) (2007/2008) and DNGS-Far (bottom) (2019)																					
Arsenic	µg/L	5	4	1	0%	0.50	0.53	0.05	0.50	0.60	4	0.02 - 1	100%	0.77	0.77	0.02	0.75	0.80	38	0.000	e
Tungsten	µg/L	30	4	0.1	25%	0.06	0.07	0.02	0.05	0.10	4	0.01 - 1	75%	0.10	0.10	0.01	0.09	0.11	40	0.040	e
Total Residual Chlorine	mg/L	0.0005	3	0.002	0%	0.001	0.001	0.000	0.001	0.001	4	0.0012	25%	0.001	0.004	0.006	0.001	0.01	122	0.009	e
SW11 (bottom)																					
Arsenic	µg/L	5	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.02 - 1	100%	0.80	0.80	0.01	0.78	0.81	46	0.000	e
Total Residual Chlorine	mg/L	0.0005	3	0.002	0%	0.001	0.001	0.000	0.001	0.001	4	0.0012	25%	0.001	0.006	0.009	0.001	0.02	142	0.009	e
SW9 (bottom)																					
Unionized Ammonia	mg/L	0.019	4	0.001	0%	0.000	0.000	0.000	0.000	0.001	4	0.00051 - 0.044	50%	0.002	0.002	0.003	0.000	0.005	139	0.037	e
Arsenic	µg/L	5	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.02 - 1	100%	0.76	0.75	0.03	0.71	0.77	40	0.000	e
Tungsten	µg/L	30	4	0.1	25%	0.06	0.07	0.02	0.05	0.10	4	0.01 - 1	75%	0.10	0.09	0.009	0.08	0.10	32	0.004	e
SW9 (top)																					
Ammonia	mg/L	1.54	4	0.01	50%	0.01	0.01	0.009	0.007	0.03	4	0.01 - 1	100%	0.17	0.14	0.08	0.02	0.19	164	0.011	
Unionized Ammonia	mg/L	0.019	4	0.001	0%	0.000	0.000	0.000	0.000	0.001	4	0.00051 - 0.044	100%	0.006	0.005	0.003	0.002	0.007	171	0.002	e
Arsenic	µg/L	5	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.02 - 1	100%	0.77	0.76	0.03	0.73	0.80	42	0.000	e
Total Residual Chlorine	mg/L	0.0005	3	0.002	0%	0.001	0.001	0.000	0.001	0.001	4	0.0012	50%	0.001	0.004	0.006	0.001	0.01	126	0.009	e
SW10 (bottom)																					
Arsenic	µg/L	5	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.02 - 1	100%	0.78	0.78	0.03	0.76	0.82	44	0.000	e
Total Residual Chlorine	mg/L	0.0005	3	0.002	0%	0.001	0.001	0.000	0.001	0.001	4	0.0012	25%	0.001	0.006	0.009	0.001	0.02	140	0.009	e
SW2 (Regional Study Area)																					
Ammonia	mg/L	1.54	3	0.01	67%	0.02	0.02	0.010	0.005	0.02	4	0.01 - 1	100%	0.12	0.12	0.09	0.02	0.22	154	0.010	
Unionized Ammonia	mg/L	0.019	3	0.001	0%	0.001	0.001	0.000	0.001	0.001	4	0.00051 - 0.044	75%	0.005	0.005	0.004	0.000	0.009	156	0.010	e
Arsenic	µg/L	5	3	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.02 - 1	100%	0.78	0.77	0.03	0.73	0.80	43	0.000	e

123	Exceeds criteria.
123	RPD less than -20 (decrease). P-value for decrease statistically significant.
123	RPD greater than 20 (increase). P-value for increase statistically significant.

Notes:

a - 2007/2008 units were based on MPN/100 mL. 2019 units were based on CFU/100mL.

b -summary stats based on seasonal means (N_{means} = 4 for most parameters), each with five replicate samples.

c - 2019 data is uncensored. Therefore some parameters may have values below the MDL.

d - Parameters with both 'd' and 'e' notes indicate that 100% of samples in both 2008 and 2019 were below detection. Therefore assessment of change is not possible.

e - The 2009 ERA TSD set all samples to 1/2 MDL if all measurements were <MDL. Therefore, RPD and p-value calculations are based on all 2008 measurements being 1/2MDL if all measurements were <MDL.

f - All 2019 samples were below the MDL. Results are based on un-detected uncensored data.

Table 6-23: Non-Radionuclide Parameters Exceeding in Lake Ontario in 2019 Only

Parameter	Units	Criteria	2007/2008 Sampling Program [b]								2019 Sampling Program[c]								Assessment of Change		
			N_{means}	MDL	% above MDL	Median	Grand Mean	Std Dev	Min	Max	N	MDL	% above MDL	Median	Mean	Std Dev	Min	Max	RPD (means)	Mann–Whitney *U* test (p-value)	Note[d]
SW7 (bottom) (2007/2008) and DNGS-Near (bottom) (2019)																					
No parameters exceeded in 2019 that did not exceed in 2007/2008.																					
SW7 (top) (2007/2008) and DNGS-Near (top) (2019)																					
Unionized Ammonia	mg/L	0.019	4	0.001	25%	0.001	0.001	0.000	0.001	0.001	4	0.00051 - 0.044	75%	0.004	0.07	0.13	0.000	0.26	194	0.291	
Phosphorus	mg/L	0.02	4	0.002 / 0.01	75%	0.006	0.006	0.002	0.003	0.008	4	0.02 - 2.51	25%	0.01	0.01	0.01	-0.0013	0.022	58	0.328	
SW8 (bottom) (2007/2008) and DNGS-Far (bottom) (2019)																					
Unionized Ammonia	mg/L	0.019	4	0.001	25%	0.000	0.000	0.000	0.000	0.001	4	0.00051 - 0.044	75%	0.004	0.03	0.06	0.000	0.13	195	0.128	
SW11 (bottom)																					
No parameters exceeded in 2019 that did not exceed in 2007/2008.																					
SW9 (bottom)																					
pH (Field)	pH	6.5-8.5	3	-	100%	8.1	8.0	0.173205	7.8	8.1	4	-	100%	8.4	8.3	0.28	7.9	8.6	4	0.338	
SW9 (top)																					
No parameters exceeded in 2019 that did not exceed in 2007/2008.																					
SW10 (bottom)																					
No parameters exceeded in 2019 that did not exceed in 2007/2008.																					
SW2 (Regional Study Area)																					
No parameters exceeded in 2019 that did not exceed in 2007/2008.																					

123	Exceeds criteria.
123	RPD less than -20 (decrease). P-value for decrease statistically significant.
123	RPD greater than 20 (increase). P-value for increase statistically significant.

Notes:
a - 2007/2008 units were based on MPN/100 mL. 2019 units were based on CFU/100mL.
b -summary stats based on seasonal means (N_{means} = 4 for most parameters), each with five replicate samples.
c - 2019 data is uncensored. Therefore some parameters may have values below the MDL.
d - Parameters with both 'd' and 'e' notes indicate that 100% of samples in both 2008 and 2019 were below detection. Therefore assessment of change is not possible.
e - The 2009 ERA TSD set all samples to 1/2 MDL if all measurements were <MDL. Therefore, RPD and p-value calculations are based on all 2008 measurements being 1/2MDL if all measurements were <MDL.
f - All 2019 samples were below the MDL. Results are based on un-detected uncensored data.

Coot's Pond

Direct comparison can be made between the 2007/2008 and 2019 surface water data for Coot's Pond, at station SW12 (surface). Most parameters measured within Coot's Pond during both sampling programs demonstrated a statistically meaningful decrease or no statistical change from 2007/2008 to 2019. Only tin and uranium demonstrated a statistical increase ($p < 0.05$) from 2007/2008 to 2019.

In 2007/2008, all four seasonal mean tin concentrations were below the detection limit (< MDL 0.1 µg/L), while in 2019 one sample was above detection (maximum = 0.52 µg/L). The 2016 DN ERA utilized a pond surface water toxicity benchmark for tin (no guideline) of 73 µg/L, a Secondary Chronic Value derived by Suter and Tsao (1996) (EcoMetrix 2016a). Based on the tin concentrations being well below the toxicity benchmark (2019 maximum 0.52 µg/L < 73 µg/L toxicity benchmark), the increase does not change the conclusions of the 2009 application supporting documents.

For uranium, all four seasonal mean concentrations in 2007/2008 (grand mean = 0.89 µg/L) and all four sample concentrations in 2019 (mean = 1.1 µg/L) were above their respective MDLs. However, the maximum values in both years were well below the interim PWQO of 5 µg/L (2007/2008 highest seasonal mean = 1.86 µg/L; 2019 highest seasonal value = 1.5 µg/L).

For non-radiological parameters with guidelines, nitrite, aluminium (filtered) and cobalt exceeded surface water guidelines in 2007/2008, but not in 2019; further, the decreases were all statistically meaningful ($p < 0.05$). As such, these decreases do not change the conclusions of the 2009 application for the DNNP PRSL. Hydrazine and PCB both exceeded in 2007/2008, but were not measured in 2019; therefore, the 2007/2008 concentrations represent baseline.

Unionized ammonia, phosphorus, aluminum, boron, iron, and total coliforms exceeded in both years; however, changes (increase or decrease) were not statistically meaningful or they were statistically meaningful decreases. Therefore, although exceeding in both years, these parameters do not change the conclusions of the 2009 application supporting documents.

There were no new non-radiological parameter exceedances in 2019 which did not occur in 2007/2008.

For radionuclides, of the seven parameters measured in both years (C-14, Co-60, Cs-134, Cs-137, I-131, K-40 and tritium), only I-131 and tritium had detectable activity in one or both years. Tritium decreased statistically ($p < 0.05$) and I-131 had no meaningful change. Both tritium and I-131 and all other measured radionuclides in both years were below guidelines.

Therefore, radionuclides in Coot's Pond do not change the conclusions of 2009 application supporting documents.

Treefrog Pond

Direct comparison can be made between the 2007/2008 and 2019 surface water data for Treefrog Pond, at station SW13. Most parameters measured within Treefrog Pond during both sampling programs demonstrated a statistically meaningful decrease or no statistical change from 2007/2008 to 2019. Only alkalinity and ammonia demonstrated a statistical increase ($p < 0.05$) from 2007/2008 to 2019. However, the maximum ammonia values in both years were well below the guideline of 1.54 µg/L (2007/2008 highest seasonal mean = 0.03 µg/L; 2019 highest seasonal value = 0.21 µg/L). Alkalinity does not have a guideline value. Despite the statistical increase in alkalinity, RPD values for pH were less than 20%. As such, the increase in alkalinity does not change the conclusions of the 2009 application supporting documents.

TRC, hydrazine and PCB exceeded in 2007/2008, but were not measured in 2019; therefore, the 2007/2008 concentrations represent baseline.

All other exceedances occurred in 2007/2008 only, or if they occurred in both years, changes (increase or decrease) were not statistically meaningful or they were statistically meaningful decreases. There were no new parameter exceedances in 2019 which did not occur in 2007/2008.

For radionuclides, of the seven parameters measured in both years (C-14, Co-60, Cs-134, Cs-137, I-131, K-40 and tritium), only I-131 and tritium had detectable activity in one or both years. Tritium decreased statistically ($p < 0.05$) and I-131 had no meaningful change. Both tritium and I-131 and all other measured radionuclides in both years were below guidelines. Therefore, radionuclides in Treefrog Pond do not change the conclusions of the 2009 application supporting documents.

6.4.2.2 Changes to Standards

Non-radiological surface water quality guidelines used in the Surface Water Environment Existing Environmental Conditions TSD (Golder 2009) and the EcoRA TSD were based on 1994 MECP PWQOs, 2007 CCME CWQGs (Aquatic Life and Recreational), and 2008 HC FTP CDW.

The EcoRA TSD compared some radiological parameters to human health drinking water guidelines. The Radiation and Radioactivity Environment Existing Environmental Conditions TSD compared tritium concentrations to the MECP ODWQS, an OPG voluntary commitment level for nearby WSPs (not in table below), and a drinking water screening level for gross beta (not in table below).

Table 6-24 provides a summary of the changes to the guidelines that are relevant to the project. Parameters with a guideline which have become more stringent or are new are discussed further in Section 6.5.1.1.

Table 6-24: Comparison of surface water quality guidelines used in the 2009 application supporting documents to recent guidelines

Group	Parameters	Unit	CCME CWQG[1] 2009	CCME CWQG[1] 2019	CCME Updated Time	CCME Recreational 2009	CCME Recreational 2019	PWQO[2] 2009	PWQO[2] 2019	iPWQO[2] 2009	iPWQO[2] 2019	Health Canada[4] 2009[5]	Health Canada[4] 2019	O.Reg. 169/03: ODWS[3] 2009	O.Reg. 169/03: ODWS[3] 2019	Other Applicable Guidelines	Comments
Metals	Aluminum (filtered)	µg/L		-	-	-	-	-	-	75	75	-	-	-	-	-	-
Metals	Aluminum	µg/L	100	100	1987	-	-	-	-	-	-	100	-	-	-	-	-
Metals	Antimony	µg/L		-	-	-	-	-	20	20	-	6	6	-	-	-	-
Metals	Arsenic	µg/L	5	5	1997	-	-	100	100	-	5	10	10	-	-	-	-
Metals	Barium	µg/L	-	-	-	-	-		-	-	-	1000	1000	-	-	-	-
Metals	Beryllium	µg/L	-	-	-	-	-	1100	1100	-	-	-	-	-	-	-	PWQO value applies for water with hardness greater than 75 mg/L.
Metals	Bismuth	µg/L	-	-	-	-	-	-	-	-	-			-	-	-	-
Metals	Boron	µg/L	-	1500	2009	-	-	-	-	200	200	5000	5000	-	-	-	CCME CWQG updated in 2009.
Metals	Cadmium	µg/L	$10^{[0.86*\log(hardness)-3.2]}$	$10^{\{0.83(\log[hardness]) - 2.46\}}$ if water hardness is between 17 and 280 mg/L.	2014	-	-	0.20	0.2	0.50	0.5	5	5	-	-	-	CCME CWQG has been updated. For PWQO, assume water hardness greater than 100 mg/L.
Metals	Calcium (total)	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals	Cesium	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals	Chromium (VI)	µg/L	1	1	1997	-	-	1	1	-	-	-	-	-	-	-	-
Metals	Chromium(III)	µg/L	8.9	8.9	1997	-	-	8.9	8.9	-	-	-	-	-	-	-	-
Metals	Chromium, Total	µg/L	-	-	-	-	-	8.9	8.9			50	50	-	-		-
Metals	Cobalt	µg/L	-	-	-	-	-	-	-	0.9	0.9	-	-	-	-	-	-
Metals	Copper	µg/L	2 if water hardness < 82 mg/L. 0.2 * e{0.8545[ln(hardness)]-1.465} if water hardness between 82 and 180 mg/L. 4 if water hardness is greater than 180 mg/L.		1987	-	-	5	5	1	5	1000	2000	-	-	-	In 2009, iPWQO of 1 µg/L was used assuming low water hardness (less than 20 mg/L).
Metals	Iron	µg/L	300	300	1987	-	-	300	300	-	-	300	-	-	-	-	-
Metals	Lead	µg/L	1 if water hardness < 60 mg/L. $e^{\{1.273(\ln[hardness]) - 4.705\}}$ if water hardness is between 60 and 180 mg/L. 7 if water hardness >180 mg/L.		1987	-	-	25	25	1	5	10	5	-	-	-	The original application used 1 µg/L for iPWQO. For PWQO/iPWQO in 2019, assume hardness is greater than 80 mg/L.
Metals	Lithium	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals	Magnesium	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals	Manganese	µg/L	-	-	-	-	-	-	-	-	-	50	120	-	-	-	-
Metals	Mercury (Filtered)	µg/L	0.026	0.026	2003	-	-	0.2	0.2	-	-	1	1	-	-	-	-
Metals	Molybdenum	µg/L	73	73	1999	-	-		-	40	40	-	-	-	-	-	-
Metals	Nickel	µg/L	25 if water hardness < 60 mg/L. $e^{\{0.76(\ln[hardness])+1.06\}}$ if water hardness is between 60 and 180 mg/L. 150 if water hardness >180 mg/L.		1987	-	-	25	25	-	-	-	-	-	-	-	-
Metals	Potassium	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals	Selenium	µg/L	1	1	1987	-	-	100	100	-	-	10	50	-	-	-	-
Metals	Silver	µg/L		0.25	2015	-	-	0.1	0.1	-	-	-	-			-	-
Metals	Sodium	µg/L	-	-	-	-	-	-	-	-	-	200000	-	-	-	-	-
Metals	Strontium	µg/L	-	-	-	-	-	-	-	-	-	-	7000	-	-	-	-
Metals	Thallium	µg/L	0.8	0.8	1999	-	-	-	-	0.3	0.3	-	-	-	-	-	-
Metals	Thorium	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals	Tin	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals	Titanium	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals	Tungsten	µg/L	-	-	-	-	-	-	-	30	30	-	-	-	-	-	-
Metals	Uranium	µg/L	-	-	-	-	-	-	-	5	5	20	20	-	-	-	-
Metals	Vanadium	µg/L	-	-	-	-	-	-	-	6	6	-	-	-	-	-	-
Metals	Zinc	µg/L	30	7	2018	-	-	30	30	20	20	5000	-	-	-	-	CCME CWQG was updated in 2018 for dissolved zinc. The conversion factor between dissolved and total zinc is 0.978, hence it is appropriate to screen total zinc concentration against dissolved zinc criteria.
Metals	Zirconium	µg/L	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-
Hydrocarbons	PHC F1	µg/L	-	-	-	-	-	-	-	-	-	2.4	-	-	-	167	CCME PHC document was updated in 2008. No CCME CWQG.
Hydrocarbons	PHC F2	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	42	CCME PHC document was updated in 2008. No CCME CWQG.
Hydrocarbons	PHC F3	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hydrocarbons	PHC F4	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PCBs	Total PCBs	µg/L	-	-	-	-	-	0.001	0.001	-	-	-	-	-	-	-	-
VOCs	Benzene	µg/L	370	370	1999	-	-			100	100	5	5	-	-	-	-
VOCs	Ethylbenzene	µg/L	90	90	1996	-	-	-	-	8	8	-	140	-	-	-	-
VOCs	Toluene	µg/L	2	2	1996	-	-	-	-	0.8	0.8	24	60	-	-	-	Interim guideline published in 1996.
VOCs	m-Xylene	µg/L	-	-	-	-	-	-	-	2	2	-	-	-	-	-	-
VOCs	o-Xylene	µg/L	-	-	-	-	-	-	-	40	40	-	-	-	-	-	-
VOCs	p-Xylene	µg/L	-	-	-	-	-	-	-	30	30	-	-	-	-	-	-
VOCs/Semi-VOCs	Bromodichloromethane	µg/L	-	-	-	-	-	-	-	200	200	-	-	-	-	-	Only investigated in 2009 program. This parameter was removed in the 2019 program as bromodichloromethane is volatile.
VOCs/Semi-VOCs	Bromoform	µg/L	-	-	1992	-	-	-	-	60	60	-	-	-	-	-	-
VOCs/Semi-VOCs	Chloroform	µg/L	1.8	1.8	1992	-	-	-	-	-	-	-	-	-	-	-	-
VOCs/Semi-VOCs	Dibromochloromethane	µg/L	-	-	-	-	-	-	-	40	-	-	-	-	-	-	-
Radionuclides	^{3}H	Bq/L	-	-	-	-	-	7000	7000	-	-	-	7000	7000	7000	-	Case study used in PWQO is outdated, therefore the Health Canada and ODWQS guidelines were used.
Radionuclides	^{134}Cs	Bq/L	-	-	-	-	-	-	-	-	-	-	-	7	7	-	
Radionuclides	^{137}Cs	Bq/L	-	-	-	-	-	50	50	-	-	10	10	10	10	-	
Radionuclides	^{60}Co	Bq/L	-	-	-	-	-	-	-	-	-	-	-	2	2	-	
Radionuclides	^{131}I	Bq/L	-	-	-	-	-	10	10	-	-	6	6	-	-	-	
Radionuclides	^{90}Sr	Bq/L	-	-	-	-	-	10	10	-	-	90	90	5	5	-	
Radionuclides	^{14}C	Bq/L	-	-	-	-	-	-	-	-	-	-	-	200	200	-	
Other	pH	N/A	6.5-9.0	6.5-9.0	1987	6.5-9.0	6.5-9.0	6.5-8.5	6.5-8.5	-	-	-	-	-	-	-	-
Other	Total residual chlorine	mg/L	0.0005	0.0005	1999	-	-	0.002	0.002	-	-	-	-	-	-	-	-
Other	Total suspended solids	mg/L	Narrative	Narrative	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	Turbidity	NTU	-	-	-	50	50	-	-	-	-	-	-	-	-	-	-
Other	Total Kjeldahl Nitrogen (TKN)		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	Ammonia -N	mg/L	Variable (see comment)		2001	-	-	-	-	-	-	-	-	-	-	-	Different pH and temperature assumption was used leading to different ammonia criteria. Therefore, 1.54 mg/L was used in 2009 and 0.044 was used in 2019.
Other	Ammonia (unionised)	mg/L	0.019	0.019	2001	-	-	-	0.02	0.02	-	-	-	-	-	-	-
Other	Nitrate	mg/L	13	13		-	-	-	-	-	-	-	45	-	-	-	Interim guideline.
Other	Nitrite - N	mg/L	0.197	0.06	-	-	-	-	-	-	-	-	3	-	-	-	2019 CCME guideline is based on Nitrite-N; 2009 guideline was expressed as whole molecule (NO_2).
Other	Total Phosphorus	mg/L	-	-	-	-	-	-	-	0.01	0.01	-	-	-	-	-	iPWQO against aesthetic dterioration for ice-free period. Therfore in 2019, 0.02 was used in consideration of prevention of algae growth.
Other	E. coli 5 sample geo-mean	E.coli/100 ml	-	-	-	200	200	100	100	-	-	-	Non detectable	-	-	-	-
Other	Total coliforms	E.coli/100 ml	-	-	-	-	-	-	-	-	-	-	Non detectable	-	-	-	-
Other	Hydrazine	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	2.6	CCME has no guideline for Hydrazine. The new number is from the Federal environmental water quality guideline.
Other	Morpholine	µg/L	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-

- Criteria value decreased.
- Criteria value increased.
- Criteria added after 2009.

Notes:
[1] Canadian Council of Ministers of the Environment (CCME). Canadian Water Quality Guidelines for the Protection of Aquatic Life
[2] Ministry of the Environment (MOE). Water Management: Policies, Guidelines, Provincial Water Quality Objectives. ISBN 0-7778-8473-9 rev.
[3] O. Reg. 169/03: ONTARIO DRINKING WATER QUALITY STANDARDS
[4] Guideline for Canadian Drinking Water Quality. Accessed December 2019.
[5] 2009 Health Canada guideline is presented in the ERA TSD in the form of "CCME Health Based Guideline", which is a combination of IMAC and AO.

Supporting documents:
NK054-REP-07730-00003 Aquatic Environment Exisiting Environmental Conditions Technical Support Document New Nuclear - Darlington Environmental Assessment
NK054-REP-07730-00022-R000 Ecological Risk Assessment and Assessment of Effects on Non-Human Biota Technical Support Document New Nuclear - Darlington Environmental Assessment
NK054-REP-07730-00002 Surface Water Environment Existing Environmental Conditions Technical Supporting Document, Table 2.2-5.

6.4.3 Sediment Quality

6.4.3.1 Changes to Baseline

The assessment of changes to baseline focused on locations and parameters that were common between the 2007/2008 and 2019 sediment sampling programs. Direct comparisons between 2007/2008 and 2019 sediment data can be made for one location in Lake Ontario (SW10), Coot's Pond, and Treefrog Pond. PCBs, PAHs, and nutrients were not measured in both years, thus are not compared. Specifically, for the ponds and SW10, PCBs were only measured in 2007/2008, and PAHs and nutrients were only measured in 2019. PAH and nutrients measured in 2019 supplement baseline as additional parameters.

To assess changes from 2007/2008 to 2019 for SW10 (Lake Ontario), SW12 (Coot's Pond), and SW13 (Treefrog Pond), first the RPD between the 2007/2008 and 2019 medians was calculated to identify parameters for which median values have increased or decreased by more than 20%. Second, a Mann–Whitney *U* test was performed to determine if changes between the 2007/2008 and 2019 samples were statistically different (p-value < 0.05).

All parameters were assessed in terms of changes in the data. Parameters with guidelines were further assessed in terms of any exceedances in either year. Where guidelines do not exist and a statistical increase is evident, or a guideline is exceeded, the 2016 DN ERA was consulted for available toxicity values. Radionuclides do not have sediment guidelines, so Canadian background levels are discussed as reference values.

Lake Ontario

For Lake Ontario, SW10 was included in the sampling programs for both 2007/2008 and 2019. The 2019 assessment focused on the future embayment and infill areas where shoreline modifications may occur within the vicinity of the Darlington Creek outlet (depths 0-4 m). SW10 (14 m depth), which is the only offshore location included in 2019, is located offshore of the embayment/infill areas in the new build zone. In 2007/2008, two of the five Lake Ontario Stations were in the new build zone; the remaining three stations were proximate to the existing DN diffuser and intake. Overall, recent sediment data from Lake Ontario supplements the baseline by providing more information for the embayment and infill areas. Direct data comparisons for sediment data from 2007/2008 and 2019 were considered for Lake Ontario Station SW10.

Table 6-25 shows summary statistics for both the 2007/2008 and 2019 sampling programs in relation to the lowest sediment guideline value. As well, an assessment of change from 2007/2008 and 2019 is provided for each parameter, in terms of RPD and statistical difference.

Table 6-25: Assessment of Baseline Sediment Data Change at Station SW10 (Lake Ontario)

	Parameter	Units	Criteria	2008 Sampling Program SW10 - Lake Ontario								2019 Sampling Program[a] SW10 - Lake Ontario								Assessment of Change		
				N	MDL	% above MDL	Median	Mean	Std Dev	Min	Max	N	MDL[b]	% above MDL	Median	Mean	Std Dev	Min	Max	RPD (medians)	Mann–Whitney *U* test (p-value)	Note[c]
Metals	Total Aluminum (Al)	mg/kg	-	5	1	100%	5031	6892	5526	2593	16572	5	100	100%	1890	1938	276	1560	2320	-91	0.012	
	Total Antimony (Sb)	mg/kg	-	5	0.05	100%	0.10	0.12	0.06	0.08	0.22	5	0.1	20%	0.06	0.08	0.04	0.06	0.15	-38	0.144	
	Total Arsenic (As)	mg/kg	5.9	5	0.05	100%	2.0	2.0	0.12	1.9	2.2	5	0.5	100%	1.3	1.3	0.1	1.2	1.5	-44	0.012	
	Total Barium (Ba)	mg/kg	-	5	0.5	100%	309	317	27	285	354	5	0.1	100%	14	15	4	10.8	20.4	-183	0.012	
	Total Beryllium (Be)	mg/kg	-	5	0.5	100%	1.4	1.3	0.11	1.2	1.5	5	0.2	0%	0.12	0.11	0.02	0.09	0.13	-168	0.012	e
	Total Bismuth (Bi)	mg/kg	-	5	0.05	100%	0.10	0.10	0.02	0.08	0.13	5	0.1	0%	0.03	0.03	0.01	0.02	0.04	-106	0.012	e
	Total Boron (B)	mg/kg	-	5	0.05	100%	15	17	2.6	15	21	5	1	100%	3.0	3.1	0.4	2.6	3.6	-135	0.012	
	Boron-hot water	mg/kg	-	5	0.05	0%	0.03	0.03	-	0.03	0.03	5	0.05	100%	0.24	0.29	0.11	0.20	0.46	162	0.007	d
	Total Cadmium (Cd)	mg/kg	0.6	5	0.05	100%	0.13	0.14	0.03	0.10	0.16	5	0.05	100%	0.08	0.09	0.04	0.06	0.15	-52	0.060	
	Total Calcium (Ca)	mg/kg	-	5	1	100%	50308	52763	5470	47025	60497	5	100	100%	61200	60340	4900	53100	66000	20	0.060	
	Total Cesium (Cs)	mg/kg	-	5	0.05	100%	0.31	0.31	0.08	0.19	0.39	5	1	0%	0.15	0.16	0.04	0.12	0.21	-66	0.022	e
	Total Chromium (Cr)	mg/kg	26	5	1	100%	16	16	1.7	13	17	5	1	100%	6.1	6.1	1.0	4.5	7.0	-91	0.012	
	Total Cobalt (Co)	mg/kg	50	5	0.05	100%	4.3	4.2	0.38	3.6	4.6	5	0.3	100%	1.5	1.4	0.2	1.2	1.7	-99	0.012	
	Total Copper (Cu)	mg/kg	16	5	1	100%	3.0	3.1	0.52	2.6	3.8	5	0.5	100%	3.7	3.8	1.3	2.4	5.3	18	0.531	
	Total Iron (Fe)	mg/kg	20000	5	0.5	100%	11040	10526	1335	8229	11599	5	100	100%	6670	6650	1350	4550	8220	-49	0.012	
	Total Lead (Pb)	mg/kg	31	5	0.05	100%	13	14	1.7	12	16	5	0.1	100%	3.1	7.1	9.2	2.6	23.6	-125	0.144	
	Total Lithium (Li)	mg/kg	-	5	0.005	100%	6.6	6.6	0.47	6.1	7.4	5	5	0%	2.4	2.5	0.3	2.2	2.9	-93	0.012	e
	Total Magnesium (Mg)	mg/kg	-	5	0.5	100%	3509	3806	1070	3039	5682	5	100	100%	3740	3524	368	2960	3820	6	0.835	
	Total Manganese (Mn)	mg/kg	460	5	1	100%	289	286	27	241	316	5	0.2	100%	130	128	7	118	135	-76	0.012	
	Total Mercury (Hg)	mg/kg	0.17	5	0.01	0%	0.005	0.005	-	0.005	0.005	5	0.05	0%	0.01	0.01	0.00	0.01	0.01	66	0.007	d,e
	Total Molybdenum (Mo)	mg/kg	13.8	5	0.05	100%	0.29	0.27	0.04	0.22	0.31	5	0.1	80%	0.13	0.12	0.02	0.09	0.14	-77	0.012	
	Total Nickel (Ni)	mg/kg	16	5	1	100%	4.6	4.6	0.42	4.0	5.0	5	0.8	100%	3.2	3.5	0.5	3.1	4.3	-36	0.022	
	Total Phosphorus (P)	mg/kg	600	5	0.5	100%	9133	9135	588	8467	10022	5	10	100%	568	523	111	392	660	-177	0.012	
	Total Potassium (K)	mg/kg	-	5	1	100%	320	320	65	249	406	5	100	100%	385	392	62	316	484	18	0.144	
	Total Selenium (Se)	mg/kg	1.9	5	0.05	100%	0.23	0.23	0.06	0.17	0.30	5	0.5	0%	0.12	0.16	0.06	0.11	0.24	-60	0.144	e
	Total Silver (Ag)	mg/kg	0.5	5	0.05	0%	0.03	0.03	-	0.03	0.03	5	0.05	0%	0.02	0.02	0.00	0.01	0.02	-23	0.007	d,e
	Total Sodium (Na)	mg/kg	-	5	5	100%	8616	8742	1401	7000	10811	5	100	100%	118	122	10	111	136	-195	0.012	
	Total Strontium (Sr)	mg/kg	-	5	1	100%	243	255	28	225	294	5	0.1	100%	99	99	10	85	110	-84	0.012	
	Total Thallium (Tl)	mg/kg	-	5	0.05	100%	0.26	0.28	0.03	0.25	0.31	5	0.05	0%	0.03	0.03	0.01	0.02	0.04	-159	0.012	e
	Total Thorium (Th)	mg/kg	-	5	0.05	100%	1.3	1.3	0.27	0.96	1.5	5	0.1	100%	1.4	1.5	0.2	1.3	1.8	9	0.402	
	Total Tin (Sn)	mg/kg	-	5	0.05	100%	1.2	1.6	0.88	1.0	3.1	5	0.1	100%	0.33	0.32	0.05	0.26	0.38	-112	0.012	
	Total Titanium (Ti)	mg/kg	-	5	0.5	100%	858	852	157	619	1052	5	1	100%	221	237	50	181	298	-118	0.012	
	Total Tungsten (W)	mg/kg	-	5	0.005	100%	0.15	0.15	0.02	0.14	0.18	5	0.5	0%	0.07	0.07	0.01	0.07	0.08	-71	0.012	e
	Total Uranium (U)	mg/kg	104.4	5	0.01	100%	1.2	1.1	0.11	0.96	1.2	5	0.05	100%	0.35	0.33	0.05	0.26	0.38	-108	0.012	
	Total Vanadium (V)	mg/kg	35.2	5	2.5	100%	27	26	3.4	21	29	5	2	100%	12	12	3	7.7	15.2	-77	0.012	
	Total Zinc (Zn)	mg/kg	120	5	2	100%	23	23	1.7	21	25	5	1	100%	16	16	3	13.1	19.3	-36	0.012	
	Total Zirconium (Zr)	mg/kg	-	5	1	100%	30	29	3.9	23	32	5	0.5	80%	0.71	0.75	0.24	0.46	1.02	-191	0.012	
Hydrocarbons	F1 (C6-C10) - BTEX	mg/kg		Not measured in 2008									10	0%	0.00	0.00	0.00	0.00	0.00		-	d,e
	F1 (C6-C10)	mg/kg	-	5	10	0%	5.0	5.0	-	5.0	5.0	5	10	0%	0.00	0.00	0.00	0.00	0.00	-200	0.004	d,e
	F2 (C10-C16 Hydrocarbons)	mg/kg	-	5	10	0%	5.0	5.0	-	5.0	5.0	5	10 (4); 20 (1)	0%	0.00	0.00	0.00	0.00	0.00	-200	0.004	d,e
	F3 (C16-C34 Hydrocarbons)	mg/kg	-	5	10	40%	5.0	55	106	5.0	244	5	50 (4); 100 (1)	0%	39	42	12	30.429	61.99	154	0.139	e
	F4 (C34-C50 Hydrocarbons)	mg/kg	-	5	10	20%	5.0	31	58	5.0	135	5	50 (4); 100 (1)	0%	0.00	0.00	0.00	0.00	0.00	-200	0.006	e
PCBs	PCBs (total)	mg/kg	0.0341	5	0.05	0%	0.03	0.03	-	0.03	0.03	Not measured in 2019									-	d,e
PAHs	Anthracene	mg/kg	0.0469	Not measured in 2008								5	0.005 (4); 0.01 (1)	0%	0.00	0.00	0.00	0.00	0.00		-	d,e
	Benzo(a)anthracene	mg/kg	0.317									5	0.005 (4); 0.01 (1)	0%	0.00	0.00	0.00	0.00	0.01		-	d,e
	Benzo(a)pyrene	mg/kg	0.0319									5	0.005 (4); 0.01 (1)	20%	0.00	0.00	0.00	0.00	0.01		-	d
	Benzo(g,h,i)perylene	mg/kg	0.17									5	0.005 (4); 0.01 (1)	40%	0.00	0.00	0.00	0.00	0.01		-	d
	Benzo(k)fluoranthene	mg/kg	0.24									5	0.005 (4); 0.01 (1)	0%	0.00	0.00	0.00	0.00	0.01		-	d,e
	Chrysene	mg/kg	0.0571									5	0.005 (4); 0.01 (1)	20%	0.00	0.00	0.00	0.00	0.01		-	d
	Dibenz(a,h)anthracene	mg/kg	0.00622									5	0.005 (4); 0.01 (1)	0%	0.00	0.00	0.00	0.00	0.00		-	d,e
	Fluoranthene	mg/kg	0.111									5	0.005 (4); 0.01 (1)	100%	0.01	0.01	0.01	0.01	0.03		-	d
	Fluorene	mg/kg	0.0212									5	0.005 (4); 0.01 (1)	0%	0.00	0.00	0.00	0.00	0.00		-	d,e
	Indeno(1,2,3-cd)pyrene	mg/kg	0.2									5	0.005 (4); 0.01 (1)	20%	0.00	0.00	0.00	0.00	0.01		-	d
	Phenanthrene	mg/kg	0.0419									5	0.005 (4); 0.01 (1)	20%	0.00	0.00	0.01	0.00	0.01		-	d
	Pyrene	mg/kg	0.053									5	0.005 (4); 0.01 (1)	60%	0.01	0.01	0.01	0.00	0.02		-	d
Nutrients	Calculated Total Kjeldahl Nitrogen	mg/kg	550	Not measured in 2008								5	100	100%	440	530	247	321	944		-	d
	Nitrate (N)	mg/kg	-									5	2	0%	0.00	0.00	0.00	0.00	0.00		-	d,e
	Nitrate + Nitrite (N)	mg/kg	-									5	3	0%	0.42	0.46	0.30	0.16	0.83		-	d,e
	Nitrite (N)	mg/kg	-									5	0.5	0%	0.08	0.06	0.04	-0.01	0.10		-	d,e
	Total Organic Carbon	mg/kg	10000									5	500	100%	3300	4160	2919	2000	9100		-	d
Radionuclides	Ag-110m	Bq/kg	-	5	2	0%	1.0	1.0	-	1.0	1.0	5	0.49-0.8	0%	0.16	0.15	0.05	0.09	0.21	-146	0.007	d,e
	Am-241	Bq/kg	-	Not measured in 2008								5	7.4-11	0%	5.0	4.3	2.8	1.2	8.2		-	d,e
	Ba-140	Bq/kg	-	5	5	0%	2.5	2.5	0.00	2.5	2.5	Not measured in 2019									-	d,e
	Be-7	Bq/kg	-	5	10	20%	5.0	7.6	5.8	5.0	18	Not measured in 2019									-	e
	C-14	Bq/g-C	-	5	100	0%	50	50	-	50	50	5	0.04-0.06	80%	0.17	0.23	0.23	-0.01	0.55	-199	0.007	d
	Ce-141	Bq/kg	-	5	1	0%	0.50	0.50	-	0.50	0.50	Not measured in 2019									-	d,e
	Ce-144	Bq/kg	-	5	5	0%	2.5	2.5	-	2.5	2.5	Not measured in 2019									-	d,e
	Co-57	Bq/kg	-	5	1	0%	0.50	0.50	-	0.50	0.50	Not measured in 2019									-	d,e
	Co-58	Bq/kg	-	5	1	0%	0.50	0.50	-	0.50	0.50	Not measured in 2019									-	d,e
	Co-60	Bq/kg	-	5	1	0%	0.50	0.50	-	0.50	0.50	5	0.5-0.73	0%	0.01	-0.04	0.16	-0.31	0.10	-193	0.007	d,e
	Cr-51	Bq/kg	-	5	10	0%	5.0	5.0	-	5.0	5.0	Not measured in 2019									-	d,e
	Cs-134	Bq/kg	-	5	1	0%	0.50	0.50	-	0.50	0.50	5	0.29-0.81	0%	0.14	0.13	0.07	0.05	0.23	-114	0.007	d,e
	Cs-137	Bq/kg	-	5	1	20%	0.50	0.64	0.31	0.50	1.2	5	0.56-0.87	60%	0.93	0.83	0.25	0.55	1.09	61	0.131	
	Eu-154	Bq/kg	-	5	3	0%	1.5	1.5	-	1.5	1.5	Not measured in 2019									-	d,e
	Eu-155	Bq/kg	-	5	2	0%	1.0	1.0	-	1.0	1.0	Not measured in 2019									-	d,e
	Fe-59	Bq/kg	-	5	2	0%	1.0	1.0	-	1.0	1.0	Not measured in 2019									-	d,e
	Gross Beta	Bq/kg	-	5	0.1	100%	390	454	96	380	590	Not measured in 2019									-	e
	I-131	Bq/kg	-	5	2	0%	1.0	1.0	-	1.0	1.0	5	0.64-1.3	0%	0.28	0.51	0.43	0.14	1.05	-113	0.119	d,e
	K-40	Bq/kg	-	5	10	100%	215	203	34	144	224	5	5.3-7.5	100%	263	261	25	223	283	20	0.028	
	La-140	Bq/kg	-	5	2	0%	1.0	1.0	-	1.0	1.0	Not measured in 2019									-	d,e
	Mn-54	Bq/kg	-	5	1	0%	0.50	0.50	-	0.50	0.50	5	0.29-0.8	0%	0.14	0.25	0.20	0.06	0.51	-113	0.119	d,e
	Nb-94	Bq/kg	-	Not measured in 2008								5	0.31-0.94	0%	0.09	0.13	0.08	0.06	0.22		-	d,e
	Nb-95	Bq/kg	-	5	1	0%	0.50	0.50	-	0.50	0.50	5	0.43-0.75	0%	0.17	0.20	0.07	0.11	0.31	-97	0.007	d,e
	Ru-103	Bq/kg	-	5	1	0%	0.50	0.50	-	0.50	0.50	Not measured in 2019									-	d,e
	Ru-106	Bq/kg	-	5	10	0%	5.0	5.0	-	5.0	5.0	Not measured in 2019									-	d,e
	Sb-124	Bq/kg	-	5	2	0%	1.0	1.0	-	1.0	1.0	Not measured in 2019									-	d,e
	Sb-125	Bq/kg	-	5	2	0%	1.0	1.0	-	1.0	1.0	5	1.5-2	0%	0.78	0.79	0.40	0.39	1.29	-24	0.656	d,e
	Se-75	Bq/kg	-	5	1	0%	0.50	0.50	-	0.50	0.50	Not measured in 2019									-	d,e
	Strontium-90	Bq/kg	-	5	20	0%	10.0	10.0	-	10.0	10.0	Not measured in 2019									-	d,e
	H-3	Bq/kg	-	5	15	0%	7.5	7.5	-	7.5	7.5	5	9.4-10.3	0%	4.4	3.5	2.0	0.0	4.5	-52	0.007	d,e
	Zn-65	Bq/kg	-	5	3	0%	1.5	1.5	-	1.5	1.5	Not measured in 2019									-	d,e
	Zr-95	Bq/kg	-	5	2	0%	1.0	1.0	-	1.0	1.0	5	0.91-2.1	0%	0.42	0.40	0.15	0.21	0.54	-81	0.007	d,e
	U-Series	Bq/kg	-	Not measured in 2008								5	2.4-3.6	100%	6.0	6.0	0.6	5.4	7.0		-	d
	Th-Series	Bq/kg	-	Not measured in 2008								5	2.3-3.1	100%	5.6	5.1	1.0	3.9	6.1		-	d

123 (yellow)	Maximum value exceeds criteria.
123 (red text)	RPD less than -20 (decrease). P-value for decrease statistically significant.
123 (pink)	RPD greater than 20 (increase). P-value for increase statistically significant.

Notes:

a - 2019 data is uncensored. Therefore some parameters may have values below the MDL.

b - MDLs for radionuclides are shown as a range.

c - Parameters with both 'd' and 'e' notes indicate that 100% of samples in both 2008 and 2019 were below detection. Therefore assessment of change is not possible.

d - The 2009 ERA TSD set all samples to 1/2 MDL if all measurements were <MDL. Therefore, RPD and p-value calculations are based on all 2008 measurements being 1/2MDL if all measurements were <MDL.

e - All 2019 samples were below the MDL. Results are based on un-detected uncensored data.

For SW10, all but five metal constituents, with detections in both years, had RPD absolute values of the median greater than 20%. This indicates that the median sediment concentration decreased (29 metal constituents) or increased (one metal constituent: boron-hot water).

Boron-hot water and K-40 all had RPDs greater than 20% and showed the increase was statistically meaningful ($p < 0.05$). An assessment of change was not possible for mercury since all samples were below detection in both 2007/2008 and 2019.

The difference for boron-hot water between 2007/2008 and 2019 and was found to be statistically meaningful ($p < 0.05$). In 2007/2008, all 5 samples were below a detection limit of 0.05 mg/kg for boron-hot water, while in 2019 all 5 samples ranged from 0.2 to 0.46 mg/kg. There are no available sediment guidelines or toxicity benchmarks for boron-hot water in sediment. Further, concern with boron-hot water toxicity generally pertains to terrestrial plants, and not aquatic plants. The increase in boron-hot water at SW10 does not change the conclusions of the 2009 application supporting documents.

Hydrocarbon fractions did not demonstrate any statistically meaningful increases.

Twelve radiological parameters were measured in both years, three of which had detectable activity in one or both years (C-14, Cs-137, and K-40). Comparing these parameters with detectable activity from 2007/2008 to 2019, C-14 decreased ($p < 0.05$). Cs-137 showed no statistically meaningful change. K-40 is the only radionuclide which was found to show a statistical increase between 2007/2008 (144-224 Bq/kg) and 2019 (223-283 Bq/kg). K-40 naturally occurs in soil and rocks and Sheppard *et al.* (2011) cited background levels of K-40 in beach soil (which can be applied to sediment) for Southern Ontario ranging from 235 to 679 Bq/kg, as well as an overall suggested Canadian soil background of 430 Bq/kg. K-40 concentrations at SW10 are within the range of these background values.

Phosphorous concentrations showed a statistically meaningful decrease (RPD = -177, $p < 0.05$); however, concentrations exceeded the phosphorous sediment quality guideline of 600 mg/kg. All samples exceeded the phosphorous guideline of 600 mg/kg in 2007/2008 (8,467-10,022 mg/kg), while in 2019, only the maximum (660 mg/kg) exceeded. Since the baseline has improved, the conclusions of the 2009 application supporting documents do not change.

Total Kjeldahl Nitrogen (TKN) was not measured in 2007/2008, so no statistical comparison was performed. TKN exceeded its sediment quality guideline at SW10 in 2019 (maximum 944 mg/kg > guideline 550 mg/kg). However, elevated TKN is unlikely to be attributed to DNGS operations and is potentially due to agricultural inputs into Lake Ontario. Therefore, in the case of TKN exceedances in sediment at SW10, the conclusions of the 2009 application supporting documents do not change.

Coot's Pond

Direct comparison can be made between the 2007/2008 and 2019 sediment data for Coot's Pond, at station SW12. Table 6-26 shows summary statistics for both the 2007/2008 and 2019 sampling programs in relation to the lowest sediment guideline value. As well, an assessment of change from 2007/2008 and 2019 is provided for each parameter in terms of RPD and statistical difference.

Table 6-26: Assessment of Baseline Sediment Data Change at Coot's Pond (SW12)

	Parameter	Units	Criteria	2008 Sampling Program Coots Pond (SW12)								2019 Sampling Program[a] Coots Pond (SW12)								Assessment of Change		
				N	MDL	% above MDL	Median	Mean	Std Dev	Min	Max	N	MDL[b]	% above MDL	Median	Mean	Std Dev	Min	Max	RPD (medians)	Mann–Whitney *U* test (p-value)	Note[c]
Metals	Total Aluminum (Al)	mg/kg	-	5	1	100%	25874	26282	1926	24147	28715	5	100	100%	14300	13194	5095	8140	20300	-58	0.012	
	Total Antimony (Sb)	mg/kg	-	5	0.05	100%	0.39	0.35	0.09	0.20	0.41	5	0.1	100%	0.18	0.26	0.22	0.11	0.64	-73	0.210	
	Total Arsenic (As)	mg/kg	5.9	5	0.05	100%	2.9	2.8	0.45	2.1	3.4	5	0.5	100%	1.8	1.8	0.66	1.0	2.7	-48	0.037	
	Total Barium (Ba)	mg/kg	-	5	0.5	100%	339	337	5.0	330	342	5	0.1	100%	96	111	37	67	159	-111	0.012	
	Total Beryllium (Be)	mg/kg	-	5	0.5	100%	1.4	1.4	0.05	1.3	1.4	5	0.2	80%	0.48	0.50	0.24	0.17	0.81	-96	0.012	
	Total Bismuth (Bi)	mg/kg	-	5	0.05	100%	0.24	0.24	0.03	0.20	0.27	5	0.1	40%	0.09	0.09	0.04	0.05	0.15	-90	0.012	
	Total Boron (B)	mg/kg	-	5	0.05	100%	51	48	11	30	55	5	1	100%	12	10	6.4	1.2	18	-127	0.012	
	Boron-hot water	mg/kg	-	5	0.02	100%	4.9	5.2	4.6	0.89	12.24	5	0.05	100%	1.4	1.3	0.29	0.91	1.6	-111	0.296	
	Total Cadmium (Cd)	mg/kg	0.6	5	0.05	100%	0.24	0.23	0.05	0.14	0.25	5	0.05	100%	0.23	0.49	0.62	0.15	1.6	-5	1.000	
	Total Calcium (Ca)	mg/kg	-	5	1	100%	187530	179021	25377	136332	201620	5	100	100%	136000	103260	74432	7900	180000	-32	0.060	
	Total Cesium (Cs)	mg/kg	-	5	0.05	100%	2.3	2.1	0.54	1.2	2.5	5	1	20%	0.61	0.79	0.40	0.46	1.4	-115	0.022	
	Total Chromium (Cr)	mg/kg	26	5	1	100%	23	23	2.5	19	25	5	1	100%	19	20	7.2	13	31	-19	0.403	
	Total Cobalt (Co)	mg/kg	50	5	0.05	100%	9.7	9.3	1.0	7.6	9.9	5	0.3	100%	7.6	8.7	5.2	4.2	17	-25	0.210	
	Total Copper (Cu)	mg/kg	16	5	1	100%	27	24	6.0	13	27	5	0.5	100%	21	22	11	8.7	41	-26	0.403	
	Total Iron (Fe)	mg/kg	20000	5	0.5	100%	13401	13374	1186	11462	14387	5	100	100%	19500	17880	5098	11300	23700	37	0.296	
	Total Lead (Pb)	mg/kg	31	5	0.05	100%	17	17	2.1	13	19	5	0.1	100%	11	10	2.7	6.4	13	-42	0.012	
	Total Lithium (Li)	mg/kg	-	5	0.005	100%	27	25	5.6	16	29	5	5	100%	9.7	13	6.6	6.2	22	-95	0.037	
	Total Magnesium (Mg)	mg/kg	-	5	0.5	100%	10044	9849	522	8947	10257	5	100	100%	11400	8730	4181	3910	12400	13	0.676	
	Total Manganese (Mn)	mg/kg	460	5	1	100%	469	461	54	368	503	5	0.2	100%	400	387	146	173	540	-16	0.531	
	Total Mercury (Hg)	mg/kg	0.17	5	0.05	100%	0.02	0.02	0.01	0.01	0.03	5	0.05	20%	0.03	0.04	0.02	0.02	0.07	34	0.296	
	Total Molybdenum (Mo)	mg/kg	13.8	5	0.05	100%	1.3	1.2	0.39	0.48	1.4	5	0.1	100%	0.70	1.6	2.4	0.22	6.0	-63	0.296	
	Total Nickel (Ni)	mg/kg	16	5	1	100%	12	11	1.7	8.5	13	5	0.8	100%	17	14	5.1	7.3	20	35	0.531	
	Total Phosphorus (P)	mg/kg	600	5	0.5	100%	664	651	33	592	673	5	10	100%	648	631	155	398	812	-2	0.835	
	Total Potassium (K)	mg/kg	-	5	1	100%	11393	11479	500	10756	11959	5	100	100%	1930	2246	1202	1170	3940	-142	0.012	
	Total Selenium (Se)	mg/kg	1.9	5	0.05	100%	0.86	0.77	0.32	0.23	1.06	5	0.5	0%	0.22	0.25	0.07	0.18	0.36	-119	0.037	e
	Total Silver (Ag)	mg/kg	0.5	5	0.05	0%	0.03	0.03	-	0.03	0.03	5	0.05	40%	0.04	0.05	0.01	0.03	0.06	57	0.007	d
	Total Sodium (Na)	mg/kg	-	5	5	100%	5742	6313	1483	5403	8949	5	100	100%	441	409	138	189	550	-171	0.012	
	Total Strontium (Sr)	mg/kg	-	5	1	100%	602	608	100	452	702	5	0.1	100%	348	266	177	29	442	-53	0.012	
	Total Thallium (Tl)	mg/kg	-	5	0.05	100%	0.38	0.37	0.04	0.30	0.40	5	0.05	100%	0.11	0.13	0.07	0.07	0.23	-110	0.012	
	Total Thorium (Th)	mg/kg	-	5	0.05	100%	5.7	5.4	0.91	3.8	6.0	5	0.1	100%	2.8	2.7	0.89	1.5	3.7	-68	0.012	
	Total Tin (Sn)	mg/kg	-	5	0.05	100%	1.8	1.8	0.34	1.2	2.2	5	0.1	100%	0.84	0.84	0.33	0.51	1.3	-74	0.022	
	Total Titanium (Ti)	mg/kg	-	5	0.5	100%	916	940	125	779	1103	5	1	100%	581	609	169	447	795	-45	0.022	
	Total Tungsten (W)	mg/kg	-	5	0.005	100%	0.55	0.55	0.17	0.29	0.74	5	0.5	0%	0.15	0.16	0.06	0.09	0.23	-114	0.012	e
	Total Uranium (U)	mg/kg	104.4	5	0.01	100%	2.3	2.2	0.44	1.5	2.6	5	0.05	100%	0.81	0.87	0.40	0.43	1.3	-96	0.012	
	Total Vanadium (V)	mg/kg	35.2	5	2.5	100%	39	38	3.9	32	41	5	2	100%	32	35	16	21	60	-18	0.835	
	Total Zinc (Zn)	mg/kg	120	5	2	100%	73	71	16	44	83	5	1	100%	88	95	49	33	170	19	0.144	
	Total Zirconium (Zr)	mg/kg	-	5	1	100%	25	27	5.3	22	36	5	0.5	100%	1.7	1.6	0.55	0.73	2.1	-174	0.012	
Hydrocarbons	F1 (C6-C10) - BTEX	mg/kg	-	Not measured in 2008								5	0 (1); 20 (2); 30 (2)	0%	0.00	0.00	0.00	0.00	0.00		-	d,e
	F1 (C6-C10)	mg/kg	-	5	10	0%	5.0	5.0	-	5.0	5.0	5	0 (1); 20 (2); 30 (2)	0%	0.00	0.00	0.00	0.00	0.00	-200	0.004	d,e
	F2 (C10-C16 Hydrocarbons)	mg/kg	-	5	10	0%	5.0	5.0	-	5.0	5.0	5	20 (2); 30 (3)	20%	16	16	19	0.00	46	105	0.655	d
	F3 (C16-C34 Hydrocarbons)	mg/kg	-	5	10	100%	282	269	40	209	313	5	100 (2); 150 (3)	80%	310	277	145	97	440	9	0.835	
	F4 (C34-C50 Hydrocarbons)	mg/kg	-	5	10	0%	52	49	8.1	38	59	5	100 (2); 150 (3)	20%	87	72	71	0.00	160	50	0.674	d
PCBs	PCBs (total)	mg/kg	0.0341	5	0.05	0%	0.03	0.03	-	0.03	0.03	Not measured in 2019									-	d,e
PAHs	Anthracene	mg/kg	0.0469	Not measured in 2008								5	0.01 (3); 0.015 (2)	0%	0.00	0.00	0.00	0.00	0.00		-	d,e
	Benzo(a)anthracene	mg/kg	0.317									5	0.01 (3); 0.015 (2)	0%	0.00	0.00	0.00	0.00	0.00		-	d,e
	Benzo(a)pyrene	mg/kg	0.0319									5	0.01 (3); 0.015 (2)	0%	0.00	0.00	0.00	0.00	0.00		-	d,e
	Benzo(g,h,i)perylene	mg/kg	0.17									5	0.01 (3); 0.015 (2)	40%	0.01	0.01	0.01	0.00	0.01		-	d
	Benzo(k)fluoranthene	mg/kg	0.24									5	0.01 (3); 0.015 (2)	0%	0.00	0.00	0.00	0.00	0.00		-	d,e
	Chrysene	mg/kg	0.0571									5	0.01 (3); 0.015 (2)	0%	0.00	0.00	0.00	0.00	0.01		-	d,e
	Dibenz(a,h)anthracene	mg/kg	0.00622									5	0.01 (3); 0.015 (2)	0%	0.00	0.00	0.00	0.00	0.00		-	d,e
	Fluoranthene	mg/kg	0.111									5	0.01 (3); 0.015 (2)	40%	0.01	0.01	0.00	0.01	0.02		-	d
	Fluorene	mg/kg	0.0212									5	0.01 (3); 0.015 (2)	0%	0.00	0.00	0.00	0.00	0.00		-	d,e
	Indeno(1,2,3-cd)pyrene	mg/kg	0.2									5	0.01 (3); 0.015 (2)	0%	0.00	0.00	0.00	0.00	0.01		-	d,e
	Phenanthrene	mg/kg	0.0419									5	0.01 (3); 0.015 (2)	0%	0.00	0.00	0.00	0.00	0.01		-	d,e
	Pyrene	mg/kg	0.053									5	0.01 (3); 0.015 (2)	40%	0.01	0.01	0.01	0.00	0.01		-	d
Nutrients	Calculated Total Kjeldahl Nitrogen	mg/kg	550	Not measured in 2008								5	100	100%	2840	2792	792	1960	3780		-	d
	Nitrate (N)	mg/kg	-									5	2	0%	0.00	0.00	0.00	0.00	0.00		-	d,e
	Nitrate + Nitrite (N)	mg/kg	-									5	3	0%	0.33	0.36	0.18	0.11	0.53		-	d,e
	Nitrite (N)	mg/kg	-									5	0.5	0%	0.13	0.12	0.04	0.07	0.16		-	d,e
	Total Organic Carbon	mg/kg	10000									5	500	100%	26000	24000	6671	16000	31000		-	d
Radionuclides	Ag-110m	Bq/kg	-	5	2	0%	1.0	1.0	-	1.0	1.0	5	0.29-0.77	0%	0.13	0.12	0.04	0.06	0.18	-155	0.007	d,e
	Am-241	Bq/kg	-	Not measured in 2008								5	2.3-11	0%	2.4	1.5	2.5	-2.68	3.9		-	d,e
	Ba-140	Bq/kg	-	5	5	0%	2.5	2.5	-	2.5	2.5	Not measured in 2019									-	d,e
	Be-7	Bq/kg	-	5	10	0%	5.0	5.0	-	5.0	5.0	Not measured in 2019									-	d,e
	C-14	Bq/g-C	-	5	100	100%	193	185	47	104	218	5	0.03-0.06	80%	0.13	0.14	0.12	-0.02	0.30	-200	0.012	
	Ce-141	Bq/kg	-	5	1	0%	0.50	0.50	-	0.50	0.50	Not measured in 2019									-	d,e
	Ce-144	Bq/kg	-	5	5	0%	2.5	2.5	-	2.5	2.5	Not measured in 2019									-	d,e
	Co-57	Bq/kg	-	5	1	0%	0.50	0.50	-	0.50	0.50	Not measured in 2019									-	d,e
	Co-58	Bq/kg	-	5	1	0%	0.50	0.50	-	0.50	0.50	Not measured in 2019									-	d,e
	Co-60	Bq/kg	-	5	1	0%	0.50	0.50	-	0.50	0.50	5	0.22-0.63	0%	-0.02	0.00	0.09	-0.11	0.12	-213	0.007	d,e
	Cr-51	Bq/kg	-	5	10	0%	5.0	5.0	-	5.0	5.0	Not measured in 2019									-	d,e
	Cs-134	Bq/kg	-	5	1	0%	0.50	0.50	-	0.50	0.50	5	0.24-0.97	0%	-0.01	-0.11	0.43	-0.78	0.34	-207	0.007	d,e
	Cs-137	Bq/kg	-	5	1	0%	0.50	0.50	-	0.50	0.50	5	0.25-0.83	80%	0.99	0.88	0.50	0.29	1.5	65	0.656	d
	Eu-154	Bq/kg	-	5	3	0%	1.5	1.5	-	1.5	1.5	Not measured in 2019									-	d,e
	Eu-155	Bq/kg	-	5	2	0%	1.0	1.0	-	1.0	1.0	Not measured in 2019									-	d,e
	Fe-59	Bq/kg	-	5	2	0%	1.0	1.0	-	1.0	1.0	Not measured in 2019									-	d,e
	Gross Beta	Bq/kg	-	5	0.1	100%	770	740	93	580	820	Not measured in 2019									-	e
	I-131	Bq/kg	-	5	2	0%	1.0	1.0	-	1.0	1.0	5	0.52-2	0%	0.23	0.30	0.43	-0.31	0.87	-125	0.007	d,e
	K-40	Bq/kg	-	5	10	100%	90	110	47	82	193	5	1.9-11	100%	208	225	45	190	304	79	0.022	
	La-140	Bq/kg	-	5	2	0%	1.0	1.0	-	1.0	1.0	Not measured in 2019									-	d,e
	Mn-54	Bq/kg	-	5	1	0%	0.50	0.50	-	0.50	0.50	5	0.25-1	0%	0.21	0.19	0.09	0.05	0.27	-84	0.007	d,e
	Nb-94	Bq/kg	-	Not measured in 2008								5	0.19-0.9	0%	0.09	0.07	0.05	-0.02	0.10		-	d,e
	Nb-95	Bq/kg	-	5	1	0%	0.50	0.50	-	0.50	0.50	5	0.16-0.67	0%	0.18	0.20	0.10	0.08	0.32	-92	0.007	d,e
	Ru-103	Bq/kg	-	5	1	0%	0.50	0.50	-	0.50	0.50	Not measured in 2019									-	d,e
	Ru-106	Bq/kg	-	5	10	0%	5.0	5.0	-	5.0	5.0	Not measured in 2019									-	d,e
	Sb-124	Bq/kg	-	5	2	0%	1.0	1.0	-	1.0	1.0	Not measured in 2019									-	d,e
	Sb-125	Bq/kg	-	5	2	0%	1.0	1.0	-	1.0	1.0	5	0.89-2.8	0%	0.40	0.53	0.26	0.33	0.95	-86	0.007	d,e
	Se-75	Bq/kg	-	5	1	0%	0.50	0.50	-	0.50	0.50	Not measured in 2019									-	d,e
	Strontium-90	Bq/kg	-	5	20	0%	10.0	10.0	-	10.0	10.0	Not measured in 2019									-	d,e
	H-3	Bq/kg	-	5	7	100%	262	241	64	132	298	5	10-10.4	100%	35	36	4.0	33	43	-153	0.012	
	Zn-65	Bq/kg	-	5	3	0%	1.5	1.5	-	1.5	1.5	Not measured in 2019									-	d,e
	Zr-95	Bq/kg	-	5	2	0%	1.0	1.0	-	1.0	1.0	5	0.43-1.2	0%	0.04	0.32	0.52	-0.08	1.2	-183	0.119	d,e
	U-Series	Bq/kg	-	Not measured in 2008								5	0.82-3.2	100%	9.1	9.2	0.92	8.2	10		-	d
	Th-Series	Bq/kg	-	Not measured in 2008								5	0.91-3.3	100%	11	9.9	1.5	8.0	11		-	d

123	Maximum value exceeds criteria.
123	RPD less than -20 (decrease). P-value for decrease statistically significant.
123	RPD greater than 20 (increase). P-value for increase statistically significant.

Notes:
a - 2019 data is uncensored. Therefore some parameters may have values below the MDL.
b - MDLs for radionuclides are shown as a range.
c - Parameters with both 'd' and 'e' notes indicate that 100% of samples in both 2008 and 2019 were below detection. Therefore assessment of change is not possible.
d - The 2009 ERA TSD set all samples to 1/2 MDL if all measurements were <MDL. Therefore, RPD and p-value calculations are based on all 2008 measurements being 1/2MDL if all measurements were <MDL.
e - All 2019 samples were below the MDL. Results are based on un-detected uncensored data.

For Coot's Pond (SW12), all but seven metal parameters had RPD absolute values of the median greater than 20%. This indicates that the median sediment concentration decreased (26 metal constituents) or increased (4 metal constituents).

Only silver was found to have a statistically meaningful increase ($p < 0.05$) from 2007/2008 (all samples < MDL 0.05) to 2019 (maximum = 0.06 mg/kg). Despite this, the maximum in 2019 is just marginally above the MDL (0.01 mg/kg greater than MDL). Further, the maximum silver concentration of 0.06 mg/kg in 2019 is well below the selected sediment criteria for silver of 0.5 mg/kg. Thus, this marginal detection of silver in 2019, which was not seen in 2007/2008, does not change the conclusions of the 2009 application supporting documents.

Hydrocarbon fractions did not demonstrate any statistically significant changes from 2007/2008 to 2019.

For radionuclides, of the twelve parameters measured in both years, C-14, Cs-137, K-40, and H-3 had detectable activity in one or both years. Comparing these parameters with detectable activity from 2007/2008 to 2019, C-14 and H-3 showed a statistical decrease ($p < 0.05$). Cs-137 did not show any statistically meaningful change. Similar to SW10 in Lake Ontario, K-40 was the only radionuclide at SW12 which was found to show a statistical increase between 2007/2008 and 2019. Sheppard *et al.* (2011) cited background levels of K-40 in beach soil for Southern Ontario ranging from 235 to 679 Bq/kg, as well as an overall suggested Canadian soil background of 430 Bq/kg. K-40 concentrations at SW10 are within the range of these background values.

For parameters with guidelines (non-radiological only), guideline exceedances occurred in both years for copper, manganese, phosphorous, and vanadium. However, none of these show a statistically meaningful change from 2007/2008 to 2019.

Cadmium, chromium, iron, nickel, and zinc were below guidelines in 2007/2008, but exceeded in 2019. Although not statistically meaningful increases, these are exceedances of guidelines in 2019 which did not occur in 2007/2008. Chromium and iron are below the sediment background applied in the 2009 EcoRA (SENES 2009c) and therefore do not change the conclusions of the 2009 application supporting documents. Toxicity benchmarks for cadmium, nickel, and zinc were not available from the 2016 DN ERA; this is discussed further in Section 6.4.

The only other exceedances at SW12 were for TKN (maximum 3780 mg/kg > guideline 550 mg/kg) and Total Organic Carbon (TOC) (maximum 31,000 mg/kg > guideline 10,000 mg/kg) in 2019. However, it is expected that TOC in pond locations will frequently exceed the MECP PSQG guideline, since the guideline for TOC is based on a Great Lakes data set, and no pond guidelines are available. The screening level concentration (SLC) method used by the MECP is constrained by the range of values in the data set; it cannot yield a higher guideline. Therefore, the TOC guideline is not suitable for ponds. TKN and TOC were not measured in 2007/2008. Overall, it is evident that the ponds are nutrient enriched, potentially due to agricultural runoff. Elevated TKN and TOC are unlikely to be attributed to DNGS operations, and do not change the conclusions of the 2009 application supporting documents.

Treefrog Pond

Direct comparison can be made between the 2007/2008 and 2019 sediment data for Treefrog Pond at station SW13. Table 6-27 shows summary statistics for both the 2007/2008 and 2019 sampling programs in relation to the lowest sediment guideline value. As well, an assessment of change from 2007/2008 and 2019 is provided for each parameter in terms of RPD and statistical difference.

For Treefrog Pond (SW13), all but five metal constituents had RPD absolute values of the median greater than 20%, indicating that the median sediment concentration decreased (23 constituents) or increased (9 parameters).

Aluminum, antimony, boron hot-water, cadmium, mercury, phosphorus, selenium and silver showed a statistical increase from 2007/2008 to 2019 (p <0.05). Although mercury and silver increased and mercury is approaching the guideline, they still remain below guidelines. The 2016 DN ERA utilized a pond sediment toxicity benchmark for aluminum (no guideline) of 58,030 mg/kg, a Probable Effect Concentration derived by Jones *et al.* (1997) (EcoMetrix 2016a). Based on the aluminium concentrations being well below the toxicity benchmark (2019 maximum 17,900 mg/kg < 58,030 mg/kg toxicity benchmark), the increase does not change the conclusions of the 2009 application supporting documents. For antimony (no guideline), a toxicity benchmark is not available from the 2016 DN ERA; it is discussed further in Section 6.5.1.2. Concern with boron-hot water toxicity generally pertains to terrestrial plants, and not aquatic plants, therefore the increase does not change the conclusions of the 2009 application supporting documents. Cadmium, phosphorus and selenium increases are discussed below, in relation to guideline exceedances.

Hydrocarbon fraction F3 was detected in both years and showed a statistical increase from 2007/2008 to 2019. Similarly, F2, although below MDLs in both years, shows a statistical increase based on uncensored 2019 data. PHC F2 and F3 do not have sediment guidelines and toxicity benchmarks are not available from the 2016 DN ERA. PHC F2 and F3 are discussed further in Section 6.5.1.2.

For radionuclides, of the twelve parameters measured in both years, C-14, Cs-137, K-40, Nb-95, and H-3 had detectable activity in one or both years. Comparing these parameters with detectable activity from 2007/2008 to 2019, C-14, K-40 and H-3 all decreased (p <

0.05). Nb-95 did not show any statistically meaningful change. Cs-137 was the only radiological parameter in Treefrog Pond to show a statistical increase from 2007/2008 (single detected sample = 1 Bq/kg) to 2019 (all samples detectable; maximum = 7.0 Bq/kg).

For parameters with guidelines (non-radiological only), chromium, iron, manganese and nickel exceeded sediment guidelines in 2007/2008, but not in 2019; further, the decreases were all statistically meaningful ($p < 0.05$). As such, these decreases do not change the conclusions of the 2009 application supporting documents.

Table 6-27: Assessment of Baseline Sediment Data Change at Treefrog Pond (SW13)

	Parameter	Units	Criteria	2008 Sampling Program Tree Frog Pond (SW13) N	MDL	% above MDL	Median	Mean	Std Dev	Min	Max	2019 Sampling Program[a] Tree Frog Pond (SW13) N	MDL[b]	Parm	<RDL	% above MDL	Count (<RDL)	Median	Mean	Std Dev	Min	Max	Assessment of Change RPD (medians)	RPD (means)	Mann–Whitney *U* test (p-value)	Note[c]
Metals	Total Aluminum (Al)	mg/kg	-	5	1	100%	8398	8580	3870	3661	14021	5	100	Total Aluminum (Al)	0	100%	0	15800	15300	2146	12000	17900	61	56	0.022	
	Total Antimony (Sb)	mg/kg	-	5	0.05	100%	0.14	0.16	0.04	0.12	0.21	5	0.1	Total Antimony (Sb)	0	100%	0	0.25	0.27	0.09	0.18	0.40	53	50	0.037	
	Total Arsenic (As)	mg/kg	5.9	5	0.05	100%	2.7	2.8	0.27	2.5	3.2	5	0.5	Total Arsenic (As)	0	100%	0	1.6	1.7	0.46	1.3	2.5	-56	-49	0.022	
	Total Barium (Ba)	mg/kg	-	5	0.5	100%	433	428	69	321	494	5	0.1	Total Barium (Ba)	0	100%	0	112	109	21	83	129	-118	-119	0.012	
	Total Beryllium (Be)	mg/kg	-	5	0.5	100%	1.8	1.7	0.26	1.4	2.0	5	0.2	Total Beryllium (Be)	0	100%	0	0.63	0.63	0.10	0.50	0.77	-96	-93	0.012	
	Total Bismuth (Bi)	mg/kg	-	5	0.05	100%	0.37	0.36	0.04	0.31	0.41	5	0.1	Total Bismuth (Bi)	0	100%	0	0.16	0.16	0.03	0.11	0.20	-79	-79	0.012	
	Total Boron (B)	mg/kg	-	5	0.05	100%	35	34	4.4	30	41	5	1	Total Boron (B)	0	100%	0	9.2	8.9	1.1	7.0	10.0	-117	-118	0.012	
	Boron-hot water	mg/kg	-	5	0.02 (4); 0.05 (1)	80%	0.10	0.09	0.04	0.03	0.14	5	0.05 (2); 0.1 (3)	Hot Water Ext. Boron (B)	0	100%	0	1.2	1.3	1.1	0.19	2.4	170	173	0.012	
	Total Cadmium (Cd)	mg/kg	0.6	5	0.05	100%	0.31	0.30	0.08	0.21	0.38	5	0.05	Total Cadmium (Cd)	0	100%	0	0.55	0.66	0.32	0.41	1.2	56	75	0.012	
	Total Calcium (Ca)	mg/kg	-	5	1	100%	59682	58623	7903	47838	68349	5	100	Total Calcium (Ca)	0	100%	0	11900	13678	5309	7990	21800	-134	-124	0.012	
	Total Cesium (Cs)	mg/kg	-	5	0.05	100%	1.5	1.5	0.26	1.3	2.0	5	1	Total Cesium (Cs)	5	0%	0	0.72	0.75	0.12	0.62	0.90	-70	-69	0.012	e
	Total Chromium (Cr)	mg/kg	26	5	1	100%	44	43	3.8	38	47	5	1	Total Chromium (Cr)	0	100%	0	21	22	2.7	19	26	-70	-65	0.012	
	Total Cobalt (Co)	mg/kg	50	5	0.05	100%	13	13	1.2	11	15	5	0.3	Total Cobalt (Co)	0	100%	0	5.0	4.9	0.86	3.9	6.0	-91	-90	0.012	
	Total Copper (Cu)	mg/kg	16	5	1	100%	21	21	4.3	15	25	5	0.5	Total Copper (Cu)	0	100%	0	19	25	17	15	55	-11	19.7	0.835	
	Total Iron (Fe)	mg/kg	20000	5	0.5	100%	24352	24127	1843	21165	26228	5	100	Total Iron (Fe)	0	100%	0	15400	14720	2172	12000	17300	-45	-48	0.012	
	Total Lead (Pb)	mg/kg	31	5	0.05	100%	19	19	4.4	15	26	5	0.1	Total Lead (Pb)	0	100%	0	22	22	6.4	14	30	15	14	0.531	
	Total Lithium (Li)	mg/kg	-	5	0.005	100%	30	29	4.7	23	35	5	5	Total Lithium (Li)	0	100%	0	12	12	2.4	9.8	16	-88	-80	0.012	
	Total Magnesium (Mg)	mg/kg	-	5	0.5	100%	5323	5614	793	4807	6836	5	100	Total Magnesium (Mg)	0	100%	0	3780	3674	631	2970	4550	-34	-42	0.012	
	Total Manganese (Mn)	mg/kg	460	5	1	100%	442	461	35	431	517	5	0.2	Total Manganese (Mn)	0	100%	0	140	144	23	121	181	-104	-105	0.012	
	Total Mercury (Hg)	mg/kg	0.17	5	0.05	100%	0.05	0.05	0.01	0.04	0.06	5	0.05	Total Mercury (Hg)	0	100%	0	0.08	0.10	0.04	0.05	0.168	53	66	0.021	
	Total Molybdenum (Mo)	mg/kg	13.8	5	0.05	100%	0.49	0.52	0.14	0.37	0.73	5	0.1	Total Molybdenum (Mo)	0	100%	0	0.86	0.83	0.39	0.48	1.4	54	45	0.209	
	Total Nickel (Ni)	mg/kg	16	5	1	100%	18	18	1.8	16	20	5	0.8	Total Nickel (Ni)	0	100%	0	13	13	1.3	11	14	-36	-34	0.012	
	Total Phosphorus (P)	mg/kg	600	5	0.5	100%	716	664	83	538	725	5	10		0	100%	0	1230	1190	209	881	1420	53	57	0.012	
	Total Potassium (K)	mg/kg	-	5	1	100%	11554	11578	1979	8899	14152	5	100	Total Potassium (K)	0	100%	0	1540	1524	340	1160	1980	-153	-153	0.012	
	Total Selenium (Se)	mg/kg	1.9	5	0.05	100%	0.17	0.18	0.04	0.15	0.25	5	0.5	Total Selenium (Se)	0	100%	0	1.3	1.5	0.95	0.56	3.1	155	157	0.012	
	Total Silver (Ag)	mg/kg	0.5	5	0.05	0%	0.03	0.03	-	0.03	0.03	5	0.05	Total Silver (Ag)	0	100%	0	0.11	0.12	0.03	0.08	0.15	126	129	0.007	d
	Total Sodium (Na)	mg/kg	-	5	5	100%	6111	5912	926	4396	6752	5	100	Total Sodium (Na)	0	100%	0	153	152	15	128	167	-190	-190	0.012	
	Total Strontium (Sr)	mg/kg	-	5	1	100%	180	183	17	162	202	5	0.1	Total Strontium (Sr)	0	100%	0	36	38	10	25	54	-134	-132	0.012	
	Total Thallium (Tl)	mg/kg	-	5	0.05	100%	0.54	0.52	0.08	0.39	0.61	5	0.05	Total Thallium (Tl)	0	100%	0	0.13	0.13	0.02	0.11	0.16	-121	-118	0.012	
	Total Thorium (Th)	mg/kg	-	5	0.05	100%	2.3	2.8	1.1	1.9	4.7	5	0.1	Total Thorium (Th)	0	100%	0	2.1	1.8	0.61	0.94	2.3	-13	-43	0.059	
	Total Tin (Sn)	mg/kg	-	5	0.05	100%	2.1	2.1	0.32	1.8	2.6	5	0.1	Total Tin (Sn)	0	100%	0	1.3	1.2	0.14	0.96	1.3	-53	-58	0.012	
	Total Titanium (Ti)	mg/kg	-	5	0.5	100%	1742	1557	449	798	1920	5	1	Total Titanium (Ti)	0	100%	0	536	472	135	315	591	-106	-107	0.012	
	Total Tungsten (W)	mg/kg	-	5	0.005	100%	0.24	0.23	0.08	0.14	0.35	5	0.5	Total Tungsten (W)	5	0%	0	0.11	0.10	0.02	0.08	0.12	-75	-75	0.012	e
	Total Uranium (U)	mg/kg	104.4	5	0.01	100%	1.8	1.7	0.21	1.5	2.0	5	0.05	Total Uranium (U)	0	100%	0	1.9	2.8	2.4	1.3	7.0	5	47	0.835	
	Total Vanadium (V)	mg/kg	35.2	5	2.5	100%	66	65	4.7	58	71	5	2	Total Vanadium (V)	0	100%	0	37	35	3.4	30	38	-57	-60	0.012	
	Total Zinc (Zn)	mg/kg	120	5	2	100%	71	69	10	57	82	5	1	Total Zinc (Zn)	0	100%	0	85	87	20	69	119	18	23	0.210	
	Total Zirconium (Zr)	mg/kg	-	5	1	100%	51	51	3.0	46	54	5	0.5	Total Zirconium (Zr)	0	100%	0	2.1	2.3	0.77	1.5	3.6	-184	-183	0.012	
Hydrocarbons	F1 (C6-C10) - BTEX	mg/kg		Not measured in 2008								5	20 (1); 30 (2); 40 (1); 50 (1)		5	0%	0	0.00	0.00	0.00	0.00	0.00			-	d,e
	F1 (C6-C10)	mg/kg	-	5	10	0%	5.0	5.0	-	5.0	5.0	5	20 (1); 30 (2); 40 (1); 50 (1)		5	0%	0	0.00	0.00	0.00	0.00	0.00	-200	-200	0.004	d,e
	F2 (C10-C16 Hydrocarbons)	mg/kg	-	5	10	0%	5.0	5.0	-	5.0	5.0	5	30 (3); 40 (1); 70 (1)		5	0%	0	16	19	8.7	13	34	103	116	0.007	d,e
	F3 (C16-C34 Hydrocarbons)	mg/kg	-	5	10	100%	17	20	4.8	16	25	5	150 (3); 200 (1); 350 (1)		4	20%	0	147	189	127	87	410	159	162	0.012	
	F4 (C34-C50 Hydrocarbons)	mg/kg	-	5	10	0%	5.0	5.0	-	5.0	5.0	5	150 (3); 200 (1); 350 (1)		5	0%	0	61	69	53	0.00	148	170	173	0.119	d,e
PCBs	PCBs (total)	mg/kg	0.0341	5	0.05	0%	0.03	0.03	-	0.03	0.03	Not measured in 2019													-	d,e
PAHs	Anthracene	mg/kg	0.0469	Not measured in 2008								5	0.015 (2); 0.02 (2); 0.03 (1)		5	0%	0	0.00	0.00	0.00	0.00	0.00			-	d,e
	Benzo(a)anthracene	mg/kg	0.317									5	0.015 (2); 0.02 (2); 0.03 (1)		5	0%	0	0.00	0.01	0.01	0.00	0.02			-	d,e
	Benzo(a)pyrene	mg/kg	0.0319									5	0.015 (2); 0.02 (2); 0.03 (1)		4	20%	0	0.01	0.01	0.01	0.00	0.03			-	d
	Benzo(g,h,i)perylene	mg/kg	0.17									5	0.015 (2); 0.02 (2); 0.03 (1)		2	60%	0	0.02	0.02	0.01	0.01	0.04			-	d
	Benzo(k)fluoranthene	mg/kg	0.24									5	0.015 (2); 0.02 (2); 0.03 (1)		5	0%	0	0.00	0.00	0.00	0.00	0.01			-	d,e
	Chrysene	mg/kg	0.0571									5	0.015 (2); 0.02 (2); 0.03 (1)		4	20%	0	0.01	0.01	0.01	0.00	0.02			-	d
	Dibenz(a,h)anthracene	mg/kg	0.00622									5	0.015 (2); 0.02 (2); 0.03 (1)		5	0%	0	0.00	0.00	0.00	0.00	0.00			-	d,e
	Fluoranthene	mg/kg	0.111									5	0.015 (2); 0.02 (2); 0.03 (1)		1	80%	0	0.02	0.03	0.01	0.01	0.04			-	d
	Fluorene	mg/kg	0.0212									5	0.015 (2); 0.02 (2); 0.03 (1)		5	0%	0	0.00	0.00	0.00	0.00	0.00			-	d,e
	Indeno(1,2,3-cd)pyrene	mg/kg	0.2									5	0.015 (2); 0.02 (2); 0.03 (1)		5	0%	0	0.01	0.01	0.01	0.00	0.03			-	d,e
	Phenanthrene	mg/kg	0.0419									5	0.015 (2); 0.02 (2); 0.03 (1)		4	20%	0	0.01	0.01	0.01	0.00	0.02			-	d
	Pyrene	mg/kg	0.053									5	0.015 (2); 0.02 (2); 0.03 (1)		1	80%	0	0.02	0.02	0.01	0.01	0.03			-	d
Nutrients	Calculated Total Kjeldahl Nitrogen	mg/kg	550	Not measured in 2008								5	100		0	100%	0	9460	12476	5636	7470	21200			-	d
	Nitrate (N)	mg/kg	-									5	2		4	20%	0	0.00	0.80	1.8	0.00	4.0			-	d
	Nitrate + Nitrite (N)	mg/kg	-									5	3		4	20%	0	1.5	2.1	1.3	0.75	4.0			-	d
	Nitrite (N)	mg/kg	-									5	0.5		4	20%	0	0.44	0.42	0.18	0.23	0.70			-	d
	Total Organic Carbon	mg/kg	10000									5	500		0	100%	0	100000	144000	75063	87000	260000			-	d
Radionuclides	Ag-110m	Bq/kg	-	5	2	0%	1.0	1.0	-	1.0	1.0	5	0.45-0.95		5	0%	0	0.14	0.02	0.27	-0.44	0.23	-151	-191	0.007	d,e
	Am-241	Bq/kg	-	Not measured in 2008								5	6.4-18		5	0%	0	1.6	3.9	4.2	1.1	11			-	d,e
	Ba-140	Bq/kg	-	5	5(4); 6(1)	0%	2.5	3.0	-	3.0	3.0	Not measured in 2019													-	d,e
	Be-7	Bq/kg	-	5	10	0%	5.0	5.0	-	5.0	5.0	Not measured in 2019													-	d,e
	C-14	Bq/g-C	-	5	100	100%	196	194	34	145	230	5	0.05-0.06		0	100%	0	0.36	0.36	0.11	0.21	0.47	-199	-199	0.012	
	Ce-141	Bq/kg	-	5	1	0%	0.50	0.50	-	0.50	0.50	Not measured in 2019													-	d,e
	Ce-144	Bq/kg	-	5	5	0%	2.5	2.5	-	2.5	2.5	Not measured in 2019													-	d,e
	Co-57	Bq/kg	-	5	1	0%	0.50	0.50	-	0.50	0.50	Not measured in 2019													-	d,e
	Co-58	Bq/kg	-	5	1	0%	0.50	0.50	-	0.50	0.50	Not measured in 2019													-	d,e
	Co-60	Bq/kg	-	5	1	0%	0.50	0.50	-	0.50	0.50	5	0.4-0.68		5	0%	0	-0.19	-0.21	0.12	-0.35	-0.04	-454	-491	0.007	d,e
	Cr-51	Bq/kg	-	5	10	0%	5.0	5.0	-	5.0	5.0	Not measured in 2019													-	d,e
	Cs-134	Bq/kg	-	5	1	0%	0.50	0.05	-	0.50	0.50	5	0.52-0.78		5	0%	0	0.11	0.14	0.20	-0.16	0.34	-126	96	0.007	d,e
	Cs-137	Bq/kg	-	5	1	20%	0.50	0.60	0.20	0.50	1.00	5	0.47-1		0	100%	0	4.8	4.9	1.4	3.6	7.0	162	156	0.010	
	Eu-154	Bq/kg	-	5	3	0%	1.5	1.5	-	1.5	1.5	Not measured in 2019													-	d,e
	Eu-155	Bq/kg	-	5	2	0%	1.0	1.0	-	1.0	1.0	Not measured in 2019													-	d,e
	Fe-59	Bq/kg	-	5	2	0%	1.0	1.0	-	1.0	1.0	Not measured in 2019													-	d,e
	Gross Beta	Bq/kg	-	5	0.1	100%	840	866	114	760	1050	Not measured in 2019													-	e
	I-131	Bq/kg	-	5	2	0%	1.0	1.0	-	1.0	1.0	5	1.2-1.8		5	0%	0	0.45	0.43	0.07	0.34	0.53	-75	-79	0.007	d,e
	K-40	Bq/kg	-	5	10	100%	258	259	22	237	291	5	3.6-6.6		0	100%	0	189	162	74	47	228	-31	-46	0.012	
	La-140	Bq/kg	-	5	2	0%	1.0	1.0	-	1.0	1.0	Not measured in 2019													-	d,e
	Mn-54	Bq/kg	-	5	1	0%	0.50	0.05	-	0.50	0.50	5	0.46-0.65		5	0%	0	0.01	0.04	0.18	-0.16	0.27	-191	-31	0.007	d,e
	Nb-94	Bq/kg	-	Not measured in 2008								5	0.2-0.73		5	0%	0	0.05	0.04	0.08	-0.06	0.13			-	d,e
	Nb-95	Bq/kg	-	5	1	0%	0.50	0.50	-	0.50	0.50	5	0.34-0.79		4	20%	0	0.27	0.38	0.29	0.07	0.72	-61	-27	0.656	d
	Ru-103	Bq/kg	-	5	1	0%	0.50	0.50	-	0.50	0.50	Not measured in 2019													-	d,e
	Ru-106	Bq/kg	-	5	10	0%	5.0	5.0	-	5.0	5.0	Not measured in 2019													-	d,e
	Sb-124	Bq/kg	-	5	2	0%	1.0	1.0	-	1.0	1.0	Not measured in 2019													-	d,e
	Sb-125	Bq/kg	-	5	2	0%	1.0	1.0	-	1.0	1.0	5	1.3-2.5		5	0%	0	0.49	0.34	0.27	-0.10	0.53	-69	-97	0.007	d,e
	Se-75	Bq/kg	-	5	1	0%	0.50	0.50	-	0.50	0.50	Not measured in 2019													-	d,e
	Strontium-90	Bq/kg	-	5	20	0%	10.0	10.0	-	10.0	10.0	Not measured in 2019													-	d,e
	H-3	Bq/kg	-	5	7	100%	187	194	35	145	242	5	10.2-11.8		0	100%	0	40	42	4.7	38	50	-129	-129	0.012	
	Zn-65	Bq/kg	-	5	3	0%	1.5	1.5	-	1.5	1.5	Not measured in 2019													-	d,e
	Zr-95	Bq/kg	-	5	2	0%	1.0	1.0	-	1.0	1.0	5	0.59-1.3		5	0%	0	0.17	0.18	0.15	-0.02	0.39	-142	-140	0.007	d,e
	U-Series	Bq/kg	-	Not measured in 2008								5	1.7-3.1		0	100%	0	8.6	7.6	2.6	3.7	10			-	d
	Th-Series	Bq/kg	-	Not measured in 2008								5	1.8-2.7		0	100%	0	9.3	7.6	3.3	3.2	11			-	d

123	Maximum value exceeds criteria.
123	RPD less than -20 (decrease). P-value for decrease statistically significant.
123	RPD greater than 20 (increase). P-value for increase statistically significant.

Notes:
a - 2019 data is uncensored. Therefore some parameters may have values below the MDL.
b - MDLs for radionuclides are shown as a range.
c - Parameters with both 'd' and 'e' notes indicate that 100% of samples in both 2008 and 2019 were below detection. Therefore assessment of change is not possible.
d - The 2009 ERA TSD set all samples to 1/2 MDL if all measurements were <MDL. Therefore, RPD and p-value calculations are based on all 2008 measurements being 1/2MDL if all measurements were <MDL.
e - All 2019 samples were below the MDL. Results are based on un-detected uncensored data.

Guideline exceedances occurred in both years for copper, phosphorous, and vanadium, of which phosphorus demonstrated a statistically meaningful increase from 2007/2008 to 2019 as indicated above. Copper did not show a statistically meaningful change, and vanadium demonstrated a statistically meaningful decrease; therefore, copper and vanadium although exceeding in both years, do not change the conclusions of the 2009 application supporting documents. Phosphorus exceeded in both years, but the exceedances in 2019 are now more than twice the guideline value. Overall, it is evident that the ponds are nutrient enriched, potentially due to agricultural runoff. The statistical increase in phosphorus exceedances is unlikely to be attributed to DNGS operations, and the conclusions of the 2009 application supporting documents do not change.

Cadmium and selenium were below guidelines in 2007/2008, but exceeded in 2019, and as indicated previously, they showed statistical increases from 2007/2008 to 2019. Toxicity benchmarks for cadmium and selenium were not available from the 2016 DN ERA and are discussed further in Section 6.5.1.2.

Similar to SW12 (Coot's Pond), the only other exceedances at SW13 were for TKN (maximum 21,200 mg/kg > guideline 550 mg/kg) and TOC (maximum 260,000 mg/kg > guideline 10,000 mg/kg) in 2019, which were not measured in 2007/2008. However, it is expected that TOC in pond locations will frequently exceed the MECP PSQG guideline, since the guideline for TOC is based on a Great Lakes data set, and no pond guidelines are available. The SLC method used by the MECP is constrained by the range of values in the data set; it cannot yield a higher guideline. Therefore, the TOC guideline is not suitable for ponds. As mentioned above in regard to phosphorus, it is evident that the ponds are nutrient enriched, potentially due to agricultural runoff. Elevated TKN and TOC are unlikely to be attributed to DNGS operations, and do not change the conclusions of the 2009 application supporting documents.

6.4.3.2 Changes to Standards

Sediment quality guidelines used in the Ecological Risk Assessment and Assessment of Effects on Non-Human Biota TSD were based on the 1993 MECP PSQGs, 2002 CCME CSQGs (Aquatic Life), and Thompson *et al.* (2005) LELs. All of these guidelines have remained the same. As such, there are no guideline changes that would alter the conclusions of the 2009 application supporting documents.

Table 6-28 provides a summary of the MECP PSQGs, CCME CSQGs (Aquatic Life), and Thompson *et al.* (2005) LEL guidelines used in the 2009 assessment, and the same guidelines used recently.

Table 6-28: Comparison of sediment quality guidelines used in the 2009 application supporting documents to recent guidelines

Parameters		Unit	PSQG (LEL)[1] 2009	PSQG (LEL)[1] 2019	CSQG[2] 2009	CSQG[2] 2019	Thompson et al., 2005 (LEL)	Comments
Metals	Aluminum	µg/g		-		-	-	
	Antimony	µg/g		-		-	-	
	Arsenic	µg/g	6	6	5.9	5.9	-	
	Barium	µg/g		-		-	-	
	Beryllium	µg/g		-		-	-	
	Bismuth	µg/g		-		-	-	
	Boron	µg/g		-		-	-	
	Boron (hot water)	µg/g		-		-	-	
	Cadmium	µg/g	0.6	0.6	0.6	0.6	-	
	Calcium	µg/g		-		-	-	
	Cesium	µg/g		-		-	-	
	Chromium	µg/g	26	26	37.3	37.3	-	
	Cobalt	µg/g	50	-		-	-	2009 value is from Open Water Disposal Guidelines (1992).
	Copper	µg/g	16	16	35.7	35.7	-	
	Iron	µg/g	20000	20000		-	-	
	Lead	µg/g	31	31	35	35.0	-	
	Lithium	µg/g		-		-	-	
	Magnesium	µg/g		-		-	-	
	Manganese	µg/g	460	460		-	-	
	Mercury	µg/g	0.2	0.2	0.17	0.17	-	
	Molybdenum	µg/g		-		-	13.8	2009 Criteria based on Thompson et al. 2005 (LEL).
	Nickel	µg/g	16	16		-	-	
	Phosphorous	µg/g	600	600		-	-	
	Potassium	µg/g		-		-	-	
	Selenium	µg/g		-		-	1.9	2009 Criteria based on Thompson et al. 2005 (LEL).

Parameters		Unit	PSQG (LEL)[1]		CSQG[2]		Thompson et al., 2005 (LEL)	Comments
			2009	2019	2009	2019		
	Silver	µg/g	0.5	-		-	-	2009 value is from Open Water Disposal Guidelines (1992).
	Sodium	µg/g		-		-	-	
	Strontium	µg/g		-		-	-	
	Thallium	µg/g		-		-	-	
	Thorium	µg/g		-		-	-	
	Tin	µg/g		-		-	-	
	Titanium	µg/g		-		-	-	
	Tungsten	µg/g		-		-	-	
	Uranium	µg/g		-		-	104.4	2009 Criteria based on Thompson et al. 2005 (LEL).
	Vanadium	µg/g		-		-	35.2	2009 Criteria based on Thompson et al. 2005 (LEL).
	Zinc	µg/g	120	120		123	-	
	Zirconium	µg/g		-		-	-	
Hydrocarbons	PHC F1	µg/g		-		-	-	
Hydrocarbons	PHC F2	µg/g		-		-	-	
Hydrocarbons	PHC F3	µg/g		-		-	-	
Hydrocarbons	PHC F4	µg/g		-		-	-	
PCBs	PCBs (Total)	µg/g	0.07	0.07	0.0341	0.0341		

Criteria value decreased

Criteria value increased

Notes:

[1] Ministry of the Environment (MOE). 1993. Guidelines for the protection of aquatic sediment quality in Ontario. ISBN 0-7729-9248-7

[2] Canadian Council of Ministers of the Environment (CCME). Canadian Sediment Quality Guidelines for the Protection of Aquatic Life

6.5 Assessment of Changes

This section provides an assessment of the changes that were described in Section 6.4, and their potential to alter the conclusions described in the EcoRA (SENES 2009c) prepared in support of the 2009 application.

6.5.1 Potential for Change in Conclusions of Site Evaluation

6.5.1.1 Surface Water

6.5.1.1.1 Surface Water Parameters: More Stringent Guidelines

Surface water quality guidelines used in the 2009 assessments were reviewed to determine if surface water concentrations for parameters which now have more stringent guidelines (i.e., guideline decreased or new guideline implemented) would now exceed the updated guideline.

Most guidelines that became more stringent were not the lowest selected guideline, and thus the guideline changes do not change the conclusions of the 2009 application supporting documents. Table 6-29 includes a list of those parameters from Table 6-24 where the guidelines have become more stringent, and the guidelines are compared to the respective maximum concentrations measured in 2007/2008. Any parameters which were not considered an exceedance in 2007/2008, but now exceed a new guideline, are identified, and the implications for conclusions about residual adverse effects of the project are considered.

Strontium, zinc, nitrite and *E. coli* are the only parameters that have become more stringent and were the lowest selected guideline. Guideline decreases for zinc and nitrite are due to selection of the filtered guideline for zinc and the nitrogen-based guideline for nitrite. The updated CCME CWQG for zinc of 7 µg/L represents the dissolved form while the guideline of 30 µg/L applied in the 2009 application supporting documents was for total zinc. The maximum measured total zinc of 9.4 µg/L in 2007/2008 occurred at Treefrog Pond and exceeded the new dissolved zinc guideline (7 µg/L). This dissolved zinc guideline is over-conservative for total zinc. For nitrite, the CCME CWQG applied in the 2009 application supporting documents was expressed as NO_2 (whole molecule). The current CWQG is expressed as nitrite-N. The maximum nitrite measurement in 2007/2008 of 0.07 mg/L as NO_2 at Coot's Pond numerically exceeds the current 0.06 mg/L nitrite-N guideline, but does not exceed when expressed in comparable units (i.e., 0.07 mg/L of NO_2 = 0.02 mg/L of NO_2-N).,. Strontium did not exceed the new guideline. Health Canada drinking water guidelines for *E. coli* are 'non-detectable' levels. However, considering these are drinking water quality guidelines, they are overly-conservative and not applicable to surface water.

Therefore, the changes to strontium, zinc, nitrite and *E. coli* guidelines do not impact the conclusions of the 2009 application supporting documents.

Table 6-29: Screening of 2009 maximum surface water values for parameters with more stringent guidelines

	Parameters	Unit	CCME CWQG[1]		CCME Updated Time	PWQO[2]		iPWQO[2]		Health Canada[3]		Comments	2007/2008 Maximum Concentration	Description of Exceedance	Impact to 2009 Conclusions?
			2009	2019		2009	2019	2009	2019	2009[4]	2019				
Metals	Boron	µg/L	-	1500	2009	-	-	200	200	5000	5000	CCME CWQG updated in 2009.	Was not lowest selected guideline (iPWQO was most stringent)		
Metals	Lead	µg/L	1 if water hardness < 60 mg/L. $e^{\{1.273(\ln[hardness]) - 4.705\}}$ if water hardness is between 60 and 180 mg/L. 7 if water hardness >180 mg/L.		1987	25	25	1	5	10	5	The original application used 1 µg/L for iPWQO. For PWQO/iPWQO in 2019, assume hardness is greater than 80 mg/L.	Was not lowest selected guideline (based on a hardness of 110mg/L(lowest from the collected samples), CWQG is 3.59 which is most stringent. Also previous iPWQO of 1 µg/L was more stringent.)		
Metals	Silver	µg/L	-	0.25	2015	0.1	0.1	-	-	-	-	-	Was not lowest selected guideline (PWQO was most stringent)		
Metals	Strontium	µg/L	-	-	-	-	-	-	-	-	7000	-	714 (Coots Pond)	-	-
Metals	Zinc	µg/L	30	7	2018	30	30	20	20	5000	-	CCME CWQG was updated in 2018 for dissolved zinc. The conversion factor between dissolved and total zinc is 0.978, hence it is appropriate to screen total zinc concentration against dissolved zinc criteria.	9.4 (Tree Frog Pond)	The maximum value at Tree Frog Pond exceeded. The 2019 guideline is for dissolved zinc.	This guideline is for dissolved zinc and thus is likely over-conservative. Thus, this minor exceedance unlikely to impact the conclusions of the Site Evaluation.
VOCs	Ethylbenzene	µg/L	90	90	1996	-	-	8	8	-	140	-	Was not lowest selected guideline (iPWQO was most stringent)		
Other	Nitrate	mg/L	13	13	-	-	-	-	-	-	45	Interim guideline.	Was not lowest selected guideline (CWQG was most stringent)		
Other	Nitrite - N	mg/L	0.197	0.06	-	-	-	-	-	-	3	-	0.07 (Coots Pond)	In the 2009 TSDs the guideline was based on NO_2 (whole molecule). The current nitrite-N guideline is numerically lower, but equivalent.	Apparent exceedance has no impact on the conclusions of the Site Evaluation.
Other	E. coli 5 sample geo-mean	E.coli/100 ml	-	-	-	100	100	-	-	-	Non detectable	-	908 (SW9 bottom) *was also above detection at every location	Measured above detection, however the non-detectable Health Canada guideline is for the protection of human health drinking water.	The human health drinking water guideline is conservative considering direct consumption as a drinking water source is unlikely. The exceedance of the non-detectable drinking water guideline is unlikely to impact the conclusions of the Site Evaluation.
Other	Total coliforms	E.coli/100 ml	-	-	-	-	-	-	-	-	Non detectable	-	12210 (Tree Frog Pond) *was also above detection at every location		

- Criteria value decreased.
- Criteria value increased.
- Criteria added after 2009.

Notes:

1 Canadian Council of Ministers of the Environment (CCME). Canadian Water Quality Guidelines for the Protection of Aquatic Life

2 Ministry of the Environment (MOE). Water Management: Policies, Guidelines, Provincial Water Quality Objectives. ISBN 0-7778-8473-9 rev.

3 Guideline for Canadian Drinking Water Quality. Accessed December 2019.

4 2009 Health Canada guideline is presented in the ERA TSD in the form of "CCME Health Based Guideline", which is a combination of IMAC and AO.

Supporting documents:

NK054-REP-07730-00003 Aquatic Environment Exisiting Environmental Conditions Technical Support Document New Nuclear - Darlington Environmental Assessment

NK054-REP-07730-00022-R000 Ecological Risk Assessment and Assessment of Effects on Non-Human Biota Technical Support Document New Nuclear - Darlington Environmental Assessment

NK054-REP-07730-00002 Surface Water Environment Existing Environmental Conditions Technical Supporting Document, Table 2.2-5.

6.5.1.2 Sediment

The main changes in the sediment baseline between 2007/08 and the current site condition are evaluated in the following sub-sections to assess whether those changes are likely to alter the conclusions of the 2009 application supporting documents.

6.5.1.2.1 Cadmium, Nickel, and Zinc Exceedances at Coot's Pond in 2019

Cadmium, nickel, and zinc did not show any statistically meaningful change from 2007/2008 to 2019 and the mean pond values meet 2019 guidelines. However, maximum values did exceed their respective guidelines in 2019. All three parameters have increased variability as indicated by standard deviations (Table 6-30). Toxicity benchmarks were not available for these parameters from the 2016 DN ERA. Recent exceedances of cadmium, nickel and zinc in Coot's Pond will be taken into consideration as part of the next ERA. However, elevated concentrations of cadmium, nickel and zinc in Coot's Pond sediment are not a result of existing emissions from DNGS. Coot's Pond receives runoff from the DN landfill and any future construction and operation of DNNP would not result in additional releases to Coot's Pond. Therefore, it was concluded that the updated Coot's Pond sediment quality data do not alter the original conclusions regarding residual adverse effects of the project and no further actions are necessary.

Table 6-30: Cadmium, Nickel, and Zinc Exceedances at Coot's Pond in 2019

Parameter	Units	Criteria	2008 Sampling Program Coots Pond (SW12)								2019 Sampling Program Coots Pond (SW12)							
			N	MDL	% above MDL	Median	Mean	Std Dev	Min	Max	N	MDL	% above MDL	Median	Mean	Std Dev	Min	Max
Total Cadmium (Cd)	mg/kg	0.6	5	0.05	100%	0.24	0.23	0.05	0.14	0.25	5	0.05	100%	0.23	0.49	0.62	0.15	1.6
Total Nickel (Ni)	mg/kg	16	5	1	100%	12	11	1.7	8.5	13	5	0.8	100%	17	14	5.1	7.3	20
Total Zinc (Zn)	mg/kg	120	5	2	100%	73	71	16	44	83	5	1	100%	88	95	49	33	170

6.5.1.2.2 Baseline Increase at Treefrog Pond: Antimony, PHC F3, and Cs-137

Antimony, PHC F3, and Cs-137 increased from 2007/2008 to 2019 within Treefrog Pond (Table 6-31). Antimony and PHC F3 do not have sediment guidelines and toxicity benchmarks were not available from the 2016 DN ERA; Cs-137 was assessed in the 2016 DN ERA as part of the assessment of radiological dose. These parameters will be taken into consideration as part of the next ERA. Regardless there is no impact to the DNNP as Treefrog Pond will be removed as part of the construction of DNNP. Therefore, it was concluded that the updated Treefrog Pond sediment quality data do not alter the original conclusions regarding residual adverse effects of the project and no further actions are necessary.

Table 6-31: Baseline Increase at Treefrog Pond: Antimony, PHC F3, and Cs-137

Parameter	Units	2008 Sampling Program Treefrog Pond (SW13)								2019 Sampling Program Treefrog Pond (SW13)							
		N	MDL	% above MDL	Median	Mean	Std Dev	Min	Max	N	MDL	% above MDL	Median	Mean	Std Dev	Min	Max
Total Antimony (Sb)	mg/kg	5	0.05	100%	0.14	0.16	0.04	0.12	0.21	5	0.1	100%	0.25	0.27	0.09	0.18	0.40
F3 (C16-C34 Hydrocarbons)	mg/kg	5	10	100%	17	20	4.8	16	25	5	150 (3); 200 (1); 350 (1)	20%	147	189	127	87	410
Cs-137	Bq/kg	5	1	20%	0.50	0.60	0.20	0.50	1.00	5	0.47-1	100%	4.8	4.9	1.4	3.6	7.0

6.5.1.2.3 Baseline Increase with Exceedances at Treefrog Pond: Cadmium and Selenium

Cadmium and selenium increased from 2007/2008 to 2019 within Treefrog Pond (Table 6-32). Further, cadmium and selenium did not previously exceed criteria in 2007/2008 but did in 2019. Toxicity benchmarks were not available for these parameters from the 2016 DN ERA. As such, they will be taken into consideration as part of the next ERA. However, Treefrog Pond will be removed as part of the construction of DNNP. The Ecological Risk Assessment and Assessment of Effects on Non-Human Biota TSD (SENES 2009c) states that soil constituents within the DNNP area to be excavated are below soil criteria for industrial sites (with the exception of beryllium which has concentrations representative of natural site conditions). It concludes that there are no project activities which will result in a release of conventional constituents that may affect soil or groundwater concentrations such that stormwater would be measurably affected. Mean cadmium and selenium values in Treefrog Pond sediment remain below industrial soil criteria. Therefore, it was concluded that the updated Treefrog Pond sediment quality data do not alter the original conclusions regarding residual adverse effects of the project and no further actions are necessary.

Table 6-32: Baseline Increase with Exceedances at Treefrog Pond: Cadmium, and Selenium

Parameter	Units	Criteria	2008 Sampling Program Treefrog Pond (SW13)								2019 Sampling Program Treefrog Pond (SW13)							
			N	MDL	% above MDL	Median	Mean	Std Dev	Min	Max	N	MDL	% above MDL	Median	Mean	Std Dev	Min	Max
Total Cadmium (Cd)	mg/kg	0.6	5	0.05	100%	0.31	0.30	0.08	0.21	0.38	5	0.05	100%	0.55	0.66	0.32	0.41	1.2
Total Selenium (Se)	mg/kg	1.9	5	0.05	100%	0.17	0.18	0.04	0.15	0.25	5	0.5	100%	1.3	1.5	0.95	0.56	3.1

6.5.2 Additional Commitments (if Required)

6.5.2.1 Mitigating Action

No mitigating actions pertaining to hydrology, surface water and sediment are suggested.

6.5.2.2 Follow-up Monitoring

No follow-up monitoring is required.

6.5.2.3 Conclusion

The current baseline data and regulatory guidelines do not alter the conclusions of the 2009 application supporting documents regarding residual adverse effects of the project and no further actions are necessary to address the DNNP.

7.0 BASELINE AQUATIC COMMUNITIES

7.1 Compliance with REGDOC 1.1.1

The Compliance Assessment (Kinectrics 2019) identified three sections within REGDOC 1.1.1 containing potential gaps relevant to aquatic communities. Ten gaps apply to REGDOC 1.1.1 Section C.7.1 - Baseline Aquatic Biota and Habitat (Table 7-1). One gap pertains to Section C.7.2 – Baseline Food Chain Data, which states that *characterization information shall include reference locations that would not be exposed to project effects made over multiple years to understand natural year-to-year variability*. The final gap pertains to Section G.5.4 – Effect of Thermal Plume on the Aquatic Environment, which states *descriptions of models (physical, mathematical, conceptual) used to predict temperature effects and thermal discharge jet effects, and to account for long-term effects of climate warming relative to incremental effects of the project; a listing of aquatic fish and shellfish species, aquatic plants, and invertebrates, identifying which life stages are susceptible to exposure to the interaction, and which subset of species are most sensitive; and the potential for gas-bubble disease*. These gaps are assessed in Section 7.5.1.

Table 7-1: Potential Gaps relevant to Aquatic Communities Identified in Compliance Assessment against Section C.7.1 of REGDOC 1.1.1

Subject of Potential Gap
Fish Habitat Map inclusive of: spawning, nursery, rearing, feeding, refuge/cover, movement corridors, existing thermal discharge, lake currents, contaminant pulses, storm water release points, groundwater plumes, shoreline plant communities.
Watershed Map delineating watershed boundaries and land use.
Review of past site clearing and shoreline development.
Potential effects of climate change on habitat suitability and how that may alter spatial distributions of biota.
Background ranges of habitat characteristics that may be affected by project.
Site background information and biological life history that affect population growth and the capacity to recover from adverse effects.
Cover and standing biomass of aquatic plants as a basis to predict and detect changes.
Adequate characterization of the VC structural attributes; including specific attribute that is focus of assessment as important to project. VC characterization of population, geographical distribution of species, and spawning requirements. Statement of confidence of characterization.
Information on stability of VCs and capacity to be resilient to project disturbance, baseline values and trends of VCs.
An aquatic species inventory list based on field studies for the site and local study area and available published information for the regional study area for fish, benthic invertebrates, major macrophyte species along with evidence that information is representative by identification of expected species compared to catalogued species found during field investigations.

7.2 Changes to Codes, Standards and Practices

Species listings under both the *Species at Risk Act* (SARA) and the *Endangered Species Act* (ESA) have been updated since the original DNNP PRSL was granted. These changes are discussed in Sections 7.4.12 and 7.5.1.1.

7.3 Baseline Characterization

This section provides an overview of the current baseline for the aquatic community as required by REGDOC 1.1.1. Baseline data collected in support of the 2009 application for the DNNP PRSL is described in the *Aquatic Environment Existing Environmental Conditions Technical Support Document, New Nuclear - Darlington Environmental Assessment* (Aquatic Environment Existing Environmental Conditions TSD) (Golder and SENES 2009).

7.3.1 Study Areas

The Regional, Local, and Site (Figure 7-1) Study Area boundaries are consistent with those described in the Aquatic Environment Existing Environmental Conditions TSD (Golder and SENES 2009).

Figure 7-1: DNNP Site Study Area for Aquatic Communities

7.3.2 Summary of Baseline Data

7.3.2.1 Periphyton, Phytoplankton and Zooplankton Communities

Description from the Aquatic Environment Existing Environmental Conditions TSD

Baseline conditions of the DNNP Site Study Area were described for the aquatic biota of Lake Ontario nearshore habitats (Golder and SENES 2009). Plankton (phyto- and zoo-) occupy the water column and are distributed by ambient current conditions. Plankton species composition and relative abundances vary seasonally near the DNNP Site Study Area.

DNNP Deep Water Aquatic Habitat Characterization – 2012-13

Sampling of macrozooplankton within the DNNP Site Study Area on Lake Ontario (10-30 m depths), occurred between August 2012 and May 2013 (HSL 2013a). Sampling included the summer, fall, and spring periods. Plankton nets (1000 µm mesh) were towed vertically through the water column (all seasons) and horizontally just above the lake bottom (spring). Native opossum shrimp (*Mysis diluviana*) was captured in the summer, fall and spring at all depths (12, 20 and 28 m), but in relatively low numbers especially at the 12 m depth. Invasive bloody red shrimp (*Hemimysis anomala*) was captured at the 12 m depth zone in August 2012, but was not collected during any of the other vertical sampling events. Bloody red shrimp was also collected during benthic tow sampling in the spring of 2013. A number of other macrozooplankton species were found, with different species being numerically dominant during different seasons, indicating fluctuation in communities throughout the year, potentially due to seasonal variability in the timing of various zooplankton species peaks as well as the influence of lake currents, which are known to affect macrozooplankton distribution.

DNNP Deep Water Aquatic Community Characterization – 2018

In 2018, studies were undertaken within the DNNP Site Study Area in the Lake Ontario nearshore (5 to 15 m) and offshore (>15 to 30 m) to collect additional baseline information to characterize the aquatic community, as well as inform OPG-decision making on the optimum location of the DNNP intake and diffuser structures to minimize residual impacts to fish habitat and fisheries productivity (EcoMetrix 2019b). Macrozooplankton samples were collected from the entire water column (66 samples), as well as the bottom 10 m (66 samples), during spring, summer and fall. Plankton nets used were 363 µm mesh. A summary of macrozooplankton results is presented Table 7-2.

Table 7-2: Summary of 2018 Macrozooplankton Results (Full Water Column)

Summary	Spring (April 5-20, 2018)	Summer (July 3-25, 2018)	Fall (Sept. 4-17, 2018)
Species Composition and Major Taxonomic Groups	2391 individuals from 7 unique taxa representing 5 major taxonomic groups (Order or higher). Calanoida: 94.9-100% at each location Others: Cladocera, Cyclopoida, Mysidacea, and Amphipoda.	29,139 individuals from 15 unique taxa representing 6 major taxonomic groups (Order or higher). Cladocera: 70.1-95.4% at each location. Others: Calanoida, Cyclopoida, Amphipoda, Ostracoda, Mysidacea.	162,886 individuals from 16 unique taxa representing 5 major taxonomic groups (Order or higher). Cladocera: 63.9-93.1% at each location; Others: Calanoida, Mysidacea, Cyclopoida, Amphipoda
CPUE (Density- no. per L)	*Gravel/cobble substrate:* Range: 0.0068 (25m) to 0.0216 (15m). *Sand substrate:* Range: 0.0120 (15m) to 0.0169 (25m).	*Gravel/cobble substrate:* Range: 0.1050 (10m) to 0.1907 (15m). *Sand substrate:* Range: 0.1793 (25m) to 0.2205 (20m).	*Gravel/cobble substrate:* Range: 0.2907 (5m) to 1.6460 (30m). *Sand substrate:* Range: 0.4270 (25m) to 0.5853 (15m).
BPUE (µg/L)	*Gravel/cobble substrate:* Range: 0.235 (25m) to 0.984 (15m). *Sand substrate:* Range: 0.364 (15m) to 0.438 (20m).	*Gravel/cobble substrate:* Range: 1.348 (10m) to 4.235 (30m). *Sand substrate:* Range: 2.875 (15m) to 7.239 (20m).	*Gravel/cobble substrate:* Range: 2.336 (5m) to 16.141 (30m). *Sand substrate:* Range: 4.898 (25m) to 8.685 (15m).
Overall Taxa Richness per location	*Gravel/cobble substrate:* Range: 3 (5m) to 5 (10, 25 and 30m) *Sand substrate:* Range: 2 (15m) to 5 (25m)	*Gravel/cobble substrate:* Range: 10 (10m) to 13 (20 and 30m) *Sand substrate:* Range: 10 (20 and 25m) to 12 (15m)	*Gravel/cobble substrate:* Range: 8 (25m) to 14 (5m) *Sand substrate:* Range: 8 (25m) to 13 (20m)
Mysids	*Hemimysis anomala* not collected. *Gravel/cobble substrate:* *M. diluviana* collected at 5, 15, 20, 25 and 30 m. Max CPUE: 0.0005; Max BPUE: 0.1883 (20m) *Sand substrate:* *M. diluviana* collected at 25m; CPUE: 0.0001, BPUE: 0.0208	*M. diluviana* not collected. *Gravel/cobble substrate:* *H. anomala* collected at 30 m. CPUE: 0.00004; BPUE: 0.0001 *Sand substrate:* *H. anomala* collected at 15m; CPUE: 7×10^{-6}, BPUE: 1.4×10^{-5}	*M. diluviana* not collected. *Gravel/cobble substrate:* *H. anomala* collected at 5m. CPUE: 0.0119; BPUE: 0.0300 *Sand substrate:* *H. anomala* collected at 20m; CPUE: 0.0001, BPUE: 0.0001
Diversity (Shannon-Wiener Index)	*Gravel/cobble substrate:* Range: 0.47 (15m) to 0.82 (10m). *Sand substrate:* Range: 0.60 (15m) to 0.76 (25m).	*Gravel/cobble substrate:* Range: 1.15 (20m) to 1.38 (5m). *Sand substrate:* Range: 0.84 (15m) to 0.94 (25m).	*Gravel/cobble substrate:* Range: 0.99 (30m) to 1.48 (5m). *Sand substrate:* Range: 1.34 (25m) to 1.42 (15m).

Source (EcoMetrix 2019b).

Macrozooplankton catch per unit effort (CPUE) densities increased from spring to fall, but within each season, varied with depth and substrate. CPUE ranged from 0.0068 – 0.0216 individuals/L (ind./L) in the spring, to 0.1050 – 0.2205 ind./L in the summer, and 0.2907 –

1.6460 ind./L in the fall. Biomass per unit effort (BPUE) similarly increased from spring to fall but varied with depth and substrate, ranging from 0.235 – 0.984 µg/L in the spring, to 1.348 – 7.239 µg/L in the summer, to 2.236 – 16.141 µg/L in the fall. The total number of unique taxa also increased from spring (7) to summer (15) to fall (16); though at each location and in each season, the number of taxa were lower and variable. In the spring, Calanoid copepods were the most dominant and ubiquitous taxonomic group, while Cladocera were the most dominant and ubiquitous in the summer and fall. A primary focus of the macrozooplankton program was to characterize the density and biomass of the native opossum shrimp and invasive bloody red shrimp in the DNNP Site Study Area. The well-documented diel vertical migrations and varied diets with age (shift from phytoplankton to zooplankton as a food source) make opossum shrimp an important forage species in the Great Lakes. Low numbers of opossum shrimp were present over gravel/cobble and sand substrates in the spring at six sampling locations (5-30 m); in general, they accounted for a small percentage of overall catch (<1%) densities and less than 11% of biomass densities. Opossum shrimp were absent from summer and fall catches; however, in these seasons, water temperatures in the entire water column were higher than their preferred temperature range. Bloody red shrimp were present in the summer and fall over both gravel/cobble and sand substrates and at only two locations for each season; and accounted for minimal catch densities (<0.01% and 0.3% in summer and fall, respectively) and biomass (<0.01% and 0.07% in summer and fall, respectively). Macrozooplankton CPUE and BPUE increased with increasing depth in the fall; however, the number of species decreased with increasing depth.

A summary of benthic macrozooplankton results collected from the bottom at 10-m is presented in Table 7-3. Benthic macrozooplankton CPUE (as densities) increased from spring to fall, and for each season, varied with depth and substrate, ranging from 0.0119 – 0.0393 ind./L in the spring, to 0.0517 – 0.1229 ind./L in the summer, and 0.1183 – 0.4482 ind./L in the fall. BPUE similarly increased from spring to fall and varied with depth and substrate, ranging from 0.364 – 1.193 µg/L in the spring, to 1.015 – 2.489 µg/L in the summer, to 1.266 – 4.290 µg/L in the fall. Similar taxa were present from the macrozooplankton and benthic macrozooplankton collections. The total number of unique taxa also increased from spring to summer to fall, going from 11 to 16 to 17; however, at each location for each season, the number of taxa were lower and variable. In the spring, calanoids were the most dominant and ubiquitous taxonomic group while in the summer and fall, Cladocera were the most dominant and ubiquitous. Similar to macrozooplankton, benthic macrozooplankton richness decreased with increasing depths in summer and fall; however, there were no significant differences in abundance at the different depths.

Table 7-3: Summary of 2018 Benthic Macrozooplankton Results (Bottom 10 Meters of Water Column)

Summary	Spring (April 5-20, 2018)	Summer (July 3-25, 2018)	Fall (Sept. 4-17, 2018)
Species Composition and Major Taxonomic Groups	1864 individuals from 11 unique taxa representing 6 major taxonomic groups (Order or higher). Calanoida: 91.2-99.5% at each location Others: Cladocera, Cyclopoida, Mysidacea, Amphipoda, Ostracoda.	8,398 individuals from 16 unique taxa representing 6 major taxonomic groups (Order or higher). Cladocera: 70.1-94.1% at each location. Others: Calanoida, Cyclopoida, Amphipoda, Ostracoda, Mysidacea.	12,299 individuals from 17 unique taxa representing 6 major taxonomic groups (Order or higher). Cladocera: 63.9-93.3% at each location; Others: Calanoida, Mysidacea, Cyclopoida, Amphipoda, Ostracoda
CPUE (Density- no. per L)	*Gravel/cobble substrate:* Range: 0.0155 (30m) to 0.0393 (15m). *Sand substrate:* Range: 0.0119 (25m) to 0.0295 (15m).	*Gravel/cobble substrate:* Range: 0.0659 (25m) to 0.1084 (5m). *Sand substrate:* Range: 0.0517 (25m) to 0.1229 (15m).	*Gravel/cobble substrate:* Range: 0.2104 (20m) to 0.3079 (10m). *Sand substrate:* Range: 0.1183 (25m) to 0.4482 (15m).
BPUE (µg/L)	*Gravel/cobble substrate:* Range: 0.476 (5m) to 1.193 (15m). *Sand substrate:* Range: 0.364 (25m) to 0.892 (15m).	*Gravel/cobble substrate:* Range: 1.217 (25m) to 2.489 (5m). *Sand substrate:* Range: 1.015 (25m) to 1.863 (15m).	*Gravel/cobble substrate:* Range: 2.263 (20m) to 4.290 (30m). *Sand substrate:* Range: 1.266 (25m) to 4.065 (15m).
Overall Taxa Richness per location	*Gravel/cobble substrate:* Range: 3 (5m) to 5 (10 and 15m) *Sand substrate:* Range: 3 (20 and 25m) to 5 (15m)	*Gravel/cobble substrate:* Range: 8 (5m) to 14 (30m) *Sand substrate:* Range: 10 (15 and 20m) to 11 (25m)	*Gravel/cobble substrate:* Range: 9 (10, 20 and 25m) to 14 (5 and 30m) *Sand substrate:* Range: 8 (25m) to 11 (20m)
Diversity (Shannon-Wiener Index)	*Gravel/cobble substrate:* Range: 0.67 (5m) to 0.82 (10m). *Sand substrate:* Range: 0.74 (15m) to 0.76 (25m).	*Gravel/cobble substrate:* Range: 0.84 (15m) to 1.38 (5m). *Sand substrate:* Range: 0.84 (15m) to 1.38 (15m).	*Gravel/cobble substrate:* Range: 1.01 (30m) to 1.38 (20m). *Sand substrate:* Range: 1.25 (25m) to 1.38 (20m).

Source (EcoMetrix 2019b).

7.3.2.2 Benthic Invertebrates

Lake Ontario Nearshore and Coot's Pond (Aquatic Environment Existing Environmental Conditions TSD)

Baseline conditions of the DNNP Site Study Area have been described for the aquatic biota of Coot's Pond and Lake Ontario nearshore habitats (Golder and SENES 2009). Coot's Pond is a stormwater runoff and settling pond. The pond was inhabited by emergent and submergent aquatic vegetation, and habitat quality was sufficient to support a wide array of aquatic invertebrates. Benthic invertebrates occupying the Lake Ontario lake bed substrates were limited to relatively few species. Non-native dreissenid mussels (*Dreissena* sp.) have colonized the area, influencing local benthic habitat and productivity.

DNNP Deep Water Aquatic Habitat Characterization – 2012-13

Sampling of Lake Ontario (10-30 m depths) within the DNNP Site Study Area was undertaken during summer 2012 and spring 2013, using a benthic sled (500 µm mesh plankton net attached to the sled) (HSL 2013a). Dreissenid mussels were found to be broadly distributed throughout the DNNP Site Study Area, but at higher concentrations in inshore waters (i.e., densities highest at 12 m depth).

DNGS Entrainment Study – 2015-16

An entrainment study was undertaken between December 2015 and November 2016 within the DNNP Site Study Area, specifically at DNGS (Arcadis 2017). DNGS has an offshore intake consisting of a porous veneer which is located on the bottom of Lake Ontario at a depth of approximately 10 m. Benthic invertebrates were entrained in all months from February to November 2016 with a total of approximately 22,301 individuals collected. Most invertebrates were collected in April 2016 (4,900 individuals or 22% of total), followed by May 2016 (3,965 individuals or 18% of total), September 2016 (2,900 individuals or 13% of total), March 2016 (2,837 individuals or 13% of total), November 2016 (2,309 individuals or 10% of total) and October 2016 (2,091 individuals or 9% of total). Less than 5% of the total number of benthic invertebrates were collected in each of the remaining months (February, June, July and August of 2016). A statistical difference related to diurnal effect was observed with greater entrainment occurring at night. On an annual basis, the estimated benthic invertebrate entrainment at DNGS for the period from February 1st, 2016 to November 30th, 2016 was 1,548,288,043, with 59% entrained at night and 41% entrained during the day. The most abundant entrained species were *Echinogammarus* (759,350,379 individuals entrained) and other amphipods (likely *Gammarus*, 642,209,675 individuals entrained). Together, these amphipods accounted for approximately 91% (1.4 billion) of the estimated benthic invertebrates entrained annually at DNGS.

DNGS Benthic Study - 2016

Characterization of the benthic invertebrate community in Lake Ontario within the DNNP Site Study Area, as well as two reference areas (Bond Head and Thickson Point) was completed in 2016 (EcoMetrix 2016b). Epifauna (on-sediment dwellers) sampling occurred during May, June, and August 2016 using a benthic sled (plankton net attached to the sled was 363 µm); samples were collected during the day and overnight at 5, 10, and 15 m depths. Infauna (in-sediment dwellers) sampling occurred in late August/early September 2016 using a diver assisted airlift sampler fitted with 363 µm mesh; sampling occurred at the 5, 10, and 15 m depths.

The most abundant and ubiquitous epifauna taxa collected across the DNNP Site Study Area included amphipods, midge larvae (chironomids), oligochaete worms and aquatic sowbugs (isopods). Epifauna community composition was largely unchanged over the three sampling seasons. On average, invertebrate abundance ranged from about 1,500 to 9,000 animals per benthic tow across the DNNP Site Study Area. On average, taxa richness was in the range of 7 to 9. No consistent seasonal, depth or area trends were seen in the epifauna data, in terms of invertebrate abundance and diversity. Evenness (E) and Simpson's Diversity (D) scores reflected the patterns seen in invertebrate abundance and richness. The range of E and D scores were similar across the DNNP Site Study Area and no consistent area, depth or seasonal patterns were evident. Hilsenhoff Biotic Index (HBI) scores reflected "poor" water quality across the DNNP Site Study Area, based on the composition of the resident benthic community. This likely reflected the substantial algal cover on the lake bottom that would tend to favor those benthic invertebrates that prefer nutrient-enriched conditions. Bray-Curtis Dissimilarity Index (B-C) scores indicated that the community at the DNNP Site Study Area included elements (taxa) of both Bond Head and Thickson Point and that community structure at the reference locations differed most from each other.

Dreissenid mussels were abundant across the DNNP Site Study Area and were found in high numbers at locations with hard substrates (cobble and rock in particular). All the mussels identified in the epifauna program were the invasive quagga mussel (*Dreissena bugensis*), which has essentially replaced the invasive zebra mussel (*Dreissena polymorpha*) in the nearshore environment of Lake Ontario. On average, mussel abundance in the 5 m depth zone was similar across the DNNP Site Study Area for a given sampling season and abundance showed an increasing trend from May to August. Mussel abundance at the 10 m and 15 m depth zones was generally in the same range across the DNNP Site Study Area over the course of the sampling program.

Benthic invertebrate taxa representing fifteen taxonomic groups (Order or higher) were found in the infauna samples across the DNNP Site Study Area. The most abundant and ubiquitous taxa across the DNNP Site Study Area included the oligochaete worms, water mites (Acari), harpacticoid copepods, seed shrimp (ostracods), and chironomid dipterans. Together these taxa groups accounted for about three-quarters of total invertebrate density across the DNNP Site Study Area. Other taxa such as amphipods, aquatic sowbugs and snails were abundant in some areas, and/or samples, but were not as widely distributed. Consistent with the results of the epifauna component of the benthic program, quagga mussels were found in high numbers at locations with hard substrate across the DNNP Site Study Area. Invertebrate density ranged widely within and among sampling locations, though density at the DNNP Site Study Area was within the range of what was measured in the reference areas at each depth. At the DNNP Site Study Area, mean invertebrate density ranged from 3,577 to 22,743 animals per m^2, and increased with increasing depth. At Bond Head, mean density ranged from 3,895 to 35,504 animals per m^2, with density increasing with depth, similar to the DNNP Site Study Area. Mean invertebrate density in samples collected at Thickson Point ranged from 5,325 to 36,989 animals per m^2, and density was higher at the 10 and 15 m depths than at 5 m.

Taxa richness measured at the DNNP Site Study Area was within the range of richness measured at the reference areas for a given depth. On average, taxa richness at the DNNP Site Study Area ranged from 11 to 23 taxa, and decreased with increasing depth. At Bond Head, mean taxa richness was 20, 22 and 17 at the 5, 10 and 15 m depths, respectively. At Thickson Point, mean taxa richness on average was similar across all depths, with mean richness equal to 14, 16 and 13 at the 5, 10 and 15 m depths, respectively. Evenness scores at the DNNP Site Study Area were within the range of those measured at the reference areas. At the DNNP Site Study Area, mean Evenness scores were within the range 0.30 to 0.50 and decreased with increasing depth. Mean Evenness scores at Bond Head were within the range 0.25 to 0.57 and also decreased with increasing depth. Mean Evenness scores were within the range 0.24 to 0.51 at Thickson Point and, on average, Evenness was greater at 5 m than at 10 and 15 m. Simpson's Diversity scores at the DNNP Site Study Area were similar to those measured at the reference sites. At the DNNP Site Study Area, Bond Head, and Thickson Point, mean Simpson's Diversity scores ranged from 0.67 to 0.91, from 0.74 to 0.91, and from 0.46 to 0.84, respectively, and in each case the scores decreased with increasing depth. HBI scores across the DNNP Site Study Area ranged on average from about 7 to 8. These scores were indicative of "poor" water quality, based on benthic community structure, and were likely as the result of the substantial algal cover on the lake bottom that would tend to favor those benthic invertebrates that prefer nutrient-enriched conditions. In general, B-C scores were high regardless of which site was used to define the reference condition, indicating a relatively high degree of variability in benthic community composition within and among sampling areas (i.e., DNNP Site Study Area and reference locations).

Consistent with the general spatial patterns seen across the DNNP Site Study Area in benthic community composition, no spatial pattern in feeding strategy was observed. This indicates that the benthic invertebrate community at the DNNP Site Study Area did not differ from the other sampling areas (i.e., reference locations) with respect to feeding strategy. Collector-gatherer taxa were the most abundant feeding group across the DNNP Site Study Area and, on average, accounted for between 47% and 71% of total invertebrate density. The relative abundance of both scraper and filterer taxa generally increased with increasing depth in all areas (i.e., DNNP Site Study Area and reference locations). In contrast, predator taxa were generally more abundant at the 5 m sampling depth across the DNNP Site Study Area than at 10 and 15 m (EcoMetrix 2016b).

DNNP Aquatic Community Characterization Study - 2018

In 2018, studies were undertaken in Lake Ontario (5 to 30 m depths) to collect additional baseline information to characterize the aquatic community, as well as inform OPG-decision making on the optimum location of the DNNP intake and diffuser structures to minimize residual impacts to fish habitat and fisheries productivity (EcoMetrix 2019b). Benthic invertebrate samples (66 total) were collected in gravel/cobble and sand substrates in the DNNP Site Study Area during the spring (April to June) using a benthic sled (363 µm mesh plankton nets attached to the sled) and a summary of results is presented in Table 7-4. A total of 64 unique benthic invertebrate taxa from 19 major taxonomic groups were collected with a majority of the unique taxa being dipterans (true flies). Bivalves (exclusively Dreissenid quagga mussels) and dipterans were most abundant and ubiquitous across the study locations. CPUE for all species combined varied across depths and locations, ranging from 7,900 (5 m depth in gravel/cobble) to 75,876 (15 m depth in gravel/cobble) organisms per 300 m tow. Mean taxa richness, including Dreissenids, ranged from 16 (10 m depth in gravel/cobble) to 22 (15 m depth in gravel/cobble). Excluding Dreissenids, densities were reduced to 5,172 (20 m depth in sand) to 26,586 (10 m depth in gravel/cobble) organisms per 300 m tow.

Table 7-4: Summary of 2018 Benthic Invertebrate Results

Summary	Spring (April 8-June 19, 2018)
CPUE (Density) (no. per 300m tow)	*Gravel/cobble substrate:* Range: 7,900 (5m) to 75,876 (15m) *Sand substrate:* Range: 19,652 (20m) to 54,434 (15m).
Taxa Richness	*Gravel/cobble substrate:* Range: 16 (10m) to 22 (15m) *Sand substrate:* Range: 19 (25m) to 21 (15m).
Major Taxonomic Groups	64 unique taxa from 19 taxonomic groups (Order or higher). Dreissenids and dipterans are most abundant and ubiquitous across sampling locations. Other ubiquitous: oligochaete worms, amphipods, gastropods, ostracods, nemata, isopods, trombidiformes, and harpacticoida (copepods).

Source (EcoMetrix 2019b).

7.3.2.3 Fisheries

7.3.2.3.1 Fish Species

A list of flora and fauna documented at Darlington Nuclear since 2007 was compiled in 2012 (OPG 2013c). The list was revised and updated to include additional studies undertaken since 2009 and includes 55 species of fish observed to date (Table 7-5). Data from gillnetting, electrofishing, minnow trapping, impingement, entrainment and larval sampling studies are included. Spoonhead Sculpin (*Cottus ricei*) were reported in studies undertaken in 2010 and 2011. Examination of photographs presented in the source documents by experienced fish taxonomists[3] suggested misidentification. It was noted that the preopercular spine was not curved enough for a Spoonhead Sculpin, and the species depicted in the photos were likely Mottled Sculpin (*Cottus bairdii*) or Slimy Sculpin (*Cottus cognatus*). Features to differentiate among Mottled Sculpin and Slimy Sculpin were not visible in the photographs.

[3] Robert Eakins (Ontario Freshwater Fishes Life History Database); Erling Holm (Royal Ontario Museum)

Table 7-5: Fish Observed 2009-2019 DNNP Site Study Area

Common Name	Species	Most Recent Observation	Year Observed							
		Year	2009	2010	2011	2012	2013	2016	2018	2019
Alewife	*Alosa pseudoharengus*	2019	•	•	•	•	•	•	•	•
American Eel	*Anguilla ostrata*	2019			•					•
Atlantic Salmon	*Salmo salar*	2019							•	•
Blacknose Dace	*Rhinichthys atratulus**	pre-2007								
Brook Stickleback	*Culaea inconstans*	pre-2007								
Brook Trout	*Salvelinus fontinalis*	2012				•				
Brown Bullhead	*Ameiurus nebulosus*	2019	•	•	•					•
Brown Trout	*Salmo trutta*	2019	•	•	•	•			•	•
Burbot	*Lota*	2019			•	•		•	•	•
Channel Catfish	*Ictalurus punctatus*	2019								•
Chinook Salmon	*Oncorhynchus tshawytscha*	2019				•	•		•	•
Cisco	*Coregonus artedi*	2018							•	
Coho Salmon	*Oncorhynchus kisutch*	2018							•	
Common Carp	*Cyprinus carpio*	2019		•					•	•
Creek Chub	*Semotilus atromaculatus*	pre-2007								
Deepwater Sculpin	*Myoxocephalus thompsonii*	2018			•			•	•	
Emerald Shiner	*Notropis atherinoides*	2011		•	•					
Fallfish	*Semotilus corporalis*	2011			•					
Fathead Minnow	*Pimephales promelas*	pre-2007								
Freshwater Drum	*Aplodinotus grunniens*	2018			•				•	
Goldfish	*Carassius auratus*	pre-2007								
Gizzard Shad	*Dorosoma cepedianum*	2019	•	•	•				•	•
Johnny Darter	*Etheostoma nigrum*	pre-2007								
Lake Chub	*Couesius plumbeus*	2019	•		•					•
Lake Sturgeon	*Acipenser fulvescens*	pre-2007								
Lake Trout	*Salvelinus namaycush*	2019	•	•	•	•	•		•	•
Lake Whitefish	*Coregonus clupeaformis*	2019				•				•
Largemouth Bass	*Micropterus salmoides*	2019								•
Logperch	*Percina caprodes*	2009	•							
Longnose Dace	*Rhinichthys cataractae*	2011			•					
Longnose Gar	*Lepisosteus osseus*	pre-2007								
Longnose Sucker	*Catostomus catostomus*	2019	•		•					•
Mottled Sculpin	*Cottus bairdi*	2018						•	•	
Northern Pike	*Esox lucius*	2011		•	•					•
Northern Redbelly Dace	*Chrosomus eos*	2008								
Pink Salmon	*Oncorhynchus gorbuscha*	pre-2007								
Pumpkinseed	*Lepomis gibbosus*	2010		•						
Rainbow Smelt	*Osmerus mordax*	2019	•	•	•	•	•	•	•	•
Rainbow Trout	*Oncorhynchus mykiss*	2019	•		•	•			•	•
Rock Bass	*Ambloplites rupestris*	2019	•		•				•	•
Round Goby	*Neogobius melanostomus*	2019	•	•	•	•	•	•	•	•
Round Whitefish	*Prosopium cylindraceum*	2019	•	•	•	•			•	•
Sea Lamprey	*Petromyzon marinus*	pre-2007								
Shorthead Redhorse	*Moxostoma macrolepidotum*	2012				•				
Slimy Sculpin	*Cottus cognatus*	2018			•		•	•	•	
Smallmouth Bass	*Micropterus dolomieu*	2019		•						•
Splake	*Salvelinus fontinalis x S. namaycush*	pre-2007								
Spoonhead Sculpin	*Cottus ricei***	2011		•	•					
Spottail Shiner	*Notropis hudsonius*	2011	•		•					
Threespine Stickleback	*Gasterosteus aculeatus*	2019			•					•
Trout-Perch	*Percopsis omiscomaycus*	2009	•							
Walleye	*Sander vitreus*	2019	•	•	•	•		•	•	•
White Bass	*Morone chrysops*	2019							•	•
White Perch	*Morone americana*	2019							•	•
White Sucker	*Catostomus commersoni*	2019	•	•	•	•			•	•
Yellow Perch	*Perca flavescens*	2019	•		•	•				•

* - currently recognized as *Rhinichtys atratulus*

** - probable misidentified Mottled Sculpin (*Cottus bairdii*) or Slimy Sculpin (*Cottus cognathus*)

7.3.2.3.2 Darlington Creek and Coot's, Treefrog, Polliwog and Dragonfly Ponds

Baseline conditions of the aquatic biota of on-site waterbodies including Darlington Creek, and Treefrog, Polliwog and Dragonfly ponds (Golder and SENES 2009). Darlington Creek, located east of DNNP Site Study Area, is a Lake Ontario tributary that has been considerably affected by realignment and channelization over much of its length. Darlington Creek supports a warmwater fish community and varying habitat quality, with better quality habitats occurring in the upper reaches. Tributaries to Darlington Creek within the DNNP Site Study Area included intermittent swales which lacked permanent aquatic habitat and did not support fish.

Central Lake Ontario Conservation Authority documented eight species of fishes in Darlington Creek during 2010 (CLOCA, 2011). Species collected included Brook Stickleback (*Culaea inconstans*), White Sucker (*Catostomus commersonii*) Creek Chub (*Semotilus atromaculatus*), Fathead Minnow (*Pimephales promelas*), Blacknose Dace (*Rhinichthys atratulus*)[4], Rainbow Trout (*Oncorhynchus mykiss*), Green Sunfish (*Lepomis cyanellus*) and Northern Redbelly Dace (*Chrosomus eos)*. Eight species were also reported during 2015 electrofishing surveys including Brook Stickleback, Creek Chub, White Sucker, Blacknose Dace, Fathead Minnow, Largemouth Bass (*Micropterus salmoides*), Green Sunfish and Rainbow Trout. Adult Rainbow Trout and White Sucker were observed during spring spawning surveys (D. Moore, CLOCA, pers. comm. 10 January, 2020).

Treefrog, Polliwog and Dragonfly Ponds are small wetland ponds that were constructed to promote on-site biodiversity. The ponds were poorly connected to on-site watercourses and do not support fish. Dragonfly and Polliwog Ponds were observed to dry up completely during summer. Coot's Pond was comprised of wetland and open-water habitats, and was inhabited by Northern Redbelly Dace (Golder and SENES 2009).

7.3.2.3.3 Lake Ontario Gillnetting

Baseline conditions of nearshore fisheries communities at the DNNP Site Study Area were described as part of the 2009 application for the DNNP PRSL (Golder and SENES 2009). The nearshore Lake Ontario fish community was described as a low density, relatively diverse and seasonally dynamic assemblage due to the intersection of species assemblages typical of both the pelagic zone and more protected nearshore, tributary and coastal marsh and embayment habitats.

Gillnetting studies were undertaken in the nearshore at the DNNP Site Study Area in 2009 (spring, summer, and fall), 2010 (fall) and 2011 (spring, summer, and fall). The fish

[4] Species is currently recognized as Western Blacknose Dace (*Rhincihthys obtusus*).

community was sampled at six locations or sites, utilizing a similar methodology. Gillnets[5] were set for approximately 24-hours on the lake bottom at six sites (depth range 3 to 15 m) on three separate occasions for each season. The sites included the existing DNGS diffuser area (north end and south end), proposed DNNP intake and diffuser areas, proposed infill area and the St. Marys Embayment. In fall 2010, two reference locations to the east (Bond Head) and west (Thickson Point) of the DNNP Site Study Area were added. In summer 2011, three sites in the area of the proposed infill were added and sampled with MNRF broadscale nets. Study results are summarized below. Aquatic community characterization studies were carried out in Lake Ontario in the DNNP Site Study Area in 2012-13 (summer, fall, and spring) at the 10-30 m depths and again in 2018 and 2019 with the survey area extended to the 5 m contour (i.e., depths of 5 – 30 m). Gillnets were set on the lake bottom. However, the sampling methodology in 2012-13 was not identical to the 2018 and 2019 studies. Study results are summarized below.

Nearshore Fish Community in the DNNP Site Study Area – 2009 (Spring, Summer and Fall)

Species composition and relative abundance of fish in the Lake Ontario nearshore within the DNNP Site Study Area were assessed during the spring, summer and fall of 2009 (SENES 2010). The 2009 results were compared to results from historical studies conducted in 1995, 1997 and 1999:

- In spring 2009, Round Goby (*Neogobius melanostomus*) was most abundant at every sampling site, comprising 80% of the total catch. The remainder was comprised of White Sucker and seven other species. Fish were typically more abundant at shallower sampling sites than at deeper sites. Comparison of fish abundance in 2009 to historical data showed that species composition in 1995 was dominated by Alewife (*Alosa pseudoharengus*) and Rainbow Smelt (*Osmerus mordax*), while in 2009, species composition was dominated by Round Goby.

- In summer 2009, Alewife and Round Goby were most abundant. Alewife were more abundant at shallower depths, while Round Goby was found mostly at deeper sites. Comparisons to historical data (1995, 1997 and 1999) showed that Alewife was most common in those years as well, but Round Goby was not captured.

- In fall 2009, Round Whitefish (*Prosopium cylindraceum*) were most abundant. Comparisons to historical data showed that Round Whitefish also dominated the

[5] Each gillnet consisted of 9, 50 ft (15.24 m) long and 6 ft (1.8 m) high panels [mesh sizes from 1" (25 mm) to 5"(127 mm) in 0.5" (12.7 mm) increments] for a total of 450 ft (137.2 m).

catch in 1995 and 1999 but were observed at a higher relative abundance than in 2009.

- Historical comparisons showed that Round Whitefish abundance in 2009 had declined since the 1990s. Lake Trout (*Salvelinus namaycush*) numbers also appeared to have declined, while Alewife numbers were quite variable, but remained high, and White Sucker populations remained relatively unchanged.

- Fish morphometrics (fork length, weight, sex, maturity and general health) were also recorded for fish caught in the DNNP Site Study Area in 2009, and compared to the results from previous studies.

Nearshore Fish Community in the DNNP Site Study Area – Fall 2010

The general fish community at six sites in the DNNP Site Study Area was further assessed during the fall of 2010 (SENES 2011a). Sampling was also conducted at two reference sites to the west and east of the DNNP Site Study Area (Thickson Point and Bond Head). In 2010, White Sucker and Round Whitefish comprised the majority of the catch (47% and 31%, respectively) at the DNNP Site Study Area. Relative abundance of Round Whitefish at sampling locations within the DNNP Site Study Area in fall 2010 was consistent with fall 2009 data (CPUE = 2.8 fish/24hr and CPUE = 2.6 fish/24hr in fall 2010 and fall 2009, respectively). The total number of Round Whitefish collected each year was also similar (2009- 51 and 2010- 48) and they were caught at all site locations (depths ranging from 2 to 15 m). At the reference sites in fall 2010, the majority of the catch consisted of White Sucker (60%), followed by Round Whitefish (17%). Fish morphometrics (fork length, weight, sex, maturity and general health) were recorded for fish caught and compared to the previous studies. Results from fall 2010 followed similar trends as observed in fall 2009.

Nearshore Fish Community in the DNNP Site Study Area – Spring 2011

Gillnets were set at six sites within the DNNP Site Study Area and at and two reference locations (Thickson Point and Bond Head) during the spring of 2011 (SENES 2011b). Scales and otoliths were collected for the aging of Round Whitefish and the gut contents of Round Goby were examined for possible ingestion of Round Whitefish larvae. A total of 326 fish were collected in the DNNP Site Study Area with four species (Rainbow Smelt, Alewife, Round Goby and White Sucker) comprising 92% of the catch. A total of 12 species were collected with the greater species richness observed in the St. Marys Embayment. A total of 232 fish were caught at the reference sites with Alewife, Round Goby and Rainbow Smelt comprising 89% of the fish collected. Round Whitefish comprised only 2% of the catch (similar to the DNNP Site Study Area). A total of 10 species were collected at the reference sites. Overall, a total of 15 species were collected in the DNNP Site Study Area and the reference sites. Aging results of the Round Whitefish collected indicated that the majority of fish were older than 15 years and all fish were over 10 years of age.

Chironomids comprised over half of the food found in Round Goby guts in spring 2011. No Round Whitefish larvae were found in the guts of Round Goby.

Nearshore Fish Community in the DNNP Site Study Area – Summer 2011

To assess the general fish community, gillnets were set at six sites within the DNNP Site Study Area and two reference locations during the summer 2011 period (SENES 2011c). A total of 3,638 fish were collected with Alewife and Round Goby comprising 99% of the catch (76% and 23%, respectively). A total of 15 species were captured, including Fallfish (*Semotilus corporalis*), a species not collected during summer 2009. Species richness was highest within the St. Marys Embayment) (n=11) and lowest nearshore near the existing diffuser (n=3). A total of 575 fish were caught at the reference sites with Alewife being the most abundant species (96%). Round Goby comprised only 1% of the catch. A total of 8 species were collected at the reference sites. Overall, a total of 17 species were collected in the DNNP Site Study Area and the reference sites.

To assess the general fish community at the proposed infill location within the DNNP Site Study Area, small mesh broadscale nets were set on the lake bottom at three sites over the summer 2011 period. Three replicates were undertaken. A total of 564 fish were collected with Alewife and Round Goby comprising 95% of fish caught (79% and 19%, respectively). A total of seven species were collected, including Logperch (*Percina caprodes*). CPUE ranged from 75.2 fish/24-hr to 30.9 fish/24-hr. Alewife ranged from age-1 to age-5 with the majority (32%) being age-1. Similarly, Round Goby ranged from age-0 to age-4 with the majority being age 1 (84%).

Nearshore Fish Community in the DNNP Site Study Area – Fall/Early Winter 2011

Further baseline fisheries studies were undertaken in late fall and early winter (November to December) of 2011 within the DNNP Site Study Area and reference locations with a particular emphasis on Round Whitefish (SENES 2013). A total of 1,286 fish, estimated at a CPUE of 39.2/24-hr, were collected from the six sampling sites within the DNNP Site Study Area. Two species, Alewife and Round Whitefish, comprised almost the entire catch at 85% and 11% of the catch, respectively. The remaining 4% of the catch consisted of the following 10 species: Atlantic Salmon (*Salmo salar*), Brown Trout (*Salmo trutta*), Common Carp (*Cyprinus carpio*), Gizzard Shad (*Dorosoma cepedianum*), Lake Chub (*Couesius plumbeus*), Lake Trout, Rainbow Trout, Round Goby, Walleye (*Sander vitreus*) and White Sucker. A total of 561 fish at a CPUE of 50.84/24-hr were collected at the two reference sites. Alewife were most abundant with 83% of the total catch, with Round Whitefish at 7%, White Sucker at 6%, Rainbow Trout at 2% and Brown Trout at 1%. An additional four fish species (i.e., Atlantic Salmon, Brown Bullhead [*Ameiurus nebulosus*], Gizzard Shad, and Northern Pike [*Esox lucius*]) accounted for the remaining 1%.

Aquatic Community Characterization Study – Summer 2012, Fall 2012, Spring 2013

Gillnetting was undertaken within the DNNP Site Study Area during summer 2012, fall 2012 and spring 2013 to assess seasonal utilization of habitat (HSL 2013a). Gillnets[6] utilized were constructed as per the Eastern Lake Ontario Fish Community Index Netting Protocol specifications (Hoyle 2011), but only 1.83 m (6 ft.) in height. Nets were set for approximately 24-hours on the lake bottom at seven sites focused within the proposed DNNP intake and diffuser area (depth range 10 to 30 m) of the DNNP Site Study Area and two reference areas (Bond Head and Thickson Point), on three separate occasions during each season.

In total, 3,921 fish from 13 different species were captured during the 2012 summer season. Alewife were the most abundant species comprising 97% (n=3,801) of the overall catch. Round Goby (n=50), Brown Trout (n=28) and Rainbow Smelt (n=14) were the next most abundant species, comprising 1.3%, 0.7% and 0.4% of the catch, respectively. The remaining 8 species (Round Whitefish (n=9), Lake Trout (n=5), Chinook Salmon (*Oncorhynchus tshawytscha*) (n=3), Rainbow Trout (n=2), Burbot (*Lota lota*) (n=2), Shorthead Redhorse (*Moxostoma macrolepidotum*) (n=2), Brook Trout (*Salvelinus fontinalis*) (n=1) and Walleye (n=1)) each represented less than 0.25% of the total catch. Alewife were captured at each location. Round Goby was collected at 8 of the 9 sampling locations, whereas Brown Trout and Rainbow Smelt were collected at 6 locations. Burbot, Brook Trout, Shorthead Redhorse, Walleye and White Sucker were captured at only one location within the DNNP Site Study Area.

During the fall 2012 season, 295 fish from 11 different species were captured. Lake Trout were the most abundant species comprising 61% (n=180) of the overall catch. Alewife (n=59), Walleye (n=28) and Round Goby (n=9) were the next most abundant species, comprising 20%, 9.5% and 3.0% of the catch, respectively. The remaining 8 species (Brown Trout (n=4), White Sucker (n=5), Round Whitefish (n=4), Rainbow Trout (n=1), Lake Whitefish (*Coregonus clupeaformis*) (n=1), Yellow Perch (*Perca flavescens*) (n=2), and Rainbow Smelt (n=2)) each represented less than 2.0% of the total catch. Lake Trout, Alewife and Walleye were captured at most locations, whereas Brown Trout, White Sucker, Round Whitefish, Rainbow Trout, Lake Whitefish, Rainbow Smelt and Yellow Perch were captured at one to three locations.

A total of 907 fish from 5 different species were captured during the spring 2013 season. Alewife were the most abundant species comprising 87.2% (n=791) of the overall catch. Other species caught included Rainbow Smelt (n=55 or 6.1% of the catch), Lake Trout (n=33 or 3.6%), Round Goby (n=26 or 2.9%) and Chinook Salmon (n=2 or 0.2%). Alewife,

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[6] Each gillnet consisted of 2, 15 ft (4.6 m) long and 6 ft (1.8 m) high panels [mesh sizes 1” (25 mm) and 1.5” (38 mm), and 9, 50 ft (15.2 m) long and 6 ft (1.8 m) high panels [mesh sizes from 2” (51 mm) to 6” (152 mm) in 0.5” (12.7 mm) increments] for a total of 480 ft (146.3 m).

Lake Trout, Round Goby and Rainbow Smelt were present at all netting locations, whereas Chinook Salmon was only captured at two netting locations.

Aquatic Community Characterization Study - 2018

In 2018, studies were undertaken within the DNNP Site Study Area to collect additional baseline information to characterize the aquatic community, as well as inform OPG-decision making on the optimum location of the DNNP intake and diffuser structures to minimize residual impacts to fish habitat and fisheries productivity (EcoMetrix 2019b). The fish community was surveyed seasonally during spring, summer and fall. Gillnets[7] were constructed as per the Lake Ontario Fish Community Index Netting Protocol specifications (Hoyle 2015). Nets were set at depths between 5 and 30 m, over gravel/cobble and sand substrates. A summary of results is presented in Table 7-6.

Alewife and Round Goby were the most abundant and ubiquitous species collected for each of the spring, summer and fall seasons, and comprised 88.9, 94.8, and 99.7% of the total catch, respectively. Salmonid species were collected during all seasons. In the spring, Lake Trout were collected at all locations in low numbers. In the summer, 5 salmonid species were captured in low numbers and mostly in deeper, cooler water (25 and 30 m depth). In the fall, Chinook Salmon were collected in depths of 15 m and greater. Low numbers of Round Whitefish were also collected in the fall. From spring to summer to fall, species richness from gill net sets increased from 7 to 11 to 18. Fish abundance based on CPUE, was variable by location (depth and substrate) but was highest in the summer (range, 23.23 – 717.97 fish/net set) and lowest in the spring (range, 5.63 – 24.05 fish/net set). Abundance based on BPUE was highest in the fall (range, 5,579 – 50,819 g/net set) and lowest in the spring (range, 988 – 6,120 g/net set). In each season, small-bodied fish (e.g., Alewife, Round Goby) typically accounted for the vast majority (>85% at most locations) of the CPUE; however, in the spring and fall, these smaller fish accounted for a minority of the BPUE (2 to 38% of the catch at each location). Large-bodied fish, comprising mostly salmonids, accounted for the majority of the fall biomass. Community composition, fish species richness, and proportion of small-bodied fish to large-bodied fish were generally similar to catches reported by the Ministry of Natural Resources and Forestry (MNRF) during their index gill netting program in the Cobourg area.

[7] Each gillnet consisted of two gangs joined by a 50 ft (15.2 m) spacer. Each gang consisted of 1, 15 ft (4.6 m) long and 8 ft (2.4 m) high panel [mesh size 1.5” (38 mm)], and 9, 50 ft (15.2 m) long and 8 ft (2.4 m) high panels [mesh sizes from 2” (51 mm) to 6“ (152 mm) in 0.5” (12.7 mm) increments] for a total of 465 ft (141.7 m).

Table 7-6: Summary of 2018 Fish Community Results

Summary	Spring (May 1-18, 2018)	Summer (July 3-27, 2018)	Fall (Sept. 3-20, 2018)
Species Composition	463 fish Alewife - 60.3% Round Goby - 34.5% Lake Trout - 3.9% Other - 1.3%	9,023 fish Alewife - 70.8% Round Goby - 29.0% Other - 0.3%	644 fish Round Goby - 59.5% Alewife - 29.4% Chinook Salmon - 3.6% Other - 7.6%
Overall Species Richness	7	11	18
CPUE (no. fish/ net set)	*Gravel/cobble substrate:* Range: 7.03 (20m) to 17.45 (10m). % Small-bodied: 89-98%. *Sand substrate:* Range: 5.63 (25m) to 24.05 (20m). % Small-bodied: 78-98%.	*Gravel/cobble substrate:* Range: 23.23 (10m) to 717.97 (20m). % Small-bodied: 99-100%. *Sand substrate:* Range: 107.18 (25m) to 268.73 (15m). % Small-bodied: 99.5-100%.	*Gravel/cobble substrate:* Range: 15.70 (5m) to 159.64 (25m). % Small-bodied: 66-96%. *Sand substrate:* Range: 25.52 (25m) to 51.66 (20m). % Small-bodied: 77-99%.
BPUE (g per net set)	*Gravel/cobble substrate:* Range: 988 (5m) to 6,120 (25m). % Small-bodied: 6-37%. *Sand substrate:* Range: 1,161 (15m) to 5,938 (25m). % Small-bodied: 3-38%.	*Gravel/cobble substrate:* Range: 1,053 (10m) to 24,791 (20m). % Small-bodied: 61-100%. *Sand substrate:* Range: 3,511 (25m) to 10,205 (15m). % Small-bodied: 85-95%.	*Gravel/cobble substrate:* Range: 8,996 (5m) to 50,819 (10m). % Small-bodied: 5-19%. *Sand substrate:* Range: 5,579 (15m) to 27,350 (25m). % Small-bodied: 2-36%.
Diversity (Shannon-Wiener Index)	*Gravel/cobble substrate:* Range: 0.23 (10m) to 1.04 (25m). *Sand substrate:* Range: 0.25 (20m) to 0.47 (25m).	*Gravel/cobble substrate:* Range: 0.30 (5m) to 0.88 (25m). *Sand substrate:* Range: 0.13 (20m) to 0.39 (15m).	*Gravel/cobble substrate:* Range: 0.60 (15m) to 1.33 (5m). *Sand substrate:* Range: 0.52 (15m) to 1.25 (25m).

Source (EcoMetrix 2019b).

Deepwater Fish Community Characterization Study - 2019

In 2019, a fish community study was undertaken in Lake Ontario within the DNNP Site Study Area to confirm the fish community results from the 2018 aquatic community characterization study. This study employed the same methodology used for the fish community component of the 2018 aquatic community characterization study. The fish community was surveyed seasonally during spring, summer and fall. Gillnets[8] were

[8] Each gillnet consisted of two gangs joined by a 50 ft (15.2 m) spacer. Each gang consisted of 1, 15 ft (4.6 m) long and 8 ft (2.4 m) high panel [mesh size 1.5” (38 mm), and 9, 50 ft (15.2 m) long and 8 ft (2.4 m) high panels [mesh sizes from 2” (51 mm) to 6“ (152 mm) in 0.5” (12.7 mm) increments] for a total of 465 ft (141.7 m).

constructed as per the Lake Ontario Fish Community Index Netting Protocol specifications (Hoyle 2015). Nets were set at depths between 5 and 30 m, over gravel/cobble and sand substrates. A summary of results is presented in Table 7-7.

Table 7-7: Summary of 2019 Deepwater Fish Community Results

Summary	Spring (May 6-23, 2019)	Summer (July 08-17, 2019)	Fall (Sept. 9-24, 2019)
Species Composition	521 fish Alewife - 45.31% Round Goby - 40.68% Lake Trout - 10.37% Other - 3.65%	2,170 fish Alewife - 90.75% Round Goby - 7.27% Other - 1.98%	694 fish Alewife - 31.23% Round Goby - 55.47% Lake Trout - 7.63% Other - 4.94%
Overall Species Richness	12	12	16
CPUE (no. fish/ net set)	*Gravel/cobble substrate:* Range: 1.65 (15m) to 40.50 (5m). % Small-bodied: 0-100%. *Sand substrate:* Range: 3.80 (25m) to 23.83 (20m). % Small-bodied: 77-95%.	*Gravel/cobble substrate:* Range: 2.65 (25m) to 234.80 (10m). % Small-bodied: 62-100%. *Sand substrate:* Range: 3.67 (25m) to 39.07 (25m). % Small-bodied: 57-100%.	*Gravel/cobble substrate:* Range: 1.00 (10,30m) to 105.63 (20m). % Small-bodied: 0-100%. *Sand substrate:* Range: 3.00 (25m) to 28.09 (20m). % Small-bodied: 25-100%.
BPUE (g per net set)	*Gravel/cobble substrate:* Range: 71 (15m) to 10,957 (25m). % Small-bodied: 0-100%. *Sand substrate:* Range: 1,516 (25m) to 15,582 (20m). % Small-bodied: 3-20%.	*Gravel/cobble substrate:* Range: 96 (15m) to 20,904 (5m). % Small-bodied: 3-100%. *Sand substrate:* Range: 146 (25m) to 5,052 (20m). % Small-bodied: 2-100%.	*Gravel/cobble substrate:* Range: 1,072 (30m) to 32,237 (25m). % Small-bodied: 0 -100%. *Sand substrate:* Range: 142 (15m) to 22,440 (20m). % Small-bodied: 36-100%.
Diversity (Shannon-Wiener Index)	*Gravel/cobble substrate:* Range: 0.24 (5m) to 0.54 (25m). *Sand substrate:* Range: 0.34 (25m) to 0.65 (20m).	*Gravel/cobble substrate:* Range: 0.00 (20m) to 0.34 (25m). *Sand substrate:* Range: 0.13 (20m) to 0.39 (15m).	*Gravel/cobble substrate:* Range: 0.19 (30m) to 1.16 (5m). *Sand substrate:* Range: 0.45 (15m) to 0.65 (25m).

Source (EcoMetrix 2019b).

7.3.2.3.4 Lake Ontario Ichthyoplankton -Benthic Larval Tows

DN Larval Fish Community Assessment – Spring 2009

A total of 84 nocturnal benthic larvae tow samples were collected within the DNNP Site Study Area (depths of 5 to 15 m) during a 2009 spring fisheries assessment, resulting in the capture of 487 larval fish (including a sculpin egg) (Golder and SENES, 2009). Round Goby were the most abundant at all sites, comprising over 97% of total fish larvae caught. Only 10 larval Round Whitefish were collected, and only at three sites. Sculpin (*Cottus* sp.) were found as larvae at only one site and as eggs at one other site. Overall CPUE was 0.111 larvae/100 m^3.

DN Larval Fish Community Assessment – Spring 2011

In spring 2011, larval fish sampling was undertaken with focus on assessing potential larval Round Whitefish presence and relative abundance within the DNNP Site Study Area and reference locations. A total of 127 samples (depths of 2 to 15 m) were collected by benthic sled (plankton net attached to the sled was 500 µm mesh), resulting in the capture of 99 larval fish from five species. Round Goby was the most abundant species captured (89%) followed by Round Whitefish (6%). The remainder of the larvae collected included Burbot, Deepwater Sculpin (*Myoxocephalus thompsonii*) and Perch Family (Percidae). A total of 26 larvae were collected at the reference locations during 44 tows. Round Goby was the most abundant species (85% of larvae collected). Round Whitefish (11%) and Deepwater Sculpin (4%) were also collected. For spring 2011, the average CPUE of Round Whitefish larvae was 0.040 larvae/100 m^3 within the DNNP Site Study Area and 0.058 larvae/100 m^3 at the reference locations (SENES 2011b).

DNNP Aquatic Community Characterization – 2012-13

Benthic larval tow sampling in Lake Ontario within the DNNP Site Study Area using a benthic sled (equipped with 500 µm mesh plankton net), at depths of 10 to 30 m, was undertaken during April and May 2013 in the vicinity of the proposed DNNP (HSL 2013a). Only two species of larval fish were captured in spring 2013; Round Goby and Slimy Sculpin.

DNGS Benthic Study - 2016

Several species of fishes were collected during benthic tows undertaken during May, June, and August 2016 at depths of 5 to 15 m, during a DNGS benthic study (EcoMetrix 2016b). Round Goby, sculpin (*Cottus* spp.) and Rainbow Smelt were collected within the DNNP Site Study Area, whereas Round Goby, sculpin and Northern Pike were captured at the Thickson Point reference area, and Round Goby, sculpin and Johnny Darter (*Etheostoma nigrum*) were captured at the Bond Head reference area. The eggs of a further two species were also identified: Alewife (all areas) and sucker (*Catostomus* sp.) (Thickson Point). Greater numbers of fishes were collected within the DNNP Site Study Area than at the reference areas and fishes were generally more abundant in the shallower tows. Gobies were the most readily collected fish species. Alewife eggs were collected in relatively high numbers in June, particularly at Thickson Point and to a lesser extent at Bond Head.

DNNP Aquatic Community Characterization - 2018

In 2018, studies were undertaken on Lake Ontario (5 to 30 m depths) within the DNNP Site Study Area to collect additional baseline information to characterize the aquatic community, as well as inform OPG-decision making on the optimum location of the DNNP intake and diffuser structures to minimize residual impacts to fish habitat and fisheries productivity (EcoMetrix 2019b). Larval fish and egg sampling were conducted weekly using a benthic sled (plankton nets attached to the sled equipped with 363 µm mesh) from the last week of March to the end of June. Tows were conducted over both gravel/cobble and sand substrates. A summary of results is presented in Table 7-8.

Most (60% or 63 of 105) benthic tow samples collected during spring sampling did not contain any fish eggs or larvae. Where ichthyoplankton were captured, approximately 86% (or 1,286 eggs and 5 larvae) of the collections were from the 25 m depth, 79% of which were from two tows comprising 1,181 Rainbow Smelt eggs and 3 Round Goby larvae. Overall, across all depths, 1,420 eggs and 82 larvae from five (5) taxa were collected in the spring larval tows. The majority (87.7%) of ichthyoplankton specimens were Rainbow Smelt eggs. The remainder were Alewife eggs (6.9%), Round Goby larvae (4.4%), one Deepwater Sculpin larva (0.1%) and Mottled/Slimy Sculpin (1.0%). With the exception of the 25 m depth locations, the CPUE at all gravel/cobble and sand substrate locations was low and ranged from 0.47 to 3.67 ind./100 m^3. CPUE at the 25 m depths was 22.40 ind./100 m^3 (in gravel/cobble) and 78.20 ind./100 m^3 (in sand), with the CPUE largely influenced by the two tows containing 79% of the overall catch and comprised almost entirely of Rainbow Smelt eggs. Species diversity was very low as most samples did not contain fish, and for those that did, most only had one species. No fish eggs or larvae were captured until mid-April when the one Deepwater Sculpin larva was captured. Rainbow Smelt eggs and Round Goby larvae were collected in mid-April to mid-June. Mottled/Slimy Sculpin larvae and Alewife eggs were not present until the second half of June. Some fish eggs and larvae were also collected from vertical plankton tows. Alewife eggs (7) and larvae (1), and Gizzard Shad eggs (3) were collected at the end of July; and a Deepwater Sculpin larva was collected in early April.

Table 7-8: Summary of 2018 Fish Egg and Larvae Results

Summary	Spring (March 27-June 25, 2018)
Species Composition	No eggs or larvae in 63 of 105 samples 1420 eggs and 82 larvae = 1502 individuals Eggs: Rainbow Smelt - 87.7%*; Alewife - 6.9%* Larvae: Round Goby - 4.4%*; Sculpin sp. - 1.0%*; Deepwater Sculpin - 0.1%*
Overall Species Richness	5
CPUE (no. per 100 m^3 tow)	*Gravel/cobble substrate:* Range: 0.47 (30m) to 3.67 (5m). Exception: 22.40 (25m). *Sand substrate:* Range: 1.32 (20m) to 1.81 (15m). Exception: 78.20 (25m). Note: values at 25 m depths largely influenced by two tows comprising 79% of overall catch.
Diversity (Shannon-Wiener Index)	*Gravel/cobble substrate:* Range: 0.000 (5 and 30m) to 0.086 (20m). *Sand substrate:* Range: 0.000 (15 and 20m) to 0.004 (25m). Note: Most samples had zero or one species.

*Adds up to 100.1% due to rounding.
Source (EcoMetrix 2019b).

7.3.2.3.5 Thermal Effects Assessment

The effects of predicted temperature changes during operation of the proposed DNNP diffuser were assessed on the basis of modeled temperatures at three locations: the proposed diffuser location; the embayment created by the proposed lakefill; and the existing DNGS diffuser, with both facilities operating (Golder 2010). A range of climatic conditions was covered that included years during which temperatures were similar to long term averages, as well as a warmer-than-average year and a colder-than average year. Temperature changes were assessed against published temperature benchmarks for the fish species that have been recorded in abundance in the area, or that are of particular conservation concern. All life stages that could be present were considered. A conservative approach was taken that assumed that if suitable habitat existed, the species could be present, regardless of whether the species had actually been observed in the area. The species considered were Round Whitefish, Emerald Shiner (*Notropis atherinoides*), Alewife, White Sucker and Lake Trout. While these specific species were considered in the assessment, they were also considered as representative of the potential effects on other species with similar habitat requirements.

The assessment indicated that predicted weekly average temperatures at the DNNP diffuser at typical Round Whitefish spawning depths were not likely to exceed the threshold values during the critical period when the eggs/embryos would be developing. The main temperature changes occurred in the late fall, as a slight retardation of the cooling of the lake waters. During the winter months, predicted mean weekly temperatures were similar to baseline temperatures at most locations, and the effects on whitefish egg development were expected to be negligible. The highest increase (1ºC during the winter months) was expected to occur at the deepest offshore location, and represented a relatively minor potential impact since temperatures were still within the optimum range. The occurrence of the highest temperature increases in the deepest locations was considered to be a function of the location of the proposed diffuser in depths ranging from 10 to 20 m. No effects from operation of the DNNP diffuser were predicted for Emerald Shiner, Alewife, White Sucker or Lake Trout.

Egg incubation experiments on Round Whitefish collected in Lakes Ontario and Huron, and Lake Whitefish (*Coregonus clupeaformis*) collected in Lake Huron were carried out in 2011-12 and 2012-13 to evaluate the effects of fixed and fluctuating temperatures on mortality and hatch success (COG 2014). For both years of studies and both fish species, survival was high for each experimental treatment; however, survival tended to decrease with increased temperatures above ambient. The time window for hatching for all experimental temperature treatments was variable and hatching windows tended to be greater as temperatures increased. Models to predict survival and hatch times for Round Whitefish and Lake Whitefish were developed. Based on the results, a thermal benchmark of 3.7 °C above ambient was estimated for Round Whitefish. Round Whitefish eggs exposed to a temperature increase of 3.7 °C above ambient or less did not result in excessive direct mortality. The results for Lake Whitefish indicated a greater tolerance of temperature increases compared to Round Whitefish, which was suggestive of a higher thermal benchmark.

Various statistical models can be fit to the COG (2014) data and used to predict Round Whitefish survival for any sequence of temperatures measured over the embryonic period. First the duration of the embryonic period must be predicted, since this also depends on the temperature regime. OPG (2014c) used a degree day model, fit to the COG (2014) data, to predict this duration at specific locations where temperature was continuously recorded, assumed three different fertilization dates in December, and then used a logistic quadratic model to predict survival at each location based on average temperature over the period. The predicted survival over the winter of 2011-2012 was greater than 95%. The largest predicted survival loss (as compared to an average of reference locations) was 1.1%, well below the 10% threshold used by the CNSC in the Darlington Refurbishment EA to demark a moderate risk.

EcoMetrix (2016c) developed a hybrid thermal response model for early development of Round Whitefish using the lower temperature exposures from the COG (2014) study (2011-

12 data) and the higher exposures from the Griffiths (1980) study. To better understand the effect on Round Whitefish from various temperature changes, a range of wider data sets was employed resulting in additional modeling on six (6) different combinations of the COG (2014) and Griffiths (1980) treatments representing different datasets. The data sets represented the use of uncensored data (fixed and variable temperatures) as well as data considering biological life-cycle imperatives. Threshold temperature, defined as the temperature that corresponds to a 90% probability of survival, was estimated for each model assessed. Results suggested little variability among the various models examined (6.2 - 6.9°C). For the most comprehensive dataset (15 treatments), the predicted threshold temperature was 6.2 °C. A temperature of 6.3°C was predicted based on a dataset which was considered most realistic based on visual inspection and biological arguments.

COG (2017) summarized and consolidated findings from the COG (2014) report with the published and grey literature on the thermal effects on whitefish eggs, and developed science-based thermal benchmarks. Studies to develop critical thermal methods (CTM) with CTMin and CTMax for minimum and maximum results and incipient lethal temperatures (ILT) as acute thermal toxicity benchmarks for whitefish were recommended. The mean weekly average temperature (MWAT) was not recommended as a whitefish thermal benchmark due to ambient temperature variability and problematic assumptions. Although the short-term maximum (STmax) is more conservative than the MWAT, it uses the upper incipient lethal temperature (UILT) and assumes that a value 2°C lower will be protective. However, it is unknown if this temperature has no effect or potentially causes immobility or death with chronic exposure. For these reasons, this benchmark was also not recommended. A delta T value of Δ3°C was recommended as a conservative benchmark for Round Whitefish. Hybrid thermal response models were considered to be more representative than the Gagnon (2011) block 1 model at lower temperatures, but conservative at the higher temperatures.

Thermal monitoring was conducted in 2011-12 (Golder 2012a, 2012b) at the DNNP Site Study Area and again in 2017-18 (OPG 2018c) in support of the Darlington Refurbishment EA and Follow-up Monitoring. The 2017-18 results were consistent with the 2011-12 monitoring. Elevated plume temperatures were observed relative to reference locations (average for all locations was ~ 0.4 ºC greater during the period of early Round Whitefish embryo development and 0.1 ºC greater during the period of late Round Whitefish embryo development). See Section 6.3.2.1.3 for additional details related to the thermal monitoring.

7.3.2.3.6 Impingement and Entrainment

Impingement

Impingement sampling at DNGS was conducted over a one-year period from May 4, 2010 to April 26, 2011 (SENES 2011d). The estimated annual impingement at DNGS was 274,931 (2,362 kg) fish. The estimated counts and biomass were higher than totals reported from 2006-07 sampling (26,020 fish or 839 kg). A total of 13 species were identified of which Round Goby and Alewife contributed approximately 54% and 42% of the total, respectively (Table 7-9). In 2006-07, eight species were impinged. Impingement at DNGS was compared to that at other power plants on the Great Lakes. The results indicated that DNGS impinged fewer fish relative to other locations. Impingement levels in 2010-11 at DNGS (2,362 kg) were considerably lower than those at the Pickering Nuclear Generating Station (PNGS) (4,617 kg) for 2010-11 which had a fish protection system in place (barrier net). A total of 13 fish species were identified as impinged at DNGS compared to 41 species at PNGS.

Table 7-9: Percent Composition of Fish Impinged at DNGS (May 2010 to April 2011)

Fish Species	Total Count Impinged	Percentage (%)
Alewife	16,874	41.6
American Eel	1	0.0
Brown Bullhead	1	0.0
Cottus sp.	21	0.1
Emerald Shiner	8	0.0
Pumpkinseed	8	0.0
Rainbow Smelt	692	1.7
Round Goby	21,985	54.2
Slimy Sculpin	24	0.1
Smallmouth Bass	1	0.0
Spoonhead Sculpin*	234	0.6
Sunfish species	1	0.0
Threespine Stickleback	1	0.0
White Sucker	7	0.0
Yellow Perch	2	0.0
unidentified	712	1.8
Totals	**40,572**	**100.0**

* - probable misidentified Mottled Sculpin or Slimy Sculpin. See Section 7.3.2.3.1

The impingement report also evaluated the biological liability of fish that were impinged at DNGS in 2010-11. Lost fishery yield was relatively small (89 kg) and consisted almost exclusively of Rainbow Smelt (almost 98%). Lost fishery yield for all other species combined amounted to less than 2 kg. The number of equivalent age-1 fish that could have resulted from impinged fish was estimated to be 4,242,050 with Round Goby as the predominant species (91% or 3,860,403 age-1 equivalents) and Alewife only comprising 1.3% (56,515 age 1-equivalents). The total future production foregone was estimated to be 905.47 kg, with Alewife, Rainbow Smelt and Round Goby comprising 99% of the biomass. The production foregone of Alewife and Rainbow Smelt were negligible when considering the biomass of each species present in Lake Ontario. For example, in 2009, the Alewife population in Lake Ontario was estimated at 134 million year one- and older fish which translated to an estimated biomass of 5,298 MT.

In recent years, American Eel (*Anguilla rostrata*) have been observed during impingement monitoring by OPG staff. American Eel, is a provincial species-at-risk, designated as Endangered in Ontario. As per conditions of Permit LOMU-B-003, issued under clause 17(2) of the *Endangered Species Act*, DNGS provides annual reports to the Ontario Ministry of Natural Resources and Forestry (MNRF) of all ESA listed species impinged. The reporting periods typically cover April to March. A total of 13, 24 and 5 American Eels were reported during 2016-17, 2017-18 and 2018-19, respectively (OPG 2017b, 2018d, 2019f).

Entrainment

An entrainment study was undertaken between December 2015 and November 2016 at DNGS (Arcadis 2017). A total of 2,613 fish eggs were entrained from the end of April 2016 to the beginning of August 2016, the majority (90.0%) identified as Alewife (2,351 eggs). Interpretation of DNA results obtained for a subsample of the entrained eggs showed that Walleye (241 or 9.2% of total) and Round Goby (10 eggs or 0.4% of total) were also entrained. Nine eggs were likely Slimy Sculpin or Mottled Sculpin and two eggs were unidentified. A total of 122 fish larvae from four taxa and one unidentified group were entrained over the study period. Larvae entrained included Round Goby (108 larvae or 89% of total), Deepwater Sculpin (9 larvae or 7% of total), Burbot, (1 larva or 1% of total), and Alewife (1 larva or 1% of total). Two (2) larvae (2% of total) were identified as being either Alewife or Rainbow Smelt. Notably absent from the species captured were eggs or larvae of Round Whitefish. For the entrainment of fish larvae, a statistically significant difference related to diurnal effect was observed at $\alpha=0.05$, with nighttime entrainment density significantly higher than daytime entrainment density. The diurnal effect was not found to be significant on the entrainment density of fish eggs. On an annual basis (December 2015 to November 2016), an estimated total of 105,465,932 ichthyoplankton (10,983,411 larvae and 94,482,521 eggs) were entrained at DNGS (Table 7-10). The greatest number of entrained larvae were Round Goby (9,969,551 or 90.8% of all larvae entrained) and of eggs were Alewife (87,428,046 or 92.5% of all eggs entrained). About half (estimated at approximately 5.2 million) of the larvae were entrained during the month of August and about 20% (estimated at 2.2 million) were entrained during September. An estimated 724,746 Deepwater Sculpin larvae were entrained in the winter/early spring months (January to April). The majority of larvae (more than 80%) were entrained during the night.

Table 7-10: Estimated Number of Ichthyoplankton Entrained Annually at DNGS (December 2015 – November 2016)

Species	Day	Night	Total
Eggs-Alewife	50,481,179	36,946,867	87,428,046
Eggs-Round Goby	107,149	156,514	263,663
Eggs-Slimy/Mottled Sculpin	48,166	220,048	268,215
Eggs-Walleye	2,591,777	3,878,057	6,469,834
Eggs-unidentified	24,826	27,937	52,763
Eggs-Total	**53,253,098**	**41,229,423**	**94,482,521**
Larvae-Alewife	0	99,019	99,019
Larvae-Burbot	30,011	0	30,011
Larvae-Deepwater Sculpin	217,543	507,203	724,746
Larvae-Round Goby	912,123	9,057,427	9,969,551
Larvae-Rainbow Smelt / Alewife	0	58,461	58,461
Larvae-unidentified	101,623	0	101,623
Larvae-Total	**1,261,300**	**9,722,111**	**10,983,411**
Total Larvae & Eggs	**54,514,398**	**50,951,534**	**105,465,932**

Equivalent loss estimates of entrainment numbers were calculated using the Equivalent Adult Model (EAM), Biomass Loss Model (BLM), and the Equivalent Yield Model (EYM). These models were used to extrapolate the annual losses to equivalent numbers of Age 1 fish, or to the future biomass production by the lost organisms had they lived, or to the future commercial and/or recreational harvest represented by these organisms. The equivalent Age 1 biomass lost was estimated at 48 kg with Round Goby (15 kg or 31% of total) and Deepwater Sculpin (13 kg or 28% of total) being the major contributors. The total biomass lost to entrainment was estimated at 589 kg with a 181 kg contribution (31% of total) from Round Goby, 174 kg (29%) from Walleye, and a 122 kg contribution (21% of total) from Deepwater Sculpin. Alewife and Rainbow Smelt contributed 8 kg and 38 kg to the total biomass loss, respectively. Excluding Round Goby, an invasive species, total biomass lost was estimated at 408 kg. Lost fishery yield for Walleye, the only species subject to fishing, was estimated to be 149 kg.

DNGS received a *Fisheries Act* authorization for I&E losses in 2015.

7.3.2.3.7 DNGS Forebay

An aquatic assessment was undertaken by SENES and Milne (2010) to characterize the fish and aquatic habitat within the DNGS forebay of the DNNP Site Study Area, and assess the performance of the porous veneer intake structure. Methods included gillnets, minnow traps, larval tow net, underwater video, and hydroacoustic techniques.

The primary method for collecting fish was gillnetting utilizing 450-foot (137-m) nets, comprised of 9, 50-foot panels with the following mesh sizes: 1”, 1.5”, 2”, 2.5”, 3”, 3.5”, 4”, 4.5”, and 5”. Three nets were set overnight on February 22-23, 2010. Two nets were set on bottom at depths of 6 and 10 m, whereas the third net ended up suspended in the water column as a result of the intense flows. Four baited minnow traps were set at the bottom of the forebay overnight on February 22-23, 2010 and were intended to catch smaller, bottom dwelling species which may not be caught by gillnets. Sampling for larval fish (and eggs) at the DNGS forebay was completed during the spring (April 15-17, 2010) and summer (July 29-31, 2010). Tows included both day and night sampling. For each event, sampling was undertaken at two locations and at three depths (surface, mid-depth, bottom) using paired tow nets (0.5 m diameter with 363 µm mesh). Surface tows were conducted at approximately 1 m from the surface, mid-depth tows at 3-4 m from the surface and bottom tows at 5-7 m from the surface.

Relative species abundance, size ranges, age classes and densities were determined for captured fish. Walleye, Smallmouth Bass (*Micropterus dolomieu*) and Round Goby were caught in the gillnets and a Spoonhead Sculpin[9] was caught in a minnow trap, during February. Common Carp and Northern Pike were also observed. One Round Whitefish larva and three Round Goby larvae were collected from the larval tows during the spring sampling period. Sculpin eggs were also collected, as well as native and invasive (bloody red shrimp) shrimp species. During the summer sampling period, 102 Round Goby larvae and two Alewife larvae were collected. Native and invasive shrimp species were also collected.

The 2010 DNGS forebay study utilized hydroacoustics to further evaluate the forebay’s fish abundance to allow for an estimation of overall fish densities (SENES and Milne 2010). Hydroacoustic survey transects followed a systematic “zig-zag” design. Additional data was collected along a west-to-east transect through the deepest section of the forebay. Surveys were completed during the day and night time periods and at least three replicates of all transects were completed during each diel period.

Acoustic assessment of the forebay was completed on February 19, 2010 using a Simrad EK60 120 kHz split-beam and an ES60 710 kHz single beam echo-sounder. A number of fish targets were detected throughout the forebay (excluding the west forebay area). Smaller targets (~<10 cm) were observed to be suspended within the water column whereas the larger fish targets appeared to be associated with the bottom. Inspection of the echograms revealed that approximately 10 single target “fish tracks” were detected during the night time surveys (~ 1 to 2 per survey replicate) and approximately 12 single target “fish tracks” were detected during the daytime surveys. No fish “schools” or “shoals” were detected during the daytime surveys. Estimates of total fish abundances (>15 cm) in the forebay ranged up to 154 individuals.

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[9] Probable Slimy Sculpin or Mottled Sculpin. See section 7.3.2.3.1.

Underwater video was collected throughout the DNGS forebay on February 22 and 23, 2010, and along the vegetated areas on the north shore on July 30, 2010. The purpose of the monitoring was to assess the quality of fish habitat afforded within the forebay as well as fish utilization of those habitats. Video was collected along lengthwise transects in the forebay during February and lengthwise transects along the north shore of the forebay in July, where macrophytes and/or attached algae were noted during the February survey.

Fish were present and growing in the forebay and displayed foraging activity. There was no evidence of spawning, and the forebay would be unlikely to support certain fish life history processes including spawning or larval fish development. The forebay did provide habitats for both large and small fish. The larger fish appeared to congregate in the central channel of the west forebay to possibly forage upon prey being drawn into the forebay through the intake. The number of large fish inhabiting the forebay was estimated to be in the hundreds. Fish likely entered via the intake structure at an early age and have continued to grow in the forebay. Similar to other power plants on the Great Lakes, the forebay at Darlington is a man-made structure that is an integral part of the facility. Cooling water is drawn for the power plant as part of electricity production. The high velocities within the intake channel prevent fish from returning to the lake. Therefore, there is no connectivity to the lake other than through the cooling water discharge system. Fish which enter the station are collected on 3/8 in (9 mm) mesh travelling screens, and these fish are recorded as “impinged” fish.

7.3.2.3.8 EMP Monitoring

OPG undertakes annual radiological monitoring within the DNNP Site Study Area including for fish (OPG 2019d). Within the DNNP Site Study Area, fish sampling takes place near the cooling water discharge diffuser and background samples are taken from the Bay of Quinte area of Lake Ontario. The target fish species is White Sucker and eight replicate fish samples are collected and analyzed at each location. In the past, Round Whitefish were sampled in addition to White Sucker, but were discontinued in 2012 due to conservation concerns. A sample consists of the fish muscle tissue only, and excludes the head, skin, fins, and as many bones as possible. Analysis of HTO, C-14, Co-60, Cs-134, Cs-137, and K-40 are performed on each fish sample.

Tritium oxide levels in fish change quickly in response to changes in water HTO concentrations from waterborne emissions. Thus, HTO concentrations measured in fish tissue reflect the HTO concentration in the water in the few hours before they were sampled. In 2018, the HTO in Lake Ontario background fish samples averaged < 2.9 Bq/L, whereas HTO levels in fish samples from the DNNP Site Study Area averaged 9.2 Bq/L (Figure 7-2). Based on the past 10 years of data, a Mann-Kendall trend analysis at the 95% confidence level does not indicate any statistically significant trend for HTO in fish collected within the DNNP Site Study Area.

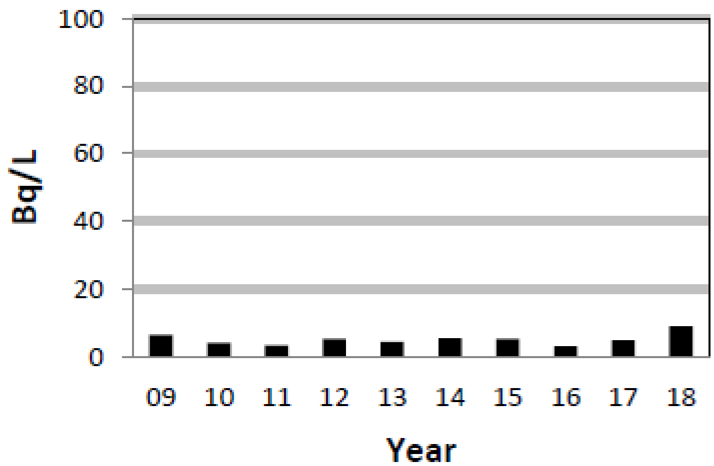

Figure 7-2: DN Annual Average HTO in Fish, 2018

The average C-14 level in fish measured at a background Lake Ontario location was 229 Bq/kg-C in 2018. The concentrations of C-14 in fish within the DNNP Site Study Area was consistent with past years and comparable to background levels. The 2018 annual average C-14 level in fish samples from the DNNP Site Study Area was 256 Bq/kg-C. Based on the past 10 years of data, a Mann-Kendall trend analysis at the 95% confidence level does not indicate any statistically significant trend for C-14 in fish collected within the DNNP Site Study Area (Figure 7-3).

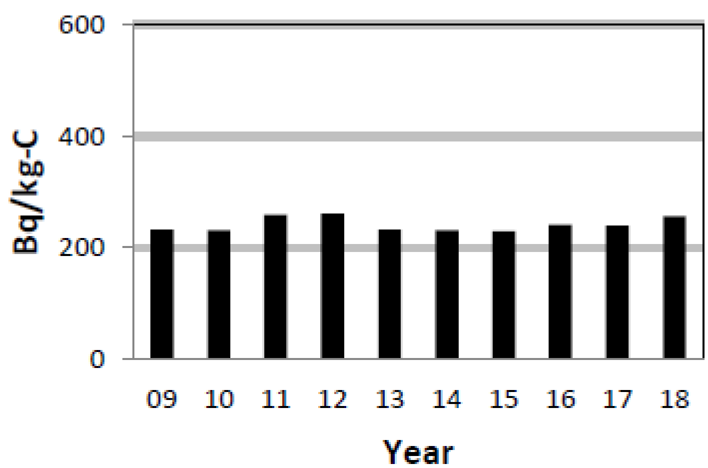

Figure 7-3: DN Annual Average C-14 in Fish, 2018

The majority of the gamma activity in fish is naturally occurring K-40. A small amount of Cs-137 is usually present which is primarily due to nuclear weapons testing and not reactor operation given that Cs-134 and Co-60, which are indicative of reactor operation, were not detected. In 2018, the average Cs-137 value for background Lake Ontario fish was 0.2 Bq/kg. The average Cs-137 value for fish samples from the DNNP Site Study Area was 0.1 Bq/kg and has decreased slightly over time (Figure 7-4). Given the level of uncertainty at such low concentrations, this is not distinguishable from background. Cs-134 and Co- 60, which are indicative of reactor operation, were not detected in any fish samples at the DNNP Site Study Area in 2018.

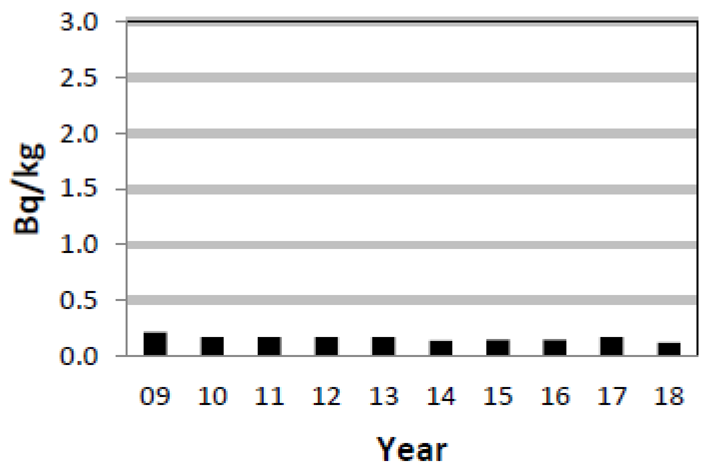

Figure 7-4: DN Annual Average Cs-137 in Fish, 2018

7.3.2.3.9 Lake Ontario Nearshore Aquatic Habitat

The area of Lake Ontario adjacent to the DNNP Site Study Area is similar to the majority of the north shore of the lake and is not distinctive in terms of its physical habitat (SENES 2011e). Habitat exhibits a gently sloping bathymetry, exposed to the effects of waves and currents which scour the substrate, resulting in relatively featureless flat rocky to sandy substrates, with very little fine sediment. This exposed habitat offers sparse physical cover for most fish. The nearshore area habitat use by pelagic and migratory species is generally seasonal. The nearshore fish community is influenced to a limited extent by the seasonal presence of warmwater fish from nearby tributaries, bays and coastal marshes (Golder and SENES 2009).

The nearshore of Lake Ontario at the DNNP Site Study Area slopes gradually, with an average depth of about 10 m, approximately 1 km offshore (SENES 2011e). There are no drop-offs, distinct shoals or other specialised physical habitat features within this area. Wave erosion acting on glacial deposits has created shoreline bluffs, which have deposited the eroded material on the beaches and in the lake. Darlington Creek outlets to Lake Ontario east of the bluffs on the St. Marys property (Golder and SENES 2009).

Extensive stretches of the nearshore are characterised by shallow gravel/cobble beaches (SENES 2011e). Underwater substrates are comprised of clayey glacial till with small areas of bedrock outcrop further offshore. Lag deposits of gravel, cobble and boulder overlay the till and bedrock, and are remnants of erosion of the bluffs and subsequent transport and deposit by wave and current action. Finer sediments are patchy and thin. The exposure of the north shoreline to wind, wave and current action creates a high-energy aquatic environment. The coarse substrates of gravel and cobbles near the beach are frequently displaced during storms.

Underwater video images acquired within the DNNP Site Study Area in 2008 and 2009 indicated that substrates at locations in and immediately-adjacent to the proposed lake infill zone ranged from finer sediment (sand or silt) over bedrock to densely packed cobble and boulders. Attached algae was observed usually attached to dreissenid mussels and no aquatic macrophytes were observed. Similar substrate observations were made within the DNNP Site Study Area for the proposed infill area and in front of DNGS from side-scan sonar conducted in November 2008 (Golder and SENES 2009).

Substrate Classification - Fall 2010

Underwater video of the substrate was recorded on November 1, 2010 at the approximate location of each gillnet set, during nearshore fish community netting within the DNNP Site Study Area during Fall 2010 (see Section 7.2.2.3.2) (SENES 2011a). Similar to the substrate analysis conducted in 2009, the video was analysed for sediment composition, mussel and algae coverage, and macrophyte presence. Fish observed in the video were recorded.

Substrate analysis of the gillnetting sites showed that substrates were fairly consistent between most of the sites, with a moderate to dense small cobble mix on either bedrock or finer sediments predominating as the typical substrate. Mussel and attached algae coverage were typically very dense and ubiquitous at the majority of the sites with a few exceptions. No fish or aquatic macrophytes were observed in any of the video and there did not appear to be a correlation between substrate type and Round Whitefish relative abundance.

Substrate Classification - Spring 2011

Underwater video of the substrate within the DNNP Site Study Area was recorded during May and June, 2011, in conjunction with larval towing (see Section 7.2.2.3.3) (SENES

2011b). Similar to the substrate analysis conducted in 2009 and 2010, the video was analysed for sediment composition, mussel and algae coverage, and macrophyte presence. Distinct changes in sediment composition within each transect were noted and recorded as different substrate types. Each substrate type within a transect was analysed separately. Fish observed in the video were also recorded.

Base substrates within the DNNP Site Study Area consisted of either bedrock or finer sediments. Sediment sizes and densities on top of the base substrate varied greatly across all the sites sampled and, at times, within a single transect. The transects running parallel to the diffuser had bedrock as a base. The presence of smaller surface sediments (sand, gravel, and pebble) was difficult to discern in the vicinity of the DNGS diffuser due to the dense coverage of mussels. Any sediments of cobble and boulder size were usually densely coated with mussels, regardless of location. Attached algae coverage was generally ubiquitous on any sediments pebble size or larger and was at times found on exposed bedrock as well. No aquatic macrophytes were observed along any of the transects. Many fish, mostly small and assumed to be Round Goby or schooling fish, likely Alewife or Rainbow Smelt, were observed throughout the area surveyed and across all transects.

Aquatic Habitat Mapping – Summer 2012/Spring 2013

In support of the proposed DNNP, aquatic habitat within the DNNP Site Study Area in the Lake Ontario was surveyed between July 2012 and May 2013 (see Section 7.2.2.3.2) (HSL 2013a). The focus of the aquatic habitat mapping was offshore from the 10 to 30 m depth contours, and laterally along the shoreline from a point approximately 110 m east of the east border of the DNGS property westward over a distance of 1.5 km. Habitat was surveyed using high resolution multi-beam sonar, sediment sampling, and underwater video to establish the substrate characteristics of the acoustic classes identified during the sonar survey.

The sampling program established preliminary ecological conditions within the lake environment (10-30 m) specifically adjacent to the proposed DNNP. Substrate was variable throughout with some areas dominated by sand and others dominated by a mix of rocky substrates. There did not appear to be any unique habitat features (e.g., rocky shoals or steep drop-offs) that would serve to concentrate fish, with the habitat likely similar to other surrounding areas of Lake Ontario.

Substrate Classification Spring/Summer 2016

Substrate type and general habitat information was collected within the DNNP Site Study Area (mostly in front of DNGS) and reference locations during May and August 2016, coincident with epifauna sampling using an underwater video camera (see Section 7.2.2.2) (EcoMetrix 2016b). Video footage was recorded during daytime sampling events along each benthic tow transect. The video from each tow was visually inspected and the dominant substrate observed was documented according to the relative proportion of boulder/cobble, gravel, sand and clay.

The relative abundance of algae and mussels along each sled tow was also assessed based on observations of the video footage. Abundance was evaluated on a scale of 1 to 5, with 1 being sparse and 5 being very abundant.

No substantial differences in substrate characteristics were noted at any of the individual sampling locations, indicating that the benthic tows were generally completed over similar bottom types during the surveys. Substrate types were also generally consistent across the survey area, with boulder and cobble most often the dominant substrate with sand as the underlying bed material. Hard clay substrates, rather than sand, were more strongly represented within the DNNP Site Study Area as the underlying bed material, compared to reference. Coarse substrates were generally covered with dreissenid mussels across the survey area. In May, where algae were present it was often dead, whereas in August, the algal mat on hard substrates was generally thicker and lusher than was observed during May.

7.3.2.4 Species at Risk

Fish Species at Risk (SAR) are known to reside in Lake Ontario and have been found in the Lake Ontario nearshore within the DNNP Site Study Area. These include:

- Lake Sturgeon (*Acipenser fulvescens*) (Great Lakes – Upper St. Lawrence population) (COSEWIC: threatened; SARA: not listed; Species at Risk Ontario (SARO): endangered): Lake Sturgeon have not been collected from any recent fisheries studies within the DNNP Site Study Area described in Section 7.3.2.3 or 7.3.2.5.2;

- Atlantic Salmon (Lake Ontario population) (COSEWIC: extinct; SARA: not listed; SARO: extinct): While the Lake Ontario population of Atlantic Salmon is extinct, stocking efforts are ongoing to reintroduce the species back to Lake Ontario. Atlantic Salmon (from re-introduction efforts) were collected within the DNNP Site Study Area in 2011 and 2019 (see Sections 7.3.2.3 or 7.3.2.5.2);

- American Eel (COSEWIC: threatened; SARA: not listed; SARO: endangered): An American Eel was collected from DNGS impingement sampling in 2011 (Section 7.3.2.3.6). In 2019, one American Eel was collected through gillnetting from a reference sampling location (Section 7.3.2.5.2.3) and many eels were impinged at DNGS between 2016 and 2019 (S. 7.3.2.3.6). A recovery strategy for the American Eel has been in place since 2014 (DFO 2014); and,

- Deepwater Sculpin (COSEWIC: Special Concern; SARA: Special Concern; SARO: Not at Risk): One Deepwater Sculpin larva was collected in spring 2011 within the DNNP Site Study Area (Section 7.3.2.3.3), some Deepwater Sculpin larvae were entrained in 2016 at DNGS (Section 7.3.2.3.6) and one Deepwater Sculpin larva was collected from larval tows in 2018 within the DNNP Site Study Area (7.3.2.3.4). Data from bottom trawl surveys conducted from 1996 through to 2016 suggest that Deepwater Sculpin populations in Lake Ontario have recovered and current densities and biomass may be similar to those of other Great Lakes (Weidel et al. 2017).

Nearshore Lake Ontario within the DNNP Site Study Area does not contain critical habitat such as spawning or nursery areas for these species at risk. For Lake Sturgeon, the Aquatic Environment Existing Environmental Conditions TSD indicated that collection of large juvenile Lake Sturgeon in the 1990s at the DNNP Site Study Area suggests that general nearshore nursery/foraging habitat exists but would only be part of widely similar available habitat along the north shore. Similarly, for American Eel, nearshore Lake Ontario within the DNNP Site Study Area is only a small proportion of widely available foraging habitat for the species. Deepwater Sculpin are a bottom dwelling species and are primarily found in cold, deeper depths; still larvae may be found more inshore likely due to larval drift.

Overall, the area of Lake Ontario within the DNNP Site Study Area is similar to extensive stretches of the north shore and is not distinct compared to the Local Study Area or Site Study Area in terms of physical habitat and fish community.

7.3.2.5 2019 Studies

7.3.2.5.1 Darlington Creek Tributaries Fish Habitat Assessment

The objectives of this 2019 fish habitat assessment at the intermittent Darlington Creek tributaries were:

1. To assess if the Darlington Creek tributaries (D2 and E) provide habitat for “fish that support” a fishery as connected to Darlington Creek and Lake Ontario; and,

2. To address CNSC’s comment on the 2016 DN ERA that OPG should provide supporting information that the intermittent tributaries do not provide seasonal fish habitat.

Darlington Creek is situated east of the DNNP Site Study Area and flows south, discharging into Lake Ontario between the proposed DNNP and St. Marys Cement Inc. facilities. There are two intermittent tributaries to Darlington Creek (D2 and E) within the DNNP Site Study Area that run from west to east before joining with the creek (Figure 7-5).

Fish habitat surveys of representative reaches of the two Darlington Creek tributaries were undertaken by an experienced fisheries biologist on April 25, 2019. The surveys occurred during the spring period when flow and water quantity are highest (post snow melt) and potential habitat availability is greatest. The timing of the surveys was selected to ensure: water levels / flows were high enough to potentially provide passage to fish; water temperatures had reached a level which was considered suitable for spawning by spring spawning species known to inhabit Darlington Creek (approximately 10 °C); and fish habitat (i.e., substrates, riparian vegetation, etc.) were visible. The surveys included a non-lethal electrofishing assessment of fish habitat potential and measurement of stream flows (discharge). A total of three reaches (upper, mid, lower) were surveyed on each tributary; each reach length was a minimum of 60 m, to ensure spatial representation.

Observations of fish habitat included: channel morphology and bank stability; flow (velocities and calculated discharge); bottom substrate characteristics; in-situ physical and chemical measurements (e.g., temperature, turbidity, dissolved oxygen); occurrence of riparian vegetation; and, occurrence of in-stream cover. Photographs of representative reaches and habitat features were taken.

Fishing was undertaken using a Smith-Root LR-24 backpack electrofisher. In situ water quality measurements were obtained using a YSI EXO1 multiparameter sonde calibrated to manufacturer's specifications prior to use. Flow velocity was measured using a Marsh-McBirney Flomate 2000 and water depth was measured using a meter stick. Channel width and intervals were measured using a tape measure. A Garmin GPSmap 62s was used to record UTM coordinates. Field data collection forms, flow calculations and site photographs are provided in Appendix E.

Figure 7-5: Location of the Upper, Mid and Lower Reach Assessed for the 2019 Darlington Creek Tributaries Fish Habitat Assessment

Tributary D2

The upper reach of Darlington Creek Tributary D2 collects runoff from an adjacent corn field (Figure 7-6). Within the surveyed reach (90 m), situated west of the eastern DNNP property boundary (Figure 7-5), the watercourse has a defined channel averaging 0.5 m wide (Table 7-11). Stream banks were moderately unstable and the gradient was moderate. The stream channel meandered slightly beneath a dense canopy. Substrates were comprised of field stones (boulders) and soil (clayey silt). Some standing water was observed in portions of the channel during the survey; however, the channel was mostly dry. Adjacent land use was agricultural and the dominant terrestrial vegetation observed included willow (*Salix* sp.), ash (*Fraxinus* sp.), dogwood (*Cornus* sp.), maple (*Acer* sp.) and grasses (Poaceae). Electrofishing was not undertaken within this reach as there was not sufficient water present.

Figure 7-6: Upper Reach Darlington Creek Tributary D2 Looking Upstream, 2019

Table 7-11: Darlington Creek Intermittent Tributary Survey Reach Data, 2019

Darlington Creek Tributary	Survey Reach	UTM Coordinates (NAD83, Zone 17T)		Surveyed Length (m)	Mean Velocity (m/s)	Mean Width (m)	Mean Depth (m)
D2	Upper	0684200 E	4861491 N	90	0	0.5	0
	Mid	0684407 E	4861569 N	85	0	1.25	0
	Lower	0684614 E	4861607 N	60	0	N/A	0
E	Upper	0684265 E	4860905 N	75	0.05	1.2	0.10
	Mid	0684532 E	4860704 N	60	0.2	0.65	0.16
	Lower	0684764 E	4860662 N	70	0.25	1	0.10

The mid reach of Darlington Creek Tributary D2 is situated east of the DNNP lands, along an Ontario Hydro transmission line easement (Figure 7-5). At this station, a defined channel approximately 1.25 m wide was observed within a cropped agricultural field (Table 7-11). No water was observed within the grass and shrub lined channel of the 85 m surveyed reach (Figure 7-7). Within the downstream portion of the reach, intermittent drainage from the watercourse flowed across a plowed field. Stream banks were moderately unstable and the gradient was moderate. The stream channel meandered within open to partly open canopy. Substrates were comprised primarily of soil (silty clay) with a few cobbles (field stones). Adjacent land use was agricultural and the dominant terrestrial vegetation observed included willow, dogwood, burdock (*Arctium minus*), grasses and elderberry (*Sambucus canadensis*). Electrofishing was not undertaken within this reach as there was no water present.

Figure 7-7: Mid Reach of Darlington Creek Tributary D2 Looking Upstream, 2019

The lower reach of Darlington Creek Tributary D2 is situated west of Symons Road, downstream of the agricultural field (Figure 7-5). At this station, the channel was braided and undefined, flowing intermittently through a grassy meadow (Figure 7-8). Water flow was absent within the 60 m surveyed reach (Table 7-11) and there was no culvert or stream channel beneath Symons Road. Stream banks were unstable to stable and the gradient was moderate to low. The stream canopy was open to partly open. Substrates were comprised of soil (silty clay). Adjacent land use was agricultural and the dominant terrestrial vegetation observed included grasses, willow, poplar (*Populus* sp.) and Manitoba maple (*Acer negundo*). Electrofishing was not undertaken within this reach as there was not sufficient water present.

Figure 7-8: Lower Reach of Darlington Creek Tributary D2 Looking Upstream, 2019

Tributary E

The upper reach of Darlington Creek Tributary E is fed by drainage ditches flowing within a small wooded area (Figure 7-9). Within the surveyed reach (75 m), situated downstream of the DNNP site access road (Figure 7-5), ponded water was observed, but with very little flow. Initially the channel was defined, averaging 1.2 m wide, 0.1 m deep and 0.05 m/s flow velocity (Table 7-11). Below the wooded area, the channel becomes undefined and flows within a wetland. Stream banks were stable and the gradient was moderate to low. The stream channel was braided and meandering, and the canopy was dense to partly open. Substrates were comprised primarily of clay. Adjacent terrain was primarily meadow and the dominant terrestrial vegetation observed included willow, dogwood and hawthorn (*Crataegus* sp.). The water temperature was 8.9 °C and dissolved oxygen was 8.72 mg/L (Table 7-12). Specific conductance was 583 µS/cm and pH was 8.23. Turbidity was 0.5 NTU and discharge was 0.0044 m^3/s. Electrofishing was not undertaken within this reach as there were no fish observed within the two downstream reaches.

Figure 7-9: Upper Reach of Darlington Creek Tributary E Looking Upstream, 2019

Table 7-12: Darlington Creek Tributary in situ Water Quality and Flow Discharge

Darlington Creek Tributary	Survey Reach	Time	Water Temperature °C	Dissolved Oxygen (mg/L)	Turbidity (NTU)	Specific Conductance (µs/cm)	pH	Flow Discharge (m^3/s)
D2	Upper	-	-	-	-	-	-	0
	Mid	-	-	-	-	-	-	0
	Lower	-	-	-	-	-	-	0
E	Upper	16:23	8.9	8.72	0.5	583	8.23	0.0044
	Mid	14:40	9.4	8.39	1.7	570	8.13	0.0095
	Lower	12:06	8.6	11.37	2.85	671	8.49	0.0135

The mid reach of Darlington Creek Tributary E is situated west of the eastern DNNP property boundary (Figure 7-5). Above the access road, a braided channel flows through a grassy meadow. Downstream of the road culvert, flow within a defined channel was observed (Figure 7-10). Within a 60 m reach, mean channel width was 0.65 m, mean depth was 0.16 m and mean flow velocity was 0.2 m/s (Table 7-11). Stream banks were unstable and the gradient was moderate. The stream canopy was open to partly open and substrates were comprised primarily of silt and clay (soil), with a few cobbles present downstream of the culvert. Adjacent terrain was meadow and the dominant terrestrial vegetation observed included willow, dogwood and grasses. The water temperature was

9.4 °C and dissolved oxygen was 8.39 mg/L (Table 7-12). Specific conductance was 570 µS/cm and pH was 8.13. Turbidity was 1.7 NTU and discharge was 0.0095 m^3/s. No fish were collected during 137 seconds of electrofishing effort within this reach.

Figure 7-10: Mid Reach of Darlington Creek Tributary E Looking Downstream, 2019

The lower reach of Darlington Creek Tributary E is situated on St. Marys Cement Inc. property, east of the DNNP lands (Figure 7-5). The reach extends upstream of the confluence with Darlington Creek. Much of the reach flows within a defined channel with woody riparian vegetation (Figure 7-11). Within a 70 m reach, mean channel width was 1 m, mean depth was 0.1 m and mean flow velocity was 0.25 m/s (Table 7-11). Stream banks were stable to unstable and the gradient was moderate. The stream canopy was dense to partly open and substrates were diverse, comprised of cobble, silt, clay, gravel, sand and boulder. Adjacent land use is industrial and the terrain was meadow and forested lowland. Dominant terrestrial vegetation observed included dogwood, willow, hawthorn and grasses. The water temperature was 8.6 °C and dissolved oxygen was 11.37 mg/L (Table 7-12). Specific conductance was 671 µS/cm and pH was 8.49. Turbidity was 2.85 NTU and discharge was 0.0135 m^3/s. No fish were collected during 347 seconds of electrofishing effort within this reach.

Figure 7-11: Lower Reach of Darlington Creek Tributary E Looking Downstream, 2019

Conclusion

Based on the fisheries and habitat data collected in spring 2019, the intermittent tributaries D2 and E to Darlington Creek do not provide seasonal habitat for fish. Although fish do not reside in these intermittent tributaries, these intermittent tributaries do provide indirect fish habitat, by contributing flow and nutrients downstream to permanent habitat, either in off-site reaches of the tributaries or the main branch of Darlington Creek.

7.3.2.5.2 Nearshore Fish Community 2019

In support of commitment D-P-12.4, an adult fish community assessment was conducted in 2019 to define the local fish community within the DNNP Site Study Area during the spring, summer and fall seasons. This study was consistent with past studies conducted in support of the proposed DNNP EA (SENES and Golder 2009; SENES 2010; SENES 2011a, b, d; SENES 2013). A shoreline habitat use study was also completed using small mesh broadscale nets to establish the contemporary baseline for later use to test for effects of lake infill armouring, if employed, and the effectiveness of mitigation. This data will inform implementation of adaptive management strategies to decrease the environmental impacts of any future development associated with the DNNP.

The objectives of this nearshore baseline gillnetting study were:

1. To collect baseline fish community data in the DNNP Site Study Area and reference locations in the spring, summer, and fall, consistent with the locations sampled in 2009-11, to meet the OPG commitments (D-P-12.4) to conduct adult fish community surveys in the DNNP Site Study Area and reference locations on an ongoing basis, and to pay specific attention to the spring gillnetting results to verify the findings on fish spatial distribution and relatively high native species abundance in the embayment area;

2. To collect baseline fish community data in the proposed infill area to address OPG's commitment (D-P-12.4) to conduct a habitat use study to establish the contemporary baseline for later use to test for effects of lake infill armouring, if employed, and the effectiveness of mitigation. This fish baseline information collected will also be used to support a future *Fisheries Act* Authorization in the infill area, if required.

Fish community assessment (gillnetting) using large mesh gillnets was carried out at six locations (sites A to F) within the DNNP Site Study and at two reference sites, G and H (Figure 7-12; Figure 7-13; Table 7-13). The western reference site is located at Thickson Point, which is offshore of Whitby, ON, approximately 15km to the west of the DNNP Site Study Area. The eastern reference site was located at Bond Head, south of Newcastle, ON, approximately 13 km east of the DNNP Site Study Area (Figure 7-12). These reference sites were the same used in the previous studies from 2010- 2011. Fish community assessment using MNRF small mesh broadscale nets was conducted within the DNNP Site Study Area focused in the proposed infill area (sites I to K; Figure 7-13); the sampling sites were consistent with the past infill survey conducted in 2011.

Fish Community Assessment

The 2019 sampling design for the DNNP Site Study Area and reference locations (large mesh gillnetting; sites A to H) was consistent with past 2009-11 gillnetting studies (SENES and Golder, 2009; SENES, 2010; 2011a, 2011b and 2011c). The 2019 sampling design for the proposed infill area (labelled I to K) using small mesh broadscale nets was consistent with the past infill area sampling conducted in summer 2011 (SENES, 2011c). Sampling was conducted during the spring (April 22nd to May 16th), summer (August 6th to September 6th) and fall (October 28th to November 13th) periods of 2019. In each season, there was 3 sampling events (or replicates). Each sampling event consisted of 11 net sets (locations labelled A to K in Figure 7-12, Figure 7-13 and Table 7-13). Each net was set for a duration of 18-24 hours. Sets at locations A through H consisted of 137 m long experimental gillnets (1.8 m [6 ft] high, 9 mesh panels 15.2 m [50-ft] long, mesh sizes ranging from 25.4 mm [1 inch] to 127 mm [5 inch] in 12.7 mm [0.5 inch] increments). Locations I to K (infill area) were sampled using the MNRF small mesh broadscale nets (1.8 m high, mesh sizes ranging from 12.7 mm [0.5 inch] to 38.1 mm [1.5 inch] in 6.4 mm [0.25

inch] increments). All nets were set approximately perpendicular to shore. The timing of the sampling events each season generally coincided with the timing from the past studies.

Fish morphometrics (weight in grams; fork and total length in mm; gender, if possible; and general fish health [e.g., fin clips, eroded fins, deformities, lamprey scars]) from all fish caught up to a minimum of 20 measurements/species/gillnet when possible, was obtained, consistent with past 2009-11 studies (SENES and Golder 2009; SENES 2010; SENES, 2011a, 2011b, 2011c). Data on water quality parameters (depth, temperature, turbidity and conductivity) were also collected during each net set and retrieval.

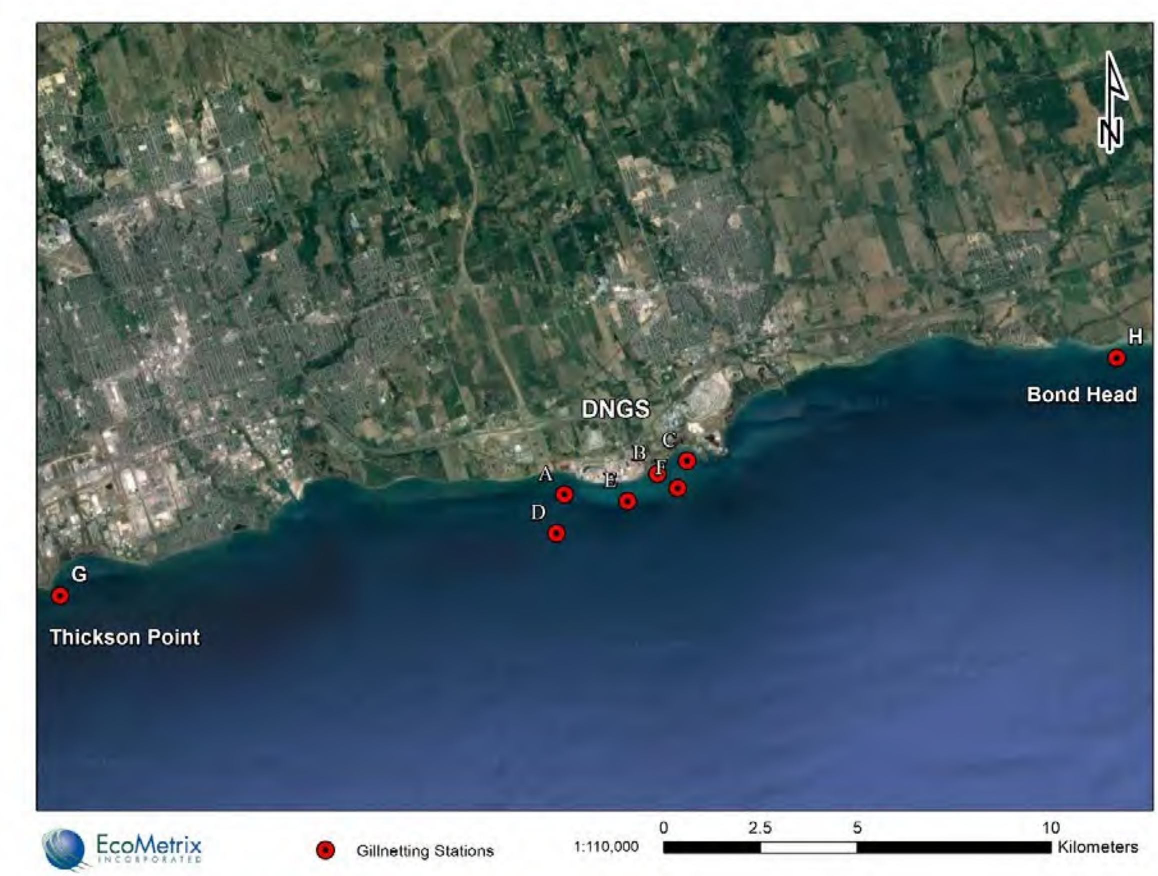

Figure 7-12: DNNP Site Study Area and Reference Gillnetting Sites

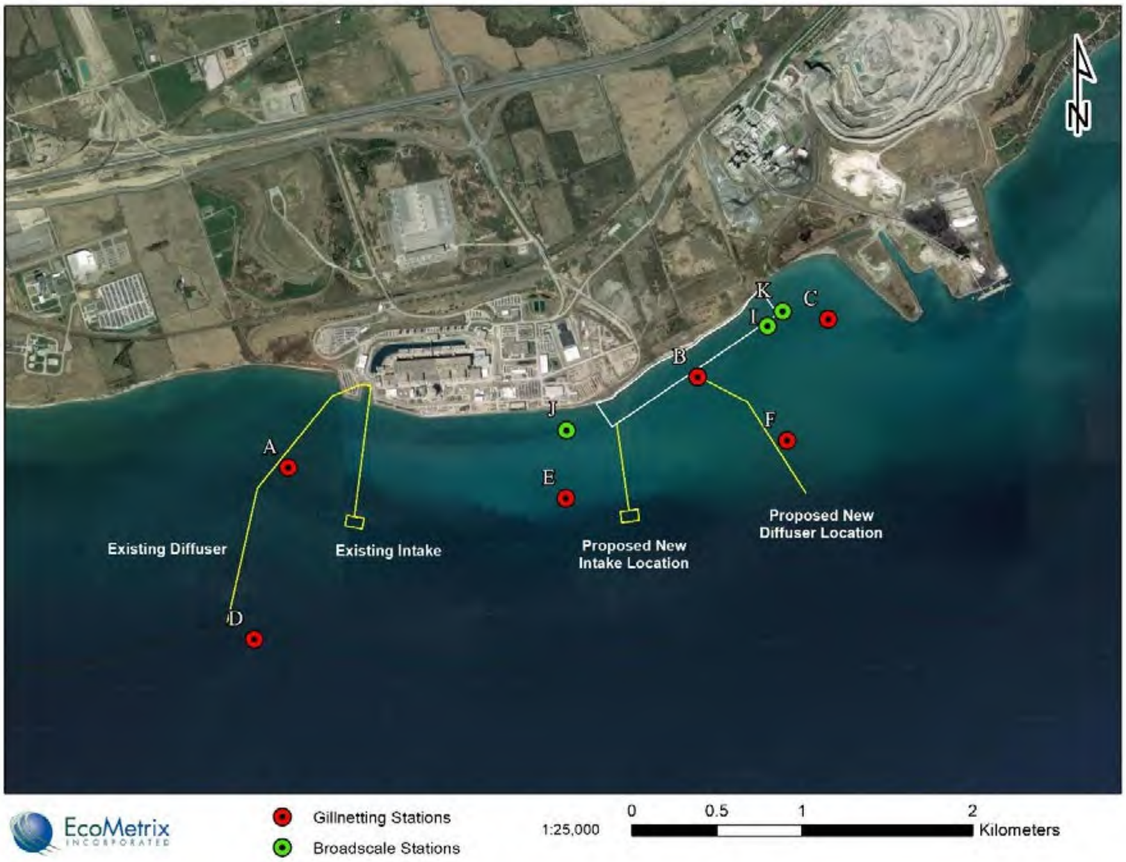

Figure 7-13: Gillnetting Sites A-H and Broadscale Netting Sites I-K in the DNNP Site Study Area

Table 7-13: 2019 Nearshore Gillnetting Sites

Survey Area	Site ID	Approximate Depth (m)	UTM Coordinates (Zone 17T, NAD83)		Comment
			Easting	Northing	
DNNP Site Study Area and Reference Areas (large mesh gillnets)	A	6.5	681969	4859316	Nearshore northern end of existing diffuser
	B	2-3	684370	4859849	Proposed infill area
	C	5	685137	4860187	St. Marys Embayment
	D	15	681769	4858310	Offshore southern end of existing diffuser
	E	10	683599	4859136	Offshore near proposed new intake
	F	8	684895	4859476	Offshore near proposed new diffuser
	G	2	668951	4856700	Reference location #1: Thickson Point
	H	2.1	696233	4862839	Reference location #2: Bond Head
Infill Area within DNNP Site Study Area	I	3	684782	4860147	Outer perimeter of proposed infill area
	J	3.5	683603	4859535	Along existing armour stone wall in front of DN Site
	K	3	684870	4860233	Outer perimeter of proposed infill area

Calculations and Analysis

The following metrics were calculated:

1. Fish species composition and species richness were determined for each sampling site and all sites combined.

2. For each fish species and all fish species combined, the relative abundance (presented as catch per unit effort or CPUE (no. of fish per 24 hours)) was calculated for each sampling site and all sites combined.

3. Summary statistics of morphometrics (length and weight) were calculated (sample size, mean, standard deviation, minimum, and maximum) for each fish species.

All calculations and analyses for species composition, richness, CPUE, and morphometrics were completed using Microsoft® Excel. All statistical analyses were completed using RStudio.

A one-way analysis of variance (ANOVA) was used with CPUE data to determine if any site preferences existed for dominant species, and for the fish community as a whole. Dominant species were identified as any that comprised 25% or more of fish at any sampling location. If a significant effect ($p \leq 0.05$) was found, a range test (Tukey test) was performed to determine site preferences. Normality of CPUE data was assessed using a Shapiro Wilk test. If data was non-normal, a non-parametric Kruskal-Wallis test was used instead of the ANOVA and a non-parametric Dwass-Steel-Chritchlow-Fligner test was used for post hoc comparison instead of a Tukey test.

An ANOVA was also used to determine if there were any morphometric (size and weight) differences in fish caught using large mesh gillnets compared to small mesh broadscale gillnets. Average values for each net type were compared across seasons to determine effect. Normality of CPUE data was assessed using a Shapiro Wilk test. If data was non-normal, a non-parametric Kruskal-Wallis test was used instead of the ANOVA and a non-parametric Dwass-Steel-Chritchlow-Fligner test was used for post hoc comparison instead of a Tukey test.

7.3.2.5.2.1 Spring (Results and Discussion)

Species Composition DNNP Site Study Area Sites A to F

A total of 466 fish, comprising 15 species were caught over three sampling events between April 22nd and May 16th, 2019 at the six sampling sites within the DNNP Site Study Area (A to F) (Table 7-14). Alewife (*Alosa pseudoharengus*) (n=113), Round Goby (*Neogobius melanostomus*) (n=239) and White Sucker (*Catostomus commersonii*) (n=57) comprised approximately 88% of the total catch (Figure 7-14). The remainder of the fish caught (12%) consisted of Gizzard Shad (*Dorosoma cepedianum*) (n=21), Lake Trout (*Salvelinus namaycush*) (n=9), Brown Trout (*Salmo trutta*) (n=8), Atlantic Salmon (*Salmo salar*) (n=4), Lake Chub (*Couesius plumbeus*) (n=4), Rainbow Smelt (*Osmerus mordax*) (n=3), Rainbow Trout (*Oncorhynchus mykiss*) (n=3), Chinook Salmon (*Oncorhynchus tshawytscha*) (n=1), Longnose Sucker (*Catostomus catostomus*) (n=1), Round Whitefish (*Prosopium cylindraceum*) (n=1), Walleye (*Sander vitreus*) (n=1) and White Bass (*Morone chrysops*) (n=1). Species richness at individual sites ranged from 3 species at site A, to 11 species caught at site B. A total of seven (7) species were found in the embayment area (site C).

Table 7-14: Total Fish and Species Richness for Sites within the DNNP Site Study Area (A-F) and Reference Sites (G & H), Spring 2019

Fish Species	A	B	C	D	E	F	G (Ref)	H (Ref)	Total	Total DN	Total Ref
Alewife	2	3	80	1	1	26	3	74	190	113	77
Atlantic Salmon	0	2	0	1	0	1	1	2	7	4	3
Brown Trout	0	4	2	0	0	2	1	0	9	8	1
Chinook Salmon	0	1	0	0	0	0	0	0	1	1	0
Gizzard Shad	0	13	8	0	0	0	0	0	21	21	0
Lake Chub	0	1	3	0	0	0	0	0	4	4	0
Lake Trout	0	1	0	4	0	4	1	1	11	9	2
Longnose Sucker	0	0	0	1	0	0	0	1	2	1	1
Rainbow Smelt	0	0	0	0	3	0	1	1	5	3	2
Rainbow Trout	0	3	0	0	0	0	0	0	3	3	0
Rock Bass	0	0	0	0	0	0	1	0	1	0	1
Round Goby	44	7	13	86	27	62	12	19	270	239	31
Round Whitefish	0	0	0	0	0	1	0	0	1	1	0
Walleye	0	1	0	0	0	0	0	0	1	1	0
White Bass	0	0	1	0	0	0	0	0	1	1	0
White Perch	0	0	0	0	0	0	1	0	1	0	1
White Sucker	1	15	39	0	1	1	5	17	79	57	22
Total	**47**	**51**	**146**	**93**	**32**	**97**	**26**	**115**	**607**	**466**	**141**
Species Richness	3	11	7	5	4	7	9	7	17	15	10

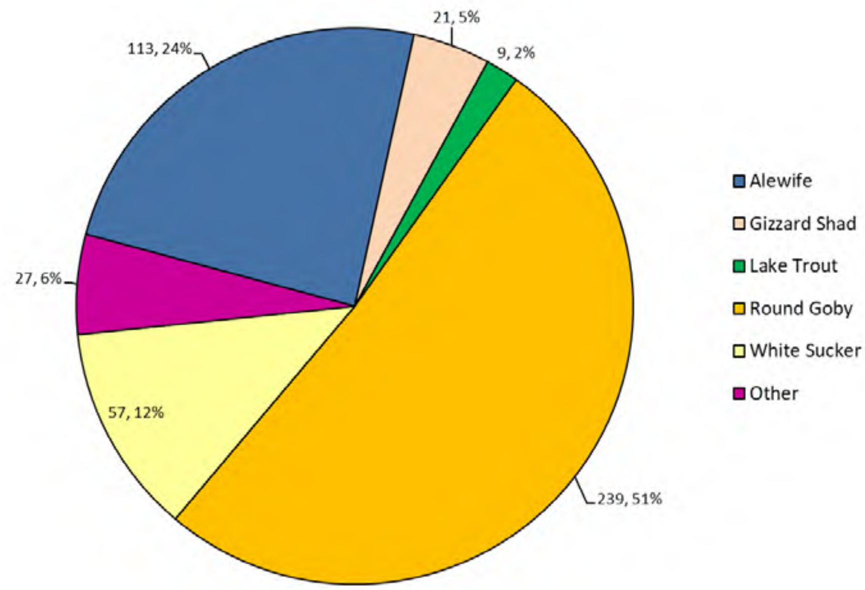

Figure 7-14: Fish Species Composition within the DNNP Site Study Area (A to F), Spring 2019 (n=466)

Species Composition Reference Sites G and H

Fish catch for the two reference sites is presented in Table 7-14. Overall, a total of 141 fish, comprising 10 species were collected at the reference sites. Similar to the sampling sites within the DNNP Site Study Area, Alewife (n=77), Round Goby (n=31) and White Sucker (n=22) were the dominant species at the reference sites and comprised approximately 92% of the total catch (Figure 7-15). The remainder of the fish caught (8%) consisted of Atlantic Salmon (n=3), Lake Trout (n=2), Rainbow Smelt (n=2), Brown Trout (n=1), Longnose Sucker (n=1), Rock Bass (*Ambloplites rupestris*) (n=1) and White Perch (*Morone americana*) (n=1). Species richness at reference sites was 9 at site G and 7 at site H.

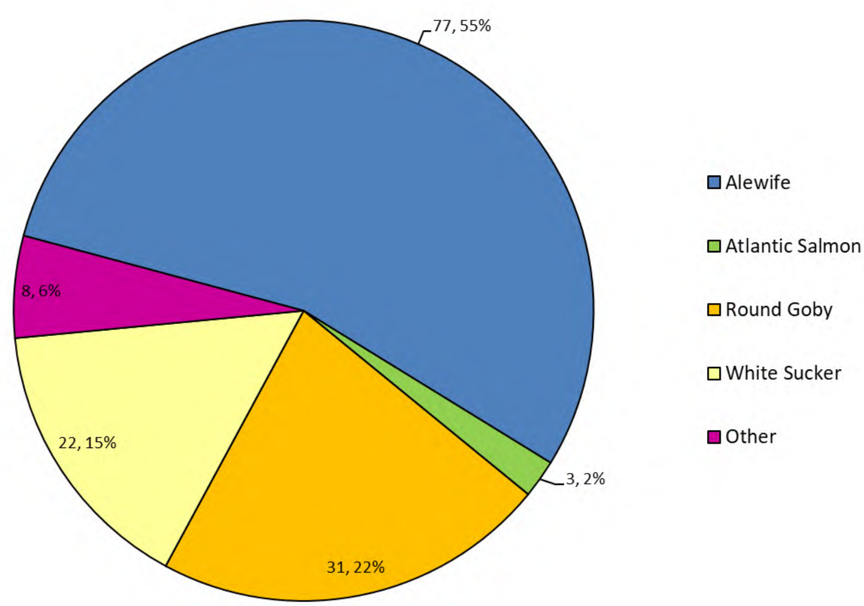

Figure 7-15: Fish Species Composition at the Reference Sites (G and H), Spring 2019 (n=141)

Relative Abundance (CPUE) DNNP Site Study Area Sites A to F

Mean CPUE of all six sites within the DNNP Site Study Area (A to F) was 28.8 fish caught/ 24-hr. Round Goby, Alewife, and White Sucker were the most abundant, with mean CPUE values of 15.0, 6.7, and 3.5 fish/24-hr, respectively (Table 7-15). Total CPUE varied between the sampling sites within the DNNP Site Study Area, ranging from 11.8 fish caught/ 24-hr at site E to 52.8 fish caught/ 24-hr at site C (embayment) (Table 7-15). Higher CPUE values at site C compared to other sampling locations may be due to the sheltered nature of the St. Marys Embayment area. Of the seven species caught at site C, only Lake Chub, White Bass and White Sucker are native species. Lake Chub was only collected at two locations, site C and site B, but were more abundant at site C (1.1 fish/24-hr). White Sucker was collected at all sites with the exception of site D and was by far most abundant at site C (CPUE 14.1 fish/24-hr) compared to the other sites (CPUE 5.8 fish/24-hr or less). White Bass was only collected at site C. Among sites, species CPUE was variable (Table 7-15; Figure 7-16; Figure 7-17). Sites A, D, E and F were dominated by Round Goby, site C was dominated by Alewife, while site B had no species comprising more than 50% of the community CPUE (Figure 7-16). Interestingly, Gizzard Shad was only present at sites C and B (Table 7-15, Figure 7-16; Figure 7-17).

Table 7-15: Standardized Spring 2019 Gillnetting Results, CPUE (fish caught/24-hr)

Fish Species	A	B	C	D	E	F	G (Ref)	H (Ref)	Total DN	Total Ref	Total
Alewife	0.8	1.1	29.0	0.4	0.4	8.8	1.2	25.0	6.7	13.1	8.3
Atlantic Salmon	0.0	0.8	0.0	0.4	0.0	0.3	0.4	0.8	0.2	0.6	0.3
Brown Trout	0.0	1.5	0.7	0.0	0.0	0.7	0.4	0.0	0.5	0.2	0.4
Chinook Salmon	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Gizzard Shad	0.0	5.0	2.9	0.0	0.0	0.0	0.0	0.0	1.3	0.0	1.0
Lake Chub	0.0	0.4	1.1	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2
Lake Trout	0.0	0.4	0.0	1.6	0.0	1.4	0.4	0.4	0.6	0.4	0.5
Longnose Sucker	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.4	0.1	0.2	0.1
Rainbow Smelt	0.0	0.0	0.0	0.0	1.1	0.0	0.4	0.3	0.2	0.4	0.2
Rainbow Trout	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.1
Rock Bass	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.2	0.0
Round Goby	16.2	2.7	4.7	33.7	9.9	23.0	4.9	6.6	15.0	5.7	12.7
Round Whitefish	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.1	0.0	0.0
Walleye	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
White Bass	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
White Perch	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.2	0.0
White Sucker	0.3	5.8	14.1	0.0	0.3	0.4	2.0	6.0	3.5	4.0	3.6
Total	**17.4**	**19.5**	**52.8**	**36.4**	**11.8**	**35.0**	**10.4**	**39.4**	**28.8**	**24.9**	**27.8**
Species Richness	3	11	7	5	4	7	9	7	15	10	17

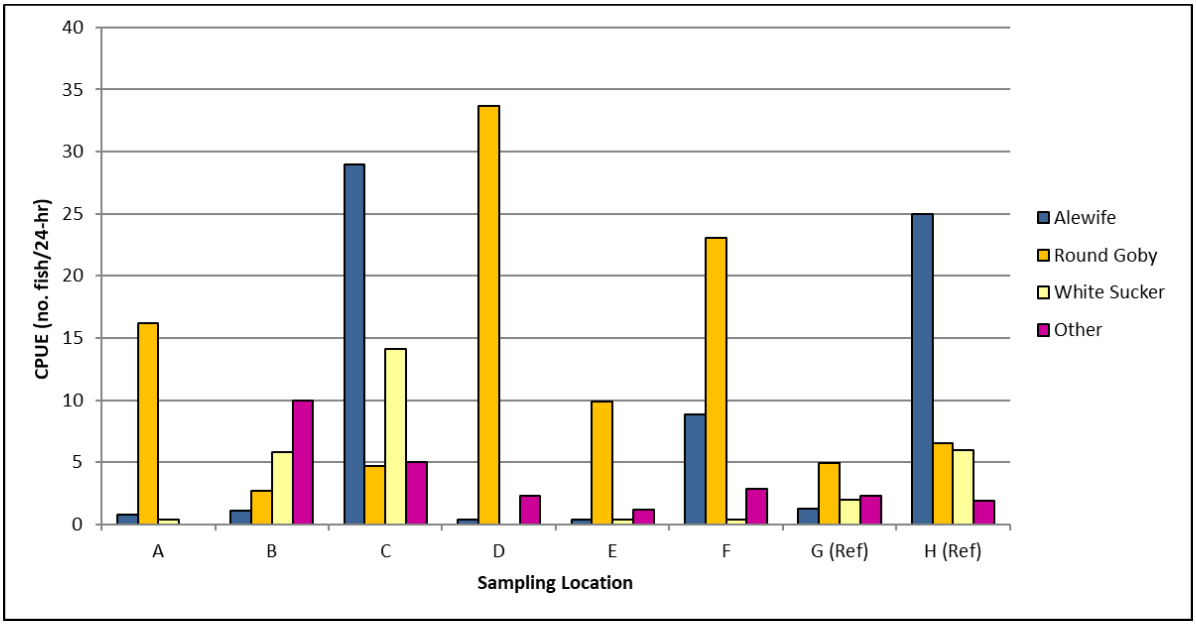

Figure 7-16: Distribution of Fish Captured Across the DNNP Site Study Area Sampling Sites (A-F) and Reference Location Sites (G & H), Spring 2019

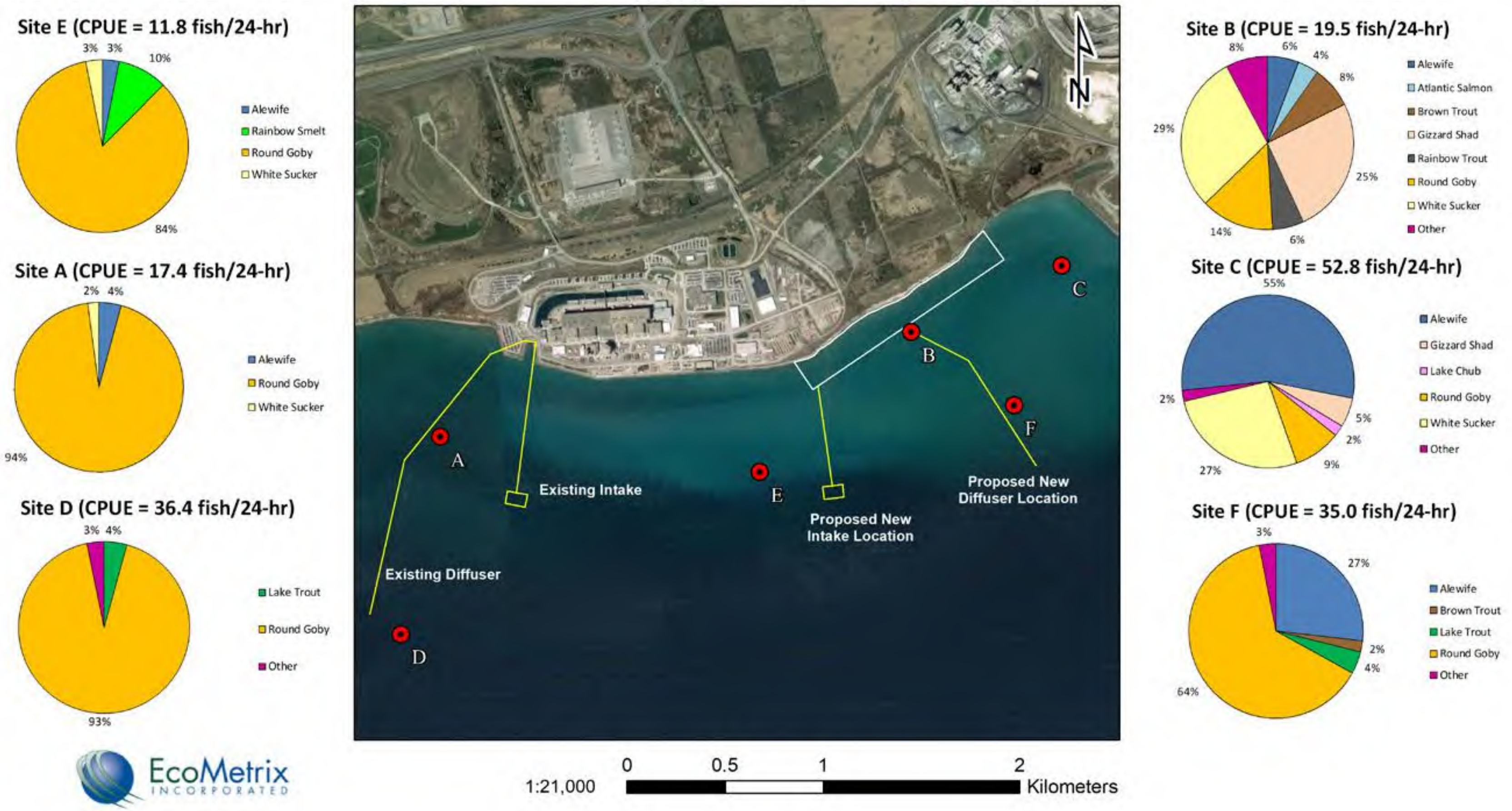

Figure 7-17: Comparison of Relative Abundance (CPUE) of Fish at the Six Sampling Sites (A-F) within the DNNP Site Study Area, Spring 2019

Relative Abundance (CPUE) Reference Sites G and H

The mean CPUE of the two reference sites (G and H) was 24.9 fish caught/ 24-hr. Total CPUE was higher at site H (39.4 fish caught/ 24-hr) than at site G (10.4 fish caught/ 24-hr) (Table 7-15). Round Goby, Alewife, and White Sucker were the most abundant, with mean CPUE values of 13.1, 5.7, and 4.0 fish caught/ 24-hr, respectively (Table 7-15). The CPUE for each species was variable between the two reference sites (Figure 7-16; Figure 7-18). The CPUE at reference site G was dominated by Round Goby, while the CPUE at site H was dominated by Alewife (Figure 7-16; Figure 7-18).

Morphometrics (Sites A-H)

The summary statistics of fork length and weight of all fish species captured during spring sampling are presented in Table 7-16. The longest fish was a Lake Trout (fork length of 86.8 cm) and the shortest fish was a Round Goby (fork length of 7.7 cm; Table 7-16). Similarly, the heaviest fish was a Lake Trout (8,870 g) and the lightest fish was a Round Goby (4.0 g; Table 7-16).

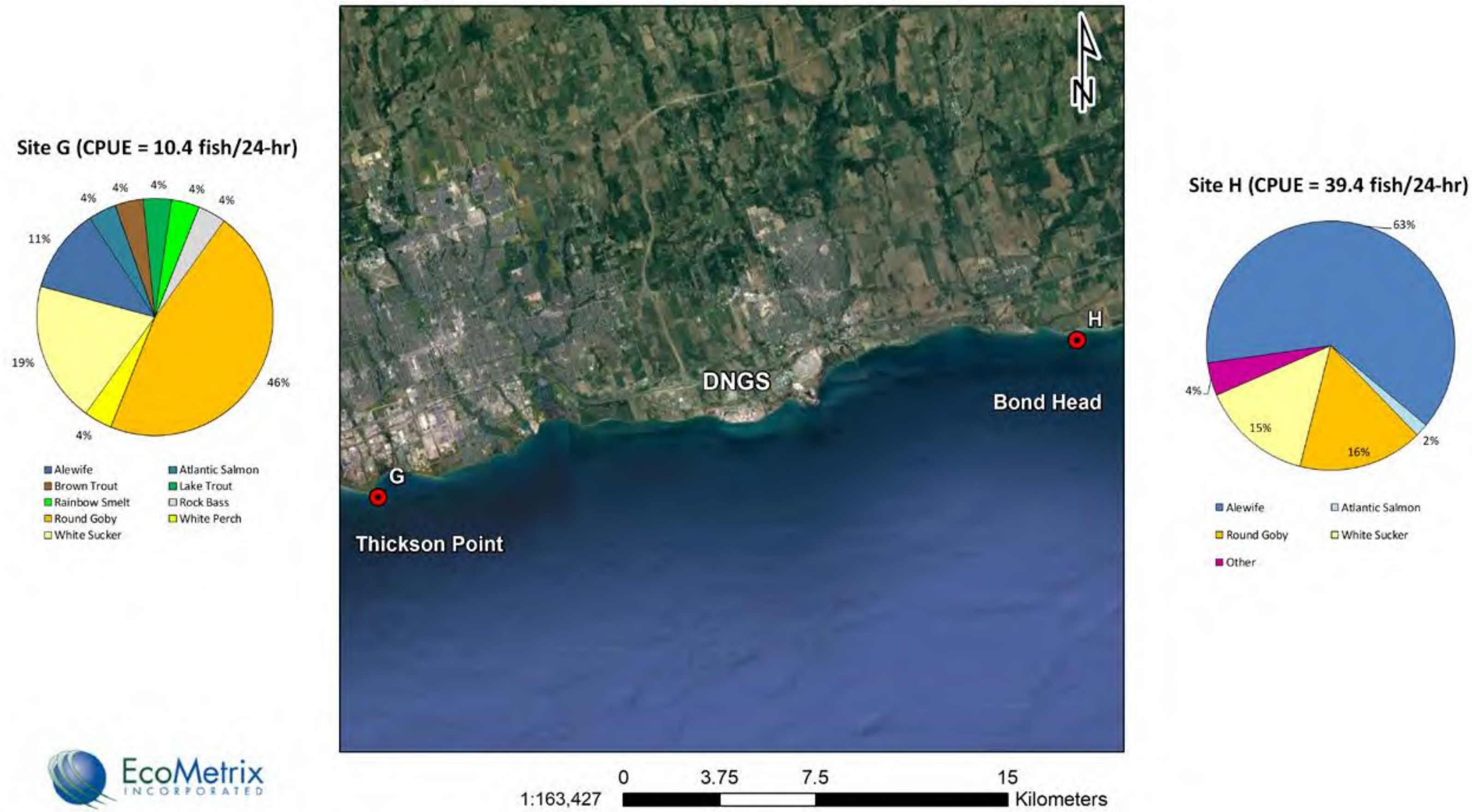

Figure 7-18: Comparison of Relative Abundance (CPUE) of Fish at the Two Reference Sampling Sites (G & H), Spring 2019

Table 7-16: Fish Species Morphometrics at the DNNP Site Study Area and Reference Locations (Sites A-H), Spring 2019

	Fish Species	Alewife	Atlantic Salmon	Brown Trout	Chinook Salmon	Gizzard Shad	Lake Chub	Lake Trout	Longnose Sucker	Rainbow Smelt	Rainbow Trout	Rock Bass	Round Goby*	Round Whitefish	Walleye	White Bass	White Perch	White Sucker
GROUPED	Count	190	7	9	1	21	4	11	2	5	3	1	270	1	1	1	1	79
	Mean Fork Length (cm)	14.5	51.3	55.1	78.0	38.3	14.6	63.1	37.0	14.4	50.6	19.1	10.2	46.0	69.0	34.2	25.0	35.4
	Std. Dev.Fork Length (cm)	0.9	11.3	5.1	-	3.5	3.1	13.9	5.4	0.6	33.8	-	5.6	-	-	-	-	6.9
	Max Fork Length (cm)	17.9	68.3	62.7	-	44.5	17.3	86.8	40.8	15.0	72.2	-	18.6	-	-	-	-	47.7
	Min Fork Length (cm)	13.2	38.8	48.3	-	33.2	10.2	48.5	33.2	13.4	11.6	-	7.7	-	-	-	-	11.0
	Mean Weight	31.6	1771.4	2506.7	7030.0	888.6	42.8	4059.1	790.0	19.8	2857.0	120.0	17.7	1040.0	3820.0	820.0	300.0	643.0
	St. Dev. Weight	9.3	1123.0	1062.8	-	266.4	19.6	2703.6	381.8	4.0	2505.5	-	14.6	-	-	-	-	327.6
	Max Weight	72.0	3630.0	4300.0	7030.0	1520.0	60.0	8870.0	1060.0	26.0	4730.0	120.0	99.0	1040.0	3820.0	820.0	300.0	1420.0
	Min Weight	14.0	650.0	1350.0	7030.0	540.0	15.0	1250.0	520.0	15.0	11.0	120.0	4.0	1040.0	3820.0	820.0	300.0	15.0
DN	Count	113	4	8	1	21	4	9	1	3	3	-	239	1	1	1	-	57
	Mean Fork Length (cm)	14.9	49.3	54.6	78.0	38.3	14.6	65.5	33.2	14.3	50.6	-	10.2	46.0	69.0	34.2	-	34.3
	Std. Dev.Fork Length (cm)	0.6	9.9	5.2	-	3.5	3.1	14.3	-	0.8	33.8	-	5.9	-	-	-	-	7.1
	Max Fork Length (cm)	17.9	58.9	62.7	-	44.5	17.3	86.8	-	15.0	72.2	-	18.6	-	-	-	-	47.7
	Min Fork Length (cm)	13.2	40.1	48.3	-	33.2	10.2	50.2	-	13.4	11.6	-	7.7	-	-	-	-	11.0
	Mean Weight	36.3	1505.0	2383.8	7030.0	888.6	42.8	4514.4	520.0	18.0	2857.0	-	17.9	1040.0	3820.0	820.0	-	589.3
	St. Dev. Weight	6.0	958.7	1065.6	-	266.4	19.6	2776.6	-	2.6	2505.5	-	14.6	-	-	-	-	318.8
	Max Weight	72.0	2350.0	4300.0	7030.0	1520.0	60.0	8870.0	520.0	20.0	4730.0	-	99.0	1040.0	3820.0	820.0	-	1420.0
	Min Weight	14.0	650.0	1350.0	7030.0	540.0	15.0	1830.0	520.0	15.0	11.0	-	4.0	1040.0	3820.0	820.0	-	15.0
REF	Count	77	3	1	-	-	-	2	1	2	-	1	31	-	-	-	1	22
	Mean Fork Length (cm)	13.9	54.0	59.0	-	-	-	52.4	40.8	14.7	-	19.1	10.0	-	-	-	25.0	38.3
	Std. Dev.Fork Length (cm)	1.0	14.8	-	-	-	-	5.5	-	0.1	-	-	2.0	-	-	-	-	5.4
	Max Fork Length (cm)	17.1	68.3	59.0	-	-	-	56.3	-	14.7	-	-	18.2	-	-	-	-	46.3
	Min Fork Length (cm)	13.3	38.8	59.0	-	-	-	48.5	-	14.6	-	-	8.7	-	-	-	-	27.0
	Mean Weight	24.7	2126.7	3490.0	-	-	-	2010.0	1060.0	22.5	-	120.0	16.0	-	-	-	300.0	782.3
	St. Dev. Weight	9.0	1439.9	-	-	-	-	1074.8	-	4.9	-	-	14.5	-	-	-	-	315.5
	Max Weight	52.0	3630.0	-	-	-	-	2770.0	1060.0	26.0	-	120.0	86.0	-	-	-	300.0	1310.0
	Min Weight	19.0	760.0	-	-	-	-	1250.0	1060.0	19.0	-	120.0	10.0	-	-	-	300.0	260.0

Fork length for Alewife and total length for Round Goby were estimated with length to weight ratio if catches exceeded 20 per net
GROUPED= Sites A to H grouped, DN = Darlington Nuclear sited A to F, REF = Reference sited G and H
*values are for total length

Statistical Analysis of CPUE DNNP Site Study Area and Reference Locations (Sites A to H)

Due to the non-normality of the spring 2019 CPUE data a Kruskal Wallis test (non-parametric test) was used to determine if any site preferences exist for dominant species, and for the fish community as a whole. Species identified as being dominant (>25% total number at any location) were Alewife, Round Goby, White Sucker and Gizzard Shad. There was no significant difference in the full fish community CPUE found across sites in spring (p=0.47), indicating that there is no site preference for the community as a whole (Table 7-17). Alewife and Round Goby showed no statistical differences across sites (p>0.05); however, White Sucker and Gizzard Shad did result in significant difference among sites (Table 7-17). Interestingly, a post hoc test to determine specific site differences revealed that no sampling locations were significantly different (Table 7-17). Therefore, no species demonstrated site preferences during spring.

Table 7-17: Statistical Summary of the Kruskal-Wallis Test to Determine Spring Fish Community and Dominant Species Site Preferences

Parameter	Kruskal-Wallis			Dwass-Steel-Chritchlow-Fligner Test
	DF	Chi^2	P	
CPUE	7	6.59	0.47	-
Alewife	7	2.51	0.92	-
Round Goby	7	6.39	0.49	-
White Sucker	7	17.91	0.01	No preference
Gizzard Shad	7	18.98	<0.01	No preference

Infill Area Species Composition at Sites I to K

Based on raw catch data, a total of 93 fish, comprising 5 species, were caught among the three infill area sites (I to K; Table 7-18) within the DNNP Site Study Area during the spring. Alewife (n=63) and Round Goby (n=24) comprised approximately 94% of the total catch (Figure 7-19 and Table 7-18). The remaining species caught were Rainbow Smelt (n=3), Threespine Stickleback (*Gasterosteus aculeatus*) (n=2) and Lake Chub (n=1). Species richness per location ranged between 3 and 5 (Table 7-18).

Table 7-18: Total Fish Catch and Species Richness for Infill Sites (I-K), Spring 2019

Fish Species	I	J	K	Total
Alewife	9	37	17	63
Lake Chub	0	0	1	1
Rainbow Smelt	1	1	1	3
Round Goby	11	10	3	24
Three Spine Stickleback	0	0	2	2
Total	21	48	24	93
Species Richness	3	3	5	5

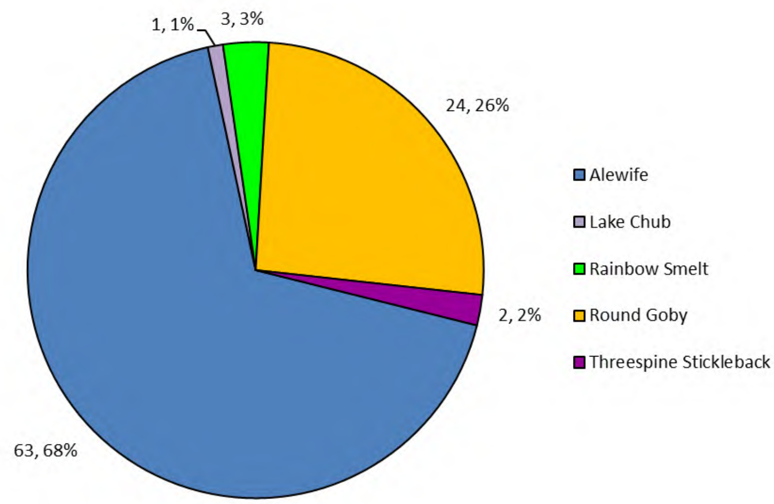

Figure 7-19: Fish Species Composition at the Infill Sites (I-K), Spring 2019 (n=93)

Infill Area Relative Abundance (CPUE) at Sites I-K

The relative abundance (i.e., standardized catch data), presented as CPUE, indicated that Alewife and Round Goby were the most abundant species in the infill area (Table 7-19). Alewife had the highest mean CPUE value of 7.7 fish caught/ 24-hr but varied among sites (Figure 7-20). Mean CPUE of all three infill area sites (I to K) was 11.3 fish caught/ 24-hr. Alewife had the highest CPUE at sites J and K, while Round Goby had the highest CPUE at site I. Overall, CPUE was highest at site J (18.5 fish caught/ 24-hr) compared to the other two sites in the infill area (Table 7-19; Figure 7-20). Site I was co-dominated by Alewife and Round Goby, while Sites J and K were dominated by Alewife (Figure 7-21).

Table 7-19: CPUE (fish caught/24-hr) of Fish Collected in the Proposed Infill Area (I to K), Spring 2019

Fish Species	I	J	K	Mean
Alewife	3.1	14.4	5.7	7.7
Lake Chub	0.0	0.0	0.3	0.1
Rainbow Smelt	0.4	0.4	0.3	0.4
Round Goby	3.9	3.7	1.0	2.9
Threespine Stickleback	0.0	0.0	0.7	0.2
Total	**7.3**	**18.5**	**8.1**	**11.3**

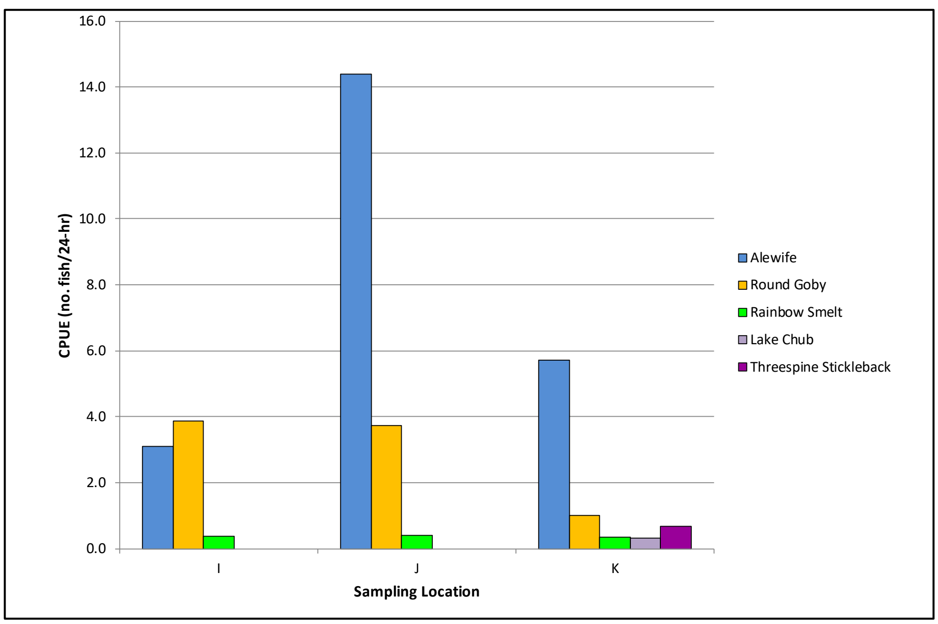

Figure 7-20: Distribution of Fish Captured Across Infill (I-K) Sites, Spring 2019

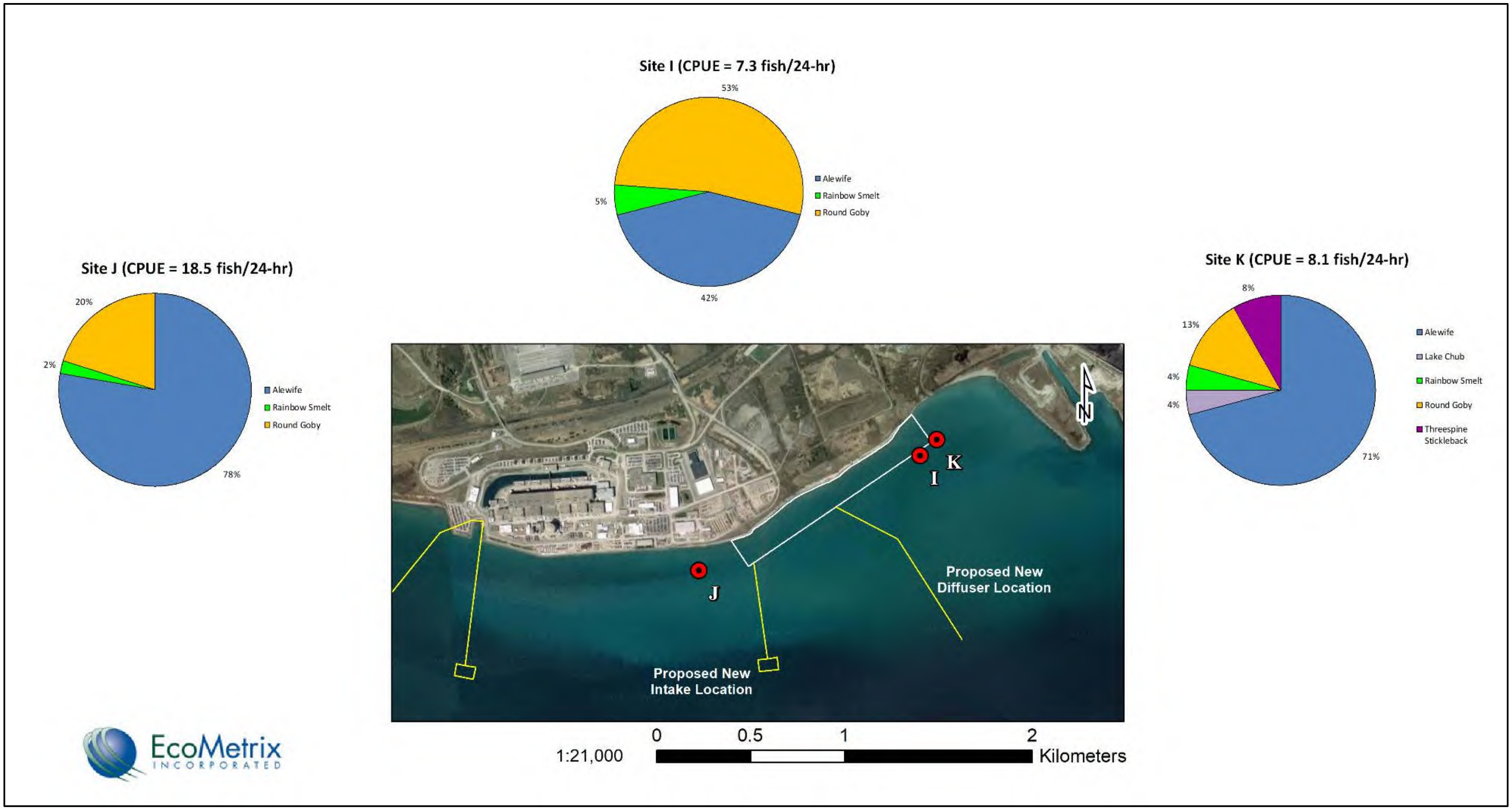

Figure 7-21: Comparison of Relative Abundance (CPUE) of Fish Collected at the Infill Sites (I-K), Spring 2019

Infill Area Morphometrics (Sites I-K)

The summary statistics of fork length and weight of all fish species captured during spring sampling are presented in Table 7-20. The longest fish was an Alewife (fork length of 17.1 cm) and the shortest fish was a Threespine Stickleback (fork length of 5.4 cm). Similarly, the heaviest fish was an Alewife (46.0 g) and the lightest fish was a Threespine Stickleback (2.0 g; Table 7-20).

Table 7-20: Fish Species Morphometrics from Broadscale Nets (Sites I-K), Spring 2019

Fish Species		Fork Length (cm)				Weight (g)			
	Count	Mean Fork Length	Std. Dev. Fork Length	Max	Min	Mean Weight	Std. Dev. Weight	Max	Min
Alewife	63	13.9	1.8	17.1	7.8	28.8	9.3	46.0	4.0
Lake Chub*	1	13.5	-	-	-	32.0	-	-	-
Rainbow Smelt	3	14.5	0.7	15.1	13.7	23.3	2.5	26.0	21.0
Round Goby	24	10.1	1.2	11.6	7.1	15.4	5.4	23.0	5.0
Three Spine Stickleback	2	6.1	1.0	6.8	5.4	2.5	0.7	3.0	2.0

Note: Fork length for Alewife were estimated with length to weight ratio if catches exceeded 20 per net.

*values are for a single measurement only.

Round Goby measures are based on total length.

7.3.2.5.2.2 Summer (Results and Discussion)

Species Composition DNNP Site Study Area Sites A to F

A total of 565 fish, comprising 12 species were caught over three sampling events between August 6th and September 6th, 2019 at the six study locations (A to F) within the DNNP Site Study Area (Table 7-21). Alewife (n=270), Round Goby (n=186) and White Sucker (n=52) comprised approximately 90% of the total catch (Figure 7-22). The remainder of the fish caught (10%) consisted of Gizzard Shad (n=22), Lake Trout (n=9), Rock Bass (n=8), Walleye (*Sander vitreus*), Lake Chub (n=5), Yellow Perch (*Perca flavascens*) (n=3), Brown Bullhead (*Ameiurus nebulosus*) (n=1), Chinook Salmon (n=1) and Longnose Sucker (n=1). Species richness at individual sites ranged from 4 species at sites A, E and F, to 9 species caught at site C (St. Marys Embayment).

Table 7-21: Total Fish and Species Richness for Sites within the DNNP Site Study Area (A-F) and Reference Sites (G & H), Summer 2019

Fish Species	A	B	C	D	E	F	G	H	Total	Total DN	Total REF
Alewife	94	19	53	4	30	70	10	392	672	270	402
Brown Bullhead	0	0	1	0	0	0	3	0	4	1	3
Brown Trout	0	0	0	0	0	0	0	3	3	0	3
Chinook Salmon	1	0	0	0	0	0	0	2	3	1	2
Gizzard Shad	0	3	19	0	0	0	0	0	22	22	0
Lake Chub	0	0	5	0	0	0	0	0	5	5	0
Lake Trout	0	4	2	0	1	2	0	5	14	9	5
Longnose Sucker	0	0	0	1	0	0	0	0	1	1	0
Rock Bass	0	2	6	0	0	0	4	0	12	8	4
Round Goby	6	4	10	141	10	15	2	0	188	186	2
Walleye	0	6	0	1	0	0	0	0	7	7	0
White Sucker	20	16	12	1	2	1	1	20	73	52	21
Yellow Perch	0	0	3	0	0	0	0	1	4	3	1
Total	**121**	**54**	**111**	**148**	**43**	**88**	**20**	**423**	**1008**	**565**	**443**
Species Richness	4	7	9	5	4	4	5	6	13	12	9

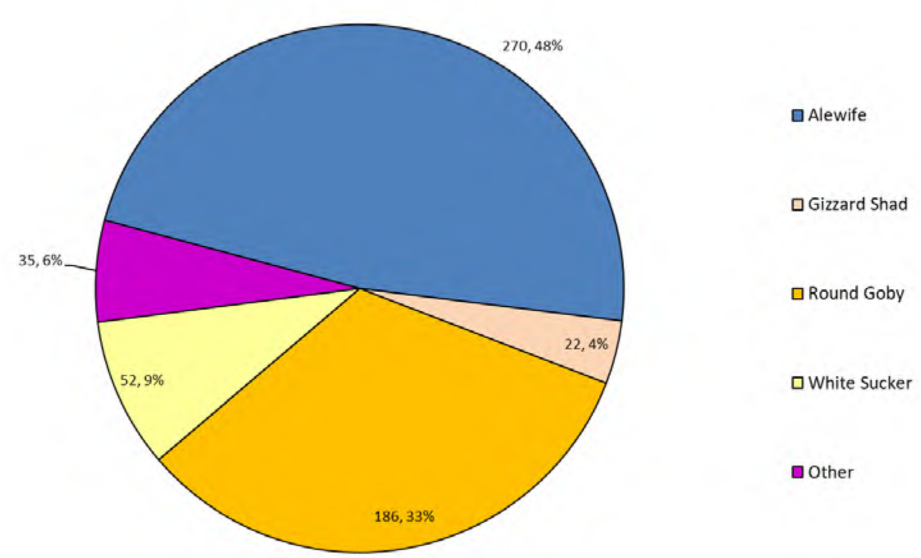

Figure 7-22: Fish Species Composition within the DNNP Site Study Area (A to F), Summer 2019 (n=565)

Species Composition Reference Sites G and H

Fish catch for the two reference sites is presented in Table 7-21. Overall, a total of 443 fish, comprising 9 species were collected at the reference sites. Alewife (n=402) were by far the most dominant species, comprising 91% of the total catch (Figure 7-23). The remainder of the fish caught (9%) consisted of White Sucker (n=21), Lake Trout (n=5), Rock Bass (n=4), Brown Bullhead (n=3), Brown Trout (n=3), Chinook Salmon (n=2), Round Goby (n=2) and Yellow Perch (n=1). Species richness at reference sites was 5 species at site G and 6 species at site H.

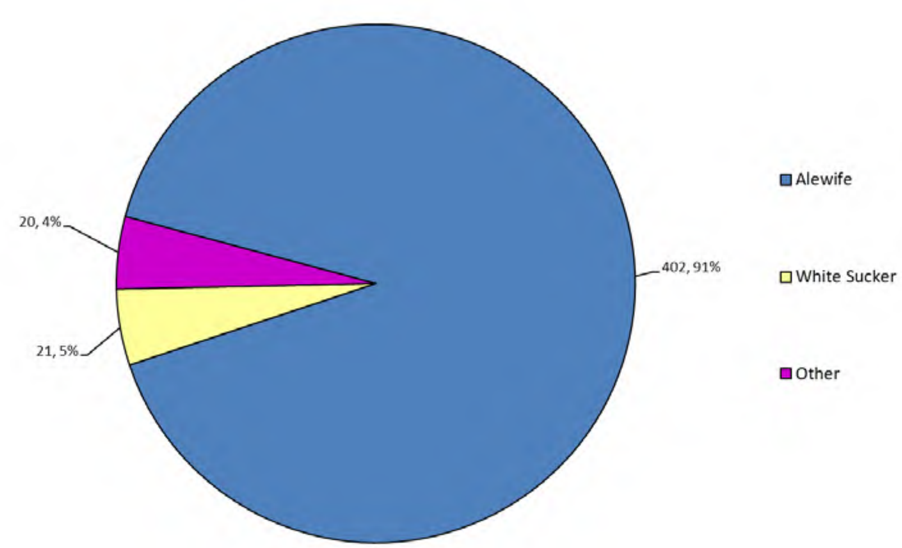

Figure 7-23: Fish Species Composition at the Reference Sites (G and H), Summer 2019 (n=443)

Relative Abundance (CPUE) DNNP Site Study Area Sites A to F

Mean CPUE of all six sampling sites (A to F) within the DNNP Site Study Area was 38.1 fish caught/ 24-hr. Alewife, Round Goby, and White Sucker were the most abundant, with mean CPUE values of 18.3 fish caught/ 24-hr, 12.2 fish caught/ 24-hr, and 3.7 fish caught/ 24-hr, respectively (Table 7-22). Similar to spring, the lowest CPUE value was found at site E (16.6 fish caught/ 24-hr); however, the highest was found at site D (58.0 fish caught/ 24-hr) (Table 7-22). CPUE was 47.3 fish caught/ 24-hr at site C (St. Marys Embayment). Of the nine species caught at site C, Brown Bullhead, Lake Chub, Lake Trout, Rock Bass, White Sucker and Yellow Perch are native species, comprising 26% of the total catch. Among sites, species CPUE was variable (Table 7-22; Figure 7-24; Figure 7-25). Sampling sites A, E and F were dominated by Alewife, site D was dominated by Round Goby, while sites B and C (St. Marys Embayment) had no one species that comprised more than 50% of the total CPUE for that site (Figure 7-25). Site C was the most diverse (n=9), followed by site B (n=7) (Table 7-22, Figure 7-25).

Relative Abundance (CPUE) Reference Sites G and H

The mean CPUE of the two reference sites (G and H) was 76.0 fish caught/ 24-hr. Total CPUE was much higher at site H (144.1 fish caught/ 24-hr) than at site G (7.8 fish caught/ 24-hr) (Table 7-22). Alewife and White Sucker were the most abundant, with mean CPUE values of 68.5 fish caught/ 24-hr and 3.7 fish caught/ 24-hr, respectively (Table 7-22). The CPUE for each species was variable between the two reference sites (Table 7-22; Figure 7-26). Alewife comprised 50% or more of the CPUE at both reference sites (Table 7-22; Figure 7-26).

Table 7-22: Standardized Summer 2019 Gillnetting Results, CPUE (fish caught/24-hr)

Fish Species	A	B	C	D	E	F	G (Ref)	H (Ref)	DN (mean)	REF (mean)	ALL (mean)
Alewife	37.1	7.7	23.1	1.6	11.6	28.9	3.9	133.1	18.3	68.5	30.9
Brown Bullhead	0.0	0.0	0.4	0.0	0.0	0.0	1.2	0.0	0.1	0.6	0.2
Brown Trout	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.6	0.1
Chinook Salmon	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.1	0.4	0.1
Gizzard Shad	0.0	1.2	7.7	0.0	0.0	0.0	0.0	0.0	1.5	0.0	1.1
Lake Chub	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.3
Lake Trout	0.0	1.7	0.8	0.0	0.4	0.8	0.0	1.7	0.6	0.8	0.7
Longnose Sucker	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Rock Bass	0.0	0.8	2.6	0.0	0.0	0.0	1.6	0.0	0.6	0.8	0.6
Round Goby	2.4	1.7	4.3	55.3	3.9	5.8	0.8	0.0	12.2	0.4	9.3
Walleye	0.0	2.6	0.0	0.4	0.0	0.0	0.0	0.0	0.5	0.0	0.4
White Sucker	8.5	6.7	5.3	0.4	0.7	0.4	0.4	7.1	3.7	3.7	3.7
Yellow Perch	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.3	0.2	0.2	0.2
Total	**48.4**	**22.5**	**47.3**	**58.0**	**16.6**	**35.9**	**7.8**	**144.1**	**38.1**	**76.0**	**47.6**
Species Richness	4	7	9	5	4	4	5	6	13	12	9

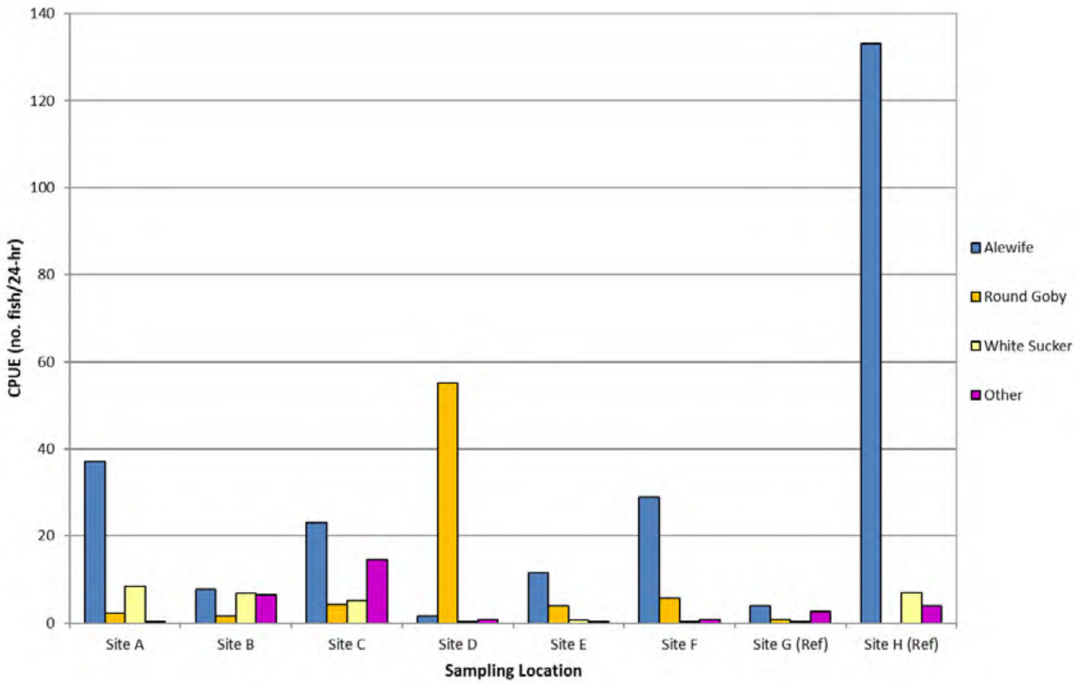

Figure 7-24: Distribution of Fish Captured Across DNNP Site Study Area Sampling Sites (A-F) and Reference Location Sites (G & H), Summer 2019

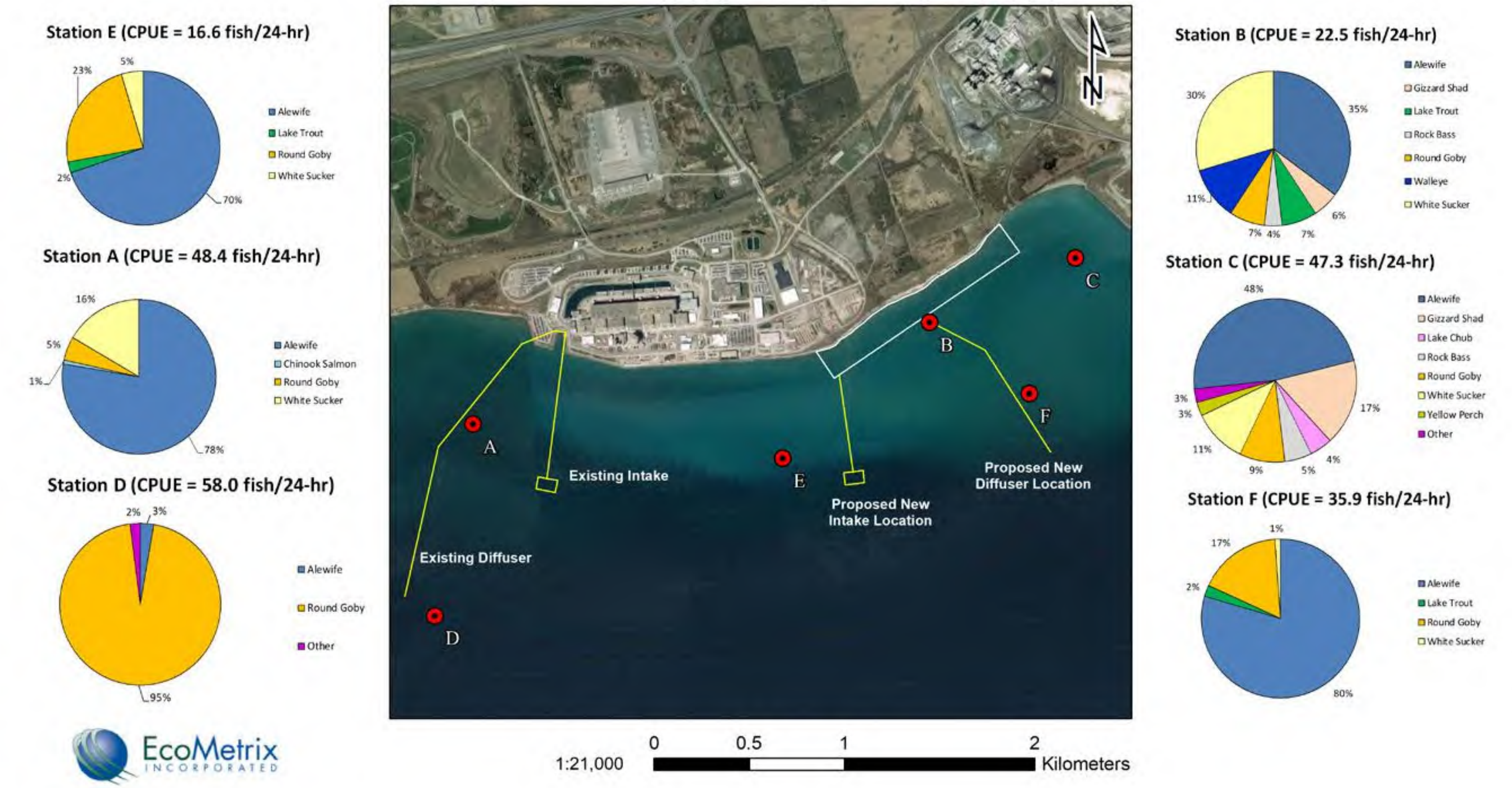

Figure 7-25: Comparison of Relative Abundance (CPUE) of Fish Collected at the DNNP Site Study Area Sampling Sites (A-F), Summer 2019

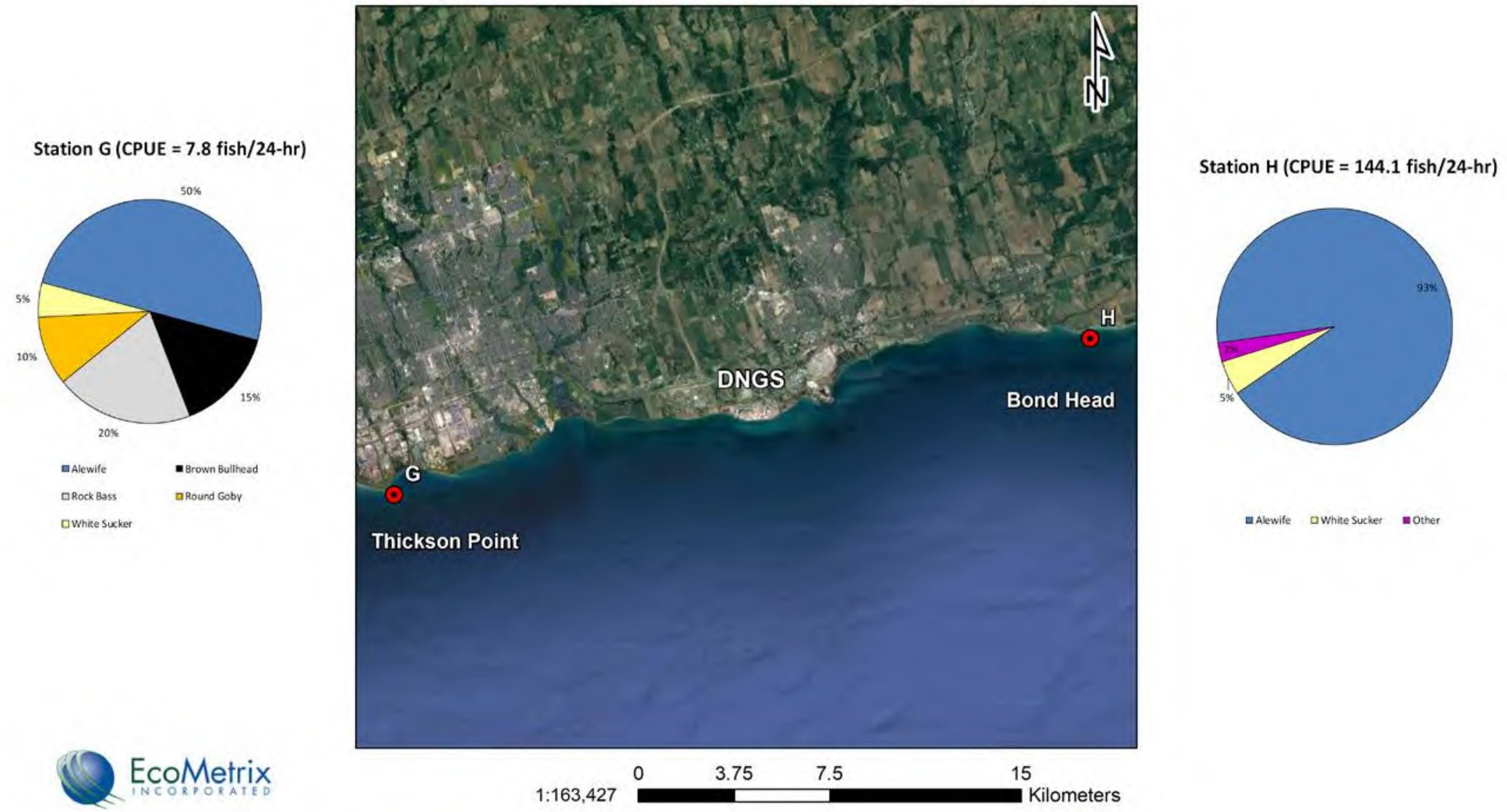

Figure 7-26: Comparison of Relative Abundance (CPUE) of Fish Collected at the Reference Sampling Sites (G & H), Summer 2019

Morphometrics (Sites A-H)

The summary statistics of fork length and weight of all fish species captured during summer sampling are presented in Table 7-23. The longest fish was a Lake Trout (fork length of 73.9 cm) and the shortest fish was a Round Goby (fork length of 8.9 cm; Table 3-9). Similarly, the heaviest fish was a Lake Trout (6,150 g) and the lightest fish was a Round Goby (8.0 g; Table 7-23).

Table 7-23: Morphometrics of Fish Collected at the DNNP Site Study Area and Reference Locations (Sites A-H), Summer 2019

	Fish Species	Alewife	Brown Bullhead *	Brown Trout	Chinook Salmon	Gizzard Shad	Lake Chub	Lake Trout	Longnose Sucker	Rock Bass	Round Goby*	Walleye	White Sucker	Yellow Perch
GROUPED	Count	672	4	3	3	22	5	14	1	12	188	7	73	4
	Mean Fork Length (cm)	14.2	24.0	50.7	53.9	39.7	11.3	63.6	30.2	18.0	10.8	57.2	36.4	14.1
	Std. Dev.Fork Length (cm)	0.9	1.8	1.8	17.5	2.4	0.5	4.0	-	2.6	1.7	9.7	10.0	0.7
	Max Fork Length (cm)	16.6	26.0	52.7	67.2	44.4	11.7	73.9	-	22.9	17.6	69.0	53.4	14.5
	Min Fork Length (cm)	9.4	22.0	49.3	34.0	35.9	10.4	56.5	-	14.3	8.9	43.1	15.5	13.1
	Mean Weight (g)	31.4	220.0	1640.0	2653.3	1048.2	15.0	3652.9	390.0	158.3	17.4	2704.3	742.7	41.3
	St. Dev. Weight (g)	4.8	51.6	105.8	1972.2	171.5	3.2	982.5	-	63.6	13.0	1389.1	420.3	7.8
	Max Weight (g)	55	280	1760	4410	1340	19	6150	-	290	96	4650	1720	52
	Min Weight (g)	9	160	1560	520	750	12	2130	-	75	8	880	34	35
DN	Count	270	1	-	1	22	5	9	1	8	186	7	52	3
	Mean Fork Length (cm)	13.9	22.9	-	67.2	39.7	11.3	63.9	30.2	18.9	10.8	57.2	35.1	14.0
	Std. Dev.Fork Length (cm)	1.2	-	-	-	2.4	0.5	4.9	-	2.6	1.7	9.7	11.5	0.8
	Max Fork Length (cm)	16.6	-	-	-	44.4	11.7	73.9	-	22.9	17.6	69.0	53.4	14.5
	Min Fork Length (cm)	9.4	-	-	-	35.9	10.4	56.5	-	15.0	9.1	43.1	15.5	13.1
	Mean Weight (g)	29.5	200.0	-	4410.0	1048.2	15.0	3796.7	390.0	180.6	17.3	2704.3	717.8	43.3
	St. Dev. Weight (g)	6.3	-	-	-	171.5	3.2	1116.5	-	63.0	12.9	1389.1	477.3	8.1
	Max Weight (g)	55	-	-	-	1340	19	6150	-	290	96	4650	1720	52
	Min Weight (g)	9	-	-	-	750	12	2130	-	100	8	880	34	36
REF	Count	402	3	3	2	-	-	5	-	4	2	-	21	1
	Mean Fork Length (cm)	14.3	24.3	50.7	47.2	-	-	63.2	-	16.4	11.7	-	39.5	14.4
	Std. Dev.Fork Length (cm)	0.5	2.1	1.8	18.7	-	-	1.9	-	1.8	3.9	-	3.4	-
	Max Fork Length (cm)	16.4	26.0	52.7	60.4	-	-	64.8	-	18.6	14.4	-	44.9	-
	Min Fork Length (cm)	10.2	22.0	49.3	34.0	-	-	60.4	-	14.3	8.9	-	32.3	-
	Mean Weight (g)	32.8	226.7	1640.0	1775.0	-	-	3394.0	-	113.8	26.5	-	804.3	35.0
	St. Dev. Weight (g)	3.0	61.1	105.8	1774.8	-	-	716.9	-	39.6	21.9	-	222.4	-
	Max Weight (g)	47	280	1760	3030	-	-	4130	-	168	42	-	1200	-
	Min Weight (g)	11	160	1560	520	-	-	2320	-	75	11	-	350	-

Fork Length for Alewife and total length for Round Goby were estimated with length to weight ratio if catches exceeded 20 per net.
GROUPED= Sites A to H grouped, DN = Darlington Nuclear sited A to F, REF = Reference sited G and H.
*values are for total length.

Statistical Analysis CPUE DNNP Site Study Area and Reference Locations Sites A to H

Due to the non-normality of the summer 2019 CPUE data, a Kruskal-Wallis test (non-parametric test) was used to determine if any site preferences exist for dominant species, and for the fish community as a whole. Species identified as being dominant (>25% total number at any location) were Alewife, Round Goby and White Sucker. There was no significant difference in whole community CPUE found across sites A-H in summer, 2019 (p=0.56; Table 7-24). None of the dominant species showed site preferences (p>0.05).

Table 7-24: Statistical Summary of the Kruskal-Wallis Test to Determine Summer 2019 Fish Community and Dominant Species Site Preferences

Parameter	Kruskal-Wallis			Dwass-Steel-Chritchlow-Fligner Test
	DF	Chi^2	P	
CPUE	7	5.8	0.56	-
Alewife	7	7.65	0.36	-
Round Goby	7	13.19	0.07	-
White Sucker	7	11.28	0.13	-

Infill Area Species Composition at Sites I-K

Based on raw catch data, a total of 392 fish, comprising 8 species, were caught among the three infill area sampling sites (I to K; Table 7-25) within the DNNP Site Study Area during the summer. Alewife was the dominant species (n=353), comprising approximately 90% of the total catch (Figure 7-27 and Table 7-25). The other species caught were: Round Goby (n=31), Rainbow Smelt (n=3), Brown Bullhead (n=1), Brown Trout (n=1), Rainbow Trout (n=1), White Sucker (n=1) and Yellow Perch (n=1). Species richness per location ranged between 3 and 6 (Table 7-25).

Table 7-25: Total Fish Catch and Species Richness for Infill Sites (I-K), Summer 2019

Species	I	J	K	Total
Alewife	68	191	94	**353**
Brown Bullhead	0	0	1	**1**
Brown Trout	1	0	0	**1**
Rainbow Smelt	0	1	2	**3**
Rainbow Trout	0	1	0	**1**
Round Goby	9	5	17	**31**
White Sucker	0	0	1	**1**
Yellow Perch	0	0	1	**1**
Total	**78**	**198**	**116**	**392**
Species Richness	3	4	6	**8**

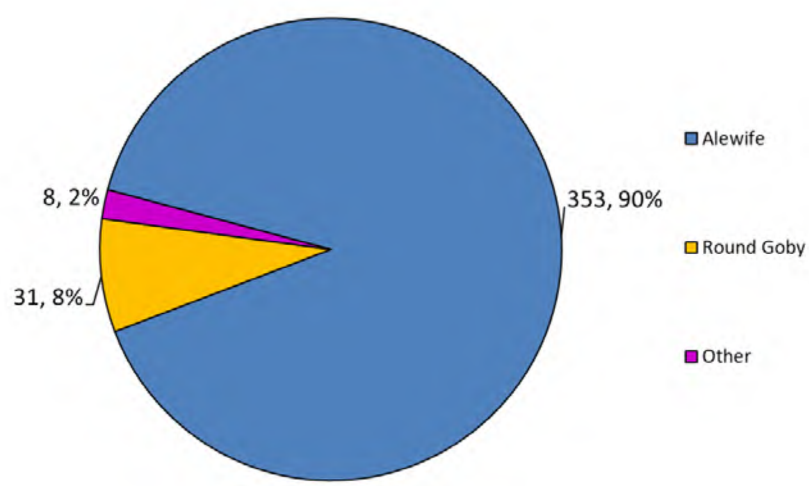

Figure 7-27: Fish Species Composition at the Infill Sites (I-K), Summer 2019 (n=392)

Infill Area Relative Abundance (CPUE) at Sites I-K

The relative abundance (i.e., standardized catch data), presented as CPUE, indicated that Alewife was by far the most abundant species in the infill area within the DNNP Site Study Area, followed by Round Goby (Table 7-26). Alewife had the highest mean CPUE value of 47.4 fish caught/ 24-hr but varied among sites (Figure 7-28). Mean CPUE for the three infill area sampling sites (I to K) was 52.6 fish caught/ 24-hr. Alewife had the highest CPUE at all sites. Overall, Alewife CPUE was highest at site J (75.5 fish caught/ 24-hr) compared to the other two sites in the infill area (Table 7-26; Figure 7-28).

Table 7-26: CPUE (fish caught/24-hr) of Fish Collected at the Proposed Infill Area (Sites I to K), Summer 2019

Species	I	J	K	Mean
Alewife	27.5	75.5	39.0	**47.4**
Brown Bullhead	0.0	0.0	0.4	**0.1**
Brown Trout	0.4	0.0	0.0	**0.1**
Rainbow Smelt	0.0	0.4	0.7	**0.4**
Rainbow Trout	0.0	0.4	0.0	**0.1**
Round Goby	3.5	2.1	7.1	**4.2**
White Sucker	0.0	0.0	0.4	**0.1**
Yellow Perch	0.0	0.0	0.4	**0.1**
Total	**31.4**	**78.4**	**48.1**	**52.6**
Species Richness	3	4	6	**8**

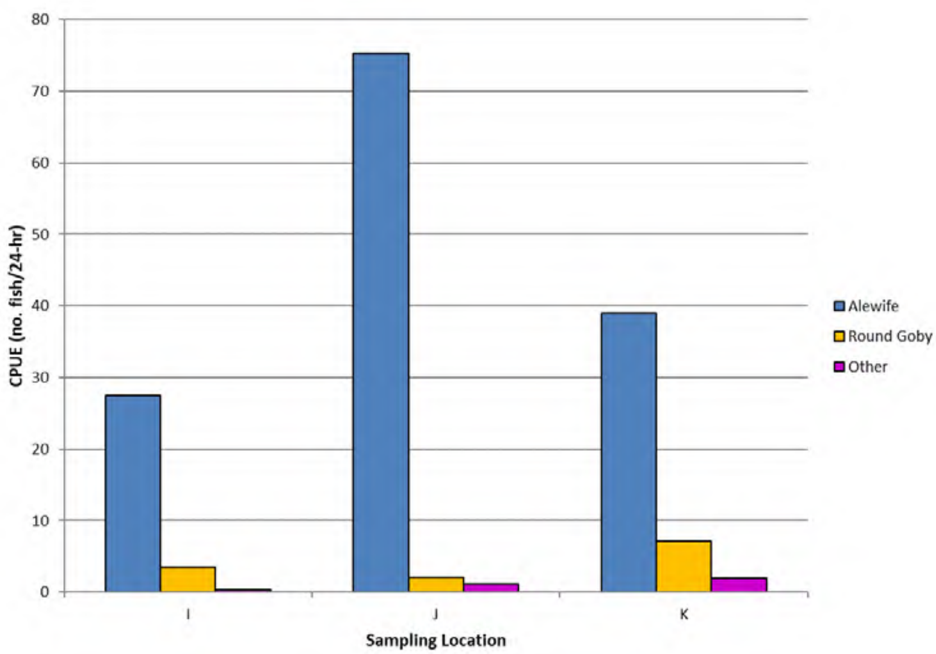

Figure 7-28: Distribution of Fish Captured Across Infill (I-K) Sites, Summer 2019

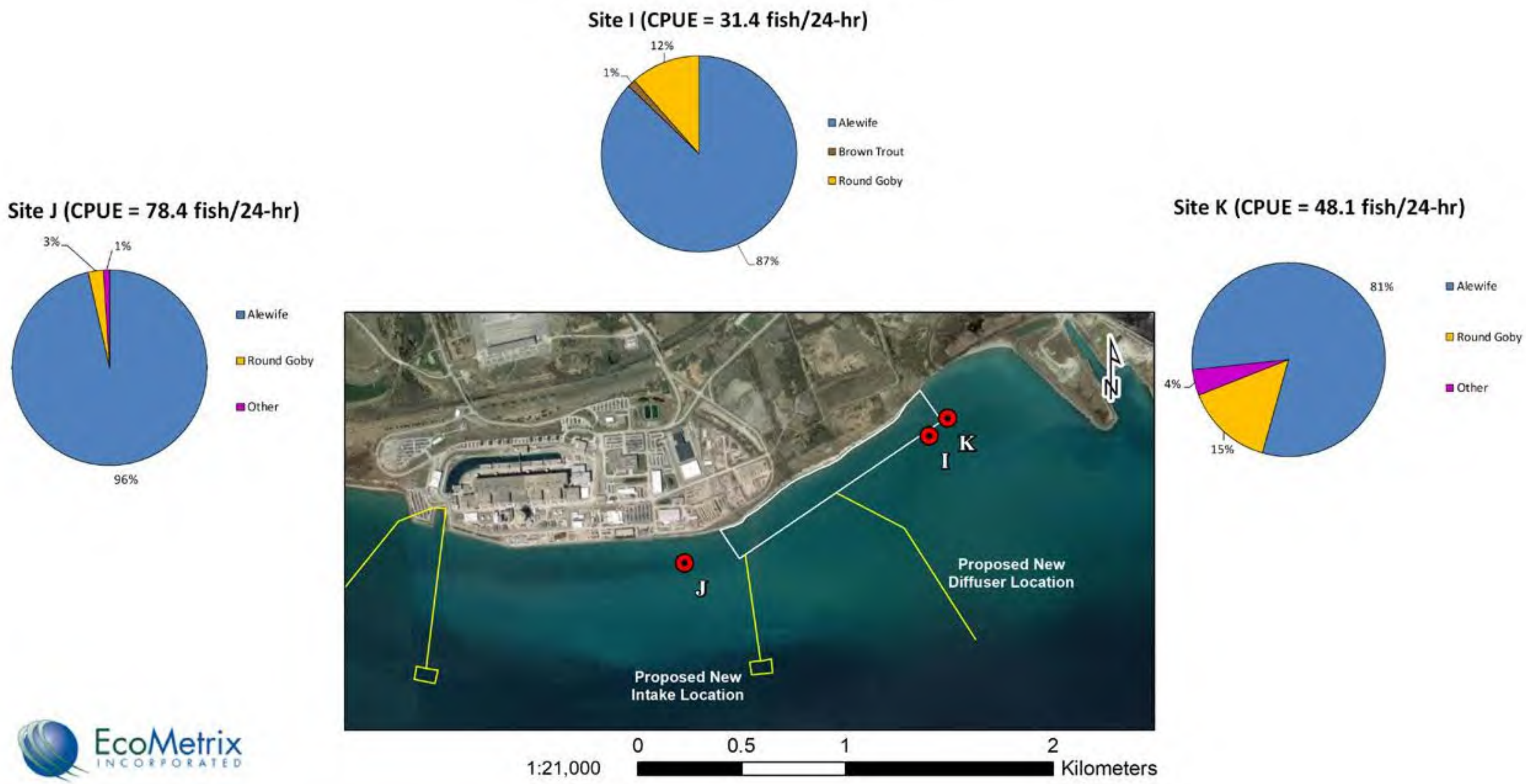

Figure 7-29: Comparison of Relative Abundance (CPUE) of Fish Collected at the Infill Sites (I-K), Summer 2019

Infill Area Morphometrics (Sites I-K)

The summary statistics of fork length and weight of all fish species captured during summer sampling are presented in Table 7-27. The longest fish was a Brown Trout (fork length of 21.1 cm) and the shortest fish were Alewife and Round Goby (fork length of 4.7 cm for both). Similarly, the heaviest fish was a Brown Trout (92.0 g) and the lightest fish were Alewife and Round Goby (1.0 g; Table 7-27).

Table 7-27: Fish Species Morphometrics from Fish Collected in the Proposed Infill Area (Sites I-K), Summer 2019

Fish Species		Fork Length (cm)				Weight (g)			
	Count	Mean Fork Length	Std. Dev. Fork Length	Max	Min	Mean Weight	Std. Dev. Weight	Max	Min
Alewife	353	12.3	2.4	16.5	4.7	22.1	8.2	43.0	1.0
Brown Bullhead*	1	14.9	-	-	-	48.0	-	-	-
Brown Trout*	1	21.1	-	-	-	92.0	-	-	-
Rainbow Smelt	3	11.1	4.0	15.4	7.6	11.0	13.1	26.0	2.0
Rainbow Trout*	1	19.2	-	-	-	88.0	-	-	-
Round Goby	31	7.4	2.2	14.2	4.7	6.0	6.0	30.0	1.0
White Sucker*	1	17.2	-	-	-	57.0	-	-	-
Yellow Perch*	1	9.7	-	-	-	12.0	-	-	-

Note: Fork length for Alewife were estimated with length to weight ratio if catches exceeded 20 per net.

*values are for a single measurement only.

Round Goby and Brown Bullhead measures are based on total length.

7.3.2.5.2.3 Fall (Results and Discussion)

Species Composition DNNP Site Study Area Sites A to F

A total of 176 fish, comprising 15 species were caught over three sampling events between October 28th and November 13th, 2019 at the six study locations (A to F) within the DNNP Site Study Area (Table 7-28). Total catches of large-bodied fish were proportionally higher in the fall, than in the spring and summer sampling events. Lake Trout (n=69) and White Sucker (n=26) comprised approximately 54% of the total catch (Figure 7-30). The remainder of the fish caught (46%) consisted of Alewife (n=15), Round Whitefish (n=15), Rainbow Trout (n=11), Walleye (n=11), Brown Trout (n=9), Round Goby (n=6), Yellow Perch (n=4), Brown Bullhead (n=3), Gizzard Shad (n=3), Common Carp (*Cyprinus carpio*) (n=1), Lake Chub (n=1), Lake Whitefish (*Coregonus clupeaformis*) (n=1) and Largemouth Bass (*Micropterus salmoides*) (n=1). Species richness at individual sites ranged from 5 species at site A, to 11 species caught at site C (St. Marys Embayment).

Table 7-28: Total Fish and Species Richness for Sites within the DNNP Site Study Area (A-F) and Reference Sites (G & H), Fall 2019

Fish Species	A	B	C	D	E	F	G (Ref)	H (Ref)	Total	Total DN	Total Ref
Alewife	8	0	1	1	3	2	1	0	**16**	15	1
American Eel	0	0	0	0	0	0	0	1	**1**	0	1
Brown Bullhead	0	0	3	0	0	0	0	0	**3**	3	0
Brown Trout	0	5	1	0	1	2	0	2	**11**	9	2
Common Carp	0	0	1	0	0	0	0	0	**1**	1	0
Gizzard Shad	0	2	1	0	0	0	0	0	**3**	3	0
Lake Chub	0	0	1	0	0	0	0	0	**1**	1	0
Lake Trout	3	7	9	38	5	7	2	1	**72**	69	3
Lake Whitefish	0	0	0	0	1	0	0	0	**1**	1	0
Largemouth Bass	0	0	1	0	0	0	0	0	**1**	1	0
Northern Pike	0	0	0	0	0	0	1	0	**1**	0	1
Rainbow Trout	0	7	2	0	2	0	1	1	**13**	11	2
Round Goby	0	0	0	6	0	0	0	0	**6**	6	0
Round Whitefish	6	0	0	7	1	1	1	0	**16**	15	1
Walleye	5	0	0	4	1	1	0	0	**11**	11	0
White Sucker	5	2	6	8	3	2	5	7	**38**	26	12
Yellow Perch	0	2	2	0	0	0	0	0	**4**	4	0
Total	**27**	**25**	**28**	**64**	**17**	**15**	**11**	**12**	**199**	**176**	**23**
Species Richness	5	6	11	6	8	6	6	5	**17**	15	8

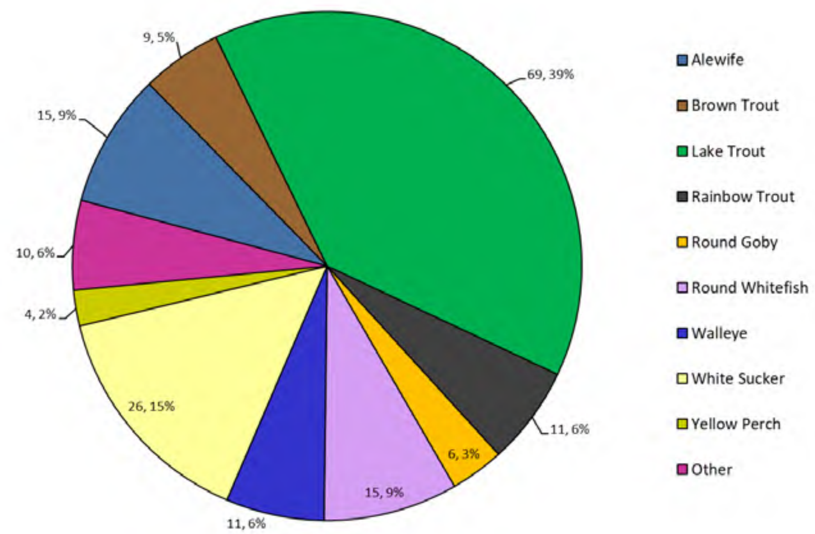

Figure 7-30: Fish Species Composition within the DNNP Site Study Area (A to F), Fall 2019 (n=176)

Species Composition Reference Sites G and H

Fish catch for the two reference sites is presented in Table 7-28. Overall, a total of 23 fish, comprising 8 species were collected at the reference sites. White Sucker (n=12) were the most dominant species, comprising 52% of the total catch (Figure 7-31). The remainder of the fish caught (48%) consisted of Lake Trout (n=3), Brown Trout (n=2), Rainbow Trout (n=2), Alewife (n=1), American Eel (*Anguilla rostrata*) (n=1), Northern Pike (*Esox lucius)* (n=1) and Round Whitefish (n=1). American Eel is listed as endangered under the provincial *Endangered Species Act;* as such, the individual was released immediately upon capture and morphometric data were not obtained. Species richness was similar across sites, with six species being caught at site G and five being caught at site H.

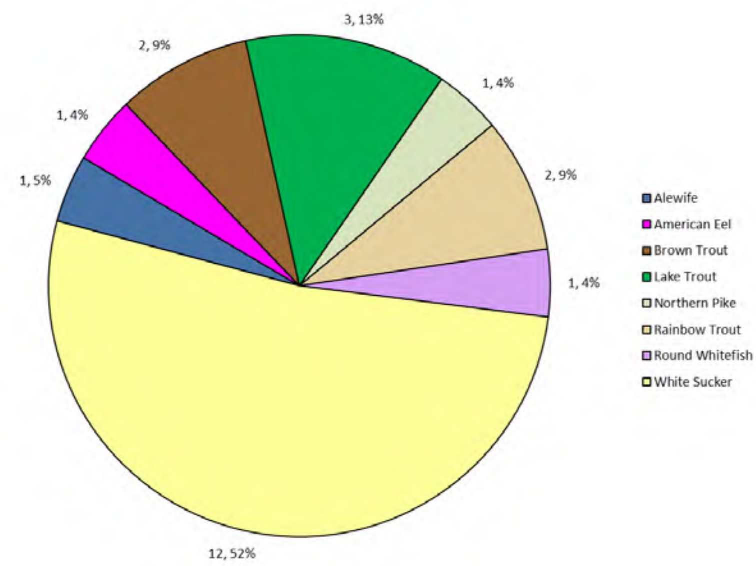

Figure 7-31: Fish Species Composition at the Reference Sites (G and H), Fall 2019 (n=23)

Relative Abundance (CPUE) DNNP Site Study Area Sites A to F

Mean CPUE of all six sampling sites (A to F) within the DNNP Site Study Area was 11.2 fish caught/ 24-hr. Lake Trout and White Sucker were the most abundant, with mean CPUE values of 4.4 fish caught/ 24-hr, and 1.6 fish caught/ 24-hr, respectively (Table 7-29). Total CPUE varied between the sampling sites, ranging from 5.7 fish caught/ 24-hr at site F to 24.7 fish caught/ 24-hr at site D (Table 7-29). Among sites, species CPUE was variable (Table 7-29; Figure 7-32; Figure 7-33). Lake Trout was the dominant fish species caught at all locations except for site A, where Alewife was the dominant species collected. Similar to what was obtained during summer sampling, site C was the most diverse (n=11) (Table 7-29, Figure 7-33). Of the eleven species caught at site C, Brown Bullhead, Lake Chub, Lake Trout, Largemouth Bass, White Sucker and Yellow Perch are native species, comprising approximately 79.6% of the total catch.

Table 7-29: Standardized Fall 2019 Gillnetting Results, CPUE (fish caught/24-hr)

Fish Species	A	B	C	D	E	F	G (Ref)	H (Ref)	DN (mean)	REF (mean)	ALL (mean)
Alewife	3.0	0.0	0.4	0.4	1.1	0.8	0.4	0.0	0.9	0.2	0.8
American Eel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.2	0.0
Brown Bullhead	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.1
Brown Trout	0.0	1.9	0.4	0.0	0.4	0.8	0.0	0.8	0.6	0.4	0.5
Common Carp	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Gizzard Shad	0.0	0.8	0.4	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.1
Lake Chub	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Lake Trout	1.1	2.7	3.5	14.6	1.8	2.6	0.8	0.4	4.4	0.6	3.4
Lake Whitefish	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.1	0.0	0.0
Largemouth Bass	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Northern Pike	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.2	0.0
Rainbow Trout	0.0	2.6	0.7	0.0	0.7	0.0	0.4	0.4	0.7	0.4	0.6
Round Goby	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.0	0.4	0.0	0.3
Round Whitefish	2.2	0.0	0.0	2.7	0.4	0.4	0.4	0.0	0.9	0.2	0.8
Walleye	1.9	0.0	0.0	1.5	0.4	0.4	0.0	0.0	0.7	0.0	0.5
White Sucker	1.9	0.8	2.3	3.1	1.1	0.8	1.9	2.7	1.6	2.3	1.8
Yellow Perch	0.0	0.8	0.8	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.2
Total	**10.1**	**9.6**	**10.8**	**24.7**	**6.2**	**5.7**	**4.3**	**4.6**	**11.2**	**4.4**	**9.5**
Species Richness	5	6	11	6	8	6	6	5	17	15	8

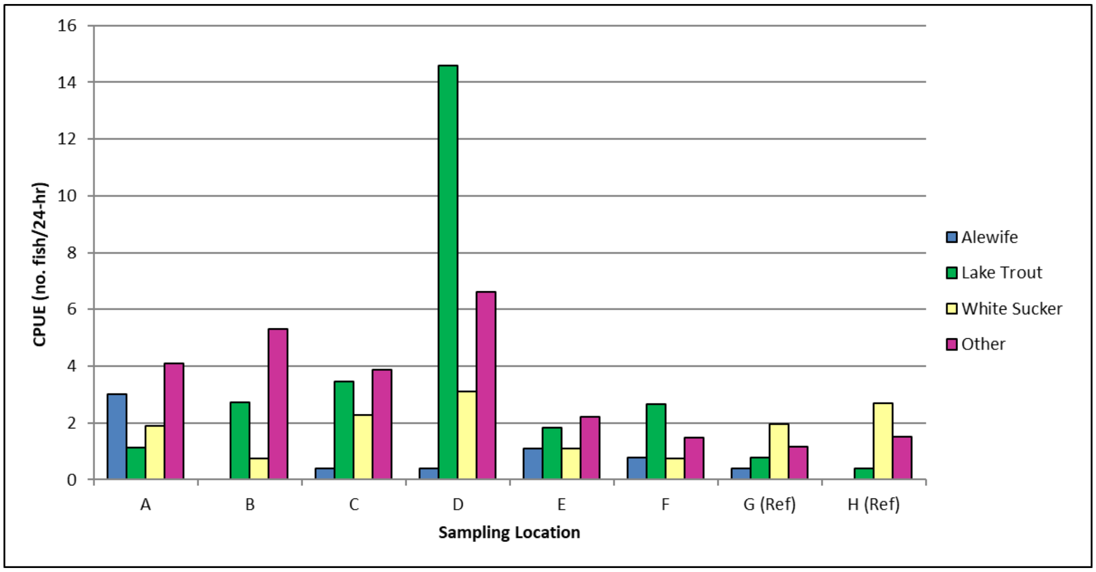

Figure 7-32: Distribution of Fish Captured Across Sampling Sites within the DNNP Site Study Area (A-F) and Reference Locations (G & H), Fall 2019

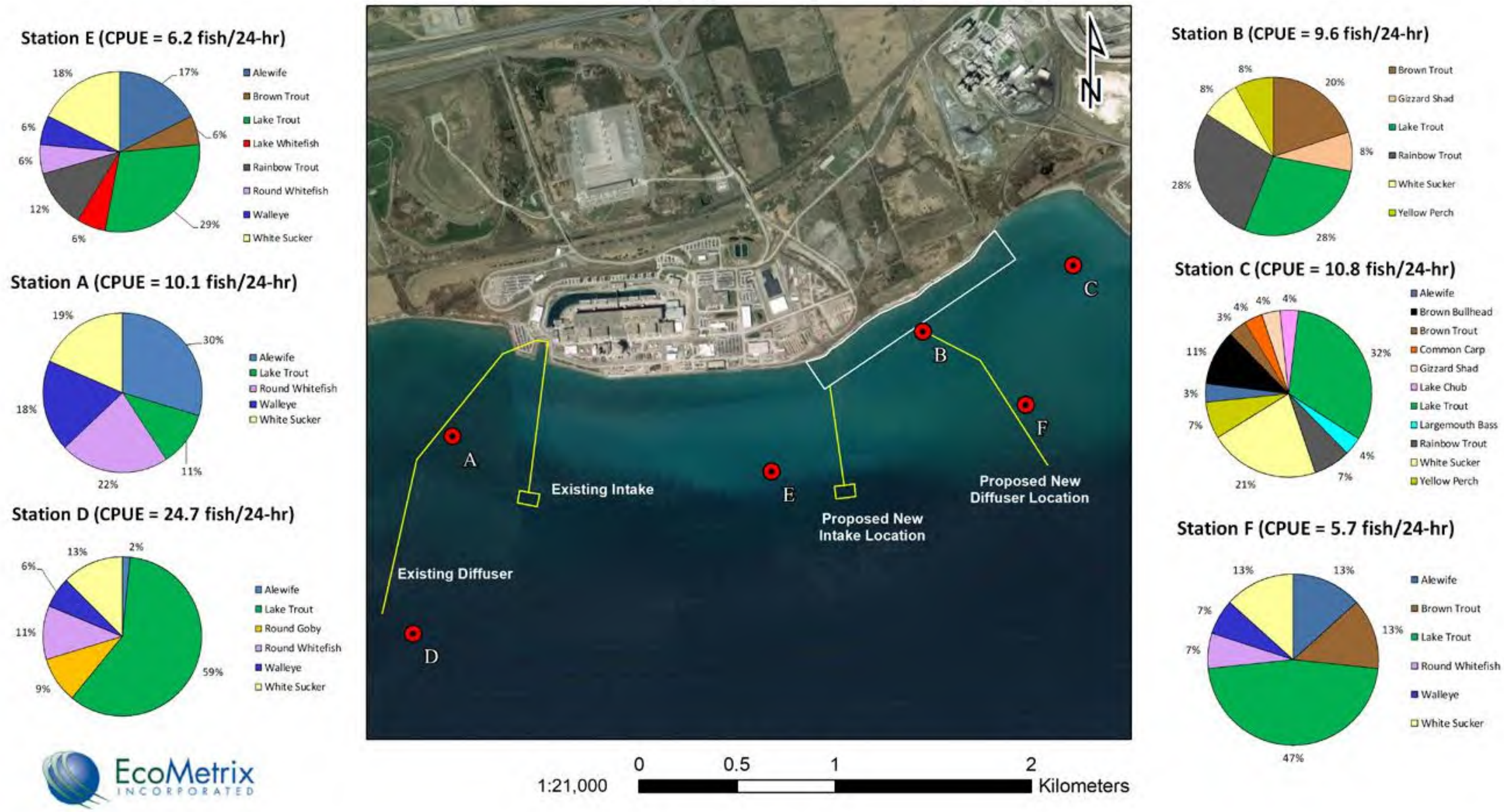

Figure 7-33: Comparison of Relative Abundance of Fish Collected Between Sampling Sites (A-F) within the DNNP Site Study Area, Fall 2019

Relative Abundance (CPUE) Reference Sites G and H

The mean CPUE of the two reference sites (G and H) was 4.4 fish caught/ 24-hr. Total CPUE was similar between reference sites (4.3 fish caught/ 24-hr at G and 4.6 fish caught/ 24-hr at H). White Sucker was the most abundant species with a mean CPUE value of 1.3 fish caught/24-hr (Table 7-29). Although species composition was variable, White Sucker, Lake Trout and Rainbow Trout were caught in similar proportions across both reference sites (Table 7-29; Figure 7-33; Figure 7-34). White Sucker comprised 46% or more of the fish CPUE at both reference sites (Table 7-29; Figure 7-34).

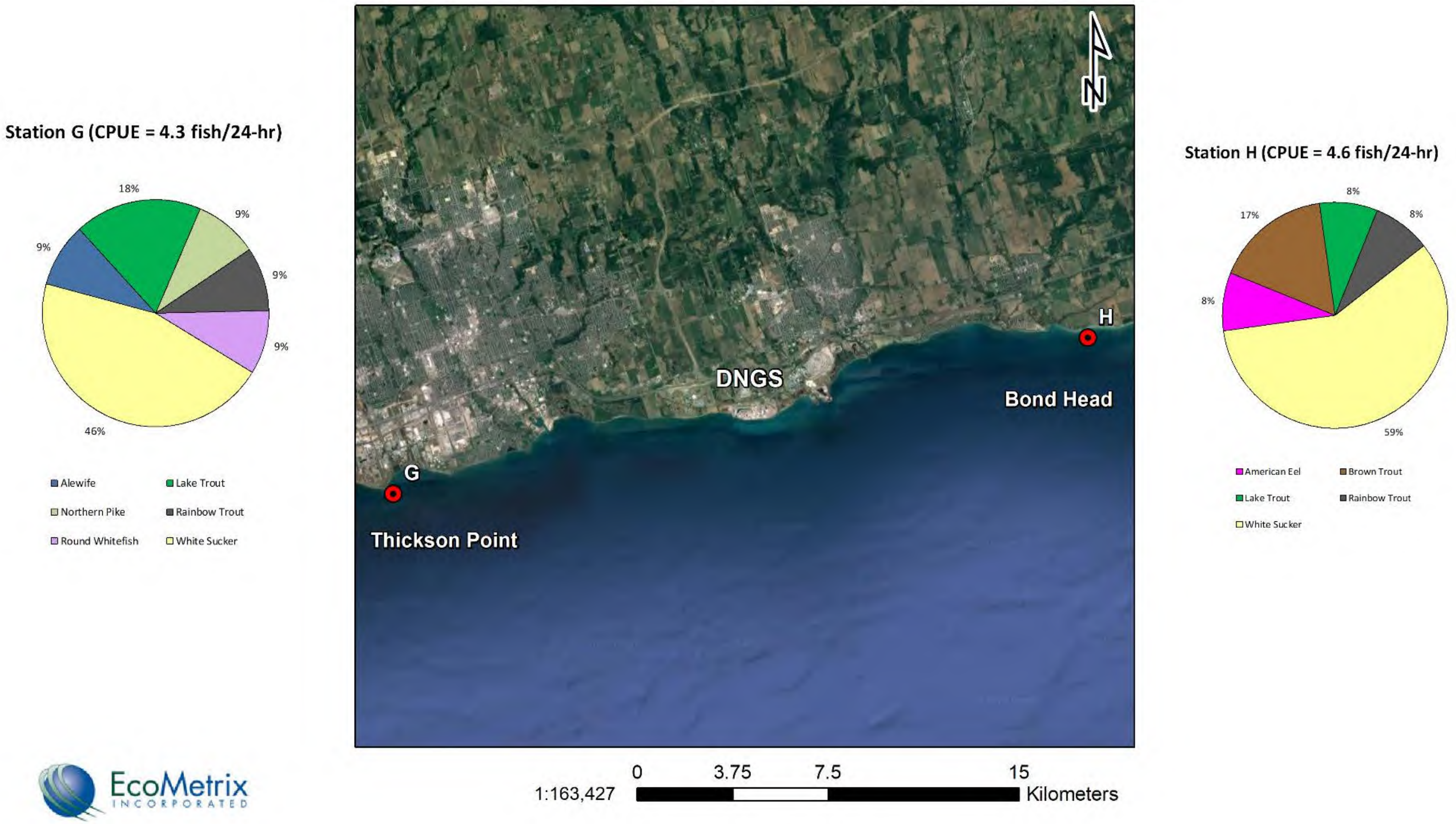

Figure 7-34: Comparison of Relative Abundance (CPUE) of Fish Between Reference Sampling Sites (G & H), Fall 2019

Morphometrics (Sites A-H)

The summary statistics of fork length and weight of all fish species captured during fall sampling are presented in Table 7-30. The longest fish was a Lake Trout (fork length of 91.0 cm) and the shortest fish was an Alewife (fork length of 8.8 cm; Table 7-30). Similarly, the heaviest fish was a Lake Trout (9,850 g) and the lightest fish was an Alewife (2.0 g; Table 7-30).

Table 7-30: Morphometrics of Fish Collected from the DNNP Site Study Area and Reference Locations (Sites A-H), Fall 2019

	Fish Species	Alewife	Brown Bullhead*	Brown Trout	Common Carp*	Gizzard Shad	Lake Chub	Lake Trout	Lake Whitefish	Largemouth Bass	Northern Pike	Rainbow Trout	Round Goby*	Round Whitefish	Walleye	White Sucker	Yellow Perch
GROUPED	Count	16	3	11	1	3	1	72	1	1	1	13	6	16	11	38	4
	Mean Fork Length (cm)	11.5	29.9	54.7	68.6	40.3	10.5	67.0	59.0	5.3	50.5	38.1	12.8	46.2	55.5	38.6	14.8
	Std. Dev.Fork Length (cm)	2.6	4.7	9.9	-	3.6	-	10.7	-	-	-	14.7	1.5	3.2	8.1	11.3	1.8
	Max Fork Length (cm)	14.9	34.9	66.4	-	44.0	-	91.0	-	-	-	67.8	14.3	49.7	74.2	64.2	17.4
	Min Fork Length (cm)	8.8	25.7	37.1	-	36.8	-	40.6	-	-	-	10.7	10.0	37.5	46.5	16.3	13.3
	Mean Weight (g)	24.4	466.7	2678.2	7250.0	1343.3	14.0	4315.6	2270.0	2.0	820.0	937.5	36.8	1195.6	2540.0	975.1	44.3
	St. Dev. Weight (g)	17.1	201.3	1384.0	-	425.2	-	2110.1	-	-	-	989.4	11.5	272.8	1277.0	710.1	22.1
	Max Weight (g)	52.0	680.0	4960.0	-	1760.0	-	9850.0	-	-	-	3320.0	44.0	1670.0	5840.0	3740.0	77.0
	Min Weight (g)	2.0	280.0	660.0	-	910.0	-	720.0	-	-	-	14.0	14.0	630.0	1380.0	41.0	29.0
DN	Count	15	3	9	1	3	1	69	1	1	-	11	6	15	11	26	4
	Mean Fork Length (cm)	11.7	29.9	53.3	68.6	40.3	10.5	66.9	59.0	5.3	-	41.1	12.8	46.0	55.5	40.6	14.8
	Std. Dev.Fork Length (cm)	2.7	4.7	10.2	-	3.6	-	10.9	-	-	-	13.0	1.5	3.2	8.1	11.0	1.8
	Max Fork Length (cm)	14.9	34.9	65.7	-	44.0	-	91.0	-	-	-	67.8	14.3	49.7	74.2	64.2	17.4
	Min Fork Length (cm)	8.8	25.7	37.1	-	36.8	-	40.6	-	-	-	25.2	10.0	37.5	46.5	16.6	13.3
	Mean Weight (g)	25.9	466.7	2564.4	7250.0	1343.3	14.0	4316.4	2270.0	2.0	-	1102.7	36.8	1178.0	2540.0	1101.3	44.3
	St. Dev. Weight (g)	16.6	201.3	1463.6	-	425.2	-	2153.1	-	-	-	989.8	11.5	272.8	1277.0	768.4	22.1
	Max Weight (g)	52.0	680.0	4960.0	-	1760.0	-	9850.0	-	-	-	3320.0	44.0	1670.0	5840.0	3740.0	77.0
	Min Weight (g)	9.0	280.0	660.0	-	910.0	-	720.0	-	-	-	210.0	14.0	630.0	1380.0	53.0	29.0
REF	Count	1	-	2	-	-	-	3	-	-	1	2	-	1	-	12	-
	Mean Fork Length (cm)	9.4	-	61.1	-	-	-	69.7	-	-	50.5	21.5	-	49.3	-	34.2	-
	Std. Dev.Fork Length (cm)	-	-	7.5	-	-	-	3.5	-	-	-	15.2	-	-	-	11.1	-
	Max Fork Length (cm)	-	-	66.4	-	-	-	71.8	-	-	-	32.2	-	-	-	48.6	-
	Min Fork Length (cm)	-	-	55.8	-	-	-	65.6	-	-	-	10.7	-	-	-	16.3	-
	Mean Weight (g)	2.0	-	3190.0	-	-	-	4296.7	-	-	820.0	29.0	-	1460.0	-	701.7	-
	St. Dev. Weight (g)	-	-	1173.8	-	-	-	664.6	-	-	-	21.2	-	-	-	484.6	-
	Max Weight (g)	-	-	4020.0	-	-	-	4710.0	-	-	-	44.0	-	-	-	1380.0	-
	Min Weight (g)	-	-	2360.0	-	-	-	3530.0	-	-	-	14.0	-	-	-	41.0	-

Fork Length for Alewife and total length for Round Goby were estimated with length to weight ratio if catches exceeded 20 per net.
GROUPED= Sites A to H grouped, DN = Darlington Nuclear sited A to F, REF = Reference sited G and H.
*values are for total length.

Statistical Analysis CPUE DNNP Site Study Area and Reference Locations Sites A to H

For the fall 2019 CPUE data, a Kruskal Wallis test (non-parametric) was used to determine if any site preferences exist for dominant species, and for the fish community as a whole. Species identified as being dominant (>25% total number at any location) were Alewife, White Sucker, Rainbow Trout and Lake Trout. There was no significant difference in CPUE found across sites A-H in the fall, 2019 ($p=0.25$), indicating that there is no site preference for the community as a whole (Table 7-31). None of the dominant species showed site preferences ($p>0.05$).

Table 7-31: Statistical Summary of the Kruskal-Wallis Test to Determine Fall Fish Community and Dominant Species Site Preferences

Parameter	Kruskal-Wallis			Dwass-Steel-Chritchlow-Fligner Test
	DF	Chi^2	P	
CPUE	7	8.99	0.25	-
Alewife	7	2.51	0.92	-
White Sucker	7	4.21	0.76	-
Rainbow Trout	7	8.41	0.30	-
Lake Trout	7	11.91	0.10	-

Infill Area Species Composition at Sites I-K

Based on raw catch data, a total of 137 fish, comprising 6 species, were caught among the three infill area sampling sites (I to K; Table 7-32) during the fall. Alewife was the dominant species (n=130), comprising approximately 95% of the total catch (Figure 7-35 and Table 7-32). The other species caught were Gizzard Shad (n=2), Lake Chub (n=2), Rainbow Trout (n=1), Round Goby (n=1) and Yellow Perch (n=1). Species richness per location ranged between 1 and 5 (Table 7-32).

Table 7-32: Total Fish Catch and Species Richness for Infill Sites (I-K), Fall 2019

Species	I	J	K	Total
Alewife	16	60	54	130
Gizzard Shad	0	0	2	2
Lake Chub	2	0	0	2
Rainbow Trout	1	0	0	1
Round Goby	1	0	0	1
Yellow Perch	1	0	0	1
Total	**21**	**60**	**56**	**137**
Species Richness	5	1	2	6

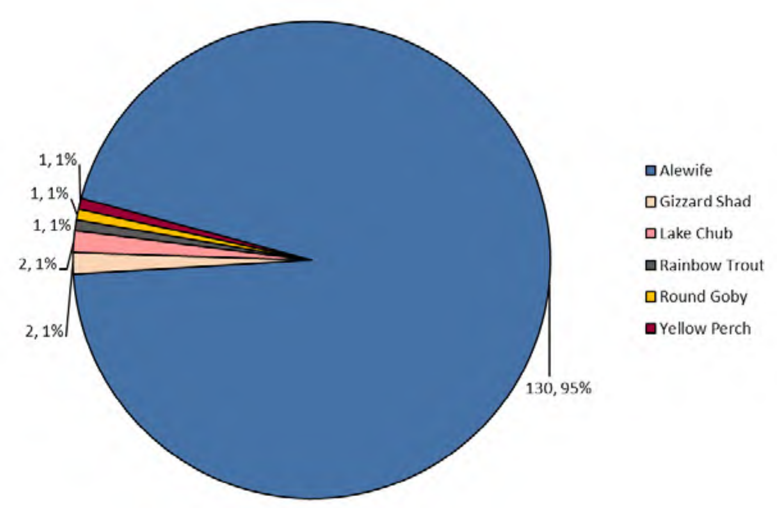

Figure 7-35: Fish Species Composition at the Infill Sites (I-K), Fall 2019 (n=137)

Infill Area Relative Abundance (CPUE) at Sites I-K

The relative abundance (i.e., standardized catch data), presented as CPUE, indicated that Alewife was the most abundant species in the infill area (Table 7-33). Alewife had the highest mean CPUE value of 16.2 fish caught/ 24-hr but varied among sites (Figure 7-36).

Mean CPUE of all three infill area sampling sites (I to K) was 17.0 fish caught/ 24-hr and ranged from 7.7 fish caught/ 24-hr (site I) to 21.9 fish caught/ 24-hr (site K) (Table 7-33; Figure 7-36). Interestingly, site I was the most diverse, but had the least amount of fish caught (Table 7-33, Figure 7-36; Figure 7-37).

Table 7-33: CPUE (fish caught/24-hr) of Fish Collected in the Proposed Infill Area (Sites I to K), Fall 2019

Species	I	J	K	Mean
Alewife	5.9	21.5	21.1	16.2
Gizzard Shad	0.0	0.0	0.8	0.3
Lake Chub	0.7	0.0	0.0	0.2
Rainbow Trout	0.4	0.0	0.0	0.1
Round Goby	0.4	0.0	0.0	0.1
Yellow Perch	0.4	0.0	0.0	0.1
Total	**7.7**	**21.5**	**21.9**	**17.0**

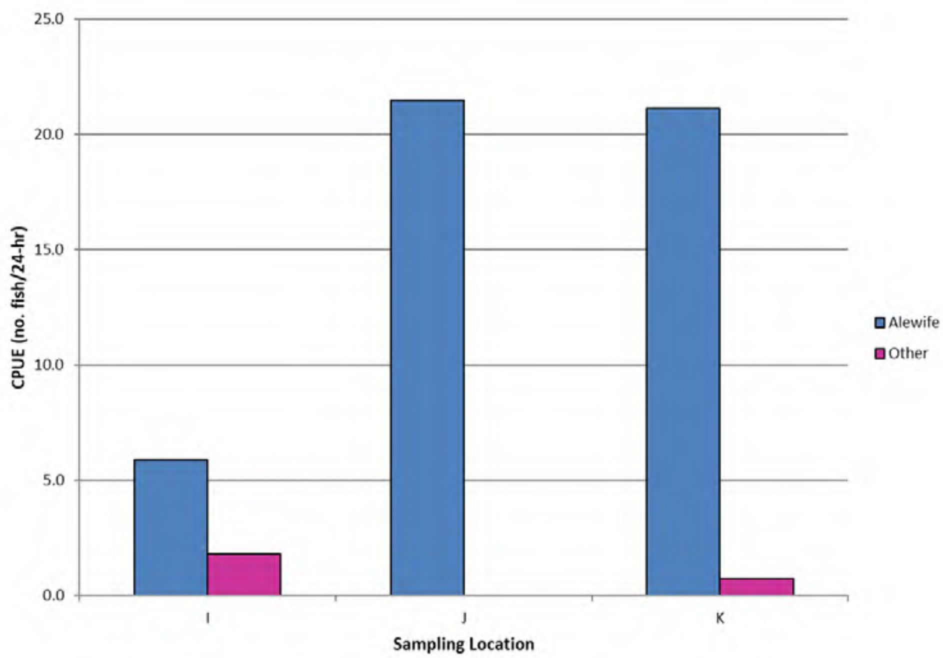

Figure 7-36: Distribution of Fish Captured Across Infill (I-K) Sites, Fall 2019

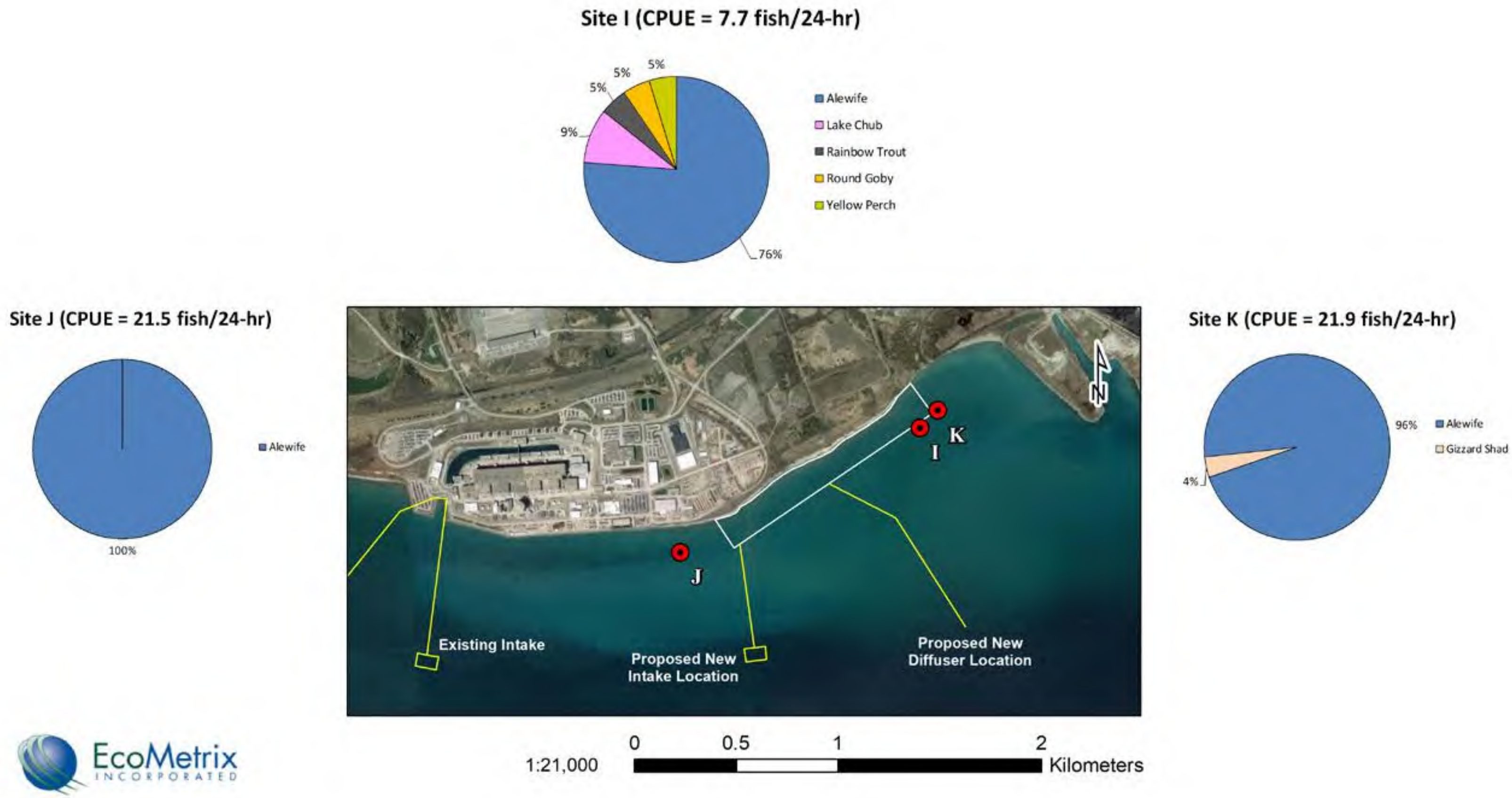

Figure 7-37: Comparison of Relative Abundance (CPUE) of Fish Between Infill Sites (I-K), Fall 2019

Infill Area Morphometrics (Sites I-K)

Summary statistics of fork length and weight of all fish species captured during fall sampling are presented in Table 7-34. The longest fish was a Rainbow Trout (fork length of 22.4 cm) and the shortest fish was Round Goby (fork length of 6.2 cm for). Similarly, the heaviest fish was a Rainbow Trout (135.0 g) and the lightest fish were Alewife and Round Goby (1.0 g; Table 7-34).

Table 7-34: Fish Species Morphometrics of Fish Collected in the Proposed Infill Area (Sites I-K), Fall 2019

Fish Species		Fork Length (cm)				Weight (g)			
	Count	Mean Fork Length	Std. Dev. Fork Length	Max	Min	Mean Weight	Std. Dev. Weight	Max	Min
Alewife	130	8.7	1.6	14.1	5.8	7.6	6.2	37.0	1.0
Gizzard Shad	2	9.4	1.3	10.3	8.5	11.5	3.5	14.0	9.0
Lake Chub	2	9.9	0.3	10.1	9.7	12.5	0.7	13.0	12.0
Rainbow Trout*	1	22.4	-	-	-	135.0	-	-	-
Round Goby*	1	6.2	-	-	-	4.0	-	-	-
Yellow Perch*	1	10.8	-	-	-	13.0	-	-	-

Note: Fork length for Alewife were estimated with length to weight ratio if catches exceeded 20 per net.

*Values are for a single measurement.

Round Goby measures are based on total length.

7.3.2.5.2.4 Morphometric Comparison

An ANOVA was used to determine if there were any differences in the size (length and weight) of fish caught using large mesh gillnets (sites A-H) and broadscale nets (sites I-K). Morphometrics of Alewife and Round Goby were used because these species were caught in all seasons and in both net types. There were no Alewife caught at site B during the fall, thus average values for each net type (A-H and I-K) for each season were used. No significant differences were found between the weight or length of Alewife or Round Goby between the larger mesh gillnets (sites A to H) and broadscale nets (sites I to K) (Table 7-35).

Table 7-35: Morphometric Comparison Between Alewife and Round Goby Collected from Large Mesh Gillnets (Sites A-H) and Alewife and Round Goby Collected from Broadscale (Sites I-K) Nets Across All Seasons

Parameter	Normality		ANOVA	
	P	Y/N	F	P
Alewife (Fork Length)	0.3	Y	4.7	0.4
Round Goby (Total Length)	0.7	Y	6.7	0.1
Alewife (Weight)	0.1	Y	2.1	0.2
Round Goby (Weight)	0.3	Y	4.8	0.1

7.3.2.5.2.5 Seasonal Comparison

DNNP Site Study Area (Sites A to F)

Table 7-36 summarizes the fish caught at all sampling sites (sites A-F) within the DNNP Site Study Area during spring, summer and fall sampling. At the sampling sites there were a total of 21 species caught. Only seven of the species were caught during all three seasons; these were Alewife, Gizzard Shad, Lake Chub, Lake Trout, Round Goby, Walleye and White Sucker. Alewife were caught at all locations, during all seasons except for site B in the fall. Gizzard Shad was only caught at sites B (infill) and C (embayment) during all seasons. Lake Chub were consistently caught at site C throughout all seasons. Lake Trout were caught at sites B and F during all seasons, and caught at all locations in the fall. Round Goby were caught at all locations in the spring and summer, but only at site D in the fall. Walleye were not caught consistently at any one location. White Sucker was caught at all locations in all seasons, except for site D in the spring. Brown Trout, Rainbow Trout and Round Whitefish were caught in the spring and fall, but not the summer. Atlantic Salmon and White Bass were only caught in the spring. Brown Bullhead and Yellow Perch were only caught in the summer and fall. Chinook Salmon and Longnose Sucker were caught in the spring and summer, but not the fall. Common Carp and Lake Whitefish were only caught in the fall. Rock Bass was only caught in the summer.

In terms of relative abundance (CPUE), the highest catch was in the summer (38.1 fish caught/24-hr), followed by the spring (28.8 fish caught/ 24-hr) and then the fall (11.2 fish caught/24-hr). Generally, each sampling site followed a similar pattern, with the exception of site C which had a higher CPUE in the spring (52.8 fish caught/ 24-hr) than in the summer (47.3 fish caught/ 24-hr). This observation was due to the high number of White Sucker caught in the spring, most likely due to temperature preferences and proximity to spawning season. In addition, there may be a preference for site C specifically, as the embayment area is sheltered.

Table 7-36: Comparison of Fish Species CPUE Across Seasons for the Sites (A-F) within the DNNP Site Study Area, 2019

Season	Station	Alewife	Atlantic Salmon	Brown Bullhead	Brown Trout	Chinook Salmon	Common Carp	Gizzard Shad	Lake Chub	Lake Trout	Lake Whitefish	Largemouth Bass	Longnose Sucker	Rainbow Smelt	Rainbow Trout	Rock Bass	Round Goby	Round Whitefish	Walleye	White Bass	White Sucker	Yellow Perch	**Total**
Spring	**A**	0.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16.2	-	-	-	0.3	-	**17.4**
	B	1.1	0.8	-	1.5	0.4	-	5.0	0.4	0.4	-	-	-	-	1.2	-	2.7	-	0.4	-	5.8	-	**19.5**
	C	29.0	-	-	0.7	-	-	2.9	1.1	-	-	-	-	-	-	-	4.7	-	-	0.4	14.1	-	**52.8**
	D	0.4	0.4	-	-	-	-	-	-	1.6	-	-	0.4	-	-	-	33.7	-	-	-	-	-	**36.4**
	E	0.4	-	-	-	-	-	-	-	-	-	-	-	1.1	-	-	9.9	-	-	-	0.3	-	**11.8**
	F	8.8	0.3	-	0.7	-	-	-	-	1.4	-	-	-	-	-	-	23.0	0.3	-	-	0.4	-	**35.0**
	Mean	6.7	0.2	-	0.5	0.1	-	1.3	0.2	0.6	-	-	0.1	0.2	0.2	-	15.0	0.1	0.1	0.1	3.5	-	**28.8**
Summer	**A**	37.1	-	-	-	0.4	-	-	-	-	-	-	-	-	-	-	2.4	-	-	-	8.5	-	**48.4**
	B	7.7	-	-	-	-	-	1.2	-	1.7	-	-	-	-	-	0.8	1.7	-	2.6	-	6.7	-	**22.5**
	C	23.1	-	0.4	-	-	-	7.7	2.1	0.8	-	-	-	-	-	2.6	4.3	-	-	-	5.3	1.1	**47.3**
	D	1.6	-	-	-	-	-	-	-	-	-	-	0.4	-	-	-	55.3	-	0.4	-	0.4	-	**58.0**
	E	11.6	-	-	-	-	-	-	-	0.4	-	-	-	-	-	-	3.9	-	-	-	0.7	-	**16.6**
	F	28.9	-	-	-	-	-	-	-	0.8	-	-	-	-	-	-	5.8	-	-	-	0.4	-	**35.9**
	Mean	18.3	-	0.1	-	0.1	-	1.5	0.4	0.6	-	-	0.1	-	-	0.6	12.2	-	0.5	-	3.7	0.2	**38.1**
Fall	**A**	3.0	-	-	0.0	-	-	-	-	1.1	-	-	-	-	-	-	-	2.2	1.9	-	1.9	-	**10.1**
	B	-	-	-	1.9	-	-	0.8	-	2.7	-	-	-	-	2.6	-	-	-	-	-	0.8	0.8	**9.6**
	C	0.4	-	1.2	0.4	-	0.4	0.4	0.4	3.5	-	0.4	-	-	0.7	-	-	-	-	-	2.3	0.8	**10.8**
	D	0.4	-	-	-	-	-	-	-	14.6	-	-	-	-	-	-	2.4	2.7	1.5	-	3.1	-	**24.7**
	E	1.1	-	-	0.4	-	-	-	-	1.8	0.4	-	-	-	0.7	-	-	0.4	0.4	-	1.1	-	**6.2**
	F	0.8	-	-	0.8	-	-	-	-	2.6	-	-	-	-	-	-	-	0.4	0.4	-	0.8	-	**5.7**
	Mean	0.9	-	0.2	0.6	-	0.1	0.2	0.1	4.4	0.1	0.1	-	-	0.7	-	0.4	0.9	0.7	-	1.6	0.3	**11.2**

Note: Blue highlighted cells indicate species was caught during all seasons.

Reference Sites (G and H)

Table 7-37 summarizes the fish caught at all reference sites (sites G and H) during spring, summer and fall sampling. At the reference sites there were a total of 16 species caught. Only four of the species were caught during all three seasons; these were Alewife, Brown Trout, Lake Trout and White Sucker. Alewife were caught at both reference locations during all seasons except for site H in the fall. Brown Trout were only caught at one of the two reference sites in each of the seasons. Lake Trout were caught at both locations in all seasons, except for site G in the summer. White Sucker was caught at both locations in all seasons. American Eel, Northern Pike and Round Whitefish were only caught in the fall. Atlantic Salmon, Longnose Sucker and White Perch were only caught in the spring. Brown Bullhead, Chinook Salmon and Yellow Perch were only caught in the summer. Rock Bass and Round Goby were caught in the spring and summer, but not the fall. Rainbow Smelt were caught in the spring and the fall, but not the summer.

In terms of relative abundance (CPUE), the highest mean catch was in the summer (76.0 fish caught/24-hr), followed by the spring (24.9 fish caught/ 24-hr) and then the fall (4.4 fish caught/24-hr). This pattern was observed at site H. However, at site G, CPUE was higher in the spring (10.4 fish caught/ 24-hr) than in the summer (7.8 fish caught/ 24-hr).

Table 7-37: Comparison of Fish Species CPUE Across Seasons for the Reference Sites (G&H), 2019

Season	Station	Alewife	American Eel	Atlantic Salmon	Brown Bullhead	Brown Trout	Chinook Salmon	Lake Trout	Northern Pike	Longnose Sucker	Rainbow Smelt	Rock Bass	Round Goby	Round Whitefish	White Perch	White Sucker	Yellow Perch	**Total**
Spring	**G (Ref)**	1.2	-	0.4	-	0.4	-	0.4	-	-	0.4	0.4	4.9	-	0.4	2.0	-	**10.4**
	H (Ref)	25.0	-	0.8	-	-	-	0.4	-	0.4	0.3	-	6.6	-	-	6.0	-	**39.4**
	Mean	13.1	-	0.6	-	0.2	-	0.4	-	0.2	0.4	0.2	5.7	-	0.2	4.0	-	**24.9**
Summer	**G (Ref)**	3.9	-	-	1.2	-	-	-	-	-	-	1.6	0.8	-	-	0.4	-	**7.8**
	H (Ref)	133.1	-	-	-	1.2	0.8	1.7	-	-	-	-	-	-	-	7.1	0.3	**144.1**
	Mean	68.5	-	-	1.2	0.6	0.4	0.8	-	-	-	-	-	-	-	3.7	0.2	**76.0**
Fall	**G (Ref)**	0.4	-	-	-	-	-	0.8	0.4	-	0.4	-	-	0.4	-	1.9	-	**4.3**
	H (Ref)	-	0.4	-	-	0.8	-	0.4	-	-	0.4	-	-	-	-	2.7	-	**4.6**
	Mean	0.2	0.2	-	-	0.4	-	0.6	0.2	-	0.4	-	-	0.2	-	2.3	-	**4.4**

Note: Blue highlighted cells indicate species was caught during all seasons.

7.3.2.5.2.6 Proposed Infill Area Fish Community Assessment (Sites I to K)

Table 7-38 summarizes the fish caught at all infill sampling sites (sites I, J and K) during spring, summer and fall sampling. At the infill sites there were a total of 11 species caught. Only two of the species were caught during all three seasons; these were Alewife and Round Goby. Alewife were caught at all locations, during all seasons. Round Goby were caught at all locations, except sites J and K in the fall. Brown Bullhead, Brown Trout and White Sucker were only caught in the summer. Gizzard Shad was only caught in the fall and Threespine Stickleback was only caught in the spring. Lake Chub was caught in the spring and fall. Rainbow Smelt was caught in the spring and summer, but not the fall. Rainbow Trout and Yellow Perch were caught in the summer and fall, but not the spring.

In terms of relative abundance (CPUE), the highest catch was in the summer (52.6 fish caught/24-hr), followed by the fall (17.0 fish caught/ 24-hr) and then the spring (11.3 fish caught/24-hr). Each sampling site (I-K) followed this seasonal pattern. This pattern is different than what was found using large mesh nets at sites A-H, which found CPUE to increase from fall to spring to summer.

Table 7-38: Comparison of Fish Species CPUE Across Seasons for the Infill Area Sites (I-K), 2019

Season	Station	Alewife	Brown Bullhead	Brown Trout	Gizzard Shad	Lake Chub	Rainbow Smelt	Rainbow Trout	Round Goby	Threespine Stickleback	White Sucker	Yellow Perch	Total
Spring	I	3.1	-	-	-	-	0.4	-	3.9	-	-	-	**7.3**
	J	14.4	-	-	-	-	0.4	-	3.7	-	-	-	**18.5**
	K	5.7	-	-	-	0.3	0.3	-	1.0	0.7	-	-	**8.1**
	Mean	7.7	-	-	-	0.1	0.4	-	2.9	0.2	-	-	**11.3**
Summer	I	27.5	-	0.4	-	-	0.0	-	3.5	-	-	-	**31.4**
	J	75.5	-	-	-	-	0.4	0.4	2.1	-	-	-	**78.4**
	K	39.0	0.4	-	-	-	0.7	-	7.1	-	0.4	0.4	**48.1**
	Mean	47.4	0.1	0.1	-	-	0.4	0.1	4.2	-	0.1	0.1	**52.6**
Fall	I	5.9	-	-	-	0.7	-	0.4	0.4	-	-	0.4	**7.7**
	J	21.5	-	-	-	-	-	-	-	-	-	-	**21.5**
	K	21.1	-	-	0.8	-	-	-	-	-	-	-	**21.9**
	Mean	16.2	-	-	0.3	0.2	-	0.1	0.1	-	-	0.1	**17.0**

Note: Blue highlighted cells indicate species was caught during all seasons.

7.3.2.5.3 Video Collection of Fish Habitat of Infill Area 2019

The objective of the fish habitat video collection in 2019 was to collect substrate information (substrate, macrophyte presence, algae coverage, dreissenid mussel coverage, fish observations) in the infill area within the DNNP Site Study Area to assess fish habitat quality and quantity to complement results of field activities in support of commitment D-P-12.3 (sediment quality monitoring in the infill) and D-P-12.4 (baseline fish habitat use in the infill area) and to support the Fisheries Authorization Application (i.e., for offsetting) prior to in-water works, if infilling is required.

Underwater video data collection occurred in the proposed infill area as shown in Figure 7-38. The area is approximately 2000 m long along the shore and extends out into Lake Ontario to a water depth of approximately 2 m.

Figure 7-38: Underwater Video Collection in the DNNP Proposed Infill Area

Underwater video collection was conducted on September 5, 2019. Video was collected with a GoPro camera mounted on a rigid pole, along six transects running parallel to shore. The transects were numbered 1 through 6 (Figure 7-39), with transect 1 running immediately adjacent to shore and transect 6 being the furthest offshore to a maximum depth of 2.4 m. Transect 1 video was collected by walking along the shoreline from east to west. The pole was held above the water, with the camera facing down to capture substrate where the water met the shoreline. Transect 2 video was collected by walking the shoreline from west to east. A float was attached to the pole, allowing the camera to sit just below the water's surface. Transect 3 utilized the same pole and camera set up as transect 2 although the boat was driven from east to west. Video from transect 4, 5 and 6 was collected by submerging the pole and holding it near the lake bottom while the boat was driven in lines parallel to shore. GPS coordinates were taken at the beginning and end of each transect.

Figure 7-39: Six Underwater Video Transects in the Proposed Infill Area (0-2 m), 2019

Following the methodology of substrate analysis conducted for the Aquatic Environment Existing Environmental Conditions TSD (SENES and Golder 2009), and for the Fall 2010 Fish Community Sampling Program and Spring 2011 Fish Community and Larval Sampling Program (SENES 2011a and 2011e), videos from all six transects were reviewed. Video lengths for each transect were divided by four to capture one image at five locations along the transect (beginning ¼, ½, ¾ and end) to capture a total of 30 images from east to west. Images captured are presented Appendix E. Observations for each image represent the sediment composition (base sediment, sediment size and substrate type), macrophyte presence, attached algae and dreissenid mussel coverage as well as any fish observed in the infill area.

Observations on sediment composition included base sediment (i.e., bedrock, finer sediments) and surface sediment sizes which were then grouped into substrate types. The typical surface sediment size as well the overall surface sediment size range were also noted. The sediment size classification used for substrate analysis followed that used by the Canadian Biomonitoring Network (CABIN, 2008) and is shown in Table 7-39. As it was not possible to differentiate smaller sediment sizes from the video, the term ‘finer’ sediments was used to describe all sediments less than 2mm in size. Substrate type descriptions were consistent with descriptions provided in the Aquatic Environment Existing Environmental Conditions TSD (SENES and Golder 2009) which are summarized as follows:

Type 1. Finer sediments over bedrock with patches of exposed bedrock;
Type 2. Finer sediments usually with distinct ridges and/or ripples;
Type 3. Finer sediments with scattered gravel and cobble;
Type 4. Gravel and cobble in a base of fine sediments;
Type 5. Rocks ranging in size from gravel to boulders in a base of finer sediments; and
Type 6. Densely packed cobble and boulders.

Table 7-39: Sediment Size Classification Used for Substrate Analysis

Sediment	Size (mm)
Coarse sand, silt and clay	<1
Very Coarse Sand	1-2
Finer Sediments	<2
Gravel	2-16
Pebble	16-64
Cobble	64-256
Boulder	>256

Note: Modified from CABIN 2008.

When classifying mussel and algae coverage the terms sparse, moderate and dense were utilized. Sparse describes 0-25% coverage, moderate describes 25-75% coverage and dense refers to 75-100% coverage. If fish were seen within a transect, fish presence was noted.

Results

The results of the sediment composition analysis along each of the six transects are presented in Figure 7-40 and summarized in Table 7-40. Images of the 30 screenshots (5 images per transect) are provided in Appendix E.

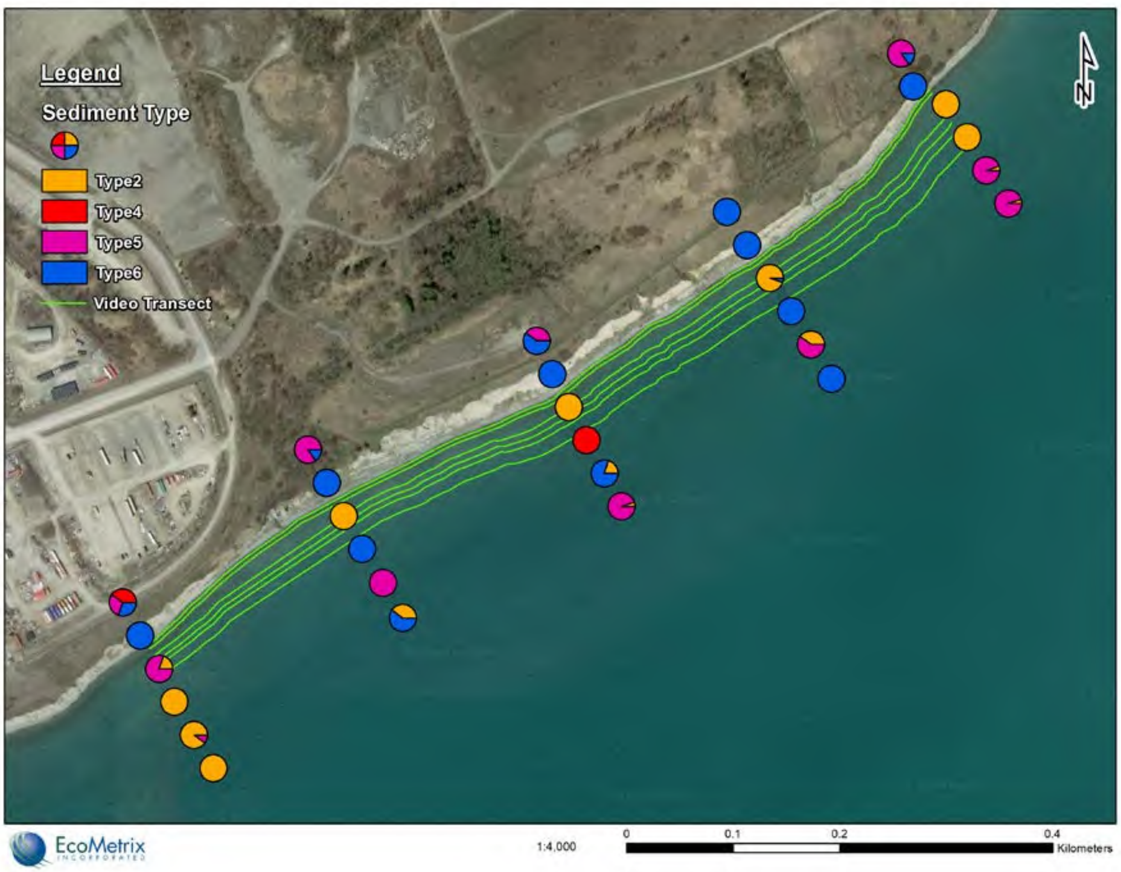

Figure 7-40: Sediment Type Composition Observed in the Underwater Video Transects, 2019

Note: Sediment types 1 and 3 are not in legend as they were not observed.

Base substrates in the infill area solely consisted of finer sediments. The surficial sediments varied greatly with size (finer sediments to large boulders) and density (scattered to dense) throughout the area, and within transects. Of the six substrate types, four were represented in the infill area; these were Type 2, Type 4, Type 5, and Type 6. In general, coarser sediment types (Type 5 and 6 – cobble and boulders) were seen closer to shore (transects 1 and 2) with finer sediments representing the majority of transect 3. As depth increased, substrate type and size were more variable, switching from finer sediments to boulder in transects 4 through 6.

Dreissenid mussels were absent from all transects in the infill area. Deeper transects 5 and 6 had sparse amounts of dead mussel shells and fragments. Attached algae was seen in various amounts throughout transects 2, 4, 5 and 6 ranging from sparse to dense. The density increased as depth and particle size increased. Algae was only attached to sediment sizes larger than pebble, although detached algae could be seen on finer sediments in every transect. No aquatic macrophytes were seen along any transect.

Small bodied fish were observed in all transects with the exception of transect 1. Schooling Alewife were seen above all sediment types in Transects 2, 4, 5, and 6. Schools of Alewife ranged from 50 to 200+ individuals with the largest school observed in transect 6. Single Alewife and Round Gobies were also seen throughout the transects.

Table 7-40: Results of Underwater Video Substrate Analysis, 2019

Transect	Image	Substrate Type	Substrate				Mussel Coverage[1]				Algae Coverage[1]			Aquatic Macrophytes	Fish Presence (Y/N)
			Base	Surface Sediments	Surface Sediment Size: Typical	Surface Sediment Size: Range	Minimum	Typical	Maximum	Dead Mussel Shells	Minimum	Typical	Maximum		
1	1	5	Finer Sediments	Densely packed pebble, cobble and boulders with a small patch of finer sediments	Pebble and boulder	Finer sediments to boulder	0	0	0	0	0	0	0	None	N
	2	6	Finer Sediments	Densely packed cobble with patches of pebble, gravel and finer sediments. Very large boulder.	Cobble	Finer sediments to boulder	0	0	0	0	0	0	0	None	
	3	6	Finer Sediments	Dense cobble with finer sediments, gravel and pebbles scattered throughout	Cobble	Finer sediments to boulder	0	0	0	0	0	0	0	None	
	4	4 and 5	Finer Sediments	Mostly gravel with few pebbles, cobbles and a boulder with patches of finer sediments	Gravel	Finer sediments to boulder	0	0	0	0	0	0	0	None	
	5	4, 5 and 6	Finer Sediments	Majority pebble with gravel and cobble interspersed. Few large boulders.	Pebble	Gravel to boulder	0	0	0	0	0	0	0	None	
2	1	6	Finer Sediments	Dense cobble and with very few pebbles and boulders	Cobble	Pebble to boulder	0	0	0	0	Sparse	Sparse	Sparse	None	Y
	2	6	Finer Sediments	Dense cobble and with very few pebbles and boulders	Cobble	Pebble to boulder	0	0	0	0	Sparse	Sparse	Sparse	None	
	3	6	Finer Sediments	Dense cobble and boulder with very few pebbles scattered throughout	Cobble and boulder	Pebble to boulder	0	0	0	0	Sparse	Sparse	Sparse	None	
	4	5	Finer Sediments	Layer of pebbles and boulders embedded in finer sediments with a few cobbles	Pebble	Finer sediments to boulder	0	0	0	0	Sparse	Sparse	Sparse	None	
	5	6	Finer Sediments	Dense layer of predominately cobble with some pebble and boulder mixed in	Cobble	Pebble to boulder	0	0	0	0	Sparse	Sparse	Sparse	None	
3	1	2	Finer Sediments	Finer sediments with distinct ripples	Finer sediments	Finer sediments	0	0	0	0	0	0	0	None	Y
	2	2	Finer Sediments	Finer sediments with distinct ripples with a small patch of cobbles	Finer sediments	Finer sediments to cobble	0	0	0	0	0	0	0	None	
	3	2	Finer Sediments	Finer sediments with distinct ripples	Finer sediments	Finer sediments	0	0	0	0	0	0	0	None	
	4	2	Finer Sediments	Finer sediments with distinct ripples	Finer sediments	Finer sediments	0	0	0	0	0	0	0	None	
	5	5	Finer Sediments	Rocks ranging in size from pebble to boulder with a patch of finer sediments	Boulder	Finer sediments to boulder	0	0	0	0	0	0	0	None	

Transect	Image	Substrate Type	Substrate				Mussel Coverage[1]				Algae Coverage[1]			Aquatic Macrophytes	Fish Presence (Y/N)
			Base	Surface Sediments	Surface Sediment Size: Typical	Surface Sediment Size: Range	Minimum	Typical	Maximum	Dead Mussel Shells	Minimum	Typical	Maximum		
4	1	2	Finer Sediments	Finer sediments with distinct ripples	Finer sediments	Finer sediments	0	0	0	0	0	0	0	None	Y
	2	6	Finer Sediments	Densely packed cobble with a large boulder	Cobble	Pebble to boulder	0	0	0	0	Sparse	Moderate	Dense	None	
	3	4	Finer Sediments	Layer of pebbles and cobbles embedded in finer sediments. Small patches of fines throughout	Cobble	Finer sediments to cobble	0	0	0	0	Sparse	Moderate	Dense	None	
	4	6	Finer Sediments	Densely packed cobble and boulders	Cobble	Finer sediments to boulder	0	0	0	0	Sparse	Moderate	Dense	None	
	5	2	Finer Sediments	Finer sediments with distinct ripples	Finer sediments	Finer sediments	0	0	0	0	0	0	0	None	
5	1	2 and 5	Finer Sediments	Cobble and boulders embedded in finer sediments	Boulder	Finer sediments to boulder	0	0	0	Sparse	Sparse	Moderate	Dense	None	Y
	2	2 and 5	Finer Sediments	Cobble and boulders embedded in finer sediments with patch of finer sediments	Boulder	Finer sediments to boulder	0	0	0	0	Sparse	Moderate	Dense	None	
	3	2 and 6	Finer Sediments	Dense coverage of rocks embedded in finer sediments	Boulder and cobble	Finer sediments to boulder	0	0	0	Sparse	Sparse	Moderate	Dense	None	
	4	5	Finer Sediments	Dense coverage of rocks embedded in finer sediments	Boulder and cobble	Finer sediments to boulder	0	0	0	Sparse	Moderate	Moderate	Dense	None	
	5	2 and 5	Finer Sediments	Large patch of rippled finer sediments with scattered rocks	Finer sediments	Finer sediments to boulder	0	0	0	Sparse	Sparse	Sparse	Dense	None	
6	1	2 and 5	Finer Sediments	Scattered rocks embedded in finer sediments ranging from 0% to 100% coverage	Finer sediments and cobble	Finer sediments to boulder	0	0	0	Sparse	Sparse	Moderate	Dense	None	Y
	2	6	Finer sediments	Dense coverage of rocks embedded in finer sediments	Boulder and cobble	Finer sediments to boulder	0	0	0	Sparse	Moderate	Moderate	Dense	None	
	3	2 and 5	Finer sediments	Scattered rocks embedded in finer sediments ranging from 0% to 100% coverage	Boulder and cobble	Finer sediments to boulder	0	0	0	0	Moderate	Moderate	Dense	None	
	4	2 and 6	Finer sediments	Densely packed patch of rocks embedded in finer sediments. Large patch of sand.	Finer sediments and cobble	Finer sediments to cobble	0	0	0	0	Sparse	Sparse	Dense	None	
	5	2	Finer sediments	Finer sediments with distinct ripples	Finer sediments	Finer sediments	0	0	0	0	0	0	0	None	

[1] Sparse (0-25%), Moderate (26-75%), Dense (76-100%)

7.3.2.5.4 Sediment Particle Size 2019

In 2019, sediment sampling was conducted in Lake Ontario within the DNNP Site Study Area (10 embayment locations, 12 infill area locations, and one offshore location; Section 6.3.2.3.2) and in Coot's and Treefrog Ponds (Section 6.3.2.3.3). The 2019 embayment sediment sampling locations were consistent with sediment sampling locations from the 2012 DN Water Quality and Coastal Processes Study (SENES 2012). The offshore sediment sampling location (SW10) was also sampled for sediment quality to support the 2009 application for the DNNP PRSL (Golder and SENES 2009). This section describes the physical characteristics (particle size) of sediment; for the sediment quality analysis (conventional and radiological) from 2019, refer to Section 6.3.2.3.

The sampling station locations of the 2019 sediment sampling program are displayed in Figure 7-41**.** A complete list of sample locations and number of samples taken is presented in Table 7-41.

Sampling followed the methodology described in the sampling plan (EcoMetrix 2019a). Sediment sampling took place during the late spring/ early summer season from June 17-19, 2019. One surficial sediment sample was taken from each location, except at SW10, where 5 surficial sediment samples were collected on the same day. Five surficial sediment samples were also collected at Coot's and Treefrog ponds. Duplicate samples were analyzed from SD09, SD26, SW10, and SW12. Samples were analyzed by Bureau Veritas Laboratories using a pipette and sieve analysis and graded using the Udden-Wentworth scale.

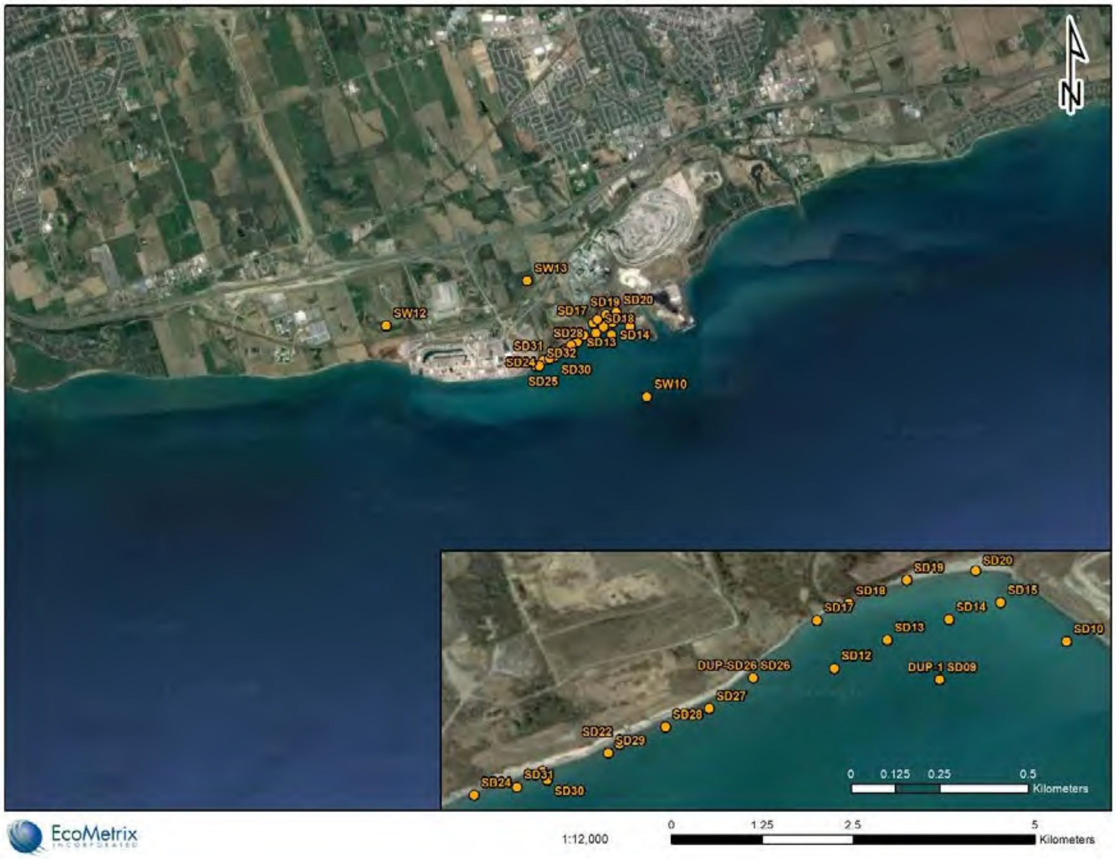

Figure 7-41: Sampling Stations for the 2019 Sediment Sampling Program, 2019, at the DNNP Site Study Area

Table 7-41: Sediment Sampling Locations at the DNNP Site Study Area, 2019

Sampling Area	Sample Location	UTM Coordinates (NAD83, Zone 17T)		Number of Samples Taken	Depth (m)
		Easting	Northing		
Infill	SD21	684534	4860152	1	0-2 m
	SD22	684401	4860063	1	0-2 m
	SD23	684247	4859983	1	0-2 m
	SD24	684109	4859912	1	0-2 m
	SD25	684004	4859836	1	0-2 m
	SD26	684668	4860258	2	0-2 m
	SD27	684581	4860169	1	0-2 m
	SD28	684494	4860115	1	0-2 m
	SD29	684379	4860038	1	0-2 m
	SD30	684257	4859959	1	0-2 m
	SD31	684196	4859937	1	0-2 m
	SD32	684058	4859840	1	0-2 m
Offshore	SW10* rep 1	685535	4859409	2	14 m
	SW10* rep 2	685535	4859409	1	14 m
	SW10* rep 3	685535	4859409	1	14 m
	SW10* rep 4	685535	4859409	1	14 m
	SW10* rep 5	685535	4859409	1	14 m
Embayment**	SD09	685059	4860250	2	4
	SD10	685302	4860370	1	4
	SD12	684850	4860282	1	2
	SD13	684936	4860366	1	2
	SD14	685058	4860429	1	2
	SD15	685166	4860480	1	2
	SD17	684790	4860424	1	0
	SD18	684868	4860485	1	0
	SD19	684972	4860551	1	0
	SD20	685096	4860592	1	0
Ponds	SW12*rep 1	684832	4860288	2	1.5-2 m
	SW12*rep 2	684832	4860288	1	1.5-2 m
	SW12*rep 3	684832	4860288	1	1.5-2 m
	SW12*rep 4	684832	4860288	1	1.5-2 m
	SW12*rep 5	684832	4860288	1	1.5-2 m
	SW13*rep 1	684938	4860372	1	0-1 m
	SW13*rep 2	684938	4860372	1	0-1 m
	SW13*rep 3	684938	4860372	1	0-1 m
	SW13*rep 4	684938	4860372	1	0-1 m
	SW13*rep 5	684938	4860372	1	0-1 m

Lake Infill Sediment (Particle Size)

The sediment samples from the lake infill area were collected at depths of 2 m or less and were distributed within the infill area. The 12 infill locations were: SD21, SD22, SD23, SD24, SD25, SD26, SD27, SD28, SD29, SD30, SD31, and SD32 (Figure 7-41).

The sediments in the infill area were primarily sand (89.5%) with small amounts of silt and clay; 9.4% and 1.0%, respectively (Table 7-42). It should be noted that sediment was sampled with a petite ponar dredge so that samples could also be quantified for conventional and radiological parameters (see Section 6.3.2.3.2); therefore, rocky areas were avoided. Visual observations made while sediment sampling indicated that the infill area is a mixture of boulder and cobble areas, interspersed with sand. Video analysis of substrate that was performed in the same area was generally consistent with findings from the laboratory particle size analysis. Video analysis generally described the nearshore infill area as predominantly boulder and cobble with a base layer or patches of sand (see Section 7.3.2.5.3).

Table 7-42: Summary Statistics for Particle Size Analysis in the Infill Area, 2019

Parameter	Units	Total Count	Median	Mean	Std Dev	Minimum	Maximum
< +1 Phi (0.5 mm)	%	12	100.0	99.6	0.5	99	100
< +2 Phi (0.25 mm)	%	12	91.0	90.1	6.3	74	96
< +3 Phi (0.12 mm)	%	12	42.5	47.3	17.3	28	80
< +4 Phi (0.062 mm)	%	12	5.2	10.5	12.5	1.4	42
< +5 Phi (0.031 mm)	%	12	2.5	3.6	2.9	0.77	9.1
< +6 Phi (0.016 mm)	%	12	1.4	1.8	1.0	0.75	3.5
< +7 Phi (0.0078 mm)	%	12	1.1	1.2	0.4	0.61	1.8
< +8 Phi (0.0039 mm)	%	12	1.0	1.0	0.3	0.6	1.5
< +9 Phi (0.0020 mm)	%	12	0.9	1.0	0.3	0.68	1.6
< 0 Phi (1 mm)	%	12	100.0	100.0	0.0	100	100
< -1 Phi (2 mm)	%	12	100.0	100.0	0.0	100	100
Clay	%	12	1.0	1.0	0.3	0.6	1.5
Gravel	%	12	0.0	0.0	0.0	0	0.1
Sand	%	12	95.0	89.5	12.5	58	99
Silt	%	12	4.2	9.4	12.1	0.78	40

Sediment in the Embayment Area (Particle Size)

Nearshore area (0-2m)

The embayment nearshore area included four sampling locations at depths less than 2 m that were distributed parallel to the shoreline. The four areas where grain size analysis was performed were: SD17, SD18, SD19, and SD20 (Figure 7-41).

Sediments were primarily sand (96.8%) with small amounts of gravel, clay and silt, having values of 2.6%, 0.5% and 0.2%, respectively (Table 7-43). It should be noted that sediment was sampled with a petite ponar dredge so that samples could also be quantified for conventional and radiological parameters (see Section 6.2.2.3.2); therefore, rocky areas were avoided. Visual observations made while sediment sampling indicated that boulder and cobble patches were present in the embayment area.

Table 7-43: Summary Statistics for Particle Size Analysis in the Nearshore Embayment Area, 2019

Parameter	Units	Total Count	Median	Mean	Std Dev	Minimum	Maximum
< +1 Phi (0.5 mm)	%	4	91.0	86.8	15.2	65.0	100.0
< +2 Phi (0.25 mm)	%	4	57.5	51.8	28.7	12.0	80.0
< +3 Phi (0.12 mm)	%	4	4.4	5.6	5.3	0.7	13.0
< +4 Phi (0.062 mm)	%	4	0.6	0.7	0.2	0.6	0.9
< +5 Phi (0.031 mm)	%	4	0.6	0.6	0.1	0.5	0.7
< +6 Phi (0.016 mm)	%	4	0.6	0.5	0.0	0.5	0.6
< +7 Phi (0.0078 mm)	%	4	0.5	0.5	0.1	0.5	0.6
< +8 Phi (0.0039 mm)	%	4	0.5	0.5	0.1	0.4	0.6
< +9 Phi (0.0020 mm)	%	4	0.5	0.5	0.0	0.5	0.5
< 0 Phi (1 mm)	%	4	97.0	95.3	5.7	87.0	100.0
< -1 Phi (2 mm)	%	4	98.5	97.5	3.1	93.0	100.0
Clay	%	4	0.5	0.5	0.1	0.4	0.6
Gravel	%	4	1.6	2.6	3.2	0.0	7.2
Sand	%	4	98.0	96.8	3.2	92.0	99.0
Silt	%	4	0.2	0.2	0.2	0.0	0.4

2-meter depth

At the 2 m depth contour of the embayment area, the following locations were sampled for sediment: SD12, SD13, SD14, and SD15.

Sediments collected in this area consisted primarily of sand (95.0%) with smaller amounts of silt, clay, and gravel having values of 3.5%, 1.1%, and 0.3%, respectively (Table 7-44). Field observations noted that some boulder and cobble patches were present.

Table 7-44: Summary Statistics for Particle Size Analysis in the Embayment Area (2-meter depth), 2019

Parameter	Units	Total Count	Minimum	Maximum	Mean	Median	Std Dev
Clay	%	4	0.6	1.8	1.1	1.0	0.5
Gravel	%	4	0.0	0.8	0.3	0.1	0.4
Sand	%	4	92.0	98.0	95.0	95.0	3.5
Silt	%	4	1.1	6.5	3.5	3.3	2.7

4-meter depth

Stations SD09 and SD10 were located at the 4m depth contour of the embayment area; substrate analysis for these locations is presented in Table 7-45. Sediment at station SD09 was comprised of sand (57.0%), silt (27.0%), and clay (16%). Station SD10 was mostly comprised of sand (96.0%) with some silt (2.6%) and less than 1%, clay and gravel. While both of these stations are at 4.0 m depth, SD09 is near the central area of the embayment area and is therefore more depositional in nature than SD10, which is located close to shore (Figure 7-41).

Table 7-45: Particle Size Analysis Station SD09 and SD10, 2019

Particle Size	Unit	SD09	SD10
Clay (<0.0039 mm)	%	16.0	0.8
Gravel (> 2.0 mm)	%	0.0	0.2
Sand (0.062 - 2.0 mm)	%	57.0	96.0
Silt (0.0039 - 0.062 mm)	%	27.0	2.6

Sediment in the Offshore Area (Particle Size)

A single offshore location was sampled. Station SW10 (14 meters deep) was dominated by sand (91.0%) followed by much lower proportions of silt (5.4%), clay (3.4%), and gravel (0.7%; Table 7-46).

Table 7-46: Summary Statistics for Particle Size Analysis at Offshore Station SW10, 2019

Parameter	Units	Total Count	Minimum	Maximum	Mean	Median	Std Dev
Clay (<0.0039 mm)	%	5	2.6	7.9	4.2	3.4	2.1
Gravel (> 2.0 mm)	%	5	0.3	1.7	0.8	0.7	0.6
Sand (0.062 - 2.0 mm)	%	5	82.0	95.0	90.2	91.0	5.0
Silt (0.0039 - 0.062 mm)	%	5	2.1	8.2	5.1	5.4	2.3

Pond Sediment (Particle Size)

Sediments from Treefrog and Coot's Ponds were also collected during the 2019 field season to provide baseline data for future comparisons. A total of five replicate samples were collected from each of the two ponds. Sediment quality (conventional and radiological parameters) is presented in Section 6.3.2.3.3, particle size is presented here.

Coot's Pond (SW12) was sampled at depths between 1.5-2.0 m and was a mixture of clay (46.8%) and silt (42.0%) with lower proportion of sand (11.4%) and gravel (0.1%; Table 7-47).

Treefrog Pond (SW13) was sampled at depths between 0.5-1.0 m and was a mixture of clay (41.0%), silt (38.0%) and sand (19.0%) with small amounts of gravel (1.3%; Table 7-48).

Table 7-47: Summary Statistics for Particle Size Analysis in Coot's Pond, 2019

Parameter	Units	Total Count	Minimum	Maximum	Mean	Median	Std Dev
Clay (<0.0039 mm)	%	5	21.0	67.0	46.8	50.0	18.2
Gravel (> 2.0 mm)	%	5	0.0	0.2	0.1	0.0	0.1
Sand (0.062 - 2.0 mm)	%	5	1.6	41.0	11.4	5.3	16.7
Silt (0.0039 - 0.062 mm)	%	5	31.0	57.0	42.0	39.0	9.6

Table 7-48: Summary Statistics for Particle Size Analysis in Treefrog Pond, 2019

Parameter	Units	Total Count	Minimum	Maximum	Mean	Median	Std Dev
Clay (<0.0039 mm)	%	5	33.0	57.0	43.0	41.0	8.7
Gravel (> 2.0 mm)	%	5	0.0	2.8	1.3	1.5	1.1
Sand (0.062 - 2.0 mm)	%	5	9.6	24.0	18.3	19.0	5.6
Silt (0.0039 - 0.062 mm)	%	5	33.0	43.0	37.6	38.0	3.8

7.4 Identification of Changes to Baseline or Standards

As presented in Section 7.3 (Baseline Characterization), many aquatic related studies have been conducted since the 2009 application for the DNNP PRSL. These studies provide updated or additional baseline information to the baseline presented in the Aquatic Environment Existing Environmental Conditions TSD (Golder and SENES 2009). The comparison of the updated baseline information to information presented in the Aquatic Environment Existing Environmental Conditions TSD (Golder and SENES 2009) is presented herein.

As identified in Section 7.1, both SARA and ESA have been updated since the original DNNP PRSL was granted.

7.4.1 Darlington Creek Tributaries Fish Habitat Assessment

The Darlington Creek tributary fish habitat assessment conducted in 2008 in support of the 2009 application concluded that intermittent tributary D2 does not appear to constitute direct fish habitat but may be considered indirect fish habitat because it is an identifiable watercourse feature that conveys flow to downstream fish habitat either in off-site downstream sections of the tributary or in the main branch of Darlington Creek. For intermittent tributary E, it was concluded that the E tributary did not appear to represent direct fish habitat within the DNNP Site Study Area. It would be considered indirect fish habitat, by contributing flow and nutrients downstream to permanent habitat, either in off-site reaches of the tributary or the main branch of Darlington Creek (Golder and SENES 2009).

As described in Section 7.3.2.5.1, two intermittent tributaries of Darlington Creek were surveyed in spring 2019 for fish and fish habitat. It was concluded the intermittent tributaries to Darlington Creek, D2 and E, do not provide seasonal habitat for fish. Tributary D2 was dry and tributary E had minimal flow (0.0044 – 0.0135 m^3/s) and electrofishing confirmed the absence of fish. The results from 2019 confirm the conclusions drawn on the intermittent tributaries to Darlington Creek reported in the Aquatic Environment Existing Environmental Conditions TSD (SENES and Golder 2009), as well as, the 2016 DN ERA (EcoMetrix 2016).

Concerning the intermittent tributaries to Darlington Creek, D2 and E, the conclusions of the 2009 application for the DNNP PRSL and supporting documents remain valid and no further assessment is required.

7.4.2 Nearshore Fish Community

In support of commitment D-P-12.4, an adult fish community assessment was conducted in 2019 to define the local fish community within the DNNP Site Study Area during the spring, summer and fall seasons (see Section 7.3.2.5.2). This study was consistent with past studies conducted during 2009-2011 in support of the DNNP EA (SENES and Golder 2009; SENES 2010, 2011a, 2011b and 2011c). Below is a comparison of the 2009-2011 results to that of 2019 to determine if an appreciable change in baseline fish community has occurred that may impact the conclusions of the 2009 application for the DNNP PRSL and supporting documents.

As identified in Section 7.3.2.5.2, an adult fish community assessment was conducted within the DNNP Site Study Area and reference locations (large mesh gillnet at stations A to H), and additional focused netting was conducted in the infill area within the DNNP Site Study Area (broadscale mesh at stations I to K). Comparisons of the adult fish community assessment can be made among three years of study (2009, 2011, and 2019) for each season (spring, summer, and fall). A fourth year of study was completed in 2010, however this was only for the fall season; therefore, for the fall season, comparisons can be made for four years of study. Reference areas (G and H) can only be compared between 2010, 2011 and 2019 as these areas were not sampled in 2009. The focused sampling in the infill area was conducted in 2011 and 2019 but comparison is limited to the summer season as the 2011 study did not sample in the spring or fall. The endpoints used for comparison are % CPUE and species richness.

7.4.2.1 Spring

DNNP Site Study Area Sites (A to F)

Dominant species in 2019 were Round Goby and Alewife, which comprised 52.1 and 23.4% of the total catch, respectively (Table 7-49). In 2011, Rainbow Smelt was dominant along with Alewife and Round Goby with each species comprising 38.7, 24.2, and 18.6% of the total catch, respectively. In 2009, Round Goby were the dominant species comprising 80.5% of the total catch.

Species richness at the sites varied across years, with 15, 12 and 9 species being caught in 2019, 2011 and 2009, respectively. New species caught in the spring of 2019 that were not caught in the spring of past studies include Atlantic Salmon, Chinook Salmon, and White Perch. Species caught in past studies that were not caught in spring 2019 include Spottail Shiner (*Noptropis hudsonius*) and Northern Pike in 2011 and Sculpin sp. in 2009.

Total CPUE was highest at site C (St. Marys Embayment) during the spring of 2019 and 2011 and second highest in 2009. Specifically, catch of White Sucker, a native species, was much higher at site C, than all other sampling sites for all years. This result may be due to the sheltered nature of the embayment area.

Reference Sites (G & H)

Dominant species in 2019 were Alewife and Round Goby, which comprised 52.6 and 23.0% of the total catch, respectively (Table 7-49). Similar to the 2011 results at stations A to F, the dominant species at the reference sites in 2011 were Alewife, Rainbow Smelt, and Round Goby with each species comprising 32.0, 27.7, and 27.7% of the total catch, respectively. Reference sites were not sampled in 2009.

Species richness at the reference sites was 10 in 2019 and 11 in 2011 (Table 7-49). New species caught in the spring of 2019 that were not caught in past studies include Atlantic Salmon and White Perch.

7.4.2.2 Summer

DNNP Site Study Area Sites (A to F)

Dominant species in 2019 were Alewife and Round Goby, which comprised 48.1 and 32.1% of the total catch, respectively (Table 7-50). The same species (Alewife and Round Goby) were the dominant species in 2011 with proportion of total catch representing 75.9 and 22.8%, respectively. Similarly, Alewife and Round Goby were also the dominant species in 2009 with each representing 67.3 and 32.0% of total catch, respectively.

Summer species richness at the sampling sites varied little across years, with 12, 15 and 13 species being caught in 2019, 2011 and 2009, respectively (Table 7-50). There were no new species caught in the spring of 2019 that were not caught in past studies. Species caught in past studies that were not caught in spring 2019 include Fallfish (*Semotilus corporalis*), Freshwater Drum (*Aplodinotus grunniens*), Logperch (*Percina caprodes*) and Trout Perch (*Percopsis omiscomaycus*).

Reference Sites (G & H)

The dominant species in 2019 and 2011 was Alewife, consisting of 90.2% and 95.8% of total fish catch, respectively (Table 7-50).

Species richness at the reference sites was 12 in 2019 and 9 in 2011. New species caught in the spring of 2019 that were not caught in 2011 include Chinook Salmon and Lake Trout. The only species that was caught at the reference site in 2011 and not in 2019 was Longnose Dace (*Rhinichthys cataractae*).

Table 7-49: Standardized Spring Gillnetting Results Between Years

Study Year	Fish Species	Individual Station								Group Means					
		CPUE (fish caught/24-hr)											% CPUE		
		A	B	C	D	E	F	G (Ref)	H (Ref)	DN[a] (mean)	REF[a] (mean)	ALL[a] (mean)	DN (mean)	REF (mean)	ALL (mean)
2019	Alewife	0.8	1.1	29.0	0.4	0.4	8.8	1.2	25.0	6.7	13.1	8.3	23.4	52.6	30.0
	Atlantic Salmon	0.0	0.8	0.0	0.4	0.0	0.3	0.4	0.8	0.2	0.6	0.3	0.8	2.4	1.2
	Brown Trout	0.0	1.5	0.7	0.0	0.0	0.7	0.4	0.0	0.5	0.2	0.4	1.7	0.7	1.5
	Chinook Salmon	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.0	0.2
	Gizzard Shad	0.0	5.0	2.9	0.0	0.0	0.0	0.0	0.0	1.3	0.0	1.0	4.5	0.0	3.5
	Lake Chub	0.0	0.4	1.1	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2	0.9	0.0	0.7
	Lake Trout	0.0	0.4	0.0	1.6	0.0	1.4	0.4	0.4	0.6	0.4	0.5	2.0	1.6	1.9
	Longnose Sucker	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.4	0.1	0.2	0.1	0.2	0.7	0.3
	Rainbow Smelt	0.0	0.0	0.0	0.0	1.1	0.0	0.4	0.3	0.2	0.4	0.2	0.7	1.4	0.8
	Rainbow Trout	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.1	0.7	0.0	0.5
	Rock Bass	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.2	0.0	0.0	0.8	0.2
	Round Goby	16.2	2.7	4.7	33.7	9.9	23.0	4.9	6.6	15.0	5.7	12.7	52.2	23.0	45.6
	Round Whitefish	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.1	0.0	0.0	0.2	0.0	0.2
	Walleye	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.0	0.2
	White Bass	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.0	0.2
	White Perch	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.2	0.0	0.0	0.7	0.2
	White Sucker	0.3	5.8	14.1	0.0	0.3	0.4	2.0	6.0	3.5	4.0	3.6	12.1	15.9	13.0
	Total	**17.4**	**19.5**	**52.8**	**36.4**	**11.8**	**35.0**	**10.4**	**39.4**	**28.8**	**24.9**	**27.8**	**100.0**	**100.0**	**100.0**
	Species Richness	3	11	7	5	4	7	9	7	15	10	17	-	-	-
2011	Alewife	0.2	7.6	0.0	0.0	10.8	1.3	16.1	0.9	3.3	8.5	4.6	24.2	32.0	27.3
	Brown Trout	0.0	0.0	0.0	0.0	0.0	0.0	0.2	2.4	0.0	1.3	0.3	0.0	4.9	1.9
	Gizzard Shad	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.6	0.0	0.4
	Lake Chub	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.4	0.0	0.2
	Lake Trout	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.2	0.0	0.0	0.6	0.2
	Longnose Sucker	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.3	0.1	0.2	0.1	0.4	0.6	0.4
	Northern Pike	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.4	0.1
	Rainbow Smelt	0.9	4.7	22.8	0.0	2.9	0.5	3.4	11.3	5.3	7.4	5.8	38.7	27.7	34.4
	Rainbow Trout	0.0	0.7	0.0	0.0	0.2	0.0	0.6	0.6	0.2	0.6	0.3	1.1	2.3	1.6
	Round Goby	0.5	1.2	1.8	2.1	7.2	2.5	9.7	5.0	2.6	7.4	3.8	18.6	27.7	22.2
	Round Whitefish	0.0	0.0	0.0	0.0	0.7	1.3	1.0	0.0	0.3	0.5	0.4	2.4	1.9	2.2
	Spottail Shiner	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.3	2.6	0.0	1.6
	Walleye	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.1
	White Sucker	0.2	0.2	7.8	0.0	0.0	0.3	0.8	0.3	1.4	0.6	1.2	10.4	2.1	7.1
	Yellow Perch	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.4	0.0	0.2
	Total	**1.8**	**14.6**	**35.9**	**2.1**	**21.8**	**5.9**	**32.0**	**21.1**	**13.7**	**26.6**	**16.9**	**100.0**	**100.0**	**100.0**
	Species Richness	4	6	8	1	5	5	8	8	12	11	15	-	-	-
2009	Alewife	0.0	0.7	0.0	0.0	0.7	0.0	-	-	0.2	-	-	2.2	-	-
	Lake Chub	0.0	0.0	0.7	0.0	0.0	0.0	-	-	0.1	-	-	1.1	-	-
	Lake Trout	0.7	0.4	0.0	0.0	0.4	0.0	-	-	0.3	-	-	2.3	-	-
	Rainbow Smelt	0.0	0.4	0.0	0.4	0.4	0.0	-	-	0.2	-	-	1.9	-	-
	Round Goby	6.7	1.1	6.9	14.3	9.2	13.4	-	-	8.6	-	-	80.5	-	-
	Round Whitefish	0.7	0.0	0.0	0.7	0.0	0.0	-	-	0.2	-	-	2.2	-	-
	Sculpin sp.	0.4	0.0	0.0	0.0	0.0	0.0	-	-	0.1	-	-	0.6	-	-
	Walleye	0.4	0.0	0.0	0.0	0.0	0.0	-	-	0.1	-	-	0.6	-	-
	White Sucker	0.0	0.4	4.7	0.4	0.0	0.0	-	-	0.9	-	-	8.6	-	-
	Total	**8.9**	**3.0**	**12.3**	**15.8**	**10.7**	**13.4**	**0.0**	**0.0**	**10.7**	**0.0**	**0.0**	**100.0**	**0.0**	**0.0**
	Species Richness	5	5	3	4	4	1	-	-	9	-	-	-	-	-

Species richness is reported as the total number of different species caught.

Table 7-50: Standardized Summer Gillnetting Results Between Years

Study Year	Fish Species	Individual Station								Group Means					
		CPUE (fish caught/24-hr)											% CPUE		
		A	B	C	D	E	F	G (Ref)	H (Ref)	DN[a] (mean)	REF[a] (mean)	ALL[a] (mean)	DN (mean)	REF (mean)	ALL (mean)
2019	Alewife	37.1	7.7	23.1	1.6	11.6	28.9	3.9	133.1	18.3	68.5	30.9	48.1	90.2	64.9
	Brown Bullhead	0.0	0.0	0.4	0.0	0.0	0.0	1.2	0.0	0.1	0.6	0.2	0.2	0.8	0.4
	Brown Trout	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.6	0.1	0.0	0.8	0.3
	Chinook Salmon	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.1	0.4	0.1	0.2	0.5	0.3
	Gizzard Shad	0.0	1.2	7.7	0.0	0.0	0.0	0.0	0.0	1.5	0.0	1.1	3.9	0.0	2.3
	Lake Chub	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.3	0.9	0.0	0.6
	Lake Trout	0.0	1.7	0.8	0.0	0.4	0.8	0.0	1.7	0.6	0.8	0.7	1.6	1.1	1.4
	Longnose Sucker	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.0	0.1
	Rock Bass	0.0	0.8	2.6	0.0	0.0	0.0	1.6	0.0	0.6	0.8	0.6	1.5	1.0	1.3
	Round Goby	2.4	1.7	4.3	55.3	3.9	5.8	0.8	0.0	12.2	0.4	9.3	32.1	0.5	19.5
	Walleye	0.0	2.6	0.0	0.4	0.0	0.0	0.0	0.0	0.5	0.0	0.4	1.3	0.0	0.8
	White Sucker	8.5	6.7	5.3	0.4	0.7	0.4	0.4	7.1	3.7	3.7	3.7	9.6	4.9	7.7
	Yellow Perch	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.3	0.2	0.2	0.2	0.5	0.2	0.4
	Total	**48.4**	**22.5**	**47.3**	**58.0**	**16.6**	**35.9**	**7.8**	**144.1**	**38.1**	**76.0**	**47.6**	**100.0**	**100.0**	**100.0**
	Species Richness	4	7	9	5	4	4	5	6	12	9	13	-	-	-
2011	Alewife	10.9	40.3	194.3	29.5	4.6	338.2	59.9	82.6	103.0	71.3	95.0	75.9	95.8	78.9
	Brown Bullhead	0.0	0.0	0.5	0.0	0.0	0.0	0.3	0.0	0.1	0.2	0.1	0.1	0.2	0.1
	Brown Trout	0.0	0.0	0.5	0.0	0.0	0.0	0.3	0.0	0.1	0.2	0.1	0.1	0.2	0.1
	Fallfish	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.1
	Freshwater Drum	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
	Gizzard Shad	0.0	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.1
	Lake Chub	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
	Lake Trout	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0
	Longnose Dace	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.2	0.0	0.0	0.2	0.0
	Rainbow Smelt	0.0	0.0	0.5	0.0	0.2	0.6	0.0	0.0	0.2	0.0	0.2	0.2	0.0	0.1
	Rainbow Trout	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Rock Bass	0.0	0.0	0.5	0.0	0.0	0.0	0.3	0.5	0.1	0.4	0.2	0.1	0.5	0.1
	Round Goby	13.7	1.1	2.3	65.1	50.4	53.0	1.3	0.5	30.9	0.9	23.4	22.8	1.2	19.5
	Salmonid	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Walleye	0.0	0.0	0.3	0.3	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.1
	White Sucker	0.5	0.2	2.3	0.8	0.8	0.6	2.2	0.0	0.9	1.1	0.9	0.6	1.5	0.8
	Yellow Perch	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.3	0.1	0.0	0.3	0.1
	Total	**25.1**	**42.0**	**202.3**	**96.0**	**56.2**	**392.8**	**64.8**	**83.9**	**135.7**	**74.4**	**120.4**	**100.0**	**100.0**	**100.0**
	Species Richness	3	5	11	5	5	5	7	4	15	8	17	-	-	-
2009	Alewife	66.2	82.2	494	34.9	19.4	12.5	-	-	118.2	-	-	67.3	-	-
	Brown Bullhead	0	0	0.2	0	0	0	-	-	0.0	-	-	0.0	-	-
	Brown Trout	0	0.2	0	0	0.5	0	-	-	0.1	-	-	0.1	-	-
	Lake Chub	0.2	0	0.2	0	0.5	0	-	-	0.2	-	-	0.1	-	-
	Logperch	0	0	0.2	0	0	0	-	-	0.0	-	-	0.0	-	-
	Longnose Sucker	0	0	0	0.2	0	0	-	-	0.0	-	-	0.0	-	-
	Rainbow Smelt	0.2	0	0.2	0.2	0	0	-	-	0.1	-	-	0.1	-	-
	Rock Bass	0	0	0	0	0	0.2	-	-	0.0	-	-	0.0	-	-
	Round Goby	32.2	9.7	12.7	241.8	22.7	18.1	-	-	56.2	-	-	32.0	-	-
	Troutperch	0	0.2	0.2	0	0	0	-	-	0.1	-	-	0.0	-	-
	Walleye	0.2	0.2	0	0	0	0	-	-	0.1	-	-	0.0	-	-
	White Sucker	0.5	0.7	0.7	1.2	0.2	0	-	-	0.6	-	-	0.3	-	-
	Yellow Perch	0	0	0	0	0	0.2	-	-	0.0	-	-	0.0	-	-
	Total	**99.5**	**93.2**	**508.4**	**278.3**	**43.3**	**31.0**	-	-	**175.6**	-	-	**100.0**	-	-
	Species Richness	6	6	8	5	5	4	-	-	13	-	-	-	-	-

Species richness is reported as the total number of different species caught.

Infill Area (Sites I to K)

Alewife was the dominant species in both 2019 and 2011, comprising 90.0 and 78.8% of the total catch, respectively (Table 7-51).

Species richness at the infill sampling sites was similar across years, with 8 and 7 being caught in 2019 and 2011, respectively (Table 7-51). New species caught in the summer of 2019 that were not caught in summer 2011 include Brown Bullhead, Brown Trout and White Sucker. Species caught in summer 2011 that were not caught in summer 2019 include Fallfish, Logperch and Longnose Dace.

Table 7-51: Standardized Summer Broadscale Netting Results Between Years

Study Year	Fish Species	Individual Station			Group Means	
		CPUE (fish caught/24-hr)				% CPUE
		I	J	K	ALL[a] (mean)	ALL (mean)
2019	Alewife	27.5	75.5	39.0	47.4	90.0
	Brown Bullhead	0.0	0.0	0.4	0.1	0.3
	Brown Trout	0.4	0.0	0.0	0.1	0.3
	Rainbow Smelt	0.0	0.4	0.7	0.4	0.7
	Rainbow Trout	0.0	0.4	0.0	0.1	0.2
	Round Goby	3.5	2.1	7.1	4.2	8.0
	White Sucker	0.0	0.0	0.4	0.1	0.3
	Yellow Perch	0.0	0.0	0.4	0.1	0.3
	Total	**31.4**	**78.4**	**48.1**	**52.6**	**100.0**
	Species Richness	3	4	6	8	-
2011	Alewife	66.3	24.3	24.8	38.5	78.8
	Fallfish	0.5	0.3	0.8	0.5	1.1
	Logperch	0.0	0.0	0.5	0.2	0.3
	Longnose Dace	0.0	0.0	2.1	0.7	1.4
	Rainbow Smelt	1.3	1.3	1.3	1.3	2.7
	Round Goby	7.1	14.3	1.3	7.6	15.5
	Yellow Perch	0.0	0.3	0.0	0.1	0.2
	Total	**75.2**	**40.5**	**30.8**	**48.8**	**100.0**
	Species Richness	4	5	6	7	-

Species richness is reported as the total number of different species caught.

7.4.2.3 Fall

DNNP Site Study Area Sites (A to F)

In 2019 the dominant species were Lake Trout and White Sucker, which comprised 39.3 and 14.7% of total catch, respectively (Table 7-52). In 2011 the dominant species were Alewife and Round Whitefish, which made up 85.5 and 10.8% of total catch, respectively. In 2010 the dominant species were White Sucker and Round Whitefish, comprising 47.0 and 30.4% of the total catch, respectively. The catch in 2009 was dominated by Round Whitefish, Round Goby, and Spottail Shiner, comprising 30.6, 15.7 and 13.8% of the catch, respectively.

Fall species richness at the sampling sites varied across years, with 15, 12, 9 and 13 species being caught in 2019, 2011, 2010 and 2009, respectively (Table 7-52). New species caught in the spring of 2019 that were not caught in past studies include Lake Whitefish and Largemouth Bass. The only species caught during 2011, 2010 or 2009 that was not caught in 2019 was Spottail Shiner.

Reference Sites (G & H)

The dominant species in both 2019 and 2010 was White Sucker consisting of 52.1% and 60.4% of total fish catch, respectively (Table 7-52). In 2011, Alewife was the dominant species, comprising 82.7% of total fish catch.

Species richness at the reference sites was 8 in 2019, 9 in 2011 and 7 in 2011 (Table 7-52). The only species that was caught in the fall of 2019 that was not caught in 2011 or 2010 was the American Eel at site G. Brown Bullhead was caught at the reference sites in 2010 and 2011 and not in 2019.

Table 7-52: Standardized Fall Gillnetting Results Between Years

Study Year	Fish Species	Individual Station								Group Means					
		CPUE (fish caught/24-hr)											% CPUE		
		A	B	C	D	E	F	G (Ref)	H (Ref)	DN[a] (mean)	REF[a] (mean)	ALL[a] (mean)	DN (mean)	REF (mean)	ALL (mean)
2019	Alewife	3.0	0.0	0.4	0.4	1.1	0.8	0.4	0.0	0.9	0.2	0.8	8.4	4.4	8.0
	American Eel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.2	0.0	0.0	4.4	0.5
	Brown Bullhead	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.1	1.8	0.0	1.6
	Brown Trout	0.0	1.9	0.4	0.0	0.4	0.8	0.0	0.8	0.6	0.4	0.5	5.1	8.8	5.6
	Common Carp	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.6	0.0	0.5
	Gizzard Shad	0.0	0.8	0.4	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.1	1.7	0.0	1.5
	Lake Chub	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.6	0.0	0.5
	Lake Trout	1.1	2.7	3.5	14.6	1.8	2.6	0.8	0.4	4.4	0.6	3.4	39.3	13.3	36.3
	Lake Whitefish	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.1	0.0	0.0	0.6	0.0	0.5
	Largemouth Bass	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.6	0.0	0.5
	Northern Pike	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.2	0.0	0.0	4.4	0.5
	Rainbow Trout	0.0	2.6	0.7	0.0	0.7	0.0	0.4	0.4	0.7	0.4	0.6	6.1	8.2	6.3
	Round Goby	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.0	0.4	0.0	0.3	3.5	0.0	3.1
	Round Whitefish	2.2	0.0	0.0	2.7	0.4	0.4	0.4	0.0	0.9	0.2	0.8	8.4	4.4	7.9
	Walleye	1.9	0.0	0.0	1.5	0.4	0.4	0.0	0.0	0.7	0.0	0.5	6.2	0.0	5.5
	White Sucker	1.9	0.8	2.3	3.1	1.1	0.8	1.9	2.7	1.6	2.3	1.8	14.7	52.1	19.1
	Yellow Perch	0.0	0.8	0.8	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.2	2.3	0.0	2.0
	Total	**10.1**	**9.6**	**10.8**	**24.7**	**6.2**	**5.7**	**4.3**	**4.6**	**11.2**	**4.4**	**9.5**	**100.0**	**100.0**	**100.0**
	Species Richness	5	6	11	6	8	6	6	5	15	8	17	-	-	-
2011	Alewife	7.8	88.0	68.0	0.3	3.3	38.9	58.1	25.6	34.4	41.8	36.2	85.5	82.7	84.7
	Atlantic Salmon	0.0	0.2	0.0	0.0	0.2	0.0	0.0	0.4	0.1	0.2	0.1	0.2	0.4	0.2
	Brown Bullhead	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.2	0.1
	Brown Trout	0.0	0.2	0.8	0.2	0.0	0.2	0.2	1.3	0.2	0.7	0.4	0.5	1.5	0.8
	Common Carp	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
	Gizzard Shad	0.0	0.2	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.1	0.2	0.1
	Lake Chub	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
	Lake Trout	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.2	0.0	0.1	0.4	0.0	0.3
	Northern Pike	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.2	0.1
	Rainbow Trout	0.0	0.8	0.4	0.0	0.0	0.0	0.5	1.5	0.2	1.0	0.4	0.5	2.0	0.9
	Round Goby	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
	Round Whitefish	10.5	0.2	1.3	6.5	4.2	3.4	2.8	3.9	4.4	3.4	4.1	10.8	6.7	9.6
	Walleye	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
	White Sucker	0.2	0.2	2.7	0.3	0.4	0.4	3.7	2.6	0.7	3.2	1.3	1.7	6.3	3.1
	Total	**33.5**	**106.0**	**96.3**	**39.1**	**22.5**	**54.5**	**76.2**	**44.8**	**40.2**	**50.6**	**42.8**	**100.0**	**100.0**	**100.0**
	Species Richness	3	7	8	5	5	4	7	6	12	9	14	-	-	-
2010	Alewife	0.0	0.0	0.0	0.0	0.0	0.0	2.2	0.0	0.0	1.1	0.3	0.0	9.8	2.9
	Brown Bullhead	0.0	0.0	0.4	0.0	0.0	0.0	0.6	0.0	0.1	0.3	0.1	0.7	2.7	1.3
	Brown Trout	0.0	1.8	1.5	0.0	0.3	0.0	0.6	1.3	0.6	1.0	0.7	6.6	8.4	7.2
	Gizzard Shad	0.0	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	1.5	0.0	1.0
	Lake Trout	0.7	0.7	1.5	0.0	0.3	0.0	0.0	0.4	0.5	0.2	0.5	5.9	1.8	4.7
	Northern Pike	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.7	0.0	0.5
	Round Goby	0.0	0.0	0.0	1.3	1.0	0.0	0.3	0.0	0.4	0.2	0.3	4.2	1.3	3.4
	Round Whitefish	4.9	0.4	1.9	2.3	5.9	1.1	3.1	0.4	2.8	1.8	2.5	30.4	15.6	26.0
	Walleye	0.3	0.0	0.0	0.3	1.0	0.0	0.0	0.0	0.3	0.0	0.2	2.9	0.0	2.1
	White Sucker	7.8	0.4	12.1	4.5	0.7	0.0	9.3	4.3	4.3	6.8	4.9	47.0	60.4	50.9
	Total	**13.7**	**3.7**	**18.2**	**8.4**	**9.2**	**1.1**	**16.1**	**6.4**	**9.1**	**11.3**	**9.6**	**100.0**	**100.0**	**100.0**
	Species Richness	4	5	7	4	6	1	6	4	9	7	10	-	-	-
2009	Alewife	0.0	0.4	0.0	0.3	0.2	0.2	-	-	0.2	-	-	2.1	-	-
	Brown Bullhead	0.0	0.0	1.1	0.0	0.0	0.0	-	-	0.2	-	-	2.1	-	-
	Brown Trout	0.0	1.4	1.8	0.0	0.5	0.2	-	-	0.7	-	-	7.3	-	-
	Gizzard Shad	0.0	1.8	0.0	0.0	0.0	0.0	-	-	0.3	-	-	3.4	-	-
	Lake Chub	0.4	0.0	0.4	0.0	0.0	0.0	-	-	0.1	-	-	1.5	-	-
	Lake Trout	1.1	0.7	0.7	0.3	0.0	1.0	-	-	0.6	-	-	7.1	-	-
	Rock Bass	0.0	0.0	0.4	0.3	0.0	0.0	-	-	0.1	-	-	1.3	-	-
	Round Goby	2.8	0.0	0.0	5.2	0.2	0.2	-	-	1.4	-	-	15.7	-	-
	Round Whitefish	1.8	1.8	7.4	1.7	2.0	1.7	-	-	2.7	-	-	30.6	-	-
	Spottail Shiner	0.4	0.7	6.3	0.0	0.0	0.0	-	-	1.2	-	-	13.8	-	-
	Walleye	0.0	0.0	1.1	1.0	0.2	0.2	-	-	0.4	-	-	4.7	-	-
	White Sucker	1.1	0.7	2.8	0.3	0.5	0.0	-	-	0.9	-	-	10.1	-	-
	Yellow Perch	0.0	0.0	0.0	0.3	0.0	0.0	-	-	0.1	-	-	0.6	-	-
	Total	**7.6**	**7.5**	**22.0**	**9.4**	**3.6**	**3.5**	-	-	**8.9**	-	-	**100.0**	-	-
	Species Richness	6	7	9	8	6	6	-	-	13	-	-	-	-	-

Species richness is reported as the total number of different species caught.

7.4.2.4 Statistical Comparison Across Years - Spring

Statistical comparisons were conducted on spring fish CPUE across the years 2019, 2011 and 2009. These comparisons were done for total CPUE, as well as CPUE for the fish species commonly present for the three years of comparison: Alewife, Round Goby, Round Whitefish, Lake Trout, White Sucker and Rainbow Smelt. Statistical comparisons between years were only made for the spring season since only the spring 2009 data were presented in the Aquatic Environment Existing Environmental Conditions TSD used in support of the 2009 application for the DNNP PRSL. Data were tested for normality using the Shapiro-Wilk normality test. ANOVA was used if data were normal and the Kruskal-Wallis test was used if data were non-normal. Results of the normality tests and statistical comparisons across years are described in Table 7-53. Round Goby and Rainbow Smelt abundance was significantly different across years (Table 7-53). Round Goby abundance was highest in 2019 and lowest in 2009. Rainbow Smelt abundance was highest in 2011, specifically at site C, which accounted for approximately 72% of the Rainbow Smelt catch in 2011 (Table 7-53). Total CPUE, White Sucker CPUE, Lake Trout CPUE, Round Whitefish CPUE and Alewife CPUE were not significantly different across years. Although not significant, Total CPUE exhibits an increasing trend from 2009 to 2019 (10.7 to 13.7 to 28.8, for 2009, 2011 and 2019, respectively).

Table 7-53: Statistical Analysis of Spring CPUE Data Across 2019, 2011, and 2009.

Variable Examined	Shapiro-Wilk Normality		Kruskal-Wallis	
	P	(Y/N)	P	Chi-squared
Alewife	<0.001	N	0.075	5.19
Round Goby	0.004	N	0.027	7.24
Round Whitefish	<0.001	N	0.63	0.92
Lake Trout	<0.001	N	0.125	4.16
White Sucker	<0.001	N	0.429	1.69
Rainbow Smelt	<0.001	N	0.03	7.01
Total CPUE	0.033	N	0.062	5.56

Note: All data was non-normal.

7.4.2.5 Conclusion

Subtle differences in the fish community were observed among years. Generally, however, the spring and summer fish communities were dominated by small-bodied forage fish, while the fall fish community (with the exception of 2011) was generally dominated by large-bodied bottom feeding fish, salmonids, and other large-bodied predatory fish. Of note is the presence of Atlantic Salmon in the fall of 2011 and spring of 2019. This is not surprising as stocking programs started in 1995, and in 2006 the 'Bring Back the Salmon Initiative' further increased stocking and reintroduction efforts to reintroduce this native species back into Lake Ontario (OFAH 2017). The yearly variability of the fish community within the DNNP Site Study Area is attributed to natural variation of fish populations. The conclusions of the 2009 application for the DNNP PRSL and supporting documents remain valid and no further assessment is required.

7.4.3 Fish Habitat

Infill (within DNNP Site Study Area)

In November 2008 (SENES and Golder 2009) underwater video images and side scan sonar profiles were collected in the infill area. Underwater video was also captured in November 2010 at gillnet location B located in the infill area (SENES 2011a). In 2011 underwater video was analyzed for substrate composition at two transects (H and I) in the infill area (SENES 2011e). In 2019 (see Section 7.3.2.5.3), video was again taken in the infill area. Although the exact observation locations were different between studies, they do overlap and the same substrate composition was observed. In all four studies, the base substrate in the infill area was finer sediments with surface sediments ranging in size from gravel to boulder. In 2008 it was noted that the eastern portion of the proposed infill area was dominated by rocky substrates close to shore and transitioned to more sandy substrates in the deeper areas (SENES and Golder 2009). Gillnet location B in 2010 and transect H and I in 2011 noted sparse to dense dreissenid mussel coverage while in 2008 and 2019 only dead mussel shells were observed. No aquatic macrophytes were observed in any of the studies. No fish were observed in the underwater video in previous years; however, many were observed in 2019. Algae coverage in all years was noted at sparse to dense.

DNNP Site Study Area

The substrate and bathymetry of the Lake Ontario nearshore within the DNNP Site Study Area was well characterized in the Aquatic Environment Existing Conditions TSD (SENES and Golder 2009). Underwater video completed in fall 2010, spring 2011, 2012-13, and 2016 (see Section 7.3.2.3.9) and visual observations made during gillnetting programs in 2018 (EcoMetrix 2019b) and 2019 (see Section 7.3.2.5.3) verified the findings in the Aquatic Environment Existing Conditions TSD (SENES and Golder 2009) that the nearshore of Lake Ontario within the DNNP Site Study Area is dominated by hard substrates (e.g., cobble, rocky glacial till, dreissenid mussels) with intermittent patches of sand.

Conclusion

Substrate characterization was consistent among studies, which indicates that the conclusions of the 2009 application supporting documents remain valid and no further assessment is required.

7.4.4 Sediment Particle Size

Particle size analysis data from 2019 was compared to corresponding historical data from 2012 (SENES 2012) and from 2008 (Golder and SENES 2009) to determine if sediment particle size composition within the DNNP Site Study Area has changed over time. Sites with overlapping locations that were used for comparison are presented in Figure 7-42. Samples collected in 2008 and presented in the Aquatic Environment Existing Environmental Conditions TSD (Golder and SENES 2009) could not be directly compared, as station overlap did not occur, but a general comparison is provided.

The method to determine sediment particle size distribution was different between sampling programs. In 2019, particle size was determined using a pipette and sieve analysis and the results were graded using the Udden-Wentworth scale. In 2012, sediment particle size was determined using a grain size sieve analysis and graded using the Unified Soil Classification System (USCS). The laboratory method of the 2008 samples is not known. The data from 2012 were estimated from particle size frequency distribution graphs. It appears that the USCS method may be less sensitive to measuring fines as silt and clay was only quantified for two of the 2012 samples[10]. Therefore, only percent sand and gravel will be discussed, although tables will include silt and clay to provide context concerning their low contribution to overall particle size analysis.

Summary statistics were analyzed between comparable sites within the nearshore area, 2-meter depth area, and at station SD10 (4-meter depth). Individual station data are presented in Table 7-54.

[10] The 2012 methodology indicated that hydrometer analysis was conducted on sediment samples that had >5% of sample remaining in the bottom of the sieve (i.e., particle size <0.075 mm). This was applicable to two samples and analysis indicated that the majority of the fines were fine sand with minimal clay and/or silt content. Thus, this information is not included in the analysis presented herein.

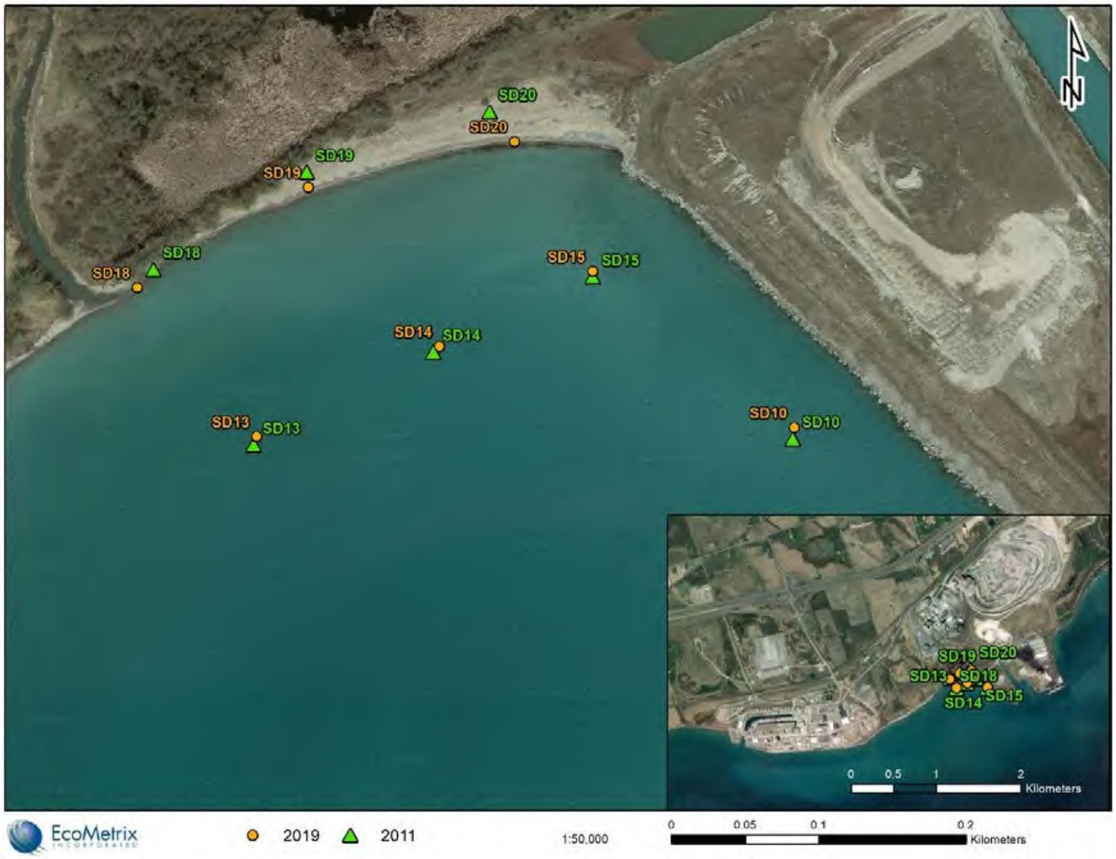

Figure 7-42: Common Sediment Sampling Locations within the DNNP Site Study Area for Particle Size in 2012 and 2019

Table 7-54: Sediment Particle Size for Stations Sampled in 2012 and 2019

Year	Sample ID	Clay %	Gravel %	Sand %	Silt %
2012	SD10	0.0	0.5	99.5	0.0
	SD13	0.0	0.5	99.5	0.0
	SD14	0.0	1.0	99.0	0.0
	SD15	0.0	1.0	99.0	0.0
	SD18	0.0	56.0	44.0	0.0
	SD19	0.0	15.0	85.0	0.0
	SD20	0.0	4.0	96.0	0.0
2019	SD10	0.8	0.2	96.0	2.6
	SD13	0.6	0.1	98.0	1.1
	SD14	1.0	0.0	98.0	1.4
	SD15	1.0	0.2	92.0	6.5
	SD18	0.6	7.2	92.0	0.0
	SD19	0.5	1.4	98.0	0.1
	SD20	0.4	1.7	98.0	0.2

Embayment Area

Nearshore

The nearshore area includes three comparable sampling locations at depths less than 2 m within the embayment area: SD18, SD19, and SD20 (Figure 7-42). Sediments from the nearshore area in 2019 and 2012 were similar (Table 7-55). Sand was dominant in both years of sampling (>75%) followed by gravel.

2-Meter-Depth

Thee samples were comparable at depths of 2 meters within the embayment area: SD13, SD14, and SD15 (Figure 7-42). Sediments at these areas were similar between 2019 and 2012 (Table 7-56). The sediment was greater than 95% sand in both years of sampling.

4-Meter Depth

Station SD10 is 4 meters deep and was sampled in both 2012 and 2019. Sand was the dominant particle size in both years and comprised greater than 95% of the composition (Table 7-57).

Table 7-55: Summary Statistics for Particle Size Analysis at Nearshore Stations (SD10, SD19, and SD20)

Year	Statistic	Clay %	Gravel %	Sand %	Silt %
2012	Total Count	3	3	3	3
	Minimum	0.0	4.0	44.0	0.0
	Maximum	0.0	56.0	96.0	0.0
	Mean	0.0	25.0	75.0	0.0
	Median	0.0	15.0	85.0	0.0
	Standard Deviation	0.0	27.4	27.4	0.0
2019	Total Count	3	3	3	3
	Minimum	0.35	1.4	92	0.018
	Maximum	0.55	7.2	98	0.23
	Mean	0.48	3.43	96.00	0.12
	Median	0.53	1.7	98	0.12
	Standard Deviation	0.11	3.27	3.46	0.11

Table 7-56: Summary Statistics for Particle Size Analysis at 2-Meter-Depth Stations (SD13, SD14, and SD15)

Year	Statistic	Clay %	Gravel %	Sand %	Silt %
2012	Total Count	3	3	3	3
	Minimum	0.0	0.5	99.0	0.0
	Maximum	0.0	1.0	99.5	0.0
	Mean	0.0	0.8	99.2	0.0
	Median	0.0	1.0	99.0	0.0
	Standard Deviation	0.0	0.3	0.3	0.0
2019	Total Count	3	3	3	3
	Minimum	0.6	0.0	92.0	1.1
	Maximum	1.0	0.2	98.0	6.5
	Mean	0.9	0.1	96.0	3.0
	Median	1.0	0.1	98.0	1.4
	Standard Deviation	0.2	0.1	3.5	3.0

Table 7-57: Particle Size Analysis at Station SD10 in 2012 and 2019

Particle Size	Unit	2012	2019
		SD10	
Clay (<0.0039 mm)	%	0.0	0.8
Silt (0.0039 - 0.062 mm)	%	0.0	2.6
Sand (0.062 - 2.0 mm)	%	99.5	96.0
Gravel (> 2.0 mm)	%	0.5	0.2

Infill area

The nearshore infill area particle size analysis from 2008 reported in the Aquatic Environment Existing Environmental Conditions TSD indicated that sediments were dominated by sand with the range of all nine samples of 92.0%-99.9% (Golder and SENES 2009). These results are similar to the results from 2019 which reported ranges of sand composition from 58%-98.6% (see Section 7.3.2.5.4). Differences at the lower end of the range are due to three samples having a larger proportion of silt in 2019. This is likely a function of the difference in laboratory methods. The erosion bluff shoreline results in sand deposition along the shoreline of this region of Lake Ontario.

Conclusion

Lake Ontario sediments are primarily composed of sand in the nearshore of the DNNP Site Study Area and have not changed since the 2009 application for the DNNP PRSL and supporting documents were compiled; therefore, the conclusions of the 2009 application supporting documents remain valid and no further assessment is required.

7.4.5 Periphyton/Attached Algae

The Aquatic Environment Existing Conditions TSD (Golder and SENES 2009) identifies that the periphyton community is dominated by attached algae (*Cladophora sp.*). Successive studies using video monitoring of habitat conducted in 2010 (SENES 2011a), 2011 (SENES 2011e), and 2019 (see Section 7.4.3) confirm that attached algae is still abundant in the nearshore area of the DNNP Site Study Area. Within Lake Ontario the association between dreissenid mussels and *Cladophora sp.* is well known, and fouling of intake structures by Cladophora at the DNGS facility does occur.

Concerning attached algae, the conclusions of the 2009 application supporting documents remain valid and no further assessment is required.

7.4.6 Benthic Invertebrates

Since the mid-1990's the benthic community and benthic habitat of Lake Ontario has been altered by the invasion of exotic dreissenid mussels. Nearshore areas were rapidly colonized, first by the zebra mussel, and now by the closely related quagga mussel, which has all but replaced the former. Mussels have had a significant impact on Lake Ontario including the nearshore environment of the DNNP Site Study Area (Golder and SENES 2009).

As described in the Aquatic Environment Existing Conditions TSD (Golder and SENES 2009), immature tubificids, chironomidae (*Stictochironomus sp.*), amphipoda (*Gammarus sp.*), and quagga mussels (*Dreissena bugensis*) are the dominant taxa within the nearshore area of DNNP Site Study Area. This dominance is largely due to hard packed substrate and high wave energy as the nearshore area is periodically exposed to storm surges and the sand/cobble substrate is too densely packed for invertebrates to burrow into. Recent studies conducted in 2016 and 2018 (see Section 7.3.2.2) demonstrated the same four dominant taxa in the epifauna community as was reported in the Aquatic Environment Existing Conditions TSD (Golder and SENES 2009). In 2016, it was noted that isopoda were also dominant at a few locations (EcoMetrix 2016b).

Recent studies demonstrate that the benthic community is similar to that described in the Aquatic Environment Existing Conditions TSD (Golder and SENES 2009). Therefore, the conclusions of the 2009 application supporting documents remain valid and no further assessment is required.

7.4.7 Plankton

The Aquatic Environment Existing Conditions TSD (Golder and SENES 2009) indicated that the phytoplankton and zooplankton communities within the DNNP Site Study Area were found to be consistent with the broader north shore and lake-wide planktonic community in terms of density, community structure, seasonal fluctuations and succession of dominant species. It further states that phytoplankton and zooplankton are carried around the lake by currents, such that populations of these organisms can be considered features of the Regional Study Area and are not specific to the Local Study Area or Site Study Area. This is due to the relatively high average current velocities in the nearshore area that transport these organisms past the DNNP Site Study Area. As stated in the Aquatic Environment Existing Conditions TSD (Golder and SENES 2009), both phytoplankton and zooplankton were excluded as valued ecosystem component indicator species as they are a reflection of the relatively low sensitivity of lake-wide populations of plankton species to local perturbations and also of the low degree of interaction with the DNNP Site Study Area given the relatively short residence time imposed by ambient lake currents that can carry plankton through the DNNP Site Study Area. Although Lake Ontario is undergoing planktonic community changes due to invasive species (e.g., spiny water flea, dreissenid mussel, bloody red shrimp) (see Sections 7.3.2.1 and 7.3.2.2, and Golder and SENES 2009), these aspects of the plankton community (low sensitivity of lake-wide populations of plankton species to local perturbations and low degree of interaction with the DNNP Site Study Area) have not changed. As such, the conclusions of the 2009 application for the DNNP PRSL and 2009 supporting documents remain valid and no further assessment is required.

7.4.8 Ichthyoplankton

The Aquatic Environment Existing Conditions TSD (Golder and SENES 2009) reported on larval fish sampling within the DNNP Site Study Area during the spring of 2009. It was determined that Round Goby was clearly the dominant species of larval fish and comprised 97% of all larval fish caught. The two other species of larval fish caught were Round Whitefish and sculpin. Sculpin eggs were the only eggs encountered during the study. Springtime studies conducted after 2009 reported similar findings concerning larval fish. In spring of 2011, 2013, 2016, and 2018 (see Section 7.3.2.3.4), Round Goby was the dominant larval fish caught. Across these studies, sporadic capture of larval Round Whitefish, Rainbow Smelt, and sculpin occurred. While sculpin eggs were also found in the post-2009 studies, so were eggs of Rainbow Smelt and Alewife. Any differences observed are well within natural variability expected for the ichthyoplankton community.

Ichthyoplankton studies conducted since 2009 confirm the findings of the community described in the Aquatic Environment Existing Conditions TSD (Golder and SENES 2009). Therefore, the conclusions of the 2009 application for the DNNP PRSL and 2009 supporting documents remain valid and no further assessment is required.

7.4.9 Thermal Effects

Within the Aquatic Environment Existing Conditions TSD (Golder and SENES 2009) thermal effects are discussed relative to the once-through cooling system currently in use at DNGS. The DNGS diffuser consists of a single line of 90 diffuser ports that project from a lake bottom discharge pipe. The diffuser line is oriented roughly perpendicular to shore and offset from productive shallows. Due the upward angle of the diffuser ports and the buoyancy of the thermal effluent in the usually cooler receiving lake waters, confirmatory studies of the thermal plume and diffuser mixing characteristics have shown that interaction of heated water with the lake bottom is minimal (Golder 2009). Average surface temperature increases from ambient within the DNGS area ranged between 1 to 2°C, these temperature increases are minimal and little effect on the local fish populations can be expected. The Aquatic Environment Existing Conditions TSD (Golder and SENES 2009) concluded that the diffuser configuration of DNGS appears to have effectively mitigated thermal plume effects relative to a surface thermal discharge. Furthermore, in the EIS (SENES and MMM 2009), no adverse effects to fish resulting from the thermal plume of the DNGS diffuser were identified.

Egg development in bottom substrates was also considered in the Aquatic Environment Existing Conditions TSD (Golder and SENES 2009). Temperature monitoring along the perimeter of the mixing zone indicated that the estimated percent of time when temperature changes exceeded 2°C above ambient was less than 5%. This information was compared against simulation studies to determine the potential effects of thermal discharge on developing Round and Lake Whitefish eggs during the winter period (Griffiths 1979, 1980). The simulation studies determined that periodic exposure to elevated temperatures was less deleterious than continuous exposure, but survival declined sharply when eggs were re-cycled to temperatures above 7°C. Computations indicated that survival would be maintained at 75% of expected ambient levels if constant temperature increases were limited to 3.5°C above ambient temperatures. Periodic increases (for 25% of the time) of 5°C above ambient would have a similar effect. Furthermore, additional simulations under worst (warmest) conditions concluded that continuous elevations above ambient of 0.5°C to 1°C or periodic (25-75% of time) elevations of 2°C to 2.5°C above ambient will have little adverse effect on Round Whitefish eggs.

With its offshore multi-port diffuser, DNGS is employing Best Available Technology in terms of thermal discharge effects (Canadian Nuclear Safety Commission 2006).

As presented in Section 7.3.2.3.5, multiple thermal effect studies have been conducted since the Aquatic Environment Existing Conditions TSD (Golder and SENES 2009).

Thermal plume modeling conducted by Golder (2010) predicted that there were no effects from operation of the DNNP diffuser on any of the five fish species considered – Round Whitefish, Emerald Shiner, Alewife, White Sucker or Lake Trout. These five fish species were assumed representative of the potential effects on other fish species with similar habitat requirements.

A synthesis report evaluated the latest information on thermal effects to Whitefish egg survival (COG 2017). This assessment was determined to be the most accurate to date and developed science-based thermal benchmarks, useful for industry and regulatory agencies (COG 2017). Using multiple datasets, the ΔT (change in temperature) that elicit effects (10% mortality or 90% probability of survival) ranged from 2.9°C to 3.4°C above ambient. The average modeled ΔT was 3.0°C which is also the recommended ΔT for effect proposed by Environment and Climate Change Canada (COG 2017). A hybrid response model for early development of Round Whitefish using various scenarios (combinations of the 2011-12 data from COG (2014) and data from Griffiths (1980)) resulted in a narrow range of threshold temperatures, defined as the temperature that corresponds to 90% probability of survival (10% mortality). A threshold temperature of 6.3°C was predicted based on a dataset which was considered most realistic based on visual inspection and biological arguments (EcoMetrix 2016c).

Successive studies conducted on thermal effects since the 2009 application for the DNNP PRSL confirms the conclusions presented in the Aquatic Environment Existing Conditions TSD (Golder and SENES 2009). According to the MECP amended Certificate of Approval (now Environmental Compliance Approval; see Section 6.3.2.1.3), the DNGS diffuser is designed to limit the surface water temperature to a maximum of 2 degrees Celsius above ambient lake temperature at the edge of a one kilometre square mixing zone. Since the thermal discharge diffuser for the proposed DNNP is expected to be comparable to or improved compared to the diffuser for the DNGS, thermal discharge is unlikely to impact local fish populations including whitefish egg survival. Therefore, the conclusions of the 2009 application for the DNNP PRSL and 2009 supporting documents remain valid and no further assessment is required.

7.4.10 Impingement and Entrainment

Impingement

The DNNP intake structure will be at least as effective as the DNGS intake structure which has been designed to mitigate impingement and entrainment mortality (OPG 2019c). Therefore, estimates of impingement and entrainment at DNGS are applicable to DNNP. The Aquatic Environment Existing Conditions TSD (Golder and SENES 2009) presented a number of impingement studies at DNGS with the most recent study occurring in 2006-07. An estimated impingement range at DNGS was 14,119 (437 kg) to 26,020 (839 kg) fish/yr. Eight species were impinged in 2006-07 with Alewife and Round Goby comprising 85.9% and 8.5% of the total impinged, respectively. Four different models used to quantify impingement losses suggested that the losses were negligible considering the lake populations of these impinged organisms. Differences in fish species impinged in 2006-07 compared to historical studies were attributed to changes in the fish community in Lake Ontario and associated changes in Lake Ontario productivity and other receiving system changes (e.g., climate change).

An impingement study conducted in 2010/2011 (see Section 7.3.2.3.6) resulted in impingement values of 274,931 (2,362 kg) (54% Round Goby and 42% Alewife) which was higher than in 2006-07. SENES (2011d) indicated that the increase in impingement numbers may be attributed to the increased prevalence of Round Goby, more efficient travelling screens that were installed, and changes in the lake population dynamics of Alewife (increased numbers of age-1 fish). Biological liability analysis was conducted on the fish that were impinged, with results indicating that the production foregone of Alewife and Rainbow Smelt were negligible when considering the biomass of each species present in Lake Ontario. Furthermore, lost fishery yield was relatively small (89 kg) and consisted almost exclusively of Rainbow Smelt (almost 98%). Lost fishery yield for all other species combined amounted to less than 2 kg (SENES 2011d).

The conclusions made in the Aquatic Environment Existing Conditions TSD and 2011 based on the liability analysis are still valid. For example, Alewife biomass in Lake Ontario in 2018 was estimated to be 26.6 kg/ha based on a hydroacoustic survey and 33.7 kg/ha based on bottom trawl surveys (MNRF 2019). Lake Ontario is approximately 1,806,000 hectares (US EPA 2011). Thus, the production foregone of Alewife (~577 kg; SENES 2011d) is negligible when considering the biomass of Alewife in Lake Ontario.

Entrainment

Two entrainment studies conducted in 2004 and 2006 provide annual entrainment estimates of 15,631,833 and 605,059 fish eggs, respectively, and 1,201,943 and 6,996,246 larval fish, respectively. Species entrained in 2004 were dominated by Alewife and Rainbow Smelt. In 2006, Alewife, Common Carp and Freshwater Drum were the only species entrained. Models were used to extrapolate the entrainment losses at DNGS and it was concluded that these relatively small estimated losses were not considered meaningful to populations of these species (Golder and SENES 2009). Invertebrate entrainment was also quantified and it was determined that the losses were negligible considering the large nearshore density and lake populations of the entrained organisms.

An entrainment study conducted in 2015/2016 (Arcadis 2017, see Section 7.3.2.3.6) concluded that 94,482,521 fish eggs (92.5% Alewife) and 210,983,411 larval fish (90.8% Round Goby) were entrained annually. These entrainment estimates were higher than the estimates in 2004 and 2006; however, the 2015-16 entrainment estimates were considered more accurate than the previous studies as the sample design was more robust (Arcadis 2017). Equivalent loss estimates of entrainment numbers were calculated using the Equivalent Adult Model (EAM), Biomass Loss Model (BLM), and the Equivalent Yield Model (EYM), with the modeling considered to be more accurate than the modeling completed for the 2004 and 2006 entrainment studies. These biological loss estimates (see Section 7.3.2.3.6) from entrainment are not considered meaningful to populations of these species entrained. Although Alewife was a major species entrained at DNGS, the biomass lost was estimated at 8 kg. Considering that the Alewife biomass lost from impingement (577 kg) is negligible compared to the 2018 Alewife biomass in Lake Ontario, the loss from entrainment, which is far less than from impingement, is also expected to be negligible compared to the lake population. Deepwater Sculpin, a federal species of special concern, were not entrained in 2004 or 2006 but were entrained in 2015/2016. Arcadis (2017) indicated that the biomass lost (122 kg or 21% of total biomass lost at DNGS) was likely overestimated. Furthermore, it was noted that the Deepwater Sculpin population in Lake Ontario is recovering and densities and biomass may be similar to other Great Lakes (Weidel et al. 2017). Furthermore, the Deepwater Sculpin population in Lake Ontario may be nearing its carrying capacity (MNRF 2019).

Conclusions

Although current fish impingement and entrainment estimates are higher than estimates presented in the Aquatic Environment Existing Conditions TSD (Golder and SENES 2009),the conclusion that losses from impingement and entrainment are too low to measurably affect Lake Ontario fish populations is still valid. As such, the conclusions of the 2009 application for the DNNP PRSL and 2009 supporting documents remain valid and no further assessment is required.

7.4.11 Darlington Creek Fish Community

The Aquatic Environment Existing Conditions TSD (Golder and SENES 2009) describes Darlington Creek as a warmwater fish community. Fish habitat was found to be of good quality in the upper reaches and of progressively lower quality toward the outlet into Lake Ontario. Historical data that was compiled for the creek (1998 to 2009) resulted in ten confirmed species (Common Carp, White Sucker, Brook Stickleback, Pumpkinseed, Bluntnose Minnow, Fathead Minnow, Blacknose Dace, Longnose Dace, Creek Chub, and Rainbow Trout).

As described in Section 7.3.2.3.2, fish community studies were conducted in 2010 and 2015 by the Central Lake Ontario Conservation Authority. Eight species were captured in both 2010 and 2015, of these species, only three were not reported between 1998 and 2009 (Green Sunfish, Northern Redbelly Dace, and Largemouth Bass). The fish community has not changed (is well within variability found in natural systems) since the Aquatic Environment Existing Conditions TSD was published and is still considered a warm water fish community.

Regarding the fish community of Darlington Creek, the conclusions of the Aquatic Environment Existing Conditions TSD (Golder and SENES 2009) are in agreement with the successive studies presented above. Therefore, the conclusions of the 2009 application for the DNNP PRSL and 2009 supporting documents remain valid and no further assessment is required.

7.4.12 Species at Risk

ESA (Provincial) and SARA (Federal)

No new aquatic species at risk have been identified since the Aquatic Environment Existing Conditions TSD (Golder and SENES 2009). However, as identified in Section 7.2, species at risk designations have changed. Since the 2009 application for the DNNP PRSL, the following species have become listed as a provincial species at risk:

- American Eel (*Anguilla rostrata*): listed as endangered. The species was described as a transition species to be listed in the ESA in the supporting documents for the 2009 application.

- Lake Sturgeon (*Acipenser fulvescens*, Great Lakes – Upper St. Lawrence population): listed as endangered. At the time the supporting documents for the 2009 application for the DNNP PRSL was submitted, there was no provincial listing for Lake Sturgeon.

Further, the following updates are provided with regards to federal species at risk since the 2009 application for the DNNP PRSL:

- American Eel: The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) has assessed American Eel as threatened (2012). At the time of the 2009 application for the DNNP PRSL, the species was assessed as Special Concern. The SARA status has remained unchanged (i.e., not listed on Schedule 1 of SARA).

- Lake Sturgeon (Great Lakes – Upper St. Lawrence populations): Lake Sturgeon has remained assessed as threatened by COSEWIC. The SARA status has remained unchanged (i.e., not listed on Schedule 1 of SARA). Note that Lake Sturgeon have not been present in aquatic sampling around the DNNP Site Study Area since 1999.

- Atlantic Salmon (*Salmo salar*, Lake Ontario Population): COSEWIC assessed the species as extinct (2010); the species was considered extirpated at the time of the 2009 application for the DNNP PRSL.

- Deepwater Sculpin (*Myoxocephalus thompsonii*): COSEWIC assessment (Special Concern) and SARA status have not changed. The species is listed in Schedule 1 of SARA as a species of Special Concern.

These changes in species at risk status are assessed in Section 7.5.1.1.

7.5 Assessment of Changes

This section provides an assessment of the changes that were described in Section 7.4, and their potential to alter the conclusions described in the Aquatic Environment Existing Environmental Conditions TSD (Golder and SENES 2009) prepared in support of the 2009 application for the DNNP PRSL.

7.5.1 Potential for Change in Conclusions of Site Evaluation

7.5.1.1 Species at Risk

As identified in Section 7.4.12, provincial and federal species at risk designations have changed since the 2009 applications for the DNNP PRSL.

Assessment/Disposition

Before site preparation activities occur, the provincially-listed American Eel and Lake Sturgeon would have to be assessed as part of the Overall Benefit permitting process under the ESA (S. 17(2)(c)). Requirement for this permit was identified under D-P-3.7 of the DNNP Commitments Report (OPG 2019c). Thus, listing of these two fish species do not alter conclusions with respect to residual adverse effects of the project and do not impact conclusions of the original site evaluation.

Although COSEWIC designations of species at risk have changed for some aquatic species (American Eel, Atlantic Salmon), none of the fish are listed in Schedule 1 of SARA, which is the official list of wildlife species at risk. However, despite not being listed in Schedule 1 of SARA, these fish were considered as species of conservation concern in the 2009 application supporting documents for the DNNP PRSL. Deepwater Sculpin remains as a species of Special Concern under Schedule 1.

There has been no change to the federal status of these species and the change in COSEWIC designations do not alter the original conclusions regarding residual adverse effects of the project. As such, no further actions are necessary.

7.5.1.2 REGDOC 1.1.1 Section C.7.1 – Baseline Aquatic Biota and Habitat

Ten potential gaps related to Section C.7.1 of REGDOC 1.1.1 were identified.

Assessment/Disposition

Review of additional reporting and studies since the 2009 application for the DNNP PRSL identified that nine of the ten potential gaps have been addressed (dispositions are presented in Table 7-58) and no further actions are necessary.

The remaining potential gap - *Fish Habitat Map Inclusive of: spawning, nursery, rearing, feeding, refuge/cover, movement corridors, existing thermal discharge, lake currents, contaminant pulses, storm water release points, groundwater plumes, shoreline plant communities* - was assessed to determine if it had the potential to impact conclusions regarding residual adverse effects of the project or site evaluation. Although a specific fish habitat map satisfying all these requirements was not produced, it was determined that the information relevant to the creation of habitat maps was already considered during the original assessment of project effects and therefore the intent of Section C.7.1 has been met. This potential gap does not impact conclusions about residual adverse effects of the project or the site evaluation and no further actions are necessary.

Table 7-58: Potential Gaps Regarding REGDOC 1.1.1 Section C.7.1 (Baseline Aquatic Biota and Habitat)

Subject of Potential Gap	Potential Gap Exists After Review of Additional Studies?	Disposition	Impact on Residual Adverse Effects of the Project?
Fish Habitat Map inclusive of: spawning, nursery, rearing, feeding, refuge/cover, movement corridors, existing thermal discharge, lake currents, contaminant pulses, storm water release points, groundwater plumes, shoreline plant communities.	**Yes**	Although a specific fish habitat map satisfying all these requirements was not produced, it was determined that the information relevant to the creation of habitat maps was already considered during the original assessment of project effects and therefore the intent has been met.	No
Watershed Map delineating watershed boundaries and land use.	No	Detailed land use, including ELC classification, for the DNNP Site Study Area is presented in Section 8.4.1.	No
Review of past site clearing and shoreline development.	No	The shoreline of the DNNP lands is undeveloped. During construction of the DNGS facility the DNNP lands were used for construction staging as described in *Geological and Hydrogeological Environment – Environmental Effects Technical Support Document, New Nuclear – Darlington Environmental Assessment* (Geological and Hydrogeological Environment Effects TSD) (CH2M HILL 2009).	No
Potential effects of climate change on habitat suitability and how that may alter spatial distributions of biota.	No	Climate change is discussed in the Aquatic Environment Effects TSD (SENES and Golder 2009). This includes discussion on increased temperature and reduced basin runoff and effects on VECs include increased algal growth and shift toward more warmwater fish species relative to coldwater species.	No
Background ranges of habitat characteristics that may be affected by project.	No	As identified in Section 7.3.2, background conditions of fish, invertebrates, and plankton have been well quantified with field studies.	No
Site background information and biological life history that affect population growth and the capacity to recover from adverse effects.	No	Environmental monitoring within the DNNP Site Study Area has demonstrated that the aquatic community is resilient to nuclear power production activities.	No
Cover and standing biomass of aquatic plants as a basis to predict and detect changes.	No	Standing biomass of aquatic plants has not be estimated because they are notably absent. Due to the erosional nature of the site, aquatic macrophyte presence is negligible. The filamentous algae Cladophora (*Cladophora sp.*) is present and can form dense mats.	No
Adequate characterization of the VC structural attributes; including specific attribute that is focus of assessment as important to project. VC characterization of population, geographical distribution of species, and spawning requirements. Statement of confidence of characterization.	No	As described in Section 7.3.2, the aquatic community structure has been well studied within the DNNP Site Study Area.	No
Information on stability of VCs and capacity to be resilient to project disturbance, baseline values and trends of VCs.	No	Environmental monitoring within the DNNP Site Study Area has demonstrated that the aquatic community is resilient to nuclear power production activities.	No
An aquatic species inventory list based on field studies for the site and local study area and available published information for the regional study area for fish, benthic invertebrates, major macrophyte species along with evidence that information is representative by identification of expected species compared to catalogued species found during field investigations.	No	As identified in Section 7.3.2, numerous field investigations have been conducted resulting in a comprehensive species inventory.	No

7.5.1.3 REGDOC 1.1.1 Section C.7.2 – Baseline Food Change

Within REGDOC 1.1.1 Section C.7.2, the text states that *characterization information shall include reference locations that would not be exposed to project effects made over multiple years to understand natural year-to-year variability*. Sampling of reference location(s) among years was not included in the Aquatic Environment Existing Environmental Conditions TSD.

Assessment/Disposition

Since the 2009 application for the DNNP PRSL, reference locations have been established at Thickson Point and Bond Head and have been sampled over multiple years for fish community data, including supporting water quality measurements, (see Section 7.3.2). As such, the intent of Section C.7.2 has been met. The original conclusions regarding residual adverse effect of the project are not impacted and no further actions are necessary.

7.5.1.4 REGDOC 1.1.1 Section G.5.4 – Effect of Thermal Plume on the Aquatic Environment

Within REGDOC 1.1.1 it is stated in Section G.5.4 that *descriptions of models (physical, mathematical, conceptual) used to predict temperature effects and thermal discharge jet effects, and to account for long-term effects of climate warming relative to incremental effects of the project*; *a listing of aquatic fish and shellfish species, aquatic plants, and invertebrates, identifying which life stages are susceptible to exposure to the interaction, and which subset of species are most sensitive*; and *the potential for gas-bubble disease* shall be provided.

Assessment/Disposition

Review of the reports and studies conducted since the 2009 application for the DNNP PRSL addresses this potential gap. The effects of predicted temperature changes during operation of the proposed DNNP diffuser were assessed on the basis of modeled temperatures at three locations including the proposed diffuser location; the embayment created by the proposed lakefill; and the existing DNGS diffuser, with both facilities operating (Golder 2010). A range of climatic conditions was covered that included years during which temperatures were similar to long term averages, as well as a warmer-than-average year and a colder-than average year. Temperature changes were assessed against published temperature benchmarks for the fish species that have been recorded in abundance in the area, or that were of particular conservation concern. All life stages that could be present were considered. A conservative approach was taken that assumed that if suitable habitat existed, the species could be present, regardless of whether the species had actually been observed in the area. The species considered were Round Whitefish, Emerald Shiner, Alewife, White Sucker and Lake Trout. While these specific species were considered in the assessment, they were also considered as representative of the potential effects on other species with similar habitat requirements. No effects from the operation of the DNNP diffuser were predicted for the five species considered. The lack of effects on Round Whitefish, Alewife, and Lake Trout is important as these species prefer cold waters and can be considered sentinel species sensitive to climate change effects in this system. Round and Lake Whitefish egg incubation experiments identified that Round Whitefish developing eggs were more sensitive to temperature changes and a thermal benchmark of 3.7 °C above ambient temperatures was established (COG 2014); using models, this benchmark was further revised to 2.9°C to 3.4°C above ambient that would result in a 90% probability of survival. Further, under commitment D-P-12.4 (OPG 2019c), an aquatic monitoring program will be implemented as a condition of any Fisheries Act Authorization. Similarly, OPG has committed (D-C-1.2) to work with ECCC to ensure that thermal modelling and assessment of climate change scenarios are incorporated into the design of the DNNP diffuser to address policy objectives and compliance with applicable Federal statutes (OPG 2019c). As such, the intent of Section G.5.4 has been met. The conclusions regarding residual adverse effects of the project remain valid and no further actions are necessary.

Gas-bubble disease is easily recognized during fish examinations with signs including exophthalmia and gas-filled bubbles on the head, mouth, jaws and caudal fin. The occurrence of gas-bubble disease has never been observed during the many studies conducted throughout the operation of the DNGS facility; therefore, it is unlikely to be an effect of the DNNP diffuser. The diffuser discharge system at DNGS was designed to reduce the temperature change to surrounding waters and therefore would also minimize the potential for gas bubble trauma in fish. Concern for gas-bubble disease is addressed with OPG's commitment D-C-1.2 (OPG 2019c) to design the diffuser such that the thermal discharge will not be deleterious or it can be mitigated such that it causes minimal harm to fish. As such, the intent of Section G.5.4 has been met. The conclusions regarding residual adverse effects of the project remain valid and no further actions are necessary.

7.5.2 Additional Commitments (if Required)

7.5.2.1 Mitigating Action

No additional mitigating measures were identified.

7.5.2.2 Follow-up Monitoring

No additional monitoring was identified.

7.5.2.3 Conclusion

The current baseline data and regulatory guidelines do not alter the original conclusions of the 2009 application supporting documents regarding residual adverse effects of the project and no further actions are necessary to address the DNNP.

8.0 BASELINE TERRESTRIAL COMMUNITIES

8.1 Compliance with REGDOC 1.1.1

Baseline information concerning terrestrial communities was found to be compliant with REGDOC 1.1.1 with one exception. Kinectrics (2019) identified that per Section C.6, a “description of natural and human-induced pre-existing environmental stresses and the current ecological conditions that indicate such stresses” was needed.

To address this potential gap, changes in site conditions that could result in an environmental stress since completion of the 2009 application for the DNNP PRSL were reviewed. These potential stresses were classified as either human-induced or natural and current ecological conditions that are reflective of these stresses were identified. The following provides information to address this gap and Section 8.5.1 provides an assessment of these changes.

8.1.1 Human Induced Pre-existing Environmental Stresses

Roads, Energy Drive and Highway 401 Interchanges

In 2014, roadworks began by the Ministry of Transportation and the Municipality of Clarington associated with the realignment of Energy Drive and the construction of a series of roundabouts along Holt Road. These works have modified the northern portion of the DNNP Site Study Area. These projects resulted in a change of the DN property boundary and removal/modification of the vegetation communities and associated habitat functions within the northern portion of the Site Study Area. Vegetation communities removed/altered as a result of these works include woodlands, wetland, meadows and thickets (Beacon 2019a). The noise from Hwy 401 is thought to negatively affect the breeding bird community in the northern portions of the site. Disruption to wildlife movements likely continues at a low level for some species as the site is effectively surrounded by and dissected by busy roadways.

Installation of New Water/Sewer Lines

Some temporary disturbances occurred on the DNNP Site Study Area, due to the installation of the new water and sewer lines beginning in 2012. The disturbances were localized to the areas south of Coot’s Pond and south of the Switchyard (Beacon 2012a and Beacon 2012b). These areas are now cultural meadow communities with the Switchyard area being of poorer quality, likely due to the condition of the soil used during restoration (Beacon 2019a). This represents a change in vegetation communities and habitat quality.

Soil Disposal Bobolink Hill

On the top of Bobolink Hill, soil disposal activities, which took place in 2016 and 2017, and subsequent restoration efforts in 2017 and 2018 have taken place. These works have altered an area that was previously turf sports field and cultural meadow creating additional habitat. The restoration efforts focused on the creation of a butterfly and pollinator area (Beacon 2019a).

Campus Plan Projects and Other Land Use Changes

Through OPG Campus Plan initiatives and other land use changes on the DNNP Site Study Area there have been several alterations to the terrestrial environment. The meadows in the southwest area of the site (north and west of the intake channel) were converted to parking areas in 2014. The treed area located west of the building effluent lagoons and east of the upper parking lot were removed in 2019. Beginning in 2015 the waterfront trail that crosses the northern portion of the DNNP Site Study Area has been upgraded and expanded. Overall, these changes have resulted in an increase of anthropogenic areas and a decrease in vegetation communities and associated habitat (Beacon 2019a).

Pond Berms

Continued leakage of the Coot's Pond berm has limited water level management options (Beacon 2019a). High water levels cannot be maintained during the drawdown cycle, which is the period when the water level is manually dropped to the lowest level. In addition to the leakage in the Coot's Pond berm there has been a lack of maintenance at the outfalls of Dragonfly and Polliwog ponds on the east side of the DNNP Site Study Area (Beacon 2019a and b). This has resulted in a reduced hydro-period and has consequently been linked to a decline in breeding amphibian activity in these ponds and change in plant community composition.

Agriculture

While the agricultural fields do provide some benefit to wildlife, mainly as found dependant on crop type, nutrient runoff is likely the greater concern. As identified in Section 5.3.2.4, nitrate was detected within a number of groundwater wells located in agricultural fields within the DNNP lands. Excessive fertilizer (nitrogen and phosphorus) runoff from agricultural activities can increase primary productivity of surface waters resulting in change of aquatic community structure and function.

Yard Waste and Building Materials Dump Site

As identified in Section 5.5.1.1.1, soil sampled within the yard waste and building materials dump site (DN6) has MECP Table 3 Standard exceedances for several metals, PHC and

PAHs, and two of the three samples in this area were impacted. This presents a possible exposure pathway for wildlife.

8.1.2 Natural Pre-existing Environmental Stresses

Phragmites

Phragmites around Coot's Pond has increased since the 2009 application for the DNNP PRSL. This vegetation community was previously described as Meadow Marsh (MAM2) and has been changed to Mineral Shallow Marsh (MAS2) in 2018 to better describe the conditions. The total cover of Phragmites dominated wetlands in the Site Study Area has increased to 3.38 ha. Phragmites is found throughout the DNNP Site Study Area but does not dominate marsh communities to the extent that it does at Coot's Pond (Beacon 2019a). Its presence may threaten the persistence of the Mineral Fen community found in the southwest shoreline bluffs, as well as the Great Lakes Shoreline Graminoid Marsh (MAM4-1).

Emerald Ash Borer

Noted in 2013 was the arrival of Emerald Ash Borer (Beacon 2014). Dead ash trees and borer exit holes have been observed in the northeast part of the property and the conditions appear to be progressing across the DNNP Site Study Area. In 2018, the damage from the borer was apparent within what would have been ash dominated deciduous forests or swamp. The decimation of ash trees by the borer has caused the core of this deciduous forest to revert to cultural thicket, swamp thicket and cultural woodland communities. Regeneration within areas that have reverted to thicket is mostly European Buckthorn, a highly invasive shrub that restricts competition (Beacon 2019a).

Lake Ontario Water Levels

Water levels in Lake Ontario have been at record levels since 2017. The water levels have the potential to create an environmental stress for the DNNP Site Study Area through the interaction with the bluff face and loss of beach habitat for certain plant species. Elevated water levels allowed waves to reach the base of the bluffs resulting in the stability of the face being undermined, which may have implications for the Bank Swallow colonies as well as the rare vegetation communities associated with the bluffs (Beacon 2018a).

8.2 Changes to Codes, Standards and Practices

Species listings under both the *Species at Risk Act* (SARA) and *Endangered Species Act* (ESA) have been updated since the original DNNP PRSL was granted. Therefore, the current DNNP Site Study Area species list and habitat was compared against the most recent versions of these *Acts* in Sections 8.3.2.7 and 8.4.6.

8.3 Baseline Characterization

This section provides an overview of the current baseline for the Terrestrial Environment as required by REGDOC 1.1.1. Baseline data collected in support of the 2009 application for the DNNP PRSL is described in the *Terrestrial Environment - Existing Environmental Conditions Technical Support Document, New Nuclear – Darlington Environmental Assessment* (Beacon 2009a).

8.3.1 Study Areas

The Site Study Area of the terrestrial environment for both the *Terrestrial Environment Existing Environmental Conditions Technical Support Document* (TSD) (Beacon 2009a) and the current baseline update (Beacon 2019b) encompass the entirety of the DNNP Site Study Area (Figure 8-1, Beacon 2009a, Beacon 2019b). Although terrestrial monitoring and survey studies rarely occurred off property, the use of the DNNP Site Study Area as breeding habitat, wildlife corridor and migratory refuge was considered when determining use of the DNNP Site Study Area by wildlife. Annual biodiversity studies have been conducted at the DNNP Site Study Area since 1997 (Beacon 2019b). A total of 961 species have been identified since record keeping for the DNNP Site Study Area began, as shown in Table 8-1. A list of field investigations conducted after the submission of the Terrestrial Environment Existing Environmental Conditions TSD (Beacon 2009a) in 2009, along with the year conducted, is presented in Table 8-2. Unless otherwise indicated, the studies listed in Table 8-2 were used to characterize the current terrestrial environment. A map of the biomonitoring locations is provided in Figure F-1 of Appendix F.

Several studies completed in support of the 2009 application have not been undertaken since. These studies are: dragonfly and damselfly surveys, butterfly surveys, bird strike surveys, winter waterfowl surveys, small mammal trapping, and winter wildlife and raptor surveys.

Figure 8-1: Terrestrial Communities DNNP Site Study Area

Table 8-1: Cumulative DNNP Site Study Area Terrestrial Species Count to 2019

Terrestrial Group	Cumulative Species Count
All Bird Species	232
Mammals	36
Reptiles and Amphibians	13
Butterflies	33
Dragonflies/Damselflies	42
Moths	211
Other insects	13
Vascular Plants	380
Liverworts and Mosses	1
Total species recorded	**961**

Source: Beacon 2019b.

Table 8-2: DNNP Site Study Area Surveys performed from 2010 to 2019

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Breeding Bird (BB) Line Transects[1]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BB South Area Walkabout[1]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Eastern Meadowlark		✓	✓	✓	✓	✓	✓	✓	✓	✓
Bobolink		✓	✓	✓	✓	✓	✓	✓	✓	✓
Barn Swallow	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bank Swallow	✓	✓	✓	✓		✓	✓	✓	✓	✓
Least Bittern			✓	✓	✓	✓	✓	✓	✓	✓
Amphibians	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Reptiles[2]		✓								✓
Bats Transects			✓	✓	✓	✓	✓	✓	✓	
Ponds	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ecological Land Classification (ELC)				✓					✓	
Butternut										✓
South West Area Natural Features[3]	✓									
Targeted Rare Plants[3]	✓									
Bat Passive Monitoring[3]									✓	
North East Area Walkabout (BB) [3]									✓	

Source: Beacon 2019b.

[1] 2019 breeding bird line transect, and south area walkabout data not included in baseline update.

[2] 2019 reptile survey data were not included in the baseline update.

[3] Indicates studies that are not part of the DN biodiversity program.

8.3.2 Summary of Baseline Data

8.3.2.1 Vegetation

Since 2007, the Ecological Land Classification (ELC) for Southern Ontario (Lee et al. 1998) and floral inventory have been repeated every five years (2013 and 2018) within the DNNP Site Study Area (Beacon 2019b). Previously, the ELC and floral inventory were completed at the DNNP Site Study Area in 2007 and were used to describe vegetation in the Terrestrial Environment Existing Environmental Conditions TSD (Beacon 2009a).

As of 2018, approximately half of the DNNP Site Study Area consists of ecological features (57%) while the other half is in anthropogenic use, including agricultural, turf, stormwater management ponds, and infrastructure (43%; Table 8-3).

The dominant ecological feature of the DNNP Site Study Area is meadow (24%), followed by thicket (14%), woodland (5%), and swamp (5%) (Table 8-4 and Table 8-5). In general the DNNP Site Study Area has four main areas: in the northwest there are sports fields, a large settling pond (Coot's Pond), and Bobolink Hill comprised of cultural meadow and cultural thicket; in the north east there are agricultural fields, cultural thicket, and deciduous forest as well as three constructed wetland ponds (Treefrog, Dragonfly and Polliwog ponds); the south east is mostly cultural meadow; and in the south center and south east is the DNGS. A detailed map depicting land use is presented in Figure F-2 of Appendix F.

In general, flora identification is conducted in conjunction with ELC field investigations. Currently, there are 380 documented plant species at the DNNP Site Study Area (Beacon 2019b).

Apart from the flora inventory being generated during ELC field investigations, a more detailed flora inventory was conducted in the extreme south west corner of the DNNP Site Study Area adjacent to the Lake Ontario Bluffs as field investigations identified this area as having unique ecological features. The detailed botanical inventory that was undertaken in the area identified 30 rare and/or uncommon plants from the southwest area. This includes 14 species that are considered locally (Durham) and/or regionally rare (GTA) and six species that are locally and/or regionally uncommon (Beacon 2011a).

Table 8-3: Land Cover Category Comparison 2007, 2013, and 2018

Category	Area by year (ha)		
	2007	2013	2018
Upland Forest	15.4	14	15.6
Cultural Woodland (incl. plantation)	46.1	39.4	23.4
Cultural thicket/old field Meadow	179.2	182.3	171.5
All wetlands	31.6	35.9	42.2
Open / Submerged aquatic	2.0	1.9	8.8
Shore/Beach/Bluff	3.9	3.9	3.8
Subtotal	278.2	277.4	265.3
Agricultural and other (e.g. roads, parkland, industrial, disturbed, etc.)	200.4	201	196.9
Total (ha)	**478.6**	**478.4**	**462.2**

Source: Beacon 2019b.

Table 8-4: Terrestrial Community Class Comparison 2007, 2013, and 2018

		Code	Area			% DNNP Site Study Area			% Terrestrial Community Classes		
			2007	2013	2018	2007	2013	2018	2007	2013	2018
Terrestrial Community Classes	Beach	BB	1.5	2.0	2.1	<1	<1	<1	<1	<1	1
	Bluff	BL	2.4	1.9	1.8	<1	<1	<1	<1	<1	<1
	Forest	FO	15.4	14	15.6	3	3	3	6	6	7
	Woodland	CUW/CUP	45.9	39.4	23.4	10	8	5	19	16	11
	Thicket	TH/CUT	61	69.5	62.6	12	15	14	25	29	29
	Meadow	ME/CUM	118.3	112.8	108.9	25	24	24	48	47	51
	Total Terrestrial		**244.5**	**239.6**	**214.4**	**51%**	**50%**	**48%**			

Source: Beacon 2019b.

Table 8-5: Wetland Community Class Comparison 2007, 2013, and 2018

		Code	Area			% DNNP Site Study Area			% Wetland Community Classes		
			2007	2013	2018	2007	2013	2018	2007	2013	2018
Aquatic and Wetland Community Classes	Marsh	MA	13	15.2	17.3	2.7	3	<1	39	42	34
	Open Aquatic	OA	2.0	1.9	6.9	<1	<1	1	6	5	13
	Submerged Aquatic	SA	0.1	0.2	1.9	<1	<1	<1	<1	<1	4
	Swamp	SW	18.4	18.5	24.8	3.8	3.9	5	55	52	49
	Total Aquatic and Wetland		**33.5**	**35.8**	**50.9**	**7%**	**7%**	**11%**			

Source: Beacon 2019b.

8.3.2.2 Breeding Birds

Breeding bird surveys have been conducted annually as part of the DN Biodiversity Monitoring Program. Additionally, in 2018, a breeding bird survey was completed in the northeastern quadrant of the DNNP Site Study Area away from the pond complex (Treefrog, Dragonfly, and Polliwog) and remnant woodlot as this area had not been surveyed since the preparation of the Terrestrial Environment Existing Environmental Conditions TSD. Survey methods included: transect, roving, and species-specific methods for bird species at risk (Beacon 2019b).

Four distinct breeding bird communities can be determined at the DNNP Site Study Area. The following is a general description of each of the four breeding bird communities:

1) Wetland (primarily Coot's Pond Transect)

   Within Coot's Pond and in other moist or wet thicket areas, the dominant breeding species are Yellow Warbler and Red-winged Blackbird. Other common breeding species include: Common Yellowthroat, Willow Flycatcher and Song Sparrow. Within wetlands, breeding species include: Green Heron, Mute Swan, Mallard, Wood Duck, Marsh Wren and Swamp Sparrow (Beacon 2019b). In 2017 and 2018, Bank Swallow were observed using the Phragmites at Coot's Pond as a nocturnal roost.

2) Open Country[11] (Bobolink Hill Transect)

   Within this habitat, breeding birds include four species protected by the federal *Species at Risk Act* and the provincial *Endangered Species Act*. The four species are: Bank Swallow (feeding – breeding occurs on bluffs, roosting at Coot's Pond), Barn Swallow (feeding – breeding occurs on structures), Eastern Meadowlark (breeding) and Bobolink (breeding). The dominant species in this community at the DNNP Site Study Area are: Bank Swallow (feeding), Tree Swallow (mainly using nest-boxes), Barn Swallow (feeding), Eastern Kingbird, Song Sparrow, Savannah Sparrow, Red-winged Blackbird, and American Goldfinch (Beacon 2019b). Other species present in small numbers in this community often include: Field Sparrow, Clay-colored Sparrow and Brown-headed Cowbird.

3) Upland Successional Community (Big Hedge, Butterfly Meadow, Bunting Thicket and East Hedge transects)

   This habitat represents the ecotone between open country and woodland habitats. It consists of a diverse group of birds that include: Mourning Dove, House Wren, Willow Flycatcher, Gray Catbird, American Robin, Cedar Waxwing, Yellow Warbler, Common Yellowthroat, Song Sparrow, Red-winged Blackbird, Common Grackle, and American Goldfinch (Beacon 2019b). Less common species include: Northern Flicker, Alder Flycatcher, Brown Thrasher, American Redstart and Orchard Oriole.

4) Woodland (Woodland, Big Hedge, East Hedge and Bunting Thicket Transects)

   Woodland-associated bird species present on the DNNP Site Study Area include: Downy Woodpecker, Eastern Wood-Pewee, Great Crested Flycatcher, Black-capped Chickadee, Red-eyed Vireo, American Redstart and Rose-breasted Grosbeak. Eastern Wood-Pewee is designated as special concern both federally and provincially (Beacon 2019b).

8.3.2.3 Insects

As of 2019, a total of 299 insects (butterflies, dragonflies/damselflies, moths, and other insects) have been recorded on the DNNP Site Study Area (Table 8-1). In 2007, two site visits were conducted to specifically survey dragonflies. Similarly, three evenings of moth

[11] Open Country habitat is similar to Upland Cultural Meadow/Cultural Thicket described in the Terrestrial Environment Existing Conditions TSD (Beacon 2009a).

investigations occurred in 2000 (Beacon 2009a). Since the 2009 application for the DNNP PRSL, no targeted surveys for insects have been conducted (Beacon 2019b).

Migrant Butterflies

A total of 33 butterfly species have been recorded within the DNNP Site Study Area. Monarchs (listed as special concern federally and provincially) use the site for breeding and during migration (Beacon 2019b). While many thousands of Monarchs pass through the DNNP Site Study Area every fall on their southbound migrations, fall roosting sites (large sheltered conifers) are lacking.

Dragonflies and Damselflies

Forty-two dragonfly and damselfly species have been found within the DNNP Site Study Area (Table 8-1). The ponds on site (Coot's Pond, Treefrog Pond, Dragonfly Pond and Polliwog Pond) provide ideal habitat for these insects. Further, the DNNP Site Study Area is on a dragonfly migration pathway and the open water attracts migrants (Beacon 2019b).

Moths

Surveys have recorded 211 moth species within the DNNP Site Study Area. This number of moth species is typical of what would be expected in an area that includes large expanses of regenerating old field habitat (Beacon 2019b).

8.3.2.4 Amphibians and Reptiles

From 1998 to 2018, an annual census of breeding amphibians has been conducted at two locations (Coot's Pond and Treefrog Pond) at the DNNP Site Study Area as part of the DN Biodiversity Program. Two additional locations were added - Dragonfly Pond and Polliwog Pond in 2004 and 2005, respectively (Beacon 2019b). The amphibian surveys for calling males undertaken followed the provincial Marsh Monitoring Program protocol (Bird Studies Canada 2009). To date, eight amphibian species and five reptile species have been found on the DNNP Site Study Area (Table 8-6). The most regularly occurring amphibians on the DNNP Site Study Area are: Northern Leopard Frog, American Toad and Green Frog.

In 2019, breeding Red-backed Salamander was observed (an adult and juvenile together) in the southwest area of the DNNP Site Study Area, which is outside the area of direct effect from the project. This represents the first record of this species for the DNNP Site Study Area and presumably represents a remnant isolated population centered in the southwest area of the Site Study Area. There are few records of this species from southern Durham Region. The population and extent of habitat within the DNNP Site Study Area is unknown (Beacon 2019b).

Snake species found on site have mainly been documented through incidental observations. A snake hibernaculum was built in 2008 and snake monitoring was attempted by lifting boards that were laid out in 2010 and 2011. The monitoring was discontinued after 2011 due to infrastructure projects in the area. In 2019, transects were re-established and monitored, with future monitoring events planned in 2021 (Beacon 2019b).

Previously laid snake boards were checked in 2019 and a number of Eastern Gartersnake and a Dekay's Brownsnake was found. Dekay's Brownsnake was first recorded within the DNNP Site Study Area in 2011 and Eastern Gartersnake had been previously documented. On a qualitative basis, reports of snakes within the DNNP Site Study Area appear to be increasing over time.

Midland Painted Turtle have been regularly observed in Coot's Pond from 2010 – 2018. Common Snapping Turtle has been continually recorded at Coot's Pond between 2014 and 2018. Both Common Snapping Turtle and the Midland Painted Turtle breed around Coot's Pond.

Table 8-6: Amphibian and Reptile Species List for the DNNP Site Study Area.

Common Name	***Scientific Name***
REPTILES AND AMPHIBIANS	
American Toad	*Bufo americanus*
Eastern Gray Treefrog	*Hyla versicolor*
Western Chorus Frog	*Pseudacris triseriata*
Northern Leopard Frog	*Rana pipiens*
Green Frog	*Rana clamitans*
Wood Frog	*Rana sylvatica*
Midland Painted Turtle	*Chrysemys picta*
Common Snapping Turtle	*Chelydra serpentine*
Red-eared Slider	*Trachemys scripta*
Eastern Garter Snake	*Thamnophis sirtalis*
Spring Peeper	*Pseudacris crucifer*
DeKay's Brownsnake	*Storeria dekayi*
Red-back Salamander	*Plethodon cinereus*

Source: Beacon 2019b.

8.3.2.5 Mammals

As of 2019, a total of 36 mammals have been identified within the DNNP Site Study Area (Table 8-7). In 1999 a live-trapping study was conducted, and in 2006/2007 a winter tracks study was conducted (Beacon 2009a). Incidental observations have been recorded since 1997 (Beacon 2019b).

In 2012, the DN Biodiversity Program began implementing active bat surveys as it was expected that several bat species would be listed as species at risk. The surveys consisted of walking transects and ultrasonic recording devices (Beacon 2019b). After the first year of study, 2012, two of the five transects were removed from the program due to interference from ultrasonic noise generated from power lines and other station components (Beacon 2019b).

The only bat species recorded every year was the Big Brown Bat (Table 8-8). Silver-haired Bat was recorded in all but the initial study year, while three other bat species (Tri-coloured Bat, Hoary Bat, and Eastern Red Bat) were recorded sporadically across years. Little Brown Myotis was recorded in 2013, 2017 and 2018.

Table 8-7: Mammals Species List for the DNNP Site Study Area

Common Name	***Scientific Name***
MAMMALS	
Virginia Opossum	*Didelphis virginiana*
Masked Shrew	*Sorex cinereus*
Smoky Shrew	*Sorex fumeus*
Pygmy Shrew	*Sorex hoyi*
Northern Short-tailed Shrew	*Blarina brevicauda*
Star-nosed Mole	*Condylura cristata*
Little Brown Myotis	*Myotis lucifugus*
Northern Myotis	*Myotis septentrionalis*
Silver-haired Bat	*Lasionycteris noctivagans*
Tri-coloured Bat	*Pipistrellus subflavus*
Big Brown Bat	*Eptesicus fuscus*
Eastern Red Bat	*Lasiurus borealis*
Hoary Bat	*Lasiurus cinereus*
Eastern Cottontail	*Sylvilagus floridanus*
European Hare	*Lepus europaeus*
Eastern Chipmunk	*Tamias striatus*
Woodchuck	*Marmota monax*
Grey Squirrel	*Sciurus carolinensis*
Red Squirrel	*Tamiasciurus hudsonicus*
Beaver	*Castor canadensis*
White-footed Mouse	*Peromyscus leucopus*
Deer Mouse	*Peromyscus maniculatus*
Meadow Vole	*Microtus pennsylvanicus*
Muskrat	*Ondatra zibethicus*

Common Name	***Scientific Name***
MAMMALS	
Norway Rat	*Rattus norvegicus*
Meadow Jumping Mouse	*Zapus hudsonius*
Woodland Jumping Mouse	*Napaeozapus insignis*
Eastern Coyote	*Canis latrans*
Red Fox	*Vulpes vulpes*
Black Bear	*Ursus americanus*
Raccoon	*Procyon lotor*
Short-tailed Weasel	*Mustela erminea*
Long-tailed Weasel	*Mustela frenata*
Mink	*Mustela vison*
Striped Skunk	*Mephitis mephitis*
White-tailed Deer	*Odocoileus virginianus*

Source: Beacon 2019b.

Table 8-8: Presence of Bats on Transect Surveys 2012 to 2018

Year	**2012**			**2013**			**2014**			**2015**			**2016**			**2017**			**2018**		
Transect	**W**	**X**	**Y**	**W**	**X**	**Y**	**W**	**X**	**Y**	**W**	**X**	**Y**	**W**	**X**	**Y**	**W**	**X**	**Y**	**W**	**X**	**Y**
Little Brown Myotis				✓												✓	✓	✓	✓	✓	✓
Tri Coloured Bat																			✓	✓	
Silver Haired Bat						✓		✓				✓		✓		✓	✓			✓	✓
Big Brown Bat		✓		✓		✓		✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Hoary Bat								✓	✓						✓		✓	✓			
Eastern Red Bat				✓		✓				✓		✓	✓	✓			✓				

Source: Beacon 2019b.

In response to the potential for species at risk to occur, an additional survey technique for bats using passive monitoring was implemented in 2018. Passive monitoring was employed to understand roosting activity in areas that may have potential interactions with DNNP. The passive sampling incorporated elements of the MNRF Survey Protocol for Species at Risk Bats within Treed Habitats (MNRF 2017). Seven species were identified through the passive monitoring program in 2018. These were: Big Brown Bat, Silver-haired Bat, Hoary Bat, Eastern Red Bat, Little Brown Myotis, Northern Myotis and Tri-coloured Bat.

Three of these species: Little Brown Myotis, Northern Myotis and Tri-coloured Bat, are listed as endangered both provincially and federally through ESA and SARA, respectively (Beacon 2019b). The pattern of occurrence indicates that Little Brown Myotis could be roosting in treed areas on the east side of the DNNP Site Study Area. Northern Myotis may not be roosting but using treed areas on the east side of the site as foraging habitat. Tri-coloured Bat recordings were likely recorded as flyover occurrences (Beacon 2018b).

8.3.2.6 Connectivity

Connectivity between habitats to allow movement or dispersal of biota within the DNNP Site Study Area was examined in the Landscape Connectivity Report (Beacon 2011b). Six terrestrial/aerial and three aquatic corridors were identified on and within the vicinity of the DNNP Site Study Area. Recommendations for indirect and direct enhancement opportunities were identified in the Landscape Connectivity Report with the objective of maintaining and enhancing corridor function on and within the vicinity of the DNNP Site Study Area (Beacon 2019b).

8.3.2.7 Species at Risk

A list of the sixteen recently occurring provincial and federal species at risk recorded within the DNNP Site Study Area between 2010 and 2019 is provided in Table 8-9. Eleven of the sixteen species receive protection as threatened or endangered species through the provincial ESA and/or federal SARA, while six species are designated as special concern federally and/or provincially. A species at risk habitat map for regularly occurring threatened and endangered species is presented in Figure F-3 of Appendix F.

Species at risk monitoring completed since the 2009 application for the DNNP PRSL have focused on several species. A summary of the monitoring is provided in the following paragraphs.

A Butternut Health Assessment (BHA) was undertaken in 2009, the results of which were included in the Terrestrial Environment Existing Environmental Conditions TSD. A second Butternut tree was located in 2018 and a BHA was completed on this tree and the BHA from 2009 was repeated on the previously known specimen.

Since the 2009 application for the DNNP PRSL, the DN Biodiversity Program breeding bird surveys include the Least Bittern monitoring component annually following the same protocols documented in the Terrestrial Environment Existing Environmental Conditions TSD. Species-specific surveys have also been undertaken for Eastern Meadowlark and Bobolink as part of the DN Biodiversity Program annually following their listing on the ESA in 2012 and 2010, respectively.

In 2009, OPG initiated an annual Barn Swallow survey, surveying all suitable nesting structures within the DNNP Site Study Area. Starting in 2012, OPG constructed three artificial Barn Swallow nesting structures and in 2015 two additional structures were built. The annual survey also included monitoring of these structures.

Bank Swallow monitoring has continued annually from 2010 to 2019. In 2010, an expanded Bank Swallow survey was undertaken along the north shore of Lake Ontario from Port Granby East to Presqu'ile Provincial Park as well as portions of four inland rivers within Durham Region (Beacon 2010). In 2013, a reference location, the Bond Head Bluffs, was added to the annual monitoring (HSL 2013b). This reference location has been surveyed annually from 2013 to 2019. In 2011, productivity surveys were undertaken at three colonies located within the Bank Swallow Evaluation Area (Beacon 2011c). Occupancy surveys were also completed in 2011 at ten colony locations within the BSEA (Beacon 2011c).

In 2012, in anticipation of several bat species being listed as a species at risk, the DN Biodiversity Program began implementing active bat surveys using walking transects and ultrasonic recording devices. In 2018, two methods to record bat echolocations were used: bat transect surveys which have been in place since 2012 and passive monitoring. The passive monitoring was a new addition for 2018 at the request of OPG to survey roosting activity in areas with potential interactions with DNNP.

Table 8-9: Summary of Recently Occurring Species at Risk Recorded from 2010 to 2019 within the DNNP Site Study Area

Species	Provincial ESA Status (2019)	Federal SARA Status (2019)	Notes
		Plants	
Butternut (tree)	Endangered	Endangered	Two individuals. One was identified in 2007 and included in the Terrestrial Environment Existing Environmental Conditions TSD and in 2018, a new sapling specimen was found. A Butternut Health Assessment in 2019 determined the tree identified in 2007 is non-retainable and the 2018 tree is retainable.
		Invertebrates	
Monarch (butterfly)	Special Concern	Special Concern	Observed annually. Breeds and a common fall migrant, no roosting aggregations have been noted.
		Birds	
Least Bittern	Threatened	Threatened	One individual was found dead in 2018, likely due to a collision with the overhead transmission lines, was likely a wandering non-breeding bird. This species was last recorded on site in 2012. Annual surveys at

Species	Provincial ESA Status (2019)	Federal SARA Status (2019)	Notes
			Coot's Pond did not reveal any breeding individuals since 2012.
Peregrine Falcon	Special Concern	Special Concern	This species includes the DNNP Site Study Area in its territory in most years and regularly breeds at an adjacent property.
Short-eared Owl	Special Concern	Special Concern	This species was observed hunting on Bobolink Hill in May 2018; it has not been recorded for many years, presumed a migrant.
Common Nighthawk	Special Concern	Threatened	One individual observed on the west side of Bobolink Hill in May 2018, presumed a migrant. Likely to use the DNNP Site Study Area infrequently on migration.
Whip-poor-will	Threatened	Threatened	One individual was observed and photographed (not calling) in the east end of the site in the spring of 2018 and is a presumed migrant. Not heard during nocturnal amphibian surveys in the spring.
Eastern Wood-Pewee	Special Concern	Special Concern	This species is recorded annually for the last ten years but was not always present as a breeding species previously. In 2019, seven pairs were estimated.
Bank Swallow	Threatened	Threatened	Annual breeder in large colonies on lakeshore bluffs. 1,362 burrows counted within the DNNP Site Study Area in 2019, representing approximately 817 pairs. Also, a nocturnal roost was present in *Phragmites* at Coot's Pond in 2017 and 2018.
Barn Swallow	Threatened	Threatened	Known to breed annually. Forages on site. 86 occupied nests in 2019 all in DNGS station structures. A concentration of nests in the old Boiler House rear storage shed (Building 125).
Bobolink	Threatened	Threatened	Was an annual breeder until 2016 when after a decline it was absent for the first time. In 2017 two pairs, and in 2018 three pairs were recorded. In 2019, one pair was recorded.
Eastern Meadowlark	Threatened	Threatened	Annual breeder. One to two pairs consistently observed on Bobolink Hill. Fewer than in the past.
Reptiles			
Snapping Turtle	Special Concern	Special Concern	Recorded occasionally since 2007 (2007, 2014-2018), present and breeds annually around Coot's Pond.
Mammals			
Little Brown Myotis	Endangered	Endangered	Recorded during 2018 acoustic monitoring and in previous years transects. Likely roosting habitat on site.
Tri-colored Bat	Endangered	Endangered	First known documentation of this species during the 2018 acoustic monitoring. Presence is more likely flyovers with core habitat likely occurring off site or in the southwestern valley.

Species	Provincial ESA Status (2019)	Federal SARA Status (2019)	Notes
Northern Myotis	Endangered	Endangered	First known documentation of this species during the 2018 acoustic monitoring. May not be roosting on site but using treed communities for foraging.

Source: Beacon 2019b.

8.3.2.8 Radiological Monitoring

Since the 2009 application, radiological monitoring of fruits and vegetables, milk, and animal feed within the vicinity of the DNNP Site Study Area has continued annually with the addition of poultry and eggs to the annual program starting in 2014 (OPG 2019d).

When interpreting this long-term data, it is important to note that the number of samples and locations have changed over the years and prevailing winds, emissions, and humidity are all sources of yearly variation (OPG 2019d).

8.3.2.8.1 Fruits and Vegetables

Fruits and vegetables are monitored annually for HTO and C-14 as part of the DN Environmental Monitoring Program (OPG 2019d). In 2018, seven locations surrounding the DNNP Site Study Area and four background locations were sampled three times a year.

The 2018 average concentration for HTO was 15.9 Bq/L in fruits and 14.7 Bq/L in vegetables. Figure 8-2 illustrates the combined DNNP Site Study Area fruit and vegetable annual average HTO results over the past 10 years. A Mann-Kendall trend analysis at the 95% confidence level does not indicate any statistically significant trend (OPG 2019d).

The 2018 average concentration of C-14 was 235 Bq/kg-C in fruits and 237 Bq/kg-C in vegetables. Figure 8-3 illustrates the combined DNNP Site Study Area fruit and vegetable annual average C-14 results over the past 10 years. A Mann-Kendall trend analysis at the 95% confidence level does not indicate any statistically significant trend (OPG 2019d).

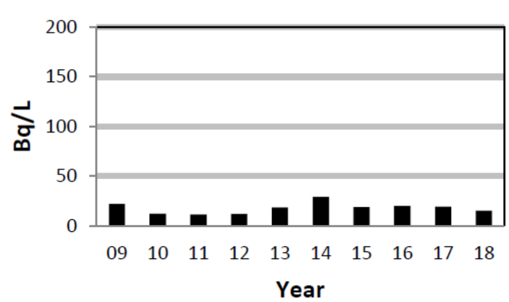

Figure 8-2: Annual Average HTO in Vegetation

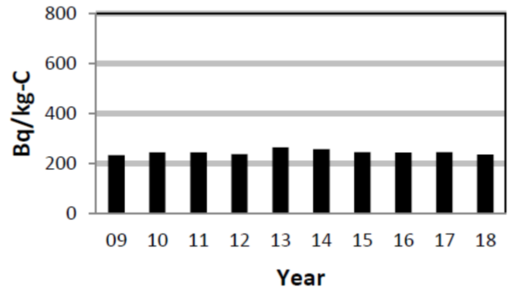

Figure 8-3: Annual Average C-14 in Vegetation

8.3.2.8.2 Milk and Animal Feed

Milk and animal feed are monitored annually for HTO and C-14 as part of the DN Environmental Monitoring Program (OPG 2019d). In 2018, milk was sampled monthly from three dairy farms surrounding the DNNP Site Study Area, as well as, a background location. Locally grown animal feed is also collected from three dairy farms surrounding the DNNP Site Study Area and a background location but on a biannual basis. Since 2013, dry feed (grains, hay, etc.) and wet feed (forage) are collected separately (OPG 2019d).

In the farm location surrounding the DNNP Site Study Area, the 2018 average concentration for HTO was 4.8 Bq/L in milk and 12.0 Bq/L for wet feed, while no dry feed samples were available in 2018. Figure 8-4 illustrates the combined DNNP Site Study Area milk annual average HTO results over the past 10 years. A Mann-Kendall trend analysis at the 95% confidence level does not indicate any statistically significant trend (OPG 2019d).

In the farm location surrounding the DNNP Site Study Area, the 2018 average concentration of C-14 was 237 Bq/kg-C in milk and 236 Bq/kg-C in wet feed (forage). Figure 8-5 illustrates the combined DNNP Site Study Area milk annual average C-14 results over the past 10 years. A Mann-Kendall trend analysis at the 95% confidence level does not indicate any statistically significant trend (OPG 2019d).

No trend analysis was performed on animal feed since, beginning in 2013, wet feed and dry feed have been sampled separately, resulting in changes to sampling frequency and replicates. However, no apparent trend was observed from inspection of HTO and C-14 data (OPG 2019d).

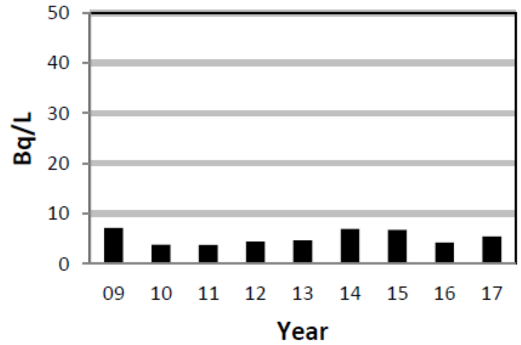

Figure 8-4: Annual Average HTO in Milk

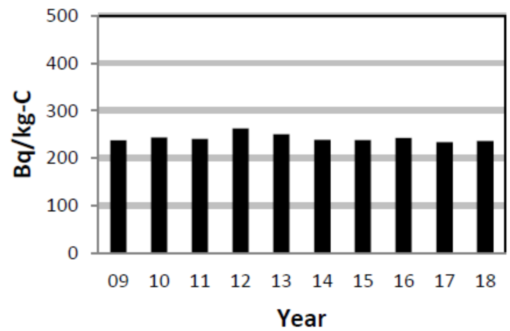

Figure 8-5: Annual Average C-14 in Milk

8.3.2.8.3 Eggs and Poultry

Since 2019, eggs and poultry have been monitored annually for HTO and C-14 as part of the DN Environmental Monitoring Program (OPG 2019d). In 2018, eggs were sampled quarterly from one farm location surrounding the DNNP Site Study Area, as well as, a background location. Poultry was collected from one farm surrounding the DNNP Site Study Area and a background location on an annual basis (OPG 2019d).

In the farm location surrounding the DNNP Site Study Area, the 2018 average concentration for HTO was 2.5 Bq/L in eggs and 7.1 Bq/L in poultry. The concentration of C-14 was 233 Bq/kg-C in eggs and 227 Bq/kg-C in poultry (OPG 2019d).

No trend analysis was performed for poultry and eggs as only five years of data have been collected from these locations thus far. However, no apparent trend was observed from inspection of HTO and C-14 data (OPG 2019d).

8.4 Identification of Changes to Baseline or Standards

8.4.1 Vegetation

A comparative analysis of Land Cover Category (Table 8-3), Terrestrial Community Class (Table 8-4), and Wetland Community Class (Table 8-5) indicates that the vegetation communities within the DNNP Site Study Area have experienced some changes since 2009. A vegetation map is provided in Figure F-4 of Appendix F.

Wetland communities increased by 16 ha (34%) from 2007 to 2018. Cultural meadow/cultural thicket communities remained relatively constant with an 8 ha (4%) decrease in area. Shrub bluff communities experienced negligible change with less than 1% change in area from 2007 to 2018. Upland forest communities (woodland ecosystem in the Terrestrial Environment Existing Environmental Conditions TSD) remained constant with approximately 15 ha whereas cultural woodland/cultural plantations experienced a 23 ha (49%) decrease in area compared to historical data.

Any changes are largely attributed to successional changes in community compositions, land use changes and changes to the DN site boundary (Beacon 2019b). The arrival of Emerald Ash Borer and consequential progression of European Buckthorn and Phragmites also has contributed to changes in vegetation communities and composition since the 2009 application for the DNNP PRSL and supporting documents were compiled (Beacon 2019b).

Based on the change in vegetation community area, the increase in wetland communities is a measurable change in site within the DNNP Site Study Area. An assessment of this change in the context of the DNNP is provided in Section 8.5.1.

8.4.2 Breeding Birds

A comparative analysis of breeding birds demonstrates that mean number of bird species that were found breeding within the DNNP Site Study Area has increased between the first decade of monitoring and the second decade from 58 to 67, respectively (Table 8-10). In the five years preceding the preparation of the Terrestrial Environment Existing Environmental Conditions TSD (2004 - 2008), the mean species richness was 62, compared to 65 in the past five years (2014 - 2018). The difference between the number of breeding bird species since the 2009 application for the DNNP PRSL, and the recent years, is negligible.

On-going monitoring has shown that the species present within any particular year are not the same. Within any two or more years there is some ‘turn-over’ of breeding birds using the property. This is to be expected especially of the species that breed in very small numbers on the property.

Overall, the number of birds that are breeding within the DNNP Site Study Area are expected to have declined. As indicated in Section 8.4.1, there has been a slight decrease in cultural woodland habitat and an increase in wetland habitat on the site; moreover, there has been a decrease in the physical area of the DN site (19.2 ha) primarily due to road and parking lot construction, which is an important driver in the estimates of bird numbers. While no detailed analysis has been conducted of all species count estimates over the years of record, it is expected that many common species and habitat generalists will have declined as their habitats have declined. This change will be assessed in Section 8.5.1.

Winter waterfowl staging area and winter habitat surveys as well as winter raptor feeding, and roosting area assessment have not been completed since the 2009 application for the DNNP PRSL. However, it can be reasonably assumed that there has been a negligible change in conditions for both these components based on the availability of habitat.

Table 8-10: Confirmed and Probable Breeding Bird Species, 1997 to Present

Year	Confirmed and Probable Breeding Species
1997	63
1999	55
2000	55
2001	55
2002	53
2003	57
2004	57
2005	61
2006	61
2007	66
2008	65
2009	69
2010	66
2011	67
2012	69
2013	69
2014	66
2015	65
2016	61
2017	65
2018	69

Source: Beacon 2019b.

8.4.3 Insects

A comparative analysis of insects between the Terrestrial Environment TSDs in support of the 2009 application for the DNNP PRSL and current is not possible. The two studies conducted on moths and dragonflies (see Section 8.3.2.3) were conducted in 2003 and 2007, respectively. No specific studies were conducted after 2009 for comparison. While incidental observations have been recorded since 1999 these data are very sparse and are not appropriate for comparison to the 2003 and 2007 studies. Using habitat area and function as a surrogate for targeted insect surveys indicates that the occurrence of rare dragonflies and damselflies within the DNNP Site Study Area has likely declined since the 2009 application for the DNNP PRSL. This may be attributed to the relatively recent occurrence of fish in Coot's Pond, which predate dragonfly and damselfly larvae and the changes in hydro-period at Dragonfly and Polliwog ponds.

Migrant butterfly stopover area (cultural meadow communities) occupied approximately 109 ha in 2018 compared to 118 ha in 2007. This change in area has resulted in the decrease of some habitat opportunities but a high proportion of the DNNP Site Study Area remains occupied by cultural meadow.

Using these habitat data and function-based assumptions to infer change, it appears likely there has been a measurable change in the insect community within the DNNP Site Study Area; however, detailed species surveys would be necessary to validate this conclusion. An assessment of this change in the context of the DNNP is provided in Section 8.5.1.

8.4.4 Amphibians and Reptiles

Amphibian calling count scores, which provide a very coarse measurement of population, were variable among years, which is to be expected (Table 8-11). The most notable pattern is a decrease of calling counts in Polliwog and Dragonfly ponds since 2012, which is attributed to berms which fail to retain water. Comparison of the two remaining ponds (Coot's and Treefrog) demonstrates that both ponds had calling counts during the time that the 2009 application for the DNNP PRSL and supporting TSDs were compiled (1997 -2007 data for the terrestrial environment) that are similar to the most recent years of monitoring (Table 8-11) and do not represent a measurable change in site conditions.

Table 8-11: Cumulative Calling Score 1998 to 2018

Cumulative Calling Count Scores					Total Score
	Coot's Pond	**Treefrog Pond**	**Dragonfly Pond**	**Polliwog Pond**	
1997	*No data*	*Not constructed*	*Not constructed*	*Not constructed*	No data
1998	*No data*	*Newly constructed* (1 species)			No data

Cumulative Calling Count Scores					Total Score
	Coot's Pond	Treefrog Pond	Dragonfly Pond	Polliwog Pond	
1999	11 (3 species)	4 (2 species)			15
2000	7 (2 species)	6 (2 species)			13
2001	3 (2 species)	3 (2 species)			6
2002	9 (3 species)	6 (3 species)			15
2003	6 (3 species)	8 (3 species)			14
2004	4 (2 species)	4 (2 species)	*Newly constructed*		8
2005	5 (2 species)	5 (2 species)	6 (4 species)	*Newly constructed* 3 (1 species)	19
2006	7 (3 species)	4 (2 species)	5 (3 species)	2 (1 species)	18
2007	6 (3 species)	3 (2 species)	2 (1 species)	2 (2 species)	13
2008	2 (1 species)	3 (2 species)	8 (3 species)	0 (0 species)	13
2009	3 (1 species)	1 (1 species)	4 (3 species)	2 (2 species)	10
2010	4 (2 species)	2 (1 species)	6 (3 species)	3 (2 species)	15
2011	4 (2 species)	2 (1 species)	5 (2 species)	2 (1 species)	13
2012	4 (2 species)	2 (1 species)	3 (2 species)	0 (0 species)	9
2013	1 (1 species)	3 (2 species)	5 (3 species)	3 (2 species)	12
2014	7 (3 species)	2 (1 species)	2 (1 species)	0 (0 species)	11
2015	4 (1 species)	2 (1 species)	6 (3 species)	0 (0 species)	12
2016	2 (2 species)	2 (1 species)	0 (0 species)	0 (0 species)	4
2017	8 (3 species)	2 (2 species)	2 (1 species)	0 (0 species)	13
2018	6 (2 species)	4 (2 species)	3 (2 species)	2 (1 species)	15

Source: Beacon 2019b.

Since the completion of the 2009 application for the DNNP PRSL, the total number of amphibian species recorded for the site has increased by one, with the 2019 breeding record of Red-backed Salamander. This probably indicates the presence of a remnant population associated with the seepage zone in the southwest portion of the DNNP Site Study Area. Although the size of the population and extent of the habitat on the site is currently unknown, they were found outside the area of direct effect from the project and therefore no direct effects from the project are expected.

There has been one additional snake species recorded, the Dekay's Brownsnake. Although known from the Local Study Area this is a new species for the DNNP Site Study Area since the 2009 application for the DNNP PRSL and 2009 supporting documents were compiled. The inclusion of Eastern Gartersnake in the Terrestrial Environment TSDs is sufficient to address this additional species as their habitat requirements are similar and it is concluded that there is not a measurable change in the baseline data.

8.4.5 Mammals

Transect based bat monitoring commenced in 2012 and passive bat monitoring was completed in 2018, after the 2009 application for the DNNP PRSL. The results of the bat monitoring have provided new information related to the use of habitat on the DNNP Site Study Area indicating that both SAR and non-SAR bats are using the DNNP Site Study Area for roosting and foraging activities. Although these species were likely using the site at the time of the 2009 application for the DNNP PRSL, this represents a change in baseline data as it was not previously considered. An assessment of this change in the context of the DNNP is provided in Section 8.5.1.

A comparative analysis of mammals between the 2009 application for the DNNP PRSL and supporting TSDs with recent observations is not possible. Besides bats, the two studies conducted, one using live-trapping and the other using winter tracks (see Section 8.3.2.5), were conducted in 1999 and 2006/2007, respectively. While incidental mammals have been recorded since 1999, these data are not appropriate for comparison to the previous studies. Using habitat area and function as a surrogate for species surveys indicates that there likely has not been an appreciable change in the mammal community (excluding bats) in the DNNP Site Study Area since the completion of the 2009 application for the DNNP PRSL; however, detailed species surveys would be necessary to validate this conclusion.

8.4.6 Species at Risk

At the time of the 2009 application for the DNNP PRSL, eleven documented species-at-risk were assessed, based on records of species at risk for the DNNP Site Study Area since 2006 (Table 8-12; also see Beacon 2009a). As of 2019, there are fifteen additional ESA and SARA species that are either new records for the DNNP Site Study Area (including seven migrants or likely non-breeding species and eight breeding species) or have been updated to species at risk status since the 2009 application for the DNNP PRSL.

It should be noted that new records for the DNNP Site Study Area do not mean that the species were previously absent, just that they were not previously detected. The new species at risk records for the DNNP Site Study Area since the 2009 application for the DNNP PRSL are: Common Nighthawk, Eastern Whip-poor-will, Rusty Blackbird, Little Brown Myotis, Northern Myotis, and Tri-coloured Bat. The species that were previously recorded on the DNNP Site Study Area at the time of the 2009 application for the DNNP PRSL but have been updated to species at risk are: Eastern Wood-Pewee, Olive-sided Flycatcher, Canada Warbler, Bank Swallow, Barn Swallow, Wood Thrush, Bobolink, Eastern Meadowlark and Snapping Turtle.

The new species at risk identified in the DNNP Site Study Area since 2009, as well as those already existing on site but now considered at risk, need to be considered as this represents both a change in baseline and new standards (see Section 8.5.1).

Table 8-12: Presence of Species at Risk at the DNNP Site Study Area 2006 to 2019

Species	Provincial/ Federal Status	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Notes
Least Bittern	THR/THR	✓	✓	x	x	x	x	✓	x	x	x	x	x	✓	x	• Has not bred on site since 2012. Migrant record from 2018 • Already assessed as a species of special concern when the *Endangered Species Act* (ESA) took effect in 2008. Schedule 1 of the federal *Species at Risk Act* (SARA) in 2003
Bald Eagle	SC/None	✓	x	x	x	x	x	x	x	x	x	x	x	x	x	• Regular migrant species, not breeding in the DNNP Site Study Area • Already assessed as a species of special concern when the ESA took effect in 2008
Peregrine Falcon	SC/SC	✓	✓	✓	x	✓	✓	✓	✓	✓	✓	x	✓	✓	✓	• Possible breeding on site in the past, foraging at the DNNP Site Study Area from nearby known nest • Downlisted by COSSARO in 2012 to special concern. The species is currently special concern nationally under SARA
Black Tern	SC/None	x	✓	✓	x	x	x	x	x	x	x	x	x	x	x	• Has not attempted to breed in the DNNP Site Study Area since 2007 • Already assessed as a species of special concern when the ESA took effect in 2008
Short-eared Owl	SC/SC	x	✓	x	x	x	x	x	x	x	x	x	x	✓	x	• Scarce or rare migrant species, at least two spring records • Already assessed as a species of special concern when the ESA took effect in 2008. Schedule 1 of the federal SARA in 2012
Common Nighthawk	SC/THR	NAS	NAS	NAS	NAS	✓	NAS	NAS	NAS	NAS	NAS	NAS	✓	✓		• Regular but declining migrant species • Special concern by COSSARO in late 2009. Schedule 1 of the federal SARA in 2010
Chimney Swift	THR/THR	x	x	x	✓	x	x	x	x	x	x	✓	x	x	x	• Regular aerial foraging species, unlikely to breed • Listed as threatened by COSSARO in 2009. Schedule 1 of the federal SARA in 2009
Eastern Whip-poor-will	THR/THR	NAS	NAS	NAS	NAS	NAS	NAS	NAS	NAS	NAS	NAS	NAS	NAS	✓	NAS	• Scarce migrant species, one record • Listed as threatened by COSSARO in 2009. Schedule 1 of the federal SARA in 2011
Olive-sided Flycatcher	SC/THR	x	x	✓	x	✓	x	✓	x	x	X	x	X	x	✓	• Scarce late season migrant • Listed as special concern by COSSARO in late 2009. Schedule 1 of the federal SARA in 2011
Eastern Wood-Pewee	SC/SC	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	• Regular breeding species • Listed as special concern by COSSARO in 2014. Schedule 1 of the federal SARA in 2017
Bank Swallow	THR/THR	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	• Annual breeding species, roosting habitat at Coot's Pond • Threatened by COSSARO in 2014. Schedule 1 of the federal SARA in 2017
Barn Swallow	THR/THR	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	• Annual breeding species • Listed as threatened by COSSARO in 2010. Schedule 1 of the federal SARA in 2017
Wood Thrush	SC/THR	x	✓	✓	x	x	x	x	x	✓	✓	x	x	x	x	• Has not bred on site since 2015, marginally suitable habitat • Listed as special concern by COSSARO in 2014. Schedule 1 of the federal SARA in 2017
Canada Warbler	SC/THR	x	x	✓	x	x	✓	x	x	x	x	x	x	x	x	• Regular migrant species • Listed as special concern by COSSARO in 2009. Schedule 1 of the federal SARA in 2010
Yellow-breasted Chat	END/END	x	x	x	✓	x	x	x	x	x	x	x	x	x	x	• Very rare migrant species, one record • Listed as endangered by COSSARO in 2011. Schedule 1 of the federal SARA in 2003
Bobolink	THR/THR	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	x	✓	✓	✓	• Almost annual breeding species, declined • Listed as threatened by COSSARO in 2010. Schedule 1 of the federal SARA in 2017
Eastern Meadowlark	THR/THR	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	• Annual breeding species, declined • Listed as threatened by COSSARO in 2012. Schedule 1 of the federal SARA in 2017
Rusty Blackbird	SC/SC	x	x	x	x	✓	x	x	x	x	x	x	x	x	x	• Annual uncommon migrant species • Listed as special concern by COSSARO in 2018. Schedule 1 of the federal SARA in 2009
Little Brown Myotis	END/END	NAS	NAS	NAS	NAS	NAS	NAS	NAS	✓	NAS	NAS	NAS	✓	✓	NAS	• Present on site, possible roosts • Listed as endangered by COSSARO in 2013. Schedule 1 of the federal SARA in 2014
Northern Myotis	END/END	MAS	NAS	NAS	NAS	NAS	NAS	NAS	NAS	NAS	NAS	NAS	NAS	✓	NAS	• Recorded on site but roosts are unlikely, foraging • Listed as endangered by COSSARO in 2013. Schedule 1 of the federal SARA in 2014

Species	Provincial/ Federal Status	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Notes
Tri-colored Bat	END/END	NAS	NAS	NAS	NAS	NAS	NAS	NAS	NAS	NAS	NAS	NAS	NAS	✓	NAS	• Possibly a migrant species on site • Listed as Endangered by COSSARO in 2016. Schedule 1 of the federal SARA in 2014
Snapping Turtle	SC/SC	NAS	✓	NAS	NAS	NAS	NAS	NAS	NAS	✓	✓	✓	✓	✓	NAS	• Resident at Coot's Pond, breeds • Listed as Special concern by COSSARO in 2009. Schedule 1 of the federal SARA in 2011
Monarch	SC/SC	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	• Breeding species, common to abundant migrant, no mass roost gatherings detected • Already assessed as a species of special concern when ESA took effect in 2008. Schedule 1 of the federal SARA in 2003
Butternut	END/END	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	• One tree, now joined by a sapling, previously more on site that have died • Already assessed as a species of special concern when ESA took effect in 2008. Schedule 1 of the federal SARA in 2005

Note a "✓" indicates the species was recorded, an "x" indicates that a species was surveyed for but not detected and NAS (No Applicable Survey) indicates that surveys that are likely to detect the species did not occur and therefore the absence of data for those years does not necessarily represent a true absence of the species for the DNNP Site Study Area.
Grey shading indicates that the species was not listed either provincially or federally during that time. The table also provides a summary of the listing status of the species, key dates related to timing of ESA and SARA protections as well as the status of the species on the site (i.e., migrant, breeding, etc.).
Modified from Beacon 2019b.

8.5 Assessment of Changes

This section provides an assessment of the changes that were described in Section 8.4, and their potential to alter the conclusions described in the *Terrestrial Environment Assessment of Environmental Effects Technical Support Document New Nuclear – Darlington Environmental* (Terrestrial Environment - Assessment of Environmental Effects TSD) (Beacon 2009b) prepared in support of the 2009 application for the DNNP PRSL.

8.5.1 Potential for Change in Conclusions of Site Evaluation

8.5.1.1 REGDOC 1.1.1 Section C.6 - Baseline Terrestrial Flora, Fauna and Food Chain Data

A potential gap was identified by Kinectrics (2019) against REGDOC 1.1.1; concerning Section C.6 - Baseline terrestrial flora, fauna and food chain data, where it is identified that baseline information shall include a "description of natural and human-induced pre-existing environmental stresses and the current ecological conditions that indicate such stresses" (Table 3-1).

Assessment/Disposition

Information needed to address this potential gap against REGDOC 1.1.1 has been provided in Section 8.1. These pre-existing stresses are primarily reflected in changes to habitat conditions and extent within the DNNP Site Study Area. The manner in which these stresses have resulted in a change to baseline data related to the terrestrial environment has been identified in Section 8.4. This potential gap has therefore been addressed and does not impact conclusions about residual adverse effects of the project or the site evaluation and no further actions are necessary.

8.5.1.2 Species at Risk

Evaluation of updated codes and standards (Appendix A) identified that updates to both ESA and SARA lists have occurred since the 2009 application for the DNNP PRSL. As identified in Section 8.4.6, these updated standards, along with newly recorded species in the DNNP Site Study Area, resulted in fifteen species at risk (i.e., Common Nighthawk, Eastern Whip-poor-will, Rusty Blackbird, Little Brown Myotis, Northern Myotis, Tri-coloured Bat, Eastern Wood-Pewee, Olive-sided Flycatcher, Canada Warbler, Bank Swallow, Barn Swallow, Wood Thrush, Bobolink, Eastern Meadowlark and Snapping Turtle) that were not previously assessed as species at risk when the 2009 application for the DNNP PRSL and documents were compiled. Since these species were not considered in support of the 2009 application for the DNNP PRSL, there is potential for a change concerning the residual adverse effects of the project. Table 8-13 lists SAR species on site, identifies current relevant commitments (OPG 2012b), and proposes updated commitments, if warranted.

8.5.1.3 Changes to Baseline Conditions

Beyond the updated codes and standards related to the ESA and SARA, additional changes to baseline conditions related to the terrestrial environment have been identified and summarized in Section 8.4. Sub-components with identified changes to baseline have been assessed to consider the likelihood for a change to the residual adverse effects of the project and conclusion of the 2009 application supporting documents. Sub-components that did not have a measurable change to baseline conditions were not advanced for further consideration.

As indicated in Section 8.4 additional data for some components have not been collected since the 2009 application for the DNNP PRSL or the information collected is insufficient to determine a change. In these instances, habitat data has been used to the extent possible to assess the potential for a change in the residual adverse effects of the project. Although habitat can be a useful indicator, the conclusions from this approach are limited by the assumption that habitat would be a measurable indicator of change and does not take into consideration other possible variables.

Identified baseline changes were evaluated against the DNNP Commitments Report (OPG 2019c) to determine if any updates to commitments are required to mitigate project effects such that residual adverse effects identified in the EIS (SENES and MMM 2009) remain unchanged (see Table 8-13). The environmental sub-components with potential changes to baseline conditions were previously considered through the original DNNP PRSL and detailed mitigation and commitments were developed to reduce, control or eliminate adverse effects. These mitigations and commitments were developed to be adaptable and will be scaled appropriately to address identified changes to baseline as well as to conform to any permitting requirements. Therefore, the existing mitigations and commitments summarized in Table 8-13 are valid to address potential change in residual adverse effects. As summarized in Table 8-13, all but one change in baseline conditions was adequately addressed by existing commitments; this one change to baseline regarding the new Butternut tree is addressed further in Section 8.5.2.

The changes in terrestrial baseline conditions summarized in Table 8-13 do not alter the conclusions of the 2009 application supporting documents regarding residual adverse effects of the project, nor do they impact the conclusions of the original site evaluation.

Table 8-13: Summary of Terrestrial Baseline Changes and Relevant Commitments

Environmental Sub-component	VEC	Baseline Change	DNNP PRSL Mitigation and/or Follow-up Commitments Relevant to Addressing this Change	Revised or Additional Commitment Proposed?	Impact on Project Residual Adverse Effects?
Vegetation Communities and Species	Wetland Ecosystem	• 11 ha (34%) increase in wetland habitat in the Site Study Area, 9 ha of which are within the Area of Direct Effects.	• Perform a thorough evaluation of site layout opportunities before site preparation activities begin, in order to minimize the overall effects on the terrestrial environment and maximize the opportunity for quality terrestrial habitat rehabilitation. (D-P-3.7) • Good Industry Management Practices applied during clearing and grubbing activities to reduce environmental impact include: o Minimizing the area to be cleared to the extent feasible; o Minimizing compaction of roots in areas that will not be cleared; and o Compliance with seasonal constraints and regulatory requirements (D-P-3.7) • Use best management practices to prevent or minimize the potential runoff of sediment and other contaminants into wildlife habitat associated with Coot's Pond during site preparation and construction phases. (D-P-3.7) • Development of stormwater management techniques to provide for adequate flow and water quality (e.g., TSS) to Coot's Pond. (D-P-3.4) • Create of new fish-free wetland ponds with riparian plantings in appropriate areas on the DNNP Site Study Area. (D-P-3.7) • Wetlands will be incorporated into the new lake infill area after the Construction phase. (D-P-3.7) • Compensate for the loss of ponds by designing compensation ponds that maximize ecological function, and not necessarily limited to "like-for-like". (D-P-3.7) • Salvage and relocate or replant rare plant species to suitable existing or created habitat in advance of site preparation activities. (D-P-3.7) • Salvage and relocate aquatic plants and biota where practicable, to a suitable existing or created habitat in advance of site preparation activities. (D-P-3.7) • Monitor conditions to confirm the EIS predictions of habitat restoration post construction. (D-P-12.5)	• No further mitigation required to address change in baseline conditions. Mitigation and commitments documented in DNNP Commitments Report (OPG 2019c) were developed to be adaptable and will be scaled appropriately to address changes to baseline and future permitting requirements. Therefore, the original conclusions regarding residual adverse effects of the project remain valid and no further actions are necessary.	• No
	Woodland Ecosystem	• Identification of a new retainable Butternut tree.	• Perform a thorough evaluation of site layout opportunities before site preparation activities begin, in order to minimize the overall effects on the terrestrial environment and maximize the opportunity for quality terrestrial habitat rehabilitation. (D-P-3.7) • Good Industry Management Practices applied during clearing and grubbing activities to reduce environmental impact include: o Minimizing the area to be cleared to the extent feasible; o Minimizing compaction of roots in areas that will not be cleared; and o Compliance with seasonal constraints and regulatory requirements (D-P-3.7) • Monitor conditions to confirm the EIS predictions of habitat restoration post construction. (D-P-12.5)	• Yes, Include Butternut in site planting plans through the ESA Notice of Activity process for new Butternut in commitment D-P-3.7 (see Section 8.5.2). With this updated commitment, the original conclusions regarding residual adverse effects of the project remain	• No

Environmental Sub-component	VEC	Baseline Change	DNNP PRSL Mitigation and/or Follow-up Commitments Relevant to Addressing this Change	Revised or Additional Commitment Proposed?	Impact on Project Residual Adverse Effects?
			• Develop and implement a management plan for species at risk, as may be appropriate. (D-P-3.7)	valid and no further actions are necessary.	
Insects	Dragonflies and Damselflies	• Possible decline in dragonfly and damselfly community.	• Perform a thorough evaluation of site layout opportunities before site preparation activities begin, in order to minimize the overall effects on the terrestrial environment and maximize the opportunity for quality terrestrial habitat rehabilitation. (D-P-3.7) • Good Industry Management Practices applied during clearing and grubbing activities to reduce environmental impact include: o Minimizing the area to be cleared to the extent feasible; o Minimizing compaction of roots in areas that will not be cleared(D-P-3.7) • Use best management practices to prevent or minimize the potential runoff of sediment and other contaminants into wildlife habitat associated with Coot's Pond during site preparation and construction phases. (D-P-3.7) • Development of stormwater management techniques to provide for adequate flow and water quality (e.g., TSS) to Coot's Pond. (D-P-3.4) • Create of new fish-free wetland ponds with riparian plantings in appropriate areas on the DNNP Site Study Area. (D-P-3.7) • Wetlands will be incorporated into the new lake infill area after the Construction phase. (D-P-3.7) • Develop a follow-up program for insect communities as appropriate, with a focus for this follow-up program on species at risk and the use of this follow-up program to verify the conclusions of the Ecological Risk Assessment. (D-P-12.5) • Monitor conditions to confirm the EIS predictions of habitat restoration post construction. (D-P-12.5)	• No further mitigation required to address change in baseline conditions. Mitigation and commitments documented in DNNP Commitments Report (OPG 2019c) were developed to be adaptable and will be scaled appropriately to address changes to baseline and future permitting requirements. Therefore, the original conclusions regarding residual adverse effects of the project remain valid and no further actions are necessary.	• No
	Migrant Butterfly Stopover Area	• Decrease of 10 ha (10%) of migrant butterfly stopover habitat in the Site Study Area.	• Perform a thorough evaluation of site layout opportunities before site preparation activities begin, in order to minimize the overall effects on the terrestrial environment and maximize the opportunity for quality terrestrial habitat rehabilitation. (D-P-3.7) • Good Industry Management Practices applied during clearing and grubbing activities to reduce environmental impact include: o Minimizing the area to be cleared to the extent feasible; o Minimizing compaction of roots in areas that will not be cleared (D-P-3.7) • Re-planting of approx. 40 to 50 ha of Cultural Meadow. (D-P-3.7) • Develop a follow-up program for insect communities as appropriate, with a focus for this follow-up program on species at risk and the use of this follow-up program to verify the conclusions of the Ecological Risk Assessment. (D-P-12.5) Monitor conditions to confirm the EIS predictions of habitat restoration post construction. (D-P-12.5)	• No further mitigation required to address change in baseline conditions. Mitigation and commitments documented in DNNP Commitments Report (OPG 2019c) were developed to be adaptable and will be scaled appropriately to address changes to baseline and future permitting requirements. Therefore, the original conclusions regarding residual adverse effects of the project remain	• No

Environmental Sub-component	VEC	Baseline Change	DNNP PRSL Mitigation and/or Follow-up Commitments Relevant to Addressing this Change	Revised or Additional Commitment Proposed?	Impact on Project Residual Adverse Effects?
				valid and no further actions are necessary.	
Bird Communities and Species	Breeding Birds	• Occurrence of six SAR breeding species: o Bank Swallow[1] o Barn Swallow[1] o Eastern Wood Pewee[1] o Wood Thrush[1] o Bobolink[1] o Eastern Meadowlark[1] • Decade of data confirming persistence of Bank Swallow colony at DN Site and records of nocturnal roosting at Coot's Pond. • Decade of data related to Least Bittern breeding occurrence on site.	• Perform a thorough evaluation of site layout opportunities before site preparation activities begin, in order to minimize the overall effects on the terrestrial environment and maximize the opportunity for quality terrestrial habitat rehabilitation. (D-P-3.7) • Good Industry Management Practices applied during clearing and grubbing activities to reduce environmental impact include: o Minimizing the area to be cleared to the extent feasible; o Minimizing compaction of roots in areas that will not be cleared; and o Compliance with seasonal constraints and regulatory requirements (D-P-3.7) • Post-development restoration of Woodland, dominated by Sugar Maple. (D-P-3.7) • Re-planting of approx. 40 to 50 ha of Cultural Meadow and approximately 15 to 20 ha of Cultural Thicket with native shrub plantings. Include native forb seeds in hydroseed mix for Cultural Meadow to be restored. (D-P-3.7) Cultural meadow and cultural thicket habitat loss will be offset by developing restoration plans tailored to the needs of the Eastern Meadowlark, Bobolink, and Monarch including native grasslands consisting of tall vegetation species. (D-P-3.7). • Use best management practices to prevent or minimize the potential runoff of sediment and other contaminants into wildlife habitat associated with Coot's Pond during site preparation and construction phases. (D-P-3.7) • Development of stormwater management techniques to provide for adequate flow and water quality (e.g., TSS) to Coot's Pond. (D-P-3.4) • Create of new fish-free wetland ponds with riparian plantings in appropriate areas on the DNNP Site Study Area. (D-P-3.7) • Wetlands will be incorporated into the new lake infill area after the Construction phase. (D-P-3.7) • Conduct more sampling to confirm the presence of Least Bittern before site preparation activities begin. (D-P-12.5) • Further site and species specific information pertaining to Bobolink will be required. (D-P-12.5) • Avoid disruption to breeding migratory birds on the site and avoid habitat destruction (e.g. vegetation clearing, initial grading) at a minimum between the period May 1 and July 31 of any year. (D-P-3.7) • Monitor conditions to confirm the EIS predictions of habitat restoration post construction. (D-P-12.5) • Develop and implement a management plan for species at risk, as may be appropriate. (D-P-3.7)	• No further mitigation required to address change in baseline conditions. Mitigation and commitments documented in DNNP Commitments Report (OPG 2019c) were developed to be adaptable and will be scaled appropriately to address changes to baseline as well as ESA/SARA permitting. Therefore, the original conclusions regarding residual adverse effects of the project remain valid and no further actions are necessary. • No revision is proposed at this time, however, as Bank Swallow have become a SAR since the 2009 application and will be included in ESA permitting, the Bank Swallow Specific Mitigation under D-P-3.8 may need to be revisited in the future to align with the conditions of the ESA permit.	• No

Environmental Sub-component	VEC	Baseline Change	DNNP PRSL Mitigation and/or Follow-up Commitments Relevant to Addressing this Change	Revised or Additional Commitment Proposed?	Impact on Project Residual Adverse Effects?
			Bank Swallow Specific Mitigation • Bank Swallow mitigation measures and plans to be developed in consultation with the CNSC, EC, MNR and CLOCA. (D-P-3.8) • When the project site is developed, every effort should be made to minimize the destruction of the natural bluff, using the best available technology economically achievable. In particular, the bluff should remain intact until all site layout options for the selected reactor technology have been thoroughly evaluated. The bluff should only be removed if it is then determined that this is absolutely necessary for the development of the project. The evaluation of site layout alternatives to be undertaken in consultation with relevant departments/agencies. (D-P-3.8) • If the bounding case scenario is realized (i.e., all bluff habitat used by Bank Swallows east of the existing Darlington Nuclear Generating Station to the Darlington Nuclear (DN) site boundary would be lost), implement a plan that includes the following: 1) Provision of artificial Bank Swallow habitat on the Darlington Nuclear (DN) site; (The detailed plan to implement this will be finalized once the site layout is prepared and site-specific opportunities for artificial habitat creation are determined.) 2) Acquisition of lands containing existing colonies for study and protection; 3) Provision of artificial nesting habitat for related Chimney Swift and Purple Martins on the DNNP Site Study Area; 4) Partner to undertake research into declining aerial foragers in Ontario, and *5)* Integration of interpretive opportunities, such as, interpretive signage and observation decks*.* (D-P-3.8) • If the actual site development is less than the bounding case scenario, OPG intends to apply mitigation measures appropriate to the actual effect based on the actual site layout and associated effect. The preferred options will be the provision of artificial Bank Swallow habitat (item 1 above) plus a combination of items 3, 4 and 5 above. (D-P-3.8) • Prior to site preparation activities, develop a Bank Swallow mitigation plan for implementation during the site preparation and construction phase, and verification of the implementation plan. This mitigation plan will include all relevant details of timing, assessing performance and function. Verification will be conducted through EA Follow-up. (D-P-3.8) • Based on OPG's on-going monitoring of Bank Swallow colonies, refinements to the additional mitigation measures will be made considering evolving science and opportunities to build on OPG's Biodiversity Plan at Darlington. (D-P-3.8). • Undertake an adaptive management approach as part of a Follow-up and Monitoring Program for nesting Bank Swallows on site, involving creation of new banks of predetermined characteristics for the birds to nest in, monitoring the		

Environmental Sub-component	VEC	Baseline Change	DNNP PRSL Mitigation and/or Follow-up Commitments Relevant to Addressing this Change	Revised or Additional Commitment Proposed?	Impact on Project Residual Adverse Effects?
			results in terms of numbers of successful nests created, and adapting the best design for the creation of additional sites. (D-P-12.5) • Verify the results (of the Bank Swallow mitigation plan) predicted in the EIS during initial operation of the DNNP. (D-P-12.5)		
	Migrant Songbirds and their Habitat	• Occurrence of six migrant SAR bird species: o Olive-sided Flycatcher[1] o Common Nighthawk[2] o Eastern Whip-Poor-Will[2] o Canada Warbler[1] o Rusty Blackbird[2] o Least Bittern (previously considered a breeding species. New information indicates also a migrant species at the DNNP Site Study Area)	• Perform a thorough evaluation of site layout opportunities before site preparation activities begin, in order to minimize the overall effects on the terrestrial environment and maximize the opportunity for quality terrestrial habitat rehabilitation. (D-P-3.7) • Good Industry Management Practices applied during clearing and grubbing activities to reduce environmental impact include: o Minimizing the area to be cleared to the extent feasible; o Minimizing compaction of roots in areas that will not be cleared; and o Compliance with seasonal constraints and regulatory requirements (D-P-3.7) • Re-plant approximately 15 to 20 ha of Cultural Thicket with native shrub plantings, and Woodland dominated by Sugar Maple. (D-P-3.7) • Implementation of Good Industry Management Practice in the initial design and development of security fencing systems, to reduce the incidence of bird entanglement and entrapment to the extent practicable. (D-P-7.2) • Implement Good Industry Management Practice in the design and development of lighting systems that will, among other considerations (e.g., mitigation of bird strikes, navigation safety) serve to reduce, to the extent practicable, the night-time visibility of the overall site and its dominant features, including cooling towers. (D-P-7.2) • Monitor conditions to confirm the EIS predictions of habitat restoration post construction. (D-P-12.5)	• No further mitigation required to address change in baseline conditions. Mitigation and commitments documented in DNNP Commitments Report (OPG 2019c) including for ESA/SARA permitting, are sufficient to address potential for change to the effects of the project. Therefore, the original conclusions regarding residual adverse effects of the project remain valid and no further actions are necessary.	• No
Amphibians and Reptiles	Breeding and Key Summer Habitat	• Occurrence of one breeding SAR turtle species: o Common Snapping Turtle[1]	• Perform a thorough evaluation of site layout opportunities before site preparation activities begin, in order to minimize the overall effects on the terrestrial environment and maximize the opportunity for quality terrestrial habitat rehabilitation. (D-P-3.7) • Good Industry Management Practices applied during clearing and grubbing activities to reduce environmental impact include: o Minimizing the area to be cleared to the extent feasible; o Minimizing compaction of roots in areas that will not be cleared; and o Compliance with seasonal constraints and regulatory requirements (D-P-3.7) • Use best management practices to prevent or minimize the potential runoff of sediment and other contaminants into wildlife habitat associated with Coot's Pond during site preparation and construction phases. (D-P-3.7) • Development of stormwater management techniques to provide for adequate flow and water quality (e.g., TSS) to Coot's Pond. (D-P-3.4)	• No further mitigation required to address change in baseline conditions. Mitigation and commitments documented in DNNP Commitments Report (OPG 2019c) were developed to be adaptable and will be scaled appropriately to address changes to baseline and future permitting requirements. Therefore, the original conclusions regarding	• No

Environmental Sub-component	VEC	Baseline Change	DNNP PRSL Mitigation and/or Follow-up Commitments Relevant to Addressing this Change	Revised or Additional Commitment Proposed?	Impact on Project Residual Adverse Effects?
			• Creation of new fish-free wetland ponds with riparian plantings in appropriate areas on the DNNP Site Study Area. (D-P-3.7) • Wetlands will be incorporated into the new lake infill area after the Construction phase. (D-P-3.7) • Develop and implement a management plan for species at risk, as may be appropriate. (D-P-3.7) • Monitor conditions to confirm the EIS predictions of habitat restoration post construction. (D-P-12.5)	residual adverse effects of the project remain valid and no further actions are necessary.	
Mammal Communities and Species	Breeding Mammal	• Use of Site Study Area as foraging/roosting habitat for seven species of bats, including three SAR bat species: o Big Brown Bat o Silver-haired Bat o Hoary Bat o Eastern Red Bat • SAR species o Little Brown Myotis[2] o Northern Myotis[2] o Tri-coloured Bat[2]	• Perform a thorough evaluation of site layout opportunities before site preparation activities begin, in order to minimize the overall effects on the terrestrial environment and maximize the opportunity for quality terrestrial habitat rehabilitation. (D-P-3.7) • Good Industry Management Practices applied during clearing and grubbing activities to reduce environmental impact include: o Minimizing the area to be cleared to the extent feasible; o Minimizing compaction of roots in areas that will not be cleared; and o Compliance with seasonal constraints and regulatory requirements (D-P-3.7) • Re-plant approximately 40 to 50 ha of Cultural Meadow and approximately 15 to 20 ha of Cultural Thicket with native shrub plantings, and Woodland dominated by Sugar Maple. (D-P-3.7) • Use best management practices to prevent or minimize the potential runoff of sediment and other contaminants into wildlife habitat associated with Coot's Pond during site preparation and construction phases. (D-P-3.7) • Development of stormwater management techniques to provide for adequate flow and water quality (e.g., TSS) to Coot's Pond. (D-P-3.4) • Create of new fish-free wetland ponds with riparian plantings in appropriate areas on the DNNP Site Study Area. (D-P-3.7) • Wetlands will be incorporated into the new lake infill area after the Construction phase. (D-P-3.7) • Develop a follow-up program to verify the effectiveness of mitigation measures for mammals. (D-P-12.5) • Develop a follow-up program for mammal species and communities as appropriate, with a focus for this follow-up program on species at risk and the use of this follow-up program to verify the conclusions of the Ecological Risk Assessment. (D-P-12.5) • Develop and implement a management plan for species at risk, as may be appropriate. (D-P-3.7) • Monitor conditions to confirm the EIS predictions of habitat restoration post construction. (D-P-12.5)	• No further mitigation required to address change in baseline conditions. Mitigation and commitments documented in DNNP Commitments Report (OPG 2019c), including for ESA/SARA permitting, are sufficient to address potential for change to the effects of the project. Therefore, the original conclusions regarding residual adverse effects of the project remain valid and no further actions are necessary.	• No

[1] Status change to a species-at-risk since the 2009 application.
[2] New species-at-risk records for the DNNP Site Study Area since the 2009 application.

8.5.2 Additional Commitments

8.5.2.1 Mitigating Action

As indicated in Section 8.5.1, new information and/or changes to the baseline conditions have the potential to change the effects of the project from those considered for the 2009 application for the DNNP PRSL. For all potential changes identified, mitigation and commitments documented in DNNP Commitments Report (OPG 2019c) were reviewed and considered for applicability or contribution to mitigating the potential change in effects (Table 8-13). With the exception of actions related to a new Butternut tree, the mitigation and commitments currently identified were sufficient to address the potential change in effects.

Mitigation Commitment

Under commitment D-P-3.7, Butternut should be included in site planting plans through the ESA Notice of Activity process for new Butternut.

8.5.2.2 Follow-up Monitoring

No additional monitoring was identified.

8.5.2.3 Conclusion

Through implementation of the mitigating action, the current baseline data and regulatory guidelines do not alter the conclusions of the 2009 application supporting documents regarding residual adverse effects of the project and no further actions are necessary to address the DNNP.

9.0 SUMMARY AND CONCLUSIONS

Table 9-1 provides a summary of the conclusions presented in this report.

9.1 Baseline Climate, Meteorology and Air Quality

Since the 2009 application, the following three applicable codes and standards have been updated: 1) Canadian Climate Normals; 2) the Ontario Ambient Air Quality Criteria (AAQC) for acrolein has increased from 0.08 µg/m³ to 0.4 µg/m³, and for BaP has decreased from 0.0011 µg/m³ to 0.00005 µg/m³ As a result, BaP is now the most restrictive contaminant for VOCs and PAHs combined; and 3) the Canadian Council of Ministers of the Environment (CCME) established the Canadian Ambient Air Quality Standards (CAAQS).

Annual air sampling indicates that HTO and C-14 have remained constant over the last decade (2009 – 2018). Noble gas parameters measured at the DNNP Site Study Area boundary have average dose rates that are typically below detection limits.

It was concluded that the updated Canadian Climate Normals do not change the conclusions of the 2009 application for the DNNP PRSL or supporting documents. For the remaining updated standards it was determined that they will be addressed as part of the air monitoring program that is currently under development for the site preparation phase (D-P-12.2) and that changes to CAAQS for $PM_{2.5}$ will be factored into the development of the Nuisances Effects Management Plan(s) and Dust Management Plan as outlined in D-P-3.2 and D-P-12.2 of the Commitments Report.

Baseline information concerning climate, meteorology, and air quality was found to be compliant with REGDOC 1.1.1 (Kinectrics 2019), as no gaps associated with REGDOC 1.1.1 with respect to climate, meteorology, and air quality were identified.

Within the DNNP Local Study Area, baseline air quality has generally improved, or is within the natural variability experienced in the area, compared to conditions documented in the 2009 application. As such, there is no direct impact on the conclusions of the site evaluation. Review of updated codes and standards, current data, and assessment of change in baseline conditions relevant to climate, meteorology and air quality data, demonstrated that the conclusions of the 2009 application and 2009 supporting documents remain valid.

9.2 Baseline Geology and Hydrogeology

Soil and groundwater quality guidelines applicable to the Geological and Hydrogeological Environment Existing Environmental Conditions TSD (CH2M HILL and Kinectrics 2009) have been updated since the document was published in 2009.

Concerning groundwater, thirty-five parameters had groundwater quality guidelines that either did not exist previously or decreased (became more stringent); six of these parameters exceeded the current guideline value. Of the six parameters, exceedances for two parameters, cobalt and nickel, were determined to be non-reproducible (CH2M HILL and Kinectrics 2009). The other four parameters only exceeded the updated guideline (sodium, chloride, PHC F3, and chrysene). Exceedances of sodium, chloride, and PHC F3 are attributed to natural background. There was one marginal exceedance of chrysene, which is a PAH (1.1 µg/L compared to the guideline of 1.0 µg/L). This exceedance is considered anomalous as PAHs in all other samples (107 wells with two sampling events each) were below the MDL.

Screening of groundwater data collected over the previous three years of monitoring (2016 – 2018 or 2012 – 2014 where more recent data were not available) did not identify concerns with regard to the DNNP Site Study Area with the exception of the 2009 Injection Water Storage Tank (IWST) spill which caused an increase in localized concentrations of tritium in groundwater within the DNGS protected area. Groundwater quality (radioactive and non-radioactive substances) has been consistent with that documented in the 2009 application for the DNNP's PRSL. Groundwater quality continues to meet applicable guidelines, with the exception of a few areas where natural geologic properties account for elevated concentrations. Other than the IWST spill, comparison of current values for groundwater quality with those reported in the Geological and Hydrogeological Existing Environmental Conditions TSD (CH2M HILL and Kinectrics 2009) demonstrated that site baseline conditions have remained similar over time.

The potential gap associated with Section C.5.4 of REGDOC 1.1.1 has been addressed with the review of studies and reporting since the Geological and Hydrogeological Existing Environmental Conditions TSD (CH2M HILL and Kinectrics 2009). The potential gap was in reference to Section C.5.4 of REGDOC 1.1.1 which states that the rate of transfer between aquifers, and capture zones of wells, are required; however, the hydraulic properties of the subsurface at the DNNP Site Study Area have been extensively characterized through monitoring and testing of wells in the existing groundwater monitoring network. The rates and direction of groundwater flow and the transfer of water between aquifers are all understood on the basis of water level, hydraulic conductivity, hydraulic gradient, transmissivity (rate of transfer), and vertical gradient information available for the DNNP Site Study Area. An in-depth understanding of the groundwater flow system has been developed through field investigations, involving the installation of numerous monitoring wells and observations and testing on the wells, in addition to extensive groundwater modelling that was focused on groundwater flow at and around the site (CH2M HILL and Kinectrics 2009). Flow gradients occur toward Lake Ontario and Darlington Creek; therefore, determination of capture zone of wells is not applicable as any residential wells occur upgradient from the DNNP Site Study Area. Therefore, the general intent of REGDOC 1.1.1 has been met and the original conclusions regarding residual adverse effects of the project remain valid.

Concerning soil, 13 parameters had soil quality guidelines that either did not exist previously or decreased (became more stringent); however; assessment of past soil quality data against current soil quality guidelines indicated that only barium was in exceedance of a guideline value. The concentration of barium appears to be a natural condition of the site as exceedances are only in deep soil samples near bedrock.

An update to baseline surficial soil quality within the DNNP Site Study Area was conducted based on the 2019 sampling program which included soil data for potentially impacted soils in DNNP lands. Screening against appropriate benchmarks indicated that soils were found to be of good quality with the exception of soils within the yard waste and building materials dump site. This aligns with the assumption made in the Geological and Hydrogeological Environment Existing Conditions TSD that the yard waste and building materials dump site would have soils that exceeded soil quality guidelines.

As there are no specific soil standards for radionuclides, a comparison to background levels was made to provide additional context to measured data. Of the seven measured parameters (tritium, C-14, Cs-137, Cs-134, Co-60, K-40, I-131), six had detectable activity with only H-3, C-14, and Co-60 detected above background levels. Concentrations above background can be expected, due to influence from DNGS, and were noted also in 2007-2008 sampling. Comparison between 2019 and 2007-2008 sampling demonstrated that two radionuclides measured at detectable levels in 2019 (Co-60 at 1 of 37 sample locations, and I-131 at 5 of 37 sample locations) were not detected in 2007-2008. The 2019 detectable levels were measured at locations that were not sampled in 2007-2008 as part of the 2009 supporting documents.

Review of updated codes and standards, current data, and possible change in baseline conditions relevant to geology and hydrogeology, demonstrated that the conclusions of the 2009 application and supporting documents remain valid.

9.3 Baseline Hydrology, Surface Water and Sediment Quality

Baseflow estimates taken in 2008 for Darlington Creek and reported in the Surface Water Environment Existing Conditions TSD were slightly lower than estimates (discharge) taken in 2019. The difference is within expected natural variability.

Lake current direction was measured historically and discussed within the Surface Water TSD and were also measured as part of the 2011 Thermal and Current Monitoring Program. Both reports were in agreement and concluded that lake currents were predominately alongshore and favoured a westerly direction.

Lake water temperature and thermal plume character described in the Surface Water TSD were consistent with additional studies conducted in 2011/2012 and 2017/2018. In winter, warm thermal plumes rise from the diffuser and spread along the lake surface. In summer, warm water plumes are still most common but coldwater plumes also occur – this happens when the intake occurs below the lake stratification layer during periods of high surface water temperatures. Cold plumes rise due to discharge velocity and generally mix vertically through the water column but they can form a diving plume.

Surface water quality guidelines applicable to the Surface Water Environment Existing Environmental Conditions TSD (Golder 2009) have been updated since the document was published in 2009. For ten parameters, water quality guidelines either did not exist previously or decreased (became more stringent); however, when considering the benchmark values used to support the 2009 application, the guidelines for only four of these parameters (strontium, zinc, nitrite and *E. coli*) have become more stringent. No changes to sediment quality guidelines have occurred since the Ecological Risk Assessment and Assessment of Effects on Non-Human Biota TSD was published in 2009.

Surface water sampling was conducted in 2007/2008 within Lake Ontario, Coot's Pond and Treefrog Pond and was reported in the Surface Water Environment Existing Conditions TSD (Golder 2009). In 2019, surface water quality was sampled at both ponds and at ten locations within Lake Ontario. Sampling locations were similar between studies for both ponds and six Lake Ontario sampling locations. Review of the data concluded that surface water meets water quality guidelines with a few exceptions for the following parameters; total ammonia, un-ionized ammonia, total suspended solids, total aluminum, total iron, total boron, dissolved zinc, total phosphorus, pH, and *E. coli*. Of these 10 parameters that exceeded water quality guidelines only three were not considered in exceedance in the 2009 application: un-ionized ammonia, total phosphorus, and pH. Exceedances for phosphorus and pH were marginal. Total phosphorus and un-ionized ammonia are unlikely to be attributed to DNGS operations and are potentially due to agricultural inputs into Lake Ontario. All radiological parameters met applicable quality guidelines and were at levels similar to those presented in the Surface Water Environment Existing Conditions TSD.

Sediment collected from Lake Ontario in 2019 met sediment quality guidelines with the exceptions of total Kjeldahl nitrogen and total phosphorus. Within the 2009 supporting documents, total phosphorus exceeded sediment quality guidelines, but total Kjeldahl nitrogen was not measured. However, elevated total phosphorus and total Kjeldahl nitrogen are unlikely to be attributed to DNGS operations, but are potentially due to agricultural inputs into Lake Ontario. Within Lake Ontario, one location was sampled in both 2007/2008 and 2019 and only K-40 concentration showed a statistically meaningful increase, but was within the range of natural background levels of K-40 in beach sand (which can be applied to sediment) for Southern Ontario. The remaining 22 locations sampled in 2019 within the DNNP Site Study Area are considered additional baseline information.

Sediment collected in Coot’s Pond had higher cadmium, nickel, and zinc concentrations in 2019 compared to 2007/2008 with some samples exceeding sediment quality guidelines. These elevated sediment concentrations are attributed to stormwater runoff from the DN landfill. The only radionuclide to have higher activity in 2019 compared to 2007/2008 was K-40 but activity was within the range of background values.

Within Treefrog Pond, concentrations of antimony and PHC F3 in sediment were higher in 2019 compared to 2007/2008; however, no sediment quality guidelines are available for these parameters. Concentrations of cadmium and selenium were higher in Treefrog Pond in 2019 compared to 2007/2008 and some samples exceeded sediment quality guidelines. The only radionuclide to have higher activity in 2019 compared to 2007/2008 was Cs-137. Regardless, there is no impact to the DNNP as this pond is planned to be removed during the construction phase.

Baseline information concerning hydrology, surface water and sediment quality was found to be compliant with REGDOC 1.1.1 (Kinectrics 2019).

Review of updated codes and standards, current data, and possible change in baseline conditions relevant to hydrology, surface water and sediment, demonstrated that the conclusions of the 2009 application and supporting documents remain valid.

9.4 Baseline Aquatic Communities

A review of updated codes and standards identified that the ESA and SARA species-at-risk lists have been updated since the 2009 application for the DNNP PRSL was submitted. American Eel and Lake Sturgeon have become provincially listed since the 2009 application; since any impact with respect to provincial species at risk will be addressed as part of the Overall Benefit permitting process under the ESA, the change in species listings does not alter original conclusions regarding residual adverse effects of the project and do not impact the conclusions of the original site evaluation. The COSEWIC status of American Eel and Atlantic Salmon have changed since the 2009 application supporting documents were submitted; however, there has been no change in their official federal status under Schedule 1 of SARA since the 2009 application supporting documents were submitted. Since there is no change to the official federal status of these species the new COSEWIC status does not alter the original conclusions regarding residual adverse effects of the project or the site evaluation.

Review of studies and reporting since the Aquatic Environment Existing Environmental Conditions (TSD) (Golder and SENES 2009) indicated that the aquatic community is well characterized for the DNNP Site Study Area and that baseline conditions have remained similar over time.

Annual fish tissue sampling indicates that HTO and C-14 have remained constant over the last decade (2009 – 2018). The majority of the gamma activity in fish is naturally occurring K-40. A small amount of Cs-137 due to fall out from nuclear weapons testing is usually observed. The Cs-137 detected in fish is not a result of reactor operations given that Cs-134 and Co-60, which are indicative of reactor operation, were not detected in any fish samples at the DNNP Site Study Area in 2018. The average Cs-137 concentration for fish sampled from the DNNP Site Study Area was 0.1 Bq/kg and has decreased slightly over time. Given the level of uncertainty at such low concentrations, this is not distinguishable from background.

The gaps identified in three sections of REGDOC 1.1.1 with respect to the aquatic environment described in the 2009 application have been addressed through additional aquatic studies conducted since the Aquatic Environment Existing Environmental Conditions TSD (Golder and SENES 2009). In Section C.7.1, nine of ten gaps were addressed within this report by existing studies. It was determined that the remaining potential gap concerning the creation of a fish habitat map would not impact the conclusions of the original site evaluation as this information was already considered during the application process but was not compiled into a single map. The single gap pertaining to Section C.7.2, concerning the requirement that reference locations shall be sampled over multiple years, was satisfied as many studies conducted since the 2009 application have resulted in a reference area being sampled in multiple years for fish, including supporting water quality measurements. The intent of the single gap pertaining to Section G.5.4, concerning thermal plume effects on the environment, has been met, as many studies investigating such effects have been conducted since the 2009 application. Additionally, OPG made commitments (see Section 7.5.1.4) related to thermal plume monitoring that will provide further information concerning potential thermal plume effects on the environment.

Review of updated codes and standards, current data, and possible change in baseline conditions relevant to aquatic communities, demonstrated that the conclusions of the 2009 application and supporting documents remain valid.

9.5 Baseline Terrestrial Communities

Since the 2009 application both SARA and ESA species lists have been updated. Due to these updated standards, and continued monitoring since 2009, there are six additional ESA and SARA species that are new records for the DNNP Site Study Area (Common Nighthawk, Eastern Whip-poor-will, Rusty Blackbird, Little Brown Myotis, Northern Myotis, and Tri-coloured Bat). Additionally, status change to a species at risk has occurred for nine species (Eastern Wood-Pewee, Olive-sided Flycatcher, Canada Warbler, Bank Swallow, Barn Swallow, Wood Thrush, Bobolink, Eastern Meadowlark, and Snapping Turtle) since the 2009 application was submitted. Existing mitigation measures and commitments documented in the Commitments Report (see Section 8.5.1.2) were developed to be adaptable and will be scaled appropriately to address changes to species at risk and related permitting requirements. As such, the change in status of some species and the presence of new species does not impact the conclusions of the 2009 application for the DNNP PRSL and supporting documents. A non-retainable Butternut tree was documented in the 2009 application; however, anew sapling specimen of Butternut tree was found on DNNP Site Study Area since that time. This recently identified Butternut tree was deemed retainable; therefore, an updated mitigation commitment is proposed to include Butternut in site planting plans (see Section 8.5.2.1); however, there will be no impact to the conclusions regarding residual adverse effects of the project nor the original site evaluation.

Since the 2009 application, radiological monitoring of fruits and vegetables, milk, and animal feed within the vicinity of the DNNP Site Study Area has continued annually with the addition of poultry and eggs to the annual program starting in 2014. Annual vegetation (fruit and vegetable) and milk sampling indicates that HTO and C-14 have remained constant over the last decade (2009 – 2018). No trend analysis was performed on animal feed since, beginning in 2013, wet feed and dry feed have been sampled separately. Similarly, no trend analysis was performed for eggs and poultry as only five years of data have been collected from these locations. However, no apparent trend was observed from inspection of HTO and C-14 data for feed (wet or dry), eggs, or poultry.

The terrestrial community of the DNNP Site Study Area has changed since the Terrestrial Environment Existing Environmental Conditions TSD was submitted (Beacon 2019b); however, it was concluded that the current commitments (OPG 2019c), along with the updated commitment regarding the Butternut tree, address these changes and the conclusions of the 2009 application and supporting documents remain valid.

Review of studies and reporting since the Terrestrial Environment Existing Environmental Conditions TSD (Beacon 2009a) indicated that the terrestrial community is well characterized for the DNNP Site Study Area (Beacon 2019b).

Review of studies and reporting since the Terrestrial Environment Existing Environmental Conditions TSD (Beacon 2009a) identified a gap within Section C.6 of REGDOC 1.1.1 (Kinectrics 2019). This gap, to provide a description of natural and human-induced pre-existing environmental stresses and the current ecological conditions that indicate such stresses was addressed within this report. Further, it was concluded that these existing stressors do not change the residual adverse effects of the project, nor the conclusions regarding site evaluation.

9.6 Conclusion

The DNNP 2009 application and 2009 supporting documents has been reviewed against REGDOC 1.1.1, current codes, standards and practices as well as current site baseline data. While changes have been identified and assessed (Table 9-1), their resulting impacts do not change the residual adverse effects of the project, nor the conclusions regarding site evaluation.

Table 9-1: General Overview of Conclusions Regarding DNNP PRSL Application Renewal

Environmental Component	Baseline Change	REGDOC 1.1.1 Gap	Updated Code or Standard[1]	Revised or Additional Commitment Proposed?	Change to Project Residual Adverse Effects?
Climate, Meteorology and Air Quality	• Reduction of mean 1-hr and 24-hr ambient nitrogen dioxide (NO2) and sulfur dioxide (SO2) concentrations and 24-hr ambient particulate matter (PM2.5) concentrations	• No	• Canadian Climate Normals • Ontario Ambient Air Quality Criteria (AAQC) • Canadian Ambient Air Quality Standards (CAAQS)	• No	• No
Geology and Hydrogeology	• IWST spill which caused an increase in localized concentrations of tritium in groundwater within the DNGS protected area	• Section C.5.3 - Rate of transfer between aquifers, and capture zones of wells.	• MECP Table 3 (Non-potable) groundwater quality guidelines • MECP Table 3 (Industrial \ Commercial \ Community) soil quality guidelines • CCME Soil Quality Guidelines (SQGs)	• No	• No
Hydrology, Surface Water and Sediment Quality	• Surface water exceedance of un-ionized ammonia, total phosphorus, and pH • Sediment K-40 higher at one Lake Ontario location • Coot's Pond sediment had higher concentrations of cadmium, nickel, and zinc in exceedance of quality guidelines • Treefrog Pond, sediment concentrations of antimony, PHC F3, Cs-	• No	• CCME Canadian Water Quality Guidelines (CWQGs) • MECP interim Provincial Water Quality Objectives (iPWQO) • Health Canada's Guideline for Canadian Drinking Water Quality	• No	• No

Environmental Component	Baseline Change	REGDOC 1.1.1 Gap	Updated Code or Standard[1]	Revised or Additional Commitment Proposed?	Change to Project Residual Adverse Effects?
	137 cadmium and selenium increased. Only cadmium and selenium exceeded quality guidelines				
Aquatic Communities	• Within natural variability	• Section C.7.1 - Baseline Aquatic Biota and Habitat • Section C.7.2 - Baseline Food Chain Data • Section G.5.4 - Effect of Thermal Plume on the Aquatic Environment	• Endangered Species Act (ESA) • Species at Risk Act (SARA)	• No	• No
Terrestrial Communities	• 11 ha (34%) increase in wetland habitat in the Site Study Area, 9 ha of which are within the Area of Direct Effects. • New retainable Butternut tree • Possible decline in dragonfly and damselfly community • Decrease of 10 ha (10%) of migrant butterfly stopover habitat in the Site Study Area	• Section C.6 - description of natural and human-induced pre-existing environmental stresses and the current ecological conditions that indicate such stresses	• Endangered Species Act (ESA) • Species at Risk Act (ESA)	• Addition of Butternut to site planting plans through the ESA Notice of Activity process for new Butternut	• No

Environmental Component	Baseline Change	REGDOC 1.1.1 Gap	Updated Code or Standard[1]	Revised or Additional Commitment Proposed?	Change to Project Residual Adverse Effects?
	• Occurrence of six SAR breeding species: o Bank Swallow[2] o Barn Swallow[2] o Eastern Wood Pewee[2] o Wood Thrush[2] o Bobolink[2] o Eastern Meadowlark[2] • Decade of data confirming persistence of Bank Swallow colony at DNNP Site Study Area and records of nocturnal roosting at Coot's Pond • Decade of data related to Least Bittern breeding occurrence on site • Occurrence of six migrant SAR bird species: o Olive-sided Flycatcher[2] o Common Nighthawk[3] o Eastern Whip-Poor-Will[3] o Canada Warbler[2] o Rusty Blackbird[3] • Least Bittern (previously considered a breeding species. New information indicates also a migrant				

Environmental Component	Baseline Change	REGDOC 1.1.1 Gap	Updated Code or Standard[1]	Revised or Additional Commitment Proposed?	Change to Project Residual Adverse Effects?
	species at the DNNP Site Study Area) • Occurrence of one breeding SAR turtle species: o Common Snapping Turtle[2] • Use of Site Study Area as foraging/roosting habitat for seven species of bats, including three SAR bat species: o Big Brown Bat o Silver-haired Bat o Hoary Bat o Eastern Red Bat • SAR species o Little Brown Myotis[3] o Northern Myotis[3] o Tri-coloured Bat[3]				

[1] Updated code or standard since 2009.

[2] Status change to a species-at-risk since the 2009 application.

[3] New species-at-risk records for the DNNP Site Study Area since the 2009 application.

10.0 REFERENCES

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Appendix A: Evaluation of Applicable Environmental Codes and Standards to Support Darlington PRSL Renewal

Introduction

This appendix presents the review that EcoMetrix conducted of applicable environmental codes and standards against materials submitted to support the 2009 Darlington New Nuclear Project (DNNP) Nuclear Power Reactor Site Preparation Licence (PRSL) application.

Methodology for Review of Codes and Standards Applicable to Site Evaluation

A number of codes and standards relevant to the environment (the environmental subset of Table 1 of the DNNP PRSL Renewal Plan NK054-PLAN-01210-0000) were reviewed to look at OPG's assessment of project effects and site evaluation work for the DNNP and examine the degree to which OPG's previous work complies with these new or revised codes and standards. The types of review of codes and standards was specified by OPG as high level or clause-by-clause. According to the DNNP PRSL Renewal Plan, these types of reviews are defined as follows:

> *Clause by Clause Review: An assessment conducted against individual clauses of a current code, standard or practice to demonstrate with supporting evidence whether requirements or guidance identified in the clause are met.*
>
> *High Level Review: An assessment conducted to establish the degree of conformance to the intent of a clause or groups of clauses of a current code, standard or practice.*

Incremental high level or clause-by-clause review applies to codes and standards that were part of the existing licensing basis but have been revised or updated since the time of the 2009 application. Only the differences between the two documents are subject to review.

Compliance with the entire code or standard is not considered necessary, but rather the focus is on sections that are applicable to site evaluation as indicated in REGDOC 1.1.1 "Site Evaluation and Site Preparation for New Reactor Facilities". See the PRSL Renewal Plan for further details on the review methodologies.

The review of codes and standards applicable to site evaluation was undertaken in a stepwise process (Figure A.1), as follows:

1. REGDOC 1.1.1 was reviewed to determine where each code or standard was referenced. The section referenced was documented in Table A.1.
2. The section referenced in REGDOC 1.1.1 was evaluated to determine which clauses from the code or standard would be relevant to the topic in REGDOC 1.1.1.

3. The relevant OPG DNNP documents were evaluated to determine compliance with the identified clause or group of clauses.

4. A compliance category was assigned (compliant, gap, not applicable).

5. Document steps 2 to 4 in Table A.2.

Any identified gaps are assessed in the main body of this document.

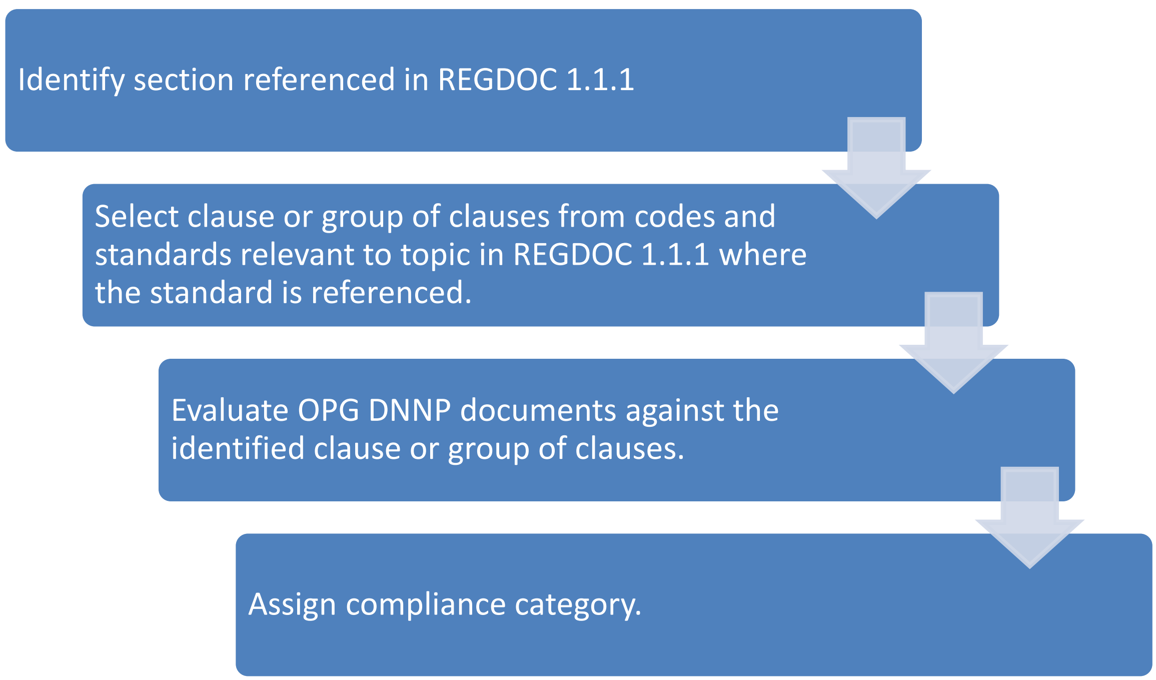

Figure A.1: Methodology for Evaluation of Relevant Codes and Standards

Table A.1: Relevant Sections of REGDOC 1.1.1 Where Environmental Codes and Standards Applicable to Site Evaluation (from Table 1 of DNNP PRSL Renewal Plan) are Referenced

Document Number	Document Title	Edition/Version/Issue Date	Level of Review	Location Referenced in REGDOC 1.1.1
REGDOC 2.9.1	Environmental Protection: Environmental Principles, Assessments and Protection Measures	Version 1.1	Incremental High Level	Section 2.1 Environmental Assessments Section 2.4 Overview of site preparation Section 3 Site Evaluation for New Reactor Facilities Section 3.4 Gathering Baseline Data Section 3.8 Management system Section 4.9 Environmental protection Section 4.9.1 General considerations for environmental protection Appendix A: Licence Application Guide: Licence to Prepare Site, Section A.1 General considerations
CSA N288.1	Guidelines for Calculating Derived Release Limits for Radioactive Material in Airborne and Liquid Effluents for Normal Operation of Nuclear Facilities	14	Incremental High Level.	Section 4.9 Environmental protection Section 4.9.1 General considerations for environmental protection Appendix G: Effects of the Project on the Environment, Section G.7.1 Radiological Risks
CSA N288.4	Environmental Monitoring Programs at Class I Nuclear Facilities and Uranium mines and Mills	10	High Level Review	Section 3.4 Gathering Baseline Data Section 4.9 Environmental protection Appendix B: Site Evaluation Program and Processes, Section B.3 Process for gathering baseline data Appendix C: Baseline Data used to Evaluate Suitability Throughout the Lifecycle of the Facility, Section C.8 Baseline ambient radioactivity and ambient non-radioactive hazardous substances Appendix G: Effects of the Project on the Environment • Section G.3 Effects of the project on the terrestrial environment • Section G.5 Effects of the project on the aquatic environment
CSA N288.5	Effluent Monitoring Programs at Class I Nuclear Facilities and Uranium Mines and Mills	11	High Level Review	Section 4.9 Environmental protection Appendix G: Effects of the Project on the Environment • Section G.3 Effects of the project on the terrestrial environment • Section G.5 Effects of the project on the aquatic environment
CSA N288.6	Environmental Risk Assessment at Class I Nuclear Facilities and Uranium Mines and Mills	12	Clause by Clause	Section 3.1 Role of site evaluation in the CNSC regulatory process Section 3.4 Gathering Baseline Data Section 4.9 Environmental protection Section 4.9.1 General considerations for environmental protection Appendix B: Site Evaluation Program and Processes, Section B.1 General considerations Appendix G: Effects of the Project on the Environment, • Section G.3 Effects of the project on the terrestrial environment • Section G.4 Effects of nuclear and hazardous substances on the terrestrial environment • Section G.5 Effects of the project on the aquatic environment • Section G.8 Prediction of non-human biota dose, Section G.8.1 Exposure information • Section G.8 Prediction of non-human biota dose, Section G.8.3 Uncertainties
CCME	Canadian Environmental Quality Guidelines	1999-2016	Incremental High Level	Appendix C: Baseline Data used to Evaluate Suitability Throughout the Lifecycle of the Facility • Section C.2 Baseline climate, meteorological data and air quality data • Section C.5.2 Baseline surface water quality • Section C.5.3 Baseline sediment quality • Section C.5.4 Baseline hydrogeology and groundwater quality • Section C.8 Baseline ambient radioactivity and ambient non-radioactive hazardous substances Appendix G: Effects of the Project on the Environment, Section G.5.1 Effects of liquid effluent on the aquatic environment

Document Number	Document Title	Edition/Version/Issue Date	Level of Review	Location Referenced in REGDOC 1.1.1
Government of Canada	Canadian Climate Normals	Webpage	Incremental Clause by Clause	Section 3.4.1 Atmospheric and meteorological data Appendix C: Baseline Data used to Evaluate Suitability Throughout the Lifecycle of the Facility, Section C.2 Baseline climate, meteorological data and air quality data

Table A.2: Relevant Clauses of Identified Codes and Standards based on REGDOC 1.1.1 Topics

Document Number/Name	Location and Text Referenced in REGDOC 1.1.1	Applicable Clause(s) in the Code or Standard	Requirement	Recommended	Option	Assessment	Compliance
REGDOC 2.9.1 Environmental Protection: Environmental Principles, Assessments and Protection Measures	<u>Section 2.1 Environmental Assessments</u> For EAs conducted by the CNSC in accordance with federal environmental assessment legislation, the Commission must render an EA decision prior to making a licensing decision under the NSCA…. For more information on the CNSC's EA and licensing processes, see: • REGDOC 2.9.1, Environmental Protection: Environmental Principles, Assessments and Protection Measures, Version 1.1 • REGDOC 3.5.1, Licensing Process for Class I Nuclear Facilities and Uranium Mines and Mills, Version 2	Not applicable – Clause in REGDOC 1.1.1 is referencing information on the CNSC's EA and licensing process, and does not indicate a requirement, recommendation or option for site evaluation.				Not applicable	Not applicable
	<u>Section 2.4 Overview of site preparation</u> The licensing of reactor facilities in Canada involves several steps, beginning with consideration of the proposed site, conduct of the environmental assessment and issuance of a licence to prepare site. The Commission's granting of the licence to prepare site declares the site suitable and permits the licensee to perform the licensed activity (site preparation). **Note:** No licence will be issued until the EA is complete and the Commission has determined that the proposed project is not likely to result in adverse environmental effects, taking into consideration the implementation of mitigation measures. For more information on the CNSC's EA and licensing processes, see: • REGDOC2.9.1, *Environmental Protection: Environmental Principles, Assessments and Protection Measures*, Version1.1 • REGDOC3.5.1, *Licensing Process for Class I Nuclear Facilities and Uranium Mines and Mills*, Version 2	Not applicable – Clause in REGDOC 1.1.1 is referencing information on the CNSC's EA and licensing process, and does not indicate a requirement, recommendation or option for site evaluation.				Not applicable	Not applicable
	<u>Section 3 Site Evaluation for New Reactor Facilities</u> As stated in section 2, the licensing of reactor facilities in Canada involves several steps, beginning with	Not applicable – Clause in REGDOC 1.1.1 is referencing information on the CNSC's EA and licensing process, and does not indicate a requirement, recommendation or option for site evaluation.				Not applicable	Not applicable

<table>
<tr><th>Document Number/Name</th><th>Location and Text Referenced in REGDOC 1.1.1</th><th>Applicable Clause(s) in the Code or Standard</th><th>Requirement</th><th>Recommended</th><th>Option</th><th>Assessment</th><th>Compliance</th></tr>
<tr><td></td><td>consideration of the proposed site, conduct of the environmental assessment and issuance of a licence to prepare site. For more information on the CNSC's EA and licensing processes, see:
REGDOC2.9.1, Environmental Protection: Environmental Principles, Assessments and Protection Measures, Version1.1
REGDOC3.5.1, Licensing Process for Class I Nuclear Facilities and Uranium Mines and Mills, Version 2</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td><u>Section 3.4 Gathering Baseline Data</u>
Guidance
Where possible, baseline data should take into account archeological, paleontological, and prehistoric data (including the oral history of Indigenous peoples), as well as historic and instrumentally recorded sources.
Baseline data should be of sufficient sample size and duration to obtain a basic understanding of within-year and between-year variation. For more information on specific baseline environmental components, see appendix B.
As described in CSA N288.4, Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills, the proposed operational monitoring program may require additional intensive baseline sampling for monitoring elements where a specific level, effect, or change in the environment is detected.
All provincially or federally listed wildlife species occurring or reasonably expected to occur, within the spatial boundaries should be identified as VCs.
For more information, see:
CSA N288.6, Environmental risk assessments at class I nuclear facilities and uranium mines and mills (note that CSA N288.6-12 refers to VCs as receptors)
REGDOC-2.9.1, Environmental Protection: Environmental Principles, Assessments and Protection Measures, Version 1.1</td><td><u>Appendix B: Characterization of the Baseline Environment for an Environmental Assessment Under CEAA 2012 </u>(REGDOC 2.9.1)
For a new licence, the applicant should use the information in this appendix to develop a characterization of the baseline environment. During the lifecycle of the facility or activity, the licensee should use this information to review and update the characterization, and also use the information in appendix C to document and predict the future environmental effects compared to this baseline characterization.
For additional information, see appendix D for a sample matrix for mapping the facility/activity-environmental-component interactions.
B.1 Atmospheric environment
B.2 Surface water environment
B.3 Aquatic environment
B.4 Geological and hydrogeological environment
B.5 Terrestrial environment
B.6 Ambient radioactivity
B.7 Human health
B.8 Aboriginal land and resource use

<u>B.3 Aquatic environment</u>
…The applicant or licensee should identify any biological species of natural conservation status (that is, rare, vulnerable, endangered, threatened or uncommon at a federal, provincial or municipal level) and their critical habitats, if identified.
<u>B.5 Terrestrial environment</u>
…The applicant or licensee should describe the terrestrial species at the site and within the local and regional study areas, including flora, fauna and their habitat. The applicant or licensee should identify all biological species at risk (that is, endangered, threatened, special concern, extirpated at a federal, provincial or municipal level) known to occur in the area or where the site is within the range of the species.
The applicant or licensee should describe the presence and importance of wildlife habitat within the study areas, including critical habitats for listed species (if identified). The applicant or licensee should also describe any wildlife corridors and physical barriers to movement.</td><td></td><td>X</td><td></td><td>It is understood that the reference to REGDOC 2.9.1 in Section 3.4 of REGDOC 1.1.1 relates to the recommendation to include provincially or federally listed wildlife species as VCs. REGDOC 2.9.1 does not require that all provincially or federally listed wildlife species present on-site be identified as VCs in the assessment, rather listed species should be identified.

Fish species at risk in the site study area were identified in NK054-REP-07730-00003-R000 "Aquatic Environment Existing Environmental Conditions Technical Support Document New Nuclear - Darlington Environmental Assessment".
Flora and fauna species at risk in the site study area were identified in NK054-REP-07730-00004-R000 "Terrestrial Environment Existing Environmental Conditions Technical Support Document New Nuclear - Darlington Environmental Assessment".

The LRA Report: Baseline Characterization will identify any new species at risk since preparation of the above-mentioned EA documents.</td><td>Compliant</td></tr>
</table>

Document Number/Name	Location and Text Referenced in REGDOC 1.1.1	Applicable Clause(s) in the Code or Standard	Requirement	Recommended	Option	Assessment	Compliance
	Section 3.8 Management system The applicant shall establish a management system when it can be applied to the site evaluation process. In addition, the management system may be graded in accordance with the importance to safety of the individual evaluation activity under consideration. For more information, see: • IAEA GSR Part2, *Leadership and Management for Safety: General Safety Requirements*http://nuclearsafety.gc.ca/eng/acts-and-regulations/regulatory-documents/published/html/regdoc-1-1-1/index.cfm - fnb23 • IAEA GS-G-3.1, *Application of the Management System for Facilities and Activities* • IAEA GS-G-3.5, *The Management System for Nuclear Installations* • CSA N286, *Management system requirements for nuclear facilities* • CNSC REGDOC-2.9.1, *Environmental Protection: Environmental Principles, Assessments and Protection Measures*, Version 1.1	4.6 Environmental management system (REGDOC 2.9.1) An environmental management system (EMS) refers to the management of an organization's environmental policies, measures and procedures in a comprehensive, systematic, planned and documented manner. It includes the organizational structure, planning and resources for developing, implementing and maintaining policy for environmental protection and for continuous improvement by: • identifying and managing environmental risks associated with a facility or activity (see section 3 and section 4.1) • the identification, implementation and maintenance of pollution control activities and technologies (see section 4.2.1) • monitoring of releases (see section 4.2.2) • monitoring of contaminants and for their potential effects in the environment (see section 4.3) In addition, the EMS should address environmental emergency preparedness. The EMS serves as the management tool for integrating all of the applicant or licensee's environmental protection measures in a documented, managed and auditable process by: • identifying and managing non-compliances and corrective actions within the activities, through internal and external inspections and audits • summarizing and reporting the performance of these activities, both internally (licensee's management structure) and externally (to the Commission and the public) • training of the personnel involved in these activities • ensuring the availability of resources (such as qualified personnel, organizational infrastructure, technology and financial resources) • defining and delegating roles, responsibilities and authorities essential to effective environmental management The EMS may be implemented within the licensee's integrated management system. **Requirements** For Class I nuclear facilities and uranium mines and mills, the licensee shall manage their environmental protection measures within an EMS that reflects the nature and complexity of their environmental protection measures. The licensee shall: • establish, implement and maintain an EMS that meets the requirements set by CAN/CSA ISO 14001, *Environmental Management Systems – Requirements with Guidance for Use* (2004 edition or successor editions) [1, 2]	X	X		The EIS document for NND, NK054-REP-07730-00029 “Environmental Impact Statement New Nuclear - Darlington Environmental Assessment” indicates that OPG has an Environmental Management System (EMS) that is in accordance with ISO 14001. The requirement to have an EMS is documented in OPG's Environmental Policy (OPG-POL-0021). The key principles of the policy are the following: • Pollution Prevention; • Adherence to Regulations; and • Continual Improvement. OPG's EMS is documented in OPG-PROG-0005 The EMS includes the organizational structure, planning and resources for developing, implementing and maintaining policy for environmental protection and for continuous improvement, as described in REGDOC 2.9.1, and meets all specified requirements.	Compliant

Document Number/Name	Location and Text Referenced in REGDOC 1.1.1	Applicable Clause(s) in the Code or Standard	Requirement	Recommended	Option	Assessment	Compliance
		• ensure that the scope of the EMS is consistent with the definition of environment, environmental effects and pollution prevention provided in the glossary of this regulatory document • conduct internal audits at planned intervals so that all elements of the EMS are audited on at least a five-year cycle • conduct an annual management review **Guidance** For facilities or activities other than Class I nuclear facilities and uranium mines and mills, for which the CNSC has determined that there are direct interactions with the environment, the applicant or licensee should manage their environmental protection measures within an EMS that reflects the nature and complexity of their environmental protection measures. In addition to the information provided in this regulatory document, the licensee should refer to the following documents: • CAN/CSA ISO 14001, *Environmental Management Systems – Requirements with Guidance for Use* (2004 edition or successor editions) [1, 2] • CAN/CSA ISO 14004, *Environmental Management Systems – General Guidelines on Principles, Systems and Support Techniques* [14] **Note:** The CNSC does not consider certification to CAN/CSA ISO 14001 by an authorized registrar or other independent third party as solely sufficient for demonstrating compliance with the requirements. The CNSC evaluates all activities in relation to the requirements of this regulatory document. The CNSC's compliance verification focuses on the effectiveness of the EMS rather than on the licensee's adherence to CAN/CSA ISO 14001 (2004 edition or successor editions) [1, 2]. During the design of an EMS, the ISO documents provide guidance and information that may be useful; however, the licensee should note that, as a federal agency, the CNSC has adopted certain key concepts in environmental protection from other federal statutes. Where applicable, the CNSC expects licensees to apply the more-demanding meanings from federal legislation in the scope of their EMS. To avoid misinterpretation of these concepts, the licensee should review the following differences between key concepts in federal legislation and those in CAN/CSA ISO 14001 (2004 edition or successor editions) [1, 2] and consider them in the scope of their EMS: • the CNSC's definitions of environment, environmental effect (i.e., impact) and pollution prevention (i.e., prevention of pollution) in this regulatory document are taken from federal legislation and are broader than the definitions of the related					

Document Number/Name	Location and Text Referenced in REGDOC 1.1.1	Applicable Clause(s) in the Code or Standard	Requirement	Recommended	Option	Assessment	Compliance
		terms in CAN/CSA ISO 14001 (2004 edition or successor editions) [1, 2] • in both the NSCA and the *Canadian Environmental Protection Act, 1999* (CEPA 1999), risk is a key concept in environmental protection that is not addressed in CAN/CSA ISO 14001 [1, 2] • the licensee should use the ERA as one of the core sources to inform the significant environmental aspects and effects of the EMS • CAN/CSA ISO 14001 [1, 2] provides only minimal guidance on the interpretation of adverse environmental effects Pollution prevention is the key principle underlying the management of hazardous substances in Canada. Section 64 of CEPA 1999 defines the nature of toxic substances, explicitly defining unreasonable risk for certain scheduled substances. For other potentially hazardous substances that are not subject to legislation, unreasonable risk may be interpreted in terms of likely significant adverse effects. This concept is nearly equivalent to the CAN/CSA ISO 14001 [1, 2] concept of significant environmental effects. In the CNSC licensing process for Class I nuclear facilities and uranium mines and mills, an EA under the NSCA or CEAA 2012 process provides an initial framework for identifying and assessing the equivalent of ISO-significant environmental aspects in an appropriate context. This information can provide the initial foundation for the scope of the EMS. For nuclear substances, the *Radiation Protection Regulations* require exposure and doses to persons to be managed according to the ALARA (as low as reasonably achievable) principle, while taking social and economic factors into account. G-129, *Keeping Radiation Exposures and Doses "As Low As Reasonably Achievable (ALARA)"* [8] provides additional information. The *Radiation Protection Regulations* define risk for workers and the public through prescribed dose limits, and require doses to be monitored by direct measurement or by estimation of the quantities and concentrations of any nuclear substance released as a result of the licensed activity. The EMS framework should cover the assessment of releases and potential effects, the measures to control releases of nuclear substances and hazardous substances into the environment, and the measures taken to prevent or mitigate potential effects. The framework should be appropriate for the type of facility or activity and the licensing phase, and should be commensurate with overall regulatory requirements. In addition to the environmental protection measures described in detail earlier, the EMS should address environmental emergency preparedness.					
	<u>Section 4.9 Environmental protection</u> For reactor facilities, environmental protection includes requirements in addition to REGDOC-	Not applicable – Clause in REGDOC 1.1.1 is referencing requirements for site preparation phase, which will be implemented as part of DNNP's transition to the OPGN Management System. The				Not applicable	Not applicable

Document Number/Name	Location and Text Referenced in REGDOC 1.1.1	Applicable Clause(s) in the Code or Standard	Requirement	Recommended	Option	Assessment	Compliance
	2.9.1, *Environmental Principles, Assessments and Protection Measures*, Version 1.1	focus of this review is to determine conformance of previous site evaluation work.					
	Section 4.9.1 General considerations for environmental protection All applications for new reactor facilities shall include an environmental risk assessment (ERA). For more information, see REGDOC-2.9.1, *Environmental Protection: Environmental Principles, Assessments and Protection Measures*, Version 1.1. As described in REGDOC-2.9.1 and as applicable to site preparation activities, the applicant shall describe the proposed: • effluent and emissions control and monitoring measures • environmental monitoring measures • groundwater protection and monitoring measures • environmental management system	Not applicable – The CNSC has indicated that an ERA is not required for the DNNP PRSL renewal [May 1, 2019, meeting minutes, NK054-CORR-00531-10499.				Not applicable	Not applicable
	Appendix A: Licence Application Guide: Licence to Prepare Site, Section A.1 General considerations The applicant may submit a complete application or a partial application. For a partial application, the applicant should include the following information: • applicant's general information and general project information (sections A.3 through A.5) • a schedule for submission of the remaining material • the intended approach for the conduct of the EA and licensing process (that is, parallel or sequential approach); see REGDOC 2.9.1, *Environmental Protection: Environmental Principles, Assessment and Protection Measures*, Version 1.1	Not applicable – Clause in REGDOC 1.1.1 is referencing the CNSC's EA and licensing process should the intent be to submit a partial application. This is not applicable to the PRSL renewal.				Not applicable	Not applicable
CSA N288.1 Guidelines for Calculating Derived Release Limits for Radioactive Material in Airborne and Liquid Effluents for Normal Operation of Nuclear Facilities	Section 4.9 Environmental Protection Applicants for a licence to prepare site must also: • describe the protection measures for accidents and malfunctions that may occur during site preparation • fully demonstrate that they meet the requirements of: o CAN/CSA-ISO14001, *Environmental management systems – Requirements with guidance for use* (2004 edition or successor editions)	Not applicable – Clause in REGDOC 1.1.1 is referencing requirements for site preparation phase, which will be implemented as part of DNNP's transition to the OPGN Management System. The focus of this review is to determine conformance of previous site evaluation work. Also, it is expected that N288.1 will not be applicable during site preparation, because nuclear substances requiring authorization will not be released in this phase.				Not applicable	Not applicable

Document Number/Name	Location and Text Referenced in REGDOC 1.1.1	Applicable Clause(s) in the Code or Standard	Requirement	Recommended	Option	Assessment	Compliance
	o CSA N288.1, *Guidelines for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities* o CSA N288.4, *Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills* o CSA N288.5, *Effluent monitoring programs at Class I nuclear facilities and uranium mines and mills* o CSA N288.6, *Environmental risk assessments at class I nuclear facilities and uranium mines and mills* o CSA N288.7, *Groundwater protection programs at Class I nuclear facilities and uranium mines and mills* o CSA N288.8, *Establishing and implementing action levels for releases to the environment from nuclear facilities*						
	Section 4.9.1 General considerations for environmental protection **Guidance** For site preparation, environmental monitoring consists of defining baseline characteristics and monitoring the effects of site preparation activities on the environment. As applicable to site preparation activities, the environmental protection measures should also address: • CSA N288.1, *Guidelines for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities* • CSA N288.2, *Guidelines for calculating the radiological consequences to the public of a release of airborne radioactive material for nuclear reactor accidents* • CSA N288.6, *Environmental risk assessments at class I nuclear facilities and uranium mines and mills* • CNSC, G228, *Developing and Using Action Levels* • IAEA Safety Guide No.WSG2.3, *Regulatory Control of Radioactive Discharges to the Environment*	Not applicable – Clause in REGDOC 1.1.1 is referencing requirements for site preparation phase, which will be implemented as part of DNNP's transition to the OPGN Management System. The focus of this review is to determine conformance of previous site evaluation work. Also, it is expected that N288.1 will not be applicable during site preparation, because nuclear substances requiring authorization will not be released in this phase. Programs for soil and groundwater management will be in place, supported by monitoring, to confirm that this is the case.				Not applicable	Not applicable

Document Number/Name	Location and Text Referenced in REGDOC 1.1.1	Applicable Clause(s) in the Code or Standard	Requirement	Recommended	Option	Assessment	Compliance
	<u>Appendix G: Effects of the Project on the Environment, Section G.7.1 Radiological Risks</u> **Guidance** Documentation should identify radiation doses received by persons on and offsite at similar existing facilities (when they exist) that use the best available technology economically achievable (BATEA). This benchmarking exercise should be used to develop a licensing basis that achieves similar or lower doses. These estimates may be based on modelling of prospective radionuclide exposure (both external exposure and, internal exposure via intakes of radionuclides) to the identified human receptors using methods and/or dose coefficient acceptable to the CNSC, for example, as described in: • CSA N288.1, *Guidelines for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities* • ICRP68, *Dose Coefficients for Intakes of Radionuclides by Workers* • ICRP72, *Age-dependent Doses to the Members of the Public from Intake of Radionuclides– Part5, Compilation of Ingestion and Inhalation Coefficients* • U.S. EPA, Federal Guidance Report No.12: *External Exposure to Radionuclides in Air, Water, and Soil*	General guidance to conduct radiation dose calculations to human receptors according to CSA N288.1-14.		X		Clause 0.4 in CSA N288.1-14 outlines the changes made in the 2014 edition from the 2008 edition which include: (a) updated energy expenditures and dietary intake rates for humans; (b) updated half-lives, gamma energies, and photon yields for all radionuclides; (c) updated values for many parameters based largely on a new International Atomic Energy Agency handbook of parameter values for environmental transfers of radionuclides (IAEA, 2010); (d) improved direction on when the Guideline can be used to calculate derived release limits (DRLs) for intermittent releases; (e) updated wind direction and precipitation data for use in the wet deposition model; (f) introduction of a model for wild waterfowl as an additional source of human exposure through ingestion; (g) extension of the carbon-14 (C-14) specific activity model to cover plant to animal transfer; (h) an improved specific activity model for tritium in animals, including an update and extension of the water intake source fractions for fresh and dry feed; and (i) provision of equations for explicit accounting of decay and progeny ingrowth in all physical media, as an alternative to the use of progeny-inclusive dose coefficients. The dose to members of the public from the NND project followed the methodology outlined in CSA N288.1-08. Overall, the differences in the two editions relate to updated literature published after the NND EA documents were prepared. The differences are minor and do not alter the conclusions with respect to protection of human receptors.	Compliant
CSA N288.4 Environmental Monitoring Programs at Class I Nuclear Facilities and Uranium mines and Mills	<u>Section 3.4 Gathering Baseline Data</u> **Guidance** …As described in CSA N288.4, *Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills*, the proposed operational monitoring program may require additional intensive baseline sampling for monitoring elements where a specific level, effect, or change in the environment is detected.	<u>Clause 5.2 Criteria for determining the need to establish an EMP</u> (N288.4) 5.2.1 The operator of a nuclear facility shall measure the concentration, intensity, or other appropriate characteristics of a contaminant, physical stressor, or an effect on the environment if (a) environmental monitoring of that contaminant, physical stressor, or effect is required by any statute, regulation, licence, or permit that governs the operation of the nuclear facility, or as otherwise directed by a regulator; or (b) based on the results of the ERA (and considering the associated uncertainty), there is a reasonable likelihood that the concentration of a contaminant or the intensity of a physical stressor could exceed the appropriate BV.	X			The baseline characterization program to support the NND EA was designed and implemented according to a systematic process. In addition, Section 2.1.5 in NK054-REP-07730-00022-R000 "Ecological Risk Assessment and Assessment of Effects on Non-Human Biota Technical Support Document New Nuclear – Darlington Environmental Assessment" assessed existing information and conclusions in previous ERAs to inform the baseline characterization program for the NND EA. Based on the results of previous studies and assessments some gaps were identified in the radiological and conventional (non-radiological) exposure information available. These included levels of radionuclides and non-radionuclides in soil, groundwater,	Compliant

Document Number/Name	Location and Text Referenced in REGDOC 1.1.1	Applicable Clause(s) in the Code or Standard	Requirement	Recommended	Option	Assessment	Compliance
		Clause 5.3 Criteria for determining the need to revise an EMP (N288.4) 5.3.4 The design of the EMP shall be revised following the principles described in this Standard where the review specified in Clause 5.3.3 indicates that (a) the EMP objectives have not been adequately met; (b) there is a change in the environmental risks; or (c) there is a change in any requirement to measure the (i) concentration, intensity, or other appropriate characteristic of a contaminant or physical stressor; or (ii) effects on receptors in the environment.				sediment, surface water, and air. Other gaps were identified related to available information for species to support development of food webs, specifically for terrestrial vegetation and insects. These modifications or additions were incorporated into the baseline characterization program for the NND EA as part of the Aquatic and Terrestrial work packages. As a result of the entire NND EA process, follow-up monitoring was recommended to verify the EA predictions and effectiveness of the identified mitigation measures. OPG has prepared the "Darlington New Nuclear Project Commitments Report" to document the key commitments as a set of deliverables along with timelines for completion. One of the commitments is Environmental Monitoring and Environmental Assessment (EA) Follow-up (DNNP Commitment D-P-12). OPG reports to the CNSC and other agencies on the status of the commitments.	
		Clause 7.2 Contaminants and physical stressors to be monitored (N288.4) 7.2.2 Any facility-related contaminant/physical stressor identified in the ERA or by any relevant study as having potential to produce effects in the receiving environment should be addressed in the design of the EMP (see Clause 5.2). The contaminant/physical stressor measurements in the EMP should be made in a manner that is relevant to measures of exposure that are utilized in the ERA. Any exposure assessments made within EMP reports should be consistent with ERA methodology.		X		The baseline characterization program to support the NND EA was designed and implemented according to a systematic process. The 2nd step in that process included identification of contaminants to be monitored: **"Step 2 – Determine environmental parameters that are useful as indicators of environmental change and effect** - a determination of the features of the environment that are relevant to the environmental component as indicators for the assessment of potential effects of the project." In addition, Section 2.1.5 in NK054-REP-07730-00022-R000 "Ecological Risk Assessment and Assessment of Effects on Non-Human Biota Technical Support Document New Nuclear – Darlington Environmental Assessment" assessed existing information and conclusions in previous ERAs to inform the baseline characterization program for the NND EA. Based on the results of previous studies and assessments some gaps were identified in the radiological and conventional (non-radiological) exposure information available. These included levels of radionuclides and non-radionuclides in soil, groundwater, sediment, surface water, and air. This was incorporated into the baseline characterization program for the NND EA as part of the Aquatic and Terrestrial work packages.	Compliant
		Clause 7.5 Media to be measured or sampled (N288.4) 7.5.1 The environmental media to be measured or sampled in the EMP include the media for which contaminants/physical stressors of concern were identified in the ERA (Clause 7.2.1). Monitoring intended to independently check on the effectiveness of containment, or to check on effluent controls, should involve the media to which contaminants of concern are potentially or actually discharged.		X		The baseline characterization program to support the NND EA was designed and implemented according to a systematic process. In addition, Section 2.1.5 in NK054-REP-07730-00022-R000 "Ecological Risk Assessment and Assessment of Effects on Non-Human Biota Technical Support Document New Nuclear – Darlington Environmental Assessment" assessed existing	Compliant

Document Number/Name	Location and Text Referenced in REGDOC 1.1.1	Applicable Clause(s) in the Code or Standard	Requirement	Recommended	Option	Assessment	Compliance
		7.5.2 Any environmental media in which benchmark concentrations have been exceeded or are predicted to be exceeded should be considered for inclusion in the EMP for measurement of those same contaminants/physical stressors.				information and conclusions in previous ERAs to inform the baseline characterization program for the NND EA. Based on the results of previous studies and assessments some gaps were identified in the radiological and conventional (non-radiological) exposure information available. These included levels of radionuclides and non-radionuclides in soil, groundwater, sediment, surface water, and air. This was incorporated into the baseline characterization program for the NND EA as part of the Aquatic and Terrestrial work packages.	
		Clause 7.6 Monitoring locations (N288.4) 7.6.1 The locations to be monitored in the EMP should represent the area(s) in which contaminants/physical stressors of concern or potential effects were identified in the ERA (Clause 7.2.1). Within a large area of concern, sub-areas may be defined for monitoring and assessment purposes (see Clause 7.6.4). General advice on selecting monitoring areas and sampling locations within areas is provided in Clauses 7.6.2 to 7.6.11, and in Clause 9.2 on statistical analysis. 7.6.2 Any environmental areas in which benchmark concentrations have been exceeded or are predicted to be exceeded should be included in the EMP for measurement of those same contaminants/physical stressors. These selected areas shall represent areas where a potential for facility-related effects is considered to exist, with minimal confounding factors, based on consideration of recent ERA results. Within these areas, habitat conditions and the presence of receptors and life stages should be considered in selecting sampling locations. Measurements should be made in areas where potentially affected organisms are likely to be present. 7.6.3 In addition to the areas mentioned in Clause 7.6.2, areas with similar environmental conditions but without potential for facility-related effects should be included in the EMP as reference areas. Multiple reference areas might be needed, particularly when a potential for effects has been identified in several areas with quite different environmental conditions. **Note:** *Data from reference areas are used for comparison to data from contaminant/physical stressor exposed areas, in order to understand where exposure levels have increased or where effects are discernable relative to natural environmental changes.*	X	X		Rationale for the selection of monitoring locations is provided in the respective NND EA TSDs for each of the environmental components. • Surface Water Environment (NK054-REP-07730-00002), • Geology and Hydrogeology Environment (NK054-REP-07730-00005), • Atmospheric Environment (NK054-REP-07730-00011), • Aquatic Environment (NK054-REP-07730-00003) and • Terrestrial Environment (NK054-REP-07730-00004) TSDs	Compliant
	Section 4.9 Environmental Protection Applicants for a licence to prepare site must also: • describe the protection measures for accidents and malfunctions that may occur during site preparation • fully demonstrate that they meet the requirements of: o CAN/CSA-ISO14001, *Environmental management systems –*	Not applicable –. Clause in REGDOC 1.1.1 is referencing requirements for site preparation phase, which will be implemented as part of DNNP's transition to the OPGN Management System. The focus of this review is to determine conformance of previous site evaluation work. It is expected that N288.4 will be applicable during site preparation (see Clause 1.1.3) because monitoring will be needed to ensure environmental protection. N288.4 contains no guidance that is specific to site preparation; however, the general requirements for program design based on objectives (systematic planning				Not applicable	Not applicable

Document Number/Name	Location and Text Referenced in REGDOC 1.1.1	Applicable Clause(s) in the Code or Standard	Requirement	Recommended	Option	Assessment	Compliance
	Requirements with guidance for use (2004 edition or successor editions) o CSA N288.1, *Guidelines for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities* o CSA N288.4, *Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills* o CSA N288.5, *Effluent monitoring programs at Class I nuclear facilities and uranium mines and mills* o CSA N288.6, *Environmental risk assessments at class I nuclear facilities and uranium mines and mills* o CSA N288.7, *Groundwater protection programs at Class I nuclear facilities and uranium mines and mills* o CSA N288.8, *Establishing and implementing action levels for releases to the environment from nuclear facilities*	process) are considered to be applicable. Monitoring will be designed to address the issues of human exposure and wildlife disturbance that are normally encountered during site preparation.					
	Appendix B: Site Evaluation Program and Processes, Section B.3 Process for gathering baseline data **Guidance** The applicant should document the process for reviewing the credibility and quality of data collection and the analysis methods used by consulting companies. Limitations and data gaps in the quality and completeness of baseline information should be identified and addressed. Specific attention should be paid to the adequacy of baseline data collection for those elements of the environment to be carried forward into future licensing phases with the objective of monitoring for a specified level of change in some environmental parameter or analyte. This process requires specific statistical study design considerations as outlined in CSA N288.4, *Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills…* For more information on field sampling baseline, see: • CSA N288.4, *Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills*	Clause 6.2 Systematic planning process for the development of an EMP (N288.4) 6.2.1 The EMP shall be developed using a systematic, informed planning process. Notes: (1) One such process is the data quality objectives (DQO) process outlined in Clause 6.2.2, which uses a series of logical steps that assist the designer of an EMP in creating a resource-efficient program that will provide the required environmental data. The DQO process consists of six iterative steps that are documented in Figure 3. While the interaction of these steps is portrayed in Figure 3 and described in the following clauses in a sequential fashion, the iterative nature of the DQO process allows one or more of these steps to be revisited as more information on the problem is obtained. (2) Additional guidance on the DQO process can be found in U.S. EPA QA/G-4. …6.2.2.4 The designer shall determine how the data collected will be used to achieve the defined objectives, including consideration of (a) specific questions to be resolved (hypotheses to be tested) and planned statistical analyses of the data (e.g., trend analysis, gradient analysis) (see Clause 9.2); (b) the metrics to be used for decision-making purposes (e.g., to determine the occurrence or severity of an effect); and	X			The baseline characterization to support the NND EA was designed and implemented prior to N288.4 being published. However, the baseline characterization program was performed according to a systematic process. The data quality objectives (DQO) process was followed as outlined below: • Step 1 – Define the project and its interactions with the environment • Step 2 – Determine environment parameters that are useful as indicators of environmental change and effect • Step 3 – Estimate possible extent and magnitude of environmental effects • Step 4 – Establish baseline information quality objectives • Step 5 – Review existing information and identify data gaps • Step 6 – Design baseline characterization program • Step 7 – Review and reiterate This same process was applied to the Surface Water Environment (NK054-REP-07730-00002), Geology and Hydrogeology Environment (NK054-REP-07730-00005),	Compliant

Document Number/Name	Location and Text Referenced in REGDOC 1.1.1	Applicable Clause(s) in the Code or Standard	Requirement	Recommended	Option	Assessment	Compliance
	• EPA *Guidance on Choosing a Sampling Design for Environmental Data Collection for Use in Developing a Quality Assurance Project Plan*	(c) pertinent decision level (e.g., a compliance level or other environmental protection criteria).				Atmospheric Environment (NK054-REP-07730-00011), Aquatic Environment (NK054-REP-07730-00003) and Terrestrial Environment (NK054-REP-07730-00004) TSDs. Details on the quantitative aspects of the framework are documented in NK054-REP-07730-0313661 "Data Quality and Design of Baseline Characterization Program Framework" (SENES, 2007). While pre-dating N288.4, the sampling design followed EPA guidance (EPA-QA/G-5S) that is cited in N288.4.	
		Clause 7.6 Monitoring locations (N288.4) 7.6.1 The locations to be monitored in the EMP should represent the area(s) in which contaminants/physical stressors of concern or potential effects were identified in the ERA (Clause 7.2.1). Within a large area of concern, sub-areas may be defined for monitoring and assessment purposes (see Clause 7.6.4). General advice on selecting monitoring areas and sampling locations within areas is provided in Clauses 7.6.2 to 7.6.11, and in Clause 9.2 on statistical analysis. …7.6.5 The arrangement of monitoring areas, and the number and arrangement of sampling locations (stations) within monitoring areas, should be consistent with the design objectives, the specific questions to be resolved, and the associated statistical analyses that are planned. In general, increased sampling effort in relevant areas will reduce decision error. Additional guidance on statistical design and analysis is provided in Clause 9.2. **Note:** *This is especially important for spatially explicit assessments (Clause 9.2.6) where ability to detect patterns depends upon the survey scale, design, and configuration of survey locations (Peterson et al., 2006). In general, increased sampling effort in relevant areas will reduce decision error. A minimum sampled area should be determined, below which results might be misleading since they would be too small a fraction of the total study area to be representative.*		X		Rationale for the selection of monitoring locations is provided in the respective NND EA TSDs for each of the environmental components. • Surface Water Environment (NK054-REP-07730-00002), • Geology and Hydrogeology Environment (NK054-REP-07730-00005), • Atmospheric Environment (NK054-REP-07730-00011), • Aquatic Environment (NK054-REP-07730-00003) and • Terrestrial Environment (NK054-REP-07730-00004) TSDs	Compliant
		Clause 9.2 Statistical analysis (N288.4) 9.2.1 Statistical analysis of monitoring data is preferred, but not always required. However, statistical analysis need not always be elaborate. For example, environmental data collected for use in refining predictive model parameters or for supporting facility operations and maintenance likely do not require hypothesis testing, and might need little or no evaluation beyond a few descriptive statistics such as the central tendency (mean, median, or mode) and corresponding measures of variability. If statistical analysis is not required, it should be justified in the documentation of the EMP. **Note:** *Where detailed statistical analysis is required, EPA QA/G-9S provides guidance on statistical methods that can be used for data analysis or decision making. Environment Canada (2002, ch. 9) provides guidance on statistical methods specifically applicable to BEM.*		X		The statistical methods used to evaluate the baseline data are discussed in the respective NND EA TSDs for each of the environmental components. In some cases, summary statistics were not used, for example when data sets were too small. • Surface Water Environment (NK054-REP-07730-00002), • Geology and Hydrogeology Environment (NK054-REP-07730-00005), In most cases, the data was used in its entirety without the use of summary statistics due to a small number of measurements • Atmospheric Environment (NK054-REP-07730-00011),	Compliant

Document Number/Name	Location and Text Referenced in REGDOC 1.1.1	Applicable Clause(s) in the Code or Standard	Requirement	Recommended	Option	Assessment	Compliance
		9.2.2 Hypothesis testing can be used to address specific questions such as temporal trends or differences between areas. For example, sampling designs with two or more discrete monitoring areas, and stations within each area, lend themselves to analysis of variance (ANOVA) approaches to statistical evaluation. Alternatively, regression analysis might be more appropriate when data are collected from a more continuous arrangement of sampling stations along an environmental gradient (no discrete areas). 9.2.3 Data should be analyzed to identify temporal trends (e.g., positive or negative), spatial trends (e.g., gradient or patches), or both [e.g., before-after-control-impact (BACI) differences between exposure and reference sites through time]. Graphical analysis might be sufficient to detect any trends in the data; however, apparent trends should be confirmed with appropriate statistical methods, either classical or geostatistical. Environmental data collected over extended periods of time might also display seasonal variation which could mask any longer-term directional trends. For data showing strong seasonal variation, time series analysis might be required to identify any longer-term trends, and sampling frequency shall be sufficient to capture the seasonal pattern. For media that are expected to be relatively constant, quarterly sampling is usually adequate to represent variability. **Notes:** **(1)** *Time series analysis is a specialized area of statistics and users are advised to consult a qualified statistician before attempting to perform any time series analysis of environmental data.* **(2)** *See Ver Hoef (2002) for examples of statistical methods.*				• Aquatic Environment (NK054-REP-07730-00003) and • Terrestrial Environment (NK054-REP-07730-00004) TSDs The baseline monitoring programs were designed in consideration of subsequent data use for statistical purposes, such as hypothesis testing or achieving specified confidence intervals on summary statistics, as described in SENES (2007). While pre-dating N288.4, the sampling design followed EPA guidance (EPA-QA/G-5S) that is cited in N288.4.	
	<u>Appendix C: Baseline Data used to Evaluate Suitability Throughout the Lifecycle of the Facility, Section C.8 Baseline ambient radioactivity and ambient non-radioactive hazardous substances</u> **Guidance** …Ambient radioactivity baseline information should consider: • CSA N288.4, *Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills* • IAEA RS-G-1.8, *Environmental and Source Monitoring for Purposes of Radiation Protection* Ambient hazardous substances baseline information should consider: • CSA N288.4, *Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills* • federal guidelines; for example, the *Canadian Environmental Quality Guidelines*, specifically the *Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health*	<u>Clause 7.2 Contaminants and physical stressors to be monitored</u> (N288.4) 7.2.1 The contaminants/physical stressors to be monitored in the EMP should be those that caused one or more criteria for establishing an EMP to be met (Clause 5.2). The associated environmental media and areas where contaminant/physical stressor levels of concern were identified in the ERA should be noted, as a guide to selection of monitoring media and locations (Clauses 7.5 and 7.6). 7.2.2 Any facility-related contaminant/physical stressor identified in the ERA or by any relevant study as having potential to produce effects in the receiving environment should be addressed in the design of the EMP (see Clause 5.2). The contaminant/physical stressor measurements in the EMP should be made in a manner that is relevant to measures of exposure that are utilized in the ERA. Any exposure assessments made within EMP reports should be consistent with ERA methodology. 7.2.3 For contaminants, exposure may be represented by measured or predicted concentrations, or they may be doses based on these concentrations. Dose assessments are receptor-specific and are normally part of the ERA. The EMP should include contaminants		X		The baseline characterization program to support the NND EA was designed and implemented according to a systematic process. The 2nd step in that process included identification of contaminants to be monitored: **"Step 2 – Determine environmental parameters that are useful as indicators of environmental change and effect** - a determination of the features of the environment that are relevant to the environmental component as indicators for the assessment of potential effects of the project." In addition, Section 2.1.5 in NK054-REP-07730-00022-R000 "Ecological Risk Assessment and Assessment of Effects on Non-Human Biota Technical Support Document New Nuclear – Darlington Environmental Assessment" assessed existing information and conclusions in previous ERAs to inform the baseline characterization program for the NND EA. Based on the results of previous studies and assessments some gaps were identified in the radiological and conventional (non-radiological) exposure information available. These included levels of radionuclides and non-radionuclides in soil, groundwater, sediment, surface water, and air. This was incorporated into the baseline characterization	Compliant

Document Number/Name	Location and Text Referenced in REGDOC 1.1.1	Applicable Clause(s) in the Code or Standard	Requirement	Recommended	Option	Assessment	Compliance
	• provincial guidelines and standards; for example, *Operations Manual for Air Quality Monitoring in Ontario* • international and foreign guidelines and standards; for example, EPA QA/G-5S, *Guidance on Choosing a Sampling Design for Environmental Data Collection for Use in Developing a Quality Assurance Project Plan*	relevant to the dose assessment, measured in appropriate media (see Clause 7.5).				program for the NND EA as part of the Aquatic and Terrestrial work packages.	
	Appendix G: Effects of the Project on the Environment, Section G.3 Effects of the project on the terrestrial environment The applicant shall examine and document the effects of the proposed project on the terrestrial environment, including flora and fauna, including effects on wildlife corridors, protected areas, and other valued components (VCs). This assessment includes potential effects from project activities during site preparation, construction, operation, decommissioning and abandonment at the site, at both local and regional scales… **Guidance** For more information, see: • CCME, *A Framework for Ecological Risk Assessment: General Guidance* • CCME, *A Framework for Ecological Risk Assessment: Technical Appendices* • *A framework for ecological risk assessment at contaminated sites in Canada: review and recommendations* • *Priority Substances List Assessment Report. Releases of radionuclides from nuclear facilities (impact on non-human biota)* • where applicable, provincial guidelines and the following CSA Group standards: • N288.4, *Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills* • N288.6, *Environmental risk assessments at class I nuclear facilities and uranium mines and mills* • N288.5, *Effluent monitoring programs at Class I nuclear facilities and uranium mines and mills*	Clause 1.6 Dose assessment (N288.4) Although one of the objectives of an EMP may be to provide the data required to support radiation dose assessments or assessments of exposure to non-radioactive hazardous substances, this document does not address dose assessment methods for either human or non-human biota. **Note:** *Assessments of dose/exposure are normally part of the ERA and any subsequent assessments based on environmental monitoring data should be done the same way, using the same standards and guidance that were used in the ERA or their most recent updates. Monitoring to support dose assessment is further addressed in Clause 7.5.*			X	The reference to N288.4 in Section G.3 of REGDOC 1.1.1 is regarding assessment of potential effects on VCs. Clause 1.6 of N288.4 specifically states that dose assessment methods for human and non-human biota are outside of the scope of the standard. While dose assessment methods are excluded from the scope of N288.4, Clause 1.6 indicates that an EMP objective may be to provide data to support dose assessment. Section 3.1.3 in NK054-REP-07730-00022-R000 "Ecological Risk Assessment and Assessment of Effects on Non-Human Biota Technical Support Document New Nuclear – Darlington Environmental Assessment" states that "a baseline sampling program was developed to address the gaps identified in Section 2.1.5 and to provide sufficient information to carry out an ERA for the existing environment."	Compliant
		Clause 7.7.10 Biological effects monitoring (N288.4) If BEM of community and/or population response to habitat changes is indicated, the monitoring should include at least one and preferably several monitoring years prior to a planned habitat change. Subsequent monitoring should document community and/or population changes that occur in response to habitat alterations. Monitoring may be discontinued or reduced in frequency when the community/population in the disturbed habitat seems to have stabilized.		X		NK054-REP-07730-00014-R000 "Terrestrial Environment Assessment of Environmental Effects Technical Support Document New Nuclear – Darlington Environmental Assessment" identifies potential effects to vegetation communities and species, insects, bird communities and species, amphibians and reptiles, mammal communities and species due to habitat removal during project activities. Mitigation for these effects are identified in the TSD. It is assumed that monitoring will occur at that time as necessary.	Compliant
		Clause 9 Interpretation of data (N288.4) 9.1 General 9.1.1 The data analysis and interpretation requirements shall be determined and documented. This should include the examination of data from actual samples and QC samples for consistency. Additionally, the applicability of the statistical analysis methods that might be used for interpretation of the data should be determined. 9.1.2 The result of an environmental monitoring measurement for any contaminant, physical stressor, or effect shall be compared to the BV for that contaminant or physical stressor. Where the measured values are components of a calculated quantity for which there is a benchmark, the calculated value should be compared to the benchmark. Any required conversion factors shall be documented and reported.	X	X		While dose assessment methods are excluded from the scope of N288.4 (see above), Clause 9 provides some guidance on interpretation of data. The effects assessment in the NND EA for the terrestrial environment is documented in NK054-REP-07730-00014-R000 "Terrestrial Environment Assessment of Environmental Effects Technical Support Document New Nuclear – Darlington Environmental Assessment" and NK054-REP-07730-00022-R000 "Ecological Risk Assessment and Assessment of Effects on Non-Human Biota Technical Support Document New Nuclear – Darlington Environmental Assessment". These TSDs assessed the potential effects on the terrestrial	Compliant

Document Number/Name	Location and Text Referenced in REGDOC 1.1.1	Applicable Clause(s) in the Code or Standard	Requirement	Recommended	Option	Assessment	Compliance
		9.1.3 Data should be interpreted using the same BVs that were used in the ERA and following the same standards and guidance, or their most recent updates that were followed when performing the ERA. 9.1.4 Interpretation of the results of a measurement might require comparisons to data that were collected before the facility began operation (baseline) or in areas that are not impacted by the facility (reference). Baseline monitoring is outside the scope of this Standard but any reference data that might be required should be collected following the guidance given in this Standard. Consideration should be given to other regional contributors to the effects.				environment by comparison to BVs in a manner consistent with N288.4.	
	Appendix G: Effects of the Project on the Environment, Section G.5 Effects of the project on the aquatic environment **Guidance** …The applicant should evaluate information and data on the aquatic effects against credible criteria and objectives, to ensure that the information is sufficient to identify likely interactions between the project and its effects on the biological components of the aquatic environment. For more information on determining the appropriate aquatic effects criteria and objectives, see: • CCME, *A Framework for Ecological Risk Assessment: General Guidance* • CCME, *A Framework for Ecological Risk Assessment: Technical Appendices* • *A framework for ecological risk assessment at contaminated sites in Canada: review and recommendations* • *Priority Substances List Assessment Report. Releases of radionuclides from nuclear facilities (impact on non-human biota)* • where applicable, provincial guidelines and the following CSA Group standards: • N288.4, *Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills* • N288.6, *Environmental risk assessments at class I nuclear facilities and uranium mines and mills* • N288.5, *Effluent monitoring programs at Class I nuclear facilities and uranium mines and mills*	Clause 1.6 Dose assessment (N288.4) Although one of the objectives of an EMP may be to provide the data required to support radiation dose assessments or assessments of exposure to non-radioactive hazardous substances, this document does not address dose assessment methods for either human or non-human biota. **Note:** *Assessments of dose/exposure are normally part of the ERA and any subsequent assessments based on environmental monitoring data should be done the same way, using the same standards and guidance that were used in the ERA or their most recent updates. Monitoring to support dose assessment is further addressed in Clause 7.5.*			X	The reference to N288.4 in Section G.5 of REGDOC 1.1.1 is regarding assessment of potential effects on VCs. Clause 1.6 of N288.4 specifically states that dose assessment methods for human and non-human biota are outside of the scope of the standard. While dose assessment methods are excluded from the scope of N288.4, Clause 1.6 indicates that an EMP objective may be to provide data to support dose assessment. Section 3.1.3 in NK054-REP-07730-00022-R000 "Ecological Risk Assessment and Assessment of Effects on Non-Human Biota Technical Support Document New Nuclear – Darlington Environmental Assessment" states that "a baseline sampling program was developed to address the gaps identified in Section 2.1.5 and to provide sufficient information to carry out an ERA for the existing environment."	Compliant
		Clause 7.7.10 Biological effects monitoring (N288.4) If BEM of community and/or population response to habitat changes is indicated, the monitoring should include at least one and preferably several monitoring years prior to a planned habitat change. Subsequent monitoring should document community and/or population changes that occur in response to habitat alterations. Monitoring may be discontinued or reduced in frequency when the community/population in the disturbed habitat seems to have stabilized.		X		NK054-REP-07730-00013-R000 "Aquatic Environment Assessment of Environmental Effects Technical Support Document New Nuclear – Darlington Environmental Assessment" identifies potential effects to aquatic species due to project activities. For example, removal of shallow ponds and wetlands, and lake infill activities will result in potential effects to fish and benthic invertebrates. The EA looked at the likelihood of affecting species at the population level. Mitigation for these effects are identified in the TSD. It is assumed that monitoring will occur at that time as necessary.	Compliant
		Clause 9 Interpretation of data (N288.4) 9.1 General 9.1.1 The data analysis and interpretation requirements shall be determined and documented. This should include the examination of data from actual samples and QC samples for consistency. Additionally, the applicability of the statistical analysis methods that might be used for interpretation of the data should be determined. 9.1.2 The result of an environmental monitoring measurement for any contaminant, physical stressor, or effect shall be compared to the BV for that contaminant or physical stressor. Where the measured values are components of a calculated quantity for which there is a	X	X		While dose assessment methods are excluded from the scope of N288.4 (see above), Clause 9 provides some guidance on interpretation of data. The effects assessment in the NND EA for the aquatic environment is documented in NK054-REP-07730-00013-R000 "Aquatic Environment Assessment of Environmental Effects Technical Support Document New Nuclear – Darlington Environmental Assessment", NK054-REP-07730-00022-R000 "Ecological Risk Assessment and Assessment of Effects on Non-Human Biota Technical Support Document New Nuclear –	Compliant

Document Number/Name	Location and Text Referenced in REGDOC 1.1.1	Applicable Clause(s) in the Code or Standard	Requirement	Recommended	Option	Assessment	Compliance
		benchmark, the calculated value should be compared to the benchmark. Any required conversion factors shall be documented and reported. 9.1.3 Data should be interpreted using the same BVs that were used in the ERA and following the same standards and guidance, or their most recent updates that were followed when performing the ERA. 9.1.4 Interpretation of the results of a measurement might require comparisons to data that were collected before the facility began operation (baseline) or in areas that are not impacted by the facility (reference). Baseline monitoring is outside the scope of this Standard but any reference data that might be required should be collected following the guidance given in this Standard. Consideration should be given to other regional contributors to the effects.				Darlington Environmental Assessment", and NK054-REP-07730-00012-R000 "Surface Water Environment Assessment of Environmental Effects Technical Support Document New Nuclear – Darlington Environmental Assessment". These TSDs assessed the potential effects on the aquatic environment by comparison to BVs in a manner consistent with N288.4.	
CSA N288.5 Effluent Monitoring Programs at Class I Nuclear Facilities and Uranium Mines and Mills	<u>Section 4.9 Environmental Protection</u> Applicants for a licence to prepare site must also: • describe the protection measures for accidents and malfunctions that may occur during site preparation • fully demonstrate that they meet the requirements of: o CAN/CSA-ISO14001, *Environmental management systems – Requirements with guidance for use* (2004 edition or successor editions) o CSA N288.1, *Guidelines for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities* o CSA N288.4, *Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills* o CSA N288.5, *Effluent monitoring programs at Class I nuclear facilities and uranium mines and mills* o CSA N288.6, *Environmental risk assessments at class I nuclear facilities and uranium mines and mills* o CSA N288.7, *Groundwater protection programs at Class I nuclear facilities and uranium mines and mills* o CSA N288.8, *Establishing and implementing action levels for releases to the environment from nuclear facilities*	Not applicable – Clause in REGDOC 1.1.1 is referencing requirements for site preparation phase, which will be implemented as part of DNNP's transition to the OPGN Management System. The focus of this review is to determine conformance of previous site evaluation work. It is expected that N288.5 will be applicable during site preparation (see Clause 1.1.2) because effluent may arise from dewatering of excavations or stormwater collection. N288.5 contains no guidance that is specific to site preparation; however, the general requirements for program design based on objectives (systematic planning process) are considered to be applicable. Monitoring will address the suitability of any effluent for discharge.				Not applicable	Not applicable

Document Number/Name	Location and Text Referenced in REGDOC 1.1.1	Applicable Clause(s) in the Code or Standard	Requirement	Recommended	Option	Assessment	Compliance
	<u>Appendix G: Effects of the Project on the Environment, Section G.3 Effects of the project on the terrestrial environment</u> The applicant shall examine and document the effects of the proposed project on the terrestrial environment, including flora and fauna, including effects on wildlife corridors, protected areas, and other valued components (VCs). This assessment includes potential effects from project activities during site preparation, construction, operation, decommissioning and abandonment at the site, at both local and regional scales… **Guidance** For more information, see: • CCME, *A Framework for Ecological Risk Assessment: General Guidance* • CCME, *A Framework for Ecological Risk Assessment: Technical Appendices* • *A framework for ecological risk assessment at contaminated sites in Canada: review and recommendations* • *Priority Substances List Assessment Report. Releases of radionuclides from nuclear facilities (impact on non-human biota)* • where applicable, provincial guidelines and the following CSA Group standards: • N288.4, *Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills* • N288.6, *Environmental risk assessments at class I nuclear facilities and uranium mines and mills* • N288.5, *Effluent monitoring programs at Class I nuclear facilities and uranium mines and mills*	<u>Clause 1.8 Dose assessment</u> (N288.5) Although one of the objectives of an effluent monitoring program can be to provide the data required to support radiation dose assessments or assessments of exposure to non-radioactive hazardous substances, this Standard does not address dose assessment methods for either humans or non-human biota.			X	The reference to N288.5 in Section G.3 of REGDOC 1.1.1 is regarding assessment of potential effects on VCs. Clause 1.8 of N288.5 specifically states that dose assessment methods for human and non-human biota are outside of the scope of the standard. While dose assessment methods are excluded from the scope of N288.5, Clause 1.8 indicates that an effluent monitoring objective may be to provide data to support dose assessment. The ecological risk assessment for the NND EA did not use effluent data in the assessment; however, radiation doses to humans were calculated generally using measured concentrations of radionuclides in environmental media, supplemented with atmospheric and waterborne emissions when environmental data are lacking (NK054-REP-07730-00008-R000 “Radiation and Radioactivity Existing Environmental Conditions Technical Support Document New Nuclear – Darlington Environmental Assessment”).	Compliant
	<u>Appendix G: Effects of the Project on the Environment, Section G.5 Effects of the project on the aquatic environment</u> **Guidance** …The applicant should evaluate information and data on the aquatic effects against credible criteria and objectives, to ensure that the information is sufficient to identify likely interactions between the project and its effects on the biological components of the aquatic environment. For more information on determining the appropriate aquatic effects criteria and objectives, see:	<u>Clause 1.8 Dose assessment</u> (N288.5) Although one of the objectives of an effluent monitoring program can be to provide the data required to support radiation dose assessments or assessments of exposure to non-radioactive hazardous substances, this Standard does not address dose assessment methods for either humans or non-human biota.			X	The reference to N288.5 in Section G.5 of REGDOC 1.1.1 is regarding assessment of potential effects on VCs. Clause 1.8 of N288.5 specifically states that dose assessment methods for human and non-human biota are outside of the scope of the standard. While dose assessment methods are excluded from the scope of N288.5, Clause 1.8 indicates that an effluent monitoring objective may be to provide data to support dose assessment. The ecological risk assessment for the NND EA did not use effluent data in the assessment; however, radiation doses to humans were calculated generally using measured concentrations of radionuclides in environmental media, supplemented	Compliant

Document Number/Name	Location and Text Referenced in REGDOC 1.1.1	Applicable Clause(s) in the Code or Standard	Requirement	Recommended	Option	Assessment	Compliance
	• CCME, *A Framework for Ecological Risk Assessment: General Guidance* • CCME, *A Framework for Ecological Risk Assessment: Technical Appendices* • *A framework for ecological risk assessment at contaminated sites in Canada: review and recommendations* • *Priority Substances List Assessment Report. Releases of radionuclides from nuclear facilities (impact on non-human biota)* • where applicable, provincial guidelines and the following CSA Group standards: • N288.4, *Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills* • N288.6, *Environmental risk assessments at class I nuclear facilities and uranium mines and mills* • N288.5, *Effluent monitoring programs at Class I nuclear facilities and uranium mines and mills*					with atmospheric and waterborne emissions when environmental data are lacking (NK054-REP-07730-00008-R000 "Radiation and Radioactivity Existing Environmental Conditions Technical Support Document New Nuclear – Darlington Environmental Assessment").	
CSA N288.6 Environmental Risk Assessment at Class I Nuclear Facilities and Uranium Mines and Mills	Section 3.1 Role of site evaluation in the CNSC regulatory process In accordance with CSA N288.6, Environmental risk assessments at class I nuclear facilities and uranium mines and mills, the site evaluation is periodically re-evaluated. The re-evaluation focuses on confirmation of the site characteristics (in particular, external events) and assessing the effects of the updated information. Design modifications, updates to operations, or both may be needed.	Clause 5.3 Risk Assessment Updates (N288.6) 5.3.1 A nuclear facility shall review its ERA to verify its applicability and shall update it, as necessary, consistent with the overall iterative process for ERA. Facility ERA updates should be performed on a five-year cycle, or more frequently if major facility changes are proposed that would trigger a predictive assessment. See Clause 11 for guidance on the scope of the periodic review process. **Note:** This timeline is consistent with the ERA review cycle recommended by CSA N288.4.	X	X		In 2016, Darlington NND EA documents, technical supporting documents, and other relevant OPG documents and monitoring data were reviewed according to Clause 5.3 of N288.6. The periodic review is documented in Section 1.3 of NK38-REP-07701-00001-R000 "Darlington Nuclear Environmental Risk Assessment". The periodic review presents the changes in the site since the last ERA. OPG document NK38-REP-07701-00001-R000 "Darlington Nuclear Environmental Risk Assessment" is the most recent ERA for the site and was conducted in 2016 in accordance with N288.6. There is no mention of site evaluation in N288.6.	Compliant
		5.3.2 The purpose of a periodic review of an ERA is to identify and assess any risks that might have emerged or changed since the last ERA review. This review can indicate that the potential for risks is substantively the same and therefore that the ERA does not require changes. Conversely, the review might identify changes (e.g., site conditions or benchmarks) that could lead to reduced or increased risk. In either case, the review process and findings shall be thoroughly documented.	X			In 2016, Darlington NND EA documents, technical supporting documents, and other relevant OPG documents and monitoring data were reviewed according to Clause 5.3 of N288.6. The periodic review is documented in Section 1.3 of NK38-REP-07701-00001-R000 "Darlington Nuclear Environmental Risk Assessment". The periodic review presents the changes in the site since the last ERA. OPG document NK38-REP-07701-00001-R000 "Darlington Nuclear Environmental Risk Assessment" is the most recent ERA for the site and was conducted in 2016 in accordance with N288.6. There is no mention of site evaluation in N288.6.	Compliant

Document Number/Name	Location and Text Referenced in REGDOC 1.1.1	Applicable Clause(s) in the Code or Standard	Requirement	Recommended	Option	Assessment	Compliance
		Clause 11 Periodic Review of the ERA (N288.6) 11.1 A nuclear facility shall review its ERA to verify its applicability, and shall update it as necessary, consistent with the overall iterative process for ERAs. Facility ERAs should be reviewed on a five-year cycle or more frequently if major facility changes are proposed that would trigger a predictive assessment (see Figure5.1). Prior to each update, the most recent ERA should be reviewed to identify (a) changes that have occurred in site ecology or surrounding land use; (b) changes to the physical facility or facility processes that have the potential to change the nature of facility effluent(s) and the resulting risks to receptors; (c) new environmental monitoring data collected since the last ERA update; (d) new or previously unrecognized environmental issues that have been revealed by the EMP; (e) scientific advances that require a change to ERA approaches or parameters; and (f) changes in regulatory requirements pertinent to the ERA. The purpose of the periodic review of the ERA is to identify and assess any risks that might have emerged since the last ERA review. This review can indicate that the potential for risks is substantively the same and therefore that the ERA does not require changes. Conversely, the review can identify new risks or highlight changes in the risk assessment variables that need to be updated to reflect the new risk profile. In either case, the review process and findings shall be thoroughly documented. A full or partial update of the ERA may be completed, as needed, to reflect important changes since the last ERA review. **Notes:** **(1)** The review will constitute an update of the problem formulation, considering the new monitoring data and any of the other changes listed in this Clause. The significance of changes should be judged based on their potential to alter the conclusions of the ERA. For example, new contaminants or physical stressors of potential concern, new areas of concern, or new receptors would warrant new assessment of those issues in a partial update of the ERA. If there are many such new issues a full update of the ERA would be appropriate. **(2)** The cycle of periodic reviews can stop when there are no longer risk issues to be addressed. This will normally occur after operations have ceased and when the site has been decommissioned.	X	X		In 2016, Darlington NND EA documents, technical supporting documents, and other relevant OPG documents and monitoring data were reviewed according to Clause 5.3 of N288.6. The periodic review is documented in Section 1.3 of NK38-REP-07701-00001-R000 "Darlington Nuclear Environmental Risk Assessment". The periodic review presents the changes in the site since the last ERA. OPG document NK38-REP-07701-00001-R000 "Darlington Nuclear Environmental Risk Assessment" is the most recent ERA for the site and was conducted in 2016 in accordance with N288.6. There is no mention of site evaluation in N288.6.	Compliant
	Section 3.4 Gathering Baseline Data **Guidance** Where possible, baseline data should take into account archeological, paleontological, and prehistoric data (including the oral history of Indigenous peoples), as well as historic and instrumentally recorded sources.	Clause 7.2.3 Receptor selection and characterization (N288.6) 7.2.3.5 Additional criteria can come into play to help focus the selection of receptors. Criteria that should be considered during receptor selection are described in Table 7.1. The selection of each receptor should be justified by listing the criteria from Table 7.1 that it meets.		X		It is understood that the reference to N288.6 in Section 3.4 of REGDOC 1.1.1 relates to the recommendation to include provincially or federally listed wildlife species as VCs. This relates to the "ecological significance" criterion in Table 7.1 of N288.6 under receptor selection and characterization. N288.6 does not require that all provincially or federally listed wildlife species present on-	Compliant

Document Number/Name	Location and Text Referenced in REGDOC 1.1.1	Applicable Clause(s) in the Code or Standard	Requirement	Recommended	Option	Assessment	Compliance
	Baseline data should be of sufficient sample size and duration to obtain a basic understanding of within-year and between-year variation. For more information on specific baseline environmental components, see appendix B. As described in CSA N288.4, *Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills*, the proposed operational monitoring program may require additional intensive baseline sampling for monitoring elements where a specific level, effect, or change in the environment is detected. All provincially or federally listed wildlife species occurring or reasonably expected to occur, within the spatial boundaries should be identified as VCs. For more information, see: • CSA N288.6, *Environmental risk assessments at class I nuclear facilities and uranium mines and mills* (note that CSA N288.6-12 refers to VCs as receptors)	Table 7.1 criteria: 1. **Represents a major plant or animal group**. A receptor from each of the following groups should be represented in the assessment if possible: a) aquatic and terrestrial plant species; b) small and large mammals; c) bird species with terrestrial and aquatic habitats; d) soil and benthic invertebrates; e) amphibians or reptiles; f) zooplankton; and g) fish. This allows a range of ecological receptors to be represented that collectively reflects the main ecological exposure pathways, feeding habits, and habitats at or on the site. 2. **Receptor of interest to facility**. The candidate receptor can be of interest to the facility because of its use in previous monitoring studies (e.g., whitefish) or of concern for other reasons (e.g., white-tailed deer can be of interest because their high numbers have impacts on site revegetation efforts, and because they are involved in numerous vehicle collisions). 3. **Identified by a stakeholder**. This criterion encourages selection of receptors that are of interest to stakeholders. Identified receptors can be represented by ecologically similar species in order to facilitate assessment. 4. **Potential to conduct a population effects study**. This criterion relies on a sensitive yet sufficiently robust population available to undertake a reliable survey. A reliable population survey needs to be able to distinguish facility-related effects from natural fluctuations and from the effects of other confounding factors. 5. **Potential for detectable exposure to a contaminant or physical stressor**. The receptor is potentially exposed to a contaminant or physical stressor of potential concern and the exposure can likely be quantified by measurement (e.g., a contaminant likely to accumulate in tissues to a detectable level). 6. **Potential for significant exposure to a contaminant or physical stressor**. The receptor is potentially exposed to a contaminant or physical stressor of potential concern and the exposure is potentially significant (e.g., approaching levels of concern). Organisms in their early life stages can be more likely than adults to receive significant exposure if their critical habitat is present in the exposure area. 7. **Receptor has ecological significance**. A receptor with a well-defined and understood importance to ecosystem structure, process, or function would meet this criterion. A species of conservation status (e.g., a vulnerable,				site be identified as VCs in the assessment, rather it is an item to consider when selecting VCs. Ecological receptor selection is outlined in Appendix C of NK054-REP-07730-00022-R000 "Ecological Risk Assessment and Assessment of Effects on Non-Human Biota Technical Support Document New Nuclear – Darlington Environmental Assessment". The Ecological significance of receptors is discussed in the "Additional Comments/Notes from TSD" column in Tables C-2 and C-3 of the EcoRA TSD. The considerations discussed align with N288.6.	

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		threatened, or endangered species) would also be ecologically significant. 8. **Receptor has socio-economic significance**. The receptor does or does not play a large ecological role but has important intrinsic or economic value to humans. 9. **Scientific literature, a database, or other information exists on populations and stressor levels at the facility or in a reference area.**					
		<u>Clause 7.2.4 Assessment and measurement endpoints</u> (N288.6) 7.2.4.3 Vulnerable, threatened, or endangered (VTE) species should be assessed at the individual and not at the population level, as effects on a few individuals would not be acceptable. Species that should be assessed at the individual level are those listed in the Government of Canada's Species at Risk Act or its regulations or in corresponding provincial/territorial statutes and regulations.		X		Species at risk are identified in Section 4.1.2.2 of NK054-REP-07730-00022-R000 "Ecological Risk Assessment and Assessment of Effects on Non-Human Biota Technical Support Document New Nuclear – Darlington Environmental Assessment". Species at risk were assessed at the individual level, to the extent possible based on available TRVs, using surrogate species as appropriate In 2016, an updated ERA was prepared for DN and is documented in NK38-REP-07701-00001-R000 "Darlington Nuclear Environmental Risk Assessment". Section 4.4.2 "Discussion of Chemical and Radiation Effects" in the ERA states that the assessment endpoint for species at risk was protection of the individual.	Compliant

	<u>Section 4.9 Environmental protection</u>
	Applicants for a licence to prepare site must also:
	• describe the protection measures for accidents and malfunctions that may occur during site preparation
	• fully demonstrate that they meet the requirements of:
	  o CAN/CSA-ISO14001, *Environmental management systems – Requirements with guidance for use* (2004 edition or successor editions)
	  o CSA N288.1, *Guidelines for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities*
	  o CSA N288.4, *Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills*
	  o CSA N288.5, *Effluent monitoring programs at Class I nuclear facilities and uranium mines and mills*
		Not applicable – The CNSC has indicated that an ERA is not required for the DNNP PRSL renewal [May 1, 2019, meeting minutes, NK054-CORR-00531-10499. Therefore, CSA N288.6 is not applicable for the PRSL renewal application. In compliance with REGDOC 3.1.1, DN routinely updates its site wide ERA in accordance with CSA N288.6.				Not applicable	Not applicable

Document Number/Name	Location and Text Referenced in REGDOC 1.1.1	Applicable Clause(s) in the Code or Standard	Requirement	Recommended	Option	Assessment	Compliance
	o CSA N288.6, *Environmental risk assessments at class I nuclear facilities and uranium mines and mills* o CSA N288.7, *Groundwater protection programs at Class I nuclear facilities and uranium mines and mills* o CSA N288.8, *Establishing and implementing action levels for releases to the environment from nuclear facilities*						
	Section 4.9.1 General considerations for environmental protection **Guidance** For site preparation, environmental monitoring consists of defining baseline characteristics and monitoring the effects of site preparation activities on the environment. As applicable to site preparation activities, the environmental protection measures should also address: • CSA N288.1, *Guidelines for calculating derived release limits for radioactive material in airborne and liquid effluents for normal operation of nuclear facilities* • CSA N288.2, *Guidelines for calculating the radiological consequences to the public of a release of airborne radioactive material for nuclear reactor accidents* • CSA N288.6, *Environmental risk assessments at class I nuclear facilities and uranium mines and mills* • CNSC, G228, *Developing and Using Action Levels* • IAEA Safety Guide No.WSG2.3, *Regulatory Control of Radioactive Discharges to the Environment*	Not applicable – The CNSC has indicated that an ERA is not required for the DNNP PRSL renewal [May 1, 2019, meeting minutes, NK054-CORR-00531-10499. Therefore, CSA N288.6 is not applicable for the PRSL renewal application. In compliance with REGDOC 3.1.1, DN routinely updates its site wide ERA in accordance with CSA N288.6.				Not applicable	Not applicable
	Appendix B: Site Evaluation Program and Processes, Section B.1 General considerations **Guidance** The site evaluation process should satisfy the criteria contained in the following documents that apply to the facility being considered: • applicable federal environmental legislation • either: • REGDOC-2.5.2, *Design of Reactor Facilities: Nuclear Power Plants* or	Requirement is to generally comply with the standards listed, as they apply to the facility. No specific requirements from CSA N288.6 are listed. N288.6 does not mention site evaluation.				A gap analysis was conducted in 2016 of the Darlington NND EA documents against N288.6. Note that N288.6 was not yet published when the NND EA documents were prepared. A number of gaps were identified which were categorized into six overall main findings including: • No combined human health risk assessment (HHRA) and ecological risk assessment (EcoRA) report • Limited discussion on quality assurance and quality control • Some N288.6 requirements were lacking in the Problem Formulation	Compliant

Document Number/Name	Location and Text Referenced in REGDOC 1.1.1	Applicable Clause(s) in the Code or Standard	Requirement	Recommended	Option	Assessment	Compliance
	• RD-367, *Design of Small Reactor Facilities* • EPS1/PG/2 *Environmental codes of practice for steam electric power generation: siting phase* • CSA N288.6, *Environmental risk assessments at class I nuclear facilities and uranium mines and mills*					• Some N288.6 requirements were lacking in the Exposure Assessment • A specific discussion of uncertainties in human health TRVs was lacking • An uncertainty evaluation of the overall risk estimates in the Risk Characterization sections had not been provided In 2016, an updated Darlington ERA (NK38-REP-07701-00001-R000) was conducted that is compliant with N288.6 and accepted by the CNSC.	
	Appendix G: Effects of the Project on the Environment, Section G.3 Effects of the project on the terrestrial environment The applicant shall examine and document the effects of the proposed project on the terrestrial environment, including flora and fauna, including effects on wildlife corridors, protected areas, and other valued components (VCs). This assessment includes potential effects from project activities during site preparation, construction, operation, decommissioning and abandonment at the site, at both local and regional scales. The applicant shall assess the effects from the project on the terrestrial environment in a manner consistent with CSA N288.6, *Environmental risk assessments at class I nuclear facilities and uranium mines and mills*	General requirement to follow the methods in N288.6 to determine effects on the terrestrial environment.				A gap analysis was conducted in 2016 of the Darlington NND EA documents against N288.6. Note that N288.6 was not yet published when the NND EA documents were prepared. For NK054-REP-07730-00022-R000 "Ecological Risk Assessment and Assessment of Effects on Non-Human Biota Technical Support Document New Nuclear – Darlington Environmental Assessment", the risk assessment methods were consistent with N288.6 except for the following discrepancies: • equations used to estimate radiation doses (clause 7.3.4.1.2), • seasonal occupancy (clause 7.3.4.2.6), • specific activity models (clause 7.3.4.3.6), • references used for bioaccumulation and transfer factors (clause 7.3.5.3), • references used for dose coefficients (clauses 7.3.5.6), and • tabulation of exposure point concentrations and doses (clause 7.3.8.1). Overall, the differences relate to updated literature published after the NND EA documents were prepared. The differences are minor and do not alter the conclusions with respect to protection of terrestrial receptors. In 2016, an updated Darlington ERA (NK38-REP-07701-00001-R000) was conducted that is compliant with N288.6 and accepted by the CNSC.	Compliant
	Appendix G: Effects of the Project on the Environment, Section G.3 Effects of the project on the terrestrial environment **Guidance** …Information and data on the terrestrial effects should be evaluated against reliable criteria and objectives, so as to ensure that the information can identify likely interactions between the project and its effects on the terrestrial environment's biological components. Guidance on selecting appropriate toxicological	Clause 7.4.3 Toxicological benchmarks (N288.6) 7.4.3.1 The BVs selected should correspond to the lowest exposure levels (e.g., LOAELs, LOECs, EC_{20} values, and ED_{20} values) that have been associated with adverse effects for each generic receptor type. They are derived from toxicological studies with measurement endpoints that are relevant to the assessment endpoints (see Clause 7.2.4). Typically, these are survival, growth, or reproduction endpoints. BVs represent the lowest exposure levels at which measurable adverse effects relevant to population success have been observed. Regardless of the toxicological benchmarks used, the risk assessor should provide appropriate interpretations when		X		The benchmark values (BVs) used in NK054-REP-07730-00022-R000 "Ecological Risk Assessment and Assessment of Effects on Non-Human Biota Technical Support Document New Nuclear – Darlington Environmental Assessment", are outlined in Section 4.3.1 of that document. They align with N288.6. For birds and mammals, the selected BVs were NOAELs and LOAELs. For birds, the selected endpoints were reproduction, growth, and mortality. For mammals, the	Compliant

Document Number/Name	Location and Text Referenced in REGDOC 1.1.1	Applicable Clause(s) in the Code or Standard	Requirement	Recommended	Option	Assessment	Compliance
	benchmarks is provided in CSA N288.6, *Environmental risk assessments at class I nuclear facilities and uranium mines and mills*. For more information, see: • CCME, *A Framework for Ecological Risk Assessment: General Guidance* • CCME, *A Framework for Ecological Risk Assessment: Technical Appendices* • *A framework for ecological risk assessment at contaminated sites in Canada: review and recommendations* • *Priority Substances List Assessment Report. Releases of radionuclides from nuclear facilities (impact on non-human biota)* • where applicable, provincial guidelines and the following CSA Group standards: • N288.4, *Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills* • N288.6, *Environmental risk assessments at class I nuclear facilities and uranium mines and mills* • N288.5, *Effluent monitoring programs at Class I nuclear facilities and uranium mines and mills*	benchmarks are exceeded. For example, exceedance of a NOAEL does not have the same meaning as exceedance of a LOAEL. Only the latter indicates exposures above levels that have been associated with effects. **Notes:** **(1)** The CCME (1996) framework recommends the use of lowest observed effect concentrations (LOECs, EC_{20}s) as benchmarks in a preliminary quantitative EcoRA. The US EPA (1998) guidance indicates that either effect or no-effect levels can be used, or that an entire dose-response function can be used, as a basis for making inferences about effects. **(2)** Benchmark values should not be set below a reasonable upper limit of background concentrations (see Clause 7.2.5.3.2).				selected endpoints were reproduction, body weight and bone changes, and lifespan and longevity. BVs based on survival, growth, and reproduction endpoints appear to have been used where available for terrestrial receptors. NOAELs were used only when no other data were available.	
		7.4.3.2 BVs should be taken from the following sources: (a) Suter and Tsao (1996) for aquatic organisms (fishes, invertebrates, and plants); (b) Sample, et al. (1996) for terrestrial wildlife; (c) Efroymson, et al. (1997a, 1997b) for terrestrial plants and invertebrates; or (d) other sources, with sufficient information to support their applicability and credibility. **Note:** Other sources can include the following databases: (a) ORNL Risk Assessment Information System (RAIS), available at http://rais.ornl.gov/; and (b) US EPA ECOTOX, available at http://www.epa.gov/ecotox/.		X		The benchmark values (BVs) used in NK054-REP-07730-00022-R000 "Ecological Risk Assessment and Assessment of Effects on Non-Human Biota Technical Support Document New Nuclear – Darlington Environmental Assessment", are outlined in Section 4.3.1 of that document. They align with N288.6. Recommended values from Sample et al. (1996) were used for terrestrial wildlife, to the extent possible based on data available in that report.	Compliant
		7.4.3.3 Site-specific modifying factors should be considered, as appropriate, in defining the BVs for non-radiological COPCs. For example, the copper concentration in water associated with adverse effects on aquatic biota is strongly dependent on water hardness, as reflected in the US EPA (2002c) national ambient water quality criteria, which is a continuous function of hardness. In sediments, total organic carbon (TOC) is a recognized modifying factor for organic contaminant benchmarks (OMOE, 1993) and is also important for many inorganics (Hart, et al., 1988). Grain size has been used as a modifier of ecotoxicity-based soil quality guidelines		X		The toxicological benchmarks used in NK054-REP-07730-00022-R000 "Ecological Risk Assessment and Assessment of Effects on Non-Human Biota Technical Support Document New Nuclear – Darlington Environmental Assessment", for the terrestrial environment, appear to have been selected with consideration of modifying factors, although the topic is not discussed. NK054-REP-07730-00005 "Geology and Hydrogeological Environment Existing Environmental	Compliant

Document Number/Name	Location and Text Referenced in REGDOC 1.1.1	Applicable Clause(s) in the Code or Standard	Requirement	Recommended	Option	Assessment	Compliance
		(OMOE, 2011) and can also modify sediment toxicity, with less toxicity (higher benchmarks) in fine-grained soils and sediments.				Conditions Technical Support Document indicates that grain size analysis was conducted in soil samples as part of the baseline characterization program. The MECP Table 3 standards for coarse soil were selected for soil screening for the DNNP ecological risk assessment, which is conservative with respect to grain size effects.	
	Appendix G: Effects of the Project on the Environment, G.4 Effects of nuclear and hazardous substances on the terrestrial environment **Guidance** The typical variation in concentrations of nuclear and hazardous substances at reference site(s) should clearly demonstrate no anthropogenic point source influences. The reference site(s) should closely match the site of interest with respect to the geological, hydrological, meteorological, climate, human and environmental settings (for example, as described in CSA N288.6, *Environmental risk assessments at class I nuclear facilities and uranium mines and mills)*	Clause 6.2.2 Site characterization (N288.6) 6.2.2.2 For some naturally occurring and ubiquitous substances (e.g., arsenic, mercury, and uranium) comparisons can also be made to measurements from a reference site to ascertain whether the chemicals in question stem from local anthropogenic sources (HC, 2010a) (see Clause 6.2.5.8). The reference site should be shown to be free of possible anthropogenic point source influences with regard to the chemicals of interest and should closely match the site of interest with respect to (a) location; (b) topography; (c) size or area; (d) the physical and chemical characteristics of the soil geology; (e) hydrology; and (f) land use, exclusive of the activity being assessed.		X		Appendix B of NK054-REP-07730-00022-R000 “Ecological Risk Assessment and Assessment of Effects on Non-Human Biota Technical Support Document New Nuclear – Darlington Environmental Assessment”, outlines the baseline characterization program. Surface water and sediment samples were collected in the site study area, local study area, and regional study area. Surface water and sediment samples collected in the local study area and regional study area are generally considered background concentrations. For the terrestrial environment, background soil concentrations from the MOE (now MECP) were used in the ecological risk assessment. The 98th percentile Ontario Typical Range (OTR_{98}) were used as background soil concentrations. A contaminant exceeding both background and toxicity-based screening criteria was considered a COPC in the assessment (see Figure 4.1-1 in NK054-REP-07730-00022-R000).	Compliant
		6.2.2.2 … Preference should be given to vacant land, naturally wooded areas, parks, or large residential lots. Sites with obvious vegetation damage should be avoided. The history of the reference site and adjacent land, including current and past activities, shall be considered and documented (HC, 2010a).	X			For the terrestrial environment background soil concentrations from the MOE (now MECP) were used in NK054-REP-07730-00022-R000 “Ecological Risk Assessment and Assessment of Effects on Non-Human Biota Technical Support Document New Nuclear – Darlington Environmental Assessment”. The MOE 98th percentile Ontario Typical Range (OTR_{98}) background soil concentrations represent the upper end of normal for unimpacted sites, similar to those described in Clause 6.2.2.2.	Compliant
	Appendix G: Effects of the Project on the Environment, Section G.5 Effects of the project on the aquatic environment **Guidance** …The applicant should evaluate information and data on the aquatic effects against credible criteria and objectives, to ensure that the information is sufficient to identify likely interactions between the project and its effects on the biological components of the aquatic environment. For more information on determining the appropriate aquatic effects criteria and objectives, see: • CCME, *A Framework for Ecological Risk Assessment: General Guidance* • CCME, *A Framework for Ecological Risk Assessment: Technical Appendices*	Clause 7.4.3 Toxicological benchmarks (N288.6) 7.4.3.1 The BVs selected should correspond to the lowest exposure levels (e.g., LOAELs, LOECs, EC_{20} values, and ED_{20} values) that have been associated with adverse effects for each generic receptor type. They are derived from toxicological studies with measurement endpoints that are relevant to the assessment endpoints (see Clause 7.2.4). Typically, these are survival, growth, or reproduction endpoints. BVs represent the lowest exposure levels at which measurable adverse effects relevant to population success have been observed. Regardless of the toxicological benchmarks used, the risk assessor should provide appropriate interpretations when benchmarks are exceeded. For example, exceedance of a NOAEL does not have the same meaning as exceedance of a LOAEL. Only the latter indicates exposures above levels that have been associated with effects. **Notes:**		X		The BVs used in NK054-REP-07730-00022-R000 “Ecological Risk Assessment and Assessment of Effects on Non-Human Biota Technical Support Document New Nuclear – Darlington Environmental Assessment”, are outlined in Section 4.3.1 of that document. They align with guidance in N288.6. The BVs for aquatic receptors were (sometimes approximated) EC_{20} values. Many of the BVs were based on EC_{50} or LC_{50} values where EC_{20} values were not available, with empirical factors of 4 or 10 applied for the conversion to approximate EC_{20} values. The selected endpoints included survival, growth, and reproduction, as well as mortality, immobility, locomotion, and general population changes, among others.	Compliant

Document Number/Name	Location and Text Referenced in REGDOC 1.1.1	Applicable Clause(s) in the Code or Standard	Requirement	Recommended	Option	Assessment	Compliance
	• *A framework for ecological risk assessment at contaminated sites in Canada: review and recommendations* • *Priority Substances List Assessment Report. Releases of radionuclides from nuclear facilities (impact on non-human biota)* • where applicable, provincial guidelines and the following CSA Group standards: • N288.4, *Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills* • N288.6, *Environmental risk assessments at class I nuclear facilities and uranium mines and mills* • N288.5, *Effluent monitoring programs at Class I nuclear facilities and uranium mines and mills*	**(1)** The CCME (1996) framework recommends the use of lowest observed effect concentrations (LOECs, EC_{20}s) as benchmarks in a preliminary quantitative EcoRA. The US EPA (1998) guidance indicates that either effect or no-effect levels can be used, or that an entire dose-response function can be used, as a basis for making inferences about effects. **(2)** Benchmark values should not be set below a reasonable upper limit of background concentrations (see Clause 7.2.5.3.2).				The BVs for sediment were based on Probable Effect Levels (PELs) and Severe Effect Levels (SELs) from various sources. These quantities are concentrations at which ecological effects may be expected.	
		7.4.3.2 BVs should be taken from the following sources: (e) Suter and Tsao (1996) for aquatic organisms (fishes, invertebrates, and plants); (f) Sample, et al. (1996) for terrestrial wildlife; (g) Efroymson, et al. (1997a, 1997b) for terrestrial plants and invertebrates; or (h) other sources, with sufficient information to support their applicability and credibility. **Note:** Other sources can include the following databases: (a) ORNL Risk Assessment Information System (RAIS), available at http://rais.ornl.gov/; and (b) US EPA ECOTOX, available at http://www.epa.gov/ecotox/.		X		The BVs used in NK054-REP-07730-00022-R000 “Ecological Risk Assessment and Assessment of Effects on Non-Human Biota Technical Support Document New Nuclear – Darlington Environmental Assessment”, are outlined in Section 4.3.1 of that document. They align with guidance in N288.6. Recommended values from Suter and Tsao (1996) were used for aquatic organisms in addition to other literature and regulatory sources such as CCME, MOE, US EPA AQUIRE (now ECOTOX).	Compliant
		7.4.3.3 Site-specific modifying factors should be considered, as appropriate, in defining the BVs for non-radiological COPCs. For example, the copper concentration in water associated with adverse effects on aquatic biota is strongly dependent on water hardness, as reflected in the US EPA (2002c) national ambient water quality criteria, which is a continuous function of hardness. In sediments, total organic carbon (TOC) is a recognized modifying factor for organic contaminant benchmarks (OMOE, 1993) and is also important for many inorganics (Hart, et al., 1988). Grain size has been used as a modifier of ecotoxicity-based soil quality guidelines (OMOE, 2011) and can also modify sediment toxicity, with less toxicity (higher benchmarks) in fine-grained soils and sediments.		X		For the aquatic environment, the toxicological benchmarks used in NK054-REP-07730-00022-R000 “Ecological Risk Assessment and Assessment of Effects on Non-Human Biota Technical Support Document New Nuclear – Darlington Environmental Assessment”, were for appropriate levels of modifying factors where applicable, e.g. water hardness for metals, temperature and pH for ammonia.	Compliant
		7.4.3.4 Benchmark values for contaminants that are continually released should generally be defined based on chronic (long-term) exposure studies. However, there can be acute (short-term) situations of interest, such as boiler blowdown over a period of a few hours. For these situations, acute exposure BVs should be used. The risk assessor should justify the BVs selected, considering relevant exposure scenarios and timeframes.		X		The toxicological benchmarks used in NK054-REP-07730-00022-R000 “Ecological Risk Assessment and Assessment of Effects on Non-Human Biota Technical Support Document New Nuclear – Darlington Environmental Assessment”, were applied to chronic exposure situations; therefore, chronic benchmarks were used. In some cases, where only acute benchmarks	Compliant

Document Number/Name	Location and Text Referenced in REGDOC 1.1.1	Applicable Clause(s) in the Code or Standard	Requirement	Recommended	Option	Assessment	Compliance
		Note: The US EPA (2002c) acute criteria for water quality provide conservative benchmarks for short-term releases to the aquatic environment. Values for specific short-term exposure durations are available in the toxicity literature and can be accessed through the ECOTOX database (http://www.epa.gov/ecotox/).				were available, they were converted to chronic using a factor of 10 to adjust from acute to chronic exposures. This is discussed in Section 4.3.1.3 of the EcoRA TSD for the NND EA.	
		Clause 7.4.4 Thermal benchmarks (N288.6) 7.4.4.1 Temperature benchmarks exist for direct thermal effects on the growth, survival, and reproduction of aquatic biota, as discussed in Clauses 7.4.4.2 to 7.4.4.5. These benchmarks vary by species and life stage.			X	For information purposes only. No gap assessment needed.	Not applicable
		7.4.4.2 Maximum weekly average temperatures (MWATs) can be used to assess thermal conditions for fish growth (Brungs and Jones, 1977; US EPA, 1997c). An MWAT is a growth optimum (GO) temperature plus one-third of the difference between the upper incipient lethal (UIL) and GO temperatures. It represents a temperature at which juvenile growth is expected to be appreciably reduced, applies during the growing season, and is most likely to be exceeded during the warmer summer months.			X	The Aquatic Environment Effects TSD for the Darlington Nuclear Generating Station Refurbishment and Continued Operation (NK38-REP-07730-10005-R000) and Aquatic Environment Prediction of Temperature Effects on Fish Species from Operation of the NND Diffuser Based on Modelled Temperature Changes. (NK054-REP-07730-0313784-T25) considered maximum weekly average temperatures (MWATs) in the vicinity of the DN thermal discharge, and compared these to MWAT criteria for fish species known to occur in the area, including emerald shiner, alewife, white sucker and lake trout.	Compliant
		7.4.4.3 The maximum temperature for embryos (MTE) can be used to assess thermal conditions during the period of spawning and embryonic development (Brungs and Jones, 1977; US EPA, 1997c). For a given fish species, this MTE is usually lower than the MWAT for juvenile growth, represents a temperature below which successful incubation and hatching are expected, and applies during the spawning and embryonic period (typically the spring or fall/winter month).			X	The assessment in the NND EA (in NK054-REP-07730-00003-R000 Aquatic Environment Existing Environmental Conditions TSD and NK054-REP-07730-00013-R000 Aquatic Environment Effects TSD) focused on early life stages of round whitefish: egg survival and hatching. The round whitefish temperature benchmarks for egg survival and hatching are presented in Table 3.3.2-6 of NK054-REP-07730-00003-R000. The short–term mortality threshold of 5ºC for embryo survival was used as a benchmark for short-term acute exposure.	Compliant
		7.4.4.4 It is possible for hatching to be successful but seasonally advanced as a result of elevated temperatures. This can be problematic when larvae are transported out of the warmed area. For any fish species, the timing of spawning and hatching can be estimated for a given ΔT based on the spawning temperatures and degree-days required for development (Goodyear, et al., 1982), and considering the amount of time that the plume is likely to be on the spawning bed. Temperature data-loggers can be placed on the spawning bed for a more accurate indication of when spawning and hatching are likely occurring. Similar measurements in reference spawning areas can provide a normal range of timing for the region. Any hatch occurring in advance of this range can be considered subject to the effects of hatch advance. **Note:** Turnpenny and Liney (2006) suggest that a maximum allowable ΔT of 3 °C should be protective in most waters against potential effects of both hatch advance and thermal fronts interfering with fish movements. The temperature criterion used to define the			X	Assessment of potential thermal effects to juvenile round whitefish growth and development is presented in Section 3.3.2.5 of NK054-REP-07730-00013-R000 Aquatic Environment Effects TSD for the NND EA. Hatch advance does not appear to have been considered in these assessments. OPG has, however, considered advanced hatching in its reassessment of potential thermal effects on round whitefish survival and hatching using a COG model (OPG, 2014. Memorandum: Reassessment of the impact of thermal plumes on round whitefish egg survival and hatch using the new COG model. N-REP-07250-0518222).	Compliant

Document Number/Name	Location and Text Referenced in REGDOC 1.1.1	Applicable Clause(s) in the Code or Standard	Requirement	Recommended	Option	Assessment	Compliance
		zone of potential adverse effects can be lower or higher than 3 °C based on the sensitivity of the receiving waters, the species, and the particular stage of early development (see Turnpenny and Liney, 2006; OPG, 2010). Species-specific values should be used if available. Otherwise, a nominal value of 3 °C may be used.					
	Appendix G: Effects of the Project on the Environment, Section G.8 Prediction of non-human biota dose, Section G.8.1 Exposure information **Guidance** The applicant should provide a high-level discussion of the relative merits of alternative approaches to put the presented approach in a current national and international context. An example of an acceptable approach is available in CSA N288.6, *Environmental risk assessments at class I nuclear facilities and uranium mines and mills*. The applicant should document the details of transfer parameters and their validation for site conditions. Site-specific data, and/or authoritative data sources, should support model structure and parameter choices. The applicant should note the choice of food chain transfer factors for VCs, which can vary by orders of magnitude in different environments for different species. The applicant may use a software tool, if it addresses risks to VCs explicitly or by reasonable analogy. If an approach different from CSA N288.6 is used, the applicant should describe the model structure and implementation. Regardless of the approach taken, the applicant should document a few representative samples of dose calculations starting with media and/or food concentrations.	General requirement to follow the dose calculation methods in N288.6				A gap analysis was conducted in 2016 of the Darlington NND EA documents against N288.6. Note that N288.6 was not yet published when the NND EA documents were prepared. For NK054-REP-07730-00022-R000 “Ecological Risk Assessment and Assessment of Effects on Non-Human Biota Technical Support Document New Nuclear – Darlington Environmental Assessment”, the exposure assessment was consistent with N288.6 except for the following discrepancies: • equations used to (specifically for external dose) estimate radiation doses (clause 7.3.4.1.2), • seasonal occupancy (clause 7.3.4.2.6), • specific activity models (clause 7.3.4.3.6), • references used for bioaccumulation and transfer factors (clause 7.3.5.3), • references used for dose coefficients (clauses 7.3.5.6), and • tabulation of exposure point concentrations and doses (clause 7.3.8.1). Overall, the differences relate to updated literature published after the NND EA documents were prepared. The differences are minor and do not alter the conclusions with respect to protection of non-human biota. In 2016, an updated Darlington ERA (NK38-REP-07701-00001-R000) was conducted that is compliant with N288.6 and accepted by the CNSC.	Compliant
	Appendix G: Effects of the Project on the Environment, Section G.8 Prediction of non-human biota dose, Section G.8.3 Uncertainties **Guidance** The applicant should address the effects of using radiation weighting factors suggested in CSA N288.6, *Environmental risk assessments at class I nuclear facilities and uranium mines and mills* for calculating a "biota effective dose" from absorbed dose (for example, weighting factors of 40 for alpha particles, and 3 for tritium beta particles).	Clause 7.3.5.8 (N288.6) A nominal radiation weighting factor (relative biological effectiveness [RBE]) of 2 for the tritium (^3H) absorbed dose should be used for Canadian nuclear facilities; however, a range of 1 to 3 should be considered in the evaluation of uncertainty. **Note:** The CNSC (2010, INFO-0799) cites average values of 1.4 and 2.2, relative to X- and γ-rays, respectively, noting that the ICRP use of 1 still affords adequate protection of people because optimized exposures are very low. UNSCEAR (2008) recommends a nominal value of 1 but emphasizes the literature range of 1 to 3 and notes that the most appropriate factor remains an open question. The ICRP (2008) notes that there is no formal or universally accepted approach to account for RBE in non-human biota. In the context of human protection, the ICRP (Cox, et al., 2008) continues to recommend an RBE of 1. Blaylock, et al. (1993) and Amiro (1997) both use an RBE		X		Section 4.3.2.3 of NK054-REP-07730-00022-R000 “Ecological Risk Assessment and Assessment of Effects on Non-Human Biota Technical Support Document New Nuclear – Darlington Environmental Assessment”, indicates that an RBE of 3 was used as a conservative approach to assessing absorbed dose for tritium. The document notes that the estimated absorbed dose of tritium may be overestimated.	Compliant

Document Number/Name	Location and Text Referenced in REGDOC 1.1.1	Applicable Clause(s) in the Code or Standard	Requirement	Recommended	Option	Assessment	Compliance
		of 1 as a radiation weighting factor for ^3H. EC/HC (2003) recommends an RBE of 3 for use in estimation of internal dose. ACRP (2002) suggests that an RBE of 2 ±1 could be defensible, based on the notion that radiation benchmarks for ecological effects are typically based on studies involving γ-rather than X-irradiation, and that γ-radiation is approximately half as effective. Pröhl (2003) discusses the range of possible values and presents internal dose coefficients for ^3H with RBEs of 1 and 3.					
		7.3.5.9 An RBE of 10 should be used as a central value for the α component of internal dose from α emitters. **Note:** UNSCEAR (1996), Kocher and Trabalka (2000), and Trivedi and Gentner (2000) recommend an RBE range of 5 to 10 for deterministic effects that are relevant to protection of natural biota. UNSCEAR (2008) recommends a nominal value of 10. ACRP (2002), US DOE (2002), and UK EA (2002) suggest an RBE of 20 as a "likely conservative" value. EC/HC (2003) recommends a value of 40.		X		Alpha emitters were not considered in the NND EA. The level of airborne and waterborne gross alpha emissions from OPG nuclear facilities has been considered to be negligible. Monitoring of waterborne gross alpha emissions show concentrations six to seven orders of magnitude smaller than the applicable water DRL, and monitoring of air emissions show concentrations four to five orders of magnitude smaller than the applicable air DRL (NK38-REP-07701-00001-R000 "Darlington Nuclear Environmental Risk Assessment").	Not applicable
CCME, Canadian Environmental Quality Guidelines	<u>Appendix C: Baseline Data used to Evaluate Suitability Throughout the Lifecycle of the Facility, Section C.2 Baseline climate, meteorological data and air quality data</u> **Guidance** For baseline air quality data, air quality assessment results should be compared against applicable provincial and federal air quality criteria and objectives, such as annual, 24-hour and one-hour maximum acceptable concentrations. Precise guidance can be obtained from provincial regulations and standards.	Any air quality guidelines used in the NND EA submission that have been updated since the submission are applicable. The Ministry of the Environment, Conservation and Parks Ambient and CCME Canadian Ambient Air Quality Standards (CAAQS) were used to screen the baseline air quality data in the Local and Regional study areas. The criteria/standards are posted at the following webpage: • The Ministry of the Environment, Conservation and Parks Ambient Air Quality Criteria (AAQC), https://www.ontario.ca/page/ontarios-ambient-air-quality-criteria-sorted-contaminant-name. • The Canadian Ambient Air Quality Standards (CAAQS): https://www.ccme.ca/en/current_priorities/air/caaqs.html		X		The Atmospheric Environment TSD for the NND EIS (NK054-REP-07730-00001) used the most recent Canadian Climate Normals available at that time. In particular, acrolein and benzo(a)pyrene (BaP) guidelines have changed.	Gap Addressed in Section 4.0
	<u>Appendix C: Baseline Data used to Evaluate Suitability Throughout the Lifecycle of the Facility, Section C.5.2 Baseline surface water quality</u> **Guidance** The focus should be on those parameters expected to change as a result of project activities assessed throughout all licensing stages. Baseline surface water quality data should be initially screened against recognized water quality guidelines, such as the *Canadian Environmental Quality Guidelines*. Where federal or provincial standards or guidelines are not available or where natural background as documented in an appropriate baseline study demonstrates the water quality standards or guidelines are not applicable, benchmarks from the peer-reviewed	Any water quality guidelines used in the NND EA submission that have been updated since the submission are applicable. The water quality guidelines that were used in screening to identify COPCs were the CCME water guidelines for protection of aquatic life, and the Ontario provincial water quality objectives (PWQOs) for protection of aquatic life. CCME drinking water guidelines were used for a few parameters (barium, sodium) where guidelines for protection of aquatic life were lacking.		X		Table 6-1 identifies water quality guidelines that have changed since the NND EA submission. Any changes and implications are assessed in the main body of this document New CCME guidelines exist for boron and silver. The guideline for cadmium is a revised function of hardness, and is less stringent. The guideline for zinc has been reduced. (Ontario PWQOs have not changed).	Gap Addressed in Section 6.0

Document Number/Name	Location and Text Referenced in REGDOC 1.1.1	Applicable Clause(s) in the Code or Standard	Requirement	Recommended	Option	Assessment	Compliance
	scientific literature may be used with appropriate rationale. Site-specific water quality objectives may be developed with the support of the scientific literature and the application of the procedures for deriving numerical water quality objectives as documented in the *Canadian Environmental Quality Guidelines*. For more information, refer to the *Canadian Environmental Quality Guidelines*, specifically the *Canadian Water Quality Guidelines for the Protection of Aquatic Life*.						
	Appendix C: Baseline Data used to Evaluate Suitability Throughout the Lifecycle of the Facility, Section C.5.3 Baseline sediment quality **Guidance** The focus should be on those parameters expected to change as a result of project activities assessed throughout all licensing stages. Baseline sediment quality data should initially be screened against federal sediment quality guidelines, such as the *Canadian Environmental Quality Guidelines*. Where an appropriate baseline study demonstrates that natural background exceeds the available standards or guidelines (or that none exist for the COPC of interest), sediment quality benchmarks from the peer-reviewed scientific literature should be used with appropriate rationale.	Any sediment quality guidelines used in the NND EA submission that have been updated since the submission are applicable. The sediment quality guidelines that were used in screening to identify COPCs were the CCME guidelines for protection of aquatic life, and the Ontario sediment guidelines for protection of aquatic life. Literature values (Thompson et al., 2005) were used for a few parameters (molybdenum, selenium, uranium, vanadium) where federal/provincial values were lacking.				CCME sediment quality guidelines have not changed since the NND EA submission. (Ontario sediment quality guidelines also have not changed).	Compliant
	Appendix C: Baseline Data used to Evaluate Suitability Throughout the Lifecycle of the Facility, Section C.5.4 Baseline hydrogeology and groundwater quality **Guidance** The focus should be on those parameters expected to change as a result of project activities assessed throughout all licensing stages. Baseline groundwater quality data should be compared to federal water quality guidelines, such as the *Canadian Environmental Quality Guidelines*. If federal or provincial standards and guidelines are not available, water quality benchmarks from the peer-reviewed scientific literature should be used with appropriate rationale.	Any groundwater quality guidelines used in the NND EA submission that have been updated since the submission are applicable. The groundwater quality guidelines that were used in consideration of groundwater data were the Ontario (Table 3) values for non-potable groundwater. However, groundwater data were not included in the screening process to identify COPCs.				Table 5-6 identifies Ontario groundwater quality guidelines that have changed since the NND EA submission. Any changes and implications are assessed in the main body of this document The relevant Ontario Table 3 groundwater guidelines were updated in 2011. These guidelines were reduced for boron, cadmium, chromium, cobalt, lead, and nickel. Other metal values were the same or increased.	Gap Addressed in Section 5.0
	Appendix C: Baseline Data used to Evaluate Suitability Throughout the Lifecycle of the Facility, Section C.8 Baseline ambient radioactivity and ambient non-radioactive hazardous substances **Guidance** Ambient hazardous substances baseline information should consider:	Any soil quality guidelines used in the NND EA submission that have been updated since the submission are applicable. The soil quality guidelines that were used in screening to identify COPCs were generally the CCME (2007) or Ontario (2004) soil quality guidelines for residential/parkland land use. In one case (barium) a higher commercial/ industrial value was used; in other cases (cobalt, nickel) values below the residential parkland guideline were used.				Table 5-5 identifies soil quality guidelines that have changed since the NND EA submission. Any changes and implications are assessed in the main body of this document. CCME has provided a new commercial/industrial (C/I) guideline for beryllium, and has dropped its residential/ parkland (R/P) guideline for boron (hot water soluble). It has updated its guidelines for nickel, uranium and zinc (the only reduced value is the R/P value for nickel).	Gap Addressed in Section 5.0

Document Number/Name	Location and Text Referenced in REGDOC 1.1.1	Applicable Clause(s) in the Code or Standard	Requirement	Recommended	Option	Assessment	Compliance
	• CSA N288.4, *Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills* • federal guidelines; for example, the *Canadian Environmental Quality Guidelines*, specifically the *Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health* • provincial guidelines and standards; for example, *Operations Manual for Air Quality Monitoring in Ontario* • international and foreign guidelines and standards; for example, EPA QA/G-5S, *Guidance on Choosing a Sampling Design for Environmental Data Collection for Use in Developing a Quality Assurance Project Plan*					(Ontario soil guidelines were updated in 2011. All R/P values for metals were reduced as compared to 2004).	
	Appendix G: Effects of the Project on the Environment, Section G.5 Effects of the project on the aquatic environment, Section G.5.1 Effects of liquid effluent on the aquatic environment **Guidance** …Predicted changes to surface water and sediment quality from modelling data should be evaluated using criteria that ensure that surface water and/or sediment quality changes and liquid effluent input into water bodies do not pose risks to human health and the environment. When determining appropriate surface water quality criteria and objectives, the applicant should consider federal guidelines, such as the *Canadian Environmental Quality Guidelines*, as well as provincial guidelines and standards, and use water-quality benchmarks from reputable scientific literature. The description of zones of influence of stressors in space and time should be relative to habitat and occurrence of interacting organisms, specified and supportable from site studies and/or scientific/agency publications dealing with pulse-type and continuous release aquatic effects. Descriptions of effects should include direct exposure effects (for example, on survival, growth, reproduction, age, species distribution of community), and indirect effects (for example, altered predators, prey, competition, exposure via the food chain). To determine the dilution factors and to perform mixing zone calculations, it is expected that a conservative final exposure concentration of contaminants in the liquid effluents entering water bodies will be used in accordance with the *Canadian Environmental Quality Guidelines*	Any water or sediment quality guidelines used in the NND EA submission that have been updated since the submission are applicable. The water quality guidelines that were used in screening to identify COPCs were the CCME water guidelines for protection of aquatic life, and the Ontario provincial water quality objectives (PWQOs) for protection of aquatic life. CCME drinking water guidelines were used for a few parameters (barium, sodium) where guidelines for protection of aquatic life were lacking. The sediment quality guidelines that were used in screening to identify COPCs were the CCME guidelines for protection of aquatic life, and the Ontario sediment guidelines for protection of aquatic life. Literature values (Thompson et al., 2005) were used for a few parameters (molybdenum, selenium, uranium, vanadium) where federal/provincial values were lacking.				Table 6-1 identifies water quality guidelines that have changed since the NND EA submission. Any changes and implications are assessed in the main body of this document. New CCME guidelines exist for boron and silver. The guideline for cadmium is a revised function of hardness, and is less stringent. The guideline for zinc has been reduced. (Ontario PWQOs have not changed). CCME sediment quality guidelines have not changed since the NND EA submission. (Ontario sediment quality guidelines also have not changed).	Gap Addressed in Section 7.0

Document Number/Name	Location and Text Referenced in REGDOC 1.1.1	Applicable Clause(s) in the Code or Standard	Requirement	Recommended	Option	Assessment	Compliance
Government of Canada, Canadian Climate Normals	<u>Section 3.4.1 Atmospheric and meteorological data</u> The applicant shall provide a description of the ambient air quality in the study areas, with emphasis on those parameters for which there will be radiological and non-radiological emissions resulting from the project. A comprehensive site evaluation relies on understanding how meteorological phenomena may affect the site. The evaluation shall take into account instrumentally recorded climate data sources that reflect the regional conditions, such as the "Canadian climate normals" webpage	The most recent Canadian Climate Normals are posted on the Canadian Climate normal webpage (http://climate.weather.gc.ca/climate_normals/) are for 1981-2010.	X			The Atmospheric Environment TSD for the NND EIS (NK054-REP-07730-00001) used the most recent Canadian Climate Normals available at that time 1971-2000.	Gap Addressed in Section 4.0
	<u>Appendix C: Baseline Data used to Evaluate Suitability Throughout the Lifecycle of the Facility, Section C.2 Baseline climate, meteorological data and air quality data</u> **Guidance** Information should include: • prehistoric, historic, and instrumentally recorded climate data sources that reflect the regional conditions (for example, the "Canadian Climate Normals" webpage) o five years of regional meteorological data to evaluate the potential environmental effects on the surrounding areas, or one year of site-specific meteorological data for the most recent one-year period: o this information should provide the atmospheric dispersion in the vicinity of the site and the surrounding areas o the assumptions used should be clearly identified under a separate header o conservatism should be addressed	The most recent Canadian Climate Normals are posted on the Canadian Climate normal webpage (http://climate.weather.gc.ca/climate_normals/) are for 1981-2010.		X		The Atmospheric Environment TSD for the NND EIS (NK054-REP-07730-00001) used the most recent Canadian Climate Normals available at that time 1971-2000.	Gap Addressed in Section 4.0

Appendix B: Climate, Meteorological Data and Air Quality Data

Table B-1: Criteria Air Contaminants Monitoring Data at Courtice WPCP Station (Upwind of Durham York Energy Centre) (2013-2018).

Pollutant	Averaging Period	AAQC Standards µg/m³	AAQC Standards ppb	Summary Statistics	2013 Concentration (µg/m³)	2013 Concentration (ppbv)	2014 Concentration (µg/m³)	2014 Concentration (ppbv)	2015 Concentration (µg/m³)	2015 Concentration (ppbv)
SO2	1	690	250	Maximum	157.2	56.3	120.7	43.3	103.8	39.0
				Minimum	0.0	0.0	0.0	0.0	0.0	0.0
				Mean	4.4	1.6	4.0	1.5	2.7	1.0
				Standard Deviation	8.3	3.0	6.0	2.2	5.1	1.8
				# of Exceedances	0	0	0	0	0	0
	24	275	100	Maximum	36.8	13.8	43.7	15.6	23.5	8.8
				Minimum	0.0	0.0	0.0	0.0	0.0	0.0
				Mean	4.4	1.6	4.0	1.5	2.7	1.0
				Standard Deviation	5.6	2.0	3.6	1.3	2.9	1.0
				# of Exceedances	0	0	0	0	0	0
	Annual	55	20	Mean	4.4	1.6	4.0	1.5	2.7	1.0
				# of Exceedances	N/A [A]	N/A [A]	0	0	0	0
PM2.5	24	30	NA	Maximum	27.0	-	43.2	-	59.6	-
				Minimum	1.8	-	0.2	-	0.2	-
				Mean	8.6	-	8.6	-	7.8	-
				98th Percentile	21.5	-	22.3	-	27.3	-
				Standard Deviation	4.7	-	5.6	-	7.4	-
				# of Exceedances	N/A	-	N/A	-	N/A	-
	Annual	10	N/A	Mean (Period)	-	-	-	-	7.7	-
				# of Exceedances	-	-	-	-	N/A	-
NO2	1	400	200	Maximum	93.8	48.0	108.6	52.7	135.2	62.3
				Minimum	0.0	0.0	0.0	0.0	0.0	0.0
				Mean	12.6	6.4	16.1	8.0	13.8	6.8
				Standard Deviation	14.0	7.1	15.7	7.6	14.7	7.1
				# of Exceedances	0	0	0	0	0	0
	24	200	100	Maximum	54.5	26.8	68.8	31.7	55.2	25.9
				Minimum	0.5	0.3	0.1	0.1	0.0	0.0
				Mean	12.6	6.4	16.1	8.0	13.7	6.8
				Standard Deviation	8.0	4.1	9.7	4.6	9.7	4.6
				# of Exceedances	0	0	0	0	0	0
	Annual	60	30	Mean	-	-	16.1	8.0	13.8	6.8
				# of Exceedances	-	-	0	0	0	0
TSP	24	120	NA	Maximum	62.0	-	57.0	-	-	-
				Minimum	5.0	-	4.0	-	-	-
				Arithmetic Mean	25.0	-	25.0	-	-	-
				# of Exceedances	0.0	-	0.0	-	-	-

NOTE:
1) As the length of the measurement period in 2013 was less than 9-months, the period (i.e. 8-months) averages presented in this report were not compared to available MOE annual criteria.

Table B-1: Criteria Air Contaminants Monitoring Data at Courtice WPCP Station (Upwind of Durham York Energy Centre) (2013-2018).

Pollutant	Averaging Period	AAQC Standards		Summary Statistics	2016		2017		2018	
		$\mu g/m^3$	ppb		Concentration ($\mu g/m^3$)	Concentration (ppbv)	Concentration ($\mu g/m^3$)	Concentration (ppbv)	Concentration ($\mu g/m^3$)	Concentration (ppbv)
SO2	1	690	250	Maximum	153.6	57.1	257.7	95.6	-	96
				Minimum	0	0	0	0	-	ND
				Mean	4.8	1.7	4.9	1.8	-	2.7
				Standard Deviation	9.7	3.5	12	4.3	-	ND
				# of Exceedances	0	0	0	0	-	0
	24	275	100	Maximum	36.5	13	50.8	18.7	-	17
				Minimum	0	0	0	0	-	ND
				Mean	4.8	1.7	4.9	1.8	-	2.7
				Standard Deviation	5	1.8	6.4	2.3	-	ND
				# of Exceedances	0	0	0	0	-	0
	Annual	55	20	Mean	4.8	1.7	4.9	1.8	-	2.7
				# of Exceedances	0	0	6.4	0	-	0
PM2.5	24	30	NA	Maximum	34.7	-	70.6	-	35	-
				Minimum	0.2	-	0.2	-	ND	-
				Mean	6.8	-	6.4	-	6	-
				98th Percentile	21.6	-	19.8	-	19	-
				Standard Deviation	4.8	-	5.5	-	ND	-
				# of Exceedances	N/A	-	N/A	-	N/A	-
	Annual	10	N/A	Mean (Period)	6.8	-	6.4	-	6	-
				# of Exceedances	N/A	-	N/A	-	N/A	-
NO2	1	400	200	Maximum	125.9	62.4	89.4	42.8	-	71
				Minimum	0	0	0	0	-	ND
				Mean	12.7	6.4	12.8	6.4	-	6
				Standard Deviation	13	6.4	12.8	6.4	-	ND
				# of Exceedances	0	0	0	0	-	0
	24	200	100	Maximum	47.8	23.1	55.8	26.4	-	21
				Minimum	0.8	0.4	0.7	0.3	-	ND
				Mean	12.7	6.4	12.8	6.4	-	6
				Standard Deviation	7.3	3.6	7.6	3.7	-	ND
				# of Exceedances	0	0	0	0	-	0
	Annual	60	30	Mean	12.7	6.4	12.84	6.4	-	6
				# of Exceedances	0	0	0	0	-	0
TSP	24	120	NA	Maximum	95	-	59.6	-	84.7	-
				Minimum	8	-	9.9	-	4.6	-
				Arithmetic Mean	27	-	26	-	24.3	-
				# of Exceedances	0	-	0	-	0	-

NOTE:
1) As the length of the measurement period in 2013 was less than 9-months, the period (i.e. 8-months) averages presented in this report were not compared to available MOE annual criteria.

Table B-2: Criteria Air Contaminants Monitoring Data at Rundle Road (Downwind of Durham York Energy Centre) (2013-2018).

Pollutant	Averaging Period	AAQC Standards		Summary Statistics	2013		2014		2015	
		μg/m^3	ppb		Concentration (μg/m^3)	Concentration (ppbv)	Concentration (μg/m^3)	Concentration (ppbv)	Concentration (μg/m^3)	Concentration (ppbv)
SO2	1	690	250	Maximum	65.3	24.8	91.6	34.1	79.3	28.3
				Minimum	0.0	0.0	0.0	0.0	0.0	0.0
				Mean	1.2	0.4	1.8	0.7	2.0	0.7
				Standard Deviation	2.7	1.0	3.3	1.2	3.0	1.1
				# of Exceedances	0	0	0	0	0	0
	24	275	100	Maximum	10.4	3.9	11.2	4.2	22.4	8.3
				Minimum	0.0	0.0	0.0	0.0	0.0	0.0
				Mean	1.2	0.4	1.8	0.7	2.1	0.7
				Standard Deviation	1.2	0.4	1.6	0.6	2.4	0.8
				# of Exceedances	0	0	0	0	0	0
	Annual	55	20	Mean	1.2	0.4	1.8	0.7	2.0	0.7
				# of Exceedances	N/A [A]	N/A [A]	0	0	0	0
PM2.5	24	30	0	Maximum	50.6	-	41.3	-	64.7	-
				Minimum	0.6	-	0.2	-	0.2	-
				Mean	8.4	-	8.5	-	9.5	-
				98th Percentile	21.7	-	21.1	-	28.4	-
				Standard Deviation	6.2	-	5.2	-	7.3	-
				# of Exceedances	N/A	-	N/A	-	N/A	-
	Annual	10	N/A	Mean (Period)	-	-	-	-	9.5	-
				# of Exceedances	-	-	-	-	N/A	-
NO2	1	400	200	Maximum	78.3	39.3	117.4	62.2	86.4	42.6
				Minimum	0.0	0.0	0.0	0.0	0.0	0.0
				Mean	12.8	6.5	12.2	6.1	13.1	6.6
				Standard Deviation	10.0	5.1	11.8	5.8	10.8	5.3
				# of Exceedances	0	0	0	0	0	0
	24	200	100	Maximum	50.4	24.7	60.4	28.0	45.9	22.6
				Minimum	0.4	0.2	0.0	0.0	0.0	0.0
				Mean	12.9	6.6	12.2	6.1	13.1	6.6
				Standard Deviation	6.9	3.5	8.1	3.9	7.6	3.7
				# of Exceedances	0	0	0	0	0	0
	Annual	60	30	Mean	-	-	12.2	6.1	13.1	6.6
				# of Exceedances	-	-	0	0	0	0
TSP	24	120	NA	Maximum	78	-	59	-	-	-
				Minimum	6	-	8	-	-	-
				Arithmetic Mean	31	-	25	-	-	-
				# of Exceedances	0	-	0	-	-	-

NOTE:

1) As the length of the measurement period in 2013 was less than 9-months, the period (i.e. 8-months) averages presented in this report were not compared to available MOE annual criteria.

2) TSP/ metals, and PAHs were not measured in 2015 as per Section 1.2 of the Ambient Monitoring Plan (Stantec, 2012).

Table B-2: Criteria Air Contaminants Monitoring Data at Rundle Road (Downwind of Durham York Energy Centre) (2013-2018).

Pollutant	Averaging Period	AAQC Standards		Summary Statistics	2016		2017		2018	
		µg/m³	ppb		Concentration (µg/m³)	Concentration (ppbv)	Concentration (µg/m³)	Concentration (ppbv)	Concentration (µg/m³)	Concentration (ppbv)
SO2	1	690	250	Maximum	81	30.7	159.7	61	-	66
				Minimum	0	0	0	0	-	ND
				Mean	2.1	0.8	1.6	0.6	-	0.7
				Standard Deviation	3.7	1.4	2.5	1	-	ND
				# of Exceedances	0	0	0	0	-	0
	24	275	100	Maximum	16.3	6.2	13.7	5.2	-	8
				Minimum	0	0	0	0	-	ND
				Mean	2.1	0.8	1.6	0.6	-	0.7
				Standard Deviation	2.3	0.8	1.2	0.5	-	ND
				# of Exceedances	0	0	0	0	-	0
	Annual	55	20	Mean	2.1	0.8	1.6	0.6	-	0.7
				# of Exceedances	0	0	0	0	-	0
PM2.5	24	30	0	Maximum	43.1	-	35.8	-	31	-
				Minimum	0	-	0.1	-	ND	-
				Mean	9.6	-	6.3	-	6	-
				98th Percentile	32.9	-	20.3	-	19	-
				Standard Deviation	7.5	-	4.8	-	ND	-
				# of Exceedances	N/A	-	N/A	-	N/A	-
	Annual	10	N/A	Mean (Period)	9.6	-	6.3	-	6	-
				# of Exceedances	N/A	-	N/A	-	N/A	-
NO2	1	400	200	Maximum	70.8	36.2	90.8	42.9	-	38
				Minimum	0	0	0	0	-	ND
				Mean	10.7	5.4	11	5.5	-	5
				Standard Deviation	10.1	5	11	5.4	-	ND
				# of Exceedances	0	0	0	0	-	0
	24	200	100	Maximum	44.1	21.5	64.5	30.5	-	21
				Minimum	0	0	0	0	-	ND
				Mean	10.7	5.4	11	5.5	-	5
				Standard Deviation	7.2	3.5	8.3	4	-	ND
				# of Exceedances	0	0	0	0	-	0
	Annual	60	30	Mean	10.7	5.4	11	5.5	-	5
				# of Exceedances	0	0	0	0	-	0
TSP	24	120	NA	Maximum	97	-	232	-	203.6	-
				Minimum	9	-	11.1	-	5.3	-
				Arithmetic Mean	32	-	38	-	53	-
				# of Exceedances	0	-	2	-	4	-

NOTE:
1) As the length of the measurement period in 2013 was less than 9-months, the period (i.e. 8-months) averages presented in this report were not compared to available MOE annual criteria.
2) TSP/ metals, and PAHs were not measured in 2015 as per Section 1.2 of the Ambient Monitoring Plan (Stantec, 2012).

Table B-3: Comparison of Measured Ambient CAC Concentrations (Crago Road Station) (2013-2018).

Pollutant	Averaging Period	AAQC Standards		Summary Statistics	2013		2014		2015	
		μg/m3	ppb		Concentration (μg/m3)	Concentration (ppbv)	Concentration (μg/m3)	Concentration (ppbv)	Concentration (μg/m3)	Concentration (ppbv)
SO2	1	690	250	Maximum	-	-	-	-	-	120.5
				Minimum	-	-	-	-	-	0.0
				Mean	-	-	-	-	-	1.1
				Standard Deviation	-	-	-	-	-	ND
				# of Exceedances	-	-	-	-	-	0
	24	275	100	Maximum	-	-	-	-	-	19.9
				Minimum	-	-	-	-	-	0.0
				Mean	-	-	-	-	-	1.1
				Standard Deviation	-	-	-	-	-	ND
				# of Exceedances	-	-	-	-	-	0
	Annual	55	20	Mean	-	-	-	-	-	1.1
				# of Exceedances	-	-	-	-	-	0
PM2.5	24	30	0	Maximum	-	-	-	-	45.8	-
				Minimum	-	-	-	-	0.4	-
				Mean	-	-	-	-	7.3	-
				98th Percentile	-	-	-	-	22.7	-
				Standard Deviation	-	-	-	-	ND	-
				# of Exceedances	-	-	-	-	N/A	-
	Annual	10	N/A	Mean (Period)	-	-	-	-	7.3	-
				# of Exceedances	-	-	-	-	N/A	-
NO2	1	400	200	Maximum	-	-	-	-	-	44.0
				Minimum	-	-	-	-	-	0.0
				Mean	-	-	-	-	-	4.7
				Standard Deviation	-	-	-	-	-	ND
				# of Exceedances	-	-	-	-	-	0.0
	24	200	100	Maximum	-	-	-	-	-	22.3
				Minimum	-	-	-	-	-	0.0
				Mean	-	-	-	-	-	4.7
				Standard Deviation	-	-	-	-	-	ND
				# of Exceedances	-	-	-	-	-	0.0
	Annual	60	30	Mean	-	-	-	-	-	4.7
				# of Exceedances	-	-	-	-	-	0.0
TSP	24	120	NA	Maximum	-	-	-	-	-	-
				Minimum	-	-	-	-	-	-
				Arithmetic Mean	-	-	-	-	-	-
				# of Exceedances	-	-	-	-	-	-

Table B-3: Comparison of Measured Ambient CAC Concentrations (Crago Road Station) (2013-2018).

Pollutant	Averaging Period	AAQC Standards		Summary Statistics	2016		2017		2018	
		μg/m^3	ppb		Concentration (μg/m^3)	Concentration (ppbv)	Concentration (μg/m^3)	Concentration (ppbv)	Concentration (μg/m^3)	Concentration (ppbv)
SO2	1	690	250	Maximum	-	41.3	-	66.1	-	-
				Minimum	-	0	-	0	-	-
				Mean	-	0.9	-	0.6	-	-
				Standard Deviation	-	ND	-	ND	-	-
				# of Exceedances	-	0	-	0	-	-
	24	275	100	Maximum	-	24.7	-	14.9	-	-
				Minimum	-	0	-	0	-	-
				Mean	-	0.9	-	0.6	-	-
				Standard Deviation	-	ND	-	ND	-	-
				# of Exceedances	-	0	-	0	-	-
	Annual	55	20	Mean	-	0.9	-	0.6	-	-
				# of Exceedances	-	0	-	0	-	-
PM2.5	24	30	0	Maximum	96	-	30.4	-	-	-
				Minimum	0.2	-	0	-	-	-
				Mean	6.6	-	5.6	-	-	-
				98th Percentile	22.6	-	15.1	-	-	-
				Standard Deviation	ND	-	ND	-	-	-
				# of Exceedances	N/A	-	N/A	-	-	-
	Annual	10	N/A	Mean (Period)	6.6	-	5.6	-	-	-
				# of Exceedances	N/A	-	N/A	-	-	-
NO2	1	400	200	Maximum	-	56.5	-	62.6	-	-
				Minimum	-	0	-	0	-	-
				Mean	-	5.5	-	5.2	-	-
				Standard Deviation	-	ND	-	ND	-	-
				# of Exceedances	-	0	-	0	-	-
	24	200	100	Maximum	-	20.9	-	27.9	-	-
				Minimum	-	0	-	0	-	-
				Mean	-	5.5	-	5.2	-	-
				Standard Deviation	-	ND	-	ND	-	-
				# of Exceedances	-	0	-	0	-	-
	Annual	60	30	Mean	-	5.5	-	5.2	-	-
				# of Exceedances	-	0	-	0	-	-
TSP	24	120	NA	Maximum	102.16	-	89.51	-	-	-
				Minimum	8.94	-	11.11	-	-	-
				Arithmetic Mean	29.7	-	29.01	-	-	-
				# of Exceedances	0	-	0	-	-	-

Table B-4: TSP Monitoring at Fenceline Station (2013-2018).

Pollutant	Averaging Period	AAQC Standards			2013		2014		2015	
		$\mu g/m^3$	ppb		Concentration ($\mu g/m^3$)	Concentration (ppbv)	Concentration ($\mu g/m^3$)	Concentration (ppbv)	Concentration ($\mu g/m^3$)	Concentration (ppbv)
TSP	24	120	NA	Maximum	-	-	-	-	-	-
				Minimum	-	-	-	-	-	-
				Arithmetic Mean	-	-	-	-	-	-
				# of Exceedances	-	-	-	-	-	-

NOTE:

1) The fence line station was installed at the east property line of the DYEC, and started measuring metals and total particulate matter since 2016 year.

Table B-4: TSP Monitoring at Fenceline Station (2013-2018).

Pollutant	Averaging Period	AAQC Standards			2016		2017		2018	
		$\mu g/m^3$	ppb		Concentration ($\mu g/m^3$)	Concentration (ppbv)	Concentration ($\mu g/m^3$)	Concentration (ppbv)	Concentration ($\mu g/m^3$)	Concentration (ppbv)
TSP	24	120	NA	Maximum	80	-	86.1	-	93.6	-
				Minimum	11	-	12.3	-	8.2	-
				Arithmetic Mean	33	-	35	-	36.4	-
				# of Exceedances	0	-	0	-	0	-

NOTE:
1) The fence line station was installed at the east property line of the DYEC, and started measuring metals and total particulate matter since 2016 year.

Table B-5: PAH (Benzo(a)pyrene) monitoring at Courtice WPCP (Upwind), Rundle Road (Downwind) and Crago Road Stations.

Pollutant	Averaging Period	AAQC Standards		Courtice WPCP (Upwind) Station					
				2013	2014	2015	2016	2017	2018
		ng/m^3		Concentration (ng/m^3)	Concentration (ng/m^3)	Concentration (ng/m^3)	Concentration (ng/m^3)	Concentration (ng/m^3)	Concentration (ng/m^3)
Benzo(a)pyrene	24	0.05	Maximum	0.0648	0.132	-	0.104	0.088	1.81E-01
			Minimum	0.00635	0.00811	-	0.006	0.006	2.77E-03
			Arithmetic Mean	0.0189	0.0312	-	0.028	0.03	3.20E-02
			# of Exceedances	1	3	-	5	4	5

NOTE:

1) TSP/ metals, and PAHs were not measured in 2015 as per Section 1.2 of the Ambient Monitoring Plan (Stantec, 2012).

Table B-5: PAH (Benzo(a)pyrene) monitoring at Courtice WPCP (Upwind), Rundle Road (Downwind) and Crago Road Stations.

Pollutant	Averaging Period	AAQC Standards		Rundle Road (Downwind) Station					
				2013	2014	2015	2016	2017	2018
		ng/m^3		Concentration (ng/m^3)	Concentration (ng/m^3)	Concentration (ng/m^3)	Concentration (ng/m^3)	Concentration (ng/m^3)	Concentration (ng/m^3)
Benzo(a)pyrene	24	0.05	Maximum	0.413	0.288	-	0.207	0.158	1.39E-01
			Minimum	0.006	0.0066	-	0.005	0.009	2.49E-03
			Arithmetic Mean	0.0414	0.0497	-	0.043	0.043	3.39E-02
			# of Exceedances	3	4	-	7	8	7

NOTE:

1) TSP/ metals, and PAHs were not measured in 2015 as per Section 1.2 of the Ambient Monitoring Plan (Stantec, 2012).

Table B-5: PAH (Benzo(a)pyrene) monitoring at Courtice WPCP (Upwind), Rundle Road (Downwind) and Crago Road Stations.

Pollutant	Averaging Period	AAQC Standards		Crago Road Station					
				2013	2014	2015	2016	2017	2018
		ng/m^3		Concentration (ng/m^3)	Concentration (ng/m^3)	Concentration (ng/m^3)	Concentration (ng/m^3)	Concentration (ng/m^3)	Concentration (ng/m^3)
Benzo(a)pyrene	24	0.05	Maximum	-	-	-	8.12E-02	1.60E-01	-
			Minimum	-	-	-	5.60E-03	8.00E-03	-
			Arithmetic Mean	-	-	-	3.15E-02	3.69E-02	-
			# of Exceedances	-	-	-	4	6	-

NOTE:

1) TSP/ metals, and PAHs were not measured in 2015 as per Section 1.2 of the Ambient Monitoring Plan (Stantec, 2012).

Table B-6: Criteria Air Contaminants Monitoring Data at St Marys Cement, SMC1 (2014-2018).

Pollutant	Averaging Period	AAQC Standards	Summary Statistics	2014	2015	2016	2017	2018
		μg/m^3		Concentration (μg/m^3)	Concentration (μg/m^3)	Concentration (μg/m^3)	Concentration (μg/m^3)	Concentration (μg/m^3)
PM10	24	50	Maximum	86.7	71.8	92.3	93.9	51.4
			Minimum	0.5	0.5	0.1	0.0	2.2
			Mean	15.4	17.8	12.4	13.5	15.0
			Standard Deviation	9.0	9.8	8.0	9.1	7.2
			# of Exceedances	4	5	3	2	1

Table B-7: Criteria Air Contaminants Monitoring Data at St Marys Cement, SMC2 (2014-2018).

Pollutant	Averaging Period	AAQC Standards $\mu g/m^3$	Summary Statistics	2014 Concentration ($\mu g/m^3$)	2015 Concentration ($\mu g/m^3$)	2016 Concentration ($\mu g/m^3$)	2017 Concentration ($\mu g/m^3$)	2018 Concentration ($\mu g/m^3$)
PM10	24	50	Maximum	82.9	76.3	53.2	47.3	63.4
			Minimum	0.8	0.5	0.2	0.0	0.4
			Mean	14.1	13.5	9.4	9.9	10.5
			Standard Deviation	8.8	9.3	6.8	6.8	7.1
			# of Exceedances	5	3	1	0	2

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Table B-8: Data Recovery Rates for the DYEC Monitoring Stations.

Station	Pollutant	2013	2014	2015	2016	2017	2018
Courtice WPCP	PM2.5	75.0%	98.5%	93.0%	100.0%	94.0%	98.8%
	NOx	98.0%	99.5%	97.0%	98.0%	99.4%	98.4%
	NOx	98.0%	99.5%	97.0%	98.0%	99.4%	98.4%
	NO2	98.0%	99.5%	97.0%	98.0%	99.4%	98.4%
	SO2	97.0%	99.5%	97.0%	97.0%	99.5%	98.4%
	TSP & Metals	98.0%	93.0%	NA	95.0%	100.0%	96.7%
	PAHs	100.0%	100.0%	NA	96.0%	100.0%	93.5%
	D&F	100.0%	100.0%	67.0%	100.0%	100.0%	100.0%
Rundle Road	PM2.5	75.0%	99.5%	99.0%	95.0%	99.0%	99.3%
	NOx	83.0%	99.5%	99.0%	99.0%	99.5%	99.0%
	NOx	83.0%	99.5%	99.0%	99.0%	99.5%	99.0%
	NO2	83.0%	99.5%	99.0%	99.0%	99.5%	99.0%
	SO2	85.0%	98.5%	99.0%	99.0%	99.6%	96.6%
	TSP & Metals	95.0%	100.0%	NA	100.0%	98.0%	82.0%
	PAHs	100.0%	100.0%	NA	93.0%	97.0%	96.8%
	D&F	90.0%	100.0%	100.0%	95.0%	94.0%	100.0%
Fenceline	TSP & Metals	NA	NA	NA	96.0%	100%	89.5%
Crago Road	PM2.5	NA	NA	84%	98.0%	99%	NA
	NOx	NA	NA	98%	98.0%	100%	NA
	NOx	NA	NA	98%	98.0%	100%	NA
	NO2	NA	NA	98%	98.0%	100%	NA
	SO2	NA	NA	86%	98.0%	100%	NA
	TSP & Metals	NA	NA	NA	100%	100%	NA
	PAHs	NA	NA	NA	100%	100%	NA
	D&F	NA	NA	100%	100%	100%	NA

Table B-9: Summary of Regional Ambient Monitoring Data of Criteria Air Contaminants (2000 -2017).

Year	Station Name	MOECP Station ID	PM 2.5 (µg/m3)								NOx (ppb)							
			1-hr	1-hr	1-hr	1-hr	24-hr	24-hr	24-hr	24-hr	1-hr	1-hr	1-hr	1-hr	24-hr	24-hr	24-hr	24-hr
			50%	90%	Max	Annual	50%	90%	Max	Annual	50%	90%	Max	Annual	50%	90%	Max	Annual
2000	Toronto Downtown	31103					6	20	32	8.8	58.0	137.0	745.0	76.0	65	121	340	76
	Toronto East	33003									60	169	1692	87	72	148	427	87
	Toronto North	34020					6	19	36	8.3	53.0	154.0	1092.0	74.0	62	135	350	74
	Toronto West	35125																
	Etobicoke South 2	35033					7.0	21.0	33.0	9.5	83.0	224.0	1510.0	119.0			489	119
	Oshawa	45025					6	19	34	8.4	45.0	132.0	596.0	63.0	52	118	299	63
	Belleville	54012																
	Peterborough	59006									19	60	357	29	22	56	148	29
2001	Toronto Downtown	31103					7	19	51	9.1	55.0	128.0	645.0	69.0	62	108	209	69
	Toronto East	33003									56	149	683	76	70	122	253	76
	Toronto North	34020					6	19	45	8.7	49.0	145.0	803.0	68.0	62	120	237	68
	Toronto West	35125																
	Etobicoke South 2	35033					8.0	23.0	45.0	10.6	68.0	203.0	1232.0	96.0			320	96
	Oshawa	45025					7	20	40	9.1	43.0	126.0	827.0	61.0	50	112	292	61
	Belleville	54012																
	Peterborough	59006					5.0	18.0	44.0	8.0	17	56	370	27	20	47	150	27
2002	Toronto Downtown	31103					5	20	47	8.6	47.0	109.0	523.0	59.0	54	89	257	59
	Toronto East	33003					6.0	21.0	50.0	9.2	55	133	799	71	64	112	361	71
	Toronto North	34020					6	20	46	8.7	45.0	128.0	735.0	63.0	55	112	362	63
	Toronto West	35125																
	Etobicoke South 2	35033					6.0	20.0	49.0	9.1	66.0	194.0	1213.0	93.0			446	93
	Oshawa	45025					6	21	57	9.1	38.0	103.0	641.0	51.0	44	87	276	51
	Belleville	54012																
	Peterborough	59006					5.0	17.0	72.0	7.4	19	47	322	25	19	47	133	25
2003	Toronto Downtown	31103					6	18	48	8.4	47.0	113.0	660.0	61.0	54	94	254	61
	Toronto East	33003					6.0	19.0	49.0	8.8	51	141	1126	71	61	124	335	71
	Toronto North	34020					6	18	46	8.3	47.0	113.0	743.0	62.0	52	117	291	62
	Toronto West	35125																
	Etobicoke South 2	35033					8.0	22.0	52.0	INS	68.0	212.0	1194.0	100.0			389	100
	Oshawa	45025					6	17	46	7.8	34.0	102.0	502.0	48.0	40	87	241	48
	Belleville	54012					5	15	42	6.9	19	58	472	30	24	50	177	30
	Peterborough	59006					5.0	15.0	42.0	6.7	15	47	318	22	16	43	107	22
2004	Toronto Downtown	31103					4	17	37	7.1	39.0	103.0	528.0	53.0	46	91	191	53
	Toronto East	33003									51	137	799	68	58	121	262	68
	Toronto North	34020					5	18	43	7.4	38.0	115.0	641.0	INS	45	102	260	INS
	Toronto West	35125																
	Etobicoke South 2	35033					5.0	18.0	45.0	8.0	64.0	205.0	882.0	93.0			378	93
	Oshawa	45025					5	18	43	7.9	28.0	88.0	511.0	42.0	33	84	232	42
	Belleville	54012					4	15	37	6.4	17	53	500	27	21	51	149	27
	Peterborough	59006					3.0	15.0	39.0	5.9								

Table B-9: Summary of Regional Ambient Monitoring Data of Criteria Air Contaminants (2000 -2017).

Year	Station Name	MOECP Station ID	PM 2.5 (µg/m3)								NOx (ppb)							
			1-hr 50%	1-hr 90%	1-hr Max	1-hr Annual	24-hr 50%	24-hr 90%	24-hr Max	24-hr Annual	1-hr 50%	1-hr 90%	1-hr Max	1-hr Annual	24-hr 50%	24-hr 90%	24-hr Max	24-hr Annual
2005	Toronto Downtown	31103					5	21	43	8.5	41.0	98.0	551.0	53.0	47	83	303	53
	Toronto East	33003					5.0	21.0	44.0	8.4	47	126	1079	65	55	108	398	65
	Toronto North	34020					6	24	51	9.4	41.0	118.0	803.0	57.0	50	99	300	57
	Toronto West	35125																
	Etobicoke South 2	35033					7.0	24.0	48.0	10.4	64.0	199.0	957.0	94.0			421	94
	Oshawa	45025					5	20	44	8.1	19.0	43.0	261.0	INS	20	40	63	INS
	Belleville	54012					4	18	39	7	13	49	457	24	17	42	214	24
	Peterborough	59006					4.0	19.0	50.0	7.5								
2006	Toronto Downtown	31103					5	16	35	7.3	39.0	92.0	449.0	49.0	43	81	171	49
	Toronto East	33003					5.0	17.0	37.0	7.6	41	107	880	56	50	95	246	56
	Toronto North	34020					5	17	36	7.6	36.0	111.0	481.0	52.0	43	94	253	52
	Toronto West	35125																
	Etobicoke South 2	35033					6.0	19.0	38.0	8.8	60.0	194.0	1049.0	88.0			350	88
	Oshawa	45025					5	15	38	6.8	19.0	45.0	290.0	24.0	21	42	98	24
	Belleville	54012					4	14	34	6.2	8	28	286	14	10	26	111	14
	Peterborough	59006					4.0	15.0	36.0	6.3	9	36	278	17	13	34	98	17
2007	Toronto Downtown	31103					5	16	41	7.3	40.0	74.0	628.0	45.0	40	74	151	46
	Toronto East	33003					6.0	16.0	41.0	7.8	45	92	857	53	45	92	246	53
	Toronto North	34020					6	16.06	40	7.8	40.0	87.0	656.0	47.0	40	87	188	47
	Toronto West	35125																
	Etobicoke South 2	35033																
	Oshawa	45025					4	15	38.3	6.8	15.0	43.0	214.0	21.0	17	39	111	21
	Belleville	54012					4	14	38.79	6.1	14	32	353	18	14	32	132	18
	Peterborough	59006					4.0	13.6	39.3	6.4	13	32	222	16	13	32	84	16
2008	Toronto Downtown	31103									18	39	167	22.05	20.25	36.04	68.08	22.05
	Toronto East	33003									19	50	269	25.72	21.78	44.96	95.71	25.73
	Toronto North	34020									17	51	253	24.24	19.85	44.63	111.79	24.23
	Etobicoke South 2	35033																
	Toronto West	35125									28	72	414	36.97	33.74	62.21	153.79	37
	Oshawa	45026	4.0	15.0	45.0	6.3	4.5	13.0	30.6	6.3	8	24	140	11.66	9.63	21.69	48.63	11.75
	Belleville	54012	5.0	14.0	49.0	6.1	4.5	12.4	27.3	6.1	7	20	184	10.21	8.26	16.85	53	10.2
	Peterborough	59006	4.0	14.0	42.0	6.0	4.4	12.4	24.2	6.0	7	21	152	9.97	7.83	19.21	49.46	9.93
2009	Toronto Downtown	31103									18.0	39.0	198.0	21.6	20.1	34.4	85.8	21.6
	Toronto East	33003									16.0	45.0	323.0	22.7	19.8	41.3	113.5	22.7
	Toronto North	34020									17.0	47.0	289.0	22.8	19.4	42.2	98.8	22.8
	Etobicoke South 2	35033																
	Toronto West	35125									24.0	65.0	445.0	32.5	30.0	50.8	117.6	32.5
	Oshawa	45026	4.0	11.0	40.0	5.2	4.3	9.7	33.0	5.2	7.0	22.0	95.0	10.4	8.2	20.1	44.1	10.4
	Belleville	54012	4.0	11.0	36.0	4.9	4.2	9.3	30.8	4.9	5.0	16.0	142.0	7.9	6.8	14.2	30.1	7.9
	Peterborough	59006	4.0	11.0	31.0	4.9	4.0	9.5	17.9	4.9	5.0	15.0	168.0	7.5	5.5	15.6	36.3	7.5

Table B-9: Summary of Regional Ambient Monitoring Data of Criteria Air Contaminants (2000 -2017).

Year	Station Name	MOECP Station ID	PM 2.5 (µg/m3)								NOx (ppb)							
			1-hr 50%	1-hr 90%	1-hr Max	1-hr Annual	24-hr 50%	24-hr 90%	24-hr Max	24-hr Annual	1-hr 50%	1-hr 90%	1-hr Max	1-hr Annual	24-hr 50%	24-hr 90%	24-hr Max	24-hr Annual
2010	Toronto Downtown	31103									16.0	36.0	269.0	20.3	17.7	34.0	92.9	20.3
	Toronto East	33003									17.0	43.0	350.0	22.6	19.0	40.9	90.9	22.6
	Toronto North	34020									14.0	40.0	212.0	20.0	16.6	35.7	87.9	20.0
	Etobicoke South 2	35033									22.0	61.0	437.0	31.5	26.8	56.3	134.6	31.5
	Toronto West	35125									25.0	64.0	373.0	33.5	28.7	56.0	184.3	33.5
	Oshawa	45026	4.0	14.0	44.0	5.6	4.2	12.3	30.1	5.6	6.0	20.0	132.0	9.5	7.8	18.8	38.0	9.5
	Belleville	54012	3.0	10.0	30.0	4.3	3.4	8.1	24.5	4.3	5.0	15.0	153.0	7.8	6.5	14.0	34.9	7.8
	Peterborough	59006	3.0	12.0	49.0	5.1	3.8	11.0	26.2	5.1	5.0	13.0	119.0	6.7	5.2	13.3	29.7	6.8
2011	Toronto Downtown	31103									15.0	34.0	161.0	18.4	16.3	30.9	64.4	18.4
	Toronto East	33003									17.0	45.0	260.0	22.8	20.0	40.4	101.2	22.8
	Toronto North	34020									16.0	43.0	241.0	21.5	18.0	38.8	104.2	21.5
	Etobicoke South 2	35033									5.0	25.0	342.0	11.3	7.7	24.0	87.7	11.3
	Toronto West	35125									23.0	64.0	309.0	31.5	28.6	50.9	103.3	31.4
	Oshawa	45026	4.0	12.0	38.0	5.4	4.2	11.0	22.4	5.4	6.0	19.0	107.0	9.2	7.0	18.8	53.4	9.3
	Belleville	54012	4.0	11.0	46.0	4.8	3.6	9.4	19.5	4.8	5.0	17.0	148.0	8.7	6.7	14.7	53.3	8.7
	Peterborough	59006	4.0	12.0	48.0	5.5	4.4	10.8	22.7	5.5	4.0	13.0	99.0	6.6	4.6	12.2	41.3	6.6
2012	Toronto Downtown	31103									12.0	31.0	181.0	16.2	14.3	26.7	63.5	16.2
	Toronto East	33003									15.0	41.0	248.0	20.6	17.4	35.2	109.3	20.6
	Toronto North	34020									13.0	39.0	211.0	18.5	14.9	34.2	89.0	18.5
	Etobicoke South 2	35033									3.0	22.0	257.0	9.1	5.9	19.2	78.6	9.1
	Toronto West	35125									19.0	59.0	249.0	27.6	23.1	45.9	113.6	27.6
	Oshawa	45026	4.0	12.0	38.0	5.5	4.4	11.3	20.7	5.5	6.0	16.0	117.0	7.8	6.7	13.8	45.2	7.8
	Belleville	54012	4.0	11.0	44.0	5.1	4.1	10.3	19.3	5.1	4.0	13.0	114.0	6.4	5.1	11.5	30.0	6.4
	Peterborough	59006	4.0	11.0	50.0	4.9	3.9	10.0	21.3	4.9	4.0	11.0	98.0	5.4	4.1	9.5	34.9	5.4
2013	Toronto Downtown	31103	7.0	16.0	75.0	8.2	7.0	15.6	32.9	8.3	13.0	30.0	129.0	16.1	15.0	25.7	45.8	16.1
	Toronto East	33003	6.0	16.0	64.0	8.2	6.9	15.8	33.2	8.2	15.0	37.0	329.0	19.3	17.3	31.5	92.0	19.3
	Toronto North	34020	7.0	16.0	54.0	8.3	7.2	14.9	32.0	8.3	13.0	34.0	170.0	17.0	14.9	30.8	66.6	17.0
	Etobicoke South 2	35033	7.0	18.0	70.0	9.4	8.0	17.0	39.6	9.4	3.0	18.0	264.0	8.2	5.9	17.3	83.4	8.3
	Toronto West	35125	7.0	18.0	75.0	8.8	7.6	15.7	33.5	8.8	18.0	50.0	325.0	24.7	22.0	40.7	108.9	24.7
	Oshawa	45026	6.0	14.0	77.0	7.4	6.2	13.2	40.5	7.4	5.0	15.0	85.0	7.4	6.5	13.2	33.9	7.4
	Belleville	54012	5.0	14.0	79.0	6.9	5.8	12.0	39.7	6.9	4.0	13.0	136.0	6.3	5.2	11.1	24.0	6.3
	Peterborough	59006	6.0	15.0	77.0	7.4	6.2	13.0	36.5	7.4	5.0	13.0	93.0	6.6	5.4	12.5	27.8	6.6
2014	Toronto Downtown	31103	7.0	17.0	52.0	8.7	7.7	14.6	32.5	8.7	13.0	30.0	162.0	16.5	14.8	25.4	76.0	16.5
	Toronto East	33003	7.0	17.0	60.0	8.9	7.5	15.7	32.8	8.9	15.0	39.0	396.0	20.4	17.4	34.2	139.0	20.4
	Toronto North	34020	7.0	17.0	58.0	9.2	8.1	15.4	33.4	9.2	13.0	35.0	300.0	17.7	15.9	30.5	115.7	17.7
	Etobicoke South 2	35033	8.0	19.0	63.0	9.8	8.4	16.1	39.1	9.8	3.0	18.0	368.0	8.8	5.7	16.2	131.8	8.8
	Toronto West	35125	7.0	17.0	65.0	9.1	7.9	14.6	34.5	9.1	20.0	52.0	362.0	26.5	22.9	42.7	140.5	26.6
	Oshawa	45026	6.0	15.0	47.0	7.7	6.8	13.2	27.0	7.7	6.0	18.0	132.0	8.8	6.9	16.6	48.9	8.8
	Belleville	54012	6.0	13.0	43.0	6.8	6.0	11.5	23.1	6.8	3.0	12.0	158.0	5.7	4.5	9.6	37.3	5.7
	Peterborough	59006	5.0	14.0	61.0	6.9	6.1	11.4	29.3	6.9	5.0	14.0	134.0	7.0	5.3	13.3	54.4	7.1

Table B-9: Summary of Regional Ambient Monitoring Data of Criteria Air Contaminants (2000 -2017).

Year	Station Name	MOECP Station ID	PM 2.5 (µg/m3)								NOx (ppb)							
			1-hr	1-hr	1-hr	1-hr	24-hr	24-hr	24-hr	24-hr	1-hr	1-hr	1-hr	1-hr	24-hr	24-hr	24-hr	24-hr
			50%	90%	Max	Annual	50%	90%	Max	Annual	50%	90%	Max	Annual	50%	90%	Max	Annual
2015	Toronto Downtown	31103	7.0	17.0	54.0	8.4	6.8	15.2	34.0	8.4	13.0	30.0	129.0	16.0	14.3	26.8	50.2	16.0
	Toronto East	33003	6.0	17.0	60.0	8.5	6.8	15.4	39.0	8.5	14.0	40.0	209.0	19.7	16.9	34.3	67.4	19.7
	Toronto North	34020	7.0	18.0	54.0	9.4	7.8	17.0	37.0	9.4	12.0	34.0	157.0	16.9	13.8	31.6	66.0	16.9
	Etobicoke South 2	35033	7.0	19.0	56.0	9.4	7.8	17.6	37.1	9.4	3.0	19.0	366.0	8.4	5.4	17.4	95.8	8.4
	Toronto West	35125	7.0	17.0	58.0	8.5	7.0	16.2	32.8	8.6	19.0	51.0	263.0	25.7	21.8	42.0	108.8	25.7
	Oshawa	45026	6.0	16.0	50.0	7.5	6.0	14.9	26.3	7.5	6.0	19.0	112.0	8.9	6.9	17.8	31.8	8.9
	Belleville	54012	5.0	14.0	41.0	6.6	5.4	13.0	21.7	6.5	4.0	13.0	132.0	6.2	4.9	12.2	38.4	6.2
	Peterborough	59006	5.0	14.0	56.0	6.8	5.7	13.1	26.4	6.8	4.0	13.0	119.0	6.6	4.7	13.4	39.0	6.6
2016	Toronto Downtown	31103	6.0	13.0	36.0	7.0	6.0	11.7	21.9	7.0	13.0	29.0	182.0	15.9	14.4	25.0	65.2	15.9
	Toronto East	33003	6.0	13.0	54.0	7.0	5.9	12.3	27.1	7.0	12.0	34.0	333.0	17.5	14.7	29.9	120.2	17.7
	Toronto North	34020	6.0	14.0	46.0	7.3	6.3	12.9	25.6	7.4	11.0	32.0	252.0	15.4	12.4	29.1	94.8	15.4
	Etobicoke South 2	35033	7.0	15.0	53.0	8.1	7.0	13.3	28.3	8.1	2.0	16.0	276.0	7.4	4.3	15.4	91.5	7.4
	Toronto West	35125	6.0	13.0	43.0	7.0	6.0	12.0	24.4	7.0	17.0	48.0	339.0	23.8	20.7	37.3	134.8	23.7
	Oshawa	45026	5.0	12.0	70.0	5.9	5.2	10.8	21.7	6.0	6.0	18.0	140.0	8.8	6.9	16.7	45.8	8.8
	Belleville	54012	4.0	11.0	36.0	5.5	4.7	9.4	20.2	5.5	4.0	13.0	145.0	6.7	5.4	11.5	36.6	6.7
	Peterborough	59006	5.0	12.0	38.0	5.8	5.2	10.4	20.8	5.8	4.0	12.0	121.0	5.9	4.4	11.6	37.0	5.9
2017	Toronto Downtown	31103	6.0	14.0	82.0	7.4	6.4	12.9	27.8	7.4	12.0	30.0	122.0	15.7	14.0	25.0	62.5	15.7
	Toronto East	33003	6.0	14.0	40.0	7.4	6.5	12.4	27.0	7.4	12.0	32.0	189.0	15.8	13.9	27.5	66.3	15.8
	Toronto North	34021	6.0	15.0	58.0	7.4	6.6	12.5	27.2	7.4	9.0	28.0	191.0	13.5	11.3	25.1	65.8	13.5
	Etobicoke South 2	35033																
	Toronto West	35125	6.0	14.0	47.0	7.4	6.6	12.0	25.3	7.4	16.0	46.0	203.0	22.7	19.5	39.9	97.0	22.6
	Oshawa	45026	5.0	12.0	49.0	5.9	5.1	10.5	23.5	5.9	6.0	18.0	128.0	8.8	7.2	15.6	57.4	8.8
	Belleville	54012	4.0	12.0	39.0	5.8	4.9	10.7	20.3	5.8	3.0	12.0	102.0	5.4	4.3	9.6	31.9	5.3
	Peterborough	59006	4.0	12.0	44.0	5.8	4.8	10.6	21.9	5.8	4.0	11.0	91.0	5.8	4.7	9.9	43.1	5.8

NOTES:

NR - Not reported (method change); Blank cells indicate that no data was available

1) Station 34021 replaced station 34020 as the Toronto North site in 2017.

2) Criteria air contaminants monitoring data from all above AQ monitoring stations are provided by MOECP, except monitoring data from Etobicoke South 2 station which is obtained from NAPS (NAPS station 60435) .

3) Note that NAPS has not made 2017 AQ monitoring data publicly available, except PAHs and PM.

4) Note that MOECP reported real-time PM2.5 with the Thermo Scientific TEOM 1400AB/SES until 2012 and adopted Thermo Scientific SHARP 5030 method in 2013. As before 2013 year PM2.5 level at all Ontario stations were measured using a less accurate method, the historical PM2.5 monitoring data are not comparable to the monitored PM levels after 2013 and thus not presented in the table.

5) Note that Etobicoke South 2 station (NAPS ID 60435) started criteria air contaminants monitoring in 2010 and VOC monitoring in 2009.

Table B-9: Summary of Regional Ambient Monitoring Data of Criteria Air Contaminants (2000 -2017).

Year	Station Name	MOECP Station ID	NO2 (ppb)								NO (ppb)							
			1-hr 50%	1-hr 90%	1-hr Max	1-hr Annual	24-hr 50%	24-hr 90%	24-hr Max	24-hr Annual	1-hr 50%	1-hr 90%	1-hr Max	1-hr Annual	24-hr 50%	24-hr 90%	24-hr Max	24-hr Annual
2000	Toronto Downtown	31103	47	83	164	50	47	74	99	50								
	Toronto East	33003	41	77	162	45	43	67	93	45								
	Toronto North	34020	39	77	152	43	42	69	99	43								
	Toronto West	35125																
	Etobicoke South 2	35033	49	86	199	53			121	53								
	Oshawa	45025	34	70	158	37	34	62	89	37								
	Belleville	54012																
	Peterborough	59006	15	45	109	20	17	37	81	20								
2001	Toronto Downtown	31103	47	81	173	51	50	72	92	51								
	Toronto East	33003	39	73	143	43	42	60	85	43								
	Toronto North	34020	38	73	152	41	41	64	92	41								
	Toronto West	35125																
	Etobicoke South 2	35033	45	83	370	49			122	49								
	Oshawa	45025	32	66	160	36	34	56	94	36								
	Belleville	54012																
	Peterborough	59006	13	43	103	20	17	37	73	20								
2002	Toronto Downtown	31103	39	73	186	44	43	62	100	44								
	Toronto East	33003	39	68	167	41	41	58	86	41								
	Toronto North	34020	36	71	152	39	39	61	88	39								
	Toronto West	35125																
	Etobicoke South 2	35033	45	81	207	49			118	49								
	Oshawa	45025	28	62	156	32	31	52	75	32								
	Belleville	54012																
	Peterborough	59006	15	35	100	18	15	35	70	18								
2003	Toronto Downtown	31103	39	75	164	44	41	65	117	44								
	Toronto East	33003	36	71	182	40	38	63	117	40								
	Toronto North	34020	45	85	149	38	36	61	107	38								
	Toronto West	35125																
	Etobicoke South 2	35033	45	85	188	50			118	50								
	Oshawa	45025	26	58	154	30	29	49	90	30								
	Belleville	54012	15	41	113	20	18	31	64	20								
	Peterborough	59006	11	34	92	16	12	30	55	16								
2004	Toronto Downtown	31103	34	68	149	38	36	58	96	38								
	Toronto East	33003	34	68	139	37	35	58	96	37								
	Toronto North	34020	28	64	150	INS	30	57	92	INS								
	Toronto West	35125																
	Etobicoke South 2	35033	43	86	224	49			145	49								
	Oshawa	45025	23	55	152	27	24	47	71	27								
	Belleville	54012	13	38	113	18	16	30	58	18								
	Peterborough	59006																

Table B-9: Summary of Regional Ambient Monitoring Data of Criteria Air Contaminants (2000 -2017).

Year	Station Name	MOECP Station ID	NO2 (ppb)								NO (ppb)							
			1-hr 50%	1-hr 90%	1-hr Max	1-hr Annual	24-hr 50%	24-hr 90%	24-hr Max	24-hr Annual	1-hr 50%	1-hr 90%	1-hr Max	1-hr Annual	24-hr 50%	24-hr 90%	24-hr Max	24-hr Annual
2005	Toronto Downtown	31103	38	56	141	39	38	57	113	39								
	Toronto East	33003	32	70	196	38	36	56	122	38								
	Toronto North	34020	32	70	167	36	35	57	109	36								
	Toronto West	35125																
	Etobicoke South 2	35033	45	83	186	52			128	52								
	Oshawa	45025	13	26	86	INS	15	24	36	INS								
	Belleville	54012	9	34	107	15	12	28	71	15								
	Peterborough	59006																
2006	Toronto Downtown	31103	32	62	141	36	33	55	85	36								
	Toronto East	33003	28	58	128	33	31	49	85	33								
	Toronto North	34020	28	64	132	33	32	56	79	33								
	Toronto West	35125																
	Etobicoke South 2	35033	39	81	167	45			100	45								
	Oshawa	45025	13	34	81	17	15	30	47	17								
	Belleville	54012	6	21	83	8	6	18	34	8								
	Peterborough	59006	8	26	77	12	9	23	47	12								
2007	Toronto Downtown	31103	32	52	141	34	32	52	87	34								
	Toronto East	33003	30	51	145	32	30	51	86	32								
	Toronto North	34020	29	53	118	32	29	53	80	32								
	Toronto West	35125																
	Etobicoke South 2	35033																
	Oshawa	45025	13	27	83	15	13	27	58	15								
	Belleville	54012	10	22	94	12	10	22	49	12								
	Peterborough	59006	10	22	79	12	10	22	50	12								
2008	Toronto Downtown	31103	15	30	68	17.02	16.5	26.13	43.42	17.02	2	11	122	5.02	3.63	9.75	31.79	5.02
	Toronto East	33003	14	31	66	16.49	15.4	25.3	43.79	16.5	4	20	213	9.25	6.96	18.81	66.29	9.25
	Toronto North	34020	14	33	81	16.53	14.92	29.25	48.29	16.53	3	19	194	7.72	4.33	17.27	63.38	7.71
	Etobicoke South 2	35033																
	Toronto West	35125	19	36	78	20.8	19.9	31.02	48.79	20.8	7	39	356	16.18	12.45	36.94	115.71	16.2
	Oshawa	45026	6	18	51	8.47	7.08	15.78	29	8.56	2	7	91	3.19	2.36	6.3	27.83	3.19
	Belleville	54012	5	15	55	7.25	6.17	12.48	22.13	7.25	1	6	145	3.01	2.08	5.33	34	3.01
	Peterborough	59006	5	15	51	6.98	5.83	13.28	24.63	6.95	1	6	100	2.98	1.83	6.69	28.88	2.97
2009	Toronto Downtown	31103	14.0	29.0	67.0	16.5	15.9	25.4	39.6	16.5	3.0	10.0	138.0	5.1	3.8	9.8	46.2	5.1
	Toronto East	33003	12.0	29.0	79.0	14.9	14.0	23.2	38.7	14.9	3.0	17.0	263.0	7.8	5.4	17.2	76.3	7.8
	Toronto North	34020	14.0	31.0	71.0	15.8	14.8	26.9	45.5	15.8	3.0	18.0	219.0	7.1	4.7	15.7	55.0	7.1
	Etobicoke South 2	35033																
	Toronto West	35125	17.0	34.0	68.0	19.0	18.2	28.4	41.5	19.0	5.0	34.0	377.0	13.4	10.5	25.7	85.9	13.4
	Oshawa	45026	5.0	16.0	43.0	7.4	6.1	13.6	25.8	7.4	2.0	6.0	66.0	3.0	2.0	6.8	18.3	3.0
	Belleville	54012	4.0	13.0	44.0	6.0	5.4	10.6	19.1	6.0	1.0	4.0	103.0	1.9	1.4	3.8	11.5	1.9
	Peterborough	59006	4.0	12.0	50.0	5.6	4.2	11.6	22.5	5.6	1.0	3.0	121.0	1.9	1.1	4.0	15.5	1.9

Table B-9: Summary of Regional Ambient Monitoring Data of Criteria Air Contaminants (2000 -2017).

Year	Station Name	MOECP Station ID	NO2 (ppb)								NO (ppb)							
			1-hr	1-hr	1-hr	1-hr	24-hr	24-hr	24-hr	24-hr	1-hr	1-hr	1-hr	1-hr	24-hr	24-hr	24-hr	24-hr
			50%	90%	Max	Annual	50%	90%	Max	Annual	50%	90%	Max	Annual	50%	90%	Max	Annual
2010	Toronto Downtown	31103	14.0	29.0	69.0	16.1	15.2	25.0	41.3	16.1	2.0	8.0	201.0	4.1	2.7	8.7	61.0	4.2
	Toronto East	33003	12.0	28.0	67.0	14.8	13.8	23.7	34.6	14.8	4.0	17.0	289.0	7.8	5.3	15.6	65.0	7.8
	Toronto North	34020	12.0	29.0	65.0	14.3	13.2	24.2	43.6	14.3	2.0	11.0	158.0	5.7	3.5	11.2	57.6	5.7
	Etobicoke South 2	35033	17.0	35.0	94.0	19.3	18.7	29.6	52.5	19.3	5.0	28.0	365.0	12.3	8.1	25.6	99.5	12.3
	Toronto West	35125	18.0	35.0	66.0	20.1	19.5	29.7	43.8	20.1	5.0	31.0	322.0	13.4	9.5	27.9	144.3	13.4
	Oshawa	45026	5.0	15.0	41.0	7.2	5.9	13.0	26.0	7.2	1.0	5.0	91.0	2.3	1.6	5.2	18.9	2.3
	Belleville	54012	4.0	12.0	42.0	5.5	4.7	10.3	16.6	5.5	1.0	5.0	112.0	2.3	1.7	4.2	21.6	2.3
	Peterborough	59006	3.0	11.0	38.0	5.0	4.0	10.3	20.8	5.0	1.0	3.0	93.0	1.7	1.1	3.4	14.2	1.7
2011	Toronto Downtown	31103	13.0	27.0	54.0	14.9	13.8	23.3	35.8	14.9	1.0	8.0	123.0	3.4	2.2	7.8	28.5	3.4
	Toronto East	33003	13.0	30.0	60.0	15.2	14.5	23.4	40.8	15.2	3.0	17.0	218.0	7.6	5.0	17.2	60.3	7.6
	Toronto North	34020	13.0	30.0	61.0	15.4	14.0	25.8	43.5	15.4	3.0	14.0	181.0	6.2	4.0	13.2	62.0	6.2
	Etobicoke South 2	35033	16.0	33.0	67.0	18.4	17.9	26.8	44.3	18.4	5.0	25.0	342.0	11.3	7.6	24.0	87.7	11.3
	Toronto West	35125	17.0	34.0	71.0	19.1	18.4	28.0	42.2	19.1	5.0	33.0	253.0	12.4	9.3	26.1	71.5	12.3
	Oshawa	45026	5.0	15.0	47.0	7.0	5.5	14.3	32.0	7.0	1.0	5.0	64.0	2.3	1.4	5.5	31.0	2.3
	Belleville	54012	4.0	13.0	47.0	6.3	5.2	10.7	26.2	6.3	1.0	5.0	111.0	2.3	1.5	4.2	28.0	2.3
	Peterborough	59006	3.0	9.0	46.0	4.3	3.1	8.7	27.9	4.3	1.0	4.0	87.0	2.2	1.3	4.7	21.0	2.2
2012	Toronto Downtown	31103	11.0	25.0	57.0	13.4	12.6	20.6	35.8	13.4	1.0	7.0	126.0	2.8	1.6	6.0	29.6	2.8
	Toronto East	33003	12.0	27.0	52.0	14.0	13.1	21.9	33.8	14.0	3.0	15.0	208.0	6.6	4.3	14.5	75.5	6.5
	Toronto North	34020	11.0	27.4	60.0	13.4	12.3	23.8	35.2	13.4	2.0	12.0	151.0	5.0	2.5	11.3	57.8	5.0
	Etobicoke South 2	35033	14.0	32.0	69.0	16.4	16.0	25.5	39.2	16.5	3.0	26.0	257.0	10.2	5.9	19.2	78.6	9.1
	Toronto West	35125	14.0	31.0	70.0	16.3	15.7	25.1	34.6	16.3	4.0	29.0	214.0	11.3	7.6	25.5	81.1	11.3
	Oshawa	45026	4.0	12.0	36.0	5.6	5.0	9.7	23.2	5.6	1.0	5.0	90.0	2.1	1.4	4.4	25.1	2.1
	Belleville	54012	3.0	10.0	33.0	4.7	3.9	8.2	17.9	4.7	0.0	3.0	92.0	1.6	0.9	3.2	20.8	1.6
	Peterborough	59006	2.0	8.0	32.0	3.7	2.8	7.2	18.2	3.7	1.0	3.0	89.0	1.8	1.1	3.2	16.8	1.8
2013	Toronto Downtown	31103	12.0	24.0	60.0	13.4	13.2	20.0	32.7	13.5	1.0	7.0	85.0	2.6	1.8	6.0	16.7	2.6
	Toronto East	33003	11.0	26.0	79.0	13.6	13.0	21.1	31.0	13.6	3.0	12.0	250.0	5.7	4.2	11.4	63.1	5.7
	Toronto North	34020	11.0	25.0	56.0	12.9	12.6	21.4	33.8	12.9	2.0	10.0	121.0	4.1	2.5	9.8	35.6	4.1
	Etobicoke South 2	35033	14.0	32.0	83.0	17.0	16.4	25.5	40.7	17.0	3.0	18.0	264.0	8.2	5.9	17.3	83.4	8.2
	Toronto West	35125	14.0	30.0	76.0	16.1	15.6	23.4	37.9	16.1	3.0	21.0	249.0	8.6	6.6	18.3	73.6	8.6
	Oshawa	45026	4.0	12.0	38.0	5.9	5.4	10.2	22.1	5.9	1.0	3.0	61.0	1.5	1.0	3.4	11.9	1.5
	Belleville	54012	3.0	10.0	37.0	4.7	3.9	8.3	17.1	4.7	1.0	3.0	99.0	1.7	1.3	3.0	11.3	1.7
	Peterborough	59006	4.0	10.0	41.0	5.0	4.2	9.5	17.8	5.0	1.0	3.0	57.0	1.7	1.2	3.1	10.1	1.7
2014	Toronto Downtown	31103	12.0	25.0	65.0	14.0	13.0	20.8	41.9	14.0	1.0	6.0	99.0	2.5	1.6	5.1	34.1	2.5
	Toronto East	33003	12.0	27.0	89.0	14.2	12.6	23.0	48.0	14.2	3.0	13.0	316.0	6.2	4.6	12.0	90.9	6.2
	Toronto North	34020	11.0	26.0	69.0	13.4	12.5	21.3	42.6	13.4	2.0	10.0	231.0	4.3	2.5	9.2	73.8	4.3
	Etobicoke South 2	35033	14.0	32.0	95.0	16.9	15.77	25.08	56.46	16.91	3.0	18.0	368.0	8.8	5.6	16.2	131.8	8.8
	Toronto West	35125	15.0	31.0	83.0	17.1	15.6	25.9	51.2	17.1	4.0	23.0	282.0	9.5	6.9	19.6	89.1	9.5
	Oshawa	45026	5.0	14.0	45.0	6.8	5.7	12.2	27.0	6.8	1.0	4.0	93.0	2.0	1.3	4.2	21.8	2.0
	Belleville	54012	3.0	10.0	46.0	4.5	3.8	7.9	20.2	4.5	0.0	3.0	117.0	1.2	0.8	2.3	17.7	1.2
	Peterborough	59006	4.0	11.0	43.0	5.3	4.0	10.9	26.5	5.3	1.0	3.0	93.0	1.8	1.3	3.0	28.0	1.8

Table B-9: Summary of Regional Ambient Monitoring Data of Criteria Air Contaminants (2000 -2017).

Year	Station Name	MOECP Station ID	NO2 (ppb)								NO (ppb)							
			1-hr 50%	1-hr 90%	1-hr Max	1-hr Annual	24-hr 50%	24-hr 90%	24-hr Max	24-hr Annual	1-hr 50%	1-hr 90%	1-hr Max	1-hr Annual	24-hr 50%	24-hr 90%	24-hr Max	24-hr Annual
2015	Toronto Downtown	31103	11.0	25.0	58.0	13.3	12.3	21.1	32.6	13.3	1.0	6.0	88.0	2.7	1.8	5.6	21.8	2.7
	Toronto East	33003	11.0	28.0	69.0	13.9	12.6	22.9	38.0	13.9	2.0	12.0	164.0	5.8	4.1	12.8	42.6	5.8
	Toronto North	34020	10.0	26.0	60.0	12.9	11.2	22.4	39.8	12.9	1.0	9.0	111.0	3.9	2.3	8.2	37.4	3.9
	Etobicoke South 2	35033	14.0	33.0	78.0	16.8	15.75	26.46	38.75	16.73	3.0	19.0	366.0	8.4	5.4	17.4	95.8	8.3
	Toronto West	35125	14.0	31.0	63.0	16.6	15.5	25.7	41.8	16.6	4.0	23.0	221.0	9.2	7.0	18.7	67.1	9.1
	Oshawa	45026	5.0	14.0	46.0	6.6	5.3	12.9	25.9	6.6	1.0	5.0	78.0	2.3	1.5	5.2	16.5	2.3
	Belleville	54012	3.0	10.0	45.0	4.8	4.0	9.4	24.4	4.8	0.0	3.0	91.0	1.5	0.9	3.3	14.1	1.5
	Peterborough	59006	3.0	11.0	44.0	5.1	3.8	10.3	22.5	5.1	1.0	3.0	77.0	1.5	0.9	2.8	16.5	1.5
2016	Toronto Downtown	31103	11.0	25.0	57.0	13.3	12.5	20.8	31.0	13.3	1.0	5.0	139.0	2.6	1.7	4.7	34.3	2.5
	Toronto East	33003	9.0	25.0	68.0	12.1	11.4	20.1	44.9	12.2	2.0	10.0	281.0	5.4	3.5	10.2	75.0	5.5
	Toronto North	34020	9.0	25.0	56.0	12.0	10.7	22.0	38.8	12.0	1.0	7.0	197.0	3.5	1.9	7.4	56.1	3.4
	Etobicoke South 2	35033	12.0	30.0	70.0	14.7	13.63	24.60	42.75	14.74	2.0	16.0	276.0	7.4	4.3	15.4	91.5	7.4
	Toronto West	35125	13.0	31.0	64.0	15.7	15.1	23.9	40.6	15.7	2.0	19.0	297.0	8.2	5.5	16.3	94.3	8.1
	Oshawa	45026	4.0	14.0	43.0	6.3	5.4	12.5	29.3	6.4	1.0	5.0	104.0	2.5	1.7	4.9	20.8	2.5
	Belleville	54012	4.0	11.0	43.0	5.1	4.5	8.6	20.8	5.0	1.0	3.0	110.0	1.8	1.4	3.3	18.4	1.8
	Peterborough	59006	3.0	10.0	58.0	4.5	3.5	9.1	22.3	4.6	1.0	2.0	71.0	1.3	0.8	2.5	14.9	1.3
2017	Toronto Downtown	31103	11.0	24.0	50.0	13.0	12.1	20.2	33.8	13.0	1.0	6.0	83.0	2.7	1.9	5.0	29.9	2.7
	Toronto East	33003	9.0	23.0	55.0	11.5	10.4	18.9	34.2	11.4	2.0	9.0	149.0	4.4	3.3	8.9	34.5	4.4
	Toronto North	34021	8.0	22.0	49.0	10.5	9.4	18.3	35.7	10.5	1.0	6.0	154.0	3.0	1.6	6.9	37.9	3.0
	Etobicoke South 2	35033																
	Toronto West	35125	13.0	28.0	55.0	15.0	14.2	23.1	40.7	14.9	3.0	18.0	153.0	7.7	5.1	17.3	62.1	7.6
	Oshawa	45026	5.0	13.0	41.0	6.4	5.5	11.1	30.8	6.4	1.0	5.0	88.0	2.4	1.8	4.4	26.7	2.4
	Belleville	54012	3.0	9.0	35.0	4.3	3.6	7.5	17.3	4.3	0.0	3.0	75.0	1.1	0.6	2.3	19.7	1.1
	Peterborough	59006	3.0	10.0	41.0	4.7	3.8	8.3	27.4	4.7	1.0	2.0	58.0	1.2	0.9	1.8	15.7	1.2

NOTES:

NR - Not reported (method change); Blank cells indicate that no data was available

1) Station 34021 replaced station 34020 as the Toronto North site in 2017.

2) Criteria air contaminants monitoring data from all above AQ monitoring stations are provided by MOECP, except monitoring data from Etobicoke South 2 station which is obtained from NAPS (NAPS station 60435) .

3) Note that NAPS has not made 2017 AQ monitoring data publicly available, except PAHs and PM.

4) Note that MOECP reported real-time PM2.5 with the Thermo Scientific TEOM 1400AB/SES until 2012 and adopted Thermo Scientific SHARP 5030 method in 2013. As before 2013 year PM2.5 level at all Ontario stations were measured using a less accurate method, the historical PM2.5 monitoring data are not comparable to the monitored PM levels after 2013 and thus not presented in the table.

5) Note that Etobicoke South 2 station (NAPS ID 60435) started criteria air contaminants monitoring in 2010 and VOC monitoring in 2009.

Table B-9: Summary of Regional Ambient Monitoring Data of Criteria Air Contaminants (2000 -2017).

Year	Station Name	MOECP Station ID	SO2 (ppb)								CO (ppm)							
			1-hr 50%	1-hr 90%	1-hr Max	1-hr Annual	24-hr 50%	24-hr 90%	24-hr Max	24-hr Annual	1-hr 50%	1-hr 90%	1-hr Max	1-hr Annual	8-hr 50%	8-hr 90%	8-hr Max	8-hr Annual
2000	Toronto Downtown	31103	7.8	23.5	133.4	12.3			45	12	1511	2426	4132	1442			3113	
	Toronto East	33003																
	Toronto North	34020																
	Toronto West	35125	2.0	8.0	165.0	3.6	2.5	7.6	24.8	3.6								
	Etobicoke South 2	35033	13.1	26.2	170.0	13.6			51	14	2255	3044	6890	1969			4807	
	Oshawa	45025																
	Belleville	54012																
	Peterborough	59006	2.6	10.5	54.9	4.4			28	4	927	1270	3685	938			2255	
2001	Toronto Downtown	31103	10.5	23.5	125.6	13.1			47	13	1019	1568	3674	1064			2518	
	Toronto East	33003																
	Toronto North	34020																
	Toronto West	35125	3.0	9.0	147.0	4.7	3.9	8.4	20.9	4.7								
	Etobicoke South 2	35033	7.8	23.5	251.1	10.5			45	11	973	1888	5265	1087			3319	
	Oshawa	45025																
	Belleville	54012																
	Peterborough	59006	2.6	10.5	52.3	4.7			26	5	618	1568	3811	801			2632	
2002	Toronto Downtown	31103	7.8	23.5	104.6	10.5			47	11	893	1293	3296	824			2449	
	Toronto East	33003																
	Toronto North	34020																
	Toronto West	35125																
	Etobicoke South 2	35033	7.8	23.5	112.5	11.8			42	12	984	1476	5253	1019			3949	
	Oshawa	45025																
	Belleville	54012																
	Peterborough	59006	2.6	10.5	54.9	3.7			29	4	526	813	3125	538			1831	
2003	Toronto Downtown	31103					6	19	55	8	538	858	2747	561			1625	
	Toronto East	33003																
	Toronto North	34020																
	Toronto West	35125	2.0	6.0	107.0	2.9	2.0	6.0	17.2	2.9								
	Etobicoke South 2	35033	5.2	20.9	164.8	INS			47	INS	698	1030	4029	INS			2907	
	Oshawa	45025																
	Belleville	54012	2.6	7.8	44.5	3.9	2.9	8.2	18.3	3.9	423	790	1751	458			1339	
	Peterborough	59006	2.6	10.5	62.8	3.4	2	9	24	3	401	824	3308	446			1751	
2004	Toronto Downtown	31103	2.6	15.7	143.9	5.8	4	13	45	6	366	607	2175	INS			1431	
	Toronto East	33003																
	Toronto North	34020																
	Toronto West	35125	1.0	6.0	82.0	2.7	1.8	6.2	15.1	2.7								
	Etobicoke South 2	35033																
	Oshawa	45025																
	Belleville	54012	0	5.2	47.1	2.1	1.1	5.2	18.3	2.1	401	572	1740	INS			984	
	Peterborough	59006																

Table B-9: Summary of Regional Ambient Monitoring Data of Criteria Air Contaminants (2000 -2017).

Year	Station Name	MOECP Station ID	SO2 (ppb)								CO (ppm)							
			1-hr	1-hr	1-hr	1-hr	24-hr	24-hr	24-hr	24-hr	1-hr	1-hr	1-hr	1-hr	8-hr	8-hr	8-hr	8-hr
			50%	90%	Max	Annual	50%	90%	Max	Annual	50%	90%	Max	Annual	50%	90%	Max	Annual
2005	Toronto Downtown	31103	5.2	15.7	125.6	7.3	6	15	29	7	355	629	1820	INS			1316	
	Toronto East	33003																
	Toronto North	34020																
	Toronto West	35125	1.0	5.0	54.0	2.3	1.6	5.1	12.2	2.3								
	Etobicoke South 2	35033									286	504	2094	INS			1190	
	Oshawa	45025																
	Belleville	54012	2.6	7.8	73.2	2.9	2.2	7	15.7	2.9								
	Peterborough	59006																
2006	Toronto Downtown	31103	2.6	13.1	99.4	5.0	4	11	34	5	343	584	1671	378			1167	
	Toronto East	33003																
	Toronto North	34020																
	Toronto West	35125	1.0	5.0	27.0	2.0	1.5	4.3	9.4	2.0								
	Etobicoke South 2	35033																
	Oshawa	45025																
	Belleville	54012																
	Peterborough	59006																
2007	Toronto Downtown	31103	3.4	11.7	102.0	4.9	3	12	34	5	229	378	1946	229				
	Toronto East	33003																
	Toronto North	34020																
	Toronto West	35125	1.0	4.0	26.0	1.5	1.0	3.4	10.8	1.5								
	Etobicoke South 2	35033																
	Oshawa	45025																
	Belleville	54012																
	Peterborough	59006																
2008	Toronto Downtown	31103	1	4	33	1.59	1.17	3.54	9.46	1.6	0.08	0.2	0.93	0.09	0.08	0.19	0.46	0.09
	Toronto East	33003																
	Toronto North	34020																
	Etobicoke South 2	35033																
	Toronto West	35125	1.0	4.0	24.0	1.4	0.9	3.4	7.6	1.4	0.21	0.38	1.73	0.22	0.22	0.36	1.00	0.22
	Oshawa	45026																
	Belleville	54012																
	Peterborough	59006																
2009	Toronto Downtown	31103	1.0	2.0	23.0	0.9	0.6	2.4	6.5	0.9	0.2	0.3	1.1	0.2	0.17	0.28	0.93	0.17
	Toronto East	33003																
	Toronto North	34020																
	Etobicoke South 2	35033																
	Toronto West	35125	1.0	3.0	18.0	1.2	0.8	2.7	8.3	1.2	0.2	0.4	1.6	0.2	0.21	0.34	1.00	0.22
	Oshawa	45026																
	Belleville	54012																
	Peterborough	59006																

Table B-9: Summary of Regional Ambient Monitoring Data of Criteria Air Contaminants (2000 -2017).

Year	Station Name	MOECP Station ID	SO2 (ppb)								CO (ppm)							
			1-hr	1-hr	1-hr	1-hr	24-hr	24-hr	24-hr	24-hr	1-hr	1-hr	1-hr	1-hr	8-hr	8-hr	8-hr	8-hr
			50%	90%	Max	Annual	50%	90%	Max	Annual	50%	90%	Max	Annual	50%	90%	Max	Annual
2010	Toronto Downtown	31103	1.0	2.0	22.0	0.9	0.9	2.0	6.9	0.9	0.2	0.4	1.5	0.3	0.25	0.38	1.08	0.26
	Toronto East	33003																
	Toronto North	34020																
	Etobicoke South 2	35033																
	Toronto West	35125	1.0	2.0	27.0	0.9	0.9	1.9	5.0	0.9	0.2	0.3	1.8	0.2	0.20	0.33	1.23	0.21
	Oshawa	45026																
	Belleville	54012																
	Peterborough	59006																
2011	Toronto Downtown	31103																
	Toronto East	33003																
	Toronto North	34020																
	Etobicoke South 2	35033																
	Toronto West	35125	1.0	3.0	17.0	1.5	1.2	2.5	5.0	1.5	0.2	0.3	1.4	0.2	0.19	0.31	0.72	0.20
	Oshawa	45026																
	Belleville	54012																
	Peterborough	59006																
2012	Toronto Downtown	31103																
	Toronto East	33003																
	Toronto North	34020																
	Etobicoke South 2	35033																
	Toronto West	35125	0.0	2.0	18.0	0.6	0.3	1.7	3.5	0.6	0.2	0.4	1.4	0.3	0.23	0.36	0.83	0.25
	Oshawa	45026																
	Belleville	54012																
	Peterborough	59006																
2013	Toronto Downtown	31103																
	Toronto East	33003																
	Toronto North	34020																
	Etobicoke South 2	35033																
	Toronto West	35125	0.0	1.0	15.0	0.6	0.3	1.3	4.6	0.6	0.2	0.4	1.4	0.3	0.24	0.35	1.05	0.25
	Oshawa	45026																
	Belleville	54012																
	Peterborough	59006																
2014	Toronto Downtown	31103																
	Toronto East	33003																
	Toronto North	34020																
	Etobicoke South 2	35033																
	Toronto West	35125	1.0	1.0	21.0	0.7	0.7	1.5	5.8	0.7	0.2	0.4	1.6	0.3	0.24	0.36	0.89	0.26
	Oshawa	45026																
	Belleville	54012																
	Peterborough	59006																

Table B-9: Summary of Regional Ambient Monitoring Data of Criteria Air Contaminants (2000 -2017).

Year	Station Name	MOECP Station ID	SO2 (ppb)								CO (ppm)							
			1-hr	1-hr	1-hr	1-hr	24-hr	24-hr	24-hr	24-hr	1-hr	1-hr	1-hr	1-hr	8-hr	8-hr	8-hr	8-hr
			50%	90%	Max	Annual	50%	90%	Max	Annual	50%	90%	Max	Annual	50%	90%	Max	Annual
2015	Toronto Downtown	31103																
	Toronto East	33003																
	Toronto North	34020																
	Etobicoke South 2	35033																
	Toronto West	35125	1.0	2.0	15.0	1.0	1.0	1.9	4.3	1.0	0.2	0.4	1.3	0.2	0.23	0.35	0.77	0.25
	Oshawa	45026																
	Belleville	54012																
	Peterborough	59006																
2016	Toronto Downtown	31103																
	Toronto East	33003																
	Toronto North	34020																
	Etobicoke South 2	35033																
	Toronto West	35125	1.0	1.0	10.0	0.6	0.7	1.2	2.8	0.6	0.2	0.4	1.7	0.2	0.23	0.34	1.13	0.25
	Oshawa	45026																
	Belleville	54012																
	Peterborough	59006																
2017	Toronto Downtown	31103																
	Toronto East	33003																
	Toronto North	34021																
	Etobicoke South 2	35033																
	Toronto West	35125	0.0	1.0	11.0	0.5	0.3	1.0	2.8	0.5	0.2	0.4	1.2	0.2	0.23	0.34	0.79	0.25
	Oshawa	45026																
	Belleville	54012																
	Peterborough	59006																

NOTES:

NR - Not reported (method change); Blank cells indicate that no data was available

1) Station 34021 replaced station 34020 as the Toronto North site in 2017.

2) Criteria air contaminants monitoring data from all above AQ monitoring stations are provided by MOECP, except monitoring data from Etobicoke South 2 station which is obtained from NAPS (NAPS station 60435) .

3) Note that NAPS has not made 2017 AQ monitoring data publicly available, except PAHs and PM.

4) Note that MOECP reported real-time PM2.5 with the Thermo Scientific TEOM 1400AB/SES until 2012 and adopted Thermo Scientific SHARP 5030 method in 2013. As before 2013 year PM2.5 level at all Ontario stations were measured using a less accurate method, the historical PM2.5 monitoring data are not comparable to the monitored PM levels after 2013 and thus not presented in the table.

5) Note that Etobicoke South 2 station (NAPS ID 60435) started criteria air contaminants monitoring in 2010 and VOC monitoring in 2009.

Table B-10: Summary of Available PAH Monitoring Data from all selected AQ monitoring stations (2008-2017).

AQ Monitoring Station	MOECP ID	NAPS ID	Location	City	Year	# of Samples	24-h Average Benzo(a)pyrene (µg/m3)			Ontario AAQC
							50%	90%	Max	
Etobicoke South-2	35033	S60435	461 Kipling Avenue	Toronto	2010	29	4.23E-05	1.40E-04	2.04E-04	5.00E-05
					2011	7	4.00E-05	2.08E-04	3.58E-04	5.00E-05
Toronto West	35125	S60430	125 Resources Road	Toronto	2016	54	3.65E-05	8.89E-05	1.93E-04	5.00E-05
					2017	4	1.18E-04	5.22E-04	6.93E-04	5.00E-05
Roadside - 401W-Toronto	83126	S60438	401W - 125 Resources Road	Toronto	2017	4	2.40E-04	4.37E-04	5.11E-04	5.00E-05
Background - Downsview	34021	S60440	4905 Dufferin St.	Toronto	2017	6	6.91E-04	8.49E-04	8.84E-04	5.00E-05

NOTES:

1) The Ontario AAQC uses Benzo(a)pyrene as a surrogate of total Polycyclic Aromatic Hydrocarbons (PAHs).

Table B-11: VOC Monitoring Data Summary for Etobicoke South-2 Station (2009-2016).

Year	Station Name	MOECP Station ID	Percentile	Ethane (ug/m3)	Ethylene (ug/m3)	Acetylene (ug/m3)	Propylene (ug/m3)	Propane (ug/m3)	1-Propyne (ug/m3)	Isobutane (ug/m3)	1-Butene/Isobutene (ug/m3)	1,3-Butadiene (ug/m3)	Butane (ug/m3)	trans-2-Butene (ug/m3)	2,2-Dimethylpropane (ug/m3)	1-Butyne (ug/m3)	cis-2-Butene (ug/m3)
2009	Etobicoke South 2	35033	50%	3.416	0.886	0.516	0.230	2.602	-	0.876	0.178	0.034	1.536	0.048	-	-	0.040
	Etobicoke South 2	35033	90%	6.460	1.577	1.098	0.400	5.570	-	2.460	0.286	0.064	3.354	0.116	-	-	0.104
	Etobicoke South 2	35033	Max.	9.819	12.943	12.567	0.820	8.788	-	7.662	0.560	0.128	6.262	0.228	-	-	0.162
2010	Etobicoke South 2	35033	50%	3.437	0.998	0.625	0.268	2.366	0.040	1.329	0.240	0.041	1.999	0.082	0.012	0.000	0.062
	Etobicoke South 2	35033	90%	6.510	2.062	1.126	0.553	4.993	0.080	3.439	0.452	0.082	6.019	0.184	0.026	0.003	0.139
	Etobicoke South 2	35033	Max.	7.955	4.794	2.377	1.676	8.789	0.227	6.068	1.515	0.281	10.151	0.666	0.042	0.008	0.468
2011	Etobicoke South 2	35033	50%	3.921	1.305	0.836	0.309	3.189	0.050	1.182	0.193	0.046	2.106	0.048	0.013	0.002	0.035
	Etobicoke South 2	35033	90%	5.689	1.967	1.262	0.441	4.213	0.072	1.989	0.335	0.068	3.122	0.150	0.018	0.003	0.095
	Etobicoke South 2	35033	Max.	6.546	2.052	1.424	0.489	4.290	0.082	2.759	0.483	0.079	5.480	0.286	0.019	0.004	0.201
2012	Etobicoke South 2	35033	50%	3.581	1.024	0.562	0.282	2.640	0.038	0.979	0.202	0.040	1.657	0.064	0.013	0.000	0.057
	Etobicoke South 2	35033	90%	6.681	1.668	0.993	0.596	6.030	0.081	2.313	0.441	0.082	4.407	0.169	0.030	0.004	0.151
	Etobicoke South 2	35033	Max.	10.033	3.332	1.580	1.350	13.093	0.133	5.414	0.941	0.175	12.579	0.465	0.049	0.006	0.375
2013	Etobicoke South 2	35033	50%	3.965	1.089	0.635	0.262	2.808	0.035	0.882	0.188	0.037	1.749	0.052	0.014	0.000	0.050
	Etobicoke South 2	35033	90%	6.425	2.083	1.129	0.566	4.856	0.059	2.307	0.389	0.072	3.668	0.129	0.033	0.003	0.123
	Etobicoke South 2	35033	Max.	19.433	40.043	30.592	1.512	9.293	0.693	3.858	0.797	0.205	11.195	0.609	0.052	0.020	0.553
2014	Etobicoke South 2	35033	50%	3.416	0.886	0.516	0.230	2.602	-	0.876	0.178	0.034	1.536	0.048	-	-	0.040
	Etobicoke South 2	35033	90%	6.460	1.577	1.098	0.400	5.570	-	2.460	0.286	0.064	3.354	0.116	-	-	0.104
	Etobicoke South 2	35033	Max.	9.819	12.943	12.567	0.820	8.788	-	7.662	0.560	0.128	6.262	0.228	-	-	0.162
2015	Etobicoke South 2	35033	50%	4.304	1.122	0.671	0.263	3.399	-	1.059	0.186	0.039	2.255	0.063	-	-	0.055
	Etobicoke South 2	35033	90%	6.808	1.603	0.853	0.452	5.328	-	2.008	0.324	0.066	4.131	0.126	-	-	0.117
	Etobicoke South 2	35033	Max.	10.611	2.894	1.747	0.757	8.002	-	3.704	0.501	0.116	7.065	0.314	-	-	0.290
2016	Etobicoke South 2	35033	50%	2.817	0.817	0.580	0.212	2.707	-	0.822	0.132	0.028	1.574	0.037	-	-	0.037
	Etobicoke South 2	35033	90%	7.377	1.952	1.322	0.360	5.699	-	2.151	0.270	0.051	4.332	0.147	-	-	0.129
	Etobicoke South 2	35033	Max.	14.602	5.076	4.690	1.311	12.177	-	6.876	0.780	0.160	21.532	0.665	-	-	0.549

NOTES:

1) Among all AQ monitoring stations located within regional study area, VOCs are only measured at station 60435 (Etobicoke South-2) for the time period from 2009 to 2016 year.

Table B-11: VOC Monitoring Data Summary for Etobicoke South-2 Station (2009-2016).

Year	Station Name	MOECP Station ID	Percentile	Isopentane (ug/m3)	1-Pentene (ug/m3)	2-Methyl-1-butene (ug/m3)	3-Methyl-1-butene (ug/m3)	Pentane (ug/m3)	Isoprene (ug/m3)	trans-2-Pentene (ug/m3)	cis-2-Pentene (ug/m3)	2-Methyl-2-butene (ug/m3)	2,2-Dimethylbutane (ug/m3)	Cyclopentene (ug/m3)	4-Methyl-1-pentene (ug/m3)	3-Methyl-1-pentene (ug/m3)	Cyclopentane (ug/m3)
2009	Etobicoke South 2	35033	50%	1.202	0.044	0.050	0.016	1.012	0.036	0.052	0.026	0.050	0.046	-	-	-	0.082
	Etobicoke South 2	35033	90%	3.578	0.114	0.164	0.042	3.264	0.214	0.174	0.090	0.178	0.128	-	-	-	0.234
	Etobicoke South 2	35033	Max.	6.736	0.180	0.298	0.086	11.666	0.494	0.318	0.166	0.338	0.224	-	-	-	0.442
2010	Etobicoke South 2	35033	50%	1.733	0.050	0.060	0.018	1.213	0.045	0.066	0.033	0.062	0.053	0.009	0.000	0.003	0.105
	Etobicoke South 2	35033	90%	4.007	0.100	0.141	0.040	3.286	0.247	0.189	0.091	0.192	0.121	0.024	0.006	0.012	0.270
	Etobicoke South 2	35033	Max.	8.051	0.250	0.386	0.109	10.696	0.515	0.454	0.233	0.565	0.171	0.083	0.053	0.030	0.563
2011	Etobicoke South 2	35033	50%	0.954	0.035	0.035	0.012	0.789	0.018	0.033	0.018	0.034	0.035	0.006	0.000	0.004	0.069
	Etobicoke South 2	35033	90%	1.563	0.054	0.062	0.022	1.316	0.031	0.053	0.029	0.062	0.057	0.011	0.002	0.007	0.116
	Etobicoke South 2	35033	Max.	2.179	0.085	0.125	0.040	2.376	0.037	0.138	0.071	0.162	0.076	0.023	0.006	0.009	0.141
2012	Etobicoke South 2	35033	50%	1.627	0.051	0.060	0.020	1.437	0.057	0.062	0.034	0.059	0.054	0.010	0.000	0.005	0.121
	Etobicoke South 2	35033	90%	3.179	0.108	0.123	0.042	2.945	0.357	0.134	0.071	0.144	0.099	0.024	0.006	0.012	0.217
	Etobicoke South 2	35033	Max.	8.901	0.241	0.391	0.124	6.340	0.667	0.400	0.201	0.421	0.218	0.056	0.031	0.026	0.539
2013	Etobicoke South 2	35033	50%	1.392	0.047	0.054	0.018	1.236	0.036	0.048	0.026	0.048	0.053	0.007	0.000	0.005	0.096
	Etobicoke South 2	35033	90%	3.484	0.098	0.127	0.042	3.194	0.224	0.141	0.075	0.157	0.107	0.021	0.007	0.012	0.211
	Etobicoke South 2	35033	Max.	7.975	0.182	0.318	0.100	6.074	0.598	0.320	0.165	0.356	0.229	0.039	0.022	0.022	0.406
2014	Etobicoke South 2	35033	50%	1.202	0.044	0.050	0.016	1.012	0.036	0.052	0.026	0.050	0.046	-	-	-	0.082
	Etobicoke South 2	35033	90%	3.578	0.114	0.164	0.042	3.264	0.214	0.174	0.090	0.178	0.128	-	-	-	0.234
	Etobicoke South 2	35033	Max.	6.736	0.180	0.298	0.086	11.666	0.494	0.318	0.166	0.338	0.224	-	-	-	0.442
2015	Etobicoke South 2	35033	50%	1.767	0.056	0.065	0.020	1.625	0.040	0.066	0.034	0.067	0.061	-	-	-	0.115
	Etobicoke South 2	35033	90%	4.297	0.116	0.160	0.047	5.195	0.200	0.157	0.084	0.173	0.124	-	-	-	0.274
	Etobicoke South 2	35033	Max.	6.183	0.218	0.401	0.110	11.139	0.584	0.408	0.213	0.447	0.218	-	-	-	0.414
2016	Etobicoke South 2	35033	50%	1.663	0.050	0.066	0.017	1.340	0.041	0.064	0.034	0.065	0.052	-	-	-	0.094
	Etobicoke South 2	35033	90%	4.593	0.104	0.143	0.044	3.326	0.353	0.155	0.079	0.182	0.124	-	-	-	0.217
	Etobicoke South 2	35033	Max.	16.511	0.314	0.630	0.135	9.934	1.114	0.717	0.363	0.966	0.462	-	-	-	0.565

NOTES:

1) Among all AQ monitoring stations located within regional study area, VOCs are only measured at station 60435 (Etobicoke South-2) for the time period from 2009 to 2016 year.

Table B-11: VOC Monitoring Data Summary for Etobicoke South-2 Station (2009-2016).

Year	Station Name	MOECP Station ID	Percentile	2,3-Dimethylbutane (ug/m3)	trans-4-Methyl-2-pentene (ug/m3)	2-Methylpentane (ug/m3)	cis-4-Methyl-2-pentene (ug/m3)	3-Methylpentane (ug/m3)	1-Hexene/2-Methyl-1-Pentene (ug/m3)	Hexane (ug/m3)	trans-2-Hexene (ug/m3)	2-methyl-2-Pentene (ug/m3)	2-Ethyl-1-Butene (ug/m3)	trans-3-Methyl-2-pentene (ug/m3)	cis-2-Hexene (ug/m3)	cis-3-Methyl-2-pentene (ug/m3)	2,2-Dimethylpentane (ug/m3)
2009	Etobicoke South 2	35033	50%	0.072	-	0.320	0.006	0.212	0.030	0.274	0.010	-	-	0.000	0.010	0.006	-
	Etobicoke South 2	35033	90%	0.202	-	0.948	0.014	0.646	0.062	0.628	0.023	-	-	0.000	0.020	0.016	-
	Etobicoke South 2	35033	Max.	0.462	-	1.766	0.028	1.244	0.092	1.464	0.036	-	-	0.000	0.030	0.024	-
2010	Etobicoke South 2	35033	50%	0.086	0.000	0.456	0.006	0.333	0.032	0.334	0.010	-	-	0.000	0.000	0.000	0.014
	Etobicoke South 2	35033	90%	0.221	0.005	1.137	0.018	0.775	0.063	0.822	0.031	-	-	0.000	0.015	0.007	0.038
	Etobicoke South 2	35033	Max.	0.397	0.013	1.760	0.055	1.254	0.159	1.552	0.076	-	-	0.000	0.039	0.029	0.065
2011	Etobicoke South 2	35033	50%	0.053	0.000	0.240	0.004	0.183	0.027	0.229	0.007	-	-	0.000	0.003	0.006	0.009
	Etobicoke South 2	35033	90%	0.094	0.002	0.443	0.007	0.318	0.037	0.382	0.011	-	-	0.000	0.010	0.007	0.015
	Etobicoke South 2	35033	Max.	0.123	0.004	0.574	0.013	0.378	0.046	0.454	0.017	-	-	0.000	0.013	0.017	0.018
2012	Etobicoke South 2	35033	50%	0.087	0.000	0.429	0.006	0.293	0.036	0.399	0.010	-	-	0.000	0.000	0.000	0.016
	Etobicoke South 2	35033	90%	0.161	0.004	0.816	0.016	0.567	0.068	0.769	0.024	-	-	0.000	0.012	0.008	0.030
	Etobicoke South 2	35033	Max.	0.421	0.010	2.207	0.043	1.457	0.140	1.585	0.057	-	-	0.000	0.054	0.048	0.060
2013	Etobicoke South 2	35033	50%	0.077	0.000	0.352	0.006	0.245	0.029	0.335	0.009	-	0.000	0.000	0.000	0.000	0.013
	Etobicoke South 2	35033	90%	0.193	0.003	0.845	0.013	0.561	0.057	0.694	0.020	-	0.000	0.000	0.017	0.009	0.028
	Etobicoke South 2	35033	Max.	0.356	0.007	1.889	0.032	1.200	0.101	1.342	0.048	-	0.000	0.000	0.049	0.026	0.056
2014	Etobicoke South 2	35033	50%	0.072	-	0.320	0.006	0.212	0.030	0.274	0.010	-	-	0.000	0.010	0.006	-
	Etobicoke South 2	35033	90%	0.202	-	0.948	0.014	0.646	0.062	0.628	0.023	-	-	0.000	0.020	0.016	-
	Etobicoke South 2	35033	Max.	0.462	-	1.766	0.028	1.244	0.092	1.464	0.036	-	-	0.000	0.030	0.024	-
2015	Etobicoke South 2	35033	50%	0.115	-	0.416	0.006	0.284	0.034	0.374	0.011	-	-	0.000	0.007	0.007	-
	Etobicoke South 2	35033	90%	0.253	-	1.021	0.015	0.734	0.073	0.838	0.022	-	-	0.006	0.015	0.018	-
	Etobicoke South 2	35033	Max.	0.454	-	1.536	0.031	1.086	0.115	1.222	0.034	-	-	0.062	0.018	0.028	-
2016	Etobicoke South 2	35033	50%	0.096	-	0.344	0.003	0.252	0.028	0.305	0.008	-	-	0.000	0.006	0.008	-
	Etobicoke South 2	35033	90%	0.218	-	0.793	0.011	0.564	0.051	0.619	0.019	-	-	0.009	0.016	0.023	-
	Etobicoke South 2	35033	Max.	0.643	-	2.454	0.061	1.602	0.136	2.073	0.075	-	-	0.064	0.037	0.067	-

NOTES:

1) Among all AQ monitoring stations located within regional study area, VOCs are only measured at station 60435 (Etobicoke South-2) for the time period from 2009 to 2016 year.

Table B-11: VOC Monitoring Data Summary for Etobicoke South-2 Station (2009-2016).

Year	Station Name	MOECP Station ID	Percentile	Methylcyclopentane (ug/m3)	2,4-Dimethylpentane (ug/m3)	2,2,3-Trimethylbutane (ug/m3)	1-Methylcyclopentene (ug/m3)	Benzene (ug/m3)	Cyclohexane (ug/m3)	2-Methylhexane (ug/m3)	Cyclohexene (ug/m3)	3-Methylhexane (ug/m3)	1-Heptene (ug/m3)	2,2,4-Trimethylpentane (ug/m3)	trans-3-Heptene (ug/m3)	cis-3-Heptene (ug/m3)	Heptane (ug/m3)
2009	Etobicoke South 2	35033	50%	0.130	0.042	-	-	0.440	0.060	0.196	-	0.252	-	0.158	-	-	0.202
	Etobicoke South 2	35033	90%	0.316	0.108	-	-	0.772	0.112	0.422	-	0.594	-	0.348	-	-	0.530
	Etobicoke South 2	35033	Max.	0.564	0.208	-	-	1.360	0.238	1.134	-	1.524	-	0.744	-	-	1.432
2010	Etobicoke South 2	35033	50%	0.152	0.047	0.005	0.007	0.524	0.063	0.228	0.000	0.274	0.000	0.149	0.000	-	0.221
	Etobicoke South 2	35033	90%	0.427	0.121	0.015	0.021	0.921	0.143	0.476	0.000	0.593	0.000	0.386	0.000	-	0.620
	Etobicoke South 2	35033	Max.	0.736	0.215	0.021	0.076	1.557	0.623	1.257	0.009	1.695	0.000	0.732	0.000	-	1.582
2011	Etobicoke South 2	35033	50%	0.096	0.030	0.003	0.005	0.556	0.053	0.159	0.000	0.209	-	0.121	0.000	-	0.185
	Etobicoke South 2	35033	90%	0.164	0.049	0.005	0.009	0.710	0.078	0.238	0.000	0.297	-	0.170	0.007	-	0.252
	Etobicoke South 2	35033	Max.	0.196	0.059	0.007	0.014	0.826	0.096	0.246	0.000	0.323	-	0.204	0.009	-	0.306
2012	Etobicoke South 2	35033	50%	0.159	0.045	0.004	0.008	0.448	0.065	0.202	0.000	0.247	-	0.153	0.000	-	0.242
	Etobicoke South 2	35033	90%	0.327	0.090	0.013	0.019	0.867	0.171	0.443	0.000	0.480	-	0.292	0.000	-	0.541
	Etobicoke South 2	35033	Max.	0.717	0.219	0.085	0.055	1.398	0.246	1.035	0.000	1.250	-	0.704	0.010	-	1.038
2013	Etobicoke South 2	35033	50%	0.146	0.044	0.005	0.006	0.456	0.060	0.243	0.000	0.312	-	0.178	0.000	-	0.260
	Etobicoke South 2	35033	90%	0.292	0.091	0.011	0.013	0.858	0.109	0.461	0.000	0.589	-	0.312	0.002	-	0.521
	Etobicoke South 2	35033	Max.	0.601	0.201	0.020	0.034	1.273	0.217	0.770	0.000	0.996	-	0.507	0.004	-	1.359
2014	Etobicoke South 2	35033	50%	0.130	0.042	-	-	0.440	0.060	0.196	-	0.252	-	0.158	-	-	0.202
	Etobicoke South 2	35033	90%	0.316	0.108	-	-	0.772	0.112	0.422	-	0.594	-	0.348	-	-	0.530
	Etobicoke South 2	35033	Max.	0.564	0.208	-	-	1.360	0.238	1.134	-	1.524	-	0.744	-	-	1.432
2015	Etobicoke South 2	35033	50%	0.161	0.063	-	-	0.529	0.077	0.279	-	0.353	0.000	0.192	-	-	0.278
	Etobicoke South 2	35033	90%	0.390	0.118	-	-	0.658	0.157	0.463	-	0.611	0.089	0.406	-	-	0.573
	Etobicoke South 2	35033	Max.	0.525	0.168	-	-	1.402	0.278	0.647	-	0.827	0.152	0.601	-	-	0.736
2016	Etobicoke South 2	35033	50%	0.130	0.053	-	-	0.395	0.058	0.197	-	0.247	0.000	0.171	-	-	0.194
	Etobicoke South 2	35033	90%	0.261	0.093	-	-	0.765	0.100	0.441	-	0.539	0.026	0.369	-	-	0.450
	Etobicoke South 2	35033	Max.	0.881	0.337	-	-	1.481	0.376	1.486	-	2.057	0.038	1.073	-	-	2.116

NOTES:

1) Among all AQ monitoring stations located within regional study area, VOCs are only measured at station 60435 (Etobicoke South-2) for the time period from 2009 to 2016 year.

Table B-11: VOC Monitoring Data Summary for Etobicoke South-2 Station (2009-2016).

Year	Station Name	MOECP Station ID	Percentile	trans-2-Heptene (ug/m3)	cis-2-Heptene (ug/m3)	2,2-Dimethylhexane (ug/m3)	Methylcyclohexane (ug/m3)	2,5-Dimethylhexane (ug/m3)	2,4-Dimethylhexane (ug/m3)	2,3,4-Trimethylpentane (ug/m3)	Toluene (ug/m3)	2-Methylheptane (ug/m3)	1-Methylcyclohexene (ug/m3)	4-Methylheptane (ug/m3)	3-Methylheptane (ug/m3)	cis-1,3-Dimethylcyclohexane (ug/m3)	trans-1,4-Dimethylcyclohexane (ug/m3)
2009	Etobicoke South 2	35033	50%	-	-	-	0.080	0.024	0.028	0.048	1.142	0.048	-	0.018	0.040	-	-
	Etobicoke South 2	35033	90%	-	-	-	0.166	0.046	0.056	0.104	3.092	0.094	-	0.036	0.088	-	-
	Etobicoke South 2	35033	Max.	-	-	-	0.340	0.094	0.118	0.208	7.816	0.174	-	0.068	0.170	-	-
2010	Etobicoke South 2	35033	50%	0.003	0.000	-	0.087	0.023	0.029	0.049	1.543	0.054	0.002	0.021	0.048	0.033	0.014
	Etobicoke South 2	35033	90%	0.007	0.000	-	0.248	0.061	0.076	0.137	4.847	0.158	0.004	0.056	0.144	0.129	0.049
	Etobicoke South 2	35033	Max.	0.019	0.000	-	0.532	0.143	0.170	0.272	10.237	0.290	0.012	0.116	0.293	0.250	0.096
2011	Etobicoke South 2	35033	50%	0.002	0.000	-	0.070	0.022	0.023	0.040	1.115	0.050	0.002	0.017	0.041	0.027	0.010
	Etobicoke South 2	35033	90%	0.003	0.000	-	0.102	0.032	0.035	0.058	1.841	0.070	0.003	0.028	0.065	0.036	0.016
	Etobicoke South 2	35033	Max.	0.004	0.000	-	0.114	0.034	0.043	0.071	2.078	0.079	0.004	0.030	0.071	0.046	0.021
2012	Etobicoke South 2	35033	50%	0.003	0.000	-	0.086	0.026	0.031	0.050	1.320	0.047	0.002	0.019	0.046	0.031	0.012
	Etobicoke South 2	35033	90%	0.006	0.000	-	0.221	0.050	0.061	0.100	3.167	0.121	0.004	0.044	0.107	0.075	0.027
	Etobicoke South 2	35033	Max.	0.019	0.000	-	0.404	0.119	0.141	0.252	8.353	0.252	0.021	0.104	0.244	0.185	0.081
2013	Etobicoke South 2	35033	50%	0.003	0.000	-	0.090	0.028	0.029	0.051	1.299	0.048	0.002	0.018	0.043	0.031	0.011
	Etobicoke South 2	35033	90%	0.005	0.000	-	0.179	0.057	0.061	0.106	2.834	0.093	0.004	0.038	0.090	0.088	0.028
	Etobicoke South 2	35033	Max.	0.010	0.000	-	0.310	0.081	0.101	0.161	5.530	0.188	0.006	0.074	0.180	0.191	0.058
2014	Etobicoke South 2	35033	50%	-	-	-	0.080	0.024	0.028	0.048	1.142	0.048	-	0.018	0.040	-	-
	Etobicoke South 2	35033	90%	-	-	-	0.166	0.046	0.056	0.104	3.092	0.094	-	0.036	0.088	-	-
	Etobicoke South 2	35033	Max.	-	-	-	0.340	0.094	0.118	0.208	7.816	0.174	-	0.068	0.170	-	-
2015	Etobicoke South 2	35033	50%	-	-	-	0.112	0.026	0.033	0.061	1.427	0.061	-	0.020	0.048	-	-
	Etobicoke South 2	35033	90%	-	-	-	0.241	0.054	0.065	0.121	3.736	0.124	-	0.043	0.097	-	-
	Etobicoke South 2	35033	Max.	-	-	-	0.293	0.076	0.088	0.194	6.786	0.189	-	0.066	0.164	-	-
2016	Etobicoke South 2	35033	50%	-	-	-	0.072	0.024	0.027	0.058	1.154	0.050	-	0.018	0.040	-	-
	Etobicoke South 2	35033	90%	-	-	-	0.149	0.046	0.052	0.112	2.825	0.091	-	0.034	0.076	-	-
	Etobicoke South 2	35033	Max.	-	-	-	0.517	0.151	0.184	0.304	25.703	0.260	-	0.093	0.240	-	-

NOTES:

1) Among all AQ monitoring stations located within regional study area, VOCs are only measured at station 60435 (Etobicoke South-2) for the time period from 2009 to 2016 year.

Table B-11: VOC Monitoring Data Summary for Etobicoke South-2 Station (2009-2016).

Year	Station Name	MOECP Station ID	Percentile	2,2,5-Trimethylhexane (ug/m3)	1-Octene (ug/m3)	Octane (ug/m3)	trans-1,2-Dimethylcyclohexane (ug/m3)	trans-2-Octene (ug/m3)	cis-1,4/t-1,3-Dimethylcyclohexane (ug/m3)	cis-2-Octene (ug/m3)	cis-1,2-Dimethylcyclohexane (ug/m3)	Ethylbenzene (ug/m3)	2,5-Dimethylheptane (ug/m3)	m and p-Xylene (ug/m3)	4-Methyloctane (ug/m3)	3-Methyloctane (ug/m3)	Styrene (ug/m3)
2009	Etobicoke South 2	35033	50%	-	-	0.068	-	0.000	-	-	0.012	0.192	-	0.556	-	-	0.062
	Etobicoke South 2	35033	90%	-	-	0.118	-	0.000	-	-	0.019	0.374	-	1.182	-	-	0.406
	Etobicoke South 2	35033	Max.	-	-	0.248	-	0.000	-	-	0.028	0.810	-	2.650	-	-	1.732
2010	Etobicoke South 2	35033	50%	0.012	0.015	0.070	0.000	0.024	0.013	-	0.016	0.231	-	0.697	-	-	0.055
	Etobicoke South 2	35033	90%	0.029	0.027	0.241	0.000	0.098	0.047	-	0.034	0.719	-	2.304	-	-	0.125
	Etobicoke South 2	35033	Max.	0.070	0.037	0.470	0.000	0.185	0.102	-	0.059	1.396	-	4.443	-	-	0.163
2011	Etobicoke South 2	35033	50%	0.010	0.014	0.063	0.000	0.018	0.010	-	0.011	0.171	-	0.488	-	-	0.024
	Etobicoke South 2	35033	90%	0.014	0.023	0.080	0.000	0.027	0.015	-	0.014	0.313	-	1.007	-	-	0.032
	Etobicoke South 2	35033	Max.	0.021	0.040	0.096	0.000	0.032	0.017	-	0.014	0.342	-	1.088	-	-	0.046
2012	Etobicoke South 2	35033	50%	0.012	0.016	0.066	0.000	0.020	0.011	-	0.010	0.180	-	0.555	-	-	0.081
	Etobicoke South 2	35033	90%	0.025	0.026	0.181	0.000	0.049	0.027	-	0.018	0.410	-	1.271	-	-	0.308
	Etobicoke South 2	35033	Max.	0.056	0.050	0.401	0.000	0.148	0.073	-	0.046	1.042	-	3.344	-	-	0.453
2013	Etobicoke South 2	35033	50%	0.013	0.016	0.065	0.000	0.019	0.012	-	0.008	0.185	-	0.566	-	-	0.032
	Etobicoke South 2	35033	90%	0.027	0.025	0.122	0.000	0.048	0.032	-	0.016	0.375	-	1.163	-	-	0.104
	Etobicoke South 2	35033	Max.	0.041	0.060	0.308	0.013	0.119	0.072	-	0.037	0.730	-	2.317	-	-	0.296
2014	Etobicoke South 2	35033	50%	-	-	0.068	-	0.000	-	-	0.012	0.192	-	0.556	-	-	0.062
	Etobicoke South 2	35033	90%	-	-	0.118	-	0.000	-	-	0.019	0.374	-	1.182	-	-	0.406
	Etobicoke South 2	35033	Max.	-	-	0.248	-	0.000	-	-	0.028	0.810	-	2.650	-	-	1.732
2015	Etobicoke South 2	35033	50%	-	-	0.076	-	0.000	-	-	0.011	0.219	-	0.619	-	-	0.082
	Etobicoke South 2	35033	90%	-	-	0.182	-	0.000	-	-	0.023	0.509	-	1.470	-	-	0.920
	Etobicoke South 2	35033	Max.	-	-	0.303	-	0.000	-	-	0.039	0.702	-	2.207	-	-	3.562
2016	Etobicoke South 2	35033	50%	-	-	0.061	-	0.000	-	-	0.009	0.196	-	0.519	-	-	0.155
	Etobicoke South 2	35033	90%	-	-	0.131	-	0.000	-	-	0.017	0.374	-	1.147	-	-	1.476
	Etobicoke South 2	35033	Max.	-	-	0.374	-	0.021	-	-	0.042	1.147	-	3.612	-	-	5.349

NOTES:

1) Among all AQ monitoring stations located within regional study area, VOCs are only measured at station 60435 (Etobicoke South-2) for the time period from 2009 to 2016 year.

Table B-11: VOC Monitoring Data Summary for Etobicoke South-2 Station (2009-2016).

Year	Station Name	MOECP Station ID	Percentile	o-Xylene (ug/m3)	1-Nonene (ug/m3)	Nonane (ug/m3)	iso-Propylbenzene (ug/m3)	3,6-Dimethyloctane (ug/m3)	n-Propylbenzene (ug/m3)	3-Ethyltoluene (ug/m3)	4-Ethyltoluene (ug/m3)	1,3,5-Trimethylbenzene (ug/m3)	2-Ethyltoluene (ug/m3)	1-Decene (ug/m3)	tert-Butylbenzene (ug/m3)	1,2,4-Trimethylbenzene (ug/m3)	Decane (ug/m3)
2009	Etobicoke South 2	35033	50%	0.188	-	0.076	0.012	-	0.038	0.109	0.054	0.050	0.044	-	-	0.170	0.110
	Etobicoke South 2	35033	90%	0.392	-	0.162	0.024	-	0.080	0.224	0.116	0.110	0.090	-	-	0.394	0.306
	Etobicoke South 2	35033	Max.	0.866	-	0.386	0.050	-	0.172	0.526	0.284	0.262	0.210	-	-	0.902	0.716
2010	Etobicoke South 2	35033	50%	0.197	0.000	0.091	0.015	0.007	0.047	0.139	0.068	0.066	0.053	0.000	0.000	0.220	0.139
	Etobicoke South 2	35033	90%	0.567	0.002	0.327	0.036	0.024	0.135	0.389	0.210	0.198	0.163	0.010	0.002	0.686	0.514
	Etobicoke South 2	35033	Max.	1.204	0.023	0.811	0.082	0.068	0.314	1.010	0.479	0.499	0.397	0.024	0.017	1.612	1.243
2011	Etobicoke South 2	35033	50%	0.147	0.000	0.068	0.010	0.006	0.031	0.082	0.038	0.036	0.034	0.004	0.000	0.110	0.087
	Etobicoke South 2	35033	90%	0.269	0.016	0.121	0.017	0.010	0.052	0.139	0.073	0.065	0.057	0.014	0.001	0.214	0.175
	Etobicoke South 2	35033	Max.	0.300	0.039	0.136	0.019	0.012	0.056	0.163	0.083	0.079	0.068	0.018	0.003	0.271	0.243
2012	Etobicoke South 2	35033	50%	0.190	0.000	0.086	0.014	0.007	0.047	0.126	0.065	0.059	0.055	0.000	0.000	0.215	0.140
	Etobicoke South 2	35033	90%	0.435	0.005	0.246	0.032	0.021	0.107	0.330	0.167	0.157	0.133	0.011	0.000	0.562	0.444
	Etobicoke South 2	35033	Max.	1.080	0.035	0.789	0.071	0.073	0.282	0.928	0.483	0.477	0.352	0.035	0.020	1.634	1.370
2013	Etobicoke South 2	35033	50%	0.188	0.000	0.085	0.013	0.007	0.035	0.096	0.048	0.044	0.040	0.000	0.000	0.163	0.124
	Etobicoke South 2	35033	90%	0.400	0.000	0.178	0.024	0.014	0.078	0.232	0.118	0.109	0.094	0.008	0.000	0.392	0.292
	Etobicoke South 2	35033	Max.	0.769	0.065	0.417	0.049	0.040	0.166	0.517	0.268	0.263	0.209	0.014	0.001	0.935	0.719
2014	Etobicoke South 2	35033	50%	0.188	-	0.076	0.012	-	0.038	0.109	0.054	0.050	0.044	-	-	0.170	0.110
	Etobicoke South 2	35033	90%	0.392	-	0.162	0.024	-	0.080	0.224	0.116	0.110	0.090	-	-	0.394	0.306
	Etobicoke South 2	35033	Max.	0.866	-	0.386	0.050	-	0.172	0.526	0.284	0.262	0.210	-	-	0.902	0.716
2015	Etobicoke South 2	35033	50%	0.205	-	0.094	0.015	-	0.040	0.107	0.052	0.050	0.043	-	-	0.166	0.134
	Etobicoke South 2	35033	90%	0.522	-	0.261	0.029	-	0.092	0.263	0.133	0.129	0.107	-	-	0.430	0.377
	Etobicoke South 2	35033	Max.	0.769	-	5.593	0.051	-	0.137	0.486	0.221	0.707	0.151	-	-	1.445	7.918
2016	Etobicoke South 2	35033	50%	0.199	-	0.080	0.012	-	0.037	0.109	0.050	0.053	0.044	-	-	0.177	0.112
	Etobicoke South 2	35033	90%	0.402	-	0.180	0.024	-	0.066	0.194	0.099	0.096	0.080	-	-	0.321	0.266
	Etobicoke South 2	35033	Max.	1.207	-	1.108	0.073	-	0.420	1.454	0.697	0.807	0.557	-	-	2.447	1.759

NOTES:

1) Among all AQ monitoring stations located within regional study area, VOCs are only measured at station 60435 (Etobicoke South-2) for the time period from 2009 to 2016 year.

Table B-11: VOC Monitoring Data Summary for Etobicoke South-2 Station (2009-2016).

Year	Station Name	MOECP Station ID	Percentile	iso-Butylbenzene (ug/m3)	sec-Butylbenzene (ug/m3)	1,2,3-Trimethylbenzene (ug/m3)	p-Cymene (ug/m3)	Indane (ug/m3)	1-Undecene (ug/m3)	1,3-Diethylbenzene (ug/m3)	1,4-Diethylbenzene (ug/m3)	n-Butylbenzene (ug/m3)	1,2-Diethylbenzene (ug/m3)	Undecane (ug/m3)	Naphthalene (ug/m3)	Dodecane (ug/m3)	Hexylbenzene (ug/m3)
2009	Etobicoke South 2	35033	50%	-	-	0.042	0.018	0.02	-	0.01	0.034	-	-	0.122	0.074	0.112	-
	Etobicoke South 2	35033	90%	-	-	0.092	0.048	0.042	-	0.02	0.07	-	-	0.39	0.264	0.326	-
	Etobicoke South 2	35033	Max.	-	-	0.204	0.108	0.09	-	0.044	0.146	-	-	0.844	0.434	0.644	-
2010	Etobicoke South 2	35033	50%	0.005	0.007	0.047	0.019	0.0261	0	0.0119	0.0399	0.0128	0.004	0.1784	0.118	0.1661	0
	Etobicoke South 2	35033	90%	0.015	0.020	0.154	0.056	0.0812	0.00738	0.03664	0.12516	0.03842	0.01162	0.6051	0.35424	0.5177	0.0079
	Etobicoke South 2	35033	Max.	0.029	0.042	0.362	0.120	0.1491	0.0387	0.0762	0.2431	0.0717	0.0199	1.1037	0.8613	0.8888	0.0217
2011	Etobicoke South 2	35033	50%	0.003	0.004	0.025	0.011	0.0137	0.0027	0.0065	0.0245	0.0084	0.0023	0.1001	0.0489	0.0568	0.004
	Etobicoke South 2	35033	90%	0.005	0.007	0.050	0.020	0.02468	0.01316	0.01154	0.0391	0.0133	0.00468	0.20294	0.0871	0.17804	0.01076
	Etobicoke South 2	35033	Max.	0.006	0.009	0.067	0.027	0.0326	0.0235	0.0162	0.0657	0.0187	0.0062	0.3315	0.122	0.1945	0.012
2012	Etobicoke South 2	35033	50%	0.005	0.007	0.049	0.019	0.0218	0	0.0114	0.0379	0.0117	0.004	0.1929	0.1078	0.1614	0.0064
	Etobicoke South 2	35033	90%	0.011	0.014	0.123	0.037	0.055	0.00716	0.02512	0.08022	0.02518	0.00862	0.38174	0.24218	0.32356	0.01528
	Etobicoke South 2	35033	Max.	0.028	0.043	0.354	0.085	0.1528	0.0368	0.0678	0.2288	0.0739	0.031	1.7989	0.8474	0.6267	0.0296
2013	Etobicoke South 2	35033	50%	0.004	0.006	0.041	0.018	0.0185	0	0.0094	0.0335	0.0106	0.0033	0.1604	0.0952	0.1215	0.0057
	Etobicoke South 2	35033	90%	0.008	0.012	0.090	0.037	0.04498	0.01228	0.02098	0.07418	0.02288	0.00766	0.37268	0.2169	0.274	0.01344
	Etobicoke South 2	35033	Max.	0.020	0.025	0.203	0.056	0.0908	0.0429	0.0411	0.1362	0.0418	0.0144	0.653	0.3968	0.5319	0.0244
2014	Etobicoke South 2	35033	50%	-	-	0.042	0.018	0.02	-	0.01	0.034	-	-	0.122	0.074	0.112	-
	Etobicoke South 2	35033	90%	-	-	0.092	0.048	0.042	-	0.02	0.07	-	-	0.39	0.264	0.326	-
	Etobicoke South 2	35033	Max.	-	-	0.204	0.108	0.09	-	0.044	0.146	-	-	0.844	0.434	0.644	-
2015	Etobicoke South 2	35033	50%	-	-	0.038	0.017	0.01788	-	0.0077425	0.024274	-	-	0.1043575	0.0543955	0.0754525	-
	Etobicoke South 2	35033	90%	-	-	0.100	0.043	0.044377	-	0.0196744	0.0620233	-	-	0.3005063	0.1093396	0.2212003	-
	Etobicoke South 2	35033	Max.	-	-	0.292	0.065	0.061047	-	0.043328	0.257348	-	-	4.45165	0.241879	0.358451	-
2016	Etobicoke South 2	35033	50%	-	-	0.037	0.018	0.016983	-	0.007545	0.020303	-	-	0.078589	0.035967	0.034389	-
	Etobicoke South 2	35033	90%	-	-	0.074	0.037	0.035216	-	0.0155752	0.0442444	-	-	0.2162392	0.1022098	0.089237	-
	Etobicoke South 2	35033	Max.	-	-	0.503	0.136	0.167089	-	0.072676	0.167982	-	-	0.853914	0.294742	0.31627	-

NOTES:

1) Among all AQ monitoring stations located within regional study area, VOCs are only measured at station 60435 (Etobicoke South-2) for the time period from 2009 to 2016 year.

Table B-11: VOC Monitoring Data Summary for Etobicoke South-2 Station (2009-2016).

Year	Station Name	MOECP Station ID	Percentile	MTBE (ug/m3)	a-Pinene (ug/m3)	b-Pinene (ug/m3)	d-Limonene (ug/m3)	Camphene (ug/m3)	Freon 22 (ug/m3)	Chloromethane (ug/m3)	Freon 114 (ug/m3)	Freon 113 (ug/m3)	Vinylchloride (ug/m3)	Bromomethane (ug/m3)	Chloroethane (ug/m3)	Freon 11 (ug/m3)	Freon 12 (ug/m3)
2009	Etobicoke South 2	35033	50%	0	0.092	0.042	0.096	0.024	0.9761	1.208	0.122	-	0.002	0.052	0.018	1.5386	2.596
	Etobicoke South 2	35033	90%	0	0.464	0.16	0.456	0.054	1.454	1.332	0.132	-	0.004	0.064	0.026	1.65	2.808
	Etobicoke South 2	35033	Max.	0.012	0.556	0.246	1.722	0.198	3.678	1.4	0.138	-	0.0041	0.16	0.034	2.27	3.474
2010	Etobicoke South 2	35033	50%	0	0.0966	0.0471	0.1329	0.0261	0.9086	1.1453	0.1096	0.5963	0.0018	0.0552	0.0238	1.6614	2.5474
	Etobicoke South 2	35033	90%	0	0.30416	0.14156	0.65506	0.069	1.35666	1.28432	0.12212	0.64238	0.00444	0.06662	0.02882	1.84448	2.7212
	Etobicoke South 2	35033	Max.	0.221	0.4734	0.2271	2.1069	0.1179	2.3425	1.5954	0.1319	0.7585	0.0075	0.0793	0.0682	1.9585	3.056
2011	Etobicoke South 2	35033	50%	0	0.029	0.0069	0.0459	0.0142	0.8394	1.2364	0.1125	0.6341	0.0027	0.0517	0.0287	1.58	2.6421
	Etobicoke South 2	35033	90%	0.00668	0.05976	0.02004	0.15304	0.03162	1.13616	1.34014	0.12836	0.6796	0.00358	0.05724	0.03268	1.7818	2.90154
	Etobicoke South 2	35033	Max.	0.0095	0.0745	0.0508	0.4073	0.0516	1.1504	1.3806	0.133	0.7168	0.0041	0.0574	0.0344	1.8855	2.9571
2012	Etobicoke South 2	35033	50%	0	0.0982	0.042	0.1456	0.0261	0.9479	1.1117	0.1094	0.5833	0.0022	0.053	0.0212	1.6513	2.536
	Etobicoke South 2	35033	90%	0.00644	0.37476	0.11504	0.42914	0.07068	1.26196	1.34606	0.15344	0.69858	0.0035	0.07186	0.03174	1.83968	2.88102
	Etobicoke South 2	35033	Max.	0.0232	0.723	0.2489	1.2386	0.1343	2.3999	1.451	0.1696	0.7664	0.0077	0.0841	0.0614	3.1917	3.1301
2013	Etobicoke South 2	35033	50%	0	0.1091	0.0404	0.1485	0.0246	0.9306	1.1602	0.1113	0.5796	0.0016	0.0534	0.0185	1.5962	2.5565
	Etobicoke South 2	35033	90%	0.00908	0.54498	0.1349	0.37528	0.05556	1.4157	1.31704	0.12392	0.66526	0.00426	0.06666	0.0232	1.86914	2.79116
	Etobicoke South 2	35033	Max.	0.0165	0.8229	0.2536	0.657	0.077	4.1524	1.5546	0.1386	0.766	0.0056	0.0828	0.033	2.1468	3.0628
2014	Etobicoke South 2	35033	50%	0	0.092	0.042	0.096	0.024	0.9761	1.208	0.122	-	0.002	0.052	0.018	1.5386	2.596
	Etobicoke South 2	35033	90%	0	0.464	0.16	0.456	0.054	1.454	1.332	0.132	-	0.004	0.064	0.026	1.65	2.808
	Etobicoke South 2	35033	Max.	0.012	0.556	0.246	1.722	0.198	3.678	1.4	0.138	-	0.0041	0.16	0.034	2.27	3.474
2015	Etobicoke South 2	35033	50%	0	0.1347425	0.0357405	0.1421275	0.021906	1.0526505	1.1319015	0.113667	-	0.0019775	0.0486475	0.017019	1.5998445	2.5761075
	Etobicoke South 2	35033	90%	0.0083863	0.4732549	0.1788946	0.541578	0.0478515	1.7362031	1.3442216	0.1215084	-	0.0037784	0.055914	0.0240244	1.7500275	2.8640643
	Etobicoke South 2	35033	Max.	0.025856	0.906463	0.273528	0.810019	0.074884	5.133376	1.546141	0.132419	-	0.010331	0.069952	0.040618	1.863928	2.989574
2016	Etobicoke South 2	35033	50%	0	0.151179	0.049665	0.115289	0.022872	1.097081	1.070624	0.111192	-	0.001445	0.030981	0.012152	1.494955	2.404123
	Etobicoke South 2	35033	90%	0.0079164	0.3558136	0.1395946	0.4748978	0.0551244	1.6219118	1.1776388	0.1270766	-	0.0035556	0.0337382	0.017489	1.7214336	2.73249
	Etobicoke South 2	35033	Max.	0.01713	0.933437	0.557009	3.409708	0.286719	3.229077	1.314671	0.133885	-	0.005937	0.036204	0.058619	1.903361	2.959729

NOTES:

1) Among all AQ monitoring stations located within regional study area, VOCs are only measured at station 60435 (Etobicoke South-2) for the time period from 2009 to 2016 year.

Table B-11: VOC Monitoring Data Summary for Etobicoke South-2 Station (2009-2016).

Year	Station Name	MOECP Station ID	Percentile	Ethylbromide (ug/m3)	1,1-Dichloroethylene (ug/m3)	Dichloromethane (ug/m3)	trans-1,2-Dichloroethylene (ug/m3)	1,1-Dichloroethane (ug/m3)	cis-1,2-Dichloroethylene (ug/m3)	Bromochloromethane (ug/m3)	Chloroform (ug/m3)	1,2-Dichloroethane (ug/m3)	1,1,1-Trichloroethane (ug/m3)	Carbontetrachloride (ug/m3)	Dibromomethane (ug/m3)	1,2-Dichloropropane (ug/m3)	Bromodichloromethane (ug/m3)
2009	Etobicoke South 2	35033	50%	-	0	0.42	-	-	-	-	0.112	0.066	0.024	0.52	-	0.018	-
	Etobicoke South 2	35033	90%	-	0	0.584	-	-	-	-	0.162	0.082	0.028	0.552	-	0.024	-
	Etobicoke South 2	35033	Max.	-	0	1.904	-	-	-	-	0.244	0.092	0.064	0.666	-	0.032	-
2010	Etobicoke South 2	35033	50%	0.003	0	0.4917	0.0056	0	0.0029	-	0.1151	0.0713	0.0475	0.5467	0.0273	0.0158	0.004
	Etobicoke South 2	35033	90%	0.00532	0.001	1.04568	0.01538	0	0.00688	-	0.16474	0.25346	0.05472	0.60406	0.03016	0.02372	0.00952
	Etobicoke South 2	35033	Max.	0.0062	0.0027	23.3622	0.0339	0	0.0326	-	0.2249	0.5572	0.0678	0.6856	0.0322	0.0318	0.017
2011	Etobicoke South 2	35033	50%	0.0023	0	0.425	0.0057	0	0.0019	-	0.082	0.0668	0.0415	0.5389	0.0261	0.0214	0.0034
	Etobicoke South 2	35033	90%	0.00318	0.00036	0.6084	0.01232	0	0.00386	-	0.12396	0.07702	0.04546	0.58014	0.03622	0.03076	0.00532
	Etobicoke South 2	35033	Max.	0.0035	0.0018	0.7394	0.0139	0	0.0082	-	0.1355	0.0804	0.0471	0.5917	0.0405	0.0364	0.0075
2012	Etobicoke South 2	35033	50%	0.0024	0	0.4314	0.0094	0	0.0027	-	0.1137	0.0701	0.0365	0.552	0.0217	0.0153	0.0057
	Etobicoke South 2	35033	90%	0.00514	0.00024	0.85298	0.0259	0	0.00574	-	0.16494	0.10126	0.05038	0.6848	0.0318	0.02624	0.01058
	Etobicoke South 2	35033	Max.	0.024	0.0028	1.7795	0.0872	0	0.0162	-	0.2196	0.1166	0.0597	0.7447	0.0349	0.0334	0.0198
2013	Etobicoke South 2	35033	50%	0.0024	0	0.4735	0.0122	0	0.0022	-	0.1114	0.0669	0.0293	0.5375	0.0188	0.0186	0.0057
	Etobicoke South 2	35033	90%	0.0033	0.00082	0.80798	0.025	0	0.00558	-	0.18594	0.08666	0.03586	0.63144	0.0241	0.02506	0.01288
	Etobicoke South 2	35033	Max.	0.0059	0.0019	1.5078	0.0371	0	0.0114	-	0.2124	0.1026	0.0496	0.6813	0.0324	0.0311	0.0185
2014	Etobicoke South 2	35033	50%	-	0	0.42	-	-	-	-	0.112	0.066	0.024	0.52	-	0.018	-
	Etobicoke South 2	35033	90%	-	0	0.584	-	-	-	-	0.162	0.082	0.028	0.552	-	0.024	-
	Etobicoke South 2	35033	Max.	-	0	1.904	-	-	-	-	0.244	0.092	0.064	0.666	-	0.032	-
2015	Etobicoke South 2	35033	50%	-	0	0.450122	-	0.005929	-	-	0.132402	0.063408	0.0215285	0.5193015	-	0.023273	-
	Etobicoke South 2	35033	90%	-	0	0.8273146	-	0.007683	-	-	0.1935869	0.0923144	0.0259702	0.5747414	-	0.0300575	-
	Etobicoke South 2	35033	Max.	-	0.001087	1.151586	-	0.012007	-	-	0.246086	0.100591	0.032628	0.618757	-	0.046937	-
2016	Etobicoke South 2	35033	50%	-	0	0.438307	-	0.004887	-	-	0.11604	0.059259	0.017447	0.481791	-	0.019547	-
	Etobicoke South 2	35033	90%	-	0.000645	0.9185364	-	0.0074684	-	-	0.1831438	0.0750942	0.0225816	0.544757	-	0.0302092	-
	Etobicoke South 2	35033	Max.	-	0.001755	3.107031	-	0.010253	-	-	0.238844	0.083567	0.046566	0.643945	-	0.047113	-

NOTES:

1) Among all AQ monitoring stations located within regional study area, VOCs are only measured at station 60435 (Etobicoke South-2) for the time period from 2009 to 2016 year.

Table B-11: VOC Monitoring Data Summary for Etobicoke South-2 Station (2009-2016).

Year	Station Name	MOECP Station ID	Percentile	Trichloroethylene (ug/m3)	cis-1,3-Dichloropropene (ug/m3)	trans-1,3-Dichloropropene (ug/m3)	1,1,2-Trichloroethane (ug/m3)	Bromotrichloromethane (ug/m3)	Dibromochloromethane (ug/m3)	EDB (ug/m3)	Tetrachloroethylene (ug/m3)	Chlorobenzene (ug/m3)	Benzylchloride (ug/m3)	Bromoform (ug/m3)	1,4-Dichlorobutane (ug/m3)	1,1,2,2-Tetrachloroethane (ug/m3)	1,3-Dichlorobenzene (ug/m3)
2009	Etobicoke South 2	35033	50%	0.032	-	-	0.004	-	-	-	0.084	0.006	0	0.016	-	0	0.002
	Etobicoke South 2	35033	90%	0.078	-	-	0.004	-	-	-	0.204	0.012	0.002	0.024	-	0	0.002
	Etobicoke South 2	35033	Max.	0.256	-	-	0.004	-	-	-	0.428	0.03	0.004	0.044	-	0.002	0.004
2010	Etobicoke South 2	35033	50%	0.0592	0	0	0	-	0.0041	0	0.1793	0.0062	0	0.0147	0	0	0.0021
	Etobicoke South 2	35033	90%	0.1757	0.00434	0.00342	0.00264	-	0.00594	0.00254	0.46688	0.00906	0	0.02262	0	0	0.0059
	Etobicoke South 2	35033	Max.	0.379	0.0569	0.0456	0.0334	-	0.0091	0.0084	1.4292	0.0315	0.022	0.0281	0.0239	0.0407	0.0393
2011	Etobicoke South 2	35033	50%	0.0462	0	0	0	-	0.0033	0	0.1701	0.0066	0	0.0145	0	0	0.0026
	Etobicoke South 2	35033	90%	0.08354	0	0	0.00468	-	0.00462	0.00184	0.28572	0.0113	0.0024	0.01778	0	0	0.00338
	Etobicoke South 2	35033	Max.	0.1457	0	0	0.005	-	0.0059	0.0022	0.3366	0.0139	0.0052	0.0202	0	0	0.0054
2012	Etobicoke South 2	35033	50%	0.0534	0	0	0	-	0.004	0	0.1009	0.0065	0	0.0152	0	0	0.0023
	Etobicoke South 2	35033	90%	0.1469	0	0	0	-	0.00636	0.00092	0.31478	0.011	0.0022	0.02054	0	0	0.00408
	Etobicoke South 2	35033	Max.	0.8693	0.0026	0.0017	0.008	-	0.0122	0.0043	0.8231	0.022	0.0066	0.0272	0	0.0039	0.0074
2013	Etobicoke South 2	35033	50%	0.0443	0	0	0	-	0.0037	0	0.1084	0.0066	0	0.0145	0	0	0.0022
	Etobicoke South 2	35033	90%	0.09018	0	0	0	-	0.0067	0.00074	0.23552	0.01132	0.00228	0.0208	0	0	0.0043
	Etobicoke South 2	35033	Max.	0.4932	0.0032	0.0016	0.0043	-	0.0099	0.0015	0.9241	0.0226	0.0052	0.0265	0	0	0.0071
2014	Etobicoke South 2	35033	50%	0.032	-	-	0.004	-	-	-	0.084	0.006	0	0.016	-	0	0.002
	Etobicoke South 2	35033	90%	0.078	-	-	0.004	-	-	-	0.204	0.012	0.002	0.024	-	0	0.002
	Etobicoke South 2	35033	Max.	0.256	-	-	0.004	-	-	-	0.428	0.03	0.004	0.044	-	0.002	0.004
2015	Etobicoke South 2	35033	50%	0.0435715	-	-	0.0026885	-	-	-	0.109606	0.006422	0	0.0169945	-	0	0.001711
	Etobicoke South 2	35033	90%	0.1700018	-	-	0.0035815	-	-	-	0.3009502	0.0104735	0.0037606	0.0215006	-	0	0.0033038
	Etobicoke South 2	35033	Max.	0.482347	-	-	0.004449	-	-	-	0.956419	0.030436	0.009519	0.031725	-	0.002106	0.004662
2016	Etobicoke South 2	35033	50%	0.046353	-	-	0.002768	-	-	-	0.0923	0.009228	0	0.01623	-	0	0.001442
	Etobicoke South 2	35033	90%	0.152216	-	-	0.0041536	-	-	-	0.2810014	0.014527	0.0017212	0.0208868	-	0.0002084	0.003695
	Etobicoke South 2	35033	Max.	1.742709	-	-	0.00595	-	-	-	0.600739	0.036073	0.00448	0.023673	-	0.002073	0.004894

NOTES:

1) Among all AQ monitoring stations located within regional study area, VOCs are only measured at station 60435 (Etobicoke South-2) for the time period from 2009 to 2016 year.

Table B-11: VOC Monitoring Data Summary for Etobicoke South-2 Station (2009-2016).

Year	Station Name	MOECP Station ID	Percentile	1,4-Dichlorobenzene (ug/m3)	1,2-Dichlorobenzene (ug/m3)	1,2,4-Trichlorobenzene (ug/m3)	Hexachlorobutadiene (ug/m3)
2009	Etobicoke South 2	35033	50%	0.0483	0.002	0.004	0.002
	Etobicoke South 2	35033	90%	0.146	0.004	0.008	0.004
	Etobicoke South 2	35033	Max.	0.318	0.008	0.012	0.006
2010	Etobicoke South 2	35033	50%	0.0809	0.0027	0.0073	0.0023
	Etobicoke South 2	35033	90%	0.1671	0.0069	0.02776	0.00592
	Etobicoke South 2	35033	Max.	0.3681	0.0586	0.0641	0.1117
2011	Etobicoke South 2	35033	50%	0.045	0.0035	0.0073	0.0022
	Etobicoke South 2	35033	90%	0.07532	0.00744	0.01284	0.00312
	Etobicoke South 2	35033	Max.	0.0949	0.0107	0.0229	0.0048
2012	Etobicoke South 2	35033	50%	0.058	0.0032	0.0057	0.0029
	Etobicoke South 2	35033	90%	0.1434	0.00554	0.01358	0.00434
	Etobicoke South 2	35033	Max.	0.3228	0.0083	0.0315	0.0066
2013	Etobicoke South 2	35033	50%	0.0541	0.0027	0.0052	0.0026
	Etobicoke South 2	35033	90%	0.1356	0.0049	0.01202	0.00434
	Etobicoke South 2	35033	Max.	0.2737	0.0087	0.021	0.0079
2014	Etobicoke South 2	35033	50%	0.0483	0.002	0.004	0.002
	Etobicoke South 2	35033	90%	0.146	0.004	0.008	0.004
	Etobicoke South 2	35033	Max.	0.318	0.008	0.012	0.006
2015	Etobicoke South 2	35033	50%	0.044793	0.002478	0.003958	0.0019175
	Etobicoke South 2	35033	90%	0.1168992	0.0040466	0.0079268	0.0036969
	Etobicoke South 2	35033	Max.	0.20586	0.035674	0.01344	0.005155
2016	Etobicoke South 2	35033	50%	0.039759	0.002231	0.003459	0.001293
	Etobicoke South 2	35033	90%	0.0895792	0.0053878	0.0110842	0.0028012
	Etobicoke South 2	35033	Max.	0.175009	0.007335	0.038877	0.003957

NOTES:

1) Among all AQ monitoring stations located within regional study area, VOCs are only measured at station 60435 (Etobicoke South-2) for the time period from 2009 to 2016 year.

Appendix C: Soils Data

Appendix C-1: Spring Soil Quality Data (Uncensored)

			Soil Quality Objectives				DN1	DN1-A	DN1-B	DN2	DN2-A	DN2-B	DN3	DN3-A	DN3-B
				CCME SQG			DN1	DN1-A	DN1-B	DN2	DN2-A	DN2-B	DN3	DN3-A	DN3-B
Parameter	Unit	Detection Limit	Table 3 Standards	(Residential/ Parkland)	CCME SQG (Commercial)	CCME SQG (Industrial)	23-Apr-19	23-Apr-19	23-Apr-19	23-Apr-19	23-Apr-19	23-Apr-19	23-Apr-19	23-Apr-19	23-Apr-19
Physical/Conventional Parameters															
Conductivity	µmho/cm	2	1400	1400	4000	4000	190	175	182	147	139	99	407	170	233
pH	pH	0	5-9	5-9	5-9	5-9	7.65	7.52	7.69	7.74	7.59	8.12	7.8	7.46	7.75
TOC	%	0.1	-	-	-	-	0.92	1.36	0.35	0.2	0.35	0.26	0.41	0.35	0.65
Moisture	%	1	-	-	-	-	9.6	20	9.8	19	13	5.7	20	15	17
Metals															
Total Antimony (Sb)	µg/g	0.1	40	20	40	40	0.18	0.36	0.09462	0.05725	0.07944	0.04695	0.07968	0.08483	0.0996
Total Arsenic (As)	µg/g	0.5	18	12	12	12	1.43	2.19	1.22	1.55	1.31	1.15	1.45	1.31	1.57
Total Barium (Ba)	µg/g	0.1	670	500	2000	2000	28.5	48.1	22.5	59.7	39.5	26.1	81.2	51.5	109
Total Beryllium (Be)	µg/g	0.2	8	4	8	8	0.19674	0.22	0.18924	0.4	0.24	0.28	0.42	0.26	0.5
Total Boron (B)	µg/g	1	120	-	-	-	4.2	5.4	3.9	8.3	5.8	8.4	7.5	5.4	8.3
Total Calcium (Ca)	µg/g	100	-	-	-	-	144000	202000	139000	145000	162000	277000	135000	156000	115000
Total Cadmium (Cd)	µg/g	0.05	1.9	10	22	22	0.168	0.218	0.1	0.138	0.084	0.164	0.125	0.105	0.134
Total Cesium (Cs)	µg/g	1	-	-	-	-	0.3119	0.34366	0.31375	0.70611	0.44191	0.61502	0.70717	0.47405	0.79681
Total Chromium (Cr)	µg/g	1	160	64	87	87	8.8	12	8	22.7	8.9	7.8	16.7	11.1	20.3
Total Cobalt (Co)	µg/g	0.3	80	50	300	300	2.74	2.66	2.64	4.11	2.93	2.67	5.12	3.62	6.37
Total Copper (Cu)	µg/g	0.5	230	63	91	91	7.71	16.3	7.1	5.93	6.53	2.53	10.7	7.94	14.1
Total Lead (Pb)	µg/g	0.1	120	140	260	260	9.22	14.4	7.47	5.4	4.79	5.02	6.26	5.14	7.27
Total Mercury (Hg)	µg/g	0.05	3.9	6.6	24	50	0.02399	0.01452	0.00996	0.01908	0.01986	0.01408	0.01494	0.00998	0.01494
Total Molybdenum (Mo)	µg/g	0.1	40	10	40	40	0.75	1.18	0.32	0.26	0.32	0.22	0.41	0.3	0.36
Total Nickel (Ni)	µg/g	0.8	270	45	89	89	6.62	12.2	5.15	9.28	6.26	7.12	11.8	7.48	13.8
Total Selenium (Se)	µg/g	0.5	5.5	1	2.9	2.9	0.13436	0.24685	0.09462	0.08111	0.05958	0.08451	0.10458	0.06487	0.11454
Total Silver (Ag)	µg/g	0.05	40	20	40	40	0.0096	0.03388	0.00498	0.01431	0.00497	-0.00469	0.01494	0.01497	0.02988
Total Sodium (Na)	µg/g	100	-	-	-	-	219	482	258	196	156	189	245	195	316
Total Thallium (Tl)	µg/g	0.05	3.3	1	1	1	0.067	0.053	0.07	0.091	0.074	0.052	0.11	0.075	0.139
Total Tin (Sn)	µg/g	0.1	-	50	300	300	0.47	0.88	0.39	0.44	0.38	0.17	0.57	0.48	0.64
Total Uranium (U)	µg/g	0.05	33	23	300	300	0.465	0.532	0.468	0.601	0.551	0.676	0.573	0.534	0.538
Total Vanadium (V)	µg/g	2	86	130	130	130	15	8.8	16.3	21	15.4	7.7	24.6	18.5	30.9
Total Zinc (Zn)	µg/g	1	340	250	410	410	42.2	67.9	26.7	35.1	38.8	34.3	51	60.5	51.1
Total Aluminum (Al)	µg/g	100	-	-	-	-	3500	3000	3980	8170	4540	4400	9660	6080	12000
Hot Water Ext. Boron (B)	µg/g	0.05	2	-	-	-	0.3	0.29	0.073	0.38	0.19	0.51	0.16	0.21	0.2
Total Titanium (Ti)	µg/g	1	-	-	-	-	244	98.4	321	307	284	24.4	520	370	719
Total Bismuth (Bi)	µg/g	0.1	-	-	-	-	0.02879	0.03872	0.0249	0.04771	0.02979	0.03286	0.04482	0.03493	0.0498
Total Iron (Fe)	µg/g	100	-	-	-	-	11300	8290	9710	12100	10300	6610	14200	11400	17200
Total Lithium (Li)	µg/g	5	-	-	-	-	5.5	4.3514	5.3	9.8	6	8.5	9.5	6.8	10.7
Total Magnesium (Mg)	µg/g	100	-	-	-	-	5020	5130	5040	7370	6180	8740	7190	6140	8090
Total Manganese (Mn)	µg/g	0.2	-	-	-	-	268	234	243	364	265	251	335	298	366
Total Potassium (K)	µg/g	100	-	-	-	-	737	669	711	1820	1100	1320	1840	1180	2400
Total Strontium (Sr)	µg/g	0.1	-	-	-	-	232	401	213	263	266	480	250	262	207
Total Thorium (Th)	µg/g	0.1	-	-	-	-	1.89	1.15	2.24	2.8	2.36	2.17	3.59	2.6	4.01
Total Tungsten (W)	µg/g	0.5	-	-	-	-	0.07678	0.09681	0.06972	0.10496	0.07944	0.01408	0.16932	0.06986	0.09462
Total Zirconium (Zr)	µg/g	0.5	-	-	-	-	0.7	0.92	0.9	0.91	1.87	2.58	2.33	1.58	3.56
Sodium Adsorption Ratio	N/A	0	12	5	12	12	0.23	0.25	0.51	0.27	0.29	0.38	0.27	0.25	0.21
PHC															
F1 (C6-C10) - BTEX	µg/g	10-20	55	210	320	320	0	0	0	0	0	0	0	0	0
F1 (C6-C10)	µg/g	10-20	55	210	320	320	0	0	0	0	0	0	0	0	0
F2 (C10-C16 Hydrocarbons)	µg/g	10-20	230	150	260	260	0	12	0	0	0	0	0	0	0
F3 (C16-C34 Hydrocarbons)	µg/g	50-100	1700	300	1700	1700	52	83	7.34769	10.6276	49.43436	30.49427	29.27954	14.87138	19.60449
F4 (C34-C50 Hydrocarbons)	µg/g	50-100	3300	2800	3300	3300	0	0	0	0	0	0	0	0	0
F4G-sg (Grav. Heavy Hydrocarbons)	µg/g	100	3300	2800	3300	3300									
Reached Baseline at C50	µg/g	-	-	-	-	-	1	1	1	1	1	1	1	1	1
VOC															
1,1,1,2-Tetrachloroethane	µg/g	0.05	0.087	-	-	-	0	0	0	0	0	0	0	0	0
1,1-Dichloroethane	µg/g	0.05	17	5	50	50	0	0	0	0	0	0	0	0	0
1,1-Dichloroethylene	µg/g	0.05	0.064	5	50	50	0	0	0	0	0	0	0	0	0
1,2-Dibromoethane	µg/g	0.05	0.05	-	-	-	0	0	0	0	0	0	0	0	0
1,2-Dichlorobenzene	µg/g	0.05	6.8	1	10	10	0	0	0	0	0	0	0	0	0
1,2-Dichloroethane	µg/g	0.05	0.05	5	50	50	0	0	0	0	0	0	0	0	0
1,2-Dichloropropane	µg/g	0.05	0.16	5	50	50	0	0	0	0	0	0	0	0	0
1,3-Dichlorobenzene	µg/g	0.05	9.6	1	10	10	0	0	0	0	0	0	0	0	0
1,3-Dichloropropene (cis+trans)	µg/g	0.05	0.18	-	-	-	0	0	0	0	0	0	0	0	0
1,4-Dichlorobenzene	µg/g	0.05	0.2	1	10	10	0	0	0	0	0	0	0	0	0
2-Butanone	µg/g	0.5	70	-	-	-	0	0	0	0	0	0	0	0	0
Methyl Isobutyl Ketone	µg/g	0.5	31	-	-	-	0	0	0	0	0	0	0	0	0
Acetone (2-Propanone)	µg/g	0.5	16	-	-	-	0	0	0	0	0	0	0	0	0
Benzene	µg/g	0.02	0.32	0.03	0.03	0.03	0	0	0	0	0	0	0	0	0
Bromodichloromethane	µg/g	0.05	18	-	-	-	0	0	0	0	0	0	0	0	0
Bromoform	µg/g	0.05	0.61	-	-	-	0	0	0	0	0	0	0	0	0
Bromomethane	µg/g	0.05	0.05	-	-	-	0	0	0	0	0	0	0	0	0
Carbon Tetrachloride	µg/g	0.05	0.21	5	50	50	0	0	0	0	0	0	0	0	0
Chlorobenzene	µg/g	0.05	2.4	1	10	10	0	0	0	0	0	0	0	0	0
Chloroform	µg/g	0.05	0.47	5	50	50	0	0	0	0	0	0	0	0	0
cis-1,2-Dichloroethylene	µg/g	0.05	55	-	-	-	0	0	0	0	0	0	0	0	0
cis-1,3-Dichloropropene	µg/g	0.03	-	-	-	-	0	0	0	0	0	0	0	0	0
Dibromochloromethane	µg/g	0.05	13	-	-	-	0	0	0	0	0	0	0	0	0
Dichlorodifluoromethane (FREON 12)	µg/g	0.05	16	-	-	-	0	0	0	0	0	0	0	0	0
Ethylbenzene	µg/g	0.02	9.5	0.082	0.082	0.082	0	0	0	0	0	0	0	0	0
p+m-Xylene	µg/g	0.02	-	-	-	-	0	0	0	0	0	0	0	0	0
Methyl t-butyl ether (MTBE)	µg/g	0.05	11	-	-	-	0	0	0	0	0	0	0	0	0
Methylene Chloride(Dichloromethane)	µg/g	0.05	1.6	5	50	50	0	0	0	0	0	0	0	0	0
o-Xylene	µg/g	0.02	-	-	-	-	0	0	0	0	0	0	0	0	0
Styrene	µg/g	0.05	34	5	50	50	0	0	0	0	0	0	0	0	0
trans-1,2-Dichloroethylene	µg/g	0.05	1.3	-	-	-	0	0	0	0	0	0	0	0	0
trans-1,3-Dichloropropene	µg/g	0.04	-	-	-	-	0	0	0	0	0	0	0	0	0
Trichloroethylene	µg/g	0.05	0.91	-	-	-	0	0	0	0	0	0	0	0	0
Trichlorofluoromethane (FREON 11)	µg/g	0.05	4	-	-	-	0	0	0	0	0	0	0	0	0
Vinyl Chloride	µg/g	0.02	0.032	-	-	-	0	0	0	0	0	0	0	0	0
Total Xylenes	µg/g	0.02	26	11	11	11	0	0	0	0	0	0	0	0	0
Hexane	µg/g	0.05	46	0.49	6.5	6.5	0	0	0	0	0	0	0	0	0
PAHs															
1-Methylnaphthalene	µg/g	0.005-0.05	76	-	-	-	0	0.003717	0	0	0	0	0	0	0
2-Methylnaphthalene	µg/g	0.005-0.05	76	-	-	-	0	0.004046	0	0	0	0	0	0	0
Acenaphthene	µg/g	0.005-0.05	96	-	-	-	0	0	0	0	0	0	0	0	0
Acenaphthylene	µg/g	0.005-0.05	0.15	-	-	-	0	0	0	0	0	0	0	0	0
Anthracene	µg/g	0.005-0.05	0.67	2.5	32	32	0	0	0	0	0	0	0	0	0
Benzo(b/j)fluoranthene	µg/g	0.005-0.05	0.96	1	10	10	0.0089	0.014	0	0	0	0	0	0	0
Benzo(a)anthracene	µg/g	0.005-0.05	0.96	1	10	10	0.0065	0.0087	0	0	0	0	0	0	0
Benzo(a)pyrene	µg/g	0.005-0.05	0.3	20	50	50	0.0059	0.0088	0	0	0	0	0	0	0
Benzo(g,h,i)perylene	µg/g	0.005-0.05	9.6	-	-	-	0.006	0.0091	0	0	0	0	0	0	0
Benzo(k)fluoranthene	µg/g	0.005-0.05	0.96	1	10	10	0	0.004155	0	0	0	0	0	0	0
Chrysene	µg/g	0.005-0.05	9.6	-	-	-	0.0083	0.011	0	0	0	0	0	0	0
Dibenz(a,h)anthracene	µg/g	0.005-0.05	0.1	1	10	10	0	0	0	0	0	0	0	0	0
Fluoranthene	µg/g	0.005-0.05	9.6	50	180	180	0.016	0.021	0	0	0	0	0	0	0
Fluorene	µg/g	0.005-0.05	62	-	-	-	0	0	0	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	µg/g	0.005-0.05	0.76	1	10	10	0.005	0.0072	0	0	0	0	0	0	0
Naphthalene	µg/g	0.005-0.05	9.6	0.6	22	22	0	0	0	0	0	0	0	0	0
Phenanthrene	µg/g	0.005-0.05	12	5	50	50	0.013	0.02	0	0	0	0	0	0	0
Pyrene	µg/g	0.005-0.05	96	10	100	100	0.014	0.016	0	0	0	0	0	0	0
Radionuclides															
H-3	Bq/kg	10-22.4	-	-	-	-	23.4	4.3	18.3	8	167	16.2	11.6	84.8	15.6
C-14	Bq/g-C	0.04-0.06	-	-	-	-	0.106	0	-0.0537	0.0718	-0.0518	-0.0076	-0.0436	0.0306	-0.006
Co-60	Bq/kg	0.2-1	-	-	-	-	0.1	0.1	0	0.6	-0.1	-0.4	-0.1	-0.1	-0.2
Cs-134	Bq/kg	0.1-1	-	-	-	-	-0.2	0.1	0.2	0.1	0.1	0.1	0.2	-0.5	0.1
Cs-137	Bq/kg	0.3-1	-	-	-	-	0.2	0.1	0.1	0.4	0.4	0.1	0.3	0.1	0
I-131	Bq/kg	0.3-3	-	-	-	-	-0.1	0.5	0.1	0	0.2	0.3	0.1	-0.3	0.6
K-40	Bq/kg	1-30	-	-	-	-	251	218	251	433	251	263	357	277	376
Th-Series	Bq/kg	0.7-7.8	-	-	-	-	11.7	8.8	11.1	16.6	8.8	12.4	15.1	10.8	16.3
U-Series	Bq/kg	0.5-7.4	-	-	-	-	16	16.3	11.3	15.2	11.5	14.2	13	10.9	14.9
Other															
Cyanide (free)	µg/g	0.01	0.051	0.9	8	8	0.01	0.03	0.00838	0.00261	0.0058	-0.00102	0.00384	0.00468	0.00364
Total Phosphorus	µg/g	10	-	-	-	-	556	474	498	575	507	346	561	545	648

Notes:

1. For all analysis results, uncensored data is reported.
2. Results greater than any of the soil quality guidelines are bolded and shaded in grey cells.

			Soil Quality Objectives				DN4	DN4-A	DN4-B	DN5	DN5-A		DN5-B	DN6	DN6-A	DN6-B
				CCME SQG			DN4	DN4-A	DN4-B	DN5	DN5-A	DUP-2	DN5-B	DN6	DN6-A	DN6-B
Parameter	Unit	Detection Limit	Table 3 Standards	(Residential/ Parkland)	CCME SQG (Commercial)	CCME SQG (Industrial)	24-Apr-19	24-Apr-19	24-Apr-19	24-Apr-19	24-Apr-19	24-Apr-19	24-Apr-19	24-Apr-19	24-Apr-19	24-Apr-19
Physical/Conventional Parameters																
Conductivity	µmho/cm	2	1400	1400	4000	4000	200	195	270	151	106	104	139	91	154	115
pH	pH	0	5-9	5-9	5-9	5-9	7.83	7.77	7.76	7.68	7.58	7.73	7.66	7.96	7.85	7.89
TOC	%	0.1	-	-	-	-	0.61	0.82	0.78	0.43	0.21	0.28	0.34	0.86	0.89	1.71
Moisture	%	1	-	-	-	-	26	37	42	14	15	16	12	7.8	9.9	7.9
Metals																
Total Antimony (Sb)	µg/g	0.1	40	20	40	40	0.11	0.13	0.16	0.07859	0.0297	0.02994	0.09453	15.4	0.67	0.18
Total Arsenic (As)	µg/g	0.5	18	12	12	12	2.46	3.3	3.87	1.46	0.87	0.91	1.56	**133**	4.88	3.23
Total Barium (Ba)	µg/g	0.1	670	500	2000	2000	54.4	63.1	56.2	44.4	32	25.2	48.3	110	32.2	44.6
Total Beryllium (Be)	µg/g	0.2	8	4	8	8	0.41	0.53	0.68	0.25	0.19307	0.16966	0.25	0.53	0.24	0.5
Total Boron (B)	µg/g	1	120	-	-	-	7.3	8.7	13.2	6.2	4.6	3.7	6.2	12.4	6.4	13
Total Calcium (Ca)	µg/g	100	-	-	-	-	227000	250000	235000	130000	118000	112000	140000	104000	177000	199000
Total Cadmium (Cd)	µg/g	0.05	1.9	10	22	22	0.04455	0.06	0.065	0.059	0.0396	0.03493	0.065	**3.75**	0.195	0.12
Total Cesium (Cs)	µg/g	1	-	-	-	-	0.30198	0.4	0.42871	0.44204	0.31188	0.23453	0.47264	0.42157	0.375	0.96806
Total Chromium (Cr)	µg/g	1	160	64	87	87	11.8	17.1	17.2	10.9	8.6	7.3	10.7	**74.8**	11.3	12
Total Cobalt (Co)	µg/g	0.3	80	50	300	300	2.28	3.01	2.98	4.02	2.86	2.47	3.54	**159**	8.11	5.07
Total Copper (Cu)	µg/g	0.5	230	63	91	91	6.5	7.43	7.54	14.8	5.7	5.13	7.98	**2230**	**76.2**	23.4
Total Lead (Pb)	µg/g	0.1	120	140	260	260	3.36	4.27	4.25	5.02	2.5	2.41	4.42	**589**	43.6	15.4
Total Mercury (Hg)	µg/g	0.05	3.9	6.6	24	50	0.00495	0.005	0.00499	0.00491	0.00495	0.00499	0.00498	0.0049	0.005	0.02994
Total Molybdenum (Mo)	µg/g	0.1	40	10	40	40	0.5	0.51	0.61	0.29	0.2	0.16	0.34	**42.3**	1.24	0.85
Total Nickel (Ni)	µg/g	0.8	270	45	89	89	7.25	9.97	10	7.79	5.8	4.54	7.74	**129**	12.3	23.6
Total Selenium (Se)	µg/g	0.5	5.5	1	2.9	2.9	0.17327	0.295	0.38385	0.07367	0.0198	0.02994	0.04975	**6.12**	0.225	0.3992
Total Silver (Ag)	µg/g	0.05	40	20	40	40	0.01485	0.015	0.01496	0.01965	0.01485	0.00998	0.0199	1.85	0.07	0.03493
Total Sodium (Na)	µg/g	100	-	-	-	-	116	114	126	265	238	193	247	1920	226	301
Total Thallium (Tl)	µg/g	0.05	3.3	1	1	1	0.064	0.095	0.115	0.074	0.054	0.04491	0.08	0.137	0.06	0.11
Total Tin (Sn)	µg/g	0.1	-	50	300	300	0.46	0.56	0.61	0.73	0.34	0.28	0.49	**108**	4.55	0.45
Total Uranium (U)	µg/g	0.05	33	23	300	300	0.634	0.825	0.912	0.511	0.465	0.429	0.532	0.868	0.605	1.16
Total Vanadium (V)	µg/g	2	86	130	130	130	17.9	22	23.3	18.6	16.6	14.3	17.9	22.2	14	13.2
Total Zinc (Zn)	µg/g	1	340	250	410	410	29.7	37.3	39	45.3	17.5	17.6	28.8	**9320**	**385**	45.4
Total Aluminum (Al)	µg/g	100	-	-	-	-	6630	8830	9990	5300	4040	3260	5350	11700	4080	6780
Hot Water Ext. Boron (B)	µg/g	0.05	2	-	-	-	0.5	0.46	0.75	0.21	0.09	0.084	0.11	0.11	0.16	0.15
Total Titanium (Ti)	µg/g	1	-	-	-	-	339	437	488	450	426	342	420	416	180	54.6
Total Bismuth (Bi)	µg/g	0.1	-	-	-	-	0.03465	0.045	0.04985	0.03438	0.0198	0.01996	0.03483	0.73	0.055	0.06487
Total Iron (Fe)	µg/g	100	-	-	-	-	13100	11900	13600	11000	9220	8180	10800	94900	12600	11900
Total Lithium (Li)	µg/g	5	-	-	-	-	4.80693	5.3	5.3	6.5	5.1	4.31637	7	9.6	5.9	11.3
Total Magnesium (Mg)	µg/g	100	-	-	-	-	5950	6300	6490	9830	11000	9840	9020	15900	6890	8670
Total Manganese (Mn)	µg/g	0.2	-	-	-	-	279	319	330	285	265	231	279	572	287	356
Total Potassium (K)	µg/g	100	-	-	-	-	555	645	536	1350	916	740	1380	1650	968	1980
Total Strontium (Sr)	µg/g	0.1	-	-	-	-	316	332	283	221	190	174	235	244	338	755
Total Thorium (Th)	µg/g	0.1	-	-	-	-	2.08	2.41	2.52	2.72	2.53	2.09	2.57	2.57	2.03	3.23
Total Tungsten (W)	µg/g	0.5	-	-	-	-	0.13366	0.19	0.21934	0.07859	0.04455	0.0499	0.08458	1.91	0.27	0.04491
Total Zirconium (Zr)	µg/g	0.5	-	-	-	-	8.13	12.2	14.5	2.78	3.22	2.47	2.51	10.6	1.44	5.3
Sodium Adsorption Ratio	N/A	0	12	5	12	12	0.21	0.21	0.18	0.26	0.3	0.22	0.27	0.31	0.28	0.29
PHC																
F1 (C6-C10) - BTEX	µg/g	10-20	55	210	320	320	0	0	0	0	0	0	0	0	0	0
F1 (C6-C10)	µg/g	10-20	55	210	320	320	0	0	0	0	0	0	0	0	0	0
F2 (C10-C16 Hydrocarbons)	µg/g	10-20	230	150	260	260	0	0	0	0	0	0	0	0	0	10
F3 (C16-C34 Hydrocarbons)	µg/g	50-100	1700	300	1700	1700	17.23428	25.77977	24.27467	43.48835	12.31394	14.74067	22.66767	34.99123	250	210
F4 (C34-C50 Hydrocarbons)	µg/g	50-100	3300	2800	3300	3300	0	0	0	0	0	0	0	56	750	130
F4G-sg (Grav. Heavy Hydrocarbons)	µg/g	100	3300	2800	3300	3300								420	**3900**	290
Reached Baseline at C50	µg/g	-	-	-	-	-	1	1	1	1	1	1	1	0	0	0
VOC																
1,1,1,2-Tetrachloroethane	µg/g	0.05	0.087	-	-	-	0	0	0	0	0	0	0	0	0	0
1,1-Dichloroethane	µg/g	0.05	17	5	50	50	0	0	0	0	0	0	0	0	0	0
1,1-Dichloroethylene	µg/g	0.05	0.064	5	50	50	0	0	0	0	0	0	0	0	0	0
1,2-Dibromoethane	µg/g	0.05	0.05	-	-	-	0	0	0	0	0	0	0	0	0	0
1,2-Dichlorobenzene	µg/g	0.05	6.8	1	10	10	0	0	0	0	0	0	0	0	0	0
1,2-Dichloroethane	µg/g	0.05	0.05	5	50	50	0	0	0	0	0	0	0	0	0	0
1,2-Dichloropropane	µg/g	0.05	0.16	5	50	50	0	0	0	0	0	0	0	0	0	0
1,3-Dichlorobenzene	µg/g	0.05	9.6	1	10	10	0	0	0	0	0	0	0	0	0	0
1,3-Dichloropropene (cis+trans)	µg/g	0.05	0.18	-	-	-	0	0	0	0	0	0	0	0	0	0
1,4-Dichlorobenzene	µg/g	0.05	0.2	1	10	10	0	0	0	0	0	0	0	0	0	0
2-Butanone	µg/g	0.5	70	-	-	-	0	0	0	0	0	0	0	0	0	0
Methyl Isobutyl Ketone	µg/g	0.5	31	-	-	-	0	0	0	0	0	0	0	0	0	0
Acetone (2-Propanone)	µg/g	0.5	16	-	-	-	0	0	0	0	0	0	0	0	0	0
Benzene	µg/g	0.02	0.32	0.03	0.03	0.03	0	0	0	0	0	0	0	0	0	0
Bromodichloromethane	µg/g	0.05	18	-	-	-	0	0	0	0	0	0	0	0	0	0
Bromoform	µg/g	0.05	0.61	-	-	-	0	0	0	0	0	0	0	0	0	0
Bromomethane	µg/g	0.05	0.05	-	-	-	0	0	0	0	0	0	0	0	0	0
Carbon Tetrachloride	µg/g	0.05	0.21	5	50	50	0	0	0	0	0	0	0	0	0	0
Chlorobenzene	µg/g	0.05	2.4	1	10	10	0	0	0	0	0	0	0	0	0	0
Chloroform	µg/g	0.05	0.47	5	50	50	0	0	0	0	0	0	0	0	0	0
cis-1,2-Dichloroethylene	µg/g	0.05	55	-	-	-	0	0	0	0	0	0	0	0	0	0
cis-1,3-Dichloropropene	µg/g	0.03	-	-	-	-	0	0	0	0	0	0	0	0	0	0
Dibromochloromethane	µg/g	0.05	13	-	-	-	0	0	0	0	0	0	0	0	0	0
Dichlorodifluoromethane (FREON 12)	µg/g	0.05	16	-	-	-	0	0	0	0	0	0	0	0	0	0
Ethylbenzene	µg/g	0.02	9.5	0.082	0.082	0.082	0	0	0	0	0	0	0	0	0	0
p+m-Xylene	µg/g	0.02	-	-	-	-	0	0	0	0	0	0	0	0	0	0
Methyl t-butyl ether (MTBE)	µg/g	0.05	11	-	-	-	0	0	0	0	0	0	0	0	0	0
Methylene Chloride(Dichloromethane)	µg/g	0.05	1.6	5	50	50	0	0	0	0	0	0	0	0	0	0
o-Xylene	µg/g	0.02	-	-	-	-	0	0	0	0	0	0	0	0	0	0
Styrene	µg/g	0.05	34	5	50	50	0	0	0	0	0	0	0	0	0	0
trans-1,2-Dichloroethylene	µg/g	0.05	1.3	-	-	-	0	0	0	0	0	0	0	0	0	0
trans-1,3-Dichloropropene	µg/g	0.04	-	-	-	-	0	0	0	0	0	0	0	0	0	0
Trichloroethylene	µg/g	0.05	0.91	-	-	-	0	0	0	0	0	0	0	0	0	0
Trichlorofluoromethane (FREON 11)	µg/g	0.05	4	-	-	-	0	0	0	0	0	0	0	0	0	0
Vinyl Chloride	µg/g	0.02	0.032	-	-	-	0	0	0	0	0	0	0	0	0	0
Total Xylenes	µg/g	0.02	26	11	11	11	0	0	0	0	0	0	0	0	0	0
Hexane	µg/g	0.05	46	0.49	6.5	6.5	0	0	0	0	0	0	0	0	0	0
PAHs																
1-Methylnaphthalene	µg/g	0.005-0.05	76	-	-	-	0	0	0	0	0	0	0	0.004047	0	0.00492
2-Methylnaphthalene	µg/g	0.005-0.05	76	-	-	-	0.004375	0	0	0	0	0	0	0.004028	0	0.004567
Acenaphthene	µg/g	0.005-0.05	96	-	-	-	0	0	0	0	0	0	0	0.014	0.041823	0
Acenaphthylene	µg/g	0.005-0.05	0.15	-	-	-	0	0	0	0	0	0	0	0	0	0
Anthracene	µg/g	0.005-0.05	0.67	2.5	32	32	0	0	0	0	0	0	0	0.015	0.048847	0
Benzo(b/j)fluoranthene	µg/g	0.005-0.05	0.96	1	10	10	0.003894	0.00488	0	0	0	0	0	0.083	0.1	0.006
Benzo(a)anthracene	µg/g	0.005-0.05	0.96	1	10	10	0	0	0	0	0	0	0	0.054	0.086	0
Benzo(a)pyrene	µg/g	0.005-0.05	0.3	20	50	50	0	0.004927	0	0	0	0	0	0.059	0.081	0.004152
Benzo(g,h,i)perylene	µg/g	0.005-0.05	9.6	-	-	-	0.004313	0.006245	0	0	0	0	0	0.046	0.083	0.0057
Benzo(k)fluoranthene	µg/g	0.005-0.05	0.96	1	10	10	0	0	0	0	0	0	0	0.031	0.034582	0
Chrysene	µg/g	0.005-0.05	9.6	-	-	-	0.004498	0.004754	0	0	0	0	0	0.053	0.077	0.0095
Dibenz(a,h)anthracene	µg/g	0.005-0.05	0.1	1	10	10	0	0	0	0	0	0	0	0.01	0	0
Fluoranthene	µg/g	0.005-0.05	9.6	50	180	180	0.004079	0	0	0	0	0	0	0.16	0.26	0
Fluorene	µg/g	0.005-0.05	62	-	-	-	0	0	0	0	0	0	0	0.012	0.041499	0
Indeno(1,2,3-cd)pyrene	µg/g	0.005-0.05	0.76	1	10	10	0	0	0	0	0	0	0	0.045	0.061	0
Naphthalene	µg/g	0.005-0.05	9.6	0.6	22	22	0	0	0	0	0	0	0	0.007	0	0
Phenanthrene	µg/g	0.005-0.05	12	5	50	50	0.004165	0	0	0	0	0	0	0.12	0.26	0.0075
Pyrene	µg/g	0.005-0.05	96	10	100	100	0.004424	0.005759	0	0	0	0	0	0.12	0.18	0
Radionuclides																
H-3	Bq/kg	10-22.4	-	-	-	-	6.2	-3.4	26.5	3.1	-3.1	6.7	4.8	56.8	5	17.3
C-14	Bq/g-C	0.04-0.06	-	-	-	-	0.0303	0.117	0.129	-0.0139	0.0534	-0.0247	-0.0405	0.0258	-0.0118	0.107
Co-60	Bq/kg	0.2-1	-	-	-	-	0.1	-0.1	-0.1	0.1	0	0.1	0.1	0	0	0
Cs-134	Bq/kg	0.1-1	-	-	-	-	0.3	0.1	0.1	0.4	0	0.4	0.1	0.2	0.1	0
Cs-137	Bq/kg	0.3-1	-	-	-	-	0.4	0.1	0.2	0.3	0.3	0.2	0.1	0.3	0.1	0.2
I-131	Bq/kg	0.3-3	-	-	-	-	0.3	0.4	0.2	0.3	0.5	0.3	0.1	1.4	0	1.1
K-40	Bq/kg	1-30	-	-	-	-	148	98.5	84.6	375	399	403	333	229	247	386
Th-Series	Bq/kg	0.7-7.8	-	-	-	-	8.1	7.48	7.9	11.7	12.2	11.1	10.8	9.9	9.6	19.9
U-Series	Bq/kg	0.5-7.4	-	-	-	-	7.4	6.57	5.2	13.2	11.4	12.2	11.2	10.3	12.3	27.9
Other																
Cyanide (free)	µg/g	0.01	0.051	0.9	8	8	0.00274	0.01	-0.00173	0.00565	0.00347	0.00245	0.00113	**0.33**	0.0054	0.00753
Total Phosphorus	µg/g	10	-	-	-	-	315	380	373	618	655	610	556	423	469	672

Notes:
1. For all analysis results, uncensored data is reported.
2. Results greater than any of the soil quality guidelines are bolded and shaded in grey cells.

Parameter	Unit	Detection Limit	Table 3 Standards	CCME SQG (Residential/ Parkland)	CCME SQG (Commercial)	CCME SQG (Industrial)	DN7	DN7-A	DN7-B	DN8	DN8-A	DN8-B	DN9	DN10
			Soil Quality Objectives				DN7	DN7-A	DN7-B	DN8	DN8-A	DN8-B	DN9	DN10
							24-Apr-19	24-Apr-19	24-Apr-19	24-Apr-19	24-Apr-19	24-Apr-19	23-Apr-19	23-Apr-19
Physical/Conventional Parameters														
Conductivity	µmho/cm	2	1400	1400	4000	4000	124	146	126	221	106	256	156	187
pH	pH	0	5-9	5-9	5-9	5-9	7.99	7.6	7.86	7.89	8.11	8.01	7.48	7.55
TOC	%	0.1	-	-	-	-	0.78	1.77	0.79	0.25	0.16	0.76	1.71	0.96
Moisture	%	1	-	-	-	-	8.2	11	7.2	7.7	7	9.2	23	17
Metals														
Total Antimony (Sb)	µg/g	0.1	40	20	40	40	0.17	0.23	0.43	0.05941	0.18	0.0789	0.04912	0.18
Total Arsenic (As)	µg/g	0.5	18	12	12	12	1.42	1.66	1.33	1.09	1.14	1.54	0.83	6.77
Total Barium (Ba)	µg/g	0.1	670	500	2000	2000	22.6	30.5	20	23.7	27.3	26	33.4	104
Total Beryllium (Be)	µg/g	0.2	8	4	8	8	0.21	0.27	0.17734	0.22	0.15764	0.33	0.21	0.55
Total Boron (B)	µg/g	1	120	-	-	-	5.2	7.2	5.1	6.1	3.8	7.7	5.1	4.6
Total Calcium (Ca)	µg/g	100	-	-	-	-	174000	172000	166000	153000	176000	176000	106000	11500
Total Cadmium (Cd)	µg/g	0.05	1.9	10	22	22	0.069	0.09	0.084	0.054	0.03448	0.079	0.054	0.179
Total Cesium (Cs)	µg/g	1	-	-	-	-	0.35329	0.48259	0.31034	0.43069	0.27586	0.52268	0.32908	0.72709
Total Chromium (Cr)	µg/g	1	160	64	87	87	7.1	9	8.3	7.8	5.4	9.1	9.9	22.2
Total Cobalt (Co)	µg/g	0.3	80	50	300	300	2.41	3.14	2.14	2.46	2.14	2.94	2.91	7.06
Total Copper (Cu)	µg/g	0.5	230	63	91	91	8.68	11.2	8.56	5.93	5.76	8.22	6.02	16.8
Total Lead (Pb)	µg/g	0.1	120	140	260	260	7.13	10.9	10.7	4.65	2.75	8	3.59	23.6
Total Mercury (Hg)	µg/g	0.05	3.9	6.6	24	50	0.01472	0.01493	0.00493	0.00495	0	0.00493	0.01473	0.03486
Total Molybdenum (Mo)	µg/g	0.1	40	10	40	40	0.42	0.66	0.63	0.25	0.23	0.4	0.24	0.25
Total Nickel (Ni)	µg/g	0.8	270	45	89	89	6.71	11	5.98	6.41	3.99	8.6	6.07	13
Total Selenium (Se)	µg/g	0.5	5.5	1	2.9	2.9	0.11776	0.18905	0.08374	0.05941	0.02463	0.09862	0.07367	0.20916
Total Silver (Ag)	µg/g	0.05	40	20	40	40	0.01963	0.02488	0.0197	0.0099	0.00493	0.01479	0.01473	0.0498
Total Sodium (Na)	µg/g	100	-	-	-	-	155	197	138	173	137	208	204	205
Total Thallium (Tl)	µg/g	0.05	3.3	1	1	1	0.064	0.085	0.04926	0.0495	0.054	0.064	0.059	0.144
Total Tin (Sn)	µg/g	0.1	-	50	300	300	0.43	0.4	0.49	0.34	0.55	0.42	0.42	0.79
Total Uranium (U)	µg/g	0.05	33	23	300	300	0.52	0.587	0.438	0.554	0.517	0.537	0.629	0.642
Total Vanadium (V)	µg/g	2	86	130	130	130	12.4	12.2	11.5	12.8	11.6	13.6	19.4	36.7
Total Zinc (Zn)	µg/g	1	340	250	410	410	34.2	42.5	50.4	28.8	22.7	63.6	21.3	50.3
Total Aluminum (Al)	µg/g	100	-	-	-	-	3250	4160	3280	3950	2940	4750	4380	13900
Hot Water Ext. Boron (B)	µg/g	0.05	2	-	-	-	0.15	0.27	0.17	0.14	0.076	0.16	0.2	0.12
Total Titanium (Ti)	µg/g	1	-	-	-	-	166	118	174	196	253	133	400	874
Total Bismuth (Bi)	µg/g	0.1	-	-	-	-	0.03435	0.04478	0.03448	0.0297	0.0197	0.03945	0.03438	0.05976
Total Iron (Fe)	µg/g	100	-	-	-	-	8890	9600	8750	8520	8160	8940	10700	18500
Total Lithium (Li)	µg/g	5	-	-	-	-	5.5	7.1	5	6.2	4.86207	8.4	4.8723	11
Total Magnesium (Mg)	µg/g	100	-	-	-	-	5790	6870	5190	6230	5640	7220	7660	4720
Total Manganese (Mn)	µg/g	0.2	-	-	-	-	276	286	244	240	279	267	243	443
Total Potassium (K)	µg/g	100	-	-	-	-	807	958	750	1040	782	1210	986	2010
Total Strontium (Sr)	µg/g	0.1	-	-	-	-	320	392	304	282	276	351	174	29.3
Total Thorium (Th)	µg/g	0.1	-	-	-	-	1.8	1.74	1.61	2.45	3.23	2.29	2.71	3.78
Total Tungsten (W)	µg/g	0.5	-	-	-	-	0.06869	0.07463	0.11823	0.07921	0.04926	0.04931	0.05894	0.07968
Total Zirconium (Zr)	µg/g	0.5	-	-	-	-	0.88	0.83	0.85	2.36	1.93	1.79	1.85	1.34
Sodium Adsorption Ratio	N/A	0	12	5	12	12	0.35	0.27	0.27	0.26	0.33	0.22	0.24	0.22
PHC														
F1 (C6-C10) - BTEX	µg/g	10-20	55	210	320	320	0	0	0	0	0	0	0	0
F1 (C6-C10)	µg/g	10-20	55	210	320	320	0	0	0	0	0	0	0	0
F2 (C10-C16 Hydrocarbons)	µg/g	10-20	230	150	260	260	0	10	0	0	0	0	0	0
F3 (C16-C34 Hydrocarbons)	µg/g	50-100	1700	300	1700	1700	59	140	48.69741	57	8.258527	41.13107	19.29551	16.21587
F4 (C34-C50 Hydrocarbons)	µg/g	50-100	3300	2800	3300	3300	61	120	90	0	0	0	0	0
F4G-sg (Grav. Heavy Hydrocarbons)	µg/g	100	3300	2800	3300	3300	140	770	500					
Reached Baseline at C50	µg/g	-	-	-	-	-	0	0	0	1	1	1	1	1
VOC														
1,1,1,2-Tetrachloroethane	µg/g	0.05	0.087	-	-	-	0	0	0	0	0	0	0	0
1,1-Dichloroethane	µg/g	0.05	17	5	50	50	0	0	0	0	0	0	0	0
1,1-Dichloroethylene	µg/g	0.05	0.064	5	50	50	0	0	0	0	0	0	0	0
1,2-Dibromoethane	µg/g	0.05	0.05	-	-	-	0	0	0	0	0	0	0	0
1,2-Dichlorobenzene	µg/g	0.05	6.8	1	10	10	0	0	0	0	0	0	0	0
1,2-Dichloroethane	µg/g	0.05	0.05	5	50	50	0	0	0	0	0	0	0	0
1,2-Dichloropropane	µg/g	0.05	0.16	5	50	50	0	0	0	0	0	0	0	0
1,3-Dichlorobenzene	µg/g	0.05	9.6	1	10	10	0	0	0	0	0	0	0	0
1,3-Dichloropropene (cis+trans)	µg/g	0.05	0.18	-	-	-	0	0	0	0	0	0	0	0
1,4-Dichlorobenzene	µg/g	0.05	0.2	1	10	10	0	0	0	0	0	0	0	0
2-Butanone	µg/g	0.5	70	-	-	-	0	0	0	0	0	0	0	0
Methyl Isobutyl Ketone	µg/g	0.5	31	-	-	-	0	0	0	0	0	0	0	0
Acetone (2-Propanone)	µg/g	0.5	16	-	-	-	0	0	0	0	0	0	0	0
Benzene	µg/g	0.02	0.32	0.03	0.03	0.03	0	0	0	0	0	0	0	0
Bromodichloromethane	µg/g	0.05	18	-	-	-	0	0	0	0	0	0	0	0
Bromoform	µg/g	0.05	0.61	-	-	-	0	0	0	0	0	0	0	0
Bromomethane	µg/g	0.05	0.05	-	-	-	0	0	0	0	0	0	0	0
Carbon Tetrachloride	µg/g	0.05	0.21	5	50	50	0	0	0	0	0	0	0	0
Chlorobenzene	µg/g	0.05	2.4	1	10	10	0	0	0	0	0	0	0	0
Chloroform	µg/g	0.05	0.47	5	50	50	0	0	0	0	0	0	0	0
cis-1,2-Dichloroethylene	µg/g	0.05	55	-	-	-	0	0	0	0	0	0	0	0
cis-1,3-Dichloropropene	µg/g	0.03	-	-	-	-	0	0	0	0	0	0	0	0
Dibromochloromethane	µg/g	0.05	13	-	-	-	0	0	0	0	0	0	0	0
Dichlorodifluoromethane (FREON 12)	µg/g	0.05	16	-	-	-	0	0	0	0	0	0	0	0
Ethylbenzene	µg/g	0.02	9.5	0.082	0.082	0.082	0	0	0	0	0	0	0	0
p+m-Xylene	µg/g	0.02	-	-	-	-	0	0	0	0	0	0	0	0
Methyl t-butyl ether (MTBE)	µg/g	0.05	11	-	-	-	0	0	0	0	0	0	0	0
Methylene Chloride(Dichloromethane)	µg/g	0.05	1.6	5	50	50	0	0	0	0	0	0	0	0
o-Xylene	µg/g	0.02	-	-	-	-	0	0	0	0	0	0	0	0
Styrene	µg/g	0.05	34	5	50	50	0	0	0	0	0	0	0	0
trans-1,2-Dichloroethylene	µg/g	0.05	1.3	-	-	-	0	0	0	0	0	0	0	0
trans-1,3-Dichloropropene	µg/g	0.04	-	-	-	-	0	0	0	0	0	0	0	0
Trichloroethylene	µg/g	0.05	0.91	-	-	-	0	0	0	0	0	0	0	0
Trichlorofluoromethane (FREON 11)	µg/g	0.05	4	-	-	-	0	0	0	0	0	0	0	0
Vinyl Chloride	µg/g	0.02	0.032	-	-	-	0	0	0	0	0	0	0	0
Total Xylenes	µg/g	0.02	26	11	11	11	0	0	0	0	0	0	0	0
Hexane	µg/g	0.05	46	0.49	6.5	6.5	0	0	0	0	0	0	0	0
PAHs														
1-Methylnaphthalene	µg/g	0.005-0.05	76	-	-	-	0	0.003227	0	0	0	0	0	0
2-Methylnaphthalene	µg/g	0.005-0.05	76	-	-	-	0	0	0	0	0	0	0	0
Acenaphthene	µg/g	0.005-0.05	96	-	-	-	0	0	0	0	0	0	0	0
Acenaphthylene	µg/g	0.005-0.05	0.15	-	-	-	0	0	0	0	0	0	0	0
Anthracene	µg/g	0.005-0.05	0.67	2.5	32	32	0	0	0	0	0	0	0	0
Benzo(b/j)fluoranthene	µg/g	0.005-0.05	0.96	1	10	10	0.011	0.0064	0.01	0.004942	0	0.0073	0	0.00436
Benzo(a)anthracene	µg/g	0.005-0.05	0.96	1	10	10	0.003863	0	0.003761	0	0	0	0	0
Benzo(a)pyrene	µg/g	0.005-0.05	0.3	20	50	50	0.0061	0.004249	0.0066	0	0	0.003664	0	0
Benzo(g,h,i)perylene	µg/g	0.005-0.05	9.6	-	-	-	0.0088	0.0096	0.014	0.003385	0	0.0056	0	0
Benzo(k)fluoranthene	µg/g	0.005-0.05	0.96	1	10	10	0	0	0	0	0	0	0	0
Chrysene	µg/g	0.005-0.05	9.6	-	-	-	0.0061	0.0078	0.0062	0.004774	0	0.0051	0	0
Dibenz(a,h)anthracene	µg/g	0.005-0.05	0.1	1	10	10	0	0	0	0	0	0	0	0
Fluoranthene	µg/g	0.005-0.05	9.6	50	180	180	0.004816	0.003016	0.0065	0	0	0.003926	0	0.004652
Fluorene	µg/g	0.005-0.05	62	-	-	-	0	0	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	µg/g	0.005-0.05	0.76	1	10	10	0.0059	0.003948	0.0079	0	0	0.004394	0	0
Naphthalene	µg/g	0.005-0.05	9.6	0.6	22	22	0	0	0	0	0	0	0	0
Phenanthrene	µg/g	0.005-0.05	12	5	50	50	0.004002	0.0065	0.005	0	0	0.00398	0	0
Pyrene	µg/g	0.005-0.05	96	10	100	100	0.0054	0.004499	0.007	0	0	0.004198	0	0.003856
Radionuclides														
H-3	Bq/kg	10-22.4	-	-	-	-	26.2	27.7	31.3	6.4	30.8	49.7	172	16.1
C-14	Bq/g-C	0.04-0.06	-	-	-	-	-0.0161	-0.035	-0.004	-0.0614	-0.0384	-0.0814	0.0321	0.0488
Co-60	Bq/kg	0.2-1	-	-	-	-	0	0.1	0.3	-0.1	0.2	0.3	-0.2	-0.2
Cs-134	Bq/kg	0.1-1	-	-	-	-	0.1	0.1	0.1	0.2	0	0.4	0	0.2
Cs-137	Bq/kg	0.3-1	-	-	-	-	0	0.1	0	0.2	0.2	0.4	0.4	1.3
I-131	Bq/kg	0.3-3	-	-	-	-	0.5	0.2	0.5	0.6	0	-0.1	0.4	1.5
K-40	Bq/kg	1-30	-	-	-	-	268	266	237	270	210	373	518	637
Th-Series	Bq/kg	0.7-7.8	-	-	-	-	11.5	10.1	10.1	13.6	10.3	15.8	14.6	20.7
U-Series	Bq/kg	0.5-7.4	-	-	-	-	14.7	13.2	14.2	10.5	10.9	12.6	14	15.8
Other														
Cyanide (free)	µg/g	0.01	0.051	0.9	8	8	0.00532	0.00573	0.00318	0	0.00206	0.00328	0.01	0.00492
Total Phosphorus	µg/g	10	-	-	-	-	452	582	407	458	395	436	624	751

Notes:

1. For all analysis results, uncensored data is reported.
2. Results greater than any of the soil quality guidelines are bolded and shaded in grey cells.

			Soil Quality Objectives				DN11		DN12	DN13	DN13	DN14	DN15	DN16
				CCME SQG			DN11	DUP-1	DN12	DN13	DUP-4	DN14	DN15	DN16
Parameter	Unit	Detection Limit	Table 3 Standards	CCME SQG (Residential/ Parkland)	CCME SQG (Commercial)	CCME SQG (Industrial)	23-Apr-19	23-Apr-19	24-Apr-19	24-Apr-19	24-Apr-19	24-Apr-19	24-Apr-19	24-Apr-19
Physical/Conventional Parameters														
Conductivity	µmho/cm	2	1400	1400	4000	4000	265	248	251	165	191	230	246	256
pH	pH	0	5-9	5-9	5-9	5-9	7.25	7.54	7.22	7.38	7.59	7.59	7.55	7.44
TOC	%	0.1	-	-	-	-	2.27	2.57	2.06	1.55	1.7	2.43	3.41	2.13
Moisture	%	1	-	-	-	-	26	29	33	24	17	20	25	26
Metals														
Total Antimony (Sb)	µg/g	0.1	40	20	40	40	0.12	0.11	0.14	0.06972	0.06468	0.06836	0.13	0.07905
Total Arsenic (As)	µg/g	0.5	18	12	12	12	2.46	2.13	2.31	1.38	1.33	1.8	2	1.39
Total Barium (Ba)	µg/g	0.1	670	500	2000	2000	65.3	66.7	66.1	43.5	43.5	92.9	54.4	107
Total Beryllium (Be)	µg/g	0.2	8	4	8	8	0.4	0.4	0.47	0.3	0.28	0.55	0.38	0.48
Total Boron (B)	µg/g	1	120	-	-	-	6.9	6.8	6.3	4.3	4.1	6.5	6.6	7.7
Total Calcium (Ca)	µg/g	100	-	-	-	-	55400	56500	12500	65200	74500	48400	57300	86000
Total Cadmium (Cd)	µg/g	0.05	1.9	10	22	22	0.199	0.199	0.285	0.129	0.129	0.117	0.274	0.138
Total Cesium (Cs)	µg/g	1	-	-	-	-	0.54835	0.5107	0.515	0.38347	0.33333	0.64941	0.36355	0.76087
Total Chromium (Cr)	µg/g	1	160	64	87	87	16.5	16.1	16.3	11.1	10.2	20.9	14.3	20.8
Total Cobalt (Co)	µg/g	0.3	80	50	300	300	5.21	4.51	5	3.22	3.18	7.1	4.19	6.98
Total Copper (Cu)	µg/g	0.5	230	63	91	91	16.4	11.7	9.58	5.8	6.32	15.2	14.9	15.1
Total Lead (Pb)	µg/g	0.1	120	140	260	260	9.03	7.91	14.3	6.07	6.11	8.14	9.83	7.19
Total Mercury (Hg)	µg/g	0.05	3.9	6.6	24	50	0.02991	0.02918	0.045	0.01494	0.0199	0.02441	0.04482	0.01976
Total Molybdenum (Mo)	µg/g	0.1	40	10	40	40	0.39	0.36	0.39	0.24	0.22	0.23	0.95	0.26
Total Nickel (Ni)	µg/g	0.8	270	45	89	89	9.59	10.2	9.85	6.59	6.37	15.1	8.5	13.7
Total Selenium (Se)	µg/g	0.5	5.5	1	2.9	2.9	0.334	0.29183	0.33	0.10956	0.12438	0.12695	0.29382	0.12846
Total Silver (Ag)	µg/g	0.05	40	20	40	40	0.04487	0.04377	0.055	0.01992	0.0199	0.03906	0.553	0.04447
Total Sodium (Na)	µg/g	100	-	-	-	-	192	184	114	133	128	168	117	266
Total Thallium (Tl)	µg/g	0.05	3.3	1	1	1	0.095	0.097	0.11	0.07	0.065	0.137	0.1	0.148
Total Tin (Sn)	µg/g	0.1	-	50	300	300	0.91	0.71	0.72	0.49	0.42	0.58	0.64	0.69
Total Uranium (U)	µg/g	0.05	33	23	300	300	0.508	0.506	0.455	0.418	0.388	0.454	0.583	0.455
Total Vanadium (V)	µg/g	2	86	130	130	130	25.3	24.6	25.5	19.9	17.7	27.5	21.5	30.2
Total Zinc (Zn)	µg/g	1	340	250	410	410	63	53.8	52.9	31.5	31.8	44	53.3	53.5
Total Aluminum (Al)	µg/g	100	-	-	-	-	9170	8840	10900	6610	6410	12800	8760	11800
Hot Water Ext. Boron (B)	µg/g	0.05	2	-	-	-	0.65	0.23	0.41	0.15	0.2	0.29	0.44	0.41
Total Titanium (Ti)	µg/g	1	-	-	-	-	403	390	313	330	278	434	264	639
Total Bismuth (Bi)	µg/g	0.1	-	-	-	-	0.05982	0.0535	0.075	0.03486	0.03483	0.07324	0.0747	0.06917
Total Iron (Fe)	µg/g	100	-	-	-	-	14300	13800	15000	11300	10500	17800	14000	17300
Total Lithium (Li)	µg/g	5	-	-	-	-	8.6	8.6	11	5.4	5.4	12.6	7.9	10.5
Total Magnesium (Mg)	µg/g	100	-	-	-	-	5560	5460	3300	4150	4190	6060	4130	7740
Total Manganese (Mn)	µg/g	0.2	-	-	-	-	326	322	397	296	296	408	446	399
Total Potassium (K)	µg/g	100	-	-	-	-	1530	1480	1480	875	924	2310	1240	2770
Total Strontium (Sr)	µg/g	0.1	-	-	-	-	103	103	27.3	112	122	93.5	95.4	142
Total Thorium (Th)	µg/g	0.1	-	-	-	-	1.91	1.92	1.91	1.99	1.7	3.87	1.76	3.56
Total Tungsten (W)	µg/g	0.5	-	-	-	-	0.09472	0.08268	0.095	0.05976	0.0597	0.08789	7.04	0.12846
Total Zirconium (Zr)	µg/g	0.5	-	-	-	-	0.72	0.82	0.66	0.47311	0.56	2.12	0.62	1.81
Sodium Adsorption Ratio	N/A	0	12	5	12	12	0.19	0.2	0.21	0.23	0.3	0.2	0.19	0.19
PHC														
F1 (C6-C10) - BTEX	µg/g	10-20	55	210	320	320	0	0	0	0	0	0	0	0
F1 (C6-C10)	µg/g	10-20	55	210	320	320	0	0	0	0	0	0	0	0
F2 (C10-C16 Hydrocarbons)	µg/g	10-20	230	150	260	260	0	0	0	0	0	0	0	0
F3 (C16-C34 Hydrocarbons)	µg/g	50-100	1700	300	1700	1700	24.25687	23.66427	30.09146	21.19762	27.94283	62	44.34857	34.77169
F4 (C34-C50 Hydrocarbons)	µg/g	50-100	3300	2800	3300	3300	0	0	0	0	0	0	0	0
F4G-sg (Grav. Heavy Hydrocarbons)	µg/g	100	3300	2800	3300	3300								
Reached Baseline at C50	µg/g	-	-	-	-	-	1	1	1	1	1	1	1	1
VOC														
1,1,1,2-Tetrachloroethane	µg/g	0.05	0.087	-	-	-	0	0	0	0	0	0	0	0
1,1-Dichloroethane	µg/g	0.05	17	5	50	50	0	0	0	0	0	0	0	0
1,1-Dichloroethylene	µg/g	0.05	0.064	5	50	50	0	0	0	0	0	0	0	0
1,2-Dibromoethane	µg/g	0.05	0.05	-	-	-	0	0	0	0	0	0	0	0
1,2-Dichlorobenzene	µg/g	0.05	6.8	1	10	10	0	0	0	0	0	0	0	0
1,2-Dichloroethane	µg/g	0.05	0.05	5	50	50	0	0	0	0	0	0	0	0
1,2-Dichloropropane	µg/g	0.05	0.16	5	50	50	0	0	0	0	0	0	0	0
1,3-Dichlorobenzene	µg/g	0.05	9.6	1	10	10	0	0	0	0	0	0	0	0
1,3-Dichloropropene (cis+trans)	µg/g	0.05	0.18	-	-	-	0	0	0	0	0	0	0	0
1,4-Dichlorobenzene	µg/g	0.05	0.2	1	10	10	0	0	0	0	0	0	0	0
2-Butanone	µg/g	0.5	70	-	-	-	0	0	0	0	0	0	0	0
Methyl Isobutyl Ketone	µg/g	0.5	31	-	-	-	0	0	0	0	0	0	0	0
Acetone (2-Propanone)	µg/g	0.5	16	-	-	-	0	0	0	0	0	0	0	0
Benzene	µg/g	0.02	0.32	0.03	0.03	0.03	0	0	0	0	0	0	0	0
Bromodichloromethane	µg/g	0.05	18	-	-	-	0	0	0	0	0	0	0	0
Bromoform	µg/g	0.05	0.61	-	-	-	0	0	0	0	0	0	0	0
Bromomethane	µg/g	0.05	0.05	-	-	-	0	0	0	0	0	0	0	0
Carbon Tetrachloride	µg/g	0.05	0.21	5	50	50	0	0	0	0	0	0	0	0
Chlorobenzene	µg/g	0.05	2.4	1	10	10	0	0	0	0	0	0	0	0
Chloroform	µg/g	0.05	0.47	5	50	50	0	0	0	0	0	0	0	0
cis-1,2-Dichloroethylene	µg/g	0.05	55	-	-	-	0	0	0	0	0	0	0	0
cis-1,3-Dichloropropene	µg/g	0.03	-	-	-	-	0	0	0	0	0	0	0	0
Dibromochloromethane	µg/g	0.05	13	-	-	-	0	0	0	0	0	0	0	0
Dichlorodifluoromethane (FREON 12)	µg/g	0.05	16	-	-	-	0	0	0	0	0	0	0	0
Ethylbenzene	µg/g	0.02	9.5	0.082	0.082	0.082	0	0	0	0	0	0	0	0
p+m-Xylene	µg/g	0.02	-	-	-	-	0	0	0	0	0	0	0	0
Methyl t-butyl ether (MTBE)	µg/g	0.05	11	-	-	-	0	0	0	0	0	0	0	0
Methylene Chloride(Dichloromethane)	µg/g	0.05	1.6	5	50	50	0	0	0	0	0	0	0	0
o-Xylene	µg/g	0.02	-	-	-	-	0	0	0	0	0	0	0	0
Styrene	µg/g	0.05	34	5	50	50	0	0	0	0	0	0	0	0
trans-1,2-Dichloroethylene	µg/g	0.05	1.3	-	-	-	0	0	0	0	0	0	0	0
trans-1,3-Dichloropropene	µg/g	0.04	-	-	-	-	0	0	0	0	0	0	0	0
Trichloroethylene	µg/g	0.05	0.91	-	-	-	0	0	0	0	0	0	0	0
Trichlorofluoromethane (FREON 11)	µg/g	0.05	4	-	-	-	0	0	0	0	0	0	0	0
Vinyl Chloride	µg/g	0.02	0.032	-	-	-	0	0	0	0	0	0	0	0
Total Xylenes	µg/g	0.02	26	11	11	11	0	0	0	0	0	0	0	0
Hexane	µg/g	0.05	46	0.49	6.5	6.5	0	0	0	0	0	0	0	0
PAHs														
1-Methylnaphthalene	µg/g	0.005-0.05	76	-	-	-	0	0	0	0	0	0	0.0091	0
2-Methylnaphthalene	µg/g	0.005-0.05	76	-	-	-	0	0	0	0	0	0	0.0092	0
Acenaphthene	µg/g	0.005-0.05	96	-	-	-	0	0	0	0	0	0	0	0
Acenaphthylene	µg/g	0.005-0.05	0.15	-	-	-	0	0	0	0	0	0	0	0
Anthracene	µg/g	0.005-0.05	0.67	2.5	32	32	0	0	0	0	0	0	0	0
Benzo(b/j)fluoranthene	µg/g	0.005-0.05	0.96	1	10	10	0.004231	0.004444	0.01	0	0	0.004163	0.0089	0.006
Benzo(a)anthracene	µg/g	0.005-0.05	0.96	1	10	10	0	0	0.0052	0	0	0	0.004761	0
Benzo(a)pyrene	µg/g	0.005-0.05	0.3	20	50	50	0	0	0.0067	0	0	0	0.0064	0.004595
Benzo(g,h,i)perylene	µg/g	0.005-0.05	9.6	-	-	-	0	0.003808	0.0071	0	0	0.0058	0.0075	0.0059
Benzo(k)fluoranthene	µg/g	0.005-0.05	0.96	1	10	10	0	0	0.002909	0	0	0	0	0
Chrysene	µg/g	0.005-0.05	9.6	-	-	-	0	0	0.0054	0	0	0	0.0061	0.004319
Dibenz(a,h)anthracene	µg/g	0.005-0.05	0.1	1	10	10	0	0	0	0	0	0	0	0
Fluoranthene	µg/g	0.005-0.05	9.6	50	180	180	0.004109	0.0052	0.011	0	0	0.003637	0.0092	0.0062
Fluorene	µg/g	0.005-0.05	62	-	-	-	0	0	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	µg/g	0.005-0.05	0.76	1	10	10	0	0	0.0064	0	0	0	0.004912	0.004157
Naphthalene	µg/g	0.005-0.05	9.6	0.6	22	22	0	0	0	0	0	0	0.004408	0
Phenanthrene	µg/g	0.005-0.05	12	5	50	50	0	0	0.0057	0	0	0	0.0082	0
Pyrene	µg/g	0.005-0.05	96	10	100	100	0.00395	0.02	0.0096	0	0	0	0.0086	0.0062
Radionuclides														
H-3	Bq/kg	10-22.4	-	-	-	-	74.4	302	60.2	2.8	34.1	1.4	30	8
C-14	Bq/g-C	0.04-0.06	-	-	-	-	0.0646	-0.0136	0.134	-0.0053	0.114	0.0336	0.259	0.058
Co-60	Bq/kg	0.2-1	-	-	-	-	-0.1	-0.1	-0.3	-0.1	0.3	-0.2	0	-0.1
Cs-134	Bq/kg	0.1-1	-	-	-	-	0.1	0.1	0.1	0	0.2	0.1	0.1	0.2
Cs-137	Bq/kg	0.3-1	-	-	-	-	1.7	2.4	5.5	0.6	0.8	0.7	6.3	0.6
I-131	Bq/kg	0.3-3	-	-	-	-	-0.1	2.5	2.2	0.8	0.6	2.4	0.3	0.3
K-40	Bq/kg	1-30	-	-	-	-	405	424	450	385	436	580	514	498
Th-Series	Bq/kg	0.7-7.8	-	-	-	-	11.1	14.9	15.4	12.7	15	25.9	22.7	18.5
U-Series	Bq/kg	0.5-7.4	-	-	-	-	10.2	15.1	11.7	13.4	12	16.8	16.4	11.7
Other														
Cyanide (free)	µg/g	0.01	0.051	0.9	8	8	0.04	0.03	**0.07**	0.00412	0.05	0.04	0.01	0.00682
Total Phosphorus	µg/g	10	-	-	-	-	742	709	583	600	629	661	782	768

Notes:
1. For all analysis results, uncensored data is reported.
2. Results greater than any of the soil quality guidelines are bolded and shaded in grey cells.

Parameter	Unit	Detection Limit	Soil Quality Objectives: Table 3 Standards	CCME SQG (Residential/ Parkland)	CCME SQG (Commercial)	CCME SQG (Industrial)	DN17	DN17-A	DN17-B	DN18	DN18-A	DN18-A
							DN17	DN17-A	DN17-B	DN18	DN18-A	
							24-Apr-19	24-Apr-19	24-Apr-19	24-Apr-19	24-Apr-19	24-Apr-19
Physical/Conventional Parameters												
Conductivity	µmho/cm	2	1400	1400	4000	4000	173	172	151	110	93	100
pH	pH	0	5-9	5-9	5-9	5-9	7.19	7.24	7.4	7.68	7.65	7.75
TOC	%	0.1	-	-	-	-	2.12	1.82	1.7	0.8	0.39	0.38
Moisture	%	1	-	-	-	-	23	29	34	9.4	9.1	9.6
Metals												
Total Antimony (Sb)	µg/g	0.1	40	20	40	40	0.1	0.12	0.11	0.06417	0.07968	0.09425
Total Arsenic (As)	µg/g	0.5	18	12	12	12	1.71	1.82	1.68	0.99	0.91	0.97
Total Barium (Ba)	µg/g	0.1	670	500	2000	2000	60.3	86.9	61.4	16.1	15.2	18.3
Total Beryllium (Be)	µg/g	0.2	8	4	8	8	0.44	0.56	0.43	0.18756	0.15936	0.17361
Total Boron (B)	µg/g	1	120	-	-	-	6	5.6	5.2	2.9	2.6	2.9
Total Calcium (Ca)	µg/g	100	-	-	-	-	6520	9520	6790	104000	107000	105000
Total Cadmium (Cd)	µg/g	0.05	1.9	10	22	22	0.233	0.251	0.26	0.059	0.04482	0.06
Total Cesium (Cs)	µg/g	1	-	-	-	-	0.53571	0.66372	0.61938	0.20731	0.20916	0.20337
Total Chromium (Cr)	µg/g	1	160	64	87	87	15.9	19.8	16.6	6.7	6.8	7.2
Total Cobalt (Co)	µg/g	0.3	80	50	300	300	4.7	5.85	4.82	2.24	2.33	2.29
Total Copper (Cu)	µg/g	0.5	230	63	91	91	8.07	9.99	7.38	4.15	3.58	4.01
Total Lead (Pb)	µg/g	0.1	120	140	260	260	9.22	10.8	9.12	4.36	4.15	5.95
Total Mercury (Hg)	µg/g	0.05	3.9	6.6	24	50	0.02976	0.0295	0.03497	0.01481	0.00996	0.00496
Total Molybdenum (Mo)	µg/g	0.1	40	10	40	40	0.26	0.25	0.23	0.18	0.16	0.19
Total Nickel (Ni)	µg/g	0.8	270	45	89	89	9.17	11.6	9.17	3.74	3.79	3.54
Total Selenium (Se)	µg/g	0.5	5.5	1	2.9	2.9	0.25298	0.27532	0.26474	0.05429	0.03984	0.04464
Total Silver (Ag)	µg/g	0.05	40	20	40	40	0.03472	0.03933	0.03497	0.00987	0.00996	0.01488
Total Sodium (Na)	µg/g	100	-	-	-	-	102	126	111	85.46397	83.69024	90.29762
Total Thallium (Tl)	µg/g	0.05	3.3	1	1	1	0.104	0.128	0.105	0.04442	0.03984	0.04464
Total Tin (Sn)	µg/g	0.1	-	50	300	300	0.69	0.74	0.66	0.41	0.38	0.43
Total Uranium (U)	µg/g	0.05	33	23	300	300	0.441	0.472	0.45	0.375	0.393	0.407
Total Vanadium (V)	µg/g	2	86	130	130	130	27.2	31.2	29.7	18.3	19	18.9
Total Zinc (Zn)	µg/g	1	340	250	410	410	43.2	48.3	45.5	22.7	19.9	24.3
Total Aluminum (Al)	µg/g	100	-	-	-	-	10900	13600	11000	3320	3170	3240
Hot Water Ext. Boron (B)	µg/g	0.05	2	-	-	-	0.52	0.29	0.26	0.12	0.058	0.083
Total Titanium (Ti)	µg/g	1	-	-	-	-	431	459	471	279	278	287
Total Bismuth (Bi)	µg/g	0.1	-	-	-	-	0.05456	0.07375	0.05994	0.01974	0.01494	0.01984
Total Iron (Fe)	µg/g	100	-	-	-	-	15100	17600	16300	11500	11800	12100
Total Lithium (Li)	µg/g	5	-	-	-	-	8.3	10.4	9	4.29418	3.93426	4.12202
Total Magnesium (Mg)	µg/g	100	-	-	-	-	3080	3810	3000	3450	3680	3560
Total Manganese (Mn)	µg/g	0.2	-	-	-	-	311	368	452	269	249	251
Total Potassium (K)	µg/g	100	-	-	-	-	1150	1360	983	552	451	465
Total Strontium (Sr)	µg/g	0.1	-	-	-	-	18.2	23.8	18.5	152	154	149
Total Thorium (Th)	µg/g	0.1	-	-	-	-	3.47	2.93	2.15	1.87	3.23	2.12
Total Tungsten (W)	µg/g	0.5	-	-	-	-	0.07937	0.06883	0.06993	0.05923	0.05478	0.06448
Total Zirconium (Zr)	µg/g	0.5	-	-	-	-	0.56	0.79	0.40959	0.35044	0.45817	0.45635
Sodium Adsorption Ratio	N/A	0	12	5	12	12	0.23	0.23	0.24	0.29	0.32	0.33
PHC												
F1 (C6-C10) - BTEX	µg/g	10-20	55	210	320	320	0	0	0	0	0	0
F1 (C6-C10)	µg/g	10-20	55	210	320	320	0	0	0	0	0	0
F2 (C10-C16 Hydrocarbons)	µg/g	10-20	230	150	260	260	0	0	0	0	0	0
F3 (C16-C34 Hydrocarbons)	µg/g	50-100	1700	300	1700	1700	23.6134	28.80208	28.50926	23.51874	15.49902	26.96973
F4 (C34-C50 Hydrocarbons)	µg/g	50-100	3300	2800	3300	3300	0	0	0	0	0	0
F4G-sg (Grav. Heavy Hydrocarbons)	µg/g	100	3300	2800	3300	3300						
Reached Baseline at C50	µg/g	-	-	-	-	-	1	1	1	1	1	1
VOC												
1,1,1,2-Tetrachloroethane	µg/g	0.05	0.087	-	-	-	0	0	0	0	0	0
1,1-Dichloroethane	µg/g	0.05	17	5	50	50	0	0	0	0	0	0
1,1-Dichloroethylene	µg/g	0.05	0.064	5	50	50	0	0	0	0	0	0
1,2-Dibromoethane	µg/g	0.05	0.05	-	-	-	0	0	0	0	0	0
1,2-Dichlorobenzene	µg/g	0.05	6.8	1	10	10	0	0	0	0	0	0
1,2-Dichloroethane	µg/g	0.05	0.05	5	50	50	0	0	0	0	0	0
1,2-Dichloropropane	µg/g	0.05	0.16	5	50	50	0	0	0	0	0	0
1,3-Dichlorobenzene	µg/g	0.05	9.6	1	10	10	0	0	0	0	0	0
1,3-Dichloropropene (cis+trans)	µg/g	0.05	0.18	-	-	-	0	0	0	0	0	0
1,4-Dichlorobenzene	µg/g	0.05	0.2	1	10	10	0	0	0	0	0	0
2-Butanone	µg/g	0.5	70	-	-	-	0	0	0	0	0	0
Methyl Isobutyl Ketone	µg/g	0.5	31	-	-	-	0	0	0	0	0	0
Acetone (2-Propanone)	µg/g	0.5	16	-	-	-	0	0	0	0	0	0
Benzene	µg/g	0.02	0.32	0.03	0.03	0.03	0	0	0	0	0	0
Bromodichloromethane	µg/g	0.05	18	-	-	-	0	0	0	0	0	0
Bromoform	µg/g	0.05	0.61	-	-	-	0	0	0	0	0	0
Bromomethane	µg/g	0.05	0.05	-	-	-	0	0	0	0	0	0
Carbon Tetrachloride	µg/g	0.05	0.21	5	50	50	0	0	0	0	0	0
Chlorobenzene	µg/g	0.05	2.4	1	10	10	0	0	0	0	0	0
Chloroform	µg/g	0.05	0.47	5	50	50	0	0	0	0	0	0
cis-1,2-Dichloroethylene	µg/g	0.05	55	-	-	-	0	0	0	0	0	0
cis-1,3-Dichloropropene	µg/g	0.03	-	-	-	-	0	0	0	0	0	0
Dibromochloromethane	µg/g	0.05	13	-	-	-	0	0	0	0	0	0
Dichlorodifluoromethane (FREON 12)	µg/g	0.05	16	-	-	-	0	0	0	0	0	0
Ethylbenzene	µg/g	0.02	9.5	0.082	0.082	0.082	0	0	0	0	0	0
p+m-Xylene	µg/g	0.02	-	-	-	-	0	0	0	0	0	0
Methyl t-butyl ether (MTBE)	µg/g	0.05	11	-	-	-	0	0	0	0	0	0
Methylene Chloride(Dichloromethane)	µg/g	0.05	1.6	5	50	50	0	0	0	0	0	0
o-Xylene	µg/g	0.02	-	-	-	-	0	0	0	0	0	0
Styrene	µg/g	0.05	34	5	50	50	0	0	0	0	0	0
trans-1,2-Dichloroethylene	µg/g	0.05	1.3	-	-	-	0	0	0	0	0	0
trans-1,3-Dichloropropene	µg/g	0.04	-	-	-	-	0	0	0	0	0	0
Trichloroethylene	µg/g	0.05	0.91	-	-	-	0	0	0	0	0	0
Trichlorofluoromethane (FREON 11)	µg/g	0.05	4	-	-	-	0	0	0	0	0	0
Vinyl Chloride	µg/g	0.02	0.032	-	-	-	0	0	0	0	0	0
Total Xylenes	µg/g	0.02	26	11	11	11	0	0	0	0	0	0
Hexane	µg/g	0.05	46	0.49	6.5	6.5	0	0	0	0	0	0
PAHs												
1-Methylnaphthalene	µg/g	0.005-0.05	76	-	-	-	0.0056	0.00458	0	0	0	0
2-Methylnaphthalene	µg/g	0.005-0.05	76	-	-	-	0.0058	0.004542	0.004654	0	0	0
Acenaphthene	µg/g	0.005-0.05	96	-	-	-	0	0	0	0	0	0
Acenaphthylene	µg/g	0.005-0.05	0.15	-	-	-	0	0	0	0	0	0
Anthracene	µg/g	0.005-0.05	0.67	2.5	32	32	0	0	0	0	0	0
Benzo(b/j)fluoranthene	µg/g	0.005-0.05	0.96	1	10	10	0.0062	0.0055	0.0065	0	0	0
Benzo(a)anthracene	µg/g	0.005-0.05	0.96	1	10	10	0.003641	0	0	0	0	0
Benzo(a)pyrene	µg/g	0.005-0.05	0.3	20	50	50	0.004604	0.004054	0.006	0	0	0
Benzo(g,h,i)perylene	µg/g	0.005-0.05	9.6	-	-	-	0.0052	0.004721	0.0071	0	0	0.0054
Benzo(k)fluoranthene	µg/g	0.005-0.05	0.96	1	10	10	0	0	0	0	0	0
Chrysene	µg/g	0.005-0.05	9.6	-	-	-	0.004465	0	0.004953	0	0	0
Dibenz(a,h)anthracene	µg/g	0.005-0.05	0.1	1	10	10	0	0	0	0	0	0
Fluoranthene	µg/g	0.005-0.05	9.6	50	180	180	0.0074	0.0066	0.007	0	0	0
Fluorene	µg/g	0.005-0.05	62	-	-	-	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	µg/g	0.005-0.05	0.76	1	10	10	0.004094	0.004452	0	0	0	0
Naphthalene	µg/g	0.005-0.05	9.6	0.6	22	22	0.00363	0	0	0	0	0
Phenanthrene	µg/g	0.005-0.05	12	5	50	50	0.0072	0.0055	0.0056	0	0	0
Pyrene	µg/g	0.005-0.05	96	10	100	100	0.0065	0.0058	0.0074	0	0	0
Radionuclides												
H-3	Bq/kg	10-22.4	-	-	-	-	106	89	129	37.3	84.8	29.5
C-14	Bq/g-C	0.04-0.06	-	-	-	-	0.191	0.148	0.236	0.0219	-0.0279	-0.0291
Co-60	Bq/kg	0.2-1	-	-	-	-	-0.1	-0.1	0	-0.1	0	-0.1
Cs-134	Bq/kg	0.1-1	-	-	-	-	0.1	0.2	0.4	0.2	0.1	0.4
Cs-137	Bq/kg	0.3-1	-	-	-	-	4.2	4.6	0.1	0.1	0.7	-0.2
I-131	Bq/kg	0.3-3	-	-	-	-	0.2	0.8	0.1	0.3	2.2	0.2
K-40	Bq/kg	1-30	-	-	-	-	511	533	440	236	279	260
Th-Series	Bq/kg	0.7-7.8	-	-	-	-	18.6	20.2	13.5	8.7	10.7	9.5
U-Series	Bq/kg	0.5-7.4	-	-	-	-	16.7	13.8	11.3	7.6	9.4	11
Other												
Cyanide (free)	µg/g	0.01	0.051	0.9	8	8	0.03	0.01	0.02	0.00566	0.00339	0.0011
Total Phosphorus	µg/g	10	-	-	-	-	594	560	583	470	418	459

Notes:

1. For all analysis results, uncensored data is reported.
2. Results greater than any of the soil quality guidelines are bolded and shaded in grey cells.

Appendix D: Hydrology, Surface Water and Sediment Data

Parameter	Unit	Detection Limit	Sediment Quality Guidelines PSQG (LEL)**	CSQG***	Thompson el al. 2005 (LEL)****	Embayment Area SD09		SD10	SD12	SD13	SD14	SD15	SD17	SD18	SD19	SD20
						DUP-1	SD09	SD10	SD12	SD13	SD14	SD15	SD17	SD18	SD19	SD20
						19-Jun-19	19-Jun-19	18-Jun-19	19-Jun-19	19-Jun-19	19-Jun-19	19-Jun-19	19-Jun-19	19-Jun-19	19-Jun-19	19-Jun-19
Particle Size and Distributrion																
< +1 Phi (0.5 mm)	%	0.1				100	100	99	51	98	100	100	100	65	93	89
< +2 Phi (0.25 mm)	%	0.1				96	97	94	23	70	93	98	80	12	61	54
< +3 Phi (0.12 mm)	%	0.1				42	53	21	7.3	6.4	21	46	13	0.67	5.6	3.2
< +4 Phi (0.062 mm)	%	0.1				29	43	3.4	6.9	1.7	2.5	7.5	0.93	0.57	0.64	0.58
< +5 Phi (0.031 mm)	%	0.1				27	41	2.8	6	1.4	2.2	3.3	0.71	0.57	0.62	0.49
< +6 Phi (0.016 mm)	%	0.1				20	33	1.5	4	1.1	1.7	1.4	0.57	0.53	0.58	0.49
< +7 Phi (0.0078 mm)	%	0.1				11	18	0.79	2.1	0.68	1.1	1	0.57	0.5	0.55	0.45
< +8 Phi (0.0039 mm)	%	0.1				9.9	16	0.79	1.8	0.63	1	0.98	0.54	0.55	0.53	0.35
< +9 Phi (0.0020 mm)	%	0.1				7.2	12	0.69	1.5	0.54	0.94	0.91	0.5	0.53	0.47	0.47
< 0 Phi (1 mm)	%	0.1				100	100	100	98	100	100	100	100	87	97	97
< -1 Phi (2 mm)	%	0.1				100	100	100	99	100	100	100	100	93	99	98
Sand	%	0.1				71	57	96	92	98	98	92	99	92	98	98
Gravel	%	0.1				0	0	0.17	0.82	0.061	0	0.18	0	7.2	1.4	1.7
Silt	%	0.1				19	27	2.6	5.1	1.1	1.4	6.5	0.38	0.018	0.12	0.23
Clay	%	0.1				9.9	16	0.79	1.8	0.63	1	0.98	0.54	0.55	0.53	0.35
Physical/Conventional Parameters																
Moisture	%	1				22	29	18	14	17	18	16	17	16	18	17
Nutrients																
Calculated Total Kjeldahl Nitrogen	µg/g	100	550	550		549	**663**	0	137	0	0	0	0	0	0	0
Nitrate (N)	µg/g	2				0	0	0	0	0	0	0	0	0	0	0
Nitrate + Nitrite (N)	µg/g	3				0.032	0.034	0.33532	0.16932	0.39676	0.10159	0.20238	0.15551	0.15863	0.20319	0.14257
Nitrite (N)	µg/g	0.5				0.114	0.092	0.00013	0.0239	0.06275	0.05179	0.06349	0.07874	0.01196	0.00729	0.04016
Nitrogen (N)	%	0.01				0.055	0.066	0.0084	0.014	0.00822	0.00798	0.00754	0.00367	0.00666	0.00554	0.00534
Total Organic Carbon (BVL)*	mg/kg	500	10000			5100	5900	500	980	1300	630	580	520	2000	620	2900
TOC (Provided by Kinetrics for calculating Radionuclides value)*	%	0.1	1			0.44	0.5	0.1	0.16	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Total Phosphorus (P)	mg/kg	10	600			577	598	545	377	438	**1010**	**999**	553	214	426	422
Metals																
Total Aluminum (Al)	mg/kg	100				3150	4860	1270	1730	1240	1440	1440	1370	1120	1150	1210
Total Antimony (Sb)	mg/kg	0.1				0.04004	0.07882	0.03472	0.02924	0.02439	0.02444	0.02944	0.01974	0.01485	0.01465	0.01953
Total Arsenic (As)	mg/kg	0.5	6	5.9		1.35	1.68	0.95	1.86	1.06	1	1.53	0.67	1.44	1.01	1.13
Total Barium (Ba)	mg/kg	0.1				23.3	42.2	8.42	13.6	9.17	9.31	9.24	9.08	12.3	8.27	9.15
Total Beryllium (Be)	mg/kg	0.2				0.15516	0.24	0.17361	0.11696	0.0878	0.09775	0.10304	0.09378	0.08911	0.08301	0.08789
Total Bismuth (Bi)	mg/kg	0.1				0.02503	0.03941	0.00992	0.01462	0.01463	0.01466	0.01472	0.01481	0.0099	0.00977	0.00977
Total Boron (B)	mg/kg	1				3.8	5.4	2.7	3.5	2.7	2.9	2.6	2.7	2.9	2.4	2.7
Hot Water Ext. Boron (B)	µg/g	0.05-0.1				0.23	0.22	0.03428	0.067	0.04819	0.0339	0.03666	0.00967	0.02891	0.02236	0.02235
Total Cadmium (Cd)	mg/kg	0.05	0.6	0.6		0.055	0.089	0.03968	0.078	0.01951	0.02444	0.054	0.01481	0.0198	0.01465	0.01953
Total Calcium (Ca)	mg/kg	100				112000	121000	102000	160000	105000	104000	96300	102000	173000	111000	125000
Total Cesium (Cs)	mg/kg	1				0.24024	0.39409	0.08433	0.13645	0.0878	0.08798	0.0736	0.08391	0.12376	0.09277	0.08789
Total Chromium (Cr)	mg/kg	1	26	37.3		6.3	9.4	3.7	4.3	4.3	4.4	8.3	5.5	1.9	3.7	3.5
Total Cobalt (Co)	mg/kg	0.3				1.82	2.91	1.03	1.49	1.27	1.21	1.61	1.36	0.74	0.95	0.98
Total Copper (Cu)	mg/kg	0.5	16	35.7		3.65	6.31	1.74	1.84	1.1	1.99	1.78	2.02	1.08	0.9	1.73
Total Iron (Fe)	mg/kg	100	20000			6480	9240	4910	7230	8170	5490	14200	9520	2730	5910	6210
Total Lead (Pb)	mg/kg	0.1	31	35		2.69	4.06	1.44	1.95	1.51	1.68	1.64	1.32	1.52	1.27	1.39
Total Lithium (Li)	mg/kg	5				3.48348	5.3	1.83036	2.52437	1.83902	1.82796	1.7419	1.89536	2.16337	1.75781	1.74805
Total Magnesium (Mg)	mg/kg	100				5280	6950	3960	4860	3600	4520	4630	3650	3720	3380	3720
Total Manganese (Mn)	mg/kg	0.2	460			218	296	147	236	154	166	177	153	199	147	160
Total Mercury (Hg)	mg/kg	0.05	0.2	0.17		0.01001	0.01478	0.01488	0.00975	0.00488	0.00489	0.00491	0.00494	0.00495	0.00488	0.00488
Total Molybdenum (Mo)	mg/kg	0.1			13.8	0.15	0.19	0.11	0.17	0.12	0.16	0.17	0.12	0.06436	0.11	0.11
Total Nickel (Ni)	mg/kg	0.8	16			4.1	6.24	2.1	3.14	2.38	2.28	2.48	2.3	1.86	1.85	1.98
Total Potassium (K)	mg/kg	100				633	1010	255	383	254	284	259	272	291	233	242
Total Selenium (Se)	mg/kg	0.5			1.9	0.08509	0.12315	0.07937	0.04873	0.02927	0.02933	0.02944	0.00987	0.02475	0.02441	0.02441
Total Silver (Ag)	mg/kg	0.05				0.02002	0.0197	0.00992	0.00975	0.00976	0.00978	0.00981	0.00987	0.00495	0.00488	0.00488
Total Sodium (Na)	mg/kg	100				167	211	114	141	108	127	131	110	204	105	124
Total Strontium (Sr)	mg/kg	0.1				178	202	155	245	162	159	150	155	276	169	192
Total Thallium (Tl)	mg/kg	0.05				0.04004	0.064	0.01488	0.01949	0.01463	0.01466	0.01472	0.00987	0.01485	0.00977	0.00977
Total Thorium (Th)	mg/kg	0.1				1.51	2.01	1.37	0.95	1.19	1.96	1.85	1.3	1.92	1.05	1.01
Total Tin (Sn)	mg/kg	0.1				0.39	0.41	0.24	0.2	0.28	0.35	0.49	0.33	0.12	0.27	0.26
Total Titanium (Ti)	mg/kg	1				288	359	229	155	220	388	448	301	54.7	183	227
Total Tungsten (W)	mg/kg	0.5				0.06006	0.07882	0.05456	0.08772	0.06829	0.06843	0.07851	0.04442	0.06931	0.05371	0.06348
Total Uranium (U)	mg/kg	0.05			104.4	0.435	0.498	0.556	0.331	0.41	0.904	0.643	0.429	0.391	0.313	0.352
Total Vanadium (V)	mg/kg	2			35.2	11.1	16	8.8	11.3	13.6	11.2	27.8	17.3	3.3	10.5	10.8
Total Zinc (Zn)	mg/kg	1	120	123		15.3	25.9	6.6	20.5	7.4	8.6	13.2	6.6	7.9	6.5	7.2
Total Zirconium (Zr)	mg/kg	0.5				0.85	0.93	1.31	1.2	1.32	2.06	2.27	1.66	0.89	1.17	1.3
PHCs																
F1 (C6-C10)	µg/g	10-50				0	0	0	0	0	0	0	0	0	0	0
F1 (C6-C10) - BTEX	µg/g	10-50				0	0	0	0	0	0	0	0	0	0	0
F2 (C10-C16 Hydrocarbons)	µg/g	10-70				0	0	0	0	0	0	0	0	0	0	0
F3 (C16-C34 Hydrocarbons)	µg/g	50-350				64	52	11.2004	7.56271	9.73809	8.556194	12.1957	7.438385	7.990025	6.069832	11.36404
F4 (C34-C50 Hydrocarbons)	µg/g	50-350				0	0	0	0	0	0	0	0	0	0	0
F4G-sg (Grav. Heavy Hydrocarbons)	µg/g	230														
Reached Baseline at C50	µg/g	0				1	1	1	1	1	1	1	1	1	1	1
PAHs																
Anthracene	µg/g	0.005-0.03	0.22	0.0469		0	0	0	0	0	0	0	0	0	0	0
Benzo(a)anthracene	µg/g	0.005-0.03	0.32	0.317		0	0.0053	0	0	0	0	0	0	0	0	0
Benzo(a)pyrene	µg/g	0.005-0.03	0.37	0.0319		0.0052	0.0072	0	0	0	0	0	0	0	0	0
Benzo(g,h,i)perylene	µg/g	0.005-0.03	0.17			0.0054	0.0067	0	0	0	0	0	0	0	0	0
Benzo(k)fluoranthene	µg/g	0.005-0.03	0.24			0	0	0	0	0	0	0	0	0	0	0
Chrysene	µg/g	0.005-0.03	0.34	0.0571		0.0054	0.0072	0	0	0	0	0	0	0	0	0
Fluoranthene	µg/g	0.005-0.03	0.75	0.111		0.011	0.015	0	0	0	0	0	0	0	0	0
Fluorene	µg/g	0.005-0.03	0.19	0.0212		0	0	0	0	0	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	µg/g	0.005-0.03	0.2			0.004521	0.0057	0	0	0	0	0	0	0	0	0
Phenanthrene	µg/g	0.005-0.03	0.56	0.0419		0.0062	0.009	0	0	0	0	0	0	0	0	0
Pyrene	µg/g	0.005-0.03	0.49	0.053		0.01	0.013	0	0	0	0	0	0	0	0	0
Total PAHs	µg/g	0.02	4													
Pesticides and PCBs																
Chlordane (Total)	µg/g	0.002	0.007	0.0045												
a-Chlordane	µg/g	0.002														
g-Chlordane	µg/g	0.002														
Aldrin	µg/g	0.002	0.0020													
Aldrin + Dieldrin	µg/g	0.002														
Total (α-, β-, γ-) BHC	µg/g	0.002	0.003													
alpha-BHC	µg/g	0.002	0.006													
beta-BHC	µg/g	0.002	0.005													
gamma-BHC (Lindane)	µg/g	0.002	0.003													
delta-BHC	µg/g	0.002														
Dibenz(a,h)anthracene	µg/g	0.005-0.03	0.06	0.00622		0	0	0	0	0	0	0	0	0	0	0
Dieldrin	µg/g	0.002	0.002	0.00285												
Endrin	µg/g	0.002	0.003	0.00267												
Hexachlorobenzene	µg/g	0.002	0.02													
Heptachlor	µg/g	0.002		0.0006												
Heptachlor + Heptachlor epoxide	µg/g	0.002														
Heptachlor epoxide	µg/g	0.002	0.003	0.0006												
Mirex	µg/g	0.002	0.007													
o,p-DDT	µg/g	0.002														
o,p-DDT + p,p-DDT	µg/g	0.002	0.008													
p,p-DDD	µg/g	0.002	0.008													
p,p-DDE	µg/g	0.002	0.005													
p,p-DDT	µg/g	0.002														
Aroclor 1016	µg/g	0.015	0.007													
Aroclor 1248	µg/g	0.015	0.03													
Aroclor 1254	µg/g	0.015	0.06													
Aroclor 1260	µg/g	0.015	0.005													
Total PCB	µg/g	0.015	0.07	0.0341												
Radionuclides																
Am-241	Bq/kg	2.3-18				7.73	3.58	6.21	10.8	2.37	2.21	5.41	5.65	3.62	1.89	5.44
Ag-110m	Bq/kg	0.22-1.1				-0.001	0.323	0.282	0.397	-0.119	0.009	0.283	0.194	0.163	-0.301	0.197
H-3	Bq/kg	9.4-12.7				4.4	4.5	4.4	4.3	3.9	4.4	4.4	13.1	4.4	3.9	0
C-14	Bq/g-C	0.03-0.06				0.068	0.582	-0.009	-0.009	0.012	-0.065	0.221	0.118	0.04	0.091	-0.016
Co-60	Bq/kg	0.17-0.87				-0.2	-0.0548	0.205	-0.173	0.00818	0.042	0.0879	-0.03	-0.184	-0.145	-0.157
Cs-134	Bq/kg	0.23-0.97				-0.036	0.315	0.134	0.167	0.277	-0.059	-0.254	0.144	0.0393	-0.171	0.169
Cs-137	Bq/kg	0.24-1.1				0.485	1.11	0.135	0.336	0.258	0.185	-0.0902	0.073	0.227	-0.0365	0.188
I-131	Bq/kg	0.52-2				0.682	0.409	-0.505	0.114	1.32	0.297	0.492	1.28	0.326	0.277	0.544
K-40	Bq/kg	1.6-13				336	345	299	238	267	262	278	292	218	252	206
Mn-54	Bq/kg	0.22-1.1				0.199	0.252	-0.424	0.037	0.277	0.279	-0.218	0.093	0.239	0.0618	0.199
Nb-94	Bq/kg	0.18-0.95				0.361	0.0622	-0.391	0.074	0.00353	0.415	0.173	0.205	0.294	0.118	0.184
Nb-95	Bq/kg	0.14-1.4				0.47	0.182	0.128	0.142	0.133	-0.505	-0.347	0.062	0.00401	-0.181	0.055
Sb-125	Bq/kg	0.4-2.8				1.17	0.573	0.345	0.17	0.694	0.723	0.605	1.05	0.536	1.05	0.443
Th-Series	Bq/kg	0.82-3.7				7.18	7.87	4.8	5.21	3.91	8.13	12	5.35	4.76	4.41	5.59
U-Series	Bq/kg	0.8-4.3				11.6	14	8.55	10.1	8.21	14.3	20	12.1	15.8	12.2	11.4
Zr-95	Bq/kg	0.41-2.1				1.05	0.342	0.675	0.817	0.122	-0.045	0.628	-0.019	-0.487	0.0685	0.455

Parameter	Unit	Detection Limit	Sediment Quality Guidelines: PSQG (LEL)**	Sediment Quality Guidelines: CSQG***	Sediment Quality Guidelines: Thompson el al. 2005 (LEL)****	Infill Area: SD21	SD22	SD23	SD24	SD25	SD26		SD27	SD28	SD29	SD30	SD31	SD32
						SD21	SD22	SD23	SD24	SD25	DUP-SD26	SD26	SD27	SD28	SD29	SD30	SD31	SD32
						18-Jun-19	18-Jun-19	18-Jun-19	18-Jun-19	18-Jun-19	18-Jun-19	18-Jun-19	18-Jun-19	18-Jun-19	18-Jun-19	18-Jun-19	18-Jun-19	18-Jun-19
Particle Size and Distributrion																		
< +1 Phi (0.5 mm)	%	0.1				99	100	100	100	99	99	100	99	100	99	100	100	99
< +2 Phi (0.25 mm)	%	0.1				85	91	91	91	87	92	96	90	96	74	96	96	88
< +3 Phi (0.12 mm)	%	0.1				28	44	33	35	30	64	56	74	62	36	49	80	41
< +4 Phi (0.062 mm)	%	0.1				1.4	2.6	1.7	1.7	2	12	5	42	14	9	14	27	5.3
< +5 Phi (0.031 mm)	%	0.1				0.77	1.3	1.3	1.2	1	3.5	2.2	8	5.1	3.7	6.4	9.1	2.7
< +6 Phi (0.016 mm)	%	0.1				0.75	0.98	1.2	0.88	0.84	2.2	1.3	3.5	2.6	2	2.6	3.5	1.5
< +7 Phi (0.0078 mm)	%	0.1				0.61	0.79	1	0.81	0.75	1.6	1.1	1.8	1.4	1.4	1.4	1.8	0.99
< +8 Phi (0.0039 mm)	%	0.1				0.6	0.71	0.91	0.79	0.65	1.3	0.95	1.5	1.2	1.1	1.3	1.5	0.99
< +9 Phi (0.0020 mm)	%	0.1				0.68	0.68	0.89	0.76	0.7	1.1	0.91	1.4	1	1.1	1.2	1.6	0.95
< 0 Phi (1 mm)	%	0.1				100	100	100	100	100	100	100	100	100	100	100	100	100
< -1 Phi (2 mm)	%	0.1				100	100	100	100	100	100	100	100	100	100	100	100	100
Sand	%	0.1				99	97	98	98	98	88	95	58	86	91	86	73	95
Gravel	%	0.1				0	0	0	0	0	0	0	0	0	0.1	0	0	0.066
Silt	%	0.1				0.81	1.9	0.78	0.86	1.3	11	4.1	40	13	7.8	13	25	4.3
Clay	%	0.1				0.6	0.71	0.91	0.79	0.65	1.3	0.95	1.5	1.2	1.1	1.3	1.5	0.99
Physical/Conventional Parameters																		
Moisture	%	1				15	16	17	16	16	15	16	15	15	14	17	16	15
Nutrients																		
Calculated Total Kjeldahl Nitrogen	µg/g	100	550	550		0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrate (N)	µg/g	2				0	0	0	0	0	0	0	0	0	0	0	0	0
Nitrate + Nitrite (N)	µg/g	3				0.11937	0.0605	0.02519	0.19478	0.08461	0.13245	0.03569	0.09033	0.14436	0.153	0.01883	0.06211	0.03543
Nitrite (N)	µg/g	0.5				0.05088	0.05269	-0.03682	0.03116	0.07084	0.01107	0.05551	0.06022	0.06243	0.06081	0.04257	0.28533	0.07283
Nitrogen (N)	%	0.01				-0.00024	-0.0005	0.0014	-0.00039	0.00038	0.00087	-0.00038	0.00242	0.00049	0.00012	0.00085	0.00534	0.00035
Total Organic Carbon (BVL)*	mg/kg	500	10000			275	117	211	1100	1300	-176	1300	820	1000	1100	349	1500	-158
TOC (Provided by Kinetrics for calculating Radionuclides value)*	%	0.1	1			0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Total Phosphorus (P)	mg/kg	10	600			**626**	553	**613**	**880**	560	**704**	570	**634**	**814**	588	**682**	**685**	**789**
Metals																		
Total Aluminum (Al)	mg/kg	100				1400	1310	1230	1390	1390	1560	1470	1840	1510	1430	1410	1680	1430
Total Antimony (Sb)	mg/kg	0.1				0.02475	0.0349	0.02008	0.03021	0.02463	0.02002	0.01499	0.02456	0.02468	0.02515	0.02508	0.02	0.03003
Total Arsenic (As)	mg/kg	0.5	6	5.9		0.65	0.49352	0.55	1.43	0.51	0.62	0.61	0.61	0.71	0.55	0.58	0.91	0.54
Total Barium (Ba)	mg/kg	0.1				8.59	11.1	11	11.6	10.9	12.2	12.7	16.5	12.1	9.99	11.9	14.2	11.3
Total Beryllium (Be)	mg/kg	0.2				0.09901	0.10967	0.09036	0.1007	0.10345	0.0951	0.10989	0.10314	0.10859	0.10563	0.09529	0.11	0.0951
Total Bismuth (Bi)	mg/kg	0.1				0.01485	0.00997	0.01004	0.01511	0.01478	0.01502	0.00999	0.01473	0.01481	0.01509	0.01505	0.015	0.01502
Total Boron (B)	mg/kg	1				2.4	2.2	2.2	2.3	2.4	2.5	2.4	2.8	2.3	2.3	2.3	2.4	2.4
Hot Water Ext. Boron (B)	µg/g	0.05-0.1				0.02292	0.00905	0.02139	0.01337	0.02253	0.02061	0.02092	0.0285	0.0228	0.02043	0.02422	0.03078	0.0155
Total Cadmium (Cd)	mg/kg	0.05	0.6	0.6		0.0198	0.01496	0.0251	0.02014	0.01478	0.02002	0.01499	0.01965	0.02468	0.02012	0.01505	0.015	0.02002
Total Calcium (Ca)	mg/kg	100				99400	92000	91700	97500	98500	92700	90200	95800	91500	98300	93200	88300	98100
Total Cesium (Cs)	mg/kg	1				0.07426	0.07976	0.06526	0.07049	0.07389	0.09009	0.08492	0.11788	0.07897	0.08551	0.08024	0.095	0.07508
Total Chromium (Cr)	mg/kg	1	26	37.3		5.2	4.3	3.8	9.5	4.9	4.9	4.1	5	6.3	4.8	4.8	4.6	7.7
Total Cobalt (Co)	mg/kg	0.3				1.35	1.09	1.02	1.88	1.28	1.18	1.14	1.33	1.37	1.2	1.23	1.45	1.56
Total Copper (Cu)	mg/kg	0.5	16	35.7		2.35	1.54	1.15	1.99	2.37	1.58	2.63	1.72	1.51	2.03	2.71	1.37	1.84
Total Iron (Fe)	mg/kg	100	20000			9050	6650	6040	18100	8070	6770	5750	6650	9460	8810	7510	6160	13400
Total Lead (Pb)	mg/kg	0.1	31	35		1.39	1.17	1.1	1.56	1.21	1.3	1.26	1.44	1.33	1.25	1.31	1.32	1.34
Total Lithium (Li)	mg/kg	5				1.89604	1.79462	1.74197	1.7422	1.97044	1.97197	1.99301	2.33301	1.81145	1.99698	1.77031	2	1.77678
Total Magnesium (Mg)	mg/kg	100				3950	3730	3710	3960	3760	4540	4180	5680	4760	4370	4640	5380	4260
Total Manganese (Mn)	mg/kg	0.2	460			145	132	131	165	139	144	135	165	153	151	148	155	154
Total Mercury (Hg)	mg/kg	0.05	0.2	0.17		0.00495	0.00499	0.00502	0.00504	0.00493	0.00501	0.005	0.00491	0.00494	0.00503	0.00502	0.005	0.00501
Total Molybdenum (Mo)	mg/kg	0.1			13.8	0.16	0.11	0.11	0.19	0.13	0.15	0.13	0.12	0.15	0.13	0.12	0.12	0.18
Total Nickel (Ni)	mg/kg	0.8	16			2.06	1.71	1.66	2.44	2.05	1.88	1.85	2.36	2.04	1.94	1.91	2.07	2.22
Total Potassium (K)	mg/kg	100				273	254	233	250	290	304	281	365	272	273	257	303	259
Total Selenium (Se)	mg/kg	0.5			1.9	0.01485	0.01496	0.01004	0.01007	0.00985	0.01001	0.00999	0.01473	0.01481	0.01509	0.01003	0.005	0.00501
Total Silver (Ag)	mg/kg	0.05				0.0099	0.00499	0.00502	0.01007	0.00493	0.01001	0.00999	0.00491	0.00494	0.00503	0.00502	0.01	0.00501
Total Sodium (Na)	mg/kg	100				110	111	102	117	114	134	123	153	130	115	121	143	115
Total Strontium (Sr)	mg/kg	0.1				151	138	138	145	145	146	140	147	138	148	144	137	141
Total Thallium (Tl)	mg/kg	0.05				0.01485	0.00997	0.01004	0.01007	0.00985	0.01001	0.01499	0.01965	0.01481	0.01006	0.01505	0.015	0.01001
Total Thorium (Th)	mg/kg	0.1				1.81	1.79	1.31	3.67	1.53	1.97	1.44	1.59	1.55	1.47	1.64	1.6	2.05
Total Tin (Sn)	mg/kg	0.1				0.35	0.25	0.26	0.43	0.33	0.27	0.27	0.28	0.31	0.29	0.68	0.26	0.37
Total Titanium (Ti)	mg/kg	1				366	268	243	469	343	347	289	337	362	286	291	307	425
Total Tungsten (W)	mg/kg	0.5				0.04455	0.03988	0.03514	0.05539	0.04433	0.04004	0.03497	0.0442	0.04936	0.03521	0.04012	0.035	0.05506
Total Uranium (U)	mg/kg	0.05			104.4	1.05	0.494	0.361	0.71	0.414	0.45	0.624	0.437	0.469	0.397	0.406	0.435	0.526
Total Vanadium (V)	mg/kg	2			35.2	16.5	12.4	11.3	33.9	15	12.9	11	12.6	18.2	15.7	14.1	11.8	26
Total Zinc (Zn)	mg/kg	1	120	123		6.6	6.4	8.2	8.7	7.3	7.4	5.4	7.9	7.2	6.4	6.2	7.8	6.9
Total Zirconium (Zr)	mg/kg	0.5				1.94	1.65	1.57	2.23	1.74	2	1.74	2.11	2.13	1.8	1.84	1.92	2.27
PHCs																		
F1 (C6-C10)	µg/g	10-50				0	0	0	0	0	0	0	0	0	0	0	0	0
F1 (C6-C10) - BTEX	µg/g	10-50				0	0	0	0	0	0	0	0	0	0	0	0	0
F2 (C10-C16 Hydrocarbons)	µg/g	10-70				0	0	0	0	0	0	0	0	0	0	0	0	0
F3 (C16-C34 Hydrocarbons)	µg/g	50-350				11.11233	11.51921	11.755	10.31141	19.19232	10.10733	10.86129	10.69309	11.35512	10.04991	7.72244	11.25841	6.60597
F4 (C34-C50 Hydrocarbons)	µg/g	50-350				0	0	0	0	0	0	0	0	0	0	0	0	0
F4G-sg (Grav. Heavy Hydrocarbons)	µg/g	230																
Reached Baseline at C50	µg/g	0				1	1	1	1	1	1	1	1	1	1	1	1	1
PAHs																		
Anthracene	µg/g	0.005-0.03	0.22	0.0469		0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(a)anthracene	µg/g	0.005-0.03	0.32	0.317		0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(a)pyrene	µg/g	0.005-0.03	0.37	0.0319		0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(g,h,i)perylene	µg/g	0.005-0.03	0.17			0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(k)fluoranthene	µg/g	0.005-0.03	0.24			0	0	0	0	0	0	0	0	0	0	0	0	0
Chrysene	µg/g	0.005-0.03	0.34	0.0571		0	0	0	0	0	0	0	0	0	0	0	0	0
Fluoranthene	µg/g	0.005-0.03	0.75	0.111		0	0	0	0	0	0	0	0	0	0	0	0	0
Fluorene	µg/g	0.005-0.03	0.19	0.0212		0	0	0	0	0	0	0	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	µg/g	0.005-0.03	0.2			0	0	0	0	0	0	0	0	0	0	0	0	0
Phenanthrene	µg/g	0.005-0.03	0.56	0.0419		0	0	0	0	0	0	0	0	0	0	0	0	0
Pyrene	µg/g	0.005-0.03	0.49	0.053		0	0	0	0	0	0	0	0	0	0	0	0	0
Total PAHs	µg/g	0.02	4			0	0	0	0	0	0	0	0	0	0	0	0	0
Pesticides and PCBs																		
Chlordane (Total)	µg/g	0.002	0.007	0.0045		0	0	0	0	0	0	0	0	0	0	0	0	0
a-Chlordane	µg/g	0.002				0	0	0	0	0	0	0	0	0	0	0	0	0
g-Chlordane	µg/g	0.002				0	0	0	0	0	0	0	0	0	0	0	0	0
Aldrin	µg/g	0.002	0.0020			0	0	0	0	0	0	0	0	0	0	0	0	0
Aldrin + Dieldrin	µg/g	0.002				0	0	0	0	0	0	0	0	0	0	0	0	0
Total (α-, β-, γ-) BHC	µg/g	0.002	0.003			0	0	0	0	0	0	0	0	0	0	0	0	0
alpha-BHC	µg/g	0.002	0.006			0	0	0	0	0	0	0	0	0	0	0	0	0
beta-BHC	µg/g	0.002	0.005			0	0	0	0	0	0	0	0	0	0	0	0	0
gamma-BHC (Lindane)	µg/g	0.002	0.003			0	0	0	0	0	0	0	0	0	0	0	0	0
delta-BHC	µg/g	0.002				0	0	0	0	0	0	0	0	0	0	0	0	0
Dibenz(a,h)anthracene	µg/g	0.005-0.03	0.06	0.00622		0	0	0	0	0	0	0	0	0	0	0	0	0
Dieldrin	µg/g	0.002	0.002	0.00285		0	0	0	0	0	0	0	0	0	0	0	0	0
Endrin	µg/g	0.002	0.003	0.00267		0	0	0	0	0	0	0	0	0	0	0	0	0
Hexachlorobenzene	µg/g	0.002	0.02			0	0	0	0	0	0	0	0	0	0	0	0	0
Heptachlor	µg/g	0.002		0.0006		0	0	0	0	0.000189	0	0.000182	0.000233	0.000132	0.000195	0.000178	0	0
Heptachlor + Heptachlor epoxide	µg/g	0.002				0	0	0	0	0	0	0	0	0	0	0	0	0
Heptachlor epoxide	µg/g	0.002	0.003	0.0006		0	0	0	0	0	0	0	0	0	0	0	0	0
Mirex	µg/g	0.002	0.007			0	0	0	0	0	0	0	0	0	0	0	0	0
o,p-DDT	µg/g	0.002				0	0	0	0	0	0	0	0	0	0	0	0	0
o,p-DDT + p,p-DDT	µg/g	0.002	0.008			0	0	0	0	0	0	0	0	0	0	0	0	0
p,p-DDD	µg/g	0.002	0.008			0	0	0	0	0	0	0	0	0	0	0	0	0
p,p-DDE	µg/g	0.002	0.005			0	0	0	0	0	0	0	0	0	0	0	0	0
p,p-DDT	µg/g	0.002				0	0	0	0	0	0	0	0	0	0	0	0	0
Aroclor 1016	µg/g	0.015	0.007			0	0	0	0	0	0	0	0	0	0	0	0	0
Aroclor 1248	µg/g	0.015	0.03			0	0	0	0	0	0	0	0	0	0	0	0	0
Aroclor 1254	µg/g	0.015	0.06			0	0	0	0	0	0	0	0	0	0	0	0	0
Aroclor 1260	µg/g	0.015	0.005			0	0	0	0	0	0	0	0	0	0	0	0	0
Total PCB	µg/g	0.015	0.07	0.0341		0	0	0	0	0	0	0	0	0	0	0	0	0
Radionuclides																		
Am-241	Bq/kg	2.3-18				0.279	0.644	6.38	2.29	9.04	3.2	3.99	6.14	11.3	2.51	4.12	2.5	2.5
Ag-110m	Bq/kg	0.22-1.1				0.462	-0.183	-0.05	0.13	0.182	0.046	0.268	0.193	0.177	0.18	0.138	0.271	0.025
H-3	Bq/kg	9.4-12.7				8.8	4.5	0	4.5	8.9	13.3	4.5	4.5	0	4.5	13.5	4.5	4.1
C-14	Bq/g-C	0.03-0.06				-0.063	0.094	-0.024	0.159	0.064	0.405	0.166	-0.045	-0.002	0.06	0.1	0.066	0.034
Co-60	Bq/kg	0.17-0.87				0.0172	-0.0892	-0.034	-0.087	-0.234	0.084	-0.054	0.15	0.208	-0.208	-0.063	-0.224	0.026
Cs-134	Bq/kg	0.23-0.97				0.156	0.246	0.092	0.212	0.355	0.157	0.106	0.045	0.544	0.184	0.061	0.501	0.077
Cs-137	Bq/kg	0.24-1.1				0.447	-0.0894	-0.11	0.1	0.496	0.042	0.281	0.229	0.582	0.223	0.101	0.416	0.086
I-131	Bq/kg	0.52-2				0.399	0.1	0.696	0.801	0.674	0.594	0.386	0.558	0.945	0.824	0.495	0.207	0.142
K-40	Bq/kg	1.6-13				293	358	356	282	309	361	359	368	297	301	343	379	312
Mn-54	Bq/kg	0.22-1.1				-0.068	-0.17	0.275	0.042	0.248	0.032	0.216	0.145	0.129	0.0513	0.289	0.246	0.069
Nb-94	Bq/kg	0.18-0.95				0.143	0.0161	0.195	0.377	0.106	0.154	0.482	0.156	0.275	0.106	0.034	0.05	0.027
Nb-95	Bq/kg	0.14-1.4				-0.064	-0.164	0.183	0.046	0.152	0.057	0.027	0.272	0.494	0.042	0.864	0.18	0.13
Sb-125	Bq/kg	0.4-2.8				0.41	0.722	0.42	1.14	0.393	0.457	0.301	0.544	1.01	0.726	0.376	0.095	0.441
Th-Series	Bq/kg	0.82-3.7				6.48	5.21	5.62	10.5	4.83	7.49	6.18	4.98	9.97	7	6.17	6.82	10.2
U-Series	Bq/kg	0.8-4.3				14	11.2	8.77	19.3	6.71	12.6	9.66	10.3	14.5	14.3	11.2	9.04	19.5
Zr-95	Bq/kg	0.41-2.1				-0.026	-0.0738	0.112	0.445	0.041	0.239	0.779	0.496	0.699	0.31	0.469	0.683	0.097

Table D-1: 2019 Sediment Quality Data (Uncensored)

Parameter	Unit	Detection Limit	Sediment Quality Guidelines			Offshore Area						Coot's Pond						Treefrog Pond				
			PSQG (LEL)**	CSQG***	Thompson el al. 2005 (LEL)****	SW10						SW12						SW13				
						DUP-2	SW10-1	SW10-2	SW10-3	SW10-4	SW10-5	DUP	SW12-1	SW12-2	SW12-3	SW12-4	SW12-5	SW13-1	SW13-2	SW13-3	SW13-4	SW13-5
						19-Jun-19	19-Jun-19	19-Jun-19	19-Jun-19	19-Jun-19	19-Jun-19	17-Jun-19	17-Jun-19	17-Jun-19	17-Jun-19	17-Jun-19	17-Jun-19	17-Jun-19	17-Jun-19	17-Jun-19	17-Jun-19	17-Jun-19
Particle Size and Distributrion																						
< +1 Phi (0.5 mm)	%	0.1				98	97	99	91	90	96	100	100	99	99	100	99	96	97	98	98	97
< +2 Phi (0.25 mm)	%	0.1				90	90	92	78	53	81	99	99	97	95	100	98	93	94	97	94	94
< +3 Phi (0.12 mm)	%	0.1				25	23	20	17	19	14	99	98	96	80	99	98	88	88	94	85	88
< +4 Phi (0.062 mm)	%	0.1				10	8.7	7	10	16	4.7	96	97	94	59	98	95	76	80	90	75	81
< +5 Phi (0.031 mm)	%	0.1				8.3	7.5	5.6	9.1	15	4.4	90	95	92	42	96	90	68	70	84	59	76
< +6 Phi (0.016 mm)	%	0.1				6.6	5.8	4.4	7.2	12	3.7	68	92	82	33	91	72	58	57	78	48	61
< +7 Phi (0.0078 mm)	%	0.1				4.8	4	3.2	7	8.9	2.7	41	76	56	24	70	44	43	45	64	37	47
< +8 Phi (0.0039 mm)	%	0.1				4.1	3.4	3	4.2	7.9	2.6	34	67	50	21	59	37	41	41	57	33	43
< +9 Phi (0.0020 mm)	%	0.1				3.6	3.1	2.7	3.2	5.6	2.4	18	48	37	16	33	17	37	35	49	27	36
< 0 Phi (1 mm)	%	0.1				99	99	99	99	98	99	100	100	100	100	100	99	97	98	99	99	98
< -1 Phi (2 mm)	%	0.1				100	99	100	100	98	99	100	100	100	100	100	100	97	99	100	99	98
Sand	%	0.1				90	91	93	90	82	95	3.7	2.7	6.2	41	1.6	5.3	22	19	9.6	24	17
Gravel	%	0.1				0.34	0.7	0.35	0.27	1.7	0.73	0.012	0	0	0.049	0.001	0.2	2.8	1.5	0	0.63	1.6
Silt	%	0.1				6	5.4	4	6	8.2	2.1	62	31	44	39	39	57	35	38	33	43	39
Clay	%	0.1				4.1	3.4	3	4.2	7.9	2.6	34	67	50	21	59	37	41	41	57	33	43
Physical/Conventional Parameters																						
Moisture	%	1				24	24	23	26	37	23	57	68	67	46	66	55	76	71	85	66	63
Nutrients																						
Calculated Total Kjeldahl Nitrogen	µg/g	100	550	550		499	440	387	**559**	**944**	321	**2040**	**3330**	**3780**	**2050**	**2840**	**1960**	**15000**	**9250**	**21200**	**7470**	**9460**
Nitrate (N)	µg/g	2				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Nitrate + Nitrite (N)	µg/g	3				0.42292	0.82738	0.42	0.16	0.176	0.70683	0.41975	0.52893	0.10843	0.29724	0.52569	0.32992	2.76923	1.20539	1.54792	0.74583	4
Nitrite (N)	µg/g	0.5				0.09881	0.0754	0.064	0.082	0.102	-0.00966	0.14815	0.16322	0.0743	0.08465	0.15613	0.12705	0.44423	0.27801	0.7	0.23333	0.44877
Nitrogen (N)	%	0.01				0.05	0.044	0.039	0.056	0.094	0.032	0.2	0.33	0.38	0.21	0.28	0.2	1.5	0.92	2.1	0.75	0.95
Total Organic Carbon (BVL)*	mg/kg	500	10000			3500	3300	2100	4300	9100	2000	**18000**	**29000**	**31000**	**16000**	**26000**	**18000**	**180000**	**100000**	**260000**	**87000**	**93000**
TOC (Provided by Kinetrics for calculating Radionuclides value)*	%	0.1	1			0.35	0.35	0.27	0.44	0.65	0.23	**2.27**	**3.4**	**3.97**	**2.12**	**3.08**	**2.29**	**11.8**	**8**	**19.8**	**7.12**	**10**
Total Phosphorus (P)	mg/kg	10	600			506	568	**660**	568	427	392	**676**	**812**	398	588	**711**	**648**	**1420**	**1230**	**1320**	**881**	**1100**
Metals																						
Total Aluminum (Al)	mg/kg	100				2050	1880	1890	2040	2320	1560	8920	20300	14300	8140	14900	8330	12000	15900	15800	14900	17900
Total Antimony (Sb)	mg/kg	0.1				0.06944	0.05976	0.06468	0.06436	0.08325	0.15	0.15	0.18	0.64	0.11	0.24	0.15	0.31	0.25	0.4	0.18	0.2
Total Arsenic (As)	mg/kg	0.5	6	5.9		1.29	1.18	1.31	1.26	1.45	1.2	1.37	2.09	2.74	1.04	1.75	1.37	1.72	1.42	2.46	1.55	1.28
Total Barium (Ba)	mg/kg	0.1				14.4	13.5	11.6	16.5	20.4	10.8	99.7	159	96.1	66.6	138	96.2	82.7	112	127	92.7	129
Total Beryllium (Be)	mg/kg	0.2				0.11905	0.11952	0.0995	0.11881	0.13222	0.09369	0.41	0.81	0.17465	0.48	0.64	0.39	0.5	0.63	0.65	0.58	0.77
Total Bismuth (Bi)	mg/kg	0.1				0.0248	0.0249	0.02985	0.0297	0.02938	0.04438	0.06436	0.1	0.15	0.0502	0.09054	0.06436	0.2	0.14	0.17	0.11	0.16
Total Boron (B)	mg/kg	1				3.2	3.1	3	3	3.6	2.6	12.6	18.3	1.2	7.2	12.6	11.5	10	8.8	9.5	7	9.2
Hot Water Ext. Boron (B)	µg/g	0.05-0.1				0.28	0.24	0.22	0.33	0.46	0.2	1.5	1.5	1.1	0.91	1.4	1.6	2.4	2.3	1.2	0.19	0.24
Total Cadmium (Cd)	mg/kg	0.05	0.6	0.6		0.084	0.07	0.149	0.079	0.103	0.059	0.153	0.264	**1.6**	0.191	0.231	0.149	**0.636**	0.405	**1.21**	0.494	0.553
Total Calcium (Ca)	mg/kg	100				67700	66000	63000	61200	53100	58400	186000	136000	7900	41400	151000	180000	15700	11000	21800	7990	11900
Total Cesium (Cs)	mg/kg	1				0.17361	0.15438	0.13433	0.17327	0.21058	0.11834	0.72277	1.4	0.46407	0.50201	0.97082	0.60891	0.61569	0.66434	0.72134	0.84173	0.9004
Total Chromium (Cr)	mg/kg	1	26	37.3		5.8	6.1	6.9	6.1	7	4.5	15.6	**30.7**	18.8	12.9	23.6	14.8	19	23.7	21	20.7	25.7
Total Cobalt (Co)	mg/kg	0.3				1.45	1.36	1.47	1.45	1.69	1.17	5.38	9.22	17.3	4.24	7.55	5.21	3.91	4.95	4.22	5.38	6.02
Total Copper (Cu)	mg/kg	0.5	16	35.7		3.13	2.84	2.44	3.65	5	5.28	**19.5**	**22.1**	**40.5**	8.65	**20.1**	**20.5**	**19.4**	**17.8**	**54.8**	15	**19.1**
Total Iron (Fe)	mg/kg	100	20000			5960	6670	8220	6530	7280	4550	14700	**23700**	**20900**	11300	19500	14000	12000	15900	13000	15400	17300
Total Lead (Pb)	mg/kg	0.1	31	35		3.06	2.79	3.12	23.6	3.57	2.59	9.04	13.2	12	6.39	11.3	8.9	30	18	26.7	14	21.7
Total Lithium (Li)	mg/kg	5				2.58929	2.40538	2.30846	2.56931	2.85504	2.17949	9.9	21.8	6.2	7.9	17	9.7	9.8	13.7	11.5	11	15.8
Total Magnesium (Mg)	mg/kg	100				3710	3820	3760	3740	3340	2960	12200	12400	4440	3910	11400	11500	2970	3910	3160	3780	4550
Total Manganese (Mn)	mg/kg	0.2	460			131	130	133	124	135	118	413	**540**	326	173	**495**	400	129	148	140	121	181
Total Mercury (Hg)	mg/kg	0.05	0.2	0.17		0.00992	0.00996	0.00995	0.0099	0.00979	0.00986	0.0198	0.03984	0.065	0.0251	0.03018	0.0198	0.109	0.08	0.168	0.05	0.08
Total Molybdenum (Mo)	mg/kg	0.1			13.8	0.13	0.13	0.12	0.14	0.14	0.09369	0.45	0.74	5.96	0.22	0.7	0.47	0.88	0.86	1.43	0.48	0.48
Total Nickel (Ni)	mg/kg	0.8	16			3.56	3.11	3.22	3.66	4.25	3.13	11.2	**20.2**	**16.6**	7.34	**16.5**	10.8	11.1	12.5	13.9	11.9	14.2
Total Potassium (K)	mg/kg	100				429	385	364	413	484	316	2140	3940	1200	1170	2990	1930	1230	1710	1160	1540	1980
Total Selenium (Se)	mg/kg	0.5			1.9	0.15377	0.1245	0.11443	0.18317	0.24486	0.11834	0.24257	0.36355	0.18463	0.21586	0.28672	0.21287	1.35	1.07	**3.07**	0.56	1.33
Total Silver (Ag)	mg/kg	0.05				0.01984	0.01494	0.0199	0.0198	0.02449	0.01479	0.0396	0.06	0.04491	0.03012	0.05	0.04455	0.139	0.11	0.153	0.076	0.106
Total Sodium (Na)	mg/kg	100				132	136	127	116	118	111	422	550	488	189	441	376	128	152	153	159	167
Total Strontium (Sr)	mg/kg	0.1				110	110	105	99	85	95.2	453	348	28.6	132	379	442	39.1	34.8	53.5	24.6	35.8
Total Thallium (Tl)	mg/kg	0.05				0.03472	0.02988	0.02985	0.03465	0.04407	0.02465	0.109	0.229	0.07	0.08	0.181	0.109	0.114	0.115	0.153	0.131	0.156
Total Thorium (Th)	mg/kg	0.1				1.31	1.43	1.39	1.8	1.43	1.34	2.7	3.25	1.52	2.01	3.68	2.81	0.94	2.3	1.36	2.07	2.3
Total Tin (Sn)	mg/kg	0.1				0.34	0.35	0.38	0.3	0.33	0.26	0.76	1.25	0.51	0.54	1.08	0.84	1.28	1.12	1.31	0.96	1.25
Total Titanium (Ti)	mg/kg	1				252	279	298	221	205	181	488	795	774	449	581	447	315	536	337	579	591
Total Tungsten (W)	mg/kg	0.5				0.13889	0.06972	0.06965	0.07426	0.08325	0.06903	0.18812	0.14442	0.23453	0.08534	0.15091	0.20792	0.1142	0.11988	0.1087	0.08065	0.1006
Total Uranium (U)	mg/kg	0.05			104.4	0.352	0.354	0.378	0.366	0.289	0.261	0.842	1.34	0.434	0.537	1.21	0.812	2.59	1.91	6.96	1.32	1.3
Total Vanadium (V)	mg/kg	2			35.2	10.6	12.3	15.2	11.3	12.1	7.7	23.3	**41.3**	**59.6**	21.2	32.4	21.6	29.5	**37.3**	**36.7**	33.8	**37.5**
Total Zinc (Zn)	mg/kg	1	120	123		16.5	16.1	14.4	19.1	19.3	13.1	86	94.5	**170**	33	87.9	87.1	89	69.4	119	71	85.1
Total Zirconium (Zr)	mg/kg	0.5				0.8	1.02	0.96	0.61	0.45544	0.71	1.48	1.57	2.11	0.73	2.02	1.74	1.98	2.36	3.56	1.49	2.09
PHCs																						
F1 (C6-C10)	µg/g	10-50				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F1 (C6-C10) - BTEX	µg/g	10-50				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F2 (C10-C16 Hydrocarbons)	µg/g	10-70				0	0	0	0	0	0	10.36365	16.45113	16.08697	0	46	0	15.53261	16.98373	34.06861	13.94256	13.31859
F3 (C16-C34 Hydrocarbons)	µg/g	50-350				40.85573	38.7553	35.88132	41.80534	61.9921	30.42883	460	380	160	97.4344	440	310	157.0104	86.60883	410	143.3389	147.4447
F4 (C34-C50 Hydrocarbons)	µg/g	50-350				0	0	0	0	0	0	130	112.9245	0	0	160	86.83298	73.89946	0	147.9503	61.30866	61.26136
F4G-sg (Grav. Heavy Hydrocarbons)	µg/g	230										460										
Reached Baseline at C50	µg/g	0				1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
PAHs																						
Anthracene	µg/g	0.005-0.03	0.22	0.0469		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benzo(a)anthracene	µg/g	0.005-0.03	0.32	0.317		0.00435	0	0	0	0.008597	0	0	0	0	0	0	0	0.018358	0	0	0	0.010062
Benzo(a)pyrene	µg/g	0.005-0.03	0.37	0.0319		0.0057	0	0	0	0.011	0	0	0	0	0	0	0	0.025	0.013873	0	0.009577	0.011897
Benzo(g,h,i)perylene	µg/g	0.005-0.03	0.17			0.0062	0	0	0.0052	0.011	0	0.008231	0.010839	0	0	0.014	0.011	0.032	0.016494	0.035	0.013219	0.016
Benzo(k)fluoranthene	µg/g	0.005-0.03	0.24			0	0	0	0.002772	0.006074	0.001731	0	0	0	0.001792	0.003811	0.003998	0.01038	0	0	0	0
Chrysene	µg/g	0.005-0.03	0.34	0.0571		0.0066	0	0	0.004423	0.011	0.004086	0	0	0	0	0	0.007291	0.022	0.013302	0.021766	0	0.010377
Fluoranthene	µg/g	0.005-0.03	0.75	0.111		0.011	0.007	0.0058	0.008	0.026	0.0054	0.013	0.014422	0.011909	0.006098	0.015	0.015	0.037	0.022	0.036	0.013921	0.021
Fluorene	µg/g	0.005-0.03	0.19	0.0212		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	µg/g	0.005-0.03	0.2			0.0058	0	0	0.004536	0.011	0	0	0	0	0	0.008811	0.007213	0.019864	0	0.027114	0	0.011111
Phenanthrene	µg/g	0.005-0.03	0.56	0.0419		0	0	0	0	0.013	0	0	0	0	0	0	0.007115	0.023	0.013773	0	0.010225	0.01381
Pyrene	µg/g	0.005-0.03	0.49	0.053		0.0097	0.0056	0.004733	0.0065	0.02	0.004255	0.012	0.012187	0	0	0.012	0.014	0.034	0.021	0.033	0.013489	0.02
Total PAHs	µg/g	0.02	4																			
Pesticides and PCBs																						
Chlordane (Total)	µg/g	0.002	0.007	0.0045																		
a-Chlordane	µg/g	0.002																				
g-Chlordane	µg/g	0.002																				
Aldrin	µg/g	0.002	0.0020																			
Aldrin + Dieldrin	µg/g	0.002																				
Total (α-, β-, γ-) BHC	µg/g	0.002	0.003																			
alpha-BHC	µg/g	0.002	0.006																			
beta-BHC	µg/g	0.002	0.005																			
gamma-BHC (Lindane)	µg/g	0.002	0.003																			
delta-BHC	µg/g	0.002																				
Dibenz(a,h)anthracene	µg/g	0.005-0.03	0.06	0.00622		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dieldrin	µg/g	0.002	0.002	0.00285																		
Endrin	µg/g	0.002	0.003	0.00267																		
Hexachlorobenzene	µg/g	0.002	0.02																			
Heptachlor	µg/g	0.002		0.0006																		
Heptachlor + Heptachlor epoxide	µg/g	0.002																				
Heptachlor epoxide	µg/g	0.002	0.003	0.0006																		
Mirex	µg/g	0.002	0.007																			
o,p-DDT	µg/g	0.002																				
o,p-DDT + p,p-DDT	µg/g	0.002	0.008																			
p,p-DDD	µg/g	0.002	0.008																			
p,p-DDE	µg/g	0.002	0.005																			
p,p-DDT	µg/g	0.002																				
Aroclor 1016	µg/g	0.015	0.007																			
Aroclor 1248	µg/g	0.015	0.03																			
Aroclor 1254	µg/g	0.015	0.06																			
Aroclor 1260	µg/g	0.015	0.005																			
Total PCB	µg/g	0.015	0.07	0.0341																		
Radionuclides																						
Am-241	Bq/kg	2.3-18				6.27	1.24	8.21	5.14	5.03	1.94	2.01	3.93	2.48	-2.68	2.43	1.53	4.08	1.12	1.57	11.1	1.52
Ag-110m	Bq/kg	0.22-1.1				-0.062	0.156	0.177	0.121	0.206	0.089	0.167	0.116	0.061	0.179	0.14	0.126	0.024	0.228	0.14	-0.443	0.161
H-3	Bq/kg	9.4-12.7				0	0	4.4	4.4	4.5	4.3	36.7	32.6	42.9	34.2	34.7	37	38.3	41	50.1	39.7	40.2
C-14	Bq/g-C	0.03-0.06				0.11	0.354	0.551	0.079	0.167	-0.012	0.057	0.127	-0.018	0.226	0.072	0.296	0.469	0.287	0.209	0.356	0.461
Co-60	Bq/kg	0.17-0.87				0.152	0.025	-0.0321	-0.314	0.095	0.009	-0.404	-0.016	-0.106	0.0495	-0.0574	0.121	-0.348	-0.194	-0.31	-0.157	-0.044
Cs-134	Bq/kg	0.23-0.97				0.093	0.159	0.0928	0.228	0.137	0.046	0.256	0.129	-0.217	-0.00839	-0.784	0.338	0.113	-0.155	0.335	0.322	0.094
Cs-137	Bq/kg	0.24-1.1				0.697	0.553	0.577	0.934	1.09	1	0.279	0.985	1.51	1.15	0.475	0.288	7.03	3.65	4.75	3.56	5.58
I-131	Bq/kg	0.52-2				1.08	0.144	0.912	1.05	0.278	0.173	0.931	0.489	0.23	-0.313	0.228	0.868	0.342	0.379	0.53	0.467	0.452
K-40	Bq/kg	1.6-13				304	282	283	263	223	255	175	219	208	304	203	190	132	189	46.9	214	228
Mn-54	Bq/kg	0.22-1.1				0.176	0.139	0.108	0.512	0.42	0.061	0.101	0.273	0.205	0.0544	0.26	0.176	-0.157	-0.106	0.011	0.27	0.165
Nb-94	Bq/kg	0.18-0.95				0.071	0.089	0.201	0.219	0.082	0.055	0.106	0.101	-0.02	0.0872	0.0927	0.065	-0.062	0.091	0.128	-0.0278	0.052
Nb-95	Bq/kg	0.14-1.4				0.15	0.111	0.306	0.174	0.164	0.229	0.178	0.079	0.13	0.319	0.3	0.184	0.267	0.724	0.208	0.648	0.066
Sb-125	Bq/kg	0.4-2.8				1.49	0.393	1.06	0.784	1.29	0.407	0.511	0.598	0.397	0.358	0.333	0.949	0.489	0.282	0.517	-0.0968	0.532
Th-Series	Bq/kg	0.82-3.7				4.63	5.73	5.6	4.32	6.13	3.93	7.06	10.7	11.3	8.55	10.9	8.04	5.23	9.69	3.19	9.28	10.8
U-Series	Bq/kg	0.8-4.3				7.69	5.43	5.99	5.95	6.95	5.47	5.62	8.61	9.87	10.4	8.15	9.06	6.25	8.56	3.68	9.05	10.3
Zr-95	Bq/kg	0.41-2.1				0.285	0.212	0.423	0.539	0.543	0.27	0.128	0.044	-0.075	0.478	-0.00877	1.16	-0.021	0.127	0.171	0.391	0.213

Notes:

*Total Organic Carbon analyzed by BLV is presented in the report. TOC measured by Kinetrics are used to calculate level of radiological constituents in respect of carbon content.

** Ministry of the Environment, Conservation and Parks (2019). Guidelines for identifying, assessing and managing contaminated sediments in Ontario.

*** CCME (1999), Canadian Sediment Quality Guidelines for the Protection of Aquatic Life. Updated 2001.

**** P. A. Thompson, J. Kurias and S. Mihok. 2005. Derivation and use of sediment quality guidelines for ecological risk assessment of metals and radionuclides released to the environment from uranium mining and milling activities in Canada. Environmental Monitoring and Assessment (110): 71-85.

Monitoring values exceeding any selected environmental guidelines are gray-shaded and bolded.

			Water Quality Objectives				SW2-S					SW2-B			
Parameters	Units	Detection Limit	CCME CWQG	PWQO	Interim PWQO	Health Canada	Spring 16-Apr-19	Summer 3-Jul-19	Fall 20-Aug-19	Winter 12-Dec-19	Winter (Dup) 12-Dec-19	Spring 16-Apr-19	Summer 3-Jul-19	Fall 20-Aug-19	Winter 12-Dec-19
Physical/Conventional Characteristics															
Field Temperature	Celsius	-	-	-	-	-	4.9	14.22	21.92	1.38	1.38	4.31	6.68	17.42	1.85
Field pH	pH	-	6.5-9.0	6.5-8.5	-	-	8.48	**8.56**	**8.95**	8.25	8.25	8.29	8.24	**8.54**	8.21
pH	pH	-	-	-	-	-	8.28	8.31	8.43	8.22	8.22	8.28	8.21	8.24	8.23
Field Sp. Conductance	µS/cm	-	-	-	-	-	288	275	377	277		286	274	310	274
Conductivity	umho/cm	1	-	-	-	-	330	300	310	320	320	330	300	310	310
Field Turbidity	NTU	0.1	-	-	-	-	-5.2	-3.6	-5.4	6.7		-5.2	-3.5	-5.1	14.9
Turbidity	NTU	0.1	-	-	-	-	0.096	0.2	0.0981	7.2	5.3	0.0675	0.2	0.063	2.2
Alkalinity (Total as CaCO3)	mg/L	1	-	-	-	-	95	93	95	100	98	94	92	94	97
Dissolved Oxygen	mg/L	-	-	-	-	-	13.24	11.99	10.48			13.35	13.19	10.54	
Total Hardness (CaCO3)	mg/L	0.5 - 1	-	-	-	-	119	119	121	123	122	121	119	118	122
Total Suspended Solids	mg/L	1 - 10	-	-	-	-	0	0.2	0.8	11	8	0	0	0.8	6
Total Residual Chlorine*	mg/L	0.0012	0.0005	0.002	-	-	**0.0012**	**0.012**	**0.0012**			**0.0012**	**0.009**	**0.0012**	
Nutrients															
Dissolved Organic Carbon	mg/L	0.5	-	-	-	-	1.9	1.8	2.1	1.9	1.9	2	1.8	2	1.9
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1	-	-	-	-	0.19	0.16	0.19	0.12	0.11	0.28	0.16	0.21	0.11
Total Ammonia-N**	mg/L	0.01 - 1	0.044	-	-	-	-0.01582	0.04	0.04	0.01	**0.07**	**0.22**	**0.16**	**0.07**	0.02
Total Un-ionized Ammonia**	mg/L	0.00051 - 0.044	0.019	0.02	-	-	0	0.004	0.014	0.00024	0.0013	0.0059	0.0049	0.0092	0.00046
Nitrate (N)	mg/L	0.1	13	-	-	45	0.34	0.25	0.18	0.36	0.36	0.34	0.29	0.25	0.35
Nitrite (N)	mg/L	0.01	0.06	-	-	1	0.0016	-0.0029	0.0051	0.001	0.002	0.0014	-0.0033	0.0045	0.002
Total BOD	mg/L	2	-	-	-	-	2	2	2	2	2	2	2	2	2
Total Chemical Oxygen Demand (CO	mg/L	4	-	-	-	-	3.35	6.8	7.5	7.1	-3.6	6.2	5.1	6.8	-2.2
Orthophosphate (P)	mg/L	0.01	-	-	-	-	0.003	0.00342	0.00363	0.005	0.006	0.00267	0.00342	0.00354	0.006
Total Phosphorus	mg/L	0.02 - 2.51	-	-	0.02	-	0.0131	-0.0008	-0.0009	0.017	0.013	0.0178	-0.0001	0	0.011
Hydrocarbons															
Benzene	µg/L	0.1 - 0.5	370	-	100	5	0	0	0	0	0	0	0	0	0
Ethylbenzene	µg/L	0.1 - 0.5	90	-	8	140	0	0	0	0	0	0	0	0	0
F1 (C6-C10)	µg/L	25	167	-	-	-	0	0	0	0	0	0	0	0	0
F1 (C6-C10) - BTEX	µg/L	25	-	-	-	-	0	0	0	0	0	0	0	0	0
F2 (C10-C16 Hydrocarbons)	µg/L	100	42	-	-	-	0	0	0	0	0	0	0	0	0
F3 (C16-C34 Hydrocarbons)	µg/L	200	-	-	-	-	41.31728	60.34504	81.6436	58	55	40.85922	182.6578	50.01616	48
F4 (C34-C50 Hydrocarbons)	µg/L	200	-	-	-	-	0	0	0	0	0	0	0	0	0
Reached Baseline at C50	µg/L	-	-	-	-	-	1	1	1	1	1	1	1	1	1
Biological															
Chlorophyll	µg/L	0.1 - 0.2	-	-	-	-	1.31	0.39	1.65	0.91	1.47	1.26	1.3	0.97	0.81
Background	CFU/100mL	10	-	-	-	-	0	90	330	480	350	1	480	260	30
Total Coliforms	CFU/100mL	10	-	-	-	-	0	10	80	20	20	0	10	30	10
Fecal coliform	CFU/100mL	10	-	-	-	-	0	10	10	10	10	0	10	10	10
Escherichia coli	CFU/100mL	10	-	100	-	-	0	10	10	10	10	0	10	10	10
Metals															
Total Aluminum (Al)	µg/L	0.5 - 5	100	-	-	-	4.3	0.9	0.96	2.47	4.06	4.4	0.69	0.52	0.75
Dissolved (0.2u) Aluminum (Al)	µg/L	5	-	-	75	-	3.004	2.365	1.707	3	3	2.719	6	1.881	3
Total Antimony (Sb)	µg/L	0.02 - 0.5	-	20	-	6	0.133	0.096	0.132	0.141	0.124	0.131	0.092	0.137	0.133
Total Arsenic (As)	µg/L	0.02 - 1	5	100	5	10	0.73	0.787	0.788	0.738	0.706	0.76	0.796	0.803	0.73
Total Barium (Ba)	µg/L	0.02 - 2	-	-	-	1000	21.7	22.8	21.8	23.4	22.6	22.2	22.6	22	22.7
Total Beryllium (Be)	µg/L	0.01 - 0.5	-	1100	-	-	0.002	-0.0022	0.0008	0.003	0	0	-0.0032	-0.0004	0.001
Total Bismuth (Bi)	µg/L	0.005 - 1	-	-	-	-	0.001	-0.0003	-0.0004	0.0004	0.0009	0.001	-0.0001	-0.0012	0
Total Boron (B)	µg/L	10 - 50	1500	-	200	5000	22.159	20	24	22	22	21.66	21	22	22
Total Cadmium (Cd)	µg/L	0.005 - 0.1	0.17	0.2	0.5	5	0.004	0.0024	0.0018	0.003	0.0031	0.003	0.0027	0.0036	0.0037
Total Calcium (Ca)	µg/L	0.05 - 250	-	-	-	-	33600	33500	34200	35000	35100	34200	33700	33400	34600
Total Cesium (Cs)	µg/L	0.05 - 0.2	-	-	-	-	0.002	0.0016	0.003	0.002	0.002	0.002	0.0013	0.0027	0.001
Total Chromium (Cr)	µg/L	0.1 - 5	8.9	8.9	-	50	0.32	0.1	0.0878	0.06	0.06	0.424	0.0984	0.0666	0.07
Chromium (+3)	µg/L	0.5 - 5	8.9	8.9	-	-	0	0.1009	0	0	0	0	0	0	0
Chromium (VI)	µg/L	0.5	1	1	-	-	0.1945	0.2371	0.2933	0.25	0.23	0.225	0.1997	0.2879	0.23
Total Cobalt (Co)	µg/L	0.005 - 0.5	-	-	0.9	-	0.012	0.0134	0.009	0.0107	0.0114	0.014	0.0122	0.0082	0.0093
Total Copper (Cu)	µg/L	0.05 - 1	2.57	5	5	2000	0.58	0.614	0.593	0.587	0.62	0.61	0.61	0.618	0.626
Total Iron (Fe)	µg/L	1 - 100	300	300	-	-	0.318	1.2	0.4857	1.6	2.4	0.59	0.6807	-0.0506	0.8
Total Lead (Pb)	µg/L	0.005 - 0.5	3.59	25	5	5	0.007	0.0027	0.0033	0.0073	0.005	0.007	0.0022	0.003	0.0044
Total Lithium (Li)	µg/L	0.5 - 5	-	-	-	-	1.91	1.65	2.03	1.9	1.87	1.895	1.69	1.96	1.94
Total Magnesium (Mg)	µg/L	0.05 - 250	-	-	-	-	8530	8580	8760	8610	8470	8640	8560	8520	8640
Total Manganese (Mn)	µg/L	0.05 - 2	-	-	-	120	0.101	0.222	0.078	0.336	0.323	0.114	0.18	0.261	0.243
Mercury (Hg)	µg/L	0.01	0	0	0	1	-0.0004	0.0008	-0.001	0	-0.001	-0.0007	0.0004	-0.0003	-0.0002
Total Molybdenum (Mo)	µg/L	0.05 - 1	73	-	40	-	1.1	1.22	1.2	1.18	1.2	1.1	1.21	1.18	1.18
Total Nickel (Ni)	µg/L	0.02 - 1	103	25	-	-	0.507	0.469	0.498	0.495	0.513	0.511	0.518	0.509	0.487
Total Potassium (K)	µg/L	0.05 - 1000	-	-	-	-	1670	1640	1620	1570	1570	1660	1640	1620	1550
Total Selenium (Se)	µg/L	0.04 - 2	1	100	-	50	0.14	0.137	0.145	0.137	0.14	0.14	0.124	0.133	0.145
Total Silicon (Si)	µg/L	50	-	-	-	-		294	214	619	613		331	314	578
Total Silver (Ag)	µg/L	0.005 - 0.1	0.25	0.1	-	-	-0.001	-0.0004	-0.0002	-0.0007	-0.0011	-0.002	0	-0.0006	-0.0005
Total Sodium (Na)	µg/L	0.05 - 250	-	-	-	-	14600	13600	14000	13400	13700	15000	13600	13800	13700
Total Strontium (Sr)	µg/L	0.05 - 1	-	-	-	7000	173	195	186	188	190	172	195	183	190
Total Thallium (Tl)	µg/L	0.002 - 0.05	0.8	-	0.3	-	0.005	0.0043	0.0064	0.0047	0.0054	0.006	0.0048	0.0064	0.0053
Total Thorium (Th)	µg/L	0.005 - 1	-	-	-	-	0.001	-0.0006	0.0018	-0.0016	-0.0005	0.002	-0.0002	0.0014	-0.0018
Total Tin (Sn)	µg/L	0.2 - 5	-	-	-	-	0.009	0.0371	0.0094	0	0	0.01	0.0164	0.0079	0
Total Titanium (Ti)	µg/L	0.5 - 5	-	-	-	-	0.27	0.4876	-0.0879	0.08	0.14	0.266	0.4957	-0.1424	0.01
Total Tungsten (W)	µg/L	0.01 - 1	-	-	30	-	0.122	0.1	0.116	0.094	0.09	0.127	0.093	0.107	0.091
Total Uranium (U)	µg/L	0.002 - 0.1	-	-	5	20	0.36	0.357	0.37	0.394	0.389	0.37	0.351	0.368	0.377
Total Vanadium (V)	µg/L	0.2 - 5	-	-	6	-	0.164	-0.7195	0.1727	0.12	0.14	0.18	-0.6793	0.1824	0.16
Total Zinc (Zn)	µg/L	0.1 - 5	7	30	20	-	0.602	0.27	0.33	0.28	0.21	0.899	0.65	1.2	0.34
Dissolved Zinc (Zn)	µg/L	5	7	-	-	-	0.369	-0.353	2.136	0.8	0.4	0.974	0.037	4.397	0.2
Total Zirconium (Zr)	µg/L	0.1 - 1	-	-	4	-	-0.01	0.0014	0.0173	-0.0019	0.01	-0.012	0.0002	0.008	-0.0005
Radionuclides															
H-3	Bq/kg	9.4 - 14.8	-	7000	-	7000	5.1	4.2	-5.3	-3.3	-5.1	0	0	-5.3	-1.8
C-14	Bq/kg	0.04 - 0.1	-	-	-	-	0.02	-0.03	0.06	0.04	-0.02	0.05	-0.05	0.06	0.14
I-131	Bq/kg	0.078 - 170	-	10	-	6	0.499	1.09	69.4	-0.0414	0.997	0.206	1.04	72.4	0.26
K-40	Bq/kg	0.79 - 11	-	-	-	-	3.07	1.44	-4.72	3.25	-7.44	-1.39	-1.71	-3.58	1.53
Co-60	Bq/kg	0.066 - 0.95	-	-	-	-	0.093	0.198	0.00567	-0.13	-0.154	-0.0151	-0.069	0.0875	-0.0743
Cs-134	Bq/kg	0.094 - 0.99	-	-	-	-	0.164	-0.201	0.038	-0.215	0.0607	0.278	0.036	0.0333	0.0686
Cs-137	Bq/kg	0.11 - 0.9	-	50	-	10	0.191	0.141	0.0523	-0.369	0.118	0.172	0.015	0.206	0.0825
Th-Series	Bq/kg	0.3 - 5	-	-	-	-	0.00704	0.093	-0.788	0.807	-1.69	-0.0361	-0.213	0.31	-1.24
U-Series	Bq/kg	0.33 - 3.7	-	-	-	-	0.576	0.311	-0.0997	0.54	0.359	-0.287	0.38	0.389	-0.496
Other															
Hydrazine	µg/L	0.1	2.6	-	-	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Morpholine	µg/L	4	-	-	4		0	0	0	0	0	1	0	0	0
Bromoform	µg/L	0.2 - 1	-	-	60	-	0	0	0	0	0	0	0	0	0
Chloroform	µg/L	0.1 - 0.5	1.8	-	-	-	0	0	0	0	0	0	0	0	0
Bromodichloromethane	µg/L	0.1 - 0.5	-	-	200	-	0	0	0	0	0	0	0	0	0

			Water Quality Objectives				DNGS-Far-S				DNGS-Far-M			
Parameters	Units	Detection Limit	CCME CWQG	PWQO	Interim PWQO	Health Canada	Spring April 10-17, 2019	Summer 2-Jul-19	Fall 26-Aug-19	Winter 14-Dec-19	Spring April 10-17, 2019	Summer 2-Jul-19	Fall 26-Aug-19	Winter 14-Dec-19
Physical/Conventional Characteristics														
Field Temperature	Celsius	-	-	-	-	-	3.75	14.05	20.1	4.15	3.63	11.23	20.1	4.13
Field pH	pH	-	6.5-9.0	6.5-8.5	-	-	8.28	**8.53**	8.42	8.42	8.28	8.48	8.42	8.42
pH	pH	-	-	-	-	-	8.18	8.24	8.38	8.24	8.15	8.28	8.4	8.23
Field Sp. Conductance	µS/cm	-	-	-	-	-	287	279	312	282	285	277	306	282
Conductivity	umho/cm	1	-	-	-	-	320	310	310	310	320	310	310	320
Field Turbidity	NTU	0.1	-	-	-	-	-5.7	-3.5	-5.2	-2.6	-5.7	-3.4	-5.2	-3
Turbidity	NTU	0.1	-	-	-	-	0.0443	0.2	0.4	0.2	0.01	0.2	0.4	0.2
Alkalinity (Total as CaCO3)	mg/L	1	-	-	-	-	97	92	93	96	95	93	94	97
Dissolved Oxygen	mg/L	-	-	-	-	-	7.17	10.85	11.26	0	8.43	11.88	11.29	9.84
Total Hardness (CaCO3)	mg/L	0.5 - 1	-	-	-	-	116	118	125	124	113	119	123	124
Total Suspended Solids	mg/L	1 - 10	-	-	-	-	4	0.6	0.8	0	3	0.2	1	1
Total Residual Chlorine*	mg/L	0.0012	0.0005	0.002	-	-	**0.0012**	**0.014**	**0.0012**	**0.0012**	**0.0012**	**0.015**	**0.0012**	**0.0012**
Nutrients														
Dissolved Organic Carbon	mg/L	0.5	-	-	-	-	1.8	2	2	1.9	1.9	2	2	2
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1	-	-	-	-	0.06	0.15	0.33	0.15	0.18	0.17	0.39	0.11
Total Ammonia-N**	mg/L	0.01 - 1	0.044	-	-	-	-0.0008	0.01	**0.1**	0.04	**0.059**	0.02	**0.2**	0.01
Total Un-ionized Ammonia**	mg/L	0.00051 - 0.044	0.019	0.02	-	-	0	0.0014	0.011	0.0015	0.0015	0.0015	**0.023**	0.00047
Nitrate (N)	mg/L	0.1	13	-	-	45	0.35	0.28	0.19	0.4	0.35	0.28	0.19	0.4
Nitrite (N)	mg/L	0.01	0.06	-	-	1	0.00036103	-0.005	0.0047	0.002	0.00012456	-0.0042	0.0056	0.002
Total BOD	mg/L	2	-	-	-	-	2	2	2	2	2	2	2	2
Total Chemical Oxygen Demand (CO	mg/L	4	-	-	-	-	6.3	2.44	3.17	6.8	4.1	3.48	9.6	8.8
Orthophosphate (P)	mg/L	0.01	-	-	-	-	0.00436	0.0046	0.00505	0.006	0.00457	0.00415	0.00541	0.006
Total Phosphorus	mg/L	0.02 - 2.51	-	-	0.02	-	0.0075	0.015	-0.0003	0.003	0.0149	0.003	0.0013	0.004
Hydrocarbons														
Benzene	µg/L	0.1 - 0.5	370	-	100	5	0	0	0	0	0	0	0	0
Ethylbenzene	µg/L	0.1 - 0.5	90	-	8	140	0	0	0	0	0	0	0	0
F1 (C6-C10)	µg/L	25	167	-	-	-	0	0	0	0	0	0	0	0
F1 (C6-C10) - BTEX	µg/L	25	-	-	-	-	0	0	0	0	0	0	0	0
F2 (C10-C16 Hydrocarbons)	µg/L	100	42	-	-	-	0	0	0	0	0	0	0	0
F3 (C16-C34 Hydrocarbons)	µg/L	200	-	-	-	-	47.80524	170.0574	104.7571	50	60.9434	67.68684	28.78664	140
F4 (C34-C50 Hydrocarbons)	µg/L	200	-	-	-	-	0	0	0	0	0	0	0	0
Reached Baseline at C50	µg/L	-	-	-	-	-	1	1	1	1	1	1	1	1
Biological														
Chlorophyll	µg/L	0.1 - 0.2	-	-	-	-	1.54	1.34	1.78	0.94	1.35	1.36	1.79	1.25
Background	CFU/100mL	10	-	-	-	-	2	930	290	20	6	180	60	30
Total Coliforms	CFU/100mL	10	-	-	-	-	1	10	30	10	1	10	20	10
Fecal coliform	CFU/100mL	10	-	-	-	-	0	10	10	10	0	10	10	10
Escherichia coli	CFU/100mL	10	-	100	-	-	0	10	10	10	0	10	10	10
Metals														
Total Aluminum (Al)	µg/L	0.5 - 5	100	-	-	-	2.83	0.6	0.92	0.56	1.641	0.79	0.71	0.8
Dissolved (0.2u) Aluminum (Al)	µg/L	5	-	-	75	-	2.312	1.37	2.037	3	3.796	3.289	2.289	3
Total Antimony (Sb)	µg/L	0.02 - 0.5	-	20	-	6	0.115	0.131	0.131	0.153	0.124	0.112	0.129	0.146
Total Arsenic (As)	µg/L	0.02 - 1	5	100	5	10	0.84	0.763	0.792	0.759	0.8	0.777	0.761	0.786
Total Barium (Ba)	µg/L	0.02 - 2	-	-	-	1000	21.5	21.6	21.4	23.7	21.7	21	21.4	23.7
Total Beryllium (Be)	µg/L	0.01 - 0.5	-	1100	-	-	-0.001	-0.004	-0.0005	0.001	-0.001	-0.004	-0.0008	0.002
Total Bismuth (Bi)	µg/L	0.005 - 1	-	-	-	-	0	-0.0012	-0.0003	0.0003	0	-0.0007	-0.0013	0.0002
Total Boron (B)	µg/L	10 - 50	1500	-	200	5000	21.149	22	24	24	21.126	22	24	24
Total Cadmium (Cd)	µg/L	0.005 - 0.1	0.17	0.2	0.5	5	0.003	0.0017	0.0011	0.0046	0.003	0.0016	0.0009	0.004
Total Calcium (Ca)	µg/L	0.05 - 250	-	-	-	-	32500	33600	34500	35500	32300	33800	34000	35700
Total Cesium (Cs)	µg/L	0.05 - 0.2	-	-	-	-	-0.001	0	0.002	0.003	-0.001	-0.0009	0.002	0.003
Total Chromium (Cr)	µg/L	0.1 - 5	8.9	8.9	-	50	-0.402	0.059	0.12	0.03	-0.534	0.0751	0.17	0.03
Chromium (+3)	µg/L	0.5 - 5	8.9	8.9	-	-	0	0	0	0	0	0	0	0
Chromium (VI)	µg/L	0.5	1	1	-	-	0.2689	0.2761	0.2654	0.22	0.1994	0.2071	0.2938	0.21
Total Cobalt (Co)	µg/L	0.005 - 0.5	-	-	0.9	-	-0.01	0.0054	0.0083	0.0086	-0.01	0.0049	0.01	0.0075
Total Copper (Cu)	µg/L	0.05 - 1	2.57	5	5	2000	0.62	0.606	0.594	0.621	0.52	0.608	0.599	0.623
Total Iron (Fe)	µg/L	1 - 100	300	300	-	-	-0.096	0.0713	0.884	0.6	0.963	1.2	1.7	0.6
Total Lead (Pb)	µg/L	0.005 - 0.5	3.59	25	5	5	0.01	0.0013	0.0031	0.004	0.008	0.0053	0.0025	0.0039
Total Lithium (Li)	µg/L	0.5 - 5	-	-	-	-	2.1	1.85	1.93	2.21	2.1	1.85	1.92	2.23
Total Magnesium (Mg)	µg/L	0.05 - 250	-	-	-	-	8500	8320	9320	8690	7920	8540	9270	8540
Total Manganese (Mn)	µg/L	0.05 - 2	-	-	-	120	0.208	0.246	0.112	0.393	0.171	0.24	0.101	0.385
Mercury (Hg)	µg/L	0.01	0	0	0	1	0.0025	0.0004	0.0016	-0.0003	0.0019	0.0007	0.001	0
Total Molybdenum (Mo)	µg/L	0.05 - 1	73	-	40	-	1.1	1.16	1.2	1.17	1.2	1.16	1.18	1.2
Total Nickel (Ni)	µg/L	0.02 - 1	103	25	-	-	-0.316	0.499	0.446	0.494	-0.359	0.457	0.477	0.479
Total Potassium (K)	µg/L	0.05 - 1000	-	-	-	-	1640	1550	1640	1670	1540	1540	1650	1630
Total Selenium (Se)	µg/L	0.04 - 2	1	100	-	50	0.13	0.134	0.137	0.142	0.16	0.118	0.128	0.137
Total Silicon (Si)	µg/L	50	-	-	-	-		313	182	576		327	186	589
Total Silver (Ag)	µg/L	0.005 - 0.1	0.25	0.1	-	-	0.001	0.0005	-0.0013	-0.0021	0.001	0.0021	-0.0013	-0.0029
Total Sodium (Na)	µg/L	0.05 - 250	-	-	-	-	14900	13800	15100	15700	13700	14000	14900	15400
Total Strontium (Sr)	µg/L	0.05 - 1	-	-	-	7000	173	180	190	204	178	184	184	205
Total Thallium (Tl)	µg/L	0.002 - 0.05	0.8	-	0.3	-	0.006	0.0034	0.0053	0.0053	0.005	0.0035	0.0047	0.0051
Total Thorium (Th)	µg/L	0.005 - 1	-	-	-	-	0.002	0.0026	0.0015	-0.0019	0.001	0.0011	0.0018	-0.0025
Total Tin (Sn)	µg/L	0.2 - 5	-	-	-	-	0.001	0.1325	0.0033	-0.0008	-0.004	0.0319	0.0032	-0.0023
Total Titanium (Ti)	µg/L	0.5 - 5	-	-	-	-	-0.018	0.0865	-0.1525	-0.17	-0.091	0.1582	-0.0656	-0.18
Total Tungsten (W)	µg/L	0.01 - 1	-	-	30	-	0.107	0.097	0.105	0.091	0.101	0.091	0.104	0.087
Total Uranium (U)	µg/L	0.002 - 0.1	-	-	5	20	0.34	0.366	0.357	0.369	0.34	0.368	0.362	0.369
Total Vanadium (V)	µg/L	0.2 - 5	-	-	6	-	0.159	0.1929	0.1642	0.02	0.162	0.191	0.1753	0.03
Total Zinc (Zn)	µg/L	0.1 - 5	7	30	20	-	1.109	0.86	0.19	0.37	0.492	1.08	0.27	0.35
Dissolved Zinc (Zn)	µg/L	5	7	-	-	-	0.512	1.063	1.784	0.4	0.281	0.997	3.39	0.6
Total Zirconium (Zr)	µg/L	0.1 - 1	-	-	4	-	0.009	0.001	0.0067	0.01	0.005	0.0079	0.0144	0
Radionuclides														
H-3	Bq/kg	9.4 - 14.8	-	7000	-	7000	-5.29	4.5	-5.3	15.4	0	0	-5.3	10.4
C-14	Bq/kg	0.04 - 0.1	-	-	-	-	0.03	0.03	0.11	-0.01	-0.06	0.03	0.09	-0.04
I-131	Bq/kg	0.078 - 170	-	10	-	6	0.108	0.584	8.12	0.388	-0.106	0.223	20.3	0.269
K-40	Bq/kg	0.79 - 11	-	-	-	-	-1.96	0.518	-1.7	-1.19	0.612	-0.237	-1.9	-1.93
Co-60	Bq/kg	0.066 - 0.95	-	-	-	-	0.105	-0.209	0.029	-0.0806	0.173	-0.208	-0.00227	0.0225
Cs-134	Bq/kg	0.094 - 0.99	-	-	-	-	0.0807	0.06	-0.0228	0.0795	0.155	-0.032	0.257	0.3
Cs-137	Bq/kg	0.11 - 0.9	-	50	-	10	0.0517	0.009	0.125	0.0568	0.259	0.059	0.0684	0.138
Th-Series	Bq/kg	0.3 - 5	-	-	-	-	-0.472	0.08	-0.282	-0.856	0.487	-0.472	0.221	0.809
U-Series	Bq/kg	0.33 - 3.7	-	-	-	-	0.403	-0.621	-0.22	0.218	0.454	-0.753	-0.351	0.628
Other														
Hydrazine	µg/L	0.1	2.6	-	-	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Morpholine	µg/L	4	-	-	4		0	2	0	0	0	0	0	0
Bromoform	µg/L	0.2 - 1	-	-	60	-	0	0	0	0	0	0	0	0
Chloroform	µg/L	0.1 - 0.5	1.8	-	-	-	0	0	0	0	0	0	0	0
Bromodichloromethane	µg/L	0.1 - 0.5	-	-	200	-	0	0	0	0	0	0	0	0

			Water Quality Objectives				DNGS-Far-B				DNGS-Mid-S			
Parameters	Units	Detection Limit	CCME CWQG	PWQO	Interim PWQO	Health Canada	Spring April 10-17, 2019	Summer 2-Jul-19	Fall 26-Aug-19	Winter 14-Dec-19	Spring 16-Apr-19	Summer 2-Jul-19	Fall 28-Aug-19	Winter 16-Dec-19
Physical/Conventional Characteristics														
Field Temperature	Celsius	-	-	-	-	-	4.01	10.8	19.78	4.08	5.42	11.6	20.32	2.54
Field pH	pH	-	6.5-9.0	6.5-8.5	-	-	8.25	8.43	8.31	8.43	8.48	**8.52**	**8.63**	8.16
pH	pH	-	-	-	-	-	8.18	8.21	8.36	8.23	8.29	8.31	8.34	8.11
Field Sp. Conductance	µS/cm	-	-	-	-	-	286	277	311	282	306	277	316	315
Conductivity	umho/cm	1	-	-	-	-	320	310	310	320	340	310	310	360
Field Turbidity	NTU	0.1	-	-	-	-	1.2	-3.4	-5.2	-3	-4.4	-3.4	-3.8	-2.8
Turbidity	NTU	0.1	-	-	-	-	0.0389	0.1	0.5	0.2	0.3	0.1	0.6	0.3
Alkalinity (Total as CaCO3)	mg/L	1	-	-	-	-	97	92	93	96	95	93	93	96
Dissolved Oxygen	mg/L	-	-	-	-	-	9.18	11.85	11.22	9.29	13.34	11.62	9.2	14.78
Total Hardness (CaCO3)	mg/L	0.5 - 1	-	-	-	-	112	117	125	125	125	121	110	122
Total Suspended Solids	mg/L	1 - 10	-	-	-	-	2	0.2	1	1	1	0.8	2	0
Total Residual Chlorine*	mg/L	0.0012	0.0005	0.002	-	-	**0.0012**	**0.013**	**0.0012**	**0.0012**	**0.0012**	**0.01**	**0.0012**	**0.0012**
Nutrients														
Dissolved Organic Carbon	mg/L	0.5	-	-	-	-	1.9	2.1	2.1	2	2.1	2.1	2	2
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1	-	-	-	-	0.17	0.18	0.22	0.15	0.14	0.18	0.22	
Total Ammonia-N**	mg/L	0.01 - 1	0.044	-	-	-	0.011	0.00769	**0.09**	0.02	**0.05**	0.00704	**0.09**	
Total Un-ionized Ammonia**	mg/L	0.00051 - 0.044	0.019	0.02	-	-	**0.13**	0	0.0078	0.00071	0.011	0	0.016	0.0022
Nitrate (N)	mg/L	0.1	13	-	-	45	0.34	0.29	0.19	0.41	0.4	0.27	0.14	0.54
Nitrite (N)	mg/L	0.01	0.06	-	-	1	-0.0032	-0.0036	0.0049	0.003	0.0023	0.011	0.0021	0.008
Total BOD	mg/L	2	-	-	-	-	2	2	2	2	2	2	2	2
Total Chemical Oxygen Demand (CO	mg/L	4	-	-	-	-	-0.95	3.82	8.3	6.6	2.64	2.78	7.2	3.2
Orthophosphate (P)	mg/L	0.01	-	-	-	-	0.00427	0.00435	0.00549	0.006	0.00279	0.00449	0.00522	0.008
Total Phosphorus	mg/L	0.02 - 2.51	-	-	0.02	-	-0.0002876	0.0023	0.0013	0.011	**0.022**	0.0011	0.0024	0.008
Hydrocarbons														
Benzene	µg/L	0.1 - 0.5	370	-	100	5	0	0	0	0	0	0	0	0
Ethylbenzene	µg/L	0.1 - 0.5	90	-	8	140	0	0	0	0	0	0	0	0
F1 (C6-C10)	µg/L	25	167	-	-	-	0	0	0	0	0	0	0	0
F1 (C6-C10) - BTEX	µg/L	25	-	-	-	-	0	0	0	0	0	0	0	0
F2 (C10-C16 Hydrocarbons)	µg/L	100	42	-	-	-	0	0	0	0	0	0	0	0
F3 (C16-C34 Hydrocarbons)	µg/L	200	-	-	-	-	54.92916	142.3801	24.25544	46	24.48799	135.7813	73.40468	41
F4 (C34-C50 Hydrocarbons)	µg/L	200	-	-	-	-	0	0	0	0	0	0	0	0
Reached Baseline at C50	µg/L	-	-	-	-	-	1	1	1	1	1	1	1	1
Biological														
Chlorophyll	µg/L	0.1 - 0.2	-	-	-	-	1.5	1.68	1.92	1.05	2.75	1.09	1.68	0.98
Background	CFU/100mL	10	-	-	-	-	0	1400	40	10	61	10	690	30
Total Coliforms	CFU/100mL	10	-	-	-	-	0	10	70	10	51	10	40	10
Fecal coliform	CFU/100mL	10	-	-	-	-	0	10	10	10	3	10	10	10
Escherichia coli	CFU/100mL	10	-	100	-	-	0	10	10	10	3	10	10	10
Metals														
Total Aluminum (Al)	µg/L	0.5 - 5	100	-	-	-	2.975	0.55	0.97	0.65	17	1.2591	1.45	1.03
Dissolved (0.2u) Aluminum (Al)	µg/L	5	-	-	75	-	3.106	2.508	1.968	4	2.863	2.498	3.758	3
Total Antimony (Sb)	µg/L	0.02 - 0.5	-	20	-	6	0.122	0.123	0.13	0.133	0.161	0.114	0.139	0.154
Total Arsenic (As)	µg/L	0.02 - 1	5	100	5	10	0.78	0.752	0.801	0.759	0.74	0.801	0.746	0.724
Total Barium (Ba)	µg/L	0.02 - 2	-	-	-	1000	21.9	21.5	21.8	23.2	22	21.9	20.4	23.2
Total Beryllium (Be)	µg/L	0.01 - 0.5	-	1100	-	-	-0.001	-0.004	-0.0015	0.001	0.001	-0.0046	0.0001	-0.0002
Total Bismuth (Bi)	µg/L	0.005 - 1	-	-	-	-	0	-0.0004	-0.0008	-0.0003	0.001	0.0004	-0.0004	-0.0005
Total Boron (B)	µg/L	10 - 50	1500	-	200	5000	21.106	21	24	23	23.204	23	19	26
Total Cadmium (Cd)	µg/L	0.005 - 0.1	0.17	0.2	0.5	5	0.004	0.0023	0.0016	0.0055	0.004	0.0017	0.0009	0.0043
Total Calcium (Ca)	µg/L	0.05 - 250	-	-	-	-	32000	33300	34200	35600	36000	33900	30800	34200
Total Cesium (Cs)	µg/L	0.05 - 0.2	-	-	-	-	-0.001	-0.0011	0.0008	0.002	0.003	-0.0008	0.0026	0.002
Total Chromium (Cr)	µg/L	0.1 - 5	8.9	8.9	-	50	-0.453	0.0745	0.0919	0.06	0.548	0.0759	0.0718	0.09
Chromium (+3)	µg/L	0.5 - 5	8.9	8.9	-	-	0	0	0	0	0	0	0	0
Chromium (VI)	µg/L	0.5	1	1	-	-	0.2071	0.1977	0.2928	0.22	0.2199	0.1987	0.32	0.26
Total Cobalt (Co)	µg/L	0.005 - 0.5	-	-	0.9	-	-0.01	0.0043	0.0088	0.0094	0.016	0.0062	0.0103	0.0154
Total Copper (Cu)	µg/L	0.05 - 1	2.57	5	5	2000	0.55	0.586	0.617	0.647	0.66	0.62	0.591	0.707
Total Iron (Fe)	µg/L	1 - 100	300	300	-	-	-0.946	0.2324	0.5769	0.7	14	0.3753	0.5281	1
Total Lead (Pb)	µg/L	0.005 - 0.5	3.59	25	5	5	0.008	0.0017	0.0033	0.0039	0.018	0.0016	0.0059	0.0049
Total Lithium (Li)	µg/L	0.5 - 5	-	-	-	-	2.1	1.81	1.94	2.18	1.917	1.85	1.42	2.1
Total Magnesium (Mg)	µg/L	0.05 - 250	-	-	-	-	7810	8280	9530	8660	8470	8770	8080	8990
Total Manganese (Mn)	µg/L	0.05 - 2	-	-	-	120	0.171	0.311	0.092	0.372	0.935	0.25	0.187	0.857
Mercury (Hg)	µg/L	0.01	0	0	0	1	0.0015	0.0012	0.0012	0	-0.0002	0.0003	0.0005	-0.0008
Total Molybdenum (Mo)	µg/L	0.05 - 1	73	-	40	-	1.2	1.18	1.15	1.22	1.1	1.2	1.14	1.26
Total Nickel (Ni)	µg/L	0.02 - 1	103	25	-	-	-0.3	0.456	0.484	0.476	0.547	0.52	0.473	0.561
Total Potassium (K)	µg/L	0.05 - 1000	-	-	-	-	1540	1550	1730	1690	1740	1590	1510	1750
Total Selenium (Se)	µg/L	0.04 - 2	1	100	-	50	0.13	0.123	0.128	0.148	0.14	0.129	0.124	0.142
Total Silicon (Si)	µg/L	50	-	-	-	-		327	185	577		317	151	472
Total Silver (Ag)	µg/L	0.005 - 0.1	0.25	0.1	-	-	0.001	0.001	-0.0006	-0.0022	-0.001	0.0016	0.0016	0.001
Total Sodium (Na)	µg/L	0.05 - 250	-	-	-	-	14300	13900	15600	15900	16200	14300	12900	22400
Total Strontium (Sr)	µg/L	0.05 - 1	-	-	-	7000	180	183	187	207	182	184	180	188
Total Thallium (Tl)	µg/L	0.002 - 0.05	0.8	-	0.3	-	0.006	0.0033	0.0056	0.0059	0.006	0.0064	0.0055	0.0051
Total Thorium (Th)	µg/L	0.005 - 1	-	-	-	-	0	0.0022	0.002	-0.0017	0.004	0.0024	0.0003	0.0013
Total Tin (Sn)	µg/L	0.2 - 5	-	-	-	-	0.405	0.0264	0.0088	0	0.008	0.013	0.0442	0.01
Total Titanium (Ti)	µg/L	0.5 - 5	-	-	-	-	0.147	-0.0129	0.0794	-0.219	0.739	0.2863	-0.0406	0.06
Total Tungsten (W)	µg/L	0.01 - 1	-	-	30	-	0.102	0.094	0.11	0.085	0.115	0.098	0.104	0.097
Total Uranium (U)	µg/L	0.002 - 0.1	-	-	5	20	0.35	0.364	0.357	0.373	0.38	0.367	0.357	0.378
Total Vanadium (V)	µg/L	0.2 - 5	-	-	6	-	0.211	0.1808	0.24	0.04	0.189	0.1931	0.28	0.13
Total Zinc (Zn)	µg/L	0.1 - 5	7	30	20	-	0.706	1.79	0.8	0.36	0.879	0.4263	0.5	0.54
Dissolved Zinc (Zn)	µg/L	5	7	-	-	-	0.333	1.749	0.689	0.6	0.401	0.254	1.896	0.6
Total Zirconium (Zr)	µg/L	0.1 - 1	-	-	4	-	0.002	0.004	0.0132	-0.0064	-0.004	-0.0047	0.0078	0.01
Radionuclides														
H-3	Bq/kg	9.4 - 14.8	-	7000	-	7000	0	9.2	-5.3	5.1	0	4.6	-10.6	9.8
C-14	Bq/kg	0.04 - 0.1	-	-	-	-	-0.03	-0.01	0.1	0.01	-0.09	0.01	0.08	0.03
I-131	Bq/kg	0.078 - 170	-	10	-	6	0.269	0.11	6.67	0.0875	0.218	0.49	8.42	0.143
K-40	Bq/kg	0.79 - 11	-	-	-	-	-2.37	-1.73	-3.6	4.72	2.3	1.12	-2	3.15
Co-60	Bq/kg	0.066 - 0.95	-	-	-	-	-0.0441	-0.05	0.0246	-0.0865	0.12	-0.31	0.0498	-0.000609
Cs-134	Bq/kg	0.094 - 0.99	-	-	-	-	-0.293	-0.18	0.0469	-0.529	0.112	-0.06	0.0755	0.222
Cs-137	Bq/kg	0.11 - 0.9	-	50	-	10	-0.103	-0.122	0.035	0.236	0.219	0.105	0.0681	0.0588
Th-Series	Bq/kg	0.3 - 5	-	-	-	-	0.475	-0.042	0.171	-1.19	-0.251	0.296	-0.203	-0.379
U-Series	Bq/kg	0.33 - 3.7	-	-	-	-	0.601	-0.464	-0.199	-0.482	0.646	0.194	0.119	-0.211
Other														
Hydrazine	µg/L	0.1	2.6	-	-	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Morpholine	µg/L	4	-	-	4		0	1	0	0	0	1	0	0
Bromoform	µg/L	0.2 - 1	-	-	60	-	0	0	0	0	0	0	0	0
Chloroform	µg/L	0.1 - 0.5	1.8	-	-	-	0	0	0	0	0	0	0	0
Bromodichloromethane	µg/L	0.1 - 0.5	-	-	200	-	0	0	0	0	0	0	0	0

			Water Quality Objectives				DNGS-Mid-M				DNGS-Mid-B				
Parameters	Units	Detection Limit	CCME CWQG	PWQO	Interim PWQO	Health Canada	Spring 16-Apr-19	Summer 2-Jul-19	Fall 28-Aug-19	Winter 16-Dec-19	Spring 16-Apr-19	Summer 2-Jul-19	Fall 28-Aug-19	Fall (Dup) 28-Aug-19	Winter 16-Dec-19
Physical/Conventional Characteristics															
Field Temperature	Celsius	-	-	-	-	-	4.8	11.43	20.3	2.54	5	9.48	20.2	20.2	2.52
Field pH	pH	-	6.5-9.0	6.5-8.5	-	-	8.49	8.34	**8.64**	8.15	8.41	8.49	**8.63**	**8.63**	8.17
pH	pH	-	-	-	-	-	8.27	8.31	8.38	8.02	8.28	8.31	8.41	8.39	8.16
Field Sp. Conductance	µS/cm	-	-	-	-	-	302	277	315	315	331	278	315		314
Conductivity	umho/cm	1	-	-	-	-	340	300	310	360	380	310	310	310	360
Field Turbidity	NTU	0.1	-	-	-	-	-4.7	-3.5	-3.9	-2.8	-3	-3.5	-4.2		-2.8
Turbidity	NTU	0.1	-	-	-	-	0.0957	0.1	0.7	0.4	1.5	0.1	0.5	0.6	0.3
Alkalinity (Total as CaCO3)	mg/L	1	-	-	-	-	94	94	93	95	100	93	93	94	97
Dissolved Oxygen	mg/L	-	-	-	-	-	13.3	11.38	9.29	14.79	12.98	12.09	9.31		14.91
Total Hardness (CaCO3)	mg/L	0.5 - 1	-	-	-	-	122	118	112	124	132	120	115	116	124
Total Suspended Solids	mg/L	1 - 10	-	-	-	-	0	0.6	2	1	2	0	2	2	0
Total Residual Chlorine*	mg/L	0.0012	0.0005	0.002	-	-	**0.0012**	**0.019**	**0.0012**	**0.0012**	**0.011**	**0.013**	**0.0012**		**0.0012**
Nutrients															
Dissolved Organic Carbon	mg/L	0.5	-	-	-	-	2	2	2.1	1.9	2.2	2.2	2	2.1	2
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1	-	-	-	-	0.48	0.14	0.26	0.13	0.48	0.16	0.24	0.39	0.18
Total Ammonia-N**	mg/L	0.01 - 1	0.044	-	-	-	0.04242	0.04	**0.11**	0.03	0.02094	0.02	**0.08**	**0.16**	0.03
Total Un-ionized Ammonia**	mg/L	0.00051 - 0.044	0.019	0.02	-	-	0	0.0021	**0.02**	0.00051	0	0.0013	0.014	**0.028**	0.00062
Nitrate (N)	mg/L	0.1	13	-	-	45	0.38	0.27	0.14	0.55	0.49	0.3	0.14	0.15	0.55
Nitrite (N)	mg/L	0.01	0.06	-	-	1	0.0011	-0.006	0.0022	0.005	0.0034	-0.0021	0.0024	0.003	0.004
Total BOD	mg/L	2	-	-	-	-	2	2	2	2	2	2	2	2	2
Total Chemical Oxygen Demand (CO	mg/L	4	-	-	-	-	3.35	3.48	7.9	-3	0.16	-1.38	9.2	9.9	5.7
Orthophosphate (P)	mg/L	0.01	-	-	-	-	0.00277	0.00418	0.00523	0.008	0.00383	0.00415	0.0053	0.00503	0.008
Total Phosphorus	mg/L	0.02 - 2.51	-	-	0.02	-	0.0173	-0.0001	**0.024**	0.006	0.0168	-0.0017	**0.024**	**0.021**	0.006
Hydrocarbons															
Benzene	µg/L	0.1 - 0.5	370	-	100	5	0	0	0	0	0	0	0	0	0
Ethylbenzene	µg/L	0.1 - 0.5	90	-	8	140	0	0	0	0	0	0	0	0	0
F1 (C6-C10)	µg/L	25	167	-	-	-	0	0	0	0	0	0	0	0	0
F1 (C6-C10) - BTEX	µg/L	25	-	-	-	-	0	0	0	0	0	0	0	0	0
F2 (C10-C16 Hydrocarbons)	µg/L	100	42	-	-	-	0	0	0	0	0	0	0	0	0
F3 (C16-C34 Hydrocarbons)	µg/L	200	-	-	-	-	41.45882	125.5707	64.4612	32	29.21684	119.0014	66.9384	112.136	30
F4 (C34-C50 Hydrocarbons)	µg/L	200	-	-	-	-	0	0	0	0	0	0	0	0	0
Reached Baseline at C50	µg/L	-	-	-	-	-	1	1	1	1	1	1	1	1	1
Biological															
Chlorophyll	µg/L	0.1 - 0.2	-	-	-	-	2.32	0.94	1.62	0.95	2.84	1.25	1.77	1.54	0.83
Background	CFU/100mL	10	-	-	-	-	5	10	510	10	160	50	730	370	20
Total Coliforms	CFU/100mL	10	-	-	-	-	16	10	40	10	62	10	10	190	10
Fecal coliform	CFU/100mL	10	-	-	-	-	0	10	10	10	2	10	10	10	10
Escherichia coli	CFU/100mL	10	-	100	-	-	0	10	10	10	1	10	10	10	10
Metals															
Total Aluminum (Al)	µg/L	0.5 - 5	100	-	-	-	5.8	0.92	1.57	1.64	44	1.13	1.18	1.21	1.02
Dissolved (0.2u) Aluminum (Al)	µg/L	5	-	-	75	-	2.311	1.64	3.745	2	3.661	1.299	2.65	3.634	3
Total Antimony (Sb)	µg/L	0.02 - 0.5	-	20	-	6	0.125	0.114	0.142	0.155	0.131	0.118	0.132	0.125	0.144
Total Arsenic (As)	µg/L	0.02 - 1	5	100	5	10	0.79	0.754	0.748	0.743	0.68	0.751	0.75	0.758	0.734
Total Barium (Ba)	µg/L	0.02 - 2	-	-	-	1000	21.4	21.6	21.2	23.5	23.1	21.5	20.7	21	23.5
Total Beryllium (Be)	µg/L	0.01 - 0.5	-	1100	-	-	0.001	-0.0051	-0.0004	-0.0008	0.002	-0.004	-0.0001	0.0001	-0.0011
Total Bismuth (Bi)	µg/L	0.005 - 1	-	-	-	-	0	-0.0011	-0.0001	-0.0013	0	-0.0005	-0.0001	-0.0003	-0.0008
Total Boron (B)	µg/L	10 - 50	1500	-	200	5000	21.948	22	20	26	20.937	22	20	20	26
Total Cadmium (Cd)	µg/L	0.005 - 0.1	0.17	0.2	0.5	5	0.003	0.0013	0.0013	0.0047	0.005	0.0006	0.001	0.0008	0.0038
Total Calcium (Ca)	µg/L	0.05 - 250	-	-	-	-	34700	33000	31600	3470	38700	33700	32600	32200	34500
Total Cesium (Cs)	µg/L	0.05 - 0.2	-	-	-	-	0.002	-0.0003	0.003	0.002	0.004	-0.0009	0.0031	0.0017	0.002
Total Chromium (Cr)	µg/L	0.1 - 5	8.9	8.9	-	50	0.264	0.0628	0.0818	0.08	0.276	0.0731	0.11	0.1	0.09
Chromium (+3)	µg/L	0.5 - 5	8.9	8.9	-	-	0	0	0	0	0	0	0	0	0
Chromium (VI)	µg/L	0.5	1	1	-	-	0.212	0.2276	0.315	0.29	0.2609	0.1834	0.314	0.3392	0.25
Total Cobalt (Co)	µg/L	0.005 - 0.5	-	-	0.9	-	0.01	0.0048	0.0116	0.0125	0.048	0.0037	0.0098	0.0112	0.0151
Total Copper (Cu)	µg/L	0.05 - 1	2.57	5	5	2000	0.59	0.639	0.621	0.718	0.69	0.584	0.598	0.605	0.73
Total Iron (Fe)	µg/L	1 - 100	300	300	-	-	0.949	0.6468	0.9198	1.3	45	0.1431	0.9418	1.1	1.3
Total Lead (Pb)	µg/L	0.005 - 0.5	3.59	25	5	5	0.006	0.0018	0.0049	0.0071	0.053	0.0011	0.0049	0.0098	0.0045
Total Lithium (Li)	µg/L	0.5 - 5	-	-	-	-	1.901	1.84	1.45	2.13	1.88	1.79	1.49	1.56	2.11
Total Magnesium (Mg)	µg/L	0.05 - 250	-	-	-	-	8440	8550	8180	8960	8550	8610	8110	8500	9090
Total Manganese (Mn)	µg/L	0.05 - 2	-	-	-	120	0.19	0.304	0.234	0.893	3.6	0.264	0.203	0.211	0.812
Mercury (Hg)	µg/L	0.01	0	0	0	1	-0.0005	0.0001	0.0022	0	-0.0002	-0.0003	0.0015	0.0016	0
Total Molybdenum (Mo)	µg/L	0.05 - 1	73	-	40	-	1.1	1.16	1.17	1.24	1.1	1.19	1.18	1.21	1.24
Total Nickel (Ni)	µg/L	0.02 - 1	103	25	-	-	0.474	0.503	0.482	0.552	0.551	0.496	0.486	0.46	0.611
Total Potassium (K)	µg/L	0.05 - 1000	-	-	-	-	1640	1580	1520	1720	1790	1590	1510	1590	1720
Total Selenium (Se)	µg/L	0.04 - 2	1	100	-	50	0.13	0.122	0.119	0.151	0.14	0.131	0.127	0.137	0.166
Total Silicon (Si)	µg/L	50	-	-	-	-		300	153	476		311	154	160	474
Total Silver (Ag)	µg/L	0.005 - 0.1	0.25	0.1	-	-	-0.001	0.0003	0.0003	0.0007	-0.001	0.0009	-0.0002	-0.0009	0
Total Sodium (Na)	µg/L	0.05 - 250	-	-	-	-	14800	14100	13100	22000	19400	14300	13000	13800	22300
Total Strontium (Sr)	µg/L	0.05 - 1	-	-	-	7000	174	184	176	192	176	185	179	178	194
Total Thallium (Tl)	µg/L	0.002 - 0.05	0.8	-	0.3	-	0.005	0.0035	0.0054	0.0051	0.005	0.003	0.0054	0.0051	0.0055
Total Thorium (Th)	µg/L	0.005 - 1	-	-	-	-	0.002	0.0019	-0.0004	-0.0005	0.004	0.0016	0.0005	-0.0002	0.0013
Total Tin (Sn)	µg/L	0.2 - 5	-	-	-	-	0.011	0.0135	0.0832	0.05	0.011	0.0148	0.0565	0.0579	0.12
Total Titanium (Ti)	µg/L	0.5 - 5	-	-	-	-	0.284	-0.0211	-0.2472	0.04	1.894	0.032	-0.1	-0.2629	0.05
Total Tungsten (W)	µg/L	0.01 - 1	-	-	30	-	0.124	0.099	0.105	0.096	0.099	0.098	0.11	0.103	0.095
Total Uranium (U)	µg/L	0.002 - 0.1	-	-	5	20	0.36	0.363	0.353	0.38	0.4	0.369	0.35	0.345	0.386
Total Vanadium (V)	µg/L	0.2 - 5	-	-	6	-	0.158	0.1748	0.23	0.1	0.228	0.1942	0.26	0.26	0.12
Total Zinc (Zn)	µg/L	0.1 - 5	7	30	20	-	0.527	0.39	0.37	0.55	0.924	0.69	0.68	0.58	0.77
Dissolved Zinc (Zn)	µg/L	5	7	-	-	-	**13**	0.54	2.044	0.5	0.528	0.666	2.018	1.953	1
Total Zirconium (Zr)	µg/L	0.1 - 1	-	-	4	-	-0.009	0.0405	0.0028	0.01	0.004	0.34	-0.001	0.0069	0.01
Radionuclides															
H-3	Bq/kg	9.4 - 14.8	-	7000	-	7000	0	0	-10.6	10.4	5.1	0	-10.3	-5.2	8.4
C-14	Bq/kg	0.04 - 0.1	-	-	-	-	-0.03	0.04	0.07	0.01	0.05	0.01	0.05	0.04	0.03
I-131	Bq/kg	0.078 - 170	-	10	-	6	0.423	0.175	10.7	0.0354	0.854	0.092	3.73	21.2	0.0537
K-40	Bq/kg	0.79 - 11	-	-	-	-	-3.16	2.26	-4.4	-1.71	-2.32	-1.51	-1.9	-6.46	-2.68
Co-60	Bq/kg	0.066 - 0.95	-	-	-	-	0.224	-0.255	-0.0817	0.0483	-0.0656	-0.153	-0.0355	0.00713	-0.00401
Cs-134	Bq/kg	0.094 - 0.99	-	-	-	-	0.21	-0.136	0.0542	0.0449	0.339	0.056	0.0428	0.0254	0.124
Cs-137	Bq/kg	0.11 - 0.9	-	50	-	10	0.0517	0.075	0.143	0.121	0.202	0.16	0.0333	0.264	0.0247
Th-Series	Bq/kg	0.3 - 5	-	-	-	-	0.283	0.013	0.213	0.0412	0.0394	-0.259	0.322	0.454	-0.449
U-Series	Bq/kg	0.33 - 3.7	-	-	-	-	1.26	0.661	0.12	0.146	0.704	-0.708	0.213	-0.174	-0.427
Other															
Hydrazine	µg/L	0.1	2.6	-	-	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1		0.1
Morpholine	µg/L	4	-	-	4		0	1	0	0	0	0	0	0	0
Bromoform	µg/L	0.2 - 1	-	-	60	-	0	0	0	0	0	0	0	0	0
Chloroform	µg/L	0.1 - 0.5	1.8	-	-	-	0	0	0	0	0	0	0	0	0
Bromodichloromethane	µg/L	0.1 - 0.5	-	-	200	-	0	0	0	0	0	0	0	0	0

			Water Quality Objectives				DNGS-Near-S						DNGS-Near-M			
Parameters	**Units**	**Detection Limit**	**CCME CWQG**	**PWQO**	**Interim PWQO**	**Health Canada**	Spring	Sping (Dup)	Summer	Summer (Dup)	Fall	Winter	Spring	Summer	Fall	Winter
							16-Apr-19	16-Apr-19	2-Jul-19	2-Jul-19	28-Aug-19	16-Dec-19	16-Apr-19	2-Jul-19	28-Aug-19	16-Dec-19
Physical/Conventional Characteristics																
Field Temperature	Celsius	-	-	-	-	-	4.84	4.84	13.62	13.62	19.94	2.01	4.84	13.21	19.87	2
Field pH	pH	-	6.5-9.0	6.5-8.5	-	-	**8.53**	**8.53**	8.49	8.49	8.39	8.17	**8.53**	8.49	8.39	8.18
pH	pH	-	-	-	-	-	8.3	8.3	8.3	8.32	8.42	8.18	8.29	8.31	8.44	8.19
Field Sp. Conductance	µS/cm	-	-	-	-	-	307		278		315	335	307	278	314	334
Conductivity	umho/cm	1	-	-	-	-	360	360	310	310	310	400	350	300	310	390
Field Turbidity	NTU	0.1	-	-	-	-	0.2		-3		-5	1.3	0.2	-3	-4.9	1.1
Turbidity	NTU	0.1	-	-	-	-	3.2	3.6	0.3	0.4	0.4	2.9	3	0.4	0.4	2.6
Alkalinity (Total as CaCO3)	mg/L	1	-	-	-	-	98	99	95	93	93	100	99	93	93	100
Dissolved Oxygen	mg/L	-	-	-	-	-	13.3		10.73		9.49	14.82	13.29	10.91	9.48	14.84
Total Hardness (CaCO3)	mg/L	0.5 - 1	-	-	-	-	127	129	118	119	113	132	131	119	112	128
Total Suspended Solids	mg/L	1 - 10	-	-	-	-	4	8	0.6	0	2	5	5	0.8	1	4
Total Residual Chlorine*	mg/L	0.0012	0.0005	0.002	-	-	**0.0012**		**0.013**		**0.0012**	**0.0012**	**0.0012**	**0.014**	**0.0012**	**0.0012**
Nutrients																
Dissolved Organic Carbon	mg/L	0.5	-	-	-	-	2	2	2	2	2.1	2.1	2.1	2	2.1	2.2
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1	-	-	-	-	0.21	0.18	0.15	0.14	0.2	0.16	0.19	0.2	0.17	0.16
Total Ammonia-N**	mg/L	0.01 - 1	0.044	-	-	-	**0.05**	-0.00317	0.02	0.01	**0.06**	0.02	**0.05**	0.04	0.03	**0.1**
Total Un-ionized Ammonia**	mg/L	0.00051 - 0.044	0.019	0.02	-	-	**0.26**	0	0.0013	0.001	0.0063	0.00035	**0.081**	0.0035	0.0035	0.0018
Nitrate (N)	mg/L	0.1	13	-	-	45	0.42	0.42	0.28	0.28	0.15	0.58	0.41	0.28	0.14	0.55
Nitrite (N)	mg/L	0.01	0.06	-	-	1	0.00022304	0.0017	-0.0017	-0.0082	0.0021	0.004	0.0017	-0.0021	0.002	0.005
Total BOD	mg/L	2	-	-	-	-	2	2	2	2	2	2	2	2	2	2
Total Chemical Oxygen Demand (CC	mg/L	4	-	-	-	-	7.3	5.1	4.2	4.5	8.2	-1.6	6.2	1.39	7.6	3.2
Orthophosphate (P)	mg/L	0.01	-	-	-	-	0.00238	0.00224	0.00451	0.00423	0.00531	0.007	0.00282	0.00528	0.00572	0.007
Total Phosphorus	mg/L	0.02 - 2.51	-	-	0.02	-	0.0139	0.0151	-0.0013	-0.0033	**0.022**	0.007	0.0171	-0.0002	0.0014	0.01
Hydrocarbons																
Benzene	µg/L	0.1 - 0.5	370	-	100	5	0	0	0	0	0	0	0	0	0	0.12
Ethylbenzene	µg/L	0.1 - 0.5	90	-	8	140	0	0	0	0	0	0	0	0	0	0
F1 (C6-C10)	µg/L	25	167	-	-	-	0	0	0	0	0	0	0	0	0	0
F1 (C6-C10) - BTEX	µg/L	25	-	-	-	-	0	0	0	0	0	0	0	0	0	0
F2 (C10-C16 Hydrocarbons)	µg/L	100	42	-	-	-	0	0	0	0	0	0	0	0	0	0
F3 (C16-C34 Hydrocarbons)	µg/L	200	-	-	-	-	49.4674	34.97067	168.2122	138.5071	95.19896	53	32.2308	144.9305	93.293	56
F4 (C34-C50 Hydrocarbons)	µg/L	200	-	-	-	-	0	0	0	0	0	0	0	0	0	0
Reached Baseline at C50	µg/L	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1
Biological																
Chlorophyll	µg/L	0.1 - 0.2	-	-	-	-	2.58	2.69	0.66	0.75	1.57	1.37	2.81	0.9	2.02	1.29
Background	CFU/100mL	10	-	-	-	-	500	220	30	10	310	720	250	60	370	540
Total Coliforms	CFU/100mL	10	-	-	-	-	110	150	10	10	80	100	160	10	140	170
Fecal coliform	CFU/100mL	10	-	-	-	-	8	3	10	10	10	20	2	10	10	10
Escherichia coli	CFU/100mL	10	-	100	-	-	4	3	10	10	10	20	2	10	10	10
Metals																
Total Aluminum (Al)	µg/L	0.5 - 5	100	-	-	-	65.1	70.8	0.7	1.02	1.12	2.95	76.5	0.95	3.17	2.3
Dissolved (0.2u) Aluminum (Al)	µg/L	5	-	-	75	-	2.681	3.622	1.867	3.326	2.342	4	3.271	1.295	21	3
Total Antimony (Sb)	µg/L	0.02 - 0.5	-	20	-	6	0.135	0.132	0.121	0.121	0.138	0.145	0.131	0.119	0.138	0.148
Total Arsenic (As)	µg/L	0.02 - 1	5	100	5	10	0.74	0.7	0.748	0.75	0.735	0.673	0.77	0.762	0.73	0.68
Total Barium (Ba)	µg/L	0.02 - 2	-	-	-	1000	22.9	22.9	21.7	21.5	20.8	25.7	23.9	21.4	20.5	24.8
Total Beryllium (Be)	µg/L	0.01 - 0.5	-	1100	-	-	0.005	0.003	-0.004	-0.0045	-0.0006	-0.0005	0.005	-0.0033	-0.0006	-0.0003
Total Bismuth (Bi)	µg/L	0.005 - 1	-	-	-	-	0.001	0.001	-0.0001	-0.0003	0.0001	-0.001	0.001	-0.0006	0	0.0002
Total Boron (B)	µg/L	10 - 50	1500	-	200	5000	22.774	22.03	22	22	20	27	23.328	23	20	26
Total Cadmium (Cd)	µg/L	0.005 - 0.1	0.17	0.2	0.5	5	0.006	0.004	0.0011	0.0007	0.0003	0.0041	0.005	-0.0004	0.001	0.005
Total Calcium (Ca)	µg/L	0.05 - 250	-	-	-	-	36800	37500	33300	33300	31700	37900	38000	33400	31300	36400
Total Cesium (Cs)	µg/L	0.05 - 0.2	-	-	-	-	0.009	0.008	-0.0001	-0.0007	0.0036	0.001	0.008	-0.0005	0.0023	0
Total Chromium (Cr)	µg/L	0.1 - 5	8.9	8.9	-	50	0.466	0.433	0.0706	0.0802	0.15	0.09	0.655	0.0796	0.0845	0.09
Chromium (+3)	µg/L	0.5 - 5	8.9	8.9	-	-	0	0	0	0	0	0	0	0	0	0
Chromium (VI)	µg/L	0.5	1	1	-	-	0.2062	0.2134	0.2487	0.2001	0.3324	0.24	0.2497	0.2072	0.3019	0.29
Total Cobalt (Co)	µg/L	0.005 - 0.5	-	-	0.9	-	0.048	0.054	0.0057	0.0068	0.0091	0.0176	0.055	0.0058	0.0093	0.0161
Total Copper (Cu)	µg/L	0.05 - 1	2.57	5	5	2000	0.69	0.73	0.601	0.622	0.615	0.731	0.74	0.617	0.593	0.74
Total Iron (Fe)	µg/L	1 - 100	300	300	-	-	79	83	0.6536	0.3281	1.9	2.9	89	0.5571	0.4791	2.2
Total Lead (Pb)	µg/L	0.005 - 0.5	3.59	25	5	5	0.068	0.065	0.0008	0.003	0.0022	0.0058	0.068	0.0028	0.0103	0.0051
Total Lithium (Li)	µg/L	0.5 - 5	-	-	-	-	1.83	2.1	1.83	1.85	1.44	2.14	2.2	1.9	1.49	2.12
Total Magnesium (Mg)	µg/L	0.05 - 250	-	-	-	-	8520	8660	8550	8630	8210	9130	8850	8670	8100	9050
Total Manganese (Mn)	µg/L	0.05 - 2	-	-	-	120	3	3.2	0.428	0.442	0.147	1.56	3.3	0.388	0.131	1.54
Mercury (Hg)	µg/L	0.01	0	0	0	1	-0.0015	0	0.0008	0.0009	0.0007	0	0.0004	0.0005	-0.0004	0
Total Molybdenum (Mo)	µg/L	0.05 - 1	73	-	40	-	1.1	1.1	1.14	1.2	1.18	1.23	1.1	1.18	1.21	1.19
Total Nickel (Ni)	µg/L	0.02 - 1	103	25	-	-	0.57	0.578	0.528	0.506	0.466	0.554	0.604	0.506	0.498	0.519
Total Potassium (K)	µg/L	0.05 - 1000	-	-	-	-	1730	1720	1580	1580	1540	1780	1790	1590	1510	1800
Total Selenium (Se)	µg/L	0.04 - 2	1	100	-	50	0.17	0.14	0.118	0.109	0.116	0.159	0.15	0.117	0.125	0.145
Total Silicon (Si)	µg/L	50	-	-	-	-			285	277	150	621		284	151	579
Total Silver (Ag)	µg/L	0.005 - 0.1	0.25	0.1	-	-	-0.001	-0.002	0.0015	0.0006	-0.0013	0.0002	-0.001	0.0002	-0.0009	0.0007
Total Sodium (Na)	µg/L	0.05 - 250	-	-	-	-	16200	16200	14000	14200	13100	25600	16700	14600	1290	24700
Total Strontium (Sr)	µg/L	0.05 - 1	-	-	-	7000	181	182	183	184	176	199	183	184	180	191
Total Thallium (Tl)	µg/L	0.002 - 0.05	0.8	-	0.3	-	0.006	0.006	0.0034	0.004	0.0051	0.0057	0.006	0.0038	0.0048	0.005
Total Thorium (Th)	µg/L	0.005 - 1	-	-	-	-	0.014	0.004	0.0015	0	-0.0003	0.001	0.013	0.0011	0.0001	-0.0002
Total Tin (Sn)	µg/L	0.2 - 5	-	-	-	-	0.012	0.068	0.0099	0.008	0.0314	0.03	0.015	0.0061	0.0807	0.01
Total Titanium (Ti)	µg/L	0.5 - 5	-	-	-	-	3.572	3.844	0.0933	-0.0143	-0.1591	0.13	4.107	-0.0301	-0.1918	0.11
Total Tungsten (W)	µg/L	0.01 - 1	-	-	30	-	0.116	0.128	0.099	0.097	0.108	0.096	0.134	0.096	0.104	0.088
Total Uranium (U)	µg/L	0.002 - 0.1	-	-	5	20	0.38	0.38	0.376	0.366	0.348	0.431	0.4	0.374	0.353	0.402
Total Vanadium (V)	µg/L	0.2 - 5	-	-	6	-	0.267	0.283	0.2	0.1965	0.24	0.11	0.318	0.1996	0.26	0.12
Total Zinc (Zn)	µg/L	0.1 - 5	7	30	20	-	0.764	0.798	0.4	0.32	0.29	0.51	1.024	0.29	1.18	0.54
Dissolved Zinc (Zn)	µg/L	5	7	-	-	-	0.225	0.263	0.198	0.112	2.092	0.5	0.298	0.104	2.211	0.7
Total Zirconium (Zr)	µg/L	0.1 - 1	-	-	4	-	0.013	0.007	-0.0012	0.0039	-0.0015	0.01	0.008	0.013	0.0032	0.01
Radionuclides																
H-3	Bq/kg	9.4 - 14.8	-	7000	-	7000	5.3	0	0	0	-5.3	7.4	0	4.2	-5.2	10.8
C-14	Bq/kg	0.04 - 0.1	-	-	-	-	-0.18	0.02	0.01	0.36	0.07	-0.04	-0.12	0.09	0.06	0
I-131	Bq/kg	0.078 - 170	-	10	-	6	0.932	0.72	0.504	0.109	19.1	0.158	0.771	0.714	16.4	0.06
K-40	Bq/kg	0.79 - 11	-	-	-	-	2.05	-2.93	1.09	0.408	-1.8	-5.95	-4.1	0.24	-0.84	3.83
Co-60	Bq/kg	0.066 - 0.95	-	-	-	-	0.272	0.106	-0.137	-0.234	0.0841	-0.0158	0.0875	-0.228	0.0153	-0.234
Cs-134	Bq/kg	0.094 - 0.99	-	-	-	-	0.0861	0.343	0.108	0.046	0.0395	0.151	0.187	-0.02	0.105	0.059
Cs-137	Bq/kg	0.11 - 0.9	-	50	-	10	0.0833	0.215	-0.055	-0.009	0.0507	0.0543	0.169	-0.01	0.0496	0.0861
Th-Series	Bq/kg	0.3 - 5	-	-	-	-	0.401	0.0892	0.008	-0.478	-0.628	-0.394	0.711	-0.372	0.403	0.697
U-Series	Bq/kg	0.33 - 3.7	-	-	-	-	0.69	0.537	-0.404	-0.876	-0.167	0.0242	0.504	-0.489	0.362	0.671
Other																
Hydrazine	µg/L	0.1	2.6	-	-	-	0.1	0.1	0.1	0.1	0.11	0.1	0.1	0.1	0.1	0.1
Morpholine	µg/L	4	-	-	4		0	1	1	0	0	0	0	0	0	0
Bromoform	µg/L	0.2 - 1	-	-	60	-	0	0	0	0	0	0	0	0	0	0
Chloroform	µg/L	0.1 - 0.5	1.8	-	-	-	0	0	0	0	0	0	0	0	0	0
Bromodichloromethane	µg/L	0.1 - 0.5	-	-	200	-	0	0	0	0	0	0	0	0	0	0

			Water Quality Objectives				DNGS-Near-B			
Parameters	Units	Detection Limit	CCME CWQG	PWQO	Interim PWQO	Health Canada	Spring 16-Apr-19	Summer 2-Jul-19	Fall 28-Aug-19	Winter 16-Dec-19
Physical/Conventional Characteristics										
Field Temperature	Celsius	-	-	-	-	-	4.81	9.5	19.81	2.01
Field pH	pH	-	6.5-9.0	6.5-8.5	-	-	**8.53**	8.44	8.35	8.17
pH	pH	-	-	-	-	-	8.29	8.31	8.33	8.18
Field Sp. Conductance	µS/cm	-	-	-	-	-	308	274	314	336
Conductivity	umho/cm	1	-	-	-	-	360	300	310	400
Field Turbidity	NTU	0.1	-	-	-	-	0.7	-2.9	-3.4	2.5
Turbidity	NTU	0.1	-	-	-	-	4	0.5	2.8	3.6
Alkalinity (Total as CaCO3)	mg/L	1	-	-	-	-	100	92	95	100
Dissolved Oxygen	mg/L	-	-	-	-	-	13.32	12.16	9.18	14.85
Total Hardness (CaCO3)	mg/L	0.5 - 1	-	-	-	-	132	117	113	130
Total Suspended Solids	mg/L	1 - 10	-	-	-	-	8	1	6	6
Total Residual Chlorine*	mg/L	0.0012	0.0005	0.002	-	-	**0.0012**	**0.016**	**0.0012**	**0.0012**
Nutrients										
Dissolved Organic Carbon	mg/L	0.5	-	-	-	-	2.1	2	2.1	2.2
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1	-	-	-	-	0.12	0.16	0.26	0.13
Total Ammonia-N**	mg/L	0.01 - 1	0.044	-	-	-	0.02618	0.02	**0.18**	0.01
Total Un-ionized Ammonia**	mg/L	0.00051 - 0.044	0.019	0.02	-	-	0	0.0012	0.018	0.00025
Nitrate (N)	mg/L	0.1	13	-	-	45	0.44	0.26	0.15	0.58
Nitrite (N)	mg/L	0.01	0.06	-	-	1	0.0038	0.0017	0.0034	-0.0085
Total BOD	mg/L	2	-	-	-	-	2	2	2	2
Total Chemical Oxygen Demand (CO	mg/L	4	-	-	-	-	-4.82	3.13	9.9	-4.4
Orthophosphate (P)	mg/L	0.01	-	-	-	-	0.00286	0.00417	0.00645	0.006
Total Phosphorus	mg/L	0.02 - 2.51	-	-	0.02	-	0.0172	0	0.0066	0.016
Hydrocarbons										
Benzene	µg/L	0.1 - 0.5	370	-	100	5	0	0	0	0.12
Ethylbenzene	µg/L	0.1 - 0.5	90	-	8	140	0	0	0	0
F1 (C6-C10)	µg/L	25	167	-	-	-	0	0	0	0
F1 (C6-C10) - BTEX	µg/L	25	-	-	-	-	0	0	0	0
F2 (C10-C16 Hydrocarbons)	µg/L	100	42	-	-	-	0	0	0	0
F3 (C16-C34 Hydrocarbons)	µg/L	200	-	-	-	-	41.0822	134.2372	82.30948	41
F4 (C34-C50 Hydrocarbons)	µg/L	200	-	-	-	-	0	0	0	0
Reached Baseline at C50	µg/L	-	-	-	-	-	1	1	1	1
Biological										
Chlorophyll	µg/L	0.1 - 0.2	-	-	-	-	2.55	0.39	2.08	1.17
Background	CFU/100mL	10	-	-	-	-	400	40	1100	840
Total Coliforms	CFU/100mL	10	-	-	-	-	120	10	60	120
Fecal coliform	CFU/100mL	10	-	-	-	-	7	10	30	10
Escherichia coli	CFU/100mL	10	-	100	-	-	6	10	10	10
Metals										
Total Aluminum (Al)	µg/L	0.5 - 5	100	-	-	-	85.3	1.76	2.35	2.95
Dissolved (0.2u) Aluminum (Al)	µg/L	5	-	-	75	-	4.142	2.561	3.911	4
Total Antimony (Sb)	µg/L	0.02 - 0.5	-	20	-	6	0.168	0.124	0.129	0.144
Total Arsenic (As)	µg/L	0.02 - 1	5	100	5	10	0.72	0.763	0.774	0.68
Total Barium (Ba)	µg/L	0.02 - 2	-	-	-	1000	24	21.3	22.7	25
Total Beryllium (Be)	µg/L	0.01 - 0.5	-	1100	-	-	0.004	-0.0051	0.0001	-0.0007
Total Bismuth (Bi)	µg/L	0.005 - 1	-	-	-	-	0	-0.0008	0.0005	-0.0011
Total Boron (B)	µg/L	10 - 50	1500	-	200	5000	23.014	21	20	25
Total Cadmium (Cd)	µg/L	0.005 - 0.1	0.17	0.2	0.5	5	0.005	-0.0006	0.0017	0.004
Total Calcium (Ca)	µg/L	0.05 - 250	-	-	-	-	38000	32900	31500	37000
Total Cesium (Cs)	µg/L	0.05 - 0.2	-	-	-	-	0.009	-0.0009	0.0022	0.001
Total Chromium (Cr)	µg/L	0.1 - 5	8.9	8.9	-	50	0.456	0.0794	0.0782	0.1
Chromium (+3)	µg/L	0.5 - 5	8.9	8.9	-	-	0	0	0	0
Chromium (VI)	µg/L	0.5	1	1	-	-	0.2186	0.2206	0.3372	0.22
Total Cobalt (Co)	µg/L	0.005 - 0.5	-	-	0.9	-	0.06	0.0053	0.017	0.0179
Total Copper (Cu)	µg/L	0.05 - 1	2.57	5	5	2000	0.73	0.594	0.546	0.751
Total Iron (Fe)	µg/L	1 - 100	300	300	-	-	100	1.7	1.3	2.8
Total Lead (Pb)	µg/L	0.005 - 0.5	3.59	25	5	5	0.079	0.0034	0.0079	0.009
Total Lithium (Li)	µg/L	0.5 - 5	-	-	-	-	2	1.8	1.54	2.08
Total Magnesium (Mg)	µg/L	0.05 - 250	-	-	-	-	8910	8400	8340	9190
Total Manganese (Mn)	µg/L	0.05 - 2	-	-	-	120	3.9	0.51	0.542	1.48
Mercury (Hg)	µg/L	0.01	0	0	0	1	0.0004	-0.0001	0.0015	0
Total Molybdenum (Mo)	µg/L	0.05 - 1	73	-	40	-	1.1	1.17	1.2	1.18
Total Nickel (Ni)	µg/L	0.02 - 1	103	25	-	-	0.602	0.491	0.446	0.55
Total Potassium (K)	µg/L	0.05 - 1000	-	-	-	-	1800	1550	1560	1800
Total Selenium (Se)	µg/L	0.04 - 2	1	100	-	50	0.14	0.121	0.117	0.149
Total Silicon (Si)	µg/L	50	-	-	-	-		219	160	613
Total Silver (Ag)	µg/L	0.005 - 0.1	0.25	0.1	-	-	-0.001	0.0011	-0.0014	-0.0001
Total Sodium (Na)	µg/L	0.05 - 250	-	-	-	-	17500	13600	13800	25600
Total Strontium (Sr)	µg/L	0.05 - 1	-	-	-	7000	184	178	182	197
Total Thallium (Tl)	µg/L	0.002 - 0.05	0.8	-	0.3	-	0.007	0.0033	0.0054	0.0041
Total Thorium (Th)	µg/L	0.005 - 1	-	-	-	-	0.009	0.0016	0	0.0003
Total Tin (Sn)	µg/L	0.2 - 5	-	-	-	-	0.056	0.0082	0.0375	0.02
Total Titanium (Ti)	µg/L	0.5 - 5	-	-	-	-	4.721	0.1487	-0.2125	0.01
Total Tungsten (W)	µg/L	0.01 - 1	-	-	30	-	0.113	0.09	0.109	0.094
Total Uranium (U)	µg/L	0.002 - 0.1	-	-	5	20	0.4	0.366	0.349	0.403
Total Vanadium (V)	µg/L	0.2 - 5	-	-	6	-	0.313	0.21	0.29	0.1
Total Zinc (Zn)	µg/L	0.1 - 5	7	30	20	-	0.981	0.6	0.45	1.97
Dissolved Zinc (Zn)	µg/L	5	7	-	-	-	0.493	0.285	2.034	0.6
Total Zirconium (Zr)	µg/L	0.1 - 1	-	-	4	-	0.022	0.0031	0.0109	0.01
Radionuclides										
H-3	Bq/kg	9.4 - 14.8	-	7000	-	7000	5.2	0	-5.2	7.7
C-14	Bq/kg	0.04 - 0.1	-	-	-	-	-0.09	-0.01	0.04	-0.12
I-131	Bq/kg	0.078 - 170	-	10	-	6	0.494	0.421	7.76	0.133
K-40	Bq/kg	0.79 - 11	-	-	-	-	-5.46	-0.673	-5.1	-1.38
Co-60	Bq/kg	0.066 - 0.95	-	-	-	-	0.129	-0.174	0.123	0.179
Cs-134	Bq/kg	0.094 - 0.99	-	-	-	-	0.342	0.002	0.0883	0.142
Cs-137	Bq/kg	0.11 - 0.9	-	50	-	10	0.267	0.04	0.0776	0.148
Th-Series	Bq/kg	0.3 - 5	-	-	-	-	-1.14	-0.382	-0.369	0.548
U-Series	Bq/kg	0.33 - 3.7	-	-	-	-	0.34	-0.947	0.198	0.682
Other										
Hydrazine	µg/L	0.1	2.6	-	-	-	0.1	0.1	0.1	0.1
Morpholine	µg/L	4	-	-	4		0	0	0	0
Bromoform	µg/L	0.2 - 1	-	-	60	-	0	0	0	0
Chloroform	µg/L	0.1 - 0.5	1.8	-	-	-	0	0	0	0
Bromodichloromethane	µg/L	0.1 - 0.5	-	-	200	-	0	0	0	0

			Water Quality Objectives					SW9-S				SW9-B			
			CCME		Interim	Health	Winter (Dup)	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
Parameters	Units	Detection Limit	CWQG	PWQO	PWQO	Canada	16-Dec-19	April 10-17	4-Jul-19	26-Aug-19	14-Dec-19	April 10-17	4-Jul-19	26-Aug-19	14-Dec-19
Physical/Conventional Characteristics															
Field Temperature	Celsius	-	-	-	-	-	2.01	5.45	13.57	19.2	2.29	5.43	12.51	19.2	2.29
Field pH	pH	-	6.5-9.0	6.5-8.5	-	-	8.17	8.39	**8.57**	7.95	8.46	8.39	**8.59**	7.93	8.44
pH	pH	-	-	-	-	-	8.2	8.19	8.3	8.38	8.25	8.18	8.29	8.4	8.26
Field Sp. Conductance	µS/cm	-	-	-	-	-		326	277	316	319	326	282	317	320
Conductivity	umho/cm	1	-	-	-	-	410	360	300	310	360	360	310	310	340
Field Turbidity	NTU	0.1	-	-	-	-		-4.2	-3.4	-3.7	4.2	-4.2	-3.3	-3.9	8.4
Turbidity	NTU	0.1	-	-	-	-	6.5	0.6	0.4	1.1	2.4	0.6	0.3	0.7	3.2
Alkalinity (Total as CaCO3)	mg/L	1	-	-	-	-	110	100	94	94	100	100	93	92	100
Dissolved Oxygen	mg/L	-	-	-	-	-		19.33	12.71	12.41	89.9	19.69	13.12	12.34	8.6
Total Hardness (CaCO3)	mg/L	0.5 - 1	-	-	-	-	137	122	118	122	131	123	120	123	133
Total Suspended Solids	mg/L	1 - 10	-	-	-	-	10	2	0	4	6	2	0.2	2	6
Total Residual Chlorine*	mg/L	0.0012	0.0005	0.002	-	-		**0.0012**	**0.014**	**0.0012**	**0.0012**	**0.0012**	**0.015**	**0.0012**	**0.0012**
Nutrients															
Dissolved Organic Carbon	mg/L	0.5	-	-	-	-	2.2	2	2	2.1	2	2	2	2.1	2.1
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1	-	-	-	-	0.13	0.14	0.16	0.29	0.14	0.22	0.17	0.18	0.14
Total Ammonia-N**	mg/L	0.01 - 1	0.044	-	-	-	0.02	**0.19**	0.02	**0.19**	**0.15**	0.04008	0.00838	**0.09**	**0.16**
Total Un-ionized Ammonia**	mg/L	0.00051 - 0.044	0.019	0.02	-	-	0.00031	0.0072	0.002	0.0074	0.0052	0	0	0.0033	0.0053
Nitrate (N)	mg/L	0.1	13	-	-	45	0.66	0.43	0.25	0.2	0.49	0.43	0.26	0.19	0.47
Nitrite (N)	mg/L	0.01	0.06	-	-	1	0.006	0.003	-0.0025	0.0054	0.004	0.0022	0.013	0.0056	0.003
Total BOD	mg/L	2	-	-	-	-	2	2	2	2	2	2	2	2	2
Total Chemical Oxygen Demand (CO	mg/L	4	-	-	-	-	-0.27	6.6	5.8	6.6	13	6.6	6.2	7.6	-7
Orthophosphate (P)	mg/L	0.01	-	-	-	-	0.006	0.00376	0.00516	0.00507	0.005	0.00408	0.00488	0.00508	0.005
Total Phosphorus	mg/L	0.02 - 2.51	-	-	0.02	-	0.017	0.0079	**0.021**	0.0088	0.009	0.0079	**0.025**	0.0079	0.009
Hydrocarbons															
Benzene	µg/L	0.1 - 0.5	370	-	100	5	0	0	0	0	0	0	0	0	0
Ethylbenzene	µg/L	0.1 - 0.5	90	-	8	140	0	0	0	0	0	0	0	0	0
F1 (C6-C10)	µg/L	25	167	-	-	-	0	0	0	0	0	0	0	0	0
F1 (C6-C10) - BTEX	µg/L	25	-	-	-	-	0	0	0	0	0	0	0	0	0
F2 (C10-C16 Hydrocarbons)	µg/L	100	42	-	-	-	0	0	0	0	0	0	0	0	0
F3 (C16-C34 Hydrocarbons)	µg/L	200	-	-	-	-	41	57.88912	53.44168	32.12524	56	52.21476	19.29424	101.0038	54
F4 (C34-C50 Hydrocarbons)	µg/L	200	-	-	-	-	0	0	0	0	0	0	0	0	0
Reached Baseline at C50	µg/L	-	-	-	-	-	1	1	1	1	1	1	1	1	1
Biological															
Chlorophyll	µg/L	0.1 - 0.2	-	-	-	-	1.07	2.84	0.5	2.18	1.48	2.78	0.75	2.03	1.7
Background	CFU/100mL	10	-	-	-	-	1100	8	320	670	360	10	420	430	320
Total Coliforms	CFU/100mL	10	-	-	-	-	140	0	20	30	30	0	40	30	40
Fecal coliform	CFU/100mL	10	-	-	-	-	30	0	10	10	10	0	10	10	10
Escherichia coli	CFU/100mL	10	-	100	-	-	30	0	20	10	10	0	10	10	10
Metals															
Total Aluminum (Al)	µg/L	0.5 - 5	100	-	-	-	4.71	15.5	1.67	1.79	3.34	19.1	1.26	1.49	2.39
Dissolved (0.2u) Aluminum (Al)	µg/L	5	-	-	75	-	3	3.016	2.179	3.037	3	3.468	2.337	2.286	3
Total Antimony (Sb)	µg/L	0.02 - 0.5	-	20	-	6	0.144	0.123	0.154	0.146	0.145	0.117	0.148	0.146	0.148
Total Arsenic (As)	µg/L	0.02 - 1	5	100	5	10	0.675	0.79	0.731	0.795	0.742	0.77	0.755	0.769	0.711
Total Barium (Ba)	µg/L	0.02 - 2	-	-	-	1000	26.2	23.3	20.6	21.6	24.9	23.2	20.9	21.9	25.3
Total Beryllium (Be)	µg/L	0.01 - 0.5	-	1100	-	-	-0.0008	0	-0.0008	0.0002	0.001	-0.001	-0.0008	-0.0005	0.001
Total Bismuth (Bi)	µg/L	0.005 - 1	-	-	-	-	-0.0006	0.001	0.0004	0.0002	0.0006	0	0.0006	0.0005	-0.0001
Total Boron (B)	µg/L	10 - 50	1500	-	200	5000	26	21.519	19	25	24	21.645	20	26	24
Total Cadmium (Cd)	µg/L	0.005 - 0.1	0.17	0.2	0.5	5	0.0045	0.004	0.0017	0.0016	0.0023	0.004	0.0018	0.0012	0.0044
Total Calcium (Ca)	µg/L	0.05 - 250	-	-	-	-	39800	34700	33600	33700	38000	35800	34200	33900	38200
Total Cesium (Cs)	µg/L	0.05 - 0.2	-	-	-	-	0.001	0	0.0027	0.0033	0.004	0.001	0.0016	0.0017	0.003
Total Chromium (Cr)	µg/L	0.1 - 5	8.9	8.9	-	50	0.13	-0.404	0.098	0.0931	0.08	-0.383	0.0596	0.0718	0.06
Chromium (+3)	µg/L	0.5 - 5	8.9	8.9	-	-	0	0	0	0	0	0	0	0	0
Chromium (VI)	µg/L	0.5	1	1	-	-	0.34	0.2984	0.2199	0.3084	0.22	0.332	0.2139	0.2838	0.21
Total Cobalt (Co)	µg/L	0.005 - 0.5	-	-	0.9	-	0.0206	0	0.0083	0.0107	0.0147	0.001	0.0094	0.0107	0.0146
Total Copper (Cu)	µg/L	0.05 - 1	2.57	5	5	2000	0.754	0.59	0.669	0.614	0.73	0.61	0.682	0.618	0.647
Total Iron (Fe)	µg/L	1 - 100	300	300	-	-	4.6	16	1.5	1.1	5	17	1	0.9127	1.9
Total Lead (Pb)	µg/L	0.005 - 0.5	3.59	25	5	5	0.0071	0.024	0.0064	0.0125	0.0062	0.027	0.0033	0.0066	0.0058
Total Lithium (Li)	µg/L	0.5 - 5	-	-	-	-	2.12	2.6	1.7	1.93	2.53	2.6	1.75	1.95	2.5
Total Magnesium (Mg)	µg/L	0.05 - 250	-	-	-	-	9130	8520	8250	9230	8820	8180	8310	9400	9130
Total Manganese (Mn)	µg/L	0.05 - 2	-	-	-	120	1.59	1.5	0.223	0.27	0.733	1.4	0.369	0.25	0.695
Mercury (Hg)	µg/L	0.01	0	0	0	1	0	0.0016	0.0003	0.0012	0	0.0022	0.0006	0.0008	0
Total Molybdenum (Mo)	µg/L	0.05 - 1	73	-	40	-	1.23	1.2	1.11	1.2	1.15	1.2	1.18	1.24	1.13
Total Nickel (Ni)	µg/L	0.02 - 1	103	25	-	-	0.642	-0.318	0.509	0.439	0.539	-0.249	0.507	0.463	0.493
Total Potassium (K)	µg/L	0.05 - 1000	-	-	-	-	1860	1720	1570	1630	1810	1650	1590	1670	1820
Total Selenium (Se)	µg/L	0.04 - 2	1	100	-	50	0.146	0.13	0.135	0.135	0.122	0.13	0.156	0.121	0.147
Total Silicon (Si)	µg/L	50	-	-	-	-	713		291	169	659		280	171	665
Total Silver (Ag)	µg/L	0.005 - 0.1	0.25	0.1	-	-	0.0005	0.001	-0.0006	0.0009	-0.0023	0.001	-0.001	0.0001	-0.0025
Total Sodium (Na)	µg/L	0.05 - 250	-	-	-	-	27800	18100	13700	15000	21100	16800	13800	15400	21400
Total Strontium (Sr)	µg/L	0.05 - 1	-	-	-	7000	201	202	182	187	227	205	184	190	227
Total Thallium (Tl)	µg/L	0.002 - 0.05	0.8	-	0.3	-	0.0046	0.006	0.0041	0.0045	0.0048	0.007	0.0044	0.0053	0.0053
Total Thorium (Th)	µg/L	0.005 - 1	-	-	-	-	0.0005	0.002	-0.0001	0.0038	-0.0029	0.002	-0.0001	0.005	-0.0013
Total Tin (Sn)	µg/L	0.2 - 5	-	-	-	-	0.01	0.004	0.0073	0.0257	-0.0058	0.001	0.005	0.0388	-0.0009
Total Titanium (Ti)	µg/L	0.5 - 5	-	-	-	-	0.09	0.632	-0.127	-0.0809	-0.144	0.509	0.2586	-0.0076	-0.117
Total Tungsten (W)	µg/L	0.01 - 1	-	-	30	-	0.088	0.098	0.1	0.103	0.087	0.1	0.093	0.1	0.081
Total Uranium (U)	µg/L	0.002 - 0.1	-	-	5	20	0.422	0.36	0.358	0.355	0.394	0.36	0.361	0.36	0.39
Total Vanadium (V)	µg/L	0.2 - 5	-	-	6	-	0.14	0.23	0.21	0.1552	0.05	0.19	0.22	0.1524	0.06
Total Zinc (Zn)	µg/L	0.1 - 5	7	30	20	-	0.48	0.715	0.49	0.5	0.45	0.854	0.6	0.41	0.36
Dissolved Zinc (Zn)	µg/L	5	7	-	-	-	1.2	0.405	2.767	2.47	0.6	0.146	-0.048	1.733	1.1
Total Zirconium (Zr)	µg/L	0.1 - 1	-	-	4	-	0.02	0.018	0.0177	0.012	0.02	0.004	-0.0048	0.0116	0.01
Radionuclides															
H-3	Bq/kg	9.4 - 14.8	-	7000	-	7000	8.1	0	0	-5.2	5.2	0	0	0	5.2
C-14	Bq/kg	0.04 - 0.1	-	-	-	-	-0.01	0.06	0.08	0.1	-0.05	0.03	0.15	0.04	-0.03
I-131	Bq/kg	0.078 - 170	-	10	-	6	0.441	0.117	0.183	20.3	0.463	-0.0191	0.234	7.37	0.407
K-40	Bq/kg	0.79 - 11	-	-	-	-	1.1	2.83	-3.19	-5.14	1.84	-3.36	1.13	-7.87	1.75
Co-60	Bq/kg	0.066 - 0.95	-	-	-	-	-0.0728	0.217	0.039	-0.0798	-0.177	-0.0228	-0.121	0.0461	-0.0535
Cs-134	Bq/kg	0.094 - 0.99	-	-	-	-	-0.577	0.575	0.033	0.0462	0.093	0.0308	-0.129	0.0803	0.182
Cs-137	Bq/kg	0.11 - 0.9	-	50	-	10	0.213	0.507	0.725	0.0519	0.279	0.0743	0.143	0.107	0.079
Th-Series	Bq/kg	0.3 - 5	-	-	-	-	-1.23	1.31	0.05	0.156	-0.377	-0.215	0.149	-0.412	0.625
U-Series	Bq/kg	0.33 - 3.7	-	-	-	-	0.204	0.0059	0.083	-1.29	0.533	0.0948	0.096	0.12	0.515
Other															
Hydrazine	µg/L	0.1	2.6	-	-	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Morpholine	µg/L	4	-	-	4		0	0	0	0	0	0	0	0	0
Bromoform	µg/L	0.2 - 1	-	-	60	-	0	0	0	0	0	0	0	0	0
Chloroform	µg/L	0.1 - 0.5	1.8	-	-	-	0	0	0	0	0	0	0	0	0
Bromodichloromethane	µg/L	0.1 - 0.5	-	-	200	-	0	0	0	0	0	0	0	0	0

			Water Quality Objectives				SW10-S					SW10-B			
Parameters	Units	Detection Limit	CCME CWQG	PWQO	Interim PWQO	Health Canada	Spring 10-Apr-19	Summer 4-Jul-19	Fall 20-Aug-19	Fall (Dup) 20-Aug-19	Winter 14-Dec-19	Spring 10-Apr-19	Summer 4-Jul-19	Fall 20-Aug-19	Winter 14-Dec-19
Physical/Conventional Characteristics															
Field Temperature	Celsius	-	-	-	-	-	4.53	15.81	22.67	22.67	2.74	4.38	6.69	14.07	2.72
Field pH	pH	-	6.5-9.0	6.5-8.5	-	-	8.29	**8.56**	**8.99**	**8.99**	8.45	8.21	8.4	6.9	8.38
pH	pH	-	-	-	-	-	8.16	8.3	8.42	8.44	8.12	8.17	8.23	8.2	8.24
Field Sp. Conductance	µS/cm	-	-	-	-	-	294	278	334		287	294	275	335	289
Conductivity	umho/cm	1	-	-	-	-	330	300	310	310	330	330	300	310	320
Field Turbidity	NTU	0.1	-	-	-	-	-5.7	-3.4	-5.2		-2.5	-5.7	-3.5	-5	-2.4
Turbidity	NTU	0.1	-	-	-	-	0.05	0.4	0.3	0.1	0.3	0.1	0.01	0.01	0.4
Alkalinity (Total as CaCO3)	mg/L	1	-	-	-	-	97	94	95	94	95	96	93	94	96
Dissolved Oxygen	mg/L	-	-	-	-	-	19.71	11.71	11.09		11.59	20.63	13.47	12.73	11.58
Total Hardness (CaCO3)	mg/L	0.5 - 1	-	-	-	-	117	118	121	123	125	119	119	123	124
Total Suspended Solids	mg/L	1 - 10	-	-	-	-	3	0	1	0.8	1	4	0.8	0.4	2
Total Residual Chlorine*	mg/L	0.0012	0.0005	0.002	-	-	**0.0012**	**0.02**	**0.0012**		**0.0012**	**0.0012**	**0.019**	**0.0012**	**0.0012**
Nutrients															
Dissolved Organic Carbon	mg/L	0.5	-	-	-	-	1.9	2	2	2	2	1.9	2	1.9	2
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1	-	-	-	-	0.18	0.19	0.2	0.2	0.15	0.08	0.36	0.19	0.13
Total Ammonia-N**	mg/L	0.01 - 1	0.044	-	-	-	**0.23**	**0.09**	**0.05**	**0.13**	0	**0.1**	0.02	**0.13**	0.01
Total Un-ionized Ammonia**	mg/L	0.00051 - 0.044	0.019	0.02	-	-	0.0064	0.011	**0.021**	**0.051**	0	0.0023	0.0011	0.00032	0
Nitrate (N)	mg/L	0.1	13	-	-	45	0.37	0.27	0.17	0.18	0.4	0.36	0.28	0.26	0.41
Nitrite (N)	mg/L	0.01	0.06	-	-	1	0.0006678	-0.0013	0.0039	0.0047	0.002	0.00042351	0.0044	0.0045	0.002
Total BOD	mg/L	2	-	-	-	-	2	2	2	2	2	2	2	2	2
Total Chemical Oxygen Demand (CC	mg/L	4	-	-	-	-	1.58	5.1	6.1	8.2	4.4	1.22	5.8	7.2	10
Orthophosphate (P)	mg/L	0.01	-	-	-	-	0.00435	0.00507	0.00425	0.00349	0.007	0.0041	0.00566	0.00533	0.007
Total Phosphorus	mg/L	0.02 - 2.51	-	-	0.02	-	0.01	0.0172	0.0062	0.0012	0.002	0.0014	0.0121	0.0007	0.006
Hydrocarbons															
Benzene	µg/L	0.1 - 0.5	370	-	100	5	0	0	0	0	0	0	0	0	0
Ethylbenzene	µg/L	0.1 - 0.5	90	-	8	140	0	0	0	0	0	0	0	0	0
F1 (C6-C10)	µg/L	25	167	-	-	-	0	0	0	0	0	0	0	0	0
F1 (C6-C10) - BTEX	µg/L	25	-	-	-	-	0	0	0	0	0	0	0	0	0
F2 (C10-C16 Hydrocarbons)	µg/L	100	42	-	-	-	0	0	0	0	0	0	0	0	0
F3 (C16-C34 Hydrocarbons)	µg/L	200	-	-	-	-	54.64128	31.64524	52.33324	76.42308	52	49.24808	32.57304	60.0462	47
F4 (C34-C50 Hydrocarbons)	µg/L	200	-	-	-	-	0	0	0	0	0	0	0	0	0
Reached Baseline at C50	µg/L	-	-	-	-	-	1	1	1	1	1	1	1	1	1
Biological															
Chlorophyll	µg/L	0.1 - 0.2	-	-	-	-	1.96	0.61	0.91	0.95	1.11	2.09	1.46	0.81	1.06
Background	CFU/100mL	10	-	-	-	-	0	170	10	10	10	12	110	90	10
Total Coliforms	CFU/100mL	10	-	-	-	-	0	10	10	10	10	0	10	20	10
Fecal coliform	CFU/100mL	10	-	-	-	-	0	10	10	10	10	0	10	10	10
Escherichia coli	CFU/100mL	10	-	100	-	-	0	10	10	10	10	0	10	10	10
Metals															
Total Aluminum (Al)	µg/L	0.5 - 5	100	-	-	-	2.761	0.69	1.06	0.9	0.76	10.4	1.07	0.64	0.74
Dissolved (0.2u) Aluminum (Al)	µg/L	5	-	-	75	-	2.522	2.95	2.029	2.135	3	3.517	1.182	1.524	2
Total Antimony (Sb)	µg/L	0.02 - 0.5	-	20	-	6	0.122	0.143	0.139	0.142	0.134	0.121	0.14	0.135	0.144
Total Arsenic (As)	µg/L	0.02 - 1	5	100	5	10	0.81	0.736	0.84	0.815	0.769	0.82	0.759	0.795	0.763
Total Barium (Ba)	µg/L	0.02 - 2	-	-	-	1000	22.1	21	22.3	22	23.3	22.4	21.1	21.9	23.7
Total Beryllium (Be)	µg/L	0.01 - 0.5	-	1100	-	-	-0.001	0	0.0008	-0.0001	-0.0003	-0.001	0.0038	0.0002	-0.0003
Total Bismuth (Bi)	µg/L	0.005 - 1	-	-	-	-	0.001	0.0003	-0.0004	-0.0005	0.0006	0	0.0006	-0.0003	0.0006
Total Boron (B)	µg/L	10 - 50	1500	-	200	5000	22.065	20	24	23	24	21.106	19	23	24
Total Cadmium (Cd)	µg/L	0.005 - 0.1	0.17	0.2	0.5	5	0.004	0.002	0.002	0.001	0.0036	0.004	0.0042	0.0037	0.0039
Total Calcium (Ca)	µg/L	0.05 - 250	-	-	-	-	34100	33400	34200	34800	35900	33700	33900	34700	35400
Total Cesium (Cs)	µg/L	0.05 - 0.2	-	-	-	-	-0.001	0.0024	0.0038	0.0026	0.002	-0.001	0.0019	0.0034	0.003
Total Chromium (Cr)	µg/L	0.1 - 5	8.9	8.9	-	50	-0.514	0.0702	0.0969	0.0874	0.04	-0.453	0.0914	0.0696	0.06
Chromium (+3)	µg/L	0.5 - 5	8.9	8.9	-	-	0	0	0	0	0	0	0	0	0
Chromium (VI)	µg/L	0.5	1	1	-	-	0.1774	0.2252	0.2687	0.3105	0.22	0.2056	0.2334	0.247	0.19
Total Cobalt (Co)	µg/L	0.005 - 0.5	-	-	0.9	-	-0.009	0.0084	0.0092	0.0095	0.008	-0.006	0.0085	0.0096	0.0086
Total Copper (Cu)	µg/L	0.05 - 1	2.57	5	5	2000	0.58	0.657	0.619	0.606	0.594	0.61	0.767	0.614	0.622
Total Iron (Fe)	µg/L	1 - 100	300	300	-	-	0.778	1.1	0.2596	0.0607	0.7	12	0.7331	0.2468	0.7
Total Lead (Pb)	µg/L	0.005 - 0.5	3.59	25	5	5	0.008	0.0024	0.0033	0.0034	0.0046	0.019	0.0184	0.0027	0.0036
Total Lithium (Li)	µg/L	0.5 - 5	-	-	-	-	2.1	1.73	2.01	2	2.23	2.1	1.72	1.97	2.3
Total Magnesium (Mg)	µg/L	0.05 - 250	-	-	-	-	7840	8370	8770	8630	8640	8420	8350	8750	8760
Total Manganese (Mn)	µg/L	0.05 - 2	-	-	-	120	0.284	0.36	0.182	0.195	0.378	0.763	0.284	0.445	0.391
Mercury (Hg)	µg/L	0.01	0	0	0	1	0.0022	0.001	-0.0005	-0.001	0	0.0023	0.0002	-0.0007	0
Total Molybdenum (Mo)	µg/L	0.05 - 1	73	-	40	-	1.2	1.15	1.2	1.2	1.14	1.1	1.11	1.16	1.19
Total Nickel (Ni)	µg/L	0.02 - 1	103	25	-	-	-0.349	0.552	0.472	0.46	0.443	-0.307	0.505	0.492	0.463
Total Potassium (K)	µg/L	0.05 - 1000	-	-	-	-	1550	1560	1620	1630	1660	1620	1510	1610	1670
Total Selenium (Se)	µg/L	0.04 - 2	1	100	-	50	0.14	0.145	0.136	0.139	0.147	0.13	0.145	0.148	0.141
Total Silicon (Si)	µg/L	50	-	-	-	-		282	238	238	590		261	333	586
Total Silver (Ag)	µg/L	0.005 - 0.1	0.25	0.1	-	-	0.001	-0.0012	0	-0.0005	-0.0022	0.001	-0.0002	-0.0001	-0.0023
Total Sodium (Na)	µg/L	0.05 - 250	-	-	-	-	15100	13800	14400	14000	16300	15200	13700	14000	16700
Total Strontium (Sr)	µg/L	0.05 - 1	-	-	-	7000	180	178	187	187	210	174	174	188	206
Total Thallium (Tl)	µg/L	0.002 - 0.05	0.8	-	0.3	-	0.006	0.0045	0.0071	0.0067	0.0048	0.005	0.0053	0.0066	0.0045
Total Thorium (Th)	µg/L	0.005 - 1	-	-	-	-	0	-0.0016	0.0022	0.0017	-0.0025	0	-0.0013	0.0033	-0.0025
Total Tin (Sn)	µg/L	0.2 - 5	-	-	-	-	-0.005	0.0064	0.004	0.0019	-0.0029	-0.005	0.023	0.0026	-0.0002
Total Titanium (Ti)	µg/L	0.5 - 5	-	-	-	-	-0.087	-0.0703	-0.037	-0.1637	-0.248	0.369	-0.0419	-0.1294	-0.183
Total Tungsten (W)	µg/L	0.01 - 1	-	-	30	-	0.097	0.098	0.111	0.103	0.09	0.098	0.095	0.102	0.089
Total Uranium (U)	µg/L	0.002 - 0.1	-	-	5	20	0.35	0.354	0.366	0.364	0.372	0.34	0.349	0.358	0.371
Total Vanadium (V)	µg/L	0.2 - 5	-	-	6	-	0.145	0.21	0.1945	0.1704	0.03	0.17	0.1981	0.177	0.03
Total Zinc (Zn)	µg/L	0.1 - 5	7	30	20	-	0.533	0.25	0.14	0.34	0.31	0.786	0.58	0.17	0.33
Dissolved Zinc (Zn)	µg/L	5	7	-	-	-	0.493	-0.1	1.84	3.368	0.4	0.527	-0.135	1.937	0.2
Total Zirconium (Zr)	µg/L	0.1 - 1	-	-	4	-	0.006	0.0133	0.0059	0.0131	0.01	0.002	-0.0022	0.0108	0.01
Radionuclides															
H-3	Bq/kg	9.4 - 14.8	-	7000	-	7000	5.28	0	-5.3	-5.3	0	0	0	-5.1	0
C-14	Bq/kg	0.04 - 0.1	-	-	-	-	0.06	0.23	-0.01	0.08	-0.1	-0.03	0.1	0.05	0
I-131	Bq/kg	0.078 - 170	-	10	-	6	0.344	0.831	29.6	52.1	0.119	1.04	0.37	33.8	0.161
K-40	Bq/kg	0.79 - 11	-	-	-	-	-5.84	-1.88	-2.44	-3.3	-1.29	-2.81	-3.67	-4.29	-1.93
Co-60	Bq/kg	0.066 - 0.95	-	-	-	-	0.0665	0.104	-0.0781	-0.025	0.113	0.109	0.086	0.0875	0.0844
Cs-134	Bq/kg	0.094 - 0.99	-	-	-	-	0.0939	-0.704	0.123	0.0253	0.279	0.134	0.012	0.126	0.0536
Cs-137	Bq/kg	0.11 - 0.9	-	50	-	10	0.214	0.097	0.0972	0.067	0.281	0.272	0.537	0.081	0.0819
Th-Series	Bq/kg	0.3 - 5	-	-	-	-	-0.521	-0.017	-0.181	-0.348	-0.629	0.106	0.45	0.263	0.503
U-Series	Bq/kg	0.33 - 3.7	-	-	-	-	-0.623	0.025	0.487	0.0759	0.941	0.629	0.059	0.557	0.592
Other															
Hydrazine	µg/L	0.1	2.6	-	-	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Morpholine	µg/L	4	-	-	4		0	0	0	0	0	0	0	0	0
Bromoform	µg/L	0.2 - 1	-	-	60	-	0	0	0	0	0	0	0	0	0
Chloroform	µg/L	0.1 - 0.5	1.8	-	-	-	0	0	0	0	0	0	0	0	0
Bromodichloromethane	µg/L	0.1 - 0.5	-	-	200	-	0	0	0	0	0	0	0	0	0

Table D-2: 2019 Surface Water Sample Values (Uncensored)

			Water Quality Objectives				SW11-S						SW11-B				
Parameters	Units	Detection Limit	CCME CWQG	PWQO	Interim PWQO	Health Canada	Spring 10-Apr-19	Spring (Dup) 10-Apr-19	Summer 3-Jul-19	Summer (Dup) 3-Jul-19	Fall 20-Aug-19	Winter 14-Dec-19	Spring 10-Apr-19	Spring (Dup) 17-Apr-19	Summer 3-Jul-19	Fall 20-Aug-19	Winter 14-Dec-19
Physical/Conventional Characteristics																	
Field Temperature	Celsius	-	-	-	-	-	4.67	4.67	13.15	13.15	22.09	3.99	4.66		9.03	21.42	3.2
Field pH	pH	-	6.5-9.0	6.5-8.5	-	-	8.3	8.3	8.43	8.43	**8.68**	8.45	8.28		8.4	**8.64**	8.45
pH	pH	-	-	-	-	-	8.17	8.17	8.31	8.29	8.42	8.22	8.15		8.26	8.38	8.23
Field Sp. Conductance	µS/cm	-	-	-	-	-	293		286		326	282	293		277	304	282
Conductivity	umho/cm	1	-	-	-	-	320	330	310	310	310	320	330		300	310	320
Field Turbidity	NTU	0.1	-	-	-	-	-5.7		-3.5		-4.6	-2.7	-1.7		-3.6	-4.8	-2.7
Turbidity	NTU	0.1	-	-	-	-	0.0438	0.01	0.3	0.2	0.6	0.2	0.1		0.2	0.6	0.2
Alkalinity (Total as CaCO3)	mg/L	1	-	-	-	-	96	97	94	95	94	95	96		93	94	95
Dissolved Oxygen	mg/L	-	-	-	-	-	15.44		13.02		10.84	10.67	17.98		14.41	10.39	10.68
Total Hardness (CaCO3)	mg/L	0.5 - 1	-	-	-	-	117	114	122	123	120	124	114		122	118	125
Total Suspended Solids	mg/L	1 - 10	-	-	-	-	0	3	0.8	0.2	1	1	5		0	2	1
Total Residual Chlorine*	mg/L	0.0012	0.0005	0.002	-	-	**0.0012**		**0.014**		**0.0012**	**0.0012**	**0.0012**		**0.02**	**0.0012**	**0.0012**
Nutrients																	
Dissolved Organic Carbon	mg/L	0.5	-	-	-	-	1.9	1.8	1.9	2.1	2.1	2	1.9		1.9	2	1.9
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1	-	-	-	-	0.22	0.08	0.2	0.21	0.17	0.15	0.1		0.22	0.23	0.13
Total Ammonia-N**	mg/L	0.01 - 1	0.044	-	-	-	**0.15**	**0.13**	0.00649	**0.07**	**0.13**	**0.1**	**0.13**		0.00788	**0.07**	0.01
Total Un-ionized Ammonia**	mg/L	0.00051 - 0.044	0.019	0.02	-	-	0.0043	0.0037	0	0.0048	**0.028**	0.0037	0.0036		0	0.014	0.00047
Nitrate (N)	mg/L	0.1	13	-	-	45	0.37	0.37	0.29	0.31	0.17	0.4	0.38		0.3	0.16	0.4
Nitrite (N)	mg/L	0.01	0.06	-	-	1	0.00069197	0.001	-0.0005116	0.0029	0.0042	0.002	0.00044686		-0.0027	0.0036	0.001
Total BOD	mg/L	2	-	-	-	-	2	2	2	2	2	2	2		2	2	2
Total Chemical Oxygen Demand (CO	mg/L	4	-	-	-	-	-0.23	-3.47	7.2	7.9	8.2	7.6	3.74		6.8	5.8	2.4
Orthophosphate (P)	mg/L	0.01	-	-	-	-	0.00454	0.00453	0.00329	0.00467	0.00328	0.005	0.00419		0.00375	0.00349	0.01
Total Phosphorus	mg/L	0.02 - 2.51	-	-	0.02	-	0.0101	0.0072	-0.0005	0.0005	0.0103	0.005	0.0034		-0.0003	0.0058	0.004
Hydrocarbons																	
Benzene	µg/L	0.1 - 0.5	370	-	100	5	0	0	0	0	0	0	0		0	0	0
Ethylbenzene	µg/L	0.1 - 0.5	90	-	8	140	0	0	0	0	0	0	0		0	0	0
F1 (C6-C10)	µg/L	25	167	-	-	-	0	0	0	0	0	0	0		0	0	0
F1 (C6-C10) - BTEX	µg/L	25	-	-	-	-	0	0	0	0	0	0	0		0	0	0
F2 (C10-C16 Hydrocarbons)	µg/L	100	42	-	-	-	0	0	0	0	0	0	0		0	0	0
F3 (C16-C34 Hydrocarbons)	µg/L	200	-	-	-	-	50.50768	75.52124	70.3122	39.6108	64.29388	93	47.17852		98.58712	80.33428	69
F4 (C34-C50 Hydrocarbons)	µg/L	200	-	-	-	-	0	0	0	0	0	0	0		0	0	0
Reached Baseline at C50	µg/L	-	-	-	-	-	1	1	1	1	1	1	1		1	1	1
Biological																	
Chlorophyll	µg/L	0.1 - 0.2	-	-	-	-	1.79	2.04	0.79	0.69	0.9	1.1	1.97		1.48	0.88	1.14
Background	CFU/100mL	10	-	-	-	-	2	3	20	20	200	50	4		50	200	20
Total Coliforms	CFU/100mL	10	-	-	-	-	0	0	10	10	20	10	0		10	40	10
Fecal coliform	CFU/100mL	10	-	-	-	-	0	0	10	10	10	10	0		10	10	10
Escherichia coli	CFU/100mL	10	-	100	-	-	0	0	10	10	10	10	0		10	10	10
Metals																	
Total Aluminum (Al)	µg/L	0.5 - 5	100	-	-	-	2.341	2.179	1.15	0.88	1.09	0.56	2.406		0.67	1.66	0.89
Dissolved (0.2u) Aluminum (Al)	µg/L	5	-	-	75	-	2.738	2.45	1.801	1.446	3.317	3	2.248		1.544	2.965	2
Total Antimony (Sb)	µg/L	0.02 - 0.5	-	20	-	6	0.128	0.117	0.097	0.09	0.139	0.146	0.114		0.093	0.152	0.141
Total Arsenic (As)	µg/L	0.02 - 1	5	100	5	10	0.83	0.82	0.825	0.81	0.775	0.766	0.81		0.784	0.798	0.804
Total Barium (Ba)	µg/L	0.02 - 2	-	-	-	1000	22.5	21.9	23.6	23.6	22.1	22.5	21.6		22.7	21.7	23.4
Total Beryllium (Be)	µg/L	0.01 - 0.5	-	1100	-	-	-0.001	-0.001	-0.0025	-0.0025	0.0008	0.001	-0.001		-0.003	0.0012	0
Total Bismuth (Bi)	µg/L	0.005 - 1	-	-	-	-	-0.001	0	0.0005	0.0006	-0.0001	0.0004	0		0	-0.0003	0.0006
Total Boron (B)	µg/L	10 - 50	1500	-	200	5000	22.843	20.71	21	21	23	23	20.065		21	23	24
Total Cadmium (Cd)	µg/L	0.005 - 0.1	0.17	0.2	0.5	5	0.003	0.003	0.0026	0.0036	0.0029	0.0017	0.003		0.0023	0.0032	0.0025
Total Calcium (Ca)	µg/L	0.05 - 250	-	-	-	-	33900	32600	34500	34900	33800	35900	32400		34500	33300	35700
Total Cesium (Cs)	µg/L	0.05 - 0.2	-	-	-	-	-0.002	-0.002	0.0019	0.0021	0.0031	0.003	-0.001		0.0024	0.0026	0.003
Total Chromium (Cr)	µg/L	0.1 - 5	8.9	8.9	-	50	0.485	-0.419	0.0696	0.0766	0.11	0.05	-0.457		0.0684	0.069	0.04
Chromium (+3)	µg/L	0.5 - 5	8.9	8.9	-	-	0	0	0	0	0	0	0		0	0	0
Chromium (VI)	µg/L	0.5	1	1	-	-	0.1991	0.2932	0.2342	0.2202	0.2579	0.22	0.1968		0.2096	0.2718	0.25
Total Cobalt (Co)	µg/L	0.005 - 0.5	-	-	0.9	-	-0.001	-0.009	0.0159	0.0157	0.0109	0.0083	-0.011		0.0131	0.0106	0.0091
Total Copper (Cu)	µg/L	0.05 - 1	2.57	5	5	2000	0.58	0.53	0.649	0.654	0.568	0.605	0.58		0.632	0.583	0.617
Total Iron (Fe)	µg/L	1 - 100	300	300	-	-	2.676	-0.114	1.1	0.627	0.5872	0.6	-0.585		0.7705	1.4	0.7
Total Lead (Pb)	µg/L	0.005 - 0.5	3.59	25	5	5	0.005	0.005	0.0041	0.003	0.0058	0.0048	0.007		0.003	0.0087	0.0048
Total Lithium (Li)	µg/L	0.5 - 5	-	-	-	-	2.2	2.1	1.74	1.83	1.82	2.21	1.994		1.72	1.88	2.24
Total Magnesium (Mg)	µg/L	0.05 - 250	-	-	-	-	7800	7810	8640	8690	8620	8450	8130		8690	8430	8590
Total Manganese (Mn)	µg/L	0.05 - 2	-	-	-	120	0.342	0.253	0.872	1.05	0.221	0.406	0.27		0.352	0.279	0.394
Mercury (Hg)	µg/L	0.01	0	0	0	1	0.0011	0.0024	0.0013	0.001	-0.0004	0	0.0018		0.0007	-0.0001	0
Total Molybdenum (Mo)	µg/L	0.05 - 1	73	-	40	-	1.2	1.2	1.22	1.21	1.16	1.17	1.2		1.21	1.15	1.17
Total Nickel (Ni)	µg/L	0.02 - 1	103	25	-	-	0.166	-0.299	0.466	0.464	0.489	0.496	-0.148		0.478	0.502	0.459
Total Potassium (K)	µg/L	0.05 - 1000	-	-	-	-	1510	1540	1660	1680	1630	1610	1610		1650	1590	1670
Total Selenium (Se)	µg/L	0.04 - 2	1	100	-	50	0.13	0.14	0.124	0.132	0.134	0.153	0.15		0.141	0.136	0.138
Total Silicon (Si)	µg/L	50	-	-	-	-			321	329	233	609			305	241	604
Total Silver (Ag)	µg/L	0.005 - 0.1	0.25	0.1	-	-	0.001	0.001	-0.0007	-0.0004	0.0003	-0.0023	0		-0.0005	0.0014	-0.0029
Total Sodium (Na)	µg/L	0.05 - 250	-	-	-	-	14700	14100	15000	15200	14100	15000	15400		14100	13900	15400
Total Strontium (Sr)	µg/L	0.05 - 1	-	-	-	7000	178	174	198	197	181	208	170		196	176	206
Total Thallium (Tl)	µg/L	0.002 - 0.05	0.8	-	0.3	-	0.007	0.005	0.0042	0.0043	0.0065	0.0047	0.005		0.0043	0.0068	0.0047
Total Thorium (Th)	µg/L	0.005 - 1	-	-	-	-	-0.001	-0.001	-0.0004	-0.0007	0.0038	-0.0028	-0.001		-0.0005	0.004	-0.0022
Total Tin (Sn)	µg/L	0.2 - 5	-	-	-	-	-0.006	-0.003	0.0068	0.0127	0.011	0	-0.006		0.0108	0.0412	-0.0006
Total Titanium (Ti)	µg/L	0.5 - 5	-	-	-	-	-0.116	-0.052	0.68	0.4598	-0.0295	-0.228	-0.019		0.6	-0.0043	-0.239
Total Tungsten (W)	µg/L	0.01 - 1	-	-	30	-	0.1	0.095	0.095	0.094	0.109	0.082	0.097		0.097	0.103	0.093
Total Uranium (U)	µg/L	0.002 - 0.1	-	-	5	20	0.34	0.33	0.359	0.369	0.359	0.365	0.34		0.355	0.371	0.377
Total Vanadium (V)	µg/L	0.2 - 5	-	-	6	-	0.206	0.158	-0.6979	-0.6158	0.23	0.02	0.197		-0.6745	0.23	0.05
Total Zinc (Zn)	µg/L	0.1 - 5	7	30	20	-	0.394	0.283	0.3	0.31	0.47	0.41	0.644		0.59	0.92	0.33
Dissolved Zinc (Zn)	µg/L	5	7	-	-	-	0.892	0.687	0.383	0.424	2.68	0.4	0.486		0.365	3.483	0.3
Total Zirconium (Zr)	µg/L	0.1 - 1	-	-	4	-	0.013	0.011	0.0011	0.0089	0.0074	0.01	0.007		0.0022	0.0021	0.02
Radionuclides																	
H-3	Bq/kg	9.4 - 14.8	-	7000	-	7000	0	0	4.2	0	-5.3	4.6	0		0	-5.3	0
C-14	Bq/kg	0.04 - 0.1	-	-	-	-	0.01	0.02	-0.01	-0.09	0.11	-0.03	-0.01		-0.09	0.06	-0.01
I-131	Bq/kg	0.078 - 170	-	10	-	6	0.349	0.102	0.23	1.07	40.3	0.378	0.539		0.666	28.1	0.547
K-40	Bq/kg	0.79 - 11	-	-	-	-	-2.94	-1.89	-1.8	-2.82	-7.08	4.98	-5.16		0.177	-2.27	4.7
Co-60	Bq/kg	0.066 - 0.95	-	-	-	-	-0.0843	0.0657	0.207	0.052	0.091	0.148	0.314		0.103	0.0707	0.0995
Cs-134	Bq/kg	0.094 - 0.99	-	-	-	-	0.148	0.0508	-0.545	0.021	0.049	0.443	0.117		-0.848	0.0337	0.372
Cs-137	Bq/kg	0.11 - 0.9	-	50	-	10	0.0654	0.0939	0.101	0.745	0.203	0.0485	0.124		0.092	0.0473	0.144
Th-Series	Bq/kg	0.3 - 5	-	-	-	-	-1.06	0.169	-0.131	-0.044	0.246	-0.927	-0.224		0.23	0.676	-0.201
U-Series	Bq/kg	0.33 - 3.7	-	-	-	-	0.0255	-0.0363	0.132	-0.039	-0.395	1.34	2		-0.103	0.352	0.357
Other																	
Hydrazine	µg/L	0.1	2.6	-	-	-	0.1		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Morpholine	µg/L	4	-	-	4		0	0	0	0	0	0	0		0	0	0
Bromoform	µg/L	0.2 - 1	-	-	60	-	0	0	0	0	0	0	0		0	0	0
Chloroform	µg/L	0.1 - 0.5	1.8	-	-	-	0	0	0	0	0	0	0		0	0	0
Bromodichloromethane	µg/L	0.1 - 0.5	-	-	200	-	0	0	0	0	0	0	0		0	0	0

			Water Quality Objectives				SW16-S						
Parameters	Units	Detection Limit	CCME CWQG	PWQO	Interim PWQO	Health Canada	Spring Collection #1 10-Apr-19	Spring Collection #1 (Dup) 10-Apr-19	Spring Collection #2 15-Apr-19	Spring Collection #3 22-Apr-19	Summer Collection #1 3-Jul-19	Summer Collection #2 8-Jul-19	Summer Collection #3 15-Jul-19
Physical/Conventional Characteristics													
Field Temperature	Celsius	-	-	-	-	-	5.26	5.27	4.81	6.8	11.46	19.57	12.59
Field pH	pH	-	6.5-9.0	6.5-8.5	-	-	8.39	8.39	**8.51**	8.35	**8.51**	8.33	8.19
pH	pH	-	-	-	-	-	8.11	8.19			8.14		
Field Sp. Conductance	µS/cm	-	-	-	-	-	338		305	354	280	299	312
Conductivity	umho/cm	1	-	-	-	-	370	380			310		
Field Turbidity	NTU	0.1	-	-	-	-	-3.6		-3.7	-4.6	-3.2	-2.7	-1.9
Turbidity	NTU	0.1	-	-	-	-	0.9	1.1			0.4		
Alkalinity (Total as CaCO3)	mg/L	1	-	-	-	-	99	100			92		
Dissolved Oxygen	mg/L	-	-	-	-	-	16.73		20.36	11.2	13.42	9.93	13.5
Total Hardness (CaCO3)	mg/L	0.5 - 1	-	-	-	-	124	128	130	140	121		
Total Suspended Solids	mg/L	1 - 10	-	-	-	-	4	3	2	1	0.8		
Total Residual Chlorine*	mg/L	0.0012	0.0005	0.002	-	-	**0.0012**				**0.019**		
Nutrients													
Dissolved Organic Carbon	mg/L	0.5	-	-	-	-	2	2	2	2.2	1.8	2.1	2
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1	-	-	-	-	0.12	0.2	0.14	0.15	0.16	0.15	0.22
Total Ammonia-N**	mg/L	0.01 - 1	0.044	-	-	-	**0.32**	0.031	-0.03083	-0.0422	0.00659	0.00697	**0.05**
Total Un-ionized Ammonia**	mg/L	0.00051 - 0.044	0.019	0.02	-	-	0.012	**0.12**	0	0	0	0	0.0019
Nitrate (N)	mg/L	0.1	13	-	-	45	0.45	0.45	0.43	0.47	0.28	0.23	0.25
Nitrite (N)	mg/L	0.01	0.06	-	-	1	0.0021	0.0026	-0.0013	0.0011	0.0022	-0.0003546	0.0016
Total BOD	mg/L	2	-	-	-	-	2	2			2	2	2
Total Chemical Oxygen Demand (CO	mg/L	4	-	-	-	-	0.13	5.5			8.9	5.4	3.47
Orthophosphate (P)	mg/L	0.01	-	-	-	-	0.00407	0.00382	0.00474	0.00508	0.00399	0.00247	0.00431
Total Phosphorus	mg/L	0.02 - 2.51	-	-	0.02	-	0.0092	0.0089	0.0112	**0.028**	0.0096	0.0037	0.0132
Hydrocarbons													
Benzene	µg/L	0.1 - 0.5	370	-	100	5	0	0			0		
Ethylbenzene	µg/L	0.1 - 0.5	90	-	8	140	0	0			0		
F1 (C6-C10)	µg/L	25	167	-	-	-	0	0			0		
F1 (C6-C10) - BTEX	µg/L	25	-	-	-	-	0	0			0		
F2 (C10-C16 Hydrocarbons)	µg/L	100	42	-	-	-	0	0			0		
F3 (C16-C34 Hydrocarbons)	µg/L	200	-	-	-	-	58.05764	66.70696			40.64904		
F4 (C34-C50 Hydrocarbons)	µg/L	200	-	-	-	-	0	0			0		
Reached Baseline at C50	µg/L	-	-	-	-	-	1	1			1		
Biological													
Chlorophyll	µg/L	0.1 - 0.2	-	-	-	-	2.87	3.09	2.75	1.71	0.86	0.5	0.47
Background	CFU/100mL	10	-	-	-	-	120	46	7	40	40	10	490
Total Coliforms	CFU/100mL	10	-	-	-	-	5	4	0	2	10	10	30
Fecal coliform	CFU/100mL	10	-	-	-	-	0	1	0	0	10	10	10
Escherichia coli	CFU/100mL	10	-	100	-	-	0	1	0	0	10	10	10
Metals													
Total Aluminum (Al)	µg/L	0.5 - 5	100	-	-	-	23.6	18.4		23	0.97		
Dissolved (0.2u) Aluminum (Al)	µg/L	5	-	-	75	-	3.278	3.317			1.34		
Total Antimony (Sb)	µg/L	0.02 - 0.5	-	20	-	6	0.111	0.127		0.176	0.094		
Total Arsenic (As)	µg/L	0.02 - 1	5	100	5	10	0.77	0.8		0.704	0.78		
Total Barium (Ba)	µg/L	0.02 - 2	-	-	-	1000	22.6	23.8		24	23		
Total Beryllium (Be)	µg/L	0.01 - 0.5	-	1100	-	-	0.001	0		0.007	-0.0028		
Total Bismuth (Bi)	µg/L	0.005 - 1	-	-	-	-	0	0.001		0.014	-0.0001		
Total Boron (B)	µg/L	10 - 50	1500	-	200	5000	21.889	21.227		24	20		
Total Cadmium (Cd)	µg/L	0.005 - 0.1	0.17	0.2	0.5	5	0.004	0.004		0.01	0.0024		
Total Calcium (Ca)	µg/L	0.05 - 250	-	-	-	-	36000	37600		39000	34200		
Total Cesium (Cs)	µg/L	0.05 - 0.2	-	-	-	-	0.002	0.003			0.0022		
Total Chromium (Cr)	µg/L	0.1 - 5	8.9	8.9	-	50	-0.107	0.891		0.924	0.0934		
Chromium (+3)	µg/L	0.5 - 5	8.9	8.9	-	-	0	0			0		
Chromium (VI)	µg/L	0.5	1	1	-	-	0.3235	0.1836			0.2515		
Total Cobalt (Co)	µg/L	0.005 - 0.5	-	-	0.9	-	0.007	0.023		0.037	0.0149		
Total Copper (Cu)	µg/L	0.05 - 1	2.57	5	5	2000	0.64	0.7		0.82	0.61		
Total Iron (Fe)	µg/L	1 - 100	300	300	-	-	22	28		27.429	0.4609		
Total Lead (Pb)	µg/L	0.005 - 0.5	3.59	25	5	5	0.035	0.03		0.058	0.0044		
Total Lithium (Li)	µg/L	0.5 - 5	-	-	-	-	2.9	3		2.464	1.78		
Total Magnesium (Mg)	µg/L	0.05 - 250	-	-	-	-	8230	8310		9200	8640		
Total Manganese (Mn)	µg/L	0.05 - 2	-	-	-	120	1.8	2.1		1.884	0.307		
Mercury (Hg)	µg/L	0.01	0	0	0	1	0.0025	0.0022			0.0014		
Total Molybdenum (Mo)	µg/L	0.05 - 1	73	-	40	-	1.1	1.2		1.2	1.22		
Total Nickel (Ni)	µg/L	0.02 - 1	103	25	-	-	-0.122	0.624		0.654	0.452		
Total Potassium (K)	µg/L	0.05 - 1000	-	-	-	-	1750	1810	1800	1700	1630		
Total Selenium (Se)	µg/L	0.04 - 2	1	100	-	50	0.14	0.17		0.13	0.127		
Total Silicon (Si)	µg/L	50	-	-	-	-				690	272		
Total Silver (Ag)	µg/L	0.005 - 0.1	0.25	0.1	-	-	0.001	0		0.004	0		
Total Sodium (Na)	µg/L	0.05 - 250	-	-	-	-	18800	19400		18000	13900		
Total Strontium (Sr)	µg/L	0.05 - 1	-	-	-	7000	211	226		180	198		
Total Thallium (Tl)	µg/L	0.002 - 0.05	0.8	-	0.3	-	0.006	0.006		0.01	0.0038		
Total Thorium (Th)	µg/L	0.005 - 1	-	-	-	-	0	0.001			0.0009		
Total Tin (Sn)	µg/L	0.2 - 5	-	-	-	-	0.004	-0.013		-0.035	0.0084		
Total Titanium (Ti)	µg/L	0.5 - 5	-	-	-	-	0.595	0.745		3.932	0.56		
Total Tungsten (W)	µg/L	0.01 - 1	-	-	30	-	0.093	0.094		0.095	0.099		
Total Uranium (U)	µg/L	0.002 - 0.1	-	-	5	20	0.35	0.37		0.4	0.366		
Total Vanadium (V)	µg/L	0.2 - 5	-	-	6	-	0.206	0.224		0.496	-0.6577		
Total Zinc (Zn)	µg/L	0.1 - 5	7	30	20	-	1.457	0.654		-0.1	0.28		
Dissolved Zinc (Zn)	µg/L	5	7	-	-	-	0.556	1.066			0.48		
Total Zirconium (Zr)	µg/L	0.1 - 1	-	-	4	-	0.017	0.022		0.042	-0.0015		
Radionuclides													
H-3	Bq/kg	9.4 - 14.8	-	7000	-	7000	-5.2	0			4.5		
C-14	Bq/kg	0.04 - 0.1	-	-	-	-	0	0			0.03		
I-131	Bq/kg	0.078 - 170	-	10	-	6	-0.0914	-0.48			1.1		
K-40	Bq/kg	0.79 - 11	-	-	-	-	0.824	-1.34			-2.97		
Co-60	Bq/kg	0.066 - 0.95	-	-	-	-	0.185	0.17			-0.128		
Cs-134	Bq/kg	0.094 - 0.99	-	-	-	-	0.0659	0.417			0.178		
Cs-137	Bq/kg	0.11 - 0.9	-	50	-	10	0.0284	0.177			0.149		
Th-Series	Bq/kg	0.3 - 5	-	-	-	-	0.411	0.55			-0.233		
U-Series	Bq/kg	0.33 - 3.7	-	-	-	-	0.429	0.98			0.587		
Other													
Hydrazine	µg/L	0.1	2.6	-	-	-							
Morpholine	µg/L	4	-	-	4		0	0			0		
Bromoform	µg/L	0.2 - 1	-	-	60	-	0	0			0		
Chloroform	µg/L	0.1 - 0.5	1.8	-	-	-	0	0			0		
Bromodichloromethane	µg/L	0.1 - 0.5	-	-	200	-	0	0			0		

			Water Quality Objectives				SW16-S						
							Fall Collection #1	Fall Collection #2	Fall Collection #3	Winter Collection #1	Winter Collection #1 (Dup)	Winter Collection #2	Winter Collection #3
Parameters	**Units**	**Detection Limit**	**CCME CWQG**	**PWQO**	**Interim PWQO**	**Health Canada**	26-Aug-19	3-Sep-19	9-Sep-19	29-Nov-19	29-Nov-19	3-Dec-19	14-Dec-19
Physical/Conventional Characteristics													
Field Temperature	Celsius	-	-	-	-	-	19.28	15.74	16.91	3.91	3.91	1.78	2.25
Field pH	pH	-	6.5-9.0	6.5-8.5	-	-	8.48	8.32	**9.07**	**8.67**	**8.67**	6.8	**8.6**
pH	pH	-	-	-	-	-	8.4						8.24
Field Sp. Conductance	µS/cm	-	-	-	-	-	309	302	307	287		287	321
Conductivity	umho/cm	1	-	-	-	-	310						360
Field Turbidity	NTU	0.1	-	-	-	-	-3.6	-5	-4.8	4.3		7.7	5.1
Turbidity	NTU	0.1	-	-	-	-	1						2.4
Alkalinity (Total as CaCO3)	mg/L	1	-	-	-	-	93						99
Dissolved Oxygen	mg/L	-	-	-	-	-	14.05	10.58	10.14	12.14		12.48	8.6
Total Hardness (CaCO3)	mg/L	0.5 - 1	-	-	-	-	126						132
Total Suspended Solids	mg/L	1 - 10	-	-	-	-	3						7
Total Residual Chlorine*	mg/L	0.0012	0.0005	0.002	-	-	**0.0012**						**0.0012**
Nutrients													
Dissolved Organic Carbon	mg/L	0.5	-	-	-	-	2	1.9	2	1.9	1.9	1.8	2.1
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1	-	-	-	-	0.3	0.22	0.26	0.16	0.18	0.19	0.15
Total Ammonia-N**	mg/L	0.01 - 1	0.044	-	-	-	**0.06**	0.01	0	0.01	0.02	0.02	0.02
Total Un-ionized Ammonia**	mg/L	0.00051 - 0.044	0.019	0.02	-	-	0.0073	0.00079	0	0.00092	0.001	0.00001	0.00071
Nitrate (N)	mg/L	0.1	13	-	-	45	0.19	0.23	0.14	0.41	0.41	0.42	0.48
Nitrite (N)	mg/L	0.01	0.06	-	-	1	0.0048	0.0034	0.001	0.002	0.004	-0.0026	0.004
Total BOD	mg/L	2	-	-	-	-	2	2	2	2	2	2	2
Total Chemical Oxygen Demand (CC	mg/L	4	-	-	-	-	4.9	7.7	3.4	-0.38	-2.1	-2.1	8.5
Orthophosphate (P)	mg/L	0.01	-	-	-	-	0.00567	0.00544	0.004	0.006	0.006	0.007	0.005
Total Phosphorus	mg/L	0.02 - 2.51	-	-	0.02	-	0.0043	-0.0011	0.004	0.006	0.001	0.014	0.007
Hydrocarbons													
Benzene	µg/L	0.1 - 0.5	370	-	100	5	0						0
Ethylbenzene	µg/L	0.1 - 0.5	90	-	8	140	0						0
F1 (C6-C10)	µg/L	25	167	-	-	-	0						0
F1 (C6-C10) - BTEX	µg/L	25	-	-	-	-	0						0
F2 (C10-C16 Hydrocarbons)	µg/L	100	42	-	-	-	0						0
F3 (C16-C34 Hydrocarbons)	µg/L	200	-	-	-	-	33.49796						57
F4 (C34-C50 Hydrocarbons)	µg/L	200	-	-	-	-	0						0
Reached Baseline at C50	µg/L	-	-	-	-	-	1						1
Biological													
Chlorophyll	µg/L	0.1 - 0.2	-	-	-	-	2.01	1.85	2.51	1.02	1.12	1.08	1.51
Background	CFU/100mL	10	-	-	-	-	710	210	420	180	180	120	380
Total Coliforms	CFU/100mL	10	-	-	-	-	50	10	170	30	30	10	10
Fecal coliform	CFU/100mL	10	-	-	-	-	10	10	10	30	10	10	10
Escherichia coli	CFU/100mL	10	-	100	-	-	10	10	10	10	10	10	10
Metals													
Total Aluminum (Al)	µg/L	0.5 - 5	100	-	-	-	1.55						1.78
Dissolved (0.2u) Aluminum (Al)	µg/L	5	-	-	75	-	2.73						3
Total Antimony (Sb)	µg/L	0.02 - 0.5	-	20	-	6	0.124						0.138
Total Arsenic (As)	µg/L	0.02 - 1	5	100	5	10	0.817						0.728
Total Barium (Ba)	µg/L	0.02 - 2	-	-	-	1000	21.9						24.9
Total Beryllium (Be)	µg/L	0.01 - 0.5	-	1100	-	-	0						-0.0003
Total Bismuth (Bi)	µg/L	0.005 - 1	-	-	-	-	-0.0007						0.0004
Total Boron (B)	µg/L	10 - 50	1500	-	200	5000	25						24
Total Cadmium (Cd)	µg/L	0.005 - 0.1	0.17	0.2	0.5	5	0						0.0017
Total Calcium (Ca)	µg/L	0.05 - 250	-	-	-	-	35200						38100
Total Cesium (Cs)	µg/L	0.05 - 0.2	-	-	-	-	0.0023						0.004
Total Chromium (Cr)	µg/L	0.1 - 5	8.9	8.9	-	50	0.0959						0.04
Chromium (+3)	µg/L	0.5 - 5	8.9	8.9	-	-	0						0
Chromium (VI)	µg/L	0.5	1	1	-	-	0.2965						0.22
Total Cobalt (Co)	µg/L	0.005 - 0.5	-	-	0.9	-	0.0095						0.0122
Total Copper (Cu)	µg/L	0.05 - 1	2.57	5	5	2000	0.591						0.609
Total Iron (Fe)	µg/L	1 - 100	300	300	-	-	0.8102						1.2
Total Lead (Pb)	µg/L	0.005 - 0.5	3.59	25	5	5	0.0047						0.006
Total Lithium (Li)	µg/L	0.5 - 5	-	-	-	-	1.94						2.53
Total Magnesium (Mg)	µg/L	0.05 - 250	-	-	-	-	9280						8980
Total Manganese (Mn)	µg/L	0.05 - 2	-	-	-	120	0.291						0.74
Mercury (Hg)	µg/L	0.01	0	0	0	1	0.0023						0
Total Molybdenum (Mo)	µg/L	0.05 - 1	73	-	40	-	1.18						1.19
Total Nickel (Ni)	µg/L	0.02 - 1	103	25	-	-	0.473						0.482
Total Potassium (K)	µg/L	0.05 - 1000	-	-	-	-	1640						1900
Total Selenium (Se)	µg/L	0.04 - 2	1	100	-	50	0.128						0.143
Total Silicon (Si)	µg/L	50	-	-	-	-	170						672
Total Silver (Ag)	µg/L	0.005 - 0.1	0.25	0.1	-	-	0.0015						-0.0027
Total Sodium (Na)	µg/L	0.05 - 250	-	-	-	-	15300						21400
Total Strontium (Sr)	µg/L	0.05 - 1	-	-	-	7000	185						224
Total Thallium (Tl)	µg/L	0.002 - 0.05	0.8	-	0.3	-	0.0059						0.0055
Total Thorium (Th)	µg/L	0.005 - 1	-	-	-	-	0.0062						-0.0022
Total Tin (Sn)	µg/L	0.2 - 5	-	-	-	-	0.0033						0
Total Titanium (Ti)	µg/L	0.5 - 5	-	-	-	-	0.0874						-0.225
Total Tungsten (W)	µg/L	0.01 - 1	-	-	30	-	0.102						0.085
Total Uranium (U)	µg/L	0.002 - 0.1	-	-	5	20	0.356						0.385
Total Vanadium (V)	µg/L	0.2 - 5	-	-	6	-	0.21						0.06
Total Zinc (Zn)	µg/L	0.1 - 5	7	30	20	-	0.23						0.61
Dissolved Zinc (Zn)	µg/L	5	7	-	-	-	2.123						0.8
Total Zirconium (Zr)	µg/L	0.1 - 1	-	-	4	-	0.0145						0.01
Radionuclides													
H-3	Bq/kg	9.4 - 14.8	-	7000	-	7000	-5.2						0.3
C-14	Bq/kg	0.04 - 0.1	-	-	-	-	0.09						0.04
I-131	Bq/kg	0.078 - 170	-	10	-	6	26.8						0.56
K-40	Bq/kg	0.79 - 11	-	-	-	-	-6.24						2.27
Co-60	Bq/kg	0.066 - 0.95	-	-	-	-	-0.0416						-0.145
Cs-134	Bq/kg	0.094 - 0.99	-	-	-	-	0.0512						-0.612
Cs-137	Bq/kg	0.11 - 0.9	-	50	-	10	0.0736						-0.129
Th-Series	Bq/kg	0.3 - 5	-	-	-	-	-0.642						-0.278
U-Series	Bq/kg	0.33 - 3.7	-	-	-	-	-0.0961						-0.0115
Other													
Hydrazine	µg/L	0.1	2.6	-	-	-							0
Morpholine	µg/L	4	-	-	4		0						0
Bromoform	µg/L	0.2 - 1	-	-	60	-	0						0
Chloroform	µg/L	0.1 - 0.5	1.8	-	-	-	0						0
Bromodichloromethane	µg/L	0.1 - 0.5	-	-	200	-	0						0

Table D-2: 2019 Surface Water Sample Values (Uncensored)

			Water Quality Objectives				SW16-B							
Parameters	Units	Detection Limit	CCME CWQG	PWQO	Interim PWQO	Health Canada	Spring Collection #1	Spring Collection #2	Spring Collection #2 (Dup)	Spring Collection #3	Summer Collection #1	Summer Collection #2	Summer Collection #2 (Dup)	Summer Collection #3
							10-Apr-19	15-Apr-19	15-Apr-19	22-Apr-19	3-Jul-19	8-Jul-19	8-Jul-19	15-Jul-19
Physical/Conventional Characteristics														
Field Temperature	Celsius	-	-	-	-	-	5.85	4.71	4.71	6.73	10.66	19.11	19.11	6.74
Field pH	pH	-	6.5-9.0	6.5-8.5	-	-	8.03	**8.55**	**8.55**	8.36	**8470**	8.21	8.21	8.23
pH	pH	-	-	-	-	-	8.25				8.29			
Field Sp. Conductance	µS/cm	-	-	-	-	-	490	304		359	322	299		295
Conductivity	umho/cm	1	-	-	-	-	550				330			
Field Turbidity	NTU	0.1	-	-	-	-	7.5	-3.4		-4.5	-3	-1.6		-2.4
Turbidity	NTU	0.1	-	-	-	-	9.2				0.3			
Alkalinity (Total as CaCO3)	mg/L	1	-	-	-	-	130				93			
Dissolved Oxygen	mg/L	-	-	-	-	-	16.23	20.34		11.01	13.53	10.15		14.83
Total Hardness (CaCO3)	mg/L	0.5 - 1	-	-	-	-	190	130	130	140	124			
Total Suspended Solids	mg/L	1 - 10	-	-	-	-	15	4	3	1	0.4			
Total Residual Chlorine*	mg/L	0.0012	0.0005	0.002	-	-	**0.0012**				**0.017**			
Nutrients														
Dissolved Organic Carbon	mg/L	0.5	-	-	-	-	2.7	2.1	1.9	2.2	1.9	2.1	2.1	2
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1	-	-	-	-	0.38	0.12	0.13	0.19	0.15	0.12	0.19	0.14
Total Ammonia-N**	mg/L	0.01 - 1	0.044	-	-	-	**0.19**	-0.02282	-0.0149	0.00364	0.01	0.02	0.02	0.02
Total Un-ionized Ammonia**	mg/L	0.00051 - 0.044	0.019	0.02	-	-	0.0032	0	0	0	0.00068	0.0015	0.0012	0.00068
Nitrate (N)	mg/L	0.1	13	-	-	45	0.85	0.42	0.42	0.47	0.31	0.24	0.24	0.3
Nitrite (N)	mg/L	0.01	0.06	-	-	1	0.0045	-0.0009209	-0.001	0.00049534	0.0015	0.00002891	-0.0001732	-0.0031
Total BOD	mg/L	2	-	-	-	-	2				2	2	2	2
Total Chemical Oxygen Demand (CC	mg/L	4	-	-	-	-	5.9				5.1	2.57	-0.23	2.09
Orthophosphate (P)	mg/L	0.01	-	-	-	-	0.00233	0.00275	0.00255	0.00447	0.00339	0.00289	0.00235	0.00447
Total Phosphorus	mg/L	0.02 - 2.51	-	-	0.02	-	0.0158	0.0101	0.0107	0.009	0.0027	**0.022**	0.0101	0.005
Hydrocarbons														
Benzene	µg/L	0.1 - 0.5	370	-	100	5	0				0			
Ethylbenzene	µg/L	0.1 - 0.5	90	-	8	140	0				0			
F1 (C6-C10)	µg/L	25	167	-	-	-	0				0			
F1 (C6-C10) - BTEX	µg/L	25	-	-	-	-	0				0			
F2 (C10-C16 Hydrocarbons)	µg/L	100	42	-	-	-	0				0			
F3 (C16-C34 Hydrocarbons)	µg/L	200	-	-	-	-	40.03512				109.6891			
F4 (C34-C50 Hydrocarbons)	µg/L	200	-	-	-	-	0				0			
Reached Baseline at C50	µg/L	-	-	-	-	-	1				1			
Biological														
Chlorophyll	µg/L	0.1 - 0.2	-	-	-	-	3.45	2.32	2.46	1.64	0.73	0.59	0.58	1.04
Background	CFU/100mL	10	-	-	-	-	350	14	9	66	60	60	40	70
Total Coliforms	CFU/100mL	10	-	-	-	-	110	1	3	30	30	30	40	10
Fecal coliform	CFU/100mL	10	-	-	-	-	9	0	0	0	10	10	10	10
Escherichia coli	CFU/100mL	10	-	100	-	-	7	0	0	0	10	10	10	10
Metals														
Total Aluminum (Al)	µg/L	0.5 - 5	100	-	-	-	**109**			24	0.85			
Dissolved (0.2u) Aluminum (Al)	µg/L	5	-	-	75	-	4.072				1.326			
Total Antimony (Sb)	µg/L	0.02 - 0.5	-	20	-	6	0.112			0.132	0.091			
Total Arsenic (As)	µg/L	0.02 - 1	5	100	5	10	0.71			0.841	0.772			
Total Barium (Ba)	µg/L	0.02 - 2	-	-	-	1000	29.9			24	23.2			
Total Beryllium (Be)	µg/L	0.01 - 0.5	-	1100	-	-	0.005			0.005	-0.0019			
Total Bismuth (Bi)	µg/L	0.005 - 1	-	-	-	-	0.001			0.027	-0.0001			
Total Boron (B)	µg/L	10 - 50	1500	-	200	5000	23.099			24	21			
Total Cadmium (Cd)	µg/L	0.005 - 0.1	0.17	0.2	0.5	5	0.007			0.014	0.0023			
Total Calcium (Ca)	µg/L	0.05 - 250	-	-	-	-	60900			40000	35300			
Total Cesium (Cs)	µg/L	0.05 - 0.2	-	-	-	-	0.043				0.0036			
Total Chromium (Cr)	µg/L	0.1 - 5	8.9	8.9	-	50	-0.256			0.977	0.0897			
Chromium (+3)	µg/L	0.5 - 5	8.9	8.9	-	-	0				0			
Chromium (VI)	µg/L	0.5	1	1	-	-	0.2056				0.2215			
Total Cobalt (Co)	µg/L	0.005 - 0.5	-	-	0.9	-	0.075			0.025	0.0144			
Total Copper (Cu)	µg/L	0.05 - 1	2.57	5	5	2000	0.77			0.79	0.628			
Total Iron (Fe)	µg/L	1 - 100	300	300	-	-	144			20.655	1			
Total Lead (Pb)	µg/L	0.005 - 0.5	3.59	25	5	5	0.148			0.063	0.0027			
Total Lithium (Li)	µg/L	0.5 - 5	-	-	-	-	5.4			2.809	2.5			
Total Magnesium (Mg)	µg/L	0.05 - 250	-	-	-	-	9170			9000	8800			
Total Manganese (Mn)	µg/L	0.05 - 2	-	-	-	120	10.5			1.812	0.624			
Mercury (Hg)	µg/L	0.01	0	0	0	1	0.0018				0.0003			
Total Molybdenum (Mo)	µg/L	0.05 - 1	73	-	40	-	1.1			1.1	1.22			
Total Nickel (Ni)	µg/L	0.02 - 1	103	25	-	-	-0.116			0.574	0.455			
Total Potassium (K)	µg/L	0.05 - 1000	-	-	-	-	2950	1700	1700	1800	1780			
Total Selenium (Se)	µg/L	0.04 - 2	1	100	-	50	0.17			0.147	0.132			
Total Silicon (Si)	µg/L	50	-	-	-	-				670	267			
Total Silver (Ag)	µg/L	0.005 - 0.1	0.25	0.1	-	-	0.001			0.005	-0.0004			
Total Sodium (Na)	µg/L	0.05 - 250	-	-	-	-	32800			19000	15700			
Total Strontium (Sr)	µg/L	0.05 - 1	-	-	-	7000	373			190	241			
Total Thallium (Tl)	µg/L	0.002 - 0.05	0.8	-	0.3	-	0.009			0.014	0.0048			
Total Thorium (Th)	µg/L	0.005 - 1	-	-	-	-	0.009				0.0003			
Total Tin (Sn)	µg/L	0.2 - 5	-	-	-	-	0.059			-0.026	0.005			
Total Titanium (Ti)	µg/L	0.5 - 5	-	-	-	-	4.79			4.316	0.56			
Total Tungsten (W)	µg/L	0.01 - 1	-	-	30	-	0.09			0.105	0.099			
Total Uranium (U)	µg/L	0.002 - 0.1	-	-	5	20	0.54			0.42	0.37			
Total Vanadium (V)	µg/L	0.2 - 5	-	-	6	-	0.427			0.58	-0.712			
Total Zinc (Zn)	µg/L	0.1 - 5	7	30	20	-	1.711			-0.073	0.18			
Dissolved Zinc (Zn)	µg/L	5	7	-	-	-	0.517				0.429			
Total Zirconium (Zr)	µg/L	0.1 - 1	-	-	4	-	0.063			0.032	0.0113			
Radionuclides														
H-3	Bq/kg	9.4 - 14.8	-	7000	-	7000	5.2				0			
C-14	Bq/kg	0.04 - 0.1	-	-	-	-	-0.05				0.09			
I-131	Bq/kg	0.078 - 170	-	10	-	6	0.142				0.368			
K-40	Bq/kg	0.79 - 11	-	-	-	-	-1.89				-2.24			
Co-60	Bq/kg	0.066 - 0.95	-	-	-	-	0.133				-0.13			
Cs-134	Bq/kg	0.094 - 0.99	-	-	-	-	0.0558				0.07			
Cs-137	Bq/kg	0.11 - 0.9	-	50	-	10	0.0542				0.083			
Th-Series	Bq/kg	0.3 - 5	-	-	-	-	-0.994				0.281			
U-Series	Bq/kg	0.33 - 3.7	-	-	-	-	0.0926				0.061			
Other														
Hydrazine	µg/L	0.1	2.6	-	-	-								
Morpholine	µg/L	4	-	-	4		1				0			
Bromoform	µg/L	0.2 - 1	-	-	60	-	0				0			
Chloroform	µg/L	0.1 - 0.5	1.8	-	-	-	0				0			
Bromodichloromethane	µg/L	0.1 - 0.5	-	-	200	-	0				0			

Parameters	Units	Detection Limit	Water Quality Objectives CCME CWQG	PWQO	Interim PWQO	Health Canada	SW16-B Fall Collection #1	Fall Collection #2	Fall Collection #2 (Dup)	Fall Collection #3	Winter Collection #1	Winter Collection #2	Winter Collection #3
							26-Aug-19	3-Sep-19	3-Sep-19	9-Sep-19	29-Nov-19	3-Dec-19	14-Dec-19
Physical/Conventional Characteristics													
Field Temperature	Celsius	-	-	-	-	-	19.26	15.46	15.46	16.68	3.91	2.06	2.24
Field pH	pH	-	6.5-9.0	6.5-8.5	-	-	**8.66**	8.27	8.27	**9.05**	**9**	6.8	**8.62**
pH	pH	-	-	-	-	-	8.4						8.25
Field Sp. Conductance	µS/cm	-	-	-	-	-	310	300		308	322	412	321
Conductivity	umho/cm	1	-	-	-	-	310						360
Field Turbidity	NTU	0.1	-	-	-	-	-3.5	-4.8		-4.8	5.1	14.5	11.7
Turbidity	NTU	0.1	-	-	-	-	1.1						2.7
Alkalinity (Total as CaCO3)	mg/L	1	-	-	-	-	93						100
Dissolved Oxygen	mg/L	-	-	-	-	-	14.43	10.67		10.22	12.06	12.43	8.06
Total Hardness (CaCO3)	mg/L	0.5 - 1	-	-	-	-	125						132
Total Suspended Solids	mg/L	1 - 10	-	-	-	-	11						6
Total Residual Chlorine*	mg/L	0.0012	0.0005	0.002	-	-	**0.0012**						**0.0012**
Nutrients													
Dissolved Organic Carbon	mg/L	0.5	-	-	-	-	2.1	2	1.9	2	1.9	1.7	2.1
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1	-	-	-	-	0.25	0.21	0.15	0.24	0.16	0.2	0.12
Total Ammonia-N**	mg/L	0.01 - 1	0.044	-	-	-	0.03	**0.06**	0.04	**0.06**	0.03	0.02	0.03
Total Un-ionized Ammonia**	mg/L	0.00051 - 0.044	0.019	0.02	-	-	0.005	0.0037	0.0027	**0.02**	0.004	0.00002	0.0012
Nitrate (N)	mg/L	0.1	13	-	-	45	0.19	0.22	0.24	0.15	0.46	0.41	0.47
Nitrite (N)	mg/L	0.01	0.06	-	-	1	0.0065	0.0013	0.0061	0.001	0.003	-0.002	0.004
Total BOD	mg/L	2	-	-	-	-	2	2	2	2	2	2	2
Total Chemical Oxygen Demand (CO	mg/L	4	-	-	-	-	4.2	7.1	6.4	7.9	-3.5	-1.8	9.5
Orthophosphate (P)	mg/L	0.01	-	-	-	-	0.00518	0.00513	0.00526	0.004	0.007	0.006	0.005
Total Phosphorus	mg/L	0.02 - 2.51	-	-	0.02	-	0.0046	-0.0041	-0.0006	0.001	0.011	0.011	0.006
Hydrocarbons													
Benzene	µg/L	0.1 - 0.5	370	-	100	5	0						0
Ethylbenzene	µg/L	0.1 - 0.5	90	-	8	140	0						0
F1 (C6-C10)	µg/L	25	167	-	-	-	0						0
F1 (C6-C10) - BTEX	µg/L	25	-	-	-	-	0						0
F2 (C10-C16 Hydrocarbons)	µg/L	100	42	-	-	-	0						0
F3 (C16-C34 Hydrocarbons)	µg/L	200	-	-	-	-	42.32556						84
F4 (C34-C50 Hydrocarbons)	µg/L	200	-	-	-	-	0						0
Reached Baseline at C50	µg/L	-	-	-	-	-	1						1
Biological													
Chlorophyll	µg/L	0.1 - 0.2	-	-	-	-	2.74	1.84	2	2.8	0.92	1.16	1.28
Background	CFU/100mL	10	-	-	-	-	840	290	360	840	220	80	500
Total Coliforms	CFU/100mL	10	-	-	-	-	10	10	20	220	30	50	20
Fecal coliform	CFU/100mL	10	-	-	-	-	10	10	10	10	20	10	10
Escherichia coli	CFU/100mL	10	-	100	-	-	10	10	10	10	10	10	10
Metals													
Total Aluminum (Al)	µg/L	0.5 - 5	100	-	-	-	1.5						3.2
Dissolved (0.2u) Aluminum (Al)	µg/L	5	-	-	75	-	2.786						6
Total Antimony (Sb)	µg/L	0.02 - 0.5	-	20	-	6	0.13						0.135
Total Arsenic (As)	µg/L	0.02 - 1	5	100	5	10	0.799						0.705
Total Barium (Ba)	µg/L	0.02 - 2	-	-	-	1000	21.6						25.7
Total Beryllium (Be)	µg/L	0.01 - 0.5	-	1100	-	-	0.0005						0
Total Bismuth (Bi)	µg/L	0.005 - 1	-	-	-	-	-0.0002						0.0001
Total Boron (B)	µg/L	10 - 50	1500	-	200	5000	25						24
Total Cadmium (Cd)	µg/L	0.005 - 0.1	0.17	0.2	0.5	5	0.0018						0.0037
Total Calcium (Ca)	µg/L	0.05 - 250	-	-	-	-	34100						38300
Total Cesium (Cs)	µg/L	0.05 - 0.2	-	-	-	-	0.0031						0.003
Total Chromium (Cr)	µg/L	0.1 - 5	8.9	8.9	-	50	0.0759						0.06
Chromium (+3)	µg/L	0.5 - 5	8.9	8.9	-	-	0						0
Chromium (VI)	µg/L	0.5	1	1	-	-	0.2632						0.23
Total Cobalt (Co)	µg/L	0.005 - 0.5	-	-	0.9	-	0.0111						0.0112
Total Copper (Cu)	µg/L	0.05 - 1	2.57	5	5	2000	0.581						0.619
Total Iron (Fe)	µg/L	1 - 100	300	300	-	-	0.5002						1.3
Total Lead (Pb)	µg/L	0.005 - 0.5	3.59	25	5	5	0.004						0.0055
Total Lithium (Li)	µg/L	0.5 - 5	-	-	-	-	1.92						2.55
Total Magnesium (Mg)	µg/L	0.05 - 250	-	-	-	-	9570						8710
Total Manganese (Mn)	µg/L	0.05 - 2	-	-	-	120	0.392						0.676
Mercury (Hg)	µg/L	0.01	0	0	0	1	0.001						0
Total Molybdenum (Mo)	µg/L	0.05 - 1	73	-	40	-	1.13						1.21
Total Nickel (Ni)	µg/L	0.02 - 1	103	25	-	-	0.46						0.5
Total Potassium (K)	µg/L	0.05 - 1000	-	-	-	-	1700						1830
Total Selenium (Se)	µg/L	0.04 - 2	1	100	-	50	0.122						0.148
Total Silicon (Si)	µg/L	50	-	-	-	-	164						670
Total Silver (Ag)	µg/L	0.005 - 0.1	0.25	0.1	-	-	0.0002						-0.0023
Total Sodium (Na)	µg/L	0.05 - 250	-	-	-	-	15600						21100
Total Strontium (Sr)	µg/L	0.05 - 1	-	-	-	7000	185						226
Total Thallium (Tl)	µg/L	0.002 - 0.05	0.8	-	0.3	-	0.0058						0.0057
Total Thorium (Th)	µg/L	0.005 - 1	-	-	-	-	0.0047						-0.0034
Total Tin (Sn)	µg/L	0.2 - 5	-	-	-	-	0.016						-0.0034
Total Titanium (Ti)	µg/L	0.5 - 5	-	-	-	-	0.0444						-0.0915
Total Tungsten (W)	µg/L	0.01 - 1	-	-	30	-	0.1						0.09
Total Uranium (U)	µg/L	0.002 - 0.1	-	-	5	20	0.358						0.394
Total Vanadium (V)	µg/L	0.2 - 5	-	-	6	-	0.25						0.04
Total Zinc (Zn)	µg/L	0.1 - 5	7	30	20	-	0.31						0.45
Dissolved Zinc (Zn)	µg/L	5	7	-	-	-	1.844						0.7
Total Zirconium (Zr)	µg/L	0.1 - 1	-	-	4	-	0.0121						0.01
Radionuclides													
H-3	Bq/kg	9.4 - 14.8	-	7000	-	7000	-5.2						2.4
C-14	Bq/kg	0.04 - 0.1	-	-	-	-	0.12						-0.02
I-131	Bq/kg	0.078 - 170	-	10	-	6	41.4						0.0646
K-40	Bq/kg	0.79 - 11	-	-	-	-	-0.167						-0.217
Co-60	Bq/kg	0.066 - 0.95	-	-	-	-	0.0222						0.0405
Cs-134	Bq/kg	0.094 - 0.99	-	-	-	-	0.0159						0.0959
Cs-137	Bq/kg	0.11 - 0.9	-	50	-	10	0.0347						0.213
Th-Series	Bq/kg	0.3 - 5	-	-	-	-	-0.374						0.202
U-Series	Bq/kg	0.33 - 3.7	-	-	-	-	0.151						0.385
Other													
Hydrazine	µg/L	0.1	2.6	-	-	-							0
Morpholine	µg/L	4	-	-	4		0						0
Bromoform	µg/L	0.2 - 1	-	-	60	-	0						0
Chloroform	µg/L	0.1 - 0.5	1.8	-	-	-	0						0
Bromodichloromethane	µg/L	0.1 - 0.5	-	-	200	-	0						0

			Water Quality Objectives				SW17-B					
			CCME		Interim	Health	Spring Collection #1	Spring Collection #2	Spring Collection #3	Summer Collection #1	Summer Collection #2	Summer Collection #3
Parameters	Units	Detection Limit	CWQG	PWQO	PWQO	Canada	10-Apr-19	15-Apr-19	22-Apr-19	3-Jul-19	8-Jul-19	15-Jul-19
Physical/Conventional Characteristics												
Field Temperature	Celsius	-	-	-	-	-	5	4.81	6.12	8.8	18.22	6.15
Field pH	pH	-	6.5-9.0	6.5-8.5	-	-	8.2	**8.52**	8.44	8.41	8.04	7.71
pH	pH	-	-	-	-	-	8.19			8.26		
Field Sp. Conductance	µS/cm	-	-	-	-	-	335	313	365	297	300	296
Conductivity	umho/cm	1	-	-	-	-	380			320		
Field Turbidity	NTU	0.1	-	-	-	-	-2.8	1.1	-4.3	-3.3	-1.5	-2.6
Turbidity	NTU	0.1	-	-	-	-	1.2			0.3		
Alkalinity (Total as CaCO3)	mg/L	1	-	-	-	-	100			93		
Dissolved Oxygen	mg/L	-	-	-	-	-	18.03	17.35	12.06	13.69	10.77	14.43
Total Hardness (CaCO3)	mg/L	0.5 - 1	-	-	-	-	127	130	160	124		
Total Suspended Solids	mg/L	1 - 10	-	-	-	-	5	12	0	0		
Total Residual Chlorine*	mg/L	0.0012	0.0005	0.002	-	-	**0.0012**			**0.016**		
Nutrients												
Dissolved Organic Carbon	mg/L	0.5	-	-	-	-	2	2.1	2.4	1.8	2.1	2
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1	-	-	-	-	0.3	0.16	0.2	0.17	0.13	0.15
Total Ammonia-N**	mg/L	0.01 - 1	0.044	-	-	-	**0.12**	-0.02243	**0.40207**	0.01	0.02	0.02
Total Un-ionized Ammonia**	mg/L	0.00051 - 0.044	0.019	0.02	-	-	0.0029	0	0	0.00055	0.00075	0.00013
Nitrate (N)	mg/L	0.1	13	-	-	45	0.45	0.5	0.61	0.28	0.24	0.3
Nitrite (N)	mg/L	0.01	0.06	-	-	1	0.0034	0.00025453	0.0011	-0.0028	-0.0006186	-0.0000067
Total BOD	mg/L	2	-	-	-	-	2			2	2	2
Total Chemical Oxygen Demand (CO	mg/L	4	-	-	-	-	0.13			5.1	2.22	-4.46
Orthophosphate (P)	mg/L	0.01	-	-	-	-	0.00366	0.00245	0.00423	0.00336	0.00249	0.00534
Total Phosphorus	mg/L	0.02 - 2.51	-	-	0.02	-	0.0124	0.0159	0.0078	0.0047	0.0114	0.0096
Hydrocarbons												
Benzene	µg/L	0.1 - 0.5	370	-	100	5	0			0		
Ethylbenzene	µg/L	0.1 - 0.5	90	-	8	140	0			0		
F1 (C6-C10)	µg/L	25	167	-	-	-	0			0		
F1 (C6-C10) - BTEX	µg/L	25	-	-	-	-	0			0		
F2 (C10-C16 Hydrocarbons)	µg/L	100	42	-	-	-	0			0		
F3 (C16-C34 Hydrocarbons)	µg/L	200	-	-	-	-	74.27592			91.79932		
F4 (C34-C50 Hydrocarbons)	µg/L	200	-	-	-	-	0			0		
Reached Baseline at C50	µg/L	-	-	-	-	-	1			1		
Biological												
Chlorophyll	µg/L	0.1 - 0.2	-	-	-	-	3.05	2.64	2.01	0.96	0.47	0.8
Background	CFU/100mL	10	-	-	-	-	46	190	86	80	60	10
Total Coliforms	CFU/100mL	10	-	-	-	-	2	70	45	20	60	10
Fecal coliform	CFU/100mL	10	-	-	-	-	0	16	3	10	20	10
Escherichia coli	CFU/100mL	10	-	100	-	-	0	6	1	10	10	10
Metals												
Total Aluminum (Al)	µg/L	0.5 - 5	100	-	-	-	21.8		36	1.19		
Dissolved (0.2u) Aluminum (Al)	µg/L	5	-	-	75	-	3.474			1.329		
Total Antimony (Sb)	µg/L	0.02 - 0.5	-	20	-	6	0.13		0.121	0.096		
Total Arsenic (As)	µg/L	0.02 - 1	5	100	5	10	0.77		0.648	0.789		
Total Barium (Ba)	µg/L	0.02 - 2	-	-	-	1000	23.4		26	23.3		
Total Beryllium (Be)	µg/L	0.01 - 0.5	-	1100	-	-	0.001		0.006	-0.0034		
Total Bismuth (Bi)	µg/L	0.005 - 1	-	-	-	-	0		0.004	0		
Total Boron (B)	µg/L	10 - 50	1500	-	200	5000	21.728		24	21		
Total Cadmium (Cd)	µg/L	0.005 - 0.1	0.17	0.2	0.5	5	0.004		0.016	0.0023		
Total Calcium (Ca)	µg/L	0.05 - 250	-	-	-	-	37400		45000	35300		
Total Cesium (Cs)	µg/L	0.05 - 0.2	-	-	-	-	0.006			0.0023		
Total Chromium (Cr)	µg/L	0.1 - 5	8.9	8.9	-	50	-0.43		1.346	0.0857		
Chromium (+3)	µg/L	0.5 - 5	8.9	8.9	-	-	0			0		
Chromium (VI)	µg/L	0.5	1	1	-	-	0.2177			0.1666		
Total Cobalt (Co)	µg/L	0.005 - 0.5	-	-	0.9	-	0.008		0.05	0.0144		
Total Copper (Cu)	µg/L	0.05 - 1	2.57	5	5	2000	0.57		1	0.642		
Total Iron (Fe)	µg/L	1 - 100	300	300	-	-	23		43.878	1.3		
Total Lead (Pb)	µg/L	0.005 - 0.5	3.59	25	5	5	0.039		0.056	0.0041		
Total Lithium (Li)	µg/L	0.5 - 5	-	-	-	-	3.1		4.248	2.36		
Total Magnesium (Mg)	µg/L	0.05 - 250	-	-	-	-	8230		9800	8710		
Total Manganese (Mn)	µg/L	0.05 - 2	-	-	-	120	2		3.5	0.614		
Mercury (Hg)	µg/L	0.01	0	0	0	1	0.0024			0.0006		
Total Molybdenum (Mo)	µg/L	0.05 - 1	73	-	40	-	1.2		1.1	1.23		
Total Nickel (Ni)	µg/L	0.02 - 1	103	25	-	-	-0.278		0.703	0.49		
Total Potassium (K)	µg/L	0.05 - 1000	-	-	-	-	1780	1900	2400	1720		
Total Selenium (Se)	µg/L	0.04 - 2	1	100	-	50	0.13		0.189	0.129		
Total Silicon (Si)	µg/L	50	-	-	-	-			820	281		
Total Silver (Ag)	µg/L	0.005 - 0.1	0.25	0.1	-	-	0.001		0.003	-0.0004		
Total Sodium (Na)	µg/L	0.05 - 250	-	-	-	-	19000		24000	15500		
Total Strontium (Sr)	µg/L	0.05 - 1	-	-	-	7000	229		260	228		
Total Thallium (Tl)	µg/L	0.002 - 0.05	0.8	-	0.3	-	0.007		0.01	0.0047		
Total Thorium (Th)	µg/L	0.005 - 1	-	-	-	-	0.002			0.0003		
Total Tin (Sn)	µg/L	0.2 - 5	-	-	-	-	-0.005		-0.011	0.1165		
Total Titanium (Ti)	µg/L	0.5 - 5	-	-	-	-	1.904		4.236	0.59		
Total Tungsten (W)	µg/L	0.01 - 1	-	-	30	-	0.099		0.092	0.095		
Total Uranium (U)	µg/L	0.002 - 0.1	-	-	5	20	0.36		0.45	0.362		
Total Vanadium (V)	µg/L	0.2 - 5	-	-	6	-	0.214		0.64	-0.7057		
Total Zinc (Zn)	µg/L	0.1 - 5	7	30	20	-	0.898		0.531	0.41		
Dissolved Zinc (Zn)	µg/L	5	7	-	-	-	0.412			-0.149		
Total Zirconium (Zr)	µg/L	0.1 - 1	-	-	4	-	0.019		0.026	0.0081		
Radionuclides												
H-3	Bq/kg	9.4 - 14.8	-	7000	-	7000	0			0		
C-14	Bq/kg	0.04 - 0.1	-	-	-	-	-0.01			-0.07		
I-131	Bq/kg	0.078 - 170	-	10	-	6	-0.00222			0.321		
K-40	Bq/kg	0.79 - 11	-	-	-	-	-1.31			-3.35		
Co-60	Bq/kg	0.066 - 0.95	-	-	-	-	0.0364			-0.016		
Cs-134	Bq/kg	0.094 - 0.99	-	-	-	-	-0.566			0.052		
Cs-137	Bq/kg	0.11 - 0.9	-	50	-	10	-0.0416			0.081		
Th-Series	Bq/kg	0.3 - 5	-	-	-	-	-0.071			-0.005		
U-Series	Bq/kg	0.33 - 3.7	-	-	-	-	-0.0258			0.118		
Other												
Hydrazine	µg/L	0.1	2.6	-	-	-						
Morpholine	µg/L	4	-	-	4		0			0		
Bromoform	µg/L	0.2 - 1	-	-	60	-	0			0		
Chloroform	µg/L	0.1 - 0.5	1.8	-	-	-	0			0		
Bromodichloromethane	µg/L	0.1 - 0.5	-	-	200	-	0			0		

			Water Quality Objectives				SW17-B						
							Fall Collection #1	Fall Collection #2	Fall Collection #3	Fall Collection #3 (Dup)	Winter Collection #1	Winter Collection #2	Winter Collection #3
Parameters	**Units**	**Detection Limit**	**CCME CWQG**	**PWQO**	**Interim PWQO**	**Health Canada**	26-Aug-19	3-Sep-19	9-Sep-19	9-Sep-19	29-Nov-19	3-Dec-19	12-Dec-19
Physical/Conventional Characteristics													
Field Temperature	Celsius	-	-	-	-	-	18.88	12.92	16.63	16.63	4.06	2.06	1.43
Field pH	pH	-	6.5-9.0	6.5-8.5	-	-	**8.55**	8.19	**8.75**	**8.75**	**9.21**	6.8	8.05
pH	pH	-	-	-	-	-	8.39						8.24
Field Sp. Conductance	µS/cm	-	-	-	-	-	313	311	307		295	282	342
Conductivity	umho/cm	1	-	-	-	-	310						400
Field Turbidity	NTU	0.1	-	-	-	-	-4.3	-4.4	-4.7		4.5	7	13.2
Turbidity	NTU	0.1	-	-	-	-	0.7						9.7
Alkalinity (Total as CaCO3)	mg/L	1	-	-	-	-	94						100
Dissolved Oxygen	mg/L	-	-	-	-	-	11.26	11.25	16.23		12.06	12.29	
Total Hardness (CaCO3)	mg/L	0.5 - 1	-	-	-	-	125						133
Total Suspended Solids	mg/L	1 - 10	-	-	-	-	2						13
Total Residual Chlorine*	mg/L	0.0012	0.0005	0.002	-	-	**0.0012**						
Nutrients													
Dissolved Organic Carbon	mg/L	0.5	-	-	-	-	2.1	1.9	2	1.9	1.9	1.7	2.1
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1	-	-	-	-	0.23	0.19	0.23	0.24	0.18	0.16	0.12
Total Ammonia-N**	mg/L	0.01 - 1	0.044	-	-	-	0.02	0.03	0	0	0.01	0.02	0.02
Total Un-ionized Ammonia**	mg/L	0.00051 - 0.044	0.019	0.02	-	-	0.0025	0.0012	0	0	0.0027	0.00001	0.0002
Nitrate (N)	mg/L	0.1	13	-	-	45	0.2	0.25	0.16	0.16	0.41	0.4	0.49
Nitrite (N)	mg/L	0.01	0.06	-	-	1	0.0067	0.002	0.001	0.001	-0.000894	-0.0019	0.003
Total BOD	mg/L	2	-	-	-	-	2	2	2	2	2	2	2
Total Chemical Oxygen Demand (CO	mg/L	4	-	-	-	-	4.5	5.7	4.8	5.8	1.1	1.7	-0.023
Orthophosphate (P)	mg/L	0.01	-	-	-	-	0.00533	0.00698	0.004	0.005	0.005	0.007	0.006
Total Phosphorus	mg/L	0.02 - 2.51	-	-	0.02	-	0.0022	-0.0013	-0.0021	0.001	0.006	0.005	0.015
Hydrocarbons													
Benzene	µg/L	0.1 - 0.5	370	-	100	5	0						0.14
Ethylbenzene	µg/L	0.1 - 0.5	90	-	8	140	0						0
F1 (C6-C10)	µg/L	25	167	-	-	-	0						0
F1 (C6-C10) - BTEX	µg/L	25	-	-	-	-	0						0
F2 (C10-C16 Hydrocarbons)	µg/L	100	42	-	-	-	0						0
F3 (C16-C34 Hydrocarbons)	µg/L	200	-	-	-	-	44.512						56
F4 (C34-C50 Hydrocarbons)	µg/L	200	-	-	-	-	0						0
Reached Baseline at C50	µg/L	-	-	-	-	-	1						1
Biological													
Chlorophyll	µg/L	0.1 - 0.2	-	-	-	-	1.75	1.86	2.68	2.64	0.64	0.62	2.27
Background	CFU/100mL	10	-	-	-	-	640	840	480	380	250	60	1100
Total Coliforms	CFU/100mL	10	-	-	-	-	10	10	160	80	30	10	220
Fecal coliform	CFU/100mL	10	-	-	-	-	10	10	10	10	10	10	10
Escherichia coli	CFU/100mL	10	-	100	-	-	10	10	10	10	10	10	10
Metals													
Total Aluminum (Al)	µg/L	0.5 - 5	100	-	-	-	1.12						8.06
Dissolved (0.2u) Aluminum (Al)	µg/L	5	-	-	75	-	2.44						3
Total Antimony (Sb)	µg/L	0.02 - 0.5	-	20	-	6	0.132						0.135
Total Arsenic (As)	µg/L	0.02 - 1	5	100	5	10	0.801						0.673
Total Barium (Ba)	µg/L	0.02 - 2	-	-	-	1000	21.7						24.7
Total Beryllium (Be)	µg/L	0.01 - 0.5	-	1100	-	-	-0.0004						0.002
Total Bismuth (Bi)	µg/L	0.005 - 1	-	-	-	-	-0.0002						0.0004
Total Boron (B)	µg/L	10 - 50	1500	-	200	5000	25						23
Total Cadmium (Cd)	µg/L	0.005 - 0.1	0.17	0.2	0.5	5	0.001						0.003
Total Calcium (Ca)	µg/L	0.05 - 250	-	-	-	-	34600						38900
Total Cesium (Cs)	µg/L	0.05 - 0.2	-	-	-	-	0.0016						0.002
Total Chromium (Cr)	µg/L	0.1 - 5	8.9	8.9	-	50	0.086						0.08
Chromium (+3)	µg/L	0.5 - 5	8.9	8.9	-	-	0						0
Chromium (VI)	µg/L	0.5	1	1	-	-	0.3001						0.27
Total Cobalt (Co)	µg/L	0.005 - 0.5	-	-	0.9	-	0.011						0.0185
Total Copper (Cu)	µg/L	0.05 - 1	2.57	5	5	2000	0.573						0.645
Total Iron (Fe)	µg/L	1 - 100	300	300	-	-	0.5368						6.7
Total Lead (Pb)	µg/L	0.005 - 0.5	3.59	25	5	5	0.0044						0.0141
Total Lithium (Li)	µg/L	0.5 - 5	-	-	-	-	1.93						2.35
Total Magnesium (Mg)	µg/L	0.05 - 250	-	-	-	-	9470						8660
Total Manganese (Mn)	µg/L	0.05 - 2	-	-	-	120	0.272						1.11
Mercury (Hg)	µg/L	0.01	0	0	0	1	0.001						0
Total Molybdenum (Mo)	µg/L	0.05 - 1	73	-	40	-	1.13						1.12
Total Nickel (Ni)	µg/L	0.02 - 1	103	25	-	-	0.477						0.539
Total Potassium (K)	µg/L	0.05 - 1000	-	-	-	-	1650						1840
Total Selenium (Se)	µg/L	0.04 - 2	1	100	-	50	0.132						0.149
Total Silicon (Si)	µg/L	50	-	-	-	-	173						679
Total Silver (Ag)	µg/L	0.005 - 0.1	0.25	0.1	-	-	-0.001						-0.0008
Total Sodium (Na)	µg/L	0.05 - 250	-	-	-	-	15300						23800
Total Strontium (Sr)	µg/L	0.05 - 1	-	-	-	7000	186						212
Total Thallium (Tl)	µg/L	0.002 - 0.05	0.8	-	0.3	-	0.0047						0.0051
Total Thorium (Th)	µg/L	0.005 - 1	-	-	-	-	0.0021						0
Total Tin (Sn)	µg/L	0.2 - 5	-	-	-	-	0.005						0.01
Total Titanium (Ti)	µg/L	0.5 - 5	-	-	-	-	0.0689						0.23
Total Tungsten (W)	µg/L	0.01 - 1	-	-	30	-	0.104						0.087
Total Uranium (U)	µg/L	0.002 - 0.1	-	-	5	20	0.357						0.396
Total Vanadium (V)	µg/L	0.2 - 5	-	-	6	-	0.23						0.15
Total Zinc (Zn)	µg/L	0.1 - 5	7	30	20	-	0.24						0.42
Dissolved Zinc (Zn)	µg/L	5	7	-	-	-	2.08						0.4
Total Zirconium (Zr)	µg/L	0.1 - 1	-	-	4	-	0.0059						0.01
Radionuclides													
H-3	Bq/kg	9.4 - 14.8	-	7000	-	7000	-5.3						0
C-14	Bq/kg	0.04 - 0.1	-	-	-	-	-0.01						-0.02
I-131	Bq/kg	0.078 - 170	-	10	-	6	13.7						0.0998
K-40	Bq/kg	0.79 - 11	-	-	-	-	-2.98						-3.44
Co-60	Bq/kg	0.066 - 0.95	-	-	-	-	-0.078						-0.23
Cs-134	Bq/kg	0.094 - 0.99	-	-	-	-	0.0761						0.179
Cs-137	Bq/kg	0.11 - 0.9	-	50	-	10	0.104						0.26
Th-Series	Bq/kg	0.3 - 5	-	-	-	-	0.349						-1.22
U-Series	Bq/kg	0.33 - 3.7	-	-	-	-	-1.47						1.75
Other													
Hydrazine	µg/L	0.1	2.6	-	-	-							
Morpholine	µg/L	4	-	-	4		0						0
Bromoform	µg/L	0.2 - 1	-	-	60	-	0						0
Chloroform	µg/L	0.1 - 0.5	1.8	-	-	-	0						0
Bromodichloromethane	µg/L	0.1 - 0.5	-	-	200	-	0						0

			Water Quality Objectives				SW17-S							
							Spring Collection #1	Spring Collection #2	Spring Collection #3	Spring Collection #3 (Dup)	Summer Collection #1	Summer Collection #2	Summer Collection #3	Summer Collection #3 (Dup)
Parameters	**Units**	**Detection Limit**	**CCME CWQG**	**PWQO**	**Interim PWQO**	**Health Canada**	10-Apr-19	15-Apr-19	22-Apr-19	22-Apr-19	3-Jul-19	8-Jul-19	15-Jul-19	15-Jul-19
Physical/Conventional Characteristics														
Field Temperature	Celsius	-	-	-	-	-	4.94	4.81	6.36	6.36	11.8	19.28	10.54	10.54
Field pH	pH	-	6.5-9.0	6.5-8.5	-	-	8.33	**8.53**	8.38	8.38	8.46	8.19	7.9	7.9
pH	pH	-	-	-	-	-	8.2				8.28			
Field Sp. Conductance	µS/cm	-	-	-	-	-	327	317	328		280	299	331	
Conductivity	umho/cm	1	-	-	-	-	370				310			
Field Turbidity	NTU	0.1	-	-	-	-	-3.1	-0.7	-4.9		-3.2	-2.7	-2.1	
Turbidity	NTU	0.1	-	-	-	-	1.5				0.3			
Alkalinity (Total as CaCO3)	mg/L	1	-	-	-	-	100				93			
Dissolved Oxygen	mg/L	-	-	-	-	-	18.54	19.78	11.54		13.03	10.13	14.55	
Total Hardness (CaCO3)	mg/L	0.5 - 1	-	-	-	-	124	130	140	140	122			
Total Suspended Solids	mg/L	1 - 10	-	-	-	-	6	6	3	0	0.8			
Total Residual Chlorine*	mg/L	0.0012	0.0005	0.002	-	-	**0.0012**				**0.016**			
Nutrients														
Dissolved Organic Carbon	mg/L	0.5	-	-	-	-	1.9	2.1	2.1	2.1	1.9	2.1	2	2
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1	-	-	-	-	0.23	0.16	0.17	0.17	0.17	0.13	0.14	0.19
Total Ammonia-N**	mg/L	0.01 - 1	0.044	-	-	-	**0.1**	-0.02596	0.03229	0.03933	0.00942	0.02	0.02	0.02
Total Un-ionized Ammonia**	mg/L	0.00051 - 0.044	0.019	0.02	-	-	0.0032	0	0	0	0	0.0015	0.00046	0.00029
Nitrate (N)	mg/L	0.1	13	-	-	45	0.43	0.49	0.4	0.4	0.28	0.23	0.26	0.27
Nitrite (N)	mg/L	0.01	0.06	-	-	1	0.003	0.00050611	-0.0001799	0.0002787	-0.0045	-0.0028	-0.0017	0.0001953
Total BOD	mg/L	2	-	-	-	-	2				2	2	2	2
Total Chemical Oxygen Demand (CO	mg/L	4	-	-	-	-	-1.31				8.2	-0.93	5.5	2.44
Orthophosphate (P)	mg/L	0.01	-	-	-	-	0.00372	0.00529	0.00347	0.00469	0.0035	0.00238	0.00477	0.00584
Total Phosphorus	mg/L	0.02 - 2.51	-	-	0.02	-	**0.021**	0.0128	-0.0019	0.0028	-0.0008	0.0144	0.0049	0.0086
Hydrocarbons														
Benzene	µg/L	0.1 - 0.5	370	-	100	5	0				0			
Ethylbenzene	µg/L	0.1 - 0.5	90	-	8	140	0				0			
F1 (C6-C10)	µg/L	25	167	-	-	-	0				0			
F1 (C6-C10) - BTEX	µg/L	25	-	-	-	-	0				0			
F2 (C10-C16 Hydrocarbons)	µg/L	100	42	-	-	-	0				0			
F3 (C16-C34 Hydrocarbons)	µg/L	200	-	-	-	-	64.82776				65.62596			
F4 (C34-C50 Hydrocarbons)	µg/L	200	-	-	-	-	0				0			
Reached Baseline at C50	µg/L	-	-	-	-	-	1				1			
Biological														
Chlorophyll	µg/L	0.1 - 0.2	-	-	-	-	2.81	2.73	1.66	1.33	0.91	0.46	0.38	0.29
Background	CFU/100mL	10	-	-	-	-	42	230	14	14	20	10	40	20
Total Coliforms	CFU/100mL	10	-	-	-	-	8	120	1	1	20	10	10	10
Fecal coliform	CFU/100mL	10	-	-	-	-	0	8	0	0	10	10	10	10
Escherichia coli	CFU/100mL	10	-	100	-	-	0	7	0	0	10	10	10	10
Metals														
Total Aluminum (Al)	µg/L	0.5 - 5	100	-	-	-	19.7		16	17	0.85			
Dissolved (0.2u) Aluminum (Al)	µg/L	5	-	-	75	-	3.375				2.072			
Total Antimony (Sb)	µg/L	0.02 - 0.5	-	20	-	6	0.119		0.151	0.16	0.091			
Total Arsenic (As)	µg/L	0.02 - 1	5	100	5	10	0.75		0.788	0.807	0.788			
Total Barium (Ba)	µg/L	0.02 - 2	-	-	-	1000	23.2		24	25	23.3			
Total Beryllium (Be)	µg/L	0.01 - 0.5	-	1100	-	-	-0.001		0.007	0.003	-0.0032			
Total Bismuth (Bi)	µg/L	0.005 - 1	-	-	-	-	0		0.011	0.005	-0.0001			
Total Boron (B)	µg/L	10 - 50	1500	-	200	5000	22.251		25	26	21			
Total Cadmium (Cd)	µg/L	0.005 - 0.1	0.17	0.2	0.5	5	0.005		0.012	0.011	0.0021			
Total Calcium (Ca)	µg/L	0.05 - 250	-	-	-	-	35900		39000	38000	34300			
Total Cesium (Cs)	µg/L	0.05 - 0.2	-	-	-	-	0.005				0.003			
Total Chromium (Cr)	µg/L	0.1 - 5	8.9	8.9	-	50	0.833		0.939	1.206	0.0762			
Chromium (+3)	µg/L	0.5 - 5	8.9	8.9	-	-	0				0			
Chromium (VI)	µg/L	0.5	1	1	-	-	0.2029				0.2283			
Total Cobalt (Co)	µg/L	0.005 - 0.5	-	-	0.9	-	0.019		0.029	0.027	0.0141			
Total Copper (Cu)	µg/L	0.05 - 1	2.57	5	5	2000	0.65		0.852	0.943	0.635			
Total Iron (Fe)	µg/L	1 - 100	300	300	-	-	28		42.509	13.335	0.4983			
Total Lead (Pb)	µg/L	0.005 - 0.5	3.59	25	5	5	0.044		0.056	0.042	0.0016			
Total Lithium (Li)	µg/L	0.5 - 5	-	-	-	-	2.8		2.105	2.368	1.97			
Total Magnesium (Mg)	µg/L	0.05 - 250	-	-	-	-	8360		9400	9500	8750			
Total Manganese (Mn)	µg/L	0.05 - 2	-	-	-	120	2		1.388	1.093	0.385			
Mercury (Hg)	µg/L	0.01	0	0	0	1	0.0031				0.0015			
Total Molybdenum (Mo)	µg/L	0.05 - 1	73	-	40	-	1.1		1.1	1.2	1.22			
Total Nickel (Ni)	µg/L	0.02 - 1	103	25	-	-	0.253		0.649	0.594	0.486			
Total Potassium (K)	µg/L	0.05 - 1000	-	-	-	-	1780	1900	1600	1700	1690			
Total Selenium (Se)	µg/L	0.04 - 2	1	100	-	50	0.15		0.162	0.164	0.137			
Total Silicon (Si)	µg/L	50	-	-	-	-			590	580	271			
Total Silver (Ag)	µg/L	0.005 - 0.1	0.25	0.1	-	-	0.001		0.006	0.002	0			
Total Sodium (Na)	µg/L	0.05 - 250	-	-	-	-	18300		17000	17000	14500			
Total Strontium (Sr)	µg/L	0.05 - 1	-	-	-	7000	207		170	170	210			
Total Thallium (Tl)	µg/L	0.002 - 0.05	0.8	-	0.3	-	0.005		0.006	0.009	0.0043			
Total Thorium (Th)	µg/L	0.005 - 1	-	-	-	-	0.002				-0.0003			
Total Tin (Sn)	µg/L	0.2 - 5	-	-	-	-	0.014		-0.035	-0.031	0.0086			
Total Titanium (Ti)	µg/L	0.5 - 5	-	-	-	-	0.756		3.556	3.99	0.55			
Total Tungsten (W)	µg/L	0.01 - 1	-	-	30	-	0.099		0.096	0.101	0.093			
Total Uranium (U)	µg/L	0.002 - 0.1	-	-	5	20	0.36		0.39	0.41	0.365			
Total Vanadium (V)	µg/L	0.2 - 5	-	-	6	-	0.228		0.58	0.6	-0.7033			
Total Zinc (Zn)	µg/L	0.1 - 5	7	30	20	-	1.368		0.57	0.135	0.27			
Dissolved Zinc (Zn)	µg/L	5	7	-	-	-	0.953				0.443			
Total Zirconium (Zr)	µg/L	0.1 - 1	-	-	4	-	0.019		0.022	0.018	-0.0041			
Radionuclides														
H-3	Bq/kg	9.4 - 14.8	-	7000	-	7000	0				0			
C-14	Bq/kg	0.04 - 0.1	-	-	-	-	-0.06				0.02			
I-131	Bq/kg	0.078 - 170	-	10	-	6	0.154				0.303			
K-40	Bq/kg	0.79 - 11	-	-	-	-	-1.2				-3.89			
Co-60	Bq/kg	0.066 - 0.95	-	-	-	-	0.0814				-0.15			
Cs-134	Bq/kg	0.094 - 0.99	-	-	-	-	0.216				0.062			
Cs-137	Bq/kg	0.11 - 0.9	-	50	-	10	0.061				0.009			
Th-Series	Bq/kg	0.3 - 5	-	-	-	-	0.0755				-0.743			
U-Series	Bq/kg	0.33 - 3.7	-	-	-	-	0.376				-0.562			
Other														
Hydrazine	µg/L	0.1	2.6	-	-	-								
Morpholine	µg/L	4	-	-	4		0				0			
Bromoform	µg/L	0.2 - 1	-	-	60	-	0				0			
Chloroform	µg/L	0.1 - 0.5	1.8	-	-	-	0				0			
Bromodichloromethane	µg/L	0.1 - 0.5	-	-	200	-	0				0			

			Water Quality Objectives				SW17-S						
							Fall Collection #1	Fall Collection #2	Fall Collection #3	Winter Collection #1	Winter Collection #2	Winter Collection #2 (Dup)	Winter Collection #3
Parameters	**Units**	**Detection Limit**	**CCME CWQG**	**PWQO**	**Interim PWQO**	**Health Canada**	26-Aug-19	3-Sep-19	9-Sep-19	29-Nov-19	3-Dec-19	3-Dec-19	12-Dec-19
Physical/Conventional Characteristics													
Field Temperature	Celsius	-	-	-	-	-	19.02	16.19	17.09	4.08	1.89	1.89	1.45
Field pH	pH	-	6.5-9.0	6.5-8.5	-	-	8.43	**8.56**	**8.8**	**8.9**	6.8	6.8	7.88
pH	pH	-	-	-	-	-	8.39						8.23
Field Sp. Conductance	µS/cm	-	-	-	-	-	308	301	304	282	283		342
Conductivity	umho/cm	1	-	-	-	-	310						400
Field Turbidity	NTU	0.1	-	-	-	-	-4.6	-5	-4.8	1.5	6.5		11.5
Turbidity	NTU	0.1	-	-	-	-	0.6						8.2
Alkalinity (Total as CaCO3)	mg/L	1	-	-	-	-	94						110
Dissolved Oxygen	mg/L	-	-	-	-	-	11.28	10.63	10.1	12.09	12.39		
Total Hardness (CaCO3)	mg/L	0.5 - 1	-	-	-	-	123						131
Total Suspended Solids	mg/L	1 - 10	-	-	-	-	2						7
Total Residual Chlorine*	mg/L	0.0012	0.0005	0.002	-	-	**0.0012**						
Nutrients													
Dissolved Organic Carbon	mg/L	0.5	-	-	-	-	2	2	2.1	1.9	1.7	1.7	2
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1	-	-	-	-	0.2	0.21	0.26	0.16	0.16	0.16	0.08
Total Ammonia-N**	mg/L	0.01 - 1	0.044	-	-	-	0.03	0.03	-0.0015	0.02	**0.08**	0.02	0.02
Total Un-ionized Ammonia**	mg/L	0.00051 - 0.044	0.019	0.02	-	-	0.0032	0.003	0	0.002	0.00006	0.00002	0.00014
Nitrate (N)	mg/L	0.1	13	-	-	45	0.19	0.24	0.13	0.41	0.4	0.4	0.48
Nitrite (N)	mg/L	0.01	0.06	-	-	1	0.005	0.0019	0.012	0.002	-0.0027	-0.0017	0.003
Total BOD	mg/L	2	-	-	-	-	2	2	2	2	2	2	2
Total Chemical Oxygen Demand (CO	mg/L	4	-	-	-	-	5.6	9.4	4.8	0.1	-2	0.6	0.9
Orthophosphate (P)	mg/L	0.01	-	-	-	-	0.0053	0.0054	0.004	0.006	0.006	0.006	0.005
Total Phosphorus	mg/L	0.02 - 2.51	-	-	0.02	-	0.0106	-0.0053	-0.004	0.004	0.007	0.005	0.014
Hydrocarbons													
Benzene	µg/L	0.1 - 0.5	370	-	100	5	0						0
Ethylbenzene	µg/L	0.1 - 0.5	90	-	8	140	0						0
F1 (C6-C10)	µg/L	25	167	-	-	-	0						0
F1 (C6-C10) - BTEX	µg/L	25	-	-	-	-	0						0
F2 (C10-C16 Hydrocarbons)	µg/L	100	42	-	-	-	0						0
F3 (C16-C34 Hydrocarbons)	µg/L	200	-	-	-	-	36.78648						39
F4 (C34-C50 Hydrocarbons)	µg/L	200	-	-	-	-	0						0
Reached Baseline at C50	µg/L	-	-	-	-	-	1						1
Biological													
Chlorophyll	µg/L	0.1 - 0.2	-	-	-	-	1.65	1.94	2.61	0.91	1.62	1.23	2.32
Background	CFU/100mL	10	-	-	-	-	360	150	520	60	100	120	1200
Total Coliforms	CFU/100mL	10	-	-	-	-	30	10	210	10	10	30	220
Fecal coliform	CFU/100mL	10	-	-	-	-	10	10	10	10	10	10	40
Escherichia coli	CFU/100mL	10	-	100	-	-	10	10	10	10	10	10	40
Metals													
Total Aluminum (Al)	µg/L	0.5 - 5	100	-	-	-	0.92						4.4
Dissolved (0.2u) Aluminum (Al)	µg/L	5	-	-	75	-	2.532						3
Total Antimony (Sb)	µg/L	0.02 - 0.5	-	20	-	6	0.13						0.131
Total Arsenic (As)	µg/L	0.02 - 1	5	100	5	10	0.761						0.695
Total Barium (Ba)	µg/L	0.02 - 2	-	-	-	1000	22						25.2
Total Beryllium (Be)	µg/L	0.01 - 0.5	-	1100	-	-	-0.0015						0.002
Total Bismuth (Bi)	µg/L	0.005 - 1	-	-	-	-	-0.0008						0.0001
Total Boron (B)	µg/L	10 - 50	1500	-	200	5000	25						24
Total Cadmium (Cd)	µg/L	0.005 - 0.1	0.17	0.2	0.5	5	0.0009						0.0043
Total Calcium (Ca)	µg/L	0.05 - 250	-	-	-	-	33800						38200
Total Cesium (Cs)	µg/L	0.05 - 0.2	-	-	-	-	0.0023						0.003
Total Chromium (Cr)	µg/L	0.1 - 5	8.9	8.9	-	50	0.0797						0.06
Chromium (+3)	µg/L	0.5 - 5	8.9	8.9	-	-	0						0
Chromium (VI)	µg/L	0.5	1	1	-	-	0.2859						0.27
Total Cobalt (Co)	µg/L	0.005 - 0.5	-	-	0.9	-	0.0091						0.0188
Total Copper (Cu)	µg/L	0.05 - 1	2.57	5	5	2000	0.576						0.639
Total Iron (Fe)	µg/L	1 - 100	300	300	-	-	0.3963						3.4
Total Lead (Pb)	µg/L	0.005 - 0.5	3.59	25	5	5	0.0031						0.0112
Total Lithium (Li)	µg/L	0.5 - 5	-	-	-	-	1.99						2.44
Total Magnesium (Mg)	µg/L	0.05 - 250	-	-	-	-	9340						8740
Total Manganese (Mn)	µg/L	0.05 - 2	-	-	-	120	0.206						1.07
Mercury (Hg)	µg/L	0.01	0	0	0	1	0.0011						-0.0001
Total Molybdenum (Mo)	µg/L	0.05 - 1	73	-	40	-	1.15						1.17
Total Nickel (Ni)	µg/L	0.02 - 1	103	25	-	-	0.442						0.529
Total Potassium (K)	µg/L	0.05 - 1000	-	-	-	-	1660						1810
Total Selenium (Se)	µg/L	0.04 - 2	1	100	-	50	0.119						0.131
Total Silicon (Si)	µg/L	50	-	-	-	-	167						660
Total Silver (Ag)	µg/L	0.005 - 0.1	0.25	0.1	-	-	0						-0.0016
Total Sodium (Na)	µg/L	0.05 - 250	-	-	-	-	15600						24000
Total Strontium (Sr)	µg/L	0.05 - 1	-	-	-	7000	186						220
Total Thallium (Tl)	µg/L	0.002 - 0.05	0.8	-	0.3	-	0.0052						0.005
Total Thorium (Th)	µg/L	0.005 - 1	-	-	-	-	0.0043						-0.0012
Total Tin (Sn)	µg/L	0.2 - 5	-	-	-	-	0.001						0.01
Total Titanium (Ti)	µg/L	0.5 - 5	-	-	-	-	0.0973						0.13
Total Tungsten (W)	µg/L	0.01 - 1	-	-	30	-	0.101						0.097
Total Uranium (U)	µg/L	0.002 - 0.1	-	-	5	20	0.355						0.397
Total Vanadium (V)	µg/L	0.2 - 5	-	-	6	-	0.22						0.16
Total Zinc (Zn)	µg/L	0.1 - 5	7	30	20	-	0.15						0.35
Dissolved Zinc (Zn)	µg/L	5	7	-	-	-	1.993						0.4
Total Zirconium (Zr)	µg/L	0.1 - 1	-	-	4	-	0.0088						-0.0028
Radionuclides													
H-3	Bq/kg	9.4 - 14.8	-	7000	-	7000	-5.2						3.8
C-14	Bq/kg	0.04 - 0.1	-	-	-	-	0.1						0
I-131	Bq/kg	0.078 - 170	-	10	-	6	35.2						0.194
K-40	Bq/kg	0.79 - 11	-	-	-	-	-2.45						0.445
Co-60	Bq/kg	0.066 - 0.95	-	-	-	-	-0.0567						-0.00175
Cs-134	Bq/kg	0.094 - 0.99	-	-	-	-	0.0723						-0.383
Cs-137	Bq/kg	0.11 - 0.9	-	50	-	10	0.141						-0.0811
Th-Series	Bq/kg	0.3 - 5	-	-	-	-	0.254						-0.241
U-Series	Bq/kg	0.33 - 3.7	-	-	-	-	0.429						-0.101
Other													
Hydrazine	µg/L	0.1	2.6	-	-	-							
Morpholine	µg/L	4	-	-	4		0						0
Bromoform	µg/L	0.2 - 1	-	-	60	-	0						0
Chloroform	µg/L	0.1 - 0.5	1.8	-	-	-	0						0
Bromodichloromethane	µg/L	0.1 - 0.5	-	-	200	-	0						0

			Water Quality Objectives				SW18-M											
Parameters	**Units**	**Detection Limit**	**CCME CWQG**	**PWQO**	**Interim PWQO**	**Health Canada**	Spring Collection #1 10-Apr-19	Spring Collection #2 15-Apr-19	Spring Collection #3 22-Apr-19	Summer Collection #1 3-Jul-19	Summer Collection #2 8-Jul-19	Summer Collection #3 15-Jul-19	Fall Collection #1 26-Aug-19	Fall Collection #2 3-Sep-19	Fall Collection #3 9-Sep-19	Winter Collection #1 29-Nov-19	Winter Collection #2 3-Dec-19	Winter Collection #3 14-Dec-19
Physical/Conventional Characteristics																		
Field Temperature	Celsius	-	-	-	-	-	5.65	4.08	8.75	13.87	20.92	13.64	19.78	15.35	16.46	3.86	1.89	2.26
Field pH	pH	-	6.5-9.0	6.5-8.5	-	-	7.97	8.27	8.41	8.25	7.88	8.4	7.91	7.91	**9.15**	8.35	6.8	6.69
pH	pH	-	-	-	-	-	8.26			8.19			8.32					8.27
Field Sp. Conductance	µS/cm	-	-	-	-	-	569	702	728	712	860	588	302	381	332	293	329	413
Conductivity	umho/cm	1	-	-	-	-	570			510			310					570
Field Turbidity	NTU	0.1	-	-	-	-	10.6	26.1	-2.8	-2.4	2.5	-1.5	-1.3	-1.9	-3	5.4	8.9	19.7
Turbidity	NTU	0.1	-	-	-	-	11			1.2			1.6					2.7
Alkalinity (Total as CaCO3)	mg/L	1	-	-	-	-	150			96			94					110
Dissolved Oxygen	mg/L	-	-	-	-	-	14.73	12.67	11.05	11.41	8.23	13.25	10.94	10.5	10.36	12.14	12.56	10.13
Total Hardness (CaCO3)	mg/L	0.5 - 1	-	-	-	-	191	270	160	164			125					176
Total Suspended Solids	mg/L	1 - 10	-	-	-	-	17	33	0	2			3					8
Total Residual Chlorine*	mg/L	0.0012	0.0005	0.002	-	-	**0.0012**			**0.028**			**0.0012**					**0.0012**
Nutrients																		
Dissolved Organic Carbon	mg/L	0.5	-	-	-	-	3	6	2.4	1.8	2.3	2	2.1	1.9	2	1.9	1.7	2.1
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1	-	-	-	-	0.31	0.28	0.26	0.16	0.33	0.21	0.21	0.21	0.23	0.18	0.18	0.17
Total Ammonia-N**	mg/L	0.01 - 1	0.044	-	-	-	**0.067**	**0.054**	-0.0333	0.03	**0.16**	0.03	**0.26**	**0.07**	-0.0039	0.02	0.04	0.03
Total Un-ionized Ammonia**	mg/L	0.00051 - 0.044	0.019	0.02	-	-	0.00099	0.0014	0	0.0017	0.006	0.0021	0.0096	0.0019	0	0.00054	0.00003	0.00002
Nitrate (N)	mg/L	0.1	13	-	-	45	1.08	2.2	0.61	0.28	0.22	0.27	0.19	0.27	0.17	0.43	0.48	0.65
Nitrite (N)	mg/L	0.01	0.06	-	-	1	0.0044	0.0061	0.0008611	0.0005402	0.012	-0.0097	0.0058	0.0048	0.005	0.003	-0.0014	0.006
Total BOD	mg/L	2	-	-	-	-	2			2	2	2	2	2	2	2	2	2
Total Chemical Oxygen Demand (CC	mg/L	4	-	-	-	-	4.5			3.76	4.3	2.78	6.9	8.8	-1.5	-0.29	3.7	6.6
Orthophosphate (P)	mg/L	0.01	-	-	-	-	0.0033	0.013	0.00433	0.0033	0.00027	0.00469	0.00491	0.0048	0.004	0.005	0.006	0.005
Total Phosphorus	mg/L	0.02 - 2.51	-	-	0.02	-	**0.022**	**0.059**	0.0063	0.0031	0.0172	0.0052	0.0068	0.0039	0.003	0.002	0.007	0.009
Hydrocarbons																		
Benzene	µg/L	0.1 - 0.5	370	-	100	5	0			0			0					0
Ethylbenzene	µg/L	0.1 - 0.5	90	-	8	140	0			0			0					0
F1 (C6-C10)	µg/L	25	167	-	-	-	0			0			0					0
F1 (C6-C10) - BTEX	µg/L	25	-	-	-	-	0			0			0					0
F2 (C10-C16 Hydrocarbons)	µg/L	100	42	-	-	-	0			0			0					0
F3 (C16-C34 Hydrocarbons)	µg/L	200	-	-	-	-	49.01924			54.03636			98.3738					68
F4 (C34-C50 Hydrocarbons)	µg/L	200	-	-	-	-	0			0			0					0
Reached Baseline at C50	µg/L	-	-	-	-	-	1			1			1					1
Biological																		
Chlorophyll	µg/L	0.1 - 0.2	-	-	-	-	2.93	1.68	2.11	0.87	1.15	0.38	1.59	6.62	2.7	1.11	1.06	9.08
Background	CFU/100mL	10	-	-	-	-	800	2000	250	3800	9600	680	610	4900	1000	200	190	560
Total Coliforms	CFU/100mL	10	-	-	-	-	210	2000	130	210	2100	20	10	80	240	30	40	100
Fecal coliform	CFU/100mL	10	-	-	-	-	20	2000	1	10	80	10	10	20	10	10	10	20
Escherichia coli	CFU/100mL	10	-	100	-	-	20	**2000**	1	10	20	10	10	20	10	10	10	20
Metals																		
Total Aluminum (Al)	µg/L	0.5 - 5	100	-	-	-	**142**		40	2.5			1.92					2.3
Dissolved (0.2u) Aluminum (Al)	µg/L	5	-	-	75	-	4.122			4.03			2.769					3
Total Antimony (Sb)	µg/L	0.02 - 0.5	-	20	-	6	0.106		0.12	0.097			0.12					0.138
Total Arsenic (As)	µg/L	0.02 - 1	5	100	5	10	0.66		0.727	0.793			0.813					0.695
Total Barium (Ba)	µg/L	0.02 - 2	-	-	-	1000	32.3		25	25.4			22.3					29.3
Total Beryllium (Be)	µg/L	0.01 - 0.5	-	1100	-	-	0.007		0.007	-0.0028			-0.0004					0.001
Total Bismuth (Bi)	µg/L	0.005 - 1	-	-	-	-	0.001		0.007	0.0004			-0.0005					0.0001
Total Boron (B)	µg/L	10 - 50	1500	-	200	5000	21.851		23	25			25					27
Total Cadmium (Cd)	µg/L	0.005 - 0.1	0.17	0.2	0.5	5	0.009		0.008	0.0024			0.0007					0.0028
Total Calcium (Ca)	µg/L	0.05 - 250	-	-	-	-	62100		44000	47600			34400					51700
Total Cesium (Cs)	µg/L	0.05 - 0.2	-	-	-	-	0.034			0.0232			0.0036					0.087
Total Chromium (Cr)	µg/L	0.1 - 5	8.9	8.9	-	50	-0.199		1.212	0.0828			0.089					0.07
Chromium (+3)	µg/L	0.5 - 5	8.9	8.9	-	-	0			0			0					0
Chromium (VI)	µg/L	0.5	1	1	-	-	0.2225			0.241			0.2824					0.27
Total Cobalt (Co)	µg/L	0.005 - 0.5	-	-	0.9	-	0.091		0.045	0.0292			0.0117					0.0209
Total Copper (Cu)	µg/L	0.05 - 1	2.57	5	5	2000	0.85		0.853	0.648			0.569					0.639
Total Iron (Fe)	µg/L	1 - 100	300	300	-	-	178		39.697	3			0.5403					2.9
Total Lead (Pb)	µg/L	0.005 - 0.5	3.59	25	5	5	0.157		0.057	0.0064			0.0104					0.007
Total Lithium (Li)	µg/L	0.5 - 5	-	-	-	-	3.3		4.24	8.99			2					10.2
Total Magnesium (Mg)	µg/L	0.05 - 250	-	-	-	-	8830		9500	11000			9420					11400
Total Manganese (Mn)	µg/L	0.05 - 2	-	-	-	120	18.1		3.9	12.8			0.372					3.64
Mercury (Hg)	µg/L	0.01	0	0	0	1	0.0023			0.0005			0.002					0
Total Molybdenum (Mo)	µg/L	0.05 - 1	73	-	40	-	1.2		1.1	1.35			1.19					1.31
Total Nickel (Ni)	µg/L	0.02 - 1	103	25	-	-	-0.054		0.625	0.5			0.5					0.565
Total Potassium (K)	µg/L	0.05 - 1000	-	-	-	-	3110	6500	2400	3190			1710					5040
Total Selenium (Se)	µg/L	0.04 - 2	1	100	-	50	0.18		0.126	0.128			0.12					0.153
Total Silicon (Si)	µg/L	50	-	-	-	-			790	254			172					932
Total Silver (Ag)	µg/L	0.005 - 0.1	0.25	0.1	-	-	0.001		0.005	-0.0001			0					-0.0026
Total Sodium (Na)	µg/L	0.05 - 250	-	-	-	-	32700		25000	32300			15600					39600
Total Strontium (Sr)	µg/L	0.05 - 1	-	-	-	7000	285		260	625			189					606
Total Thallium (Tl)	µg/L	0.002 - 0.05	0.8	-	0.3	-	0.008		0.009	0.0078			0.0053					0.0077
Total Thorium (Th)	µg/L	0.005 - 1	-	-	-	-	0.012			0			0.0048					-0.0019
Total Tin (Sn)	µg/L	0.2 - 5	-	-	-	-	0.003		-0.029	0.0112			0.0071					0
Total Titanium (Ti)	µg/L	0.5 - 5	-	-	-	-	5.2		5.2	0.69			0.244					-0.193
Total Tungsten (W)	µg/L	0.01 - 1	-	-	30	-	0.079		0.089	0.092			0.102					0.077
Total Uranium (U)	µg/L	0.002 - 0.1	-	-	5	20	0.61		0.45	0.372			0.348					0.438
Total Vanadium (V)	µg/L	0.2 - 5	-	-	6	-	0.483		0.64	-0.8141			0.3					0.06
Total Zinc (Zn)	µg/L	0.1 - 5	7	30	20	-	3.138		2.016	0.35			0.28					0.5
Dissolved Zinc (Zn)	µg/L	5	7	-	-	-	0.509			0.098			2.506					0.4
Total Zirconium (Zr)	µg/L	0.1 - 1	-	-	4	-	0.078		0.033	0.0077			0.0103					0.01
Radionuclides																		
H-3	Bq/kg	9.4 - 14.8	-	7000	-	7000	0			0			-5.3					4
C-14	Bq/kg	0.04 - 0.1	-	-	-	-	0.09			-0.09			0.16					-0.04
I-131	Bq/kg	0.078 - 170	-	10	-	6	0.412			0.513			11.7					0.333
K-40	Bq/kg	0.79 - 11	-	-	-	-	0.625			-2.68			-5.17					0.696
Co-60	Bq/kg	0.066 - 0.95	-	-	-	-	0.231			-0.236			0.0852					0.0448
Cs-134	Bq/kg	0.094 - 0.99	-	-	-	-	0.0467			0.028			0.082					0.25
Cs-137	Bq/kg	0.11 - 0.9	-	50	-	10	0.056			0.022			0.0351					0.228
Th-Series	Bq/kg	0.3 - 5	-	-	-	-	0.506			0.132			-0.367					0.883
U-Series	Bq/kg	0.33 - 3.7	-	-	-	-	0.677			0.137			0.131					0.675
Other																		
Hydrazine	µg/L	0.1	2.6	-	-	-							0.1					0
Morpholine	µg/L	4	-	-	4		1			0			0					0
Bromoform	µg/L	0.2 - 1	-	-	60	-	0			0			0					0
Chloroform	µg/L	0.1 - 0.5	1.8	-	-	-	0			0			0					0
Bromodichloromethane	µg/L	0.1 - 0.5	-	-	200	-	0			0			0					0

			Water Quality Objectives				SW12-S							
Parameters	Units	Detection Limit	CCME CWQG	PWQO	Interim PWQO	Health Canada	Spring 2-Apr-19	Spring (Dup) 2-Apr-19	Summer 26-Jun-19	Summer (Dup) 26-Jun-19	Fall 30-Aug-19	Fall (Dup) 30-Aug-19	Winter 28-Nov-19	Winter (Dup) 28-Nov-19
Physical/Conventional Characteristics														
Field Temperature	Celsius	-	-	-	-	-	4.92	4.92	22.95	22.95	22.17	22.17	4.39	4.39
Field pH	pH	-	6.5-9.0	6.5-8.5	-	-	8.33	8.33	**9.62**	**9.62**	7.4	7.4	7.76	7.76
pH	pH	-	-	-	-	-	8.19	8.18	9.4	9.4	8.36	8.36	8.25	8.27
Field Sp. Conductance	µS/cm	-	-	-	-	-	583		424		528		563	
Conductivity	umho/cm	1	-	-	-	-	610	610	420	430	530	530	650	650
Field Turbidity	NTU	0.1	-	-	-	-	-1		-2.6		14			
Turbidity	NTU	0.1	-	-	-	-								
Alkalinity (Total as CaCO3)	mg/L	1	-	-	-	-	200	200	120	120	180	180	200	200
Dissolved Oxygen	mg/L	-	-	-	-	-	13.64		13.86		8.03		11.61	
Total Hardness (CaCO3)	mg/L	0.5 - 1	-	-	-	-	292	282	181	183	227	219	292	297
Total Suspended Solids	mg/L	1 - 10	-	-	-	-								
Total Residual Chlorine*	mg/L	0.0012	0.0005	0.002	-	-								
Nutrients														
Dissolved Organic Carbon	mg/L	0.5	-	-	-	-	5.6	5.6	8.6	8.8	9.4	9.5	8.1	8.3
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1	-	-	-	-	0.42	0.36	0.42	0.39	0.6	0.65	0.4	0.43
Total Ammonia-N**	mg/L	0.01 - 1	0.044	-	-	-	**0.073**	**0.058**	**0.06**	**0.05**	**0.08**	0.04	0.02	**0.06**
Total Un-ionized Ammonia**	mg/L	0.00051 - 0.044	0.019	0.02	-	-	0.0023	0.0018	**0.048**	**0.044**	0.0011	0.00059	0.00013	0.00046
Nitrate (N)	mg/L	0.1	13	-	-	45	0	0	0	0	0	0	0	0
Nitrite (N)	mg/L	0.01	0.06	-	-	1	-0.0003531	-0.0011	-0.0024	-0.0028	0	0.001	-0.0066	0.002
Total BOD	mg/L	2	-	-	-	-	2	2	2	2	3	5	2	2
Total Chemical Oxygen Demand (CO	mg/L	4	-	-	-	-	15	17	21	16	48	47	16	4.4
Orthophosphate (P)	mg/L	0.01	-	-	-	-	0.00315	0.00457	0.00926	0.0091	0.009	0.006	0.008	0.008
Total Phosphorus	mg/L	0.02 - 2.51	-	-	0.02	-	**0.026**	**0.026**	**0.045**	**0.035**	**0.09**	**0.099**	**0.045**	**0.035**
Hydrocarbons														
Benzene	µg/L	0.1 - 0.5	370	-	100	5	0	0	0	0	0	0	0	0
Ethylbenzene	µg/L	0.1 - 0.5	90	-	8	140	0	0	0	0	0	0	0	0
F1 (C6-C10)	µg/L	25	167	-	-	-	0	0	0	0	0	0	0	0
F1 (C6-C10) - BTEX	µg/L	25	-	-	-	-	0	0	0	0	0	0	0	0
F2 (C10-C16 Hydrocarbons)	µg/L	100	42	-	-	-	0	0	0	0	0	0	0	0
F3 (C16-C34 Hydrocarbons)	µg/L	200	-	-	-	-	85.3612	75.45876	53.22028	74.48412	130	99	44	62
F4 (C34-C50 Hydrocarbons)	µg/L	200	-	-	-	-	0	0	0	0	0	0	0	0
Reached Baseline at C50	µg/L	-	-	-	-	-	1	1	1	1	1	1	1	1
Biological														
Chlorophyll	µg/L	0.1 - 0.2	-	-	-	-	2.88	1.93	2.33	2.33			24.8	14.1
Background	CFU/100mL	10	-	-	-	-	780	670	280	10	9600	12000	900	500
Total Coliforms	CFU/100mL	10	-	-	-	-	18	33	30	30	60	30	280	90
Fecal coliform	CFU/100mL	10	-	-	-	-	1	1	10	10	20	20	10	10
Escherichia coli	CFU/100mL	10	-	100	-	-	1	1	10	10	20	10	10	10
Metals														
Total Aluminum (Al)	µg/L	0.5 - 5	100	-	-	-	88.6	78.4	6.09	7.4	**369**	**369**	2.15	1.71
Dissolved (0.2u) Aluminum (Al)	µg/L	5	-	-	75	-	3.926	3.581	7	7	6	6	4	25
Total Antimony (Sb)	µg/L	0.02 - 0.5	-	20	-	6	0.179	0.167	0.174	0.223	0.268	0.253	0.229	0.217
Total Arsenic (As)	µg/L	0.02 - 1	5	100	5	10	0.34	0.31	0.732	0.694	1.32	1.24	0.629	0.651
Total Barium (Ba)	µg/L	0.02 - 5	-	-	-	1000	38.7	38	14.8	13.6	45	44.2	55.5	56.5
Total Beryllium (Be)	µg/L	0.01 - 0.5	-	1100	-	-	0.006	0.005	-0.0055	-0.0006	0.017	0.017	-0.0008	-0.0005
Total Bismuth (Bi)	µg/L	0.005 - 1	-	-	-	-	0.001	0.001	-0.0009	0.0002	0.006	0.003	-0.0007	0
Total Boron (B)	µg/L	10 - 50	1500	-	200	5000	146	142	199	**213**	**230**	**227**	161	161
Total Cadmium (Cd)	µg/L	0.005 - 0.1	0.17	0.2	0.5	5	0.005	0.004	0.0003	0.0015	0.0074	0.0095	0.0009	0.0013
Total Calcium (Ca)	µg/L	0.05 - 250	-	-	-	-	74500	71500	25800	26100	44000	42500	68700	69500
Total Cesium (Cs)	µg/L	0.05 - 0.2	-	-	-	-	0.018	0.009	0.0031	0.003			-0.0011	-0.0007
Total Chromium (Cr)	µg/L	0.1 - 5	8.9	8.9	-	50	0.829	0.653	0.0632	0.0493	1.58	0.48	0.06	0.07
Chromium (+3)	µg/L	0.5 - 5	8.9	8.9	-	-	0	0	0	0	0	0	0	0
Chromium (VI)	µg/L	0.5	1	1	-	-	0.1665	0.1245	0	0.2937	0.29	0.31	0.15	0.2
Total Cobalt (Co)	µg/L	0.005 - 0.5	-	-	0.9	-	0.123	0.103	0.113	0.112	0.235	0.224	0.0742	0.0732
Total Copper (Cu)	µg/L	0.05 - 1	2.57	5	5	2000	0.92	0.77	0.524	0.52	1.72	0.62	0.421	0.428
Total Iron (Fe)	µg/L	1 - 100	300	300	-	-	161	143	8.2	6.5	**433**	**396**	5.9	5.4
Total Lead (Pb)	µg/L	0.005 - 0.5	3.59	25	5	5	0.127	0.116	0.0217	0.021	0.614	0.384	0.0135	0.0144
Total Lithium (Li)	µg/L	0.5 - 5	-	-	-	-	3.9	3.8	5.66	5.75	4.73	4.61	2.49	2.56
Total Magnesium (Mg)	µg/L	0.05 - 250	-	-	-	-	25600	25100	28200	28600	28400	27400	294	30000
Total Manganese (Mn)	µg/L	0.05 - 2	-	-	-	120	20.8	20.3	1.31	1.28	68.5	65.6	4.07	3.94
Mercury (Hg)	µg/L	0.01	0	0	0	1	-0.0004	0.0002	0.0017	0.0029	0	0	0	0
Total Molybdenum (Mo)	µg/L	0.05 - 1	73	-	40	-	0.552	0.568	0.59	0.622	0.533	0.634	1.03	1.04
Total Nickel (Ni)	µg/L	0.02 - 1	103	25	-	-	0.632	0.602	0.523	0.56	0.88	0.83	0.594	0.616
Total Potassium (K)	µg/L	0.05 - 1000	-	-	-	-	5090	4910	3740	2670	6190	6100	6930	7030
Total Selenium (Se)	µg/L	0.04 - 2	1	100	-	50	0.065	0.061	0.069	0.059	0.073	0.077	0.052	0.05
Total Silicon (Si)	µg/L	50	-	-	-	-			80	86	2110	2270	1920	1990
Total Silver (Ag)	µg/L	0.005 - 0.1	0.25	0.1	-	-	0.002	0.002	0	0	0.003	0.002	0.0012	0.0008
Total Sodium (Na)	µg/L	0.05 - 250	-	-	-	-	17200	16900	19600	19900	21400	20800	18400	18600
Total Strontium (Sr)	µg/L	0.05 - 1	-	-	-	7000	477	454	322	325	385	381	501	506
Total Thallium (Tl)	µg/L	0.002 - 0.05	0.8	-	0.3	-	0.003	0.004	0	0.0009	0.0053	0.0058	0.0018	0.0011
Total Thorium (Th)	µg/L	0.005 - 1	-	-	-	-	0.011	0.013	0.0008	-0.0001			-0.0012	-0.0009
Total Tin (Sn)	µg/L	0.2 - 5	-	-	-	-	0.025	0.012	0.0197	0.0547	0.52	0.06	0.01	0.03
Total Titanium (Ti)	µg/L	0.5 - 5	-	-	-	-	4.644	4.616	-0.0075	0.0307	19	19	0.21	0.31
Total Tungsten (W)	µg/L	0.01 - 1	-	-	30	-	0.028	0.026	0.058	0.06			0.025	0.023
Total Uranium (U)	µg/L	0.002 - 0.1	-	-	5	20	1.19	1.12	1.01	1.01	0.787	0.774	1.48	1.48
Total Vanadium (V)	µg/L	0.2 - 5	-	-	6	-	0.739	0.747	1.81	1.98	2.53	2.45	1.05	1.01
Total Zinc (Zn)	µg/L	0.1 - 5	7	30	20	-	1.653	1.678	0.57	1.2	2.8	2.5	1.88	1.43
Dissolved Zinc (Zn)	µg/L	5	7	-	-	-	0.763	0.724	1.133	2.222	0.6	1.8	0.9	0.3
Total Zirconium (Zr)	µg/L	0.1 - 1	-	-	4	-	0.067	0.067	0.0364	0.0259	0.18	0.14	0.07	0.05
Radionuclides														
H-3	Bq/kg	9.4 - 14.8	-	7000	-	7000	31	31.5			31.9	37.2	30	31.3
C-14	Bq/kg	0.04 - 0.1	-	-	-	-	0.007	0.065			-0.07	0.01	-0.04	-0.03
I-131	Bq/kg	0.078 - 170	-	10	-	6	0.0316	0.0225			3.85	5.14	-0.493	0.369
K-40	Bq/kg	0.79 - 11	-	-	-	-	-3.72	-1.61			-13.3	-3.6	-0.861	1.62
Co-60	Bq/kg	0.066 - 0.95	-	-	-	-	0.0544	0.0652			-0.0287	0.00397	-0.107	0.0781
Cs-134	Bq/kg	0.094 - 0.99	-	-	-	-	0.0283	0.0186			0.14	0.0509	0.127	-0.406
Cs-137	Bq/kg	0.11 - 0.9	-	50	-	10	0.0377	0.0469			0.17	-0.0093	0.0209	0.0996
Th-Series	Bq/kg	0.3 - 5	-	-	-	-	-0.642	0.155			0.098	0.494	-0.692	-1
U-Series	Bq/kg	0.33 - 3.7	-	-	-	-	0.181	-0.445			0.0153	-0.444	0.0292	0.13
Other														
Hydrazine	µg/L	0.1	2.6	-	-	-								
Morpholine	µg/L	4	-	-	4		0	0	0	1	0	0	0	0
Bromoform	µg/L	0.2 - 1	-	-	60	-	0	0	0	0	0	0	0	0
Chloroform	µg/L	0.1 - 0.5	1.8	-	-	-	0	0	0	0	0	0	0	0
Bromodichloromethane	µg/L	0.1 - 0.5	-	-	200	-	0	0	0	0	0	0	0	0

Table D-2: 2019 Surface Water Sample Values (Uncensored)

			Water Quality Objectives				SW12-B				SW13-S			
Parameters	Units	Detection Limit	CCME CWQG	PWQO	Interim PWQO	Health Canada	SW12-B Spring	SW12-B Summer	SW12-B Fall	SW12-B Winter	Spring 2-Apr-19	Summer 26-Jun-19	Fall 30-Aug-19	Winter 28-Nov-19
Physical/Conventional Characteristics														
Field Temperature	Celsius	-	-	-	-	-	4.67	21.9	22.05	4.41	10.12	21.63	21.5	6.08
Field pH	pH	-	6.5-9.0	6.5-8.5	-	-	8.33	**9.55**	7.39	7.75	8.26	7	6.88	7.02
pH	pH	-	-	-	-	-	8.19	8.94	8.29	8.28	7.55	7.99	7.82	7.72
Field Sp. Conductance	µS/cm	-	-	-	-	-	577	427	525	263	241	469	462	528
Conductivity	umho/cm	1	-	-	-	-	620	450	530	650	420	430	500	580
Field Turbidity	NTU	0.1	-	-	-	-	-0.7	-2.3	15.2		-5.3	3.6	-3.9	
Turbidity	NTU	0.1	-	-	-	-								
Alkalinity (Total as CaCO3)	mg/L	1	-	-	-	-	200	130	180	200	200	230	260	270
Dissolved Oxygen	mg/L	-	-	-	-	-	13.82	12.71	7.99	12.03	8.07	16.61	5.41	4.08
Total Hardness (CaCO3)	mg/L	0.5 - 1	-	-	-	-	284	197	225	296	207	225	263	285
Total Suspended Solids	mg/L	1 - 10	-	-	-	-								
Total Residual Chlorine*	mg/L	0.0012	0.0005	0.002	-	-								
Nutrients														
Dissolved Organic Carbon	mg/L	0.5	-	-	-	-	5.6	8.4	9.8	8.2	6.1	11	11	7.6
Total Kjeldahl Nitrogen (TKN)	mg/L	0.1	-	-	-	-	0.35	0.41	0.72	0.45	1.1	0.44	0.96	0.5
Total Ammonia-N**	mg/L	0.01 - 1	0.044	-	-	-	**0.18**	0.04	**0.05**	0.02	**0.13**	0.03	**0.21**	**0.12**
Total Un-ionized Ammonia**	mg/L	0.00051 - 0.044	0.019	0.02	-	-	0.0056	**0.03**	0.00069	0.00013	0.005	0.00018	0.00086	0.00021
Nitrate (N)	mg/L	0.1	13	-	-	45	0	0	0	0	0	0	0	0
Nitrite (N)	mg/L	0.01	0.06	-	-	1	-0.0018	-0.0026	0.002	0.003	0.0000947	-0.0008935	0.002	0.004
Total BOD	mg/L	2	-	-	-	-	2	2	4	3	2	2	2	2
Total Chemical Oxygen Demand (CO	mg/L	4	-	-	-	-	19	25	46	12	17	27	34	15
Orthophosphate (P)	mg/L	0.01	-	-	-	-	0.00477	0.011	0.006	0.008	0.023	0.00869	0.063	0.066
Total Phosphorus	mg/L	0.02 - 2.51	-	-	0.02	-	**0.029**	**0.044**	**0.092**	**0.036**	**0.053**	**0.033**	**0.18**	**0.11**
Hydrocarbons														
Benzene	µg/L	0.1 - 0.5	370	-	100	5	0	0	0	0	0	0	0	0
Ethylbenzene	µg/L	0.1 - 0.5	90	-	8	140	0	0	0	0	0	0	0	0
F1 (C6-C10)	µg/L	25	167	-	-	-	0	0	0	0	0	0	0	0
F1 (C6-C10) - BTEX	µg/L	25	-	-	-	-	0	0	0	0	0	0	0	0
F2 (C10-C16 Hydrocarbons)	µg/L	100	42	-	-	-	0	0	0	0	0	0	0	0
F3 (C16-C34 Hydrocarbons)	µg/L	200	-	-	-	-	81.81356	54.70384	91	160	81.6142	64.0832	89	23
F4 (C34-C50 Hydrocarbons)	µg/L	200	-	-	-	-	0	0	0	0	0	0	0	0
Reached Baseline at C50	µg/L	-	-	-	-	-	1	1	1	1	1	1	1	1
Biological														
Chlorophyll	µg/L	0.1 - 0.2	-	-	-	-	2.61	3.56		26.4	6.94	0.79		1.22
Background	CFU/100mL	10	-	-	-	-	700	520	12000	550	540	1100	8400	8000
Total Coliforms	CFU/100mL	10	-	-	-	-	10	70	40	120	41	610	640	40
Fecal coliform	CFU/100mL	10	-	-	-	-	1	10	40	10	0	10	350	10
Escherichia coli	CFU/100mL	10	-	100	-	-	1	10	40	10	0	10	**340**	10
Metals														
Total Aluminum (Al)	µg/L	0.5 - 5	100	-	-	-	80.3	6.9	**353**	2.24	18.2	5	3.6	4.79
Dissolved (0.2u) Aluminum (Al)	µg/L	5	-	-	75	-	3.805	7	6	4	11	6	4	7
Total Antimony (Sb)	µg/L	0.02 - 0.5	-	20	-	6	0.186	0.235	0.245	0.22	0.063	0.059	0.051	0.059
Total Arsenic (As)	µg/L	0.02 - 1	5	100	5	10	0.33	0.722	1.24	0.623	0.25	0.265	0.298	0.295
Total Barium (Ba)	µg/L	0.02 - 2	-	-	-	1000	38.4	18.2	43.3	55.5	24.4	17.8	34.6	39.8
Total Beryllium (Be)	µg/L	0.01 - 0.5	-	1100	-	-	0.008	-0.0001	0.016	-0.0018	0.003	0.002	0.002	0.001
Total Bismuth (Bi)	µg/L	0.005 - 1	-	-	-	-	0.001	0.0013	0.003	0.0004	0.003	-0.0002	0	0.0003
Total Boron (B)	µg/L	10 - 50	1500	-	200	5000	141	**227**	**227**	162	7.74	6.1893	21	10
Total Cadmium (Cd)	µg/L	0.005 - 0.1	0.17	0.2	0.5	5	0.006	0.0017	0.0072	0.0028	0.005	0.0017	0.0019	0.0044
Total Calcium (Ca)	µg/L	0.05 - 250	-	-	-	-	71100	31800	43500	69000	71900	76800	91600	97900
Total Cesium (Cs)	µg/L	0.05 - 0.2	-	-	-	-	0.011	0.0013		-0.0015	0.01	0.0046		0.011
Total Chromium (Cr)	µg/L	0.1 - 5	8.9	8.9	-	50	0.989	0.0579	0.47	0.08	1.2	0.0864	0.05	0.18
Chromium (+3)	µg/L	0.5 - 5	8.9	8.9	-	-	0	0	0	0	0	0	0	0
Chromium (VI)	µg/L	0.5	1	1	-	-	0.1374	0.1287	0.3	0.21	0.1294	0.1632	0.24	0.16
Total Cobalt (Co)	µg/L	0.005 - 0.5	-	-	0.9	-	0.113	0.102	0.221	0.0766	0.153	0.073	0.143	0.24
Total Copper (Cu)	µg/L	0.05 - 1	2.57	5	5	2000	0.99	0.45	0.61	0.473	0.388	0.15	0.08	0.307
Total Iron (Fe)	µg/L	1 - 100	300	300	-	-	147	8.2	**395**	6.4	300	98.1	209	**520**
Total Lead (Pb)	µg/L	0.005 - 0.5	3.59	25	5	5	0.14	0.033	0.398	0.0188	0.07	0.0182	0.014	0.026
Total Lithium (Li)	µg/L	0.5 - 5	-	-	-	-	4	5.92	4.65	2.48	0.204	0.4046	0.37	0.18
Total Magnesium (Mg)	µg/L	0.05 - 250	-	-	-	-	25900	28700	28300	29900	6650	8150	8390	9900
Total Manganese (Mn)	µg/L	0.05 - 2	-	-	-	120	20.8	1.1	67.5	4.25	**141**	15.1	**222**	**310**
Mercury (Hg)	µg/L	0.01	0	0	0	1	0.0007	0.0025	0	0	0.0023	0.0038	0	0
Total Molybdenum (Mo)	µg/L	0.05 - 1	73	-	40	-	0.537	0.638	0.55	1.04	0.121	0.0371	0.014	0.15
Total Nickel (Ni)	µg/L	0.02 - 1	103	25	-	-	0.582	0.59	0.81	0.567	0.229	0.19	0.13	0.271
Total Potassium (K)	µg/L	0.05 - 1000	-	-	-	-	5110	4510	6090	7030	2020	370	2350	5870
Total Selenium (Se)	µg/L	0.04 - 2	1	100	-	50	0.069	0.059	0.079	0.049	0.066	0.072	0.089	0.114
Total Silicon (Si)	µg/L	50	-	-	-	-		203	2000	1940		505	3060	4440
Total Silver (Ag)	µg/L	0.005 - 0.1	0.25	0.1	-	-	0.002	0.0011	0.001	0.0008	0.002	0.0002	0.002	0.0007
Total Sodium (Na)	µg/L	0.05 - 250	-	-	-	-	17000	20300	21300	18500	3450	3530	2280	4860
Total Strontium (Sr)	µg/L	0.05 - 1	-	-	-	7000	471	367	381	501	143	196	200	225
Total Thallium (Tl)	µg/L	0.002 - 0.05	0.8	-	0.3	-	0.004	0.0011	0.005	0.0014	0.01	0.0005	0.0016	0.0036
Total Thorium (Th)	µg/L	0.005 - 1	-	-	-	-	0.012	0.0006		-0.0004	0.002	-0.0015		0.0009
Total Tin (Sn)	µg/L	0.2 - 5	-	-	-	-	0.076	0.0983	0.05	0.02	0.036	0.0361	0.02	0.01
Total Titanium (Ti)	µg/L	0.5 - 5	-	-	-	-	4.566	0.1216	18.1	0.31	1.592	0.0468	0.4	0.44
Total Tungsten (W)	µg/L	0.01 - 1	-	-	30	-	0.03	0.058		0.026	0.007	0.0045		-0.0006
Total Uranium (U)	µg/L	0.002 - 0.1	-	-	5	20	1.15	0.989	0.782	1.46	0.37	0.178	0.0617	0.672
Total Vanadium (V)	µg/L	0.2 - 5	-	-	6	-	0.72	1.84	2.42	1.08	0.32	0.1782	0.12	0.4
Total Zinc (Zn)	µg/L	0.1 - 5	7	30	20	-	3.75	1.8	2.8	3.53	2.752	3.1	0.8	2.15
Dissolved Zinc (Zn)	µg/L	5	7	-	-	-	2.615	0.998	0.6	2.4	1.524	3.502	0.9	2.9
Total Zirconium (Zr)	µg/L	0.1 - 1	-	-	4	-	0.066	0.0225	0.19	0.05	0.065	0.0263	0.02	0.06
Radionuclides														
H-3	Bq/kg	9.4 - 14.8	-	7000	-	7000	46.8		31.8	24.7	31.3		58	35.6
C-14	Bq/kg	0.04 - 0.1	-	-	-	-	-0.029		0.07	-0.25	0.089		0.05	0.05
I-131	Bq/kg	0.078 - 170	-	10	-	6	-0.0685		0.0429	0.385	0.221		-2.27	0.191
K-40	Bq/kg	0.79 - 11	-	-	-	-	1.38		-1.47	1.47	-2.19		-4.84	-1.31
Co-60	Bq/kg	0.066 - 0.95	-	-	-	-	0.0281		-0.00981	0.119	0.0555		0.0188	0.0503
Cs-134	Bq/kg	0.094 - 0.99	-	-	-	-	0.0103		0.0326	0.146	-0.096		0.0711	0.0374
Cs-137	Bq/kg	0.11 - 0.9	-	50	-	10	0.156		0.0992	0.209	-0.0551		0.0669	0.0374
Th-Series	Bq/kg	0.3 - 5	-	-	-	-	0.193		0.292	0.438	0.307		0.13	-0.174
U-Series	Bq/kg	0.33 - 3.7	-	-	-	-	0.19		-0.358	0.455	1.12		-0.335	0.265
Other														
Hydrazine	µg/L	0.1	2.6	-	-	-								
Morpholine	µg/L	4	-	-	4		0	0	0	0	0	0	0	0
Bromoform	µg/L	0.2 - 1	-	-	60	-	0	0	0	0	0	0	0	0
Chloroform	µg/L	0.1 - 0.5	1.8	-	-	-	0	0	0	0	0	0	0	0
Bromodichloromethane	µg/L	0.1 - 0.5	-	-	200	-	0	0	0	0	0	0	0	0

Notes:
* The detection limit of total residual chlorine is greater than the environmental guideline. In addition, all summer values are not representative of the Lake Ontario value due to machine calibration issue.
** Elevated ammonia concentration was observed in spring due to contamination issue at the analytical laboratory (BVL).
*** Values exceeding the CCME CWQG, PWQO, interim PWQO and Health Canada Drinking Water Quality Guideline are bold and shaded in grey.

Table D-3: 2019 Surface Water Sampling Results - Statistics (Calculated with Uncensored Values Where Possible)

Location	Category	Parameter	Units	Total N	N (<RDL)	N (<RDL and uncensored)	Minimum	5th Percentile	50th Percentile	95th Percentile	Maximum	Arithmetic Mean	StdDev
SW2-B	Conventional Characteristics	Alkalinity (Total as CaCO3)	mg/L	4	0	0	92	92.3	94	96.55	97	94.25	2.0616
		Conductivity	umho/cm	4	0	0	300	301.5	310	327	330	312.5	12.583
		Field pH	pH	4	0	0	8.21	8.2145	8.265	8.5025	8.54	8.32	0.15033
		Field Sp. Conductance	µS/cm	4	0	0	274	274	280	306.4	310	286	16.971
		pH	pH	4	0	0	8.21	8.213	8.235	8.274	8.28	8.24	0.029439
		Field Temperature	Celsius	4	0	0	1.85	2.219	5.495	15.809	17.42	7.565	6.8596
		Total Hardness (CaCO3)	mg/L	4	0	0	118	118.15	120	121.85	122	120	1.8257
		Dissolved Oxygen	mg/L	3	0	0	10.54	10.805	13.19	13.334	13.35	12.36	1.5782
		Turbidity	NTU	4	2	2	0.063*	0.063675*	0.13375*	1.9	2.2	0.63263*	1.0468
		Total Suspended Solids	mg/L	4	3	3	0*	0*	0.4*	5.22*	6	1.7*	2.8914
		Total Residual Chlorine	mg/L	3	2	0	<0.0012	<0.0012	<0.0012	<0.00822	0.009	<0.0038	0.0045033
	Nutrients	Nitrate (N)	mg/L	4	0	0	0.25	0.256	0.315	0.3485	0.35	0.3075	0.046458
		Nitrite (N)	mg/L	4	4	4	-0.0033*	-0.002595*	0.0017*	0.004125*	0.0045*	0.00115*	0.0032563
		Total Ammonia-N	mg/L	4	0	0	0.02	0.0275	0.115	0.211	0.22	0.1175	0.089582
		Total Un-ionized Ammonia	mg/L	4	1	1	0.00046*	0.001126*	0.0054	0.008705	0.0092	0.005115*	0.0036064
		Total Kjeldahl Nitrogen (TKN)	mg/L	4	0	0	0.11	0.1175	0.185	0.2695	0.28	0.19	0.072572
		Total Phosphorus	mg/L	4	4	4	-0.0001*	-0.000085*	0.0055*	0.01678*	0.0178*	0.007175*	0.0087926
		Orthophosphate (P)	mg/L	4	4	4	0.00267*	0.0027825*	0.00348*	0.005631*	0.006*	0.0039075*	0.0014471
	Biological	Chlorophyll	µg/L	4	0	0	0.81	0.834	1.115	1.294	1.3	1.085	0.23502
		Total BOD	mg/L	4	3	1	2*	<2	<2	<2	2*	2*	0
		Total Chemical Oxygen Demand (COD)	mg/L	4	1	1	-2.2*	-1.105*	5.65	6.71	6.8	3.975*	4.1764
		Dissolved Organic Carbon	mg/L	4	0	0	1.8	1.815	1.95	2	2	1.925	0.095743
		Escherichia coli	CFU/100mL	4	3	0	0	<1.5	<10	<10	<10	<7.5	5
		Fecal coliform	CFU/100mL	4	3	0	0	<1.5	<10	<10	<10	<7.5	5
		Total Coliforms	CFU/100mL	4	2	0	0	<1.5	<10	<27	30	<12.5	12.583
	Metals	Dissolved (0.2u) Aluminum (Al)	µg/L	4	3	3	1.881*	2.0067*	2.8595*	5.55*	6	3.4*	1.7973
		Total Aluminum (Al)	µg/L	4	0	0	0.52	0.5455	0.72	3.8525	4.4	1.59	1.8759
		Total Antimony (Sb)	µg/L	4	1	1	0.092	0.09785*	0.132*	0.1364	0.137	0.12325*	0.020982
		Total Arsenic (As)	µg/L	4	0	0	0.73	0.7345	0.778	0.80195	0.803	0.77225	0.033886
		Total Barium (Ba)	µg/L	4	0	0	22	22.03	22.4	22.685	22.7	22.375	0.3304
		Total Beryllium (Be)	µg/L	4	4	4	-0.0032*	-0.00278*	-0.0002*	0.00085*	0.001*	-0.00065*	0.0017991
		Total Bismuth (Bi)	µg/L	4	4	4	-0.0012*	-0.001035*	-0.00005*	0.00085*	0.001*	-0.000075*	0.00089954
		Total Boron (B)	µg/L	4	1	1	21	21.099*	21.83*	22	22	21.665*	0.47142
		Total Cadmium (Cd)	µg/L	4	4	4	0.0027*	0.002745*	0.0033*	0.003685*	0.0037*	0.00325*	0.00047958
		Total Calcium (Ca)	µg/L	4	0	0	33400	33445	33950	34540	34600	33975	531.51
		Total Cesium (Cs)	µg/L	4	4	4	0.001*	0.001045*	0.00165*	0.002595*	0.0027*	0.00175*	0.00075939
		Total Chromium (Cr)	µg/L	4	4	4	0.0666*	0.06711*	0.0842*	0.37516*	0.424*	0.16475*	0.17342
		Chromium (VI)	µg/L	4	4	4	0.1997*	0.2035*	0.2275*	0.27922*	0.2879*	0.23565*	0.037273
		Chromium (+3)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Total Cobalt (Co)	µg/L	4	1	1	0.0082	0.008365	0.01075	0.01373*	0.014*	0.010925*	0.002655
		Total Copper (Cu)	µg/L	4	0	0	0.61	0.61	0.614	0.6248	0.626	0.616	0.0076594
		Total Iron (Fe)	µg/L	4	4	4	-0.0506*	0.04549*	0.63535*	0.78211*	0.8*	0.50503*	0.38027
		Total Lead (Pb)	µg/L	4	4	4	0.0022*	0.00232*	0.0037*	0.00661*	0.007*	0.00415*	0.0021063
		Total Lithium (Li)	µg/L	4	1	1	1.69	1.7208*	1.9175*	1.957	1.96	1.8713*	0.12385
		Total Magnesium (Mg)	µg/L	4	0	0	8520	8526	8600	8640	8640	8590	60
		Total Manganese (Mn)	µg/L	4	1	1	0.114*	0.1239*	0.2115	0.2583	0.261	0.1995*	0.066746
		Mercury (Hg)	µg/L	4	4	4	-0.0007*	-0.00064*	-0.00025*	0.00031*	0.0004*	-0.0002*	0.00045461
		Total Molybdenum (Mo)	µg/L	4	0	0	1.1	1.112	1.18	1.2055	1.21	1.1675	0.04717
		Total Nickel (Ni)	µg/L	4	1	1	0.487	0.4903	0.51*	0.51695*	0.518	0.50625*	0.013401
		Total Potassium (K)	µg/L	4	0	0	1550	1560.5	1630	1657	1660	1617.5	47.871
		Total Selenium (Se)	µg/L	4	0	0	0.124	0.12535	0.1365	0.14425	0.145	0.1355	0.0091104
		Total Silicon (Si)	µg/L	3	0	0	314	315.7	331	553.3	578	407.67	147.76
		Total Silver (Ag)	µg/L	4	4	4	-0.002*	-0.00179*	-0.00055*	-0.000075*	0*	-0.000775*	0.00085781
		Total Sodium (Na)	µg/L	4	0	0	13600	13615	13750	14820	15000	14025	655.11
		Total Strontium (Sr)	µg/L	4	0	0	172	173.65	186.5	194.25	195	185	9.9666
		Total Thallium (Tl)	µg/L	4	1	1	0.0048	0.004875	0.00565*	0.00634*	0.0064	0.005625*	0.00071356
		Total Thorium (Th)	µg/L	4	4	4	-0.0018*	-0.00156*	0.0006*	0.00191*	0.002*	0.00035*	0.0017078
		Total Tin (Sn)	µg/L	4	4	4	0*	0.001185*	0.00895*	0.01544*	0.0164*	0.008575*	0.0067638
		Total Titanium (Ti)	µg/L	4	4	4	-0.1424*	-0.11954*	0.138*	0.46125*	0.4957*	0.15733*	0.28157
		Total Tungsten (W)	µg/L	4	1	1	0.091	0.0913	0.1	0.124*	0.127*	0.1045*	0.016603
		Total Uranium (U)	µg/L	4	0	0	0.351	0.35355	0.369	0.37595	0.377	0.3665	0.01103
		Total Vanadium (V)	µg/L	4	4	4	-0.6793*	-0.55341*	0.17*	0.18204*	0.1824*	-0.039225*	0.42683
		Total Zinc (Zn)	µg/L	4	1	1	0.34	0.3865	0.7745*	1.1549*	1.2	0.77225*	0.36552
		Dissolved Zinc (Zn)	µg/L	4	4	4	0.037*	0.06145*	0.587*	3.8836*	4.397*	1.402*	2.0381
		Total Zirconium (Zr)	µg/L	4	4	4	-0.012*	-0.010275*	-0.00015*	0.00683*	0.008*	-0.001075*	0.0082395
	Hydrocarbons	F1 (C6-C10)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F2 (C10-C16 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F3 (C16-C34 Hydrocarbons)	µg/L	4	4	4	40.859*	41.93*	49.008*	162.76*	182.66*	80.383*	68.296
		F4 (C34-C50 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Benzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Ethylbenzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromodichloromethane	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
	Radionuclides	C-14	Bq/kg	4	2	2	-0.05*	-0.035*	0.055*	0.128	0.14	0.05*	0.077889
		Co-60	Bq/kg	4	4	4	-0.0743*	-0.073505*	-0.04205*	0.07211*	0.0875*	-0.017725*	0.075076
		Cs-134	Bq/kg	4	4	4	0.0333*	0.033705*	0.0523*	0.24659*	0.278*	0.10398*	0.11712
		Cs-137	Bq/kg	4	4	4	0.015*	0.025125*	0.12725*	0.2009*	0.206*	0.11888*	0.086653
		H-3	Bq/kg	4	4	4	-5.3*	-4.775*	-0.9*	0*	0*	-1.775*	2.4985
		I-131	Bq/kg	4	4	4	0.206*	0.2141*	0.65*	61.696*	72.4*	18.477*	35.951
		K-40	Bq/kg	4	4	4	-3.58*	-3.2995*	-1.55*	1.092*	1.53*	-1.2875*	2.1121
	Other	Hydrazine	µg/L	4	4	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0
		Morpholine	µg/L	4	4	4	0*	0*	0*	0.85*	1*	0.25*	0.5
		Bromoform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Chloroform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		4-Bromofluorobenzene	%	8	0	0	97	97.35	99	100	100	98.875	0.99103

Table D-3: 2019 Surface Water Sampling Results - Statistics (Calculated with Uncensored Values Where Possible)

Location	Category	Parameter	Units	Total N	N (<RDL)	N (<RDL and uncensored)	Minimum	5th Percentile	50th Percentile	95th Percentile	Maximum	Arithmetic Mean	StdDev
SW2-S	Conventional Characteristics	Alkalinity (Total as CaCO3)	mg/L	4	0	0	93	93.3	95	99.25	100	95.75	2.9861
		Conductivity	umho/cm	4	0	0	300	301.5	315	328.5	330	315	12.91
		Field pH	pH	4	0	0	8.25	8.2845	8.52	8.8915	8.95	8.56	0.29132
		Field Sp. Conductance	µS/cm	4	0	0	275	275.3	282.5	363.65	377	304.25	48.836
		pH	pH	4	0	0	8.22	8.229	8.295	8.412	8.43	8.31	0.088318
		Field Temperature	Celsius	4	0	0	1.38	1.908	9.56	20.765	21.92	10.605	9.287
		Total Hardness (CaCO3)	mg/L	4	0	0	119	119	120	122.7	123	120.5	1.9149
		Dissolved Oxygen	mg/L	3	0	0	10.48	10.631	11.99	13.115	13.24	11.903	1.382
		Turbidity	NTU	4	2	2	0.096*	0.096315*	0.14905*	6.15	7.2	1.8985*	3.5347
		Total Suspended Solids	mg/L	4	3	3	0*	0.03*	0.5*	9.47*	11	3*	5.3442
		Total Residual Chlorine	mg/L	3	2	0	<0.0012	<0.0012	<0.0012	<0.01092	0.012	<0.0048	0.0062354
	Nutrients	Nitrate (N)	mg/L	4	0	0	0.18	0.1905	0.295	0.357	0.36	0.2825	0.083417
		Nitrite (N)	mg/L	4	4	4	-0.0029*	-0.002315*	0.0013*	0.004575*	0.0051*	0.0012*	0.0032772
		Total Ammonia-N	mg/L	4	2	1	-0.01582*	-0.011947*	<0.025	0.04	0.04	0.018545*	0.026923
		Total Un-ionized Ammonia	mg/L	4	2	2	0*	0.000036*	0.00212*	0.0125	0.014	0.00456*	0.0065545
		Total Kjeldahl Nitrogen (TKN)	mg/L	4	0	0	0.12	0.126	0.175	0.19	0.19	0.165	0.033166
		Total Phosphorus	mg/L	4	4	4	-0.0009*	-0.000885*	0.00615*	0.016415*	0.017*	0.0071*	0.009317
		Orthophosphate (P)	mg/L	4	4	4	0.003*	0.003063*	0.003525*	0.0047945*	0.005*	0.0037625*	0.00086558
	Biological	Chlorophyll	µg/L	5	0	0	0.39	0.494	1.31	1.614	1.65	1.146	0.50327
		Total BOD	mg/L	4	3	1	2*	<2	<2	<2	2*	2*	0
		Total Chemical Oxygen Demand (COD)	mg/L	4	1	1	3.35*	3.8675*	6.95	7.44	7.5	6.1875*	1.9133
		Dissolved Organic Carbon	mg/L	4	0	0	1.8	1.815	1.9	2.07	2.1	1.925	0.12583
		Escherichia coli	CFU/100mL	4	3	0	0	<1.5	<10	<10	<10	<7.5	5
		Fecal coliform	CFU/100mL	4	3	0	0	<1.5	<10	<10	<10	<7.5	5
		Total Coliforms	CFU/100mL	4	0	1	0	1.5	15	71	80	27.5	35.94
	Metals	Dissolved (0.2u) Aluminum (Al)	µg/L	4	4	4	1.707*	1.8057*	2.6825*	3.0034*	3.004*	2.519*	0.61904
		Total Aluminum (Al)	µg/L	4	0	0	0.9	0.909	1.715	4.0255	4.3	2.1575	1.6024
		Total Antimony (Sb)	µg/L	4	1	1	0.096	0.1014	0.1325*	0.1398*	0.141	0.1255*	0.020075
		Total Arsenic (As)	µg/L	4	0	0	0.73	0.7312	0.7625	0.78785	0.788	0.76075	0.031063
		Total Barium (Ba)	µg/L	4	0	0	21.7	21.715	22.3	23.31	23.4	22.425	0.81803
		Total Beryllium (Be)	µg/L	4	4	4	-0.0022*	-0.00175*	0.0014*	0.00285*	0.003*	0.0009*	0.0022539
		Total Bismuth (Bi)	µg/L	4	4	4	-0.0004*	-0.000385*	0.00005*	0.00091*	0.001*	0.000175*	0.00065511
		Total Boron (B)	µg/L	4	1	1	20	20.3	22.08*	23.724*	24	22.04*	1.6349
		Total Cadmium (Cd)	µg/L	4	4	4	0.0018*	0.00189*	0.0027*	0.00385*	0.004*	0.0028*	0.00093808
		Total Calcium (Ca)	µg/L	4	0	0	33500	33515	33900	34880	35000	34075	689.81
		Total Cesium (Cs)	µg/L	4	4	4	0.0016*	0.00166*	0.002*	0.00285*	0.003*	0.00215*	0.00059722
		Total Chromium (Cr)	µg/L	4	3	4	0.06*	0.06417*	0.0939*	0.287*	0.32*	0.14195*	0.11987
		Chromium (VI)	µg/L	4	4	4	0.1945*	0.20089*	0.24355*	0.28681*	0.2933*	0.24373*	0.040678
		Chromium (+3)	µg/L	4	4	4	0*	0*	0*	0.085765*	0.1009*	0.025225*	0.05045
		Total Cobalt (Co)	µg/L	4	1	1	0.009	0.009255	0.01135*	0.01319*	0.0134	0.011275*	0.0018751
		Total Copper (Cu)	µg/L	4	0	0	0.58	0.58105	0.59	0.61085	0.614	0.5935	0.014663
		Total Iron (Fe)	µg/L	4	2	2	0.318*	0.34316*	0.84285*	1.54	1.6	0.90093*	0.60287
		Total Lead (Pb)	µg/L	4	3	3	0.0027*	0.00279*	0.00515*	0.007255*	0.0073	0.005075*	0.0024116
		Total Lithium (Li)	µg/L	4	1	1	1.65	1.6875	1.905*	2.012*	2.03	1.8725*	0.15966
		Total Magnesium (Mg)	µg/L	4	0	0	8530	8537.5	8595	8737.5	8760	8620	98.995
		Total Manganese (Mn)	µg/L	4	1	1	0.078	0.08145*	0.1615*	0.3189	0.336	0.18425*	0.11927
		Mercury (Hg)	µg/L	4	4	4	-0.001*	-0.00091*	-0.0002*	0.00068*	0.0008*	-0.00015*	0.00075498
		Total Molybdenum (Mo)	µg/L	4	0	0	1.1	1.112	1.19	1.217	1.22	1.175	0.052599
		Total Nickel (Ni)	µg/L	4	1	1	0.469	0.4729	0.4965	0.50565*	0.507*	0.49225*	0.016317
		Total Potassium (K)	µg/L	4	0	0	1570	1577.5	1630	1665.5	1670	1625	42.032
		Total Selenium (Se)	µg/L	4	0	0	0.137	0.137	0.1385	0.14425	0.145	0.13975	0.0037749
		Total Silicon (Si)	µg/L	3	0	0	214	222	294	586.5	619	375.67	214.5
		Total Silver (Ag)	µg/L	4	4	4	-0.001*	-0.000955*	-0.00055*	-0.00023*	-0.0002*	-0.000575*	0.00035
		Total Sodium (Na)	µg/L	4	0	0	13400	13430	13800	14510	14600	13900	529.15
		Total Strontium (Sr)	µg/L	4	0	0	173	174.95	187	193.95	195	185.5	9.1833
		Total Thallium (Tl)	µg/L	4	1	1	0.0043	0.00436	0.00485*	0.00619*	0.0064	0.0051*	0.00091287
		Total Thorium (Th)	µg/L	4	4	4	-0.0016*	-0.00145*	0.0002*	0.00168*	0.0018*	0.00015*	0.0015351
		Total Tin (Sn)	µg/L	4	4	4	0*	0.00135*	0.0092*	0.032945*	0.0371*	0.013875*	0.01608
		Total Titanium (Ti)	µg/L	4	4	4	-0.0879*	-0.062715*	0.175*	0.45496*	0.4876*	0.18743*	0.24784
		Total Tungsten (W)	µg/L	4	1	1	0.094	0.0949	0.108	0.1211*	0.122*	0.108*	0.013166
		Total Uranium (U)	µg/L	4	0	0	0.357	0.35745	0.365	0.3904	0.394	0.37025	0.01678
		Total Vanadium (V)	µg/L	4	4	4	-0.7195*	-0.59358*	0.142*	0.1714*	0.1727*	-0.0657*	0.43648
		Total Zinc (Zn)	µg/L	4	1	1	0.27	0.2715	0.305	0.5612*	0.602*	0.3705*	0.15655
		Dissolved Zinc (Zn)	µg/L	4	4	4	-0.353*	-0.2447*	0.5845*	1.9356*	2.136*	0.738*	1.0464
		Total Zirconium (Zr)	µg/L	4	4	4	-0.01*	-0.008785*	-0.00025*	0.014915*	0.0173*	0.0017*	0.01145
	Hydrocarbons	F1 (C6-C10)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F2 (C10-C16 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F3 (C16-C34 Hydrocarbons)	µg/L	4	4	4	41.317*	43.82*	59.173*	78.449*	81.644*	60.326*	16.545
		F4 (C34-C50 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Benzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Ethylbenzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromodichloromethane	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
	Radionuclides	C-14	Bq/kg	4	3	3	-0.03*	-0.0225*	0.03*	0.057*	0.06	0.0225*	0.038622
		Co-60	Bq/kg	4	4	4	-0.13*	-0.10965*	0.049335*	0.18225*	0.198*	0.041668*	0.13885
		Cs-134	Bq/kg	4	4	4	-0.215*	-0.2129*	-0.0815*	0.1451*	0.164*	-0.0535*	0.18576
		Cs-137	Bq/kg	4	4	4	-0.369*	-0.30581*	0.09665*	0.1835*	0.191*	0.003825*	0.25508
		H-3	Bq/kg	4	4	4	-5.3*	-5*	0.45*	4.965*	5.1*	0.175*	5.2443
		I-131	Bq/kg	4	4	4	-0.0414*	0.03966*	0.7945*	59.154*	69.4*	17.737*	34.445
		K-40	Bq/kg	4	4	4	-4.72*	-3.796*	2.255*	3.223*	3.25*	0.76*	3.7429
	Other	Hydrazine	µg/L	4	4	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0
		Morpholine	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromoform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Chloroform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		4-Bromofluorobenzene	%	8	0	0	98	98.35	100	103.3	104	100.5	1.8516

Table D-3: 2019 Surface Water Sampling Results - Statistics (Calculated with Uncensored Values Where Possible)

Location	Category	Parameter	Units	Total N	N (<RDL)	N (<RDL and uncensored)	Minimum	5th Percentile	50th Percentile	95th Percentile	Maximum	Arithmetic Mean	StdDev
DNGS-Far-B	Conventional Characteristics	Alkalinity (Total as CaCO3)	mg/L	4	0	0	92	92.15	94.5	96.85	97	94.5	2.3805
		Conductivity	umho/cm	4	0	0	310	310	315	320	320	315	5.7735
		Field pH	pH	4	0	0	8.25	8.259	8.37	8.43	8.43	8.355	0.09
		Field Sp. Conductance	µS/cm	4	0	0	277	277.75	284	307.25	311	289	15.122
		pH	pH	4	0	0	8.18	8.1845	8.22	8.3405	8.36	8.245	0.079372
		Field Temperature	Celsius	4	0	0	4.01	4.0205	7.44	18.433	19.78	9.6675	7.4559
		Total Hardness (CaCO3)	mg/L	4	0	0	112	112.75	121	125	125	119.75	6.3966
		Dissolved Oxygen	mg/L	4	0	0	9.18	9.1965	10.255	11.756	11.85	10.385	1.3533
		Turbidity	NTU	4	1	2	0.0389*	0.048065*	0.15	0.455	0.5	0.20973*	0.20459
		Total Suspended Solids	mg/L	4	3	3	0.2*	0.32*	<1	1.85*	2*	1.05*	0.73711
		Total Residual Chlorine	mg/L	4	3	0	<0.0012	<0.0012	<0.0012	<0.01123	0.013	<0.00415	0.0059
	Nutrients	Nitrate (N)	mg/L	4	0	0	0.19	0.205	0.315	0.3995	0.41	0.3075	0.092511
		Nitrite (N)	mg/L	4	4	4	-0.0036*	-0.00354*	-0.0001*	0.004615*	0.0049*	0.000275*	0.0043169
		Total Ammonia-N	mg/L	4	2	2	0.00769*	0.0081865*	0.0155*	0.0795	0.09	0.032173*	0.038901
		Total Un-ionized Ammonia	mg/L	4	1	1	0*	0.0001065*	0.004255	0.11167	0.13	0.034628*	0.063679
		Total Kjeldahl Nitrogen (TKN)	mg/L	4	0	0	0.15	0.153	0.175	0.214	0.22	0.18	0.029439
		Total Phosphorus	mg/L	4	4	4	-0.0002876*	-0.00004946*	0.0018*	0.009695*	0.011*	0.0035781*	0.0050613
		Orthophosphate (P)	mg/L	4	4	4	0.00427*	0.004282*	0.00492*	0.0059235*	0.006*	0.0050275*	0.00085488
	Biological	Chlorophyll	µg/L	4	0	0	1.05	1.1175	1.59	1.884	1.92	1.5375	0.36773
		Total BOD	mg/L	4	3	1	2*	<2	<2	<2	2*	2*	0
		Total Chemical Oxygen Demand (COD)	mg/L	4	2	2	-0.95*	-0.2345*	5.21*	8.045	8.3	4.4425*	4.0415
		Dissolved Organic Carbon	mg/L	4	0	0	1.9	1.915	2.05	2.1	2.1	2.025	0.095743
		Escherichia coli	CFU/100mL	4	3	0	0	<1.5	<10	<10	<10	<7.5	5
		Fecal coliform	CFU/100mL	4	3	0	0	<1.5	<10	<10	<10	<7.5	5
		Total Coliforms	CFU/100mL	4	2	0	0	<1.5	<10	<61	70	<22.5	32.016
	Metals	Dissolved (0.2u) Aluminum (Al)	µg/L	4	4	4	1.968*	2.049*	2.807*	3.8659*	4*	2.8955*	0.87076
		Total Aluminum (Al)	µg/L	4	1	1	0.55	0.565	0.81	2.6743*	2.975*	1.2863*	1.14
		Total Antimony (Sb)	µg/L	4	1	1	0.122*	0.12215*	0.1265	0.13255	0.133	0.127*	0.0053541
		Total Arsenic (As)	µg/L	4	0	0	0.752	0.75305	0.7695	0.79785	0.801	0.773	0.022136
		Total Barium (Ba)	µg/L	4	0	0	21.5	21.545	21.85	23.005	23.2	22.1	0.75277
		Total Beryllium (Be)	µg/L	4	4	4	-0.004*	-0.003625*	-0.00125*	0.0007*	0.001*	-0.001375*	0.0020565
		Total Bismuth (Bi)	µg/L	4	4	4	-0.0008*	-0.00074*	-0.00035*	-0.000045*	0*	-0.000375*	0.0003304
		Total Boron (B)	µg/L	4	1	1	21	21.016*	22.053*	23.85	24	22.277*	1.4712
		Total Cadmium (Cd)	µg/L	4	3	3	0.0016*	0.001705*	0.00315*	0.005275*	0.0055	0.00335*	0.0017521
		Total Calcium (Ca)	µg/L	4	0	0	32000	32195	33750	35390	35600	33775	1515.2
		Total Cesium (Cs)	µg/L	4	4	4	-0.0011*	-0.001085*	-0.0001*	0.00182*	0.002*	0.000175*	0.0014975
		Total Chromium (Cr)	µg/L	4	4	4	-0.453*	-0.37605*	0.06725*	0.08929*	0.0919*	-0.05665*	0.26455
		Chromium (VI)	µg/L	4	4	4	0.1977*	0.19911*	0.21355*	0.28188*	0.2928*	0.2294*	0.043244
		Chromium (+3)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Total Cobalt (Co)	µg/L	4	2	2	-0.01*	-0.007855*	0.00655*	0.00931	0.0094	0.003125*	0.0090412
		Total Copper (Cu)	µg/L	4	0	0	0.55	0.5554	0.6015	0.6425	0.647	0.6	0.041609
		Total Iron (Fe)	µg/L	4	4	4	-0.946*	-0.76924*	0.40465*	0.68154*	0.7*	0.14083*	0.75109
		Total Lead (Pb)	µg/L	4	4	4	0.0017*	0.00194*	0.0036*	0.007385*	0.008*	0.004225*	0.0026825
		Total Lithium (Li)	µg/L	4	0	0	1.81	1.8295	2.02	2.168	2.18	2.0075	0.1652
		Total Magnesium (Mg)	µg/L	4	0	0	7810	7880.5	8470	9399.5	9530	8570	728.33
		Total Manganese (Mn)	µg/L	4	1	1	0.092	0.10385*	0.241*	0.36285	0.372	0.2365*	0.12791
		Mercury (Hg)	µg/L	4	4	4	0*	0.00018*	0.0012*	0.001455*	0.0015*	0.000975*	0.00066521
		Total Molybdenum (Mo)	µg/L	4	0	0	1.15	1.1545	1.19	1.217	1.22	1.1875	0.029861
		Total Nickel (Ni)	µg/L	4	1	1	-0.3*	-0.1866*	0.466	0.4828	0.484	0.279*	0.38618
		Total Potassium (K)	µg/L	4	0	0	1540	1541.5	1620	1724	1730	1627.5	96.738
		Total Selenium (Se)	µg/L	4	0	0	0.123	0.12375	0.129	0.1453	0.148	0.13225	0.010905
		Total Silicon (Si)	µg/L	3	0	0	185	199.2	327	552	577	363	198.46
		Total Silver (Ag)	µg/L	4	4	4	-0.0022*	-0.00196*	0.0002*	0.001*	0.001*	-0.0002*	0.0015319
		Total Sodium (Na)	µg/L	4	0	0	13900	13960	14950	15855	15900	14925	974.25
		Total Strontium (Sr)	µg/L	4	0	0	180	180.45	185	204	207	189.25	12.176
		Total Thallium (Tl)	µg/L	4	1	1	0.0033	0.003645	0.00575	0.005985*	0.006*	0.0052*	0.001278
		Total Thorium (Th)	µg/L	4	4	4	-0.0017*	-0.001445*	0.001*	0.00217*	0.0022*	0.000625*	0.001841
		Total Tin (Sn)	µg/L	4	4	4	0*	0.00132*	0.0176*	0.34821*	0.405*	0.11005*	0.19694
		Total Titanium (Ti)	µg/L	4	4	4	-0.219*	-0.18809*	0.03325*	0.13686*	0.147*	-0.001375*	0.1592
		Total Tungsten (W)	µg/L	4	1	1	0.085	0.08635	0.098*	0.1088*	0.11	0.09775*	0.01072
		Total Uranium (U)	µg/L	4	0	0	0.35	0.35105	0.3605	0.37165	0.373	0.361	0.0098319
		Total Vanadium (V)	µg/L	4	3	3	0.04*	0.06112*	0.1959*	0.23565*	0.24	0.16795*	0.088658
		Total Zinc (Zn)	µg/L	4	1	1	0.36	0.4119*	0.753*	1.6415	1.79	0.914*	0.61388
		Dissolved Zinc (Zn)	µg/L	4	4	4	0.333*	0.37305*	0.6445*	1.59*	1.749*	0.84275*	0.62282
		Total Zirconium (Zr)	µg/L	4	4	4	-0.0064*	-0.00514*	0.003*	0.01182*	0.0132*	0.0032*	0.0080465
	Hydrocarbons	F1 (C6-C10)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F2 (C10-C16 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F3 (C16-C34 Hydrocarbons)	µg/L	4	4	4	24.255*	27.517*	50.465*	129.26*	142.38*	66.891*	51.948
		F4 (C34-C50 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Benzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Ethylbenzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromodichloromethane	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
	Radionuclides	C-14	Bq/kg	4	3	4	-0.03*	-0.027*	0*	0.0865*	0.1	0.0175*	0.057373
		Co-60	Bq/kg	4	4	4	-0.0865*	-0.081025*	-0.04705*	0.014295*	0.0246*	-0.039*	0.046362
		Cs-134	Bq/kg	4	4	4	-0.529*	-0.4936*	-0.2365*	0.012865*	0.0469*	-0.23878*	0.23961
		Cs-137	Bq/kg	4	4	4	-0.122*	-0.11915*	-0.034*	0.20585*	0.236*	0.0115*	0.16521
		H-3	Bq/kg	4	4	4	-5.3*	-4.505*	2.55*	8.585*	9.2*	2.25*	6.2846
		I-131	Bq/kg	4	4	4	0.0875*	0.090875*	0.1895*	5.7099*	6.67*	1.7841*	3.2583
		K-40	Bq/kg	4	4	4	-3.6*	-3.4155*	-2.05*	3.7525*	4.72*	-0.745*	3.7251
	Other	Hydrazine	µg/L	4	4	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0
		Morpholine	µg/L	4	4	4	0*	0*	0*	0.85*	1*	0.25*	0.5
		Bromoform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Chloroform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		4-Bromofluorobenzene	%	8	0	0	91	92.05	97	100	100	96.75	3.1053

Table D-3: 2019 Surface Water Sampling Results - Statistics (Calculated with Uncensored Values Where Possible)

Location	Category	Parameter	Units	Total N	N (<RDL)	N (<RDL and uncensored)	Minimum	5th Percentile	50th Percentile	95th Percentile	Maximum	Arithmetic Mean	StdDev
DNGS-Far-M	Conventional Characteristics	Alkalinity (Total as CaCO3)	mg/L	4	0	0	93	93.15	94.5	96.7	97	94.75	1.7078
		Conductivity	umho/cm	4	0	0	310	310	315	320	320	315	5.7735
		Field pH	pH	4	0	0	8.28	8.301	8.42	8.471	8.48	8.4	0.084853
		Field Sp. Conductance	µS/cm	4	0	0	277	277.75	283.5	302.85	306	287.5	12.767
		pH	pH	4	0	0	8.15	8.162	8.255	8.382	8.4	8.265	0.10472
		Field Temperature	Celsius	4	0	0	3.63	3.705	7.68	18.77	20.1	9.7725	7.7104
		Total Hardness (CaCO3)	mg/L	4	0	0	113	113.9	121	123.85	124	119.75	4.9917
		Dissolved Oxygen	mg/L	4	0	0	8.43	8.6415	10.565	11.792	11.88	10.36	1.546
		Turbidity	NTU	4	1	1	0.01*	0.0385*	0.2	0.37	0.4	0.2025*	0.15924
		Total Suspended Solids	mg/L	4	3	3	0.2*	0.32*	<1	2.7*	3*	1.3*	1.1944
		Total Residual Chlorine	mg/L	4	3	0	<0.0012	<0.0012	<0.0012	<0.01293	0.015	<0.00465	0.0069
	Nutrients	Nitrate (N)	mg/L	4	0	0	0.19	0.2035	0.315	0.3925	0.4	0.305	0.091104
		Nitrite (N)	mg/L	4	4	4	-0.0042*	-0.0035513*	0.0010623*	0.00506*	0.0056*	0.00088114*	0.0040788
		Total Ammonia-N	mg/L	4	1	0	<0.01	<0.0115	0.0395	0.17885	0.2	<0.07225	0.087751
		Total Un-ionized Ammonia	mg/L	4	1	1	0.00047*	0.0006245*	0.0015	0.019775	0.023	0.0066175*	0.010932
		Total Kjeldahl Nitrogen (TKN)	mg/L	4	0	0	0.11	0.119	0.175	0.3585	0.39	0.2125	0.1223
		Total Phosphorus	mg/L	4	4	4	0.0013*	0.001555*	0.0035*	0.013265*	0.0149*	0.0058*	0.0061682
		Orthophosphate (P)	mg/L	4	4	4	0.00415*	0.004213*	0.00499*	0.0059115*	0.006*	0.0050325*	0.00083092
	Biological	Chlorophyll	µg/L	4	0	0	1.25	1.265	1.355	1.7255	1.79	1.4375	0.24019
		Total BOD	mg/L	4	3	1	2*	<2	<2	<2	2*	2*	0
		Total Chemical Oxygen Demand (COD)	mg/L	4	1	1	3.48*	3.573*	6.45	9.48	9.6	6.495*	3.1507
		Dissolved Organic Carbon	mg/L	4	0	0	1.9	1.915	2	2	2	1.975	0.05
		Escherichia coli	CFU/100mL	4	3	0	0	<1.5	<10	<10	<10	<7.5	5
		Fecal coliform	CFU/100mL	4	3	0	0	<1.5	<10	<10	<10	<7.5	5
		Total Coliforms	CFU/100mL	4	2	0	1	<2.35	<10	<18.5	20	<10.25	7.7621
	Metals	Dissolved (0.2u) Aluminum (Al)	µg/L	4	4	4	2.289*	2.3957*	3.1445*	3.72*	3.796*	3.0935*	0.6292
		Total Aluminum (Al)	µg/L	4	1	1	0.71	0.722	0.795	1.5149*	1.641*	0.98525*	0.43902
		Total Antimony (Sb)	µg/L	4	1	1	0.112	0.1138*	0.1265*	0.14345	0.146	0.12775*	0.014104
		Total Arsenic (As)	µg/L	4	0	0	0.761	0.7634	0.7815	0.7979	0.8	0.781	0.01635
		Total Barium (Ba)	µg/L	4	0	0	21	21.06	21.55	23.4	23.7	21.95	1.2014
		Total Beryllium (Be)	µg/L	4	4	4	-0.004*	-0.00355*	-0.0009*	0.00158*	0.002*	-0.00095*	0.0024515
		Total Bismuth (Bi)	µg/L	4	4	4	-0.0013*	-0.00121*	-0.00035*	0.00017*	0.0002*	-0.00045*	0.00068557
		Total Boron (B)	µg/L	4	1	1	21.126*	21.257*	23	24	24	22.782*	1.4515
		Total Cadmium (Cd)	µg/L	4	4	4	0.0009*	0.001005*	0.0023*	0.00385*	0.004*	0.002375*	0.0013913
		Total Calcium (Ca)	µg/L	4	0	0	32300	32525	33900	35445	35700	33950	1391.64
		Total Cesium (Cs)	µg/L	4	4	4	-0.001*	-0.000985*	0.00055*	0.00285*	0.003*	0.000775*	0.0020337
		Total Chromium (Cr)	µg/L	4	3	3	-0.534*	-0.4494*	0.05255*	0.15577*	0.17	-0.064725*	0.31824
		Chromium (VI)	µg/L	4	4	4	0.1994*	0.20056*	0.20855*	0.28123*	0.2938*	0.22758*	0.044376
		Chromium (+3)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Total Cobalt (Co)	µg/L	4	2	2	-0.01*	-0.007765*	0.0062*	0.009625	0.01	0.0031*	0.0089781
		Total Copper (Cu)	µg/L	4	0	0	0.52	0.53185	0.6035	0.62075	0.623	0.5875	0.046076
		Total Iron (Fe)	µg/L	4	2	2	0.6*	0.65445*	1.0815*	1.625	1.7	1.1158*	0.46108
		Total Lead (Pb)	µg/L	4	3	3	0.0025*	0.00271*	0.0046*	0.007595*	0.008*	0.004925*	0.0023472
		Total Lithium (Li)	µg/L	4	0	0	1.85	1.8605	2.01	2.2105	2.23	2.025	0.17253
		Total Magnesium (Mg)	µg/L	4	0	0	7920	8013	8540	9160.5	9270	8567.5	552.05
		Total Manganese (Mn)	µg/L	4	1	1	0.101	0.1115*	0.2055*	0.36325	0.385	0.22425*	0.12126
		Mercury (Hg)	µg/L	4	4	4	0*	0.000105*	0.00085*	0.001765*	0.0019*	0.0009*	0.0007874
		Total Molybdenum (Mo)	µg/L	4	0	0	1.16	1.163	1.19	1.2	1.2	1.185	0.019149
		Total Nickel (Ni)	µg/L	4	1	1	-0.359*	-0.2366*	0.467	0.4787	0.479	0.2635*	0.41512
		Total Potassium (K)	µg/L	4	0	0	1540	1540	1585	1647	1650	1590	58.31
		Total Selenium (Se)	µg/L	4	0	0	0.118	0.1195	0.1325	0.15655	0.16	0.13575	0.017933
		Total Silicon (Si)	µg/L	3	0	0	186	200.1	327	562.8	589	367.33	204.51
		Total Silver (Ag)	µg/L	4	4	4	-0.0029*	-0.00266*	-0.00015*	0.001935*	0.0021*	-0.000275*	0.0022515
		Total Sodium (Na)	µg/L	4	0	0	13700	13745	14450	15325	15400	14500	787.4
		Total Strontium (Sr)	µg/L	4	0	0	178	178.9	184	201.85	205	187.75	11.843
		Total Thallium (Tl)	µg/L	4	1	1	0.0035	0.00368	0.00485*	0.005085*	0.0051	0.004575*	0.00073655
		Total Thorium (Th)	µg/L	4	4	4	-0.0025*	-0.001975*	0.00105*	0.001695*	0.0018*	0.00035*	0.001933
		Total Tin (Sn)	µg/L	4	4	4	-0.004*	-0.003745*	0.00045*	0.027595*	0.0319*	0.0072*	0.016751
		Total Titanium (Ti)	µg/L	4	4	4	-0.18*	-0.16665*	-0.0783*	0.12463*	0.1582*	-0.0446*	0.14382
		Total Tungsten (W)	µg/L	4	1	1	0.087	0.0876	0.096*	0.10355*	0.104	0.09575*	0.0080571
		Total Uranium (U)	µg/L	4	0	0	0.34	0.3433	0.365	0.36885	0.369	0.35975	0.013525
		Total Vanadium (V)	µg/L	4	4	4	0.03*	0.0498*	0.16865*	0.18865*	0.191*	0.13958*	0.074005
		Total Zinc (Zn)	µg/L	4	1	1	0.27	0.282	0.421*	0.9918*	1.08	0.548*	0.36636
		Dissolved Zinc (Zn)	µg/L	4	4	4	0.281*	0.32885*	0.7985*	3.0311*	3.39*	1.317*	1.4127
		Total Zirconium (Zr)	µg/L	4	4	4	0*	0.00075*	0.00645*	0.013425*	0.0144*	0.006825*	0.0060124
	Hydrocarbons	F1 (C6-C10)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F2 (C10-C16 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F3 (C16-C34 Hydrocarbons)	µg/L	4	4	4	28.787*	33.61*	64.315*	129.15*	140*	74.354*	46.94
		F4 (C34-C50 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Benzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Ethylbenzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromodichloromethane	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
	Radionuclides	C-14	Bq/kg	4	3	4	-0.06*	-0.057*	-0.005*	0.081*	0.09	0.005*	0.068557
		Co-60	Bq/kg	4	4	4	-0.208*	-0.17714*	0.010115*	0.15043*	0.173*	-0.0036925*	0.15668
		Cs-134	Bq/kg	4	4	4	-0.032*	-0.00395*	0.206*	0.29355*	0.3*	0.17*	0.14776
		Cs-137	Bq/kg	4	4	4	0.059*	0.06041*	0.1032*	0.24085*	0.259*	0.1311*	0.09226
		H-3	Bq/kg	4	4	4	-5.3*	-4.505*	0*	8.84*	10.4*	1.275*	6.5764
		I-131	Bq/kg	4	4	4	-0.106*	-0.05665*	0.246*	17.295*	20.3*	5.1715*	10.087
		K-40	Bq/kg	4	4	4	-1.93*	-1.9255*	-1.0685*	0.48465*	0.612*	-0.86375*	1.2625
	Other	Hydrazine	µg/L	4	4	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0
		Morpholine	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromoform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Chloroform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		4-Bromofluorobenzene	%	8	0	0	91	91	97.5	101	101	96.875	4.051

Table D-3: 2019 Surface Water Sampling Results - Statistics (Calculated with Uncensored Values Where Possible)

Location	Category	Parameter	Units	Total N	N (<RDL)	N (<RDL and uncensored)	Minimum	5th Percentile	50th Percentile	95th Percentile	Maximum	Arithmetic Mean	StdDev
DNGS-Far-S	Conventional Characteristics	Alkalinity (Total as CaCO3)	mg/L	4	0	0	92	92.15	94.5	96.85	97	94.5	2.3805
		Conductivity	umho/cm	4	0	0	310	310	310	318.5	320	312.5	5
		Field pH	pH	4	0	0	8.28	8.301	8.42	8.5135	8.53	8.4125	0.10243
		Field Sp. Conductance	µS/cm	4	0	0	279	279.45	284.5	308.25	312	290	15.033
		pH	pH	4	0	0	8.18	8.189	8.24	8.359	8.38	8.26	0.084853
		Field Temperature	Celsius	4	0	0	3.75	3.81	9.1	19.193	20.1	10.513	7.9718
		Total Hardness (CaCO3)	mg/L	4	0	0	116	116.3	121	124.85	125	120.75	4.4253
		Dissolved Oxygen	mg/L	3	0	0	7.17	7.538	10.85	11.219	11.26	9.76	2.2524
		Turbidity	NTU	4	1	1	0.0443*	0.067655*	0.2	0.37	0.4	0.21108*	0.14578
		Total Suspended Solids	mg/L	4	4	4	0*	0.09*	0.7*	3.52*	4*	1.35*	1.7991
		Total Residual Chlorine	mg/L	4	3	0	<0.0012	<0.0012	<0.0012	<0.01208	0.014	<0.0044	0.0064
	Nutrients	Nitrate (N)	mg/L	4	0	0	0.19	0.2035	0.315	0.3925	0.4	0.305	0.091104
		Nitrite (N)	mg/L	4	4	4	-0.005*	-0.0041958*	0.0011805*	0.004295*	0.0047*	0.00051526*	0.0040889
		Total Ammonia-N	mg/L	4	1	2	-0.0008*	0.00082*	0.025	0.091	0.1	0.0373*	0.045223
		Total Un-ionized Ammonia	mg/L	4	1	1	0*	0.00021*	0.00145	0.009575	0.011	0.003475*	0.0050632
		Total Kjeldahl Nitrogen (TKN)	mg/L	4	1	1	0.06*	0.0735*	0.15	0.303	0.33	0.1725*	0.11325
		Total Phosphorus	mg/L	4	4	4	-0.0003*	0.000195*	0.00525*	0.013875*	0.015*	0.0063*	0.0066227
		Orthophosphate (P)	mg/L	4	4	4	0.00436*	0.004396*	0.004825*	0.0058575*	0.006*	0.0050025*	0.0007239
	Biological	Chlorophyll	µg/L	4	0	0	0.94	1	1.44	1.744	1.78	1.4	0.35553
		Total BOD	mg/L	4	3	1	2*	<2	<2	<2	2*	2*	0
		Total Chemical Oxygen Demand (COD)	mg/L	4	2	2	2.44*	2.5495*	4.735*	6.725	6.8	4.6775*	2.1921
		Dissolved Organic Carbon	mg/L	4	0	0	1.8	1.815	1.95	2	2	1.925	0.095743
		Escherichia coli	CFU/100mL	4	3	0	0	<1.5	<10	<10	<10	<7.5	5
		Fecal coliform	CFU/100mL	4	3	0	0	<1.5	<10	<10	<10	<7.5	5
		Total Coliforms	CFU/100mL	4	2	0	1	<2.35	<10	<27	30	<12.75	12.258
	Metals	Dissolved (0.2u) Aluminum (Al)	µg/L	4	4	4	1.37*	1.4701*	2.1745*	2.8968*	3*	2.1798*	0.67488
		Total Aluminum (Al)	µg/L	4	1	1	0.56	0.566	0.76	2.5435*	2.83*	1.2275*	1.0804
		Total Antimony (Sb)	µg/L	4	1	1	0.115*	0.1174*	0.131	0.1497	0.153	0.1325*	0.01561
		Total Arsenic (As)	µg/L	4	0	0	0.759	0.7596	0.7775	0.8328	0.84	0.7885	0.03735
		Total Barium (Ba)	µg/L	4	0	0	21.4	21.415	21.55	23.385	23.7	22.05	1.103
		Total Beryllium (Be)	µg/L	4	4	4	-0.004*	-0.00355*	-0.00075*	0.000775*	0.001*	-0.001125*	0.0020966
		Total Bismuth (Bi)	µg/L	4	4	4	-0.0012*	-0.001065*	-0.00015*	0.000255*	0.0003*	-0.0003*	0.00064807
		Total Boron (B)	µg/L	4	1	1	21.149*	21.277*	23	24	24	22.787*	1.4428
		Total Cadmium (Cd)	µg/L	4	4	4	0.0011*	0.00119*	0.00235*	0.00436*	0.0046*	0.0026*	0.0015513
		Total Calcium (Ca)	µg/L	4	0	0	32500	32665	34050	35350	35500	34025	1279.
		Total Cesium (Cs)	µg/L	4	4	4	-0.001*	-0.00085*	0.001*	0.00285*	0.003*	0.001*	0.0018257
		Total Chromium (Cr)	µg/L	4	3	3	-0.402*	-0.3372*	0.0445*	0.11085*	0.12	-0.04825*	0.2388
		Chromium (VI)	µg/L	4	4	4	0.22*	0.22681*	0.26715*	0.27502*	0.2761*	0.2576*	0.025459
		Chromium (+3)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Total Cobalt (Co)	µg/L	4	1	1	-0.01*	-0.00769*	0.00685	0.008555	0.0086	0.003075*	0.0088353
		Total Copper (Cu)	µg/L	4	0	0	0.594	0.5958	0.613	0.62085	0.621	0.61025	0.012816
		Total Iron (Fe)	µg/L	4	4	4	-0.096*	-0.070905*	0.33565*	0.8414*	0.884*	0.36483*	0.45584
		Total Lead (Pb)	µg/L	4	4	4	0.0013*	0.00157*	0.00355*	0.0091*	0.01*	0.0046*	0.0037709
		Total Lithium (Li)	µg/L	4	0	0	1.85	1.862	2.015	2.1935	2.21	2.0225	0.16276
		Total Magnesium (Mg)	µg/L	4	0	0	8320	8347	8595	9225.5	9320	8707.5	435.38
		Total Manganese (Mn)	µg/L	4	1	1	0.112	0.1264*	0.227*	0.37095	0.393	0.23975*	0.11669
		Mercury (Hg)	µg/L	4	4	4	-0.0003*	-0.000195*	0.001*	0.002365*	0.0025*	0.00105*	0.001245
		Total Molybdenum (Mo)	µg/L	4	0	0	1.1	1.109	1.165	1.1955	1.2	1.1575	0.041932
		Total Nickel (Ni)	µg/L	4	1	1	-0.316*	-0.2017*	0.47	0.49825	0.499	0.28075*	0.39855
		Total Potassium (K)	µg/L	4	0	0	1550	1563.5	1640	1665.5	1670	1625	51.962
		Total Selenium (Se)	µg/L	4	0	0	0.13	0.1306	0.1355	0.14125	0.142	0.13575	0.005058
		Total Silicon (Si)	µg/L	3	0	0	182	195.1	313	549.7	576	357	200.65
		Total Silver (Ag)	µg/L	4	4	4	-0.0021*	-0.00198*	-0.0004*	0.000925*	0.001*	-0.000475*	0.001466
		Total Sodium (Na)	µg/L	4	0	0	13800	13965	15000	15610	15700	14875	793.2
		Total Strontium (Sr)	µg/L	4	0	0	173	174.05	185	201.9	204	186.75	13.451
		Total Thallium (Tl)	µg/L	4	1	1	0.0034	0.003685	0.0053	0.005895*	0.006*	0.005*	0.0011165
		Total Thorium (Th)	µg/L	4	4	4	-0.0019*	-0.00139*	0.00175*	0.00251*	0.0026*	0.00105*	0.0020174
		Total Tin (Sn)	µg/L	4	4	4	-0.0008*	-0.00053*	0.00215*	0.11312*	0.1325*	0.034*	0.065688
		Total Titanium (Ti)	µg/L	4	4	4	-0.17*	-0.16738*	-0.08525*	0.070825*	0.0865*	-0.0635*	0.12088
		Total Tungsten (W)	µg/L	4	1	1	0.091	0.0919	0.101	0.1067*	0.107*	0.1*	0.0073937
		Total Uranium (U)	µg/L	4	0	0	0.34	0.34255	0.3615	0.36855	0.369	0.358	0.013038
		Total Vanadium (V)	µg/L	4	4	4	0.02*	0.04085*	0.1616*	0.1886*	0.1929*	0.13403*	0.077465
		Total Zinc (Zn)	µg/L	4	1	1	0.19	0.217	0.615	1.0717*	1.109*	0.63225*	0.42564
		Dissolved Zinc (Zn)	µg/L	4	4	4	0.4*	0.4168*	0.7875*	1.6759*	1.784*	0.93975*	0.63305
		Total Zirconium (Zr)	µg/L	4	4	4	0.001*	0.001855*	0.00785*	0.00985*	0.01*	0.006675*	0.0040277
	Hydrocarbons	F1 (C6-C10)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F2 (C10-C16 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F3 (C16-C34 Hydrocarbons)	µg/L	4	4	4	47.805*	48.134*	77.379*	160.26*	170.06*	93.155*	57.641
		F4 (C34-C50 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Benzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Ethylbenzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromodichloromethane	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
	Radionuclides	C-14	Bq/kg	4	3	3	-0.01*	-0.004*	0.03*	0.098*	0.11	0.04*	0.050332
		Co-60	Bq/kg	4	4	4	-0.209*	-0.18974*	-0.0258*	0.0936*	0.105*	-0.0389*	0.13661
		Cs-134	Bq/kg	4	4	4	-0.0228*	-0.01038*	0.06975*	0.08052*	0.0807*	0.04935*	0.049027
		Cs-137	Bq/kg	4	4	4	0.009*	0.015405*	0.05425*	0.11477*	0.125*	0.060625*	0.047971
		H-3	Bq/kg	4	3	3	-5.3*	-5.2985*	-0.395*	13.765*	15.4	2.3275*	9.8626
		I-131	Bq/kg	4	4	4	0.108*	0.15*	0.486*	6.9896*	8.12*	2.3*	3.8849
		K-40	Bq/kg	4	4	4	-1.96*	-1.921*	-1.445*	0.2618*	0.518*	-1.083*	1.1142
	Other	Hydrazine	µg/L	4	4	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0
		Morpholine	µg/L	4	4	4	0*	0*	0*	1.7*	2*	0.5*	1
		Bromoform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Chloroform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		4-Bromofluorobenzene	%	8	0	0	91	92.05	97	100.95	102	96.875	3.3568

Table D-3: 2019 Surface Water Sampling Results - Statistics (Calculated with Uncensored Values Where Possible)

Location	Category	Parameter	Units	Total N	N (<RDL)	N (<RDL and uncensored)	Minimum	5^{th} Percentile	50^{th} Percentile	95^{th} Percentile	Maximum	Arithmetic Mean	StdDev
DNGS-Mid-B	Conventional Characteristics	Alkalinity (Total as CaCO3)	mg/L	4	0	0	93	93	95	99.55	100	95.75	3.4034
		Conductivity	umho/cm	4	0	0	310	310	335	377	380	340	35.59
		Field pH	pH	4	0	0	8.17	8.206	8.45	8.609	8.63	8.425	0.19279
		Field Sp. Conductance	µS/cm	4	0	0	278	283.4	314.5	328.6	331	309.5	22.398
		pH	pH	4	0	0	8.16	8.178	8.295	8.395	8.41	8.29	0.10296
		Field Temperature	Celsius	4	0	0	2.52	2.892	7.24	18.592	20.2	9.3	7.8167
		Total Hardness (CaCO3)	mg/L	4	0	0	115	115.75	122	130.8	132	122.75	7.1822
		Dissolved Oxygen	mg/L	4	0	0	9.31	9.727	12.535	14.621	14.91	12.323	2.3279
		Turbidity	NTU	4	0	1	0.1	0.13	0.4	1.35	1.5	0.6	0.62183
		Total Suspended Solids	mg/L	4	3	3	0*	0*	1*	2	2*	1*	1.1547
		Total Residual Chlorine	mg/L	4	2	0	<0.0012	<0.0012	<0.0061	0.0127	0.013	<0.0066	0.0062886
	Nutrients	Nitrate (N)	mg/L	4	0	0	0.14	0.164	0.395	0.541	0.55	0.37	0.18673
		Nitrite (N)	mg/L	4	4	4	-0.0021*	-0.001425*	0.0029*	0.00391*	0.004*	0.001925*	0.0027633
		Total Ammonia-N	mg/L	4	1	1	0.02	0.020141*	0.02547*	0.0725	0.08	0.037735*	0.028535
		Total Un-ionized Ammonia	mg/L	4	1	1	0*	0.000093*	0.00096	0.012095	0.014	0.00398*	0.0067011
		Total Kjeldahl Nitrogen (TKN)	mg/L	4	0	0	0.16	0.163	0.21	0.444	0.48	0.265	0.14731
		Total Phosphorus	mg/L	4	3	3	-0.0017*	-0.000545*	0.0114*	0.02292*	0.024	0.011275*	0.011382
		Orthophosphate (P)	mg/L	4	4	4	0.00383*	0.003878*	0.004725*	0.007595*	0.008*	0.00532*	0.0018949
	Biological	Chlorophyll	µg/L	4	0	0	0.83	0.893	1.51	2.6795	2.84	1.6725	0.86812
		Total BOD	mg/L	4	3	1	2*	<2	<2	<2	2*	2*	0
		Total Chemical Oxygen Demand (COD)	mg/L	4	2	2	-1.38*	-1.149*	2.93*	8.675	9.2	3.42*	4.9083
		Dissolved Organic Carbon	mg/L	4	0	0	2	2	2.1	2.2	2.2	2.1	0.11547
		Escherichia coli	CFU/100mL	4	2	1	1	<2.35	<10	<10	10*	7.75*	4.5
		Fecal coliform	CFU/100mL	4	2	1	2	<3.2	<10	<10	10*	8*	4
		Total Coliforms	CFU/100mL	4	2	1	10*	<10	<10	<54.2	62	23*	26
	Metals	Dissolved (0.2u) Aluminum (Al)	µg/L	4	4	4	1.299*	1.5017*	2.825*	3.5619*	3.661*	2.6525*	0.99495
		Total Aluminum (Al)	µg/L	4	0	0	1.02	1.0365	1.155	37.577	44	11.833	21.445
		Total Antimony (Sb)	µg/L	4	1	1	0.118	0.11995*	0.1315*	0.1422	0.144	0.13125*	0.010626
		Total Arsenic (As)	µg/L	4	0	0	0.68	0.6881	0.742	0.75085	0.751	0.72875	0.03342
		Total Barium (Ba)	µg/L	4	0	0	20.7	20.82	22.3	23.44	23.5	22.2	1.3216
		Total Beryllium (Be)	µg/L	4	4	4	-0.004*	-0.003565*	-0.0006*	0.001685*	0.002*	-0.0008*	0.002494
		Total Bismuth (Bi)	µg/L	4	4	4	-0.0008*	-0.000755*	-0.0003*	-0.000015*	0*	-0.00035*	0.00036968
		Total Boron (B)	µg/L	4	1	1	20	20.141*	21.469*	25.4	26	22.234*	2.6401
		Total Cadmium (Cd)	µg/L	4	4	4	0.0006*	0.00066*	0.0024*	0.00482*	0.005*	0.0026*	0.0021417
		Total Calcium (Ca)	µg/L	4	0	0	32600	32765	34100	38070	38700	34875	2666.3
		Total Cesium (Cs)	µg/L	4	4	4	-0.0009*	-0.000465*	0.00255*	0.003865*	0.004*	0.00205*	0.0021299
		Total Chromium (Cr)	µg/L	4	3	3	0.0731*	0.075635*	0.1*	0.2511*	0.276*	0.13728*	0.093705
		Chromium (VI)	µg/L	4	4	4	0.1834*	0.19339*	0.25545*	0.30604*	0.314*	0.25208*	0.053644
		Chromium (+3)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Total Cobalt (Co)	µg/L	4	2	2	0.0037*	0.004615*	0.01245	0.043065*	0.048*	0.01915*	0.019789
		Total Copper (Cu)	µg/L	4	0	0	0.584	0.5861	0.644	0.724	0.73	0.6505	0.07085
		Total Iron (Fe)	µg/L	4	2	2	0.1431*	0.26291*	1.1209*	38.445	45	11.846*	22.108
		Total Lead (Pb)	µg/L	4	4	4	0.0011*	0.00161*	0.0047*	0.045785*	0.053*	0.015875*	0.024809
		Total Lithium (Li)	µg/L	4	1	1	1.49	1.535	1.835*	2.0755*	2.11	1.8175*	0.25656
		Total Magnesium (Mg)	µg/L	4	0	0	8110	8176	8580	9018	9090	8590	401.
		Total Manganese (Mn)	µg/L	4	0	0	0.203	0.21215	0.538	3.1818	3.6	1.2198	1.6103
		Mercury (Hg)	µg/L	4	4	4	-0.0003*	-0.000285*	-0.0001*	0.001275*	0.0015*	0.00025*	0.00084262
		Total Molybdenum (Mo)	µg/L	4	0	0	1.1	1.112	1.185	1.2325	1.24	1.1775	0.057951
		Total Nickel (Ni)	µg/L	4	1	1	0.486	0.4875	0.5235*	0.602*	0.611	0.536*	0.057591
		Total Potassium (K)	µg/L	4	0	0	1510	1522	1655	1779.5	1790	1652.5	126.06
		Total Selenium (Se)	µg/L	4	0	0	0.127	0.1276	0.1355	0.1621	0.166	0.141	0.017531
		Total Silicon (Si)	µg/L	3	0	0	154	169.7	311	457.7	474	313	160.01
		Total Silver (Ag)	µg/L	4	4	4	-0.001*	-0.00088*	-0.0001*	0.000765*	0.0009*	-0.000075*	0.00078049
		Total Sodium (Na)	µg/L	4	0	0	13000	13195	16850	21865	22300	17250	4354.69
		Total Strontium (Sr)	µg/L	4	0	0	176	176.45	182	192.65	194	183.5	7.9373
		Total Thallium (Tl)	µg/L	4	1	1	0.003	0.0033*	0.0052*	0.005485	0.0055	0.004725*	0.0011701
		Total Thorium (Th)	µg/L	4	4	4	0.0005*	0.00062*	0.00145*	0.00364*	0.004*	0.00185*	0.0015067
		Total Tin (Sn)	µg/L	4	4	4	0.011*	0.01157*	0.03565*	0.11048*	0.12*	0.050575*	0.050665
		Total Titanium (Ti)	µg/L	4	4	4	-0.1*	-0.0802*	0.041*	1.6174*	1.894*	0.469*	0.95235
		Total Tungsten (W)	µg/L	4	1	1	0.095	0.09545	0.0985*	0.10835*	0.11	0.1005*	0.0065574
		Total Uranium (U)	µg/L	4	0	0	0.35	0.35285	0.3775	0.3979	0.4	0.37625	0.021608
		Total Vanadium (V)	µg/L	4	3	3	0.12*	0.13113*	0.2111*	0.2552*	0.26	0.20055*	0.060046
		Total Zinc (Zn)	µg/L	4	1	1	0.68	0.6815	0.73	0.9009*	0.924*	0.766*	0.11277
		Dissolved Zinc (Zn)	µg/L	4	4	4	0.528*	0.5487*	0.833*	1.8653*	2.018*	1.053*	0.67316
		Total Zirconium (Zr)	µg/L	4	3	3	-0.001*	-0.00025*	0.007*	0.2905*	0.34	0.08825*	0.16789
	Hydrocarbons	F1 (C6-C10)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F2 (C10-C16 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F3 (C16-C34 Hydrocarbons)	µg/L	4	4	4	29.217*	29.334*	48.469*	111.19*	119.*	61.289*	42.309
		F4 (C34-C50 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Benzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Ethylbenzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromodichloromethane	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
	Radionuclides	C-14	Bq/kg	4	4	4	0.01*	0.013*	0.04*	0.05*	0.05*	0.035*	0.019149
		Co-60	Bq/kg	4	4	4	-0.153*	-0.13989*	-0.05055*	-0.0087335*	-0.00401*	-0.064528*	0.064118
		Cs-134	Bq/kg	4	4	4	0.0428*	0.04478*	0.09*	0.30675*	0.339*	0.14045*	0.13706
		Cs-137	Bq/kg	4	4	4	0.0247*	0.02599*	0.09665*	0.1957*	0.202*	0.105*	0.089486
		H-3	Bq/kg	4	4	4	-10.3*	-8.755*	2.55*	7.905*	8.4*	0.8*	8.167
		I-131	Bq/kg	4	4	4	0.0537*	0.059445*	0.473*	3.2986*	3.73*	1.1824*	1.7379
		K-40	Bq/kg	4	4	4	-2.68*	-2.626*	-2.11*	-1.5685*	-1.51*	-2.1025*	0.50757
	Other	Hydrazine	µg/L	4	4	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0
		Morpholine	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromoform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Chloroform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		4-Bromofluorobenzene	%	8	0	0	97	97.35	99	105.55	108	100	3.4641

Table D-3: 2019 Surface Water Sampling Results - Statistics (Calculated with Uncensored Values Where Possible)

Location	Category	Parameter	Units	Total N	N (<RDL)	N (<RDL and uncensored)	Minimum	5th Percentile	50th Percentile	95th Percentile	Maximum	Arithmetic Mean	StdDev
DNGS-Mid-M	Conventional Characteristics	Alkalinity (Total as CaCO3)	mg/L	4	0	0	93	93.15	94	94.85	95	94	0.8165
		Conductivity	umho/cm	4	0	0	300	301.5	325	357	360	327.5	27.538
		Field pH	pH	4	0	0	8.15	8.1785	8.415	8.6175	8.64	8.405	0.20952
		Field Sp. Conductance	µS/cm	4	0	0	277	280.75	308.5	315	315	302.25	17.914
		pH	pH	4	0	0	8.02	8.0575	8.29	8.3695	8.38	8.245	0.15674
		Field Temperature	Celsius	4	0	0	2.54	2.879	8.115	18.97	20.3	9.7675	7.971
		Total Hardness (CaCO3)	mg/L	4	0	0	112	112.9	120	123.7	124	119	5.2915
		Dissolved Oxygen	mg/L	4	0	0	9.29	9.6035	12.34	14.567	14.79	12.19	2.3845
		Turbidity	NTU	4	1	2	0.0957*	0.096345*	0.25	0.655	0.7	0.32393*	0.28836
		Total Suspended Solids	mg/L	4	3	2	0*	0.09*	0.8*	<1.85	2	0.9*	0.84063
		Total Residual Chlorine	mg/L	4	3	0	<0.0012	<0.0012	<0.0012	<0.01633	0.019	<0.00565	0.0089
	Nutrients	Nitrate (N)	mg/L	4	0	0	0.14	0.1595	0.325	0.5245	0.55	0.335	0.17369
		Nitrite (N)	mg/L	4	4	4	-0.006*	-0.004935*	0.00165*	0.00458*	0.005*	0.000575*	0.0046807
		Total Ammonia-N	mg/L	4	1	1	0.03	0.0315	0.04121*	0.099863*	0.11	0.055605*	0.03666
		Total Un-ionized Ammonia	mg/L	4	2	2	0*	0.0000765*	0.001305*	0.017315	0.02	0.0056525*	0.0096067
		Total Kjeldahl Nitrogen (TKN)	mg/L	4	0	0	0.13	0.1315	0.2	0.447	0.48	0.2525	0.16276
		Total Phosphorus	mg/L	4	3	3	-0.0001*	0.000815*	0.01165*	0.022995*	0.024	0.0118*	0.010868
		Orthophosphate (P)	mg/L	4	4	4	0.00277*	0.0029815*	0.004705*	0.0075845*	0.008*	0.005045*	0.0022128
	Biological	Chlorophyll	µg/L	4	0	0	0.94	0.9415	1.285	2.215	2.32	1.4575	0.65718
		Total BOD	mg/L	4	3	1	2*	<2	<2	<2	2*	2*	0
		Total Chemical Oxygen Demand (COD)	mg/L	4	3	3	-3*	-2.0475*	3.415*	7.237*	7.9	2.9325*	4.485
		Dissolved Organic Carbon	mg/L	4	0	0	1.9	1.915	2	2.085	2.1	2	0.08165
		Escherichia coli	CFU/100mL	4	3	0	0	<1.5	<10	<10	<10	<7.5	5
		Fecal coliform	CFU/100mL	4	3	0	0	<1.5	<10	<10	<10	<7.5	5
		Total Coliforms	CFU/100mL	4	2	0	<10	<10	<13	36.4	40	<19	14.283
	Metals	Dissolved (0.2u) Aluminum (Al)	µg/L	4	4	4	1.64*	1.694*	2.1555*	3.5299*	3.745*	2.424*	0.92236
		Total Aluminum (Al)	µg/L	4	0	0	0.92	1.0175	1.605	5.176	5.8	2.4825	2.2353
		Total Antimony (Sb)	µg/L	4	1	1	0.114	0.11565*	0.1335*	0.15305	0.155	0.134*	0.018129
		Total Arsenic (As)	µg/L	4	0	0	0.743	0.74375	0.751	0.7846	0.79	0.75875	0.021313
		Total Barium (Ba)	µg/L	4	0	0	21.2	21.23	21.5	23.215	23.5	21.925	1.0626
		Total Beryllium (Be)	µg/L	4	4	4	-0.0051*	-0.004455*	-0.0006*	0.00079*	0.001*	-0.001325*	0.0026323
		Total Bismuth (Bi)	µg/L	4	4	4	-0.0013*	-0.00127*	-0.0006*	-0.000015*	0*	-0.000625*	0.0006702
		Total Boron (B)	µg/L	4	1	1	20	20.292*	21.974*	25.4	26	22.487*	2.5202
		Total Cadmium (Cd)	µg/L	4	4	4	0.0013*	0.0013*	0.00215*	0.004445*	0.0047*	0.002575*	0.0016276
		Total Calcium (Ca)	µg/L	4	0	0	3470	7689.5	32300	34445	34700	25692.5	14869.13
		Total Cesium (Cs)	µg/L	4	4	4	-0.0003*	0.000045*	0.002*	0.00285*	0.003*	0.001675*	0.0013985
		Total Chromium (Cr)	µg/L	4	4	4	0.0628*	0.06538*	0.0809*	0.23667*	0.264*	0.12215*	0.094954
		Chromium (VI)	µg/L	4	4	4	0.212*	0.21434*	0.2588*	0.31125*	0.315*	0.26115*	0.049239
		Chromium (+3)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Total Cobalt (Co)	µg/L	4	2	2	0.0048*	0.00558*	0.0108*	0.012365	0.0125	0.009725*	0.0034423
		Total Copper (Cu)	µg/L	4	0	0	0.59	0.59465	0.63	0.70615	0.718	0.642	0.054559
		Total Iron (Fe)	µg/L	4	3	3	0.6468*	0.68775*	0.9344*	1.2474*	1.3	0.9539*	0.26788
		Total Lead (Pb)	µg/L	4	3	3	0.0018*	0.002265*	0.00545*	0.006935*	0.0071	0.00495*	0.002284
		Total Lithium (Li)	µg/L	4	1	1	1.45	1.5085	1.8705*	2.0957*	2.13	1.8303*	0.28257
		Total Magnesium (Mg)	µg/L	4	0	0	8180	8219	8495	8898.5	8960	8532.5	324.49
		Total Manganese (Mn)	µg/L	4	1	1	0.19*	0.1966*	0.269	0.80465	0.893	0.40525*	0.32854
		Mercury (Hg)	µg/L	4	4	4	-0.0005*	-0.000425*	0.00005*	0.001885*	0.0022*	0.00045*	0.0011958
		Total Molybdenum (Mo)	µg/L	4	0	0	1.1	1.109	1.165	1.2295	1.24	1.1675	0.057373
		Total Nickel (Ni)	µg/L	4	1	1	0.474*	0.4752*	0.4925	0.54465	0.552	0.50275*	0.035037
		Total Potassium (K)	µg/L	4	0	0	1520	1529	1610	1708	1720	1615	85.44
		Total Selenium (Se)	µg/L	4	0	0	0.119	0.11945	0.126	0.14785	0.151	0.1305	0.014434
		Total Silicon (Si)	µg/L	3	0	0	153	167.7	300	458.4	476	309.67	161.72
		Total Silver (Ag)	µg/L	4	4	4	-0.001*	-0.000805*	0.0003*	0.00064*	0.0007*	0.000075*	0.00074106
		Total Sodium (Na)	µg/L	4	0	0	13100	13250	14450	20920	22000	16000	4060.38
		Total Strontium (Sr)	µg/L	4	0	0	174	174.3	180	190.8	192	181.5	8.226
		Total Thallium (Tl)	µg/L	4	1	1	0.0035	0.003725*	0.00505*	0.005355	0.0054	0.00475*	0.00085049
		Total Thorium (Th)	µg/L	4	4	4	-0.0005*	-0.000485*	0.00075*	0.001985*	0.002*	0.00075*	0.0013868
		Total Tin (Sn)	µg/L	4	4	4	0.011*	0.011375*	0.03175*	0.07822*	0.0832*	0.039425*	0.034196
		Total Titanium (Ti)	µg/L	4	4	4	-0.2472*	-0.21329*	0.00945*	0.2474*	0.284*	0.013925*	0.21835
		Total Tungsten (W)	µg/L	4	1	1	0.096	0.09645	0.102	0.12115*	0.124*	0.106*	0.01257
		Total Uranium (U)	µg/L	4	0	0	0.353	0.35405	0.3615	0.37745	0.38	0.364	0.01146
		Total Vanadium (V)	µg/L	4	3	3	0.1*	0.1087*	0.1664*	0.22172*	0.23	0.1657*	0.05352
		Total Zinc (Zn)	µg/L	4	1	1	0.37	0.373	0.4585*	0.54655*	0.55	0.45925*	0.092352
		Dissolved Zinc (Zn)	µg/L	4	3	3	0.5*	0.506*	1.292*	11.357*	13	4.021*	6.029
		Total Zirconium (Zr)	µg/L	4	4	4	-0.009*	-0.00723*	0.0064*	0.035925*	0.0405*	0.011075*	0.021122
	Hydrocarbons	F1 (C6-C10)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F2 (C10-C16 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F3 (C16-C34 Hydrocarbons)	µg/L	4	4	4	32*	33.419*	52.96*	116.4*	125.57*	65.873*	42.068
		F4 (C34-C50 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Benzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Ethylbenzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromodichloromethane	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
	Radionuclides	C-14	Bq/kg	4	4	4	-0.03*	-0.024*	0.025*	0.0655*	0.07*	0.0225*	0.04272
		Co-60	Bq/kg	4	4	4	-0.255*	-0.22901*	-0.0167*	0.19765*	0.224*	-0.0161*	0.20263
		Cs-134	Bq/kg	4	4	4	-0.136*	-0.10887*	0.04955*	0.18663*	0.21*	0.043275*	0.14149
		Cs-137	Bq/kg	4	4	4	0.0517*	0.055195*	0.098*	0.1397*	0.143*	0.097675*	0.041738
		H-3	Bq/kg	4	4	4	-10.6*	-9.01*	0*	8.84*	10.4*	-0.05*	8.5734
		I-131	Bq/kg	4	4	4	0.0354*	0.05634*	0.299*	9.1584*	10.7*	2.8334*	5.2469
		K-40	Bq/kg	4	4	4	-4.4*	-4.214*	-2.435*	1.6645*	2.26*	-1.7525*	2.8921
	Other	Hydrazine	µg/L	4	4	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0
		Morpholine	µg/L	4	4	4	0*	0*	0*	0.85*	1*	0.25*	0.5
		Bromoform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Chloroform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		4-Bromofluorobenzene	%	8	0	0	98	98.35	100	107.3	108	101.25	3.6547

Table D-3: 2019 Surface Water Sampling Results - Statistics (Calculated with Uncensored Values Where Possible)

Location	Category	Parameter	Units	Total N	N (<RDL)	N (<RDL and uncensored)	Minimum	5th Percentile	50th Percentile	95th Percentile	Maximum	Arithmetic Mean	StdDev
DNGS-Mid-S	Conventional Characteristics	Alkalinity (Total as CaCO3)	mg/L	4	0	0	93	93	94	95.85	96	94.25	1.5
		Conductivity	umho/cm	4	0	0	310	310	325	357	360	330	24.495
		Field pH	pH	4	0	0	8.16	8.208	8.5	8.6135	8.63	8.4475	0.20189
		Field Sp. Conductance	µS/cm	4	0	0	277	281.35	310.5	315.85	316	303.5	18.23
		pH	pH	4	0	0	8.11	8.137	8.3	8.3355	8.34	8.2625	0.10372
		Field Temperature	Celsius	4	0	0	2.54	2.972	8.51	19.012	20.32	9.97	7.8674
		Total Hardness (CaCO3)	mg/L	4	0	0	110	111.65	121.5	124.55	125	119.5	6.5574
		Dissolved Oxygen	mg/L	4	0	0	9.2	9.563	12.48	14.564	14.78	12.235	2.4005
		Turbidity	NTU	4	0	1	0.1	0.13	0.3	0.555	0.6	0.325	0.20616
		Total Suspended Solids	mg/L	4	3	3	0*	0.12*	0.9*	1.85*	2	0.95*	0.8226
		Total Residual Chlorine	mg/L	4	3	0	<0.0012	<0.0012	<0.0012	<0.00868	0.01	<0.0034	0.0044
	Nutrients	Nitrate (N)	mg/L	4	0	0	0.14	0.1595	0.335	0.519	0.54	0.3375	0.17173
		Nitrite (N)	mg/L	4	3	3	0.0021*	0.00213*	0.00515*	0.01055*	0.011	0.00585*	0.0043898
		Total Ammonia-N	mg/L	3	1	2	0.00704*	0.011336*	0.05	0.086	0.09	0.049013*	0.041489
		Total Un-ionized Ammonia	mg/L	4	1	1	0*	0.00033*	0.0066	0.01525	0.016	0.0073*	0.0074984
		Total Kjeldahl Nitrogen (TKN)	mg/L	3	0	0	0.14	0.144	0.18	0.216	0.22	0.18	0.04
		Total Phosphorus	mg/L	4	3	3	0.0011*	0.001295*	0.0052*	0.0199*	0.022	0.008375*	0.009564
		Orthophosphate (P)	mg/L	4	4	4	0.00279*	0.003045*	0.004855*	0.007583*	0.008*	0.005125*	0.0021703
	Biological	Chlorophyll	µg/L	4	0	0	0.98	0.9965	1.385	2.5895	2.75	1.625	0.81053
		Total BOD	mg/L	4	3	1	2*	<2	<2	<2	2*	2*	0
		Total Chemical Oxygen Demand (COD)	mg/L	4	3	3	2.64*	2.661*	2.99*	6.6*	7.2	3.955*	2.1764
		Dissolved Organic Carbon	mg/L	4	0	0	2	2	2.05	2.1	2.1	2.05	0.057735
		Escherichia coli	CFU/100mL	4	3	0	3	<4.05	<10	<10	<10	<8.25	3.5
		Fecal coliform	CFU/100mL	4	3	0	3	<4.05	<10	<10	<10	<8.25	3.5
		Total Coliforms	CFU/100mL	4	2	0	<10	<10	<25	49.35	51	<27.75	20.982
	Metals	Dissolved (0.2u) Aluminum (Al)	µg/L	4	4	4	2.498*	2.5528*	2.9315*	3.6443*	3.758*	3.0298*	0.52972
		Total Aluminum (Al)	µg/L	4	1	1	1.03	1.0644*	1.3546*	14.668	17	5.1848*	7.8787
		Total Antimony (Sb)	µg/L	4	1	1	0.114	0.11775	0.1465	0.15995*	0.161*	0.142*	0.020801
		Total Arsenic (As)	µg/L	4	0	0	0.724	0.7264	0.743	0.79275	0.801	0.75275	0.03348
		Total Barium (Ba)	µg/L	4	0	0	20.4	20.625	21.95	23.02	23.2	21.875	1.1471
		Total Beryllium (Be)	µg/L	4	4	4	-0.0046*	-0.00394*	-0.00005*	0.000865*	0.001*	-0.000925*	0.0025025
		Total Bismuth (Bi)	µg/L	4	4	4	-0.0005*	-0.000485*	0*	0.00091*	0.001*	0.000125*	0.00070887
		Total Boron (B)	µg/L	4	1	1	19	19.6	23.102*	25.581*	26	22.801*	2.88
		Total Cadmium (Cd)	µg/L	4	4	4	0.0009*	0.00102*	0.00285*	0.004255*	0.0043*	0.002725*	0.001682
		Total Calcium (Ca)	µg/L	4	0	0	30800	31265	34050	35730	36000	33725	2159.28
		Total Cesium (Cs)	µg/L	4	4	4	-0.0008*	-0.00038*	0.0023*	0.00294*	0.003*	0.0017*	0.0017166
		Total Chromium (Cr)	µg/L	4	4	4	0.0718*	0.072415*	0.08295*	0.4793*	0.548*	0.19643*	0.23451
		Chromium (VI)	µg/L	4	4	4	0.1987*	0.20188*	0.23995*	0.311*	0.32*	0.24965*	0.053345
		Chromium (+3)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Total Cobalt (Co)	µg/L	4	2	2	0.0062*	0.006815*	0.01285	0.01591*	0.016*	0.011975*	0.004622
		Total Copper (Cu)	µg/L	4	0	0	0.591	0.59535	0.64	0.69995	0.707	0.6445	0.050362
		Total Iron (Fe)	µg/L	4	3	2	0.3753*	0.39822*	0.76405*	<12.05	14	3.9759*	6.6881
		Total Lead (Pb)	µg/L	4	3	3	0.0016*	0.002095*	0.0054*	0.016185*	0.018*	0.0076*	0.0071726
		Total Lithium (Li)	µg/L	4	1	1	1.42	1.4845	1.8835*	2.0726*	2.1	1.8218*	0.28792
		Total Magnesium (Mg)	µg/L	4	0	0	8080	8138.5	8620	8957	8990	8577.5	394.24
		Total Manganese (Mn)	µg/L	4	1	1	0.187	0.19645	0.5535	0.9233*	0.935*	0.55725*	0.39329
		Mercury (Hg)	µg/L	4	4	4	-0.0008*	-0.00071*	0.00005*	0.00047*	0.0005*	-0.00005*	0.00058023
		Total Molybdenum (Mo)	µg/L	4	0	0	1.1	1.106	1.17	1.251	1.26	1.175	0.07
		Total Nickel (Ni)	µg/L	4	1	1	0.473	0.48005	0.5335*	0.5589*	0.561	0.52525*	0.038767
		Total Potassium (K)	µg/L	4	0	0	1510	1522	1665	1748.5	1750	1647.5	117.3
		Total Selenium (Se)	µg/L	4	0	0	0.124	0.12475	0.1345	0.1417	0.142	0.13345	0.0086554
		Total Silicon (Si)	µg/L	3	0	0	151	167.6	317	456.5	472	313.33	160.53
		Total Silver (Ag)	µg/L	4	4	4	-0.001*	-0.0007*	0.0013*	0.0016*	0.0016*	0.0008*	0.0012329
		Total Sodium (Na)	µg/L	4	0	0	12900	13110	15250	21470	22400	16450	4190.86
		Total Strontium (Sr)	µg/L	4	0	0	180	180.3	183	187.4	188	183.5	3.4157
		Total Thallium (Tl)	µg/L	4	1	1	0.0051	0.00516	0.00575*	0.00634*	0.0064	0.00575*	0.00056862
		Total Thorium (Th)	µg/L	4	4	4	0.0003*	0.00045*	0.00185*	0.00376*	0.004*	0.002*	0.0015854
		Total Tin (Sn)	µg/L	4	4	4	0.008*	0.0083*	0.0115*	0.03952*	0.0442*	0.0188*	0.017058
		Total Titanium (Ti)	µg/L	4	4	4	-0.0406*	-0.02551*	0.17315*	0.6711*	0.739*	0.26118*	0.34664
		Total Tungsten (W)	µg/L	4	1	1	0.097	0.09715	0.101	0.11335*	0.115*	0.1035*	0.0082664
		Total Uranium (U)	µg/L	4	0	0	0.357	0.3585	0.3725	0.3797	0.38	0.3705	0.010661
		Total Vanadium (V)	µg/L	4	3	3	0.13*	0.13885*	0.19105*	0.26697*	0.28	0.19803*	0.061787
		Total Zinc (Zn)	µg/L	4	2	2	0.4263*	0.43736*	0.52	0.82815*	0.879*	0.58633*	0.20072
		Dissolved Zinc (Zn)	µg/L	4	4	4	0.254*	0.27605*	0.5005*	1.7016*	1.896*	0.78775*	0.75231
		Total Zirconium (Zr)	µg/L	4	4	4	-0.0047*	-0.004595*	0.0019*	0.00967*	0.01*	0.002275*	0.0077077
	Hydrocarbons	F1 (C6-C10)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F2 (C10-C16 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F3 (C16-C34 Hydrocarbons)	µg/L	4	4	4	24.488*	26.965*	57.202*	126.42*	135.78*	68.668*	49.139
		F4 (C34-C50 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Benzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Ethylbenzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromodichloromethane	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
	Radionuclides	C-14	Bq/kg	4	4	4	-0.09*	-0.075*	0.02*	0.0725*	0.08*	0.0075*	0.071356
		Co-60	Bq/kg	4	4	4	-0.31*	-0.26359*	0.024596*	0.10947*	0.12*	-0.035202*	0.18976
		Cs-134	Bq/kg	4	4	4	-0.06*	-0.039675*	0.09375*	0.2055*	0.222*	0.087375*	0.11632
		Cs-137	Bq/kg	4	4	4	0.0588*	0.060195*	0.08655*	0.2019*	0.219*	0.11273*	0.073606
		H-3	Bq/kg	4	4	4	-10.6*	-9.01*	2.3*	9.02*	9.8*	0.95*	8.6785
		I-131	Bq/kg	4	4	4	0.143*	0.15425*	0.354*	7.2305*	8.42*	2.3178*	4.0709
		K-40	Bq/kg	4	4	4	-2*	-1.532*	1.71*	3.0225*	3.15*	1.1425*	2.2543
	Other	Hydrazine	µg/L	4	4	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0
		Morpholine	µg/L	4	4	4	0*	0*	0*	0.85*	1*	0.25*	0.5
		Bromoform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Chloroform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		4-Bromofluorobenzene	%	8	0	0	94	95.05	99	105.55	108	99.625	3.9978

Table D-3: 2019 Surface Water Sampling Results - Statistics (Calculated with Uncensored Values Where Possible)

Location	Category	Parameter	Units	Total N	N (<RDL)	N (<RDL and uncensored)	Minimum	5th Percentile	50th Percentile	95th Percentile	Maximum	Arithmetic Mean	StdDev
DNGS-Near-B	Conventional Characteristics	Alkalinity (Total as CaCO3)	mg/L	4	0	0	92	92.45	97.5	100	100	96.75	3.9476
		Conductivity	umho/cm	4	0	0	300	301.5	335	394	400	342.5	46.458
		Field pH	pH	4	0	0	8.17	8.197	8.395	8.5165	8.53	8.3725	0.1537
		Field Sp. Conductance	µS/cm	4	0	0	274	279.1	311	332.7	336	308	25.665
		pH	pH	4	0	0	8.18	8.1965	8.3	8.327	8.33	8.2775	0.06702
		Field Temperature	Celsius	4	0	0	2.01	2.43	7.155	18.264	19.81	9.0325	7.8213
		Total Hardness (CaCO3)	mg/L	4	0	0	113	113.6	123.5	131.7	132	123	9.4163
		Dissolved Oxygen	mg/L	4	0	0	9.18	9.627	12.74	14.621	14.85	12.378	2.3995
		Turbidity	NTU	4	0	0	0.5	0.845	3.2	3.94	4	2.725	1.565
		Total Suspended Solids	mg/L	4	1	2	1	1.75	6	7.7*	8*	5.25*	2.9861
		Total Residual Chlorine	mg/L	4	3	0	<0.0012	<0.0012	<0.0012	<0.01378	0.016	<0.0049	0.0074
	Nutrients	Nitrate (N)	mg/L	4	0	0	0.15	0.1665	0.35	0.559	0.58	0.3575	0.1905
		Nitrite (N)	mg/L	4	4	4	-0.0085*	-0.00697*	0.00255*	0.00374*	0.0038*	0.0001*	0.0058052
		Total Ammonia-N	mg/L	4	2	1	<0.01	<0.0115	0.02309*	0.15693*	0.18	0.059045*	0.080912
		Total Un-ionized Ammonia	mg/L	4	2	2	0*	0.0000375*	0.000725*	0.01548	0.018	0.0048625*	0.0087736
		Total Kjeldahl Nitrogen (TKN)	mg/L	4	0	0	0.12	0.1215	0.145	0.245	0.26	0.1675	0.063966
		Total Phosphorus	mg/L	4	4	4	0*	0.00099*	0.0113*	0.01702*	0.0172*	0.00995*	0.0081525
		Orthophosphate (P)	mg/L	4	4	4	0.00286*	0.0030565*	0.005085*	0.0063825*	0.00645*	0.00487*	0.0016637
	Biological	Chlorophyll	µg/L	5	0	0	0.39	0.526	1.17	2.456	2.55	1.452	0.85926
		Total BOD	mg/L	4	3	1	2*	<2	<2	<2	2*	2*	0
		Total Chemical Oxygen Demand (COD)	mg/L	4	3	3	-4.82*	-4.757*	-0.635*	8.8845*	9.9	0.9525*	6.9945
		Dissolved Organic Carbon	mg/L	4	0	0	2	2.015	2.1	2.185	2.2	2.1	0.08165
		Escherichia coli	CFU/100mL	4	3	0	6	<6.6	<10	<10	<10	<9	2
		Fecal coliform	CFU/100mL	4	2	0	7	<7.45	<10	<27	30	<14.25	10.595
		Total Coliforms	CFU/100mL	4	0	1	10	17.5	90	120	120	77.5	53.151
	Metals	Dissolved (0.2u) Aluminum (Al)	µg/L	4	4	4	2.561*	2.7635*	3.9555*	4.1207*	4.142*	3.6535*	0.73452
		Total Aluminum (Al)	µg/L	4	0	0	1.76	1.8485	2.65	72.948	85.3	23.09	41.476
		Total Antimony (Sb)	µg/L	4	1	1	0.124	0.12475	0.1365	0.1644*	0.168*	0.14125*	0.019755
		Total Arsenic (As)	µg/L	4	0	0	0.68	0.686	0.7415	0.77235	0.774	0.73425	0.043022
		Total Barium (Ba)	µg/L	4	0	0	21.3	21.51	23.35	24.85	25	23.25	1.6052
		Total Beryllium (Be)	µg/L	4	4	4	-0.0051*	-0.00444*	-0.0003*	0.003415*	0.004*	-0.000425*	0.0037322
		Total Bismuth (Bi)	µg/L	4	4	4	-0.0011*	-0.001055*	-0.0004*	0.000425*	0.0005*	-0.00035*	0.00073258
		Total Boron (B)	µg/L	4	1	1	20	20.15	22.007*	24.702*	25	22.254*	2.2189
		Total Cadmium (Cd)	µg/L	4	4	4	-0.0006*	-0.000255*	0.00285*	0.00485*	0.005*	0.002525*	0.0024998
		Total Calcium (Ca)	µg/L	4	0	0	31500	31710	34950	37850	38000	34850	3139.53
		Total Cesium (Cs)	µg/L	4	4	4	-0.0009*	-0.000615*	0.0016*	0.00798*	0.009*	0.002825*	0.00431
		Total Chromium (Cr)	µg/L	4	4	3	0.0782*	0.07838*	0.0897*	0.4026*	0.456*	0.1784*	0.18534
		Chromium (VI)	µg/L	4	4	4	0.2186*	0.21881*	0.2203*	0.31971*	0.3372*	0.2491*	0.058739
		Chromium (+3)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Total Cobalt (Co)	µg/L	4	1	1	0.0053	0.007055	0.01745	0.053685*	0.06*	0.02505*	0.023996
		Total Copper (Cu)	µg/L	4	0	0	0.546	0.5532	0.662	0.74785	0.751	0.65525	0.10074
		Total Iron (Fe)	µg/L	4	0	0	1.3	1.36	2.25	85.42	100	26.45	49.037
		Total Lead (Pb)	µg/L	4	2	2	0.0034*	0.004075*	0.00845	0.0685*	0.079*	0.024825*	0.036198
		Total Lithium (Li)	µg/L	4	0	1	1.54	1.579	1.9	2.068	2.08	1.855	0.24076
		Total Magnesium (Mg)	µg/L	4	0	0	8340	8349	8655	9148	9190	8710	409.63
		Total Manganese (Mn)	µg/L	4	0	0	0.51	0.5148	1.011	3.537	3.9	1.608	1.5929
		Mercury (Hg)	µg/L	4	4	4	-0.0001*	-0.000085*	0.0002*	0.001335*	0.0015*	0.00045*	0.00073258
		Total Molybdenum (Mo)	µg/L	4	0	0	1.1	1.1105	1.175	1.197	1.2	1.1625	0.043493
		Total Nickel (Ni)	µg/L	4	1	1	0.446	0.45275	0.5205	0.5942*	0.602*	0.52225*	0.068119
		Total Potassium (K)	µg/L	4	0	0	1550	1551.5	1680	1800	1800	1677.5	141.51
		Total Selenium (Se)	µg/L	4	0	0	0.117	0.1176	0.1305	0.14765	0.149	0.13175	0.015262
		Total Silicon (Si)	µg/L	3	0	0	160	165.9	219	573.6	613	330.67	246.28
		Total Silver (Ag)	µg/L	4	4	4	-0.0014*	-0.00134*	-0.00055*	0.00092*	0.0011*	-0.00035*	0.0011091
		Total Sodium (Na)	µg/L	4	0	0	13600	13630	15650	24385	25600	17625	5610.93
		Total Strontium (Sr)	µg/L	4	0	0	178	178.6	183	195.05	197	185.25	8.2209
		Total Thallium (Tl)	µg/L	4	1	1	0.0033	0.00342	0.00475	0.00676*	0.007*	0.00495*	0.0016176
		Total Thorium (Th)	µg/L	4	4	4	0*	0.000045*	0.00095*	0.00789*	0.009*	0.002725*	0.0042406
		Total Tin (Sn)	µg/L	4	4	4	0.0082*	0.00997*	0.02875*	0.053225*	0.056*	0.030425*	0.020871
		Total Titanium (Ti)	µg/L	4	4	4	-0.2125*	-0.17913*	0.07935*	4.0352*	4.721*	1.1668*	2.3741
		Total Tungsten (W)	µg/L	4	1	1	0.09	0.0906	0.1015	0.1124*	0.113*	0.1015*	0.01121
		Total Uranium (U)	µg/L	4	0	0	0.349	0.35155	0.383	0.40255	0.403	0.3795	0.026363
		Total Vanadium (V)	µg/L	4	2	2	0.1*	0.1165*	0.25	0.30955*	0.313*	0.22825*	0.096223
		Total Zinc (Zn)	µg/L	4	1	1	0.45	0.4725	0.7905*	1.8217*	1.97	1.0003*	0.68405
		Dissolved Zinc (Zn)	µg/L	4	4	4	0.285*	0.3162*	0.5465*	1.8189*	2.034*	0.853*	0.79812
		Total Zirconium (Zr)	µg/L	4	4	4	0.0031*	0.004135*	0.01045*	0.020335*	0.022*	0.0115*	0.0078192
	Hydrocarbons	F1 (C6-C10)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F2 (C10-C16 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F3 (C16-C34 Hydrocarbons)	µg/L	4	4	4	41*	41.012*	61.696*	126.45*	134.24*	74.657*	44.228
		F4 (C34-C50 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Benzene	µg/L	4	3	3	0*	0*	0*	0.102*	0.12	0.03*	0.06
		Ethylbenzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromodichloromethane	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
	Radionuclides	C-14	Bq/kg	4	4	4	-0.12*	-0.1155*	-0.05*	0.0325*	0.04*	-0.045*	0.073258
		Co-60	Bq/kg	4	4	4	-0.174*	-0.12945*	0.126*	0.1715*	0.179*	0.06425*	0.16081
		Cs-134	Bq/kg	4	4	4	0.002*	0.014945*	0.11515*	0.312*	0.342*	0.14358*	0.14431
		Cs-137	Bq/kg	4	4	4	0.04*	0.04564*	0.1128*	0.24915*	0.267*	0.13315*	0.099832
		H-3	Bq/kg	4	4	4	-5.2*	-4.42*	2.6*	7.325*	7.7*	1.925*	5.7314
		I-131	Bq/kg	4	4	4	0.133*	0.1762*	0.4575*	6.6701*	7.76*	2.202*	3.7086
		K-40	Bq/kg	4	4	4	-5.46*	-5.406*	-3.24*	-0.77905*	-0.673*	-3.1533*	2.477
	Other	Hydrazine	µg/L	4	4	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0
		Morpholine	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromoform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Chloroform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		4-Bromofluorobenzene	%	8	0	0	96	96.7	100.5	105.65	106	100.75	3.37

Table D-3: 2019 Surface Water Sampling Results - Statistics (Calculated with Uncensored Values Where Possible)

Location	Category	Parameter	Units	Total N	N (<RDL)	N (<RDL and uncensored)	Minimum	5th Percentile	50th Percentile	95th Percentile	Maximum	Arithmetic Mean	StdDev
DNGS-Near-M	Conventional Characteristics	Alkalinity (Total as CaCO3)	mg/L	4	0	0	93	93	96	99.85	100	96.25	3.7749
		Conductivity	umho/cm	4	0	0	300	301.5	330	384	390	337.5	41.13
		Field pH	pH	4	0	0	8.18	8.2115	8.44	8.524	8.53	8.3975	0.1565
		Field Sp. Conductance	µS/cm	4	0	0	278	282.35	310.5	331	334	308.25	23.186
		pH	pH	4	0	0	8.19	8.205	8.3	8.4205	8.44	8.3075	0.10275
		Field Temperature	Celsius	4	0	0	2	2.426	9.025	18.871	19.87	9.98	8.1311
		Total Hardness (CaCO3)	mg/L	4	0	0	112	113.05	123.5	130.55	131	122.5	8.6603
		Dissolved Oxygen	mg/L	4	0	0	9.48	9.6945	12.1	14.608	14.84	12.13	2.3945
		Turbidity	NTU	4	0	0	0.4	0.4	1.5	2.94	3	1.6	1.3952
		Total Suspended Solids	mg/L	4	2	3	0.8*	0.83*	2.5	4.85*	5*	2.7*	2.1197
		Total Residual Chlorine	mg/L	4	3	0	<0.0012	<0.0012	<0.0012	<0.01208	0.014	<0.0044	0.0064
	Nutrients	Nitrate (N)	mg/L	4	0	0	0.14	0.161	0.345	0.529	0.55	0.345	0.17559
		Nitrite (N)	mg/L	4	4	4	-0.0021*	-0.00153*	0.00185*	0.00455*	0.005*	0.00165*	0.0029103
		Total Ammonia-N	mg/L	4	0	1	0.03	0.0315	0.045	0.0925	0.1	0.055	0.031091
		Total Un-ionized Ammonia	mg/L	4	0	0	0.0018	0.002055	0.0035	0.069375	0.081	0.02245	0.039042
		Total Kjeldahl Nitrogen (TKN)	mg/L	4	0	0	0.16	0.1615	0.18	0.1985	0.2	0.18	0.018257
		Total Phosphorus	mg/L	4	4	4	-0.0002*	0.00004*	0.0057*	0.016035*	0.0171*	0.007075*	0.0080454
		Orthophosphate (P)	mg/L	4	4	4	0.00282*	0.003189*	0.0055*	0.006808*	0.007*	0.005205*	0.0017494
	Biological	Chlorophyll	µg/L	4	0	0	0.9	0.9585	1.655	2.6915	2.81	1.755	0.84271
		Total BOD	mg/L	4	3	1	2*	<2	<2	<2	2*	2*	0
		Total Chemical Oxygen Demand (COD)	mg/L	4	2	2	1.39*	1.6615*	4.7*	7.39	7.6	4.5975*	2.818
		Dissolved Organic Carbon	mg/L	4	0	0	2	2.015	2.1	2.185	2.2	2.1	0.08165
		Escherichia coli	CFU/100mL	4	3	0	2	<3.2	<10	<10	<10	<8	4
		Fecal coliform	CFU/100mL	4	3	0	2	<3.2	<10	<10	<10	<8	4
		Total Coliforms	CFU/100mL	4	1	0	<10	<29.5	150	168.5	170	<120	74.386
	Metals	Dissolved (0.2u) Aluminum (Al)	µg/L	4	3	3	1.295*	1.5508*	3.1355*	18.341*	21	7.1415*	9.2803
		Total Aluminum (Al)	µg/L	4	0	0	0.95	1.1525	2.735	65.501	76.5	20.73	37.191
		Total Antimony (Sb)	µg/L	4	1	1	0.119	0.1208*	0.1345*	0.1465	0.148	0.134*	0.012193
		Total Arsenic (As)	µg/L	4	0	0	0.68	0.6875	0.746	0.7688	0.77	0.7355	0.040837
		Total Barium (Ba)	µg/L	4	0	0	20.5	20.635	22.65	24.665	24.8	22.65	2.0306
		Total Beryllium (Be)	µg/L	4	4	4	-0.0033*	-0.002895*	-0.00045*	0.004205*	0.005*	0.0002*	0.0034728
		Total Bismuth (Bi)	µg/L	4	4	4	-0.0006*	-0.00051*	0.0001*	0.00088*	0.001*	0.00015*	0.00066081
		Total Boron (B)	µg/L	4	1	1	20	20.45	23.164*	25.599*	26	23.082*	2.455
		Total Cadmium (Cd)	µg/L	4	4	3	-0.0004*	-0.00019*	0.003*	<0.005	0.005*	0.00265*	0.0027731
		Total Calcium (Ca)	µg/L	4	0	0	31300	31615	34900	37760	38000	34775	3000.42
		Total Cesium (Cs)	µg/L	4	4	4	-0.0005*	-0.000425*	0.00115*	0.007145*	0.008*	0.00245*	0.0038957
		Total Chromium (Cr)	µg/L	4	4	4	0.0796*	0.080335*	0.08725*	0.57025*	0.655*	0.22728*	0.28518
		Chromium (VI)	µg/L	4	4	4	0.2072*	0.21358*	0.26985*	0.30012*	0.3019*	0.2622*	0.042935
		Chromium (+3)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Total Cobalt (Co)	µg/L	4	1	1	0.0058	0.006325	0.0127	0.049165*	0.055*	0.02155*	0.022706
		Total Copper (Cu)	µg/L	4	0	0	0.593	0.5966	0.6785	0.74	0.74	0.6725	0.078556
		Total Iron (Fe)	µg/L	4	2	2	0.4791*	0.4908*	1.3786*	75.98	89	23.059*	43.968
		Total Lead (Pb)	µg/L	4	2	2	0.0028*	0.003145*	0.0077	0.059345*	0.068*	0.02155*	0.031125
		Total Lithium (Li)	µg/L	4	0	0	1.49	1.5515	2.01	2.188	2.2	1.9275	0.31805
		Total Magnesium (Mg)	µg/L	4	0	0	8100	8185.5	8760	9020	9050	8667.5	408.93
		Total Manganese (Mn)	µg/L	4	0	0	0.131	0.16955	0.964	3.036	3.3	1.3398	1.4433
		Mercury (Hg)	µg/L	4	4	4	-0.0004*	-0.00034*	0.0002*	0.000485*	0.0005*	0.000125*	0.0004113
		Total Molybdenum (Mo)	µg/L	4	0	0	1.1	1.112	1.185	1.207	1.21	1.17	0.048305
		Total Nickel (Ni)	µg/L	4	1	1	0.498	0.4992	0.5125	0.59125*	0.604*	0.53175*	0.048938
		Total Potassium (K)	µg/L	4	0	0	1510	1522	1690	1798.5	1800	1672.5	145.23
		Total Selenium (Se)	µg/L	4	0	0	0.117	0.1182	0.135	0.14925	0.15	0.13425	0.015777
		Total Silicon (Si)	µg/L	3	0	0	151	164.3	284	549.5	579	338	219.05
		Total Silver (Ag)	µg/L	4	4	4	-0.001*	-0.000985*	-0.00035*	0.000625*	0.0007*	-0.00025*	0.00083467
		Total Sodium (Na)	µg/L	4	0	0	1290	3286.5	15650	23500	24700	14322.5	9717.13
		Total Strontium (Sr)	µg/L	4	0	0	180	180.45	183.5	189.95	191	184.5	4.6547
		Total Thallium (Tl)	µg/L	4	1	1	0.0038	0.00395	0.0049	0.00585*	0.006*	0.0049*	0.00090185
		Total Thorium (Th)	µg/L	4	4	4	-0.0002*	-0.000155*	0.0006*	0.011215*	0.013*	0.0035*	0.0063577
		Total Tin (Sn)	µg/L	4	4	4	0.0061*	0.006685*	0.0125*	0.070845*	0.0807*	0.02795*	0.035355
		Total Titanium (Ti)	µg/L	4	4	4	-0.1918*	-0.16755*	0.03995*	3.5075*	4.107*	0.99877*	2.0758
		Total Tungsten (W)	µg/L	4	1	1	0.088	0.0892	0.1	0.1295*	0.134*	0.1055*	0.020091
		Total Uranium (U)	µg/L	4	0	0	0.353	0.35615	0.387	0.4017	0.402	0.38225	0.023301
		Total Vanadium (V)	µg/L	4	3	3	0.12*	0.13194*	0.2298*	0.3093*	0.318*	0.2244*	0.08474
		Total Zinc (Zn)	µg/L	4	1	1	0.29	0.3275	0.782*	1.1566*	1.18	0.7585*	0.41448
		Dissolved Zinc (Zn)	µg/L	4	4	4	0.104*	0.1331*	0.499*	1.9844*	2.211*	0.82825*	0.95466
		Total Zirconium (Zr)	µg/L	4	4	4	0.0032*	0.00392*	0.009*	0.01255*	0.013*	0.00855*	0.0041162
	Hydrocarbons	F1 (C6-C10)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F2 (C10-C16 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F3 (C16-C34 Hydrocarbons)	µg/L	4	4	4	32.231*	35.796*	74.647*	137.18*	144.93*	81.614*	49.126
		F4 (C34-C50 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Benzene	µg/L	4	3	3	0*	0*	0*	0.102*	0.12	0.03*	0.06
		Ethylbenzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromodichloromethane	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
	Radionuclides	C-14	Bq/kg	4	3	4	-0.12*	-0.102*	0.03*	0.0855*	0.09	0.0075*	0.092871
		Co-60	Bq/kg	4	4	4	-0.234*	-0.2331*	-0.10635*	0.07667*	0.0875*	-0.0898*	0.1657
		Cs-134	Bq/kg	4	4	4	-0.02*	-0.00815*	0.082*	0.1747*	0.187*	0.08275*	0.086573
		Cs-137	Bq/kg	4	4	4	-0.01*	-0.00106*	0.06785*	0.15657*	0.169*	0.073675*	0.074883
		H-3	Bq/kg	4	4	4	-5.2*	-4.42*	2.1*	9.81*	10.8*	2.45*	6.7654
		I-131	Bq/kg	4	4	4	0.06*	0.1581*	0.7425*	14.056*	16.4*	4.4863*	7.949
		K-40	Bq/kg	4	4	4	-4.1*	-3.611*	-0.3*	3.2915*	3.83*	-0.2175*	3.2687
	Other	Hydrazine	µg/L	4	4	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0
		Morpholine	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromoform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Chloroform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		4-Bromofluorobenzene	%	8	0	0	97	97.35	100	105.55	108	100.38	3.4615

Table D-3: 2019 Surface Water Sampling Results - Statistics (Calculated with Uncensored Values Where Possible)

Location	Category	Parameter	Units	Total N	N (<RDL)	N (<RDL and uncensored)	Minimum	5th Percentile	50th Percentile	95th Percentile	Maximum	Arithmetic Mean	StdDev
DNGS-Near-S	Conventional Characteristics	Alkalinity (Total as CaCO3)	mg/L	4	0	0	93	93.3	96.5	99.7	100	96.5	3.1091
		Conductivity	umho/cm	4	0	0	310	310	335	394	400	345	43.589
		Field pH	pH	4	0	0	8.17	8.203	8.44	8.524	8.53	8.395	0.16114
		Field Sp. Conductance	µS/cm	4	0	0	278	282.35	311	332	335	308.75	23.641
		pH	pH	4	0	0	8.18	8.198	8.3	8.402	8.42	8.3	0.097979
		Field Temperature	Celsius	4	0	0	2.01	2.4345	9.23	18.992	19.94	10.103	8.2124
		Total Hardness (CaCO3)	mg/L	4	0	0	113	113.75	122.5	131.25	132	122.5	8.5829
		Dissolved Oxygen	mg/L	4	0	0	9.49	9.676	12.015	14.592	14.82	12.085	2.4171
		Turbidity	NTU	4	0	0	0.3	0.315	1.65	3.155	3.2	1.7	1.5642
		Total Suspended Solids	mg/L	4	2	2	0.6*	0.81*	3*	4.85*	5	2.9*	1.9765
		Total Residual Chlorine	mg/L	4	3	0	<0.0012	<0.0012	<0.0012	<0.01123	0.013	<0.00415	0.0059
	Nutrients	Nitrate (N)	mg/L	4	0	0	0.15	0.1695	0.35	0.556	0.58	0.3575	0.18482
		Nitrite (N)	mg/L	4	4	4	-0.0017*	-0.0014115*	0.0011615*	0.003715*	0.004*	0.0011558*	0.0024499
		Total Ammonia-N	mg/L	4	0	1	0.02	0.02	0.035	0.0585	0.06	0.0375	0.020616
		Total Un-ionized Ammonia	mg/L	4	1	1	0.00035*	0.0004925*	0.0038	0.22195	0.26	0.066988*	0.1287
		Total Kjeldahl Nitrogen (TKN)	mg/L	4	0	0	0.15	0.1515	0.18	0.2085	0.21	0.18	0.029439
		Total Phosphorus	mg/L	4	3	3	-0.0013*	-0.000055*	0.01045*	0.020785*	0.022	0.0104*	0.0099207
		Orthophosphate (P)	mg/L	4	4	4	0.00238*	0.0026995*	0.00491*	0.0067465*	0.007*	0.0048*	0.0019184
	Biological	Chlorophyll	µg/L	4	0	0	0.66	0.7665	1.47	2.4285	2.58	1.545	0.79282
		Total BOD	mg/L	4	3	1	2*	<2	<2	<2	2*	2*	0
		Total Chemical Oxygen Demand (COD)	mg/L	4	1	1	-1.6*	-0.73*	5.75	8.065	8.2	4.525*	4.4282
		Dissolved Organic Carbon	mg/L	4	0	0	2	2	2.05	2.1	2.1	2.05	0.057735
		Escherichia coli	CFU/100mL	4	2	0	4	<4.9	<10	<18.5	20	<11	6.6333
		Fecal coliform	CFU/100mL	4	2	0	8	<8.3	<10	<18.5	20	<12	5.416
		Total Coliforms	CFU/100mL	4	1	0	<10	<20.5	90	108.5	110	<75	45.093
	Metals	Dissolved (0.2u) Aluminum (Al)	µg/L	4	4	4	1.867*	1.9383*	2.5115*	3.8022*	4*	2.7225*	0.91477
		Total Aluminum (Al)	µg/L	4	0	0	0.7	0.763	2.035	55.778	65.1	17.468	31.77
		Total Antimony (Sb)	µg/L	4	1	1	0.121	0.1231*	0.1365*	0.14395	0.145	0.13475*	0.010079
		Total Arsenic (As)	µg/L	4	0	0	0.673	0.6823	0.7375	0.7468	0.748	0.724	0.034419
		Total Barium (Ba)	µg/L	4	0	0	20.8	20.935	22.3	25.28	25.7	22.775	2.1313
		Total Beryllium (Be)	µg/L	4	4	4	-0.004*	-0.00349*	-0.00055*	0.004175*	0.005*	-0.000025*	0.0037241
		Total Bismuth (Bi)	µg/L	4	4	4	-0.001*	-0.000865*	0*	0.000865*	0.001*	0*	0.00082057
		Total Boron (B)	µg/L	4	1	1	20	20.3	22.387*	26.366*	27	22.944*	2.9461
		Total Cadmium (Cd)	µg/L	4	4	4	0.0003*	0.00042*	0.0026*	0.005715*	0.006*	0.002875*	0.0026487
		Total Calcium (Ca)	µg/L	4	0	0	31700	31940	35050	37735	37900	34925	2910.18
		Total Cesium (Cs)	µg/L	4	4	4	-0.0001*	0.000065*	0.0023*	0.00819*	0.009*	0.003375*	0.0040582
		Total Chromium (Cr)	µg/L	4	3	3	0.0706*	0.07351*	0.12*	0.4186*	0.466*	0.19415*	0.18436
		Chromium (VI)	µg/L	4	4	4	0.2062*	0.21127*	0.24435*	0.31985*	0.3324*	0.25683*	0.053615
		Chromium (+3)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Total Cobalt (Co)	µg/L	4	1	1	0.0057	0.00621	0.01335	0.04344*	0.048*	0.0201*	0.019262
		Total Copper (Cu)	µg/L	4	0	0	0.601	0.6031	0.6525	0.72485	0.731	0.65925	0.061765
		Total Iron (Fe)	µg/L	4	1	1	0.6536*	0.84056*	2.4	67.585	79	21.113*	38.602
		Total Lead (Pb)	µg/L	4	3	3	0.0008*	0.00101*	0.004*	0.05867*	0.068*	0.0192*	0.032601
		Total Lithium (Li)	µg/L	4	1	1	1.44	1.4985	1.83	2.0935	2.14	1.81*	0.28671
		Total Magnesium (Mg)	µg/L	4	0	0	8210	8256.5	8535	9043	9130	8602.5	383.79
		Total Manganese (Mn)	µg/L	4	0	0	0.147	0.18915	0.994	2.784	3	1.2838	1.297
		Mercury (Hg)	µg/L	4	4	4	-0.0015*	-0.001275*	0.00035*	0.000785*	0.0008*	0*	0.0010614
		Total Molybdenum (Mo)	µg/L	4	0	0	1.1	1.106	1.16	1.2225	1.23	1.1625	0.055603
		Total Nickel (Ni)	µg/L	4	1	1	0.466	0.4753	0.541	0.5676*	0.57*	0.5295*	0.045735
		Total Potassium (K)	µg/L	4	0	0	1540	1546	1655	1772.5	1780	1657.5	115.58
		Total Selenium (Se)	µg/L	4	0	0	0.116	0.1163	0.1385	0.16835	0.17	0.14075	0.027801
		Total Silicon (Si)	µg/L	3	0	0	150	163.5	285	587.4	621	352	242.54
		Total Silver (Ag)	µg/L	4	4	4	-0.0013*	-0.001255*	-0.0004*	0.001305*	0.0015*	-0.00015*	0.0012767
		Total Sodium (Na)	µg/L	4	0	0	13100	13235	15100	24190	25600	17225	5733.16
		Total Strontium (Sr)	µg/L	4	0	0	176	176.75	182	196.6	199	184.75	9.9457
		Total Thallium (Tl)	µg/L	4	1	1	0.0034	0.003655	0.0054	0.005955*	0.006*	0.00505*	0.0011619
		Total Thorium (Th)	µg/L	4	4	4	-0.0003*	-0.000105*	0.00125*	0.012125*	0.014*	0.00405*	0.0066766
		Total Tin (Sn)	µg/L	4	4	4	0.0099*	0.010215*	0.021*	0.03119*	0.0314*	0.020825*	0.011449
		Total Titanium (Ti)	µg/L	4	4	4	-0.1591*	-0.12124*	0.11165*	3.0557*	3.572*	0.90905*	1.7799
		Total Tungsten (W)	µg/L	4	1	1	0.096	0.09645	0.1035	0.1148*	0.116*	0.10475*	0.0090692
		Total Uranium (U)	µg/L	4	0	0	0.348	0.3522	0.378	0.42335	0.431	0.38375	0.034568
		Total Vanadium (V)	µg/L	4	2	3	0.11*	0.1235*	0.22	0.26295*	0.267*	0.20425*	0.068597
		Total Zinc (Zn)	µg/L	4	1	1	0.29	0.3065	0.455	0.7259*	0.764*	0.491*	0.20295
		Dissolved Zinc (Zn)	µg/L	4	4	4	0.198*	0.20205*	0.3625*	1.8532*	2.092*	0.75375*	0.90254
		Total Zirconium (Zr)	µg/L	4	4	4	-0.0015*	-0.001455*	0.0044*	0.01255*	0.013*	0.005075*	0.0075204
	Hydrocarbons	F1 (C6-C10)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F2 (C10-C16 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F3 (C16-C34 Hydrocarbons)	µg/L	4	4	4	49.467*	49.997*	74.099*	157.26*	168.21*	91.47*	55.219
		F4 (C34-C50 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Benzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Ethylbenzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromodichloromethane	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
	Radionuclides	C-14	Bq/kg	4	4	4	-0.18*	-0.159*	-0.015*	0.061*	0.07*	-0.035*	0.10661
		Co-60	Bq/kg	4	4	4	-0.137*	-0.11882*	0.03415*	0.24382*	0.272*	0.050825*	0.17296
		Cs-134	Bq/kg	4	4	4	0.0395*	0.04649*	0.09705*	0.14455*	0.151*	0.09615*	0.046401
		Cs-137	Bq/kg	4	4	4	-0.055*	-0.039145*	0.0525*	0.07895*	0.0833*	0.033325*	0.060665
		H-3	Bq/kg	4	4	4	-5.3*	-4.505*	2.65*	7.085*	7.4*	1.85*	5.6936
		I-131	Bq/kg	4	4	4	0.158*	0.2099*	0.718*	16.375*	19.1*	5.1735*	9.2897
		K-40	Bq/kg	4	4	4	-5.95*	-5.3275*	-0.355*	1.906*	2.05*	-1.1525*	3.5926
	Other	Hydrazine	µg/L	4	3	0	<0.1	<0.1	<0.1	<0.1085	0.11	<0.1025	0.005
		Morpholine	µg/L	4	4	4	0*	0*	0*	0.85*	1*	0.25*	0.5
		Bromoform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Chloroform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		4-Bromofluorobenzene	%	8	0	0	98	98	99.5	105.55	108	100.5	3.2514

Table D-3: 2019 Surface Water Sampling Results - Statistics (Calculated with Uncensored Values Where Possible)

Location	Category	Parameter	Units	Total N	N (<RDL)	N (<RDL and uncensored)	Minimum	5th Percentile	50th Percentile	95th Percentile	Maximum	Arithmetic Mean	StdDev
SW10-B	Conventional Characteristics	Alkalinity (Total as CaCO3)	mg/L	4	0	0	93	93.15	95	96	96	94.75	1.5
		Conductivity	umho/cm	4	0	0	300	301.5	315	328.5	330	315	12.91
		Field pH	pH	4	0	0	6.9	7.0965	8.295	8.397	8.4	7.9725	0.72006
		Field Sp. Conductance	µS/cm	4	0	0	275	277.1	291.5	328.85	335	298.25	25.786
		pH	pH	4	0	0	8.17	8.1745	8.215	8.2385	8.24	8.21	0.031623
		Field Temperature	Celsius	4	0	0	2.72	2.969	5.535	12.963	14.07	6.965	5.0086
		Total Hardness (CaCO3)	mg/L	4	0	0	119	119	121	123.85	124	121.25	2.63
		Dissolved Oxygen	mg/L	4	0	0	11.58	11.753	13.1	19.556	20.63	14.603	4.0929
		Turbidity	NTU	4	2	3	0.01*	0.01*	0.055*	0.355	0.4	0.13*	0.18493
		Total Suspended Solids	mg/L	4	3	3	0.4*	0.46*	1.4*	3.7*	4*	1.8*	1.6166
		Total Residual Chlorine	mg/L	4	3	0	<0.0012	<0.0012	<0.0012	<0.01633	0.019	<0.00565	0.0089
	Nutrients	Nitrate (N)	mg/L	4	0	0	0.26	0.263	0.32	0.4025	0.41	0.3275	0.06994
		Nitrite (N)	mg/L	4	4	4	0.00042351*	0.00065998*	0.0032*	0.004485*	0.0045*	0.0028309*	0.0019777
		Total Ammonia-N	mg/L	4	1	0	<0.01	<0.0115	0.06	0.1255	0.13	<0.065	0.059161
		Total Un-ionized Ammonia	mg/L	4	2	2	0*	0.000048*	0.00071*	0.00212	0.0023	0.00093*	0.0010235
		Total Kjeldahl Nitrogen (TKN)	mg/L	4	1	1	0.08*	0.0875*	0.16	0.3345	0.36	0.19*	0.12193
		Total Phosphorus	mg/L	4	4	4	0.0007*	0.000805*	0.0037*	0.011185*	0.0121*	0.00505*	0.0052552
		Orthophosphate (P)	mg/L	4	4	4	0.0041*	0.0042845*	0.005495*	0.006799*	0.007*	0.0055225*	0.001192
	Biological	Chlorophyll	µg/L	4	0	0	0.81	0.8475	1.26	1.9955	2.09	1.355	0.55836
		Total BOD	mg/L	4	3	1	2*	<2	<2	<2	2*	2*	0
		Total Chemical Oxygen Demand (COD)	mg/L	4	1	1	1.22*	1.907*	6.5	9.58	10	6.055*	3.6659
		Dissolved Organic Carbon	mg/L	4	0	0	1.9	1.9	1.95	2	2	1.95	0.057735
		Escherichia coli	CFU/100mL	4	3	0	0	<1.5	<10	<10	<10	<7.5	5
		Fecal coliform	CFU/100mL	4	3	0	0	<1.5	<10	<10	<10	<7.5	5
		Total Coliforms	CFU/100mL	4	2	0	0	<1.5	<10	<18.5	20	<10	8.165
	Metals	Dissolved (0.2u) Aluminum (Al)	µg/L	4	4	4	1.182*	1.2333*	1.762*	3.2895*	3.517*	2.0558*	1.0303
		Total Aluminum (Al)	µg/L	4	0	0	0.64	0.655	0.905	9.0005	10.4	3.2125	4.7952
		Total Antimony (Sb)	µg/L	4	1	1	0.121*	0.1231*	0.1375	0.1434	0.144	0.135*	0.010033
		Total Arsenic (As)	µg/L	4	0	0	0.759	0.7596	0.779	0.81625	0.82	0.78425	0.028768
		Total Barium (Ba)	µg/L	4	0	0	21.1	21.22	22.15	23.505	23.7	22.275	1.0905
		Total Beryllium (Be)	µg/L	4	4	4	-0.001*	-0.000895*	-0.00005*	0.00326*	0.0038*	0.000675*	0.0021407
		Total Bismuth (Bi)	µg/L	4	4	4	-0.0003*	-0.000255*	0.0003*	0.0006*	0.0006*	0.000225*	0.00045
		Total Boron (B)	µg/L	4	1	1	19	19.316*	22.053*	23.85	24	21.777*	2.206
		Total Cadmium (Cd)	µg/L	4	4	4	0.0037*	0.00373*	0.00395*	0.00417*	0.0042*	0.00395*	0.00020817
		Total Calcium (Ca)	µg/L	4	0	0	33700	33730	34300	35295	35400	34425	780.49
		Total Cesium (Cs)	µg/L	4	4	4	-0.001*	-0.000565*	0.00245*	0.00334*	0.0034*	0.001825*	0.0019873
		Total Chromium (Cr)	µg/L	4	4	4	-0.453*	-0.37605*	0.0648*	0.08813*	0.0914*	-0.058*	0.26366
		Chromium (VI)	µg/L	4	4	4	0.19*	0.19234*	0.2195*	0.24496*	0.247*	0.219*	0.025897
		Chromium (+3)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Total Cobalt (Co)	µg/L	4	1	1	-0.006*	-0.003825*	0.00855	0.00945	0.0096	0.005175*	0.0074665
		Total Copper (Cu)	µg/L	4	0	0	0.61	0.6106	0.618	0.74525	0.767	0.65325	0.075997
		Total Iron (Fe)	µg/L	4	3	3	0.2468*	0.31478*	0.71655*	10.31*	12	3.42*	5.7243
		Total Lead (Pb)	µg/L	4	3	3	0.0027*	0.002835*	0.011*	0.01891*	0.019*	0.010925*	0.0089887
		Total Lithium (Li)	µg/L	4	0	0	1.72	1.7575	2.035	2.27	2.3	2.0225	0.24309
		Total Magnesium (Mg)	µg/L	4	0	0	8350	8360.5	8585	8758.5	8760	8570	215.56
		Total Manganese (Mn)	µg/L	4	1	1	0.284	0.30005	0.418	0.7153*	0.763*	0.47075*	0.206
		Mercury (Hg)	µg/L	4	4	4	-0.0007*	-0.000595*	0.0001*	0.001985*	0.0023*	0.00045*	0.0012923
		Total Molybdenum (Mo)	µg/L	4	0	0	1.1	1.1015	1.135	1.1855	1.19	1.14	0.042426
		Total Nickel (Ni)	µg/L	4	1	1	-0.307*	-0.1915*	0.4775	0.50305	0.505	0.28825*	0.39722
		Total Potassium (K)	µg/L	4	0	0	1510	1525	1615	1662.5	1670	1602.5	67.02
		Total Selenium (Se)	µg/L	4	0	0	0.13	0.13165	0.143	0.14755	0.148	0.141	0.007874
		Total Silicon (Si)	µg/L	3	0	0	261	268.2	333	560.7	586	393.33	170.69
		Total Silver (Ag)	µg/L	4	4	4	-0.0023*	-0.001985*	-0.00015*	0.000835*	0.001*	-0.0004*	0.0013784
		Total Sodium (Na)	µg/L	4	0	0	13700	13745	14600	16475	16700	14900	1363.82
		Total Strontium (Sr)	µg/L	4	0	0	174	174	181	203.3	206	185.5	15.177
		Total Thallium (Tl)	µg/L	4	1	1	0.0045	0.004575*	0.00515*	0.006405	0.0066	0.00535*	0.00089629
		Total Thorium (Th)	µg/L	4	4	4	-0.0025*	-0.00232*	-0.00065*	0.002805*	0.0033*	-0.000125*	0.0025012
		Total Tin (Sn)	µg/L	4	4	4	-0.005*	-0.00428*	0.0012*	0.01994*	0.023*	0.0051*	0.012339
		Total Titanium (Ti)	µg/L	4	4	4	-0.183*	-0.17496*	-0.08565*	0.30737*	0.369*	0.003675*	0.2504
		Total Tungsten (W)	µg/L	4	1	1	0.089	0.0899	0.0965*	0.1014*	0.102	0.096*	0.0054772
		Total Uranium (U)	µg/L	4	0	0	0.34	0.34135	0.3535	0.36905	0.371	0.3545	0.013229
		Total Vanadium (V)	µg/L	4	4	4	0.03*	0.051*	0.1735*	0.19494*	0.1981*	0.14378*	0.076785
		Total Zinc (Zn)	µg/L	4	1	1	0.17	0.194	0.455	0.7551*	0.786*	0.4665*	0.27173
		Dissolved Zinc (Zn)	µg/L	4	4	4	-0.135*	-0.08475*	0.3635*	1.7255*	1.937*	0.63225*	0.91085
		Total Zirconium (Zr)	µg/L	4	4	4	-0.0022*	-0.00157*	0.006*	0.01068*	0.0108*	0.00515*	0.0063085
	Hydrocarbons	F1 (C6-C10)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F2 (C10-C16 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F3 (C16-C34 Hydrocarbons)	µg/L	4	4	4	32.573*	34.737*	48.124*	58.426*	60.046*	47.217*	11.302
		F4 (C34-C50 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Benzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Ethylbenzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromodichloromethane	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
	Radionuclides	C-14	Bq/kg	4	2	3	-0.03*	-0.0255*	0.025*	0.0925	0.1	0.03*	0.057155
		Co-60	Bq/kg	4	4	4	0.0844*	0.08464*	0.08675*	0.10578*	0.109*	0.091725*	0.011586
		Cs-134	Bq/kg	4	4	4	0.012*	0.01824*	0.0898*	0.1328*	0.134*	0.0814*	0.058723
		Cs-137	Bq/kg	4	3	3	0.081*	0.081135*	0.17695*	0.49725*	0.537	0.24298*	0.21562
		H-3	Bq/kg	4	4	4	-5.1*	-4.335*	0*	0*	0*	-1.275*	2.55
		I-131	Bq/kg	4	4	4	0.161*	0.19235*	0.705*	28.886*	33.8*	8.8428*	16.642
		K-40	Bq/kg	4	4	4	-4.29*	-4.197*	-3.24*	-2.062*	-1.93*	-3.175*	1.0282
	Other	Hydrazine	µg/L	4	4	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0
		Morpholine	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromoform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Chloroform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		4-Bromofluorobenzene	%	8	0	0	95	95.35	97	100	100	97.625	1.8468

Table D-3: 2019 Surface Water Sampling Results - Statistics (Calculated with Uncensored Values Where Possible)

Location	Category	Parameter	Units	Total N	N (<RDL)	N (<RDL and uncensored)	Minimum	5th Percentile	50th Percentile	95th Percentile	Maximum	Arithmetic Mean	StdDev
SW10-S	Conventional Characteristics	Alkalinity (Total as CaCO3)	mg/L	4	0	0	94	94.15	95	96.7	97	95.25	1.2583
		Conductivity	umho/cm	4	0	0	300	301.5	320	330	330	317.5	15
		Field pH	pH	4	0	0	8.29	8.314	8.505	8.9255	8.99	8.5725	0.2996
		Field Sp. Conductance	µS/cm	4	0	0	278	279.35	290.5	328	334	298.25	24.717
		pH	pH	4	0	0	8.12	8.126	8.23	8.402	8.42	8.25	0.13711
		Field Temperature	Celsius	4	0	0	2.74	3.0085	10.17	21.641	22.67	11.438	9.463
		Total Hardness (CaCO3)	mg/L	4	0	0	117	117.15	119.5	124.4	125	120.25	3.594
		Dissolved Oxygen	mg/L	4	0	0	11.09	11.165	11.65	18.51	19.71	13.525	4.1321
		Turbidity	NTU	4	1	1	0.05*	0.0875*	0.3	0.385	0.4	0.2625*	0.1493
		Total Suspended Solids	mg/L	4	3	3	0*	0.15*	<1	2.7*	3*	1.25*	1.2583
		Total Residual Chlorine	mg/L	4	3	0	<0.0012	<0.0012	<0.0012	<0.01718	0.02	<0.0059	0.0094
	Nutrients	Nitrate (N)	mg/L	4	0	0	0.17	0.185	0.32	0.3955	0.4	0.3025	0.10436
		Nitrite (N)	mg/L	4	4	4	-0.0013*	-0.0010048*	0.0013339*	0.003615*	0.0039*	0.0013169*	0.0021915
		Total Ammonia-N	mg/L	4	1	1	0*	0.0075*	0.07	0.209	0.23	0.0925*	0.098784
		Total Un-ionized Ammonia	mg/L	4	1	1	0*	0.00096*	0.0087	0.0195	0.021	0.0096*	0.0088378
		Total Kjeldahl Nitrogen (TKN)	mg/L	4	0	0	0.15	0.1545	0.185	0.1985	0.2	0.18	0.021602
		Total Phosphorus	mg/L	4	4	4	0.002*	0.00263*	0.0081*	0.01612*	0.0172*	0.00885*	0.0064547
		Orthophosphate (P)	mg/L	4	4	4	0.00425*	0.004265*	0.00471*	0.0067105*	0.007*	0.0051675*	0.0012751
	Biological	Chlorophyll	µg/L	4	0	0	0.61	0.655	1.01	1.8325	1.96	1.1475	0.57933
		Total BOD	mg/L	4	3	1	2*	<2	<2	<2	2*	2*	0
		Total Chemical Oxygen Demand (COD)	mg/L	4	1	1	1.58*	2.003*	4.75	5.95	6.1	4.295*	1.9398
		Dissolved Organic Carbon	mg/L	4	0	0	1.9	1.915	2	2	2	1.975	0.05
		Escherichia coli	CFU/100mL	4	3	0	0	<1.5	<10	<10	<10	<7.5	5
		Fecal coliform	CFU/100mL	4	2	1	0	<1.5	<10	<10	10*	7.5*	5
		Total Coliforms	CFU/100mL	4	1	2	0	<1.5	<10	<10	10*	7.5*	5
	Metals	Dissolved (0.2u) Aluminum (Al)	µg/L	4	4	4	2.029*	2.103*	2.736*	2.9925*	3*	2.6253*	0.45169
		Total Aluminum (Al)	µg/L	4	1	1	0.69	0.7005	0.91	2.5059*	2.761*	1.3178*	0.97546
		Total Antimony (Sb)	µg/L	4	1	1	0.122*	0.1238*	0.1365	0.1424	0.143	0.1345*	0.0091104
		Total Arsenic (As)	µg/L	4	0	0	0.736	0.74095	0.7895	0.8355	0.84	0.78875	0.045646
		Total Barium (Ba)	µg/L	4	0	0	21	21.165	22.2	23.15	23.3	22.175	0.94296
		Total Beryllium (Be)	µg/L	4	4	4	-0.001*	-0.000895*	-0.00015*	0.00068*	0.0008*	-0.000125*	0.00074554
		Total Bismuth (Bi)	µg/L	4	4	4	-0.0004*	-0.000295*	0.00045*	0.00094*	0.001*	0.000375*	0.0005909
		Total Boron (B)	µg/L	4	1	1	20	20.31*	23.033*	24	24	22.516*	1.9095
		Total Cadmium (Cd)	µg/L	4	4	4	0.002*	0.002*	0.0028*	0.00394*	0.004*	0.0029*	0.001052
		Total Calcium (Ca)	µg/L	4	0	0	33400	33505	34150	35645	35900	34400	1061.45
		Total Cesium (Cs)	µg/L	4	4	4	-0.001*	-0.00055*	0.0022*	0.00359*	0.0038*	0.0018*	0.0020199
		Total Chromium (Cr)	µg/L	4	4	4	-0.514*	-0.4309*	0.0551*	0.092895*	0.0969*	-0.076725*	0.29244
		Chromium (VI)	µg/L	4	4	4	0.1774*	0.18379*	0.2226*	0.26218*	0.2687*	0.22283*	0.037334
		Chromium (+3)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Total Cobalt (Co)	µg/L	4	1	1	-0.009*	-0.00645*	0.0082	0.00908	0.0092	0.00415*	0.0087809
		Total Copper (Cu)	µg/L	4	0	0	0.58	0.5821	0.6065	0.6513	0.657	0.6125	0.033769
		Total Iron (Fe)	µg/L	4	3	3	0.2596*	0.32566*	0.739*	1.0517*	1.1	0.7094*	0.34626
		Total Lead (Pb)	µg/L	4	4	4	0.0024*	0.002535*	0.00395*	0.00749*	0.008*	0.004575*	0.0024554
		Total Lithium (Li)	µg/L	4	0	0	1.73	1.772	2.055	2.2105	2.23	2.0175	0.21188
		Total Magnesium (Mg)	µg/L	4	0	0	7840	7919.5	8505	8750.5	8770	8405	411.87
		Total Manganese (Mn)	µg/L	4	1	1	0.182	0.1973*	0.322*	0.3753	0.378	0.301*	0.089181
		Mercury (Hg)	µg/L	4	4	4	-0.0005*	-0.000425*	0.0005*	0.00202*	0.0022*	0.000675*	0.0011927
		Total Molybdenum (Mo)	µg/L	4	0	0	1.14	1.1415	1.175	1.2	1.2	1.1725	0.032016
		Total Nickel (Ni)	µg/L	4	1	1	-0.349*	-0.2302*	0.4575	0.54	0.552	0.2795*	0.42153
		Total Potassium (K)	µg/L	4	0	0	1550	1551.5	1590	1654	1660	1597.5	51.881
		Total Selenium (Se)	µg/L	4	0	0	0.136	0.1366	0.1425	0.1467	0.147	0.142	0.0049666
		Total Silicon (Si)	µg/L	3	0	0	238	242.4	282	559.2	590	370	191.79
		Total Silver (Ag)	µg/L	4	4	4	-0.0022*	-0.00205*	-0.0006*	0.00085*	0.001*	-0.0006*	0.0013952
		Total Sodium (Na)	µg/L	4	0	0	13800	13890	14750	16120	16300	14900	1073.93
		Total Strontium (Sr)	µg/L	4	0	0	178	178.3	183.5	206.55	210	188.75	14.683
		Total Thallium (Tl)	µg/L	4	1	1	0.0045	0.004545	0.0054*	0.006935*	0.0071	0.0056*	0.0011916
		Total Thorium (Th)	µg/L	4	4	4	-0.0025*	-0.002365*	-0.0008*	0.00187*	0.0022*	-0.000475*	0.0020614
		Total Tin (Sn)	µg/L	4	4	4	-0.005*	-0.004685*	0.00055*	0.00604*	0.0064*	0.000625*	0.0054408
		Total Titanium (Ti)	µg/L	4	4	4	-0.248*	-0.22385*	-0.07865*	-0.041995*	-0.037*	-0.11058*	0.093945
		Total Tungsten (W)	µg/L	4	1	1	0.09	0.09105*	0.0975*	0.10905	0.111	0.099*	0.0087559
		Total Uranium (U)	µg/L	4	0	0	0.35	0.3506	0.36	0.3711	0.372	0.3605	0.010247
		Total Vanadium (V)	µg/L	4	3	3	0.03*	0.04725*	0.16975*	0.20768*	0.21	0.14488*	0.081446
		Total Zinc (Zn)	µg/L	4	1	1	0.14	0.1565	0.28	0.49955*	0.533*	0.30825*	0.16555
		Dissolved Zinc (Zn)	µg/L	4	4	4	-0.1*	-0.025*	0.4465*	1.638*	1.84*	0.65825*	0.82975
		Total Zirconium (Zr)	µg/L	4	4	4	0.0059*	0.005915*	0.008*	0.012805*	0.0133*	0.0088*	0.0035562
	Hydrocarbons	F1 (C6-C10)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F2 (C10-C16 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F3 (C16-C34 Hydrocarbons)	µg/L	4	4	4	31.645*	34.698*	52.167*	54.295*	54.641*	47.655*	10.738
		F4 (C34-C50 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Benzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Ethylbenzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromodichloromethane	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
	Radionuclides	C-14	Bq/kg	4	3	3	-0.1*	-0.0865*	0.025*	0.2045*	0.23	0.045*	0.13964
		Co-60	Bq/kg	4	4	4	-0.0781*	-0.05641*	0.08525*	0.11165*	0.113*	0.05135*	0.088618
		Cs-134	Bq/kg	4	4	4	-0.704*	-0.58432*	0.10845*	0.2556*	0.279*	-0.052025*	0.44218
		Cs-137	Bq/kg	4	4	4	0.097*	0.09703*	0.1556*	0.27095*	0.281*	0.1723*	0.09104
		H-3	Bq/kg	4	4	4	-5.3*	-4.505*	0*	4.488*	5.28*	-0.005*	4.3193
		I-131	Bq/kg	4	4	4	0.119*	0.15275*	0.5875*	25.285*	29.6*	7.7235*	14.587
		K-40	Bq/kg	4	4	4	-5.84*	-5.33*	-2.16*	-1.3785*	-1.29*	-2.8625*	2.0398
	Other	Hydrazine	µg/L	4	4	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0
		Morpholine	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromoform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Chloroform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		4-Bromofluorobenzene	%	8	0	0	95	95.35	97	102.65	103	98.125	2.997

Table D-3: 2019 Surface Water Sampling Results - Statistics (Calculated with Uncensored Values Where Possible)

Location	Category	Parameter	Units	Total N	N (<RDL)	N (<RDL and uncensored)	Minimum	5th Percentile	50th Percentile	95th Percentile	Maximum	Arithmetic Mean	StdDev
SW11-B	Conventional Characteristics	Alkalinity (Total as CaCO3)	mg/L	4	0	0	93	93.15	94.5	95.85	96	94.5	1.291
		Conductivity	umho/cm	4	0	0	300	301.5	315	328.5	330	315	12.91
		Field pH	pH	4	0	0	8.28	8.298	8.425	8.6115	8.64	8.4425	0.14975
		Field Sp. Conductance	µS/cm	4	0	0	277	277.75	287.5	302.35	304	289	12.028
		pH	pH	4	0	0	8.15	8.162	8.245	8.362	8.38	8.255	0.095394
		Field Temperature	Celsius	4	0	0	3.2	3.419	6.845	19.562	21.42	9.5775	8.2744
		Total Hardness (CaCO3)	mg/L	4	0	0	114	114.6	120	124.55	125	119.75	4.7871
		Dissolved Oxygen	mg/L	4	0	0	10.39	10.434	12.545	17.445	17.98	13.365	3.58
		Turbidity	NTU	4	0	1	0.1	0.115	0.2	0.54	0.6	0.275	0.22174
		Total Suspended Solids	mg/L	4	3	2	0*	0.15*	<1.5	4.55*	5*	2*	2.1602
		Total Residual Chlorine	mg/L	4	3	0	<0.0012	<0.0012	<0.0012	<0.01718	0.02	<0.0059	0.0094
	Nutrients	Nitrate (N)	mg/L	4	0	0	0.16	0.181	0.34	0.397	0.4	0.31	0.10893
		Nitrite (N)	mg/L	4	4	4	-0.0027*	-0.002228*	0.00072343*	0.00321*	0.0036*	0.00058672*	0.0025867
		Total Ammonia-N	mg/L	4	2	1	0.00788*	0.008198*	<0.04	0.121	0.13	0.05447*	0.058006
		Total Un-ionized Ammonia	mg/L	4	2	2	0*	0.0000705*	0.002035*	0.01244	0.014	0.0045175*	0.0065205
		Total Kjeldahl Nitrogen (TKN)	mg/L	4	0	1	0.1	0.1045	0.175	0.2285	0.23	0.17	0.064807
		Total Phosphorus	mg/L	4	4	4	-0.0003*	0.000255*	0.0037*	0.00553*	0.0058*	0.003225*	0.0025617
		Orthophosphate (P)	mg/L	4	4	3	0.00349*	0.003529*	0.00397*	0.0091285*	<0.01	0.0053575*	0.0031085
	Biological	Chlorophyll	µg/L	4	0	0	0.88	0.919	1.31	1.8965	1.97	1.3675	0.47084
		Total BOD	mg/L	4	3	1	2*	<2	<2	<2	2*	2*	0
		Total Chemical Oxygen Demand (COD)	mg/L	4	2	2	2.4*	2.601*	4.77*	6.65	6.8	4.685*	1.9858
		Dissolved Organic Carbon	mg/L	4	0	0	1.9	1.9	1.9	1.985	2	1.925	0.05
		Escherichia coli	CFU/100mL	4	3	0	0	<1.5	<10	<10	<10	<7.5	5
		Fecal coliform	CFU/100mL	4	3	0	0	<1.5	<10	<10	<10	<7.5	5
		Total Coliforms	CFU/100mL	4	2	0	0	<1.5	<10	<35.5	40	<15	17.321
	Metals	Dissolved (0.2u) Aluminum (Al)	µg/L	4	4	4	1.544*	1.6124*	2.124*	2.8575*	2.965*	2.1893*	0.59369
		Total Aluminum (Al)	µg/L	4	1	1	0.67	0.703	1.275	2.2941*	2.406*	1.4065*	0.79004
		Total Antimony (Sb)	µg/L	4	1	1	0.093	0.09615*	0.1275*	0.15035	0.152	0.125*	0.026646
		Total Arsenic (As)	µg/L	4	0	0	0.784	0.7861	0.801	0.8091	0.81	0.799	0.011136
		Total Barium (Ba)	µg/L	4	0	0	21.6	21.615	22.2	23.295	23.4	22.35	0.85829
		Total Beryllium (Be)	µg/L	4	4	4	-0.003*	-0.0027*	-0.0005*	0.00102*	0.0012*	-0.0007*	0.0017776
		Total Bismuth (Bi)	µg/L	4	4	4	-0.0003*	-0.000255*	0*	0.00051*	0.0006*	0.000075*	0.00037749
		Total Boron (B)	µg/L	4	1	1	20.065*	20.205*	22	23.85	24	22.016*	1.8021
		Total Cadmium (Cd)	µg/L	4	4	4	0.0023*	0.00233*	0.00275*	0.00317*	0.0032*	0.00275*	0.00042032
		Total Calcium (Ca)	µg/L	4	0	0	32400	32535	33900	35520	35700	33975	1436.14
		Total Cesium (Cs)	µg/L	4	4	4	-0.001*	-0.00049*	0.0025*	0.00294*	0.003*	0.00175*	0.0018502
		Total Chromium (Cr)	µg/L	4	4	4	-0.457*	-0.38245*	0.0542*	0.06891*	0.069*	-0.0699*	0.25842
		Chromium (VI)	µg/L	4	4	4	0.1968*	0.19872*	0.2298*	0.26853*	0.2718*	0.23205*	0.034875
		Chromium (+3)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Total Cobalt (Co)	µg/L	4	1	1	-0.011*	-0.007985*	0.00985	0.012725	0.0131	0.00545*	0.01109
		Total Copper (Cu)	µg/L	4	0	0	0.58	0.58045	0.6	0.62975	0.632	0.603	0.025599
		Total Iron (Fe)	µg/L	4	3	3	-0.585*	-0.39225*	0.73525*	1.3056*	1.4	0.57138*	0.83267
		Total Lead (Pb)	µg/L	4	3	3	0.003*	0.00327*	0.0059*	0.008445*	0.0087	0.005875*	0.0024945
		Total Lithium (Li)	µg/L	4	1	1	1.72	1.744	1.937*	2.2031*	2.24	1.9585*	0.21874
		Total Magnesium (Mg)	µg/L	4	0	0	8130	8175	8510	8675	8690	8460	244.68
		Total Manganese (Mn)	µg/L	4	1	1	0.27*	0.27135*	0.3155	0.3877	0.394	0.32375*	0.059511
		Mercury (Hg)	µg/L	4	4	4	-0.0001*	-0.000085*	0.00035*	0.001635*	0.0018*	0.0006*	0.0008756
		Total Molybdenum (Mo)	µg/L	4	0	0	1.15	1.153	1.185	1.2085	1.21	1.1825	0.027538
		Total Nickel (Ni)	µg/L	4	1	1	-0.148*	-0.05695*	0.4685	0.4984	0.502	0.32275*	0.31433
		Total Potassium (K)	µg/L	4	0	0	1590	1593	1630	1667	1670	1630	36.515
		Total Selenium (Se)	µg/L	4	0	0	0.136	0.1363	0.1395	0.14865	0.15	0.14125	0.0061847
		Total Silicon (Si)	µg/L	3	0	0	241	247.4	305	574.1	604	383.33	193.76
		Total Silver (Ag)	µg/L	4	4	4	-0.0029*	-0.00254*	-0.00025*	0.00119*	0.0014*	-0.0005*	0.0017907
		Total Sodium (Na)	µg/L	4	0	0	13900	13930	14750	15400	15400	14700	812.4
		Total Strontium (Sr)	µg/L	4	0	0	170	170.9	186	204.5	206	187	16.852
		Total Thallium (Tl)	µg/L	4	1	1	0.0043	0.00436	0.00485*	0.00653*	0.0068	0.0052*	0.0011045
		Total Thorium (Th)	µg/L	4	4	4	-0.0022*	-0.00202*	-0.00075*	0.003325*	0.004*	0.000075*	0.0027122
		Total Tin (Sn)	µg/L	4	4	4	-0.006*	-0.00519*	0.0051*	0.03664*	0.0412*	0.01135*	0.021096
		Total Titanium (Ti)	µg/L	4	3	3	-0.239*	-0.206*	-0.01165*	0.50936*	0.6	0.084425*	0.36009
		Total Tungsten (W)	µg/L	4	1	1	0.093	0.0936	0.097	0.1021	0.103	0.0975*	0.0041231
		Total Uranium (U)	µg/L	4	0	0	0.34	0.34225	0.363	0.3761	0.377	0.36075	0.016661
		Total Vanadium (V)	µg/L	4	3	3	-0.6745*	-0.56583*	0.1235*	0.22505*	0.23	-0.049375*	0.42403
		Total Zinc (Zn)	µg/L	4	1	1	0.33	0.369	0.617*	0.8786*	0.92	0.621*	0.24192
		Dissolved Zinc (Zn)	µg/L	4	4	4	0.3*	0.30975*	0.4255*	3.0335*	3.483*	1.1585*	1.5516
		Total Zirconium (Zr)	µg/L	4	4	4	0.0021*	0.002115*	0.0046*	0.01805*	0.02*	0.007825*	0.0084326
	Hydrocarbons	F1 (C6-C10)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F2 (C10-C16 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F3 (C16-C34 Hydrocarbons)	µg/L	4	4	4	47.179*	50.452*	74.667*	95.849*	98.587*	73.775*	21.516
		F4 (C34-C50 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Benzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Ethylbenzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromodichloromethane	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
	Radionuclides	C-14	Bq/kg	4	3	3	-0.09*	-0.078*	-0.01*	0.0495*	0.06	-0.0125*	0.061305
		Co-60	Bq/kg	4	4	4	0.0707*	0.07502*	0.10125*	0.28235*	0.314*	0.1468*	0.1124
		Cs-134	Bq/kg	4	4	4	-0.848*	-0.71575*	0.07535*	0.33375*	0.372*	-0.081325*	0.53099
		Cs-137	Bq/kg	4	4	4	0.0473*	0.054005*	0.108*	0.141*	0.144*	0.10183*	0.04219
		H-3	Bq/kg	4	4	4	-5.3*	-4.505*	0*	0*	0*	-1.325*	2.65
		I-131	Bq/kg	4	4	4	0.539*	0.5402*	0.6065*	23.985*	28.1*	7.463*	13.758
		K-40	Bq/kg	4	4	4	-5.16*	-4.7265*	-1.0465*	4.0216*	4.7*	-0.63825*	4.1741
	Other	Hydrazine	µg/L	4	4	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0
		Morpholine	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromoform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Chloroform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		4-Bromofluorobenzene	%	8	0	0	95	95	99	101	101	98.25	2.3755

Table D-3: 2019 Surface Water Sampling Results - Statistics (Calculated with Uncensored Values Where Possible)

Location	Category	Parameter	Units	Total N	N (<RDL)	N (<RDL and uncensored)	Minimum	5th Percentile	50th Percentile	95th Percentile	Maximum	Arithmetic Mean	StdDev
SW11-S	Conventional Characteristics	Alkalinity (Total as CaCO3)	mg/L	4	0	0	94	94	94.5	95.85	96	94.75	0.95743
		Conductivity	umho/cm	4	0	0	310	310	315	320	320	315	5.7735
		Field pH	pH	4	0	0	8.3	8.3195	8.44	8.6455	8.68	8.465	0.15801
		Field Sp. Conductance	µS/cm	4	0	0	282	282.6	289.5	321.05	326	296.75	20.023
		pH	pH	4	0	0	8.17	8.1775	8.265	8.4035	8.42	8.28	0.10985
		Field Temperature	Celsius	4	0	0	3.99	4.092	8.91	20.749	22.09	10.975	8.5013
		Total Hardness (CaCO3)	mg/L	4	0	0	117	117.45	121	123.7	124	120.75	2.9861
		Dissolved Oxygen	mg/L	4	0	0	10.67	10.696	11.93	15.077	15.44	12.493	2.2374
		Turbidity	NTU	4	1	1	0.0438*	0.06723*	0.25	0.555	0.6	0.28595*	0.23441
		Total Suspended Solids	mg/L	4	3	3	0*	0.12*	0.9*	<1	1*	0.7*	0.4761
		Total Residual Chlorine	mg/L	4	3	0	<0.0012	<0.0012	<0.0012	<0.01208	0.014	<0.0044	0.0064
	Nutrients	Nitrate (N)	mg/L	4	0	0	0.17	0.188	0.33	0.3955	0.4	0.3075	0.10275
		Nitrite (N)	mg/L	4	4	4	-0.0005116*	-0.00033106*	0.001346*	0.00387*	0.0042*	0.0015951*	0.0020169
		Total Ammonia-N	mg/L	4	1	1	0.00649*	0.020517*	0.115	0.147	0.15	0.096623*	0.063505
		Total Un-ionized Ammonia	mg/L	4	1	1	0*	0.000555*	0.004	0.024445	0.028	0.009*	0.012809
		Total Kjeldahl Nitrogen (TKN)	mg/L	4	0	0	0.15	0.153	0.185	0.217	0.22	0.185	0.031091
		Total Phosphorus	mg/L	4	4	4	-0.0005*	0.000325*	0.00755*	0.01027*	0.0103*	0.006225*	0.0051104
		Orthophosphate (P)	mg/L	4	4	4	0.00328*	0.0032815*	0.003915*	0.004931*	0.005*	0.0040275*	0.0008777
	Biological	Chlorophyll	µg/L	4	0	0	0.79	0.8065	1	1.6865	1.79	1.145	0.44874
		Total BOD	mg/L	4	3	1	2*	<2	<2	<2	2*	2*	0
		Total Chemical Oxygen Demand (COD)	mg/L	4	1	1	-0.23*	0.8845*	7.4	8.11	8.2	5.6925*	3.9697
		Dissolved Organic Carbon	mg/L	4	0	0	1.9	1.9	1.95	2.085	2.1	1.975	0.095743
		Escherichia coli	CFU/100mL	4	3	0	0	<1.5	<10	<10	<10	<7.5	5
		Fecal coliform	CFU/100mL	4	3	0	0	<1.5	<10	<10	<10	<7.5	5
		Total Coliforms	CFU/100mL	4	2	0	0	<1.5	<10	<18.5	20	<10	8.165
	Metals	Dissolved (0.2u) Aluminum (Al)	µg/L	4	4	4	1.801*	1.9416*	2.869*	3.2695*	3.317*	2.714*	0.65308
		Total Aluminum (Al)	µg/L	4	1	1	0.56	0.6395	1.12	2.1624*	2.341*	1.2853*	0.75211
		Total Antimony (Sb)	µg/L	4	1	1	0.097	0.10165*	0.1335*	0.14495	0.146	0.1275*	0.021641
		Total Arsenic (As)	µg/L	4	0	0	0.766	0.76735	0.8	0.82925	0.83	0.799	0.033176
		Total Barium (Ba)	µg/L	4	0	0	22.1	22.16	22.5	23.435	23.6	22.675	0.64485
		Total Beryllium (Be)	µg/L	4	4	4	-0.0025*	-0.002275*	-0.0001*	0.00097*	0.001*	-0.000425*	0.00165
		Total Bismuth (Bi)	µg/L	4	4	4	-0.001*	-0.000865*	0.00015*	0.000485*	0.0005*	-0.00005*	0.00068557
		Total Boron (B)	µg/L	4	1	1	21	21.276*	22.922*	23	23	22.461*	0.97664
		Total Cadmium (Cd)	µg/L	4	4	4	0.0017*	0.001835*	0.00275*	0.002985*	0.003*	0.00255*	0.00059161
		Total Calcium (Ca)	µg/L	4	0	0	33800	33815	34200	35690	35900	34525	967.38
		Total Cesium (Cs)	µg/L	4	4	4	-0.002*	-0.001415*	0.00245*	0.003085*	0.0031*	0.0015*	0.0023958
		Total Chromium (Cr)	µg/L	4	3	3	0.05*	0.05294*	0.0898*	0.42875*	0.485*	0.17865*	0.20576
		Chromium (VI)	µg/L	4	4	4	0.1991*	0.20224*	0.2271*	0.25435*	0.2579*	0.2278*	0.024708
		Chromium (+3)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Total Cobalt (Co)	µg/L	4	1	1	-0.001*	0.000395*	0.0096	0.01515	0.0159	0.008525*	0.0070901
		Total Copper (Cu)	µg/L	4	0	0	0.568	0.5698	0.5925	0.6424	0.649	0.6005	0.035819
		Total Iron (Fe)	µg/L	4	3	3	0.5872*	0.58912*	0.85*	2.4396*	2.676*	1.2408*	0.98614
		Total Lead (Pb)	µg/L	4	3	3	0.0041*	0.004205*	0.0049*	0.00568*	0.0058	0.004925*	0.0006994
		Total Lithium (Li)	µg/L	4	0	0	1.74	1.752	2.01	2.2085	2.21	1.9925	0.24757
		Total Magnesium (Mg)	µg/L	4	0	0	7800	7897.5	8535	8637	8640	8377.5	394.32
		Total Manganese (Mn)	µg/L	4	1	1	0.221	0.23915*	0.374*	0.8021	0.872	0.46025*	0.28502
		Mercury (Hg)	µg/L	4	4	4	-0.0004*	-0.00034*	0.00055*	0.00127*	0.0013*	0.0005*	0.00082865
		Total Molybdenum (Mo)	µg/L	4	0	0	1.16	1.1615	1.185	1.217	1.22	1.1875	0.027538
		Total Nickel (Ni)	µg/L	4	1	1	0.166*	0.211*	0.4775	0.49495	0.496	0.40425*	0.15935
		Total Potassium (K)	µg/L	4	0	0	1510	1525	1620	1655.5	1660	1602.5	65
		Total Selenium (Se)	µg/L	4	0	0	0.124	0.1249	0.132	0.15015	0.153	0.13525	0.012527
		Total Silicon (Si)	µg/L	3	0	0	233	241.8	321	580.2	609	387.67	196.67
		Total Silver (Ag)	µg/L	4	4	4	-0.0023*	-0.00206*	-0.0002*	0.000895*	0.001*	-0.000425*	0.0014315
		Total Sodium (Na)	µg/L	4	0	0	14100	14190	14850	15000	15000	14700	424.26
		Total Strontium (Sr)	µg/L	4	0	0	178	178.45	189.5	206.5	208	191.25	14.221
		Total Thallium (Tl)	µg/L	4	1	1	0.0042	0.004275	0.0056	0.006925*	0.007*	0.0056*	0.0013589
		Total Thorium (Th)	µg/L	4	4	4	-0.0028*	-0.00253*	-0.0007*	0.00317*	0.0038*	-0.0001*	0.0027928
		Total Tin (Sn)	µg/L	4	4	4	-0.006*	-0.0051*	0.0034*	0.01037*	0.011*	0.00295*	0.0074929
		Total Titanium (Ti)	µg/L	4	3	3	-0.228*	-0.2112*	-0.07275*	0.57358*	0.68	0.076625*	0.41038
		Total Tungsten (W)	µg/L	4	1	1	0.082	0.08395	0.0975*	0.10765*	0.109	0.0965*	0.011269
		Total Uranium (U)	µg/L	4	0	0	0.34	0.34285	0.359	0.3641	0.365	0.35575	0.010874
		Total Vanadium (V)	µg/L	4	3	3	-0.6979*	-0.59022*	0.113*	0.2264*	0.23	-0.060475*	0.43519
		Total Zinc (Zn)	µg/L	4	1	1	0.3	0.3141*	0.402*	0.461	0.47	0.3935*	0.070396
		Dissolved Zinc (Zn)	µg/L	4	4	4	0.383*	0.38555*	0.646*	2.4118*	2.68*	1.0888*	1.0868
		Total Zirconium (Zr)	µg/L	4	4	4	0.0011*	0.002045*	0.0087*	0.01255*	0.013*	0.007875*	0.0050632
	Hydrocarbons	F1 (C6-C10)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F2 (C10-C16 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F3 (C16-C34 Hydrocarbons)	µg/L	4	4	4	50.508*	52.576*	67.303*	89.597*	93*	69.528*	17.708
		F4 (C34-C50 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Benzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Ethylbenzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromodichloromethane	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
	Radionuclides	C-14	Bq/kg	4	3	3	-0.03*	-0.027*	0*	0.095*	0.11	0.02*	0.062183
		Co-60	Bq/kg	4	3	3	-0.0843*	-0.058005*	0.1195*	0.19815*	0.207	0.090425*	0.12574
		Cs-134	Bq/kg	4	4	4	-0.545*	-0.4559*	0.0985*	0.39875*	0.443*	0.02375*	0.41446
		Cs-137	Bq/kg	4	4	4	0.0485*	0.051035*	0.0832*	0.1877*	0.203*	0.10448*	0.069232
		H-3	Bq/kg	4	4	4	-5.3*	-4.505*	2.1*	4.54*	4.6*	0.875*	4.6126
		I-131	Bq/kg	4	4	4	0.23*	0.24785*	0.3635*	34.312*	40.3*	10.314*	19.991
		K-40	Bq/kg	4	4	4	-7.08*	-6.459*	-2.37*	3.963*	4.98*	-1.71*	5.0038
	Other	Hydrazine	µg/L	4	4	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0
		Morpholine	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromoform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Chloroform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		4-Bromofluorobenzene	%	8	0	0	95	96.05	99	100.65	101	98.625	1.7678

Table D-3: 2019 Surface Water Sampling Results - Statistics (Calculated with Uncensored Values Where Possible)

Location	Category	Parameter	Units	Total N	N (<RDL)	N (<RDL and uncensored)	Minimum	5th Percentile	50th Percentile	95th Percentile	Maximum	Arithmetic Mean	StdDev
SW12-B	Conventional Characteristics	Alkalinity (Total as CaCO3)	mg/L	4	0	0	130	137.5	190	200	200	177.5	33.04
		Conductivity	umho/cm	4	0	0	450	462	575	645.5	650	562.5	90.692
		Field pH	pH	4	0	0	7.39	7.444	8.04	9.367	9.55	8.255	0.9462
		Field Sp. Conductance	µS/cm	4	0	0	263	287.6	476	569.2	577	448	138.13
		pH	pH	4	0	0	8.19	8.2035	8.285	8.8425	8.94	8.425	0.34627
		Field Temperature	Celsius	4	0	0	4.41	4.449	13.285	22.028	22.05	13.258	10.067
		Total Hardness (CaCO3)	mg/L	4	0	0	197	201.2	254.5	294.2	296	250.5	47.276
		Dissolved Oxygen	mg/L	4	0	0	7.99	8.596	12.37	13.654	13.82	11.638	2.5411
	Nutrients	Nitrate (N)	mg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Nitrite (N)	mg/L	4	4	4	-0.0026*	-0.00248*	0.0001*	0.00285*	0.003*	0.00015*	0.0027635
		Total Ammonia-N	mg/L	4	0	0	0.02	0.023	0.045	0.1605	0.18	0.0725	0.072744
		Total Un-ionized Ammonia	mg/L	4	1	1	0.00013*	0.000214*	0.003145	0.02634	0.03	0.009105*	0.014145
		Total Kjeldahl Nitrogen (TKN)	mg/L	4	0	0	0.35	0.359	0.43	0.6795	0.72	0.4825	0.16358
		Total Phosphorus	mg/L	5	0	0	0.029	0.0304	0.044	67.378	84.2	16.88	37.633
		Orthophosphate (P)	mg/L	4	3	3	0.00477*	0.0049545*	0.007*	0.01055*	0.011	0.0074425*	0.0027197
	Biological	Chlorophyll	µg/L	3	0	0	2.61	2.705	3.56	24.116	26.4	10.857	13.469
		Total BOD	mg/L	4	1	1	2*	2	2.5	3.85	4	2.75*	0.95743
		Total Chemical Oxygen Demand (COD)	mg/L	4	0	0	12	13.05	22	42.85	46	25.5	14.663
		Dissolved Organic Carbon	mg/L	4	0	0	5.6	5.99	8.3	9.59	9.8	8	1.7512
		Escherichia coli	CFU/100mL	4	1	1	1	<2.35	<10	<35.5	40	15.25*	17.037
		Fecal coliform	CFU/100mL	4	1	1	1	<2.35	<10	<35.5	40	15.25*	17.037
		Total Coliforms	CFU/100mL	4	0	0	10	14.5	55	112.5	120	60	46.904
	Metals	Dissolved (0.2u) Aluminum (Al)	µg/L	4	2	2	3.805*	3.8343*	5*	6.85	7	5.2013*	1.5563
		Total Aluminum (Al)	µg/L	4	0	0	2.24	2.939	43.6	312.1	353	110.61	165.5
		Total Antimony (Sb)	µg/L	4	1	1	0.186*	0.1911*	0.2275	0.2435	0.245	0.2215*	0.025801
		Total Arsenic (As)	µg/L	4	0	0	0.33	0.37395	0.6725	1.1623	1.24	0.72875	0.3793
		Total Barium (Ba)	µg/L	4	0	0	18.2	21.23	40.85	53.67	55.5	38.85	15.531
		Total Beryllium (Be)	µg/L	4	3	3	-0.0018*	-0.001545*	0.00395*	0.0148*	0.016	0.005525*	0.0081884
		Total Bismuth (Bi)	µg/L	4	4	4	0.0004*	0.00049*	0.00115*	0.002745*	0.003*	0.001425*	0.0011147
		Total Boron (B)	µg/L	4	0	0	141	144.15	194.5	227	227	189.25	44.425
		Total Cadmium (Cd)	µg/L	4	3	3	0.0017*	0.001865*	0.0044*	0.00702*	0.0072	0.004425*	0.0025979
		Total Calcium (Ca)	µg/L	4	0	0	31800	33555	56250	70785	71100	53850	19325.37
		Total Cesium (Cs)	µg/L	3	3	3	-0.0015*	-0.00122*	0.0013*	0.01003*	0.011*	0.0036*	0.0065597
		Total Chromium (Cr)	µg/L	4	3	3	0.0579*	0.061215*	0.275*	0.91115*	0.989*	0.39923*	0.43637
		Chromium (VI)	µg/L	4	4	4	0.1287*	0.13001*	0.1737*	0.2865*	0.3*	0.19403*	0.079498
		Chromium (+3)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Total Cobalt (Co)	µg/L	4	1	1	0.0766	0.08041	0.1075*	0.2048*	0.221	0.12815*	0.063749
		Total Copper (Cu)	µg/L	4	0	0	0.45	0.45345	0.5415	0.933	0.99	0.63075	0.2497
		Total Iron (Fe)	µg/L	4	0	0	6.4	6.67	77.6	357.8	395	139.15	182.84
		Total Lead (Pb)	µg/L	4	1	1	0.0188	0.02093	0.0865*	0.3593*	0.398	0.14745*	0.17558
		Total Lithium (Li)	µg/L	4	0	0	2.48	2.708	4.325	5.7295	5.92	4.2625	1.431
		Total Magnesium (Mg)	µg/L	4	0	0	25900	26260	28500	29720	29900	28200	1677.3
		Total Manganese (Mn)	µg/L	4	0	0	1.1	1.5725	12.525	60.495	67.5	23.413	30.635
		Mercury (Hg)	µg/L	4	4	4	0*	0*	0.00035*	0.00223*	0.0025*	0.0008*	0.0011804
		Total Molybdenum (Mo)	µg/L	4	1	1	0.537*	0.53895*	0.594	0.9797	1.04	0.69125*	0.23679
		Total Nickel (Ni)	µg/L	4	1	1	0.567	0.56925*	0.586*	0.777	0.81	0.63725*	0.11556
		Total Potassium (K)	µg/L	4	0	0	4510	4600	5600	6889	7030	5685	1108.2
		Total Selenium (Se)	µg/L	4	1	1	0.049	0.0505	0.064*	0.0775*	0.079	0.064*	0.01291
		Total Silicon (Si)	µg/L	3	0	0	203	376.7	1940	1994	2000	1381	1020.62
		Total Silver (Ag)	µg/L	4	4	4	0.0008*	0.00083*	0.00105*	0.001865*	0.002*	0.001225*	0.00053151
		Total Sodium (Na)	µg/L	4	0	0	17000	17225	19400	21150	21300	19275	1908.53
		Total Strontium (Sr)	µg/L	4	0	0	367	369.1	426	496.5	501	430	66.061
		Total Thallium (Tl)	µg/L	4	3	3	0.0011*	0.001145*	0.0027*	0.00485*	0.005	0.002875*	0.0019242
		Total Thorium (Th)	µg/L	3	3	3	-0.0004*	-0.0003*	0.0006*	0.01086*	0.012*	0.0040667*	0.0068886
		Total Tin (Sn)	µg/L	4	4	4	0.02*	0.0245*	0.063*	0.094955*	0.0983*	0.061075*	0.033755
		Total Titanium (Ti)	µg/L	4	3	3	0.1216*	0.14986*	2.438*	16.07*	18.1	5.7744*	8.4694
		Total Tungsten (W)	µg/L	3	1	1	0.026	0.0264*	0.03*	0.0552*	0.058	0.038*	0.017436
		Total Uranium (U)	µg/L	4	0	0	0.782	0.81305	1.0695	1.4135	1.46	1.0953	0.28604
		Total Vanadium (V)	µg/L	4	1	1	0.72*	0.774*	1.46	2.333	2.42	1.515*	0.76287
		Total Zinc (Zn)	µg/L	4	1	1	1.8	1.95	3.165	3.717*	3.75*	2.97*	0.87936
		Dissolved Zinc (Zn)	µg/L	4	4	4	0.6*	0.6597*	1.699*	2.5828*	2.615*	1.6533*	1.0035
		Total Zirconium (Zr)	µg/L	4	3	3	0.0225*	0.026625*	0.058*	0.1714*	0.19	0.082125*	0.074126
	Hydrocarbons	F1 (C6-C10)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F2 (C10-C16 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F3 (C16-C34 Hydrocarbons)	µg/L	4	4	4	54.704*	58.77*	86.407*	149.65*	160*	96.879*	44.813
		F4 (C34-C50 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Benzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Ethylbenzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromodichloromethane	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
	Radionuclides	C-14	Bq/kg	3	2	3	-0.25*	-0.2279*	-0.029*	0.0601*	0.07	-0.069667*	0.16383
		Co-60	Bq/kg	3	3	3	-0.00981*	-0.006019*	0.0281*	0.10991*	0.119*	0.045763*	0.066197
		Cs-134	Bq/kg	3	3	3	0.0103*	0.01253*	0.0326*	0.13466*	0.146*	0.062967*	0.072768
		Cs-137	Bq/kg	3	3	3	0.0992*	0.10488*	0.156*	0.2037*	0.209*	0.15473*	0.054911
		H-3	Bq/kg	3	0	0	24.7	25.41	31.8	45.3	46.8	34.433	11.283
		I-131	Bq/kg	3	3	3	-0.0685*	-0.05736*	0.0429*	0.35079*	0.385*	0.1198*	0.23633
		K-40	Bq/kg	3	3	3	-1.47*	-1.185*	1.38*	1.461*	1.47*	0.46*	1.672
	Other	Morpholine	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromoform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Chloroform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		4-Bromofluorobenzene	%	8	0	0	97	97	98.5	101.3	102	98.875	1.7269

Table D-3: 2019 Surface Water Sampling Results - Statistics (Calculated with Uncensored Values Where Possible)

Location	Category	Parameter	Units	Total N	N (<RDL)	N (<RDL and uncensored)	Minimum	5th Percentile	50th Percentile	95th Percentile	Maximum	Arithmetic Mean	StdDev
SW12-S	Conventional Characteristics	Alkalinity (Total as CaCO3)	mg/L	4	0	0	120	129	190	200	200	175	37.859
		Conductivity	umho/cm	4	0	0	420	436.5	570	644	650	552.5	101.45
		Field pH	pH	4	0	0	7.4	7.454	8.045	9.4265	9.62	8.2775	0.97346
		Field Sp. Conductance	µS/cm	4	0	0	424	439.6	545.5	580	583	524.5	70.751
		pH	pH	4	0	0	8.19	8.199	8.305	9.244	9.4	8.55	0.57102
		Field Temperature	Celsius	4	0	0	4.39	4.4695	13.545	22.833	22.95	13.608	10.345
		Total Hardness (CaCO3)	mg/L	4	0	0	181	187.9	259.5	292	292	248	54.166
		Dissolved Oxygen	mg/L	4	0	0	8.03	8.567	12.625	13.827	13.86	11.785	2.7005
	Nutrients	Nitrate (N)	mg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Nitrite (N)	mg/L	4	4	4	-0.0066*	-0.00597*	-0.0013766*	-0.000052965*	0*	-0.0023383*	0.0030318
		Total Ammonia-N	mg/L	4	0	0	0.02	0.026	0.0665	0.07895	0.08	0.05825	0.026813
		Total Un-ionized Ammonia	mg/L	4	1	1	0.00013*	0.0002755*	0.0017	0.041145	0.048	0.012883*	0.023428
		Total Kjeldahl Nitrogen (TKN)	mg/L	4	0	0	0.4	0.403	0.42	0.573	0.6	0.46	0.093808
		Total Phosphorus	mg/L	5	0	0	0.026	0.0298	0.045	73.138	91.4	18.321	40.852
		Orthophosphate (P)	mg/L	4	4	4	0.00315*	0.0038775*	0.0085*	0.009221*	0.00926*	0.0073525*	0.0028538
	Biological	Chlorophyll	µg/L	3	0	0	2.33	2.385	2.88	22.608	24.8	10.003	12.817
		Total BOD	mg/L	4	2	1	2*	<2	<2	<2.85	3	2.25*	0.5
		Total Chemical Oxygen Demand (COD)	mg/L	4	0	0	15	15.15	18.5	43.95	48	25	15.556
		Dissolved Organic Carbon	mg/L	4	0	0	5.6	5.975	8.35	9.28	9.4	7.925	1.6399
		Escherichia coli	CFU/100mL	4	1	1	1	<2.35	<10	<18.5	20	10.25*	7.7621
		Fecal coliform	CFU/100mL	4	1	1	1	<2.35	<10	<18.5	20	10.25*	7.7621
		Total Coliforms	CFU/100mL	4	0	0	18	19.8	45	247	280	97	123.27
	Metals	Dissolved (0.2u) Aluminum (Al)	µg/L	4	2	2	3.926*	3.9371*	5*	6.85	7	5.2315*	1.5209
		Total Aluminum (Al)	µg/L	4	0	0	2.15	2.741	47.345	326.94	369	116.46	173.01
		Total Antimony (Sb)	µg/L	4	1	1	0.174	0.17475*	0.204*	0.26215	0.268	0.2125*	0.044561
		Total Arsenic (As)	µg/L	4	0	0	0.34	0.38335	0.6805	1.2318	1.32	0.75525	0.41144
		Total Barium (Ba)	µg/L	4	0	0	14.8	18.385	41.85	53.925	55.5	38.5	17.253
		Total Beryllium (Be)	µg/L	4	3	3	-0.0055*	-0.004795*	0.0026*	0.01535*	0.017	0.004175*	0.0097667
		Total Bismuth (Bi)	µg/L	4	4	4	-0.0009*	-0.00087*	0.00015*	0.00525*	0.006*	0.00135*	0.0032151
		Total Boron (B)	µg/L	4	0	0	146	148.25	180	225.35	230	184	37.921
		Total Cadmium (Cd)	µg/L	4	3	3	0.0003*	0.00039*	0.00295*	0.00704*	0.0074	0.0034*	0.0033872
		Total Calcium (Ca)	µg/L	4	0	0	25800	28530	56350	73630	74500	53250	22578.23
		Total Cesium (Cs)	µg/L	3	3	3	-0.0011*	-0.00068*	0.0031*	0.01651*	0.018*	0.0066667*	0.010037
		Total Chromium (Cr)	µg/L	4	3	3	0.06*	0.06048*	0.4461*	1.4674*	1.58	0.63305*	0.7276
		Chromium (VI)	µg/L	4	4	4	0*	0.0225*	0.15825*	0.27148*	0.29*	0.15163*	0.11883
		Chromium (+3)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Total Cobalt (Co)	µg/L	4	1	1	0.0742	0.08002	0.118*	0.2182*	0.235	0.1363*	0.069084
		Total Copper (Cu)	µg/L	4	0	0	0.421	0.43645	0.722	1.6	1.72	0.89625	0.58979
		Total Iron (Fe)	µg/L	4	0	0	5.9	6.245	84.6	392.2	433	152.03	200.89
		Total Lead (Pb)	µg/L	4	1	1	0.0135	0.01473	0.07435*	0.54095*	0.614	0.19405*	0.2847
		Total Lithium (Li)	µg/L	4	0	0	2.49	2.7015	4.315	5.5205	5.66	4.195	1.3449
		Total Magnesium (Mg)	µg/L	4	0	0	294	4089.9	26900	28370	28400	20623.5	13612.88
		Total Manganese (Mn)	µg/L	4	0	0	1.31	1.724	12.435	61.345	68.5	23.67	31.102
		Mercury (Hg)	µg/L	4	4	4	-0.0004*	-0.00034*	0*	0.001445*	0.0017*	0.000325*	0.00093586
		Total Molybdenum (Mo)	µg/L	4	1	1	0.533	0.53585*	0.571*	0.964	1.03	0.67625*	0.23702
		Total Nickel (Ni)	µg/L	4	1	1	0.523	0.53365	0.613*	0.8428*	0.88	0.65725*	0.15522
		Total Potassium (K)	µg/L	4	0	0	3740	3942.5	5640	6819	6930	5487.5	1388.77
		Total Selenium (Se)	µg/L	4	1	1	0.052	0.05395*	0.067*	0.0724	0.073	0.06475*	0.0091059
		Total Silicon (Si)	µg/L	3	0	0	80	264	1920	2091	2110	1370	1121.21
		Total Silver (Ag)	µg/L	4	4	4	0*	0.00018*	0.0016*	0.00285*	0.003*	0.00155*	0.0012689
		Total Sodium (Na)	µg/L	4	0	0	17200	17380	19000	21130	21400	19150	1791.65
		Total Strontium (Sr)	µg/L	4	0	0	322	331.45	431	497.4	501	421.25	82.931
		Total Thallium (Tl)	µg/L	4	3	3	0*	0.00027*	0.0024*	0.004955*	0.0053	0.002525*	0.0022232
		Total Thorium (Th)	µg/L	3	3	3	-0.0012*	-0.001*	0.0008*	0.00998*	0.011*	0.0035333*	0.0065432
		Total Tin (Sn)	µg/L	4	3	3	0.01*	0.011455*	0.02235*	0.44575*	0.52	0.14368*	0.25096
		Total Titanium (Ti)	µg/L	4	3	3	-0.0075*	0.025125*	2.427*	16.847*	19	5.9616*	8.9526
		Total Tungsten (W)	µg/L	3	1	1	0.025	0.0253*	0.028*	0.055*	0.058	0.037*	0.018248
		Total Uranium (U)	µg/L	4	0	0	0.787	0.82045	1.1	1.4365	1.48	1.1168	0.29294
		Total Vanadium (V)	µg/L	4	1	1	0.739*	0.78565*	1.43	2.422	2.53	1.5323*	0.80301
		Total Zinc (Zn)	µg/L	4	1	1	0.57	0.73245*	1.7665*	2.662	2.8	1.7258*	0.91631
		Dissolved Zinc (Zn)	µg/L	4	4	4	0.6*	0.62445*	0.8315*	1.0981*	1.133*	0.849*	0.22558
		Total Zirconium (Zr)	µg/L	4	3	3	0.0364*	0.04099*	0.0685*	0.1635*	0.18	0.08835*	0.062958
	Hydrocarbons	F1 (C6-C10)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F2 (C10-C16 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F3 (C16-C34 Hydrocarbons)	µg/L	4	4	4	44*	45.383*	69.291*	123.3*	130*	78.145*	38.851
		F4 (C34-C50 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Benzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Ethylbenzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromodichloromethane	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
	Radionuclides	C-14	Bq/kg	3	3	3	-0.07*	-0.067*	-0.04*	0.0023*	0.007*	-0.034333*	0.038812
		Co-60	Bq/kg	3	3	3	-0.107*	-0.09917*	-0.0287*	0.04609*	0.0544*	-0.0271*	0.080712
		Cs-134	Bq/kg	3	3	3	0.0283*	0.03817*	0.127*	0.1387*	0.14*	0.098433*	0.061084
		Cs-137	Bq/kg	3	3	3	0.0209*	0.02258*	0.0377*	0.15677*	0.17*	0.0762*	0.081666
		H-3	Bq/kg	3	0	0	30	30.1	31	31.81	31.9	30.967	0.95044
		I-131	Bq/kg	3	3	3	-0.493*	-0.44054*	0.0316*	3.4682*	3.85*	1.1295*	2.3705
		K-40	Bq/kg	3	3	3	-13.3*	-12.342*	-3.72*	-1.1469*	-0.861*	-5.9603*	6.5151
	Other	Morpholine	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromoform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Chloroform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		4-Bromofluorobenzene	%	8	0	0	95	95.35	97.5	100.95	102	97.875	2.1671

Table D-3: 2019 Surface Water Sampling Results - Statistics (Calculated with Uncensored Values Where Possible)

Location	Category	Parameter	Units	Total N	N (<RDL)	N (<RDL and uncensored)	Minimum	5^{th} Percentile	50^{th} Percentile	95^{th} Percentile	Maximum	Arithmetic Mean	StdDev
SW13-S	Conventional Characteristics	Alkalinity (Total as CaCO3)	mg/L	4	0	0	200	204.5	245	268.5	270	240	31.623
		Conductivity	umho/cm	4	0	0	420	421.5	465	568	580	482.5	74.106
		Field pH	pH	4	0	0	6.88	6.898	7.01	8.074	8.26	7.29	0.64962
		Field Sp. Conductance	µS/cm	4	0	0	241	274.15	465.5	519.15	528	425	126.19
		pH	pH	4	0	0	7.55	7.5755	7.77	7.9645	7.99	7.77	0.18421
		Field Temperature	Celsius	4	0	0	6.08	6.686	15.81	21.611	21.63	14.833	7.9472
		Total Hardness (CaCO3)	mg/L	4	0	0	207	209.7	244	281.7	285	245	35.44
		Dissolved Oxygen	mg/L	4	0	0	4.08	4.2795	6.74	15.329	16.61	8.5425	5.6283
	Nutrients	Nitrate (N)	mg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Nitrite (N)	mg/L	4	4	4	-0.0008935*	-0.00074527*	0.0010474*	0.0037*	0.004*	0.0013003*	0.0021637
		Total Ammonia-N	mg/L	4	0	0	0.03	0.0435	0.125	0.198	0.21	0.1225	0.073655
		Total Un-ionized Ammonia	mg/L	4	2	2	0.00018*	0.0001845*	0.000535*	0.004379	0.005	0.0015625*	0.002313
		Total Kjeldahl Nitrogen (TKN)	mg/L	4	0	0	0.44	0.449	0.73	1.079	1.1	0.75	0.32924
		Total Phosphorus	mg/L	5	0	0	0.033	0.037	0.11	56.196	70.2	14.115	31.352
		Orthophosphate (P)	mg/L	4	1	1	0.00869*	0.010837*	0.043	0.06555	0.066	0.040173*	0.028718
	Biological	Chlorophyll	µg/L	3	0	0	0.79	0.833	1.22	6.368	6.94	2.9833	3.4333
		Total BOD	mg/L	4	2	2	2*	<2	<2	<2	2*	2*	0
		Total Chemical Oxygen Demand (COD)	mg/L	4	0	0	15	15.3	22	32.95	34	23.25	8.8835
		Dissolved Organic Carbon	mg/L	4	0	0	6.1	6.325	9.3	11	11	8.925	2.473
		Escherichia coli	CFU/100mL	4	1	1	0	<1.5	<10	<290.5	340	90*	166.73
		Fecal coliform	CFU/100mL	4	1	1	0	<1.5	<10	<299	350	92.5*	171.73
		Total Coliforms	CFU/100mL	4	0	0	40	40.15	325.5	635.5	640	332.75	337.68
	Metals	Dissolved (0.2u) Aluminum (Al)	µg/L	4	1	1	4*	4.3*	6.5	10.4	11	7*	2.9439
		Total Aluminum (Al)	µg/L	4	0	0	3.6	3.7785	4.895	16.22	18.2	7.8975	6.8959
		Total Antimony (Sb)	µg/L	4	1	1	0.051	0.0522	0.059	0.0624*	0.063*	0.058*	0.0050332
		Total Arsenic (As)	µg/L	4	0	0	0.25	0.25225	0.28	0.29755	0.298	0.277	0.023367
		Total Barium (Ba)	µg/L	4	0	0	17.8	18.79	29.5	39.02	39.8	29.15	9.9081
		Total Beryllium (Be)	µg/L	4	4	4	0.001*	0.00115*	0.002*	0.00285*	0.003*	0.002*	0.0008165
		Total Bismuth (Bi)	µg/L	4	4	4	-0.0002*	-0.00017*	0.00015*	0.002595*	0.003*	0.000775*	0.0014975
		Total Boron (B)	µg/L	4	3	2	6.1893*	6.4219*	8.87*	<19.35	21	11.232*	6.6971
		Total Cadmium (Cd)	µg/L	4	4	4	0.0017*	0.00173*	0.00315*	0.00491*	0.005*	0.00325*	0.0016941
		Total Calcium (Ca)	µg/L	4	0	0	71900	72635	84200	96955	97900	84550	12220.34
		Total Cesium (Cs)	µg/L	3	3	3	0.0046*	0.00514*	0.01*	0.0109*	0.011*	0.0085333*	0.0034429
		Total Chromium (Cr)	µg/L	4	2	2	0.05*	0.05546*	0.1332*	1.047	1.2	0.3791*	0.55
		Chromium (VI)	µg/L	4	4	4	0.1294*	0.13399*	0.1616*	0.22848*	0.24*	0.17315*	0.047099
		Chromium (+3)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Total Cobalt (Co)	µg/L	4	1	1	0.073	0.0835	0.148*	0.22695*	0.24	0.15225*	0.068476
		Total Copper (Cu)	µg/L	4	2	2	0.08*	0.0905*	0.2285	0.37585*	0.388*	0.23125*	0.14117
		Total Iron (Fe)	µg/L	4	0	0	98.1	114.74	254.5	487	520	281.78	178.99
		Total Lead (Pb)	µg/L	4	3	3	0.014*	0.01463*	0.0221*	0.0634*	0.07*	0.03205*	0.025784
		Total Lithium (Li)	µg/L	4	4	4	0.18*	0.1836*	0.287*	0.39941*	0.4046*	0.28965*	0.11406
		Total Magnesium (Mg)	µg/L	4	0	0	6650	6875	8270	9673.5	9900	8272.5	1330.42
		Total Manganese (Mn)	µg/L	4	0	0	15.1	33.985	181.5	296.8	310	172.03	125.33
		Mercury (Hg)	µg/L	4	4	4	0*	0*	0.00115*	0.003575*	0.0038*	0.001525*	0.0018644
		Total Molybdenum (Mo)	µg/L	4	3	3	0.014*	0.017465*	0.07905*	0.14565*	0.15	0.080525*	0.065259
		Total Nickel (Ni)	µg/L	4	1	1	0.13	0.139	0.2095*	0.2647*	0.271	0.205*	0.05995
		Total Potassium (K)	µg/L	4	0	0	370	617.5	2185	5342	5870	2652.5	2313.27
		Total Selenium (Se)	µg/L	4	1	1	0.066*	0.0669*	0.0805	0.11025	0.114	0.08525*	0.0215
		Total Silicon (Si)	µg/L	3	0	0	505	760.5	3060	4302	4440	2668.33	1996.52
		Total Silver (Ag)	µg/L	4	4	4	0.0002*	0.000275*	0.00135*	0.002*	0.002*	0.001225*	0.00091788
		Total Sodium (Na)	µg/L	4	0	0	2280	2455.5	3490	4660.5	4860	3530	1054.8
		Total Strontium (Sr)	µg/L	4	0	0	143	150.95	198	221.25	225	191	34.477
		Total Thallium (Tl)	µg/L	4	2	3	0.0005*	0.000665*	0.0026*	0.00904	0.01	0.003925*	0.0042484
		Total Thorium (Th)	µg/L	3	3	3	-0.0015*	-0.00126*	0.0009*	0.00189*	0.002*	0.00046667*	0.0017898
		Total Tin (Sn)	µg/L	4	4	4	0.01*	0.0115*	0.028*	0.036085*	0.0361*	0.025525*	0.012821
		Total Titanium (Ti)	µg/L	4	4	4	0.0468*	0.09978*	0.42*	1.4192*	1.592*	0.6197*	0.67185
		Total Tungsten (W)	µg/L	3	3	3	-0.0006*	-0.00009*	0.0045*	0.00675*	0.007*	0.0036333*	0.0038734
		Total Uranium (U)	µg/L	4	0	0	0.0617	0.079145	0.274	0.6267	0.672	0.32043	0.26664
		Total Vanadium (V)	µg/L	4	3	3	0.12*	0.12873*	0.2491*	0.388*	0.4	0.25455*	0.12829
		Total Zinc (Zn)	µg/L	4	2	2	0.8*	1.0025*	2.451*	3.0478*	3.1	2.2005*	1.0128
		Dissolved Zinc (Zn)	µg/L	4	4	4	0.9*	0.9936*	2.212*	3.4117*	3.502*	2.2065*	1.2017
		Total Zirconium (Zr)	µg/L	4	4	4	0.02*	0.020945*	0.04315*	0.06425*	0.065*	0.042825*	0.022955
	Hydrocarbons	F1 (C6-C10)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F2 (C10-C16 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F3 (C16-C34 Hydrocarbons)	µg/L	4	4	4	23*	29.162*	72.849*	87.892*	89*	64.424*	29.527
		F4 (C34-C50 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Benzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Ethylbenzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromodichloromethane	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
	Radionuclides	C-14	Bq/kg	3	1	2	0.05*	0.05	0.05	0.0851	0.089	0.063*	0.022517
		Co-60	Bq/kg	3	3	3	0.0188*	0.02195*	0.0503*	0.05498*	0.0555*	0.041533*	0.019859
		Cs-134	Bq/kg	3	3	3	-0.096*	-0.08266*	0.0374*	0.06773*	0.0711*	0.0041667*	0.088368
		Cs-137	Bq/kg	3	3	3	-0.0551*	-0.04585*	0.0374*	0.06395*	0.0669*	0.0164*	0.063653
		H-3	Bq/kg	3	0	0	31.3	31.73	35.6	55.76	58	41.633	14.336
		I-131	Bq/kg	3	3	3	-2.27*	-2.0239*	0.191*	0.218*	0.221*	-0.61933*	1.4296
		K-40	Bq/kg	3	3	3	-4.84*	-4.575*	-2.19*	-1.398*	-1.31*	-2.78*	1.8375
	Other	Morpholine	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromoform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Chloroform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		4-Bromofluorobenzene	%	8	0	0	97	97	98	101.3	102	98.5	1.6903

Table D-3: 2019 Surface Water Sampling Results - Statistics (Calculated with Uncensored Values Where Possible)

Location	Category	Parameter	Units	Total N	N (<RDL)	N (<RDL and uncensored)	Minimum	5th Percentile	50th Percentile	95th Percentile	Maximum	Arithmetic Mean	StdDev
SW16-B	Conventional Characteristics	Alkalinity (Total as CaCO3)	mg/L	4	0	0	93	93	96.5	125.5	130	104	17.645
		Conductivity	umho/cm	4	0	0	310	313	345	521.5	550	387.5	110.26
		Field pH	pH	12	0	0	6.8	7.4765	8.455	3816.48	8470	713.48	2442.67
		Field Sp. Conductance	µS/cm	12	0	0	295	297.2	315.5	447.1	490	336.83	58.356
		pH	pH	4	0	0	8.25	8.25	8.27	8.3835	8.4	8.2975	0.070887
		Field Temperature	Celsius	12	0	0	2.06	2.159	6.735	19.178	19.26	9.4508	6.5148
		Total Hardness (CaCO3)	mg/L	6	0	0	124	124.25	131	177.5	190	140.17	25.079
		Dissolved Oxygen	mg/L	12	0	0	8.06	9.2095	12.245	18.08	20.34	12.83	3.3096
		Turbidity	NTU	4	0	0	0.3	0.42	1.9	8.225	9.2	3.325	4.0418
		Total Suspended Solids	mg/L	6	3	2	0.4*	0.55*	<5	14	15	6.2333*	5.7625
		Total Residual Chlorine	mg/L	4	3	0	<0.0012	<0.0012	<0.0012	<0.01463	0.017	<0.00515	0.0079
	Nutrients	Nitrate (N)	mg/L	12	0	0	0.15	0.172	0.36	0.641	0.85	0.37417	0.18856
		Nitrite (N)	mg/L	12	12	11	-0.0031*	-0.002495*	0.00115*	0.0054*	0.0065*	0.0013586*	0.0027797
		Total Ammonia-N	mg/L	12	2	2	-<0.02282	-0.008267*	0.025	0.1185	0.19	0.037568*	0.052999
		Total Un-ionized Ammonia	mg/L	12	3	2	0*	0*	0.00135	0.01175	0.02	0.0033317*	0.0055296
		Total Kjeldahl Nitrogen (TKN)	mg/L	12	0	0	0.12	0.12	0.175	0.3085	0.38	0.19	0.075318
		Total Phosphorus	mg/L	12	11	10	-0.0041*	-0.001295*	0.0075*	0.01859*	0.022	0.0078417*	0.0069283
		Orthophosphate (P)	mg/L	12	12	11	0.00233*	0.002561*	0.00447*	0.00645*	0.007*	0.0043842*	0.0013914
	Biological	Chlorophyll	µg/L	12	0	0	0.59	0.667	1.46	3.0925	3.45	1.7092	0.92666
		Total BOD	mg/L	10	9	1	2*	<2	<2	<2	2*	2*	0
		Total Chemical Oxygen Demand (COD)	mg/L	10	4	4	-3.5*	-2.735*	4.65	8.78	9.5	3.906*	4.1556
		Dissolved Organic Carbon	mg/L	12	0	0	1.7	1.81	2.05	2.425	2.7	2.0667	0.23868
		Escherichia coli	CFU/100mL	12	9	0	0	0	<10	<10	<10	<8.0833	3.872
		Fecal coliform	CFU/100mL	12	8	0	0	0	<10	<14.5	20	<9.0833	5.1427
		Total Coliforms	CFU/100mL	12	1	2	1	5.95	30	159.5	220	45.917*	61.792
	Metals	Dissolved (0.2u) Aluminum (Al)	µg/L	4	3	3	1.326*	1.545*	3.429*	5.7108*	6	3.546*	1.9837
		Total Aluminum (Al)	µg/L	5	0	0	0.85	0.98	3.2	92.	109	27.71	46.452
		Total Antimony (Sb)	µg/L	5	2	2	0.091	0.0952*	0.13	0.1344*	0.135	0.12*	0.018534
		Total Arsenic (As)	µg/L	5	1	1	0.705	0.706	0.772	0.8326*	0.841*	0.7654*	0.058321
		Total Barium (Ba)	µg/L	5	0	0	21.6	21.92	24	29.06	29.9	24.88	3.1713
		Total Beryllium (Be)	µg/L	5	5	5	-0.0019*	-0.00152*	0.0005*	0.005*	0.005*	0.00172*	0.0031252
		Total Bismuth (Bi)	µg/L	5	5	5	-0.0002*	-0.00018*	0.0001*	0.0218*	0.027*	0.00556*	0.011995
		Total Boron (B)	µg/L	5	1	1	21	21.42*	24	24.8	25	23.42*	1.5107
		Total Cadmium (Cd)	µg/L	5	5	5	0.0018*	0.0019*	0.0037*	0.0126*	0.014*	0.00576*	0.0050332
		Total Calcium (Ca)	µg/L	5	0	0	34100	34340	38300	56720	60900	41720	10975.06
		Total Cesium (Cs)	µg/L	4	4	4	0.003*	0.003015*	0.00335*	0.03709*	0.043*	0.013175*	0.019885
		Total Chromium (Cr)	µg/L	5	5	5	-0.256*	-0.1928*	0.0759*	0.79954*	0.977*	0.18932*	0.46321
		Chromium (VI)	µg/L	4	4	4	0.2056*	0.20799*	0.22575*	0.25822*	0.2632*	0.23008*	0.024289
		Chromium (+3)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Total Cobalt (Co)	µg/L	5	2	2	0.0111	0.01112	0.0144	0.065*	0.075*	0.02734*	0.027243
		Total Copper (Cu)	µg/L	5	1	1	0.581	0.5886	0.628	0.786*	0.79*	0.6776*	0.09539
		Total Iron (Fe)	µg/L	5	2	3	0.5002*	0.60016*	1.3	119.33*	144	33.491*	62.364
		Total Lead (Pb)	µg/L	5	4	4	0.0027*	0.00296*	0.0055	0.131*	0.148*	0.04464*	0.063172
		Total Lithium (Li)	µg/L	5	1	1	1.92	2.036	2.55	4.8818*	5.4	3.0358*	1.361
		Total Magnesium (Mg)	µg/L	5	0	0	8710	8728	9000	9490	9570	9050	341.1
		Total Manganese (Mn)	µg/L	5	1	1	0.392	0.4384	0.676	8.7624*	10.5	2.8008*	4.3391
		Mercury (Hg)	µg/L	4	4	4	0*	0.000045*	0.00065*	0.00168*	0.0018*	0.000775*	0.00080156
		Total Molybdenum (Mo)	µg/L	5	0	0	1.1	1.1	1.13	1.218	1.22	1.152	0.058907
		Total Nickel (Ni)	µg/L	5	2	2	-0.116*	-0.0018*	0.46	0.5592*	0.574*	0.3746*	0.27836
		Total Potassium (K)	µg/L	6	0	0	1700	1700	1790	2670	2950	1960	487.89
		Total Selenium (Se)	µg/L	5	1	1	0.122	0.124	0.147*	0.1656	0.17	0.1438*	0.018226
		Total Silicon (Si)	µg/L	4	0	0	164	179.45	468.5	670	670	442.75	265.75
		Total Silver (Ag)	µg/L	5	5	5	-0.0023*	-0.00192*	0.0002*	0.0042*	0.005*	0.0007*	0.0026944
		Total Sodium (Na)	µg/L	5	0	0	15600	15620	19000	30460	32800	20840	7077.64
		Total Strontium (Sr)	µg/L	5	0	0	185	186	226	346.6	373	243	76.43
		Total Thallium (Tl)	µg/L	5	2	2	0.0048	0.00498	0.0058	0.013*	0.014*	0.00786*	0.0037839
		Total Thorium (Th)	µg/L	4	4	4	-0.0034*	-0.002845*	0.0025*	0.008355*	0.009*	0.00265*	0.0053743
		Total Tin (Sn)	µg/L	5	5	5	-0.026*	-0.02148*	0.005*	0.0504*	0.059*	0.01012*	0.031375
		Total Titanium (Ti)	µg/L	5	4	4	-0.0915*	-0.06432*	0.56	4.6952*	4.79*	1.9238*	2.4182
		Total Tungsten (W)	µg/L	5	2	2	0.09*	0.09	0.099	0.104*	0.105*	0.0968*	0.0066106
		Total Uranium (U)	µg/L	5	0	0	0.358	0.3604	0.394	0.516	0.54	0.4164	0.073067
		Total Vanadium (V)	µg/L	5	3	3	-0.712*	-0.5616*	0.25	0.5494*	0.58	0.117*	0.5053
		Total Zinc (Zn)	µg/L	5	2	2	-0.073*	-0.0224*	0.31	1.4588*	1.711*	0.5156*	0.69546
		Dissolved Zinc (Zn)	µg/L	4	4	4	0.429*	0.4422*	0.6085*	1.6724*	1.844*	0.8725*	0.65743
		Total Zirconium (Zr)	µg/L	5	5	5	0.01*	0.01026*	0.0121*	0.0568*	0.063*	0.02568*	0.022747
	Hydrocarbons	F1 (C6-C10)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F2 (C10-C16 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F3 (C16-C34 Hydrocarbons)	µg/L	4	4	4	40.035*	40.379*	63.163*	105.84*	109.69*	69.012*	33.819
		F4 (C34-C50 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Benzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Ethylbenzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromodichloromethane	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
	Radionuclides	C-14	Bq/kg	4	2	2	-0.05*	-0.0455*	0.035*	0.1155	0.12	0.035*	0.082664
		Co-60	Bq/kg	4	4	4	-0.13*	-0.10717*	0.03135*	0.11913*	0.133*	0.016425*	0.109
		Cs-134	Bq/kg	4	4	4	0.0159*	0.021885*	0.0629*	0.092015*	0.0959*	0.0594*	0.033416
		Cs-137	Bq/kg	4	4	4	0.0347*	0.037625*	0.0686*	0.1935*	0.213*	0.096225*	0.080338
		H-3	Bq/kg	4	4	4	-5.2*	-4.42*	1.2*	4.78*	5.2*	0.6*	4.4121
		I-131	Bq/kg	4	4	4	0.0646*	0.07621*	0.255*	35.245*	41.4*	10.494*	20.605
		K-40	Bq/kg	4	4	4	-2.24*	-2.1875*	-1.0535*	-0.1745*	-0.167*	-1.1285*	1.091
	Other	Morpholine	µg/L	4	4	4	0*	0*	0*	0.85*	1*	0.25*	0.5
		Bromoform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Chloroform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		4-Bromofluorobenzene	%	8	0	0	91	91.7	96.5	99.65	100	96.125	3.2266

Table D-3: 2019 Surface Water Sampling Results - Statistics (Calculated with Uncensored Values Where Possible)

Location	Category	Parameter	Units	Total N	N (<RDL)	N (<RDL and uncensored)	Minimum	5th Percentile	50th Percentile	95th Percentile	Maximum	Arithmetic Mean	StdDev
SW16-S	Conventional Characteristics	Alkalinity (Total as CaCO3)	mg/L	4	0	0	92	92.15	96	99	99	95.75	3.7749
		Conductivity	umho/cm	4	0	0	310	310	335	368.5	370	337.5	32.016
		Field pH	pH	12	0	0	6.8	7.5645	8.435	8.85	9.07	8.3517	0.53787
		Field Sp. Conductance	µS/cm	12	0	0	280	283.85	306	345.2	354	308.42	21.305
		pH	pH	4	0	0	8.11	8.1145	8.19	8.376	8.4	8.2225	0.13074
		Field Temperature	Celsius	12	0	0	1.78	2.0385	9.13	19.411	19.57	10.03	6.6851
		Total Hardness (CaCO3)	mg/L	6	0	0	121	121.75	128	138	140	128.83	6.7651
		Dissolved Oxygen	mg/L	12	0	0	8.6	9.3315	12.31	18.364	20.36	12.761	3.2473
		Turbidity	NTU	4	0	0	0.4	0.475	0.95	2.19	2.4	1.175	0.85781
		Total Suspended Solids	mg/L	6	4	3	0.8*	0.85*	<2.5	6.25*	7	2.9667*	2.3166
		Total Residual Chlorine	mg/L	4	3	0	<0.0012	<0.0012	<0.0012	<0.01633	0.019	<0.00565	0.0089
	Nutrients	Nitrate (N)	mg/L	12	0	0	0.14	0.1675	0.345	0.4745	0.48	0.33167	0.12268
		Nitrite (N)	mg/L	12	12	11	-0.0026*	-0.001885*	0.0018*	0.00436*	0.0048*	0.0014955*	0.0021397
		Total Ammonia-N	mg/L	12	6	5	-0.0422*	-0.035947*	<0.01	0.177	0.32	0.035878*	0.093846
		Total Un-ionized Ammonia	mg/L	12	6	5	0*	0*	0.00036*	0.009415	0.012	0.0019692*	0.00377
		Total Kjeldahl Nitrogen (TKN)	mg/L	12	0	0	0.12	0.131	0.16	0.278	0.3	0.185	0.054356
		Total Phosphorus	mg/L	12	11	10	-0.0011*	0.00154*	0.0081*	0.0203*	0.028	0.0090917*	0.0073791
		Orthophosphate (P)	mg/L	12	12	11	0.00247*	0.003306*	0.00487*	0.00645*	0.007*	0.0048142*	0.0011702
	Biological	Chlorophyll	µg/L	12	0	0	0.47	0.4865	1.61	2.804	2.87	1.595	0.83423
		Total BOD	mg/L	10	9	1	2*	<2	<2	<2	2*	2*	0
		Total Chemical Oxygen Demand (COD)	mg/L	10	5	5	-2.1*	-1.326*	4.185*	8.72	8.9	3.992*	3.8403
		Dissolved Organic Carbon	mg/L	12	0	0	1.8	1.8	2	2.145	2.2	1.9833	0.11934
		Escherichia coli	CFU/100mL	12	9	0	0	0	<10	<10	<10	<7.5	4.5227
		Fecal coliform	CFU/100mL	12	8	0	0	0	<10	<19	30	<9.1667	7.9296
		Total Coliforms	CFU/100mL	12	5	0	0	1.1	<10	104	170	<28.083	46.967
	Metals	Dissolved (0.2u) Aluminum (Al)	µg/L	4	4	4	1.34*	1.5485*	2.865*	3.2363*	3.278*	2.587*	0.86091
		Total Aluminum (Al)	µg/L	5	0	0	0.97	1.086	1.78	23.48	23.6	10.18	11.982
		Total Antimony (Sb)	µg/L	5	2	2	0.094	0.0974*	0.124	0.1684*	0.176*	0.1286*	0.031077
		Total Arsenic (As)	µg/L	5	1	1	0.704*	0.7088*	0.77	0.8096	0.817	0.7598*	0.044466
		Total Barium (Ba)	µg/L	5	0	0	21.9	22.04	23	24.72	24.9	23.28	1.1819
		Total Beryllium (Be)	µg/L	5	5	5	-0.0028*	-0.0023*	0*	0.0058*	0.007*	0.00098*	0.0036444
		Total Bismuth (Bi)	µg/L	5	5	5	-0.0007*	-0.00058*	0*	0.01128*	0.014*	0.00272*	0.006318
		Total Boron (B)	µg/L	5	1	1	20	20.378*	24	24.8	25	22.978*	2.0144
		Total Cadmium (Cd)	µg/L	5	5	5	0*	0.00034*	0.0024*	0.0088*	0.01*	0.00362*	0.0038447
		Total Calcium (Ca)	µg/L	5	0	0	34200	34400	36000	38820	39000	36500	2002.5
		Total Cesium (Cs)	µg/L	4	4	4	0.002*	0.00203*	0.00225*	0.003745*	0.004*	0.002625*	0.00092511
		Total Chromium (Cr)	µg/L	5	5	5	-0.107*	-0.0776*	0.0934*	0.75838*	0.924*	0.20926*	0.40798
		Chromium (VI)	µg/L	4	4	4	0.22*	0.22473*	0.274*	0.31945*	0.3235*	0.27288*	0.046093
		Chromium (+3)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Total Cobalt (Co)	µg/L	5	2	2	0.007*	0.0075*	0.0122	0.03258*	0.037*	0.01612*	0.01204
		Total Copper (Cu)	µg/L	5	1	1	0.591	0.5946	0.61	0.784*	0.82*	0.654*	0.094448
		Total Iron (Fe)	µg/L	5	3	3	0.4609*	0.53076*	1.2	26.343*	27.429*	10.38*	13.228
		Total Lead (Pb)	µg/L	5	4	4	0.0044*	0.00446*	0.006	0.0534*	0.058*	0.02162*	0.024132
		Total Lithium (Li)	µg/L	5	1	1	1.78	1.812	2.464*	2.826	2.9	2.3228*	0.45749
		Total Magnesium (Mg)	µg/L	5	0	0	8230	8312	8980	9264	9280	8866	433.45
		Total Manganese (Mn)	µg/L	5	1	1	0.291	0.2942	0.74	1.8672*	1.884*	1.0044*	0.78611
		Mercury (Hg)	µg/L	4	4	4	0*	0.00021*	0.00185*	0.00247*	0.0025*	0.00155*	0.0011387
		Total Molybdenum (Mo)	µg/L	5	0	0	1.1	1.116	1.19	1.216	1.22	1.178	0.046043
		Total Nickel (Ni)	µg/L	5	2	2	-0.122*	-0.0072*	0.473	0.6196*	0.654*	0.3878*	0.29623
		Total Potassium (K)	µg/L	6	0	0	1630	1632.5	1725	1875	1900	1736.67	102.89
		Total Selenium (Se)	µg/L	5	1	1	0.127	0.1272	0.13*	0.1424	0.143	0.1336*	0.0073689
		Total Silicon (Si)	µg/L	4	0	0	170	185.3	472	687.3	690	451	268.93
		Total Silver (Ag)	µg/L	5	5	5	-0.0027*	-0.00216*	0.001*	0.0035*	0.004*	0.00076*	0.0024317
		Total Sodium (Na)	µg/L	5	0	0	13900	14180	18000	20880	21400	17480	2955.84
		Total Strontium (Sr)	µg/L	5	0	0	180	181	198	221.4	224	199.6	18.202
		Total Thallium (Tl)	µg/L	5	2	2	0.0038	0.00414	0.0059	0.0092*	0.01*	0.00624*	0.002281
		Total Thorium (Th)	µg/L	4	3	3	-0.0022*	-0.00187*	0.00045*	0.005405*	0.0062	0.001225*	0.0035631
		Total Tin (Sn)	µg/L	5	5	5	-0.035*	-0.028*	0.0033*	0.00752*	0.0084*	-0.00386*	0.017663
		Total Titanium (Ti)	µg/L	5	4	4	-0.225*	-0.16252*	0.56	3.2646*	3.932*	0.98988*	1.6798
		Total Tungsten (W)	µg/L	5	2	2	0.085	0.0866*	0.095*	0.1014	0.102	0.0948*	0.0064962
		Total Uranium (U)	µg/L	5	0	0	0.35	0.3512	0.366	0.397	0.4	0.3714	0.02078
		Total Vanadium (V)	µg/L	5	4	4	-0.6577*	-0.51416*	0.206*	0.4388*	0.496*	0.06286*	0.43271
		Total Zinc (Zn)	µg/L	5	2	2	-0.1*	-0.034*	0.28	1.2876*	1.457*	0.4954*	0.59354
		Dissolved Zinc (Zn)	µg/L	4	4	4	0.48*	0.4914*	0.678*	1.9246*	2.123*	0.98975*	0.76773
		Total Zirconium (Zr)	µg/L	5	5	5	-0.0015*	0.0008*	0.0145*	0.037*	0.042*	0.0164*	0.015974
	Hydrocarbons	F1 (C6-C10)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F2 (C10-C16 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F3 (C16-C34 Hydrocarbons)	µg/L	4	4	4	33.498*	34.571*	48.825*	57.899*	58.058*	47.301*	12.173
		F4 (C34-C50 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Benzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Ethylbenzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromodichloromethane	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
	Radionuclides	C-14	Bq/kg	4	4	4	0*	0.0045*	0.035*	0.0825*	0.09*	0.04*	0.037417
		Co-60	Bq/kg	4	4	4	-0.145*	-0.14245*	-0.0848*	0.15101*	0.185*	-0.0324*	0.15184
		Cs-134	Bq/kg	4	4	4	-0.612*	-0.51252*	0.05855*	0.16119*	0.178*	-0.079225*	0.35967
		Cs-137	Bq/kg	4	4	4	-0.129*	-0.10539*	0.051*	0.13769*	0.149*	0.0305*	0.11739
		H-3	Bq/kg	4	4	4	-5.2*	-5.2*	-2.45*	3.87*	4.5*	-1.4*	4.711
		I-131	Bq/kg	4	4	4	-0.0914*	0.00631*	0.83*	22.945*	26.8*	7.0922*	13.148
		K-40	Bq/kg	4	4	4	-6.24*	-5.7495*	-1.073*	2.0531*	2.27*	-1.529*	3.8401
	Other	Morpholine	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromoform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Chloroform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		4-Bromofluorobenzene	%	8	0	0	90	91.4	96	100.65	101	96.5	3.5456

Table D-3: 2019 Surface Water Sampling Results - Statistics (Calculated with Uncensored Values Where Possible)

Location	Category	Parameter	Units	Total N	N (<RDL)	N (<RDL and uncensored)	Minimum	5^{th} Percentile	50^{th} Percentile	95^{th} Percentile	Maximum	Arithmetic Mean	StdDev
SW17-B	Conventional Characteristics	Alkalinity (Total as CaCO3)	mg/L	4	0	0	93	93.15	97	100	100	96.75	3.7749
		Conductivity	umho/cm	4	0	0	310	311.5	350	397	400	352.5	44.253
		Field pH	pH	12	0	0	6.8	7.3005	8.305	8.957	9.21	8.2392	0.59384
		Field Sp. Conductance	µS/cm	12	0	0	282	289.15	309	352.35	365	313	23.487
		pH	pH	4	0	0	8.19	8.1975	8.25	8.3705	8.39	8.27	0.085245
		Field Temperature	Celsius	12	0	0	1.43	1.7765	6.135	18.517	18.88	8.7567	6.2913
		Total Hardness (CaCO3)	mg/L	6	0	0	124	124.25	128.5	153.25	160	133.17	13.556
		Dissolved Oxygen	mg/L	11	0	0	10.77	11.01	12.29	17.69	18.03	13.584	2.5839
		Turbidity	NTU	4	0	0	0.3	0.36	0.95	8.425	9.7	2.975	4.4984
		Total Suspended Solids	mg/L	6	3	3	0*	0*	3.5*	12.75	13	5.3333*	5.8538
		Total Residual Chlorine	mg/L	3	2	0	<0.0012	<0.0012	<0.0012	<0.01452	0.016	<0.0061333	0.0085448
	Nutrients	Nitrate (N)	mg/L	12	0	0	0.16	0.182	0.35	0.5495	0.61	0.3575	0.13923
		Nitrite (N)	mg/L	12	12	11	-0.0028*	-0.002305*	0.00062727*	0.004885*	0.0067*	0.00093627*	0.0025909
		Total Ammonia-N	mg/L	12	4	3	-<0.02243	-0.010094*	0.02	0.24693*	0.40207*	0.054137*	0.11461
		Total Un-ionized Ammonia	mg/L	12	6	5	0*	0*	0.000375*	0.00279	0.0029	0.00091167*	0.0011417
		Total Kjeldahl Nitrogen (TKN)	mg/L	12	0	0	0.12	0.1255	0.175	0.2615	0.3	0.185	0.05
		Total Phosphorus	mg/L	12	12	11	-0.0021*	-0.00166*	0.0069*	0.015405*	<0.0159	0.0072167*	0.0059053
		Orthophosphate (P)	mg/L	12	12	11	<0.00245	0.002472*	0.004615*	0.006989*	0.007*	0.0046533*	0.0015546
	Biological	Chlorophyll	µg/L	12	0	0	0.47	0.5525	1.805	2.8465	3.05	1.6458	0.91656
		Total BOD	mg/L	10	9	1	2*	<2	<2	<2	2*	2*	0
		Total Chemical Oxygen Demand (COD)	mg/L	10	6	6	-4.46*	-2.4634*	1.96*	5.43	5.7	2.0767*	3.1198
		Dissolved Organic Carbon	mg/L	12	0	0	1.7	1.755	2	2.235	2.4	2.0083	0.17816
		Escherichia coli	CFU/100mL	12	8	1	0	0.55	<10	<10	10*	8.0833*	3.7285
		Fecal coliform	CFU/100mL	12	7	1	0	1.65	<10	17.8	20	9.9167*	5.0894
		Total Coliforms	CFU/100mL	12	1	3	2	<6.4	25	187	220	53.917*	68.321
	Metals	Dissolved (0.2u) Aluminum (Al)	µg/L	4	4	4	1.329*	1.4957*	2.72*	3.4029*	3.474*	2.5608*	0.92354
		Total Aluminum (Al)	µg/L	5	0	0	1.12	1.134	8.06	33.16	36	13.634	15.079
		Total Antimony (Sb)	µg/L	5	2	2	0.096	0.101*	0.13*	0.1344	0.135	0.1228*	0.015865
		Total Arsenic (As)	µg/L	5	1	1	0.648*	0.653*	0.77	0.7986	0.801	0.7362*	0.070539
		Total Barium (Ba)	µg/L	5	0	0	21.7	22.02	23.4	25.74	26	23.82	1.6177
		Total Beryllium (Be)	µg/L	5	5	5	-0.0034*	-0.0028*	0.001*	0.0052*	0.006*	0.00104*	0.0034392
		Total Bismuth (Bi)	µg/L	5	5	5	-0.0002*	-0.00016*	0*	0.00328*	0.004*	0.00084*	0.0017799
		Total Boron (B)	µg/L	5	1	1	21	21.146*	23	24.8	25	22.946*	1.6281
		Total Cadmium (Cd)	µg/L	5	5	5	0.001*	0.00126*	0.003*	0.0136*	0.016*	0.00526*	0.0061023
		Total Calcium (Ca)	µg/L	5	0	0	34600	34740	37400	43780	45000	38240	4145.24
		Total Cesium (Cs)	µg/L	4	4	4	0.0016*	0.00166*	0.00215*	0.005445*	0.006*	0.002975*	0.002037
		Total Chromium (Cr)	µg/L	5	5	5	-0.43*	-0.328*	0.0857*	1.094*	1.346*	0.23354*	0.6605
		Chromium (VI)	µg/L	4	4	4	0.1666*	0.17427*	0.24385*	0.29559*	0.3001*	0.2386*	0.058847
		Chromium (+3)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Total Cobalt (Co)	µg/L	5	2	2	0.008*	0.0086*	0.0144	0.0437*	0.05*	0.02038*	0.017014
		Total Copper (Cu)	µg/L	5	0	1	0.57	0.5706	0.642	0.929	1	0.686	0.17919
		Total Iron (Fe)	µg/L	5	2	2	0.5368*	0.68944*	6.7	39.702*	43.878*	15.083*	18.464
		Total Lead (Pb)	µg/L	5	4	4	0.0041*	0.00416*	0.0141	0.0526*	0.056*	0.02352*	0.023054
		Total Lithium (Li)	µg/L	5	1	1	1.93	2.014	2.36	4.0184*	4.248*	2.7976*	0.91374
		Total Magnesium (Mg)	µg/L	5	0	0	8230	8316	8710	9734	9800	8974	642.29
		Total Manganese (Mn)	µg/L	5	0	0	0.272	0.3404	1.11	3.2	3.5	1.4992	1.2937
		Mercury (Hg)	µg/L	4	4	4	0*	0.00009*	0.0008*	0.00219*	0.0024*	0.001*	0.0010198
		Total Molybdenum (Mo)	µg/L	5	0	0	1.1	1.104	1.13	1.224	1.23	1.156	0.055946
		Total Nickel (Ni)	µg/L	5	2	2	-0.278*	-0.127*	0.49	0.6702*	0.703*	0.3862*	0.38206
		Total Potassium (K)	µg/L	6	0	0	1650	1667.5	1810	2275	2400	1881.67	268.66
		Total Selenium (Se)	µg/L	5	1	1	0.129	0.1292	0.132	0.181*	0.189*	0.1458*	0.025489
		Total Silicon (Si)	µg/L	4	0	0	173	189.2	480	798.85	820	488.25	310.26
		Total Silver (Ag)	µg/L	5	5	5	-0.001*	-0.00096*	-0.0004*	0.0026*	0.003*	0.00036*	0.0016697
		Total Sodium (Na)	µg/L	5	0	0	15300	15340	19000	23960	24000	19520	4261.1
		Total Strontium (Sr)	µg/L	5	0	0	186	191.2	228	253.8	260	223	27.019
		Total Thallium (Tl)	µg/L	5	2	2	0.0047	0.0047	0.0051	0.0094*	0.01*	0.0063*	0.0022771
		Total Thorium (Th)	µg/L	4	4	4	0*	0.000045*	0.00115*	0.002085*	0.0021*	0.0011*	0.0011045
		Total Tin (Sn)	µg/L	5	5	5	-0.011*	-0.0098*	0.005*	0.0952*	0.1165*	0.0231*	0.052856
		Total Titanium (Ti)	µg/L	5	4	4	0.0689*	0.10112*	0.59	3.7696*	4.236*	1.4058*	1.7388
		Total Tungsten (W)	µg/L	5	2	2	0.087	0.088*	0.095	0.103*	0.104	0.0954*	0.0065038
		Total Uranium (U)	µg/L	5	0	0	0.357	0.3576	0.362	0.4392	0.45	0.385	0.039636
		Total Vanadium (V)	µg/L	5	3	3	-0.7057*	-0.53456*	0.214*	0.558	0.64	0.10566*	0.4932
		Total Zinc (Zn)	µg/L	5	2	2	0.24	0.274	0.42	0.8246*	0.898*	0.4998*	0.2457
		Dissolved Zinc (Zn)	µg/L	4	4	4	-0.149*	-0.06665*	0.406*	1.8298*	2.08*	0.68575*	0.96563
		Total Zirconium (Zr)	µg/L	5	5	5	0.0059*	0.00634*	0.01*	0.0246*	0.026*	0.0138*	0.0084442
	Hydrocarbons	F1 (C6-C10)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F2 (C10-C16 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F3 (C16-C34 Hydrocarbons)	µg/L	4	4	4	44.512*	46.235*	65.138*	89.171*	91.799*	66.647*	20.77
		F4 (C34-C50 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Benzene	µg/L	4	3	3	0*	0*	0*	0.119*	0.14	0.035*	0.07
		Ethylbenzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromodichloromethane	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
	Radionuclides	C-14	Bq/kg	4	4	4	-0.07*	-0.0625*	-0.015*	-0.01*	-0.01*	-0.0275*	0.028723
		Co-60	Bq/kg	4	4	4	-0.23*	-0.2072*	-0.047*	0.02854*	0.0364*	-0.0719*	0.11531
		Cs-134	Bq/kg	4	4	4	-0.566*	-0.4733*	0.06405*	0.16357*	0.179*	-0.064725*	0.33869
		Cs-137	Bq/kg	4	4	4	-0.0416*	-0.02321*	0.0925*	0.2366*	0.26*	0.10085*	0.12386
		H-3	Bq/kg	4	4	4	-5.3*	-4.505*	0*	0*	0*	-1.325*	2.65
		I-131	Bq/kg	4	4	4	-0.00222*	0.013083*	0.2104*	11.693*	13.7*	3.5296*	6.7816
		K-40	Bq/kg	4	4	4	-3.44*	-3.4265*	-3.165*	-1.5605*	-1.31*	-2.77*	0.99348
	Other	Morpholine	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromoform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Chloroform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		4-Bromofluorobenzene	%	8	0	0	91	91.7	96.5	100.65	101	96.5	3.4641

Table D-3: 2019 Surface Water Sampling Results - Statistics (Calculated with Uncensored Values Where Possible)

Location	Category	Parameter	Units	Total N	N (<RDL)	N (<RDL and uncensored)	Minimum	5th Percentile	50th Percentile	95th Percentile	Maximum	Arithmetic Mean	StdDev
SW17-S	Conventional Characteristics	Alkalinity (Total as CaCO3)	mg/L	4	0	0	93	93.15	97	108.5	110	99.25	7.8049
		Conductivity	umho/cm	4	0	0	310	310	340	395.5	400	347.5	45
		Field pH	pH	12	0	0	6.8	7.394	8.405	8.845	8.9	8.2633	0.5529
		Field Sp. Conductance	µS/cm	12	0	0	280	281.1	306	335.95	342	308.5	20.791
		pH	pH	4	0	0	8.2	8.2045	8.255	8.3735	8.39	8.275	0.083467
		Field Temperature	Celsius	12	0	0	1.45	1.692	8.45	19.137	19.28	9.7875	6.7337
		Total Hardness (CaCO3)	mg/L	6	0	0	122	122.25	127	137.75	140	128.33	6.8313
		Dissolved Oxygen	mg/L	11	0	0	10.1	10.115	12.09	19.16	19.78	13.096	3.279
		Turbidity	NTU	4	0	0	0.3	0.345	1.05	7.195	8.2	2.65	3.735
		Total Suspended Solids	mg/L	6	4	3	0.8*	1.1*	4.5*	<6.75	7	4.1333*	2.5351
		Total Residual Chlorine	mg/L	3	2	0	<0.0012	<0.0012	<0.0012	<0.01452	0.016	<0.0061333	0.0085448
	Nutrients	Nitrate (N)	mg/L	12	0	0	0.13	0.163	0.34	0.4845	0.49	0.32833	0.12037
		Nitrite (N)	mg/L	12	11	10	-0.0045*	-0.003565*	0.0012031*	0.00815*	0.012	0.0012939*	0.0044012
		Total Ammonia-N	mg/L	12	4	3	-<0.02596	-0.012507*	0.02	0.089	0.1	0.027854*	0.033436
		Total Un-ionized Ammonia	mg/L	12	7	6	0*	0*	0.0003*	0.0032	0.0032	0.00113*	0.0013699
		Total Kjeldahl Nitrogen (TKN)	mg/L	12	1	1	0.08*	0.1075*	0.165	0.2435	0.26	0.1725*	0.047697
		Total Phosphorus	mg/L	12	11	10	-0.0053*	-0.004585*	0.00595*	0.01737*	0.021	0.0063917*	0.0083539
		Orthophosphate (P)	mg/L	12	12	11	0.00238*	0.0029795*	0.004885*	0.006*	0.006*	0.0045692*	0.0011383
	Biological	Chlorophyll	µg/L	12	0	0	0.38	0.424	1.655	2.766	2.81	1.6667	0.85751
		Total BOD	mg/L	10	9	1	2*	<2	<2	<2	2*	2*	0
		Total Chemical Oxygen Demand (COD)	mg/L	10	5	5	-2*	-1.6895*	2.85*	8.86	9.4	3.026*	4.1645
		Dissolved Organic Carbon	mg/L	12	0	0	1.7	1.81	2	2.1	2.1	1.9833	0.11934
		Escherichia coli	CFU/100mL	12	8	0	0	0	<10	<23.5	40	<10.583	10.022
		Fecal coliform	CFU/100mL	12	8	0	0	0	<10	<23.5	40	<10.667	9.9939
		Total Coliforms	CFU/100mL	12	4	1	1	4.85	<10	214.5	220	54.917*	81.226
	Metals	Dissolved (0.2u) Aluminum (Al)	µg/L	4	4	4	2.072*	2.141*	2.766*	3.3188*	3.375*	2.7448*	0.56575
		Total Aluminum (Al)	µg/L	5	0	0	0.85	0.864	4.4	18.96	19.7	8.374	8.8657
		Total Antimony (Sb)	µg/L	5	2	2	0.091	0.0966*	0.13	0.147*	0.151*	0.1244*	0.02195
		Total Arsenic (As)	µg/L	5	1	1	0.695	0.706	0.761	0.788	0.788*	0.7564*	0.038175
		Total Barium (Ba)	µg/L	5	0	0	22	22.24	23.3	24.96	25.2	23.54	1.1739
		Total Beryllium (Be)	µg/L	5	5	5	-0.0032*	-0.00286*	-0.001*	0.006*	0.007*	0.00066*	0.0040097
		Total Bismuth (Bi)	µg/L	5	5	5	-0.0008*	-0.00066*	0*	0.00882*	0.011*	0.00204*	0.0050213
		Total Boron (B)	µg/L	5	1	1	21	21.25*	24	25	25	23.45*	1.7711
		Total Cadmium (Cd)	µg/L	5	5	5	0.0009*	0.00114*	0.0043*	0.0106*	0.012*	0.00486*	0.0043189
		Total Calcium (Ca)	µg/L	5	0	0	33800	33900	35900	38840	39000	36240	2307.16
		Total Cesium (Cs)	µg/L	4	4	4	0.0023*	0.002405*	0.003*	0.0047*	0.005*	0.003325*	0.0011644
		Total Chromium (Cr)	µg/L	5	5	5	0.06*	0.06324*	0.0797*	0.9178*	0.939*	0.39758*	0.4475
		Chromium (VI)	µg/L	4	4	4	0.2029*	0.20671*	0.24915*	0.28352*	0.2859*	0.24678*	0.03802
		Chromium (+3)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Total Cobalt (Co)	µg/L	5	2	2	0.0091	0.0101	0.0188	0.027*	0.029*	0.018*	0.0073665
		Total Copper (Cu)	µg/L	5	1	1	0.576	0.5878	0.639	0.8116*	0.852*	0.6704*	0.10553
		Total Iron (Fe)	µg/L	5	3	3	0.3963*	0.4167*	3.4	39.607*	42.509*	14.961*	19.26
		Total Lead (Pb)	µg/L	5	4	4	0.0016*	0.0019*	0.0112	0.0536*	0.056*	0.02318*	0.025115
		Total Lithium (Li)	µg/L	5	1	1	1.97	1.974	2.105*	2.728	2.8	2.261*	0.35532
		Total Magnesium (Mg)	µg/L	5	0	0	8360	8436	8750	9388	9400	8918	442.06
		Total Manganese (Mn)	µg/L	5	1	1	0.206	0.2418	1.07	1.8776*	2	1.0098*	0.73546
		Mercury (Hg)	µg/L	4	4	4	-0.0001*	0.00008*	0.0013*	0.00286*	0.0031*	0.0014*	0.0013216
		Total Molybdenum (Mo)	µg/L	5	0	0	1.1	1.1	1.15	1.21	1.22	1.148	0.050695
		Total Nickel (Ni)	µg/L	5	2	2	0.253*	0.2908*	0.486	0.625*	0.649*	0.4718*	0.1446
		Total Potassium (K)	µg/L	6	0	0	1600	1615	1735	1877.5	1900	1740	110.09
		Total Selenium (Se)	µg/L	5	1	1	0.119	0.1214	0.137	0.1596*	0.162*	0.1398*	0.016694
		Total Silicon (Si)	µg/L	4	0	0	167	182.6	430.5	649.5	660	422	239.93
		Total Silver (Ag)	µg/L	5	5	5	-0.0016*	-0.00128*	0*	0.005*	0.006*	0.00108*	0.0029038
		Total Sodium (Na)	µg/L	5	0	0	14500	14720	17000	22860	24000	17880	3709.04
		Total Strontium (Sr)	µg/L	5	0	0	170	173.2	207	218	220	198.6	20.219
		Total Thallium (Tl)	µg/L	5	2	2	0.0043	0.00444	0.005	0.00584*	0.006*	0.0051*	0.00060828
		Total Thorium (Th)	µg/L	4	4	4	-0.0012*	-0.001065*	0.00085*	0.003955*	0.0043*	0.0012*	0.0024671
		Total Tin (Sn)	µg/L	5	5	5	-0.035*	-0.0278*	0.0086*	0.0132*	0.014*	-0.00028*	0.019972
		Total Titanium (Ti)	µg/L	5	4	4	0.0973*	0.10384*	0.55	2.996*	3.556*	1.0179*	1.4461
		Total Tungsten (W)	µg/L	5	2	2	0.093	0.0936*	0.097	0.1006*	0.101	0.0972*	0.0030332
		Total Uranium (U)	µg/L	5	0	0	0.355	0.356	0.365	0.3956	0.397	0.3734	0.018849
		Total Vanadium (V)	µg/L	5	3	3	-0.7033*	-0.53064*	0.22	0.5096*	0.58	0.09694*	0.47698
		Total Zinc (Zn)	µg/L	5	2	2	0.15	0.174	0.35	1.2084*	1.368*	0.5416*	0.48672
		Dissolved Zinc (Zn)	µg/L	4	4	4	0.4*	0.40645*	0.698*	1.837*	1.993*	0.94725*	0.74103
		Total Zirconium (Zr)	µg/L	5	5	5	-0.0041*	-0.00384*	0.0088*	0.0214*	0.022*	0.00858*	0.012031
	Hydrocarbons	F1 (C6-C10)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F2 (C10-C16 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F3 (C16-C34 Hydrocarbons)	µg/L	4	4	4	36.786*	37.119*	51.914*	65.506*	65.626*	51.56*	15.81
		F4 (C34-C50 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Benzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Ethylbenzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromodichloromethane	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
	Radionuclides	C-14	Bq/kg	4	3	3	-0.06*	-0.051*	0.01*	0.088*	0.1	0.015*	0.066081
		Co-60	Bq/kg	4	4	4	-0.15*	-0.13601*	-0.029225*	0.068928*	0.0814*	-0.031763*	0.09714
		Cs-134	Bq/kg	4	4	4	-0.383*	-0.31625*	0.06715*	0.19445*	0.216*	-0.008175*	0.25958
		Cs-137	Bq/kg	4	4	4	-0.0811*	-0.067585*	0.035*	0.129*	0.141*	0.032475*	0.09317
		H-3	Bq/kg	4	4	4	-5.2*	-4.42*	0*	3.23*	3.8*	-0.35*	3.6964
		I-131	Bq/kg	4	4	4	0.154*	0.16*	0.2485*	29.965*	35.2*	8.9628*	17.492
		K-40	Bq/kg	4	4	4	-3.89*	-3.674*	-1.825*	0.19825*	0.445*	-1.7738*	1.8428
	Other	Morpholine	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromoform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Chloroform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		4-Bromofluorobenzene	%	8	0	0	85	87.45	97.5	100.65	101	96	5.2372

Table D-3: 2019 Surface Water Sampling Results - Statistics (Calculated with Uncensored Values Where Possible)

Location	Category	Parameter	Units	Total N	N (<RDL)	N (<RDL and uncensored)	Minimum	5th Percentile	50th Percentile	95th Percentile	Maximum	Arithmetic Mean	StdDev
SW18-M	Conventional Characteristics	Alkalinity (Total as CaCO3)	mg/L	4	0	0	94	94.3	103	144	150	112.5	25.994
		Conductivity	umho/cm	4	0	0	310	340	540	570	570	490	123.29
		Field pH	pH	12	0	0	6.69	6.7505	8.11	8.743	9.15	7.9992	0.68065
		Field Sp. Conductance	µS/cm	12	0	0	293	297.95	491	787.4	860	517.42	199.42
		pH	pH	4	0	0	8.19	8.2005	8.265	8.3125	8.32	8.26	0.053541
		Field Temperature	Celsius	12	0	0	1.89	2.0935	11.195	20.293	20.92	10.543	6.9338
		Total Hardness (CaCO3)	mg/L	6	0	0	125	133.75	170	250.25	270	181	48.81
		Dissolved Oxygen	mg/L	12	0	0	8.23	9.275	11.23	13.916	14.73	11.498	1.7
		Turbidity	NTU	4	0	0	1.2	1.26	2.15	9.755	11	4.125	4.627
		Total Suspended Solids	mg/L	6	1	1	0*	0.5*	5.5	29	33	10.5*	12.598
		Total Residual Chlorine	mg/L	4	3	0	<0.0012	<0.0012	<0.0012	<0.02398	0.028	<0.0079	0.0134
	Nutrients	Nitrate (N)	mg/L	12	0	0	0.17	0.181	0.355	1.584	2.2	0.57083	0.57554
		Nitrite (N)	mg/L	12	11	10	-0.0097*	-0.005135*	0.0046*	<0.008755	0.012	0.0031168*	0.0052895
		Total Ammonia-N	mg/L	12	2	2	-0.0333*	-0.01713*	0.035	0.205	0.26	0.060317*	0.078435
		Total Un-ionized Ammonia	mg/L	12	5	5	0*	0*	0.001195	0.00762	0.0096	0.0020233*	0.0029104
		Total Kjeldahl Nitrogen (TKN)	mg/L	12	0	0	0.16	0.1655	0.21	0.319	0.33	0.2275	0.055942
		Total Phosphorus	mg/L	12	10	10	0.002*	0.00255*	0.00655*	0.03865	0.059	0.012042*	0.015959
		Orthophosphate (P)	mg/L	12	11	11	0.00027*	0.0019365*	0.004745*	0.00915*	0.013	0.0048833*	0.0029323
	Biological	Chlorophyll	µg/L	12	0	0	0.38	0.6495	1.635	7.727	9.08	2.6067	2.611
		Total BOD	mg/L	10	9	1	2*	<2	<2	<2	2*	2*	0
		Total Chemical Oxygen Demand (COD)	mg/L	10	5	5	-1.5*	-0.9555*	4.03*	7.945	8.8	3.955*	3.1415
		Dissolved Organic Carbon	mg/L	12	0	0	1.7	1.755	2.05	4.35	6	2.4333	1.1742
		Escherichia coli	CFU/100mL	12	5	1	1	<5.95	<10	911.	2000	178.42*	573.68
		Fecal coliform	CFU/100mL	12	5	1	1	<5.95	<10	944.	2000	183.42*	572.44
		Total Coliforms	CFU/100mL	12	0	1	10	15.5	115	2045	2100	430.83	760.66
	Metals	Dissolved (0.2u) Aluminum (Al)	µg/L	4	4	4	2.769*	2.8037*	3.515*	4.1082*	4.122*	3.4803*	0.69536
		Total Aluminum (Al)	µg/L	5	0	0	1.92	1.996	2.5	121.6	142	37.744	60.531
		Total Antimony (Sb)	µg/L	5	2	2	0.097	0.0988*	0.12	0.1344	0.138	0.1162*	0.015627
		Total Arsenic (As)	µg/L	5	1	1	0.66	0.667	0.727*	0.809	0.813	0.7376*	0.06462
		Total Barium (Ba)	µg/L	5	0	0	22.3	22.84	25.4	31.7	32.3	26.86	3.9348
		Total Beryllium (Be)	µg/L	5	5	5	-0.0028*	-0.00232*	0.001*	0.007*	0.007*	0.00236*	0.0044484
		Total Bismuth (Bi)	µg/L	5	5	5	-0.0005*	-0.00038*	0.0004*	0.0058*	0.007*	0.0016*	0.0030668
		Total Boron (B)	µg/L	5	1	1	21.851*	22.081*	25	26.6	27	24.37*	1.9958
		Total Cadmium (Cd)	µg/L	5	5	5	0.0007*	0.00104*	0.0028*	0.0088*	0.009*	0.00458*	0.0036813
		Total Calcium (Ca)	µg/L	5	0	0	34400	36320	47600	60020	62100	47960	10168.73
		Total Cesium (Cs)	µg/L	4	3	3	0.0036*	0.00654*	0.0286*	0.07905*	0.087	0.03695*	0.03566
		Total Chromium (Cr)	µg/L	5	5	5	-0.199*	-0.1452*	0.0828*	0.9874*	1.212*	0.25096*	0.55075
		Chromium (VI)	µg/L	4	4	4	0.2225*	0.22528*	0.2555*	0.28054*	0.2824*	0.25398*	0.027226
		Chromium (+3)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Total Cobalt (Co)	µg/L	5	2	2	0.0117	0.01354	0.0292	0.0818*	0.091*	0.03956*	0.031254
		Total Copper (Cu)	µg/L	5	1	1	0.569	0.583	0.648	0.8524*	0.853*	0.7118*	0.13115
		Total Iron (Fe)	µg/L	5	2	2	0.5403*	1.0122*	3	150.34*	178	44.827*	76.207
		Total Lead (Pb)	µg/L	5	2	2	0.0064	0.00652	0.0104	0.137*	0.157*	0.04756*	0.064781
		Total Lithium (Li)	µg/L	5	1	1	2	2.26	4.24*	9.958	10.2	5.746*	3.6278
		Total Magnesium (Mg)	µg/L	5	0	0	8830	8948	9500	11320	11400	10030	1108.02
		Total Manganese (Mn)	µg/L	5	0	0	0.372	1.0256	3.9	17.04	18.1	7.7624	7.3955
		Mercury (Hg)	µg/L	4	4	4	0*	0.000075*	0.00125*	0.002255*	0.0023*	0.0012*	0.0011225
		Total Molybdenum (Mo)	µg/L	5	0	0	1.1	1.118	1.2	1.342	1.35	1.23	0.10025
		Total Nickel (Ni)	µg/L	5	2	2	-0.054*	0.0568*	0.5	0.613*	0.625*	0.4272*	0.27398
		Total Potassium (K)	µg/L	6	0	0	1710	1882.5	3150	6135	6500	3658.33	1782.33
		Total Selenium (Se)	µg/L	5	1	1	0.12	0.1212*	0.128	0.1746	0.18	0.1414*	0.024996
		Total Silicon (Si)	µg/L	4	0	0	172	184.3	522	910.7	932	537	380.06
		Total Silver (Ag)	µg/L	5	5	5	-0.0026*	-0.0021*	0*	0.0042*	0.005*	0.00066*	0.0027655
		Total Sodium (Na)	µg/L	5	0	0	15600	17480	32300	38220	39600	29040	9117.18
		Total Strontium (Sr)	µg/L	5	0	0	189	203.2	285	621.2	625	393	206.25
		Total Thallium (Tl)	µg/L	5	2	2	0.0053	0.00578	0.0078	0.0088*	0.009*	0.00756*	0.0013649
		Total Thorium (Th)	µg/L	4	4	4	-0.0019*	-0.001615*	0.0024*	0.01092*	0.012*	0.003725*	0.0061954
		Total Tin (Sn)	µg/L	5	5	5	-0.029*	-0.0232*	0.003*	0.01038*	0.0112*	-0.00154*	0.015922
		Total Titanium (Ti)	µg/L	5	2	2	-0.193*	-0.1056*	0.69	5.2	5.2	2.2282*	2.7308
		Total Tungsten (W)	µg/L	5	2	2	0.077	0.0774*	0.089*	0.1	0.102	0.0878*	0.010183
		Total Uranium (U)	µg/L	5	0	0	0.348	0.3528	0.438	0.578	0.61	0.4436	0.1025
		Total Vanadium (V)	µg/L	5	3	3	-0.8141*	-0.63928*	0.3	0.6086*	0.64	0.13378*	0.57222
		Total Zinc (Zn)	µg/L	5	2	2	0.28	0.294	0.5	2.9136*	3.138*	1.2568*	1.2713
		Dissolved Zinc (Zn)	µg/L	4	4	4	0.098*	0.1433*	0.4545*	2.2065*	2.506*	0.87825*	1.099
		Total Zirconium (Zr)	µg/L	5	5	5	0.0077*	0.00816*	0.0103*	0.069*	0.078*	0.0278*	0.029892
	Hydrocarbons	F1 (C6-C10)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F2 (C10-C16 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F3 (C16-C34 Hydrocarbons)	µg/L	4	4	4	49.019*	49.772*	61.018*	93.818*	98.374*	67.357*	22.182
		F4 (C34-C50 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Benzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Ethylbenzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromodichloromethane	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
	Radionuclides	C-14	Bq/kg	4	2	3	-0.09*	-0.0825*	0.025*	0.1495	0.16	0.03*	0.11518
		Co-60	Bq/kg	4	4	4	-0.236*	-0.19388*	0.065*	0.20913*	0.231*	0.03125*	0.19529
		Cs-134	Bq/kg	4	4	4	0.028*	0.030805*	0.06435*	0.2248*	0.25*	0.10168*	0.10139
		Cs-137	Bq/kg	4	4	4	0.022*	0.023965*	0.04555*	0.2022*	0.228*	0.085275*	0.096175
		H-3	Bq/kg	4	4	4	-5.3*	-4.505*	0*	3.4*	4*	-0.325*	3.8152
		I-131	Bq/kg	4	4	4	0.333*	0.34485*	0.4625*	10.022*	11.7*	3.2395*	5.6408
		K-40	Bq/kg	4	4	4	-5.17*	-4.7965*	-1.0275*	0.68535*	0.696*	-1.6323*	2.836
	Other	Hydrazine	µg/L	1	1	0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
		Morpholine	µg/L	4	4	4	0*	0*	0*	0.85*	1*	0.25*	0.5
		Bromoform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Chloroform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		4-Bromofluorobenzene	%	8	0	0	92	92.35	96.5	100	100	96.375	3.1595

Table D-3: 2019 Surface Water Sampling Results - Statistics (Calculated with Uncensored Values Where Possible)

Location	Category	Parameter	Units	Total N	N (<RDL)	N (<RDL and uncensored)	Minimum	5th Percentile	50th Percentile	95th Percentile	Maximum	Arithmetic Mean	StdDev
SW9-B	Conventional Characteristics	Alkalinity (Total as CaCO3)	mg/L	4	0	0	92	92.15	96.5	100	100	96.25	4.3493
		Conductivity	umho/cm	4	0	0	310	310	325	357	360	330	24.495
		Field pH	pH	4	0	0	7.93	7.999	8.415	8.5675	8.59	8.3375	0.28465
		Field Sp. Conductance	µS/cm	4	0	0	282	287.25	318.5	325.1	326	311.25	19.856
		pH	pH	4	0	0	8.18	8.192	8.275	8.3835	8.4	8.2825	0.091058
		Field Temperature	Celsius	4	0	0	2.29	2.761	8.97	18.197	19.2	9.8575	7.554
		Total Hardness (CaCO3)	mg/L	4	0	0	120	120.45	123	131.5	133	124.75	5.6789
		Dissolved Oxygen	mg/L	4	0	0	8.6	9.161	12.73	18.705	19.69	13.438	4.6116
		Turbidity	NTU	4	0	0	0.3	0.345	0.65	2.825	3.2	1.2	1.3441
		Total Suspended Solids	mg/L	4	2	2	0.2*	0.47*	2	5.4	6	2.55*	2.4515
		Total Residual Chlorine	mg/L	5	4	0	<0.0012	<0.0012	<0.0012	<0.01224	0.015	<0.00396	0.0061715
	Nutrients	Nitrate (N)	mg/L	4	0	0	0.19	0.2005	0.345	0.464	0.47	0.3375	0.13401
		Nitrite (N)	mg/L	4	3	3	0.0022*	0.00232*	0.0043*	0.01189*	0.013	0.00595*	0.004919
		Total Ammonia-N	mg/L	4	2	2	0.00838*	0.013135*	0.06504*	0.1495	0.16	0.074615*	0.066099
		Total Un-ionized Ammonia	mg/L	4	2	2	0*	0*	0.00165*	0.005	0.0053	0.00215*	0.0026134
		Total Kjeldahl Nitrogen (TKN)	mg/L	4	0	0	0.14	0.1445	0.175	0.214	0.22	0.1775	0.03304
		Total Phosphorus	mg/L	4	3	3	0.0079*	0.0079*	0.00845*	0.0226*	0.025	0.01245*	0.0083827
		Orthophosphate (P)	mg/L	4	4	4	0.00408*	0.0042*	0.00494*	0.005068*	0.00508*	0.00476*	0.00046072
	Biological	Chlorophyll	µg/L	4	0	0	0.75	0.8925	1.865	2.6675	2.78	1.815	0.84161
		Total BOD	mg/L	4	3	1	2*	<2	<2	<2	2*	2*	0
		Total Chemical Oxygen Demand (COD)	mg/L	4	1	1	-7*	-5.02*	6.4	7.45	7.6	3.35*	6.9251
		Dissolved Organic Carbon	mg/L	4	0	0	2	2	2.05	2.1	2.1	2.05	0.057735
		Escherichia coli	CFU/100mL	4	3	0	0	<1.5	<10	<10	<10	<7.5	5
		Fecal coliform	CFU/100mL	4	2	1	0	<1.5	<10	<10	10*	7.5*	5
		Total Coliforms	CFU/100mL	4	0	0	0	4.5	35	40	40	27.5	18.93
	Metals	Dissolved (0.2u) Aluminum (Al)	µg/L	4	4	4	2.286*	2.2937*	2.6685*	3.3978*	3.468*	2.7728*	0.56622
		Total Aluminum (Al)	µg/L	4	0	0	1.26	1.2945	1.94	16.594	19.1	6.06	8.707
		Total Antimony (Sb)	µg/L	4	1	1	0.117*	0.12135*	0.147	0.148	0.148	0.13975*	0.015196
		Total Arsenic (As)	µg/L	4	0	0	0.711	0.7176	0.762	0.76985	0.77	0.75125	0.027693
		Total Barium (Ba)	µg/L	4	0	0	20.9	21.05	22.55	24.985	25.3	22.825	1.8998
		Total Beryllium (Be)	µg/L	4	4	4	-0.001*	-0.00097*	-0.00065*	0.000775*	0.001*	-0.000325*	0.00090692
		Total Bismuth (Bi)	µg/L	4	4	4	-0.0001*	-0.000085*	0.00025*	0.000585*	0.0006*	0.00025*	0.00035119
		Total Boron (B)	µg/L	4	1	1	20	20.247*	22.823*	25.7	26	22.911*	2.6334
		Total Cadmium (Cd)	µg/L	4	4	4	0.0012*	0.00129*	0.0029*	0.00434*	0.0044*	0.00285*	0.0015864
		Total Calcium (Ca)	µg/L	4	0	0	33900	33945	35000	37840	38200	35525	1968.71
		Total Cesium (Cs)	µg/L	4	4	4	0.001*	0.00109*	0.00165*	0.002805*	0.003*	0.001825*	0.00084212
		Total Chromium (Cr)	µg/L	4	4	4	-0.383*	-0.31661*	0.0598*	0.07003*	0.0718*	-0.0479*	0.22347
		Chromium (VI)	µg/L	4	4	4	0.21*	0.21059*	0.24885*	0.32477*	0.332*	0.25993*	0.058809
		Chromium (+3)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Total Cobalt (Co)	µg/L	4	1	1	0.001*	0.00226*	0.01005	0.014015	0.0146	0.008925*	0.0057268
		Total Copper (Cu)	µg/L	4	0	0	0.61	0.6112	0.6325	0.67675	0.682	0.63925	0.032633
		Total Iron (Fe)	µg/L	4	1	2	0.9127*	0.9258*	1.45	14.735	17	5.2032*	7.8772
		Total Lead (Pb)	µg/L	4	2	2	0.0033*	0.003675*	0.0062	0.02394*	0.027*	0.010675*	0.010974
		Total Lithium (Li)	µg/L	4	0	0	1.75	1.78	2.225	2.585	2.6	2.2	0.41433
		Total Magnesium (Mg)	µg/L	4	0	0	8180	8199.5	8720	9359.5	9400	8755	601.47
		Total Manganese (Mn)	µg/L	4	0	0	0.25	0.26785	0.532	1.2943	1.4	0.6785	0.51647
		Mercury (Hg)	µg/L	4	4	4	0*	0.00009*	0.0007*	0.00199*	0.0022*	0.0009*	0.00093095
		Total Molybdenum (Mo)	µg/L	4	0	0	1.13	1.1375	1.19	1.234	1.24	1.1875	0.045735
		Total Nickel (Ni)	µg/L	4	1	1	-0.249*	-0.1422*	0.478	0.5049	0.507	0.3035*	0.36879
		Total Potassium (K)	µg/L	4	0	0	1590	1599	1660	1797.5	1820	1682.5	97.767
		Total Selenium (Se)	µg/L	4	0	0	0.121	0.12235	0.1385	0.15465	0.156	0.1385	0.015885
		Total Silicon (Si)	µg/L	3	0	0	171	181.9	280	626.5	665	372	259.53
		Total Silver (Ag)	µg/L	4	4	4	-0.0025*	-0.002275*	-0.00045*	0.000865*	0.001*	-0.0006*	0.0015078
		Total Sodium (Na)	µg/L	4	0	0	13800	14040	16100	20710	21400	16850	3271.6
		Total Strontium (Sr)	µg/L	4	0	0	184	184.9	197.5	223.7	227	201.5	19.157
		Total Thallium (Tl)	µg/L	4	1	1	0.0044	0.004535	0.0053	0.006745*	0.007*	0.0055*	0.0010863
		Total Thorium (Th)	µg/L	4	3	4	-0.0013*	-0.00112*	0.00095*	0.00455*	0.005	0.0014*	0.0027604
		Total Tin (Sn)	µg/L	4	4	4	-0.0009*	-0.000615*	0.003*	0.03373*	0.0388*	0.010975*	0.018712
		Total Titanium (Ti)	µg/L	4	4	4	-0.117*	-0.10059*	0.1255*	0.47144*	0.509*	0.16075*	0.28068
		Total Tungsten (W)	µg/L	4	1	1	0.081	0.0828	0.0965	0.1	0.1*	0.0935*	0.0089629
		Total Uranium (U)	µg/L	4	0	0	0.36	0.36	0.3605	0.38565	0.39	0.36775	0.014841
		Total Vanadium (V)	µg/L	4	3	3	0.06*	0.07386*	0.1712*	0.2155*	0.22	0.1556*	0.069475
		Total Zinc (Zn)	µg/L	4	1	1	0.36	0.3675	0.505	0.8159*	0.854*	0.556*	0.22396
		Dissolved Zinc (Zn)	µg/L	4	4	4	-0.048*	-0.0189*	0.623*	1.6381*	1.733*	0.73275*	0.83451
		Total Zirconium (Zr)	µg/L	4	4	4	-0.0048*	-0.00348*	0.007*	0.01136*	0.0116*	0.0052*	0.0074261
	Hydrocarbons	F1 (C6-C10)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F2 (C10-C16 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F3 (C16-C34 Hydrocarbons)	µg/L	4	4	4	19.294*	24.232*	53.107*	93.953*	101.*	56.628*	33.613
		F4 (C34-C50 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Benzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Ethylbenzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromodichloromethane	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
	Radionuclides	C-14	Bq/kg	4	3	3	-0.03*	-0.021*	0.035*	0.1335*	0.15	0.0475*	0.075
		Co-60	Bq/kg	4	4	4	-0.121*	-0.11088*	-0.03815*	0.035765*	0.0461*	-0.0378*	0.069361
		Cs-134	Bq/kg	4	4	4	-0.129*	-0.10503*	0.05555*	0.16675*	0.182*	0.041025*	0.12965
		Cs-137	Bq/kg	4	4	4	0.0743*	0.075005*	0.093*	0.1376*	0.143*	0.10083*	0.031606
		H-3	Bq/kg	4	4	4	0*	0*	0*	4.42*	5.2*	1.3*	2.6
		I-131	Bq/kg	4	4	4	-0.0191*	0.018865*	0.3205*	6.3256*	7.37*	1.998*	3.5856
		K-40	Bq/kg	4	4	4	-7.87*	-7.1935*	-1.115*	1.657*	1.75*	-2.0875*	4.4772
	Other	Hydrazine	µg/L	4	3	1	0.1*	<0.1	<0.1	<0.1	0.1*	0.1*	0
		Morpholine	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromoform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Chloroform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		4-Bromofluorobenzene	%	8	0	0	90	90.35	96	101.3	102	96	4.0356

Table D-3: 2019 Surface Water Sampling Results - Statistics (Calculated with Uncensored Values Where Possible)

Location	Category	Parameter	Units	Total N	N (<RDL)	N (<RDL and uncensored)	Minimum	5th Percentile	50th Percentile	95th Percentile	Maximum	Arithmetic Mean	StdDev
SW9-S	Conventional Characteristics	Alkalinity (Total as CaCO3)	mg/L	4	0	0	94	94	97	100	100	97	3.4641
		Conductivity	umho/cm	4	0	0	300	301.5	335	360	360	332.5	32.016
		Field pH	pH	4	0	0	7.95	8.016	8.425	8.5535	8.57	8.3425	0.27195
		Field Sp. Conductance	µS/cm	4	0	0	277	282.85	317.5	324.95	326	309.5	22.068
		pH	pH	4	0	0	8.19	8.199	8.275	8.368	8.38	8.28	0.080416
		Field Temperature	Celsius	4	0	0	2.29	2.764	9.51	18.356	19.2	10.128	7.6913
		Total Hardness (CaCO3)	mg/L	4	0	0	118	118.6	122	129.65	131	123.25	5.5
		Dissolved Oxygen	mg/L	4	0	0	12.41	12.455	16.02	79.315	89.9	33.588	37.677
		Turbidity	NTU	4	0	0	0.4	0.43	0.85	2.205	2.4	1.125	0.89954
		Total Suspended Solids	mg/L	4	2	2	0*	0.3*	3*	5.7	6	3*	2.582
		Total Residual Chlorine	mg/L	3	2	0	<0.0012	<0.0012	<0.0012	<0.01272	0.014	<0.0054667	0.0073901
	Nutrients	Nitrate (N)	mg/L	4	0	0	0.2	0.2075	0.34	0.481	0.49	0.3425	0.13937
		Nitrite (N)	mg/L	4	4	4	-0.0025*	-0.001675*	0.0035*	0.00519*	0.0054*	0.002475*	0.0034596
		Total Ammonia-N	mg/L	4	0	0	0.02	0.0395	0.17	0.19	0.19	0.1375	0.080571
		Total Un-ionized Ammonia	mg/L	4	0	0	0.002	0.00248	0.0062	0.00737	0.0074	0.00545	0.0025053
		Total Kjeldahl Nitrogen (TKN)	mg/L	4	0	0	0.14	0.14	0.15	0.2705	0.29	0.1825	0.072284
		Total Phosphorus	mg/L	4	3	3	0.0079*	0.008035*	0.0089*	0.0192*	0.021	0.011675*	0.006235
		Orthophosphate (P)	mg/L	4	4	4	0.00376*	0.003946*	0.005035*	0.0051465*	0.00516*	0.0047475*	0.00066158
	Biological	Chlorophyll	µg/L	4	0	0	0.5	0.647	1.83	2.741	2.84	1.75	1.0014
		Total BOD	mg/L	4	3	1	2*	<2	<2	<2	2*	2*	0
		Total Chemical Oxygen Demand (COD)	mg/L	4	0	0	5.8	5.92	6.6	12.04	13	8	3.3546
		Dissolved Organic Carbon	mg/L	4	0	0	2	2	2	2.085	2.1	2.025	0.05
		Escherichia coli	CFU/100mL	4	2	0	0	<1.5	<10	<18.5	20	<10	8.165
		Fecal coliform	CFU/100mL	4	3	0	0	<1.5	<10	<10	<10	<7.5	5
		Total Coliforms	CFU/100mL	4	0	0	0	3	25	30	30	20	14.142
	Metals	Dissolved (0.2u) Aluminum (Al)	µg/L	4	4	4	2.179*	2.3022*	3.008*	3.0339*	3.037*	2.808*	0.41961
		Total Aluminum (Al)	µg/L	4	0	0	1.67	1.688	2.565	13.676	15.5	5.575	6.6602
		Total Antimony (Sb)	µg/L	4	1	1	0.123*	0.1263*	0.1455	0.1528	0.154	0.142*	0.013292
		Total Arsenic (As)	µg/L	4	0	0	0.731	0.73265	0.766	0.79425	0.795	0.7645	0.032706
		Total Barium (Ba)	µg/L	4	0	0	20.6	20.75	22.45	24.66	24.9	22.6	1.8956
		Total Beryllium (Be)	µg/L	4	4	4	-0.0008*	-0.00068*	0.0001*	0.00088*	0.001*	0.0001*	0.00073937
		Total Bismuth (Bi)	µg/L	4	4	4	0.0002*	0.00023*	0.0005*	0.00094*	0.001*	0.00055*	0.00034157
		Total Boron (B)	µg/L	4	1	1	19	19.378*	22.76*	24.85	25	22.38*	2.6867
		Total Cadmium (Cd)	µg/L	4	4	4	0.0016*	0.001615*	0.002*	0.003745*	0.004*	0.0024*	0.0011106
		Total Calcium (Ca)	µg/L	4	0	0	33600	33615	34200	37505	38000	35000	2060.74
		Total Cesium (Cs)	µg/L	4	4	4	0*	0.000405*	0.003*	0.003895*	0.004*	0.0025*	0.0017493
		Total Chromium (Cr)	µg/L	4	4	4	-0.404*	-0.3314*	0.08655*	0.097265*	0.098*	-0.033225*	0.2473
		Chromium (VI)	µg/L	4	4	4	0.2199*	0.21992*	0.2592*	0.3069*	0.3084*	0.26168*	0.048353
		Chromium (+3)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Total Cobalt (Co)	µg/L	4	1	1	0*	0.001245*	0.0095	0.0141	0.0147	0.008425*	0.0062061
		Total Copper (Cu)	µg/L	4	0	0	0.59	0.5936	0.6415	0.72085	0.73	0.65075	0.062329
		Total Iron (Fe)	µg/L	4	0	0	1.1	1.16	3.25	14.35	16	5.9	6.9575
		Total Lead (Pb)	µg/L	4	1	1	0.0062	0.00623	0.00945	0.022275*	0.024*	0.012275*	0.0083456
		Total Lithium (Li)	µg/L	4	0	0	1.7	1.7345	2.23	2.5895	2.6	2.19	0.444
		Total Magnesium (Mg)	µg/L	4	0	0	8250	8290.5	8670	9168.5	9230	8705	420.36
		Total Manganese (Mn)	µg/L	4	0	0	0.223	0.23005	0.5015	1.385	1.5	0.6815	0.59221
		Mercury (Hg)	µg/L	4	4	4	0*	0.000045*	0.00075*	0.00154*	0.0016*	0.000775*	0.00075
		Total Molybdenum (Mo)	µg/L	4	0	0	1.11	1.116	1.175	1.2	1.2	1.165	0.043589
		Total Nickel (Ni)	µg/L	4	1	1	-0.318*	-0.20445*	0.474	0.5345	0.539	0.29225*	0.40899
		Total Potassium (K)	µg/L	4	0	0	1570	1579	1675	1796.5	1810	1682.5	105
		Total Selenium (Se)	µg/L	4	0	0	0.122	0.1232	0.1325	0.135	0.135	0.1305	0.0061373
		Total Silicon (Si)	µg/L	3	0	0	169	181.2	291	622.2	659	373	255.08
		Total Silver (Ag)	µg/L	4	4	4	-0.0023*	-0.002045*	0.00015*	0.000985*	0.001*	-0.00025*	0.0015503
		Total Sodium (Na)	µg/L	4	0	0	13700	13895	16550	20650	21100	16975	3311.97
		Total Strontium (Sr)	µg/L	4	0	0	182	182.75	194.5	223.25	227	199.5	20.207
		Total Thallium (Tl)	µg/L	4	1	1	0.0041	0.00416	0.00465	0.00582*	0.006*	0.00485*	0.00081854
		Total Thorium (Th)	µg/L	4	4	4	-0.0029*	-0.00248*	0.00095*	0.00353*	0.0038*	0.0007*	0.002881
		Total Tin (Sn)	µg/L	4	4	4	-0.0058*	-0.00433*	0.00565*	0.02294*	0.0257*	0.0078*	0.013166
		Total Titanium (Ti)	µg/L	4	4	4	-0.144*	-0.14145*	-0.10395*	0.52507*	0.632*	0.070025*	0.3756
		Total Tungsten (W)	µg/L	4	1	1	0.087	0.08865*	0.099*	0.10255	0.103	0.097*	0.0069762
		Total Uranium (U)	µg/L	4	0	0	0.355	0.35545	0.359	0.3889	0.394	0.36675	0.018283
		Total Vanadium (V)	µg/L	4	3	3	0.05*	0.06578*	0.1826*	0.227*	0.23*	0.1613*	0.080656
		Total Zinc (Zn)	µg/L	4	1	1	0.45	0.456	0.495	0.68275*	0.715*	0.53875*	0.11947
		Dissolved Zinc (Zn)	µg/L	4	4	4	0.405*	0.43425*	1.535*	2.7225*	2.767*	1.5605*	1.2303
		Total Zirconium (Zr)	µg/L	4	4	4	0.012*	0.012855*	0.01785*	0.0197*	0.02*	0.016925*	0.0034384
	Hydrocarbons	F1 (C6-C10)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F2 (C10-C16 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		F3 (C16-C34 Hydrocarbons)	µg/L	4	4	4	32.125*	35.323*	54.721*	57.606*	57.889*	49.864*	11.965
		F4 (C34-C50 Hydrocarbons)	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Benzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Ethylbenzene	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromodichloromethane	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
	Radionuclides	C-14	Bq/kg	4	3	3	-0.05*	-0.0335*	0.07*	0.097*	0.1	0.0475*	0.06702
		Co-60	Bq/kg	4	4	4	-0.177*	-0.16242*	-0.0204*	0.1903*	0.217*	-0.0002*	0.16961
		Cs-134	Bq/kg	4	4	4	0.033*	0.03498*	0.0696*	0.5027*	0.575*	0.1868*	0.26008
		Cs-137	Bq/kg	4	3	3	0.0519*	0.085965*	0.393*	0.6923*	0.725	0.39073*	0.29014
		H-3	Bq/kg	4	4	4	-5.2*	-4.42*	0*	4.42*	5.2*	0*	4.2458
		I-131	Bq/kg	4	4	4	0.117*	0.1269*	0.323*	17.324*	20.3*	5.2658*	10.024
		K-40	Bq/kg	4	4	4	-5.14*	-4.8475*	-0.675*	2.6815*	2.83*	-0.915*	3.8575
	Other	Hydrazine	µg/L	4	3	0	<0.1	<0.1	<0.1	<0.1	0.1*	<0.1	0
		Morpholine	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Bromoform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		Chloroform	µg/L	4	4	4	0*	0*	0*	0*	0*	0*	0
		4-Bromofluorobenzene	%	8	0	0	93	93.7	96.5	101.95	103	97	3.1623

Notes:

1. The summary time is between 10-Jan-2019 and 30-Dec-2019.

2. The reporting locations are: "DNGS-Far-S", "DNGS-Mid-S", "SW11-S", "SW10-S", "DNGS-Near-S", "SW9-S", "SW16-S", "SW17-S", "SW18-M", "SW2-S", "SW12-S", "SW13-S", "TRIP", "FIELD", "SW12-B", "DNGS-Far-M", "DNGS-Far-B", "SW9-B", "SW10-B", "SW11-B", "SW16-B", "SW17-B", "DNGS-Near-M", "DNGS-Near-B", "DNGS-Mid-M", "DNGS-Mid-B", "SW2-B".

3. Values with '*' are stats results using un-detected uncensored data.

Table D-4: Assessment of Change in Baseline Non-Radionuclide Surface Water Data from 2007/2008 to 2019

	Parameter	Units	Criteria[g]	2007/2008 Sampling Program[b] SW2 (bottom)								2019 Sampling Program[c] SW2 (bottom)								Assessment of Change		
				N_{means}	MDL	% above MDL	Median	Grand Mean	Std Dev	Min	Max	N	MDL	% above MDL	Median	Mean	Std Dev	Min	Max	RPD (means)	Mann–Whitney *U* test (p-value)	Note[d]
General Chemistry	Alkalinity	mg/L	-	3	5	100%	91	91	1.8	89	93	4	1	100%	94	94	2.1	92	97	4	0.058	
	Bicarbonate	ppm CaCO3	-	3	5	100%	91	90	3.9	85	93	0			-	-	-	-	-		-	
	Carbonate	ppm CaCO3	-	3	5	0%	2.5	3.3	1.3	2.5	4.8	0			-	-	-	-	-		-	e
	Hydroxide	ppm CaCO3	-	3	5	0%	2.5	2.5	0.000	2.5	2.5	0			-	-	-	-	-		-	e
	Total Hardness	mg/L	-	3	1	100%	123	129	14	120	146	4	0.5 - 1	100%	120	120	1.8	118	122	-8	0.198	
	Conductivity	umho/cm	-	3	1	100%	300	300	3.7	296	303	4	1	100%	310	313	13	300	330	4	0.035	
	Dissolved Oxygen (Field)	mg/L	-	2	-	100%	9.3	9.3	0.000	9.3	9.3	3	-	100%	13	12	1.6	11	13	28	-	
	pH	pH	6.5-8.5	3	-	100%	8.0	8.1	0.6146	7.5	8.7	4	-	100%	8.2	8.2	0.03	8.2	8.3	2	0.891	
	pH (Field)	pH	6.5-8.5	2	-	100%	8.1	8.1	0.000	8.1	8.1	4	-	100%	8.3	8.3	0.15	8.2	8.5	3	0.032	
	Temperature (Field)	Celsius	-	2	-	100%	16	16	1.8	14	17	4	-	100%	5.5	7.6	6.9	1.9	17	-69	0.589	
	Chemical Oxygen Demand	mg/L	-	0	1		-	-	-	-	-	4	4	75%	5.7	4.0	4.2	-2.200	6.8		-	e
	Total Organic Carbon	mg/L	-	3	0.2	100%	2.5	2.5	0.141892	2.3	2.6	0			-	-	-	-	-		-	
	Total Dissolved Solids	mg/L	-	3	2	100%	163	166	12	156	180	0			-	-	-	-	-		-	
	Total Suspended Solids	mg/L	-	3	2	67%	2.5	2.5	1.6	1.0	4.1	4	1 - 10	25%	0.40	1.7	2.9	0.000	6.0	-39	0.007	
	Turbidity	NTU	-	3	0.1	100%	0.50	0.55	0.12	0.47	0.69	4	0.1	50%	0.13	0.63	1.0	0.06	2.2	13	0.011	
Nutrients	Ammonia	mg/L	1.54	3	0.01	67%	0.02	0.02	0.010	0.005	0.02	4	0.01 - 1	100%	0.12	0.12	0.09	0.02	0.22	154	0.010	
	Unionized Ammonia8	mg/L	0.019	3	0.001	0%	0.001	0.001	0.000	0.001	0.001	4	0.00051 - 0.044	75%	0.005	0.005	0.004	0.000	0.009	156	0.010	e
	Nitrate	mg/L	13	3	0.01	100%	1.8	1.7	0.099485	1.6	1.8	4	0.1	100%	0.32	0.31	0.05	0.25	0.35	-140	0.011	
	Nitrite	mg/L	0.06	3	0.01	33%	0.005	0.01	0.009	0.005	0.02	4	0.01	0%	0.002	0.001	0.003	-0.003	0.005	-159	0.006	f
	Phosphorus	mg/L	0.02	3	0.002 / 0.01	100%	0.005	0.005	0.001	0.004	0.007	4	0.02 - 2.51	0%	0.006	0.007	0.009	0.000	0.02	28	0.416	f
	Total Kjeldahl Nitrogen	mg/L	-	3	0.06 / 0.5	0%	0.50	0.50	0.000	0.50	0.50	4	0.1	100%	0.19	0.19	0.07	0.11	0.28	-90	0.000	e
Metals	Aluminum	µg/L	100	3	0.1	100%	8.8	8.7	3.1	5.6	11.8	4	0.5 - 5	100%	0.72	1.6	1.9	0.52	4.4	-138	0.010	
	Aluminum (filtered)	µg/L	75	3	0.1	100%	4.8	5.7	4.3	2.0	10.4	4	5	25%	2.9	3.4	1.8	1.9	6.0	-51	0.414	
	Antimony	µg/L	6	3	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.02 - 0.5	75%	0.13	0.12	0.02	0.09	0.14	-121	0.000	e
	Arsenic	µg/L	5	3	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.02 - 1	100%	0.78	0.77	0.03	0.73	0.80	43	0.000	e
	Barium	µg/L	1000	3	1	100%	24	24	1	24	25	4	0.02 - 2	100%	22	22	0.33	22	23	-9	0.008	
	Beryllium	µg/L	1100	3	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.01 - 0.5	0%	0.000	-0.001	0.002	-0.003	0.001	-201	0.000	e,f
	Bismuth	µg/L	-	3	1	0%	0.50	0.60	0.17	0.50	0.80	4	0.005 - 1	0%	0.000	0.000	0.001	-0.001	0.001	-200	0.001	e,f
	Boron	µg/L	200	3	0.1	100%	30	32	6.7	27	40	4	10 - 50	75%	22	22	0.47	21	22	-40	0.009	
	Cadmium	µg/L	0.17	3	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.005 - 0.1	0%	0.003	0.003	0.000	0.003	0.004	-176	0.000	e,f
	Calcium	µg/L	-	3	0.1	100%	33880	35900	4931	32300	41520	4	0.05 - 250	100%	33950	33975	532	33400	34600	-6	0.458	
	Cesium	µg/L	-	3	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.05 - 0.2	0%	0.002	0.002	0.001	0.001	0.003	-186	0.000	e,f
	Chromium	µg/L	8.9	3	0.1	67%	1.02	0.80	0.66	0.05	1.32	4	0.1 - 5	0%	0.08	0.16	0.17	0.07	0.42	-131	0.890	f
	Chromium (III)	µg/L	8.9	0	0.1		-	-	-	-	-	4	0.5 - 5	0%	0.000	0.000	0.000	0.000	0.000		-	e,f
	Chromium(VI)	µg/L	1	0	5		-	-	-	-	-	4	0.5	0%	0.23	0.24	0.04	0.20	0.29		-	e,f
	Cobalt	µg/L	0.9	3	0.1	0%	0.10	0.08	0.03	0.05	0.10	4	0.005 - 0.5	75%	0.01	0.01	0.003	0.008	0.01	-154	0.006	e
	Copper	µg/L	2.57	3	0.1	100%	1.0	1.1	0.098658	1.0	1.2	4	0.05 - 1	100%	0.61	0.62	0.008	0.61	0.63	-54	0.006	
	Iron	µg/L	300	3	1	100%	8.6	14	15	3.8	31	4	1 - 100	0%	0.64	0.51	0.38	-0.051	0.80	-187	0.010	f
	Lead	µg/L	3.59	3	0.1	33%	0.06	0.09	0.06	0.05	0.15	4	0.005 - 0.5	0%	0.004	0.004	0.002	0.002	0.007	-182	0.006	f
	Lithium	µg/L	-	3	0.1	100%	3.1	3.1	0.792549	2.2	3.8	4	0.5 - 5	75%	1.9	1.9	0.12	1.7	2.0	-48	0.010	
	Magnesium	µg/L	-	3	0.1	100%	10220	9653	1016	8480	10260	4	0.05 - 250	100%	8600	8590	60	8520	8640	-12	0.589	
	Manganese	µg/L	120	3	0.1	100%	0.86	0.75	0.20	0.52	0.88	4	0.05 - 2	75%	0.21	0.20	0.07	0.11	0.26	-116	0.010	
	Mercury (filtered)	µg/L	0.026	3	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.01	0%	0.000	0.000	0.000	-0.001	0.000	-202	0.017	e,f
	Molybdenum	µg/L	40	3	0.1	100%	1.3	1.4	0.080829	1.3	1.4	4	0.05 - 1	100%	1.2	1.2	0.05	1.1	1.2	-15	0.008	
	Nickel	µg/L	25	3	0.1	100%	0.72	0.73	0.01	0.72	0.74	4	0.02 - 1	75%	0.51	0.51	0.01	0.49	0.52	-36	0.006	
	Potassium	µg/L	-	3	0.1	100%	1760	1740	131	1600	1860	4	0.05 - 1000	100%	1630	1618	48	1550	1660	-7	0.586	
	Selenium	µg/L	1	3	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.04 - 2	100%	0.14	0.14	0.009	0.12	0.15	-115	0.000	e
	Silver	µg/L	0.1	3	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.005 - 0.1	0%	-0.001	-0.001	0.001	-0.002	0.000	-206	0.000	e,f
	Sodium	µg/L	-	3	0.1	100%	16600	15300	2356	12580	16720	4	0.05 - 250	100%	13750	14025	655	13600	15000	-9	0.893	
	Strontium	µg/L	7000	3	0.1	100%	202	194	21	170	210	4	0.05 - 1	100%	187	185	10.0	172	195	-5	0.026	
	Thallium	µg/L	0.3	3	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.002 - 0.05	75%	0.006	0.006	0.001	0.005	0.006	-160	0.000	e
	Thorium	µg/L	-	3	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.005 - 1	0%	0.001	0.000	0.002	-0.002	0.002	-197	0.000	e,f
	Tin	µg/L	-	3	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.2 - 5	0%	0.009	0.009	0.007	0.000	0.02	-141	0.000	e,f
	Titanium	µg/L	-	3	0.1	100%	1.0	1.0	0.192873	0.9	1.3	4	0.5 - 5	0%	0.14	0.16	0.28	-0.142	0.50	-147	0.010	f
	Tungsten	µg/L	30	3	0.1	33%	0.10	0.09	0.04	0.05	0.12	4	0.01 - 1	75%	0.10	0.10	0.02	0.09	0.13	15	0.207	
	Uranium	µg/L	5	3	0.1	100%	0.40	0.39	0.09	0.30	0.48	4	0.002 - 0.1	100%	0.37	0.37	0.01	0.35	0.38	-7	0.023	
	Vanadium	µg/L	6	3	0.1	33%	0.05	0.18	0.23	0.05	0.44	4	0.2 - 5	0%	0.17	-0.039	0.43	-0.679	0.18	-311	0.481	f
	Zinc	µg/L	7	3	0.1	100%	3.0	2.6	1.4	1.1	3.8	4	0.1 - 5	75%	0.77	0.77	0.37	0.34	1.2	-109	0.015	
	Zirconium	µg/L	4	3	0.1	0%	0.05	0.05	0.006	0.05	0.06	4	0.1 - 1	0%	0.000	-0.001	0.008	-0.012	0.008	-208	0.002	e,f
Hydrocarbons	Petro Hydrocarbons C6-10	µg/L	167	3	100	0%	50	50	0.000	50	50	4	25	0%	0.000	0.000	0.000	0.000	0.000	-200	0.014	e,f
	Petro Hydrocarbons C10-16	µg/L	42	3	100	0%	50	50	0.000	50	50	4	100	0%	0.000	0.000	0.000	0.000	0.000	-200	0.014	e,f
	Petro Hydrocarbons C16-34	µg/L	-	3	100	0%	50	50	0.000	50	50	4	200	0%	49	80	68	41	183	47	0.495	e,f
	Petro Hydrocarbons C34-50	µg/L	-	3	100	0%	50	50	0.000	50	50	4	200	0%	0.000	0.000	0.000	0.000	0.000	-200	0.014	e,f
	Benzene	µg/L	5	0	0.1		-	-	-	-	-	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000		-	e,f
	Ethylbenzene	µg/L	8	0	0.1		-	-	-	-	-	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000		-	e,f
	m/p-Xylene	µg/L	2	0	0.1		-	-	-	-	-	0			-	-	-	-	-		-	e
	o-Xylene	µg/L	40	0	0.1		-	-	-	-	-	0			-	-	-	-	-		-	e
	Toluene	µg/L	2	0	0.1		-	-	-	-	-	0			-	-	-	-	-		-	e
THMs	Total Residual Chlorine[h]	mg/L	0.0005	2	0.002	0%	0.001	0.001	0.000	0.001	0.001	3	0.0012	33%	0.001	0.004	0.005	0.001	0.009	117	-	e
	Bromodichloromethane	µg/L	200	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Bromoform	µg/L	60	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.2 - 1	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Chloroform	µg/L	1.8	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Dibromochloromethane	µg/L	-	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	0			-	-	-	-	-		-	e
Bacteria	E. Coli 19	a	-	3	1	33%	0.7	5.2	7.9	0.6	14.4	4	10	25%	10.0	7.5	5.0	0.000	10.0	36	0.684	
	E. Coli 5 sample geo-mean	a	100	3	1	33%	0.5	4.7	7.2	0.5	13	0			-	-	-	-	-		-	
	Total Coliforms	a	100	3	1	100%	906	704	616	12	1194	4	10	50%	10.0	13	13	0.000	30	-193	0.015	
Other	Hydrazine	µg/L	2.6	3	5	33%	2.5	10.0	12.99038	2.5	25	4	0.1	0%	0.10	0.10	0.000	0.10	0.10	-196	0.022	f
	Morpholine	µg/L	4	3	1	0%	0.50	0.50	0.000	0.50	0.50	4	4	0%	0.000	0.25	0.50	0.000	1.0	-67	0.491	e,f
	PCB in Water	µg/L	0.001	3	0.05	0%	0.03	0.03	0.000	0.03	0.03	0			-	-	-	-	-		-	e

###	Exceeds criteria.
###	RPD less than -20 (decrease). P-value for decrease statistically significant.
###	RPD greater than 20 (increase). P-value for increase statistically significant.

Notes:

a - 2007/2008 units were based on MPN/100 mL. 2019 units were based on CFU/100mL.

b -summary stats based on seasonal means (N_{means} = 4 for most parameters), each with five replicate samples.

c - 2019 data is uncensored. Therefore some parameters may have values below the MDL.

d - Parameters with both 'd' and 'e' notes indicate that 100% of samples in both 2008 and 2019 were below detection. Therefore assessment of change is not possible.

e - The 2009 ERA TSD set all samples to 1/2 MDL if all measurements were <MDL. Therefore, RPD and p-value calculations are based on all 2008 measurements being 1/2MDL if all measurements were <MDL.

f - All 2019 samples were below the MDL. Results are based on un-detected uncensored data.

g - The minimum total hardness in 2019 was 110 mg/L, so this was used as a conservative value in calculation of hardness dependent guidelines for cadmium, copper, lead and nickel.

h -Total residual chlorine exceedances in 2019 were attributed to a QAQC issue.

Table D-4: Assessment of Change in Baseline Non-Radionuclide Surface Water Data from 2007/2008 to 2019

	Parameter	Units	Criteria[g]	2007/2008 Sampling Program[b] SW7 (top)								2019 Sampling Program[c] DNGS-Near (top)								Assessment of Change		
				N_{means}	MDL	% above MDL	Median	Grand Mean	Std Dev	Min	Max	N	MDL	% above MDL	Median	Mean	Std Dev	Min	Max	RPD (means)	Mann–Whitney *U* test (p-value)	Note[d]
General Chemistry	Alkalinity	mg/L	-	4	5	100%	93	93	1.8	92	96	4	1	100%	97	97	3.1	93	100	3	0.080	
	Bicarbonate	ppm CaCO3	-	4	5	100%	93	93	1.8	92	96	0			-	-	-	-	-		-	
	Carbonate	ppm CaCO3	-	4	5	0%	2.5	2.5	0	2.5	2.5	0			-	-	-	-	-		-	e
	Hydroxide	ppm CaCO3	-	4	5	0%	2.5	2.5	0	2.5	2.5	0			-	-	-	-	-		-	e
	Total Hardness	mg/L	-	4	1	100%	122	124	15	110	144	4	0.5 - 1	100%	123	123	8.6	113	132	-1	0.968	
	Conductivity	umho/cm	-	4	1	100%	300	298	6.8	290	304	4	1	100%	335	345	44	310	400	14	0.002	
	Dissolved Oxygen (Field)	mg/L	-	2	-	100%	9.0	9.0	0.353553	8.7	9.2	4	-	100%	12	12	2.4	9.5	15	30	-	
	pH	pH	6.5-8.5	4	-	100%	8.2	8.3	0.203552	8.1	8.5	4	-	100%	8.3	8.3	0.10	8.2	8.4	1	0.836	
	pH (Field)	pH	6.5-8.5	4	-	100%	8.2	8.2	0.206155	8.0	8.4	4	-	100%	8.4	8.4	0.16	8.2	8.5	3	0.151	
	Temperature (Field)	Celsius	-	4	-	100%	13	14	7.3	7.1	22	4	-	100%	9.2	10	8.2	2.0	20	-30	0.295	
	Chemical Oxygen Demand	mg/L	-	1	1	100%	5.6	5.6	-	5.6	5.6	4	4	75%	5.8	4.5	4.4	-1.6000	8.2	-21	-	
	Total Organic Carbon	mg/L	-	4	0.2	100%	2.4	2.5	0.462853	2.2	3.2	0			-	-	-	-	-		-	
	Total Dissolved Solids	mg/L	-	4	2	100%	175	200	59	163	288	0			-	-	-	-	-		-	
	Total Suspended Solids	mg/L	-	4	2	50%	1.8	1.8	0.925059	1.0	2.7	4	1 - 10	50%	3.0	2.9	2.0	0.60	5.0	46.8	0.313	
	Turbidity	NTU	-	4	0.1	100%	0.74	0.85	0.39	0.51	1.40	4	0.1	100%	1.7	1.7	1.6	0.30	3.2	67	0.968	
Nutrients	Ammonia	mg/L	1.54	4	0.01	100%	0.02	0.03	0.02	0.01	0.05	4	0.01 - 1	100%	0.04	0.04	0.02	0.02	0.06	25	0.096	
	Unionized Ammonia8	mg/L	0.019	4	0.001	25%	0.001	0.001	0.000	0.001	0.001	4	0.00051 - 0.044	75%	0.004	0.07	0.13	0.0004	0.26	194	0.291	
	Nitrate	mg/L	13	4	0.01	100%	1.7	1.7	0.481056	1.1	2.1	4	0.1	100%	0.35	0.36	0.18	0.15	0.58	-129	0.002	
	Nitrite	mg/L	0.06	4	0.01	0%	0.007	0.007	0.002	0.005	0.01	4	0.01	0%	0.001	0.001	0.002	-0.0017	0.004	-143	0.001	e,f
	Phosphorus	mg/L	0.02	4	0.002 / 0.01	75%	0.006	0.006	0.002	0.003	0.008	4	0.02 - 2.51	25%	0.01	0.01	0.01	-0.0013	0.02	58	0.328	
	Total Kjeldahl Nitrogen	mg/L	-	4	0.06 / 0.5	0%	0.50	0.50	0	0.50	0.50	4	0.1	100%	0.18	0.18	0.03	0.15	0.21	-94	0.000	e
Metals	Aluminum	µg/L	100	4	0.1	100%	15	291	554	11	1121	4	0.5 - 5	100%	2.0	17	32	0.70	65	-177	0.113	
	Aluminum (filtered)	µg/L	75	4	0.1	100%	6.9	7.0	3.0	4.2	10.0	4	5	0%	2.5	2.7	0.91	1.9	4.0	-88	0.004	f
	Antimony	µg/L	6	4	1	0%	0.50	0.50	0	0.50	0.50	4	0.02 - 0.5	75%	0.14	0.13	0.01	0.12	0.15	-115	0.000	e
	Arsenic	µg/L	5	4	1	0%	0.50	0.88	0.75	0.50	2.00	4	0.02 - 1	100%	0.74	0.72	0.03	0.67	0.75	-19	0.000	e
	Barium	µg/L	1000	4	1	100%	25	85	120	24	264	4	0.02 - 2	100%	22	23	2.1	21	26	-115	0.075	
	Beryllium	µg/L	1100	4	1	0%	0.50	0.50	0	0.50	0.50	4	0.01 - 0.5	0%	-0.0006	0.0000	0.004	-0.0040	0.005	-200	0.000	e,f
	Bismuth	µg/L	-	4	1	0%	0.50	0.50	0	0.50	0.50	4	0.005 - 1	0%	0	0	0.0008	-0.0010	0.001	-200	0.000	e,f
	Boron	µg/L	200	4	0.1	100%	35	517	969	26	1970	4	10 - 50	75%	22	23	2.9	20	27	-183	0.007	
	Cadmium	µg/L	0.17	4	0.1	0%	0.05	0.05	0	0.05	0.05	4	0.005 - 0.1	0%	0.003	0.003	0.003	0.0003	0.006	-178	0.000	e,f
	Calcium	µg/L	-	4	0.1	100%	33430	34440	3787	31040	39860	4	0.05 - 250	100%	35050	34925	2910	31700	37900	1	0.903	
	Cesium	µg/L	-	4	0.1	0%	0.05	0.06	0.02	0.05	0.08	4	0.05 - 0.2	0%	0.002	0.003	0.004	-0.0001	0.009	-178	0.000	e,f
	Chromium	µg/L	8.9	4	0.1	75%	1.01	0.78	0.49	0.05	1.06	4	0.1 - 5	25%	0.12	0.19	0.18	0.07	0.47	-120	0.262	
	Chromium (III)	µg/L	8.9	1	0.1	100%	1.1	1.1	-	1.1	1.1	4	0.5 - 5	0%	0	0	0	0	0	-200	-	f
	Chromium(VI)	µg/L	1	1	5	0%	2.5	2.5	-	2.5	2.5	4	0.5	0%	0.24	0.26	0.05	0.21	0.33	-163	-	e,f
	Cobalt	µg/L	0.9	4	0.1	25%	0.08	0.31	0.47	0.06	1.02	4	0.005 - 0.5	75%	0.01	0.02	0.02	0.006	0.05	-176	0.001	
	Copper	µg/L	2.57	4	0.1	100%	1.1	1.2	0.368556	1.0	1.8	4	0.05 - 1	100%	0.65	0.66	0.06	0.60	0.73	-61	0.001	
	Iron	µg/L	300	4	1	100%	25	30	22	7.6	61	4	1 - 100	75%	2.4	21	39	0.65	79	-33	0.132	
	Lead	µg/L	3.59	4	0.1	25%	0.07	0.31	0.48	0.06	1.03	4	0.005 - 0.5	25%	0.004	0.02	0.03	0.0008	0.07	-176	0.040	
	Lithium	µg/L	-	4	0.1	100%	2.7	2.8	0.536998	2.3	3.6	4	0.5 - 5	75%	1.8	1.8	0.29	1.4	2.1	-43	0.002	
	Magnesium	µg/L	-	4	0.1	100%	9210	9235	1531	7780	10740	4	0.05 - 250	100%	8535	8603	384	8210	9130	-7	0.440	
	Manganese	µg/L	120	4	0.1	100%	1.6	1.6	0.860852	0.76	2.4	4	0.05 - 2	100%	0.99	1.3	1.3	0.15	3.0	-21	0.596	
	Mercury (filtered)	µg/L	0.026	3	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.01	0%	0.0004	0	0.001	-0.0015	0.0008	-200	0.011	e,f
	Molybdenum	µg/L	40	4	0.1	100%	1.4	1.4	0.075719	1.4	1.5	4	0.05 - 1	100%	1.2	1.2	0.06	1.1	1.2	-19	0.001	
	Nickel	µg/L	25	4	0.1	100%	0.71	0.80	0.19	0.68	1.08	4	0.02 - 1	75%	0.54	0.53	0.05	0.47	0.57	-40	0.001	
	Potassium	µg/L	-	4	0.1	100%	1940	1860	324	1400	2160	4	0.05 - 1000	100%	1655	1658	116	1540	1780	-12	0.262	
	Selenium	µg/L	1	4	1	0%	0.50	0.53	0.05	0.50	0.60	4	0.04 - 2	100%	0.14	0.14	0.03	0.12	0.17	-115	0.000	e
	Silver	µg/L	0.1	4	0.1	0%	0.05	0.05	0	0.05	0.05	4	0.005 - 0.1	0%	-0.0004	-0.0002	0.001	-0.0013	0.002	-201	0.000	e,f
	Sodium	µg/L	-	4	0.1	100%	15660	14945	2551	11420	17040	4	0.05 - 250	100%	15100	17225	5733	13100	25600	14	1.000	
	Strontium	µg/L	7000	4	0.1	100%	201	198	7.7	186	202	4	0.05 - 1	100%	182	185	9.9	176	199	-7	0.001	
	Thallium	µg/L	0.3	4	0.1	0%	0.05	0.05	0	0.05	0.05	4	0.002 - 0.05	75%	0.005	0.005	0.001	0.003	0.006	-163	0.000	e
	Thorium	µg/L	-	4	0.1	25%	0.05	0.08	0.07	0.05	0.18	4	0.005 - 1	0%	0.001	0.004	0.007	-0.0003	0.01	-181	0.000	f
	Tin	µg/L	-	4	0.1	25%	0.05	0.13	0.16	0.05	0.37	4	0.2 - 5	0%	0.02	0.02	0.01	0.01	0.03	-145	0.000	f
	Titanium	µg/L	-	4	0.1	100%	1.3	2.5	2.5	1.1	6.2	4	0.5 - 5	0%	0.11	0.91	1.8	-0.1591	3.6	-92	0.111	f
	Tungsten	µg/L	30	4	0.1	25%	0.08	0.08	0.03	0.05	0.10	4	0.01 - 1	75%	0.10	0.10	0.009	0.10	0.12	30	0.063	
	Uranium	µg/L	5	4	0.1	100%	0.40	0.41	0.02	0.40	0.44	4	0.002 - 0.1	100%	0.38	0.38	0.03	0.35	0.43	-7	0.028	
	Vanadium	µg/L	6	4	0.1	75%	0.19	0.25	0.22	0.05	0.56	4	0.2 - 5	50%	0.22	0.20	0.07	0.11	0.27	-19	0.622	
	Zinc	µg/L	7	4	0.1	100%	2.8	2.8	2.0	0.37	5.2	4	0.1 - 5	75%	0.46	0.49	0.20	0.29	0.76	-140	0.005	
	Zirconium	µg/L	4	4	0.1	25%	0.1	4.2	8.4	0.05	16.76	4	0.1 - 1	0%	0.004	0.005	0.008	-0.0015	0.01	-200	0.000	f
Hydrocarbons	Petro Hydrocarbons C6-10	µg/L	167	4	100	0%	50	50	0	50	50	4	25	0%	0	0	0	0	0	-200	0.002	e,f
	Petro Hydrocarbons C10-16	µg/L	42	4	100	0%	50	50	0	50	50	4	100	0%	0	0	0	0	0	-200	0.002	e,f
	Petro Hydrocarbons C16-34	µg/L	-	4	100	0%	50	50	0	50	50	4	200	0%	74	91	55	49	168	59	0.155	e,f
	Petro Hydrocarbons C34-50	µg/L	-	4	100	0%	50	50	0	50	50	4	200	0%	0	0	0	0	0	-200	0.002	e,f
	Benzene	µg/L	5	1	0.1	0%	0.05	0.05	-	0.05	0.05	4	0.1 - 0.5	0%	0	0	0	0	0	-200	-	e,f
	Ethylbenzene	µg/L	8	1	0.1	0%	0.05	0.05	-	0.05	0.05	4	0.1 - 0.5	0%	0	0	0	0	0	-200	-	e,f
	m/p-Xylene	µg/L	2	1	0.1	0%	0.05	0.05	-	0.05	0.05	0			-	-	-	-	-		-	e
	o-Xylene	µg/L	40	1	0.1	0%	0.05	0.05	-	0.05	0.05	0			-	-	-	-	-		-	e
	Toluene	µg/L	2	1	0.1	0%	0.05	0.05	-	0.05	0.05	0			-	-	-	-	-		-	e
THMs	Total Residual Chlorine[h]	mg/L	0.0005	3	0.002	0%	0.001	0.001	0	0.001	0.001	4	0.0012	25%	0.001	0.004	0.006	0.001	0.01	122	0.009	e
	Bromodichloromethane	µg/L	200	2	0.1	0%	0.05	0.05	0	0.05	0.05	4	0.1 - 0.5	0%	0	0	0	0	0	-200	-	e,f
	Bromoform	µg/L	60	2	0.1	0%	0.05	0.05	0	0.05	0.05	4	0.2 - 1	0%	0	0	0	0	0	-200	-	e,f
	Chloroform	µg/L	1.8	2	0.1	0%	0.05	0.05	0	0.05	0.05	4	0.1 - 0.5	0%	0	0	0	0	0	-200	-	e,f
	Dibromochloromethane	µg/L	-	2	0.1	0%	0.05	0.05	0	0.05	0.05	0			-	-	-	-	-		-	e
Bacteria	E. Coli	a	-	4	1	25%	1	47	92	1	185	4	10		10.0	11	6.6	4.0	20	-124	0.259	
	E. Coli 5 sample geo-mean	a	100	4	1	25%	1	40	79	1	159	0			-	-	-	-	-		-	
	Total Coliforms	a	100	4	1	75%	133	303	439	1	948	4	10	75%	90	75	45	10.0	110	-121	0.393	
Other	Hydrazine	µg/L	2.6	4	5	25%	2.5	8.1	11.25	2.5	25	4	0.1	25%	0.10	0.10	0.005	0.10	0.11	-195	0.007	
	Morpholine	µg/L	4	4	1	0%	0.50	0.50	0	0.50	0.50	4	4	0%	0	0.25	0.50	0	1.0	-67	0.077	e,f
	PCB in Water	µg/L	0.001	4	0.05	0%	0.03	0.03	0	0.03	0.03	0			-	-	-	-	-		-	e

###	Exceeds criteria.
###	RPD less than -20 (decrease). P-value for decrease statistically significant.
###	RPD greater than 20 (increase). P-value for increase statistically significant.

Notes:

a - 2007/2008 units were based on MPN/100 mL. 2019 units were based on CFU/100mL.

b -summary stats based on seasonal means (N_{means} = 4 for most parameters), each with five replicate samples.

c - 2019 data is uncensored. Therefore some parameters may have values below the MDL.

d - Parameters with both 'd' and 'e' notes indicate that 100% of samples in both 2008 and 2019 were below detection. Therefore assessment of change is not possible.

e - The 2009 ERA TSD set all samples to 1/2 MDL if all measurements were <MDL. Therefore, RPD and p-value calculations are based on all 2008 measurements being 1/2MDL if all measurements were <MDL.

f - All 2019 samples were below the MDL. Results are based on un-detected uncensored data.

g - The minimum total hardness in 2019 was 110 mg/L, so this was used as a conservative value in calculation of hardness dependent guidelines for cadmium, copper, lead and nickel.

h -Total residual chlorine exceedances in 2019 were attributed to a QAQC issue.

Table D-4: Assessment of Change in Baseline Non-Radionuclide Surface Water Data from 2007/2008 to 2019

	Parameter	Units	Criteria[g]	N_{means}	MDL	% above MDL	Median	Grand Mean	Std Dev	Min	Max	N	MDL	% above MDL	Median	Mean	Std Dev	Min	Max	RPD (means)	Mann–Whitney U test (p-value)	Note[d]
				2007/2008 Sampling Program [b] SW7 (bottom)								2019 Sampling Program[c] DNGS-Near (bottom)								Assessment of Change		
General Chemistry	Alkalinity	mg/L	-	4	5	100%	93	93	2.0	91	95	4	1	100%	98	97	3.9	92	100	4	0.065	
	Bicarbonate	ppm CaCO3	-	4	5	100%	93	93	2.0	91	95	0			-	-	-	-	-		-	
	Carbonate	ppm CaCO3	-	4	5	0%	2.5	2.5	0.000	2.5	2.5	0			-	-	-	-	-		-	e
	Hydroxide	ppm CaCO3	-	4	5	0%	2.5	2.5	0.000	2.5	2.5	0			-	-	-	-	-		-	e
	Total Hardness	mg/L	-	4	1	100%	122	125	14	112	143	4	0.5 - 1	100%	124	123	9.4	113	132	-2	0.935	
	Conductivity	umho/cm	-	4	1	100%	300	300	3.5	296	303	4	1	100%	335	343	46	300	400	13	0.018	
	Dissolved Oxygen (Field)	mg/L	-	2	-	100%	9.0	9.0	0.282843	8.8	9.2	4	-	100%	13	12	2.4	9.2	15	32	-	
	pH	pH	6.5-8.5	4	-	100%	8.2	8.2	0.157797	8.1	8.4	4	-	100%	8.3	8.3	0.07	8.2	8.3	1	0.647	
	pH (Field)	pH	6.5-8.5	3	-	100%	8.0	8.1	0.208167	7.9	8.3	4	-	100%	8.4	8.4	0.15	8.2	8.5	4	0.064	
	Temperature (Field)	Celsius	-	3	-	100%	17	16	7.2	7.9	22	4	-	100%	7.2	9.0	7.8	2.0	20	-54	0.174	
	Chemical Oxygen Demand	mg/L	-	1	1	100%	2.3	2.3	-	2.3	2.3	4	4	25%	-0.635	0.95	7.0	-4.820	9.9	-83	0.724	
	Total Organic Carbon	mg/L	-	4	0.2	100%	2.3	2.3	0.107548	2.2	2.4	0			-	-	-	-	-		-	
	Total Dissolved Solids	mg/L	-	4	2	100%	169	167	12	151	180	0			-	-	-	-	-		-	
	Total Suspended Solids	mg/L	-	4	2	75%	2.5	3.9	3.8	1.0	9.5	4	1 - 10	75%	6.0	5.3	3.0	1.0	8.0	29.8	0.114	
	Turbidity	NTU	-	4	0.1	100%	1	1.0	0.621871	0.5	1.8	4	0.1	100%	3.2	2.7	1.6	0.50	4.0	91	0.105	
Nutrients	Ammonia	mg/L	1.54	4	0.01	100%	0.02	0.02	0.009	0.02	0.04	4	0.01 - 1	50%	0.02	0.06	0.08	0.01	0.18	86	0.570	
	Unionized Ammonia8	mg/L	0.019	4	0.001	0%	0.001	0.001	0.000	0.001	0.001	4	0.00051 - 0.044	50%	0.001	0.005	0.009	0.000	0.02	147	0.967	e
	Nitrate	mg/L	13	4	0.01	100%	1.6	1.6	0.374924	1.2	1.9	4	0.1	100%	0.35	0.36	0.19	0.15	0.58	-126	0.002	
	Nitrite	mg/L	0.06	4	0.01	0%	0.006	0.007	0.002	0.005	0.01	4	0.01	0%	0.003	0.000	0.006	-0.009	0.004	-194	0.001	e,f
	Phosphorus	mg/L	0.02	4	0.002 / 0.01	75%	0.006	0.006	0.002	0.005	0.008	4	0.02 - 2.51	0%	0.01	0.01	0.008	0.000	0.02	46	0.461	f
	Total Kjeldahl Nitrogen	mg/L	-	4	0.06 / 0.5	0%	0.50	0.50	0.000	0.50	0.50	4	0.1	100%	0.15	0.17	0.06	0.12	0.26	-100	0.000	e
Metals	Aluminum	µg/L	100	4	0.1	100%	15	192	356	12	726	4	0.5 - 5	100%	2.7	23	41	1.8	85	-157	0.113	
	Aluminum (filtered)	µg/L	75	4	0.1	100%	6.6	6.6	3.3	3.2	10.0	4	5	0%	4.0	3.7	0.73	2.6	4.1	-57	0.218	f
	Antimony	µg/L	6	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.02 - 0.5	75%	0.14	0.14	0.02	0.12	0.17	-112	0.000	e
	Arsenic	µg/L	5	4	1	0%	0.50	0.88	0.75	0.50	2.00	4	0.02 - 1	100%	0.74	0.73	0.04	0.68	0.77	-17	0.000	e
	Barium	µg/L	1000	4	1	100%	25	84	118	24	261	4	0.02 - 2	100%	23	23	1.6	21	25	-113	0.134	
	Beryllium	µg/L	1100	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.01 - 0.5	0%	0.000	0.000	0.004	-0.005	0.004	-200	0.000	e,f
	Bismuth	µg/L	-	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.005 - 1	0%	0.000	0.000	0.001	-0.001	0.001	-200	0.000	e,f
	Boron	µg/L	200	4	0.1	100%	34	238	412	26	856	4	10 - 50	75%	22	22	2.2	20	25	-166	0.005	
	Cadmium	µg/L	0.17	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.005 - 0.1	0%	0.003	0.003	0.002	-0.001	0.005	-181	0.000	e,f
	Calcium	µg/L	-	4	0.1	100%	33750	34855	3525	31940	39980	4	0.05 - 250	100%	34950	34850	3140	31500	38000	0	0.745	
	Cesium	µg/L	-	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.05 - 0.2	0%	0.002	0.003	0.004	-0.001	0.009	-179	0.000	e,f
	Chromium	µg/L	8.9	4	0.1	75%	1.04	0.81	0.51	0.05	1.12	4	0.1 - 5	0%	0.09	0.18	0.19	0.08	0.46	-128	0.268	f
	Chromium (III)	µg/L	8.9	1	0.1	100%	1.1	1.1	-	1.1	1.1	4	0.5 - 5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	f
	Chromium(VI)	µg/L	1	1	5	0%	2.5	2.5	-	2.5	2.5	4	0.5	0%	0.22	0.25	0.06	0.22	0.34	-164	-	e,f
	Cobalt	µg/L	0.9	4	0.1	50%	0.13	0.28	0.34	0.07	0.78	4	0.005 - 0.5	75%	0.02	0.03	0.02	0.005	0.06	-167	0.006	
	Copper	µg/L	2.57	4	0.1	100%	1.1	1.2	0.301717	0.98	1.6	4	0.05 - 1	100%	0.66	0.66	0.10	0.55	0.75	-58	0.001	
	Iron	µg/L	300	4	1	100%	25	37	34	11	87	4	1 - 100	100%	2.3	26	49	1.3	100	-33	0.132	
	Lead	µg/L	3.59	4	0.1	25%	0.06	0.20	0.29	0.05	0.64	4	0.005 - 0.5	50%	0.008	0.02	0.04	0.003	0.08	-156	0.041	
	Lithium	µg/L	-	4	0.1	100%	2.6	2.8	0.687677	2.1	3.7	4	0.5 - 5	100%	1.9	1.9	0.24	1.5	2.1	-39	0.002	
	Magnesium	µg/L	-	4	0.1	100%	9170	9190	1379	7920	10500	4	0.05 - 250	100%	8655	8710	410	8340	9190	-5	0.440	
	Manganese	µg/L	120	4	0.1	100%	1.9	2.0	1.1	0.84	3.4	4	0.05 - 2	100%	1.0	1.6	1.6	0.51	3.9	-22	0.350	
	Mercury (filtered)	µg/L	0.026	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.01	0%	0.000	0.000	0.001	0.000	0.002	-196	0.001	e,f
	Molybdenum	µg/L	40	4	0.1	100%	1.4	1.4	0.03266	1.4	1.4	4	0.05 - 1	100%	1.2	1.2	0.04	1.1	1.2	-19	0.001	
	Nickel	µg/L	25	4	0.1	100%	0.71	0.76	0.14	0.66	0.96	4	0.02 - 1	75%	0.52	0.52	0.07	0.45	0.60	-37	0.003	
	Potassium	µg/L	-	4	0.1	100%	1900	1815	242	1460	2000	4	0.05 - 1000	100%	1680	1678	142	1550	1800	-8	0.299	
	Selenium	µg/L	1	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.04 - 2	100%	0.13	0.13	0.02	0.12	0.15	-117	0.000	e
	Silver	µg/L	0.1	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.005 - 0.1	0%	-0.001	0.000	0.001	-0.001	0.001	-203	0.000	e,f
	Sodium	µg/L	-	4	0.1	100%	15250	14750	2462	11680	16820	4	0.05 - 250	100%	15650	17625	5611	13600	25600	18	0.350	
	Strontium	µg/L	7000	4	0.1	100%	200	198	5.0	190	200	4	0.05 - 1	100%	183	185	8.2	178	197	-6	0.000	
	Thallium	µg/L	0.3	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.002 - 0.05	75%	0.005	0.005	0.002	0.003	0.007	-164	0.000	e
	Thorium	µg/L	-	4	0.1	0%	0.05	0.06	0.02	0.05	0.08	4	0.005 - 1	0%	0.001	0.003	0.004	0.000	0.009	-182	0.000	e,f
	Tin	µg/L	-	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.2 - 5	0%	0.03	0.03	0.02	0.008	0.06	-49	0.023	e,f
	Titanium	µg/L	-	4	0.1	100%	1.4	3.3	3.9	1.2	9.1	4	0.5 - 5	0%	0.08	1.2	2.4	-0.213	4.7	-95	0.113	f
	Tungsten	µg/L	30	4	0.1	25%	0.06	0.07	0.03	0.05	0.12	4	0.01 - 1	75%	0.10	0.10	0.01	0.09	0.11	37	0.092	
	Uranium	µg/L	5	4	0.1	100%	0.40	0.40	0.000	0.40	0.40	4	0.002 - 0.1	100%	0.38	0.38	0.03	0.35	0.40	-5	0.213	
	Vanadium	µg/L	6	4	0.1	75%	0.33	0.32	0.21	0.05	0.56	4	0.2 - 5	50%	0.25	0.23	0.10	0.10	0.31	-32	0.902	
	Zinc	µg/L	7	4	0.1	100%	1.9	2.1	0.924824	1.3	3.5	4	0.1 - 5	75%	0.79	1.0	0.68	0.45	2.0	-72	0.074	
	Zirconium	µg/L	4	4	0.1	25%	0.1	2.1	4.1	0.05	8.2	4	0.1 - 1	0%	0.01	0.01	0.008	0.003	0.02	-198	0.000	f
Hydrocarbons	Petro Hydrocarbons C6-10	µg/L	167	4	100	0%	50	50	0.000	50	50	4	25	0%	0.000	0.000	0.000	0.000	0.000	-200	0.002	e,f
	Petro Hydrocarbons C10-16	µg/L	42	4	100	0%	50	50	0.000	50	50	4	100	0%	0.000	0.000	0.000	0.000	0.000	-200	0.002	e,f
	Petro Hydrocarbons C16-34	µg/L	-	4	100	0%	50	50	0.000	50	50	4	200	0%	62	75	44	41	134	40	0.913	e,f
	Petro Hydrocarbons C34-50	µg/L	-	4	100	0%	50	50	0.000	50	50	4	200	0%	0.000	0.000	0.000	0.000	0.000	-200	0.002	e,f
	Benzene	µg/L	5	1	0.1	0%	0.05	0.05	-	0.05	0.05	4	0.1 - 0.5	25%	0.000	0.03	0.06	0.000	0.12	-50	-	e
	Ethylbenzene	µg/L	8	1	0.1	0%	0.05	0.05	-	0.05	0.05	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	m/p-Xylene	µg/L	2	1	0.1	0%	0.05	0.05	-	0.05	0.05	0			-	-	-	-	-		-	e
	o-Xylene	µg/L	40	1	0.1	0%	0.05	0.05	-	0.05	0.05	0			-	-	-	-	-		-	e
	Toluene	µg/L	2	1	0.1	0%	0.05	0.05	-	0.05	0.05	0			-	-	-	-	-		-	e
THMs	Total Residual Chlorine[h]	mg/L	0.0005	2	0.002	0%	0.001	0.001	0.000	0.001	0.001	4	0.0012	25%	0.001	0.005	0.007	0.001	0.02	132	-	e
	Bromodichloromethane	µg/L	200	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Bromoform	µg/L	60	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.2 - 1	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Chloroform	µg/L	1.8	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Dibromochloromethane	µg/L	-	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	0			-	-	-	-	-		-	e
Bacteria	E. Coli	a	-	4	1	50%	1	17	33	1	67	4	10		10.0	9.0	2.0	6.0	10.0	-64	0.253	
	E. Coli 5 sample geo-mean	a	100	4	1	25%	1	16	30	1	61	0			-	-	-	-	-		-	
	Total Coliforms	a	100	4	1	100%	155	250	309	1.3	688	4	10	100%	90	78	53	10.0	120	-105	0.349	
Other	Hydrazine	µg/L	2.6	4	5	25%	2.5	8.1	11.25	2.5	25	4	0.1	0%	0.10	0.10	0.000	0.10	0.10	-195	0.006	f
	Morpholine	µg/L	4	4	1	0%	0.50	0.54	0.07	0.50	0.64	4	4	0%	0.000	0.000	0.000	0.000	0.000	-200	0.001	e,f
	PCB in Water	µg/L	0.001	4	0.05	0%	0.03	0.03	0.000	0.03	0.03	0			-	-	-	-	-		-	e

###	Exceeds criteria.
###	RPD less than -20 (decrease). P-value for decrease statistically significant.
###	RPD greater than 20 (increase). P-value for increase statistically significant.

Notes:

a - 2007/2008 units were based on MPN/100 mL. 2019 units were based on CFU/100mL.

b -summary stats based on seasonal means (N_{means} = 4 for most parameters), each with five replicate samples.

c - 2019 data is uncensored. Therefore some parameters may have values below the MDL.

d - Parameters with both 'd' and 'e' notes indicate that 100% of samples in both 2008 and 2019 were below detection. Therefore assessment of change is not possible.

e - The 2009 ERA TSD set all samples to 1/2 MDL if all measurements were <MDL. Therefore, RPD and p-value calculations are based on all 2008 measurements being 1/2MDL if all measurements were <MDL.

f - All 2019 samples were below the MDL. Results are based on un-detected uncensored data.

g - The minimum total hardness in 2019 was 110 mg/L, so this was used as a conservative value in calculation of hardness dependent guidelines for cadmium, copper, lead and nickel.

h -Total residual chlorine exceedances in 2019 were attributed to a QAQC issue.

Table D-4: Assessment of Change in Baseline Non-Radionuclide Surface Water Data from 2007/2008 to 2019

	Parameter	Units	Criteria[g]	2007/2008 Sampling Program[b] SW8 (bottom)								2019 Sampling Program[c] DNGS-Far (bottom)								Assessment of Change		
				N_{means}	MDL	% above MDL	Median	Grand Mean	Std Dev	Min	Max	N	MDL	% above MDL	Median	Mean	Std Dev	Min	Max	RPD (means)	Mann–Whitney *U* test (p-value)	Note[d]
General Chemistry	Alkalinity	mg/L	-	4	5	100%	91	92	2.3	90	95	4	1	100%	95	95	2.4	92	97	3	0.102	
	Bicarbonate	ppm CaCO3	-	4	5	100%	91	92	2.3	90	95	0			-	-	-	-	-		-	
	Carbonate	ppm CaCO3	-	4	5	0%	2.5	2.5	0.000	2.5	2.5	0			-	-	-	-	-		-	e
	Hydroxide	ppm CaCO3	-	4	5	0%	2.5	2.5	0.000	2.5	2.5	0			-	-	-	-	-		-	e
	Total Hardness	mg/L	-	4	1	100%	126	128	12	117	145	4	0.5 - 1	100%	121	120	6.4	112	125	-7	0.272	
	Conductivity	umho/cm	-	4	1	100%	301	299	4.0	293	302	4	1	100%	315	315	5.8	310	320	5	0.002	
	Dissolved Oxygen (Field)	mg/L	-	2	-	100%	8.9	8.9	0.070711	8.8	8.9	4	-	100%	10	10	1.4	9.2	12	16	-	
	pH	pH	6.5-8.5	4	-	100%	8.0	8.1	0.280179	7.9	8.5	4	-	100%	8.2	8.2	0.08	8.2	8.4	1	0.268	
	pH (Field)	pH	6.5-8.5	4	-	100%	7.9	8.0	0.221736	7.8	8.3	4	-	100%	8.4	8.4	0.09	8.3	8.4	5	0.027	
	Temperature (Field)	Celsius	-	4	-	100%	11	13	7.9	5.4	23	4	-	100%	7.4	9.7	7.5	4.0	20	-27	0.295	
	Chemical Oxygen Demand	mg/L	-	1	1	100%	3.0	3.0	-	3.0	3.0	4	4	50%	5.2	4.4	4.0	-0.950	8.3	39	-	
	Total Organic Carbon	mg/L	-	4	0.2	100%	2.3	2.3	0.103763	2.1	2.3	0			-	-	-	-	-		-	
	Total Dissolved Solids	mg/L	-	4	2	100%	189	185	12	168	194	0			-	-	-	-	-		-	
	Total Suspended Solids	mg/L	-	4	2	50%	1.4	1.6	0.597885	1.2	2.5	4	1 - 10	25%	1.0	1.1	0.74	0.20	2.0	-42.1	0.114	
	Turbidity	NTU	-	4	0.1	100%	0.64	0.71	0.41	0.28	1.26	4	0.1	75%	0.15	0.21	0.20	0.04	0.50	-108	0.007	
Nutrients	Ammonia	mg/L	1.54	4	0.01	100%	0.02	0.02	0.009	0.008	0.03	4	0.01 - 1	50%	0.02	0.03	0.04	0.008	0.09	49	1.000	
	Unionized Ammonia8	mg/L	0.019	4	0.001	25%	0.000	0.000	0.000	0.000	0.001	4	0.00051 - 0.044	75%	0.004	0.03	0.06	0.000	0.13	195	0.128	
	Nitrate	mg/L	13	4	0.01	100%	1.8	1.7	0.31647	1.3	1.9	4	0.1	100%	0.32	0.31	0.09	0.19	0.41	-139	0.002	
	Nitrite	mg/L	0.06	4	0.01	0%	0.005	0.009	0.008	0.005	0.02	4	0.01	0%	0.000	0.000	0.004	-0.004	0.005	-188	0.001	e,f
	Phosphorus	mg/L	0.02	4	0.002 / 0.01	75%	0.006	0.005	0.001	0.004	0.007	4	0.02 - 2.51	0%	0.002	0.004	0.005	0.000	0.011	-41	0.129	f
	Total Kjeldahl Nitrogen	mg/L	-	4	0.06 / 0.5	0%	0.50	0.50	0.000	0.50	0.50	4	0.1	100%	0.18	0.18	0.03	0.15	0.22	-94	0.000	e
Metals	Aluminum	µg/L	100	4	0.1	100%	15	15	5.1	8.2	21	4	0.5 - 5	75%	0.81	1.3	1.1	0.55	3.0	-168	0.002	
	Aluminum (filtered)	µg/L	75	4	0.1	100%	4.2	5.8	3.4	3.8	10.8	4	5	0%	2.8	2.9	0.87	2.0	4.0	-66	0.037	f
	Antimony	µg/L	6	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.02 - 0.5	75%	0.13	0.13	0.005	0.12	0.13	-119	0.000	e
	Arsenic	µg/L	5	4	1	0%	0.50	0.53	0.05	0.50	0.60	4	0.02 - 1	100%	0.77	0.77	0.02	0.75	0.80	38	0.000	e
	Barium	µg/L	1000	4	1	100%	24	23	3.5	17	25	4	0.02 - 2	100%	22	22	0.75	22	23	-2	0.009	
	Beryllium	µg/L	1100	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.01 - 0.5	0%	-0.001	-0.001	0.002	-0.004	0.001	-201	0.000	e,f
	Bismuth	µg/L	-	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.005 - 1	0%	0.000	0.000	0.000	-0.001	0.000	-200	0.000	e,f
	Boron	µg/L	200	4	0.1	100%	30	31	5.2	26	38	4	10 - 50	75%	22	22	1.5	21	24	-33	0.016	
	Cadmium	µg/L	0.17	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.005 - 0.1	25%	0.003	0.003	0.002	0.002	0.006	-175	0.000	e
	Calcium	µg/L	-	4	0.1	100%	33620	35060	3545	32680	40320	4	0.05 - 250	100%	33750	33775	1515	32000	35600	-4	0.839	
	Cesium	µg/L	-	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.05 - 0.2	0%	0.000	0.000	0.001	-0.001	0.002	-199	0.000	e,f
	Chromium	µg/L	8.9	4	0.1	75%	0.87	0.70	0.45	0.05	1.02	4	0.1 - 5	0%	0.07	-0.057	0.26	-0.453	0.09	-235	0.110	f
	Chromium (III)	µg/L	8.9	1	0.1	100%	0.78	0.78	-	0.78	0.78	4	0.5 - 5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	f
	Chromium(VI)	µg/L	1	1	5	0%	2.5	2.5	-	2.5	2.5	4	0.5	0%	0.21	0.23	0.04	0.20	0.29	-166	-	e,f
	Cobalt	µg/L	0.9	4	0.1	25%	0.09	0.40	0.64	0.05	1.36	4	0.005 - 0.5	50%	0.007	0.003	0.009	-0.010	0.009	-197	0.001	
	Copper	µg/L	2.57	4	0.1	100%	1.0	1.1	0.161142	1.0	1.3	4	0.05 - 1	100%	0.60	0.60	0.04	0.55	0.65	-59	0.002	
	Iron	µg/L	300	4	1	100%	22	23	13	7.4	38	4	1 - 100	0%	0.40	0.14	0.75	-0.946	0.70	-198	0.002	f
	Lead	µg/L	3.59	4	0.1	25%	0.10	0.09	0.02	0.06	0.11	4	0.005 - 0.5	0%	0.004	0.004	0.003	0.002	0.008	-182	0.002	f
	Lithium	µg/L	-	4	0.1	100%	2.6	2.8	0.444335	2.4	3.4	4	0.5 - 5	100%	2.0	2.0	0.17	1.8	2.2	-32	0.002	
	Magnesium	µg/L	-	4	0.1	100%	10330	9920	1141	8240	10780	4	0.05 - 250	100%	8470	8570	728	7810	9530	-15	0.067	
	Manganese	µg/L	120	4	0.1	100%	0.73	0.82	0.34	0.50	1.30	4	0.05 - 2	75%	0.24	0.24	0.13	0.09	0.37	-110	0.002	
	Mercury (filtered)	µg/L	0.026	3	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.01	0%	0.001	0.001	0.001	0.000	0.002	-192	0.010	e,f
	Molybdenum	µg/L	40	4	0.1	100%	1.4	1.3	0.128062	1.1	1.4	4	0.05 - 1	100%	1.2	1.2	0.03	1.2	1.2	-10	0.003	
	Nickel	µg/L	25	4	0.1	100%	0.75	0.71	0.12	0.54	0.80	4	0.02 - 1	75%	0.47	0.28	0.39	-0.300	0.48	-87	0.002	
	Potassium	µg/L	-	4	0.1	100%	1790	1755	213	1500	1940	4	0.05 - 1000	100%	1620	1628	97	1540	1730	-8	0.265	
	Selenium	µg/L	1	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.04 - 2	100%	0.13	0.13	0.01	0.12	0.15	-116	0.000	e
	Silver	µg/L	0.1	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.005 - 0.1	0%	0.000	0.000	0.002	-0.002	0.001	-202	0.000	e,f
	Sodium	µg/L	-	4	0.1	100%	16080	15260	1934	12380	16500	4	0.05 - 250	100%	14950	14925	974	13900	15900	-2	0.350	
	Strontium	µg/L	7000	4	0.1	100%	201	194	16	170	204	4	0.05 - 1	100%	185	189	12	180	207	-2	0.097	
	Thallium	µg/L	0.3	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.002 - 0.05	75%	0.006	0.005	0.001	0.003	0.006	-162	0.000	e
	Thorium	µg/L	-	4	0.1	25%	0.05	0.05	0.000	0.05	0.05	4	0.005 - 1	0%	0.001	0.001	0.002	-0.002	0.002	-195	0.000	f
	Tin	µg/L	-	4	0.1	25%	0.05	0.07	0.03	0.05	0.11	4	0.2 - 5	0%	0.02	0.11	0.20	0.000	0.41	51	0.065	f
	Titanium	µg/L	-	4	0.1	100%	1.3	1.4	0.4617	1.1	2.1	4	0.5 - 5	0%	0.03	-0.001	0.16	-0.219	0.15	-200	0.002	f
	Tungsten	µg/L	30	4	0.1	25%	0.06	0.07	0.02	0.05	0.10	4	0.01 - 1	75%	0.10	0.10	0.01	0.09	0.11	40	0.040	
	Uranium	µg/L	5	4	0.1	100%	0.40	0.38	0.05	0.30	0.40	4	0.002 - 0.1	100%	0.36	0.36	0.010	0.35	0.37	-4	0.000	
	Vanadium	µg/L	6	4	0.1	75%	0.33	0.39	0.40	0.05	0.84	4	0.2 - 5	25%	0.20	0.17	0.09	0.04	0.24	-79	0.170	
	Zinc	µg/L	7	4	0.1	100%	3.0	3.0	1.8	1.3	5.0	4	0.1 - 5	75%	0.75	0.91	0.61	0.36	1.8	-108	0.043	
	Zirconium	µg/L	4	4	0.1	25%	0.05	0.05	0.005	0.05	0.06	4	0.1 - 1	0%	0.003	0.003	0.008	-0.006	0.01	-177	0.000	f
Hydrocarbons	Petro Hydrocarbons C6-10	µg/L	167	4	100	0%	50	50	0.000	50	50	4	25	0%	0.000	0.000	0.000	0.000	0.000	-200	0.002	e,f
	Petro Hydrocarbons C10-16	µg/L	42	4	100	0%	50	50	0.000	50	50	4	100	0%	0.000	0.000	0.000	0.000	0.000	-200	0.002	e,f
	Petro Hydrocarbons C16-34	µg/L	-	4	100	0%	50	50	0.000	50	50	4	200	0%	50	67	52	24	142	29	0.913	e,f
	Petro Hydrocarbons C34-50	µg/L	-	4	100	0%	50	50	0.000	50	50	4	200	0%	0.000	0.000	0.000	0.000	0.000	-200	0.002	e,f
	Benzene	µg/L	5	1	0.1	0%	0.05	0.05	-	0.05	0.05	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Ethylbenzene	µg/L	8	1	0.1	0%	0.05	0.05	-	0.05	0.05	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	m/p-Xylene	µg/L	2	1	0.1	0%	0.05	0.05	-	0.05	0.05	0			-	-	-	-	-		-	e
	o-Xylene	µg/L	40	1	0.1	0%	0.05	0.05	-	0.05	0.05	0			-	-	-	-	-		-	e
	Toluene	µg/L	2	1	0.1	0%	0.05	0.05	-	0.05	0.05	0			-	-	-	-	-		-	e
THMs	Total Residual Chlorine[h]	mg/L	0.0005	3	0.002	0%	0.001	0.001	0.000	0.001	0.001	4	0.0012	25%	0.001	0.004	0.006	0.001	0.01	122	0.009	e
	Bromodichloromethane	µg/L	200	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Bromoform	µg/L	60	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.2 - 1	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Chloroform	µg/L	1.8	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Dibromochloromethane	µg/L	-	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	0			-	-	-	-	-		-	e
Bacteria	E. Coli	a	-	4	1	25%	0.9	3.8	6.0	0.5	12.8	4	10		10.0	7.5	5.0	0.000	10.0	66	0.590	
	E. Coli 5 sample geo-mean	a	100	4	1	25%	1.0	3.4	5.1	0.5	11	0			-	-	-	-	-		-	
	Total Coliforms	a	100	4	1	75%	77	116	140	1	312	4	10	50%	10.0	23	32	0.000	70	-135	0.133	
Other	Hydrazine	µg/L	2.6	4	5	25%	2.5	8.1	11.25	2.5	25	4	0.1	0%	0.10	0.10	0.000	0.10	0.10	-195	0.006	f
	Morpholine	µg/L	4	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	4	0%	0.000	0.25	0.50	0.000	1.0	-67	0.077	e,f
	PCB in Water	µg/L	0.001	4	0.05	0%	0.03	0.03	0.000	0.03	0.03	0			-	-	-	-	-		-	e

###	Exceeds criteria.
###	RPD less than -20 (decrease). P-value for decrease statistically significant.
###	RPD greater than 20 (increase). P-value for increase statistically significant.

Notes:

a - 2007/2008 units were based on MPN/100 mL. 2019 units were based on CFU/100mL.

b -summary stats based on seasonal means (N_{means} = 4 for most parameters), each with five replicate samples.

c - 2019 data is uncensored. Therefore some parameters may have values below the MDL.

d - Parameters with both 'd' and 'e' notes indicate that 100% of samples in both 2008 and 2019 were below detection. Therefore assessment of change is not possible.

e - The 2009 ERA TSD set all samples to 1/2 MDL if all measurements were <MDL. Therefore, RPD and p-value calculations are based on all 2008 measurements being 1/2MDL if all measurements were <MDL.

f - All 2019 samples were below the MDL. Results are based on un-detected uncensored data.

g - The minimum total hardness in 2019 was 110 mg/L, so this was used as a conservative value in calculation of hardness dependent guidelines for cadmium, copper, lead and nickel.

h -Total residual chlorine exceedances in 2019 were attributed to a QAQC issue.

Table D-4: Assessment of Change in Baseline Non-Radionuclide Surface Water Data from 2007/2008 to 2019

	Parameter	Units	Criteria[g]	2007/2008 Sampling Program[b] SW9 (top)								2019 Sampling Program[c] SW9 (top)								Assessment of Change		
				N_{means}	MDL	% above MDL	Median	Grand Mean	Std Dev	Min	Max	N	MDL	% above MDL	Median	Mean	Std Dev	Min	Max	RPD (means)	Mann–Whitney *U* test (p-value)	Note[d]
General Chemistry	Alkalinity	mg/L	-	4	5	100%	93	94	3.4	91	99	4	1	100%	97	97	3.5	94	100	3	0.077	
	Bicarbonate	ppm CaCO3	-	4	5	100%	93	94	3.4	91	99	0			-	-	-	-	-		-	
	Carbonate	ppm CaCO3	-	4	5	0%	2.5	2.5	0.000	2.5	2.5	0			-	-	-	-	-		-	e
	Hydroxide	ppm CaCO3	-	4	5	0%	2.5	2.5	0.000	2.5	2.5	0			-	-	-	-	-		-	e
	Total Hardness	mg/L	-	4	1	100%	129	129	9.0	118	139	4	0.5 - 1	100%	122	123	5.5	118	131	-4	0.393	
	Conductivity	umho/cm	-	4	1	100%	300	301	2.1	299	304	4	1	100%	335	333	32	300	360	10	0.028	
	Dissolved Oxygen (Field)	mg/L	-	2	-	100%	9.2	9.2	1.1	8.4	10.0	4	-	100%	16	34	38	12	90	114	-	
	pH	pH	6.5-8.5	4	-	100%	8.1	8.2	0.260512	8.0	8.6	4	-	100%	8.3	8.3	0.08	8.2	8.4	1	0.535	
	pH (Field)	pH	6.5-8.5	4	-	100%	8.1	8.1	0.275379	7.8	8.4	4	-	100%	8.4	8.3	0.27	8.0	8.6	3	0.106	
	Temperature (Field)	Celsius	-	4	-	100%	10	12	6.3	6.4	20	4	-	100%	9.5	10	7.7	2.3	19	-15	0.505	
	Chemical Oxygen Demand	mg/L	-	1	1	100%	2.2	2.2	-	2.2	2.2	4	4	100%	6.6	8.0	3.4	5.8	13	114	-	
	Total Organic Carbon	mg/L	-	4	0.2	100%	2.5	2.4	0.141421	2.2	2.5	0			-	-	-	-	-		-	
	Total Dissolved Solids	mg/L	-	4	2	100%	172	169	13	151	180	0			-	-	-	-	-		-	
	Total Suspended Solids	mg/L	-	4	2	50%	2.2	2.1	0.863559	1.0	3.0	4	1 - 10	50%	3.0	3.0	2.6	0.000	6.0	35.8	0.710	
	Turbidity	NTU	-	4	0.1	100%	1	1.2	0.929509	0.47	2.5	4	0.1	100%	0.85	1.1	0.90	0.40	2.4	-5	0.598	
Nutrients	Ammonia	mg/L	1.54	4	0.01	50%	0.01	0.01	0.009	0.007	0.03	4	0.01 - 1	100%	0.17	0.14	0.08	0.02	0.19	164	0.011	
	Unionized Ammonia8	mg/L	0.019	4	0.001	0%	0.000	0.000	0.000	0.000	0.001	4	0.00051 - 0.044	100%	0.006	0.005	0.003	0.002	0.007	171	0.002	e
	Nitrate	mg/L	13	4	0.01	100%	1.7	1.7	0.251854	1.3	1.9	4	0.1	100%	0.34	0.34	0.14	0.20	0.49	-132	0.002	
	Nitrite	mg/L	0.06	4	0.01	25%	0.005	0.007	0.005	0.005	0.01	4	0.01	0%	0.004	0.002	0.003	-0.003	0.005	-98	0.028	f
	Phosphorus	mg/L	0.02	4	0.002 / 0.01	100%	0.007	0.01	0.02	0.004	0.04	4	0.02 - 2.51	25%	0.009	0.01	0.006	0.008	0.02	-22	0.048	
	Total Kjeldahl Nitrogen	mg/L	-	4	0.06 / 0.5	0%	0.50	0.51	0.01	0.50	0.52	4	0.1	100%	0.15	0.18	0.07	0.14	0.29	-94	0.000	e
Metals	Aluminum	µg/L	100	4	0.1	100%	20	22	3.7	19	27	4	0.5 - 5	100%	2.6	5.6	6.7	1.7	16	-118	0.003	
	Aluminum (filtered)	µg/L	75	4	0.1	100%	5.2	6.4	3.2	4.0	11	4	5	0%	3.0	2.8	0.42	2.2	3.0	-77	0.004	f
	Antimony	µg/L	6	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.02 - 0.5	75%	0.15	0.14	0.01	0.12	0.15	-112	0.000	e
	Arsenic	µg/L	5	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.02 - 1	100%	0.77	0.76	0.03	0.73	0.80	42	0.000	e
	Barium	µg/L	1000	4	1	100%	24	23	2.9	19	25	4	0.02 - 2	100%	22	23	1.9	21	25	-3	0.052	
	Beryllium	µg/L	1100	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.01 - 0.5	0%	0.000	0.000	0.001	-0.001	0.001	-200	0.000	e,f
	Bismuth	µg/L	-	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.005 - 1	0%	0.001	0.001	0.000	0.000	0.001	-200	0.000	e,f
	Boron	µg/L	200	4	0.1	100%	31	31	5.7	24	38	4	10 - 50	75%	23	22	2.7	19	25	-32	0.003	
	Cadmium	µg/L	0.17	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.005 - 0.1	0%	0.002	0.002	0.001	0.002	0.004	-182	0.000	e,f
	Calcium	µg/L	-	4	0.1	100%	34960	35710	2791	33500	39420	4	0.05 - 250	100%	34200	35000	2061	33600	38000	-2	0.968	
	Cesium	µg/L	-	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.05 - 0.2	0%	0.003	0.003	0.002	0.000	0.004	-181	0.000	e,f
	Chromium	µg/L	8.9	4	0.1	50%	0.47	0.52	0.54	0.05	1.08	4	0.1 - 5	0%	0.09	-0.033	0.25	-0.404	0.10	-228	0.173	f
	Chromium (III)	µg/L	8.9	1	0.1	0%	0.05	0.05	-	0.05	0.05	4	0.5 - 5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Chromium(VI)	µg/L	1	1	5	0%	2.5	2.5	-	2.5	2.5	4	0.5	0%	0.26	0.26	0.05	0.22	0.31	-162	-	e,f
	Cobalt	µg/L	0.9	4	0.1	25%	0.09	0.51	0.87	0.05	1.82	4	0.005 - 0.5	75%	0.010	0.008	0.006	0.000	0.01	-194	0.001	
	Copper	µg/L	2.57	4	0.1	100%	1.1	1.1	0.289597	0.66	1.3	4	0.05 - 1	100%	0.64	0.65	0.06	0.59	0.73	-47	0.003	
	Iron	µg/L	300	4	1	100%	25	24	8.0	16	32	4	1 - 100	100%	3.3	5.9	7.0	1.1	16	-122	0.008	
	Lead	µg/L	3.59	4	0.1	0%	0.08	0.08	0.02	0.05	0.10	4	0.005 - 0.5	75%	0.009	0.01	0.008	0.006	0.02	-144	0.001	e
	Lithium	µg/L	-	4	0.1	100%	2.8	3.0	0.503157	2.6	3.7	4	0.5 - 5	100%	2.2	2.2	0.44	1.7	2.6	-30	0.003	
	Magnesium	µg/L	-	4	0.1	100%	9850	9570	841	8340	10240	4	0.05 - 250	100%	8670	8705	420	8250	9230	-9	0.132	
	Manganese	µg/L	120	4	0.1	100%	1.4	1.4	0.728537	0.56	2.2	4	0.05 - 2	100%	0.50	0.68	0.59	0.22	1.5	-69	0.016	
	Mercury (filtered)	µg/L	0.026	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.01	0%	0.001	0.001	0.001	0.000	0.002	-194	0.003	e,f
	Molybdenum	µg/L	40	4	0.1	100%	1.3	1.4	0.047258	1.3	1.4	4	0.05 - 1	100%	1.2	1.2	0.04	1.1	1.2	-15	0.002	
	Nickel	µg/L	25	4	0.1	100%	0.74	0.71	0.11	0.54	0.80	4	0.02 - 1	75%	0.47	0.29	0.41	-0.318	0.54	-83	0.002	
	Potassium	µg/L	-	4	0.1	100%	1750	1780	286	1480	2140	4	0.05 - 1000	100%	1675	1683	105	1570	1810	-6	0.439	
	Selenium	µg/L	1	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.04 - 2	100%	0.13	0.13	0.006	0.12	0.14	-117	0.000	e
	Silver	µg/L	0.1	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.005 - 0.1	0%	0.000	0.000	0.002	-0.002	0.001	-202	0.000	e,f
	Sodium	µg/L	-	4	0.1	100%	15580	15195	2002	12460	17160	4	0.05 - 250	100%	16550	16975	3312	13700	21100	11	0.351	
	Strontium	µg/L	7000	4	0.1	100%	199	196	20	170	214	4	0.05 - 1	100%	195	200	20	182	227	2	0.533	
	Thallium	µg/L	0.3	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.002 - 0.05	75%	0.005	0.005	0.001	0.004	0.006	-165	0.000	e
	Thorium	µg/L	-	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.005 - 1	0%	0.001	0.001	0.003	-0.003	0.004	-194	0.000	e,f
	Tin	µg/L	-	4	0.1	0%	0.05	0.06	0.02	0.05	0.09	4	0.2 - 5	0%	0.006	0.008	0.01	-0.006	0.03	-154	0.000	e,f
	Titanium	µg/L	-	4	0.1	100%	1.7	1.9	0.488365	1.4	2.5	4	0.5 - 5	0%	-0.104	0.07	0.38	-0.144	0.63	-185	0.002	f
	Tungsten	µg/L	30	4	0.1	25%	0.06	0.07	0.02	0.05	0.10	4	0.01 - 1	75%	0.10	0.10	0.007	0.09	0.10	36	0.126	
	Uranium	µg/L	5	4	0.1	100%	0.40	0.38	0.05	0.30	0.40	4	0.002 - 0.1	100%	0.36	0.37	0.02	0.36	0.39	-2	0.000	
	Vanadium	µg/L	6	4	0.1	50%	0.29	0.34	0.34	0.05	0.72	4	0.2 - 5	25%	0.18	0.16	0.08	0.05	0.23	-70	0.279	
	Zinc	µg/L	7	4	0.1	100%	1.7	2.2	1.4	1.2	4.2	4	0.1 - 5	75%	0.50	0.54	0.12	0.45	0.72	-121	0.003	
	Zirconium	µg/L	4	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.1 - 1	0%	0.02	0.02	0.003	0.01	0.02	-99	0.000	e,f
Hydrocarbons	Petro Hydrocarbons C6-10	µg/L	167	4	100	0%	50	50	0.000	50	50	4	25	0%	0.000	0.000	0.000	0.000	0.000	-200	0.002	e,f
	Petro Hydrocarbons C10-16	µg/L	42	4	100	0%	50	50	0.000	50	50	4	100	0%	0.000	0.000	0.000	0.000	0.000	-200	0.002	e,f
	Petro Hydrocarbons C16-34	µg/L	-	4	100	0%	50	50	0.000	50	50	4	200	0%	55	50	12	32	58	0	0.155	e,f
	Petro Hydrocarbons C34-50	µg/L	-	4	100	0%	50	50	0.000	50	50	4	200	0%	0.000	0.000	0.000	0.000	0.000	-200	0.002	e,f
	Benzene	µg/L	5	1	0.1	0%	0.05	0.05	-	0.05	0.05	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Ethylbenzene	µg/L	8	1	0.1	0%	0.05	0.05	-	0.05	0.05	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	m/p-Xylene	µg/L	2	1	0.1	0%	0.05	0.05	-	0.05	0.05	0			-	-	-	-	-		-	e
	o-Xylene	µg/L	40	1	0.1	0%	0.05	0.05	-	0.05	0.05	0			-	-	-	-	-		-	e
	Toluene	µg/L	2	1	0.1	0%	0.06	0.06	-	0.06	0.06	0			-	-	-	-	-		-	e
THMs	Total Residual Chlorine[h]	mg/L	0.0005	3	0.002	0%	0.001	0.001	0.000	0.001	0.001	4	0.0012	50%	0.001	0.004	0.006	0.001	0.01	126	0.009	e
	Bromodichloromethane	µg/L	200	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Bromoform	µg/L	60	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.2 - 1	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Chloroform	µg/L	1.8	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Dibromochloromethane	µg/L	-	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	0			-	-	-	-	-		-	e
Bacteria	E. Coli	a	-	4	1	50%	1.1	48	94	1	189	4	10		10.0	10.0	8.2	0.000	20	-131	0.967	
	E. Coli 5 sample geo-mean	a	100	3	1	33%	1.0	63	108	1.0	188	0			-	-	-	-	-		-	
	Total Coliforms	a	100	4	1	100%	106	864	1588	2.6	3242	4	10	100%	25	20	14	0.000	30	-191	0.180	
Other	Hydrazine	µg/L	2.6	3	5	0%	2.5	2.5	0.000	2.5	2.5	4	0.1	25%	0.10	0.10	0.000	0.10	0.10	-185	0.007	e
	Morpholine	µg/L	4	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	4	0%	0.000	0.000	0.000	0.000	0.000	-200	0.000	e,f
	PCB in Water	µg/L	0.001	4	0.05	0%	0.03	0.03	0.000	0.03	0.03	0			-	-	-	-	-		-	e

###	Exceeds criteria.
###	RPD less than -20 (decrease). P-value for decrease statistically significant.
###	RPD greater than 20 (increase). P-value for increase statistically significant.

Notes:

a - 2007/2008 units were based on MPN/100 mL. 2019 units were based on CFU/100mL.

b -summary stats based on seasonal means (N_{means} = 4 for most parameters), each with five replicate samples.

c - 2019 data is uncensored. Therefore some parameters may have values below the MDL.

d - Parameters with both 'd' and 'e' notes indicate that 100% of samples in both 2008 and 2019 were below detection. Therefore assessment of change is not possible.

e - The 2009 ERA TSD set all samples to 1/2 MDL if all measurements were <MDL. Therefore, RPD and p-value calculations are based on all 2008 measurements being 1/2MDL if all measurements were <MDL.

f - All 2019 samples were below the MDL. Results are based on un-detected uncensored data.

g - The minimum total hardness in 2019 was 110 mg/L, so this was used as a conservative value in calculation of hardness dependent guidelines for cadmium, copper, lead and nickel.

h -Total residual chlorine exceedances in 2019 were attributed to a QAQC issue.

Table D-4: Assessment of Change in Baseline Non-Radionuclide Surface Water Data from 2007/2008 to 2019

	Parameter	Units	Criteria[g]	2007/2008 Sampling Program [b] SW9 (bottom)								2019 Sampling Program[c] SW9 (bottom)								Assessment of Change		
				N_{means}	MDL	% above MDL	Median	Grand Mean	Std Dev	Min	Max	N	MDL	% above MDL	Median	Mean	Std Dev	Min	Max	RPD (means)	Mann–Whitney *U* test (p-value)	Note[d]
General Chemistry	Alkalinity	mg/L	-	4	5	100%	91	89	7.5	79	97	4	1	100%	97	96	4.3	92	100	7	0.205	
	Bicarbonate	ppm CaCO3	-	4	5	100%	91	89	7.5	79	97	0			-	-	-	-	-		-	
	Carbonate	ppm CaCO3	-	4	5	0%	2.5	2.5	0.000	2.5	2.5	0			-	-	-	-	-		-	e
	Hydroxide	ppm CaCO3	-	4	5	0%	2.5	2.5	0.000	2.5	2.5	0			-	-	-	-	-		-	e
	Total Hardness	mg/L	-	4	1	100%	130	129	8.2	119	136	4	0.5 - 1	100%	123	125	5.7	120	133	-3	0.089	
	Conductivity	umho/cm	-	4	1	100%	303	302	4.2	296	305	4	1	100%	325	330	24	310	360	9	0.979	
	Dissolved Oxygen (Field)	mg/L	-	2	-	100%	9.4	9.4	1.3	8.4	10.3	4	-	100%	13	13	4.6	8.6	20	36	-	
	pH	pH	6.5-8.5	4	-	100%	8.1	8.1	0.360925	7.6	8.5	4	-	100%	8.3	8.3	0.09	8.2	8.4	3	0.285	
	pH (Field)	pH	6.5-8.5	3	-	100%	8.1	8.0	0.173205	7.8	8.1	4	-	100%	8.4	8.3	0.28	7.9	8.6	4	0.338	
	Temperature (Field)	Celsius	-	4	-	100%	9.8	11	6.5	6.2	20	4	-	100%	9.0	9.9	7.6	2.3	19	-15	0.081	
	Chemical Oxygen Demand	mg/L	-	1	1	100%	3.0	3.0	-	3.0	3.0	4	4	75%	6.4	3.4	6.9	-7.000	7.6	11	-	
	Total Organic Carbon	mg/L	-	4	0.2	100%	2.2	2.7	0.967815	2.1	4.1	0			-	-	-	-	-		-	
	Total Dissolved Solids	mg/L	-	4	2	100%	177	177	9.0	167	188	0			-	-	-	-	-		-	
	Total Suspended Solids	mg/L	-	4	2	25%	1.3	1.5	0.727255	1.0	2.5	4	1 - 10	50%	2.0	2.6	2.5	0.20	6.0	49.7	0.425	
	Turbidity	NTU	-	4	0.1	100%	0.87	0.99	0.70	0.29	1.94	4	0.1	100%	0.65	1.2	1.3	0.30	3.2	19	0.008	
Nutrients	Ammonia	mg/L	1.54	4	0.01	75%	0.01	0.01	0.008	0.005	0.02	4	0.01 - 1	50%	0.07	0.07	0.07	0.008	0.16	139	0.809	
	Unionized Ammonia8	mg/L	0.019	4	0.001	0%	0.000	0.000	0.000	0.000	0.001	4	0.00051 - 0.044	50%	0.002	0.002	0.003	0.000	0.005	139	0.037	e
	Nitrate	mg/L	13	4	0.01	100%	1.8	9.4	15.54782	1.3	32.726	4	0.1	100%	0.35	0.34	0.13	0.19	0.47	-186	0.000	
	Nitrite	mg/L	0.06	4	0.01	25%	0.005	0.008	0.007	0.005	0.02	4	0.01	25%	0.004	0.006	0.005	0.002	0.01	-32	0.631	
	Phosphorus	mg/L	0.02	4	0.002 / 0.01	100%	0.007	0.01	0.02	0.004	0.04	4	0.02 - 2.51	25%	0.008	0.01	0.008	0.008	0.03	-12	0.001	
	Total Kjeldahl Nitrogen	mg/L	-	4	0.06 / 0.5	0%	0.50	0.52	0.04	0.50	0.58	4	0.1	100%	0.18	0.18	0.03	0.14	0.22	-98	0.976	e
Metals	Aluminum	µg/L	100	4	0.1	100%	18	20	4.3	17	26	4	0.5 - 5	100%	1.9	6.1	8.7	1.3	19	-106	0.001	
	Aluminum (filtered)	µg/L	75	4	0.1	100%	4.8	6.8	4.7	3.6	13.8	4	5	0%	2.7	2.8	0.57	2.3	3.5	-84	0.000	f
	Antimony	µg/L	6	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.02 - 0.5	75%	0.15	0.14	0.02	0.12	0.15	-113	0.974	e
	Arsenic	µg/L	5	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.02 - 1	100%	0.76	0.75	0.03	0.71	0.77	40	0.000	e
	Barium	µg/L	1000	4	1	100%	25	23	2.8	19	25	4	0.02 - 2	100%	23	23	1.9	21	25	-2	0.004	
	Beryllium	µg/L	1100	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.01 - 0.5	0%	-0.001	0.000	0.001	-0.001	0.001	-200	0.000	e,f
	Bismuth	µg/L	-	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.005 - 1	0%	0.000	0.000	0.000	0.000	0.001	-200	0.974	e,f
	Boron	µg/L	200	4	0.1	100%	31	32	4.4	28	38	4	10 - 50	75%	23	23	2.6	20	26	-33	0.000	
	Cadmium	µg/L	0.17	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.005 - 0.1	0%	0.003	0.003	0.002	0.001	0.004	-178	0.000	e,f
	Calcium	µg/L	-	4	0.1	100%	35620	35555	2359	33100	37880	4	0.05 - 250	100%	35000	35525	1969	33900	38200	0	0.137	
	Cesium	µg/L	-	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.05 - 0.2	0%	0.002	0.002	0.001	0.001	0.003	-186	0.224	e,f
	Chromium	µg/L	8.9	4	0.1	50%	0.50	0.59	0.64	0.05	1.30	4	0.1 - 5	0%	0.06	-0.048	0.22	-0.383	0.07	-236	0.003	f
	Chromium (III)	µg/L	8.9	1	0.1	0%	0.05	0.05	-	0.05	0.05	4	0.5 - 5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Chromium(VI)	µg/L	1	1	5	0%	2.5	2.5	-	2.5	2.5	4	0.5	0%	0.25	0.26	0.06	0.21	0.33	-162	-	e,f
	Cobalt	µg/L	0.9	4	0.1	25%	0.09	0.51	0.86	0.05	1.80	4	0.005 - 0.5	75%	0.01	0.009	0.006	0.001	0.01	-193	0.848	
	Copper	µg/L	2.57	4	0.1	100%	1.1	1.2	0.525864	0.78	2.0	4	0.05 - 1	100%	0.63	0.64	0.03	0.61	0.68	-62	0.048	
	Iron	µg/L	300	4	1	100%	24	23	7.6	15	30	4	1 - 100	75%	1.5	5.2	7.9	0.91	17	-126	0.000	
	Lead	µg/L	3.59	4	0.1	50%	0.11	0.13	0.06	0.08	0.21	4	0.005 - 0.5	50%	0.006	0.01	0.01	0.003	0.03	-169	0.979	
	Lithium	µg/L	-	4	0.1	100%	2.8	3.0	0.392046	2.6	3.5	4	0.5 - 5	100%	2.2	2.2	0.41	1.8	2.6	-29	0.873	
	Magnesium	µg/L	-	4	0.1	100%	9980	9620	998	8180	10340	4	0.05 - 250	100%	8720	8755	601	8180	9400	-9	0.004	
	Manganese	µg/L	120	4	0.1	100%	1.3	1.5	0.828654	0.7	2.6	4	0.05 - 2	100%	0.53	0.68	0.52	0.25	1.4	-74	0.000	
	Mercury (filtered)	µg/L	0.026	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.01	0%	0.001	0.001	0.001	0.000	0.002	-193	0.951	e,f
	Molybdenum	µg/L	40	4	0.1	100%	1.4	1.4	0.025166	1.3	1.4	4	0.05 - 1	100%	1.2	1.2	0.05	1.1	1.2	-13	0.000	
	Nickel	µg/L	25	4	0.1	100%	0.78	0.75	0.13	0.56	0.86	4	0.02 - 1	75%	0.48	0.30	0.37	-0.249	0.51	-84	0.979	
	Potassium	µg/L	-	4	0.1	100%	1800	1765	239	1460	2000	4	0.05 - 1000	100%	1660	1683	98	1590	1820	-5	0.009	
	Selenium	µg/L	1	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.04 - 2	100%	0.14	0.14	0.02	0.12	0.16	-113	0.000	e
	Silver	µg/L	0.1	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.005 - 0.1	0%	0.000	-0.001	0.002	-0.003	0.001	-205	0.974	e,f
	Sodium	µg/L	-	4	0.1	100%	15700	15105	1894	12360	16660	4	0.05 - 250	100%	16100	16850	3272	13800	21400	11	0.167	
	Strontium	µg/L	7000	4	0.1	100%	199	195	17	172	208	4	0.05 - 1	100%	198	202	19	184	227	4	0.021	
	Thallium	µg/L	0.3	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.002 - 0.05	75%	0.005	0.006	0.001	0.004	0.007	-160	0.000	e
	Thorium	µg/L	-	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.005 - 1	25%	0.001	0.001	0.003	-0.001	0.005	-189	0.000	e
	Tin	µg/L	-	4	0.1	0%	0.06	0.06	0.006	0.05	0.06	4	0.2 - 5	0%	0.003	0.01	0.02	-0.001	0.04	-133	0.029	e,f
	Titanium	µg/L	-	4	0.1	100%	1.9	2.0	0.725052	1.2	3.0	4	0.5 - 5	0%	0.13	0.16	0.28	-0.117	0.51	-170	0.000	f
	Tungsten	µg/L	30	4	0.1	25%	0.06	0.07	0.02	0.05	0.10	4	0.01 - 1	75%	0.10	0.09	0.009	0.08	0.10	32	0.004	
	Uranium	µg/L	5	4	0.1	100%	0.40	0.38	0.05	0.30	0.40	4	0.002 - 0.1	100%	0.36	0.37	0.01	0.36	0.39	-2	0.000	
	Vanadium	µg/L	6	4	0.1	50%	0.32	0.34	0.33	0.05	0.66	4	0.2 - 5	25%	0.17	0.16	0.07	0.06	0.22	-73	0.892	
	Zinc	µg/L	7	4	0.1	100%	2.4	2.9	1.8	1.5	5.4	4	0.1 - 5	75%	0.51	0.56	0.22	0.36	0.85	-136	0.000	
	Zirconium	µg/L	4	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.1 - 1	0%	0.007	0.005	0.007	-0.005	0.01	-162	0.000	e,f
Hydrocarbons	Petro Hydrocarbons C6-10	µg/L	167	4	100	0%	50	50	0.000	50	50	4	25	0%	0.000	0.000	0.000	0.000	0.000	-200	0.000	e,f
	Petro Hydrocarbons C10-16	µg/L	42	4	100	0%	50	50	0.000	50	50	4	100	0%	0.000	0.000	0.000	0.000	0.000	-200	0.423	e,f
	Petro Hydrocarbons C16-34	µg/L	-	4	100	0%	50	50	0.000	50	50	4	200	0%	53	57	34	19	101	12	0.423	e,f
	Petro Hydrocarbons C34-50	µg/L	-	4	100	0%	50	50	0.000	50	50	4	200	0%	0.000	0.000	0.000	0.000	0.000	-200	0.000	e,f
	Benzene	µg/L	5	1	0.1	0%	0.05	0.05	-	0.05	0.05	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Ethylbenzene	µg/L	8	1	0.1	0%	0.05	0.05	-	0.05	0.05	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	m/p-Xylene	µg/L	2	1	0.1	0%	0.05	0.05	-	0.05	0.05	0			-	-	-	-	-		-	e
	o-Xylene	µg/L	40	1	0.1	0%	0.05	0.05	-	0.05	0.05	0			-	-	-	-	-		-	e
	Toluene	µg/L	2	1	0.1	0%	0.05	0.05	-	0.05	0.05	0			-	-	-	-	-		-	e
THMs	Total Residual Chlorine[h]	mg/L	0.0005	2	0.002	0%	0.001	0.001	0.000	0.001	0.001	4	0.0012	0%	0.001	0.005	0.007	0.001	0.02	129	-	e,f
	Bromodichloromethane	µg/L	200	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Bromoform	µg/L	60	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.2 - 1	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Chloroform	µg/L	1.8	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Dibromochloromethane	µg/L	-	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	0			-	-	-	-	-		-	e
Bacteria	E. Coli	a	-	4	1	25%	1	278	556	1	1112	4	10		10.0	7.5	5.0	0.000	10.0	-190	0.967	
	E. Coli 5 sample geo-mean	a	100	4	1	25%	1	228	454	1	908	0			-	-	-	-	-		-	
	Total Coliforms	a	100	4	1	100%	220	539	809	1.3	1714	4	10	100%	35	28	19	0.000	40	-181	0.004	
Other	Hydrazine	µg/L	2.6	4	5	25%	2.5	8.1	11.25	2.5	25	4	0.1	25%	0.10	0.10	0.000	0.10	0.10	-195	0.000	
	Morpholine	µg/L	4	4	1	0%	0.50	0.58	0.15	0.50	0.80	4	4	0%	0.000	0.000	0.000	0.000	0.000	-200	0.001	e,f
	PCB in Water	µg/L	0.001	4	0.05	0%	0.03	0.03	0.000	0.03	0.03	0			-	-	-	-	-		-	e

###	Exceeds criteria.
###	RPD less than -20 (decrease). P-value for decrease statistically significant.
###	RPD greater than 20 (increase). P-value for increase statistically significant.

Notes:

a - 2007/2008 units were based on MPN/100 mL. 2019 units were based on CFU/100mL.

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c - 2019 data is uncensored. Therefore some parameters may have values below the MDL.

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Table D-4: Assessment of Change in Baseline Non-Radionuclide Surface Water Data from 2007/2008 to 2019

	Parameter	Units	Criteria[g]	2007/2008 Sampling Program [b] SW10 (bottom)								2019 Sampling Program[c] SW10 (bottom)								Assessment of Change		
				N_{means}	MDL	% above MDL	Median	Grand Mean	Std Dev	Min	Max	N	MDL	% above MDL	Median	Mean	Std Dev	Min	Max	RPD (means)	Mann–Whitney U test (p-value)	Note[d]
General Chemistry	Alkalinity	mg/L	-	4	5	100%	93	93	1.1	92	94	4	1	100%	95	95	1.5	93	96	2	0.045	
	Bicarbonate	ppm CaCO3	-	4	5	100%	93	93	1.1	92	94	0			-	-	-	-	-		-	
	Carbonate	ppm CaCO3	-	4	5	0%	2.5	2.5	0.000	2.5	2.5	0			-	-	-	-	-		-	e
	Hydroxide	ppm CaCO3	-	4	5	0%	2.5	2.5	0.000	2.5	2.5	0			-	-	-	-	-		-	e
	Total Hardness	mg/L	-	4	1	100%	132	129	11	114	139	4	0.5 - 1	100%	121	121	2.6	119	124	-6	0.272	
	Conductivity	umho/cm	-	4	1	100%	300	300	1.9	299	303	4	1	100%	315	315	13	300	330	5	0.015	
	Dissolved Oxygen (Field)	mg/L	-	2	-	100%	10.0	10.0	0.777817	9.4	10.5	4	-	100%	13	15	4.1	12	21	38	-	
	pH	pH	6.5-8.5	4	-	100%	8.1	8.1	0.228838	7.8	8.4	4	-	100%	8.2	8.2	0.03	8.2	8.2	1	0.383	
	pH (Field)	pH	6.5-8.5	4	-	100%	8.2	8.2	0.377492	7.8	8.7	4	-	100%	8.3	8.0	0.72	6.9	8.4	-3	0.924	
	Temperature (Field)	Celsius	-	4	-	100%	11	12	5.6	7.0	18	4	-	100%	5.5	7.0	5.0	2.7	14	-52	0.046	
	Chemical Oxygen Demand	mg/L	-	1	1	100%	3.4	3.4	-	3.4	3.4	4	4	75%	6.5	6.1	3.7	1.2	10.0	56	-	
	Total Organic Carbon	mg/L	-	4	0.2	100%	2.3	2.3	0.122746	2.2	2.5	0			-	-	-	-	-		-	
	Total Dissolved Solids	mg/L	-	4	2	100%	175	177	9.1	170	190	0			-	-	-	-	-		-	
	Total Suspended Solids	mg/L	-	4	2	50%	2.1	2.6	1.8	1.0	5.2	4	1 - 10	25%	1.4	1.8	1.6	0.40	4.0	-36.5	0.417	
	Turbidity	NTU	-	4	0.1	100%	0.87	0.93	0.27	0.66	1.30	4	0.1	50%	0.06	0.13	0.18	0.01	0.40	-151	0.004	
Nutrients	Ammonia	mg/L	1.54	4	0.01	75%	0.02	0.02	0.01	0.008	0.04	4	0.01 - 1	75%	0.06	0.07	0.06	0.01	0.13	100	0.095	
	Unionized Ammonia8	mg/L	0.019	4	0.001	25%	0.001	0.001	0.001	0.000	0.003	4	0.00051 - 0.044	50%	0.001	0.001	0.001	0.000	0.002	-6	0.413	
	Nitrate	mg/L	13	4	0.01	100%	1.7	1.7	0.290191	1.4	2.0	4	0.1	100%	0.32	0.33	0.07	0.26	0.41	-136	0.002	
	Nitrite	mg/L	0.06	4	0.01	0%	0.005	0.006	0.002	0.005	0.009	4	0.01	0%	0.003	0.003	0.002	0.000	0.005	-72	0.001	e,f
	Phosphorus	mg/L	0.02	4	0.002 / 0.01	100%	0.007	0.01	0.02	0.004	0.04	4	0.02 - 2.51	0%	0.004	0.005	0.005	0.001	0.01	-93	0.485	f
	Total Kjeldahl Nitrogen	mg/L	-	4	0.06 / 0.5	0%	0.50	0.50	0.000	0.50	0.50	4	0.1	75%	0.16	0.19	0.12	0.08	0.36	-90	0.000	e
Metals	Aluminum	µg/L	100	4	0.1	100%	18	37	44	8.8	101	4	0.5 - 5	100%	0.91	3.2	4.8	0.64	10	-168	0.013	
	Aluminum (filtered)	µg/L	75	4	0.1	100%	4.7	6.0	3.4	3.6	10.8	4	5	0%	1.8	2.1	1.0	1.2	3.5	-97	0.004	f
	Antimony	µg/L	6	4	1	0%	0.50	0.58	0.15	0.50	0.80	4	0.02 - 0.5	75%	0.14	0.14	0.01	0.12	0.14	-124	0.000	e
	Arsenic	µg/L	5	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.02 - 1	100%	0.78	0.78	0.03	0.76	0.82	44	0.000	e
	Barium	µg/L	1000	4	1	100%	24	23	2.3	20	24	4	0.02 - 2	100%	22	22	1.1	21	24	-3	0.011	
	Beryllium	µg/L	1100	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.01 - 0.5	0%	0.000	0.001	0.002	-0.001	0.004	-199	0.000	e,f
	Bismuth	µg/L	-	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.005 - 1	0%	0.000	0.000	0.000	0.000	0.001	-200	0.000	e,f
	Boron	µg/L	200	4	0.1	100%	34	34	10	22	44	4	10 - 50	75%	22	22	2.2	19	24	-43	0.055	
	Cadmium	µg/L	0.17	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.005 - 0.1	0%	0.004	0.004	0.000	0.004	0.004	-171	0.000	e,f
	Calcium	µg/L	-	4	0.1	100%	36060	35620	2912	32280	38080	4	0.05 - 250	100%	34300	34425	780	33700	35400	-3	0.968	
	Cesium	µg/L	-	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.05 - 0.2	0%	0.002	0.002	0.002	-0.001	0.003	-186	0.000	e,f
	Chromium	µg/L	8.9	4	0.1	50%	0.43	0.48	0.50	0.05	1.02	4	0.1 - 5	0%	0.06	-0.058	0.26	-0.453	0.09	-255	0.172	f
	Chromium (III)	µg/L	8.9	1	0.1	0%	0.05	0.05	-	0.05	0.05	4	0.5 - 5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Chromium(VI)	µg/L	1	1	5	0%	2.5	2.5	-	2.5	2.5	4	0.5	0%	0.22	0.22	0.03	0.19	0.25	-168	-	e,f
	Cobalt	µg/L	0.9	4	0.1	25%	0.09	0.53	0.91	0.05	1.90	4	0.005 - 0.5	75%	0.009	0.005	0.007	-0.006	0.010	-196	0.001	
	Copper	µg/L	2.57	4	0.1	100%	1.1	1.0	0.167631	0.8	1.2	4	0.05 - 1	100%	0.62	0.65	0.08	0.61	0.77	-44	0.002	
	Iron	µg/L	300	4	1	100%	23	32	30	7.6	76	4	1 - 100	25%	0.72	3.4	5.7	0.25	12	-162	0.010	
	Lead	µg/L	3.59	4	0.1	25%	0.07	0.08	0.03	0.05	0.12	4	0.005 - 0.5	25%	0.01	0.01	0.009	0.003	0.02	-149	0.000	
	Lithium	µg/L	-	4	0.1	100%	2.9	3.0	0.474131	2.6	3.7	4	0.5 - 5	100%	2.0	2.0	0.24	1.7	2.3	-40	0.002	
	Magnesium	µg/L	-	4	0.1	100%	10020	9690	1151	8080	10640	4	0.05 - 250	100%	8585	8570	216	8350	8760	-12	0.273	
	Manganese	µg/L	120	4	0.1	100%	1.5	1.5	0.715821	0.7	2.3	4	0.05 - 2	75%	0.42	0.47	0.21	0.28	0.76	-104	0.008	
	Mercury (filtered)	µg/L	0.026	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.01	0%	0.000	0.000	0.001	-0.001	0.002	-196	0.003	e,f
	Molybdenum	µg/L	40	4	0.1	100%	1.4	1.4	0.02582	1.3	1.4	4	0.05 - 1	100%	1.1	1.1	0.04	1.1	1.2	-18	0.001	
	Nickel	µg/L	25	4	0.1	100%	0.70	0.69	0.07	0.60	0.74	4	0.02 - 1	75%	0.48	0.29	0.40	-0.307	0.51	-82	0.002	
	Potassium	µg/L	-	4	0.1	100%	1820	1740	203	1440	1880	4	0.05 - 1000	100%	1615	1603	67	1510	1670	-8	0.266	
	Selenium	µg/L	1	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.04 - 2	100%	0.14	0.14	0.008	0.13	0.15	-112	0.000	e
	Silver	µg/L	0.1	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.005 - 0.1	0%	0.000	0.000	0.001	-0.002	0.001	-203	0.000	e,f
	Sodium	µg/L	-	4	0.1	100%	15950	15360	2333	12160	17380	4	0.05 - 250	100%	14600	14900	1364	13700	16700	-3	0.935	
	Strontium	µg/L	7000	4	0.1	100%	195	194	11	180	206	4	0.05 - 1	100%	181	186	15	174	206	-4	0.072	
	Thallium	µg/L	0.3	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.002 - 0.05	75%	0.005	0.005	0.001	0.005	0.007	-161	0.000	e
	Thorium	µg/L	-	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.005 - 1	0%	-0.001	0.000	0.003	-0.003	0.003	-201	0.000	e,f
	Tin	µg/L	-	4	0.1	0%	0.06	0.06	0.010	0.05	0.07	4	0.2 - 5	0%	0.001	0.005	0.01	-0.005	0.02	-167	0.001	e,f
	Titanium	µg/L	-	4	0.1	100%	1.6	2.4	1.9	1.2	5.1	4	0.5 - 5	0%	-0.086	0.004	0.25	-0.183	0.37	-199	0.002	f
	Tungsten	µg/L	30	4	0.1	25%	0.07	0.07	0.03	0.05	0.10	4	0.01 - 1	75%	0.10	0.10	0.005	0.09	0.10	28	0.573	
	Uranium	µg/L	5	4	0.1	100%	0.40	0.38	0.05	0.30	0.40	4	0.002 - 0.1	100%	0.35	0.35	0.01	0.34	0.37	-6	0.000	
	Vanadium	µg/L	6	4	0.1	50%	0.30	0.33	0.33	0.05	0.68	4	0.2 - 5	0%	0.17	0.14	0.08	0.03	0.20	-79	0.173	f
	Zinc	µg/L	7	4	0.1	100%	1.8	2.2	1.1	1.3	3.8	4	0.1 - 5	75%	0.46	0.47	0.27	0.17	0.79	-129	0.003	
	Zirconium	µg/L	4	4	0.1	25%	0.05	0.07	0.03	0.05	0.11	4	0.1 - 1	0%	0.006	0.005	0.006	-0.002	0.01	-171	0.000	f
Hydrocarbons	Petro Hydrocarbons C6-10	µg/L	167	4	100	0%	50	50	0.000	50	50	4	25	0%	0.000	0.000	0.000	0.000	0.000	-200	0.002	e,f
	Petro Hydrocarbons C10-16	µg/L	42	4	100	0%	50	50	0.000	50	50	4	100	0%	0.000	0.000	0.000	0.000	0.000	-200	0.002	e,f
	Petro Hydrocarbons C16-34	µg/L	-	4	100	0%	50	50	0.000	50	50	4	200	0%	48	47	11	33	60	-6	0.155	e,f
	Petro Hydrocarbons C34-50	µg/L	-	4	100	0%	50	50	0.000	50	50	4	200	0%	0.000	0.000	0.000	0.000	0.000	-200	0.002	e,f
	Benzene	µg/L	5	1	0.1	0%	0.05	0.05	-	0.05	0.05	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Ethylbenzene	µg/L	8	1	0.1	0%	0.05	0.05	-	0.05	0.05	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	m/p-Xylene	µg/L	2	1	0.1	0%	0.05	0.05	-	0.05	0.05	0			-	-	-	-	-		-	e
	o-Xylene	µg/L	40	1	0.1	0%	0.05	0.05	-	0.05	0.05	0			-	-	-	-	-		-	e
	Toluene	µg/L	2	1	0.1	0%	0.05	0.05	-	0.05	0.05	0			-	-	-	-	-		-	e
THMs	Total Residual Chlorine[h]	mg/L	0.0005	3	0.002	0%	0.001	0.001	0.000	0.001	0.001	4	0.0012	25%	0.001	0.006	0.009	0.001	0.02	140	0.009	e
	Bromodichloromethane	µg/L	200	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Bromoform	µg/L	60	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.2 - 1	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Chloroform	µg/L	1.8	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Dibromochloromethane	µg/L	-	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	0			-	-	-	-	-		-	e
Bacteria	E. Coli	a	-	4	1	75%	2.8	8.8	13.55938	0.5	29	4	10		10.0	7.5	5.0	0.000	10.0	-15	0.967	
	E. Coli 5 sample geo-mean	a	100	3	1	100%	3.0	11	15	2.0	28	0			-	-	-	-	-		-	
	Total Coliforms	a	100	4	1	100%	278	429	543	2.6	1156	4	10	50%	10.0	10.0	8.2	0.000	20	-191	0.112	
Other	Hydrazine	µg/L	2.6	3	5	0%	2.5	2.5	0.000	2.5	2.5	4	0.1	0%	0.10	0.10	0.000	0.10	0.10	-185	0.007	e,f
	Morpholine	µg/L	4	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	4	0%	0.000	0.000	0.000	0.000	0.000	-200	0.000	e,f
	PCB in Water	µg/L	0.001	4	0.05	0%	0.03	0.03	0.000	0.03	0.03	0			-	-	-	-	-		-	e

###	Exceeds criteria.
###	RPD less than -20 (decrease). P-value for decrease statistically significant.
###	RPD greater than 20 (increase). P-value for increase statistically significant.

Notes:

a - 2007/2008 units were based on MPN/100 mL. 2019 units were based on CFU/100mL.

b -summary stats based on seasonal means (N_{means} = 4 for most parameters), each with five replicate samples.

c - 2019 data is uncensored. Therefore some parameters may have values below the MDL.

d - Parameters with both 'd' and 'e' notes indicate that 100% of samples in both 2008 and 2019 were below detection. Therefore assessment of change is not possible.

e - The 2009 ERA TSD set all samples to 1/2 MDL if all measurements were <MDL. Therefore, RPD and p-value calculations are based on all 2008 measurements being 1/2MDL if all measurements were <MDL.

f - All 2019 samples were below the MDL. Results are based on un-detected uncensored data.

g - The minimum total hardness in 2019 was 110 mg/L, so this was used as a conservative value in calculation of hardness dependent guidelines for cadmium, copper, lead and nickel.

h -Total residual chlorine exceedances in 2019 were attributed to a QAQC issue.

Table D-4: Assessment of Change in Baseline Non-Radionuclide Surface Water Data from 2007/2008 to 2019

	Parameter	Units	Criteria[g]	2007/2008 Sampling Program [b] SW11 (bottom)								2019 Sampling Program[c] SW11 (bottom)								Assessment of Change		
				N_{means}	MDL	% above MDL	Median	Grand Mean	Std Dev	Min	Max	N	MDL	% above MDL	Median	Mean	Std Dev	Min	Max	RPD (means)	Mann–Whitney U test (p-value)	Note[d]
General Chemistry	Alkalinity	mg/L	-	4	5	100%	92	92	1.7	90	93	4	1	100%	95	95	1.3	93	96	3	0.013	
	Bicarbonate	ppm CaCO3	-	4	5	100%	92	92	1.7	90	93	0			-	-	-	-	-		-	
	Carbonate	ppm CaCO3	-	4	5	0%	2.5	2.5	0.000	2.5	2.5	0			-	-	-	-	-		-	e
	Hydroxide	ppm CaCO3	-	4	5	0%	2.5	2.5	0.000	2.5	2.5	0			-	-	-	-	-		-	e
	Total Hardness	mg/L	-	4	1	100%	131	129	12	114	141	4	0.5 - 1	100%	120	120	4.8	114	125	-8	0.309	
	Conductivity	umho/cm	-	4	1	100%	299	300	6.2	293	308	4	1	100%	315	315	13	300	330	5	0.006	
	Dissolved Oxygen (Field)	mg/L	-	2	-	100%	9.6	9.6	0.353553	9.3	9.8	4	-	100%	13	13	3.6	10	18	33	-	
	pH	pH	6.5-8.5	4	-	100%	8.2	8.2	0.286822	7.8	8.5	4	-	100%	8.2	8.3	0.10	8.2	8.4	1	0.535	
	pH (Field)	pH	6.5-8.5	4	-	100%	8.4	8.3	0.374166	7.8	8.7	4	-	100%	8.4	8.4	0.15	8.3	8.6	2	0.924	
	Temperature (Field)	Celsius	-	4	-	100%	12	12	7.5	5.8	20	4	-	100%	6.8	9.6	8.3	3.2	21	-25	0.505	
	Chemical Oxygen Demand	mg/L	-	1	1	100%	2.5	2.5	-	2.5	2.5	4	4	50%	4.8	4.7	2.0	2.4	6.8	61	-	
	Total Organic Carbon	mg/L	-	4	0.2	100%	2.3	2.3	0.135154	2.2	2.5	0			-	-	-	-	-		-	
	Total Dissolved Solids	mg/L	-	4	2	100%	182	183	3.4	180	188	0			-	-	-	-	-		-	
	Total Suspended Solids	mg/L	-	4	2	75%	4.4	4.3	2.4	2.0	6.5	4	1 - 10	25%	1.5	2.0	2.2	0.000	5.0	-73.0	0.201	
	Turbidity	NTU	-	4	0.1	100%	0.63	0.70	0.40	0.29	1.24	4	0.1	100%	0.20	0.28	0.22	0.10	0.60	-87	0.039	
Nutrients	Ammonia	mg/L	1.54	4	0.01	75%	0.02	0.02	0.01	0.007	0.04	4	0.01 - 1	50%	0.04	0.05	0.06	0.008	0.13	95	0.202	
	Unionized Ammonia8	mg/L	0.019	4	0.001	25%	0.001	0.001	0.001	0.000	0.002	4	0.00051 - 0.044	50%	0.002	0.005	0.007	0.000	0.01	140	0.967	
	Nitrate	mg/L	13	4	0.01	100%	1.7	1.7	0.3715	1.3	2.0	4	0.1	100%	0.34	0.31	0.11	0.16	0.40	-137	0.002	
	Nitrite	mg/L	0.06	4	0.01	0%	0.005	0.006	0.003	0.005	0.01	4	0.01	0%	0.001	0.001	0.003	-0.003	0.004	-166	0.001	e,f
	Phosphorus	mg/L	0.02	4	0.002 / 0.01	100%	0.007	0.02	0.02	0.004	0.04	4	0.02 - 2.51	0%	0.004	0.003	0.003	0.000	0.006	-131	0.022	f
	Total Kjeldahl Nitrogen	mg/L	-	4	0.06 / 0.5	0%	0.50	0.50	0.000	0.50	0.50	4	0.1	100%	0.18	0.17	0.06	0.10	0.23	-99	0.000	e
Metals	Aluminum	µg/L	100	4	0.1	100%	13	38	53	6.4	118	4	0.5 - 5	75%	1.3	1.4	0.79	0.67	2.4	-186	0.002	
	Aluminum (filtered)	µg/L	75	4	0.1	100%	5.2	6.2	3.7	3.0	11.2	4	5	0%	2.1	2.2	0.59	1.5	3.0	-95	0.002	f
	Antimony	µg/L	6	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.02 - 0.5	75%	0.13	0.13	0.03	0.09	0.15	-120	0.000	e
	Arsenic	µg/L	5	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.02 - 1	100%	0.80	0.80	0.01	0.78	0.81	46	0.000	e
	Barium	µg/L	1000	4	1	100%	24	23	2.1	21	26	4	0.02 - 2	100%	22	22	0.86	22	23	-5	0.016	
	Beryllium	µg/L	1100	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.01 - 0.5	0%	-0.001	-0.001	0.002	-0.003	0.001	-201	0.000	e,f
	Bismuth	µg/L	-	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.005 - 1	0%	0.000	0.000	0.000	0.000	0.001	-200	0.000	e,f
	Boron	µg/L	200	4	0.1	100%	34	33	8.2	24	40	4	10 - 50	75%	22	22	1.8	20	24	-40	0.039	
	Cadmium	µg/L	0.17	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.005 - 0.1	0%	0.003	0.003	0.000	0.002	0.003	-179	0.000	e,f
	Calcium	µg/L	-	4	0.1	100%	35640	35520	3367	32340	38460	4	0.05 - 250	100%	33900	33975	1436	32400	35700	-4	0.968	
	Cesium	µg/L	-	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.05 - 0.2	0%	0.003	0.002	0.002	-0.001	0.003	-186	0.000	e,f
	Chromium	µg/L	8.9	4	0.1	50%	0.51	0.52	0.54	0.05	1.00	4	0.1 - 5	0%	0.05	-0.070	0.26	-0.457	0.07	-263	0.050	f
	Chromium (III)	µg/L	8.9	1	0.1	0%	0.05	0.05	-	0.05	0.05	4	0.5 - 5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Chromium(VI)	µg/L	1	1	5	0%	2.5	2.5	-	2.5	2.5	4	0.5	0%	0.23	0.23	0.03	0.20	0.27	-166	-	e,f
	Cobalt	µg/L	0.9	4	0.1	25%	0.08	0.55	0.96	0.05	1.98	4	0.005 - 0.5	75%	0.010	0.005	0.01	-0.011	0.01	-196	0.001	
	Copper	µg/L	2.57	4	0.1	100%	0.99	0.98	0.07	0.88	1.04	4	0.05 - 1	100%	0.60	0.60	0.03	0.58	0.63	-47	0.001	
	Iron	µg/L	300	4	1	100%	13	28	33	8.0	78	4	1 - 100	25%	0.74	0.57	0.83	-0.585	1.4	-192	0.002	
	Lead	µg/L	3.59	4	0.1	25%	0.07	0.08	0.03	0.05	0.11	4	0.005 - 0.5	25%	0.006	0.006	0.002	0.003	0.009	-171	0.001	
	Lithium	µg/L	-	4	0.1	100%	2.9	3.0	0.493254	2.5	3.7	4	0.5 - 5	75%	1.9	2.0	0.22	1.7	2.2	-43	0.002	
	Magnesium	µg/L	-	4	0.1	100%	10180	9825	1178	8120	10820	4	0.05 - 250	100%	8510	8460	245	8130	8690	-15	0.180	
	Manganese	µg/L	120	4	0.1	100%	0.9	1.2	0.81525	0.44	2.3	4	0.05 - 2	75%	0.32	0.32	0.06	0.27	0.39	-112	0.004	
	Mercury (filtered)	µg/L	0.026	3	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.01	0%	0.000	0.001	0.001	0.000	0.002	-195	0.011	e,f
	Molybdenum	µg/L	40	4	0.1	100%	1.4	1.4	0.05	1.3	1.4	4	0.05 - 1	100%	1.2	1.2	0.03	1.2	1.2	-14	0.002	
	Nickel	µg/L	25	4	0.1	100%	0.66	0.66	0.04	0.60	0.70	4	0.02 - 1	75%	0.47	0.32	0.31	-0.148	0.50	-68	0.001	
	Potassium	µg/L	-	4	0.1	100%	1860	1780	205	1480	1920	4	0.05 - 1000	100%	1630	1630	37	1590	1670	-9	0.268	
	Selenium	µg/L	1	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.04 - 2	100%	0.14	0.14	0.006	0.14	0.15	-112	0.000	e
	Silver	µg/L	0.1	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.005 - 0.1	0%	0.000	-0.001	0.002	-0.003	0.001	-204	0.000	e,f
	Sodium	µg/L	-	4	0.1	100%	15990	15565	2579	12100	18180	4	0.05 - 250	100%	14750	14700	812	13900	15400	-6	0.654	
	Strontium	µg/L	7000	4	0.1	100%	196	195	11	180	206	4	0.05 - 1	100%	186	187	17	170	206	-4	0.166	
	Thallium	µg/L	0.3	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.002 - 0.05	75%	0.005	0.005	0.001	0.004	0.007	-162	0.000	e
	Thorium	µg/L	-	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.005 - 1	0%	-0.001	0.000	0.003	-0.002	0.004	-199	0.000	e,f
	Tin	µg/L	-	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.2 - 5	0%	0.005	0.01	0.02	-0.006	0.04	-126	0.000	e,f
	Titanium	µg/L	-	4	0.1	100%	1.1	2.1	2.1	1.0	5.2	4	0.5 - 5	25%	-0.012	0.08	0.36	-0.239	0.60	-185	0.002	
	Tungsten	µg/L	30	4	0.1	25%	0.05	0.07	0.05	0.05	0.14	4	0.01 - 1	75%	0.10	0.10	0.004	0.09	0.10	29	0.116	
	Uranium	µg/L	5	4	0.1	100%	0.40	0.38	0.05	0.30	0.40	4	0.002 - 0.1	100%	0.36	0.36	0.02	0.34	0.38	-4	0.000	
	Vanadium	µg/L	6	4	0.1	50%	0.30	0.32	0.31	0.05	0.62	4	0.2 - 5	25%	0.12	-0.049	0.42	-0.675	0.23	-274	0.095	
	Zinc	µg/L	7	4	0.1	100%	1.7	1.9	0.539135	1.5	2.7	4	0.1 - 5	75%	0.62	0.62	0.24	0.33	0.92	-102	0.021	
	Zirconium	µg/L	4	4	0.1	50%	0.10	0.10	0.04	0.06	0.14	4	0.1 - 1	0%	0.005	0.008	0.008	0.002	0.02	-171	0.001	f
Hydrocarbons	Petro Hydrocarbons C6-10	µg/L	167	4	100	0%	50	50	0.000	50	50	4	25	0%	0.000	0.000	0.000	0.000	0.000	-200	0.002	e,f
	Petro Hydrocarbons C10-16	µg/L	42	4	100	0%	50	50	0.000	50	50	4	100	0%	0.000	0.000	0.000	0.000	0.000	-200	0.002	e,f
	Petro Hydrocarbons C16-34	µg/L	-	4	100	0%	50	50	0.000	50	50	4	200	0%	75	74	22	47	99	38	0.155	e,f
	Petro Hydrocarbons C34-50	µg/L	-	4	100	0%	50	50	0.000	50	50	4	200	0%	0.000	0.000	0.000	0.000	0.000	-200	0.002	e,f
	Benzene	µg/L	5	1	0.1	0%	0.05	0.05	-	0.05	0.05	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Ethylbenzene	µg/L	8	1	0.1	0%	0.05	0.05	-	0.05	0.05	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	m/p-Xylene	µg/L	2	1	0.1	0%	0.05	0.05	-	0.05	0.05	0			-	-	-	-	-		-	e
	o-Xylene	µg/L	40	1	0.1	0%	0.05	0.05	-	0.05	0.05	0			-	-	-	-	-		-	e
	Toluene	µg/L	2	1	0.1	0%	0.05	0.05	-	0.05	0.05	0			-	-	-	-	-		-	e
THMs	Total Residual Chlorine[h]	mg/L	0.0005	3	0.002	0%	0.001	0.001	0.000	0.001	0.001	4	0.0012	25%	0.001	0.006	0.009	0.001	0.02	142	0.009	e
	Bromodichloromethane	µg/L	200	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Bromoform	µg/L	60	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.2 - 1	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Chloroform	µg/L	1.8	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Dibromochloromethane	µg/L	-	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	0			-	-	-	-	-		-	e
Bacteria	E. Coli	a	-	4	1	50%	1.2	6.9	11.84919	0.5	24.6	4	10		10.0	7.5	5.0	0.000	10.0	9	0.965	
	E. Coli 5 sample geo-mean	a	100	4	1	50%	1.3	6.0	10.02497	0.5	21	0			-	-	-	-	-		-	
	Total Coliforms	a	100	4	1	75%	152	346	507	1	1081	4	10	50%	10.0	15	17	0.000	40	-183	0.133	
Other	Hydrazine	µg/L	2.6	4	5	25%	2.5	8.1	11.25	2.5	25	4	0.1	0%	0.10	0.10	0.000	0.10	0.10	-195	0.006	f
	Morpholine	µg/L	4	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	4	0%	0.000	0.000	0.000	0.000	0.000	-200	0.000	e,f
	PCB in Water	µg/L	0.001	4	0.05	0%	0.03	0.03	0.000	0.03	0.03	0			-	-	-	-	-		-	e

###	Exceeds criteria.
###	RPD less than -20 (decrease). P-value for decrease statistically significant.
###	RPD greater than 20 (increase). P-value for increase statistically significant.

Notes:

a - 2007/2008 units were based on MPN/100 mL. 2019 units were based on CFU/100mL.

b -summary stats based on seasonal means (N_{means} = 4 for most parameters), each with five replicate samples.

c - 2019 data is uncensored. Therefore some parameters may have values below the MDL.

d - Parameters with both 'd' and 'e' notes indicate that 100% of samples in both 2008 and 2019 were below detection. Therefore assessment of change is not possible.

e - The 2009 ERA TSD set all samples to 1/2 MDL if all measurements were <MDL. Therefore, RPD and p-value calculations are based on all 2008 measurements being 1/2MDL if all measurements were <MDL.

f - All 2019 samples were below the MDL. Results are based on un-detected uncensored data.

g - The minimum total hardness in 2019 was 110 mg/L, so this was used as a conservative value in calculation of hardness dependent guidelines for cadmium, copper, lead and nickel.

h -Total residual chlorine exceedances in 2019 were attributed to a QAQC issue.

Table D-4: Assessment of Change in Baseline Non-Radionuclide Surface Water Data from 2007/2008 to 2019

	Parameter	Units	Criteria[g]	2007/2008 Sampling Program [b] Coots Pond (SW12)								2019 Sampling Program[c] Coots (SW12)								Assessment of Change		
				N_{means}	MDL	% above MDL	Median	Grand Mean	Std Dev	Min	Max	N	MDL	% above MDL	Median	Mean	Std Dev	Min	Max	RPD (means)	Mann–Whitney *U* test (p-value)	Note[d]
General Chemistry	Alkalinity	mg/L	-	4	5	100%	189	185	77	95	267	4	1	100%	190	175	38	120	200	-6	0.776	
	Bicarbonate	ppm CaCO3	-	4	5	100%	189	175	93	55	267	0			-	-	-	-	-		-	
	Carbonate	ppm CaCO3	-	4	5	25%	2.5	12	19	2.5	40	0			-	-	-	-	-		-	
	Hydroxide	ppm CaCO3	-	4	5	0%	2.5	2.5	0.000	2.5	2.5	0			-	-	-	-	-		-	e
	Total Hardness	mg/L	-	4	1	100%	239	256	82	186	360	4	0.5 - 1	100%	260	248	54	181	292	-3	0.968	
	Conductivity	umho/cm	-	4	1	100%	603	602	155	442	760	4	1	100%	570	553	101	420	650	-9	0.902	
	Dissolved Oxygen (Field)	mg/L	-	2	-	100%	9.9	9.9	0.707107	9.4	10.4	4	-	100%	13	12	2.7	8.0	14	17	-	
	pH	pH	6.5-8.5	4	-	100%	8.3	8.5	0.577457	8.1	9.4	4	-	100%	8.3	8.6	0.57	8.2	9.4	1	0.104	
	pH (Field)	pH	6.5-8.5	3	-	100%	8.5	8.7	0.52915	8.3	9.3	4	-	100%	7.5	7.4	0.24	7.1	7.6	-16	0.309	
	Temperature (Field)	Celsius	-	4	-	100%	19	17	7.5	5.7	23	4	-	100%	14	14	10	4.4	23	-20	0.775	
	Chemical Oxygen Demand	mg/L	-	1	1	100%	27	27	-	27	27	4	4	100%	19	25	16	15	48	-7	-	
	Total Organic Carbon	mg/L	-	4	0.2	100%	8.6	9.0	1.1	8.2	10.64	0			-	-	-	-	-		-	
	Total Dissolved Solids	mg/L	-	4	2	100%	382	379	91	290	462	0			-	-	-	-	-		-	
	Total Suspended Solids	mg/L	-	4	2	100%	7.7	19	27	1.2	60	0	1 - 10		-	-	-	-	-		-	
	Turbidity	NTU	-	4	0.1	100%	6.9	8.8	8.5	1.3	20.02	0	0.1		-	-	-	-	-		-	
Nutrients	Ammonia	mg/L	1.54	4	0.01	100%	0.02	0.28	0.53	0.01	1.08	4	0.01 - 1	100%	0.07	0.06	0.03	0.02	0.08	-131	0.012	
	Unionized Ammonia8	mg/L	0.019	4	0.001	100%	0.003	0.01	0.02	0.001	0.04	4	0.00051 - 0.044	75%	0.002	0.01	0.02	0.000	0.05	2	0.935	
	Nitrate	mg/L	13	4	0.01	100%	0.07	0.08	0.05	0.04	0.15	4	0.1	0%	0.000	0.000	0.000	0.000	0.000	-200	0.002	f
	Nitrite	mg/L	0.06	4	0.01	25%	0.005	0.02	0.03	0.005	0.07	4	0.01	0%	-0.001	-0.002	0.003	-0.007	0.000	-247	0.000	f
	Phosphorus	mg/L	0.02	4	0.002 / 0.01	100%	0.03	0.04	0.05	0.01	0.11	4	0.02 - 2.51	100%	0.05	0.05	0.03	0.03	0.09	15	0.468	
	Total Kjeldahl Nitrogen	mg/L	-	4	0.06 / 0.5	50%	0.55	1.2	1.3	0.5	3.1	4	0.1	100%	0.42	0.46	0.09	0.40	0.60	-87	0.054	
Metals	Aluminum	µg/L	100	4	0.1	100%	150	729	1248	19	2598	4	0.5 - 5	100%	47	116	173	2.2	369	-145	0.351	
	Aluminum (filtered)	µg/L	75	4	0.1	100%	13	42	62	7.6	135	4	5	50%	5.0	5.2	1.5	3.9	7.0	-156	0.004	
	Antimony	µg/L	6	4	1	0%	0.50	0.53	0.05	0.50	0.60	4	0.02 - 0.5	75%	0.20	0.21	0.04	0.17	0.27	-85	0.000	e
	Arsenic	µg/L	5	4	1	0%	0.50	0.88	0.75	0.50	2.00	4	0.02 - 1	100%	0.68	0.76	0.41	0.34	1.3	-15	0.082	e
	Barium	µg/L	1000	4	1	100%	43	50	37	15	98	4	0.02 - 2	100%	42	39	17	15	56	-25	0.968	
	Beryllium	µg/L	1100	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.01 - 0.5	25%	0.003	0.004	0.010	-0.006	0.02	-197	0.000	e
	Bismuth	µg/L	-	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.005 - 1	0%	0.000	0.001	0.003	-0.001	0.006	-199	0.000	e,f
	Boron	µg/L	200	4	0.1	100%	319	350	117	256	506	4	10 - 50	100%	180	184	38	146	230	-62	0.002	
	Cadmium	µg/L	0.17	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.005 - 0.1	25%	0.003	0.003	0.003	0.000	0.007	-175	0.000	e
	Calcium	µg/L	-	4	0.1	100%	47450	49225	27994	19280	82720	4	0.05 - 250	100%	56350	53250	22578	25800	74500	8	0.655	
	Cesium	µg/L	-	4	0.1	25%	0.05	0.08	0.06	0.05	0.16	3	0.05 - 0.2	0%	0.003	0.007	0.01	-0.001	0.02	-168	0.000	f
	Chromium	µg/L	8.9	4	0.1	75%	1.6	1.4	0.94831	0.05	2.3	4	0.1 - 5	25%	0.45	0.63	0.73	0.06	1.6	-74	0.486	
	Chromium (III)	µg/L	8.9	1	0.1	100%	1.7	1.7	-	1.7	1.7	4	0.5 - 5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	f
	Chromium(VI)	µg/L	1	1	5	0%	2.5	2.5	-	2.5	2.5	4	0.5	0%	0.16	0.15	0.12	0.000	0.29	-177	-	e,f
	Cobalt	µg/L	0.9	4	0.1	100%	0.3	1.1	1.7	0.2	3.6	4	0.005 - 0.5	75%	0.12	0.14	0.07	0.07	0.24	-156	0.016	
	Copper	µg/L	2.57	4	0.1	100%	1.1	1.1	0.436768	0.66	1.5	4	0.05 - 1	100%	0.72	0.90	0.59	0.42	1.7	-21	0.488	
	Iron	µg/L	300	4	1	100%	159	377	534	22	1170	4	1 - 100	100%	85	152	201	5.9	433	-85	0.490	
	Lead	µg/L	3.59	4	0.1	100%	0.18	0.34	0.35	0.13	0.86	4	0.005 - 0.5	75%	0.07	0.19	0.28	0.01	0.61	-53	0.219	
	Lithium	µg/L	-	4	0.1	100%	9.0	8.7	2.4	5.7	11.08	4	0.5 - 5	100%	4.3	4.2	1.3	2.5	5.7	-70	0.002	
	Magnesium	µg/L	-	4	0.1	100%	32760	32290	4493	26400	37240	4	0.05 - 250	100%	26900	20624	13613	294	28400	-44	0.047	
	Manganese	µg/L	120	4	0.1	100%	39	41	21	20	65	4	0.05 - 2	100%	12	24	31	1.3	69	-53	0.209	
	Mercury (filtered)	µg/L	0.026	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.01	0%	0.000	0.000	0.001	0.000	0.002	-197	0.001	e,f
	Molybdenum	µg/L	40	4	0.1	100%	0.52	0.67	0.54	0.20	1.44	4	0.05 - 1	75%	0.57	0.68	0.24	0.53	1.0	1	0.200	
	Nickel	µg/L	25	4	0.1	100%	0.9	1.1	0.528741	0.7	1.8	4	0.02 - 1	75%	0.61	0.66	0.16	0.52	0.88	-51	0.094	
	Potassium	µg/L	-	4	0.1	100%	7010	7660	3119	5000	11620	4	0.05 - 1000	100%	5640	5488	1389	3740	6930	-33	0.488	
	Selenium	µg/L	1	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.04 - 2	75%	0.07	0.06	0.009	0.05	0.07	-154	0.000	e
	Silver	µg/L	0.1	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.005 - 0.1	0%	0.002	0.002	0.001	0.000	0.003	-188	0.000	e,f
	Sodium	µg/L	-	4	0.1	100%	40890	38035	6676	28160	42200	4	0.05 - 250	100%	19000	19150	1792	17200	21400	-66	0.002	
	Strontium	µg/L	7000	4	0.1	100%	522	507	204	270	714	4	0.05 - 1	100%	431	421	83	322	501	-18	0.902	
	Thallium	µg/L	0.3	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.002 - 0.05	25%	0.002	0.003	0.002	0.000	0.005	-181	0.000	e
	Thorium	µg/L	-	4	0.1	25%	0.05	0.12	0.14	0.05	0.32	3	0.005 - 1	0%	0.001	0.004	0.007	-0.001	0.01	-188	0.000	f
	Tin	µg/L	-	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.2 - 5	25%	0.02	0.14	0.25	0.01	0.52	97	0.023	e
	Titanium	µg/L	-	4	0.1	100%	12	27	37	3.1	82	4	0.5 - 5	25%	2.4	6.0	9.0	-0.008	19	-128	0.310	
	Tungsten	µg/L	30	4	0.1	25%	0.05	0.06	0.03	0.05	0.10	3	0.01 - 1	67%	0.03	0.04	0.02	0.03	0.06	-51	0.103	
	Uranium	µg/L	5	4	0.1	100%	0.69	0.89	0.68	0.30	1.86	4	0.002 - 0.1	100%	1.1	1.1	0.29	0.79	1.5	23	0.024	
	Vanadium	µg/L	6	4	0.1	75%	0.80	0.74	0.60	0.05	1.32	4	0.2 - 5	75%	1.4	1.5	0.80	0.74	2.5	69	0.204	
	Zinc	µg/L	7	4	0.1	100%	4.1	4.1	2.6	1.5	6.6	4	0.1 - 5	75%	1.8	1.7	0.92	0.57	2.8	-81	0.543	
	Zirconium	µg/L	4	4	0.1	50%	0.17	0.56	0.87	0.05	1.86	4	0.1 - 1	25%	0.07	0.09	0.06	0.04	0.18	-146	0.430	
Hydrocarbons	Petro Hydrocarbons C6-10	µg/L	167	4	100	0%	50	50	0.000	50	50	4	25	0%	0.000	0.000	0.000	0.000	0.000	-200	0.002	e,f
	Petro Hydrocarbons C10-16	µg/L	42	4	100	0%	50	50	0.000	50	50	4	100	0%	0.000	0.000	0.000	0.000	0.000	-200	0.002	e,f
	Petro Hydrocarbons C16-34	µg/L	-	4	100	0%	50	50	0.000	50	50	4	200	0%	69	78	39	44	130	44	0.155	e,f
	Petro Hydrocarbons C34-50	µg/L	-	4	100	0%	50	50	0.000	50	50	4	200	0%	0.000	0.000	0.000	0.000	0.000	-200	0.002	e,f
	Benzene	µg/L	5	1	0.1	0%	0.05	0.05	-	0.05	0.05	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Ethylbenzene	µg/L	8	1	0.1	0%	0.05	0.05	-	0.05	0.05	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	m/p-Xylene	µg/L	2	1	0.1	0%	0.05	0.05	-	0.05	0.05	0			-	-	-	-	-		-	e
	o-Xylene	µg/L	40	1	0.1	0%	0.05	0.05	-	0.05	0.05	0			-	-	-	-	-		-	e
	Toluene	µg/L	2	1	0.1	0%	0.05	0.05	-	0.05	0.05	0			-	-	-	-	-		-	e
THMs	Total Residual Chlorine	mg/L	0.0005	0	0.002		-	-	-	-	-	0	0.0012		-	-	-	-	-		-	e
	Bromodichloromethane	µg/L	200	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Bromoform	µg/L	60	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.2 - 1	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Chloroform	µg/L	1.8	2	0.1	0%	0.08	0.08	0.04	0.05	0.10	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Dibromochloromethane	µg/L	-	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	0			-	-	-	-	-		-	e
Bacteria	E. Coli	a	-	4	1	100%	21	32	32	8.6	79	4	10		10.0	10	7.8	1.0	20	-104	0.031	
	E. Coli 5 sample geo-mean	a	100	4	1	100%	20	32	32	8.0	78	0			-	-	-	-	-		-	
	Total Coliforms	a	100	4	1	100%	330	3269	5961	208	12210	4	10	100%	45	97	123	18	280	-188	0.010	
Other	Hydrazine	µg/L	2.6	4	5	25%	2.5	8.1	11.25	2.5	25	0	0.1		-	-	-	-	-		-	
	Morpholine	µg/L	4	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	4	0%	0.000	0.000	0.000	0.000	0.000	-200	0.000	e,f
	PCB in Water	µg/L	0.001	4	0.05	0%	0.03	0.03	0.000	0.03	0.03	0			-	-	-	-	-		-	e

###	Exceeds criteria.
###	RPD less than -20 (decrease). P-value for decrease statistically significant.
###	RPD greater than 20 (increase). P-value for increase statistically significant.

Notes:

a - 2007/2008 units were based on MPN/100 mL. 2019 units were based on CFU/100mL.

b -summary stats based on seasonal means (N_{means} = 4 for most parameters), each with five replicate samples.

c - 2019 data is uncensored. Therefore some parameters may have values below the MDL.

d - Parameters with both 'd' and 'e' notes indicate that 100% of samples in both 2008 and 2019 were below detection. Therefore assessment of change is not possible.

e - The 2009 ERA TSD set all samples to 1/2 MDL if all measurements were <MDL. Therefore, RPD and p-value calculations are based on all 2008 measurements being 1/2MDL if all measurements were <MDL.

f - All 2019 samples were below the MDL. Results are based on un-detected uncensored data.

g - The minimum total hardness in 2019 was 110 mg/L, so this was used as a conservative value in calculation of hardness dependent guidelines for cadmium, copper, lead and nickel.

Table D-4: Assessment of Change in Baseline Non-Radionuclide Surface Water Data from 2007/2008 to 2019

	Parameter	Units	Criteria[g]	2007/2008 Sampling Program[b] Tree Frog Pond (SW13) N_{means}	MDL	% above MDL	Median	Grand Mean	Std Dev	Min	Max	2019 Sampling Program[c] Tree Frog Pond (SW13) N	MDL	% above MDL	Median	Mean	Std Dev	Min	Max	Assessment of Change RPD (means)	Mann–Whitney U test (p-value)	Note[d]
General Chemistry	Alkalinity	mg/L	-	4	5	100%	186	192	22	175	222	4	1	100%	245	240	32	200	270	22	0.010	
	Bicarbonate	ppm CaCO3	-	4	5	100%	186	192	22	175	222	0			-	-	-	-	-		-	
	Carbonate	ppm CaCO3	-	4	5	0%	2.5	2.5	0.000	2.5	2.5	0			-	-	-	-	-		-	e
	Hydroxide	ppm CaCO3	-	4	5	0%	2.5	2.5	0.000	2.5	2.5	0			-	-	-	-	-		-	e
	Total Hardness	mg/L	-	4	1	100%	219	217	57	156	275	4	0.5 - 1	100%	244	245	35	207	285	12	0.068	
	Conductivity	umho/cm	-	4	1	100%	409	428	105	330	562	4	1	100%	465	483	74	420	580	12	0.066	
	Dissolved Oxygen (Field)	mg/L	-	2	-	100%	5.8	5.8	4.0	3.0	8.6	4	-	100%	6.7	8.5	5.6	4.1	17	38	-	
	pH	pH	6.5-8.5	4	-	100%	7.5	7.5	0.155691	7.3	7.7	4	-	100%	7.8	7.8	0.18	7.6	8.0	4	0.004	
	pH (Field)	pH	6.5-8.5	4	-	100%	7.5	7.4	0.244949	7.1	7.6	4	-	100%	7.0	7.3	0.65	6.9	8.3	-1	0.309	
	Temperature (Field)	Celsius	-	4	-	100%	16	15	4.9	8.2	20	4	-	100%	16	15	7.9	6.1	22	-1	0.924	
	Chemical Oxygen Demand	mg/L	-	1	1	100%	43	43	-	43	43	4	4	100%	22	23	8.9	15	34	-60	0.289	
	Total Organic Carbon	mg/L	-	4	0.2	100%	10	11	1.9	9.8	14	0			-	-	-	-	-		-	
	Total Dissolved Solids	mg/L	-	4	2	100%	261	276	67	217	364	0			-	-	-	-	-		-	
	Total Suspended Solids	mg/L	-	4	2	100%	3.4	19	32	2.8	67	0	1 - 10		-	-	-	-	-		-	
	Turbidity	NTU	-	4	0.1	100%	3.7	9.3	12.79182	1.6	28.32	0	0.1		-	-	-	-	-		-	
Nutrients	Ammonia	mg/L	1.54	4	0.01	100%	0.03	0.03	0.005	0.02	0.03	4	0.01 - 1	100%	0.13	0.12	0.07	0.03	0.21	125	0.015	
	Unionized Ammonia8	mg/L	0.019	4	0.001	0%	0.000	0.000	0.000	0.000	0.001	4	0.00051 - 0.044	50%	0.001	0.002	0.002	0.000	0.005	146	0.211	e
	Nitrate	mg/L	13	4	0.01	75%	0.13	0.86	1.54	0.01	3.17	4	0.1	0%	0.000	0.000	0.000	0.000	0.000	-200	0.002	f
	Nitrite	mg/L	0.06	4	0.01	0%	0.005	0.005	0.000	0.005	0.005	4	0.01	0%	0.001	0.001	0.002	-0.001	0.004	-117	0.000	e,f
	Phosphorus	mg/L	0.02	4	0.002 / 0.01	100%	0.03	0.04	0.03	0.02	0.09	4	0.02 - 2.51	100%	0.09	0.09	0.09	0.03	0.18	80	0.112	
	Total Kjeldahl Nitrogen	mg/L	-	4	0.06 / 0.5	100%	0.66	0.70	0.10	0.64	0.84	4	0.1	100%	0.73	0.75	0.33	0.44	1.1	7	1.000	
Metals	Aluminum	µg/L	100	4	0.1	100%	110	1470	2763	44	5614	4	0.5 - 5	100%	4.9	7.9	6.9	3.6	18	-198	0.002	
	Aluminum (filtered)	µg/L	75	4	0.1	100%	16	17	9.5	6.2	29	4	5	75%	6.5	7.0	2.9	4.0	11	-83	0.079	
	Antimony	µg/L	6	4	1	0%	0.50	0.53	0.05	0.50	0.60	4	0.02 - 0.5	75%	0.06	0.06	0.005	0.05	0.06	-160	0.000	e
	Arsenic	µg/L	5	4	1	25%	0.50	0.88	0.75	0.50	2.00	4	0.02 - 1	100%	0.28	0.28	0.02	0.25	0.30	-104	0.000	
	Barium	µg/L	1000	4	1	100%	35	98	126	33	287	4	0.02 - 2	100%	30	29	9.9	18	40	-108	0.538	
	Beryllium	µg/L	1100	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.01 - 0.5	0%	0.002	0.002	0.001	0.001	0.003	-198	0.000	e,f
	Bismuth	µg/L	-	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.005 - 1	0%	0.000	0.001	0.001	0.000	0.003	-199	0.000	e,f
	Boron	µg/L	200	4	0.1	75%	7.9	425	839	0.000	1684	4	10 - 50	25%	8.9	11	6.7	6.2	21	-190	0.146	
	Cadmium	µg/L	0.17	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.005 - 0.1	0%	0.003	0.003	0.002	0.002	0.005	-176	0.000	e,f
	Calcium	µg/L	-	4	0.1	100%	73220	72695	19597	52380	91960	4	0.05 - 250	100%	84200	84550	12220	71900	97900	15	0.068	
	Cesium	µg/L	-	4	0.1	25%	0.05	0.13	0.17	0.05	0.38	3	0.05 - 0.2	0%	0.01	0.009	0.003	0.005	0.01	-176	0.000	f
	Chromium	µg/L	8.9	4	0.1	75%	1.2	1.8	2.1	0.05	4.9	4	0.1 - 5	50%	0.13	0.38	0.55	0.05	1.2	-132	0.387	
	Chromium (III)	µg/L	8.9	1	0.1	100%	4.9	4.9	-	4.9	4.9	4	0.5 - 5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	f
	Chromium(VI)	µg/L	1	1	5	0%	2.5	2.5	-	2.5	2.5	4	0.5	0%	0.16	0.17	0.05	0.13	0.24	-174	-	e,f
	Cobalt	µg/L	0.9	4	0.1	100%	0.30	1.4	2.2	0.3	4.7	4	0.005 - 0.5	75%	0.15	0.15	0.07	0.07	0.24	-161	0.000	
	Copper	µg/L	2.57	4	0.1	100%	0.93	1.5	1.7	0.2	4.0	4	0.05 - 1	50%	0.23	0.23	0.14	0.08	0.39	-147	0.112	
	Iron	µg/L	300	4	1	100%	321	1032	1479	236	3249	4	1 - 100	100%	255	282	179	98	520	-114	0.543	
	Lead	µg/L	3.59	4	0.1	100%	0.20	0.62	0.88	0.12	1.94	4	0.005 - 0.5	25%	0.02	0.03	0.03	0.01	0.07	-180	0.002	
	Lithium	µg/L	-	4	0.1	100%	0.80	1.5	1.6	0.42	3.9	4	0.5 - 5	0%	0.29	0.29	0.11	0.18	0.40	-135	0.003	f
	Magnesium	µg/L	-	4	0.1	100%	8780	8670	2012	6140	10980	4	0.05 - 250	100%	8270	8273	1330	6650	9900	-5	0.968	
	Manganese	µg/L	120	4	0.1	100%	132	253	311	44	704	4	0.05 - 2	100%	182	172	125	15	310	-38	0.543	
	Mercury (filtered)	µg/L	0.026	3	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.01	0%	0.001	0.002	0.002	0.000	0.004	-188	0.010	e,f
	Molybdenum	µg/L	40	4	0.1	50%	0.21	0.60	0.85	0.10	1.86	4	0.05 - 1	25%	0.08	0.08	0.07	0.01	0.15	-152	0.194	
	Nickel	µg/L	25	4	0.1	100%	0.56	1.1	1.2	0.4	2.9	4	0.02 - 1	75%	0.21	0.21	0.06	0.13	0.27	-137	0.001	
	Potassium	µg/L	-	4	0.1	100%	3220	5070	4189	2520	11320	4	0.05 - 1000	100%	2185	2653	2313	370	5870	-63	0.132	
	Selenium	µg/L	1	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	0.04 - 2	75%	0.08	0.09	0.02	0.07	0.11	-142	0.000	e
	Silver	µg/L	0.1	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.005 - 0.1	0%	0.001	0.001	0.001	0.000	0.002	-190	0.000	e,f
	Sodium	µg/L	-	4	0.1	100%	4170	5385	3778	2320	10880	4	0.05 - 250	100%	3490	3530	1055	2280	4860	-42	0.542	
	Strontium	µg/L	7000	4	0.1	100%	179	198	40	174	258	4	0.05 - 1	100%	198	191	34	143	225	-3	0.187	
	Thallium	µg/L	0.3	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.002 - 0.05	50%	0.003	0.004	0.004	0.001	0.01	-171	0.000	e
	Thorium	µg/L	-	4	0.1	25%	0.05	0.20	0.31	0.05	0.66	3	0.005 - 1	0%	0.001	0.000	0.002	-0.002	0.002	-199	0.000	f
	Tin	µg/L	-	4	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.2 - 5	0%	0.03	0.03	0.01	0.01	0.04	-65	0.000	e,f
	Titanium	µg/L	-	4	0.1	100%	6.7	65	120	2.4	245	4	0.5 - 5	0%	0.42	0.62	0.67	0.05	1.6	-196	0.003	f
	Tungsten	µg/L	30	4	0.1	25%	0.05	0.08	0.05	0.05	0.15	3	0.01 - 1	0%	0.005	0.004	0.004	-0.001	0.007	-182	0.000	f
	Uranium	µg/L	5	4	0.1	100%	0.79	1.1	1.0	0.3	2.5	4	0.002 - 0.1	100%	0.27	0.32	0.27	0.06	0.67	-109	0.107	
	Vanadium	µg/L	6	4	0.1	75%	0.44	0.42	0.31	0.05	0.76	4	0.2 - 5	25%	0.25	0.25	0.13	0.12	0.40	-50	0.345	
	Zinc	µg/L	7	4	0.1	100%	3.4	4.6	3.2	2.3	9.4	4	0.1 - 5	50%	2.5	2.2	1.0	0.80	3.1	-71	0.490	
	Zirconium	µg/L	4	4	0.1	75%	0.14	4.1	8.0	0.09	16.02	4	0.1 - 1	0%	0.04	0.04	0.02	0.02	0.07	-196	0.005	f
Hydrocarbons	Petro Hydrocarbons C6-10	µg/L	167	4	100	0%	50	50	0.000	50	50	4	25	0%	0.000	0.000	0.000	0.000	0.000	-200	0.002	e,f
	Petro Hydrocarbons C10-16	µg/L	42	4	100	0%	50	50	0.000	50	50	4	100	0%	0.000	0.000	0.000	0.000	0.000	-200	0.002	e,f
	Petro Hydrocarbons C16-34	µg/L	-	4	100	0%	58	66	24	50	100	4	200	0%	73	64	30	23	89	-3	0.923	e,f
	Petro Hydrocarbons C34-50	µg/L	-	4	100	0%	50	50	0.000	50	50	4	200	0%	0.000	0.000	0.000	0.000	0.000	-200	0.002	e,f
	Benzene	µg/L	5	1	0.1	0%	0.05	0.05	-	0.05	0.05	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Ethylbenzene	µg/L	8	1	0.1	0%	0.05	0.05	-	0.05	0.05	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	m/p-Xylene	µg/L	2	1	0.1	0%	0.05	0.05	-	0.05	0.05	0			-	-	-	-	-		-	e
	o-Xylene	µg/L	40	1	0.1	0%	0.05	0.05	-	0.05	0.05	0			-	-	-	-	-		-	e
	Toluene	µg/L	2	1	0.1	0%	0.05	0.05	-	0.05	0.05	0			-	-	-	-	-		-	e
THMs	Total Residual Chlorine	mg/L	0.0005	1	0.002	0%	0.001	0.001	-	0.001	0.001	0	0.0012		-	-	-	-	-		-	e
	Bromodichloromethane	µg/L	200	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Bromoform	µg/L	60	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	4	0.2 - 1	0%	0.000	0.000	0.000	0.000	0.000	-200	-	e,f
	Chloroform	µg/L	1.8	2	0.1	100%	0.16	0.16	0.07	0.11	0.21	4	0.1 - 0.5	0%	0.000	0.000	0.000	0.000	0.000	-200	-	f
	Dibromochloromethane	µg/L	-	2	0.1	0%	0.05	0.05	0.000	0.05	0.05	0			-	-	-	-	-		-	e
Bacteria	E. Coli	a	-	4	1	100%	31	53	63	5.0	144	4	10		10.0	90	167	0.000	340	52	0.686	
	E. Coli 5 sample geo-mean	a	100	4	1	100%	23	48	64	5.0	142	0			-	-	-	-	-		-	
	Total Coliforms	a	100	4	1	100%	4943	4198	2846	310	6596	4	10	100%	326	333	338	40	640	-171	0.038	
Other	Hydrazine	µg/L	2.6	4	5	25%	2.5	8.1	11.25	2.5	25	0	0.1		-	-	-	-	-		-	
	Morpholine	µg/L	4	4	1	0%	0.50	0.50	0.000	0.50	0.50	4	4	0%	0.000	0.000	0.000	0.000	0.000	-200	0.000	e,f
	PCB in Water	µg/L	0.001	4	0.05	0%	0.03	0.03	0.000	0.03	0.03	0			-	-	-	-	-		-	e

###	Exceeds criteria.
###	RPD less than -20 (decrease). P-value for decrease statistically significant.
###	RPD greater than 20 (increase). P-value for increase statistically significant.

Notes:

a - 2007/2008 units were based on MPN/100 mL. 2019 units were based on CFU/100mL.

b -summary stats based on seasonal means (N_{means} = 4 for most parameters), each with five replicate samples.

c - 2019 data is uncensored. Therefore some parameters may have values below the MDL.

d - Parameters with both 'd' and 'e' notes indicate that 100% of samples in both 2008 and 2019 were below detection. Therefore assessment of change is not possible.

e - The 2009 ERA TSD set all samples to 1/2 MDL if all measurements were <MDL. Therefore, RPD and p-value calculations are based on all 2008 measurements being 1/2MDL if all measurements were <MDL.

f - All 2019 samples were below the MDL. Results are based on un-detected uncensored data.

g - The minimum total hardness in 2019 was 110 mg/L, so this was used as a conservative value in calculation of hardness dependent guidelines for cadmium, copper, lead and nickel.

Table D-5: Assessment of Change in Baseline Radionuclide Surface Water Data from 2007/2008 to 2019

Radionuclide	Units	Criteria	2008 Sampling Program SW02							2019 Sampling Program[a] SW02						
			N	MDL	% above MDL	Mean	Std Dev	Min	Max	N	MDL[b]	% above MDL	Mean	Std Dev	Min	Max
Ag-110m	Bq/L		9	2	0.0	-	-	1.00	1.00							
Ba-140	Bq/L		9	5	0.0	-	-	2.50	2.50							
Be-7	Bq/L		9	10	0.0	-	-	5.00	5.00							
Carbon-14	Bq/L	200	9	0.5	0.0	-		0.25	0.25	4	0.04 - 0.1	50%	0.05	0.08	-0.05	0.14
Ce-141	Bq/L		9	1	0.0	-	-	0.50	0.50							
Ce-144	Bq/L		9	5	0.0	-	-	2.50	2.50							
Chlorine-36	Bq/L															
Co-57	Bq/L		9	1	0.0	-	-	0.50	0.50							
Co-58	Bq/L		9	1	0.0	-	-	0.50	0.50							
Co-60	Bq/L	2	9	1	0.0	-	-	0.50	0.50	4	0.066 - 0.95	0%	-0.02	0.08	-0.07	0.09
Cr-51	Bq/L		9	10	0.0	-	-	5.00	5.00							
Cs-134	Bq/L	7	9	1	0.0	-	-	0.50	0.50	4	0.094 - 0.99	0%	0.10	0.12	0.03	0.28
Cs-137	Bq/L	10	9	1	0.0	-	-	0.50	0.50	4	0.11 - 0.9	0%	0.12	0.09	0.02	0.21
Eu-154	Bq/L		9	3	0.0	-	-	1.50	1.50							
Eu-155	Bq/L		9	2	0.0	-	-	1.00	1.00							
Fe-59	Bq/L		9	2	0.0	-	-	1.00	1.00							
Gross Beta	Bq/L		9	0.1	0.0	-	-	0.05	0.05							
I-131[c]	Bq/L	6	9	2	0.0	-	-	1.00	1.00	4	0.078 - 170	0%	18	36	0.21	72
Iodine-129	Bq/L															
Iodine-129	Bq/L															
K-40	Bq/L		9	10	0.0	-	-	5.00	5.00	4	0.79 - 11	0%	-1.29	2.1	-3.58	1.5
La-140	Bq/L		9	2	0.0	-	-	1.00	1.00							
Mn-54	Bq/L		9	1	0.0	-	-	0.50	0.50							
Nb-95	Bq/L		9	1	0.0	-	-	0.50	0.50							
Ru-103	Bq/L		9	1	0.0	-	-	0.50	0.50							
Ru-106	Bq/L		9	10	0.0	-	-	5.00	5.00							
Sb-124	Bq/L		9	2	0.0	-	-	1.00	1.00							
Sb-125	Bq/L		9	2	0.0	-	-	1.00	1.00							
Se-75	Bq/L		9	1	0.0	-	-	0.50	0.50							
Strontium-89	Bq/L															
Strontium-90	Bq/L	5														
Technicium-99	Bq/L															
Technicium-99	Bq/L															
Tritium	Bq/L	7000	9	15	0.0	-	-	7.50	7.50	4	9.4 - 14.8	0%	-1.78	2.5	-5.30	0.00
Zn-65	Bq/L		9	3	0.0	-	-	1.50	1.50							
Zr-95	Bq/L		9	2	0.0	-	-	1.00	1.00							
Th-Series	Bq/L									4	0.3 - 5		-0.29	0.67	-1.24	0.31
U-Series	Bq/L									4	0.33 - 3.7		0.00	0.46	-0.50	0.39

###	Maximum value exceeds criteria.
###	RPD less than -20 (decrease). P-value for decrease statistically significant.
###	RPD greater than 20 (increase). P-value for increase statistically significant.

Notes:
a - 2019 data is uncensored. Therefore some parameters may have values below the MDL.
b - MDLs for radionuclides are shown as a range.
c - Exceedances of I-131 were attributed to a QAQC issue.
Note: Due to all concentrations in 2007/2008 being below MDL for parameters that were measured in both years, RPD and p-values were not calculated.

Table D-5: Assessment of Change in Baseline Radionuclide Surface Water Data from 2007/2008 to 2019

Radionuclide	Units	Criteria	2008 Sampling Program SW07							2019 Sampling Program DNGS-Near						
			N	MDL	% above MDL	Mean	Std Dev	Min	Max	N	MDL[b]	% above MDL	Mean	Std Dev	Min	Max
Ag-110m	Bq/L		19	2	0.0	-	-	1.00	1.00							
Ba-140	Bq/L		19	5	0.0	-	-	2.50	2.50							
Be-7	Bq/L		19	10	0.0	-	-	5.00	5.00							
Carbon-14	Bq/L	200	19	0.5	0.0	-		0.25	0.25	8	0.04 - 0.1	0%	-0.04	0.08	-0.18	0.07
Ce-141	Bq/L		19	1	0.0	-	-	0.50	0.50							
Ce-144	Bq/L		19	5	0.0	-	-	2.50	2.50							
Chlorine-36	Bq/L															
Co-57	Bq/L		19	1	0.0	-	-	0.50	0.50							
Co-58	Bq/L		19	1	0.0	-	-	0.50	0.50							
Co-60	Bq/L	2	19	1	0.0	-	-	0.50	0.50	8	0.066 - 0.95	0%	0.06	0.15	-0.17	0.27
Cr-51	Bq/L		19	10	0.0	-	-	5.00	5.00							
Cs-134	Bq/L	7	19	1	0.0	-	-	0.50	0.50	8	0.094 - 0.99	0%	0.12	0.10	0.00	0.34
Cs-137	Bq/L	10	19	1	0.0	-	-	0.50	0.50	8	0.11 - 0.9	0%	0.08	0.09	-0.06	0.27
Eu-154	Bq/L		19	3	0.0	-	-	1.50	1.50							
Eu-155	Bq/L		19	2	0.0	-	-	1.00	1.00							
Fe-59	Bq/L		19	2	0.0	-	-	1.00	1.00							
Gross Beta	Bq/L		19	0.1	16.0	0.06	0.02	0.05	0							
I-131[c]	Bq/L	6	19	2	0.0	-	-	1.00	1.00	8	0.078 - 170	0%	3.7	6.7	0.13	19
Iodine-129	Bq/L															
Iodine-129	Bq/L															
K-40	Bq/L		19	10	0.0	-	-	5.00	5.00	8	0.79 - 11	0%	-2.15	3.1	-5.95	2.1
La-140	Bq/L		19	2	0.0	-	-	1.00	1.00							
Mn-54	Bq/L		19	1	0.0	-	-	0.50	0.50							
Nb-95	Bq/L		19	1	0.0	-	-	0.50	0.50							
Ru-103	Bq/L		19	1	0.0	-	-	0.50	0.50							
Ru-106	Bq/L		19	10	0.0	-	-	5.00	5.00							
Sb-124	Bq/L		19	2	0.0	-	-	1.00	1.00							
Sb-125	Bq/L		19	2	0.0	-	-	1.00	1.00							
Se-75	Bq/L		19	1	0.0	-	-	0.50	0.50							
Strontium-89	Bq/L		16	0.1	0.0	-	-	0.05	0.05							
Strontium-90	Bq/L	5	16	0.1	0.0	-	-	0.05	0.05							
Technicium-99	Bq/L															
Technicium-99	Bq/L															
Tritium	Bq/L	7000	19	15	0.0	-	-	7.50	7.50	8	9.4 - 14.8	0%	1.9	5.3	-5.30	7.7
Zn-65	Bq/L		19	3	0.0	-	-	1.50	1.50							
Zr-95	Bq/L		19	2	0.0	-	-	1.00	1.00							
Th-Series	Bq/L									8	0.3 - 5		-0.24	0.55	-1.14	0.55
U-Series	Bq/L									8	0.33 - 3.7		0.05	0.56	-0.95	0.69

###	Maximum value exceeds criteria.
###	RPD less than -20 (decrease). P-value for decrease statistically significant.
###	RPD greater than 20 (increase). P-value for increase statistically significant.

Notes:

a - 2019 data is uncensored. Therefore some parameters may have values below the MDL.

b - MDLs for radionuclides are shown as a range.

c - Exceedances of I-131 were attributed to a QAQC issue.

Note: Due to all concentrations in 2007/2008 being below MDL for parameters that were measured in both years, RPD and p-values were not calculated.

Table D-5: Assessment of Change in Baseline Radionuclide Surface Water Data from 2007/2008 to 2019

Radionuclide	Units	Criteria	2008 Sampling Program SW08							2019 Sampling Program[a] DNGS-Far						
			N	MDL	% above MDL	Mean	Std Dev	Min	Max	N	MDL[b]	% above MDL	Mean	Std Dev	Min	Max
Ag-110m	Bq/L		14	2	0.0	-	-	1.00	1.00							
Ba-140	Bq/L		14	5(11); 6(1); 9(1); 12(1)	0.0	-	-	2.50	6.00							
Be-7	Bq/L		14	10	0.0	-	-	5.00	5.00							
Carbon-14	Bq/L	200	14	0.5	0.0	-		0.25	0.25	4	0.04 - 0.1	25%	0.02	0.06	-0.03	0.10
Ce-141	Bq/L		14	1(13); 2(1)	0.0	-	-	0.50	1.00							
Ce-144	Bq/L		14	5	0.0	-	-	2.50	2.50							
Chlorine-36	Bq/L															
Co-57	Bq/L		14	1	0.0	-	-	0.50	0.50							
Co-58	Bq/L		14	1	0.0	-	-	0.50	0.50							
Co-60	Bq/L	2	14	1	0.0	-	-	0.50	0.50	4	0.066 - 0.95	0%	-0.04	0.05	-0.09	0.02
Cr-51	Bq/L		14	10	0.0	-	-	5.00	5.00							
Cs-134	Bq/L	7	14	1	0.0	-	-	0.50	0.50	4	0.094 - 0.99	0%	-0.24	0.24	-0.53	0.05
Cs-137	Bq/L	10	14	1	0.0	-	-	0.50	0.50	4	0.11 - 0.9	0%	0.01	0.17	-0.12	0.24
Eu-154	Bq/L		14	3	0.0	-	-	1.50	1.50							
Eu-155	Bq/L		14	2	0.0	-	-	1.00	1.00							
Fe-59	Bq/L		14	2(13); 3(1)	0.0	-	-	1.00	1.50							
Gross Beta	Bq/L		14	0.1	7.0	0.054	0.013	0.05	0.1							
I-131[c]	Bq/L	6	14	2(11); 3(2); 4(1)	0.0	-	-	1.00	2.00	4	0.078 - 170	0%	1.8	3.3	0.09	6.7
Iodine-129	Bq/L															
Iodine-129	Bq/L															
K-40	Bq/L		14	10	0.0	-	-	5.00	5.00	4	0.79 - 11	0%	-0.75	3.7	-3.60	4.7
La-140	Bq/L		14	2(12); 3(2)	0.0	-	-	1.00	1.50							
Mn-54	Bq/L		14	1	0.0	-	-	0.50	0.50							
Nb-95	Bq/L		14	1	0.0	-	-	0.50	0.50							
Ru-103	Bq/L		14	1	0.0	-	-	0.50	0.50							
Ru-106	Bq/L		14	10	0.0	-	-	5.00	5.00							
Sb-124	Bq/L		14	2(13); 4(1)	0.0	-	-	1.00	2.00							
Sb-125	Bq/L		14	2	0.0	-	-	1.00	1.00							
Se-75	Bq/L		14	1	0.0	-	-	0.50	0.50							
Strontium-89	Bq/L															
Strontium-90	Bq/L	5														
Technicium-99	Bq/L															
Technicium-99	Bq/L															
Tritium	Bq/L	7000	14	15	0.0	-	-	7.50	7.50	4	9.4 - 14.8	0%	2.3	6.3	-5.30	9.2
Zn-65	Bq/L		10	3	0.0	-	-	1.50	1.50							
Zr-95	Bq/L		10	2	0.0	-	-	1.00	1.00							
Th-Series	Bq/L									4	0.3 - 5		-0.15	0.73	-1.19	0.48
U-Series	Bq/L									4	0.33 - 3.7		-0.14	0.51	-0.48	0.60

###	Maximum value exceeds criteria.
###	RPD less than -20 (decrease). P-value for decrease statistically significant.
###	RPD greater than 20 (increase). P-value for increase statistically significant.

Notes:

a - 2019 data is uncensored. Therefore some parameters may have values below the MDL.

b - MDLs for radionuclides are shown as a range.

c - Exceedances of I-131 were attributed to a QAQC issue.

Note: Due to all concentrations in 2007/2008 being below MDL for parameters that were measured in both years, RPD and p-values were not calculated.

Table D-5: Assessment of Change in Baseline Radionuclide Surface Water Data from 2007/2008 to 2019

Radionuclide	Units	Criteria	2008 Sampling Program SW09							2019 Sampling Program[a] SW09						
			N	MDL	% above MDL	Mean	Std Dev	Min	Max	N	MDL[b]	% above MDL	Mean	Std Dev	Min	Max
Ag-110m	Bq/L		19	2	0.0	-	-	1.00	1.00							
Ba-140	Bq/L		19	5(18);6(1)	0.0	-	-	2.50	2.50							
Be-7	Bq/L		19	10	0.0	-	-	5.00	5.00							
Carbon-14	Bq/L	200	19	0.5	0.0	-		0.25	0.25	8	0.04 - 0.1	25%	0.05	0.07	-0.05	0.15
Ce-141	Bq/L		19	1	0.0	-	-	0.50	0.50							
Ce-144	Bq/L		19	5	0.0	-	-	2.50	2.50							
Chlorine-36	Bq/L															
Co-57	Bq/L		19	1	0.0	-	-	0.50	0.50							
Co-58	Bq/L		19	1	0.0	-	-	0.50	0.50							
Co-60	Bq/L	2	19	1	0.0	-	-	0.50	0.50	8	0.066 - 0.95	0%	-0.02	0.12	-0.18	0.22
Cr-51	Bq/L		19	10	0.0	-	-	5.00	5.00							
Cs-134	Bq/L	7	19	1	0.0	-	-	0.50	0.50	8	0.094 - 0.99	0%	0.11	0.21	-0.13	0.58
Cs-137	Bq/L	10	19	1	0.0	-	-	0.50	0.50	8	0.11 - 0.9	12.5%	0.25	0.25	0.05	0.73
Eu-154	Bq/L		19	3	0.0	-	-	1.50	1.50							
Eu-155	Bq/L		19	2	0.0	-	-	1.00	1.00							
Fe-59	Bq/L		19	2	0.0	-	-	1.00	1.00							
Gross Beta	Bq/L		19	0.1	11.0	0	0	0	0							
I-131[c]	Bq/L	6	19	2	0.0	-	-	1.00	1.00	8	0.078 - 170	0%	3.6	7.2	-0.02	20
Iodine-129	Bq/L															
Iodine-129	Bq/L															
K-40	Bq/L		19	10	0.0	-	-	5.00	5.00	8	0.79 - 11	0%	-1.50	3.9	-7.87	2.8
La-140	Bq/L		19	2	0.0	-	-	1.00	1.00							
Mn-54	Bq/L		19	1	0.0	-	-	0.50	0.50							
Nb-95	Bq/L		19	1	0.0	-	-	0.50	0.50							
Ru-103	Bq/L		19	1	0.0	-	-	0.50	0.50							
Ru-106	Bq/L		19	10	0.0	-	-	5.00	5.00							
Sb-124	Bq/L		19	2	0.0	-	-	1.00	1.00							
Sb-125	Bq/L		19	2	0.0	-	-	1.00	1.00							
Se-75	Bq/L		19	1	0.0	-	-	0.50	0.50							
Strontium-89	Bq/L															
Strontium-90	Bq/L	5														
Technicium-99	Bq/L															
Technicium-99	Bq/L															
Tritium	Bq/L	7000	19	15	0.0	-	-	7.50	7.50	8	9.4 - 14.8	0%	0.65	3.3	-5.20	5.2
Zn-65	Bq/L		19	3	0.0	-	-	1.50	1.50							
Zr-95	Bq/L		19	2	0.0	-	-	1.00	1.00							
Th-Series	Bq/L									8	0.3 - 5		0.16	0.57	-0.41	1.3
U-Series	Bq/L									8	0.33 - 3.7		0.02	0.57	-1.29	0.53

###	Maximum value exceeds criteria.
###	RPD less than -20 (decrease). P-value for decrease statistically significant.
###	RPD greater than 20 (increase). P-value for increase statistically significant.

Notes:
a - 2019 data is uncensored. Therefore some parameters may have values below the MDL.
b - MDLs for radionuclides are shown as a range.
c - Exceedances of I-131 were attributed to a QAQC issue.
Note: Due to all concentrations in 2007/2008 being below MDL for parameters that were measured in both years, RPD and p-values were not calculated.

Table D-5: Assessment of Change in Baseline Radionuclide Surface Water Data from 2007/2008 to 2019

Radionuclide	Units	Criteria	2008 Sampling Program SW10							2019 Sampling Program[a] SW10						
			N	MDL	% above MDL	Mean	Std Dev	Min	Max	N	MDL[b]	% above MDL	Mean	Std Dev	Min	Max
Ag-110m	Bq/L		14	2	0.0	-	-	1.00	1.00							
Ba-140	Bq/L		14	5(13); 6(1)	0.0	-	-	2.50	3.00							
Be-7	Bq/L		14	10	0.0	-	-	5.00	5.00							
Carbon-14	Bq/L	200	14	0.5	0.0	-		0.25	0.25	4	0.04 - 0.1	50%	0.03	0.06	-0.03	0.10
Ce-141	Bq/L		14	1	0.0	-	-	0.50	0.50							
Ce-144	Bq/L		14	5	0.0	-	-	2.50	2.50							
Chlorine-36	Bq/L															
Co-57	Bq/L		14	1	0.0	-	-	0.50	0.50							
Co-58	Bq/L		14	1	0.0	-	-	0.50	0.50							
Co-60	Bq/L	2	14	1	0.0	-	-	0.50	0.50	4	0.066 - 0.95	0%	0.09	0.01	0.08	0.11
Cr-51	Bq/L		14	10	0.0	-	-	5.00	5.00							
Cs-134	Bq/L	7	14	1	0.0	-	-	0.50	0.50	4	0.094 - 0.99	0%	0.08	0.06	0.01	0.13
Cs-137	Bq/L	10	14	1	0.0	-	-	0.50	0.50	4	0.11 - 0.9	25%	0.24	0.22	0.08	0.54
Eu-154	Bq/L		14	3	0.0	-	-	1.50	1.50							
Eu-155	Bq/L		14	2	0.0	-	-	1.00	1.00							
Fe-59	Bq/L		14	2	0.0	-	-	1.00	1.00							
Gross Beta	Bq/L		14	0.1	14.0	0	0	0	0							
I-131[c]	Bq/L	6	14	2	0.0	-	-	1.00	1.00	4	0.078 - 170	0%	8.8	17	0.16	34
Iodine-129	Bq/L															
Iodine-129	Bq/L															
K-40	Bq/L		14	10	0.0	-	-	5.00	5.00	4	0.79 - 11	0%	-3.18	1.0	-4.29	-1.93
La-140	Bq/L		14	2	0.0	-	-	1.00	1.00							
Mn-54	Bq/L		14	1	0.0	-	-	0.50	0.50							
Nb-95	Bq/L		14	1	0.0	-	-	0.50	0.50							
Ru-103	Bq/L		14	1	0.0	-	-	0.50	0.50							
Ru-106	Bq/L		14	10	0.0	-	-	5.00	5.00							
Sb-124	Bq/L		14	2	0.0	-	-	1.00	1.00							
Sb-125	Bq/L		14	2	0.0	-	-	1.00	1.00							
Se-75	Bq/L		14	1	0.0	-	-	0.50	0.50							
Strontium-89	Bq/L															
Strontium-90	Bq/L	5														
Technicium-99	Bq/L															
Technicium-99	Bq/L															
Tritium	Bq/L	7000	14	15	0.0	-	-	7.50	7.50	4	9.4 - 14.8	0%	-1.28	2.6	-5.10	0.00
Zn-65	Bq/L		14	3	0.0	-	-	1.50	1.50							
Zr-95	Bq/L		14	2	0.0	-	-	1.00	1.00							
Th-Series	Bq/L									4	0.3 - 5		0.33	0.18	0.11	0.50
U-Series	Bq/L									4	0.33 - 3.7		0.46	0.27	0.06	0.63

###	Maximum value exceeds criteria.
###	RPD less than -20 (decrease). P-value for decrease statistically significant.
###	RPD greater than 20 (increase). P-value for increase statistically significant.

Notes:
a - 2019 data is uncensored. Therefore some parameters may have values below the MDL.
b - MDLs for radionuclides are shown as a range.
c - Exceedances of I-131 were attributed to a QAQC issue.
Note: Due to all concentrations in 2007/2008 being below MDL for parameters that were measured in both years, RPD and p-values were not calculated.

Table D-5: Assessment of Change in Baseline Radionuclide Surface Water Data from 2007/2008 to 2019

Radionuclide	Units	2008 Sampling Program Coots Pond (SW12)							2019 Sampling Program[a] Coots Pond (SW12)										
		N	MDL	% above MDL	Mean	Std Dev	Min	Max	N	MDL[b]	% above MDL	Mean	Std Dev	Min	Max	RPD (means)	Welch t-test (means)	p-value	Note[c]
Ag-110m	Bq/L	26	2	0%	-	-	1.0	1.0											d,e
Ba-140	Bq/L	26	5 (24);7 (1); 9(1)	8%	2.6	0.43	2.5	4.5											e
Be-7	Bq/L	26	10	0%	-	-	5.0	5.0											d,e
Carbon-14	Bq/L	5	0.5	0%	-	-	0	0	3	0.04 - 0.1	0%	-0.03	0.04	-0.07	0.01				d,e
Ce-141	Bq/L	26	1	0%	-	-	1	1											d,e
Ce-144	Bq/L	26	5	0%	-	-	2.5	2.5											d,e
Chlorine-36	Bq/L	11	10	0%	-	-	5.0	5.0											d,e
Co-57	Bq/L	26	1	0%	-	-	1	1											d,e
Co-58	Bq/L	26	1	0%	-	-	1	1											d,e
Co-60	Bq/L	26	1	0%	-	-	1	1	3	0.066 - 0.95	0%	-0.03	0.08	-0.11	0.05				d,e
Cr-51	Bq/L	26	10	0%	-	-	5.0	5.0											d,e
Cs-134	Bq/L	26	1	0%	-	-	1	1	3	0.094 - 0.99	0%	0.10	0.06	0.03	0.14				d,e
Cs-137	Bq/L	26	1	0%	-	-	1	1	3	0.11 - 0.9	0%	0.08	0.08	0.02	0.17				d,e
Eu-154	Bq/L	26	3	0%	-	-	1.5	1.5											d,e
Eu-155	Bq/L	26	2	0%	-	-	1.0	1.0											d,e
Fe-59	Bq/L	26	2	0%	-	-	1.0	1.0											d,e
Gross Beta	Bq/L	26	0.1	85%	0.41	0.28	0.05	0.90											e
I-131	Bq/L	26	2 (24);3 (1); 4(1)	8%	1.1	0.22	1.0	2.0	3	0.078 - 170	0%	1.1	2.4	-0.49	3.9	6	-0.0507796	0.961149	e
Iodine-129	Bq/L	5	10	0%	-	-	5.0	5.0											d,e
Iodine-129	Bq/L	6	10	0%	-	-	5.0	5.0											d,e
K-40	Bq/L	26	10	0%	-	-	5.0	5.0	3	0.79 - 11	0%	-5.96	6.5	-13.30	-0.86				d,e
La-140	Bq/L	26	2	0%	-	-	1.0	1.0											d,e
Mn-54	Bq/L	26	1	0%	-	-	1	1											d,e
Nb-95	Bq/L	26	1	0%	-	-	1	1											d,e
Ru-103	Bq/L	26	1	0%	-	-	1	1											d,e
Ru-106	Bq/L	26	10	0%	-	-	5.0	5.0											d,e
Sb-124	Bq/L	26	2	0%	-	-	1.0	1.0											d,e
Sb-125	Bq/L	26	2	0%	-	-	1.0	1.0											d,e
Se-75	Bq/L	26	1	0%	-	-	1	1											d,e
Strontium-89	Bq/L	11	0.1	0%	-	-	0	0											d,e
Strontium-90	Bq/L	11	0.1	0%	-	-	0	0											d,e
Technicium-99	Bq/L	5	10	0%	-	-	5.0	5.0											d,e
Technicium-99	Bq/L	6	10	0%	-	-	5.0	5.0											d,e
Tritium	Bq/L	26	15	100%	51	17	18	78	3	9.4 - 14.8	100%	31	0.95	30	32	-49	5.8289003	0.001122	
Zn-65	Bq/L	26	3	0%	-	-	1.5	1.5											d,e
Zr-95	Bq/L	26	2	0%	-	-	1.0	1.0											d,e
Th-Series	Bq/L								3	0.3 - 5	0%	-0.41	0.44	-0.69	0.10				
U-Series	Bq/L								3	0.33 - 3.7	0%	0.08	0.09	0.02	0.18				

###	Maximum value exceeds criteria.
###	RPD less than -20 (decrease). P-value for decrease statistically significant.
###	RPD greater than 20 (increase). P-value for increase statistically significant.

Notes:

a - 2019 data is uncensored. Therefore some parameters may have values below the MDL.

b - MDLs for radionuclides are shown as a range.

c - Parameters with both 'd' and 'e' notes indicate that 100% of samples in both 2008 and 2019 were below detection. Therefore assessment of change is not possible.

d - The 2009 ERA TSD set all samples to 1/2 MDL if all measurements were <MDL. Therefore, RPD and p-value calculations are based on all 2008 measurements being 1/2MDL if all measurements were <MDL.

e - All 2019 samples were below the MDL. Results are based on un-detected uncensored data.

Table D-5: Assessment of Change in Baseline Radionuclide Surface Water Data from 2007/2008 to 2019

Radionuclide	Units	2008 Sampling Program Tree Frog Pond (SW13)							2019 Sampling Program[a] Tree Frog Pond (SW13)										
		N	MDL	% above MDL	Mean	Std Dev	Min	Max	N	MDL[b]	% above MDL	Mean	Std Dev	Min	Max	RPD (means)	Welch t-test (means)	p-value	Note[c]
Ag-110m	Bq/L	29	2	0%	-	-	1.0	1.0											d,e
Ba-140	Bq/L	29	5 (27); 6(1); 9 (1)	7%	2.6	0.38	2.5	4.5											e
Be-7	Bq/L	29	10	0%	-	-	5.0	5.0											d,e
Carbon-14	Bq/L	5	0.5	0%	-	-	0	0	3	0.04 - 0.1	0%	0.06	0.02	0.05	0.09				d,e
Ce-141	Bq/L	29	1	0%	-	-	1	1											d,e
Ce-144	Bq/L	29	5	0%	-	-	2.5	2.5											d,e
Chlorine-36	Bq/L	9	10	0%	-	-	5.0	5.0											d,e
Co-57	Bq/L	29	1	0%	-	-	1	1											d,e
Co-58	Bq/L	29	1	0%	-	-	1	1											d,e
Co-60	Bq/L	29	1	0%	-	-	1	1	3	0.066 - 0.95	0%	0.04	0.02	0.02	0.06				d,e
Cr-51	Bq/L	29	10	0%	-	-	5.0	5.0											d,e
Cs-134	Bq/L	29	1	0%	-	-	1	1	3	0.094 - 0.99	0%	0.00	0.09	-0.10	0.07				d,e
Cs-137	Bq/L	29	1	0%	-	-	1	1	3	0.11 - 0.9	0%	0.02	0.06	-0.06	0.07				d,e
Eu-154	Bq/L	29	3	0%	-	-	1.5	1.5											d,e
Eu-155	Bq/L	29	2	0%	-	-	1.0	1.0											d,e
Fe-59	Bq/L	29	2	0%	-	-	1.0	1.0											d,e
Gross Beta	Bq/L	29	0.1	83%	0.41	0.26	0.05	0.80											e
I-131	Bq/L	29	2 (27); 3(1); 5(1)	7%	1.1	0.29	1.0	2.5	3	0.078 - 170	0%	-0.62	1.4	-2.27	0.22	-750	2.042395	0.087155	e
Iodine-129	Bq/L	3	10	0%	-	-	5.0	5.0											d,e
Iodine-129	Bq/L	6	10	0%	-	-	5.0	5.0											d,e
K-40	Bq/L	29	10	0%	-	-	5.0	5.0	3	0.79 - 11	0%	-2.78	1.8	-4.84	-1.31				d,e
La-140	Bq/L	29	2	0%	-	-	1.0	1.0											d,e
Mn-54	Bq/L	29	1	0%	-	-	1	1											d,e
Nb-95	Bq/L	29	1	0%	-	-	1	1											d,e
Ru-103	Bq/L	29	1	0%	-	-	1	1											d,e
Ru-106	Bq/L	29	10	0%	-	-	5.0	5.0											d,e
Sb-124	Bq/L	29	2	0%	-	-	1.0	1.0											d,e
Sb-125	Bq/L	29	2	0%	-	-	1.0	1.0											d,e
Se-75	Bq/L	29	1	0%	-	-	1	1											d,e
Strontium-89	Bq/L	14	0.1	0%	-	-	0	0											d,e
Strontium-90	Bq/L	14	0.1	0%	-	-	0	0											d,e
Technicium-99	Bq/L	3	10	0%	-	-	5.0	5.0											d,e
Technicium-99	Bq/L	6	10	0%	-	-	5.0	5.0											d,e
Tritium	Bq/L	29	7	100%	83	31	44	158	3	9.4 - 14.8	100%	42	14	31	58	-66	4.088819	0.006438	
Zn-65	Bq/L	29	3	0%	-	-	1.5	1.5											d,e
Zr-95	Bq/L	29	2	0%	-	-	1.0	1.0											d,e
Th-Series	Bq/L								3	0.3 - 5		0.09	0.24	-0.17	0.31				
U-Series	Bq/L								3	0.33 - 3.7		0.35	0.73	-0.34	1.1				

###	Maximum value exceeds criteria.
###	RPD less than -20 (decrease). P-value for decrease statistically significant.
###	RPD greater than 20 (increase). P-value for increase statistically significant.

Notes:

a - 2019 data is uncensored. Therefore some parameters may have values below the MDL.

b - MDLs for radionuclides are shown as a range.

c - Parameters with both 'd' and 'e' notes indicate that 100% of samples in both 2008 and 2019 were below detection. Therefore assessment of change is not possible.

d - The 2009 ERA TSD set all samples to 1/2 MDL if all measurements were <MDL. Therefore, RPD and p-value calculations are based on all 2008 measurements being 1/2MDL if all measurements were <MDL.

e - All 2019 samples were below the MDL. Results are based on un-detected uncensored data.

Appendix E: Aquatic Communities

Appendix E-1: Tributary Fish Habitat Site Photographs

Photo 1: Darlington Creek Tributary D2 looking upstream (25 April 2019). This upper reach receives runoff from an adjacent cornfield. No water was observed within this portion of the intermittent watercourse.

Photo 2: Darlington Creek Tributary D2 looking upstream (25 April 2019). This upper reach is located west of the eastern DNNP property boundary. Some standing water was observed within this portion of the intermittent watercourse.

Photo 3: Darlington Creek Tributary D2 looking upstream (25 April 2019). This mid reach is located east of the DNNP lands, and flows intermittently through an agricultural field. No water was observed within the grass and shrub lined channel.

Photo 4: Darlington Creek Tributary D2 looking downstream (25 April 2019). At this location, the tributary flows intermittently through a plowed agricultural field. No flow was observed within this mid reach portion of the watercourse.

Photo 5: Darlington Creek Tributary D2 looking upstream (25 April 2019). This lower reach is situated west of Symons Road, and flows intermittently within an undefined channel.

Photo 6: Darlington Creek Tributary D2 looking downstream (25 April 2019). At this location, no defined channel, nor a culvert beneath Symons Road were observed. No flow was observed within this lower reach portion of the intermittent watercourse.

Photo 7: Darlington Creek Tributary E looking upstream (25 April 2019). This upper reach is fed by ditches and flows within a small wooded area. Standing water with very little flow was observed within this portion of the intermittent watercourse.

Photo 8: Darlington Creek Tributary E looking downstream (25 April 2019). Below the wooded area, the upper reach flows through a wetland.

Photo 9: Darlington Creek Tributary E looking upstream (25 April 2019). This mid reach is located west of the eastern DNNP property boundary. Above the access road, the intermittent tributary flows through a grassed field within a braided channel.

Photo 10: Darlington Creek Tributary E looking downstream (25 April 2019). Flow was observed within a defined channel, immediately below the access road culvert.

Photo 11: Darlington Creek Tributary E looking downstream (25 April 2019). This lower reach is situated on St. Marys Cement property, east of the DNNP lands. At this location, the watercourse flows among grasses and shrubs within a defined channel.

Photo 12: Darlington Creek Tributary E looking downstream (25 April 2019). Much of this lower reach flows within a defined channel with woody riparian vegetation. Despite its proximity to Darlington Creek, no fish were observed within this watercourse.

Client: OPG
Project No.: 18-2521
Investigators: RG, AP

1 of 1

DARLINGTON CREEK TRIBUTARY ELECTROFISHING FIELD SHEET

Watercourse: Darlington Creek Tributary Station No.: D2 E Reach: Upper Mid Lower
Location: U/S + D/S Date: April 25/19 Time: 15:00
UTM Coordinates (NAD83, Zone 17T): Top of Reach: 0684797 E 4860721 N
Bottom of Reach: 0684540 E 4860697 N
Electrofishing Effort: 137 (seconds) Length Surveyed (min 60m): 30 (m) Water Temp: 9.4 (°C)

Species	Length (mm)	Weight (g)	Sex	Age Class	Reproductive Condition
NO Fish					
TOTALS					

Photo ID: 8179 Description: D/S VIEW TO EAST BELOW ROAD
Photo ID: 8183 Description: D/S VIEW TO EAST ABOVE ROAD
Photo ID: ____ Description: ____

Notes: Channel undefined upstream, therefore limiting reached electrofished.

Field Sheet Sign Off Name: ROB GAKINS Signature: [signature]

Client: OPG
Project No.: 18-2521
Investigators: RG, AT

DARLINGTON CREEK TRIBUTARY ELECTROFISHING FIELD SHEET

Watercourse: Darlington Creek Tributary Station No.: D2 E Reach: Upper Mid Lower
Location: U/S DARLINGTON CREEK Date: 25 APRIL 2019 Time: 12:30
UTM Coordinates (NAD83, Zone 17T): Top of Reach: 0684718 E 4860651 N
Bottom of Reach: 0684781 E 4860663 N
Electrofishing Effort: 347 (seconds) Length Surveyed (min 60m): 70 (m) Water Temp: 8.6 (°C)

Species	Length (mm)	Weight (g)	Sex	Age Class	Reproductive Condition
NO FISH					
TOTALS					

Photo ID: 8166 Description: D/S VIEW TO EAST
Photo ID: 8176 Description: U/S VIEW TO WEST
Photo ID: 8175 Description: D/S VIEW TO EAST

Notes: 3-SPINE STICKLEBACK ADULTS, RAINBOW TROUT PARR, CHINOOK SALMON PARR COLLECTED IN DARLINGTON CREEK

Field Sheet Sign Off Name: ROB GOKINT Signature: [signature]

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: OPG
Project No. 18-2521
Investigators:

Date: 25 APRIL 2019
Time: 16:30

LOCATION DATA

Watercourse: Darlington Creek Tributary		Station Number: D2 E	
Reach: Upper Mid Lower	Location: O/S SITE ROAD		
UTM Coordinates (NAD83, Zone 17T): 0684265 E 4860905 N			
Topo Map Name/No.: 30 M/15	Township: CLARINGTON MUN		Stream Order: 1

STATION DATA

Flow Vel. (m/s): 0.05	Length (m): 75	Mean Width (m): 1.2	Mean Depth (m): 0.1

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable:	Stable: 100

Stream Morphology (% Total Surface Area)

Pool: 65	Riffle: 5	Cascade:	Run:	Flat: 30

Stream Gradient (% Reach)

High:	Moderate: 60	Low: 40

Stream Channel Type (% Reach)

Straight:	Meandering: 60	Braided: 40	Ponded:

Stream Canopy (% Stream Shaded)

Dense: 60	Partly Open: 40	Open:

Instream Cover (% Total Surface Area)

Undercut Banks:	Boulder:	Logs & Trees: 5	Log Jams: 10	Deep Pool: 5	Aquatic Macrophyte:

Substrate Types (%)

Bedrock:	Boulder:	Cobble:	Gravel:	Sand:
Silt:	Clay: 100	Marl:	Muck:	Detritus:

Terrain Characteristics (%)

Cultivated:	Meadow: 40	Lawn:	Urban:	Forested Lowland: 60
Marsh:	Beaver Pond:	Bog:	Swamp:	Forested Upland:

Dominant Terrestrial Vegetation: WILLOW, DOGWOOD, HAWTHORN
Dominant Aquatic Vegetation: CATTAIL
Adjacent Land Use: INDUSTRIAL

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers/Obstacles Observed: None (X) Natural ( ) Artificial ( ) Type: ______

WEATHER

Cloud Cover (%): 100 Air Temperature (°C): 8
Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Time: 16:23	Water Temp. (°C): 8.9	DO (mg/L): 8.72	DO (% Sat.): 75.3
Turbidity (NTU): 0.50	Specific Cond. (µS/cm): 583		pH: 8.23

Water Colour: Colourless (X) Yellow/Brown ( ) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) D-Net ( ) Other ( ) ______

Sampling Methods: Qualitative ( ) Quantitative ( ) OBBN ( ) Other ( ) ______

Benthic Community Notes: ______

Fish Community
Not Assessed (X) Electrofisher ( ) Seine ( ) Dip Net ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Other. ( ) ______

Sampling Methods: Qualitative ( ) Quantitative ( ) Other. ( ) ______

Fish Community Notes: DEFINED CHANNEL IN WILLOWS, UNDEFINED IN WETLAND D/S FLOODED FOREST [illegible]

PHOTOS (Required)
ID: 8168 Description: D/S VIEW TO SOUTH
ID: 8190 Description: U/S VIEW TO NORTH
ID: 8193 Description: U/S VIEW TO NORTH
ID: 8194 Description: D/S VIEW TO SOUTH WETLAND

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: OPG
Project No. 18-2521
Investigators: RE & AP

Date: April 25/19
Time: 15:00

LOCATION DATA

Watercourse: Darlington Creek Tributary		Station Number: D2 (E)
Reach: Upper (Mid) Lower	Location: Upstream OPG property line	
UTM Coordinates (NAD83, Zone 17T): 0684532 E	4860704 N	
Topo Map Name/No.: 30 M/15	Township: Clarington	Stream Order: 1st

STATION DATA

Flow Vel. (m/s): 0.2	Length (m): 60	Mean Width (m): 0.65	Mean Depth (m): 0.16

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable: 100%	Moderately Unstable:	Stable:

Stream Morphology (% Total Surface Area)

Pool: 5%	Riffle: 5%	Cascade:	Run: 90%	Flat:

Stream Gradient (% Reach)

High:	Moderate: 100%	Low:

Stream Channel Type (% Reach)

Straight:	Meandering:	Braided: 100%	Ponded:

Stream Canopy (% Stream Shaded)

Dense:	Partly Open: 50%	Open: 50%

Instream Cover (% Total Surface Area)

Undercut Banks: –	Boulder: –	Logs & Trees: –	Log Jams: –	Deep Pool: –	Aquatic Macrophyte: –

Substrate Types (%)

Bedrock:	Boulder:	Cobble: 5	Gravel:	Sand:
Silt: 45	Clay: 50	Marl:	Muck:	Detritus:

45	50	45	120
15	13	18	18
0.35	0.16	0.07	0.14

Terrain Characteristics (%)

Cultivated:	Meadow: 80	Lawn:	Urban:	Forested Lowland: 20
Marsh:	Beaver Pond:	Bog:	Swamp:	Forested Upland:

Dominant Terrestrial Vegetation: Willow, Dogwood, grass
Dominant Aquatic Vegetation: Reed Canary, Cattail, Marsh Marigold
Adjacent Land Use: INDUSTRIAL

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy (X)
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers/Obstacles Observed: None (X) Natural ( ) Artificial ( ) Type: ______

WEATHER

Cloud Cover (%): 80 Air Temperature (°C): 12
Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Time: 2:40pm	Water Temp. (°C): 9.4	DO (mg/L): 8.39	DO (% Sat.): 73.5
Turbidity (NTU): 1.70	Specific Cond. (µS/cm): 570		pH: 8.13

Water Colour: Colourless (X) Yellow/Brown ( ) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) D-Net ( ) Other (X) VISUAL

Sampling Methods: Qualitative ( ) Quantitative ( ) OBBN ( ) Other ( ) ______

Benthic Community Notes: EARTHWORMS + SNAIL OBSERVED

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dip Net ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Other. ( ) ______

Sampling Methods: Qualitative (X) Quantitative ( ) Other. ( ) ______

Fish Community Notes: No fish 137 SECONDS

PHOTOS (Required)
ID: 8179 Description: D/S VIEW TO EAST BELOW ROAD
ID: 8181 Description: U/S VIEW TO WEST ABOVE ROAD
ID: 8184 Description: U/S VIEW TO WEST ABOVE ROAD
ID: 8185 Description: U/S VIEW TO WEST ABOVE ROAD

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: OPG
Project No. 18-2521
Investigators: RE/AP

Date: 25 APRIL 2019
Time: 11:45am

LOCATION DATA

Watercourse: Darlington Creek Tributary		Station Number: D2 E
Reach: Upper Mid Lower	Location: Upstream Darlington Creek (St. Marys)	
UTM Coordinates (NAD83, Zone 17T): 0684764 E 4860662 N		
Topo Map Name/No.: 30 M/15	Township: Clarington MUN	Stream Order: 1

STATION DATA

Flow Vel. (m/s): 0.25	Length (m): 70	Mean Width (m): 1	Mean Depth (m): 0.21

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable: 55	Stable: 45

Stream Morphology (% Total Surface Area)

Pool: 5	Riffle: 40	Cascade: ✓	Run: 35	Flat: 10

Stream Gradient (% Reach)

High:	Moderate: 100	Low:

Stream Channel Type (% Reach)

Straight:	Meandering: 55	Braided: 45	Ponded:

Stream Canopy (% Stream Shaded)

Dense: 40	Partly Open: 60	Open:

Instream Cover (% Total Surface Area)

Undercut Banks:	Boulder: 5	Logs & Trees:	Log Jams: ✓	Deep Pool: ✓	Aquatic Macrophyte:

Substrate Types (%)

Bedrock:	Boulder: 5	Cobble: 25	Gravel: 15	Sand: 5
Silt: 25	Clay: 25	Marl:	Muck:	Detritus:

0.4 0.45 0.3 0.2 0.1
1.1 0.9 1.2 0.5 1.2
7 10 10 9 15

Terrain Characteristics (%)

Cultivated:	Meadow: 50	Lawn:	Urban:	Forested Lowland: 50
Marsh:	Beaver Pond:	Bog:	Swamp:	Forested Upland:

Dominant Terrestrial Vegetation: DOGWOOD, WILLOW, HAWTHORN, GRASS
Dominant Aquatic Vegetation: NONE
Adjacent Land Use: ST. MARY'S CEMENT

Sediment Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers/Obstacles Observed: None ( ) Natural (X) Artificial ( ) Type: LOG JAM

WEATHER

Cloud Cover (%): 0 Air Temperature (°C): 10
Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )
Recent Precipitation: None (X) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Time: 12:06 pm	Water Temp. (°C): 8.606	DO (mg/L): 11.37	DO (% Sat.): 97.6
Turbidity (NTU): 2.85	Specific Cond. (µS/cm): 671		pH: 8.49

Water Colour: Colourless (✓) Yellow/Brown ( ) Blue/Green ( )
Water Clarity: Clear (✓) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) D-Net ( ) Other ( ) ______

Sampling Methods: Qualitative ( ) Quantitative ( ) OBBN ( ) Other ( ) ______

Benthic Community Notes: ______

Fish Community
Not Assessed ( ) Electrofisher (X) Seine ( ) Dip Net ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Other. ( ) ______

Sampling Methods: Qualitative (X) Quantitative ( ) Other. ( ) ______

Fish Community Notes: NO FISH COLLECTED 347 SECONDS

PHOTOS (Required)
ID: 8166 Description: D/S VIEW TO EAST
ID: 8171 Description: CROSS CHANNEL VIEW TO SOUTH
ID: 8175 Description: D/S VIEW TO EAST
ID: 8176 Description: U/S VIEW TO WEST

EcoMetrix Incorporated Stream Habitat Assessment Form	Client: OPG Project No. 18-2521 Investigators: RE & AP	Date: April 25/2019 Time: 17:35

LOCATION DATA

Watercourse: Darlington Creek Tributary		Station Number: D2 E
Reach: Upper Mid Lower	Location: Upstream of access Rd. (OPG)	
UTM Coordinates (NAD83, Zone 17T): 0684200 E 4861491 N		
Topo Map Name/No.: 30 M / 15	Township: Clarington MUN	Stream Order: 1st

STATION DATA

Flow Vel. (m/s): —	Length (m): 90	Mean Width (m): 0.5	Mean Depth (m): Ø

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable: 20%	Moderately Unstable: 80%	Stable:

Stream Morphology (% Total Surface Area)

Pool: —	Riffle: —	Cascade: —	Run: —	Flat: —

Stream Gradient (% Reach)

High:	Moderate: 100%	Low:

Stream Channel Type (% Reach)

Straight:	Meandering: 90%	Braided: 10%	Ponded:

Stream Canopy (% Stream Shaded)

Dense: 100%	Partly Open:	Open:

Instream Cover (% Total Surface Area)

Undercut Banks: —	Boulder: —	Logs & Trees: —	Log Jams: —	Deep Pool: —	Aquatic Macrophyte: —

Substrate Types (%)

Bedrock:	Boulder: 50%	Cobble:	Gravel:	Sand:
Silt: 50%	Clay:	Marl:	Muck:	Detritus:

Terrain Characteristics (%)

Cultivated: 100%	Meadow:	Lawn:	Urban:	Forested Lowland:
Marsh:	Beaver Pond:	Bog:	Swamp:	Forested Upland:

Dominant Terrestrial Vegetation: Willow, Ash, Dogwood, Grape vine, Maple, Grass
Dominant Aquatic Vegetation: Marsh marigold, watercress (in)
Adjacent Land Use: Agriculture (corn)

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy (X)
Algae Overlaying Substrate: None (X) Slight ( ) Moderate ( ) Heavy ( )
Barriers/Obstacles Observed: None (X) Natural ( ) Artificial ( ) Type: ____________

WEATHER

Cloud Cover (%): 80% Air Temperature (°C): 11°C
Precipitation: None ( ) Light (✓) Moderate ( ) Heavy ( )
Recent Precipitation: None (✓) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Time: —	Water Temp. (°C): —	DO (mg/L): —	DO (% Sat.): —
Turbidity (NTU): —	Specific Cond. (µS/cm): —	pH: —	

Water Colour: Colourless (X) Yellow/Brown ( ) Blue/Green ( )
Water Clarity: Clear (X) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (X) Ekman ( ) Surber ( ) Ponar ( ) D-Net ( ) Other ( ) ____________

Sampling Methods: Qualitative ( ) Quantitative ( ) OBBN ( ) Other ( ) ____________

Benthic Community Notes: ____________

Fish Community
Not Assessed (X) Electrofisher ( ) Seine ( ) Dip Net ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Other. ( ) ____________

Sampling Methods: Qualitative ( ) Quantitative ( ) Other. ( ) ____________

Fish Community Notes: ____________

PHOTOS (Required)
ID: 8198 Description: U/S VIEW TO WEST AT ROAD
ID: 8199 Description: D/S VIEW TO EAST BELOW PROPERTY
ID: 8204 Description: U/S VIEW TO WEST
ID: 8207 Description: U/S VIEW TO WEST START OF CHANNEL

EcoMetrix Incorporated
Stream Habitat Assessment Form

Client: OPG
Project No. 18-2521
Investigators: RE & AP

Date: April 25, 2019
Time: 8:30 am

LOCATION DATA

Watercourse: Darlington Creek Tributary		Station Number: D2 E
Reach: Upper Mid Lower	Location: Mid crop field (Ontario Hydro)	
UTM Coordinates (NAD83, Zone 17T): 0684407 E 4861569 N		
Topo Map Name/No.: 30 M/15	Township: Clarington	Stream Order: 1st

STATION DATA

1.25 chanel width

Flow Vel. (m/s): n/a	Length (m): 85	Mean Width (m): ∅	Mean Depth (m): ∅

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable:	Moderately Unstable: 100%	Stable:

Stream Morphology (% Total Surface Area) N/A

Pool: —	Riffle: —	Cascade: —	Run: —	Flat: —

Stream Gradient (% Reach)

High:	Moderate: 100%	Low:

Stream Channel Type (% Reach)

Straight:	Meandering: 100%	Braided:	Ponded:

Stream Canopy (% Stream Shaded)

Dense:	Partly Open: 50%	Open: 50%

Instream Cover (% Total Surface Area)

Undercut Banks: —	Boulder: —	Logs & Trees: —	Log Jams: —	Deep Pool: —	Aquatic Macrophyte: —

Substrate Types (%)

Bedrock:	Boulder:	Cobble: ✓	Gravel:	Sand:
Silt:	Clay: 100%	Marl:	Muck:	Detritus:

Terrain Characteristics (%)

Cultivated: 100%	Meadow:	Lawn:	Urban:	Forested Lowland:
Marsh:	Beaver Pond:	Bog:	Swamp:	Forested Upland:

Dominant Terrestrial Vegetation: Willow, Dogwood, Burdock, grass, ELDERBERRY
Dominant Aquatic Vegetation: none
Adjacent Land Use: Transmission line easement, Agriculture.

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy (✓)
Algae Overlaying Substrate: None (✓) Slight ( ) Moderate ( ) Heavy ( )
Barriers/Obstacles Observed: None (✓) Natural ( ) Artificial ( ) Type: ____

WEATHER

Cloud Cover (%): 0% Air Temperature (°C): 6°C
Precipitation: None (✓) Light ( ) Moderate ( ) Heavy ( )
Recent Precipitation: None (✓) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Time: —	Water Temp. (°C): —	DO (mg/L): —	DO (% Sat.): —
Turbidity (NTU): —	Specific Cond. (µS/cm): —	pH: —	

Water Colour: n/a Colourless ( ) Yellow/Brown ( ) Blue/Green ( )
Water Clarity: n/a Clear ( ) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (✓) Ekman ( ) Surber ( ) Ponar ( ) D-Net ( ) Other ( ) ____

Sampling Methods: Qualitative ( ) Quantitative ( ) OBBN ( ) Other ( ) ____

Benthic Community Notes: ____

Fish Community
Not Assessed (✓) Electrofisher ( ) Seine ( ) Dip Net ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Other. ( ) ____

Sampling Methods: Qualitative ( ) Quantitative ( ) Other. ( ) ____

Fish Community Notes: Dry Channel

PHOTOS (Required)
ID: 8151 Description: U/S VIEW TO EAST OF SWALE
ID: 8152 Description: U/S VIEW CLOSE UP OF CHANNEL
ID: 8153 Description: D/S VIEW TO WEST BELOW SWALE
ID: 8154 Description: U/S VIEW TO EAST OF SWALE

EcoMetrix Incorporated
Stream Habitat Assessment
Form

Client: OPG
Project No. 18-2521
Investigators: RE & AP

Date: April 25, 2019
Time: 9:00 am

LOCATION DATA

Watercourse: Darlington Creek Tributary		Station Number: D2 E
Reach: Upper Mid Lower	Location: Upstream of Symons Rd.	
UTM Coordinates (NAD83, Zone 17T): 0684614 E		4861607 N
Topo Map Name/No.: 30 M/15	Township: Clarington Mun	Stream Order: 1st

STATION DATA

Flow Vel. (m/s): —	Length (m): 60	Mean Width (m): Ø	Mean Depth (m): Ø

HABITAT CHARACTERISTICS

Bank Stability (%)

Highly Unstable: 50%	Moderately Unstable:	Stable: 50%

Stream Morphology (% Total Surface Area)

Pool: —	Riffle: —	Cascade: —	Run: —	Flat: —

Stream Gradient (% Reach)

High:	Moderate: 50%	Low: 50%

Stream Channel Type (% Reach)

Straight:	Meandering: 30%	Braided: 70%	Ponded:

Stream Canopy (% Stream Shaded)

Dense:	Partly Open: 50%	Open: 50%

Instream Cover (% Total Surface Area)

Undercut Banks: —	Boulder: —	Logs & Trees: —	Log Jams: —	Deep Pool: —	Aquatic Macrophyte: —

Substrate Types (%)

Bedrock:	Boulder:	Cobble:	Gravel:	Sand:
Silt:	Clay: 100%	Marl:	Muck:	Detritus:

Terrain Characteristics (%)

Cultivated: 50%	Meadow: 50%	Lawn:	Urban:	Forested Lowland:
Marsh:	Beaver Pond:	Bog:	Swamp:	Forested Upland:

Dominant Terrestrial Vegetation: Grass, Willow, Poplar, Manitoba Maple
Dominant Aquatic Vegetation: n/a
Adjacent Land Use: Transmission line, Agricultural crops.

Sediment Overlaying Substrate: None ( ) Slight ( ) Moderate ( ) Heavy (✓)
Algae Overlaying Substrate: None (✓) Slight ( ) Moderate ( ) Heavy ( )
Barriers/Obstacles Observed: None ( ) Natural ( ) Artificial (✓) Type: Road - no culvert

WEATHER

Cloud Cover (%): 5% Air Temperature (°C): 6°C
Precipitation: None (✓) Light ( ) Moderate ( ) Heavy ( )
Recent Precipitation: None (✓) Light ( ) Moderate ( ) Heavy ( )

CHEMICAL PARAMETERS

Time: —	Water Temp. (°C): —	DO (mg/L): —	DO (% Sat.): —
Turbidity (NTU): —	Specific Cond. (µS/cm): —	pH: —	

Water Colour: n/a Colourless ( ) Yellow/Brown ( ) Blue/Green ( )
Water Clarity: n/a Clear ( ) Stained ( ) Turbid ( )

BIOLOGICAL CHARACTERISTICS

Benthic Community
Not Assessed (✓) Ekman ( ) Surber ( ) Ponar ( ) D-Net ( ) Other ( ) ______

Sampling Methods: Qualitative ( ) Quantitative ( ) OBBN ( ) Other ( ) ______

Benthic Community Notes: ______

Fish Community
Not Assessed (✓) Electrofisher ( ) Seine ( ) Dip Net ( ) Angling ( )
Minnow Trap ( ) Visual ( ) Other. ( ) ______

Sampling Methods: Qualitative ( ) Quantitative ( ) Other. ( ) ______

Fish Community Notes: Dry grass meadow and field.

PHOTOS (Required)
ID: 8161 Description: U/S VIEW TO EAST
ID: 8162 Description: U/S VIEW TO EAST
ID: 8164 Description: U/S VIEW TO EAST FIELD
ID: 8165 Description: D/S VIEW TO WEST

Appendix E-4: Fish Photo Documentation of 2019 Gillnetting Program

Figure 1: Left Alewife (*Alosa pseudoharengus*), Right – American Eel (*Anguilla rostrata*)

Figure 2: Left – Atlantic Salmon (*Salmo salar*), Right – Brown Bullhead (*Ameiurus nebulosus*)


Figure 3: Left – Brown Trout (*Salmo trutta*), Right – Chinook Salmon (*Onvorhynchus tshawytscha*)

Figure 4: Left – Common Carp (*Cyprinus carpio*), Right – Gizzard Shad (*Dorosoma cepedianum*)

Figure 5: Left – Lake Chub (*Couesius plumbeus*), Right – Lake Trout (*Salvelinus namaycush*)

Figure 6: Left – Lake Whitefish (*Coregonus clupeaformius*), Right – Largemouth Bass (*Micropterus salmoides*)

Figure 7: Left – Longnose Sucker (*Catostomus catostomus*), Right – Northern Pike (*Esox lucius*)

Figure 8: Left – Rainbow Smelt (*Osmerus mordax*), Right – Rainbow Trout (*Oncorhynchus mykiss*)

Figure 9: Left – Rock Bass (*Ambloplites rupestris*), Right – Round Goby (*Neogobius melanostomus*)

Figure 10: Left – Round Whitefish (*Prosopium cylindraceum*), Right – Walleye (*Sander vitreus*)

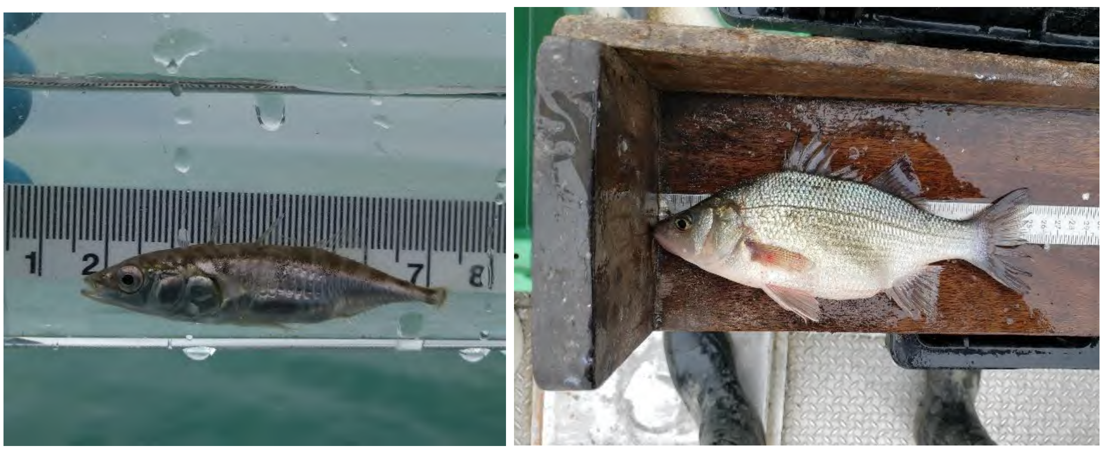

Figure 11: Left – Threespine Stickleback (*Gasterosteus aculeatus*), Right – White Perch (*Morone americana*)

Figure 12: Left – White Bass (*Morone chrysops*), Right – White Sucker (*Catostomus commersonii*)

Figure 13: Left – Yellow Perch (*Perca flavascens*)

Appendix E-6: Raw Fish Catch Data and Environmental Data for 2019 Gillnetting Program

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
23-Apr-19	24-Apr-19	B	DN	Experimental	Spring	1	1.5	White Sucker	38.0	40.6	720
23-Apr-19	24-Apr-19	B	DN	Experimental	Spring	1	1.5	White Sucker	33.2	34.8	480
23-Apr-19	24-Apr-19	B	DN	Experimental	Spring	1	2	Atlantic Salmon	40.1	42.7	650
23-Apr-19	24-Apr-19	B	DN	Experimental	Spring	1	2	White Sucker	33.3	35.5	480
23-Apr-19	24-Apr-19	B	DN	Experimental	Spring	1	2.5	Gizzard Shad	33.2	37.4	570
23-Apr-19	24-Apr-19	B	DN	Experimental	Spring	1	2.5	Gizzard Shad	34.9	39.8	730
23-Apr-19	24-Apr-19	B	DN	Experimental	Spring	1	2.5	Gizzard Shad	34.4	38.7	610
23-Apr-19	24-Apr-19	B	DN	Experimental	Spring	1	2.5	Lake Trout	79.4	84.5	6890
23-Apr-19	24-Apr-19	B	DN	Experimental	Spring	1	2.5	White Sucker	31.7	33.6	390
23-Apr-19	24-Apr-19	B	DN	Experimental	Spring	1	2.5	White Sucker	45.2	48.2	1420
23-Apr-19	24-Apr-19	B	DN	Experimental	Spring	1	3	White Sucker	40.9	43.4	1020
23-Apr-19	24-Apr-19	B	DN	Experimental	Spring	1	3	White Sucker	38.1	40.4	750
23-Apr-19	24-Apr-19	B	DN	Experimental	Spring	1	3.5	Brown Trout	56.1	57.8	2450
23-Apr-19	24-Apr-19	B	DN	Experimental	Spring	1	4.5	Chinook Salmon	78.0	84.6	7030
23-Apr-19	24-Apr-19	B	DN	Experimental	Spring	1	4.5	Gizzard Shad	42.3	47.7	1230
23-Apr-19	24-Apr-19	B	DN	Experimental	Spring	1	4.5	Gizzard Shad	41.4	46.9	1090
23-Apr-19	24-Apr-19	B	DN	Experimental	Spring	1	4.5	Gizzard Shad	35.3	39.1	830
23-Apr-19	24-Apr-19	B	DN	Experimental	Spring	1	4.5	White Sucker	40.3	43.1	980
23-Apr-19	24-Apr-19	B	DN	Experimental	Spring	1	5	Brown Trout	48.3	49.8	1600
23-Apr-19	24-Apr-19	B	DN	Experimental	Spring	1	5	Gizzard Shad	44.5	50.2	1520
23-Apr-19	24-Apr-19	B	DN	Experimental	Spring	1	5	Gizzard Shad	43.1	48.1	1040
23-Apr-19	24-Apr-19	C	DN	Experimental	Spring	1	2	White Sucker	26.7	28.2	250
23-Apr-19	24-Apr-19	C	DN	Experimental	Spring	1	2	White Sucker	26.8	28.6	260
23-Apr-19	24-Apr-19	C	DN	Experimental	Spring	1	2	White Sucker	26.1	27.9	250
23-Apr-19	24-Apr-19	C	DN	Experimental	Spring	1	2.5	White Sucker	29.9	32.2	350
23-Apr-19	24-Apr-19	C	DN	Experimental	Spring	1	2.5	White Sucker	29.7	31.6	340
23-Apr-19	24-Apr-19	C	DN	Experimental	Spring	1	2.5	White Sucker	31.0	32.9	360
23-Apr-19	24-Apr-19	C	DN	Experimental	Spring	1	2.5	White Sucker	31.1	33.0	410
23-Apr-19	24-Apr-19	C	DN	Experimental	Spring	1	3	Gizzard Shad	34.3	38.0	540
23-Apr-19	24-Apr-19	C	DN	Experimental	Spring	1	3	White Bass	34.2	38.0	820
23-Apr-19	24-Apr-19	C	DN	Experimental	Spring	1	3	White Sucker	35.2	37.7	630
23-Apr-19	24-Apr-19	C	DN	Experimental	Spring	1	3	White Sucker	34.2	38.0	530
23-Apr-19	24-Apr-19	C	DN	Experimental	Spring	1	3	White Sucker	39.3	41.5	610
23-Apr-19	24-Apr-19	C	DN	Experimental	Spring	1	3	White Sucker	37.1	39.7	560
23-Apr-19	24-Apr-19	C	DN	Experimental	Spring	1	3.5	Brown Trout	49.8	51.2	1420
23-Apr-19	24-Apr-19	C	DN	Experimental	Spring	1	3.5	White Sucker	43.6	46.4	940
23-Apr-19	24-Apr-19	C	DN	Experimental	Spring	1	3.5	White Sucker	39.2	42.0	690
23-Apr-19	24-Apr-19	C	DN	Experimental	Spring	1	3.5	White Sucker	43.1	46.0	990
23-Apr-19	24-Apr-19	C	DN	Experimental	Spring	1	4	Gizzard Shad	36.9	41.7	720
23-Apr-19	24-Apr-19	C	DN	Experimental	Spring	1	4	Gizzard Shad	36.0	41.6	730
23-Apr-19	24-Apr-19	C	DN	Experimental	Spring	1	4.5	Brown Trout	56.2	58.7	3080
23-Apr-19	24-Apr-19	C	DN	Experimental	Spring	1	4.5	Gizzard Shad	43.5	49.1	1370
23-Apr-19	24-Apr-19	C	DN	Experimental	Spring	1	4.5	Gizzard Shad	39.7	45.8	960
23-Apr-19	24-Apr-19	C	DN	Experimental	Spring	1	4.5	Gizzard Shad	36.4	42.1	890
23-Apr-19	24-Apr-19	C	DN	Experimental	Spring	1	4.5	Gizzard Shad	37.4	42.9	780
23-Apr-19	24-Apr-19	C	DN	Experimental	Spring	1	33	White Sucker	36.5	39.2	660
22-Apr-19	23-Apr-19	D	DN	Experimental	Spring	1	1	Round Goby	-	8.8	15
22-Apr-19	23-Apr-19	D	DN	Experimental	Spring	1	1	Round Goby	-	9.3	18
22-Apr-19	23-Apr-19	D	DN	Experimental	Spring	1	1.5	Round Goby	-	16.6	67
22-Apr-19	23-Apr-19	D	DN	Experimental	Spring	1	2.5	Longnose Sucker	33.2	35.9	520
22-Apr-19	23-Apr-19	D	DN	Experimental	Spring	1	4.5	Lake Trout	65.3	71.2	4150
22-Apr-19	23-Apr-19	E	DN	Experimental	Spring	1	1	Round Goby	-	9.6	11
22-Apr-19	23-Apr-19	E	DN	Experimental	Spring	1	1	Round Goby	-	9.8	12
23-Apr-19	24-Apr-19	F	DN	Experimental	Spring	1	1	Round Goby	-	9.1	11
23-Apr-19	24-Apr-19	F	DN	Experimental	Spring	1	1	Round Goby	-	8.6	10
23-Apr-19	24-Apr-19	F	DN	Experimental	Spring	1	1	Round Goby	-	9.0	13
23-Apr-19	24-Apr-19	F	DN	Experimental	Spring	1	1	Round Goby	-	9.6	14
23-Apr-19	24-Apr-19	F	DN	Experimental	Spring	1	3.5	Lake Trout	53.3	58.1	2230
23-Apr-19	24-Apr-19	F	DN	Experimental	Spring	1	4.5	Brown Trout	62.7	64.8	4300
23-Apr-19	24-Apr-19	F	DN	Experimental	Spring	1	4.5	White Sucker	45.4	48.4	1170
22-Apr-19	23-Apr-19	G	TP	Experimental	Spring	1	1	Round Goby	-	9.1	13
22-Apr-19	23-Apr-19	G	TP	Experimental	Spring	1	3	Rock Bass	19.1	19.6	120
22-Apr-19	23-Apr-19	G	TP	Experimental	Spring	1	3	White Sucker	32.8	35.1	420
22-Apr-19	23-Apr-19	G	TP	Experimental	Spring	1	5	Atlantic Salmon	68.3	73.4	3630
24-Apr-19	25-Apr-19	H	BH	Experimental	Spring	1	3	Lake Trout	56.3	61.3	2770
24-Apr-19	25-Apr-19	H	BH	Experimental	Spring	1	3	White Sucker	45.1	48.2	1140
24-Apr-19	25-Apr-19	H	BH	Experimental	Spring	1	4	Atlantic Salmon	38.8	40.9	760
24-Apr-19	25-Apr-19	H	BH	Experimental	Spring	1	4	Atlantic Salmon	55.0	57.2	1990
24-Apr-19	25-Apr-19	H	BH	Experimental	Spring	1	4	White Sucker	38.4	40.6	860
22-Apr-19	23-Apr-19	I	DN	Broadscale	Spring	1	25	Rainbow Smelt	14.6	15.7	23
22-Apr-19	23-Apr-19	I	DN	Broadscale	Spring	1	25	Round Goby	-	9.6	11
22-Apr-19	23-Apr-19	J	DN	Broadscale	Spring	1	25	Rainbow Smelt	15.1	16.7	26
23-Apr-19	24-Apr-19	K	DN	Broadscale	Spring	1	25	Alewife	10.4	12.1	12
23-Apr-19	24-Apr-19	K	DN	Broadscale	Spring	1	25	Rainbow Smelt	13.7	14.9	21
2-May-19	03-May-19	A	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
2-May-19	03-May-19	A	DN	Experimental	Spring	2	1	Round Goby	-	9.3	15
2-May-19	03-May-19	A	DN	Experimental	Spring	2	1	Round Goby	-	9.0	12
2-May-19	03-May-19	A	DN	Experimental	Spring	2	1	Round Goby	-	9.2	12
2-May-19	03-May-19	A	DN	Experimental	Spring	2	1	Round Goby	-	9.0	12
2-May-19	03-May-19	A	DN	Experimental	Spring	2	1	Round Goby	-	9.4	14
2-May-19	03-May-19	A	DN	Experimental	Spring	2	1	Round Goby	-	8.7	11
2-May-19	03-May-19	A	DN	Experimental	Spring	2	1	Round Goby	-	9.1	12
2-May-19	03-May-19	A	DN	Experimental	Spring	2	1	Round Goby	-	9.3	12
2-May-19	03-May-19	A	DN	Experimental	Spring	2	1	Round Goby	-	9.4	13
2-May-19	03-May-19	A	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
2-May-19	03-May-19	A	DN	Experimental	Spring	2	1	Round Goby	-	9.6	18
2-May-19	03-May-19	A	DN	Experimental	Spring	2	1	Round Goby	-	8.9	10
2-May-19	03-May-19	A	DN	Experimental	Spring	2	1	Round Goby	-	9.0	11
2-May-19	03-May-19	A	DN	Experimental	Spring	2	1	Round Goby	-	9.3	12
2-May-19	03-May-19	A	DN	Experimental	Spring	2	1	Round Goby	-	7.7	9
2-May-19	03-May-19	A	DN	Experimental	Spring	2	1	Round Goby	-	9.6	14
2-May-19	03-May-19	A	DN	Experimental	Spring	2	1	Round Goby	-	9.0	10
2-May-19	03-May-19	A	DN	Experimental	Spring	2	1	Round Goby	-	8.7	11
2-May-19	03-May-19	A	DN	Experimental	Spring	2	1	Round Goby	-	14.4	50
2-May-19	03-May-19	A	DN	Experimental	Spring	2	1.5	Round Goby	-	15.0	46
2-May-19	03-May-19	A	DN	Experimental	Spring	2	1.5	Round Goby	-	13.7	40
2-May-19	03-May-19	A	DN	Experimental	Spring	2	1.5	Round Goby	-	15.2	36
2-May-19	03-May-19	A	DN	Experimental	Spring	2	1.5	Round Goby	-	14.8	52
2-May-19	03-May-19	A	DN	Experimental	Spring	2	3.5	White Sucker	33.3	35.6	560
3-May-19	04-May-19	B	DN	Experimental	Spring	2	1	Lake Chub	10.2	11.5	15
3-May-19	04-May-19	B	DN	Experimental	Spring	2	1	Rainbow Trout	11.6	12.2	11
3-May-19	04-May-19	B	DN	Experimental	Spring	2	1	Round Goby	-	9.0	11
3-May-19	04-May-19	B	DN	Experimental	Spring	2	1	Round Goby	-	9.5	12
3-May-19	04-May-19	B	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	B	DN	Experimental	Spring	2	1	White Sucker	35.5	37.6	580
3-May-19	04-May-19	B	DN	Experimental	Spring	2	2	Round Goby	-	17.8	97
3-May-19	04-May-19	B	DN	Experimental	Spring	2	2.5	Atlantic Salmon	41.5	44.7	700
3-May-19	04-May-19	B	DN	Experimental	Spring	2	2.5	White Sucker	35.0	37.3	560
3-May-19	04-May-19	B	DN	Experimental	Spring	2	3	White Sucker	36.2	38.5	580
3-May-19	04-May-19	B	DN	Experimental	Spring	2	3.5	Rainbow Trout	68.0	76.0	3830
3-May-19	04-May-19	B	DN	Experimental	Spring	2	3.5	Rainbow Trout	72.2	76.9	4730
3-May-19	04-May-19	B	DN	Experimental	Spring	2	4	Brown Trout	50.3	52.3	1350
3-May-19	04-May-19	B	DN	Experimental	Spring	2	4	Brown Trout	52.9	54.9	1670
3-May-19	04-May-19	B	DN	Experimental	Spring	2	4	White Sucker	47.7	51.4	1270
3-May-19	04-May-19	B	DN	Experimental	Spring	2	4	White Sucker	39.2	42.2	870
3-May-19	04-May-19	B	DN	Experimental	Spring	2	4	White Sucker	38.0	40.6	680
3-May-19	04-May-19	B	DN	Experimental	Spring	2	4.5	Gizzard Shad	34.2	38.6	570
3-May-19	04-May-19	B	DN	Experimental	Spring	2	4.5	White Sucker	43.4	46.5	1170
3-May-19	04-May-19	B	DN	Experimental	Spring	2	5	Gizzard Shad	37.8	43.4	700
3-May-19	04-May-19	B	DN	Experimental	Spring	2	5	Gizzard Shad	42.6	49.0	1120
3-May-19	04-May-19	B	DN	Experimental	Spring	2	5	Gizzard Shad	37.5	41.8	790
3-May-19	04-May-19	C	DN	Experimental	Spring	2	1	Round Goby	-	9.1	14
3-May-19	04-May-19	C	DN	Experimental	Spring	2	1	Round Goby	-	9.0	12
3-May-19	04-May-19	C	DN	Experimental	Spring	2	1.5	Alewife	13.5	15.8	27
3-May-19	04-May-19	C	DN	Experimental	Spring	2	1.5	Alewife	13.8	15.7	32
3-May-19	04-May-19	C	DN	Experimental	Spring	2	1.5	Lake Chub	17.3	19.4	60
3-May-19	04-May-19	C	DN	Experimental	Spring	2	1.5	Lake Chub	15.1	16.4	44
3-May-19	04-May-19	C	DN	Experimental	Spring	2	1.5	Lake Chub	15.7	17.2	52
3-May-19	04-May-19	C	DN	Experimental	Spring	2	2.5	White Sucker	26.0	27.5	240
3-May-19	04-May-19	C	DN	Experimental	Spring	2	3	White Sucker	30.4	32.5	370
3-May-19	04-May-19	C	DN	Experimental	Spring	2	3	White Sucker	32.4	34.5	410
3-May-19	04-May-19	C	DN	Experimental	Spring	2	3	White Sucker	29.9	31.6	370
3-May-19	04-May-19	C	DN	Experimental	Spring	2	3	White Sucker	29.3	31.4	330
3-May-19	04-May-19	C	DN	Experimental	Spring	2	3	White Sucker	30.5	32.4	330
3-May-19	04-May-19	C	DN	Experimental	Spring	2	3	White Sucker	32.5	34.8	510
3-May-19	04-May-19	C	DN	Experimental	Spring	2	3	White Sucker	29.7	32.2	370
3-May-19	04-May-19	C	DN	Experimental	Spring	2	3.5	White Sucker	29.9	32.2	400
3-May-19	04-May-19	C	DN	Experimental	Spring	2	3.5	White Sucker	38.2	40.3	630
3-May-19	04-May-19	C	DN	Experimental	Spring	2	4	White Sucker	37.1	39.6	630
3-May-19	04-May-19	C	DN	Experimental	Spring	2	4	White Sucker	37.2	39.6	680
3-May-19	04-May-19	C	DN	Experimental	Spring	2	4.5	White Sucker	43.1	46.4	870
2-May-19	3-May-19	D	DN	Experimental	Spring	2	1	Round Goby	-	9.7	16
2-May-19	3-May-19	D	DN	Experimental	Spring	2	1	Round Goby	-	9.6	14
2-May-19	3-May-19	D	DN	Experimental	Spring	2	1	Round Goby	-	9.2	12
2-May-19	3-May-19	D	DN	Experimental	Spring	2	1	Round Goby	-	8.9	11
2-May-19	3-May-19	D	DN	Experimental	Spring	2	1	Round Goby	-	9.2	13
2-May-19	3-May-19	D	DN	Experimental	Spring	2	1	Round Goby	-	9.6	14
2-May-19	3-May-19	D	DN	Experimental	Spring	2	1	Round Goby	-	9.3	13
2-May-19	3-May-19	D	DN	Experimental	Spring	2	1	Round Goby	-	9.3	13
2-May-19	3-May-19	D	DN	Experimental	Spring	2	1	Round Goby	-	9.6	14

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
2-May-19	3-May-19	D	DN	Experimental	Spring	2	1	Round Goby	-	9.9	16
2-May-19	3-May-19	D	DN	Experimental	Spring	2	1	Round Goby	-	9.3	12
2-May-19	3-May-19	D	DN	Experimental	Spring	2	1	Round Goby	-	9.7	13
2-May-19	3-May-19	D	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
2-May-19	3-May-19	D	DN	Experimental	Spring	2	1	Round Goby	-	9.9	16
2-May-19	3-May-19	D	DN	Experimental	Spring	2	1	Round Goby	-	10.3	15
2-May-19	3-May-19	D	DN	Experimental	Spring	2	1	Round Goby	-	9.7	13
2-May-19	3-May-19	D	DN	Experimental	Spring	2	1	Round Goby	-	9.7	13
2-May-19	3-May-19	D	DN	Experimental	Spring	2	1	Round Goby	-	9.4	11
2-May-19	3-May-19	D	DN	Experimental	Spring	2	1	Round Goby	-	9.5	14
2-May-19	3-May-19	D	DN	Experimental	Spring	2	1.5	Round Goby	-	15.2	52
2-May-19	3-May-19	D	DN	Experimental	Spring	2	1.5	Round Goby	-	14.2	42
2-May-19	3-May-19	D	DN	Experimental	Spring	2	1.5	Round Goby	-	14.1	41
2-May-19	3-May-19	D	DN	Experimental	Spring	2	1.5	Round Goby	-	14.0	41
2-May-19	3-May-19	D	DN	Experimental	Spring	2	1.5	Round Goby	-	14.4	46
2-May-19	3-May-19	D	DN	Experimental	Spring	2	1.5	Round Goby	-	14.1	43
2-May-19	3-May-19	D	DN	Experimental	Spring	2	2	Round Goby	-	17.2	82
2-May-19	3-May-19	D	DN	Experimental	Spring	2	2.5	Atlantic Salmon	58.9	62.3	2320
2-May-19	3-May-19	D	DN	Experimental	Spring	2	5	Lake Trout	52.6	57.6	2030
2-May-19	3-May-19	E	DN	Experimental	Spring	2	1	Rainbow Smelt	14.5	15.6	20
2-May-19	3-May-19	E	DN	Experimental	Spring	2	1	Round Goby	-	9.6	13
2-May-19	3-May-19	E	DN	Experimental	Spring	2	1	Round Goby	-	9.8	13
2-May-19	3-May-19	E	DN	Experimental	Spring	2	1	Round Goby	-	10.0	11
2-May-19	3-May-19	E	DN	Experimental	Spring	2	1	Round Goby	-	10.1	15
2-May-19	3-May-19	E	DN	Experimental	Spring	2	1	Round Goby	-	9.4	10
2-May-19	3-May-19	E	DN	Experimental	Spring	2	1	Round Goby	-	9.3	11
2-May-19	3-May-19	E	DN	Experimental	Spring	2	1	Round Goby	-	9.4	11
2-May-19	3-May-19	E	DN	Experimental	Spring	2	1	Round Goby	-	9.8	14
2-May-19	3-May-19	E	DN	Experimental	Spring	2	1	Round Goby	-	8.7	10
2-May-19	3-May-19	E	DN	Experimental	Spring	2	1	Round Goby	-	10.1	13
2-May-19	3-May-19	E	DN	Experimental	Spring	2	1	Round Goby	-	8.7	12
2-May-19	3-May-19	E	DN	Experimental	Spring	2	1	Round Goby	-	9.2	12
2-May-19	3-May-19	E	DN	Experimental	Spring	2	1	Round Goby	-	9.6	12
2-May-19	3-May-19	E	DN	Experimental	Spring	2	1	Round Goby	-	9.8	14
2-May-19	3-May-19	E	DN	Experimental	Spring	2	1	Round Goby	-	9.6	13
2-May-19	3-May-19	E	DN	Experimental	Spring	2	1.5	Round Goby	-	13.8	44
2-May-19	3-May-19	E	DN	Experimental	Spring	2	1.5	Round Goby	-	14.0	41
2-May-19	3-May-19	E	DN	Experimental	Spring	2	3.5	White Sucker	37.7	40.1	780
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.7	14
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	10.2	15
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.8	13
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	10.2	17
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.5	14
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.5	13
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.2	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.8	15
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.5	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.7	14
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.6	13
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.5	14
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.9	15
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.3	13
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.7	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1.5	Round Goby	-	12.6	36
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1.5	Round Goby	-	12.4	35
3-May-19	04-May-19	F	DN	Experimental	Spring	2	1.5	Round Goby	-	14.0	43
3-May-19	04-May-19	F	DN	Experimental	Spring	2	2	Round Goby	-	14.0	42
3-May-19	04-May-19	F	DN	Experimental	Spring	2	3.5	Brown Trout	60.4	62.5	3200
3-May-19	04-May-19	F	DN	Experimental	Spring	2	3.5	Lake Trout	66.1	72.0	4350
3-May-19	04-May-19	F	DN	Experimental	Spring	2	4.5	Lake Trout	50.2	54.0	1830
2-May-19	3-May-19	G	TP	Experimental	Spring	2	1	Rainbow Smelt	14.6	15.8	26
2-May-19	3-May-19	G	TP	Experimental	Spring	2	1	Round Goby	-	9.6	13
2-May-19	3-May-19	G	TP	Experimental	Spring	2	3.5	White Perch	25.0	26.7	300
2-May-19	3-May-19	G	TP	Experimental	Spring	2	3.5	White Sucker	36.8	39.7	670
2-May-19	3-May-19	G	TP	Experimental	Spring	2	4.5	Brown Trout	59.0	61.0	3490
2-May-19	3-May-19	G	TP	Experimental	Spring	2	4.5	White Sucker	44.8	47.5	1260
3-May-19	04-May-19	H	BH	Experimental	Spring	2	1	Round Goby	-	9.6	13
3-May-19	04-May-19	H	BH	Experimental	Spring	2	1	Round Goby	-	9.8	13
3-May-19	04-May-19	H	BH	Experimental	Spring	2	1	Round Goby	-	9.3	11
3-May-19	04-May-19	H	BH	Experimental	Spring	2	1	Round Goby	-	9.3	12
3-May-19	04-May-19	H	BH	Experimental	Spring	2	1	Round Goby	-	9.4	12
3-May-19	04-May-19	H	BH	Experimental	Spring	2	1.5	Alewife	15.1	17.6	32
3-May-19	04-May-19	H	BH	Experimental	Spring	2	2.5	White Sucker	29.7	31.8	360
3-May-19	04-May-19	H	BH	Experimental	Spring	2	3	White Sucker	31.6	33.5	430
3-May-19	04-May-19	H	BH	Experimental	Spring	2	3.5	Longnose Sucker	40.8	43.5	1060
3-May-19	04-May-19	H	BH	Experimental	Spring	2	3.5	White Sucker	36.0	38.3	650
3-May-19	04-May-19	H	BH	Experimental	Spring	2	5	White Sucker	38.3	41.2	830
3-May-19	04-May-19	I	DN	Broadscale	Spring	2	25	Round Goby	-	8.9	9
3-May-19	04-May-19	I	DN	Broadscale	Spring	2	32	Alewife	13.1	15.2	26
3-May-19	04-May-19	I	DN	Broadscale	Spring	2	32	Round Goby	-	11.2	21
2-May-19	3-May-19	J	DN	Broadscale	Spring	2	25	Round Goby	-	11.4	23
2-May-19	3-May-19	J	DN	Broadscale	Spring	2	32	Round Goby	-	11.4	20
2-May-19	3-May-19	J	DN	Broadscale	Spring	2	32	Round Goby	-	11.6	22
2-May-19	3-May-19	J	DN	Broadscale	Spring	2	32	Round Goby	-	10.0	14
2-May-19	3-May-19	K	DN	Broadscale	Spring	2	32	Alewife	15.5	17.9	42
2-May-19	3-May-19	K	DN	Broadscale	Spring	2	38	Alewife	12.4	14.1	20
15-May-19	16-May-19	A	DN	Experimental	Spring	3	1	Round Goby	-	9.4	15
15-May-19	16-May-19	A	DN	Experimental	Spring	3	1	Round Goby	-	9.3	13
15-May-19	16-May-19	A	DN	Experimental	Spring	3	1	Round Goby	-	9.7	14
15-May-19	16-May-19	A	DN	Experimental	Spring	3	1	Round Goby	-	9.6	12
15-May-19	16-May-19	A	DN	Experimental	Spring	3	1	Round Goby	-	9.9	14
15-May-19	16-May-19	A	DN	Experimental	Spring	3	1	Round Goby	-	9.5	14
15-May-19	16-May-19	A	DN	Experimental	Spring	3	1	Round Goby	-	10.1	15
15-May-19	16-May-19	A	DN	Experimental	Spring	3	1	Round Goby	-	9.4	11
15-May-19	16-May-19	A	DN	Experimental	Spring	3	1	Round Goby	-	10.2	14
15-May-19	16-May-19	A	DN	Experimental	Spring	3	1	Round Goby	-	97.0	13
15-May-19	16-May-19	A	DN	Experimental	Spring	3	1	Round Goby	-	10.1	14
15-May-19	16-May-19	A	DN	Experimental	Spring	3	1	Round Goby	-	9.9	12
15-May-19	16-May-19	A	DN	Experimental	Spring	3	1	Round Goby	-	9.6	13
15-May-19	16-May-19	A	DN	Experimental	Spring	3	1	Round Goby	-	9.7	10
15-May-19	16-May-19	A	DN	Experimental	Spring	3	1	Round Goby	-	10.0	13
15-May-19	16-May-19	A	DN	Experimental	Spring	3	1	Round Goby	-	9.7	14
15-May-19	16-May-19	A	DN	Experimental	Spring	3	1	Round Goby	-	10.5	14
15-May-19	16-May-19	A	DN	Experimental	Spring	3	1.5	Alewife	16.0	18.7	42
15-May-19	16-May-19	A	DN	Experimental	Spring	3	1.5	Alewife	15.8	18.4	41
15-May-19	16-May-19	A	DN	Experimental	Spring	3	1.5	Round Goby	-	14.4	47
15-May-19	16-May-19	A	DN	Experimental	Spring	3	1.5	Round Goby	-	13.5	39
15-May-19	16-May-19	A	DN	Experimental	Spring	3	2	Round Goby	-	17.9	89
15-May-19	16-May-19	B	DN	Experimental	Spring	3	1	Round Goby	-	9.6	13
15-May-19	16-May-19	B	DN	Experimental	Spring	3	1	Round Goby	-	9.3	13
15-May-19	16-May-19	B	DN	Experimental	Spring	3	1	Round Goby	-	9.6	11
15-May-19	16-May-19	B	DN	Experimental	Spring	3	1.5	Alewife	14.1	16.5	33
15-May-19	16-May-19	B	DN	Experimental	Spring	3	1.5	Alewife	14.4	16.8	36
15-May-19	16-May-19	B	DN	Experimental	Spring	3	1.5	Alewife	15.2	18.3	40
15-May-19	16-May-19	B	DN	Experimental	Spring	3	4	Gizzard Shad	40.9	45.3	980
15-May-19	16-May-19	B	DN	Experimental	Spring	3	4.5	Walleye	69.0	72.0	3820
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1	Round Goby	-	10.1	16

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1	Round Goby	-	9.9	14
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1	Round Goby	-	9.8	14
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1	Round Goby	-	9.4	13
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1	Round Goby	-	10.1	15
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1	Round Goby	-	10.3	15
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1	Round Goby	-	10.0	4
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1	Round Goby	-	9.3	12
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1	Round Goby	-	10.3	14
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1	Round Goby	-	9.7	14
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1	White Sucker	11.0	11.8	15
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Round Goby	-	10.4	14
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	15.8	18.0	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.7	17.0	29
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.2	16.2	32
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.1	15.9	34
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.5	16.3	36
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	15.6	18.1	42
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	13.7	15.5	29
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	16.8	36
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	13.9	15.8	29
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.6	15.5	24
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.3	16.1	25
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.2	16.1	26
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.3	16.3	26
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.8	16.8	23
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.8	17.0	29
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.8	17.0	32
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.4	16.6	34
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.4	16.6	35
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	15.3	18.6	45
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Alewife	14.9	17.3	38
14-May-19	15-May-19	C	DN	Experimental	Spring	3	1.5	Round Goby	-	14.0	39
14-May-19	15-May-19	C	DN	Experimental	Spring	3	2	Alewife	13.2	15.4	23
14-May-19	15-May-19	C	DN	Experimental	Spring	3	2	Alewife	17.9	21.3	72
14-May-19	15-May-19	C	DN	Experimental	Spring	3	2	White Sucker	27.3	29.8	260
14-May-19	15-May-19	C	DN	Experimental	Spring	3	2	White Sucker	26.9	28.6	260
14-May-19	15-May-19	C	DN	Experimental	Spring	3	2	White Sucker	27.6	29.6	260
14-May-19	15-May-19	C	DN	Experimental	Spring	3	2	White Sucker	30.2	31.9	320
14-May-19	15-May-19	C	DN	Experimental	Spring	3	2.5	White Sucker	29.8	32.6	370
14-May-19	15-May-19	C	DN	Experimental	Spring	3	3.5	Gizzard Shad	39.0	44.7	890
14-May-19	15-May-19	C	DN	Experimental	Spring	3	3.5	White Sucker	33.4	35.7	540
14-May-19	15-May-19	C	DN	Experimental	Spring	3	4	White Sucker	40.0	42.9	790
14-May-19	15-May-19	C	DN	Experimental	Spring	3	4.5	White Sucker	41.4	44.1	890
14-May-19	15-May-19	C	DN	Experimental	Spring	3	4.5	White Sucker	47.5	50.5	1410
14-May-19	15-May-19	C	DN	Experimental	Spring	3	5	White Sucker	14.8	16.9	44
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	10.1	14
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	10.3	15
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.5	12
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.3	13
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.6	13
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.6	15
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.8	14
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.6	12
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.6	15
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.7	14
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.5	13
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.8	14
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.1	12
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	8.7	12
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.2	12
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	10.0	16
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.4	15
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.6	15
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.5	14
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.9	14
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.4	13
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.4	13
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.4	13
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.4	13
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.4	13
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.4	13
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.4	13
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.4	13
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.4	13
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.4	13
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.4	13
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.4	13
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.4	13
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.4	13
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.4	13
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.4	13
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.4	13
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.4	13
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.4	13
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.4	13
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.4	13
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.4	13
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.4	13
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.4	13
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.4	13
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.4	13
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.4	13
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1	Round Goby	-	9.4	13
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1.5	Alewife	15.6	18.1	41

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1.5	Round Goby	-	12.0	27
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1.5	Round Goby	-	12.0	27
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1.5	Round Goby	-	12.0	27
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1.5	Round Goby	-	12.0	27
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1.5	Round Goby	-	12.0	27
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1.5	Round Goby	-	12.0	27
15-May-19	16-May-19	D	DN	Experimental	Spring	3	1.5	Round Goby	-	12.0	27
15-May-19	16-May-19	D	DN	Experimental	Spring	3	2	Round Goby	-	18.6	99
15-May-19	16-May-19	D	DN	Experimental	Spring	3	3.5	Lake Trout	82.3	89.2	8100
15-May-19	16-May-19	D	DN	Experimental	Spring	3	4.5	Lake Trout	86.8	94.0	8870
15-May-19	16-May-19	E	DN	Experimental	Spring	3	1	Rainbow Smelt	13.4	14.2	15
15-May-19	16-May-19	E	DN	Experimental	Spring	3	1	Rainbow Smelt	15.0	16.5	19
15-May-19	16-May-19	E	DN	Experimental	Spring	3	1	Round Goby	-	9.6	10
15-May-19	16-May-19	E	DN	Experimental	Spring	3	1	Round Goby	-	9.4	11
15-May-19	16-May-19	E	DN	Experimental	Spring	3	1	Round Goby	-	9.5	12
15-May-19	16-May-19	E	DN	Experimental	Spring	3	1	Round Goby	-	9.6	11
15-May-19	16-May-19	E	DN	Experimental	Spring	3	1	Round Goby	-	10.4	11
15-May-19	16-May-19	E	DN	Experimental	Spring	3	1	Round Goby	-	9.6	11
15-May-19	16-May-19	E	DN	Experimental	Spring	3	1	Round Goby	-	9.1	11
15-May-19	16-May-19	E	DN	Experimental	Spring	3	1.5	Alewife	15.2	17.6	37
15-May-19	16-May-19	E	DN	Experimental	Spring	3	2	Round Goby	-	17.8	84
14-May-19	15-May-19	F	DN	Experimental	Spring	3	1	Round Goby	-	9.3	12
14-May-19	15-May-19	F	DN	Experimental	Spring	3	1	Round Goby	-	9.7	14
14-May-19	15-May-19	F	DN	Experimental	Spring	3	1	Round Goby	-	10.1	14
14-May-19	15-May-19	F	DN	Experimental	Spring	3	1	Round Goby	-	10.0	13
14-May-19	15-May-19	F	DN	Experimental	Spring	3	1.5	Alewife	13.4	15.6	28
14-May-19	15-May-19	F	DN	Experimental	Spring	3	1.5	Alewife	15.2	17.4	34
14-May-19	15-May-19	F	DN	Experimental	Spring	3	1.5	Alewife	14.6	16.7	32
14-May-19	15-May-19	F	DN	Experimental	Spring	3	1.5	Alewife	16.3	18.9	47
14-May-19	15-May-19	F	DN	Experimental	Spring	3	1.5	Alewife	15.0	17.1	32
14-May-19	15-May-19	F	DN	Experimental	Spring	3	1.5	Alewife	14.7	16.6	33
14-May-19	15-May-19	F	DN	Experimental	Spring	3	1.5	Alewife	15.2	17.5	30
14-May-19	15-May-19	F	DN	Experimental	Spring	3	1.5	Alewife	15.9	18.4	39
14-May-19	15-May-19	F	DN	Experimental	Spring	3	1.5	Alewife	14.8	17.0	31
14-May-19	15-May-19	F	DN	Experimental	Spring	3	1.5	Alewife	13.5	15.4	27
14-May-19	15-May-19	F	DN	Experimental	Spring	3	1.5	Alewife	15.4	17.6	41
14-May-19	15-May-19	F	DN	Experimental	Spring	3	1.5	Alewife	14.4	16.6	35
14-May-19	15-May-19	F	DN	Experimental	Spring	3	1.5	Alewife	15.7	17.8	36
14-May-19	15-May-19	F	DN	Experimental	Spring	3	1.5	Alewife	15.7	17.9	37
14-May-19	15-May-19	F	DN	Experimental	Spring	3	1.5	Alewife	15.8	18.1	38
14-May-19	15-May-19	F	DN	Experimental	Spring	3	1.5	Alewife	14.6	16.3	37
14-May-19	15-May-19	F	DN	Experimental	Spring	3	1.5	Alewife	14.1	16.2	31
14-May-19	15-May-19	F	DN	Experimental	Spring	3	1.5	Alewife	15.3	17.8	34
14-May-19	15-May-19	F	DN	Experimental	Spring	3	1.5	Alewife	14.2	16.3	31
14-May-19	15-May-19	F	DN	Experimental	Spring	3	1.5	Alewife	13.5	16.6	35
14-May-19	15-May-19	F	DN	Experimental	Spring	3	1.5	Alewife	16.0	18.2	37
14-May-19	15-May-19	F	DN	Experimental	Spring	3	1.5	Alewife	14.5	16.4	36
14-May-19	15-May-19	F	DN	Experimental	Spring	3	1.5	Alewife	15.5	17.6	38
14-May-19	15-May-19	F	DN	Experimental	Spring	3	1.5	Alewife	14.8	17.0	39
14-May-19	15-May-19	F	DN	Experimental	Spring	3	1.5	Round Goby	-	14.1	40
14-May-19	15-May-19	F	DN	Experimental	Spring	3	2	Round Goby	-	17.4	67
14-May-19	15-May-19	F	DN	Experimental	Spring	3	2.5	Atlantic Salmon	56.8	59.5	2350
14-May-19	15-May-19	F	DN	Experimental	Spring	3	3	Round Whitefish	46.0	49.6	1040
14-May-19	15-May-19	F	DN	Experimental	Spring	3	3.5	Alewife	13.5	15.2	28
14-May-19	15-May-19	F	DN	Experimental	Spring	3	4.5	Alewife	15.8	18.0	42
14-May-19	15-May-19	F	DN	Experimental	Spring	3	5	Lake Trout	53.4	58.0	2180
15-May-19	16-May-19	G	TP	Experimental	Spring	3	1	Round Goby	-	12.0	13
15-May-19	16-May-19	G	TP	Experimental	Spring	3	1	Round Goby	-	9.4	11
15-May-19	16-May-19	G	TP	Experimental	Spring	3	1	Round Goby	-	9.6	12
15-May-19	16-May-19	G	TP	Experimental	Spring	3	1	Round Goby	-	9.2	10
15-May-19	16-May-19	G	TP	Experimental	Spring	3	1	Round Goby	-	9.5	12
15-May-19	16-May-19	G	TP	Experimental	Spring	3	1	Round Goby	-	10.1	15
15-May-19	16-May-19	G	TP	Experimental	Spring	3	1	Round Goby	-	9.1	11
15-May-19	16-May-19	G	TP	Experimental	Spring	3	1	Round Goby	-	8.7	10
15-May-19	16-May-19	G	TP	Experimental	Spring	3	1	Round Goby	-	9.2	11
15-May-19	16-May-19	G	TP	Experimental	Spring	3	1	Round Goby	-	8.7	10
15-May-19	16-May-19	G	TP	Experimental	Spring	3	1.5	Alewife	15.4	17.8	35
15-May-19	16-May-19	G	TP	Experimental	Spring	3	1.5	Alewife	15.2	17.2	36
15-May-19	16-May-19	G	TP	Experimental	Spring	3	1.5	Alewife	13.9	15.7	29
15-May-19	16-May-19	G	TP	Experimental	Spring	3	3	White Sucker	30.8	32.7	350
15-May-19	16-May-19	G	TP	Experimental	Spring	3	4	Lake Trout	48.5	51.7	1250
15-May-19	16-May-19	G	TP	Experimental	Spring	3	4	White Sucker	40.7	43.0	920
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1	Alewife	16.1	18.4	45
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1	Rainbow Smelt	14.7	16.0	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1	Round Goby	-	9.5	13

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1	Round Goby	-	9.4	12
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1	Round Goby	-	8.7	10
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1	Round Goby	-	9.7	13
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1	Round Goby	-	9.3	12
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1	Round Goby	-	9.3	12
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1	Round Goby	-	9.7	13
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1	Round Goby	-	8.9	11
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1	Round Goby	-	9.4	12
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1	Round Goby	-	9.7	13
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1	Round Goby	-	9.6	13
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	15.6	18.0	39
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.7	15.8	30
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	15.9	18.1	44
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.9	15.6	32
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	15.0	18.5	46
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	14.7	16.9	31
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	15.8	17.6	31
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	15.4	17.7	40
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	16.1	18.4	39
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.3	15.4	27
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	14.9	17.1	48
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	14.1	16.3	31
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	16.0	18.6	39
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	17.1	19.9	52
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	14.5	16.7	32
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	14.6	16.8	30
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	15.6	18.1	41
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	14.8	17.1	32
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	14.6	16.9	33
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Alewife	13.4	15.1	19
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Round Goby	-	13.9	32
14-May-19	15-May-19	H	BH	Experimental	Spring	3	1.5	Round Goby	-	14.2	41
14-May-19	15-May-19	H	BH	Experimental	Spring	3	2	Alewife	15.6	18.1	37
14-May-19	15-May-19	H	BH	Experimental	Spring	3	2	Round Goby	-	18.2	86
14-May-19	15-May-19	H	BH	Experimental	Spring	3	2.5	White Sucker	27.0	28.6	260
14-May-19	15-May-19	H	BH	Experimental	Spring	3	3.5	White Sucker	36.4	38.5	590
14-May-19	15-May-19	H	BH	Experimental	Spring	3	3.5	White Sucker	41.5	44.2	970
14-May-19	15-May-19	H	BH	Experimental	Spring	3	3.5	White Sucker	37.6	40.3	690
14-May-19	15-May-19	H	BH	Experimental	Spring	3	3.5	White Sucker	37.1	39.9	640
14-May-19	15-May-19	H	BH	Experimental	Spring	3	3.5	White Sucker	46.3	50.2	1260
14-May-19	15-May-19	H	BH	Experimental	Spring	3	3.5	White Sucker	38.7	40.7	710
14-May-19	15-May-19	H	BH	Experimental	Spring	3	4	White Sucker	41.4	44.2	890
14-May-19	15-May-19	H	BH	Experimental	Spring	3	4	White Sucker	43.4	46.1	1180
14-May-19	15-May-19	H	BH	Experimental	Spring	3	4	White Sucker	41.4	44.3	820
14-May-19	15-May-19	H	BH	Experimental	Spring	3	4.5	White Sucker	46.1	49.0	1310
14-May-19	15-May-19	I	DN	Broadscale	Spring	3	19	Alewife	7.9	8.8	5
14-May-19	15-May-19	I	DN	Broadscale	Spring	3	19	Round Goby	-	7.1	5
14-May-19	15-May-19	I	DN	Broadscale	Spring	3	25	Alewife	11.6	12.7	15
14-May-19	15-May-19	I	DN	Broadscale	Spring	3	25	Alewife	9.9	11.4	9
14-May-19	15-May-19	I	DN	Broadscale	Spring	3	25	Round Goby	-	9.8	14
14-May-19	15-May-19	I	DN	Broadscale	Spring	3	25	Round Goby	-	9.0	10
14-May-19	15-May-19	I	DN	Broadscale	Spring	3	25	Round Goby	-	9.3	14
14-May-19	15-May-19	I	DN	Broadscale	Spring	3	25	Round Goby	-	10.1	14
14-May-19	15-May-19	I	DN	Broadscale	Spring	3	32	Alewife	13.0	15.0	20
14-May-19	15-May-19	I	DN	Broadscale	Spring	3	32	Round Goby	-	11.5	22
14-May-19	15-May-19	I	DN	Broadscale	Spring	3	32	Round Goby	-	11.1	21
14-May-19	15-May-19	I	DN	Broadscale	Spring	3	32	Round Goby	-	11.4	21
14-May-19	15-May-19	I	DN	Broadscale	Spring	3	38	Alewife	13.9	15.9	30
14-May-19	15-May-19	I	DN	Broadscale	Spring	3	38	Alewife	15.7	17.6	42
14-May-19	15-May-19	I	DN	Broadscale	Spring	3	38	Alewife	14.8	16.8	30
14-May-19	15-May-19	I	DN	Broadscale	Spring	3	38	Alewife	14.2	16.0	31
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	19	Alewife	7.8	8.9	4
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	25	Alewife	12.9	14.9	21
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	25	Round Goby	-	9.0	10
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	25	Round Goby	-	9.0	10
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	25	Round Goby	-	9.1	12
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	25	Round Goby	-	9.2	12
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	32	Alewife	13.7	16.0	18
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	32	Alewife	12.7	14.7	21
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	32	Alewife	12.4	14.3	26
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	32	Alewife	13.0	15.1	23
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	32	Alewife	13.5	9.9	28
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	32	Alewife	13.5	9.9	28
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	32	Alewife	13.5	9.9	28
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	32	Alewife	13.5	9.9	28
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	32	Alewife	13.5	9.9	28
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	32	Alewife	13.5	9.9	28
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	32	Alewife	13.5	9.9	28
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	32	Alewife	13.5	9.9	28
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	32	Alewife	13.5	9.9	28
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	32	Alewife	13.5	9.9	28
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	32	Alewife	13.5	9.9	28
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	32	Alewife	13.5	9.9	28
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	32	Alewife	13.5	9.9	28
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	32	Alewife	13.5	9.9	28
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	32	Alewife	13.5	9.9	28
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	32	Alewife	13.5	9.9	28
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	32	Round Goby	-	11.5	21
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	32	Round Goby	-	11.5	22
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	38	Alewife	15.2	17.6	37
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	38	Alewife	15.6	18.2	37
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	38	Alewife	14.5	16.8	32
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	38	Alewife	14.2	16.4	30
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	38	Alewife	13.9	16.2	30
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	38	Alewife	14.6	16.9	34
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	38	Alewife	13.6	15.6	28
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	38	Alewife	14.8	17.3	32
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	38	Alewife	16.2	18.9	45
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	38	Alewife	15.3	17.7	34

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	38	Alewife	14.7	17.0	39
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	38	Alewife	16.5	19.2	46
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	38	Alewife	16.8	19.6	46
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	38	Alewife	15.5	18.0	39
15-May-19	16-May-19	J	DN	Broadscale	Spring	3	38	Alewife	14.9	17.2	33
14-May-19	15-May-19	K	DN	Broadscale	Spring	3	13	Three Spine Stickleback	5.4	5.6	2
14-May-19	15-May-19	K	DN	Broadscale	Spring	3	13	Three Spine Stickleback	6.8	7.0	3
14-May-19	15-May-19	K	DN	Broadscale	Spring	3	19	Round Goby	-	10.2	18
14-May-19	15-May-19	K	DN	Broadscale	Spring	3	25	Round Goby	-	9.7	14
14-May-19	15-May-19	K	DN	Broadscale	Spring	3	25	Round Goby	-	8.9	9
14-May-19	15-May-19	K	DN	Broadscale	Spring	3	32	Lake Chub	13.5	13.6	32
14-May-19	15-May-19	K	DN	Broadscale	Spring	3	32	Alewife	12.5	14.4	20
14-May-19	15-May-19	K	DN	Broadscale	Spring	3	32	Alewife	12.5	14.3	19
14-May-19	15-May-19	K	DN	Broadscale	Spring	3	32	Alewife	12.4	14.1	19
14-May-19	15-May-19	K	DN	Broadscale	Spring	3	32	Alewife	12.6	14.5	18
14-May-19	15-May-19	K	DN	Broadscale	Spring	3	38	Alewife	14.7	16.8	30
14-May-19	15-May-19	K	DN	Broadscale	Spring	3	38	Alewife	15.3	17.8	33
14-May-19	15-May-19	K	DN	Broadscale	Spring	3	38	Alewife	17.1	19.9	46
14-May-19	15-May-19	K	DN	Broadscale	Spring	3	38	Alewife	13.4	16.1	31
14-May-19	15-May-19	K	DN	Broadscale	Spring	3	38	Alewife	16.6	19.0	39
14-May-19	15-May-19	K	DN	Broadscale	Spring	3	38	Alewife	15.5	17.8	36
14-May-19	15-May-19	K	DN	Broadscale	Spring	3	38	Alewife	16.5	19.1	39
14-May-19	15-May-19	K	DN	Broadscale	Spring	3	38	Alewife	15.7	18.2	35
14-May-19	15-May-19	K	DN	Broadscale	Spring	3	38	Alewife	16.3	18.9	42
14-May-19	15-May-19	K	DN	Broadscale	Spring	3	38	Alewife	15.3	17.4	33
06-Aug-19	07-Aug-19	A	DN	Experimental	Summer	1	1	Round Goby	-	10	13
06-Aug-19	07-Aug-19	A	DN	Experimental	Summer	1	1.5	Round Goby	-	15	46
06-Aug-19	07-Aug-19	A	DN	Experimental	Summer	1	1.5	Round Goby	-	15	42
06-Aug-19	07-Aug-19	A	DN	Experimental	Summer	1	3.5	White Sucker	48	52	1480
07-Aug-19	08-Aug-19	B	DN	Experimental	Summer	1	1	Round Goby	-	10	11
07-Aug-19	08-Aug-19	B	DN	Experimental	Summer	1	1	Round Goby	-	10	12
07-Aug-19	08-Aug-19	B	DN	Experimental	Summer	1	1.5	White Sucker	17	18	62
07-Aug-19	08-Aug-19	B	DN	Experimental	Summer	1	1.5	Alewife	16	18	48
07-Aug-19	08-Aug-19	B	DN	Experimental	Summer	1	1.5	Alewife	16	18	35
07-Aug-19	08-Aug-19	B	DN	Experimental	Summer	1	1.5	Alewife	14	16	32
07-Aug-19	08-Aug-19	B	DN	Experimental	Summer	1	1.5	Alewife	14	16	28
07-Aug-19	08-Aug-19	B	DN	Experimental	Summer	1	1.5	Alewife	14	16	30
07-Aug-19	08-Aug-19	B	DN	Experimental	Summer	1	1.5	Alewife	15	18	35
07-Aug-19	08-Aug-19	B	DN	Experimental	Summer	1	1.5	Alewife	14	16	32
07-Aug-19	08-Aug-19	B	DN	Experimental	Summer	1	1.5	Alewife	13	15	20
07-Aug-19	08-Aug-19	B	DN	Experimental	Summer	1	1.5	Alewife	15	18	33
07-Aug-19	08-Aug-19	B	DN	Experimental	Summer	1	1.5	Alewife	15	18	29
07-Aug-19	08-Aug-19	B	DN	Experimental	Summer	1	1.5	Alewife	15	16	34
07-Aug-19	08-Aug-19	B	DN	Experimental	Summer	1	2	Alewife	14	17	34
07-Aug-19	08-Aug-19	B	DN	Experimental	Summer	1	2	Alewife	14	16	35
07-Aug-19	08-Aug-19	B	DN	Experimental	Summer	1	2.5	White Sucker	31	33	150
07-Aug-19	08-Aug-19	B	DN	Experimental	Summer	1	2.5	White Sucker	37	40	580
07-Aug-19	08-Aug-19	B	DN	Experimental	Summer	1	2.5	Rock Bass	20	20	190
07-Aug-19	08-Aug-19	B	DN	Experimental	Summer	1	3	White Sucker	36	39	670
07-Aug-19	08-Aug-19	B	DN	Experimental	Summer	1	3	White Sucker	36	38	710
07-Aug-19	08-Aug-19	B	DN	Experimental	Summer	1	4	Gizzard Shad	41	46	960
07-Aug-19	08-Aug-19	B	DN	Experimental	Summer	1	4	Gizzard Shad	36	41	830
07-Aug-19	08-Aug-19	B	DN	Experimental	Summer	1	4	White Sucker	45	48	1130
07-Aug-19	08-Aug-19	B	DN	Experimental	Summer	1	4	Gizzard Shad	43	49	1240
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	5	Gizzard Shad	41	47	1010
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	5	Gizzard Shad	38	43	940
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	5	Gizzard Shad	39	44	1010
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	5	Gizzard Shad	40	46	1290
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	5	Gizzard Shad	39	43	1080
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	5	Gizzard Shad	38	44	980
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	5	Gizzard Shad	41	47	1220
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	4.5	Gizzard Shad	36	41	790
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	4.5	Gizzard Shad	43	48	1170
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	4	Gizzard Shad	39	44	1080
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	4	Alewife	13	15	31
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	3.5	White Sucker	40	42	860
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	3.5	White Sucker	41	44	860
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	3.5	Rock Bass	21	22	230
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	3	White Sucker	32	33	460
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	3.5	Rock Bass	23	24	290
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	3	White Sucker	33	33	610
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	3	White Sucker	35	36	500
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	2.5	White Sucker	49	52	1490
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	2.5	Rock Bass	19	19	180
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	2.5	Rock Bass	15	16	100

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	2.5	Rock Bass	16	16	100
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	2	Alewife	13	15	26
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1.5	Alewife	13	15	28
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1.5	Alewife	15	18	27
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1.5	Alewife	14	16	27
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1.5	Alewife	14	15	28
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1.5	Alewife	14	16	30
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1.5	Alewife	14	17	32
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1.5	Alewife	14	16	32
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1.5	Alewife	13	15	21
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1.5	Alewife	14	17	32
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1.5	Alewife	16	19	41
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1.5	Alewife	14	16	31
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1.5	Alewife	13	15	29
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1.5	Alewife	14	16	30
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1.5	Alewife	14	16	27
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1.5	Alewife	14	16	28
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1.5	Alewife	14	16	29
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1.5	Alewife	15	17	31
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1.5	Alewife	14	16	32
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1.5	White Sucker	17	18	34
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1.5	White Sucker	16	17	46
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1.5	White Sucker	17	18	53
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1.5	White Sucker	16	17	61
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1.5	Round Goby	-	15	48
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1.5	Round Goby	-	15	44
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Lake Chub	12	13	19
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Lake Chub	11	12	12
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Lake Chub	12	13	18
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Lake Chub	10	11	13
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Alewife	12	13	17
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Alewife	12	13	12
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Round Goby	-	11	17
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Round Goby	-	10	12
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Round Goby	-	10	15
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Round Goby	-	10	14
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Round Goby	-	11	16
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Round Goby	-	10	12
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Round Goby	-	10	14
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	White Sucker	17	18	55
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Alewife	14	16	32
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Alewife	14	16	32
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Alewife	14	16	32
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Alewife	14	16	32
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Alewife	14	16	32
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Alewife	14	16	32
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Alewife	14	16	32
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Alewife	14	16	32
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Alewife	14	16	32
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Alewife	14	16	32
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Alewife	14	16	32
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Alewife	14	16	32
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Alewife	14	16	32
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Alewife	14	16	32
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Alewife	14	16	32
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Alewife	14	16	32
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Alewife	14	16	32
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Alewife	14	16	32
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Alewife	14	16	32
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Alewife	14	16	32
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Alewife	14	16	32
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Alewife	14	16	32
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Alewife	14	16	32
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Alewife	14	16	32
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Alewife	14	16	32
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Alewife	14	16	32
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	Alewife	14	16	32
07-Aug-19	08-Aug-19	C	DN	Experimental	Summer	1	1	White Sucker	17	18	55
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	11	14
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	11
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	13
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	14
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	13

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	13
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	13
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	9	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	13
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	11	13
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	13
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	11
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	11	14
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	15
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	11	13
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	11	15
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1.5	Alewife	14	16	33
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1.5	Round Goby	-	14	43
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1.5	Round Goby	-	14	38
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1.5	Round Goby	-	14	41
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1.5	Round Goby	-	15	48
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1.5	Round Goby	-	14	42
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	D	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	E	DN	Experimental	Summer	1	1	Round Goby	-	10	10
06-Aug-19	07-Aug-19	E	DN	Experimental	Summer	1	1	Alewife	11	13	15
06-Aug-19	07-Aug-19	E	DN	Experimental	Summer	1	1	Round Goby	-	10	14
06-Aug-19	07-Aug-19	E	DN	Experimental	Summer	1	1	Round Goby	-	10	10
06-Aug-19	07-Aug-19	E	DN	Experimental	Summer	1	1	Round Goby	-	10	12
06-Aug-19	07-Aug-19	E	DN	Experimental	Summer	1	1	Round Goby	-	9	8
06-Aug-19	07-Aug-19	E	DN	Experimental	Summer	1	1	Round Goby	-	9	10
06-Aug-19	07-Aug-19	E	DN	Experimental	Summer	1	1.5	Alewife	13	15	25
06-Aug-19	07-Aug-19	E	DN	Experimental	Summer	1	1.5	Alewife	13	15	20
06-Aug-19	07-Aug-19	E	DN	Experimental	Summer	1	1.5	Alewife	13	15	20
06-Aug-19	07-Aug-19	E	DN	Experimental	Summer	1	1.5	Alewife	14	17	26
06-Aug-19	07-Aug-19	E	DN	Experimental	Summer	1	1.5	Alewife	12	15	22
06-Aug-19	07-Aug-19	E	DN	Experimental	Summer	1	1.5	Alewife	14	16	27
06-Aug-19	07-Aug-19	E	DN	Experimental	Summer	1	1.5	Alewife	14	16	26
06-Aug-19	07-Aug-19	E	DN	Experimental	Summer	1	1.5	Alewife	14	17	29
06-Aug-19	07-Aug-19	E	DN	Experimental	Summer	1	1.5	Alewife	15	17	35
06-Aug-19	07-Aug-19	E	DN	Experimental	Summer	1	2	Round Goby	-	18	96
06-Aug-19	07-Aug-19	F	DN	Experimental	Summer	1	1	Round Goby	-	9	10
06-Aug-19	07-Aug-19	F	DN	Experimental	Summer	1	1	Round Goby	-	9	10
06-Aug-19	07-Aug-19	F	DN	Experimental	Summer	1	1	Round Goby	-	9	10
06-Aug-19	07-Aug-19	F	DN	Experimental	Summer	1	1	Round Goby	-	10	10
06-Aug-19	07-Aug-19	F	DN	Experimental	Summer	1	1	Alewife	13	14	20
06-Aug-19	07-Aug-19	F	DN	Experimental	Summer	1	1	Round Goby	-	10	10
06-Aug-19	07-Aug-19	F	DN	Experimental	Summer	1	1	Round Goby	-	10	10
06-Aug-19	07-Aug-19	F	DN	Experimental	Summer	1	1	Round Goby	-	10	10
06-Aug-19	07-Aug-19	F	DN	Experimental	Summer	1	1	Round Goby	-	10	10
06-Aug-19	07-Aug-19	F	DN	Experimental	Summer	1	1	Round Goby	-	10	10
06-Aug-19	07-Aug-19	F	DN	Experimental	Summer	1	1	Round Goby	-	10	10
06-Aug-19	07-Aug-19	F	DN	Experimental	Summer	1	1	Round Goby	-	10	10
06-Aug-19	07-Aug-19	F	DN	Experimental	Summer	1	1	Round Goby	-	10	10
06-Aug-19	07-Aug-19	F	DN	Experimental	Summer	1	1.5	Alewife	14	16	29
06-Aug-19	07-Aug-19	F	DN	Experimental	Summer	1	1.5	Alewife	14	15	32
06-Aug-19	07-Aug-19	F	DN	Experimental	Summer	1	1.5	Round Goby	-	15	43
06-Aug-19	07-Aug-19	F	DN	Experimental	Summer	1	1.5	Round Goby	-	15	42
06-Aug-19	07-Aug-19	F	DN	Experimental	Summer	1	3.5	White Sucker	41	44	980
06-Aug-19	07-Aug-19	G	TP	Experimental	Summer	1	2.5	Rock Bass	16	16	114
06-Aug-19	07-Aug-19	G	TP	Experimental	Summer	1	2	Rock Bass	14	15	75
06-Aug-19	07-Aug-19	G	TP	Experimental	Summer	1	1.5	Alewife	15	17	36
06-Aug-19	07-Aug-19	G	TP	Experimental	Summer	1	1.5	Alewife	14	17	32
06-Aug-19	07-Aug-19	G	TP	Experimental	Summer	1	1.5	Alewife	14	17	34
06-Aug-19	07-Aug-19	G	TP	Experimental	Summer	1	1.5	Round Goby	-	14	42
06-Aug-19	07-Aug-19	H	BH	Experimental	Summer	1	1.5	Yellow Perch	14	15	35
06-Aug-19	07-Aug-19	H	BH	Experimental	Summer	1	1.5	Alewife	14	16	26
06-Aug-19	07-Aug-19	H	BH	Experimental	Summer	1	1.5	Alewife	15	17	38
06-Aug-19	07-Aug-19	H	BH	Experimental	Summer	1	1.5	Alewife	16	18	38
06-Aug-19	07-Aug-19	H	BH	Experimental	Summer	1	1.5	Alewife	14	16	32
06-Aug-19	07-Aug-19	H	BH	Experimental	Summer	1	1.5	Alewife	14	16	37
06-Aug-19	07-Aug-19	H	BH	Experimental	Summer	1	1.5	Alewife	12	14	17
06-Aug-19	07-Aug-19	H	BH	Experimental	Summer	1	1.5	Alewife	16	18	38
06-Aug-19	07-Aug-19	H	BH	Experimental	Summer	1	1.5	Alewife	15	17	35
06-Aug-19	07-Aug-19	H	BH	Experimental	Summer	1	1.5	Alewife	12	14	20
06-Aug-19	07-Aug-19	H	BH	Experimental	Summer	1	1.5	Alewife	16	18	42
06-Aug-19	07-Aug-19	H	BH	Experimental	Summer	1	1.5	Alewife	14	16	32
06-Aug-19	07-Aug-19	H	BH	Experimental	Summer	1	1.5	Alewife	15	17	35
06-Aug-19	07-Aug-19	H	BH	Experimental	Summer	1	1.5	Alewife	14	16	35
06-Aug-19	07-Aug-19	H	BH	Experimental	Summer	1	3.5	White Sucker	45	48	1190
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1	Alewife	10	12	11
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1	Alewife	10	12	11
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1	Alewife	10	12	10
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1	Alewife	10	11	12
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1	Alewife	13	15	25
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1	Alewife	12	13	16
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	30

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	29
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	30
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	31
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	27
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	29
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	15	17	38
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	15	17	31
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	15	17	30
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	15	18	24
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	23
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	13	16	28
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	13	15	22
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	13	16	29
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	13	16	29
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	13	15	24
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	27
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	15	18	36
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	30
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	29
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Round Goby	-	14	40
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	1.5	Round Goby	-	14	41

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	2.5	White Sucker	50	54	1270
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	2.5	Alewife	13	15	23
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	3.5	Alewife	15	17	36
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	3.5	Chinook Salmon	67	72	4410
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	3.5	Alewife	13	16	27
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	5	Alewife	15	17	28
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	5	Alewife	14	16	31
13-Aug-19	14-Aug-19	A	DN	Experimental	Summer	2	5	Alewife	13	15	24
13-Aug-19	14-Aug-19	B	DN	Experimental	Summer	2	5	Lake Trout	66	73	4500
13-Aug-19	14-Aug-19	B	DN	Experimental	Summer	2	4	Lake Trout	61	66	3510
13-Aug-19	14-Aug-19	B	DN	Experimental	Summer	2	3.5	Lake Trout	74	80	6150
13-Aug-19	14-Aug-19	B	DN	Experimental	Summer	2	3	Lake Trout	66	71	4150
13-Aug-19	14-Aug-19	B	DN	Experimental	Summer	2	1.5	White Sucker	16	17	51
13-Aug-19	14-Aug-19	B	DN	Experimental	Summer	2	1	Round Goby	-	10	12
13-Aug-19	14-Aug-19	C	DN	Experimental	Summer	2	1.5	Alewife	13	15	25
13-Aug-19	14-Aug-19	C	DN	Experimental	Summer	2	4.5	Lake Trout	57	61	2130
13-Aug-19	14-Aug-19	C	DN	Experimental	Summer	2	4.5	Lake Trout	63	68	3400
12-Aug-19	13-Aug-19	D	DN	Experimental	Summer	2	3	Longnose Sucker	30	32	390
12-Aug-19	13-Aug-19	D	DN	Experimental	Summer	2	1.5	Round Goby	-	15	43
12-Aug-19	13-Aug-19	D	DN	Experimental	Summer	2	1.5	Round Goby	-	15	46
12-Aug-19	13-Aug-19	D	DN	Experimental	Summer	2	1.5	Alewife	16	18	33
12-Aug-19	13-Aug-19	D	DN	Experimental	Summer	2	1.5	Alewife	15	18	31
12-Aug-19	13-Aug-19	D	DN	Experimental	Summer	2	1	Round Goby	-	10	12
12-Aug-19	13-Aug-19	E	DN	Experimental	Summer	2	1	Round Goby	-	10	12
12-Aug-19	13-Aug-19	E	DN	Experimental	Summer	2	1.5	Alewife	14	17	30
12-Aug-19	13-Aug-19	E	DN	Experimental	Summer	2	1.5	Alewife	16	18	30
12-Aug-19	13-Aug-19	E	DN	Experimental	Summer	2	1.5	Alewife	13	15	28
12-Aug-19	13-Aug-19	E	DN	Experimental	Summer	2	1.5	Alewife	15	17	30
12-Aug-19	13-Aug-19	E	DN	Experimental	Summer	2	1.5	Alewife	16	18	28
12-Aug-19	13-Aug-19	E	DN	Experimental	Summer	2	1.5	Alewife	16	19	33
12-Aug-19	13-Aug-19	E	DN	Experimental	Summer	2	1.5	Alewife	15	17	30
12-Aug-19	13-Aug-19	E	DN	Experimental	Summer	2	1.5	Alewife	16	18	36
12-Aug-19	13-Aug-19	E	DN	Experimental	Summer	2	1.5	Alewife	17	19	34
12-Aug-19	13-Aug-19	E	DN	Experimental	Summer	2	1.5	Alewife	15	17	26
12-Aug-19	13-Aug-19	E	DN	Experimental	Summer	2	1.5	Alewife	15	18	30
12-Aug-19	13-Aug-19	E	DN	Experimental	Summer	2	1.5	Alewife	13	15	26
12-Aug-19	13-Aug-19	E	DN	Experimental	Summer	2	1.5	Alewife	15	17	23
12-Aug-19	13-Aug-19	E	DN	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	E	DN	Experimental	Summer	2	1.5	Alewife	15	18	30
12-Aug-19	13-Aug-19	E	DN	Experimental	Summer	2	1.5	Alewife	14	16	30
12-Aug-19	13-Aug-19	E	DN	Experimental	Summer	2	1.5	Alewife	14	16	26
12-Aug-19	13-Aug-19	E	DN	Experimental	Summer	2	2	Alewife	14	16	25
12-Aug-19	13-Aug-19	E	DN	Experimental	Summer	2	2	Alewife	13	15	22
12-Aug-19	13-Aug-19	E	DN	Experimental	Summer	2	5	Lake Trout	61	66	3080
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	5	Alewife	16	18	36
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	4.5	Alewife	14	16	26
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	4.5	Lake Trout	62	67	3290
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	4	Alewife	13	14	20
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	4	Alewife	14	17	26
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	3	Round Goby	-	16	48
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	3	Alewife	13	16	29
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	3	Alewife	14	16	25
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	16	19	33
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	15	18	30
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	17	19	32
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	15	17	30
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	14	17	29
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	14	16	29
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	15	17	27
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	15	17	30
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	14	17	33
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	14	17	28
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	16	18	35
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	14	16	31
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	14	16	29
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	15	18	35
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	15	16	26
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	14	17	30
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	14	17	29
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	15	17	29
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	14	16	32
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	14	15	27
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	15	17	28
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	15	17	28
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	15	17	28

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	15	17	28
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	15	17	28
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	15	17	28
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	15	17	28
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	15	17	28
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	15	17	28
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	15	17	28
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	15	17	28
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	15	17	28
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	15	17	28
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1.5	Alewife	15	17	28
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1	Alewife	10	11	11
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1	Alewife	11	13	14
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1	Alewife	9	11	9
13-Aug-19	14-Aug-19	F	DN	Experimental	Summer	2	1	Alewife	14	16	24
12-Aug-19	13-Aug-19	G	TP	Experimental	Summer	2	1.5	Alewife	14	16	29
12-Aug-19	13-Aug-19	G	TP	Experimental	Summer	2	1.5	Alewife	14	16	28
12-Aug-19	13-Aug-19	G	TP	Experimental	Summer	2	1.5	Alewife	16	18	30
12-Aug-19	13-Aug-19	G	TP	Experimental	Summer	2	1.5	Alewife	14	16	31
12-Aug-19	13-Aug-19	G	TP	Experimental	Summer	2	1.5	Alewife	14	16	26
12-Aug-19	13-Aug-19	G	TP	Experimental	Summer	2	1.5	Alewife	14	15	28
12-Aug-19	13-Aug-19	G	TP	Experimental	Summer	2	1.5	Alewife	13	15	22
12-Aug-19	13-Aug-19	G	TP	Experimental	Summer	2	1	Round Goby	-	9	11
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1	Alewife	16	18	32
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1	Alewife	12	13	22
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1	Alewife	13	15	28
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1	Alewife	12	14	17
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1	Alewife	13	15	27
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	16	19	35
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	16	31
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	15	17	29
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	16	18	40
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	16	29
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	13	15	24
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	15	18	38
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	16	31
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	16	29
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	13	15	30
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	15	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	16	29
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	16	30
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	15	18	29
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	16	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	15	17	31
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	30
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	32
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	15	16	34
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	16	31
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
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12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33

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Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
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12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	33
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	31
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	31
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	31
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	31
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	31
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	31
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	31
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	31
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	31
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	31
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	31
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	31
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	31
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	31
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	31
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	31
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	31
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	31
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	31
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	31
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	31
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	31
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	1.5	Alewife	14	17	31
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	3	Lake Trout	60	66	2320
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	2	Alewife	16	19	44
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	2	Alewife	13	15	24
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	2	Alewife	15	17	26

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	2	Alewife	15	18	29
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	2	Alewife	13	16	26
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	2.5	Chinook Salmon	34	38	520
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	2.5	Alewife	13	15	24
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	3	White Sucker	34	36	430
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	3	White Sucker	39	42	710
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	3.5	White Sucker	32	34	530
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	4	White Sucker	39	41	680
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	4	Lake Trout	64	71	3970
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	4	White Sucker	43	46	890
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	4	White Sucker	39	42	810
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	4	White Sucker	40	43	770
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	4	White Sucker	41	44	770
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	4	White Sucker	42	45	920
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	4	White Sucker	39	42	710
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	4	White Sucker	40	42	850
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	4	Lake Trout	64	69	3260
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	4	White Sucker	43	46	1030
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	4	White Sucker	38	41	670
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	4	White Sucker	41	44	930
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	4	White Sucker	43	46	1200
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	4.5	Lake Trout	62	67	3290
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	4.5	Lake Trout	65	70	4130
12-Aug-19	13-Aug-19	H	BH	Experimental	Summer	2	4.5	Brown Trout	50	52	1600
5-Sep-19	6-Sep-19	A	DN	Experimental	Summer	3	3.5	White Sucker	51	54	1720
5-Sep-19	6-Sep-19	A	DN	Experimental	Summer	3	3.5	White Sucker	39	42	840
5-Sep-19	6-Sep-19	A	DN	Experimental	Summer	3	3.5	White Sucker	46	50	1140
5-Sep-19	6-Sep-19	A	DN	Experimental	Summer	3	3.5	White Sucker	41	45	960
5-Sep-19	6-Sep-19	A	DN	Experimental	Summer	3	3.5	White Sucker	40	43	860
5-Sep-19	6-Sep-19	A	DN	Experimental	Summer	3	3.5	White Sucker	32	34	410
5-Sep-19	6-Sep-19	A	DN	Experimental	Summer	3	3.5	White Sucker	46	49	1280
5-Sep-19	6-Sep-19	A	DN	Experimental	Summer	3	3.5	White Sucker	41	43	870
5-Sep-19	6-Sep-19	A	DN	Experimental	Summer	3	3.5	White Sucker	37	40	670
5-Sep-19	6-Sep-19	A	DN	Experimental	Summer	3	4	White Sucker	40	43	930
5-Sep-19	6-Sep-19	A	DN	Experimental	Summer	3	4	White Sucker	38	40	740
5-Sep-19	6-Sep-19	A	DN	Experimental	Summer	3	4	White Sucker	42	45	920
5-Sep-19	6-Sep-19	A	DN	Experimental	Summer	3	4	White Sucker	37	40	770
5-Sep-19	6-Sep-19	A	DN	Experimental	Summer	3	4	White Sucker	38	40	710
5-Sep-19	6-Sep-19	A	DN	Experimental	Summer	3	4	White Sucker	47	50	1370
5-Sep-19	6-Sep-19	A	DN	Experimental	Summer	3	4.5	White Sucker	44	46	1130
5-Sep-19	6-Sep-19	A	DN	Experimental	Summer	3	4.5	White Sucker	45	48	1130
5-Sep-19	6-Sep-19	A	DN	Experimental	Summer	3	4.5	White Sucker	50	54	1660
5-Sep-19	6-Sep-19	A	DN	Experimental	Summer	3	1	Round Goby	-	10	11
5-Sep-19	6-Sep-19	A	DN	Experimental	Summer	3	1.5	Alewife	16	19	53
5-Sep-19	6-Sep-19	A	DN	Experimental	Summer	3	1.5	Alewife	16	19	55
5-Sep-19	6-Sep-19	A	DN	Experimental	Summer	3	1.5	Alewife	15	17	36
5-Sep-19	6-Sep-19	A	DN	Experimental	Summer	3	1.5	Alewife	15	18	31
5-Sep-19	6-Sep-19	A	DN	Experimental	Summer	3	1.5	Alewife	14	16	33
5-Sep-19	6-Sep-19	A	DN	Experimental	Summer	3	1.5	Alewife	15	18	41
5-Sep-19	6-Sep-19	A	DN	Experimental	Summer	3	1.5	Alewife	15	17	37
5-Sep-19	6-Sep-19	A	DN	Experimental	Summer	3	1.5	Alewife	14	17	35
5-Sep-19	6-Sep-19	B	DN	Experimental	Summer	3	4.5	WALLEYE	62	66	3190
5-Sep-19	6-Sep-19	B	DN	Experimental	Summer	3	4.5	WALLEYE	69	73	4650
5-Sep-19	6-Sep-19	B	DN	Experimental	Summer	3	4.5	WALLEYE	52	55	1800
5-Sep-19	6-Sep-19	B	DN	Experimental	Summer	3	4.5	WALLEYE	64	67	3790
5-Sep-19	6-Sep-19	B	DN	Experimental	Summer	3	4	WALLEYE	48	51	1330
5-Sep-19	6-Sep-19	B	DN	Experimental	Summer	3	4	White Sucker	42	45	890
5-Sep-19	6-Sep-19	B	DN	Experimental	Summer	3	3.5	White Sucker	38	40	800
5-Sep-19	6-Sep-19	B	DN	Experimental	Summer	3	3.5	White Sucker	37	40	690
5-Sep-19	6-Sep-19	B	DN	Experimental	Summer	3	3.5	White Sucker	36	39	680
5-Sep-19	6-Sep-19	B	DN	Experimental	Summer	3	3.5	White Sucker	41	44	930
5-Sep-19	6-Sep-19	B	DN	Experimental	Summer	3	3	WALLEYE	43	45	880
5-Sep-19	6-Sep-19	B	DN	Experimental	Summer	3	3	White Sucker	34	37	510
5-Sep-19	6-Sep-19	B	DN	Experimental	Summer	3	1.5	Rock Bass	19	20	190
5-Sep-19	6-Sep-19	B	DN	Experimental	Summer	3	1.5	White Sucker	17	18	52
5-Sep-19	6-Sep-19	B	DN	Experimental	Summer	3	1.5	White Sucker	16	17	50
5-Sep-19	6-Sep-19	B	DN	Experimental	Summer	3	1	White Sucker	16	17	49
5-Sep-19	6-Sep-19	B	DN	Experimental	Summer	3	1	Alewife	10	11	10
5-Sep-19	6-Sep-19	B	DN	Experimental	Summer	3	1	Alewife	10	12	12
5-Sep-19	6-Sep-19	B	DN	Experimental	Summer	3	1	Alewife	10	12	9
5-Sep-19	6-Sep-19	B	DN	Experimental	Summer	3	1	Alewife	10	11	11
5-Sep-19	6-Sep-19	B	DN	Experimental	Summer	3	1	Alewife	10	12	12
5-Sep-19	6-Sep-19	B	DN	Experimental	Summer	3	1	Alewife	12	13	17
5-Sep-19	6-Sep-19	B	DN	Experimental	Summer	3	1	Round Goby	-	10	12
28-Aug-19	29-Aug-19	C	DN	Experimental	Summer	3	4.5	Gizzard Shad	38	43	910

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
28-Aug-19	29-Aug-19	C	DN	Experimental	Summer	3	4.5	Gizzard Shad	38	43	1020
28-Aug-19	29-Aug-19	C	DN	Experimental	Summer	3	4.5	Gizzard Shad	43	50	1340
28-Aug-19	29-Aug-19	C	DN	Experimental	Summer	3	5	Gizzard Shad	44	50	1310
28-Aug-19	29-Aug-19	C	DN	Experimental	Summer	3	5	Gizzard Shad	42	47	990
28-Aug-19	29-Aug-19	C	DN	Experimental	Summer	3	5	Gizzard Shad	42	47	1050
28-Aug-19	29-Aug-19	C	DN	Experimental	Summer	3	4	Gizzard Shad	36	42	750
28-Aug-19	29-Aug-19	C	DN	Experimental	Summer	3	4	Gizzard Shad	38	44	860
28-Aug-19	29-Aug-19	C	DN	Experimental	Summer	3	4	Gizzard Shad	40	46	1230
28-Aug-19	29-Aug-19	C	DN	Experimental	Summer	3	2.5	Rock Bass	19	20	165
28-Aug-19	29-Aug-19	C	DN	Experimental	Summer	3	2.5	Brown Bullhead	23	23	200
28-Aug-19	29-Aug-19	C	DN	Experimental	Summer	3	1.5	Yellow Perch	15	15	52
28-Aug-19	29-Aug-19	C	DN	Experimental	Summer	3	1.5	Alewife	16	19	35
28-Aug-19	29-Aug-19	C	DN	Experimental	Summer	3	1.5	Yellow Perch	13	14	36
28-Aug-19	29-Aug-19	C	DN	Experimental	Summer	3	1.5	Alewife	13	17	28
28-Aug-19	29-Aug-19	C	DN	Experimental	Summer	3	1	Yellow Perch	14	15	42
28-Aug-19	29-Aug-19	C	DN	Experimental	Summer	3	1	Round Goby	-	10	10
28-Aug-19	29-Aug-19	C	DN	Experimental	Summer	3	1	LAKE CHUB	11	12	13
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	5	White Sucker	53	56	1362
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	5	WALLEYE	63	66	3290
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1.5	Round Goby	-	15	54
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1.5	Round Goby	-	14	45
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1.5	Round Goby	-	15	37
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1.5	Round Goby	-	14	37
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1.5	Round Goby	-	14	42
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1.5	Round Goby	-	14	41
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1.5	Round Goby	-	14	47
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1.5	Alewife	15	18	21
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1.5	Round Goby	-	13	35
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1.5	Round Goby	-	14	41
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1.5	Round Goby	-	14	40
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1.5	Round Goby	-	15	45
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1.5	Round Goby	-	13	39
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1.5	Round Goby	-	14	38
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	10	8
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	10	11
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	10	11
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	11	10
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	10	12
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	11	15
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	10	13
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	10	14
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	10	16
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	10	11
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	11	12
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	11	14
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	10	11
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	10	11
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	10	11
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	10	11
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	10	11
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	10	11
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	10	11
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	10	11
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	10	11
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	10	11
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	10	11
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	10	11
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	10	11
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	10	11
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	10	11
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	10	11
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	10	11
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	10	11
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	10	11
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	10	11
28-Aug-19	29-Aug-19	D	DN	Experimental	Summer	3	1	Round Goby	-	10	11
28-Aug-19	29-Aug-19	E	DN	Experimental	Summer	3	4	White Sucker	42	45	980
28-Aug-19	29-Aug-19	E	DN	Experimental	Summer	3	1.5	Alewife	14	16	34
28-Aug-19	29-Aug-19	E	DN	Experimental	Summer	3	1.5	Round Goby	-	15	43
28-Aug-19	29-Aug-19	E	DN	Experimental	Summer	3	1.5	White Sucker	16	17	54
28-Aug-19	29-Aug-19	E	DN	Experimental	Summer	3	1	Round Goby	-	10	9
5-Sep-19	6-Sep-19	F	DN	Experimental	Summer	3	5	Lake Trout	66	71	3960
5-Sep-19	6-Sep-19	F	DN	Experimental	Summer	3	2	Alewife	14	16	25
5-Sep-19	6-Sep-19	F	DN	Experimental	Summer	3	2	Alewife	10	12	12
5-Sep-19	6-Sep-19	F	DN	Experimental	Summer	3	1.5	Alewife	15	17	33

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
5-Sep-19	6-Sep-19	F	DN	Experimental	Summer	3	1.5	Alewife	15	17	34
5-Sep-19	6-Sep-19	F	DN	Experimental	Summer	3	1.5	Alewife	15	17	35
5-Sep-19	6-Sep-19	F	DN	Experimental	Summer	3	1.5	Alewife	14	16	37
5-Sep-19	6-Sep-19	F	DN	Experimental	Summer	3	1.5	Alewife	14	16	34
5-Sep-19	6-Sep-19	F	DN	Experimental	Summer	3	1.5	Alewife	15	17	36
5-Sep-19	6-Sep-19	F	DN	Experimental	Summer	3	1.5	Alewife	14	16	28
5-Sep-19	6-Sep-19	F	DN	Experimental	Summer	3	1.5	Alewife	15	17	33
5-Sep-19	6-Sep-19	F	DN	Experimental	Summer	3	1.5	Alewife	14	16	30
5-Sep-19	6-Sep-19	F	DN	Experimental	Summer	3	1.5	Alewife	14	17	36
5-Sep-19	6-Sep-19	F	DN	Experimental	Summer	3	1.5	Alewife	14	16	32
5-Sep-19	6-Sep-19	F	DN	Experimental	Summer	3	1.5	Alewife	15	17	35
5-Sep-19	6-Sep-19	F	DN	Experimental	Summer	3	1.5	Alewife	16	19	39
5-Sep-19	6-Sep-19	F	DN	Experimental	Summer	3	1.5	Alewife	14	16	32
5-Sep-19	6-Sep-19	F	DN	Experimental	Summer	3	1.5	Alewife	15	17	42
5-Sep-19	6-Sep-19	F	DN	Experimental	Summer	3	1.5	Alewife	13	15	31
5-Sep-19	6-Sep-19	F	DN	Experimental	Summer	3	1.5	Alewife	14	16	34
5-Sep-19	6-Sep-19	F	DN	Experimental	Summer	3	1.5	Alewife	14	16	34
5-Sep-19	6-Sep-19	F	DN	Experimental	Summer	3	1.5	Alewife	15	17	35
5-Sep-19	6-Sep-19	F	DN	Experimental	Summer	3	1.5	Alewife	14	16	30
5-Sep-19	6-Sep-19	F	DN	Experimental	Summer	3	1.5	Alewife	14	16	33
28-Aug-19	29-Aug-19	G	TP	Experimental	Summer	3	2.5	Rock Bass	16	17	98
28-Aug-19	29-Aug-19	G	TP	Experimental	Summer	3	2.5	Brown Bullhead	22	22	160
28-Aug-19	29-Aug-19	G	TP	Experimental	Summer	3	3	Brown Bullhead	26	27	280
28-Aug-19	29-Aug-19	G	TP	Experimental	Summer	3	3	Brown Bullhead	25	25	240
28-Aug-19	29-Aug-19	G	TP	Experimental	Summer	3	3	White Sucker	33	35	350
28-Aug-19	29-Aug-19	G	TP	Experimental	Summer	3	3	Rock Bass	19	19	168
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	4.5	Brown Trout	53	54	1760
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	4	White Sucker	44	47	1130
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	4	White Sucker	40	42	780
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	3.5	Chinook Salmon	60	64	3030
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	3.5	White Sucker	41	43	840
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	3.5	White Sucker	37	40	700
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	3.5	Brown Trout	49	51	1560
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	1	Alewife	10	12	11
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	2	Alewife	16	19	35
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	1.5	Alewife	15	18	44
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	1.5	Alewife	15	17	38
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	1.5	Alewife	15	17	39
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	1.5	Alewife	14	16	34
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	1.5	Alewife	16	18	41
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	1.5	Alewife	15	17	37
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	1.5	Alewife	14	17	38
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	1.5	Alewife	15	18	38
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	1.5	Alewife	16	19	46
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	1.5	Alewife	13	16	32
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	1.5	Alewife	14	16	32
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	1.5	Alewife	14	16	33
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	1.5	Alewife	14	16	33
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	1.5	Alewife	14	16	35
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	1.5	Alewife	13	15	28
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	1.5	Alewife	16	19	46
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	1.5	Alewife	15	17	38
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	1.5	Alewife	14	16	33
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	1.5	Alewife	14	16	32
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	1.5	Alewife	14	17	33
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	1.5	Alewife	15	17	37
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	1.5	Alewife	16	19	47
5-Sep-19	6-Sep-19	H	BH	Experimental	Summer	3	1.5	Alewife	14	17	33
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	25	Alewife	12	15	22
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	25	Round Goby	-	10	13
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	25	Round Goby	-	9	11
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	25	Round Goby	-	7	4
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	13	Alewife	13	15	24
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	13	Round Goby	-	5	2
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	38	Alewife	13	15	24
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	38	Alewife	14	16	30
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	38	Alewife	15	17	32
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	38	Alewife	13	14	24
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	38	Alewife	14	16	28
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	38	Alewife	14	16	27
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	38	Alewife	15	17	32
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	38	Alewife	14	16	33
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	38	Brown Trout	21	22	92
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	19	Round Goby	-	7	4
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	19	Round Goby	-	7	5

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	21
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	16	27
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	12	14	22
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	12	14	22
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	12	14	19
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	14	16	26
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	12	14	19
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	14	21
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	14	16	31
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	14	22
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	12	14	20
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	I	DN	Broadscale	Summer	1	32	Alewife	13	15	23
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Rainbow Trout	19	20	88
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	13	15	24
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	14	15	24
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	13	15	22
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	13	15	22
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	13	15	23
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	13	15	23
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	13	14	22
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	12	14	17
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	13	15	24
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	12	13	17
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	13	15	22
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	13	15	26
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	13	16	21
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	14	16	27
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	14	16	29
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	14	16	29
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	12	14	22
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	14	16	29

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	12	15	20
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	14	15	25
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	13	15	24
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	13	15	24
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	13	15	24
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	13	15	24
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	13	15	24
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	13	15	24
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	13	15	24
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	13	15	24
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	13	15	24
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	13	15	24
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	13	15	24
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	32	Alewife	13	15	24
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	38	Alewife	14	17	34
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	38	Alewife	14	16	29
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	38	Alewife	15	17	34
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	38	Alewife	15	18	31
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	38	Alewife	14	16	28
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	38	Round Goby	-	7	5
06-Aug-19	07-Aug-19	J	DN	Broadscale	Summer	1	25	Round Goby	-	11	13
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	12	14	20
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	14	16	26
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	21
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	22
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	23
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	19
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	22
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	14	16	26
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	22
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	21
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	20
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	14	16	26
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	26
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	16	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	14	16	27
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	32	Alewife	13	15	25
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	25	Alewife	12	14	18
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	25	Alewife	13	15	2
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	25	Alewife	13	15	22
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	25	Round Goby	-	9	8
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	25	Round Goby	-	10	13
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	25	Round Goby	-	10	11
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	25	Round Goby	-	9	9
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	25	Round Goby	-	9	9
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	25	Round Goby	-	10	10
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	13	Alewife	12	15	22
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	13	Round Goby	-	5	1
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	13	Round Goby	-	6	2
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	13	Round Goby	-	5	1
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	13	Round Goby	-	5	2
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	13	Round Goby	-	6	2
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	38	Brown Bullhead	-	15	48
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	38	White Sucker	17	18	57
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	38	Alewife	14	17	34
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	38	Alewife	14	16	21
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	38	Alewife	14	16	28
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	38	Alewife	15	17	32
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	38	Alewife	14	16	26
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	19	Yellow Perch	10	10	12
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	19	Round Goby	-	7	4
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	19	Round Goby	-	7	4
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	19	Round Goby	-	7	5
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	19	Round Goby	-	8	5
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	19	Round Goby	-	7	3
07-Aug-19	08-Aug-19	K	DN	Broadscale	Summer	1	19	Round Goby	-	7	3
13-Aug-19	14-Aug-19	I	DN	Broadscale	Summer	2	25	Alewife	9	11	8
13-Aug-19	14-Aug-19	I	DN	Broadscale	Summer	2	38	Alewife	13	15	18
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	25	Alewife	10	11	9
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	25	Alewife	13	15	23
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	25	Alewife	13	14	19
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	25	Alewife	10	11	10
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	25	Alewife	10	11	10
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	25	Alewife	13	15	12
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	25	Alewife	10	12	8
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	25	Alewife	9	10	21
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	25	Alewife	10	11	11
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	25	Alewife	9	10	8
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	38	Alewife	14	16	32
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	38	Alewife	15	17	33
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	38	Alewife	14	16	29
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	38	Alewife	15	17	30
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	38	Alewife	15	17	34
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	38	Alewife	15	17	33
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	38	Alewife	16	18	37

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	38	Alewife	15	18	30
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	38	Alewife	15	17	30
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	38	Alewife	16	18	33
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	38	Alewife	14	16	31
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	38	Alewife	14	17	29
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	38	Alewife	14	16	28
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	38	Alewife	15	17	33
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	38	Alewife	14	15	21
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	14	16	27
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	24
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	12	14	22
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	12
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	23
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	14	16	24
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	27
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	14	22
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	12	14	22
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	16	26
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	12	14	23
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	14	16	28
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	12	14	18
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	14	16	23
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	14	15	24
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	14	16	28
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	14	22
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
12-Aug-19	13-Aug-19	J	DN	Broadscale	Summer	2	32	Alewife	13	15	25
28-Aug-19	29-Aug-19	I	DN	Broadscale	Summer	3	13	Round Goby	-	5	1
28-Aug-19	29-Aug-19	I	DN	Broadscale	Summer	3	25	Round Goby	-	5	1
28-Aug-19	29-Aug-19	I	DN	Broadscale	Summer	3	38	Round Goby	-	14	30
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	32	Alewife	14	16	29
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	32	Alewife	16	18	31
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	32	Alewife	13	16	25
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	32	Alewife	13	15	24
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	32	Alewife	13	15	26
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	32	Alewife	13	15	20
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	32	Alewife	13	15	26
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	32	Alewife	14	16	30
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	32	Alewife	13	15	21
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	38	Alewife	16	18	34
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	38	Alewife	16	19	36
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	38	Alewife	16	19	37
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	38	Alewife	15	17	34
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	38	Alewife	17	19	40
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	38	Alewife	14	16	30
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	19	Alewife	7	8	3
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	19	Alewife	7	8	4
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	19	Alewife	7	8	3
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	19	Alewife	7	8	3
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	19	Alewife	7	8	3
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	19	Alewife	7	8	5
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	19	Round Goby	-	8	4
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	25	Rainbow Smelt	15	17	26
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	25	Alewife	10	11	10
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	25	Alewife	10	12	11
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	25	Alewife	10	11	9
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	25	Alewife	10	11	11
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	25	Alewife	11	12	13
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	25	Alewife	10	11	9
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	25	Alewife	10	11	9
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	25	Alewife	10	11	9
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	13	Alewife	6	6	2
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	13	Alewife	6	7	2
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	13	Alewife	6	7	2
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	13	Alewife	6	6	1
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	13	Alewife	5	5	1
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	13	Alewife	6	7	3
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	13	Alewife	6	7	2
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	13	Alewife	6	6	2
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	13	Alewife	6	6	2
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	13	Alewife	6	6	2
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	13	Alewife	5	7	1
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	13	Alewife	5	6	1
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	13	Alewife	5	6	1
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	13	Alewife	5	6	2
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	13	Alewife	6	6	2
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	13	Alewife	5	6	1
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	13	Alewife	6	6	2
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	13	Alewife	5	6	1
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	13	Alewife	5	6	1
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	13	Alewife	6	6	2
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	13	Alewife	6	7	2
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	13	Alewife	6	7	3
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	13	Alewife	5	6	1
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	13	Alewife	6	6	2
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	13	Alewife	6	7	2
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	13	Alewife	5	6	2
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	13	Alewife	6	6	1
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	13	Alewife	6	7	3
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	13	Round Goby	-	5	1
5-Sep-19	6-Sep-19	J	DN	Broadscale	Summer	3	13	Round Goby	-	5	1
28-Aug-19	29-Aug-19	K	DN	Broadscale	Summer	3	13	Alewife	5	6	1
28-Aug-19	29-Aug-19	K	DN	Broadscale	Summer	3	13	Rainbow Smelt	8	8	2
28-Aug-19	29-Aug-19	K	DN	Broadscale	Summer	3	38	Alewife	14	16	34
28-Aug-19	29-Aug-19	K	DN	Broadscale	Summer	3	38	Alewife	15	17	34
28-Aug-19	29-Aug-19	K	DN	Broadscale	Summer	3	38	Alewife	15	17	43
28-Aug-19	29-Aug-19	K	DN	Broadscale	Summer	3	19	Rainbow Smelt	10	12	5

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
28-Oct-19	29-Oct-19	A	DN	Experimental	Fall	1	1	Alewife	9.0	10.2	22
28-Oct-19	29-Oct-19	A	DN	Experimental	Fall	1	1.5	Alewife	14.2	16.6	42
28-Oct-19	29-Oct-19	A	DN	Experimental	Fall	1	1.5	Alewife	13.7	16.0	38
28-Oct-19	29-Oct-19	A	DN	Experimental	Fall	1	1.5	Alewife	14.8	17.1	52
28-Oct-19	29-Oct-19	A	DN	Experimental	Fall	1	1.5	Alewife	14.9	17.3	44
28-Oct-19	29-Oct-19	A	DN	Experimental	Fall	1	1.5	Alewife	14.5	16.2	39
28-Oct-19	29-Oct-19	A	DN	Experimental	Fall	1	1.5	Alewife	13.8	15.9	36
28-Oct-19	29-Oct-19	A	DN	Experimental	Fall	1	2.5	Walleye	74.2	77.8	5840
28-Oct-19	29-Oct-19	A	DN	Experimental	Fall	1	2.5	Lake Trout	62.5	67.3	3430
28-Oct-19	29-Oct-19	A	DN	Experimental	Fall	1	3	Lake Trout	73.7	80.0	5770
28-Oct-19	29-Oct-19	A	DN	Experimental	Fall	1	3	White Sucker	45.4	50.0	1500
28-Oct-19	29-Oct-19	A	DN	Experimental	Fall	1	3	Round Whitefish	45.4	49.5	1000
28-Oct-19	29-Oct-19	A	DN	Experimental	Fall	1	4	Walleye	50.9	54.1	1380
28-Oct-19	29-Oct-19	A	DN	Experimental	Fall	1	4	White Sucker	41.2	44.4	970
28-Oct-19	29-Oct-19	A	DN	Experimental	Fall	1	4	White Sucker	49.3	53.0	1490
28-Oct-19	29-Oct-19	A	DN	Experimental	Fall	1	4	Round Whitefish	44.0	48.3	910
28-Oct-19	29-Oct-19	A	DN	Experimental	Fall	1	4.5	White Sucker	49.1	53.2	1730
28-Oct-19	29-Oct-19	A	DN	Experimental	Fall	1	4.5	Lake Trout	71.7	78.2	4610
28-Oct-19	29-Oct-19	A	DN	Experimental	Fall	1	4.5	White Sucker	45.4	48.6	1290
28-Oct-19	29-Oct-19	A	DN	Experimental	Fall	1	5	Walleye	46.5	49.1	1410
28-Oct-19	29-Oct-19	A	DN	Experimental	Fall	1	5	Walleye	52.3	55.8	2040
28-Oct-19	29-Oct-19	A	DN	Experimental	Fall	1	5	Walleye	61.7	65.1	3370
29-Oct-19	30-Oct-19	B	DN	Experimental	Fall	1	1.5	Yellow Perch	13.3	14.0	33
29-Oct-19	30-Oct-19	B	DN	Experimental	Fall	1	1.5	Yellow Perch	17.4	18.1	77
29-Oct-19	30-Oct-19	B	DN	Experimental	Fall	1	2	White Sucker	22.2	23.5	130
29-Oct-19	30-Oct-19	B	DN	Experimental	Fall	1	2	Lake Trout	63.0	68.6	3080
29-Oct-19	30-Oct-19	B	DN	Experimental	Fall	1	2.5	Lake Trout	73.0	78.5	5440
29-Oct-19	30-Oct-19	B	DN	Experimental	Fall	1	3	Lake Trout	70.5	76.1	4250
29-Oct-19	30-Oct-19	B	DN	Experimental	Fall	1	3.5	Brown Trout	62.5	65.0	4960
29-Oct-19	30-Oct-19	B	DN	Experimental	Fall	1	3.5	Brown Trout	47.4	48.9	1680
29-Oct-19	30-Oct-19	B	DN	Experimental	Fall	1	3.5	Brown Trout	61.0	63.1	2650
29-Oct-19	30-Oct-19	B	DN	Experimental	Fall	1	3.5	Brown Trout	58.6	60.4	2810
29-Oct-19	30-Oct-19	B	DN	Experimental	Fall	1	3.5	Lake Trout	60.1	65.2	2540
29-Oct-19	30-Oct-19	B	DN	Experimental	Fall	1	4.5	Brown Trout	39.4	41.7	800
29-Oct-19	30-Oct-19	B	DN	Experimental	Fall	1	5	Lake Trout	55.5	60.0	2250
29-Oct-19	30-Oct-19	B	DN	Experimental	Fall	1	5	Gizzard Shad	40.2	45.5	1360
29-Oct-19	30-Oct-19	B	DN	Experimental	Fall	1	5	Gizzard Shad	44.0	50.4	1760
29-Oct-19	30-Oct-19	B	DN	Experimental	Fall	1	5	Lake Trout	57.9	62.9	2270
29-Oct-19	30-Oct-19	B	DN	Experimental	Fall	1	5	Lake Trout	73.0	79.6	5350
29-Oct-19	30-Oct-19	C	DN	Experimental	Fall	1	5	Gizzard Shad	36.8	41.4	910
29-Oct-19	30-Oct-19	C	DN	Experimental	Fall	1	4.5	Common Carp	68.6	74.2	7250
29-Oct-19	30-Oct-19	C	DN	Experimental	Fall	1	4	Brown Bullhead	34.9	35.6	680
29-Oct-19	30-Oct-19	C	DN	Experimental	Fall	1	4	Lake Trout	72.0	78.1	5480
29-Oct-19	30-Oct-19	C	DN	Experimental	Fall	1	3.5	Brown Bullhead	29.1	29.9	440
29-Oct-19	30-Oct-19	C	DN	Experimental	Fall	1	3.5	White Sucker	36.0	38.2	540
29-Oct-19	30-Oct-19	C	DN	Experimental	Fall	1	3.5	Lake Trout	62.6	68.1	3310
29-Oct-19	30-Oct-19	C	DN	Experimental	Fall	1	3	Brown Bullhead	25.7	26.2	280
29-Oct-19	30-Oct-19	C	DN	Experimental	Fall	1	3	White Sucker	36.7	39.4	660
29-Oct-19	30-Oct-19	C	DN	Experimental	Fall	1	3	Lake Trout	62.0	67.0	3110
29-Oct-19	30-Oct-19	C	DN	Experimental	Fall	1	3	Lake Trout	89.1	95.5	9730
29-Oct-19	30-Oct-19	C	DN	Experimental	Fall	1	2.5	Lake Trout	77.4	84.4	6770
29-Oct-19	30-Oct-19	C	DN	Experimental	Fall	1	1.5	Alewife	14.8	17.2	45
29-Oct-19	30-Oct-19	C	DN	Experimental	Fall	1	1.5	Yellow Perch	14.1	14.8	38
29-Oct-19	30-Oct-19	C	DN	Experimental	Fall	1	1	Lake Chub	10.5	11.8	14
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	5	Lake Trout	76.3	82.5	6150
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	5	Lake Trout	79.6	85.7	6740
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	5	Lake Trout	71.0	76.4	5340
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	5	Lake Trout	56.8	61.7	2160
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	5	Lake Trout	57.9	63.2	2480
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	5	Lake Trout	73.2	80.0	6030
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	5	White Sucker	47.4	50.7	1460
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	4.5	Round Whitefish	43.7	48.0	1110
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	4.5	White Sucker	47.9	51.4	1360
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	4.5	White Sucker	43.4	46.8	1020
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	4.5	White Sucker	43.2	46.7	1120
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	4.5	Lake Trout	55.4	60.2	2190
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	4.5	Walleye	62.0	65.3	3190
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	4	Lake Trout	58.1	63.5	2150
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	4	Lake Trout	58.3	62.4	2860
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	3.5	Lake Trout	75.2	80.4	6280
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	3.5	Lake Trout	62.0	67.6	3210
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	3.5	Round Whitefish	43.4	47.5	1100
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	3.5	Round Whitefish	46.0	49.8	950
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	3.5	Lake Trout	53.0	58.3	1810
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	3.5	Walleye	48.3	51.0	1630

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	3.5	Lake Trout	53.5	58.1	1770
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	3.5	Lake Trout	56.3	61.0	2220
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	3	Lake Trout	91.0	97.5	9850
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	3	White Sucker	48.8	52.7	1460
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	3	Lake Trout	56.4	61.7	2230
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	1.5	Round Goby	-	12.6	42
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	1.5	Round Goby	-	12.6	36
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	1.5	Round Goby	-	13.5	42
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	1.5	Round Goby	-	13.7	44
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	1.5	Round Goby	-	14.3	43
28-Oct-19	29-Oct-19	D	DN	Experimental	Fall	1	1	Round Goby	-	10.0	14
28-Oct-19	29-Oct-19	E	DN	Experimental	Fall	1	1	Alewife	9.3	10.4	9
28-Oct-19	29-Oct-19	E	DN	Experimental	Fall	1	1	Alewife	9.2	10.6	9
28-Oct-19	29-Oct-19	E	DN	Experimental	Fall	1	1	Alewife	9.4	10.6	10
28-Oct-19	29-Oct-19	E	DN	Experimental	Fall	1	2.5	Walleye	50.8	53.5	2150
28-Oct-19	29-Oct-19	E	DN	Experimental	Fall	1	2.5	Rainbow Trout	31.0	33.0	390
28-Oct-19	29-Oct-19	E	DN	Experimental	Fall	1	3.5	Rainbow Trout	35.0	34.7	650
28-Oct-19	29-Oct-19	E	DN	Experimental	Fall	1	3.5	Lake Trout	71.7	77.9	4680
28-Oct-19	29-Oct-19	E	DN	Experimental	Fall	1	3.5	Lake Trout	60.8	66.4	3050
28-Oct-19	29-Oct-19	E	DN	Experimental	Fall	1	4	Lake Trout	76.8	83.0	6260
28-Oct-19	29-Oct-19	E	DN	Experimental	Fall	1	4	Round Whitefish	46.2	50.5	1060
28-Oct-19	29-Oct-19	E	DN	Experimental	Fall	1	4.5	Lake Trout	48.5	53.0	1580
28-Oct-19	29-Oct-19	E	DN	Experimental	Fall	1	4.5	White Sucker	49.1	52.7	1570
28-Oct-19	29-Oct-19	E	DN	Experimental	Fall	1	4.5	White Sucker	64.2	70.1	3740
28-Oct-19	29-Oct-19	E	DN	Experimental	Fall	1	5	Lake Trout	54.2	58.8	1920
29-Oct-19	30-Oct-19	F	DN	Experimental	Fall	1	5	Lake Trout	62.7	67.5	2740
29-Oct-19	30-Oct-19	F	DN	Experimental	Fall	1	5	Lake Trout	76.7	82.1	6190
29-Oct-19	30-Oct-19	F	DN	Experimental	Fall	1	4.5	White Sucker	49.5	53.4	1890
29-Oct-19	30-Oct-19	F	DN	Experimental	Fall	1	4.5	Brown Trout	51.1	52.6	2040
29-Oct-19	30-Oct-19	F	DN	Experimental	Fall	1	3	Lake Trout	59.0	64.1	2720
29-Oct-19	30-Oct-19	F	DN	Experimental	Fall	1	1	Alewife	8.8	10.4	9
29-Oct-19	30-Oct-19	F	DN	Experimental	Fall	1	1	Alewife	9.6	11.1	12
28-Oct-19	29-Oct-19	G	TP	Experimental	Fall	1	1	Alewife	9.4	10.8	2
28-Oct-19	29-Oct-19	G	TP	Experimental	Fall	1	1.5	White Sucker	17.0	18.0	49
28-Oct-19	29-Oct-19	G	TP	Experimental	Fall	1	1.5	White Sucker	16.3	17.3	41
28-Oct-19	29-Oct-19	G	TP	Experimental	Fall	1	2.5	Lake Trout	65.6	70.6	3530
28-Oct-19	29-Oct-19	G	TP	Experimental	Fall	1	3	White Sucker	30.0	31.8	410
28-Oct-19	29-Oct-19	G	TP	Experimental	Fall	1	3.5	Northern Pike	50.5	53.2	820
28-Oct-19	29-Oct-19	G	TP	Experimental	Fall	1	3.5	Round Whitefish	49.3	53.3	1460
28-Oct-19	29-Oct-19	G	TP	Experimental	Fall	1	4	White Sucker	38.7	41.2	890
28-Oct-19	29-Oct-19	G	TP	Experimental	Fall	1	5	Lake Trout	71.8	77.8	4650
29-Oct-19	30-Oct-19	H	BH	Experimental	Fall	1	5	Lake Trout	71.6	77.7	4710
29-Oct-19	30-Oct-19	H	BH	Experimental	Fall	1	5	White Sucker	48.6	51.7	1340
29-Oct-19	30-Oct-19	H	BH	Experimental	Fall	1	4.5	Brown Trout	55.8	58.2	2360
29-Oct-19	30-Oct-19	H	BH	Experimental	Fall	1	3.5	White Sucker	45.8	49.2	1380
29-Oct-19	30-Oct-19	H	BH	Experimental	Fall	1	3.5	White Sucker	43.3	46.8	1120
29-Oct-19	30-Oct-19	H	BH	Experimental	Fall	1	3.5	Brown Trout	66.4	67.8	4020
29-Oct-19	30-Oct-19	H	BH	Experimental	Fall	1	2.5	White Sucker	37.7	40.4	920
29-Oct-19	30-Oct-19	H	BH	Experimental	Fall	1	2.5	White Sucker	24.7	26.4	240
29-Oct-19	30-Oct-19	H	BH	Experimental	Fall	1	2.5	American Eel	-	-	-
7-Nov-19	08-Nov-19	A	DN	Experimental	Fall	2	3.5	Round Whitefish	37.5	40.8	630
7-Nov-19	08-Nov-19	A	DN	Experimental	Fall	2	3.5	Round Whitefish	49.7	53.4	1600
6-Nov-19	07-Nov-19	B	DN	Experimental	Fall	2	4	Rainbow Trout	43.9	46.2	870
6-Nov-19	07-Nov-19	B	DN	Experimental	Fall	2	4	Rainbow Trout	67.8	70.9	3320
6-Nov-19	07-Nov-19	B	DN	Experimental	Fall	2	4.5	Rainbow Trout	37.5	39.8	530
6-Nov-19	07-Nov-19	B	DN	Experimental	Fall	2	5	Rainbow Trout	47.6	50.4	1690
6-Nov-19	07-Nov-19	C	DN	Experimental	Fall	2	1	Largemouth Bass	5.3	5.7	2
6-Nov-19	07-Nov-19	C	DN	Experimental	Fall	2	1.5	Yellow Perch	14.2	14.8	29
6-Nov-19	07-Nov-19	C	DN	Experimental	Fall	2	1.5	White Sucker	16.6	17.5	53
6-Nov-19	07-Nov-19	C	DN	Experimental	Fall	2	2	Rainbow Trout	25.2	27.0	210
6-Nov-19	07-Nov-19	C	DN	Experimental	Fall	2	2.5	White Sucker	24.1	25.7	210
6-Nov-19	07-Nov-19	C	DN	Experimental	Fall	2	3	White Sucker	28.3	29.8	260
6-Nov-19	07-Nov-19	C	DN	Experimental	Fall	2	3	Brown Trout	37.1	39.1	660
6-Nov-19	07-Nov-19	C	DN	Experimental	Fall	2	3	Lake Trout	84.4	90.7	8570
6-Nov-19	07-Nov-19	C	DN	Experimental	Fall	2	3.5	Lake Trout	87.6	94.9	8380
6-Nov-19	07-Nov-19	C	DN	Experimental	Fall	2	4	Lake Trout	75.4	84.8	7080
6-Nov-19	07-Nov-19	C	DN	Experimental	Fall	2	4.5	White Sucker	43.7	46.1	1170
7-Nov-19	8-Nov-19	D	DN	Experimental	Fall	2	1	Alewife	10.1	11.3	9
7-Nov-19	8-Nov-19	D	DN	Experimental	Fall	2	2.5	Lake Trout	61.3	67.0	2570
7-Nov-19	8-Nov-19	D	DN	Experimental	Fall	2	3	Lake Trout	72.7	78.0	4890
7-Nov-19	8-Nov-19	D	DN	Experimental	Fall	2	3	Lake Trout	75.2	82.3	6330
7-Nov-19	8-Nov-19	D	DN	Experimental	Fall	2	3.5	Lake Trout	40.6	44.1	720
7-Nov-19	8-Nov-19	D	DN	Experimental	Fall	2	4	Walleye	51.7	54.7	2050
7-Nov-19	8-Nov-19	D	DN	Experimental	Fall	2	4	Round Whitefish	49.0	52.8	1250
7-Nov-19	8-Nov-19	D	DN	Experimental	Fall	2	4	Lake Trout	51.0	55.4	1630

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
7-Nov-19	8-Nov-19	D	DN	Experimental	Fall	2	4	White Sucker	48.1	52.0	1480
7-Nov-19	8-Nov-19	D	DN	Experimental	Fall	2	4	Lake Trout	83.4	91.4	7360
7-Nov-19	8-Nov-19	D	DN	Experimental	Fall	2	4.5	Round Whitefish	47.8	51.2	1330
7-Nov-19	8-Nov-19	D	DN	Experimental	Fall	2	4.5	Lake Trout	55.4	60.9	2370
7-Nov-19	8-Nov-19	D	DN	Experimental	Fall	2	4.5	Round Whitefish	49.7	52.8	1670
7-Nov-19	8-Nov-19	D	DN	Experimental	Fall	2	4.5	Lake Trout	57.5	62.7	2360
7-Nov-19	8-Nov-19	D	DN	Experimental	Fall	2	5	Lake Trout	66.7	71.2	4090
7-Nov-19	8-Nov-19	D	DN	Experimental	Fall	2	5	Lake Trout	79.3	85.1	6220
7-Nov-19	8-Nov-19	D	DN	Experimental	Fall	2	5	Lake Trout	59.9	66.4	2890
7-Nov-19	8-Nov-19	D	DN	Experimental	Fall	2	5	Lake Trout	79.4	85.8	6130
6-Nov-19	7-Nov-19	E	DN	Experimental	Fall	2	5	Lake Whitefish	59.0	65.0	2270
6-Nov-19	7-Nov-19	F	DN	Experimental	Fall	2	2.5	Round Whitefish	49.4	53.2	1420
6-Nov-19	7-Nov-19	F	DN	Experimental	Fall	2	4	Brown Trout	65.7	68.1	4360
6-Nov-19	7-Nov-19	F	DN	Experimental	Fall	2	4.5	Lake Trout	58.4	63.9	2700
6-Nov-19	7-Nov-19	F	DN	Experimental	Fall	2	5	Walleye	51.8	54.8	2130
6-Nov-19	7-Nov-19	F	DN	Experimental	Fall	2	5	Lake Trout	71.9	77.8	4910
7-Nov-19	8-Nov-19	H	BH	Experimental	Fall	2	2.5	Rainbow Trout	32.2	34.1	44
7-Nov-19	8-Nov-19	H	BH	Experimental	Fall	2	4	White Sucker	39.2	41.7	830
12-Nov-19	13-Nov-19	A	DN	Experimental	Fall	3	3	Round Whitefish	44.0	47.8	1030
12-Nov-19	13-Nov-19	A	DN	Experimental	Fall	3	4.5	Round Whitefish	47.3	51.1	1300
12-Nov-19	13-Nov-19	A	DN	Experimental	Fall	3	1	Alewife	9.0	11.0	12
12-Nov-19	13-Nov-19	B	DN	Experimental	Fall	3	2.5	Rainbow Trout	29.5	31.4	280
12-Nov-19	13-Nov-19	B	DN	Experimental	Fall	3	2.5	Rainbow Trout	29.5	31.4	330
12-Nov-19	13-Nov-19	B	DN	Experimental	Fall	3	3	White Sucker	32.0	33.9	390
12-Nov-19	13-Nov-19	B	DN	Experimental	Fall	3	5	Rainbow Trout	52.7	55.7	1940
11-Nov-19	12-Nov-19	C	DN	Experimental	Fall	3	5	Rainbow Trout	52.3	55.6	1920
11-Nov-19	12-Nov-19	C	DN	Experimental	Fall	3	3.5	Lake Trout	76.2	81.5	6690
12-Nov-19	13-Nov-19	D	DN	Experimental	Fall	3	5	Lake Trout	76.8	82.5	5540
12-Nov-19	13-Nov-19	D	DN	Experimental	Fall	3	5	Lake Trout	53.5	58.8	2140
12-Nov-19	13-Nov-19	D	DN	Experimental	Fall	3	4.5	Lake Trout	63.7	66.4	2780
12-Nov-19	13-Nov-19	D	DN	Experimental	Fall	3	4.5	Walleye	59.9	62.9	2750
12-Nov-19	13-Nov-19	D	DN	Experimental	Fall	3	4.5	White Sucker	44.0	47.4	1110
12-Nov-19	13-Nov-19	D	DN	Experimental	Fall	3	4.5	White Sucker	44.1	47.2	1250
12-Nov-19	13-Nov-19	D	DN	Experimental	Fall	3	4	Lake Trout	78.6	84.4	7380
12-Nov-19	13-Nov-19	D	DN	Experimental	Fall	3	4	Lake Trout	49.2	53.5	1440
12-Nov-19	13-Nov-19	D	DN	Experimental	Fall	3	4	Lake Trout	67.0	72.4	3650
12-Nov-19	13-Nov-19	D	DN	Experimental	Fall	3	4	Round Whitefish	46.5	50.0	1310
12-Nov-19	13-Nov-19	D	DN	Experimental	Fall	3	4	Lake Trout	77.2	83.4	6040
12-Nov-19	13-Nov-19	D	DN	Experimental	Fall	3	4	Lake Trout	74.0	80.7	5390
12-Nov-19	13-Nov-19	D	DN	Experimental	Fall	3	4	Lake Trout	71.0	77.3	4860
12-Nov-19	13-Nov-19	D	DN	Experimental	Fall	3	4	Lake Trout	55.7	60.4	2470
11-Nov-19	12-Nov-19	E	DN	Experimental	Fall	3	5	Brown Trout	56.5	59.0	3120
11-Nov-19	12-Nov-19	E	DN	Experimental	Fall	3	2	White Sucker	21.0	22.3	140
11-Nov-19	12-Nov-19	F	DN	Experimental	Fall	3	5	Lake Trout	73.0	79.7	5580
11-Nov-19	12-Nov-19	F	DN	Experimental	Fall	3	5	Lake Trout	72.2	78.0	4670
11-Nov-19	12-Nov-19	F	DN	Experimental	Fall	3	2.5	White Sucker	35.4	38.1	640
12-Nov-19	13-Nov-19	G	TP	Experimental	Fall	3	4	White Sucker	42.7	45.6	960
12-Nov-19	13-Nov-19	G	TP	Experimental	Fall	3	1	Rainbow Trout	10.7	11.6	14
11-Nov-19	12-Nov-19	H	BH	Experimental	Fall	3	2.5	White Sucker	25.9	27.7	240
28-Oct-19	29-Oct-19	I	DN	Broadscale	Fall	1	19	Round Goby	-	6.2	4
28-Oct-19	29-Oct-19	I	DN	Broadscale	Fall	1	19	Alewife	8.3	9.4	6
28-Oct-19	29-Oct-19	I	DN	Broadscale	Fall	1	19	Alewife	7.5	8.5	4
28-Oct-19	29-Oct-19	I	DN	Broadscale	Fall	1	25	Lake Chub	10.1	11.4	13.0
28-Oct-19	29-Oct-19	I	DN	Broadscale	Fall	1	25	Lake Chub	9.7	11.1	12.0
28-Oct-19	29-Oct-19	I	DN	Broadscale	Fall	1	25	Alewife	9.5	10.9	10.0
28-Oct-19	29-Oct-19	I	DN	Broadscale	Fall	1	25	Alewife	9.2	10.5	8.0
28-Oct-19	29-Oct-19	I	DN	Broadscale	Fall	1	25	Alewife	9.6	11.0	11.0
28-Oct-19	29-Oct-19	I	DN	Broadscale	Fall	1	25	Alewife	9.2	10.6	8.0
28-Oct-19	29-Oct-19	I	DN	Broadscale	Fall	1	25	Alewife	9.5	10.9	9.0
28-Oct-19	29-Oct-19	I	DN	Broadscale	Fall	1	38	Rainbow Trout	22.4	24.2	135.0
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	13	Alewife	5.8	6.3	1.0
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	19	Alewife	8.5	9.6	5.0
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	19	Alewife	8.4	9.5	6.0
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	19	Alewife	7.0	7.7	3.0
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	19	Alewife	8.1	9.2	5.0
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	19	Alewife	9.8	10.6	9.0
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	19	Alewife	6.8	7.7	4.0
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	19	Alewife	7.4	8.5	4.0
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	19	Alewife	7.1	7.9	4.0
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	19	Alewife	7.9	8.4	5.0
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	19	Alewife	7.6	8.5	5.0
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	19	Alewife	7.7	8.7	4.0
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	19	Alewife	7.6	8.6	5.0
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	19	Alewife	7.4	8.3	3.0
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	19	Alewife	7.8	8.9	5.0

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	19	Alewife	8.2	9.2	4.0
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	19	Alewife	8.2	9.3	4.0
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	19	Alewife	7.5	8.4	4.0
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	19	Alewife	7.5	8.5	4.0
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	19	Alewife	7.3	8.3	4.0
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	19	Alewife	7.3	8.3	4.0
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	19	Alewife	7.4	8.4	4.0
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	19	Alewife	7.3	8.3	4.0
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	19	Alewife	7.3	8.3	4.0
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	38	Alewife	14.1	16.1	37
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	25	Alewife	9.1	10.4	8
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	25	Alewife	9.0	10.3	7
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	25	Alewife	9.5	10.7	7
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	25	Alewife	9.5	10.9	8
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	25	Alewife	10.0	11.5	11
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	25	Alewife	9.5	10.8	10
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	25	Alewife	10.2	11.5	11
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	25	Alewife	9.5	10.7	10
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	25	Alewife	10.0	11.5	12
28-Oct-19	29-Oct-19	J	DN	Broadscale	Fall	1	25	Alewife	9.0	10.0	8
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	25	Alewife	10.0	11.5	11
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	25	Alewife	8.6	10.5	7
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	25	Alewife	8.5	10.0	7
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	25	Alewife	8.7	10.2	8
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	25	Alewife	9.3	10.5	8
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	25	Alewife	9.2	10.6	9
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	25	Alewife	9.0	10.2	8
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	25	Alewife	9.4	10.4	9
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	25	Alewife	10.2	11.8	12
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	25	Alewife	9.5	10.9	10
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	25	Alewife	9.2	10.3	8
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	25	Alewife	9.4	10.7	10
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	25	Alewife	9.5	11.0	10
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	25	Alewife	9.1	10.5	7
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	25	Alewife	9.4	10.5	9
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	25	Alewife	9.1	10.5	9
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	19	Alewife	7.1	8.5	4
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	19	Alewife	7.7	8.7	4
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	19	Alewife	7.3	8.4	3
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	19	Alewife	8.8	10.0	6
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	19	Alewife	8.1	9.1	4
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	19	Alewife	7.7	8.9	4
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	19	Alewife	7.9	9.1	4
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	19	Alewife	7.5	8.6	4
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	19	Alewife	7.1	8.3	3
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	19	Alewife	7.5	8.6	4
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	19	Alewife	7.8	8.9	4
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	19	Alewife	8.2	9.5	5
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	19	Alewife	6.6	7.6	4
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	19	Alewife	7.3	8.4	4
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	19	Alewife	7.5	8.6	4
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	19	Alewife	7.2	8.1	4
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	19	Alewife	7.3	8.4	4
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	19	Alewife	7.7	8.8	4
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	19	Alewife	8.0	9.1	4
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	19	Alewife	7.9	9.1	4
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	19	Alewife	8.0	9.2	4
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	19	Alewife	8.6	10.0	5
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	19	Alewife	7.7	8.6	4
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	19	Alewife	7.3	8.4	3
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	19	Alewife	7.2	8.1	3
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	19	Alewife	7.4	8.4	4
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	19	Alewife	7.4	8.4	4
29-Oct-19	30-Oct-19	K	DN	Broadscale	Fall	1	19	Alewife	7.5	8.6	4
6-Nov-19	7-Nov-19	I	DN	Broadscale	Fall	2	38	Alewife	13.7	15.6	28
6-Nov-19	7-Nov-19	I	DN	Broadscale	Fall	2	32	Alewife	13.1	14.9	28
6-Nov-19	7-Nov-19	I	DN	Broadscale	Fall	2	32	Alewife	12.8	14.6	24
6-Nov-19	7-Nov-19	I	DN	Broadscale	Fall	2	32	Alewife	12.9	14.7	23
6-Nov-19	7-Nov-19	I	DN	Broadscale	Fall	2	19	Alewife	8.4	9.5	6
6-Nov-19	7-Nov-19	I	DN	Broadscale	Fall	2	19	Alewife	8.6	9.7	8
6-Nov-19	7-Nov-19	I	DN	Broadscale	Fall	2	19	Alewife	7.5	8.3	3
6-Nov-19	7-Nov-19	I	DN	Broadscale	Fall	2	19	Alewife	7.9	8.9	4
6-Nov-19	7-Nov-19	I	DN	Broadscale	Fall	2	19	Alewife	7.5	8.4	4
6-Nov-19	7-Nov-19	J	DN	Broadscale	Fall	2	13	Alewife	7.2	8.1	2
6-Nov-19	7-Nov-19	J	DN	Broadscale	Fall	2	19	Alewife	7.7	8.7	4

Table 1: Raw fish Catch Data and Meristics for Sampling Events in Spring, Summer and Fall, 2019.

Set Date	Collection Date	Site	Location	Net Type	Season	Sampling Event	Mesh Size	Common Name	Fork Length (cm)	Total Length (cm)	Weight (g)
6-Nov-19	7-Nov-19	J	DN	Broadscale	Fall	2	38	Alewife	14.1	16.2	33
6-Nov-19	7-Nov-19	J	DN	Broadscale	Fall	2	38	Alewife	13.5	15.8	34
6-Nov-19	7-Nov-19	J	DN	Broadscale	Fall	2	25	Alewife	9.5	10.8	8
6-Nov-19	7-Nov-19	J	DN	Broadscale	Fall	2	25	Alewife	9.8	11.1	11
6-Nov-19	7-Nov-19	J	DN	Broadscale	Fall	2	25	Alewife	9.3	10.6	7
6-Nov-19	7-Nov-19	J	DN	Broadscale	Fall	2	25	Alewife	9.1	10.9	7
7-Nov-19	8-Nov-19	K	DN	Broadscale	Fall	2	38	Gizzard Shad	10.3	11.8	14
7-Nov-19	8-Nov-19	K	DN	Broadscale	Fall	2	32	Gizzard Shad	8.5	9.9	9
7-Nov-19	8-Nov-19	K	DN	Broadscale	Fall	2	32	Alewife	10.0	11.3	9
7-Nov-19	8-Nov-19	K	DN	Broadscale	Fall	2	32	Alewife	9.5	10.7	7
7-Nov-19	8-Nov-19	K	DN	Broadscale	Fall	2	32	Alewife	8.7	10.0	7
7-Nov-19	8-Nov-19	K	DN	Broadscale	Fall	2	19	Alewife	8.6	9.7	4
7-Nov-19	8-Nov-19	K	DN	Broadscale	Fall	2	19	Alewife	7.9	8.9	4
7-Nov-19	8-Nov-19	K	DN	Broadscale	Fall	2	19	Alewife	7.5	8.4	3
7-Nov-19	8-Nov-19	K	DN	Broadscale	Fall	2	19	Alewife	8.4	9.4	5
7-Nov-19	8-Nov-19	K	DN	Broadscale	Fall	2	19	Alewife	7.6	8.6	6
7-Nov-19	8-Nov-19	K	DN	Broadscale	Fall	2	19	Alewife	7.5	8.5	4
7-Nov-19	8-Nov-19	K	DN	Broadscale	Fall	2	19	Alewife	7.9	8.9	6
11-Nov-19	12-Nov-19	I	DN	Broadscale	Fall	3	32	Yellow Perch	10.8	11.5	13
11-Nov-19	12-Nov-19	J	DN	Broadscale	Fall	3	25	Alewife	9.6	11.0	10
11-Nov-19	12-Nov-19	J	DN	Broadscale	Fall	3	25	Alewife	10.1	11.0	10
11-Nov-19	12-Nov-19	J	DN	Broadscale	Fall	3	25	Alewife	9.3	10.4	7
11-Nov-19	12-Nov-19	J	DN	Broadscale	Fall	3	25	Alewife	9.7	11.3	11
11-Nov-19	12-Nov-19	J	DN	Broadscale	Fall	3	25	Alewife	10.3	11.7	11
11-Nov-19	12-Nov-19	J	DN	Broadscale	Fall	3	25	Alewife	9.5	10.6	9
11-Nov-19	12-Nov-19	J	DN	Broadscale	Fall	3	25	Alewife	9.6	10.4	11
11-Nov-19	12-Nov-19	J	DN	Broadscale	Fall	3	25	Alewife	9.5	10.6	10
11-Nov-19	12-Nov-19	J	DN	Broadscale	Fall	3	25	Alewife	10.3	11.5	12
11-Nov-19	12-Nov-19	J	DN	Broadscale	Fall	3	32	Alewife	12.3	13.8	21
11-Nov-19	12-Nov-19	J	DN	Broadscale	Fall	3	32	Alewife	11.0	12.7	16
11-Nov-19	12-Nov-19	J	DN	Broadscale	Fall	3	19	Alewife	7.7	8.8	4
11-Nov-19	12-Nov-19	J	DN	Broadscale	Fall	3	19	Alewife	6.8	7.6	4
11-Nov-19	12-Nov-19	J	DN	Broadscale	Fall	3	19	Alewife	8.3	9.5	6
11-Nov-19	12-Nov-19	J	DN	Broadscale	Fall	3	19	Alewife	8.0	9.1	6
11-Nov-19	12-Nov-19	J	DN	Broadscale	Fall	3	19	Alewife	7.2	8.2	4
11-Nov-19	12-Nov-19	J	DN	Broadscale	Fall	3	19	Alewife	6.5	7.4	3

Note: DN=Darlington Nuclear, TP=Thickson Point, BH=Bond Head
"-" indicates that the meristics were unavailable

Table 2: Supporting Environmental Data for Net Set and Lift for Spring, Summer and Fall Gillnetting Events, Lake Ontario, 2019.

						Surface						Middle						Bottom									
		Net	Date	Time	Air Temp (ºC)	T (ºC)	Cond (mS/cm)	pH	D.O. (mg/L)	D.O.%	Turb (NTU)	T (ºC)	Cond (mS/cm)	pH	D.O. (mg/L)	D.O.%	Turb (NTU)	T (ºC)	Cond (mS/cm)	pH	D.O. (mg/L)	D.O.%	Turb (NTU)	Set/ Lift Time	Start depth	End depth	Net Type
Spring 1	SET	A	22-Apr-19	13:06	12.4	5.41	0.328	8.2	12.72	100.8	-5.2	4.71	0.325	8.16	12.67	98.5	-5.2	4.71	0.326	8.16	12.39	96.3	-5.2	13:10	9.4	9.8	E
		B	23-Apr-19	11:42	9	7	0.365	8.34	12.93	106.6	-4.7	7.08	3.67	8.34	12.92	106.7	-4.7	7.02	0.366	8.36	13.37	111.1	-4.7	12:00	4.2	3	E
		C	23-Apr-19	12:28	10	5.93	0.323	8.31	12.87	103.3	-4.7	5.94	0.321	8.31	12.83	103	-4.6	5.94	0.322	8.32	12.84	103	-4.6	12:40	5.4	3.7	E
		D	22-Apr-19	12:10	97.7	6.08	0.338	8.32	24.33	195.9	-5.2	4.59	0.333	8.26	24.73	191.5	-5.2	4.25	0.334	8.24	24.53	187.9	-5.1	12:50	14.6	14.6	E
		E	22-Apr-19	13:39	11.5	5.47	0.323	8.33	12.83	101.7	-5.2	4.91	0.321	8.27	12.91	100.9	-5.2	4.81	0.321	8.25	12.88	100.4	-5.2	13:55	8.7	13.1	E
		F	23-Apr-19	12:00	9	5.16	0.307	8.31	13.17	103.9	-5.3	5.16	0.307	8.3	13.26	104.1	-5.3	5.15	0.307	8.29	13.26	104.5	-5.2	12:15	10.4	8.9	E
		G	22-Apr-19	11:28	11	6.62	0.411	8.34	14.26	116.5	-3.5	6.04	0.385	8.33	14.47	116.6	-4.6	5.71	0.368	8.46	14.81	118.2	-5	11:40	4.1	8.8	E
		H	24-Apr-19	13:00	10	6.34	0.323	8.24	8.25	67.1	-3.3	6.35	0.323	8.24	8.32	67.7	-3.3	6.34	0.323	8.24	8.45	68.4	-3.1	13:16	4.5	6	E
		I	22-Apr-19	14:00	11.8	6.58	0.346	8.33	9.71	79.2	-4.7	6.56	0.347	8.37	9.7	79.1	-4.7	6.66	0.369	8.35	9.71	79.4	-4.3	14:13	3.1	3.2	B
		J	22-Apr-19	13:26	12.6	5.79	0.333	8.28	12.56	100.4	-4.4	5.57	0.332	8.23	12.54	99.7	-4.5	5.57	0.333	8.21	12.43	98.9	-4.5	13:35	3.2	3.6	B
		K	23-Apr-19	12:49	10	6.23	0.326	8.32	12.56	102.5	-4.7	6.21	0.326	8.32	12.94	104.6	-4.7	6.22	0.326	8.33	13.24	106.3	-1.6	12:54	2.9	2.7	B
Spring 2		A	02-May-19	13:00	9	6.28	0.289	8.24	12.69	102.8	-0.1	6.24	0.289	8.22	12.71	102.8	-0.3	6.24	0.289	8.21	12.72	102.9	-0.3	13:05	10.5	8.8	E
		B	03-May-19	13:27	8	7.31	0.301	8.32	12.23	101.7	0.5	7.3	0.301	8.33	12.27	102.1	0.5	7.27	0.3	8.32	12.41	103	0.3	13:34	4.6	2.8	E
		C	03-May-19	14:00	9	7.28	0.302	8.3	12.45	103.3	2	7.25	0.304	8.3	12.47	103.5	2.1	7.25	0.317	8.29	12.51	103.8	2.8	14:05	6.9	5.2	E
		D	02-May-19	12:25	9	5.45	0.28	8.19	13.01	103.1	-4.1	5.4	0.28	8.19	13.02	103.1	-4.1	5.4	0.28	8.17	13.01	103	-4.1	12:45	15.5	13.8	E
		E	02-May-19	13:30	8	6.28	0.288	8.25	12.71	102.9	0.1	6.25	0.289	8.24	12.71	102.8	0.3	6.27	0.29	8.24	12.71	102.9	0.5	13:38	9	7.4	E
		F	03-May-19	14:00	8	7.18	0.295	8.28	12.09	100.1	1.5	6.71	0.288	8.27	12.16	99.6	-0.1	6.69	0.287	8.27	12.16	99.5	-0.7	13:51	10.6	9.3	E
		G	02-May-19	11:40	8	6.56	0.303	7.81	12.7	103.6	1.5	6.56	0.303	7.76	12.71	103.6	1.5	6.54	0.303	7.67	12.72	103.7	1.5	11:45	6.5	3.3	E
		H	03-May-19	15:04	9	7.37	0.288	8.35	12.52	104.2	8.3	7.13	0.284	8.33	12.58	104.1	5.3	6.83	0.282	8.32	12.59	103.4	1.7	15:12	5.6	4.2	E
		I	03-May-19	13:22	9	7.36	0.316	8.31	12.15	101.1	1.9	7.35	0.314	8.31	12.16	101.2	2.8	7.35	0.323	8.31	12.19	101.4	2.4	13:22	3.5	3.2	B
		J	02-May-19	13:17	9	6.94	0.301	8.27	12.54	103.3	5.2	6.92	0.304	8.26	12.56	103.3	5.3	6.93	0.304	8.26	12.56	103.4	5.1	13:22	3.7	3.4	B
		K	02-May-19	13:45	9	7.15	0.329	8.28	12.48	103.3	13.6	7.14	0.33	8.25	12.5	103.5	13.4	7.11	0.337	8.22	12.66	104.7	13.2	14:00	3.5	3.4	B
Spring 3		A	15-May-19	16:15	12	6.86	0.3	8.26	12.81	105.2	5	6.19	0.292	8.27	13.19	106.4	-1.7	5.84	0.291	8.28	13.35	106.9	-1.1	16:25	10.2	8.6	E
		B	15-May-19	10:05	12	6.43	0.296	8.27	12.28	99.8	1.9	6.36	0.295	8.27	12.26	99.5	1.9	6.25	0.295	8.28	12.26	99.2	2.1	10:15	3.7	2.7	E
		C	14-May-19	11:00	9	6.5	0.304	8.23	12.42	101.1	25.9	6.47	0.307	8.2	12.46	101.4	32.2	6.47	0.307	8.2	12.46	101.4	32.2	11:10	6.2	4.8	E
		D	15-May-19	1:40	12	6.69	0.292	8.27	13	106.4	-1.2	6.23	0.292	8.27	12.99	105.3	-1.4	5.71	0.292	8.28	13.03	103.9	-1.9	16:07	15.2	15.4	E
		E	15-May-19	17:41	12	6.07	0.291	8.26	15.46	124.5	-1.9	5.94	0.291	8.27	15.5	124.5	-1.9	5.79	0.291	8.29	15.58	124.7	-1.9	17:50	11.2	10.1	E
		F	14-May-19	13:00	8	6.14	0.294	8.25	12.11	97.7	0.8	6.09	0.295	8.23	12.1	97.3	5.6	6.17	0.296	8.21	11.96	96.6	10.7	13:10	10.1	9.2	E
		G	15-May-19	15:15	12	7.23	0.301	8.29	12.83	106.5	0.9	7.09	0.301	8.3	12.88	106.1	0.4	6.73	0.304	8.27	12.7	104.1	2.4	15:20	5.6	4.9	E
		H	14-May-19	12:05	7	7.16	0.299	8.29	11.77	97.5	18	7.1	0.299	8.29	1.77	97.3	16.1	6.86	0.3	8.28	11.72	93.6	31.2	12:17	5.9	4.8	E
		I	14-May-19	13:20	6	6.55	0.304	8.25	11.87	96.7	-22.3	6.53	0.304	8.26	11.87	96.7	23.5	6.55	0.355	8.25	11.75	95.8	23.8	13:30	3.6	3.6	B
		J	15-May-19	16:30	12	6.38	0.292	8.29	15.09	121.8	-1.2	6.35	0.292	8.29	14.73	119.2	-1	6.33	0.292	8.29	14.25	115.2	-0.7	16:40	3.5	3.4	B
		K	14-May-19	13:20	6	6.55	0.304	8.25	11.87	96.7	22.3	6.53	0.304	8.26	11.87	96.7	23.5	6.55	0.355	8.25	11.75	95.8	23.8	13:38	3.9	3.7	B
Spring 1	LIFT	A	23-Apr-19	9:31	9	4.37	0.301	8.19	14.65	112.9	-5.4	4.33	0.302	8.18	14.64	112.8	-5.3	4.28	0.301	8.17	14.59	112.3	-5.4	9:45	9.4	9.8	E
		B	24-Apr-19	8:55	7.8	5.34	0.311	8.26	15.55	122.9	25.4	5.35	0.311	8.26	15.52	122.7	26.2	5.33	0.311	8.27	15.56	123	26.7	9:10	4.2	3	E
		C	24-Apr-19	10:54	8.5	6.32	0.335	8.26	15.14	122.7	-2.5	6.13	0.332	8.26	15.13	122.5	-2.6	5.88	0.325	8.25	15.25	122.7	-2.8	11:05	5.4	3.7	E
		D	23-Apr-19	8:39	10.3	4.85	0.304	8.19	13.9	108.9	-5.3	4.29	0.304	8.13	14.02	107.9	-5	4.26	0.302	8.16	14	107.7	-5.1	9:00	14.6	14.6	E
		E	23-Apr-19	10:47	9	4.29	0.3	8.15	13.5	103.8	-5.3	4.29	0.3	8.14	13.48	103.6	-5.3	4.34	0.3	8.15	13.43	103.5	-5.4	11:00	8.7	13.1	E
		F	24-Apr-19	10:08	11.1	4.65	0.3	8.21	15.77	122.5	-4.2	4.38	0.298	8.18	15.76	121.4	-4.7	4.21	0.298	8.16	15.78	121.2	-5	10:16	10.4	8.9	E
		G	23-Apr-19	7:45	10	6.25	0.344	8.28	11.87	96.1	-5.1	6.25	0.344	8.26	11.9	96.3	-5.2	6.25	0.343	8.25	11.9	96.3	-5.2	7:55	4.1	8.8	E
		H	25-Apr-19	9:05	8	6.17	0.331	8.23	9.17	74	-5	6.16	0.331	8.23	9.23	74.5	-4.9	6.16	0.331	8.23	9.23	74.5	-5	9:20	4.5	6	E
		I	23-Apr-19	11:23	9	6.81	0.355	8.32	14.4	109.9	-4.7	6.77	0.353	8.31	13.39	109.8	-4.8	6.73	0.351	8.31	13.35	109.4	-4.8	11:30	3.1	3.2	B
		J	23-Apr-19	10:00	9	6.29	0.326	8.32	13.83	112.2	-5	6.29	0.326	8.33	13.8	111.9	-5	6.3	0.326	8.33	13.78	111.4	-5	10:43	3.2	3.6	B
		K	24-Apr-19	11:50	10.1	6.65	0.335	8.27	14.05	114.9	-1.4	6.62	0.335	8.28	14.06	114.8	-1.4	6.64	0.337	8.28	14.12	114.9	-1.8	12:00	2.9	2.7	B
Spring 2		A	03-May-19	11:50	9	6.9	0.291	8.28	12.23	100.6	1	6.81	0.29	8.28	12.25	100.5	0.9	6.8	0.29	8.28	12.26	100.6	1.7	12:10	10.5	8.8	E
		B	04-May-19	9:35	10	7.61	0.316	8.33	12.12	101.4	0.8	7.57	0.314	8.33	12.14	101.6	0.7	7.55	0.312	8.34	12.32	103.3	0	9:45	4.6	2.8	E
		C	04-May-19	11:45	12	7.46	0.296	8.31	12.13	101.2	-1	7.38	0.297	8.32	12.15	101.1	-0.7	7.09	0.304	8.3	12.14	100.3	0.2	12:00	6.9	5.2	E
		D	03-May-19	10:55	8	5.65	0.274	8.31	12.66	100.9	-3.5	5.58	0.274	8.31	12.67	100.8	-3.5	5.5	0.273	8.3	12.2	100.8	-3.7	11:10	15.5	13.8	E
		E	03-May-19	12:30	10	7.1	0.293	8.31	12.21	100.9	0.3	6.9	0.292	8.31	12.29	101.1	-0.1	6.88	0.292	8.31	12.61	103.6	-0.5	12:40	9	7.4	E
		F	04-May-19	10:50	12	7.07	0.289	8.28	12.14	100.3	-0.6	6.76	0.283	8.23	12.19	99.8	-1.6	6.07	0.274	8.21	12.34	99.4	-3.4	11:05	10.6	9.3	E
		G	03-May-19	9:20	8	6.83	0.286	8.32	12.64	103.8	-3.9	6.82	0.286	8.31	12.65	103.8	-3.8	6.82	0.286	8.32	12.64	103.7	-3.8	9:40	6.5	3.3	E
		H	04-May-19	12:45	10	7.26	0.281	8.32	12.31	102.2	1.2	7.2	0.284	8.32	12.27	101.7	2.4	6.77	0.279	8.29	12.17	99.8	-0.3	12:55	5.6	4.2	E
		I	04-May-19	9:03	10	7.41	0.308	8.32	12.12	100.9	-0.6	7.41	0.309	8.33	12.1	100.8	-0.3	7.61	0.375	8.28	11.95	100.3	0.2	9:22	3.5	3.2	B
		J	03-May-19	12:30	10	7.34	0.301	8.31	12.2	101.4	1.4	7.35	0.3	8.31	12.21	101.5	1.4	7.27	0.307	8.3	12.23	101.5	3	12:20	3.7	3.4	B
		K	03-May-19	13:06	9	7.36	0.316	8.31	12.15	101.1	1.9	7.35	0.314	8.31	12.16	101.2	1.8	7.35	0.323	8.31	12.19	101.4	2.4	13:15	3.5	3.4	B
Spring 3		A	16-May-19	12:30	16.2	7.01	0.299	8.29	13.72	113.2	3.5	6.5	0.301	8.29	13.84	112.7	5.5	5.6	0.292	8.28	14.21	113	-1.4	12:40	10.2	8.6	E
		B	16-May-19	8:15	11.1	6.77	0.303	8.26	12.56	103	1.4	6.75	0.302	8.26	12.51	102.5	1.5	6.72	0.302	8.27	12.49	102.2	1.8	8:20	3.7	2.7	E
		C	15-May-19	9:06	7	6.6	0.302	8.27	12.71	103.9	7.2	6.44	0.305	8.27	12.74	103.5	8.2	6.53	0.321	8.27	12.62	102.8	9.3	9:15	6.2	4.8	E
		D	16-May-19	11:35	11.5	7.39	0.297	8.23	13.81	115	-0.1	5.25	0.29	8.24	14.81	117	-2	5.22	0.29	8.26	15.4	121.5	-2.1	11:45	15.2	15.4	E
		E	16-May-19	13:50	15	7.37	0.292	8.28	13.47	112	-1	6.45	0.291	8.29	13.62	110.8	-1.3	5.9	0.292	8.3	13.78	110.6	-0.8	13:55	11.2	10.1	E
		F	15-May-19	12:46	12	6.29	0.294	8.28	13.27	107.1	2.5	6.04	0.294	8.27	12.45	99.3	1.7	5.82	0.293	8.26	9.84	77.5	1.4	12:50	10.1	9.2	E
		G	16-May-19	10:36	10	7.7	0.312	8.27	14.18	119	2.6	7.18	0.309	8.27	14.48	119.7	2.2	6.77	0.321	8.22	14.44	117.7	2.4	10:40	5.6	4.9	E
		H	15-May-19	11:43	7	7.43	0.304	8.3	12.34	102.9	9.9	7.03	0.302	8.29	12.37	102	10	6.71	0.299	8.28	12.34	101.1	8.5	12:00	5.9	4.8	E
		I	15-May-19	13:15	12	6.6	0.309	8.27	12.88	105.2	2	6.6	0.312	8.26	12.88	105	1.9	6.55	0.315	8.27	12.86	104.8	2.5	13:15	3.6	3.6	B
		J	16-May-19	13:10	15	7.01	0.296	8.29	13.54	111.8	1.4	6.72	0.296	8.29	13.8	113.3	1	6.4	0.295	8.31	14.43	114.8	0.2	13:15	3.5	3.4	B
		K	15-May-19	13:31	12	6.6	0.309	8.27	12.88	105.2	2	6.6	0.312	8.26	12.88	105	1.9	6.55	0.315	8.27	12.86	104.8	2	13:33	3.9	3.7	B

Table 2: Supporting Environmental Data for Net Set and Lift for Spring, Summer and Fall Gillnetting Events, Lake Ontario, 2019.

						Surface						Middle						Bottom									
		Net	Date	Time	Air Temp (°C)	T (°C)	Cond (mS/cm)	pH	D.O. (mg/L)	D.O.%	Turb (NTU)	T (°C)	Cond (mS/cm)	pH	D.O. (mg/L)	D.O.%	Turb (NTU)	T (°C)	Cond (mS/cm)	pH	D.O. (mg/L)	D.O.%	Turb (NTU)	Set/ Lift Time	Start depth	End depth	Net Type
		A	06-Aug-19	12:04	-	22.96	0.333	8.69	9.92	115.7	-5.3	22.81	0.334	8.62	10.04	117.2	-5.3	21.48	0.331	8.59	10.45	118.4	-5	12:13	10.2	9	E
		B	07-Aug-19	13:30	22	23.65	0.326	8.34	9.29	109.7	-5.6	23.55	0.327	8.36	9.42	111.4	-4.6	23.11	0.33	8.36	10.09	118.1	-0.6	13:30	4	3	E
		C	07-Aug-19	13:20	25	23.69	0.327	8.24	9.64	113.9	-5.4	23.23	0.325	8.2	9.79	114.8	-5.6	22.89	0.324	8.18	9.91	115.6	-4	13:30	6.5	4.8	E
		D	06-Aug-19	11:45	-	22.89	0.339	8.69	10.18	118.7	-5.5	22.3	0.334	8.51	10.37	118.2	-5.5	19.15	0.332	8.02	9.83	106.3	-2.9	11:54	15.1	14.2	E
		E	06-Aug-19	12:25	-	22.87	0.334	8.77	10.49	122.4	-5.3	22.42	0.333	8.76	10.67	122.6	-4.9	21.87	0.329	8.72	10.67	121.6	-5.2	12:32	10.8	7.9	E
Summer 1		F	06-Aug-19	12:52	-	22.8	0.334	8.66	10.41	121	-5.3	22.23	0.329	8.66	10.86	124.6	-5.4	21.88	0.329	8.64	10.8	123.4	-5.1	13:02	9.8	9	E
		G	06-Aug-19	11:09	27	22.5	0.337	8.44	11.76	135.9	-5.4	22.52	0.338	8.4	11.81	136.6	-5.4	22.43	0.339	8.34	11.88	136.8	-4.9	11:19	5.1	3.6	E
		H	06-Aug-19	13:27	-	23.31	0.331	8.84	10.72	125.8	-4.7	23.23	0.331	8.83	10.69	125.2	-4.7	22.71	0.328	8.78	10.71	124.1	-4.5	14:08	5.9	3.9	E
		I	07-Aug-19	13:30	22	23.65	0.326	8.34	9.29	109.7	-5.6	23.55	0.327	8.36	9.42	111.4	-4.6	23.11	0.33	8.36	10.09	118.1	-0.6	13:36	3.4	3.2	B
		J	06-Aug-19	12:38	26	22.9	0.335	8.57	9.75	113.6	-3.8	22.9	0.335	8.56	9.74	113.3	-3.1	22.9	0.334	8.55	9.75	113.8	-2.7	12:40	3.5	3.6	B
		K	07-Aug-19	13:30	22	23.63	0.325	8.34	9.29	109.7	-5.6	23.55	0.327	8.36	9.42	111.4	-4.6	23.11	0.39	8.36	10.09	118.1	-0.6	13:34	3.4	3.4	B
		A	12-Aug-19	13:03	23	12.63	0.321	8.45	13.92	129.7	-5.1	9.04	0.32	8.09	13.72	119.3	-4.7	5.69	0.316	7.62	13.41	106.9	-5	13:10	10	9.2	E
		B	13-Aug-19	13:52	34	12.32	0.307	7.11	12.88	120	-5.2	11.09	0.304	7	13.05	118.8	-5	9.3	0.288	7.05	13.55	118	-5.1	13:52	3.1	4.4	E
		C	13-Aug-19	13:56	34	12.32	0.307	7.11	12.88	120	-5.2	11.09	0.304	7	13.05	118.8	-5	9.3	0.288	7.05	13.55	118	-5.1	14:21	4.6	6.7	E
		D	12-Aug-19	12:27	21	9.55	0.319	7.73	12.97	113.6	-5.1	8.45	0.318	7.61	12.67	108.4	-5.1	5.27	0.309	7.53	13.12	104.2	-5	12:46	15.3	15	E
		E	12-Aug-19	13:23	23.3	10.9	0.322	8.18	13.44	121.5	-4	6.19	0.316	7.68	13.4	108.2	-4.8	5.55	0.315	7.65	13.56	107.7	-4.9	13:40	8	8.5	E
Summer 2	SET	F	13-Aug-19	13:56	34	12.32	0.307	7.11	12.88	120	-5.2	11.09	0.304	7	13.05	118.8	-5	9.3	0.288	7.05	13.55	118	-5.1	14:13	9.5	9.9	E
		G	12-Aug-19	11:25	21.9	11.01	0.329	7.71	13.48	122.3	-5	9.37	0.331	7.24	13.24	115.9	-5	8.12	0.328	7.22	13.98	118.5	-4.8	11:25	4.9	8.5	E
		H	12-Aug-19	6:57	21	10.35	0.322	7.85	14.61	132	-4.9	9.04	0.316	7.73	15.17	132.2	-4.7	7.14	0.309	7.74	15.98	132	-4.8	14:36	6.3	4.1	E
		I	13-Aug-19	13:56	34	12.32	0.307	7.11	12.88	120	-5.2	11.09	0.304	7	13.05	118.8	-5	9.3	0.288	7.05	13.55	118	-5.1	14:01	3.4	3.1	B
		J	12-Aug-19	13:48	21	10.08	0.319	8.09	13.32	118.6	-4.3	8.85	0.312	8.1	13.7	117.1	-4.7	7.1	0.304	8.09	13.83	114.2	-4.8	13:59	3.5	4	B
		K	13-Aug-19	13:56	34	12.32	0.307	7.11	12.88	120	-5.2	11.09	0.304	7	13.05	118.8	-5	9.3	0.288	7.05	13.55	118	-5.1	14:06	3.5	3.6	B
		A	05-Sep-19	14:34	20	16.38	0.269	7.73	11.41	116.6	-5	15.38	0.262	7.48	11.52	115.2	-4.7	11.74	0.237	7.2	12.33	113.8	-4.5	14:43	9.7	8.5	E
		B	05-Sep-19	16:03	20	16.66	0.271	7.89	11.8	121.3	-5.2	16.56	0.267	7.93	11.94	122.7	-5.2	16.07	0.254	8.02	12.36	125.2	-5	16:09	3.9	2.8	E
		C	28-Aug-19	12:35	20	20.4	0.316	8.35	9.61	106.5	-5	20.03	0.312	8.36	9.35	103	-4.5	20	0.325	8.3	9.19	101.4	-3.5	12:42	5.8	4.2	E
		D	28-Aug-19	11:55	-	20.31	0.319	8.29	9.69	107.3	-5.1	20.02	0.318	8.25	9.66	106.1	-5.2	19.81	0.318	8.12	9.16	100.6	-5.1	12:10	14.9	14.1	E
		E	28-Aug-19	12:15	20	20.15	0.314	8.46	9.58	105.7	-5.2	19.99	0.312	8.48	9.78	107.6	-5	19.94	0.302	8.56	9.79	107.6	-4.8	12:28	8.2	7.6	E
Summer 3		F	05-Sep-19	16:25	20	17.23	0.296	8.23	11.55	120.2	-5.2	16.8	0.294	8.11	11.67	120.6	-5.2	10.57	0.283	8.05	13.06	117.6	-5.1	16:34	9.5	9.9	E
		G	28-Aug-19	11:20	20	20.49	0.328	7.9	8.96	99.9	-3.9	20.09	0.329	7.93	9.2	101.1	-5	20.04	0.327	7.88	8.78	96.9	-4.6	11:30	6	3.5	E
		H	05-Sep-19	13:55	20	12.87	0.279	8.42	12.83	121.6	-4.2	12.18	0.293	8.58	13.18	122.9	-4.4	10.98	0.261	8.54	13.55	122.9	-4.8	14:05	5.2	3.4	E
		I	28-Aug-19	12:48	20	20.49	0.319	8.32	9.48	103.4	-4.9	20.38	0.318	8.32	9.56	106.2	-4.8	20.11	0.313	8.33	9.67	106.7	-4.2	12:50	3.1	3	B
		J	05-Sep-19	16:14	20	16.59	0.287	8.02	11.69	120.8	-5.2	16.57	0.286	8.03	11.86	122.8	-5.2	16.57	0.285	8.06	11.94	122.5	-5.1	16:19	3.1	3.3	B
		K	28-Aug-19	12:48	20	20.49	0.319	8.32	9.48	105.4	-4.9	20.38	0.318	8.32	9.56	106.2	-4.8	20.11	0.313	8.33	9.67	106.7	-4.2	13:05	3.3	3	B
		A	07-Aug-19	8:29	-	22.91	0.327	8.86	10.2	118.8	-5.4	22.9	0.327	8.86	10.21	119.1	-5.4	22.7	0.328	8.84	10.25	118.9	-5.3	8:36	10.2	9	E
		B	08-Aug-19	9:39	26	22.96	0.328	8.64	9.79	114.1	-5.3	22.94	0.328	8.65	9.85	115	-5.1	22.85	0.328	8.68	10.02	116.6	-4.2	9:50	4	3	E
		C	08-Aug-19	7:37	20.5	22.9	0.331	9.19	9.96	115.9	-5	22.58	0.357	9.14	9.82	113.5	-4.8	22.54	0.447	9.08	9.69	112.1	-4.1	7:45	6.5	4.8	E
		D	07-Aug-19	7:48	21	22.95	0.329	8.89	9.54	110.8	-5.6	22.62	0.33	8.85	9.62	111.9	-5.5	14.86	0.319	7.83	11.49	113.5	-4.6	7:59	15.1	14.2	E
		E	07-Aug-19	8:55	-	22.89	0.326	8.85	9.47	110.2	-5.3	22.92	0.326	8.83	9.42	109.7	-5.4	22.81	0.328	8.82	9.35	108.8	-5.3	9:00	10.8	7.9	E
Summer 1		F	07-Aug-19	9:40	-	23.08	0.324	8.85	8.75	102.5	-5.6	22.64	0.327	8.79	8.82	102.3	-5.2	21.97	0.323	8.78	9.18	105	-5.4	9:55	9.8	9	E
		G	07-Aug-19	7:05	-	22.87	0.33	8.85	10.11	117.6	-5.3	22.87	0.331	8.85	9.69	111.9	-5.4	22.61	0.333	8.65	9.02	104.8	-5.1	7:10	5.1	3.6	E
		H	07-Aug-19	14:20	25	23.36	0.341	8.2	9.58	112.6	-5.5	23.04	0.329	8.16	9.86	115	-5.3	22.08	0.318	8.16	10.8	123.9	-4.4	14:02	5.9	3.9	E
		I	08-Aug-19	9:39	28.5	22.96	0.328	8.64	9.79	114.1	-5.3	22.94	0.328	8.65	9.85	115	-5.1	22.85	0.328	8.68	10.02	116.6	-4.2	9:20	3.4	3.2	B
		J	07-Aug-19	9:15	22	22.73	0.326	8.79	9.82	114	-4.9	22.73	0.326	8.79	9.76	113.2	-4.9	22.7	0.327	8.78	9.65	111.9	-4.3	9:20	3.5	3.6	B
		K	08-Aug-19	9:39	29.6	22.96	0.328	8.64	9.79	114.1	-5.3	22.94	0.328	8.65	9.85	115	-5.1	22.85	0.328	8.68	10.02	116.6	-4.2	8:45	3.4	3.4	B
		A	13-Aug-19	9:24	-	11.28	0.315	8.4	12.47	113.5	-4.2	8.05	0.311	8.02	12.33	104.4	-4.8	6.92	0.303	8.07	12.47	102.6	-2.5	9:36	10	9.2	E
		B	14-Aug-19	8:11	22	11.05	0.311	7.89	13.56	123.1	-4.9	10.97	0.311	7.85	13.57	123.1	-4.9	10.9	0.308	7.82	13.55	122.7	-2.4	8:20	3.1	4.4	E
		C	14-Aug-19	10:15	24	11.46	0.314	7.56	13.68	125.4	-4.8	11.13	0.312	7.51	13.76	125.2	-4.8	10.08	0.306	7.49	13.91	123.4	-4.7	10:21	4.6	6.7	E
		D	13-Aug-19	8:45	20.9	10.9	0.318	8.25	12.74	114.9	-4.5	9.83	0.313	7.9	12.26	107.5	-4.9	5.57	0.3	7.76	12.46	99.2	-5.1	8:55	15.3	15	E
		E	13-Aug-19	10:20	22	11.29	0.322	7.73	12.79	116.8	-5.1	8.89	0.311	7.4	12.77	110	-4.9	8.11	0.301	7.5	12.57	106.4	-2.2	10:28	8	8.5	E
Summer 2	LIFT	F	14-Aug-19	9:24	25	11.86	0.307	7.77	13.49	124.9	-5	10.98	0.3	7.77	13.63	123.6	-5	9.32	0.287	7.82	13.52	117.6	-4.9	9:30	9.5	9.9	E
		G	13-Aug-19	7:56	19	11.47	0.318	8	12.99	118.7	-5.1	10.81	0.319	7.89	12.75	115	-5	10.56	0.322	7.9	12.48	111.5	-5.1	8:07	4.9	8.5	E
		H	13-Aug-19	15:56	35	11.1	0.315	7.17	12.7	115.5	-4.7	9.84	0.309	7.11	13.13	115.9	-3.9	9.85	0.292	7.35	13.9	115.7	-1	14:37	6.3	4.1	E
		I	14-Aug-19	8:11	22	11.05	0.311	7.89	13.56	123.1	-4.9	10.97	0.311	7.85	13.57	123.1	-4.9	10.9	0.308	7.82	13.55	172.7	-2.4	9:02	3.4	3.1	B
		J	13-Aug-19	10:55	29.6	10.95	0.314	7.61	12.33	111.9	-2.8	8.96	0.301	7.6	12.95	112.1	-5	9	0.297	7.73	12.86	111.1	-4.9	11:00	3.5	4	B
		K	14-Aug-19	8:11	22	11.05	0.311	7.89	13.56	123.1	-4.9	10.97	0.311	7.85	13.57	123.1	-4.9	10.9	0.308	7.82	13.55	127.7	-2.4	9:12	3.5	3.6	B
		A	06-Sep-19	9:19	17	15.89	0.295	8.87	12.01	121.5	-5	15.23	0.291	8.77	12.12	120.8	-4.9	13.46	0.283	8.67	12.38	118.2	-4.8	9:24	9.7	8.5	E
		B	06-Sep-19	10:15	18	15.94	0.294	8.69	11.96	121.1	-5	15.92	0.293	8.69	11.96	121.1	-5	15.56	0.291	8.68	11.99	120.5	-5	10:23	3.9	2.8	E
		C	29-Aug-19	10:18	-	19.98	0.311	8.64	9.37	103.1	-2.1	19.99	0.308	8.65	9.36	103	-2	19.81	0.315	8.68	9.44	103.7	-2.3	10:20	5.8	4.2	E
		D	29-Aug-19	9:10	-	20.52	0.309	8.41	9.63	107	-4.8	18.42	0.304	8.21	10.02	106.2	-4.8	14.78	0.294	7.99	10.41	102.8	-5.1	9:15	14.9	14.1	E
		E	29-Aug-19	9:51	-	20.16	0.31	8.62	9.43	104.1	-4.4	20.07	0.309	8.62	8.45	104.1	-4.4	18.37	0.302	8.5	9.86	104.9	-4.9	9:57	8.2	7.6	E
Summer 3		F	06-Sep-19	11:40	20	16.94	0.296	8.35	11.91	123.2	-5.2	16.77	0.297	8.24	11.96	123.4	-5.1	13.62	0.295	7.68	12.66	121.9	-4.9	11:56	9.5	9.9	E
		G	29-Aug-19	8:20	20	20.05	0.307	8.64	8.74	96.3	2.8	20.05	0.305	8.62	8.64	94.9	3	19.63	0.302	8.59	8.69	94.7	4.2	8:20	6	3.5	E
		H	06-Sep-19	8:20	17	13.92	0.29	8.42	12	116.3	-4.2	13.39	0.286	8.58	11.95	114.1	-4.5	11.83	0.28	8.54	12.01	111.1	-4.5	8:33	5.2	3.4	E
		I	29-Aug-19	10:18	-	19.98	0.311	8.64	9.37	103.1	-2.1	19.99	0.308	8.65	9.36	103	-2	19.81	0.315	8.68	9.44	103.7	-2.3	11:04	3.1	3	B
		J	06-Sep-19	11:00	20	16.08	0.282	8.26	12.15	123.3	-5.1	16.02	0.275	8.29	12.14	123.3	-5.1	15.93	0.297	8.34	12.05	121.4	-5	11:05	3.1	3.3	B
		K	29-Aug-19	10:18	-	19.98	0.311	8.64	9.37	103.1	-2.1	19.99	0.308	8.65	9.36	103	-2	19.81	0.315	8.68	9.44	103.7	-2.3	10:53	3.3	3	B

Table 2: Supporting Environmental Data for Net Set and Lift for Spring, Summer and Fall Gillnetting Events, Lake Ontario, 2019.

						Surface						Middle						Bottom									
		Net	Date	Time	Air Temp (ºC)	T (ºC)	Cond (mS/cm)	pH	D.O. (mg/L)	D.O.%	Turb (NTU)	T (ºC)	Cond (mS/cm)	pH	D.O. (mg/L)	D.O.%	Turb (NTU)	T (ºC)	Cond (mS/cm)	pH	D.O. (mg/L)	D.O.%	Turb (NTU)	Set/ Lift Time	Start depth	End depth	Net Type
Fall 1	SET	A	28-Oct-19	12:58	12	10.69	277	8.02	10.96	98.8	-7.4	10.22	277	7.99	11.07	98.5	-6.9	10.09	278	7.97	11.08	98.4	-6.2	13:10	9.6	8.5	E
		B	29-Oct-19	11:00	9	10.52	281	8.26	10.68	96	-6.1	10.45	281	8.23	10.77	96.6	-5.2	10.41	282	8.32	10.86	97.5	-4.5	11:08	2.6	3.8	E
		C	29-Oct-19	13:20	14	10.59	277	8.15	11.25	101.1	-7.4	10.48	277	8.24	11.42	103	-6.9	10.4	299	8.33	10.92	107.6	-6.6	13:28	4.5	6.1	E
		D	28-Oct-19	12:25	13	11.39	277	8	10.93	100	-7.2	10.43	277	7.97	11	98.4	-7.3	10.32	277	7.92	11.01	98.2	-7.4	12:39	14.2	14.1	E
		E	28-Oct-19	13:18	13	10.74	277	8.08	10.95	98.8	-7.3	10.43	277	8.11	11.16	100	-7.2	10.25	276	8.24	11.44	101.8	-7.4	13:28	9.1	6.7	E
		F	29-Oct-19	12:02	14	10.61	277	8.02	11.22	100.9	-7.3	10.37	277	8.04	11.36	101.6	-7.3	10.19	277	8.12	11.45	101.9	-7.3	12:11	9.7	9.6	E
		G	28-Oct-19	11:26	12	9.1	280	8.04	11.19	94.2	-6.6	8.92	282	8.04	11.25	97.2	-5.9	8.76	286	8.04	11.32	97.4	-3	11:59	5.6	4.5	E
		H	29-Oct-19	13:56	14	10.14	279	8.07	11	98	-4.3	10.13	279	8.09	11.04	98.2	-4.4	10.1	279	8.16	11.07	98.3	-4.5	14:04	5.4	3.3	E
		I	28-Oct-19	14:00	13	10.82	277	8.05	10.93	98.8	-7.1	10.37	281	8.14	11.1	99.2	2	9.7	286	8.23	11.26	99.7	7.3	14:06	3	2.8	B
		J	28-Oct-19	13:35	14	10.85	277	8.14	11.04	100	-7.4	10.75	277	8.18	11.37	103.4	-7.3	10.26	276	8.26	11.75	104.8	-6.9	13:46	3.1	3	B
		K	29-Oct-19	12:48	14	10.73	294	8.28	11.21	101.1	-5.7	10.72	295	8.3	11.26	101.6	-5.6	10.69	296	8.32	11.27	101.5	-5.6	12:43	2.5	2.8	B
Fall 2		A	07-Nov-19	11:41	0	6.44	289	8.29	12.44	101.3	-6.1	6.45	289	8.24	12.6	102.4	-6.1	6.45	289	8.18	12.95	105.4	-6	11:52	8.9	9.6	E
		B	06-Nov-19	11:45	4	6.67	338	8.33	12.26	102.1	12.6	6.63	342	8.33	12.36	101.1	26.5	6.62	341	8.33	12.32	101	23.5	11:50	3.7	2.9	E
		C	06-Nov-19	12:06	4	6.94	312	8.24	12.29	101.5	8.9	6.96	312	8.23	12	101	9.6	6.99	318	8.2	12.8	100	9.9	12:09	6.2	4.1	E
		D	07-Nov-19	11:18	0	7.75	285	8.25	11.97	100.5	-6.9	7.58	284	8.24	11.99	100.2	-6.9	7.55	285	8.25	11.99	100.3	-6.9	11:32	14.7	14.2	E
		E	06-Nov-19	11:17	3	6.99	285	8.11	11.75	96.9	-3.2	6.99	285	8.1	11.76	96.8	-3.6	6.99	285	8.1	11.75	96.9	1.6	11:32	10.1	7.5	E
		F	06-Nov-19	12:27	4	7.25	290	8.31	11.66	96.6	-3	7.3	289	8.3	11.73	97.4	-3.2	7.26	289	8.25	11.96	99.2	-2.9	12:35	9.9	9	E
		G	07-Nov-19	12:16	0	6.32	293	8.38	12.7	102.9	-5.7	6.31	292	8.4	12.74	103.3	-5.7	6.31	292	8.39	12.83	104.2	-5.8	12:28	4	6.5	E
		H	07-Nov-19	13:20	0	6.49	292	8.35	12.3	100.1	-4.3	6.5	292	8.35	12.31	100.3	-4.2	6.51	292	8.37	12.34	100.5	-4.4	13:33	4	5.2	E
		I	06-Nov-19	11:51	4	6.83	320	8.2	12.4	101.2	13	6.81	321	8.19	12.4	101.1	12.7	6.78	326	8.15	12.36	98.8	13.6	11:59	3.1	2.9	B
		J	06-Nov-19	11:31	4	6.5	314	8.34	12.41	101.5	20.5	6.51	318	8.31	12.46	100.2	22	6.48	323	8.31	12.46	98.9	24.5	11:38	2.9	2.8	B
		K	07-Nov-19	10:53	-1	6.07	307	8.4	12.41	100	-0.5	6.08	310	8.38	12.54	101.1	0.7	6.12	346	8.37	12.65	102.1	4	11:02	2.8	3	B
Fall 3		A	12-Nov-19	13:35	-7	4.51	282	8.12	11.56	89.9	-3.7	4.71	286	8.08	11.58	90.1	-3.6	4.72	287	7.97	11.66	90.7	-3.3	13:44	10.2	9.1	E
		B	12-Nov-19	13:51	-7	4.6	292	8.16	11.76	91.2	-1.1	4.64	291	8.12	11.79	91.5	-1.3	4.64	292	8	11.85	92	-1.2	14:00	4.2	2.8	E
		C	11-Nov-19	12:45	-5	5.34	286	8.2	14.15	111.9	-5.2	5.34	287	8.2	14.14	111.9	-4.3	5.37	287	8.2	14.21	112.5	-4.1	12:51	5.2	4	E
		D	12-Nov-19	13:12	-7	4.61	283	8.09	11.72	91	-6.8	4.81	283	8.03	11.73	91.6	-6.8	4.66	283	7.92	11.89	92.6	-6.8	13:24	14.7	15.3	E
		E	11-Nov-19	13:45	-5	5.38	291	8.21	12.06	94.9	-5.8	5.39	291	8.21	12.07	95.3	-5.9	5.4	291	8.2	12.02	95.5	-5.9	14:00	9.5	7.1	E
		F	11-Nov-19	12:20	-	5.32	285	8.17	12.24	96.6	-6.3	5.33	285	8.17	12.23	96.6	-6.2	5.34	285	8.16	12.22	96.7	-6.1	12:30	9.4	9.8	E
		G	12-Nov-19	12:34	-7	3.9	297	8.21	12.18	92.8	-3.3	3.87	298	8.18	12.12	92.3	-3.1	3.86	298	8.04	11.97	91	-3.3	12:41	3.9	6.2	E
		H	11-Nov-19	11:45	-5	4.83	287	8.19	11.92	92.9	-4.3	4.84	287	8.18	11.94	93.1	-4.3	4.84	287	8.19	11.94	93.1	-4.2	11:50	5.1	3.8	E
		I	11-Nov-19	13:00	-5	5.33	292	8.22	14.65	115.9	1.2	5.33	292	8.21	14.64	115.8	1.6	5.34	292	8.21	14.68	116	6.5	13:15	2.9	2.8	B
		J	11-Nov-19	13:25	-5	4.91	296	8.29	15.49	120.8	14.6	4.91	296	8.26	15.44	120.8	14.6	4.93	296	8.25	15.46	120.7	15.8	13:35	3.2	2.6	B
		K	12-Nov-19	11:08	-9	4.44	293	8.16	11.6	89.7	0.7	4.47	294	8.08	11.66	90.2	0.9	4.47	293	8.03	11.7	90.4	0.9	11:10	2.7	2.9	B
Fall 1	LIFT	A	29-Oct-19	10:08	9	10.14	277	8.19	10.33	92	-7.3	10.12	277	8.19	10.35	92.1	-7.3	10.12	277	8.2	10.4	92.8	-6.1	10:18	9.6	8.5	E
		B	30-Oct-19	7:37	8	10.31	282	8.23	10.39	92.8	-7.2	10.31	281	8.22	10.38	92.7	-7.2	10.32	281	8.21	10.4	92.9	-7.2	7:47	2.6	3.8	E
		C	30-Oct-19	9:27	9	10.39	284	8.34	10.53	94.2	-6	10.39	284	8.33	10.54	94.3	-6	10.38	285	8.32	10.56	94.5	-6.2	9:36	4.5	6.1	E
		D	29-Oct-19	8:49	8	11.08	278	8.17	10.16	92.2	-7.3	10.09	277	8.17	10.18	90.4	-7	9.94	277	8.12	10.19	90.6	-7	8:54	14.2	14.1	E
		E	29-Oct-19	11:22	10	10.46	277	8.12	10.34	92.8	-7.4	10.18	277	8.18	10.54	94.3	-7.3	10.18	277	8.27	10.66	94.8	-7.3	11:29	9.1	6.7	E
		F	30-Oct-19	8:23	9	10.3	284	8.28	10.5	93.6	-6.9	10.31	284	8.25	10.48	93.6	-7	10.31	283	8.23	10.5	93.7	-6.3	8:31	9.7	9.6	E
		G	29-Oct-19	8:00	-	9.89	283	8.13	10.46	92.5	-6.6	9.9	283	8.11	10.44	92.4	-6.7	9.9	283	8.08	10.42	92.2	-6.9	8:15	5.6	4.5	E
		H	30-Oct-19	10:27	9	10.61	278	8.26	10.38	93.4	-7.1	10.61	278	8.27	10.46	94.4	-7.1	10.61	278	8.27	10.61	95.4	-7.2	10:34	5.4	3.3	E
		I	29-Oct-19	12:25	14	10.61	279	8.27	11.55	104.1	-6	10.57	280	8.36	11.72	105.6	-4.8	10.56	281	8.5	11.88	106.7	-4.8	12:31	3	2.8	B
		J	29-Oct-19	12:48	14	10.73	294	8.28	11.21	101.1	-5.7	10.72	295	8.3	11.26	101.6	-5.6	10.69	296	8.32	11.27	101.5	-5.6	12:50	3.1	3	B
		K	30-Oct-19	8:56	9	10.26	296	8.28	10.46	93.4	-6.5	10.27	296	8.28	10.55	94.4	-6.4	10.27	296	8.27	10.73	96.1	-6.4	9:01	2.5	2.8	B
Fall 2		A	08-Nov-19	9:49	-5	6.06	295	8.39	11.95	96.2	-5.2	6.07	295	8.39	11.98	96.5	-5	6.07	295	8.39	12.05	97.3	-5.1	9:56	8.9	9.6	E
		B	07-Nov-19	8:49	-2	6.45	287	8.3	12.2	99.2	-4.5	6.46	287	8.29	12.27	100.1	-4.8	6.46	287	8.22	12.67	103.5	-5.7	8:55	3.7	2.9	E
		C	07-Nov-19	9:29	-1	6.69	290	8.32	11.98	98	-4.2	6.69	290	8.33	12.08	98.8	-3.7	6.25	303	8.32	12.47	101.2	0.3	9:40	6.2	4.1	E
		D	08-Nov-19	8:36	-6	6.56	285	8.25	11.63	94.9	-6.9	6.44	285	8.22	11.73	95.5	-6.9	6.4	285	8.17	12.04	98	-6.9	8:39	14.7	14.2	E
		E	07-Nov-19	7:55	-2	6.81	284	7.9	11.71	96.2	-7	6.82	284	7.98	11.69	96	-6.9	6.84	284	7.9	11.72	96.3	-6.7	8:06	10.1	7.5	E
		F	07-Nov-19	10:16	-1	6.85	286	8.28	11.84	97.3	-6.5	6.86	286	8.29	12	98.7	-6.5	6.79	289	8.29	12.46	102.7	-5.5	10:28	9.9	9	E
		G	08-Nov-19	10:40	-5	5.73	294	8.27	12.21	97.5	-6.7	5.72	294	8.28	12.3	98.2	-6.7	5.71	293	8.3	12.37	98.8	-6.8	10:52	4	6.5	E
		H	08-Nov-19	11:55	-4	5.96	288	8.31	12.19	90.8	-6.5	5.97	288	8.3	12.33	99.1	-6.5	5.92	289	8.3	12.47	100.3	-6.3	12:02	4	5.2	E
		I	07-Nov-19	9:13	-2	6.35	298	8.365	12.2	99.1	-3.5	6.35	298	8.34	12.32	100.1	-3.3	6.35	300	8.31	12.57	102	-3.1	9:20	3.1	2.9	B
		J	07-Nov-19	8:26	-2	5.98	311	8.32	12.56	101	9	5.98	311	8.3	12.58	101.1	8.7	5.97	311	8.27	12.68	102	9.1	8:32	2.9	2.8	B
		K	08-Nov-19	8:03	-6	6	312	8.07	11.54	92.6	-5.8	6	317	8.06	11.55	92.8	-5.8	6.06	320	8.04	11.58	93.3	-5.8	8:12	2.8	3	B
Fall 3		A	13-Nov-19	11:26	-14	3.99	290	8.12	12.83	97.9	-5	4.05	290	8.11	12.86	98.4	-5	4.07	289	8.09	12.95	99.3	-5.4	11:34	10.2	9.1	E
		B	13-Nov-19	11:49	-14	3.98	288	8.1	13.54	103.6	-3.7	3.99	292	8.11	13.75	105	-3.8	3.92	292	8.09	14.32	109.1	-3.7	11:59	4.2	2.8	E
		C	12-Nov-19	10:36	-7	4.45	294	8.14	11.44	88.4	2.3	4.45	294	8.06	11.46	88.5	2.3	4.44	294	7.99	11.45	88.5	3.5	10:43	5.2	4	E
		D	13-Nov-19	10:44	-14	4.22	283	8.08	12.8	98.3	-7.1	4.25	283	7.98	12.88	99	-7.1	4.26	284	7.93	13.01	100.2	-7.3	10:51	14.7	15.3	E
		E	12-Nov-19	11:33	-7	4.58	291	8.16	11.76	91.3	-1.4	4.58	291	8.16	11.68	90.7	-1.1	4.58	290	8.15	11.74	91	-0.8	11:39	9.5	7.1	E
		F	12-Nov-19	10:07	-7	4.87	286	8.17	11.32	88.5	-3.7	4.89	285	8.16	11.37	88.9	-3.7	4.9	286	8.12	11.45	89.6	-3.5	10:15	9.4	9.8	E
		G	13-Nov-19	10:06	-14	3.9	291	8.08	12.92	98.5	-6.6	3.9	290	8.04	12.95	98.7	-6.6	3.92	290	8	13	99	-6.6	10:15	3.9	6.2	E
		H	12-Nov-19	9:24	-8	3.94	293	7.93	11.42	87.1	-3.3	3.89	294	7.92	11.47	87.4	-3.1	3.93	293	7.93	11.58	88.3	-3	9:31	5.1	3.8	E
		I	12-Nov-19	10:54	-7	4.44	293	8.16	11.6	89.7	0.7	4.47	294	8.08	11.66	90.2	0.9	4.47	293	8.03	11.7	90.4	0.9	10:59	2.9	2.8	B
		J	12-Nov-19	11:11	-7	4.18	288	8.12	11.77	90.5	-2	4.18	289	8.06	11.93	91.8	-1.5	4.17	288	8.03	12.16	93.3	-0.7	11:15	3.2	2.6	B
		K	13-Nov-19	9:26	-11	3.66	291	7.97	12.92	97.8	-1.4	3.66	295	7.93	12.96	98	-1.3	3.7	295	7.93	13	98.5	-1.2	9:30	2.7	2.9	B

Notes: E = Experimental gill net, B = Small mesh broadscale gill net

Appendix F: Terrestrial Communities

Table F-1: ELC vegetation codes

		Vegetation Type		2007	Approximate Area (ha)		
Community Series	**Ecosite**	**Code**	**Description**	**Polygon ID**	**2007***	**2013**	**2018**
BLS – Shrub Bluff	BLS1 – Mineral Shrub Bluff	BLS1	Mineral Shrub Bluff	301	1.2	1.0	0.97
BLO - Open Bluff	BLO1 - Mineral Open Bluff	BLO1-1	Open Clay Bluff	309	1.2	0.9	0.77
BBO - Open Beach/Bar	BBO1 - Mineral Open Beach/Bar	BBO1	Beach	308A B	1.5	2.0	2.09
FOM - Mixed Forest	FOM4 - Dry - Fresh White Cedar Mixed Forest	FOM4-2	Dry - Fresh White Cedar - AspenMixed Forest	66	0.9	1.1	0.39
	FOM7 - Fresh -Moist White Cedar - Hardwood Mixed Forest	FOM7-1	Fresh - Moist White Cedar - Sugar Maple Mixed Forest	228A B	0.9	1.0	0.47
FOD - Deciduous Forest	FOD3 - Dry - Fresh Aspen - White Birch Deciduous Forest	FOD3-1	Dry - Fresh Aspen Deciduous Forest	303	0.9	0.6	0.50
	FOD4 - Dry - Fresh Deciduous Forest	FOD4	Dry-Fresh Deciduous Forest	40, 44	N/A	N/A	0.59
		FOD4-2	Dry - Fresh White Ash Deciduous Forest		3.8	2.1	4.28
	FOD5 – Dry – Fresh Sugar Maple Deciduous Forest	FOD5-8	Dry – Fresh Sugar Maple – White Ash Deciduous Forest	50	2.2	3.1	2.28
		FOD7	Fresh-Moist Lowland Deciduous Forest		N/A	N/A	0.54

		Vegetation Type		2007	Approximate Area (ha)		
Community Series	**Ecosite**	**Code**	**Description**	**Polygon ID**	**2007***	**2013**	**2018**
	FOD7 – Fresh – Moist Lowland Deciduous Forest	FOD7-2	Fresh – Moist Ash Lowland Deciduous Forest	59, 61	1.7	0.3	0.28
		FOD7-3	Fresh – Moist Willow Lowland Deciduous Forest		N/A	N/A	1.32
	FOD8 – Fresh – Moist Aspen – Sassafrass Deciduous Forest	FOD8-1	Fresh – Moist Aspen Deciduous Forest	24, 52, 58, 100, 239, 230B	5.9	5.9	4.96
CUP – Cultural Plantation	CUP3 – Coniferous Plantation	CUP3-2	White Pine Coniferous Plantation	30, 68	2.6	1.2	1.27
		CUP3-3	Scotch Pine Coniferous Plantation	63A B C, 95	1.4	1.4	0.65
CUM - Cultural Meadow	CUM1 – Mineral Cultural Meadow	CUM1-1 G	Dry – Moist Old Field Meadow (dominated by cool season grasses)	14, 60A B, 93, 227, 252, 306, 236B	13.5	10.6	19.18
		CUM1-1 F	Dry – Moist Old Field Meadow (dominated by forbs)	3A B, 19A B, 54A B, 64A B, 103, 104, 200A B,	27.9	26.4	34.44

		Vegetation Type		2007	Approximate Area (ha)		
Community Series	**Ecosite**	**Code**	**Description**	**Polygon ID**	**2007***	**2013**	**2018**
				213, 235, 247			
		CUM1-1 M	Dry – Moist Old Field Meadow (mixture of cool season grasses and forbs)	2A B, 20 A B, 42, 56, 62A B C, 74, 83, 88, 90A B C, 96A B C, 101, 201A B C, 209, 219A B C, 237, 241, 249A B	76.8	75.9	55.31
					118.2	112.9	108.94
CUT – Cultural Thicket	CUT1 – Mineral Cultural Thicket	CUT1	Thicket communities not taken to vegetation type due to limitations of system	52.8	51.8	61.6	53.15
		CUT1-1	Sumac Cultural Thicket	4.9	4.9	4.4	5.24
		CUT1-3	Chokecherry Cultural Thicket	4.4	4.1	3.5	4.19
CUW - Cultural Woodland	CUW1 - Mineral Cultural Woodland	CUW1	Not taken to vegetation type due to limitations of system	7, 18, 22, 26A B C,	42.1	36.8	21.5

		Vegetation Type		2007	Approximate Area (ha)		
Community Series	**Ecosite**	**Code**	**Description**	**Polygon ID**	**2007***	**2013**	**2018**
				41A B, 55A B, 65, 71, 72, 84, 92, 105, 106, 107, 202, 205, 217, 218, 221, 226A B, 236			
SWD – Deciduous Swamp	SWD2 – Ash Mineral Deciduous Swamp	SWD2-2	Green Ash Mineral Deciduous Swamp	73, 6A	3.5	3.4	2.38
	SWD3 – Maple Mineral Deciduous Swamp	SWD3-3	Swamp Maple Mineral Deciduous Swamp		N/A	N/A	0.50
		SWD3-4	Manitoba Maple Mineral Deciduous Swamp	81, 102	2.5	2.4	5.76
	SWD4 – Mineral Deciduous Swamp	SWD4-1	Willow Mineral Deciduous Swamp	5, 23, 67A B C, 80, 82, 208, 211, 231, 245	8.8	8.1	10.57

		Vegetation Type		2007	Approximate Area (ha)		
Community Series	**Ecosite**	**Code**	**Description**	**Polygon ID**	**2007***	**2013**	**2018**
		SWD4-3	White Birch –PoplarMineral Deciduous Swamp		N/A	N/A	0.13
SWT – Swamp Thicket	SWT2 – Mineral Thicket Swamp	SWT2-2	Willow Mineral Thicket Swamp	16, 77,	1.7	2.5	3.27
		SWT2-5	Red-osier Dogwood Mineral Thicket Swamp	207, 242,	1.8	2.1	2.22
MAM – Meadow Marsh	MAM2 – Mineral Meadow Marsh	MAM2	Not taken to vegetation type due to limitations of system	46	0.1	0.4	
		**MAM2 (p)	Mineral Meadow Marsh (Phragmites)	6B, 9, 13, 29, 89, 251	1.8	2.0	0.10
		MAM2-2	Reed-canary Grass Mineral Meadow Marsh	17, 31B C 69A B, 78, 204A B, 218A B, 244, 250, 239 A B, 247B	6.8	6.9	9.11
		MAM2-7	Horsetail Mineral Meadow Marsh	15, 28	0.3	1.4	0.30
		MAM2-10	Forb Mineral Meadow Marsh		N/A	N/A	0.35
	MAM4 – Great Lakes Coastal Meadow Marsh	MAM4-1	Graminoid Coastal Meadow Marsh		N/A	N/A	0.34

		Vegetation Type		2007	Approximate Area (ha)		
Community Series	**Ecosite**	**Code**	**Description**	**Polygon ID**	**2007***	**2013**	**2018**
	MAM5 – Mineral Fen Meadow Marsh	MAM5	Not taken to vegetation type due to limitations of system	300	0.04	0.2	0.31
MAS – Shallow Marsh	MAS2 – Mineral Shallow Marsh	MAS2(p)	Mineral Shallow Marsh (Phragmites)		N/A	N/A	1.49
		MAS2	Mineral Shallow Marsh		N/A	N/A	1.79
		MAS2-1	Cattail Mineral Shallow Marsh	31A, 75, 79, 87, 230, 248A B, 253, 301A B, 232B	2.3	3.4	2.55
		MAS2-7	Bur-reed Mineral Shallow Marsh	8, 45	1.7	1.0	1.02
OAO– Open Aquatic	No further division				2.0	1.9	6.9
SAS – Submerged Shallow Aquatic	SAS1 – Submerged Shallow Aquatic	SAS1	Not taken to vegetation type due to limitations of system			0.1	0.56
		SAS1-3	Stonewort Submerged	47,310	0.1	0.1	1.37

*Note: the areas for 2007 differ from those included in the 2007 report as they have been corrected to remove the railroad right of way.
**Some marshes dominated by Phragmites have been changed from Meadow Marsh MAM2(p) to Shallow Marsh MAS2 (p) to better describe ecological conditions.
Taken from Beacon 2019.

Transects and Monitoring Locations

Figure F-1

DNNP Terrestrial Environment
Existing Conditions Baseline Update

Legend

- Site Study Area
- Amphibian Monitoring Stations
- Survey Area Boundary
- Drainage Feature
- Bat Acoustic Monitor Locations
- Bank Swallow Monitoring Area

Breeding Bird Transects

- A Coot's Pond
- B Bobolink Hill
- C Big Hedge
- D Butterfly Meadow (Discontinued 2015)
- E East Hedge
- F Woodlot
- G Bunting Thicket

Snake Monitoring Transects

- 1 Snake Monitoring Transects, 1
- 2 Snake Monitoring Transects, 2
- Snake Hibernaculum

Bat Monitoring Transects

- W North East
- X Coot's Pond
- Y South West

First Base Solutions
Web Mapping Service 2018

UTM Zone 17 N, NAD 83

0 125 250 500 Metres

1:12,000

N W E S

BEACON ENVIRONMENTAL

Project 218117
May 2019

ELC Communities 2018

Figure F-2

DNNP Terrestrial Environment Existing Conditions Baseline Update

Legend

Site Study Area (462.2 ha)

ELC Communities

ELC Communities	ha
AG: Agricultural	45.09
ANT: Anthropogenic	132.83
BBO1: Mineral Open Shoreline	2.09
BLO1-1: Open Clay Bluff	0.77
BLS1: Mineral Shrub Bluff	0.97
CUM1-1: Dry - Moist Old Field Meadow	108.94
CUP3-2: White Pine Coniferous Plantation	1.27
CUP3-3: Scotch Pine Coniferous Plantation	0.65
CUT1: Mineral Cultural Thicket	53.15
CUT1-1: Sumac Cultural Thicket	5.24
CUT1-3: Chokecherry Cultural Thicket	4.19
CUW1: Mineral Cultural Woodland	21.5
FOD3-1: Dry - Fresh Aspen Deciduous Forest	0.5
FOD4: Dry - Fresh Deciduous Forest	0.59
FOD4-2: Dry - Fresh White Ash Deciduous Forest	4.28
FOD5-8: Dry - Fresh Sugar Maple - White Ash Deciduous Forest	2.28
FOD7: Fresh - Moist Lowland Deciduous Forest	0.54
FOD7-2: Fresh - Moist Ash Lowland Deciduous Forest	0.28
FOD7-3: Fresh - Moist Willow Lowland Deciduous Forest	1.32
FOD8-1: Fresh - Moist Aspen Deciduous Forest	4.96
FOM4-2: Dry - Fresh White Cedar - Aspen Mixed Forest	0.39
FOM7-1: Fresh - Moist White Cedar - Sugar Maple Mixed Forest	0.47
MAM2: Mineral Meadow Marsh	0.1
MAM2-10: Forb Mineral Meadow Marsh	0.35
MAM2-2: Reed-canary Grass Mineral Meadow Marsh	9.11
MAM2-7: Horsetail Mineral Meadow Marsh	0.3
MAM4-1: Graminoid Coastal Meadow Marsh	0.34
MAM5: Mineral Fen Meadow Marsh	0.31
MAS2: Mineral Shallow Marsh	3.28
MAS2-1: Cattail Mineral Shallow Marsh	2.55
MAS2-7: Bur-reed Mineral Shallow Marsh	1.02
OAO: Open Aquatic	6.9
SAS1: Submerged Shallow Aquatic	0.56
SAS1-3: Stonewort Submerged Shallow Aquatic	1.37
STWM: Storm Water Management	0.35
SWD2-2: Green Ash Mineral Deciduous Swamp	2.38
SWD3-3: Swamp Maple Mineral Deciduous Swamp	0.5
SWD3-4: Manitoba Maple Mineral Deciduous Swamp	5.76
SWD4-1: Willow Mineral Deciduous Swamp	10.57
SWD4-3: White Birch - Poplar Mineral Deciduous Swamp	0.13
SWT2-2: Willow Mineral Thicket Swamp	3.27
SWT2-5: Red-osier Mineral Thicket Swamp	2.22

BEACON ENVIRONMENTAL

Project: 218117
Last Revised: December 2018

Client: OPG

Prepared by: RM
Checked by: BH

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0 200 400 m

Species at Risk Habitat	Figure F-3

DNNP Terrestrial Environment
Existing Conditions Baseline Update

Legend

Site Study Area

Eastern Meadowlark

Habitat

Occasional Use

General Habitat Under ESA

Bobolink

Habitat

General Habitat Under ESA

Least Bittern

Occasional Use

Barn Swallow

2017 - 2019

Historic

Other Species

Butternut Tree

Typical Bank Swallow Colony Area

Bank Swallow Roost

Potential Bat Roost Habitat (Approximate)

*** Note: Habitat for migrant species not mapped**

BEACON ENVIRONMENTAL

Project: 219023
Last Revised: December 2019

Client: OPG

Prepared by: BD
Checked by: BEH

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C:\Dropbox\Dropbox (Beacon)\All GIS Projects\2019\219023 DNGS and PNGS Biodiversity 2019-2021\MXD\2019-12-08_Figure01_BiodiversityReport2019_ThreatenedAndEndangeredSpeciesHabitat_219023.mxd

Bounding Extent of Direct Losses of Vegetation Communities (2018)

Figure F-4

Terrestrial Baseline Communities

Legend

- DN Site
- Areas of Direct Effect
- Ag: Agricultural
- BBO 1: Beach
- BLO 1-1: Open Clay Bluff
- CUM 1-1 F: Dry-Moist Old Field Meadow (dominated by forbs)
- CUM 1-1 G: Dry-Moist Old Field Meadow (dominated by cool season grasses)
- CUM 1-1 M: Dry-Moist Old Field Meadow (mixture of grasses and forbs)
- CUP 3-2: White Pine Coniferous Plantation
- CUP 3-3: Scotch Pine Coniferous Plantation
- CUT 1: Mineral Cultural Thicket
- CUT 1-1: Sumac Cultural Thicket
- CUT 1-3: Chokecherry Cultural Thickset
- CUW 1: Mineral Cultural Woodland
- FOD 3-1: Dry-Fresh Poplar Deciduous Forest
- FOD 4-2: Dry-Fresh White Ash Deciduous
- FOD 5-8: Dry-Fresh Sugar Maple - White Ash Deciduous Forest
- FOD 8-1: Fresh-Moist Poplar Deciduous Forest
- FOM 4-2: Dry-Fresh White Cedar - Poplar Mixed Forest
- FOM 7-1: Fresh-Moist White Cedar - Sugar Maple Mixed Forest
- MAM 2-2: Reed-canary Grass Mineral Meadow Marsh
- MAM 2-7: Horsetail Mineral Meadow Marsh
- MAM 2: Mineral Meadow Marsh
- MAS 2: Mineral Shallow Marsh
- MAS 2-1: Cattail Mineral Shallow Marsh
- MAS 2-7: Bur-reed Mineral Shallow Marsh
- SAS 1-3: Stonewort Submerged Shallow
- SWD 3-4: Manitoba Maple Mineral Deciduous Swamp
- SWD 4-1: Willow Mineral Deciduous Swamp
- SWT 2-2: Willow Mineral Thicket Swamp
- SWT 2-5: Red-osier Dogwood Mineral Thicket
- Sports Field
- Turf

BEACON ENVIRONMENTAL

Project: 218214
Last Revised: January 2020

Client: OPG

Prepared by: BD
Checked by: BEH

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