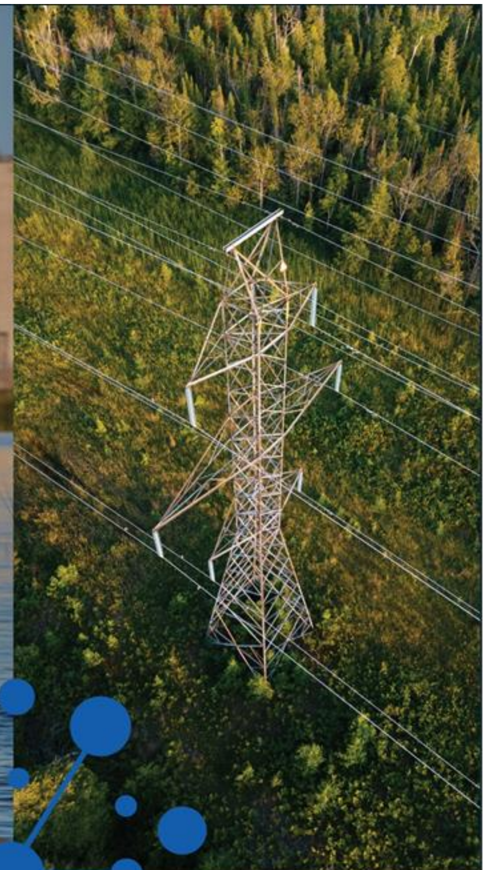

Environmental Protection Report 2024

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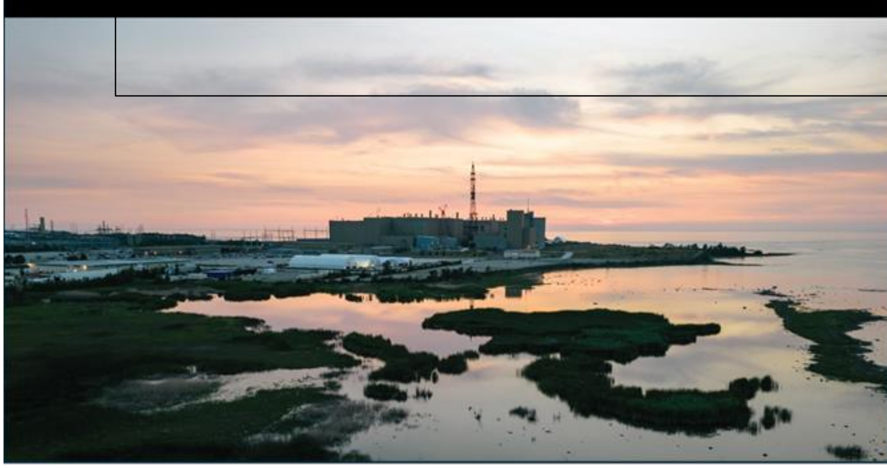

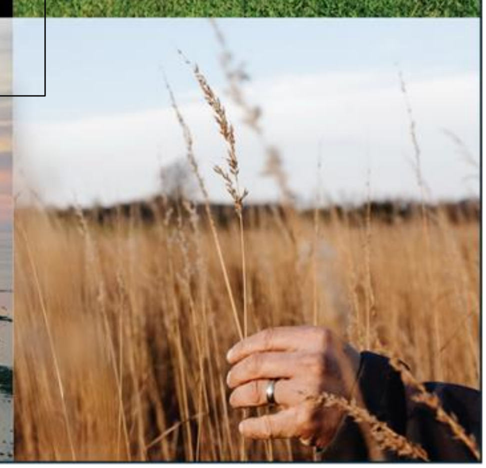

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2024 ENVIRONMENTAL PROTECTION REPORT

B-REP-07000-00017

Rev 000

May 1, 2025

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ABSTRACT OF PRESENT REVISION:

Initial Issue

INDIGENOUS LAND ACKNOWLEDGEMENT

The Bruce Power site is located within the Saugeen Ojibway Nation Territory, the shared treaty and traditional Territory of the Chippewas of Saugeen First Nation and the Chippewas of Nawash Unceded First Nation (Neyaashiinigmiing).

Bruce Power is dedicated to honouring Indigenous history and culture and is committed to moving forward in the spirit of reconciliation and respect with the Indigenous communities we work with. We are committed to strong and respectful relationships with the Saugeen Ojibway Nation, the Métis Nation of Ontario Region 7, and Historic Saugeen Métis.

Bruce Power appreciates the support of the local residents, businesses and communities surrounding the Bruce Power site who voluntarily take part in the environmental monitoring programs. Results from air monitoring equipment placed throughout the communities, along with local sample results from fish, honey, eggs, beef, poultry, grains, fruits, vegetables, animal feed and water, help confirm the result for a representative dose to public.

EXECUTIVE SUMMARY

The purpose of this report is to meet regulatory requirements for environmental protection as outlined in Condition 3.3 of the Bruce A and B Power Reactor Operating Licence [R-1] and the Canadian Nuclear Safety Commission Regulatory Document REGDOC-3.1.1 Reporting Requirements for Nuclear Power Plants [R-2].

The International Organization for Standardization (ISO)14001, Environmental Management Systems Standard, provides a framework for organizations to improve their environmental performance and protect the environment. Bruce Power has implemented and maintained alignment with ISO 14001 for 19 years, and successfully completed a surveillance audit in 2024, with the next re-certification audit planned for 2026. More details are described in Section 10.0.

The Canadian Standards Association (CSA) N288 series of Standards and Guidelines provide overall direction on environmental management and protection for nuclear facilities, and several are required by the operating licence for the facility. Bruce Power has implemented these standards as per the requirements of the Licence Condition Handbook [R-3].

Site Description

Bruce Power has safely operated the Bruce Nuclear Facility (referred to as the “Site” herein) near Tiverton, Ontario since May 2001. The Site is located on the east shore of Lake Huron approximately 18 kilometres north of Kincardine. It includes Bruce Nuclear Generating Station A (Bruce A) and Bruce Nuclear Generating Station B (Bruce B), each comprising four CANDU reactors, as well as ancillary facilities. Currently, six of the eight reactors are operational. Two reactors (Unit 3 and 4) are undergoing Major Component Replacements, with Unit 3 expected to return to service in 2026 and Unit 4 in 2027. Additional reactors (Units 5, 7, and 8) are planned to start MCR projects within the next six years.

Environmental Protection

Bruce Power’s Environmental Protection Program is built upon an integrated monitoring approach that strives to understand environmental impact, verify environmental protection, and continuously improve performance through engagement with Indigenous Nations and Communities and striving to incorporate Indigenous knowledge into our monitoring and risk assessment programs and by driving strategic research and innovation through collaborations with industry and community. Environmental safety and responsibility are woven into all aspects of the company’s nuclear safety culture, and Bruce Power commits to meet or exceed all relevant legal and voluntary environmental requirements. The company holds itself accountable to prevent pollution through strong management of emissions, effluents, and waste and implements robust spill mitigation measures in order to provide effective containment and control of contaminants.

Dose to Public

Each year Bruce Power gathers information in order to calculate the radiological dose to representative persons living near the Site. This includes meteorological data, analysis of local environmental media and Site radiological emissions and effluents that include all utilities near or within the Bruce Power Site boundary. Following the methodology outlined in CSA N288.1 and using a site-specific environmental transfer model, a dose is calculated for each representative person at three age classes – adult, child and infant. A representative person is determined using the lifestyle characteristics identified in the Site Specific Survey and is defined as an individual who receives a dose that is representative of the most highly exposed individuals in the population. The most limiting result, or highest calculated dose, is used as the annual dose to public and is published annually in this report.

For the thirty-third consecutive year, Bruce Power's contribution to the annual dose of a member of the public is less than the lower threshold for significance (less than 10 microsieverts per year) and is considered *de minimus*. The maximum dose associated with Bruce Power operations in 2024 was obtained for the Bruce Subsistence Farmer (BSF2) Adult who received 1.1 microsieverts per year. All other representative persons have a lower dose. This maximum dose is a small fraction of a percent of the legal limit of 1,000 microsieverts per year.

Representative Person	Committed Effective Dose	Percentage of Legal Limit
BSF2 Adult	1.1 microsieverts per year	0.11%

Community Investment and Sustainability

Social responsibility and environmental stewardship are key values within Bruce Power's business model. We are dedicated to facilitating community partnerships and supporting local environment and sustainability -related projects and initiatives through our Environment & Sustainability Fund, where funding is provided for initiatives that promote environmental conservation and restoration, energy efficiency and carbon emission reductions, climate change mitigation and resilience, and environmental education, awareness, and research. The Environment & Sustainability Fund saw the distribution of $458,000 across sponsorships, long -term partnerships, and events in 2024.

The Environment & Sustainability Fund is managed by Bruce Power's Sustainability Program and endorsed by Bruce Power's Environment & Sustainability Oversight Committee. Bruce Power's Sustainability Program takes a balanced approach to responsible business practices and ensures that our reporting aligns with global standards and best practices. Bruce Power supports provincial and federal carbon-reduction goals through our generation of non-greenhouse gas emitting electricity providing on average 30% of the province's electricity demand, and our own 2027 Net Zero Strategy. In 2024, Bruce Power completed the third, and final, year of its work with ALUS New Acre Project, which supports nature-based carbon sequestering opportunities and the protection and enhancement of local ecosystem across Bruce And Grey Counties. The third year of involvement saw support distributed to 27 local farmers to establish and maintain 200 additional acres of locally led nature-based projects on marginal land. To date, Bruce Power's investment has supported over 60 participants in delivering 600 projects acres in Bruce And Grey Counties. Preliminary estimates of 2024 projects forecast

2,566 tonnes of CO_2 emissions removed over the committed duration of five years, bringing the total carbon sequestered over the course of the investment to 6,602 tonnes CO_2e over five years.

In 2024, Bruce Power prepared a recertification submission for the Wildlife Habitat Council, the world's only voluntary sustainability standard designed for broad-based biodiversity enhancement and conservation education on corporate landholdings. With a focus on increasing the number and quality of project's submitted, Bruce Power's program has achieved Certified Gold which is the highest level of recognition.

Bruce Power undergoes an annual process to obtain an Environment Social Governance (ESG) Risk Rating, which was completed by Morningstar Sustainalytics, a leading third-party ESG Risk Rating agency. In 2024, Bruce Power maintained a "Low Risk" ESG risk rating, recognizing Bruce Power as a strong performer. The ESG Risk Rating combines an assessment of the company's exposure to industry specific ESG issues and how well the company is managing those risks through suitable policies, programs, and initiatives.

Environmental Risk Assessment

An Environmental Risk Assessment was prepared in 2022 following the guidance of CSA N288.6-12 which defines an Environmental Risk Assessment as a systematic process used to identify, quantify, and characterize the risk posed by contaminants and physical stressors in the environment on biological receptors (human and non-human biota), including the magnitude and extent of the potential effects associated with a facility [R-4]. The Environmental Risk Assessment demonstrates that the operation of the Bruce Nuclear Facility has not resulted in adverse effects on human health of nearby residents or visitors due to exposure to radiological or conventional substances and physical stressors. A low risk to specific mainly cold and cool water fish was assessed because of exposure to thermal effluent. All other risks associated with exposure to physical stressors were assessed as negligible. Risks to ecological receptors due to exposure to radiological substance were assessed as negligible. Risks to ecological receptors from exposure to conventional substances were limited to specific areas on site and are detailed in Section 4.1. Where risks have the potential to be elevated, follow-up monitoring at specific locations was recommended. Implementation of recommendations is in progress in preparation for the submission of the next Environmental Risk Assessment in June of 2027.

The results of the 2022 Environmental Risk Assessment were shared with Saugeen Ojibway Nation, Métis Nation of Ontario Region 7, and Historic Saugeen Métis prior to the submission of the Environmental Risk Assessment to the CNSC. Based on the review of the past Bruce Power specific concerns raised by Indigenous Nations, all technical considerations within the construct of the CSA N288.6 framework have been considered and those related to the Environmental Risk Assessment have been highlighted within the text.

Environmental Monitoring

The environmental monitoring program is designed to meet the requirements of CSA N288.4-10 [R-5]. This consists of both radiological environmental monitoring program, which is used to characterize dose to public annually, and non-radiological (conventional) environmental monitoring program. Together, environmental monitoring and assessment verifies that emissions and effluents as a result of site operations have a minimal impact on the surroundings.

Radiological Environmental Monitoring

The Radiological Environmental Monitoring program establishes a database of radiological activity measured in the environment near Bruce Power and determines the contribution of overall radiation dose to members of the public as a consequence of the radiological releases from normal operations on Site. The radiological environmental monitoring data implicitly reflects the cumulative impact of releases from all Bruce Power licensed facilities as well as facilities within or adjacent to the Bruce Power Site boundary that are owned or operated by other parties. The program involves the annual collection and analysis of environmental media for radionuclides specific to nuclear power generation. The program design is based on risk and is informed by a radionuclide and exposure pathways analysis. Monitoring locations are conservatively selected to be representative of locations of exposure of representative persons and also based on practical considerations, including the availability of samples and participation of local residents and farmers. Sampling locations are grouped by proximity to site and these groups include indicator, area near and area far locations. Generally, radionuclide concentrations decrease with distance from site and all levels result in a *de minimus* dose. In 2024, as stated above, the maximum dose associated with Bruce Power operations was obtained for the Subsistence Farmer BSF2 Adult who received 1.1 microsieverts per year which is less than the lower threshold for significance (less than 10 microsieverts per year).

Bruce Power regularly collects samples of pelagic (whitefish) and benthic (suckers) fish in the near shore by Bruce Power and farther afield at a control location and measures for tritium oxide, organically bound tritium, carbon-14 and CANDU related gamma emitters. Measured radionuclide concentrations are consistently near background levels and well below the CNSC reference levels, indicating that there is no risk to members of the public or the environment from consuming fish caught near Bruce Power.

Conventional Environmental Monitoring

The Conventional Environmental Monitoring Program collects information about non-radiological contaminants, physical stressors, and biological effects in the environment around Bruce Power. This data is analyzed every five years through an Environmental Risk Assessment process to determine potential impacts on both human and non-human biota. Bruce Power has a strong water quality monitoring program that continues to verify that effluent and emissions, as well as physical stressors imposed by facility operations, have little-to-no effect on the surrounding waterbody, and that Bruce Power has effective containment and effluent control measures in place. Fish impingement and entrainment losses in 2024 were consistent with prior years and well below the maximum loss permitted in Bruce Power's *Fisheries Act* Authorization. Fish offsetting activities continued as planned in 2024, with monitoring in the Saugeen River in the vicinity of the former Truax Dam as per Bruce Power's Offsetting Plan. This year's results continue to show a positive net balance between fish productivity in the Saugeen River versus losses at Bruce A and Bruce B through impingement and entrainment. Results of thermal monitoring in Lake Huron in 2024 are being used for ongoing verification of the thermal risk assessment to address both the Ministry of Environment, Conservation and Parks environmental compliance approval conditions and analysis for the Environmental Risk Assessment. Long term biological effects monitoring of local wildlife populations continues to demonstrate diverse and abundant communities of amphibians, reptiles, birds, waterfowl, and fish.

Groundwater Protection

The Bruce Power Groundwater Protection Program is aligned with CSA N288.7-15, Groundwater Protection Programs at Class 1 Nuclear Facilities and Uranium Mines and Mills. The program is designed to achieve the overall groundwater protection goal to protect the quality and quantity of groundwater by minimizing the interactions of Bruce Power activities with the environment. The groundwater goals are achieved through the setting of objectives which form the basis of program performance monitoring. Performance against program objectives is evaluated at least annually which allows for identification of gaps and opportunities to drive continuous program improvements.

The results of the 2024 Groundwater Monitoring program demonstrate that groundwater quality on the Bruce Power site is within historical trend. There were no observations of unforeseen conditions which would represent potential adverse impacts to human health or the environment.

Effluent Monitoring

The effluent monitoring program includes both radiological and conventional and is aligned with CSA standard N288.5, Effluent monitoring programs at Class I nuclear facilities and uranium mines and mills [R-6]. Results of the Effluent Monitoring program demonstrate that all conventional and radiological effluents (waterborne and airborne) are, and continue to be, well below regulatory limits.

Radiological Emissions and Effluent Monitoring

In 2024, all radiological releases continued to remain well below the Derived Release Limits. Bruce Power has several engineered barriers in place, where possible, to minimize radionuclides released to the environment and keep airborne emissions and waterborne effluent as low as reasonably achievable. These barriers, in addition to systematic monitoring, trending and investigation of emissions and effluent that are above normal levels, assists Bruce Power in minimizing releases and ensuring they remain well below regulatory limits.

Conventional Effluent Monitoring

Air emissions and water effluents are controlled to meet regulatory requirements and to minimize impacts to protect the natural environment. Emissions and effluents are discharged according to specific licenses, permits, and regulations under (but not limited to) the *Environmental Protection Act* [R-7] and the *Ontario Water Resources Act* [R-8]. Bruce Power performs extensive modelling and monitoring of its emissions and effluent to ensure that controlled discharges are monitored according to requirements and releases occur within acceptable limits and environmental impacts are minimized.

Waste Management

Bruce Power complies with all waste regulations and requirements of the relevant federal, provincial, and municipal authorities. Further, Bruce Power has taken an active role for many years to reduce all forms of waste: from an environmental and financial standpoint waste reduction is good for our company and the community in which we reside. Our philosophy employs a whole life-cycle approach in that we reduce waste at the consumer level, generate less waste at the company level, find opportunities to reuse products (on-site, off-site donations, or auction), and implement recycling programs that are available in the ever-changing recycling market. Regardless of its end point, each waste stream generated at Bruce Power is processed and disposed of in a safe and environmentally responsible manner.

CONCLUSION

In conclusion, the 2024 Environmental Protection Report for Bruce Power demonstrates the effectiveness of the company's commitment to environmental safety, regulatory compliance, and community engagement. The report highlights Bruce Power's fulfillment of regulatory requirements, continuous improvement in environmental protection measures, and significant investments in community and sustainability initiatives. With strong monitoring programs, effective waste management, and proactive risk assessments, Bruce Power ensures minimal environmental impact while supporting sustainability goals. The company's dedication to transparency, innovation, and collaboration with communities further underscores its role as a responsible and forward-thinking energy provider.

Table of Contents

1.0 INTRODUCTION

1.1 Purpose

The purpose of this report is to fulfill regulatory requirements on environmental protection in accordance with Licence Condition 3.3 of the Bruce A and Bruce B Power Reactor Operating Licence Bruce Nuclear Generating Stations A and B 18.04/2028 [R-1] and the Canadian Nuclear Safety Commission (CNSC) Regulatory Document REGDOC-3.1.1 Reporting Requirements for Nuclear Power Plants, Section 3.6 [R-2].

1.2 Regulatory Requirements

1.2.1 Licence Requirements

Bruce A and B Power Reactor Operating Licence [R-1] and the associated Licence Condition Handbook [R-3] contains Section 3.3 Reporting Requirements that require Bruce Power to notify and report in accordance with CNSCregulatory document REGDOC-3.1.1, version 3 [R-2]. Environmental Protection is one safety control area which covers programs that identify, control, and monitor all releases of radiological, non radiological and hazardous substances, and monitors the effects on the environment from the operation of facilities or as the result of licensed activities.

The environmental protection report is submitted annually to the CNSC and contains information as required by REGDOC-3.1.1, version 3 Section 3.6 [R-2] posted publicly at, Publications – Bruce Power.

Federal and Provincial regulations require licencees to monitor and report on the characteristics of airborne and waterborne effluent. Licencees are required to comply with any statutes, regulations, licences, or permits that govern the operation of the nuclear facility or licenced activity. The release of hazardous substances is regulated by both the Ontario Ministry of the Environment, Conservation and Parks and Environment and Climate Change Canada through various acts and regulations, as well as by the Canadian Nuclear Safety Commission.

The Licensee may be required to submit annual reports to other government departments regarding their environmental protection program, which include the results of effluent/emission and environmental monitoring programs. Licensees may send a copy of such reports to the CNSC to demonstrate compliance with the CNSC's requirement for oversight of the Bruce Power environmental monitoring program.

1.2.2 Environmental Protection Program

Bruce Power's Environmental Protection Program is founded on an integrated monitoring approach aimed at understanding environmental impact, verifying environmental protection, and continuously improving through engagement with Indigenous Nations and Communities and striving to incorporate Indigenous knowledge into our monitoring and risk assessment programs and engage in strategic research and innovation in collaboration with industry and community partners.

Environmental safety and pollution protection are integral to the company's nuclear safety culture, and Bruce Power is committed to meeting or exceeding all relevant legal and voluntary environmental requirements. The company holds itself accountable for pollution protection by effectively managing emissions, effluents, and waste, and by implementing robust spill mitigation measures to ensure effective containment and control of contaminants. To demonstrate environmental protection, Bruce Power conducts extensive monitoring and modeling of both radiological and conventional contaminants. Bruce Power complies with Federal Regulations, programs, and standards which protect human health and the environment under the *Nuclear Safety and Control Act* [R-9]. The key elements are listed below:

- The *General Nuclear Safety and Control Regulations* [R-10] require every licensee to take all reasonable precautions to protect the environment and to control release of radioactive nuclear substances or hazardous substances within the site of the licensed activity and into the environment as a result of the licenced activity.

- The *Class 1 Nuclear Facilities Regulations* [R-11] set out environmental protection requirements that must be met.

- The *Radiation Protection Regulations* [R-12] prescribe radiation dose limits for the general public of 1 mSv (1000 μSv) per calendar year.

- Power Reactor Operating Licence 18.04/2028, Nuclear Reactor Operating Licence Bruce Nuclear Generating Stations A and B [R-1].

When considering relicensing, the CNSC is obligated under the Nuclear Safety and Control Act [R-13] to assess whether an applicant will make adequate provisions for environmental protection and the health and safety of people, as outlined in REGDOC-2.9.1 Environmental Protection Policies, Programs and Procedures [R-14] . Consequently, the CSA N288 standards are implemented through the requirements set out in the Licence Condition Handbook [R-3]

REGDOC-2.9.1 [R-14] outlines the requirements for an environmental protection program that aligns with the International Organization for Standardization (ISO) 14001, Environmental Management System [R-15]. BP-PROG-00.02, Environmental Management program is used and followed to implement this environmental protection program.

1.2.2.1 Canadian Standards Association N288 Series

The Canadian Standards Association (CSA) N288 standards are part of a series of guidelines and standards on environmental management of nuclear facilities. Bruce Power will continue to strive to be industry best and implement newer versions of the CSA N288 series of environmental standards as they become available.

Bruce Power has implemented the following CSA standards that are relevant to the CNSC's regulatory framework for environmental compliance:

- CSA N288.1-20, Guidelines for modelling radionuclide environmental transport, fate, and exposure associated with the normal operation of nuclear facilities [R-16];
- CSA N288.4-10, Environmental Monitoring Program at Class 1 nuclear facilities and uranium mines and mills [R-5];
- CSA N288.5-11, Effluent monitoring programs at Class 1 nuclear facilities and uranium mines and mills [R-17];
- CSA N288.6-12, Environmental Risk Assessments at Class 1 nuclear facilities and uranium mines and mills [R-18]; and
- CSA N288.7-15, Groundwater Protection Programs at Class 1 nuclear facilities and uranium mines and mills [R-19].
- CSA N288.8-17, Establishing and implementing action levels for releases to the environment from nuclear facilities [R-20].

Bruce Power is proactively implementing CSA N288.0-22, Environmental management of nuclear facilities: Common requirements of the CSA N288 series of standards. This standard is required to be implemented when moving to the new versions (2022 onwards) of the CSA N288 standards.

1.2.2.2 Environmental Management System (International Organization for Standardization 14001 Standard)

International Standards Association (ISO) 14001 [R-21] specifies the requirements for an environmental management system that an organization can use to enhance its environmental performance. The standard is used to manage environmental responsibilities in a systematic manner that contributes to environmental sustainability and ensures environmental protection.

In 2023, Bruce Power had a successful re-registration audit to confirm that Bruce Power operates an environmental management system compliant with the requirements of ISO 14001:2015 [R-21]. The new certification is valid for an additional three years (2023-2026).

The Bruce Power environmental management system program oversees the planning, implementation, and operation of integrated activities, with a focus on minimizing the potential adverse impact of Bruce Power operations on the environment. This includes ensuring Bruce Power's Environmental Management Program as defined by BP-PROG-00.02, Environmental Management [R-22], conforms to the ISO 14001 standard for Environmental Management System [R-21], environmental compliance obligations applicable to Bruce Power, and the commitments made in the Environment & Sustainability Policy.

The environmental management system serves as the management tool for integrating pollution prevention, changing environmental conditions (climate change), sustainability and environmental protection measures in a documented, managed and auditable process. The environmental management system at Bruce Power is integrated within the Bruce Power Management System, which is implemented in accordance with CSA N286-12, Management System Requirements for Nuclear Facilities standard [R-23].

Environment and Sustainability Policy

The Environment & Sustainability Policy (2024) describes sustainability principles, addresses strategic research and innovation efforts, and demonstrates our commitment to meeting or exceeding requirements. This Policy establishes guiding principles and environmental expectations for employees and those working on behalf of Bruce Power. The Environmental Policy reflects Bruce Power's dedication to environmental protection and states that you can count on Bruce Power to:

- Ingrain a healthy nuclear safety culture which promotes nuclear safety, radiological safety, industrial safety and environmental safety and sustainability;
- Commit to excellence by meeting or exceeding all relevant legal and voluntary requirements to which Bruce Power subscribes;
- Understand our environmental impact and verify environmental protection through monitoring the environment, collaborating with industry and the community, and driving related strategic research and innovation;
- Focus on continuous improvement by adopting applicable industry best practices and requirements of the International Organization for Standardization 14001;
- Ensure our business decisions support the application and practice of sustainability principles by protecting, conserving, and restoring our resources through energy conservation, reducing water consumption, supporting waste diversion, and considering product life cycle in our Supply Chain;
- Hold ourselves accountable to prevent pollution through robust management of emissions, effluents and waste, as well as implementation of spill mitigation measures;

- Promote environmental stewardship and awareness at work, in the community, and across Ontario;
- Uphold the trust of the community through open and transparent communication with partners, Indigenous Nations and Communities, interested parties on environmental interests, and sustainability commitments;
- Play a leading role in keeping the air clean and fighting climate change; supporting emissions reductions strategies to achieve a Net Zero Canada by 2050; adopting ambitious net reduction strategies for Bruce Power to achieve Net Zero (Scope 1 and 2 Greenhouse Gas emissions by 2027); and
- Support partners, communities and organizations to drive innovations and projects to offset and sequester carbon in a real and tangible way.

2.0 BACKGROUND

The Site is located in the Municipality of Kincardine on the eastern shore of Lake Huron within Bruce County. The Municipality of Kincardine is comprised of the town of Kincardine and several small villages and towns including Inverhuron and Tiverton. The area is a popular tourist destination with many cottages and holiday parks attracting visitors from across Ontario, Canada and the United States. The next closest municipality to the Site is the Town of Saugeen Shores, which is approximately 25 kilometres from the Site. The Town of Saugeen Shores includes Southampton and Port Elgin.

Bruce County can be broadly split into three sections: (i) the Bruce Peninsula, part of the Niagara Escarpment, (ii) the Lakeshore that includes a number of sandy beaches and fresh water, and (iii) the Interior Region, also known as the “breadbasket” which has a strong history of farming and agriculture. Bruce County has economic strengths in many sectors including tourism, agriculture and energy. The 2021 Census showed a population of 12,268 people in the Municipality of Kincardine (an increase of 7.7% from 2016) and a population of 15,908 in the Town of Saugeen Shores (an increase of 16% from 2016), which includes Southampton and Port Elgin. Both municipalities are in Bruce County, which has a total population of 73,396 (an increase of 7.7% from 2016).

2.1 Bruce Power Site

Bruce Power has been safely operating the Bruce Nuclear Facility, referred to as the “Site”, near Tiverton, Ontario since May 2001. Situated on the east shore of Lake Huron, approximately 18 kilometres north of Kincardine, the Site includes Bruce Nuclear Generating Station A (Bruce A) and Bruce Nuclear Generating Station B (Bruce B), each comprising four CANDU reactors, radioactive waste storage and ancillary facilities. The Site also encompasses lands currently occupied by Ontario Power Generation, Canadian Nuclear Laboratories Douglas Point and Hydro One.

Currently, six of the eight reactors are operational, with Unit 3 and Unit 4 at Bruce A undergoing Major Component Replacement.

2.1.1 Life Extension Program and Major Component Replacement

In December 2015, Bruce Power reached an agreement with the Independent Electricity System Operator to advance a long-term investment program to refurbish its nuclear fleet. As Ontario's largest electricity generating facility, Bruce Power's Life-Extension Program and Major Component Replacement projects will play a key role in supporting growing electricity needs by extending the operation of its eight units to continue to produce clean energy and cancer-fighting isotopes through 2064 and beyond.

The Life-Extension Program started planning activities on January 1, 2016, and involves the gradual replacement of older systems in the company's eight reactor units during routine maintenance outages.

As part of the Life-Extension program, Bruce Power is carrying out an intensive Major Component Replacement project. The Major Component Replacement project activities began in January 2020 and focuses on the replacement of key primary side components in Units 3 to 8, including steam generators, pressure tubes, calandria tubes and feeder tubes.

Through the first 5 years of these projects, since kicking off in 2020, overall environmental performance has been strong and as of March 2025, there were no environmental infractions related to the Life Extension program or Major Component Replacement project. Environment personnel continue to perform as key stakeholders in Life Extension and Major Component Replacement projects, providing document reviews and feedback throughout all stages of planning and execution. The Environment staff conduct routine field walk downs and observations; ensuring oversight on activities which have the potential to impact the environment and providing timely guidance on mitigation measures where appropriate.

Environmental Management Plans are created to manage potential environmental risks and mitigation strategies related to the larger project scopes of work. The Environmental Management Plans are developed to provide project execution vendors with key information regarding the environmental aspects of the activities covered in their scope of work, including conventional and radiological emissions, hazardous and conventional waste, and spills management. The Environmental Management Plans also provide the execution owner with awareness on items such as regulatory requirements and event reporting expectations. For the remainder of smaller scope planned evolutions, an Environmental Management Plan may not be appropriate but Environmental Impact Workflows are utilized to perform an environmental impact assessment of the activity. Environmental Impact Workflows prompt for a description of the activity being performed and contain a series of questions which allows for environment personnel to then assess the risk and provide relevant guidance to ensure any potential environmental risk the activity poses are appropriately managed and mitigated.

The Unit 6 Major Component Replacement project was completed and returned to service in September 2023 with minimal environmental impact as anticipated in the 2017 Predictive Environmental Risk Assessment. Several lessons learned were addressed through the corrective action program to be applied to future Major Component Replacement projects, ensuring continued environmental protection.

The Unit 3 Major Component Replacement project started with breaker open on March 01, 2023, and has completed the removal of the upper and lower feeders as well as the pressure tubes and calandria tubes. Now the project will continue with the installation series of work and start lead out preparations by the end of 2025.

The Unit 4 Major Component Replacement project started with breaker open on February 01, 2025, and has been safely cooled down and defueled and is now progressing the lead in activities.

Environment assessment and guidance is integrated throughout all the Major Component Replacement projects; starting at the planning stage and continuing through execution to ensure that Environmental Management Plans and Environmental Impact Workflow guidance and requirements are adhered to. As the execution of Unit 3 and Unit 4 Major Component Replacement project progresses, planning and preparation for future Major Component Replacement projects is ongoing while ensuring that previous experience and lessons learned are being incorporated.

2.1.2 Bruce C Project

With electricity demand in Ontario expected to grow rapidly in the coming decades, Bruce Power is beginning the long-term planning required to advance new nuclear generation on its site. The Bruce C Project is creating the option to build up to 4,800 MW of nuclear capacity on the existing Bruce Power site. Through the federal integrated Impact Assessment process led by the Impact Assessment Agency of Canada alongside the CNSC, Bruce Power will study the potential environmental, economic, social and health impacts of a new nuclear build. If the Government of Canada determines that the project is of public interest, then a licensing decision for a licence to prepare site will be made as part of the integrated process.

Engaging with local Indigenous Nations and Communities, municipalities and the public is a critical part of the process. More information can be found at: https://engage.brucepower.com/brucec

2.1.3 Ontario Power Generation Land and Facilities

The Western Waste Management Facility is owned and operated by Ontario Power Generation. It is located centrally on the Bruce site and is designated for the management of radioactive waste and licensed for such use by the CNSC. This 19-hectare facility contains the Low and Intermediate Level Waste storage area and the used fuel dry storage area [R-24].

The objectives of the Western Waste Management Facility are to provide safe material handling (receipt, transfers, and retrieval), treatment, and storage of radioactive materials produced at nuclear generating stations and other facilities currently or previously operated by Ontario Power Generation or its predecessor, Ontario Hydro. This facility also provides safe storage of Bruce Power's used fuel in Dry Storage Containers until it can be transported to an alternative long term used fuel storage or disposal facility. The used fuel dry storage area is a security protected area located northeast of the Low and Intermediate Level Waste storage area and consists of Dry Storage Containers processing and storage buildings.

The Low and Intermediate Level Waste portion of the facility consists of various structures such as the Amenities Building, Waste Volume Reduction Building, Transportation Package Maintenance Building, low level and intermediate level waste storage buildings, quadricells, in ground containers, trenches, and tile holes. These structures are primarily used for processing of low-level waste and storage of Low and Intermediate Level Waste from Ontario Power Generation's Pickering and Darlington Nuclear Generating Stations as well as Bruce Power operations.

2.1.3.1 Ontario Power Generation Western Waste Management Facility

The Ontario Power Generation Western Waste Management Facility operates under a Waste Facility Operating Licence (WFOL-W4-314.00 2027) [R-25] and monitors emissions in accordance with Ontario Power Generation's N-STD-OP-0031 Monitoring of Nuclear and Hazardous Substances in Effluents [R-26]. N-STD-OP-0031 establishes the minimum standards for monitoring airborne and waterborne releases for Ontario Power Generation nuclear facilities in accordance with CSA N288.5 [R-6]. The effluent monitoring program ensures emissions are maintained well below the Derived Release Limits established in the Licence Condition Handbook (LCH-W4-314.00 2027) [R-27] and provides for early detection of potential adverse trends. The effluent monitoring results are reported annually to the CNSC by Ontario Power Generation. The effluent monitoring program is reviewed and updated as necessary to ensure it is inclusive of changing site conditions (e.g., expansions and aging management), historic performance, updated standards and industry best practices.

The efficacy of the effluent monitoring program is also assessed by the Western Waste Management Facility specific Environmental Risk Assessment process and the Environmental Monitoring Program. The Environmental Risk Assessment and Environmental Monitoring Program are completed in accordance with CSA N288.6 and N288.4 [R-5][R-28]. The Environmental Risk Assessment is updated at a minimum of once every five years and the Environmental Monitoring Program is reviewed annually.

The most recent Western Waste Management Facility Environmental Risk Assessment update was completed in 2021 [R-29]. The conclusions of the Environmental Risk Assessment and the Environmental Monitoring Program indicate that there are no adverse effects to human health or to the local community level ecology from the operation of the Western Waste Management Facility [R-24]. The Environmental Risk Assessment and Annual Environmental Monitoring Program reports are available to the public on Ontario Power Generation's website [R-30].

2.1.4 Canadian Nuclear Laboratories Lands and Facilities

The Douglas Point Waste Facility is operated by Canadian Nuclear Laboratories and is located on the Bruce Nuclear Power Development Site. Douglas Point, which operated between 1966 and 1984, was the prototype commercial-scale Canada Deuterium Uranium (CANDU) nuclear power plant. With full operation commencing in 1968, the Douglas Point Generating Station supplied 220 Megawatts to the Ontario grid over the next 16 years.

Eventually a decision was made to shut down Douglas Point rather than undertake the refurbishment of the pressure tubes that was required for continued operation. While the Douglas Point facility structures remain in place today, the reactor has been permanently shut down since 1984. Used fuel from the reactor is stored in dry storage modules at the facility. Decommissioning of the Douglas Point Facility is progressing with a 2070 timeline for completion. The decommissioning plans for the coming years include the dismantling of non-nuclear buildings and nuclear support buildings. The reactor and its building are anticipated to be decommissioned after 2030.

In 2020, the facility was in Phase 2 of decommissioning, known as “Storage with Surveillance”. In 2021, the CNSC amended the decommissioning licence to allow Canadian Nuclear Laboratories to begin Phase 3 of the five-phase process of decommissioning activities [R-31].

2.1.5 Hydro One Lands and Facilities

Hydro One owns and operates a number of assets within Bruce Site. These include, but are not limited to, office and workshops for maintenance, switchyards at Bruce A and Bruce B, switching stations and transformer stations, and transmission corridors.

2.2 Nuclear Processing Facilities Near Site

2.2.1 Kinectrics’ Ontario Nuclear Services Facility

Kinectrics’ Ontario Nuclear Services Facility is located in Tiverton, Ontario, approximately 3 kilometres from the Bruce Site. The site has an approximate footprint of 25,600 square metres and houses one building with an approximate footprint of 3440 square metres. The facility functions as a radioactive workspace to decontaminate and refurbish large nuclear reactor tools and equipment used during reactor maintenance activities during outages.

Kinectrics carries out effluent monitoring activities on both airborne tritium releases through exhaust stacks and on liquid releases to sewer, following Kinectrics’ effluent monitoring procedures. Specifically:

- Kinectrics’ Waste Nuclear Substance Licence requires releases to air to be monitored for tritium only at Kinectrics’ Ontario Nuclear Services Facility, since particulates are caught in pre-filters and High Efficiency Particulate Air filters prior to exhaust. Tritium releases through exhaust stacks are continuously sampled, and analysis of the samples is conducted weekly [R-32].

- Potentially active wastewater is temporarily stored in collection tanks and sampled and analyzed prior to release. If any radiological or chemical contaminant is found to be above administrative control levels, which are set below the Waste Nuclear Substance Licence limits, then the tank contents are filtered through two charcoal filters and then re-analyzed. All releases are maintained below the Waste Nuclear Substance Licence limits [R-33]. The processes at Kinectrics' Ontario Nuclear Services Facility produce very small volumes of liquid waste, hence discharge to the environment is not required often (less than once per year).

2.2.2 Laurentis' Western Clean-Energy Sorting and Recycling Facility

The Western Clean-Energy Sorting and Recycling Facility is owned by Laurentis Energy Partners, a subsidiary of Ontario Power Generation, and is located near Tiverton, Ontario, approximately 3 kilometres from the Bruce Power Site. The site has a footprint of approximately 1.32 hectares and houses one building with an approximate footprint of 3800 square metres. The facility function is the sorting and segregation of Utilities Low Level Radioactive Waste for the purposes of volume reduction. All radioactive waste received at the facility is subject to waste acceptance screening, to ensure only low level radioactive waste is accepted. [R-34]

EnergySolutions carries out effluent monitoring of the high efficiency particulate air filtered, facility stack exhausts, as per their Waste Nuclear Substance License requirements. Contaminants in the stack emissions consist of tritium only since particulates are caught in pre-filters and high efficiency particulate air filters prior to exhaust. Tritium releases through exhaust stacks are continuously sampled, and analysis of the samples is conducted bi-weekly. There is no liquid effluent release from the facility. [R-34]

2.3 Canadian Nuclear Safety Commission, Independent Environmental Monitoring Program

The Independent Environmental Monitoring Program is a CNSC environmental sampling initiative designed to provide additional confidence that public health and the environment in areas around licensed nuclear facilities are protected. It is separate from, but complementary to, the CNSC's ongoing compliance verification program. The Independent Environmental Monitoring Program involves taking samples from publicly accessible areas around the facilities. CNSC staff collect the samples and send them to CNSC's state-of-the-art laboratory for testing and analysis. [R-35]

Since the implementation of the Independent Environmental Monitoring Program, the area outside of the Bruce Nuclear Generating Station perimeter was sampled in 2013, 2015, 2016, 2019 and 2022. The next sampling campaign is planned for 2025. [R-36]. The sampling plans focus on measuring concentrations of contaminants in the environment at publicly accessible locations such as parks, residential communities and beaches, and in areas of interest identified in Environmental Risk Assessments. Samples of air, water, soil, sediment, sand, vegetation, and some local food may be taken. [R-35]

The CNSC has also conducted a large study to look at radiation exposure and the incidence of cancer around Ontario nuclear generating sites, including the Bruce Power site. This study concluded that doses to the public were well below levels of natural background radiation and that people who live near nuclear generating sites have no excess cancer risk and are as healthy as the rest of Canada's general population [R-37].

2.3.1 2022 Independent Environmental Monitoring Program Results

The 2022 Independent Environmental Monitoring Program sampling plan for the Bruce A and B nuclear generating stations site focused on radiological and hazardous substances. A site-specific sampling plan was developed based on the licensee's approved environmental monitoring program and the CNSC's regulatory experience with the site. The CNSC endeavors to incorporate traditional Indigenous land use, values and knowledge by engaging with Indigenous Nations and Communities on the sampling plan.

In advance of the 2022 sampling campaign, Indigenous Nations and Communities near the facility were invited to review the plan and provide input on species of interest, valued components, and potential sampling locations where traditional practices and activities may take place. In addition, representatives joined the field team to participate in sampling and learn about the equipment and procedures used. Continuing the work completed during the 2019 Bruce Power site Independent Environmental Monitoring Program, plantain, eastern white cedar, cat tails (roots and leaves/flowers), and balsam fir were sampled again at the same locations as in 2019. Milkweed and creeping juniper were added to the sample plan for 2022 at the request of the Saugeen Ojibway Nation. Community members also provided samples of whitefish and trout from Lake Huron.

In July 2022, the CNSC collected air, water, soil, sand, sediment, vegetation, and food samples in publicly accessible areas outside the facility perimeter. The levels of radiological and hazardous substances measured in air, water, soil, sediment, vegetation, food were below available guidelines and the CNSC screening levels. These screening levels are based on conservative assumptions about the exposure that would result in a dose of 0.1 millisieverts per year (one-tenth of the regulatory public dose limit of 1 millisieverts per year).

Measurements conducted by the Independent Environmental Monitoring Program to date have consistently found levels of radioactivity in the environment to be low, and well within the range of natural background radiation levels. As a result, no effects on human health are expected.

2.3.2 Independent Environmental Monitoring Program Conclusions

Independent Environmental Monitoring Program results from 2013, 2015, 2016, 2019, and 2022 are consistent with the results submitted by Bruce Power and Ontario Power Generation, supporting the assessment that the licensee's environmental protection program is effective. The results add to the body of evidence that people and the environment in the vicinity of the Bruce A and B nuclear generating stations site are protected and that there are no anticipated health impacts from the operation of the facilities on the site.

2.4 Local Indigenous Nations

The Bruce Power site is located within the Saugeen Ojibway Nation (SON) Territory, the shared treaty and traditional Territory of the Chippewas of Saugeen First Nation and Chippewas of Nawash Unceded First Nation (Neyaashiinigmiing).

SON has asserted and proven Aboriginal and Treaty rights throughout its Traditional Territory and continues to rely on this Territory for its economic, cultural, and spiritual survival. SON asserts its Aboriginal and Treaty rights entitle its members to be sustained by the lands, waters and resources of their Territory. SON has the right to protect and preserve its Territory to ensure that it will be able to sustain its future generations. SON asserts that its rights include, but are not limited to: be a distinct people, maintain language, culture and way of life, be sustained by the lands, waters and resources within their Territory, exclusive use and occupation of their communal lands, continued use of all their Territory to harvest for sustenance, cultural and livelihood purposes, involvement in decisions that will affect their Territory, and protecting SON way of life as stewards of their Territory for generations to come.

Two individual Métis communities, the Metis Nation of Ontario Region 7 and the Historic Saugeen Metis, are also located close to the Bruce Power site.

The Historic Saugeen Metis, according to their website, "…. are a distinctive Aboriginal community descended from unions between our European traders and Indian women. We are the Lake Huron watershed Métis with a unique Métis history and culture that lived, fished, hunted, trapped, and harvested the lands and waters of the Bruce Peninsula, the Lake Huron proper shoreline and its watersheds, their traditional Métis territory." [R-38]

The Métis Nation of Ontario Region 7 was established in 1993 "as a representative organization with the objective to protect, assert, and support the distinct culture, traditions, economic wellbeing, and Métis constitutional rights embodied in the *Constitution Act*, 1982, Section 35, within the Métis Homelands of Ontario" [R-38]. The Métis Nation of Ontario and the Georgian Bay Regional Consultation Committee assert that their people exercise Aboriginal rights across the Georgian Bay Traditional Harvest Territory and includes hunting, fishing, trapping, gathering, sugaring, wood harvesting, use of sacred and communal sites and use of water.

Bruce Power is dedicated to honoring Indigenous history and culture and is committed to moving forward in the spirit of reconciliation and respect with the Indigenous Nations we work with. We are committed to strong and respectful relationships with the Saugeen Ojibway Nation, the Métis Nation of Ontario Region 7, and Historic Saugeen Métis.

2.5 Bruce Power's Community Engagement

2.5.1 Community Investment and Sustainability

Social responsibility is a core value at Bruce Power. We are dedicated to strengthening our communities and protecting the environment to secure tomorrow. In 2024, Bruce Power invested more than $3 million to support initiatives that focus on health and wellness, youth development, minimizing environmental impacts, community engagement, and Indigenous youth development and cultural, recreational, and educational programming. This is executed through five funding streams: Community Investment and Sponsorship, Environment and Sustainability, Indigenous Community Investment, Gifts in Kind, and Tripartite.

Bruce Power's Environment and Sustainability Fund is responsible for the continued support of environment and sustainability-related projects and initiatives. Established in 2015, the Environment and Sustainability Fund seeks opportunities to partner with organizations on initiatives related to:

- Environmental conservation and restoration,
- Energy efficiency and carbon emission reduction,
- Climate change mitigation and resilience, and/or
- Environmental education, awareness, and research

Initiatives local to Bruce, Grey, and Huron counties are prioritized for funding given their proximity to the Bruce Power site. In 2024, the Environment and Sustainability Fund provided support to various groups and environmental initiatives, including:

- **Bruce County Museum & Cultural Centre**: This partnership allowed for a virtual Earth Week program to be offered, including presentations from local experts on plastic pollution and impacts on local biodiversity. The digital format provided the opportunity to reach students and families from across the Bluewater and Bruce Grey Catholic District School boards, and beyond.
- **The Lake Huron Coastal Centre's Coast Watchers Program**: This is a citizen scientist program where local volunteers are trained to observe the coast, record qualitative and quantitative shoreline conditions, and take steps to initiate action when necessary, including beach clean-ups and habitat preservation.
- **The Outdoors Adventures Club's Upper Sydenham River Fish and Wildlife Enhancement**: This project includes several fisheries habitat improvement projects on the Upper Sydenham River, including riparian and in-stream habitat enhancement, riparian tree and shrub planting, spawning site development and erosion control measures.

- **Plug'n Drive**: Through a five-year funding partnership, we support Plug'n Drive's effort to accelerate electric vehicle adoption to maximize their environmental and economic benefits, and the development of Zero Emission Vehicle (ZEV) infrastructure.

Bruce Power prioritizes environmental protection and conservation. In 2024, Bruce Power prepared a recertification submission for the Wildlife Habitat Council, focusing on increasing the number, and quality, of projects included from previous submissions. These projects focused on onsite monitoring, conservation, and education and engagement. Featured projects included species monitoring on the Bruce Power site, phragmites control and small fish communities monitoring in Baie du Doré, water temperature monitoring and redd surveys in Bothwell's Creek, and redd surveys on Stream C. In early 2025, Bruce Power was informed that the program has been Certified Gold through 2027.

Bruce Power is committed to supporting provincial, national, and global sustainability goals. We continue to make strides towards our ambitious target of achieving net zero scope 1 and 2 greenhouse gas emissions by 2027. Through our 2027 Net Zero Strategy, we have identified and implemented energy and emission reductions, substitutions, and offsetting actions to achieve these targets. Bruce Power met its net greenhouse gas emission reduction target of 37.5% from baseline (2019) in 2024. A reduction in fuel, electricity and steam consumption has contributed to reaching the reduction target. Clean Energy Credits played an important role in meeting this milestone. In 2024, we introduced Bruce Power's Carbon Offset & Credit Policy to build greater transparency and trust in the market items supporting our Net Zero Strategy.

In the pursuit of emission-reduction goals, Bruce Power, through a partnership with the Nuclear Innovation Institute, continues to support ALUS New Acre Project. This local carbon-offset project, funded by the Carbon Offset Accelerator Fund, supports carbon sequestering opportunities and the protection and enhancement of local ecosystem across 600 acres of nature-based projects, on agricultural land across Bruce And Grey Counties. The New Acre project identified acres for implementation over three years (2022-2024), with five-year agreements requiring participants to manage and maintain these projects. These acres will provide environmental benefits for at least five years.

Farmers in Bruce And Grey Counties met the 200-acre annual target again in Year 3, with 27 participants enrolling projects, resulting in the project achieving the three-year target of 600 project acres. Preliminary estimates of 2024 projects forecast 2,566 tonnes of carbon dioxide emissions removed over five years, subject to site visits and satellite review in 2025, bringing the total carbon sequestered over the course of the investment to 6,602 tonnes CO_2e over 5 years.

In 2024, data was collected from over 300 sampled tree plots, measuring height and diameter at breast height (DBH) for all trees above 2.5 centimetre DBH. Additionally, 150 grassland sites were surveyed using on-field soil sensor technology. This data will support the evaluation of scalable technology solutions for generating precise, site-specific carbon estimations, and guiding the development of robust monitoring data protocols.

In 2025, ALUS' Environmental Benefits CO_2 Quantification Methodology was successfully validated by an accredited third-party. The carbon credits eligible for issuance will adhere to rigorous verification standards, resulting in lower credit issuance compared to the total estimated carbon sequestered by the full spectrum of ALUS New Acre project activities. This innovative methodology opens up future opportunities for certified carbon credits and reflects the on-the-ground realities of farmers and ranchers who have established nature-based projects.

In addition to innovative operational initiatives and partnerships, Bruce Power employs green financing initiatives towards eligible investments associated with life extension and increasing output of existing units, further supporting provincial and federal reduction targets through the production of non-greenhouse gas emitting-power. In 2024, Bruce Power issued $600 million in March and another $600 million in December to further help the province achieve its net zero goals through clean energy projects. Bruce Power has issued $2.3 million in green bonds since the inaugural issuance in 2021. The company's Green Bond Reports, available on the Bruce Power website, Green Financing Framework - Bruce Power, provide information on the allocation and impact of green bond proceeds. The next Green Bond Report will be released in mid-2025.

In 2023, Bruce Power published an updated Green Financing Framework that will guide future issuance of green bonds for eligible investments. These investments will continue to optimize our assets through our Project 2030 initiative, targeting a site net peak output of more than 7,000 megawatts by the early 2030s. Project 2030 focuses on continued asset optimization, innovations, and leveraging new technology to increase the site peak at Bruce Power, helping to support a low-carbon electricity grid for decades to come. With the updated Green Financing Framework, Bruce Power will include new nuclear technologies as eligible green expenditure, highlighting our commitment to aligning with Canada's climate and environmental priorities while prioritizing nuclear as a vital part of Canada's clean energy future. The updated framework received a Second Party Opinion of "Medium Green" under the Shades of Green analytical approach from leading provider S&P Global Ratings, along with an assessment of "Aligned", indicating that the framework is aligned with industry recognized green loan principles.

As a leading producer of non-carbon- emitting electricity for the province, Bruce Power now offers Clean Energy Credits to help Ontario corporate electricity customers reach their environmental and sustainability goals. Similar to Renewable Energy Credits (RECs), each unit of CEC represents 1 MWh of clean energy. Clean Energy Credits are electronic certificates that businesses can purchase from Ontario clean energy generators, including nuclear operators, to offset Scope 2 electricity emissions to achieve voluntary environmental targets. Each CEC is intended to be exclusively purchased and claimed (or retired) by a load customer within Ontario, thereby maintaining the environmental attributes within the province.

On an annual basis, an Environment Social Governance (ESG) Risk Rating is undertaken for Bruce Power by Morningstar Sustainalytics, a leading third-party Environment Social Governance Risk Rating agency. This Risk Rating combines an assessment of the company's exposure to industry specific sustainability issues and how these risks are being managed. In 2024, Bruce Power maintained a "Low Risk" rating. Bruce Power was recognized for strong ESG Risk Management in Occupational Health and Safety, Community Relations, Business Ethics, and Land Use and Biodiversity.

More information on our Sustainability Program can be found in Bruce Power's 2024 Sustainability Report, which highlights our ongoing commitment to having a positive impact in our local community and supporting provincial and federal carbon emission-reduction goals. The report provides clear, relevant disclosure of our sustainability commitments, focusing on our 2023 sustainability performance across 33 key performance indicators which are monitored annually. Our next report, including our 2024 performance metrics, will be published in June 2025.

3.0 DOSE TO PUBLIC

Canadians are regularly exposed to ionizing radiation as part of their everyday lives [R-39] [R-40] [R-41]. This is partly due to exposure to naturally occurring cosmic radiation from the sun and stars and from terrestrial radiation from radioactive materials (e.g., uranium, thorium, and radium) that naturally exist in soil and rocks. Radon is a naturally occurring radioactive gas that is produced by the earth's crust and is present in the air. A variety of foods contain natural sources of radiation including potatoes, carrots, bananas, milk and red meats. The effective dose from natural radiation in Canada is estimated to be 1,800 microsieverts per year [R-42]. Other locations in the world have higher exposure rates, for example, the Kerala Coast in India has an annual effective dose of 12,500 microsieverts per year [R-42].

In addition to these sources, human activities also contribute to overall radiation exposure, such as air travel, smoking and medical or clinical services such as x-ray machines and CT scanners. For example, a cross country flight (20 microsieverts), tobacco and smoke detectors (100 microsieverts), a dental (5 microsieverts) or chest (100 microsieverts) x-ray, or a CT scan (7,000 microsieverts) adds to a person's overall radiation dose [R-40].

Living near a nuclear power plant also contributes to annual dose as radionuclides associated with CANDU reactors are released to the environment as part of normal operation. These discharges to air and water are heavily regulated in Canada and limits are imposed to ensure levels are safe to workers, the public and the environment. The annual dose limit for a member of the public is 1,000 microsieverts per year [R-43]. As part of the regulatory requirements, Bruce Power must calculate and report its contribution to radiological exposure dose to members of the public on an annual basis.

The annual doses are calculated using the computer software IMPACT following the methodology described in CSA N288.1 [R-16]. The approach uses a radionuclide transport and exposure pathways model that incorporates concentrations of radionuclides measured in environmental media, human characteristics specific to local behaviors and lifestyles, site specific meteorological data, as well as facility characteristics and radiological release information. The details are described in the sections below, however the overall outcome for 2024 is provided here.

For the thirty-third consecutive year, Bruce Power's contribution to the annual dose of a member of the public is less than the lower threshold for significance (<10 microsieverts per year or <1% of the legal dose limit) and is considered *de minimus* [R-44]. The representative person's dose associated with Bruce Power operations in 2024, who is calculated to have the maximum, is the BSF2 Adult who received 1.1 microsieverts per year (Table 1). All other representative persons have a lower dose. This maximum dose is a fraction of a percent of the legal dose limit of 1,000 microsieverts per year.

Table 1 - 2024 Maximum Representative Person's Dose

Maximum Representative Person	Committed Effective Dose	Percentage of Legal Limit
BSF2 Adult	1.1 microsieverts per year	0.11%

The contribution of each radionuclide or radionuclide group to the 2024 radiological dose for the maximally exposed representative person is shown in Table 2 and Figure 1. Consistent with previous years, most of the radiological dose is from two radionuclides (carbon-14 = 52%, tritium oxide = 39%). Exposure pathways to these radionuclides are predominantly ingestion of local food sources as well as air inhalation and immersion.

Table 2 - 2024 Radiological Dose by Contaminant for Representative Persons Group BSF2 Adult

	Carbon-14	Cobalt-60	Cesium-134	Cesium-137	Tritium Oxide	Iodine, mixed fission products	Noble Gases	Total
Dose (microsieverts)	0.6	<0.1	<0.1	<0.1	0.4	<0.1	0.1	1.1
Percentage	52%	0%	0%	2%	39%	0%	7%	100%

Note:

1. BSF2 is Subsistence Farmer 2.
2. Tritium oxide includes dose incurred via ingestion of organically bound tritium in fish, plant produce, and animal products.

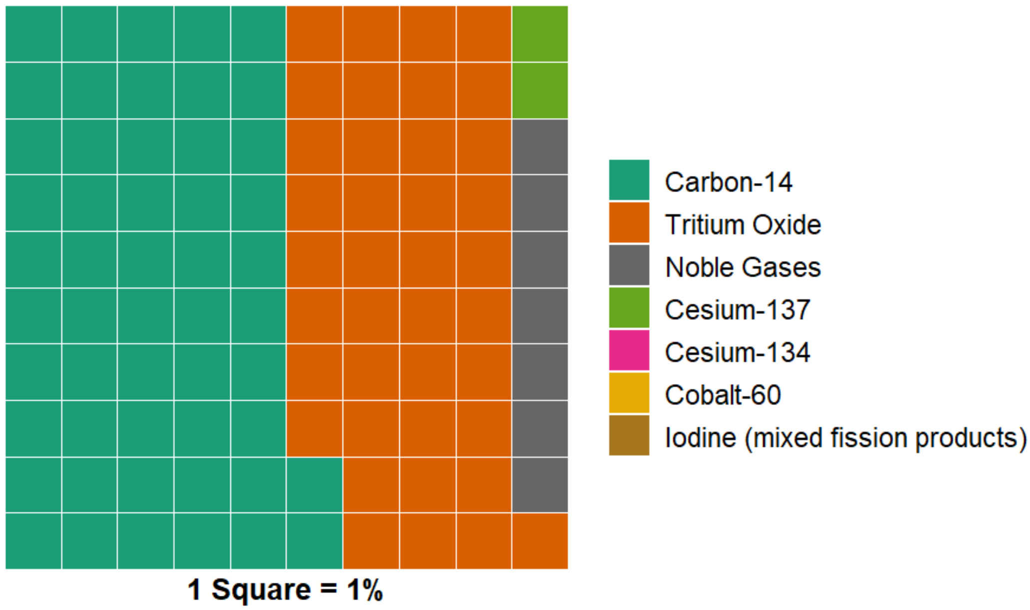


Figure 1 - 2024 Radiological Dose by Contaminant for Representative Persons Group BSF2 Adult

3.1 Historical Dose to Public

The additional contribution to the annual radiation dose to members of the public from Bruce Power Site activities has been below the level of significance (less than 10 microsieverts per year) for 33 consecutive years. The annual maximum dose for the last ten years is shown in Figure 2, along with the maximum dose predicted in the most recent Environmental Risk Assessment. Although the annual value fluctuates based on operational or maintenance activities that occur (e.g., preparations in advance of the vacuum building outage in 2015), the outcome is only a small fraction of a percent of the legal limit of 1,000 microsieverts per year. Furthermore, these values are negligible compared to the annual dose experienced from natural radiation in Canada (1,800 microsieverts per year) [R-42]. The calculation of public dose demonstrates that the radiological releases from the Bruce Power Site have an extremely small impact on public dose.

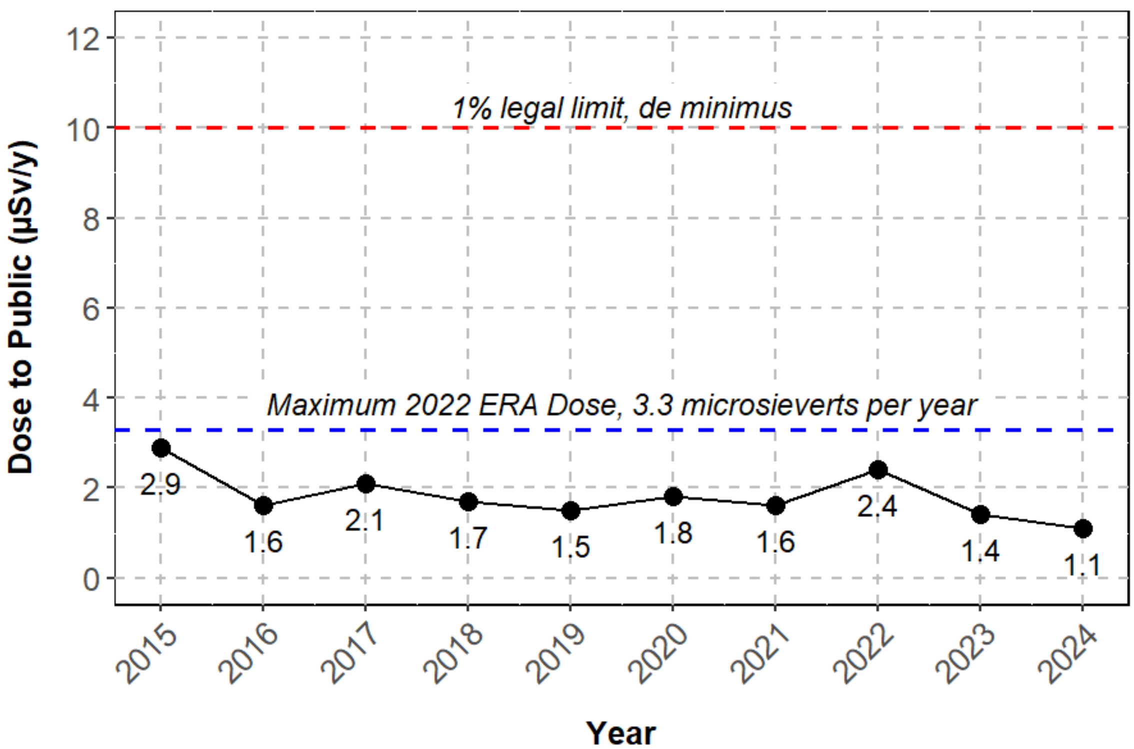


Figure 2 - Historical Dose to Public Over Time
The maximum dose from the latest Environmental Risk Assessment is 3.3 microsieverts per year; the dose limit is 1000 microsieverts per year

3.2 2024 Dose to Public

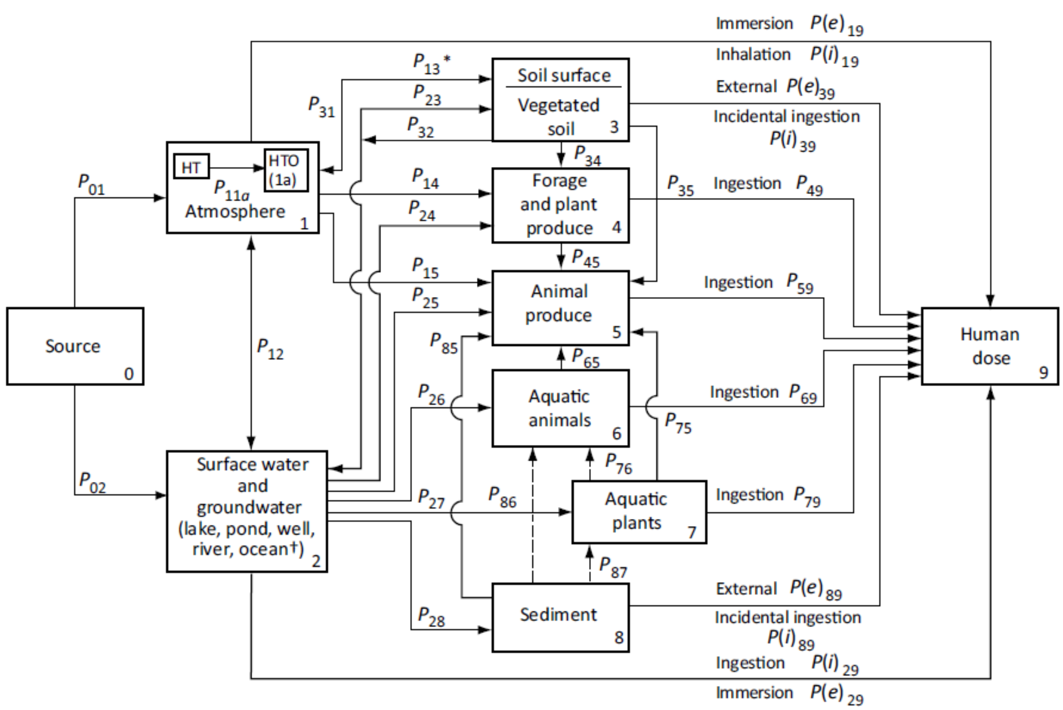
3.2.1 Methodology

Living near the Bruce Power Site results in an additional radiation dose to members of the public due to radiological releases to the environment as part of normal operation. The additional contribution to a person's overall dose is calculated each year and provided in this report.

The following information is required for calculating the public dose:

- Annual radiological airborne emission and waterborne effluent data from all licensed activities on or adjacent to the Bruce Power Site (Section 5.1)
- Annual Radiological Environmental Monitoring data (Section 6.1)
- Annual meteorological data (Section 3.2.2)
- Characteristics of the Representative Persons (Section 3.2.4)

The methodology used to calculate annual public dose from normal operations at CANDU nuclear power stations is described in CSA N288.1 [R-16]. A radionuclide transport and exposure pathways model is used which relies on an array of mathematical equations that describe the transfer of radioactive materials through the environment, as depicted in Figure 3 [R-16]. This pathways model may be likened to a food web that is specific to the local area and population. For example, one pathway could be of a radiological contaminant (e.g., tritiated water) released to the air that is deposited on a field and taken up by the plants. Dairy cattle may eat these plants, which may impact the cow's milk that is ingested by a child. These elaborate networks are set up in computer software called IMPACT, which is the acronym for Integrated Model for the Probabilistic Assessment of Contaminant Transport. IMPACT is a customizable tool that allows the user to assess the transport and fate of a contaminant through a user-specified environment. All of these exposure pathways are summed together in order to quantify the overall human exposure (i.e., dose). CSA N288.1 provides the transport and exposure factors for each step, as well as default values for human and site characteristics, which are refined for the local area based on the Site Specific Survey and annual meteorological data [R-16].



* *Includes transfer factors P_{13area}, P_{13mass}, and P_{13spw}.*
† *For ocean water, pathways P_{23}, P_{24}, P_{25}, and $P(i)_{29}$ are not used.*

Notes:

1) *The broken lines represent pathways that are not explicitly considered in the model or are considered only in special circumstances.*
2) *Factors include multiple transfers where appropriate.*

Figure 3 - Environmental Transfer Model
(Extracted from Canadian Standards Association N288.1)

Measured concentrations of radionuclides in environmental media such as air, water and food are used in calculating dose. The data is verified, and the background is subtracted before being entered into the IMPACT model by a third party independent contractor. All data undergoes a quality assurance and quality control review prior to the dose calculation. For some radionuclide and media combinations, concentrations are below the limit of detection of the measuring equipment and thus may inhibit the ability to measure the desired radionuclide. In cases where monitoring data are not available for a particular exposure media, the available environmental monitoring data are used to calculate or define the missing radionuclide concentrations in the intermediate media as far along the exposure pathway (i.e., food chain) as possible. If no data is available for any media along a specified exposure pathway, transport modelling and emissions or effluent data are used to define the radionuclide concentrations in the exposure media.

The exposure pathways used in the model for each of the radionuclides that contribute significantly to dose, based on sample medium, are shown in Table 3. The dose contributions from each of these exposure pathways are summed to give a total overall dose for each of the representative persons and age groups (i.e., infant, child, and adult). These three age groups are used to refine exposure based on diet and lifestyle differences. The maximum result is taken as the “dose to public” for the year, with all others having a lower dose. As per the *Radiation Protection Regulations SOR/2000-203*, the public radiation dose limit for a year is 1000 microsieverts (100 millirem) [R-43].

Table 3 - Radionuclides Measured as Part of Radiological Environmental Monitoring

Radionuclide	Sample Medium	Exposure Pathway
Tritium oxide	Air	Inhalation (includes skin absorption)
Tritium oxide	Water (drinking water, surface water, well water, precipitation)	Ingestion
Tritium oxide	Plants (fruits, vegetables, grains)	Ingestion
Tritium oxide	Animals (meat, milk, honey)	Ingestion
Tritium oxide	Fish	Ingestion
Carbon-14	Air	Inhalation, External
Carbon-14	Plants (fruits, vegetables, grains)	Ingestion
Carbon-14	Animals (meat, milk, honey, eggs)	Ingestion
Carbon-14	Fish	Ingestion
Gamma	Air	Inhalation, External
Gamma	Water (surface water)	Ingestion
Gamma	Animals (meat, honey)	Ingestion
Gamma	Fish	Ingestion
Gamma	Sediment	External
Gamma	Soil	External
Gross Beta	Water (drinking water, surface water, well water, precipitation)	Ingestion
Iodine-131	Site emissions	Air inhalation, Air external Terrestrial animals (ingestion)
Iodine-131	Milk	Ingestion
Noble Gases	Air	Air External
Organic bound tritium	Fish	Ingestion

There are uncertainties inherent in radiological effluent and emissions monitoring, radiological environmental monitoring, and the dose estimates derived from them. The uncertainty of Bruce Power radiological releases has been estimated, and minimum uncertainties have been characterized as a percentage of weekly airborne emissions or per-batch or monthly waterborne emissions, as applicable. These estimates exclude analysis uncertainties which vary with each measurement. Uncertainty estimates vary for each stack and radionuclide but are generally about 5 – 25% for stacks that contribute most significantly to total airborne emissions. The uncertainty estimates for radiological liquid effluents range from about 5% to 50% for each active liquid waste batch release of tritium and gross gamma respectively, and around 5 to 15% for monthly releases of carbon-14 and gross alpha. Regardless of the uncertainty associated with radiological effluent and emissions reporting the annual totals are well below all licensed release limits (i.e., Derived Release Limits).

The uncertainties in radiological effluent and emissions reporting have a limited effect on uncertainties in the dose results. Data from the Radiological Environmental Monitoring program is used wherever available to provide actual concentrations of radionuclides in environmental media, which reduces the dependence on effluent and emissions data and its associated uncertainty. This approach is in alignment with recommendations of CSA N288.4 to use measured versus modelled concentrations where possible to achieve more precise dose estimates [R-5]. The uncertainties associated with radiological environmental monitoring data are dependent on each specific analysis method and measurement result.

The overall uncertainties associated with public dose estimates have been characterized by a CANDU Owners Group study [R-45]. This study concluded that dose estimates based on environmental measures for important exposure pathways, such as Bruce Power's annual dose calculation, tend to have uncertainties on the order of ± 30%. Adding this level of uncertainty to the limiting dose to public still results in an annual dose value that is below 1% of the legal dose limit and is negligible (*de minimus*).

3.2.1.1 2024 Dose Calculations

For 2024, the basic set-up of the IMPACT model, in terms of transfer parameters and environmental variables, is identical to that used in 2023, as well as in the most recent Environmental Risk Assessment and Derived Release Limit updates. The general physiological characteristics of the representative persons (e.g., inhalation rates, water ingestion rates, food intake rates) were the mean values taken from CSA N288.1 [R-16].

The fractions of ingested food that originate from local sources (e.g., backyard gardens or local farm markets) are based in part on the results of the most recent Site-Specific Survey (Section 3.2.3). The net percentage contribution of each specific food type (e.g., fruits or beef) to each major category of consumption (i.e., total plant product or animal product) is based on both the local fraction and the generic intake rates. The percentage of food intake from local sources and rates of intake used are provided in APPENDIX A.

The radiological emissions and effluents that were directly considered in the dose calculation process include tritium oxide, carbon-14, noble gases, and radio-iodines. For the purpose of public dose calculations, it is assumed that iodine emissions are in the form of mixed fission products, assumed to be present in a ratio associated with a state of secular equilibrium (i.e., other radionuclides from iodine-131 to iodine-135 are assumed to be present). The dose calculation process assumes that all iodine is iodine-131 for longer duration pathways (i.e., anything related to sediment or soil partitioning, or bio-uptake), but for shorter duration pathways (i.e., air inhalation or immersion, lake water immersion or ingestion) the full release is equivalent to iodine-mixed fission products. In modeling the environmental transport and partitioning of radio-iodines, there is assumed to be no isotopic discrimination, and that iodine-mixed fission products behave the same as iodine-131.

In 2018, it was decided *a priori* to assume that all reported beta/gamma emissions and effluents were cobalt-60, consistent with the approach applied in the Environmental Risk Assessment [R-4]. This assumption has been shown to be conservative, very likely over-stating the actual dose that could be associated with Bruce Power emissions and effluents. It should be noted that doses for cesium-134 and cesium-137 are still calculated where direct environmental measures of those radionuclides are available through the Radiological Environmental Monitoring program. For alpha emitters, it has been determined in past analysis, including the most recent Environmental Risk Assessment, that alpha emitters are released at rates which lead to public doses that are negligible. For this reason, alpha emissions are not included in the dose calculation process.

Since 2018, when Radiological Environmental Monitoring data included values that were less than the associated detection limit or critical level, those values were taken as reported. For example, in the calculation of local or background averages where some measured values were reported as less than the critical level or the detection limit, the uncensored analytical results were used in the calculation. The implications of this approach to the reported doses are very minor, and typically conservative.

For 2024 dose calculations [R-46], the following conservative measures were taken to address unavailable data or measured values being lower than background:

- No milk sample was available for locations BDF12, BDF13 and BDF14. The average results for the milk samples collected from the nearest dairy farm that is closer to the sources of emissions (i.e., BDF1 for BDF12, BDF15 for BDF13 and BDF14) was applied for these locations.

- For deep residential wells, the activity level of tritium oxide in all samples collected in 2024 was reported to be less than the critical level. In this specific case, the critical level itself was assigned, with adjustment for background, as the representative value for tritium oxide in all deep residential wells. The public dose associated with tritium oxide in deep residential wells is in the order of 0.01 microsieverts per year or less.

- The activity level of carbon-14 in local samples of food products (both animal-based and plant-based) was lower than the corresponding activity in background samples. To quantify the carbon-14 activity in these media, the environmental transport models in IMPACT were invoked. Honey was the only food product for which measured carbon-14 activity at the area near location was above background activity.

- The measured activity of beta/gamma emitters (i.e., cobalt-60, cesium-134 and cesium-137) in local samples of some media (e.g., soil, beach sand, sediment, fish, deer) was lower than background. For these cases the environmental transport models in IMPACT were invoked.

- In the case of cobalt-60 in sediment, activity in all local samples was less than background and below the critical level. To avoid being overconservative, a value equivalent to the average critical level was used, instead of assigning a zero value and invoking the transport models.
- In 2024 there were two batches of near and control benthic fish collected because higher than expected concentrations of tritium were obtained for the control fish in the first sampling campaign. This was suspected to be a result of sample integrity, however this was unable to be confirmed. Dose calculations were carried out assuming that the second batch of benthic fish were representative. However, an additional sensitivity case was completed to investigate doses where the first batch of samples were treated as representative of tritium activity in area near fish. This is discussed further in Section 3.2.5.1.

3.2.2 Meteorological Data

Meteorological data are required in order to calculate doses to the public resulting from the operation of nuclear facilities on the Bruce Power site. Specifically, the processed meteorological data in the format of Triple Joint Frequency are required as inputs to the computer code IMPACT for public dose calculations. The calculation of joint frequency data used by Bruce Power meets the requirements described in Clause 6.1.4 of CSA N288.1 [R-16].

There are two meteorological towers at the Bruce Power site: one 50-metre on-site tower and one 10-metre off-site tower. These towers were installed in 1990 at specific locations to ensure that the meteorological measurements are representative of local atmospheric conditions experienced, and to better account for how emissions are conveyed inland.

In order to be used for calculating the Triple Joint Frequency, the annual data collection must be 90% complete as per Clause 4.3.2.6 of CSA N288.2 [R-47]. In 2020, both the on-site and off-site meteorological towers were upgraded to improve data availability. At both locations the monitoring equipment were replaced and have battery back-up capabilities, and the dataloggers and software were upgraded. The data availability analysis results for the two meteorological towers for 2024 is shown in Table 4. It should be noted that some datasets with the wind speed of 0 were identified during the screening process. Although the data is considered valid, that is, it reflects true calm conditions, the datasets cannot be used for air dispersion modelling. From this perspective, these datasets are conservatively treated as missing data as per Clause B.2.5 of CSA N288.2:19 [R-47].

Table 4 - Summary of Data Availability for 2024

Data Source	Available Records	Total Records Planned	Record Availability (%)
10-metre Tower	8780	8784	100%
50-metre Tower	8288	8784	94%

The data availability in the 2024 raw meteorological data met the 90% data availability requirement and were used to calculate the Double Joint Frequency and Triple Joint Frequency for the Site [R-48]. The methodology for obtaining the Double Joint Frequency and Triple Joint Frequency, as well as the results for the 50-metre tower is provided in APPENDIX B.

3.2.3 Site Survey

The Site Specific Survey Report includes a collection of information on the local population and the environment surrounding Bruce Power. The report is used to support a number of site programs, such as the Radiological Emissions and Effluent Monitoring Program and calculation of Derived Release Limits, the Radiological Environmental Monitoring Program, Emergency Preparedness, Safety Reports and licence renewal. The Site Specific Survey is updated typically every five years to reflect recent changes to the area surrounding the Bruce Power site.

The survey report includes meteorology, land usage, population distribution, water usage, agriculture, recreational activities and food sources in the area. In addition, information on daycare centres, before and after school programs, long term care homes, school boards, and recreational parks located within 20 kilometres of the Bruce Power site are documented. The diet and lifestyle data collected is used to identify groups of people with similar characteristics to develop or refine the “representative persons” (see Section 3.2.4). These unique groups are used for dose to public calculations as per CSA N288.1 [R-16].

The Site Specific Survey Report was updated in 2021 and focused on refining the characteristics of the hunter/fisher receptor to better reflect the behaviours and practices of local First Nations and Métis groups. Diet surveys were co-developed and completed in 2019-2021 by members of Saugeen Ojibway Nation, Metis Nation of Ontario Region 7 and Historic Saugeen Metis. An independent third party reviewed and then consolidated the individual results to update the hunter/fisher receptor characteristics with the most conservative parameters. This ensures that the dose calculation is representative of the local population. The updated hunter/fisher receptor has been used for all dose calculations since 2021, including the 2022 Environmental Risk Assessment.

The 2021 Site Specific Survey was revised in 2023 to incorporate the 2021 Census data from Statistics Canada. The census includes population, including the Indigenous population, and agricultural data specific to the local area. The next local population survey is planned for 2025-2026.

3.2.4 Representative Persons

Doses received by individual members of the public as a result of a given radionuclide release vary depending on factors such as proximity to the release, dietary and behavioral habits, age and metabolism, and variations in the environment [R-16]. A homogenous group of individuals with the same exposure factors may be grouped together, where the individual that receives the highest dose within that group is considered the representative person of that group. Each representative person is broken down into three age classes (i.e., infant, child, adult) in order to account for different diets, breathing rates and dose coefficients.

The Site Specific Survey Report provides the information needed to refine the standard human characteristics specified in CSA N288.1 [R-16] to include local environmental and lifestyle information. This includes details like where people live in relation to Bruce Power, where a person's drinking water comes from, how much local food a person consumes and how much time is spent outdoors.

The following categories of representative persons have been identified based on distinct lifestyle and proximity to the Site:

- **Non-farm resident** - The non-farm resident is considered the typical, full-time resident in the area surrounding the Site. They get a large portion of their food from grocery stores.
- **Farm resident** - The farm resident is more likely to consume their own crop or livestock but still use grocery stores for a portion of their food intake.
- **Subsistence farm resident** - The subsistence farm resident gets a larger portion of their food, milk and water from local sources, and over half of their diet is self-produced.
- **Dairy farm resident** - The dairy farm resident is assumed to consume some fresh milk from their own farm and a slightly higher fraction of locally grown produce and livestock.
- **Bruce Eco Industrial Park worker** - For consistency with previous studies, the Bruce Eco Industrial Park worker is referred to as a Bruce Energy Centre worker, which corresponds to the former name of the facility. The assessment for a Bruce Energy Centre worker represents occupational exposures at a location near the facility. It is assumed that the Bruce Energy Centre worker does not also live at one of the other selected receptor locations, i.e., the Bruce Energy Centre worker dose is independent of the other representative person doses.

- **Hunter/Fisher** - The hunter/fisher resident represents individuals who may catch and consume wild game and fish in significantly greater quantities than other residents. They are assumed to obtain all of their fish and wild game from local sources and consume greater quantities of these foods than the average Canadian diet. For other food categories, some is sourced locally while the remainder is from grocery stores. The characteristics of this resident have been developed based on surveys of the Saugeen Ojibway Nation, Historic Saugeen Métis, and the Métis Nation of Ontario Region 7 undertaken from 2019 to 2021.

A total of 19 representative persons were selected, each comprised of an adult (16 to 70 years old), child (6 to 15 years old), and infant (0 to 5 years old) [R-16], except for the Bruce Eco Industrial park worker, who is assumed to be an adult. All representative persons were chosen based on proximity to the Site (i.e., all locations are within 15 kilometres from the Site), with the exception of the hunter/fisher resident, who is located approximately 20 kilometres north of the site. A description of the representative persons by group name is provided in Table 5 and the locations are shown on Figure 4.

Table 5 - Description of Representative Persons

Group Name	General Characteristics and Location of Group
BR1	Non-farm resident, lakeshore at Scott Point (Located to the northeast of Bruce A at a distance of approximately 2 kilometres and northeast of Bruce B at a distance of approximately 5 kilometres)
BR17	Non-farm resident, inland (Located to the southeast of Bruce A at a distance of approximately 4 kilometres and east of Bruce B at a distance of approximately 5 kilometres)
BR25	Non-farm resident, inland (Located to the south of Bruce A at a distance of approximately 5 kilometres and to the southeast of Bruce B at a distance of approximately 4 kilometres)
BR27	Non-farm resident, inland, trailer park (Located to the south of Bruce A at a distance of approximately 5 kilometres and to the southeast of Bruce B at a distance of approximately 3 kilometres)
BR32	Non-farm resident, lakeshore (Located to the south of Bruce A in Inverhuron at a distance of approximately 6 kilometres and to the south of Bruce B in Inverhuron at a distance of approximately 3 kilometres)
BR48	Non-farm resident, inland (Located to the southeast of Bruce A near Baie du Doré at a distance of approximately 2 kilometres and to the east of Bruce B near Baie du Doré at a distance of approximately 3 kilometres)
BF8	Agricultural, farm resident (Located to the south of Bruce A at a distance of approximately 8 kilometres and to the southeast of Bruce B at a distance of approximately 7 kilometres)
BF14	Agricultural, farm resident (Located to the south of Bruce A at a distance of approximately 5 kilometres and to the southeast of Bruce B at a distance of approximately 3 kilometres)
BF16	Agricultural, farm resident (Located to the southeast of Bruce A at a distance of approximately 7 kilometres and to the east of Bruce B at a distance of approximately 8 kilometres)

Group Name	General Characteristics and Location of Group
BSF2	Agricultural, subsistence farm resident (Located to the southeast of Bruce A at a distance of approximately 9 kilometres and to the southeast of Bruce B at a distance of approximately 9 kilometres)
BSF3	Agricultural, subsistence farm resident (Located to the southeast of Bruce A at a distance of approximately 8 kilometres and to the southeast of Bruce B at a distance of approximately 8 kilometres)
BHF1	Generic hunter/fisher resident (Located approximately 20 kilometres north of the Site in Southampton)
BDF1	Agricultural, dairy farm resident (Located to the northeast of Bruce A at a distance of approximately 11 kilometres and to the northeast of Bruce B at a distance of approximately 14 kilometres)
BDF9	Agricultural, dairy farm resident (Located to the southeast of Bruce A at a distance of approximately 13 kilometres and to the southeast of Bruce B at a distance of approximately 12 kilometres)
BDF12	Agricultural, dairy farm resident (Located to the east of Bruce A at a distance of approximately 13 kilometres and to the northeast of Bruce B at a distance of approximately 15 kilometres)
BDF13	Agricultural, dairy farm resident (Located to the southeast of Bruce A at a distance of approximately 13 kilometres and to the southeast of Bruce B at a distance of approximately 12 kilometres)
BDF14	Agricultural, dairy farm resident (Located to the southeast of Bruce A at a distance of approximately 14 kilometres and to the southeast of Bruce B at a distance of approximately 13 kilometres)
BDF15	Agricultural, dairy farm resident (Located to the southeast of Bruce A at a distance of approximately 13 kilometres and to the southeast of Bruce B at a distance of approximately 12 kilometres)
BEC	Worker in Bruce Energy Centre (Located to the southeast of Bruce A at a distance of approximately 4 kilometres and to the east of Bruce B at a distance of approximately 4 kilometres)

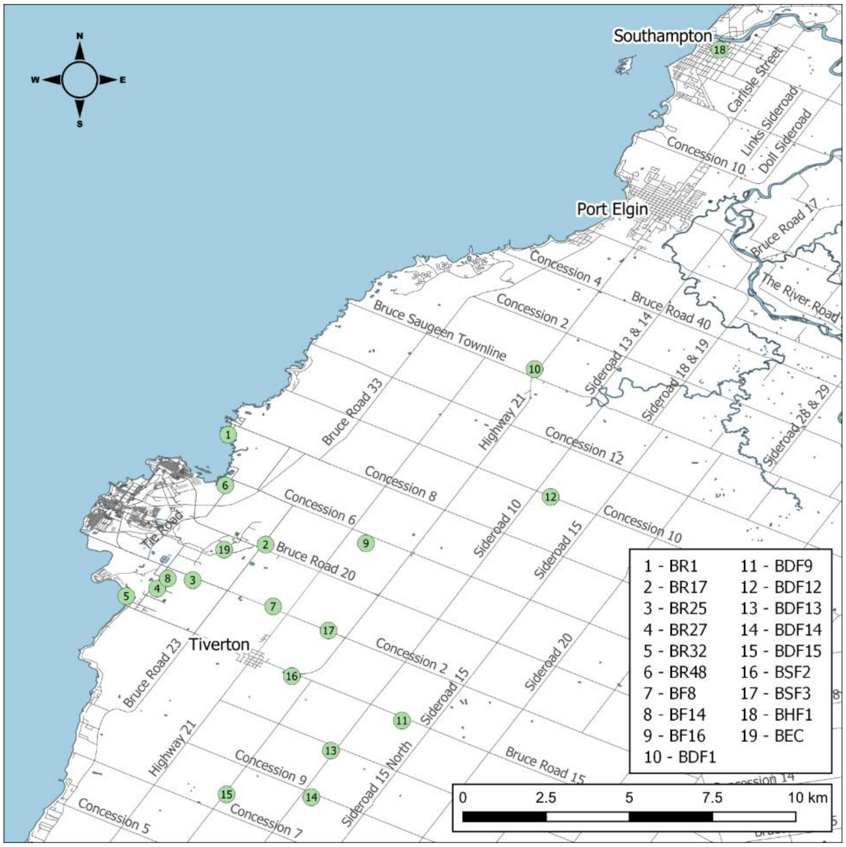


Figure 4 - Representative Person Locations

3.2.5 Dose Results and Interpretation

The maximum dose to a member of the public in 2024 was obtained for the subsistence farmer BSF2 adult with a value of 1.1 microsieverts per year [R-46] and remains well below the public dose limit of 1000 microsieverts per year [R-43]. This is a decrease of about 21% compared to the maximum dose calculated in 2023 (1.4 microsieverts per year) for the same representative group (i.e., subsistence farmer). The calculated dose for this subsistence farmer group has been the highest of all groups for all but one year (2019) since this group was added in 2012.

In 2024, the doses calculated for all age classes of the subsistence farmer group at both locations (BSF2 and BSF3) were in the range of about 1.0 to 1.1 microsieverts per year. The average dose for the subsistence farmer group was 60% higher than the average dose for all other groups. Doses to the various representative locations and age classes of the farmer (BF) and dairy farmer (BDF) groups range from 0.5 to 1.1 microsieverts per year. The doses calculated for the non-farming resident (BR) group range from about 0.6 to 1.0 microsieverts per year. The doses calculated for members of the hunter/fisher (BHF) group near Southampton were between 0.3 and 0.4 microsieverts per year, which is the same range of doses calculated for 2023. Other than the Bruce Energy Centre (BEC) group, the hunter/fisher group is the only representative group for which doses do not exceed 0.5 microsieverts per year. Annual doses calculated for 2024 for all representative groups and age classes are provided in APPENDIX C [R-46].

A substantial majority (63 to 74%) of the total dose to the subsistence farmer (BSF) group is associated with terrestrial food ingestion, which simply reflects the relatively high rate of local food consumption by members of this group. For other farm-based groups (BF and BDF), local terrestrial food consumption also accounts for a significant percentage (an average of 50% and 58%, respectively) of total dose for the same reason. For non-farm residential groups (excluding hunter/fisher (BHF) and Bruce Energy Centre (BEC) groups), the dose associated with terrestrial food ingestion averages 30% of total dose, which is notably lower than doses for farm-associated groups.

Aside from food consumption, direct exposure to radionuclides in air via inhalation and immersion is the only other significant contributor to total dose, accounting for about 34% of total dose for farm-based groups (farm (BF), dairy farm (BDF), and subsistence farm (BSF) groups) and 62% for the residential (BR) group. Overall, exposure pathways associated with emissions to atmosphere accounted for an average of 92% of total public dose. These general patterns are consistent with the patterns observed for the past decade.

The main contributing radionuclides to the limiting dose (subsistence farmer BSF2 adult) are carbon-14 at about 52% of total dose and tritium oxide at about 39% of total dose. Overall, carbon-14 and tritium oxide (including organically bound tritium) combined account for an average of about 79% of the total dose for all groups of representative persons that have been considered in 2024. This dominance of carbon-14 and tritium oxide as contributors to total dose in 2024 is consistent with the findings of public dose calculations over the past decade. Noble gases, cesium-137 and cobalt-60 were the only other radionuclide group to consistently contribute more than 1% of public dose, with noble gases accounting for an average of about 18% of total dose for all groups considered, and cobalt-60 contributing an average of 1%. The remaining radionuclides combined (iodine mixed fission products, cesium-134, and cesium-137) account for only about 3% of total public dose on average.

The decrease in public dose in 2024 relative to 2023 is associated almost entirely with decreases in dose from carbon-14 and tritium oxide. For both radionuclides, the trend in dose reflects the trend in emissions. Compared to 2023, carbon-14 emissions to air decreased by about 20% in 2024 while dose associated with carbon-14 decreased by an average of about 13%. For tritium oxide, atmospheric emissions decreased by 47% while doses decreased by an average of 27%.

Relative to 2023, measures of carbon-14 and tritium oxide in the environment exhibited trends in 2024 that were largely in parallel to their respective dose and emission trends. Measures of both tritium oxide and carbon-14 in air and food products were notably lower in 2024 at most representative locations.

Overall, the calculation of public dose demonstrates that the radiological emissions and effluents from Bruce Power facilities have an extremely small public dose impact. The maximum public dose associated with Bruce Power operations in 2024 (i.e., 1.1 microsieverts per year for the subsistence farmer BSF2 adult) is still only a fraction of a percent of the legal limit (i.e., 1,000 microsieverts per year) [R-43] and of the average Canadian background dose (i.e., 1,800 microsieverts per year) [R-49]. It is also well below the *de minimus* threshold of 10 microsieverts per year and is considered negligible [R-44].

3.2.5.1 Special Sensitivity Case – Dose Impact from Elevated Tritium in Control Fish for 2024

In 2024, unexpected tritium oxide results were obtained for benthic fish collected at the control location (see Section 6.1.4.1). An additional dose calculation was conducted to understand the dose impact for the case where these fish were representative of the near field location (this is assuming the fish samples were switched at some point during collection or sample preparation).

For calculating dose from fish ingestion, the average of all area near fish (benthic and pelagic) is considered to represent the local fish consumed by all representative persons. For this sensitivity case, the atypical control benthic fish tritium oxide results were used in place of the area near benthic fish tritium oxide results in calculating the representative tritium activity in fish. The average tritium oxide value for area near fish increased from 6.61 becquerel per litre to 62.4 becquerel per litre, with all other inputs being the same. It was determined that the dose implications from this change are very minor; total doses for all representative groups and age classes would increase by less than 1%, and the maximum dose marginally changes from 1.11 to 1.12 microsieverts per year. These doses are extremely small and are not expected to have any health impacts for people or the environment.

4.0 ENVIRONMENTAL RISK ASSESSMENT

The Environmental Risk Assessment fulfills the environmental protection requirements under the *Nuclear Safety and Control Act* [R-13]. The *Canadian Impact Assessment Act* [R-50] does not apply to existing site activities, including major component replacement. An important area of focus related to the Environmental Risk Assessment is public and Indigenous engagement. The Environmental Risk Assessment process is meant to provide an on-going analysis of a company's interaction with the environment. Completion of an update to the Environmental Risk Assessment on a 5-year cycle is supported by annual environmental protection reports and both documents are subject to in-depth regulatory review.

One of the benefits of updating the Environmental Risk Assessment is the regular check in points with regulators and the public every 5 years on an ongoing basis. This gives all parties an opportunity to contribute, identify concerns and include Indigenous knowledge and values, as well as new studies or advances in science as per N288.6 guidance [R-28][R-51]. This process allows for the identification of emerging trends and identifies any new risks that may arise. Indigenous Nations and other members of the public will continue to participate in and provide feedback on the Environmental Risk Assessment.

4.1 Results of the 2022 Environmental Risk Assessment

An updated retrospective and predictive Environmental Risk Assessment was prepared following the guidance of CSA N288.6-12 in 2022 [R-4][R-52]. Review of the 2022 Environmental Risk Assessment by the CNSC and Environment and Climate Change Canada concluded that the report is consistent with the overall methodology and complies with all the applicable requirements of CSA N288.6-12 [R-53]. The potential risk from physical stressors and from radiological and non-radiological releases to the environment were found to be generally low to negligible.

The cumulative environmental effects of multiple stressors are not directly assessed in the 2022 Environmental Risk Assessment as it is not an operating licence requirement. Bruce Power acknowledges the need to address the cumulative environmental effect of multiple stressors when and where it is warranted. The science behind the determination of cumulative effects is at its infancy: there is no consensus on a definition of “cumulative impact” and assessment methods are largely absent. Understanding cumulative impacts to a system first begins by evaluating its individual stressors. Bruce Power has done this and none of the individual stressors poses an unreasonable risk to the environment. Over forty years of operations of the Bruce site and continued monitoring and assessment has provided empirical evidence of little to no risk to the local environment.

4.1.1 Indigenous Engagement

The results of the 2022 Environmental Risk Assessment were shared with Saugeen Ojibway Nation, Métis Nation of Ontario Region 7, and Historic Saugeen Métis prior to the submission of the Environmental Risk Assessment to the CNSC. Based on the review of the past Bruce Power specific- concerns raised by Indigenous Nations, all technical considerations within the construct of the CSA N288.6 framework have been considered and those related to the Environmental Risk Assessment have been highlighted within the text. Bruce Power is committed to ongoing engagement, consultation, and communication with Saugeen Ojibway Nation, Métis Nation of Ontario Region 7, and Historic Saugeen Métis in accordance with Bruce Power’s Indigenous Relations Policy, Protocol, and Relationship Agreements with the communities and regulatory requirements.

4.1.2 Conventional Risk Assessment

The conventional (non-radiological) human health risk assessment evaluated the potential for health risks for members of the public residing in the area surrounding the Site, including recreational users. The potential for health risks to humans due to conventional chemicals were negligible considering normal operations at the Site.

Data considered in the conventional ecological risk assessment is available for review at: https://wsp-shinyapps.shinyapps.io/ERA_screening_tables/ and included groundwater, soil, surface water and sediment data from locations on the Bruce Power site as shown in Figure 5.

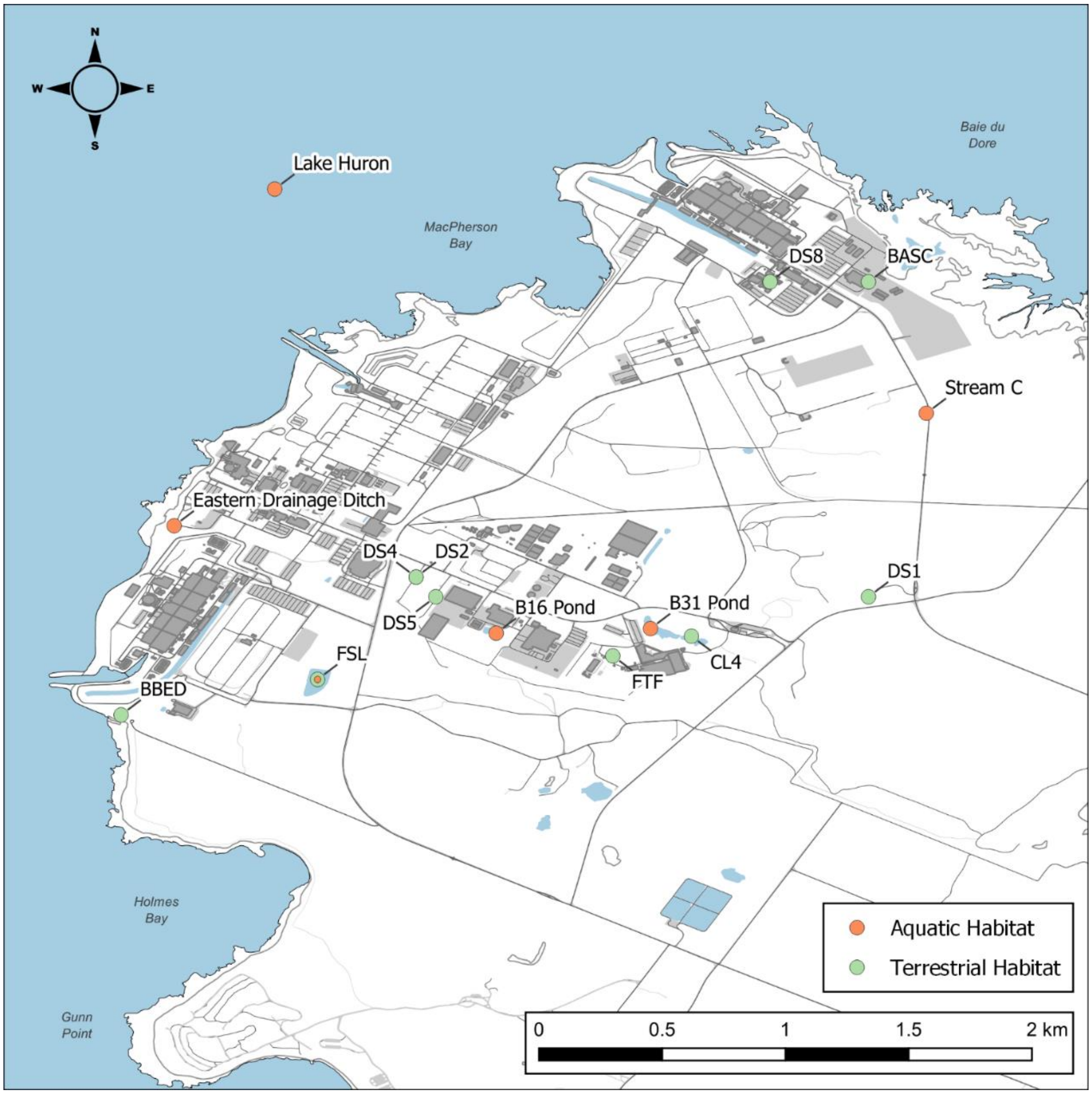


Figure 5 - Areas Assessed in the Conventional Ecological Risk Assessment

The conventional ecological risk assessment identified potential risks to terrestrial ecological receptors at Construction Landfill #4, Fire Training Facility, Distribution Station #1 and at five general soil sampling sites, to semi-aquatic receptors at Eastern Drainage Ditch and to aquatic receptors in Lake Huron, Former Sewage Lagoon, B31 Pond and Eastern Drainage Ditch (Table 6 and Table 7). The conservative nature of the methodology used to assess risks due to conventional contaminants in the ecological risk assessment results in the identification of areas of potential risk but does not necessarily indicate a current risk to receptors. Additional follow-up monitoring is in progress to refine the risk assessment.

Table 6 - Summary of Conventional Ecological Risk Assessment Terrestrial Conclusions and Recommendations

Area	Media Assessed	Conclusions	Recommendations
Construction Landfill #4	Soil	Hazard Quotients above 1 for terrestrial wildlife from zinc and high molecular weight polycyclic aromatic hydrocarbons.	Additional sampling should characterize the extent of zinc impacts around Construction Landfill #4 collected in 2016 and polycyclic aromatic hydrocarbons impacts around site CL4-9 collected in 2000 to affirm potential risks because these were the only locations that exceeded a hazard quotient of 1.0 at Construction Landfill #4. Further work should characterize the current acid base extractable concentrations at site CL4-9 collected in 2000 to confirm if they remain chemicals of potential concern in the absence of risk-based criteria.
Fire Training Facility	Soil	Hazard Quotients above 1 for plants and soil invertebrates from light total petroleum hydrocarbons.	Additional sampling should characterize the current Petroleum Hydrocarbon (PHC) concentrations around historically contaminated areas within surface soil to affirm potential risks. Additional sampling should characterize the current acetone and acid base extractable concentrations at site FTF-12 collected in 2000 to confirm if they remain chemicals of potential concern in absence of risk-based criteria.
Distribution Station #1	Soil	Hazard Quotients above 1 for plants and soil invertebrates from light total petroleum hydrocarbons.	Additional sampling should characterize the current petroleum hydrocarbons concentrations around historically contaminated areas within surface soil to affirm potential risks.
General Surface Soil Samples (BPS and SS series – site not shown on map as distributed across Bruce Power lands)	Soil	Hazard Quotients above 1 for plants and soil invertebrates from boron (hot water soluble), selenium and petroleum hydrocarbons (fraction 2 and 3). Hazard Quotients above 1 for terrestrial wildlife from lead and selenium.	Additional sampling should delineate the extent of metal impacts in surface soil around sites BPS-04-07 and SS6 and the extent of petroleum hydrocarbons impacts around sites BPS-07-07 and BPS-01-07 to affirm potential risks because these were the only locations that exceeded the site specific- target level. Additional sampling should delineate strontium impacts around sites BPS-01-07 and BPS-02-07 to confirm if strontium remains a chemical of potential concern in absence of risk -based criteria.

Table 7 - Summary of Conventional Ecological Risk Assessment Aquatic Conclusions and Recommendations

Area	Media Assessed	Conclusions	Recommendations
Lake Huron shoreline and nearshore habitat	Surface Water	Hazard Quotients above 1 for aquatic communities from zinc.	Additional sampling events required to affirm potential risks as per updates to the environmental monitoring program. Analysis of dissolved organic carbon required to derive site-specific toxicological benchmark for zinc.
Former Sewage Lagoon	Sediment	Hazard Quotients above 1 for aquatic communities from petroleum hydrocarbon.	Additional sampling should delineate petroleum hydrocarbon impacts; total organic carbon should be assessed to derive a site-specific toxicological benchmark.
Former Sewage Lagoon	Surface Water	Hazard Quotients above 1 for aquatic communities from copper and zinc.	Additional sampling events required to affirm potential risks as per updates to the environmental monitoring program. Analysis of dissolved organic carbon required to derive site-specific toxicological benchmark for zinc.
B31 Pond	Surface Water	Hazard Quotients above 1 for aquatic communities from copper.	Additional sampling events required to affirm potential risks as per updates to the environmental monitoring program.
Distal Eastern Drainage Ditch	Sediment	Hazard Quotients above 1 for aquatic communities from petroleum hydrocarbon fraction 3. Hazard Quotients above 1 for insectivorous, semi-aquatic wildlife from vanadium.	Additional sampling should delineate petroleum hydrocarbon impacts; total organic carbon should be assessed to derive a site-specific toxicological benchmark. Additional sampling should delineate vanadium impacts and measure chemical of potential concern concentration in benthos.

4.1.3 Radiological Risk Assessment

The radiation doses to members of the public residing in the area surrounding the Site are less than 1% of the CNSC effective dose limit for a member of the public (1 millisievert per year) [R-54]. With a hazard quotient of less than 0.01, and with many of the uncertainties in the assessment (e.g., concentrations reported as less than a detection limit) addressed in a conservative manner, there is no radiological risk to human health for members of the public resulting from normal operations on the Site.

The radiation dose rates to non-human biota residing on or near the Site are less than 1% of the applicable United Nations Scientific Committee on the Effects of Atomic Radiation benchmark value [R-55]. With a hazard quotient of less than 0.01, and with many of the uncertainties in the assessment (e.g., occupancy factors and ingestion parameters) addressed in a conservative manner, there is no radiological risk to non-human biota resulting from normal operations on the Site.

4.1.4 Physical Stressor Assessment

The assessment of the physical effects of the noise, cooling water intakes and discharges, and habitat alteration has shown no unreasonable risk to human or ecological receptors.

Bruce Power has completed a comprehensive quantitative thermal risk assessment with substantial methodological improvements over past thermal risk assessments. These improvements have included the full incorporation of thermal modelling data, modelled thermal benchmarks for cold water fish species and assessment of all species and life stages present in the nearshore area. A pilot method of presenting daily maximum temperature data and overlays of fish species and life stage benchmark exceedances for improved visualization can be accessed at: https://wsp-shinyapps.shinyapps.io/ERA_temperature/. The thermal risk assessment assessed a low risk to several mainly cold and cool water species and life stages located in the Local Study Area:

- Lake Trout, Lake Whitefish, Round Whitefish, Walleye and Brown Bullhead eggs
- Larval Deepwater Sculpin, Lake Whitefish and Walleye
- Growth stage for Rainbow Trout, Chinook Salmon, Lake Whitefish, Walleye, Gizzard Shad and Yellow Perch
- Parent Smallmouth Bass and Brown Bullhead.

Given the similar habitat available along the length of the Lake Huron coast and the mobility of older life stages, no population level effects are expected. Further details on the thermal risk assessment can be found in the 2022 Environmental Quantitative Risk Assessment [R-4].

No benchmarks for fish impingement or entrainment are available from federal or provincial authorities that can be used to assess the environmental risk. Effect thresholds are dependent on sufficient knowledge of the population including natural variability. Bruce Power obtained a *Fisheries Act* authorization from Fisheries and Oceans Canada in 2019 [R-56] that permits continued operation with the requirement to meet specific conditions related to impingement and entrainment, including offsetting that is intended to provide complete compensation for the fish losses incurred through impingement and entrainment. Using this construct, fish losses from impingement and entrainment are compensated for by fisheries offsets, resulting in a no net loss over time.

Monitoring and assessment of impingement and entrainment and thermal effluents over time (in prior environmental assessments and environmental risk assessments) continues to verify low to negligible risk to the natural environment because of these physical stressors. Extensive monitoring to verify these conclusions, coupled with comprehensive assessments that utilize best practices to characterize risk, have resulted in the conclusion that further mitigation is not warranted at this time.

The design and use of existing mitigation technologies has been implemented to minimize impingement and entrainment and thermal impacts to the greatest extent possible. High impingement of gizzard shad challenged operations in February 2023. In February 2025 a cooling water blockage challenged operations due to a larger impingement of gizzard shad. A Root Cause Investigation is in progress to identify the cause and contributing factors, and will identify appropriate mitigation actions for implementation over the medium term and long term.

The Bruce Power site location, situated on the Douglas Point headland, was strategically picked because of its high energy zone with access to cold, deep water. The headland juts into Lake Huron providing a natural feature for dispersion of thermal effluent and the shoreline location itself is naturally low in diversity of fish species due to high wave action and winter ice movement. In 2020, Bruce Power submitted a report documenting an assessment of feasible mitigation measures for thermal effluent and impingement and entrainment effects at the Bruce Power site [R-57]. This assessment of feasible mitigation measures for reduction of impingement and entrainment and thermal effluents identified the most feasible options for reduction of Impingement and Entrainment and thermal effluent as Variable Speed Drives and velocity cap modifications (i.e., light or sound deterrents). The results of the 2020 assessment of feasible mitigation measures are integrated into the 2022 Environmental Risk Assessment and any changes to mitigation technologies will be integrated into future Environmental Risk Assessments. The update of the assessment of feasible mitigation measures within the Environmental Risk Assessment on a 5-year cycle provides a continual surveillance of potential mitigation measures in the event of operational changes or that continued monitoring of thermal effluent, impingement and entrainment show a significant increase in environmental impact to aquatic biota. This iterative assessment will also include ongoing engagement with Indigenous Nations and Communities to provide opportunities to include Indigenous Knowledge and values, as was done throughout the mitigation measures assessment report [R-58].

Bruce Power continues to be engaged in understanding the impacts from climate change predictions and considering how they may affect future operations and the local environment. Bruce Power has prepared an assessment of the potential effects of climate change on water temperatures by 2054 to 2074 [R-59]. The impact of Bruce Power operations in terms of thermal effluent will remain unchanged under all climate change scenarios; this means that the temperature changes driven by thermal effluent from Bruce Power operations in the local study area will not be altered as Lake Huron temperatures increase. The absolute temperature in the local study area is predicted to increase proportionately to the temperature increase in other nearshore areas of Lake Huron by 1-2 degrees Celsius. As climate change prediction models become more advanced and/or the ambient conditions change, the Environmental Risk Assessment will be updated to determine if and how such changes impact the operation of Bruce Power's facilities and, if required, assess the feasibility of mitigation measures.

4.1.5 Predictive Effects Assessment

Over the past 20 years Bruce Power has gained a significant amount of experience in the restart and refurbishment of its CANDU reactors. Overall, as outlined in Appendix D [R-52] of the 2022 Environmental Risk Assessment report, potential environmental effects of planned future activities are anticipated to be similar to those associated with the existing operations. Therefore, the existing environmental monitoring programs will be retained as required to confirm predictions and be reported through the annual environmental monitoring program findings.

New site activities including Lutetium-177 production, life extension and major component replacement activities were evaluated for potential interactions with the environment. The preliminary assessment screened these interactions to assess whether the current operational conditions were bounding. Where this was not considered to be the case, a predicted bounding condition was developed and screened against accepted values for the protection of human health and the environment. In all cases, the current conditions were considered bounding, or the predicted conditions were screened as being acceptable.

The environmental effects and interactions that were discussed in this report are continually evaluated throughout the project planning and execution stages through involvement of the Environment Department as a stakeholder in the design process and planning of site activities, and oversight on execution activities. Environmental management plans are implemented and executed as required for site activities.

All activities at the Bruce Power site, including major component replacement activities, will continue to be executed in a manner that ensures continual protection of human health and the environment, in accordance with applicable operating licences, codes and standards.

4.1.6 Conclusions

The Environmental Risk Assessment demonstrates that the operation of the Bruce Nuclear Facility has resulted in minimal environmental risk and no expected adverse effects on the human health of nearby residents or visitors due to exposure to radiological or conventional substances and physical stressors. For nonhuman biota exposed to radiological or conventional substances, the Environmental Risk Assessment indicated that no adverse effects are expected. There was generally negligible to low risk to the environment due to exposure to physical stressors.

The baseline radiation doses to members of the public residing in the area surrounding the Site as calculated based on current operational conditions are less than 1% of the CNSC effective dose limit for a member of the public of 1 millisieverts per year. There is no radiological risk to human health for members of the public resulting from normal operations on the Site. The human health risk assessment for conventional contaminants identified no unreasonable risk for people using the land around the Site for recreational or residential/agricultural uses.

The radiation doses to non-human biota residing on or near the Site are less than 1% of the applicable United Nations Scientific Committee on the Effects of Atomic Radiation benchmark value. There is no radiological risk to non-human biota resulting from normal operations on the Site. The conventional ecological risk assessment identified potential risks to terrestrial ecological receptors at Construction Landfill #4, Fire Training Facility, Distribution Station #1 and at five general soil sampling sites, to semi-aquatic receptors at Eastern Drainage Ditch and to aquatic receptors in Lake Huron, Former Sewage Lagoon, B31 Pond and Eastern Drainage Ditch. Additional follow-up monitoring will be completed to refine these potential risks.

For thermal effluent, a low risk to some mainly cold and cool water species and life stages located in the Local Study Area was assessed during the thermal risk assessment process. Given the similar habitat available along the length of the Lake Huron coast and the mobility of older life stages, no population level effects are expected. For impingement and entrainment, Bruce Power has a *Fisheries Act* authorization from Fisheries and Oceans Canada that permits continued operation with the requirement to meet specific conditions related to impingement and entrainment, including offsetting that is intended to provide compensation for the fish losses incurred through impingement and entrainment. Using this construct, fish losses from impingement and entrainment are compensated for by fisheries offsets, resulting in a no net loss over time. For other physical stressors, the assessment of the physical effects of noise, cooling water discharges and habitat alteration has shown minimal risk to human or ecological receptors.

As the current operational conditions are demonstrated to be bounding of future activities, the 2022 Environmental Risk Assessment is, therefore, shown to be bounding of proposed future activities. There is no additional radiological or non-radiological risk to human or non-human biota resulting from anticipated future activities.

4.2 Thermal Risk Assessment

Bruce Power will prepare a thermal risk assessment as part of the 2027 Environmental Risk Assessment. The thermal risk assessment will be updated every 5 years to incorporate up-to-date climate science and 5 years of off-site thermal monitoring and Lake Huron hydrodynamic modelling data with and without the impacts of operations considered, as well as advancements in the scientific literature on the effects of temperature on aquatic biota. The thermal risk assessment will include a year round ecological risk assessment for cold, cool and warm water fish species and life stages present in the Local Study Area. Future thermal risk assessments will also be used to support future Environmental Compliance Approval applications.

The most recent thermal risk assessment was completed in July 2023 to support the application for thermal flexibility at Bruce A, and updated the 2022 thermal risk assessment to include comparisons between modelled temperatures under operational and non-operational conditions. [R-60] This change in methodology refined the assessment by distinguishing between thermal benchmark exceedances driven by operational conditions and those related to ambient lake temperatures. In general, the assessment indicated that thermal effluent poses no unreasonable risk to fish species located in the local study area near Bruce Power. Fish species assessed included Lake Whitefish, Round Whitefish, Deepwater Sculpin, Chinook Salmon, Rainbow Trout, Lake Trout, Emerald Shiner, Gizzard Shad, Smallmouth Bass, Walleye, White Sucker, Yellow Perch, Brown Bullhead, Channel Catfish, Common Carp, Freshwater Drum and White Bass at the applicable life stages occurring in the nearshore environment potentially affected by thermal effluent from Bruce Power. Most species were found to be at no unreasonable risk from temperatures measured at thermal monitoring sites in the local study area from October 1st, 2017 to September 30th, 2022. Four cold water species in early life stages were found to be at low risk from thermal effluent near Bruce Power following a detailed quantitative assessment and consideration of the biological and ecological context of the species and life stage. Thermal effluent poses a low risk to the following species and life stages within the local study area:

- Lake Trout, Lake Whitefish and, Round Whitefish eggs
- Larval Deepwater Sculpin

The thermal risk assessment concluded that thermal effluent does not pose a moderate or higher risk to any fish species considered within the local study area. All the fish species noted to be at low risk from thermal effluent within the local study area utilize a widespread habitat along the length of the Lake Huron coastline and the much smaller extent of the local study area (area assessed to be under the influence of the thermal plume) does not represent specialized habitat that these species are limited to utilize. Additionally, for some of the fish species assessed, specifically Lake and Round Whitefish embryos, the habitat within the local study area is sub-optimal based on the high exposure to prevailing currents and the high energy environment compared to protected spawning and incubation areas further north, such as the Fishing Islands and Stokes Bay [R-61]. For future consideration, to fully assess the potential effects of post Major Component Replacement operations with the effects of climate change, a bounding scenario was included under a 2030 climate scenario, titled Efficiency Gains. The Efficiency Gains scenario includes Project 2030. Project 2030 is an incremental investment program that will build on the existing life extension program (Major Component Replacement and Asset Management) that enables additional targeted investments to increase power output from 6,300 Megawatts (in 2016) to up to 7,000 Megawatts. The results show a generally unchanged level of risk under both operational warm and median 2030 climate scenarios compared to current operations.

Bruce Power continues to pursue the conceptual engineering project options on flexible Condenser Cooling Water pumping capacity (flow) and modifying the Bruce A discharge to mitigate thermal impacts. Modeling of modifications to the Bruce A discharge was completed in 2023/2024. The results showed no substantial change if this mitigation measure was implemented. A substantial change was defined as a change of 10 percent or more in the area encompassed by thermal benchmark exceedances under operational conditions compared to non-operational conditions. In 2024, Bruce Power attended a conference held by the Electric Power Research Institute (EPRI) to kick off the “Power Uprate Technical Advisory Group (TAG)”. This program is jointly funded by Bruce Power and other utilities with a goal of investigating innovative technologies and processes that enable Bruce Power to maximize the benefits of existing facilities while meeting environmental and climate goals. This includes improving power production efficiency to convert more thermal energy to electrical energy, investigating heat sink temperature, investigation options to reduce thermal discharge, and heat exchanger efficiency. Detailed outcomes from these two conceptual engineering project options and EPRI initiative will be reported in the 2027 Environmental Risk Assessment. Bruce Power will continue working with the EPRI on Climate READi and Climate Hazard Information and Projection initiatives. Bruce Power will also continue to monitor the latest research and innovations on feasible mitigation measures for thermal effluent and fish impingement. This iterative assessment will also include ongoing engagement with Indigenous Nations and Communities to provide opportunities to include Indigenous Knowledge and values, as was done throughout the mitigation measures assessment report [R-58].

To address other climate change related concerns identified by the Historic Saugeen Métis, including invasive species and extreme weather events that are not applicable to the Bruce A thermal flexibility, Bruce Power has developed a Climate Project with the Nuclear Innovation Institute in Port Elgin, Ontario. The Climate Project is a living, trusted and accessible digital hub with scientific research findings from qualified sources in academia, municipal, provincial and federal governments, Indigenous Nations and Communities, conservation authorities, non-governmental organizations, and industry partners. This initiative aims to meet the pressing need to localize news and provide actional information about climate change that helps people better understand what a changing global climate could mean for where they live. Funded by Bruce Power and created by the Nuclear Innovation Institute, the Climate Project aims to address pressing questions about how climate change is impacting those in Bruce, Grey, and Huron counties and local Indigenous communities—all located within the Saugeen Ojibway Nation Territory. The Climate Project is in the initial development phase and Bruce Power welcomes contributions from the Saugeen Ojibway Nation, Historic Saugeen Métis and Métis Nation of Ontario Region 7 to the structure and function of the hub.

Bruce Power shares the concerns of the Saugeen Ojibway Nation, Historic Saugeen Métis and Métis Nation of Ontario Region 7 about the effects of climate change on the impact of thermal effluent in Lake Huron and will include a modelling projection for warm and median climate conditions and known operational conditions in the 2040s, 2050s and 2060s in the 2027 and 2032 updates to the Thermal Risk Assessment. As a result, the potential impacts of climate change will be integrated into the thermal risk assessment on an ongoing, iterative basis.

The results of the five year update to the thermal risk assessment will strive to include Indigenous knowledge shared by Saugeen Ojibway Nation, Historic Saugeen Métis and Métis Nation of Ontario Region 7 and projections for the following three decades with the current knowledge of potential future operational conditions. Bruce Power strives to not only assess the current effects of thermal effluent, but to provide a look ahead into the combination of future climate scenarios and future operational scenarios. Climate projections used in these future hydrodynamic modelling efforts will be updated to remain with the ever evolving state of climate science.

4.3 Preparation of the 2027 Environmental Risk Assessment

Table 8 described the progress on the recommendations listed in the conclusion of the 2022 Environmental Risk Assessment. The plan and progress towards the recommendations will be updated annually in this report.

Table 8 - Plan and Progress of Recommendations in the 2022 Environmental Risk Assessment

Recommendation in the 2022 Environmental Risk Assessment	Plan and Progress
Bruce Power will continue to engage with Saugeen Ojibway Nation, Métis Nation of Ontario Region 7 and Historic Saugeen Métis to support climate change research that is relevant to each community.	This engagement is ongoing through regular and ad hoc meetings.
Bruce Power will continue to support the Coastal Waters Environmental Monitoring Program. This program was jointly developed between Bruce Power and Saugeen Ojibway Nation and aims to enhance the existing body of knowledge being compiled through Bruce Power's routine Environmental Monitoring.	Bruce Power is continuing to support the Coastal Waters Environmental Monitoring Program and Bruce Power will continue to integrate shared results into relevant environmental assessments.
As a follow up to the submission of the Assessment of Feasible Mitigation Measures report [R-58], updates to the risk assessment for Impingement and Entrainment and thermal effluent will continue to include an assessment of the need for mitigation measures and an update on any progress to mitigation measure implementation, if applicable.	Assessment of feasible mitigation measures continues, and results will be incorporated as needed into: • Bruce A and B environmental compliance approvals; • *Fisheries Act* authorization application; • Thermal risk assessments; and, Projects on site that impact thermal effluent and water taking, including Project 2030. For further information on physical stressors see Section 4.1.4.

Recommendation in the 2022 Environmental Risk Assessment	**Plan and Progress**
Bruce Power is required to complete entrainment monitoring and offset projects as part of the conditions of the *Fisheries Act Authorization* [R-56] and will continue to engage with Saugeen Ojibway Nation, Métis Nation of Ontario Region 7 and Historic Saugeen Métis to communicate the results of the entrainment monitoring and to select and complete these offset projects.	Implementation of the *Fisheries Act Authorization* is ongoing. A pilot entrainment monitoring program was planned for implementation in 2023 and has been delayed due to challenges encountered, and the identified need to build in additional monitoring capabilities based on feedback from Indigenous Nations and Communities. The pilot is on track to begin in 2025. Engagement with Saugeen Ojibway Nation, Métis Nation of Ontario Region 7 and Historic Saugeen Métis is ongoing through regular and ad hoc meetings.
For the conventional ecological risk assessment, Bruce Power will complete follow up monitoring as recommended in Table 6 and Table 7 to refine the assessment of risk in the 2027 Environmental Risk Assessment. Results of follow up monitoring will be reported annually in the environmental protection reports and compared to the site specific target levels calculated in the 2022 Environmental Risk Assessment.	Follow up- monitoring is ongoing, and results are compared to the site specific target levels calculated in the 2022 Environmental Risk Assessment. A portion- of the soil and sediment sampling and monitoring of lake water and stream water quality were completed in the 2024 calendar year with results reported in Section 6.2 of this report.
Effluent and environmental data reported as less than a detection limit is a source of uncertainty in the radiological Environmental Risk Assessment. Uncensored data below the detection limit is now recorded and used where possible for environmental monitoring data. In some cases, the critical level is conservatively used as an upper bound of contaminant concentration. For effluent/emissions monitoring data, Bruce Power is in the process of completing the required work to report uncensored data and critical level information for all radiological analyses. This uncensored data and critical level information will then be used in routine reporting. The use of uncensored data and critical level information for effluent and emissions data will represent a refinement of the Environmental Risk Assessment dose calculations. However, most of the Human Health Risk Assessment dose calculations are based on measurements in environmental media and are not dependent on effluent/emissions data. As a result, increasing the accuracy of reported emissions will have a small effect on reported doses and on the outcomes of the radiological Human and Ecological Risk Assessments.	Updates to the management of uncensored data as described in the recommendation are in progress. This information will be integrated into the 2027 Environmental Risk Assessment.

Recommendation in the 2022 Environmental Risk Assessment	Plan and Progress
From the Ecological Risk Assessment, additional measurements of radionuclides in on site waterbodies have confirmed that the Former Sewage Lagoon is the bounding exposure location. Doses to non-human biota remain far below benchmark values, therefore additional refinement of dose calculations is not required. Continued monitoring of radionuclides in water and sediment at the Former Sewage Lagoon is recommended. This may include characterization of Carbon-14 in surface water to refine concentrations that were calculated based on modelling.	Bimonthly sample collection of surface water from the Former Sewage Lagoon is completed as part of the Radiological Environmental Monitoring program and will continue to be reported annually. The regular program measures for tritium only. For the 2022 Environmental Risk Assessment, gamma analysis was also completed and the results for all CANDU related radionuclides were less than the critical level. For verification purposes, a surface water sample will be taken and measured for gamma for the next environmental risk assessment. Collection of sediment samples at on-site waterbodies, including the Former Sewage Lagoon, will continue at a 5-year frequency and be measured for gamma emitting radionuclides in advance of the next environmental risk assessment. This sampling and analysis of gamma in surface water and sediment from the Former Sewage Lagoon is planned for 2025. The other input for the Ecological Risk Assessment for aquatic biota in the Former Sewage Lagoon is carbon-14 in water, and for the last Ecological Risk Assessment this was calculated from the maximum measured airborne carbon-14 on-site. This approach results in higher uncertainty, however the maximum total dose rate to aquatic biota at the Former Sewage Lagoon (benthic invertebrates at 0.002 milligray per day) was well below the applicable benchmark (9.6 millgray per day) and this approach was deemed acceptable. (Continued on next page)

Recommendation in the 2022 Environmental Risk Assessment	**Plan and Progress**
	The direct measurement of carbon-14 in surface water was considered for the next Ecological Risk Assessment, however this supplemental sampling was determined to provide minimal benefit for the additional effort. Upon review of the data from the last assessment, it was determined that the modelled value of carbon-14 in surface water at the Former Sewage Lagoon based on measured carbon-14 in air (0.003 becquerels per litre) was below available analysis detection limits (0.1-0.3 becquerels per litre). Additionally, the background value of carbon-14 in surface water (0.004 becquerels per litre) was estimated to be below available detection limits. When environmental data is less than detection the approach is to allow the model to estimate the value, which is a conservative approach as the model typically overestimates the result. This was the approach used for the 2022 Ecological Risk Assessment. Since the model was calculating such small values, which were below what could be measured by a laboratory and the approach is conservative, further analysis was determined to not be warranted. As the maximum predicted dose rate to aquatic biota in the Former Sewage Lagoon was well below the benchmark value (<1%) in the last Ecological Risk Assessment, further refinement through the measurement of carbon-14 in water is not warranted, and is not planned for the next environmental risk assessment.
Monitoring for impingement will continue. Bruce Power will also complete entrainment monitoring and offset projects as part of the conditions of the *Fisheries Act* authorization [R-56].	Impingement monitoring continues and is reported in Section 6.2.2.1. A pilot entrainment monitoring program was planned for 2023 and has been delayed until 2025. Offset projects are ongoing and are reported in Section 6.2.2.

Recommendation in the 2022 Environmental Risk Assessment	**Plan and Progress**
In response to the low risk posed by thermal effluent to several fish species, Bruce Power will continue to execute year round thermal monitoring through logger deployments and thermal modelling work to monitor the risk posed by thermal effluent in the Local Study Area. Thermal logger deployments at depths over 10 metres will be discontinued during the winter period starting in the fall of 2022. Deployments at 3 metres, 5 metres and 10 metres depths will continue. Bluetooth technology for data loggers is being trialed to help improve retrieval of temperature loggers at shallow depths (≤10 metres). Deep locations (>10 metres) are difficult to retrieve in the spring, resulting in more field days and additional exposure of field personnel to health and safety concerns because of searching for and pulling these deep locations from the lake bottom. Over the winter period, the Thermal Risk Assessment considers only Lake Whitefish and Round Whitefish eggs at depths of 4 to 10 metres and Lake Trout eggs at depths of over 12 metres. For Lake Trout eggs, the only species and life stage assessed over the winter period at depths greater than 10 metres, thermal exceedances occur equitably at both reference and Local Study Area sites early in the incubation period; therefore, deployment and retrieval of temperature loggers over the winter period at depths greater than 10 metres is not contributing to the assessment of thermal effects. The Local Study Area Remapping Tool generates daily temperatures for 8,815 nodes at the surface and 8,815 nodes at the bottom over the entire Thermal Risk Assessment period. Daily average and daily maximum temperatures from the Local Study Area Remapping Tool can be used in the same manner as measured temperature values in the Thermal Risk Assessment process. For the 2022 Thermal Risk Assessment, the tool was used to increase the spatial assessment of the extent of thermal exceedances for Lake Whitefish eggs, Round Whitefish eggs and Lake Trout eggs. In the 2027 Thermal Risk Assessment, temperatures used for Hazard Quotient calculations for Lake Trout eggs will be generated using the Local Study Area Remapping Tool. Temperatures used for Hazard Quotient calculations for Lake and Round Whitefish eggs will also be completed using the Local Study Area Remapping Tool and available measured data.	Thermal monitoring continued in 2024. Over the summer of 2024, three Spotter Buoy and Smart Mooring devices, equipped with cellular transmission capability were deployed and retrieved in the fall. Data from the Spotter Buoys is publicly available on the Seagull platform (Seagull (glos.org)) run by the Great Lakes Observing System. Three Spotter Buoys are planned to be deployed over the ice-free period in 2025, with a trial of two additional configurations planned over the winter of 2025/2026. Bluetooth technology for data loggers was trialed in 2022 to help improve retrieval of temperature loggers at shallow depths (≤10m). There was no effective transmission through water to aid in retrieval and therefore did not improve data retrieval. These loggers continue to be deployed and downloaded as part of the routine program. The thermal risk assessment was updated in 2023 for the Bruce A Environmental Compliance Approval amendment application for thermal flexibility during the warmer months when lake temperatures are elevated. See Section 6.2.3.

Recommendation in the 2022 Environmental Risk Assessment	**Plan and Progress**
Continued monitoring and assessment of impingement and entrainment and thermal effects will occur as per the established regulatory framework. This iterative assessment will also include ongoing Indigenous engagement and working to include Indigenous values as was done throughout the mitigation measures assessment report. A reevaluation of risks and basis for decisions surrounding mitigation measure will be reported in subsequent Environmental Risk Assessments. Bruce Power will provide an update on the progress of the use of intake water flow flexibility (i.e., variable speed drives) engineering work and on current research related to the effects of sound and light on fish species relevant to the Local Study Area in the 2027 Environmental Risk Assessment.	Monitoring and assessment of impingement and entrainment and thermal effluent continues and results are and will be incorporated as needed into: • Bruce A and B environmental compliance approvals; • *Fisheries Act Authorization* application; • Thermal risk assessments; and, Projects on site that impacts thermal effluent and water taking, including Project 2030.
Although no significant impact on the environment is expected from Lutetium-177 production, Bruce Power will collect data to verify and confirm that changes in atmospheric emissions are negligible. During commissioning of the Isotope Production System and for a limited period thereafter, the particulate filters from the stack monitor will be analyzed for the presence of Ytterbium-175, Ytterbium -177 and Lutetium-177 in the gaseous effluents. Bruce Power will review the additional monitoring data to validate the assumptions presented in the predictive Environmental Risk Assessment.	Radiological emissions on site, including those related to isotope production, are reported in Section 5.1.
With the successful execution of a large portion of the higher risk Life Extension and Major Component Replacement activities for Unit 6, including the draining of systems and the removal of components, no substantial changes to baseline radiological and conventional emissions and effluents are expected to occur during Life Extension and Major Component Replacement. As the current operational conditions are demonstrated to be bounding of future activities, including Major Component Replacement activities, the 2022 Environmental Risk Assessment is, therefore, shown to be bounding of the proposed activities. The need to evaluate for monitoring related to Gas Bubble Trauma at the completion of the Life Extension Program will be carried to the 2027 Environmental Risk Assessment. No specific recommendations are required.	No specific follow-up is required for the impacts of Major Component Replacement. The recommendation for Gas Bubble Trauma monitoring will be carried to the 2032 Environmental Risk Assessment update. In preparation for the 2027 Predictive Environmental Risk Assessment, the impacts of Project 2030 are being evaluated. A gap analysis for Project 2030 was submitted to the CNSC in December of 2024 [R-62]. An Environmental Management Plan is being used to evaluate the impacts of Project 2030 on all environmental aspects. Incorporation of an efficiency gains scenario was included in the updated thermal risk assessment. See Section 4.2.

In addition to the recommendations listed in Table 8 above, the CNSC and Environment and Climate Change Canada have reviewed the 2022 Environmental Risk Assessment and provided feedback and comments. Bruce Power considered feedback and provided responses to technical comments in June of 2023 and again in October of 2024 [R-63][R-64]. Based on this feedback the following recommendations will be implemented for the 2027 Environmental Risk Assessment:

- Regular wildlife, turtle and bird surveys of on-site permanent drainage features and other habitats will continue at the frequency described in the current environmental monitoring program. Bruce Power will consider follow -up monitoring of benthic invertebrate communities in the nearshore area of Lake Huron, the discharge channels, and the addition of a reference site location if such monitoring is deemed necessary through the environmental monitoring program. Results will be included in future iterations of the annual Environmental Protection Report and in the 2027 Environmental Risk Assessment to provide additional context for risk characterization. An enhanced description of the permanent drainage features on site will be added to the 2027 Environmental Risk Assessment.

- Analysis of selenium and vanadium in sediment samples collected from the Eastern Drainage Ditch and the Former Sewage Lagoon and of pH from surface water at the Former Sewage Lagoon will continue during routine monitoring. Lake Huron surface water sampling will include antimony, barium, molybdenum, selenium, uranium, and vanadium as part of routine sampling. Bruce Power will continue to use the Ontario Interim Provincial Water Quality Objective of 40 ug/L as a preliminary screening value for molybdenum in the 2027 ERA unless other more suitable values become available in the interim. A discussion of the potential cumulative effects from project activities on phosphorus in effluent will be included in the 2027 environmental risk assessment. All sampling results will be included in future iterations of the Annual Environmental Protection Report and assessed in the 2027 Environmental Risk Assessment.

- As completed for the 2022 Environmental Risk Assessment, future Environmental Risk Assessments will include a review of available Toxicity Reference Values for all Chemicals of Potential Concern. Diet information will be included in the 2027 environmental risk assessment based on the recommended sources in the applicable version of N288.6 and will be updated as these sources are updated. An interactive interface will be considered to facilitate regulator and stakeholder review of the screening process, similar to the one piloted for the 2022 Environmental Risk Assessment (https://wsp-shinyapps.shinyapps.io/ERA_screening_tables/).

- A map of the Lake Huron fishing Zone 1 will be included in the Impingement and Entrainment section.

- In the 2027 thermal risk assessment, several changes will be made:

    - All available thermal monitoring data from April 1, 2021 to April 30, 2026 will be incorporated.

- Bruce Power will provide a table in the 2027 thermal risk assessment to indicate deployment and retrieval success for all years included in the thermal risk assessment.

- Validation results for the hydrodynamic model will be presented for two years on a seasonal basis. Bruce Power will ensure two full years of water current validation, provided sufficient data has been successfully collected, are included in the validation presented within the 2027 thermal risk assessment.

- Bruce Power plans to move towards a two-stream approach for meteorological and hydrodynamic model inputs, set-up, calibration, validation, and ongoing improvements. The first stream will focus on fitness for use in the 2027 thermal risk assessment and this will be defined by the model validation results. If the model meets the model validation performance criteria, Bruce Power plans to request regulatory acceptance that the model results are fit for purpose for use in risk characterization in the 2027 thermal risk assessment. The second stream will focus on continuous improvement to the model that do not fall under specific regulatory requirements. Potential improvements such as ice cover, seasonal under- or over- prediction and other issues can be addressed in this stream. Engagement on the 2027 thermal risk assessment methodology is on-going in 2025.

- The Local Study Area Remapping Tool, thermal modelling improvements, calibration and validation efforts will be briefly discussed within the methodology section of the 2027 thermal risk assessment. Bruce Power plans to continue to incorporate a correction of modelled data for measured data on a weighted basis throughout the local study area in an effort to improve the amalgamation of measured and modelled data in the risk characterization of the thermal risk assessment.

- The spatial extent of thermal benchmark exceedances and hatch advance for Lake Whitefish eggs will be compared between operational and non-operational scenarios to enhance the risk characterization. This will provide additional context as to the spatial extent of exceedances within the local study area.

- Reference site selection criteria will be explicitly stated for all reference sites.

- An interactive interface for thermal risk assessment data will be considered, similar to the one prepared as a pilot for regulators and stakeholders for the 2022 thermal risk assessment (https://wsp-shinyapps.shinyapps.io/ERA_temperature/).

- In future thermal risk assessments, the results of operational and non-operational scenarios will be compared to provide additional local context for acute, chronic and hatch advance calculations. For the 2027 thermal risk assessment, Bruce Power will re-assess risks related to thermal effluent within the local study area and will specifically re-assess the risk to Lake Whitefish embryos in November.

- Bruce Power will consider contributing funding and/or in-kind contributions to future projects to characterize the Habitat Productivity Index for Lake Huron run by external organizations. Bruce Power will not be initiating projects to characterize Habitat Productivity Index in Lake Huron based on the current *Fisheries Act* authorization conditions.

- Bruce Power will consider posting a public plain language summary in addition to the posting of an accessible version of the report. Information will be provided regarding risk terminology, the quality assurance processes for the site-specific survey, and the periodic review process for the Environmental Risk Assessment. Bruce Power will also continue to list the changes made with each Environmental Risk Assessment update, including changes made to reach compliance with CSA N288.6-22.

5.0 EMISSIONS AND EFFLUENT MONITORING

To demonstrate environmental protection, Bruce Power performs extensive monitoring and modelling of radiological and conventional contaminants.

Air emissions and water/land effluents are controlled and regulated. Releases occur in a manner that minimizes environmental impact. Bruce Power's radiological and conventional environmental monitoring programs are designed to continuously verify that environmental protection is being maintained and that these releases have minimal impact on the surroundings. The effluent and emissions monitoring programs are based on CSA N288.5 [R-6], CNSC REGDOC-2.9.1 [R-14], reporting requirements in CNSC REGDOC-3.1.1 [R-2] and the framework laid out in internal procedures.

The key goal of the emissions and effluent monitoring program is to:

- Ensure that physical stressors and radiological and conventional contaminants released through controlled pathways or spills do not cause undue risk to living organisms.

This is achieved by fulfilling key program objectives:

- Demonstrate compliance with limits on the concentration/activity of radiological and hazardous contaminants and intensity of physical stressors in the environment and/or their effect on the environment;

- Provide data to verify predictions, refine models, and/or reduce uncertainty in predictions as required for the Environmental Risk Assessment [R-4], and incorporate any recommendations into the program design; and,

- Maintain transparency and trust and demonstrate due diligence and meet stakeholder commitment.

5.1 Radiological Emissions and Effluent Monitoring Programs

Bruce Power monitors its radiological airborne emissions and waterborne effluent to ensure that releases are occurring within acceptable limits and remain as low as reasonably achievable. Radiological emissions and effluent monitoring data is reported to the CNSC quarterly and is compared to internal administrative levels in addition to reportable regulatory levels and limits. If abnormal conditions are identified, investigations are undertaken, and appropriate corrective actions are applied.

Radiological emissions and effluent monitoring results feed into the larger Environmental Protection framework to ensure the public and the environment are protected at all times. Data from the radiological emissions and effluent monitoring program are utilized in conjunction with Radiological Environmental Monitoring measurements to support radiation dose assessments and complete a comprehensive Environmental Risk Assessment in accordance with CSA N288.6 [R-18].

As demonstrated throughout this report, the 2024 radiological emissions and effluent monitoring program is effective as the program continued to meet the program objectives defined in CSA standard N288.5, Effluent monitoring programs at Class I nuclear facilities and uranium mines and mills, by:

a) demonstrating compliance with authorized release limits (Derived Release Limits) and other regulatory requirements;

b) demonstrating adherence to internal objectives and targets set on release amounts, for the purposes of emissions and effluent control;

c) confirming the adequacy of controls on releases from the source;

d) providing an indication of unusual or unforeseen conditions that might require corrective action or additional monitoring;

e) providing data to assess the level of risk on human health and safety, and the potential biological effects in the environment of the nuclear substances released from the facility; and,

f) providing data which, when combined with the results of environmental monitoring, can be used to test, verify or refine models used in Environmental Risk Assessments and dose assessments, and incorporate recommendations into program design [R-17].

Radionuclides in airborne emissions and waterborne effluents are monitored, as applicable, at Bruce Power facilities including Bruce A, Bruce B, Central Maintenance Facility, and the Central Storage Facility. Other facilities located on or near site that monitor for airborne and waterborne radionuclides, as applicable, include Canadian Nuclear Laboratories, Ontario Power Generation's Western Waste Management Facility, Kinectrics' Ontario Nuclear Services Facility, and Laurentis' Western Clean-Energy Sorting and Recycling Facility. Descriptions of the radiological emissions and effluent programs for these facilities can be found in Section 2.0. Figure 6 below provides a map of radiological emissions and effluent monitoring locations.

Figure 6 - Radiological Emissions and Effluent Monitoring Locations

5.1.1 Bruce Power Facilities (Bruce A, Bruce B, Central Maintenance Facility, Central Storage Facility)

Monitoring of radiological emissions and effluents from Bruce A, Bruce B, the Central Maintenance Facility, and the Central Storage Facility occurs within the Bruce Power framework for control of radioactive emissions and effluents and includes the monitoring systems operating and quality assurance requirements. Airborne radiological emissions are monitored from applicable stacks within each facility for tritium oxide, carbon-14, radioiodine (^{131}I), noble gasses, gross beta/gamma, and gross alpha. Waterborne radiological effluents are monitored at applicable release points for tritium oxide, carbon-14, gross beta/gamma and gross alpha.

All airborne emissions and waterborne effluents at Bruce Power remain well below the Derived Release Limits, which are regulatory limits developed using CSA standard N288.1[R-65], and based on a public dose limit of 1 millisievert per year as mandated by the CNSC (*Radiation Protection Regulations*, SOR/2000-203) [R-66]. Bruce Power operates well below Derived Release Limits to ensure that members of the public and the environment are protected. Environmental Action Levels, developed in accordance with CSA standard N288.8, are established at Bruce Power and are used as a precautionary measure to provide early warning of any actual or potential loss(es) of control of the Environmental Protection Program [R-67]. These levels are not an indication of risk to the public or environment as they represent a very small fraction of the Derived Release Limit (typically less than 1% of the Derived Release Limit) with annual dose to public remaining low (*de minimus)*. Bruce Power controls radiological emissions and effluent as low as reasonably achievable by taking action to investigate causes of elevated emissions and effluents and initiating mitigating actions, when necessary.

5.1.2 Airborne Radiological Emissions

5.1.2.1 2024 Radiological Airborne Emission Results

Through Bruce Power's normal operation and outage maintenance activities, airborne radiological emissions are released to the environment. These airborne emissions are primarily monitored through exhaust stacks and are well below regulatory limits (Derived Release Limits). Radiological airborne emissions typically originate from reactor systems such as the main moderator and heat transport systems and their auxiliary systems. Airborne emissions can fluctuate during planned and unplanned activities; however, monitoring systems are in place to capture this variability. Planned activities that may result in temporary elevated emissions include controlled removal of defect fuel bundles from the reactor core, moderator cover gas purges to keep chemistry parameters within specifications, and planned outage days where maintenance work is performed on reactor systems to support equipment health and continued safe operation. Other causes of elevated emissions can include equipment deficiencies such as stack filter by-pass, resin exhaustion in ion-exchange purification systems, and boiler tube leaks that may cause increased emissions through feedwater venting.

Bruce Power has several engineered barriers in place to minimize the release of radionuclides to the environment and keep releases as low as reasonably achievable. These barriers include high efficiency particulate air filters and high efficiency carbon air filters to remove airborne particulates and radioiodine. Testing of Bruce Power's stack filters is conducted annually by a third-party vendor to assess and assure their removal efficiency. Additional barriers include moderator and heat transport purification systems designed to remove radionuclides, and moderator confinement and vault vapour recovery systems which reduce airborne tritium releases. Together, these engineered barriers along with systematic monitoring and investigation of emissions above normal operating levels ensures Bruce Power maintains emissions to levels that are as low as reasonably achievable. At all times, Bruce Power operations are designed to minimize emissions below internal administrative levels and Environmental Action Levels (CNSC reportable levels), which ensures emissions remain well below regulatory Derived Release Limits.

The 2024 radiological airborne emission results for all licensed facilities located on or near site are shown in [R-68]–[R-71]. This includes annual results of tritium, noble gases, radioiodine (^{131}I), carbon-14, particulate alpha, and particulate beta/gamma. Bruce Power provides emission results to the CNSC in quarterly reports in accordance with the Power Reactor Operating Licence. Bruce Power's radiological airborne emissions continue to remain well below regulatory limits (Derived Release Limits) as shown in Table 10 which displays Bruce Power's annual emissions as a percentage of the Derived Release Limit. In 2024, airborne radiological emissions at Bruce A, Bruce B, the Central Maintenance Facility, and the Central Storage Facility were well below Derived Release Limits.

In 2024, the Bruce B Ancillary Service Building experienced airborne tritium emissions that reached it's Environmental Action Level during the period of October 23, 2024 to October 30, 2024 due to activities related to air-drying large, shielded containers, designed to hold heavy water, called Multiple Purpose Transportation Packages from Ontario Power Generation's Pickering site. Tritium emissions were 336 Curies over the course of the week, which was 124% of the Ancillary Service Building exhaust stack Environmental Action Level. Reaching this Environmental Action Level was reported to the CNSC; however, it is important to note that this tritium emission was not an indication of risk to the public or environment as it remained a very small percentage (less than 0.1%) of Bruce Power's weekly Derived Release Limit and dose to public remained *de minimus.*

Table 9 - Annual Radiological Airborne Emissions for 2024

Facility & Radionuclide/ Radionuclide Group	Bruce A	Bruce B	Central Maintenance Facility	Central Storage Facility	Ontario Power Generation Western Waste Management Facility	Canadian Nuclear Laboratories Douglas Point Waste Facility	Kinectrics' Ontario Nuclear Services Facility	Laurentis EnergySolutions Western Clean-Energy Sorting and Recycling Facility	Total
Tritium Oxide (becquerels per year)	3.2E+14	3.7E+14	3.9E+09	1.8E+12	1.4E+13	4.02E+11	1.63E+11	<1E+12	7.0E+14
Noble Gas (becquerel-megaelectronvolts per year)	6.2E+13	2.5E+13	N/A	N/A	N/A	N/A	N/A	N/A	8.7E+13
Iodine-131 (becquerels per year)	1.4E+05	1.5E+05	0.0E+00	N/A	4.5E+03	N/A	N/A	N/A	2.9E+05
Particulate Gross Beta/ Gamma (becquerels per year)	2.0E+06	7.4E+06	0.0E+00	0.0E+00	1.8E+03	1.19E+05	N/A	N/A	9.5E+06
Particulate Gross Alpha (becquerels per year)	1.3E+04	3.7E+04	4.0E+02	N/A	N/A	N/A	N/A	N/A	5.0E+04
Carbon-14 (becquerels per year)	1.2E+12	9.2E+11	N/A	N/A	5.3E+09	N/A	N/A	N/A	2.1E+12

Note:

1. Beta/Gamma Results: Bruce A, Bruce B, and the Canadian Nuclear Laboratories Douglas Point Waste Facility perform beta analysis, and the Central Maintenance Facility, Central Storage Facility, and Ontario Power Generation Western Waste Management Facility utilize gamma scan results. Naturally occurring radionuclide material detected in the gamma scan analysis is not included in the summation of releases and are not reported.
2. Airborne radiological emissions from Bruce Power facilities are monitored continuously via stack monitoring systems with weekly analysis performed.

Table 10 - Annual Radiological Airborne Emissions for 2024 as a Percentage of the Derived Release Limit

Facility & Radionuclide/ Radionuclide Group	Bruce A	Bruce B	Central Maintenance Facility	Central Storage Facility
Tritium Oxide (% Derived Release Limit)	9.4E-02	4.7E-02	1.3E-06	4.2E-04
Noble Gas (% Derived Release Limit)	4.0E-02	6.6E-03	N/A	N/A
Iodine-131 (% Derived Release Limit)	4.1E-06	3.8E-06	0.0E+00	N/A
Particulate Gross Beta/ Gamma (% Derived Release Limit)	3.1E-04	5.4E-04	0.0E+00	0.0E+00
Particulate Gross Alpha (% Derived Release Limit)	4.8E-06	5.2E-06	1.2E-07	N/A
Carbon-14 (% Derived Release Limit)	5.4E-02	2.3E-02	N/A	N/A

5.1.2.2 Air Emission Monitoring of Radioisotope Lutetium-177 Production

In January 2022, Bruce Power began production of lutetium-177, a medical isotope used in targeted radionuclide therapy to treat neuroendocrine tumours and prostate cancer. The lutetium-177 produced at Bruce B is used in cancer treatments around the world to precisely target malignant cancer cells without damaging surrounding healthy tissues.

Commissioning of the isotope production system in Unit 7 began in January 2022 and became operational on October 24, 2022. Although no changes to radiological emission levels were expected from this isotope production system, monitoring of lutetium-177, ytterbium-175 and ytterbium-177 has occurred at Bruce B since commissioning. Due to the short half-life of the decay products associated with the production of lutetium-177, particles will either quickly decay to negligible activity or be filtered out by high efficiency particulate air filters prior to release resulting in negligible emissions. Although it is expected to have a negligible impact on emissions, any measurable radiological emissions produced from the lutetium-177 isotope production system would be detected by the existing stack monitoring systems already in place and reported to the CNSC via routine quarterly reporting. No waterborne effluent is produced from the lutetium-177 isotope production system.

To date, no measurable airborne emissions from the production of lutetium-177 have been identified.

5.1.2.3 Historical Radiological Airborne Emission Results

Figure 7 through Figure 16 below provide an overview of the five and ten-year historical trends of annual airborne radiological emissions at Bruce A, Bruce B, the Central Maintenance Facility and the Central Storage Facility. Ten-year historical trends have been developed for Bruce A and Bruce B tritium and carbon-14 emissions as these radionuclides are the principal radionuclides contributing to dose to public (see Section 3.0) with five-year historical trends developed for the remaining radionuclide(s)/radionuclide groups. Additionally, to prevent graphical scaling issues and provide a clearer visual of radiological emissions, Bruce A and Bruce B have been trended separately from the Central Maintenance Facility and Central Storage Facility as these support buildings emit significantly lower emissions.

Figure 7 displays the airborne tritium emissions from Bruce A and Bruce B. Airborne tritium is a principal radionuclide associated with dose to the public. Tritium emissions from Bruce B in 2024 were similar to previous years; however airborne tritium emissions from Bruce A decreased in 2024 compared to previous years. This decrease was a result of a continued emphasis on improving equipment reliability and performance of the confinement vapour recovery and vault vapour recovery systems. In December 2021 and January 2022, increased tritium emissions were experienced at Bruce A due to fresh air purges required to execute repairs and cleanup activities of a Unit 1 moderator pump seal leak within confinement rooms. Additionally, in 2022, tritium emission increases at Bruce A were attributed to Bruce A's Vacuum Building Outage as well as moderator confinement vapour recovery and vault vapour recovery equipment challenges. In 2023, Bruce A airborne tritium emissions were slightly elevated due to a Unit 4 Heat Transport System leak outside containment (within the powerhouse) due to a heat transport purification filter hose rupture as well as a temporary increase during planned chemical decontamination activities supporting the Unit 3 Major Component Replacement. In 2024, the Bruce B Ancillary Service Building experienced airborne tritium emissions that reached its Environmental Action Level for the week ending October 30, 2024. As previously described in this report, please refer to Section 5.1.2.1 for further details of this event. All Bruce A and Bruce B airborne tritium emissions in 2024 continued to remain well below regulatory limits with dose to public remaining *de minimus*.

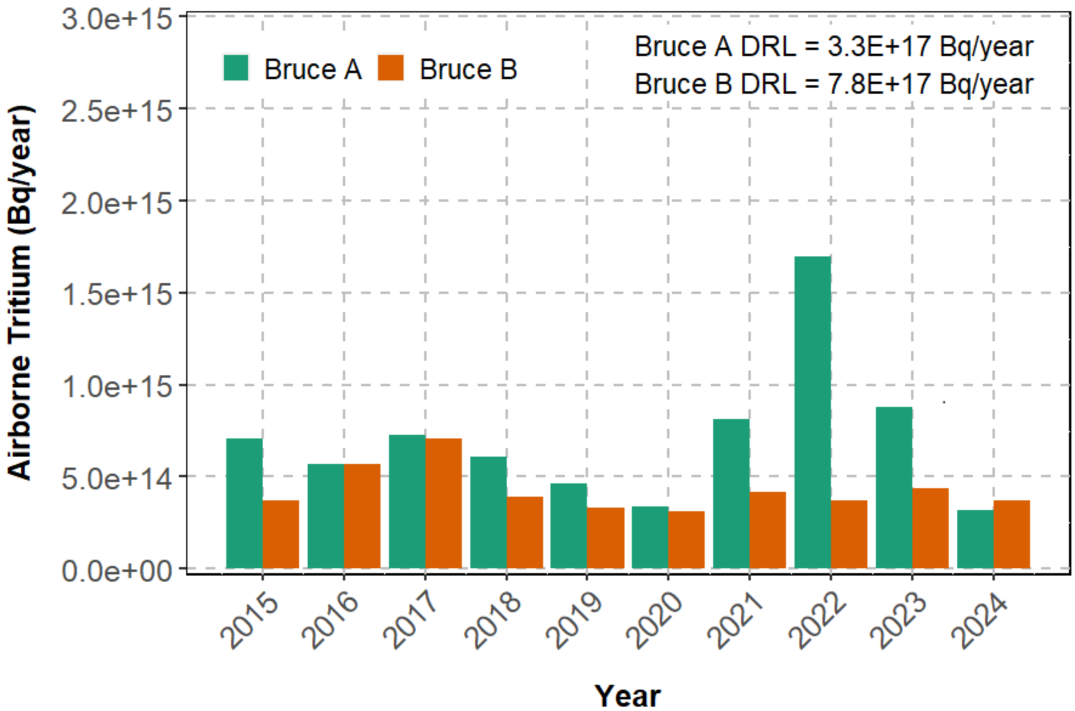


Figure 7 - Historical Airborne Tritium Emissions - Bruce A and Bruce B

The Central Maintenance Facility and Central Storage Facility historical airborne tritium emissions are provided in Figure 8 and Figure 9 and continue to remain very low (two separate figures are provided to present a clearer visual of the low emissions released from the Central Maintenance Facility). The Central Maintenance Facility contains various maintenance areas and laboratories responsible for fabrication and welding activities, equipment refurbishment, and radiation protection instrumentation calibration and repair. All current and historical tritium emissions remain low due to the limited radiological work that occurs at the Central Maintenance Facility. The Central Storage Facility is designed to store and perform maintenance on materials including contaminated tooling, equipment, and components from Major Component Replacement outages. Monitoring of emissions at the Central Storage Facility started upon commencement of building operations in December 2020 and continue to remain low. In 2024, tritium emissions increased at the Central Storage Facility as a result of planned off-gassing and maintenance of equipment within shipping containers containing bulkheads, moderator drain and dry equipment, and vault air-conditioners. While emissions appear to have increased, they continue to remain very low. All emissions from the Central Maintenance Facility and Central Storage Facility were well below Bruce Power’s Derived Release Limits and the dose to public remained *de minimus*.

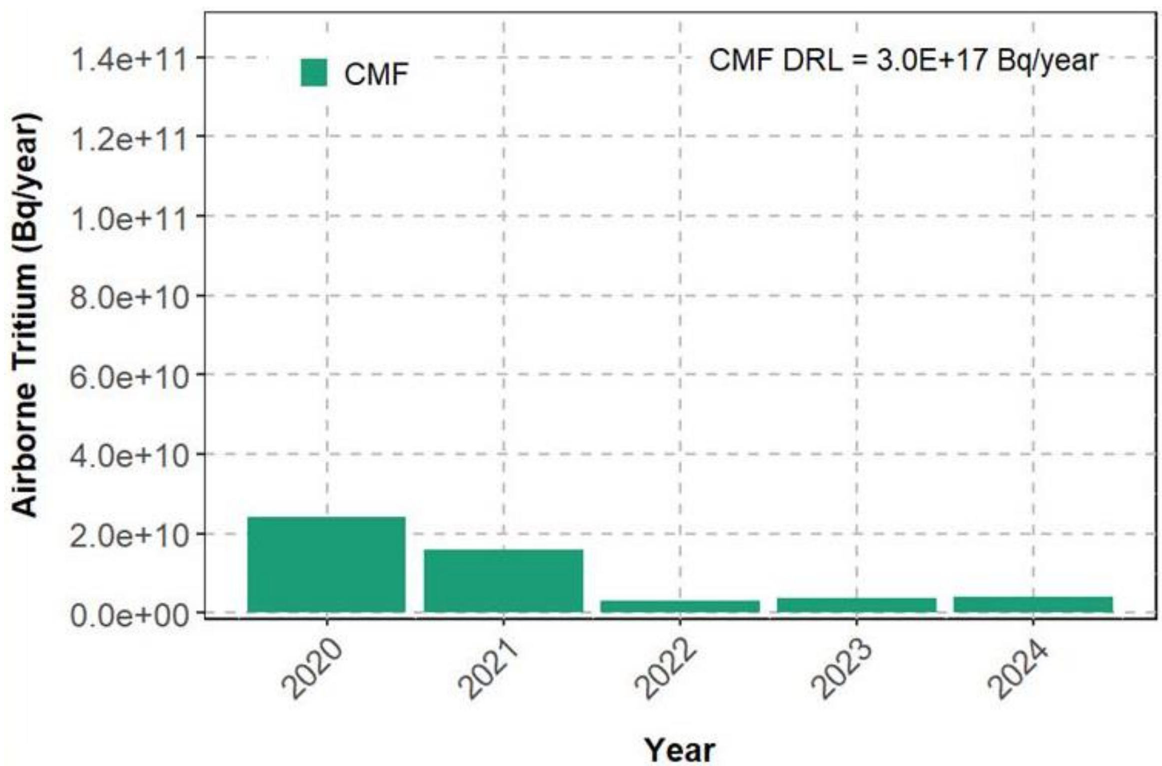


Figure 8 - Historical Airborne Tritium Emissions - Central Maintenance Facility

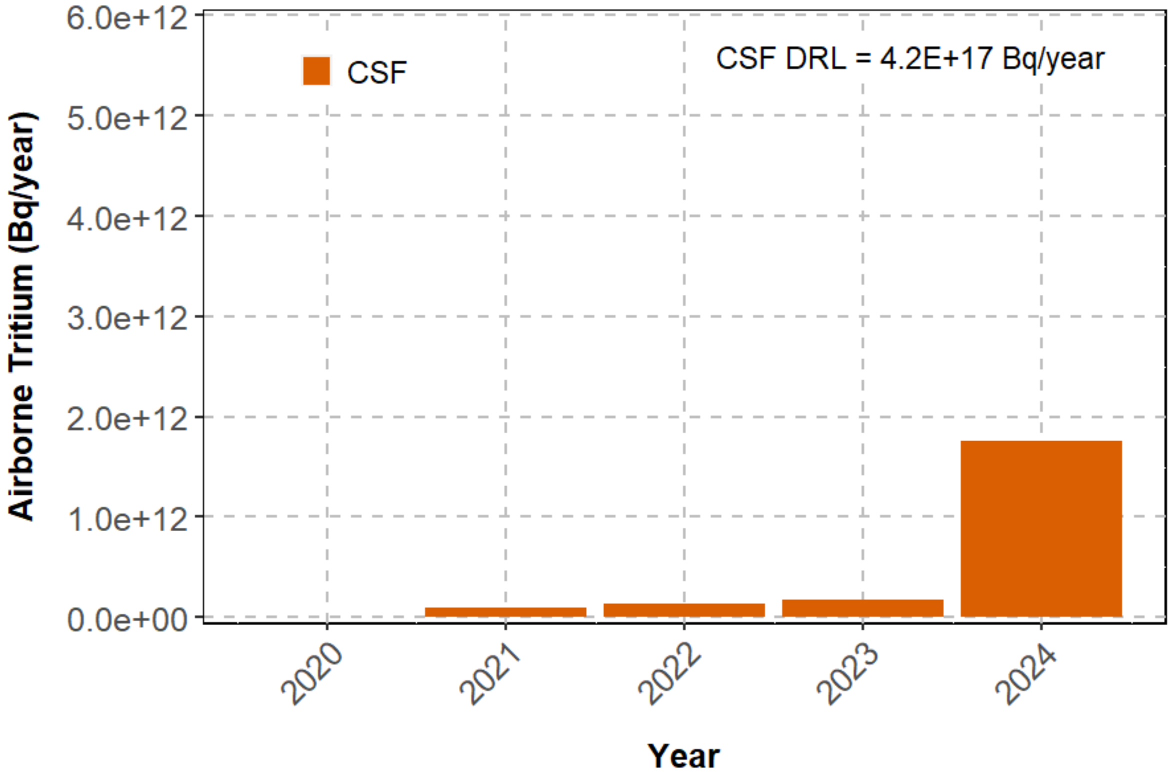


Figure 9 - Historical Airborne Tritium Emissions - Central Storage Facility

Figure 10 displays the historical trend of airborne carbon-14 emissions from Bruce A and Bruce B. In 2024, carbon-14 emissions remained low at Bruce B with a decrease at Bruce A compared to previous years. Compared to Bruce A, airborne carbon-14 emissions at Bruce B have a consistently lower baseline due to an operational bulk oxygen system reducing the number of moderator cover gas purges. In 2022, elevated carbon-14 emissions at Bruce A were attributed to confinement room purges and moderator cover gas purging in support of maintenance activities, system chemistry specifications (moderator cover gas) as well as multiple and simultaneous outages, including the Vacuum Building Outage, and fueling ahead activities in preparation for Unit 3's Major Component Replacement. In 2023, contributing factors to carbon-14 emissions at Bruce A included increased resin demand for multiple forced and planned outages. Conversely, in 2024, carbon-14 emissions at Bruce A decreased due to a reduced number of outages compared to 2023, therefore, reducing the amount of cover gas purges and resin demand. All carbon-14 emissions were below Environmental Action Levels and well below regulatory limits with dose to public remaining *de minimus*.

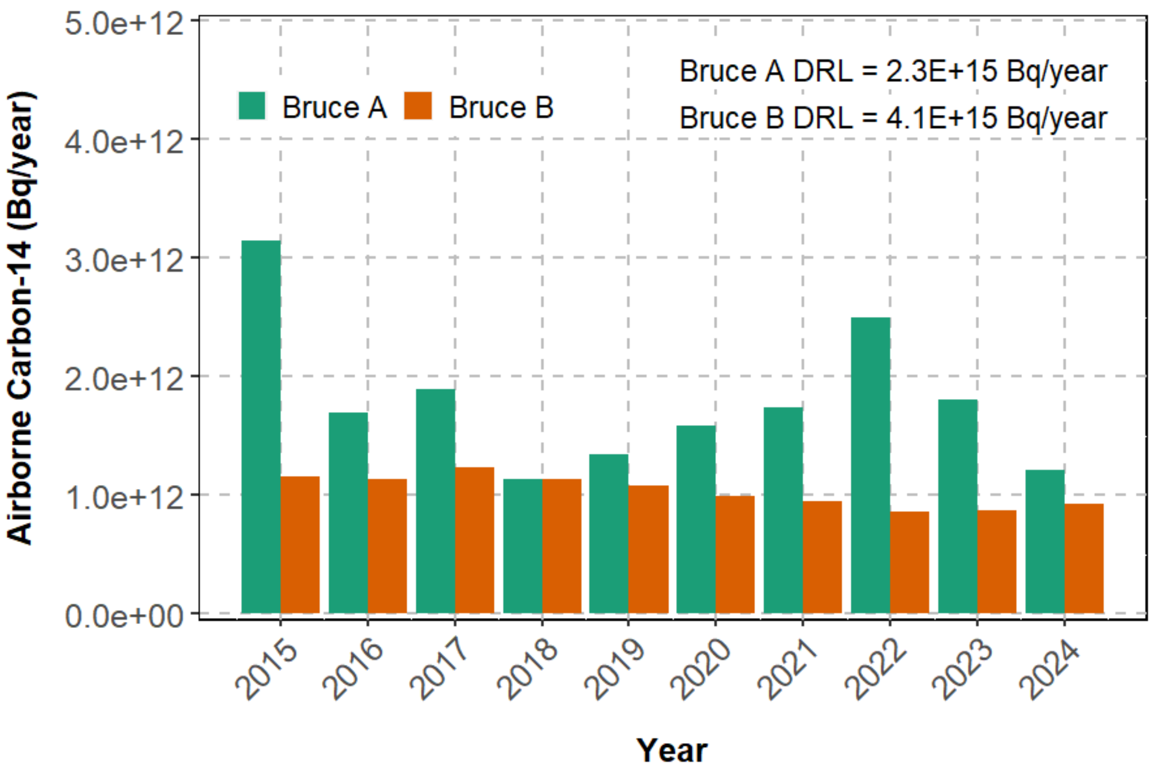


Figure 10 - Historical Airborne Carbon-14 Emissions

Figure 11 displays historical radioiodine emissions at Bruce A and Bruce B over the last 5 years. Radioiodine emissions at Bruce A and Bruce B in 2024 remained very low similar to 2023. Although graphically it appears that there are no radioiodine emissions in 2021, 2023 (Bruce B), and 2024, it is important to note that emissions for these years are present; however, they are very low (less than 4.9E+05 becquerels per year). Graphical scaling was required to accommodate the elevated Bruce A radioiodine emission in 2022. In 2022, Bruce A experienced two weeks of increased iodine emissions caused by the planned removal of defect fuel on February 2nd, 2022. The radioiodine emissions during this period were above Bruce A's Environmental Action Level. Corrective actions were put in place to reduce the risk of re-occurrence including replacement of the High Efficiency Carbon Air filter beds and an increased focus placed on the filter maintenance and testing program. Although the radioiodine emissions in February 2022 were above the Environmental Action Level and reported to the
CNSC, all emissions during this time and historically were well below Bruce Power's Derived Release Limit and the dose to public remained *de minimus*.

No airborne radioiodine emissions have been generated from the Central Maintenance Facility over the last 5 years and therefore no trend figure is included in this report.

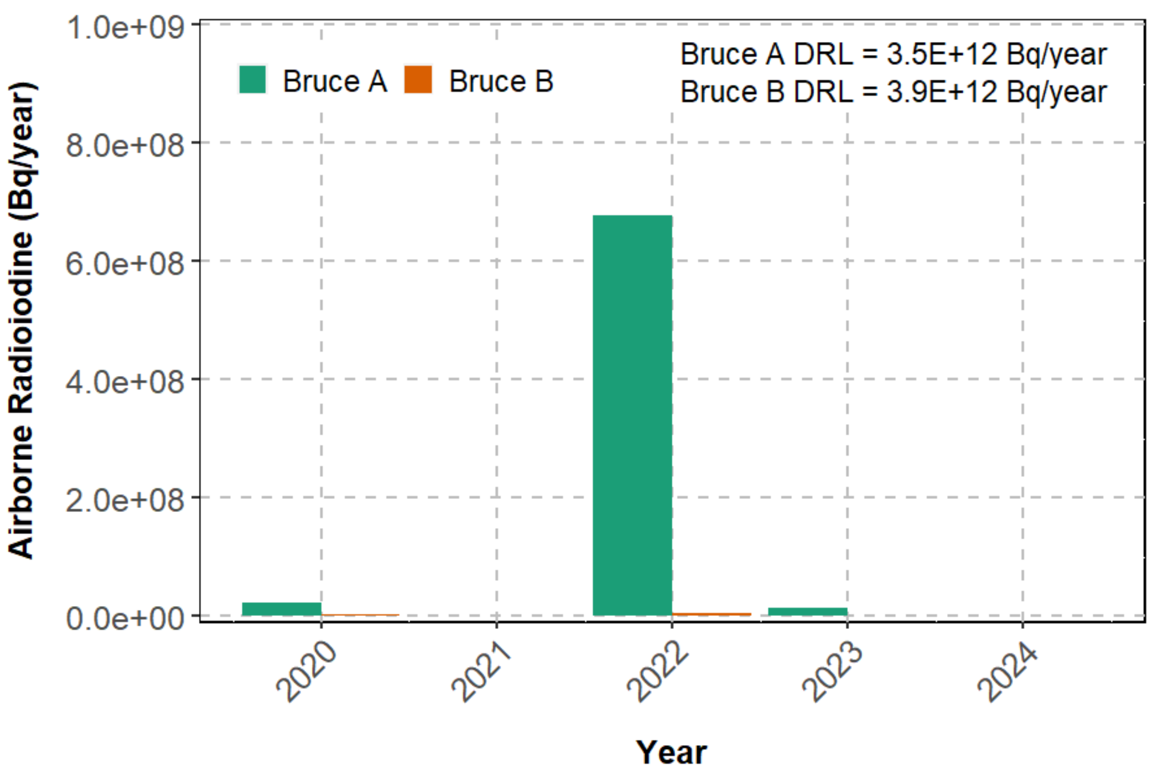


Figure 11 - Historical Radioiodine Emissions

Figure 12 displays historical noble gas emissions over the last 5 years from Bruce A and Bruce B. In 2024, Bruce A and Bruce B noble gas emissions remained low when compared to historical trends. Compared to Bruce B, it is suspected that noble gas emissions at Bruce A have a consistently higher baseline due to an increased number of required primary system purges such as moderator cover gas and annulus gas. In an effort to minimize airborne radiological emissions (particularly noble gas), where possible, prior to executing system purges, purge pathway configurations are considered to promote decay time within the vault, prior to reaching an exhaust stack. All noble gas emissions are below Environmental Action Levels and well below regulatory limits with dose to public remaining *de minimus*.

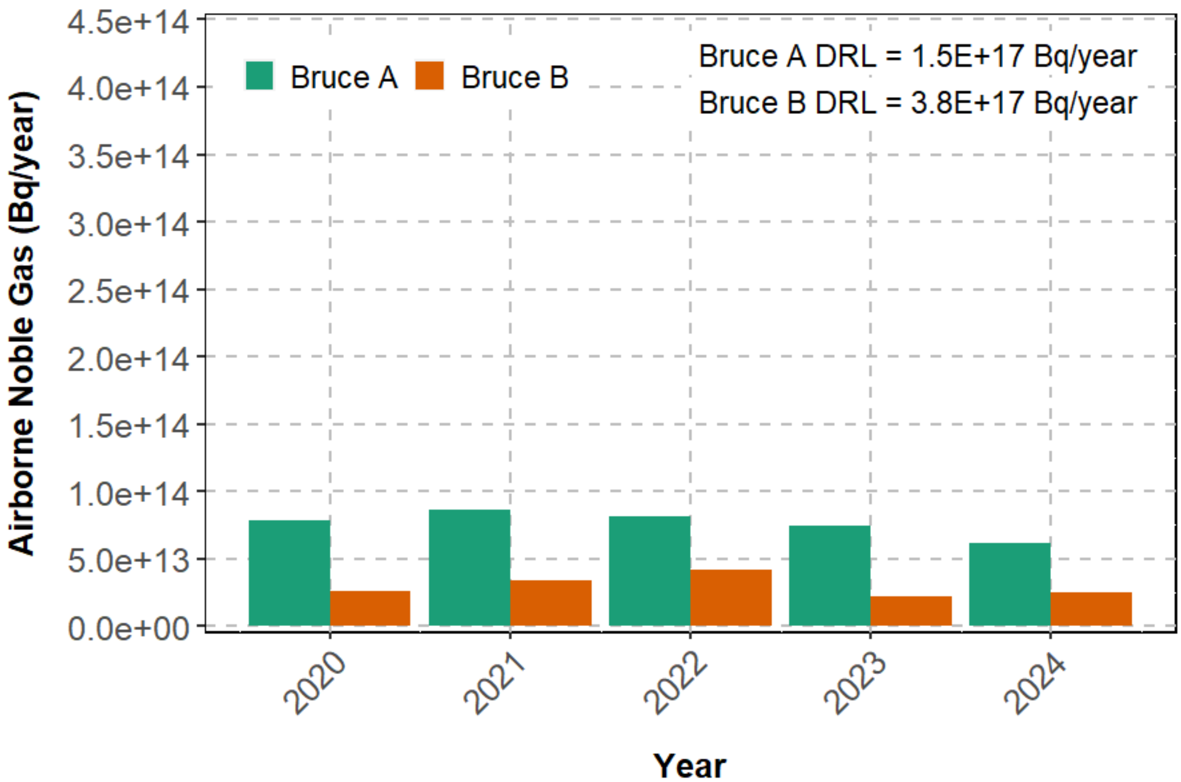


Figure 12 - Historical Noble Gas Emissions in Air

Figure 13 and Figure 15 display the historical trend for particulate gross beta/gamma emissions and particulate gross alpha emissions for Bruce A and Bruce B, respectively. Figure 14 and Figure 16 display the particulate gross beta/gamma emissions for the Central Maintenance Facility and the Central Storage Facility and the particulate gross alpha emissions for the Central Maintenance Facility, respectively. In 2024, particulate gross beta/gamma and particulate alpha emissions continued to remain very low at all facilities with a majority of weekly stack emission results being less than the minimum detectable activity. Radiological particulate emissions can be influenced by Naturally Occurring Radioactive Material as well as fluctuate depending on the amount of construction or maintenance activities scheduled to occur, typically during outages. This work can include concrete work, opening up primary systems, and cutting, welding, or grinding of primary system equipment, to support asset management and ensure safe and reliable continued operation. To minimize the release of particulates to the environment, contaminated exhaust stacks at Bruce A, Bruce B, the Central Maintenance Facility, and the Central Storage Facility contain high efficiency particulate air filters that are effective at capturing and removing airborne particulates prior to release through the exhaust stacks. At the Central Maintenance Facility and the Central Storage Facility, there were no identified particulate gross beta/gamma emissions in 2020, 2023, and 2024 as shown in Figure 14. In 2021, particulate gross beta/gamma emissions were identified but remained very low. At the Central Maintenance Facility, particulate gross beta/gamma and particulate gross alpha emissions were suspected to be caused by Naturally Occurring Radioactive Material. At the Central Storage Facility, an attributing cause to the particulate gross gamma emission may have been planned maintenance activities on steam generators and tooling from the Unit 6 Major Component Replacement. All particulate gross beta/gamma and particulate gross alpha emissions at Bruce A, Bruce B, the Central Maintenance Facility, and the Central Storage Facility remained below applicable Environmental Action Levels and well below regulatory limits with dose to public remaining *de minimus*.

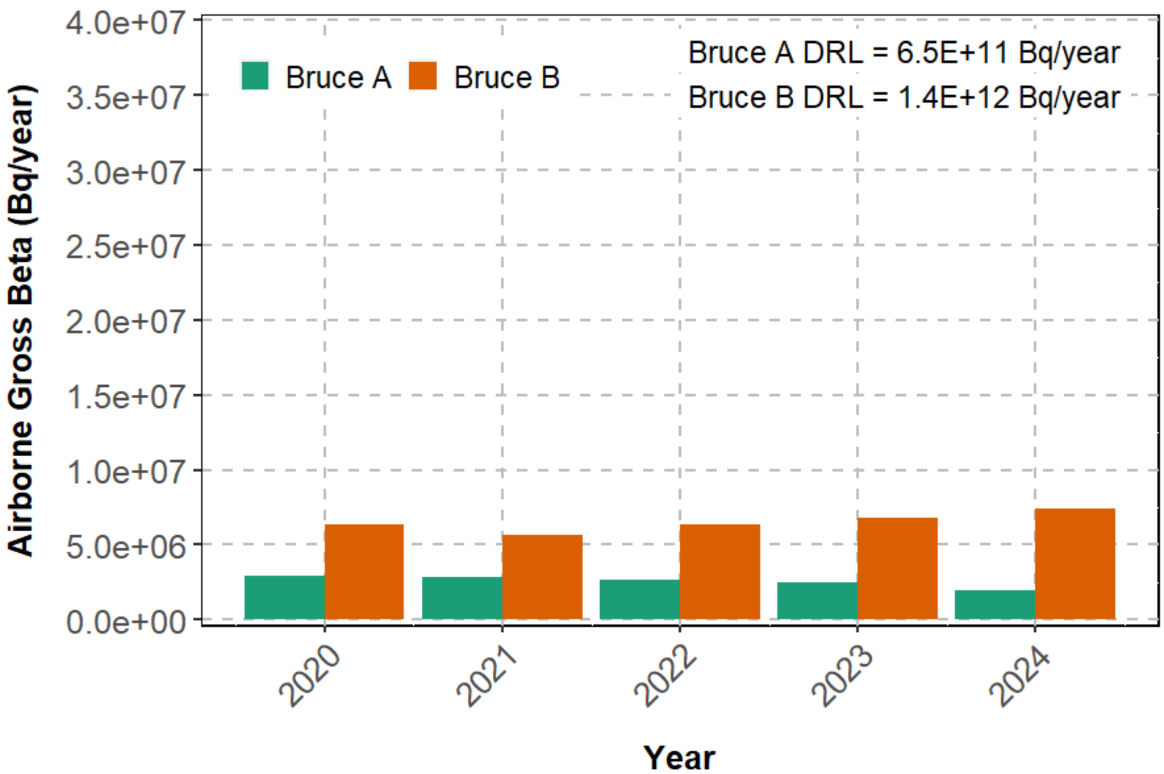


Figure 13 - Historical Particulate Beta/Gamma Emissions in Air - Bruce A and Bruce B

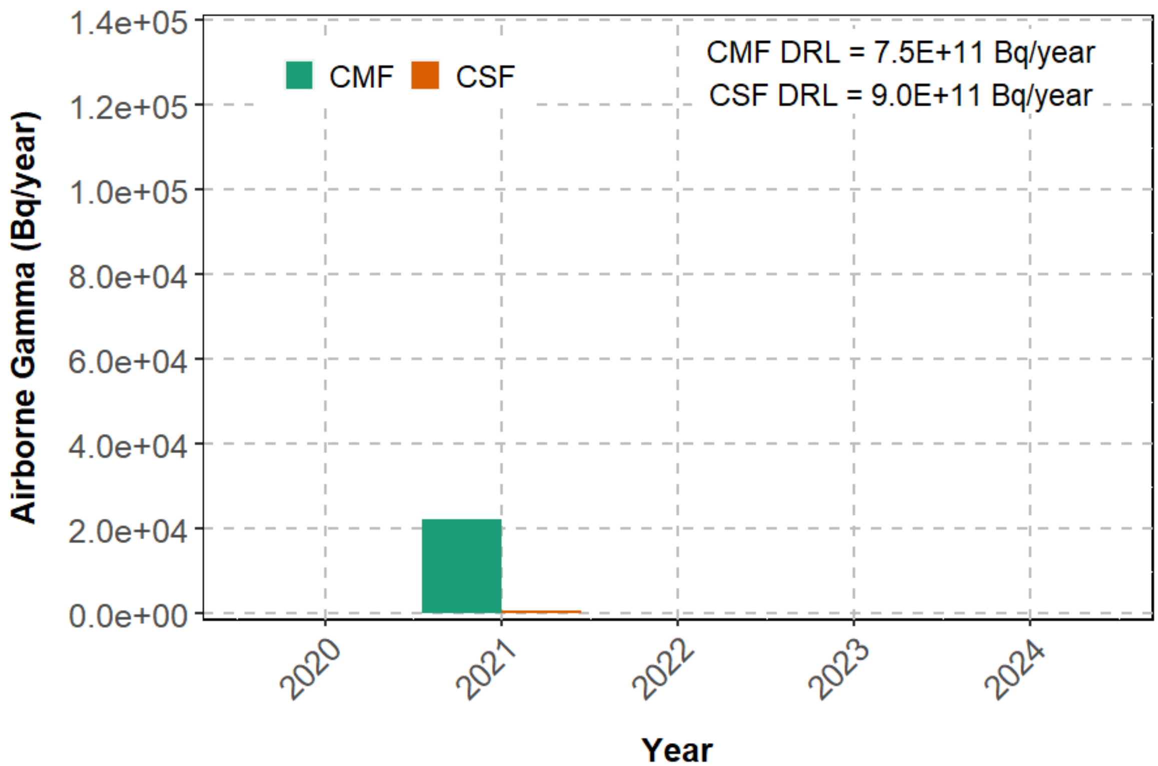


Figure 14 - Historical Particulate Beta/Gamma Emissions in Air - Central Maintenance Facility and Central Storage Facility

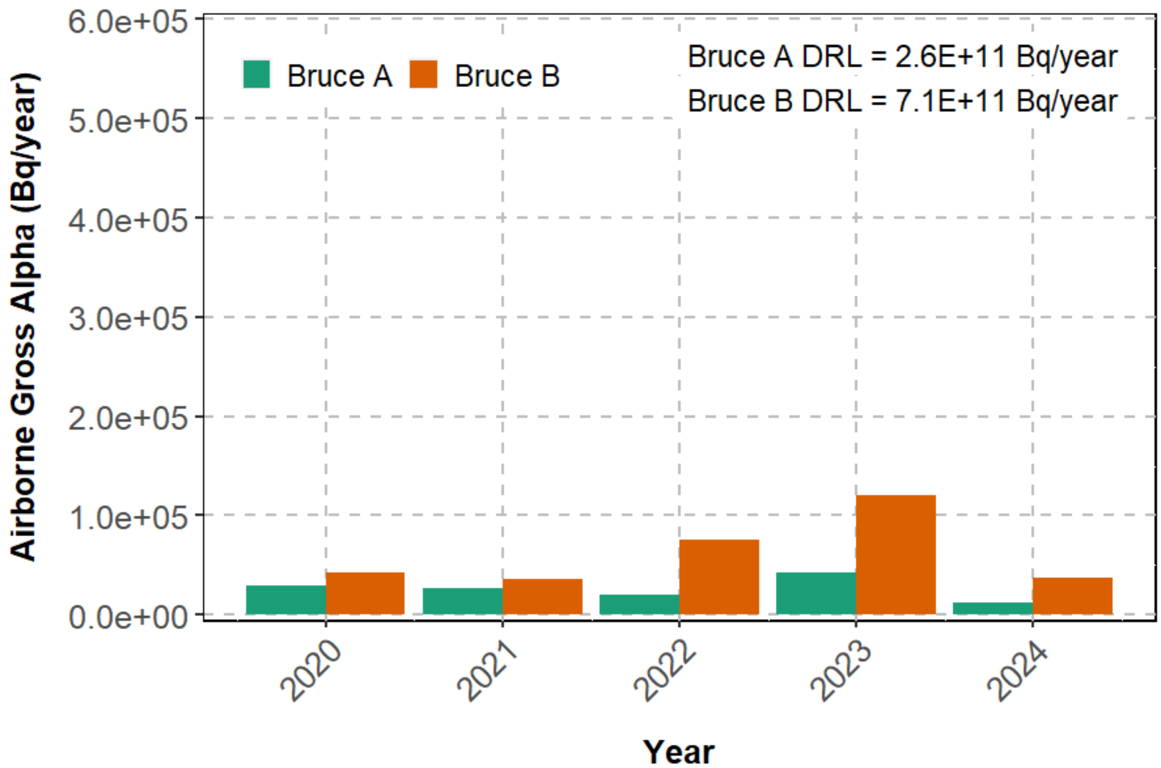


Figure 15 - Historical Particulate Gross Alpha Emissions in Air - Bruce A and Bruce B

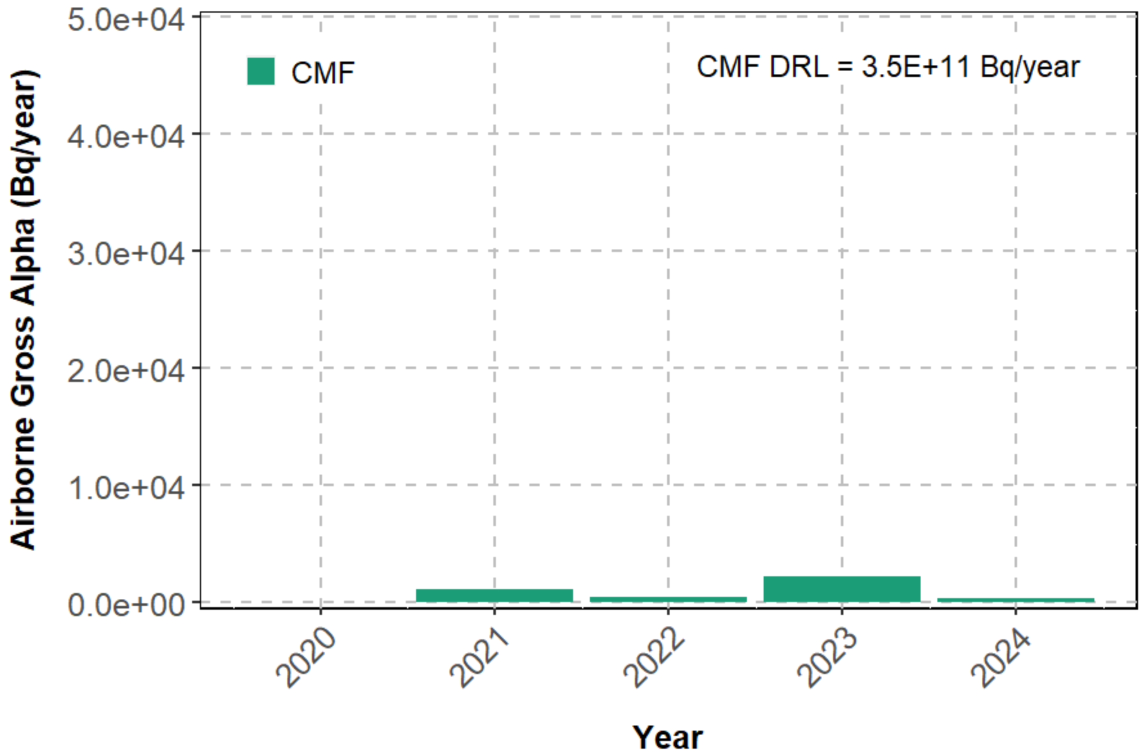


Figure 16 - Historical Particulate Gross Alpha Emissions in Air - Central Maintenance Facility

5.1.3 Waterborne Radiological Effluent

5.1.3.1 2024 Radiological Waterborne Effluent Results

Waterborne radiological effluent, produced during Bruce Power's normal operation and outage activities, remained well below regulatory limits in 2024. Waterborne effluent is monitored through release pathways that include Active Liquid Waste, feedwater discharges and foundation drainage. Ultimately, these effluent streams are discharged to Lake Huron via the Condenser Cooling Water Duct.

Sources for radiological waterborne effluent typically originate within reactor systems such as the moderator and heat transport systems and their auxiliary systems, where minor amounts are collected via systems such as vault vapour recovery or spent resin storage systems and directed to the Active Liquid Waste treatment system prior to discharge.

The largest contributor to waterborne radiological effluent is the Active Liquid Waste system. Water in this system is collected in tanks and re-circulated to allow time for short-lived radionuclides to decay. Reverse osmosis and filtration systems are also used to remove radioactive particulate. Prior to release, the contents of each tank are re-circulated and analyzed to ensure established discharge criteria are met.

Waterborne effluent loading can fluctuate depending on planned and unplanned activities that take place. Unplanned events that may result in higher radionuclide concentrations in effluent include equipment challenges such as moderator or primary heat transport upgraders being out of service, delays in offsite processing (de-tritiation) of heavy water (D_2O), purification resin exhaustion, and boiler tube leaks. Planned activities for which effluent fluctuations may occur include increased spent resin transfer activities, controlled discharges from collection and recovery systems, and planned outage days where maintenance work is performed on reactor systems to support equipment health and continued safe operation.

Bruce Power has several engineered barriers in place to minimize waterborne radionuclides from being released to the environment. These barriers include moderator and heat transport purification to remove waterborne radionuclides from reactor systems, heavy water in light water (D_2O in H_2O) leak detection to provide indication of a heavy water leak or boiler tube leak, and heavy water (D_2O) supply and inventory systems to maximize the capture of heavy water (D_2O) for re-use. These barriers, in conjunction with applying the as low as reasonably achievable principle, routine monitoring, and initiating investigations when effluent levels are above normal operating levels, assists Bruce Power in minimizing effluent and ensuring effluent remains well below regulatory limits.

Bruce A, Bruce B, Canadian Nuclear Laboratories, and Kinectrics' Ontario Nuclear Services Facility monitor for waterborne radionuclides (as applicable). The 2024 results of waterborne radiological effluents including tritium, carbon-14, particulate gross beta/gamma, and particulate gross alpha from these facilities are presented in Table 11 [R-68][R-69][R-71]. Bruce Power reports quarterly to the CNSC results of radiological waterborne effluents in accordance with the Power Reactor Operating Licence. In 2024, Bruce Power's radiological waterborne effluents were well below regulatory limits as shown in Table 11 which displays Bruce Power's annual effluents as a percentage of the Derived Release Limit, as well as below applicable reportable Environmental Action Levels.

There are no direct waterborne radiological effluent releases to the environment from the Central Maintenance Facility or Central Storage Facility. All radiological waterborne releases from these buildings are directed to Bruce A's Active Liquid Waste management system for processing and are included in the waterborne effluent total for Bruce A.

Starting January 2021, monitoring of discharge from the Western Waste Management Facility's Sample Stations system surface (stormwater) and subsurface (groundwater) streams was transitioned from the effluent monitoring program to CSA N288.6, *Environmental risk assessments at Class I nuclear facilities and uranium mines and mills*, and CSA N288.7, *Groundwater protection programs at Class I nuclear facilities and uranium mines and mills*, respectively [R-28], [R-72]. This change was based on the absence of releases of effluent into the stormwater system—other than the deposition of airborne emissions via precipitation. The monitoring and reporting of these airborne emissions are already managed under the airborne effluent monitoring programs and not reported separately as waterborne effluent [R-73].

Table 11 - Annual Waterborne Radiological Effluent Results for 2024

Facility & Radionuclide/ Radionuclide Group	Bruce A	Bruce B	Canadian Nuclear Laboratories Douglas Point Waste Facility	Total
Tritium Oxide (becquerels per year)	3.5E+14	1.1E+15	2.44E+10	1.4E+15
Carbon-14 (becquerels per year)	1.2E+10	4.9E+09	N/A	1.7E+10
Gross Gamma (becquerels per year)	1.4E+09	3.9E+09	N/A	5.3E+09
Gross Beta (becquerels per year)	N/A	N/A	1.48E+07	1.5E+07
Gross Alpha (becquerels per year)	2.4E+05	3.3E+05	1.18E+07	1.2E+07

Note:

1. There were no waterborne effluents in 2024 for Kinectrics' Ontario Nuclear Services Facility.

2. Radiological waterborne effluents from Bruce Power facilities are primarily processed through the active liquid waste system. Tritium and gross gamma samples are analyzed on a per batch discharge frequency (grab and composite sampling) and gross alpha and carbon-14 samples are analyzed via monthly composite samples.

Table 12 - Annual Radiological Waterborne Effluent Results for 2024 as a Percentage of the Derived Release Limit

Facility & Radionuclide/ Radionuclide Group	Bruce A	Bruce B
Tritium Oxide (% Derived Release Limit)	4.0E-02	1.4E-01
Carbon-14 (% Derived Release Limit)	1.2E-02	2.3E-03
Gross Gamma (% Derived Release Limit)	4.9E-02	6.1E-02
Gross Alpha (% Derived Release Limit)	1.5E-05	1.0E-05

5.1.3.2 Historical Radiological Waterborne Effluent Results

Figure 17 through Figure 20 below provide an overview of the five and ten-year historical trends of annual waterborne radiological effluents at Bruce A and Bruce B. Ten-year historical trends have been developed for Bruce A and Bruce B tritium and carbon-14 effluents as these radionuclides are the principal radionuclides contributing to dose to public (see Section 3.0) with five-year historical trends developed for the remaining radionuclide groups.

Figure 17 details the historical trend for waterborne tritium. Waterborne tritium releases are a minor contributor to the overall dose to the public when compared to airborne tritium. Waterborne tritium effluent at Bruce B has a consistently higher baseline compared to Bruce A due to larger volumes of Moderator Confinement Vapour Recovery condensate routed to the Active Liquid Waste System. Bruce A waterborne tritium effluent in 2024 remained relatively stable compared to historical trends and Bruce B waterborne tritium effluent increased compared to previous years. In 2021, an increase in effluent at Bruce B was primarily attributed to a leaking motorized valve in the Unit 8 Emergency Coolant Injection U loop which was identified and repaired in November 2021. To prepare for the 2024 Bruce B Vacuum Building Outage, planned and closely monitored draining activities of the Bruce B Emergency Water Storage Tank occurred in 2023 and 2024 contributing to waterborne tritium effluent. In 2024 waterborne tritium effluent at Bruce A included a very small, preheater leak in Unit 2 that is on-going and closely monitored. All effluent was well below regulatory limits with dose to public remaining *de minimus*.

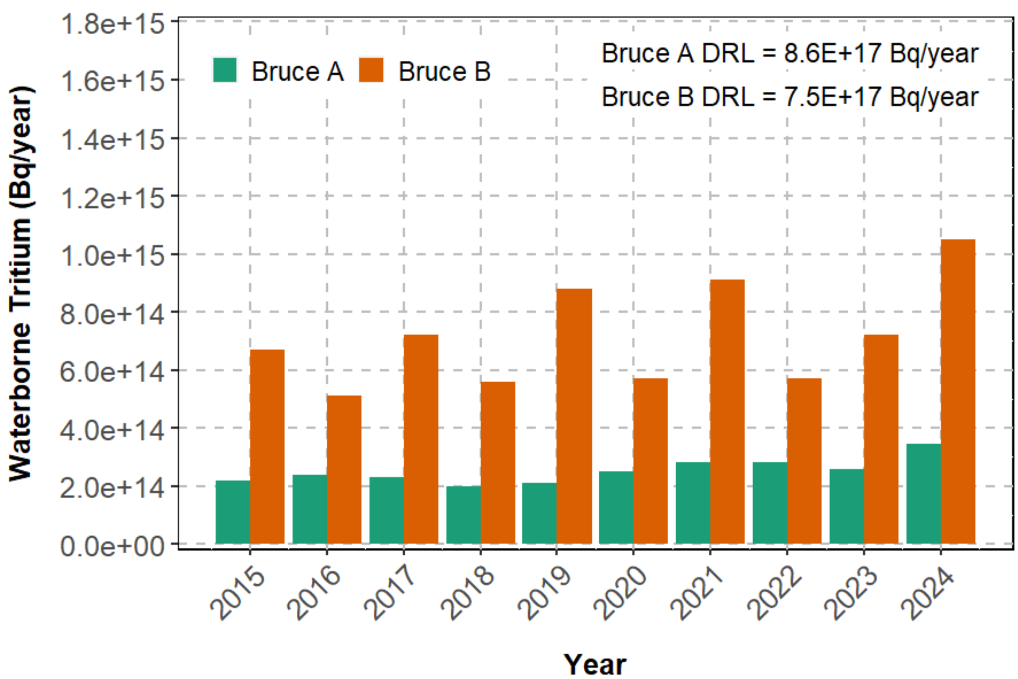


Figure 17 - Historical Tritium Waterborne Effluent

Figure 18 details the historical trend of waterborne carbon-14 effluent. Carbon-14 in water is a radiological effluent associated with dose to public and control/oversight is provided through Bruce Power's resin management program. The total annual 2024 waterborne carbon-14 effluent increased at Bruce A compared to 2023 with Bruce B remaining similar. Carbon-14 in waterborne effluent can fluctuate due to variations in the volume of spent ion exchange resins that are processed for waste each year. In 2015, 2023, and 2024 increases in carbon-14 effluent at Bruce B were attributed to preparation activities supporting the Vacuum Building Outage including drainage of the Emergency Water Storage Tank. In 2022, Bruce A and Bruce B carbon-14 waterborne effluent remained low; however, carbon-14 effluent increases experienced in 2023 and 2024 at Bruce A were a result of increased spent resin dewatering activities that were planned and required to support outages including the first of a kind heat transport chemical decontamination activities associated with Major Component Replacement. Waterborne- carbon14 effluent remained well below regulatory limits with dose to public remaining *de minimus*.

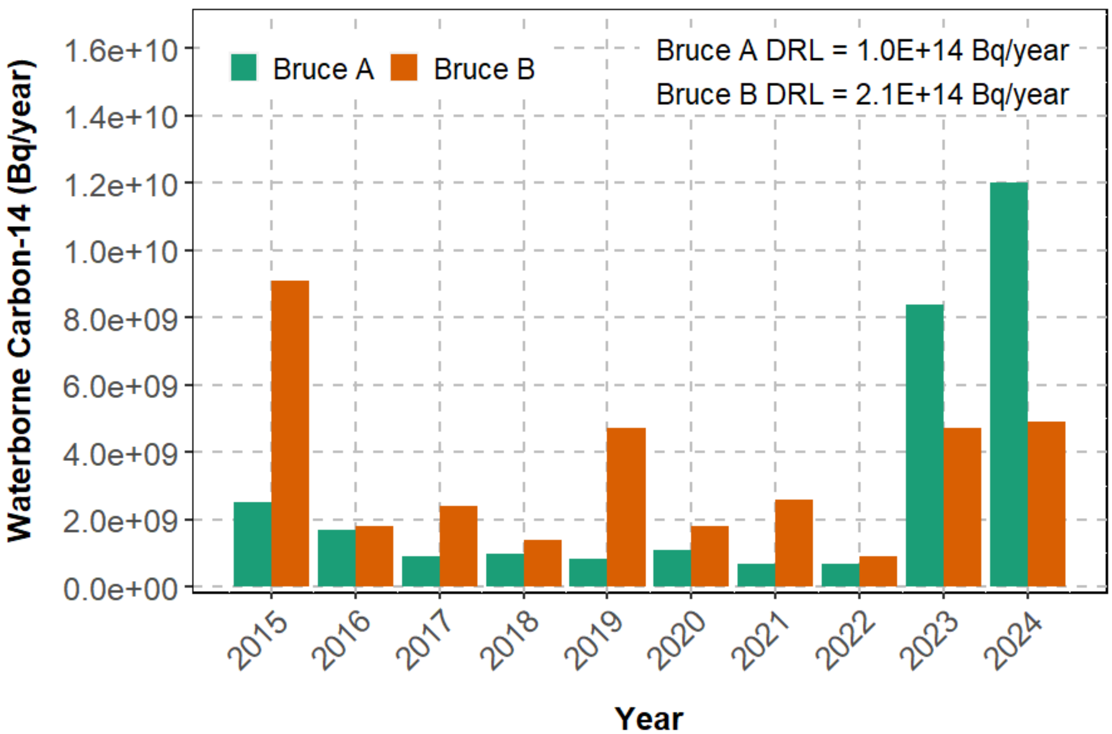


Figure 18 - Historical Carbon-14 Waterborne Effluent

Bruce A and Bruce B historical waterborne gross gamma effluent is shown in Figure 19 and waterborne gross alpha effluent is shown in Figure 20. Bruce A and Bruce B waterborne gross gamma and gross alpha effluent in 2024 remained low and well within regulatory limits. Bruce A experienced slightly elevated levels of gamma in effluent in late 2021 due to water ingress into the Primary Irradiated Fuel Bay and the associated controlled discharges of this water to the Active Liquid Waste System to maintain bay levels. In 2023 and 2024, Bruce B experienced increased levels of gamma in effluent primarily due to planned spent resin dewatering activities that were processed through the active liquid waste system and discharged in a controlled manner. In April 2024, the Bruce B active liquid waste ion exchange filtration system was returned to service to reduce waterborne particulates prior to discharging. As shown in Figure 28 there were no waterborne gross alpha effluent from 2020 to 2022 at Bruce A and Bruce B as all results were less than the Minimum Detectable Activity. In 2023 and 2024, a shift to reporting results greater than critical level (below the Minimum Detectable Activity threshold) occurred and as displayed gross alpha effluents continued to remain extremely low with a majority of results less than the Minimum Detectable Activity. Gross gamma and gross alpha effluent remained well below regulatory limits with dose to public remaining *de minimus*.

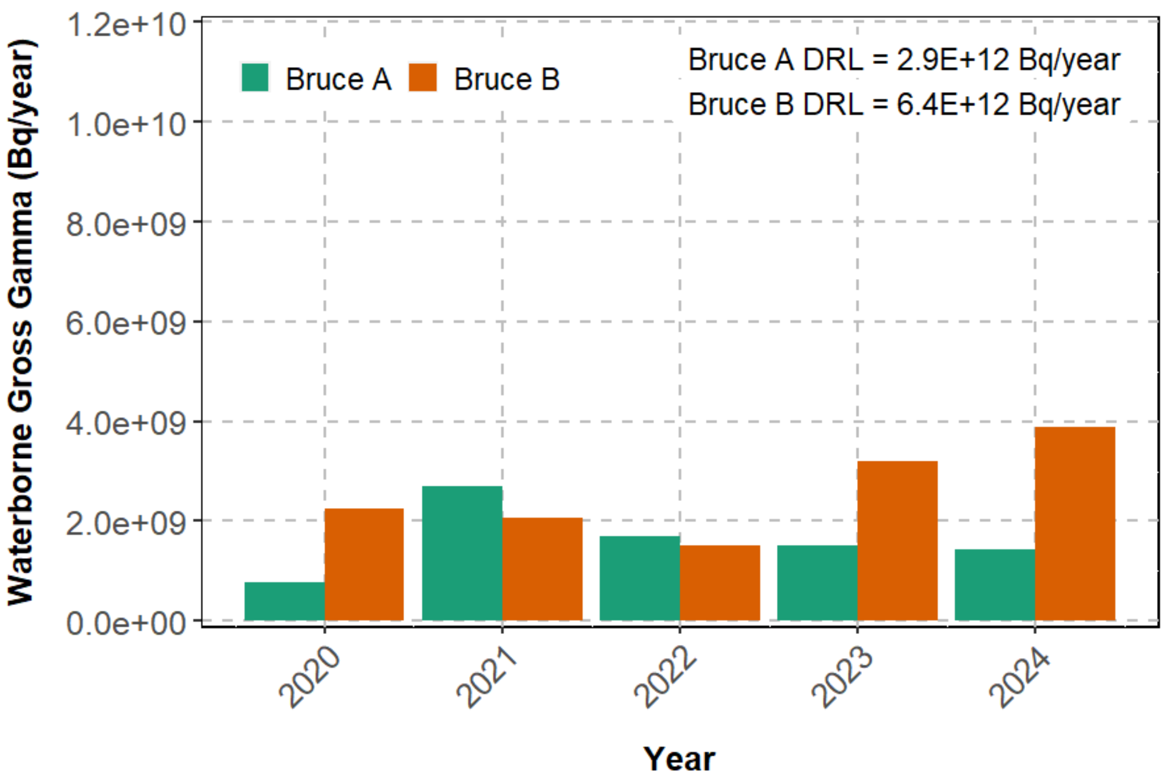


Figure 19 - Historical Waterborne Gross Beta/Gamma Effluent

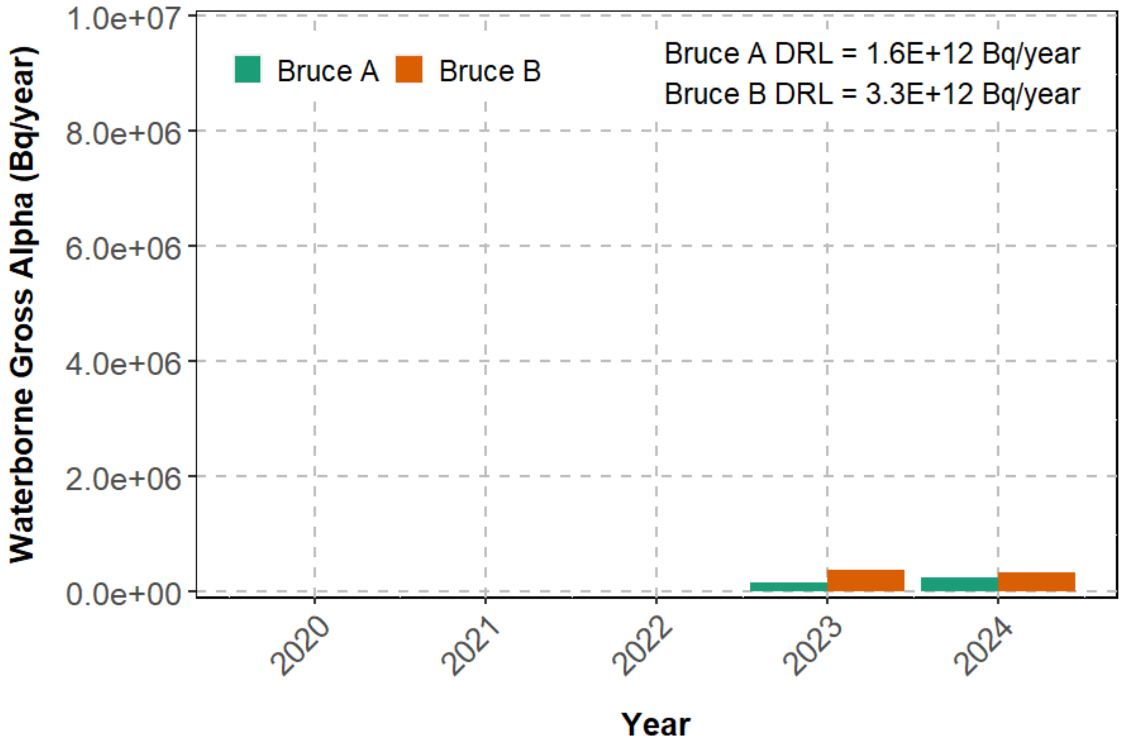


Figure 20 - Historical Waterborne Gross Alpha Effluent

5.1.3.3 Sewage

Domestic wastewater (sanitary sewage) is collected from all facilities at the Bruce Power site including Bruce A and Bruce B, Central Maintenance Facility, Central Storage Facility, Canadian Nuclear Laboratories (Douglas Point), Ontario Power Generation (Western Waste Management Facility) and Centre of Site buildings. This wastewater is treated onsite at the Bruce Power Sewage Processing Plant. The sanitary sewage collection system is a 10 kilometer network of gravity sewers and force mains.

The sewage processing plant has an average design flow capacity of 1,590 cubic metres per day and a maximum design flow capacity of 4,700 cubic metres per day. The plant consists of an inlet chamber, aerated equalization tank, screening and grinding equipment, liquid chemical injection, and two parallel biological treatment trains consisting of aeration tanks, settling tanks, and aerobic sludge digesters, followed by ultraviolet disinfection, and two onsite lagoons for sludge storage. Final effluent from the plant is discharged to Lake Huron via a gravity pipe to the Lake Huron outfall located near Douglas Point.

Sewage processing plant effluent monitoring data includes radiological analytical results from the treated liquid effluent routed to the lake and the sludge digester tanks routed to onsite lagoons.

As shown in Table 13 and Table 14, quarterly and annual averages for radiological parameters in sewage sludge and sewage effluent in 2024 were low and remained well below Bruce Power's internal acceptance criteria of 5,956 becquerels per litre for tritium, 4.3 becquerels per litre for gross beta, and 9.0 becquerels per litre for gross gamma. Additionally, the annual averages are well below the Ontario Drinking Water Quality Objective for tritium (7,000 becquerels per litre) [R-74].

Table 13 - 2024 Sewage Processing Plant - Sewage Digester Sludge

Sample Source	Tritium (becquerels per litre)	Gamma (becquerels per litre)
Quarter 1	310	0.022
Quarter 2	480	0.16
Quarter 3	320	None detected
Quarter 4	180	None detected
Annual Average	320	0.046

Note:

1. Beta analyses are not done on sludge samples due to sample beta-self absorption.

2. Sewage processing plant sewage digester sludge is sampled and analyzed via grab samples when digester sludge is transferred to the sewage lagoon.

Table 14 - 2024 Sewage Processing Plant - Sewage Effluent

Sample Source	Tritium (becquerels per litre)	Gross Beta (becquerels per litre)
Quarter 1	310	0.48
Quarter 2	760	0.60
Quarter 3	200	0.49
Quarter 4	150	0.56
Annual Average	360	0.53

Note:

1. Gamma analyses are not done on effluent samples since beta analysis is the most sensitive analysis for liquids.

2. Sewage processing plant sewage effluent is sampled and analyzed weekly via a 24-hour composite sample.

5.2 Conventional (Non-Radiological) Emissions and Effluent Monitoring

Bruce Power performs extensive modelling and monitoring of its emissions and effluent for conventional/hazardous contaminants to ensure that releases occur within acceptable limits and environmental impact is minimized.

The objectives of the conventional emission and effluent monitoring program are to:

- Demonstrate compliance with authorized release limits and any other regulatory requirements concerning the release of hazardous substances from the source;
- Demonstrate adherence to internal objectives and targets set on release amounts, for purposes of effluent control;
- Confirm the adequacy of control on releases from the source and ensure that appropriate measures are taken if new or existing activities will increase or change air or water emissions;
- Inform continual improvement strategies;
- Provide an indication of unusual or unforeseen conditions that might require corrective action or additional monitoring;
- Provide data to assess the level of risk on human health and safety, and the potential biological effects in the environment of the hazardous substances of concern released from the facility;
- Assist with determining whether a discharge/release event is reportable to external regulators; and
- Provide data which, when combined with the results of environmental monitoring, can be used to test, verify or refine models used in Environmental Risk Assessments, and incorporate recommendations into program design.

The results of monitoring events are submitted to the appropriate environmental Authorities Having Jurisdiction at various times throughout the year. Table 15 provides a summary of the monitoring reports that Bruce Power submits throughout the year as well as identifies the time of submission and the lead regulatory agency. The reports provide details and information necessary to meet regulatory reporting requirements. The following sections describe some of the regulatory context for each report.

5.2.1 Conventional (Non-Radiological) Emissions and Effluent Monitoring Program Methodologies

Effluent sampling and monitoring is conducted in compliance with limits set forth in the following:

- *Ontario Regulation 419/05: Air Pollution - Local Air Quality* [R-75], the *Environmental Protection A*ct (R.S.O. 1990, c. E. 19) [R-14]
- *Ontario Water Resources Act* (R.S.O. 1990, c.O.40) [R-76]
- Environmental Compliance Approvals issued by the Ministry of the Environment Conservation and Parks [R-77] [R-77] [R-78][R-79]
- Permits to Take Water issued by Ministry of the Environment Conservation and Parks and with Internal Administrative Levels [R-80] [R-81] [R-82]*Ontario Regulation 390/18: Greenhouse Gas Emissions: Quantification, Reporting and Verification* [R-83]
- *Federal Halocarbon Regulations, 2022, SOR/2022-210* [R-84]
- Notice to Report: Under the authority of Section 46 of the *Canadian Environmental Protection Act*, operators of facilities that meet the criteria specified in the annual notice with respect to reporting of greenhouse gases, published in the Canada Gazette, are required to report facility Greenhouse Gas emissions to Environment and Climate Change Canada by the annual June 1st reporting deadline [R-85].
- Notice to Report: Under the authority of the *Canadian Environmental Protection Act*, 1999
(CEPA 1999), owners or operators of facilities that meet published reporting requirements are required to report to the National Pollutant Release Inventory [R-86]
- *Ontario Regulation 463/10: Ozone Depleting Substances and other Halocarbons* [R-87]
- *Ozone-Depleting Substances and Halocarbon Alternatives Regulations (SOR/2016-137)* [R-88]

Table 15 – 2024 Bruce Power Regulator Reporting for Conventional Parameters

Regulatory Instrument	**Report Title (Document Control Number)**	**Regulatory Agency**	**Submission Date (Frequency)**
Air – Environmental Compliance Approval	Written Summary for Reporting Year 2024 Environmental Compliance Approval – Air 7747-8PGMTZ	Ministry of the Environment, Conservation and Parks	15JUN2025 (Annual)
Air - Halocarbon	Halocarbon Release Report Pursuant to the *Federal Halocarbon Regulations (SOR/2022-210)* Section 25 January to June 2024 (BP-CORR-00521-00079)	Environment and Climate Change Canada	31JUL2024 (Semi-annual)
Air - Halocarbon	Halocarbon Release Report Pursuant to the *Federal Halocarbon Regulations (SOR/2022-210)* Section 25 July to December 2024 (BP-CORR-00521-00087)	Environment and Climate Change Canada	31JAN2025 (Semi-annual)
Air – Greenhouse Gas	Not required to report 2024 Federal and Provincial Greenhouse gas Reporting	Internal Report	Quantify Greenhouse Gas emissions by 01JUN2025 (Annual) Not required to report
Air – National Pollutant Release Inventory	2024 National Pollutant Release Inventory for Bruce Power NPRI ID #7041	Environment and Climate Change Canada	01JUN2025 (Annual)
Water – Annual Effluent	2024 Annual Effluent Discharge Report (BP-CORR-00541-00273)	Ministry of Environment, Conservation and Parks	01JUN2025 (Annual)
Water – Quarterly Effluent and Environmental Compliance Approval Report	Q1 2024 Effluent Discharge Report (BP-CORR-00541-00220)	Ministry of Environment, Conservation and Parks	15MAY2024(Quarterly)
Water – Quarterly Effluent and Environmental Compliance Approval Report	Q2 2024 Effluent Discharge Report (BP-CORR-00541-00221)	Ministry of Environment, Conservation and Parks	14AUG2024 (Quarterly)
Water – Quarterly Effluent and Environmental Compliance Approval Report	Q3 2024 Effluent Discharge Report (BP-CORR-00541-00261)	Ministry of Environment, Conservation and Parks	14NOV2024 (Quarterly)

Regulatory Instrument	Report Title (Document Control Number)	Regulatory Agency	Submission Date (Frequency)
Water – Quarterly Effluent and Environmental Compliance Approval Report	Q4 2024 Effluent Discharge Report (BP-CORR-00541-00270)	Ministry of Environment, Conservation and Parks	14FEB2025 (Quarterly)
Water – Environmental Compliance Approval	2024 Environmental Compliance Approval (Water) Annual Compliance Report for Bruce A (BP-CORR-00541-00277)	Ministry of Environment, Conservation and Parks	31MAR2025(Annual)
Water – Environmental Compliance Approval	2024 Environmental Compliance Approval (Water) Annual Compliance Report for Bruce B (BP-CORR-00541-00278)	Ministry of Environment, Conservation and Parks	31MAR2025 (Annual)
Water – Environmental Compliance Approval	2024 Environmental Compliance Approval (Water) Annual Compliance Report for Centre-of-Site (BP-CORR-00541-00276)	Ministry of Environment, Conservation and Parks	31MAR2025 (Annual)
Water – Permit to Take Water	2024 BA Water Taking Data - Permit to Take Water # P-300-2114648110 (BP-CORR-00541-00279)	Ministry of Environment, Conservation and Parks	31MAR2025 (Annual)
Water – Permit to Take Water	2024 BB Water Taking Data - Permit to Take Water # P-300-4114675736 (BP-CORR-00541-00275)	Ministry of Environment, Conservation and Parks	31MAR2025 (Annual)
Water – Permit to Take Water	2024 CS Water Taking Data - Permit to Take Water # P-300-7116089842 (BP-CORR-00541-00276)	Ministry of Environment, Conservation and Parks	31MAR2025 (Annual)
Water – *Wastewater Systems Effluent Regulation*	2024 Q1 Wastewater Systems Effluent Regulation Report (BP-CORR-00521-00076)	Environment Climate Change Canada	15MAY2024 (Quarterly)
Water – *Wastewater Systems Effluent Regulation*	2024 Q2 Wastewater Systems Effluent Regulation Report (BP-CORR-00521-00081	Environment Climate Change Canada	14AUG2024 (Quarterly)

Regulatory Instrument	**Report Title (Document Control Number)**	**Regulatory Agency**	**Submission Date (Frequency)**
Water – *Wastewater Systems Effluent Regulation*	2024 Q3 Wastewater Systems Effluent Regulation Report (BP-CORR-00521-00085)	Environment Climate Change Canada	14NOV2024 (Quarterly)
Water – *Wastewater Systems Effluent Regulation*	2024 Q4 Wastewater Systems Effluent Regulation Report (BP-CORR-00521-00089)	Environment Climate Change Canada	14FEB2025 (Quarterly)

5.2.2 Conventional Air Emissions

5.2.2.1 Environmental Compliance Approval

Conventional air emissions are held to performance standards stipulated in Environmental Compliance Approval for Air Number 7477-8PGMTZ [R-89] which incorporates all non-radiological air emission sources on site. The Environmental Compliance Approval for Air allows flexibility to release contaminants up to a maximum Point of Impingement concentration limit at its property boundary. These limits are typically Ministry of the Environment, Conservation and Parks limits (as per *Ontario Regulation 419/05*) [R-75], and for cases where there is no pre-defined Ministry of the Environment, Conservation and Parks Point of Impingement limit, Bruce Power is bound by a Maximum Ground Level Concentration accepted by the Ministry of the Environment, Conservation and Parks upon its Environmental Compliance Approval for Air application submission.

An application to renew Bruce Power's Environmental Compliance Approval for Air Limited Operational Flexibility is currently under review by the Ministry of the Environment, Conservation and Parks. The Ministry of the Environment, Conservation and Parks Director issued a letter indicating that Condition 2.1 of the Environmental Compliance Approval for Air allows the Limited Operational Flexibility to remain in effect until the Environmental Compliance Approval for Air has been revoked with the issuance of the new Limited Operational Flexibility. All other Terms and Conditions of the Environmental Compliance Approval for Air remain in effect [R-90].

Air contaminants of concern are modelled for all non-negligible sources in worst-case scenarios. Estimated emission rates are then analyzed to ensure regulatory limits at the Point of Impingement are met. While Bruce Power is bound by Environmental Compliance Approval for Air performance limits, the company has operational flexibility to do things like modify the location of emissions sources or add new buildings and exhaust stacks, once it can be demonstrated that it will remain within these limits. The total facility emission rates, maximum point of impingement concentrations and limits are presented in Table 16.

Table 16 – Emission Summary Table

Contaminant	Total Facility Emission Rate (grams/second)	Maximum Point of Impingement Concentration (micrograms/cubic meter)	Averaging Period	Point of Impingement Limit (micrograms/cubic meter)	Percentage of Point of Impingement Limit
Aliphatic Naphtha	1.68	87	24-hour	122.5	71.1
Ammonia	1.42	3.06	24-hour	100	3.1
Ethanolamine	0.182	0.389	24-hour	35	1.1
Ferric/Iron Oxide	0.0693	3.02	24-hour	25	12.1
Hexavalent Chromium	0.00000294	0.00000154	Annual	0.00014	1.1
Hydrazine	0.0315	0.121	24-hour	0.14	84.3
Manganese	0.0101	0.388	24-hour	0.4	96.9
Methylamine	0.192	0.409	24-hour	25	1.6
Morpholine	2.76	5.80	24-hour	200	2.9
Nickel	0.00000643	0.00000662	Annual	0.04	<1
Nitrogen Oxides	4.25	14.7	24-hour	200	7.3
Nitrogen Oxides	4.25	110	1-hour	400	27.4
Nitrogen Oxides – Emergency	46.0	1470	0.5-hour	1880	78.4
Particulate Matter	0.397	7.33	24-hour	120	6.1
Propylene Glycol	0.0858	1.62	24-hour	120	1.3
Sulphur Dioxide	0.762	27.9	1-hour	100	27.9
Sulphur Dioxide	0.762	0.362	Annual	10	3.6
Xylene	0.555	342	10-minute	3000	11.4
Xylene	0.555	28.8	24-hour	730	4.0
Toluene	1.11	57.6	24-hour	2000	2.9

Specific contaminants emitted from non-negligible air emission source on site are identified in the Emission Summary and Dispersion Modelling report that reflects the actual operation of the facility [R-75]. Specific contaminants emitted from non-negligible air emission source on site are identified in the Emission Summary and Dispersion Modelling report that reflects the actual operation of the facility [R-75].

Bruce Power maintains an up-to-date Emission Summary and Dispersion Modelling report that reflects current operations. Upon making any modifications (within the bounds of the operational flexibility prescribed in the Environmental Compliance Approval for Air [R-89]), the modification log and Emission Summary and Dispersion Modelling report are updated to document that the facility is in compliance. For temporary modifications, a memorandum is prepared to document the temporary change which supplements the Emission Summary and Dispersion Modelling report. The Emission Summary and Dispersion Modelling Report shows that:

1. The nature of the operations of the facility continues to be consistent with the description section of the Environmental Compliance Approval for Air;
2. The production at the facility continues to be below the facility production limit specified in the Environmental Compliance Approval for Air; and
3. The performance limits are met.

During 2024, four modification notifications were submitted to the Ministry of the Environment, Conservation and Parks for welding, oxy propane torch cutting, and the use of diesel compressors and generators as follows:

- Temporary welding and plasma cutting activities conducted at the Major Component Replacement storage area near building B16.
- Temporary oxy-propane torch cutting activities to cut through old turbine rotors conducted outdoors southwest of Bruce A.
- Various diesel compressors and generators were required for the Bruce B Vacuum Building Outage.
- A temporary 500 kilowatt diesel generator was required to provide power for a chiller and heat exchanger to provide supplemental cooling for Bruce B Unit 8 vault.

The modifications demonstrated compliance with the Point of Impingement limits (as per Ontario Regulation 419/05) and the conditions of Bruce Power's Environmental Compliance Approval for Air.

5.2.2.2 Noise

The Environmental Compliance Approval for Air [R-89] requires that Bruce Power is within the noise limits of Noise Pollution Clearinghouse-232 Sound Level Limits for Stationary Sources in Class 3 Areas (Rural).

Noise monitoring conducted between 2015 and 2020, demonstrated that the sound levels at the concerned receptors complied with the quantitative limits stipulated by the Ministry of Environment, Conservation and Parks.

The studies did, however, reveal that the Bruce Power facility can be audible at Inverhuron Provincial Park and along Lake Street when background sound levels are at a minimum. There were no noise complaints received from nearby residents in 2024.

5.2.2.3 Halocarbon Management & Releases

In Canada, the federal, provincial, and territorial governments have legislation to protect the ozone layer and manage ozone depleting substances and their halocarbon alternatives. The use and handling of these substances are regulated by the provinces and territories in their respective jurisdictions-, and through the *Federal Halocarbon Regulations*, 2022 [R-91] for refrigeration, air conditioning, fire extinguishing, and solvent systems under Federal jurisdiction. Bruce Power is governed by both the provincial and federal regulations.

Figure 21 below provides the number of reportable halocarbon releases across site for the 2024 calendar year. These releases are broken down by magnitude. Halocarbon releases of 10 – 100 kilograms are reported to Environment and Climate Change Canada in semi-annual release reports. Halocarbon releases greater than 100 kilograms are immediately reportable to Environment and Climate Change Canada and Ministry of the Environment, Conservation and Parks.

There were nine releases between 10 – 100 kilograms and four releases greater than 100 kilograms in 2024.

Although the number of reportable releases increased in 2024, several of the releases were identified during increased leak checks on equipment containing greater than 100 kilograms of halocarbons. Leak check frequency was increased on large equipment in an effort to reduce the volume of halocarbons released by identifying in a more timely manner. Three of the four releases greater than 100 kilograms were due to a quality issue with relief valves on Main Control Room Chillers at Bruce B. Following the releases, extensive investigations were conducted to determine corrective actions to reduce the risk of halocarbon releases. Corrective actions included the prompt replacement of the relief valves for Bruce B Main Control Room Chillers and later replacement of similar relief valves on the Main Control Room Chillers at Bruce A.

Additional improvements to the halocarbon management program are being tracked with a specific focus on prevention and detection for equipment containing greater than 100 kilograms of halocarbon.

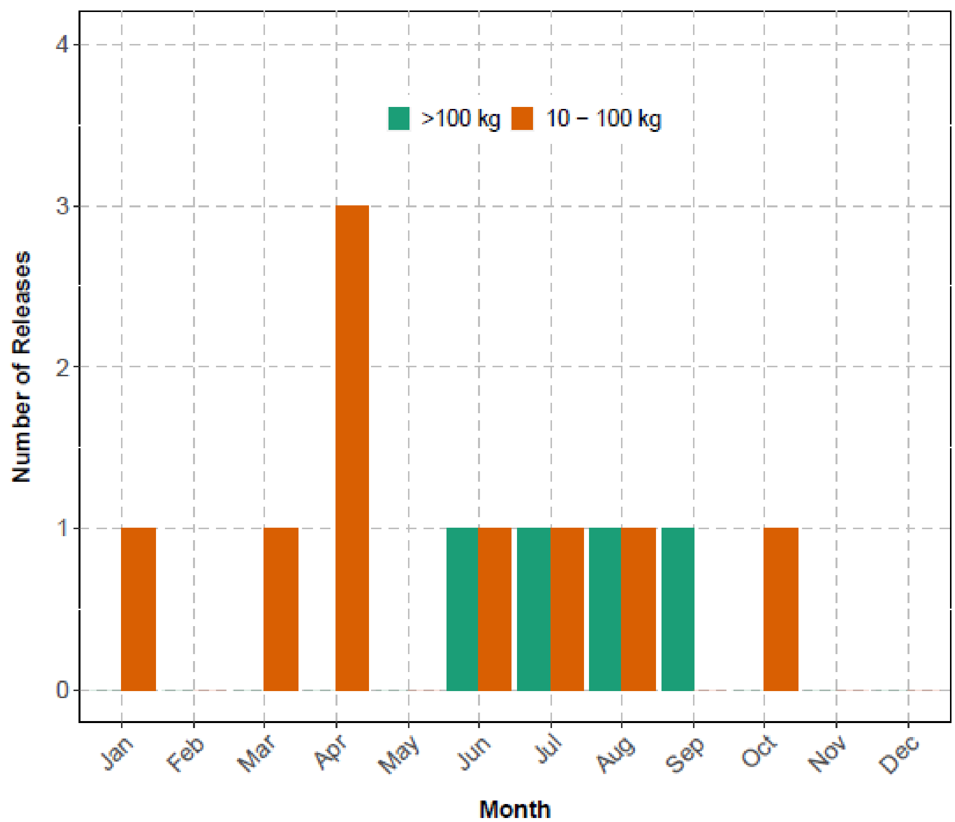


Figure 21 - 2024 Bruce Power Halocarbon Release Occurrences

<u>Historical Halocarbons Releases</u>

The environmental impact of these halocarbon discharges is reduced as a result of the older ozone depleting refrigerants (chlorofluorocarbon and hydrochlorofluorocarbons) being replaced by hydrofluorocarbons with negligible impact on the ozone layer (examples include R134a and R410). Hydrofluorocarbons however have high global warming potential and pose a threat as a greenhouse gas [R-91].

Figure 22 below provides the historical trend of the total number of halocarbon releases since 2015. Between 2017 and 2020, no halocarbon releases greater than 100 kilograms were reported to Environment and Climate Change Canada. However, three halocarbon releases greater than 100 kilograms were reported to Environment and Climate Change Canada in 2021 (Bruce B – 317 kilograms, Bruce B - 209 kilograms and Centre of Site – 99 kilograms), two releases were reported in 2022 (Centre of Site – 215 kilograms and Bruce A – 274 kilograms) and four releases were reported in 2024 (Bruce B – 172, 168 and 243 kilograms and Centre of Site – 138 kilograms). The 99 kilograms release at Centre of Site in 2021 was conservatively reported given that the exact volume of halocarbon release cannot be determined due to the accuracy of instrumentation.

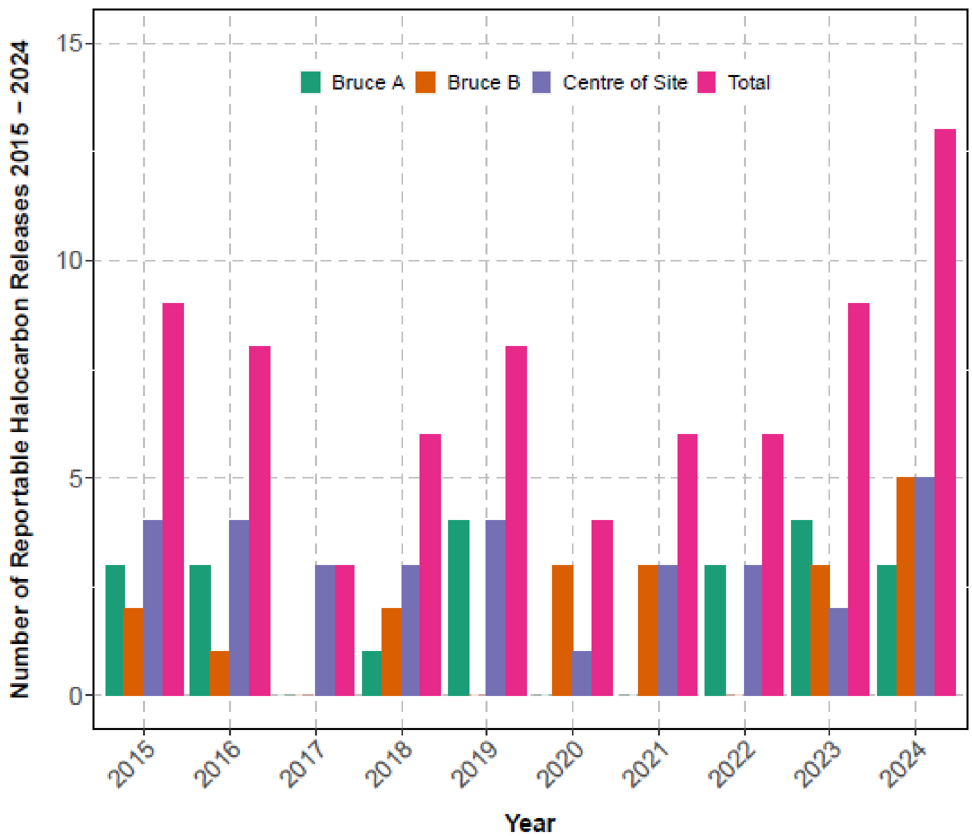


Figure 22 - Historical Bruce Power Halocarbon Releases

5.2.2.4 Greenhouse Gas Emissions

The provincial threshold for reporting greenhouse gas emissions dropped from 25,000 tonnes of carbon dioxide equivalent to 10,000 tonnes of carbon dioxide equivalent in 2015. Bruce Power was below the 25,000 tonnes of carbon dioxide equivalent threshold in 2013 and 2014 and below the 10,000 tonnes of carbon dioxide equivalent threshold from 2015 to 2023. In order to cease reporting, there must be three consecutive years reported under the threshold. Therefore, 2015 was the last year of reporting greenhouse gas emissions.

Greenhouse gas emissions will continue to be calculated for 2024 and onwards to confirm they remain below threshold values. The calculation of 2024 emissions will be completed by June 1, 2025.

Historical Greenhouse Gas Emissions

Figure 23 shows greenhouse gas emissions from 2014 to 2023. Greenhouse gas emissions on site have been consistent since the Bruce Steam Plant shut down. The Steam Plant last operated in 2015 to supplement the Vacuum Building Outage at Bruce B and was officially shut down in December of 2015 when the stack was removed. Since 2012, greenhouse gas emissions from Bruce Power included combustion of stove oil and diesel by boilers at the steam plant and combustion of stove oil and diesel from stationary equipment (examples include: standby generators, temporary generators, heaters). Greenhouse gas emissions decreased in 2023 due to a reduction in standby generator test runs and a reduction in the volume of halocarbons released.

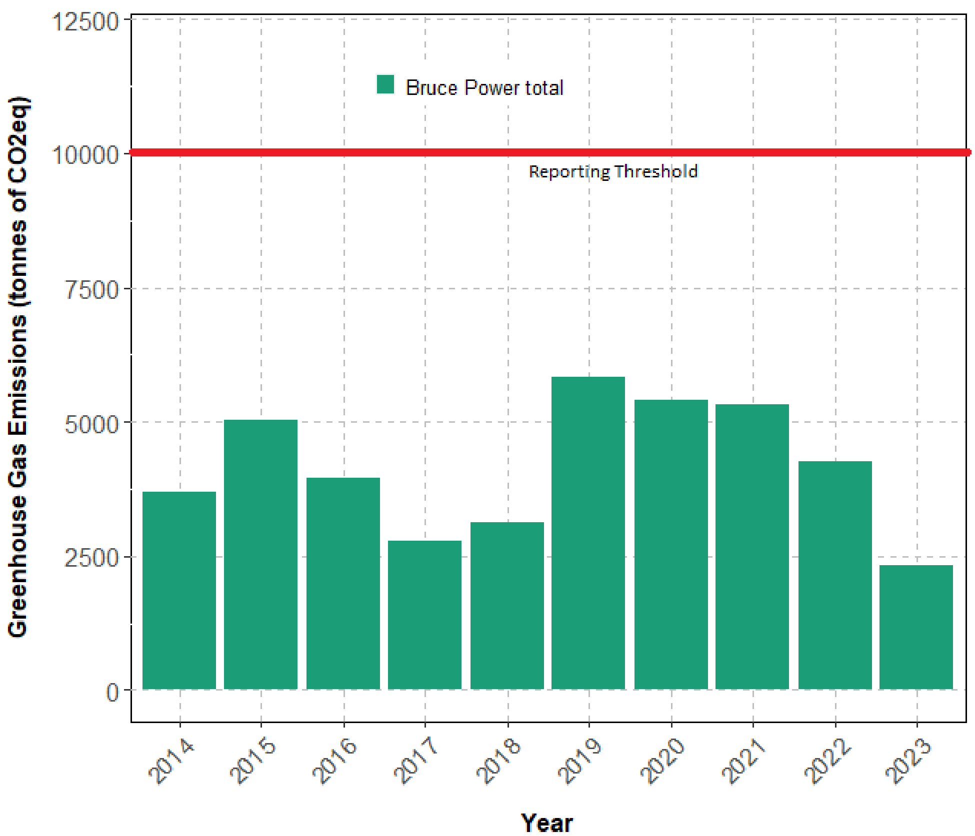


Figure 23 - Provincial Greenhouse Gas Reporting Tonnes Carbon Dioxide Equivalent - Conventional Air

In March of 2021, Bruce Power made a commitment to achieving Net Zero greenhouse gas emissions from site operations by 2027. The Net Zero 2027 Strategy outlines how emissions reduction targets will be achieved and our structured approach to supporting both Provincial and Federal Climate Change goals. Bruce Power met emissions reduction targets in 2024 and continues to work on the implementation of operational initiatives, local carbon sequestration and offset projects, as well as participating in the Ontario Clean Energy Program. Details of Bruce Power's Net Zero 2027 goals and progress are included in the 2024 Sustainability Report.

5.2.2.5 National Pollutant Release Inventory

The National Pollutant Release Inventory is Canada's legislated, publicly accessible inventory of pollutant releases, disposals and recycling. National Pollutant Release Inventory information is a major starting point for identifying and monitoring sources of pollution in Canada, and in developing indicators for the quality of air, land, and water. The National Pollutant Release Inventory provides Canadians with annual information on industrial, institutional, commercial, and other releases and transfers in Canadian communities [R-91].

Bruce Power complies with reporting requirements and regulatory limits, as shown in Section 5.2. Bruce Power's National Pollutant Release Inventory contaminants reported for the 2023 calendar year are presented in Table 17. Calculations and reporting for the 2024 calendar year will be completed by June 1, 2025.

Table 17 - National Pollutant Release Inventory Contaminants Reported for 2023

Contaminant	**Volume to Air (kilograms)**	**Volume to Water (kilograms)**	**Volume to Land (kilograms)**
Ammonia (total)	8,465.8	3,105.8	-
Hydrazine	20.3	1,441.7	188.1
Lead	12.4	-	281.7
Oxides of nitrogen	13,214.4	-	-
Particulate Matter 10	4,210.9	-	-
Particulate Matter 2.5	3,207.2	-	-
Volatile organic compounds	14,531.3	-	-

A graphical comparison of releases reported under National Pollutant Release Inventory to air, water and land is shown in Figure 24.

Changes to reporting requirements and refinements to calculations over the years has resulted in changes to ammonia, hydrazine and volatile organic compound releases to air. Refinements to construction dust calculations were made in 2020 resulting in changes to emissions of particulate matter and hence the step change in emissions. In addition, parking lot construction during 2020 resulted in an increase in particulate matter emissions. Nitrogen oxide emissions decreased in 2023 due to a reduction in the consumption of stove oil for standby generators due to a reduction in testing frequency.

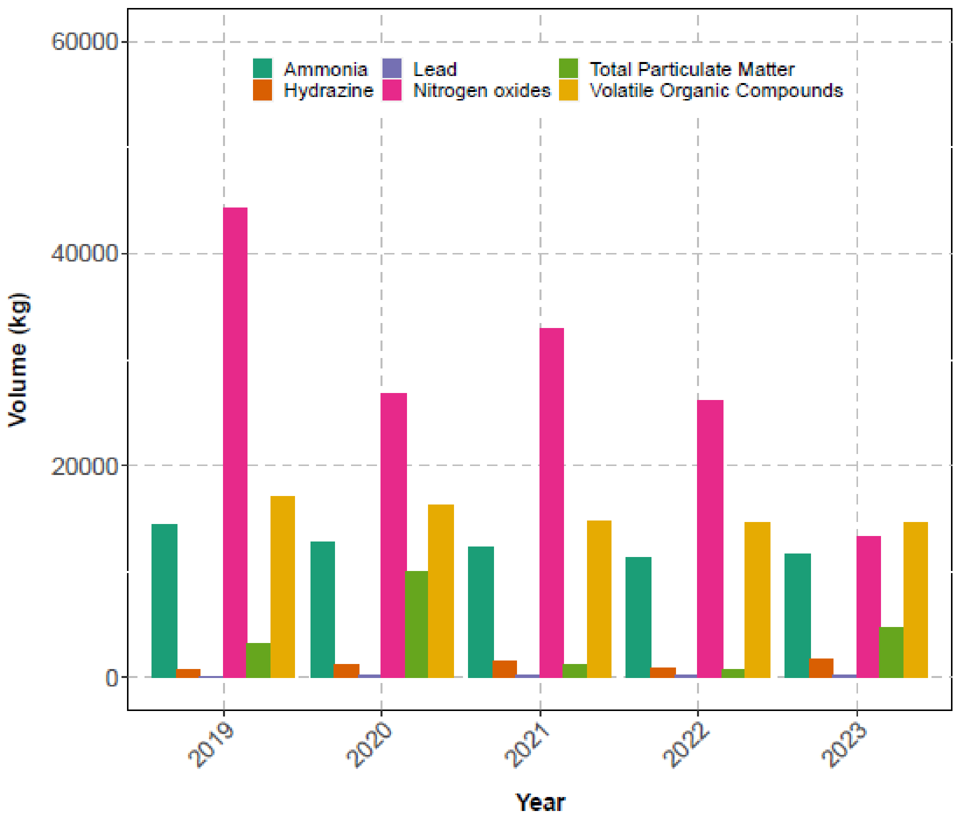


Figure 24 - 2019 to 2023 Releases to Air, Water and Land (kilograms)

<u>Quality Assurance/Quality Control</u>

Quality assurance activities for conventional air emissions are outlined in the Emission Summary and Dispersion Modelling report [R-92]. The Emission Summary and Dispersion Modelling report includes the operating conditions, emission estimating, data quality and sample calculations. Modelling is conducted in accordance with the Air Dispersion Modelling Guideline for Ontario, Version 3.0 [R-93].

Data included in the National Pollutant Release Inventory reporting follows the guideline released by Environment and Climate Change Canada [R-94]. Hydrazine, Ammonia and Morpholine Calculation Methodology for National Pollutant Release Inventory Reporting [R-96], describes the process for obtaining continuous emissions monitoring data, plant information, drain data for the calculation of air and water emissions for hydrazine, morpholine and ammonia.

Data included in the greenhouse gas calculations follows Canada's Greenhouse Gas Quantification Requirements [R-97].

5.2.3 Conventional Water Effluent

Site conventional water effluents are controlled to meet regulatory requirements and to minimize environmental impacts to protect the environment. Conventional water effluents at Bruce Power are discharged according to specific licenses, permits, and regulations under (but not limited to) the *Environmental Protection Act* [R-98] and the *Ontario Water Resources Act* [R-76]. Figure 25 below indicates the locations Bruce Power monitors as final discharge points to Lake Huron: Bruce A and Bruce B Condenser Cooling Water Duct and the Centre of Site Sewage Processing Plant effluent. Additional monitoring locations are reported in the reports listed in Table 15 – 2024 Bruce Power Regulator Reporting for Conventional Parameters, above.

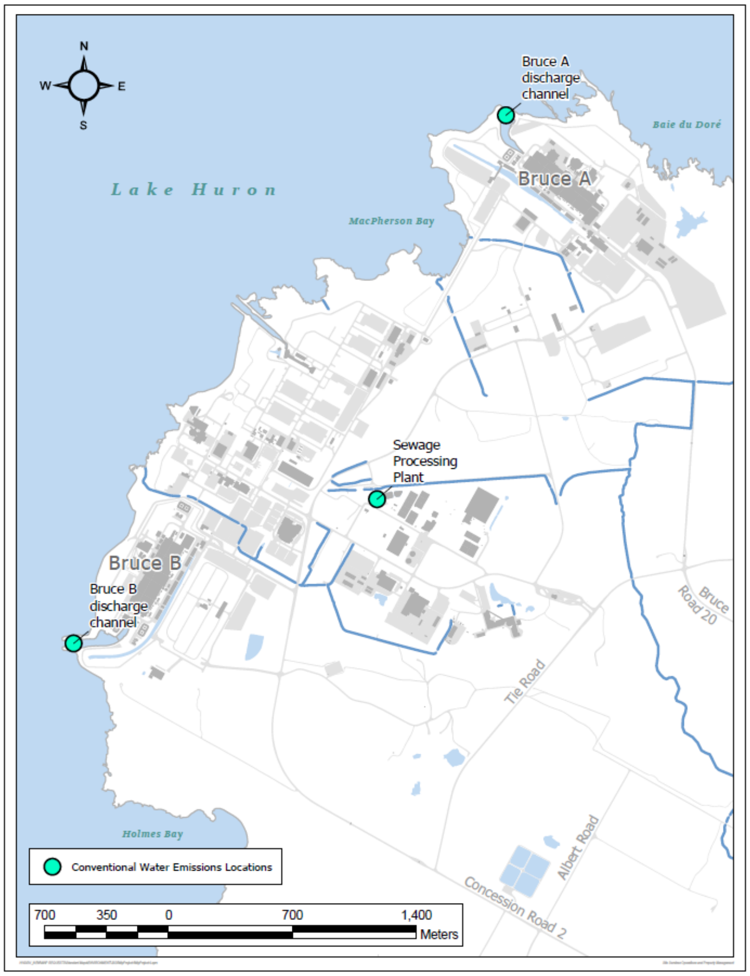


Figure 25 - Conventional Water Effluent Sampling locations

5.2.3.1 Environmental Compliance Approvals

The *Ontario Water Resources Act* states that no person shall use, operate, establish, alter, extend, or replace new or existing sewage works except under, and in accordance with, an Environmental Compliance Approval. Bruce Power operates according to three Environmental Compliance Approvals regulating conventional water effluents across site; Bruce A, Bruce B, and Centre of Site[R-99] [R-100] [R-101]. These Environmental Compliance Approvals impose site-specific effluent limits and monitoring and reporting requirements for the operation of the facility. Non-compliances of Environmental Compliance Approval limits are reportable to the Ministry of Environment, Conservation and Parks and are subject to Environmental Penalties under *Ontario Regulation 223/07* [R-102]. Table 18, Table 19, Table 20 and Table 21 show summaries of the measured effluent concentrations in the Bruce A and Bruce B cooling water discharge ducts, and the Centre of Site sewage processing plant between 2020 and 2024. The maximum measured values for all regulated parameters were all below the approved limits in 2024, with the exception of Total Suspended Solids limit exceedances at the Bruce B Water Demineralization Plant in January 2024, and an acute lethality failure in the Bruce B Active Liquid Waste System discharge in August 2024 as discussed below.

Table 18 - The Average and Maximum Monthly Effluent Concentrations Measured in The Bruce A Cooling Water Discharge Duct (2020-2024)
Table units are micrograms per litre ug/Lor as stated.

Parameter	Units	Method Detection Limit (2024)	Environmental Compliance Approval Limit (or Objective)	Average	Maximum
Ammonia (unionized)	ug/L	Varies based on pH and temperature but does not exceed 3.5 micrograms per litre	<20	< Method Detection Limit	< Method Detection Limit
Boron	ug/L	4	5,000	15	19.6
Hydrazine	ug/L	3	100	1.2	12
Morpholine	ug/L	11	2,500	< Method Detection Limit	440
Total Residual Chlorine	ug/L	1	<10	< Method Detection Limit	< Method Detection Limit
pH	Not Applicable	Not Applicable	6.0 to 9.5	7.9	8.5 (Minimum: 7.0)
Phosphorus	ug/L	5	1,000 (objective)	25.5	62
Acute Lethality- rainbow trout	Percent mortality	Not Applicable	50 percent	0	0
Acute Lethality- *daphnia magna*	Percent mortality	Not Applicable	50 percent	0	3.33

Table 19 - The Average and Maximum Monthly Effluent Concentrations Measured in the Bruce B Cooling Water Discharge Duct (2020-2024)

Table units are micrograms per litre ug/Lor as stated.

Parameter	Units	Method Detection Limit (2024)	Environmental Compliance Approval Limit or (Objective)	Average	Maximum
Ammonia (unionized)	ug/L	Varies based on pH and temperature, but does not exceed 3.5 micrograms per litre	<20	< Method Detection Limit	< Method Detection Limit
Hydrazine	ug/L	3	100	5	24
Morpholine	ug/L	15	2,500	< Method Detection Limit	< Method Detection Limit
Total Residual Chlorine	ug/L	1	<10	< Method Detection Limit	< Method Detection Limit
pH	Not Applicable	Not Applicable	6.0 to 9.5	7.6	8.7 (Minimum: 6.5)
Phosphorus	ug/L	5	1,000 (objective)	10.6	64
Acute Lethality- rainbow trout	Percent mortality	Not Applicable	50 percent	0	0
Acute Lethality- *daphnia magna*	Percent mortality	Not Applicable	50 percent	0	3.33

Table 20 - The Maximum Daily and Monthly Average (measured weekly) Environmental Compliance Approval Effluent Concentrations at the Centre of Site Sewage Processing Plant (2020-2024)

Table units are micrograms per litre ug/Lor as stated.

Parameter	Units	Method Detection Limit (2024)	Daily Limit	Monthly Average Limit	Average	Maximum
Biochemical Oxygen Demand (5-day)	ug/L	Not Applicable	Not Applicable	25,000	2,500	14,700
Nitrogen (Ammonia + Ammonium)	ug/L	6	Not Applicable	7,000	47	1,700
Total Phosphorus	ug/L	14	Not Applicable	1,000	220	650
Total Suspended Solids	ug/L	400	44,000	18,000	9,100	78,000*
Oil and Grease	ug/L	1,000	38,000	12,000	760	3,800
pH	Not Applicable	Not Applicable	6.0-9.5	Not Applicable	7.2	8.9 (Minimum: 6.1)
Escherichia coli	Colony Forming Unit per 100 millilitres (rolling geometric mean)	Not Applicable	Not Applicable	200	0.45	5
Acute Lethality- rainbow trout	Percent mortality	Not Applicable	50 percent *quarterly limit	Not Applicable	0	0
Acute Lethality- *daphnia magna*	Percent mortality	Not Applicable	50 percent *quarterly limit	Not Applicable	1	17

* Total Suspended Solids Daily Limit Exceedance occurred on June 3, 2023, see BP-CORR-00541-00203- 14 Day Letter- Sewage Processing Plant Total Suspended Solids Environmental Compliance Approval Exceedance- June 3, 2023.

Table 21 - Quarterly Average (measured monthly) Wastewater Systems Effluent Regulation Effluent Concentrations at the Centre of Site Sewage Processing Plant (2020-2024)

Table units are micrograms per litre ug/Lor as stated.

Parameter	Units	Method Detection Limit (2024)	Quarterly Average Limit	Average	Maximum
Carbonaceous Biochemical Oxygen Demand	ug/L	4,000	25,000	< Minimum Detection Level	10,000
Total Suspended Solids	ug/L	2,000	25,000	6700	10,000

The 5-year trend of the annual average effluent concentrations in the Bruce A and Bruce B cooling water discharge ducts is shown in Figure 26 for ammonia, hydrazine and morpholine. The annual average values for these parameters have been well below the limits over the last 5 years, demonstrating continued compliance and protection of the receiving environment.

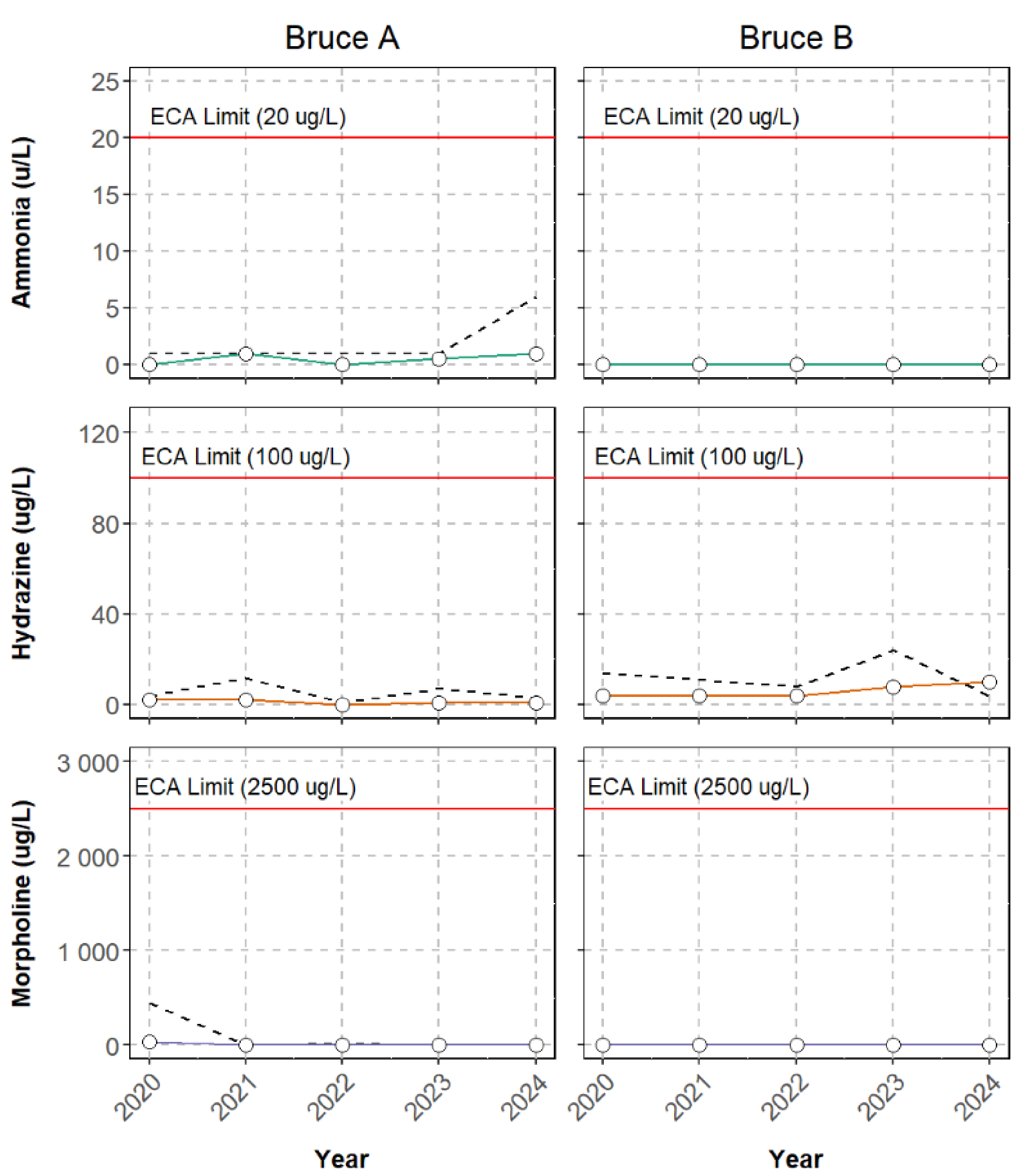


Figure 26 - Bruce A and Bruce B Cooling Water Discharge Duct Discharge Annual Average Concentrations from 2020 through 2024. The solid line indicates the average annual value; the dashed line indicates the maximum annual value.

In 2024, minor administrative revisions to the Bruce A, Bruce B, and Centre of Site Environmental Compliance Approvals were issued by the Ministry of Environment, Conservation, and Parks. In April 2024, the amended Bruce A Environmental Compliance Approval was issued as A-500-3151105259, version 2.0[R-99] and the Amended Bruce B Environmental Compliance Approval was issued as A-500-7141062184, version 2.1[R-100]. In June 2024, the Centre of Site Environmental Compliance Approval was issued as A-500-8256973434, version 1.0[R-101].

In 2024, there were two reportable events related to the site Environmental Compliance Approvals; Total Suspended Solids limit exceedances at the Bruce B Water Demineralization Plant in January 2024 (as a result of natural environmental conditions- storm event), and an acute lethality failure in the Bruce B Active Liquid Waste System discharge in August 2024. These events were reported to the Ministry of Environment, Conservation, and Parks as well as to the CNSC (reference B-2024-334626- Bruce B Water Demineralization Plant Total Suspended Solids Limit Exceeded and B-2024-398946- Bruce B Environmental Regulatory Limit Exceeded). The Total Suspended Solids limit exceedances were a result of lake conditions during a winter storm event that caused elevated suspended solids in the incoming raw water to the plant and consequentially challenged the effluent discharge limits related to TSS. The acute lethality failure was attributed to low hardness in Active Liquid Waste effluent, as this is predominately demineralized water, and the Toxicity Identification Evaluation that was completed on the failed sample did not identify any specific parameter causing toxicity. Hardness addition is now in place to reduce the likelihood of recurrence.

Thermal effluent limits from the Bruce A and B Environmental Compliance Approvals are provided in Table 22. No exceedances of these limits occurred in 2024. Section 6.2.3 provides a summary of off-site thermal monitoring programs. As climate change gradually affects lakewide temperature, a temporary flexibility amendment of the Bruce A environmental compliance approval is in place to allow a maximum effluent temperature of 34.5 degrees Celsius (an increase of 2.3 degrees Celsius) between June 15th and September 30th each year. This provides operational flexibility for a maximum of 30 aggregate days within this period, and for no more than a maximum of 15 consecutive days at a time. This operational flexibility was not invoked in 2024 because the maximum daily average effluent temperature at Bruce A did not exceed 32.2 degrees Celsius. The amended Bruce A Environmental Compliance Approval containing the updated Thermal Flexibility was issued in April 2024 [R-99] and is valid through December 21, 2028. Bruce Power is required to notify the Ministry of Environment, Conservation, and Parks Local District Manager verbally at the start and end of each occurrence of invoking Thermal Flexibility, followed by written notification within 14 days. An updated Thermal Risk Assessment will be prepared every 5 years as part of the Environmental Risk Assessment update (Section 4.3). The Thermal Risk Assessment will incorporate up-to-date climate science and 5 years of off-site thermal monitoring and modelling data as well as advancements in the scientific literature on the effects of temperature on aquatic biota. The Thermal Risk Assessment is to be submitted to the Ministry of Environment, Conservation, and Parks District Manager in June 2027, as well as to the Saugeen Ojibway Nation, the Metis Nation of Ontario Region 7 and Historic Saugeen Metis.

Table 22 - ECA Limits for Bruce A and Bruce B.

Station	Parameter	Calendar Period	Daily (24hr) Average Temperature Limit
Bruce A	Effluent Temperature	Jun 15 to Sept 30	34.5ºC **
		Oct 1 to Jun 14	32.2ºC
	Temperature Difference (effluent minus intake)	Dec 15 to Apr 14	13.0ºC
		Apr 15 to Dec 14	11.1ºC
Bruce B	Effluent Temperature	Entire Year	No Limit
	Temperature Difference (effluent minus intake)	Dec 15 to Apr 14	13ºC
		Apr 15 to Dec 14	11ºC

Note: During the Bruce A Operational Flexibility window, Bruce A shall be allowed to go beyond the Daily (24 hour) average effluent temperature limit of 32.2°C for no more than 30 aggregate days in this window and no more than 15 consecutive days for each

5.2.3.2 Wastewater Systems Effluent Regulations

The *Wastewater Systems Effluent Regulations* [R-103] is a Federal wastewater regulation under the *Fisheries Act* that came into effect in 2012. The regulation applies to wastewater treatment systems like Bruce Power's Sewage Processing Plant because it discharges wastewater effluent at a flowrate that exceeds 100 cubic metres a day. Table 20 shows a summary of the measured Sewage Processing Plant effluent concentrations from 2020 to 2024. There were no exceedances reported in 2024.

5.2.3.3 Permit to Take Water

Most operations in Ontario that take more than 50,000 litres of water per day from a lake, river, stream, or groundwater source must obtain a Permit to Take Water from the Ministry of Environment, Conservation and Parks [R-76]. These permits help ensure Ontario's water is conserved, protected, managed, and used sustainably. Ontario's Water Taking Regulation (*Ontario Regulation 387/04*) [R-104] helps ensure fair sharing of water resources and it prevents interferences among water users. Permits are not issued to assign rights to water or to establish priorities on water use. *Ontario Regulation 387/04* [R-104] sets out criteria that the Ministry must consider when assessing an application for a Permit to Take Water. A permit will not be issued if the Ministry determines that the proposed water taking will adversely impact existing users or the environment [R-104].

Bruce Power has a separate permit for each station Bruce A P-300-2114648110 [R-80], Bruce B P-300-4114675736 [R-81] and Centre of Site P-300-7116089842 [R-82]. The Bruce A and Bruce B permits include flexibility throughout the year to allow for optimized efficiency in unit output as well as upgrades to Condenser Cooling Water pumps. Bruce Power remained in compliance with all Permit to Take Water requirements in 2024.

Bruce Power recognizes the value and importance of its interactions with Lake Huron. Bruce Power uses the cold, deep Lake Huron water in a once-through cooling process to supply operational needs including consumption for boiler feedwater and domestic water. We greatly value this resource and return more than 99.9 per cent of the water used for once through cooling. This process is highly regulated, including provincial permits for water taking and reporting and imposing protective limits on water quality for waters returned to the lake. This ensures the conservation, protection, management and sustainable use of Ontario's freshwater resources.

In our effort to uphold and support these goals, we monitor our usage, including the amounts returned directly to the lake with no chemical changes, and report on daily amounts drawn. Beyond considerations of water quantity management, we are committed to monitoring and ensuring the protection of the quality of water, and our fish habitats in and around our shores and the greater region.

5.2.3.4 Quality Assurance/Quality Control

Quality Assurance, quality control for the conventional water emissions program has been developed by applying the requirements of both the Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater [R-105] for Environmental Compliance Approvals [R-106],[R-107],[R-108] which also meets the requirements of CSA N288.5-11, Effluent monitoring programs at Class I nuclear facilities and uranium mines and mills [R-6]. The Quality Assurance Quality Control program also includes requirements of the Environment and Climate Change Canada *Wastewater Systems Effluent Regulation* [R-103].

The Quality Assurance Quality Control requirements for conventional water include field quality control, lab quality control, and tracking of quality control data. The Quality Assurance Quality Control program documentation further defines when lab accreditation is required for specific sampling parameters, and at times defines actions and how to report data depending on the Quality Assurance Quality Control results.

5.3 Pollution Prevention

Under Part 4 of *Canadian Environmental Protection Act* [R-109], Environment and Climate Change Canada has the authority to require preparation and implementation of pollution prevention plans for toxic substances. Pollution prevention planning is a method of identifying and implementing pollution prevention options to minimize or avoid the creation of pollutants or waste. Environment and Climate Change Canada issued a pollution prevention planning notice for any person who operates a facility in the electricity sector that has a concentration of hydrazine that is higher than the specified target levels under normal operating conditions and at any final discharge point. Bruce Power reviewed the notice and determined that it does not apply and as such, submitted a Notification of Non-Engagement [R-110]. In 2024, all

Bruce A and Bruce B Cooling Water Discharge Duct hydrazine results were below the P2 threshold.

5.4 Environmental Emergency Regulations

The aim of the Federal *Environmental Emergencies Regulations, 2019* [R-111] (under *Canadian Environmental Protection Act*) is to help reduce the frequency and severity of accidental releases of hazardous substances into the environment. Two hundred and forty-nine hazardous substances are included in the regulations, identified for their emergency hazard characteristics (oxidizer that may explode, inhalation, aquatically toxic, explosion, combustible, pool fire). The *Environmental Emergencies Regulations* identify minimum threshold quantities for these substances, above which there are requirements for submitting notices, developing Environmental Emergency Plans, and completing drills. These are based on both the total volume on site and the size of the largest container system for the substance(s). There are additional reporting requirements for Environmental Emergencies. To date, Bruce Power has not had a reportable Environmental Emergency under this regulation. Bruce Power currently meets the reporting threshold on site for diesel (Chemical Abstract Service Number 68334-30-5). Diesel volumes on site are above the total volume on site threshold; this required Bruce Power to submit a Schedule 2 notice to Environment and Climate Change Canada.

6.0 ENVIRONMENTAL MONITORING

Bruce Power's Environmental Monitoring program is built upon an integrated monitoring approach that strives to understand environmental impact, verify environmental protection, and continuously improve by driving strategic research and innovation through collaborations with industry and community. To demonstrate environmental protection, Bruce Power performs extensive monitoring and modelling of radiological and conventional contaminants in the permeable zones near the Earth's surface where living organisms, air, water, soil, sediment, and groundwater interact, Figure 27.

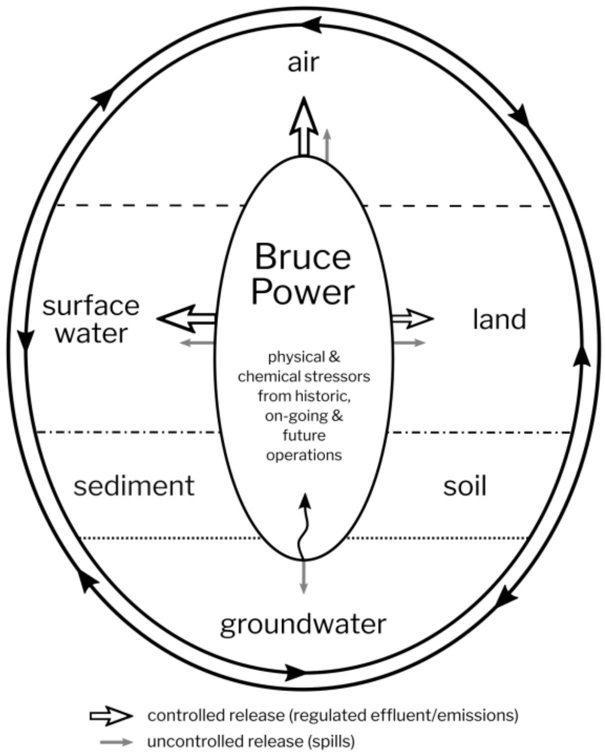


Figure 27 - Bruce Power has multiple layers of protection in place to minimize emissions and effluents released during facility operations. The Environmental Monitoring program monitors and models physical, radiological and chemical stressors released to the environment and continuously assesses their risk and impact.

Emissions and effluents to air, water and land are controlled and regulated to ensure that all releases occur in a manner that minimizes environmental impact. Bruce Power's Radiological and Conventional Environmental Monitoring programs are designed to continuously verify that environmental protection is being maintained and that these releases have a minimal impact on the surroundings. The programs are based on CSA N288.4-10 Environmental monitoring programs at nuclear facilities and uranium mines and mills [R-5], CNSC REGDOC-2.9.1 Environmental Protection: Environmental Principals, Assessments and Protection Measures [R-14], and reporting requirements in CNSC REGDOC-3.1.1 Reporting Requirements for Nuclear Power Plants [R-2].

The primary objectives of the Environmental Monitoring program are to:

- Demonstrate compliance with all applicable environmental compliance obligations, Licence conditions and the Environmental & Sustainability Policy.
- To have in place environmental monitoring to provide timely data confirming that uncontrolled releases are not occurring and, if uncontrolled releases do occur, to identify when and where.

- To protect human and ecological health that may be affected by the release of contaminants or physical stressors into the environment arising from the facility.
- Support business decisions to drive environmental protection, sustainability principles and Environment Social Governance (ESG) strategy.
- Maintain strong engagement and collaboration with Indigenous Nations, community members and other stakeholders.

Additionally, the CSA standard N288.4, Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills outlines the following objectives for Environmental Monitoring programs [R-5]:

- Collect environmental monitoring data to assess the level of risk to human health and safety, and the potential biological effects in the environment of the contaminants and physical stressors of concern arising from the facility,
- Demonstrate compliance with limits on the concentration and/or intensity of contaminants and physical stressors in the environment and their effect on the environment; and
- Verify that the facility has effective containment and effluent control measures in place.

Bruce Power has well-established environmental monitoring programs that focus on the local area around the facility, including neighboring communities and Lake Huron. Together, the results build an overall understanding of the risk to human health and impact on the environment. The company's strong commitment to excellence has yielded exceptional environmental performance, and Environmental Risk Assessments continually show the operation of the facility has little-to-no impact on human and ecological health. This conclusion is supported by evidence independently collected by the Federal and Provincial governments who monitor and measure concentrations of contaminants in the environment near Bruce Power.

Bruce Power continues to engage with Saugeen Ojibway Nation, Métis Nation of Ontario Region 7 and Historic Saugeen Métis and make progress on all commitments made at the 2018 licence renewal. Regular meetings are held with the Saugeen Ojibway Nation, Métis Nation of Ontario Region 7, and Historic Saugeen Métis to discuss key concerns, regulatory items, and other items of interest. This continued dialogue results in improved understanding and opportunities for feedback and collaboration. Over the last seven years, topics of focus have included thermal effluent, fish impingement and entrainment, environmental monitoring and assessment, and dietary surveys. In 2024 progress on commitments are as follows:

- Preliminary discussions on the Impact Assessment process, following the Ontario Government's announcement of support for Bruce Power to commence the long-term planning and consultation work required to explore nuclear expansion options on the Bruce Power site (Bruce C Project). Although no decision has been made to advance with a project, the process has been initiated to begin early dialogue and engagement to ensure all voices are heard.

- Sustained support for the Saugeen Ojibway Nation's Coastal Waters Monitoring Program, currently in year seven. This program enhances the existing body of knowledge compiled through Bruce Power's environmental monitoring program and was integrated throughout the 2022 Environmental Risk Assessment.

- Continued sharing of impingement and entrainment and thermal effluent information.

- Ongoing discussions with the Saugeen Ojibway Nation to identify a meaningful offset project that is supported by the community. Bruce Power's *Fisheries Act* Authorization was amended in December 2024 and the project plan is now due to Fisheries and Oceans Canada by December 31, 2025.

- Completion of the fish offset project to remove invasive Phragmites from the Fishing Islands wetland complex, in collaboration with the Historic Saugeen Métis community. This project has helped to restore fish habitat and encourage naturalization of the area by removing high density Phragmites. The final report on the offset project was submitted to Fisheries and Oceans Canada in March 2024.

- In December 2023, an offset project plan was approved by Fisheries and Oceans Canada to improve fish habitat and restore connectivity in Bothwell's Creek, near Leith, Ontario. Bothwell's Creek has been used by the Métis Nation of Ontario Region 7 community for fishing and recreation, however a decline in fish has been noticed over the past decade. Erosion, leading to high sedimentation, and a build-up of large debris may be the leading causes of the observed decline in fish in the creek. With the assistance of the Grey Sauble Conservation Authority, Bruce Power and the Métis Nation of Ontario Region 7 held a community tree planting event in May 2024 to plant fifty white cedar trees along vulnerable stretches of the stream bank. In addition to the offset project, Bruce Power, the Métis Nation of Ontario Region 7 and Freshwater Conservation Canada completed temperature monitoring and redd surveys in Bothwell's Creek, to better understand the condition of the creek and guide future rehabilitation or enhancement activities.

- In 2021 Bruce Power began collaborating with the Historic Saugeen Métis, Town of Saugeen Shores, University of Waterloo, and the Nuclear Innovation Institute to monitor and assess ongoing water quality issues in Fairy Lake located in Southampton, Ontario. The goal of the project was to identify possible management options to help mitigate the impacts of invasive Curly-leaf pondweed and Common Carp on this small lake. Signage will be posted around Fairy Lake to help increase awareness on impacts of invasive species, and foster community stewardship.

In 2025 Bruce Power will continue to engage with each community on thermal effluent monitoring, fish impingement and the upcoming entrainment study, as well as continue work on community specific offset plans as required by the *Fisheries Act* Authorization. Engagement on the Impact Assessment for the Bruce C Project will remain a top priority.

6.1 Radiological Environmental Monitoring

The Radiological Environmental Monitoring Program establishes a database of radiological activity measured in the environment near Bruce Power and determines the contribution of radiation dose to members of the public as a result of the radiological releases from normal operations on Site. The Radiological Environmental Monitoring Program is conducted in accordance with CSA N288.4-10 [R-5] and is integrated into the environmental management system framework which requires a regular review, assessment and refinement of the program to ensure the environment and the public are adequately protected.

The Radiological Environmental Monitoring data implicitly reflects the influence of releases from all licensed activities carried out at Bruce Power licensed facilities (i.e., Bruce A, Bruce B, Central Maintenance Facility and Central Storage Facility) as well as from facilities within or adjacent to the Bruce Power site boundary that are owned and operated by other parties. This includes the Western Waste Management Facility (owned and operated by Ontario Power Generation) and the Douglas Point Waste Facility (owned and operated by Canadian Nuclear Laboratories), both of which are located inside the Site perimeter, as well as the Ontario Nuclear Services Facility (owned and operated by Kinectrics) and the Western Clean – Energy Sorting and Recycling Facility (owned by Laurentis Energy Partners and operated by EnergySolutions) which are located outside the Site perimeter.

The Radiological Environmental Monitoring Program involves the collection and analysis of environmental media for radionuclides specific to nuclear power generation. Background levels of radioactivity in the environment due to naturally occurring sources are subtracted from the totals in order to determine the impact specific to Bruce Power operations. The data gathered each year is used in the annual dose to public calculation, which is described in Section 3.0.

The design of the Radiological Environmental Monitoring Program is based on risk and is informed by a radionuclide and exposure pathways analysis. This analysis outlines which radionuclides and environmental media should be monitored due to their contribution to human or non-human radiological dose. For radionuclide-media pairs contributing >10% to the total dose of any human receptor, Bruce Power attempts to obtain samples at a minimum of one location per 22.5° wind sector over land to provide spatial resolution at the cardinal points of the compass and align with standard partitioning of meteorological data. The media contributing greater than 10% to receptor dose are air, soil, milk, meat, and terrestrial plants such as grains, fruit and vegetables. For radionuclide-media contributing <10% to the total dose, Bruce Power attempts to obtain samples at three locations over land within the Radiological Environmental Monitoring boundary.

The following environmental media are collected and analyzed as part of the annual Radiological Environmental Monitoring Program:

- Air
- Precipitation
- Water
    - Drinking water (e.g. water supply plants, residential wells)
    - Lake and stream water
- Terrestrial Samples
    - Animal products (e.g. milk, eggs, honey, animal meat)
    - Agricultural products (e.g. fruits, vegetables, farm crops, animal feed)
    - Soil
- Aquatic Samples
    - Fish
    - Sediment and beach sand

The radionuclides that are measured in the environmental media collected include tritiated water (tritium oxide), carbon-14, iodine-131, beta and gamma emitting radionuclides.

Bruce Power relies on the Ontario Power Generation Health Physics Laboratory in Whitby, Ontario for provincial background radiation levels measured in a variety of environmental media collected at locations outside the influence of Bruce Power or other nuclear power plants. Background radiation comes from naturally occurring radioactive materials present in the environment (see Section 3.0), and these levels are subtracted from Bruce Power environmental monitoring results for dose calculations each year. The provincial background sampling locations are shown in Figure 28.

For the Bruce Power Radiological Environmental Monitoring Program, monitoring locations for aquatic media such as lake water, fish and sediment are downstream of the site, at locations where radionuclides are expected to accumulate. For air sampling, monitors are situated at varying distances from Bruce Power at locations covering all landward wind directions. For terrestrial foodstuffs (e.g., milk, meat, fruit, vegetables, grains, eggs, honey), sampling is performed at nearby areas or at local farms and residences, as applicable. Monitoring locations are based on practical considerations, including the availability of samples and participation of local residents and farmers. Wild animals are sampled only when available (e.g., subject to on-site vehicle collisions or samples provided by local hunters). Milk is monitored from several local dairy farms through an agreement with the Dairy Farmers of Ontario.

Bruce Power groups the sampling locations by proximity to site and these groups include indicator, area near and area far locations. Indicator locations are used to assess the potential dose to the public. These locations are on or outside the facility perimeter and represent the highest risk of public exposure as they are closest to the source. Indicator locations are within 20 kilometres of the facility and take into consideration the locations of representative persons and where they get their food/water for consumption, as well as prevailing wind directions. Area Near locations are used in conjunction with indicator locations to provide confirmation of the validity of the computing models used to assign dose to the public. Area Near location data is used to estimate atmospheric dispersion and doses to people in local population centres located further away from the site than the indicator locations, but less than 20 kilometres from the facility. Data from the Area Near location may be used to calculate the average dilution available as a function of distance for a given monitoring period. Area Far locations are located further away but potentially still under the influence of Bruce Power. Area Far locations include the towns of Port Elgin, Paisley and Kincardine. Control locations are located outside the influence of Bruce Power but close enough to have similar background levels to Site. These samples are collected by Bruce Power when equivalent samples or analyses are not available through the Provincial background monitoring program.

Bruce Power area near and area far sampling locations are provided in Figure 29 and Figure 29. Residential sampling locations (labelled Other) where fruit, vegetable and milk samples are collected are shown on Figure 31, alongside the locations of representative persons/groups.

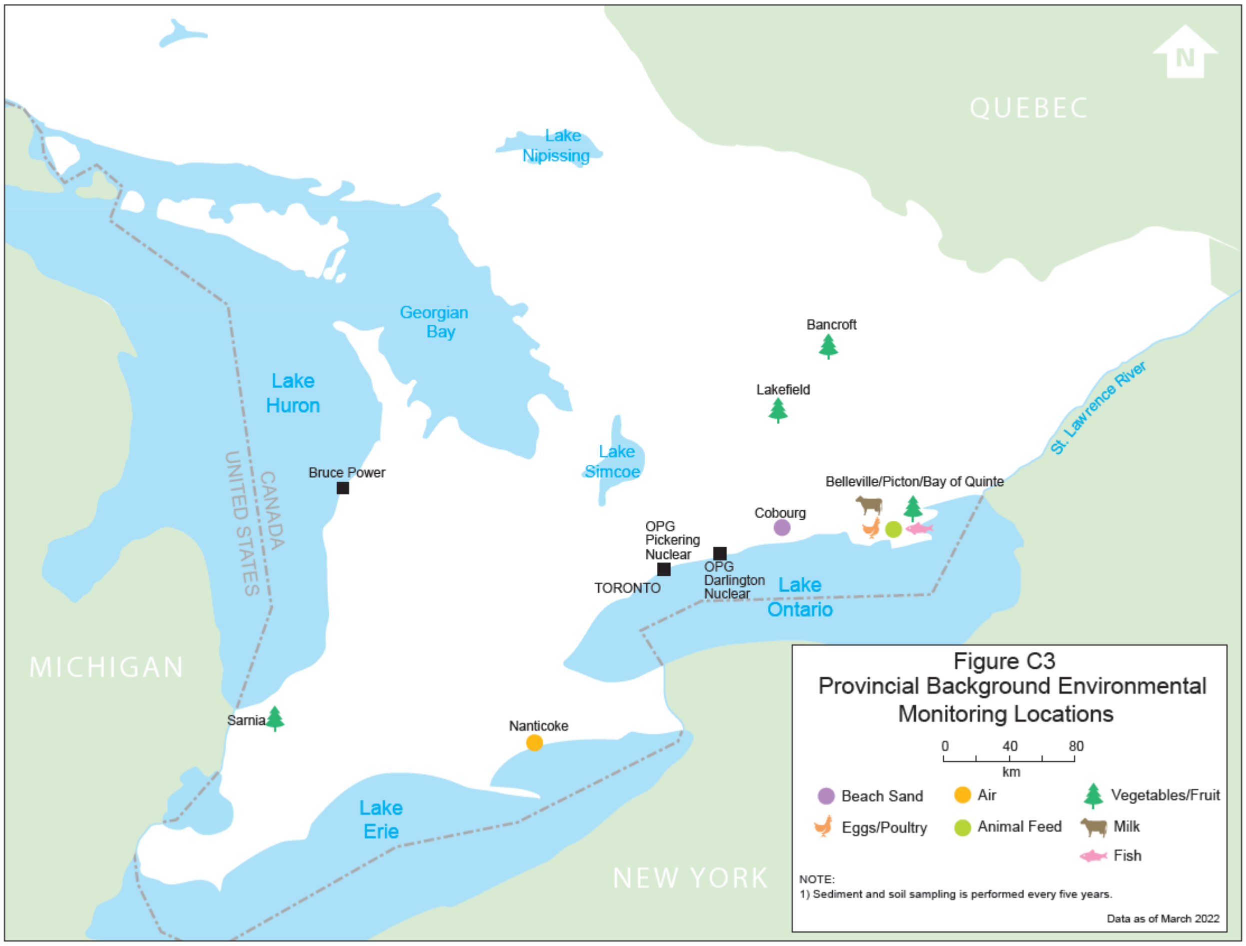


Figure 28 - Provincial Background Radiological Environmental Monitoring Locations

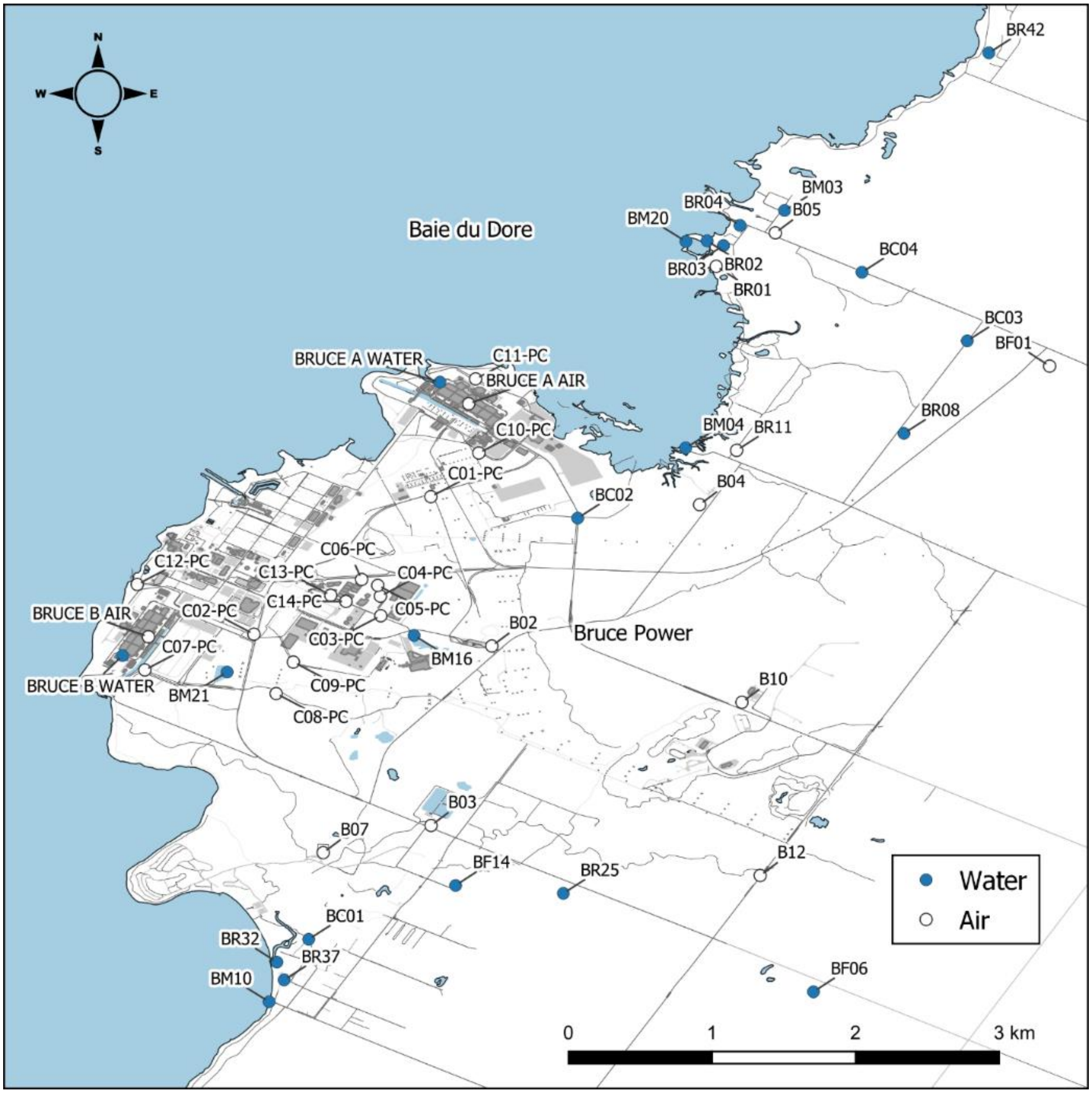


Figure 29 - Bruce Power On-Site and Area Near Radiological Environmental Monitoring Locations

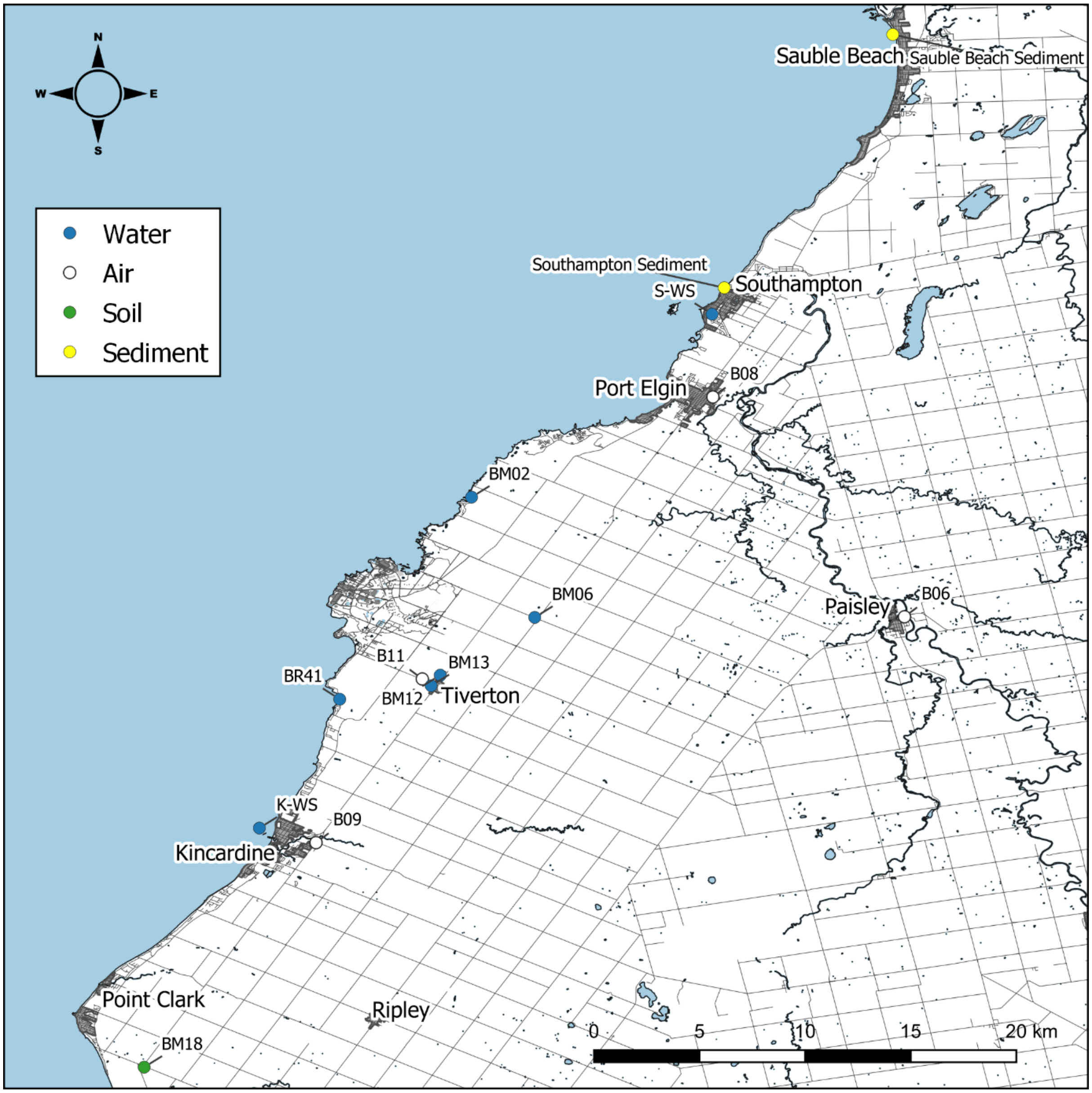


Figure 30 - Bruce Power Area Near and Far Radiological Environmental Monitoring Locations

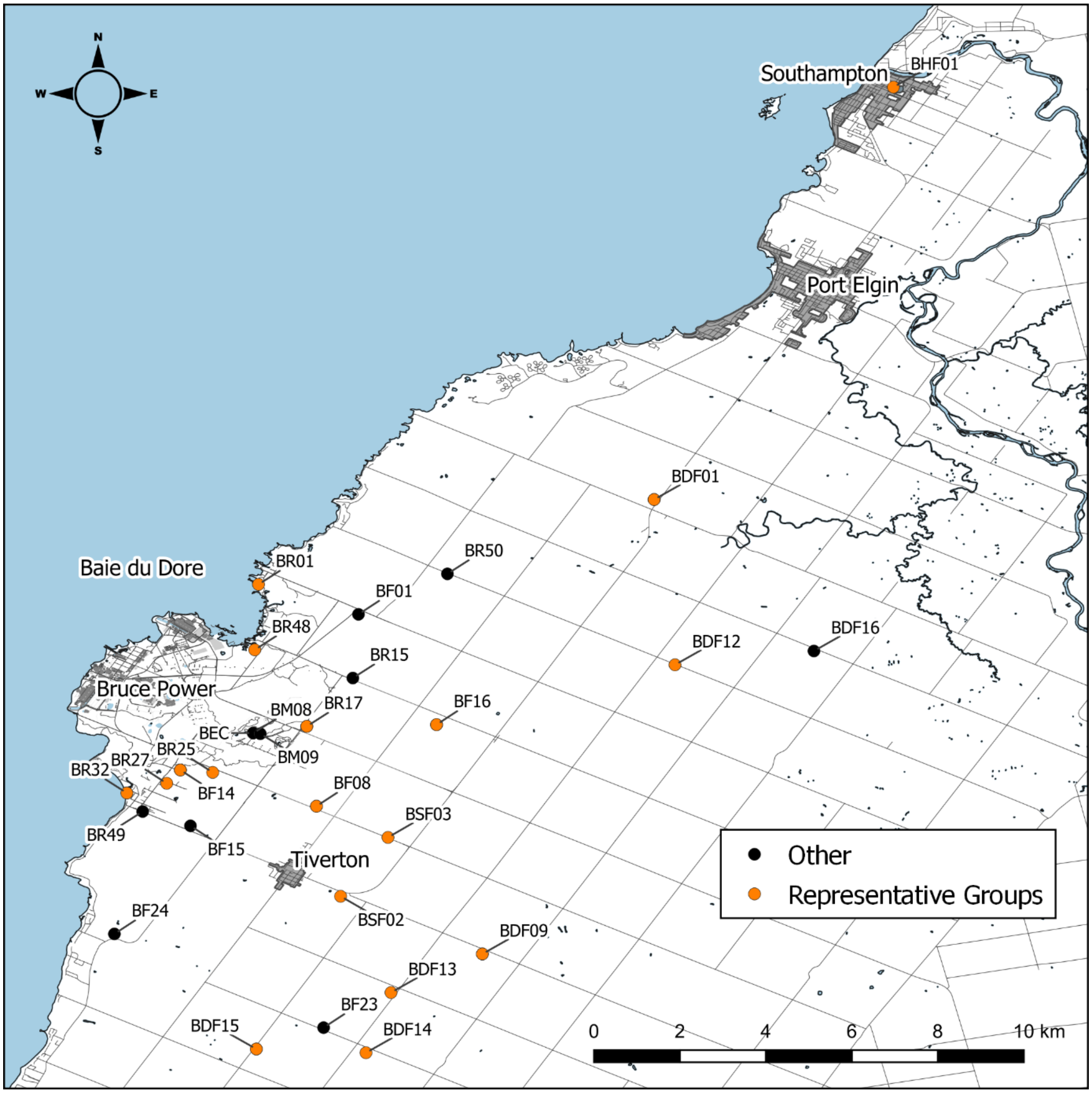


Figure 31 - Bruce Power Radiological Environmental Monitoring Residential Locations (Other) and Representative Groups

For Radiological Environmental Monitoring data analysis, the actual measured value, uncertainty, critical level and detection limit are recorded in a data management system. The critical level or decision threshold (Lc) is the calculated value based on background measurements, below which the net counts measured from the sample are indistinguishable from the background at the 95% probability level. The detection limit (Ld) is the calculated value based on the decision threshold and the measurement system parameters (e.g., count time) above which the net counts measured from the sample are expected to exceed the decision threshold at the 95% confidence level. These definitions of critical level and detection limit are consistent with CSA N288.4-10 Annex D [R-5].

For Bruce Power Radiological Environmental Monitoring data, when the actual measured value is less than the associated critical level (<Lc), those values were taken as reported (i.e., not censored). In the calculation of averages where some measured values were reported as less than the critical level, the uncensored analytical results were used in the calculation. For instances where the annual *average* value is negative or where all individual analytical results were less than the critical level, the result is stated as "<Lc" for simplification. For provincial background data where the result was less than the detection limit (<Ld), the detection limit value was used in the annual average. When all of the results for a particular radionuclide-media pair were less than the detection limit, or where the annual average was negative, then "<Ld" was stated for the annual average.

The following sections provide the results of Radiological Environmental Monitoring carried out by Bruce Power in 2024 and previous years. The provincial background results are also provided where appropriate. The CNSC completed the Independent Environmental Monitoring Program in the Bruce County area most recently in 2022 and the results are presented for comparison, as applicable, for additional demonstration that there is low radiological risk from Bruce Power operations to people and the environment.

Radiological Environmental Monitoring results are presented as monthly, quarterly or annual averages by location or location type (e.g., indicator, area near, area far, or background). The variance from the mean is presented as Standard Error bars on the figures. Where individual results are presented (e.g., animal products) the analytical uncertainty (±2σ) is provided along with the critical level (Lc).

6.1.1 Air Monitoring

Bruce Power monitors for external gamma radiation, tritium oxide and carbon-14 concentrations in air on a continuous basis at a variety of locations near and far from site. Airborne deposition of radioactive particulates is monitored through the sampling of precipitation (Section 6.1.2) and soil (Section 6.1.5.3). The air results are used in the annual dose to public calculation for each of the representative persons that live near Bruce Power. In addition, the results inform the environmental monitoring and Environmental Risk Assessment programs to ensure that Bruce Power is appropriately monitoring and understanding its impact on the environment.

6.1.1.1 External Gamma in Air

Ambient external gamma radiation in air was measured using Harshaw Environmental Thermoluminescent Dosimeters at 10 air monitoring stations near and far from Bruce Power (Figure 29 and Figure 30). The dosimeters are exposed for three-month periods, collected quarterly and measured by the Ontario Power Generation's Whitby Health Physics Laboratory. The annual dose rates are calculated as the sum of the quarterly results.

Provincial background dosimeters are located at various locations around Ontario (Figure 28) and are also collected quarterly and measured by the Whitby Health Physics Laboratory. The dosimeter locations throughout the province show the range of background radiation levels experienced by Ontario residents during the year. Bruce Power and provincial background results are detailed in Table 23.

The Bruce Power indicator sites B02, B03, and B04 are located closest to the Bruce Power site and the average external gamma dose in air was 49 nanogray per hour for 2024, with the maximum occurring at B02 with a result of 52 nanogray per hour, as shown below in Table 23. For comparison, the average of the seven provincial background sites was slightly higher at 60 nanogray per hour.

Thermoluminescent dosimeter measurements alone cannot resolve the very low gamma doses in air associated with radiological emissions from the Bruce Power site or those observed provincially. This includes radioactive noble gases such as argon-41, xenon-133 and xenon-135. As a result, a conservative modelling method of estimating noble gas activity in the environment using emissions data and atmospheric dilution factors is used in the annual dose estimates. This demonstrates that the impact of Bruce Power on the surrounding environment, with regards to gamma radiation in air, is *de minimus* or negligible.

Table 23 - 2024 Annual External Gamma Dose Rate Measurements

Location Type	Sample Location	Total Exposure Time (days)	Total Measured Dose in Air (microgray)	Annual Average Dose Rate in Air (nanogray per hour)	Annualized Exposure (microgray)
Indicator	B02-TLD	379	474	52	457
Indicator	B03-TLD	378	465	51	449
Indicator	B04-TLD	378	405	45	391
Area Near	B05-TLD	378	416	46	402
Area Near	B07-TLD	378	401	44	387
Area Near	B10-TLD	378	553	61	534
Area Near	B11-TLD	378	515	57	498
Area Far	B06-TLD	378	412	45	398
Area Far	B08-TLD	378	396	44	383
Area Far	B09-TLD	378	404	45	390
Background	Bancroft	368	628	71	623
Background	Barrie	365	539	62	539
Background	Lakefield	368	547	62	543
Background	Niagara Falls	364	408	47	409
Background	North Bay	363	531	61	534
Background	Thunder Bay	377	553	61	536
Background	Windsor	368	489	55	485
Indicator	Average	378	448	49	432
Area Near	Average	378	471	52	455
Area Far	Average	378	404	45	390
Background	Average	368	528	60	524

The annual average external gamma dose rates for Bruce Power indicator, area near and area far sites over time are shown in Figure 32, along with the annual average provincial background dose rate. External gamma values have remained relatively constant over time. Both Bruce Power and provincial measurements show similar trends, although Bruce Power is consistently below the provincial background average. A general linear model (α=0.05) was performed by site over the last 10 years and identified that there is no statistically significant change over time ($p>0.05$), or difference by site over time ($p>0.05$). An analysis of variance

(α=0.05) shows a statistically significant difference in the means by site ($p<0.001$). The results showed that the provincial site had the highest mean gamma in air, that the indicator and area near sites had no significant difference from each other and that the area far site had the lowest mean gamma in air.

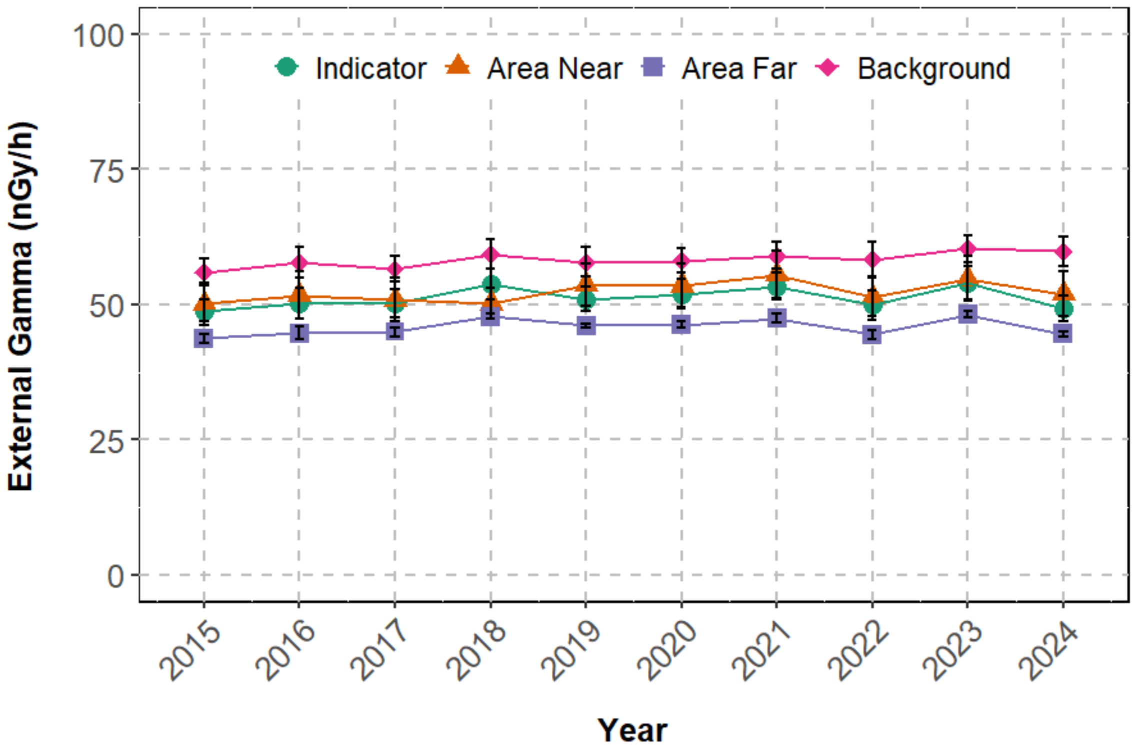


Figure 32 – 2024 Annual Average External Gamma Dose Rates (nanogray per hour) at Bruce Power Indicator, Near, Far and Provincial Background Locations Over Time (± Standard Error).

Health Canada also monitors total external gamma dose in the local area [R-112]. The Fixed Point Surveillance network monitors radiation dose to the public in real-time due to radioactive materials (natural and manmade) in the terrestrial environment, whether they are airborne or on the ground. The radiation dose from all external gamma sources, which includes natural background from mineral deposits in the ground or radon gas in the air, is provided as Total Air Kinetic Energy Released in Matter. The contributions to external dose from three radioactive noble gases argon-41, xenon-133 and xenon-135 are reported in nanogray per month (1 nanogray = 0.000001 millisieverts). There are eight Fixed Point Surveillance network monitors in the area near Bruce Power, including at the site boundary, the Visitor's Centre (Infocentre), Scott Point, Kincardine, Inverhuron, Port Elgin, Tiverton, and Shore Road. At the time of preparing this report, the fourth quarter results were not yet posted and there were data issues for other months at the Site Boundary, Inverhuron and Shore road locations. For the months that were available for 2024, the results for xenon-133 and xenon-135 were less than the limit of detection at all 8 locations. The results for argon-41 were typically less than the limit of detection at all locations, although there was one instance at Inverhuron and Tiverton in March, and at Scott Point and Infocentre in April, that detected argon-41 above the limit of detection of 6 nanogray per month, but were very low (less than 11 nanogray per month) [R-113]. Doses at these levels are considered negligible.

The CNSC Independent Environmental Monitoring Program does not monitor for external gamma using the same approach used by Bruce Power, the Province or Health Canada, but instead measures individual gamma emitting radionuclides in air. Therefore, the results are not comparable; however, they are presented to show all of the monitoring results in the Bruce Area and to demonstrate that radiological risk is low. The 2022 CNSC Independent Environmental Monitoring Program monitored for cesium-137 in air at Baie du Doré, Inverhuron, Tiverton and Neyaashiinigmiing locations. All results were <0.000052 becquerels per cubic metre, which are well below the guideline/reference level of 2.56 becquerels per cubic metre. The CNSC also measured iodine-131 at these locations in 2022, and all results were <0.00086 becquerels per cubic metre, much lower than the guideline/reference level of 0.228 becquerels per cubic metre [R-114][R-115].

6.1.1.2 Tritium Oxide in Air

Tritium oxide in air is measured at 10 locations near Bruce Power (Figure 29 and Figure 30) using active air samplers that pass air at a continuous rate through molecular sieves, where water vapour from the atmosphere is absorbed. The molecular sieves are changed out on a monthly basis and the water is extracted and analyzed for tritium by liquid scintillation counting. The results are obtained by multiplying the specific activity of tritium in the extracted water by the average absolute humidity measured for the sampling period. The average absolute humidity is determined by dividing the mass of water collected on the molecular sieve by the volume of air sampled as measured by an integrated flow metre.

Monthly samples are averaged by location for the year and are shown in Table 24, along with the provincial background value measured in Nanticoke (Figure 28). The results for 2024 are shown on a monthly basis in Figure 33.

Table 24 - 2024 Annual Average Tritium Oxide in Air

Location Type	**Sample Location**	**Tritium Oxide (becquerels per cubic metre)**
Indicator	B02-ST	1.92
Indicator	B03-ST	1.52
Indicator	B04-ST	1.96
Area Near	B05-ST	1.27
Area Near	B07-ST	1.64
Area Near	B10-ST	1.06
Area Near	B11-ST	0.67
Area Far	B06-ST	0.14
Area Far	B08-ST	0.24
Area Far	B09-ST	0.29
Indicator	Average	1.80
Area Near	Average	1.16
Area Far	Average	0.22
Background	Nanticoke	0.04

Note:

1. Sample count = 12 in all cases, except B03-ST sample count = 11.
2. For calculation of averages the uncensored analytical result was used.

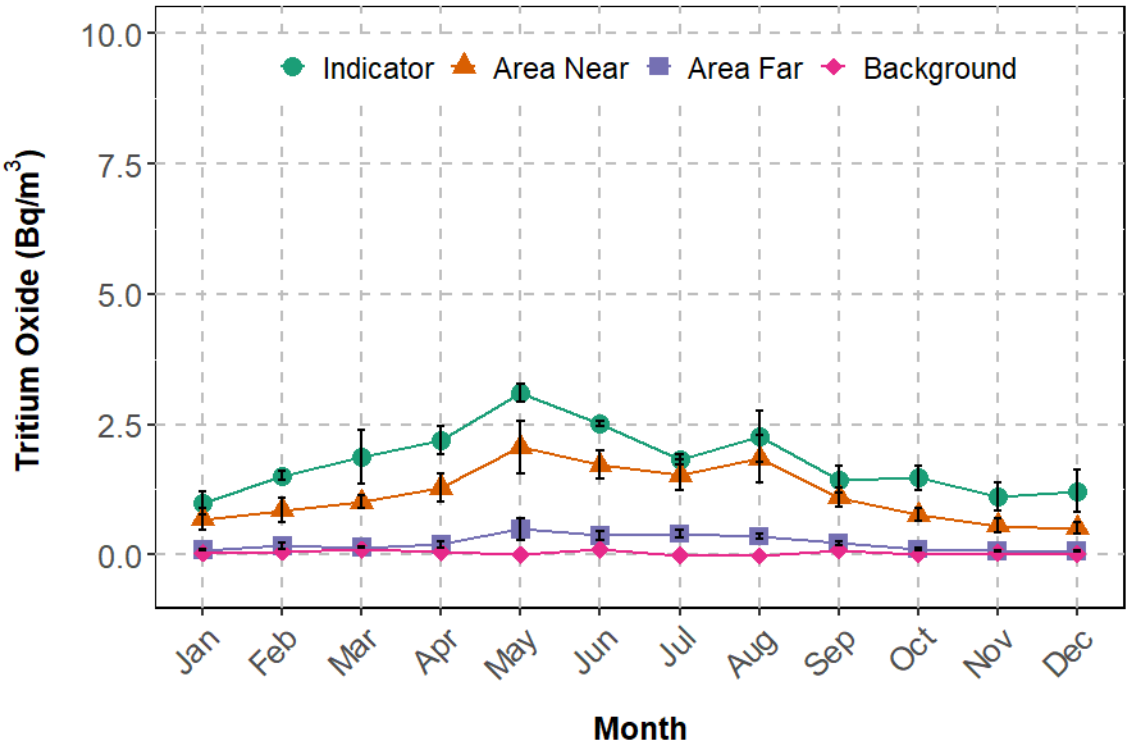


Figure 33 – 2024 Monthly Tritium Oxide in Air Concentrations (becquerels per cubic metre) at Bruce Power Indicator, Near, Far and Provincial Background Locations (± Standard Error); reference level = 340 becquerels per cubic metre.

As illustrated in Figure 33, the monthly average tritium oxide levels in air for 2024 were marginally higher at indicator sites closest to Bruce Power (B02, B03, B04), with sites further away (area near and area far) being progressively lower. The average for the area far location was close to the provincial background value each month, which was consistently lower than all Bruce Power results. In 2024 tritium oxide levels at indicator and area near locations were generally low, with a maximum value of 3.10 becquerels per cubic metre observed at the indicator location in May. The tritium oxide concentrations measured in air near Bruce Power were well below the CNSC reference level of 340 becquerels per cubic metre.

The historical trend of the annual average tritium oxide in air is shown in Figure 34 for indicator, area near, area far and provincial background locations. Concentrations of tritium oxide in air are higher closer to site and decrease with distance, with area far averages being very similar to background. The annual averages fluctuate with changes to airborne tritium emissions from the site each year, which are related to maintenance work on reactor systems or equipment deficiencies. For example, in 2017 airborne tritium emissions were impacted by maintenance work on components of the heat transport and moderator systems, whereas in 2022 there were equipment deficiencies in the vapour recovery systems at Bruce A, as well as work completed to support the planned vacuum building outage at Bruce A, that contributed to tritium releases to air that year. All historical airborne tritium releases have been well below any reportable or regulatory limits and tritium measured in air around Bruce Power have consistently been a small fraction of the CNSC reference level of 340 becquerels per cubic metre. These levels are not harmful to people or the environment.

A general linear model ($\alpha=0.05$) was performed by site over the last 10 years and identified that there is not a statistically significant change over time, or a significant difference by site ($p>0.05$). An analysis of variance ($\alpha=0.05$) shows that there is a significant difference in the means by site between the indicator, area near and area far sites, and the mean for area far site is not significantly different to provincial background ($p<0.001$).

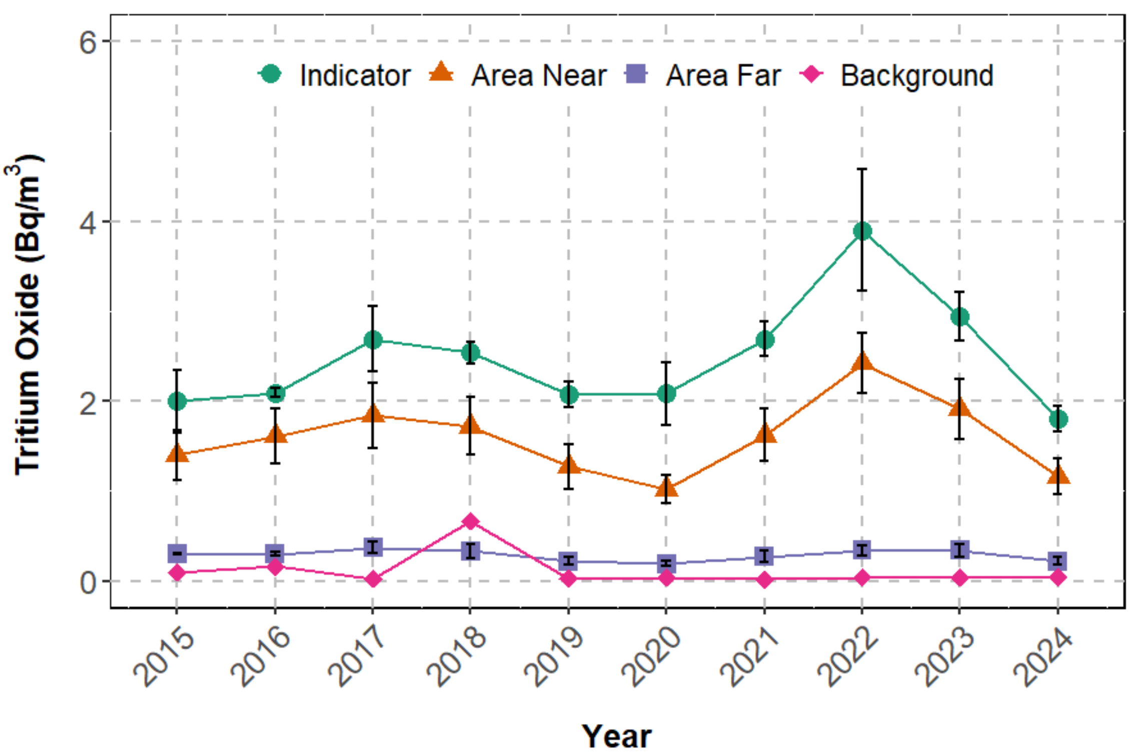


Figure 34 - 2024 Annual Average Tritium Oxide in Air Concentrations (becquerels per cubic metre) at Bruce Power Indicator, Near, Far and Provincial Background Locations Over Time (± Standard Error); reference level = 340 becquerels per cubic metre.

The CNSC Independent Environmental Monitoring Program measured air samples for tritiated water (tritium oxide) and elemental tritium at four locations near Bruce Power in 2022 including Inverhuron, Baie du Doré, Tiverton and Neyaashiinigmiing [R-114][R-115]. All results for elemental tritium were less than the limit of detection value of 2.0 becquerels per cubic metre. Two locations had values greater than the detection limit for tritiated water measured in air. These include Baie du Doré at 8.5 becquerels per cubic metre and Tiverton at 6.1 becquerels per cubic metre. All results were well below the guideline/reference level of 340 becquerels per cubic metre for tritiated water and were not expected to cause a human health impact.

6.1.1.3 Carbon-14 in Air

Carbon-14 in air is monitored using passive air samplers that contain mixed soda lime pellets that absorb carbon dioxide from the atmosphere at a controlled rate. The absorbent material is collected on a quarterly basis. The carbon dioxide is released from the pellets by titration with acid and then analyzed by liquid scintillation counting for carbon-14 content. There are eight sampling locations near Bruce Power (Figure 29), with a duplicate sampler at B05 at Scott Point. There are 14 passive samplers on-site situated around Bruce A, Bruce B and Ontario Power Generation Western Waste Management Facility. The Provincial Environmental Monitoring Program has five carbon-14 samplers, shown in Figure 28, to measure background levels.

The average carbon-14 in air results are shown for each quarter of 2024 in Figure 35. The area near and background values are very similar to one another for all quarters, with the indicator average fluctuating above and below these.

The 2024 annual average carbon-14 concentrations are provided in Table 25 for the off-site locations and in Table 26 for the on-site locations. The average carbon-14 concentration at the indicator location in 2024 was low and very similar to the average provincial background value (Table 25). The individual area near locations are comparable to the carbon-14 levels measured at the background locations.

The carbon-14 results from the on-site passive samplers circling the Ontario Power Generation Western Waste Management Facility are typically higher than other areas on-site, including monitors near the Bruce A and Bruce B stations, due to off gassing of spent resin storage containers. Since 2022, Ontario Power Generation has been installing carbon dioxide scrubbers at various locations to reduce the emissions from this source. In 2024, the annual average at C03-PC was impacted by a spurious result for the second quarter that could not be attributed to airborne releases from any site and was not congruous with any other sampling location. Vegetation collected near C03-PC in the third quarter had carbon-14 levels within the expected range. For transparency, the outlier was included in the dataset.

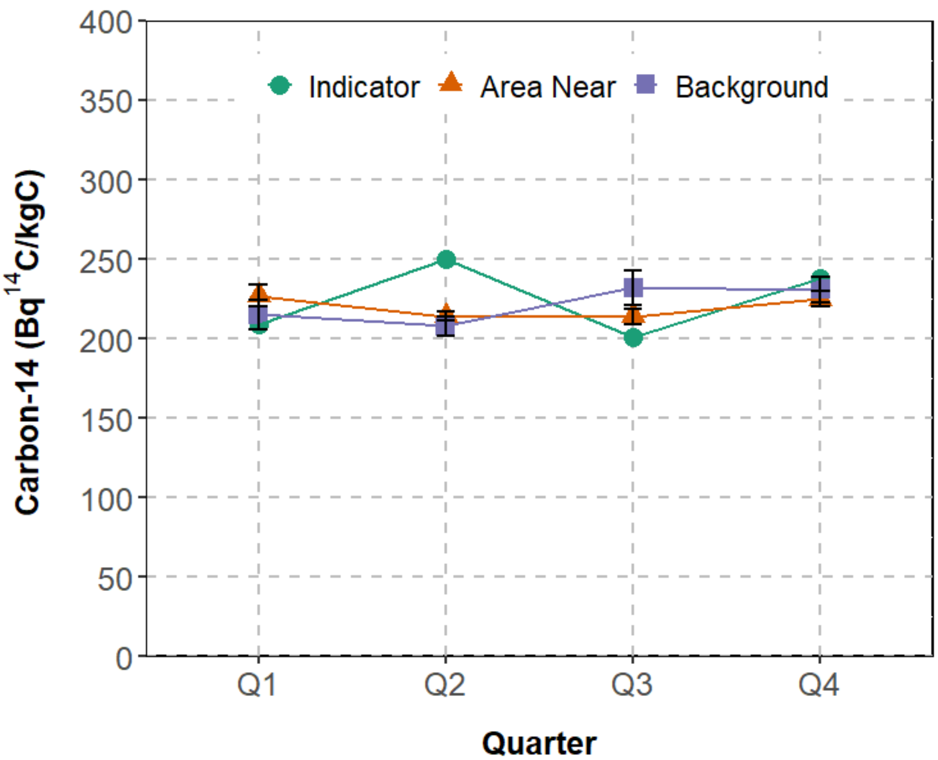


Figure 35 - 2024 Quarterly Average Carbon-14 in Air Concentrations (becquerels carbon-14 per kilogram carbon) at Bruce Power Indicator, Area Near and Provincial Background Locations (± Standard Error).

Table 25 – 2024 Annual Average Carbon-14 in Air from Passive Samplers Off-Site

Location Type	Sample Location	Carbon-14 (becquerels carbon-14 per kilogram carbon)
Indicator	B03-PC	225
Area Near	B05-PC	220
Area Near	B11-PC	217
Area Near	BF01-PC	211
Area Near	BF14-PC	215
Area Near	BF23-PC	221
Area Near	BR01-PC	217
Area Near	BR11-PC	237
Background	Bancroft	225
Background	Barrie	232
Background	Lakefield	229
Background	Nanticoke	205
Background	Picton	222
Area Near	Average	220
Background	Average	223

Note:

1. Sample count = 4 in all cases, except B05-PC sample count = 8.
2. For calculation of averages the uncensored analytical result was used.

Table 26 – 2024 Annual Average Carbon-14 in Air from Passive Samplers On-Site

Location Type	Sample Location	Carbon-14 (becquerels carbon-14 per kilogram carbon)
On-Site	C01-PC	303
On-Site	C02-PC	288
On-Site	C03-PC	23818
On-Site	C04-PC	650
On-Site	C05-PC	1032
On-Site	C06-PC	1988
On-Site	C07-PC	304
On-Site	C08-PC	472
On-Site	C09-PC	264
On-Site	C10-PC	317
On-Site	C11-PC	496
On-Site	C12-PC	416
On-Site	C13-PC	975
On-Site	C14-PC	1188

Note:

1. Sample count = 4 in all cases, except C13-PC sample count = 3.
2. For calculation of averages the uncensored analytical result was used.

The annual average carbon-14 in air concentrations for the last ten years are shown in Figure 36. The Bruce Power annual average is typically just above the provincial annual average, with trends in both being relatively stable. The 2024 averages at all locations are very similar to the previous year. A general linear model ($\alpha=0.05$) was performed by site over the last 10 years and identified a statistically significant decrease by site and by year ($p<0.001$). An analysis of variance ($\alpha=0.05$) by site shows that the means for indicator and area near sites are not significantly different from one another, with both means being significantly higher than provincial background ($p<0.001$). An analysis of variance ($\alpha=0.05$) by year shows that the means decrease over time ($p<0.05$).

The CNSC Independent Environmental Monitoring Program carried out near Bruce Power in 2022 did not monitor for carbon-14 in air.

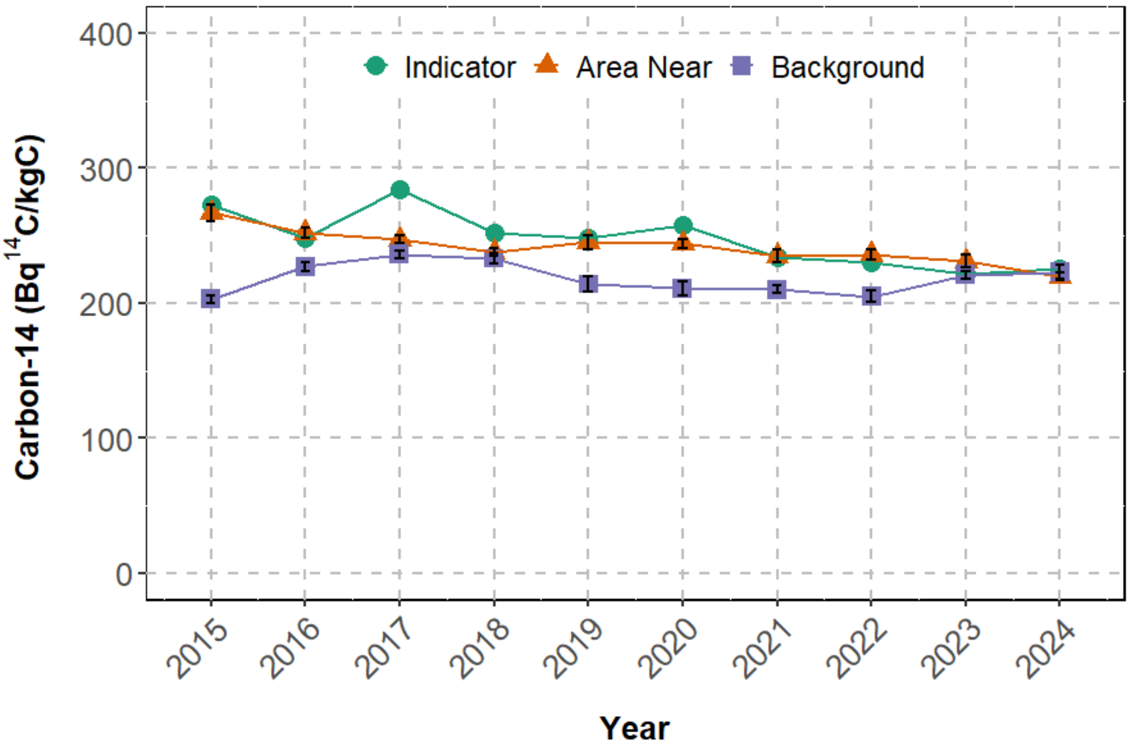


Figure 36 - Annual Average Carbon-14 in Air Concentrations (becquerels carbon-14 per kilogram carbon) at Bruce Power Indicator, Area Near and Provincial Background Locations Over Time (± Standard Error)

6.1.1.4 Air Monitoring Summary

Bruce Power monitors external gamma radiation and tritium oxide and carbon-14 concentrations in air on a continuous basis at locations near Site. All results for 2024 were within normal ranges and similar to historical values. No human health impacts are expected from these levels in the environment.

A summary of each radionuclide group is provided here:

- External gamma results for 2024 were less than provincial background and have remained relatively constant over the last decade. The external radiation levels measured in the area by the CNSC and Health Canada were negligible.
- Tritium levels in air for 2024 were lower than the previous year, and the annual averages were well below the CNSC reference level.
- For 2024, carbon-14 levels in air were similar to previous years and nearly indistinguishable from background levels.

6.1.2 Precipitation

Atmospheric deposition of airborne radionuclides is monitored through the collection of precipitation at 10 locations near and far from Bruce Power (Figure 29 and Figure 30). The snow or rainwater that has accumulated in an open pail is collected each month and analyzed for tritium oxide by liquid scintillation counting and for gross beta radiation by proportional counting.

Although the results are not representative due to the inconsistent nature of precipitation and changes in radiological emissions between precipitation events, the results can assist in understanding the movement of radionuclides through the environment. Deposition of radionuclides onto the earth will impact soil and water sources, including groundwater, and may be reviewed in comparison to other environmental monitoring data. Precipitation monitoring may also be used to verify assumptions made in the dose model for the site, however precipitation results are not used directly in the dose to public calculations.

When monitoring precipitation, the volume of water collected is highly variable and dependent on the year and season, as the pail may be empty or filled with snow or ice at the time of collection. For some months there is not enough volume to perform all of the planned measurements
(e.g., tritium or gross beta). In 2024, there were also issues with high levels of road salt/s and in the samples which prohibited gross beta analysis.

The annual average results for tritium oxide and gross beta in precipitation are presented in Table 27. The province does not collect precipitation as part of their Environmental Monitoring Program. As seen in previous years, the average tritium oxide results decrease with distance from Bruce Power (indicator > area near > area far locations), in line with what is observed with tritium oxide in air measurements (Section 6.1.1.2). By contrast, gross beta levels in precipitation remain consistent regardless of proximity to site, suggesting that Bruce Power operations are not a significant contributor to gross beta measured in precipitation.

Table 27 - 2024 Annual Average Precipitation Data

Location Type	Sample Location	Tritium Oxide (becquerels per litre)	Gross Beta (becquerels per cubic metre per month)
Indicator	B02-WP	131	19
Indicator	B03-WP	160	20
Indicator	B04-WP	164	22
Area Near	B05-WP	93	21
Area Near	B07-WP	129	21
Area Near	B10-WP	80	20
Area Near	B11-WP	58	17
Area Far	B06-WP	9	21
Area Far	B08-WP	19	21
Area Far	B09-WP	25	17
Indicator	Average	151	21
Area Near	Average	90	20
Area Far	Average	18	20

Note:

1. For tritium analysis, sample count = 12 in all cases, except at B11-WP with sample count = 11, and B09-WP with sample count = 10. For beta analysis, sample count = 12 in all cases, except B08-WP and B09-WP with sample count = 11.

2. For calculation of averages where result was less than critical level (Lc) the uncensored analytical result was used.

Tritium oxide in precipitation measured at Bruce Power monitoring locations are shown for the last ten years in Figure 37. Consistently the tritium concentration decreases with distance from Bruce Power. Averages vary from year to year mirroring the airborne tritium emissions from Site. The annual averages at the indicator and area near locations for 2024 were lower than the previous year, similar to the trends observed for tritium oxide in air (Section 6.1.1.2).

A general linear model ($\alpha=0.05$) was performed by site over the last 10 years and identified that there is no statistically significant change by site over time ($p>0.05$). An analysis of variance ($\alpha=0.05$) shows that there is a significant difference in the means between the indicator, area near and area far sites ($p<0.001$).

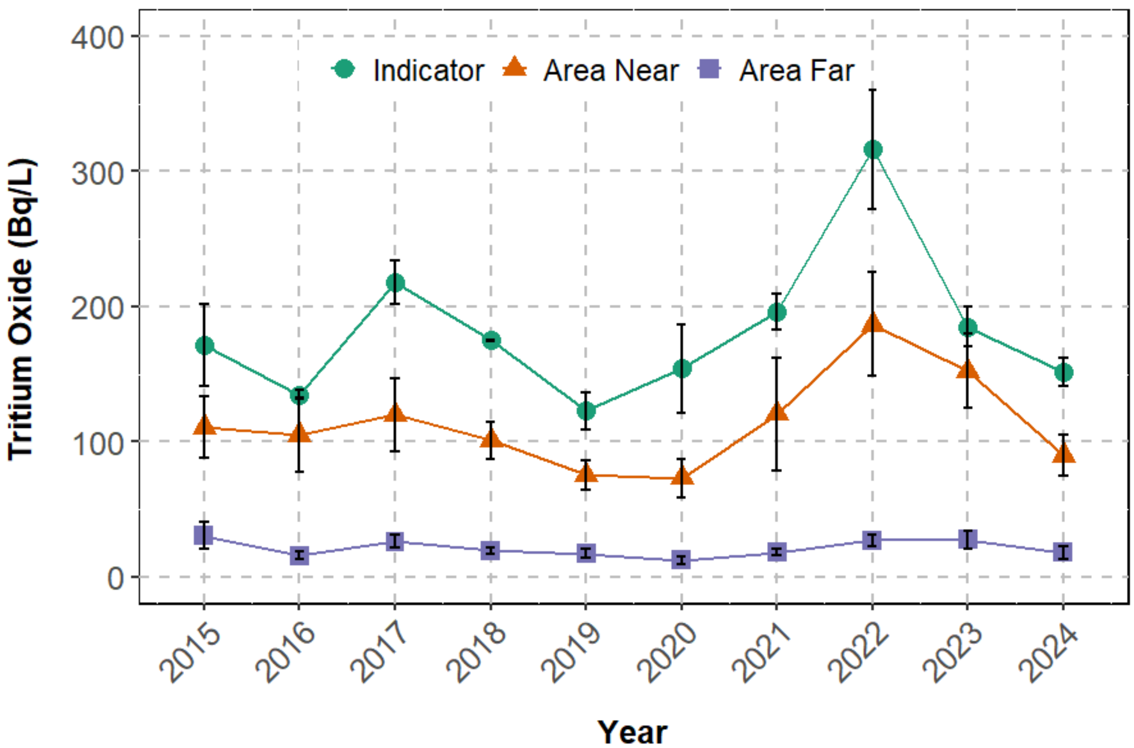


Figure 37 - Annual Average Tritium Oxide Concentrations in Precipitation (becquerels per litre) at Bruce Power Indicator, Area Near, Area Far Locations over Time (± Standard Error).

In 2024 the requirement for, and application of, precipitation monitoring data at Bruce Power was reviewed to determine if it was still required to meet the objectives of the Radiological Environmental Monitoring Program. It was shown that concentrations of radionuclides in monthly precipitation samples were not representative of airborne emissions, that tritium oxide and gross beta concentrations were measured in other, primary environmental media (e.g., air, drinking water, and soil), that precipitation results were not used in dose to public calculations or the Environmental Risk Assessment, and there were no regulatory or stakeholder commitments to continue the monitoring. Therefore, Bruce Power plans to transition precipitation monitoring out of the Radiological Environmental Monitoring Program in 2025.

6.1.3 Water Monitoring

Bruce Power regularly collects drinking water samples from the local municipal water supply plants and municipal and residential wells near Site for use in calculating dose to members of the public each year. Surface water samples are also collected from Lake Huron and local streams off-site, as well as at locations within the Bruce Power Site boundary. Both drinking water and surface water are monitored for tritium oxide, gross beta and gross gamma radiation. Bruce Power water sampling locations are shown in Figure 29 and Figure 30.

Background levels of tritium oxide in lake water are a combination of natural cosmogenic sources (produced by the action of cosmic rays) and residual fallout from historical nuclear weapons testing. The Atomic Energy Canada Limited developed a mathematical model for estimating background tritium activity in Lake Huron from cosmogenic sources and fallout from nuclear weapons testing [R-116]. Natural Lake Huron tritium levels in the absence of historical and current CANDU tritium releases are estimated to be 1.5 becquerels per litre. This value is used to subtract background from values measured locally for the dose to public calculation.

The provincial environmental monitoring program monitors for tritium oxide and gross beta in samples collected at water supply plants, municipal drinking water locations and lakes within Ontario. Provincial background sampling locations are shown in Figure 28.

The routine monitoring of the on and off-site waterbodies informs the environmental monitoring and Environmental Risk Assessment programs to ensure that Bruce Power is appropriately monitoring and understanding its impact on the environment.

6.1.3.1 Municipal Water Supply Plants

Municipal drinking water is sampled at two municipal water supply plants on Lake Huron – one in Southampton (22 kilometres northeast of Bruce A) and one in Kincardine (15 kilometres south-southwest of Bruce B). Water samples are collected twice per day during regular business hours and weekly composite samples are analyzed for tritium oxide by liquid scintillation counting. Monthly composite samples are analyzed for gross beta radiation by proportional counting. The Ontario Drinking Water Standard for tritium is 7,000 becquerels per litre (annual average), however Bruce Power has a long standing commitment with the municipalities to maintain an annual average tritium concentration at the water supply plants below 100 becquerels per litre, and this value was set as an administrative level. [R-117].

The 2024 annual average tritium and gross beta results for drinking water samples collected by Bruce Power and the province are listed in Table 28. The 2024 annual weekly average for tritium at the Kincardine water supply plant was 3.8 becquerels per litre and at the Southampton water supply plant was 12.6 becquerels per litre. These values are well below the Ontario Drinking Water Standard and CNSC reference level (7,000 becquerels per litre), as well as the committed administrative level of 100 becquerels per litre. The average annual tritium concentration at the provincial water supply locations ranged between less than detect and 2.9 becquerels per litre.

The gross beta results at the local water supply plants for 2024 (0.07 becquerels per litre) were similar to historical and provincial background results (0.06 – 0.1 becquerels per litre) and were well below the CNSC reference level of 1 becquerels per litre.

Table 28 - 2024 Annual Average Tritium Oxide and Gross Beta Concentrations in Drinking Water at Municipal Water Supply Locations

Location Type	Sample Location	Tritium Oxide (becquerels per litre)	Gross Beta (becquerels per litre)
Bruce Power	Kincardine	3.8	0.07
Bruce Power	Southampton	12.6	0.07
Background	Brockville	2.3	0.1
Background	Burlington	2.9	0.1
Background	Goderich	1.6	0.1
Background	Kingston	<Ld	0.1
Background	Niagara Falls	<Ld	0.1
Background	Windsor	1.4	0.1
Background	St. Catherine’s	<Ld	0.1
Background	Thunder Bay	<Ld	0.07
Background	North Bay	<Ld	0.09
Background	Parry Sound	<Ld	0.06
Background	Average	1.9	0.1

Note:

1. Bruce Power: For calculation of averages where the result was less than critical level (Lc), the uncensored analytical result was used.

2. Provincial background: For calculation of averages where the result was less than the minimum detection level (Ld), the uncensored analytical result was used. ‘<Ld’ stated in table when all results were <Ld.

The impact of Bruce Power discharges to Lake Huron on the local water supply plants varies from year to year and is dependent on a variety of factors including operational activities, the distance from the discharge points, lake current direction and general dispersion conditions in the lake. The Southampton water supply plant has marginally higher annual average tritium oxide concentrations each year compared to Kincardine due to the predominant lake currents near Bruce Power travelling northward.

The tritium concentrations at the water supply plants over the last ten years are shown in Figure 38. Tritium oxide concentrations are consistently low and stable from year to year, with Southampton being slightly higher than Kincardine and provincial averages. All results are below 15% of the administrative level of 100 becquerels per litre. These values are very low and no impacts to human health are expected from these levels.

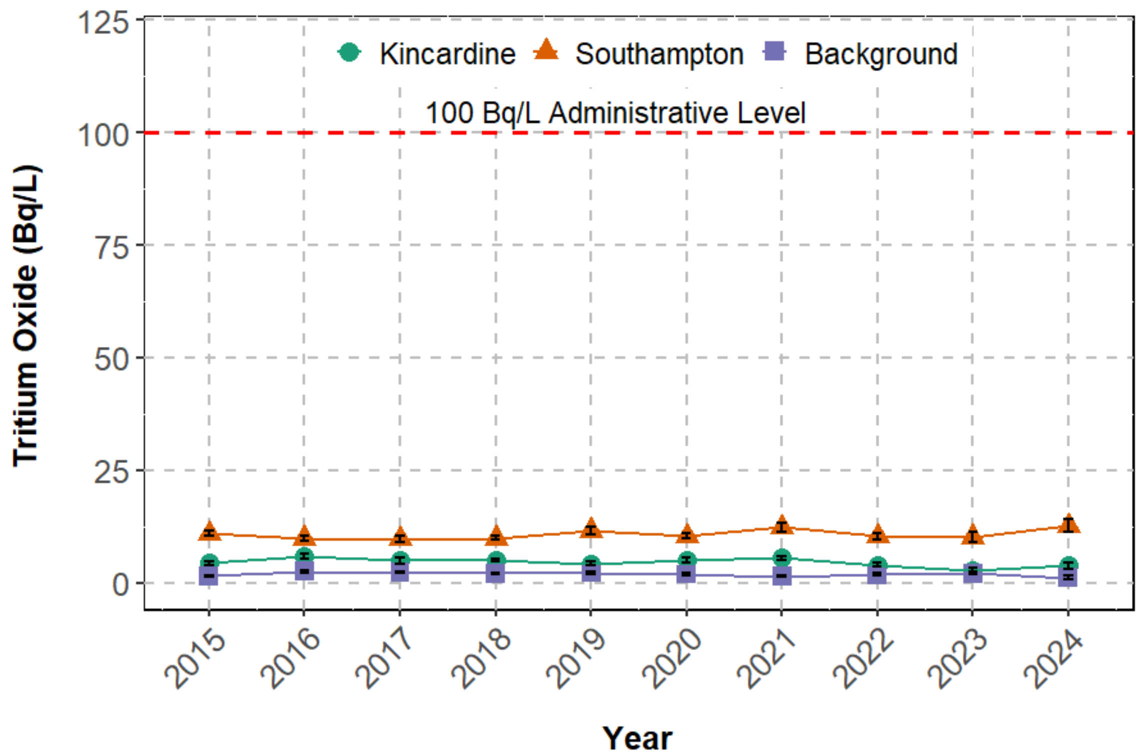


Figure 38 - Annual Average Tritium Oxide Concentrations (becquerels per litre) at the Municipal Water Supply Plants near Bruce Power (± Standard Error) and Provincial Background Locations Over Time. Reference level = 7000 becquerels per litre; Administrative level = 100 becquerels per litre.

6.1.3.2 Municipal and Residential Wells

In addition to the water supply plants in Southampton and Kincardine, drinking water is also collected at a number of municipal and local residential wells. Four municipal wells, located at Scott Point (BM03-WW), Underwood (BM06-WW) and Tiverton (BM12-WW, BM13-WW), are sampled semiannually. Seven deep residential wells are also sampled semiannually, while six shallow residential wells are sampled bimonthly, based on occupant availability. Water samples are analyzed for tritium oxide by liquid scintillation counting. Two representative locations, one to the north of Bruce Power at Scott Point (BR02-WW) and one to the south at Inverhuron (BR32-WW), are also analyzed semiannually for gross beta and gross gamma radiation. Annual average tritium oxide and gross beta results are shown in Table 29. Results for CANDU related -gamma emitting radionuclides cobalt-60, cesium-134 and cesium-137 from the gamma scan completed on semi-annual samples taken from shallow wells at Scott Point (BR02-WW) and Inverhuron (BR32-WW) are not shown as the results were indistinguishable from background (i.e., less than the critical level or not identified).

Table 29 - 2024 Annual Average Tritium Oxide and Gross Beta Concentrations in Drinking Water at Bruce Power Well Locations

Location Type	Sample Location	Tritium Oxide (becquerels per litre)	Gross Beta (becquerels per litre)
Municipal Well	BM03-WW	<Lc	Not Applicable
Municipal Well	BM06-WW	<Lc	Not Applicable
Municipal Well	BM12-WW	<Lc	Not Applicable
Municipal Well	BM13-WW	<Lc	Not Applicable
Residential Deep Well	BF01-WW	<Lc	Not Applicable
Residential Deep Well	BF14-WW	<Lc	Not Applicable
Residential Deep Well	BF23-WW	<Lc	Not Applicable
Residential Deep Well	BM02-WW	<Lc	Not Applicable
Residential Deep Well	BR01-WW	<Lc	Not Applicable
Residential Deep Well	BR08-WW	<Lc	Not Applicable
Residential Deep Well	BR25-WW	<Lc	Not Applicable
Residential Shallow Well	BF06-WW	<Lc	Not Applicable
Residential Shallow Well	BR02-WW	<Lc	0.03
Residential Shallow Well	BR03-WW	134.0	Not Applicable
Residential Shallow Well	BR04-WW	<Lc	Not Applicable
Residential Shallow Well	BR32-WW	19.6	0.3
Residential Shallow Well	BR41-WW	23.8	Not Applicable
Residential Shallow Well	BR42-WW	40.5	Not Applicable

Note: For calculation of averages where the result was less than critical level (Lc), the uncensored analytical result was used. ‘<Lc’ stated in table when all results were <Lc.

For shallow wells, the source of tritium oxide may be attributed to deposition of airborne tritium emissions from Bruce Power or precipitation washout migrating into the shallow wells. The deep wells are less likely to be affected by airborne deposition. Tritium oxide concentrations for all municipal and deep residential wells were less than the critical level for detection and indistinguishable from background. For the shallow wells the tritium oxide results were higher, although 3 out of 7 available wells had results less than the critical level. The other four wells had annual averages ranging between 20 and 134 becquerels per litre and well below the Ontario Drinking Water Standard of 7000 becquerels per litre. The average gross beta result for BR02 and BR32 were slightly higher than the background locations (Table 28) but were only a fraction of the CNSC reference level of 1 becquerels per litre.

The CNSC Independent Environmental Monitoring Program that collected samples near Bruce Power in 2022 did not include drinking water from the municipal water supply plants or residential wells. However, samples of lake water were collected, and these results are discussed in the section below.

6.1.3.3 Lakes and Streams

Water samples are collected from Lake Huron, ponds and streams in the vicinity of Bruce Power and measured for radiological contaminants. Waterbodies may be impacted by deposition of airborne radiological emissions from the Site or by precipitation washout migrating into waterways. Lake water may also be impacted by waterborne effluent from discharge points on the Bruce Power site. Samples of lake, pond and stream water are collected from the shore on a bi-monthly basis when free of ice. Surface water is analyzed for tritium oxide by liquid scintillation counting and gross beta by proportional counting. Composites of lake water samples are also analyzed for gross gamma semi-annually using gamma spectroscopy.

Bruce Power sampling locations are shown on Figure 29. On-site sample locations within the Bruce Power perimeter fence include two ponds and one stream (B31 Pond – BM16-WL, Former Sewage Lagoon – BM21-WL and Stream C – BC02-WC). Off-site samples are collected from three stream locations near Bruce Power, which include Little Sauble River (BC01-WC) to the south and two locations on Underwood Creek (BC03-WC and BC04-WC) to the north. Lake water is sampled at Inverhuron (BM10-WL) to the south, Baie du Doré (BM04-WL) to the northeast, and Scott Point (BM20-WL) to the north. The stream indicator location is Stream C (BC02-WC) located on the north side of the Bruce Power boundary and flows into Baie du Doré. The lake indicator location (BM04-WL) is sampled from the eastern shore of Baie du Doré at the end of Concession Road 6.

The 2024 annual average tritium oxide and gross beta results are shown in Table 30. Gamma results for 2024 are not shown as all results for CANDU related radionuclides cobalt-60, cesium-134 and cesium-137 were indistinguishable from background (i.e., less than the critical level or not identified in the gamma scan).

Background lake water is collected by Ontario Power Generation on a quarterly basis at three locations (Bancroft, Belleville and Cobourg) as shown in Figure 28 and analyzed for tritium oxide and gross beta radiation. Samples are not collected when the lake is frozen (typically the first and fourth quarters). The 2024 annual average results are presented in Table 30.

Table 30 - 2024 Annual Average Tritium Oxide and Gross Beta Concentrations in Ponds, Lakes and Streams

Location Type	Sample Location	Tritium Oxide (becquerels per litre)	Gross Beta (becquerels per litre)
On Site Pond	BM16-WL (B31 Pond)	126.0	Not applicable
On Site Pond	BM21-WL (Former Sewage Lagoon)	703.8	Not applicable
Indicator Stream	BC02-WC	128.7	0.1
Area Near Stream	BC01-WC	32.5	0.2
Area Near Stream	BC03-WC	41.6	0.2
Area Near Stream	BC04-WC	95.7	0.1
Indicator Lake	BM04-WL	76.5	0.1
Area Near Lake	BM10-WL	13.8	0.1
Area Near Lake	BM20-WL	59.7	0.1
Background Lake	Bancroft (Clark Lake)	<Ld	0.1
Background Lake	Belleville (Bay of Quinte)	<Ld	0.1
Background Lake	Cobourg (Lake Ontario)	0.7	0.2

Note:

1. Bruce Power: For calculation of averages where result was less than critical level (Lc) the uncensored analytical result was used.
2. Provincial background: For calculation of averages where the result was less than the minimum detection level (Ld), the uncensored analytical result was used. ‘<Ld’ stated in table when all results were <Ld.
3. Bancroft, Belleville, and Cobourg are not sampled during winter months (Quarter 1 and 4); sample count = 2.

The 2024 Bruce Power results for lake and stream water show similar trends as those observed for shallow wells and air monitoring; tritium oxide values decrease with increasing distance from Bruce Power. All values are well below the Ontario Drinking Water Standard and CNSC reference level for tritium oxide in drinking water (7000 becquerels per litre). The gross beta results are consistently low and show little variation with proximity to Bruce Power. The indicator lake results are similar to what is measured at Bancroft (Clark Lake) and Belleville (Bay of Quinte). The gross beta concentrations in surface water are well below the CNSC reference level of 1 becquerel per litre.

Annual average tritium oxide concentrations in lake and stream water samples measured at Bruce Power indicator and area near locations over time are shown in Figure 39. In 2024, the indicator stream annual average increased compared to the previous year, whereas indicator lake, area near stream and area near lake averages remained similar to historical values. The higher tritium oxide concentrations observed in 2022 were attributed to the higher airborne tritium releases that year due to equipment deficiencies and planned maintenance activities at Bruce A. For 2024, the higher value for indicator stream cannot be attributed directly to airborne releases, as tritium oxide emissions at Bruce A and Bruce B were lower than previous years (see Section 5.1.2.1), as were the tritium oxide concentrations measured at indicator locations off-site (Section 6.1.1.2). It is possible that due to the dry summer conditions, tritium deposited onto the earth accumulated and was then washed into the stream with increased precipitation in the late summer – early fall period. There may have been less dilution than in previous years. The tritium oxide concentration at the indicator stream is still very low and a small fraction of the Ontario Drinking Water Standard of 7000 becquerels per litre.

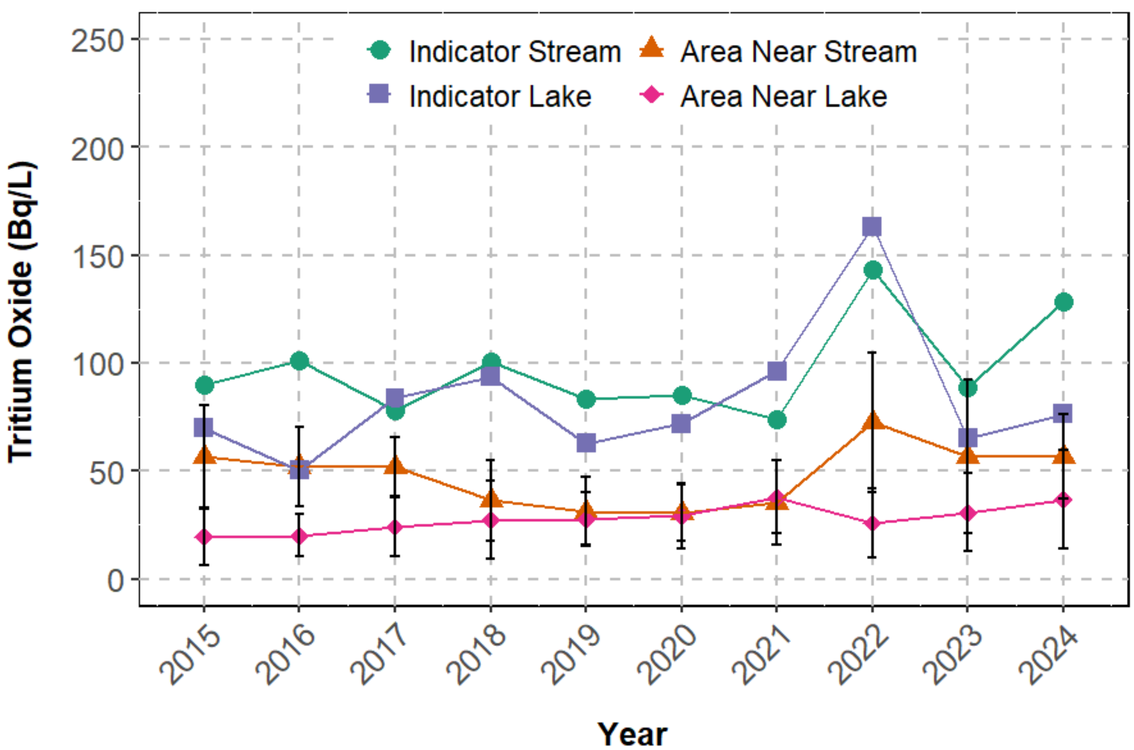


Figure 39 - Annual Average Tritium Oxide Concentrations (becquerels per litre) in Lake Huron and Streams Near Bruce Power Over Time (± Standard Error). Canadian Nuclear Safety Commission reference level = 7000 becquerels per litre.

The CNSC Independent Environmental Monitoring Program for 2022 included surface water sampling at five locations near Bruce Power including the Saugeen River in Southampton and the shores of Southampton beach, Port Elgin beach, Baie du Doré and Kincardine beach. The following radionuclides or radionuclide groups were measured in the surface water samples: tritiated water (tritium oxide), gross alpha, gross beta, cobalt-60 and cesium-137. The CNSC found that tritiated water concentrations were in the range of 3.6 becquerel per litre to 68.2 becquerel per litre and below the guideline/reference level of 7000 becquerel per litre. All gross alpha, gross beta, cobalt-60 and cesium-137 results were less than the limit of detection. These results are consistent with what Bruce Power reports and indicate that no human health impacts are expected from radionuclides in surface water from the local area [R-114][R-115].

6.1.3.4 Water Monitoring Summary

Bruce Power regularly monitors tritium oxide, beta and/or gamma emitters in drinking water and surface water at a variety of locations on and off site, including from municipal water supply plants and residential wells, from Lake Huron, streams and ponds. All results were well below the CNSC reference levels, indicating that there is no risk to members of the public or the environment.

A summary is provided here:

- Concentrations of tritium oxide in drinking water at the municipal water supply plants in Kincardine and Southampton are similar to previous years and well below the Ontario Drinking Water Standard and the commitment with the municipalities.
- Radionuclide concentrations in drinking water from local municipal and residential wells are well below the CNSC reference levels for tritium oxide and gross beta radiation.
- Annual average tritium concentrations in Lake Huron and local streams quickly decrease with distance from Bruce Power.

6.1.4 Agricultural and Animal Products Monitoring

Bruce Power collects a variety of foodstuffs each year, including milk, fish, animal products (e.g. eggs, honey, meat) and agricultural products (e.g., fruit, vegetables, grains) and measures for radioactivity. Sample type and location may vary from year to year depending on sample availability and participation from local farmers and residents. The results are used in the annual dose to public calculation for the representative persons that live near Bruce Power. Additionally, the results inform the Environmental Monitoring and Environmental Risk Assessment programs to ensure that Bruce Power is monitoring appropriately and understanding its impact on the environment.

6.1.4.1 Fish

Bruce Power monitors fish in Lake Huron for radionuclide concentrations as part of the Radiological Environmental Monitoring program. Samples of benthic forager (bottom feeders) and pelagic forager (open water) fish species are collected near Bruce Power and further afield at locations along the western shore of Lake Huron well away from Bruce Power for use as a control. The control sampling locations were updated in 2017 due to importation policies that came into effect that year. Starting in 2017, control fish are collected on the Canadian side of Lake Huron north of Tobermory or within Georgian Bay, by a contractor assisted by members of the Saugeen Ojibway Nation.

The analysis of two types of fish species provides some insight into potential radiological impacts from Bruce Power operations on the lakebed where benthic species inhabit, and through open water ecosystems where pelagic fish inhabit. The target fish species representing benthic and pelagic foragers are as follows:

- White Sucker (*Catostomus commersoni*) represents a benthic forager species. Brown Bullhead (*Ictalurus nebulosus*) is the alternate benthic species. Sample collection is conducted in the spring.

- Lake Whitefish (*Coregonus clupeaformis*) represents a predominantly pelagic forager that feeds on a wide variety of organisms from invertebrates to small fish, to plankton. Round Whitefish (*Prosopium cylindraceum*) is the alternate pelagic species. Collection is conducted in the fall when adults are near shore to spawn. The secondary alternative is Lake Trout (*Salvelinus namaycush*).

Eight composite fish samples for each species and location are analyzed for tritium oxide and carbon-14 by liquid scintillation counting and for cobalt-60, cesium-134, cesium-137 by gamma spectrometry. A composite of the eight fish samples for each species and location is measured for organically bound tritium by liquid scintillation counting. The fish flesh ventral to the lateral line is included in the samples prepared for analysis. The sample preparation and analysis method for each radionuclide group is outlined in Table 31.

Table 31 - Fish Preparation and Methods

Analyte	Sample	Preparation	Method
Cobalt-60, Cesium-134, Cesium-137	Individual fish	Skinned, filleted, and flesh sliced	Gamma spectrometry
Carbon-14	Two counts of a single sample per individual fish	Freeze dried flesh combusted	Liquid scintillation counting
Tritium oxide	Average of two samples per individual fish	Water from freeze dried flesh	Liquid scintillation counting
Organically Bound Tritium	Single composite by fish type	Solid residue (washed to remove free tritium oxide) combusted	Liquid scintillation counting

In 2024, the far field benthic fish caught at a control location in March had higher than expected tritium oxide concentrations, ranging from 41.6 to 209.0 becquerels per litre (average 97.0 becquerels per litre). These values are still very low, and not expected to have any health impacts, but still out of historical trends and raise questions about validity of results. The near field benthic fish caught near Bruce Power outside Baie du Doré in April were more typical of historical values (average 6.4 becquerels per litre) for fish caught in the local area. As it was unusual for the control fish to have a higher result than the near field fish, an investigation was launched, and Bruce Power requested the contractor to investigate whether there was potential for the samples to be switched or contaminated. Although the sampling, processing, transporting, storing and analytical processes were reviewed by vendor, an error could not be identified. Additionally, there were no abnormal waterborne tritium releases from site, or elevated levels in water sampled in Lake Huron or at the Southampton water supply plant (Section 6.1.3), during the time that the fish were caught.

To confirm that there was not an ongoing issue, another batch of benthic fish were collected from both near and far locations from Bruce Power in November/ December. Due to challenging winter weather conditions, the near field fish were caught near Oliphant approximately 50 kilometres north of Bruce Power, and only three replicates could be obtained. The average tritium oxide results for all benthic fish caught in 2024 are shown in Table 32. The tritium oxide concentrations from the second batch of fish were more in line with historical values, at 6.5 becquerels per litre for near field fish, and less than the critical level for control fish caught in Georgian Bay. Monitoring of benthic fish will continue in 2025, with sample collection planned for spring.

Table 32 - 2024 Annual Average Tritium Oxide Concentrations for Benthic Fish

Type	Location Type	Location Caught	Sample Date	Number of replicates	Tritium Oxide (becquerels per litre)
Benthic	Near	Near Baie du Doré, Lake Huron	09APR2024	8	6.4
Benthic	Near	Near Oliphant, Lake Huron	03DEC2024	3	6.5
Benthic	Control	Near Cape Croker, Georgian Bay	15MAR2024	8	97.0
Benthic	Control	Near Wiarton, Georgian Bay	08NOV2024	8	<Lc

Note:

1. For calculation of averages where result was less than critical level (Lc), the uncensored analytical result was used. ‘<Lc’ is stated in table when all results were <Lc.

As it is possible that the near and control fish for the first batch of benthic fish could have been switched, with the higher tritium oxide value (97.0 becquerels per litre) being representative of fish caught near Bruce Power, this higher value was conservatively used in dose calculations as a special sensitivity case to understand the potential impact of consuming these fish by members of the public. See Section 3.0 for further discussion.

The 2024 annual average results for benthic and pelagic fish are provided in Table 33 and Table 34 for Bruce Power area near and control fish. Results from the second batch of benthic fish are shown in the tables. Also shown are the provincial background annual average results for benthic and pelagic fish from Lake Huron and benthic fish from Lake Ontario for comparison.

Table 33 - 2024 Annual Average Radionuclide Concentrations for Fish

Location Type	Sample Type, Location	Tritium Oxide (becquerels per litre)	Carbon-14 (becquerels carbon-14 per kilogram carbon)	Organically Bound Tritium (becquerels per litre)	Organically Bound Tritium Uncertainty (±2σ) (becquerels per litre)
Bruce Power Area Near	Benthic, Lake Huron	6.5	211	24.7	4.7
Bruce Power Area Near	Pelagic, Lake Huron	7.5	223	9.1	4.3
Bruce Power Control	Benthic, Lake Huron	<Lc	211	<Lc	-
Bruce Power Control	Pelagic, Lake Huron	<Lc	214	<Lc	-
Background	Benthic, Lake Ontario	5.4	234	23.0	3.0
Background	Benthic, Lake Huron	4.1	228	22.7	3.0
Background	Pelagic, Lake Huron	4.1	222	31.0	3.2

Note:

1. Sample count = 8 for control and background fish, 2 for area near pelagic and 3 for area near benthic fish.
2. Bruce Power: For calculation of averages where result was less than critical level (Lc), the uncensored analytical result was used. ‘<Lc’ is stated in table when all results were less than the critical level.

3. Provincial background: For calculation of averages where the result was less than the minimum detection level (Ld), the minimum detection level was used. ‘<Ld’ is stated in table when all results were less than the detection limit.

4. Organically bound tritium analysis is completed on one composite sample of the replicates of each group and the raw analytical data is provided. ±2σ is the uncertainty associated with the analytical measurement. For Bruce Power, the detection limit was 9.7 becquerel per litre and the critical level was 4.8 becquerel per litre. For provincial background the limit of detection was 3.8 becquerel per litre.

Table 34 - 2024 Annual Average Gamma Spectroscopy Results for Fish

Location Type	Sample Type, Location	Cobalt-60 (becquerels per kilogram)	Cesium-134 (becquerels per kilogram)	Cesium-137 (becquerels per kilogram)
Bruce Power Area Near	Benthic, Lake Huron	<Lc	<Lc	0.05
Bruce Power Area Near	Pelagic, Lake Huron	<Lc	<Lc	0.2
Bruce Power Control	Benthic, Lake Huron	<Lc	<Lc	0.1
Bruce Power Control	Pelagic, Lake Huron	<Lc	<Lc	0.7
Background	Benthic, Lake Ontario	<Ld	<Ld	0.2
Background	Benthic, Lake Huron	<Ld	<Ld	0.1
Background	Pelagic, Lake Huron	<Ld	<Ld	0.1

Note:

1. Sample count = 8 for control and background fish, 2 for area near pelagic and 3 for area near benthic fish.

2. Bruce Power: For calculation of averages where result was less than critical level (Lc), the uncensored analytical result was used. ‘<Lc’ stated in table when all results were less than the critical level or not identified on the gamma scan.

3. Provincial background: For calculation of averages where the result was less than the minimum detection level (Ld), the minimum detection level was used. ‘<Ld’ stated in table when all results were less than the detection limit.

Tritium Oxide in Fish

The 2024 annual average concentration of tritium oxide in the second batch of benthic fish was 6.5 becquerels per litre for area near, 4.1 becquerels per litre for the Lake Huron provincial background group, and less than the critical level (and indistinguishable from background) for the control group. For pelagic fish, the area near group average was 7.5 becquerel per litre, the Lake Huron background value was 4.1 becquerels per litre, and the Bruce Power control group was less than the critical level. For both sample types, the tritium oxide concentrations in fish caught near Bruce Power were low.

The annual average tritium oxide concentrations in fish for the past 10 years are shown in Figure 40 for pelagic fish and Figure 41 for benthic fish. There has been little variation in tritium oxide levels in pelagic fish over the years, except for the higher result for the control group in 2018 for reasons unknown. In 2022, samples of pelagic fish were not available from the supplier. The annual average tritium oxide concentration for benthic fish collected near Bruce Power was very low in 2024. The higher annual average in 2021 was attributed to elevated waterborne releases from Bruce B during the spring sample collection period.

A general linear model could not be used for tritium oxide results in fish as the variance was not homogenous. A Kruskal Wallis analysis of variance ($\alpha=0.05$) showed a statistically significant difference in the medians for benthic fish ($p<0.001$) and pelagic fish ($p<0.05$) by site. Both the benthic and pelagic area near fish had a higher median than the control and provincial fish.

The CNSC Independent Environmental Monitoring Program for 2022 included fish samples collected from the Saugeen River in Southampton [R-114][R-115]. Fish species included Lake Trout and Lake Whitefish. The tritiated water (tritium oxide) results ranged from 2.5 to 8.2 becquerels per kilogram fresh weight, which are well below the guideline/reference level of 488,000 becquerels per kilogram fresh weight. No human health impacts are expected from these measured values.

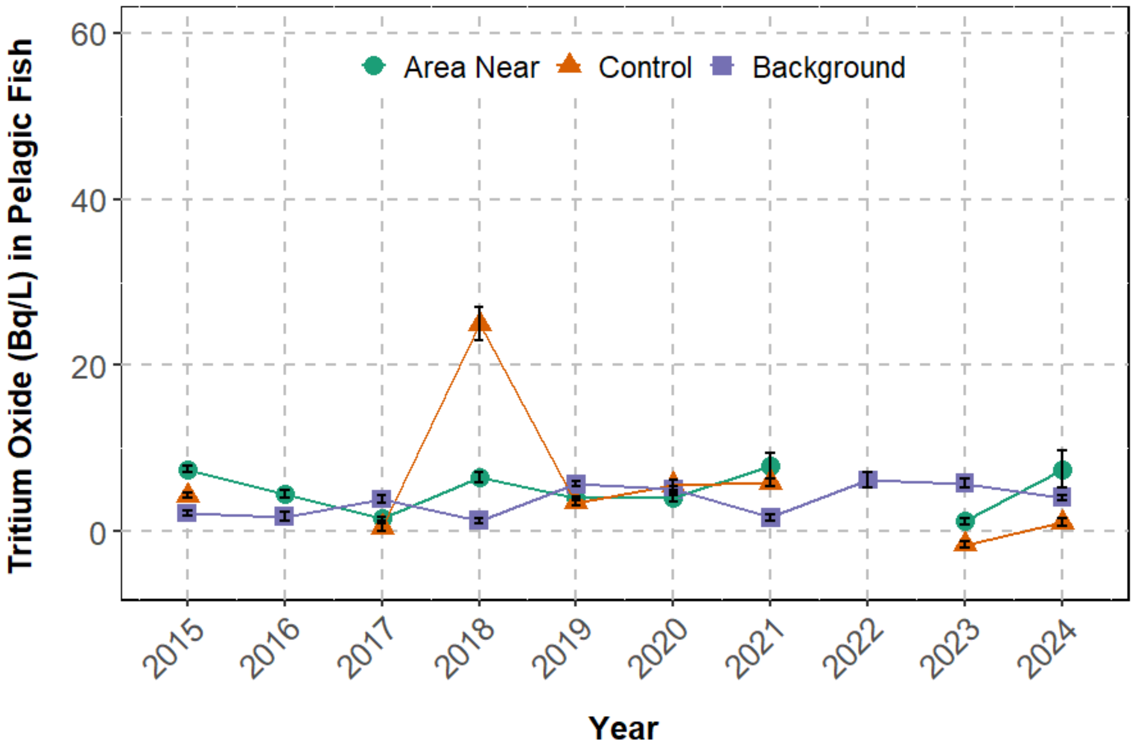


Figure 40 - Annual Average Tritium Oxide (becquerels per litre) in Pelagic Fish Tissue by Year Over Time (± Standard Error).

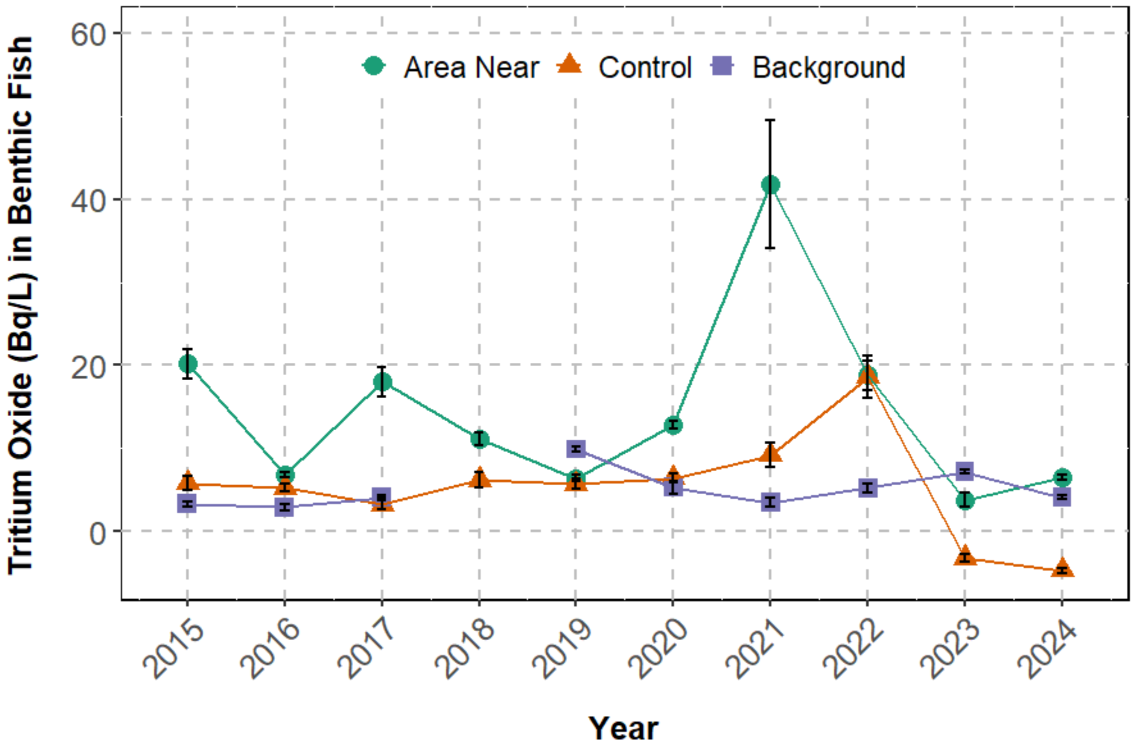


Figure 41 - Annual Average Tritium Oxide (becquerels per litre) in Benthic Fish Tissue by Year Over Time (± Standard Error)

Carbon-14 in Fish

The 2024 annual average concentration of carbon-14 in both the second batch of benthic fish collected near Bruce Power and at the control location was 211 becquerels carbon-14 per kilogram carbon. The average provincial results for Lake Huron benthic fish was slightly higher at 228 becquerels carbon-14 per kilogram carbon. For pelagic fish, the annual average carbon-14 concentration was 223 and 214 becquerels carbon-14 per kilogram carbon for area near and control locations, respectively. The average Lake Huron provincial background value for pelagic fish was similar at 222 becquerels carbon-14 per kilogram carbon. For 2024, the carbon-14 levels in fish collected near Bruce Power were the same or below background values.

The annual average carbon-14 concentrations over time are shown in Figure 42 for pelagic fish and Figure 43 for benthic fish. The carbon-14 levels measured in fish tissue of both species' types collected from Lake Huron have remained steady over time and very similar to background values.

A general linear model (α=0.05) was performed over the last 10 years and identified that there is a statistically significant change by site over time for both benthic fish ($p<0.05$) and pelagic fish ($p<0.001$). An analysis of variance (α=0.05) for benthic fish shows that there is not a significant difference in the means between the area near and provincial sites, or between area near and control sites, but there is a significant difference between the provincial and control locations. An analysis of variance (α=0.05) for pelagic fish shows that there is not a significant difference in the means between the area near, control or provincial sites.

The CNSC Independent Environmental Monitoring Program near Bruce Power did not analyze for carbon-14 in fish.

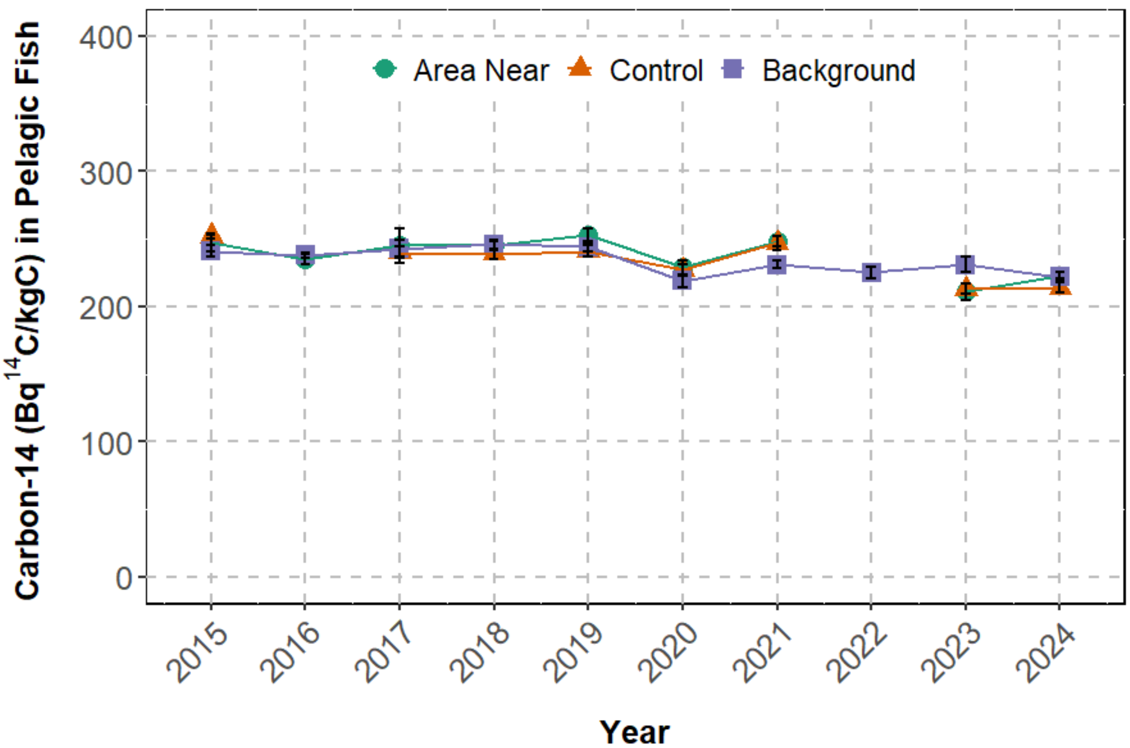


Figure 42 - Annual Average Carbon-14 (becquerels carbon-14 per kilogram carbon) in Pelagic Fish Tissue by Year Over Time (± Standard Error).

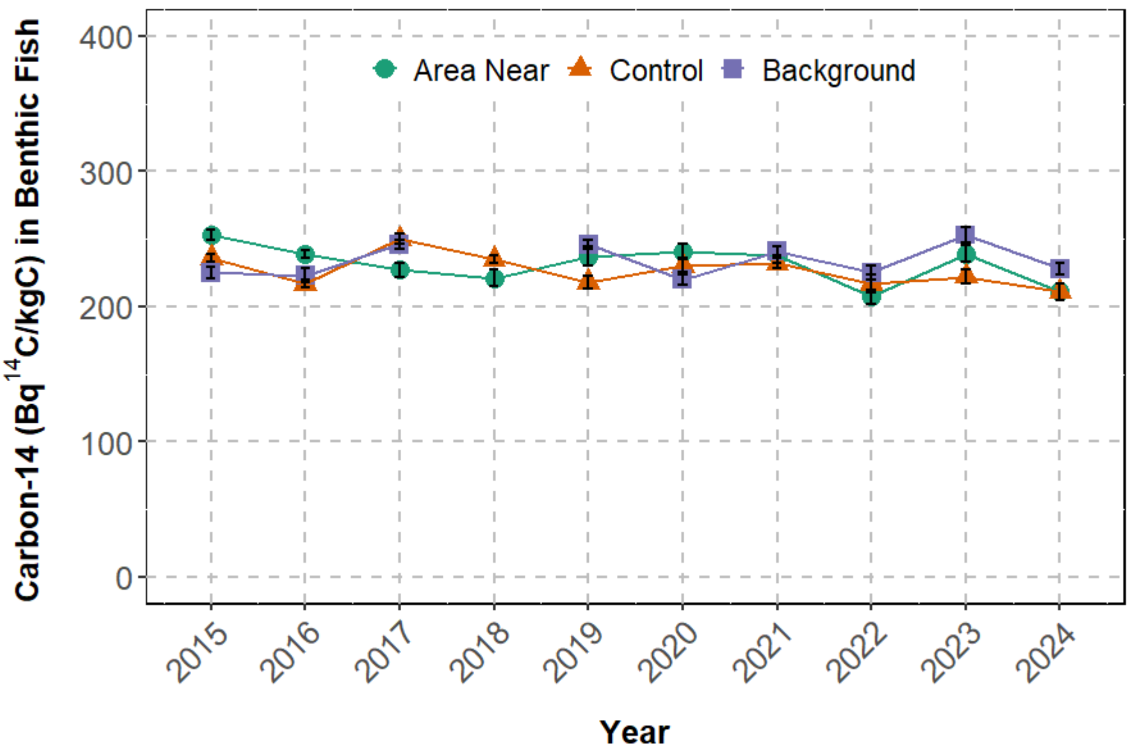


Figure 43 - Annual Average Carbon-14 (becquerels carbon-14 per kilogram carbon) in Benthic Fish Tissue by Year Over Time (± Standard Error)

Cobalt-60 and Cesium-134 in Fish

All cobalt-60 and cesium-134 concentrations in fish samples measured by Bruce Power in 2024 were less than the critical level or not identified on the gamma scan, indicating that these concentrations are indistinguishable from background and considered negligible. All fish measured by the province had cobalt-60 and cesium-134 concentrations less than the minimum detection limit (<Ld) and annual averages were stated as <Ld.

Cesium-137 in Fish

The 2024 annual average concentration of cesium-137 in benthic fish collected near Bruce Power was 0.05 becquerel per kilogram and the control was 0.1 becquerels per kilogram. The provincial average cesium-137 results for Lake Huron benthic fish were higher than Bruce Power at 0.2 becquerel per kilogram. For pelagic fish, the annual average was 0.2 and 0.7 becquerels per kilogram for area near and control locations respectively, with the Lake Huron provincial background average of 0.1 becquerels per kilogram. These values are well below the CNSC reference level of 1040 becquerels per kilogram.

The annual average cesium-137 results for the last ten years for Bruce Power area near, control and provincial background pelagic and benthic fish are shown in Figure 44 and Figure 45, respectively. Generally, the cesium-137 concentrations in fish tissue of pelagic and benthic fish collected in Lake Huron are very low and have remained steady over time.

A general linear model could not be used for benthic fish as the variance was not homogenous. A Kruskal Wallis analysis of variance (α= 0.05) showed no significant difference in the medians for benthic fish by site. A general linear model (α=0.05) was performed for pelagic fish over the last 10 years and identified that there is not a statistically significant change by site over time ($p<0.005$). An analysis of variance (α=0.05) shows that there is not a significant difference in the means ($p<0.05$) between the area near and provincial sites, or between the control and provincial sites, but there is a significant difference between the area near and control locations.

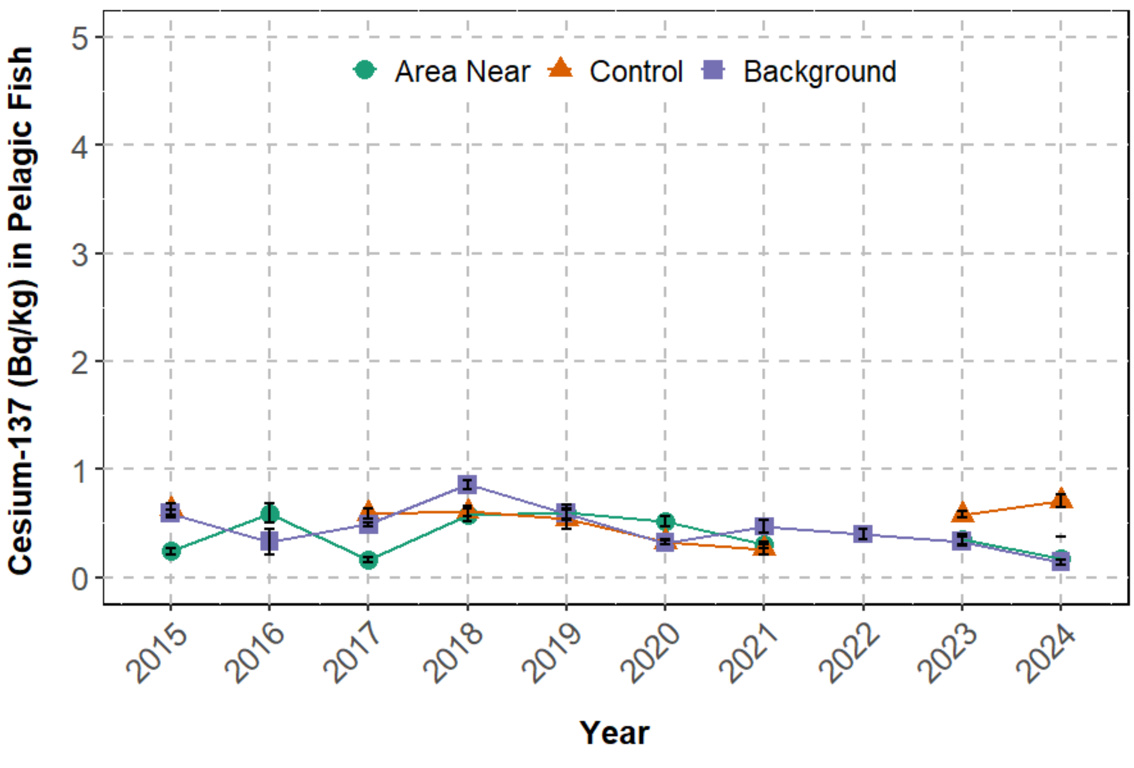


Figure 44 - Annual Average Cesium-137 (becquerels per kilogram) in Pelagic Fish Tissue by Year Over Time (± Standard Error). Reference level = 1040 becquerels per kilogram

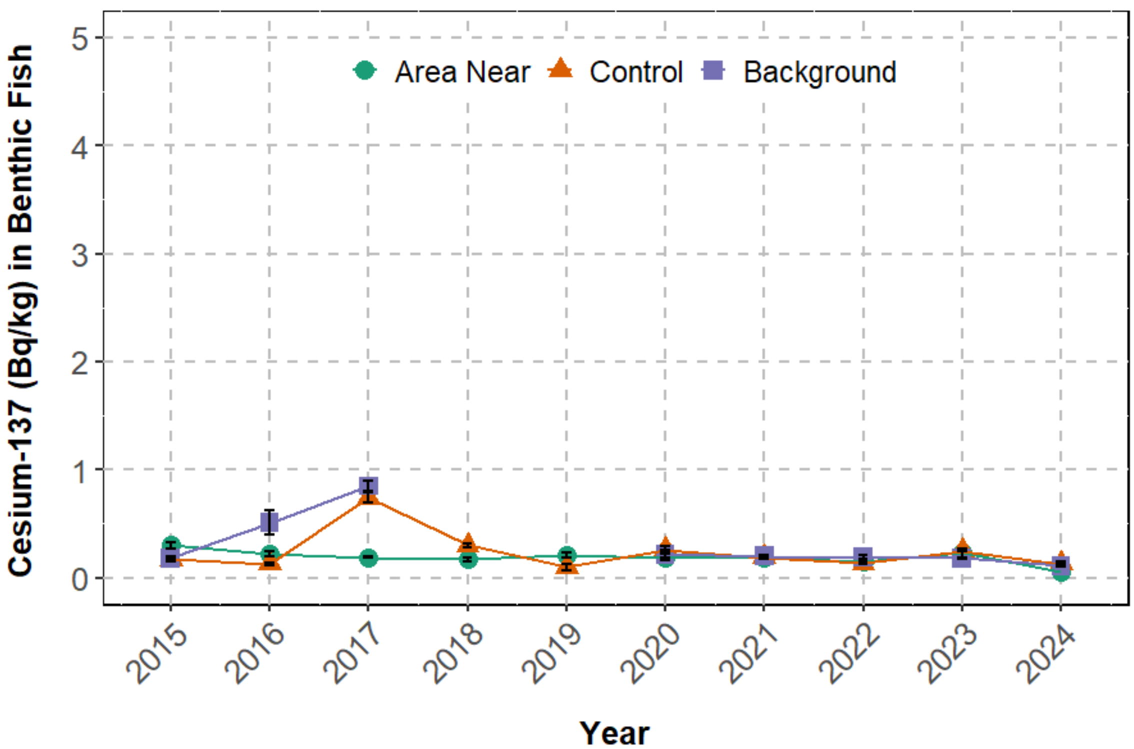


Figure 45 - Annual Average Cesium-137 (becquerels per kilogram) in Benthic Fish Tissue by Year Over Time (± Standard Error). Reference level = 1040 becquerels per kilogram.

The CNSC Independent Environmental Monitoring Program for 2022 measured cesium-137 concentrations in 3 fish samples collected from the Saugeen River in Southampton [R-114][R-115]. Fish species included Lake Trout and Lake Whitefish. All results were below the detection limit value of 0.8 becquerels per kilogram fresh weight, and well below the guideline/reference level of 1,040 becquerels per kilogram fresh weight.

Organically Bound Tritium in Fish

Tritium is present in two forms within the tissue of plants and animals. These forms include tritiated water present in tissue as free water, and organically bound tritium present in the organic molecules within the tissue. The biological half-life (i.e., the amount of time the radionuclide stays within the body of the plant or animal) is longer for organically bound tritium and therefore poses a higher exposure risk to the plant or animal. Both free tritium and organically bound tritium were measured in fish samples collected at near and control locations. The measured organically bound tritium results are not used in the dose to public calculations, but are instead modelled based on the measured free water tritium oxide concentrations, which is industry best practice and outlined in CSA N288.1 [R-118].

Organically bound tritium is measured on a composite sample of the available replicate fish samples collected for each type (pelagic and benthic) and location (area near and control) by Bruce Power. The result is based on the arithmetic mean of the activity of the single composite sample counted twice. For 2024, the composite sample for benthic fish included 3 samples and two samples for pelagic fish. For this year, organically bound tritium was higher in both the near field benthic fish (24.7 becquerels per litre) and the near field pelagic fish (9.1 becquerels per litre) compared to the fish caught at the control locations (below the critical level of 4.8 becquerels per litre for both fish types).

In 2024, organically bound tritium results for benthic fish caught in Lake Huron for the provincial environmental monitoring program were similar to Bruce Power's near field fish at 22.7 becquerels per litre. For pelagic fish, the provincial background fish were higher than Bruce Power's near field fish at 31.0 becquerels per litre.

Historically, provincial background results for organically bound tritium in fish have been higher than the Bruce Power results. The methodology used to prepare fish samples for measurement of organically bound tritium is not standardized, and Bruce Power uses a different methodology than Ontario Power Generation. It was established in 2022 that the provincial results include both exchangeable and non-exchangeable tritium, whereas Bruce Power results include only the non-exchangeable organically bound tritium. Therefore, the annual results cannot be directly compared and are not included on graphs showing long term trends.

The organically bound tritium results for the past 10 years are presented in Figure 46 for pelagic fish and Figure 47 for benthic fish. The 2017 results for Bruce Power (area near and control) pelagic and benthic fish were not available due to several factors including sample delivery, equipment reliability and QC failure. In 2022 there were no results for pelagic fish as the contractor was not able to secure whitefish for this year. For pelagic fish over time, the trends show that there is little difference between the area near and control fish and that organically bound tritium levels have remained stable over time. The results for benthic fish are similar but can be a little more variable from year to year.

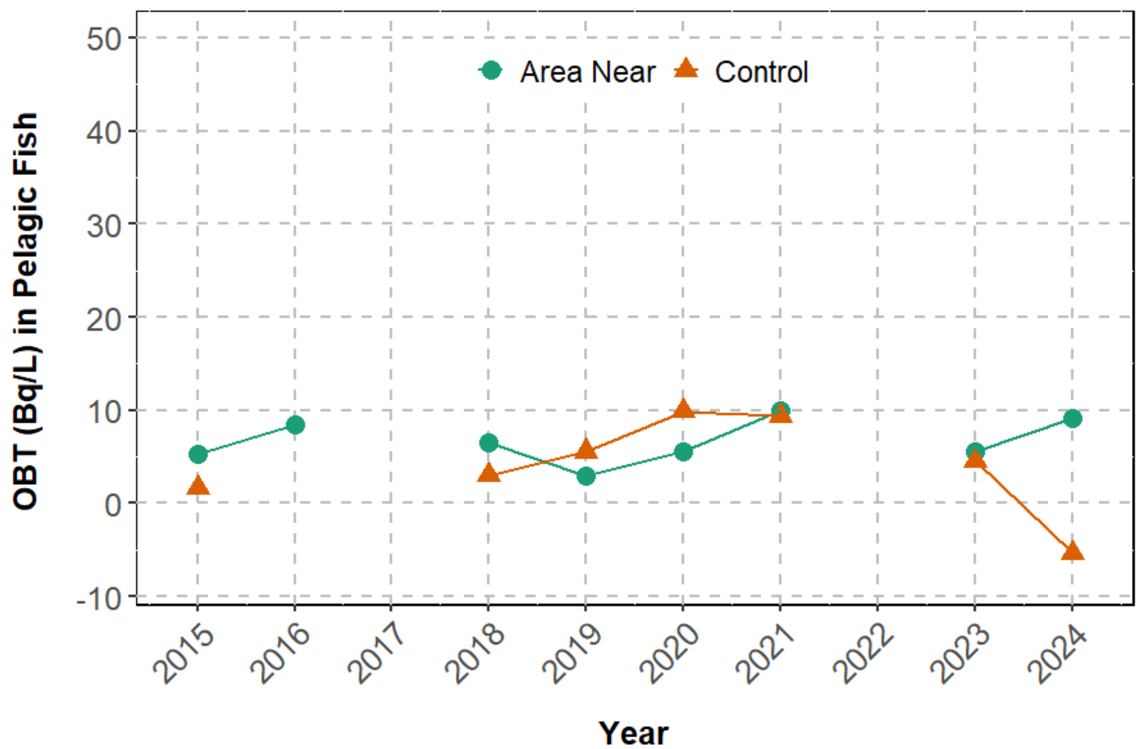


Figure 46 – Annual Organically Bound Tritium (becquerels per litre) for Pelagic Fish Tissue from Area Near and Control Locations Over Time

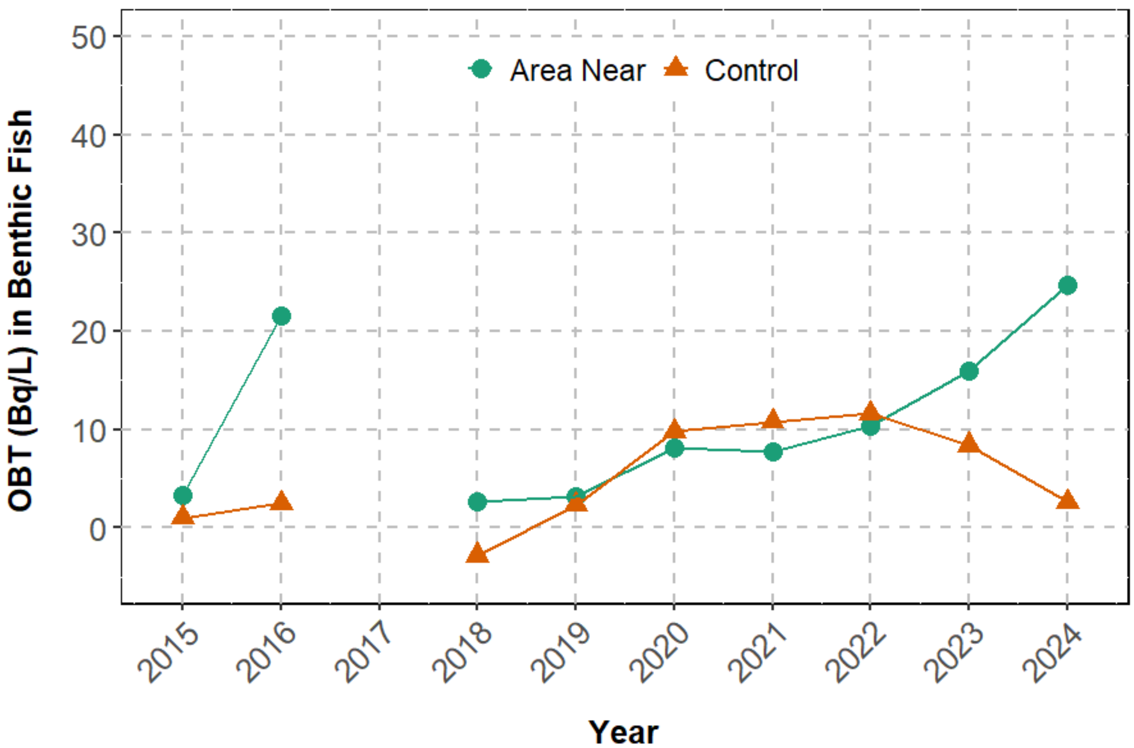


Figure 47 – Annual Organically Bound Tritium (becquerels per litre) for Benthic Fish Tissue from Area Near and Control Locations Over Time

The CNSC Independent Environmental Monitoring Program for 2022 included fish samples collected from the Saugeen River in Southampton [R-114][R-115]. The fish types included Lake Trout and Lake Whitefish. One of the three samples had an organically bound tritium result greater than the detection limit at 2.8 becquerels per kilogram fresh weight, a value well below the guideline/ reference level of 1,040 becquerels per kilogram fresh weight. No health impacts are expected at these low levels.

Fish Monitoring Summary

Bruce Power regularly monitors tritium oxide, organically bound tritium, carbon-14 and CANDU related gamma emitters in samples of pelagic (whitefish) and benthic (suckers) fish collected in the near shore by Bruce Power and farther afield at a control location. Measured radionuclide levels were similar to background samples and all results were well below the CN SC reference levels, indicating that there is no risk to members of the public or the environment.

A summary is provided here:

- Samples of whitefish and suckers collected near Bruce Power had levels of tritium oxide, carbon-14 and cesium-137 that were very similar to provincial background values, indicating that fish caught near Bruce Power are not different to those caught elsewhere in Lake Huron.
- Tritium oxide levels in suckers collected near Bruce Power show more interannual variability than whitefish, however the values remain low and were similar to background levels in 2024.
- Although initial analysis of suckers caught in the spring of 2024 identified unexpected tritium oxide results at the control location, and an investigation did not reveal a cause, a second batch of fish caught in that area in late fall showed that tritium oxide levels are low and that there is no ongoing issue. Monitoring of benthic fish at near and control locations in Lake Huron/Georgian Bay will continue in 2025.

6.1.4.2 Animal Products

Bruce Power samples animal products including honey, eggs, beef and poultry. Sampling locations are shown in Figure 31. Honey (harvested in area near and area far locations) is collected on an annual basis, while eggs are collected twice each year (spring and fall). Samples of animal meat are collected once per year from local farms, as available. In 2024 samples included beef, chicken, and rabbit meat.

On occasion, Bruce Power collects samples from wild animal fatalities that occur on-site (i.e., vehicular collisions) or from donations made by local hunters. In 2024, deer meat was provided by a local hunter, obtained from a location near MacGregor Park.

Animal products are analyzed for tritium oxide and carbon-14 by liquid scintillation counting, and the 2024 results are listed in Table 35. Some samples are also analyzed by gamma spectroscopy and the 2024 results for cobalt-60, cesium-134 and cesium-137 are shown in Table 36. The tritium oxide results are an average of two subsamples, the carbon-14 results are an average of two counts of a single sample, and the gamma results represent a single count of a single sample. As there is only one sample of each type measured, the analytical (uncensored) result is provided.

The province measures for background tritium oxide and carbon-14 concentrations in eggs (3 locations sampled quarterly) and poultry (8 samples) obtained from Picton, Ontario. The sampling location is shown in Figure 28, and the annual average values for 2024 are provided in Table 35. For 2024, no egg samples were available in the fourth quarter.

In 2024, honey collected from a hive located near Bruce Power had a higher concentration of tritium oxide compared to the honey sample collected farther afield (74.4 and 21.5 becquerels per litre, respectively), which is consistent with previous years and in line with historical levels. By contrast, the 2024 carbon-14 concentration at the area near location was lower than the area far location (226 and 243 becquerels carbon-14 per kilogram carbon, respectively), demonstrating that carbon-14 concentrations are low and within background levels. The CANDU radionuclides cobalt-60, cesium-134 and cesium-137 were less than the critical level and indistinguishable from background, which is consistent with historical samples.

The 2024 average tritium oxide result measured in eggs obtained from a farm located near Bruce Power was higher than the provincial background average (10.5 and 3.1 becquerels per litre, respectively), although the average carbon-14 result was slightly lower (221 and 223 becquerels carbon-14 per kilogram carbon, respectively). Similarly, for chicken sampled from the same local farm, the tritium oxide concentration was higher than the provincial background average (11.8 and 1.5 becquerels per litre, respectively), and the carbon-14 concentration was lower (213 and 229 becquerels carbon-14 per kilogram carbon, respectively). In general, local concentrations of tritium oxide in eggs and chicken are variable from year to year and slightly higher than provincial background, whereas carbon-14 is within the range of background and is constant over time.

In 2024 a local hunter provided deer meat from a deer caught near MacGregor Park. The tritium oxide (12.7 becquerels per litre) and carbon-14 (209 becquerels carbon-14 per kilogram carbon) concentrations were similar to or lower than what has been measured in previous years (e.g., in 2023, tritium oxide was 53 becquerels per litre; carbon-14 was 196 becquerels carbon-14 per kilogram carbon). As observed historically, the gamma scan results for cobalt-60, cesium-134 and cesium-137 were very close to or below the critical level and considered negligible. Low levels of cesium-137 occur in the environment due to historical weapons testing and other anthropogenic sources separate from Bruce Power.

The 2022 CNSC Independent Environmental Monitoring Program included locally sourced ground beef from two locations that were analyzed for tritiated water (tritium oxide) and organically bound tritium [R-114][R-115]. The tritiated water results were 9.1 and 12.5 becquerels per kilogram fresh weight, which are well below the guideline/reference level of 159,000 becquerels per kilogram fresh weight. The results for organically bound tritium were below the limit of detection (<2.0 becquerels per kilogram fresh weight), and much lower than the guideline/reference level of 69,300 becquerels per kilogram fresh weight.

Table 35 - 2024 Annual Tritium Oxide and Carbon-14 Concentrations in Animal Products

Location Type	Sample Label	Sample Type	Tritium Oxide (becquerels per litre)	Tritium Oxide Uncertainty (± 2σ) (becquerels per litre)	Tritium Oxide Critical Level (Lc) (becquerels per litre)	Carbon-14 (becquerels carbon-14 per kilogram carbon)	Carbon-14 Uncertainty (± 2σ) (becquerels carbon-14 per kilogram carbon)	Carbon-14 Critical Level (Lc) (becquerels carbon-14 per kilogram carbon)
Bruce Power	Near-Deer-AM	Deer	12.7	3.8	3.8	209	26	15
Bruce Power	Near-Beef-AM	Beef	19.1	3.5	3.0	208	26	15
Bruce Power	BF25-AM	Chicken	11.8	3.0	2.9	213	26	15
Bruce Power	BF26-AM	Rabbit	9.7	3.1	3.0	204	26	15
Bruce Power	BF25-EG (spring)	Eggs	12.2	2.9	2.7	214	25	13
Bruce Power	BF25-EG (fall)	Eggs	8.8	2.9	2.9	227	26	14
Bruce Power	Near-BR22-HO	Honey	74.4	5.2	2.9	226	27	16
Bruce Power	Far-BR22-HO	Honey	21.5	3.5	2.9	243	29	16
Background	Picton - Average	Eggs	3.1	-	-	223	-	-
Background	Picton - Average	Poultry	1.5	-	-	229	-	-

Note:

1. Lc is critical level and 2σ is uncertainty in the analytical result.
2. Provincial background: Sample count = 3 for eggs and 8 for poultry. For calculation of averages where result was less than detection limit (<Ld), the uncensored analytical result was used.

Table 36 - 2024 Annual Gamma Radionuclide Concentrations in Animal Products Near Bruce Power

Sample Label	Sample Type	Cobalt-60 (becquerels per kilogram)	Cobalt -60 Uncertainty (± 2σ) (becquerels per kilogram)	Cobalt -60 Critical Level (Lc) (becquerels per kilogram)	Cesium-134 (becquerels per kilogram)	Cesium -134 Uncertainty (± 2σ) (becquerels per kilogram)	Cesium -134 Critical Level (Lc) (becquerels per kilogram)	Cesium -137 (becquerels per kilogram)	Cesium -137 Uncertainty (± 2σ) (becquerels per kilogram)	Cesium -137 Critical Level (Lc) (becquerels per kilogram)
Near-Deer-AM	Deer	<Lc	-	-	<Lc	-	-	0.07	0.03	0.05
Near-Beef-AM	Beef	<Lc	-	-	<Lc	-	-	<Lc	-	-
BF25-AM	Chicken	<Lc	-	-	<Lc	-	-	<Lc	-	-
BF26-AM	Rabbit	<Lc	-	-	<Lc	-	-	<Lc	-	-
Far-BR22-HO	Honey	<Lc	-	-	<Lc	-	-	<Lc	-	-
Near-BR22-HO	Honey	<Lc	-	-	<Lc	-	-	<Lc	-	-

Note:

1. Lc is critical level and 2σ is uncertainty in the analytical result.
2. For honey, gamma results in becquerels per litre.
3. When activity value was a negative number or less than the critical level, ‘<Lc’ is stated in the table.

6.1.4.3 Milk

In 2016 Bruce Power re-established an agreement with the Dairy Farmers of Ontario to ensure that milk samples may be collected from local dairy farmers on a weekly basis for use in the Radiological Environmental Monitoring program. One weekly sample from all farm locations are composited together and analyzed for iodine-131 by gamma spectrometry. Samples are analyzed for iodine-131 more frequently than other radionuclides because of its shorter half-life. A second sample is collected from each farm each week and a monthly composite is analyzed for each individual farm for tritium oxide and carbon-14 by liquid scintillation counting. These radionuclides may be present in milk from the ingestion of feed and water and the inhalation of air by dairy cattle. For 2024 there were four farms participating in the Radiological Environmental Monitoring program.

The milk sampling locations for Bruce Power are shown in Figure 31 and the provincial background location (Belleville) are shown in Figure 28. Milk samples are collected quarterly for the provincial background monitoring program. The 2024 results for tritium oxide, iodine-131 and carbon-14 are shown in Table 37.

Table 37 - 2024 Annual Average Tritium Oxide, Iodine-131, Carbon-14 Concentrations in Milk

Location Type	Sample Location	Tritium Oxide (becquerels per litre)	Iodine-131 (becquerels per litre)	Carbon-14 (becquerels per litre)
Area Near	BDF01-MK	6.2	Not applicable	216
Area Near	BDF09-MK	5.5	Not applicable	211
Area Near	BDF15-MK	4.3	Not applicable	215
Area Near	BDF16-MK	4.4	Not applicable	210
Area Near	BDF-MK Composite	Not applicable	<Lc	Not applicable
Background	DF1 Belleville D	<Ld	<Ld	220
Background	DF1 Belleville E	<Ld	<Ld	219
Background	DF1 Belleville F	<Ld	<Ld	230
Area Near	**Average**	**5.1**	**<Lc**	**213**
Background	**Average**	**<Ld**	**<Ld**	**223**

Note:

1. Bruce Power: For calculation of averages where result was less than critical level (Lc) the uncensored analytical result was used. ‘<Lc’ stated in table when all values were less than the critical level or not identified on the gamma scan. Sample count is 12, except for I-131 which is 52.
2. Provincial background: For calculation of averages where result was less than detection limit (<Ld), the uncensored analytical result was used. ‘<Ld’ stated in table when all values were less than the detection limit. For provincial background sample count is 4 for each Belleville location.

For 2024, the average annual tritium oxide concentration in milk at local dairy farms was 5.1 becquerels per litre. Although this value was higher than the provincial background values (less than the minimum detection limit), this is well below the Ontario Drinking Water Standard for tritium (7000 becquerels per litre) [R-119]. Bruce Power and provincial annual average tritium concentrations in milk over time are shown in Figure 48. For 2024 there was a slight decrease from the previous year making it the lowest over the time period. A general linear model could not be used for tritium oxide in milk as the variance was not homogenous. A Kruskal Wallis analysis of variance ($\alpha=0.05$) showed a statistically significant difference in the medians by site ($p<0.001$). The area near site had a higher median than the provincial location.

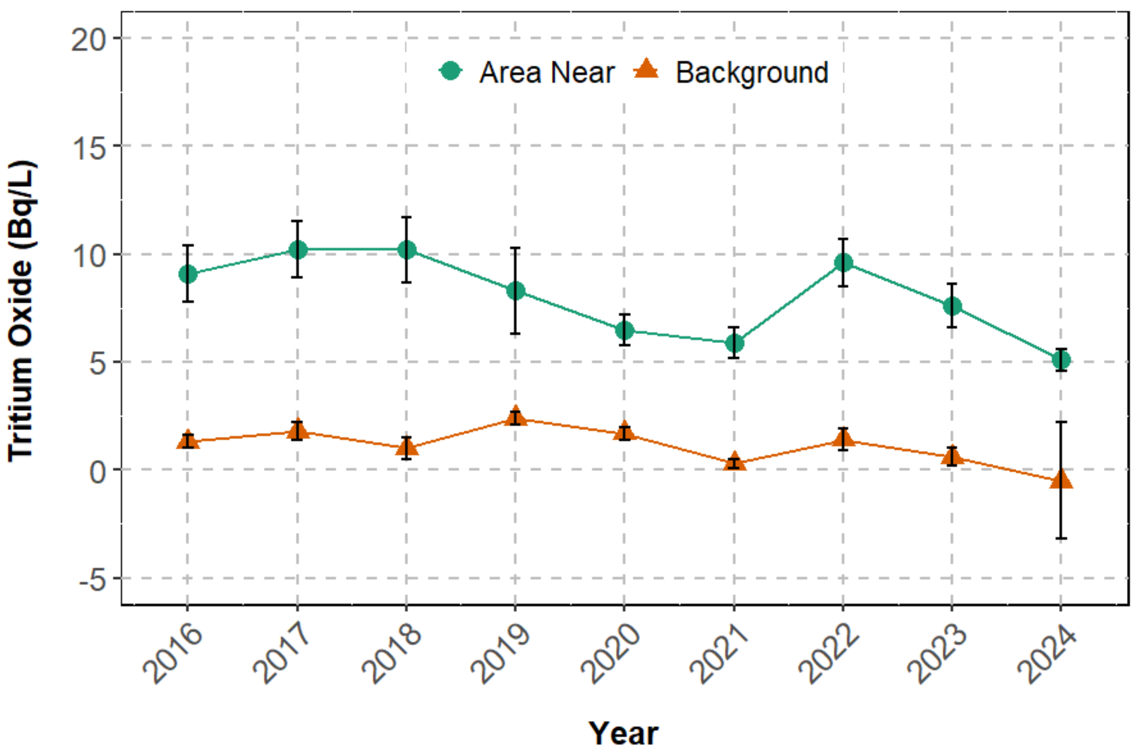


Figure 48 - Annual Average Tritium Oxide Concentration (becquerels per litre) in Milk Samples Collected Near Bruce Power and Provincial Background Locations Over Time (± Standard Error)

The annual average carbon-14 result for area near milk samples in 2024 was 213 becquerels carbon-14 per kilogram carbon, which was lower than the provincial background average of 223 becquerels carbon-14 per kilogram carbon. There is little variability in carbon-14 in milk at both locations, and the area near and background averages for 2024 were similar to previous years (e.g., for 2023, 221 and 233 becquerels carbon-14 per kilogram carbon for area near and background, respectively). Annual iodine-131 concentrations in milk for both Bruce Power and provincial samples are consistently negligible. For area near milk, all weeks were below the critical level or not identified on the gamma scan, and therefore indistinguishable from background.

For the 2022 CNSC Independent Environmental Monitoring Program, milk was collected at a location near Tiverton and analyzed for tritiated water (tritium oxide), iodine-131, cesium-137 and organically bound tritium [R-114][R-115]. The result for tritiated water was 9.6 becquerels per kilogram fresh weight, which is well below the guideline/reference level of 5,560 becquerels per kilogram fresh weight. For organically bound tritium the result was 5.7 becquerels per kilogram fresh weight, much less than the guideline/reference level of 2,260 becquerels per kilogram fresh weight. The results for iodine-131 and cesium-137 were less than the limit of detection. These results are not expected to have an impact on human health.

6.1.4.4 Agricultural Products

Local farms and residents supply Bruce Power with samples of various grains, fruits and vegetables grown on lands in the vicinity of Bruce Power. Sample locations are shown on Figure 31. These agricultural products are collected annually in specific wind sectors around the Bruce Power site and are analyzed for tritium oxide and carbon-14 by liquid scintillation counting. The commercial alcohol plant at the Bruce Eco-Industrial Park, formerly the Bruce Energy Centre, also provides Bruce Power with samples of corn mash (used for animal feed) for tritium oxide analysis on a quarterly basis.

The annual average tritium oxide and carbon-14 results for agricultural products measured by Bruce Power are provided in Table 38. For 2024, the types of grains collected were corn and soybeans and fruit samples consisted of apples. Bruce Power collects a variety of vegetable types to include above ground, leafy and below ground vegetables. In 2024 the above ground variety included tomatoes, the leafy group included rhubarb, kale, bok choy, beet greens, sage and mint, and the below ground vegetables were garlic, potato, radishes and beets. Where multiple samples within a group (i.e., above ground) were found at the same location, the samples were combined into a composite sample for analysis.

Provincial background samples for fruits and vegetables typically include two sets of composite samples at four locations, however for 2024 there were only three fruit locations and two vegetable locations available. For animal feed, sampling consists of semiannual collection at four locations. Sampling locations are provided in Figure 28 and the annual averages are provided in Table 38.

Table 38 - 2024 Annual Average Data for Agricultural Products

Location Type	Sample Type	Tritium Oxide (becquerels per litre)	Carbon-14 (becquerels carbon-14 per kilogram carbon)
Area Near	Grains	46.7	223
Area Near	Corn Mash	20.7	Not applicable
Area Near	Fruit	75.6	219
Area Near	Vegetables	32.0	209
Background	Animal Feed	1.9	216
Background	Fruit Composite	1.4	232
Background	Vegetable Composite	2.7	234

Note:

1. Bruce Power - For calculation of averages where result was less than critical level the uncensored analytical result was used.

2. Provincial background – For calculation of averages where the result was less than the minimum detection level, the uncensored analytical result was used.

Tritium oxide and carbon-14 content in agricultural products may vary each year based on the operational activities and associated radiological airborne emissions that occur during the growing season. The annual average trend of tritium oxide in fruits and vegetables over time are shown in Figure 49 and Figure 50, respectively. Consistently fruit and vegetables near Bruce Power have higher tritium oxide concentrations than at provincial background locations. The 2024 annual average for fruit harvested near Bruce Power decreased in comparison to the previous year (76 versus 81 becquerels per litre in 2023) and was similar to what has been observed in previous years. The annual average tritium oxide concentration for vegetables in 2024 was very similar to the previous year (32 versus 34 becquerels per litre for 2023). Average tritium oxide concentrations in grains for 2024 was slightly higher than the previous year (47 versus 32 becquerels per litre for 2023). The annual average trend of carbon-14 in fruit and vegetables over time is shown in Figure 51 and Figure 52. Carbon-14 average values in fruit and vegetables remain consistent with historic trends and were very similar to the provincial background values in 2024.

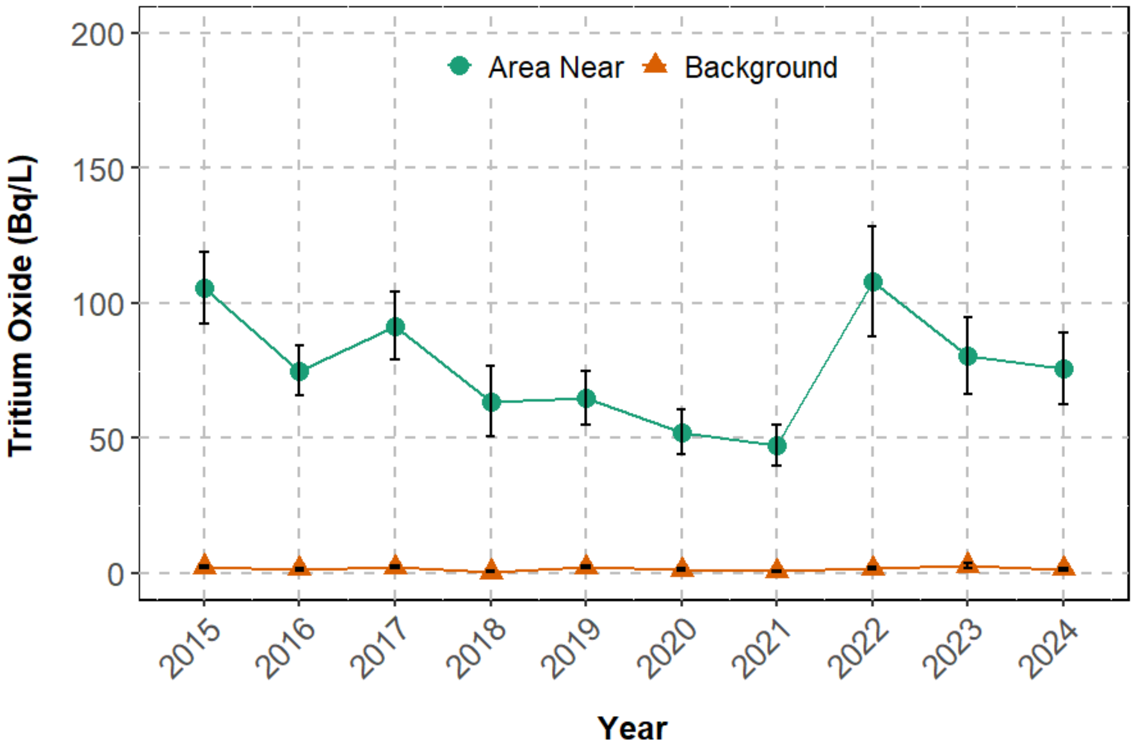


Figure 49 - Annual Average Tritium Oxide (becquerels per litre) in Fruit at Bruce Power and Provincial Background Locations Over Time (± Standard Error)

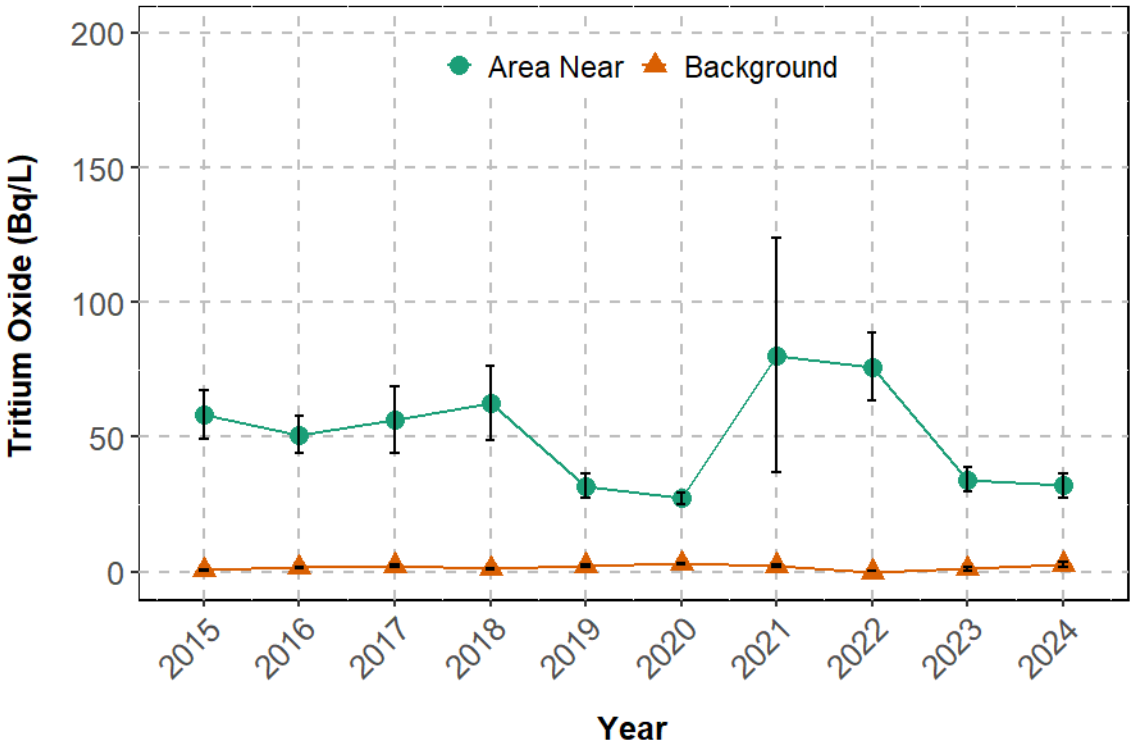


Figure 50 - Annual Average Tritium Oxide (becquerels per litre) in Vegetables at Bruce Power and Provincial Background Locations Over Time (± Standard Error)

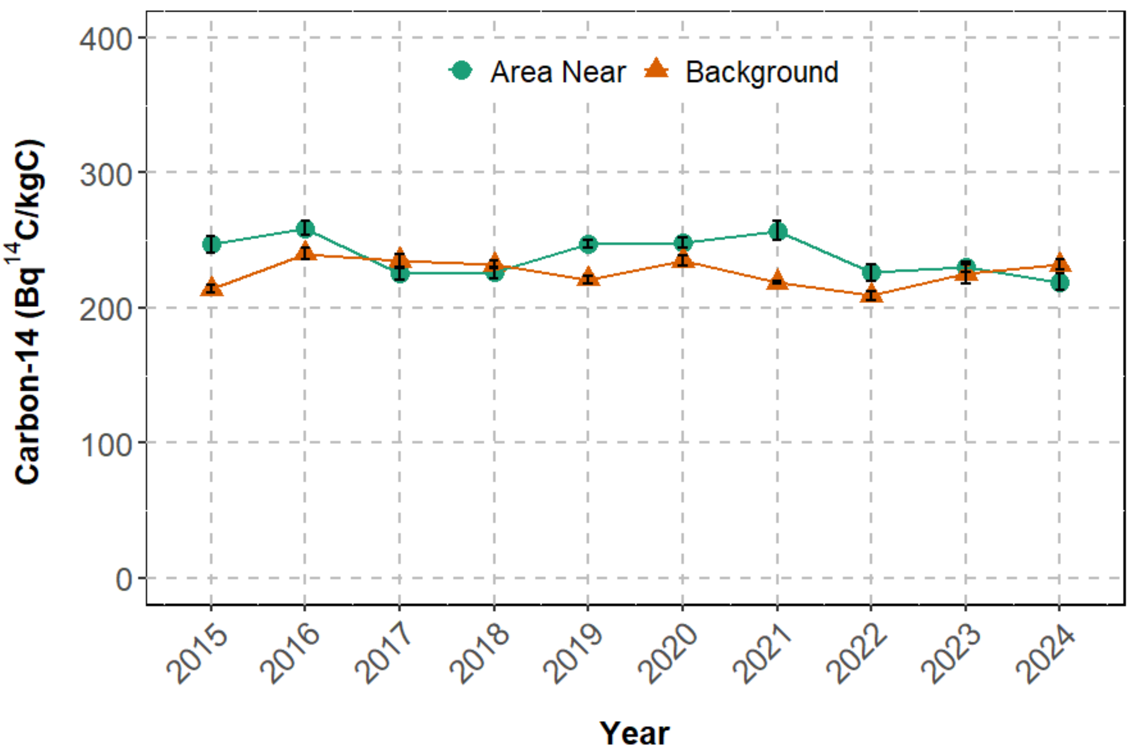


Figure 51 - Annual Average Carbon-14 (becquerels carbon-14 per kilogram carbon) in Fruit at Bruce Power and Provincial Background Locations Over Time (± Standard Error)

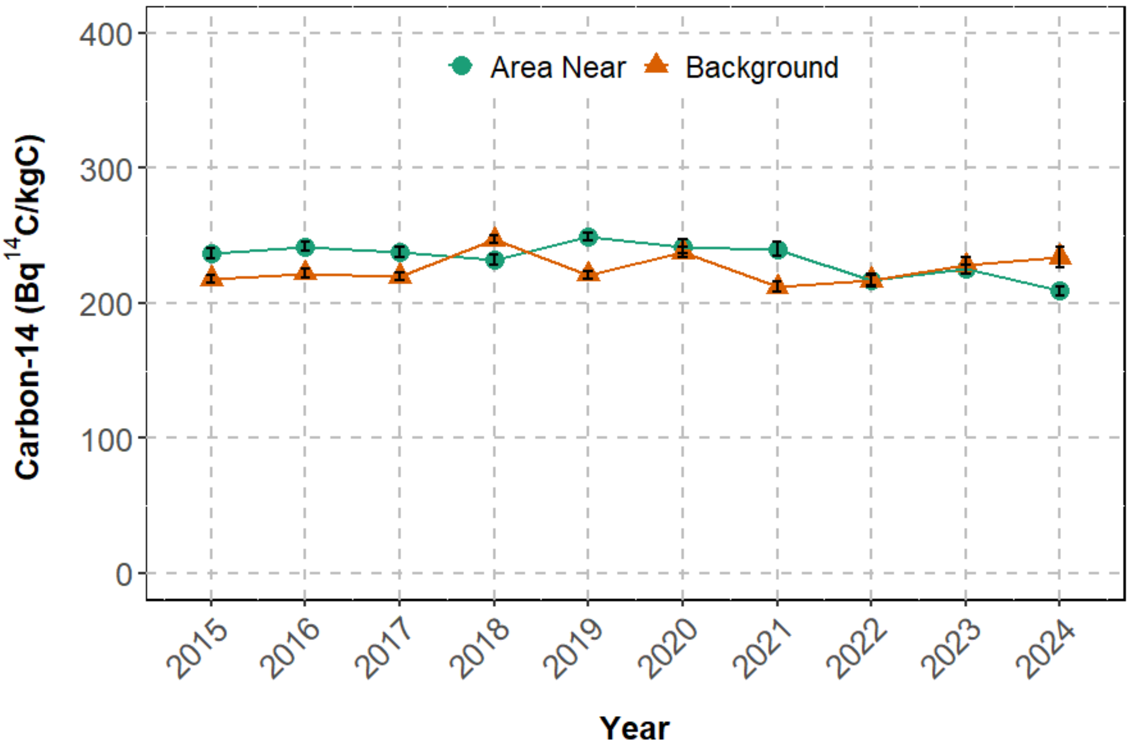


Figure 52 - Annual Average Carbon-14 (becquerels carbon-14 per kilogram carbon) in Vegetables at Bruce Power and Provincial Background Locations Over Time (± Standard Error)

As part of the 2022 CNSC Independent Environmental Monitoring Program a variety of agricultural products were sampled including fruits, vegetables and vegetation [R-114][R-115]. A fruit sample was collected at Saugeen Shores (strawberries) and was analyzed for cesium-137, tritiated water (tritium oxide) and organically bound tritium. The results for cesium-137 and organically bound tritium were below the limits of detection, and the tritiated water result was 14.7 becquerels per kilogram fresh weight, which is well below the guideline/reference level of 123,000 becquerels per kilogram fresh weight.

Samples of kale and carrots grown in Saugeen Shores were analyzed for tritiated water (tritium oxide) and organically bound tritium. The results for tritiated water ranged from 5.1 to 18.8 becquerels per kilogram fresh weight and were well below the guideline/reference levels of 104,000 (for kale) or 279,000 (for carrots) becquerels per kilogram fresh weight. The organically bound tritium results were less than detection for carrots and 11.3 becquerels per kilogram for kale and were also below the guideline/reference level (45,200 or 121,000 becquerels per kilogram for kale and carrots, respectively). These results indicate that the tritium levels in fruits and vegetables sampled near Bruce Power are very low.

Locations where vegetation was collected included Baie du Doré, Inverhuron, Kincardine, Southampton and Neyaashiinigmiing (also known as Cape Croker). Samples included plantain, Eastern white cedar, cat tails (roots and leaves), milkweed, creeping juniper and Balsam fir and were analyzed for cesium-137. All results, for all sample types and locations, had cesium-137 values that were less than the limit of detection (<1.8 becquerel per kilogram fresh weight).

6.1.4.5 Agricultural and Animal Products Summary

Bruce Power regularly monitors tritium oxide, carbon-14 and gamma emitters in fish, animal meat, honey, eggs, milk, fruit and vegetables, grains, and animal feed at a variety of locations near Bruce Power. All results in 2024 were within historical levels and where applicable were well below the CNSC reference levels, indicating that there is no impact to members of the public from ingesting foods grown locally to Bruce Power.

A summary is provided here:

- Tritium oxide, carbon-14, cesium-137 and organically bound tritium measured in benthic and pelagic fish near Bruce Power were very similar to background levels. No human health impacts are expected from these low levels.
- Levels of tritium oxide in milk are typically just above background concentrations. The annual average decreased in 2024 compared to the previous year. As observed in other years, all other radionuclides measured in milk (i.e., carbon-14, iodine-131) were indistinguishable from background.
- Concentrations of tritium oxide are slightly higher in fruits and vegetables grown near Bruce Power compared to provincial background locations, varying with operational activities that occur during harvest time. Regardless of the small fluctuations from year to year, the values are small and the dose to public remains negligible. Annual averages in 2024 were similar to those from the previous year.

6.1.5 Beach Sand, Soil and Sediment Monitoring

Samples of soil and sediment are collected once every five years, while beach sand is collected annually. Samples are dried, sieved and analyzed for -gamma emitting radionuclides using gamma spectroscopy. The results are used in the annual dose to public calculation and inform the Environmental Monitoring and Environmental Risk Assessment programs to ensure that Bruce Power is appropriately monitoring and understanding its impact on the environment.

Sampling locations in the vicinity of Bruce Power and further afield along the shore of Lake Huron are shown in Figure 29, Figure 30 and Figure 31. Sediment, beach sand and garden soil samples were collected from off-site locations in 2024, as were the on-site soil samples which will be used for the next Environmental Risk Assessment.

6.1.5.1 Beach Sand

Beach sand was collected in 2024 at Baie du Doré, Inverhuron and Scott Point. The annual results for CANDU related radionuclides cobalt-60, cesium-134 and cesium-137 are shown in Table 39, along with the provincial background results. The provincial radiological environmental monitoring program collects 8 beach sand samples from Cobourg and 2 samples from Goderich.

Table 39 - 2024 Beach Sand Data

Location Type	Location	Cobalt-60 (becquerels per kilogram)	Cesium-134 (becquerels per kilogram)	Cesium-137 (becquerels per kilogram)	Cesium -137 Uncertainty (± 2σ) (becquerels per kilogram)	Cesium -137 Critical Level (Lc) (becquerels per kilogram)
Area Near	Baie du Doré	<Lc	<Lc	3.0	0.4	0.07
Area Near	Inverhuron	<Lc	<Lc	0.4	0.06	0.06
Area Near	Inverhuron (duplicate)	<Lc	<Lc	0.5	0.1	0.07
Area Near	Scott Point	<Lc	<Lc	1.4	0.3	0.07
Background	Cobourg Average	<Ld	<Ld	0.3	-	-
Background	Goderich Average	<Ld	<Ld	<Ld	-	-

Note:

1. Bruce Power - For calculation of averages where result was less than critical level (Lc) the uncensored analytical result was used. ‘<Lc’ stated in table when all values were less than the critical level or not identified on the gamma scan.

2. Provincial background – Sample count for Cobourg is 8, for Goderich is 2. For calculation of averages where the result was less than the minimum detection level (Ld), the minimum detection level was used. ‘<Ld’ stated in table when all values were less than the detection level.

As in other years, the annual average cobalt-60 and cesium-134 values in beach sand at the area near locations are less than the critical level and indistinguishable from background. The area near average for cesium-137 is consistently very low. Although it was slightly higher than the provincial background averages for Cobourg and Goderich, it was well below the CNSC reference level for soil (58.6 becquerels per kilogram dry weight) or sediment (37,300 becquerels per kilogram dry weight). Low levels of cesium-137 occur in the environment due to historical weapons testing and other anthropogenic sources separate from Bruce Power. As observed in previous years, cesium-137 levels are marginally higher to the north at Scott Point and Baie du Doré, which is consistent with the predominant lake current direction moving in the northerly direction and the position of the point in relation to the sill at the mouth of Baie du Doré.

6.1.5.2 Sediment

Samples of sediment are typically collected on a five-year frequency. The off-site monitoring locations were sampled in 2024 by an external vendor. The on-site waterbodies were last sampled in 2021 and will be sampled again in 2025. Samples collected at off-site locations are used for dose to public calculations, while samples collected at on-site locations are used for the Ecological Risk Assessment.

Sediment was collected from the outfalls at both Bruce A and Bruce B, as well as at Inverhuron, Scott Point and three locations in Baie du Doré in the near field region. Samples were also collected from Southampton and Sauble Beach, which are along the shore in the direction of the predominant lake current direction being to the north. Four replicates were collected at each location, except for Southampton in which a composite was created from the four replicates due to poor sample quality. The averages are shown in Table 40. These results may be compared to the provincial background location in Grand Bend, which were also collected in 2024.

Table 40 - 2024 Annual Average Off-site Sediment Data

Location Type	Location	Cobalt-60 (becquerels per kilogram)	Cesium-134 (becquerels per kilogram)	Cesium-137 (becquerels per kilogram)
Indicator	Outfall BA-SD	<Lc	<Lc	1.2
Indicator	Outfall BB-SD	<Lc	<Lc	0.4
Area Near	Inverhuron-SD	<Lc	<Lc	0.5
Area Near	Scott Point-SD	<Lc	<Lc	1.5
Area Near	Baie du Doré Spar #5-SD	<Lc	<Lc	1.5
Area Near	Baie du Doré Spar #6-SD	<Lc	<Lc	1.2
Area Near	Baie du Doré Spar #103-SD	<Lc	<Lc	1.3
Area Far	Sauble Beach-SD	<Lc	<Lc	0.5
Area Far	Southampton-SD	<Lc	<Lc	<Lc
Background	Grand Bend	<Ld	<Ld	0.2

Note:

1. Bruce Power - For calculation of averages where result was less than critical level (Lc) the uncensored analytical result was used. ‘<Lc’ stated in table when all values were less than the critical level or not identified on the gamma scan. Sample count = 4 for all locations except Southampton, which was a composite (count = 1).

2. Provincial background – For calculation of averages where the result was less than the minimum detection level (Ld), the minimum detection level was used. ‘<Ld’ stated in table when all values were less than the detection level. Sample count = 4.

3. Concentrations of cobalt-60 and cesium-134 for all indicator, area near, area far and provincial background locations were less than the limits of detection. For cesium-137 the results ranged from 0.4 to 1.5 becquerels per kilogram, which are very low and consistent with what is measured in beach sand (Section 6.1.5.1), with sites north of Bruce Power (i.e., Baie du Doré and Scott Point) being slightly higher than the other locations. The 2024 results are very low and similar to those obtained in 2019 when sediment was last collected. These low levels of cesium-137 in the environment may be attributed to historical nuclear weapons testing.

4. The CNSC Independent Environmental Monitoring Program included sediment samples in 2022 that were analyzed for cesium-137 [R-114][R-115]. Sediment samples were collected from Baie du Doré and the Kincardine beach and the results ranged from 0.6 to 1.2 becquerels per kilogram dry weight, which are much lower than the guideline/reference level of 37,300 becquerels per kilogram dry weight. The cesium-137 levels in sediment are consistent with what is reported by Bruce Power and are not expected to have any impact on human health.

6.1.5.3 Soil

Samples of soil are collected on a five-year frequency. In 2024 samples were collected from both off-site and on-site locations. The off-site locations are used for dose to public calculations and the on-site locations are used for the Ecological Risk Assessment. With respect to radiological contaminants, the predominant source to soil is atmospheric deposition of airborne releases from the Site, and therefore meteorological conditions such as wind speed and direction are an important factor in location selection.

Off-Site Soil

In 2024 garden soil was collected at residential locations to the north, east and south of Bruce Power. An area far sample was also obtained from a crop field in Amberley, over 30 kilometres south of Bruce Power, for comparison purposes. Garden soil is not collected for the provincial background monitoring program. Off-site soil results are provided in Table 41.

Table 41 - 2024 Off-site Garden Soil Data

Location Type	Location	Cobalt-60 (becquerels per kilogram)	Cesium-134 (becquerels per kilogram)	Cesium-137 (becquerels per kilogram)	Cesium -137 Uncertainty (± 2σ) (becquerels per kilogram)	Cesium -137 Critical Level (Lc) (becquerels per kilogram)
Area Near	BF14-SO	<Lc	<Lc	3.6	0.5	0.1
Area Near	BR02-SO	<Lc	<Lc	4.9	0.4	0.1
Area Near	BF26-SO	<Lc	<Lc	1.7	0.4	0.1
Area Far	BM18-SO	<Lc	<Lc	3.6	0.5	0.1

Note:

1. Where result was less than the critical level (Lc) or not identified in the gamma scan, ‘<Lc’ is stated in table.

Concentrations of cobalt-60 and cesium-134 for all area near and area far locations were less than the critical level and indistinguishable from background. For cesium-137 the area near results ranged from 1.7 to 4.9 becquerels per kilogram, with the area far location measuring 3.6 becquerels per kilogram. The 2024 results are very low and similar to those obtained in 2019 when garden soil was last collected. Low levels of cesium-137 are prevalent in the environment due to historical nuclear weapons testing.

The CNSC Independent Environmental Monitoring Program included soil samples in 2022 that were analyzed for cesium-137 [R-114][R-115]. Soil was sampled at 3 locations, including Neyaashiinigmiing, Chippawa Hill and Tiverton, and the results were in the range of 2.5 to 13.5 becquerels per kilogram dry weight. These values were well below the guideline/ reference level of 58.6 becquerels per kilogram dry weight. The cesium-137 levels in soil are consistent with what is reported by Bruce Power and are not expected to have any impact on human health.

On-Site Soil

In 2024 soil was collected on-site at locations outside the Bruce A and Bruce B station exclusion boundary fences, in all landward wind sectors, for the purposes of obtaining data for the next Ecological Risk Assessment. Sample locations are shown in Figure 53. Locations were selected based on the potential for habitat, avoiding industrialized areas such as buildings, parking lots and construction areas. One location was off-site (BA-SO-ESE-1) at an air monitoring location in order to obtain a sample in the ESE wind sector of Bruce A, which is east of Baie du Doré. For each wind sector on land, one sample was obtained at each location, except at one location at Bruce A and one at Bruce B where a duplicate was collected. Samples were measured by gamma spectroscopy and the CANDU related radionuclides are provided in Table 42. These results will be assessed in the next Environmental Risk Assessment.

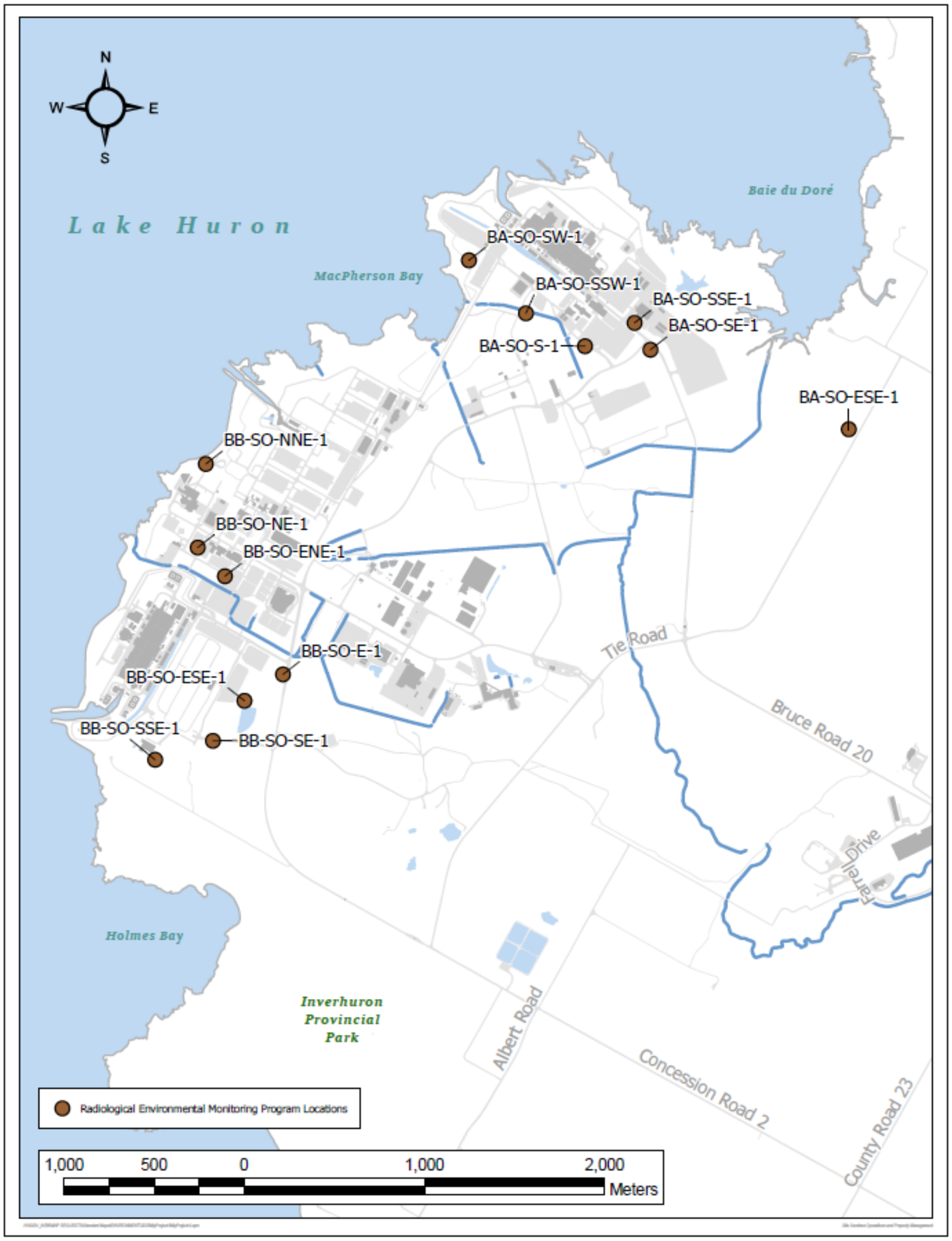


Figure 53 - 2024 On-site Soil Sample Locations

Table 42 - 2024 On-Site Soil Data

Area	Location	Cobalt-60 (becquerels per kilogram)	Cesium-134 (becquerels per kilogram)	Cesium -137 (becquerels per kilogram)	Cesium -137 Uncertainty (± 2σ) (becquerels per kilogram)	Cesium -137 Critical Level (Lc) (becquerels per kilogram)
Bruce A	BA-SO-ESE-1	<Lc	<Lc	3.6	0.3	0.1
Bruce A	BA-SO-S-1	<Lc	<Lc	4.5	0.4	0.1
Bruce A	BA-SO-SE-1	<Lc	<Lc	3.7	0.5	0.1
Bruce A	BA-SO-SSE-1	<Lc	<Lc	2.6	0.4	0.1
Bruce A	BA-SO-SSW-1	<Lc	<Lc	2.5	0.2	0.1
Bruce A	BA-SO-SW-1	<Lc	<Lc	0.5	0.1	0.1
Bruce A	BA-SO-SW-1 Duplicate	<Lc	<Lc	0.6	0.2	0.1
Bruce B	BB-SO-E-1	<Lc	<Lc	1.2	0.1	0.1
Bruce B	BB-SO-ENE-1	<Lc	<Lc	9.5	0.9	0.3
Bruce B	BB-SO-ESE-1	<Lc	<Lc	0.7	0.2	0.1
Bruce B	BB-SO-NE-1	<Lc	<Lc	17.0	1.5	0.1
Bruce B	BB-SO-NNE-1	<Lc	<Lc	0.9	0.2	0.1
Bruce B	BB-SO-SE-1	<Lc	<Lc	3.2	0.4	0.1
Bruce B	BB-SO-SSE-1	<Lc	<Lc	29.7	2.5	0.2
Bruce B	BB-SO-SSE-1 Duplicate	<Lc	<Lc	29.0	2.4	0.2

Note:

1. Where result was less than the critical level (Lc) or not identified in the gamma scan, '<Lc' is stated in table.

6.1.5.4 Beach Sand, Soil, Sediment Summary

Bruce Power regularly collects samples of sediment and beach sand in depositional areas along the Lake Huron shoreline and measure for CANDU related gamma emitting radionuclides, as well as in garden soil collected at residential locations in the predominant wind directions from the site. In 2024, levels of cobalt-60 and cesium-134 were below the critical level at all locations near and far from site and considered negligible. The cesium-137 concentrations were low and comparable to results obtained in 2019. Low levels of cesium-137 are prevalent in the environment due to historical nuclear weapons testing, and this is observed in the soil, sediment and beach sand near Bruce Power.

6.1.6 Radiological Environmental Monitoring Program Summary

The main objectives of the Radiological Environmental Monitoring program, which are listed in Section 6.0, are to (i) obtain concentrations of radioactivity in environmental media each year, (ii) calculate radiation exposure doses to representative persons and demonstrate they are below the legal limit, and (iii) check the effectiveness of emission and effluent controls in place and provide public assurance of the efficacy of these measures. The Radiological Environmental Monitoring data collected in 2024 is provided in Section 6.1 and the dose calculated from this information is described and compared to the legal dose limit in Section 3.0. The results demonstrate that radionuclide concentrations in the environment remain very low and that the emissions and effluent controls in place are effective and adequate. For 2024, the environmental monitoring results obtained were effective in meeting the Radiological Environmental Monitoring program objectives.

Following the 2022 Environmental Risk Assessment, the Radiological Environmental Monitoring program was reviewed in 2023. This process was used to evaluate the data collected, to reassess environmental risks and to determine whether the objectives of the program have been achieved. In addition, the need for and adequacy of the Radiological Environmental Monitoring program was reviewed. Through this process it was determined that the program objectives were met by the current design, that environmental risks were found to be negligible, and that there were no changes in requirements to measure radionuclides in the environment. In conclusion, the design of Radiological Environmental Monitoring was confirmed to be adequate, and no changes were required.

The next periodic review will occur after the next Environmental Risk Assessment has been completed, which is typically updated on a 5-year frequency.

6.1.7 Quality Assurance/Quality Control

6.1.7.1 Meteorological Data Analysis

The meteorological data analysis was conducted in accordance with the Kinectrics Quality Assurance program [R-120]. The Kinectrics Quality Assurance program is registered to the 2015 ISO 9001 standard and the scope of the registration covers “consulting, scientific and engineering services to nuclear and other industries to support siting, safety, licensing, design and operations by providing specialized: asset management, project management, procurement, software, environmental, integrated analytical and engineering solutions and services”. The Kinectrics Quality Assurance program is regularly audited by organizations such as CANDU Procurement Audit Committee (CANPAC) and has consistently been assessed as compliant with requirements of CSA N299.1-16 [R-121] and CSA N286-12 [R-23].

6.1.7.2 Public Dose Calculations

The Public Dose calculations for 2024 were conducted in accordance with the Calian Engineering and Technical Services Quality Assurance program. Calian has implemented and maintains a Quality Management System that is certified to the ISO 9001:2015 Standard [R-122].

The 2024 public dose calculations were conducted using the IMPACT 5.5.2 software. All inputs to the IMPACT model were verified based on Bruce Power environmental and emissions and effluents data. A verification tool was utilized to ensure that all numerical entries to the IMPACT model were inputted correctly, and the results of this IMPACT model verification were recorded. The results of the IMPACT calculation were independently verified.

The development of IMPACT 5.5.2 has been guided by, and subject to, an overall Tool Qualification program, which follows the CSA N286.7-99 guidelines for quality assurance in software development for nuclear power plants [R-123].

6.1.7.3 Provincial Background – Ontario Power Generation Whitby Laboratory

The Ontario Power Generation Whitby Laboratory performed the thermoluminescent dosimeter gamma analyses and the provincial sample analyses. Details regarding the Ontario Power Generation Quality Assurance and Quality Control program are described in the Ontario Power Generation report *2024 Results of Environmental Monitoring Programs for Darlington and Pickering Nuclear* [R-124].

6.1.7.4 Bruce Power Health Physics lab

The Bruce Power Health Physics Lab operates a comprehensive Quality Assurance program, which includes quality control samples, blank/background samples, process control samples, and externally generated proficiency testing samples.

Sample Availability

The Bruce Power Health Physics Lab collected 1042 environmental samples in 2024 against a target of 1053 for an overall sample availability of 99%. This meets the sampling criteria of greater than 90% for the Radiological Environmental Monitoring Program. Typically, sample unavailability is due to seasonal conditions (such as variations in agricultural yields or frozen streams/ponds) or due to the nature of seasonal residences closed for certain months of the year, making some samples such as wells, unavailable for sampling. Details of the sample availability for 2024 are presented in Table 43 below.

Table 43 – 2024 Sample Availability Data

Sample Types	Collection Frequency	Planned	Actual	% Complete
Air Emissions	Monthly (tritium)	120	119	99%
Air Emissions	Quarterly (carbon-14)	172	171	99%
Environmental Gamma	Quarterly (gamma)	44	44	100%
Precipitation	Monthly (tritium, beta)	120	120	100%
Water Supply Plants	Weekly Composite (tritium)	96	96	100%
Water Supply Plants	Monthly Composite (beta)	24	24	100%
Resident Well & Lake Water	Bi-Monthly (tritium, beta)	66	61	92%
Resident Well & Lake Water	Semi-Annually (tritium, beta, gamma)	32	32	100%
Local Streams	Bi-Monthly (tritium)	36	35	97%
Local Streams	Semi-Annually (beta)	8	8	100%
Site Ground Water	Semi-Annually (tritium)	80	78	98%
Fish	Annually (tritium, carbon-14, gamma, organically bound tritium)	32	37	116%
Sediment	Every 5 years (gamma)	51	48	94%
Milk	Weekly Composite (gamma)	52	52	100%
Milk	Monthly Composite (tritium, carbon-14)	48	48	100%
Fruits & Vegetables	Annually (tritium, carbon-14)	30	27	90%
Honey	Annually (tritium, carbon-14, gamma)	2	2	100%
Eggs	Annually (tritium, carbon-14)	2	2	100%
Grains	Annually (tritium, carbon-14)	6	6	100%
Grains	Quarterly (tritium)	4	4	100%
Animal Meat	Annually (tritium, carbon-14, gamma)	4	4	100%
Soil & Sand	Every 5 years and annually (gamma)	24	24	100%
Overall Site Sample Availability		1053	1042	99%

Note: Samples may have been unavailable because of seasonal conditions (e.g., freezing of water samples and seasonal residences that are closed for certain months of the year).

Laboratory Analysis Summary

A total of 1361 laboratory analyses were conducted in support of the Bruce Power Radiological Environmental Monitoring Program in 2024, with a completion rate of 99%. This meets the analysis criteria of greater than 90%. The analyses included tritium, gross beta, carbon-14, iodine-131, thermoluminescent dosimeter gamma (under contract to Ontario Power Generation), gamma spectrometry and organically bound tritium. Table 44 provides a summary of the number of samples analyzed for each analysis method.

Table 44 - 2024 Laboratory Analysis Summery

Laboratory Analysis	Planned	Actual	% Complete
Tritium oxide	668	658	99%
Gross Beta	184	181	98%
Carbon-14	296	297	100%
Iodine-131	52	52	100%
Thermoluminescent Dosimeter Gamma	44	44	100%
Gamma Spectrometry	123	125	102%
Organically Bound Tritium	4	4	100%
Total	1371	1361	99%

Note: Thermoluminescent dosimeter gamma analysis was completed by Ontario Power Generation, Whitby.

Laboratory Quality Assurance and Quality Control

The purpose of inter-laboratory proficiency testing is to provide independent assurance to Bruce Power, the CNSC, and external stakeholders that the laboratory's analytical performance is adequate, and the accuracy of the measurements meets required standards. Table 45 presents a summary of the Bruce Power Radiological Environmental Monitoring Quality Assurance and Quality Control Program.

Table 45 - Summary of the Quality Assurance and Quality Control Program

Analyses	**Tritium**	**Tritium**	**Tritium**	**Gross Beta**	**Carbon-14**	**Gamma Spec**	**Gamma Spec**	**Gamma Spec**
Medium	**Organically bound**	**Water**	**Air**	**Water**	**Produce**	**Water**	**Sediment**	**Soil**
Historical	X	X	X	X	X		X	X
Relative	X	X	X		X		X	X
Proficiency Testing	-	Eckert & Ziegler Analytics	-	Eckert & Ziegler Analytics	-	Eckert & Ziegler Analytics	Eckert & Ziegler Analytics	Eckert & Ziegler Analytics
Bias	QC Sample	QC Sample	QC Sample	QC Sample (^{137}Cs)	QC Sample (Sawdust)	Mixed Gamma QC Sample	Mixed Gamma QC Sample	Mixed Gamma QC Sample
Precision	QC Sample	QC Sample	QC Sample	QC Sample (^{137}Cs)	QC Sample (Sawdust)	Mixed Gamma QC Sample	Mixed Gamma QC Sample	Mixed Gamma QC Sample
Background	Low Tritium Water	Low Tritium Water	Low Tritium Water	Blank	Limestone	Blank	Blank	Blank
Process Controls	Contamination	Contamination	Contamination	Contamination (de-min water)	Contamination (Coal)	-	-	-

Laboratory Quality Control

Various quality control samples are utilized to estimate the precision and accuracy of analytical results and to indicate errors introduced by laboratory practices. There are two types of quality control samples used to accompany the analyses of the environmental samples collected for the Radiological Environmental Monitoring Program: process control samples and quality control samples.

1. Process Control Samples

   Process Control samples are low analyte samples that are treated as actual samples and go through the same handling process. These are intended to detect contamination and specific sources of error. The following main process control samples are used for Radiological Environmental Monitoring samples:

   - Low tritium reference water samples kept open to the air during sample handling to detect contamination from tritium in ambient air.
   - Coal (low carbon-14) samples to detect anomalies with carbon-14 analyses.
   - Demineralized water samples run as low gross beta samples to detect contamination.
   - Blank thermoluminescent dosimeters to detect radiation exposure during shipping to and from the Ontario Power Generation Whitby laboratory.

2. Quality Control Samples

Quality control samples are samples which contain known values of the analyte (usually derived from traceable standards), which are included for analysis. Statistically based quality control charts are used to evaluate validity of environmental sample results; results are considered valid when the values for the accompanying quality control samples are within ± 3 standard deviations of the known or expected value for the respective control chart.

Proficiency Testing and Inter-laboratory Comparisons

The main purpose of inter-laboratory comparison programs is to provide independent assurance to Bruce Power, the CNSC, and external stakeholders that the laboratory's analytical proficiency is adequate, and the accuracy of the measurements meets required standards. The comparison program forms a crucial part of the overall laboratory Quality Assurance program and demonstrates that the laboratory is performing within acceptable limits as measured against external unbiased standards.

The proficiency testing service is operated by Eckert & Ziegler Analytics Inc. of Atlanta, Georgia. On a quarterly basis Eckert & Ziegler Analytics provides samples containing known quantities of radionuclides to the Bruce Power Health Physics Laboratory. The samples are environmental matrices which are analogous to the samples collected for the Radiological Environmental Monitoring Program.

These samples include:

- Tritium in water
- Beta emitters in water
- Iodine in milk
- Gamma emitters in water
- Gamma emitters in soil
- Iodine-131 in iodine cartridge (annually)
- Gamma emitters on particulate filter (annually)

Upon completion of analysis, the Bruce Power analytical values are submitted to Eckert & Ziegler Analytics, which subsequently provides a final report for Bruce Power, detailing the expected values and the ratio of the laboratory value to the expected value.

All results obtained from Eckert & Ziegler Analytics shall meet the following self-imposed pass/fail investigation criteria:

$$\frac{(V_L + 1\sigma_L)}{V_A} \geq 0.75 \quad \text{AND} \quad \frac{(V_L - 1\sigma_L)}{V_A} \leq 1.2$$

Where:

V_L = Bruce Power HPL value
σ_L = Bruce Power HPL one sigma uncertainty value
V_A = Analytics Supplier value

The results for the proficiency testing are presented in APPENDIX D:. Due to delays in establishing the contract for the 2024 year, no samples were obtained for the first quarter. All remaining quarterly sample results for 2024 met the acceptance criteria and were acceptable.

6.1.8 Updates to Radiological Environmental Monitoring

The following changes were made to Radiological Environmental Monitoring in 2024:

- A new resident location was established in the S wind sector for the collection of garden vegetables for the program.
- A resident location that supplied garden vegetables in the ENE wind sector was removed from the program as the garden was no longer active. As there is already an alternate sampling location for garden vegetables in this wind sector, replacement is not required to meet the objectives of the program.
- On-site sampling of soil and sediment were formally added to the Radiological Environmental Monitoring Program to provide data on a regular frequency for updates to the Environmental Risk Assessment.
- Progress was made towards upgrading the ten off-site environmental monitoring sheds that house tritium in air monitoring equipment at various locations off-site. In 2024 renovations to the buildings at three locations were completed, while work continued towards upgrading electrical power at three locations. This work is on track to be completed in 2025. Repositioning the sheds at the remaining four locations is ongoing, with the need to establish land agreements with neighboring towns and municipalities.
- The need for monitoring precipitation for radionuclides has been reviewed and found to no longer be required for the Radiological Environmental Monitoring Program. Precipitation collection will be phased out using the change management process in 2025.

6.2 Conventional Environmental Monitoring

The CSA standard N288.4, Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills outlines the following objectives for environmental monitoring programs [R-125]:

- measure the concentration of hazardous substances and physical stressors in the environment to allow for the assessment of potential biological effects from stressors arising from the facility;
- demonstrate compliance with limits on hazardous substances and physical stressors in the environment; and
- verify that the facility has effective containment and effluent control measures in place.

The Bruce Power Conventional Environmental Monitoring program monitors conventional contaminants, physical stressors, potential biological effects, and pathways for both human and non-human biota. Non-radiological chemical stressors from historic and current operations are monitored (with future effects predicted using models as needed) in local surface waters, sediments, soil, and/or air using an activity-centered, risk-based approach. Effects on wildlife from physical stressors are documented using numerous Biological Effects Monitoring approaches.

Chemical stressors that have the *potential* for environmental impact are referred to as Chemicals of Potential Concern. Chemicals of Potential Concern are routinely monitored at Bruce Power, and they are chosen based on known controlled releases from the facility. Controlled effluents and emissions are regulated and are described in Bruce Power's Conventional Effluents and Emissions Monitoring program (see Section 5.2). A second pathway to the environment is through an uncontrolled release (i.e., spill). If a spill was to occur and a contaminant reached the environment, the location and frequency of Chemicals of Potential Concern monitoring may change on a case-by-case basis, as dictated by remediation activities and/or follow-up monitoring.

Routine monitoring for conventional Chemicals of Potential Concern occurs in surface waters (annually) and sediments (every 5 years) because they have the highest probability of impact from facility operations such as station effluents, storm water discharges, and Centre of Site operations (e.g., sewage treatment and discharges). Soil has a low probability of being impacted by chemical stressors at Bruce Power, primarily because Chemicals of Potential Concern are not discharged directly to soil under normal operations. This has been repeatedly demonstrated in past Environmental Risk Assessments [R-4]. Sediments and soils were sampled in 2021 to inform an updated Environmental Risk Assessment. For a detailed assessment of risk to potential receptors please refer to the 2022 Environmental Risk Assessment [R-4].

The impact of air emissions on the surrounding environment is assessed annually in the Conventional Environmental Monitoring Program and in recurring Environmental Risk Assessments which have demonstrated that these impacts are very low [R-4]. The transport of Chemicals of Potential Concern through the air to surface water (and potentially sediment, soil or groundwater) occurs via deposition, runoff and percolation processes. Transport through air is short-lived and thus there is minimal interaction between Chemicals of Potential Concern and potential receptors.

6.2.1 Routine Lake Water Quality and Stream Water Quality Assessment

6.2.1.1 Lake Water Quality

Lake Huron surface water quality samples were taken from 1 metre below the lake surface at five long-term monitoring locations near Bruce Power on July 31, 2024, August 30, 2024 and November 20, 2024 (Figure 54). These locations are representative of near field, wildlife habitat and reference areas. The interfaces between Lake Huron and the Bruce A and Bruce B discharges (LWQ1 and LWQ2, respectively) were sampled to sufficiently characterize the effluent from facility operations. Baie du Doré was sampled as it is a wildlife habitat area. Sampling locations at the southern (LWQ8) and northern (LWQ7) limits are reference locations. The results of these water quality analyses are presented in APPENDIX E: Table 97 alongside the historical trend observed between 2020 and 2024 (Table 101). These data continue to show that Bruce Power has effective containment and effluent control measures in place, and that facility operations have little-to-no effect on the water quality in Lake Huron [R-4] .

Sample results are compared to several criteria including:

- Provincial Water Quality Objectives as established by the Ontario Ministry of Environment, Conservation and Parks [R-126];
- The Canadian Council of Ministers of the Environment freshwater, long-term water quality guidelines for the protection of aquatic life [R-127];
- Ontario Drinking Water Standards as listed in *Ontario Regulation 169/03* [R-74];
- Health Canada Guidelines for Canadian Drinking Water Quality [R-128]; and
- Site-specific target levels, as developed in Table 38 of the 2022 Environmental Risk Assessment) [R-4].

All lake water quality parameters in 2024 were below the screening criteria, except for unionized ammonia, phenolics and dissolved oxygen in some locations.

In November 2024, ammonia (unionized) downstream of the Bruce A discharge was slightly above the Canadian Council of Ministers of the Environment screening criteria and Site-Specific Target Level (both 16 micrograms per litre), at 16.5 micrograms per litre. Ammonia inputs into Lake Huron from septic systems, agriculture and/or nearby industry (beyond Bruce Power) have been shown to impact water quality, as documented in nearby Provincial Water Quality Monitoring Network monitoring sites and off-site samples collected from within Stream C (upstream) [R-4]. Although Bruce Power contributes some ammonia to the lake, all releases in 2024 were within Environmental Compliance Approval limits (see Table 18, Table 19 and Figure 26 in Section 5.2.3.1).

Like 2022 and 2023, most lake water samples in 2024 showed phenolics above the screening criteria (1.0 microgram per litre), with the highest being 14.2 micrograms per litre in Baie du Doré (LWQ5) in November. Prior to 2022, phenolics were not routinely analyzed in Lake Huron water quality samples because they were not part of the analysis package offered by the external laboratory. This Chemical of Potential Concern occurs naturally in aquatic environments due to the decomposition of aquatic vegetation or can originate from industrial effluent, domestic sewage or pesticides [R-129]. Given the prevalence of ammonia and phosphorous in Lake Huron from agricultural sources, it is possible that a similar situation may exist for phenolics.

Samples collected at the interface of Lake Huron and the Bruce A discharge (LWQ1) and Bruce B discharge (LWQ2) in July showed dissolved oxygen levels slightly below the screening criteria of 6 milligrams per litre. This is an unusual occurrence, as all other Lake Huron samples obtained by Bruce Power since 2017 have been within the acceptable range for this parameter. The hand-held water quality meter was calibrated prior to each sampling event in 2024, but some drift in the instrument readings was noticed throughout the sampling and follow up actions were taken to address observed deficiencies with the manufacturer. It is possible that these readings are due to instrument error, rather than actual low dissolved oxygen levels. The water quality meter was repaired by the manufacturer and is now performing as expected.

Elevated levels of phosphorus, aluminum, iron and pH seen in some locations in 2023, were not seen in 2024.

Historical lake water quality data collected between 2017 and 2021 are presented in the 2022 Environmental Risk Assessment , including a discussion of any exceedances of the screening criteria and characterization of the risk to potential receptors. These data were collected from the locations shown in Figure 54 retired monitoring locations, and from the Coastal Waters Monitoring Program stations in Baie du Doré and Inverhuron Bay. A similar discussion of exceedances from 2022 to 2026 and characterization of the risk to potential receptors will be included in the 2027 Environmental Risk Assessment.

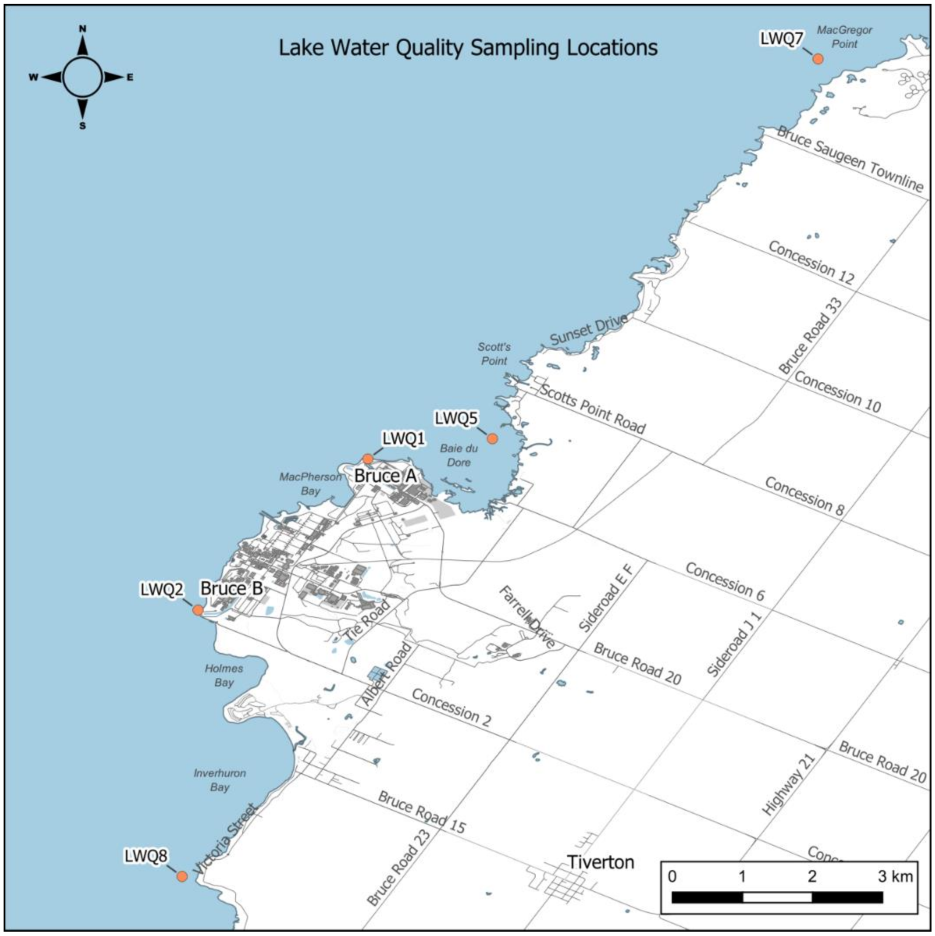


Figure 54 - Long-term Water Quality Monitoring Locations in Lake Huron.

6.2.1.2 Water Quality in Stream C and On-site Drainage Features

Surface water quality samples were collected in the spring, summer and fall of 2024 at several locations across the Bruce Power site, including the -long-term monitoring locations in ‘Stream C’ (Figure 55). Stream C is a small stream that originates off-site (headwaters on the Nipissing Bluff just east of site), flows through site including Hydro One and Ontario Power Generation lands, and discharges to Baie du Doré. Two -long-term monitoring locations exist in Stream C; one at the upstream boundary of the facility (SW1), and one at a downstream location near the discharge to Lake Huron (SW2). Additional on-site surface water monitoring locations include: Eastern Drainage Ditch (SW3), the pond adjacent to building B31 and the former Ontario Power Generation Construction Landfill #4 and the pond at the ‘Former Sewage Lagoon’. The pond beside building B16 was removed from the sampling program after the 2022 Environmental Risk Assessment determined there was no unreasonable risk to aquatic and semi-aquatic wildlife that inhabit the pond. One sample taken by Ontario Power Generation in 2020 for their Western Waste Management Facility Environmental Risk

Assessment ('Stream C Confluence') is shown for reference only and was not sampled by Bruce Power in 2024 (Figure 55).

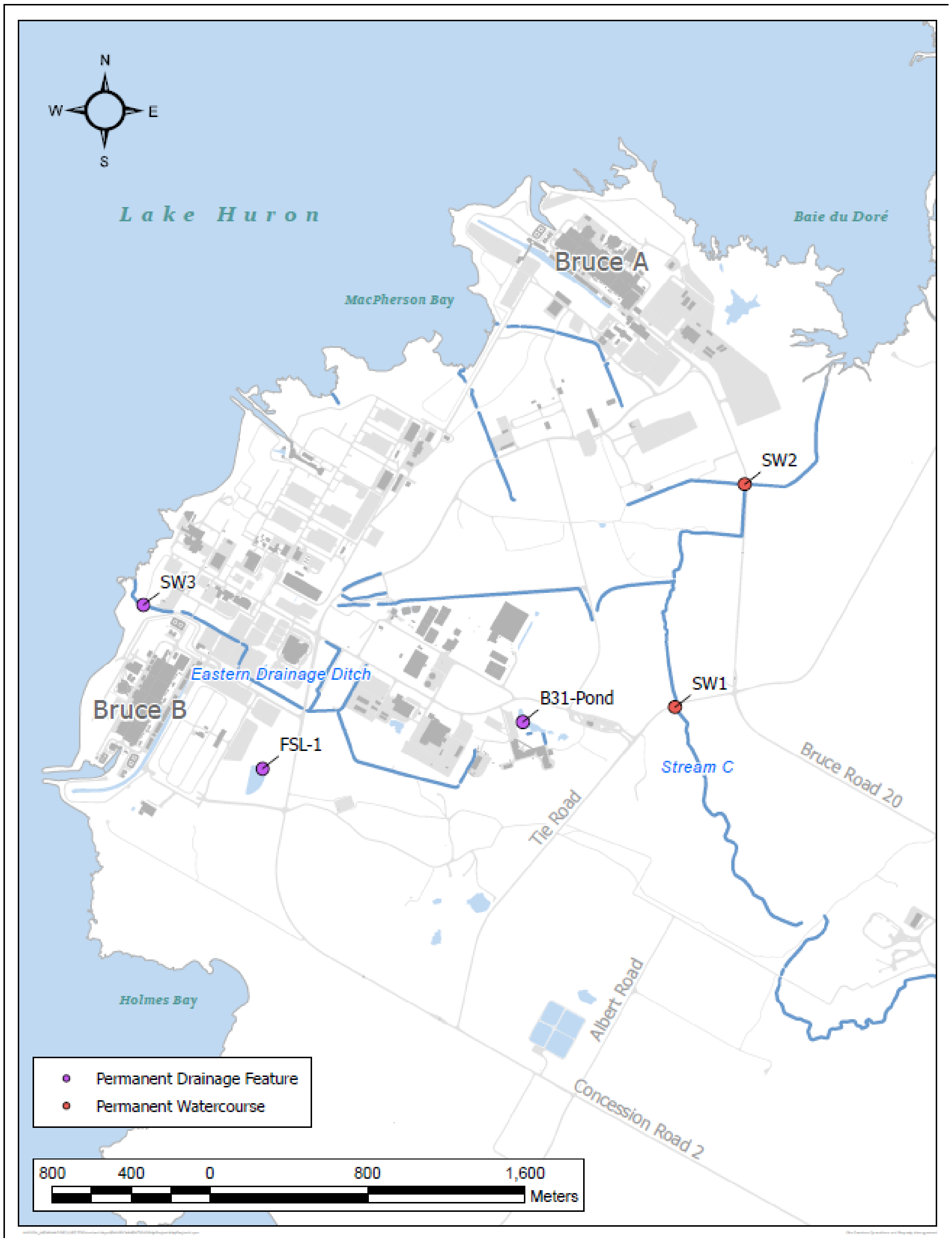


Figure 55 - Water quality monitoring locations sampled in 2024 from Stream C and other on-site drainage features.

Sample results are compared to several criteria including:

- Provincial Water Quality Objectives as established by the Ontario Ministry of Environment, Conservation and Parks [R-126];
- The Canadian Council of Ministers of the Environment freshwater, long-term water quality guidelines for the protection of aquatic life [R-127];
- Ontario Drinking Water Standards as listed in *Ontario Regulation 169/03* [R-74];
- Health Canada Guidelines for Canadian Drinking Water Quality [R-128]; and
- Site-specific target levels, as developed in Table 38 of the 2022 Environmental Risk Assessment .

In 2024, results above the screening criteria were recorded in some on-site surface water samples for the following Chemicals of Potential Concern: phosphorous, chloride, fluoride, phenolics, aluminum, copper, iron, nitrate, vanadium, zinc, and dissolved oxygen.

As mentioned in Section 6.2.1.1, phosphorous has been shown to be elevated in Lake Huron and other local surface water bodies due to run-off from agricultural activities. This is supported by the observation that phosphorous is elevated in the upstream portion of Stream C (SW1), prior to any influence from the Bruce Power site.

According to the 2022 Environmental Risk Assessment, elevated chloride levels are expected due to road salting practices as part of the facility's general maintenance and safety programs and fluoride is naturally elevated in regional groundwater and surface water due to the geology of the region [R-130]. Fluoride is not a chemical constituent used or emitted from Bruce Power operations.

Prior to 2022, phenolics were not routinely analyzed in on-site surface water quality samples because they were not part of the analysis package offered by the external laboratory. In 2022 this parameter was added to the analysis package and in 2023 most of the samples collected in August and November showed elevated levels of phenolics. All samples collected in April were below the screening criteria. In 2024, phenolics in samples from Stream C in April were below the screening criteria, but all other samples were above the screening criteria. This Chemical of Potential Concern occurs naturally in aquatic environments due to the decomposition of aquatic vegetation or can originate from industrial effluent, domestic sewage or pesticides [R-129]. The seasonal trend (summer and fall) in this Chemical of Potential Concern suggests a relationship to growth and decay of aquatic vegetation.

Aluminum occurs naturally in surface water and groundwater due to weathering of minerals. It can also be released to the environment from construction materials, vehicles, electronics, pharmaceuticals and personal care products [R-131]. Samples collected from the upstream section of Stream C (SW1) had elevated aluminum concentrations in April, August and October. The downstream section of Stream C (SW2) was only elevated in August. The pond adjacent to building B31 also had aluminum concentrations above the screening criteria in April and October. The Eastern Drainage Ditch had concentrations above the screening criteria in August and October.

Iron was above the screening criteria in the upstream portion of Stream C (SW1) in April, August and October. The downstream portion of Stream C (SW2) had an elevated iron concentration in August only. The pond adjacent to building B31 also had elevated iron concentrations in October. According to Environment and Climate Change Canada, the concentrations of iron in Canadian surface waters are generally below 10 milligrams per litre, with Lake Huron measured as 0.7 milligrams per litre [R-132]. All surface water samples were well below 10 milligrams per litre and only two exceeded 0.7 milligrams per litre.

Nitrate and vanadium concentrations in the Eastern Drainage Ditch (SW3) were above their respective screening criteria in April but returned to an acceptable range in August and October. Routine on-site surface water quality monitoring of this location will continue in 2025 and analysis of benthic invertebrates for vanadium will be carried out in 2025 to determine the uptake factor from water and sediment to benthic invertebrates.

Zinc is an essential element that is widely found in nature. In Ontario streams, zinc concentrations range from less than two micrograms per litre to 537 micrograms per litre [R-133]. Although the concentration of zinc found in the pond at building B31 was above the screening criteria in October, it was well within the range for Ontario streams. Zinc concentrations in the Former Sewage Lagoon in all three 2024 samples were above the Site-Specific Target Level calculated for this location in the 2022 Environmental Risk Assessment , but still fell within the range for Ontario streams.

Elevated levels of copper are often found naturally where there are higher concentrations of zinc [R-133]. Therefore, it is not surprising that the October sample from the pond at building B31 (which was above the screening criteria for zinc) was also above the screening criteria for copper. The fall sample from the Former Sewage Lagoon was also just above the screening criteria. The April sample from the pond at building B31 was above the Site-Specific Target Level calculated for this location in the 2022 Environmental Risk Assessment , but below the next most restrictive criteria (Canadian Environmental Quality Guidelines for the Protection of Aquatic Life [R-129]).

Finally, dissolved oxygen was below the Canadian Council of Ministers water quality long-term concentration guideline for warm water biota (early life stages) in the Eastern Drainage Ditch in the spring, summer and fall samples. The pond beside building B31 had dissolved oxygen levels below the guideline in October only.

The full results of the 2024 water quality analyses are presented in APPENDIX F: Table 103 to Table 106, alongside the historical trend observed between 2020 and 2024 (Table 107).

Historical data from 2017 to 2021 is outlined in the 2022 Environmental Risk Assessment [R-53], including a discussion of any exceedances of the screening criteria and characterization of the risk to potential receptors. A similar discussion of exceedances from 2022 to 2026 and characterization of the risk to potential receptors will be included in the 2027 Environmental Risk Assessment.

6.2.1.3 Sediment Sampling

Collection of sediment samples began in November 2024 and will continue in the spring of 2025. Results of those samples will be included in the 2025 Environmental Protection Report. Results of the last sediment sampling campaign (2021) are documented in the 2021 Environmental Protection Report [R-134] and the 2022 Environmental Risk Assessment .

Alternatively, historical sediment data can be viewed using an interactive tool that has been developed for this purpose. The tool can be accessed through the following link:

https://wsp-shinyapps.shinyapps.io/ERA_screening_tables/

6.2.1.4 Soil Sampling

Collection of on-site soil samples began in December 2024 and will continue in the spring of 2025. Results of those samples will be included in the 2025 Environmental Protection Report. Results of the last soil sampling campaign (2021) are documented in the 2021 Environmental Protection Report [R-134] and the 2022 Environmental Risk Assessment .

Alternatively, historical soil data can be viewed using an interactive tool that has been developed for this purpose. The tool can be accessed through the following link:

https://wsp-shinyapps.shinyapps.io/ERA_screening_tables/

6.2.1.1 Quality Assurance and Quality Control

The external laboratory that analyzes samples from the Conventional Environmental Monitoring program is certified under The Canadian Association for Laboratory Accreditation and operates a Quality Assurance and Quality Control program in accordance with ISO 17025 for competence of testing and calibration laboratories.

The internal Bruce Power laboratory also operates a documented, comprehensive Quality Assurance and Quality Control program, which includes the use of blank samples, blind duplicate samples and spike samples.

Performance criteria are specific to each monitoring effort and are outlined in the annual Conventional Environmental Monitoring program plan. Data acceptance criteria are defined for chemical analyses and are analyte-group specific. These criteria are defined in terms of specific data quality metrics such as analyte detection limits, matrix spike recovery, precision and blank results. The detection limit of the method used to measure the concentration, intensity should be less than the benchmark value identified for that contaminant, physical stressor, or effect [R-125].

The minimum detection limits for copper and zinc in surface water were above the screening criteria for samples collected from the Eastern Drainage Ditch SW3 on April 4, 2024 and August 28, 2024. The minimum detection limit was raised due to dilution of the samples to accommodate higher concentrations of these metals in the water.

According to protocol, the hand-held water quality instrument is calibrated prior to each water sampling event. In 2024, the instrument required several attempts to calibrate and, in some cases, could not be successfully calibrated. This reduced the confidence of certain pH, dissolved oxygen, temperature and specific conductivity readings. When the meter could not be calibrated, values from the same season in 2023 or 2022 were applied. The instrument was returned to the manufacturer for repairs and is now performing as expected.

6.2.2 Fish Impingement, Entrainment and Offsetting Activities

Bruce Power uses cold, deep Lake Huron water in a once-through-cooling system to condense steam and supply operational needs. This cooling requirement can cause adult fish and larger juveniles to become trapped against water intake screens (impingement). Smaller aquatic organisms, like fish eggs and larvae, can fit through the intake screens and then be carried through the cooling water system before returning to the lake (entrainment).

Bruce Power received a *Fisheries Act* Authorization from Fisheries and Oceans Canada in December 2019 [R-135]. The Authorization requires Bruce Power to quantify fish losses through continued monitoring of fish impingement and entrainment and to measure fish gains obtained from approved offsetting measures. These monitoring results are reported annually to Fisheries and Oceans Canada. Bruce Power works closely with the CNSC, Fisheries and Oceans Canada and local Indigenous Nations and Communities to ensure the requirements of the Authorization are met and that all are well-informed of relevant fish impingement, entrainment, and fish offsetting activities.

6.2.2.1 Impingement and Entrainment – 2024

The total loss of fish due to impingement and entrainment at Bruce A and Bruce B Generating Stations in 2024 was 2,581 kilograms (Table 46) expressed as a Habitat Productivity Index metric [R-136] [R-137]). This was consistent with losses in prior years (Figure 56), below the administrative threshold of 4,500 kilograms per year, and well below the maximum loss permitted in Bruce Power's *Fisheries Act* Authorization (6,600 kilograms per year). The total nominal weight of fish impinged in 2024 was 1,315 kilograms, excluding Round Goby, an invasive species not included in the total impingement losses. None of the fish impinged in 2024 were listed as Threatened or Endangered on Schedule 1 of the *Species At Risk Act* [R-138].

Impingement losses were measured consistently throughout 2024 by Bruce Power Operations who identified and quantified fish impinged in all unit pump houses a minimum of five days per week. The impingement monitoring program has several levels of Quality Assurance and Quality Control checks to ensure data integrity. Operators undergo training in fish identification and quantification prior to performing these tasks. The Quality Assurance and Quality Control program for fish impingement requires Operators to freeze Lake Whitefish, Round Whitefish and Deepwater Sculpin so that identification can be confirmed by field biologists who oversee the program. Frozen fish are bagged, labelled, and placed in freezers stored in each pump house until they are inspected by Bruce Power's field biologists. Operations staff will also freeze specimens that they would like the field biologists to perform a confirmatory identification. In October 2024, an Environmental Technician from the Saugeen Ojibway Nation was contracted through Makwa to provide support to the Conventional Environmental Monitoring Program, with a focus on fish impingement and entrainment monitoring. This contractor provides mentorship and guidance to Operators to identify and quantify impinged fish.

A new edition of CSA N288.9, Guideline for design of fish impingement and entrainment programs at nuclear facilities [R-139] was issued in December 2024. Revisions were completed by a technical committee that includes representatives from the regulator, utilities and consultants. A key update to the standard is the inclusion of criteria for identifying and documenting episodic events like the ones that occurred at Bruce Power in 2023 and most recently, in 2025 (as described in Section 4.1.4 of this report). The new edition of the standard will be reviewed as part of the Periodic Safety Review in 2026 to determine changes required for fish impingement and entrainment monitoring processes and documentation.

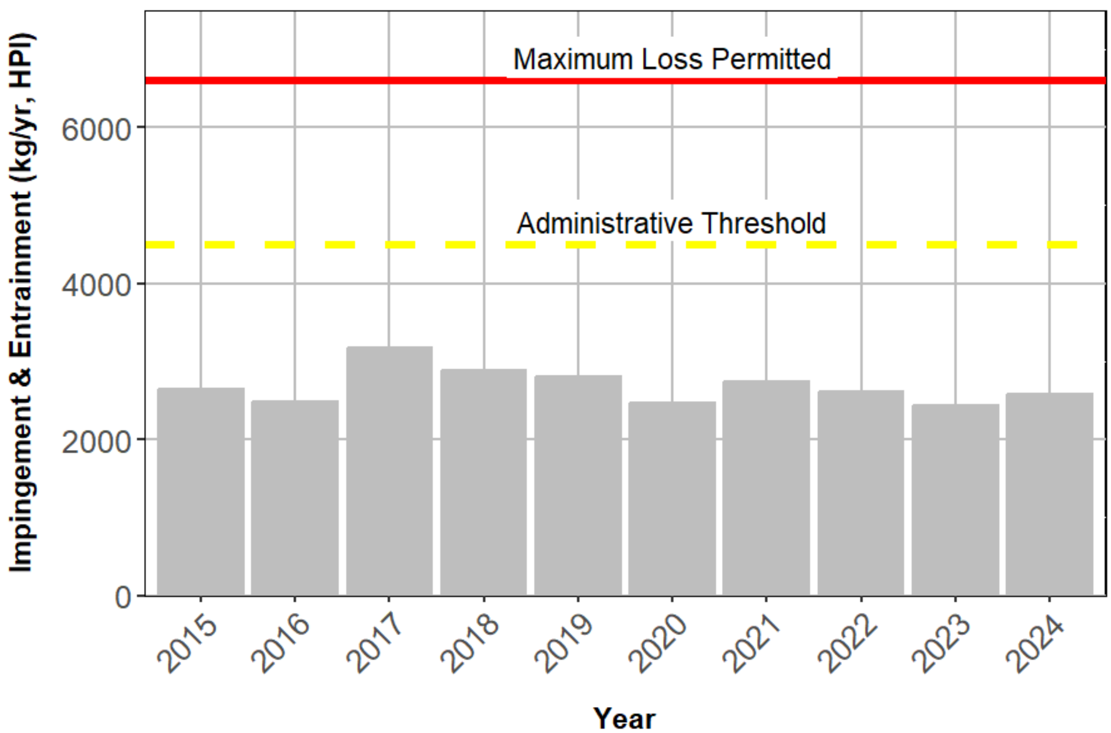


Figure 56 - Total impingement and entrainment losses at Bruce Power (2015-2024)

Note: Calculated using the Habitat Productivity Index metric [R-136] [R-137]. Impingement was measured in all years. Entrainment was estimated in 2015 through 2024 using measured data from 2013 and 2014.

Table 46 - Impingement and Entrainment Fish Losses at Bruce A and Bruce B in 2024

Species	2024 Impingement Count (number)	2024 Impingement Nominal Weight (grams)	2013/2014 Entrainment[1] Count (number of age-1 equivalents)	2013/2014 Entrainment[1] Age-1 Weight (grams)	2024 Productivity Loss (HPI, kilograms per year)
Alewife	269	3,671	6	24	5
Bloater	-	-	14,124	790,944	510
Brown Trout	22	23,948	-	-	6
Bullhead	12	8,748	-	-	2
Burbot	279	253,214	9,089	78,165	251
Carp	12	13,869	-	-	3
Channel Catfish	30	30,173	-	-	7
Chinook Salmon	17	53,920	2,208	266,285	148
Cisco	2	160	17,545	538,632	429
Coho Salmon	11	39,652	-	-	6
Cyprinid	-	-	431	259	1
Deepwater Sculpin	6	187	2,610	3,654	9
Emerald Shiner	251	6,641	-	-	6
Freshwater Drum	5	13,392	-	-	2
Gizzard Shad	1,692	408,903	-	-	158
Lake Chub	4	147	-	-	0
Lake Trout	64	168,432	-	-	28
Lake Whitefish	19	42,810	8,547	639,316	389
Minnow Sp.	3	30	-	-	0
Rainbow Smelt	1,660	11,240	16,898	152,082	201
Rainbow Trout	49	48,690	-	-	12
Rock Bass	10	2,960	-	-	1
Round Goby	231	6,303	2,529	2,529	16
Round Whitefish	1	1,601	-	-	0
Salmonid	-	-	427	8,028	8
Sculpin Sp.	1	8	-	-	0
Shiner Sp.	57	9,243	-	-	4

Species	**2024 Impingement Count (number)**	**2024 Impingement Nominal Weight (grams)**	**2013/2014 Entrainment[1] Count (number of age-1 equivalents)**	**2013/2014 Entrainment[1] Age-1 Weight (grams)**	**2024 Productivity Loss (HPI, kilograms per year)**
Smallmouth Bass	24	12,744	-	-	4
Spottail Shiner	195	24,084	-	-	12
Suckers	283	225,788	5,089	26,972	173
Three-spine Stickleback	16	74	-	-	0
Walleye	183	306,969	75	8,730	69
White Bass	-	-	-	-	0
White Perch	162	5,261	-	-	4
Yellow Perch	293	31,251	10,512	81,994	131
Total (kg/year)					2,596
Total (less Round Goby) (kg/year)					2,581

Round Goby are excluded from the annual Habitat Productivity Index calculation because they are a species listed in the *Aquatic Invasive Species Regulations* (SOR/2015-121).

Entrainment losses were not measured in 2024; power generation facilities do not routinely measure entrainment because it is an intensive effort. Instead, entrainment was conservatively estimated in 2024 based on the highest value observed (by species) in either the 2013 or 2014 entrainment monitoring programs. It is worth noting that these entrainment values are not pro-rated for actual cooling water flows experienced in recent years, and with units in Major Component Replacement, and maintenance outages with Condenser Cooling Water pumps offline, it is expected the entrainment values will be lower due to less flow. The 2581 kilogram total loss value for 2024 includes this conservative estimate of entrainment losses.

6.2.2.2 Truax Dam Removal Project Offsetting Activities – 2024

In August 2019, the Truax Dam (Saugeen River, Walkerton, Ontario) was successfully removed as part of Bruce Power's *Fisheries Act* Authorization Offsetting Plan. This project was completed in partnership between Bruce Power, the Lake Huron Fishing Club and the Municipality of Brockton, and represents the largest known dam removal to occur in the Province of Ontario in recent times (Figure 57). The successful dam removal in 2019 was a key step forward in Bruce Power's efforts to fully offset its fish losses from impingement and entrainment.

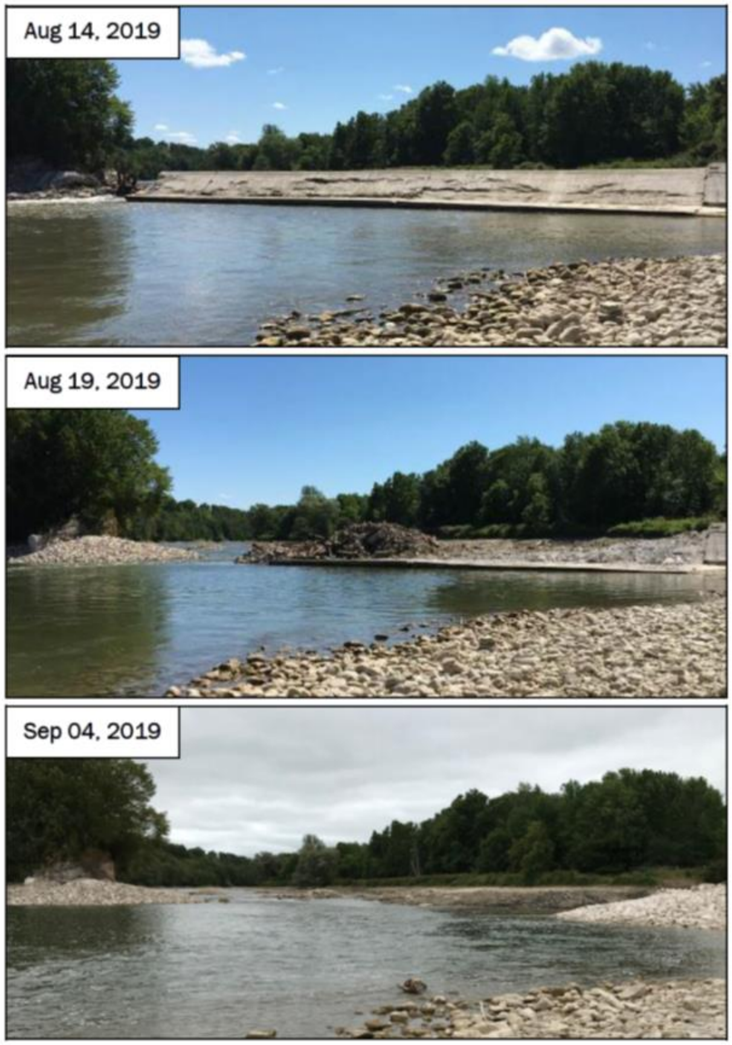


Figure 57 - Truax Dam, Walkerton, Ontario.
The original wooden dam was built in 1852 and later replaced by the concrete structure shown above in 1919. The dam posed a significant barrier to fish passage for more than a century before it was removed in the summer of 2019 over the course of 3 weeks.

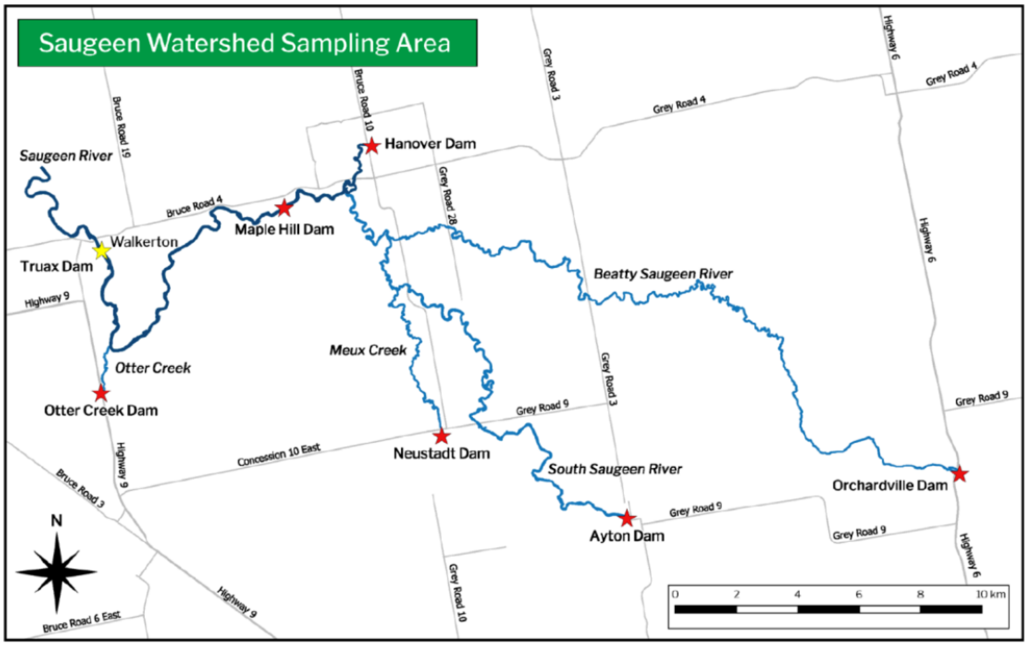


Figure 58 - Twenty-two long-term monitoring sites are located in the Saugeen (upstream & downstream of the former Truax Dam) and within the South Saugeen & Beatty Saugeen Rivers and Otter and Meux Creeks.
Dams (red stars) are natural endpoints of the study area as fish cannot pass upstream of these structures. Control sites with independent fish communities are located outside of the study area, upstream of the Hanover and Otter Creek dams.

Fish and fish habitat monitoring upstream and downstream of the former Truax Dam began in 2018 and has continued since then to quantify the change in fish biomass that has occurred because of the dam removal. Twenty-two long-term monitoring locations were established in the study area where biologists carry out electrofishing surveys to measure changes in fish biomass and production (Figure 58). Additionally, habitat assessments and redd surveys are used to monitor changes in fish spawning, and underwater video and radio-telemetry studies are being done to track fish passage throughout the watershed. Complete habitat assessments were conducted at all sites in 2024. This data compliments the last complete habitat assessment performed in 2018, and partial assessments performed between 2019 and 2023.

In 2024, the largest increases in fish biomass production continued to be found within the main stem of the Saugeen River, particularly the sites immediately upstream of the Truax Dam footprint which were previously in the dam impoundment. Increases in production across all three river segments from the downstream barrier to Maple Hill Dam were able to be carried forward to assess offsetting gains for 2024, since the measurements were deemed statistically significant through a Before-After Control-Impact analysis. Although not all tributary production gains were significant in 2024, it was the first year that all tributaries had a positive change in post -removal biomass and production. Once statistically significant, relatively small changes in the tributaries will greatly impact the total offsets generated.

As a result of the removal of the Truax Dam, increase in Habitat Productivity Index for 2024 is 2740 kilograms per year. This value might change upon review of methodology and discussion with Fisheries and Oceans Canada.

Fish production within the Saugeen River main stem is expected to continue to increase in future years as the warm-water fish community re-distributes across the newly reconnected river system and as additional successful Salmonid spawning occurs within the newly formed habitat upstream of the dam footprint. Indeed, additional observations gathered through radiotelemetry studies of Rainbow Trout, Salmonid redd surveys and videography monitoring have demonstrated an almost instantaneous increase in Salmonid presence in the Saugeen River upstream of the Truax Dam to Carrick Dam and within Otter Creek. Increased fish production of Salmonids in the tributaries is also anticipated in future years.

A photographic collection of the Saugeen River watershed field work is found at [R-140]–[R-143]:

Videographic surveys have confirmed significant increases in Rainbow Trout passage at Maple Hill Dam. Additional information is available at Biotactic's website (www.biotactic.com, [R-144]) or by following these links:

Truax Dam Removal Monitoring on the Saugeen River - Summer 2024 Update Report [R-145]

Migratory Patterns of Rainbow Trout [R-146]

Rainbow Trout and Chinook Salmon redd counts continue to be higher than the numbers recorded before the dam was removed. An average of 33 Rainbow Trout redds were observed in Otter Creek pre-removal, increasing to 66 redds in 2023 and 209 redds in 2024. Correspondingly the number of juvenile Rainbow Trout captured increased from an average of 559 individuals pre-removal to 963 individuals in 2023 and 1,063 in 2024Table 47. Similarly, Chinook Salmon redds in Otter Creek increased from 8 counted in fall 2018 to 55 counted in fall 2023 and 62 in fall 2024 (Table 48). Fewer redds were observed in fall 2022 compared to fall 2021, due to significantly decreased water levels at the mouth and throughout Otter Creek, which precluded the ability of fish to enter the tributary. This is reflected in the 2023 juvenile count, which dropped from 42 in 2022, to three in 2023. A small increase was seen in 2024, with five juveniles observed in Otter Creek. Importantly, no redds or juvenile Salmonids were found pre-removal in the dam headpond, however post-removal redd counts continue to remain elevated (Table 47). While an increase in redd counts cannot directly be correlated to increases in biomass, this provides additional evidence of the benefit of the removal of Truax Dam to fish communities and will likely lead to further increases in fish biomass and fish biomass production throughout the watershed.

A summary of redd surveys in the Saugeen River near the former Truax Dam site are provided in Table 47 and Table 48, as well as the link below.

Redd Count Surveys [R-147]

Table 47 - Rainbow Trout spring redd and summer juvenile counts in the main-stem and Otter Creek baseline (2018 and 2019) and post-dam removal (2020 - 2024).

Year	Main stem Redd counts	Main stem Juveniles	Otter Creek Redd counts	Otter Creek Juveniles
2018	0	0	45	312
2019	0	0	21	806
2020	31	15	46	488
2021	5	7	71	642
2022	5	63	92	1,128
2023	3	38	66	963
2024	27	36	209	1,063

Table 48 - Chinook Salmon fall redd and summer juvenile counts in the main-stem and Otter Creek baseline (2018) and post-dam removal (2019 - 2024).

Year	Main stem Redd counts	Main stem Juveniles	Otter Creek Redd counts	Otter Creek Juveniles
2018	0	0	8	0
2019	3	0	10	13
2020	2	0	15	3
2021	28	0	73	2
2022	19	1	18	42
2023	26	0	55	3
2024	3	1	62	5

6.2.2.3 Indigenous Nation and Community Offsetting Projects – 2024

Bruce Power continues to collaborate with local Indigenous Nations and Communities to develop offsetting projects. These projects provide an opportunity to work together in meaningful ways to improve fish and fish habitat in areas of the Lake Huron watershed that are of special importance to local Indigenous Nations and Communities. These projects are in addition to Bruce Power's support of the Saugeen Ojibway Nation Coastal Waters Monitoring Program, which is a nearshore/coastal monitoring program with the goal of building a comprehensive baseline inventory of aquatic habitat and wildlife in the Saugeen Ojibway Nation Territory [R-148].

Bruce Power and the Historic Saugeen Métis completed the offsetting project known as “Fisheries Habitat Restoration and Enhancement: Removal of *Phragmites australis* from the Fishing Islands”. The combination of western science and Indigenous knowledge produced an all-encompassing improved formula for dealing with compensating offsets. The Fishing Islands are an important harvest area for the Historic Saugeen Métis Community. Fish, aquatic plants and bird eggs are all part of the Métis way of life. Maintaining ecological integrity in this area is therefore of high importance to the Historic Saugeen Métis Community. The project plan was approved in 2021 and as per the *Fisheries Act* Authorization, annual reports were submitted to Fisheries and Oceans Canada in March 2022, and September 2023 to document work completed each year. In 2023, it was confirmed that no high density stands of Phragmites remained in the project area and the final project report was submitted to Fisheries and Oceans Canada in March 2024.The goals of this project were to: strengthen the role of the Historic Saugeen Métis community in fisheries related projects; incorporate Historic Saugeen Métis community knowledge of coastal habitats and fish interactions; restore near shore coastal habitats that are important to the Historic Saugeen Métis community; increase shoreline complexity and restore native plant diversity; improve near shore fish habitat; enhance local hydraulic conditions to favour certain functions of fish habitat; and promote restoration of degraded habitats.

This program was made possible by a number of partners including the Oliphant and Fishing Islands Phragmites Community Group, Bruce Power, Grey Sauble Conservation Authority, Township of South Bruce, Oliphant Campers Association, Bruce Peninsula Biosphere Association, Nature Conservancy of Canada and the Invasive Phragmites Control Centre as well as many seasonal and fulltime residents.

In collaboration with the Métis Nation of Ontario Region 7, a project plan to improve fish habitat and restore connectivity in Bothwell’s Creek, near Leith, Ontario was developed and incorporated into the *Fisheries Act* Authorization in December 2023. Bothwell’s Creek has been used by the Métis Nation of Ontario Region 7 community for fishing and recreation, however a decline in fish has been noticed over the past decade. Erosion, sedimentation, loss of riparian vegetation and a build-up of debris (e.g., fallen trees) are thought to be the leading causes of the observed decline in fish in the creek. The Métis Nation of Ontario Region 7 assessed and removed debris that they identified as impediments to fish passage in 2022 and 2023. With the assistance of the Grey Sauble Conservation Authority, Bruce Power and the Métis Nation of Ontario Region 7 held a community riparian tree planting event in May 2024 to plant fifty white cedar trees along vulnerable stretches of the stream bank.
Photo-documentation is ongoing and will be provided to Fisheries and Oceans Canada in a final report by March 31, 2027. In addition to this project, Bruce Power and the Métis Nation of Ontario Region 7 have also partnered with Trout Unlimited Canada to conduct water temperature monitoring and redd surveys in Bothwell’s Creek to better understand the health of the creek and guide future habitat rehabilitation work.

Although no projects have been formally proposed to Bruce Power by the Saugeen Ojibway Nation, Bruce Power and Saugeen Ojibway Nation have met on several occasions and a list of potential project ideas has been developed and discussed. Bruce Power's *Fisheries Act* Authorization was amended in December 2024 to extend the deadline for submitting a project plan to Fisheries and Oceans Canada to December 31, 2025. Bruce Power continues to engage with Saugeen Ojibway Nation and discuss ideas for meaningful projects that are supported by the community.

6.2.3 Thermal Monitoring of Lake Temperatures

As part of nuclear electricity generation, high-pressure steam is produced at Bruce A and Bruce B by means of nuclear fission producing thermal energy in the core, which is transferred to the heavy water heat transport system, which then heats demineralized light water in a closed-loop system. This steam is used to produce the electricity in the turbine-generator systems and is then condensed to liquid water in the Condenser Cooling Water system before travelling back to boilers to be reheated to high-pressure steam again. Steam condensation occurs in the Condenser Cooling Water system using a separate open loop of cool lake water that is drawn from offshore deep-water intakes, and warmer water is discharged back to the lake.

The temperature of water leaving the Bruce A and Bruce B discharge channels is monitored continuously to ensure it meets the specifications outlined in Ministry of Environment, Conservation and Parks Environmental Compliance Approvals, which are established to be protective of the environment and minimize impacts to aquatic organisms and their habitat. Because this warmer discharge water has the potential to be a physical stressor to aquatic organisms, Bruce Power has carried out extensive thermal and current monitoring over several years in order to characterize any potential risk from thermal effluent. Temperature and current monitoring in Lake Huron continued in 2024 in order to collect ongoing verification data for the thermal risk assessment. This data will be presented in the 2027 Environmental Risk Assessment.

A comprehensive thermal risk assessment was completed in the 2022 Environmental Risk Assessment (Section 4.1.4). As part of this thermal risk assessment, a low risk to some cold and cool water fish species and life stages was identified, based on modelled thermal benchmarks . Given the similar habitat available along the length of the Lake Huron coast and the mobility of older life stages, no population level effects are expected. Bruce Power will continue to execute thermal monitoring through logger deployments, as described in N288.4-10 [R-125], and thermal modelling work to monitor the risk posed by thermal effluent in the Local Study Area.

The most recent thermal risk assessment was completed in July 2023 to support the application for thermal flexibility at Bruce A using an updated methodology [R-60]. The results of the 2023 thermal risk assessment are described in Section 4.3, and showed a low risk to specific life stages of cold water fish species.

Bruce Power's thermal monitoring field program will continue to deploy thermal loggers across the local study area and at reference locations throughout the proposed thermal flexibility period. The number of sites deployed and retrieved across the local study area may change due to safety considerations related to weather and substrate composition, results of the thermal risk assessment and the adoption of advanced thermal monitoring methods. All available thermal monitoring data, including results from CWMP, will continue to be incorporated into the thermal risk assessment.

In the summer of 2024, Bruce Power purchased and deployed three Sofar Spotter Buoys and Smart Mooring devices in Lake Huron. These buoys are fitted with dataloggers that transmit real-time wave and water temperature information to a digital application called Seagull. The Seagull application is hosted by the Great Lakes Observing System and is accessible to the public through the following link: website: seagull.glos.org

6.2.4 Biological Effects Monitoring

Bruce Power has conducted long-term monitoring of local wildlife for many years to trend baseline populations on our site. By doing so, we can understand local population dynamics, detect changes if they occur, and ensure that facility operations have minimal impact on the environment. Each of the following biological effects monitoring programs provides an additional layer of assurance that Bruce Power continues to operate its facility safely and in a manner that is protective of the environment considering the cumulative impact of its operations and those of other neighbouring facilities over the last several decades.

Many of the monitoring programs (including snake board studies, turtle nesting, migratory birds, breeding birds and amphibians) are completed in collaboration with Ontario Power Generation Western Waste Management Facility.

6.2.4.1 Amphibians

Amphibians are an excellent indicator of ecosystem health because they have a dual life cycle (water and land) and are sensitive to pollutants during all life stages [R-149].

Targeted nocturnal amphibian vocalization surveys are conducted in the spring and summer, following the Environment Canada Marsh Monitoring Protocol [R-149] and Draft Western Chorus Frog Detection Protocol for Ontario provided by Environment and Climate Change Canada [R-150]. The Marsh Monitoring Protocol requires sampling on three separate calm, mild evenings at least 15 days apart to determine species presence and relative abundance. The Draft Western Chorus Frog Detection Protocol for Ontario specifies daytime surveys earlier in the spring to detect the Western Chorus Frog, which has a brief calling period and can be drowned out by other species calling in the evening. In addition to the targeted vocalization surveys, incidental observations are made throughout the year during other field studies.

Table 49 - Amphibian Call Level Codes used in Survey Protocol

Level 1	Calls did not overlap and calling individuals could be discretely counted
Level 2	Calls of individuals occasionally overlap, but numbers of individuals could still reasonably be estimated
Level 3	Numerous individuals were calling, and an overlap of calls seemed continuous, making an estimate of individuals impossible

In 2024, five surveys were completed, including two surveys in March to capture early season breeders like the Western Chorus Frog (*Pseudaoris triseriatea*) and Wood Frog (*Lithobates sylvaticus*). The amphibian vocalization surveys revealed a total of four different species.

By far, the most common and abundant species documented was the Spring Peeper (*Pseudacris crucifer*). This early breeding frog species was heard calling at all 13 stations, with call Levels 1 and 3. The second most recorded frog species was the Grey Tree Frog (*Dryophtes versicolor*). This species was documented at 12 of the 13 monitoring stations. The Green Frog (*Rana clamitans*) was the third most abundant. No Northern Leopard Frogs (*Lithobates pipiens*), Wood Frogs (*Lithobates sylvaticus*) or American Toads (*Anaxyrus americanus*) were heard during the 2024 surveys, but Western Chorus Frogs (*Pseudacris triseriata*) were heard at a call level of 1 at the DGR/MMP 3 and N4 locations, during one of the surveys in March. This (Great Lakes/St. Lawrence) species which is listed as Threatened by the Committee on the Status of Endangered Wildlife in Canada, and the *Species at Risk Act* was also heard (incidentally) in 2023. The Western Chorus Frog is a very early breeder and quite often will breed while ice is still present. It may begin calling as early as mid-March, but the majority of calling will be heard in April. The fact that this species is such an early breeder makes it more difficult to document. Specific surveys must be completed in advance of the typical starting window for the other local amphibian species.

No Bullfrog species have been documented during any of the surveys from 2019 to 2024. They are generally not found in this region of Ontario.

Table 50 shows the frog and toad species that have been recorded on site between 2017 and 2024.

Table 50 - Frog and Toad Species Recorded on Site and the Surrounding Area between 2017 and 2024

	2017	2018	2019	2020	2021	2022	2023	2024
American Toad	Yes	Yes	Yes	Yes	Yes	No	Yes	No
Bullfrog	No	No	No	No	No	No	No	No
Green Frog	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Grey Tree Frog	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Northern Leopard Frog	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Spring Peeper	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Western Chorus Frog	No	No	No	No	No	No	Yes	Yes
Wood Frog	Yes	Yes	Yes	No	Yes	Yes	No	No

Monitoring of local frog and toad populations will continue in 2025 in the same locations and using the same protocols.

On April 10 and May 21, 2024, visual surveys were completed on site for other amphibians, like salamanders and newts. Surveys involved walking in wet areas, turning over rocks, logs, etc., to search for these amphibians.

Surveys revealed one Spotted Salamander (*Ambystoma maculatum*) along with two large, Spotted Salamander egg masses - one on each side of the South Access Road. Masses have been observed in these ditches for several years. These ditches are intermittent but generally have water present in the spring.

During unrelated field work on October 25, 2024, the South Access Road was walked in its entirety and a total of nine Spotted Salamanders and five Red-bellied Newts (*Taricha rivularis*) were found and safely moved off the road.

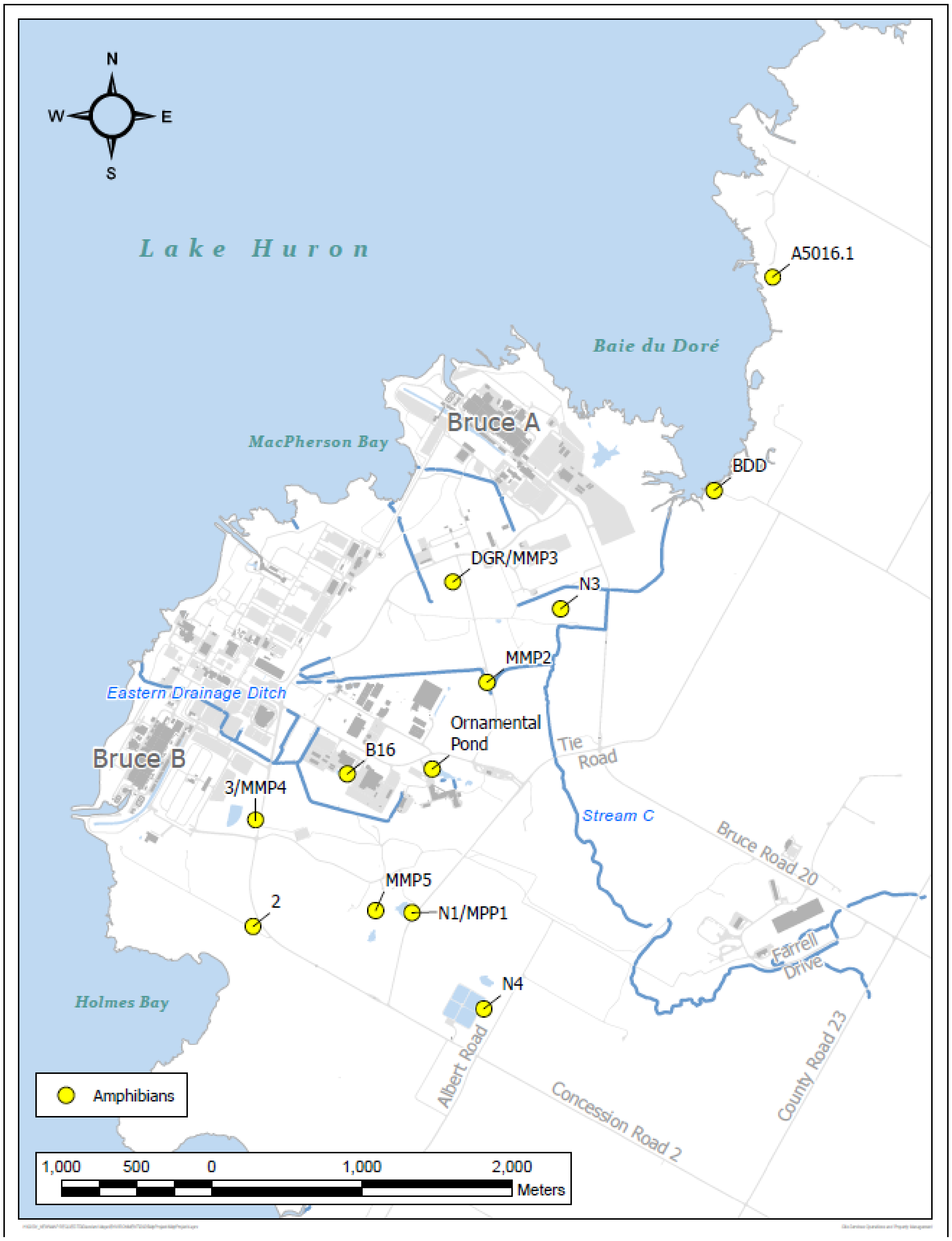


Figure 59 - Amphibian Survey Locations at Bruce Power

6.2.4.2 Snakes

Several snake species inhabit the Bruce Power site. They are an important component of natural ecosystems for many reasons, one of which is their need for diverse habitats to complete their lifecycles. Habitats include hibernacula areas, grasslands, wetlands, and other surface water features. Due to the decline and sensitivity of certain populations in Ontario, data collected on snake species presence and abundance provides information to make planning decisions and manage property holdings from an ecological perspective. Due to the increasing number of snake Species at Risk in Ontario, it is vital to monitor vulnerable snake populations in our local area. Investigations specific to snakes have been conducted in the form of pedestrian surveys from 2017 to present. These surveys locate and characterize the species assemblage and identify potential habitat on the Bruce Power site. Along with pedestrian surveys, bio inventories focus on identifying and recording snake species classified as Species at Risk. Data is also collected during Vehicle-Wildlife Collision Surveys and incidental observations by Bruce Power employees.

In 2020, Bruce Power and Ontario Power Generation Western Waste Management Facility began collaborating for snake monitoring. Thirty-three snake coverboards were placed at various locations throughout the Bruce Power Property by Ontario Power Generation Western Waste Management Facility, in addition to the eleven monitored by Bruce Power. Monitoring of these coverboards follows the guidelines outlined in the Ontario Ministry of Natural Resources and Forestry survey protocol [R-151].

In 2024, Bruce Power and Ontario Power Generation Western Waste Management Facility joined the Ontario Nature Long-term Monitoring Protocol [R-152], which added a total of 48 more snake coverboards to the site (24 Bruce Power and 24 Ontario Power Generation Western Waste Management Facility). Data collected from these coverboards are submitted to Ontario Nature each year to add to their province-wide database.

Snake coverboard locations are shown on Figure 60.

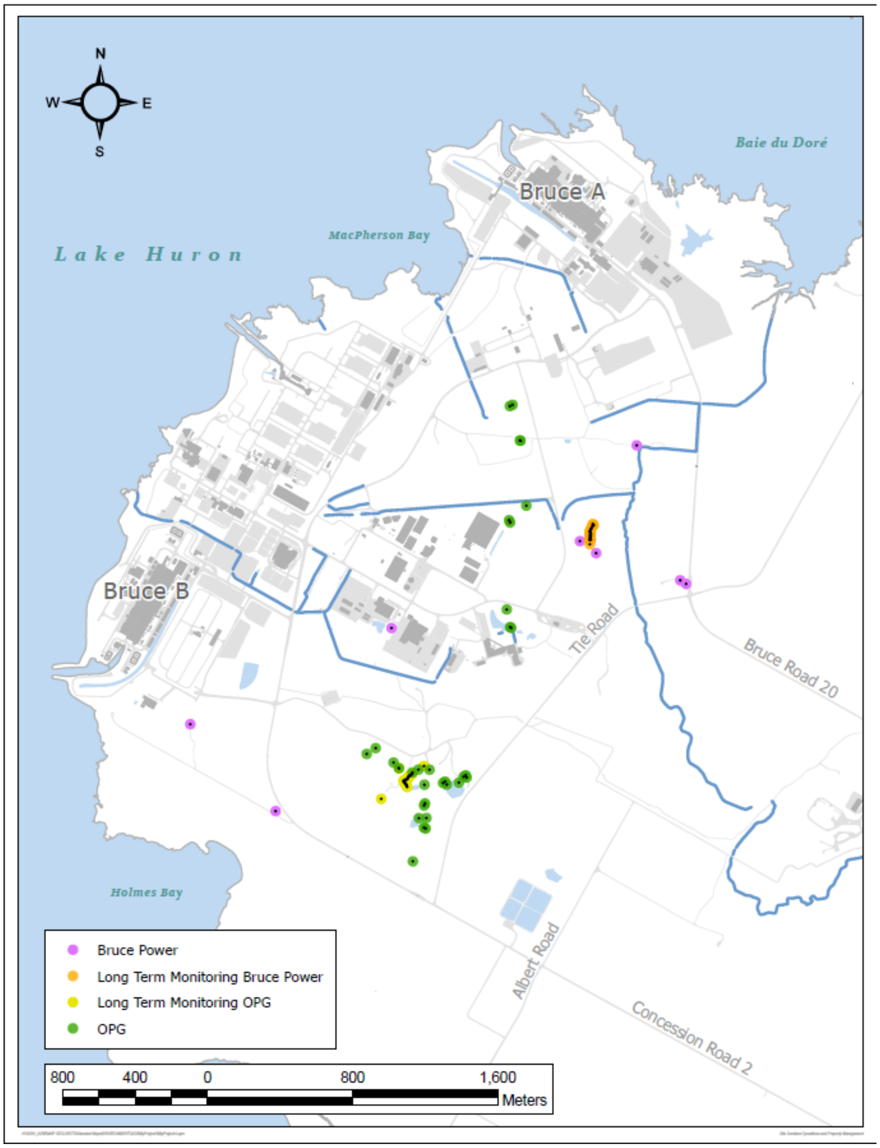


Figure 60 Snake Coverboard Locations on Bruce Power Site

<u>Bruce Power Snake Monitoring</u>

A total of nine snakes representing three snake species were recorded in 2024 by Bruce Power over the course of seven monitoring events: Eastern Gartersnake (*Thamnophis sirtalis sirtalis*), Smooth Greensnake (*Opheodrys vernalis*) and Dekay's Brownsnake (*Storeria dekayi*). Since snake monitoring began on site, five different species have been observed. Throughout the years, the most common snakes have been the Eastern Gartersnake and the Dekay's Brownsnake (*Storeria dekayi*).

No snakes were observed under the Ontario Nature Long-term Monitoring Protocol coverboards.

Ontario Power Generation Western Waste Management Facility Snake Monitoring

Deployment of the 33 snake coverboards at the Ontario Power Generation Western Waste Management Facility site has proven to be quite successful since snake monitoring began in 2020. A total of 119 snakes of eight different species have been recorded as part of the coverboard monitoring over the five field seasons. All snake species expected to occur in southern Bruce County have thus been found during coverboard monitoring at Ontario Power Generation Western Waste Management Facility.

The 2024 Ontario Power Generation Western Waste Management Facility coverboard monitoring documented a total of 20 snakes of five different species. Surprisingly, the most encountered snake species was the Northern Ring-necked Snake (*Diadophis punctatus*) (seven observations of at least four different individuals, based on size and location). This species is normally considered secretive and relatively uncommon. Perhaps equally surprising was the fact that no Red-bellied Snakes were found in 2024, as this species has been observed frequently in past years. Other highlights of the 2024 coverboard surveys included an Eastern Ribbonsnake (*Thamnophis sauritus*) (Special Concern) and one Eastern Milksnake (*Lampropeltis Triangulum*) (Special Concern, federally only). A Northern Watersnake (*Nerodia sipedon sipedon*) was observed near, but not under, a coverboard.

Two Smooth Greensnakes were found under the Ontario Nature Long-term Monitoring Protocol coverboards.

Table 51 - Snake Species Presence Recorded in the Local Area 2017-2024

Species	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Dekay’s Brownsnake	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Eastern Gartersnake	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Eastern Milksnake	No	No	No	No	Yes	Yes	Yes	Yes
Northern Ribbonsnake	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Red-bellied Snake	Yes	Yes	No	Yes	Yes	Yes	Yes	No
Northern Ring-necked Snake	No	No	No	No	Yes	Yes	Yes	Yes
Smooth Greensnake	No	No	No	Yes	Yes	Yes	Yes	Yes
Northern Watersnake	Yes	No	No	No	No	Yes	Yes	Yes

Snake surveys, following both protocols, will continue in 2025. The Ontario Nature Long-Term Monitoring Protocol coverboards will be moved to new locations that are more flat and dry, in hopes of attracting more snakes.

6.2.4.3 Turtles

In Ontario, turtles generally nest between May and mid-July, depending on the species, location and year [R-153]. Females choose nesting areas in loose, sandy substrate with sunny exposures. In 2024, three nesting surveys were performed in fifteen locations across site. Nests were observed at several of the survey locations, with a mix of Midland Painted Turtle (*Chrysemys picta*) and Snapping Turtle (*Chelydra serpentina*) nests. Some sites had new, undisturbed nests, but most nests contained older, broken eggshells, suggesting that they had been scavenged by predators.

Five basking surveys were conducted at various water features on site during the month of May, with observations of more than forty Midland Painted Turtles.

Turtle nesting and basking surveys will continue in 2025.

6.2.4.4 Waterfowl and Shorebirds

The purpose of waterfowl and shorebird surveys is to monitor overwintering and stopover migration areas to trend species abundance and distribution over time. The shoreline of Bruce Power is surveyed for waterfowl and shorebirds with both binoculars and a spotting scope from a set of nine viewpoints which were selected to cover most of the shoreline from Gunn Point to Scott Point with very little overlap (Figure 61).

In total, there were three spring and three fall survey days in 2024 completed between March and May and September to November. The total number of birds observed during the 2024 monitoring season was 1835. A total of 26 waterfowl, shorebird and gull species were identified during the waterfowl and shorebird monitoring. Canada Geese (*Branta Canadensis*) was the most abundant bird species observed, second most abundant was the Double-crested Cormorant (*Phalacrocorax auritus*) and the third most abundant was the Herring Gull (*Larus smithsonianus*)

In comparison, a total of 2678 birds across 32 species of waterfowl and shorebirds were observed in 2023. Annual surveys continue to demonstrate that there are diverse populations of local and migrant waterfowl and shorebirds inhabiting the lands nearby Bruce Power, with the highest density in Baie du Doré (Figure 62). Baie du Doré provides abundant nearshore vegetation with small embayment areas that offer shelter and feeding opportunities. Although the number of birds at most locations was down in 2024, an increased number of birds were observed at the Bruce A intake (viewpoint 5) and the Lagoon.

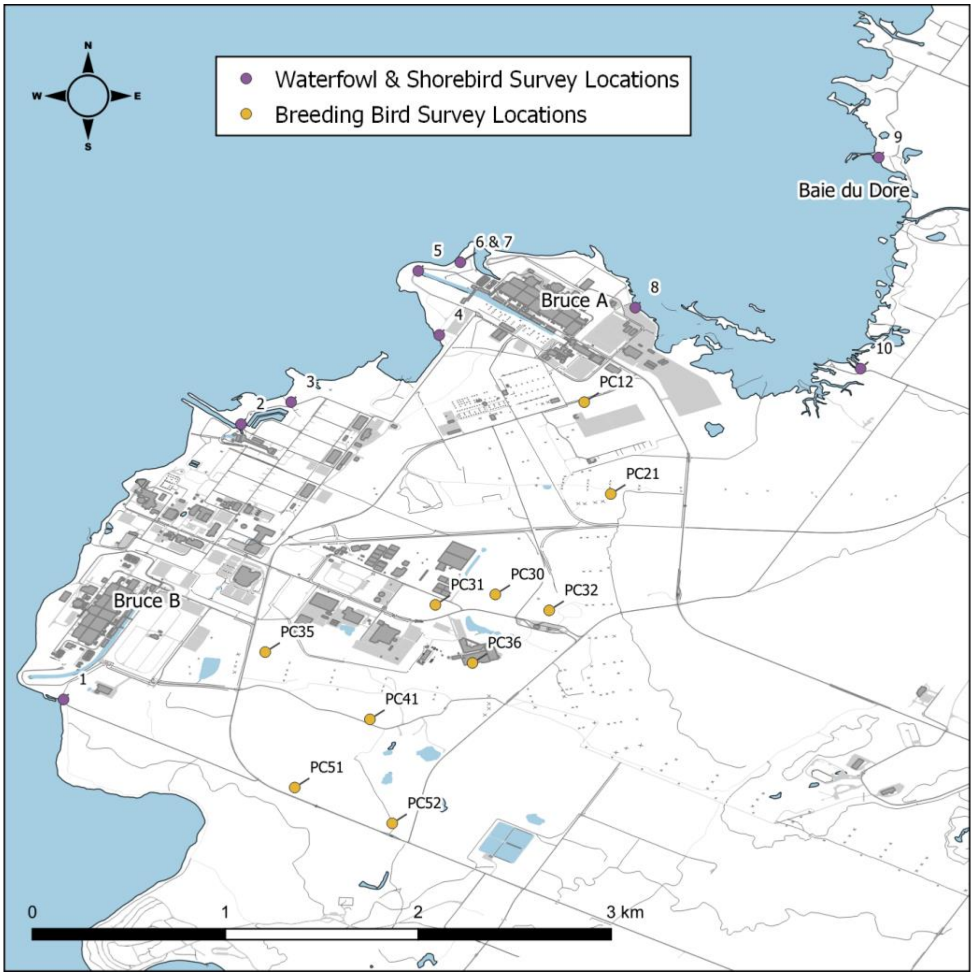


Figure 61 - Waterfowl & Shorebird and Breeding Bird Monitoring Locations at Bruce Power

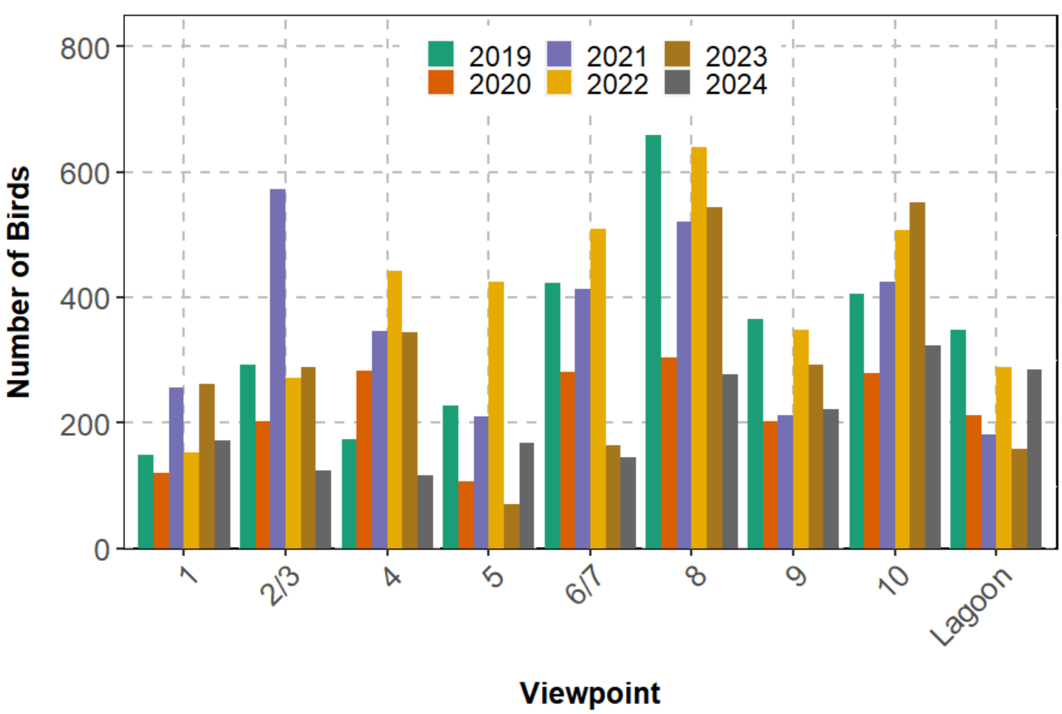


Figure 62 - Counts of Local Waterfowl and Shorebirds Observed 2019 to 2024

Ducks were abundant with a total species count of 15. Mallard (*Anas platyhynchos*) was the most abundant waterfowl species and second was merganser sp. (mergus). Green-winged Teal (*Anas carolinensis*), Blue-winged Teal (*Anas discors*) and Wood Ducks (*Aix sponsa*) were all observed during the 2024 surveys. These small dabbling ducks are early migrants to the area during spring and typically migrate early in the fall.

Diversity of gull species was lower in 2024 than in 2023 with a total of three species from this family (compared to five in 2023). Gull species included Ring-billed Gull (*Larus delawarensis*), Herring Gull and Great Black-backed Gull (*Larus marinus*). The Herring Gull is the most common of all the gulls in Canada. Along with the Ring-billed Gull, it thrives in a large lake environment like Lake Huron. The area around the Bruce Power site offers abundant food and breeding opportunities. Bonaparte's (*Chroicocephalus Philadelphia*) and Glaucous Gull (*Larus hyperboreus*) were not observed this year.

Horned Grebes (*Podiceps auritus*) (Special Concern in Ontario; rare breeders) were counted in 2024, along with one species of scoter, the White-winged Scoter (*Melanitta deglandi*). Scoters are late season migrants and are usually observed during the winter migration period.

Swans are common in Baie du Doré and are often recorded during waterfowl monitoring. Two species were recorded this year - the Mute Swan (*Cygnus olor*) and Tundra Swan (*Cygnus columbianus*). Trumpeter Swans (*Cygnus buccinators*), seen in 2022, were absent again this year.

Most of the survey locations are not ideal habitat for shoreline or wading birds. In 2024 only a single Yellowlegs sp. and a single Sandpiper sp. was seen in the Baie du Doré wetland complex, but a nesting Spotted sandpiper was found during unrelated field work in Baie du Doré, near Bruce A.

Waterfowl and shorebird monitoring will continue in 2025 in the same locations.

6.2.4.5 Breeding Birds

Ontario Power Generation Western Waste Facility staff conducted nineteen 5-minute breeding bird point counts across the site (Figure 61) on June 11 and 16, 2024. Monitoring protocols followed the standards prescribed by Birds Canada for the Ontario Breeding Bird Atlas [R-154]. A total of 58 breeding bird species were documented.

Seven new species, not previously recorded, included Common Merganser (*Mergus merganser*), Ruby-throated Hummingbird (*Archilochus colubris*), American Kestrel (*Falco sparverius*), Warbling Vireo (*Vireo gilvus*), Pine Siskin (*Spinus pinus*), Clay-coloured Sparrow (*Spizella pallida*) and Pine Warbler (*Setophaga pinus*), raising the overall total number of species recorded during point counts over the last five years (2020 to 2024) to 84 species.

The most commonly observed species during point counts within the restricted area in 2024 was the Red-eyed Vireo (*Sciurus vulgaris*) (detected at 16 stations). American Crow (*Corvus brachyrhynchos*) (13 stations), Common Yellowthroat (*Geothlypis trichas*) (13 stations), Blue Jay (*Cyanocitta cristata*) (12 stations), American Goldfinch (*Spinus tristis*) (12 stations), American Redstart (*Setophaga ruticilla*) (11 stations) and Song Sparrow (*Melospiza melodia*) (11 stations) were also very common and widespread.

Interesting observations included four Species at Risk: Eastern Wood-Pewee (*Contopus virens*), Barn Swallow (*Hirundo rustica*), Eastern Meadowlark (*Sturnella magna*) and Canada Warbler (*Cardellina canadensis*), all of them showing evidence of breeding. The Chimney Swift (*Sturnella magna*), Bobolink (*Dolichonyx oryzivorus*) and Wood Thrush (*Hylocichla mustelina*), each observed during at least one previous point count, were not documented in 2024.

Table 52 is a list of all breeding birds species detected at Bruce Power during the surveys in 2024.

Table 52 - Breeding Birds Species Detected at Bruce Power During Formal Surveys Conducted June 11 and 16, 2024

Breeding Bird Species			
Canada Goose	American Kestrel	Gray Catbird	Eastern Meadowlark (Threatened)
Wood Duck	Merlin	Brown Thrasher	Red-winged Blackbird
Common Merganser	Eastern Wood-Pewee (Special Concern)	American Robin	Ovenbird
Wild Turkey	Alder Flycatcher	Cedar Waxwing	Northern Waterflush
Ruffed Grouse	Great Crested Flycatcher	Purple Finch	Black-and-white Warbler
Mourning Dove	Warbling Vireo	Pine Siskin	Common Yellowthroat
Ruby-throated Hummingbird	Red-eyed Vireo	American Goldfinch	American Redstart
Ring-billed Gull	Blue Jay	Chipping Sparrow	Magnolia Warbler
American Herring Gull	American Crow	Clay-coloured Sparrow	Yellow Warbler
Turkey Vulture	Black-capped Chickadee	Field Sparrow	Chestnut-sided Warbler
Belted Kingfisher	Barn Swallow (Special Concern)	White-throated Sparrow	Pine Warbler
Hairy Woodpecker	White-breasted Nuthatch	Song Sparrow	Yellow-rumped Warbler
Pileated Woodpecker	House Wren	Swamp Sparrow	Black-throated Green Warbler
Northern Flicker	Winter Wren	Eastern Towhee	Canada Warbler (Threatened/Special Concern)
Northern Cardinal	Indigo Bunting		

Breeding bird point counts will continue in 2025, using the same protocol and viewing stations.

6.2.4.6 Winter Songbirds

In January 2024, two point count surveys were conducted to document bird species overwintering on and around the Bruce Power site. Ten locations were visited, spanning from Inverhuron in the south to Baie du Doré in the north and the Bruce Power Visitors' Centre in the east. Species heard or observed included American crow (*Corvus brachyrhynchos*), Tree sparrow (*Spizelloides arborea)*, Blue jay (*Cyanocitta cristata*), European starling (*Sturnus vulgaris*) and Black-capped chickadee (*Poecile atricapillus*).

Surveys for winter songbirds will be completed every five years to look for changes in abundance or species composition.

6.2.4.7 Bald Eagles

Bruce Power monitors habitat use by Bald Eagles in the vicinity of the Bruce Power Site during the winter. Three Bald Eagle monitoring surveys were completed between December 2024 and February 2025 at six monitoring stations, labelled Station 1, and Stations 3 to 7 on Figure 63. Station 2 (not labelled on Figure 63) was abandoned in 2019 due to lack of visibility because of woody shoreline vegetation.

Bald Eagles are frequently observed at Stations 4, 5, 6 and 7 around Baie du Doré and the Bruce A discharge, with lower numbers recorded at Stations 1 and 3, where there are less foraging and perching opportunities. There was a decrease in the number of Bald Eagles at Station 6 and 7 this year, but a marked increase at Station 4. This is likely due to an abundance of food (Gizzard Shad fish) in the Bruce A forebay and discharge. Total counts in 2024/2025 were similar to 2023/2024 and 2021/2022, but lower than 2022/2023 (Figure 64). Higher numbers were seen in 2022/2023 because four surveys were completed that year, compared to three in most other years.

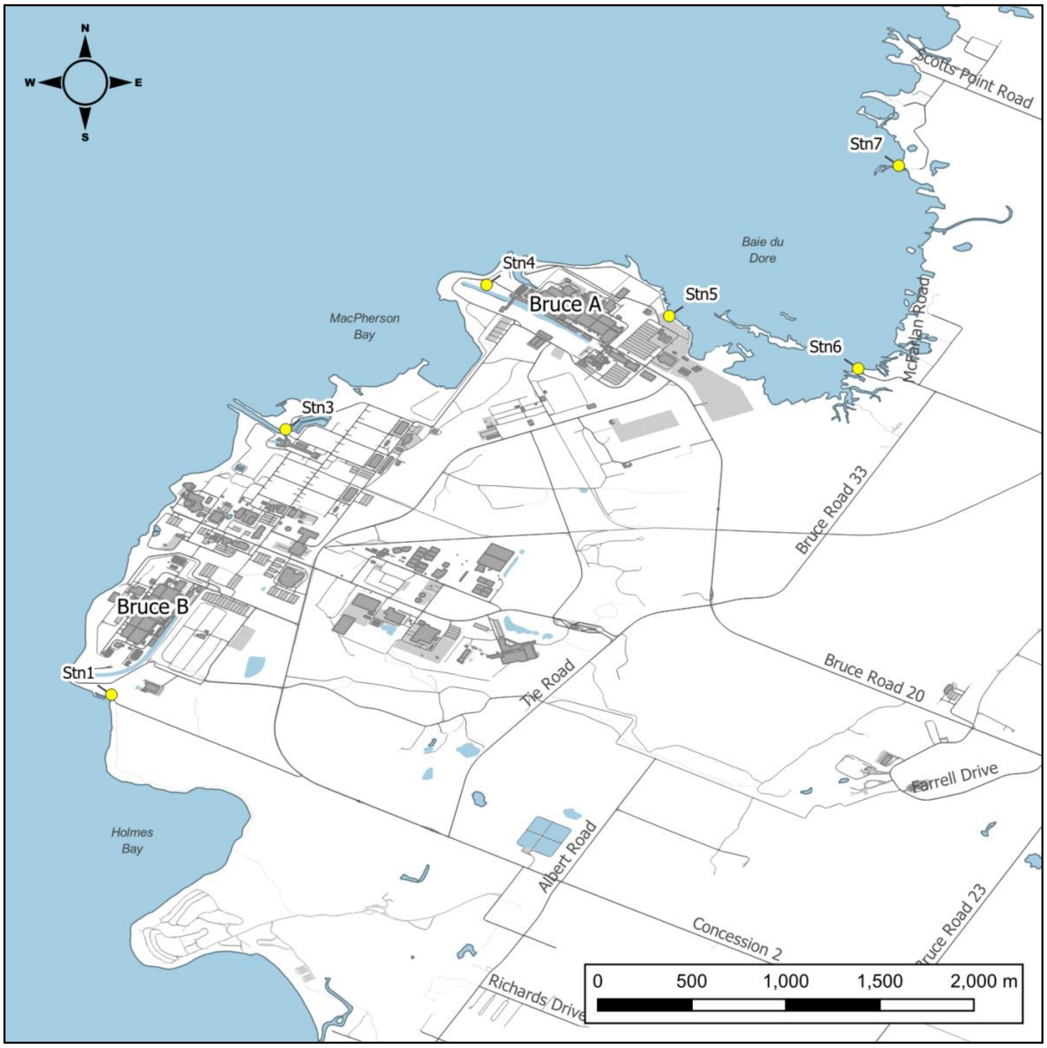


Figure 63 - Bald Eagle Monitoring Locations at Bruce Power

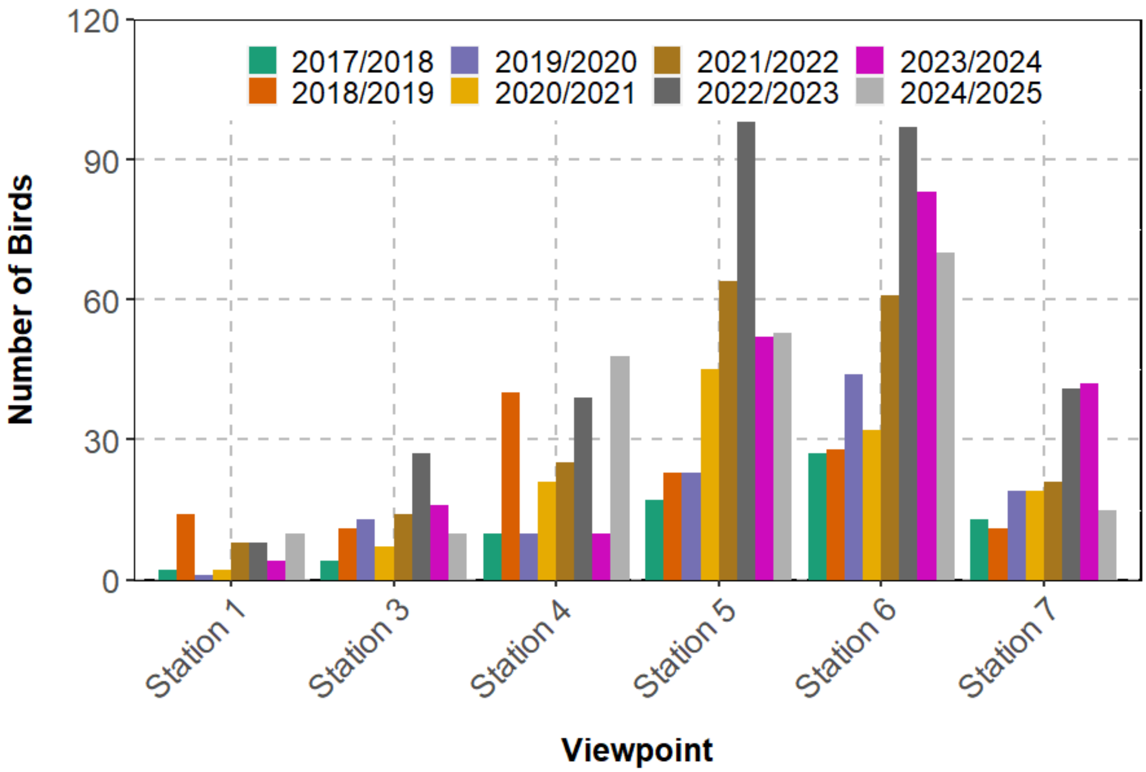


Figure 64 - Counts of Bald Eagles Observed near Bruce Power Between 2017 and 2024

Formal surveys for winter raptor species have not occurred since 2020 as none were observed during winter raptor surveys conducted in 2017-2018 and 2019-2020.; however incidental observations made by employees and Bruce Power field biologists are recorded. One Red-tailed Hawk (*Buteo jamaicensis*) was observed in 2018-2019, and one Snowy Owl (*Bubo scandiacus*) and one Northern Harrier (*Circus hudsonius*) were recorded in 2019-2020. In 2021 a Coopers Hawk (*Accipiter cooperii*), Northern Harrier and a Snowy Owl were observed on site. No additional species of winter raptors were observed in 2023 or 2024.

Bald Eagle surveys will continue in the winter of 2025/2026 at the same six monitoring stations. Bald Eagles were formerly listed as an Endangered Species provincially and in May 2023, they were down-listed from Special Concern to Not at Risk in Ontario. Populations have been steadily increasing since the 1970s when the use of DDT pesticide was phased out in Canada. The warm water discharges from Bruce A and Bruce B have created an area of open water in the winter months that allows the opportunity for Bald eagles to forage when most water bodies are ice covered.

6.2.4.8 Owls

Formal owl surveys on the Bruce Power site began in 2023 under the guidance of the Nocturnal Owl Surveys in Central Ontario: A Citizen Scientist's Guide ([R-155]). A total of seven survey locations are monitored, spanning the site from north to south. In 2024, surveys were completed on April 16, May 1 and May 15 [R-155]. A total of five Eastern screech owls (*Megascops asio*) were recorded just north of the sewage lagoons on Concession 2. The Northern saw-whet owl (*Aegolius acadicus*) and Barred owl (*Strix varia*) were not heard during the 2024 surveys, although they were detected in 2023. Owl surveys will continue in 2025.

6.2.4.9 Nightjars

Nightjar surveys on the Bruce Power site began in 2023 with guidance from the Ontario Nightjar Survey Instruction Manual [R-156]. Nightjars are night-time aerial insectivores and therefore, are great indicators of overall insect abundance.

Nightjars are widespread but very little is known about them. Two common species, Eastern whip-poor-will (*Antrostomus vociferous*) and the Common nighthawk (*Chordeiles minor*) are listed as Species at Risk and have been recorded historically on the Bruce Power Site.

Three surveys were completed in 2024 on June 18, July 11 and July 15. Seven separate sites located throughout the Bruce Power property were surveyed. A total of 11 Eastern whip-poor-wills were recorded, but no Common nighthawks were heard. The largest numbers of Eastern whip-poor-wills occurred during the June 18 survey with six heard, the second visit had two individuals and finally the third visit had three birds recorded.

Common nighthawks have been recorded on site in previous years, with the last observation in 2019 during spring amphibian surveys. Common nighthawk populations have been decreasing in recent years due to declines in insect populations, habitat loss and pesticides.

Nightjar surveys will continue in 2025.

6.2.4.10 Vehicle and Wildlife Interaction

Monitoring of vehicle-wildlife collisions on local roadways began in July 2017 to improve our understanding of wildlife mortality caused by vehicle collisions. This monitoring continued in 2024 with 56 formal surveys completed. Surveys occurred up to three times per week and were concentrated during peak wildlife migration periods or times (spring and fall, heavy rainfall events).

Standardized two pass surveys occurred on the main access roads that run between Highway 21 and Bruce Power (Bruce Road 20 – Segment 5; Concession 2 – Segment 4) and on the major on-site roadways that have the most traffic (Segments 1,2 3 and 6). Concession 6 (Segment 7) was added in 2019 because of increased traffic around the Farrell Drive industrial complex (Figure 65). Surveys were completed after 9:00 a.m. on weekdays after the peak morning traffic had subsided. All animals were identified to the species-level (wherever possible), photographed and georeferenced. Incidental observations of wildlife carcasses (outside of the formal surveys) were also recorded throughout the year.

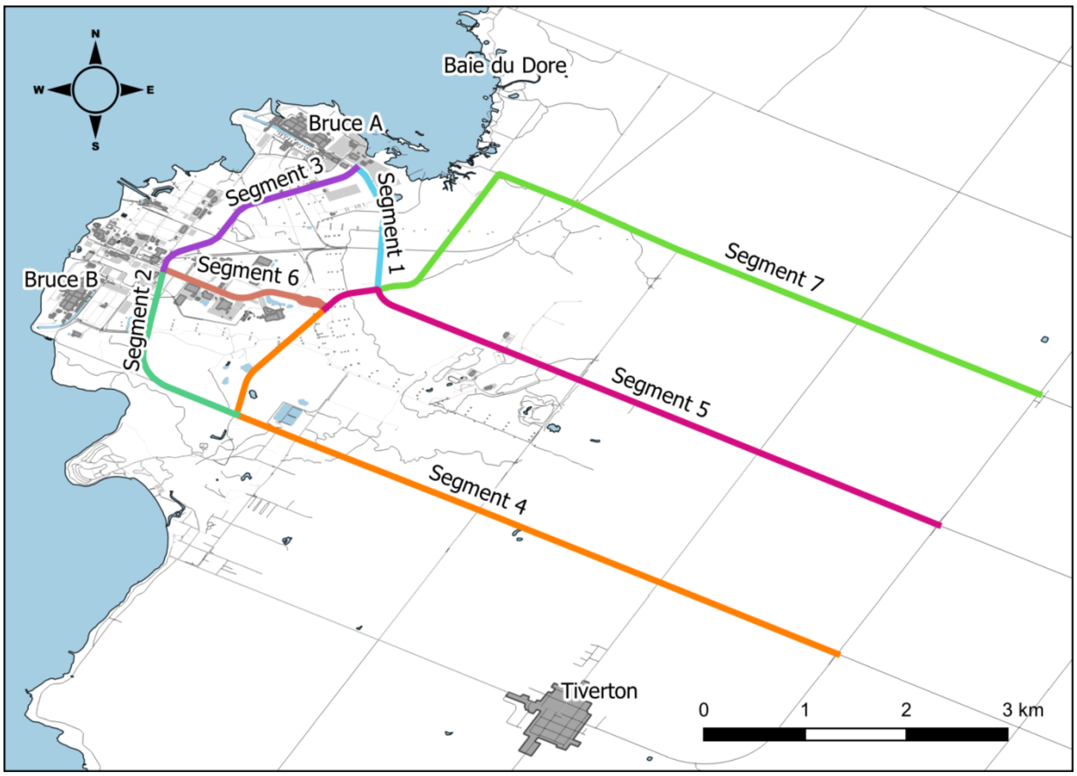


Figure 65 - Vehicle-Wildlife Collision Survey Areas

In total, 114 wildlife carcasses were recorded over the 56 formal surveys conducted in 2024 (2.0 animals per survey day). This is slightly higher than most years, but lower than 2017 and 2022 (Table 53). After the conclusion of spring monitoring, several road mortalities were observed during routine work on and around the site. It was decided to continue with monitoring, so there were the usual 24 spring and 24 fall events, with an additional 8 days between early August and September.

Table 53 – Vehicle-Wildlife Collision Mortality by Year (2017-2024)

Year	Number of Surveys Completed	Number of Deceased Animals Observed During Formal Surveys	Mortality Rate (Number of Animals Divided by Number of Surveys)
2017	19	43	2.3
2018	46	60	1.3
2019	46	78	1.7
2020	37	50	1.3
2021	48	83	1.7
2022	48	119	2.5
2023	48	75	1.6
2024	56	114	2.0

Of all the carcasses recorded, mammals constituted 47%; amphibians 31%; reptiles 17%; birds 4% and unknown 1%. The most recorded species were Northern leopard frog (*Lithobates pipiens*), Green frog (*Rana clamitans*), North American porcupine (*Erethizon dorsatum*) and Red squirrel (*Sciurus vulgaris*). A total of ten individuals classified as Species at Risk were recorded during monitoring in 2024 and an additional eight individuals were recorded as incidental road mortalities. The incidental road mortalities consisted of four Midland painted turtles and four Snapping turtles, both of which are listed as Special Concern in Ontario.

Table 54 - Mortality Rate per Kilometre by Survey Segment (2017-2024)

Year	Segment 1	Segment 2	Segment 3	Segment 4	Segment 5	Segment 6	Segment 7
2017 (half year; starting in July)	1.8	2.4	0.8	2.1	2.0	0.0	Not surveyed
2018	4.7	2.8	2.0	2.6	2.3	0.6	Not surveyed
2019	5.3	4.4	5.2	2.5	1.3	3.9	1.8
2020	4.7	1.6	1.6	1.9	1.1	0.0	1.0
2021	6.5	6.4	2.0	2.4	1.4	1.1	2.3
2022	14.1	11.2	0.8	2.5	2.7	2.8	2.4
2023	7.1	2.8	0.8	1.1	2.4	3.9	2.6
2024	4.1	6.4	3.6	3.6	1.3	1.1	4.9
Average Mortality Rate per Kilometre	6.0	4.8	2.1	2.3	1.8	1.7	2.5

In 2024, Segment 1 experienced the highest mortality rate per kilometre at 6.0, followed by Segment 2 (4.8 mortalities per kilometre) and Segment 7 (2.5 mortalities per kilometre). All three of these road segments have good quality, diverse woodlots with wetland or water features that provide preferred wildlife habitat. Segment 7 and Segment 6 are dissected by the Algonquin bluff which remains a vital wildlife corridor within Bruce County.

Looking at total mortality, across all wildlife classes and road segments, Segment 7 experienced the highest loss, with 35% of all carcasses recorded in 2024. Segment 4 accounted for the second most at 27%, followed by Segment 2 with 14% of the total recorded mortalities. Segment 6 had the lowest numbers and only represented 2% of the total mortalities.

Bruce Power has installed road signs on the North and South Access Roads (Segments 1 and 2, respectively), Concession 2 (Segment 4), Bruce Rd 20 (Segment 5) and Concession 6 (Segment 7), warning drivers of turtle and snake crossings. In 2023, the Municipality of Kincardine replaced and lowered the culvert on Tie Road, providing an alternative (and safer) means for wildlife to cross this road.

Increased vehicle presence at the Bruce Eco-Industrial Park and the continuation of Major Component Replacement work has led to an increased use of all concession roads leading to the Bruce Power site. In addition, the main entrance to Inverhuron Provincial Park is located on the west end of Concession 2 (Segment 4), adding considerable traffic to all the concession roads between the months of June and September. The park sees approximately 120,000 visitors over the course of the season.

Monitoring of these roadways will continue into 2025.

6.2.4.11 Redd Surveys in Stream C

In the early spring and late fall, salmonids migrate upstream from Lake Huron to reach suitable cool-cold water spawning grounds. The female selects a nest site and begins excavating a pit, referred to as a redd. This redd is where eggs will be deposited for fertilization by one or more males. Redd surveys are a tool for assessing the productivity and health of a watercourse, as presence and success of spawning salmonids indicates the watercourse has the necessary environmental conditions to promote healthy spawning, hatching, and rearing (i.e., substrate, temperature, and flow regimes). The timing of surveys varies depending on conditions like water temperature, rainfall, and stream water levels. Stream C surveys are conducted in the spring to capture the migration of Rainbow Trout (*Onchorynkus mykiss*) and in the fall to observe various salmon species, which include both Chinook Salmon (*Oncorhynchus tshawytscha*) and Coho Salmon (*Oncorhynchus kisutch)*. Redd surveys extend from the mouth of Stream C, at Baie du Doré (Lake Huron), upstream to the culvert on the west side of Tie Road.

Eight surveys were completed in 2024 (four in the spring, four in the fall). Thirty-four Rainbow Trout redds were observed in 2024, which is a return to more typical numbers, after a drop in 2023 (Figure 66). Of the thirty-four redds, thirteen had a Rainbow Trout on or near the nest. An additional six Rainbow Trout adults were observed in deeper pools, within the stream, but away from redds during one of the early surveys. A total of seven Coho Salmon redds were observed between October and December. Of these Coho Salmon redds, only one of them had a fish on or near the redd. No Chinook Salmon redds were observed in 2024.

During the spring surveys a large beaver dam was discovered on Stream C. This dam restricted upstream migration to some spawning areas. The beaver dam was removed in the summer of 2024 prior to salmonid fall migrations.

The high volume of baseflow groundwater and abundant precipitation made conditions adequate for spawning Rainbow Trout in the spring season. The fall migration was limited due to extremely low water levels due to lack of local precipitation. A complete Chinook Salmon run was lost due to the low water levels. During the Coho Salmon migration, stream conditions were only slightly better and is reflected in the low redd numbers observed.

The consistently high number of redds observed in Stream C since 2017 demonstrates there is excellent water quality that supports fish habitat in this stream.

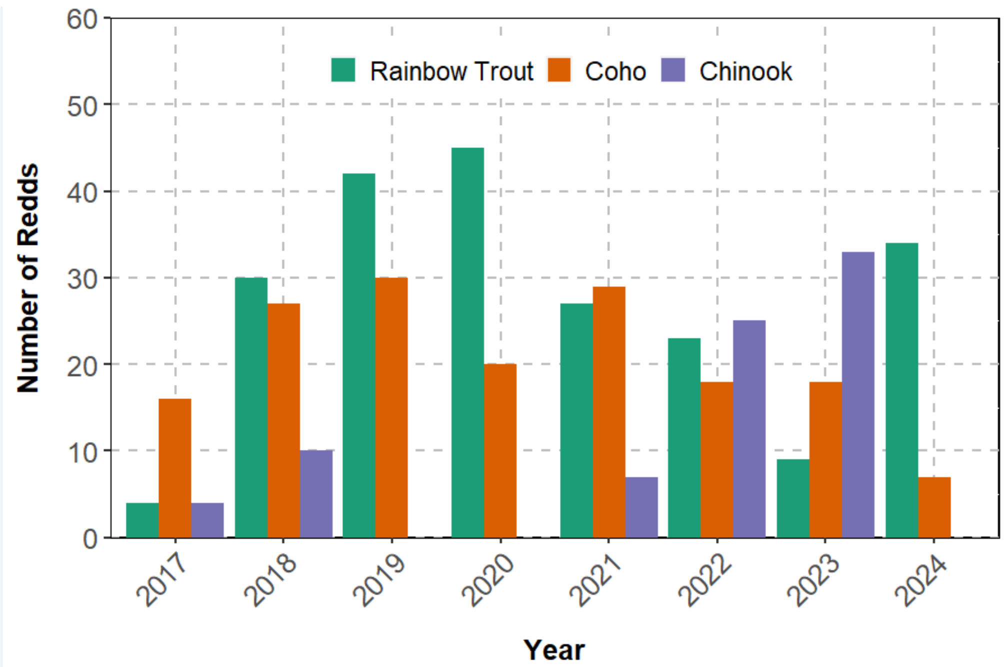


Figure 66 - Counts of Redds Observed in Stream C between 2017 and 2024

Redd surveys of Stream C will continue in the spring and fall of 2025 to confirm the suitability of this waterway for spawning, hatching, and rearing of fish.

6.2.4.12 Smallmouth Bass Nesting

In 2024, Smallmouth Bass nesting surveys were conducted in three locations in Lake Huron around Bruce Power: Bruce A discharge channel, Bruce B discharge channel, and sections within Baie du Doré that have suitable spawning conditions (i.e., provide adequate depth, gravel/sand substrate and shelter from prevailing winds and wave action).

Nesting surveys were completed from mid-May to June 2024. The timing of the nesting surveys was chosen to coincide with the expected Smallmouth Bass reproductive period, as well as early life stage development and fry dispersal. The exact start date of the 2024 Smallmouth Bass nesting surveys was chosen based on evidence of aggregating Smallmouth Bass in the discharge channels and environmental parameters like in situ water temperature, Bruce Power discharge temperature, and meteorological conditions. Surveys concluded in late June, due to warm air temperatures and absence of new spawning activity.

Water temperature, air temperature, pH, specific conductivity, and dissolved oxygen (DO) were measured using a hand-held water quality meter. Other relevant information (e.g., angler presence, incidental fish species observations, qualitative water clarity) was also recorded. A continuous record of water temperatures using duplicate temperature data loggers (Onset TidbiT®) are downloaded at the start and the end of the monitoring period, to assess differences in water temperature regimes among the three sampling areas. Temperature data loggers were programmed to measure water temperature on a 60-minute interval (i.e., 24 readings per day).

Smallmouth Bass surveys were completed by boat. Baie du Doré was surveyed by running transects spaced approximately 5 m apart. Transect spacing is determined by water clarity. On clear days with low turbidity, transect spacing could be increased, whereas under turbid water conditions, transect spacing was decreased. The two discharge channels were checked along the shoreline and in areas of lower water velocity near the docks. Smallmouth Bass nest observations were conducted by viewing the bottom substrate through an underwater viewer from the boat side. The viewer is used to eliminate water surface glare and surface turbulence and create a clear and unobstructed view of the water column and bottom substrate. When a nest was observed, its location was recorded using a GPS unit. The nest depth was recorded using the onboard depth sounder, and a unique identification number was assigned. For each observed nest on each survey event, the nest was assigned a development stage code (Table 55). During each subsequent survey, development was reassessed, and an updated development stage code was assigned.

Bruce B Discharge Channel

In 2024, nests in the Bruce B discharge channel were located in the crevices between large boulders that line the north and south sides of the channel, with more nests found on the north side of the channel versus the south side. A total of 36 nests were observed in the Bruce B discharge channel. All 36 nests (100%) had successful outcomes (i.e., reached Stages 6 to 8).

Baie du Doré

Sheltered shoreline areas and areas around the island or rocky spit which separates the bay into east and west sections under high water conditions, continued to be utilized for bass nesting in 2024. Most of the nests were in the southern portions of Baie du Doré, except for one nest located in the northeastern side of the bay and one nest in the east side of the bay. A total of 22 nests were observed in Baie du Doré. Of these, 15 nests (68%) were observed to have successful spawning outcomes (i.e., reached Stages 6 to 8) and 5 nests (23%) were recorded as unsuccessful (abandoned). During the last sampling event two previously recorded nests could not be assessed due to turbid water.

The number of Smallmouth Bass nests recorded in 2024 was down considerably in Baie du Doré compared to previous years. This is likely a result of early spawning period and unfavorable environmental conditions (i.e. high winds, turbid water etc.) that limited the number and spatial extent of surveys that could be completed during the spawning period.

A comparison of 2024 results to historical data is provided in Figure 67. Surveys in 2022 included the area immediately around the docks in the Bruce A and Bruce B discharges only. No surveys in Baie du Doré were completed that year.

Table 55 - Smallmouth Bass Nesting Survey Development Stage Codes

	Code	Code Description	Field Indicators
	0	Pairing	A pair of adult smallmouth bass with no nest observed
Active	1	Cleared Nest	A cleared nest with no guarding males was observed
Active	2	Cleared Nest; Bass Guarding	A cleared nest with a guarding bass was observed, but no eggs or fry were visible
Active	3	Eggs	A cleared nest was present and eggs were observed in the nest
Active	4	Yolk-sac Larvae	Transparent yolk-sac fry that had not risen off the bottom were observed in the nest
Active	5	Fry Risen; Tight to Bottom	Fry, located at or very near the bottom, were observed
Successful	6	Fry <2 cm Risen; Suspended	Fry <~2 cm total length, swimming suspended in the water column, were observed
Successful	7	Fry >2 cm Risen; Dispersed	Fry >~2 cm total length, swimming suspended in the water column and starting to disperse, were observed
Successful	8	Green Fry	Fry with a green coloration, which occurs at approximately 1.5 cm total length, observed in proximity of nest. May or may not be associated with that nest location
Unsuccessful	A	Abandoned	Nest was observed to be abandoned by male adult smallmouth bass or an abrupt absence of eggs, fry and adults was observed. This code includes nests that are abandoned as the result of natural physical destruction (e.g., nest silted up)

Nests are consistently located in similar areas from one year to the next, which is likely due to site fidelity and physical conditions (i.e. substrate type, water velocity). Male Smallmouth Bass are known to return to the same location year after year.

Bruce A Discharge Channel

Most of the Smallmouth Bass nests observed in the Bruce A discharge channel in 2024 were near the sheltered dock area on the northeastern side of the channel, along the bedrock shelves. A total of twelve nests were found and of these, ten nests (83%) were observed to have successful spawning outcomes (i.e., reached Stages 6 to 8). Two nests were unable to be assessed during the last visit due to water clarity; they were code 5 previously.

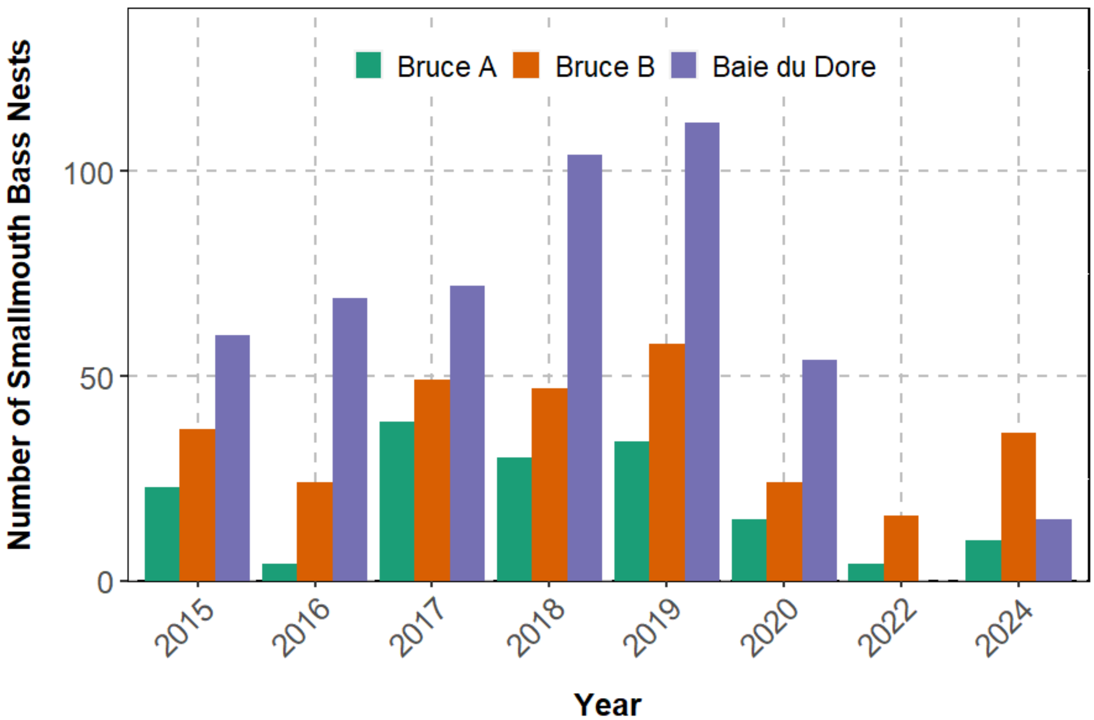


Figure 67 - Smallmouth Bass Nesting Results (2015 - 2024)

6.2.5 Supplemental Studies

6.2.5.1 Light Trespass and Sky Quality Levels

WSP Canada Ltd. was contracted to complete a light baseline program at the Bruce Power site in 2023 and 2024. Two field surveys were conducted to measure light trespass and sky quality levels at ten locations on and around the Bruce Power site (Figure 68).

Figure 68 - Light Study Monitoring Locations – 2023 and 2024

Light trespass is defined as light or illuminance that strays from its intended purpose into neighbouring areas where light may be undesirable. Sky glow (which determines sky quality levels) is defined as stray light scattered in the atmosphere brightening the night sky and reducing visibility of stars. Light trespass and sky glow can have effects on wildlife and people.

The first survey was performed in December 2023 and aimed to capture representative light conditions during winter (leaves off deciduous vegetation and ground covered by snow). The second survey was conducted in July 2024 to capture light conditions during typical summer conditions (leaves on deciduous trees and ground free of snow or ice).

There are no federal or provincial regulations or guidelines that address measurement of light levels or assessment of light effects. In the absence of federal or provincial guidance, measured light trespass and sky quality levels were compared to thresholds from the International Commission on Illumination and the Institution of Lighting Professionals [R-157].

All light trespass measurements, with the exception of one location near the exit of the north access road, were found to be less than thresholds from the International Commission on Illumination, meaning that light trespass levels are within the acceptable range, according to technical guidance. All sky quality levels were found to be higher than the applicable Institute of Lighting Professionals thresholds. Since high sky quality levels correspond to low levels of sky glow, these results indicate that existing sky glow levels around Bruce Power are also acceptable.

6.2.5.2 Underwater Noise

In April 2024, JASCO Applied Sciences (Canada) Ltd. began a one-year baseline acoustic monitoring program in Lake Huron around the Bruce Power site. Two acoustic monitors were placed offshore of Bruce Power, with a third monitor deployed near MacGregor Point to characterize the ambient underwater noise and vibration levels in these areas. The monitors will be retrieved in April 2025 and the results of the study will be included in the 2025 Environmental Protection Report.

6.2.5.3 Benthic Invertebrates – Lake Huron

Ecometrix Inc. performed a benthic invertebrate community survey in 2024 to document populations along the Lake Huron nearshore area in proximity to Bruce Power. Artificial substrates were placed in ten different sampling locations in July and recovered in October. Unfortunately, the retrieval rate was extremely low due to apparent tampering with equipment (lines cut, missing and damaged cages). No conclusions on benthic invertebrate density or diversity could be drawn based on the data collected. It is recommended that the survey be repeated in 2025, with a modified buoy arrangement and a more extensive public awareness campaign to ensure a higher rate of recovery of artificial substrates.

6.2.6 Achievement of Program Objectives – 2024

As demonstrated in this report, the 2024 Conventional Environmental Monitoring program is effective as the program continued to meet the objectives defined in the CSA N288.4, Environmental monitoring programs at Class I nuclear facilities and uranium mines and mills, by:

- measuring the concentration of hazardous substances and physical stressors in the environment to allow for the assessment of potential biological effects from stressors arising from the facility;
- demonstrating compliance with limits on hazardous substances and physical stressors in the environment; and
- verifying that Bruce Power has effective containment and effluent control measures in place [R-125].

6.2.7 Future Environmental Monitoring Activities

The Conventional Environmental Monitoring program focuses on locations with historical activity to monitor for impacts and ensure risk to receptors is sufficiently characterized. Additions or changes to the Environmental Monitoring program in 2025 and subsequent years are guided by the conclusions and recommendations outlined in the 2022 Environmental Risk Assessment , as well as baseline monitoring requirements for the Bruce C Impact Assessment.

Potential risks identified by the conventional Ecological Risk Assessment are listed in Section 4.1 of this report. The conservative nature of the methodology used to assess risks due to conventional contaminants in the Ecological Risk Assessment results in the identification of areas of potential risk but does not necessarily indicate a current risk to receptors.

In 2025, water quality monitoring of Lake Huron, Stream C and other on-site drainage features will continue. The sediment and soil sampling campaigns that were started in late 2024 will be completed in 2025. Benthic invertebrates from the Eastern Drainage Ditch (SW3) will be collected and analyzed for vanadium again to establish an uptake factor for this metal from sediment to benthic invertebrates and refine the risk to ecological receptors that consume benthic invertebrates in this location.

The benthic invertebrate study conducted in the summer of 2024 will be repeated in 2025 along the shoreline near Bruce Power. This is a follow-up to a similar study that was conducted in 2012 [R-158]. The 2012 study included sampling of benthic invertebrates and aquatic macrophytes in 15 locations that were associated with existing temperature loggers and historical benthic invertebrate sampling. Results found a low diversity of benthic invertebrates across all sample locations. Abundance was low in most areas too, except for the Bruce A discharge and Baie du Doré which are more sheltered. Previously common native species were outnumbered by the invasive *E. ischnus*, which aligns with changes seen in the rest of Lake Huron. Using head capsule measurements as an indicator, results suggested that discharge temperature to Lake Huron from Bruce A and Bruce B does not appear to play a significant role in affecting chironomid growth. Underwater video was collected in the same vicinity as the benthic invertebrate collection locations and showed that macrophyte abundance was low at most sites.

To better understand bat habitat and maternity roosting activity on the Bruce Power site, an acoustic monitoring program will begin in 2025. Twenty-five stations have been selected based on potential for roosting habitat and will be monitored from mid-May until mid-July. A second year of acoustic monitoring will occur in 2026, along with bat capture and tracking to assist in identifying the full roosting network.

The wetlands function assessment and Ecological Land Classification that began in late 2024 will continue in 2025.

7.0 GROUNDWATER PROTECTION PROGRAM

The CSA N288.7 Standard entitled: Groundwater protection and monitoring for nuclear facilities and uranium mines and mills (“*the standard*”) [R-159] provides requirements and guidance on the elements of a groundwater protection program and detailed guidance on developing groundwater monitoring programs as components of a groundwater protection program. The Bruce Power Groundwater Monitoring program has been in place since the late 1990’s. The Groundwater Protection program is part of a wider environmental monitoring program at Bruce Power and has been aligned with the standard since 2021.

The Groundwater Protection program has established groundwater protection goals and groundwater monitoring objectives. Performance against these objectives is documented annually through a program assessment under separate cover. A review of the annual monitoring and sampling which was carried out in 2024 is provided below and confirms that Bruce Power has in place a program which:

- Prevents or minimizes releases of nuclear or hazardous substances to groundwater,
- Prevents or minimizes the effects of physical stressors on groundwater end-uses, and
- Confirms that adequate measures are in place to stop, contain, control, and monitor any releases and physical stressors that can occur under normal operation.

The results of the 2024 Groundwater Monitoring program demonstrate that groundwater quality on the Bruce Power site is within historical trending. There were no observations of unforeseen conditions which would represent potential adverse impacts to human health or the environment.

7.1 Sampling and Analysis Plan

Water level measurements occurred at 149 groundwater well locations and were used to infer the groundwater flow conditions at the Bruce Power site.

Groundwater sampling was carried out in the spring and fall of 2024. The main contaminants of concern are tritium and petroleum hydrocarbons based on on-going operational activities. Other parameters include anions and nutrients, metals and inorganics, volatile organic compounds, and polycyclic aromatic hydrocarbons. Groundwater parameters are chosen based on the following:

- Confirm presence or absence of releases from systems, structures and components identified as having potential for impact to groundwater,
- Provide information where potential information gaps exist (environmental risk assessment, conceptual site model, buried piping program),
- Monitor impacted areas to confirm that there is no risk to end-use receptors.

Sampling was carried out at nine locations in 2024 (see Figure 69). The Fire Training Facility, Soil Management Area and the Bruce Heavy Water Lands were sampled in the spring and fall with the remainder only sampled in the fall. Groundwater samples for tritium were collected from monitoring locations within the Bruce A and Bruce B protected areas as shown in Figure 70 and Figure 71 respectively.

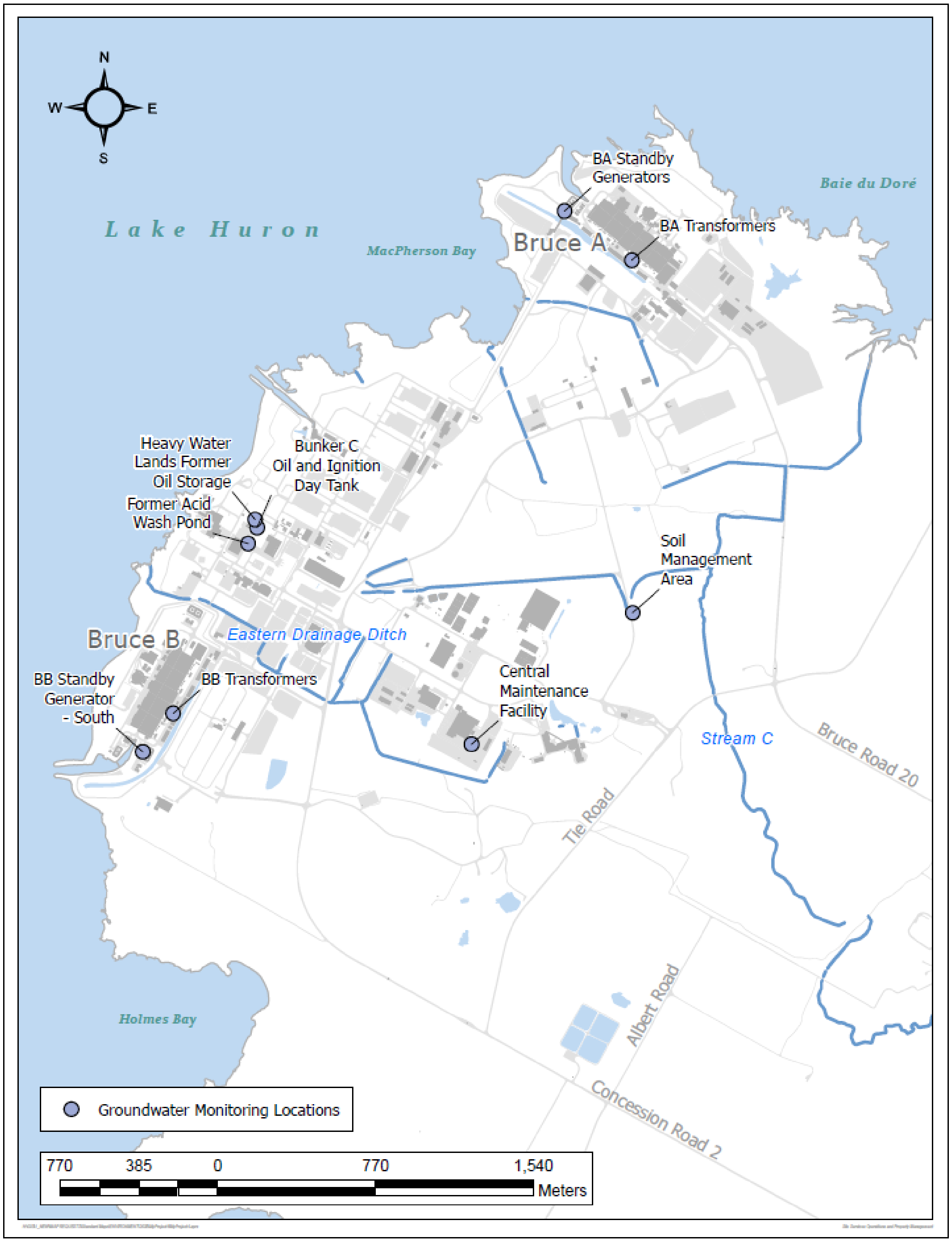


Figure 69 - 2024 Bruce Power Conventional Groundwater Sampling Locations

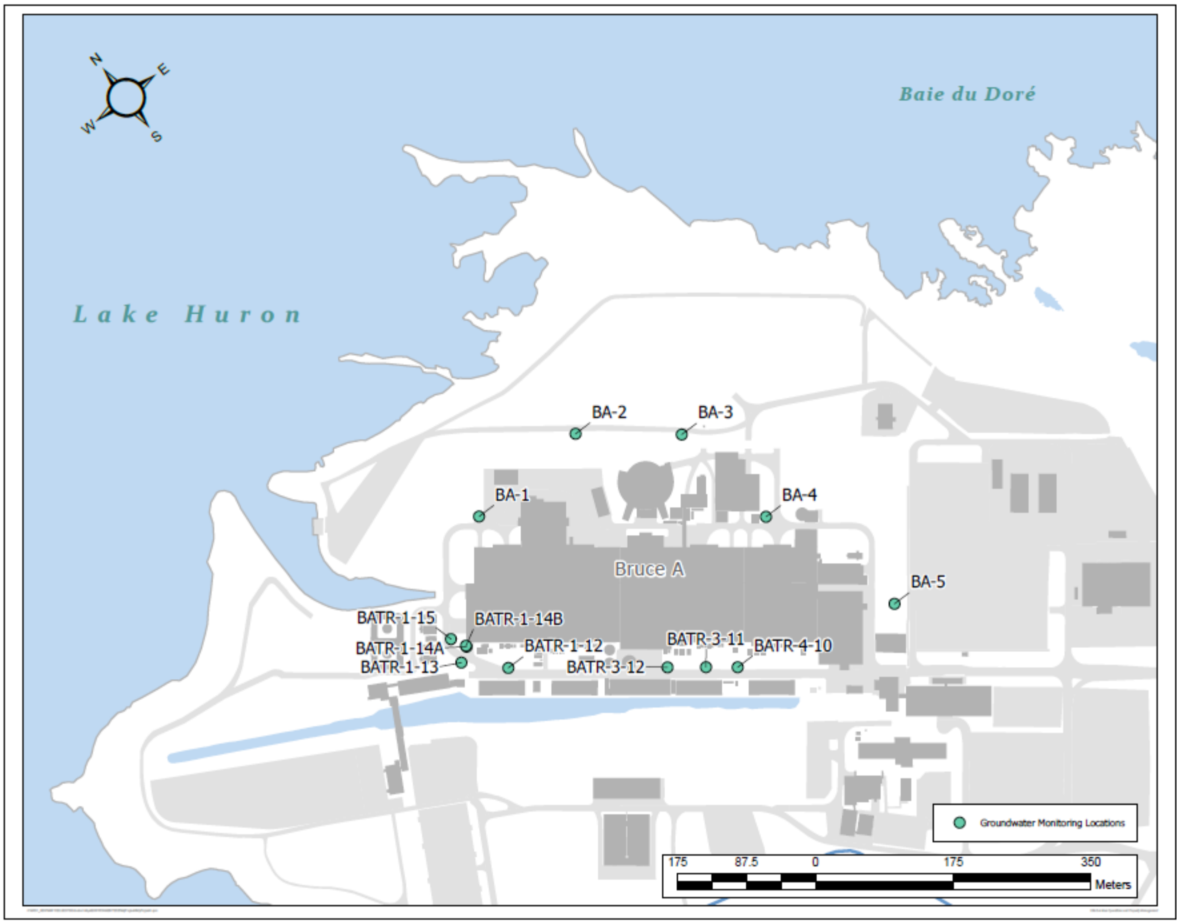


Figure 70 - Bruce A Radiological Groundwater Sampling Locations

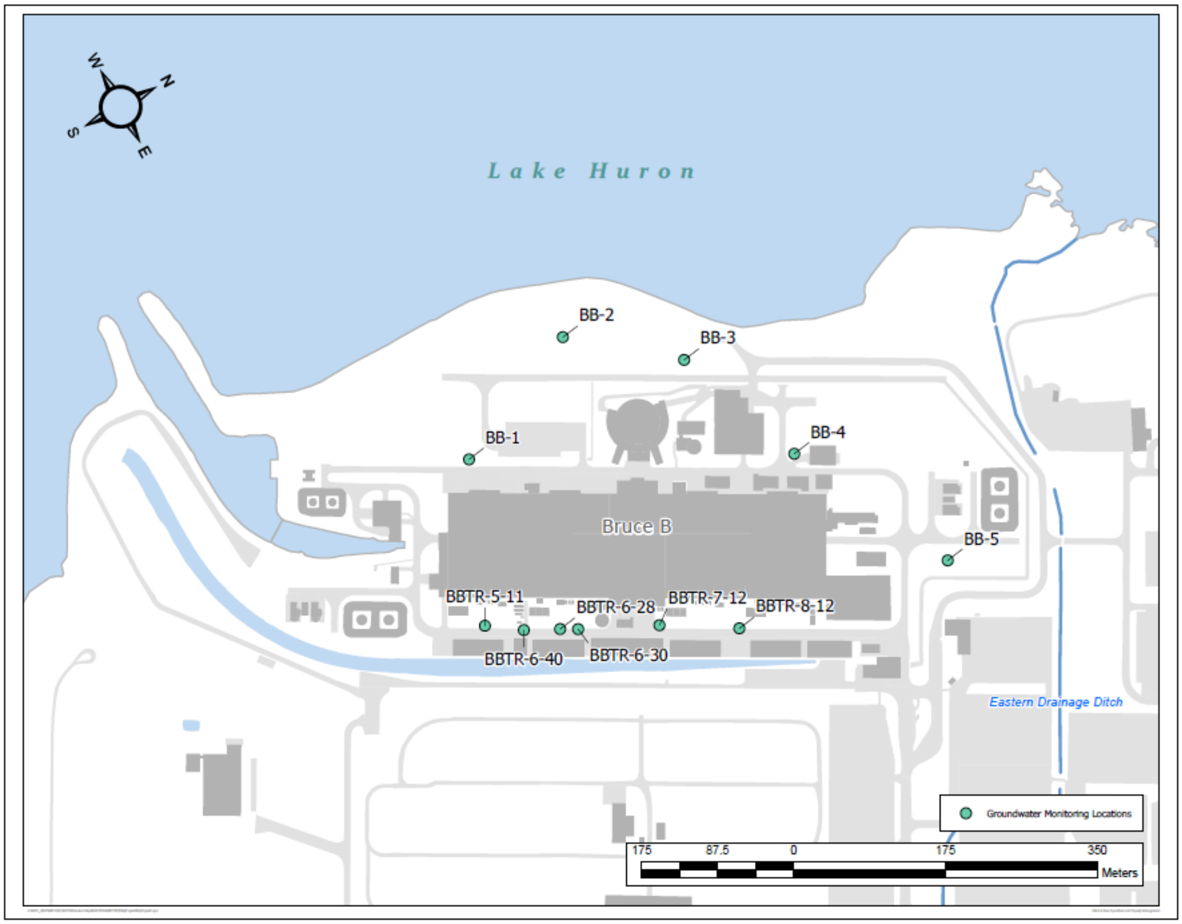


Figure 71 - Bruce B Radiological Groundwater Sampling Locations

7.2 Sampling Methodology

Monitoring wells were purged and sampled using the "low flow" technique, that is, purging the well at a slower flow rate and recording measurements of field chemistry parameters frequently – every 3 to 5 minutes. Field chemistry parameters including temperature, electrical conductance, pH, oxidation reduction potential and dissolved oxygen were recorded utilizing field meters throughout purging. Sampling occurs once field parameters have stabilized, which is indicative of stabilized groundwater conditions and ensures that the sample is representative of the surrounding formation. Low flow sampling has been shown to yield improved results for monitoring of recalcitrant contaminant parameters and turbidity influenced petroleum hydrocarbon detections. Sampling was performed in alignment with American Society for Testing and Measures standard D6771[R-160].

7.3 Quality Control

Data quality for the 2024 groundwater sampling campaign was evaluated using groundwater samples which were collected from June 18 to June 26 and from October 8 to October 17. The evaluation followed individual method requirements and guidelines from the United States Environmental Protection Agency National Functional Guidelines for Inorganic Superfunds Method Data Review (Environmental Protection Agency 2020a) [R-161] and National Functional Guidelines for Organic Superfunds Method Data Review (Environmental Protection Agency 2020b) [R-162]. The analytical results were evaluated using the criteria of precision, accuracy, representativeness, comparability and completeness. The data quality evaluation covered 176 normal groundwater samples, 32 normal surface water samples, 23 groundwater field duplicate samples, 6 surface water field duplicate samples, 15 field blank samples, 22 trip blank samples and the associated laboratory quality control samples.

The data quality evaluation is an assessment of whether the data meet the predefined data quality objectives. The goal of the assessment is to demonstrate that a sufficient number of representative samples have been collected and the resulting analytical data can be used to support project decision making processes.

For 2024, the groundwater analytical data provided for evaluation was considered valid and can be used for decision making.

7.4 Evaluation Criteria

Groundwater sample results for conventional parameters are compared against the Ministry of Environment, Conservation and Parks Site Condition Standards [R-163] (either Table 2 – Full Depth Generic Site Condition Standards in a Potable Groundwater Condition or Table 8 – Generic Site Condition Standards for Use Within 30 m of a Water Body in a Potable Groundwater Condition based on groundwater monitoring site location). These evaluation criteria are considered protective of the environment and human health and do not represent reportable limits.

For the purpose of identification of changes in conditions, groundwater sample results for tritium are compared against statistically based evaluation criteria. These criteria are derived using a mean plus three standard deviations approach. This value is established as the upper level of background and provides a reasonable benchmark for the identification of anomalous results which may potentially require further investigation or trending. This value is calculated using results from all wells which would be considered “similar” in terms of atmospheric tritium exposure. Seasonality is not differentiated in the derivation of the value.

The criteria are applied to identify any anomalous results which may require further investigation. As part of the follow up investigation, five-year trends for monitoring locations with results which were observed to be greater than the evaluation criteria are reviewed to verify that levels are within historical range or are decreasing. These plots are shown below.

7.5 Results

7.5.1 Groundwater Flow Conditions

Groundwater level measurements were taken over the entire site between October 7 and October 8. In 2024, a total of 149 locations were inspected and had water levels taken.

The shallow groundwater table is expected to be highly variable because of the presence and variable depths of extensive fill areas, which influence surface water drainage and infiltration and have variable hydraulic conductivities. Although the overburden groundwater is generally expected to flow westward toward Lake Huron, local groundwater flow direction and regimes may be highly variable, in part because of the presence of subsurface structures, utility trenches, foundations, and so on. Some shallow groundwater may flow towards surface water features (drains, ditches, wetlands, etc.). The upper bedrock at the Site is fractured; therefore, it is expected that shallow groundwater will also flow downward to the bedrock. The flow direction of the deeper groundwater within the bedrock will be influenced by the size and degree of bedrock fracture interconnections but is ultimately controlled by the hydraulic gradient.

Based on water level measurements taken, the inferred groundwater flow direction remains unchanged from 2023.

7.5.2 Groundwater Sampling Results

Groundwater samples for tritium were taken from wells within the protected area in the spring and fall of 2024. The 2024 data can be found in APPENDIX G:. Spring and fall criteria values were calculated (as per Section 7.4) and were applied against spring and fall sampling results respectively. Figure 72 and Figure 73 show the monitoring locations which were found to be above the applied criteria. The fall evaluation criterion (red line) was plotted to simplify the presentation of the data. Tritium levels observed in BATR-1-14B (southwest corner of Bruce A powerhouse) are in alignment with previous results observed at this location. Tritium in groundwater is a result of atmospheric wet deposition from station air emissions. This is supported through higher tritium levels in wells with shallower intervals and increased observations in the spring due to snow melt and increased precipitation. Monitoring at this location will continue in 2025. Tritium levels observed in BBTR-7-12 (south of Bruce B powerhouse at Unit 7) are also in alignment with previous results observed at this location (slightly decreasing). Monitoring at these locations will continue in 2025 to confirm these decreasing trends.

Overall, tritium in groundwater results within the protected areas generally fall below evaluation criteria. Results shown to be above these criteria are confirmed to be in alignment with station airborne emissions. Continued monitoring will confirm these observations.

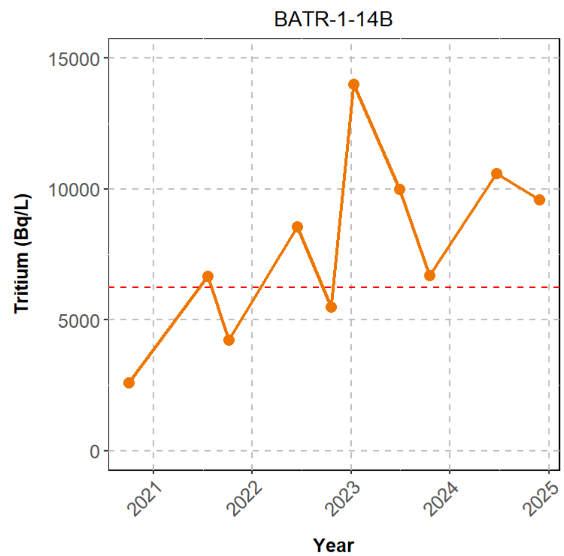


Figure 72 - Tritium in Groundwater at BATR-1-14B (Dashed line represents evaluation criteria of 6226.1 becquerels per litre)

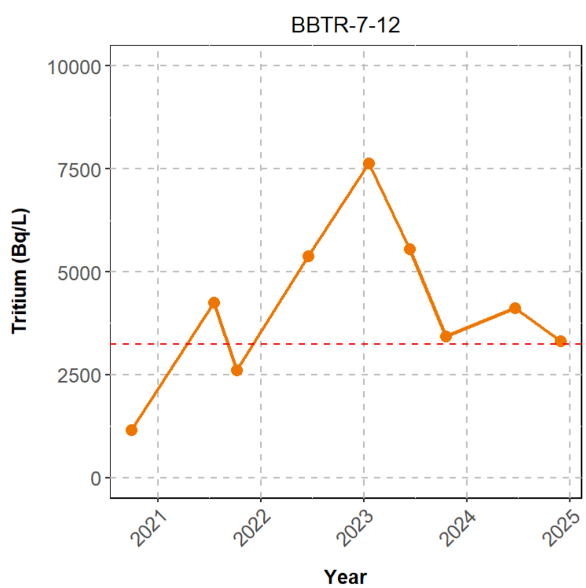


Figure 73 - Tritium in Groundwater at BBTR-7-12 (Dashed line represents evaluation criteria of 3247.5 becquerels per litre)

Groundwater samples for petroleum hydrocarbons were taken from monitoring wells located across the Bruce Power site according to the sampling and analysis plan and as per Figure 69. Dissolved petroleum hydrocarbons were observed above the applied site condition standard at several monitoring locations and are related to past events that have been well studied and managed with Regulatory oversight. These results were within historical trends and shown to be decreasing. The applied standard is considered protective of human health and the environment but does not represent a reportable limit. Where results were observed to be above the evaluation criteria, five year trends confirm that the result is not of concern and decreasing as expected. These trends are displayed in Figure 74 through Figure 80. It is important to note that Bruce Power adopted a low flow sampling methodology in the fall of 2022. The low flow method is established to better reflect the dissolved concentrations of petroleum hydrocarbons. The observed higher concentrations in samples from the fire training facility and the former heavy water lands that were collected through the well volume purging method (prior to low flow sampling) likely reflect interference from entrained sediments or immiscible product due to agitation of the water column and do not provide representative observations of the dissolved groundwater concentration only. The plots are shown below.

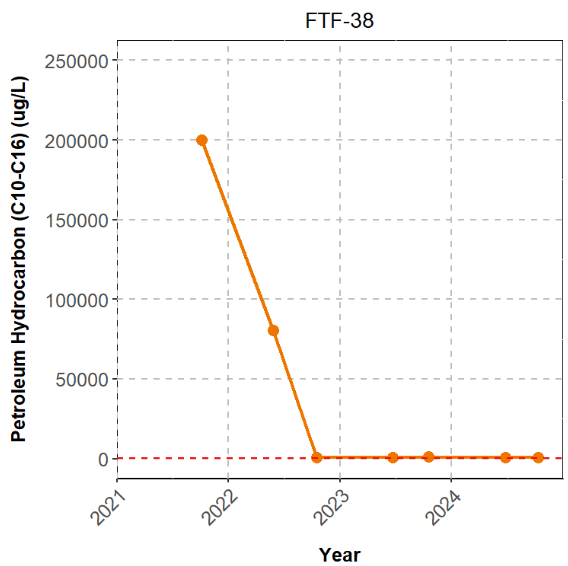


Figure 74 - Petroleum Hydrocarbons (F2) in Groundwater at FTF-38 (Dashed line represents evaluation criteria of 150 micrograms per litre)

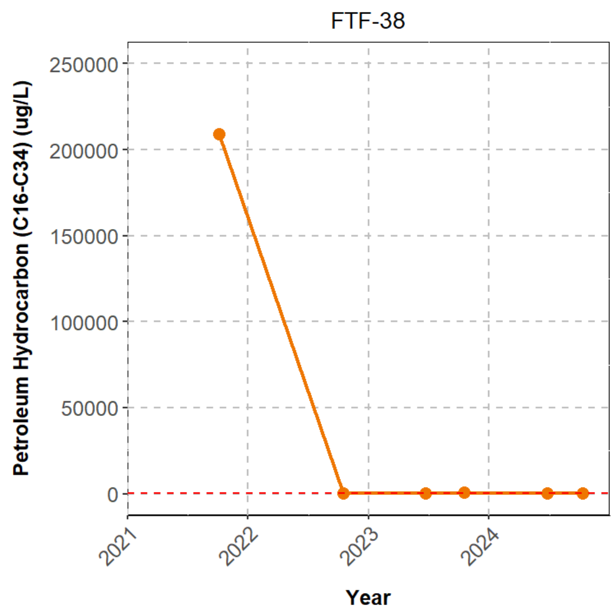


Figure 75 - Petroleum Hydrocarbons (F3) in Groundwater at FTF-38 (Dashed line represents evaluation criteria of 500 micrograms per litre)

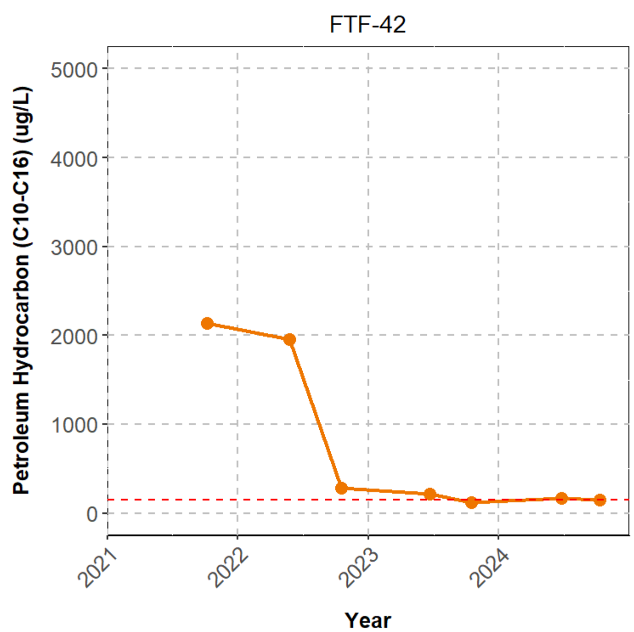


Figure 76 - Petroleum Hydrocarbons (F2) in Groundwater at FTF-42 (Dashed line represents evaluation criteria of 150 micrograms per litre)

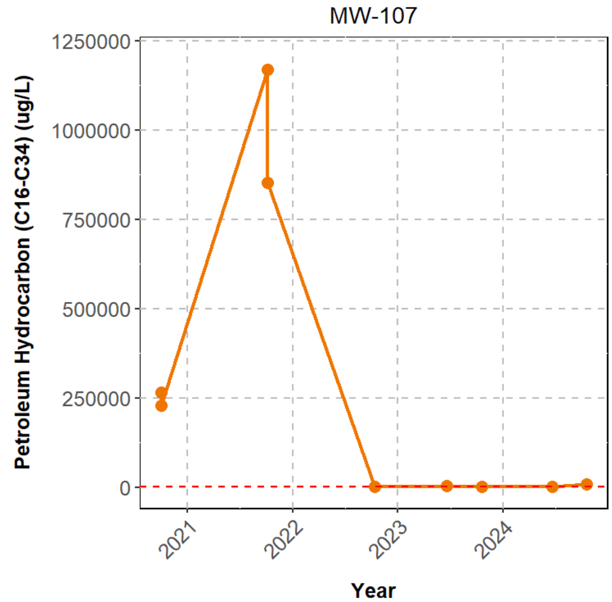


Figure 77 - Petroleum Hydrocarbons (F3) in Groundwater at MW-1-07 (Dashed line represents evaluation criteria of 500 micrograms per litre)

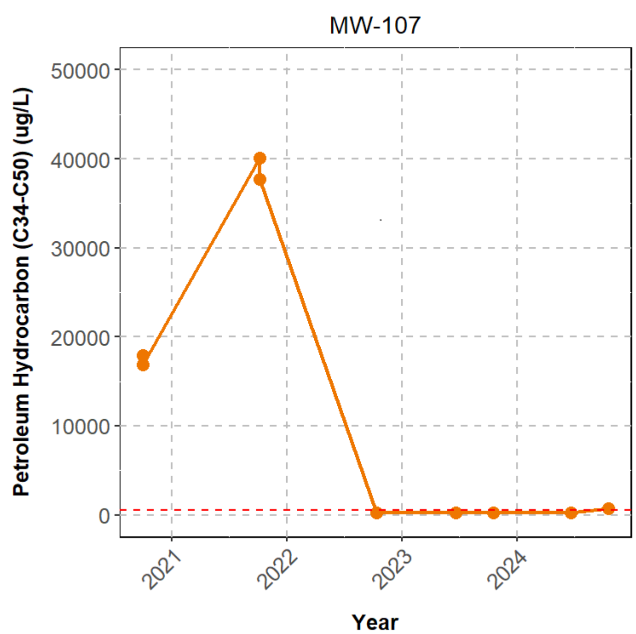


Figure 78 - Petroleum Hydrocarbons (F4) in Groundwater at MW-1-07 (Dashed line represents evaluation criteria of 500 micrograms per litre)

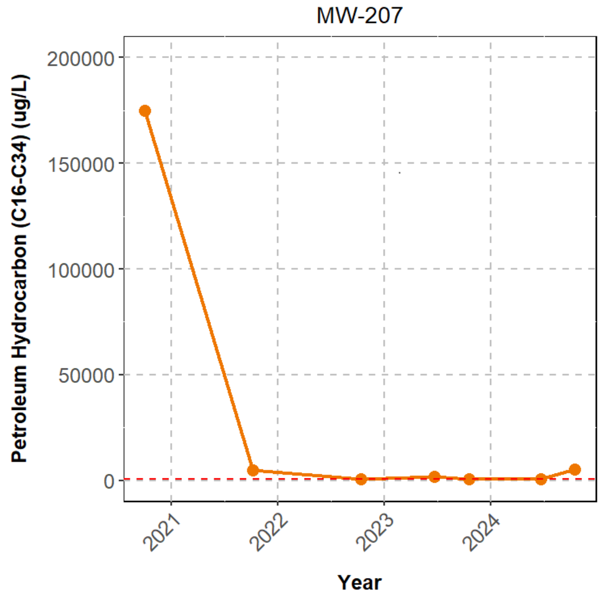


Figure 79 - Petroleum Hydrocarbons (F3) in Groundwater at MW-2-07 (Dashed line represents evaluation criteria of 500 micrograms per litre)

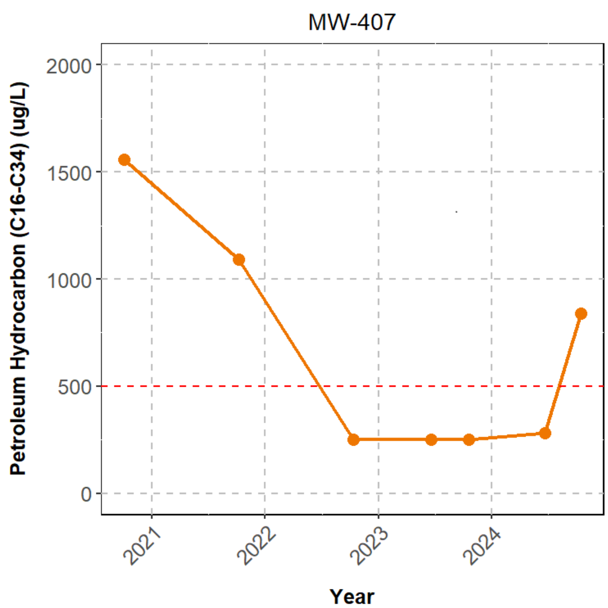


Figure 80 - Petroleum Hydrocarbons (F3) in Groundwater at MW-4-07 (Dashed line represents evaluation criteria of 500 micrograms per litre)

Other results to note included observations of sodium, chloride, chloroform, and dissolved metals vanadium, nickel, and copper. Discussion on these observations is provided below.

- Sodium and chloride-elated to road salting at Bruce B and former Acid Wash Pond
- Vanadium and Nickel - related to historical boiler cleaning activities at the former Acid Wash Pond area
- Copper – minor exceedance at the Soil Management Area
- Chloroform – residual contamination from a domestic water line leak in front of Unit 3

All of these results were shown to be within historic ranges and/or decreasing and are not a cause for concern. Monitoring will continue in 2025 to ensure this trend continues. Results are included in APPENDIX G:.

8.0 WASTE MANAGEMENT

Bruce Power manages the following different forms of waste to ensure they are disposed of safely without polluting the environment:

- Hazardous waste (oils, chemicals, lighting lamps and ballasts – some of these are recycled)
- Recyclable waste (glass, plastic, metal, cardboard, paper, wood, batteries, and electronics)
- Organics waste (food waste, compostable materials, paper towels)
- Radiological waste (low-, intermediate-, and high-level radiological waste is transferred to Ontario Power Generation for further processing and storage)
- Landfill waste (wastes that are neither hazardous, recyclable, compostable, nor radiological)

Bruce Power complies with all waste regulations and requirements of the relevant Federal, Provincial, and Municipal authorities. Further, Bruce Power has taken an active role for many years to reduce all forms of waste: from an environmental and financial standpoint waste reduction is good for our company and the community in which we reside. Our philosophy employs a whole life-cycle approach in that we reduce waste at the consumer level, generate less waste at the company level, find opportunities to reuse products (on-site, off-site donations, or sell them at auction), and implement recycling programs that are available in the ever-changing recycling market. To minimize the amount of waste sent to landfill each day, Bruce Power has implemented several initiatives that apply the principles of reduce, reuse, recycle, and recover. Wherever its fate, each waste stream generated at Bruce Power is processed and disposed of in a safe and environmentally responsible manner.

Table 56 summarizes the waste management and pollution prevention reports submitted to regulatory agencies.

Table 56 - Bruce Power Waste Regulatory Reporting

Waste	Report Title	Regulatory Agency	Submission Date (Frequency)
Conventional Waste	Report of a Waste Reduction Work Plan, *O Reg 102/94* (B-REP-00159-0004)	Internal Report	Q1 2025 (Annual)
Conventional Waste	Report of a Waste Audit, *O Reg 102/94* (B-REP-00159-0004)	Internal Report	Q1 2025 (Annual)
Waste & Pollution Prevention - Polychlorinated Biphenyl	*Federal PCB Regulations* Bruce Power 2024 Annual Report Declaration (BP-CORR-00521-00090)	Environment and Climate Change Canada	March 31, 2025 (Annual)
Waste & Pollution Prevention - Polychlorinated Biphenyl	2024 Annual Polychlorinated Biphenyl Waste Storage Report for Bruce A Storage Facility #10400A003 (BP-CORR-00541-00267)	Ministry of Environment, Conservation and Parks	January 31, 2025 (Annual)
Waste & Pollution Prevention - Polychlorinated Biphenyl	2024 Annual Polychlorinated Biphenyl (PCB) Waste Storage Report for the Waste Chemical Transfer Facility Storage Facility #10402A001 (BP-CORR-00541-00268)	Ministry of Environment, Conservation and Parks	January 31, 2025 (Annual)

8.1 Conventional Waste

The primary objective of the Conventional Waste Program is to process wastes in a safe and environmentally responsible manner while diverting as much waste from landfill as possible. Bruce Power achieves waste minimization through the application of reduce, reuse, recover, repurpose and recycle principles.

Conventional waste at Bruce Power is managed and disposed of in accordance with regulatory requirements including:

- The *Ontario Environmental Protection Act* [R-164]
- *Ontario Regulation 347, General Waste Management* [R-165]
- *Ontario Regulation 103/94, Industrial, Commercial and Institutional Source Separation Programs* [R-166]
- *Ontario Regulation 102/94, Waste Audits and Waste Reduction Work Plans* [R-167]
- *Transport Canada's Transportation of Dangerous Goods Act* [R-168]

Management of conventional waste includes all non-hazardous and non-radiological items: recyclables, compost, and waste destined for landfill. As defined in *Ontario Reg.103/94* [R-166], Bruce Power is a large manufacturing establishment and is mandated to have recycling programs in place for the following materials:

- Aluminum
- Cardboard (corrugated)
- Fine paper
- Glass
- Newsprint
- High Density Polyethylene (jugs, pails, crates, totes, and drums)
- Low Density Polyethylene (film*)
- Polystyrene expanded foam*
- Polystyrene trays, reels and spools*
- Steel
- Wood (Excluding painted, treated, or laminated wood)

*Limitations apply depending on the availability of service providers able to recycle these materials.

In addition to these recycling programs, Bruce Power has an established composting program for organic waste including food waste, paper towels, and biodegradable coffee cups, lids and food containers.

Bruce Power utilizes approved waste disposal vendors to collect conventional wastes on site. Waste disposal vendors are bound by Environmental Compliance Approvals that stipulate approved wastes that can be accepted by the landfill or facility.

As shown in Table 57, the total amount of conventional waste produced at Bruce Power in 2024 was 2,626 metric tons. While 753 metric tons of waste were sent to landfill, a total of 1,873 metric tons were diverted to a recycling or compost program. More than two-thirds of all the conventional waste produced in 2024 was diverted from landfill.

Table 57 - Conventional Waste Generated at Bruce Power from 2016 to 2024
[1 metric ton (mt) = 1,000 kg]

Year	Landfill (mt)	Compost (mt)	Recycling (mt)	Total (mt)	Diversion Rate
2016	555	103	1,145	1,965	64%
2017	462	97	1,042	1,795	63%
2018	572	111	1,226	1,967	68%
2019	609	61	1,287	2,016	67%
2020	524	62	1,219	1,805	71%
2021	597	98	1,457	2,152	72%
2022	929	93	1,851	2,873	68%
2023	707	78	1,483	2,268	69%
2024	753	93	1780	2626	71%

In 2024, 30% of Bruce Power's conventional waste was sent to landfill, 4% was composted, and the remainder was recycled via several different recycling streams (66%). The distribution among different waste streams has changed significantly over time, depending on the types of activities occurring at the company (commissioning/decommissioning) and the different recycling processes available in the global waste management market.

As per *Ontario Regulation 102/94* [R-167], Bruce Power must also perform an annual conventional waste audit. The waste audit must be completed by a third-party vendor, and a waste audit report that includes a waste reduction work plan must be prepared for Bruce Power. Independent assessments of Bruce Power's performance in conventional waste management have occurred annually for many years. The auditor's assessments consistently show that Bruce Power is performing well in comparison to other large industrial facilities.

8.1.1 Diversion Initiatives

Bruce Power makes every effort to increase diversion whenever possible. In addition to the compost and recycling streams provided by our standard conventional waste vendor, we have set up additional contracts and relationships to further divert waste on site from landfill. Some examples of the additional diversion streams include e-wastes, scrap metal, Styrofoam, binder recycling and reuse, film plastic and furniture donation to local Not for Profits. In addition, Bruce Power worked on increasing waste diversion by improving signage and messaging about waste streams across site in accordance with the site's Waste Reduction Work Plan prepared in compliance with *Ontario Regulation 102/94, Waste Audits and Waste Reduction Work Plans* [R-167]. This new signage included pictures of common waste types sold or used on site to help employees determine which waste stream is appropriate to use. This is typically updated annually to keep up with the changes in products and packaging offered on site. Articles in the company newsletter as well as segments in the monthly safety and performance excellence videos were also used to reiterate expectations to ensure employees are diverting their waste correctly. The waste management team is dedicated to ensure routine waste streams as well as non-routine emergent waste types are disposed of in the most environmental sustainable method available.

8.2 Hazardous Waste

Bruce Power's Hazardous Waste Program ensures the safe handling, storage and disposal of hazardous wastes in accordance with regulatory requirements outlined in the *Environmental Protection Act, Ontario Regulation 347, General Waste Management* [R-169].

Hazardous wastes, such as chemicals, oils, batteries, and fluorescent tubes, are generated at numerous locations on-site. They are carefully tracked to ensure all hazardous waste is safely disposed of in accordance with all applicable regulatory requirements. Bruce Power has an excellent network of external waste vendors (certified to carry and/or receive hazardous wastes) who frequently work with us to dispose of all our hazardous waste streams in an industrially and environmentally safe manner. Utilizing the programs under the Ontario Resource Recovery & Circular Economy Act, hazardous wastes are routinely diverted from landfill and recycled including batteries, light tubes, oil, and electronic waste.

8.2.1 Oil Recycling

In 2021, a site wide oil recycling program was established with a hazardous waste vendor to recycle oils from turbine lubricating oil and electrical transformer systems. The used oil from these systems are often of high-quality with low levels of contaminants such as water, particulate or chemicals. As such, these used oils can be recycled and reused in other industrial applications.

In 2024, Bruce Power disposed of 229,077 litres of oil with 138,147 litres being recycled. This means 60% of Bruce Power's waste oil was able to be recycled and reused, reducing a significant quantity of oil that would otherwise go to the hazardous waste stream.

8.2.2 Polychlorinated Biphenyls

According to the *Polychlorinated Biphenyls Regulation Statutory Orders and Regulations* /208-273 [R-170], equipment containing Polychlorinated Biphenyls in a concentration of at least 50 parts per million but less than 500 parts per million, must have the equipment removed from site by December 31, 2025. This includes electrical transformers and their auxiliary electrical equipment, lighting ballasts, and capacitors. Electrical cables, not in use, in any concentration must also be removed so that they are not "abandoned in place" which is a violation of the *Environmental Protection Act* [R-171]. Currently, there is no regulatory removal date for Polychlorinated Biphenyls cables that are in use. In 2018, a plan was created for Polychlorinated Biphenyls removal, focusing on the above equipment, to meet the regulatory deadline of December 31, 2025. This plan is reviewed and updated on a regular basis to ensure that Bruce Power will complete the Polychlorinated Biphenyls removal work before the regulatory deadline. In 2024, 78 drums of Polychlorinated Biphenyls electrical equipment and lighting ballast waste was disposed of in support of this regulatory requirement.

9.0 REPORTABLE SPILLS

There were nine immediately reportable spills that were reported to the Ministry of Environment, Conservation, and Parks Spills Action Centre in 2024. These required a follow-up fourteen-day letter to the Ministry of Environment, Conservation, and Parks Local District Office and, if the event occurred within Bruce A or Bruce B, a REGDOC-3.1.1 report to the CNSC. Report references are listed in Table 58, below.

Table 58 - Bruce A and Bruce B 2024 REGDOC-3.1.1 Reports

Event Date	Report Title (Document Control Number)	CNSC REGDOC-3.1.1 Report Reference
February 9, 2024	Written Event Report for Centre of Site Central Maintenance Facility Glycol Release (BP-CORR-00541-00224)	Not Applicable
February 28, 2024	Written Event Report for Bruce B Minor Diesel Release (BP-CORR-00541-00234)	Environmental Release (B-2024-347658)
April 2, 2024	Written Event Report for Bruce A Unit 1 Fire Resistant Fluid Release (BP-CORR-00541-00237)	Fire-Resistant Fluid Leak in Unit 1 (B-2024-357864)
June 12, 2024	Written Event Report for Centre of Site Domestic Water Buried Piping Release (BP-CORR-00541-00246)	Not Applicable
June 28, 2024	Written Event Report for Bruce B Unit 0 Main Control Room Chiller Refrigerant Leak (RFU7) – Pursuant to Ontario Regulation 463/10 Ozone Depleting Substance and Other Halocarbons (BP-CORR-00541-00252)	Unit 0 Halocarbon Release (B-2024-385054)
July 22, 2024	Written Event Report for Centre of Site B44 Refrigerant Leak (CHU1) - Pursuant to Ontario Regulation 463/10 Ozone Depleting Substance and Other Halocarbons (BP-CORR-00541-00253)	Not Applicable
August 3, 2024	Written Event Report for Bruce A Unit 0 Domestic Water Piping Release (BP-CORR-00541-00254)	Domestic Water Release (B-2024-394255)
August 30, 2024, and September 6, 2024	Written Event Report for Bruce B Unit 0 Main Control Room Chiller Refrigerant Leaks (RFU7 and RFU8) – Pursuant to Ontario Regulation 463/10 Ozone Depleting Substance and Other Halocarbons (BP-CORR-00541-00259)	Unit 0 Halocarbon Release (B-2024-400719)

10.0 AUDITS

Bruce Power has an internal audit program designed to meet the auditing requirements of both the N288 series of environmental standards for nuclear power plants and the ISO 14001, Environmental Management System standard. This program identifies areas of non-conformance with the standards, where corrective actions are taken, and highlights opportunities for improvement to consider. Internal audits thoroughly examine processes to identify weaknesses which, when addressed, contribute to a more robust system.

Bruce Power also undergoes an annual audit of the environmental management system by an external, accredited third party auditor. Every third year is a re-certification audit to confirm adherence to the ISO 14001 standard.

10.1 Internal Audits

10.1.1 N288 Series of Environmental Standards for Nuclear Power Plants

In 2024, the annual internal audit of the Dosimetry lab included an evaluation of some elements of N288.4-10, Environmental Monitoring Programs at Nuclear Facilities and Uranium Mines and Mills .

The N288.4-10 portion of the audit identified some shortcomings with the Organically Bound Tritium analysis requirements. This analysis is for information only and is not a part of the dose to public calculations. The gaps identified are being addressed through the corrective action process.

In 2025, internal audit will be evaluating N288.7, Groundwater protection programs at Class I nuclear facilities and uranium mines and mills.

10.1.2 ISO 14001 Environmental Management System Standard Internal Audit

The 2024 internal audit conducted for the ISO 14001 Environmental Management System Standard concluded Bruce Power has a mature environmental management system that is effectively implemented and maintained in conformance with the requirements of the Bruce Power Management Systems as well as the ISO 14001 standard [R-172]. There was an area of weakness identified in the areas of Wastewater Systems Effluent Regulations records retention, Environmental Compliance Approvals annual performance reporting, and a missing inspection and maintenance program for the Bruce Energy Centre Sewage Works.
Bruce Power has developed corrective actions to address the audit findings and continues to drive towards excellence in environmental protection via a continuously improving environmental management system.

In this audit, which covered Conventional Water Emissions, the Conventional Water Emissions Management program was found to be fully implemented, controlled and maintained in accordance with ISO 14001 c.8.1. Strengths identified include Environmental staff proactively identifying and addressing issues, engaging in continual improvement activities, monitoring program performance, and conducting station oversight.

10.2 External Audits

10.2.1 ISO 14001 Environmental Management System Standard External Audit

The 2024 external audit was a surveillance audit which confirmed Bruce Power's conformance to the ISO 14001, Environmental Management Systems standard.

There were no non-conformances and two opportunities for improvement identified, therefore no corrective actions were required as a result of the 2024 environmental management system external audit.

Bruce Power received "Outstanding", the highest score, in the areas of Management, Continuous Improvement, and Resources. Noting there was strong evidence of:

- Management commitment, customer and/or interested party satisfaction, knowledge and awareness across the company of environmental policy and objectives and senior management is fully engaged in supporting the environmental management system.
- Data streams are being used as sources to drive continual improvement. There is evidence of a reduction in variation and known failure modes over time. These include objectives, audit results, analysis of data, and management reviews.
- Resources for effective maintenance and improvement of the management system are defined and effectively deployed. Levels of competency are defined and demonstrated, and lesson learned and best practices are used regularly to determine resource requirements.

Bruce Power is successfully re-certified to the ISO 14001, Environmental Management Systems standard until November 2026. There will be surveillance audits conducted annually leading up to the next re-certification audit scheduled for 2026.

11.0 CONCLUSION

The purpose of this report is to fulfill regulatory requirements on environmental protection in accordance with Licence Condition 3.3 of the Bruce A and B Power Reactor Operating Licence and the CNSC Regulatory Document REGDOC-3.1.1 Reporting Requirements for Nuclear Power Plants, Section 3.6 [R-2]. This report has provided information on effluent and emission results, environmental monitoring findings, and demonstrated our continued commitment to environmental protection and sustainability.

Throughout 2024, Bruce Power maintained strong community relations and demonstrated a commitment to ongoing engagement with the local Indigenous Nations and Communities, including the Saugeen Ojibway Nation, Métis Nation of Ontario Region 7, and Historic Saugeen Métis. The company will continue to build on these strengths and commitments in the future.

Bruce Power continues to support provincial and federal carbon-reduction goals through our generation of non-greenhouse gas emitting electricity providing on average 30% of the Province’s electricity demand and our own 2027 Net Zero Strategy. In 2024, Bruce Power maintained a “Low Risk” ESG Rating based on the third party review by Morningstar Sustainalytics’.

For the thirty-third consecutive year, Bruce Power’s contribution to the annual dose of a member of the public is less than the lower threshold for significance (less than 10 microsieverts per year) and is considered *de minimus*. The maximum dose associated with Bruce Power operations in 2024 was obtained for the Bruce Subsistence Farmer (BSF2) Adult who received 1.1 microsieverts per year. All other representative persons have a lower dose. This maximum dose is a small fraction of a percent of the legal limit of 1,000 microsieverts per year.

An updated retrospective and predictive Environmental Risk Assessment was prepared and submitted to regulators in June 2022. Review of the 2022 Environmental Risk Assessment by the CNSC and Environment and Climate Change Canada concluded that the report is consistent with the overall methodology and complies with all the applicable requirements of CSA N288.6-12 [R-53]. The potential risk from physical stressors and from radiological and non-radiological releases to the environment were found to be generally low to negligible.

Through Bruce Power’s normal operation and outage maintenance activities, airborne emissions and waterborne effluents are released to the environment and monitored following robust monitoring standards to confirm releases remain within compliance limits and ensure environmental protection. All radiological releases remained well below regulatory limits, and all conventional effluent parameter limits were met. Additionally, the dose to public remained well below the lower threshold for significance at a fraction of a percent of the legal dose limit.

Bruce Power’s radiological and conventional environmental monitoring programs are designed to continuously verify that environmental protection is being maintained and that any releases have a minimal impact on the surroundings. The radiological environmental monitoring program monitors radionuclides in the air, precipitation, water, agricultural and animal products, beach sand, soil, and sediment. The conventional environmental monitoring program screens for conventional contaminants, physical stressors, and biological effects. In 2024, conventional environmental monitoring for contaminants included water quality in the lake and on-site surface water features, soil and sediment. Physical stressors and biological effects monitoring included thermal effluent in Lake Huron, fish impingement monitoring, wildlife surveys (aquatic and terrestrial) and supplemental studies for underwater noise, light trespass and sky quality and benthic invertebrates in Lake Huron. A wetlands function assessment and updates to the Ecological Land Classification began in late 2024 and will continue in 2025; results of these programs will be reported in the 2025 Environmental Protection Report. Results of the radiological and conventional environmental monitoring programs in 2024 demonstrated that there were no significant or adverse changes to contaminant levels or wildlife species presence in the environment. This provides verification of the continued effectiveness of environmental protection policies and programs at Bruce Power.

Bruce Power's groundwater protection program is designed to achieve established groundwater protection goals in alignment with CSA N288.7-15, Groundwater Protection Programs at Class 1 Nuclear Facilities and Uranium Mines and Mills. By establishing and monitoring performance against groundwater program objectives which include a robust groundwater monitoring program, Bruce Power continues to refine and improve the groundwater conceptual site model and inform key stakeholders with respect to groundwater quality.

In 2024, no significant updates were made to the environmental protection measures. The next planned periodic review will be completed following the next ERA in 2027.

Bruce Power continues to comply with all waste regulations and requirements of the relevant Federal, Provincial, and Municipal authorities. Further, Bruce Power plans to continue taking an active role to reduce all forms of waste: from an environmental and financial standpoint waste reduction is good for our company and the community in which we reside.

Finally, Bruce Power's compliance with the ISO 14001 standard and the CSA N288.4, N288.5 and N288.7 standards has been verified through internal independent oversight audits. Opportunities for improvement and any identified gaps are being addressed and do not impact overall conformance to the ISO 14001 or the N288 series standards.

The 2024 Environmental Protection Report provides evidence that Bruce Power is complying with all relevant provincial, federal, and regulatory requirements and legislation. Beyond compliance, Bruce Power is committed to measuring and minimizing its environmental impact through excellence in effluent and emissions management, continuous environmental monitoring, spill prevention, and waste management. Bruce Power plans to continue striving for excellence in all aspects of environmental monitoring and protection throughout 2025.

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APPENDIX A: REPRESENTATIVE PERSON PARAMETERS FOR DOSE CALCULATION

Table 59 - Generic Rates of Intake of Air, Water and Various Foods

Parameter	Units	Infant (1 year old)	Child (10 year old)	Adult (male)
Inhalation Rate	Cubic metre per year	1830	5660	5950
Water Ingestion Rate	Litre per year	0	151.1	379.6
Grain Intake	Kilogram per year	55.2	140.7	163.5
Fruit & Berry Intake	Kilogram per year	54.6	88.8	99.4
Vegetable Intake	Kilogram per year	25.8	69.7	128.1
Mushrooms Intake	Kilogram per year	0.3	1.0	1.2
Potato Intake	Kilogram per year	8.7	30.9	47.9
Total Plant Product Ingestion Rate	**Kilogram per year**	**144.5**	**331.1**	**440.0**
Beef Intake	Kilogram per year	4.4	13.1	45.8
Pork Intake	Kilogram per year	3.5	10.4	19.8
Lamb Intake	Kilogram per year	0.0	1.0	0.6
Poultry Intake	Kilogram per year	8.2	21.9	38.9
Egg Intake	Kilogram per year	2.1	8.1	19.2
Game (Deer, Rabbit) Intake	Kilogram per year	0.5 or 0.7	1.6 or 2.2	5.8 or 7.8
Milk Intake	Kilogram per year	242.7	228.1	125.6
Total Animal Product Ingestion Rate	**Kilogram per year**	**262.8 or 263.0**	**286.8 or 287.4**	**260.4 or 262.4**
Total Fish Ingestion Rate	**Kilogram per year**	**1.8 or 2.5**	**5.4 or 7.2**	**8.2 or 11.1**

Note:

1. The 1-year old infant is assumed to ingest cow's milk, which accounts for all fluid needs. Water (or formula made from water) is not ingested, as per CSA N288.1 [R-16]

2. All values are mean or central values from CSA N288.1 [R-16], with the exception of the Hunter/Fisher fish intake and game (e.g. deer, rabbit) intake for all age classes, which is based on the Site Specific Survey [R-173]

Table 60 - Percentage of Food Intake Obtained from Local Sources for Non-Farm Resident

Food Type	Infant (1 year old)	Child (10 year old)	Adult
Milk and dairy	23.1%	19.9%	12.1%
Beef	0.72%	1.95%	6.95%
Pork	0.39%	1.07%	2.23%
Poultry	0.85%	2.07%	4.06%
Egg	0.29%	1.00%	2.62%
Deer	0.10%	0.29%	1.11%
Honey	0.08%	0.20%	0.27%
Total Animal Products	**25.5%**	**26.5%**	**29.3%**
Grain	3.44%	3.84%	3.35%
Fruit and Berries	10.4%	7.40%	6.23%
Vegetables (above-ground)	4.26%	5.02%	6.95%
Root Vegetables	1.57%	2.44%	2.85%
Total plant Products	**19.7%**	**18.7%**	**19.4%**
Fish	23.0%	23.0%	23.0%

Note: Values are percentage of total annual intake of combined food group (e.g. fish, plants, animals).

Table 61 - Percentage of Food Intake Obtained from Local Sources for Non-Dairy Farm Resident

Food Type	**Infant (1 year old)**	**Child (10 year old)**	**Adult**
Milk and dairy	12.5%	10.7%	6.51%
Beef	1.04%	2.80%	9.97%
Pork	0.58%	1.59%	3.33%
Poultry	1.41%	3.42%	6.70%
Egg	0.56%	1.94%	5.10%
Deer	0.20%	0.57%	2.22%
Honey	0.10%	0.26%	0.34%
Total Animal Products	**16.4%**	**21.3%**	**34.2%**
Grain	4.25%	4.73%	4.13%
Fruit and Berries	21.1%	15.0%	12.6%
Vegetables (above-ground)	10.1%	12.0%	16.5%
Root Vegetables	3.60%	5.62%	6.56%
Total Plant Products	**39.1%**	**37.3%**	**39.8%**
Fish	22.3%	22.3%	22.3%

Note: Values are percentage of total annual intake of combined food group (e.g. fish, plants, animals).

Table 62 - Percentage of Food Intake Obtained from Local Sources for Dairy Farm Resident

Food Type	**Infant (1 year old)**	**Child (10 year old)**	**Adult**
Milk and dairy	62.0%	53.4%	32.4%
Beef	1.04%	2.82%	10.1%
Pork	0.67%	1.82%	3.81%
Poultry	1.88%	4.57%	8.96%
Egg	0.66%	2.31%	6.07%
Deer	0.20%	0.57%	2.22%
Honey	0.12%	0.30%	0.40%
Total Animal Products	**66.6%**	**65.8%**	**63.9%**
Grain	7.92%	8.82%	7.71%
Fruit and Berries	13.8%	9.79%	8.25%
Vegetables (above-ground)	10.3%	12.1%	16.8%
Root Vegetables	3.51%	5.48%	6.39%
Total Plant Products	**35.5%**	**36.3%**	**39.1%**
Fish	25.0%	25.0%	25.0%

Note: Values are percentage of total annual intake of combined food group (e.g. fish, plants, animals).

Table 63 - Percentage of Food Intake Obtained from Local Sources for Subsistence Farm Resident

Food Type	Infant (1 year old)	Child (10 year old)	Adult
Subsistence Farms			
Milk and dairy	73.9%	63.6%	38.6%
Beef	1.97%	5.33%	19.0%
Pork	1.33%	3.64%	7.61%
Poultry	3.14%	7.62%	14.9%
Egg	0.81%	2.81%	7.39%
Deer	0.20%	0.57%	2.22%
Honey	0.18%	0.47%	0.62%
Total Animal Products	**81.5%**	**84.1%**	**90.4%**
Grain	18.7%	20.8%	18.2%
Fruit and Berries	28.4%	20.2%	17.0%
Vegetables (above-ground)	17.1%	20.1%	27.9%
Root Vegetables	5.80%	9.04%	10.5%
Total Plant Products	**69.9%**	**70.2%**	**73.6%**
Fish	100%	100%	100%

Note: Values are percentage of total annual intake of combined food group (e.g. fish, plants, animals).

Table 64 - Percentage of Food Intake Obtained from Local Sources for Hunter-Fisher Resident

Food Type	Infant (1 year old)	Child (10 year old)	Adult
Milk and dairy	23.1%	19.9%	12.0%
Beef	0.64%	1.72%	6.11%
Pork	0.39%	1.06%	2.21%
Poultry	0.86%	2.09%	4.07%
Egg	0.31%	1.08%	2.82%
Deer	0.27%	0.77%	2.97%
Honey	0.13%	0.33%	0.43%
Total Animal Products	**25.7%**	**26.9%**	**30.6%**
Grain	7.57%	8.44%	7.38%
Fruit and Berries	20.5%	14.5%	12.2%
Vegetables (above-ground)	8.60%	10.2%	14.0%
Root Vegetables	2.72%	4.24%	4.94%
Total Plant Products	**39.3%**	**37.4%**	**38.6%**
Fish	100%	100%	100%

Note: Values are percentage of total annual intake of combined food group (e.g. fish, plants, animals).

APPENDIX B: 2024 METEORLOGICAL DATA ANALYSIS

The 2024 meteorological data for the Bruce Power site were analyzed as outlined below [R-48]. The Triple Joint Frequency data at the 10 metre elevation of the on-site 50 metre tower is used in the dose to public calculation.

The raw hourly data were first screened. It was identified that there were instances where the wind speed was 0 due to calm or no wind conditions, and these datasets cannot be used for air dispersion modelling and were treated as missing data. For these cases, when the data gap was less than four hours, the data of the previous hour were used. For a data gap of four hours or more, no substitution was performed, as the data availability was sufficiently complete (>90%). This is aligned with the requirements of CSA N288.2 [R-47].

Once the data gaps had been filled, the Double Joint Frequency was calculated for the 10 metre off-site tower and for the 10 metre and 50 metre elevations for the 50 metre on-site tower. The Triple Joint Frequency was then calculated for the 50 metre on-site tower at the 10 metre elevation only. The wind speed bins, wind direction sectors and stability class were determined as described below.

Wind speeds were grouped into bins defined in CSA N288.1 [R-16], which are reproduced in Table 65 The wind direction was then divided into 16 wind direction sectors with each sector being 22.5 degrees, as shown in Table 66.

Table 65 - Wind Speed Bins Used for the Generation of Double Joint Frequency and Triple Joint Frequency Tables

Wind Speed Class	Wind Speed, u (m/s)
1	$u \leq 2$
2	$2 < u \leq 3$
3	$3 < u \leq 4$
4	$4 < u \leq 5$
5	$5 < u \leq 6$
6	$u > 6$

Table 66 - Wind Direction Sectors

Wind Sector (direction from which wind is blowing)	Wind Direction (θ) in degrees
N	θ > 348.75 or θ ≤ 11.25
NNE	11.25 < θ ≤ 33.75
NE	33.75 < θ ≤ 56.25
ENE	56.25 < θ ≤ 78.75
E	78.75 < θ ≤ 101.25
ESE	101.25 < θ ≤ 123.75
SE	123.75 < θ ≤ 146.25
SSE	146.25 < θ ≤ 168.75
S	168.75 25 < θ ≤ 191.25
SSW	191.25 < θ ≤ 213.75
SW	213.75 < θ ≤ 236.25
WSW	236.25 < θ ≤ 258.75
W	258.75 < θ ≤ 281.25
WNW	281.25 < θ ≤ 303.75
NW	303.75 < θ ≤ 326.25
NNW	326.25 < θ ≤ 348.75

The Pasquill-Gifford stability classes A to F were used. Stability class was estimated from the standard deviation of wind direction measured, taking into account night-time conditions and wind speeds [R-174]. A surface roughness of 0.4 m was assumed for all sectors. This value represents rural areas with mixed farming, tall bushes and small villages, consistent with CSA N288.2 [R-47]. Inclusion of surface roughness in the methodology for determining Pasquill-Gifford stability category is a refinement in the classification scheme, which results in shifting more cases towards the neutral D-stability class conditions with increased roughness [R-175].

The calculated Double Joint Frequency and Triple Joint Frequency data at the 50 metre on-site meteorological tower are presented in Table 67, Table 68, Table 69.

Table 67 - Annual Average Double Joint Frequency for Bruce Power Site for Year 2024 – 50 metre Meteorological Tower at 10 metre Height

Wind Direction (wind blowing from)	Wind Speed, u (m/s)						
	u ≤ 2	**2 < u ≤ 3**	**3 < u ≤ 4**	**4 < u ≤ 5**	**5 < u ≤ 6**	**u > 6**	**Total**
	Frequency (%) at 10 m Height						
N	1.65	1.48	1.72	1.23	0.60	0.14	6.82
NNE	2.14	1.21	0.93	0.24	0.04	0.00	4.56
NE	2.34	1.17	0.54	0.01	0.00	0.00	4.06
ENE	2.57	0.61	0.16	0.13	0.01	0.00	3.49
E	2.46	0.82	0.44	0.41	0.24	0.20	4.57
ESE	3.33	1.85	1.02	0.58	0.28	0.14	7.21
SE	4.84	2.80	1.53	1.05	0.51	0.13	10.86
SSE	3.49	1.98	1.40	0.97	0.40	0.08	8.32
S	1.44	1.34	1.01	1.35	1.10	0.57	6.81
SSW	0.92	1.33	2.06	1.20	0.61	0.45	6.57
SW	0.46	1.07	1.45	0.98	0.98	0.75	5.69
WSW	0.37	0.73	0.90	0.87	0.59	1.23	4.68
W	0.66	0.90	0.73	0.95	0.88	1.08	5.21
WNW	0.95	1.26	1.12	0.78	0.73	0.85	5.69
NW	1.35	1.61	1.39	1.12	1.07	1.33	7.88
NNW	1.38	1.66	1.84	1.64	0.81	0.26	7.59
Total	30.36	21.84	18.25	13.50	8.85	7.21	100.00

Table 68 - Annual Average Double Joint Frequency for Bruce Power Site for Year 2024 – 50 metre Meteorological Tower at 50 metre Height

Wind Direction (wind blowing from)	Wind Speed, u (m/s)						
	u ≤ 2	**2 < u ≤ 3**	**3 < u ≤ 4**	**4 < u ≤ 5**	**5 < u ≤ 6**	**u > 6**	**Total**
	Frequency (%) at 50 m Height						
N	0.36	0.77	0.84	0.86	0.69	2.57	6.08
NNE	0.45	0.65	0.87	0.75	0.71	1.97	5.41
NE	0.59	0.60	0.64	0.75	0.83	0.40	3.80
ENE	0.56	1.04	0.77	0.71	0.24	0.21	3.54
E	0.71	1.21	1.27	0.73	0.44	0.45	4.81
ESE	0.41	0.75	1.13	1.06	0.77	1.63	5.74
SE	0.54	0.44	1.16	1.83	2.02	2.33	8.31
SSE	0.40	0.55	0.76	1.33	1.86	2.39	7.29
S	0.33	0.53	0.67	1.13	1.93	3.27	7.85
SSW	0.42	0.68	0.95	1.23	1.44	3.88	8.60

Wind Direction (wind blowing from)	**Wind Speed, u (m/s)**						
	u ≤ 2	**2 < u ≤ 3**	**3 < u ≤ 4**	**4 < u ≤ 5**	**5 < u ≤ 6**	**u > 6**	**Total**
	Frequency (%) at 50 m Height						
SW	0.28	0.56	0.91	1.00	1.07	2.88	6.69
WSW	0.28	0.46	0.63	0.56	0.48	2.81	5.22
W	0.25	0.60	0.51	0.46	0.44	3.19	5.44
WNW	0.37	0.82	0.69	0.57	0.57	2.93	5.95
NW	0.49	1.03	0.72	0.76	0.63	3.94	7.58
NNW	0.44	0.80	1.06	0.96	1.07	3.35	7.68
Total	6.88	11.48	13.57	14.68	15.18	38.21	100.00

Table 69 - Annual Average Triple Joint Frequency for Bruce Power Site for Year 2024 – 50 metre Meteorological Tower at 10 metre Height

Stability Class	**Wind Direction** (wind blowing from)	**Wind Speed, u (m/s)**						
		u ≤ 2	**2 < u ≤ 3**	**3 < u ≤ 4**	**4 < u ≤ 5**	**5 < u ≤ 6**	**u > 6**	**Total**
		Frequency (%) at 10 m Height						
A	N	0.37	0.78	0.98	0.61	0.33	0.06	3.12
	NNE	0.27	0.24	0.28	0.02	0.00	0.00	0.81
	NE	0.26	0.15	0.07	0.00	0.00	0.00	0.48
	ENE	0.38	0.24	0.05	0.05	0.01	0.00	0.72
	E	0.47	0.22	0.05	0.01	0.00	0.00	0.75
	ESE	0.21	0.31	0.08	0.04	0.00	0.01	0.65
	SE	0.25	0.25	0.28	0.09	0.01	0.01	0.90
	SSE	0.22	0.25	0.16	0.14	0.05	0.04	0.86
	S	0.19	0.41	0.41	0.61	0.35	0.33	2.31
	SSW	0.27	0.81	1.26	0.72	0.28	0.08	3.43
	SW	0.21	0.68	0.72	0.31	0.22	0.01	2.16
	WSW	0.16	0.37	0.29	0.14	0.04	0.02	1.02
	W	0.21	0.51	0.16	0.12	0.01	0.07	1.08
	WNW	0.29	0.58	0.32	0.07	0.04	0.04	1.33
	NW	0.20	0.70	0.13	0.06	0.01	0.01	1.11
	NNW	0.27	0.51	0.38	0.34	0.19	0.04	1.72
	Total	4.24	6.99	5.63	3.33	1.54	0.72	22.45

Stability Class	Wind Direction (wind blowing from)	Wind Speed, u (m/s)						
		u ≤ 2	2 < u ≤ 3	3 < u ≤ 4	4 < u ≤ 5	5 < u ≤ 6	u > 6	Total
		Frequency (%) at 10 m Height						
B	N	0.19	0.19	0.07	0.01	0.00	0.00	0.46
	NNE	0.15	0.15	0.12	0.02	0.00	0.00	0.45
	NE	0.11	0.22	0.14	0.01	0.00	0.00	0.48
	ENE	0.13	0.06	0.08	0.04	0.00	0.00	0.31
	E	0.26	0.18	0.08	0.12	0.06	0.09	0.79
	ESE	0.28	0.45	0.32	0.08	0.05	0.04	1.21
	SE	0.26	0.49	0.37	0.28	0.20	0.09	1.70
	SSE	0.11	0.19	0.34	0.40	0.13	0.04	1.20
	S	0.12	0.12	0.12	0.12	0.16	0.09	0.73
	SSW	0.07	0.12	0.25	0.20	0.09	0.12	0.85
	SW	0.01	0.11	0.21	0.28	0.14	0.19	0.94
	WSW	0.01	0.16	0.26	0.38	0.28	0.31	1.40
	W	0.01	0.06	0.15	0.22	0.31	0.21	0.97
	WNW	0.13	0.25	0.22	0.22	0.37	0.38	1.57
	NW	0.11	0.28	0.49	0.42	0.35	0.26	1.92
	NNW	0.08	0.39	0.48	0.57	0.19	0.11	1.81
	Total	2.03	3.42	3.71	3.38	2.33	1.92	16.79
C	N	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	NNE	0.08	0.01	0.01	0.00	0.00	0.00	0.11
	NE	0.09	0.08	0.02	0.00	0.00	0.00	0.20
	ENE	0.05	0.00	0.00	0.00	0.00	0.00	0.05
	E	0.07	0.01	0.00	0.00	0.00	0.00	0.08
	ESE	0.13	0.06	0.04	0.01	0.00	0.00	0.24
	SE	0.25	0.18	0.02	0.04	0.01	0.00	0.49
	SSE	0.12	0.05	0.04	0.00	0.00	0.00	0.20
	S	0.00	0.01	0.00	0.00	0.00	0.00	0.01
	SSW	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	SW	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	WSW	0.01	0.04	0.04	0.00	0.00	0.04	0.12
	W	0.01	0.00	0.00	0.00	0.00	0.00	0.01
	WNW	0.01	0.00	0.00	0.01	0.00	0.00	0.02
	NW	0.04	0.05	0.05	0.06	0.07	0.16	0.42
	NNW	0.02	0.02	0.01	0.00	0.00	0.00	0.06
	Total	0.88	0.51	0.22	0.12	0.08	0.20	2.01

Stability Class	**Wind Direction** (wind blowing from)	**Wind Speed, u (m/s)**						
		u ≤ 2	**2 < u ≤ 3**	**3 < u ≤ 4**	**4 < u ≤ 5**	**5 < u ≤ 6**	**u > 6**	**Total**
		Frequency (%) at 10 m Height						
D	N	0.02	0.00	0.35	0.60	0.27	0.08	1.33
	NNE	0.20	0.00	0.37	0.19	0.04	0.00	0.79
	NE	0.39	0.19	0.31	0.00	0.00	0.00	0.88
	ENE	0.35	0.00	0.02	0.05	0.00	0.00	0.42
	E	0.19	0.01	0.29	0.28	0.18	0.11	1.06
	ESE	0.44	0.20	0.59	0.45	0.24	0.09	2.00
	SE	1.05	0.95	0.82	0.64	0.28	0.02	3.77
	SSE	0.82	0.27	0.79	0.42	0.22	0.01	2.54
	S	0.13	0.04	0.39	0.62	0.58	0.14	1.90
	SSW	0.01	0.01	0.35	0.28	0.24	0.25	1.14
	SW	0.00	0.01	0.47	0.39	0.61	0.55	2.04
	WSW	0.01	0.00	0.24	0.35	0.27	0.86	1.73
	W	0.04	0.02	0.32	0.61	0.57	0.80	2.36
	WNW	0.14	0.00	0.47	0.47	0.33	0.44	1.85
	NW	0.19	0.07	0.67	0.58	0.64	0.90	3.04
	NNW	0.05	0.04	0.78	0.73	0.44	0.12	2.14
	Total	4.03	1.81	7.23	6.67	4.89	4.37	29.00
E	N	0.24	0.07	0.32	0.00	0.00	0.00	0.62
	NNE	0.48	0.27	0.15	0.00	0.00	0.00	0.91
	NE	0.78	0.39	0.00	0.00	0.00	0.00	1.17
	ENE	0.52	0.04	0.01	0.00	0.00	0.00	0.57
	E	0.61	0.22	0.01	0.00	0.00	0.00	0.85
	ESE	0.98	0.52	0.00	0.00	0.00	0.00	1.50
	SE	1.59	0.67	0.04	0.00	0.00	0.00	2.30
	SSE	1.18	0.88	0.07	0.00	0.00	0.00	2.13
	S	0.34	0.37	0.09	0.00	0.00	0.00	0.80
	SSW	0.06	0.16	0.20	0.00	0.00	0.00	0.42
	SW	0.01	0.12	0.05	0.00	0.00	0.00	0.18
	WSW	0.01	0.06	0.07	0.00	0.00	0.00	0.14
	W	0.11	0.09	0.09	0.00	0.00	0.00	0.29
	WNW	0.08	0.24	0.11	0.00	0.00	0.00	0.42
	NW	0.21	0.32	0.05	0.00	0.00	0.00	0.58
	NNW	0.15	0.39	0.19	0.00	0.00	0.00	0.73
	Total	7.35	4.81	1.45	0.00	0.00	0.00	13.61

Stability Class	**Wind Direction** (wind blowing from)	**Wind Speed, u (m/s)**						
		u ≤ 2	**2 < u ≤ 3**	**3 < u ≤ 4**	**4 < u ≤ 5**	**5 < u ≤ 6**	**u > 6**	**Total**
		Frequency (%) at 10 m Height						
F	N	0.84	0.45	0.00	0.00	0.00	0.00	1.28
	NNE	0.95	0.54	0.00	0.00	0.00	0.00	1.50
	NE	0.72	0.13	0.00	0.00	0.00	0.00	0.85
	ENE	1.14	0.28	0.00	0.00	0.00	0.00	1.43
	E	0.86	0.18	0.00	0.00	0.00	0.00	1.04
	ESE	1.30	0.32	0.00	0.00	0.00	0.00	1.61
	SE	1.45	0.26	0.00	0.00	0.00	0.00	1.71
	SSE	1.04	0.34	0.00	0.00	0.00	0.00	1.38
	S	0.66	0.40	0.00	0.00	0.00	0.00	1.06
	SSW	0.51	0.22	0.00	0.00	0.00	0.00	0.73
	SW	0.22	0.15	0.00	0.00	0.00	0.00	0.38
	WSW	0.15	0.11	0.00	0.00	0.00	0.00	0.26
	W	0.28	0.21	0.00	0.00	0.00	0.00	0.49
	WNW	0.29	0.20	0.00	0.00	0.00	0.00	0.49
	NW	0.61	0.20	0.00	0.00	0.00	0.00	0.81
	NNW	0.80	0.32	0.00	0.00	0.00	0.00	1.12
	Total	11.83	4.31	0.00	0.00	0.00	0.00	16.14
Grand Total		30.36	21.84	18.25	13.50	8.85	7.21	100.00

APPENDIX C: 2024 DETAILED DOSE CALCULATION RESULTS

Table 70 - Dose to Representative Persons Located at BR1

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Adult	Carbon-14	3.1E-04	3.6E-07	5.3E-06	5.6E-09	2.2E-11	1.2E-07	4.0E-02	4.7E-02	8.1E-02	1.7E-01
Adult	Cobalt-60	1.0E-06	3.8E-08	2.4E-06	1.1E-04	3.3E-03	1.4E-03	4.9E-04	7.2E-06	2.9E-06	5.3E-03
Adult	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Adult	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-02	3.7E-04	0.0E+00	2.6E-03	1.3E-02
Adult	Tritium oxide	2.2E-01	0.0E+00	1.0E-02	5.2E-03	0.0E+00	0.0E+00	1.3E-04	1.2E-01	1.4E-02	3.7E-01
Adult	Iodine, mixed fission products	9.7E-08	6.6E-09	0.0E+00	0.0E+00	1.0E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E-07
Adult	Noble Gases	0.0E+00	1.5E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E-01
Adult	**Total**	**2.2E-01**	**1.5E-01**	**1.0E-02**	**5.3E-03**	**3.3E-03**	**1.2E-02**	**4.1E-02**	**1.7E-01**	**9.7E-02**	**7.0E-01**
Child	Carbon-14	4.4E-04	3.6E-07	2.9E-06	5.6E-09	4.8E-11	1.4E-06	2.4E-02	5.2E-02	5.9E-02	1.4E-01
Child	Cobalt-60	1.4E-06	3.8E-08	3.1E-06	1.1E-04	3.3E-03	1.4E-03	6.8E-04	1.8E-05	5.5E-06	5.6E-03
Child	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Child	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E-02	1.2E-04	0.0E+00	5.8E-04	1.1E-02
Child	Tritium oxide	2.6E-01	0.0E+00	5.1E-03	4.3E-03	0.0E+00	0.0E+00	7.3E-05	1.1E-01	1.3E-02	3.9E-01
Child	Iodine, mixed fission products	2.2E-07	6.6E-09	0.0E+00	0.0E+00	1.0E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.4E-07
Child	Noble Gases	0.0E+00	1.5E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E-01
Child	**Total**	**2.6E-01**	**1.5E-01**	**5.1E-03**	**4.4E-03**	**3.3E-03**	**1.2E-02**	**2.5E-02**	**1.6E-01**	**7.2E-02**	**6.9E-01**
Infant	Carbon-14	3.0E-04	3.6E-07	0.0E+00	6.8E-11	8.1E-11	3.2E-06	1.7E-02	4.6E-02	7.1E-02	1.3E-01
Infant	Cobalt-60	1.1E-06	4.9E-08	0.0E+00	1.3E-06	4.3E-03	1.9E-03	5.7E-04	1.9E-05	7.3E-06	6.8E-03
Infant	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Infant	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-02	5.1E-05	0.0E+00	2.2E-04	1.4E-02
Infant	Tritium oxide	1.8E-01	0.0E+00	0.0E+00	1.4E-04	0.0E+00	0.0E+00	5.2E-05	1.1E-01	2.0E-02	3.1E-01

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Infant	Iodine, mixed fission products	2.6E-07	8.5E-09	0.0E+00	0.0E+00	1.3E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.8E-07
Infant	Noble Gases	0.0E+00	1.9E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.9E-01
Infant	**Total**	**1.8E-01**	**1.9E-01**	**0.0E+00**	**1.4E-04**	**4.3E-03**	**1.6E-02**	**1.7E-02**	**1.5E-01**	**9.1E-02**	**6.5E-01**

Note:

1. All doses reported in units of microsieverts per year.
2. Dose associated with cesium-137 includes dose due to external exposure to progeny of cesium-137 in air, water, soil, and sediment.
3. Dose associated with tritium oxide includes dose incurred via ingestion of organically bound tritium in fish, plant produce and animal products.

Table 71 - Dose to Representative Persons Located at BR17

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Adult	Carbon-14	2.3E-04	2.6E-07	4.4E-06	5.6E-09	6.4E-12	1.2E-07	4.0E-02	6.2E-02	6.7E-02	1.7E-01
Adult	Cobalt-60	8.3E-07	3.2E-08	2.4E-06	1.1E-04	4.3E-03	1.4E-03	4.9E-04	9.0E-06	3.6E-06	6.3E-03
Adult	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Adult	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-02	3.7E-04	0.0E+00	2.6E-03	1.3E-02
Adult	Tritium oxide	1.8E-01	0.0E+00	1.0E-02	5.2E-03	0.0E+00	0.0E+00	1.3E-04	6.5E-02	1.4E-02	2.8E-01
Adult	Iodine, mixed fission products	8.1E-08	5.5E-09	0.0E+00	0.0E+00	9.2E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.6E-08
Adult	Noble Gases	0.0E+00	1.2E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-01
Adult	**Total**	**1.8E-01**	**1.2E-01**	**1.0E-02**	**5.3E-03**	**4.3E-03**	**1.2E-02**	**4.1E-02**	**1.3E-01**	**8.4E-02**	**5.9E-01**
Child	Carbon-14	3.3E-04	2.6E-07	2.4E-06	5.6E-09	1.4E-11	1.4E-06	2.4E-02	6.5E-02	5.3E-02	1.4E-01
Child	Cobalt-60	1.2E-06	3.2E-08	3.1E-06	1.1E-04	4.3E-03	1.4E-03	6.8E-04	2.3E-05	6.4E-06	6.6E-03
Child	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Child	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E-02	1.2E-04	0.0E+00	5.8E-04	1.1E-02
Child	Tritium oxide	2.2E-01	0.0E+00	5.1E-03	4.3E-03	0.0E+00	0.0E+00	7.3E-05	6.4E-02	1.3E-02	3.0E-01
Child	Iodine, mixed fission products	1.8E-07	5.5E-09	0.0E+00	0.0E+00	9.2E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.0E-07
Child	Noble Gases	0.0E+00	1.2E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-01
Child	**Total**	**2.2E-01**	**1.2E-01**	**5.1E-03**	**4.4E-03**	**4.3E-03**	**1.2E-02**	**2.5E-02**	**1.3E-01**	**6.6E-02**	**5.8E-01**
Infant	Carbon-14	2.2E-04	2.6E-07	0.0E+00	6.3E-11	2.4E-11	3.2E-06	1.7E-02	5.5E-02	6.7E-02	1.4E-01
Infant	Cobalt-60	8.7E-07	4.1E-08	0.0E+00	1.3E-06	5.6E-03	1.9E-03	5.7E-04	2.4E-05	8.1E-06	8.1E-03
Infant	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Infant	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-02	5.1E-05	0.0E+00	2.2E-04	1.4E-02
Infant	Tritium oxide	1.5E-01	0.0E+00	0.0E+00	1.4E-04	0.0E+00	0.0E+00	5.2E-05	6.7E-02	2.0E-02	2.4E-01

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Infant	Iodine, mixed fission products	2.2E-07	7.1E-09	0.0E+00	0.0E+00	1.2E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.4E-07
Infant	Noble Gases	0.0E+00	1.6E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.6E-01
Infant	**Total**	**1.5E-01**	**1.6E-01**	**0.0E+00**	**1.4E-04**	**5.6E-03**	**1.6E-02**	**1.7E-02**	**1.2E-01**	**8.7E-02**	**5.5E-01**

Note:

1. All doses reported in units of microsieverts per year.
2. Dose associated with cesium-137 includes dose due to external exposure to progeny of cesium-137 in air, water, soil, and sediment.
3. Dose associated with tritium oxide includes dose incurred via ingestion of organically bound tritium in fish, plant produce and animal products.

Table 72 - Dose to Representative Persons Located at BR25

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Adult	Carbon-14	4.3E-05	4.9E-08	2.4E-06	5.5E-09	1.3E-11	1.2E-07	4.0E-02	3.2E-02	3.7E-02	1.1E-01
Adult	Cobalt-60	1.2E-06	4.5E-08	2.4E-06	1.1E-04	4.5E-03	1.4E-03	4.9E-04	9.7E-06	3.8E-06	6.6E-03
Adult	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Adult	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-02	3.7E-04	0.0E+00	2.6E-03	1.3E-02
Adult	Tritium oxide	2.6E-01	0.0E+00	1.0E-02	5.2E-03	0.0E+00	0.0E+00	1.3E-04	8.8E-02	1.4E-02	3.8E-01
Adult	Iodine, mixed fission products	1.2E-07	7.8E-09	0.0E+00	0.0E+00	1.2E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-07
Adult	Noble Gases	0.0E+00	1.7E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.7E-01
Adult	**Total**	**2.6E-01**	**1.7E-01**	**1.0E-02**	**5.3E-03**	**4.5E-03**	**1.2E-02**	**4.1E-02**	**1.2E-01**	**5.4E-02**	**6.8E-01**
Child	Carbon-14	6.1E-05	4.9E-08	1.3E-06	5.5E-09	2.8E-11	1.4E-06	2.4E-02	3.6E-02	4.0E-02	1.0E-01
Child	Cobalt-60	1.7E-06	4.5E-08	3.1E-06	1.1E-04	4.5E-03	1.4E-03	6.8E-04	2.4E-05	6.9E-06	6.8E-03
Child	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Child	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E-02	1.2E-04	0.0E+00	5.8E-04	1.1E-02
Child	Tritium oxide	3.1E-01	0.0E+00	5.1E-03	4.3E-03	0.0E+00	0.0E+00	7.3E-05	8.9E-02	1.3E-02	4.3E-01
Child	Iodine, mixed fission products	2.6E-07	7.8E-09	0.0E+00	0.0E+00	1.2E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.8E-07
Child	Noble Gases	0.0E+00	1.7E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.7E-01
Child	**Total**	**3.1E-01**	**1.7E-01**	**5.1E-03**	**4.4E-03**	**4.5E-03**	**1.2E-02**	**2.5E-02**	**1.3E-01**	**5.3E-02**	**7.2E-01**
Infant	Carbon-14	4.2E-05	4.9E-08	0.0E+00	5.3E-11	4.8E-11	3.2E-06	1.7E-02	2.9E-02	5.9E-02	1.0E-01
Infant	Cobalt-60	1.3E-06	5.9E-08	0.0E+00	1.3E-06	5.9E-03	1.9E-03	5.7E-04	2.6E-05	8.5E-06	8.4E-03
Infant	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Infant	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-02	5.1E-05	0.0E+00	2.2E-04	1.4E-02
Infant	Tritium oxide	2.2E-01	0.0E+00	0.0E+00	1.4E-04	0.0E+00	0.0E+00	5.2E-05	9.7E-02	2.0E-02	3.3E-01

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Infant	Iodine, mixed fission products	3.1E-07	1.0E-08	0.0E+00	0.0E+00	1.6E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.4E-07
Infant	Noble Gases	0.0E+00	2.3E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.3E-01
Infant	**Total**	**2.2E-01**	**2.3E-01**	**0.0E+00**	**1.4E-04**	**5.9E-03**	**1.6E-02**	**1.7E-02**	**1.3E-01**	**7.9E-02**	**6.9E-01**

Note:

1. All doses reported in units of microsieverts per year.
2. Dose associated with cesium-137 includes dose due to external exposure to progeny of cesium-137 in air, water, soil, and sediment.
3. Dose associated with tritium oxide includes dose incurred via ingestion of organically bound tritium in fish, plant produce and animal products.

Table 73 - Dose to Representative Persons Located at BR27

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Adult	Carbon-14	4.3E-05	4.9E-08	4.5E-05	5.7E-09	1.3E-11	1.2E-07	4.0E-02	3.2E-02	3.7E-02	1.1E-01
Adult	Cobalt-60	1.2E-06	4.5E-08	7.5E-05	1.1E-04	3.3E-03	1.4E-03	4.9E-04	1.1E-05	4.6E-06	5.4E-03
Adult	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Adult	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-02	3.7E-04	0.0E+00	2.6E-03	1.3E-02
Adult	Tritium oxide	2.6E-01	0.0E+00	1.2E-02	5.2E-03	0.0E+00	0.0E+00	1.3E-04	8.8E-02	1.4E-02	3.8E-01
Adult	Iodine, mixed fission products	1.2E-07	7.8E-09	0.0E+00	0.0E+00	1.2E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-07
Adult	Noble Gases	0.0E+00	1.7E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.7E-01
Adult	**Total**	**2.6E-01**	**1.7E-01**	**1.2E-02**	**5.3E-03**	**3.3E-03**	**1.2E-02**	**4.1E-02**	**1.2E-01**	**5.4E-02**	**6.9E-01**
Child	Carbon-14	6.1E-05	4.9E-08	2.5E-05	5.7E-09	2.8E-11	1.4E-06	2.4E-02	3.6E-02	4.0E-02	1.0E-01
Child	Cobalt-60	1.7E-06	4.5E-08	9.6E-05	1.1E-04	3.3E-03	1.4E-03	6.8E-04	2.7E-05	8.0E-06	5.7E-03
Child	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Child	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E-02	1.2E-04	0.0E+00	5.8E-04	1.1E-02
Child	Tritium oxide	3.1E-01	0.0E+00	6.1E-03	4.3E-03	0.0E+00	0.0E+00	7.3E-05	8.9E-02	1.3E-02	4.3E-01
Child	Iodine, mixed fission products	2.6E-07	7.8E-09	0.0E+00	0.0E+00	1.2E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.8E-07
Child	Noble Gases	0.0E+00	1.7E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.7E-01
Child	**Total**	**3.1E-01**	**1.7E-01**	**6.2E-03**	**4.4E-03**	**3.3E-03**	**1.2E-02**	**2.5E-02**	**1.3E-01**	**5.3E-02**	**7.2E-01**
Infant	Carbon-14	4.2E-05	4.9E-08	0.0E+00	2.5E-10	4.8E-11	3.2E-06	1.7E-02	2.9E-02	5.9E-02	1.0E-01
Infant	Cobalt-60	1.3E-06	5.9E-08	0.0E+00	8.0E-06	4.3E-03	1.9E-03	5.7E-04	3.0E-05	9.5E-06	6.8E-03
Infant	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Infant	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-02	5.1E-05	0.0E+00	2.2E-04	1.4E-02
Infant	Tritium oxide	2.2E-01	0.0E+00	0.0E+00	1.6E-04	0.0E+00	0.0E+00	5.2E-05	9.7E-02	2.0E-02	3.3E-01

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Infant	Iodine, mixed fission products	3.1E-07	1.0E-08	0.0E+00	0.0E+00	1.5E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.4E-07
Infant	Noble Gases	0.0E+00	2.3E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.3E-01
Infant	**Total**	**2.2E-01**	**2.3E-01**	**0.0E+00**	**1.7E-04**	**4.3E-03**	**1.6E-02**	**1.7E-02**	**1.3E-01**	**7.9E-02**	**6.8E-01**

Note:

1. All doses reported in units of microsieverts per year.
2. Dose associated with cesium-137 includes dose due to external exposure to progeny of cesium-137 in air, water, soil, and sediment.
3. Dose associated with tritium oxide includes dose incurred via ingestion of organically bound tritium in fish, plant produce and animal products.

Table 74 - Dose to Representative Persons Located at BR32

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Adult	Carbon-14	4.3E-05	4.9E-08	1.1E-04	7.1E-09	6.8E-10	1.2E-07	4.0E-02	3.2E-02	3.7E-02	1.1E-01
Adult	Cobalt-60	1.3E-06	4.9E-08	1.8E-04	1.5E-04	9.1E-03	1.4E-03	4.9E-04	2.1E-05	8.9E-06	1.1E-02
Adult	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Adult	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-02	3.7E-04	0.0E+00	2.6E-03	1.3E-02
Adult	Tritium oxide	2.9E-01	0.0E+00	1.7E-02	5.3E-03	0.0E+00	0.0E+00	1.3E-04	8.8E-02	1.4E-02	4.1E-01
Adult	Iodine, mixed fission products	1.3E-07	8.5E-09	0.0E+00	0.0E+00	1.3E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E-07
Adult	Noble Gases	0.0E+00	1.9E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.9E-01
Adult	**Total**	**2.9E-01**	**1.9E-01**	**1.7E-02**	**5.5E-03**	**9.1E-03**	**1.2E-02**	**4.1E-02**	**1.2E-01**	**5.4E-02**	**7.3E-01**
Child	Carbon-14	6.1E-05	4.9E-08	5.8E-05	7.1E-09	1.5E-09	1.4E-06	2.4E-02	3.6E-02	4.0E-02	1.0E-01
Child	Cobalt-60	1.8E-06	4.9E-08	2.3E-04	1.5E-04	9.1E-03	1.4E-03	6.8E-04	5.1E-05	1.5E-05	1.2E-02
Child	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Child	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E-02	1.2E-04	0.0E+00	5.8E-04	1.1E-02
Child	Tritium oxide	3.4E-01	0.0E+00	8.5E-03	4.4E-03	0.0E+00	0.0E+00	7.3E-05	8.9E-02	1.3E-02	4.5E-01
Child	Iodine, mixed fission products	2.8E-07	8.5E-09	0.0E+00	0.0E+00	1.3E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E-07
Child	Noble Gases	0.0E+00	1.9E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.9E-01
Child	**Total**	**3.4E-01**	**1.9E-01**	**8.8E-03**	**4.6E-03**	**9.1E-03**	**1.2E-02**	**2.5E-02**	**1.3E-01**	**5.3E-02**	**7.7E-01**
Infant	Carbon-14	4.2E-05	4.9E-08	0.0E+00	4.3E-10	2.5E-09	3.2E-06	1.7E-02	2.9E-02	5.9E-02	1.0E-01
Infant	Cobalt-60	1.4E-06	6.4E-08	0.0E+00	1.4E-05	1.2E-02	1.9E-03	5.7E-04	5.5E-05	1.6E-05	1.4E-02
Infant	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Infant	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-02	5.1E-05	0.0E+00	2.2E-04	1.4E-02
Infant	Tritium oxide	2.3E-01	0.0E+00	0.0E+00	1.3E-04	0.0E+00	0.0E+00	5.2E-05	9.7E-02	2.0E-02	3.5E-01

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Infant	Iodine, mixed fission products	3.4E-07	1.1E-08	0.0E+00	0.0E+00	1.7E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.7E-07
Infant	Noble Gases	0.0E+00	2.5E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.5E-01
Infant	**Total**	**2.3E-01**	**2.5E-01**	**0.0E+00**	**1.4E-04**	**1.2E-02**	**1.6E-02**	**1.7E-02**	**1.3E-01**	**7.9E-02**	**7.3E-01**

Note:

1. All doses reported in units of microsieverts per year.

2. Dose associated with cesium-137 includes dose due to external exposure to progeny of cesium-137 in air, water, soil, and sediment.

3. Dose associated with tritium oxide includes dose incurred via ingestion of organically bound tritium in fish, plant produce and animal products.

Table 75 - Dose to Representative Persons Located at BR 48

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Adult	Carbon-14	4.2E-04	4.9E-07	6.6E-06	5.6E-09	2.2E-11	1.2E-07	4.0E-02	8.0E-02	9.9E-02	2.2E-01
Adult	Cobalt-60	1.5E-06	5.8E-08	2.4E-06	1.1E-04	7.6E-03	1.4E-03	4.9E-04	1.6E-05	6.1E-06	9.6E-03
Adult	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Adult	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-02	3.7E-04	0.0E+00	2.6E-03	1.3E-02
Adult	Tritium oxide	3.4E-01	0.0E+00	1.0E-02	5.2E-03	0.0E+00	0.0E+00	1.3E-04	1.2E-01	1.4E-02	4.9E-01
Adult	Iodine, mixed fission products	1.5E-07	1.0E-08	0.0E+00	0.0E+00	1.7E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.8E-07
Adult	Noble Gases	0.0E+00	2.3E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.3E-01
Adult	**Total**	**3.4E-01**	**2.3E-01**	**1.0E-02**	**5.3E-03**	**7.6E-03**	**1.2E-02**	**4.1E-02**	**2.0E-01**	**1.2E-01**	**9.6E-01**
Child	Carbon-14	6.0E-04	4.9E-07	3.6E-06	5.6E-09	4.8E-11	1.4E-06	2.4E-02	7.9E-02	6.6E-02	1.7E-01
Child	Cobalt-60	2.2E-06	5.8E-08	3.1E-06	1.1E-04	7.6E-03	1.4E-03	6.8E-04	4.0E-05	1.0E-05	9.9E-03
Child	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Child	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E-02	1.2E-04	0.0E+00	5.8E-04	1.1E-02
Child	Tritium oxide	4.1E-01	0.0E+00	5.1E-03	4.3E-03	0.0E+00	0.0E+00	7.3E-05	1.3E-01	1.3E-02	5.6E-01
Child	Iodine, mixed fission products	3.4E-07	1.0E-08	0.0E+00	0.0E+00	1.7E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.6E-07
Child	Noble Gases	0.0E+00	2.3E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.3E-01
Child	**Total**	**4.1E-01**	**2.3E-01**	**5.1E-03**	**4.4E-03**	**7.6E-03**	**1.2E-02**	**2.5E-02**	**2.1E-01**	**8.0E-02**	**9.7E-01**
Infant	Carbon-14	4.1E-04	4.9E-07	0.0E+00	7.4E-11	8.1E-11	3.2E-06	1.7E-02	6.1E-02	7.6E-02	1.5E-01
Infant	Cobalt-60	1.6E-06	7.6E-08	0.0E+00	1.3E-06	9.9E-03	1.9E-03	5.7E-04	4.2E-05	1.1E-05	1.2E-02
Infant	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Infant	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-02	5.1E-05	0.0E+00	2.2E-04	1.4E-02
Infant	Tritium oxide	2.8E-01	0.0E+00	0.0E+00	1.4E-04	0.0E+00	0.0E+00	5.2E-05	1.5E-01	2.0E-02	4.5E-01

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Infant	Iodine, mixed fission products	4.0E-07	1.3E-08	0.0E+00	0.0E+00	2.2E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.4E-07
Infant	Noble Gases	0.0E+00	2.9E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.9E-01
Infant	**Total**	**2.8E-01**	**2.9E-01**	**0.0E+00**	**1.4E-04**	**9.9E-03**	**1.6E-02**	**1.7E-02**	**2.1E-01**	**9.6E-02**	**9.2E-01**

Note:

1. All doses reported in units of microsieverts per year.

2. Dose associated with cesium-137 includes dose due to external exposure to progeny of cesium-137 in air, water, soil, and sediment.

3. Dose associated with tritium oxide includes dose incurred via ingestion of organically bound tritium in fish, plant produce and animal products.

Table 76 - Dose to Representative Persons Located at BF8

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Adult	Carbon-14	2.0E-04	2.3E-07	2.5E-05	5.5E-09	1.3E-11	1.2E-07	3.9E-02	1.0E-01	9.0E-02	2.3E-01
Adult	Cobalt-60	5.3E-07	2.0E-08	2.9E-05	1.1E-04	2.3E-03	1.4E-03	4.7E-04	1.1E-05	3.7E-06	4.3E-03
Adult	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Adult	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-02	3.6E-04	0.0E+00	5.3E-03	1.6E-02
Adult	Tritium oxide	1.1E-01	0.0E+00	2.3E-02	5.1E-03	0.0E+00	0.0E+00	1.3E-04	1.5E-01	1.8E-02	3.1E-01
Adult	Iodine, mixed fission products	5.2E-08	3.5E-09	0.0E+00	0.0E+00	5.6E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.1E-08
Adult	Noble Gases	0.0E+00	7.7E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.7E-02
Adult	**Total**	**1.1E-01**	**7.7E-02**	**2.3E-02**	**5.2E-03**	**2.3E-03**	**1.2E-02**	**4.0E-02**	**2.6E-01**	**1.1E-01**	**6.4E-01**
Child	Carbon-14	2.9E-04	2.3E-07	1.4E-05	5.5E-09	2.8E-11	1.4E-06	2.4E-02	1.1E-01	5.8E-02	1.9E-01
Child	Cobalt-60	7.6E-07	2.0E-08	3.7E-05	1.1E-04	2.3E-03	1.4E-03	6.6E-04	2.7E-05	5.9E-06	4.6E-03
Child	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Child	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E-02	1.2E-04	0.0E+00	1.1E-03	1.2E-02
Child	Tritium oxide	1.3E-01	0.0E+00	1.2E-02	4.3E-03	0.0E+00	0.0E+00	7.0E-05	1.6E-01	1.2E-02	3.2E-01
Child	Iodine, mixed fission products	1.2E-07	3.5E-09	0.0E+00	0.0E+00	5.6E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-07
Child	Noble Gases	0.0E+00	7.7E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.7E-02
Child	**Total**	**1.3E-01**	**7.7E-02**	**1.2E-02**	**4.4E-03**	**2.3E-03**	**1.2E-02**	**2.4E-02**	**2.6E-01**	**7.1E-02**	**6.0E-01**
Infant	Carbon-14	2.0E-04	2.3E-07	0.0E+00	1.1E-11	4.8E-11	3.2E-06	1.6E-02	8.9E-02	5.6E-02	1.6E-01
Infant	Cobalt-60	5.5E-07	2.6E-08	0.0E+00	0.0E+00	3.0E-03	1.9E-03	5.6E-04	3.0E-05	6.4E-06	5.4E-03
Infant	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Infant	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-02	4.9E-05	0.0E+00	4.4E-04	1.4E-02
Infant	Tritium oxide	9.2E-02	0.0E+00	0.0E+00	8.9E-05	0.0E+00	0.0E+00	5.1E-05	1.8E-01	1.5E-02	2.8E-01

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Infant	Iodine, mixed fission products	1.4E-07	4.5E-09	0.0E+00	0.0E+00	7.4E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E-07
Infant	Noble Gases	0.0E+00	1.0E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-01
Infant	**Total**	**9.2E-02**	**1.0E-01**	**0.0E+00**	**8.9E-05**	**3.0E-03**	**1.6E-02**	**1.7E-02**	**2.6E-01**	**7.1E-02**	**5.6E-01**

Note:

1. All doses reported in units of microsieverts per year.

2. Dose associated with cesium-137 includes dose due to external exposure to progeny of cesium-137 in air, water, soil, and sediment.

3. Dose associated with tritium oxide includes dose incurred via ingestion of organically bound tritium in fish, plant produce and animal products.

Table 77 - Dose to Representative Persons Located at BF14

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Adult	Carbon-14	4.1E-04	4.7E-07	2.7E-05	5.5E-09	1.3E-11	1.2E-07	3.9E-02	1.8E-01	1.4E-01	3.6E-01
Adult	Cobalt-60	1.3E-06	4.9E-08	2.9E-05	1.1E-04	4.2E-03	1.4E-03	4.7E-04	1.9E-05	6.2E-06	6.2E-03
Adult	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Adult	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-02	3.6E-04	0.0E+00	5.3E-03	1.6E-02
Adult	Tritium oxide	2.9E-01	0.0E+00	2.3E-02	5.1E-03	0.0E+00	0.0E+00	1.3E-04	1.8E-01	1.8E-02	5.1E-01
Adult	Iodine, mixed fission products	1.3E-07	8.5E-09	0.0E+00	0.0E+00	1.3E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E-07
Adult	Noble Gases	0.0E+00	1.9E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.9E-01
Adult	**Total**	**2.9E-01**	**1.9E-01**	**2.3E-02**	**5.2E-03**	**4.2E-03**	**1.2E-02**	**4.0E-02**	**3.6E-01**	**1.7E-01**	**1.1E+00**
Child	Carbon-14	5.9E-04	4.7E-07	1.5E-05	5.5E-09	2.8E-11	1.4E-06	2.4E-02	1.8E-01	8.0E-02	2.8E-01
Child	Cobalt-60	1.8E-06	4.9E-08	3.7E-05	1.1E-04	4.2E-03	1.4E-03	6.6E-04	4.5E-05	9.4E-06	6.5E-03
Child	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Child	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E-02	1.2E-04	0.0E+00	1.1E-03	1.2E-02
Child	Tritium oxide	3.4E-01	0.0E+00	1.2E-02	4.3E-03	0.0E+00	0.0E+00	7.0E-05	1.8E-01	1.2E-02	5.4E-01
Child	Iodine, mixed fission products	2.8E-07	8.5E-09	0.0E+00	0.0E+00	1.3E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E-07
Child	Noble Gases	0.0E+00	1.9E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.9E-01
Child	**Total**	**3.4E-01**	**1.9E-01**	**1.2E-02**	**4.4E-03**	**4.2E-03**	**1.2E-02**	**2.4E-02**	**3.5E-01**	**9.3E-02**	**1.0E+00**
Infant	Carbon-14	4.0E-04	4.7E-07	0.0E+00	2.3E-11	4.8E-11	3.2E-06	1.6E-02	1.5E-01	7.1E-02	2.4E-01
Infant	Cobalt-60	1.4E-06	6.4E-08	0.0E+00	0.0E+00	5.4E-03	1.9E-03	5.6E-04	4.9E-05	9.4E-06	7.9E-03
Infant	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Infant	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-02	4.9E-05	0.0E+00	4.4E-04	1.4E-02
Infant	Tritium oxide	2.3E-01	0.0E+00	0.0E+00	8.9E-05	0.0E+00	0.0E+00	5.1E-05	1.9E-01	1.5E-02	4.4E-01

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Infant	Iodine, mixed fission products	3.4E-07	1.1E-08	0.0E+00	0.0E+00	1.7E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.7E-07
Infant	Noble Gases	0.0E+00	2.5E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.5E-01
Infant	**Total**	**2.4E-01**	**2.5E-01**	**0.0E+00**	**8.9E-05**	**5.4E-03**	**1.6E-02**	**1.7E-02**	**3.4E-01**	**8.6E-02**	**9.5E-01**

Note:

1. All doses reported in units of microsieverts per year.
2. Dose associated with cesium-137 includes dose due to external exposure to progeny of cesium-137 in air, water, soil, and sediment.
3. Dose associated with tritium oxide includes dose incurred via ingestion of organically bound tritium in fish, plant produce and animal products.

Table 78 - Dose to Representative Persons Located at BF16

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Adult	Carbon-14	2.3E-04	2.6E-07	2.5E-05	5.5E-09	6.4E-12	1.2E-07	3.9E-02	1.1E-01	9.7E-02	2.5E-01
Adult	Cobalt-60	8.3E-07	3.2E-08	2.9E-05	1.1E-04	4.0E-03	1.4E-03	4.7E-04	1.7E-05	5.7E-06	6.1E-03
Adult	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Adult	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-02	3.6E-04	0.0E+00	5.3E-03	1.6E-02
Adult	Tritium oxide	1.8E-01	0.0E+00	2.3E-02	5.1E-03	0.0E+00	0.0E+00	1.3E-04	1.3E-01	1.8E-02	3.6E-01
Adult	Iodine, mixed fission products	8.1E-08	5.5E-09	0.0E+00	0.0E+00	9.1E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.6E-08
Adult	Noble Gases	0.0E+00	1.2E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-01
Adult	**Total**	**1.8E-01**	**1.2E-01**	**2.3E-02**	**5.2E-03**	**4.0E-03**	**1.2E-02**	**4.0E-02**	**2.4E-01**	**1.2E-01**	**7.5E-01**
Child	Carbon-14	3.3E-04	2.6E-07	1.4E-05	5.5E-09	1.4E-11	1.4E-06	2.4E-02	1.2E-01	6.1E-02	2.0E-01
Child	Cobalt-60	1.2E-06	3.2E-08	3.7E-05	1.1E-04	4.0E-03	1.4E-03	6.6E-04	4.2E-05	8.8E-06	6.3E-03
Child	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Child	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E-02	1.2E-04	0.0E+00	1.1E-03	1.2E-02
Child	Tritium oxide	2.2E-01	0.0E+00	1.2E-02	4.3E-03	0.0E+00	0.0E+00	7.0E-05	1.2E-01	1.2E-02	3.7E-01
Child	Iodine, mixed fission products	1.8E-07	5.5E-09	0.0E+00	0.0E+00	9.1E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.0E-07
Child	Noble Gases	0.0E+00	1.2E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-01
Child	**Total**	**2.2E-01**	**1.2E-01**	**1.2E-02**	**4.4E-03**	**4.0E-03**	**1.2E-02**	**2.4E-02**	**2.4E-01**	**7.4E-02**	**7.1E-01**
Infant	Carbon-14	2.2E-04	2.6E-07	0.0E+00	1.3E-11	2.4E-11	3.2E-06	1.6E-02	9.7E-02	5.8E-02	1.7E-01
Infant	Cobalt-60	8.7E-07	4.1E-08	0.0E+00	0.0E+00	5.2E-03	1.9E-03	5.6E-04	4.6E-05	8.9E-06	7.7E-03
Infant	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Infant	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-02	4.9E-05	0.0E+00	4.4E-04	1.4E-02
Infant	Tritium oxide	1.5E-01	0.0E+00	0.0E+00	8.9E-05	0.0E+00	0.0E+00	5.1E-05	1.3E-01	1.5E-02	2.9E-01

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Infant	Iodine, mixed fission products	2.2E-07	7.1E-09	0.0E+00	0.0E+00	1.2E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.4E-07
Infant	Noble Gases	0.0E+00	1.6E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.6E-01
Infant	**Total**	**1.5E-01**	**1.6E-01**	**0.0E+00**	**8.9E-05**	**5.2E-03**	**1.6E-02**	**1.7E-02**	**2.3E-01**	**7.3E-02**	**6.5E-01**

Note:

1. All doses reported in units of microsieverts per year.
2. Dose associated with cesium-137 includes dose due to external exposure to progeny of cesium-137 in air, water, soil, and sediment.
3. Dose associated with tritium oxide includes dose incurred via ingestion of organically bound tritium in fish, plant produce and animal products.

Table 79 - Dose to Representative Persons Located at BSF2

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Adult	Carbon-14	1.6E-04	1.8E-07	1.9E-06	5.5E-09	1.3E-11	1.2E-07	1.8E-01	2.2E-01	1.8E-01	5.8E-01
Adult	Cobalt-60	5.3E-07	2.0E-08	0.0E+00	1.1E-04	1.7E-03	1.4E-03	2.1E-03	1.6E-05	4.6E-06	5.4E-03
Adult	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Adult	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-02	1.6E-03	0.0E+00	5.3E-03	1.7E-02
Adult	Tritium oxide	1.1E-01	0.0E+00	1.1E-02	5.1E-03	0.0E+00	0.0E+00	5.6E-04	2.6E-01	4.1E-02	4.3E-01
Adult	Iodine, mixed fission products	5.2E-08	3.5E-09	0.0E+00	0.0E+00	5.4E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.0E-08
Adult	Noble Gases	0.0E+00	7.7E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.7E-02
Adult	**Total**	**1.1E-01**	**7.7E-02**	**1.1E-02**	**5.2E-03**	**1.7E-03**	**1.2E-02**	**1.8E-01**	**4.9E-01**	**2.3E-01**	**1.1E+00**
Child	Carbon-14	2.2E-04	1.8E-07	1.1E-06	5.5E-09	2.8E-11	1.4E-06	1.1E-01	2.4E-01	1.8E-01	5.3E-01
Child	Cobalt-60	7.6E-07	4.9E-08	0.0E+00	1.3E-06	1.7E-03	1.4E-03	3.0E-03	4.1E-05	1.1E-05	6.2E-03
Child	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Child	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E-02	5.4E-04	0.0E+00	1.1E-03	1.2E-02
Child	Tritium oxide	1.3E-01	0.0E+00	5.4E-03	4.3E-03	0.0E+00	0.0E+00	3.2E-04	2.7E-01	3.9E-02	4.5E-01
Child	Iodine, mixed fission products	1.2E-07	3.5E-09	0.0E+00	0.0E+00	5.4E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-07
Child	Noble Gases	0.0E+00	7.7E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.7E-02
Child	**Total**	**1.3E-01**	**7.7E-02**	**5.4E-03**	**4.3E-03**	**1.7E-03**	**1.2E-02**	**1.1E-01**	**5.1E-01**	**2.2E-01**	**1.1E+00**
Infant	Carbon-14	1.5E-04	1.8E-07	0.0E+00	8.6E-12	4.8E-11	3.2E-06	7.2E-02	2.0E-01	2.7E-01	5.3E-01
Infant	Cobalt-60	5.5E-07	2.6E-08	0.0E+00	0.0E+00	2.2E-03	1.9E-03	2.5E-03	4.2E-05	1.9E-05	6.7E-03
Infant	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Infant	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-02	2.2E-04	0.0E+00	4.4E-04	1.4E-02
Infant	Tritium oxide	9.2E-02	0.0E+00	0.0E+00	8.9E-05	0.0E+00	0.0E+00	2.3E-04	2.9E-01	6.4E-02	4.4E-01

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Infant	Iodine, mixed fission products	1.4E-07	4.5E-09	0.0E+00	0.0E+00	7.0E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E-07
Infant	Noble Gases	0.0E+00	1.0E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-01
Infant	**Total**	**9.2E-02**	**1.0E-01**	**0.0E+00**	**8.9E-05**	**2.2E-03**	**1.6E-02**	**7.5E-02**	**4.8E-01**	**3.3E-01**	**1.1E+00**

Note:

1. All doses reported in units of microsieverts per year.

2. Dose associated with cesium-137 includes dose due to external exposure to progeny of cesium-137 in air, water, soil, and sediment.

3. Dose associated with tritium oxide includes dose incurred via ingestion of organically bound tritium in fish, plant produce and animal products.

Table 80 - Dose to Representative Persons Located at BSF3

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Adult	Carbon-14	1.6E-04	1.8E-07	2.0E-06	5.5E-09	1.3E-11	1.2E-07	1.8E-01	2.2E-01	1.8E-01	5.8E-01
Adult	Cobalt-60	5.3E-07	2.0E-08	0.0E+00	1.1E-04	2.3E-03	1.4E-03	2.1E-03	2.1E-05	5.9E-06	6.0E-03
Adult	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Adult	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-02	1.6E-03	0.0E+00	5.3E-03	1.7E-02
Adult	Tritium oxide	1.1E-01	0.0E+00	1.1E-02	5.1E-03	0.0E+00	0.0E+00	5.6E-04	2.4E-01	4.1E-02	4.1E-01
Adult	Iodine, mixed fission products	5.2E-08	3.5E-09	0.0E+00	0.0E+00	5.6E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.1E-08
Adult	Noble Gases	0.0E+00	7.7E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.7E-02
Adult	**Total**	**1.1E-01**	**7.7E-02**	**1.1E-02**	**5.2E-03**	**2.3E-03**	**1.2E-02**	**1.8E-01**	**4.6E-01**	**2.3E-01**	**1.1E+00**
Child	Carbon-14	2.2E-04	1.8E-07	1.1E-06	5.5E-09	2.8E-11	1.4E-06	1.1E-01	2.4E-01	1.8E-01	5.3E-01
Child	Cobalt-60	7.6E-07	2.0E-08	0.0E+00	1.1E-04	2.3E-03	1.4E-03	3.0E-03	5.3E-05	1.4E-05	6.9E-03
Child	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Child	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E-02	5.4E-04	0.0E+00	1.1E-03	1.2E-02
Child	Tritium oxide	1.3E-01	0.0E+00	5.4E-03	4.3E-03	0.0E+00	0.0E+00	3.2E-04	2.3E-01	3.9E-02	4.2E-01
Child	Iodine, mixed fission products	1.2E-07	3.5E-09	0.0E+00	0.0E+00	5.6E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-07
Child	Noble Gases	0.0E+00	7.7E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.7E-02
Child	**Total**	**1.3E-01**	**7.7E-02**	**5.4E-03**	**4.4E-03**	**2.3E-03**	**1.2E-02**	**1.1E-01**	**4.8E-01**	**2.2E-01**	**1.0E+00**
Infant	Carbon-14	1.5E-04	1.8E-07	0.0E+00	8.7E-12	4.8E-11	3.2E-06	7.2E-02	2.0E-01	2.7E-01	5.3E-01
Infant	Cobalt-60	5.5E-07	2.6E-08	0.0E+00	0.0E+00	3.0E-03	1.9E-03	2.5E-03	5.4E-05	2.4E-05	7.4E-03
Infant	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Infant	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-02	2.2E-04	0.0E+00	4.4E-04	1.4E-02
Infant	Tritium oxide	9.2E-02	0.0E+00	0.0E+00	8.9E-05	0.0E+00	0.0E+00	2.3E-04	2.3E-01	6.4E-02	3.8E-01

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Infant	Iodine, mixed fission products	1.4E-07	4.5E-09	0.0E+00	0.0E+00	7.4E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E-07
Infant	Noble Gases	0.0E+00	1.0E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-01
Infant	**Total**	**9.2E-02**	**1.0E-01**	**0.0E+00**	**8.9E-05**	**3.0E-03**	**1.6E-02**	**7.5E-02**	**4.2E-01**	**3.3E-01**	**1.0E+00**

Note:

1. All doses reported in units of microsieverts per year.
2. Dose associated with cesium-137 includes dose due to external exposure to progeny of cesium-137 in air, water, soil, and sediment.
3. Dose associated with tritium oxide includes dose incurred via ingestion of organically bound tritium in fish, plant produce and animal products.

Table 81 - Dose to Representative Persons Located at BDF1

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Adult	Carbon-14	2.3E-04	2.6E-07	2.2E-06	5.5E-09	6.4E-12	1.2E-07	4.4E-02	1.3E-01	1.5E-01	3.3E-01
Adult	Cobalt-60	8.3E-07	3.2E-08	0.0E+00	1.1E-04	3.8E-03	1.4E-03	5.3E-04	1.7E-05	6.6E-06	5.9E-03
Adult	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Adult	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-02	4.0E-04	0.0E+00	5.3E-03	1.6E-02
Adult	Tritium oxide	1.8E-01	0.0E+00	8.5E-03	5.1E-03	0.0E+00	0.0E+00	1.4E-04	1.2E-01	2.9E-02	3.5E-01
Adult	Iodine, mixed fission products	8.1E-08	5.5E-09	0.0E+00	0.0E+00	8.9E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.5E-08
Adult	Noble Gases	0.0E+00	1.2E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-01
Adult	**Total**	**1.8E-01**	**1.2E-01**	**8.5E-03**	**5.2E-03**	**3.8E-03**	**1.2E-02**	**4.5E-02**	**2.5E-01**	**1.8E-01**	**8.1E-01**
Child	Carbon-14	3.3E-04	2.6E-07	1.2E-06	5.5E-09	1.4E-11	1.4E-06	2.6E-02	1.4E-01	1.8E-01	3.4E-01
Child	Cobalt-60	1.2E-06	3.2E-08	0.0E+00	1.1E-04	3.8E-03	1.4E-03	7.4E-04	4.1E-05	1.7E-05	6.1E-03
Child	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Child	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E-02	1.3E-04	0.0E+00	1.1E-03	1.2E-02
Child	Tritium oxide	2.2E-01	0.0E+00	4.2E-03	4.3E-03	0.0E+00	0.0E+00	7.9E-05	1.2E-01	3.3E-02	3.7E-01
Child	Iodine, mixed fission products	1.8E-07	5.5E-09	0.0E+00	0.0E+00	9.0E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.0E-07
Child	Noble Gases	0.0E+00	1.2E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-01
Child	**Total**	**2.2E-01**	**1.2E-01**	**4.2E-03**	**4.4E-03**	**3.8E-03**	**1.2E-02**	**2.7E-02**	**2.5E-01**	**2.1E-01**	**8.5E-01**
Infant	Carbon-14	2.2E-04	2.6E-07	0.0E+00	1.3E-11	2.4E-11	3.2E-06	1.8E-02	1.1E-01	3.0E-01	4.2E-01
Infant	Cobalt-60	8.7E-07	4.1E-08	0.0E+00	0.0E+00	4.9E-03	1.9E-03	6.2E-04	4.1E-05	3.0E-05	7.5E-03
Infant	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Infant	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-02	5.5E-05	0.0E+00	4.4E-04	1.4E-02
Infant	Tritium oxide	1.5E-01	0.0E+00	0.0E+00	8.9E-05	0.0E+00	0.0E+00	5.7E-05	1.1E-01	6.0E-02	3.2E-01

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Infant	Iodine, mixed fission products	2.2E-07	7.1E-09	0.0E+00	0.0E+00	1.2E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.4E-07
Infant	Noble Gases	0.0E+00	1.6E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.6E-01
Infant	**Total**	**1.5E-01**	**1.6E-01**	**0.0E+00**	**8.9E-05**	**4.9E-03**	**1.6E-02**	**1.9E-02**	**2.2E-01**	**3.6E-01**	**9.2E-01**

Note:

1. All doses reported in units of microsieverts per year.
2. Dose associated with cesium-137 includes dose due to external exposure to progeny of cesium-137 in air, water, soil, and sediment.
3. Dose associated with tritium oxide includes dose incurred via ingestion of organically bound tritium in fish, plant produce and animal products.

Table 82 - Dose to Representative Persons Located at BDF9

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Adult	Carbon-14	1.0E-04	1.2E-07	9.8E-07	5.5E-09	0.0E+00	1.2E-07	4.4E-02	9.0E-02	9.1E-02	2.3E-01
Adult	Cobalt-60	5.3E-07	2.0E-08	0.0E+00	1.1E-04	1.9E-03	1.4E-03	5.3E-04	8.7E-06	3.5E-06	4.0E-03
Adult	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Adult	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-02	4.0E-04	0.0E+00	5.3E-03	1.6E-02
Adult	Tritium oxide	1.1E-01	0.0E+00	8.5E-03	5.1E-03	0.0E+00	0.0E+00	1.4E-04	1.3E-01	2.7E-02	2.8E-01
Adult	Iodine, mixed fission products	5.2E-08	3.5E-09	0.0E+00	0.0E+00	5.5E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.0E-08
Adult	Noble Gases	0.0E+00	7.7E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.7E-02
Adult	**Total**	**1.1E-01**	**7.7E-02**	**8.5E-03**	**5.2E-03**	**1.9E-03**	**1.2E-02**	**4.5E-02**	**2.2E-01**	**1.2E-01**	**6.1E-01**
Child	Carbon-14	1.4E-04	1.2E-07	5.4E-07	5.5E-09	0.0E+00	1.4E-06	2.6E-02	9.8E-02	9.6E-02	2.2E-01
Child	Cobalt-60	7.6E-07	2.0E-08	0.0E+00	1.1E-04	1.9E-03	1.4E-03	7.4E-04	2.1E-05	8.8E-06	4.3E-03
Child	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Child	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E-02	1.3E-04	0.0E+00	1.1E-03	1.2E-02
Child	Tritium oxide	1.3E-01	0.0E+00	4.2E-03	4.3E-03	0.0E+00	0.0E+00	7.9E-05	1.3E-01	3.0E-02	3.1E-01
Child	Iodine, mixed fission products	1.2E-07	3.5E-09	0.0E+00	0.0E+00	5.5E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-07
Child	Noble Gases	0.0E+00	7.7E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.7E-02
Child	**Total**	**1.3E-01**	**7.7E-02**	**4.2E-03**	**4.4E-03**	**1.9E-03**	**1.2E-02**	**2.7E-02**	**2.3E-01**	**1.3E-01**	**6.2E-01**
Infant	Carbon-14	9.8E-05	1.2E-07	0.0E+00	5.6E-12	0.0E+00	3.2E-06	1.8E-02	7.8E-02	1.4E-01	2.4E-01
Infant	Cobalt-60	5.5E-07	2.6E-08	0.0E+00	0.0E+00	2.5E-03	1.9E-03	6.2E-04	2.2E-05	1.6E-05	5.1E-03
Infant	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Infant	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-02	5.5E-05	0.0E+00	4.4E-04	1.4E-02
Infant	Tritium oxide	9.2E-02	0.0E+00	0.0E+00	8.9E-05	0.0E+00	0.0E+00	5.7E-05	1.4E-01	5.4E-02	2.9E-01

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Infant	Iodine, mixed fission products	1.4E-07	4.5E-09	0.0E+00	0.0E+00	7.1E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E-07
Infant	Noble Gases	0.0E+00	1.0E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-01
Infant	**Total**	**9.2E-02**	**1.0E-01**	**0.0E+00**	**8.9E-05**	**2.5E-03**	**1.6E-02**	**1.9E-02**	**2.2E-01**	**2.0E-01**	**6.4E-01**

Note:

1. All doses reported in units of microsieverts per year.
2. Dose associated with cesium-137 includes dose due to external exposure to progeny of cesium-137 in air, water, soil, and sediment.
3. Dose associated with tritium oxide includes dose incurred via ingestion of organically bound tritium in fish, plant produce and animal products.

Table 83 - Dose to Representative Persons Located at BDF12

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Adult	Carbon-14	2.3E-04	2.6E-07	2.2E-06	5.5E-09	6.4E-12	1.2E-07	4.4E-02	1.3E-01	1.5E-01	3.3E-01
Adult	Cobalt-60	8.3E-07	3.2E-08	0.0E+00	1.1E-04	3.8E-03	1.4E-03	5.3E-04	1.7E-05	6.6E-06	5.9E-03
Adult	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Adult	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-02	4.0E-04	0.0E+00	5.3E-03	1.6E-02
Adult	Tritium oxide	1.8E-01	0.0E+00	8.5E-03	5.1E-03	0.0E+00	0.0E+00	1.4E-04	1.2E-01	2.9E-02	3.5E-01
Adult	Iodine, mixed fission products	8.1E-08	5.5E-09	0.0E+00	0.0E+00	9.0E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.5E-08
Adult	Noble Gases	0.0E+00	1.2E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-01
Adult	**Total**	**1.8E-01**	**1.2E-01**	**8.5E-03**	**5.2E-03**	**3.8E-03**	**1.2E-02**	**4.5E-02**	**2.5E-01**	**1.8E-01**	**8.1E-01**
Child	Carbon-14	3.3E-04	2.6E-07	1.2E-06	5.5E-09	1.4E-11	1.4E-06	2.6E-02	1.4E-01	1.8E-01	3.4E-01
Child	Cobalt-60	1.2E-06	3.2E-08	0.0E+00	1.1E-04	3.8E-03	1.4E-03	7.4E-04	4.1E-05	1.7E-05	6.1E-03
Child	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Child	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E-02	1.3E-04	0.0E+00	1.1E-03	1.2E-02
Child	Tritium oxide	2.2E-01	0.0E+00	4.2E-03	4.3E-03	0.0E+00	0.0E+00	7.9E-05	1.2E-01	3.3E-02	3.7E-01
Child	Iodine, mixed fission products	1.8E-07	5.5E-09	0.0E+00	0.0E+00	9.0E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.0E-07
Child	Noble Gases	0.0E+00	1.2E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-01
Child	**Total**	**2.2E-01**	**1.2E-01**	**4.2E-03**	**4.4E-03**	**3.8E-03**	**1.2E-02**	**2.7E-02**	**2.5E-01**	**2.1E-01**	**8.5E-01**
Infant	Carbon-14	2.2E-04	2.6E-07	0.0E+00	1.3E-11	2.4E-11	3.2E-06	1.8E-02	1.1E-01	3.0E-01	4.2E-01
Infant	Cobalt-60	8.7E-07	4.1E-08	0.0E+00	0.0E+00	4.9E-03	1.9E-03	6.2E-04	4.2E-05	3.1E-05	7.5E-03
Infant	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Infant	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-02	5.5E-05	0.0E+00	4.4E-04	1.4E-02
Infant	Tritium oxide	1.5E-01	0.0E+00	0.0E+00	8.9E-05	0.0E+00	0.0E+00	5.7E-05	1.1E-01	6.0E-02	3.2E-01

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Infant	Iodine, mixed fission products	2.2E-07	7.1E-09	0.0E+00	0.0E+00	1.2E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.4E-07
Infant	Noble Gases	0.0E+00	1.6E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.6E-01
Infant	**Total**	**1.5E-01**	**1.6E-01**	**0.0E+00**	**8.9E-05**	**4.9E-03**	**1.6E-02**	**1.9E-02**	**2.2E-01**	**3.6E-01**	**9.2E-01**

Note:

1. All doses reported in units of microsieverts per year.
2. Dose associated with cesium-137 includes dose due to external exposure to progeny of cesium-137 in air, water, soil, and sediment.
3. Dose associated with tritium oxide includes dose incurred via ingestion of organically bound tritium in fish, plant produce and animal products.

Table 84 - Dose to Representative Persons Located at BDF13

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Adult	Carbon-14	1.1E-04	1.3E-07	1.1E-06	5.5E-09	0.0E+00	1.2E-07	4.4E-02	9.3E-02	7.1E-02	2.1E-01
Adult	Cobalt-60	5.3E-07	2.0E-08	0.0E+00	1.1E-04	1.5E-03	1.4E-03	5.3E-04	6.9E-06	2.1E-06	3.6E-03
Adult	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Adult	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-02	4.0E-04	0.0E+00	5.3E-03	1.6E-02
Adult	Tritium oxide	1.1E-01	0.0E+00	8.5E-03	5.1E-03	0.0E+00	0.0E+00	1.4E-04	1.2E-01	2.5E-02	2.7E-01
Adult	Iodine, mixed fission products	5.2E-08	3.5E-09	0.0E+00	0.0E+00	5.3E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.0E-08
Adult	Noble Gases	0.0E+00	7.7E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.7E-02
Adult	**Total**	**1.1E-01**	**7.7E-02**	**8.5E-03**	**5.2E-03**	**1.5E-03**	**1.2E-02**	**4.5E-02**	**2.1E-01**	**1.0E-01**	**5.8E-01**
Child	Carbon-14	1.6E-04	1.3E-07	5.8E-07	5.5E-09	0.0E+00	1.4E-06	2.6E-02	1.0E-01	4.3E-02	1.7E-01
Child	Cobalt-60	7.6E-07	2.0E-08	0.0E+00	1.1E-04	1.5E-03	1.4E-03	7.4E-04	1.7E-05	3.2E-06	3.8E-03
Child	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Child	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E-02	1.3E-04	0.0E+00	1.1E-03	1.2E-02
Child	Tritium oxide	1.3E-01	0.0E+00	4.2E-03	4.3E-03	0.0E+00	0.0E+00	7.9E-05	1.2E-01	2.5E-02	2.8E-01
Child	Iodine, mixed fission products	1.2E-07	3.5E-09	0.0E+00	0.0E+00	5.3E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-07
Child	Noble Gases	0.0E+00	7.7E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.7E-02
Child	**Total**	**1.3E-01**	**7.7E-02**	**4.2E-03**	**4.4E-03**	**1.5E-03**	**1.2E-02**	**2.7E-02**	**2.2E-01**	**6.9E-02**	**5.5E-01**
Infant	Carbon-14	1.1E-04	1.3E-07	0.0E+00	6.0E-12	0.0E+00	3.2E-06	1.8E-02	8.0E-02	3.0E-02	1.3E-01
Infant	Cobalt-60	5.5E-07	2.6E-08	0.0E+00	0.0E+00	2.0E-03	1.9E-03	6.2E-04	1.7E-05	2.7E-06	4.5E-03
Infant	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Infant	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-02	5.5E-05	0.0E+00	4.4E-04	1.4E-02
Infant	Tritium oxide	9.2E-02	0.0E+00	0.0E+00	8.9E-05	0.0E+00	0.0E+00	5.7E-05	1.1E-01	4.1E-02	2.5E-01

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Infant	Iodine, mixed fission products	1.4E-07	4.5E-09	0.0E+00	0.0E+00	6.9E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E-07
Infant	Noble Gases	0.0E+00	1.0E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-01
Infant	**Total**	**9.2E-02**	**1.0E-01**	**0.0E+00**	**8.9E-05**	**2.0E-03**	**1.6E-02**	**1.9E-02**	**1.9E-01**	**7.2E-02**	**4.9E-01**

Note:

1. All doses reported in units of microsieverts per year.
2. Dose associated with cesium-137 includes dose due to external exposure to progeny of cesium-137 in air, water, soil, and sediment.
3. Dose associated with tritium oxide includes dose incurred via ingestion of organically bound tritium in fish, plant produce and animal products.

Table 85 - Dose to Representative Persons Located at BDF14

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Adult	Carbon-14	9.5E-05	1.1E-07	9.3E-07	5.5E-09	0.0E+00	1.2E-07	4.4E-02	8.9E-02	8.8E-02	2.2E-01
Adult	Cobalt-60	5.3E-07	2.0E-08	0.0E+00	1.1E-04	1.3E-03	1.4E-03	5.3E-04	5.9E-06	2.4E-06	3.3E-03
Adult	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Adult	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-02	4.0E-04	0.0E+00	5.3E-03	1.6E-02
Adult	Tritium oxide	1.1E-01	0.0E+00	8.5E-03	5.1E-03	0.0E+00	0.0E+00	1.4E-04	1.3E-01	2.5E-02	2.8E-01
Adult	Iodine, mixed fission products	5.2E-08	3.5E-09	0.0E+00	0.0E+00	5.1E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.0E-08
Adult	Noble Gases	0.0E+00	7.7E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.7E-02
Adult	**Total**	**1.1E-01**	**7.7E-02**	**8.5E-03**	**5.2E-03**	**1.3E-03**	**1.2E-02**	**4.5E-02**	**2.2E-01**	**1.2E-01**	**6.0E-01**
Child	Carbon-14	1.4E-04	1.1E-07	5.1E-07	5.5E-09	0.0E+00	1.4E-06	2.6E-02	9.6E-02	9.3E-02	2.2E-01
Child	Cobalt-60	7.6E-07	2.0E-08	0.0E+00	1.1E-04	1.3E-03	1.4E-03	7.4E-04	1.5E-05	6.1E-06	3.6E-03
Child	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Child	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E-02	1.3E-04	0.0E+00	1.1E-03	1.2E-02
Child	Tritium oxide	1.3E-01	0.0E+00	4.2E-03	4.3E-03	0.0E+00	0.0E+00	7.9E-05	1.3E-01	2.5E-02	3.0E-01
Child	Iodine, mixed fission products	1.2E-07	3.5E-09	0.0E+00	0.0E+00	5.1E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-07
Child	Noble Gases	0.0E+00	7.7E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.7E-02
Child	**Total**	**1.3E-01**	**7.7E-02**	**4.2E-03**	**4.4E-03**	**1.3E-03**	**1.2E-02**	**2.7E-02**	**2.3E-01**	**1.2E-01**	**6.1E-01**
Infant	Carbon-14	9.3E-05	1.1E-07	0.0E+00	5.3E-12	0.0E+00	3.2E-06	1.8E-02	7.7E-02	1.4E-01	2.3E-01
Infant	Cobalt-60	5.5E-07	2.6E-08	0.0E+00	0.0E+00	1.6E-03	1.9E-03	6.2E-04	1.5E-05	1.1E-05	4.2E-03
Infant	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Infant	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-02	5.5E-05	0.0E+00	4.4E-04	1.4E-02
Infant	Tritium oxide	9.2E-02	0.0E+00	0.0E+00	8.9E-05	0.0E+00	0.0E+00	5.7E-05	1.4E-01	4.1E-02	2.7E-01

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Infant	Iodine, mixed fission products	1.4E-07	4.5E-09	0.0E+00	0.0E+00	6.7E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E-07
Infant	Noble Gases	0.0E+00	1.0E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-01
Infant	**Total**	**9.2E-02**	**1.0E-01**	**0.0E+00**	**8.9E-05**	**1.6E-03**	**1.6E-02**	**1.9E-02**	**2.2E-01**	**1.8E-01**	**6.2E-01**

Note:

1. All doses reported in units of microsieverts per year.
2. Dose associated with cesium-137 includes dose due to external exposure to progeny of cesium-137 in air, water, soil, and sediment.
3. Dose associated with tritium oxide includes dose incurred via ingestion of organically bound tritium in fish, plant produce and animal products.

Table 86 - Dose to Representative Persons Located at BDF15

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Adult	Carbon-14	1.0E-04	1.2E-07	1.0E-06	5.5E-09	0.0E+00	1.2E-07	4.4E-02	9.1E-02	9.2E-02	2.3E-01
Adult	Cobalt-60	5.3E-07	2.0E-08	0.0E+00	1.1E-04	1.5E-03	1.4E-03	5.3E-04	6.9E-06	2.8E-06	3.6E-03
Adult	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Adult	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-02	4.0E-04	0.0E+00	5.3E-03	1.6E-02
Adult	Tritium oxide	1.1E-01	0.0E+00	8.5E-03	5.1E-03	0.0E+00	0.0E+00	1.4E-04	1.3E-01	2.5E-02	2.8E-01
Adult	Iodine, mixed fission products	5.2E-08	3.5E-09	0.0E+00	0.0E+00	5.2E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.0E-08
Adult	Noble Gases	0.0E+00	7.7E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.7E-02
Adult	**Total**	**1.1E-01**	**7.7E-02**	**8.5E-03**	**5.2E-03**	**1.5E-03**	**1.2E-02**	**4.5E-02**	**2.2E-01**	**1.2E-01**	**6.1E-01**
Child	Carbon-14	1.5E-04	1.2E-07	5.6E-07	5.5E-09	0.0E+00	1.4E-06	2.6E-02	9.9E-02	9.8E-02	2.2E-01
Child	Cobalt-60	7.6E-07	2.0E-08	0.0E+00	1.1E-04	1.5E-03	1.4E-03	7.4E-04	1.7E-05	7.1E-06	3.8E-03
Child	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Child	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E-02	1.3E-04	0.0E+00	1.1E-03	1.2E-02
Child	Tritium oxide	1.3E-01	0.0E+00	4.2E-03	4.3E-03	0.0E+00	0.0E+00	7.9E-05	1.3E-01	2.5E-02	3.0E-01
Child	Iodine, mixed fission products	1.2E-07	3.5E-09	0.0E+00	0.0E+00	5.3E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-07
Child	Noble Gases	0.0E+00	7.7E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.7E-02
Child	**Total**	**1.3E-01**	**7.7E-02**	**4.2E-03**	**4.4E-03**	**1.5E-03**	**1.2E-02**	**2.7E-02**	**2.3E-01**	**1.2E-01**	**6.2E-01**
Infant	Carbon-14	1.0E-04	1.2E-07	0.0E+00	5.8E-12	0.0E+00	3.2E-06	1.8E-02	7.9E-02	1.5E-01	2.4E-01
Infant	Cobalt-60	5.5E-07	2.6E-08	0.0E+00	0.0E+00	1.9E-03	1.9E-03	6.2E-04	1.7E-05	1.3E-05	4.5E-03
Infant	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Infant	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-02	5.5E-05	0.0E+00	4.4E-04	1.4E-02
Infant	Tritium oxide	9.2E-02	0.0E+00	0.0E+00	8.9E-05	0.0E+00	0.0E+00	5.7E-05	1.4E-01	4.1E-02	2.7E-01

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Infant	Iodine, mixed fission products	1.4E-07	4.5E-09	0.0E+00	0.0E+00	6.8E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.5E-07
Infant	Noble Gases	0.0E+00	1.0E-01	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-01
Infant	**Total**	**9.2E-02**	**1.0E-01**	**0.0E+00**	**8.9E-05**	**1.9E-03**	**1.6E-02**	**1.9E-02**	**2.2E-01**	**1.9E-01**	**6.4E-01**

Note:

1. All doses reported in units of microsieverts per year.
2. Dose associated with cesium-137 includes dose due to external exposure to progeny of cesium-137 in air, water, soil, and sediment.
3. Dose associated with tritium oxide includes dose incurred via ingestion of organically bound tritium in fish, plant produce and animal products.

Table 87 - Dose to Representative Persons Located at BHF1

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Adult	Carbon-14	5.3E-05	6.1E-08	1.3E-04	2.7E-09	8.0E-10	1.7E-08	1.6E-02	4.5E-02	2.7E-02	8.8E-02
Adult	Cobalt-60	1.9E-07	7.3E-09	2.4E-04	7.7E-05	7.8E-03	1.4E-03	2.8E-04	3.7E-05	1.1E-05	9.8E-03
Adult	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Adult	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-02	1.1E-03	0.0E+00	0.0E+00	1.2E-02
Adult	Tritium oxide	3.6E-02	0.0E+00	8.4E-02	2.9E-03	0.0E+00	0.0E+00	3.8E-04	7.8E-02	2.0E-02	2.2E-01
Adult	Iodine, mixed fission products	1.9E-08	1.3E-09	0.0E+00	0.0E+00	1.9E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.2E-08
Adult	Noble Gases	0.0E+00	2.8E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.8E-02
Adult	**Total**	**3.6E-02**	**2.8E-02**	**8.5E-02**	**2.9E-03**	**7.8E-03**	**1.2E-02**	**1.7E-02**	**1.2E-01**	**4.7E-02**	**3.6E-01**
Child	Carbon-14	7.5E-05	6.1E-08	6.9E-05	2.7E-09	1.7E-09	1.9E-07	1.4E-02	5.0E-02	2.5E-02	8.9E-02
Child	Cobalt-60	2.8E-07	7.3E-09	3.0E-04	7.7E-05	7.8E-03	1.4E-03	5.8E-04	9.1E-05	2.2E-05	1.0E-02
Child	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Child	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.1E-02	5.4E-04	0.0E+00	0.0E+00	1.1E-02
Child	Tritium oxide	4.3E-02	0.0E+00	4.2E-02	2.4E-03	0.0E+00	0.0E+00	3.2E-04	7.2E-02	2.3E-02	1.8E-01
Child	Iodine, mixed fission products	4.2E-08	1.3E-09	0.0E+00	0.0E+00	1.9E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.5E-08
Child	Noble Gases	0.0E+00	2.8E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.8E-02
Child	**Total**	**4.3E-02**	**2.8E-02**	**4.2E-02**	**2.5E-03**	**7.8E-03**	**1.2E-02**	**1.6E-02**	**1.2E-01**	**4.8E-02**	**3.2E-01**
Infant	Carbon-14	5.2E-05	6.1E-08	0.0E+00	5.1E-10	3.0E-09	4.2E-07	9.6E-03	4.1E-02	3.2E-02	8.3E-02
Infant	Cobalt-60	2.0E-07	9.5E-09	0.0E+00	1.9E-05	1.0E-02	1.9E-03	4.9E-04	9.9E-05	2.9E-05	1.3E-02
Infant	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Infant	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.4E-02	2.2E-04	0.0E+00	0.0E+00	1.4E-02
Infant	Tritium oxide	2.9E-02	0.0E+00	0.0E+00	6.2E-04	0.0E+00	0.0E+00	2.3E-04	7.0E-02	3.9E-02	1.4E-01

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Infant	Iodine, mixed fission products	5.0E-08	1.7E-09	0.0E+00	0.0E+00	2.5E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.5E-08
Infant	Noble Gases	0.0E+00	3.6E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.6E-02
Infant	**Total**	**2.9E-02**	**3.6E-02**	**0.0E+00**	**6.4E-04**	**1.0E-02**	**1.6E-02**	**1.1E-02**	**1.1E-01**	**7.1E-02**	**2.8E-01**

Note:

1. All doses reported in units of microsieverts per year.
2. Dose associated with cesium-137 includes dose due to external exposure to progeny of cesium-137 in air, water, soil, and sediment.
3. Dose associated with tritium oxide includes dose incurred via ingestion of organically bound tritium in fish, plant produce and animal products.

Table 88 - Dose to Representative Persons Located at BEC

Age Class	Radionuclide	Air Inhalation	Air Immersion	Water Ingestion	Water Immersion	Soil (ingestion and external)	Sediment (ingestion and external)	Fish Ingestion	Plant Ingestion	Animal Ingestion	Total
Adult	Carbon-14	5.3E-05	6.0E-08	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.3E-05
Adult	Cobalt-60	1.9E-07	7.3E-09	0.0E+00	0.0E+00	9.6E-04	0.0E+00	0.0E+00	0.0E+00	0.0E+00	9.6E-04
Adult	Cesium-134	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Adult	Cesium-137	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Adult	Tritium oxide	4.2E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.2E-02
Adult	Iodine, mixed fission products	1.9E-08	1.3E-09	0.0E+00	0.0E+00	2.1E-09	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.2E-08
Adult	Noble Gases	0.0E+00	2.8E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.8E-02
Adult	**Total**	**4.2E-02**	**2.8E-02**	**0.0E+00**	**0.0E+00**	**9.6E-04**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**0.0E+00**	**7.1E-02**

Note:

1. All doses reported in units of microsieverts per year.

2. Dose associated with cesium-137 includes dose due to external exposure to progeny of cesium-137 in air, water, soil, and sediment.

3. Dose associated with tritium oxide includes dose incurred via ingestion of organically bound tritium in fish, plant produce and animal products.

APPENDIX D: RADIOLOGICAL ENVIRONMENTAL MONITORING PROFICIENCY TESTING

As explained in Section 6.1.7.4, acceptance criteria for the Eckert & Ziegler Analytics Proficiency Testing are:

$$\frac{(V_L + 1\sigma_L)}{V_A} \geq 0.75 \text{ AND } \frac{(V_L - 1\sigma_L)}{V_A} \leq 1.2$$

Where:

V_L = Bruce Power Health Physics Laboratory value

σ_L = S_L, Bruce Power Health Physics Laboratory one sigma uncertainty value

V_A = Analytics Supplier value

Due to delays reestablishing the contract with the analytics supplier, there are no results for the first quarter of 2024. Additionally, the analytics supplier did not supply milk, soil and water samples with a cobalt-58 spike in the second quarter. Therefore, results for this radionuclide for quarter 2 were not available.

All results met the acceptance criteria for 2024.

Table 89 - 2024 Eckert & Ziegler Analytics Test Results for Tritium in Water

Quarter	Bruce Power Value V_L (Bq/L)	1 Standard Deviation (S_L)	Eckert & Ziegler Analytics Value V_A (Bq/L)	$(V_L+S_L)/V_A$	$(V_L-S_L)/V_A$
1	-	-	-	-	-
2	4.68E+02	1.99E+01	4.75E+02	103%	94%
3	5.36E+02	1.27E+01	5.37E+02	102%	97%
4	3.62E+02	1.22E+01	3.69E+02	101%	95%

Table 90 - 2024 Eckert & Ziegler Analytics Test Results for Gross Beta in Water

Quarter	Bruce Power Value V_L (Bq/L)	1 Standard Deviation (S_L)	Eckert & Ziegler Analytics Value V_A (Bq/L)	$(V_L+S_L)/V_A$	$(V_L-S_L)/V_A$
1	-	-	-	-	-
2	9.96E+00	4.73E-01	9.68E+00	108%	98%
3	9.37E+00	4.46E-01	9.23E+00	106%	97%
4	1.08E+01	5.15E-01	1.09E+01	104%	94%

Table 91 - 2024 Eckert & Ziegler Analytics Test Results for Iodine in Milk

Quarter	Bruce Power Value V_L (Bq/L)	1 Standard Deviation (S_L)	Eckert & Ziegler Analytics Value V_A (Bq/L)	$(V_L+S_L)/V_A$	$(V_L-S_L)/V_A$
1	-	-	-	-	-
2	6.16E-01	1.10E-01	6.86E-01	106%	74%
3	3.39E+00	3.17E-01	3.47E+00	107%	89%
4	2.62E+00	2.30E-01	2.49E+00	114%	96%

Table 92 - 2024 Eckert & Ziegler Analytics Test Results for Gamma in a Filter

Radionuclide	Bruce Power Value V_L (Bq)	1 Standard Deviation (S_L)	Eckert & Ziegler Analytics Value V_A (Bq)	$(V_L+S_L)/V_A$	$(V_L-S_L)/V_A$
Cerium-141	2.52E+00	1.55E-01	2.65E+00	101%	89%
Cobalt-58	3.15E+00	1.24E-01	3.47E+00	94%	87%
Cobalt-60	7.50E+00	1.70E-01	7.77E+00	99%	94%
Chromium-51	6.65E+00	9.43E-01	6.56E+00	116%	87%
Cesium-134	4.00E+00	1.29E-01	4.09E+00	101%	95%
Cesium-137	3.65E+00	1.43E-01	3.78E+00	100%	93%
Iron-59	3.77E+00	1.36E-01	3.68E+00	106%	99%
Manganese-54	5.43E+00	4.30E-01	5.51E+00	106%	91%
Zinc-65	2.52E+00	1.55E-01	2.65E+00	101%	89%

Table 93 - 2024 Eckert & Ziegler Analytics Test Results for Iodine-131 in a Cartridge

Radionuclide	Bruce Power Value V_L (Bq)	1 Standard Deviation (S_L)	Eckert & Ziegler Analytics Value V_A (Bq)	$(V_L+S_L)/V_A$	$(V_L-S_L)/V_A$
Iodine-131	2.78E+00	3.19E-01	3.42E+00	91%	72%

Table 94 - 2024 Eckert & Ziegler Analytics Test Results for Gamma in Milk

Quarter	Radionuclide	Bruce Power Value V_L (Bq/L)	1 Standard Deviation (S_L)	Eckert & Ziegler Analytics Value V_A (Bq/L)	$(V_L+S_L)/V_A$	$(V_L-S_L)/V_A$
1	Cerium-141	-	-	-	-	-
1	Cobalt-58	-	-	-	-	-
1	Cobalt-60	-	-	-	-	-
1	Chromium-51	-	-	-	-	-
1	Cesium-134	-	-	-	-	-
1	Cesium-137	-	-	-	-	-
1	Iron-59	-	-	-	-	-
1	Iodine-131	-	-	-	-	-
1	Manganese-54	-	-	-	-	-
1	Zinc-65	-	-	-	-	-
2	Cerium-141	1.12E+00	2.00E-01	1.06E+00	125%	87%
2	Cobalt-58	-	-	-	-	-
2	Cobalt-60	1.03E+01	1.81E-01	1.11E+01	94%	91%
2	Chromium-51	8.01E+00	4.23E-01	8.27E+00	102%	92%
2	Cesium-134	6.31E+00	1.12E-01	6.86E+00	94%	90%
2	Cesium-137	6.18E+00	1.59E-01	6.49E+00	98%	93%
2	Iron-59	4.61E+00	1.12E-01	4.93E+00	96%	91%
2	Iodine-131	3.24E+00	1.74E-01	3.40E+00	100%	90%
2	Manganese-54	5.48E+00	1.43E-01	5.79E+00	97%	92%
2	Zinc-65	2.58E+00	1.97E-01	2.81E+00	99%	85%
3	Cerium-141	4.62E+00	1.86E-01	4.58E+00	105%	97%
3	Cobalt-58	5.09E+00	1.17E-01	5.53E+00	94%	90%

Quarter	Radionuclide	Bruce Power Value V_L (Bq/L)	1 Standard Deviation (S_L)	Eckert & Ziegler Analytics Value V_A (Bq/L)	$(V_L+S_L)/V_A$	$(V_L-S_L)/V_A$
3	Cobalt-60	8.26E+00	1.30E-01	8.73E+00	96%	93%
3	Chromium-51	9.37E+00	4.38E-01	1.01E+01	97%	88%
3	Cesium-134	6.32E+00	1.81E-01	6.92E+00	94%	89%
3	Cesium-137	4.47E+00	1.15E-01	4.71E+00	97%	92%
3	Iron-59	4.05E+00	1.18E-01	4.20E+00	99%	94%
3	Iodine-131	3.27E+00	1.34E-01	3.29E+00	103%	95%
3	Manganese-54	5.62E+00	1.26E-01	5.98E+00	96%	92%
3	Zinc-65	9.21E+00	4.11E-01	1.02E+01	94%	86%
4	Cerium-141	2.68E+00	2.21E-01	2.65E+00	109%	93%
4	Cobalt-58	3.14E+00	9.31E-02	3.47E+00	93%	88%
4	Cobalt-60	7.21E+00	1.34E-01	7.77E+00	95%	91%
4	Chromium-51	6.54E+00	5.44E-01	6.55E+00	108%	92%
4	Cesium-134	3.73E+00	1.32E-01	5.11E+00	76%	70%
4	Cesium-137	4.99E+00	1.32E-01	5.11E+00	100%	95%
4	Iron-59	3.05E+00	4.69E-01	3.78E+00	93%	68%
4	Iodine-131	1.77E+00	1.15E-01	1.89E+00	100%	88%
4	Manganese-54	3.61E+00	1.01E-01	3.68E+00	101%	95%
4	Zinc-65	5.18E+00	2.21E-01	5.50E+00	98%	90%

Table 95 - 2024 Eckert & Ziegler Analytics Test Results for Gamma in Water

Quarter	Analyte	Bruce Power Value V_L (Bq/L)	1 Standard Deviation (S_L)	Eckert & Ziegler Analytics Value V_A (Bq/L)	$(V_L+S_L)/V_A$	$(V_L-S_L)/V_A$
1	Cerium-141	-	-	-	-	-
1	Cobalt-58	-	-	-	-	-
1	Cobalt-60	-	-	-	-	-
1	Chromium-51	-	-	-	-	-
1	Cesium-134	-	-	-	-	-
1	Cesium-137	-	-	-	-	-

Quarter	Analyte	Bruce Power Value V_L (Bq/L)	1 Standard Deviation (S_L)	Eckert & Ziegler Analytics Value V_A (Bq/L)	$(V_L+S_L)/V_A$	$(V_L-S_L)/V_A$
1	Iron-59	-	-	-	-	-
1	Iodine-131	-	-	-	-	-
1	Manganese-54	-	-	-	-	-
1	Zinc-65	-	-	-	-	-
2	Cerium-141	1.82E+00	2.46E-01	1.39E+00	149%	113%
2	Cobalt-58	-	-	-	-	-
2	Cobalt-60	1.47E+01	2.64E-01	1.45E+01	103%	100%
2	Chromium-51	1.10E+01	8.77E-01	1.08E+01	110%	94%
2	Cesium-134	9.09E+00	2.32E-01	8.95E+00	104%	99%
2	Cesium-137	8.52E+00	2.32E-01	8.46E+00	103%	98%
2	Iron-59	6.66E+00	1.72E-01	6.43E+00	106%	101%
2	Iodine-131	6.16E-01	1.10E-01	6.86E-01	106%	74%
2	Manganese-54	7.83E+00	2.14E-01	7.54E+00	107%	101%
2	Zinc-65	3.77E+00	1.88E-01	3.67E+00	108%	98%
3	Cerium-141	5.19E+00	2.10E-01	4.73E+00	114%	105%
3	Cobalt-58	5.86E+00	1.49E-01	5.71E+00	105%	100%
3	Cobalt-60	9.22E+00	2.37E-01	9.01E+00	105%	100%
3	Chromium-51	1.06E+01	8.79E-01	1.05E+01	110%	93%
3	Cesium-134	7.22E+00	1.49E-01	7.15E+00	103%	99%
3	Cesium-137	5.17E+00	1.37E-01	4.87E+00	109%	103%
3	Iron-59	4.54E+00	2.27E-01	4.33E+00	110%	100%
3	Iodine-131	3.39E+00	3.17E-01	3.47E+00	107%	89%
3	Manganese-54	6.49E+00	1.59E-01	6.17E+00	108%	103%
3	Zinc-65	1.08E+01	5.93E-01	1.05E+01	108%	97%
4	Cerium-141	4.12E+00	2.08E-01	3.47E+00	125%	113%
4	Cobalt-58	4.68E+00	1.53E-01	4.54E+00	106%	100%
4	Cobalt-60	1.03E+01	1.98E-01	1.02E+01	103%	99%
4	Chromium-51	8.73E+00	1.22E+00	8.59E+00	116%	87%
4	Cesium-134	5.45E+00	2.23E-01	5.37E+00	106%	97%

Quarter	Analyte	Bruce Power Value V_L (Bq/L)	1 Standard Deviation (S_L)	Eckert & Ziegler Analytics Value V_A (Bq/L)	$(V_L+S_L)/V_A$	$(V_L-S_L)/V_A$
4	Cesium-137	6.78E+00	1.82E-01	6.71E+00	104%	98%
4	Iron-59	5.24E+00	1.61E-01	4.95E+00	109%	103%
4	Iodine-131	2.62E+00	2.30E-01	2.49E+00	114%	96%
4	Manganese-54	5.29E+00	1.57E-01	4.83E+00	113%	106%
4	Zinc-65	6.95E+00	2.45E-01	7.22E+00	100%	93%

Table 96 - 2024 Eckert & Ziegler Analytics Test Results for Gamma in Soil

Quarter	Analyte	Bruce Power Value V_L (Bq/kg)	1 Standard Deviation (S_L)	Eckert & Ziegler Analytics Value V_A (Bq/kg)	$(V_L+S_L)/V_A$	$(V_L-S_L)/V_A$
1	Cerium-141	-	-	-	-	-
1	Cobalt-58	-	-	-	-	-
1	Cobalt-60	-	-	-	-	-
1	Chromium-51	-	-	-	-	-
1	Cesium-134	-	-	-	-	-
1	Cesium-137	-	-	-	-	-
1	Iron-59	-	-	-	-	-
1	Manganese-54	-	-	-	-	-
1	Zinc-65	-	-	-	-	-
2	Cerium-141	2.52E+00	1.58E-01	2.34E+00	115%	101%
2	Cobalt-58	-	-	-	-	-
2	Cobalt-60	2.20E+01	3.82E-01	2.44E+01	92%	89%
2	Chromium-51	1.70E+01	7.59E-01	1.82E+01	98%	89%
2	Cesium-134	1.35E+01	4.23E-01	1.51E+01	93%	87%
2	Cesium-137	1.53E+01	3.80E-01	1.67E+01	94%	89%
2	Iron-59	9.68E+00	2.61E-01	1.08E+01	92%	87%
2	Manganese-54	1.15E+01	3.03E-01	1.27E+01	93%	88%
2	Zinc-65	5.65E+00	2.26E-01	6.18E+00	95%	88%
3	Cerium-141	8.12E+00	2.67E-01	8.22E+00	102%	96%

Quarter	Analyte	Bruce Power Value V_L (Bq/kg)	1 Standard Deviation (S_L)	Eckert & Ziegler Analytics Value V_A (Bq/kg)	$(V_L+S_L)/V_A$	$(V_L-S_L)/V_A$
3	Cobalt-58	8.96E+00	1.96E-01	9.92E+00	92%	88%
3	Cobalt-60	1.44E+01	2.64E-01	1.57E+01	93%	90%
3	Chromium-51	1.66E+01	1.01E+00	1.82E+01	97%	86%
3	Cesium-134	1.08E+01	3.78E-01	1.24E+01	90%	84%
3	Cesium-137	1.01E+01	2.27E-01	1.09E+01	95%	90%
3	Iron-59	6.72E+00	1.90E-01	7.53E+00	92%	87%
3	Manganese-54	9.84E+00	2.20E-01	1.07E+01	94%	90%
3	Zinc-65	1.64E+01	5.02E-01	1.83E+01	93%	87%
4	Cerium-141	7.12E+00	2.79E-01	6.83E+00	108%	100%
4	Cobalt-58	7.84E+00	3.30E-01	8.94E+00	91%	84%
4	Cobalt-60	1.82E+01	3.30E-01	2.00E+01	93%	89%
4	Chromium-51	1.57E+01	8.14E-01	1.69E+01	98%	88%
4	Cesium-134	9.18E+00	3.25E-01	1.06E+01	90%	84%
4	Cesium-137	1.45E+01	3.65E-01	1.56E+01	95%	91%
4	Iron-59	8.54E+00	2.68E-01	9.49E+00	93%	87%
4	Manganese-54	8.86E+00	2.46E-01	9.49E+00	96%	91%
4	Zinc-65	1.27E+01	3.33E-01	1.42E+01	92%	87%

APPENDIX E: LAKE WATER QUALITY SAMPLE RESULTS

Where no value is provided for the screening criteria in the following tables, it means that no criteria are available to assess risk to receptors; often because the parameter is not associated with acute or chronic toxicity.

The screening criteria for dissolved oxygen is temperature dependent. For the purposes of this report, a temperature of 15°C was considered to derive the Provincial Water Quality Objective guideline of 6 mg/L

Un-ionized ammonia (NH_3) is calculated from measurements of total ammonia ($NH_3 + NH_4^+$), temperature and pH according to [R-176]. Ammonia concentrations reported in mg/L NH_3 units were converted to mg/L NH_3-N units by multiplying by 0.82247.

The following acronyms and shortforms are used in this appendix to describe the screening criteria applied to lake water quality sample results.

- CCME – Canadian Council of Ministers of the Environment
- PWQO–Ontario Provincial Water Quality Objectives
- O. Reg. 169/03 – Ontario Drinking Water Quality Standards
- GCDWQ - Guidelines for Canadian Drinking Water Quality
- SSTL – Site Specific Target Level, as defined in the 2022 Environmental Risk Assessment
- CEPA – Notice Requiring the preparation and implementation of pollution prevention plans in respect of hydrazine related to the electricity sector issued on November 10, 2018 under the Canadian Environmental Protection Act

Table 97 - The results of water quality samples taken in 2024 from Bruce A discharge (LWQ1) (1 metre below the lake surface) in Lake Huron.

Screening criteria chosen are the most conservative available. The screening criteria for aluminum varies and is calculated on a per sample basis using pH measured at the time of sampling event. The screening criteria for total cadmium, total copper, total lead and total nickel vary with hardness and are calculated on a per sample basis using hardness measured at the time of sampling event. The screening criteria for zinc varies and is calculated on a per sample basis using hardness, pH and Dissolved Organic Carbon measured at time of sampling event. Table results are in milligrams per litre mg/L and micrograms per litre ug/L.

Analyte	Unit	Lowest Screening Criteria Value	Source of Screening Criteria	Bruce A Discharge LWQ1 07/31/2024	Bruce A Discharge LWQ1 08/30/2024	Bruce A Discharge LWQ1 11/20/2024
Alkalinity, Total (as CaCO3)	mg/L	Not applicable	Not applicable	79.2	83.3	81.9
Aluminum	mg/L	0.075	PWQO	0.0063	0.0053	0.012
Ammonia, total (as N)	mg/L	Not applicable	Not applicable	0.0285	0.0306	0.213
Ammonia, unionized (as NH_3-N)	mg/L	0.0156	CCME	0.0103	0.0017	0.0165
Antimony	mg/L	0.006	GCDWQ and O. Reg. 169/03	0.00018	0.00012	0.00014
Arsenic	mg/L	0.005	CCME and PWQO	0.00048	0.0005	0.00049
Barium	mg/L	1.0	O. Reg. 169/03	0.0132	0.0144	0.0143
Benzene	ug/L	1.0	O. Reg. 169/03	< 0.5	< 0.5	< 0.5
Boron	mg/L	0.200	PWQO	0.015	0.013	0.016
Cadmium	mg/L	0.00015	CCME	0.0000057	< 0.000005	< 0.000005
Carbon, dissolved organic [DOC]	mg/L	Not applicable	Not applicable	2.23	2.39	2.67
Chloride (Cl)	mg/L	120	CCME	7.88	7.73	7.77
Chromium (Total)	mg/L	0.050	O. Reg. 169/03 and GC DWQ	< 0.0005	< 0.0005	< 0.0005
Chromium, Hexavalent (Cr6+)	mg/L	0.001	CCME and PWQO	< 0.0005	< 0.0005	< 0.0005
Chromium, trivalent [Cr III]	mg/L	0.0089	CCME and PWQO	< 0.0005	< 0.0005	< 0.0005

Analyte	Unit	Lowest Screening Criteria Value	Source of Screening Criteria	Bruce A Discharge LWQ1 07/31/2024	Bruce A Discharge LWQ1 08/30/2024	Bruce A Discharge LWQ1 11/20/2024
Copper	mg/L	0.00231 - 0.00238	CCME	0.00076	0.00066	0.00177
Dissolved Oxygen	mg/L	6.0	PWQO	5.31	6.72	10.1
Ethylbenzene	ug/L	8.0	PWQO	< 0.5	< 0.5	< 0.5
F1 (C6-C10)	ug/L	Not applicable	Not applicable	< 25	< 25	< 25
F1-BTEX	ug/L	Not applicable	Not applicable	< 25	< 25	< 25
F2 (C10-C16)	ug/L	Not applicable	Not applicable	< 100	< 100	< 100
F3 (C16-C34)	ug/L	Not applicable	Not applicable	< 250	< 250	< 250
F4 (C34-C50)	ug/L	Not applicable	Not applicable	< 250	< 250	< 250
Reached Baseline at C50	None	Not applicable	Not applicable	Yes	Yes	Yes
Fluoride	mg/L	0.120	CCME	0.071	0.07	0.074
Hardness (as CaCO3)	mg/L	Not applicable	Not applicable	96.4	94.3	97.4
Hydrazine	ug/L	26.0	CEPA	< 3.0	< 3.1	< 3.1
Iron	mg/L	0.300	GCDWQ	0.021	0.075	0.019
Lead	mg/L	0.00293 - 0.00318	CCMEC	0.000201	0.000261	0.00142
Mercury	mg/L	0.000026	CCME	< 0.000005	< 0.000005	< 0.000005
Molybdenum	mg/L	0.040	PWQO	0.000486	0.000496	0.000492
Morpholine	ug/L	4.0	PWQO	2.6	1.9	3.2
Nickel	mg/L	0.025	PWQO	< 0.0005	< 0.0005	< 0.0005
Nitrate (as N)	mg/L	2.9	CCME	0.248	0.235	0.247
Nitrite (as N)	mg/L	0.060	CCME	< 0.01	< 0.01	< 0.01
o-Xylene	ug/L	Not applicable	Not applicable	< 0.3	< 0.3	< 0.3
pH	None	6.5-8.5	PWQO	7.74	7.89	8.33
Phenols, total (4AAP)	mg/L	0.001	PWQO	0.0032	0.004	0.0042
Phosphorus	mg/L	0.020	PWQO	0.0051	0.0078	0.0057
Selenium	mg/L	0.050	CCME	0.000102	0.0001	0.000101
Solids, total suspended [TSS]	mg/L	Not applicable	Not applicable	< 3	< 3	< 3

Analyte	**Unit**	**Lowest Screening Criteria Value**	**Source of Screening Criteria**	**Bruce A Discharge LWQ1 07/31/2024**	**Bruce A Discharge LWQ1 08/30/2024**	**Bruce A Discharge LWQ1 11/20/2024**
Specific Conductivity	uS/cm	Not applicable	Not applicable	421	330	525
Sulfate	mg/L	Not applicable	Not applicable	14.3	14.9	14.8
Temperature	˚C	Not applicable	Not applicable	32.0	29.4	19.9
Toluene	ug/L	0.8	PWQO	< 0.5	< 0.5	< 0.5
Total dissolved solids	mg/L	Not applicable	Not applicable	104	114	94
Uranium (U)	mg/L	0.020	O. Reg. 169/03	0.000237	0.000238	0.000212
Vanadium	mg/L	0.006	PWQO	< 0.0005	< 0.0005	< 0.0005
Xylenes, m & p	ug/L	Not applicable	Not applicable	< 0.4	< 0.4	< 0.4
Xylenes, Total	ug/L	2.0	PWQO	< 0.5	< 0.5	< 0.5
Zinc	mg/L	0.013 - 0.020	CCMEC and PWQO	< 0.003	< 0.003	0.0038

Table 98 - The results of water quality samples taken in 2024 from Bruce B discharge (LWQ2) (1 metre below the lake surface) in Lake Huron.

Screening criteria chosen are the most conservative available. The screening criteria for aluminum varies and is calculated on a per sample basis using pH measured at the time of sampling event. The screening criteria for total cadmium, total copper, total lead and total nickel vary with hardness and are calculated on a per sample basis using hardness measured at the time of sampling event. The screening criteria for zinc varies and is calculated on a per sample basis using hardness, pH and Dissolved Organic Carbon measured at time of sampling event. Table results are in milligrams per litre mg/L, micrograms per litre ug/L, and microsiemens per centimeter uS/cm.

Analyte	Unit	Lowest Screening Criteria Value	Source of Screening Criteria	Bruce B Discharge LWQ2 07/31/2024	Bruce B Discharge LWQ2 (Duplicate) 07/31/2024	Bruce B Discharge LWQ2 08/30/2024	Bruce B Discharge LWQ2 11/20/2024
Alkalinity, Total (as CaCO3)	mg/L	Not applicable	Not applicable	78.7	78	83.4	83.2
Aluminum	mg/L	0.075	PWQO	0.0106	0.0087	0.0061	0.0124
Ammonia, total (as N)	mg/L	Not applicable	Not applicable	0.511	0.751	0.0396	0.0983
Ammonia, unionized (as NH_3-N)	mg/L	0.0156	CCME	0.0051	0.0040	0.0025	0.0046
Antimony	mg/L	0.006	GCDWQ and O. Reg. 169/03	0.00014	0.00011	0.00013	0.00013
Arsenic	mg/L	0.005	CCME and PWQO	0.00048	0.00049	0.00053	0.00051
Barium	mg/L	1.0	O. Reg. 169/03	0.0135	0.0135	0.0142	0.0149
Benzene	ug/L	1.0	O. Reg. 169/03	< 0.5	< 0.5	< 0.5	< 0.5
Boron	mg/L	0.200	PWQO	0.016	0.015	0.013	0.015
Cadmium	mg/L	0.00015	CCME	0.0000072	< 0.000005	< 0.000005	< 0.000005
Carbon, dissolved organic [DOC]	mg/L	Not applicable	Not applicable	2.34	2.15	2.11	2.53
Chloride (Cl)	mg/L	120	CCME	8.95	7.96	7.75	7.85

Analyte	Unit	Lowest Screening Criteria Value	Source of Screening Criteria	Bruce B Discharge LWQ2 07/31/2024	Bruce B Discharge LWQ2 (Duplicate) 07/31/2024	Bruce B Discharge LWQ2 08/30/2024	Bruce B Discharge LWQ2 11/20/2024
Chromium (Total)	mg/L	0.050	O. Reg. 169/03 and GCDWQ	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Chromium, Hexavalent (Cr6+)	mg/L	0.001	CCME and PWQO	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Chromium, trivalent [Cr III]	mg/L	0.0089	CCME and PWQO	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper	mg/L	0.00231 - 0.00238	CCME	0.00104	0.00095	0.00059	0.00115
Dissolved Oxygen	mg/L	6.0	PWQO	5.91	5.91	6.20	8.70
Ethylbenzene	ug/L	8.0	PWQO	< 0.5	< 0.5	< 0.5	< 0.5
F1 (C6-C10)	ug/L	Not applicable	Not applicable	< 25	< 25	< 25	< 25
F1-BTEX	ug/L	Not applicable	Not applicable	< 25	< 25	< 25	< 25
F2 (C10-C16)	ug/L	Not applicable	Not applicable	< 100	< 100	< 100	< 100
F3 (C16-C34)	ug/L	Not applicable	Not applicable	< 250	< 250	< 250	< 250
F4 (C34-C50)	ug/L	Not applicable	Not applicable	< 250	< 250	< 250	< 250
Reached Baseline at C50	None	Not applicable	Not applicable	Yes	Yes	Yes	Yes
Fluoride	mg/L	0.120	CCME	0.071	0.07	0.069	0.074
Hardness (as CaCO3)	mg/L	Not applicable	Not applicable	97	99	93.8	99.2
Hydrazine	ug/L	26.0	CEPA	< 3.0	< 3.0	< 3.1	< 3.1
Iron	mg/L	0.300	GCDWQ	0.04	0.03	0.06	0.028
Lead	mg/L	0.00293 - 0.00318	CCME	0.000514	0.000307	0.000248	0.000542
Mercury	mg/L	0.000026	CCME	< 0.000005	< 0.000005	< 0.000005	< 0.000005

Analyte	Unit	Lowest Screening Criteria Value	Source of Screening Criteria	Bruce B Discharge LWQ2 07/31/2024	Bruce B Discharge LWQ2 (Duplicate) 07/31/2024	Bruce B Discharge LWQ2 08/30/2024	Bruce B Discharge LWQ2 11/20/2024
Molybdenum	mg/L	0.040	PWQO	0.000474	0.00048	0.000498	0.00049
Morpholine	ug/L	4.0	PWQO	2.2	2.3	2.4	3.7
Nickel	mg/L	0.025	PWQO	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Nitrate (as N)	mg/L	2.9	CCME	0.249	0.242	0.237	0.244
Nitrite (as N)	mg/L	0.060	CCME	< 0.01	< 0.01	< 0.01	< 0.01
o-Xylene	ug/L	Not applicable	Not applicable	< 0.3	< 0.3	< 0.3	< 0.3
pH	None	6.5-8.5	PWQO	7.81	7.81	7.87	8.12
Phenols, total (4AAP)	mg/L	0.001	PWQO	0.0059	0.0068	0.0036	0.0025
Phosphorus	mg/L	0.020	PWQO	0.0073	0.0063	0.0089	0.0062
Selenium	mg/L	0.050	CCME	0.000113	0.000112	0.0001	0.000102
Solids, total suspended [TSS]	mg/L	Not applicable	Not applicable	< 3	< 3	< 3	< 3
Specific Conductivity	uS/cm	Not applicable	Not applicable	487	487	343	553
Sulfate	mg/L	Not applicable	Not applicable	14.8	14.2	14.4	14.8
Temperature	˚C	Not applicable	Not applicable	30.9	30.9	29.0	19.1
Toluene	ug/L	0.8	PWQO	< 0.5	< 0.5	< 0.5	< 0.5
Total dissolved solids	mg/L	Not applicable	Not applicable	97	101	123	95
Uranium (U)	mg/L	0.020	O. Reg. 169/03	0.000242	0.000242	0.000231	0.000223
Vanadium	mg/L	0.006	PWQO	< 0.0005	< 0.0005	< 0.0005	< 0.0005

Analyte	Unit	Lowest Screening Criteria Value	Source of Screening Criteria	Bruce B Discharge LWQ2 07/31/2024	Bruce B Discharge LWQ2 (Duplicate) 07/31/2024	Bruce B Discharge LWQ2 08/30/2024	Bruce B Discharge LWQ2 11/20/2024
Xylenes, m & p	ug/L	Not applicable	Not applicable	< 0.4	< 0.4	< 0.4	< 0.4
Xylenes, Total	ug/L	2.0	PWQO	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	mg/L	0.013 - 0.020	CCME and PWQO	0.0031	< 0.003	< 0.003	0.0037

Table 99 - The results of water quality samples taken in 2024 from Baie du Doré (LWQ5) (1 metre below the lake surface) in Lake Huron.

Screening criteria chosen are the most conservative available. The screening criteria for aluminum varies and is calculated on a per sample basis using pH measured at the time of sampling event. The screening criteria for total cadmium, total copper, total lead and total nickel vary with hardness and are calculated on a per sample basis using hardness measured at the time of sampling event. The screening criteria for zinc varies and is calculated on a per sample basis using hardness, pH and Dissolved Organic Carbon measured at time of sampling event. Table results are in milligrams per litre mg/L, micrograms per litre ug/L, and microsiemens per centimeter uS/cm.

Analyte	Unit	Lowest Screening Criteria Value	Source of Screening Criteria	Baie du Doré LWQ5 07/31/2024	Baie du Doré LWQ5 08/30/2024	Baie du Doré LWQ5 11/20/2024
Alkalinity, Total (as CaCO3)	mg/L	Not applicable	Not applicable	80.4	83.8	83
Aluminum	mg/L	0.075	PWQO	0.0095	0.0044	0.0106
Ammonia, total (as N)	mg/L	Not applicable	Not applicable	1.15	0.0479	0.561
Ammonia, unionized (as NH_3-N)	mg/L	0.0156	CCME	0.0023	0.0005	0.0106
Antimony	mg/L	0.006	G C D W Q and O. Reg. 169/03	0.00018	0.00011	0.00015
Arsenic	mg/L	0.005	CCME and PWQO	0.00048	0.00052	0.00052
Barium	mg/L	1.0	O. Reg. 169/03	0.0134	0.0145	0.0148
Benzene	ug/L	1.0	O. Reg. 169/03	< 0.5	< 0.5	< 0.5
Boron	mg/L	0.200	PWQO	0.015	0.014	0.015
Cadmium	mg/L	0.00015	CCME	< 0.000005	< 0.000005	< 0.000005
Carbon, dissolved organic [DOC]	mg/L	Not applicable	Not applicable	2.61	2.09	2.54
Chloride (Cl)	mg/L	120	CCME	8.03	7.77	7.8
Chromium (Total)	mg/L	0.050	O. Reg. 169/03 and GCDWQ	< 0.0005	< 0.0005	< 0.0005
Chromium, Hexavalent (Cr6+)	mg/L	0.001	CCME and PWQO	< 0.0005	< 0.0005	< 0.0005

Analyte	Unit	Lowest Screening Criteria Value	Source of Screening Criteria	Baie du Doré LWQ5 07/31/2024	Baie du Doré LWQ5 08/30/2024	Baie du Doré LWQ5 11/20/2024
Chromium, trivalent [Cr III]	mg/L	0.0089	CCME and PWQO	< 0.0005	< 0.0005	< 0.0005
Copper	mg/L	0.00231 - 0.00238	CCME	0.0005	< 0.0005	0.00082
Dissolved Oxygen	mg/L	6.0	PWQO	7.95	7.05	11.8
Ethylbenzene	ug/L	8.0	PWQO	< 0.5	< 0.5	< 0.5
F1 (C6-C10)	ug/L	Not applicable	Not applicable	< 25	< 25	< 25
F1-BTEX	ug/L	Not applicable	Not applicable	< 25	< 25	< 25
F2 (C10-C16)	ug/L	Not applicable	Not applicable	< 100	< 100	< 100
F3 (C16-C34)	ug/L	Not applicable	Not applicable	< 250	< 250	< 250
F4 (C34-C50)	ug/L	Not applicable	Not applicable	< 250	< 250	< 250
Reached Baseline at C50	None	Not applicable	Not applicable	Yes	Yes	Yes
Fluoride	mg/L	0.120	CCME	0.071	0.07	0.075
Hardness (as CaCO3)	mg/L	Not applicable	Not applicable	96.3	94	98.8
Hydrazine	ug/L	26.0	CEPA	< 3.0	< 3.1	< 3.1
Iron	mg/L	0.300	GCDWQ	0.014	0.014	0.02
Lead	mg/L	0.00293 - 0.00318	CCME	0.000133	0.000084	0.000836
Mercury	mg/L	0.000026	CCME	< 0.000005	< 0.000005	< 0.000005
Molybdenum	mg/L	0.040	PWQO	0.000484	0.000486	0.000507
Morpholine	ug/L	4.0	PWQO	1.2	< 1	< 1
Nickel	mg/L	0.025	PWQO	< 0.0005	< 0.0005	< 0.0005
Nitrate (as N)	mg/L	2.9	CCME	0.206	0.214	0.246

Analyte	Unit	Lowest Screening Criteria Value	Source of Screening Criteria	Baie du Doré LWQ5 07/31/2024	Baie du Doré LWQ5 08/30/2024	Baie du Doré LWQ5 11/20/2024
Nitrite (as N)	mg/L	0.060	CCME	< 0.01	< 0.01	< 0.01
o-Xylene	ug/L	Not applicable	Not applicable	< 0.3	< 0.3	< 0.3
pH	None	6.5-8.5	PWQO	7.00	7.35	7.99
Phenols, total (4AAP)	mg/L	0.001	PWQO	0.0016	0.0013	0.0142
Phosphorus	mg/L	0.020	PWQO	0.0059	0.0074	0.0062
Selenium	mg/L	0.050	CCME	0.000098	0.000098	0.000092
Solids, total suspended [TSS]	mg/L	Not applicable	Not applicable	< 3	< 3	< 3
Specific Conductivity	uS/cm	Not applicable	Not applicable	378	240	399
Sulfate	mg/L	Not applicable	Not applicable	14.4	14.2	14.8
Temperature	˚C	Not applicable	Not applicable	20.3	22.3	10.8
Toluene	ug/L	0.8	PWQO	< 0.5	< 0.5	< 0.5
Total dissolved solids	mg/L	Not applicable	Not applicable	102	112	97
Uranium (U)	mg/L	0.020	O. Reg. 169/03	0.000237	0.000227	0.000216
Vanadium	mg/L	0.006	PWQO	< 0.0005	< 0.0005	< 0.0005
Xylenes, m & p	ug/L	Not applicable	Not applicable	< 0.4	< 0.4	< 0.4
Xylenes, Total	ug/L	2.0	PWQO	< 0.5	< 0.5	< 0.5
Zinc	mg/L	0.013 - 0.020	CCME and PWQO	< 0.003	< 0.003	< 0.003

Table 100 - The results of water quality samples taken in 2024 near MacGregor Point (LWQ7) (1 metre below the lake surface) in Lake Huron.

Screening criteria chosen are the most conservative available. The screening criteria for aluminum varies and is calculated on a per sample basis using pH measured at the time of sampling event. The screening criteria for total cadmium, total copper, total lead and total nickel vary with hardness and are calculated on a per sample basis using hardness measured at the time of sampling event. The screening criteria for zinc varies and is calculated on a per sample basis using hardness, pH and Dissolved Organic Carbon measured at time of sampling event. Table results are in milligrams per litre mg/L, micrograms per litre ug/L, and microsiemens per centimeter uS/cm.

Analyte	Unit	Lowest Screening Criteria Value	Source of Screening Criteria	MacGregor Point LWQ7 07/31/2024	MacGregor Point LWQ7 08/30/2024	MacGregor Point LWQ7 (Duplicate) 08/30/2024	MacGregor Point LWQ7 11/20/2024	MacGregor Point LWQ7 (Duplicate) 11/20/2024
Alkalinity, Total (as CaCO3)	mg/L	Not applicable	Not applicable	81.6	81.8	83.5	82.9	81.7
Aluminum	mg/L	0.075	PWQO	0.0101	0.0066	0.0074	0.0114	0.0104
Ammonia, total (as N)	mg/L	Not applicable	Not applicable	3.46	0.107	0.0631	0.319	0.0763
Ammonia, unionized (as NH_3-N)	mg/L	0.0156	CCME	0.0023	0.0035	0.0040	0.0039	0.0009
Antimony	mg/L	0.006	G C D W Q and O. Reg. 169/03	0.00048	0.00014	0.00012	0.00028	0.00017
Arsenic	mg/L	0.005	CCME and PWQO	0.00049	0.00052	0.00051	0.00052	0.00051
Barium	mg/L	1.0	O. Reg. 169/03	0.0138	0.0148	0.0145	0.0159	0.0147
Benzene	ug/L	1.0	O. Reg. 169/03	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Boron	mg/L	0.200	PWQO	0.016	0.014	0.014	0.016	0.015
Cadmium	mg/L	0.00015	CCME	0.0000223	0.0000051	< 0.000005	0.0000056	< 0.000005
Carbon, dissolved organic [DOC]	mg/L	Not applicable	Not applicable	2.65	2.47	2.16	3.2	2.3
Chloride (Cl)	mg/L	120	CCME	8.16	7.8	7.72	8.62	7.86

Analyte	Unit	Lowest Screening Criteria Value	Source of Screening Criteria	MacGregor Point LWQ7 07/31/2024	MacGregor Point LWQ7 08/30/2024	MacGregor Point LWQ7 (Duplicate) 08/30/2024	MacGregor Point LWQ7 11/20/2024	MacGregor Point LWQ7 (Duplicate) 11/20/2024
Chromium (Total)	mg/L	0.050	O. Reg. 169/03 and GCDWQ	0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Chromium, Hexavalent (Cr6+)	mg/L	0.001	CCME and PWQO	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Chromium, trivalent [Cr III]	mg/L	0.0089	CCME and PWQO	0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper	mg/L	0.00231 - 0.00238	CCME	0.00178	0.00084	0.00085	0.00084	0.00054
Dissolved Oxygen	mg/L	6.0	PWQO	8.71	7.10	7.10	9.85	9.85
Ethylbenzene	ug/L	8.0	PWQO	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
F1 (C6-C10)	ug/L	Not applicable	Not applicable	< 25	< 25	< 25	30	37
F1-BTEX	ug/L	Not applicable	Not applicable	< 25	< 25	< 25	30	37
F2 (C10-C16)	ug/L	Not applicable	Not applicable	< 110	< 100	< 100	< 100	< 100
F3 (C16-C34)	ug/L	Not applicable	Not applicable	< 250	< 250	< 250	< 250	< 250
F4 (C34-C50)	ug/L	Not applicable	Not applicable	< 250	< 250	< 250	< 250	< 250
Reached Baseline at C50	None	Not applicable	Not applicable	Yes	Yes	Yes	Yes	Yes
Fluoride	mg/L	0.120	CCME	0.075	0.069	0.069	0.075	0.075
Hardness (as CaCO3)	mg/L	Not applicable	Not applicable	97.2	93.8	94.5	101	99.7
Hydrazine	ug/L	26.0	C E P A	<3.0	<3.1	<3.1	<3.1	<3.1
Iron	mg/L	0.300	GCDWQ	0.041	0.015	0.06	0.024	0.02
Lead	mg/L	0.00293 - 0.00318	CCME	0.000449	0.000519	0.000398	0.000341	0.000206

Analyte	Unit	Lowest Screening Criteria Value	Source of Screening Criteria	MacGregor Point LWQ7 07/31/2024	MacGregor Point LWQ7 08/30/2024	MacGregor Point LWQ7 (Duplicate) 08/30/2024	MacGregor Point LWQ7 11/20/2024	MacGregor Point LWQ7 (Duplicate) 11/20/2024
Mercury	mg/L	0.000026	CCME	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
Molybdenum	mg/L	0.040	PWQO	0.00049	0.000514	0.000495	0.000506	0.00051
Morpholine	ug/L	4.0	PWQO	< 1	< 1	< 1	< 1	< 1
Nickel	mg/L	0.025	PWQO	0.00055	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Nitrate (as N)	mg/L	2.9	CCME	0.225	0.236	0.212	0.237	0.236
Nitrite (as N)	mg/L	0.060	CCME	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
o-Xylene	ug/L	Not applicable	Not applicable	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
pH	None	6.5-8.5	PWQO	7.14				
Phenols, total (4AAP)	mg/L	0.001	PWQO	0.003	0.0056	< 0.001	0.0028	< 0.001
Phosphorus	mg/L	0.020	PWQO	0.0049	0.0175	0.0058	0.0073	0.0037
Selenium	mg/L	0.050	CCME	0.000114	0.000114	0.0001	0.000106	0.000115
Solids, total suspended [TSS]	mg/L	Not applicable	Not applicable	< 3	< 3	< 3	< 3	< 3
Specific Conductivity	uS/cm	Not applicable	Not applicable	373	216	216	227	227
Sulfate	mg/L	Not applicable	Not applicable	14.3	14.1	14.1	15.9	15.3
Temperature	˚C	Not applicable	Not applicable	23.7	19.5	19.5	10.0	10.0
Toluene	ug/L	0.8	PWQO	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Total dissolved solids	mg/L	Not applicable	Not applicable	92	119	117	112	112
Uranium (U)	mg/L	0.020	O. Reg. 169/03	0.000241	0.000226	0.000231	0.000214	0.00022
Vanadium	mg/L	0.006	PWQO	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005

Analyte	Unit	Lowest Screening Criteria Value	Source of Screening Criteria	MacGregor Point LWQ7 07/31/2024	MacGregor Point LWQ7 08/30/2024	MacGregor Point LWQ7 (Duplicate) 08/30/2024	MacGregor Point LWQ7 11/20/2024	MacGregor Point LWQ7 (Duplicate) 11/20/2024
Xylenes, m & p	ug/L	Not applicable	Not applicable	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Xylenes, Total	ug/L	2.0	PWQO	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	mg/L	0.013 - 0.020	CCME and PWQO	0.0053	< 0.003	< 0.003	0.0043	< 0.003

Table 101 - The results of water quality samples taken in 2024 near McRae Point (LWQ8) (1 metre below the lake surface) in Lake Huron.

Screening criteria chosen are the most conservative available. The screening criteria for aluminum varies and is calculated on a per sample basis using pH measured at the time of sampling event. The screening criteria for total cadmium, total copper, total lead and total nickel vary with hardness and are calculated on a per sample basis using hardness measured at the time of sampling event. The screening criteria for zinc varies and is calculated on a per sample basis using hardness, pH and Dissolved Organic Carbon measured at time of sampling event. Table results are in milligrams per litre mg/L, micrograms per litre ug/L, and microsiemens per centimeter uS/cm.

Analyte	Unit	Lowest Screening Criteria Value	Source of Screening Criteria	McRae Point LWQ8 07/31/2024	McRae Point LWQ8 08/30/2024	McRae Point LWQ8 11/20/2024
Alkalinity, Total (as CaCO3)	mg/L	Not applicable	Not applicable	81	81.4	79.7
Aluminum	mg/L	0.075	PWQO	0.0119	0.0097	0.0094
Ammonia, total (as N)	mg/L	Not applicable	Not applicable	4.32	0.207	0.252
Ammonia, unionized (as NH_3-N)	mg/L	0.0156	CCME	0.0080	0.0023	0.0047
Antimony	mg/L	0.006	GCDWQ and O. Reg. 169/03	0.00036	0.00013	0.00015
Arsenic	mg/L	0.005	CCME and PWQO	0.0005	0.0005	0.00052
Barium	mg/L	1.0	O. Reg. 169/03	0.0137	0.0149	0.0145
Benzene	ug/L	1.0	O. Reg. 169/03	< 0.5	< 0.5	< 0.5
Boron	mg/L	0.200	PWQO	0.016	0.014	0.015
Cadmium	mg/L	0.00015	CCME	0.0000106	0.0000056	< 0.000005
Carbon, dissolved organic [DOC]	mg/L	Not applicable	Not applicable	2.45	2.7	2.6
Chloride (Cl)	mg/L	120	CCME	7.92	8.64	7.82
Chromium (Total)	mg/L	0.050	O. Reg. 169/03 and GCDWQ	0.00057	< 0.0005	< 0.0005
Chromium, Hexavalent (Cr6+)	mg/L	0.001	CCME and PWQO	< 0.0005	< 0.0005	< 0.0005

Analyte	Unit	Lowest Screening Criteria Value	Source of Screening Criteria	McRae Point LWQ8 07/31/2024	McRae Point LWQ8 08/30/2024	McRae Point LWQ8 11/20/2024
Chromium, trivalent [Cr III]	mg/L	0.0089	CCME and PWQO	0.00057	< 0.0005	< 0.0005
Copper	mg/L	0.00231 - 0.00238	CCME	0.00109	0.00172	0.00094
Dissolved Oxygen	mg/L	6.0	PWQO	7.81	7.60	8.90
Ethylbenzene	ug/L	8.0	PWQO	< 0.5	< 0.5	< 0.5
F1 (C6-C10)	ug/L	Not applicable	Not applicable	< 25	< 25	36
F1-BTEX	ug/L	Not applicable	Not applicable	< 25	< 25	36
F2 (C10-C16)	ug/L	Not applicable	Not applicable	< 100	< 100	< 100
F3 (C16-C34)	ug/L	Not applicable	Not applicable	< 250	< 250	< 250
F4 (C34-C50)	ug/L	Not applicable	Not applicable	< 250	< 250	< 250
Reached Baseline at C50	None	Not applicable	Not applicable	Yes	Yes	Yes
Fluoride	mg/L	0.120	CCME	0.07	0.072	0.074
Hardness (as CaCO3)	mg/L	Not applicable	Not applicable	99.9	95.8	99.2
Hydrazine	ug/L	26.0	CEPA	<3.0	<3.1	<3.1
Iron	mg/L	0.300	GCDWQ	0.068	0.114	0.011
Lead	mg/L	0.00293 - 0.00318	CCME	0.000562	0.00061	0.000234
Mercury	mg/L	0.000026	CCME	< 0.000005	< 0.000005	< 0.000005
Molybdenum	mg/L	0.040	PWQO	0.000489	0.000504	0.000496
Morpholine	ug/L	4.0	PWQO	< 1	< 1	< 1
Nickel	mg/L	0.025	PWQO	< 0.0005	0.00056	< 0.0005
Nitrate (as N)	mg/L	2.9	CCME	0.217	0.222	0.248

Analyte	Unit	Lowest Screening Criteria Value	Source of Screening Criteria	McRae Point LWQ8 07/31/2024	McRae Point LWQ8 08/30/2024	McRae Point LWQ8 11/20/2024
Nitrite (as N)	mg/L	0.060	CCME	< 0.01	< 0.01	< 0.01
o-Xylene	ug/L	Not applicable	Not applicable	< 0.3	< 0.3	< 0.3
pH	None	6.5-8.5	PWQO	7.83	7.45	7.98
Phenols, total (4AAP)	mg/L	0.001	PWQO	0.0052	0.0029	0.0028
Phosphorus	mg/L	0.020	PWQO	0.017	0.0111	0.0045 < 0.05
Selenium	mg/L	0.050	CCME	0.000106	0.000103	0.000122
Solids, total suspended [TSS]	mg/L	Not applicable	Not applicable	< 3	< 3	< 3
Specific Conductivity	uS/cm	Not applicable	Not applicable	298	234	286
Sulfate	mg/L	Not applicable	Not applicable	14.4	14.9	14.8
Temperature	˚C	Not applicable	Not applicable	22.8	20.1	10.8
Toluene	ug/L	0.8	PWQO	< 0.5	< 0.5	< 0.5
Total dissolved solids	mg/L	Not applicable	Not applicable	88	125	107
Uranium (U)	mg/L	0.020	O. Reg. 169/03	0.000246	0.000233	0.000216
Vanadium	mg/L	0.006	PWQO	< 0.0005	< 0.0005	< 0.0005
Xylenes, m & p	ug/L	Not applicable	Not applicable	< 0.4	< 0.4	< 0.4
Xylenes, Total	ug/L	2.0	PWQO	< 0.5	< 0.5	< 0.5
Zinc	mg/L	0.013 - 0.020	CCME and PWQO	0.0037	0.0061	0.0078

Table 102 - The range and number of water quality measurements taken from Lake Huron monitoring locations near Bruce Power between 2020 and 2024.

Table results are in milligrams per litre mg/L, micrograms per litre ug/L, and microsiemens per centimeter uS/cm.

Parameter	Unit	Historical Trend (2020 – 2024) Range (min to max)	Historical Trend (2020 – 2024) Number of observations	Historical Trend (2020 – 2024) Number of exceedances (if applicable)
Alkalinity, Total (as CaCO3)	mg/L	77.7 – 145	43	Not applicable
Aluminum	mg/L	<0.005 – 1.650	46	3
Ammonia, total (as N)	mg/L	<0.0102 – 1.121	51	Not applicable
Ammonia, unionized (as NH_3-N)	mg/L	<Detect - 0.170	51	11
Antimony	mg/L	0.00010 – 0.00048	32	0
Arsenic	mg/L	0.00049 – 1.07000	46	0
Barium	mg/L	0.00142 – 0.02440	32	0
Benzene	ug/L	<0.50	43	0
Boron	mg/L	0.011 – 0.021	46	0
Cadmium	mg/L	<0.000005 – 0.000037	46	0
Carbon, dissolved organic [DOC]	mg/L	1.9 – 4.8	32	Not applicable
Chloride (Cl)	mg/L	7.60 – 11.9	43	0
Chromium (Total)	mg/L	<0.5 – 3.46	46	0
Chromium, Hexavalent (Cr6+)	mg/L	<0.5 – 0.58	43	0
Chromium, trivalent [Cr III]	mg/L	<0.5 – 3.46	38	0

Parameter	**Unit**	**Historical Trend (2020 – 2024) Range (min to max)**	**Historical Trend (2020 – 2024) Number of observations**	**Historical Trend (2020 – 2024) Number of exceedances (if applicable)**
Copper	mg/L	<0.5 – 3.3	46	2
Dissolved Oxygen	mg/L	5.3 – 15.9	42	3
Ethylbenzene	ug/L	<0.20 - <0.50	43	0
F1 (C6-C10)	ug/L	<25	43	Not applicable
F1-BTEX	ug/L	<25	43	Not applicable
F2 (C10-C16)	ug/L	<100	43	Not applicable
F3 (C16-C34)	ug/L	<250	43	Not applicable
F4 (C34-C50)	ug/L	<250	43	Not applicable
Reached Baseline at C50	None	Yes	43	Not applicable
Fluoride	mg/L	0.069 – 0.118	43	0
Hardness (as $CaCO_3$)	mg/L	92.6 - 163	38	Not applicable
Hydrazine	ug/L	<0.20 – 7.1	43	0
Iron	mg/L	<0.0100 – 1.960	46	1
Lead	mg/L	<0.00005 – 0.011	46	2
Mercury	mg/L	<0.000005	46	0
Molybdenum	mg/L	0.00041 – 0.00056	32	0
Morpholine	ug/L	<1.00 – 3.70	38	0
Nickel	mg/L	<0.0005 - 2.74	46	0
Nitrate (as N)	mg/L	0.20 – 0.90	43	0

Parameter	**Unit**	**Historical Trend (2020 – 2024)** **Range (min to max)**	**Historical Trend (2020 – 2024)** **Number of observations**	**Historical Trend (2020 – 2024)** **Number of exceedances (if applicable)**
Nitrite (as N)	mg/L	<0.010 - <0.050	46	0
o-Xylene	ug/L	<0.20 - <0.30	43	Not applicable
pH	None	7.0 – 9.3	48	11
Phenols, total (4AAP)	mg/L	<0.0010 – 0.0142	38	26
Phosphorus	mg/L	0.0020 – 0.0702	46	5
Selenium	mg/L	0.000092 – 0.000155	32	0
Solids, total suspended [TSS]	mg/L	<3.0 – 49.0	46	Not applicable
Specific Conductivity	U S/c m	216 - 553	43	Not applicable
Sulfate	mg/L	11.6 – 23.2	43	Not applicable
Temperature	˚C	0.5 – 32.0	48	Not applicable
Toluene	ug/L	<0.20 - <0.50	43	0
Total dissolved solids	mg/L	70 - 185	43	Not applicable
Uranium (U)	mg/L	0.000212 – 0.000459	32	0
Vanadium	mg/L	<0.50 – 3.07	32	0
Xylenes, m & p	ug/L	<0.40	43	Not applicable
Xylenes, Total	ug/L	<0.40 - <0.50	43	0
Zinc	mg/L	<0.0002 – 0.1300	46	9

APPENDIX F: ON-SITE SURFACE WATER SAMPLE RESULTS

Where no value is provided for the screening criteria in the following tables, it means that no criteria are available to assess risk to receptors; often because the parameter is not associated with acute or chronic toxicity.

The screening criteria for dissolved oxygen is temperature dependent. For the purposes of this report, a temperature of 15˚C was considered to derive the Provincial Water Quality Objective guideline of 6 mg/L

Un-ionized ammonia (NH_3) is calculated from measurements of total ammonia (NH_3+ NH_4^+), temperature and pH according to [R-176]. Ammonia concentrations reported in mg/L NH_3 units were converted to mg/L NH_3-N units by multiplying by 0.82247.

Stream C – Upstream (SW1) is located on the east side of Tie Road and is used an indicator of background water conditions in the stream as it enters the Bruce Power site.

The following acronyms and shortforms are used in this appendix to describe the screening criteria applied to on-site surface water sample results.

- CCME – Canadian Council of Ministers of the Environment
- PWQO – Ontario Provincial Water Quality Objectives
- O. Reg. 169/03 – Ontario Drinking Water Quality Standards
- GCDWQ - Guidelines for Canadian Drinking Water Quality
- SSTL – Site Specific Target Level, as defined in the 2022 Environmental Risk Assessment

Table 103 - The results of surface water quality samples taken in 2024 from Stream C – Upstream (SW1) and Downstream (SW2).

Screening criteria chosen are the most conservative available. The screening criteria for aluminum varies and is calculated on a per sample basis using pH measured at the time of sampling event. The screening criteria for total cadmium, total copper, total lead and total nickel vary with hardness and are calculated on a per sample basis using hardness measured at the time of sampling event. The screening criteria for zinc varies and is calculated on a per sample basis using hardness, pH and Dissolved Organic Carbon measured at time of sampling event. Table results are in milligrams per litre mg/L, micrograms per litre ug/L, and microsiemens per centimeter uS/cm.

Analyte	Unit	Lowest Screening Criteria	Source of Screening Criteria	Stream C Upstream SW1 04/04/2024	Stream C Upstream SW1 08/28/2024	Stream C Upstream SW1 10/16/2024	Stream C Upstream SW2 04/04/2024	Stream C Upstream SW2 08/28/2024	Stream C Upstream SW2 10/16/2024
Alkalinity, Total (as CaCO3)	mg/L	Not applicable	Not applicable	254	315	301	248	301	282
Aluminum	mg/L	0.075	PWQO	0.139	0.188	0.0818	0.0604	0.123	0.0645
Ammonia, total (as N)	mg/L	Not applicable	Not applicable	0.0092	0.101	0.123	0.0226	0.261	0.361
Ammonia, unionized (as NH_3-N)	mg/L	0.0156	CCME	0.0001	0.0053	0.0019	0.0003	0.0114	0.0053
Antimony	mg/L	0.006	GCDWQ and O. Reg. 169/03	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Arsenic	mg/L	0.005	CCME and PWQO	0.00028	0.0008	0.00035	0.00024	0.00065	0.00033
Barium	mg/L	1.0	O. Reg. 169/03	0.0164	0.0227	0.0194	0.0161	0.0185	0.0159
Benzene	ug/L	1.0	O. Reg. 169/03	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5

Analyte	Unit	Lowest Screening Criteria	Source of Screening Criteria	Stream C Upstream SW1 04/04/2024	Stream C Upstream SW1 08/28/2024	Stream C Upstream SW1 10/16/2024	Stream C Upstream SW2 04/04/2024	Stream C Upstream SW2 08/28/2024	Stream C Upstream SW2 10/16/2024
Boron	mg/L	0.200	PWQO	0.012	0.019	0.014	0.012	0.019	0.014
Cadmium	mg/L	0.00010 - 0.00037	CCME and PWQO	0.0000076	0.000077	0.0000139	0.0000133	0.0000093	0.0000053
Carbon, dissolved organic [DOC]	mg/L	Not applicable	Not applicable	3.56	6.33	5.38	3.86	6.46	6.64
Chloride (Cl)	mg/L	120	CCME	22.9	17.8	22.6	45.8	24.4	33.7
Chromium	mg/L	0.050	Not applicable	0.00065	0.00054	0.00056	< 0.0005	< 0.0005	< 0.0005
Chromium, Hexavalent (Cr6+)	mg/L	0.001	O. Reg. 169/03 and GCDWQ	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Chromium, trivalent [Cr III]	mg/L	0.0089	CCME and PWQO	0.00065	0.00054	0.00056	< 0.0005	< 0.0005	< 0.0005
Copper	mg/L	0.00200 - 0.00400	CCME	0.00123	0.00229	0.00112	0.00267	0.00098	0.00089
Dissolved Oxygen	mg/L	6.0	CCME	8.6	7.1	8.9	8.9	7.6	11.0
Ethylbenzene	ug/L	8.0	PWQO	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
F1 (C6-C10)	ug/L	Not applicable	PWQO	< 25	< 25	< 25	< 25	< 25	< 25
F1-BTEX	ug/L	Not applicable	Not applicable	< 25	< 25	< 25	< 25	< 25	< 25
F2 (C10-C16)	ug/L	Not applicable	Not applicable	< 100	< 100	< 100	< 100	< 100	< 100
F3 (C16-C34)	ug/L	Not applicable	Not applicable	< 250	< 250	< 250	< 250	< 250	< 250

Analyte	Unit	Lowest Screening Criteria	Source of Screening Criteria	Stream C Upstream SW1 04/04/2024	Stream C Upstream SW1 08/28/2024	Stream C Upstream SW1 10/16/2024	Stream C Upstream SW2 04/04/2024	Stream C Upstream SW2 08/28/2024	Stream C Upstream SW2 10/16/2024
F4 (C34-C50)	ug/L	Not applicable	Not applicable	< 250	< 250	< 250	< 250	< 250	< 250
Reached Baseline at C50	None	Not applicable	Not applicable	Yes	Yes	Yes	Yes	Yes	Yes
Fluoride	mg/L	0.120	CCME	0.272	0.332	0.302	0.289	0.321	0.298
Hardness (as CaCO3)	mg/L	Not applicable	Not applicable	260	342	323	249	324	296
Iron	mg/L	0.300	GCDWQ	0.364	1.15	0.614	0.156	0.33	0.22
Lead	mg/L	0.001 - 0.005	CCME / GCDWQ	0.000231	0.000262	0.000165	0.000373	0.00014	0.000077
Mercury	mg/L	0.000026	CCME	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
Molybdenum	mg/L	0.040	PWQO	0.000191	0.000079	0.000139	0.000256	0.000144	0.000179
Nickel	mg/L	0.025	PWQO	< 0.0005	0.00085	< 0.0005	0.00068	0.00055	< 0.0005
Nitrate (as N)	mg/L	2.9	CCME	1	< 0.02	< 0.02	0.141	0.045	< 0.02
Nitrite (as N)	mg/L	0.060	CCME	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
o-Xylene	ug/L	Not applicable	Not applicable	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
pH	None	6.5-8.5	PWQO	7.96	8.13	7.95	8.01	8.08	7.98
Phenols, total (4AAP)	mg/L	0.001	PWQO	< 0.001	0.0022	0.0022	< 0.001	0.0023	0.0026
Phosphorus	mg/L	0.020	PWQO	0.0279	0.0711	0.0328	0.0128	0.0324	0.0815
Selenium	mg/L	0.050	CCME	0.00007	0.000125	0.000079	0.000102	0.000106	0.000092

Analyte	Unit	Lowest Screening Criteria	Source of Screening Criteria	Stream C Upstream SW1 04/04/2024	Stream C Upstream SW1 08/28/2024	Stream C Upstream SW1 10/16/2024	Stream C Upstream SW2 04/04/2024	Stream C Upstream SW2 08/28/2024	Stream C Upstream SW2 10/16/2024
Solids, total suspended [TSS]	mg/L	Not applicable	Not applicable	18.7	14.8	5.9	< 3	3.6	10.1
Specific Conductivity	uS/cm	Not applicable	Not applicable	551	632	676	651	583	411
Sulfate	mg/L	Not applicable	Not applicable	6.63	1.46	4.12	8.13	2.52	5.4
Temperature	˚C	Not applicable	Not applicable	3.1	20.5	9.1	4.0	20.0	7.9
Toluene	ug/L	0.8	PWQO	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Total dissolved solids	mg/L	Not applicable	Not applicable	283	341	353	331	330	358
Uranium (U)	mg/L	0.020	O. Reg. 169/03	0.000554	0.000223	0.000359	0.000638	0.000357	0.000414
Vanadium	mg/L	0.006	PWQO	< 0.0005	0.00074	< 0.0005	< 0.0005	0.00072	< 0.0005
Xylenes, m & p	ug/L	Not applicable	Not applicable	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Xylenes, Total	ug/L	2.0	PWQO	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	mg/L	0.015 - 0.020	CCME and PWQO	< 0.003	0.0066	0.0068	0.0053	0.0036	< 0.003

Table 104 - The results of surface water quality samples taken in 2024 from the Eastern Drainage Ditch (SW3)

Screening criteria chosen are the most conservative available. The screening criteria for aluminum varies and is calculated on a per sample basis using pH measured at the time of sampling event. The screening criteria for total cadmium, total copper, total lead and total nickel vary with hardness and are calculated on a per sample basis using hardness measured at the time of sampling event. The screening criteria for zinc varies and is calculated on a per sample basis using hardness, pH and Dissolved Organic Carbon measured at time of sampling event. Table results are in milligrams per litre mg/L, micrograms per litre ug/L, and microsiemens per centimeter uS/cm.

Analyte	Unit	Lowest Screening Criteria	Source of Screening Criteria	Eastern Drainage Ditch SW3 04/04/2024	Eastern Drainage Ditch SW3 (Duplicate) 04/04/2024	Eastern Drainage Ditch SW3 08/28/2024	Eastern Drainage Ditch SW3 (Duplicate) 08/28/2024	Eastern Drainage Ditch SW3 10/16/2024
Alkalinity, Total (as CaCO3)	mg/L	Not applicable	Not applicable	229	216	220	220	126
Aluminum	mg/L	0.075	PWQO	0.0682	0.053	< 0.03	0.0374	0.0535
Ammonia, total (as N)	mg/L	Not applicable	Not applicable	0.0481	0.116	0.308	0.14	0.321
Ammonia, unionized (as NH_3-N)	mg/L	0.0156	CCME	0.0012	0.003	0.0136	0.006	0.0105
Antimony	mg/L	0.006	GCDWQ and O. Reg. 169/03	< 0.001	< 0.001	< 0.001	< 0.001	0.00016
Arsenic	mg/L	0.005	CCME and PWQO	< 0.001	< 0.001	< 0.001	< 0.001	0.00033
Barium	mg/L	1.0	O. Reg. 169/03	0.161	0.117	0.106	0.108	0.0501
Benzene	ug/L	1.0	O. Reg. 169/03	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Boron	mg/L	0.200	PWQO	< 0.1	< 0.1	< 0.1	< 0.1	0.032
Cadmium	mg/L	0.00010 - 0.00037	CCME and PWQO	< 0.00005	< 0.00005	< 0.00005	< 0.00005	0.0000245
Carbon, dissolved organic [DOC]	mg/L	Not applicable	Not applicable	5.03	6.81	7.51	7.03	6.27

Analyte	Unit	Lowest Screening Criteria	Source of Screening Criteria	Eastern Drainage Ditch SW3 04/04/2024	Eastern Drainage Ditch SW3 (Duplicate) 04/04/2024	Eastern Drainage Ditch SW3 08/28/2024	Eastern Drainage Ditch SW3 (Duplicate) 08/28/2024	Eastern Drainage Ditch SW3 10/16/2024
Chloride (Cl)	mg/L	120	CCME	822	838	630	626	178
Chromium	mg/L	0.050	Not applicable	< 0.005	< 0.005	< 0.005	< 0.005	0.00073
Chromium, Hexavalent (Cr6+)	mg/L	0.001	O. Reg. 169/03 and GCDWQ	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Chromium, trivalent [Cr III]	mg/L	0.0089	CCME and PWQO	< 0.0005	< 0.0005	< 0.00065	< 0.00065	0.00073
Copper	mg/L	0.00200 - 0.00400	CCME	< 0.005	< 0.005	< 0.005	< 0.005	0.0017
Dissolved Oxygen	mg/L	6.0	CCME	5.0	5.0	4.5	4.5	5.4
Ethylbenzene	ug/L	8.0	PWQO	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
F1 (C6-C10)	ug/L	Not applicable	PWQO	< 25	< 25	< 25	< 25	< 25
F1-BTEX	ug/L	Not applicable	Not applicable	< 25	< 25	< 25	< 25	< 25
F2 (C10-C16)	ug/L	Not applicable	Not applicable	< 100	< 100	< 100	< 100	< 100
F3 (C16-C34)	ug/L	Not applicable	Not applicable	< 250	< 250	< 250	< 250	< 250
F4 (C34-C50)	ug/L	Not applicable	Not applicable	< 250	< 250	< 250	< 250	< 250
Reached Baseline at C50	None	Not applicable	Not applicable	Yes	Yes	Yes	Yes	Yes
Fluoride	mg/L	0.120	CCME	0.611	0.623	0.844	0.862	0.436
Hardness (as CaCO3)	mg/L	Not applicable	Not applicable	329	337	268	269	156
Iron	mg/L	0.300	GCDWQ	0.142	0.126	0.243	0.28	0.127
Lead	mg/L	0.001 - 0.005	CCME/GCDWQ	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.00013

Analyte	Unit	Lowest Screening Criteria	Source of Screening Criteria	Eastern Drainage Ditch SW3 04/04/2024	Eastern Drainage Ditch SW3 (Duplicate) 04/04/2024	Eastern Drainage Ditch SW3 08/28/2024	Eastern Drainage Ditch SW3 (Duplicate) 08/28/2024	Eastern Drainage Ditch SW3 10/16/2024
Mercury	mg/L	0.000026	CCME	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
Molybdenum	mg/L	0.040	PWQO	0.00104	0.00117	0.002	0.00205	0.00122
Nickel	mg/L	0.025	PWQO	< 0.005	< 0.005	< 0.005	< 0.005	0.00155
Nitrate (as N)	mg/L	2.9	CCME	0.249	4.55	0.445	< 0.1	0.025
Nitrite (as N)	mg/L	0.060	CCME	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01
o-Xylene	ug/L	Not applicable	Not applicable	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
pH	None	6.5-8.5	PWQO	8.31	8.31	8.05	8.05	8.28
Phenols, total (4AAP)	mg/L	0.001	PWQO	0.0013	0.0043	0.0029	< 0.001	0.0011
Phosphorus	mg/L	0.020	PWQO	0.0212	0.0245	0.0582	0.0487	0.0299
Selenium	mg/L	0.050	CCME	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.000097
Solids, total suspended [TSS]	mg/L	Not applicable	Not applicable	25.3	10.5	5.4	13	5.1
Specific Conductivity	U S/c m	Not applicable	Not applicable	3185	3185	1875	1875	909
Sulfate	mg/L	Not applicable	Not applicable	31.7	32.9	22.4	18.8	18.9
Temperature	˚C	Not applicable	Not applicable	5.4	5.4	20.5	20.5	9.4
Toluene	ug/L	0.8	PWQO	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Total dissolved solids	mg/L	Not applicable	Not applicable	1540	1560	1280	1250	452
Uranium (U)	mg/L	0.020	O. Reg. 169/03	0.00207	0.00213	0.0023	0.00226	0.0013
Vanadium	mg/L	0.006	PWQO	0.00911	0.00859	< 0.005	< 0.005	0.002
Xylenes, m & p	ug/L	Not applicable	Not applicable	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4

Analyte	Unit	Lowest Screening Criteria	Source of Screening Criteria	Eastern Drainage Ditch SW3 04/04/2024	Eastern Drainage Ditch SW3 (Duplicate) 04/04/2024	Eastern Drainage Ditch SW3 08/28/2024	Eastern Drainage Ditch SW3 (Duplicate) 08/28/2024	Eastern Drainage Ditch SW3 10/16/2024
Xylenes, Total	ug/L	2.0	PWQO	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	mg/L	0.015 - 0.020	CCME and PWQO	< 0.03	< 0.03	< 0.03	< 0.03	0.0087

Table 105 - The results of surface water quality samples taken in 2024 from the Former Sewage Lagoon (FSL).

Screening criteria chosen are the most conservative available. The screening criteria for aluminum varies and is calculated on a per sample basis using pH measured at the time of sampling event. The screening criteria for total cadmium, total copper, total lead and total nickel vary with hardness and are calculated on a per sample basis using hardness measured at the time of sampling event. The screening criteria for zinc varies and is calculated on a per sample basis using hardness, pH and Dissolved Organic Carbon measured at time of sampling event. Table results are in milligrams per litre mg/L, micrograms per litre ug/L, and microsiemens per centimeter uS/cm.

Analyte	Unit	Lowest Screening Criteria	Source of Screening Criteria	Former Sewage Lagoon (FSL) 04/04/2024	Former Sewage Lagoon (FSL) 08/28/2024	Former Sewage Lagoon (FSL) 10/16/2024	Former Sewage Lagoon (FSL) 10/16/2024
Alkalinity, Total (as CaCO3)	mg/L	Not applicable	Not applicable	112	56.6	72.4	72
Aluminum	mg/L	0.075	PWQO	0.0592	0.0754	0.0914	0.0938
Ammonia, total (as N)	mg/L	Not applicable	Not applicable	0.031	0.274	0.0876	0.11
Ammonia, unionized (as NH_3-N)	mg/L	0.0156	CCME	0.0007	0.0028	0.0001	0.0002
Antimony	mg/L	0.006	GCDWQ and O. Reg. 169/03	0.00024	0.00029	0.00032	0.00035
Arsenic	mg/L	0.005	CCME and PWQO	0.00035	0.0005	0.00047	0.00045
Barium	mg/L	1.0	O. Reg. 169/03	0.0113	0.0111	0.0095	0.0101
Benzene	ug/L	1.0	O. Reg. 169/03	< 0.5	< 0.5	< 0.5	< 0.5
Boron	mg/L	0.200	PWQO	< 0.01	0.013	0.011	0.012
Cadmium	mg/L	0.00010 - 0.00037	CCME and PWQO	0.0000228	0.0000056	0.0000587	0.0000636
Carbon, dissolved organic [DOC]	mg/L	Not applicable	Not applicable	7.8	11.4	12	12.2
Chloride (Cl)	mg/L	120	CCME	3.61	3.92	2.58	4.02
Chromium	mg/L	0.050	Not applicable	0.00081	< 0.0005	0.00062	0.00082
Chromium, Hexavalent (Cr6+)	mg/L	0.001	O. Reg. 169/03 and GCDWQ	< 0.0005	< 0.0005	< 0.0005	< 0.0005

Analyte	Unit	Lowest Screening Criteria	Source of Screening Criteria	Former Sewage Lagoon (FSL) 04/04/2024	Former Sewage Lagoon (FSL) 08/28/2024	Former Sewage Lagoon (FSL) 10/16/2024	Former Sewage Lagoon (FSL) 10/16/2024
Chromium, trivalent [Cr III]	mg/L	0.0089	CCME and PWQO	0.00081	< 0.0005	0.00062	0.00082
Copper	mg/L	0.00200 - 0.00400	CCME	0.00127	0.00068	0.00158	0.00242
Dissolved Oxygen	mg/L	6.0	CCME	6.1	7.0	10.9	10.9
Ethylbenzene	ug/L	8.0	PWQO	< 0.5	< 0.5	< 0.5	< 0.5
F1 (C6-C10)	ug/L	Not applicable	PWQO	< 25	< 25	< 25	< 25
F1-BTEX	ug/L	Not applicable	Not applicable	< 25	< 25	< 25	< 25
F2 (C10-C16)	ug/L	Not applicable	Not applicable	< 100	< 100	< 100	< 100
F3 (C16-C34)	ug/L	Not applicable	Not applicable	< 250	< 250	< 250	< 250
F4 (C34-C50)	ug/L	Not applicable	Not applicable	< 250	< 250	< 250	< 250
Reached Baseline at C50	None	Not applicable	Not applicable	Yes	Yes	Yes	Yes
Fluoride	mg/L	0.120	CCME	0.349	0.425	0.446	0.463
Hardness (as CaCO3)	mg/L	Not applicable	Not applicable	115	60	81.5	77.1
Iron	mg/L	0.300	GCDWQ	0.052	0.058	0.096	0.105
Lead	mg/L	0.001 - 0.005	CCME / GCDWQ	0.000154	0.000069	0.000199	0.00024
Mercury	mg/L	0.000026	CCME	< 0.000005	< 0.000005	< 0.000005	< 0.000005
Molybdenum	mg/L	0.040	PWQO	0.000174	0.000088	0.000125	0.000135
Nickel	mg/L	0.025	PWQO	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Nitrate (as N)	mg/L	2.9	CCME	< 0.02	< 0.02	< 0.02	0.11
Nitrite (as N)	mg/L	0.060	CCME	< 0.01	< 0.01	< 0.01	< 0.01

Analyte	**Unit**	**Lowest Screening Criteria**	**Source of Screening Criteria**	**Former Sewage Lagoon (FSL) 04/04/2024**	**Former Sewage Lagoon (FSL) 08/28/2024**	**Former Sewage Lagoon (FSL) 10/16/2024**	**Former Sewage Lagoon (FSL) 10/16/2024**
o-Xylene	ug/L	Not applicable	Not applicable	< 0.3	< 0.3	< 0.3	< 0.3
pH	None	6.5-8.5	PWQO	8.18	8.36	6.99	6.99
Phenols, total (4AAP)	mg/L	0.001	PWQO	0.0016	0.003	0.0033	0.0032
Phosphorus	mg/L	0.020	PWQO	0.0226	0.0343	0.0403	0.0468
Selenium	mg/L	0.050	CCME	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Solids, total suspended [TSS]	mg/L	Not applicable	Not applicable	3.3	3.6	5.9	10.5
Specific Conductivity	U S/c m	Not applicable	Not applicable	238	144	1980	1980
Sulfate	mg/L	Not applicable	Not applicable	0.53	1.59	< 0.3	2.86
Temperature	˚C	Not applicable	Not applicable	7.0	23.2	8.7	8.7
Toluene	ug/L	0.8	PWQO	< 0.5	< 0.5	< 0.5	< 0.5
Total dissolved solids	mg/L	Not applicable	Not applicable	122	61	99	92
Uranium (U)	mg/L	0.020	O. Reg. 169/03	0.000112	0.000098	0.000115	0.000129
Vanadium	mg/L	0.006	PWQO	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Xylenes, m & p	ug/L	Not applicable	Not applicable	< 0.4	< 0.4	< 0.4	< 0.4
Xylenes, Total	ug/L	2.0	PWQO	< 0.5	< 0.5	< 0.5	< 0.5
Zinc	mg/L	0.015 - 0.020	CCME and PWQO	< 0.003	0.0033	0.0053	0.0083

Table 106 - The results of surface water quality samples taken in 2024 from the B31 Pond.

Screening criteria chosen are the most conservative available. The screening criteria for aluminum varies and is calculated on a per sample basis using pH measured at the time of sampling event. The screening criteria for total cadmium, total copper, total lead and total nickel vary with hardness and are calculated on a per sample basis using hardness measured at the time of sampling event. The screening criteria for zinc varies and is calculated on a per sample basis using hardness, pH and Dissolved Organic Carbon measured at time of sampling event. Table results are in milligrams per litre mg/L, micrograms per litre ug/L, and microsiemens per centimeter uS/cm.

Analyte	Unit	Lowest Screening Criteria	Source of Screening Criteria	B31 Pond 04/04/2024	B31 Pond 08/28/2024	B31 Pond 10/16/2024
Alkalinity, Total (as CaCO3)	mg/L	Not applicable	Not applicable	152	82.3	78
Aluminum	mg/L	0.075	PWQO	0.122	0.0316	0.796
Ammonia, total (as N)	mg/L	Not applicable	Not applicable	0.337	0.138	0.0878
Ammonia, unionized (as NH_3-N)	mg/L	0.0156	CCME	0.005	0.0003	0.0025
Antimony	mg/L	0.006	GCDWQ and O. Reg. 169/03	0.00017	0.00011	0.00017
Arsenic	mg/L	0.005	CCME and PWQO	0.00028	0.00036	0.00047
Barium	mg/L	1.0	O. Reg. 169/03	0.0181	0.0117	0.0143
Benzene	ug/L	1.0	O. Reg. 169/03	< 0.5	< 0.5	< 0.5
Boron	mg/L	0.200	PWQO	0.049	0.081	0.104
Cadmium	mg/L	0.00010 - 0.00037	CCME and PWQO	0.0000152	0.000011	0.0000608
Carbon, dissolved organic [DOC]	mg/L	Not applicable	Not applicable	3.66	9.35	8.74
Chloride (Cl)	mg/L	120	CCME	91	61.4	83
Chromium	mg/L	0.050	Not applicable	0.00063	< 0.0005	0.00182
Chromium, Hexavalent (Cr6+)	mg/L	0.001	O. Reg. 169/03 and GCDWQ	< 0.0005	< 0.0005	< 0.0005
Chromium, trivalent [Cr III]	mg/L	0.0089	CCME and PWQO	0.00063	< 0.0005	0.00182

Analyte	**Unit**	**Lowest Screening Criteria**	**Source of Screening Criteria**	**B31 Pond 04/04/2024**	**B31 Pond 08/28/2024**	**B31 Pond 10/16/2024**
Copper	mg/L	0.00200 - 0.00400	CCME	0.0033	0.00183	0.0114
Dissolved Oxygen	mg/L	6.0	CCME	7.5	Not recorded	4.9
Ethylbenzene	ug/L	8.0	PWQO	< 0.5	< 0.5	< 0.5
F1 (C6-C10)	ug/L	Not applicable	PWQO	< 25	< 25	< 25
F1-BTEX	ug/L	Not applicable	Not applicable	< 25	< 25	< 25
F2 (C10-C16)	ug/L	Not applicable	Not applicable	< 100	< 100	< 100
F3 (C16-C34)	ug/L	Not applicable	Not applicable	< 250	< 250	< 250
F4 (C34-C50)	ug/L	Not applicable	Not applicable	< 250	< 250	< 250
Reached Baseline at C50	None	Not applicable	Not applicable	Yes	Yes	Yes
Fluoride	mg/L	0.120	CCME	0.361	0.306	0.36
Hardness (as CaCO3)	mg/L	Not applicable	Not applicable	176	93.2	94
Iron	mg/L	0.300	GCDWQ	0.188	0.157	0.979
Lead	mg/L	0.001 - 0.005	CCME / GCDWQ	0.000267	0.000191	0.0011
Mercury	mg/L	0.000026	CCME	< 0.000005	< 0.000005	< 0.000005
Molybdenum	mg/L	0.040	PWQO	0.000745	0.000348	0.000796
Nickel	mg/L	0.025	PWQO	0.00059	< 0.0005	0.00161
Nitrate (as N)	mg/L	2.9	CCME	< 0.02	< 0.02	0.045
Nitrite (as N)	mg/L	0.060	CCME	< 0.01	< 0.01	< 0.01
o-Xylene	ug/L	Not applicable	Not applicable	< 0.3	< 0.3	< 0.3
pH	None	6.5-8.5	PWQO	7.89	8.13	8.20
Phenols, total (4AAP)	mg/L	0.001	PWQO	0.0022	0.0022	0.0018

Analyte	Unit	Lowest Screening Criteria	Source of Screening Criteria	B31 Pond 04/04/2024	B31 Pond 08/28/2024	B31 Pond 10/16/2024
Phosphorus	mg/L	0.020	PWQO	0.0141	0.0371	0.0436
Selenium	mg/L	0.050	CCME	0.000097	0.000059	0.000076
Solids, total suspended [TSS]	mg/L	Not applicable	Not applicable	7	5.8	65.1
Specific Conductivity	U S/c m	Not applicable	Not applicable	1123	679	465
Sulfate	mg/L	Not applicable	Not applicable	11.8	4.44	9.54
Temperature	˚C	Not applicable	Not applicable	10.7	6.9	10.2
Toluene	ug/L	0.8	PWQO	< 0.5	< 0.5	< 0.5
Total dissolved solids	mg/L	Not applicable	Not applicable	306	181	236
Uranium (U)	mg/L	0.020	O. Reg. 169/03	0.000726	0.000111	0.000538
Vanadium	mg/L	0.006	PWQO	0.00055	< 0.0005	0.00187
Xylenes, m & p	ug/L	Not applicable	Not applicable	< 0.4	< 0.4	< 0.4
Xylenes, Total	ug/L	2.0	PWQO	< 0.5	< 0.5	< 0.5
Zinc	mg/L	0.015 - 0.020	CCME and PWQO	0.0081	0.0088	0.0258

Table 107 - The range and number of water quality measurements taken from on-site surface water monitoring locations at Bruce Power between 2020 and 2024.

Table results are in milligrams per litre mg/L, micrograms per litre ug/L, and microsiemens per centimeter uS/cm.

Parameter	Unit	Historical Trend (2020 – 2024) Range (min to max)	Historical Trend (2020 – 2024) Number of observations	Historical Trend (2020 – 2024) Number of exceedances (if applicable)
Alkalinity, Total (as CaCO3)	mg/L	51.7 - 315	73	Not applicable
Aluminum	mg/L	0.0065 – 2.23	73	34
Ammonia, total (as N)	mg/L	0.0092 - 18	71	Not applicable
Ammonia, unionized (as NH_3-N)	mg/L	0.000065 – 1.6	71	7
Antimony	mg/L	<0.0001 – 0.0004	67	0
Arsenic	mg/L	<0.00010 – 0.0011	67	0
Barium	mg/L	0.0017 – 0.16	73	0
Benzene	ug/L	<0.20 - <0.50	70	0
Boron	mg/L	<0.010 – 0.13	67	0
Cadmium	mg/L	<0.0000050 – 0.000077	73	0
Carbon, dissolved organic [DOC]	mg/L	3.25 – 12.4	60	Not applicable
Chloride (Cl)	mg/L	1.04 - 838	63	16
Chromium	mg/L	0.00020 – 0.012	73	0
Chromium, Hexavalent (Cr6+)	mg/L	0.0002 - <0.0005	73	0
Chromium, trivalent [Cr III]	mg/L	<0.00050 – 0.011	68	1
Copper	mg/L	<0.00050 – 0.019	73	8
Dissolved Oxygen	mg/L	4.50 – 19.3	64	8
Ethylbenzene	ug/L	<0.20 - <0.50	70	0
F1 (C6-C10)	ug/L	<25	70	Not applicable
F1-BTEX	ug/L	<25 - <100	64	Not applicable

Parameter	**Unit**	**Historical Trend (2020 – 2024)** **Range (min to max)**	**Historical Trend (2020 – 2024)** **Number of observations**	**Historical Trend (2020 – 2024)** **Number of exceedances (if applicable)**
F2 (C10-C16)	ug/L	<100	71	Not applicable
F3 (C16-C34)	ug/L	<200 - <250	71	Not applicable
F4 (C34-C50)	ug/L	<200 - 280	71	Not applicable
Reached Baseline at C50	None	Yes	65	Not applicable
Fluoride	mg/L	0.0293 – 0.862	71	67
Hardness (as CaCO3)	mg/L	52.7 - 347	71	Not applicable
Iron	mg/L	0.027 – 3.07	73	28
Lead	mg/L	<0.00001 – 0.0022	73	0
Mercury	mg/L	<0.000001 – 0.000025	73	0
Molybdenum	mg/L	0.000079 – 0.0021	73	0
Nickel	mg/L	0.00030 – 0.0030	73	0
Nitrate (as N)	mg/L	<0.020 – 4.6	71	1
Nitrite (as N)	mg/L	<0.010 - <0.050	71	0
o-Xylene	ug/L	<0.20 - <0.50	70	Not applicable
pH	None	7.0 – 9.9	73	9
Phenols, total (4AAP)	mg/L	<0.0010 – 0.022	60	33
Phosphorus	mg/L	0.0054 – 0.23	71	40
Selenium	mg/L	<0.000050 – 0.00022	67	0
Solids, total suspended [TSS]	mg/L	2.00 - 123	73	Not applicable
Specific Conductivity	U S/c m	111 - 3180	71	Not applicable
Sulfate	mg/L	<0.30 – 33	65	Not applicable
Temperature	˚C	1.05 – 23.3	69	Not applicable
Toluene	ug/L	<0.0002 - <0.0005	70	0
Total dissolved solids	mg/L	36 - 1560	73	Not applicable
Uranium (U)	mg/L	0.000096 – 0.0023	73	0
Vanadium	mg/L	0.00022 – 0.021	73	9

Parameter	Unit	Historical Trend (2020 – 2024) Range (min to max)	Historical Trend (2020 – 2024) Number of observations	Historical Trend (2020 – 2024) Number of exceedances (if applicable)
Xylenes, m & p	ug/L	<0.40 – 0.50	70	Not applicable
Xylenes, Total	ug/L	<0.40 – 0.81	70	0
Zinc	mg/L	<0.0011 – 0.066	73	4

APPENDIX G: GROUNDWATER SAMPLING RESULTS

Table 108 - Bruce A Protected Area Tritium Results
Table units are Bequerels per Litre Bq/L

Season	2024-S1	2024-S2
BA Evaluation Criteria (Spring)	6154.3	
BA Evaluation Criteria (Fall)		6226.1
Well Identification	Result	Result
BA-1-1	13.3	10
BA-1-2	57.4	39.6
BA-2-1	-0.159	-1.1
BA-2-2	6.14	1.12
BA-2-3	324	287
BA-3-1	2.75	0.0755
BA-3-2	1.49	-1.74
BA-3-3	292	120
BA-4-1	1.36	-0.287
BA-4-2	3010	2090
BA-5-1	1.58	-0.876
BA-5-2	-1.81	-0.332
BATR-1-12	451	1090
BATR-1-13	1670	1420
BATR-1-14A	24.7	10.4
BATR-1-14B	10600	9590
BATR-1-15	2390	1660
BATR-3-11	16.7	16.2
BATR-3-12	2790	2610
BATR-4-10	1630	1240

Table 109 - Bruce B Protected Area Tritium Results
Table units are Bequerels per Litre Bq/L

Season	2024 S1	2024-S2
BB Evaluation Criteria (Spring)	3244.1	
BB Evaluation Criteria (Fall)		3247.5
Well Identification	Result	Result
BB-1-2	390	251
BB-1-3	345	195
BB-2-1	18	32.5
BB-2-2	861	860
BB-3-1	3.84	4.49
BB-3-2	94.3	22.4
BB-3-3	255	276
BB-4-1	20.6	22.2
BB-4-2	141	150
BB-4-3	1620	1540
BB-5-1	279	221
BB-5-2	372	355
BB-5-3	596	469
BBTR-5-11	1440	1280
BBTR-6-28	1560	1600
BBTR-6-30	1610	1560
BBTR-6-40	1550	1570
BBTR-7-12	4120	3310
BBTR-8-12	1010	1020

Table 110 - Fire Training Facility Hydrocarbons Results
Table units are micrograms per litre ug/L

	Parameter	F1 (C6-C10)	F1-BTEX	F2 (C10-C16)	F3 (C16-C34)	F4 (C34-C50)
	Evaluation Criteria	750	750	150	500	500
	Units	ug/L	ug/L	ug/L	ug/L	ug/L
Well Identification	Date	Result	Result	Result	Result	Result
FTF-23	6/24/2024	< 25	< 25	< 100	< 250	< 250
FTF-23	10/9/2024	< 25	< 25	< 100	< 250	< 250
FTF-24	6/24/2024	< 25	< 25	< 100	< 250	< 250
FTF-24	10/9/2024	< 25	< 25	< 100	< 250	< 250
FTF-26	6/25/2024	< 25	< 25	< 100	< 250	< 250
FTF-26	10/10/2024	< 25	< 25	< 100	< 250	< 250
FTF-28	6/24/2024	< 25	< 25	< 100	< 250	< 250
FTF-28	10/9/2024	< 25	< 25	< 100	< 250	< 250
FTF-38	6/25/2024	32	27	940	490	< 250
FTF-38	10/9/2024	< 25	< 25	770	< 250	< 250
FTF-42	6/24/2024	< 25	< 25	170	< 250	< 250
FTF-42	10/9/2024	< 25	< 25	150	< 250	< 250
FTF-45	6/25/2024	< 25	< 25	110	< 250	< 250
FTF-45	10/9/2024	< 25	< 25	120	< 250	< 250
FTF-46	6/24/2024	< 25	< 25	< 100	< 250	< 250
FTF-46	10/10/2024	< 25	< 25	< 100	< 250	< 250
FTF-50	6/24/2024	< 25	< 25	< 100	< 250	< 250
FTF-50	10/8/2024	< 25	< 25	< 100	< 250	< 250
FTF-52	6/24/2024	< 25	< 25	< 100	< 250	< 250
FTF-52	10/8/2024	< 25	< 25	120	< 250	< 250

	Parameter Evaluation Criteria Units	F1 (C6-C10) 750 ug/L	F1-BTEX 750 ug/L	F2 (C10-C16) 150 ug/L	F3 (C16-C34) 500 ug/L	F4 (C34-C50) 500 ug/L
Well Identification	Date	Result	Result	Result	Result	Result
FTF-61	6/25/2024	< 25	< 25	< 100	< 250	< 250
FTF-61	10/8/2024	< 25	< 25	< 100	< 250	< 250
FTF-68S	6/24/2024	< 25	< 25	< 100	< 250	< 250
FTF-68S	10/10/2024	< 25	< 25	< 100	< 250	< 250

Table 111 - Bruce Heavy Water Lands (Former Oil Storage Area) Hydrocarbons Results
Table units are micrograms per litre ug/L

	Parameter	F1 (C6-C10)	F1-BTEX	F2 (C10-C16)	F3 (C16-C34)	F4 (C34-C50)
	Evaluation Criteria	420	420	150	500	500
	Units	ug/L	ug/L	ug/L	ug/L	ug/L
Well Identification	Date	Result	Result	Result	Result	Result
MW1-07	6/20/2024	< 25	< 25	< 100	1230	< 250
MW1-07	10/16/2024	< 25	< 25	< 100	7280	770
MW2-07	6/20/2024	< 25	< 25	< 100	650	< 250
MW2-07	10/16/2024	26	< 25	< 100	5070	690
MW3-07	6/20/2024	< 25	< 25	< 100	< 250	< 250
MW3-07	10/15/2024	< 25	< 25	< 100	< 250	< 250
MW4-07	6/20/2024	< 25	< 25	< 100	280	< 250
MW4-07	10/15/2024	< 25	< 25	< 100	840	< 250
MW-4A	6/19/2024	< 25	< 25	< 100	< 250	< 250
MW-4A	10/15/2024	< 25	< 25	< 100	< 250	< 250
MW-4B	6/20/2024	< 25	< 25	< 100	< 250	< 250
MW5-07	6/20/2024	< 25	< 25	< 100	< 250	< 250
MW5-07	10/15/2024	< 25	< 25	< 100	< 250	< 250

Table 112 - Soil Management Area Nutrients and Anions Results

Table units are micrograms per litre ug/L

	Well Identification		MW05-7	SMA-MW01	SMA-MW02	SMA-MW03	SMA-MW04	SMA-MW05	SMA-MW06	SMA-MW07
		Date	10/16/2024	10/16/2024	10/16/2024	10/16/2024	10/16/2024	10/16/2024	10/16/2024	10/16/2024
Parameter	Evaluation Criteria	Units	Result	Result	Result	Result	Result	Result	Result	Result
Alkalinity, Total (as CaCO3)		ug/L	409	347	883	388	339	500	134	244
Ammonia, total (as N)		ug/L	0.335	0.0182	0.0530	0.378	0.0692	0.173	0.0497	0.0637
Chloride	790	ug/L	28.6	36.6	107	31.6	45.6	37.1	14.1	129
Conductivity		ug/L	0.77	0.74	1.66	0.746	1.43	1.49	1.51	0.869
Fluoride		ug/L	0.420	0.836	0.500	0.891	1.14	1.08	0.918	0.948
Nitrate, as N		ug/L	< 0.020	< 0.020	< 0.100	< 0.020	< 0.100	< 0.100	< 0.100	< 0.020
Nitrate-Nitrite, as N, Total		ug/L	< 0.0224	< 0.0224	< 0.112	< 0.0224	< 0.112	< 0.112	< 0.112	< 0.0224
Nitrite, as N		ug/L	< 0.010	< 0.010	< 0.050	< 0.010	< 0.050	< 0.050	< 0.050	< 0.010
pH		pH UNITS	8.17	7.97	8.05	8.37	8.20	8.25	8.00	8.44
Sulphate		ug/L	1.25	19.8	4.59	7.54	446	386	742	15.6
Total Kjeldahl Nitrogen		ug/L	0.540	0.210	7.60	0.539	0.163	0.274	0.097	0.166

Table 113 - Soil Management Area Metals Results
Table units are micrograms per litre ug/L

	Well Identification Date		MW05-7 10/16/2024	SMA-MW01 10/16/2024	SMA-MW02 10/16/2024	SMA-MW03 10/16/2024	SMA-MW04 10/16/2024	SMA-MW05 10/16/2024	SMA-MW06 10/16/2024	SMA-MW07 10/16/2024
Parameter	Evaluation Criteria	Units	Result	Result	Result	Result	Result	Result	Result	Result
Antimony	6	ug/L	< 0.10	< 0.10	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00	< 0.10
Arsenic	25	ug/L	1.76	0.29	3.92	3.22	< 1.00	11.3	< 1.00	0.37
Barium	1000	ug/L	45.6	32.9	103	48.9	47.5	47.6	31.9	44.4
Beryllium	4	ug/L	< 0.020	< 0.020	< 0.200	< 0.200	< 0.200	< 0.200	< 0.200	< 0.020
Boron	5000	ug/L	101	103	109	< 100	449	467	575	28
Cadmium	2.1	ug/L	0.0056	0.0078	< 0.0500	< 0.0500	< 0.0500	< 0.0500	< 0.0500	< 0.0050
Chromium	50	ug/L	< 0.50	< 0.50	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00	< 0.50
Chromium, Hexavalent (Cr6+)	25	ug/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Cobalt	3.8	ug/L	0.47	0.12	1.89	< 1.00	1.52	< 1.00	< 1.00	0.38
Copper	69	ug/L	0.28	1.65	69.1	< 2.00	< 2.00	< 2.00	< 2.00	1.22
Lead	10	ug/L	< 0.050	< 0.050	< 0.500	< 0.500	< 0.500	< 0.500	< 0.500	< 0.050

	Well Identification Date		MW05-7 10/16/2024	SMA-MW01 10/16/2024	SMA-MW02 10/16/2024	SMA-MW03 10/16/2024	SMA-MW04 10/16/2024	SMA-MW05 10/16/2024	SMA-MW06 10/16/2024	SMA-MW07 10/16/2024
Parameter	Evaluation Criteria	Units	Result	Result	Result	Result	Result	Result	Result	Result
Mercury	0.29	ug/L	< 0.0050	< 0.0050	0.0205	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Molybdenum	70	ug/L	0.244	1.42	1.23	1.84	6.52	4.00	14.9	0.796
Nickel	100	ug/L	0.87	0.53	28.4	< 5.00	< 5.00	< 5.00	< 5.00	0.60
Phosphorus		ug/L	4.4	3.2	26.6	55.5	6.4	26.8	10.2	5.0
Selenium	10	ug/L	0.072	0.064	0.802	< 0.500	< 0.500	< 0.500	< 0.500	< 0.050
Silver	1.2	ug/L	< 0.010	< 0.010	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100	< 0.010
Sodium	490000	ug/L	20800	45500	50900	28300	113000	54300	85800	83500
Thallium	2	ug/L	< 0.010	0.012	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100	< 0.010
Uranium	20	ug/L	0.769	0.915	11.6	0.209	6.11	6.19	3.30	0.753
Vanadium	6.2	ug/L	< 0.50	< 0.50	< 5.00	< 5.00	< 5.00	< 5.00	< 5.00	< 0.50
Zinc	890	ug/L	< 1.0	< 1.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	1.4

Table 114 - Soil Management Area Hydrocarbons Results

Table units are micrograms per litre ug/L

	Parameter	F1 (C6-C10)	F1-BTEX	F2 (C10-C16)	F3 (C16-C34)	F4 (C34-C50)
	Evaluation Criteria	420	420	150	500	500
	Units	ug/L	ug/L	ug/L	ug/L	ug/L
Well Identification	Date	Result	Result	Result	Result	Result
MW05-7	10/16/2024	< 25	< 25	< 100	< 250	< 250
SMA-MW01	10/16/2024	< 25	< 25	< 100	< 250	< 250
SMA-MW02	10/16/2024	< 25	< 25	< 100	< 250	< 250
SMA-MW03	10/16/2024	< 25	< 25	< 100	< 250	< 250
SMA-MW04	10/16/2024	< 25	< 25	< 100	< 250	< 250
SMA-MW05	10/16/2024	< 25	< 25	< 100	< 250	< 250
SMA-MW06	10/16/2024	< 25	< 25	< 100	< 250	< 250
SMA-MW07	10/16/2024	< 25	< 25	< 100	< 250	< 250

Table 115 - Soil Management Area Volatile Organic Compounds Results
Table units are micrograms per litre ug/L

		Well Identification Date	MW05-7 10/16/24	SMA-MW01 10/16/24	SMA-MW02 10/16/24	SMA-MW03 10/16/24	SMA-MW04 10/16/24	SMA-MW05 10/16/24	SMA-MW06 10/16/24	SMA-MW07 10/16/24
Parameter	Evaluation Criteria	Units	Result	Result	Result	Result	Result	Result	Result	Result
1,1,1,2-Tetrachloroethane	1.1	ug/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,1,1-Trichloroethane	200	ug/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,1,2,2-Tetrachloroethane	1	ug/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,1,2-Trichloroethane	4.7	ug/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,1-Dichloroethane	5	ug/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,1-Dichloroethene	1.6	ug/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,2-Dibromoethane	0.2	ug/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
1,2-Dichlorobenzene	3	ug/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,2-Dichloroethane	1.6	ug/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,2-Dichloropropane	5	ug/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,3-Dichlorobenzene	59	ug/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,3-Dichloropropene	0.5	ug/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,4-Dichlorobenzene	1	ug/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Acetone	2700	ug/L	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
Benzene	5	ug/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Bromomethane	0.89	ug/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Carbon tetrachloride	0.79	ug/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Chlorobenzene	30	ug/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50

		Well Identification	MW05-7	SMA-MW01	SMA-MW02	SMA-MW03	SMA-MW04	SMA-MW05	SMA-MW06	SMA-MW07
		Date	10/16/24	10/16/24	10/16/24	10/16/24	10/16/24	10/16/24	10/16/24	10/16/24
Parameter	Evaluation Criteria	Units	Result	Result	Result	Result	Result	Result	Result	Result
cis-1,2-Dichloroethene	1.6	ug/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
cis-1,3-Dichloropropene	0.50	ug/L	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30
Dichlorodifluoromethane	590	ug/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Dichloromethane	50	ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	2.4	ug/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Methyl Ethyl Ketone	1800	ug/L	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
Methyl Isobutyl Ketone	640	ug/L	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
Methyl tert-butyl ether	15	ug/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
n-Hexane	51	ug/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Styrene	5.4	ug/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Tetrachloroethene	1.6	ug/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Toluene	22	ug/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Total BTEX		ug/L	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,2-Dichloroethene	1.6	ug/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
trans-1,3-Dichloropropene	0.50	ug/L	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30
Trichloroethylene	1.6	ug/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Trichlorofluoromethane	150	ug/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Vinyl Chloride	0.5	ug/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Xylene, o-		ug/L	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30
Xylenes, m- & p-		ug/L	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40
Xylenes, Total	300	ug/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50

Table 116 - Bruce A Standby Generators Area Hydrocarbon Results
Table units are micrograms per litre ug/L

	Parameter Evaluation Criteria Units	F1 (C6-C10) 420 ug/L	F1-BTEX 420 ug/L	F2 (C10-C16) 150 ug/L	F3 (C16-C34) 500 ug/L	F4 (C34-C50) 500 ug/L
Well Identification	Date	Result	Result	Result	Result	Result
BASG-13	10/15/2024	< 25	< 25	< 100	< 250	< 250
BASG-14	10/15/2024	< 25	< 25	< 100	< 250	< 250
BASG-15	10/15/2024	< 25	< 25	< 100	< 250	< 250
BASG-16	10/15/2024	< 25	< 25	< 100	< 250	< 250
BASG-17	10/15/2024	< 25	< 25	< 100	< 250	< 250
BASG-21	10/15/2024	< 25	< 25	< 100	< 250	< 250
BASG-22	10/15/2024	< 25	< 25	< 100	< 250	< 250
BASG-25	10/15/2024	< 25	< 25	< 100	< 250	< 250
BASG-26	10/15/2024	< 25	< 25	< 100	< 250	< 250

Table 117 - Bruce A Standby Generators Area Nutrients and Anions Results
Table units are micrograms per litre ug/L

		Well Identification Date	BASG-13 10/15/24	BASG-14 10/15/24	BASG-15 10/15/24	BASG-16 10/15/24	BASG-17 10/15/24	BASG-21 10/15/24	BASG-22 10/15/24	BASG-25 10/15/24	BASG-26 10/15/24
Parameter	Evaluation Criteria	Units	Result	Result	Result	Result	Result	Result	Result	Result	Result
Alkalinity, Total (as CaCO3)		ug/L	180	579	206	296	199	260	289	358	299
Ammonia, total (as N)		ug/L	0.246	0.104	< 0.0073	< 0.0068	< 0.0050	0.0544	0.300	< 0.0120	0.239
Chloride	790	ug/L	22.7	12.0	38.2	1.51	122	560	708	1.07	1.52
Conductivity		Millisiemens per centimetre	1.49	2.58	1.09	0.759	0.851	2.28	2.83	0.73	0.653
Fluoride		ug/L	1.22	0.798	1.64	1.68	0.819	1.24	0.660	0.866	0.737
Nitrate, as N		ug/L	< 0.100	< 0.100	< 0.100	< 0.020	0.149	< 0.100	< 0.100	< 0.020	0.071
Nitrate-Nitrite, as N, Total		ug/L	< 0.112	< 0.112	< 0.112	< 0.0224	0.149	< 0.112	< 0.112	< 0.0224	0.0710
Nitrite, as N		ug/L	< 0.050	< 0.050	< 0.050	< 0.010	< 0.010	< 0.050	< 0.050	< 0.010	< 0.010
pH		pH UNITS	7.80	7.19	8.02	7.90	8.11	8.09	7.91	7.56	7.64

		Well Identification Date	BASG-13 10/15/24	BASG-14 10/15/24	BASG-15 10/15/24	BASG-16 10/15/24	BASG-17 10/15/24	BASG-21 10/15/24	BASG-22 10/15/24	BASG-25 10/15/24	BASG-26 10/15/24
Parameter	Evaluation Criteria	Units	Result	Result	Result	Result	Result	Result	Result	Result	Result
Sulphate		ug/L	687	1160	352	120	45.5	39.2	58.1	48.5	60.4
Total Kjeldahl Nitrogen		ug/L	0.294	0.286	0.075	0.092	0.104	0.211	0.465	0.129	0.349

Table 118 - Bruce A Standby Generators Area Polycyclic Aromatic Hydrocarbon Results
Table units are micrograms per litre ug/L

		Well Identification Date	BASG-13 10/15/24	BASG-14 10/15/24	BASG-15 10/15/24	BASG-16 10/15/24	BASG-17 10/15/24	BASG-21 10/15/24	BASG-22 10/15/24	BASG-25 10/15/24	BASG-26 10/15/24
Parameter	Evaluation Criteria	Units	Result	Result	Result	Result	Result	Result	Result	Result	Result
1-2-MethylNaphthalenes		ug/L	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.058	< 0.015	< 0.015
1-Methylnaphthalene	3.20	ug/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.053	< 0.010	< 0.010
2-Methylnaphthalene	3.2	ug/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.023	< 0.010	< 0.010
Acenaphthene	4.1	ug/L	0.019	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	0.069	< 0.010	< 0.010
Acenaphthylene	1	ug/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Anthracene	2.4	ug/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Benzo(a)anthracene	1	ug/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Benzo(a)pyrene	0.01	ug/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Benzo(b&j)fluoranthene		ug/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010

		Well Identification Date	BASG-13 10/15/24	BASG-14 10/15/24	BASG-15 10/15/24	BASG-16 10/15/24	BASG-17 10/15/24	BASG-21 10/15/24	BASG-22 10/15/24	BASG-25 10/15/24	BASG-26 10/15/24
Parameter	Evaluation Criteria	Units	Result	Result	Result	Result	Result	Result	Result	Result	Result
Benzo(g,h,i)perylene	0.2	ug/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Benzo(k)fluoranthene	0.1	ug/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Chrysene	0.1	ug/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Dibenzo(a,h)anthracene	0.2	ug/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Fluoranthene	0.41	ug/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Fluorene	120	ug/L	0.027	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	0.211	< 0.010	< 0.010
Indeno(1,2,3-cd)Pyrene	0.2	ug/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Naphthalene	11	ug/L	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Phenanthrene	1	ug/L	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020
Pyrene	4.1	ug/L	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010

Table 119 - Bruce A Transformers Area Hydrocarbon Results
Table units are micrograms per litre ug/L

	Parameter	F1 (C6-C10)	F1-BTEX	F2 (C10-C16)	F3 (C16-C34)	F4 (C34-C50)
	Evaluation Criteria	420	420	150	500	500
	Units	ug/L	ug/L	ug/L	ug/L	ug/L
Well Identification	Date	Result	Result	Result	Result	Result
BATR-1-12	10/16/2024	< 25	< 25	< 100	< 250	< 250
BATR-1-13	10/16/2024	< 25	< 25	< 100	< 250	< 250
BATR-1-14A	10/16/2024	< 25	< 25	< 100	< 250	< 250
BATR-1-14B	10/16/2024	< 25	< 25	< 100	< 250	< 250
BATR-1-15	10/16/2024	< 25	< 25	< 100	< 250	< 250
BATR-3-11	10/16/2024	< 25	< 25	< 100	< 250	< 250

Table 120 - Bruce A Transformers Area Nutrients and Anions Results
Table units are micrograms per litre ug/L

		Well Identification Date	BATR-1-12 10/16/2024	BATR-1-13 10/16/2024	BATR-1-14A 10/16/2024	BATR-1-14B 10/16/2024	BATR-1-15 10/16/2024	BATR-3-11 10/16/2024
Parameter	Evaluation Criteria	Units	Result	Result	Result	Result	Result	Result
Alkalinity, Total (as CaCO3)		ug/L	124	246	136	118	175	88.4
Ammonia, total (as N)		ug/L	0.0249	0.0211	0.0206	< 0.0050	< 0.0050	0.0137
Chloride	790	ug/L	95.9	237	23.3	92.4	156	11.3
Conductivity		Millisiemens per centimetre	0.566	1.96	1.36	0.55	1.13	0.237
Fluoride		ug/L	0.964	1.07	1.52	0.827	1.38	0.968
Nitrate, as N		ug/L	0.378	< 0.100	< 0.100	< 0.020	0.706	0.280
Nitrate-Nitrite, as N, Total		ug/L	0.378	< 0.112	< 0.112	< 0.0224	0.706	0.280
Nitrite, as N		ug/L	< 0.010	< 0.050	< 0.050	< 0.010	< 0.050	< 0.010
pH		pH UNITS	8.06	8.02	8.21	8.08	8.24	7.67
Sulphate		ug/L	16.0	505	629	16.6	168	16.7
Total Kjeldahl Nitrogen		ug/L	0.083	0.071	0.086	0.146	0.130	0.121

Table 121 - Bruce A Transformers Area Select Volatile Organic Compounds Results
Table units are micrograms per litre ug/L.

	Parameter	Bromodichloromethane	Bromoform	Chloroform	Dibromochloromethane	Total Trihalomethanes
	Evaluation Criteria	16	25	2.4	25	
	Units	ug/L	ug/L	ug/L	ug/L	ug/L
Well Identification	Date	Result	Result	Result	Result	Result
BATR-1-12	10/16/2024	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0
BATR-1-13	10/16/2024	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0
BATR-1-14A	10/16/2024	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0
BATR-1-14B	10/16/2024	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0
BATR-1-15	10/16/2024	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0
BATR-3-11	10/16/2024	< 1.0	< 1.0	24.7	< 1.0	24.7

Table 122 - Bruce B Transformers Area Hydrocarbons Results

Table units are micrograms per litre ug/L

	Parameter Evaluation Criteria Units	F1 (C6-C10) 420 ug/L	F1-BTEX 420 ug/L	F2 (C10-C16) 150 ug/L	F3 (C16-C34) 500 ug/L	F4 (C34-C50) 500 ug/L
Well Identification	Date	Result	Result	Result	Result	Result
BBTR-5-12	10/9/2024	< 25	< 25	< 100	< 250	280
BBTR-5-13	10/9/2024	< 25	< 25	< 100	< 250	< 250
BBTR-5-14	10/9/2024	< 25	< 25	< 100	< 250	< 250
BBTR-6-28	10/9/2024	< 25	< 25	< 100	< 250	< 250
BBTR-6-30	10/9/2024	< 25	< 25	< 100	< 250	< 250
BBTR-6-40	10/9/2024	< 25	< 25	< 100	< 250	< 250
BBTR-7-12	10/9/2024	< 25	< 25	< 100	< 250	< 250
BBTR-8-12	10/9/2024	< 25	< 25	< 100	< 250	< 250

Table 123 - Bruce B Transformers Area Nutrients and Anions Results

Table units are micrograms per litre ug/Land millisiemens per centimetre mS/cm.

		Well Identification Date	BBTR-5-12 10/9/2024	BBTR-5-13 10/9/2024	BBTR-5-14 10/9/2024	BBTR-6-28 10/9/2024	BBTR-6-30 10/9/2024	BBTR-6-40 10/9/2024	BBTR-7-12 10/9/2024	BBTR-8-12 10/9/2024
Parameter	Evaluation Criteria	Units	Result	Result	Result	Result	Result	Result	Result	Result
Alkalinity, Total (as CaCO3)		ug/L	115	105	190	199	123	277	131	201
Ammonia, total (as N)		ug/L	< 0.0050	< 0.0050	< 0.0050	0.0240	0.0905	0.139	0.144	0.0326
Chloride	790	ug/L	248	120	1130	182	80.8	1040	556	509
Conductivity		mS/cm	1.11	0.659	4.08	1.05	0.806	3.85	2.11	2.09
Fluoride		ug/L	0.957	1.09	1.91	1.88	1.96	1.98	2.24	1.74
Nitrate, as N		ug/L	0.388	0.304	0.357	< 0.020	0.095	< 0.100	< 0.100	< 0.100
Nitrate-Nitrite, as N, Total		ug/L	0.388	0.304	0.357	< 0.0224	0.0950	< 0.112	< 0.112	< 0.112
Nitrite, as N		ug/L	< 0.050	< 0.010	< 0.050	< 0.010	< 0.010	< 0.050	< 0.050	< 0.050
pH		pH UNITS	8.15	8.13	8.15	8.18	8.11	8.02	8.12	8.08
Sulphate		ug/L	36.8	28.7	104	47.0	154	75.5	56.6	54.6
Total Kjeldahl Nitrogen		ug/L	0.166	0.108	0.098	0.106	0.177	0.334	0.860	0.183

Table 124 - Bruce B Transformers Area Select Volatile Organic Compounds Results
Table units are micrograms per litre ug/L

	Parameter	Bromodichloromethane	Bromoform	Chloroform	Dibromochloromethane	Total Trihalomethanes
	Evaluation Criteria	16	25	2.4	25	
	Units	ug/L	ug/L	ug/L	ug/L	ug/L
Well Identification	Date	Result	Result	Result	Result	Result
BBTR-5-12	10/9/2024	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0
BBTR-5-13	10/9/2024	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0
BBTR-5-14	10/9/2024	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0
BBTR-6-28	10/9/2024	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0
BBTR-6-30	10/9/2024	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0
BBTR-6-40	10/9/2024	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0
BBTR-7-12	10/9/2024	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0
BBTR-8-12	10/9/2024	< 1.0	< 1.0	< 1.0	< 1.0	< 2.0

Table 125 - Bruce B Standby Generators Area – South Hydrocarbons Results
Table units are micrograms per litre ug/L

	Parameter	F1 (C6-C10)	F1-BTEX	F2 (C10-C16)	F3 (C16-C34)	F4 (C34-C50)
	Evaluation Criteria	420	420	150	500	500
	Units	ug/L	ug/L	ug/L	ug/L	ug/L
Well Identification	Date	Result	Result	Result	Result	Result
BBSG-16	6/26/2024	< 25	< 25	< 100	< 250	< 250
BBSG-16	10/8/2024	< 25	< 25	< 100	< 250	< 250
BBSG-18	6/26/2024	< 25	< 25	< 100	< 250	< 250
BBSG-18	10/8/2024	< 25	< 25	< 100	< 250	< 250
BBSG-19	6/26/2024	< 25	< 25	< 100	< 250	< 250
BBSG-19	10/8/2024	< 25	< 25	< 100	< 250	< 250
BBSG-20	6/25/2024	< 25	< 25	< 100	< 250	< 250
BBSG-42	6/26/2024	< 25	< 25	< 100	< 250	< 250
BBSG-42	10/8/2024	< 25	< 25	< 100	< 250	< 250
BBSG-44	6/25/2024	< 25	< 25	< 100	< 250	< 250
BBSG-44	10/8/2024	< 25	< 25	< 100	< 250	< 250
BBSG-45	6/25/2024	< 25	< 25	< 100	< 250	< 250
BBSG-45	10/8/2024	< 25	< 25	< 100	< 250	< 250
BBSG-46	6/25/2024	< 25	< 25	< 100	< 250	< 250
BBSG-46	10/8/2024	< 25	< 25	< 100	< 250	< 250

Table 126 - Bruce B Standby Generators Area – South Nutrients and Anions Results

Table units are micrograms per litre ug/L and millisiemens per centimetre mS/cm.

	Parameter	Alkalinity, Total (as CaCO3)	Ammonia, total (as N)	Chloride	Conductivity	Fluoride	Nitrate, as N	Nitrate-Nitrite, as N, Total	Nitrite, as N	pH	Sulphate	Total Kjeldahl Nitrogen
	Evaluation Criteria			790								
	Units	ug/L	ug/L	ug/L	mS/cm	ug/L	ug/L	ug/L	ug/L	pH UNITS	ug/L	ug/L
Well Identification	Date	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
BBSG-16	6/26/2024	102	< 0.0145	61.7	0.461	0.594	0.481	0.481	< 0.010	8.26	25.3	0.098
BBSG-16	10/8/2024	144	< 0.0050	118	0.75	1.24	0.857	0.857	< 0.010	8.20	42.2	0.187
BBSG-18	6/26/2024	138	< 0.0620	54.6	0.491	0.983	0.230	0.230	< 0.010	8.20	19.7	0.133
BBSG-18	10/8/2024	116	0.0406	42.0	0.401	1.01	0.224	0.224	< 0.010	8.12	16.6	0.146
BBSG-19	6/26/2024	97.1	< 0.0050	74.7	0.487	0.535	0.446	0.446	< 0.010	8.15	20.9	0.128
BBSG-19	10/8/2024	92.6	< 0.0050	44.8	0.372	0.562	0.348	0.348	< 0.010	8.15	18.2	0.071
BBSG-20	6/25/2024	214	< 0.0139	3.64	0.526	1.17	0.389	0.389	< 0.010	8.26	51.5	0.210
BBSG-42	6/26/2024	110	< 0.0050	57.2	0.46	0.888	0.769	0.769	< 0.010	8.23	23.5	0.217
BBSG-42	10/8/2024	99.1	< 0.0050	22.5	0.32	1.03	0.408	0.408	< 0.010	8.21	18.7	0.052
BBSG-44	6/25/2024	97.3	< 0.0050	37.8	0.361	0.754	0.717	0.717	< 0.010	8.23	18.4	0.137
BBSG-44	10/8/2024	90.0	< 0.0050	10.4	0.25	0.852	0.412	0.412	< 0.010	8.18	15.6	0.057
BBSG-45	6/25/2024	148	< 0.0050	486	1.94	1.16	1.09	1.09	< 0.050	8.22	52.2	0.165
BBSG-45	10/8/2024	128	< 0.0050	260	1.18	1.22	0.618	0.618	< 0.050	8.21	35.7	0.125
BBSG-46	6/25/2024	128	< 0.0050	363	1.51	1.03	1.10	1.10	< 0.050	8.38	43.5	0.178
BBSG-46	10/8/2024	115	< 0.0050	174	0.867	1.10	0.540	0.551	0.011	8.21	30.4	0.126

Table 127 - Central Maintenance Facility Hydrocarbons Results
Table units are micrograms per litre ug/L

	Parameter Evaluation Criteria Units	F1 (C6-C10) 750 ug/L	F1-BTEX 750 ug/L	F2 (C10-C16) 150 ug/L	F3 (C16-C34) 500 ug/L	F4 (C34-C50) 500 ug/L
Well Identification	Date	Result	Result	Result	Result	Result
CMLF-1	6/19/2024	< 25	< 25	< 100	< 250	< 250
CMLF-2	6/19/2024	< 25	< 25	< 100	< 250	< 250
CMLF-3	6/18/2024	< 25	< 25	< 100	< 250	< 250
CMLF-4	6/18/2024	< 25	< 25	< 100	< 250	< 250
CMLF-5	6/18/2024	< 25	< 25	< 100	< 250	< 250
CMLF-6	6/18/2024	< 25	< 25	< 100	< 250	< 250

Table 128 - Bunker C Oil Ignition Day Tank Area Hydrocarbon Results
Table units are micrograms per litre ug/L

	Parameter	F1 (C6-C10)	F1-BTEX	F2 (C10-C16)	F3 (C16-C34)	F4 (C34-C50)
	Evaluation Criteria	750	750	150	500	500
	Units	ug/L	ug/L	ug/L	ug/L	ug/L
Well Identification	Date	Result	Result	Result	Result	Result
BCO-20	6/21/2024	< 25	< 25	< 100	< 250	< 250
BCO-20	10/10/2024	< 25	< 25	< 100	< 250	< 250
BCO-27	6/21/2024	< 25	< 25	< 100	< 250	< 250
BCO-27	10/9/2024	< 25	< 25	< 100	< 250	< 250
BCO-28A	6/21/2024	< 25	< 25	< 100	< 250	< 250
BCO-28A	10/10/2024	< 25	< 25	< 100	< 250	< 250
BCO-28B	6/21/2024	< 25	< 25	< 100	< 250	< 250
BCO-31A	6/21/2024	< 25	< 25	< 100	< 250	< 250
BCO-31A	10/8/2024	< 25	< 25	< 100	< 250	< 250
BCO-31B	6/21/2024	< 25	< 25	< 100	< 250	< 250
BCO-32	6/21/2024	< 25	< 25	< 100	< 250	< 250
BCO-32	10/8/2024	< 25	< 25	< 100	< 250	< 250
BCO-34A	6/21/2024	< 25	< 25	< 100	< 250	< 250
BCO-34A	10/9/2024	< 25	< 25	< 100	< 250	< 250
BCO-34B	6/21/2024	< 25	< 25	< 100	< 250	< 250
BCO-34B	10/10/2024	< 25	< 25	< 100	< 250	< 250

Table 129 - Bunker C Oil Ignition Day Tank Area Metals Results
Table units are micrograms per litre ug/L

		Well Identification Date	BCO-20 10/10/2024	BCO-27 10/9/2024	BCO-28A 10/10/2024	BCO-31A 10/8/2024	BCO-32 10/8/2024	BCO-34A 10/9/2024	BCO-34B 10/10/2024
Parameter	Evaluation Criteria	Units	Result	Result	Result	Result	Result	Result	Result
Antimony	6	ug/L	< 1.00	< 1.00	< 1.00	0.26	0.39	< 1.00	< 1.00
Arsenic	25	ug/L	< 1.00	< 1.00	2.09	0.76	0.26	< 1.00	2.35
Barium	1000	ug/L	37.6	47.0	38.7	33.2	17.6	39.5	54.4
Beryllium	4	ug/L	< 0.200	< 0.200	< 0.200	< 0.020	< 0.020	< 0.200	< 0.200
Boron	5000	ug/L	213	224	254	249	51	242	457
Cadmium	2.7	ug/L	< 0.0500	< 0.0500	< 0.0500	0.0696	0.0307	< 0.0500	< 0.0500
Chromium	50	ug/L	< 5.00	< 5.00	< 5.00	< 0.50	0.53	< 5.00	< 5.00
Chromium, Hexavalent (Cr6+)	25	ug/L	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Cobalt	3.8	ug/L	< 1.00	< 1.00	< 1.00	0.19	< 0.10	< 1.00	< 1.00
Copper	87	ug/L	< 2.00	< 2.00	< 2.00	0.54	2.40	< 2.00	< 2.00
Lead	10	ug/L	< 0.500	< 0.500	< 0.500	< 0.050	< 0.050	< 0.500	< 0.500
Mercury	0.29	ug/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Molybdenum	70	ug/L	5.13	3.22	4.65	5.85	1.16	6.53	3.70
Nickel	100	ug/L	5.84	< 5.00	11.5	13.3	1.32	7.96	< 5.00
Selenium	10	ug/L	< 0.500	< 0.500	< 0.500	0.993	0.243	0.881	< 0.500
Silver	1.5	ug/L	< 0.100	< 0.100	< 0.100	< 0.010	< 0.010	< 0.100	< 0.100
Sodium	490000	ug/L	320000	183000	356000	187000	15100	347000	466000
Thallium	2	ug/L	0.189	< 0.100	0.384	0.645	0.015	0.520	< 0.100
Uranium	20	ug/L	6.91	1.91	4.87	13.5	0.689	10.3	1.74
Vanadium	6.2	ug/L	21.9	< 5.00	< 5.00	< 0.50	6.62	< 5.00	13.1
Zinc	1100	ug/L	< 10.0	< 10.0	< 10.0	27.8	6.6	< 10.0	< 10.0

Table 130 - Former Acid Wash Pond Area Metals Results
Table units are micrograms per litre ug/L

		Well Identification Date	BCO-AWP-18 10/9/2024	BCO-AWP-33 10/9/2024	BCO-AWP-36 10/10/2024	BCO-AWP-38 10/10/2024
Parameter	Evaluation Criteria	Units	Result	Result	Result	Result
Antimony	6	ug/L	< 1.00	< 1.00	< 1.00	< 1.00
Arsenic	25	ug/L	< 1.00	< 1.00	< 1.00	< 1.00
Barium	1000	ug/L	60.0	167	66.1	60.3
Beryllium	4	ug/L	< 0.200	< 0.200	< 0.200	< 0.200
Boron	5000	ug/L	< 100	< 100	< 100	148
Cadmium	2.7	ug/L	0.111	< 0.0500	< 0.0500	< 0.0500
Chromium	50	ug/L	< 5.00	< 5.00	< 5.00	< 5.00
Chromium, Hexavalent (Cr6+)	25	ug/L	< 0.50	< 0.50	< 0.50	< 0.50
Cobalt	3.8	ug/L	< 1.00	< 1.00	< 1.00	< 1.00
Copper	87	ug/L	< 2.00	< 2.00	< 2.00	< 2.00
Lead	10	ug/L	< 0.500	< 0.500	< 0.500	< 0.500
Mercury	0.29	ug/L	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Molybdenum	70	ug/L	24.6	45.2	6.48	19.0
Nickel	100	ug/L	146	< 5.00	< 5.00	6.12
Selenium	10	ug/L	< 0.500	< 0.500	1.21	0.688
Silver	1.5	ug/L	< 0.100	< 0.100	< 0.100	< 0.100
Sodium	490000	ug/L	554000	501000	512000	775000
Thallium	2	ug/L	0.236	< 0.100	< 0.100	0.218
Uranium	20	ug/L	11.6	3.01	2.69	9.53

		Well Identification Date	BCO-AWP-18 10/9/2024	BCO-AWP-33 10/9/2024	BCO-AWP-36 10/10/2024	BCO-AWP-38 10/10/2024
Parameter	Evaluation Criteria	Units	Result	Result	Result	Result
Vanadium	6.2	ug/L	952	< 5.00	72.4	46.4
Zinc	1100	ug/L	< 10.0	< 10.0	< 10.0	< 10.0