Hope Bay Project

2024 Aquatic Effects Monitoring Program – Annual Report

PREPARED FOR

Agnico Eagle Mines Limited

DATE

February 2025

REFERENCE

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Hope Bay Project

2024 Aquatic Effects Monitoring Program – Annual Report

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EXECUTIVE SUMMARY

The Hope Bay Project (the Project) is a gold mining development in the West Kitikmeot region of mainland Nunavut, operated by Agnico Eagle Mines Limited. Although the Project is currently under Care and Maintenance, compliance management and monitoring activities continue, including the Aquatic Effects Monitoring Program (AEMP), in accordance with the *Hope Bay, Care and Maintenance Plan* (Agnico Eagle 2022).

The AEMP is outlined in the *Hope Bay Project: Aquatic Effects Monitoring Plan* (the Plan; TMAC Resources Inc. [TMAC] 2018). The Plan defines Project-related activities that trigger monitoring of aquatic components under a detailed monitoring framework. The Plan also includes a Response Framework. This framework provides low action level conditions that, if exceeded, can trigger the development of a Response Plan, which adaptively manages potential Project-related effects.

The 2024 AEMP included lakes adjacent to the Doris and the Madrid North Development, including Doris, Little Roberts, Patch, Imniagut, P.O., Ogama, Windy, and Glenn lakes, as well as the reference lake (Reference Lake B). Aquatic components evaluated in 2024 included fish habitat (ice thickness and stream hydrology), under-ice dissolved oxygen (DO) concentration, water temperature, water quality, and phytoplankton biomass. Additional components (sediment quality and benthic invertebrates) are monitored every 3 years and are scheduled for the 2025 AEMP. Water levels during the ice-covered season (a fish habitat variable) could not be evaluated in 2024 due to equipment malfunction, logistical challenges, and safety concerns regarding ice integrity once the replacement equipment was received. Lake level measurements from the Doris Lake-2 hydrology station were used to calculate the reduction in under-ice lake surface elevation in Doris Lake.

Due to the absence of water level data, Project-related effects for fish habitat could only be evaluated for Doris Lake in 2024. No effects for fish habitat in Doris Lake were observed. No effects were detected for DO concentrations, water temperature, or water quality variables for the exposure lakes (Table 1). In 2024, significant changes in phytoplankton biomass in Doris Lake were observed compared to the reference lake. However, this was determined not to be a Project-related effect as 2024 data were within the historical range for phytoplankton biomass in Doris Lake.

No low action level exceedances were observed for the two physical limnological variables (water temperature and dissolved oxygen profiles), the 26 water quality variables evaluated, or phytoplankton biomass in 2024. No further investigation was required.

TABLE 1 SUMMARY OF EVALUATION OF EFFECTS FOR THE 2024 AQUATIC EFFECTS MONITORING PROGRAM

Component	Exposure Lakes Included in Evaluation of Effects	Conclusion of Effect	Low Action Level Triggered?
Fish habitat (water level, ice thickness, and stream hydrology)	Windy Lake, Glenn Lake, Patch Lake, Imniagut Lake, P.O. Lake, Ogama Lake, Doris Lake, Little Roberts Lake	No Effect[1]	No Effect[1]
Physical limnology (under-ice dissolved oxygen and water temperature)	Windy Lake, Patch Lake, Doris Lake	No effect	No
Water quality	Windy Lake, Patch Lake, Doris Lake	No effect	No
Phytoplankton biomass (chlorophyll *a*)	Patch Lake, Doris Lake	No effect	No

Note:
NA = not applicable
[1] Project-related effects were unable to be assessed for Windy, Glenn, Patch, Imniagut, P.O., Ogama, and Little Roberts lakes due to the absence of under-ice water level data. Only Doris Lake was assessed for Project-related effects.

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ACRONYMS AND ABBREVIATIONS

°C	degree Celsius
>	greater than
≥	greater than or equal to
<	less than
≤	less than or equal to
μg/L	microgram per litre
%	percent
AEMP	Aquatic Effects Monitoring Program
Agnico Eagle	Agnico Eagle Mines Limited
ALS	ALS Laboratory Group
BA	Before-After
BACI	Before-After/Control-Impact
CCME	Canadian Council of Ministers of the Environment
chl *a*	chlorophyll *a*
cm	centimetre
CPRT	Crown Pillar Recovery Trench
DL	analytical detection limit
DO	dissolved oxygen
Doris Mine	Doris North Gold Mine
ERM	ERM Consultants Canada Ltd.
km	kilometre
LME	Linear mixed effects
L	litre
Madrid–Boston FEIS	*Madrid–Boston Final Environmental Impact Statement*
m	metre
mg/L	milligram per litre
NA	not applicable
NTU	nephelometric turbidity unit(s)
Plan, the	the approved *Hope Bay Project: Aquatic Effects Monitoring Plan*
Project, the	Hope Bay Project, the
TMAC	TMAC Resources Inc.

QA/QC	Quality assurance/quality control
RPD	Relative percent difference
TSS	total suspended solids

GLOSSARY

Action level	The Response Framework includes three tiers of action levels: low, medium, and high. The low action level for each monitored component is based on baseline data, and/or water or sediment quality guidelines, and/or recommended critical effects sizes for that component.
Benthic	Pertaining to the bottom region of a water body, on or near bottom substrates such as sediments or rocks.
Benthic invertebrates	A diverse group of small (non-vertebrate) aquatic organisms that live on, or close to, the bottom substrates of lakes or streams. Benthic invertebrates are an important food source for fish.
Biomass	The amount of living matter as measured on a weight or concentration basis. Biomass is an indication of the amount of food available for higher trophic levels, including fish. In the AEMP, phytoplankton biomass is estimated by measuring chlorophyll *a.*
Censored value	A value that is only partially known, e.g., a variable concentration that is reported as being below a specified detection limit, although the actual concentration is not known. Interchangeably used with 'less than detection limit' in this report.
Chlorophyll *a*	An essential light-harvesting pigment for photosynthetic organisms, including phytoplankton. Because of the difficulty involved in the direct measurement of plant carbon, chlorophyll *a* is routinely used as a "proxy" estimate for plant biomass in aquatic studies.
Reference site	Site located beyond any Project influence (i.e., Reference Lake B).
Exposure site	Site potentially influenced by Project-related activities (e.g., Doris Lake, Patch Lake, and Windy Lake)
Low action level benchmark	One condition that triggers a low action level exceedance when the concentration of a water or sediment quality variable exceeds 75% of the current respective benchmark.
Phytoplankton	Microscopic primary producers that live free-floating in water. Most of these organisms are single-celled algae that use chlorophyll *a* for the process of photosynthesis.
Seasons	When not specified, "seasons" refer to winter (under-ice) and spring/summer/fall (open water) conditions.

1. INTRODUCTION

The Hope Bay Project (the Project) is a gold mining development in the West Kitikmeot region of mainland Nunavut. The Project has been operated by Agnico Eagle Mines Limited (Agnico Eagle) since February 2021 and is currently in Care and Maintenance. Despite being in Care and Maintenance, compliance management and monitoring activities, including the Aquatic Effects Monitoring Program (AEMP), a requirement under the *Hope Bay, Care and Maintenance Plan* (Agnico Eagle 2022), are ongoing. Additionally, advanced exploration activities continued at the Project in 2024.

The Project is located approximately 153 kilometres (km) southwest of Cambridge Bay on the southern shore of Melville Sound. The underlying geological substrate in the Project area includes a greenstone belt that runs 80 km in a north–south direction, varying in width from 7 to 20 km. The Project consists of three developments: Doris, Madrid (North and South), and Boston. Current, permitted, and planned infrastructure associated with the Project is provided (Figure 1-1).

Doris is the northernmost development situated near Roberts Bay (Arctic Ocean) and contains the Doris Camp, lodging and support facilities for the Project, and the Doris North Gold Mine (Doris Mine). Construction of the Doris development began in 2010 and commercial operations were conducted from 2017 to 2022.

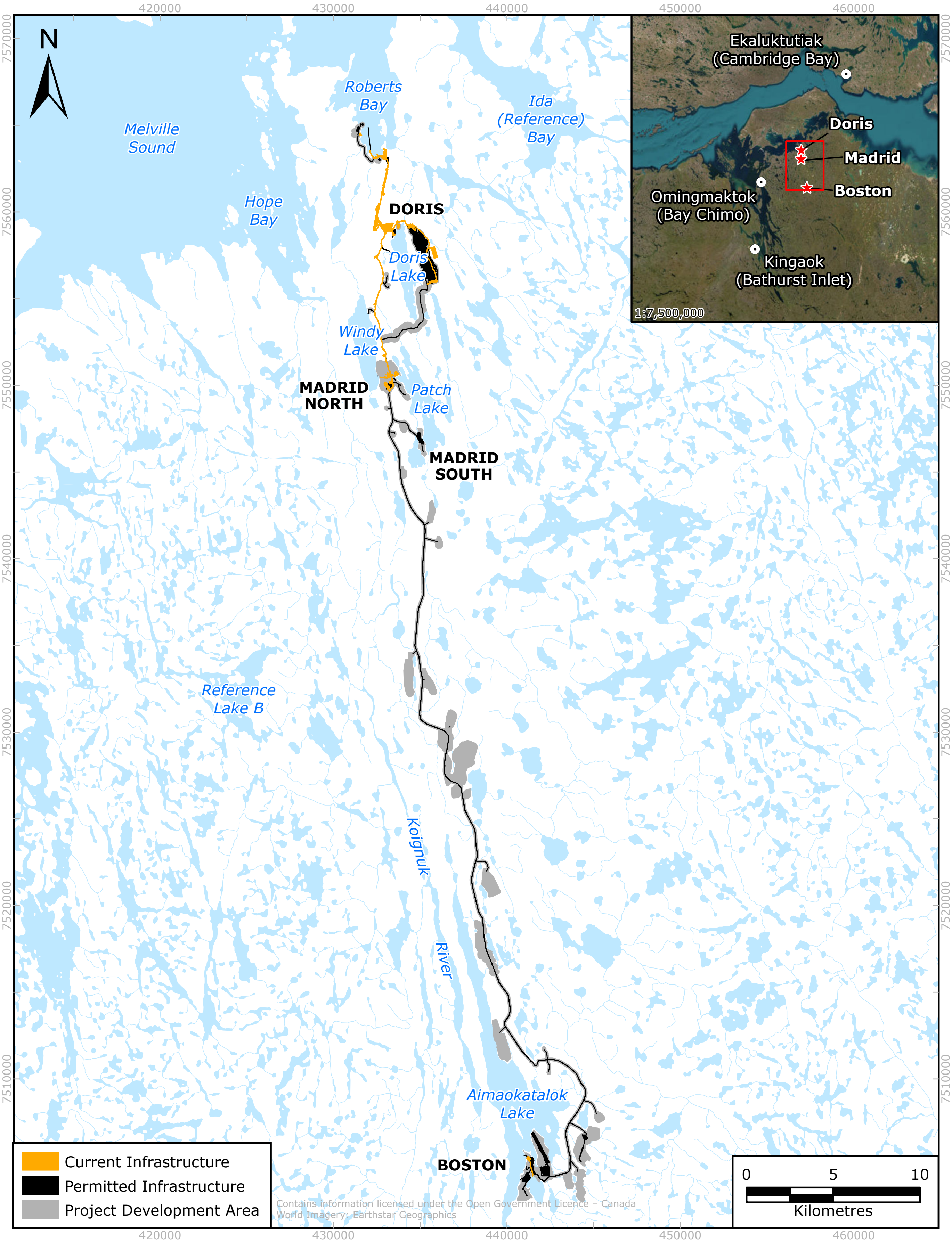
The Madrid developments are in the north-central area of the Project and accessible by road from the Doris development. Construction at the Madrid North development began in April 2019 and operation began in August 2019. All mining and development activity was suspended at Madrid North in March 2020, except for a brief period of activity at the Madrid North portal in January and February 2021.

The Boston development is in the southernmost part of the Project. As of December 2024, construction had not begun at the Madrid South or Boston developments.

The Project operates under Project Certificate No. 009 issued by the Nunavut Impact Review Board, and two Type A water licences (2AM-DOH1335 and 2AM-BOS1835) issued by the Nunavut Water Board. In April 2022, the *Hope Bay, Care and Maintenance Plan* (Agnico Eagle 2022) was submitted to the Nunavut Water Board and Nunavut Impact Review Board, as required under Project Certificate No. 009 and by the water licences. Approval of that plan was received on 1 September 2022.

The Hope Bay AEMP is a requirement of Agnico Eagle's Type A Water Licence and is outlined in the *Hope Bay Project: Aquatic Effects Monitoring Plan* (the Plan; TMAC Resources Inc. [TMAC] 2018). The Plan includes an adaptive management component through the Response Framework. The Response Framework sets environmental threshold levels that, if exceeded, would trigger further investigation and/or mitigation. The Plan also includes the Environment Effects Monitoring requirements under the *Metal* and *Diamond Mining Effluent Regulations* (SOR/2022-159), when applicable to the Project activities.

FIGURE 1-1 THE HOPE BAY PROJECT, 2024



ERM

CLIENT: Agnico Eagle Mines Ltd.
GIS NUMBER: HB-01-299-01

DATE: 24 February 2025

PROJECTION: NAD 1983 UTM Zone 13N
SCALE: 1:302,990 when printed at 8.5x11

This Annual Report includes a summary of annual Project activities relevant to the AEMP; a brief overview of the AEMP monitoring design, the evaluation of effects methods, and the Response Framework criteria; and the results and conclusions of the evaluation of effects and a comparison to action level conditions. Monitoring data, methods of sample collection, quality assurance and quality control measures, and results of the 2024 AEMP sampling are provided in Appendix A, 2024 Data Report, except for the stream hydrology monitoring and results, which are provided in Appendix B, 2024 Hydrology Compliance Monitoring Summary. Details for the evaluation of effects dataset, statistical methods, and the results of the statistical analyses are provided in Appendix C, 2024 Evaluation of Effects Supporting Information—Historical Dataset Summaries and Statistical Methods and Results.

1.1 OBJECTIVES

The primary goals of the AEMP are to evaluate potential Project effects on the surrounding freshwater environment during the construction and operation of the Project, verify predictions from the *Madrid–Boston Final Environmental Impact Statement* (Madrid–Boston FEIS; TMAC 2017), support current and future *Fisheries Act* (1985) authorizations, and provide a mechanism to respond to potential Project effects in the freshwater environment through mitigation and management actions.

1.2 PROJECT ACTIVITIES IN 2024

The Care and Maintenance status remained in effect for all developments (Doris, Madrid, and Boston sites) in 2024. Agnico Eagle continued the management of facilities to remain in regulatory compliance with permits, licences, and approvals for the Project, and conducted advanced exploration activities.

The Project-related activities (by development) relevant to the AEMP that occurred in 2024 are listed below.

Doris

- Milling activities remained suspended (since October 2021).
- Underground ore extraction in the Doris Mine remained suspended (since February 2022).
- The commissioning of the Effluent Water Treatment Plant was successfully completed.
- Effluent from underground dewatering and/or the tailings impoundment area that was compliant with the *Metal* and *Diamond Mining Effluent Regulations* (SOR/2022-159) was discharged to Roberts Bay.
- Sealift operation with delivery of supplies, including delivery of bulk diesel fuel and Jet-A, was completed.
- The Doris Air Quality Station operated throughout the year, with some inoperable periods in early 2024.
- Quarry blasting occurred at quarries 2 and D (Madrid Area) to support Care and Maintenance activities and small construction projects (e.g., the exploration track and the Naartok infrastructure pad).

Madrid

- Exploration surface drilling occurred on the bottom of Patch Lake during the ice-covered season in 2024. Additional drilling was focused on the Madrid Deposit, including the Patch 7, Patch South, and Suluk target areas. All drill sites were reclaimed following the decommissioning of the drills, which included the placement of overburden material to level the drill hole area.
- A year-round, 4x4-accessible exploration track was built to support drilling activities in this area.

Madrid North

- Ore extraction and development at Madrid North remained suspended (since October 2021).
- Dewatering from the Naartok Crown Pillar Recovery Trench (CPRT) was conducted in 2024 and water was transported to the sedimentation pond at Doris via tanker trucks, then pumped to the tailings impoundment area.
- During the spring season of 2024, waste rock from the Madrid Waste Rock pile was transported to the Naartok CPRT to support the construction of the underground portal.
- Construction of infrastructure to support operations started in October 2024, including an infrastructure pad adjacent to the Naartok CPRT.

Madrid South

- As of December 2024, construction of the Madrid South development had not yet commenced.

Boston

- As of December 2024, construction of the Boston development had not yet commenced.
- The Hope Bay Project Boston Advanced Exploration site was maintained but not occupied in 2024.

2. METHODS

2.1 MONITORING DESIGN

The advancement of Project activities in targeted development areas triggers monitoring for specific lakes, as defined by the AEMP (Table 2.1-1; TMAC 2018). Monitored sites included exposure lakes (i.e., lakes potentially influenced by Project-related activities) and a reference lake (TMAC 2018; Figure 2.1-1). As of 2024, AEMP monitoring has been triggered at the Doris and Madrid North developments in response to ongoing Care and Maintenance activities (Table 2.1-1). Monitoring includes sites proximate to infrastructure that have the potential to receive non-point-source inputs, such as runoff or dust. Additionally, monitoring includes sites that could be affected by water loss due to permitted water withdrawal and groundwater seepage into the underground developments. Exposure lakes included Doris and Little Roberts lakes (associated with the Doris Mine Development), and Imniagut, Patch, P.O., Ogama, Windy, and Glenn lakes (associated with the Madrid North Development; Figure 2.1-1).

The 2024 AEMP included the following components (Table 2.1-2):

- Fish habitat (ice thickness, water level, and stream hydrology);
- Under-ice physical limnology and water quality variables;
- Open-water physical limnology and water quality variables; and
- Open-water phytoplankton.

Not all components are monitored on an annual basis, nor are they applicable at each sampling site (TMAC 2018; Table 2.1-2). Sediment quality and lake benthic invertebrates are monitored every 3 years, with the next sampling period for both components scheduled for 2025.

The 2024 AEMP was conducted in accordance with the Plan (TMAC 2018), except for under-ice water level measurements. These measurements could not be obtained in 2024 due to equipment malfunctions, logistical challenges, and safety concerns regarding ice integrity once the replacement equipment was received. Water level measurements, and consequently the reduction in under-ice lake surface elevation, for Doris Lake only were estimated based on lake level measurements collected in April from the Doris Lake-2 hydrology monitoring station (Appendix B).

Comprehensive details of the 2024 AEMP sampling design, schedule, sampling sites, and monitoring methods for aquatic and hydrological components are provided (Appendices A and B, respectively).

2.2 EVALUATION OF EFFECTS

2.2.1 EVALUATED VARIABLES

The evaluated variables for fish habitat, physical limnology, water quality, and phytoplankton are outlined in the Plan (TMAC 2018). Project-related water use, such as water withdrawal and seepage in underground mining, has the potential to reduce lake water levels and affect stream hydrology, which could adversely affect fish habitat. Therefore, fish habitat is evaluated through water level and ice thickness, and open-water season streamflow (Table 2.2-1; Appendix B). Under-ice water level measurements were not evaluated in 2024 as part of the fish habitat evaluation of effects due to the equipment issues discussed above (Section 2.2).

TABLE 2.1-1 RATIONALE FOR AQUATIC EFFECTS MONITORING PROGRAM SAMPLING SITES BASED ON DEFINED MONITORING TRIGGERS FOR THE HOPE BAY PROJECT, 2024

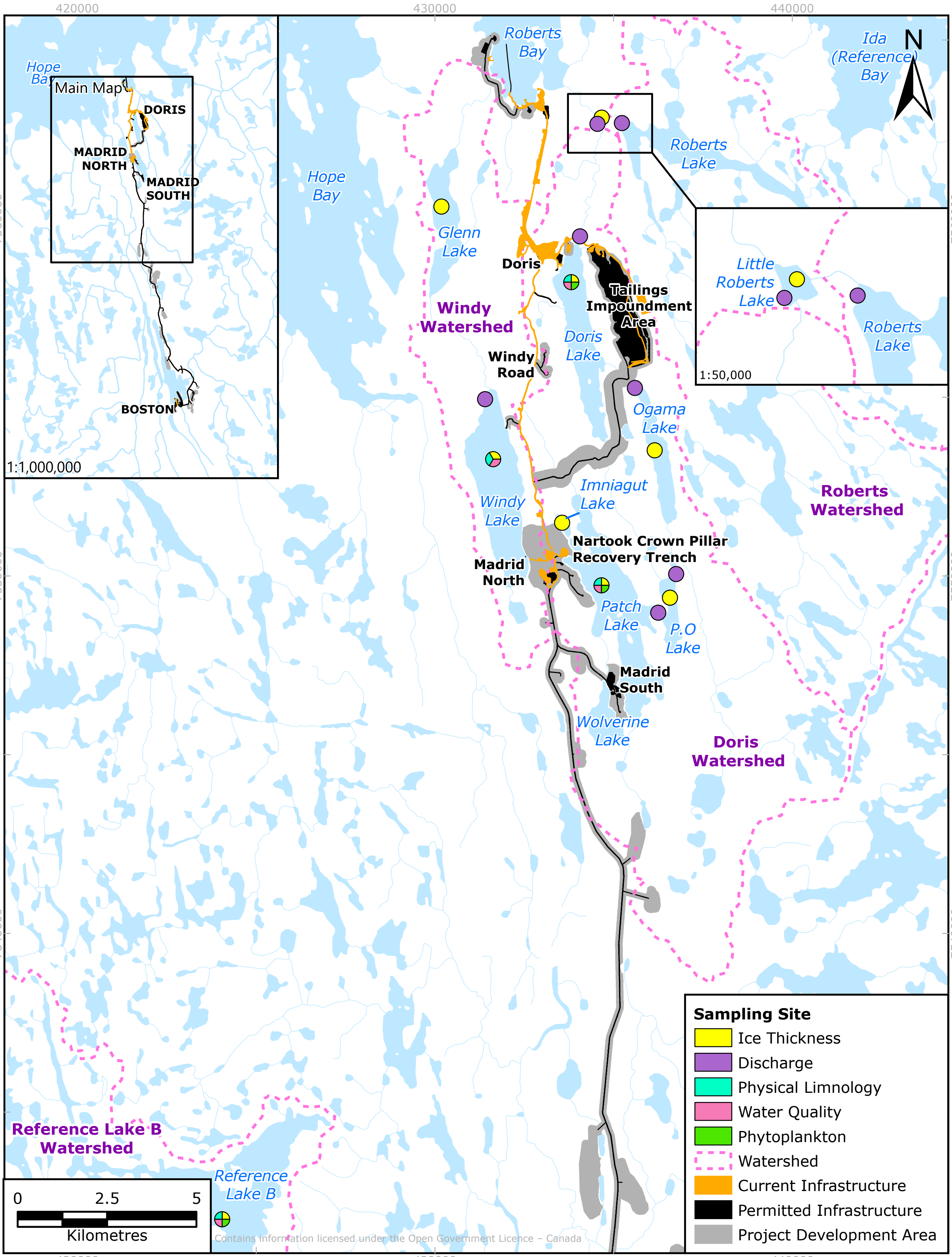
Watershed	Sampling Site	Sampling Rationale	Monitoring Trigger	2024 Monitoring Requirement and Rationale
Doris	Wolverine Lake	Drawdown from Madrid South mine groundwater inflow; inputs (e.g., dust deposition, runoff) due to proximity to infrastructure.	Madrid South construction and operations	No
	Patch Lake	Drawdown from Madrid North and South mines groundwater inflow; inputs (e.g., dust deposition, runoff) due to proximity to infrastructure.	Madrid North and South construction and operations	Yes, Care and Maintenance activities at Madrid North
	Imniagut Lake	Drawdown from Madrid North mine groundwater inflow.	Madrid North and South operations	Yes, Care and Maintenance activities at Madrid North
	P.O. Lake	Drawdown from Madrid North mine groundwater inflow.	Madrid North and South operations	Yes, Care and Maintenance activities at Madrid North
	Ogama Lake	Drawdown from Madrid North mine groundwater inflow.	Madrid North and South operations	Yes, Care and Maintenance activities at Madrid North
	Doris Lake	Water withdrawal for industrial use (e.g., dust suppression, wash bays and machine shops, process water); drawdown from Doris mine groundwater inflow; inputs (e.g., dust deposition, runoff) due to proximity to infrastructure.	Doris, Madrid North, and Madrid South construction and operations; Boston operations	Yes, Care and Maintenance activities at Doris and Madrid North
	Little Roberts Lake	Little Roberts Lake is downstream of Doris Lake; therefore, indirect effects may be observed in Little Roberts Lake as a result of drawdown and water withdrawal from Doris Lake.	Doris, Madrid North, and Madrid South construction and operations; Boston operations	Yes, Care and Maintenance activities at Doris and Madrid North

Watershed	Sampling Site	Sampling Rationale	Monitoring Trigger	2024 Monitoring Requirement and Rationale
Windy	Windy Lake	Water withdrawal for domestic use (potable water); drawdown from Madrid North mine groundwater inflow.	Doris, Madrid North, and Madrid South construction and operations	Yes, Care and Maintenance activities at Doris and Madrid North
	Glenn Lake	Glenn Lake is downstream of Windy Lake; therefore, indirect effects may be observed in Glenn Lake as a result of water withdrawal from Windy Lake.	Doris, Madrid North, and Madrid South construction and operations	Yes, Care and Maintenance activities at Doris and Madrid North
Aimaokatalok	Stickleback Lake	Inputs (e.g., dust deposition, runoff) due to proximity to infrastructure.	Boston construction and operations	No
	Aimaokatalok Lake	Inputs (e.g., dust deposition, runoff) due to proximity to infrastructure; permitted discharge.	Boston construction and operations	No
Reference	Reference Lake B	Reference area for AEMP located outside of the zone of Project influence.	Doris, Madrid, and Boston construction and operations	Yes, Care and Maintenance activities at Doris and Madrid North

Notes:

AEMP = Aquatic Effects Monitoring Program; Project = Hope Bay Project

FIGURE 2.1-1 SAMPLING SITES, HOPE BAY AEMP, 2024



ERM

CLIENT: Agnico Eagle Mines Ltd.
GIS NUMBER: HB-01-299-02

DATE: 23 January 2025

PROJECTION: NAD 1983 UTM Zone 13N
SCALE: 1:150,000 when printed at 8.5x11

TABLE 2.1-2 AQUATIC EFFECTS MONITORING PROGRAM SAMPLING LOCATIONS AND MONITORED COMPONENTS FOR THE HOPE BAY PROJECT, 2024

Site	Ice Thickness	Water Level	Streamflow	Physical Limnology	Water Quality	Phytoplankton
Doris Watershed						
Patch Lake	X	-[a]	-	X	X	X
Patch Outflow Hydro	-	-	X	-	-	-
Imniagut Lake	X	-[a]	-	-	-	-
Imniagut Lake Hydro	-	-	-	-	-	-
P.O. Lake	X	-[a]	-	-	-	-
P.O. Outflow Hydro	-	-	X	-	-	-
Ogama Lake	X	-[a]	-	-	-	-
Ogama Outflow Hydro	-	-	X	-	-	-
Doris Lake	X	-[a]	-	X	X	X
Doris Lake-2 Hydro	-	-	-	-	-	-
Doris Creek TL-2 Hydro	-	-	X	-	-	-
Little Roberts Lake	X	-[a]	-	-	-	-
Little Roberts Outflow Hydro	-	-	X	-	-	-
Windy Watershed						
Windy Lake	X	-[a]	-	X	X	-
Windy Outflow Hydro	-	-	X	-	-	-
Glenn Lake	X	-[a]	-	-	-	-
Glenn Lake Hydro	-	-	-	-	-	-
Reference Lake						
Reference Lake B	X	-[a]	-	X	X	X

Notes:
Dashes (-) = Monitoring is either not triggered by the Plan or not required at the specific site.
X = Monitoring completed in 2024.
[a] Water level measurements during the ice-covered season were not obtained in 2024 due to equipment malfunction.

TABLE 2.2-1 EVALUATED VARIABLES FOR THE HOPE BAY AQUATIC EFFECTS MONITORING PROGRAM, 2024

Category	Evaluated Variable	
Fish Habitat	• Water level[a] • Ice thickness • Stream hydrology	
Physical Limnology	• Under-ice dissolved oxygen • Temperature	
Water Quality	• pH • Total Suspended Solids • Turbidity • Chloride • Fluoride • Total ammonia • Nitrate • Nitrite • Total phosphorus[b] • Total aluminum • Total arsenic • Total boron • Total cadmium	• Total chromium • Total copper • Total iron • Total lead • Dissolved manganese • Total mercury • Total molybdenum • Total nickel • Total selenium • Total silver • Total thallium • Total uranium • Dissolved zinc
Phytoplankton	• Biomass (chlorophyll *a*)	

Notes:
[a] Water level measurements during the ice-covered season were not obtained in 2024 due to equipment malfunction.
[b] Total phosphorus was assessed in 2024 as a supporting parameter and is not an annual effects variable under the *Hope Bay Project: Aquatic Effects Monitoring Plan* (TMAC 2018).

Evaluated variables for physical limnology and water quality included those with guidelines established by the Canadian Council of Ministers of the Environment (CCME) for the protection of aquatic life (CCME 2024; Section 2.2-4). Dissolved oxygen (DO) concentrations are typically lowest during the under-ice period, representing "worst-case scenario" conditions. Lower DO concentrations during the under-ice season can be attributed to microbial decomposition and respiration, exclusion of atmospheric oxygen exchange, and decreased photosynthetic activity from phytoplankton due to ice and snow cover, which reduces light penetration (Wetzel 2001).

Total phosphorus does not have a CCME guideline but is included in the evaluation of effects as a supporting parameter due to its association with phytoplankton productivity (measured as biomass; CCME 2004). Phytoplankton biomass is estimated using the main photosynthetic pigment, chlorophyll *a* (chl *a*). The AEMP indicated that phytoplankton biomass (chl *a* concentrations) in Doris Lake significantly increased in 2022. This increase was beyond the historical baseline range (ERM Consultants Canada Ltd. [ERM] 2023), which triggered a low action level Response Plan (Agnico

Eagle 2023) and led to the *Aquatic Response Plan for Phytoplankton* (ERM 2024). Total phosphorus was assessed in 2024 to support the evaluation of effects for phytoplankton biomass.

2.2.2 DATASETS

Physical limnology, water quality, and biological data have been collected in the Doris and Madrid development areas of the Project since 1995. Over time, historical samples collected have varied by location, depth, sampling date, and method of collection (Appendix C). Therefore, historical data were evaluated for relevancy and compared to the current sampling framework, as detailed in the Plan (TMAC 2018) and were included in evaluation of effects when applicable (Appendix C).

Data from baseline years included in data analyses are:

- All years up to and including 2009 for the Doris development, as Doris Mine construction began in 2010; and
- All years up to and including 2018 for the Madrid North development, as construction and operations began in 2019.

2.2.3 OVERVIEW OF EFFECTS ASSESSMENT

This section provides an overview of the evaluation of effects methods. A detailed description of the statistical analyses, methods, and results are provided (Appendix C).

2.2.3.1 FISH HABITAT

The potential effects for fish habitat variables (water level and ice thickness) were assessed relative to the predictions in the Madrid–Boston FEIS (TMAC 2017).

2.2.3.2 PHYSICAL LIMNOLOGY

The evaluation of effects for physical limnology was conducted using graphical analyses to detect temporal changes in evaluated variables in the exposure lakes relative to the reference lake (Figure 4.2-1 in TMAC 2018). Temporal trends were assessed for the physical limnology evaluated variables (DO and temperature profiles). The absolute values (concentration in milligrams per litre [mg/L] or temperature [°C]) and water column profiles in each exposure lake were visually assessed relative to the absolute values observed during baseline years and/or in the reference lake.

2.2.3.3 WATER QUALITY AND PHYTOPLANKTON

The evaluation of effects for water quality and phytoplankton variables was conducted using statistical and graphical analyses to detect temporal changes in evaluated variables in the exposure lakes relative to the reference lake (Figure 4.2-1 in TMAC 2018).

A two-step statistical analysis was conducted for water quality and phytoplankton variables. The first step investigated any change in the variable over time, while the second step evaluated any trends for that variable in the exposure lake compared to the reference lake. The second step was conducted only for the years in which sampling was completed at both lakes for the applicable variable. A result was considered statistically different if the significance level (*p* value) for analysis was less than 0.05.

Either linear mixed-effects regression or Tobit regression models were used to examine temporal trends over the monitoring period for Doris Lake (10 or more years for most variables; Appendix C). Tobit regression was used when 10 to 50% of the data for a given analysis were below the analytical detection limit (DL). Statistical analyses were not conducted if more than 50% of the monitoring data, or the current year's observations, were less than the DL.

Patch and Windy lakes had less than 10 years of continuous historical data available for most variables, with non-sequential years of collection. For these lakes, the statistical analysis consisted of a before-after (BA) analysis where the *before* period included the baseline data (i.e., up to and including 2018, Section 2.2.2) and the *after* period included data collected in the years since Project-related activities may have affected the exposure lakes (i.e., since 2019). If there was a significant difference between the before and after periods for an exposure lake in a given season, the analysis proceeded to a Before-After/Control-Impact (BACI) analysis. The BACI analysis compares the before-after trends between the exposure and reference lake (Appendix C) and can only assess data from the same collection years at the reference and exposure lakes.

The evaluation of effects figures for water quality and phytoplankton variables included graphing all observations from each year. Additionally, the annual fitted mean (and 95% confidence intervals) was plotted for Doris Lake, while the BA fitted means were plotted for Patch and Windy lakes. If applicable, the corresponding fitted mean was plotted for the reference lake. Observations that were below the sample DL were plotted at half the DL and indicated by a hollow symbol (O or Δ). In cases where statistical analyses were not completed, graphical analyses were used to visually assess for potential changes in variables.

In the evaluation of effects, statistical assessments, graphical assessments, and professional judgment were used to determine whether an effect occurred and if action level conditions would be triggered by the Response Framework (Figure 4.2-1 in TMAC 2018). Statistical assessments themselves are not conclusive evidence of an effect. Therefore, if an evaluated variable had a statistically significant result, graphical analyses were used to identify the direction of the change. For most variables, only an increasing concentration over time would be considered an adverse effect (e.g., for total suspended solids [TSS] and total metals). However, for other variables (e.g., phytoplankton biomass or pH), either an increasing or a decreasing trend could be considered adverse. Additionally, for any statistically significant result, the 2024 observations were compared to the baseline range to assess whether the detected change was outside of historical ranges. If an effect was detected based on statistical and graphical analyses, supporting data were interpreted using professional judgment to determine the potential cause of the effect. Several factors unrelated to Project-related activities could influence the detection of a significant temporal change in an exposure lake, and relative to the reference lake. Local differences in meteorological conditions (e.g., microclimates), overland runoff or naturally variable inputs related to weathering and erosion, and variation due to lake morphology can all influence changes over time.

The Response Framework (TMAC 2018; Section 2.2.5) outlines the steps to assess whether an effect is Project-related. The purpose of the Response Framework is to pre-empt significant adverse effects to aquatic life. If a Project-related effect or an inconclusive but potentially adverse change had been identified, the data were compared to the Madrid–Boston FEIS (TMAC 2017) predictions.

2.2.4 BENCHMARKS

Annual AEMP results are compared to the CCME water quality guidelines for the protection of aquatic life (CCME 2024; Table 2.2-2), which are used as the benchmarks for physical limnology and water quality variables. When multiple guidelines exist (e.g., short- and long-term or acute and chronic exposure values), the most conservative (i.e., lowest) guideline is used as the AEMP benchmark. The CCME guidelines for TSS and turbidity are lake specific, based on background concentrations (Table 2.2-2), and are calculated for both the under-ice and open-water season for each exposure lake (Table 2.2-3). The guideline for total ammonia is pH- and temperature-dependent (Table 2.2-4).

TABLE 2.2-2 WATER QUALITY BENCHMARKS

Water Quality Variable	**Benchmark**[a]
Dissolved Oxygen	9.5 mg/L (cold-water biota: early life stages) 6.5 mg/L (cold-water biota: other life stages)
Temperature	Thermal additions must not alter thermal stratification regime, turnover date(s), and maximum weekly temperature.
pH	6.5 to 9.0
Total Suspended Solids	Maximum average increase of 5 mg/L from background (for clear-flow waters; long-term exposure); Table 2.2-3
Turbidity	Maximum average increase of 2 NTU from background (for clear-flow waters; long-term exposure)
Chloride	120 mg/L (long term)
Fluoride	0.12 mg/L
Total ammonia	Temperature- and pH-dependent; Table 2.2-4
Nitrate	3.0 mg/L (long term)
Nitrite	0.06 mg/L
Total aluminum	0.005 mg/L (if pH <6.5); 0.1 mg/L (if pH ≥6.5)
Total arsenic	0.005 mg/L
Total boron	1.5 mg/L
Total cadmium	0.00004 mg/L for hardness (as $CaCO_3$) of <17 mg/L; $10^{(0.83[\log(hardness)]-2.46)}$/1,000 mg/L for hardness of ≥17 to ≤280 mg/L; 0.00037 mg/L for hardness of >280 mg/L (long term)
Total chromium	0.001 mg/L for chromium (VI); 0.0089 mg/L for chromium (III)
Total copper	0.002 mg/L for hardness (as $CaCO_3$) of <82 mg/L; $e^{(0.8545[\ln(hardness)]-1.465)}$/1,000 mg/L for hardness of ≥82 to ≤180 mg/L; 0.004 mg/L for hardness of >180 mg/L
Total iron	0.3 mg/L

Water Quality Variable	Benchmark[a]
Total lead	0.001 mg/L for hardness (as $CaCO_3$) of ≤60 mg/L; $e^{(1.273[\ln(hardness)]-4.705)}$/1,000 mg/L for hardness of >60 to ≤180 mg/L; 0.007 mg/L for hardness of >180 mg/L
Dissolved manganese	Hardness- and pH-dependent benchmark is found in look-up table in CCME (2019). At hardness (as $CaCO_3$) of 50 mg/L and pH of 7.5, the benchmark is 0.43 mg/L. The values in the look-up table are valid between hardness 25 and 670 mg/L and pH 5.8 and 8.4.
Total mercury	0.026 µg/L
Total molybdenum	0.073 mg/L
Total nickel	0.025 mg/L for hardness (as $CaCO_3$) of ≤60 mg/L; $e^{(0.76[\ln(hardness)]+1.06)}$/1,000 mg/L for hardness of >60 to ≤180 mg/L; 0.15 mg/L for hardness of >180 mg/L
Total selenium	0.001 mg/L
Total silver	0.00025 mg/L
Total thallium	0.0008 mg/L
Total uranium	0.015 mg/L
Dissolved zinc	$e^{(0.947[\ln(hardness)]-0.815[pH]+0.398[\ln(DOC)]+4.625)}$/1,000 mg/L for hardness of 23.4 to 399 mg/L, pH of 6.5 to 8.13, and DOC of 0.3 to 22.9 mg/L; 0.007 mg/L for hardness (as $CaCO_3$) of 50 mg/L, pH of 7.5, DOC of 0.5 mg/L

Note:
> = greater than; ≥ = greater than or equal to; < = less than; ≤ = less than or equal to; µg/L = microgram per litre; $CaCO_3$ = calcium carbonate; CCME = Canadian Council of Ministers of the Environment; DOC = dissolved organic carbon; mg/L = milligram per litre; NTU = nephelometric turbidity unit(s)
[a] Source: Canadian Water Quality Guidelines for the Protection of Aquatic Life, Summary Table (CCME 2024).

TABLE 2.2-3 TOTAL SUSPENDED SOLIDS AND TURBIDITY BENCHMARKS FOR EXPOSURE LAKES

Lake	Season	Total Suspended Solids Benchmark (mg/L)	Turbidity Benchmark (NTU)
Doris	Under-ice	7.18	4.91
	Open-water	9.85	5.69
Patch	Under-ice	6.11	3.10
	Open-water	7.06	4.77
Windy	Under-ice	6.21	2.46
	Open-water	6.10	3.04

Notes:
mg/L = milligram per litre; NTU = nephelometric turbidity unit(s)

TABLE 2.2-4 TOTAL AMMONIA BENCHMARK AS A FUNCTION OF PH AND TEMPERATURE

Temperature (˚C)	pH							
	6.0	6.5	7.0	7.5	8.0	8.5	9.0	10.0
0	190	60	19	6.0	1.9	0.62	0.21	0.035
5	126	40	13	4.0	1.3	0.41	0.14	0.028
10	84	27	8.5	2.7	0.86	0.28	0.10	0.024
15	57	18	5.7	1.8	0.59	0.20	0.073	0.021
20	39	13	4.0	1.3	0.41	0.14	0.055	0.020
25	28	8.7	2.8	0.89	0.29	0.10	0.044	0.018
30	19	6.2	2.0	0.63	0.21	0.077	0.035	0.017

Notes:
˚C = degree Celsius; CCME = Canadian Council of Ministers of the Environment; mg/L = milligram per litre
Total ammonia concentration units are in mg/L.
Values outside of the shaded area should be used with caution, owing to a lack of toxicity data to accurately determine toxic effects at the extreme of these ranges (CCME 2024).

2.2.5 RESPONSE FRAMEWORK

The Response Framework is an early-detection system with defined action levels that initiate monitoring and/or management actions within an adequate timeframe to pre-empt significant adverse effects to aquatic life (Figure 4.2-1 in TMAC 2018). Significance thresholds (e.g., an unacceptable level of change in a monitored variable) are outlined in the Plan for water quality, sediment quality, and phytoplankton biomass (TMAC 2018).

All evaluated physical limnology, water quality, and phytoplankton variables were compared to the conditions required to trigger an action level response through the Response Framework (TMAC 2018). If the conditions of an action level response had been met, follow-up actions would be triggered, as described in the Response Framework (TMAC 2018).

2.2.5.1 ACTION LEVEL CONDITIONS

The action level conditions by monitoring component required to trigger a low action level are outlined in the Response Framework (TMAC 2018). The annual AEMP results are compared to these conditions. When one condition is met, the conditions for that variable are not assessed further. All conditions must be met to trigger a low action level response. However, a specific variable may not be capable of triggering every condition. In such cases, a low action level response may be triggered when all relevant conditions have been met, excluding those that are not applicable to that specific variable.

Water Quality

The conditions required to trigger a low action level response for water quality included the following:

- **Condition 1:** A statistically significant and potentially adverse change from baseline concentrations has been identified.
- **Condition 2:** The concentration of the water quality variable is outside of the normal range, based on baseline concentrations.
- **Condition 3:** The concentration of the water quality variable exceeds 75% of a benchmark.
- **Condition 4:** If a potentially adverse change is detected at the exposure site, there is no similar change at the reference site.

Similar to the effects assessment (Section 2.2.3), only a statistically significant increase in concentration would be considered a potentially adverse change for most evaluated water quality variables to fulfill Condition 1. However, for DO concentration, only a decrease would be considered potentially adverse, while for pH, a change in either direction would be considered potentially adverse. To fulfill Condition 2, all observations are required to be outside of the baseline range, trending in the same direction. Regarding Condition 3, the low action level is set at 75% of the water quality benchmark. This allows for adaptive management measures to be implemented before concentrations could negatively affect the most sensitive freshwater life.

No Response Plans for water quality variables have been initiated to date. No medium or high action level conditions have been established for water quality variables.

Phytoplankton

The conditions required to trigger a low action level response for phytoplankton biomass included the following:

- **Condition 1:** A statistically significant change from baseline concentrations has been identified.
- **Condition 2:** The concentration of chl *a* is outside of the normal range based on baseline concentrations.
- **Condition 3:** If a change has been detected at the exposure site, there is no similar change at the reference site.

For comparison to the baseline concentrations for phytoplankton biomass, the 2024 mean concentration was compared to the range of observations from the baseline period.

The Response Plan for phytoplankton biomass established in 2023 (ERM 2024) indicates that when the mean chl *a* concentration is outside of the normal range based on the baseline observations (Condition 2), a supplemental statistical test (two-tailed t-test) will be used in the AEMP to confirm if Condition 1 has been fulfilled (i.e., that the current year mean is statistically different from the baseline mean). If the low action level conditions are triggered for phytoplankton biomass, the AEMP results are compared to the medium action level conditions defined in the Response Plan (ERM 2024). Currently, there are no high action levels established for phytoplankton biomass.

3. EVALUATION OF EFFECTS

The evaluation of effects for fish habitat (Section 3.1), physical limnology (Section 3.2), water quality (Section 3.3), and phytoplankton biomass (Section 3.4) are discussed. Detailed statistical results for the determination of Project-related effects for water quality and phytoplankton biomass are provided in Section C.3 of Appendix C.

3.1 FISH HABITAT

The evaluation of effects on fish habitat during the ice-covered season was limited in 2024 due to the absence of under-ice water level data (Table 3.1-1). Ice thickness observed in 2024 was less than the maximum baseline ice thickness (TMAC 2017; Table 3.1-1). However, with the exception of Doris Lake, the reduction in under-ice lake surface elevation could not be calculated due to absence of under-ice water levels, which resulted from equipment malfunction, logistical challenges, and safety concerns regarding ice integrity upon receipt of the replacement equipment (Section 2.1).

The calculated reduction in under-ice lake surface elevation for Doris Lake was less than the Madrid-Boston FEIS predictions (TMAC 2017). No effects related to fish habitat, based on the predictions for water level fluctuation, ice thickness, and the reduction in under-ice lake surface elevation, were observed in 2024 in Doris Lake (Table 3.1-1).

TABLE 3.1-1 LAKE WATER LEVEL FLUCTUATION AND ICE THICKNESS, COMPARED TO *MADRID-BOSTON FINAL ENVIRONMENTAL IMPACT STATEMENT* PREDICTIONS, 2024

Lake	Madrid–Boston FEIS[a]			2024 AEMP Under-ice Season		
	A	B	A + B	A	B	A + B
	Maximum Baseline Water Level Fluctuation (m)	Maximum Baseline Ice Thickness (m)	Maximum Reduction in Under-ice Lake Surface Elevation (m)	Observed Water Level Fluctuation (m)[e]	Ice Thickness (m)	Reduction in Under-ice Lake Surface Elevation (m)
Windy	0.24	1.90	2.14	NA	1.70	NA
Glenn	0.26	1.95[c]	2.21	NA	1.65	NA
Patch	0.44	2.05	2.49	NA	1.63	NA
Imniagut	0.09[b]	1.91[b] (1.99[c])	2.00 (2.08)	NA	1.70	NA
P.O.	0.64	1.85	2.49	NA	1.80	NA
Ogama	0.46	1.95	2.41	NA	1.73	NA
Doris	0.74	2.00 (2.4[d])	2.74 (3.89)	0.56[f]	1.68	2.24[f]
Little Roberts	0.63	2.30[d]	2.93	NA	1.70	NA

Notes:
AEMP = Aquatic Effects Monitoring Program; Madrid–Boston FEIS = Final Environmental Impact Statement;
(continued on next page)

Notes (completed):
m = metre; NA = not applicable
Values in parentheses indicate updates of baseline predictions from the Madrid–Boston FEIS based on the more complete baseline dataset of ice thickness.
[a] Unless otherwise indicated, data source: Table 1.2.6 of Volume 5, Chapter 1 (Surface Hydrology) and Table 6.5-10 of Volume 5, Chapter 6 (Freshwater Fish) in the Madrid–Boston FEIS (TMAC 2017).
[b] Field-collected baseline data are not available; variation in open-water lake surface elevation is calculated as the average difference between simulated baseline lake surface elevation in September and June (Years 1 to 22), and ice thickness is estimated as the average of all other lakes with baseline data (TMAC 2017).
[c] Data source: Rescan (2010).
[d] Data source: Golder Associates Ltd. (2007)
[e] Under-ice water level measurements were not obtained in 2024 due to equipment malfunction.
[f] Under-ice water level measurements for Doris Lake were estimated from the mean daily water levels collected at the Doris Lake-2 hydrological monitoring station (Appendix B).

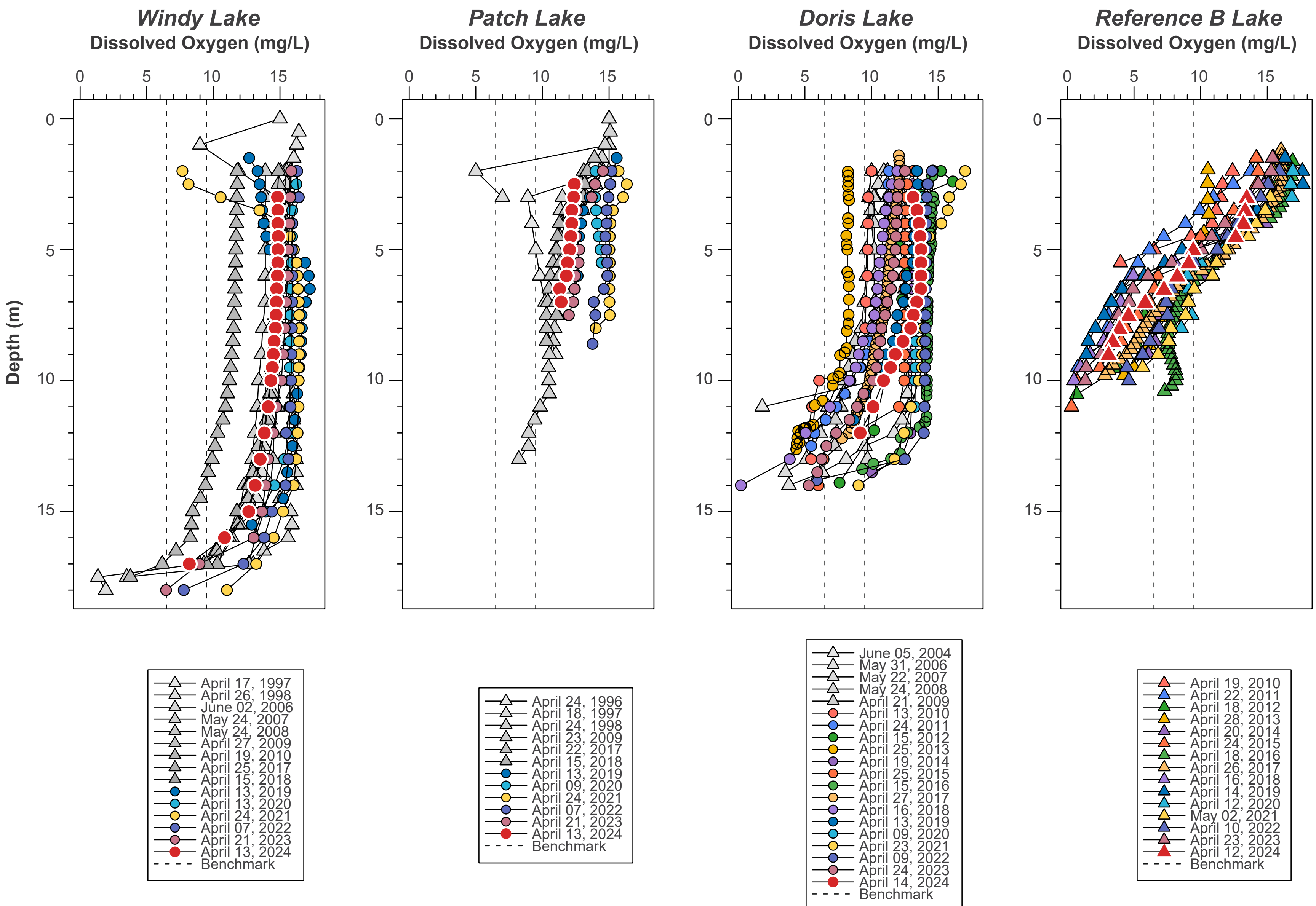
3.2 PHYSICAL LIMNOLOGY

3.2.1 DISSOLVED OXYGEN

Under-ice DO concentrations in 2024 were within the range of baseline concentrations in Patch and Windy lakes, but were 1 to 2 milligrams per litre (mg/L) higher than the baseline range for the upper portion of the water column (3 to 7 metres [m]) in Doris Lake (Figures 3.2-1 and 3.2-2). In 2024, under-ice DO concentrations in Doris Lake ranged from 13.12 mg/L at the sub-surface (3 m) to 9.15 mg/L at depth (12 m; Table A.3-2 in Appendix A). An increase in under-ice DO concentrations is not viewed as an adverse change, as only a decrease in DO would be expected to adversely affect overwintering fish populations (TMAC 2018). Graphical observations indicated that under-ice DO in both the reference and exposure lakes followed similar profiles when compared to their respective within-lake historical data (Figures 3.2-1 and 3.2-2). Although the 2024 profile is similar to the baseline profiles, overall Patch Lake DO concentrations post-baseline have been consistently higher compared to baseline values (Figure 3.2-2). Patch Lake baseline DO concentrations were measured in the same basin but at a different station from 1996 to 1998 (Figure C.1-1 in Appendix C), resulting in the variation in the DO-depth profile (Figure 3.2-2). No significant adverse temporal trends were observed for any of the exposure lakes and under-ice DO concentrations in 2024.

Open-water DO concentrations in 2024 were within the range of baseline concentrations throughout the water column in Windy Lake and in the upper portion of the water column (<5 m) in Doris Lake (Figures 3.2-3 and 3.2-4). In 2024, the open-water DO concentrations observed in Patch Lake and the lower portion of the water column (6 to 10 m) in Doris Lake were below baseline concentrations (Figure 3.2-4). Open-water DO concentrations at depth (≥10 m) in Doris Lake overlapped the measurements and profile at depth that were observed in 1995 (Figure 3.2-4).

FIGURE 3.2-1 UNDER-ICE DISSOLVED OXYGEN PROFILES, HOPE BAY AEMP, 1996 TO 2024



Notes: The benchmarks are 9.5 mg/L and 6.5 mg/L.
Triangle symbols represent baseline years (designated baseline years differ for each lake).

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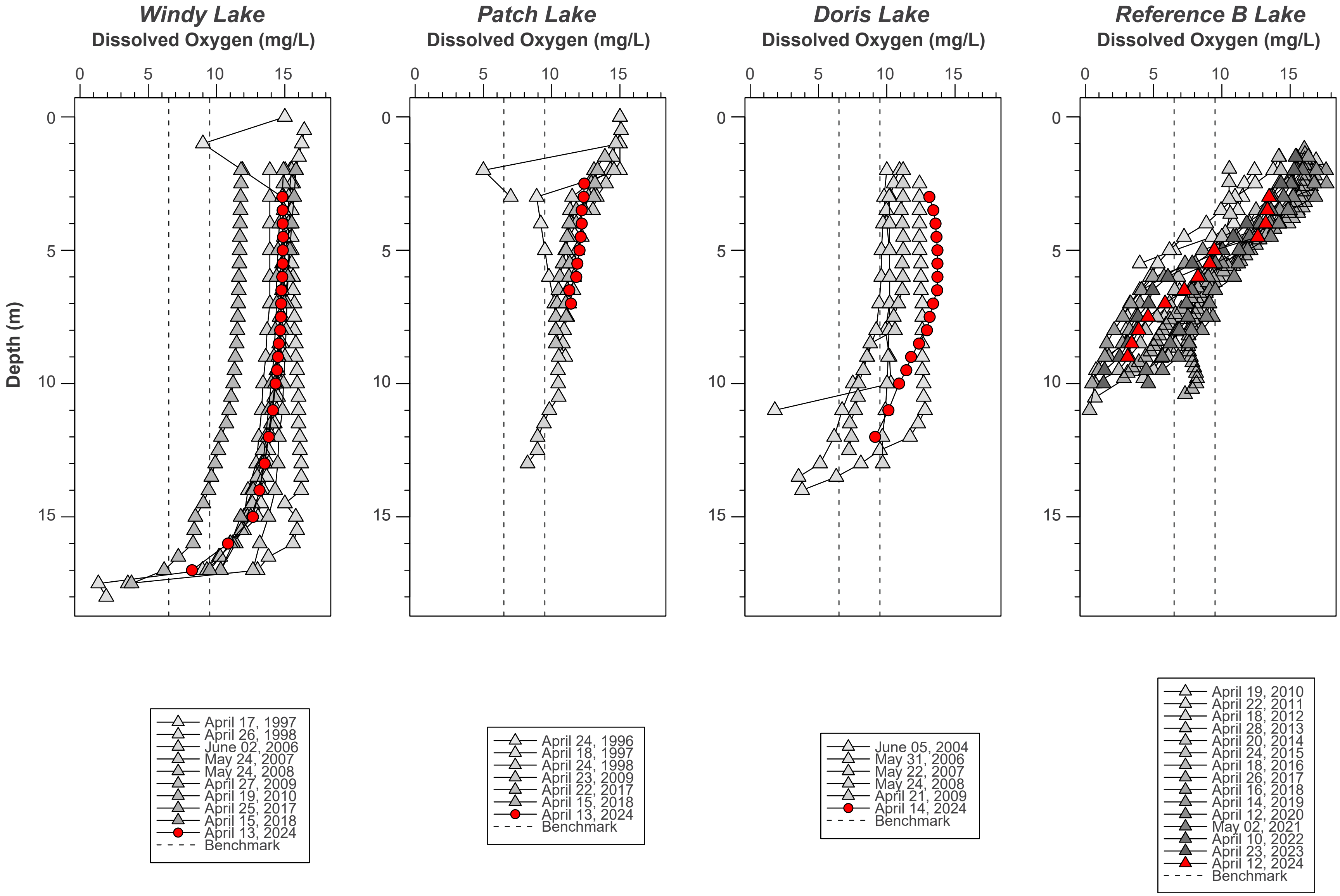
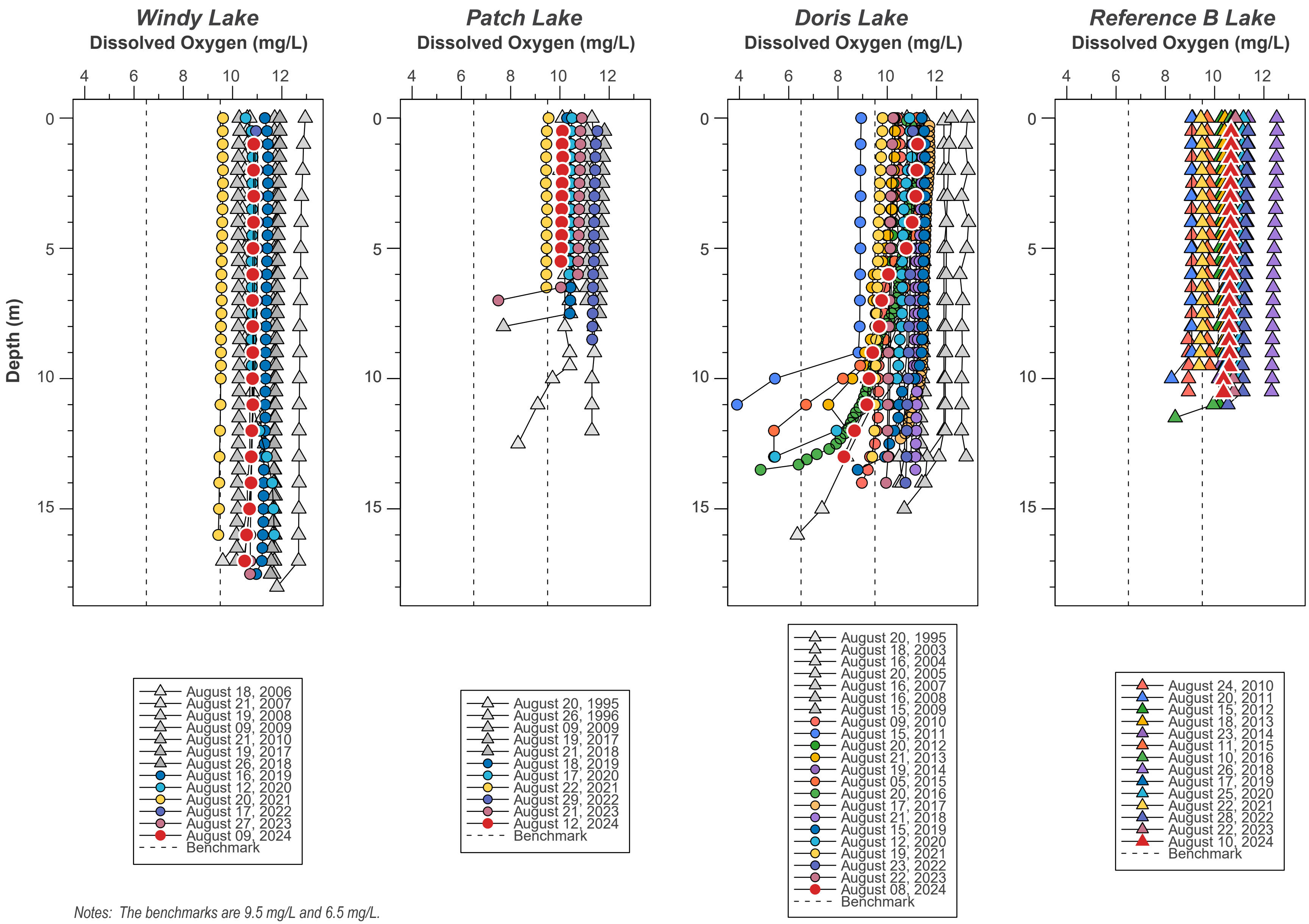
FIGURE 3.2-2 UNDER-ICE DISSOLVED OXYGEN PROFILES FOR EXPOSURE LAKES, BASELINE AND 2024



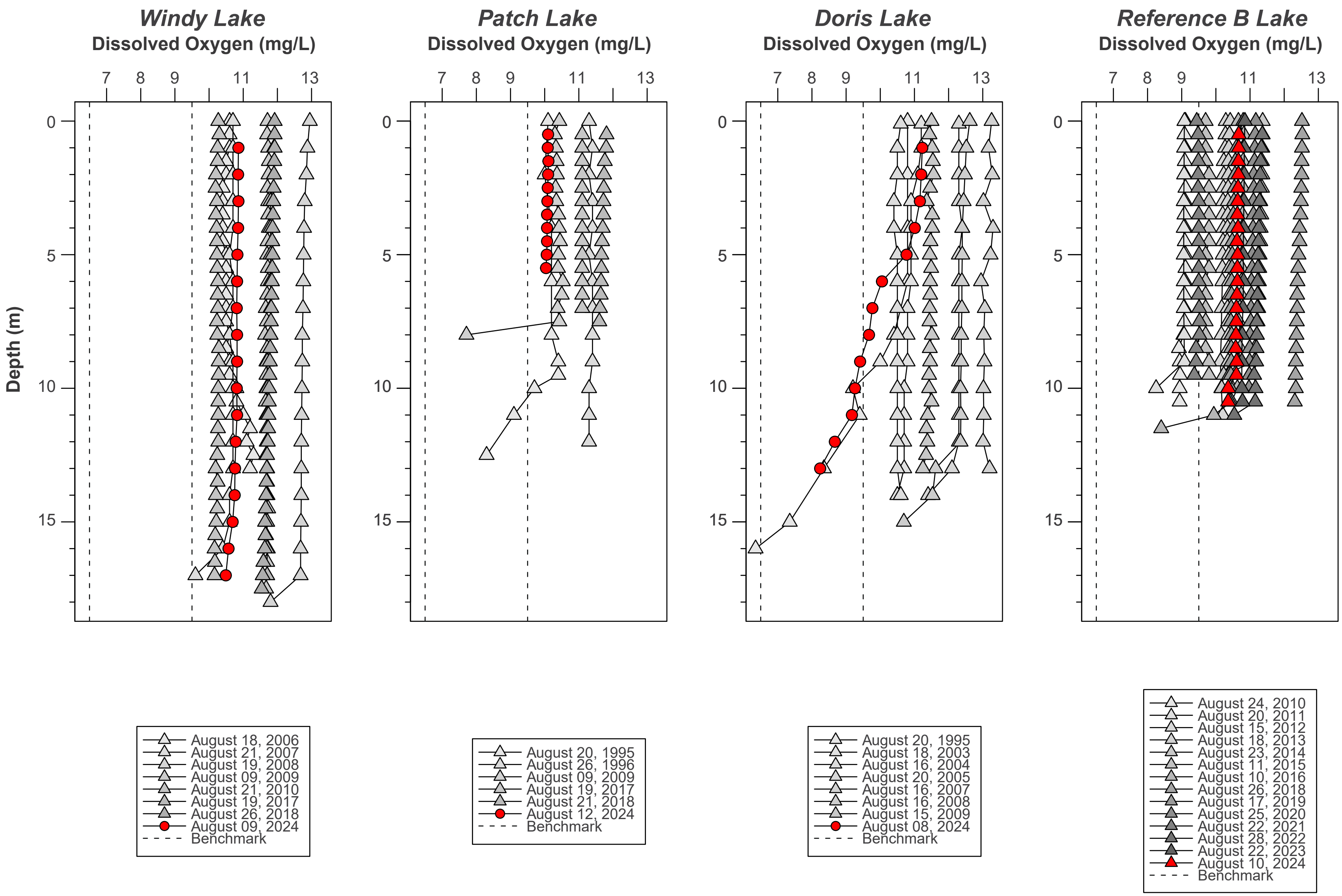
Notes: The benchmarks are 9.5 mg/L and 6.5 mg/L.
Triangle symbols represent baseline years (designated baseline years differ for each lake).

FIGURE 3.2-3   OPEN-WATER DISSOLVED OXYGEN PROFILES FOR HOPE BAY AEMP, 1996 TO 2024



Notes: The benchmarks are 9.5 mg/L and 6.5 mg/L.
Triangle symbols represent baseline years (designated baseline years differ for each lake).

FIGURE 3.2-4 OPEN-WATER DISSOLVED OXYGEN PROFILES FOR EXPOSURE LAKES, BASELINE AND 2024



Notes: The benchmarks are 9.5 mg/L and 6.5 mg/L.
Triangle symbols represent baseline years (designated baseline years differ for each lake).

ERM

CLIENT: Agnico Eagle Mines Ltd.
GRAPHICS NUMBER: HB-25ERM-001:4

In 2024, DO concentrations in exposure lakes were greater than the 9.5 mg/L benchmark throughout the entire water column during both seasons in Patch Lake and during the open-water season in Windy Lake. Concentrations were below the 9.5 mg/L benchmark during the under-ice season in Doris Lake at 12 m depth and in Windy Lake at 17 m depth, and during the open-water season in Doris Lake starting at 9 m depth to the bottom of the water column (Table A.3-2 in Appendix A). None of the exposure lakes had DO concentrations below the 6.5 mg/L benchmark in any season in 2024. The DO concentrations at depth were below the benchmarks during the baseline years in Doris Lake (under-ice in 2004, 2006, 2007, and 2009, and in open-water in 1995), Windy Lake (under-ice in 1998, 2006, and 2009), and Patch Lake (open-water in 1995 and 2009; Figures 3.2-2 and 3.2-4). Under-ice DO concentrations in the reference lake have been below the benchmarks nearly every year (Figures 3.2-1 and 3.2-2).

No potentially adverse effects were detected for DO concentrations in Doris, Patch, or Windy lakes in 2024. The conditions required to consider a low action level for DO concentrations were not exceeded in 2024.

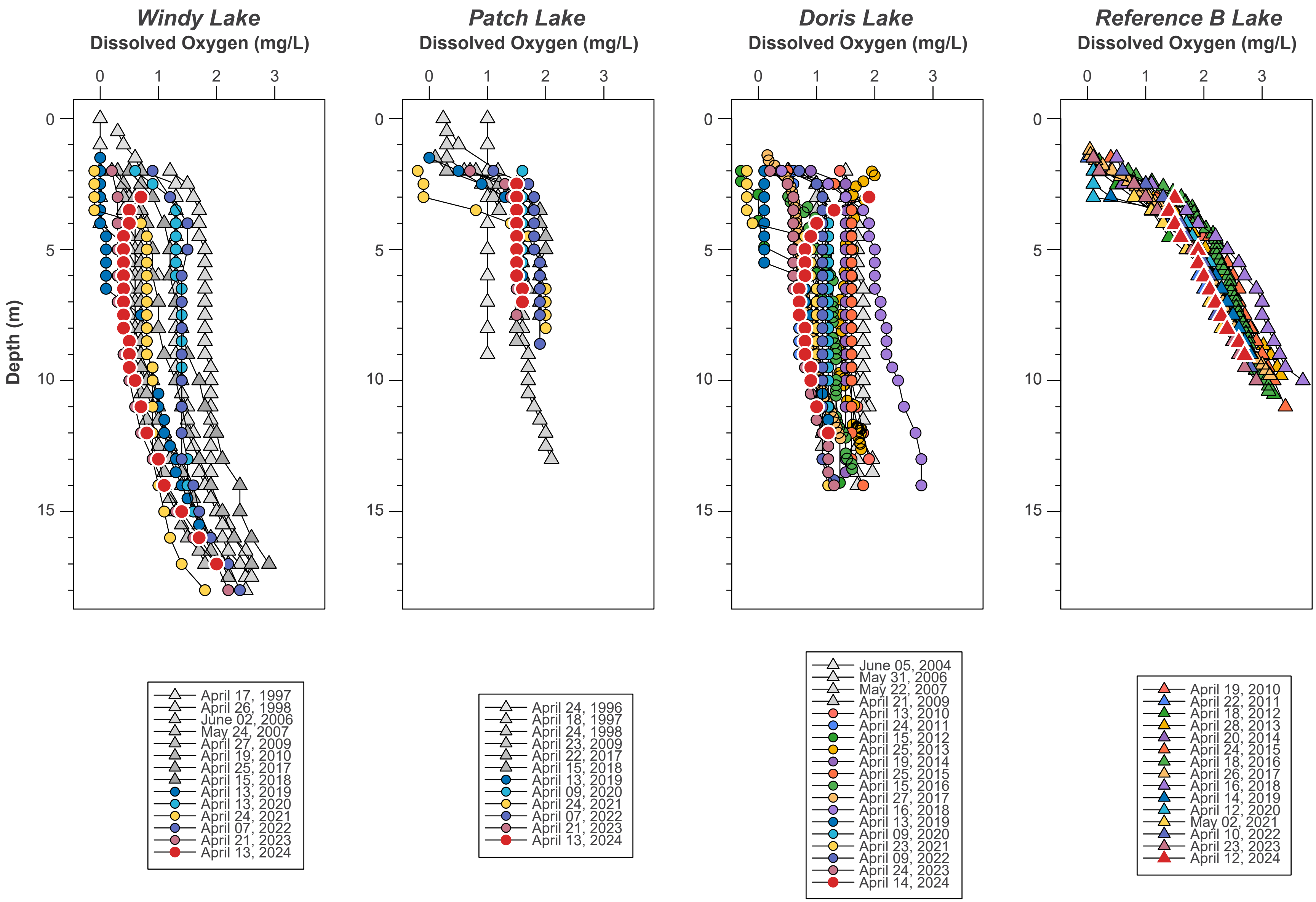
3.2.2 WATER TEMPERATURE

Under-ice temperatures in Patch Lake in 2024 were within the range of baseline temperatures, while Doris and Windy lakes were colder (i.e., near the low end of the baseline ranges) compared to baseline years throughout portions of the water column (Figures 3.2-5 and 3.2-6). Under-ice temperatures observed in 2024 were 0.2 °C lower than the lower portion of the baseline range in Doris Lake and less than 0.1 °C lower in Windy Lake. Graphical observations indicated that the under-ice temperatures in both the reference and exposure lakes followed similar profiles when compared to their respective within-lake historical data (Figures 3.2-5 and 3.2-6).

In 2024, open-water temperatures in Windy and Doris lakes were within the range of baseline temperatures, while Patch Lake was warmer than baseline temperatures (Figures 3.2-7 and 3.2-8). Open-water temperatures in Patch Lake in 2024 were the warmest on record by approximately 1.2 °C (Figure 3.2-7). However, over the sampling period, a wide range of temperatures has been observed at all exposure lakes and at the reference lake, and no patterns in profile trends have been observed (Figure 3.2-7).

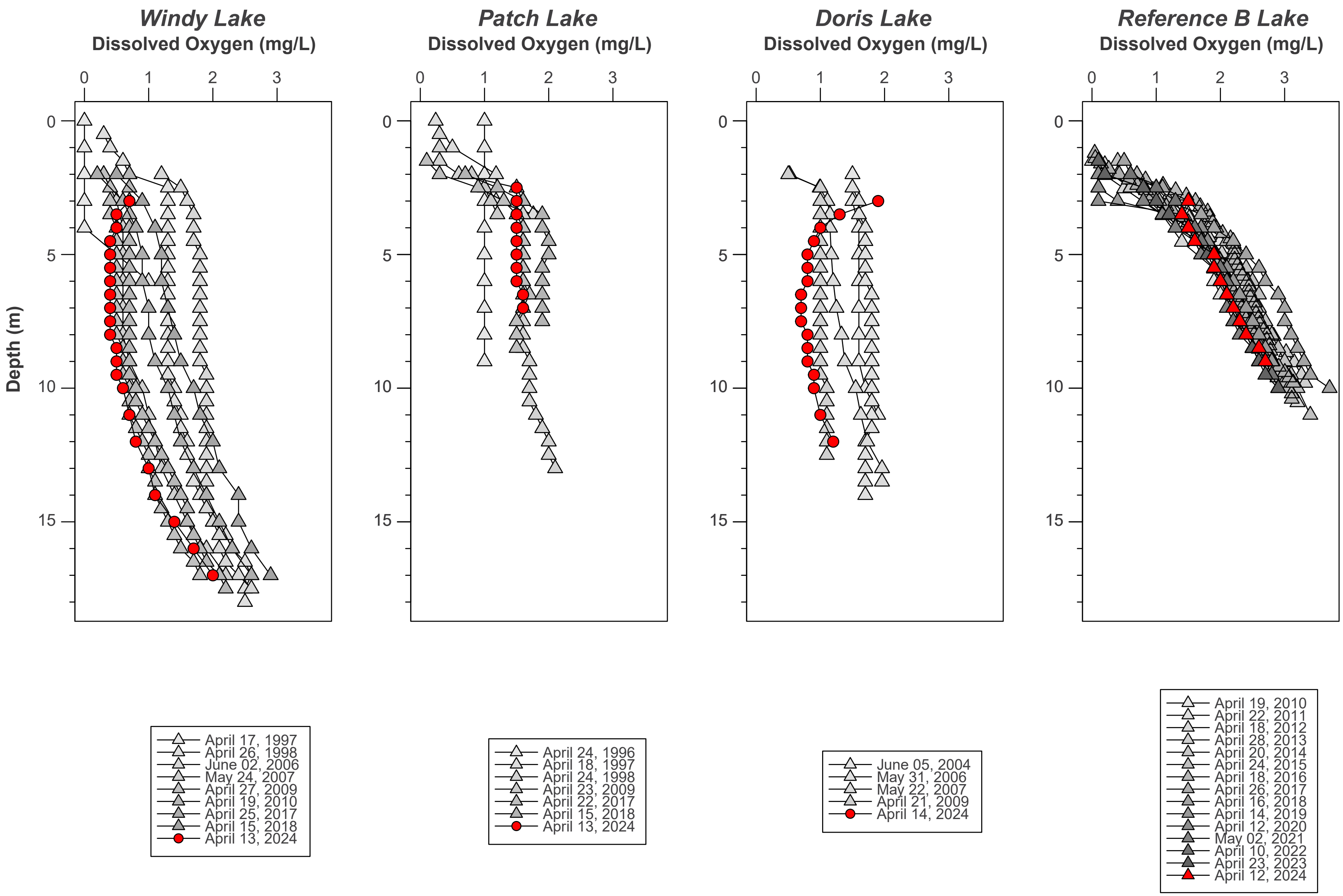
No potentially adverse effects were detected for water temperature in Doris, Windy, or Patch lakes in 2024. The conditions required to consider a low action level for water temperature were not exceeded in 2024.

FIGURE 3.2-5 UNDER-ICE TEMPERATURE PROFILES, HOPE BAY AEMP, 1996 TO 2024



Notes: Triangle symbols represent baseline years (designated baseline years differ for each lake).

FIGURE 3.2-6 UNDER-ICE DISSOLVED TEMPERATURE PROFILES FOR EXPOSURE LAKES, BASELINE AND 2024

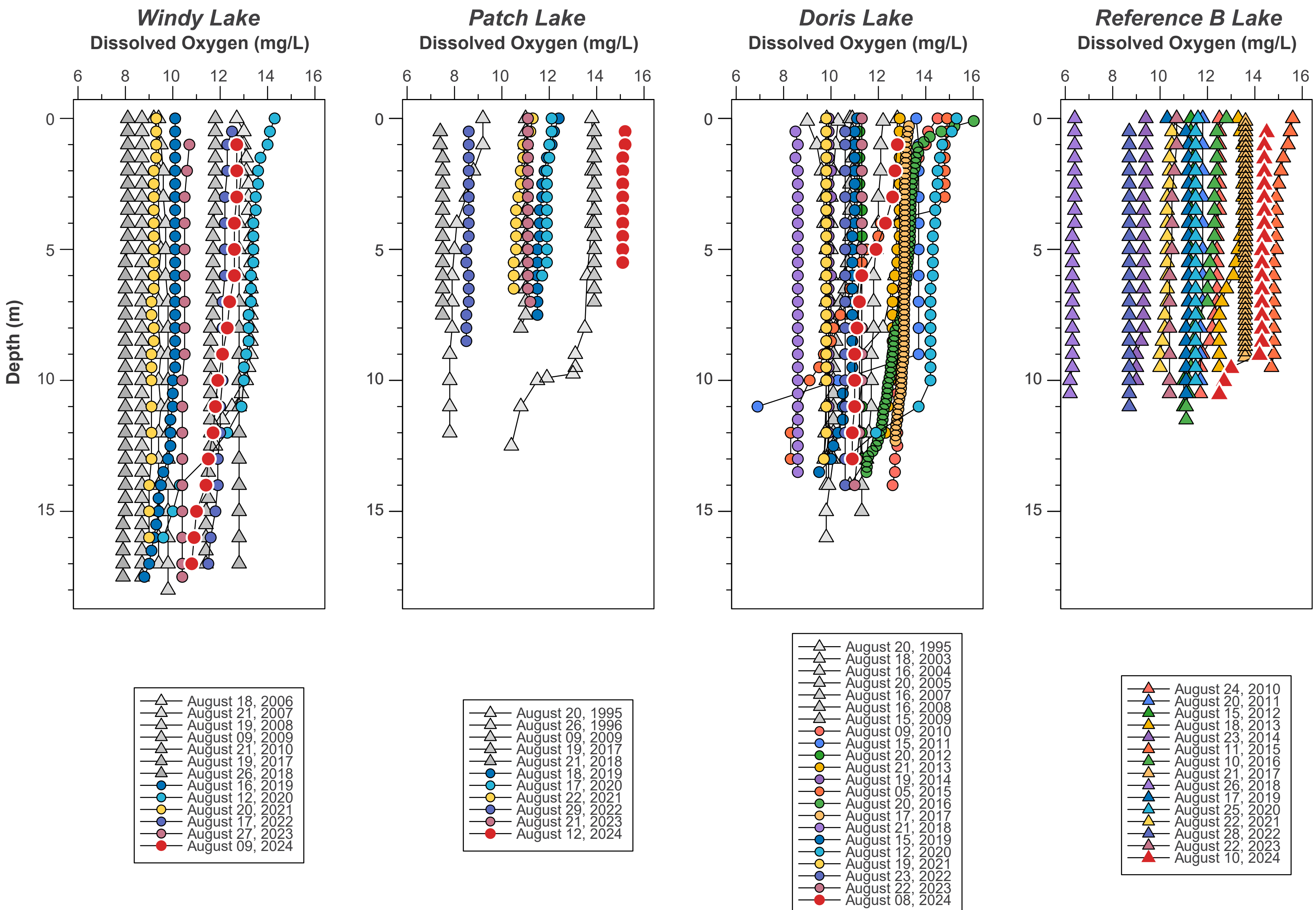


Notes: Triangle symbols represent baseline years (designated baseline years differ for each lake).

ERM

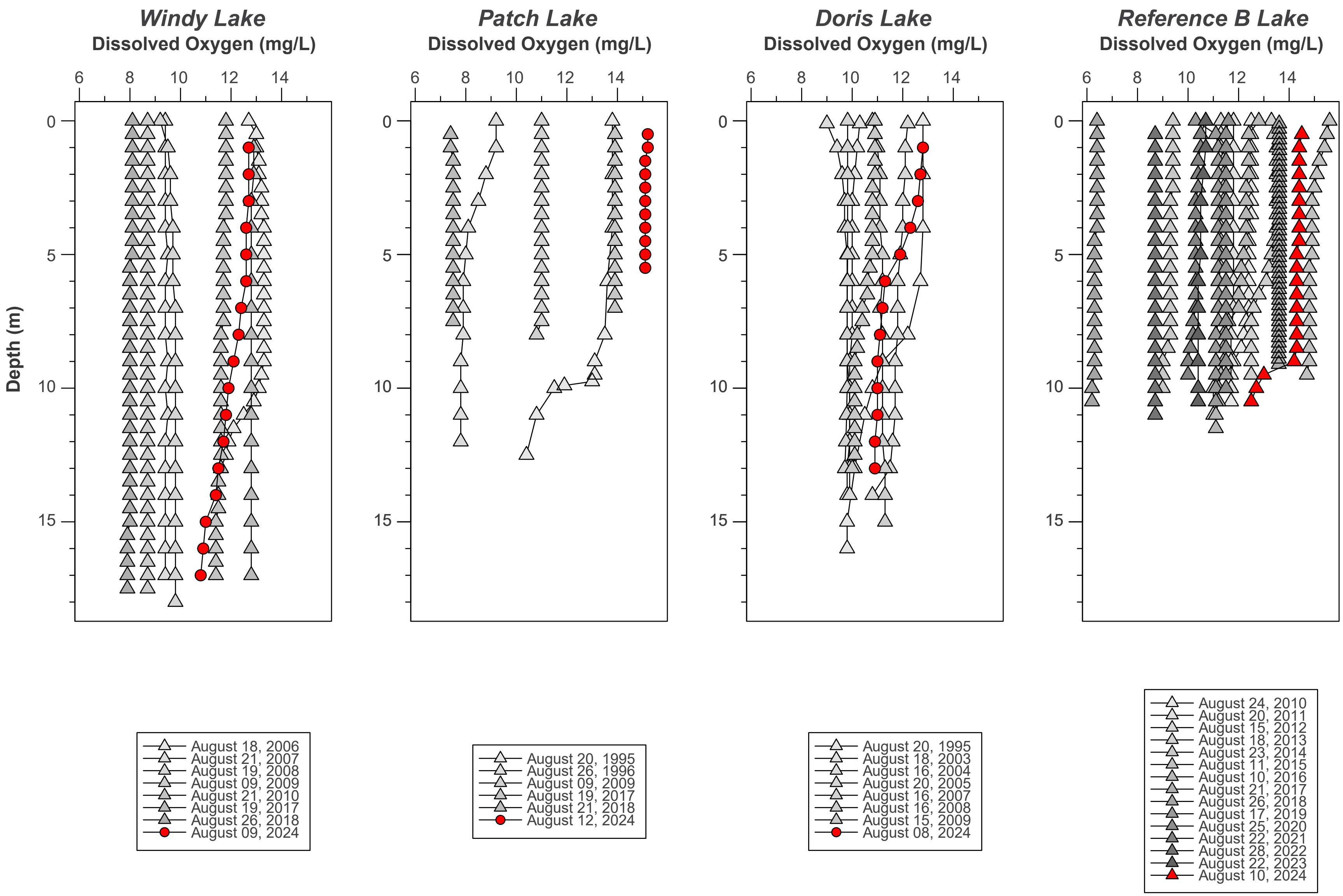
CLIENT: Agnico Eagle Mines Ltd.
GRAPHICS NUMBER: HB-25ERM-001:6

FIGURE 3.2-7 OPEN-WATER TEMPERATURE PROFILES, HOPE BAY AEMP, 1995 TO 2024



Notes: Triangle symbols represent baseline years (designated baseline years differ for each lake).

FIGURE 3.2-8 OPEN-WATER TEMPERATURE PROFILES FOR EXPOSURE LAKES, BASELINE AND 2024



Notes: Triangle symbols represent baseline years (designated baseline years differ for each lake).

3.3 WATER QUALITY

3.3.1 PH

Statistical analyses indicated a significant change over time for pH in Doris Lake during both seasons but no change was detected relative to the reference lake (Table 3.3-1). Statistical analyses indicated no significant difference between the before and after period means for pH in Patch or Windy lakes during either season (Table 3.3-1). One sample (Reference Lake B, under-ice) was below the pH benchmark of 6.5 in 2024 (pH = 6.49; Figure 3.3-1a). All other under-ice and open-water pH observations for monitored lakes were within the benchmark range in 2024 (Figures 3.3-1a and 3.3-1b).

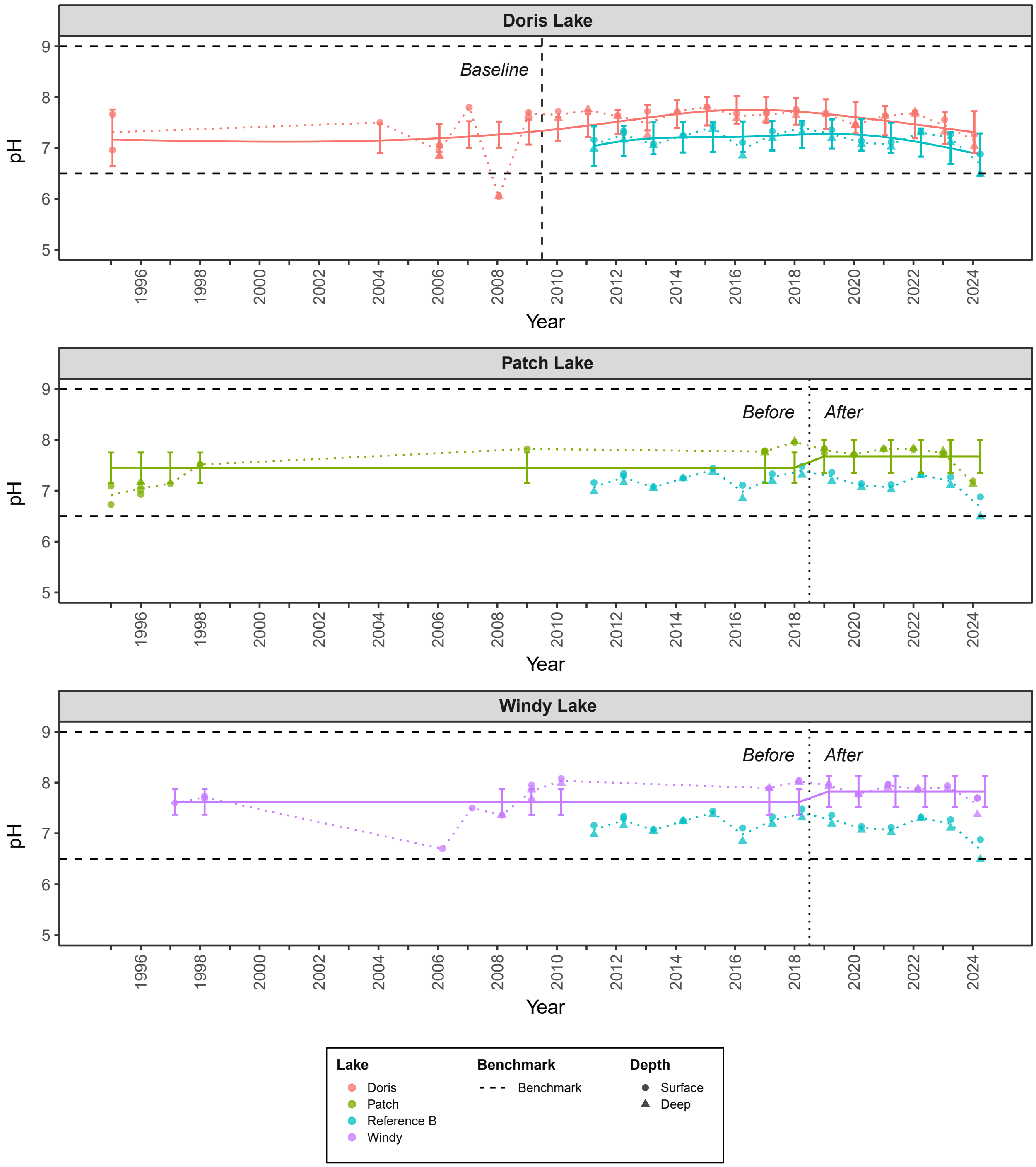
No effects were detected for pH in Doris, Patch, or Windy lakes in 2024. The conditions required to consider a low action level for pH were not exceeded in 2024.

TABLE 3.3-1 PH STATISTICAL RESULTS FOR EXPOSURE LAKES, 2024

Lake	Season	Trend Analysis		BACI	
		Significant Change Relative to a Slope of Zero (*p* value)	**Significant Trend Relative to Reference Lake B (*p* value)**	**Significant Before-After Change (*p* value)**	**Significant Before-After Change Relative to Reference Lake (*p* value)**
Doris	Under-ice	Yes (0.00070)	No (0.60830)	NA	NA
	Open-water	Yes (<0.00001)	No (0.11560)	NA	NA
Patch	Under-ice	NA	NA	No (0.2845)	-
	Open-water	NA	NA	No (0.2078)	-
Windy	Under-ice	NA	NA	No (0.2773)	-
	Open-water	NA	NA	No (0.1314)	-

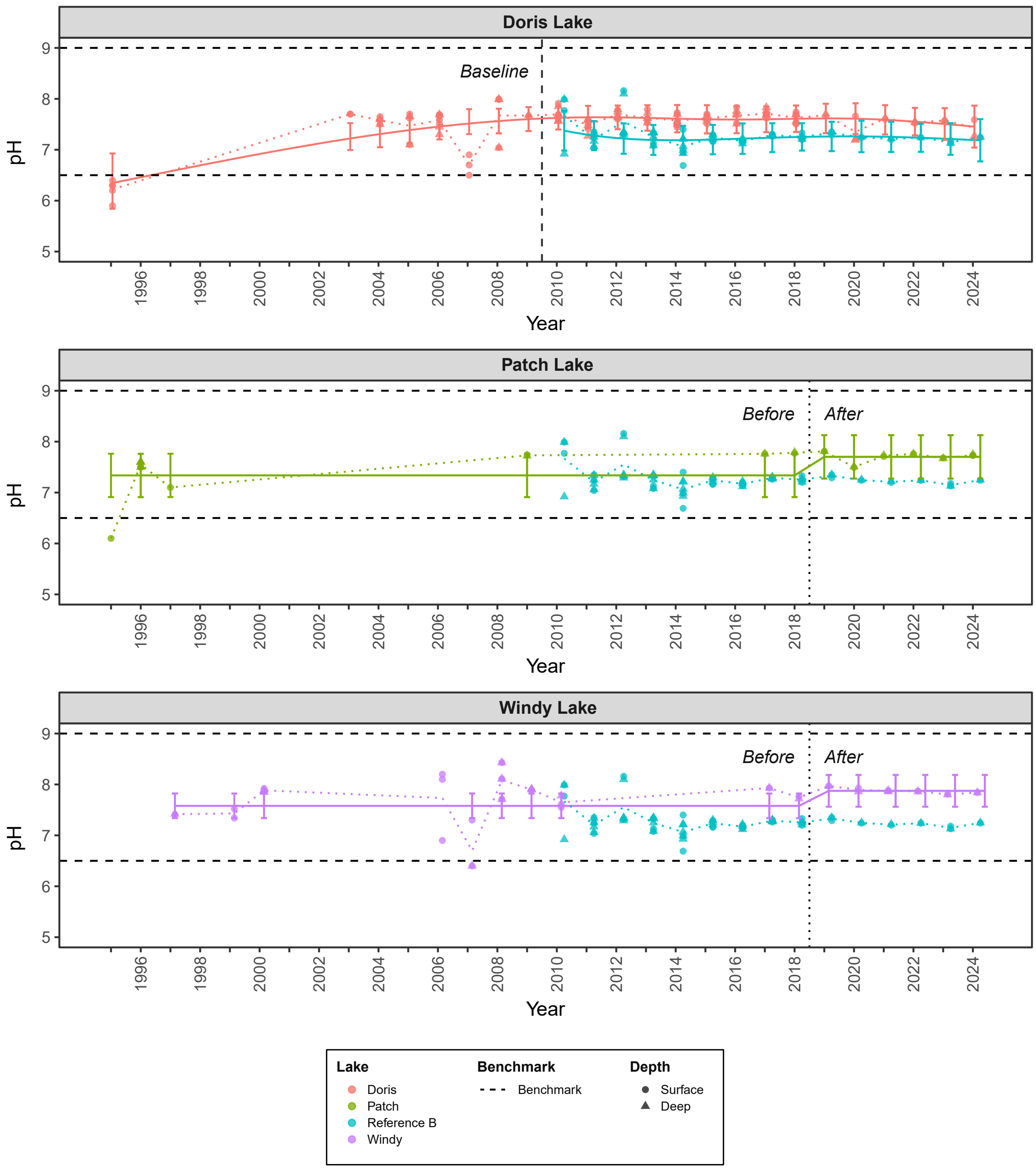
Notes:
< = less than; BACI = Before-After/Control-Impact; NA = not applicable
Dash (-) = The statistical analysis was not completed due to limitations or because the first step of the statistical analysis indicated no significant difference (Appendix C).
NA indicates that the statistical analysis was not relevant to the dataset.

FIGURE 3.3-1A UNDER-ICE PH IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 6.5 to 9.0.

FIGURE 3.3-1B   OPEN-WATER PH IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 6.5 to 9.0.

3.3.2 TOTAL SUSPENDED SOLIDS

Statistical analyses indicated a significant change over time for TSS concentrations in Doris Lake during the under-ice season (Table 3.3-2). Statistical comparison to the reference lake was not completed as more than 50% of observations from the monitoring period, including 100% of the 2024 observations, were less than the DL (<1 mg/L; Section C.3.1.2 in Appendix C). Graphical analysis indicated that the trend over time in Doris Lake (under-ice) has not followed a consistent directional change and may be influenced by the decrease observed from 1995 to the next available monitoring year, namely 2004 (Figure 3.3-2a). Mean under-ice TSS concentrations in 2024 (2.13 mg/L) were within the observed baseline range (<1 to 4 mg/L) for Doris Lake.

Statistical analyses for Patch Lake (under-ice) and Windy Lake (both seasons) were not completed as more than 50% of observations from the monitoring period and 100% of the 2024 observations were less than the DL (Section C.3.1.2 in Appendix C). No significant difference between the before and after period means was observed for Patch Lake open-water TSS (Table 3.3-2).

In 2024, under-ice and open-water TSS for all three exposure lakes were less than the benchmark (Tables 2.2-2 and Table 2.2-3; Figures 3.3-2a and 3.3-2b).

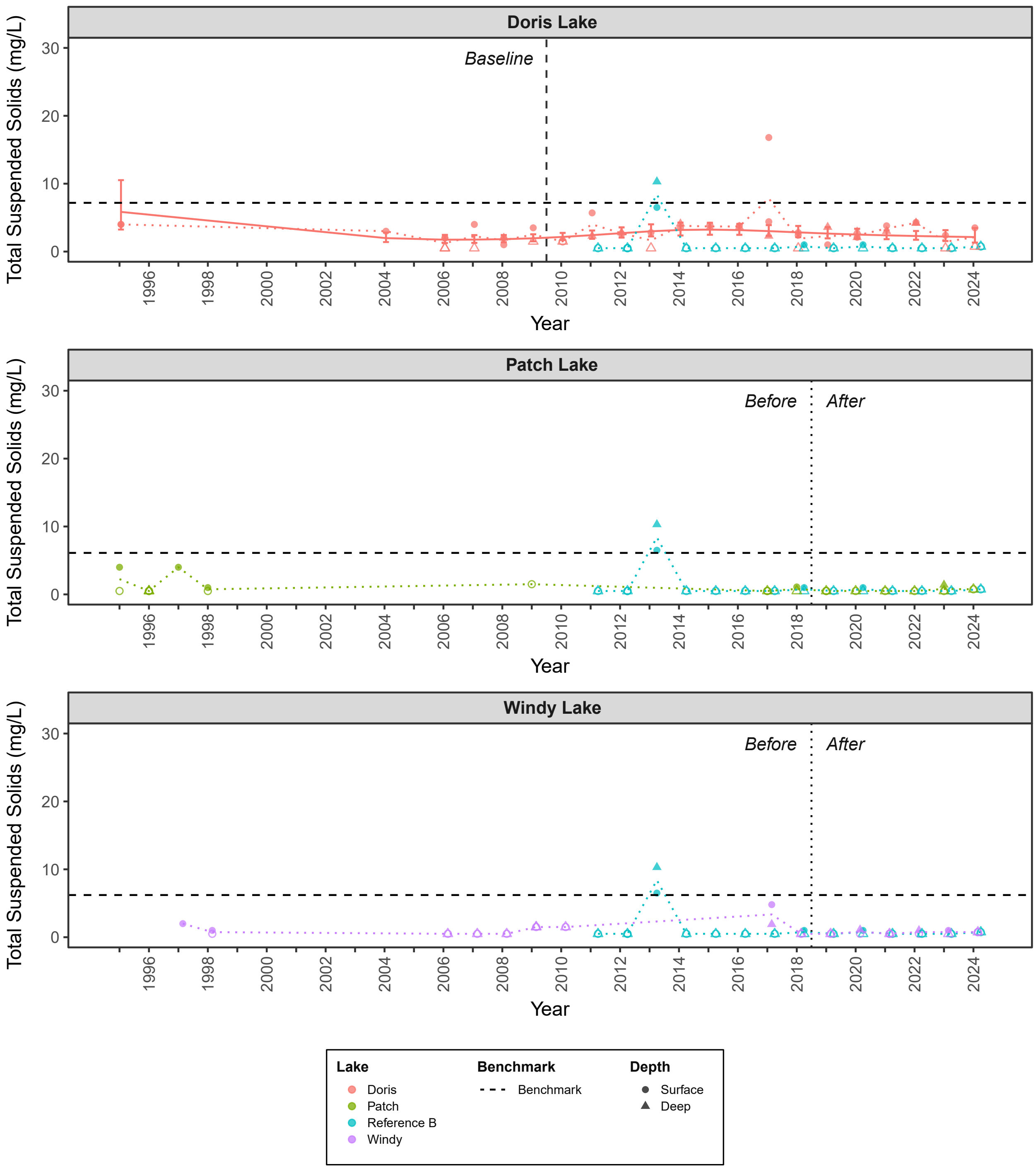
No effects were detected for TSS concentrations in Doris, Patch, or Windy lakes in 2024. The conditions required to consider a low action level for TSS were not exceeded.

TABLE 3.3-2 TOTAL SUSPENDED SOLIDS STATISTICAL RESULTS FOR EXPOSURE LAKES, 2024

Lake	Season	Trend Analysis		BACI	
		Significant Change Relative to a Slope of Zero (*p* value)	**Significant Trend Relative to Reference Lake B (*p* value)**	**Significant Before-After Change (*p* value)**	**Significant Before-After Change Relative to Reference Lake (*p* value)**
Doris	Under-ice	Yes (0.01230)	-	NA	NA
	Open-water	No (0.63300)	-	NA	NA
Patch	Under-ice	NA	NA	-	-
	Open-water	NA	NA	No (0.3376)	-
Windy	Under-ice	NA	NA	-	-
	Open-water	NA	NA	-	-

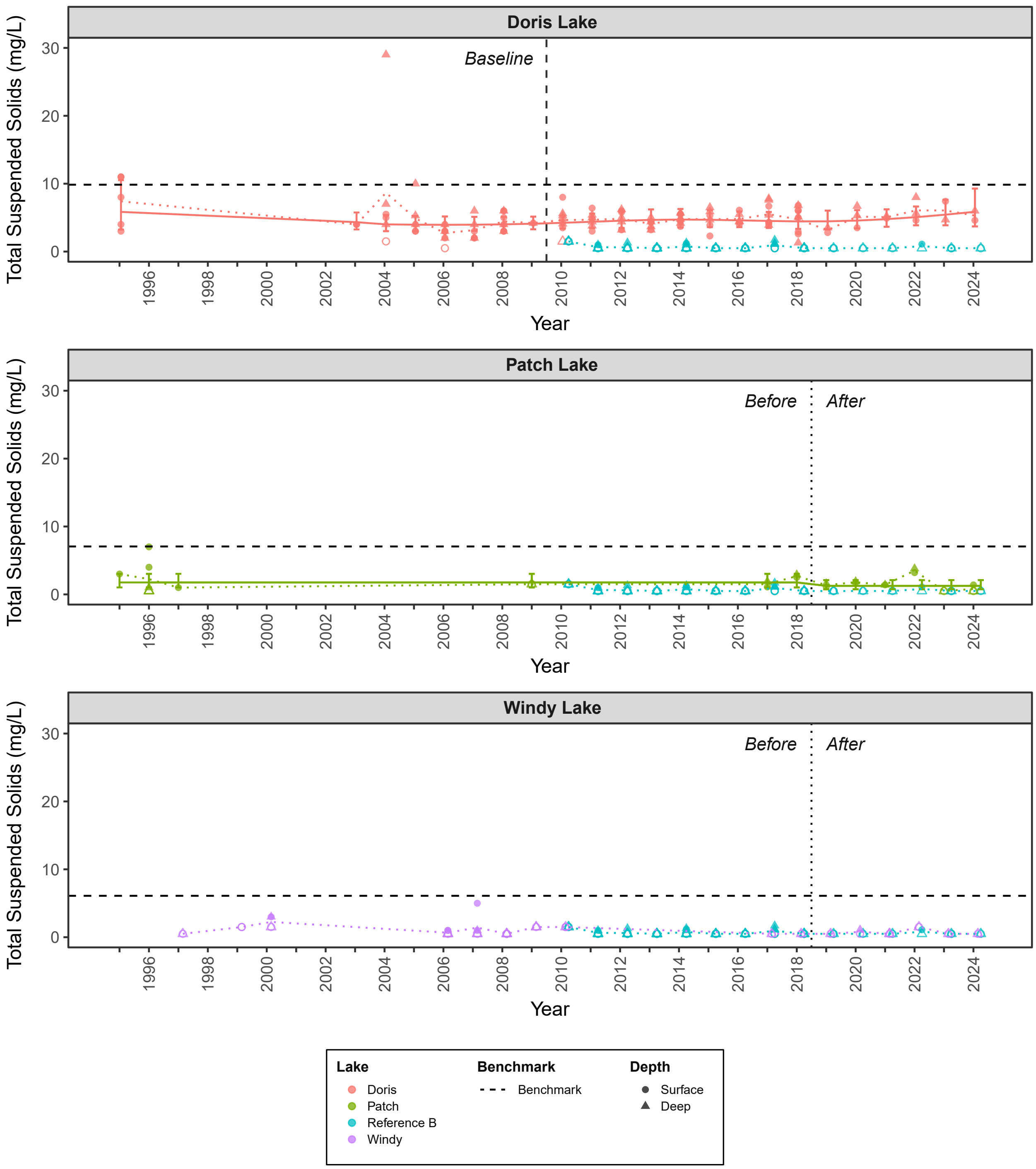
Notes:
BACI = Before-After/Control-Impact; NA = not applicable
Dash (-) = The statistical analysis was not completed due to limitations or because the first step of the statistical analysis indicated no significant difference (Appendix C).
NA indicates that the statistical analysis was not relevant to the dataset.

FIGURE 3.3-2A UNDER-ICE TOTAL SUSPENDED SOLIDS IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is lake-specific (see Table 2.2-2).

FIGURE 3.3-2B OPEN-WATER TOTAL SUSPENDED SOLIDS IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is lake-specific (see Table 2.2-2).

3.3.3 TURBIDITY

Statistical analyses indicated no significant change over time for turbidity in Doris Lake (Table 3.3-3). In 2024, the Doris Lake under-ice surface sample (6.37 nephelometric turbidity units [NTU]) and the open-water deep sample (8.50 NTU) were above respective benchmarks (Figures 3.3-3a and 3.3-3b). The benchmark for turbidity is based on an increase of 2 NTU from the mean turbidity observed during baseline years for each season (Tables 2.2-2 and 2.2-3). However, there are also limited background data to establish benchmark concentrations. The open-water season in Doris Lake has only 2 years of baseline data (2003 and 2009; mean 3.7 NTU) and the under-ice season has only 1 year of baseline data (2009; mean of 2.9 NTU). Graphical analyses of the fitted means slope indicated a potential increasing trend in turbidity in the open-water season at Doris Lake (Figure 3.3-3b). However, no trend is detected based on the yearly mean and standard deviation values.

In 2024, there was no significant change between the before and after period means in Patch or Windy lakes (Table 3.3-3). Mean turbidity was low in Patch Lake (<2 NTU) and Windy Lake (<1 NTU) for both the under-ice and open-water seasons (Figure 3.3-3a and 3.3-3b). No observations in Patch or Windy lakes exceeded their respective benchmarks.

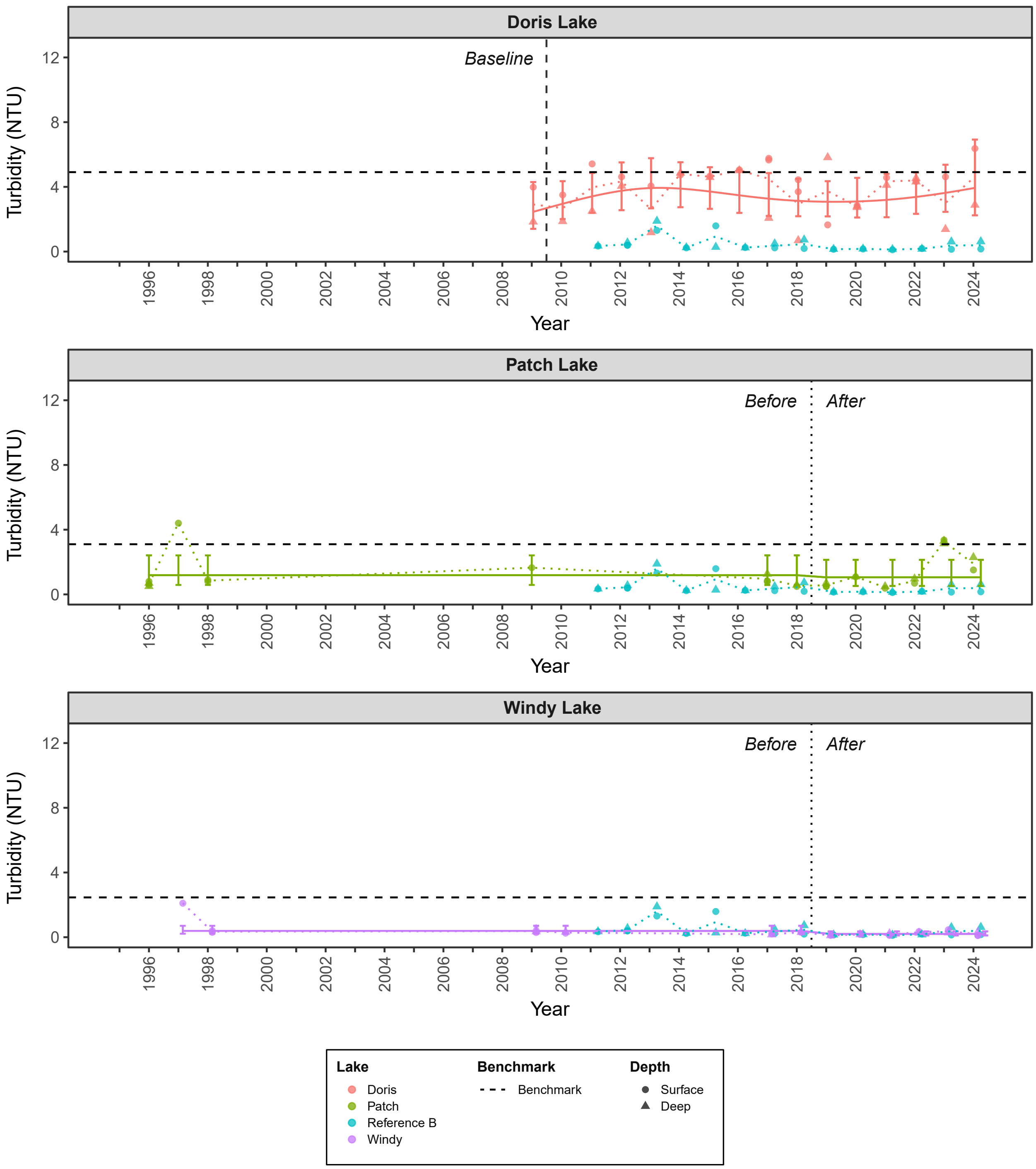
No effects were detected for turbidity in Doris, Patch, or Windy lakes in 2024. The conditions required to consider a low action level for turbidity were not exceeded in 2024.

TABLE 3.3-3 TURBIDITY STATISTICAL RESULTS FOR EXPOSURE LAKES, 2024

Lake	Season	Trend Analysis		BACI	
		Significant Change Relative to a Slope of Zero (*p* value)	**Significant Trend Relative to Reference Lake B (*p* value)**	**Significant Before-After Change (*p* value)**	**Significant Before-After Change Relative to Reference Lake (*p* value)**
Doris	Under-ice	No (0.60100)	-	NA	NA
	Open-water	No (0.28030)	-	NA	NA
Patch	Under-ice	NA	NA	No (0.7991)	-
	Open-water	NA	NA	No (0.5945)	-
Windy	Under-ice	NA	NA	No (0.111)	-
	Open-water	NA	NA	No (0.1212)	-

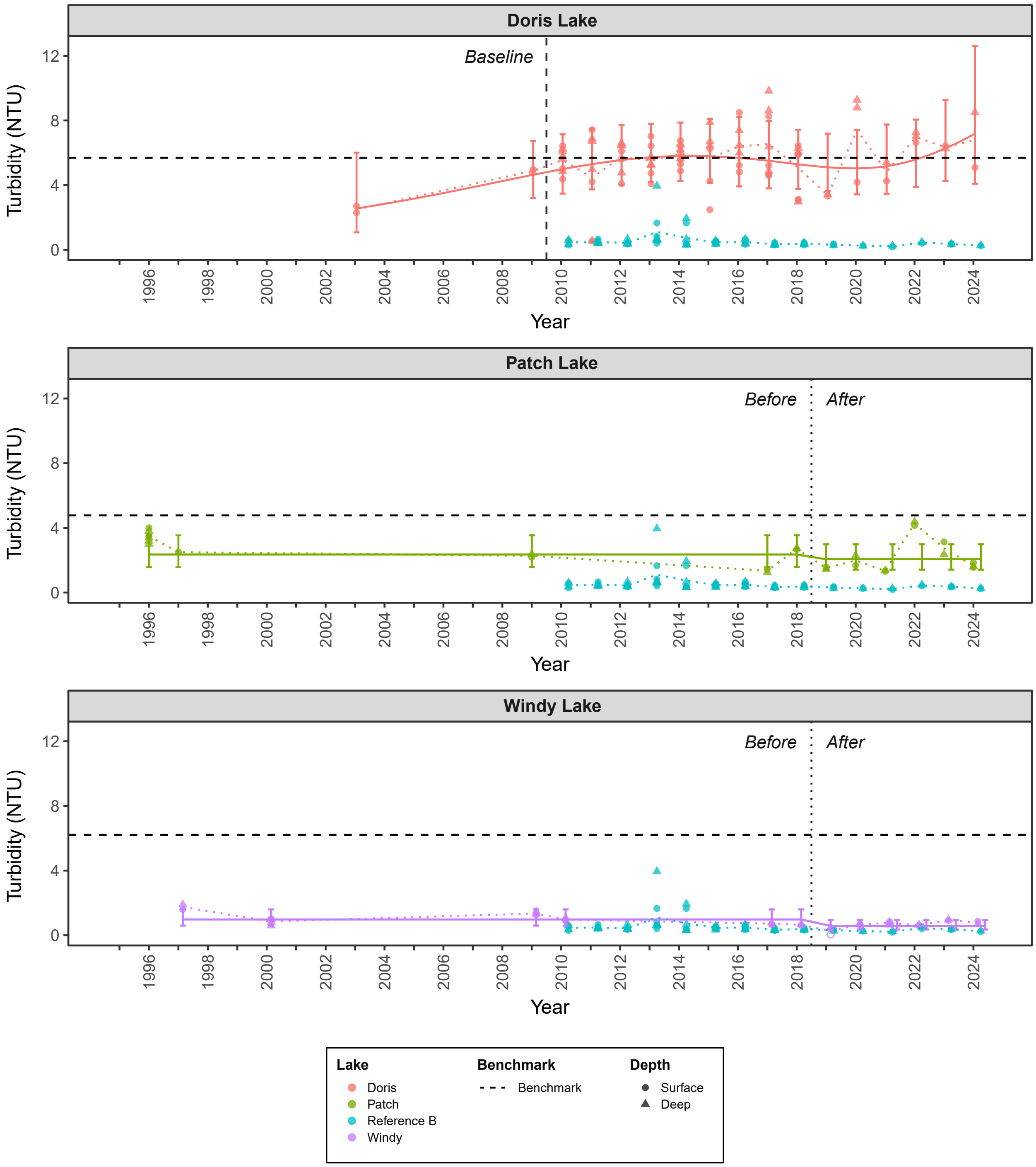
Notes:
BACI = Before-After/Control-Impact; NA = not applicable
Dash (-) = The statistical analysis was not completed due to limitations or because the first step of the statistical analysis indicated no significant difference (Appendix C).
NA indicates that the statistical analysis was not relevant to the dataset.

FIGURE 3.3-3A   UNDER-ICE TURBIDITY IN LAKES, HOPE BAY AEMP, 1996 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is lake-specific (see Table 2.2-2).

FIGURE 3.3-3B OPEN-WATER TURBIDITY IN LAKES, HOPE BAY AEMP, 1996 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is lake-specific (see Table 2.2-2).

3.3.4 CHLORIDE

Statistical analyses indicated a significant change over time for chloride concentrations in Doris Lake during both seasons, and relative to the reference lake (Table 3.3-4). Graphical analyses indicated that chloride concentrations in Doris Lake decreased from 2015 to 2019, and that concentrations have been stable (within 10% of each annual measurement) since 2020 (Figures 3.3-4a and 3.3-4b). Chloride concentrations in 2024 were near-identical to concentrations observed in 2023. It is noted that a decrease in chloride concentrations is not considered to be an adverse effect (TMAC 2018).

Statistical analyses indicated no significant difference between the before and after period means for chloride concentrations in Patch or Windy lakes during either season (Table 3.3-4).

Under-ice and open-water chloride concentrations for all three exposure lakes were less than the benchmark in 2024 (Figures 3.3-4a and 3.3-4b).

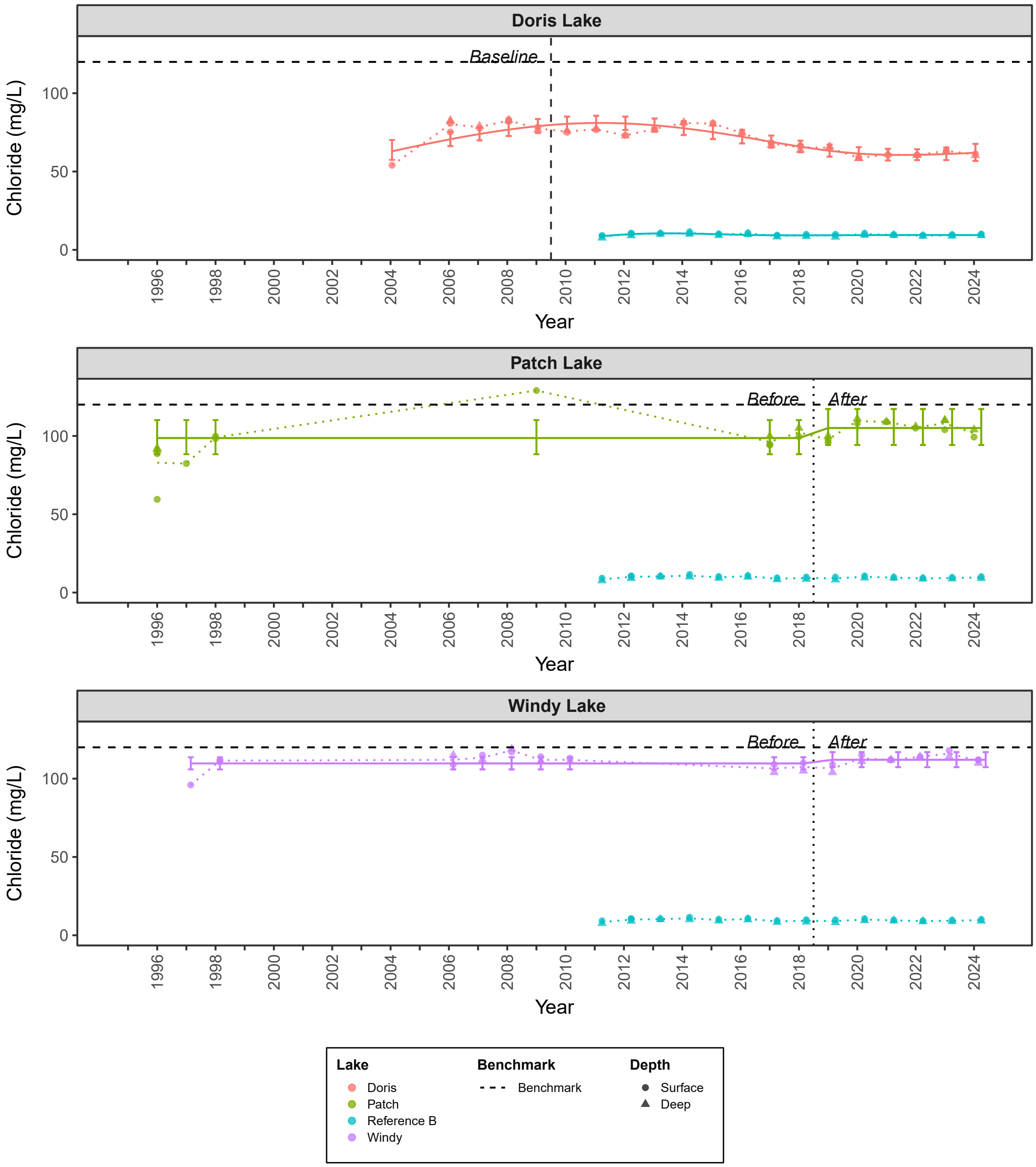
No potentially adverse effects were detected for chloride in Doris, Patch, or Windy lakes in 2024. The conditions required to consider a low action level for chloride were not exceeded in 2024.

TABLE 3.3-4 CHLORIDE STATISTICAL RESULTS FOR EXPOSURE LAKES, 2024

Lake	Season	Trend Analysis		BACI	
		Significant Change Relative to a Slope of Zero (*p* value)	Significant Trend Relative to Reference Lake B (*p* value)	Significant Before-After Change (*p* value)	Significant Before-After Change Relative to Reference Lake (*p* value)
Doris	Under-ice	Yes (<0.00001)	Yes (<0.00001)	NA	NA
	Open-water	Yes (<0.00001)	Yes (<0.00001)	NA	NA
Patch	Under-ice	NA	NA	No (0.3876)	-
	Open-water	NA	NA	No (0.7256)	-
Windy	Under-ice	NA	NA	No (0.4321)	-
	Open-water	NA	NA	No (0.4595)	-

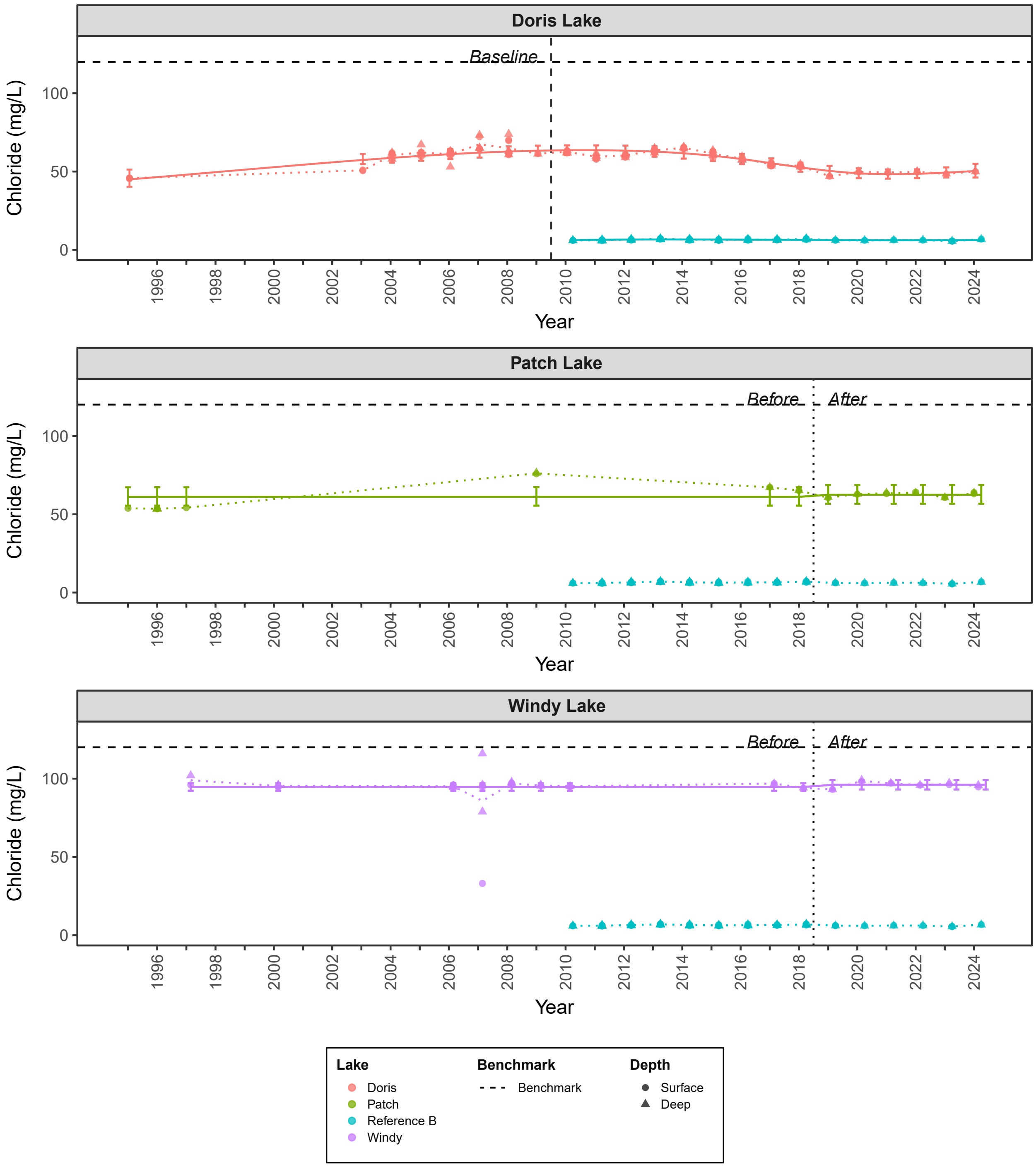
Notes:
< = less than; BACI = Before-After/Control-Impact; NA = not applicable
Dash (-) = The statistical analysis was not completed due to limitations or because the first step of the statistical analysis indicated no significant difference (Appendix C).
NA indicates statistical analysis was not relevant to the dataset.

FIGURE 3.3-4A UNDER-ICE CHLORIDE IN LAKES, HOPE BAY AEMP, 1996 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 120 mg/L.

FIGURE 3.3-4B OPEN-WATER CHLORIDE IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 120 mg/L.

3.3.5 FLUORIDE

Statistical analyses indicated no significant change over time for fluoride concentrations in Doris Lake and between the before and after period means in Patch and Windy lakes (Table 3.3-5). Graphical analyses indicated no changes in fluoride outside of historical ranges over the monitoring period in both seasons (Figures 3.3-5a and 3.3-5b). Fluoride concentrations in all three exposure lakes were less than the benchmark in 2024.

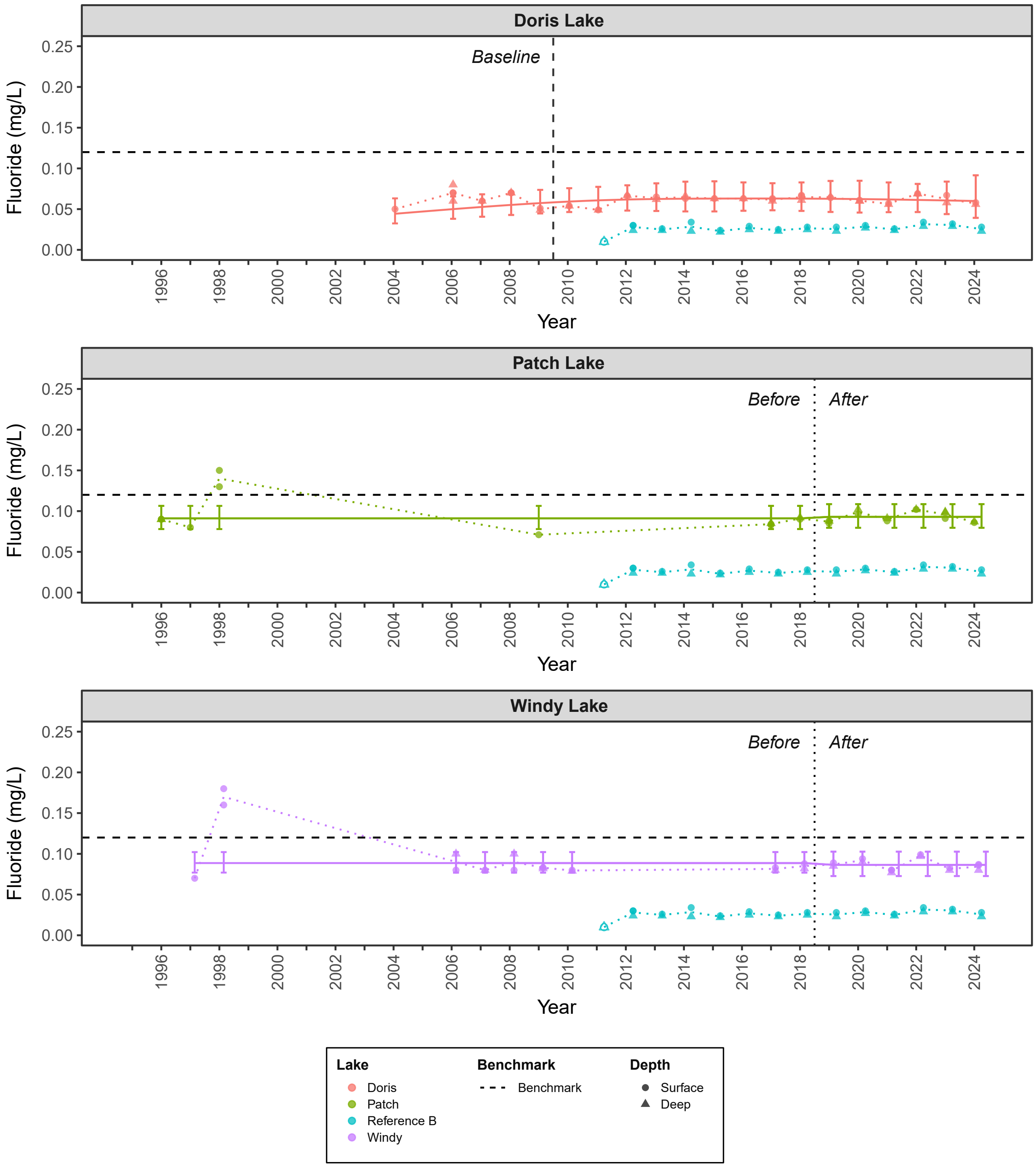
No effects were detected for fluoride in Doris, Patch, or Windy lakes in 2024. The conditions required to consider a low action level for fluoride were not exceeded in 2024.

TABLE 3.3-5 FLUORIDE STATISTICAL RESULTS FOR EXPOSURE LAKES, 2024

Lake	Season	Trend Analysis		BACI	
		Significant Change Relative to a Slope of Zero (*p* value)	**Significant Trend Relative to Reference Lake B (*p* value)**	**Significant Before-After Change (*p* value)**	**Significant Before-After Change Relative to Reference Lake (*p* value)**
Doris	Under-ice	No (0.1684)	-	NA	NA
	Open-water	No (0.8195)	-	NA	NA
Patch	Under-ice	NA	NA	No (0.8402)	-
	Open-water	NA	NA	No (0.6554)	-
Windy	Under-ice	NA	NA	No (0.8089)	-
	Open-water	NA	NA	No (0.2872)	-

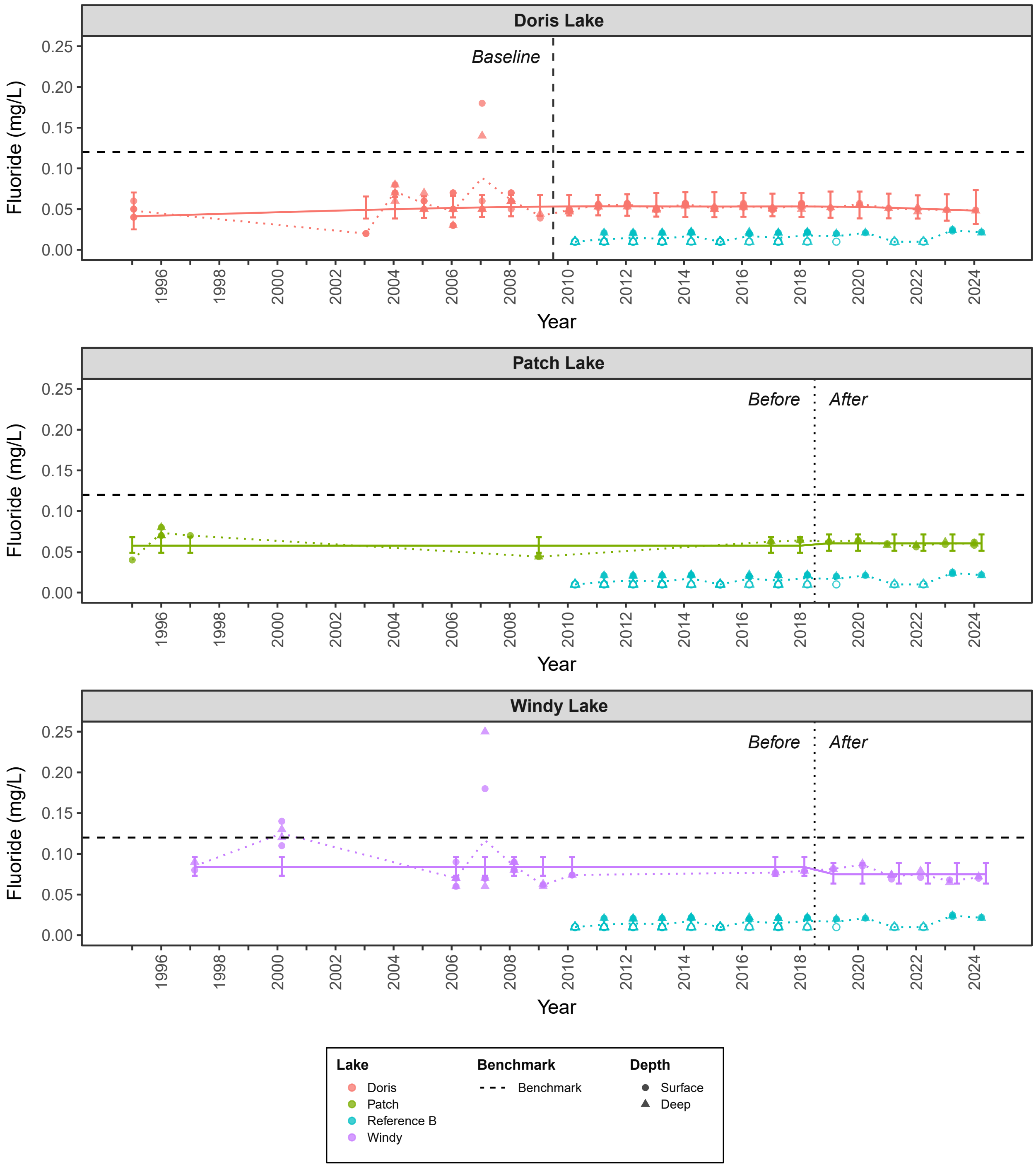
Notes:
BACI = Before-After/Control-Impact; NA = not applicable
Dash (-) = The statistical analysis was not completed due to limitations or because the first step of the statistical analysis indicated no significant difference (Appendix C).
NA indicates that the statistical analysis was not relevant to the dataset.

FIGURE 3.3-5A   UNDER-ICE FLUORIDE IN LAKES, HOPE BAY AEMP, 1996 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 0.12 mg/L.

FIGURE 3.3-5B OPEN-WATER FLUORIDE IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 0.12 mg/L.

3.3.6 TOTAL AMMONIA

Statistical analyses indicated no significant changes over time for under-ice total ammonia concentrations in Doris Lake or between the before and after period means in Patch or Windy lakes (Table 3.3-6). Statistical analyses were not completed for the open-water season in any exposure lake due to the high proportion of data, including the 2024 observations, which were less than the DL (<0.0050 mg/L; Section C.3.1.6 in Appendix C). Graphical analyses indicated the only open-water total ammonia concentration above the DL in 2024 was observed at Doris Lake (0.005 mg/L; Table A.3-4 in Appendix A).

The total ammonia benchmark is pH- and temperature-dependent (Table 2.2-4). The minimum benchmark based on the observed temperature and pH in 2024 was 6 mg/L during the under-ice season and 0.59 mg/L during the open-water season (Table 2.2-4). Ammonia concentrations in all three exposure lakes were less than their respective benchmarks in 2024 (Figures 3.3-6a and 3.3-6b; Table A.3-5 in Appendix A).

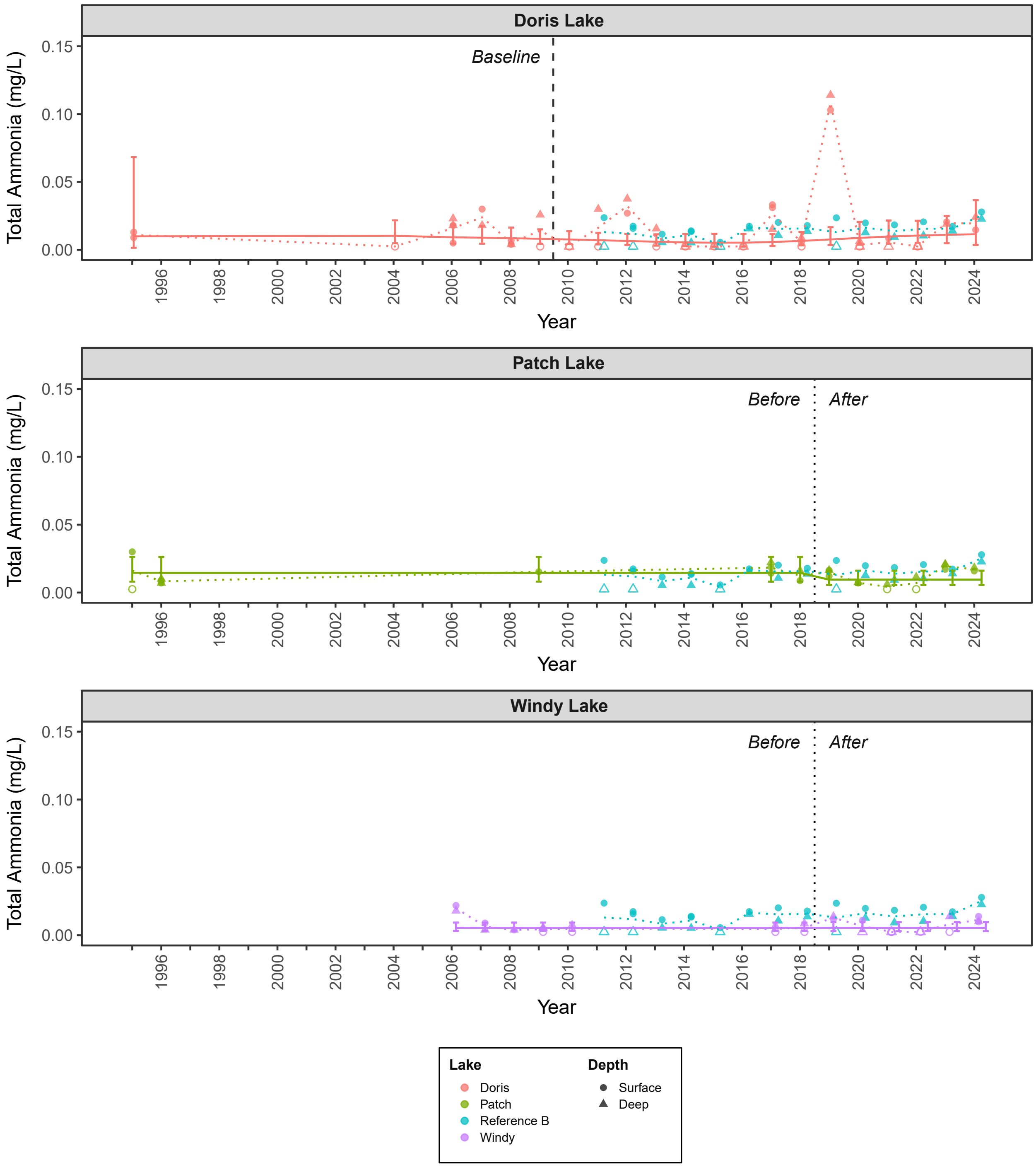
No effects were detected for total ammonia in Doris, Patch, or Windy lakes in 2024. The conditions required to consider a low action level for total ammonia were not exceeded in 2024.

TABLE 3.3-6 TOTAL AMMONIA STATISTICAL RESULTS FOR EXPOSURE LAKES, 2024

Lake	**Season**	**Trend Analysis**		**BACI**	
		Significant Change Relative to a Slope of Zero (*p* value)	**Significant Trend Relative to Reference Lake B (*p* value)**	**Significant Before-After Change (*p* value)**	**Significant Before-After Change Relative to Reference Lake (*p* value)**
Doris	Under-ice	No (0.7141)	-	NA	NA
	Open-water	-	-	NA	NA
Patch	Under-ice	NA	NA	No (0.256)	-
	Open-water	NA	NA	-	-
Windy	Under-ice	NA	NA	No (0.9962)	-
	Open-water	NA	NA	-	-

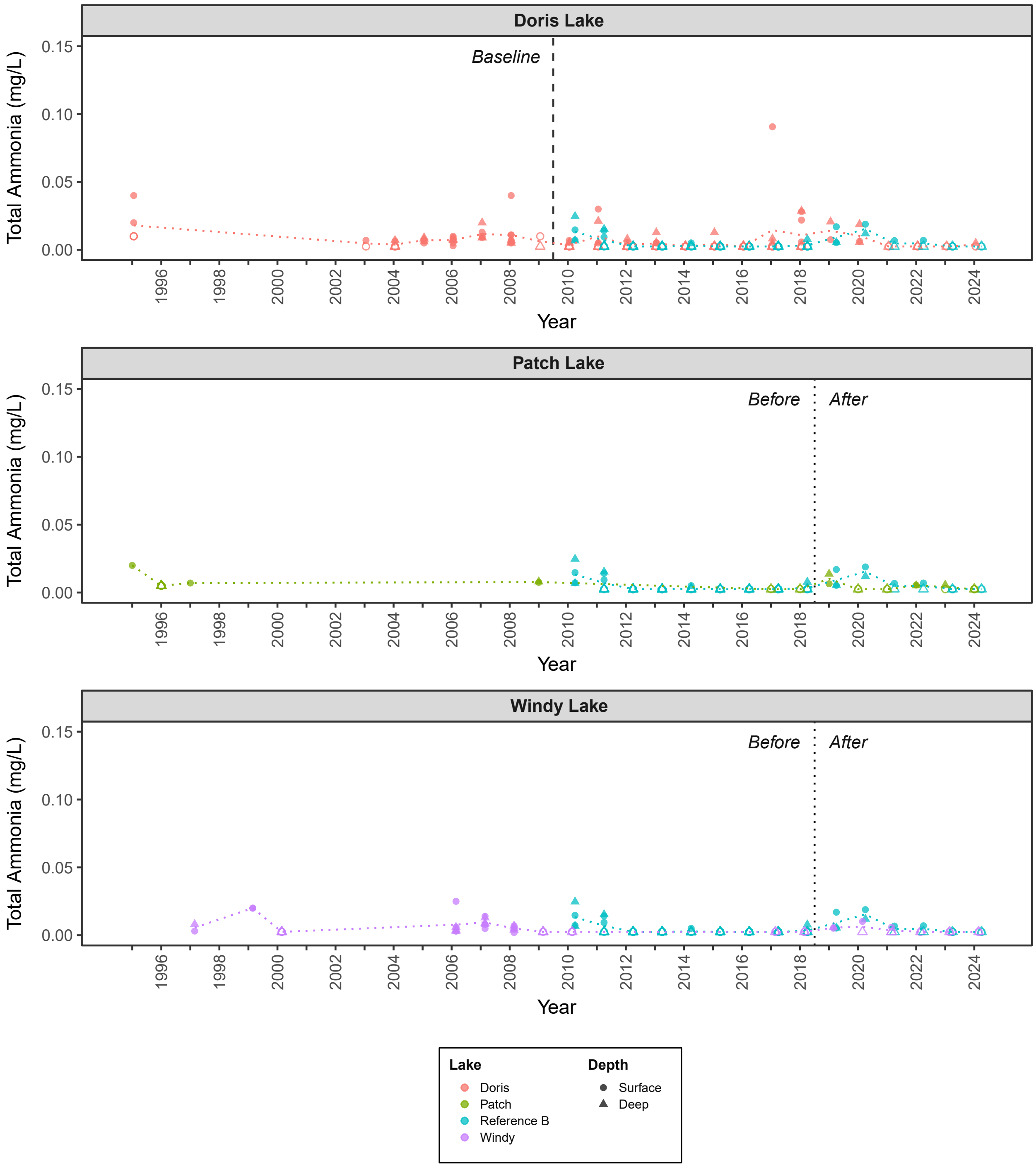
Notes:
BACI = Before-After/Control-Impact; NA = not applicable
Dash (-) = The statistical analysis was not completed due to limitations or because the first step of the statistical analysis indicated no significant difference (Appendix C).
NA indicates that the statistical analysis was not relevant to the dataset.

FIGURE 3.3-6A UNDER-ICE TOTAL AMMONIA IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is pH and temperature dependent (see Table 2.2-2).

FIGURE 3.3-6B   OPEN-WATER TOTAL AMMONIA IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is pH and temperature dependent (see Table 2.2-2).

3.3.7 NITRATE

Statistical analyses indicated no significant change over time for under-ice nitrate concentrations in Doris Lake or between the before and after period means in Patch Lake (Table 3.3-7). Statistical analyses were not completed for Windy Lake or for the open-water season in any lake due to the high proportion of data, including the 2024 observations, which were less than the DL (<0.005 mg/L; Section C.3.1.7 in Appendix C). Graphical analyses indicated nitrate concentrations in all three exposure lakes were less than the benchmark in 2024 (Figures 3.3-7a and 3.3-7b).

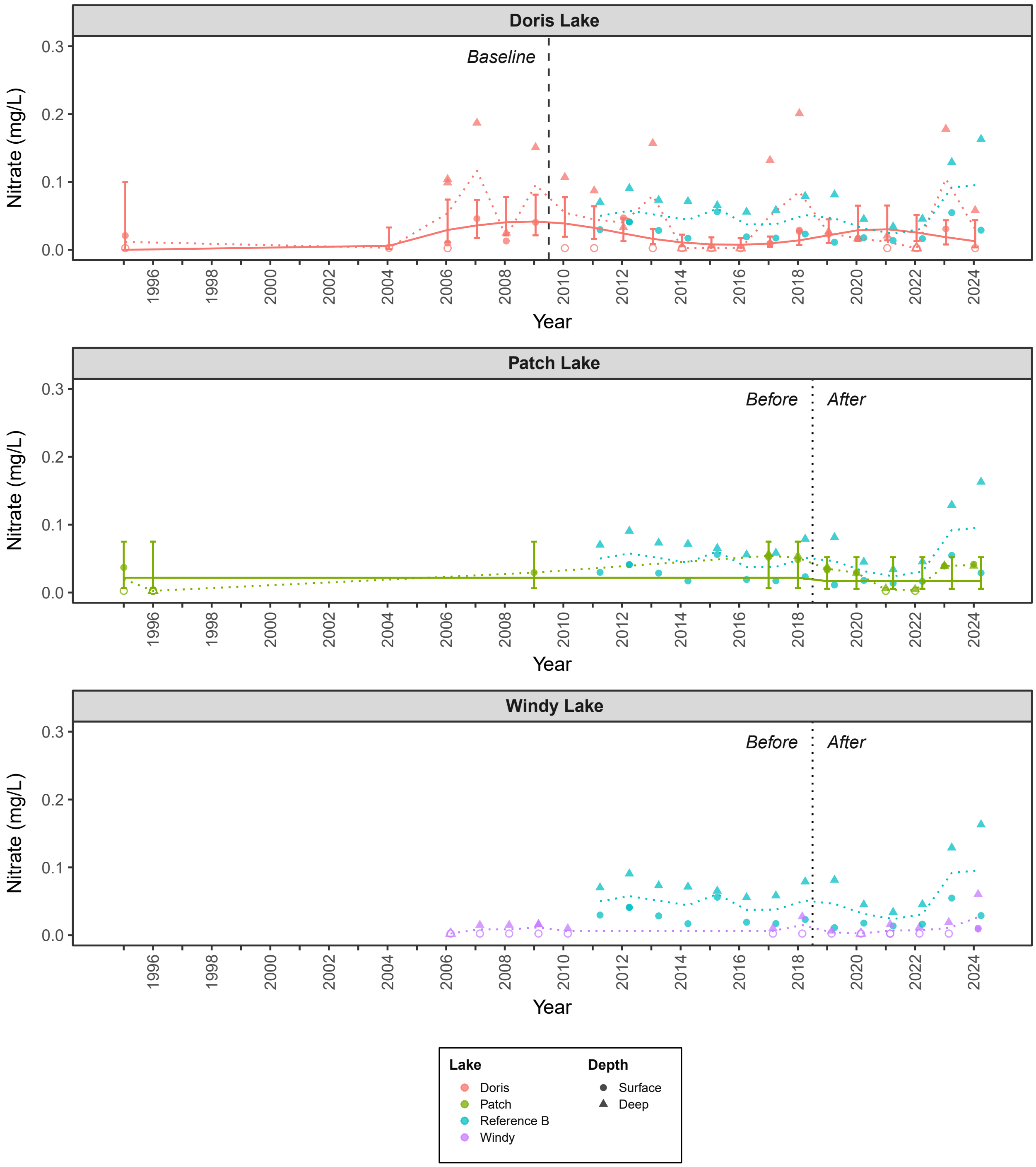
No effects were detected for nitrate in Doris, Patch, or Windy lakes in 2024. The conditions required to consider a low action level for nitrate were not exceeded in 2024.

TABLE 3.3-7 NITRATE STATISTICAL RESULTS FOR EXPOSURE LAKES, 2024

Lake	Season	Trend Analysis		BACI	
		Significant Change Relative to a Slope of Zero (*p* value)	**Significant Trend Relative to Reference Lake B (*p* value)**	**Significant Before-After Change (*p* value)**	**Significant Before-After Change Relative to Reference Lake (*p* value)**
Doris	Under-ice	No (0.4750)	-	NA	NA
	Open-water	-	-	NA	NA
Patch	Under-ice	NA	NA	No (0.7371)	-
	Open-water	NA	NA	-	-
Windy	Under-ice	NA	NA	-	-
	Open-water	NA	NA	-	-

Notes:
BACI = Before-After/Control-Impact; NA = not applicable
Dash (-) = The statistical analysis was not completed due to limitations or because the first step of the statistical analysis indicated no significant difference (Appendix C).
NA indicates that the statistical analysis was not relevant to the dataset.

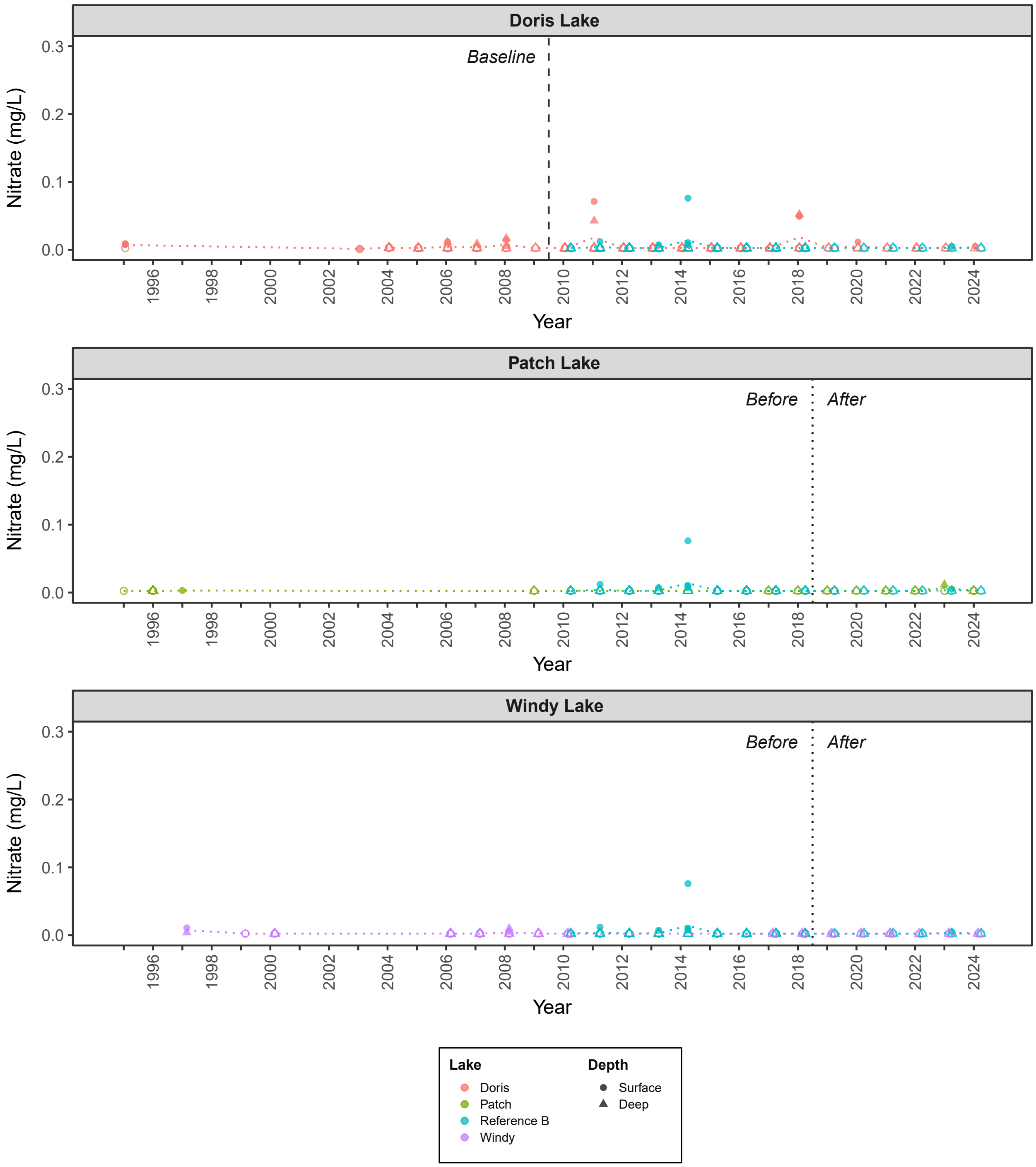
FIGURE 3.3-7A UNDER-ICE NITRATE IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 3 mg/L.

CLIENT: Agnico Eagle Mines Ltd.
GRAPHICS NUMBER: HB-25ERM-002:13

FIGURE 3.3-7B OPEN-WATER NITRATE IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 3 mg/L.

3.3.8 NITRITE

Statistical analyses for nitrite were not completed for any exposure lakes due to the high proportion of data that were less than the DL (<0.0010 mg/L; Table 3.3-8; Section C.3.1.8 in Appendix C). Graphical analyses indicated that all nitrite observations were below the benchmark in 2024 (Table 2.2-2; Figures 3.3-8a and 3.3-8b).

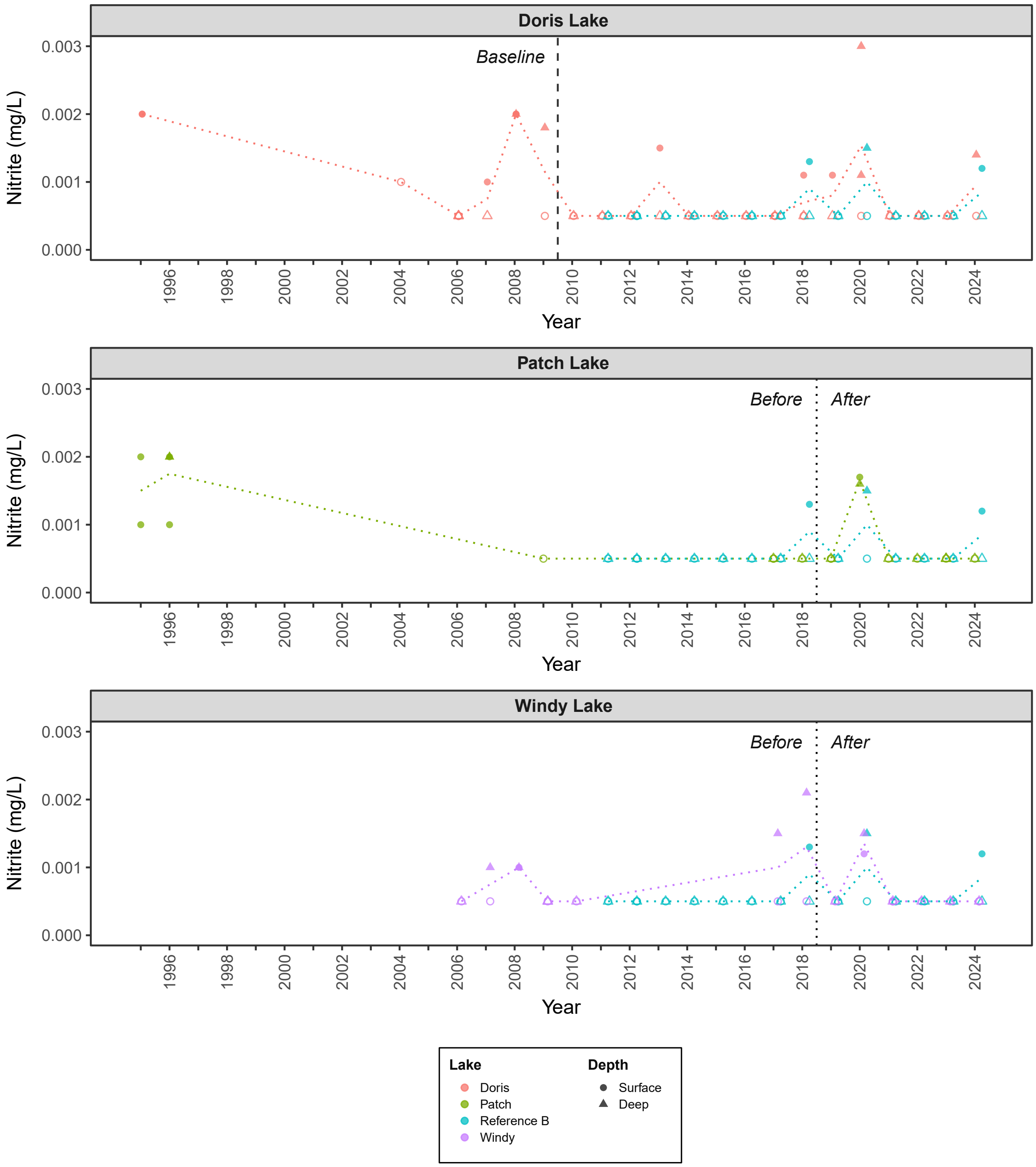
No effects were detected for nitrite in Doris, Patch, or Windy lakes in 2024. The conditions required to consider a low action level for nitrite were not exceeded in 2024.

TABLE 3.3-8 NITRITE STATISTICAL RESULTS FOR EXPOSURE LAKES, 2024

Lake	Season	Trend Analysis		BACI	
		Significant Change Relative to a Slope of Zero (*p* value)	Significant Trend Relative to Reference Lake B (*p* value)	Significant Before-After Change (*p* value)	Significant Before-After Change Relative to Reference Lake (*p* value)
Doris	Under-ice	-	-	NA	NA
	Open-water	-	-	NA	NA
Patch	Under-ice	NA	NA	-	-
	Open-water	NA	NA	-	-
Windy	Under-ice	NA	NA	-	-
	Open-water	NA	NA	-	-

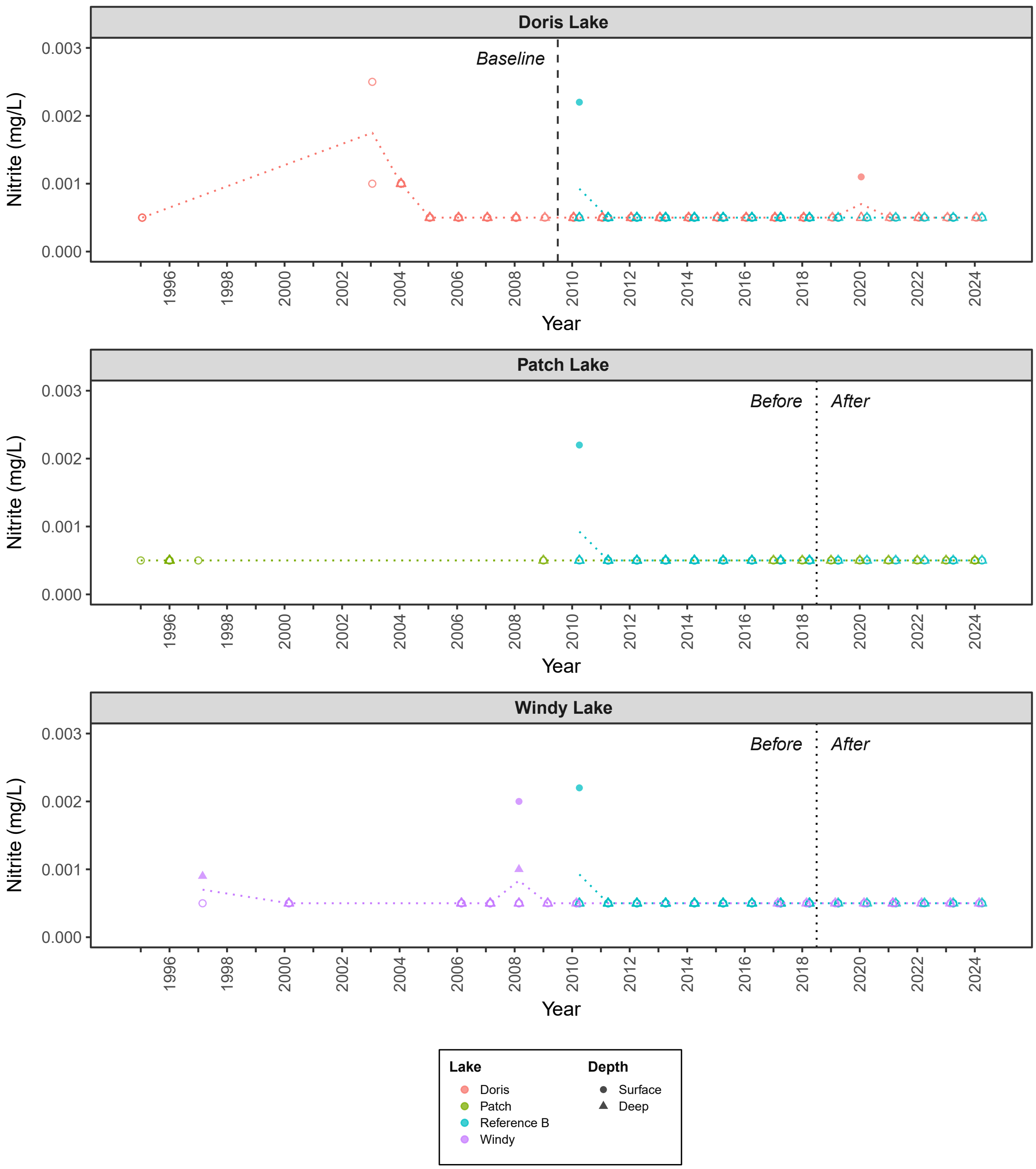
Notes:
BACI = Before-After/Control-Impact; NA = not applicable
Dash (-) = The statistical analysis was not completed due to limitations or because the first step of the statistical analysis indicated no significant difference (Appendix C).
NA indicates that the statistical analysis was not relevant to the dataset.

FIGURE 3.3-8A UNDER-ICE NITRITE IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 0.06 mg/L.

FIGURE 3.3-8B OPEN-WATER NITRITE IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 0.06 mg/L.

3.3.9 TOTAL PHOSPHORUS

Statistical analyses indicated no significant change over time for total phosphorus concentrations in Doris Lake, and between the before and after period means for the under-ice season in Patch Lake, and for both seasons in Windy Lake (Table 3.3-9). A significant difference was detected between the before and after period means for the open-water season in Patch Lake, but not relative to the reference lake. Mean total phosphorous concentrations in Doris Lake during the open-water season were elevated in 2024 compared to 2023 (0.0336 and 0.0294 mg/L, respectively). Graphical analyses of the fitted means slopes of Doris Lake indicated elevated mean total phosphorous concentrations during the under-ice and open-water seasons since 2020 (Figures 3.3-9a and 3.3-9b).

There are no benchmarks to compare total phosphorous to, as it is used as a supporting parameter for phytoplankton biomass (Section 2.2-4).

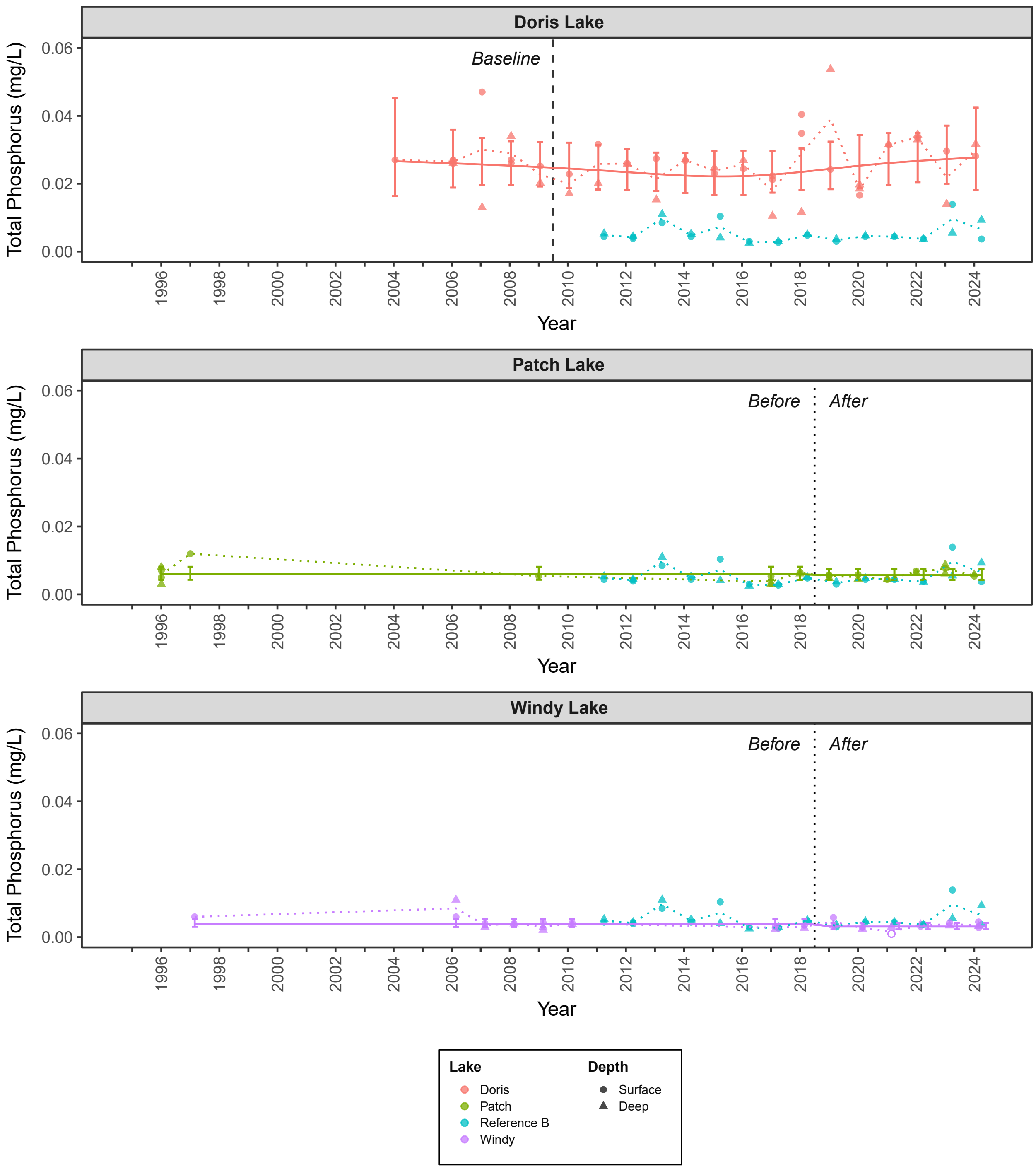
No effects were detected for total phosphorus in Doris, Patch, or Windy lakes in 2024. The conditions required to consider a low action level for total phosphorus were not exceeded in 2024.

TABLE 3.3-9 TOTAL PHOSPHORUS STATISTICAL RESULTS FOR EXPOSURE LAKES, 2024

Lake	Season	Trend Analysis		BACI	
		Significant Change Relative to a Slope of Zero (*p* value)	Significant Trend Relative to Reference Lake B (*p* value)	Significant Before-After Change (*p* value)	Significant Before-After Change Relative to Reference Lake (*p* value)
Doris	Under-ice	No (0.7839)	-	NA	NA
	Open-water	No (0.2897)	-	NA	NA
Patch	Under-ice	NA	NA	No (0.8105)	-
	Open-water	NA	NA	Yes (0.0484)	No (0.135)
Windy	Under-ice	NA	NA	No (0.2165)	-
	Open-water	NA	NA	No (0.4272)	-

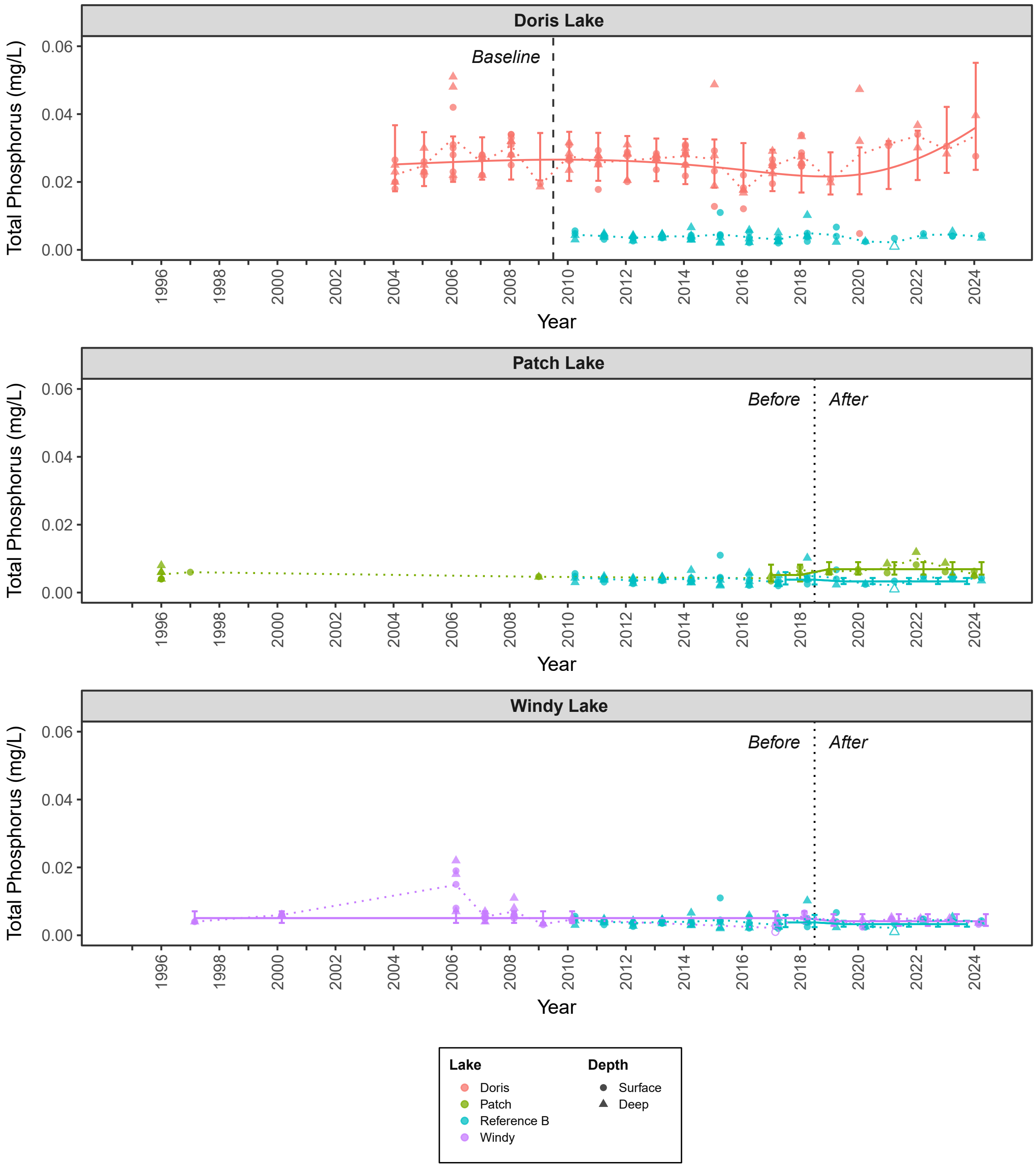
Notes:
BACI = Before-After/Control-Impact; NA = not applicable
Dash (-) = The statistical analysis was not completed due to limitations or because the first step of the statistical analysis indicated no significant difference (Appendix C).
NA indicates that the statistical analysis was not relevant to the dataset.

FIGURE 3.3-9A   UNDER-ICE TOTAL PHOSPHORUS IN LAKES, HOPE BAY AEMP, 1996 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.

FIGURE 3.3-9B OPEN-WATER TOTAL PHOSPHORUS IN LAKES, HOPE BAY AEMP, 1996 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.

3.3.10 TOTAL ALUMINUM

Statistical analyses indicated no significant changes over time for total aluminum concentrations in Doris Lake and between the before and after period means in Patch or Windy lakes (Table 3.3-10). Graphical analyses indicated that total aluminum concentrations were less than the benchmark in Doris and Windy lakes, but greater than the benchmark in Patch Lake during both seasons in 2024 (Figures 3.3-10a and 3.3-10b). In 2024, under-ice total aluminum concentrations decreased by 54% (surface) and 34% (deep) in Patch Lake, compared to the elevated concentrations observed in 2023 (Figure 3.3-10a). Open-water concentrations in Patch Lake also decreased by 23% (surface) and 20% (deep) in 2024, compared to elevated 2023 concentrations (Figure 3.3-10b).

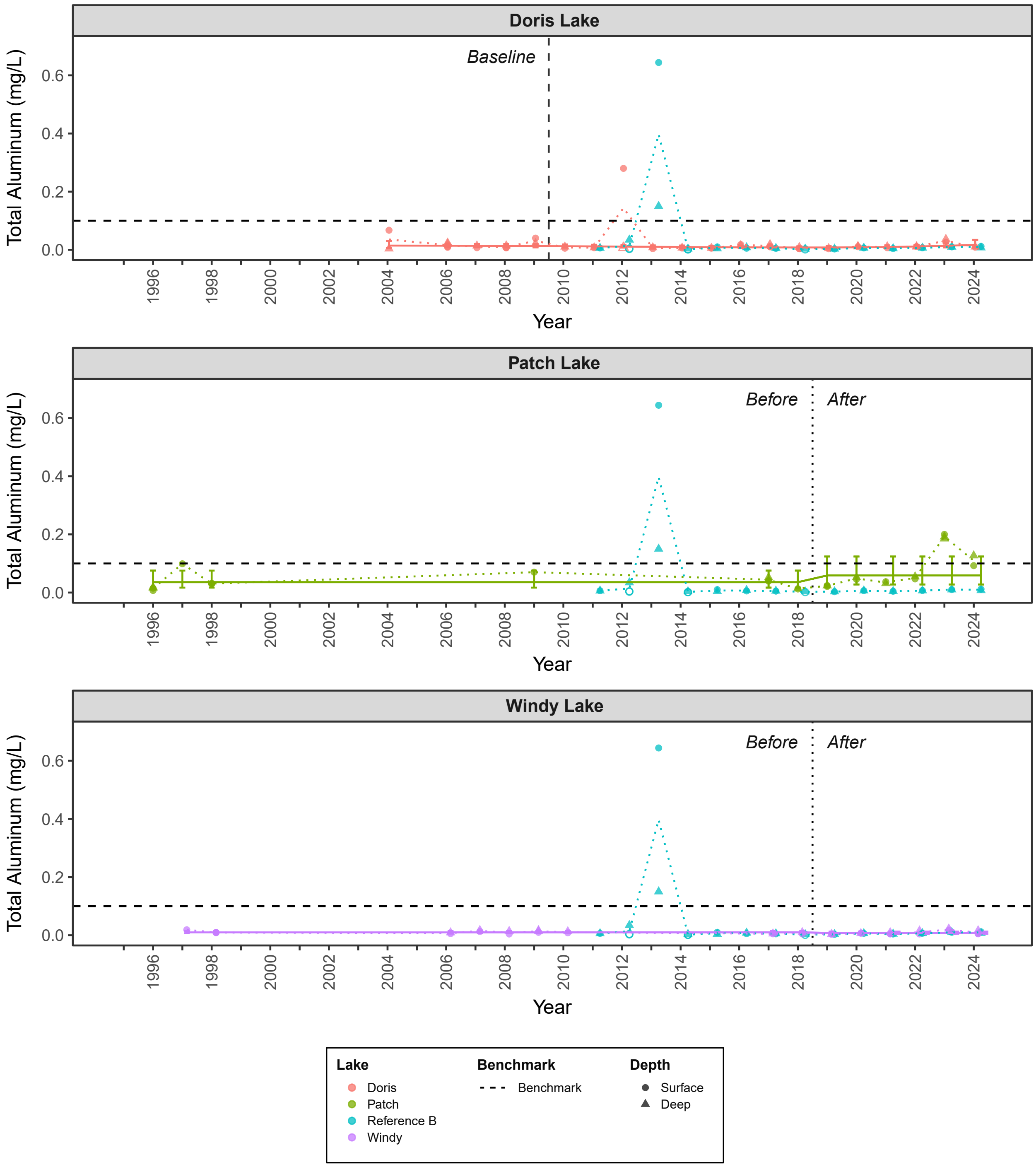
No effects were detected for total aluminum in Doris, Patch, or Windy lakes in 2024. The conditions required to consider a low action level for total aluminum were not exceeded in 2024.

TABLE 3.3-10 TOTAL ALUMINUM STATISTICAL RESULTS FOR EXPOSURE LAKES, 2024

Lake	Season	Trend Analysis		BACI	
		Significant Change Relative to a Slope of Zero (*p* value)	Significant Trend Relative to Reference Lake B (*p* value)	Significant Before-After Change (*p* value)	Significant Before-After Change Relative to Reference Lake (*p* value)
Doris	Under-ice	No (0.2198)	-	NA	NA
	Open-water	No (0.9435)	-	NA	NA
Patch	Under-ice	NA	NA	No (0.3193)	-
	Open-water	NA	NA	No (0.1231)	-
Windy	Under-ice	NA	NA	No (0.4095)	-
	Open-water	NA	NA	No (0.7066)	-

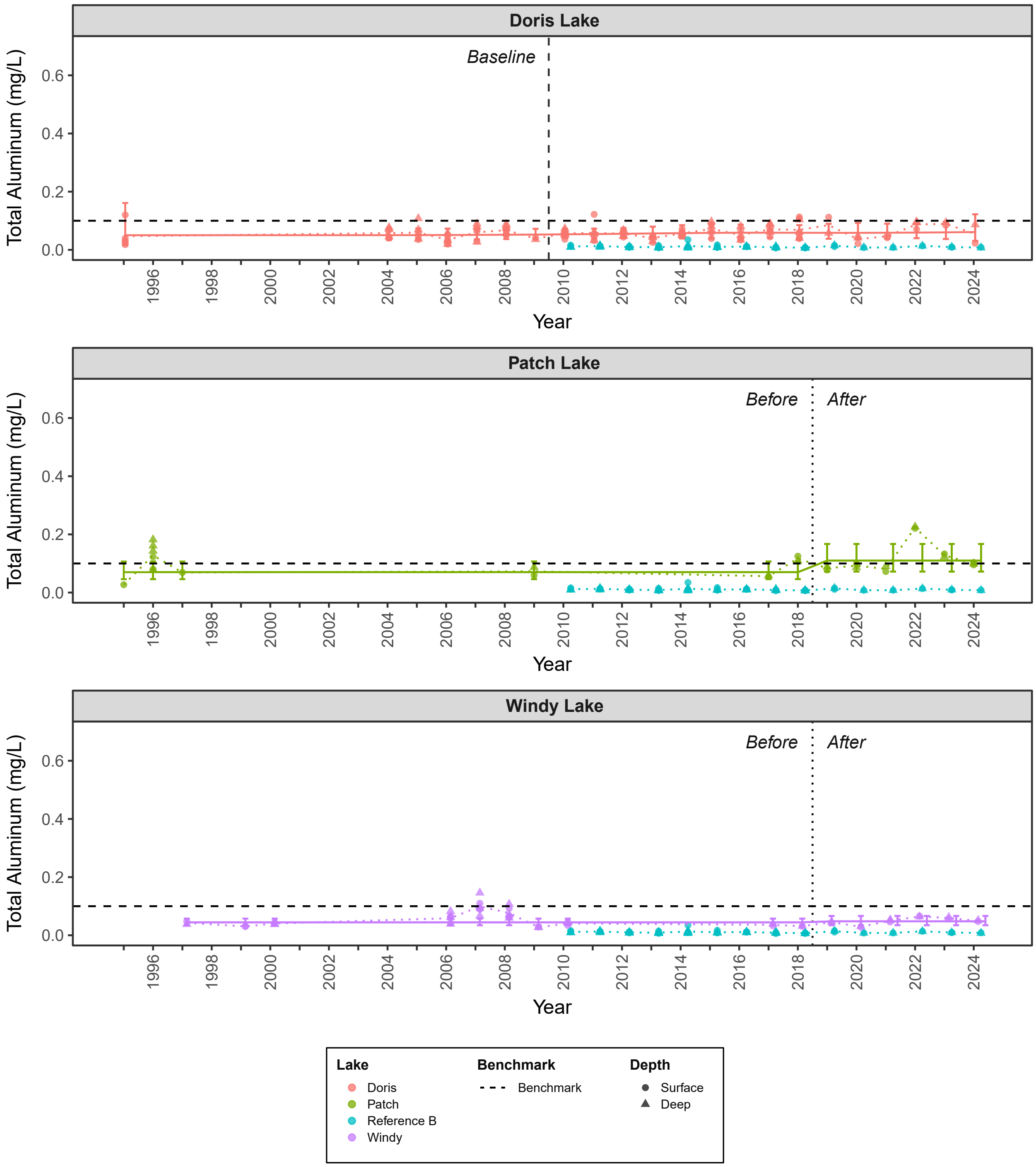
Notes:
BACI = Before-After/Control-Impact; NA = not applicable
Dash (-) = The statistical analysis was not completed due to limitations or because the first step of the statistical analysis indicated no significant difference (Appendix C).
NA indicates that the statistical analysis was not relevant to the dataset.

FIGURE 3.3-10A UNDER-ICE TOTAL ALUMINUM IN LAKES, HOPE BAY AEMP, 1996 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 0.1 mg/L.

FIGURE 3.3-10B OPEN-WATER TOTAL ALUMINUM IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 0.1 mg/L.

3.3.11 TOTAL ARSENIC

Statistical analyses indicated a significant change over time for total arsenic concentrations in Doris Lake during both seasons and relative to the reference lake during the under-ice season (Table 3.3-11). Graphical analyses indicated that total arsenic decreased in Doris Lake during the baseline years (1995 to 2009) and that concentrations have been stable (within 10% of each annual measurement) since 2012 (Figures 3.3-11a and 3.3-11b). It is noted that a decrease in total arsenic concentrations is not considered to be an adverse effect (TMAC 2018).

Statistical analyses indicated no significant difference between the before and after period means for total arsenic concentrations in Patch Lake or in the open-water season in Windy Lake (Table 3.3-11). A significant difference between the before and after period means for total arsenic was observed during the under-ice season in Windly Lake but not relative to the reference lake (Table 3.3-11).

Graphical analyses indicated that total arsenic concentrations in all three exposure lakes were less than the benchmark in 2024 (Figure 3.3-11a and 3.3-11b).

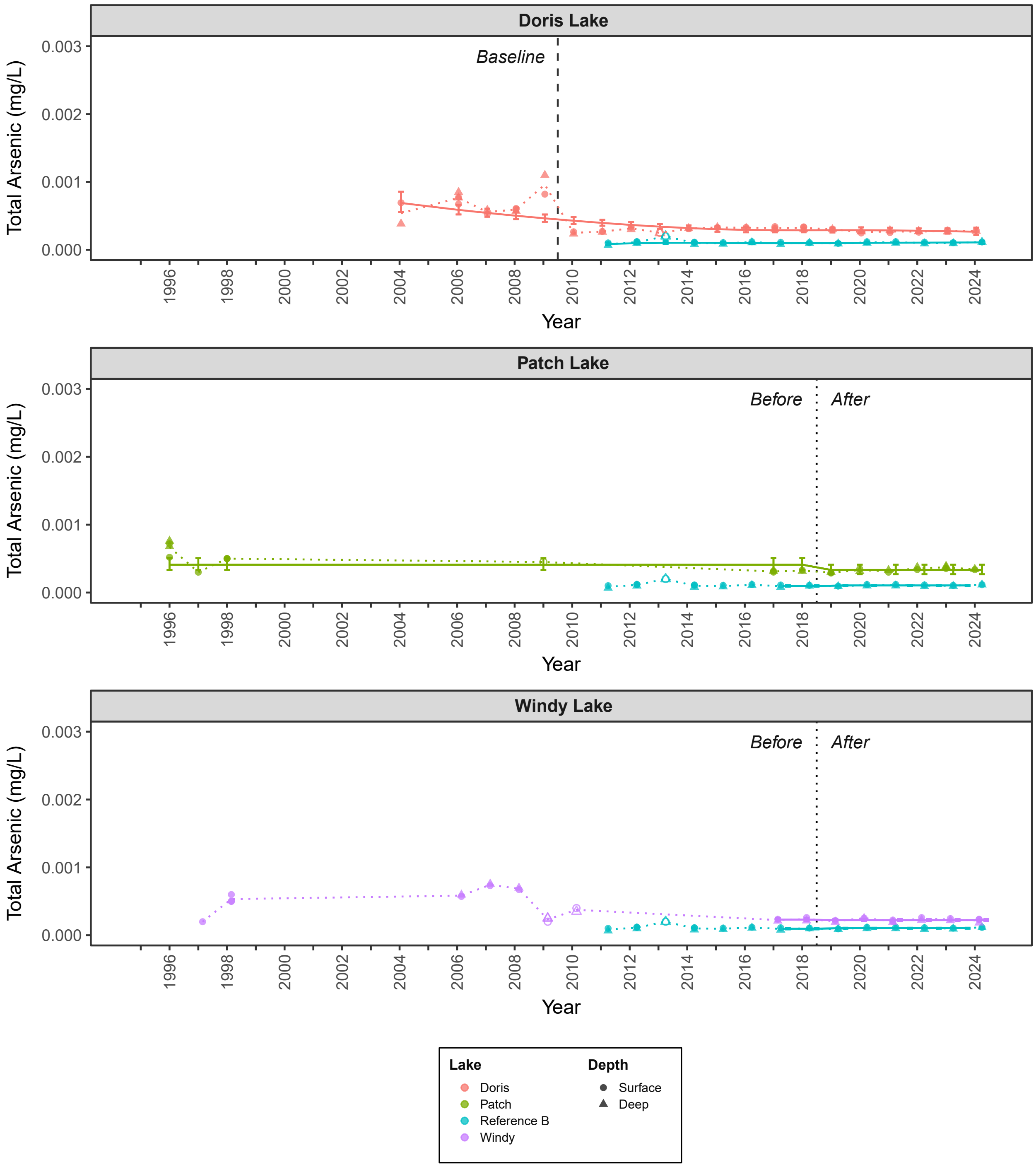
No potentially adverse effects were detected for total arsenic in Doris, Patch, or Windy lakes in 2024. The conditions required to consider a low action level for total arsenic were not exceeded in 2024.

TABLE 3.3-11 TOTAL ARSENIC STATISTICAL RESULTS FOR EXPOSURE LAKES, 2024

Lake	Season	Trend Analysis		BACI	
		Significant Change Relative to a Slope of Zero (*p* value)	Significant Trend Relative to Reference Lake B (*p* value)	Significant Before-After Change (*p* value)	Significant Before-After Change Relative to Reference Lake (*p* value)
Doris	Under-ice	Yes (<0.00001)	Yes (0.0027)	NA	NA
	Open-water	Yes (<0.00001)	No (0.0794)	NA	NA
Patch	Under-ice	NA	NA	No (0.1507)	-
	Open-water	NA	NA	No (0.6063)	-
Windy	Under-ice	NA	NA	Yes (0.0419)	No (0.171)
	Open-water	NA	NA	No (0.1658)	-

Notes:
< = less than; BACI = Before-After/Control-Impact; NA = not applicable
Dash (-) = The statistical analysis was not completed due to limitations or because the first step of the statistical analysis indicated no significant difference (Appendix C).
NA indicates that the statistical analysis was not relevant to the dataset.

FIGURE 3.3-11A   UNDER-ICE TOTAL ARSENIC IN LAKES, HOPE BAY AEMP, 1996 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 0.005 mg/L.

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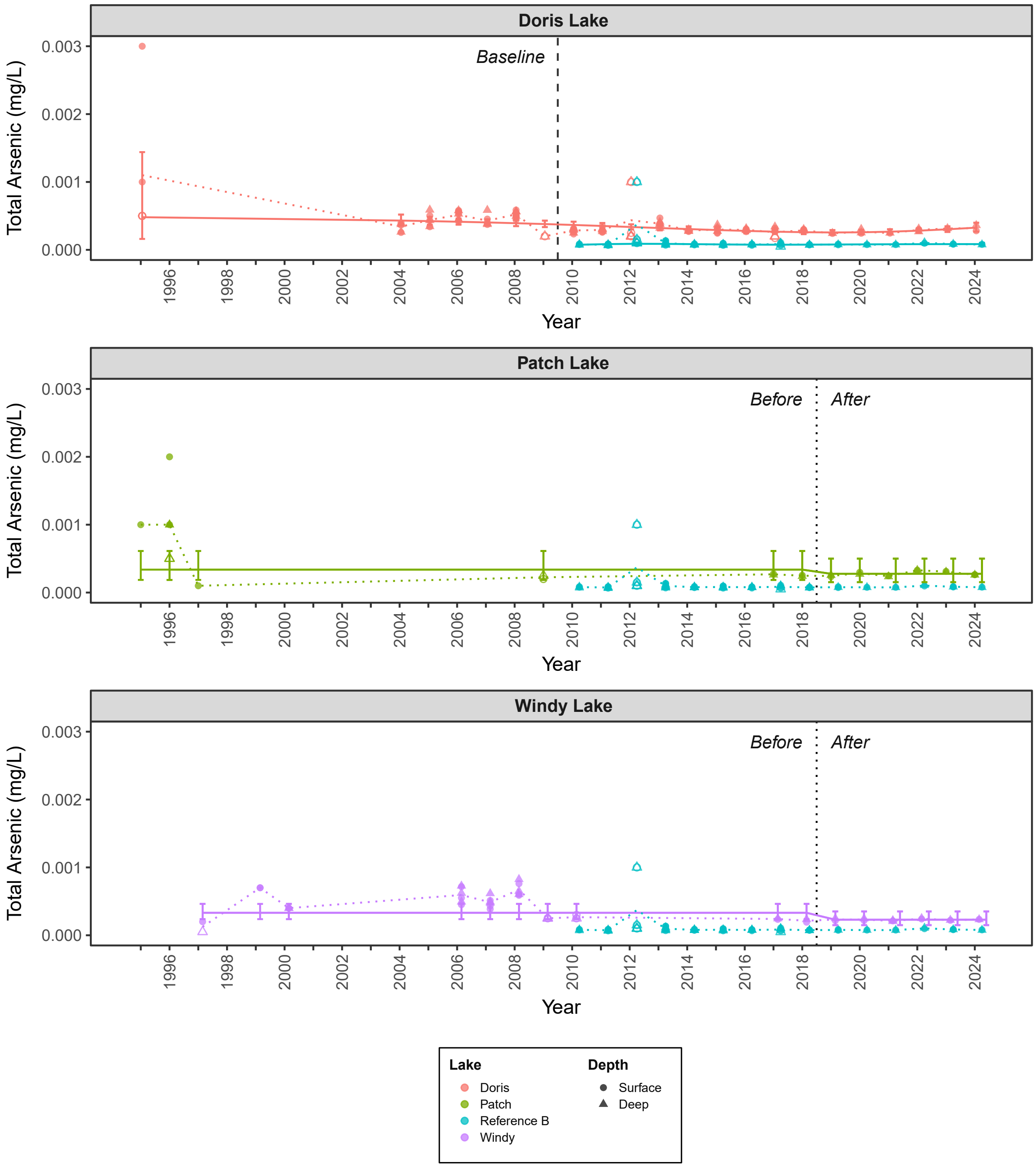
FIGURE 3.3-11B OPEN-WATER TOTAL ARSENIC IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 0.005 mg/L.

CLIENT: Agnico Eagle Mines Ltd.
GRAPHICS NUMBER: HB-25ERM-002:22

3.3.12 TOTAL BORON

Statistical analyses indicated a significant change over time for total boron concentrations in Doris Lake during both seasons (Table 3.3-12). Statistical comparison to the reference lake was not completed, as all 2024 data collected at Reference Lake B were less than the DL (<0.010 mg/L; Section C.3.1.12 in Appendix C). Graphical analyses indicated that total boron concentrations in Doris Lake increased from 2010 to 2015 (under-ice from 0.027 to 0.037 mg/L and open-water 0.029 to 0.041 mg/L) but have decreased since 2015 (Figure 3.3-12a and 3.3-12b). Total boron concentrations in 2024 were within the baseline range for Doris Lake.

Statistical analyses indicated no significant difference between the before and after period means for total boron concentrations in Patch or Windy lakes (Table 3.3-12).

Graphical analyses indicated that total boron concentrations in all three exposure lakes were less than the benchmark in 2024 (Figures 3.3-12a and 3.2-12b).

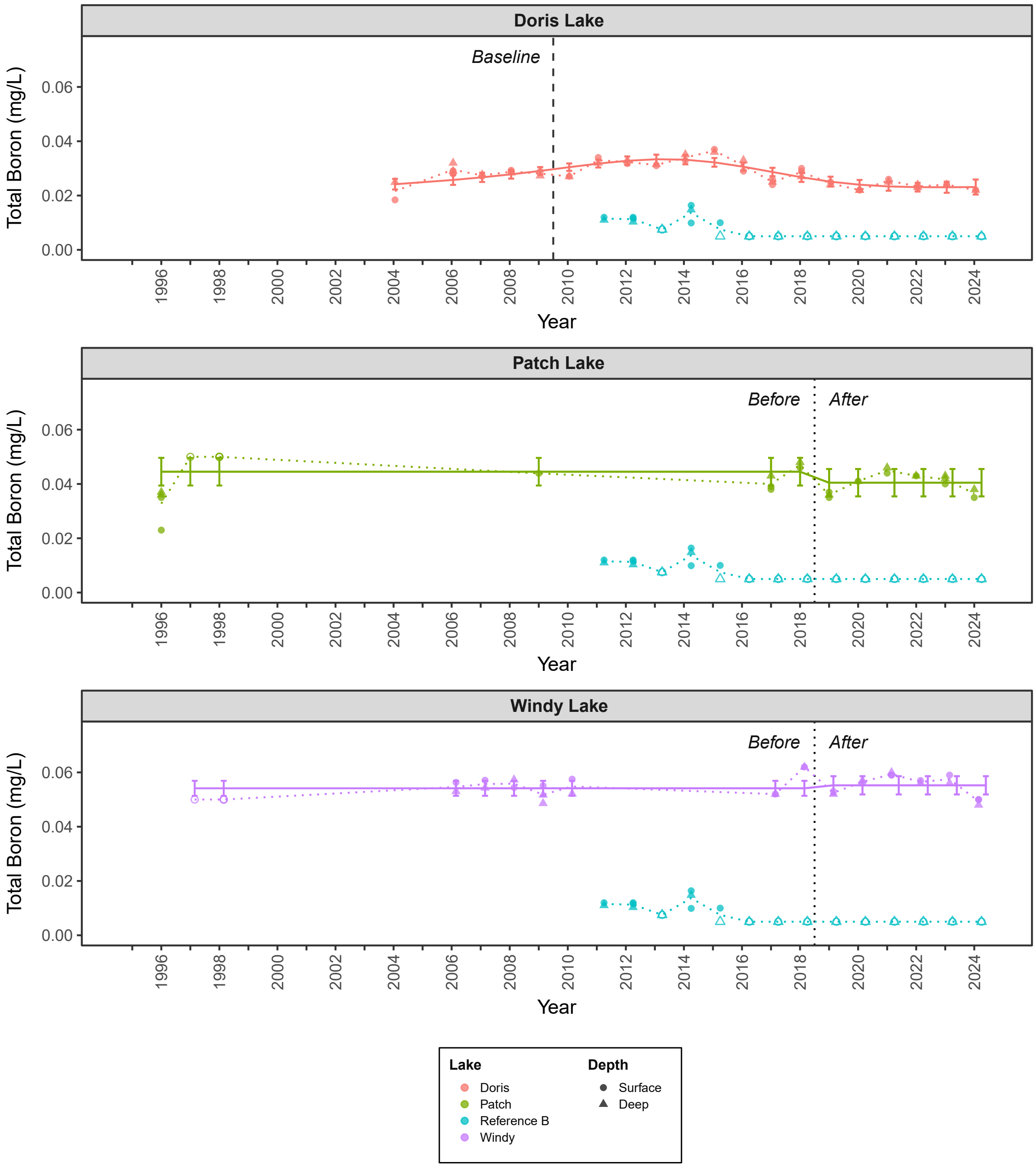
No effects were detected for total boron in Doris, Patch, or Windy lakes in 2024. The conditions required to consider a low action level for total boron were not exceeded in 2024.

TABLE 3.3-12 TOTAL BORON STATISTICAL RESULTS FOR EXPOSURE LAKES, 2024

Lake	Season	Trend Analysis		BACI	
		Significant Change Relative to a Slope of Zero (*p* value)	**Significant Trend Relative to Reference Lake B (*p* value)**	**Significant Before-After Change (*p* value)**	**Significant Before-After Change Relative to Reference Lake (*p* value)**
Doris	Under-ice	Yes (<0.00001)	-	NA	NA
	Open-water	Yes (<0.00001)	-	NA	NA
Patch	Under-ice	NA	NA	No (0.2355)	-
	Open-water	NA	NA	No (0.3211)	-
Windy	Under-ice	NA	NA	No (0.5901)	-
	Open-water	NA	NA	No (0.1613)	-

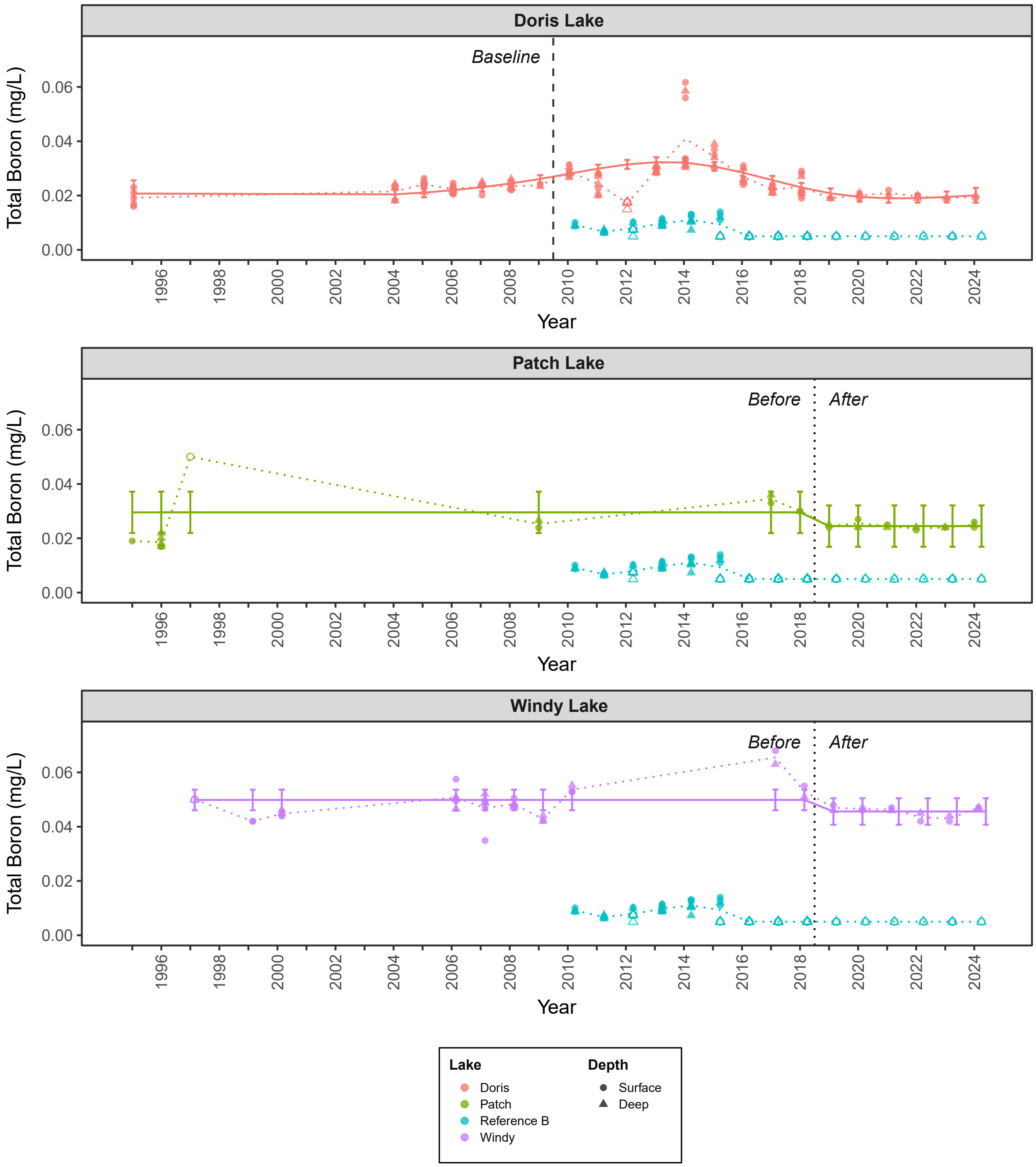
Notes:
< = less than; BACI = Before-After/Control-Impact; NA = not applicable
Dash (-) = The statistical analysis was not completed due to limitations or because the first step of the statistical analysis indicated no significant difference (Appendix C).
NA indicates that the statistical analysis was not relevant to the dataset.

FIGURE 3.3-12A UNDER-ICE TOTAL BORON IN LAKES, HOPE BAY AEMP, 1996 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 1.5 mg/L.

FIGURE 3.3-12B   OPEN-WATER TOTAL BORON IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 1.5 mg/L.

3.3.13 TOTAL CADMIUM

Statistical analyses for total cadmium were not completed for any exposure lakes due to the high proportion of data, including all the 2024 observations, which were less than the DL (<0.000005 mg/L; Table 3.3-13; Section C.3.1.13 in Appendix C). Graphical analyses indicated that total cadmium concentrations in all three exposure lakes were below the DL and the benchmark in 2024 (Figures 3.3-13a and 3.3-13b).

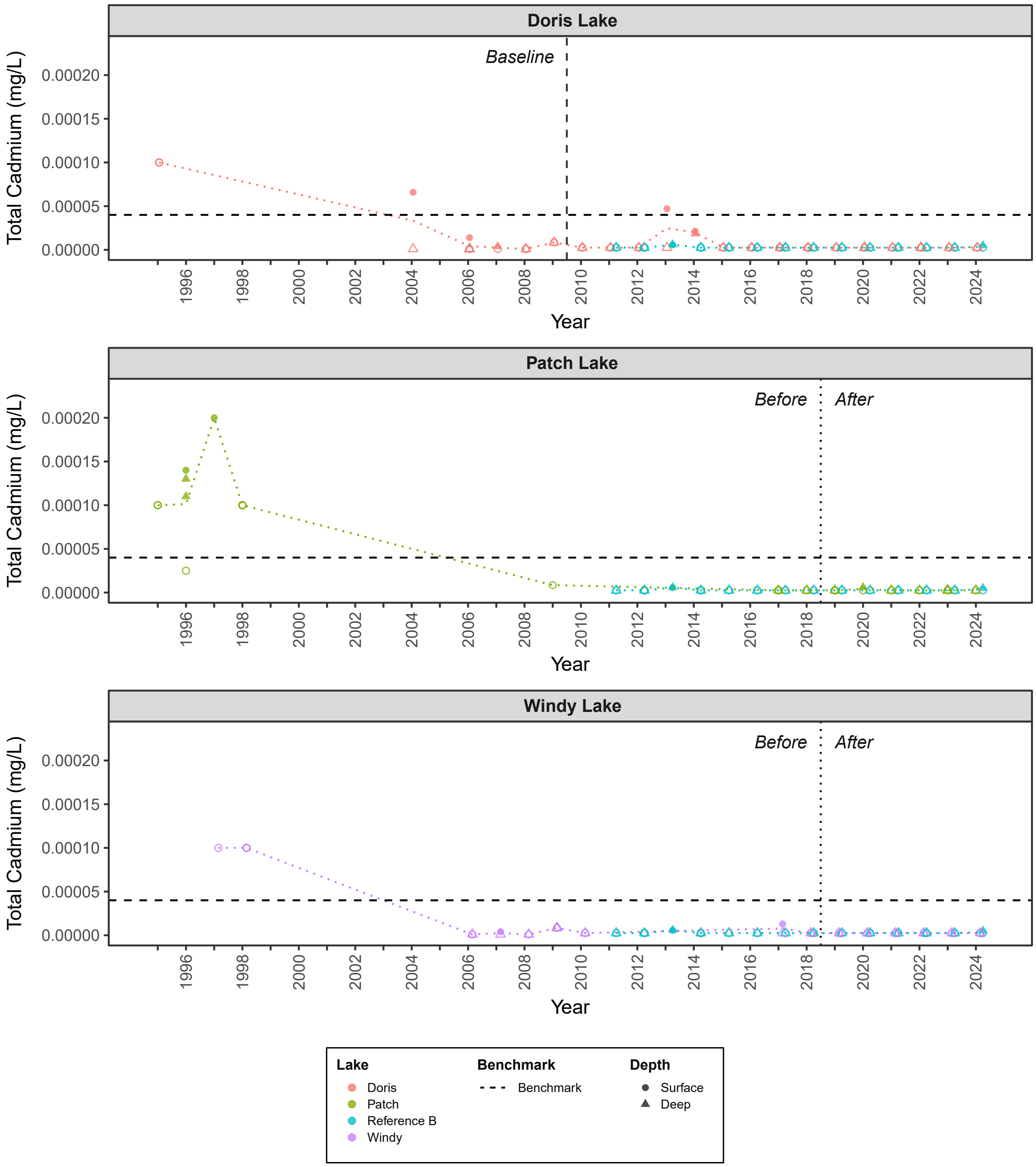
No effects were detected for total cadmium in Doris, Patch, or Windy lakes in 2024. The conditions required to consider a low action level for total cadmium were not exceeded in 2024.

TABLE 3.3-13 TOTAL CADMIUM STATISTICAL RESULTS FOR EXPOSURE LAKES, 2024

Lake	Season	Trend Analysis		BACI	
		Significant Change Relative to a Slope of Zero (*p* value)	**Significant Trend Relative to Reference Lake B (*p* value)**	**Significant Before-After Change (*p* value)**	**Significant Before-After Change Relative to Reference Lake (*p* value)**
Doris	Under-ice	-	-	NA	NA
	Open-water	-	-	NA	NA
Patch	Under-ice	NA	NA	-	-
	Open-water	NA	NA	-	-
Windy	Under-ice	NA	NA	-	-
	Open-water	NA	NA	-	-

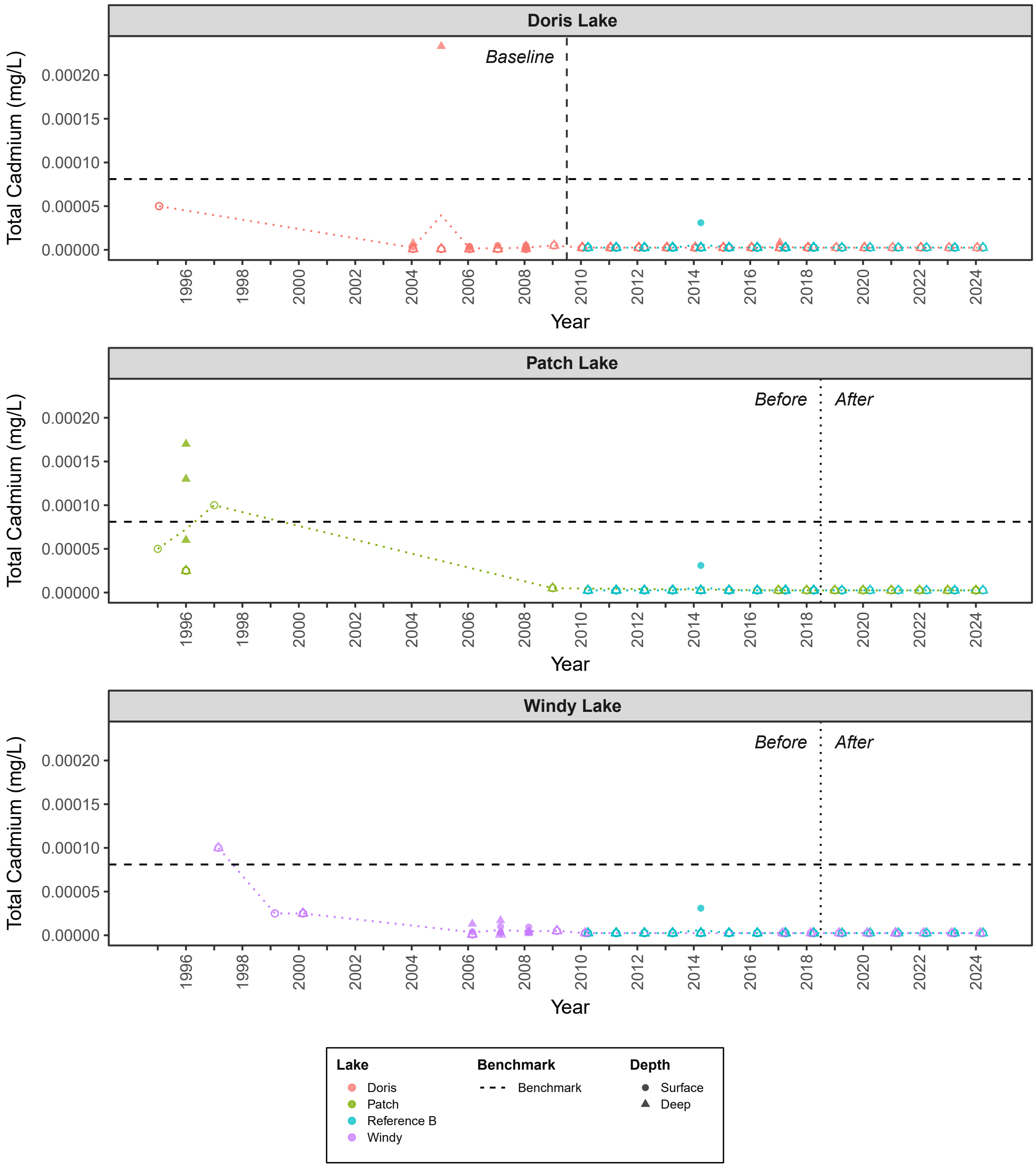
Notes:
BACI = Before-After/Control-Impact; NA = not applicable
Dash (-) = The statistical analysis was not completed due to limitations or because the first step of the statistical analysis indicated no significant difference (Appendix C).
NA indicates that the statistical analysis was not relevant to the dataset.

FIGURE 3.3-13A UNDER-ICE TOTAL CADMIUM IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is hardness dependent (minimum = 0.00004 mg/L); see Table 2.2-2).

FIGURE 3.3-13B OPEN-WATER TOTAL CADMIUM IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is hardness dependent (minimum = 0.00004 mg/L); see Table 2.2-2).

3.3.14 TOTAL CHROMIUM

Statistical analyses for total chromium were not completed for any exposure lakes due to the high proportion of data, including the 2024 observations, which were less than the DL (<0.0005 mg/L; Table 3.3-14; Section C.3.1.14 in Appendix C). Graphical analyses indicated that total chromium concentrations in all three exposure lakes were below the DL and the benchmark in 2024 (Figures 3.3-14a and 3.3-14b; Appendix A).

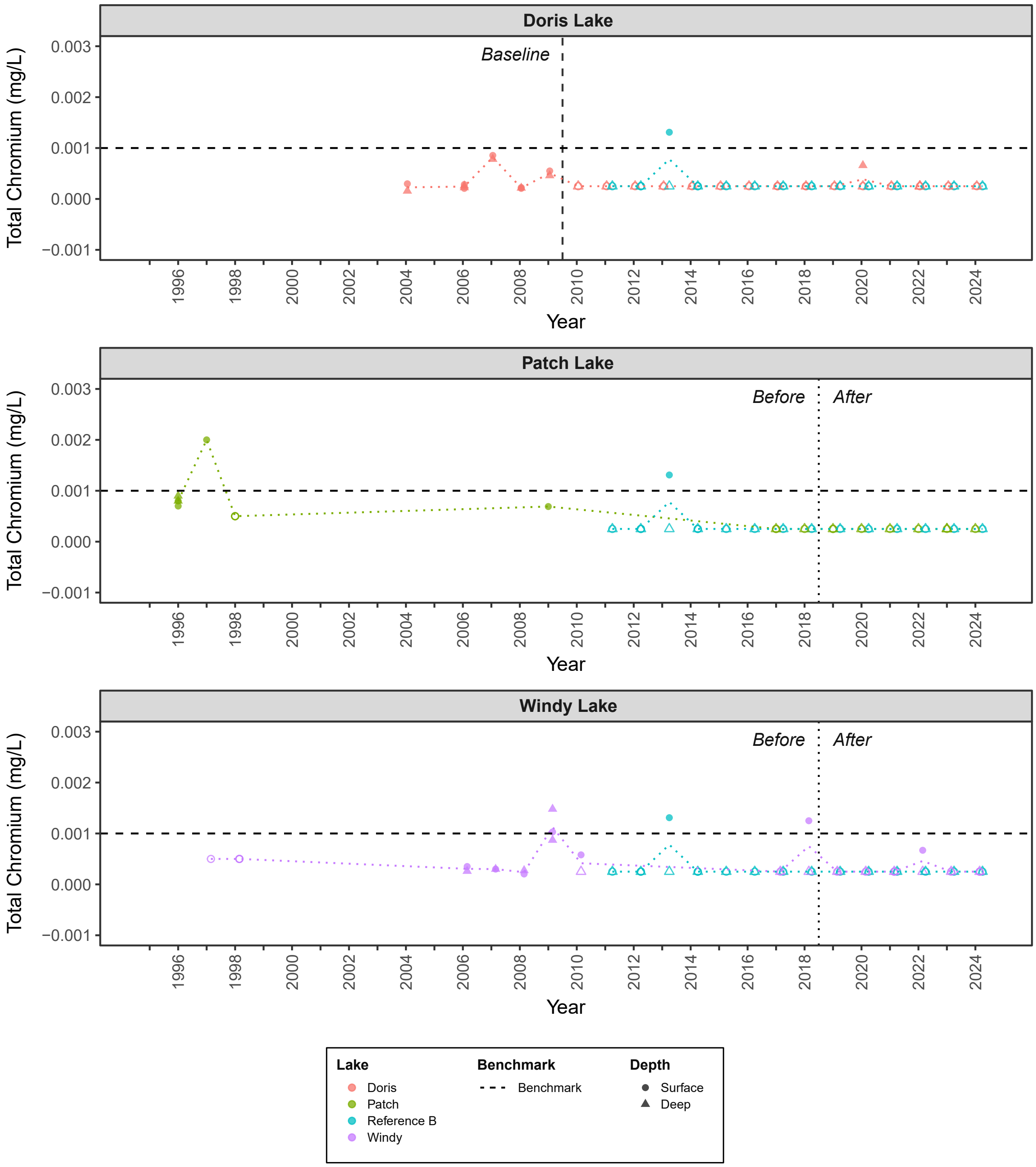
No effects were detected for total chromium in Doris, Patch, or Windy lakes in 2024. The conditions required to consider a low action level for total chromium were not exceeded in 2024.

TABLE 3.3-14 TOTAL CHROMIUM STATISTICAL RESULTS FOR EXPOSURE LAKES, 2024

Lake	Season	Trend Analysis		BACI	
		Significant Change Relative to a Slope of Zero (*p* value)	Significant Trend Relative to Reference Lake B (*p* value)	Significant Before-After Change (*p* value)	Significant Before-After Change Relative to Reference Lake (*p* value)
Doris	Under-ice	-	-	NA	NA
	Open-water	-	-	NA	NA
Patch	Under-ice	NA	NA	-	-
	Open-water	NA	NA	-	-
Windy	Under-ice	NA	NA	-	-
	Open-water	NA	NA	-	-

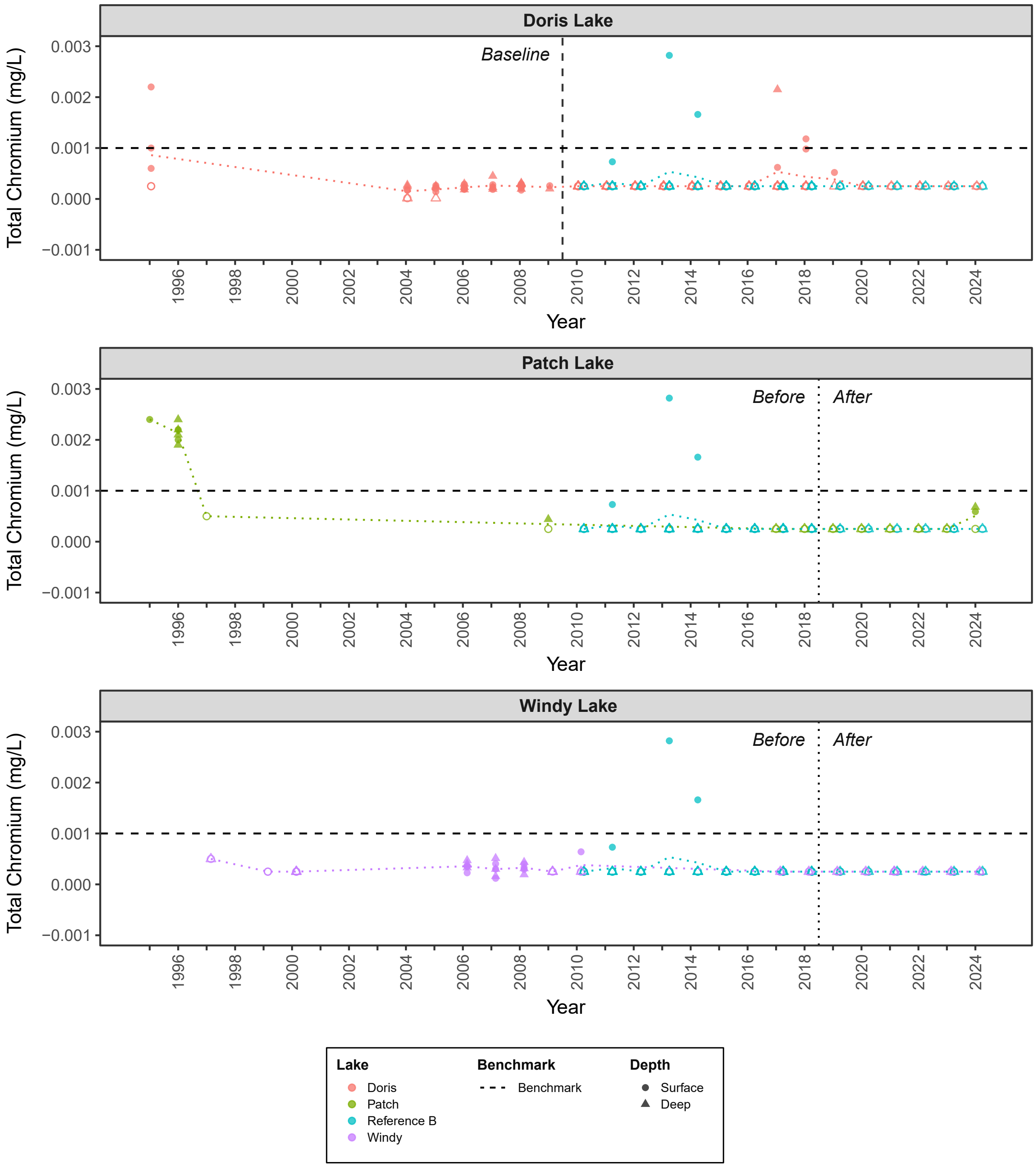
Notes:
BACI = Before-After/Control-Impact; NA = not applicable
Dash (-) = The statistical analysis was not completed due to limitations or because the first step of the statistical analysis indicated no significant difference (Appendix C).
NA indicates that the statistical analysis was not relevant to the dataset.

FIGURE 3.3-14A UNDER-ICE TOTAL CHROMIUM IN LAKES, HOPE BAY AEMP, 1996 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 0.001 mg/L.

FIGURE 3.3-14B OPEN-WATER TOTAL CHROMIUM IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 0.001 mg/L.

3.3.15 TOTAL COPPER

Statistical analyses indicated no significant changes over time for total copper concentrations in Doris Lake or between the before and after period means in Patch or Windy lakes (Table 3.3-15). Graphical analyses indicated that total copper concentrations in all three exposure lakes were below their respective benchmarks (Figures 3.3-15a and 3.3-15b; Appendix A).

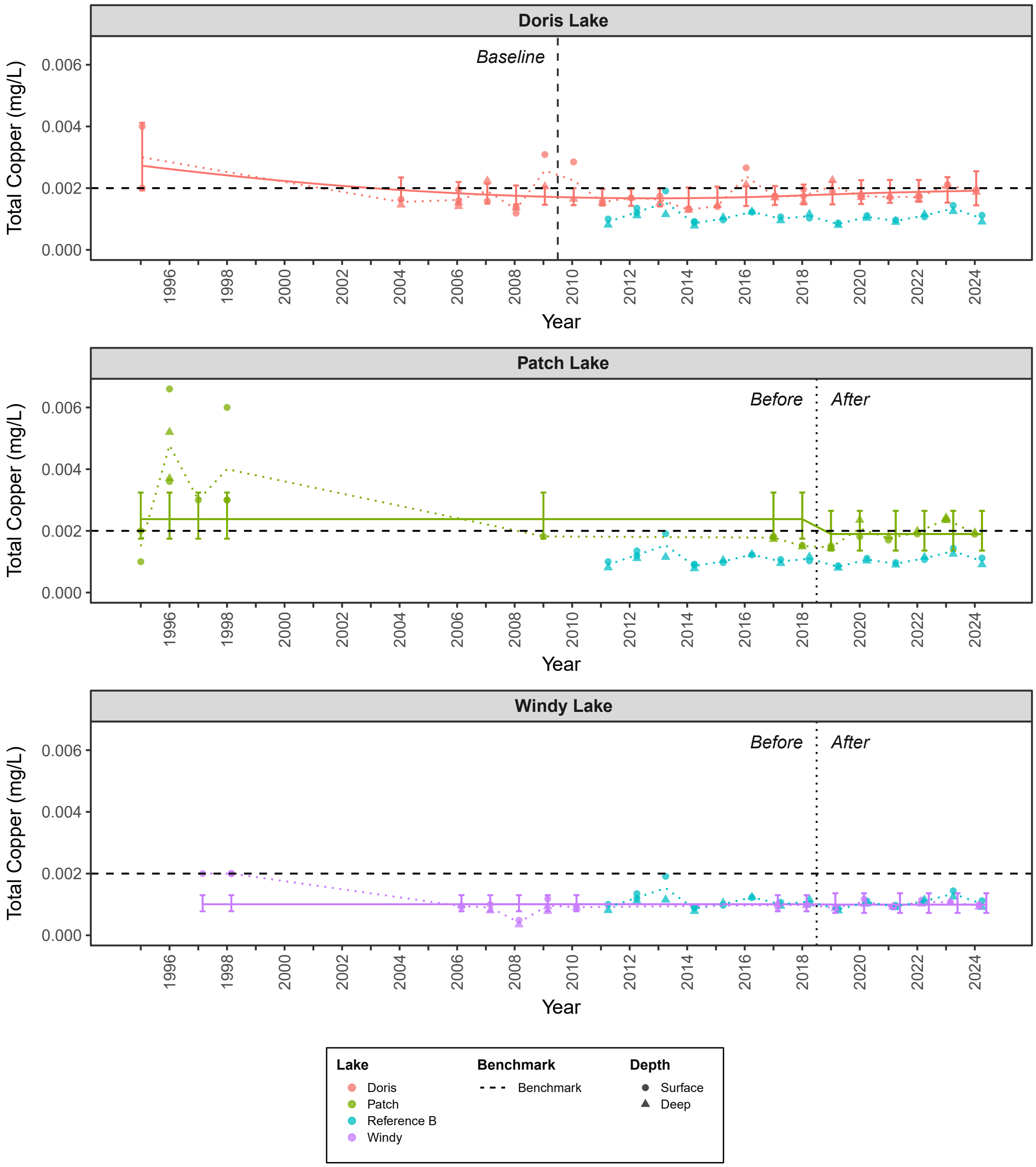
No effects were detected for total copper in Doris, Patch, or Windy lakes in 2024. The conditions required to consider a low action level for total copper were not exceeded in 2024.

TABLE 3.3-15 TOTAL COPPER STATISTICAL RESULTS FOR EXPOSURE LAKES, 2024

Lake	Season	Trend Analysis		BACI	
		Significant Change Relative to a Slope of Zero (*p* value)	**Significant Trend Relative to Reference Lake B (*p* value)**	**Significant Before-After Change (*p* value)**	**Significant Before-After Change Relative to Reference Lake (*p* value)**
Doris	Under-ice	No (0.0657)	-	NA	NA
	Open-water	No (0.6067)	-	NA	NA
Patch	Under-ice	NA	NA	No (0.2974)	-
	Open-water	NA	NA	No (0.132)	-
Windy	Under-ice	NA	NA	No (0.9564)	-
	Open-water	NA	NA	No (0.0738)	-

Notes:
BACI = Before-After/Control-Impact; NA = not applicable
Dash (-) = The statistical analysis was not completed due to limitations or because the first step of the statistical analysis indicated no significant difference (Appendix C).
NA indicates that the statistical analysis was not relevant to the dataset.

FIGURE 3.3-15A UNDER-ICE TOTAL COPPER IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is hardness dependent (minimum = 0.002 mg/L); see Table 2.2-2).

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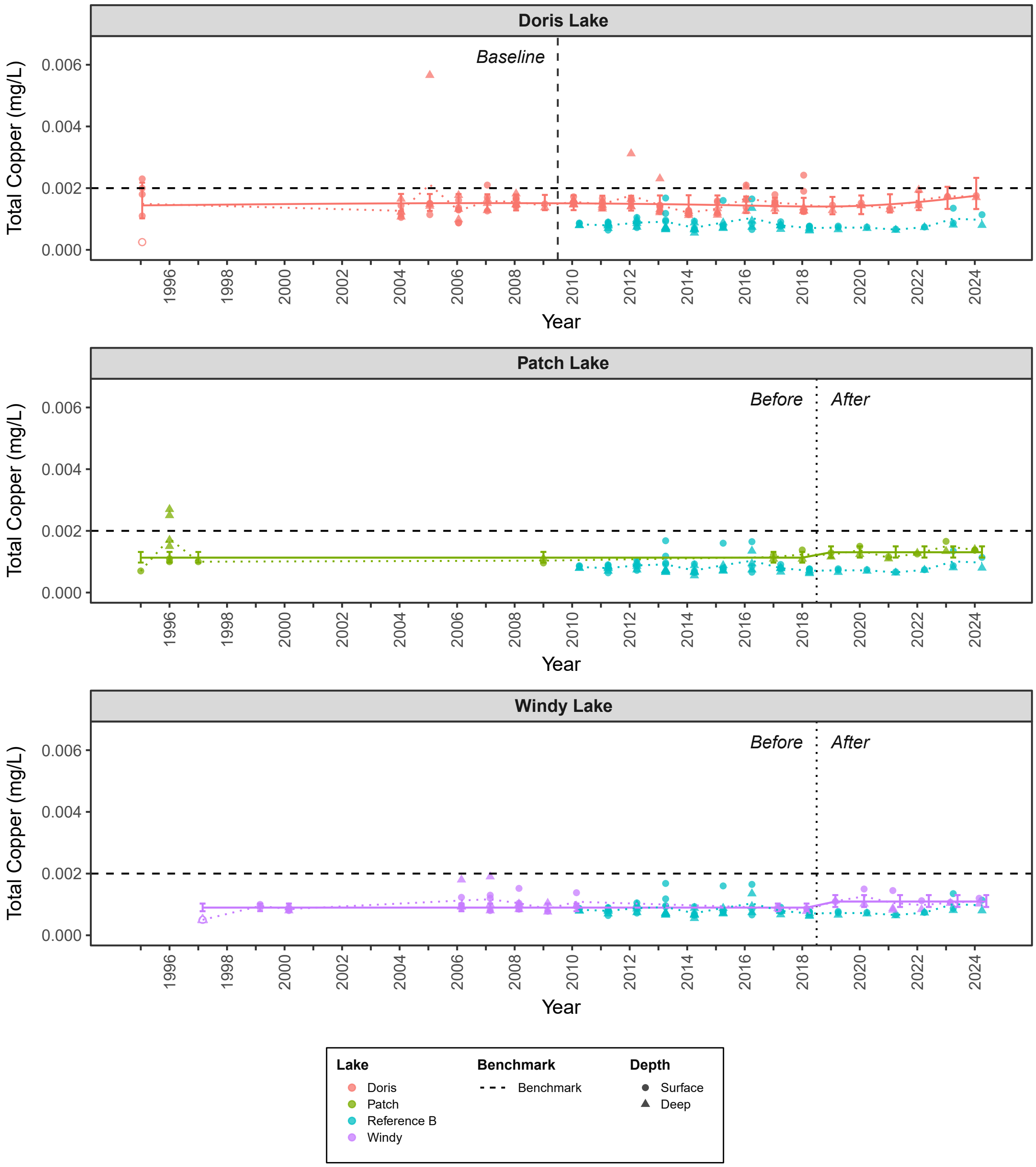
FIGURE 3.3-15B OPEN-WATER TOTAL COPPER IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is hardness dependent (minimum = 0.002 mg/L); see Table 2.2-2).

3.3.16 TOTAL IRON

Statistical analyses indicated no significant changes over time for total iron concentrations in Doris Lake, or between the before and after period means in Patch Lake (both seasons) and Windy Lake (open-water season; Table 3.3-16). Statistical analyses were not completed for the under-ice season in Patch Lake due to the high proportion of data, including all 2024 observations, which were less than the DL (Section C.3.1.16 in Appendix C).

Graphical analyses indicated that total iron concentrations in all three exposure lakes were less than the benchmark in 2024 (Figures 3.3-16a and 3.3-16b). The under-ice deep sample at the reference lake was above the benchmark by 75% (Section A.3.3 in Appendix A).

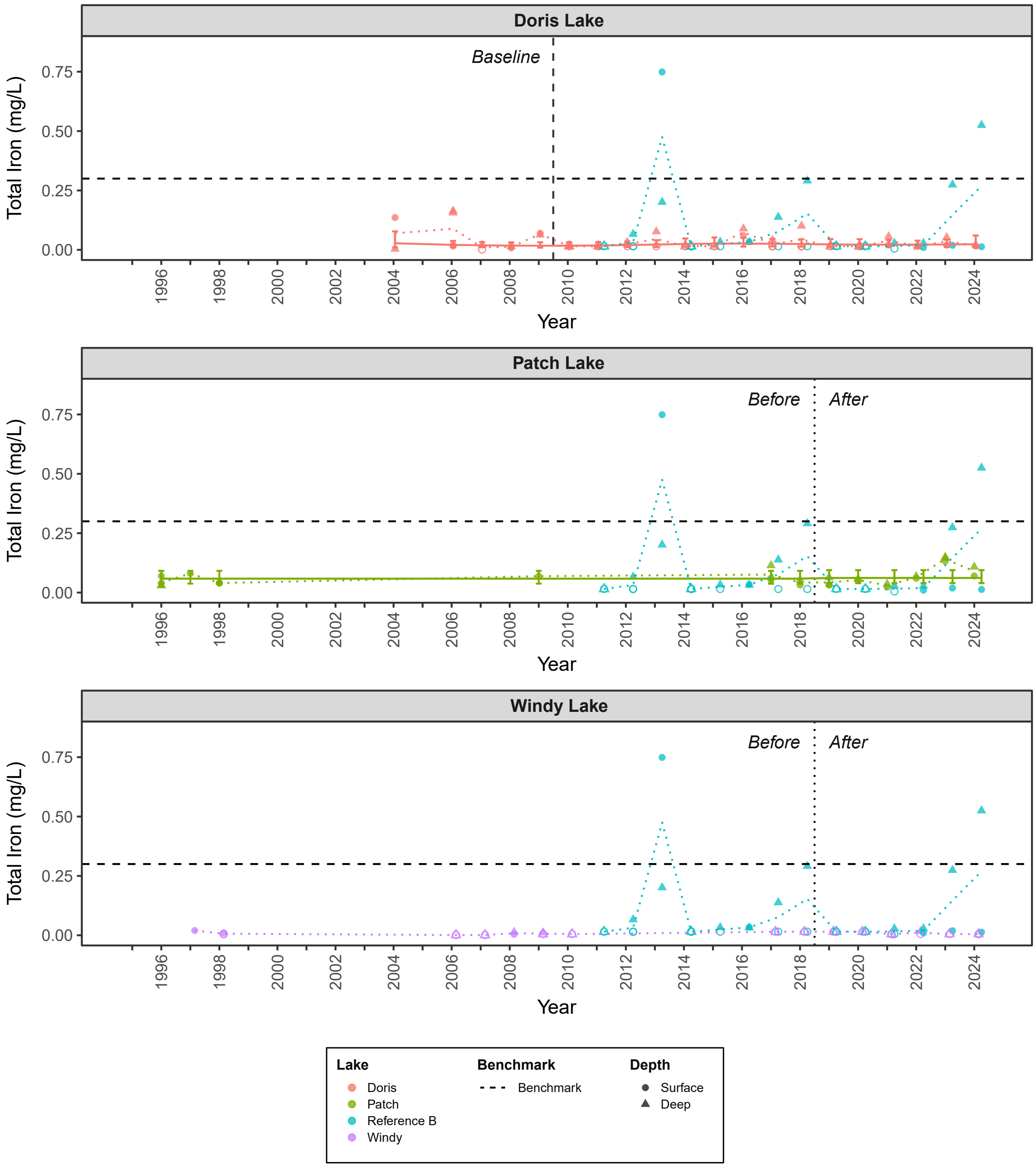
No effects were detected for total iron in Doris, Patch, or Windy lakes in 2024. The conditions required to consider a low action level for total iron were not exceeded in 2024.

TABLE 3.3-16 TOTAL IRON STATISTICAL RESULTS FOR EXPOSURE LAKES, 2024

Lake	Season	Trend Analysis		BACI	
		Significant Change Relative to a Slope of Zero (*p* value)	Significant Trend Relative to Reference Lake B (*p* value)	Significant Before-After Change (*p* value)	Significant Before-After Change Relative to Reference Lake (*p* value)
Doris	Under-ice	No (0.9041)	-	NA	NA
	Open-water	No (0.8480)	-	NA	NA
Patch	Under-ice	NA	NA	No (0.8756)	-
	Open-water	NA	NA	No (0.1580)	-
Windy	Under-ice	NA	NA	-	-
	Open-water	NA	NA	No (0.3169)	-

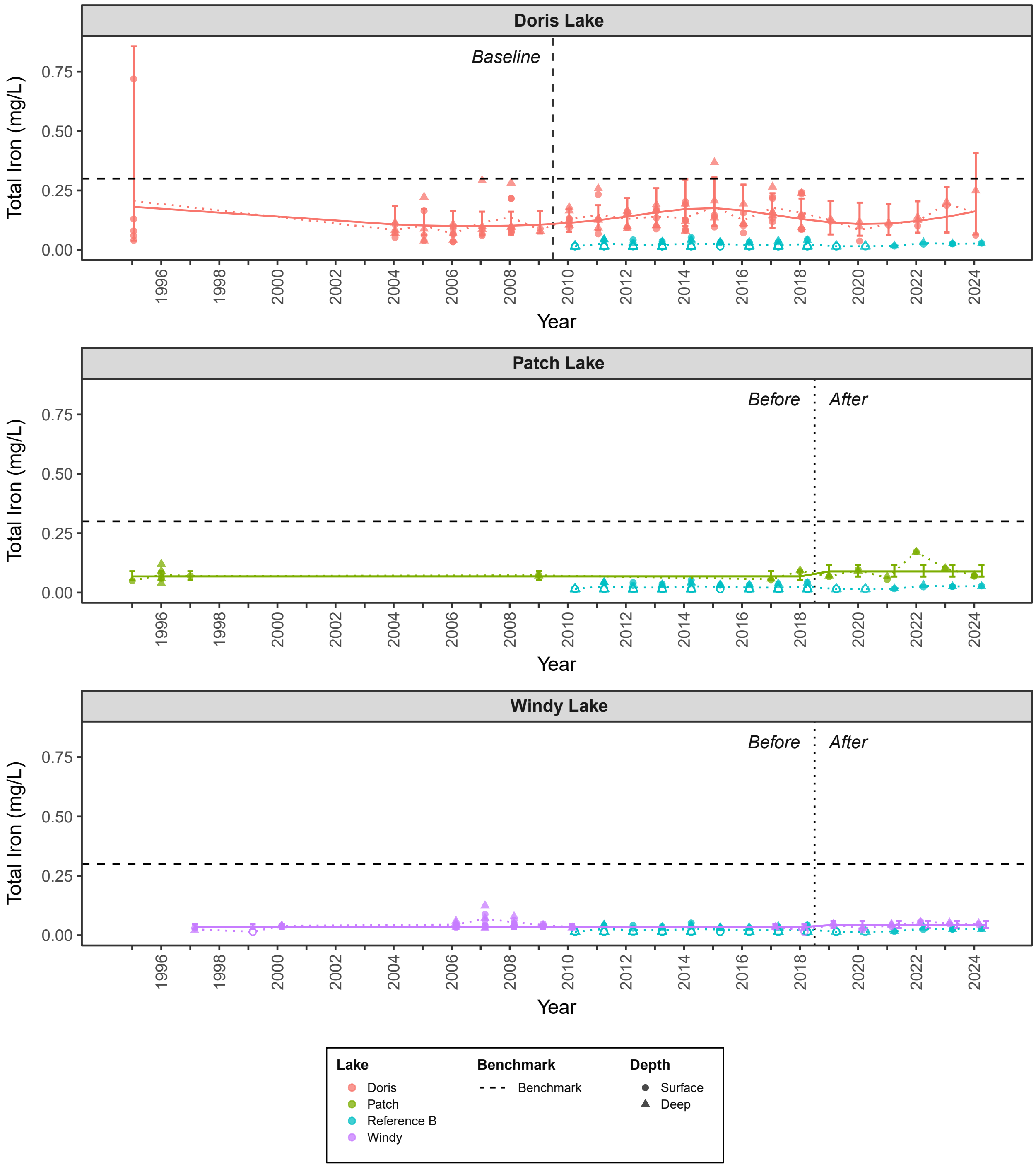
Notes:
BACI = Before-After/Control-Impact; NA = not applicable
Dash (-) = The statistical analysis was not completed due to limitations or because the first step of the statistical analysis indicated no significant difference (Appendix C).
NA indicates that the statistical analysis was not relevant to the dataset.

FIGURE 3.3-16A UNDER-ICE TOTAL IRON IN LAKES, HOPE BAY AEMP, 1996 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 0.3 mg/L.

FIGURE 3.3-16B OPEN-WATER TOTAL IRON IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 0.3 mg/L.

3.3.17 TOTAL LEAD

Statistical analyses for total lead were not completed for any of the exposure lakes as all data collected in 2024 were less than the DL (<0.000050 mg/L; Table 3.3-17; Section C.3.1.17 in Appendix C). Graphical analyses indicated that all three exposure lake samples (<0.000050 mg/L) were less than their respective, calculated total lead benchmarks (0.001 to 0.0029 mg/L; Figures 3.3-17a and 3.3-17b).

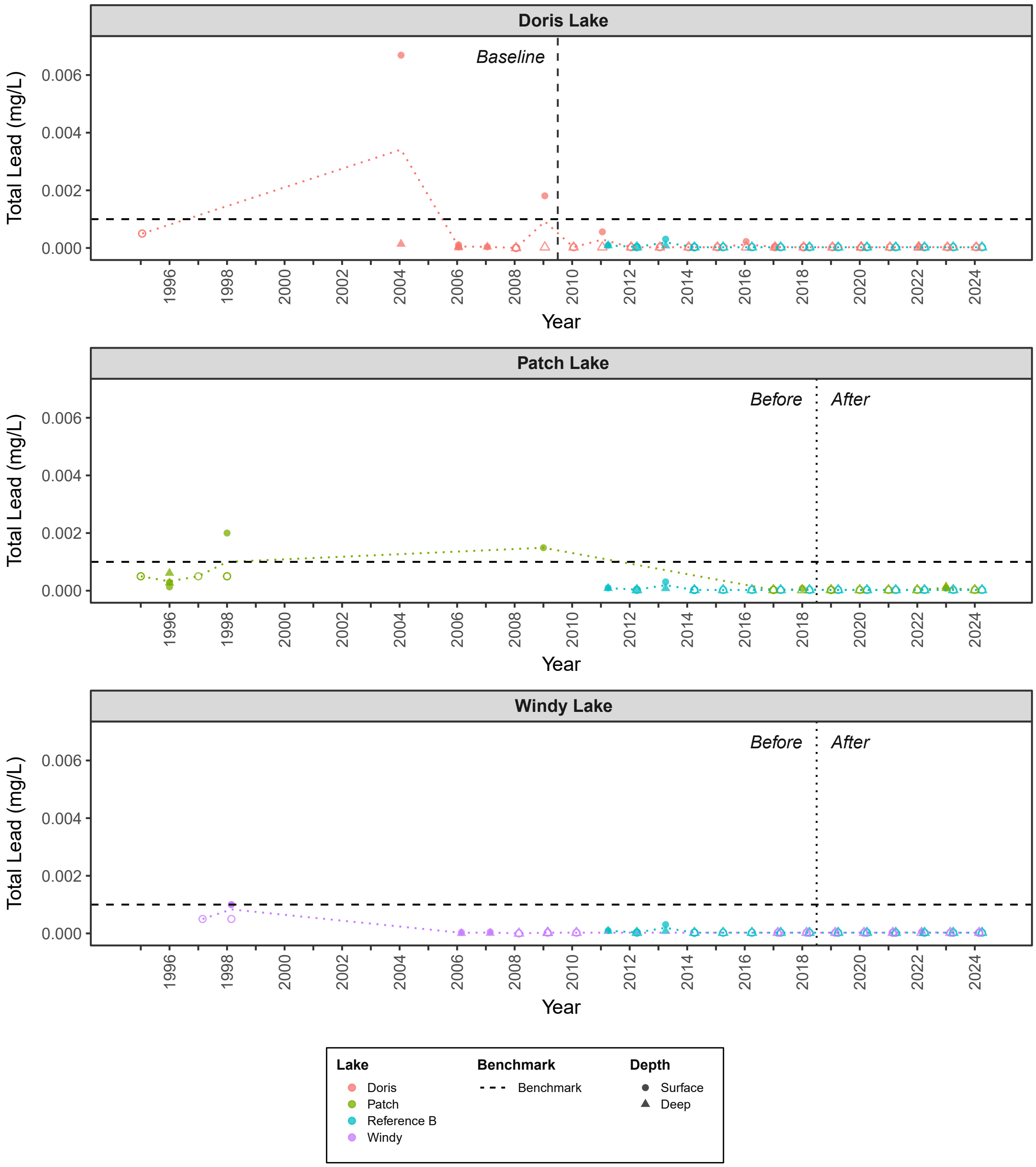
No effects were detected for total lead in Doris, Patch, or Windy lakes in 2024. The conditions required to consider a low action level for total lead were not exceeded in 2024.

TABLE 3.3-17 TOTAL LEAD STATISTICAL RESULTS FOR EXPOSURE LAKES, 2024

Lake	Season	Trend Analysis		BACI	
		Significant Change Relative to a Slope of Zero (*p* value)	Significant Trend Relative to Reference Lake B (*p* value)	Significant Before-After Change (*p* value)	Significant Before-After Change Relative to Reference Lake (*p* value)
Doris	Under-ice	-	-	NA	NA
	Open-water	-	-	NA	NA
Patch	Under-ice	NA	NA	-	-
	Open-water	NA	NA	-	-
Windy	Under-ice	NA	NA	-	-
	Open-water	NA	NA	-	-

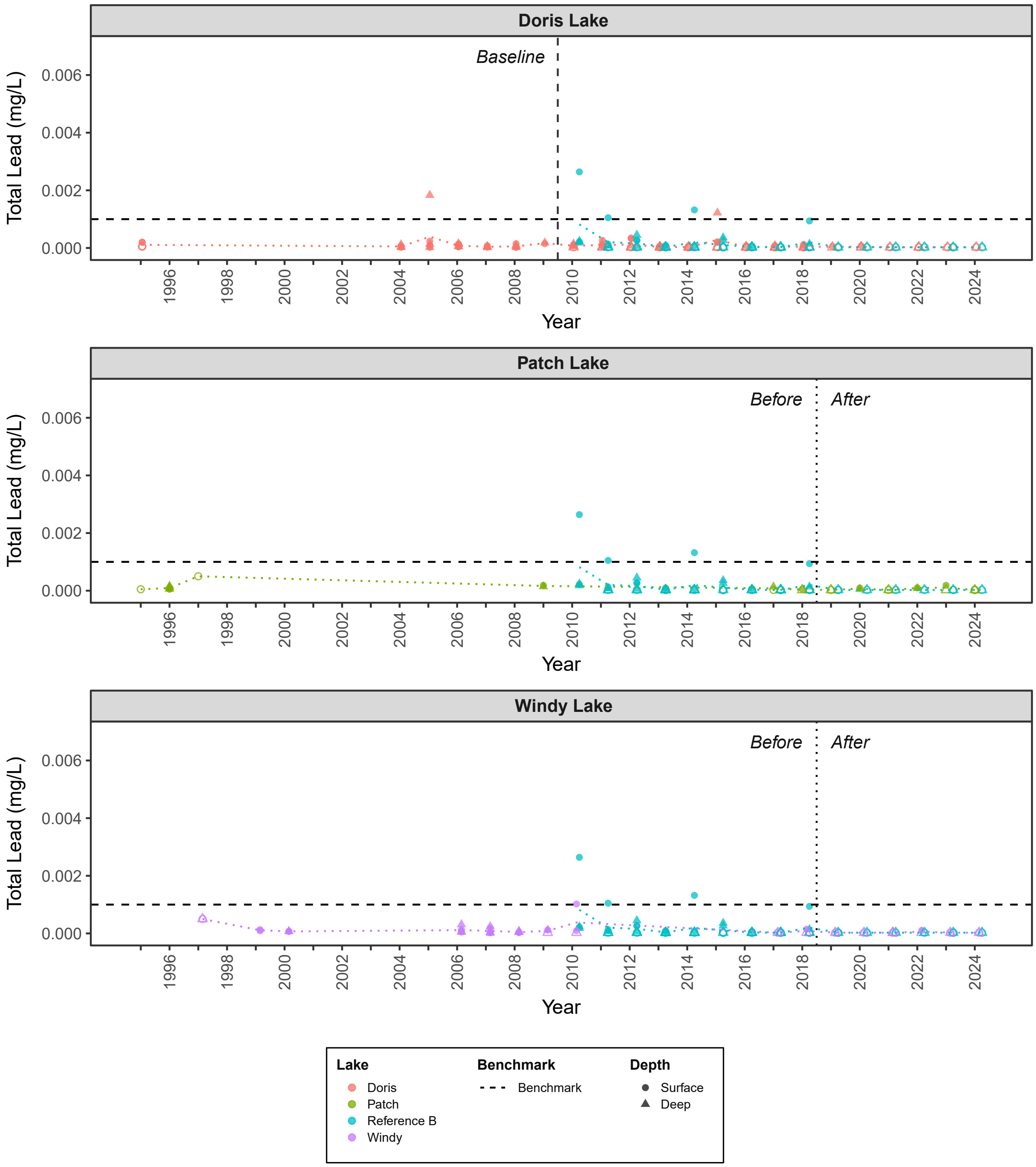
Notes:
BACI = Before-After/Control-Impact; NA = not applicable
Dash (-) = The statistical analysis was not completed due to limitations or because the first step of the statistical analysis indicated no significant difference (Appendix C).
NA indicates that the statistical analysis was not relevant to the dataset.

FIGURE 3.3-17A UNDER-ICE TOTAL LEAD IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is hardness dependent (minimum = 0.001 mg/L); see Table 2.2-2).

FIGURE 3.3-17B OPEN-WATER TOTAL LEAD IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is hardness dependent (minimum = 0.001 mg/L); see Table 2.2-2).

3.3.18 DISSOLVED MANGANESE

Statistical analyses indicated a significant change over time for dissolved manganese concentrations in Doris Lake during the open-water season, but no change relative to the reference lake was observed (Table 3.3-18). Statistical analyses indicated no significant change over time for dissolved manganese concentrations in Doris Lake during the under-ice season or between the before and after period means in Patch or Windy lakes.

Graphical analyses indicated that all three exposure lake samples were less than their respective calculated dissolved manganese benchmarks (0.21 to 0.56 mg/L; Figures 3.3-18a and 3.3-18b).

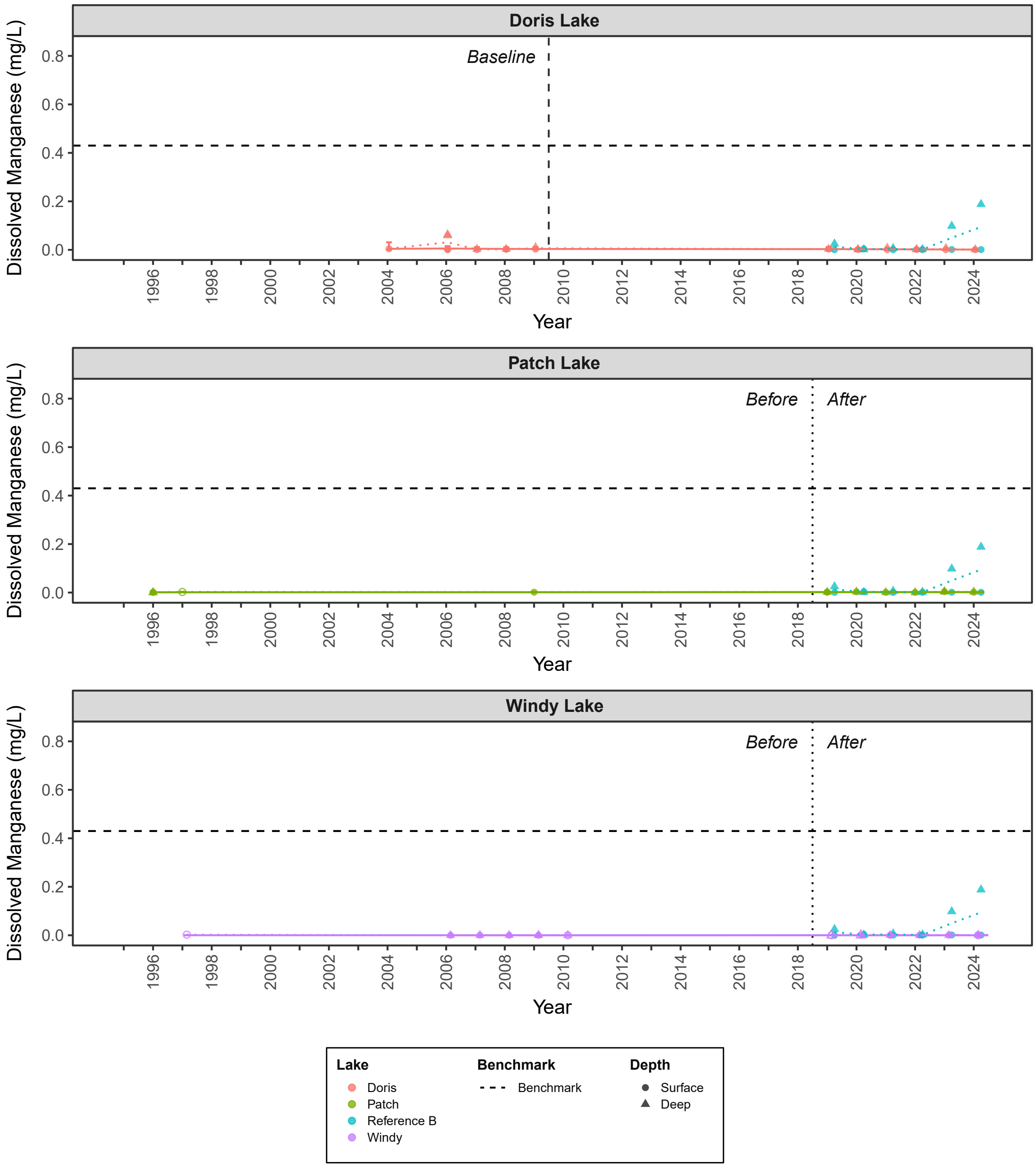
No effects were detected for dissolved manganese in Doris, Patch, or Windy lakes in 2024. The conditions required to consider a low action level for dissolved manganese were not exceeded in 2024.

TABLE 3.3-18 DISSOLVED MANGANESE STATISTICAL RESULTS FOR EXPOSURE LAKES, 2024

Lake	Season	Trend Analysis		BACI	
		Significant Change Relative to a Slope of Zero (*p* value)	**Significant Trend Relative to Reference Lake B (*p* value)**	**Significant Before-After Change (*p* value)**	**Significant Before-After Change Relative to Reference Lake (*p* value)**
Doris	Under-ice	No (0.2411)	-	NA	NA
	Open-water	Yes (<0.00001)	No (0.3965)	NA	NA
Patch	Under-ice	NA	NA	No (0.575)	-
	Open-water	NA	NA	No (0.3869)	-
Windy	Under-ice	NA	NA	No (0.3303)	-
	Open-water	NA	NA	No (0.108)	-

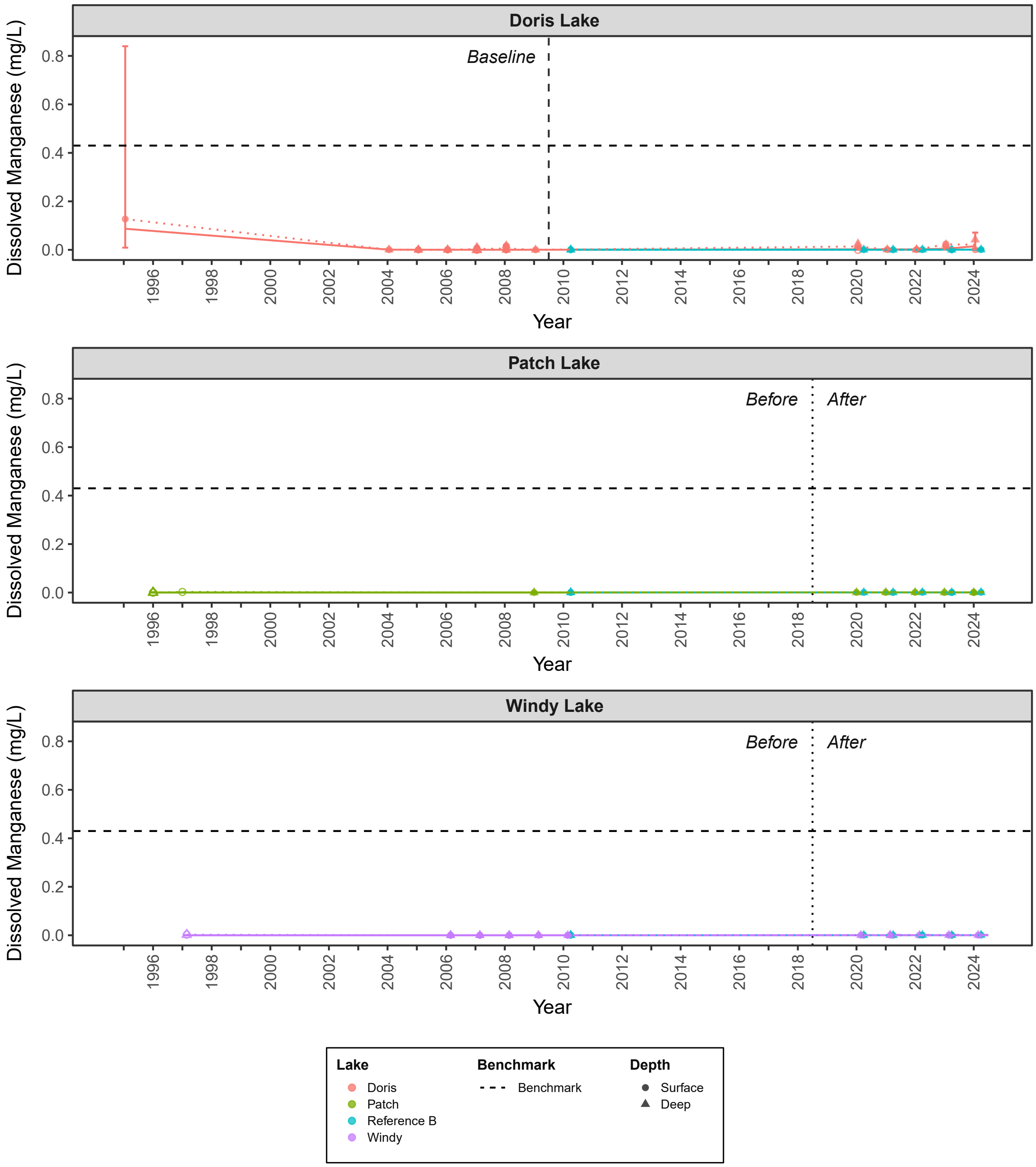
Notes:
< = less than; BACI = Before-After/Control-Impact; NA = not applicable
Dash (-) = The statistical analysis was not completed due to limitations or because the first step of the statistical analysis indicated no significant difference (Appendix C).
NA indicates that the statistical analysis was not relevant to the dataset.

FIGURE 3.3-18A UNDER-ICE DISSOLVED MANGANESE IN LAKES, HOPE BAY AEMP, 1996 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is pH and hardness dependent (see Table 2.2-2).

FIGURE 3.3-18B   OPEN-WATER DISSOLVED MANGANESE IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is pH and hardness dependent (see Table 2.2-2).

3.3.19 TOTAL MERCURY

Statistical analyses indicated a significant change over time for total mercury concentrations in Doris Lake during the under-ice season but not relative to the reference lake (Table 3.3-19). Statistical analyses indicated no significant change over time for total mercury concentrations in Doris Lake during the open-water season.

Statistical analyses indicated no significant change between the before and after period means in Patch Lake during the open-water season (Table 3.3-19). Analyses were not completed for Patch Lake during the under-ice season and for Windy Lake during both seasons due to the high proportion of data that was less than the DL over time (Table 3.3-19; Section C.3.1.19 in Appendix C). The DLs have varied over time (0.00005 to 0.0000001 mg/L) as laboratory precision for trace mercury has improved. From 1995 to 2000, the DL was as high as 0.00005 mg/L, and baseline observations for Patch and Windy lakes are biased by the higher DLs in those years (Figures 3.3-19a and 3.3-19b). Total mercury concentrations remained low (<0.0000004 mg/L) in Patch and Windy lakes, while the highest concentrations were observed during the open-water season in Doris Lake in 2024 (mean total mercury 0.00000074 mg/L).

Graphical analyses indicated that total mercury concentrations in all three exposure lakes were less than the benchmark in 2024 (Figures 3.3-19a and 3.3-19b).

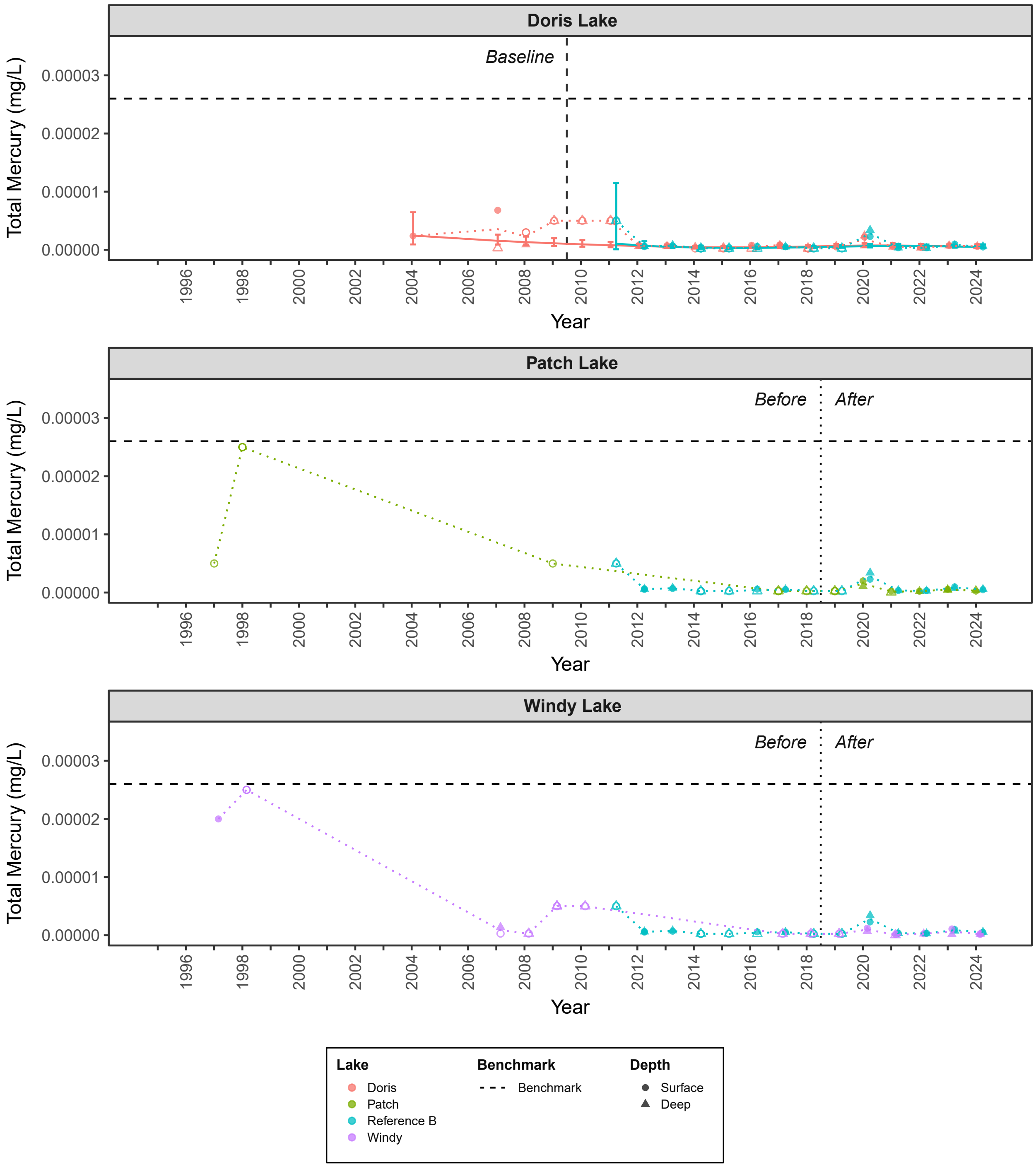
No effects were detected for total mercury in Doris, Patch, or Windy lakes in 2024. The conditions required to consider a low action level for total mercury were not exceeded in 2024.

TABLE 3.3-19 TOTAL MERCURY STATISTICAL RESULTS FOR EXPOSURE LAKES, 2024

Lake	Season	Trend Analysis		BACI	
		Significant Change Relative to a Slope of Zero (*p* value)	**Significant Trend Relative to Reference Lake B (*p* value)**	**Significant Before-After Change (*p* value)**	**Significant Before-After Change Relative to Reference Lake (*p* value)**
Doris	Under-ice	Yes (0.0044)	No (0.9715)	NA	NA
	Open-water	No (0.5984)	-	NA	NA
Patch	Under-ice	NA	NA	-	-
	Open-water	NA	NA	No (0.1663)	-
Windy	Under-ice	NA	NA	-	-
	Open-water	NA	NA	-	-

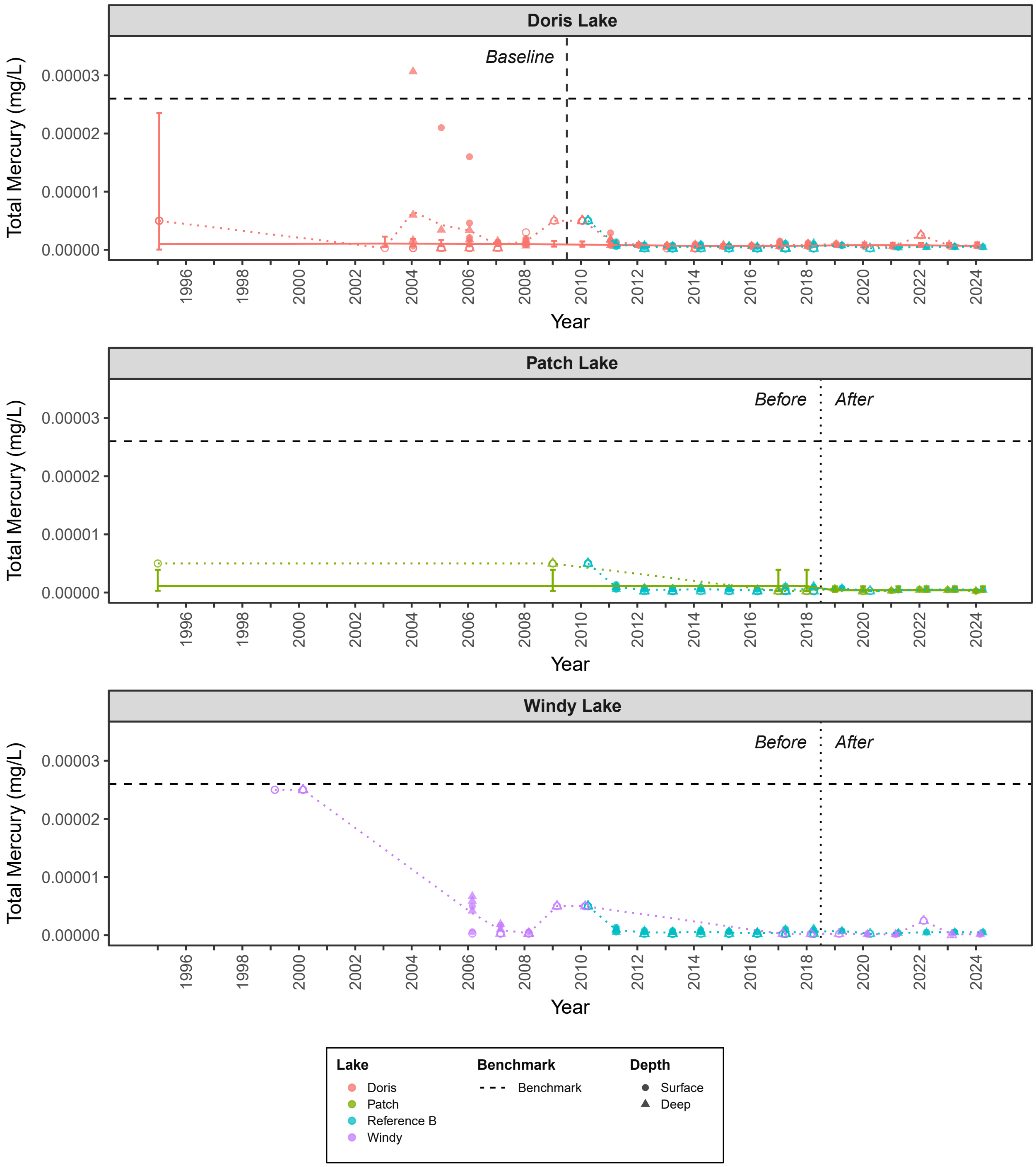
Notes:
BACI = Before-After/Control-Impact; NA = not applicable
Dash (-) = The statistical analysis was not completed due to limitations or because the first step of the statistical analysis indicated no significant difference (Appendix C).
NA indicates that the statistical analysis was not relevant to the dataset.

FIGURE 3.3-19A UNDER-ICE TOTAL MERCURY IN LAKES, HOPE BAY AEMP, 1997 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 0.000026 mg/L.

FIGURE 3.3-19B OPEN-WATER TOTAL MERCURY IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 0.000026 mg/L.

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3.3.20 TOTAL MOLYBDENUM

Statistical analyses indicated a significant change over time for total molybdenum concentrations in Doris Lake during both seasons (Table 3.3-20). Statistical comparison to the reference lake was not completed due to the high proportion of data that was less than the DL (Section C.3.1.20 in Appendix C). Graphical analyses of Doris Lake indicated that the overall mean total molybdenum concentrations during both seasons increased approximately two times between 2008 and 2018 (0.00014 mg/L to 0.000272 mg/L) but have decreased since (Figures 3.3-20a and 3.3-20b). Concentrations observed in 2024 (under-ice mean = 0.000252 mg/L; open-water mean = 0.000232 mg/L) were elevated compared to 2023 (under-ice mean = 0.000216 mg/L; open-water mean = 0.000213 mg/L).

Statistical analyses indicated there was no significant difference between the before and after period means for total molybdenum concentrations in Patch or Windy lakes (Table 3.3-20).

Graphical analyses indicated that total molybdenum concentrations in all three exposure lakes were less than the benchmark in 2024 (Figures 3.3-20a and 3.3-20b).

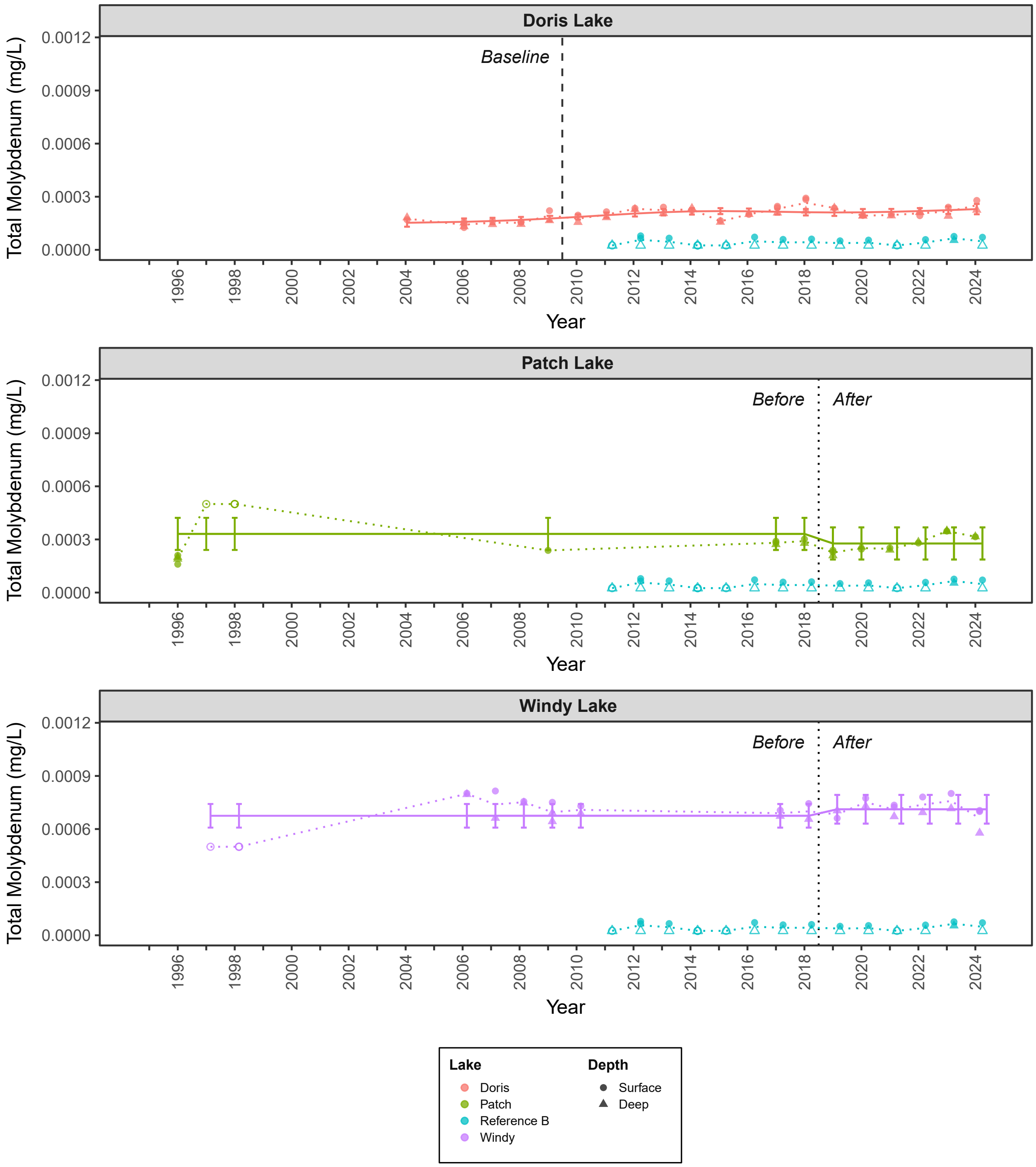
No effects were detected for total molybdenum in Doris, Patch, or Windy lakes in 2024. The conditions required to consider a low action level for total molybdenum were not exceeded in 2024.

TABLE 3.3-20 TOTAL MOLYBDENUM STATISTICAL RESULTS FOR EXPOSURE LAKES, 2024

Lake	Season	Trend Analysis		BACI	
		Significant Change Relative to a Slope of Zero (*p* value)	**Significant Trend Relative to Reference Lake B (*p* value)**	**Significant Before-After Change (*p* value)**	**Significant Before-After Change Relative to Reference Lake (*p* value)**
Doris	Under-ice	Yes (<0.00001)	-	NA	NA
	Open-water	Yes (<0.00001)	-	NA	NA
Patch	Under-ice	NA	NA	No (0.3545)	-
	Open-water	NA	NA	No (0.8406)	-
Windy	Under-ice	NA	NA	No (0.4641)	-
	Open-water	NA	NA	No (0.6711)	-

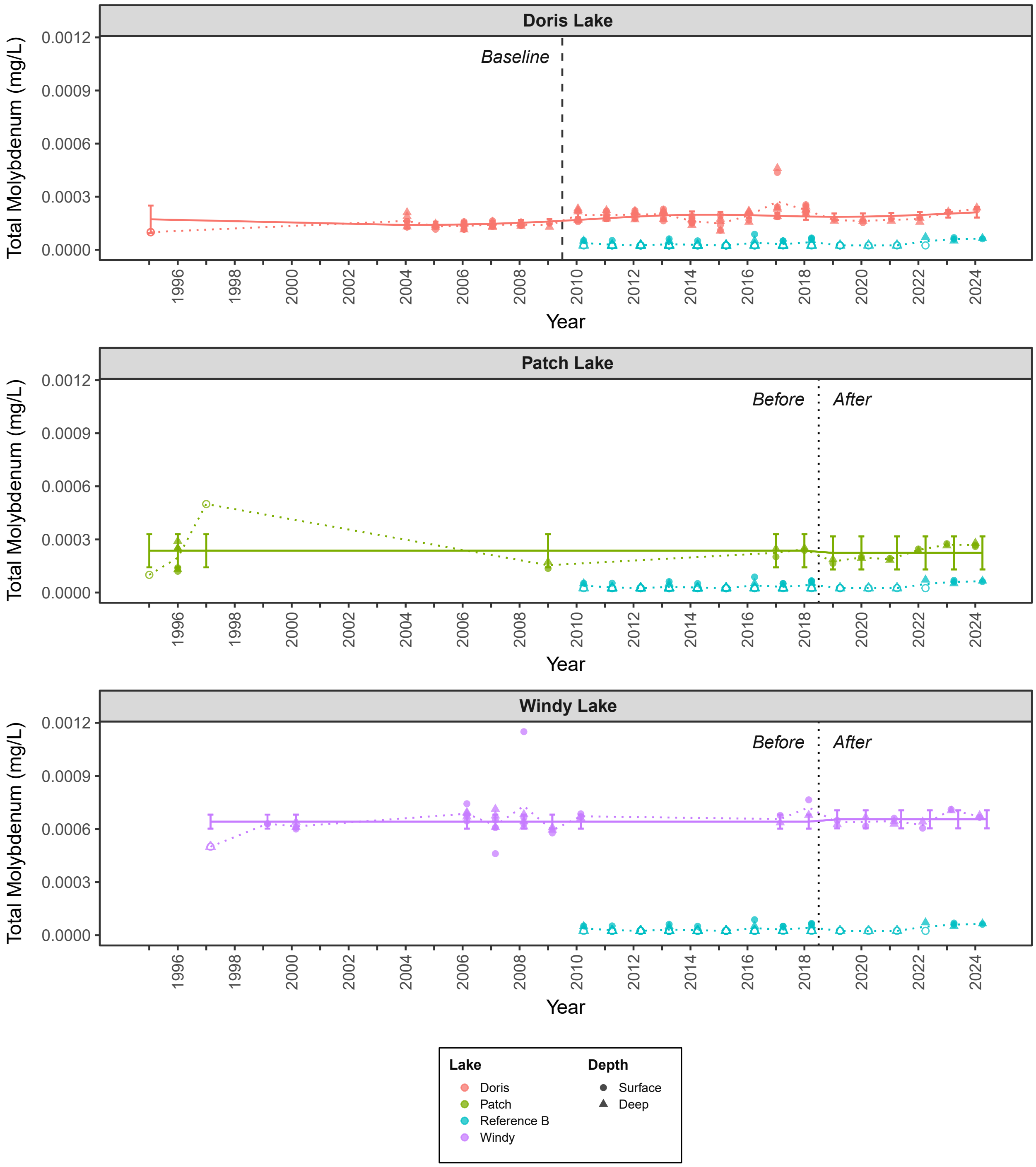
Notes:
< = less than; BACI = Before-After/Control-Impact; NA = not applicable
Dash (-) = The statistical analysis was not completed due to limitations or because the first step of the statistical analysis indicated no significant difference (Appendix C).
NA indicates that the statistical analysis was not relevant to the dataset.

FIGURE 3.3-20A UNDER-ICE TOTAL MOLYBDENUM IN LAKES, HOPE BAY AEMP, 1996 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 0.073 mg/L.

FIGURE 3.3-20B   OPEN-WATER TOTAL MOLYBDENUM IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 0.073 mg/L.

3.3.21 TOTAL NICKEL

Statistical analyses indicated no significant changes over time for total nickel concentrations in Doris Lake and between the before and after period means in Patch or Windy lakes (Table 3.3-21). Total nickel concentrations in all three exposure lakes were less than their calculated benchmarks in 2024 (Figures 3.3-21a and 3.3-21b).

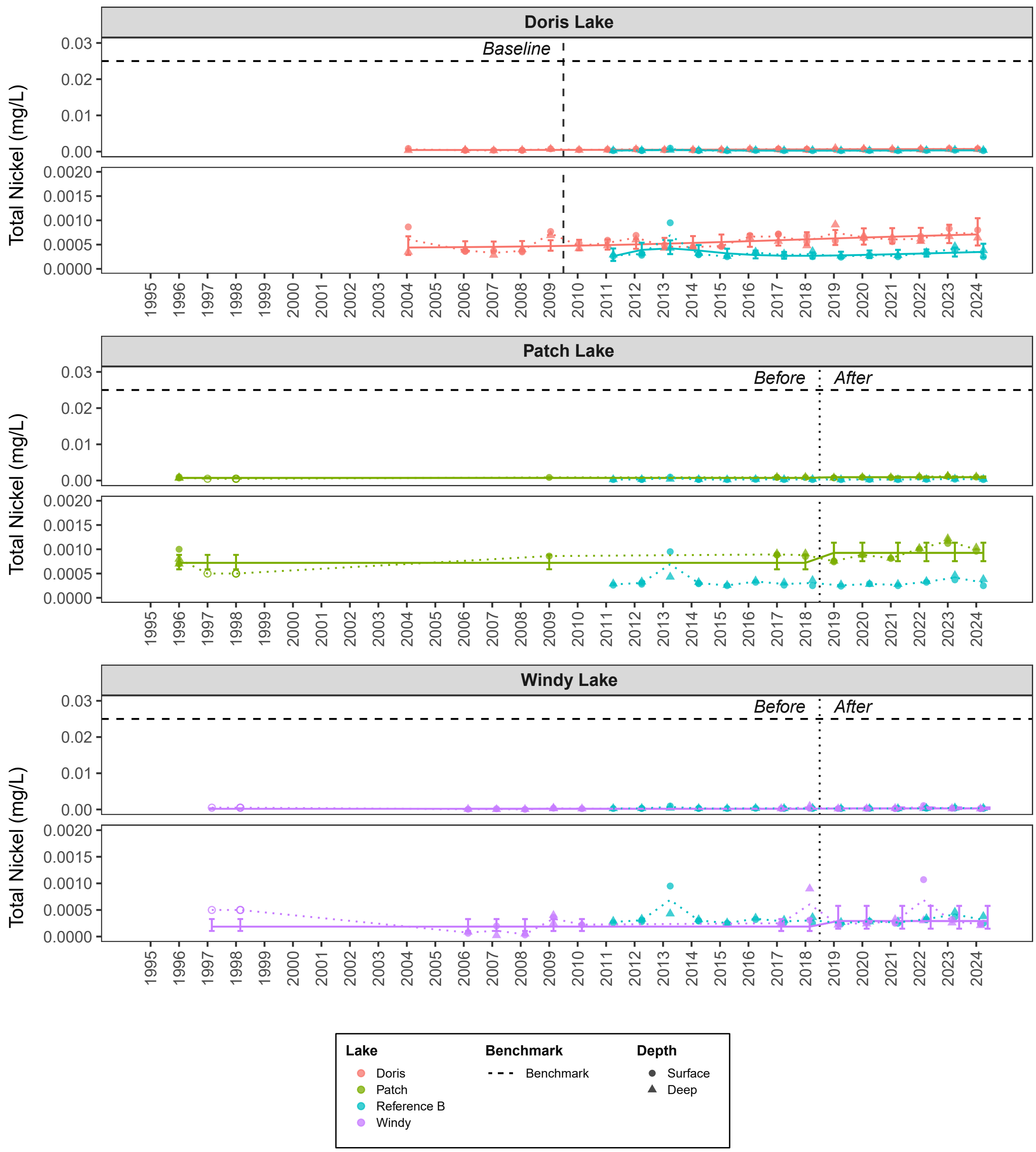
No effects were detected for total nickel in Doris, Patch, or Windy lakes in 2024. The conditions required to consider a low action level for total nickel were not exceeded in 2024.

TABLE 3.3-21 TOTAL NICKEL STATISTICAL RESULTS FOR EXPOSURE LAKES, 2024

Lake	Season	Trend Analysis		BACI	
		Significant Change Relative to a Slope of Zero (*p* value)	**Significant Trend Relative to Reference Lake B (*p* value)**	**Significant Before-After Change (*p* value)**	**Significant Before-After Change Relative to Reference Lake (*p* value)**
Doris	Under-ice	No (0.9487)	-	NA	NA
	Open-water	No (0.1301)	-	NA	NA
Patch	Under-ice	NA	NA	No (0.0759)	-
	Open-water	NA	NA	No (0.3428)	-
Windy	Under-ice	NA	NA	No (0.5765)	-
	Open-water	NA	NA	No (0.1659)	-

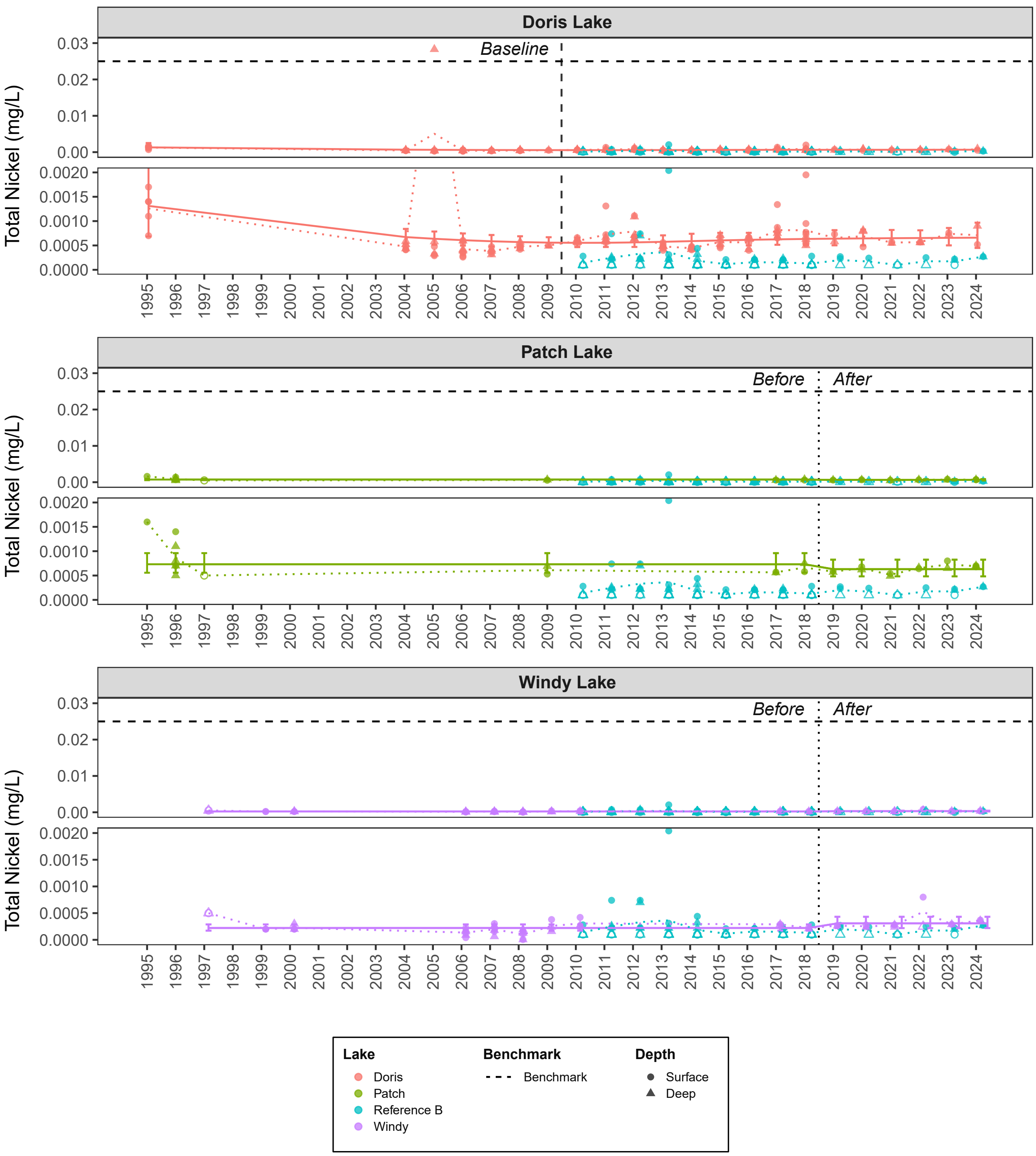
Notes:
BACI = Before-After/Control-Impact; NA = not applicable
Dash (-) = The statistical analysis was not completed due to limitations or because the first step of the statistical analysis indicated no significant difference (Appendix C).
NA indicates that the statistical analysis was not relevant to the dataset.

FIGURE 3.3-21A UNDER-ICE TOTAL NICKEL IN LAKES, HOPE BAY AEMP, 1996 TO 2024



Notes: *Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.*
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is hardness dependent. The 2024 calculated minimum is presented (0.025 mg/L; see Table 2.2-2).

FIGURE 3.3-21B OPEN-WATER TOTAL NICKEL IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is hardness dependent. The 2024 calculated minimum is presented (0.025 mg/L; see Table 2.2-2).

3.3.22 TOTAL SELENIUM

Statistical analyses for total selenium were not completed for any exposure lakes due to the high proportion of data, including all 2024 observations, which were less than the DL (<0.000050 [open-water] to <0.00020 mg/L [under-ice]; Table 3.3-22; Section C.3.1.22 in Appendix C). Graphical analyses indicated that total selenium concentrations in all three exposure lakes were less than the DL and the benchmark in 2024 (Figures 3.3-22a and 3.3-22b).

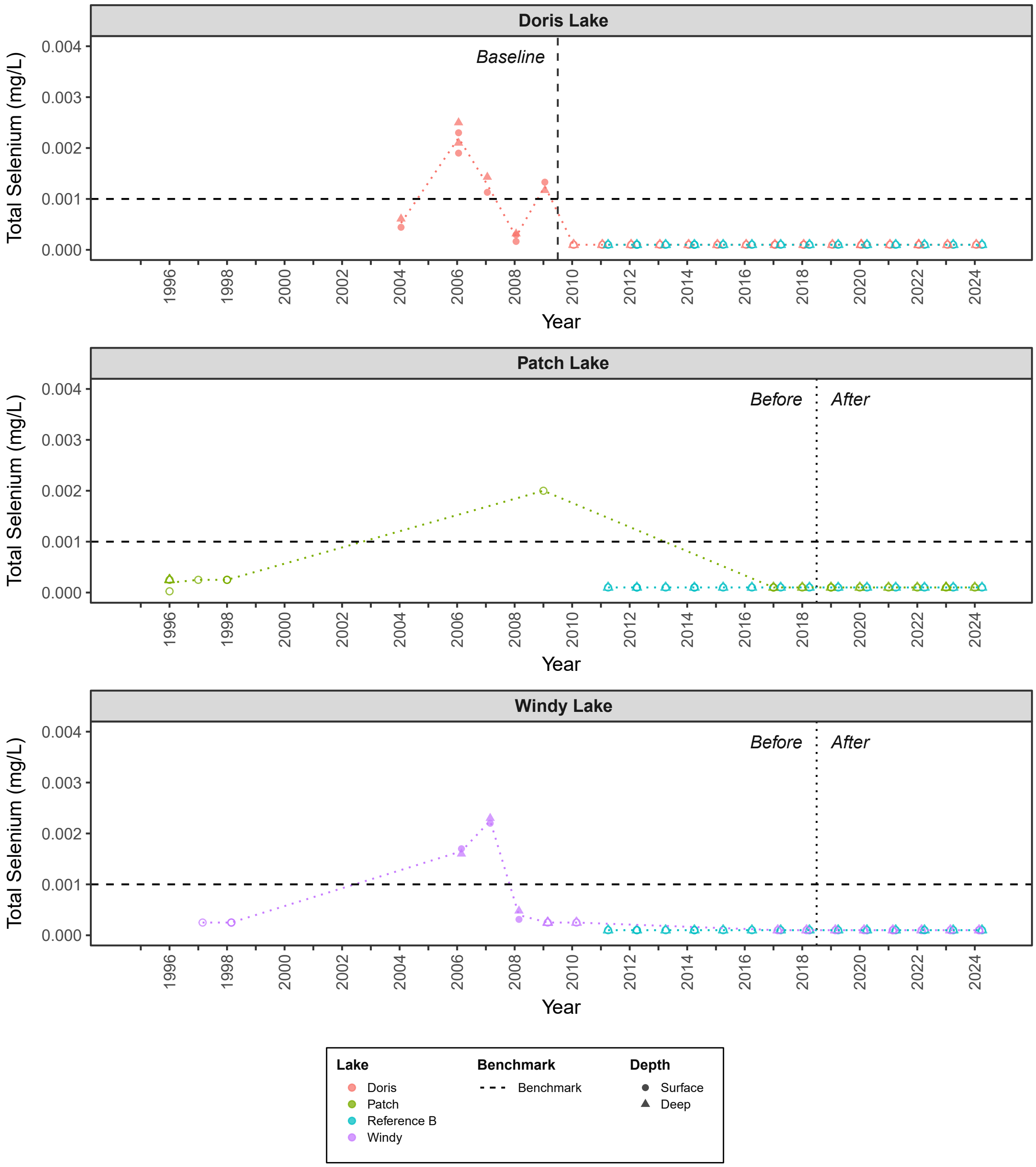
No effects were detected for total selenium in Doris, Patch, or Windy lakes in 2024. The conditions required to consider a low action level for total selenium were not exceeded in 2024.

TABLE 3.3-22 TOTAL SELENIUM STATISTICAL RESULTS FOR EXPOSURE LAKES, 2024

Lake	Season	Trend Analysis		BACI	
		Significant Change Relative to a Slope of Zero (*p* value)	**Significant Trend Relative to Reference Lake B (*p* value)**	**Significant Before-After Change (*p* value)**	**Significant Before-After Change Relative to Reference Lake (*p* value)**
Doris	Under-ice	-	-	NA	NA
	Open-water	-	-	NA	NA
Patch	Under-ice	NA	NA	-	-
	Open-water	NA	NA	-	-
Windy	Under-ice	NA	NA	-	-
	Open-water	NA	NA	-	-

Notes:
BACI = Before-After/Control-Impact; NA = not applicable
Dash (-) = The statistical analysis was not completed due to limitations or because the first step of the statistical analysis indicated no significant difference (Appendix C).
NA indicates that the statistical analysis was not relevant to the dataset.

FIGURE 3.3-22A UNDER-ICE TOTAL SELENIUM IN LAKES, HOPE BAY AEMP, 1996 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 0.001 mg/L.

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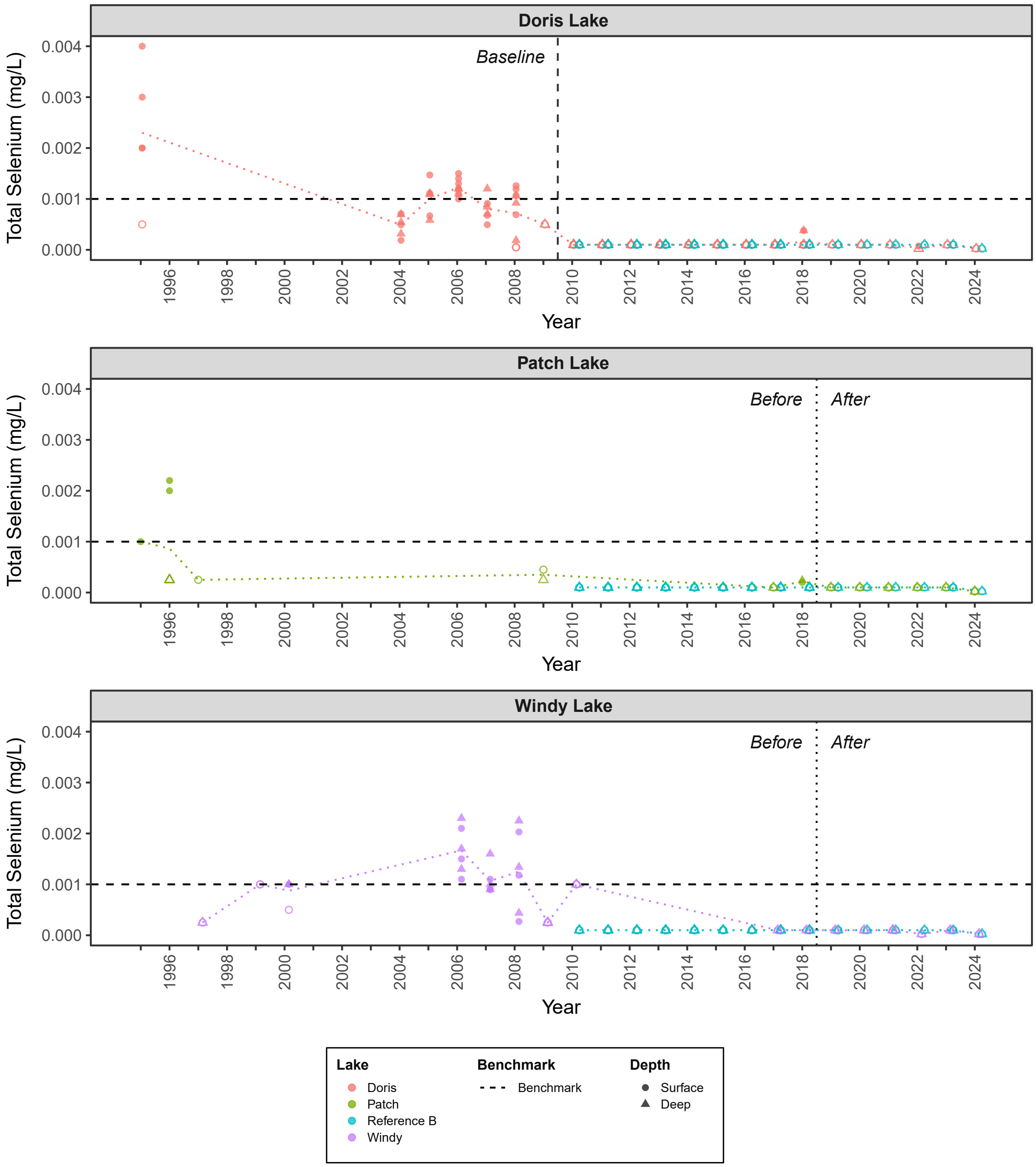
FIGURE 3.3-22B OPEN-WATER TOTAL SELENIUM IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 0.001 mg/L.

3.3.23 TOTAL SILVER

Statistical analyses for total silver were not completed for any exposure lakes due to the high proportion of data, including all 2024 observations, which were less than the DL (<0.0000050 mg/L; Table 3.3-23; Section C.3.1.23 in Appendix C). Graphical analyses indicated that total silver concentrations in all three exposure lakes were less than the DL and the benchmark in 2024 (Figures 3.3-23a and 3.3-23b).

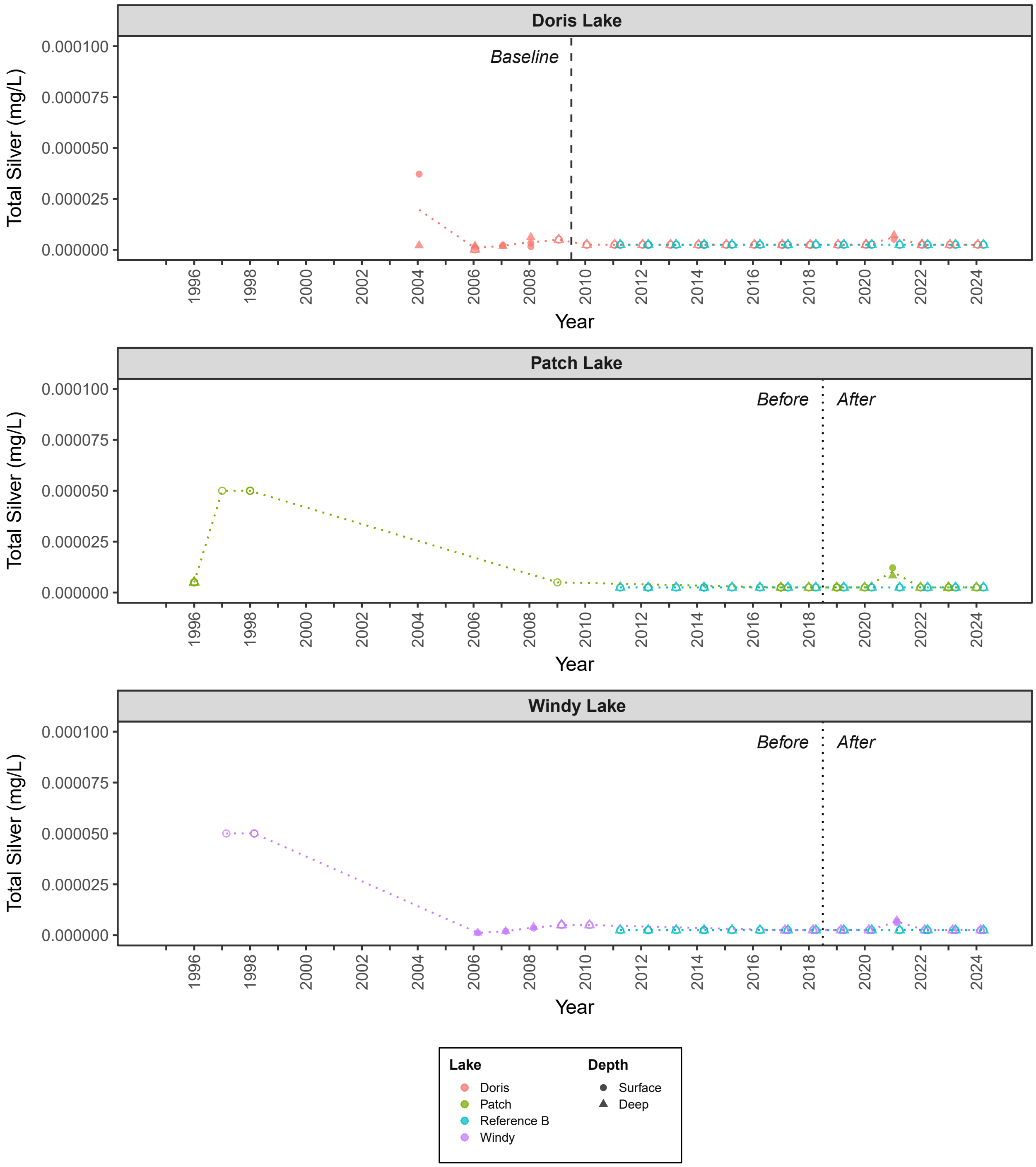
No effects were detected for total silver in Doris, Patch, or Windy lakes in 2024. The conditions required to consider a low action level for total silver were not exceeded in 2024.

TABLE 3.3-23 TOTAL SILVER STATISTICAL RESULTS FOR EXPOSURE LAKES, 2024

Lake	Season	Trend Analysis		BACI	
		Significant Change Relative to a Slope of Zero (*p* value)	**Significant Trend Relative to Reference Lake B (*p* value)**	**Significant Before-After Change (*p* value)**	**Significant Before-After Change Relative to Reference Lake (*p* value)**
Doris	Under-ice	-	-	NA	NA
	Open-water	-	-	NA	NA
Patch	Under-ice	NA	NA	-	-
	Open-water	NA	NA	-	-
Windy	Under-ice	NA	NA	-	-
	Open-water	NA	NA	-	-

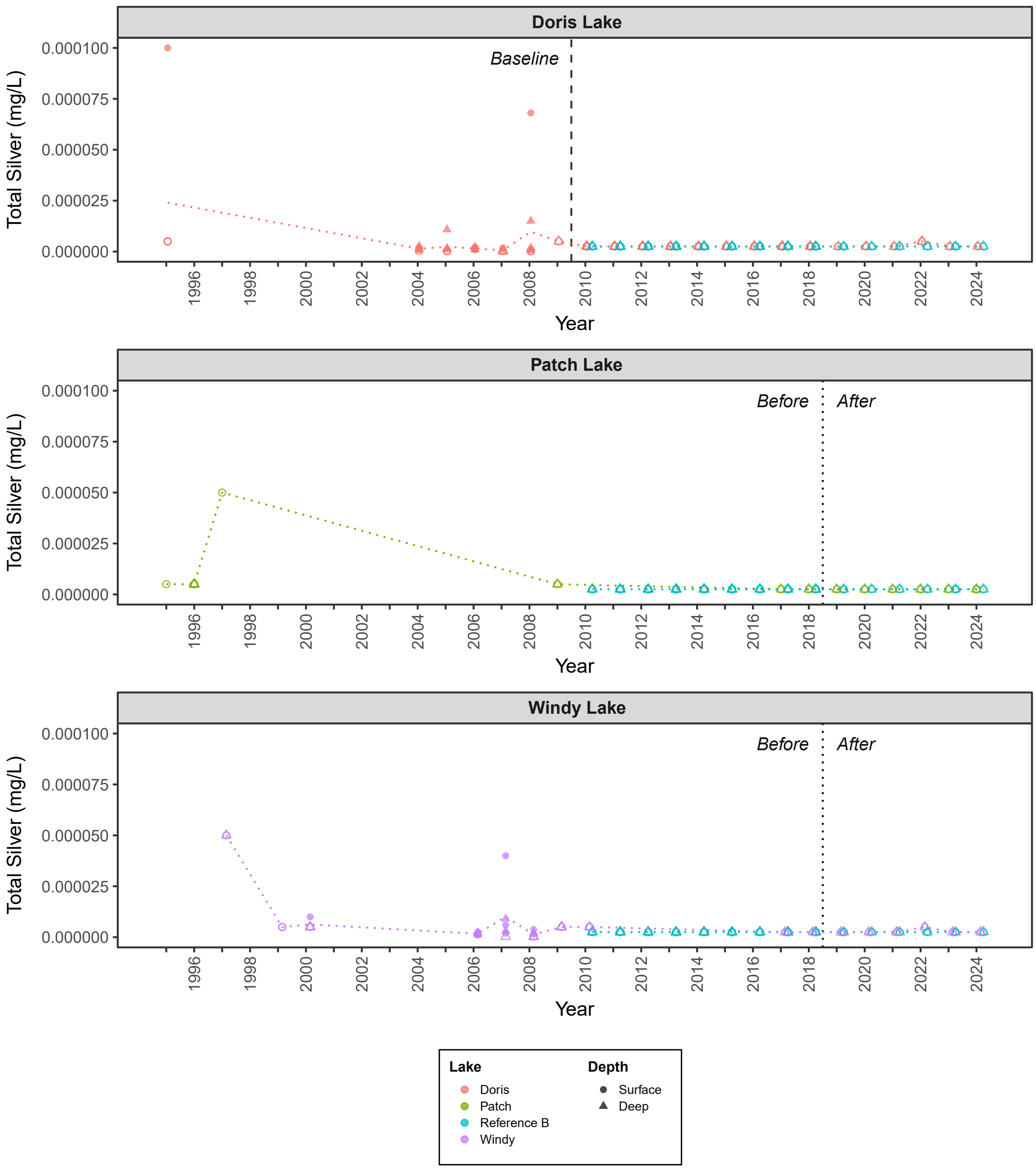
Notes:
BACI = Before-After/Control-Impact; NA = not applicable
Dash (-) = The statistical analysis was not completed due to limitations or because the first step of the statistical analysis indicated no significant difference (Appendix C).
NA indicates that the statistical analysis was not relevant to the dataset.

FIGURE 3.3-23A UNDER-ICE TOTAL SILVER IN LAKES, HOPE BAY AEMP, 1996 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 0.00025 mg/L.

FIGURE 3.3-23B OPEN-WATER TOTAL SILVER IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 0.00025 mg/L.

3.3.24 TOTAL THALLIUM

Statistical analyses for total thallium were not completed for any exposure lakes due to the high proportion of data, including all 2024 observations, which were less than the DL (<0.0000050 mg/L; Table 3.3-24; Section C.3.1.23 in Appendix C). Graphical analyses indicated that total thallium concentrations in all three exposure lakes were less than the DL and the benchmark in 2024 (Figures 3.3-24a and 3.3-24b).

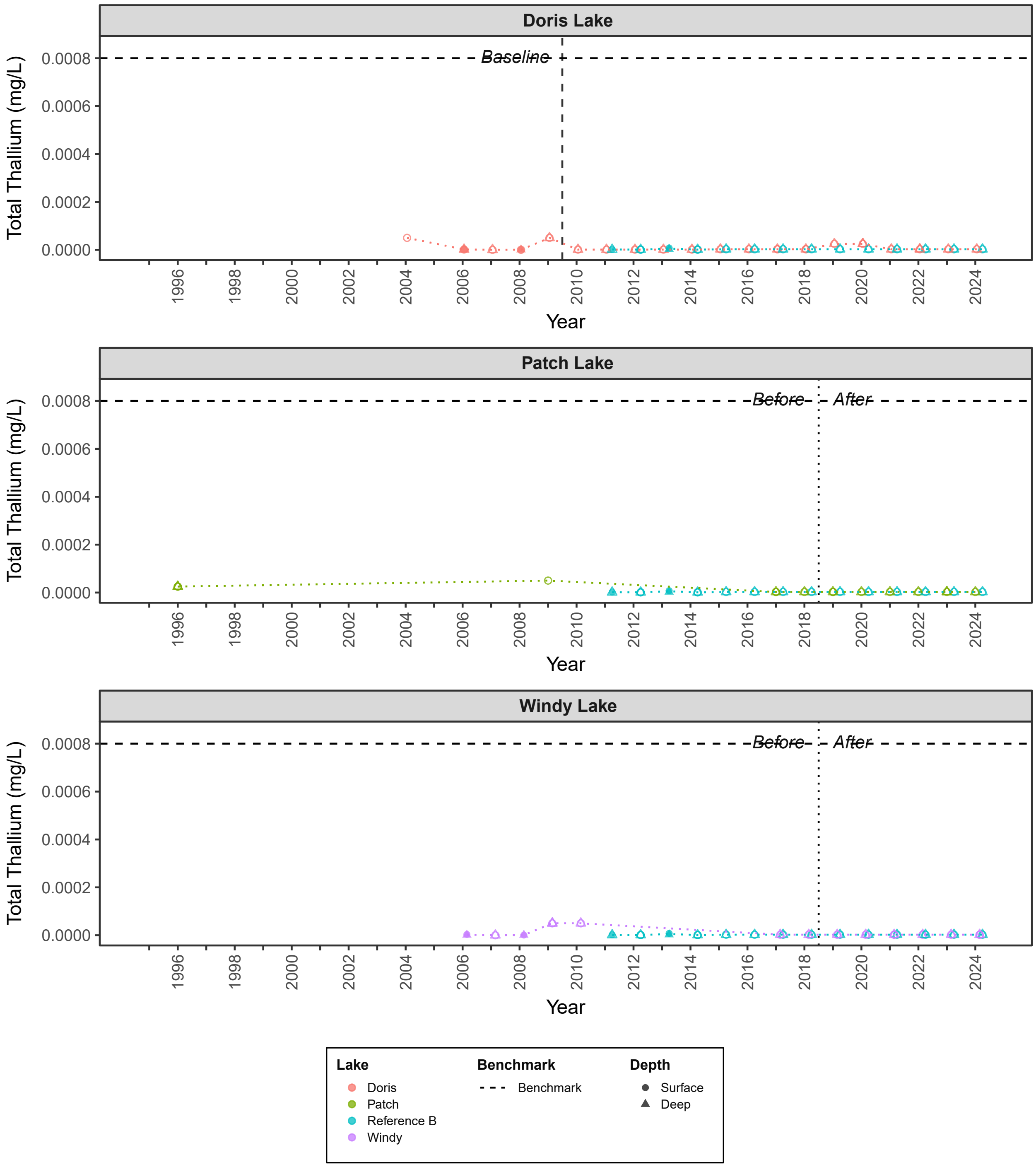
No effects were detected for total thallium in Doris, Patch, or Windy lakes in 2024. The conditions required to consider a low action level for total thallium were not exceeded in 2024.

TABLE 3.3-24 TOTAL THALLIUM STATISTICAL RESULTS FOR EXPOSURE LAKES, 2024

Lake	Season	Trend Analysis		BACI	
		Significant Change Relative to a Slope of Zero (*p* value)	Significant Trend Relative to Reference Lake B (*p* value)	Significant Before-After Change (*p* value)	Significant Before-After Change Relative to Reference Lake (*p* value)
Doris	Under-ice	-	-	NA	NA
	Open-water	-	-	NA	NA
Patch	Under-ice	NA	NA	-	-
	Open-water	NA	NA	-	-
Windy	Under-ice	NA	NA	-	-
	Open-water	NA	NA	-	-

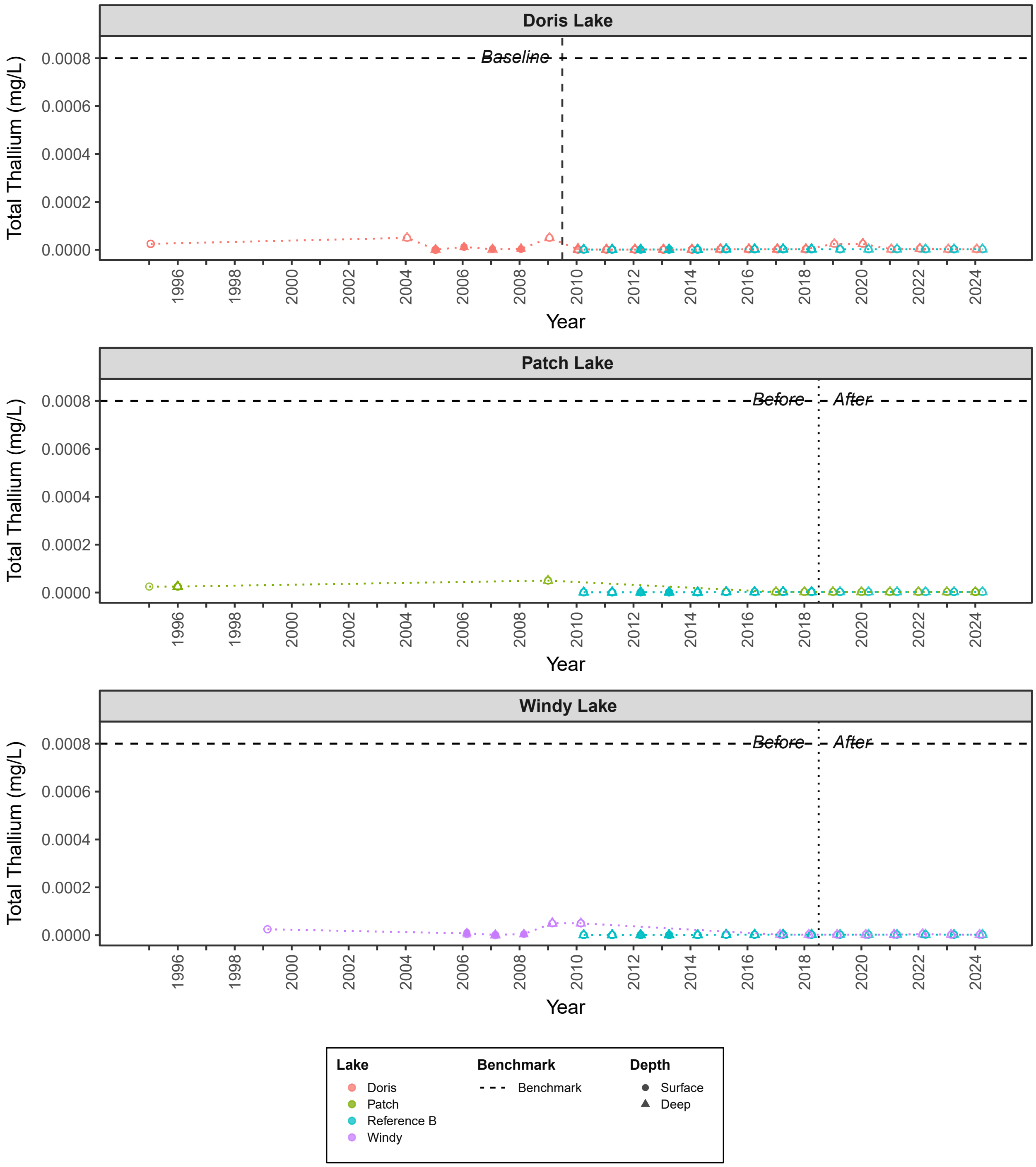
Notes:
BACI = Before-After/Control-Impact; NA = not applicable
Dash (-) = The statistical analysis was not completed due to limitations or because the first step of the statistical analysis indicated no significant difference (Appendix C).
NA indicates that the statistical analysis was not relevant to the dataset.

FIGURE 3.3-24A UNDER-ICE TOTAL THALLIUM IN LAKES, HOPE BAY AEMP, 1996 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 0.0008 mg/L.

FIGURE 3.3-24B OPEN-WATER TOTAL THALLIUM IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 0.0008 mg/L.

3.3.25 TOTAL URANIUM

Statistical analyses indicated a significant change over time for total uranium concentrations in Doris Lake but not relative to the reference lake (Table 3.3-25). Statistical analyses indicated no significant change over time for total uranium concentrations in Doris Lake during the open-water season and between the before and after period means in Patch and Windy lakes. There are no data for total uranium during baseline years at the reference lake for comparison (Figures 3.3-25a and 3.3-25b).

Graphical analyses indicated that total uranium concentrations in all three exposure lakes were less than the benchmark in 2024 (Figures 3.3-25a and 3.3-25b).

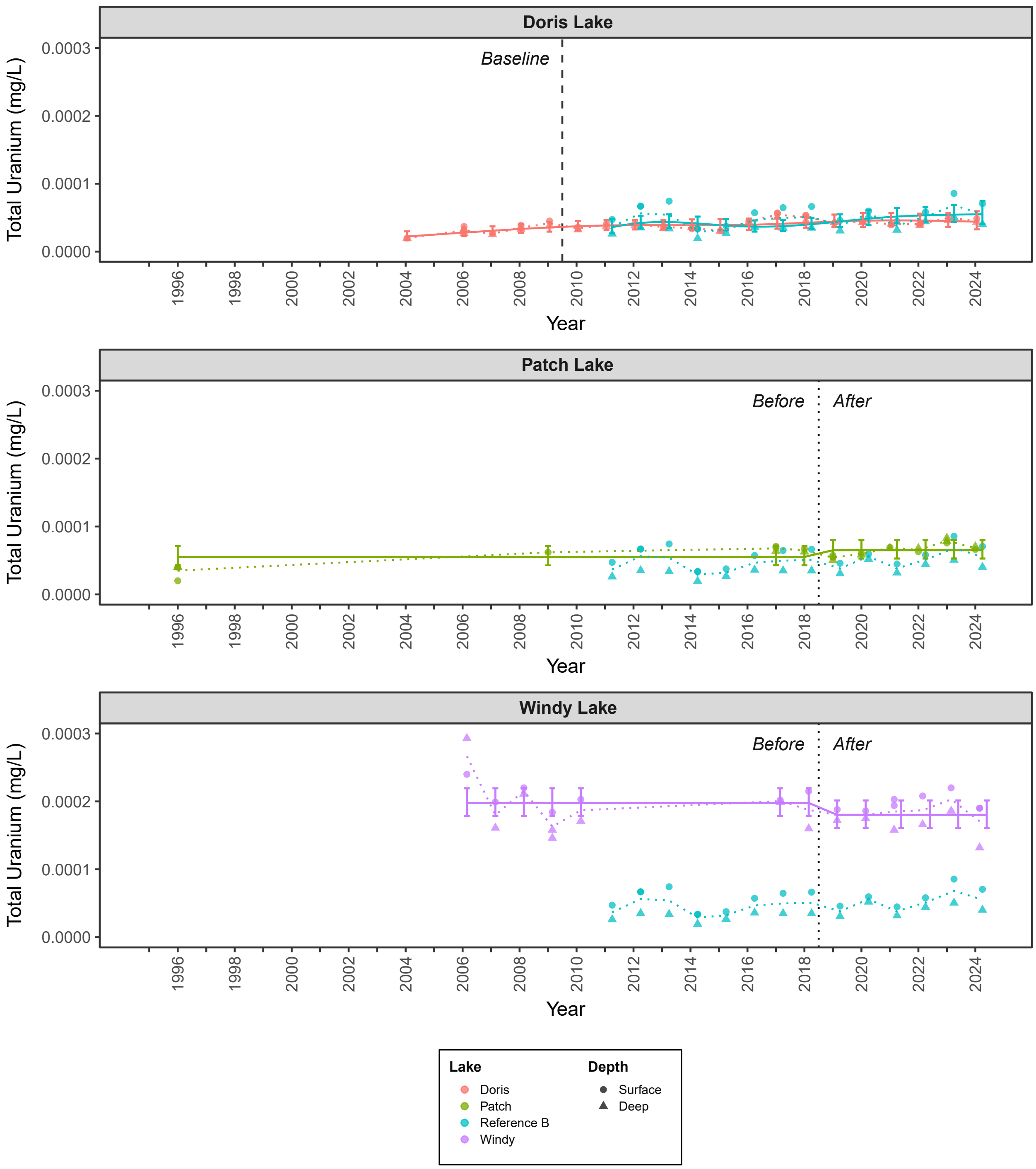
No effects were detected for total uranium in Doris, Patch, or Windy lakes in 2024. The conditions required to consider a low action level for total uranium were not exceeded in 2024.

TABLE 3.3-25 TOTAL URANIUM STATISTICAL RESULTS FOR EXPOSURE LAKES, 2024

Lake	Season	Trend Analysis		BACI	
		Significant Change Relative to a Slope of Zero (*p* value)	Significant Trend Relative to Reference Lake B (*p* value)	Significant Before-After Change (*p* value)	Significant Before-After Change Relative to Reference Lake (*p* value)
Doris	Under-ice	Yes (<0.00001)	No (0.2699)	NA	NA
	Open-water	Yes (0.0421)	No (0.9444)	NA	NA
Patch	Under-ice	NA	NA	No (0.2817)	-
	Open-water	NA	NA	No (0.2054)	-
Windy	Under-ice	NA	NA	No (0.2047)	-
	Open-water	NA	NA	No (0.183)	-

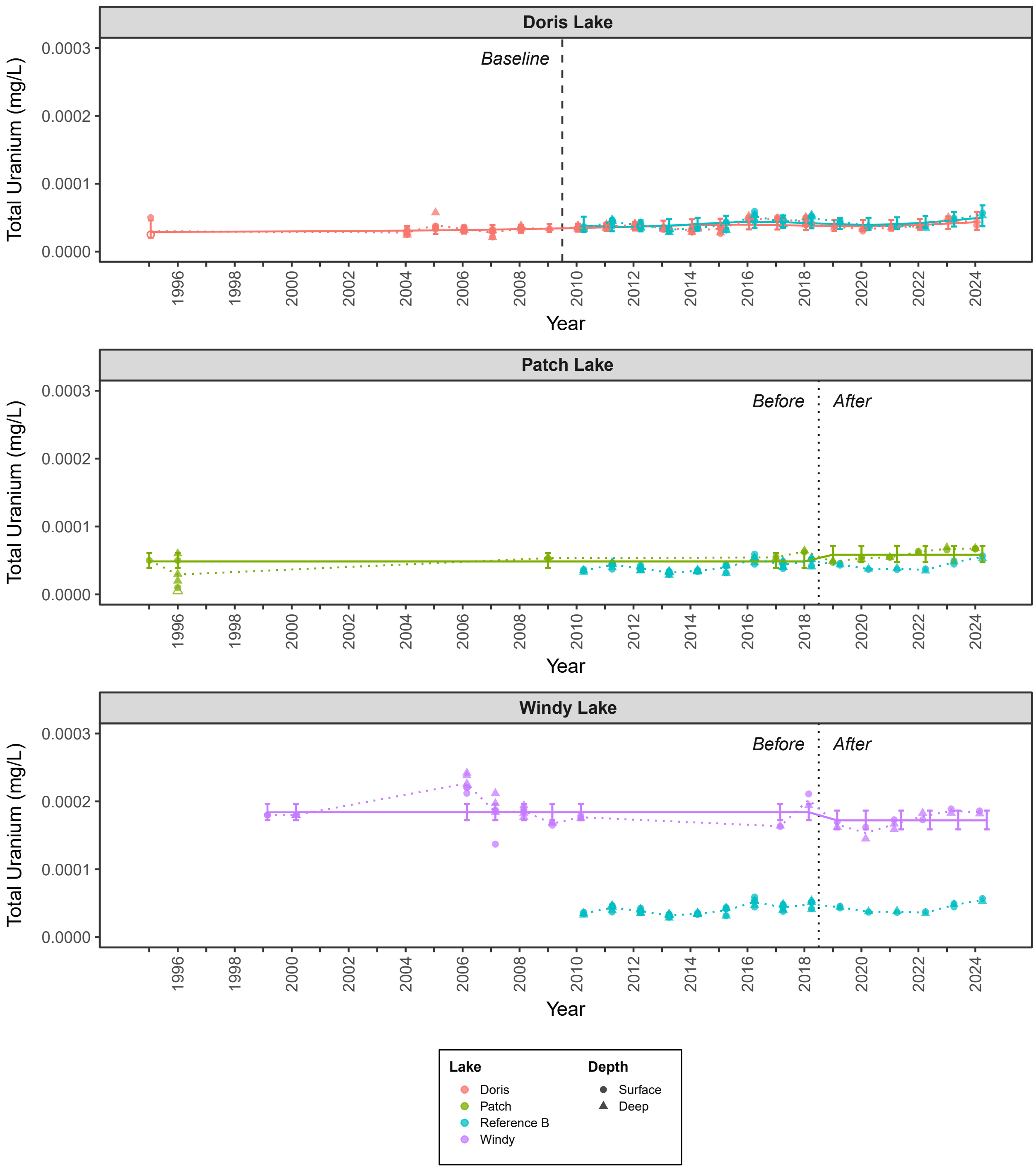
Notes:
< = less than; BACI = Before-After/Control-Impact; NA = not applicable
Dash (-) = The statistical analysis was not completed due to limitations or because the first step of the statistical analysis indicated no significant difference (Appendix C).
NA indicates that the statistical analysis was not relevant to the dataset.

FIGURE 3.3-25A   UNDER-ICE TOTAL URANIUM IN LAKES, HOPE BAY AEMP, 1996 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 0.015 mg/L.

FIGURE 3.3-25B OPEN-WATER TOTAL URANIUM IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is 0.015 mg/L.

3.3.26 DISSOLVED ZINC

Statistical analysis indicated a significant change over time for dissolved zinc concentrations in Doris Lake during the under-ice season (Table 3.3-26). Statistical analyses were not completed relative to the reference lake, for Doris Lake during the open-water season, or for Patch and Windy lakes due to the high proportion of data that was less than the DL (Section C.3.1.14 in Appendix C). During the baseline years (1995 to 2009), under-ice dissolved zinc concentrations decreased in Doris Lake (0.0161 to <0.00005 mg/L) and concentrations have been low (<0.0010 to 0.0026 mg/L) during the available monitoring period years (2019 to 2024; Figures 3.3-26a and 3.3-26b). It is noted that a decrease in dissolved zinc concentrations is not considered to be an adverse effect (TMAC 2018).

Graphical analyses indicated that dissolved zinc concentrations were below the DL (<0.0010 mg/L) during the open-water season in Doris and Windy lakes and during both seasons in Patch Lake (Figures 3.3-26a and 3.3-26b). Concentrations in all exposure lakes were less than their respective calculated dissolved zinc benchmarks (0.0139 to 0.0293 mg/L; Table 2.2-2; Table A.3-5 in Appendix A).

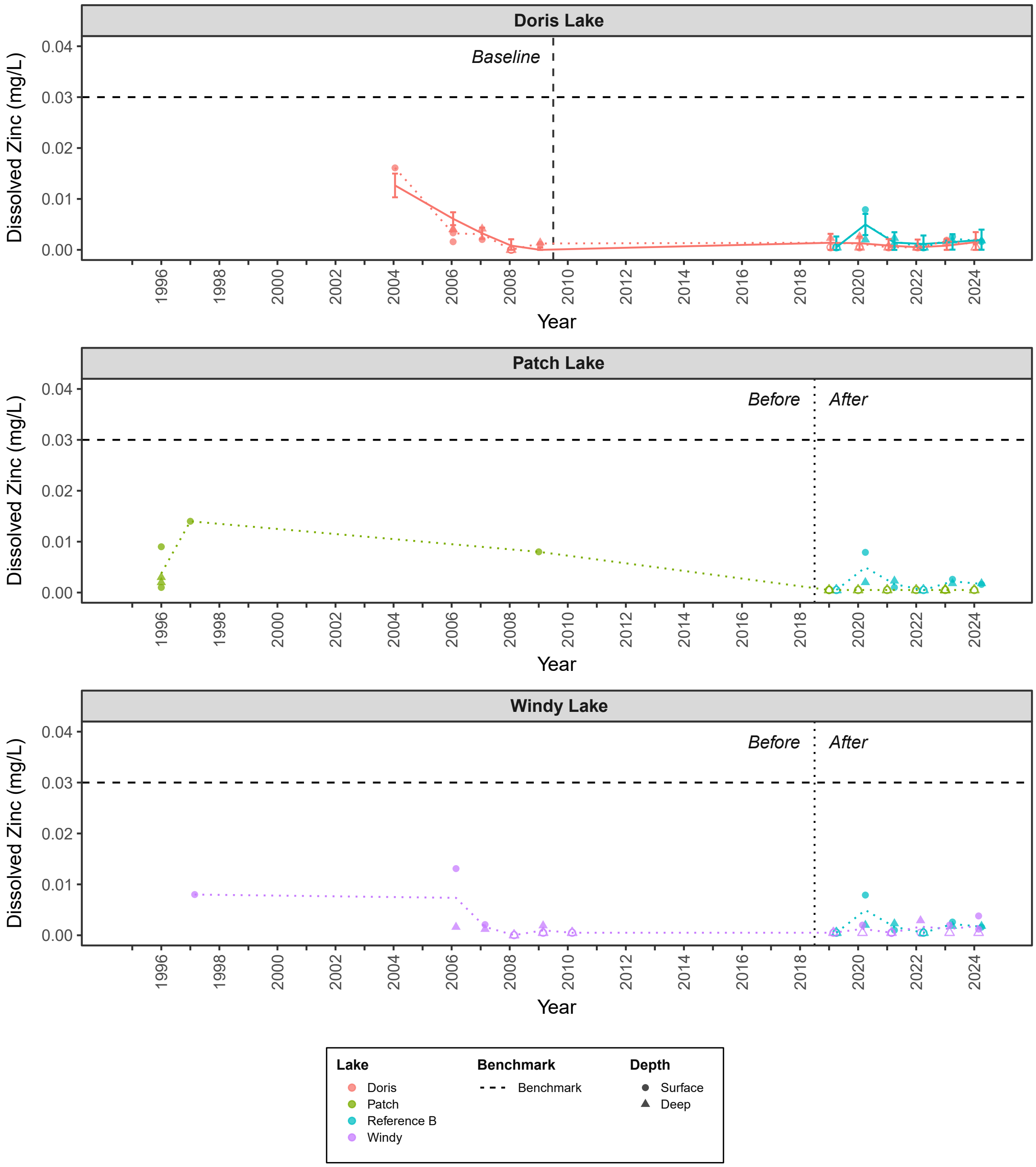
No effects were detected for dissolved zinc in Doris, Patch, or Windy lakes in 2024. The conditions required to consider a low action level for dissolved zinc were not exceeded in 2024.

TABLE 3.3-26 DISSOLVED ZINC STATISTICAL RESULTS FOR EXPOSURE LAKES, 2024

Lake	Season	Trend Analysis		BACI	
		Significant Change Relative to a Slope of Zero (*p* value)	**Significant Trend Relative to Reference Lake B (*p* value)**	**Significant Before-After Change (*p* value)**	**Significant Before-After Change Relative to Reference Lake (*p* value)**
Doris	Under-ice	Yes (<0.00001)	-	NA	NA
	Open-water	-	-	NA	NA
Patch	Under-ice	NA	NA	-	-
	Open-water	NA	NA	-	-
Windy	Under-ice	NA	NA	-	-
	Open-water	NA	NA	-	-

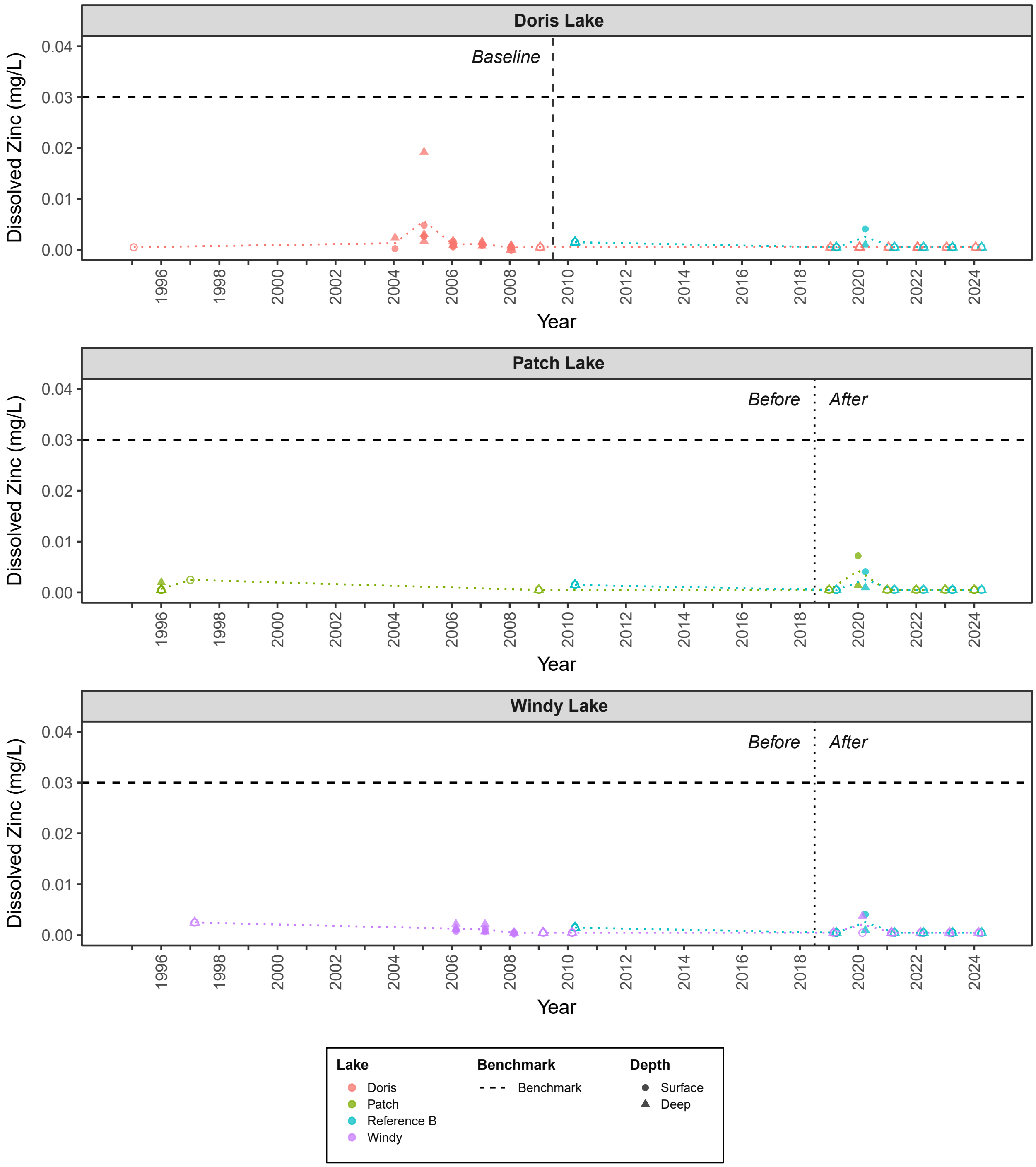
Notes:
< = less than; BACI = Before-After/Control-Impact; NA = not applicable
Dash (-) = The statistical analysis was not completed due to limitations or because the first step of the statistical analysis indicated no significant difference (Appendix C).
NA indicates that the statistical analysis was not relevant to the dataset.

FIGURE 3.3-26A UNDER-ICE DISSOLVED ZINC IN LAKES, HOPE BAY AEMP, 1996 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is dependent on pH, hardness, and DOC (see Table 2.2-2).

FIGURE 3.3-26B OPEN-WATER DISSOLVED ZINC IN LAKES, HOPE BAY AEMP, 1995 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch and Windy lakes.
The error bars are the 95% confidence intervals of the fitted means.
The benchmark is dependent on pH, hardness, and DOC (see Table 2.2-2).

3.4 PHYTOPLANKTON

3.4.1 BIOMASS

Statistical analyses indicated a significant change over time for phytoplankton biomass in Doris Lake (as measured by chl *a*), and relative to the reference lake (Table 3.4-1). Graphical analyses of mean chl *a* concentrations in Doris Lake indicated that the mean phytoplankton biomass decreased from 2011 to 2014 (range of 4.94 to 6.91 microgram per litre [µg/L]) compared to 2009 and 2010 (8.11 and 11.01 µg/L, respectively; Figure 3.4-1). Subsequently, chl *a* concentrations increased between 2014 and 2016 (from 5.43 to 16.76 µg/L). Since 2016, chl *a* concentrations have consistently been greater than baseline (2009) and earlier monitoring mean concentrations, ranging from 11.05 to 22.81 µg/L. Graphical observations provide evidence of a potential decline in mean chl *a* concentrations since it reached the highest recorded concentration (22.81 µg/L) in 2022. Additionally, mean chl *a* concentrations observed in 2024 (10.56 µg/L) were 21% lower compared to 2023 mean concentrations (13.30 µg/L; Figure 3.4-1).

Based on the conditions in TMAC (2018) and Section 3 of the *Aquatic Response Plan for Phytoplankton Biomass* (ERM 2024), a low action level was not triggered in 2024 since the concentration of chlorophyll *a* was within the normal range of baseline conditions (i.e., 2009; 5.78 to 12.10 µg/L).

Statistical analyses indicated no significant difference between the before and after period means for phytoplankton biomass in Patch Lake (Table 3.4-1).

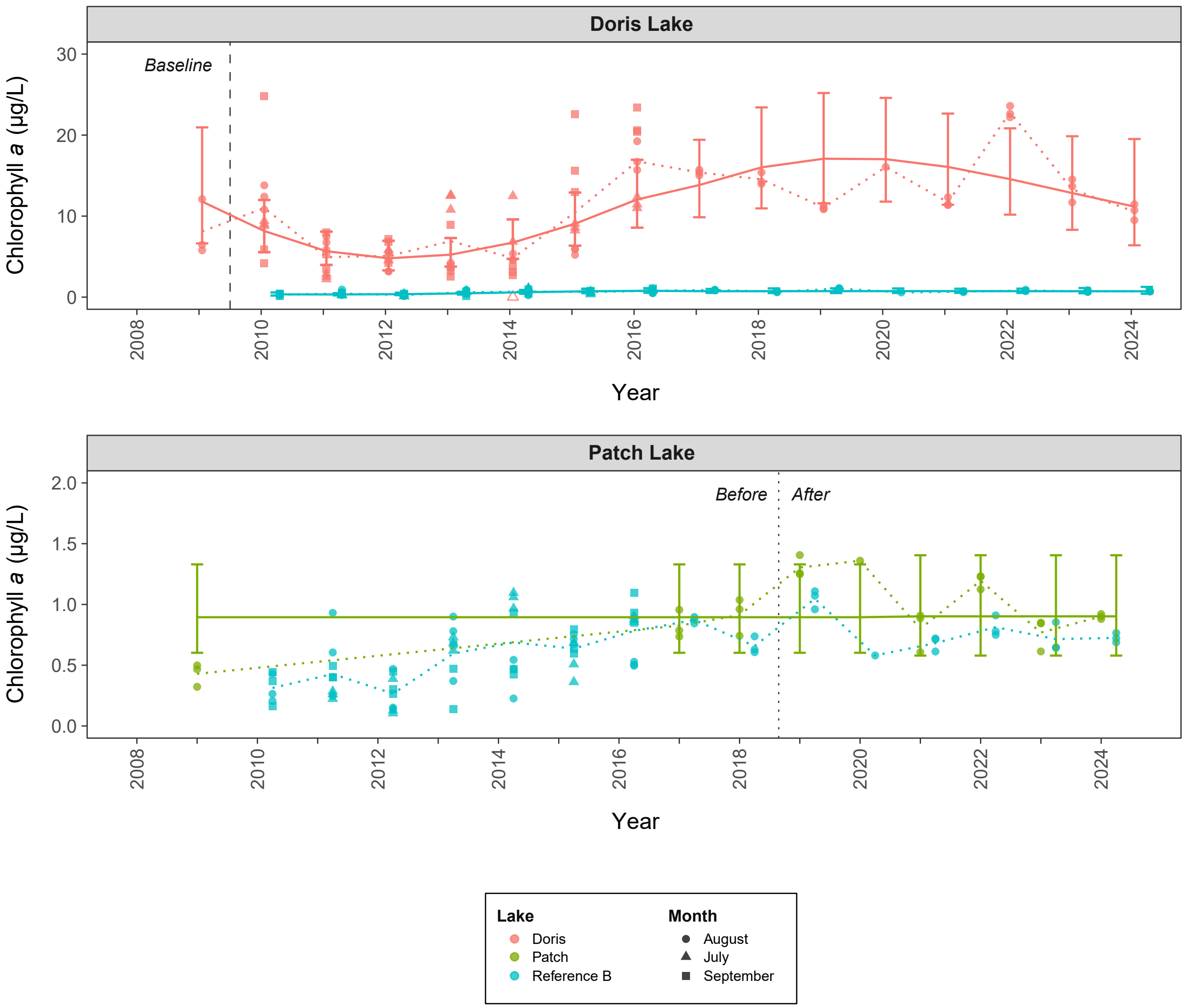
TABLE 3.4-1 PHYTOPLANKTON BIOMASS STATISTICAL RESULTS FOR EXPOSURE LAKES, 2024

Lake	Trend Analysis		BACI	
	Significant Change Relative to a Slope of Zero (*p* value)	**Significant Trend Relative to Reference Lake B (*p* value)**	**Significant Before-After Change (*p* value)**	**Significant Before-After Change Relative to Reference Lake (*p* value)**
Doris	Yes (<0.00001)	Yes (0.0167)	NA	NA
Patch	NA	NA	No (0.9749)	-

Notes:
< = less than; BACI = Before-After/Control-Impact; NA = not applicable
Dash (-) = The statistical analysis was not completed due to limitations or because the first step of the statistical analysis indicated no significant difference (Appendix C).
NA indicates that the statistical analysis was not relevant to the dataset.

No potentially adverse effects were detected for phytoplankton biomass in Doris or Patch lakes in 2024. The conditions required to consider a low action level for phytoplankton biomass in Doris or Patch lakes were not exceeded in 2024.

FIGURE 3.4-1 PHYTOPLANKTON BIOMASS IN LAKES, HOPE BAY AEMP, 2009 TO 2024



Notes: Symbols represent observed data values, observations are slightly jittered along the x-axis for legibility.
Observations less than the detection limit are shown by hollow symbols and plotted at half the detection limit.
Dotted lines connect the annual observed means.
Solid lines represent the the annual fitted mean for Doris Lake and the fitted before and after means for Patch Lake.
The error bars are the 95% confidence intervals of the fitted means.

4. SUMMARY OF EFFECTS ANALYSIS

No Project-related effects were identified for the evaluated physical limnological, water quality, and phytoplankton biomass variables in 2024 (Table 4-1). There were no under-ice water level measurements collected in 2024 due to equipment malfunction and consequently, under-ice surface elevation could not be calculated for most lakes. Although ice thickness for all exposure lakes was less than the maximum baseline ice thickness outlined in the Madrid–Boston FEIS (TMAC 2017; Table 3.1-1), Project-related effects for fish habitat could not be evaluated for Windy, Glenn, Patch, Imniagut, P.O., Ogama, and Little Roberts lakes due to the absence of water level data (Table 4-1). Water level measurements for Doris Lake only were estimated based on lake level measurements from the Doris Lake-2 hydrology monitoring station. No Project-related effects for fish habitat were observed for Doris Lake.

TABLE 4-1 SUMMARY OF EVALUATION OF EFFECTS, 2024

Variable	Exposure Lakes Included in Evaluation of Effects	Conclusion of Effect	Low Action Level Triggered?
Fish Habitat			
Water level and ice thickness	Windy Lake, Glenn Lake, Patch Lake, Imniagut Lake, P.O. Lake, Ogama Lake, Doris Lake, Little Roberts Lake	No effect[1]	No effect[1]
Physical Limnology			
Under-ice dissolved oxygen	Doris Lake, Patch Lake, Windy Lake	No effect	No
Temperature		No effect	No
Water Quality			
pH	Doris Lake, Patch Lake, Windy Lake	No effect	No
Total Suspended Solids		No effect	No
Turbidity		No effect	No
Chloride		No effect	No
Fluoride		No effect	No
Total ammonia		No effect	No
Nitrate		No effect	No
Nitrite		No effect	No
Total phosphorus		No effect	No
Total aluminum		No effect	No
Total arsenic		No effect	No
Total boron		No effect	No
Total cadmium		No effect	No

Variable	Exposure Lakes Included in Evaluation of Effects	Conclusion of Effect	Low Action Level Triggered?
Total chromium		No effect	No
Total copper		No effect	No
Total iron		No effect	No
Total lead		No effect	No
Dissolved manganese	Doris Lake, Patch Lake, Windy Lake	No effect	No
Total mercury		No effect	No
Total molybdenum		No effect	No
Total nickel		No effect	No
Total selenium		No effect	No
Total silver		No effect	No
Total thallium		No effect	No
Total uranium		No effect	No
Dissolved zinc		No effect	No
Phytoplankton			
Biomass (chl *a*)	Doris Lake, Patch Lake	No effect	No

Notes:
chl *a* = chlorophyll *a*; NA = not applicable
[1] Project-related effects were unable to be assessed for Windy, Glenn, Patch, Imniagut, P.O., Ogama, and Little Roberts lakes due to the absence of under-ice water level data. Only Doris Lake was assessed for Project-related effects.

Water column profiles for DO and temperature in the exposure lakes were either within the baseline observations, or any change observed in 2024 was not considered to be adverse. Water column profiles for DO and temperature in the exposure lakes were overlapping with the values observed during their respective baseline years.

The evaluation of effect results for water quality variables indicated the following:

- There was no significant change over time in Doris Lake, or between the before and after periods in Patch and Windy lakes; or
- If a significant change was detected, the trend was not a potentially adverse change for that variable; or
- Concentrations remained within the baseline range for the evaluated lake in the respective season.

Although significant changes were observed in the phytoplankton biomass in Doris Lake in 2024 compared to the reference lake, the conditions for a low action level response were not fulfilled, as chl *a* concentrations in exposure lakes were within the baseline range (ERM 2024). No effect was detected for phytoplankton biomass in 2024 and no update was required for the Response Plan for phytoplankton biomass (ERM 2024).

Annual variations in sampling data are expected and observed variability in water quality parameters in 2024 did not require further investigation. None of the variables evaluated in 2024 (Tables 4-2 and 4-3) exceeded low action level conditions.

TABLE 4-2 COMPARISON OF WATER QUALITY TO RESPONSE FRAMEWORK CONDITIONS FOR TRIGGERING A LOW ACTION LEVEL RESPONSE, 2024

Exposure Lake	Doris Lake						Patch Lake						Windy Lake					
Season	**Under-ice**			**Open-water**			**Under-ice**			**Open-water**			**Under-ice**			**Open-water**		
Low Action Level Assessment	**Conditions Exceeded**	**Conditions Not Exceeded**	**Conditions Not Evaluated[b]**	**Conditions Exceeded**	**Conditions Not Exceeded**	**Conditions Not Evaluated[b]**	**Conditions Exceeded**	**Conditions Not Exceeded**	**Conditions Not Evaluated[b]**	**Conditions Exceeded**	**Conditions Not Exceeded**	**Conditions Not Evaluated[b]**	**Conditions Exceeded**	**Conditions Not Exceeded**	**Conditions Not Evaluated[b]**	**Conditions Exceeded**	**Conditions Not Exceeded**	**Conditions Not Evaluated[b]**
pH	1	4	2, 3	1	4	2, 3	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4
TSS	1	2	3, 4	-	1	2, 3, 4	-	-	1, 2, 3, 4	-	1	2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4
Turbidity	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4
Chloride	-	1	2, 3, 5	-	1	2, 3, 4	-	1	2,3,4	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4
Fluoride	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4
Total ammonia	-	1	2, 3, 4	-	-	1, 2, 3, 4	-	1	2, 3, 4	-	-	1, 2, 3, 4	-	1	2, 3, 4	-	-	1, 2, 3, 4
Nitrate	-	1	2, 3, 4	-	-	1, 2, 3, 4	-	1	2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4
Nitrite	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4
Total phosphorus[a]	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4	1	4	2, 3	-	1	2, 3, 4	-	1	2, 3, 4
Total aluminum	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4
Total arsenic	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4
Total boron	1	2	3, 4	1	2	3, 4	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4
Total cadmium	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4
Total chromium	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4
Total copper	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4
Total iron	-	1	2,3, 4	-	1	2,3, 4	-	1	2,3, 4	-	1	2,3, 4	-	-	1, 2, 3, 4	-	1	2,3, 4
Total lead	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4
Dissolved manganese	-	1	2, 3, 4	1	2	3, 4	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4
Total mercury	1	4	2, 3	-	1	2, 3, 4	-	-	1, 2, 3, 4	-	1	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4
Total molybdenum	1	2	3, 4	1	2	3, 4	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4
Total nickel	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4
Total selenium	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4
Total silver	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4

Exposure Lake	Doris Lake						Patch Lake						Windy Lake					
Season	**Under-ice**			**Open-water**			**Under-ice**			**Open-water**			**Under-ice**			**Open-water**		
Low Action Level Assessment	**Conditions Exceeded**	**Conditions Not Exceeded**	**Conditions Not Evaluated[b]**	**Conditions Exceeded**	**Conditions Not Exceeded**	**Conditions Not Evaluated[b]**	**Conditions Exceeded**	**Conditions Not Exceeded**	**Conditions Not Evaluated[b]**	**Conditions Exceeded**	**Conditions Not Exceeded**	**Conditions Not Evaluated[b]**	**Conditions Exceeded**	**Conditions Not Exceeded**	**Conditions Not Evaluated[b]**	**Conditions Exceeded**	**Conditions Not Exceeded**	**Conditions Not Evaluated[b]**
Total thallium	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4
Total uranium	1	4	2, 3	1	4	2, 3	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4	-	1	2, 3, 4
Dissolved zinc	-	1	2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4	-	-	1, 2, 3, 4

Notes:
% = percent; DL = analytical detection limit; TMAC = TMAC Resources Inc.; TSS = total suspended solids
Dash (-) = no conditions to report for that category.
Condition 1: A statistically significant and potentially adverse change from baseline conditions has been identified.
Condition 2: The concentration of the water quality variable is outside of the normal range based on the baseline concentration.
Condition 3: The concentration of the water quality variable exceeds 75% of the benchmark.
Condition 4: If a potentially adverse change is detected at the exposure site, there is no similar change at the reference site.
[a] Total phosphorus was assessed only for 2024 as a supporting parameter and is not an annual effects variable under the Plan (TMAC 2018).
[b] Condition was not evaluated either because it was not necessary (i.e., at least one condition was not met) or because all 2024 observations were less than the DL).

TABLE 4-3 COMPARISON OF PHYTOPLANKTON BIOMASS TO RESPONSE FRAMEWORK CONDITIONS FOR TRIGGERING A LOW ACTION LEVEL RESPONSE, 2024

Exposure Lake	Doris Lake			Patch Lake		
Conditions for Low Action Level Response	**Conditions Exceeded**	**Conditions Not Exceeded**	**Conditions Not Evaluated[a]**	**Conditions Exceeded**	**Conditions Not Exceeded**	**Conditions Not Evaluated[a]**
Biomass	1	2	3	-	1	2, 3

Notes:
Dash (-) = no conditions to report for that category.
Condition 1: A statistically significant change from baseline conditions has been identified.
Condition 2: The concentration is outside that the normal range based on baseline conditions.
Condition 3: If a change is detected, there is no similar change at the reference site.
[a] Condition was not evaluated because it was not necessary (i.e., at least one other condition was not met).

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APPENDIX A DATA REPORT (2024)

Hope Bay Project

2024 Aquatic Effects Monitoring Program—Annual Report

Appendix A: Data Report (2024)

February 2025

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APPENDIX A: DATA REPORT (2024)

A.1 INTRODUCTION

This data report presents the winter ice measurements, water quality, and biota sampling methods (Section A.2) and monitoring data (Section A.3) for the 2024 Aquatic Effects Monitoring Program (AEMP) for the Hope Bay Project (the Project). All methods and data relating to water level and stream hydrological monitoring are presented in Appendix B - 2024 Hydrology Compliance Monitoring Summary.

A.1.1 SAMPLING PROGRAM SUMMARY

The 2024 Hope Bay AEMP was conducted according to the *Hope Bay Project Aquatic Effects Monitoring Plan* (the Plan; TMAC 2018), which includes monitoring the following components:

- Fish habitat (ice thickness, water level, and stream hydrology);
- Under-ice physical limnology and water quality variables;
- Open-water physical limnology and water quality variables; and
- Open-water phytoplankton.

Sampling occurs in the fall and/or spring depending on the monitoring component. A summary of the frequency and timing (e.g., seasonality) of sampling, the specific sampling devices used, the number of replications collected, and the depths at which samples were taken (if applicable) for each individual monitoring component is provided (Table A.1-1).

TABLE A.1-1 SAMPLING PROGRAM SUMMARY FOR THE HOPE BAY AQUATIC EFFECTS MONITORING PROGRAM, 2024

Monitoring Component	Sampling Frequency	Sample Timing	Sampling Device(s)	Sample Replication and Depths
Ice Thickness				
Ice thickness measurement	1× per year	April	Metered rod	n = 1 measurement/site
Physical Limnology				
Secchi depth; Dissolved oxygen and temperature profiles	2× per year	April (profiles only), August	Secchi disk YSI ProODO with optical dissolved oxygen and temperature probe	n = 1 profile/site throughout water column
Water Quality				
Physico-chemical variables, nutrients, metals	2× per year	April, August	Niskin (under ice) or GO-FLO (open water) water sampler	n = 1 at 1 m below the surface n = 1 at 2 m above water-sediment interface + 10% replication per sampling even

Monitoring Component	Sampling Frequency	Sample Timing	Sampling Device(s)	Sample Replication and Depths
Phytoplankton				
Biomass (chl *a*)	1× per year	August	GO-FLO water sampler, filtration equipment	n = 3/site at 1 m below the surface

Notes:
% = percent; m = metre; chl a = chlorophyll *a*

A.1.2 SAMPLING SITES

Monitoring 2024 was conducted in the Doris and Windy watersheds and at Reference Lake B (Table A.1-2). Monitoring was conducted in distinct areas of each watershed and/or lake depending on the component being assessed (Figures A.1-2 to A.1-6).

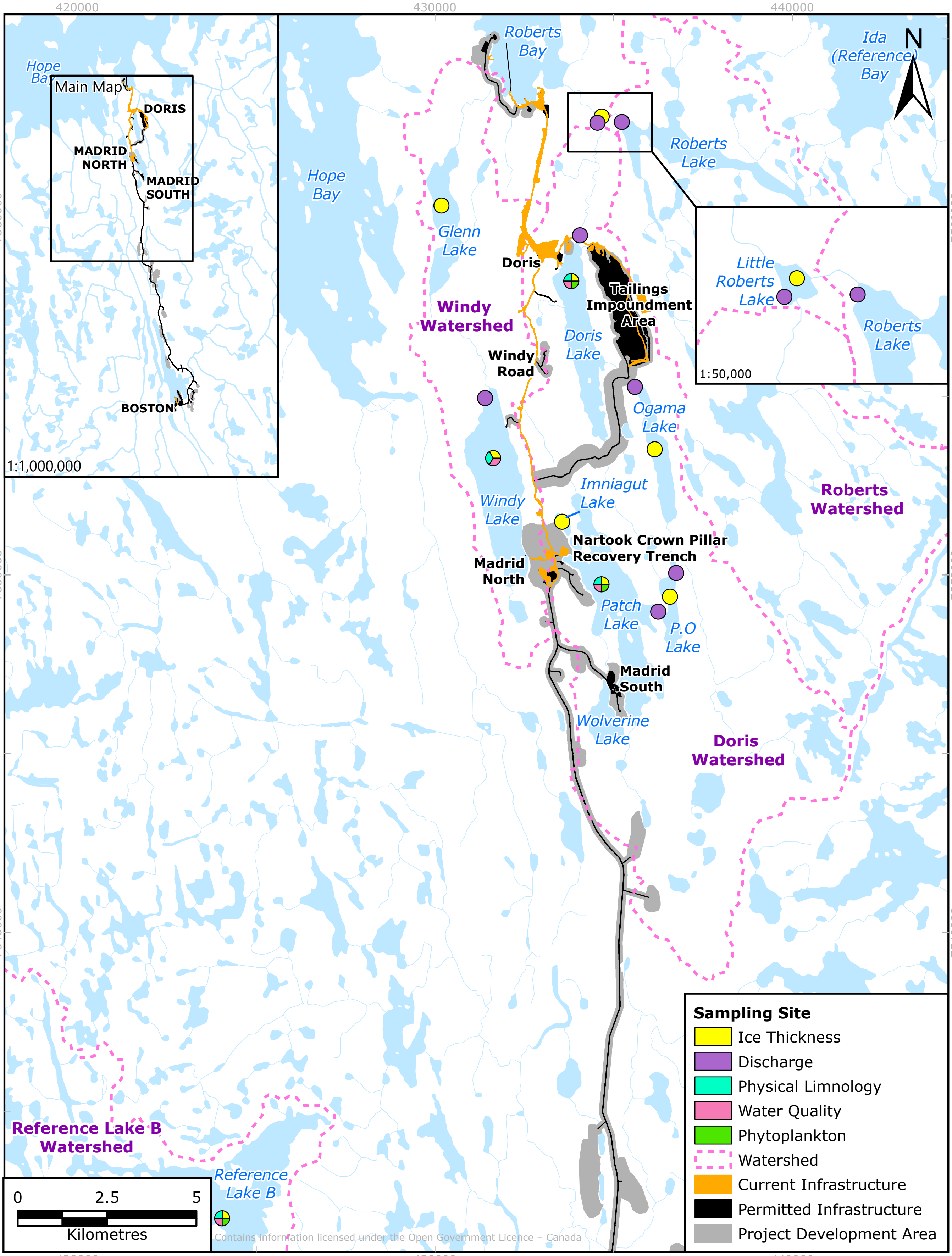
TABLE A.1-2 AQUATIC EFFECTS MONITORING PROGRAM SAMPLING LOCATIONS AND MONITORING COMPONENTS FOR THE HOPE BAY PROJECT, 2024

Site	UTM[a]		Ice Thickness	Water Level	Streamflow	Physical Limnology	Water Quality	Phytoplankton
	Easting	Northing						
Doris Watershed								
Patch Lake	434660	7549739	X	-[b]	-	X	X	X
Patch Outflow Hydro	436248	7548973	-	-	X	-	-	-
Imniagut Lake	433559	7551490	X	-[b]	-	-	-	-
Imniagut Lake Hydro	433403	7551421	-	-	-	-	-	-
P.O. Lake	436576	7549393	X	-[b]	-	-	-	-
P.O. Outflow Hydro	436749	7550055	-	-	X	-	-	-
Ogama Lake	436148	7553517	X	-[b]	-	-	-	-
Ogama Outflow Hydro	435595	7555262	-	-	X	-	-	-
Doris Lake	433815	7558222	X	-[b]	-	X	X	X
Doris Lake-2 Hydro	433547	7558601	-	-	-	-	-	-
Doris Creek TL-2 Hydro	434059	7559504	-	-	X	-	-	-
Little Roberts Lake	434665	7562826	X	-[b]	-	-	-	-
Little Roberts Outflow Hydro	434548	7562652	-	-	X	-	-	-

Site	UTM[a]		Ice Thickness	Water Level	Streamflow	Physical Limnology	Water Quality	Phytoplankton
	Easting	Northing						
Windy Watershed								
Windy Lake	431630	7553269	X	-[b]	-	X	X	-
Windy Outflow Hydro	431404	7554948	-	-	X	-	-	-
Glenn Lake	430183	7560337	X	-[b]	-	-	-	-
Glenn Lake Hydro	430410	7562001	-	-	-	-	-	-
Reference Lake								
Reference Lake B	424050	7532000	X	-[b]	-	X	X	X

Notes:
Dashes (-) = Monitoring is either not triggered by the Plan or not required at the specific site.
X = Monitoring completed in 2024.
[a] Coordinates are NAD83, UTM Zone 13N.
[b] Water level measurements were not obtained in 2024 due to equipment malfunction.

FIGURE A.1-1 SAMPLING SITES, HOPE BAY AEMP, 2024



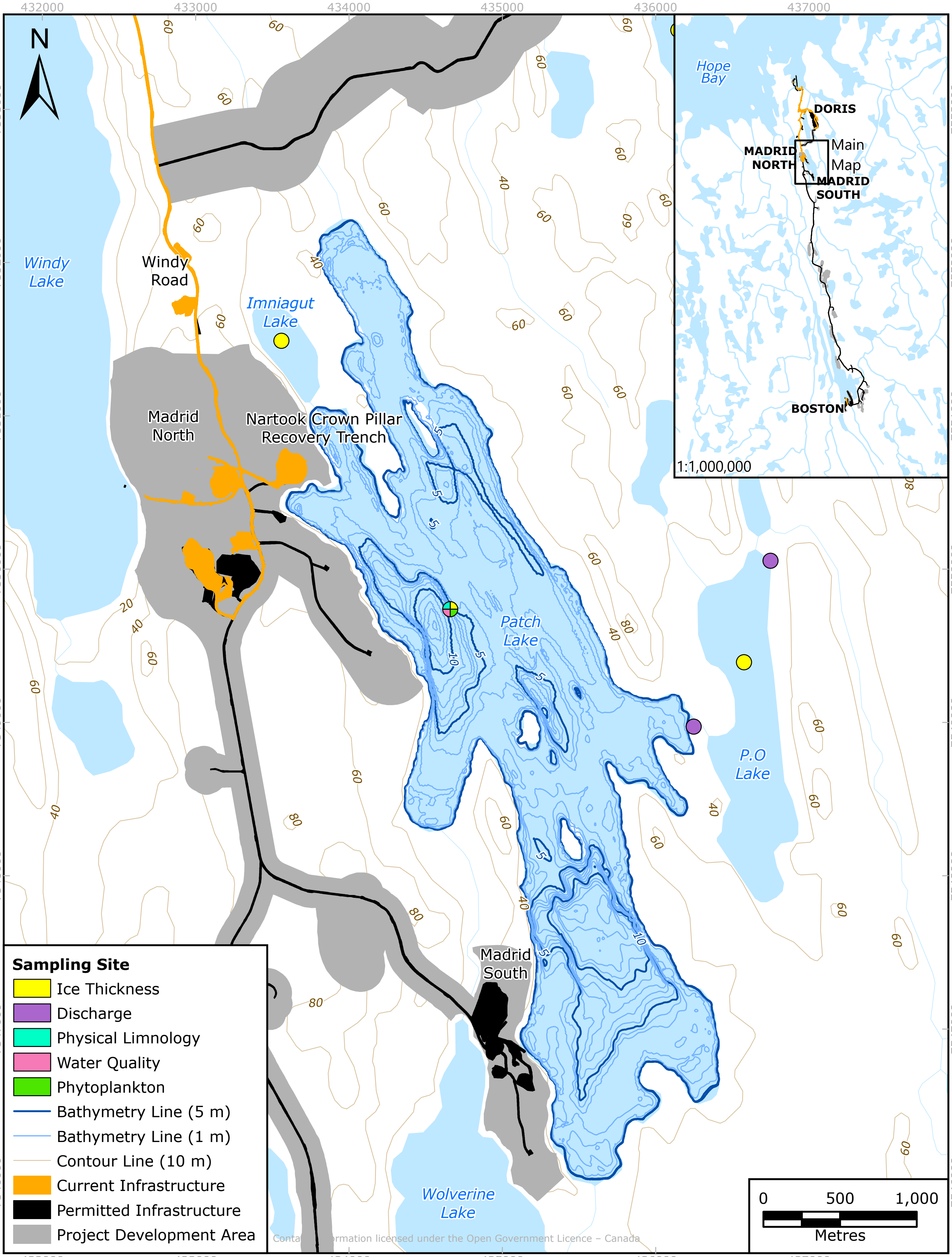
ERM

CLIENT: Agnico Eagle Mines Ltd.
GIS NUMBER: HB-01-299-03

DATE: 23 January 2025

PROJECTION: NAD 1983 UTM Zone 13N
SCALE: 1:150,000 when printed at 8.5x11

FIGURE A.1-2 PATCH LAKE, IMNIAGUT LAKE, AND P.O. LAKE SAMPLING SITES, HOPE BAY AEMP, 2024



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CLIENT: Agnico Eagle Mines Ltd.
GIS NUMBER: HB-01-299-04

DATE: 23 January 2025

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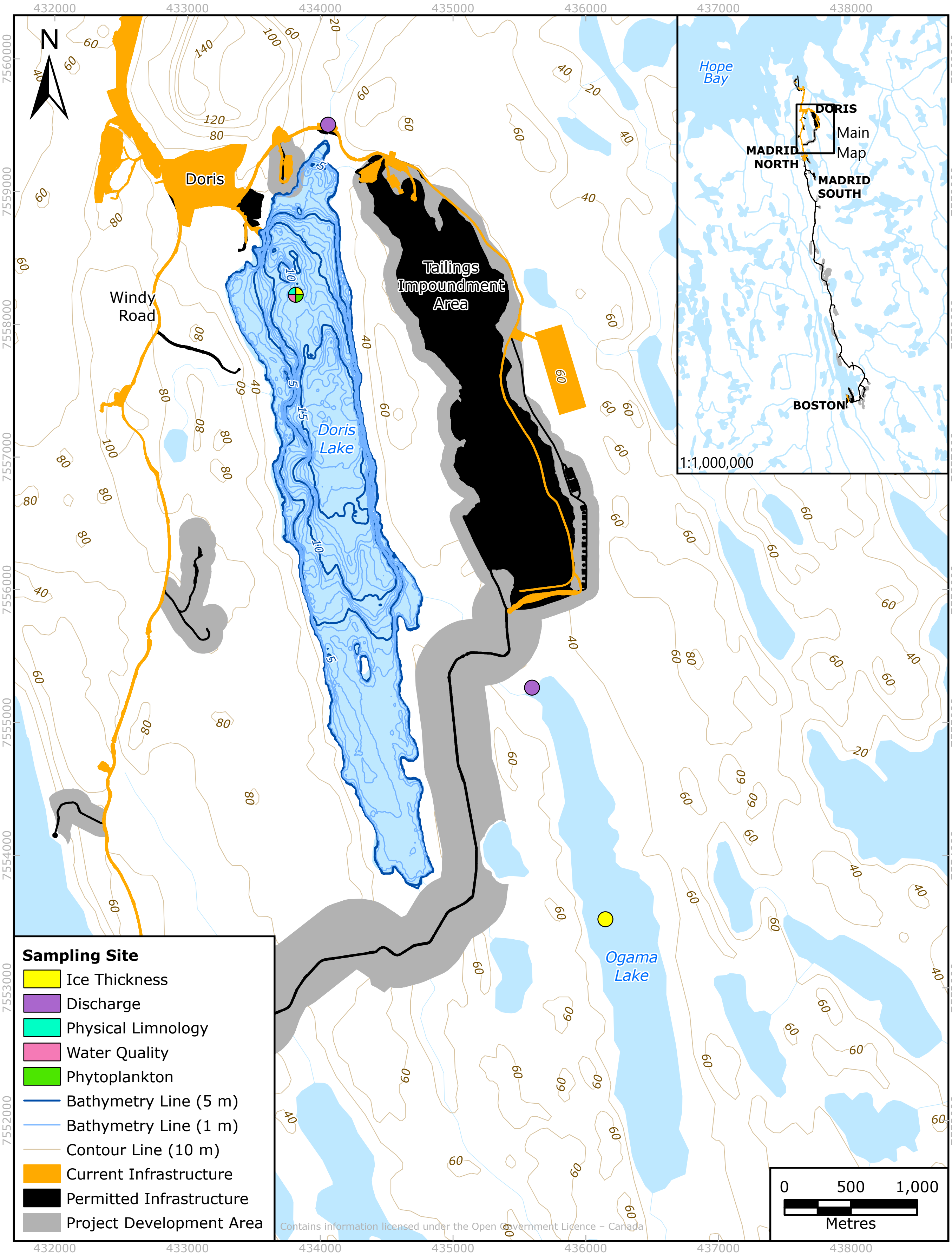
FIGURE A.1-3 DORIS LAKE AND OGAMA LAKE SAMPLING SITES, HOPE BAY AEMP, 2024



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DATE: 23 January 2025

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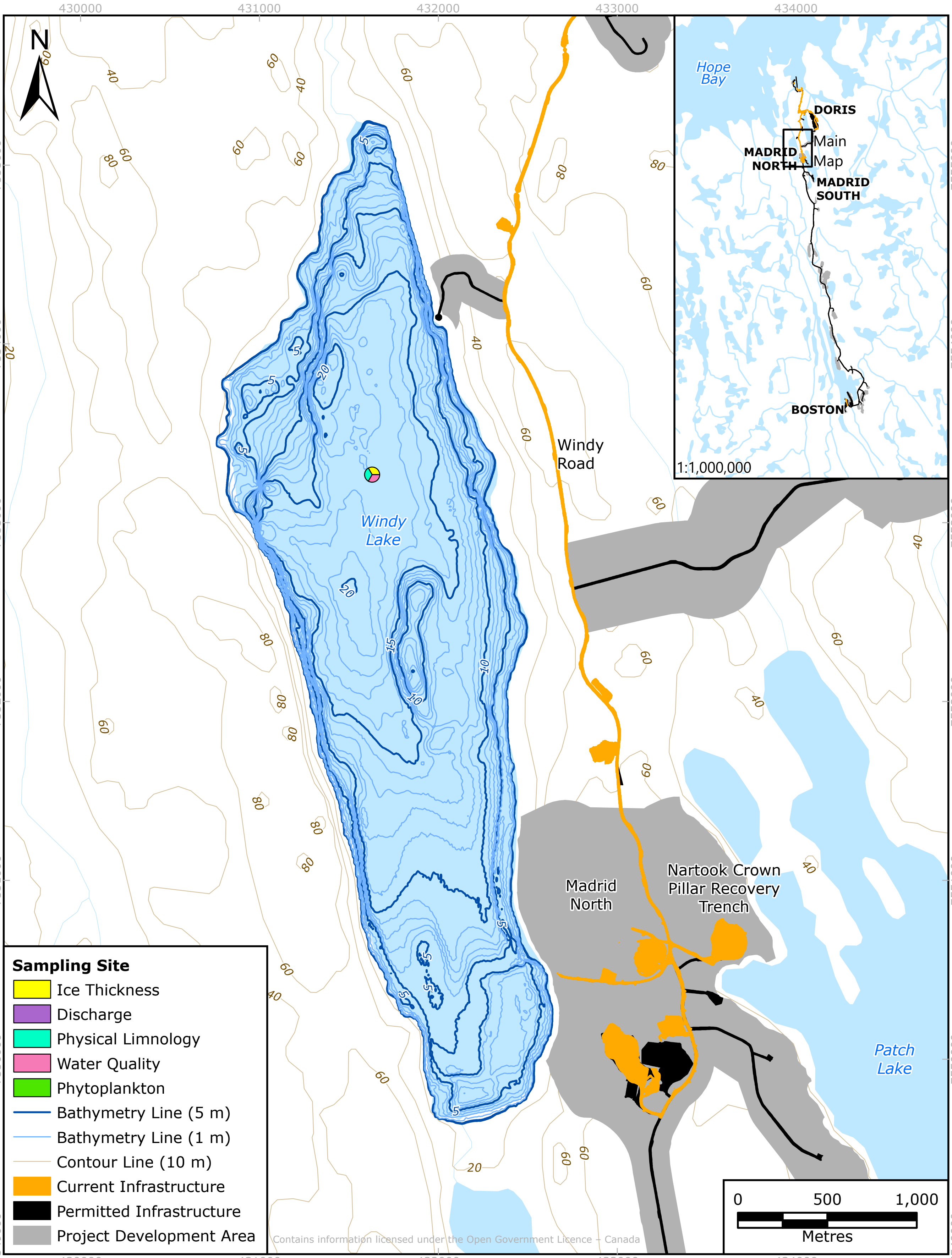
FIGURE A.1-4 WINDY LAKE SAMPLING SITES, HOPE BAY AEMP, 2024



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DATE: 23 January 2025

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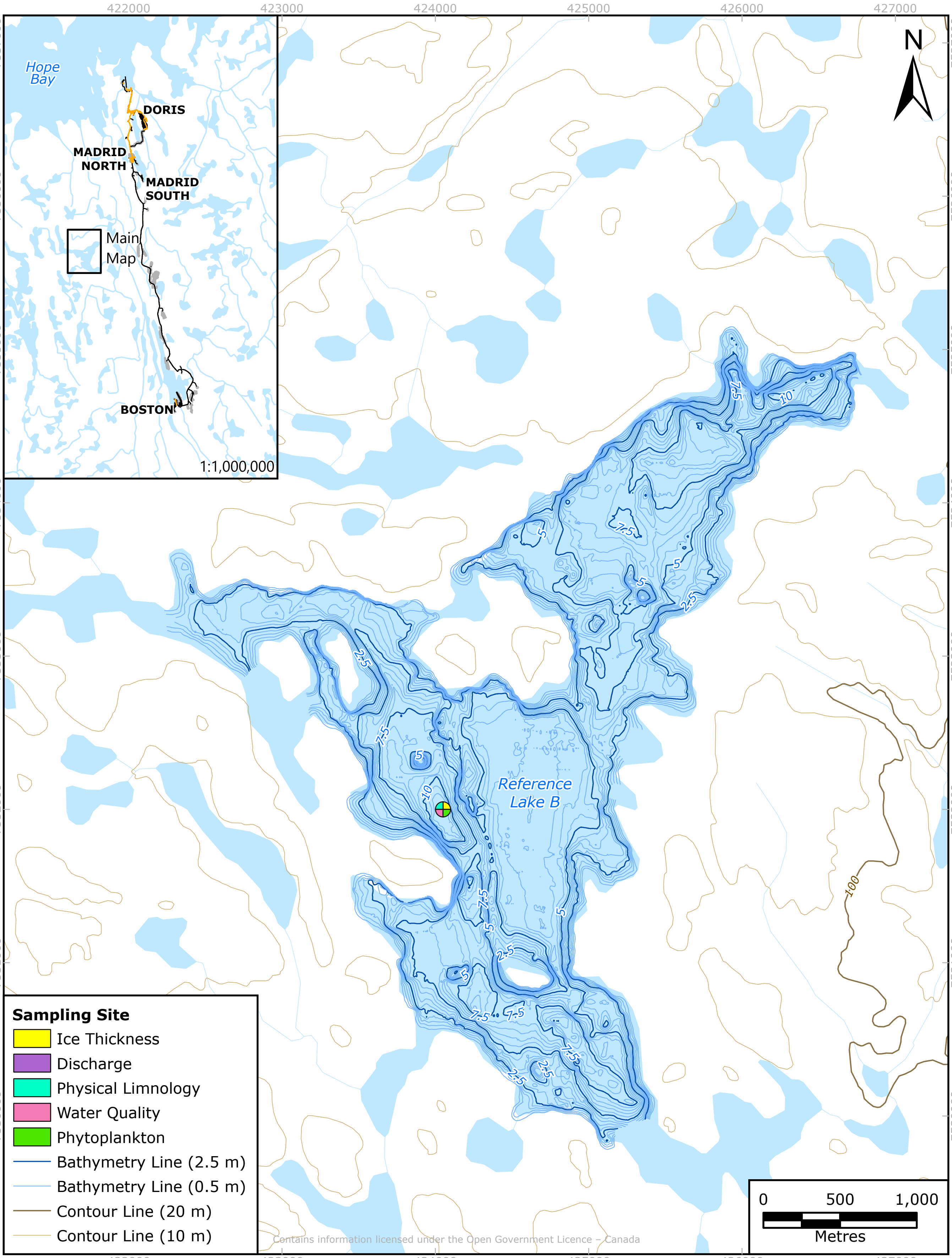
SCALE: 1:30,000 when printed at 8.5x11

FIGURE A.1-5 REFERENCE LAKE SAMPLING SITES, HOPE BAY AEMP, 2024



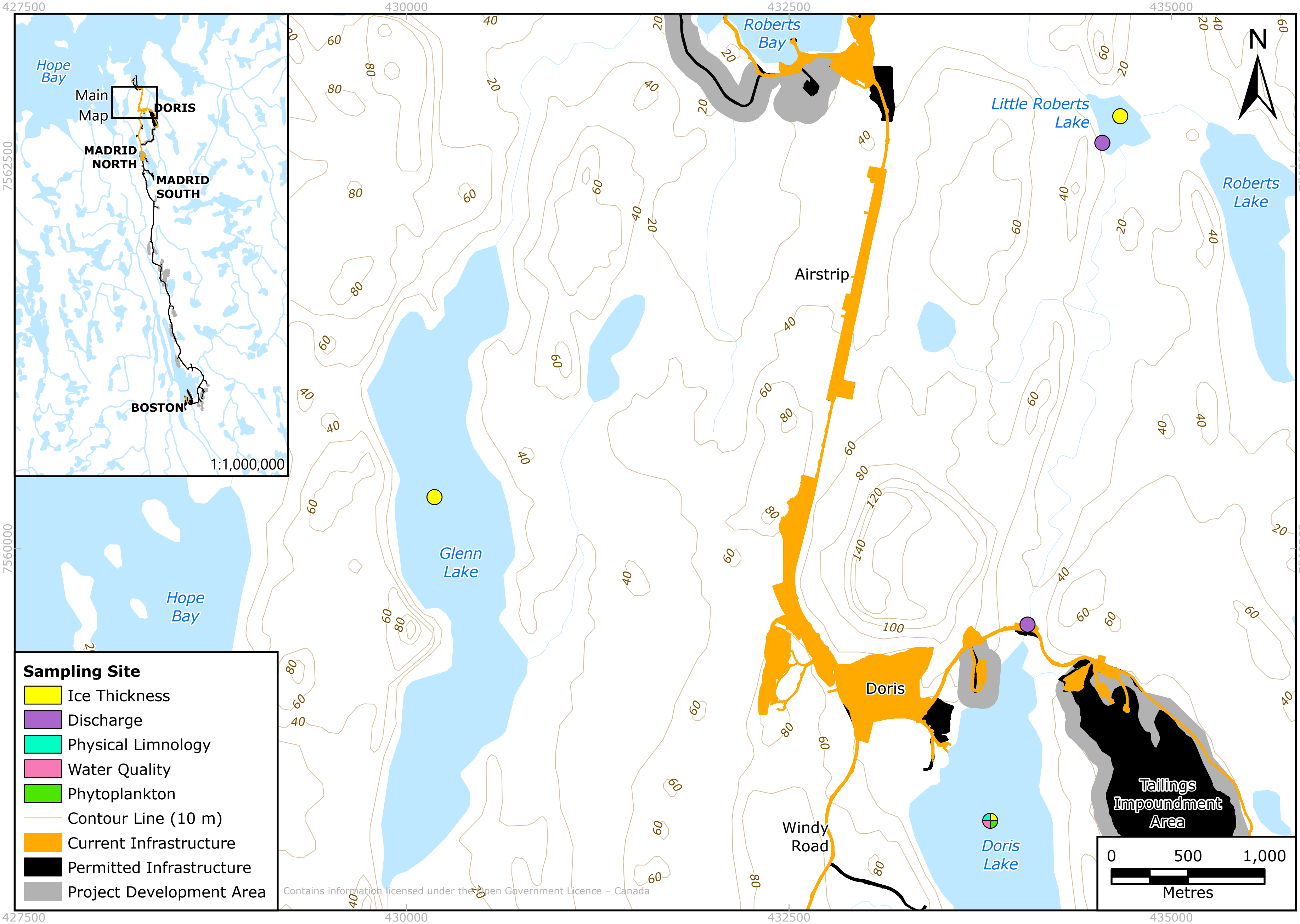
ERM

CLIENT: Agnico Eagle Mines Ltd.
GIS NUMBER: HB-01-299-07

DATE: 23 January 2025

PROJECTION: NAD 1983 UTM Zone 13N
SCALE: 1:35,000 when printed at 8.5x11

FIGURE A.1-6 GLENN LAKE AND LITTLE ROBERTS LAKE SAMPLING SITES, HOPE BAY AEMP 2024



ERM

CLIENT: Agnico Eagle Mines Ltd.
GIS NUMBER: HB-01-299-08

DATE: 01/31/2025

PROJECTION: NAD 1983 UTM Zone 13N
SCALE: 1:35,000 when printed at 8.5x11

A.2 METHODS

Sampling for the 2024 AEMP was completed during April (under-ice) and August (open-water). Under-ice sampling was conducted from April 12 to 14, 2024, at targeted sampling sites (Tables A.1-1 and A.1-2; Figures A.1-1 to A.1-6). Under-ice sampling for ice thickness, physical limnology, and water quality was conducted by auguring a hole through the ice. Ice chips and snow were cleared from the ice surface and from the augured hole using a clean, plastic ice scoop (e.g., slotted spoon).

Open-water sampling was conducted from August 8 to 12, 2024 at targeted sampling sites (Tables A.1-1 and A.1-2; Figures A.1-1 to A.1-6). Open-water sampling for physical limnology, water quality, and phytoplankton biomass was conducted from a boat.

A.2.1 ICE THICKNESS

Ice thickness was measured using a metered rod fitted with a hook. The measuring rod was "hooked" to the bottom of the ice layer and the thickness reading was recorded from the ice surface (not the snow surface). Ice thickness measurements at Windy Lake, Patch Lake, Doris Lake, and Reference Lake B were collected concurrently with water column profiling (physical limnological metrics) and water quality sampling.

A.2.2 PHYSICAL LIMNOLOGY

Temperature and DO profiles were collected after water quality sampling using a calibrated YSI ProODO meter equipped with an optical dissolved oxygen sensor. The probe was calibrated daily for DO saturation following the manufacturer's instructions. Profiles extended either from the bottom of the ice layer (under-ice season) or from the water surface (open-water) to approximately 1 m above the sediment-water interface. Depth was monitored using metered markings on the cable. Data were recorded at 0.5 m intervals for lakes less than 10 m deep and 1 m intervals from lakes greater than 10 m deep.

A.2.2.1 UNDER-ICE SEASON

The water column depth under the ice was measured using a depth sounder attached to the metered rod fitted with a hook. The measuring rod was "hooked" to the bottom of the ice layer and the under-ice water column depth was recorded. Temperature and DO profiles were collected as described above (Section A.2.2).

A.2.2.2 OPEN-WATER SEASON

The water column depth was measured using a handheld depth sounder from the surface of the water. Temperature and DO profiles were collected as described above (Section A.2.2).

The euphotic zone depth was estimated from the light attenuation in each lake using Secchi depth (D_s). The Secchi depth was measured at each site by lowering a standardized Secchi disk (20 cm diameter) on a metered line through the water column on the shaded side of the boat until it was no longer visible. The depth of disappearance was recorded. The disk was lowered further to ensure it was beyond visual perception, then slowly raised until it became visible. This depth was also recorded, and the two depths were averaged to calculate D_s.

The light extinction coefficient (k) was calculated using D_s (Equation 1), then used to calculate the 1% euphotic depth ($Z_{1\%}$; Equation 2; Parsons et al. 1984). The 1% euphotic zone depth is the depth of the water column to which 1% of the surface irradiance reaches and is often referred to as the compensation depth. There is net photosynthesis above this depth as the integrated gross water column photosynthetic production is equivalent to the integrated gross water column respiration.

Equation 1

$$\textit{Light extinction coefficient: } k\ (m^{-1}) = 1.7/D_s$$

Equation 2

$$\textit{Euphotic depth (1\%): } Z_{1\%}\ (m) = 4.6/k$$

A.2.3 WATER QUALITY

Water quality sampling was completed prior to measuring physical limnology metrics to avoid the potential for sediment suspension with near-lake bottom activity.

Two discrete water samples were collected from each site (surface and deep). Samples were collected from either 1 m below the ice-water interface (under-ice) or 1 m below the water surface (open-water) and approximately 1 to 2 m from the water-sediment interface (lake bottom). A 2.5 L Niskin water sampler was used during the under-ice season and a 5 L GoFlo water sampler was used during the open-water season. Each water sampler was acid washed prior to the sampling event. The water sampler was set to open and lowered through the water column to the desired depth before being triggered to close using a Teflon-coated messenger on the line.

Samples were collected from the water sampler and decanted in the field into clean sample bottles provided by ALS Laboratory Group (ALS; a certified laboratory under Canadian Association for Laboratory Accreditation). Examples of sample handling methods to reduce potential contamination included using new clean gloves when handling each sampling set, never contacting the bottle or cap with the spigot, and using the "clean hands-dirty hands" technique for filling the total mercury sample bottles. Cold temperatures during the under-ice sampling have the potential to freeze filters when filtering the dissolved samples. For the under-ice season only, an additional bottle of raw sample water was collected and processed back at Doris Camp (e.g., filtered and preserved) for the dissolved samples using clean syringe filters. For the open-water season, dissolved samples were filtered in the field.

All samples were kept cool and in the dark by placing them in coolers while in the field, using ice packs as appropriate. Samples were refrigerated at Doris Camp until the first available transport offsite. Sample analyses were provided by ALS in Burnaby, British Columbia (metal parameters analyses), and Edmonton, Alberta (inorganic parameters analyses). Reported detection limits (DLs) were provided by ALS (Table A.2-1).

TABLE A.2-1 WATER QUALITY VARIABLES AND REPORTED DETECTION LIMITS ANALYSED FOR THE HOPE BAY AQUATIC EFFECTS MONITORING PROGRAM, 2024

Variable	Units	Reported Detection Limits	Variable	Units	Reported Detection Limits
Physical Tests					
Conductivity	µS/cm	2.0	pH	pH	0.1
Total alkalinity (as $CaCO_3$)	mg/L	1.0	Total suspended solids	mg/L	1.0
Total hardness (as $CaCO_3$)	mg/L	0.5	Turbidity	NTU	0.1
Dissolved hardness (as $CaCO_3$)	mg/L	0.5			
Anions and Nutrients					
Total ammonia (as N)	mg/L	0.005	Nitrate (as N)	mg/L	0.005
Bromide	mg/L	0.050	Nitrite (as N)	mg/L	0.001
Chloride	mg/L	0.50	Total phosphorus	mg/L	0.002
Fluoride	mg/L	0.020	Sulphate (SO_4)	mg/L	0.30
Organic Carbon					
Dissolved organic carbon	mg/L	0.50	Total organic carbon	mg/L	0.50
Total Metals					
Aluminum	mg/L	0.0030	Niobium	mg/L	0.00010
Antimony	mg/L	0.000030	Phosphorus	mg/L	0.050
Arsenic	mg/L	0.000050	Potassium	mg/L	0.030
Barium	mg/L	0.00010	Rhenium	mg/L	0.0000050
Beryllium	mg/L	0.0000050	Rubidium	mg/L	0.000020
Bismuth	mg/L	0.000050	Selenium	mg/L	0.000050 to 0.00020
Boron	mg/L	0.010	Silicon	mg/L	0.10
Cadmium	mg/L	0.0000050	Silver	mg/L	0.0000050
Calcium	mg/L	0.020	Sodium	mg/L	0.020
Cesium	mg/L	0.0000050	Strontium	mg/L	0.00020
Chromium	mg/L	0.00050	Sulphur	mg/L	0.50
Cobalt	mg/L	0.000050	Tantalum	mg/L	0.00010
Copper	mg/L	0.00050	Tellurium	mg/L	0.000050
Gallium	mg/L	0.000050	Thallium	mg/L	0.0000050
Iron	mg/L	0.010	Thorium	mg/L	0.0000050
Lanthanum	mg/L	0.000050	Tin	mg/L	0.00020

Variable	Units	Reported Detection Limits	Variable	Units	Reported Detection Limits
Lead	mg/L	0.000050	Titanium	mg/L	0.00020
Lithium	mg/L	0.00050	Tungsten	mg/L	0.000010
Magnesium	mg/L	0.010	Uranium	mg/L	0.0000020
Manganese	mg/L	0.00020	Vanadium	mg/L	0.00020
Mercury	mg/L	0.0000001	Yttrium	mg/L	0.000010
Molybdenum	mg/L	0.000050	Zinc	mg/L	0.0030
Nickel	mg/L	0.00020	Zirconium	mg/L	0.000050
Dissolved Metals					
Manganese	mg/L	0.00020	Zinc	mg/L	0.0010

Notes:
$CaCO_3$ = calcium carbonate; mg/L = milligrams per litre; NTU = nephelometric turbidity unit(s); µS/cm = microSiemens per centimetre

A.2.3.1 QUALITY ASSURANCE AND QUALITY CONTROL

Field

The quality assurance/quality control (QA/QC) program for water quality sampling included the collection of replicates, blanks, and the use of chain of custody forms to track samples. Additional sample handling methods are outlined in Section A.2.3.

Field sample variability was accounted for by collecting replicate samples to represent 10% of the samples collected. One replicate was collected per sampling season. Replicate samples provide a measure of field sampling precision and environmental heterogeneity (BC MOE 2013). This precision is measured using relative percent difference (RPD; Equation 3) to compare the concentrations of a water quality variable between a primary (A) and replicate (B) sample.

Equation 3

$$RPD = 2*|A-B|/(A+B)*100\%$$

RPDs were calculated for specific water quality variables if at least one replicate concentration was greater than five times the analytical DL (BC MOE 2013). RPD values >20% indicated a potential issue (caution interpreting results) and values >50% indicated an issue (most likely sample contamination or lack of sample representativeness) that required follow-up (e.g., determination of cause, effect on sample data).

One travel blank, one field blank, and one equipment blank were collected or processed during each trip (~25% of total samples) and submitted with the water samples as part of the QA/QC program. These blanks were used to identify potential sources of contamination to the field samples. The travel blank was provided by ALS as pre-filled sample bottles and remained closed throughout the entire sampling effort. The travel blank was transported with the other sample bottles for each day of sampling. The field blank was collected in the field using distilled, deionized water and handled as a regular sample. The equipment blank was collected prior to any water samples being collected in the water sampler by rinsing the water sampler three times with distilled, deionized water to remove acid residue. Then, the water sampler was again filled with distilled, deionized water and collected with the same handling methods as a regular sample.

Laboratory

The laboratory QA/QC program included reviews of maximum holding times, and the use of method blanks, laboratory replicates, certified reference materials, internal reference materials, laboratory control samples, matrix spikes, and calibration verification standards. ALS has set data quality objectives (DQOs) for QA/QC samples with acceptable limits for sample recovery, precision, and accuracy. When DQOs are not met, ALS flags the sample for follow-up or adjusts the DL as required.

A.2.4 PHYTOPLANKTON BIOMASS

Chlorophyll *a* (chl *a*) samples were collected in opaque, clean, 1-L sample bottles that were rinsed with surface water at each site. For each chl *a* sample, the water sampler was lowered to approximately 1 m below the water surface and triggered to close with a messenger. Once retrieved, a subsample was decanted from the sampler into the sample bottle.

All samples were kept cool and in the dark by being placed in coolers while in the field, using ice packs as appropriate. Samples were brought to Doris Camp and were filtered using gentle vacuum filtration (hand pump). The chl *a* samples were filtered onto 47 mm diameter, 0.45 μm pore size nitrocellulose membrane filters until there was an observed colour change on the filter or the full litre of water was filtered. The filters were folded in half using forceps and placed into a black plastic tube to prevent light penetration. The filters were kept frozen and sent to ALS in Burnaby, BC, for analysis by way of ALS Edmonton to facilitate the samples staying frozen.

A.2.4.1 Quality Assurance and Quality Control

The field QA/QC program for chl *a* sampling included the collection of replicates and the use of chain of custody forms to track samples.

The laboratory QA/QC program included the use of method blanks and laboratory control samples. ALS has set DQOs for QA/QC samples with acceptable limits for sample recovery, precision, and accuracy. When DQOs are not met, ALS flags the sample for follow-up or adjusts the DL as required.

A.3 2024 AEMP DATA RESULTS

A.3.1 ICE THICKNESS

Ice thickness data (Table A.3-1) is presented.

TABLE A.3-1 ICE THICKNESS MEASUREMENTS IN MONITORED LAKES FOR THE HOPE BAY AQUATIC EFFECTS MONITORING PROGRAM, 2024

Lake	Sampling Date	Ice Thickness (m)
Reference Lake B	12 April 2024	1.79
Windy lake	13 April 2024	1.70
Patch Lake	13 April 2024	1.63
Imniagut Lake	13 April 2024	1.70
Doris Lake	14 April 2024	1.68
Ogama Lake	14 April 2024	1.73
Little Roberts Lake	14 April 2024	1.70
Glenn Lake	14 April 2024	1.65
P.O. Lake	14 April 2024	1.80

Note:
m = metres

A.3.2 PHYSICAL LIMNOLOGY

Physical limnology data for under-ice (Table A.3-2), open-water (Table A.3-3), and Secchi depth sampling with calculated euphotic depths (Table A.3-4) are presented.

TABLE A.3-2 UNDER-ICE TEMPERATURE AND DISSOLVED OXYGEN PROFILES IN MONITORED LAKES FOR THE HOPE BAY AQUATIC EFFECTS MONITORING PROGRAM, 2024

Reference B - April 12, 2024			
Depth (m)	**Temperature (°C)**	**Dissolved Oxygen (mg/L)**	**Dissolved Oxygen Saturation (%)**
3	1.5	13.46	96.1
3.5	1.4	13.34	94.2
4	1.5	13.21	94.2
4.5	1.6	12.63	90.6
5	1.9	9.45	68.1
5.5	1.9	9.11	65.7
6	2	8.25	59.6
6.5	2.1	7.25	52.8

Reference B - April 12, 2024			
Depth (m)	**Temperature (°C)**	**Dissolved Oxygen (mg/L)**	**Dissolved Oxygen Saturation (%)**
7	2.2	5.84	42.4
7.5	2.3	4.59	33.6
8	2.4	3.91	28.6
8.5	2.6	3.4	25
9	2.7	3.1	22.8

Windy Lake - April 13, 2024			
Depth (m)	**Temperature (°C)**	**Dissolved Oxygen (mg/L)**	**Dissolved Oxygen Saturation (%)**
3	0.7	14.82	103.4
3.5	0.5	14.84	103.2
4	0.5	14.84	102.9
4.5	0.4	14.87	102.9
5	0.4	14.85	102.7
5.5	0.4	14.84	102.6
6	0.4	14.81	102.4
6.5	0.4	14.75	102
7	0.4	14.73	101.9
7.5	0.4	14.71	101.7
8	0.4	14.66	101.4
8.5	0.5	14.56	100.1
9	0.5	14.5	100.1
9.5	0.5	14.43	100.1
10	0.6	14.32	99.6
11	0.7	14.12	98.4
12	8	13.82	96.7
13	1	13.52	95.1
14	1.1	13.14	92.7
15	1.4	12.66	90
16	1.7	10.84	77.7
17	2	8.2	59.3

Patch Lake - April 13, 2024			
Depth (m)	**Temperature (°C)**	**Dissolved Oxygen (mg/L)**	**Dissolved Oxygen Saturation (%)**
2.5	1.5	12.39	88.4
3	1.5	12.34	88
3.5	1.5	12.2	87
4	1.5	12.2	87
4.5	1.5	12.13	86.5
5	1.5	12.04	85.8
5.5	1.5	11.88	84.7
6	1.5	11.8	84.1
6.5	1.6	11.29	80.7
7	1.6	11.41	81.6

Doris Lake - April 14, 2024			
Depth (m)	**Temperature (°C)**	**Dissolved Oxygen (mg/L)**	**Dissolved Oxygen Saturation (%)**
3	1.9	13.12	94.4
3.5	1.3	13.41	95.1
4	1	13.57	95.5
4.5	0.9	13.64	95.7
5	0.8	13.71	95.8
5.5	0.8	13.71	95.9
6	0.8	13.71	95.9
6.5	0.7	13.69	95.5
7	0.7	13.39	93.4
7.5	0.7	13.14	91.6
8	0.8	12.94	90.5
8.5	0.8	12.36	86.4
9	0.8	11.78	82.4
9.5	0.9	11.43	80.2
10	0.9	10.9	76.4
11	1	10.12	71.2
12	1.2	9.15	64.5

Notes:
% = percent; °C = degree Celsius; m = metres; mg/L = milligrams per litre

TABLE A.3-3 OPEN-WATER TEMPERATURE AND DISSOLVED OXYGEN PROFILES IN MONITORED LAKES FOR THE HOPE BAY AQUATIC EFFECTS MONITORING PROGRAM, 2024

Patch Lake - August 12, 2024			
Depth (m)	**Temperature (°C)**	**Dissolved Oxygen (mg/L)**	**Dissolved Oxygen Saturation (%)**
0.5	15.2	10.1	100.5
1	15.2	10.09	100.5
1.5	15.1	10.11	100.4
2	15.1	10.1	100.4
2.5	15.1	10.09	100.3
3	15.1	10.08	100.2
3.5	15.1	10.07	100.1
4	15.1	10.07	100
4.5	15.1	10.07	100
5	15.1	10.06	99.9
5.5	15.1	10.04	99.8

Doris Lake - August 8, 2024			
Depth (m)	**Temperature (°C)**	**Dissolved Oxygen (mg/L)**	**Dissolved Oxygen Saturation (%)**
1	12.8	11.23	106.1
2	12.7	11.2	105.5
3	12.6	11.16	104.9
4	12.3	11.01	103
5	11.9	10.77	99.9
6	11.3	10.05	92
7	11.2	9.77	89
8	11.1	9.67	87.9
9	11	9.41	85.3
10	11	9.26	84.1
11	11	9.17	83.1
12	10.9	8.67	78.5
13	10.9	8.24	74.7

Reference B Lake - August 10, 2024			
Depth (m)	**Temperature (°C)**	**Dissolved Oxygen (mg/L)**	**Dissolved Oxygen Saturation (%)**
0.5	14.5	10.67	104.4
1.0	14.4	10.67	104.4
1.5	14.4	10.66	104.4
2.0	14.4	10.66	104.3
2.5	14.4	10.65	104.2
3.0	14.4	10.64	104.1
3.5	14.4	10.63	104.1
4.0	14.4	10.65	104
4.5	14.4	10.62	103.9
5.0	14.3	10.64	103.9
5.5	14.3	10.63	103.8
6.0	14.3	10.63	103.8
6.5	14.3	10.62	103.7
7.0	14.3	10.6	103.5
7.5	14.3	10.6	103.6
8.0	14.3	10.59	103.5
8.5	14.3	10.58	103.4
9.0	14.2	10.61	103.3
9.5	13	10.6	100.7
10.0	12.7	10.36	97
10.5	12.5	10.36	97.2

Windy Lake - August 9, 2024			
Depth (m)	**Temperature (°C)**	**Dissolved Oxygen (mg/L)**	**Dissolved Oxygen Saturation (%)**
1	12.7	10.86	102.3
2	12.7	10.85	102.3
3	12.7	10.86	102.1
4	12.6	10.85	102
5	12.6	10.83	101.8
6	12.6	10.82	101.7

Windy Lake - August 9, 2024			
Depth (m)	**Temperature (°C)**	**Dissolved Oxygen (mg/L)**	**Dissolved Oxygen Saturation (%)**
7	12.4	10.81	101.3
8	12.3	10.82	100.9
9	12.1	10.82	100.5
10	11.9	10.81	100.1
11	11.8	10.82	99.9
12	11.7	10.78	99.4
13	11.5	10.76	98.7
14	11.4	10.75	98.2
15	11	10.69	97
16	10.9	10.57	95.6
17	10.8	10.49	94.7

TABLE A.3-4 SECCHI DEPTHS AND EUPHOTIC ZONE DEPTHS FOR THE HOPE BAY AQUATIC EFFECTS MONITORING PROGRAM, 2024

Lake	Sampling Date	Lake Depth (m)	Secchi Depth (m)	Euphotic Zone Depth 1% Light Level (m)
Patch	12-Aug-24	6.875	1.8	4.87
Doris	8-Aug-24	14	2.75	7.44
Reference B	10-Aug-24	10.6	7.55	20.43*
Windy	9-Aug-24	18	4.3	11.64

Notes:
* Indicates that the euphotic zone extended to the bottom of the water column.
% = percent; m = metres

A.3.3 WATER QUALITY

Water quality sampling results are presented (Table A.3-5). Results for samples that exceed the applicable benchmark (Tables 2.2-2 to 2.2-4 in main report) are highlighted.

TABLE A.3-5 WATER QUALITY DATA FOR THE HOPE BAY AQUATIC EFFECTS MONITORING PROGRAM, 2024

Lake		Reference Lake B				Doris Lake			
Sampling Date		12-Apr-2024		10-Aug-2024		14-Apr-2024		08-Aug-2024	
Sampling Depth (m)		3 (Surface)	9 (Deep)	1 (Surface)	9 (Deep)	3 (Surface)	10 (Deep)	1 (Surface)	11 (Deep)
Replicate		1	1	1	1	1	1	1	1
ALS Sample ID	**Units**	EO2402792-001	EO2402792-002	EO2406953-001	EO2406953-002	EO2402792-003	EO2402792-004	EO2406953-003	EO2406953-004
Physical Tests									
Conductivity	µS/cm	73.1	73.2	48.7	47.7	260	261	216	216
Total alkalinity (as $CaCO_3$)	mg/L	22.4	19.4	11.8	11.7	35.5	35.3	29.3	29.7
Dissolved hardness (as $CaCO_3$)	mg/L	21.3	22.6	13.7	13.7	48.9	48.8	41.9	42.3
Total hardness (as $CaCO_3$)	mg/L	23.8	24.2	14.4	14.5	58.2	54.6	43.4	44.6
Total suspended solids	mg/L	<1.5	<1.5	<1.0	<1.0	3.5	<1.5	4.6	6
Turbidity	NTU	0.16	0.62	0.24	0.28	6.37	2.88	5.09	8.5
pH	pH units	6.88	6.49	7.24	7.25	7.26	7.04	7.59	7.27
Anions and Nutrients									
Total ammonia (as N)	mg/L	0.0279	0.0227	<0.0050	<0.0050	0.0147	0.0241	<0.0050	0.005
Bromide	mg/L	<0.050	<0.050	<0.050	<0.050	0.209	0.197	0.158	0.162
Chloride	mg/L	10.1	9.19	6.86	6.72	61.3	60.3	50	50
Fluoride	mg/L	0.028	0.023	0.022	0.021	0.058	0.056	0.049	0.048
Nitrate (as N)	mg/L	0.029	0.163	<0.0050	<0.0050	<0.0050	0.0582	0.005	<0.0050
Nitrite (as N)	mg/L	0.0012	<0.0010	<0.0010	<0.0010	<0.0010	0.0014	<0.0010	<0.0010
Total phosphorous	mg/L	0.0037	0.0093	0.0043	0.0035	0.0281	0.0317	0.0276	0.0396
Sulfate (as SO_4)	mg/L	2.43	2.1	1.64	1.52	3.21	3.12	2.64	2.47
Organic / Inorganic Carbon									
Dissolved organic carbon	mg/L	4.64	4.06	2.81	2.86	7.85	7.62	5.67	5.56
Total organic carbon	mg/L	6.28	4.18	2.88	2.88	8.36	8.24	5.76	5.96
Total Metals									
Aluminum	mg/L	0.0119	0.0075	0.0088	0.0074	0.0091	0.0105	0.0231	0.0866
Antimony	mg/L	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030
Arsenic	mg/L	0.000116	0.000116	0.00008	0.000077	0.000286	0.000276	0.000281	0.000361
Barium	mg/L	0.00248	0.00374	0.00138	0.00134	0.00267	0.00269	0.00243	0.00342
Beryllium	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Bismuth	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050

Lake		Reference Lake B				Doris Lake			
Sampling Date		12-Apr-2024		10-Aug-2024		14-Apr-2024		08-Aug-2024	
Sampling Depth (m)		3 (Surface)	9 (Deep)	1 (Surface)	9 (Deep)	3 (Surface)	10 (Deep)	1 (Surface)	11 (Deep)
Replicate		1	1	1	1	1	1	1	1
ALS Sample ID	Units	EO2402792-001	EO2402792-002	EO2406953-001	EO2406953-002	EO2402792-003	EO2402792-004	EO2406953-003	EO2406953-004
Total Metals *(cont'd)*									
Boron	mg/L	<0.010	<0.010	<0.010	<0.010	0.022	0.022	0.019	0.02
Cadmium	mg/L	<0.0000050	0.0000051	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium	mg/L	6.03	6.19	3.52	3.54	10.7	10.5	7.87	8.13
Cesium	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Chromium	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt	mg/L	<0.000050	0.0011	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000073
Copper	mg/L	0.00112	0.00091	0.00114	0.0008	0.00195	0.00187	0.00176	0.0017
Gallium	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Iron	mg/L	0.013	0.525	0.028	0.026	0.016	0.021	0.062	0.249
Lanthanum	mg/L	0.000052	0.000084	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00011
Lead	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium	mg/L	0.0006	0.00057	<0.00050	<0.00050	0.00325	0.0029	0.00291	0.00307
Magnesium	mg/L	2.13	2.12	1.37	1.38	7.64	6.9	5.78	5.89
Manganese	mg/L	0.00176	0.25	0.00193	0.00176	0.00224	0.00544	0.018	0.0859
Mercury	ng/L	0.49	0.57	0.52	0.46	0.58	0.59	0.78	0.69
Molybdenum	mg/L	0.000071	<0.000050	0.000062	0.000066	0.000279	0.000225	0.000225	0.000238
Nickel	mg/L	0.00025	0.00038	0.00027	0.00027	0.0008	0.00064	0.00052	0.0009
Niobium	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Phosphorus	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium	mg/L	0.748	0.74	0.482	0.483	2.56	2.51	2.02	2.15
Rhenium	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Rubidium	mg/L	0.00121	0.00133	0.000779	0.000763	0.00155	0.00151	0.00129	0.00143
Selenium	mg/L	<0.00020	<0.00020	<0.000050	<0.000050	<0.00020	<0.00020	<0.000050	<0.000050
Silicon	mg/L	0.38	1.35	0.14	0.14	2.02	2.12	1.66	1.85
Silver	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Sodium	mg/L	6.1	5.65	4.05	4.08	35.1	31.8	27	27
Strontium	mg/L	0.026	0.0276	0.0168	0.017	0.0416	0.0404	0.0345	0.0351

Lake		Reference Lake B				Doris Lake			
Sampling Date		**12-Apr-2024**		**10-Aug-2024**		**14-Apr-2024**		**08-Aug-2024**	
Sampling Depth (m)		**3 (Surface)**	**9 (Deep)**	**1 (Surface)**	**9 (Deep)**	**3 (Surface)**	**10 (Deep)**	**1 (Surface)**	**11 (Deep)**
Replicate		**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
ALS Sample ID	**Units**	**EO2402792-001**	**EO2402792-002**	**EO2406953-001**	**EO2406953-002**	**EO2402792-003**	**EO2402792-004**	**EO2406953-003**	**EO2406953-004**
Total Metals *(cont'd)*									
Sulfur	mg/L	1.03	0.88	0.68	0.68	1.42	1.36	1.14	1.11
Tantalum	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tellurium	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Thallium	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Thorium	mg/L	0.0000078	<0.0000050	0.0000071	0.0000055	0.0000074	0.0000194	0.0000126	0.0000335
Tin	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Titanium	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00036	0.00224
Tungsten	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	0.000079	<0.000010	<0.000010	0.000011
Uranium	mg/L	0.0000706	0.0000401	0.000057	0.0000529	0.0000485	0.0000434	0.0000387	0.0000462
Vanadium	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	0.00032
Yttrium	mg/L	0.000019	0.000023	0.000011	0.00001	0.000026	0.000026	0.000019	0.000039
Zinc	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.000059	0.000054	<0.000050	0.000063
Dissolved Metals									
Manganese	mg/L	0.00101	0.188	0.00086	0.00084	0.00037	0.00148	0.00078	0.0418
Zinc	mg/L	0.0016	0.0018	<0.0010	<0.0010	0.0016	<0.0010	<0.0010	<0.0010

Lake		Patch Lake					Windy Lake				
Sampling Date		**13-Apr-2024**		**12-Aug-2024**			**13-Apr-2024**			**09-Aug-2024**	
Sampling Depth (m)		**3 (Surface)**	**6 (Deep)**	**1 (Surface)**	**1 (Surface)**	**5 (Deep)**	**3 (Surface)**	**3 (Surface)**	**16 (Deep)**	**1 (Surface)**	**16 (Deep)**
Replicate		**1**	**1**	**1**	**2**	**1**	**1**	**2**	**1**	**1**	**1**
ALS Sample ID	**Units**	**EO2402792-005**	**EO2402792-006**	**EO2406953-005**	**EO2406953-009**	**EO2406953-006**	**EO2402792-007**	**EO2402792-009**	**EO2402792-008**	**EO2406953-007**	**EO2406953-008**
Physical Tests											
Conductivity	μS/cm	421	442	272	272	271	476	475	470	411	411
Total alkalinity (as $CaCO_3$)	mg/L	57.4	59.4	37	36.6	37.3	59.9	59.2	58	51.6	51.7
Dissolved hardness (as $CaCO_3$)	mg/L	78.1	81.7	53	51.3	52.8	81.8	80.7	78.6	73.6	72.5
Total hardness (as $CaCO_3$)	mg/L	88	92.5	55.8	55.8	55.9	90.5	90.8	88.9	79.7	79.4
Total suspended solids	mg/L	<1.5	<1.5	<1.0	1.4	<1.0	<1.5	<1.5	<1.5	<1.0	<1.0
Turbidity	NTU	1.51	2.29	1.55	1.84	1.6	0.1	0.12	0.33	0.87	0.69
pH	pH units	7.19	7.13	7.73	7.73	7.75	7.69	7.7	7.37	7.84	7.84
Anions and Nutrients											
Total ammonia (as N)	mg/L	0.0159	0.0183	<0.0050	<0.0050	<0.0050	0.0139	0.0099	0.0101	<0.0050	<0.0050
Bromide	mg/L	0.315	0.338	0.192	0.194	0.195	0.425	0.439	0.418	0.356	0.355
Chloride	mg/L	99.3	104	63.9	63.1	63.5	112	112	110	94.7	95.8
Fluoride	mg/L	0.086	0.087	0.062	0.058	0.06	0.087	0.086	0.08	0.07	0.072
Nitrate (as N)	mg/L	0.0418	0.0393	<0.0050	<0.0050	<0.0050	0.0092	0.0104	0.0604	<0.0050	<0.0050
Nitrite (as N)	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total phosphorous	mg/L	0.0054	0.0058	0.0049	0.0063	0.005	0.0028	0.0045	0.0033	0.0032	0.0036
Sulfate (as SO_4)	mg/L	4.26	4.5	2.62	2.58	2.6	10.1	10.1	9.58	8.3	8.39
Organic / Inorganic Carbon											
Dissolved organic carbon	mg/L	7.99	8.34	4.73	4.8	4.59	2.82	2.63	2.41	2.02	2.04
Total organic carbon	mg/L	8.42	8.38	4.81	4.81	4.63	2.94	2.35	2.39	1.94	1.94
Total Metals											
Aluminum	mg/L	0.0926	0.127	0.0951	0.103	0.0989	0.0052	0.0054	0.0162	0.0475	0.0515
Antimony	mg/L	0.000032	0.000034	<0.000030	<0.000030	<0.000030	0.000077	0.000075	0.000068	0.000073	0.000073
Arsenic	mg/L	0.000337	0.000345	0.000264	0.000263	0.00026	0.000237	0.000232	0.000184	0.000234	0.000233
Barium	mg/L	0.00447	0.00512	0.00283	0.00284	0.00276	0.00265	0.00265	0.00286	0.00258	0.00258
Beryllium	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Bismuth	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050

Lake		Patch Lake					Windy Lake				
Sampling Date		13-Apr-2024		12-Aug-2024			13-Apr-2024			09-Aug-2024	
Sampling Depth (m)		3 (Surface)	6 (Deep)	1 (Surface)	1 (Surface)	5 (Deep)	3 (Surface)	3 (Surface)	16 (Deep)	1 (Surface)	16 (Deep)
Replicate		1	1	1	2	1	1	2	1	1	1
ALS Sample ID	Units	EO2402792-005	EO2402792-006	EO2406953-005	EO2406953-009	EO2406953-006	EO2402792-007	EO2402792-009	EO2402792-008	EO2406953-007	EO2406953-008
Total Metals *(cont'd)*											
Boron	mg/L	0.035	0.038	0.024	0.026	0.025	0.05	0.05	0.048	0.047	0.047
Cadmium	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium	mg/L	15.8	16.1	9.7	9.64	9.59	16.3	16.1	15.8	14.1	14
Cesium	mg/L	0.0000058	0.000008	0.0000057	0.000007	0.0000063	0.0000054	0.0000056	0.0000057	0.0000059	0.000007
Chromium	mg/L	<0.00050	<0.00050	<0.00050	0.00059	0.00068	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Copper	mg/L	0.00189	0.00194	0.00137	0.00138	0.0014	0.00097	0.00099	0.00092	0.0012	0.00102
Gallium	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Iron	mg/L	0.07	0.108	0.069	0.072	0.072	<0.010	<0.010	<0.010	0.045	0.05
Lanthanum	mg/L	0.000111	0.000152	0.000092	0.000095	0.000095	<0.000050	<0.000050	<0.000050	0.000063	0.000068
Lead	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium	mg/L	0.00509	0.00541	0.00401	0.00414	0.00406	0.00286	0.00294	0.00273	0.00304	0.00301
Magnesium	mg/L	11.8	12.7	7.66	7.7	7.75	12.1	12.3	12	10.8	10.8
Manganese	mg/L	0.007	0.013	0.00865	0.0088	0.00892	0.00025	0.00044	0.00138	0.00204	0.00244
Mercury	ng/L	0.25	0.4	0.24	0.28	0.29	0.14	0.27	0.18	0.16	0.22
Molybdenum	mg/L	0.000315	0.000316	0.00026	0.000268	0.00028	0.000705	0.000699	0.000578	0.000666	0.000677
Nickel	mg/L	0.00096	0.00103	0.00068	0.0007	0.0007	0.00024	0.00024	0.00021	0.00037	0.00036
Niobium	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Phosphorus	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium	mg/L	3.87	4.04	2.69	2.68	2.66	4.58	4.6	4.41	4.24	4.28
Rhenium	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Rubidium	mg/L	0.00211	0.00222	0.00163	0.00162	0.00162	0.0021	0.00212	0.00201	0.00206	0.00205
Selenium	mg/L	<0.00020	<0.00020	<0.000050	<0.000050	<0.000050	<0.00020	<0.00020	<0.00020	<0.000050	<0.000050
Silicon	mg/L	1.14	1.27	0.48	0.5	0.49	0.39	0.39	0.73	0.37	0.39
Silver	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Sodium	mg/L	53.4	57.4	35.3	35.2	35.4	63.8	64.6	62.5	56.3	55.6
Strontium	mg/L	0.0714	0.0732	0.0473	0.0478	0.0474	0.066	0.0661	0.0648	0.0631	0.0624

Lake		Patch Lake					Windy Lake				
Sampling Date		**13-Apr-2024**		**12-Aug-2024**			**13-Apr-2024**			**09-Aug-2024**	
Sampling Depth (m)		**3 (Surface)**	**6 (Deep)**	**1 (Surface)**	**1 (Surface)**	**5 (Deep)**	**3 (Surface)**	**3 (Surface)**	**16 (Deep)**	**1 (Surface)**	**16 (Deep)**
Replicate		**1**	**1**	**1**	**2**	**1**	**1**	**2**	**1**	**1**	**1**
ALS Sample ID	**Units**	**EO2402792-005**	**EO2402792-006**	**EO2406953-005**	**EO2406953-009**	**EO2406953-006**	**EO2402792-007**	**EO2402792-009**	**EO2402792-008**	**EO2406953-007**	**EO2406953-008**
Total Metals *(cont'd)*											
Sulfur	mg/L	1.8	1.86	1.15	1.18	1.16	3.89	3.95	3.65	3.43	3.43
Tantalum	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tellurium	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Thallium	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Thorium	mg/L	0.0000278	0.0000331	0.0000211	0.0000274	0.0000226	<0.0000050	<0.0000050	0.000008	0.000015	0.0000163
Tin	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Titanium	mg/L	0.00153	0.00274	0.00276	0.00301	0.00266	<0.00020	<0.00020	0.00041	0.00224	0.0025
Tungsten	mg/L	0.00003	0.000031	0.00002	0.000022	0.000021	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Uranium	mg/L	0.0000662	0.0000705	0.0000678	0.0000668	0.0000678	0.00019	0.00019	0.000132	0.000186	0.000182
Vanadium	mg/L	<0.00020	0.00021	<0.00020	0.00021	0.00022	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Yttrium	mg/L	0.000041	0.00005	0.000027	0.000027	0.000027	<0.000010	<0.000010	<0.000010	0.000016	0.000017
Zinc	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	0.0033	<0.0030	0.0032	<0.0030	<0.0030	<0.0030
Zirconium	mg/L	0.00007	0.000137	<0.000050	0.000055	0.000052	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Dissolved Metals											
Manganese	mg/L	0.00142	0.00303	0.00036	0.00034	0.00041	<0.00020	0.00029	0.00137	0.00047	0.00026
Zinc	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0012	0.0038	<0.0010	<0.0010	<0.0010

Note:
Gray shading indicates value was greater than the benchmark (see Tables 2.2-2 to 2.2-4 in the main report).
< = greater than; μS/cm = microSiemens per centimetre; mg/L = milligrams per litre; NTU = nephelometric turbidity unit(s)

A.3.3.1 QUALITY ASSURANCE/QUALITY CONTROL RESULTS

Field QA/QC

Field replicates were collected at Windy Lake (surface) during the under-ice season and Patch Lake (surface) during the open-water season in 2024. The RPDs were calculated for 48 variables (Table A.3-6). No variable had an RPD greater than 20%, indicating that the replicate sample results were an acceptable range of precision for aqueous samples. This suggests that there was no sample contamination and that samples had an acceptable environmental homogeneity.

A subset of variables was detected in the under-ice equipment and field blank, including conductivity, nitrate, total molybdenum, total zinc, and dissolved zinc (Table A.3-7). All detections except for nitrate were less than five times the DL, which is the minimum requirement before a data issue is assumed (BC MOE 2013). Nitrate was observed in the equipment blank collected in April at a concentration greater than five times the DL (Table A.3-7). However, the data from April is still considered reliable and data from all three blanks indicated that there was no evidence to support the hypothesis of sample contamination from field handling, storage, and transportation in 2024. Data were considered acceptable for use in the AEMP evaluations.

Laboratory QA/QC

Holding time recommendations were exceeded for pH, turbidity, total suspended solids, nitrate, and nitrite during one or both sampling seasons (Table A.3-8). Recommended hold times for these variables range from 15 minutes for pH to 7 days for total suspended solids, with the remaining variables having a 3-day recommended holding time. These recommended holding times are often unattainable when sampling in remote environments. Data are reviewed for extreme outliers during data assessment and any applicable variables are compared to known DQO exceedances during investigations of cause.

The laboratory control sample for total silicon in ALS work order EO2402598 did not meet ALS's DQOs. The only sample contained in this work order was the Equipment Blank, and the results for total silicon were below detection limit. Additionally, the laboratory control sample was marginally exceeded (by < 10% absolute) for < 10% of analytes and is considered acceptable as per Canadian Council of Ministers of the Environment. There is no concern of potential contamination during analysis for total silicon.

TABLE A.3-6 RELATIVE PERCENT DIFFERENCES FOR DUPLICATE WATER QUALITY SAMPLES FOR THE HOPE BAY AQUATIC EFFECTS MONITORING PROGRAM, 2024

Lake	**Windy Lake**			**Patch Lake**		
Date Sampled	**13-Apr-2024**	**13-Apr-2024**	**RPD**	**12-Aug-2024**	**12-Aug-2024**	**RPD**
Sampling Depth (m)	**3**	**3**		**1**	**1**	
Replicate	**1**	**2**		**1**	**2**	
ALS Sample ID	**EO2402792-007**	**EO2402792-009**		**EO2406953-005**	**EO2406953-009**	
Analyte	**Results**	**Results**		**Results**	**Results**	
Physical Tests						
Conductivity	476	475	0.2	272	272	0.0
Total alkalinity (as $CaCO_3$)	59.9	59.2	1.2	37	36.6	1.1
Dissolved hardness (as $CaCO_3$)	81.8	80.7	1.4	53	51.3	3.3
Total hardness (as $CaCO_3$)	90.5	90.8	0.3	55.8	55.8	0.0
Total suspended solids	<1.5	<1.5	-	<1.0	1.4	-
Turbidity	0.1	0.12	-	1.55	1.84	17.1
pH	7.69	7.7	0.1	7.73	7.73	0.0
Anions and Nutrients						
Ammonia, total (as N)	0.0139	0.0099	-	<0.0050	<0.0050	-
Bromide	0.425	0.439	3.2	0.192	0.194	-
Chloride	112	112	0.0	63.9	63.1	1.3
Fluoride	0.087	0.086	-	0.062	0.058	-
Nitrate (as N)	0.0092	0.0104	-	<0.0050	<0.0050	-
Nitrite (as N)	<0.0010	<0.0010	-	<0.0010	<0.0010	-
Phosphorus, total	0.0028	0.0045	-	0.0049	0.0063	-
Sulfate (as SO_4)	10.1	10.1	0.0	2.62	2.58	1.5

Lake	Windy Lake			Patch Lake		
Date Sampled	13-Apr-2024	13-Apr-2024	RPD	12-Aug-2024	12-Aug-2024	RPD
Sampling Depth (m)	3	3		1	1	
Replicate	1	2		1	2	
ALS Sample ID	EO2402792-007	EO2402792-009		EO2406953-005	EO2406953-009	
Analyte	Results	Results		Results	Results	
Organic/Inorganic Carbon						
Dissolved Organic Carbon	2.82	2.63	7.0	4.73	4.8	1.5
Total Organic Carbon	2.94	2.35	-	4.81	4.81	0.0
Total Metals						
Aluminum	0.0052	0.0054	-	0.0951	0.103	8.0
Antimony	0.000077	0.000075	-	<0.000030	<0.000030	-
Arsenic	0.000237	0.000232	-	0.000264	0.000263	0.4
Barium	0.00265	0.00265	0.0	0.00283	0.00284	0.4
Beryllium	<0.0000050	<0.0000050	-	<0.0000050	<0.0000050	-
Bismuth	<0.000050	<0.000050	-	<0.000050	<0.000050	-
Boron	0.05	0.05	0.0	0.024	0.026	-
Cadmium	<0.0000050	<0.0000050	-	<0.0000050	<0.0000050	-
Calcium	16.3	16.1	1.2	9.7	9.64	0.6
Cesium	0.0000054	0.0000056	-	0.0000057	0.000007	-
Chromium	<0.00050	<0.00050	-	<0.00050	0.00059	-
Cobalt	<0.000050	<0.000050	-	<0.000050	<0.000050	-
Copper	0.00097	0.00099	-	0.00137	0.00138	-
Gallium	<0.000050	<0.000050	-	<0.000050	<0.000050	-
Iron	<0.010	<0.010	-	0.069	0.072	4.3

Lake	Windy Lake			Patch Lake		
Date Sampled	**13-Apr-2024**	**13-Apr-2024**	**RPD**	**12-Aug-2024**	**12-Aug-2024**	**RPD**
Sampling Depth (m)	**3**	**3**		**1**	**1**	
Replicate	**1**	**2**		**1**	**2**	
ALS Sample ID	**EO2402792-007**	**EO2402792-009**		**EO2406953-005**	**EO2406953-009**	
Analyte	**Results**	**Results**		**Results**	**Results**	
Total Metals *(cont'd)*						
Lanthanum	<0.000050	<0.000050	-	0.000092	0.000095	-
Lead	<0.000050	<0.000050	-	<0.000050	<0.000050	-
Lithium	0.00286	0.00294	2.8	0.00401	0.00414	3.2
Magnesium	12.1	12.3	1.6	7.66	7.7	0.5
Manganese	0.00025	0.00044	-	0.00865	0.0088	1.7
Mercury	0.14	0.27	-	0.24	0.28	-
Molybdenum	0.000705	0.000699	0.9	0.00026	0.000268	3.0
Nickel	0.00024	0.00024	-	0.00068	0.0007	-
Niobium	<0.00010	<0.00010	-	<0.00010	<0.00010	-
Phosphorus	<0.050	<0.050	-	<0.050	<0.050	-
Potassium	4.58	4.6	0.4	2.69	2.68	0.4
Rhenium	<0.0000050	<0.0000050	-	<0.0000050	<0.0000050	-
Rubidium	0.0021	0.00212	0.9	0.00163	0.00162	0.6
Selenium	<0.00020	<0.00020	-	<0.000050	<0.000050	-
Silicon	0.39	0.39	-	0.48	0.5	-
Silver	<0.0000050	<0.0000050	-	<0.0000050	<0.0000050	-
Sodium	63.8	64.6	1.2	35.3	35.2	0.3
Strontium	0.066	0.0661	0.2	0.0473	0.0478	1.1

Lake	Windy Lake			Patch Lake		
Date Sampled	**13-Apr-2024**	**13-Apr-2024**	**RPD**	**12-Aug-2024**	**12-Aug-2024**	**RPD**
Sampling Depth (m)	**3**	**3**		**1**	**1**	
Replicate	**1**	**2**		**1**	**2**	
ALS Sample ID	**EO2402792-007**	**EO2402792-009**		**EO2406953-005**	**EO2406953-009**	
Analyte	**Results**	**Results**		**Results**	**Results**	
Total Metals *(cont'd)*						
Sulfur	3.89	3.95	1.5	1.15	1.18	-
Tantalum	<0.00010	<0.00010	-	<0.00010	<0.00010	-
Tellurium	<0.000050	<0.000050	-	<0.000050	<0.000050	-
Thallium	<0.0000050	<0.0000050	-	<0.0000050	<0.0000050	-
Thorium	<0.0000050	<0.0000050	-	0.0000211	0.0000274	-
Tin	<0.00020	<0.00020	-	<0.00020	<0.00020	-
Titanium	<0.00020	<0.00020	-	0.00276	0.00301	8.7
Tungsten	<0.000010	<0.000010	-	0.00002	0.000022	-
Uranium	0.00019	0.00019	0.0	0.0000678	0.0000668	1.5
Vanadium	<0.00020	<0.00020	-	<0.00020	0.00021	-
Yttrium	<0.000010	<0.000010	-	0.000027	0.000027	-
Zinc	<0.0030	0.0032	-	<0.0030	<0.0030	-
Zirconium	<0.000050	<0.000050	-	<0.000050	0.000055	-
Dissolved Metals						
Manganese	<0.00020	0.00029	-	0.00036	0.00034	-
Zinc	0.0012	0.0038	-	<0.0010	<0.0010	-

Notes:
Dashes (-) = RPDs were not calculated (one or both replicates less than five times the detection limit); < = greater than; m= metres;
RPD = Relative Percent Difference

TABLE A.3-7 WATER QUALITY DATA FOR QUALITY ASSURANCE AND QUALITY CONTROL BLANKS FOR THE HOPE BAY AEMP, 2024

QA/QC Sample			Equipment Blank	Equipment Blank	Field Blank	Field Blank	Travel Blank	Travel Blank
Sampling Date			**08-Apr-2024**	**08-Aug-2024**	**12-Apr-2024**	**09-Aug-2024**	**12-Apr-2024**	**12-Aug-2024**
ALS Sample ID			**EO2402598-001**	**EO2406953-010**	**EO2402792-010**	**EO2406953-011**	**EO2402792-011**	**EO2406953-012**
Physical Tests								
Conductivity	2.0	μS/cm	6.4	<2.0	<2.0	<2.0	<2.0	<2.0
Total alkalinity (as $CaCO_3$)	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dissolved hardness (as $CaCO_3$)	0.50	mg/L	<0.50	<0.50	<0.50	<0.50		
Total hardness (as $CaCO_3$)	0.50	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Total suspended solids	1.0	mg/L	<1.0	<1.0	<1.5	<1.0	<1.5	<1.0
Turbidity	0.10	NTU	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
pH	0.10	pH units	4.69	5.34	5.40	5.34	5.53	5.36
Anions and Nutrients								
Total ammonia (as N)	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Bromide	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride	0.50	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Fluoride	0.020	mg/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Nitrate (as N)	0.0050	mg/L	0.276	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrite (as N)	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Total phosphorus	0.0020	mg/L	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Sulfate (as SO_4)	0.30	mg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30

QA/QC Sample			Equipment Blank	Equipment Blank	Field Blank	Field Blank	Travel Blank	Travel Blank
Sampling Date			**08-Apr-2024**	**08-Aug-2024**	**12-Apr-2024**	**09-Aug-2024**	**12-Apr-2024**	**12-Aug-2024**
ALS Sample ID			**EO2402598-001**	**EO2406953-010**	**EO2402792-010**	**EO2406953-011**	**EO2402792-011**	**EO2406953-012**
Organic / Inorganic Carbon								
Dissolved Organic Carbon	0.50	mg/L	<0.50	<0.50	<0.50	<0.50	-	-
Total Organic Carbon	0.50	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Total Metals								
Aluminum	0.0030	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Antimony	0.000030	mg/L	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030	<0.000030
Arsenic	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Barium	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Beryllium	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Bismuth	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium	0.020	mg/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Cesium	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Chromium	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Copper	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Gallium	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Iron	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lanthanum	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lead	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050

QA/QC Sample			Equipment Blank	Equipment Blank	Field Blank	Field Blank	Travel Blank	Travel Blank
Sampling Date			**08-Apr-2024**	**08-Aug-2024**	**12-Apr-2024**	**09-Aug-2024**	**12-Apr-2024**	**12-Aug-2024**
ALS Sample ID			**EO2402598-001**	**EO2406953-010**	**EO2402792-010**	**EO2406953-011**	**EO2402792-011**	**EO2406953-012**
Total Metals *(cont'd)*								
Lithium	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Magnesium	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Manganese	0.00020	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Mercury	0.10	ng/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Molybdenum	0.000050	mg/L	<0.000050	<0.000050	0.000069	<0.000050	<0.000050	<0.000050
Nickel	0.00020	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Niobium	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Phosphorus	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium	0.030	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Rhenium	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Rubidium	0.000020	mg/L	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
Selenium	0.00020	mg/L	<0.00020	<0.000050	<0.00020	<0.000050	<0.00020	<0.000050
Silicon	0.10	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Silver	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Sodium	0.020	mg/L	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Strontium	0.00020	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Sulfur	0.50	mg/L	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tantalum	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tellurium	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Thallium	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050

QA/QC Sample			Equipment Blank	Equipment Blank	Field Blank	Field Blank	Travel Blank	Travel Blank
Sampling Date			**08-Apr-2024**	**08-Aug-2024**	**12-Apr-2024**	**09-Aug-2024**	**12-Apr-2024**	**12-Aug-2024**
ALS Sample ID			**EO2402598-001**	**EO2406953-010**	**EO2402792-010**	**EO2406953-011**	**EO2402792-011**	**EO2406953-012**
Total Metals *(cont'd)*								
Thorium	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Tin	0.00020	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Titanium	0.00020	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Tungsten	0.000010	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Uranium	0.0000020	mg/L	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020	<0.0000020
Vanadium	0.00020	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Yttrium	0.000010	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Zinc	0.0030	mg/L	0.0036	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Dissolved Metals								
Manganese	0.00020	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	-	-
Zinc	0.0010	mg/L	0.0037	<0.0010	<0.0010	<0.0010	-	-

Notes:

Dash (-) = no data as analysis was not completed; < = greater than; μS/cm = microSiemens per centimetre; mg/L = milligrams per litre; DL = detection limit; NTU = nephelometric turbidity unit(s)

Detectable concentrations greater than 5 times the DL are shaded gray.

TABLE A.3-8 LABORATORY QUALITY ASSURANCE AND QUALITY CONTROL RESULTS FOR THE HOPE BAY AQUATIC EFFECTS MONITORING PROGRAM, 2024

Sampling Event	ALS Reference	Hold Time Exceedance Details	ALS DQO Exceedance Details	AEMP Data Quality Details
Under-ice	EO2402792	pH, turbidity, nitrate, and nitrite	None	-
	EO2402598	pH	Laboratory control sample for total silicon exceeded ALS DQO	AEMP sample result for total silicon was below DL; data are acceptable
Open-water	EO2406953	pH, turbidity, total suspended solids, nitrate, and nitrite	None	-

Notes:

AEMP = Aquatic Effects Monitoring Program; ALS = ALS Laboratory Group; DL = detection limit; DQO = data quality objective; QA/QC = quality assurance/quality control

A.3.4 PHYTOPLANKTON BIOMASS

The measured chl *a* mass per sample results are presented (Table A.3-9). Phytoplankton biomass results were calculated (µg chl *a*/L).

A.3.4.1 QUALITY ASSURANCE AND QUALITY CONTROL DATA

There were no occurrences of laboratory QA/QC samples not meeting DQOs for chl *a* in 2024. The chl *a* results are considered reliable.

TABLE A.3-9 PHYTOPLANKTON BIOMASS RESULTS, HOPE BAY AEMP, 2024

Lake	Sampling Date	Sampling Depth (m)	Replicate	ALS Sample ID	Chl *a* (µg/sample)	Volume Filtered (L)	Phytoplankton Biomass (µg chl *a*/L)
Doris Lake	8 August 2024	1	1	EO2406930-001	5.36	0.5	10.72
			2	EO2406930-002	5.73	0.5	11.46
			3	EO2406930-003	4.75	0.5	9.500
Patch Lake	12 August 2024	1	1	EO2406930-004	0.880	1	0.880
			2	EO2406930-005	0.921	1	0.921
			3	EO2406930-006	0.901	1	0.901
Reference Lake B	10 August 2024	1	1	EO2406930-007	0.765	1	0.765
			2	EO2406930-008	0.722	1	0.722
			3	EO2406930-009	0.688	1	0.688

Notes:

L = litre; m = metres; µg = microgram; chl a = chlorophyll a

A.4 REFERENCES

BC MOE (British Columbia Ministry of Environment). 2013. *British Columbia Field Sampling Manual Part A—Quality Control and Quality Assurance.* Victoria, BC.

Parsons, T. R., M. Takahashi, and B. Hargrave. 1984. *Biological Oceanographic Processes.* Oxford, UK: Pergamon Press.

TMAC (TMAC Resources Inc.). 2018. *Hope Bay Project: Aquatic Effects Monitoring Plan*. Prepared by TMAC Resources Inc.: Toronto, ON.

APPENDIX B 2024 HYDROLOGY COMPLIANCE MONITORING SUMMARY

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MEMO

TO	Agnico Eagle Mines Limited—Hope Bay
FROM	Michael Willcock (ERM), Cameron Evans (ERM)
CC	Craig Neufeld (ERM), Kevin Murphy (ERM), Nicole Parent (ERM)
DATE	28 February 2025
REFERENCE	0738548-02
SUBJECT	Hope Bay Project: 2024 Hydrology Compliance Monitoring Summary

1. INTRODUCTION

The Hope Bay Project (the Project) is a gold mining development in the West Kitikmeot region of mainland Nunavut. The Project property is approximately 153 kilometres (km) southwest of Cambridge Bay on the southern shore of Melville Sound. The property contains a greenstone belt that runs 80 km in a north–south direction, varying in width between 7 and 20 km. Agnico Eagle Mines Limited (Agnico Eagle) operates the Project and acquired the mining development through the purchase of TMAC Resources Inc. (TMAC) on 2 February 2021.

This memorandum provides a summary of the hydrology compliance monitoring program performed for the Project in 2024. Compliance requirements for hydrometric monitoring, listed below, are set out in Project Certificate No. 003 issued by the Nunavut Impact Review Board (NIRB) and amended on 23 September 2016 (NIRB No. 003), the Type A and B Water Licences (Nunavut Water Board [NWB] Licence No. 2AM-DOH1335 Type A, amended on 7 December 2018, and NWB Licence No. 2BE-HOP2232 Type B, renewed in 2022), and the approved *Hope Bay Project Aquatic Effects Monitoring Plan* (the Plan; TMAC [2018]).

Fisheries Act Authorization NU-02-0117.3 also has compliance requirements. Although the *Fisheries Act* Authorization does not explicitly state a monitoring requirement for the Roberts Lake outflow, monitoring outflows of this lake is necessary, as the monitoring of Roberts Lake outflow is considered a critical component for evaluating the success of the Roberts Lake Outflow Fish Habitat Compensation Monitoring Program. Monitoring of Roberts Lake also provides a control that the Aquatics Effects Monitoring Program monitored lakes can be compared to.

The Type A Water Licence (No. 2AM-DOH1335) sets out the following requirements applying to aquatic effects monitoring:

> Part I. Item 3: The licensee shall undertake the Monitoring Program provided in Tables 1, 2, and 3 of Schedule I. Table 3 outlines the requirement for monitoring Doris Outflow (TL-2) during operations upon commencement of mining in or

beneath the Doris Lake Talik and monitoring Doris Lake (ST-12) water levels during operations and closure.

The Type B Water Licence (No. 2BE-HOP2232) sets out the following requirements:

> Part J. Item 9: The licensee shall monitor water levels in Windy Lake during open water, in order to verify that additional water withdrawal for dust suppression activities does not result in drawdown beyond naturally occurring levels.

The New Project Certificate, applicable to the Madrid-Boston area (NIRB No. 009) sets out the following requirements:

> New Term and Condition 10: the Proponent shall:
>
> a. monitor the effects of Project activities and infrastructure on surface water quality conditions;
> b. ensure the monitoring data is sufficient to compare the impact predictions made for the Project with actual monitoring results;
> c. ensure that the sampling locations and frequency of monitoring is consistent with and reflects the requirements of the Plan, and Water Management Plan; and
> d. on an annual basis, compare monitoring results with the impact assessment predictions in the Final Environmental Impact Statement (FEIS) and identify any significant discrepancies between impact predictions and monitoring results.

The Plan prescribes monitoring requirements based on Project development phases. In February 2022, the Project transitioned into Care and Maintenance and Agnico Eagle submitted the *Hope Bay, Care and Maintenance Plan* (Agnico Eagle 2022) to the NWB and NIRB, in compliance with the Type A Water Licence 2AM-DOH1335 and Project Certificate No. 009. Prior to entering Care and Maintenance, the Doris development was in its operations phase, while Madrid North was in both construction and operations phases. Operations at Madrid North were subsequently suspended in February 2021 to allow for a thorough review of the proposed work plan.

These construction and operations phases triggered water level monitoring at Glenn and Imniagut lakes, as well as water level and outflow monitoring at Doris, Little Roberts, Ogama, Patch, PO, and Windy lakes. Tables 3.11 and 3.2-1 of the Plan (TMAC 2018) outline these requirements.

Agnico Eagle completed Project hydrometric monitoring in 2024, except for the winter (April) under-ice lake water level survey. The under-ice water level survey was not completed due to equipment failure and logistical issues surrounding the replacement of the damaged equipment. Ice conditions were no longer safe for crews to complete the surveys once replacement equipment had arrived onsite.

ERM Consultants Canada Ltd. (ERM), assisted by Agnico Eagle personnel, performed water level and discharge measurements during station reinstallation in June 2024.

The following sections consist of 2024 monitoring data and results. These results are based on the comparison of 2024 monitoring data with past monitoring data and the predicted Project effects from the Madrid-Boston Project FEIS (TMAC 2017).

2. MONITORING STATIONS

The 2024 compliance monitoring program consisted of 10 hydrometric monitoring stations, as presented in Tables 2-1 and 2-2. Water level surveys and manual discharge measurements are typically conducted at these stations throughout the open water season, after the installation of the pressure transducers in June. Pressure transducers were pulled from stations in mid-September.

TABLE 2-1 STATION TYPES

Station	Station Type	Monitoring Period
Windy Outflow	Discharge and Water Level	Seasonal
Glenn Lake	Lake Level Only	Seasonal
Imniagut Lake	Lake Level Only	Seasonal
Patch Outflow	Discharge and Water Level	Seasonal
PO Outflow	Discharge and Water Level	Seasonal
Ogama Outflow	Discharge and Water Level	Seasonal
Doris Lake-2	Lake Level Only	Year round
Doris Creek TL-2	Discharge Only	Seasonal
Roberts Hydro-2	Discharge and Water Level	Seasonal[a]
Little Roberts Outflow	Discharge and Water Level	Seasonal

Note:
[a] Roberts Hydro-2 was previously monitored year-round, but the pressure transducer was destroyed by ice in 2020; the station has been monitored seasonally from 2021 through 2024.

TABLE 2-2 2024 STATION LOCATIONS

Station	UTM Zone 13W		Watershed Area (km^2)	Lake Coverage (%)
	Easting	Northing		
Windy Outflow	431404	7554948	13.73	41
Glenn Lake	430410	7562001	20.59	13
Imniagut Lake	433403	7551421	1.31	12
Patch Outflow	436248	7548973	32.16	23
PO Outflow	436749	7550055	35.30	23
Ogama Outflow	435595	7555262	74.93	18
Doris Lake-2	433547	7558601	90.29	19
Doris Creek TL-2	434059	7559504	90.29	19

Station	UTM Zone 13W		Watershed Area (km^2)	Lake Coverage (%)
	Easting	Northing		
Roberts Hydro-2	435231	7562674	97.83	18
Little Roberts Outflow	434548	7562652	194.15	18

Notes:
% = percent; km^2 = square kilometre; UTM = Universal Transverse Mercator

Hydrometric stations monitored either lake level, lake outflow (discharge), or both in 2024. Most hydrometric stations operate seasonally (during the open-water season); however, Doris Lake-2 operates year-round. Roberts Hydro-2 previously operated year-round; however, the station was destroyed by ice and was operated seasonally from 2021 through 2024.

Seasonal hydrometric stations consisted of an Onset MX2001 vented pressure transducer placed on the lake or streambed in a weighted assembly, recording water level readings every 15 minutes. The Doris Lake-2 stations consisted of two Solinst Leveloggers, unvented pressure transducers, installed at depths of approximately 7 metres (m) to monitor lake level year-round. The Leveloggers were coupled with a Solinst Barologger, located at Doris Camp, to compensate for changes in atmospheric pressure.

Water level surveys were performed using an engineer's level and stadia rod using a minimum of three local benchmarks at each station. All benchmarks were tied to geodetic elevation. Manual discharge measurements were performed using the velocity area method with a SonTek FlowTracker2 acoustic doppler velocimeter. The *Doris North Project 2013 Hydrology Compliance Monitoring Report* (ERM Rescan Environmental Services Ltd. 2014) describes the details of the standard methods used for installation of hydrometric stations, development of stage-discharge rating equations, and development of daily flow hydrographs for the Project.

3. 2024 ANALYSIS AND RESULTS

Tables 3.1-1 to 3.4-2 present the 2024 compliance monitoring results that include stage discharge measurements, observed lake levels, rating equations, annual runoff, peak and low flows, and monthly runoff. Appendix A and Appendix B present the lake level graphs and the daily flow hydrographs, respectively. Appendix C and Appendix D present the mean daily lake level and the mean daily discharges, respectively.

3.1 STAGE-DISCHARGE MEASUREMENTS

ERM collected water level and discharge measurements during station reinstallation in June 2024. Agnico Eagle personnel measured open-water season water level and discharge in July and September 2024. Seasonal stations were monitored throughout the open-water season from June to September 2024, and lake level station Doris Lake-2 was monitored year-round, consistent with previous years. Manual measurements are presented in Table 3.1-1.

TABLE 3.1-1 SUMMARY OF 2024 STAGE AND DISCHARGE MEASUREMENTS

Station	Date	Stage (m)	Discharge (m^3/s)	Measurement Made By
Windy Outflow	19 Jun 2024	18.373	0.184	ERM
	24 Jun 2024	18.355	0.159	ERM
	27 Jul 2024	18.312	0.0230	Agnico Eagle
	20 Aug 2024	18.312	-0.014	Agnico Eagle
	9 Sep 2024	18.237	0.026	Agnico Eagle
Glenn Lake	16 Jun 2024	9.789	NA	ERM
	27 Jul 2024	9.603	NA	Agnico Eagle
	13 Sep 2024	9.472	NA	Agnico Eagle
Imniagut Lake	17 Jun 2024	27.248	NA	ERM
	26 Jul 2024	27.195	NA	Agnico Eagle
	9 Sep 2024	27.105	NA	Agnico Eagle
Patch Outflow	18 Jun 2024	26.389	0.558	ERM
	22 Jun 2024	26.364	0.448	ERM
	26 Jul 2024	26.219	0.169	Agnico Eagle
	24 Sep 2024	26.098	0.086	Agnico Eagle
PO Outflow	18 Jun 2024	26.283	0.565	ERM
	22 Jun 2024	26.257	0.580	ERM
	26 Jul 2024	26.130	0.157	Agnico Eagle
	8 Sep 2024	25.986	0.066	Agnico Eagle
Ogama Outflow	19 Jun 2024	24.332	1.278	ERM
	24 Jun 2024	24.292	1.066	ERM
	29 Jul 2024	24.133	0.258	Agnico Eagle
	9 Sep 2024	24.099	0.161	Agnico Eagle
Doris Lake-2	24 Jun 2024	22.047	NA	ERM
	28 Jul 2024	21.804	NA	Agnico Eagle
	22 Sep 2024	21.727	NA	Agnico Eagle
Doris Creek TL-2	15 Jun 2024	21.995	1.875	ERM
	21 Jun 2024	21.951	1.761	ERM
	25 Jun 2024	21.925	1.496	ERM
	25 Jul 2024	21.720	0.499	Agnico Eagle
	14 Sep 2024	21.604	0.151	Agnico Eagle

Station	Date	Stage (m)	Discharge (m^3/s)	Measurement Made By
Roberts Hydro-2	16 Jun 2024	6.636	2.024	ERM
	20 Jun 2024	6.600	1.536	ERM
	28 Jul 2024	6.398	0.645	Agnico Eagle
	13 Sep 2024	6.275	0.224	Agnico Eagle
Little Roberts Outflow	17 Jun 2024	5.006	3.735	ERM
	20 Jun 2024	4.958	3.206	ERM
	28 Jul 2024	4.663	1.067	Agnico Eagle
	13 Sep 2024	4.498	0.382	Agnico Eagle

Notes:
Agnico Eagle = Agnico Eagle Mines Ltd.; ERM = ERM Consultants Canada Ltd.; m = metre; m^3/s = cubic metres per second; NA = not applicable

3.2 HYDROGRAPHS

Seasonal stations were reinstalled in June 2024 and removed in mid-September. Discharge at Doris Creek TL-2 was modelled using linear regression with the Doris Lake-2 year-round monitoring station. Discharge during the open-water season that was not monitored at the other stations was modelled using a linear regression with TL-2. For the periods where ice was known or suspected to have impacted flow, discharge was estimated using exponential growth / decay curves.

For the open-water period outside of the observed data, lake levels were back calculated using the station rating curves for the periods when discharge had been modelled. For stations with no discharge monitoring, the lake level was modelled using a linear regression with Doris Lake-2. For the periods where ice was known or suspected to have impacted flow, the lake level was estimated using exponential growth/decay curves, stabilizing at the average under-ice water level from previous years for the period of January to break up. From October to December, the last recorded water level was carried to the end of the year. In situations where the winter water level was not surveyed, lake level was assumed to stabilize on the last day of modelled data. Tables 3.2-1 and 3.2-2 present the timing and approach for estimating discharge and the lake level, respectively. Table 3 .2-3 presents monthly mean, maximum, and minimum lake levels, along with the maximum water level fluctuation during the open-water season, and over the full calendar year. These monthly statistics include observed, modelled, and estimated data. Appendices A and B provide the lake levels graphs and hydrographs for each monitored station in 2024. Appendices C and D provide the mean daily lake level tables and the mean daily discharge tables. Appendices E and F provide historical lake level graphs and hydrographs for comparing data with previous years.

Flow was estimated to begin on 23 May 2024, based on site photos taken at Doris Creek TL-2 every 3 to 5 days. Flow was estimated to have ended on 20 November 2024, based on the Doris Lake water level no longer dropping and a significant cold snap. Freshet occurred as expected, compared to previous years, which resulted in a relatively normal peak and an as expected freshet period.

TABLE 3.2-1 2024 OBSERVED, MODELLED, AND ESTIMATED DISCHARGE

Station	Observed	Modelled	Estimated
Windy Outflow	20 Jun – 8 Sep	24 May – 18 Jun 9 Sep – 20 Oct	1 Jan – 23 May 21 Oct – 31 Dec
Patch Outflow	19 Jun 19 – 7 Sep	19 May – 18 Jun 8 Sep – 18 Oct	1 Jan – 18 May 19 Oct – 31 Dec
PO Outflow	19 Jun – 7 Sep	23 May – 18 Jun 8 Sep – 18 Oct	1 Jan – 22 May 19 Oct – 31 Dec
Ogama Outflow	20 Jun – 8 Sep	24 May – 19 Jun 9 Sep – 18 Oct	1 Jan – 23 May 19 Oct – 31 Dec
Roberts Hydro-2	17 Jun – 12 Sep	23 May – 16 Jun 13 Sep – 18 Oct	1 Jan – 22 May 19 Oct – 31 Dec
Little Roberts Outflow	18 Jun – 12 Sep	25 May – 17 Jun 13 Sep – 18 Oct	1 Jan – 24 May 19 Oct – 31 Dec
Doris Creek TL-2	16 Jun – 13 Sep	20 May – 15 Jun 14 Sep – 18 Oct	1 Jan – 19 May 19 Oct – 31 Dec

TABLE 3.2-2 2024 OBSERVED, MODELLED, AND ESTIMATED LAKE LEVELS

Station	Observed	Modelled	Estimated
Windy Outflow	20 Jun – 8 Sep	25 May – 19 Jun 9 Sep – 18 Oct	1 Jan – 24 May 19 Oct – 31 Dec
Patch Outflow	19 Jun – 7 Sep	21 May – 18 Jun 8 Sep – 18 Oct	1 Jan – 20 May 19 Oct – 31 Dec
PO Outflow	19 Jun – 7 Sep	27 May – 18 Jun 8 Sep – 18 Oct	1 Jan – 26 May 19 Oct – 31 Dec
Ogama Outflow	20 Jun – 8 Sep	25 May – 19 Jun 9 Sep – 18 Oct	1 Jan – 24 May 19 Oct – 31 Dec
Roberts Hydro-2	17 Jun – 12 Sep	23 May – 16 Jun 13 Sep – 18 Oct	1 Jan – 22 May 19 Oct – 31 Dec
Little Roberts Outflow	18 Jun – 12 Sep	27 May – 17 Jun 13 Sep – 18 Oct	1 Jan – 26 May 19 Oct – 31 Dec
Imniagut Lake	18 Jun – 8 Sep	24 May – 17 Jun 9 Sep – 29 Oct	1 Jan – 23 May 30 Oct – 31 Dec
Glenn Lake	17 Jun – 12 Sep	23 May – 16 Jun 13 Sep – 18 Oct	1 Jan – 23 May 19 Oct – 31 Dec
Doris Lake-2	1 Jan – 31 Dec	NA	NA

Note:
NA = not applicable

TABLE 3.2-3 SUMMARY OF 2024 LAKE LEVELS

Station	Parameter	2024 Monthly Lake Level[a] (m)												Lake Level Fluctuation[b]	
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jun-Sep	Annual
Windy Outflow	Mean	18.340	18.340	18.340	18.340	18.357	18.396	18.353	18.278	18.253	18.355	18.355	18.355	0.203	0.203
	Max	18.340	18.340	18.340	18.340	18.435	18.435	18.369	18.316	18.331	18.360	18.355	18.355		
	Min	18.340	18.340	18.340	18.340	18.336	18.358	18.325	18.248	18.232	18.339	18.355	18.355		
Glenn Lake	Mean	9.552	9.552	9.552	9.552	9.628	9.800	9.663	9.537	9.500	9.670	9.670	9.670	0.402	0.403
	Max	9.552	9.552	9.552	9.552	9.879	9.878	9.718	9.600	9.617	9.682	9.670	9.670		
	Min	9.552	9.552	9.552	9.552	9.552	9.724	9.603	9.495	9.476	9.634	9.670	9.670		
Imniagut Lake	Mean	27.130	27.130	27.130	27.130	27.166	27.264	27.215	27.156	27.127	27.298	27.255	27.255	0.193	0.253
	Max	27.130	27.130	27.130	27.130	27.300	27.299	27.237	27.200	27.240	27.359	27.255	27.255		
	Min	27.130	27.130	27.130	27.130	27.130	27.233	27.193	27.123	27.106	27.255	27.255	27.255		
Patch Outflow	Mean	26.240	26.240	26.240	26.240	26.283	26.394	26.287	26.173	26.133	26.288	26.288	26.288	0.345	0.346
	Max	26.240	26.240	26.240	26.240	26.447	26.446	26.342	26.230	26.251	26.296	26.288	26.288		
	Min	26.240	26.240	26.240	26.240	26.240	26.343	26.228	26.118	26.101	26.264	26.288	26.288		
PO Outflow	Mean	26.123	26.123	26.123	26.123	26.167	26.288	26.180	26.084	26.020	26.225	26.225	26.225	0.404	0.404
	Max	26.123	26.123	26.123	26.123	26.350	26.350	26.211	26.151	26.185	26.233	26.225	26.225		
	Min	26.123	26.123	26.123	26.123	26.123	26.218	26.147	26.025	25.946	26.199	26.225	26.225		
Ogama Outflow	Mean	24.097	24.097	24.097	24.097	24.195	24.368	24.170	24.103	24.099	24.149	24.147	24.147	0.418	0.419
	Max	24.097	24.097	24.097	24.097	24.501	24.500	24.236	24.124	24.131	24.155	24.147	24.147		
	Min	24.097	24.097	24.097	24.097	24.097	24.247	24.117	24.082	24.093	24.137	24.147	24.147		
Doris Lake-2	Mean	21.763	21.783	21.781	21.765	21.866	22.126	21.894	21.765	21.731	21.931	21.789	21.769	0.561	0.562
	Max	21.775	21.793	21.792	21.775	22.267	22.266	21.986	21.816	21.863	22.004	21.834	21.813		
	Min	21.751	21.771	21.771	21.758	21.748	21.995	21.819	21.724	21.705	21.848	21.764	21.750		
Roberts Hydro-2	Mean	6.150	6.150	6.150	6.150	6.298	6.623	6.468	6.355	6.310	6.504	6.504	6.504	0.411	0.534
	Max	6.150	6.150	6.150	6.150	6.684	6.684	6.523	6.412	6.453	6.515	6.504	6.504		
	Min	6.150	6.150	6.150	6.150	6.150	6.531	6.413	6.304	6.273	6.470	6.504	6.504		
Little Roberts Outflow	Mean	4.800	4.800	4.800	4.800	4.916	5.015	4.739	4.591	4.547	4.725	4.725	4.725	0.685	0.687
	Max	4.800	4.800	4.800	4.800	5.195	5.193	4.826	4.657	4.678	4.735	4.725	4.725		
	Min	4.800	4.800	4.800	4.800	4.800	4.839	4.661	4.544	4.508	4.694	4.725	4.725		

Notes:
m = metre; max = maximum; min = minimum
[a] Water levels include observed, modelled, and estimated data.
[b] Change in lake level refers to the difference between the highest June 2024 and lowest July to September 2024 lake levels.

Table 3.2-3 presents monthly mean, maximum, and minimum lake levels, along with the maximum water level fluctuation during the open-water season, and over the full calendar year. These monthly statistics include observed, modelled, and estimated data.

3.3 RATING CURVES

Rating curves are empirical equations unique to each monitoring station that convert stage data recorded by the monitoring station to discharge. These rating curves are developed using concurrent manual measurements of stage (water level) and discharge. Measurements from previous years are used in the development of rating curves. Older measurements are excluded from the rating curves when they no longer align with recent measurements. This adjustment is common during the development of rating curves, as erosion and aggradation of the channel change the stage–discharge relationship over time.

Minor updates to rating curves were made where appropriate, based on the data collected in 2024. Stage data collected in 2024 were converted to discharge using the equations listed in Table 3.3-1.

TABLE 3.3-1 STAGE-DISCHARGE RATING EQUATIONS FOR MADRID HYDROMETRIC STATIONS IN 2024

Station	Rating Equation[a] $Q = C(h - a)^b$	Number of Measurements Used[b]	Root Mean Square Error (m^3/s)
Windy Outflow	$Q = 5.412\ (h - 18.147)^{2.227}$	11	10.28
Patch Outflow	$Q = 3.358\ (h - 25.998)^{1.996}$	14	4.95
PO Outflow	$Q = 6.440\ (h - 25.89)^{2.514}$	5	10.27
Ogama Outflow	$Q = 8.738\ (h - 23.994)^{1.783}$	5	2.77
Doris Creek TL-2	$Q = 6.225\ (h - 21.442)^{2.012}$	11	7.02
Roberts Outflow-2	$Q = 5.986\ (h - 6.150)^{1.603}$ $h < 6.640$ $Q = 17.101\ (h - 6.190)^{2.745}$ $h > 6.640$	20	7.24
Little Roberts Outflow	$Q = 5.461\ (h - 4.260)^{1.910}$ $h < 4.94$ $Q = 12.971\ (h - 4.400)^{2.609}$ $h > 4.94$	13	8.50

Notes:
< = less than; m^3/s = cubic metres per second
[a] Equation $Q = C(h - a)^b$: Q is the discharge (m^3/s), C and b are dimensionless coefficients, h is the stage in metres (m), and a is the approximate stage at zero flow (m).
[b] The 2024 stage-discharge rating equations were developed using measurements from 2017 to 2024, where available.

3.4 HYDROLOGIC INDICES

Table 3.4-1 presents the 2024 hydrologic indices such as runoff, peak flows, and 7-day low flows. Table 3.4-2 presents the monthly runoff distributions from the seven hydrometric stations that record discharges.

TABLE 3.4-1 SUMMARY OF 2024 ANNUAL RUNOFF, PEAK FLOWS, AND LOW FLOWS

Station	Annual Runoff (mm)	Annual Peak Daily Flows[a]		Seven-Day Low Flows[b]	
		Peak Flow (m^3/s)	Date	Seven-Day Low Flow (m^3/s)	Date
Windy Outflow	132	0.338	31 May	0.024	19 Sep
Patch Outflow	111	0.679	31 May	0.042	7 Sep
PO Outflow	116	0.914	31 May	0.011	19 Sep
Ogama Outflow	104	2.602	31 May	0.129	24 Aug
Doris Creek TL-2	120	2.55	31 May	0.146	19 Sep
Roberts Outflow-2	132	2.47	31 May	0.23	16 Sep
Little Roberts Outflow	115	7.123	31 May	0.411	12 Sep

Notes:
m^3/s = cubic metres per second; mm = millimetre
[a] Peak flows refer to peak daily discharges in 2024 and are based on estimated and observed data.
[b] Seven-day low flows are June peak to 30 September 2024 data only.

TABLE 3.4-2 SUMMARY OF 2024 MONTHLY RUNOFF DISTRIBUTIONS

Station	2024 Monthly Runoff (mm)							
	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Windy Outflow	15	47	31	12	7	20	0	0
Patch Outflow	13	39	21	8	5	13	0	0
PO Outflow	12	41	19	7	3	17	0	0
Ogama Outflow	17	54	15	6	5	7	0	0
Doris Creek TL-2	17	54	23	8	6	12	0	0
Roberts Outflow-2	15	50	26	13	9	19	0	0
Little Roberts Outflow	15	46	16	8	6	9	0	0

Note:
mm = millimetre

Annual runoff is the volume of streamflow over the year normalized by drainage area and reported as depth. The annual runoff is a useful index for comparing the hydrologic responses of basins of different sizes. Estimates of annual runoff in 2024 were calculated from the available data and interpolated using the following equation:

$$Ro = \frac{(Q * t)}{A}$$

where:
runoff (Ro; units = mm) is calculated as streamflow (Q; units = cubic metres per second [m^3/s]) multiplied by time (t; units = seconds) divided by basin area (A; units = square kilometres [km^2]).

Peak daily flows are the highest mean daily flow during the year and typically occur during freshet. The lowest 7-day averaged flow during the open-water season typically occurs during late summer or early fall. Annual low flows are zero and are not reported, as the streams freeze solid in winter. Breaking runoff down by month shows that the majority of flow occurs during and shortly after freshet, with much less water flowing during late summer and fall. This flow distribution is typical of arctic streams.

3.5 ICE MEASUREMENTS

Agnico Eagle did not conduct under-ice water level surveys during the 2024 monitoring period. This was due to broken equipment and logistical issues surrounding the replacement of the damaged equipment. Ice conditions were no longer safe for crews to complete the surveys once replacement equipment had arrived onsite.

4. DISCUSSION AND COMPARISON WITH FINAL ENVIRONMENTAL IMPACT STATEMENT PREDICTIONS

4.1 PRECIPITATION INFLUENCE

Table 4.1-1 presents the precipitation at the Hope Bay meteorological station (referred to as the Doris Hydrometric Station) for the 2024 hydrologic year. The hydrologic year is the period where precipitation will contribute to the runoff of that year. It generally spans October of the prior year (2023) to September of the current reporting year (2024), starting at the beginning of freeze-up, when precipitation that falls will be stored until the spring, and ends at the start of freeze-up the following year.

The precipitation gauge at the meteorology station, which was upgraded in June 2023, operated as expected for the duration of the 2024 monitoring program.

TABLE 4.1-1 DORIS HYDROMETRIC STATION PRECIPITATION OCTOBER 2023 TO SEPTEMBER 2024

Month	Total Rainfall (mm)	Total Snowfall (SWE; mm)	Total Precipitation (mm)	Expected Mean Monthly Precipitation[a] (mm)
23 Oct	–	–	–	24
23 Nov	0	9.2	9.2	16
23 Dec	0	8.9	8.9	11
24 Jan	0.0	17.5	17.5	10
24 Feb	0.0	22.5	22.5	9
24 Mar	0.0	13.3	13.3	11
24 Apr	0.0	6.1	6.1	11
24 May	6.7	5.0	11.7	14
24 Jun	12.8	0.0	12.8	18
24 Jul	52.7	0.0	52.7	29
24 Aug	7.9	0.0	7.9	31
24 Sep	38.0	0.7	38.7	26

Notes:
mm = millimetre; SWE = snow water equivalent; FEIS = Final Environmental Impact Statement;
SRK = SRK Consulting (Canada) Inc.
Dash (–) = missing/incomplete data for the month of October 2023.
[a] Package P5-2 (Table 5) of the Hope Bay FEIS (SRK 2017a).

Table 4.1-2 presents the precipitation return periods using the *Climate and Hydrological Parameters Summary Report, Hope Bay Project*, Package P5-2 (SRK Consulting (Canada) Inc. [SRK] 2017) of the Hope Bay FEIS (TMAC 2017).

TABLE 4.1-2 HOPE BAY EXTREME PRECIPITATION DEPTHS

Return Period	Annual Precipitation (mm)
200 Wet	324
100 Wet	311
50 Wet	297
25 Wet	282
20 Wet	277
10 Wet	261
5 Wet	243

Return Period	Annual Precipitation (mm)
Average MAP	210
2 Wet	210
3 Dry	195
5 Dry	182
10 Dry	168
20 Dry	158
25 Dry	155
50 Dry	147
100 Dry	140
200 Dry	134

Source: Package P5-2 (Table 6) of the Hope Bay FEIS (SRK 2017a).

Notes:
MAP = mean annual precipitation; FEIS = Final Environmental Impact Statement; SRK = SRK Consulting (Canada) Inc.
Annual precipitation values are based on calendar year totals. While the hydrologic year is October to September, total precipitation statistics will be comparable when using a large data set.

The total annual precipitation for the 2024 monitoring program is 201 mm. This falls between a dry year with a return period of close to 3 years and an average year. This is close to average, which is reflected in the observed annual runoff across the site.

A considerable amount of precipitation fell during July 2024, almost doubling the expected mean monthly value of 29 mm.

Table 4.1-3 presents the comparison of 2024 runoff to historical averages and predicted values.

TABLE 4.1-3 COMPARISON OF 2024 RUNOFF WITH HISTORICAL AVERAGES AND PREDICTED VALUES

Station	Previous Years Data							FEIS Predicted Runoff[a]		
	2019	2020	2021	2022	2023	2024	2004–2015 Average[a]	Predicted Average Runoff	Predicted 20-Year Dry Runoff	Predicted 20-Year Wet Runoff
Windy Outflow	174	107	166	86	111	132	130	58	21	119
Patch Outflow	189	82	105	118	117	111	112	77	40	137
PO Outflow	222	102	157	117	89	116	153	80	41	143
Ogama Outflow	167	58	128	95	122	104	117	100	46	199

Station	Previous Years Data							FEIS Predicted Runoff[a]		
	2019	2020	2021	2022	2023	2024	2004–2015 Average[a]	Predicted Average Runoff	Predicted 20-Year Dry Runoff	Predicted 20-Year Wet Runoff
Doris Creek TL-2	191	75	153	121	130	120	110	101	48	213
Roberts Outflow-2	156	NA	141	127	130	132	112	NA	NA	NA
Little Roberts Outflow	175	83	144	100	113	115	93	161	64	347

Notes:
FEIS = Final Environmental Impact Statement; NA = not applicable; TMAC = TMAC Resources Inc.
[a] Data source: V5-S1 (Tables 1.2-7 and 1.5-7 to 1.5-12) of the Hope Bay FEIS (TMAC 2017).

4.2 RUNOFF

A portion of the precipitation is converted to runoff, which enters the lakes and streams, resulting in streamflow. Table 4.2-1 presents the comparison of the 2024 runoff with historical baseline data collected between 2004 and 2015, as well as the 2019 through 2024 monitoring data. Runoff in 2024 was similar and slightly abve the 2004 to 2015 average, except for at the Windy Outflow and PO Outflow stations.

TABLE 4.2-1 PREDICTED IMPACT DUE TO ANNUAL OUTFLOW FROM MONITORED LAKES

Station	FEIS Predicted Impact[a] to Annual Flow in 2024 Under Average Climate Conditions (% Change)
Windy Outflow	-6.7
Patch Outflow	0
PO Outflow	0
Ogama Outflow	0
Doris Creek TL-2	-13.4
Little Roberts Outflow	-7.8
Glenn Outflow	-2.0

Source: V5-S1 (Table 1.2-7, 1.5-7 to 1.5-12) of the Hope Bay FEIS (TMAC 2017).

Notes:
% = percent; FEIS = Final Environmental Impact Statement; TMAC = TMAC Resources Inc.
[a] Project phase: Predicted impacts were assessed for both existing and permitted projects.

The runoff at PO Outflow was below the observed average, likely due to backwatering from the downstream unnamed lake during spring discharge measurements, which caused discrepancies in the relationship between stage and discharge. PO Outflow has historically had issues with backwatering and has greater uncertainty in results than other stations (ERM 2023).

Table 4.2-1 presents modelling results from the *Madrid-Boston Project Water and Load Balance, Hope Bay Project* (SRK 2017b). Effects to Doris Lake were predicted due to water withdrawal and mine dewatering activities. Doris Lake water level drawdown could result in downstream effects to Little Roberts Outflow. Effects to Windy Lake were predicted due to the withdrawal of water from Windy Lake.

Drawdown to the Doris Lake water level was not detected in 2024 (Table 3.2-3 and Figure A8 in Appendix A). An estimation of the annual runoff (Table 4.1-3) indicates an average to slightly above average year, with freshet beginning at a similar time to previous years. Water withdrawal from Windy Lake did not cause a detectable impact in 2024. Total withdrawal for the year was 11,100 m^3, which represents 0.61% of the total volumetric discharge for the year.

In 2024, no detectable impact to lake levels or lake outflow rates caused by the Project were observed as part of the compliance monitoring.

5. CLOSING

We trust that the monitoring summaries and recommendations for improvement are sufficient for your needs. Please contact us if you have any questions.

Prepared by:

Michael Willcock
Consultant

ERM Consultants Canada Ltd.

Cameron Evans, BASc
Managing Technical Consultant

ERM Consultants Canada Ltd.

6. REFERENCES

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SRK Consulting. 2017b. *Madrid-Boston Project Water and Load Balance, Hope Bay Project*. Report Prepared for TMAC Resources Inc., 1CT022.013. November 2017.

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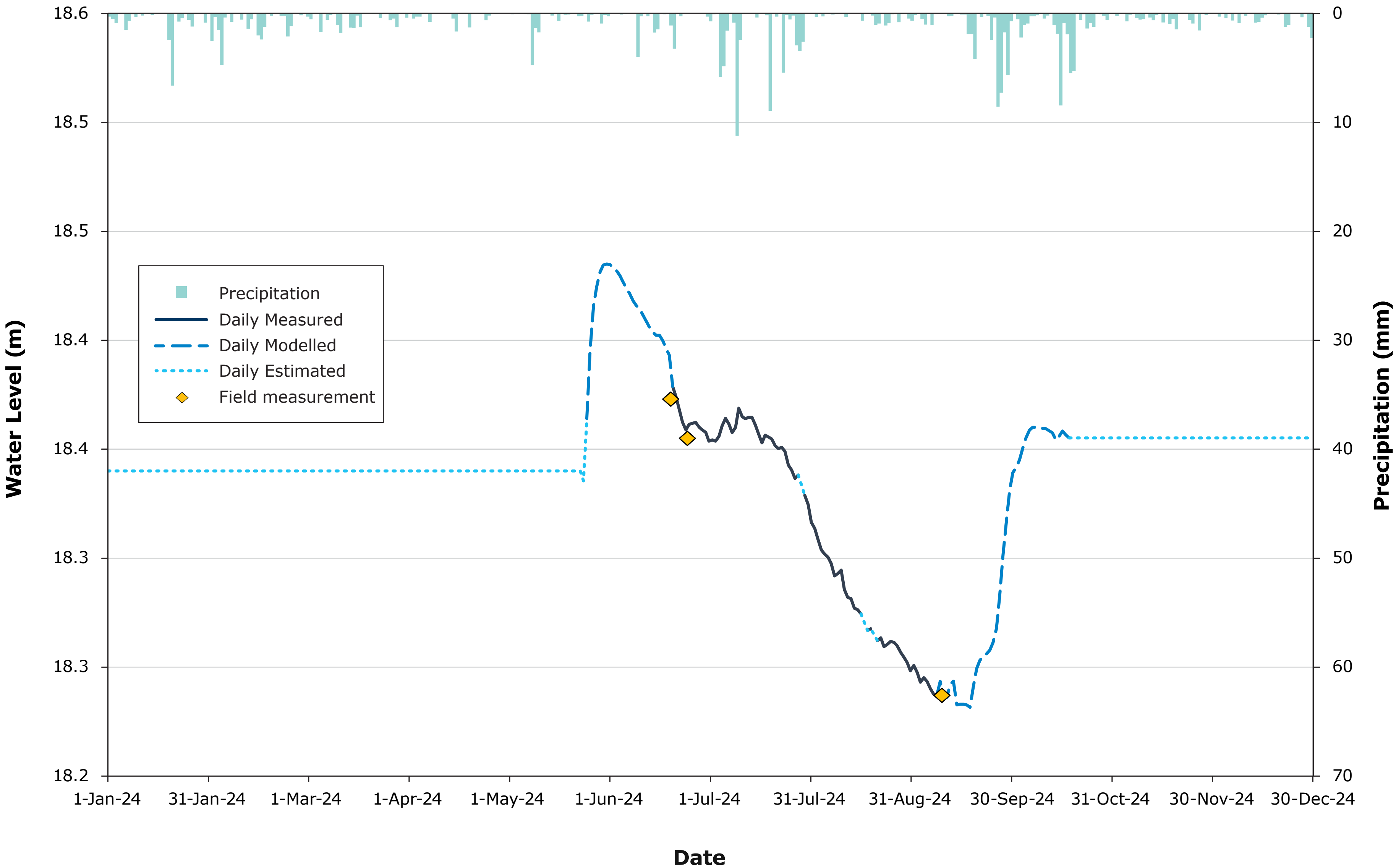
TMAC. 2018. *Hope Bay Project: Aquatic Effects Monitoring Plan.* Toronto, ON.

APPENDIX A LAKE LEVELS GRAPHS

FIGURE A1 2024 MEAN DAILY LAKE LEVEL FOR MONITORING STATION WINDY OUTFLOW



ERM

CLIENT: Agnico Eagle Mines Ltd.
GRAPHICS NUMBER: HB-25ERM-004:1

FIGURE A2 2024 MEAN DAILY LAKE LEVEL FOR MONITORING STATION GLENN LAKE

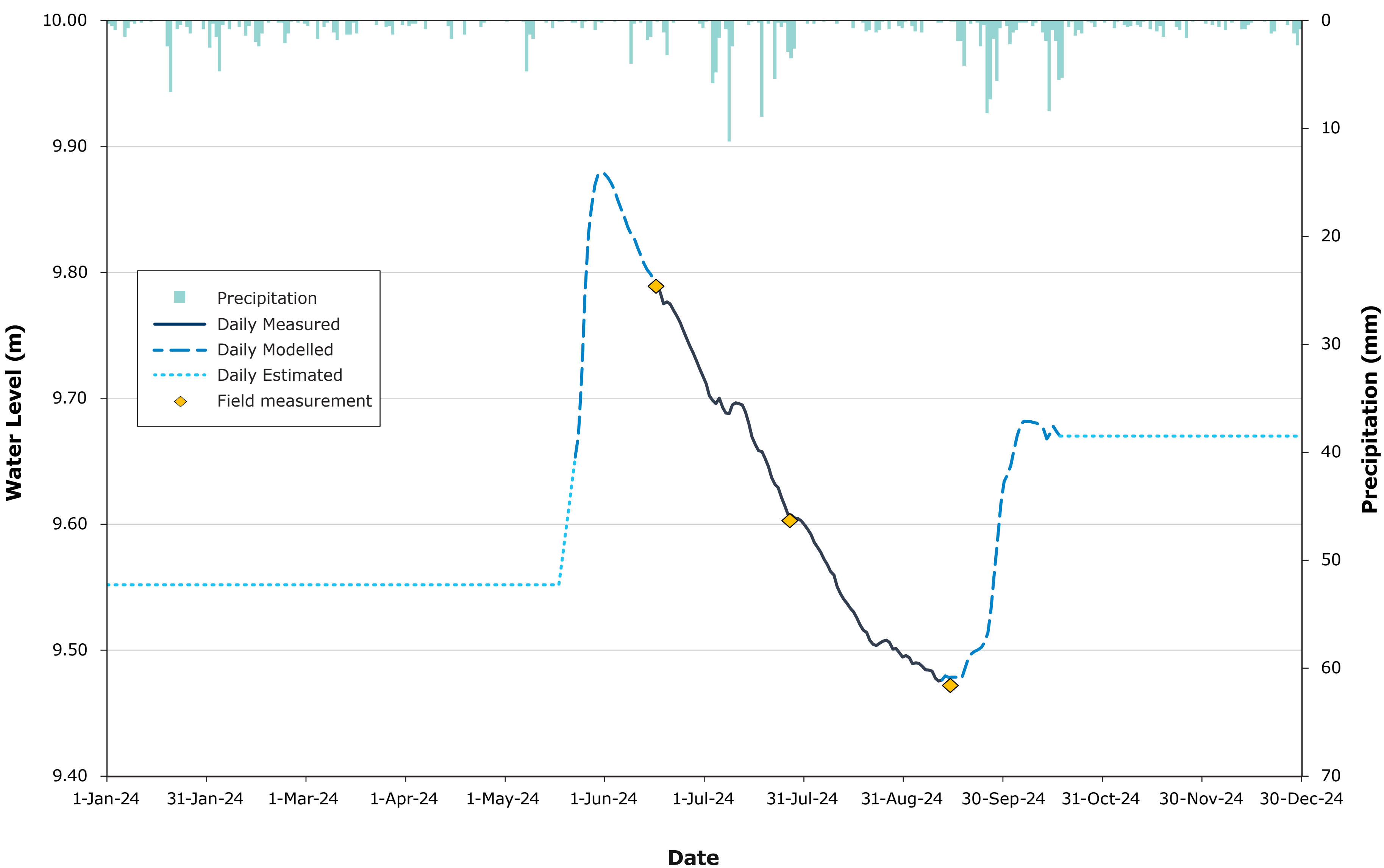
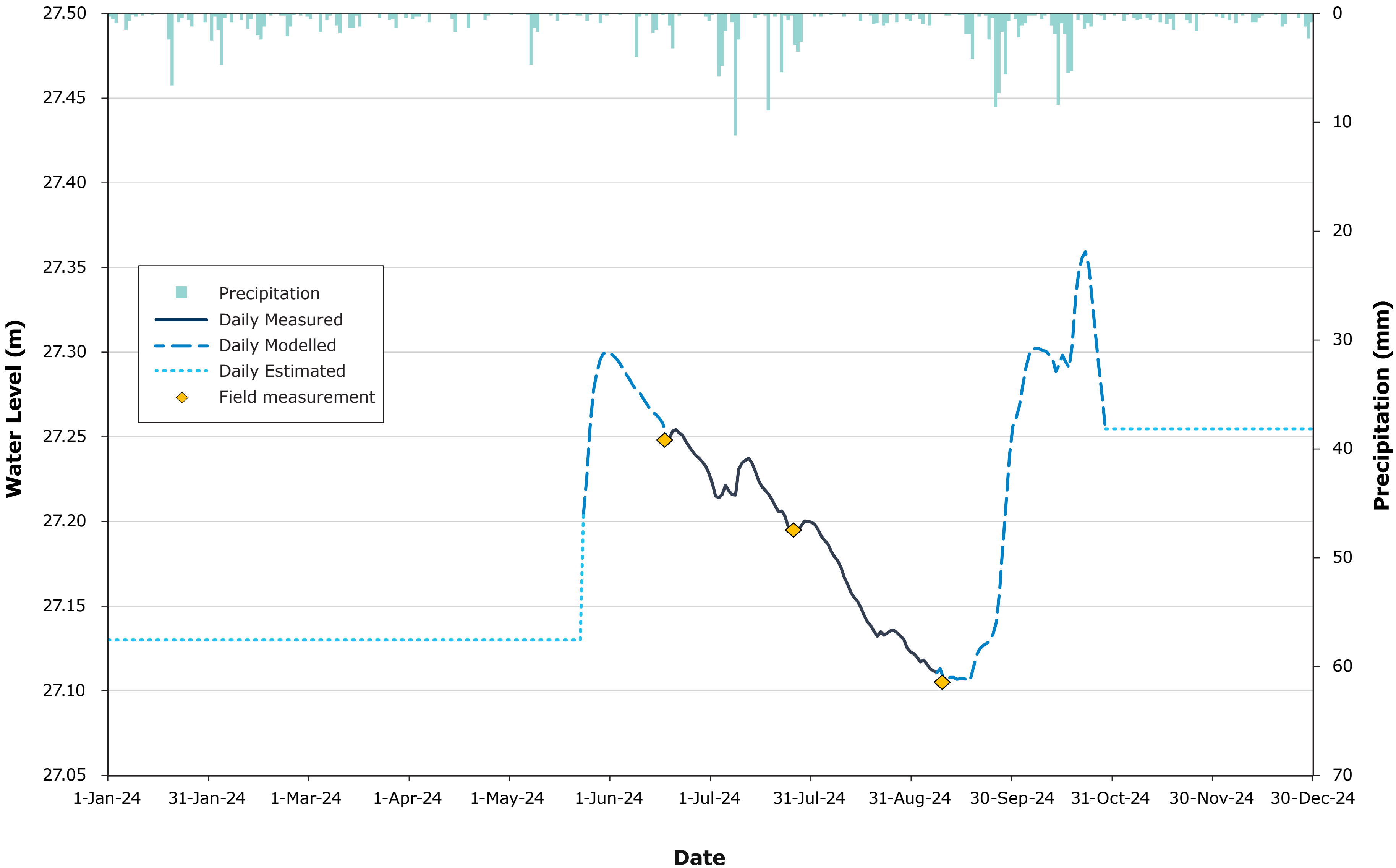


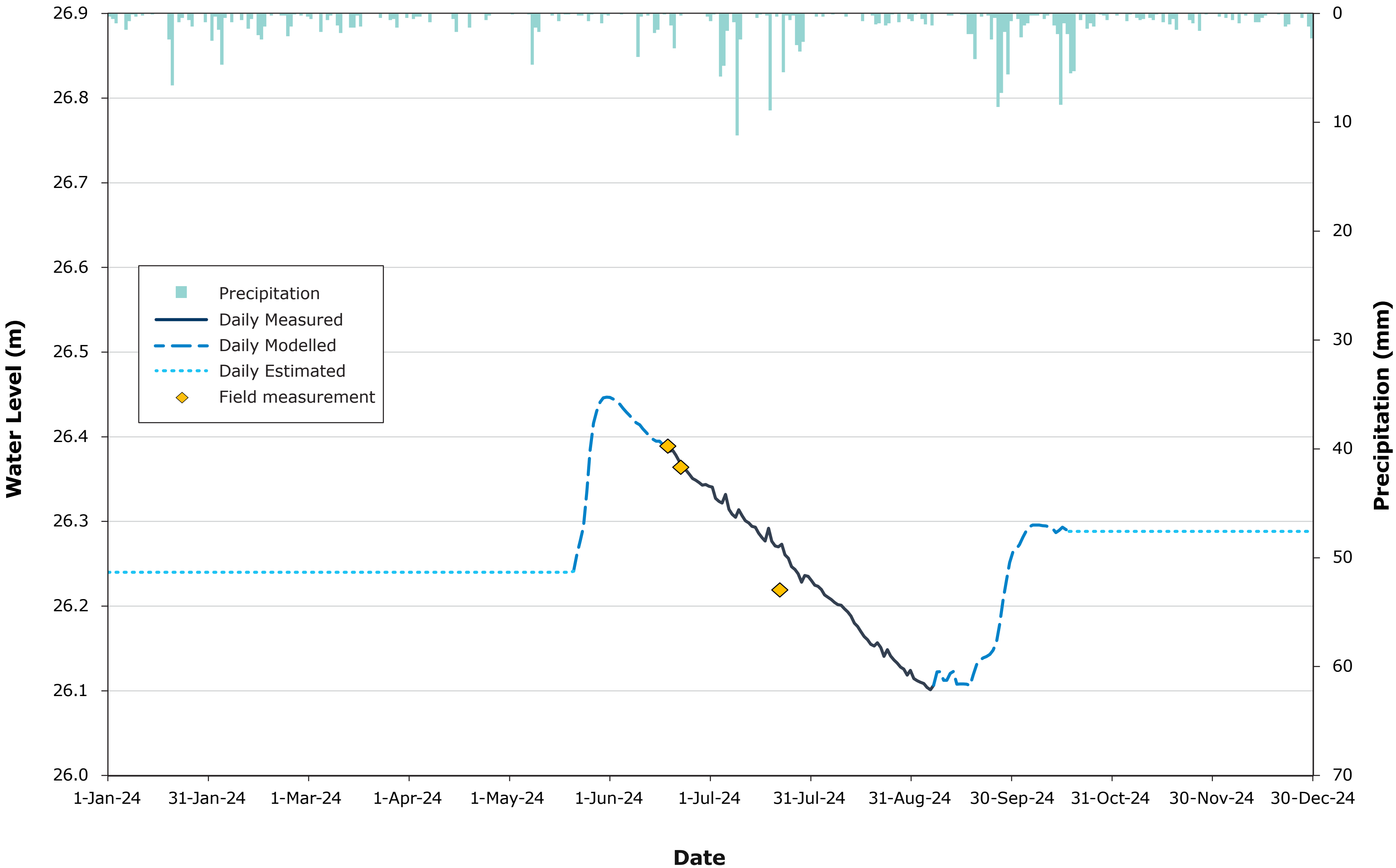
FIGURE A3 2024 MEAN DAILY LAKE LEVEL FOR MONITORING STATION IMNIAGUT LAKE



ERM

CLIENT: Agnico Eagle Mines Ltd.
GRAPHICS NUMBER: HB-25ERM-004:3

FIGURE A4 2024 MEAN DAILY LAKE LEVEL FOR MONITORING STATION PATCH OUTFLOW



ERM

CLIENT: Agnico Eagle Mines Ltd.
GRAPHICS NUMBER: HB-25ERM-004:4

FIGURE A5 2024 MEAN DAILY LAKE LEVEL FOR MONITORING STATION PO OUTFLOW

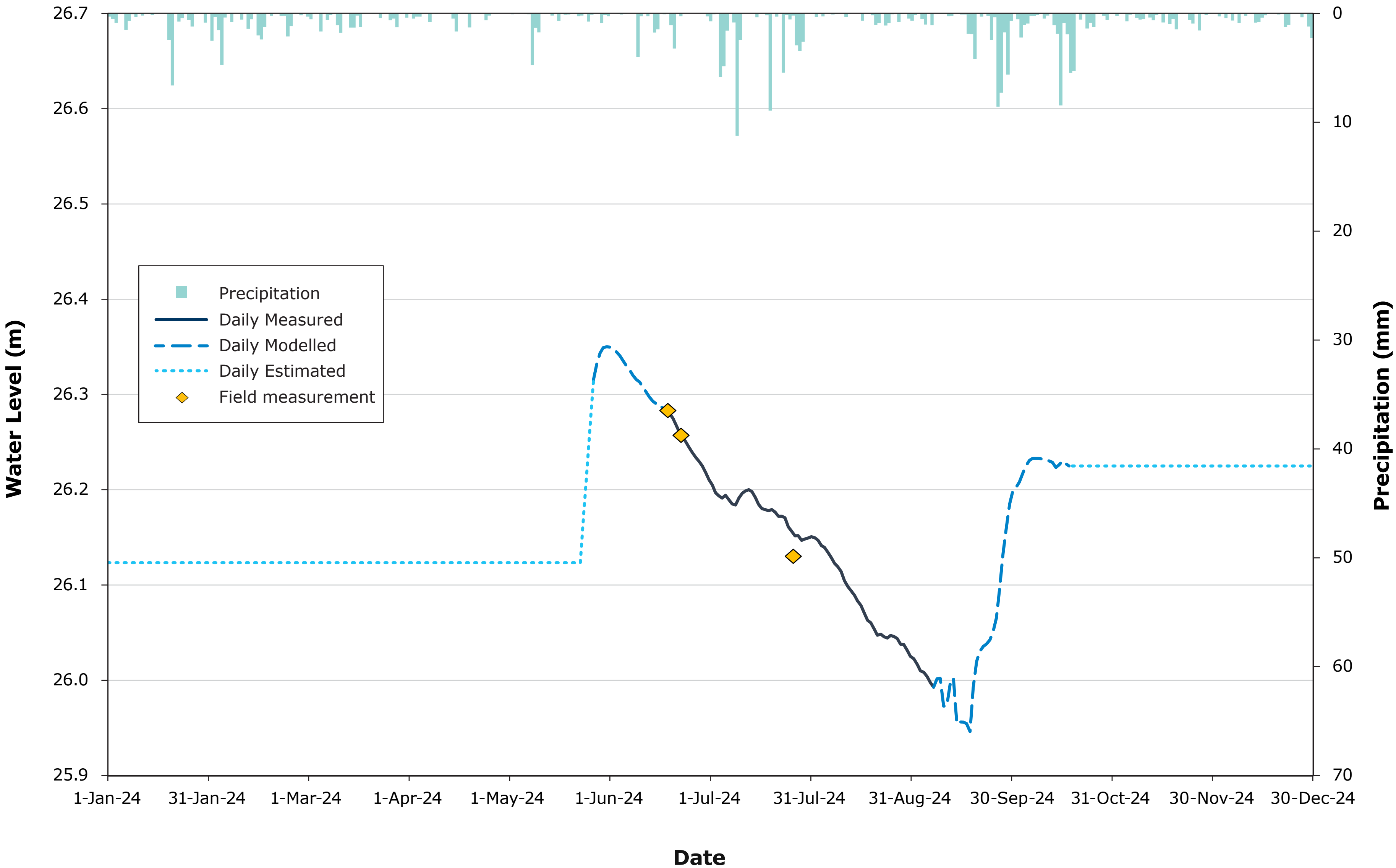
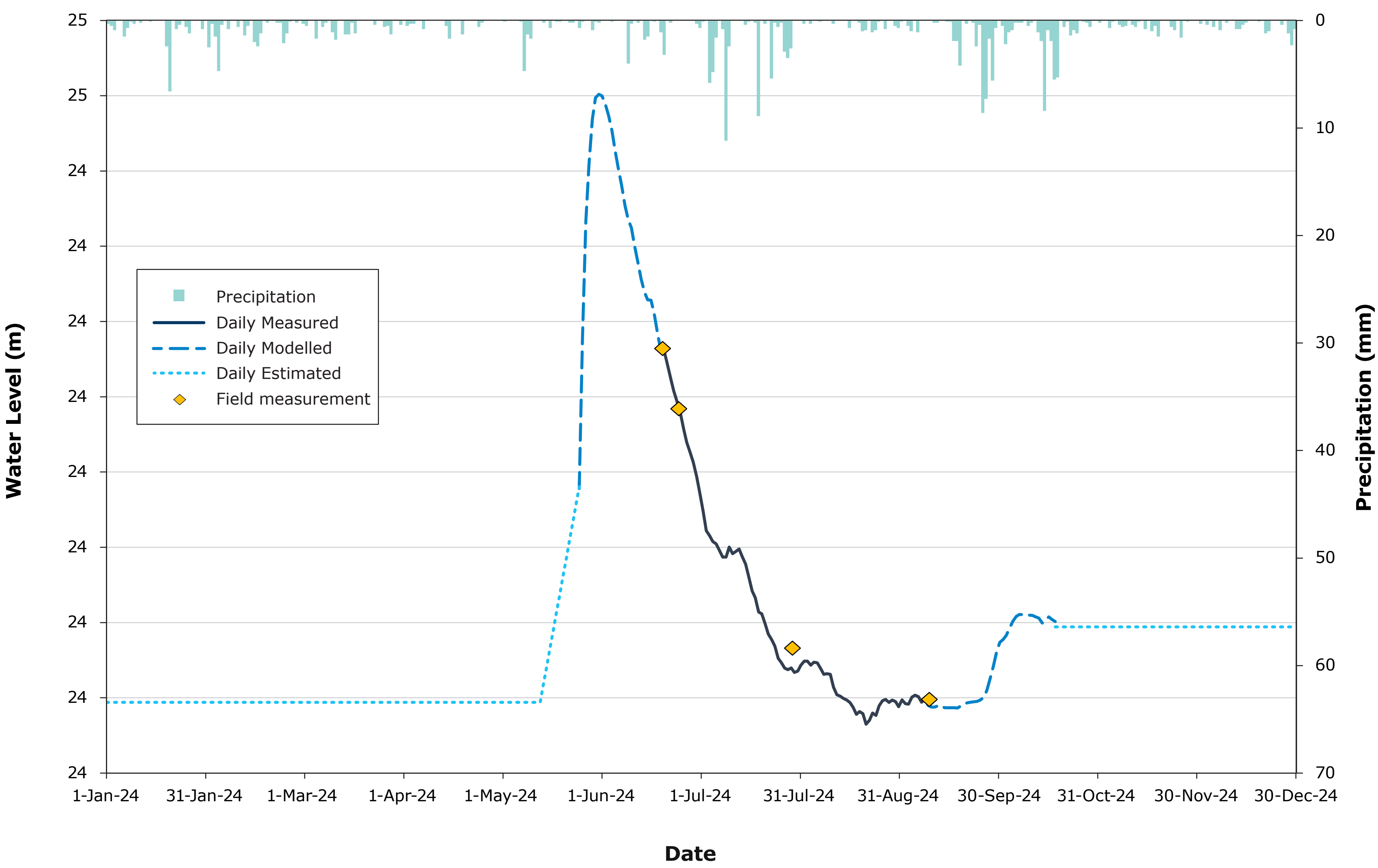
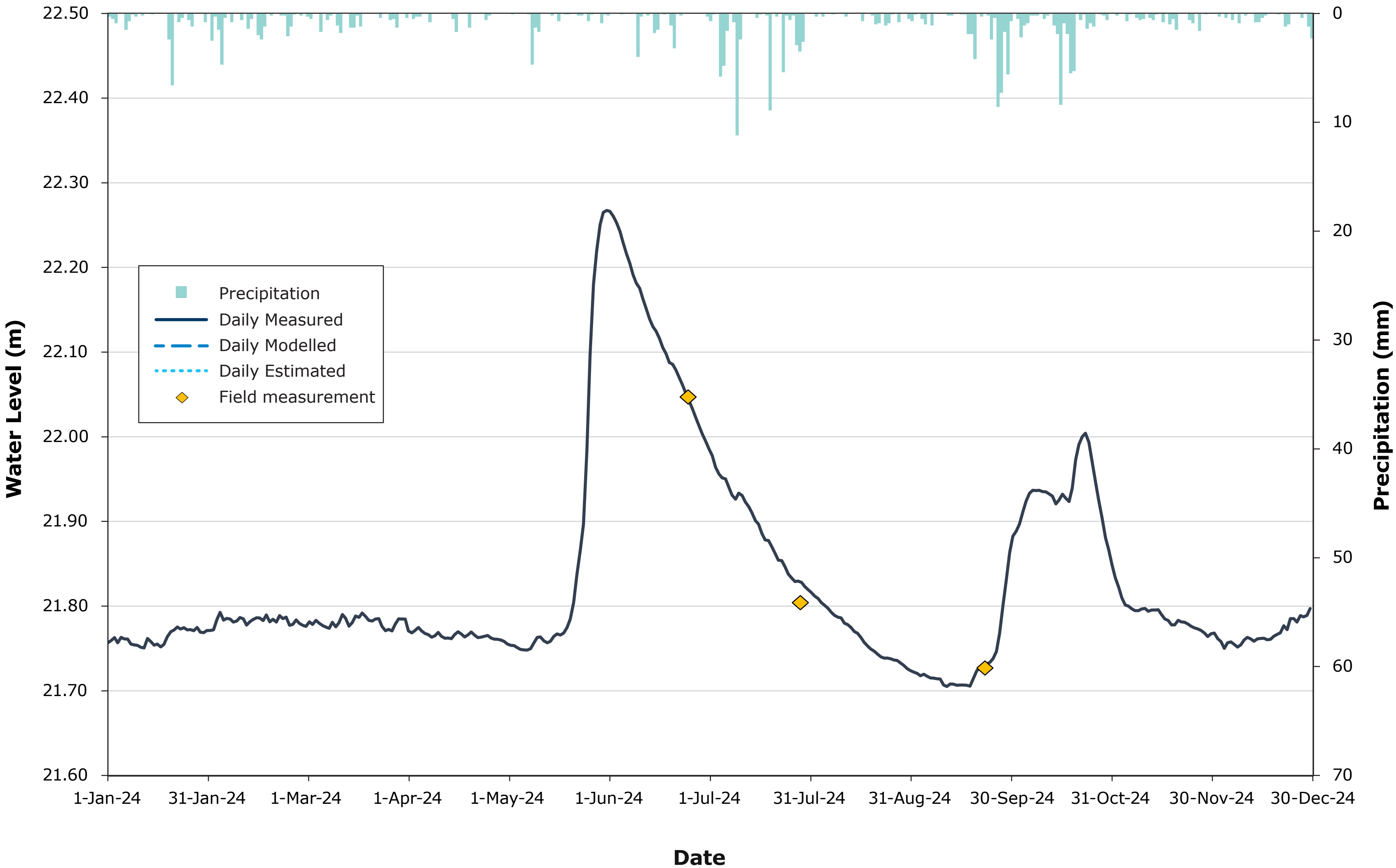


FIGURE A6 2024 MEAN DAILY LAKE LEVEL FOR MONITORING STATION OGAMA OUTFLOW



CLIENT: Agnico Eagle Mines Ltd.
GRAPHICS NUMBER: HB-25ERM-004:6

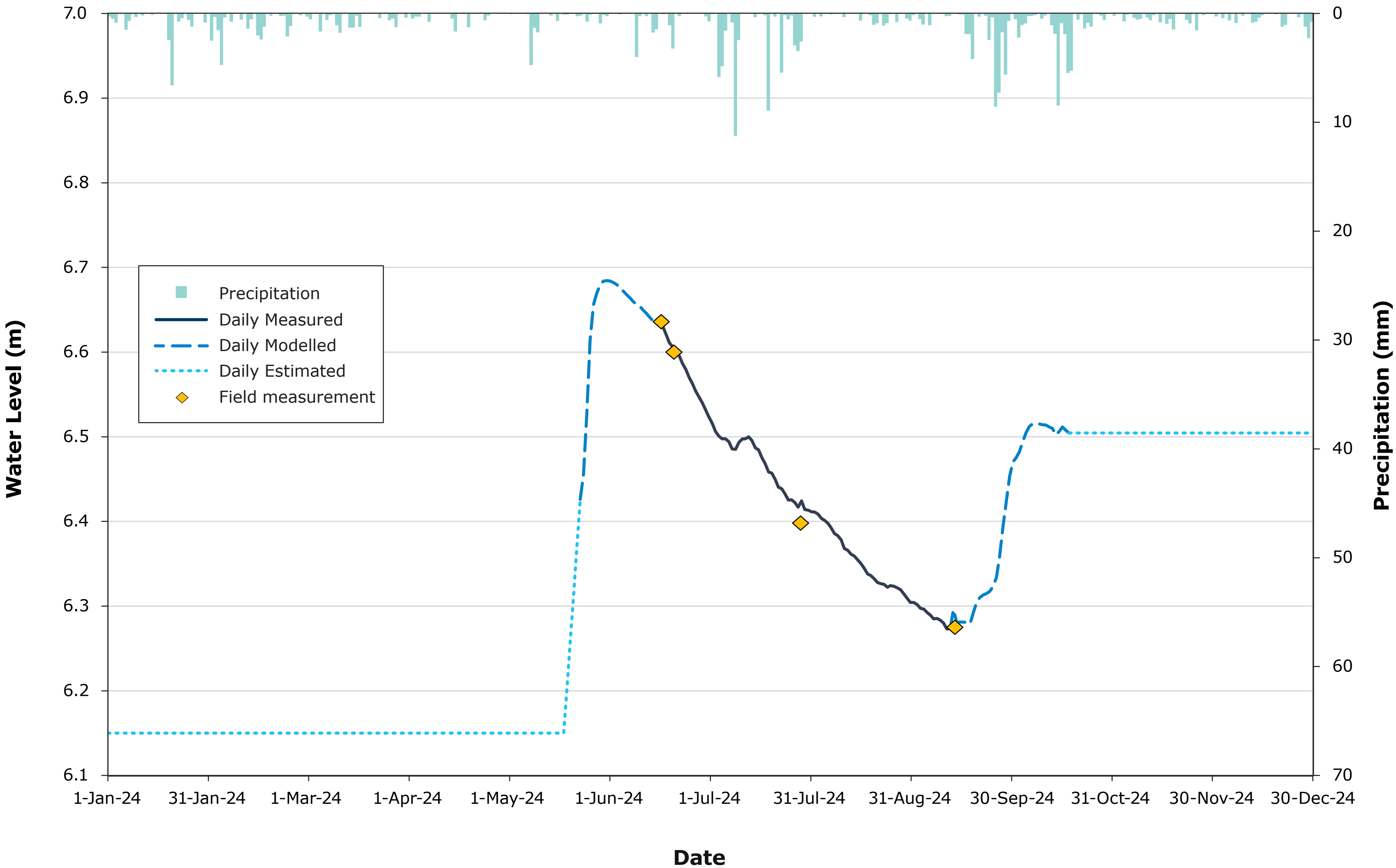
FIGURE A7   2024 MEAN DAILY LAKE LEVEL FOR MONITORING STATION DORIS LAKE-2



ERM

CLIENT: Agnico Eagle Mines Ltd.
GRAPHICS NUMBER: HB-25ERM-004:7

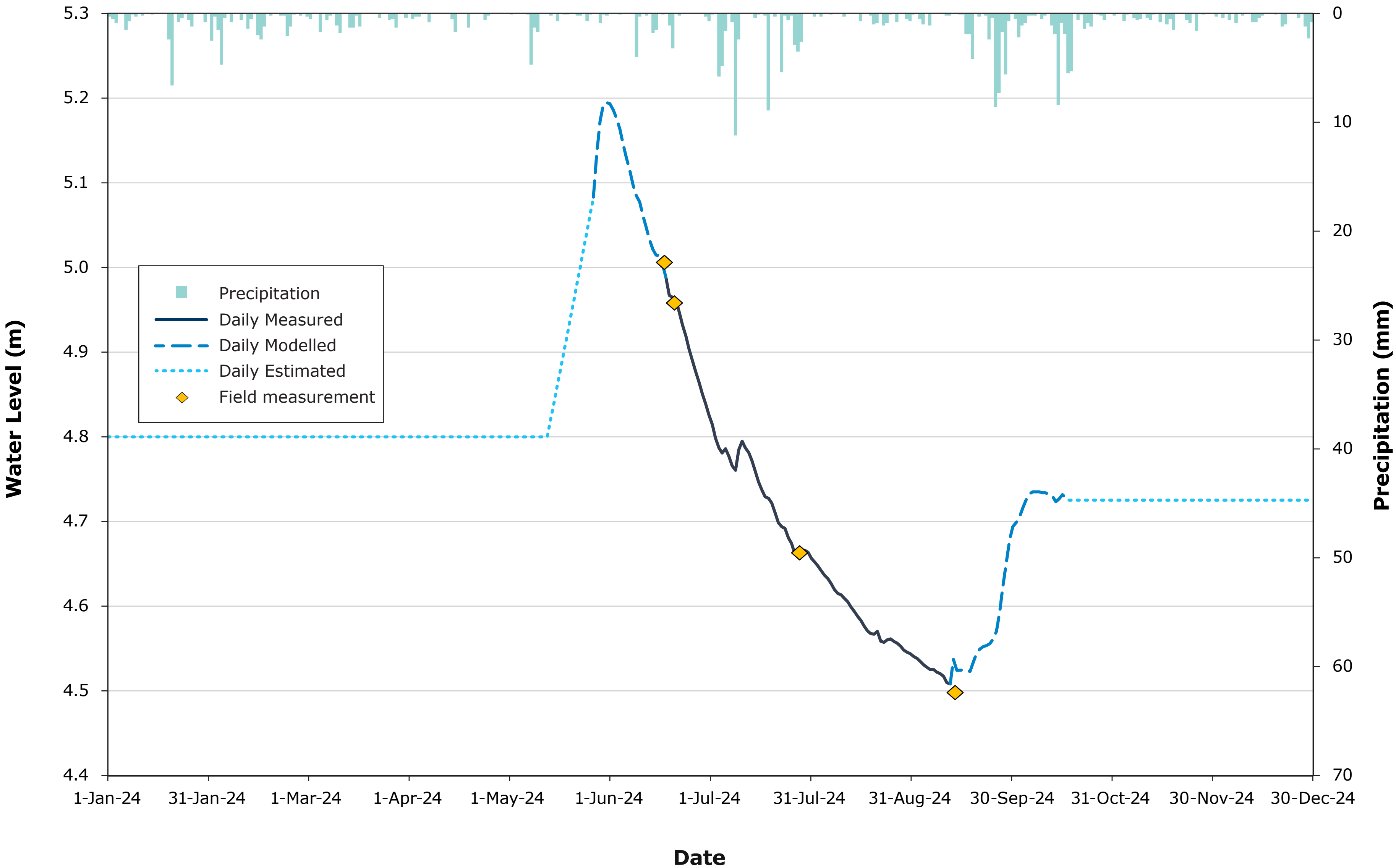
FIGURE A8 2024 MEAN DAILY LAKE LEVEL FOR MONITORING STATION ROBERTS HYDRO-2



ERM

CLIENT: Agnico Eagle Mines Ltd.
GRAPHICS NUMBER: HB-25ERM-004:8

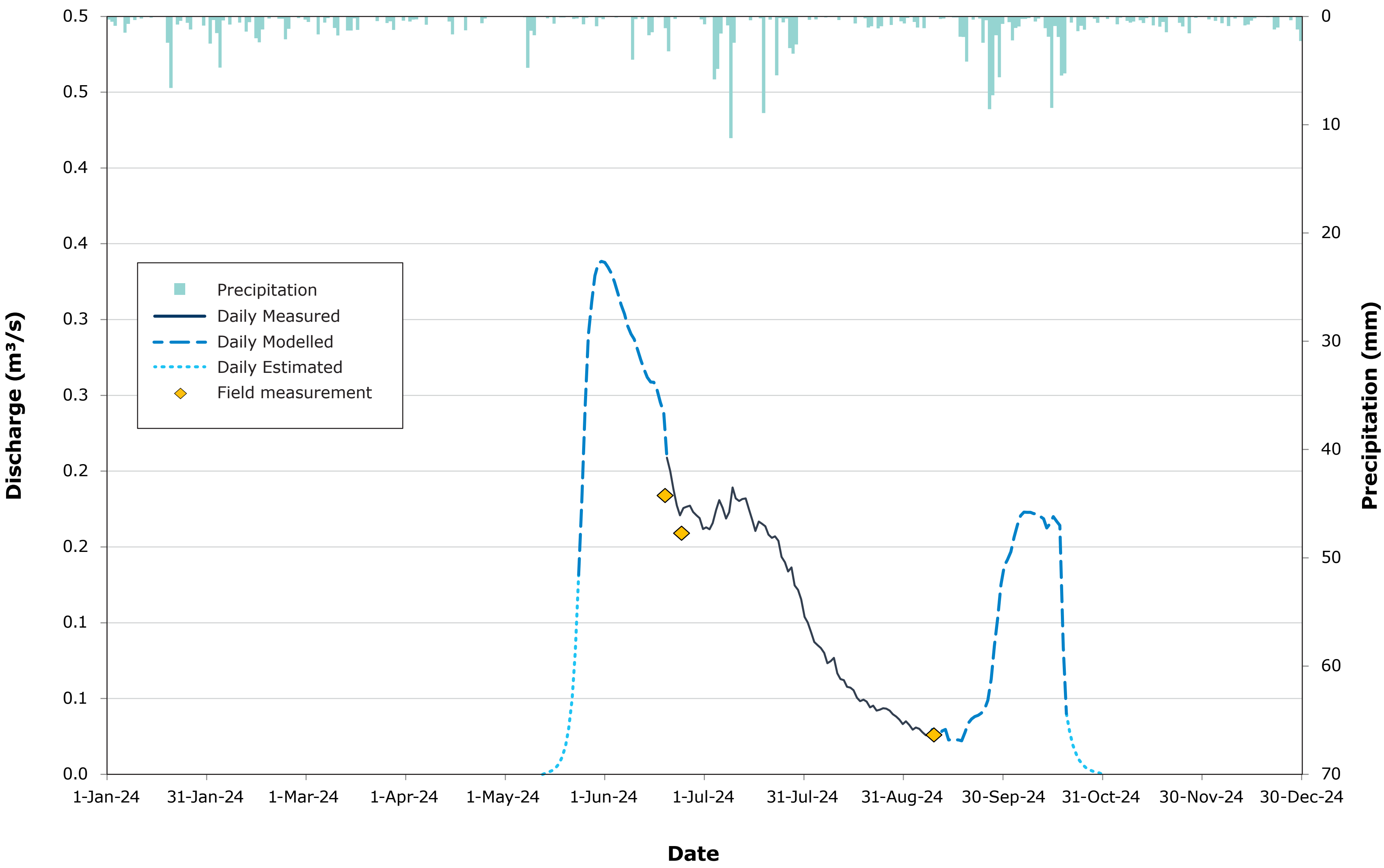
FIGURE A9 2024 MEAN DAILY LAKE LEVEL FOR MONITORING STATION LITTLE ROBERTS OUTFLOW



CLIENT: Agnico Eagle Mines Ltd.
GRAPHICS NUMBER: HB-25ERM-004:9

APPENDIX B HYDROGRAPHS

FIGURE B1 2024 MEAN DAILY HYDROGRAPH AT MONITORING STATION WINDY LAKE OUTFLOW



ERM

CLIENT: Agnico Eagle Mines Ltd.

GRAPHICS NUMBER: HB-25ERM-005:1

FIGURE B2 2024 MEAN DAILY HYDROGRAPH AT MONITORING STATION PATCH OUTFLOW

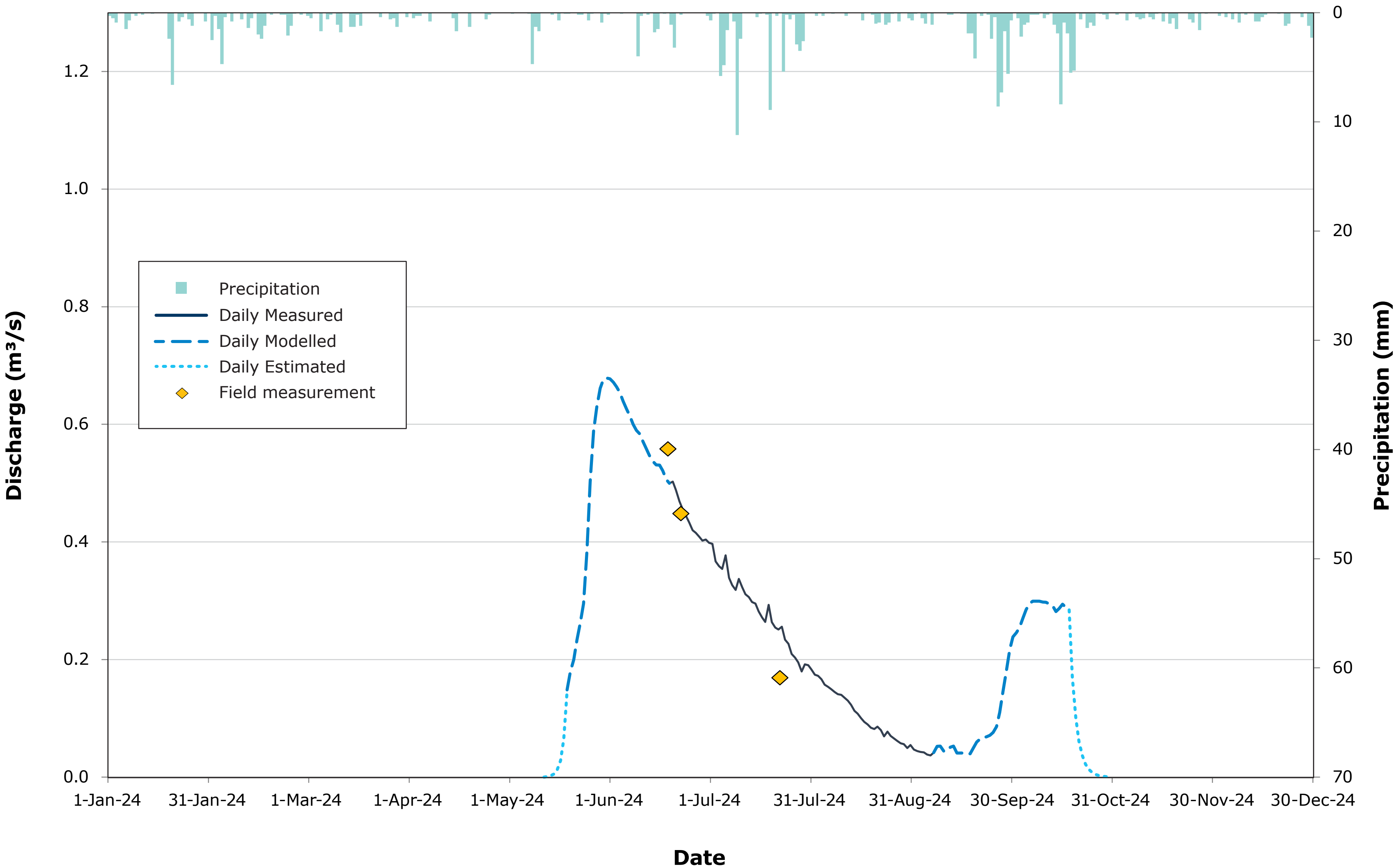
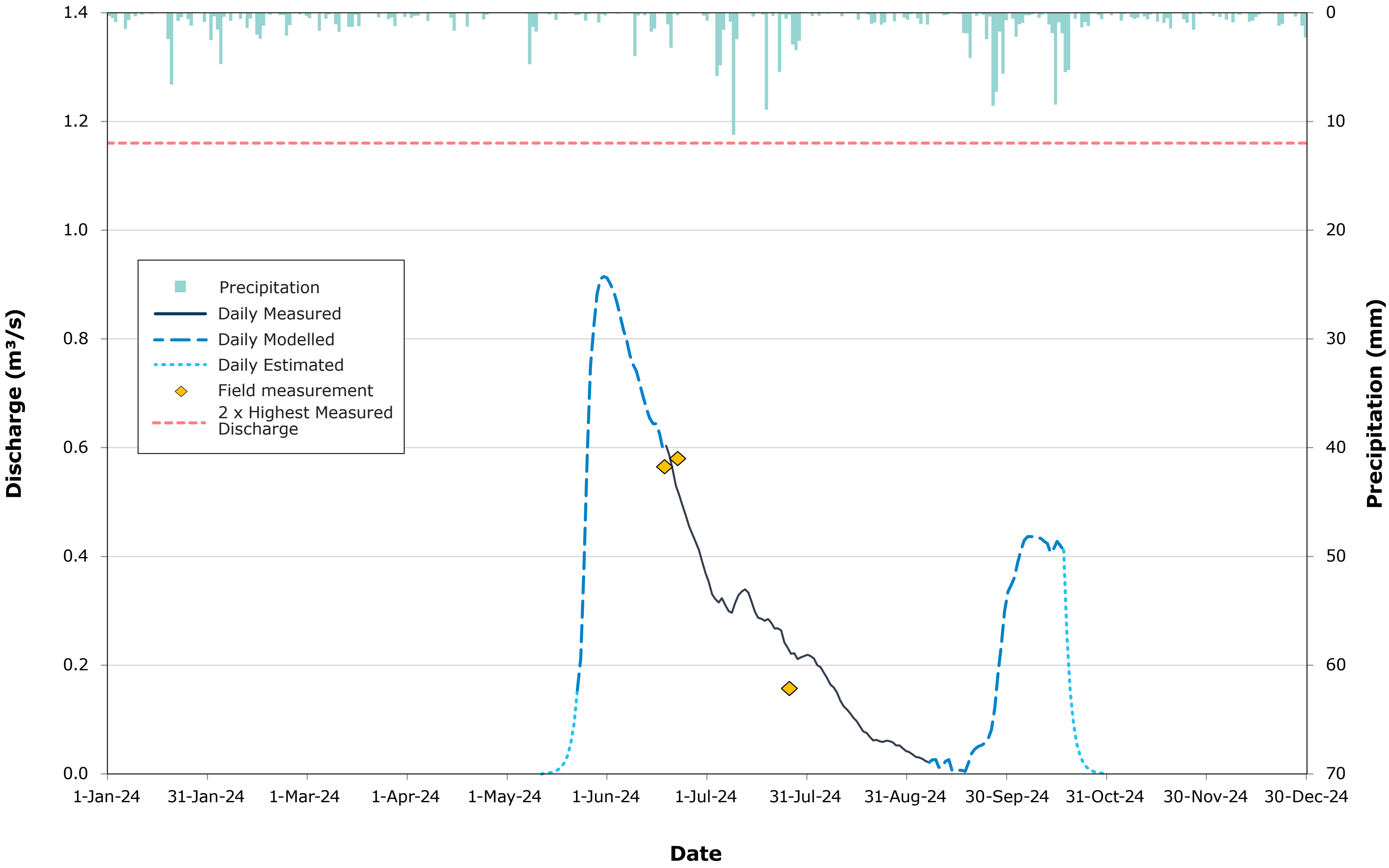


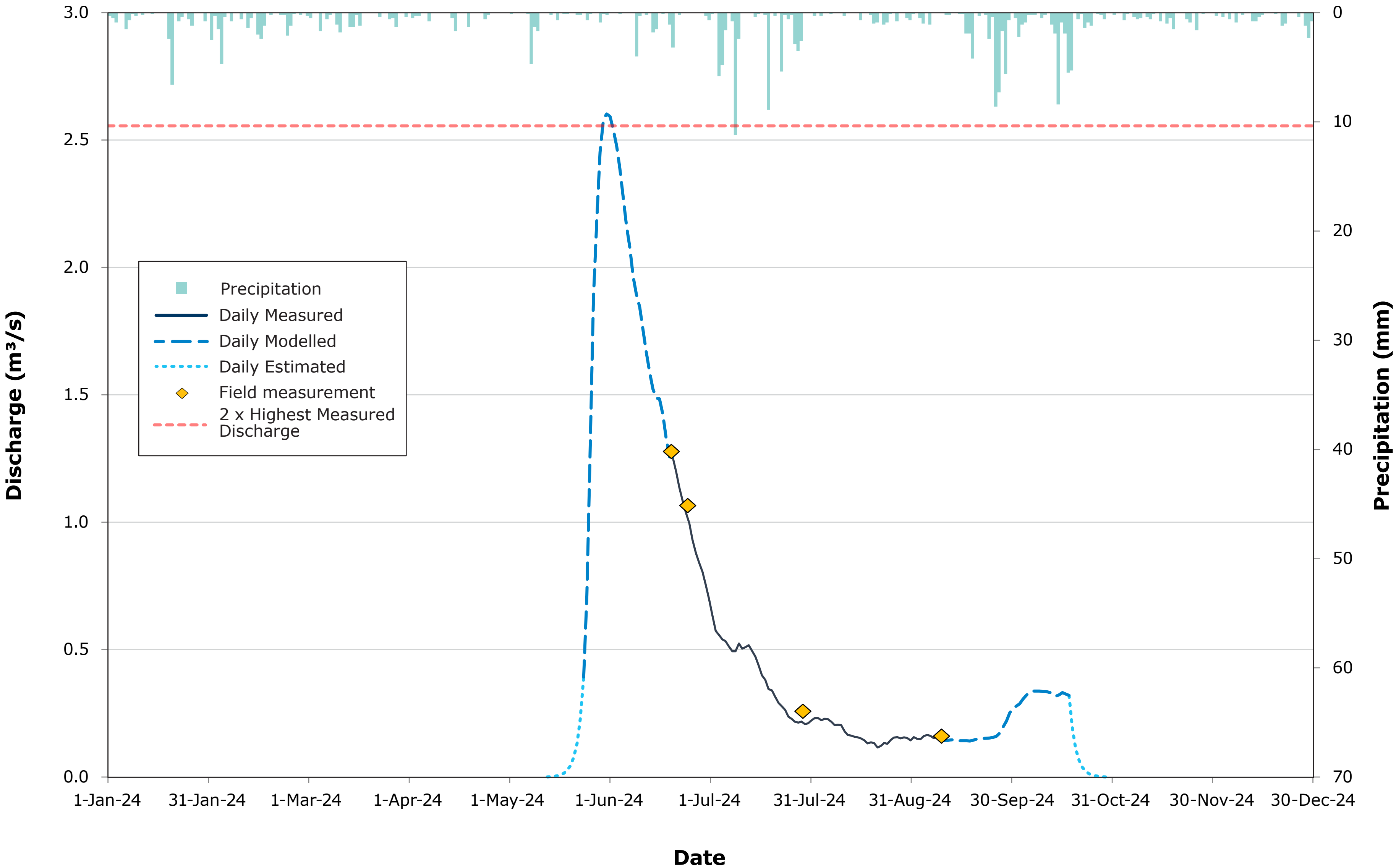
FIGURE B3 2024 MEAN DAILY HYDROGRAPH AT MONITORING STATION PO OUTFLOW



ERM

CLIENT: Agnico Eagle Mines Ltd.
GRAPHICS NUMBER: HB-25ERM-005:3

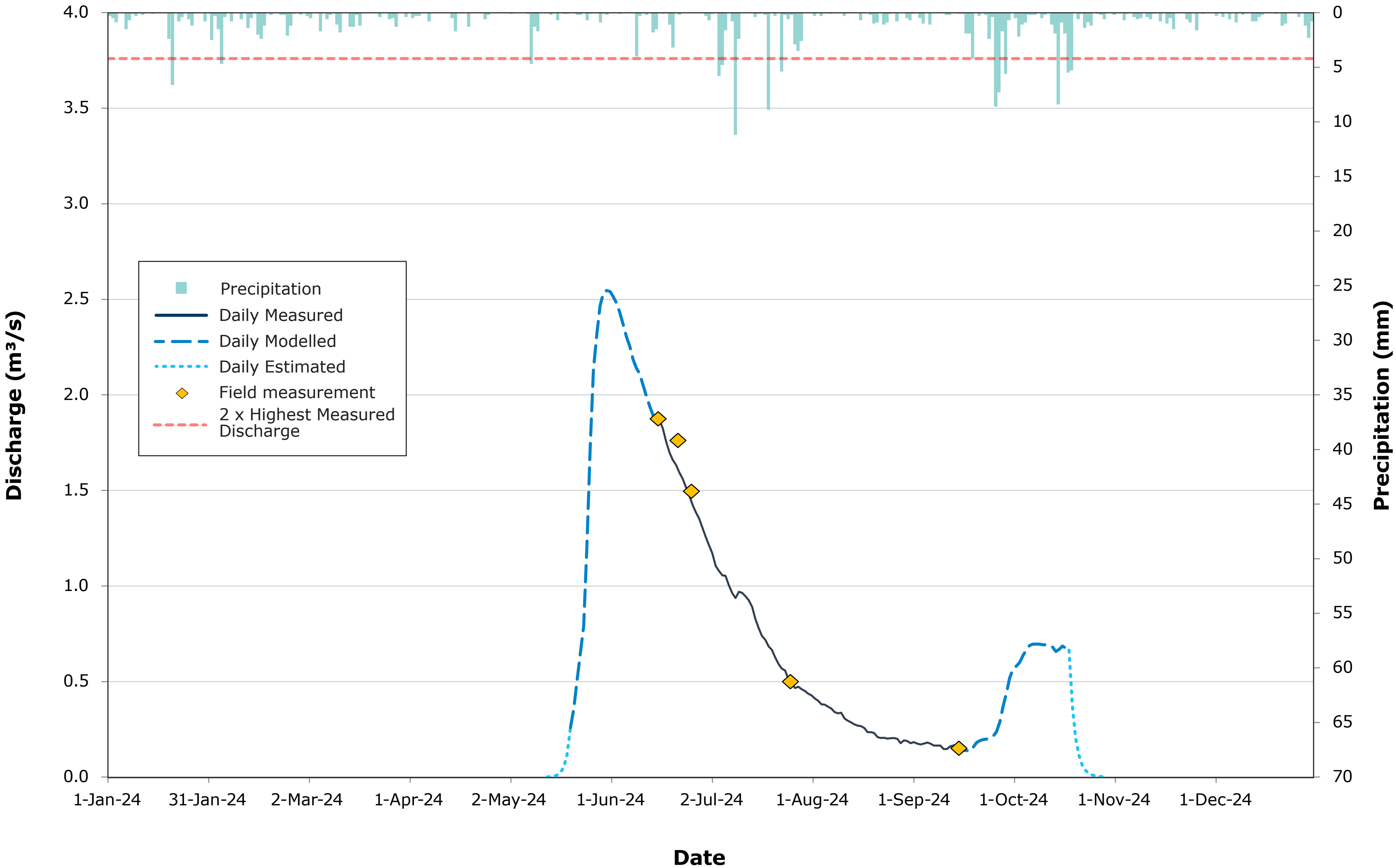
FIGURE B4 2024 MEAN DAILY HYDROGRAPH AT MONITORING STATION OGAMA OUTFLOW



ERM

CLIENT: Agnico Eagle Mines Ltd.
GRAPHICS NUMBER: HB-25ERM-005:4

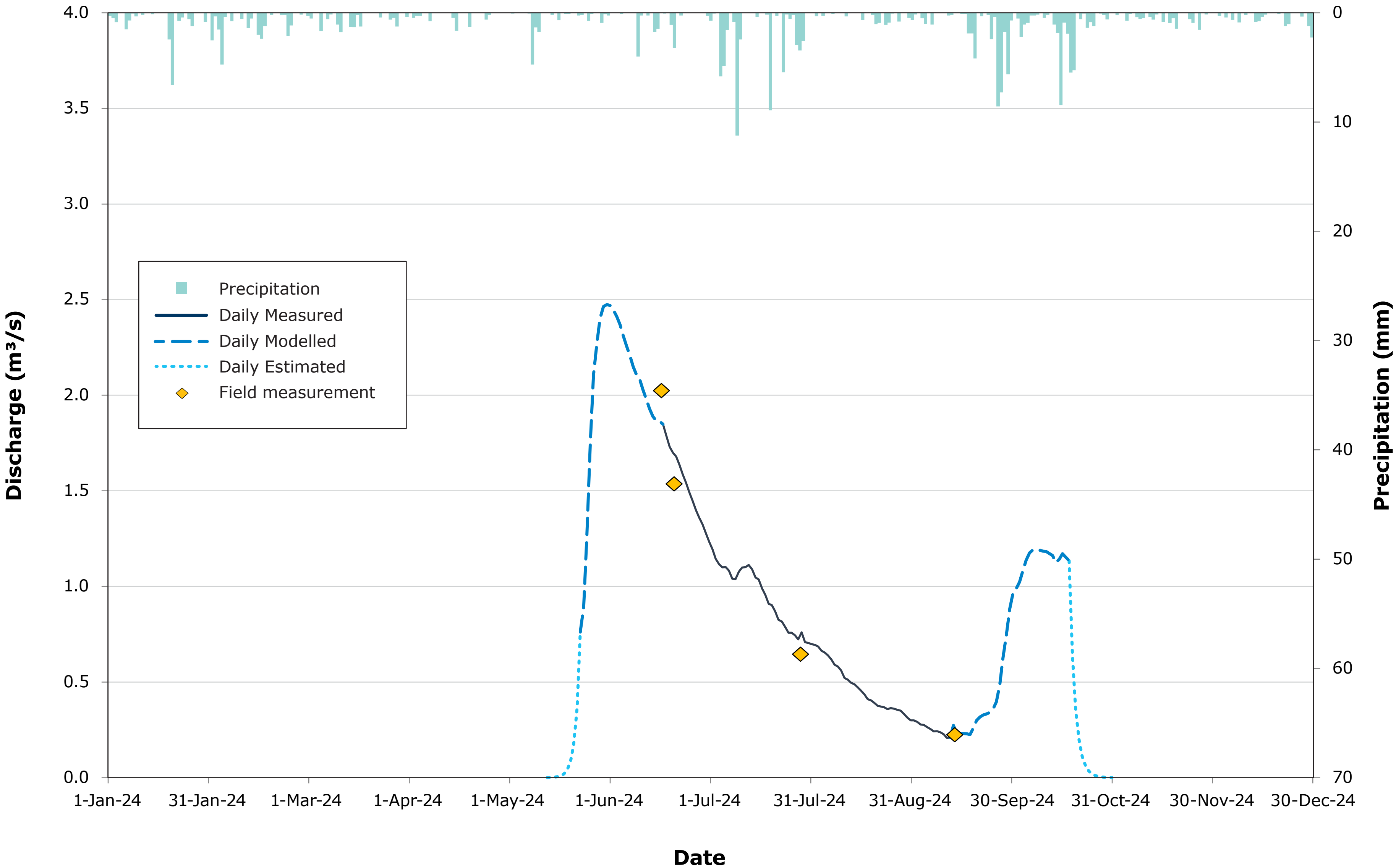
FIGURE B5 2024 MEAN DAILY HYDROGRAPH AT MONITORING STATION DORIS CREEK



ERM

CLIENT: Agnico Eagle Mines Ltd.
GRAPHICS NUMBER: HB-25ERM-005:5

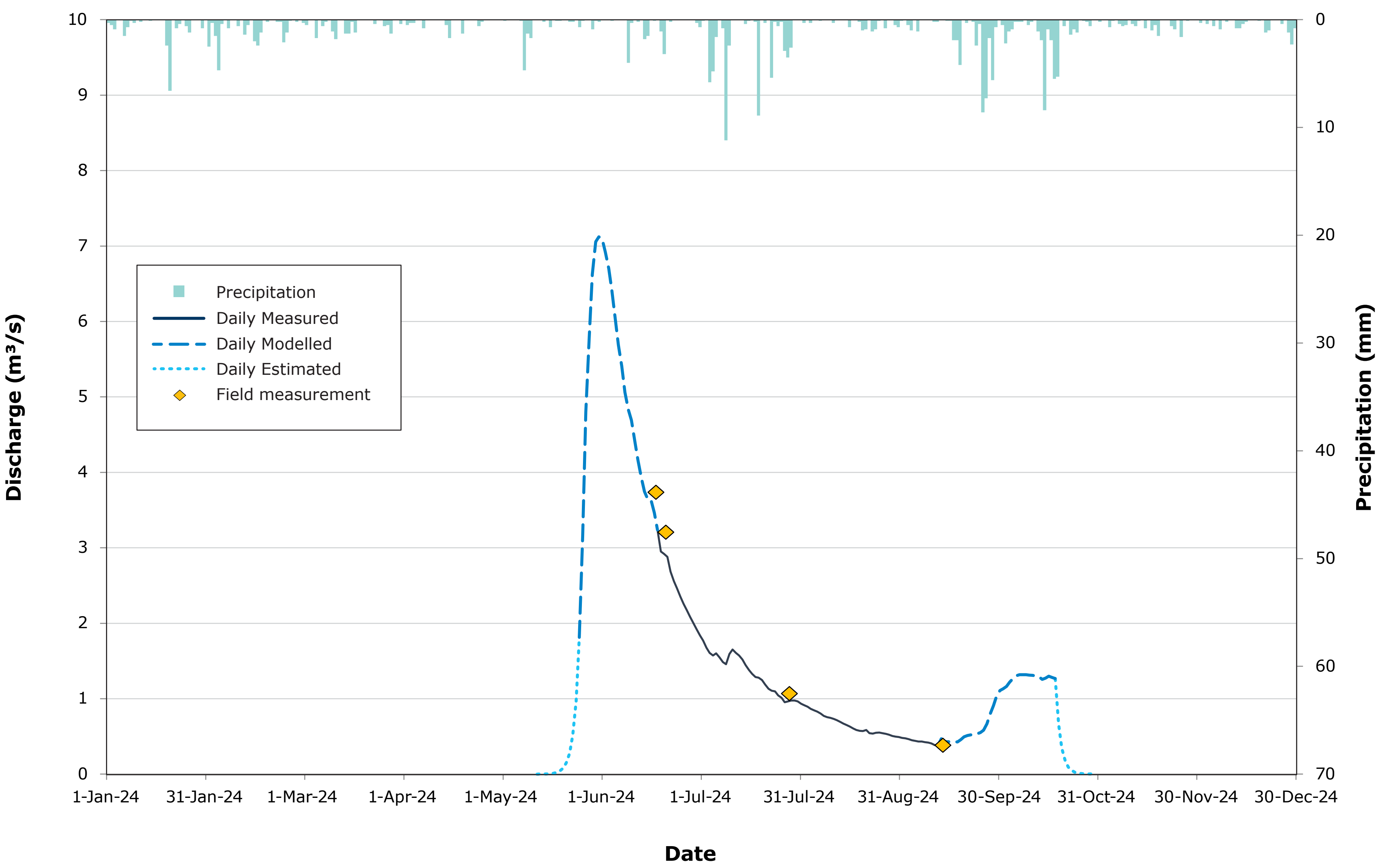
FIGURE B6 2024 MEAN DAILY HYDROGRAPH AT MONITORING STATION ROBERTS HYDRO-2



ERM

CLIENT: Agnico Eagle Mines Ltd.
GRAPHICS NUMBER: HB-25ERM-005:6

FIGURE B7 2024 MEAN DAILY HYDROGRAPH AT MONITORING STATION LITTLE ROBERTS OUTFLOW



CLIENT: Agnico Eagle Mines Ltd.
GRAPHICS NUMBER: HB-25ERM-005:7

APPENDIX C MEAN DAILY LAKE LEVEL TABLES

APPENDIX C1: SUMMARY OF MEAN DAILY WATER LEVEL (M) AT HYDROMETRIC STATION WINDY OUTFLOW, 2024

Drainage Area = 13.73 km^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	*18.340*	*18.340*	*18.340*	*18.340*	*18.340*	*18.435*	*18.354*	18.316	18.251	*18.339*	*18.355*	*18.355*
2	*18.340*	*18.340*	*18.340*	*18.340*	*18.340*	*18.434*	*18.354*	18.314	18.248	*18.342*	*18.355*	*18.355*
3	*18.340*	*18.340*	*18.340*	*18.340*	*18.340*	*18.432*	*18.354*	18.309	18.243	*18.345*	*18.355*	*18.355*
4	*18.340*	*18.340*	*18.340*	*18.340*	*18.340*	*18.430*	*18.356*	18.304	18.245	*18.351*	*18.355*	*18.355*
5	*18.340*	*18.340*	*18.340*	*18.340*	*18.340*	*18.427*	*18.361*	18.302	18.243	*18.355*	*18.355*	*18.355*
6	*18.340*	*18.340*	*18.340*	*18.340*	*18.340*	*18.424*	*18.364*	18.300	18.240	*18.359*	*18.355*	*18.355*
7	*18.340*	*18.340*	*18.340*	*18.340*	*18.340*	*18.421*	*18.362*	18.298	18.238	*18.360*	*18.355*	*18.355*
8	*18.340*	*18.340*	*18.340*	*18.340*	*18.340*	*18.418*	*18.358*	18.292	18.237	*18.360*	*18.355*	*18.355*
9	*18.340*	*18.340*	*18.340*	*18.340*	*18.340*	*18.416*	*18.360*	18.293	18.243	*18.360*	*18.355*	*18.355*
10	*18.340*	*18.340*	*18.340*	*18.340*	*18.340*	*18.414*	*18.369*	18.294	18.236	*18.360*	*18.355*	*18.355*
11	*18.340*	*18.340*	*18.340*	*18.340*	*18.340*	*18.412*	*18.365*	18.286	18.236	*18.359*	*18.355*	*18.355*
12	*18.340*	*18.340*	*18.340*	*18.340*	*18.340*	*18.409*	*18.364*	18.282	18.242	*18.358*	*18.355*	*18.355*
13	*18.340*	*18.340*	*18.340*	*18.340*	*18.340*	*18.406*	*18.365*	18.281	18.244	*18.358*	*18.355*	*18.355*
14	*18.340*	*18.340*	*18.340*	*18.340*	*18.340*	*18.404*	*18.365*	18.277	18.233	*18.354*	*18.355*	*18.355*
15	*18.340*	*18.340*	*18.340*	*18.340*	*18.340*	*18.402*	*18.361*	18.276	18.233	*18.356*	*18.355*	*18.355*
16	*18.340*	*18.340*	*18.340*	*18.340*	*18.340*	*18.402*	*18.357*	18.274	18.233	*18.358*	*18.355*	*18.355*
17	*18.340*	*18.340*	*18.340*	*18.340*	*18.340*	*18.400*	*18.353*	18.271	18.233	*18.357*	*18.355*	*18.355*
18	*18.340*	*18.340*	*18.340*	*18.340*	*18.340*	*18.396*	*18.356*	18.267	18.232	*18.355*	*18.355*	*18.355*
19	*18.340*	*18.340*	*18.340*	*18.340*	*18.340*	*18.393*	*18.356*	18.268	18.241	*18.355*	*18.355*	*18.355*
20	*18.340*	*18.340*	*18.340*	*18.340*	*18.340*	*18.379*	*18.355*	18.265	18.249	*18.355*	*18.355*	*18.355*
21	*18.340*	*18.340*	*18.340*	*18.340*	*18.340*	*18.374*	18.352	18.262	18.253	*18.355*	*18.355*	*18.355*
22	*18.340*	*18.340*	*18.340*	*18.340*	*18.340*	*18.368*	18.350	18.263	18.255	*18.355*	*18.355*	*18.355*
23	*18.340*	*18.340*	*18.340*	*18.340*	*18.340*	*18.362*	18.351	18.259	18.256	*18.355*	*18.355*	*18.355*
24	*18.340*	*18.340*	*18.340*	*18.340*	*18.336*	*18.359*	18.349	18.260	18.258	*18.355*	*18.355*	*18.355*
25	*18.340*	*18.340*	*18.340*	*18.340*	*18.364*	*18.361*	18.343	18.262	18.261	*18.355*	*18.355*	*18.355*
26	*18.340*	*18.340*	*18.340*	*18.340*	*18.395*	*18.362*	18.341	18.261	18.268	*18.355*	*18.355*	*18.355*
27	*18.340*	*18.340*	*18.340*	*18.340*	*18.416*	*18.362*	18.337	18.260	18.282	*18.355*	*18.355*	*18.355*
28	*18.340*	*18.340*	*18.340*	*18.340*	*18.425*	*18.360*	18.338	18.257	18.302	*18.355*	*18.355*	*18.355*
29	*18.340*	18.340	*18.340*	*18.340*	*18.431*	*18.359*	18.334	18.255	18.316	*18.355*	*18.355*	*18.355*
30	*18.340*		*18.340*	*18.340*	*18.435*	*18.358*	18.329	18.252	*18.331*	*18.355*	*18.355*	*18.355*
31	*18.340*		*18.340*		*18.435*		18.325	18.248		*18.355*		*18.355*
Mean	18.340	18.340	18.340	18.340	18.357	18.396	18.353	18.278	18.253	18.355	18.355	18.355
Max	18.340	18.340	18.340	18.340	18.435	18.435	18.369	18.316	18.331	18.360	18.355	18.355
Min	18.340	18.340	18.340	18.340	18.336	18.358	18.325	18.248	18.232	18.339	18.355	18.355

Note:
Estimated and modelled values are italicized.

APPENDIX C2: SUMMARY OF MEAN DAILY WATER LEVEL (M) AT HYDROMETRIC STATION GLENN LAKE, 2024

Drainage Area = 20.59 km^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	*9.552*	*9.552*	*9.552*	*9.552*	*9.552*	*9.878*	9.718	9.600	9.496	*9.634*	*9.670*	*9.670*
2	*9.552*	*9.552*	*9.552*	*9.552*	*9.552*	*9.875*	9.712	9.596	9.494	*9.639*	*9.670*	*9.670*
3	*9.552*	*9.552*	*9.552*	*9.552*	*9.552*	*9.871*	9.702	9.592	9.489	*9.646*	*9.670*	*9.670*
4	*9.552*	*9.552*	*9.552*	*9.552*	*9.552*	*9.865*	9.698	9.586	9.490	*9.659*	*9.670*	*9.670*
5	*9.552*	*9.552*	*9.552*	*9.552*	*9.552*	*9.858*	9.696	9.582	9.489	*9.670*	*9.670*	*9.670*
6	*9.552*	*9.552*	*9.552*	*9.552*	*9.552*	*9.850*	9.700	9.578	9.487	*9.679*	*9.670*	*9.670*
7	*9.552*	*9.552*	*9.552*	*9.552*	*9.552*	*9.844*	9.693	9.572	9.484	*9.682*	*9.670*	*9.670*
8	*9.552*	*9.552*	*9.552*	*9.552*	*9.552*	*9.836*	9.688	9.568	9.484	*9.682*	*9.670*	*9.670*
9	*9.552*	*9.552*	*9.552*	*9.552*	*9.552*	*9.831*	9.688	9.562	9.483	*9.682*	*9.670*	*9.670*
10	*9.552*	*9.552*	*9.552*	*9.552*	*9.552*	*9.827*	9.695	9.560	9.478	*9.681*	*9.670*	*9.670*
11	*9.552*	*9.552*	*9.552*	*9.552*	*9.552*	*9.820*	9.697	9.551	9.476	*9.680*	*9.670*	*9.670*
12	*9.552*	*9.552*	*9.552*	*9.552*	*9.552*	9.814	9.696	9.545	9.477	*9.678*	*9.670*	*9.670*
13	*9.552*	*9.552*	*9.552*	*9.552*	*9.552*	9.807	9.695	9.541	9.480	*9.676*	*9.670*	*9.670*
14	*9.552*	*9.552*	*9.552*	*9.552*	*9.552*	9.802	9.689	9.537	9.478	*9.668*	*9.670*	*9.670*
15	*9.552*	*9.552*	*9.552*	*9.552*	*9.552*	9.799	9.680	9.534	9.479	*9.672*	*9.670*	*9.670*
16	*9.552*	*9.552*	*9.552*	*9.552*	*9.552*	9.794	9.669	9.531	9.479	*9.678*	*9.670*	*9.670*
17	*9.552*	*9.552*	*9.552*	*9.552*	*9.552*	9.791	9.663	9.526	9.478	*9.674*	*9.670*	*9.670*
18	*9.552*	*9.552*	*9.552*	*9.552*	*9.552*	9.784	9.659	9.520	9.478	*9.670*	*9.670*	*9.670*
19	*9.552*	*9.552*	*9.552*	*9.552*	*9.572*	9.775	9.658	9.516	9.485	*9.670*	*9.670*	*9.670*
20	*9.552*	*9.552*	*9.552*	*9.552*	*9.592*	9.777	9.652	9.514	9.493	*9.670*	*9.670*	*9.670*
21	*9.552*	*9.552*	*9.552*	*9.552*	*9.613*	9.775	9.646	9.508	9.497	*9.670*	*9.670*	*9.670*
22	*9.552*	*9.552*	*9.552*	*9.552*	*9.633*	9.770	9.637	9.505	9.499	*9.670*	*9.670*	*9.670*
23	*9.552*	*9.552*	*9.552*	*9.552*	*9.653*	9.766	9.632	9.504	9.500	*9.670*	*9.670*	*9.670*
24	*9.552*	*9.552*	*9.552*	*9.552*	*9.671*	9.760	9.629	9.506	9.502	*9.670*	*9.670*	*9.670*
25	*9.552*	*9.552*	*9.552*	*9.552*	*9.720*	9.754	9.621	9.507	9.506	*9.670*	*9.670*	*9.670*
26	*9.552*	*9.552*	*9.552*	*9.552*	*9.783*	9.748	9.615	9.508	9.514	*9.670*	*9.670*	*9.670*
27	*9.552*	*9.552*	*9.552*	*9.552*	*9.830*	9.742	9.608	9.506	9.533	*9.670*	*9.670*	*9.670*
28	*9.552*	*9.552*	*9.552*	*9.552*	*9.852*	9.736	9.607	9.501	9.562	*9.670*	*9.670*	*9.670*
29	*9.552*	9.552	*9.552*	*9.552*	*9.870*	9.730	9.605	9.501	9.588	*9.670*	*9.670*	*9.670*
30	*9.552*		*9.552*	*9.552*	*9.878*	9.724	9.605	9.498	*9.617*	*9.670*	*9.670*	*9.670*
31	*9.552*		*9.552*		*9.879*		9.603	9.495		*9.670*		*9.670*
Mean	9.552	9.552	9.552	9.552	9.628	9.800	9.663	9.537	9.500	9.670	9.670	9.670
Max	9.552	9.552	9.552	9.552	9.879	9.878	9.718	9.600	9.617	9.682	9.670	9.670
Min	9.552	9.552	9.552	9.552	9.552	9.724	9.603	9.495	9.476	9.634	9.670	9.670

Note:
Estimated and modelled values are italicized.

APPENDIX C3: SUMMARY OF MEAN DAILY WATER LEVEL (M) AT HYDROMETRIC STATION IMNIAGUT LAKE, 2024

Drainage Area = 1.31 km^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	*27.130*	*27.130*	*27.130*	*27.130*	*27.130*	*27.299*	27.228	27.200	27.122	*27.256*	*27.255*	*27.255*
2	*27.130*	*27.130*	*27.130*	*27.130*	*27.130*	*27.298*	27.223	27.198	27.120	*27.261*	*27.255*	*27.255*
3	*27.130*	*27.130*	*27.130*	*27.130*	*27.130*	*27.296*	27.215	27.195	27.117	*27.268*	*27.255*	*27.255*
4	*27.130*	*27.130*	*27.130*	*27.130*	*27.130*	*27.293*	27.214	27.191	27.118	*27.280*	*27.255*	*27.255*
5	*27.130*	*27.130*	*27.130*	*27.130*	*27.130*	*27.290*	27.216	27.189	27.116	*27.291*	*27.255*	*27.255*
6	*27.130*	*27.130*	*27.130*	*27.130*	*27.130*	*27.287*	27.221	27.187	27.113	*27.299*	*27.255*	*27.255*
7	*27.130*	*27.130*	*27.130*	*27.130*	*27.130*	*27.284*	27.218	27.183	27.112	*27.302*	*27.255*	*27.255*
8	*27.130*	*27.130*	*27.130*	*27.130*	*27.130*	*27.280*	27.216	27.179	27.111	*27.302*	*27.255*	*27.255*
9	*27.130*	*27.130*	*27.130*	*27.130*	*27.130*	*27.278*	27.216	27.177	27.113	*27.302*	*27.255*	*27.255*
10	*27.130*	*27.130*	*27.130*	*27.130*	*27.130*	*27.276*	27.231	27.173	27.107	*27.301*	*27.255*	*27.255*
11	*27.130*	*27.130*	*27.130*	*27.130*	*27.130*	*27.273*	27.235	27.167	27.106	*27.301*	*27.255*	*27.255*
12	*27.130*	*27.130*	*27.130*	*27.130*	*27.130*	27.270	27.236	27.163	27.108	*27.298*	*27.255*	*27.255*
13	*27.130*	*27.130*	*27.130*	*27.130*	*27.130*	27.267	27.237	27.158	27.108	*27.296*	*27.255*	*27.255*
14	*27.130*	*27.130*	*27.130*	*27.130*	*27.130*	27.264	27.234	27.155	27.107	*27.289*	*27.255*	*27.255*
15	*27.130*	*27.130*	*27.130*	*27.130*	*27.130*	27.263	27.230	27.153	27.107	*27.292*	*27.255*	*27.255*
16	*27.130*	*27.130*	*27.130*	*27.130*	*27.130*	27.261	27.224	27.149	27.107	*27.298*	*27.255*	*27.255*
17	*27.130*	*27.130*	*27.130*	*27.130*	*27.130*	27.258	27.220	27.144	27.107	*27.294*	*27.255*	*27.255*
18	*27.130*	*27.130*	*27.130*	*27.130*	*27.130*	27.251	27.219	27.141	27.106	*27.291*	*27.255*	*27.255*
19	*27.130*	*27.130*	*27.130*	*27.130*	*27.130*	27.249	27.216	27.138	27.113	*27.304*	*27.255*	*27.255*
20	*27.130*	*27.130*	*27.130*	*27.130*	*27.130*	27.253	27.213	27.135	27.121	*27.333*	*27.255*	*27.255*
21	*27.130*	*27.130*	*27.130*	*27.130*	*27.130*	27.254	27.209	27.132	27.125	*27.348*	*27.255*	*27.255*
22	*27.130*	*27.130*	*27.130*	*27.130*	*27.130*	27.252	27.206	27.135	27.127	*27.356*	*27.255*	*27.255*
23	*27.130*	*27.130*	*27.130*	*27.130*	*27.130*	27.251	27.206	27.133	27.128	*27.359*	*27.255*	*27.255*
24	*27.130*	*27.130*	*27.130*	*27.130*	*27.204*	27.247	27.203	27.134	27.130	*27.350*	*27.255*	*27.255*
25	*27.130*	*27.130*	*27.130*	*27.130*	*27.227*	27.244	27.197	27.136	27.133	*27.331*	*27.255*	*27.255*
26	*27.130*	*27.130*	*27.130*	*27.130*	*27.256*	27.241	27.195	27.136	27.141	*27.311*	*27.255*	*27.255*
27	*27.130*	*27.130*	*27.130*	*27.130*	*27.277*	27.239	27.193	27.134	27.159	*27.292*	*27.255*	*27.255*
28	*27.130*	*27.130*	*27.130*	*27.130*	*27.287*	27.237	27.195	27.132	27.187	*27.274*	*27.255*	*27.255*
29	*27.130*	27.130	*27.130*	*27.130*	*27.295*	27.235	27.198	27.131	27.212	*27.255*	*27.255*	*27.255*
30	*27.130*		*27.130*	*27.130*	*27.299*	27.233	27.200	27.125	*27.240*	*27.255*	*27.255*	*27.255*
31	*27.130*		*27.130*		*27.300*		27.200	27.123		*27.255*		*27.255*
Mean	27.130	27.130	27.130	27.130	27.166	27.264	27.215	27.156	27.127	27.298	27.255	27.255
Max	27.130	27.130	27.130	27.130	27.300	27.299	27.237	27.200	27.240	27.359	27.255	27.255
Min	27.130	27.130	27.130	27.130	27.130	27.233	27.193	27.123	27.106	27.255	27.255	27.255

Note:
Estimated and modelled values are italicized.

APPENDIX C4: SUMMARY OF MEAN DAILY WATER LEVEL (M) AT HYDROMETRIC STATION PATCH OUTFLOW, 2024

Drainage Area = 32.16 km^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	*26.240*	*26.240*	*26.240*	*26.240*	*26.240*	*26.446*	26.342	26.230	26.115	*26.264*	*26.288*	*26.288*
2	*26.240*	*26.240*	*26.240*	*26.240*	*26.240*	*26.444*	26.340	26.225	26.112	*26.268*	*26.288*	*26.288*
3	*26.240*	*26.240*	*26.240*	*26.240*	*26.240*	*26.442*	26.327	26.224	26.110	*26.272*	*26.288*	*26.288*
4	*26.240*	*26.240*	*26.240*	*26.240*	*26.240*	*26.438*	26.324	26.220	26.109	*26.281*	*26.288*	*26.288*
5	*26.240*	*26.240*	*26.240*	*26.240*	*26.240*	*26.434*	26.322	26.213	26.104	*26.288*	*26.288*	*26.288*
6	*26.240*	*26.240*	*26.240*	*26.240*	*26.240*	*26.429*	26.332	26.210	26.101	*26.294*	*26.288*	*26.288*
7	*26.240*	*26.240*	*26.240*	*26.240*	*26.240*	*26.425*	26.314	26.208	26.106	*26.296*	*26.288*	*26.288*
8	*26.240*	*26.240*	*26.240*	*26.240*	*26.240*	*26.420*	26.309	26.204	26.122	*26.296*	*26.288*	*26.288*
9	*26.240*	*26.240*	*26.240*	*26.240*	*26.240*	*26.416*	26.305	26.202	26.123	*26.296*	*26.288*	*26.288*
10	*26.240*	*26.240*	*26.240*	*26.240*	*26.240*	*26.414*	26.314	26.201	26.112	*26.295*	*26.288*	*26.288*
11	*26.240*	*26.240*	*26.240*	*26.240*	*26.240*	*26.409*	26.307	26.197	26.112	*26.295*	*26.288*	*26.288*
12	*26.240*	*26.240*	*26.240*	*26.240*	*26.240*	26.405	26.301	26.193	26.121	*26.293*	*26.288*	*26.288*
13	*26.240*	*26.240*	*26.240*	*26.240*	*26.240*	26.401	26.298	26.188	26.123	*26.292*	*26.288*	*26.288*
14	*26.240*	*26.240*	*26.240*	*26.240*	*26.240*	26.397	26.294	26.180	26.108	*26.287*	*26.288*	*26.288*
15	*26.240*	*26.240*	*26.240*	*26.240*	*26.240*	26.395	26.293	26.176	26.108	*26.289*	*26.288*	*26.288*
16	*26.240*	*26.240*	*26.240*	*26.240*	*26.240*	26.395	26.286	26.170	26.108	*26.293*	*26.288*	*26.288*
17	*26.240*	*26.240*	*26.240*	*26.240*	*26.240*	26.391	26.281	26.164	26.108	*26.291*	*26.288*	*26.288*
18	*26.240*	*26.240*	*26.240*	*26.240*	*26.240*	26.386	26.277	26.160	26.106	*26.288*	*26.288*	*26.288*
19	*26.240*	*26.240*	*26.240*	*26.240*	*26.240*	26.383	26.292	26.155	26.119	*26.288*	*26.288*	*26.288*
20	*26.240*	*26.240*	*26.240*	*26.240*	*26.240*	26.384	26.277	26.153	26.131	*26.288*	*26.288*	*26.288*
21	*26.240*	*26.240*	*26.240*	*26.240*	*26.241*	26.378	26.271	26.157	26.136	*26.288*	*26.288*	*26.288*
22	*26.240*	*26.240*	*26.240*	*26.240*	*26.261*	26.371	26.270	26.151	26.139	*26.288*	*26.288*	*26.288*
23	*26.240*	*26.240*	*26.240*	*26.240*	*26.277*	26.366	26.273	26.141	26.140	*26.288*	*26.288*	*26.288*
24	*26.240*	*26.240*	*26.240*	*26.240*	*26.294*	26.361	26.261	26.148	26.143	*26.288*	*26.288*	*26.288*
25	*26.240*	*26.240*	*26.240*	*26.240*	*26.336*	26.356	26.257	26.141	26.148	*26.288*	*26.288*	*26.288*
26	*26.240*	*26.240*	*26.240*	*26.240*	*26.384*	26.351	26.247	26.136	26.157	*26.288*	*26.288*	*26.288*
27	*26.240*	*26.240*	*26.240*	*26.240*	*26.416*	26.349	26.243	26.133	26.178	*26.288*	*26.288*	*26.288*
28	*26.240*	*26.240*	*26.240*	*26.240*	*26.430*	26.346	26.238	26.128	26.207	*26.288*	*26.288*	*26.288*
29	*26.240*	26.240	*26.240*	*26.240*	*26.441*	26.343	26.228	26.126	26.229	*26.288*	*26.288*	*26.288*
30	*26.240*		*26.240*	*26.240*	*26.446*	26.344	26.236	26.118	*26.251*	*26.288*	*26.288*	*26.288*
31	*26.240*		*26.240*		*26.447*		26.235	26.124		*26.288*		*26.288*
Mean	26.240	26.240	26.240	26.240	26.283	26.394	26.287	26.173	26.133	26.288	26.288	26.288
Max	26.240	26.240	26.240	26.240	26.447	26.446	26.342	26.230	26.251	26.296	26.288	26.288
Min	26.240	26.240	26.240	26.240	26.240	26.343	26.228	26.118	26.101	26.264	26.288	26.288

Note:
Estimated and modelled values are italicized.

APPENDIX C5: SUMMARY OF MEAN DAILY WATER LEVEL (M) AT HYDROMETRIC STATION
PO OUTFLOW, 2024

Drainage Area = 35.3 km^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	*26.123*	*26.123*	*26.123*	*26.123*	*26.123*	*26.350*	26.211	26.151	26.023	*26.199*	*26.225*	*26.225*
2	*26.123*	*26.123*	*26.123*	*26.123*	*26.123*	*26.347*	26.205	26.149	26.017	*26.203*	*26.225*	*26.225*
3	*26.123*	*26.123*	*26.123*	*26.123*	*26.123*	*26.345*	26.197	26.147	26.010	*26.208*	*26.225*	*26.225*
4	*26.123*	*26.123*	*26.123*	*26.123*	*26.123*	*26.341*	26.194	26.141	26.008	*26.217*	*26.225*	*26.225*
5	*26.123*	*26.123*	*26.123*	*26.123*	*26.123*	*26.335*	26.191	26.139	26.004	*26.225*	*26.225*	*26.225*
6	*26.123*	*26.123*	*26.123*	*26.123*	*26.123*	*26.330*	26.194	26.134	25.997	*26.231*	*26.225*	*26.225*
7	*26.123*	*26.123*	*26.123*	*26.123*	*26.123*	*26.326*	26.189	26.129	25.993	*26.233*	*26.225*	*26.225*
8	*26.123*	*26.123*	*26.123*	*26.123*	*26.123*	*26.320*	26.185	26.123	26.001	*26.233*	*26.225*	*26.225*
9	*26.123*	*26.123*	*26.123*	*26.123*	*26.123*	*26.316*	26.184	26.119	26.002	*26.233*	*26.225*	*26.225*
10	*26.123*	*26.123*	*26.123*	*26.123*	*26.123*	*26.313*	26.191	26.114	25.973	*26.232*	*26.225*	*26.225*
11	*26.123*	*26.123*	*26.123*	*26.123*	*26.123*	*26.308*	26.196	26.105	25.973	*26.232*	*26.225*	*26.225*
12	*26.123*	*26.123*	*26.123*	*26.123*	*26.123*	*26.302*	26.199	26.098	25.997	*26.230*	*26.225*	*26.225*
13	*26.123*	*26.123*	*26.123*	*26.123*	*26.123*	*26.297*	26.200	26.094	26.002	*26.229*	*26.225*	*26.225*
14	*26.123*	*26.123*	*26.123*	*26.123*	*26.123*	26.293	26.198	26.089	25.954	*26.223*	*26.225*	*26.225*
15	*26.123*	*26.123*	*26.123*	*26.123*	*26.123*	26.290	26.192	26.083	25.956	*26.226*	*26.225*	*26.225*
16	*26.123*	*26.123*	*26.123*	*26.123*	*26.123*	26.290	26.185	26.078	25.956	*26.230*	*26.225*	*26.225*
17	*26.123*	*26.123*	*26.123*	*26.123*	*26.123*	26.286	26.180	26.071	25.954	*26.227*	*26.225*	*26.225*
18	*26.123*	*26.123*	*26.123*	*26.123*	*26.123*	26.279	26.179	26.063	25.946	*26.225*	*26.225*	*26.225*
19	*26.123*	*26.123*	*26.123*	*26.123*	*26.123*	26.280	26.178	26.060	25.992	*26.225*	*26.225*	*26.225*
20	*26.123*	*26.123*	*26.123*	*26.123*	*26.123*	26.275	26.179	26.054	26.020	*26.225*	*26.225*	*26.225*
21	*26.123*	*26.123*	*26.123*	*26.123*	*26.123*	26.268	26.176	26.047	26.030	*26.225*	*26.225*	*26.225*
22	*26.123*	*26.123*	*26.123*	*26.123*	*26.123*	26.260	26.172	26.048	26.035	*26.225*	*26.225*	*26.225*
23	*26.123*	*26.123*	*26.123*	*26.123*	*26.123*	26.255	26.172	26.046	26.038	*26.225*	*26.225*	*26.225*
24	*26.123*	*26.123*	*26.123*	*26.123*	*26.171*	26.250	26.171	26.044	26.042	*26.225*	*26.225*	*26.225*
25	*26.123*	*26.123*	*26.123*	*26.123*	*26.219*	26.244	26.161	26.047	26.051	*26.225*	*26.225*	*26.225*
26	*26.123*	*26.123*	*26.123*	*26.123*	*26.267*	26.239	26.157	26.046	26.066	*26.225*	*26.225*	*26.225*
27	*26.123*	*26.123*	*26.123*	*26.123*	*26.315*	26.234	26.151	26.044	26.096	*26.225*	*26.225*	*26.225*
28	*26.123*	*26.123*	*26.123*	*26.123*	*26.331*	26.230	26.152	26.038	26.133	*26.225*	*26.225*	*26.225*
29	*26.123*	26.123	*26.123*	*26.123*	*26.344*	26.225	26.147	26.037	26.159	*26.225*	*26.225*	*26.225*
30	*26.123*		*26.123*	*26.123*	*26.349*	26.218	26.148	26.031	*26.185*	*26.225*	*26.225*	*26.225*
31	*26.123*		*26.123*		*26.350*		26.149	26.025		*26.225*		*26.225*
Mean	26.123	26.123	26.123	26.123	26.167	26.288	26.180	26.084	26.020	26.225	26.225	26.225
Max	26.123	26.123	26.123	26.123	26.350	26.350	26.211	26.151	26.185	26.233	26.225	26.225
Min	26.123	26.123	26.123	26.123	26.123	26.218	26.147	26.025	25.946	26.199	26.225	26.225

Note:
Estimated and modelled values are italicized.

APPENDIX C6: SUMMARY OF MEAN DAILY WATER LEVEL (M) AT HYDROMETRIC STATION OGAMA OUTFLOW, 2024

Drainage Area = 74.93 km^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	*24.097*	*24.097*	*24.097*	*24.097*	*24.097*	*24.500*	24.236	24.122	24.099	*24.137*	*24.147*	*24.147*
2	*24.097*	*24.097*	*24.097*	*24.097*	*24.097*	*24.494*	24.224	24.124	24.096	*24.139*	*24.147*	*24.147*
3	*24.097*	*24.097*	*24.097*	*24.097*	*24.097*	*24.487*	24.211	24.124	24.096	*24.141*	*24.147*	*24.147*
4	*24.097*	*24.097*	*24.097*	*24.097*	*24.097*	*24.477*	24.208	24.122	24.100	*24.146*	*24.147*	*24.147*
5	*24.097*	*24.097*	*24.097*	*24.097*	*24.097*	*24.464*	24.204	24.124	24.102	*24.151*	*24.147*	*24.147*
6	*24.097*	*24.097*	*24.097*	*24.097*	*24.097*	*24.451*	24.202	24.123	24.101	*24.154*	*24.147*	*24.147*
7	*24.097*	*24.097*	*24.097*	*24.097*	*24.097*	*24.441*	24.198	24.120	24.097	*24.155*	*24.147*	*24.147*
8	*24.097*	*24.097*	*24.097*	*24.097*	*24.097*	*24.427*	24.194	24.116	24.099	*24.155*	*24.147*	*24.147*
9	*24.097*	*24.097*	*24.097*	*24.097*	*24.097*	*24.418*	24.193	24.116	24.095	*24.155*	*24.147*	*24.147*
10	*24.097*	*24.097*	*24.097*	*24.097*	*24.097*	*24.412*	24.200	24.116	24.094	*24.155*	*24.147*	*24.147*
11	*24.097*	*24.097*	*24.097*	*24.097*	*24.097*	24.400	24.196	24.107	24.094	*24.155*	*24.147*	*24.147*
12	*24.097*	*24.097*	*24.097*	*24.097*	*24.097*	24.389	24.197	24.102	24.095	*24.154*	*24.147*	*24.147*
13	*24.097*	*24.097*	*24.097*	*24.097*	*24.097*	24.378	24.199	24.101	24.095	*24.153*	*24.147*	*24.147*
14	*24.097*	*24.097*	*24.097*	*24.097*	*24.109*	24.369	24.194	24.100	24.093	*24.150*	*24.147*	*24.147*
15	*24.097*	*24.097*	*24.097*	*24.097*	*24.121*	24.364	24.189	24.099	24.093	*24.151*	*24.147*	*24.147*
16	*24.097*	*24.097*	*24.097*	*24.097*	*24.133*	24.364	24.180	24.097	24.093	*24.154*	*24.147*	*24.147*
17	*24.097*	*24.097*	*24.097*	*24.097*	*24.145*	24.355	24.171	24.094	24.093	*24.152*	*24.147*	*24.147*
18	*24.097*	*24.097*	*24.097*	*24.097*	*24.157*	24.342	24.167	24.089	24.093	*24.151*	*24.147*	*24.147*
19	*24.097*	*24.097*	*24.097*	*24.097*	*24.169*	24.331	24.157	24.091	24.095	*24.147*	*24.147*	*24.147*
20	*24.097*	*24.097*	*24.097*	*24.097*	*24.180*	24.331	24.156	24.090	24.096	*24.147*	*24.147*	*24.147*
21	*24.097*	*24.097*	*24.097*	*24.097*	*24.192*	24.322	24.149	24.082	24.097	*24.147*	*24.147*	*24.147*
22	*24.097*	*24.097*	*24.097*	*24.097*	*24.204*	24.313	24.142	24.085	24.097	*24.147*	*24.147*	*24.147*
23	*24.097*	*24.097*	*24.097*	*24.097*	*24.216*	24.304	24.139	24.090	24.097	*24.147*	*24.147*	*24.147*
24	*24.097*	*24.097*	*24.097*	*24.097*	*24.228*	24.297	24.134	24.088	24.098	*24.147*	*24.147*	*24.147*
25	*24.097*	*24.097*	*24.097*	*24.097*	*24.239*	24.290	24.126	24.095	24.099	*24.147*	*24.147*	*24.147*
26	*24.097*	*24.097*	*24.097*	*24.097*	*24.339*	24.279	24.123	24.098	24.100	*24.147*	*24.147*	*24.147*
27	*24.097*	*24.097*	*24.097*	*24.097*	*24.417*	24.270	24.120	24.099	24.105	*24.147*	*24.147*	*24.147*
28	*24.097*	*24.097*	*24.097*	*24.097*	*24.455*	24.263	24.119	24.097	24.113	*24.147*	*24.147*	*24.147*
29	*24.097*	24.097	*24.097*	*24.097*	*24.484*	24.257	24.120	24.099	24.121	*24.147*	*24.147*	*24.147*
30	*24.097*		*24.097*	*24.097*	*24.499*	24.247	24.117	24.097	*24.131*	*24.147*	*24.147*	*24.147*
31	*24.097*		*24.097*		*24.501*		24.118	24.094		*24.147*		*24.147*
Mean	24.097	24.097	24.097	24.097	24.195	24.368	24.170	24.103	24.099	24.149	24.147	24.147
Max	24.097	24.097	24.097	24.097	24.501	24.500	24.236	24.124	24.131	24.155	24.147	24.147
Min	24.097	24.097	24.097	24.097	24.097	24.247	24.117	24.082	24.093	24.137	24.147	24.147

Note:
Estimated and modelled values are italicized.

APPENDIX C7: SUMMARY OF MEAN DAILY WATER LEVEL (M) AT HYDROMETRIC STATION DORIS LAKE-2, 2024

Drainage Area = 90.29 km^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	21.757	21.771	21.776	21.771	21.755	22.266	21.986	21.816	21.722	21.883	21.834	21.768
2	21.759	21.772	21.781	21.768	21.754	22.261	21.978	21.812	21.721	21.889	21.822	21.761
3	21.763	21.784	21.778	21.771	21.753	22.253	21.964	21.809	21.718	21.897	21.810	21.758
4	21.757	21.793	21.783	21.775	21.751	22.243	21.956	21.804	21.719	21.911	21.801	21.750
5	21.763	21.783	21.780	21.771	21.749	22.229	21.952	21.801	21.717	21.924	21.800	21.757
6	21.761	21.786	21.777	21.768	21.748	22.216	21.950	21.798	21.715	21.933	21.797	21.758
7	21.761	21.785	21.775	21.766	21.748	22.205	21.940	21.793	21.715	21.937	21.795	21.755
8	21.755	21.781	21.774	21.763	21.750	22.191	21.931	21.789	21.714	21.937	21.795	21.752
9	21.754	21.782	21.781	21.765	21.756	22.182	21.926	21.787	21.714	21.937	21.797	21.754
10	21.754	21.787	21.776	21.769	21.763	22.175	21.934	21.786	21.707	21.935	21.797	21.760
11	21.751	21.785	21.781	21.764	21.764	22.163	21.931	21.780	21.705	21.935	21.794	21.763
12	21.751	21.778	21.790	21.762	21.759	22.151	21.923	21.778	21.708	21.932	21.795	21.761
13	21.762	21.782	21.786	21.762	21.757	22.140	21.917	21.775	21.708	21.930	21.795	21.758
14	21.758	21.784	21.776	21.762	21.758	22.130	21.910	21.770	21.707	21.921	21.796	21.761
15	21.754	21.786	21.780	21.766	21.764	22.125	21.901	21.768	21.707	21.925	21.790	21.762
16	21.755	21.786	21.788	21.770	21.767	22.116	21.897	21.763	21.707	21.932	21.785	21.762
17	21.752	21.783	21.787	21.767	21.766	22.106	21.886	21.757	21.707	21.928	21.783	21.760
18	21.755	21.789	21.792	21.764	21.768	22.098	21.878	21.753	21.706	21.923	21.778	21.761
19	21.764	21.781	21.788	21.766	21.775	22.088	21.877	21.749	21.714	21.939	21.778	21.764
20	21.770	21.785	21.783	21.769	21.785	22.085	21.870	21.747	21.723	21.973	21.783	21.767
21	21.772	21.781	21.782	21.766	21.805	22.079	21.862	21.743	21.728	21.991	21.782	21.768
22	21.775	21.789	21.785	21.763	21.837	22.070	21.854	21.740	21.730	22.000	21.781	21.777
23	21.773	21.785	21.785	21.763	21.866	22.061	21.854	21.739	21.731	22.004	21.779	21.772
24	21.775	21.787	21.776	21.764	21.897	22.051	21.847	21.739	21.733	21.994	21.776	21.785
25	21.772	21.777	21.771	21.765	21.984	22.043	21.838	21.738	21.738	21.971	21.774	21.785
26	21.772	21.778	21.773	21.762	22.097	22.033	21.833	21.736	21.747	21.947	21.773	21.781
27	21.771	21.784	21.771	21.761	22.180	22.023	21.829	21.736	21.768	21.925	21.771	21.789
28	21.775	21.780	21.779	21.761	22.220	22.013	21.829	21.733	21.802	21.904	21.768	21.787
29	21.769	21.777	21.785	21.760	22.251	22.003	21.828	21.730	21.830	21.881	21.764	21.789
30	21.769		21.785	21.758	22.265	21.995	21.823	21.726	21.863	21.867	21.767	21.797
31	21.771		21.785		22.267		21.819	21.724		21.848		21.813
Mean	21.763	21.783	21.781	21.765	21.866	22.126	21.894	21.765	21.731	21.931	21.789	21.769
Max	21.775	21.793	21.792	21.775	22.267	22.266	21.986	21.816	21.863	22.004	21.834	21.813
Min	21.751	21.771	21.771	21.758	21.748	21.995	21.819	21.724	21.705	21.848	21.764	21.750

Note:
Estimated and modelled values are italicized.

APPENDIX C8: SUMMARY OF MEAN DAILY WATER LEVEL (M) AT HYDROMETRIC STATION ROBERTS HYDRO-2, 2024

Drainage Area = 97.83 km^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	*6.150*	*6.150*	*6.150*	*6.150*	*6.150*	*6.684*	6.523	6.412	6.304	*6.470*	*6.504*	*6.504*
2	*6.150*	*6.150*	*6.150*	*6.150*	*6.150*	*6.682*	6.516	6.411	6.302	*6.475*	*6.504*	*6.504*
3	*6.150*	*6.150*	*6.150*	*6.150*	*6.150*	*6.680*	6.506	6.409	6.297	*6.482*	*6.504*	*6.504*
4	*6.150*	*6.150*	*6.150*	*6.150*	*6.150*	*6.677*	6.501	6.404	6.296	*6.494*	*6.504*	*6.504*
5	*6.150*	*6.150*	*6.150*	*6.150*	*6.150*	*6.672*	6.498	6.401	6.293	*6.505*	*6.504*	*6.504*
6	*6.150*	*6.150*	*6.150*	*6.150*	*6.150*	*6.668*	6.498	6.398	6.289	*6.512*	*6.504*	*6.504*
7	*6.150*	*6.150*	*6.150*	*6.150*	*6.150*	*6.664*	6.494	6.392	6.285	*6.515*	*6.504*	*6.504*
8	*6.150*	*6.150*	*6.150*	*6.150*	*6.150*	*6.660*	6.486	6.386	6.285	*6.515*	*6.504*	*6.504*
9	*6.150*	*6.150*	*6.150*	*6.150*	*6.150*	*6.656*	6.485	6.383	6.283	*6.515*	*6.504*	*6.504*
10	*6.150*	*6.150*	*6.150*	*6.150*	*6.150*	*6.654*	6.493	6.378	6.280	*6.514*	*6.504*	*6.504*
11	*6.150*	*6.150*	*6.150*	*6.150*	*6.150*	*6.650*	6.497	6.368	6.273	*6.514*	*6.504*	*6.504*
12	*6.150*	*6.150*	*6.150*	*6.150*	*6.150*	*6.646*	6.498	6.366	6.273	*6.512*	*6.504*	*6.504*
13	*6.150*	*6.150*	*6.150*	*6.150*	*6.150*	*6.642*	6.500	6.361	6.296	*6.510*	*6.504*	*6.504*
14	*6.150*	*6.150*	*6.150*	*6.150*	*6.150*	*6.637*	6.496	6.359	6.281	*6.502*	*6.504*	*6.504*
15	*6.150*	*6.150*	*6.150*	*6.150*	*6.150*	*6.633*	6.487	6.355	6.281	*6.506*	*6.504*	*6.504*
16	*6.150*	*6.150*	*6.150*	*6.150*	*6.150*	6.633	6.485	6.350	6.281	*6.512*	*6.504*	*6.504*
17	*6.150*	*6.150*	*6.150*	*6.150*	*6.150*	6.630	6.475	6.345	6.281	*6.508*	*6.504*	*6.504*
18	*6.150*	*6.150*	*6.150*	*6.150*	*6.150*	6.621	6.468	6.338	6.279	*6.504*	*6.504*	*6.504*
19	*6.150*	*6.150*	*6.150*	*6.150*	*6.204*	6.611	6.458	6.336	6.292	*6.504*	*6.504*	*6.504*
20	*6.150*	*6.150*	*6.150*	*6.150*	*6.259*	6.606	6.457	6.332	6.304	*6.504*	*6.504*	*6.504*
21	*6.150*	*6.150*	*6.150*	*6.150*	*6.314*	6.603	6.450	6.328	6.310	*6.504*	*6.504*	*6.504*
22	*6.150*	*6.150*	*6.150*	*6.150*	*6.370*	6.595	6.441	6.326	6.313	*6.504*	*6.504*	*6.504*
23	*6.150*	*6.150*	*6.150*	*6.150*	*6.426*	6.587	6.439	6.326	6.315	*6.504*	*6.504*	*6.504*
24	*6.150*	*6.150*	*6.150*	*6.150*	*6.455*	6.579	6.433	6.323	6.318	*6.504*	*6.504*	*6.504*
25	*6.150*	*6.150*	*6.150*	*6.150*	*6.529*	6.570	6.425	6.324	6.323	*6.504*	*6.504*	*6.504*
26	*6.150*	*6.150*	*6.150*	*6.150*	*6.614*	6.563	6.426	6.323	6.334	*6.504*	*6.504*	*6.504*
27	*6.150*	*6.150*	*6.150*	*6.150*	*6.656*	6.554	6.422	6.322	6.359	*6.504*	*6.504*	*6.504*
28	*6.150*	*6.150*	*6.150*	*6.150*	*6.669*	6.547	6.417	6.319	6.394	*6.504*	*6.504*	*6.504*
29	*6.150*	6.150	*6.150*	*6.150*	*6.679*	6.540	6.424	6.314	*6.423*	*6.504*	*6.504*	*6.504*
30	*6.150*		*6.150*	*6.150*	*6.684*	6.531	6.414	6.309	*6.453*	*6.504*	*6.504*	*6.504*
31	*6.150*		*6.150*		*6.684*		6.413	6.304		*6.504*		*6.504*
Mean	6.150	6.150	6.150	6.150	6.298	6.623	6.468	6.355	6.310	6.504	6.504	6.504
Max	6.150	6.150	6.150	6.150	6.684	6.684	6.523	6.412	6.453	6.515	6.504	6.504
Min	6.150	6.150	6.150	6.150	6.150	6.531	6.413	6.304	6.273	6.470	6.504	6.504

Note:
Estimated and modelled values are italicized.

APPENDIX C9: SUMMARY OF MEAN DAILY WATER LEVEL (M) AT HYDROMETRIC STATION LITTLE ROBERTS, 2024

Drainage Area = 194.15 km^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	*4.800*	*4.800*	*4.800*	*4.800*	*4.800*	*5.193*	4.826	4.657	4.540	*4.694*	*4.725*	*4.725*
2	*4.800*	*4.800*	*4.800*	*4.800*	*4.800*	*5.186*	4.814	4.652	4.538	*4.699*	*4.725*	*4.725*
3	*4.800*	*4.800*	*4.800*	*4.800*	*4.800*	*5.176*	4.798	4.647	4.535	*4.705*	*4.725*	*4.725*
4	*4.800*	*4.800*	*4.800*	*4.800*	*4.800*	*5.163*	4.787	4.641	4.530	*4.716*	*4.725*	*4.725*
5	*4.800*	*4.800*	*4.800*	*4.800*	*4.800*	*5.146*	4.781	4.637	4.528	*4.725*	*4.725*	*4.725*
6	*4.800*	*4.800*	*4.800*	*4.800*	*4.800*	*5.129*	4.786	4.632	4.525	*4.732*	*4.725*	*4.725*
7	*4.800*	*4.800*	*4.800*	*4.800*	*4.800*	*5.115*	4.777	4.627	4.525	*4.735*	*4.725*	*4.725*
8	*4.800*	*4.800*	*4.800*	*4.800*	*4.800*	*5.097*	4.766	4.619	4.522	*4.735*	*4.725*	*4.725*
9	*4.800*	*4.800*	*4.800*	*4.800*	*4.800*	*5.085*	4.760	4.615	4.520	*4.735*	*4.725*	*4.725*
10	*4.800*	*4.800*	*4.800*	*4.800*	*4.800*	*5.077*	4.785	4.613	4.517	*4.734*	*4.725*	*4.725*
11	*4.800*	*4.800*	*4.800*	*4.800*	*4.800*	*5.062*	4.795	4.609	4.510	*4.734*	*4.725*	*4.725*
12	*4.800*	*4.800*	*4.800*	*4.800*	*4.800*	*5.047*	4.787	4.605	4.508	*4.732*	*4.725*	*4.725*
13	*4.800*	*4.800*	*4.800*	*4.800*	*4.800*	*5.033*	4.781	4.599	4.537	*4.730*	*4.725*	*4.725*
14	*4.800*	*4.800*	*4.800*	*4.800*	*4.820*	*5.021*	4.772	4.594	4.524	*4.723*	*4.725*	*4.725*
15	*4.800*	*4.800*	*4.800*	*4.800*	*4.839*	*5.015*	4.759	4.588	4.524	*4.727*	*4.725*	*4.725*
16	*4.800*	*4.800*	*4.800*	*4.800*	*4.859*	*5.014*	4.747	4.583	4.524	*4.732*	*4.725*	*4.725*
17	*4.800*	*4.800*	*4.800*	*4.800*	*4.879*	5.003	4.737	4.576	4.524	*4.728*	*4.725*	*4.725*
18	*4.800*	*4.800*	*4.800*	*4.800*	*4.899*	4.987	4.729	4.571	4.523	*4.725*	*4.725*	*4.725*
19	*4.800*	*4.800*	*4.800*	*4.800*	*4.919*	4.967	4.727	4.568	4.534	*4.725*	*4.725*	*4.725*
20	*4.800*	*4.800*	*4.800*	*4.800*	*4.940*	4.965	4.722	4.567	4.544	*4.725*	*4.725*	*4.725*
21	*4.800*	*4.800*	*4.800*	*4.800*	*4.960*	4.962	4.710	4.570	4.549	*4.725*	*4.725*	*4.725*
22	*4.800*	*4.800*	*4.800*	*4.800*	*4.980*	4.947	4.699	4.559	4.552	*4.725*	*4.725*	*4.725*
23	*4.800*	*4.800*	*4.800*	*4.800*	*5.001*	4.932	4.694	4.557	4.553	*4.725*	*4.725*	*4.725*
24	*4.800*	*4.800*	*4.800*	*4.800*	*5.021*	4.919	4.692	4.560	4.556	*4.725*	*4.725*	*4.725*
25	*4.800*	*4.800*	*4.800*	*4.800*	*5.042*	4.903	4.681	4.561	4.561	*4.725*	*4.725*	*4.725*
26	*4.800*	*4.800*	*4.800*	*4.800*	*5.062*	4.890	4.674	4.558	4.570	*4.725*	*4.725*	*4.725*
27	*4.800*	*4.800*	*4.800*	*4.800*	*5.083*	4.877	4.661	4.556	4.593	*4.725*	*4.725*	*4.725*
28	*4.800*	*4.800*	*4.800*	*4.800*	*5.134*	4.864	4.664	4.553	4.625	*4.725*	*4.725*	*4.725*
29	*4.800*	4.800	*4.800*	*4.800*	*5.173*	4.851	4.666	4.548	*4.651*	*4.725*	*4.725*	*4.725*
30	*4.800*		*4.800*	*4.800*	*5.192*	4.839	4.666	4.546	*4.678*	*4.725*	*4.725*	*4.725*
31	*4.800*		*4.800*		*5.195*		4.663	4.544		*4.725*		*4.725*
Mean	4.800	4.800	4.800	4.800	4.916	5.015	4.739	4.591	4.547	4.725	4.725	4.725
Max	4.800	4.800	4.800	4.800	5.195	5.193	4.826	4.657	4.678	4.735	4.725	4.725
Min	4.800	4.800	4.800	4.800	4.800	4.839	4.661	4.544	4.508	4.694	4.725	4.725

Note:
Estimated and modelled values are italicized.

APPENDIX D MEAN DAILY DISCHARGE TABLES

APPENDIX D1: SUMMARY OF DAILY DISCHARGE [Q, M³/S] AT HYDROMETRIC MONITORING STATION WINDY OUTFLOW, 2024

Drainage Area = 13.73 km^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	-	-	-	-	-	*0.338*	*0.162*	0.104	0.035	*0.138*	-	-
2	-	-	-	-	-	*0.335*	*0.163*	0.100	0.033	*0.142*	-	-
3	-	-	-	-	-	*0.330*	*0.162*	0.094	0.029	*0.147*	-	-
4	-	-	-	-	-	*0.325*	*0.166*	0.087	0.031	*0.156*	-	-
5	-	-	-	-	-	*0.317*	*0.174*	0.085	0.030	*0.165*	-	-
6	-	-	-	-	-	*0.310*	*0.181*	0.083	0.028	*0.171*	-	-
7	-	-	-	-	-	*0.304*	*0.176*	0.080	0.026	*0.173*	-	-
8	-	-	-	-	-	*0.296*	*0.169*	0.073	0.026	*0.173*	-	-
9	-	-	-	-	-	*0.291*	*0.173*	0.075	0.030	*0.173*	-	-
10	-	-	-	-	-	*0.287*	*0.189*	0.077	0.025	*0.172*	-	-
11	-	-	-	-	-	*0.280*	*0.182*	0.067	0.025	*0.172*	-	-
12	-	-	-	-	-	*0.274*	*0.180*	0.063	0.029	*0.170*	-	-
13	-	-	-	-	-	*0.267*	*0.182*	0.062	0.030	*0.169*	-	-
14	-	-	-	-	*0.001*	*0.262*	*0.182*	0.058	0.023	*0.163*	-	-
15	-	-	-	-	*0.002*	*0.259*	*0.175*	0.057	0.023	*0.166*	-	-
16	-	-	-	-	*0.003*	*0.259*	*0.168*	0.056	0.023	*0.170*	-	-
17	-	-	-	-	*0.004*	*0.253*	*0.160*	0.051	0.023	*0.167*	-	-
18	-	-	-	-	*0.007*	*0.245*	*0.167*	0.048	0.022	*0.164*	-	-
19	-	-	-	-	*0.011*	*0.239*	*0.165*	0.049	0.028	*0.084*	-	-
20	-	-	-	-	*0.019*	*0.209*	*0.164*	0.048	0.034	*0.040*	-	-
21	-	-	-	-	*0.030*	*0.200*	0.158	0.044	0.037	*0.028*	-	-
22	-	-	-	-	*0.050*	*0.188*	0.156	0.045	0.038	*0.019*	-	-
23	-	-	-	-	*0.081*	*0.177*	0.157	0.042	0.039	*0.013*	-	-
24	-	-	-	-	*0.132*	*0.171*	0.154	0.043	0.040	*0.009*	-	-
25	-	-	-	-	*0.180*	*0.176*	0.143	0.044	0.043	*0.006*	-	-
26	-	-	-	-	*0.243*	*0.177*	0.140	0.043	0.049	*0.004*	-	-
27	-	-	-	-	*0.290*	*0.177*	0.134	0.042	0.063	*0.003*	-	-
28	-	-	-	-	*0.312*	*0.173*	0.137	0.040	0.085	*0.002*	-	-
29	-	-	-	-	*0.329*	*0.171*	0.125	0.038	0.104	*0.001*	-	-
30	-		-	-	*0.337*	*0.169*	0.122	0.036	*0.125*	*0.001*	-	-
31	-		-		*0.338*		0.116	0.033		-		-
Mean	0.000	0.000	0.000	0.000	0.132	0.249	0.161	0.060	0.039	0.105	0.000	0.000
Max	0.000	0.000	0.000	0.000	0.338	0.338	0.189	0.104	0.125	0.173	0.000	0.000
Min	0.000	0.000	0.000	0.000	0.001	0.169	0.116	0.033	0.022	0.001	0.000	0.000

Notes:
Estimated and modelled values are italicized.
Values in red denote high uncertainty based on extrapolation of the rating curve beyond 2 times the greatest measured discharge.

APPENDIX D2: SUMMARY OF DAILY DISCHARGE [Q, M³/S] AT HYDROMETRIC MONITORING STATION PATCH OUTFLOW, 2024

Drainage Area = 32.16 km^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	-	-	-	-	-	*0.677*	0.399	0.183	0.047	*0.238*	-	-
2	-	-	-	-	-	*0.672*	0.397	0.174	0.044	*0.245*	-	-
3	-	-	-	-	-	*0.664*	0.367	0.172	0.043	*0.254*	-	-
4	-	-	-	-	-	*0.653*	0.359	0.166	0.042	*0.271*	-	-
5	-	-	-	-	-	*0.639*	0.354	0.157	0.038	*0.285*	-	-
6	-	-	-	-	-	*0.626*	0.377	0.154	0.037	*0.295*	-	-
7	-	-	-	-	-	*0.614*	0.339	0.150	0.042	*0.299*	-	-
8	-	-	-	-	-	*0.600*	0.327	0.145	0.052	*0.299*	-	-
9	-	-	-	-	-	*0.590*	0.318	0.141	0.053	*0.299*	-	-
10	-	-	-	-	-	*0.583*	0.337	0.140	0.044	*0.298*	-	-
11	-	-	-	-	-	*0.571*	0.323	0.135	0.044	*0.297*	-	-
12	-	-	-	-	-	0.558	0.311	0.130	0.051	*0.294*	-	-
13	-	-	-	-	*0.001*	0.546	0.306	0.123	0.053	*0.292*	-	-
14	-	-	-	-	*0.002*	0.537	0.298	0.113	0.041	*0.281*	-	-
15	-	-	-	-	*0.005*	0.531	0.295	0.108	0.041	*0.287*	-	-
16	-	-	-	-	*0.012*	0.531	0.282	0.100	0.041	*0.294*	-	-
17	-	-	-	-	*0.028*	0.521	0.272	0.094	0.041	*0.289*	-	-
18	-	-	-	-	*0.064*	0.506	0.264	0.090	0.040	*0.284*	-	-
19	-	-	-	-	*0.148*	0.500	0.293	0.084	0.049	*0.170*	-	-
20	-	-	-	-	*0.179*	0.503	0.264	0.082	0.060	*0.102*	-	-
21	-	-	-	-	*0.200*	0.488	0.254	0.086	0.065	*0.061*	-	-
22	-	-	-	-	*0.233*	0.469	0.251	0.080	0.067	*0.036*	-	-
23	-	-	-	-	*0.263*	0.456	0.256	0.069	0.069	*0.022*	-	-
24	-	-	-	-	*0.295*	0.444	0.234	0.077	0.071	*0.013*	-	-
25	-	-	-	-	*0.385*	0.433	0.227	0.070	0.076	*0.008*	-	-
26	-	-	-	-	*0.502*	0.420	0.209	0.066	0.086	*0.005*	-	-
27	-	-	-	-	*0.588*	0.415	0.203	0.062	0.110	*0.003*	-	-
28	-	-	-	-	*0.629*	0.409	0.195	0.057	0.147	*0.002*	-	-
29	-	-	-	-	*0.661*	0.402	0.180	0.056	0.180	*0.001*	-	-
30	-		-	-	*0.676*	0.404	0.192	0.050	*0.217*	-	-	-
31	-		-		*0.679*		0.190	0.055		-		-
Mean	0.000	0.000	0.000	0.000	0.292	0.532	0.286	0.109	0.066	0.191	0.000	0.000
Max	0.000	0.000	0.000	0.000	0.679	0.677	0.399	0.183	0.217	0.299	0.000	0.000
Min	0.000	0.000	0.000	0.000	0.001	0.402	0.180	0.050	0.037	0.001	0.000	0.000

Notes:
Estimated and modelled values are italicized.
Values in red denote high uncertainty based on extrapolation of the rating curve beyond 2 times the greatest measured discharge.

APPENDIX D3: SUMMARY OF DAILY DISCHARGE [Q, M³/S] AT HYDROMETRIC MONITORING STATION PO OUTFLOW, 2024

Drainage Area = 35.3 km^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	-	-	-	-	-	*0.912*	0.369	0.219	0.040	*0.335*	-	-
2	-	-	-	-	-	*0.902*	0.353	0.217	0.036	*0.347*	-	-
3	-	-	-	-	-	*0.888*	0.330	0.212	0.031	*0.362*	-	-
4	-	-	-	-	-	*0.868*	0.322	0.200	0.030	*0.389*	-	-
5	-	-	-	-	-	*0.842*	0.315	0.196	0.028	*0.412*	-	-
6	-	-	-	-	-	*0.818*	0.323	0.186	0.024	*0.430*	-	-
7	-	-	-	-	-	*0.797*	0.311	0.176	0.021	*0.436*	-	-
8	-	-	-	-	-	*0.770*	0.299	0.165	0.026	*0.436*	-	-
9	-	-	-	-	-	*0.752*	0.297	0.159	0.026	*0.436*	-	-
10	-	-	-	-	-	*0.740*	0.315	0.150	0.012	*0.434*	-	-
11	-	-	-	-	-	*0.717*	0.328	0.135	0.012	*0.433*	-	-
12	-	-	-	-	-	*0.694*	0.336	0.125	0.023	*0.428*	-	-
13	-	-	-	-	*0.001*	*0.673*	0.339	0.119	0.026	*0.424*	-	-
14	-	-	-	-	*0.002*	0.655	0.333	0.112	0.006	*0.407*	-	-
15	-	-	-	-	*0.003*	0.644	0.317	0.103	0.007	*0.415*	-	-
16	-	-	-	-	*0.005*	0.644	0.298	0.097	0.007	*0.428*	-	-
17	-	-	-	-	*0.008*	0.626	0.287	0.087	0.007	*0.419*	-	-
18	-	-	-	-	*0.012*	0.599	0.285	0.078	0.005	*0.412*	-	-
19	-	-	-	-	*0.021*	0.604	0.282	0.075	0.021	*0.249*	-	-
20	-	-	-	-	*0.034*	0.586	0.285	0.068	0.038	*0.151*	-	-
21	-	-	-	-	*0.056*	0.559	0.278	0.062	0.046	*0.091*	-	-
22	-	-	-	-	*0.093*	0.530	0.268	0.063	0.050	*0.055*	-	-
23	-	-	-	-	*0.154*	0.513	0.268	0.060	0.053	*0.034*	-	-
24	-	-	-	-	*0.213*	0.494	0.264	0.059	0.057	*0.020*	-	-
25	-	-	-	-	*0.378*	0.475	0.242	0.061	0.065	*0.012*	-	-
26	-	-	-	-	*0.591*	0.456	0.232	0.060	0.081	*0.007*	-	-
27	-	-	-	-	*0.749*	0.441	0.221	0.058	0.122	*0.005*	-	-
28	-	-	-	-	*0.824*	0.427	0.222	0.053	0.184	*0.003*	-	-
29	-	-	-	-	*0.883*	0.412	0.211	0.052	0.238	*0.002*	-	-
30	-		-	-	*0.910*	0.391	0.214	0.047	*0.299*	*0.001*	-	-
31	-		-		*0.914*		0.217	0.042		-		-
Mean	0.000	0.000	0.000	0.000	0.308	0.648	0.289	0.113	0.054	0.267	0.000	0.000
Max	0.000	0.000	0.000	0.000	0.914	0.912	0.369	0.219	0.299	0.436	0.000	0.000
Min	0.000	0.000	0.000	0.000	0.001	0.391	0.211	0.042	0.005	0.001	0.000	0.000

Notes:
Estimated and modelled values are italicized.
Values in red denote high uncertainty based on extrapolation of the rating curve beyond 2 times the greatest measured discharge.

APPENDIX D4: SUMMARY OF DAILY DISCHARGE [Q, M³/S] AT HYDROMETRIC MONITORING STATION OGAMA OUTFLOW, 2024

Drainage Area = 74.93 km^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	-	-	-	-	-	*2.592*	0.698	0.223	0.157	*0.272*	-	-
2	-	-	-	-	-	*2.541*	0.636	0.231	0.150	*0.279*	-	-
3	-	-	-	-	-	*2.476*	0.574	0.232	0.149	*0.288*	-	-
4	-	-	-	-	-	*2.388*	0.558	0.223	0.161	*0.305*	-	-
5	-	-	-	-	-	*2.273*	0.541	0.229	0.165	*0.321*	-	-
6	-	-	-	-	-	*2.165*	0.533	0.228	0.162	*0.333*	-	-
7	-	-	-	-	-	*2.077*	0.513	0.217	0.152	*0.338*	-	-
8	-	-	-	-	-	*1.966*	0.494	0.204	0.157	*0.338*	-	-
9	-	-	-	-	-	*1.892*	0.494	0.206	0.146	*0.338*	-	-
10	-	-	-	-	-	*1.845*	0.524	0.204	0.144	*0.336*	-	-
11	-	-	-	-	-	1.753	0.504	0.180	0.144	*0.336*	-	-
12	-	-	-	-	-	1.668	0.510	0.166	0.146	*0.332*	-	-
13	-	-	-	-	*0.001*	1.588	0.518	0.163	0.146	*0.329*	-	-
14	-	-	-	-	*0.002*	1.524	0.495	0.159	0.142	*0.317*	-	-
15	-	-	-	-	*0.003*	1.487	0.474	0.156	0.143	*0.323*	-	-
16	-	-	-	-	*0.005*	1.485	0.437	0.152	0.143	*0.332*	-	-
17	-	-	-	-	*0.009*	1.423	0.399	0.144	0.142	*0.326*	-	-
18	-	-	-	-	*0.015*	1.332	0.381	0.132	0.142	*0.321*	-	-
19	-	-	-	-	*0.026*	1.257	0.345	0.136	0.145	*0.190*	-	-
20	-	-	-	-	*0.045*	1.256	0.340	0.133	0.149	*0.112*	-	-
21	-	-	-	-	*0.077*	1.199	0.315	0.116	0.151	*0.066*	-	-
22	-	-	-	-	*0.133*	1.138	0.291	0.122	0.152	*0.039*	-	-
23	-	-	-	-	*0.228*	1.083	0.278	0.134	0.153	*0.023*	-	-
24	-	-	-	-	*0.393*	1.038	0.264	0.130	0.154	*0.014*	-	-
25	-	-	-	-	*0.712*	0.996	0.237	0.146	0.156	*0.008*	-	-
26	-	-	-	-	*1.307*	0.931	0.228	0.155	0.160	*0.005*	-	-
27	-	-	-	-	*1.882*	0.879	0.217	0.157	0.173	*0.003*	-	-
28	-	-	-	-	*2.193*	0.842	0.214	0.152	0.196	*0.002*	-	-
29	-	-	-	-	*2.453*	0.806	0.218	0.156	0.220	*0.001*	-	-
30	-		-	-	*2.582*	0.755	0.208	0.153	*0.251*	-	-	-
31	-		-		*2.602*		0.211	0.145		-		-
Mean	0.000	0.000	0.000	0.000	0.772	1.555	0.408	0.170	0.158	0.215	0.000	0.000
Max	0.000	0.000	0.000	0.000	2.602	2.592	0.698	0.232	0.251	0.338	0.000	0.000
Min	0.000	0.000	0.000	0.000	0.001	0.755	0.208	0.116	0.142	0.001	0.000	0.000

Notes:
Estimated and modelled values are italicized.
Values in red denote high uncertainty based on extrapolation of the rating curve beyond 2 times the greatest measured discharge.

APPENDIX D5: SUMMARY OF DAILY DISCHARGE [Q, M³/S] AT HYDROMETRIC MONITORING STATION DORIS CREEK TL-2, 2024

Drainage Area = 90.29 km^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	-	-	-	-	-	*2.541*	*1.212*	0.428	0.184	*0.565*	-	-
2	-	-	-	-	-	*2.514*	*1.171*	0.412	0.175	*0.580*	-	-
3	-	-	-	-	-	*2.479*	*1.104*	0.399	0.171	*0.599*	-	-
4	-	-	-	-	-	*2.430*	*1.080*	0.381	0.176	*0.635*	-	-
5	-	-	-	-	-	*2.366*	*1.055*	0.379	0.180	*0.665*	-	-
6	-	-	-	-	-	*2.304*	*1.054*	0.369	0.176	*0.688*	-	-
7	-	-	-	-	-	*2.252*	*1.003*	0.359	0.166	*0.696*	-	-
8	-	-	-	-	-	*2.185*	*0.962*	0.340	0.165	*0.696*	-	-
9	-	-	-	-	-	*2.140*	*0.937*	0.334	0.165	*0.696*	-	-
10	-	-	-	-	-	*2.110*	*0.970*	0.338	0.147	*0.693*	-	-
11	-	-	-	-	-	*2.051*	*0.964*	0.306	0.147	*0.692*	-	-
12	-	-	-	-	-	*1.995*	*0.946*	0.296	0.161	*0.686*	-	-
13	-	-	-	-	*0.001*	*1.941*	*0.925*	0.287	0.165	*0.680*	-	-
14	-	-	-	-	*0.002*	*1.896*	*0.891*	0.277	0.140	*0.658*	-	-
15	-	-	-	-	*0.005*	*1.870*	*0.828*	0.270	0.140	*0.669*	-	-
16	-	-	-	-	*0.011*	*1.868*	*0.779*	0.266	0.140	*0.685*	-	-
17	-	-	-	-	*0.024*	*1.824*	*0.739*	0.256	0.140	*0.674*	-	-
18	-	-	-	-	*0.053*	*1.756*	*0.719*	0.235	0.137	*0.664*	-	-
19	-	-	-	-	*0.117*	*1.699*	0.685	0.235	0.158	*0.368*	-	-
20	-	-	-	-	*0.259*	*1.660*	0.665	0.231	0.180	*0.204*	-	-
21	-	-	-	-	*0.354*	*1.634*	0.627	0.210	0.191	*0.113*	-	-
22	-	-	-	-	*0.507*	*1.595*	0.591	0.204	0.196	*0.063*	-	-
23	-	-	-	-	*0.644*	*1.560*	0.568	0.206	0.200	*0.035*	-	-
24	-	-	-	-	*0.790*	*1.518*	0.558	0.202	0.205	*0.019*	-	-
25	-	-	-	-	*1.203*	*1.472*	0.513	0.204	0.215	*0.011*	-	-
26	-	-	-	-	*1.737*	*1.426*	0.492	0.205	0.236	*0.006*	-	-
27	-	-	-	-	*2.133*	*1.385*	0.466	0.200	0.289	*0.003*	-	-
28	-	-	-	-	*2.320*	*1.353*	0.473	0.177	0.369	*0.002*	-	-
29	-	-	-	-	*2.466*	*1.303*	0.461	0.193	*0.439*	*0.001*	-	-
30	-		-	-	*2.535*	*1.257*	0.451	0.189	*0.519*	-	-	-
31	-		-		*2.546*		0.436	0.178		-		-
Mean	0.000	0.000	0.000	0.000	0.932	1.879	0.785	0.276	0.202	0.439	0.000	0.000
Max	0.000	0.000	0.000	0.000	2.546	2.541	1.212	0.428	0.519	0.696	0.000	0.000
Min	0.000	0.000	0.000	0.000	0.001	1.257	0.436	0.177	0.137	0.001	0.000	0.000

Notes:
Estimated and modelled values are italicized.
Values in red denote high uncertainty based on extrapolation of the rating curve beyond 2 times the greatest measured discharge.

APPENDIX D6: SUMMARY OF DAILY DISCHARGE [Q, M³/S] AT HYDROMETRIC MONITORING STATION ROBERTS HYDRO-2, 2024

Drainage Area = 97.83 km^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	-	-	-	-	-	*2.469*	1.234	0.698	0.300	*0.965*	-	-
2	-	-	-	-	-	*2.445*	1.193	0.695	0.291	*0.990*	-	-
3	-	-	-	-	-	*2.413*	1.145	0.686	0.278	*1.024*	-	-
4	-	-	-	-	-	*2.369*	1.116	0.664	0.275	*1.084*	-	-
5	-	-	-	-	-	*2.312*	1.100	0.654	0.264	*1.137*	-	-
6	-	-	-	-	-	*2.256*	1.101	0.640	0.254	*1.176*	-	-
7	-	-	-	-	-	*2.209*	1.083	0.618	0.242	*1.191*	-	-
8	-	-	-	-	-	*2.149*	1.040	0.590	0.243	*1.190*	-	-
9	-	-	-	-	-	*2.108*	1.038	0.580	0.237	*1.191*	-	-
10	-	-	-	-	-	*2.081*	1.078	0.560	0.227	*1.185*	-	-
11	-	-	-	-	-	*2.028*	1.099	0.521	0.208	*1.184*	-	-
12	-	-	-	-	-	*1.978*	1.101	0.513	0.209	*1.173*	-	-
13	-	-	-	-	-	*1.929*	1.112	0.496	0.274	*1.163*	-	-
14	-	-	-	-	*0.001*	*1.889*	1.090	0.488	0.229	*1.124*	-	-
15	-	-	-	-	*0.002*	*1.865*	1.047	0.472	0.230	*1.143*	-	-
16	-	-	-	-	*0.004*	1.864	1.037	0.454	0.230	*1.172*	-	-
17	-	-	-	-	*0.009*	1.848	0.989	0.436	0.229	*1.152*	-	-
18	-	-	-	-	*0.019*	1.791	0.957	0.410	0.225	*1.135*	-	-
19	-	-	-	-	*0.040*	1.731	0.909	0.405	0.261	*0.632*	-	-
20	-	-	-	-	*0.083*	1.700	0.902	0.391	0.300	*0.351*	-	-
21	-	-	-	-	*0.174*	1.679	0.868	0.377	0.318	*0.196*	-	-
22	-	-	-	-	*0.364*	1.637	0.826	0.371	0.328	*0.109*	-	-
23	-	-	-	-	*0.761*	1.586	0.817	0.369	0.333	*0.061*	-	-
24	-	-	-	-	*0.893*	1.544	0.790	0.358	0.342	*0.034*	-	-
25	-	-	-	-	*1.265*	1.491	0.757	0.364	0.360	*0.019*	-	-
26	-	-	-	-	*1.746*	1.449	0.758	0.361	0.396	*0.010*	-	-
27	-	-	-	-	*2.102*	1.400	0.744	0.355	0.487	*0.006*	-	-
28	-	-	-	-	*2.271*	1.361	0.723	0.350	0.626	*0.003*	-	-
29	-	-	-	-	*2.402*	1.325	0.760	0.332	*0.747*	*0.002*	-	-
30	-		-	-	*2.464*	1.277	0.709	0.315	*0.884*	*0.001*	-	-
31	-		-		*2.474*		0.705	0.299		-		-
Mean	0.000	0.000	0.000	0.000	0.949	1.873	0.962	0.478	0.328	0.727	0.000	0.000
Max	0.000	0.000	0.000	0.000	2.474	2.469	1.234	0.698	0.884	1.191	0.000	0.000
Min	0.000	0.000	0.000	0.000	0.001	1.277	0.705	0.299	0.208	0.001	0.000	0.000

Notes:
Estimated and modelled values are italicized.
Values in red denote high uncertainty based on extrapolation of the rating curve beyond 2 times the greatest measured discharge.

APPENDIX D7: SUMMARY OF DAILY DISCHARGE [Q, M³/S] AT HYDROMETRIC MONITORING STATION LITTLE ROBERTS OUTFLOW, 2024

Drainage Area = 194.15 km^2

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	-	-	-	-	-	*7.089*	1.840	0.933	0.482	*1.108*	-	-
2	-	-	-	-	-	*6.919*	1.770	0.913	0.474	*1.132*	-	-
3	-	-	-	-	-	*6.703*	1.674	0.892	0.463	*1.163*	-	-
4	-	-	-	-	-	*6.410*	1.606	0.866	0.450	*1.219*	-	-
5	-	-	-	-	-	*6.035*	1.571	0.845	0.440	*1.267*	-	-
6	-	-	-	-	-	*5.687*	1.600	0.828	0.432	*1.303*	-	-
7	-	-	-	-	-	*5.408*	1.548	0.803	0.433	*1.317*	-	-
8	-	-	-	-	-	*5.062*	1.485	0.773	0.423	*1.317*	-	-
9	-	-	-	-	-	*4.834*	1.456	0.755	0.417	*1.317*	-	-
10	-	-	-	-	-	*4.691*	1.593	0.748	0.408	*1.312*	-	-
11	-	-	-	-	-	*4.413*	1.652	0.732	0.385	*1.311*	-	-
12	-	-	-	-	-	*4.162*	1.605	0.715	0.381	*1.300*	-	-
13	-	-	-	-	*0.001*	*3.929*	1.574	0.692	0.470	*1.291*	-	-
14	-	-	-	-	*0.002*	*3.746*	1.519	0.671	0.429	*1.256*	-	-
15	-	-	-	-	*0.003*	*3.642*	1.447	0.650	0.430	*1.273*	-	-
16	-	-	-	-	*0.007*	*3.636*	1.380	0.630	0.430	*1.299*	-	-
17	-	-	-	-	*0.012*	3.464	1.328	0.606	0.429	*1.282*	-	-
18	-	-	-	-	*0.023*	3.235	1.287	0.585	0.426	*1.266*	-	-
19	-	-	-	-	*0.043*	2.952	1.278	0.574	0.459	*0.661*	-	-
20	-	-	-	-	*0.080*	2.920	1.248	0.572	0.495	*0.345*	-	-
21	-	-	-	-	*0.149*	2.881	1.189	0.584	0.511	*0.180*	-	-
22	-	-	-	-	*0.278*	2.685	1.131	0.543	0.520	*0.094*	-	-
23	-	-	-	-	*0.519*	2.557	1.107	0.538	0.525	*0.049*	-	-
24	-	-	-	-	*0.971*	2.461	1.098	0.549	0.533	*0.026*	-	-
25	-	-	-	-	*1.814*	2.352	1.044	0.553	0.550	*0.013*	-	-
26	-	-	-	-	*3.152*	2.257	1.014	0.542	0.583	*0.007*	-	-
27	-	-	-	-	*4.801*	2.170	0.954	0.534	0.667	*0.004*	-	-
28	-	-	-	-	*5.778*	2.086	0.965	0.523	0.796	*0.002*	-	-
29	-	-	-	-	*6.627*	2.000	0.977	0.507	*0.907*	*0.001*	-	-
30	-		-	-	*7.055*	1.920	0.976	0.498	*1.034*	-	-	-
31	-		-		*7.123*		0.964	0.492		-		-
Mean	0.000	0.000	0.000	0.000	2.023	3.944	1.351	0.666	0.513	0.832	0.000	0.000
Max	0.000	0.000	0.000	0.000	7.123	7.089	1.840	0.933	1.034	1.317	0.000	0.000
Min	0.000	0.000	0.000	0.000	0.001	1.920	0.954	0.492	0.381	0.001	0.000	0.000

Notes:
Estimated and modelled values are italicized.
Values in red denote high uncertainty based on extrapolation of the rating curve beyond 2 times the greatest measured discharge.

APPENDIX E HISTORICAL LAKE LEVEL COMPARISON GRAPHS

FIGURE E1 HISTORICAL MEAN DAILY LAKE LEVEL FOR MONITORING STATION WINDY OUTFLOW

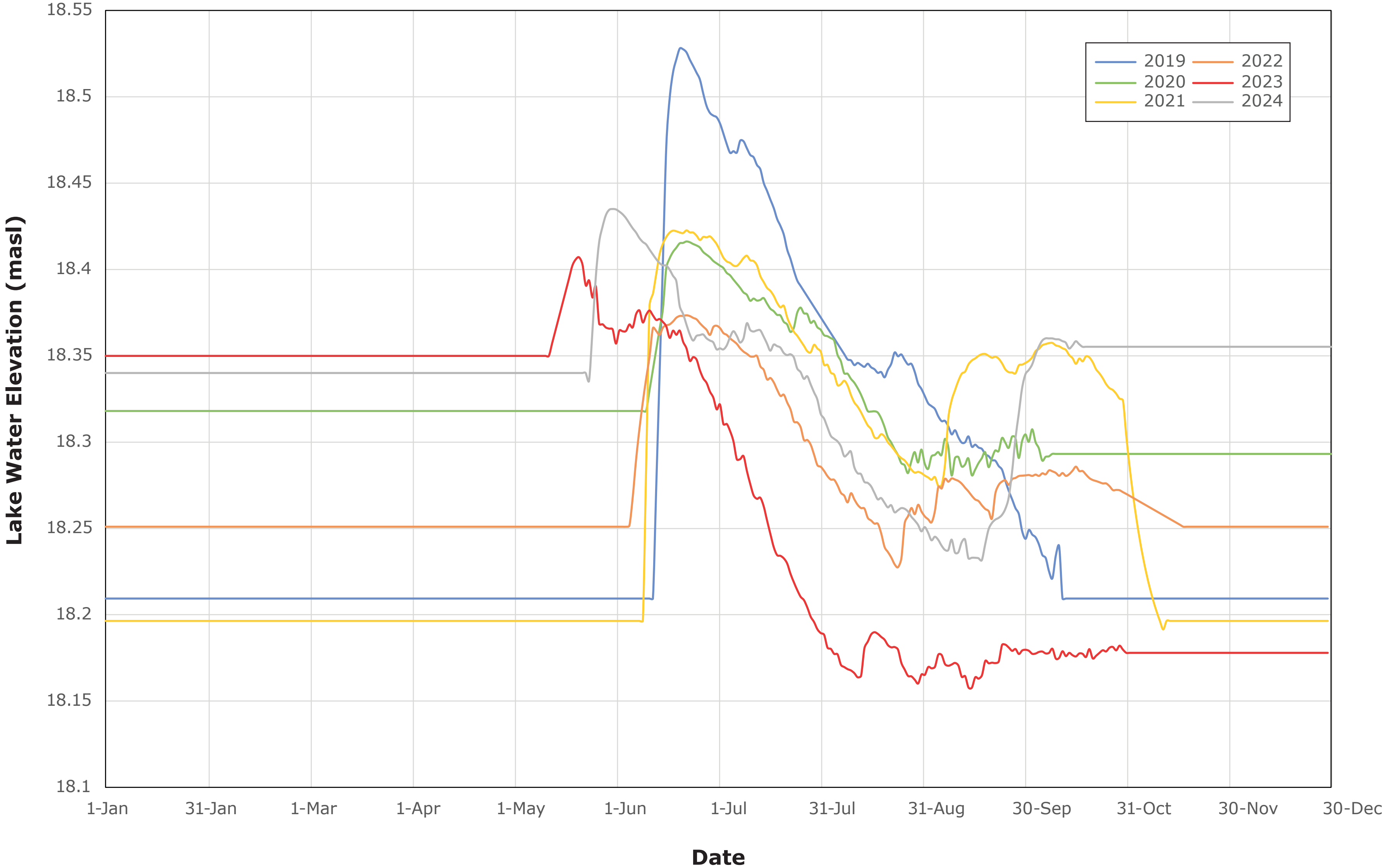


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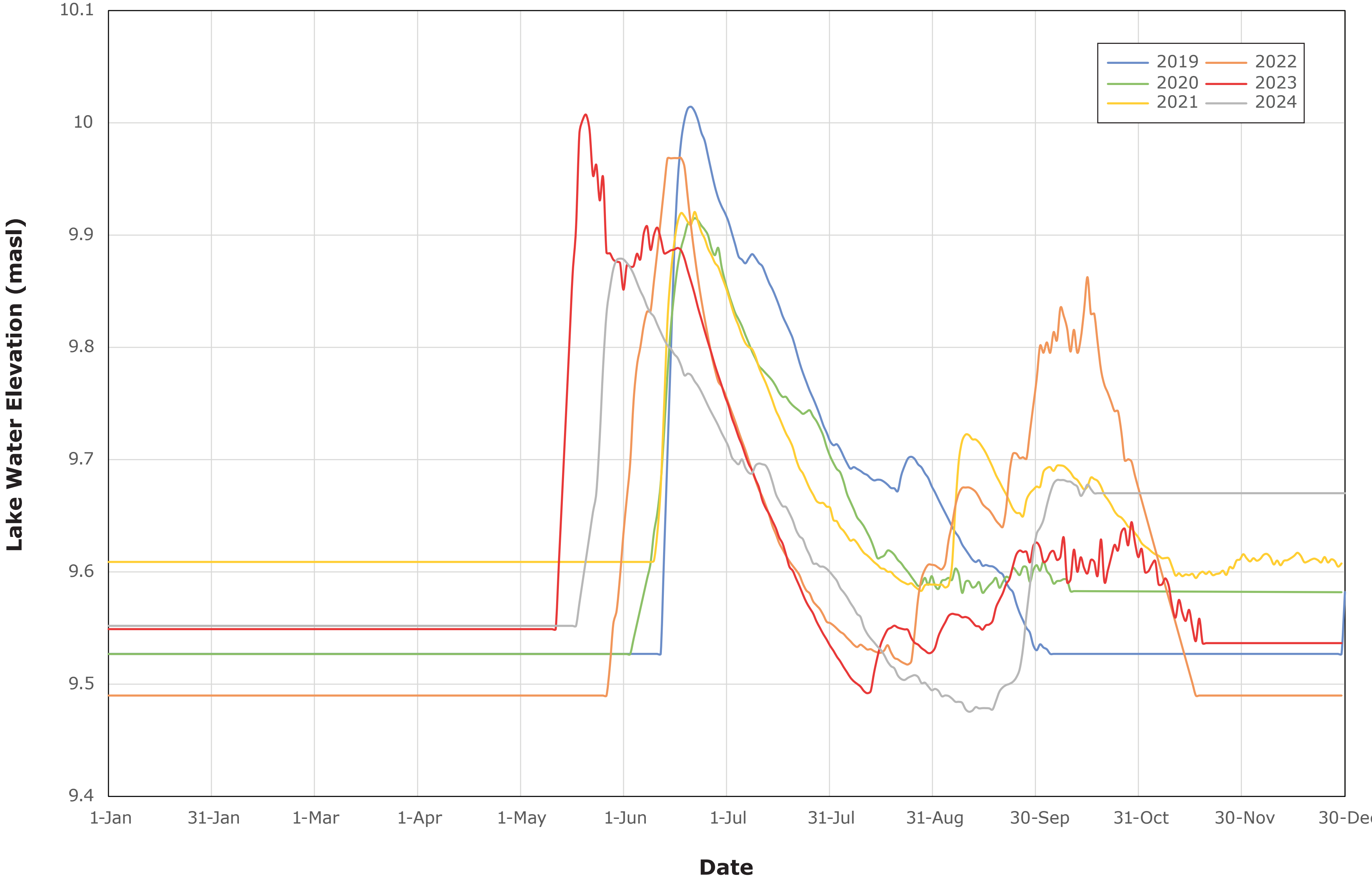
FIGURE E2 HISTORICAL MEAN DAILY LAKE LEVEL FOR MONITORING STATION GLENN LAKE



ERM

CLIENT: Agnico Eagle Mines Ltd.

GRAPHICS NUMBER: HB-25ERM-006:2

FIGURE E3 HISTORICAL MEAN DAILY LAKE LEVEL FOR MONITORING STATION IMNIAGUT LAKE

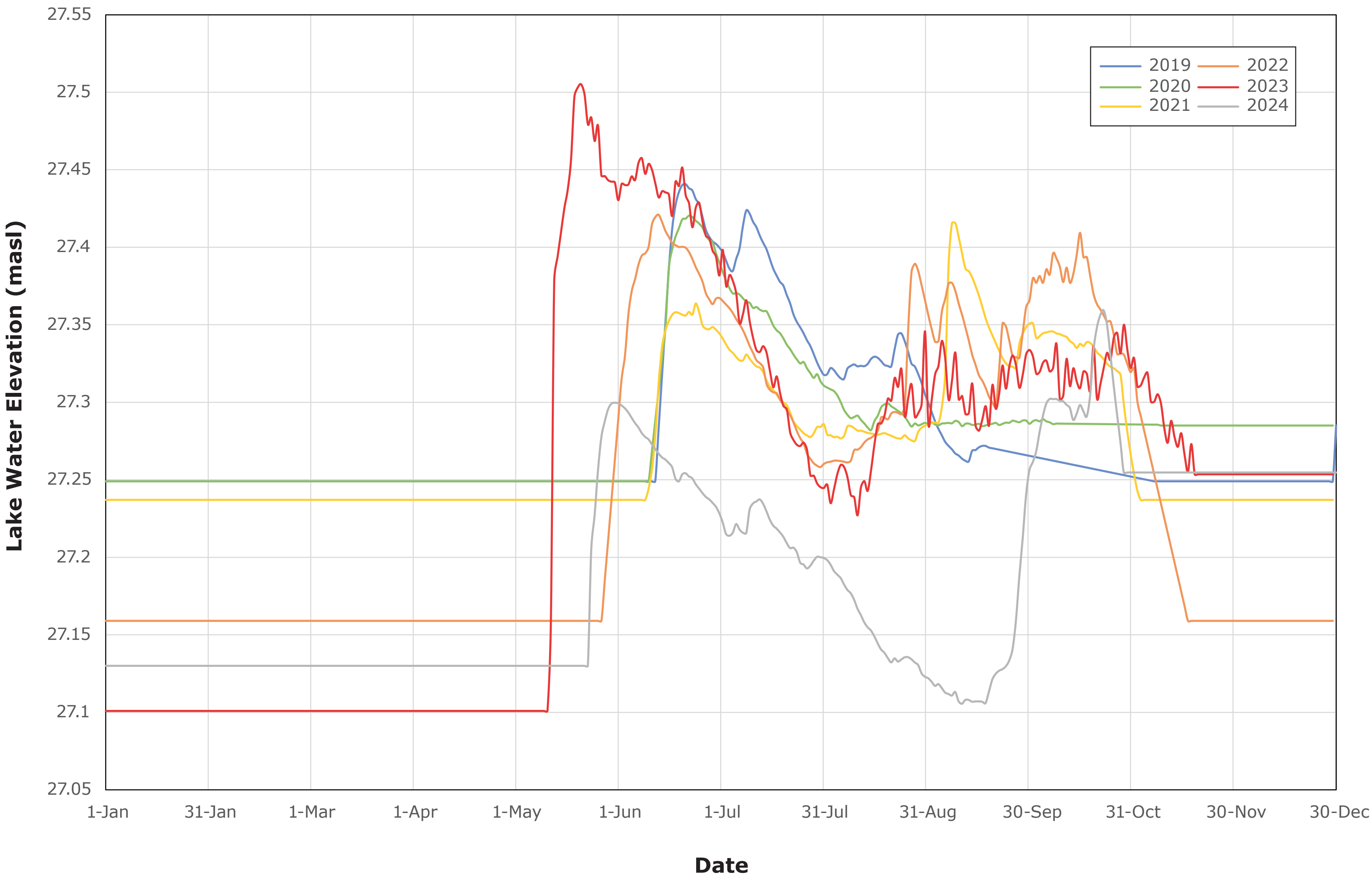


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FIGURE E4 HISTORICAL MEAN DAILY LAKE LEVEL FOR MONITORING STATION PATCH OUTFLOW

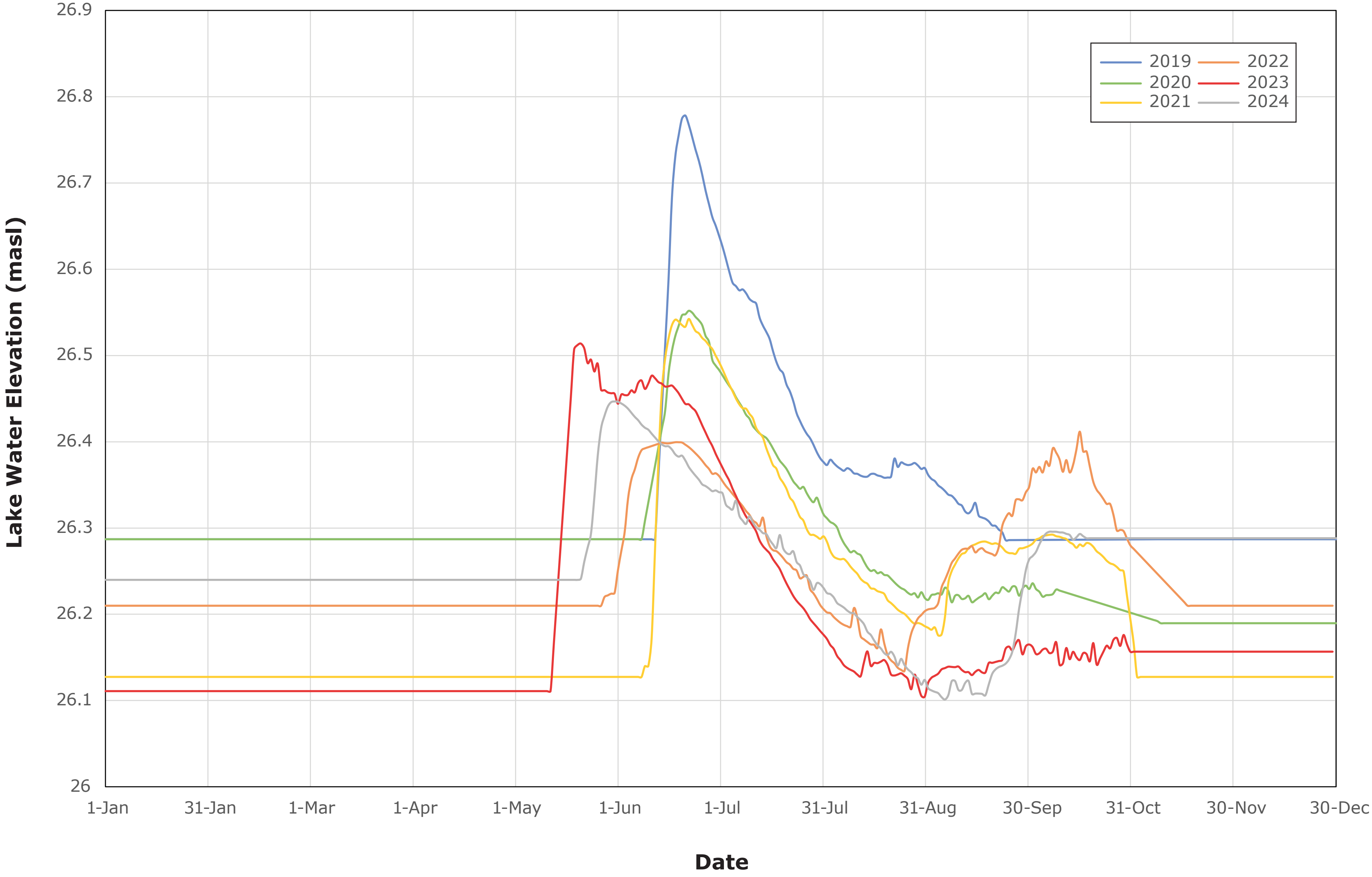
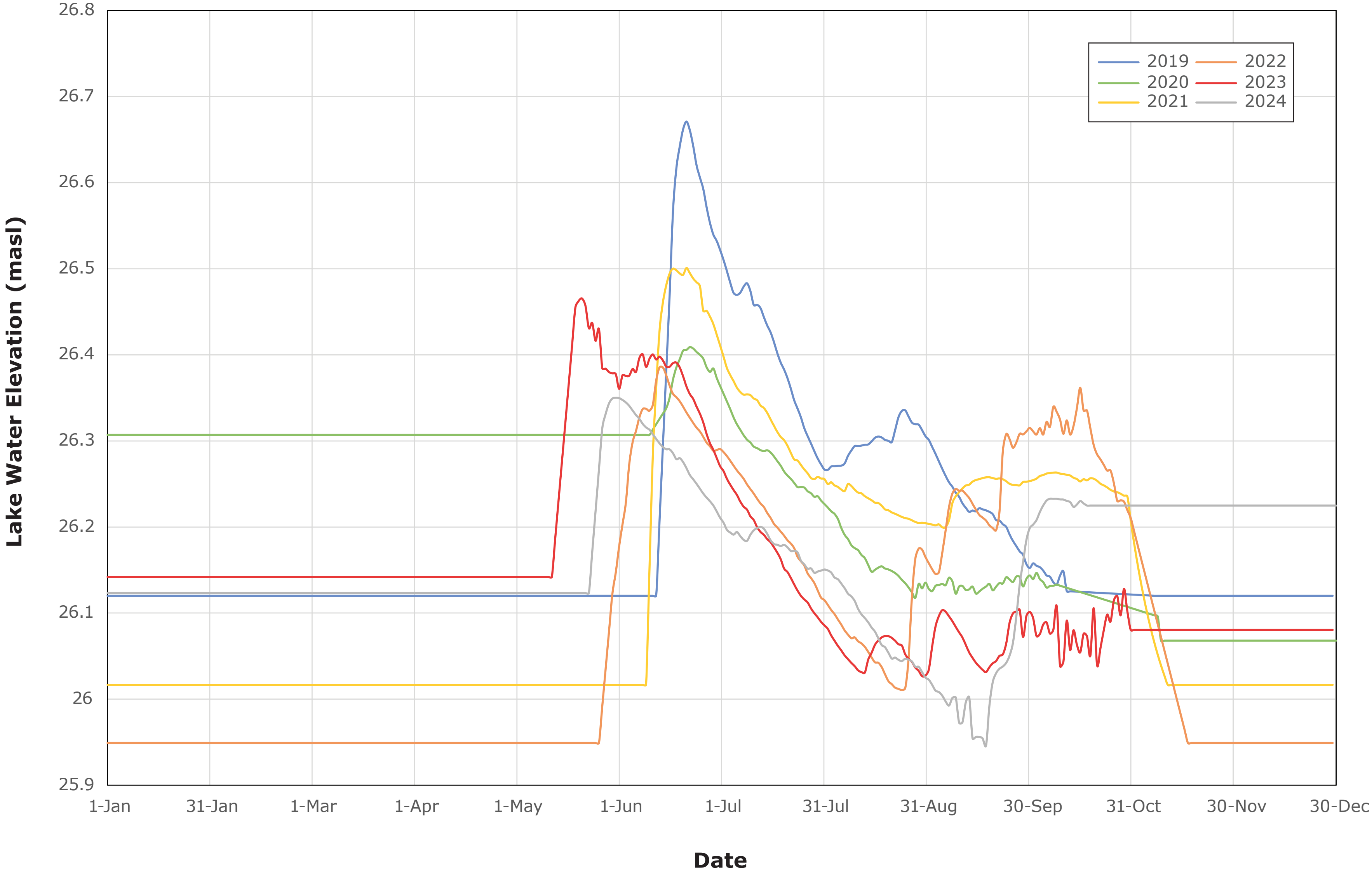


FIGURE E5 HISTORICAL MEAN DAILY LAKE LEVEL FOR MONITORING STATION PO OUTFLOW

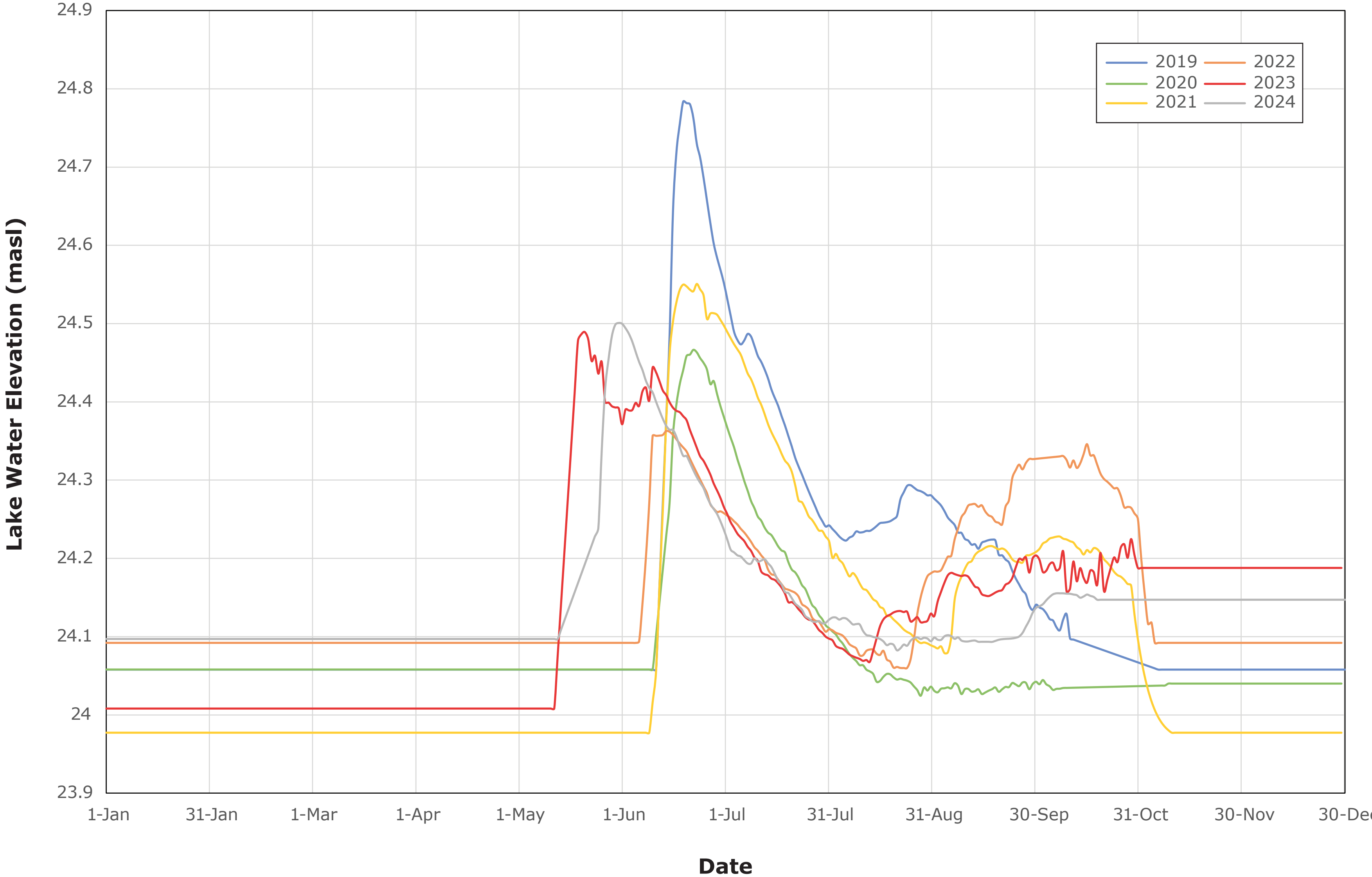


ERM

CLIENT: Agnico Eagle Mines Ltd.

GRAPHICS NUMBER: HB-25ERM-006:5

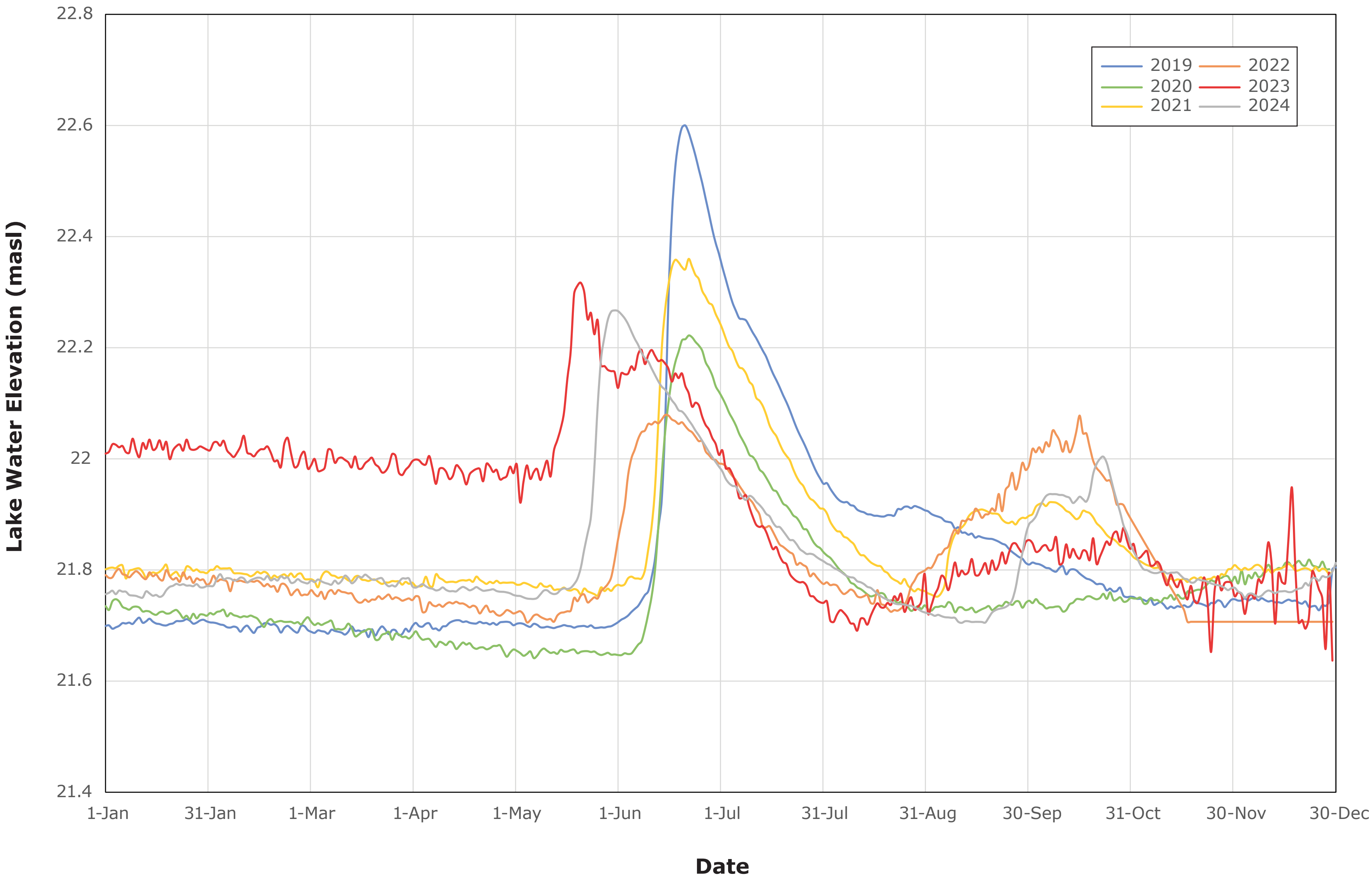
FIGURE E6 HISTORICAL MEAN DAILY LAKE LEVEL FOR MONITORING STATION OGAMA OUTFLOW



ERM

CLIENT: Agnico Eagle Mines Ltd.
GRAPHICS NUMBER: HB-25ERM-006:6

FIGURE E7 HISTORICAL MEAN DAILY LAKE LEVEL FOR MONITORING STATION DORIS LAKE



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GRAPHICS NUMBER: HB-25ERM-006:7

FIGURE E8 HISTORICAL MEAN DAILY LAKE LEVEL FOR MONITORING STATION ROBERTS HYDRO-2

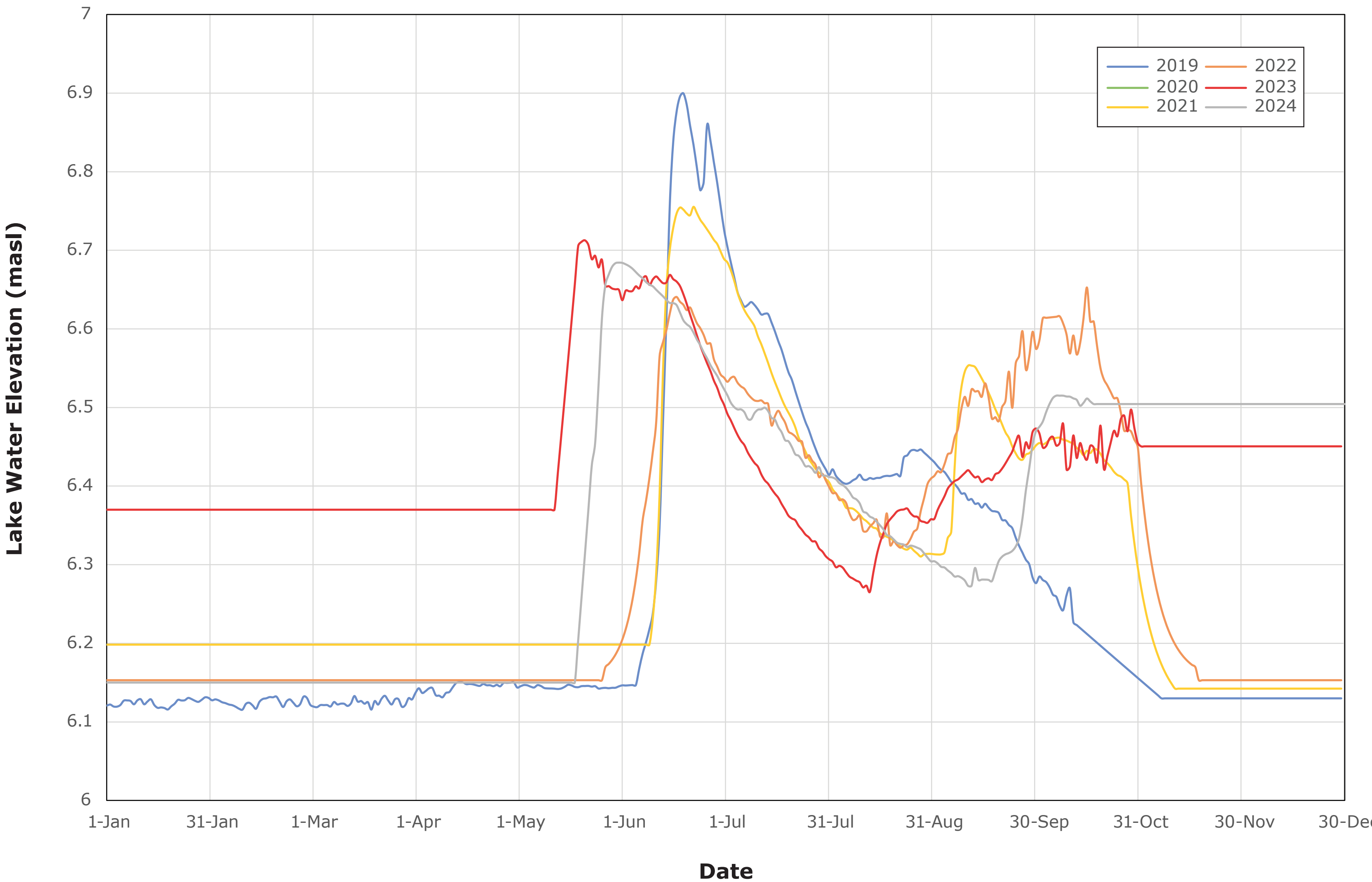
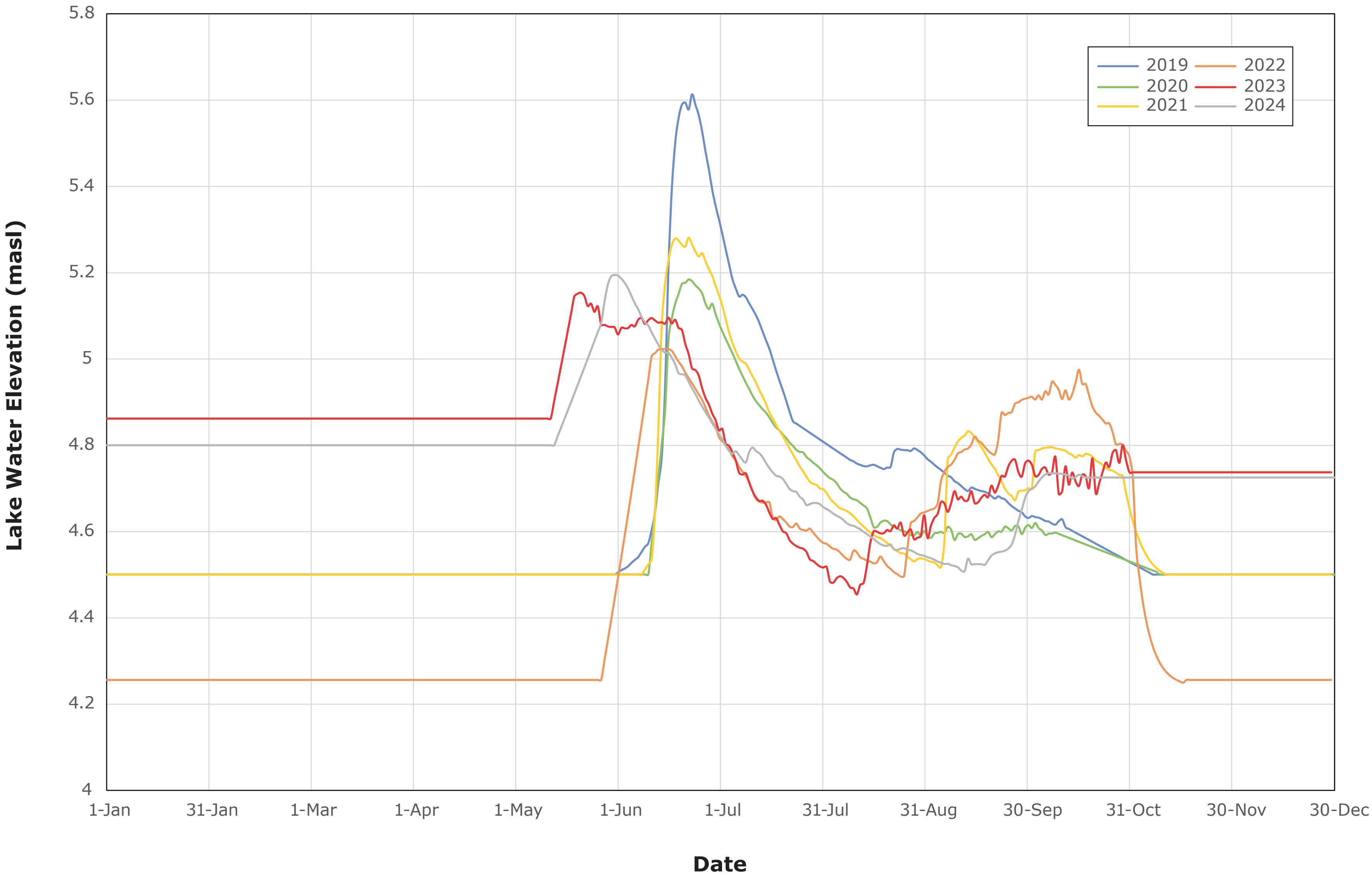


FIGURE E9 HISTORICAL MEAN DAILY LAKE LEVEL FOR MONITORING STATION LITTLE ROBERTS OUTFLOW



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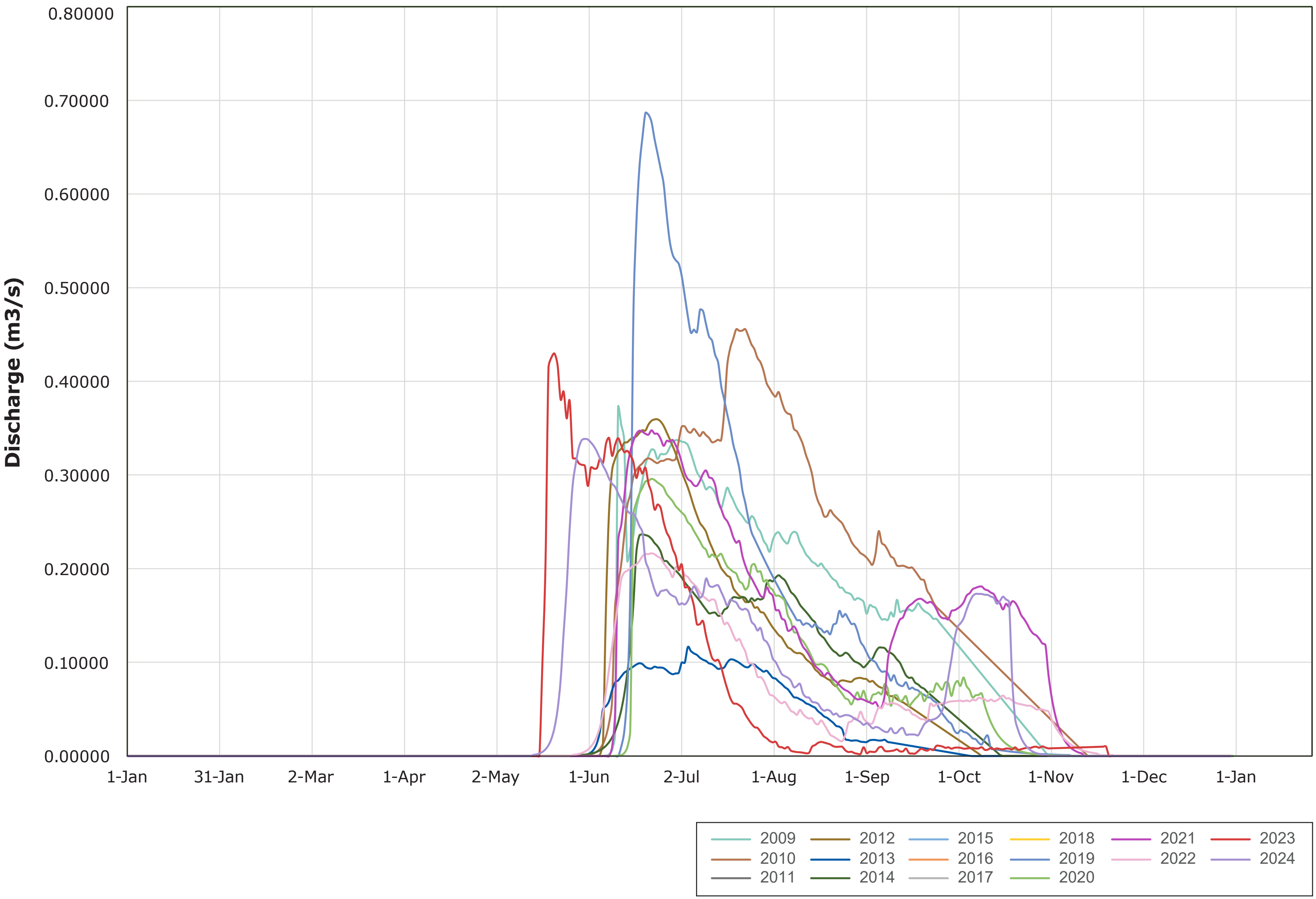
GRAPHICS NUMBER: HB-25ERM-006:7

APPENDIX F HISTORICAL MEAN DAILY DISCHARGE COMPARISON GRAPHS

FIGURE F1 HISTORICAL MEAN DAILY DISCHARGE FOR MONITORING STATION WINDY OUTFLOW



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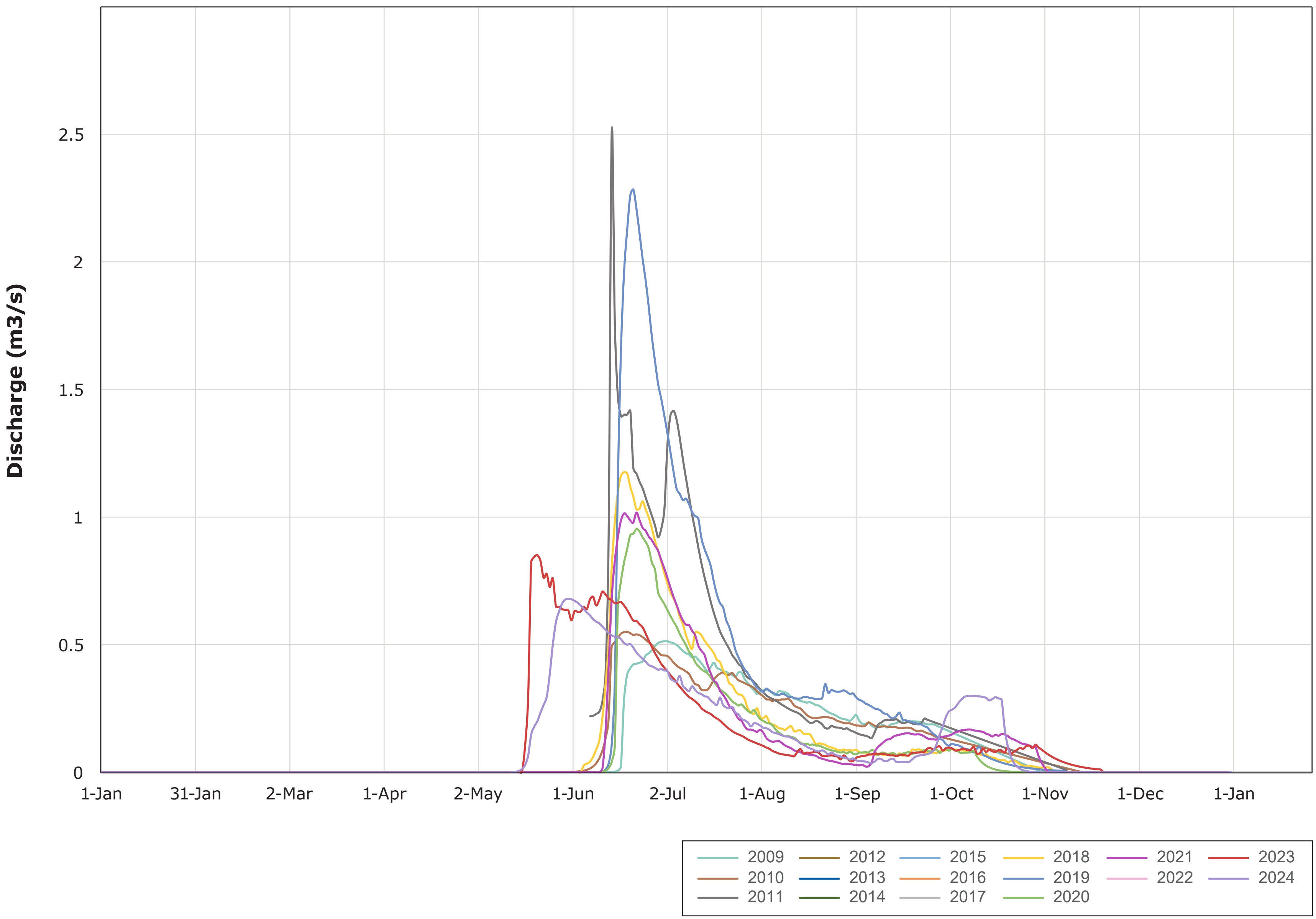
GRAPHICS NUMBER: HB-25ERM-007:1

FIGURE F2 HISTORICAL MEAN DAILY DISCHARGE FOR MONITORING STATION PATCH OUTFLOW



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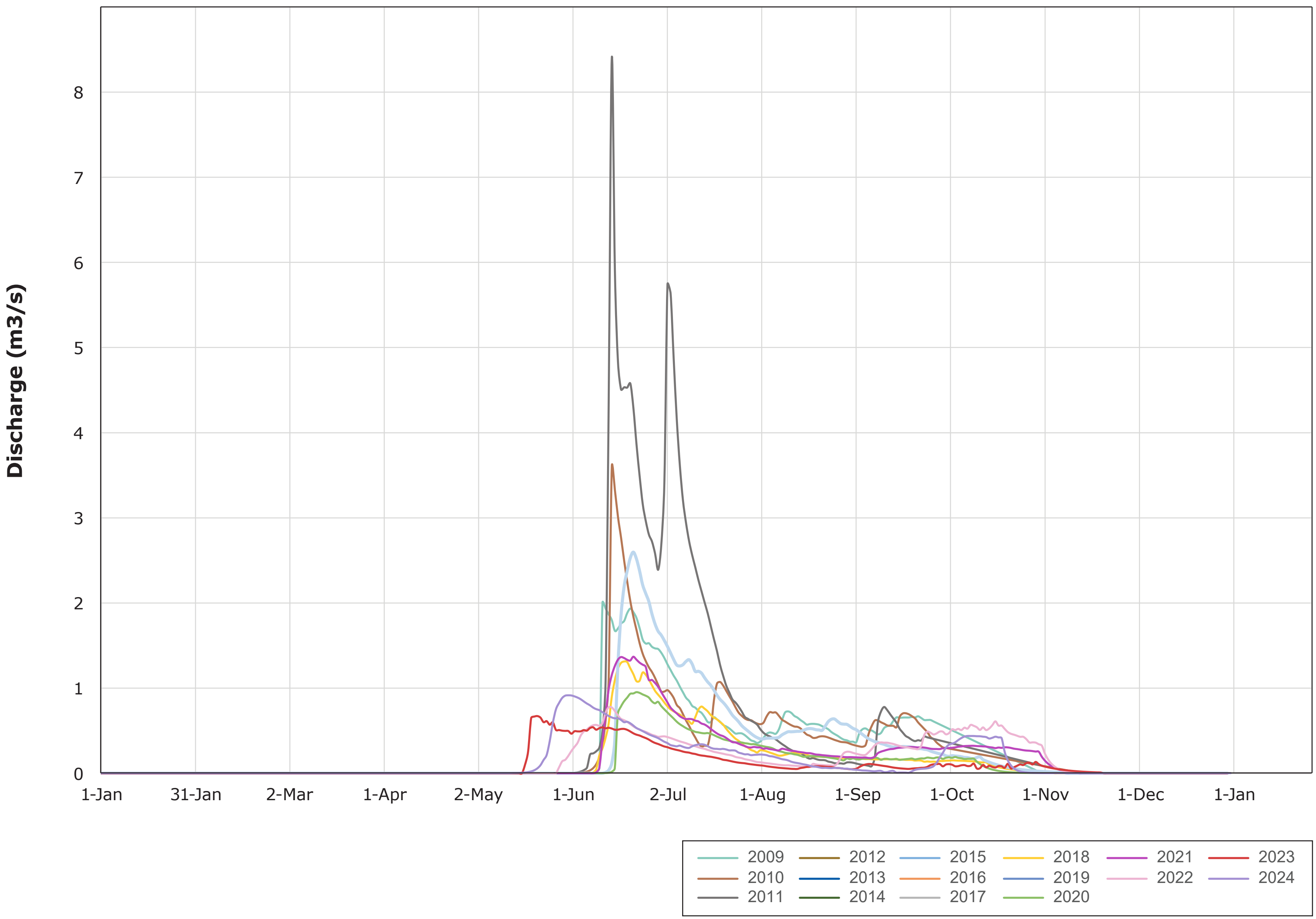
CLIENT: Agnico Eagle Mines Ltd.

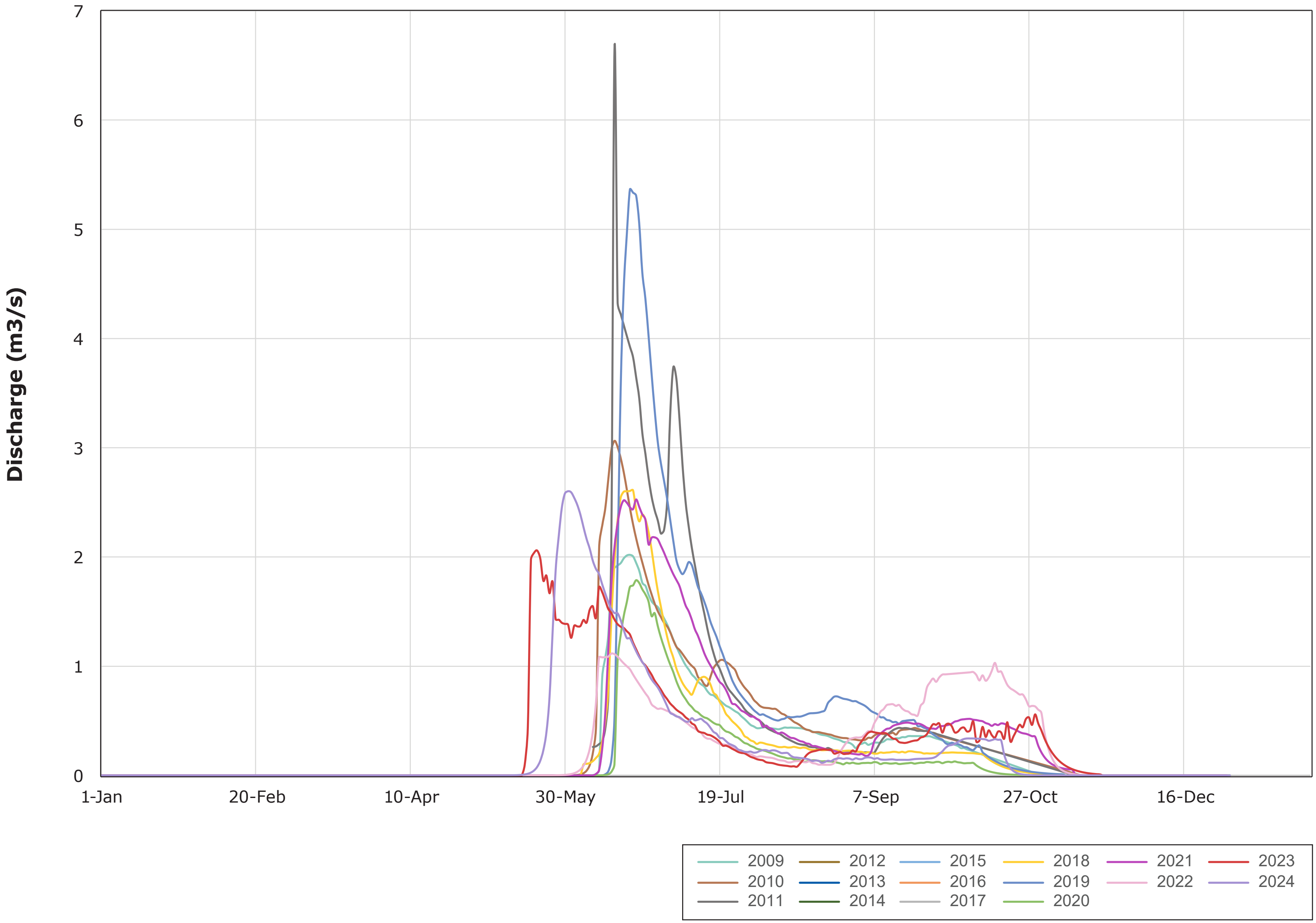
GRAPHICS NUMBER: HB-25ERM-007:2

FIGURE F3 HISTORICAL MEAN DAILY DISCHARGE FOR MONITORING STATION PO OUTFLOW



CLIENT: Agnico Eagle Mines Ltd.
GRAPHICS NUMBER: HB-25ERM-007:3

FIGURE F4 HISTORICAL MEAN DAILY DISCHARGE FOR MONITORING STATION OGAMA OUTFLOW



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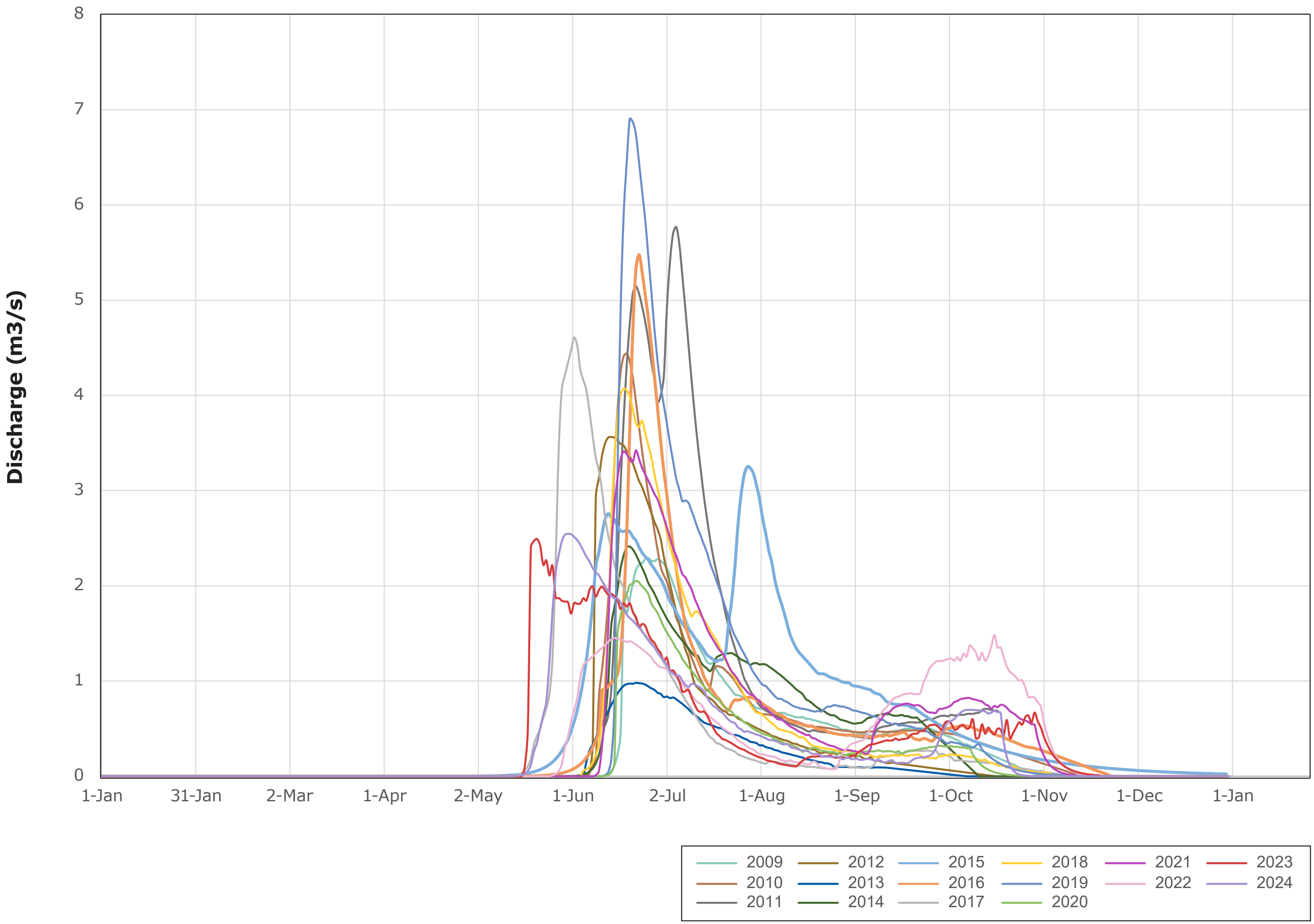
CLIENT: Agnico Eagle Mines Ltd.
GRAPHICS NUMBER: HB-25ERM-007:4

FIGURE F5 HISTORICAL MEAN DAILY DISCHARGE FOR MONITORING STATION DORIS CREEK TL-2



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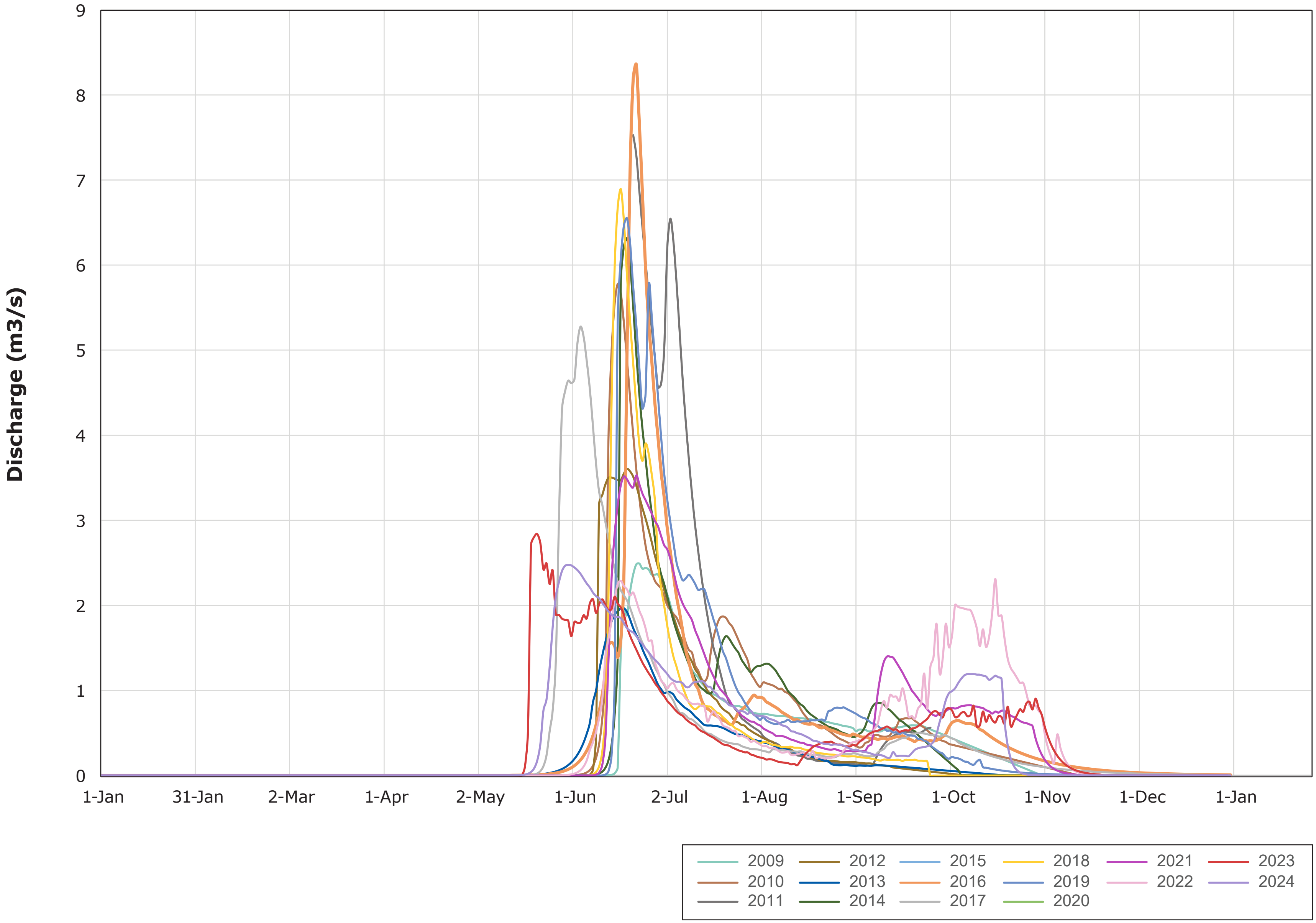
CLIENT: Agnico Eagle Mines Ltd.
GRAPHICS NUMBER: HB-25ERM-007:5

FIGURE F6 HISTORICAL MEAN DAILY DISCHARGE FOR MONITORING STATION ROBERTS HYDRO-2



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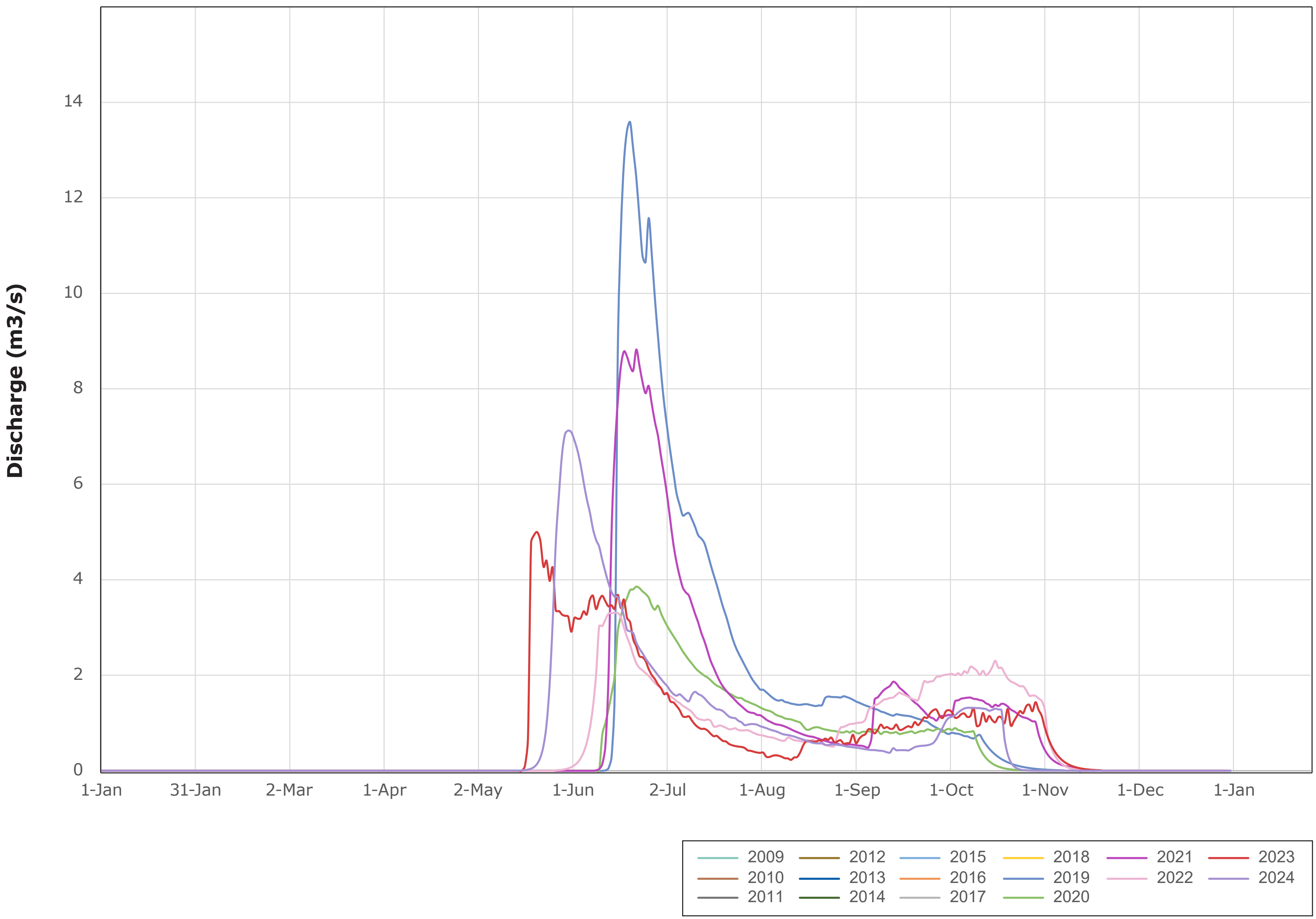
CLIENT: Agnico Eagle Mines Ltd.

GRAPHICS NUMBER: HB-25ERM-007:6

FIGURE F7 HISTORICAL MEAN DAILY DISCHARGE FOR MONITORING STATION LITTLE ROBERTS OUTFLOW



CLIENT: Agnico Eagle Mines Ltd.
GRAPHICS NUMBER: HB-25ERM-007:7

APPENDIX C EVALUATION OF EFFECTS SUPPORTING INFORMATION—HISTORICAL DATASET SUMMARIES AND STATISTICAL METHODS AND RESULTS (2024)

Hope Bay Project

2024 Aquatic Effects Monitoring Program—Annual Report

Appendix C: Evaluation of Effects Supporting Information—Historical Dataset Summaries and Statistical Methods and Results (2024)

February 2025

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APPENDIX C: EVALUATION OF EFFECTS SUPPORTING INFORMATION—HISTORICAL DATASET SUMMARIES AND STATISTICAL METHODS AND RESULTS (2024)

C.1 INTRODUCTION

This appendix presents supporting information for the evaluation of effects conducted for the 2024 Aquatic Effects Monitoring Program (AEMP) for the Hope Bay Project (the Project). Comprehensive information for physical limnology, water quality, and phytoplankton biomass, including applicable historical data (Section C.1.1), statistical methods for the evaluation of effects (Section C.2), and statistical results (Section C.3), are provided. All methods and data relating to water level and stream hydrological monitoring are presented in Appendix B - 2024 Hydrology Compliance Monitoring Summary.

C.1.1 HISTORICAL DATA SELECTION

The inclusion of historical data for the evaluation of effects was based on relevance to the current AEMP) sampling sites, timing of sample collection, and comparability of sampling methods as implemented in the *Hope Bay Project Aquatic Effects Monitoring Plan* (the Plan; TMAC 2018). Not all historical data collected at the AEMP sites are necessary or appropriate for inclusion in the evaluation of effects. For the relevant components of the 2024 AEMP (i.e., temperature and dissolved oxygen profiles, water quality, and phytoplankton biomass), the rationale for exclusion of historical data is provided, and data for the evaluation of effects are also presented (Tables C.1-1 to C.1-3, and Figures C.1-1 to C.1-3).

TABLE C.1-1 RATIONALE FOR SELECTION OF HISTORICAL TEMPERATURE AND DISSOLVED OXYGEN DATA FOR THE AQUATIC EFFECTS MONITORING PROGRAM EVALUATION OF EFFECTS FOR THE HOPE BAY PROJECT, 2024

Lake	Years Sampled	Months Sampled	Data Included in Graphs and Analyses	Data Excluded from Graphs and Analyses	Rationale for Exclusion
Doris	1995	August	Data from northern end of the lake	Data from southern end of the lake	Data that were collected from the southern end of Doris Lake were excluded, as the current AEMP sampling site is at the northern end of the lake.
	1996	April, August	None	All	All data were collected from the southern end of Doris Lake and thus were excluded, as the current AEMP sampling site is at the northern end of the lake.
	1997	April, July, August	None	All	All data were collected from the southern end of Doris Lake and thus were excluded, as the current AEMP sampling site is at the northern end of the lake.
	1998	April	None	All	All data were collected from the southern end of Doris Lake and thus were excluded, as the current AEMP sampling site is at the northern end of the lake.
	2000	August	None	All	All data were collected from the southern end of Doris Lake and thus were excluded, as the current AEMP sampling site is at the northern end of the lake.
	2003	July, August, September	Data from August	Data from July and September	Currently, profiles for the open-water season are collected in August, so historical data collected in August were included and data from other months were excluded.
	2004	June, July, August, September	Data from June and August	Data from July and September	Currently, profiles for the open-water season are collected in August, so historical data collected in August were included and data from other months were excluded.
	2005	July, August, September	Data from August	Data from July and September	Currently, profiles for the open-water season are collected in August, so historical data collected in August were included and data from other months were excluded.
	2006, 2007, 2008	May, July, August, September	Data from May and August	Data from July and September	Currently, profiles for the open-water season are collected in August, so historical data collected in August were included and data from other months were excluded.
	2009	April, August	Data collected at Doris North sampling location	Data collected at Doris South sampling location	Data that were collected from the southern end of Doris Lake were excluded, as the current AEMP sampling site is at the northern end of the lake.
	2010 to 2016	April, July, August, September	April and August data collected at Doris North sampling location	All data collected at Doris South sampling location; all data from July and September	Data that were collected from the southern end of Doris Lake were excluded, as current AEMP sampling site is at the northern end of the lake. Currently, profiles for the open-water season are collected in August, so historical data collected in August were included and data from other months were excluded.
	2017, 2018	April, July, August, September	Data from April and August	Data from July and September	Currently, profiles for the open-water season are collected in August, so historical data collected in August were included and data from other months were excluded.
	2019 to 2024	April, August	All	None	NA
Patch	1995	August	All	None	NA
	1996	April, August	All	None	Note: Data were estimated from plots of the profiles.
	1997	April, July	Data from April	Data from July	Currently, profiles for the open-water season are collected in August, so historical data collected in August were included and data from other months were excluded. Note: April data were estimated from plots of the profiles.
	1998	April	All	None	NA
	2006	June, July, and September	None	All	All data were collected from the southern end of Patch Lake and thus were excluded, as the current AEMP sampling site is at northern end of the lake.
	2007, 2008	May, July, August, September	None	All	All data were collected from the southern end of Patch Lake and thus were excluded, as the current AEMP sampling site is at northern end of the lake.
	2009	April, August	Data collected at Patch North sampling location	Data collected at Patch South sampling location	Data that was collected from the southern end of Patch Lake were excluded, as the current AEMP sampling site is at the northern end of the lake.
	2017 to 2024	April, August	All	None	NA

Lake	Years Sampled	Months Sampled	Data Included in Graphs and Analyses	Data Excluded from Graphs and Analyses	Rationale for Exclusion
Windy	1995	August	None	All	All data were collected from the southern end of Windy Lake and thus were excluded, as the current AEMP sampling site is at the northern end of the lake.
	1996	August	None	All	All data were collected from the southern end of Windy Lake and thus were excluded, as the current AEMP sampling site is at the northern end of the lake.
	1997	April, July	Data from April	Data from July	Currently, profiles for the open-water season are collected in August, so historical data collected in August were included and data from other months were excluded. Note: April data were estimated from plots of the profiles.
	1998	April	All	None	NA
	2006	June, July, August, September	Data from June and August	Data from July and September	Currently, profiles for the open-water season are collected in August, so historical data collected in August were included and data from other months were excluded.
	2007, 2008	May, July, August, September	Data from May and August	Data from July and September	Currently, profiles for the open-water season are collected in August, so historical data collected in August were included and data from other months were excluded.
	2009, 2010, 2017 to 2024	April, August	All	None	NA
Reference B	2009	May, August	None	All	All data collected from the northeastern end of Reference Lake B were excluded, as the current AEMP sampling site is in the central basin of the lake.
	2010	April, July, August September	Data from April and August	Data from July and September	Currently, profiles for the open-water season are collected in August, so historical data collected in August were included and data from other months were excluded. Data collected from July and September were excluded, as these were collected from northeastern end of the lake.
	2011 to 2018	April, July, August, September	Data from April and August	Data from July and September	Currently, profiles for the open-water season are collected in August, so historical data collected in August were included and data from other months were excluded.
	2019 to 2024	April, August	All	None	NA

TABLE C.1-2 RATIONALE FOR SELECTION OF HISTORICAL WATER QUALITY DATA FOR THE AQUATIC EFFECTS MONITORING PROGRAM EVALUATION OF EFFECTS FOR THE HOPE BAY PROJECT, 2024

Lake	Years Sampled	Months Sampled	Data Included in Graphs and Statistical Analyses	Data Excluded from Graphs and Statistical Analyses	Rationale for Exclusion
Doris	1995	May, June, July, August	Data from northern end of the lake	Data from southern end of the lake, and all shoreline grab samples	Data that were collected from the southern end of Doris Lake were excluded, as the current AEMP sampling site is at the northern end of the lake. Shoreline grabs were excluded, as they are not comparable to samples collected from a boat over deep areas of the lake.
	1996	April, August	None	All	All data were collected from the southern end of Doris Lake and thus were excluded, as the current AEMP sampling site is at the northern end of the lake.
	1997	April, July, August	None	All	All data were collected from the southern end of Doris Lake and thus were excluded, as the current AEMP sampling site is at the northern end of the lake.
	1998	April	None	All	All data were collected from the southern end of Doris Lake and thus were excluded, as the current AEMP sampling site is at the northern end of the lake.
	2000	July, August	None	All	All data were collected from the southern end of Doris Lake and thus were excluded, as the current AEMP sampling site is at the northern end of the lake.
	2003	July, August, September	All	None	NA
	2004	June, July, August, September	All	None	NA
	2005	July, August, September	All	None	NA
	2006, 2007, 2008	May, July, August, September	All	None	NA
	2009	April, August	Data collected at current Doris Lake AEMP sampling location	Data collected at Doris South sampling location	Data that were collected from the southern end of Doris Lake were excluded, as the current AEMP sampling site is at the northern end of the lake.
	2010 to 2016	April, July, August, September	Data collected at current Doris Lake AEMP sampling location	Data collected at Doris South sampling location	Data that were collected from the southern end of Doris Lake were excluded, as the current AEMP sampling site is at the northern end of the lake.
	2017, 2018	April, July, August, September	All	None	NA
	2019 to 2024	April, August	All	None	NA
Patch	1995	May, June, July, August	Data from northern end of the lake	Data from southern end of the lake, and all shoreline grab samples	Data that were collected from the southern end of Patch Lake were excluded, as the current AEMP sampling site is at the northern end of the lake. Shoreline grabs were excluded, as they are not comparable to samples collected from a boat over deep areas of the lake.
	1996	April, August	All	None	NA
	1997	April, July	All	None	NA
	1998	April	All	None	NA
	2006	June, July, August, September	None	All	All data were collected from the southern end of Patch Lake and thus were excluded, as the current AEMP sampling site is at the northern end of the lake.
	2007 and 2008	May, July, August, September	None	All	All data were collected from the southern end of Patch Lake and thus were excluded, as the current AEMP sampling site is at the northern end of the lake.
	2009	April, August	Data collected at current Patch Lake AEMP sampling location	Data collected at Patch South sampling location	Data that were collected from the southern end of Patch Lake were excluded, as the current AEMP sampling site is at the northern end of the lake.
	2017 to 2024	April, August	All	None	NA

Lake	Years Sampled	Months Sampled	Data Included in Graphs and Statistical Analyses	Data Excluded from Graphs and Statistical Analyses	Rationale for Exclusion
Windy	1995	May, June, July, August	None	All	All data were collected from the southern end of Windy Lake and thus were excluded, as the current AEMP sampling site is at northern end of the lake.
	1996	August	None	All	All data were collected from the southern end of Windy Lake and thus were excluded, as the current AEMP sampling site is at northern end of the lake.
	1997	April, July	All	None	NA
	1998	April	All	None	NA
	1999	July	Samples collected from boat	All shoreline grab samples	Shoreline samples were excluded, as they are not comparable to samples collected from a boat over deep areas of the lake.
	2000	July	All	None	NA
	2006	June, July, August, September	All	None	NA
	2007, 2008	May, July, August, September	All	None	NA
	2009, 2010, 2017 to 2024	April, August	All	None	.NA
Reference B	2009	May, August	None	All	All data were collected from the northeastern end of Reference Lake B and thus were excluded, as the current AEMP sampling site is in the central basin of the lake.
	2010	April, July, August September	Data from August and September	Data from April and July	Data that were collected from April and July were excluded, as these were collected from the northeastern end of the lake. The August and September samples were collected at the current AEMP sampling site.
	2011 to 2018	April, July, August, September	All	None	NA
	2019 to 2024	April, August	All	None	NA

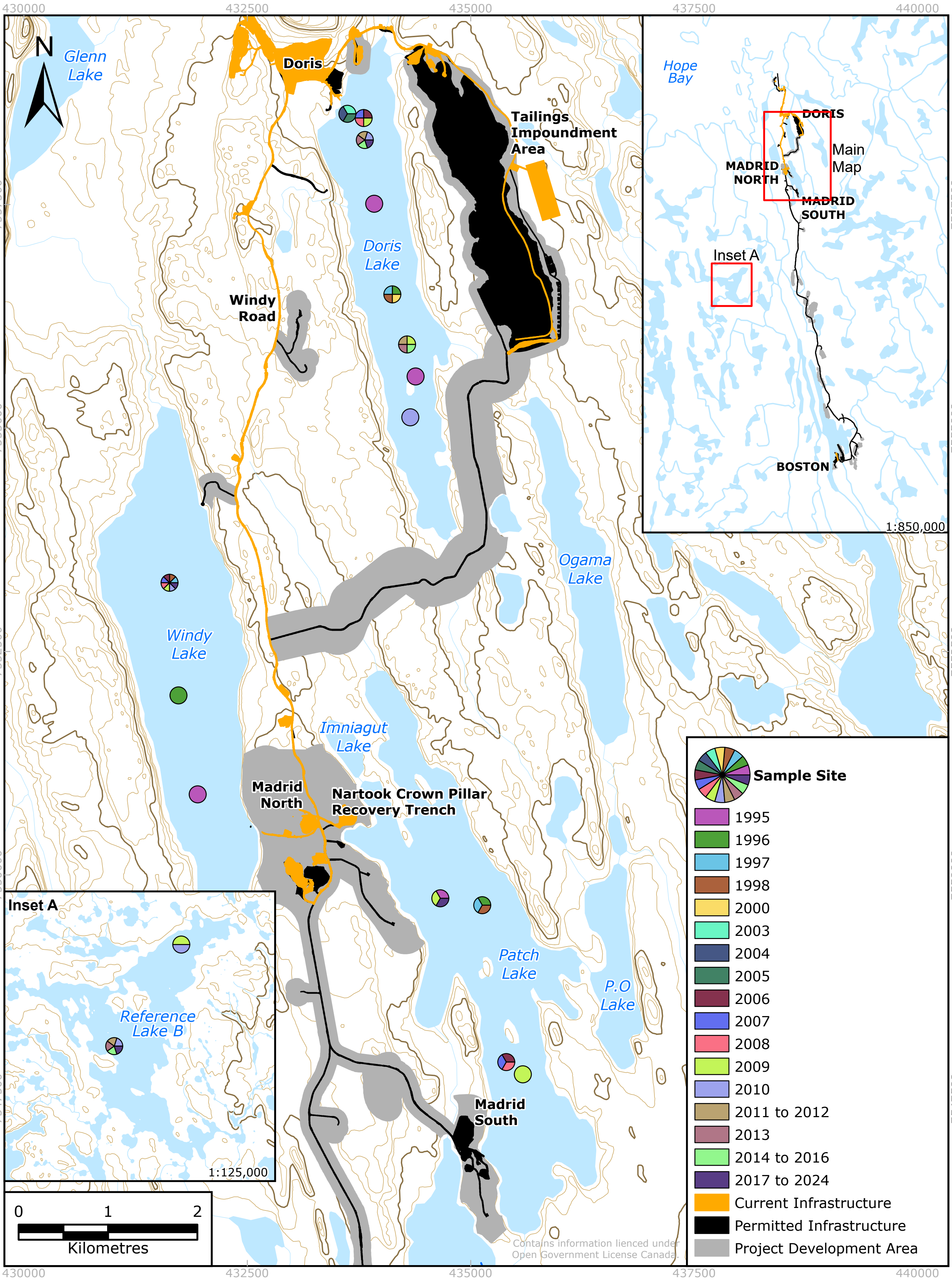
TABLE C.1-3 RATIONALE FOR SELECTION OF HISTORICAL PHYTOPLANKTON BIOMASS DATA FOR THE AQUATIC EFFECTS MONITORING PROGRAM EVALUATION OF EFFECTS FOR THE HOPE BAY PROJECT, 2024

Lake	Years Sampled	Months Sampled	Data Included in Historical Graphs and Statistical Analyses	Data Excluded from Historical Graphs and Statistical Analyses	Rationale for Exclusion
Doris	1997	July	None	All	All data were collected from the southern end of Doris Lake and thus were excluded, as the current AEMP sampling site is at the northern end of the lake. Additionally, there was a potential issue with sample integrity, as samples were lost and then found and analyzed more than one year after sample collection.
	2000	July	None	All	All data were collected from the southern end of Doris Lake and thus were excluded, as the current AEMP sampling site is at the northern end of the lake.
	2003	July, August, September	None	All	All data were excluded because of methodological differences, as samples consisted of a composite of subsamples collected throughout the euphotic zone (not comparable to discrete surface samples currently collected in the AEMP).
	2006	September	None	All	The sampling methods from 2006 were not described. As such, the data have been assumed to be a composite sample from throughout euphotic zone (not comparable to discrete surface samples currently collected in the AEMP).
	2007, 2008	July, August, September	None	All	All data were excluded because of methodological differences, as samples consisted of a composite of subsamples collected throughout the euphotic zone (not comparable to discrete surface samples currently collected in the AEMP).
	2009	April, August	August data collected at current Doris Lake AEMP sampling location	All April data and August data collected at Doris South sampling location	All data that were collected from the southern end of Doris Lake were excluded, as the current AEMP sampling site is at the northern end of the lake. Currently, only open-water season chlorophyll *a*[1] data are included in the evaluation of effects, so historical under-ice data were excluded.
	2010 to 2016	April, July, August, September	July, August, September data collected at current Doris Lake AEMP sampling location	April data and all data collected at Doris South sampling location	All data that were collected from the southern end of Doris Lake were excluded, as the current AEMP sampling site is at the northern end of the lake. Currently, only open-water season chlorophyll *a*[1] data are included in the evaluation of effects, so historical under-ice data were excluded.
	2017 to 2024	August	All	None	NA
Patch	1997	July	None	All	There was a potential issue with sample integrity, as samples were lost and then found and analyzed more than one year after sample collection.
	2006	September	None	All	All data were collected from the southern end of Patch Lake and thus were excluded, as the current AEMP sampling site is at the northern end of the lake.
	2007, 2008	July, August, September	None	All	All data were collected from the southern end of Patch Lake and thus were excluded, as the current AEMP sampling site is at the northern end of the lake. Data were excluded because of methodological differences, as samples consisted of a composite of subsamples collected throughout the euphotic zone (not comparable to discrete surface samples currently collected in the AEMP).
	2009	April, August	August data collected at current Patch Lake AEMP sampling location	All April data and August data collected at Patch South sampling location	All data that were collected from the southern end of Patch Lake were excluded, as the current AEMP sampling site is at the northern end of the lake. Currently, only open-water season chlorophyll *a*[1] data are included in the evaluation of effects, so historical under-ice data were excluded.
	2017, 2018	April, August	August data	April data	Currently, only open-water season chlorophyll *a*[1] data are included in the evaluation of effects, so historical under-ice data were excluded.
	2019	August	All	None	NA
	2020	August	Sample (n= 1) collected at 1 m	Sample collected at deeper depth	Samples that were collected at bottom depth (5 m) are not comparable to the discrete surface sample currently collected in the AEMP.
	2021 to 2024	August	All	None	NA

Lake	Years Sampled	Months Sampled	Data Included in Historical Graphs and Statistical Analyses	Data Excluded from Historical Graphs and Statistical Analyses	Rationale for Exclusion
Reference B	2009	August	None	All	All data were collected from the northeastern end of Reference Lake B and thus were excluded, as the current AEMP sampling site is in the central basin of the lake.
	2010	April, July, August, September	Data from August, September	Data from April, July	April and July data that were collected from the northeastern end of Reference Lake B were excluded, as the current AEMP sampling site is in the central basin of the lake. Currently, only open-water season chlorophyll *a*[1] data are included in the evaluation of effects, so historical under-ice data were excluded.
	2011 to 2016	April, July, August, September	Data from July, August, September	Data from April	Currently, only open-water season chlorophyll *a*[1] data are included in the evaluation of effects, so historical under-ice data were excluded.
	2017	April, August	Data from August	Data from April	Currently, only open-water season chlorophyll *a*[1] data are included in the evaluation of effects, so historical under-ice data were excluded.
	2018 to 2024	August	All	None	NA

Note:
m = metre
[1] Phytoplankton biomass is represented as chlorophyll *a*.

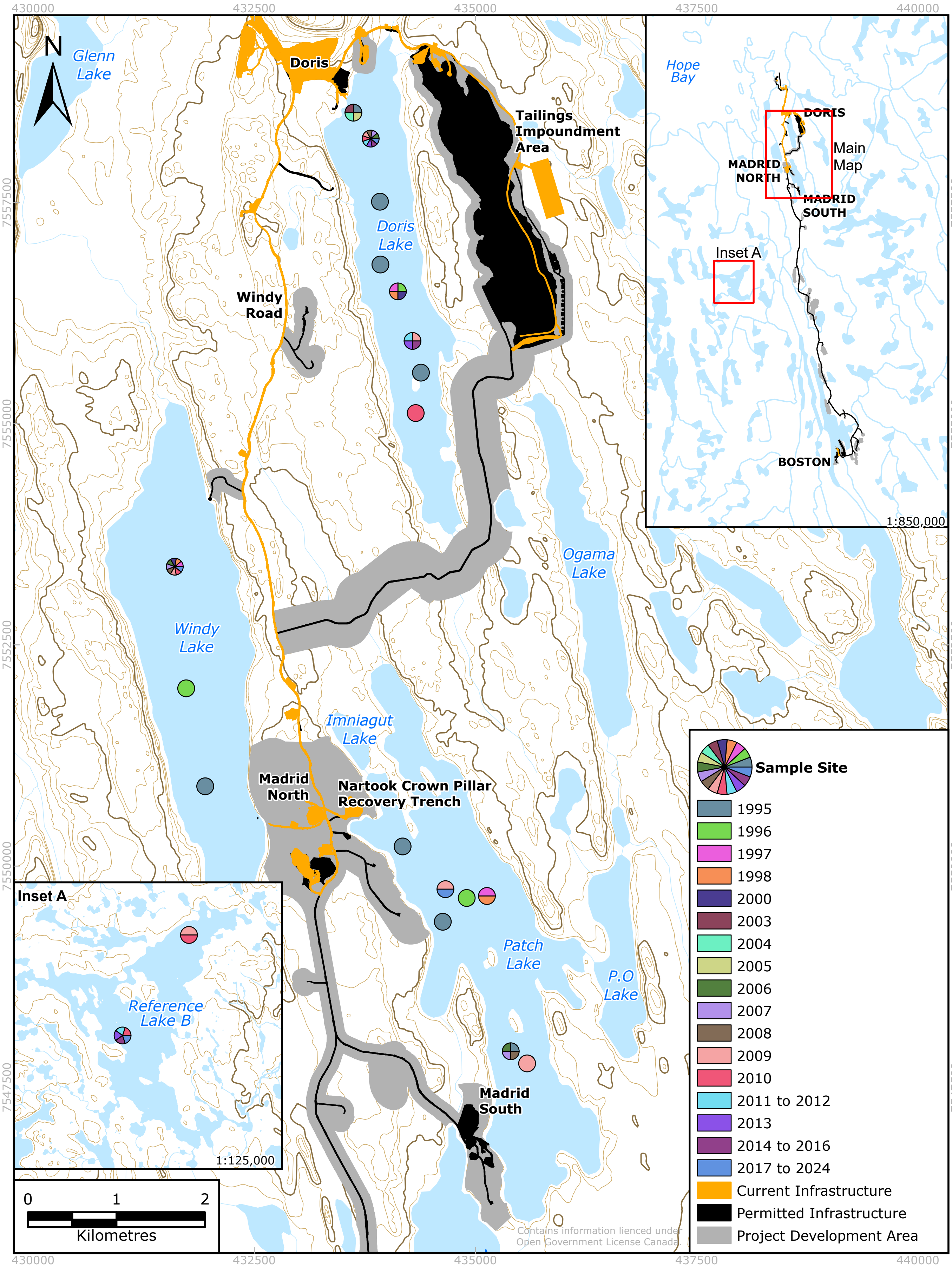
FIGURE C.1-1 HISTORICAL PHYSICAL LIMNOLOGY SAMPLING SITES, HOPE BAY AEMP, 1995 TO 2024



ERM

CLIENT: AGNICO EAGLE MINES LIMITED
GIS NUMBER: HB-01-298-09
DATE: 01/07/2025
PROJECTION: NAD 1983 UTM Zone 13N
SCALE: 1:60,000 when printed at 8.5x11

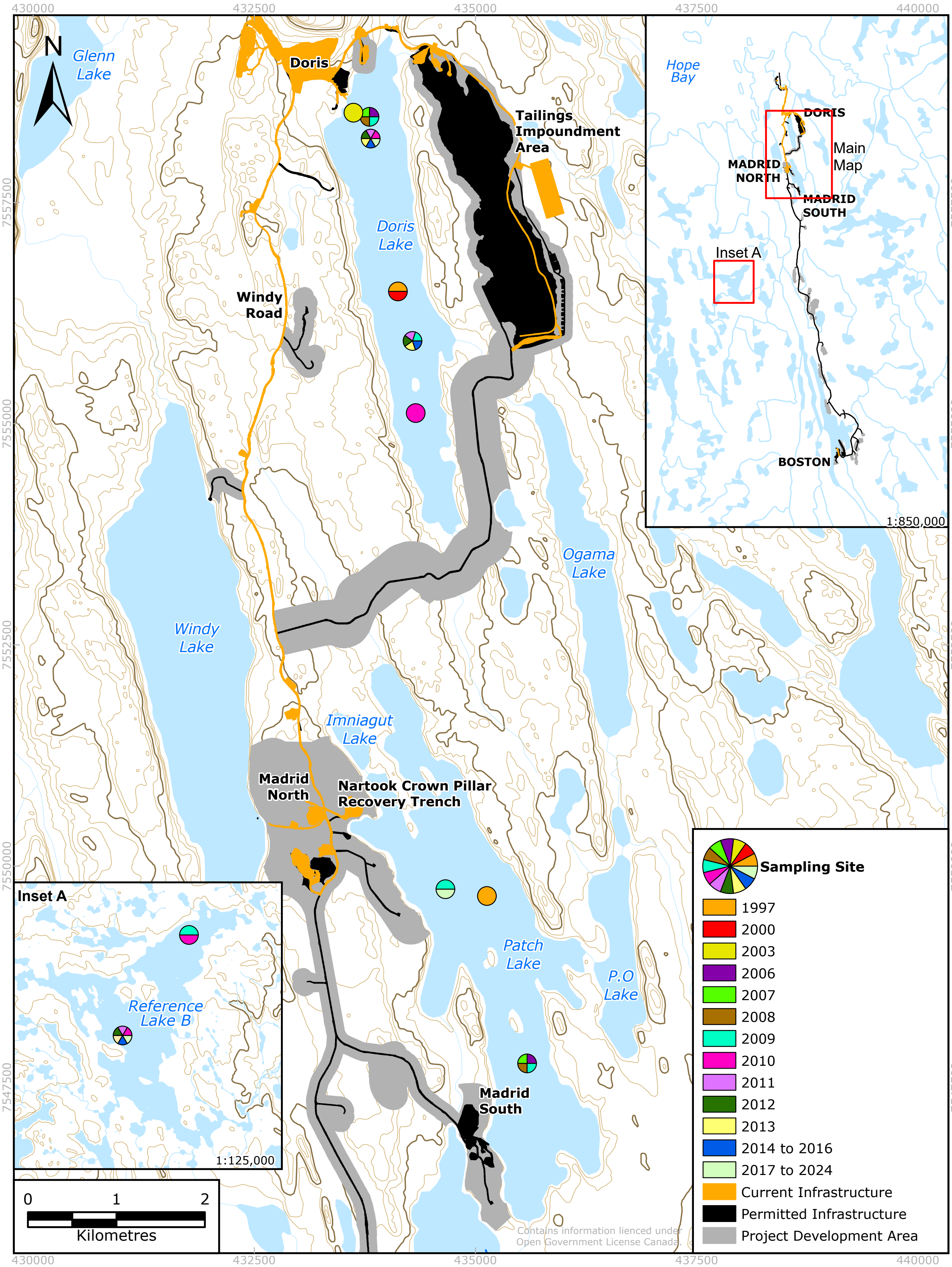
FIGURE C.1-2 HISTORICAL WATER QUALITY SAMPLING SITES, HOPE BAY AEMP, 1995 TO 2024



ERM

CLIENT: AGNICO EAGLE MINES LIMITED
GIS NUMBER: HB-01-298-10
DATE: 01/07/2025
PROJECTION: NAD 1983 UTM Zone 13N
SCALE: 1:60,000 when printed at 8.5x11

FIGURE C.1-3 HISTORICAL PHYTOPLANKTON SAMPLING SITES, HOPE BAY AEMP, 1995 TO 2024



ERM

CLIENT: AGNICO EAGLE MINES LIMITED
GIS NUMBER: HB-01-298-11

DATE: 01/07/2025

PROJECTION: NAD 1983 UTM Zone 13N
SCALE: 1:60,000 when printed at 8.5x11

C.2 STATISTICAL METHODS FOR EVALUATION OF EFFECTS

Statistical analyses were completed for water quality and phytoplankton AEMP components in 2024. The analyses investigated whether a statistically significant change through time was present for the evaluated AEMP components. This statistical analysis supports the evaluation of effects and the determination of whether Project-related effects are present for a given variable or lake.

Unless there were limitations of the dataset due to censored values (Section 2.1.1), either a temporal trend analysis (Section C.2.2) or a before-after/control-impact (BACI) analysis (Section C.2.3) was used to assess the AEMP data. However, statistical assessments are not conclusive evidence of a Project-related effect. Graphical analyses and professional judgment are used in conjunction with the results of the statistical analyses to determine an effect. The results of the statistical analyses were plotted with the observed data to support the evaluation of effects (Sections C.2.4 and C.3).

Statistical analysis can result in a type I error (finding a significant effect where an effect is not present, i.e., false positive) or a type II error (failing to find a significant effect where an effect is present, i.e., false negative). In the context of environmental monitoring, a false positive is a preferred outcome to a false negative. There is a direct trade-off between the two error rates, as reducing one type of error generally increases the other type of error. No correction for the large number of statistical tests was applied to the false positive (type I) error rate. Therefore, there may be false positives in the analyses that were conducted, which is a conservative and environmentally protective approach. The unadjusted type I error rate (or significance level) was set to 0.05 for this AEMP, indicating that statistical results will show a significant effect (i.e., p value of < 0.05) approximately 5% of the time by random chance where an effect is not actually present.

C.2.1 CENSORED DATA

Censored data refers to the concentration of a measured variable that is reported as being below a specified detection limit. Although the actual concentration is not known, these values are often set to one-half the DL for data analyses. If data have a sufficient number of censored values, it may not be feasible to conduct the analysis, or the statistical analyses may create a biased result.

If all data in the current assessment year were below the analytical detection limit (DL), no statistical analysis was performed for that variable or lake. If a large amount of data (> 50% of the dataset) for any variable were below the DL for a lake, that lake was removed from the analyses. In cases where the reference lake data were removed, it was not possible to make comparisons between exposure and reference lakes, and inference about the exposure lake was based on the within-lake regression analysis and plots of the observed data when required.

A Tobit analysis was used if more than 10% of observations from a site were censored. If censored data were included in the analyses, the data were set to half the DL unless indicated differently for a specific analysis method (Sections C.2.2 and C.2.3).

C.2.2 TEMPORAL TREND ANALYSIS

Regression models were used to assess data from lakes with 10 or more years of continuous historical data available for the majority of variables. The regression model examined temporal trends over the monitoring period and was applicable to Doris Lake for the 2024 Hope Bay AEMP. Hypothesis tests were conducted to assess temporal trends for variables. If there was a significant change over time (i.e., relative to a slope of zero), then the trend in the exposure lake (Doris Lake) was compared to the trend in the reference lake (Reference Lake B). Three or more comparable sampling years were required to compare a variable between exposure and reference lakes. Only the years in which both lakes were sampled were included in the analysis. All the observed and fitted data are presented graphically to support the interpretation of results (Section C.3).

Temporal effects were modelled using natural cubic regression spline curves to allow for nonlinearity. The first step of the regression analysis was to determine whether there was evidence of a change in a variable over time (i.e., is the fitted spline curve significantly different from no trend or a slope of zero). Note that the statistical result does not provide any information about the direction of the trend (e.g., increasing or decreasing). If the first step of the analysis determined that there was evidence of a significant change in a variable over time in the exposure lake (i.e., the trend was significantly different from zero), the variable was carried forward to the second step. The second step of the statistical analysis compared the exposure lake trend to the trend in the reference lake. This second step included modelling only the data for monitoring years in the exposure lake that align with monitoring in the reference lake.

Either linear mixed effects (LME) or Tobit regression analyses were applied to the data, depending on the fraction of samples that were less than the DL (censored). Tobit regression was used when a moderate amount of data (between 10 and 50%) from a given lake were below the DL. Tobit models account for the fact that each censored measurement ranges between zero and the DL to predict the estimated range for the mean in a given lake and year (as well as accounting for depth and season, if applicable). This interval was used in the Tobit regression analysis.

C.2.2.1 LINEAR MIXED EFFECTS REGRESSION

Model Form

The model fitted to the data have the basic regression model form as follows:

$$y = Lake + Season + Lake * Season * s(Year) + Depth\ Zone$$

where:

- y denotes a variable of interest, and
- $y_i(x)$ is an observation from lake *i* in year x.

The mean level of a variable is modelled with separate intercepts and time effects *s*(Year), for each lake and each season (under-ice and open-water).

Separate intercepts allowed for differences in the initial values of the variable between lakes and seasons. Temporal effects were modelled using natural cubic regression splines. Cubic regression splines consist of separate cubic polynomial segments connected at certain points, usually selected based on quantiles, and continuous up-to-the-second derivatives (i.e., where the slope changes). Natural cubic splines, which are a specific type of cubic splines, are linear beyond the range of the observed data. The advantage of using regression splines over linear and quadratic effects is improved flexibility in capturing fluctuations in the data where a quadratic relationship appears inadequate. Regression splines are an extension of linear and quadratic effects where, instead of representing an effect x with x and x^2, they employ functions of x, known as basis functions, to describe these effects.

Mathematically, the regression model can be written as:

$$E[y_{im}(x)] = \beta_{0im} + \sum_{n=1}^{K} \beta_{kim} h_k(x)$$

where:

- $E[y_i(x)]$ represents the expected mean value of the variable in lake *i* and season *m* in year *x*;
- β_{0im} represents the intercept for lake *i* and season *m*;
- β_{kim} represents the basis coefficients for lake *i* and season *m*; and
- $\{h_k\}$ are known functions called basis functions.

The regression model is linear in the new variables, $h_k(x)$, and usual LME or Tobit approaches for model fitting and inference may be used. The splines are represented as linear combinations of basis functions evaluated at x and the number of basis functions is dependent on the number of knots (K) chosen. The number of knots chosen was four for variables with 10 years of data and five for variables with more than 10 years of data. Plots of the fitted curves were used to assess the adequacy of the number of knots and to avoid over- or under-fitting the data.

Pseudoreplication

For water quality variables, the mean was calculated from all observations that corresponded to the same combination of lake, year, season, and depth zone. Since comparisons were conducted across years and across lakes, using the mean value from the lake had little effect on the tests of interest. For phytoplankton biomass, the mean was calculated using observations from the same lake on the same sampling date. If a sample result was less the DL, half the DL was substituted for calculating the mean.

Random Variation

Random sources of variation can affect variable measurements. Potential sources of variability include environmental factors affecting all lakes equally in a given year, sampling variation that affects samples taken from a lake in a single year, and true measurement errors from laboratory analysis. The main sources of variation can be broken down into two components: yearly effects that affect the measurements in all lakes and effects that affect each lake individually.
Random effects are included in the LME model to account for these sources of variation. The final model of the mean variable value observed in lake *i* and season *m* in year *x* becomes:

*y = Lake + Season + Lake*Season*s(Year) + Depth Zone + Year-R + Error-R* or mathematically:

$$y_{im}(x) = \beta_{0im} + \sum_{k=1}^{K} \beta_{kim} h_k(x) + \varepsilon_x + \varepsilon_{ix}$$

where ε_x and ε_{ix} represent random variables that affect all lakes identically in year *x*, and those that only affect lake *i*, respectively. These random variables are assumed to follow normal distributions with zero mean and variance σ_x^2 and σ_{ix}^2, respectively.

Assessing Model Fit and Outliers

The goodness-of-fit of the regression models was examined through plots of the residuals. Let $\hat{y}_i(x)$ denote the fitted value for lake *i* in year *x*, defined as:

$$\widehat{y_{im}}(x) = \hat{\beta}_{0im} + \sum_{k=1}^{K} \hat{\beta}_{kim} h_k(x) + \varepsilon_x + \varepsilon_{ix}$$

The residual for each observation, denoted e_{ix}, is the difference between the fitted and observed values:

$$e_{ix} = y_i(x) - \hat{y}_i(x)$$

The residuals estimate the true error or unexplained variation for lake *i* in year *x.* The key assumption is that the true errors are normally distributed with equal variance. That is, the residuals are normally distributed, and their variance does not depend on either lake or year. Normal quantile-quantile (QQ) plots were used to assess the distribution of residuals for each fitted model. Plots of the residuals by year and against the fitted values were used to assess homogeneity of variance over time and across values of the variable. A common deviation from this assumption is that variance increases as the value of the variable increases since values tend to vary more at larger scales. A natural logarithm transformation was use (when required) to smooth the variance which improves the probability of fulfilling the assumption of normally distributed residuals. Standardized residuals greater than three were identified as outliers and flagged to provide some caution during interpretation of results, but data were not removed from the analysis.

C.2.2.2 TOBIT REGRESSION

Often values below the DL are replaced with half the DL value and statistical analyses are performed as if the value is actually observed. Results from this type of analysis can be misleading, particularly when the DLs are not consistent from year to year. For example, if all observations for a given variable in one lake have been below the DL in every year but the DL for that variable has consistently decreased (perhaps due to improving technology), then the imputed observations will appear to decrease over time. There is no real information to conclude if the value is increasing, decreasing, or remaining constant. Further, replacing these values with half of the DL ignores any uncertainty in these observations and the analysis will tend to underestimate the standard deviation (SD) of the variables.

Model Form

Tobit regression accounts for the censoring below the DL. In a maximum likelihood analysis of a standard regression model (as above), the likelihood contribution of a single observation *y* given the covariates x_1, …, x_p and a single error term $\varepsilon \sim N(0, \sigma^2)$ is:

$$L(y) = \left(2\pi\sigma^2\right)^{-1/2} \exp\left(\frac{-1}{2\sigma^2}\left(y - \sum_{i=1}^{p}\beta_i x_i\right)^2\right)$$

which is simply a normal probability density function of an observation, *y*, with mean $\sum \beta_i x_i$ and variance σ^2 .

In the case where *y* is censored and is only known to lie in the interval (*a,b*), Tobit regression replaces the likelihood contribution with the integrated density:

$$L(y) = \int_a^b \exp\left(\frac{-1}{2\sigma^2}\left(y - \sum_{i=1}^{p}\beta_i x_i\right)^2\right)dy = \Phi\left(\frac{b - \sum_{i=1}^{p}\beta_i x_i}{\sigma}\right) - \Phi\left(\frac{a - \sum_{i=1}^{p}\beta_i x_i}{\sigma}\right)$$

where $\Phi(x)$ is the standard normal cumulative distribution function. The likelihood can then be formed by multiplying the appropriate censored or uncensored contributions for each observation. Maximum likelihood inference can be conducted to compute variable estimates and their standard errors and to perform hypothesis tests (Tobin 1958).

Pseudoreplication

The same concern with pseudoreplication in the LME regression models exists in the Tobit regression. However, when values were censored it was not possible to mean the observations in each lake to obtain a single value for each year or season and a different solution was necessary. Suppose that observations $y_1, \ldots, y_{n1}$ and $y'_1, \ldots, y'_{n2}$ are available from a given lake in a given year where each y_i is known exactly and each y'_i is censored so that y'_i belongs to the interval (a_i, b_i). Given these observations, the sample mean, $\overline{y}$, was bounded such that:

$$a = \frac{\sum_{i=1}^{n_1} y_i + \sum_{i=1}^{n_2} a_i}{n_1 + n_2} < \overline{y} < \frac{\sum_{i=1}^{n_1} y_i + \sum_{i=1}^{n_2} b_i}{n_1 + n_2} = b$$

and Tobit regression was performed with (*a, b*) as the censoring interval for the sample mean. If all measurements are known exactly, then $n_2 = 0$ and $a = b = \overline{y}$.

C.2.2.3 HYPOTHESIS TESTING

Once the LME or Tobit regression models were fitted, hypothesis tests were performed by computing the chi-square statistics from the variance-covariance matrix of the relevant modelled contrast values (see subsection, Structure of Tests). This determined if there was evidence that the mean variable values in the exposure lake (*E*) had changed over time. If there was no evidence of change over time, differences were attributed to random variation. If there was evidence of change over time, the temporal trend at the exposure lake was compared to the reference lake (*R*) to determine if there was a parallel trend over time. For comparisons between exposure and reference lakes, only years in which both lakes were sampled were included in the analysis.

Test 1: Comparison Within Exposure Lake

The fitted pattern of means in the exposure lake were compared to a constant value to determine if there was evidence suggesting the mean value of the variable had changed over time.

The hypothesis of this test was:

$$H_0: \beta_{kE} = 0 \text{ for } k = 1 \ldots K$$

$$H_a: \beta_{kE} \neq 0 \text{ for at least one } k = 1 \ldots K$$

Rejection of the null hypothesis provides evidence that the mean variable value in the exposure lake changed over time and the analysis proceeded with Test 2. If the reference lake was removed from the analysis, then plots of the fitted and observed values were used to identify the changes.

Test 2: Comparison to Reference Lake

If there was enough evidence to suggest that the variable changed over time, the fitted patterns of means in the exposure lake were compared to the reference lake. Only years in which both lakes were sampled were included in this comparison.

The hypotheses of these tests were:

$$H_0: \beta_{kE} = \beta_{kR} \text{ for } k = 1 \ldots K$$

$$H_a: \beta_{kE} \neq \beta_{kR} \text{ for at least one } k = 1 \ldots K$$

Rejection of the null hypothesis provides evidence that the time trend in the mean variable value in the exposure lake differed from the time trend in the reference lake.

Structure of Tests

All the hypothesis tests were performed using Wald-type chi-square tests based on the normal approximation for maximum likelihood estimation. Each null hypothesis can be written as a matrix equation with the form $L'\beta = 0$, where L' denotes the vector of regression coefficients. The Wald theory then states that the quantity:

$$X^2 = (L'\hat{\beta})(L'\Sigma L)(\hat{\beta}'L)$$

is approximately distributed as a chi-square with degrees of freedom equal to the row rank of L, where $\hat{\beta}$ is the vector of maximum likelihood estimates and Σ is its estimated variance-covariance matrix. The *p*-values for the tests are computed from the upper-tail probabilities of this distribution.

C.2.3 BEFORE-AFTER/CONTROL-IMPACT ANALYSIS

For water quality and phytoplankton variables in Patch Lake and Windy Lake, there were fewer than 10 years of continuous historical data available for most variables and with nonsequential years of collection. For these lakes, BACI statistical analyses were used. The BACI analysis first consisted of a before-after analysis for an exposure lake. The before represents the baseline years and after represents the period where there may be potential influence from Project-related activities (e.g., construction and operations). If there was no significant difference between time periods for an exposure lake, the analysis was concluded. However, if there was a significant difference, the analysis proceeded to the second step: the control-impact analysis.
The control-impact analysis compared the before-after trend at the exposure lake with the before-after trend at the reference lake and included only the years of data that were comparable. Each lake and evaluated variable were treated independently.

Data Transformations

Initial model assessment was carried out to determine if data transformation was appropriate. The approach was to compare the normalized residuals and model performance for the basic linear model using both untransformed and natural log-transformed data. Plots of standardized residuals, fitted values, and normal Q-Q plots were examined to establish the most appropriate choice of transformation. A data transformation was conducted if it produced a more uniform random distribution of residuals and a closer distribution along the 1:1 reference line on the Q-Q plot.

Outliers

The standardized residuals from the model fit were examined and outliers were identified as standardized residuals greater than three. Any outliers were flagged to provide some caution during interpretation of results but data were not removed from the model.

Model Form—Before-After Design

Regression models were constructed for each exposure site based on a *before-after* (BA) design. A model was constructed for each exposure lake and season. The models follow the general form given the following equation:

$$y = period + \textit{Year-R} + \textit{Error-R}$$

This model identifies variation associated with different components, where *period* describes the differences between the before and after periods, or mathematically as follows:

$$E[y_p] = \beta_0 + \beta_p$$

where

- $E[y_p]$ represents the expected mean value of the variable in period p;
- β_0 represents the intercept; and
- β_p represents the expected difference in the variable between the before and after periods.

Model Form—Before-After/Control-Impact Design

The LME models were constructed for each exposure site based on a BACI design. The models follow the general form as follows:

$$y = lake\ class + period + lake\ class{:}\,period.$$

This model identifies variation associated with different components, where

- *lake class* describes the differences between the reference and exposure lakes;
- *period* describes the differences between the before and after periods across all lakes (reference and exposure); and
- *lake class:period* is the interaction term describing reference and exposure lake-specific differences between periods (the BACI term).

The *lake class:period* term is the key statistical term that describes differential changes to the exposure lake during the period of potential mine effects relative to changes at the reference lake.

Let $y_{i\,sc\,p}$ denote observation *i* at lake *sc* in period *p*, where period is before or after. The basic regression model specifies:

$$E\left(y_{i\,sc\,p}\right) = \beta_0 + \beta_{sc} + \beta_p + \beta_{sc:p}$$

where β_0 is the intercept, β_{sc} is the expected difference between reference and exposure lake effects, β_p is the expected period effect, and $\beta_{sc:p}$ is a vector of expected lake-specific period effects.

Pseudoreplication

All observations from the same lake and season were presented in the plots of the observed data and modelled values. Repeated observations from each lake in each season were collected from similar locations at similar times. Thus, the variability among these observations may not reflect the true variation between random replicates from the entire lake in the given season. Analyzing these measurements as independent observations may underestimate the true variability and lead to overly sensitive statistical tests. Thus, LME models were used to incorporate random effects for lake and year and improve modelling of error variance.

Random Variation

Random effects were included in the model to control for natural interannual variation (*year*) and natural lake-to-lake variation. Including random effects for lake, year, and the interaction between lake and year provided an adjustment for dependence among observations in a given season, at a specific lake, and in a given year.

The model can be represented as:

$$E\left(y_{isp}\right) = \beta_0 + \beta_{sc} + \beta_p + \beta_{sc:p} + \varepsilon_s + \varepsilon_y + \varepsilon_{s:y}$$

Where:

- β_0 is the intercept,
- β_{sc} is the expected value for lake class *sc*,

- β_p is the expected value for period *p*,
- $\beta_{sc:p}$ is the expected value for lake class *sc* in period *p*, and
- $\varepsilon_s + \varepsilon_y + \varepsilon_{s:y}$ are the predicted random component for lake *s* and year *y*.

C.2.3.1 HYPOTHESIS TESTING

Test 1: Before-After Analysis—Comparison Within Exposure Lake

A Project-related effect would be expected to result in a significant difference between the *before-after* change observed at the exposure site. The period term describes the change from the *before* period to the *after* period. For each exposure lake, the period effect was assessed using an F-test.

The hypothesis of this test was as follows:

$$H_0: \beta_p = 0$$

$$H_a: \beta_p \neq 0$$

If the *p*-value for this *period* hypothesis test was less than α = 0.05, then it was concluded that a significant difference between the before and after periods was observed in the exposure lake and the analysis proceeded to a BACI analysis.

Test 2: Before-After/Control-Impact Analysis—Comparison of Exposure and Reference Lake

A Project-related effect would be expected to result in a significant difference between the *before-after* change observed at the exposure and reference lakes. For BACI comparisons, only years in which both lakes were sampled were included in the analysis. The *lake class:period* term describes the lake class-specific variability in the change from the before period to the after period.

The hypothesis of this test was as follows:

$$H_0: \beta_{sc:p} = 0$$

$$H_a: \beta_{sc:p} \neq 0$$

For each exposure lake, the overall *site class:period* effect was assessed using an F-test. If the *p*-value for this *lake class:period* hypothesis test was less than α = 0.05, then it was concluded that a significant lake class-specific difference between the before and after periods was observed.

Confidence Intervals for Contrast Terms

The BACI contrasts (the subtraction of *before-after* difference of the reference lake from the *before-after* difference of the exposure lake) were calculated to compare the difference between the change at the exposure and reference lake. In this approach, any contrast substantially different from zero would represent a differential before/after effect between the exposure lake and the reference lake being contrasted. For the contrasts, 95% confidence intervals were calculated to support the interpretation and identification of statistically significant lake-specific differences. If the confidence interval for a contrast did not cover zero, it was concluded that a significant lake-specific difference between the *before* and *after* periods was observed between the exposure and reference lakes.

C.2.4 PLOTS OF OBSERVED AND FITTED VALUES

Plots of the observed and fitted values were used to visually assess and compare the values within and among lakes, and aid in the interpretation of the hypothesis test results. Observations below the DL were plotted at half the DL and indicated by a hollow symbol.

For the temporal trend analyses (Doris Lake) the fitted mean values were represented with curves and error bars represented the 95% confidence intervals for the model estimate of the annual mean. For the BACI analyses (Patch Lake and Windy Lake) the fitted mean for the before and after periods were represented with curves and error bars represented the 95% confidence intervals for the fitted period mean. If a significant difference was observed for the BACI analyses, the fitted mean of the reference lake was also plotted with error bars representing the 95% confidence intervals for the fitted period mean.

C.2.5 R CODE PACKAGES

All steps of the analysis were performed using the statistical computing package R version 4.1.2. The following versions of packages were used for the analyses:

- dplyr (1.1.2)
- stringr (1.5.0)
- tidyr (1.3.0)
- lubridate (1.9.2)
- ggplot2 (3.5.1)
- knitr (1.48)
- readxl (1.4.3)
- here (1.0.1)
- survival (3.5-5)
- lme4 (1.1-35.1)

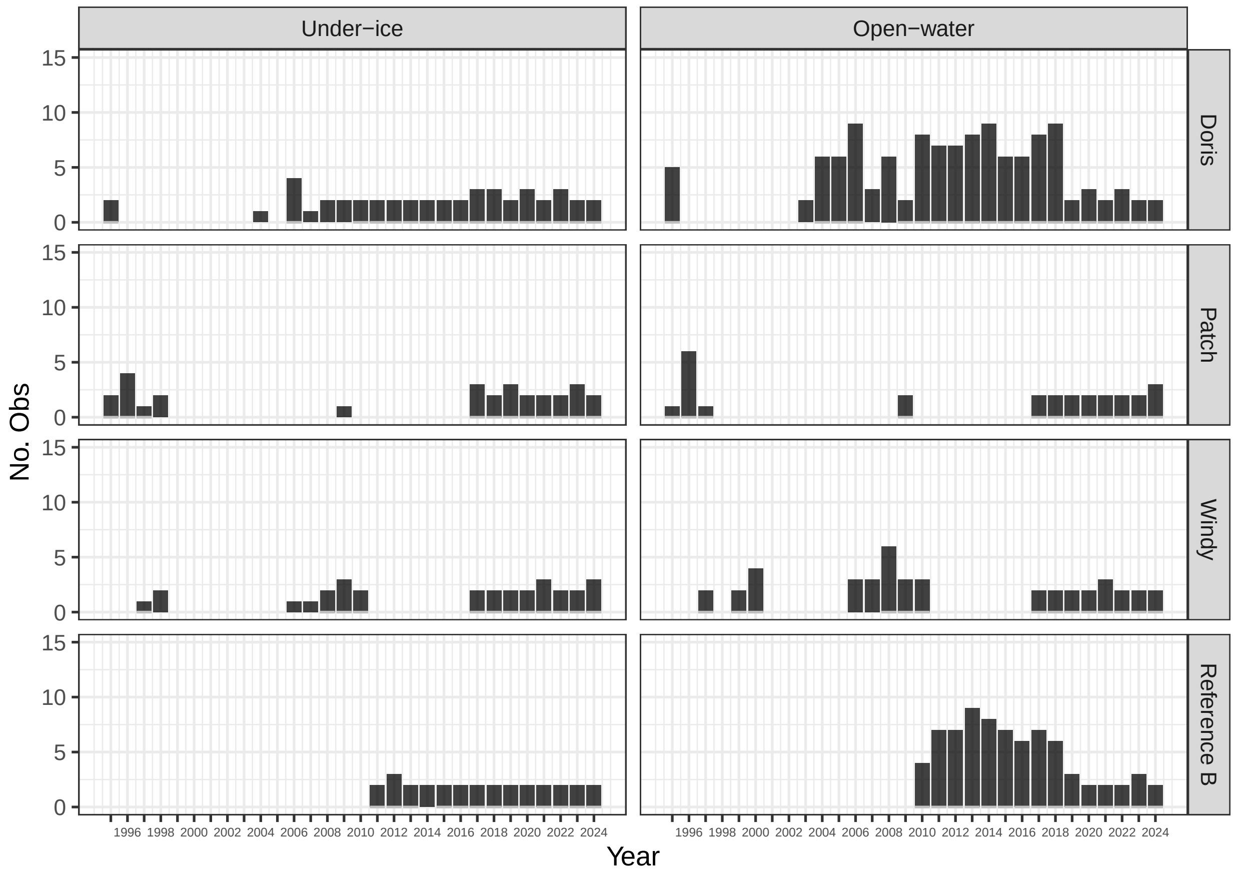
C.3 Statistical Results for Evaluation of Effects

C.3.1 Water Quality

C.3.1.1 pH

Censored Values and Sample Sizes

The following plots indicate the number of observations for each year from each lake that were less than the detection limit (light gray) or greater than the detection limit (dark gray). Observations below the analytical detection limit were considered censored.



Analysis was not performed if greater than 50% of observations from a site-season grouping were censored or if 100% of observations from the current assessment year (i.e., 2024) were censored.

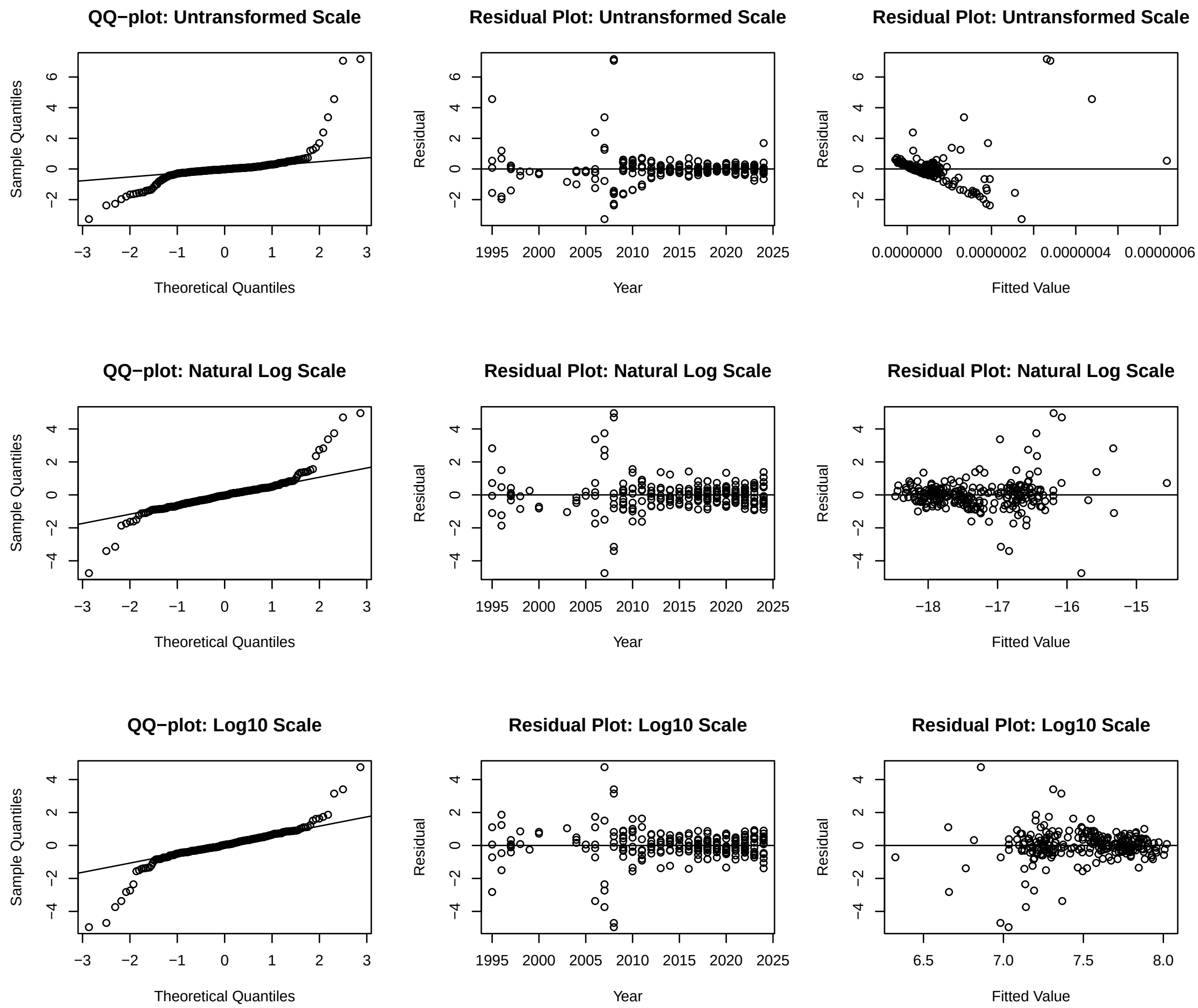
The sample sizes per lake and season are summarized in the table below.

Lake	Season	# Obs (total)	# < DL (total)	% < DL (total)	% < DL (2024)
Doris	Under-ice	46	0	0	0
Doris	Open-water	121	0	0	0
Patch	Under-ice	29	0	0	0
Patch	Open-water	27	0	0	0
Reference B	Under-ice	29	0	0	0
Reference B	Open-water	75	0	0	0
Windy	Under-ice	30	0	0	0
Windy	Open-water	43	0	0	0

None of the sites exhibited greater than 50% of data less than the detection limit. The analysis proceeds with linear mixed model regression.

Initial Model Fit

A model was fit both on the untransformed and natural log scale to assess the need for transformations. Outliers were identified from the fitted model as standardized residuals greater than 3, and flagged to caution interpretation of results but not removed from the analysis.



Outliers on untransformed scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Doris	2007	Under-ice	Surface	1.585e-08	0	-3.272
Doris	2008	Under-ice	Deep	8.913e-07	0	7.062
Doris	2008	Under-ice	Surface	8.913e-07	0	7.168
Patch	1995	Open-water	Surface	7.943e-07	0	4.558
Windy	2007	Open-water	Deep	3.981e-07	0	3.371

Outliers on natural log scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Doris	2007	Under-ice	Surface	1.585e-08	-15.793	-4.749
Doris	2008	Under-ice	Deep	8.913e-07	-16.075	4.699
Doris	2008	Under-ice	Surface	8.913e-07	-16.193	4.957
Windy	2006	Under-ice	Surface	1.995e-07	-16.965	3.370
Windy	2007	Open-water	Deep	3.981e-07	-16.442	3.737
Windy	2008	Open-water	Deep	1.033e-08	-16.834	-3.406
Windy	2008	Open-water	Surface	1.033e-08	-16.952	-3.148

Outliers on log10 scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Doris	2007	Under-ice	Surface	1.585e-08	6.859	4.749
Doris	2008	Under-ice	Deep	8.913e-07	6.981	-4.699
Doris	2008	Under-ice	Surface	8.913e-07	7.032	-4.957
Windy	2006	Under-ice	Surface	1.995e-07	7.368	-3.370
Windy	2007	Open-water	Deep	3.981e-07	7.140	-3.737
Windy	2008	Open-water	Deep	1.033e-08	7.311	3.406
Windy	2008	Open-water	Surface	1.033e-08	7.362	3.148

The log10 data meets residual assumptions better than the untransformed data. Analysis proceeds with log10 data since pH is in log base 10 units.

Doris Lake

The trend for Doris Lake was compared to a slope of zero. If there was a significant trend, then the trend for Doris Lake was compared to the trend in Reference Lake B. This contrast does not test for differences in intercepts between lakes.

Doris Under-Ice

Analysis	Chi.sq	df	p	Significance
Compare to slope zero	19.234	4	0.00070	sig.
Compare to Reference B	2.705	4	0.60830	not sig.

Doris Lake exhibited significant deviation from a slope of zero. Doris Lake did not exhibit significant deviation from the trend of Reference Lake B.

Doris Open-Water

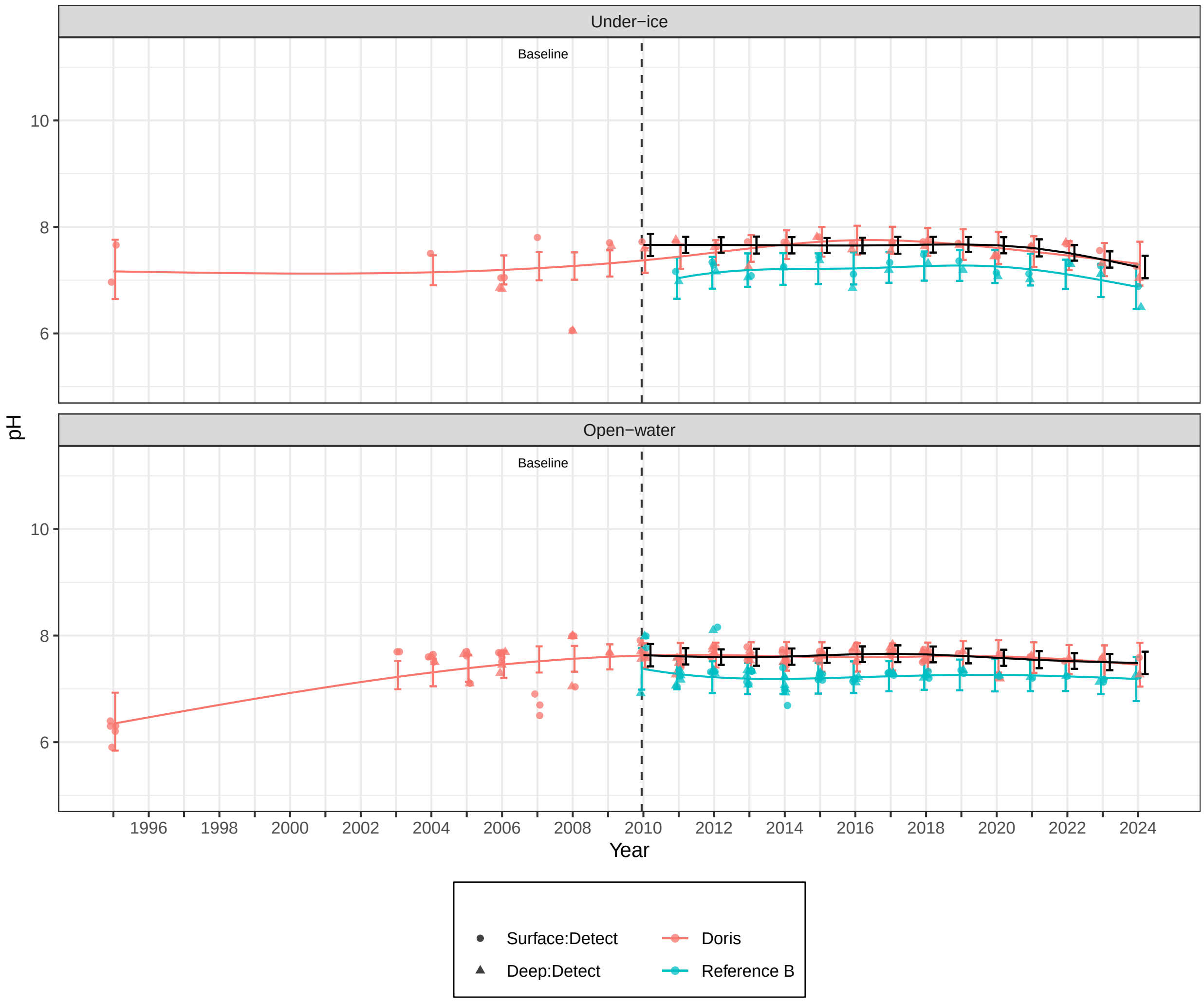
Analysis	Chi.sq	df	p	Significance
Compare to slope zero	29.039	4	<0.00001	sig.
Compare to Reference B	7.413	4	0.11560	not sig.

Doris Lake exhibited significant deviation from a slope of zero. Doris Lake did not exhibit significant deviation from the trend of Reference Lake B.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols are values presented at half the detection limit. Solid lines represent the fitted curves. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations.

As Doris Lake exhibited significant deviation from a slope of zero in at least one season, the black lines and error bars represent the model built with Doris Lake data from comparable sampling years with Reference Lake B only.



Patch Lake

Before-after analyses were first performed to compare the change in the before and after period for the exposure site. If a change was detected, then before-after-control-impact linear modelling was applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Patch Under-Ice Before-After Analysis

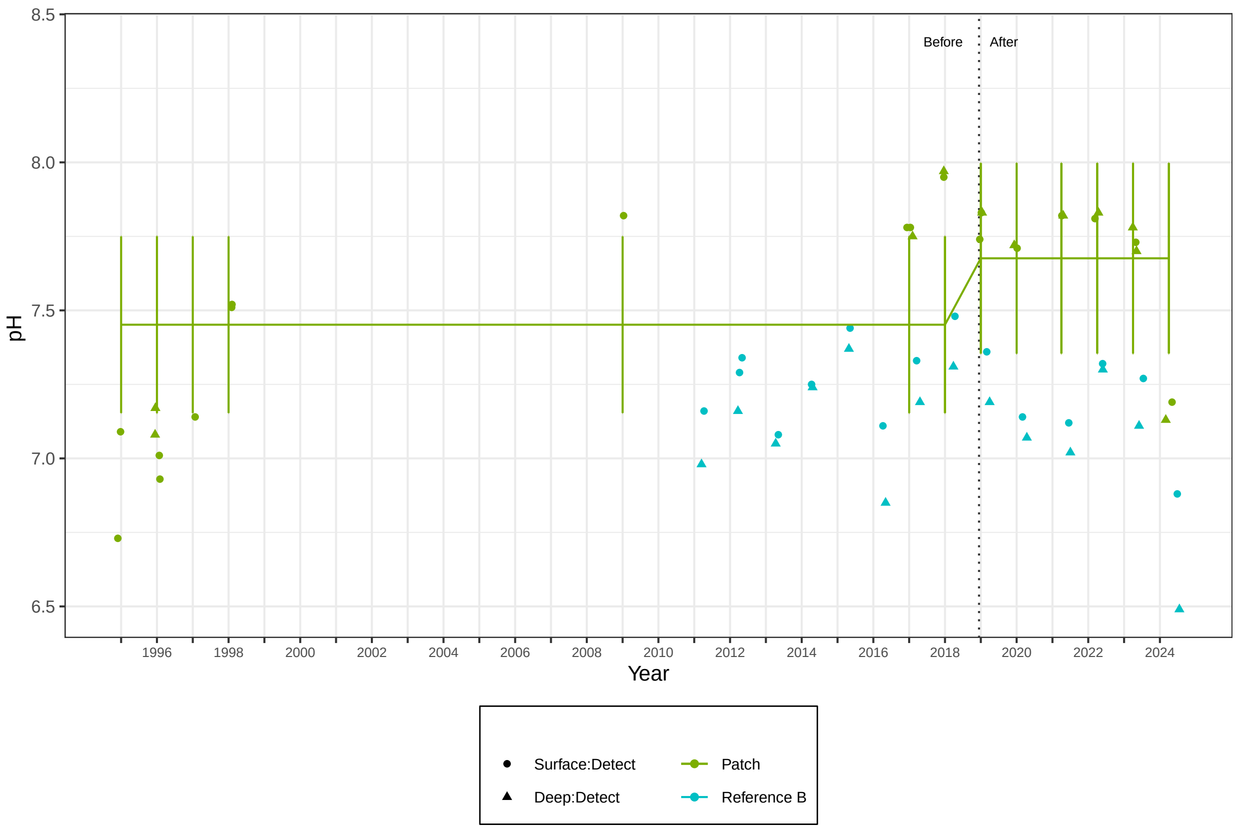
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0.2243	0.1994	11	1.125	0.2845	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Patch Open-Water Before-After Analysis

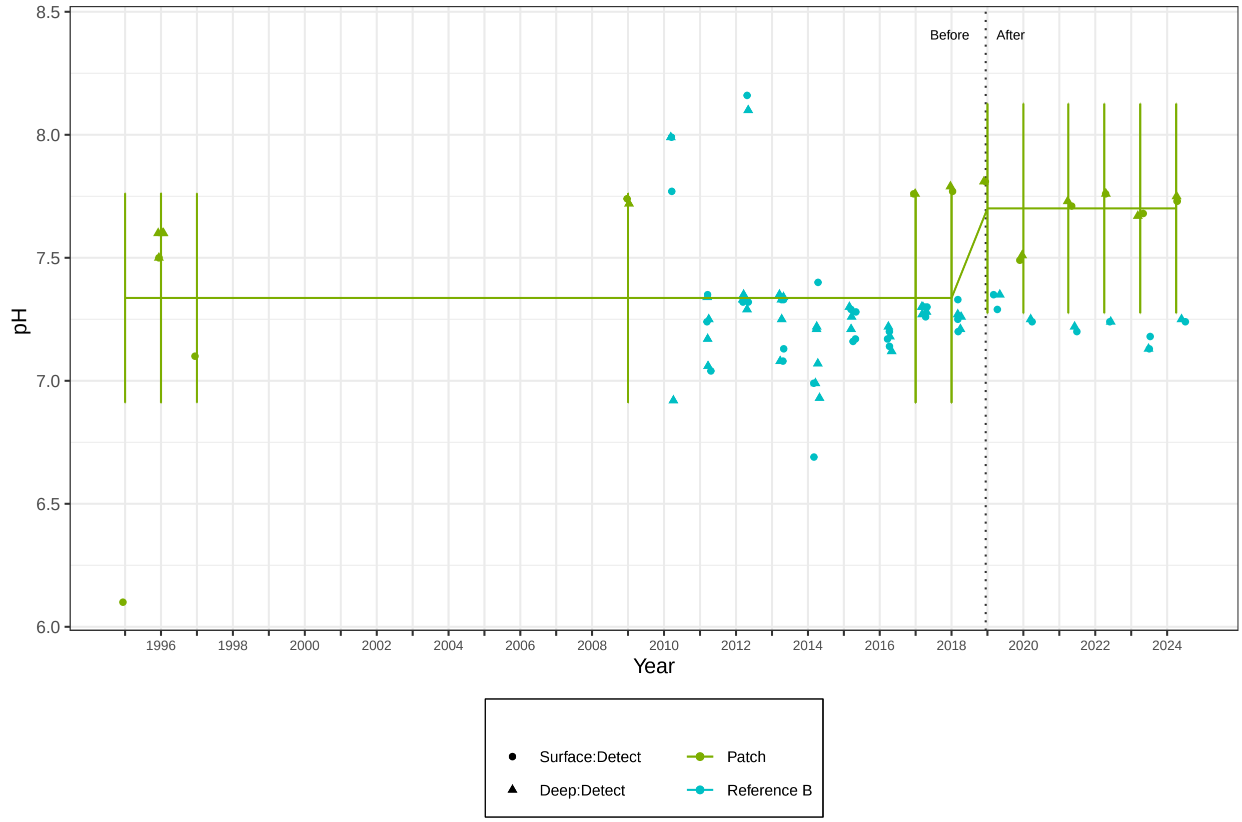
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0.3642	0.2704	9.991	1.347	0.2078	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Windy Lake

Before-after analyses were first performed to compare the change in the before and after period in the exposure lake. If a change was detected then before-after-control-impact linear modeling would be applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Windy Under-Ice Before-After Analysis

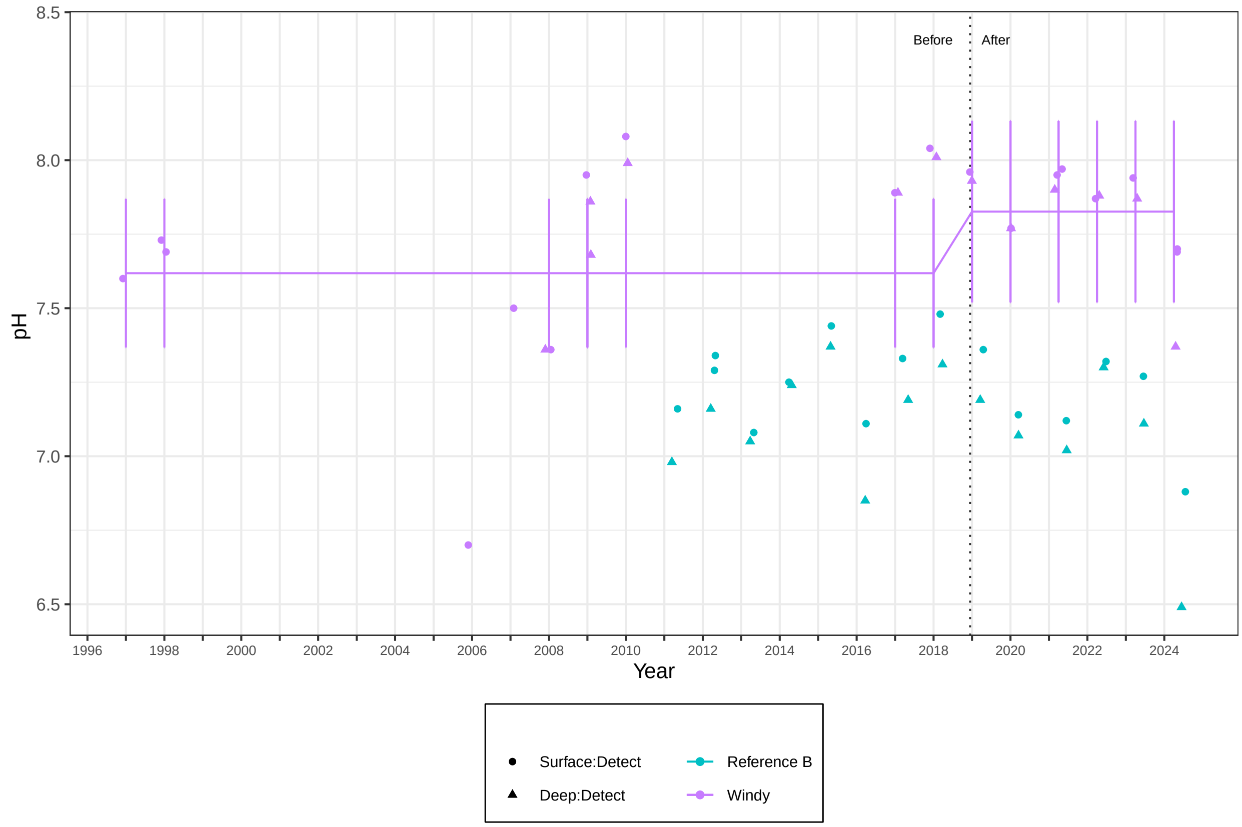
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0.208	0.1833	12.77	1.135	0.2773	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Windy Open-water Before-After Analysis

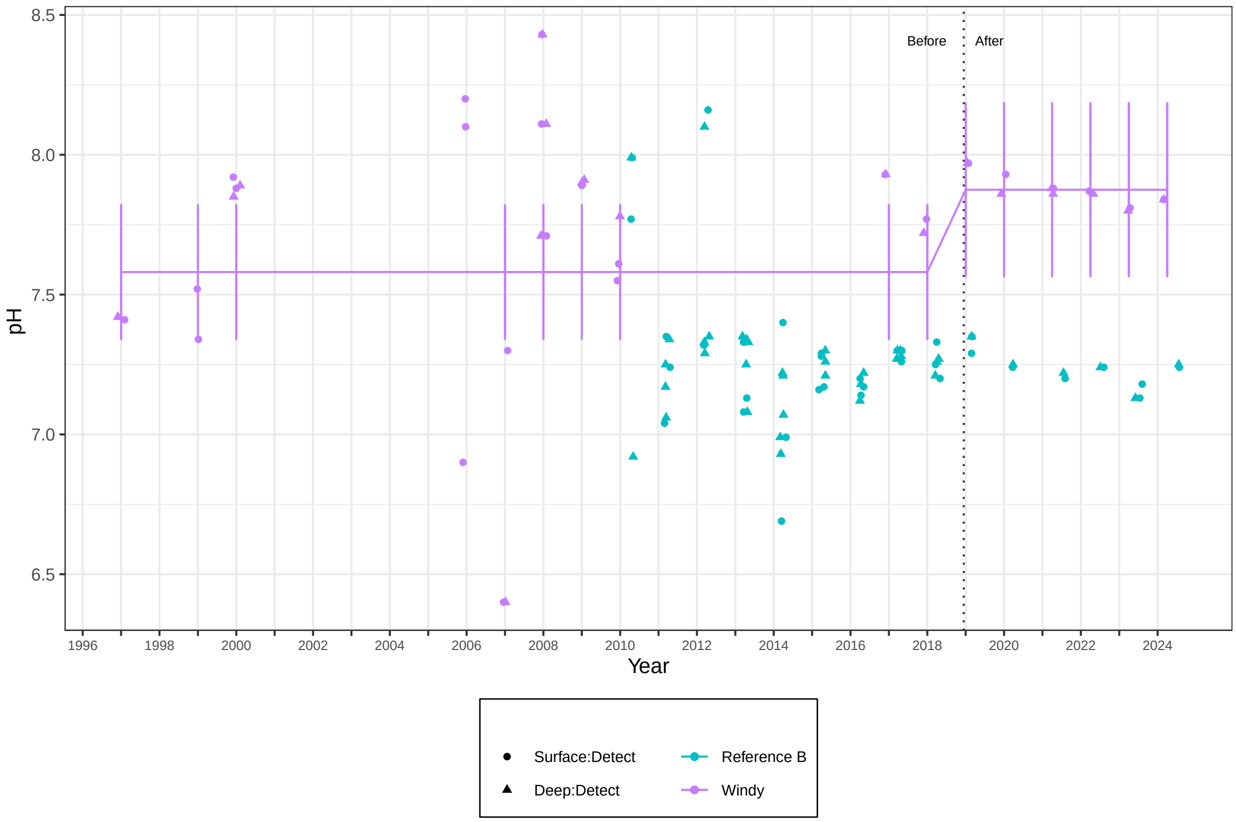
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0.2943	0.1837	14.01	1.602	0.1314	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

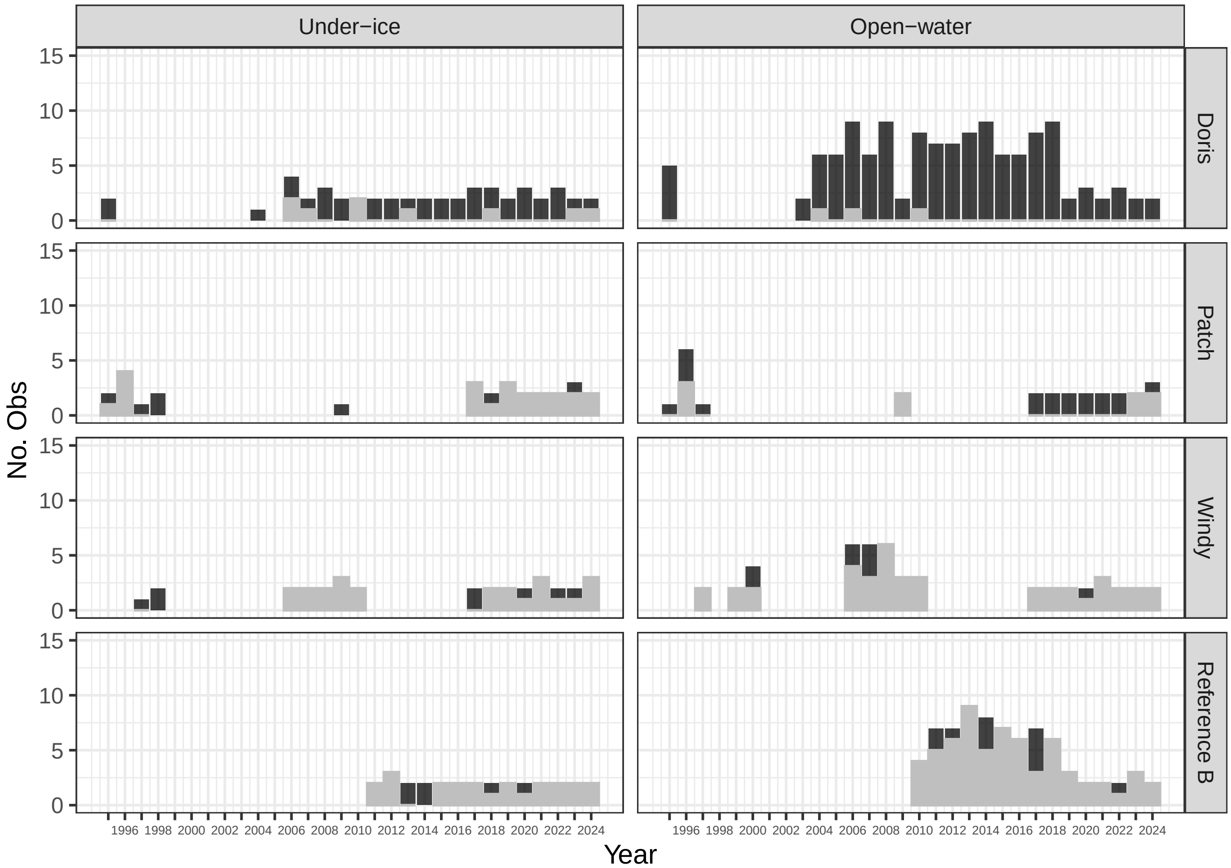
The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.


8.5
8.0
7.5
7.0
6.5
pH
Before
After
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
Year
Surface:Detect
Deep:Detect
Reference B
Windy

C.3.1.2 Total Suspended Solids

Censored Values and Sample Sizes

The following plots indicate the number of observations for each year from each lake that were less than the detection limit (light gray) or greater than the detection limit (dark gray). Observations below the analytical detection limit were considered censored.



Analysis was not performed if greater than 50% of observations from a site-season grouping were censored or if 100% of observations from the current assessment year (i.e., 2024) were censored.

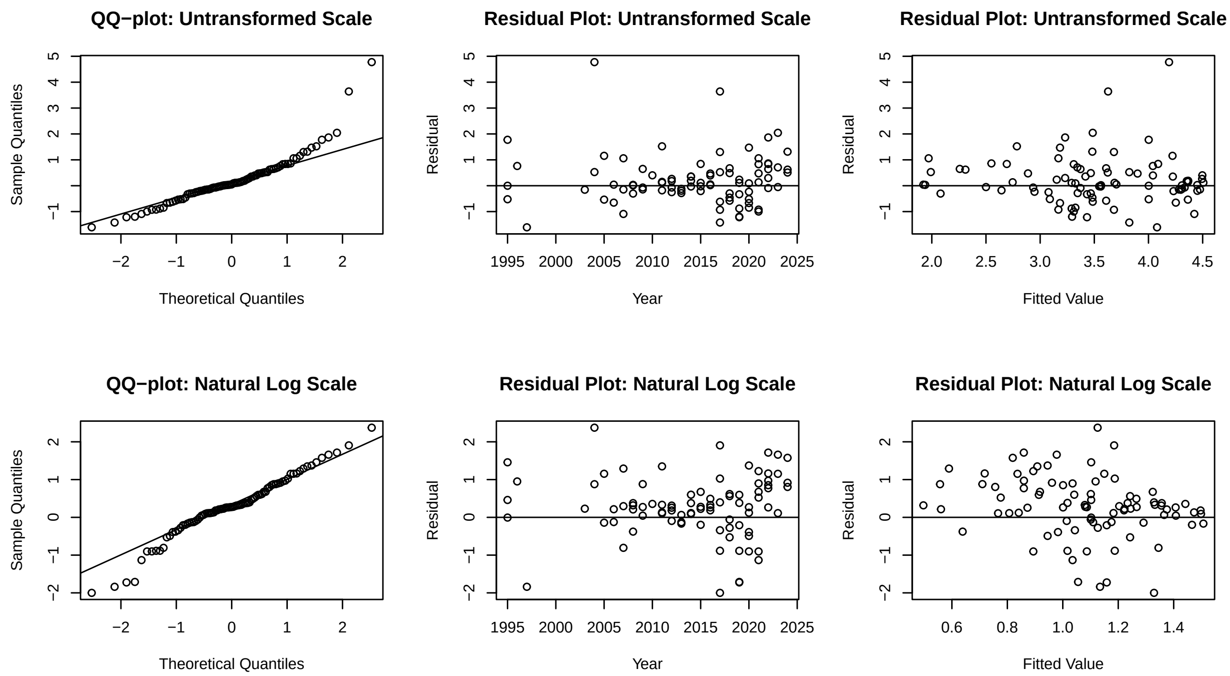
The sample sizes per lake and season are summarized in the table below.

Lake	Season	# Obs (total)	# < DL (total)	% < DL (total)	% < DL (2024)
Doris	Under-ice	48	10	21	50
Doris	Open-water	127	3	2	0
Patch	Under-ice	29	24	83	100
Patch	Open-water	27	9	33	67
Reference B	Under-ice	29	25	86	100
Reference B	Open-water	75	64	85	100
Windy	Under-ice	32	25	78	100
Windy	Open-water	49	41	84	100

More than 50% of data was under detection limit in Patch Under-ice, Reference B Under-ice, Reference B Open-water, Windy Under-ice, and Windy Open-water. Data from those site-season groupings will be removed from the analysis. Doris North Under-ice and Patch Open-water exhibited more than 10% of data under detection limit. The analysis proceeds with tobit regression for Doris Lake.

Initial Model Fit

A model was fit both on the untransformed and natural log scale to assess the need for transformations. Outliers were identified from the fitted model as standardized residuals greater than 3, and flagged to caution interpretation of results but not removed from the analysis.



Outliers on untransformed scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Doris	2004	Open-water	Deep	13.33	4.190	4.774
Doris	2017	Under-ice	Surface	10.60	3.627	3.640

Outliers on natural log scale:

None

The natural log-transformed data better meets the residual assumptions. Analysis proceeds with natural log-transformed data.

Doris Lake

The trend for Doris Lake was compared to a slope of zero. If there was a significant trend, then the trend for Doris Lake was compared to the trend in Reference Lake B. This contrast does not test for differences in intercepts between lakes.

Doris Under-Ice

Analysis	Chi.sq	df	p	Significance
Compare to slope zero	10.89	3	0.01230	sig.

Doris Lake exhibited significant deviation from a slope of zero. Comparison to the trend in Reference Lake B was not completed due to Reference Lake B being excluded from analysis.

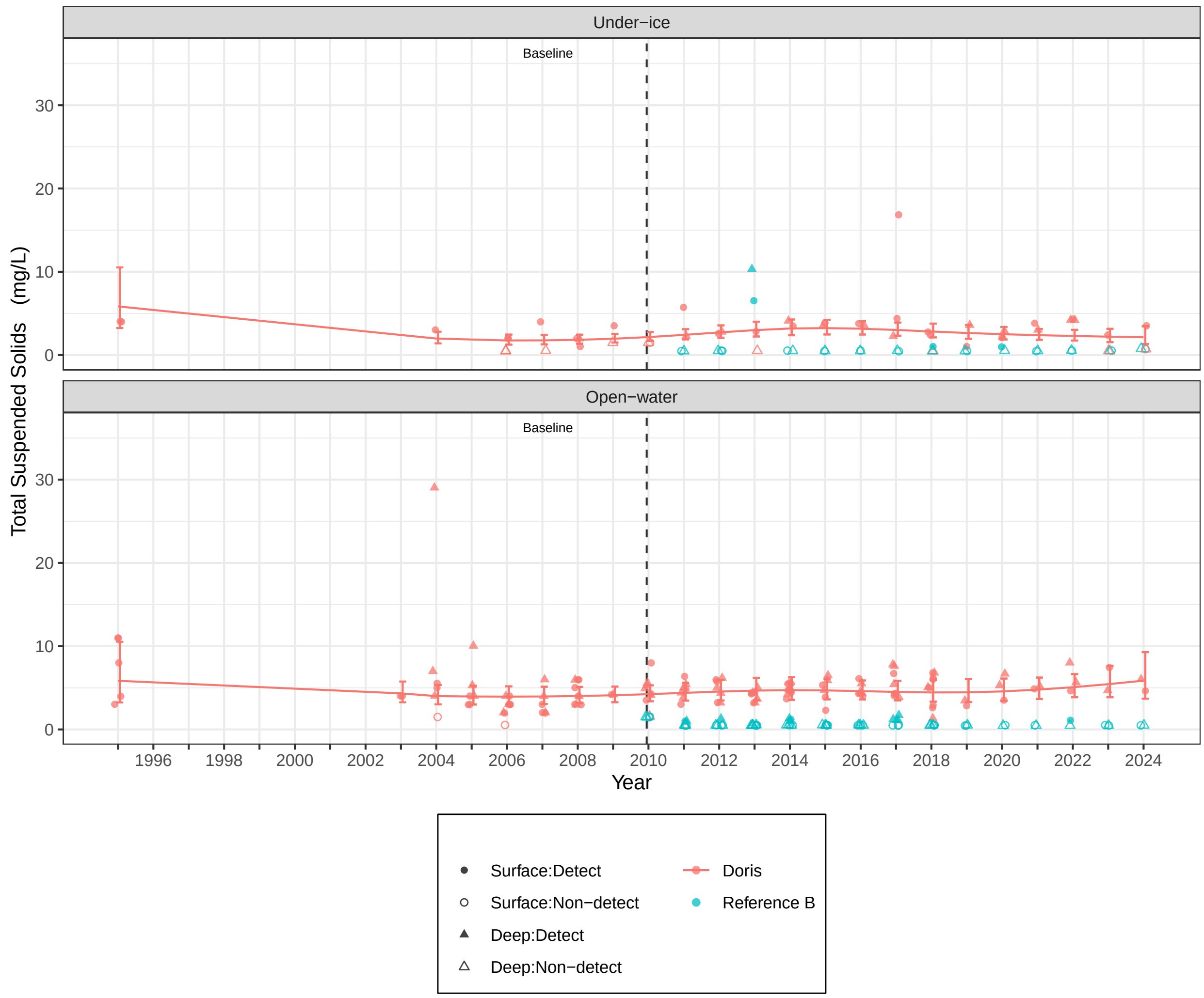
Doris Open-Water

Analysis	Chi.sq	df	p	Significance
Compare to slope zero	1.718	3	0.63300	not sig.

Doris Lake did not exhibit significant deviation from a slope of zero and thus comparison to the trend in Reference Lake B was not completed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols are values presented at half the detection limit. Solid lines represent the fitted curves. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations.



Patch Lake

Before-after analyses were first performed to compare the change in the before and after period for the exposure site. If a change was detected, then before-after-control-impact linear modelling was applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Patch Under-Ice Before-After Analysis Analysis was not performed.

Patch Open-Water Before-After Analysis

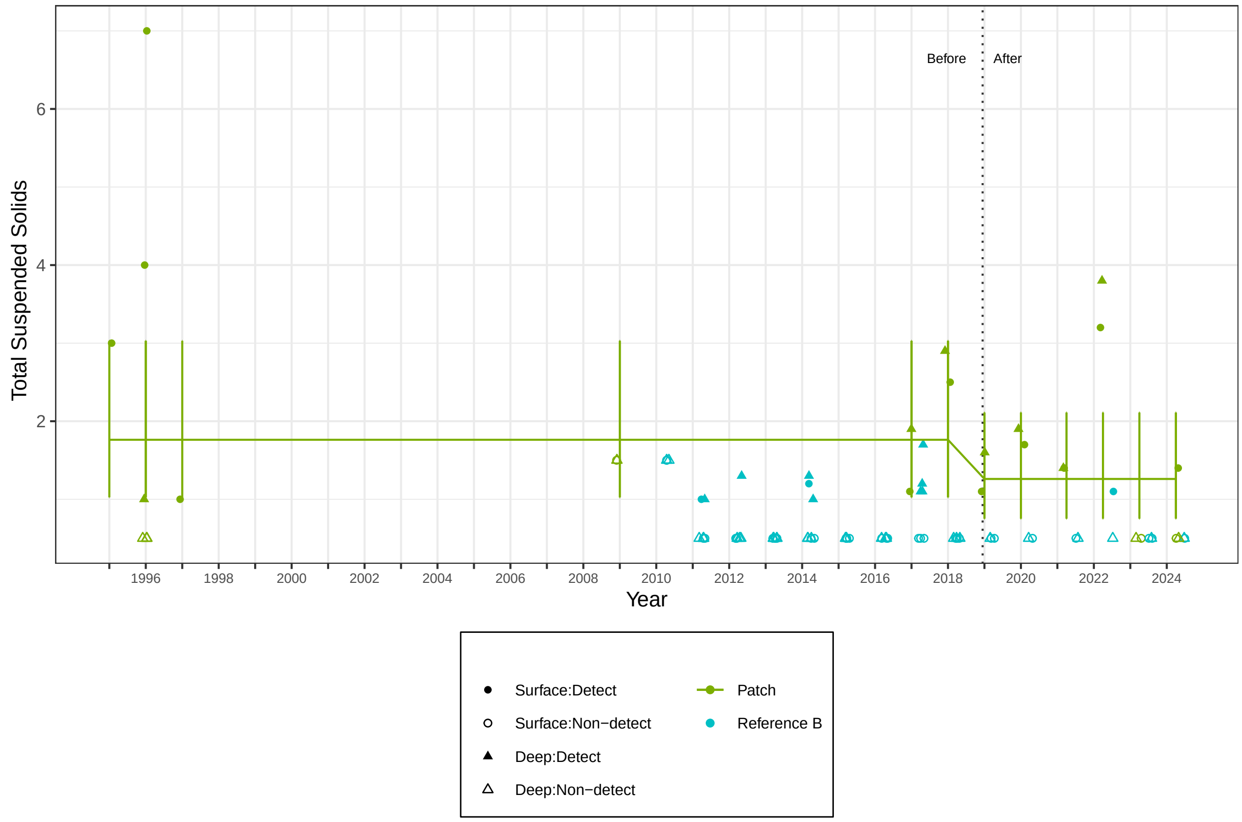
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	-0.3352	0.333	10.15	-1.006	0.3376	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Windy Lake

Before-after analyses were first performed to compare the change in the before and after period in the exposure lake. If a change was detected then before-after-control-impact linear modeling would be applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

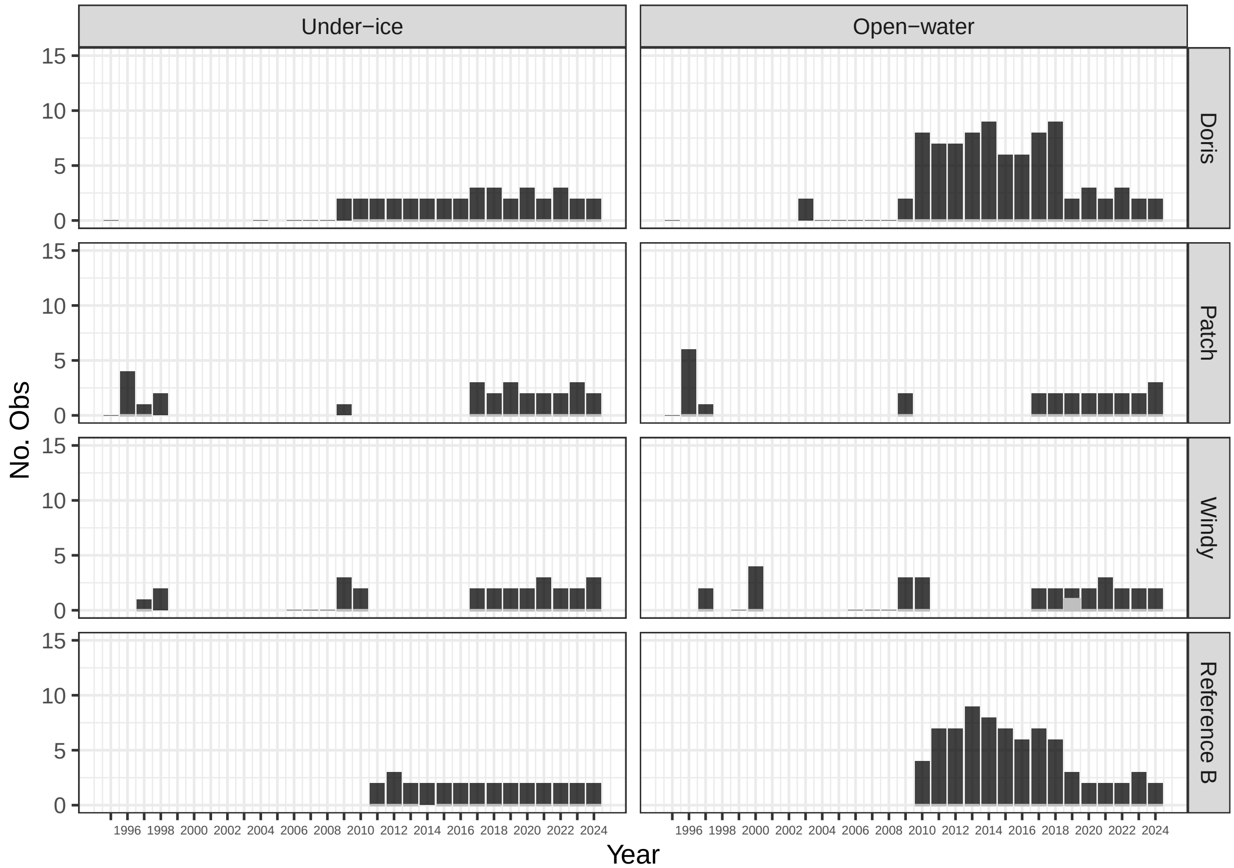
Windy Under-Ice Before-After Analysis Analysis was not performed.

Windy Open-water Before-After Analysis Analysis was not performed.

C.3.1.3 Turbidity

Censored Values and Sample Sizes

The following plots indicate the number of observations for each year from each lake that were less than the detection limit (light gray) or greater than the detection limit (dark gray). Observations below the analytical detection limit were considered censored.



Analysis was not performed if greater than 50% of observations from a site-season grouping were censored or if 100% of observations from the current assessment year (i.e., 2024) were censored.

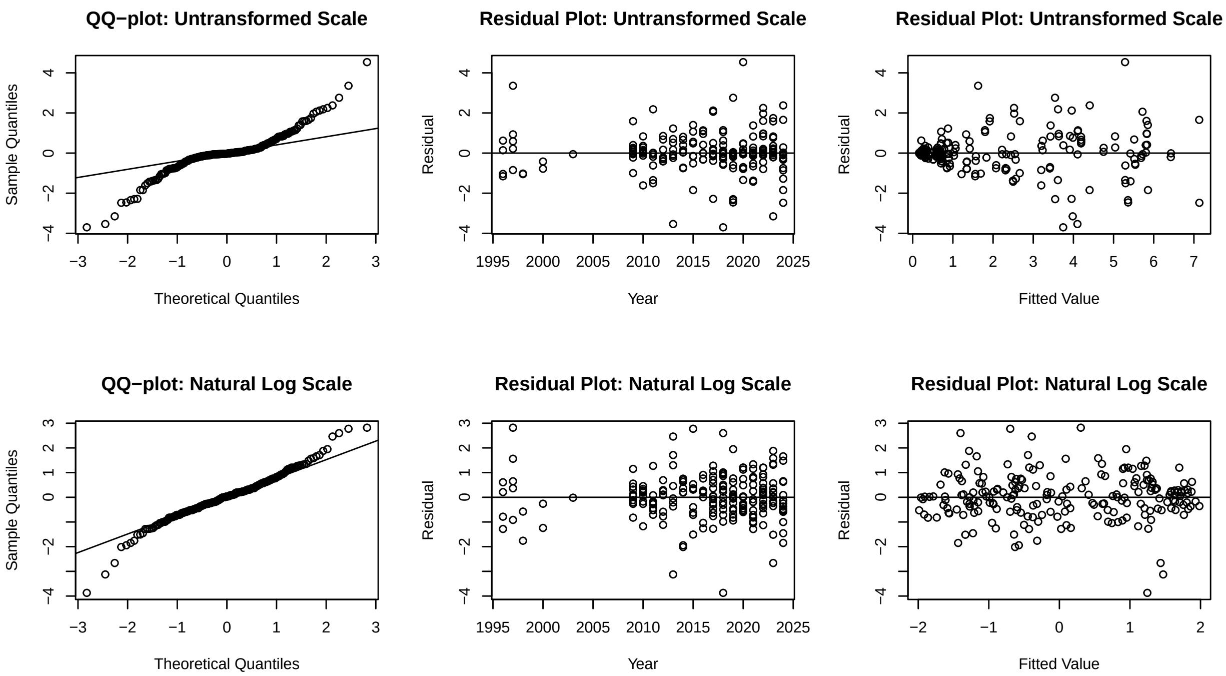
The sample sizes per lake and season are summarized in the table below.

Lake	Season	# Obs (total)	# < DL (total)	% < DL (total)	% < DL (2024)
Doris	Under-ice	36	0	0	0
Doris	Open-water	86	0	0	0
Patch	Under-ice	27	0	0	0
Patch	Open-water	26	0	0	0
Reference B	Under-ice	29	0	0	0
Reference B	Open-water	75	0	0	0
Windy	Under-ice	26	0	0	0
Windy	Open-water	29	1	3	0

None of the sites exhibited greater than 50% of data less than the detection limit. The analysis proceeds with linear mixed model regression.

Initial Model Fit

A model was fit both on the untransformed and natural log scale to assess the need for transformations. Outliers were identified from the fitted model as standardized residuals greater than 3, and flagged to caution interpretation of results but not removed from the analysis.



Outliers on untransformed scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Doris	2013	Under-ice	Deep	1.18	4.100	-3.537
Doris	2018	Under-ice	Deep	0.69	3.746	-3.701
Doris	2020	Open-water	Deep	9.03	5.286	4.535
Doris	2023	Under-ice	Deep	1.38	3.983	-3.153
Patch	1997	Under-ice	Surface	4.40	1.628	3.357

Outliers on natural log scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Doris	2013	Under-ice	Deep	1.18	1.471	-3.125
Doris	2018	Under-ice	Deep	0.69	1.246	-3.871

The natural log-transformed data better meets the residual assumptions. Analysis proceeds with natural log-transformed data. However, there was an outlier retained in the analysis. Results should be interpreted with caution and along with graphical results.

Doris Lake

The trend for Doris Lake was compared to a slope of zero. If there was a significant trend, then the trend for Doris Lake was compared to the trend in Reference Lake B. This contrast does not test for differences in intercepts between lakes.

Doris Under-Ice

Analysis	Chi.sq	df	p	Significance
Compare to slope zero	2.747	4	0.60100	not sig.

Doris Lake did not exhibit significant deviation from a slope of zero and thus comparison to the trend in Reference Lake B was not completed.

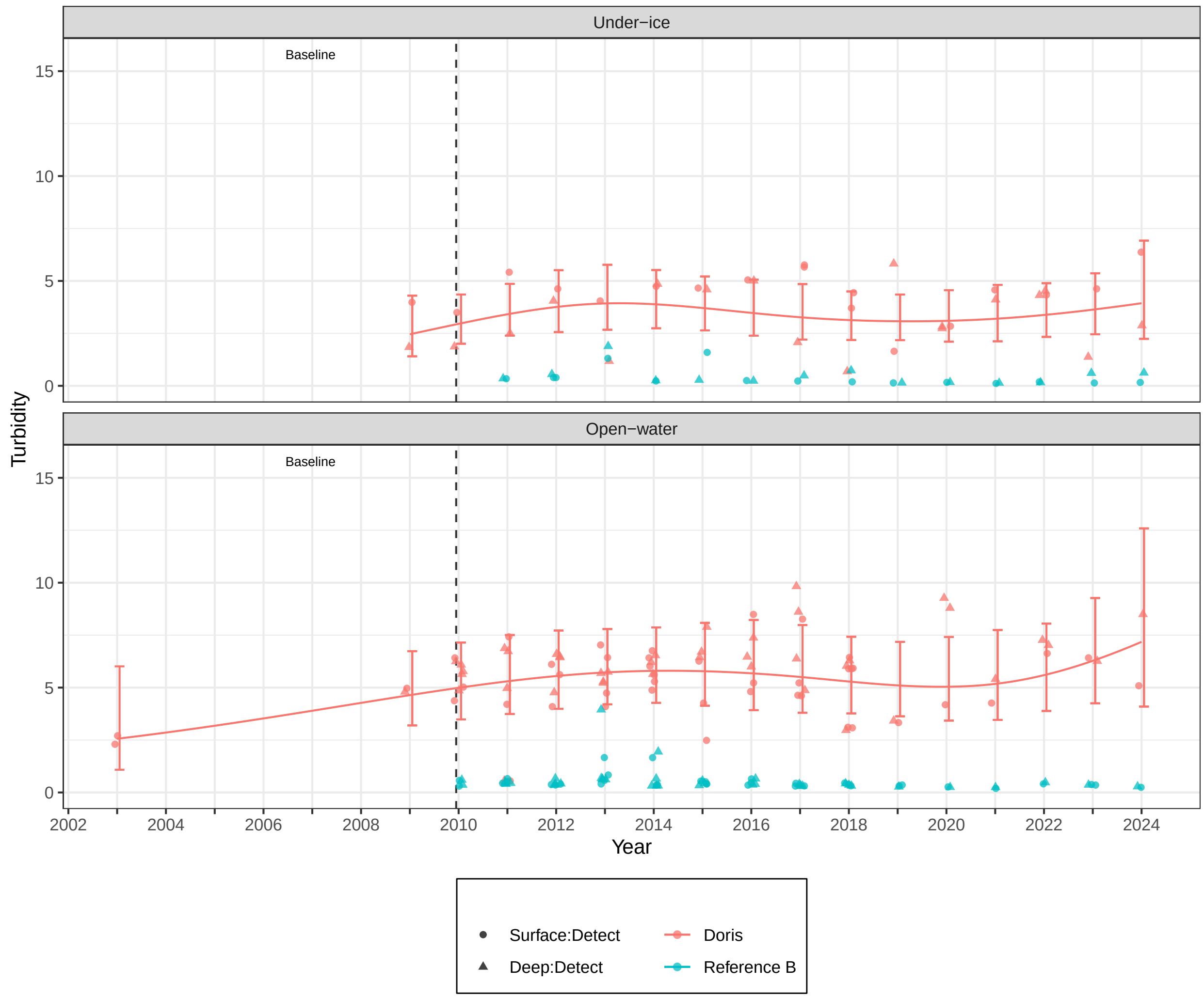
Doris Open-Water

Analysis	Chi.sq	df	p	Significance
Compare to slope zero	5.069	4	0.28030	not sig.

Doris Lake did not exhibit significant deviation from a slope of zero and thus comparison to the trend in Reference Lake B was not completed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols are values presented at half the detection limit. Solid lines represent the fitted curves. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations.



Patch Lake

Before-after analyses were first performed to compare the change in the before and after period for the exposure site. If a change was detected, then before-after-control-impact linear modelling was applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Patch Under-Ice Before-After Analysis

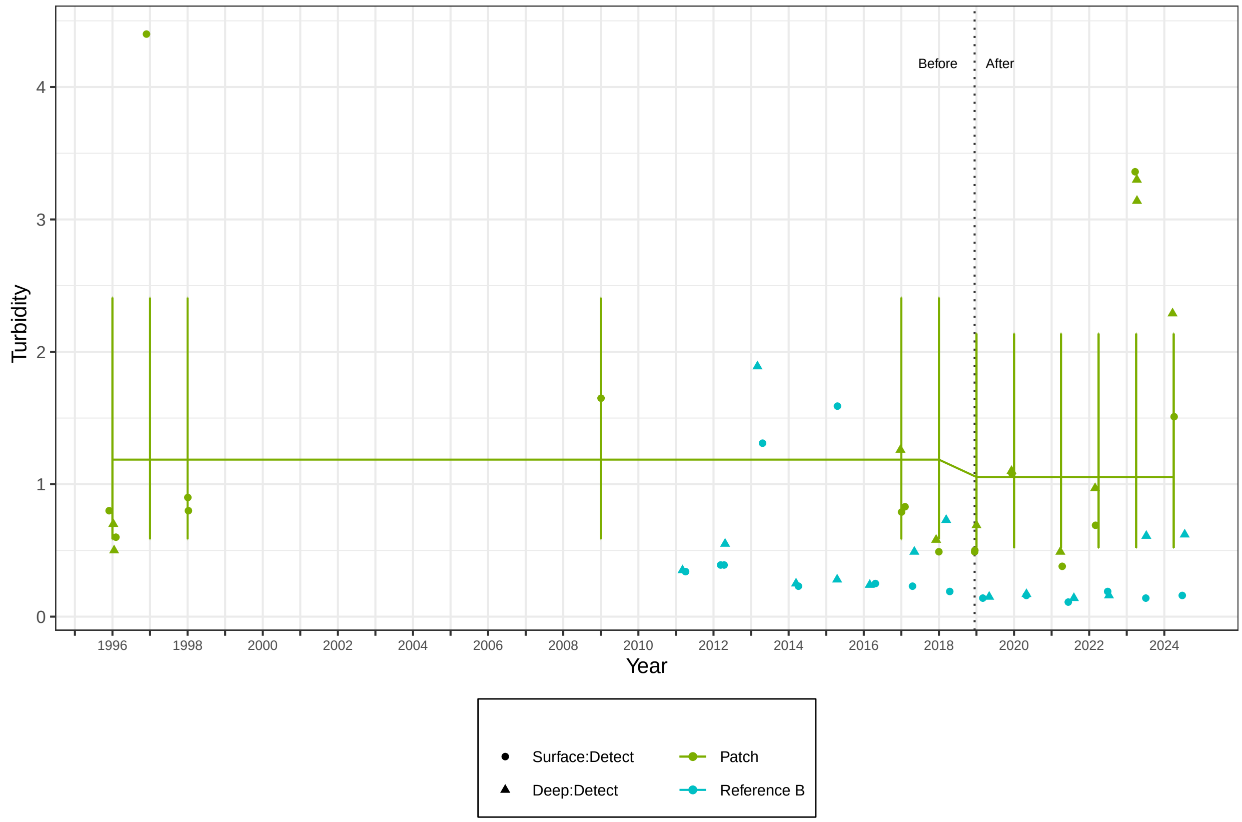
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	-0.1175	0.4494	9.972	-0.2614	0.7991	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Patch Open-Water Before-After Analysis

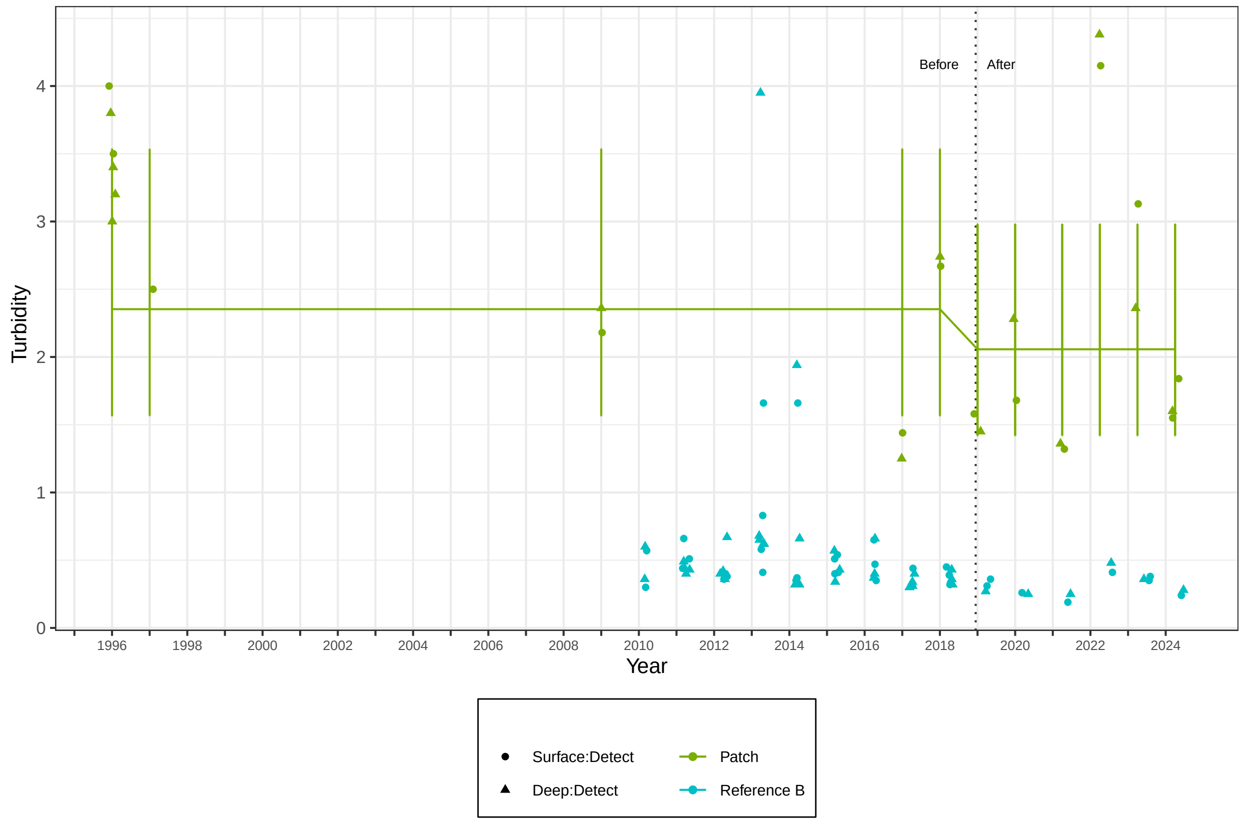
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	-0.1344	0.2436	9.075	-0.5517	0.5945	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Windy Lake

Before-after analyses were first performed to compare the change in the before and after period in the exposure lake. If a change was detected then before-after-control-impact linear modeling would be applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Windy Under-Ice Before-After Analysis

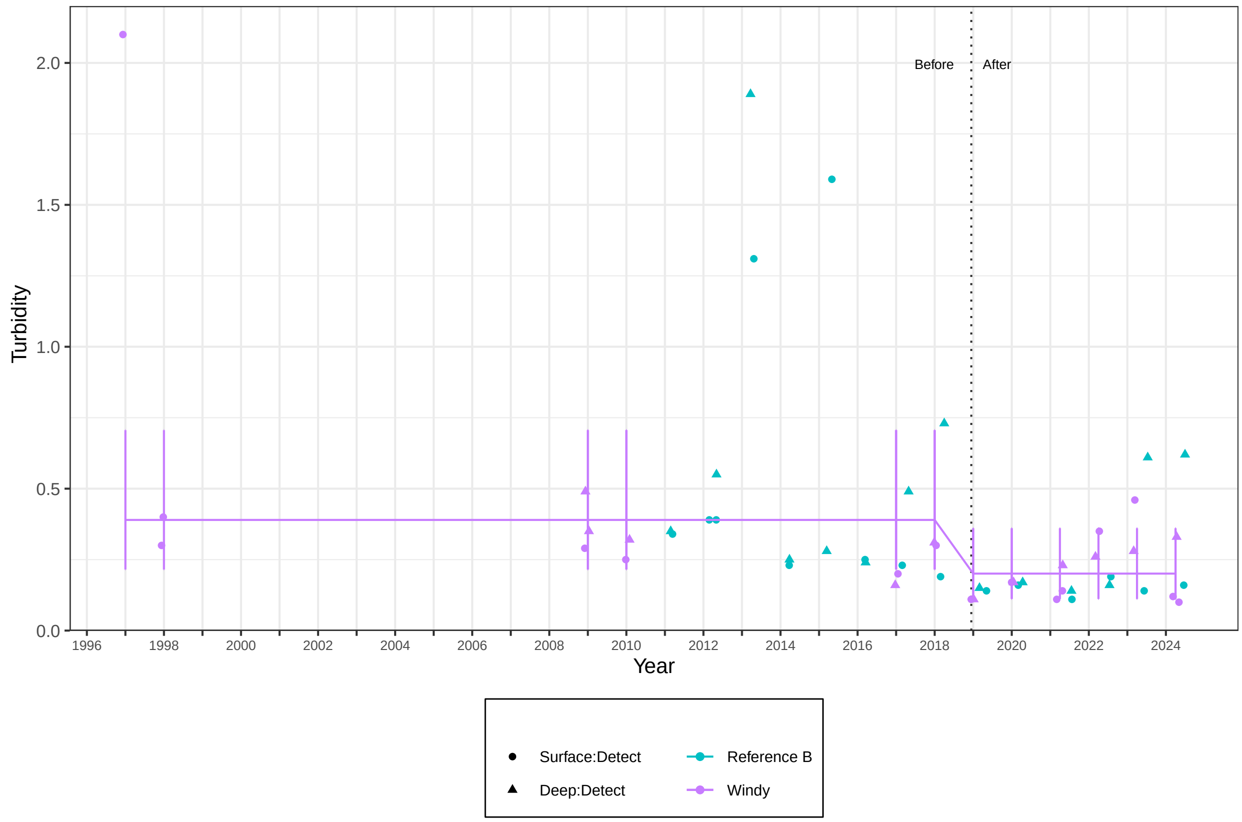
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	-0.6638	0.3738	8.612	-1.776	0.111	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Windy Open-water Before-After Analysis

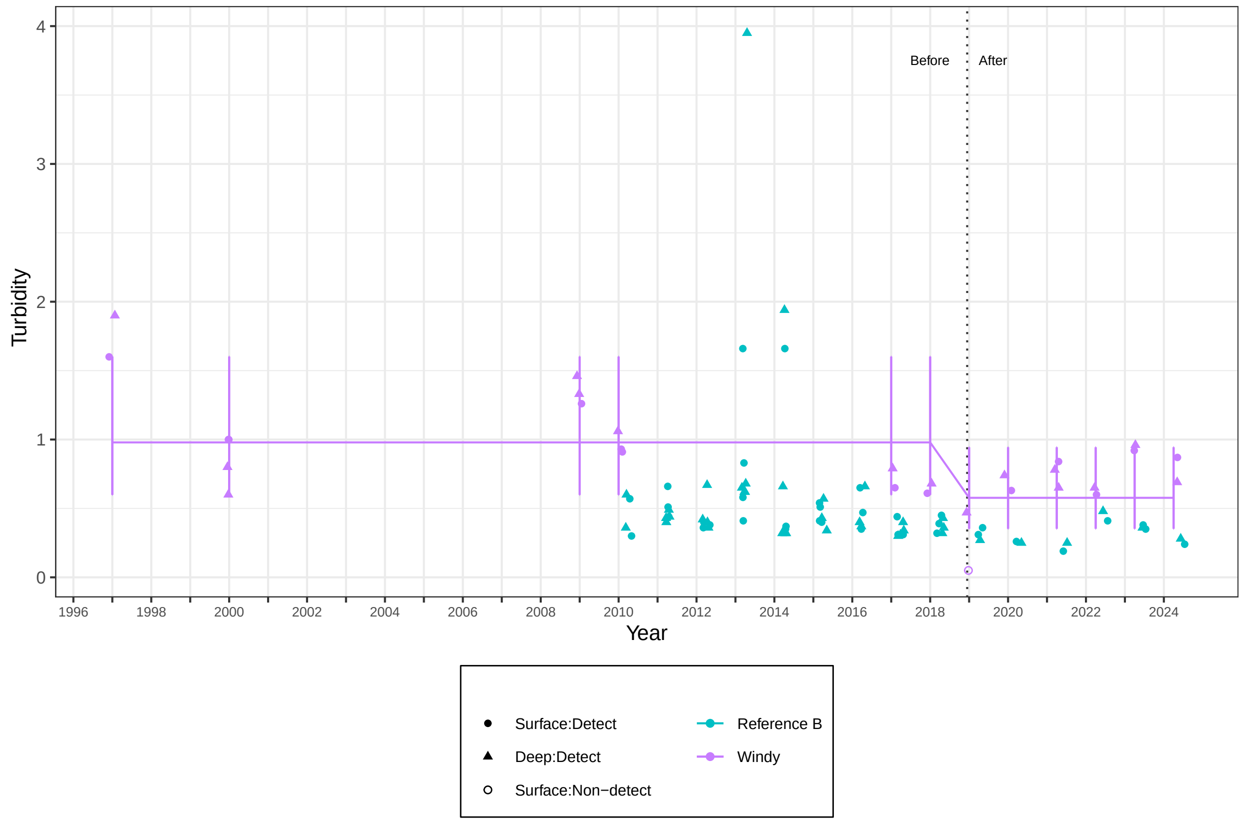
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	-0.529	0.3123	10	-1.694	0.1212	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

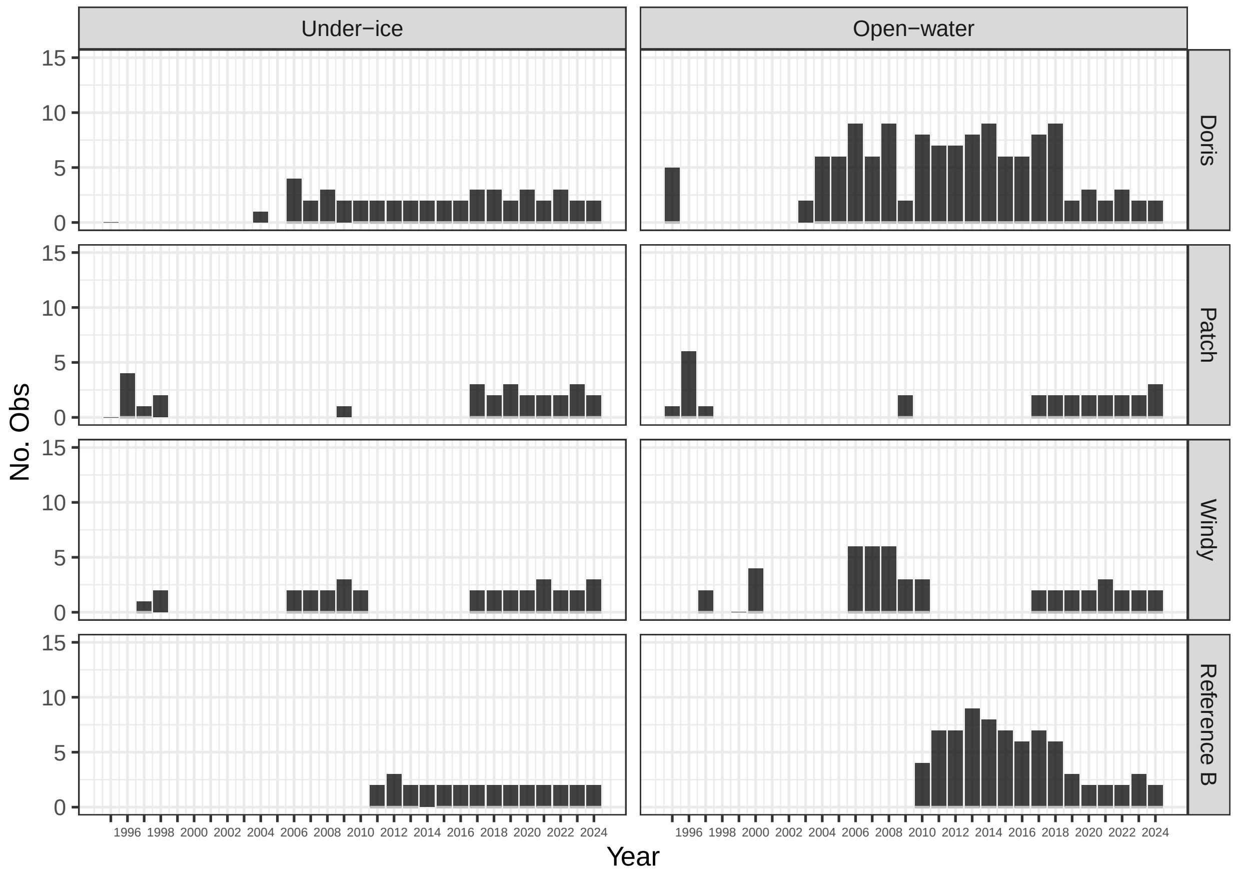
The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.


Turbidity
4
3
2
1
0
Before
After
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
Year
Surface:Detect
Deep:Detect
Surface:Non−detect
Reference B
Windy

C.3.1.4 Chloride

Censored Values and Sample Sizes

The following plots indicate the number of observations for each year from each lake that were less than the detection limit (light gray) or greater than the detection limit (dark gray). Observations below the analytical detection limit were considered censored.



Analysis was not performed if greater than 50% of observations from a site-season grouping were censored or if 100% of observations from the current assessment year (i.e., 2024) were censored.

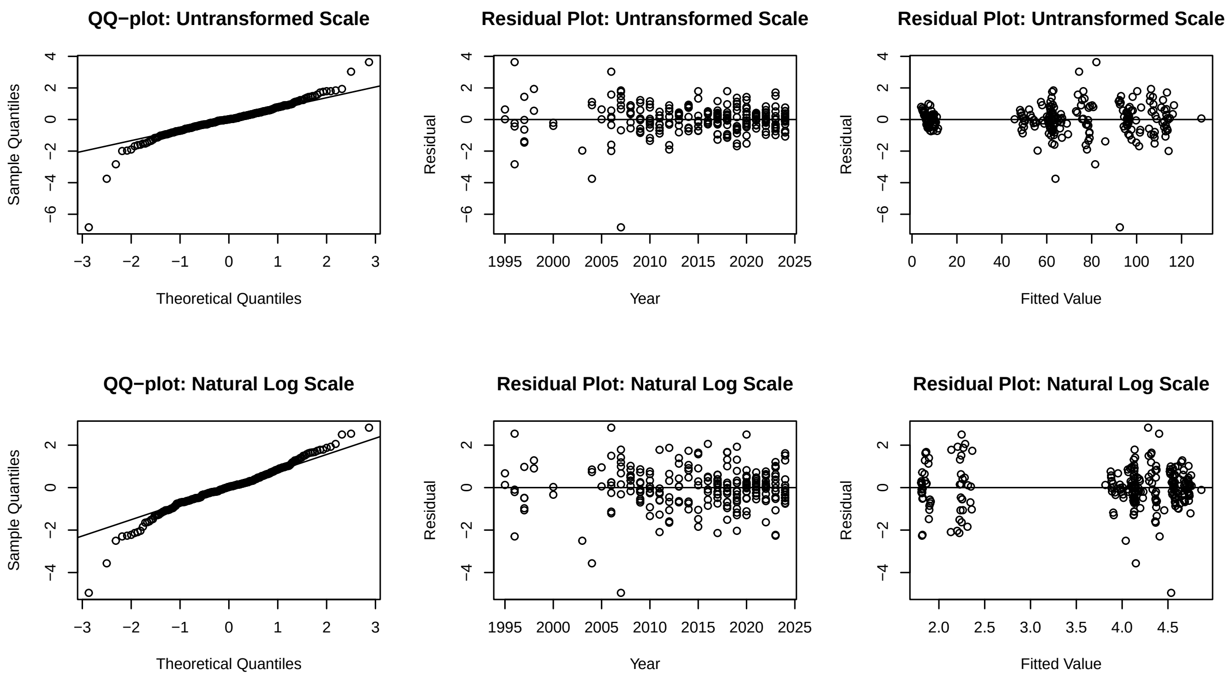
The sample sizes per lake and season are summarized in the table below.

Lake	Season	# Obs (total)	# < DL (total)	% < DL (total)	% < DL (2024)
Doris	Under-ice	46	0	0	0
Doris	Open-water	127	0	0	0
Patch	Under-ice	27	0	0	0
Patch	Open-water	27	0	0	0
Reference B	Under-ice	29	0	0	0
Reference B	Open-water	75	0	0	0
Windy	Under-ice	32	0	0	0
Windy	Open-water	47	0	0	0

None of the sites exhibited greater than 50% of data less than the detection limit. The analysis proceeds with linear mixed model regression.

Initial Model Fit

A model was fit both on the untransformed and natural log scale to assess the need for transformations. Outliers were identified from the fitted model as standardized residuals greater than 3, and flagged to caution interpretation of results but not removed from the analysis.



Outliers on untransformed scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Doris	2004	Under-ice	Surface	54.00	63.87	-3.752
Doris	2006	Under-ice	Deep	82.35	74.38	3.029
Patch	1996	Under-ice	Deep	91.65	82.09	3.635
Windy	2007	Open-water	Surface	74.57	92.53	-6.829

Outliers on natural log scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Doris	2004	Under-ice	Surface	54.00	4.150	-3.566
Windy	2007	Open-water	Surface	74.57	4.535	-4.958

The natural log-transformed data better meets the residual assumptions. Analysis proceeds with natural log-transformed data. However, there was an outlier retained in the analysis. Results should be interpreted with caution and along with graphical results.

Doris Lake

The trend for Doris Lake was compared to a slope of zero. If there was a significant trend, then the trend for Doris Lake was compared to the trend in Reference Lake B. This contrast does not test for differences in intercepts between lakes.

Doris Under-Ice

Analysis	Chi.sq	df	p	Significance
Compare to slope zero	123.83	4	<0.00001	sig.
Compare to Reference B	79.42	4	<0.00001	sig.

Doris Lake exhibited significant deviation from a slope of zero. Doris Lake exhibited significant deviation from the trend of Reference Lake B.

Doris Open-Water

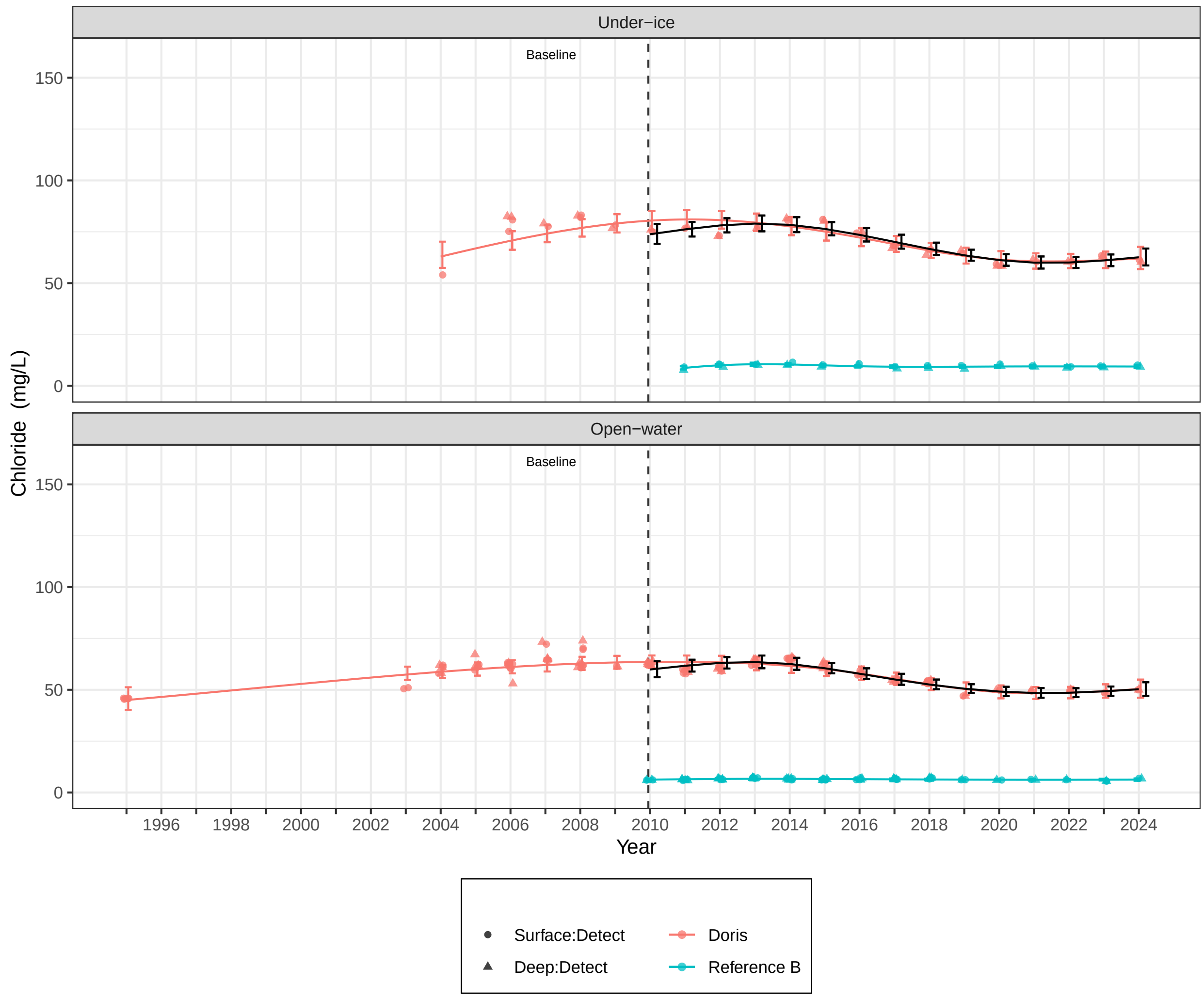
Analysis	Chi.sq	df	p	Significance
Compare to slope zero	135.83	4	<0.00001	sig.
Compare to Reference B	58.67	4	<0.00001	sig.

Doris Lake exhibited significant deviation from a slope of zero. Doris Lake exhibited significant deviation from the trend of Reference Lake B.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols are values presented at half the detection limit. Solid lines represent the fitted curves. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations.

As Doris Lake exhibited significant deviation from a slope of zero in at least one season, the black lines and error bars represent the model built with Doris Lake data from comparable sampling years with Reference Lake B only.



Patch Lake

Before-after analyses were first performed to compare the change in the before and after period for the exposure site. If a change was detected, then before-after-control-impact linear modelling was applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Patch Under-Ice Before-After Analysis

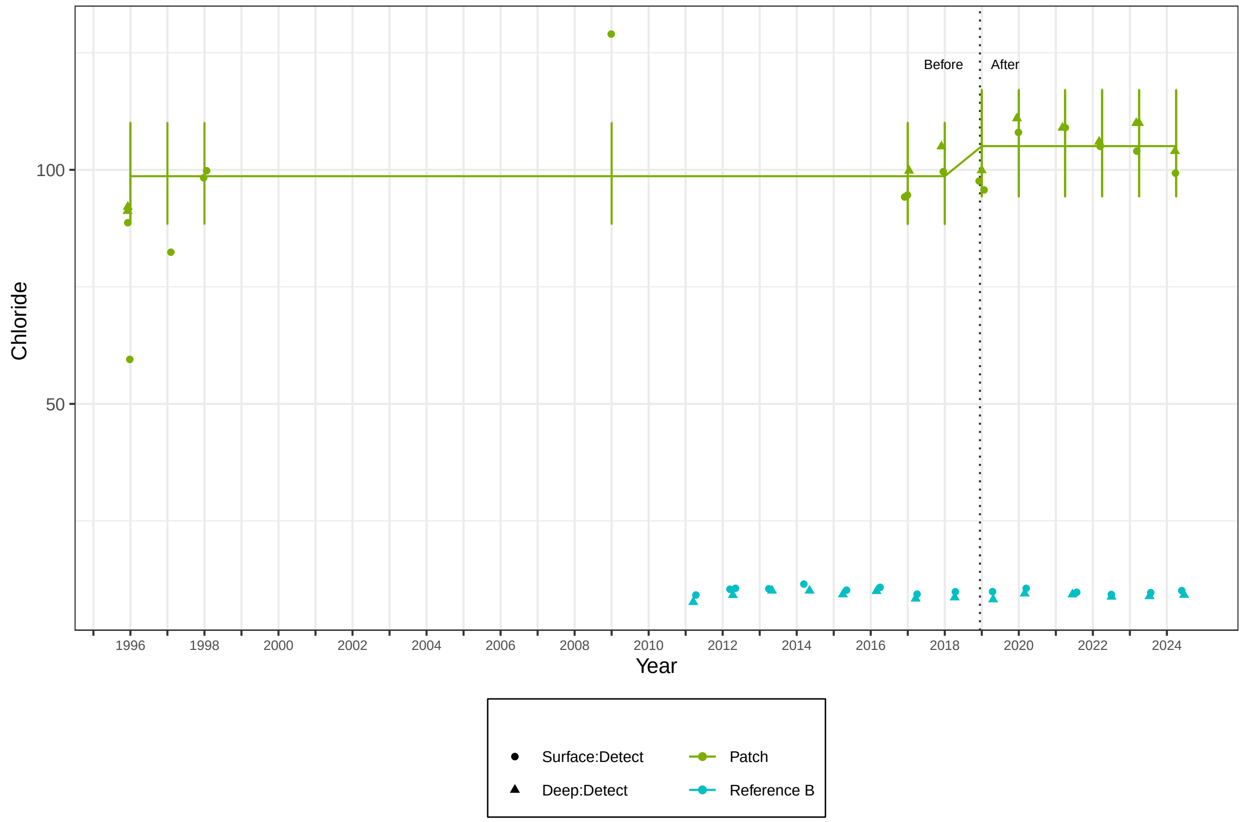
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0.0631	0.0697	9.402	0.9058	0.3876	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Patch Open-Water Before-After Analysis

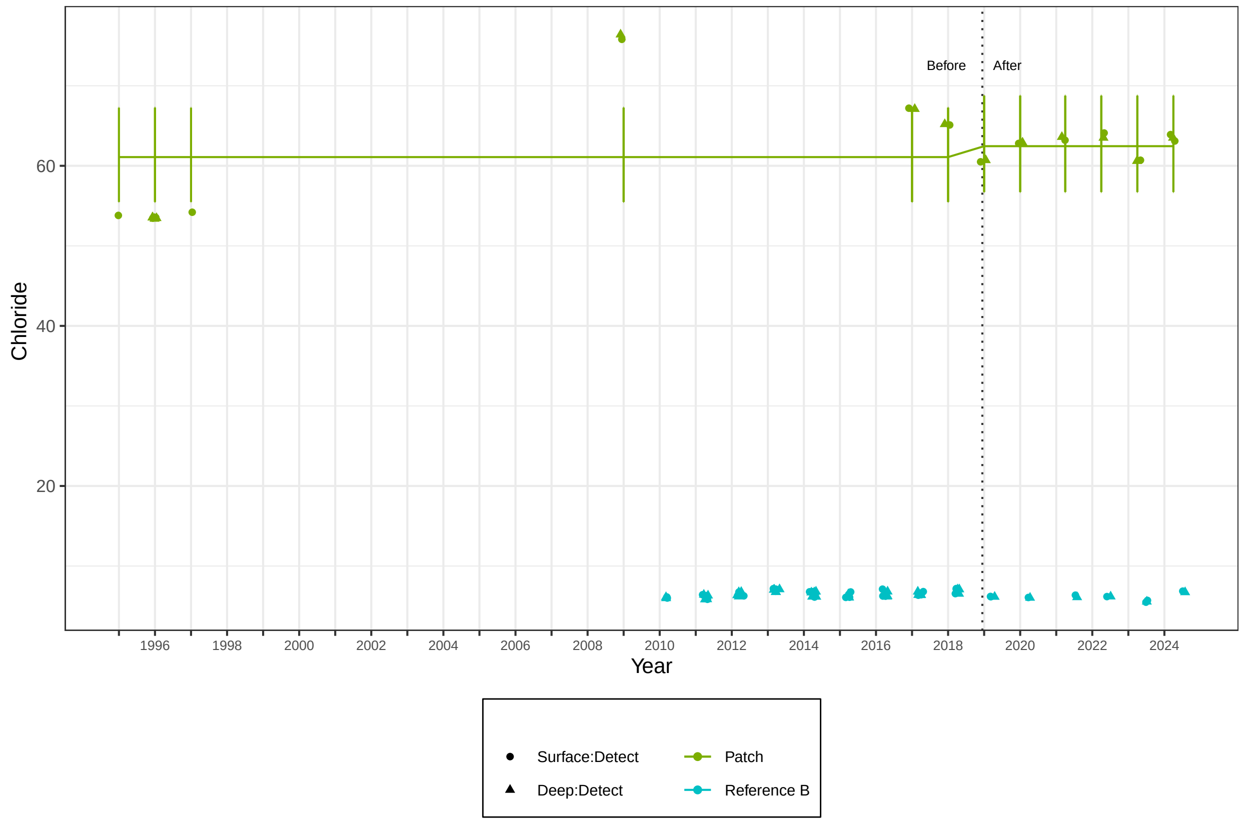
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0.0221	0.0611	9.999	0.361	0.7256	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Windy Lake

Before-after analyses were first performed to compare the change in the before and after period in the exposure lake. If a change was detected then before-after-control-impact linear modeling would be applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Windy Under-Ice Before-After Analysis

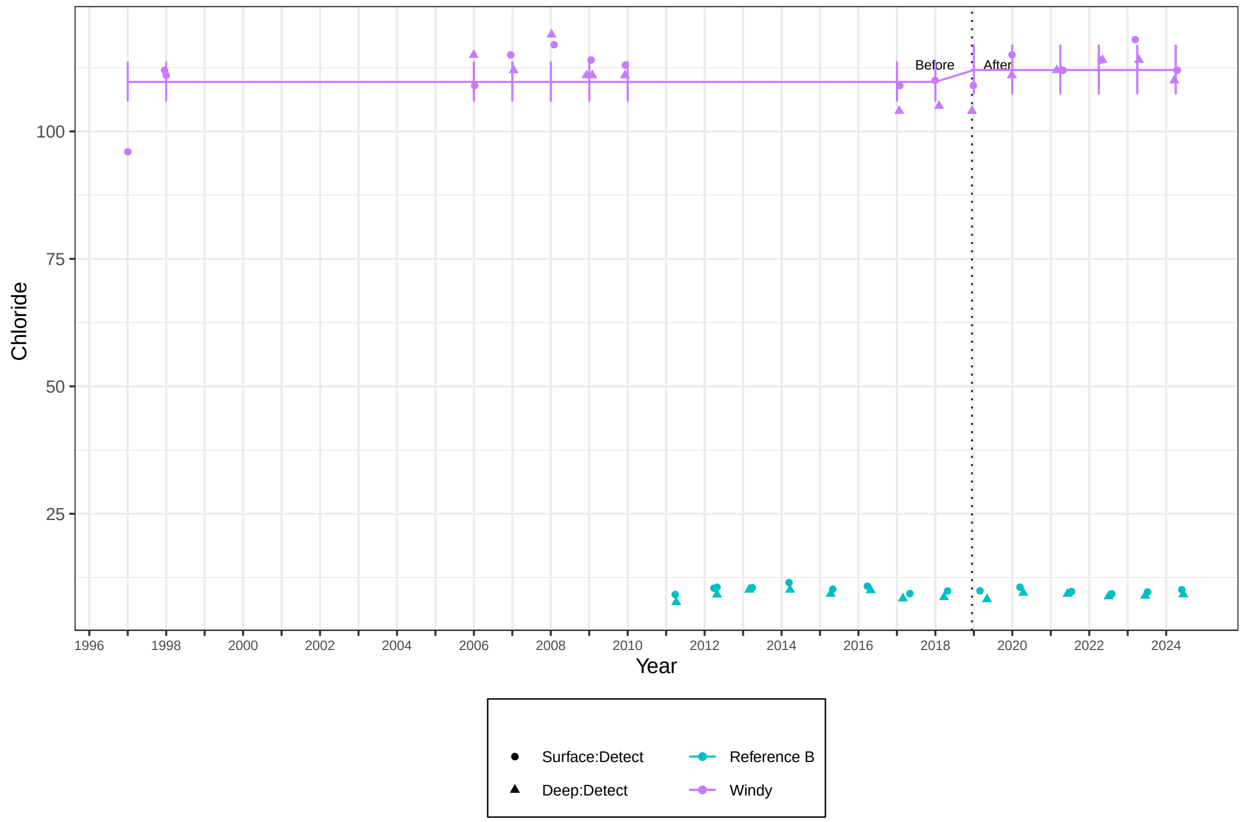
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0.0209	0.0257	11.75	0.8135	0.4321	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Windy Open-water Before-After Analysis

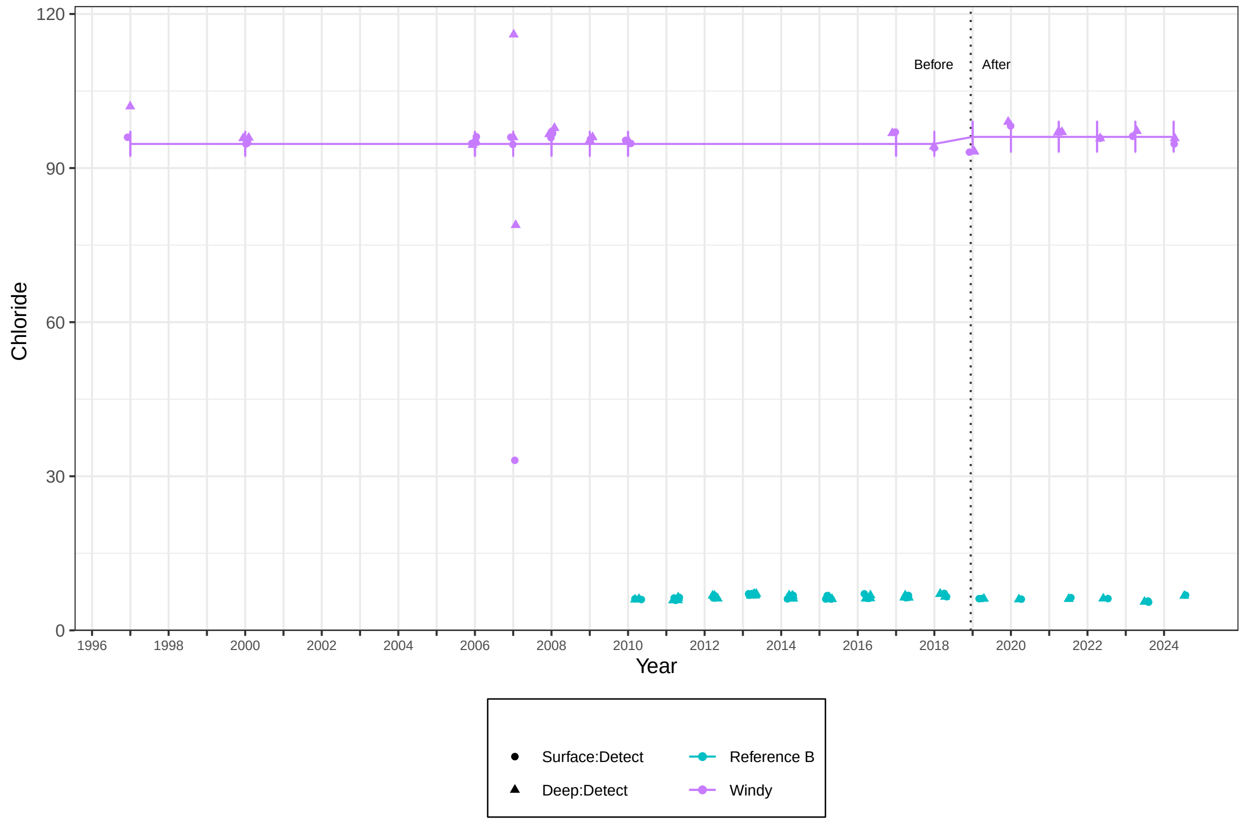
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0.0144	0.0189	13	0.7623	0.4595	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

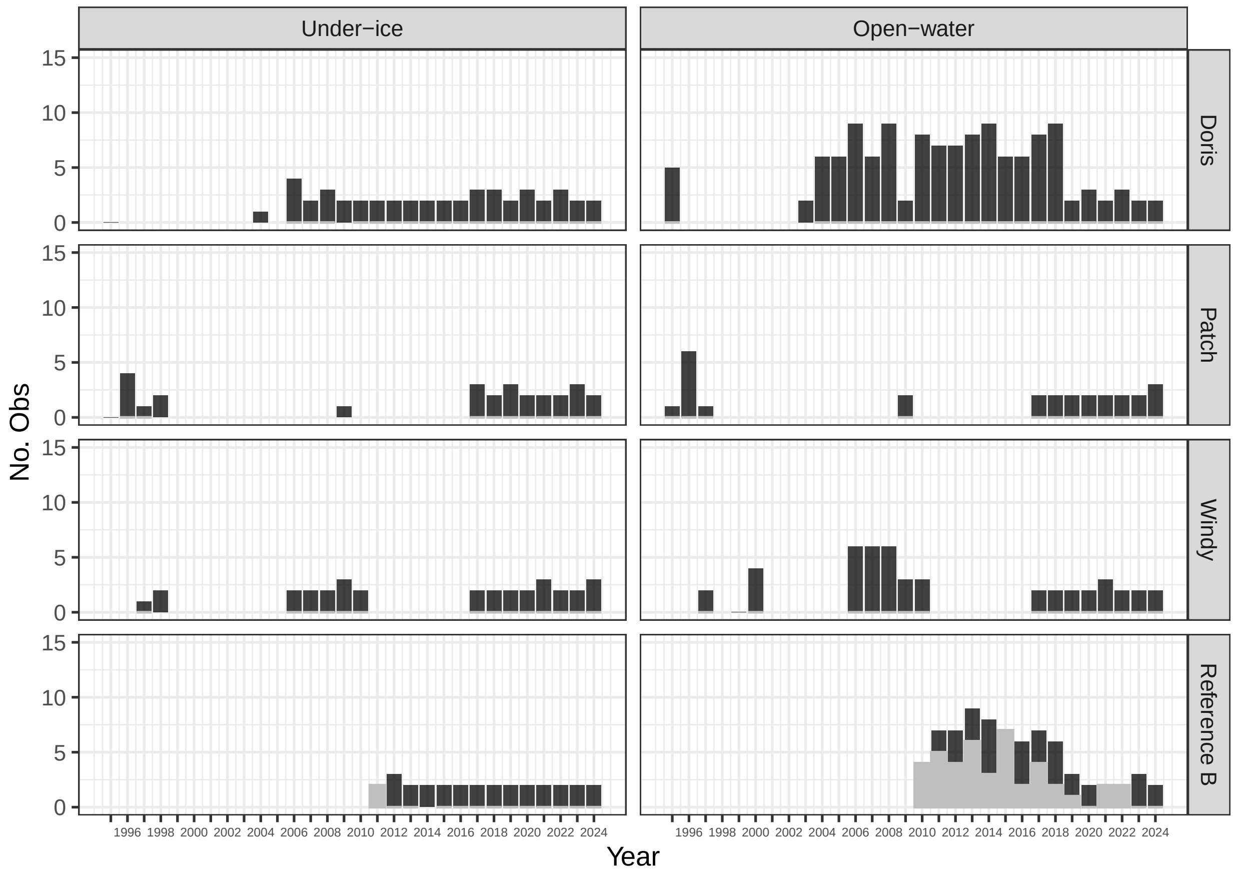
The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.


Chloride
Year
Before
After
0
30
60
90
120
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
Surface:Detect
Deep:Detect
Reference B
Windy

C.3.1.5 Fluoride

Censored Values and Sample Sizes

The following plots indicate the number of observations for each year from each lake that were less than the detection limit (light gray) or greater than the detection limit (dark gray). Observations below the analytical detection limit were considered censored.



Analysis was not performed if greater than 50% of observations from a site-season grouping were censored or if 100% of observations from the current assessment year (i.e., 2024) were censored.

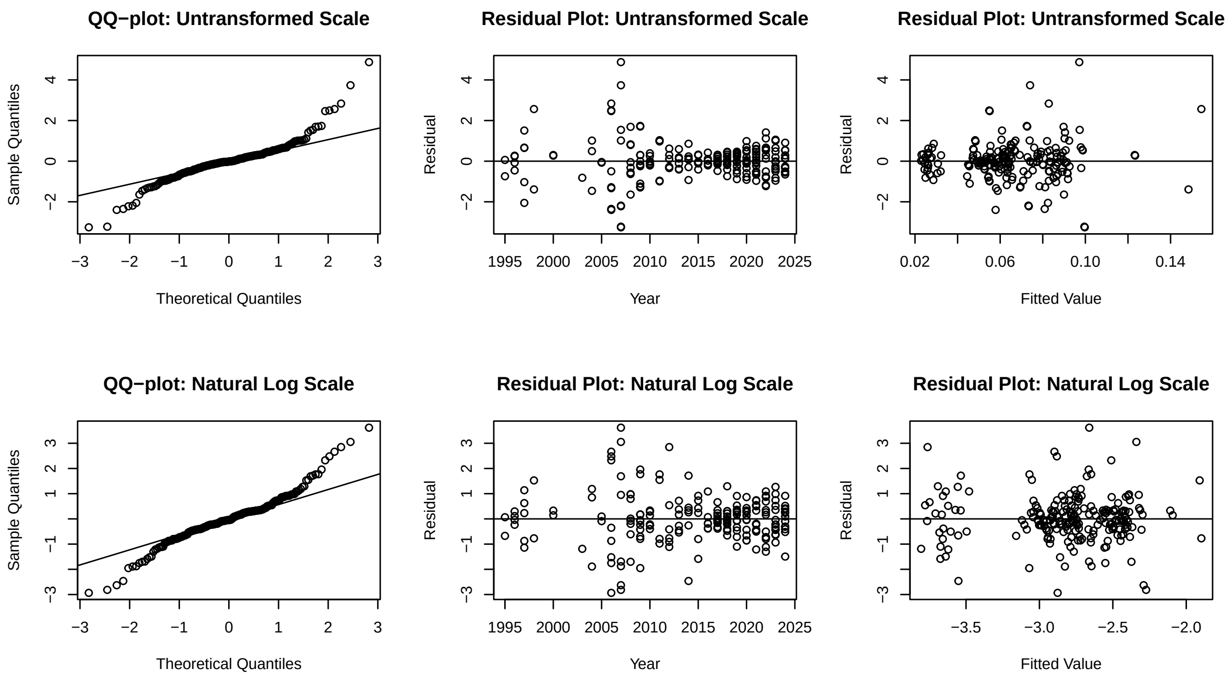
The sample sizes per lake and season are summarized in the table below.

Lake	Season	# Obs (total)	# < DL (total)	% < DL (total)	% < DL (2024)
Doris	Under-ice	46	0	0	0
Doris	Open-water	127	0	0	0
Patch	Under-ice	27	0	0	0
Patch	Open-water	27	0	0	0
Reference B	Under-ice	29	2	7	0
Reference B	Open-water	75	42	56	0
Windy	Under-ice	32	0	0	0
Windy	Open-water	47	0	0	0

More than 50% of data was under detection limit in Reference B Open-water. Data from those site-season groupings will be removed from the analysis.

Initial Model Fit

A model was fit both on the untransformed and natural log scale to assess the need for transformations. Outliers were identified from the fitted model as standardized residuals greater than 3, and flagged to caution interpretation of results but not removed from the analysis.



Outliers on untransformed scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Doris	2007	Open-water	Surface	0.09667	0.074	3.738
Windy	2007	Under-ice	Deep	0.08000	0.100	-3.225
Windy	2007	Under-ice	Surface	0.08000	0.100	-3.257
Windy	2007	Open-water	Deep	0.12667	0.097	4.876

Outliers on natural log scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Doris	2007	Open-water	Surface	0.09667	-2.661	3.618
Windy	2007	Open-water	Deep	0.12667	-2.340	3.053

The natural log-transformed data better meets the residual assumptions. Analysis proceeds with natural log-transformed data. However, there was an outlier retained in the analysis. Results should be interpreted with caution and along with graphical results.

Doris Lake

The trend for Doris Lake was compared to a slope of zero. If there was a significant trend, then the trend for Doris Lake was compared to the trend in Reference Lake B. This contrast does not test for differences in intercepts between lakes.

Doris Under-Ice

Analysis	Chi.sq	df	p	Significance
Compare to slope zero	6.443	4	0.16840	not sig.

Doris Lake did not exhibit significant deviation from a slope of zero and thus comparison to the trend in Reference Lake B was not completed.

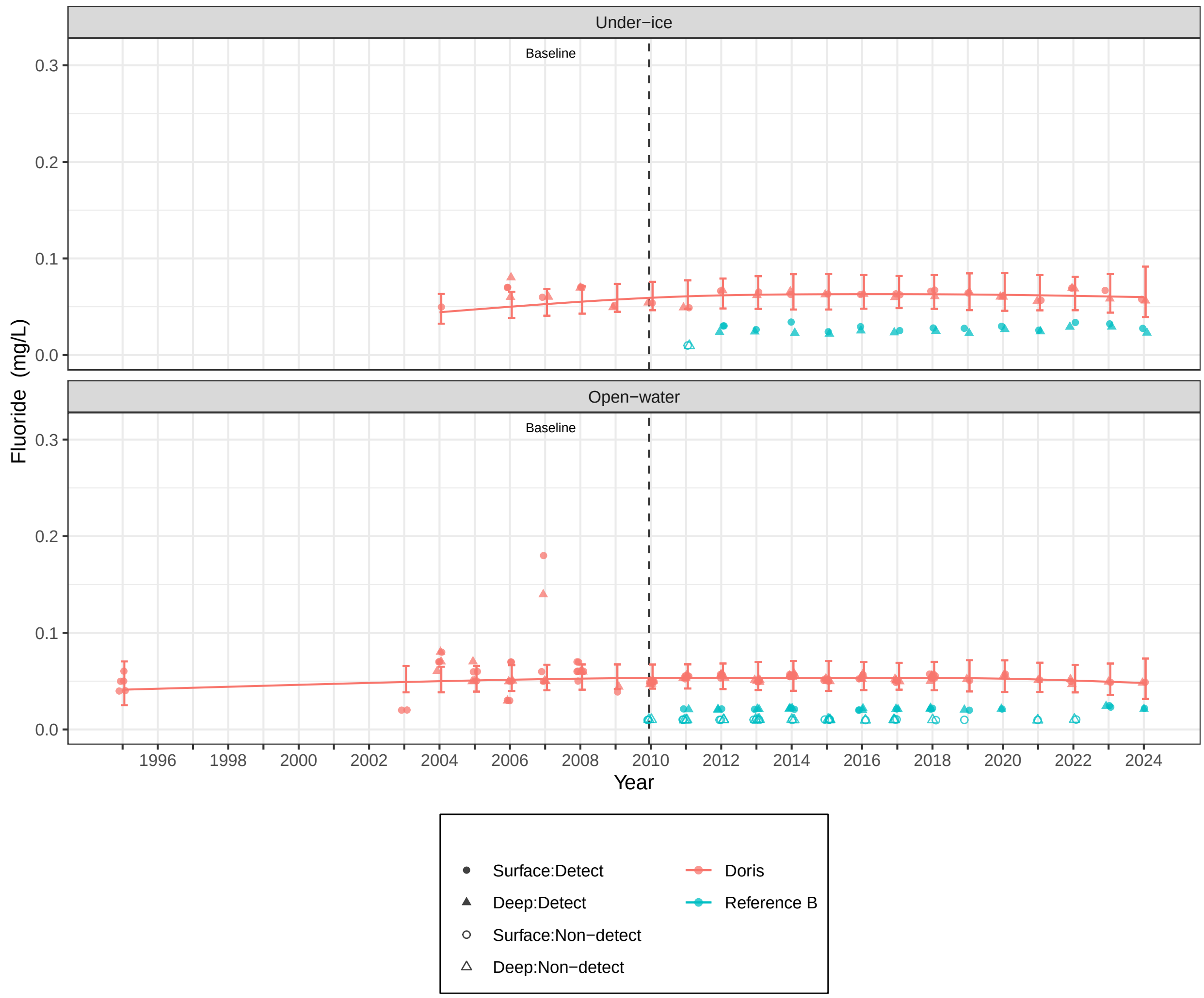
Doris Open-Water

Analysis	Chi.sq	df	p	Significance
Compare to slope zero	1.54	4	0.81950	not sig.

Doris Lake did not exhibit significant deviation from a slope of zero and thus comparison to the trend in Reference Lake B was not completed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols are values presented at half the detection limit. Solid lines represent the fitted curves. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations.



Patch Lake

Before-after analyses were first performed to compare the change in the before and after period for the exposure site. If a change was detected, then before-after-control-impact linear modelling was applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Patch Under-Ice Before-After Analysis

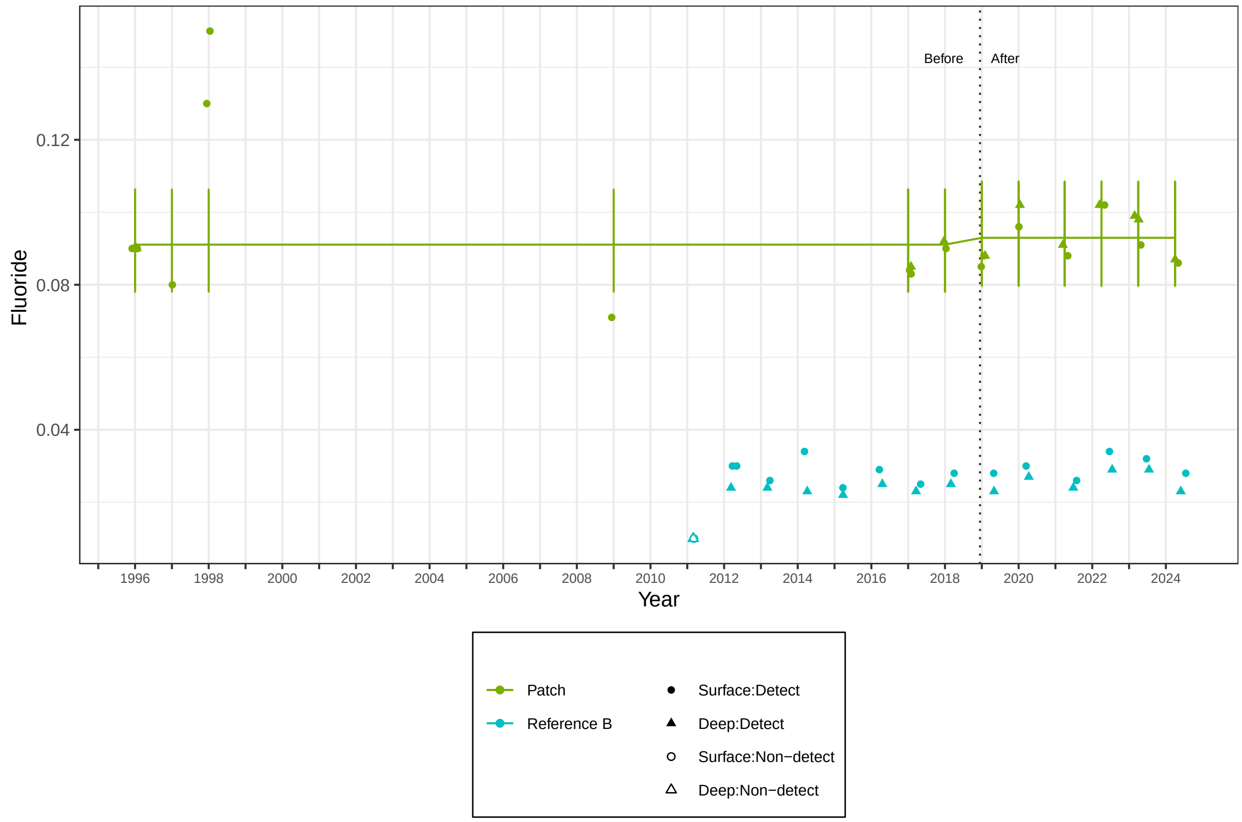
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0.0205	0.0988	9.929	0.207	0.8402	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Patch Open-Water Before-After Analysis

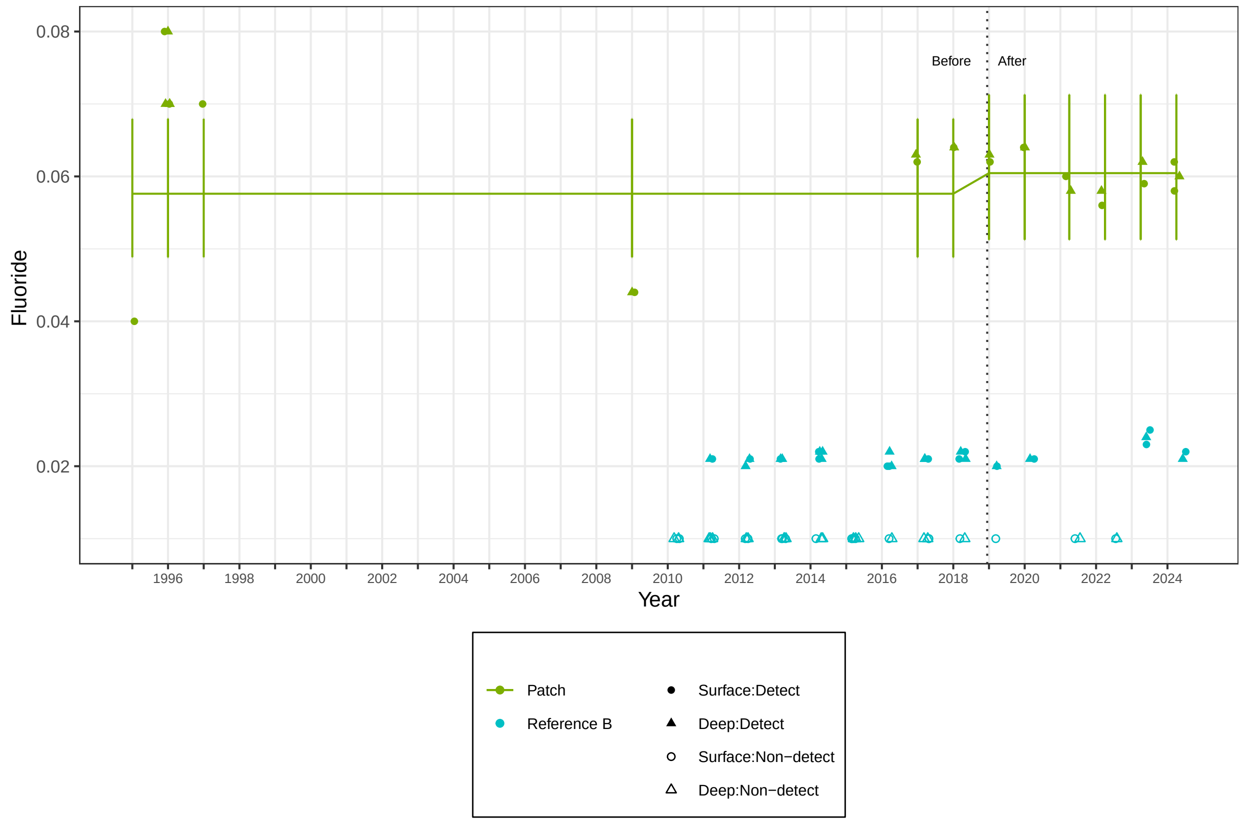
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0.0482	0.1047	9.966	0.46	0.6554	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Windy Lake

Before-after analyses were first performed to compare the change in the before and after period in the exposure lake. If a change was detected then before-after-control-impact linear modeling would be applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Windy Under-Ice Before-After Analysis

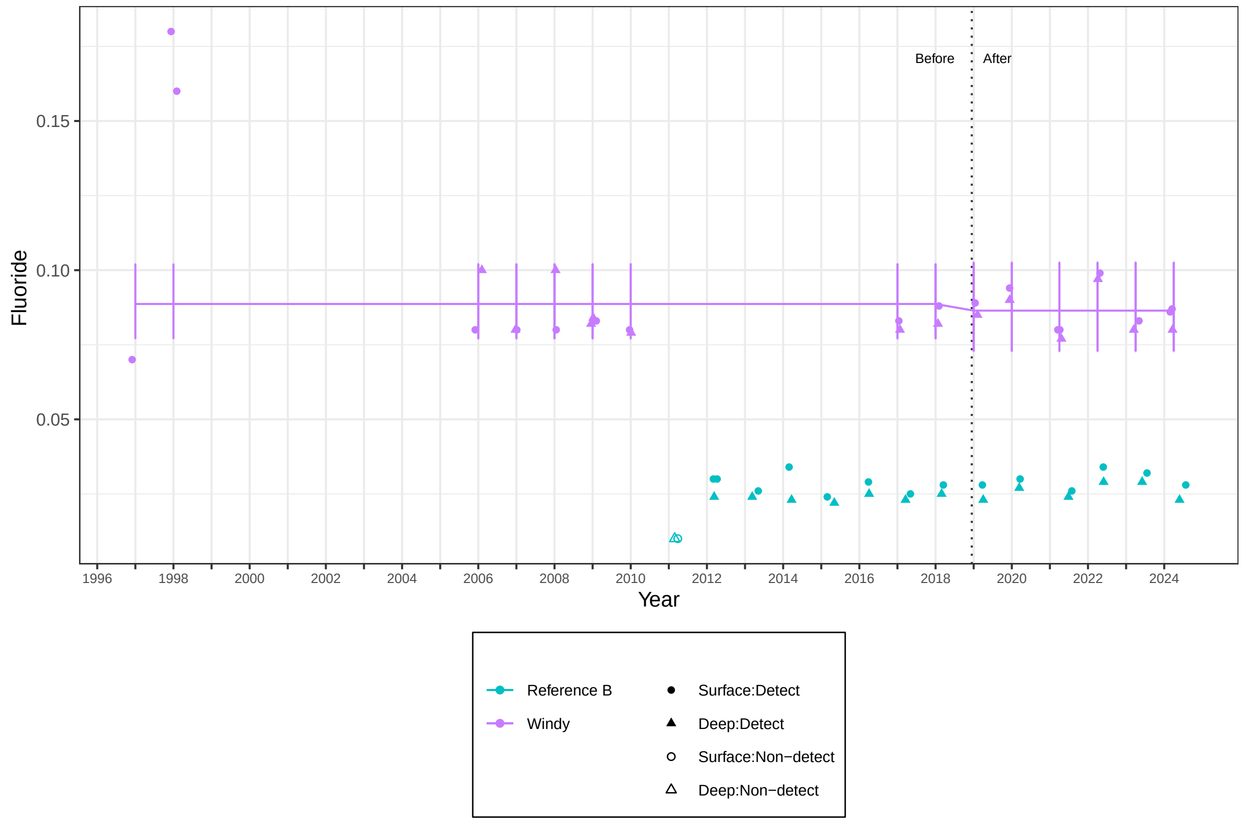
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	-0.0255	0.1031	11.52	-0.2474	0.8089	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Windy Open-water Before-After Analysis

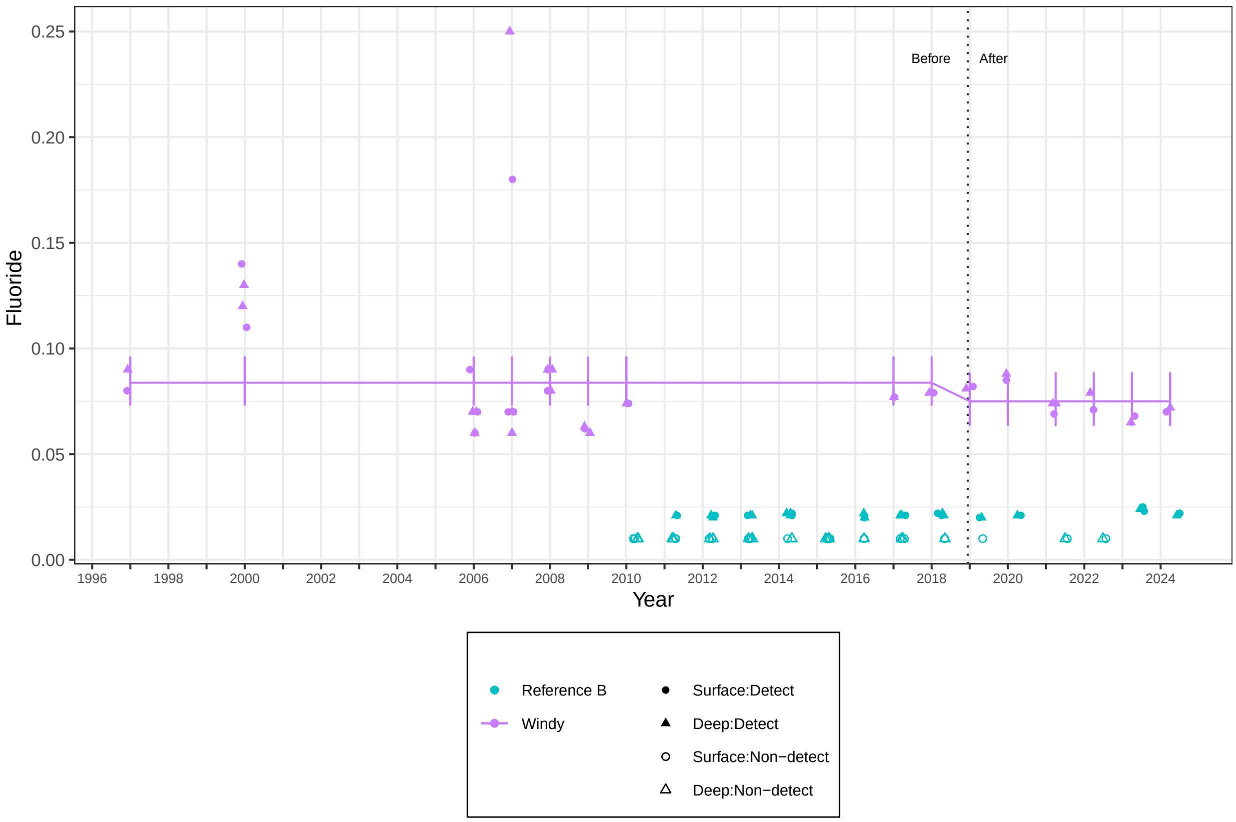
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	-0.1108	0.0998	13	-1.11	0.2872	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

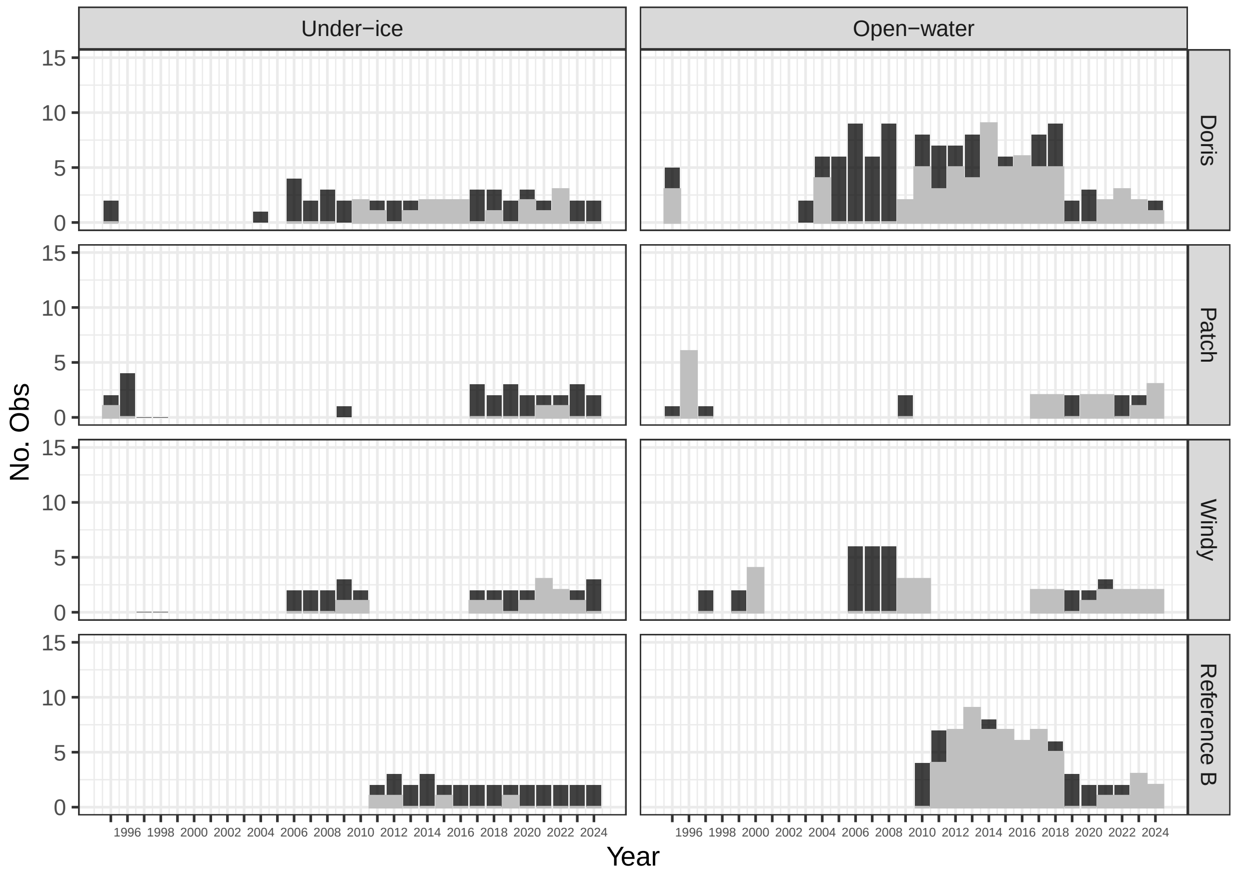
The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.


Fluoride
Year
Before
After
Reference B
Windy
Surface:Detect
Deep:Detect
Surface:Non−detect
Deep:Non−detect

C.3.1.6 Total Ammonia

Censored Values and Sample Sizes

The following plots indicate the number of observations for each year from each lake that were less than the detection limit (light gray) or greater than the detection limit (dark gray). Observations below the analytical detection limit were considered censored.



Analysis was not performed if greater than 50% of observations from a site-season grouping were censored or if 100% of observations from the current assessment year (i.e., 2024) were censored.

The sample sizes per lake and season are summarized in the table below.

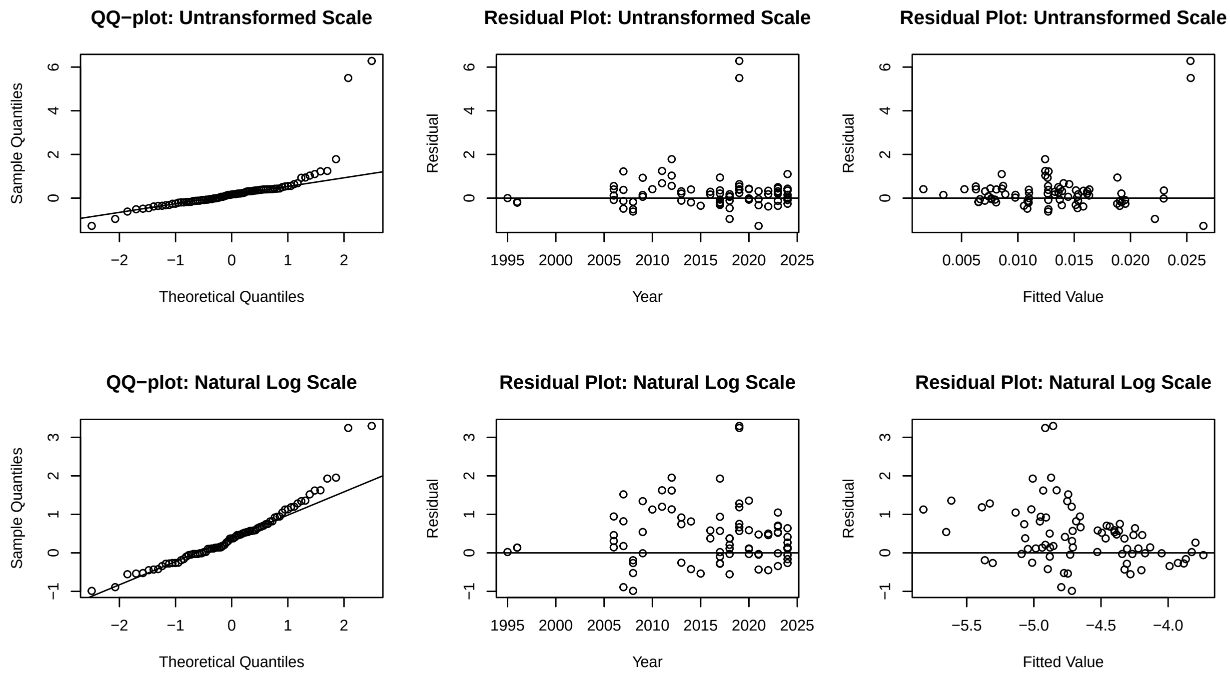
Lake	Season	# Obs (total)	# < DL (total)	% < DL (total)	% < DL (2024)
Doris	Under-ice	48	19	40	0
Doris	Open-water	127	65	51	50
Patch	Under-ice	26	3	12	0
Patch	Open-water	27	18	67	100
Reference B	Under-ice	30	4	13	0
Reference B	Open-water	75	59	79	100
Windy	Under-ice	29	11	38	0
Windy	Open-water	49	23	47	100

More than 50% of data was under detection limit in Doris North Open-water, Patch Open-water, Reference B Open-water, and Windy Open-water. Data from those site-season groupings will be removed from the analysis. Doris North Under-ice, Patch Under-ice, Reference B Under-ice, Windy Under-ice, and Windy

Open-water exhibited more than 10% of data under detection limit. The analysis proceeds with tobit regression for Doris Lake.

Initial Model Fit

A model was fit both on the untransformed and natural log scale to assess the need for transformations. Outliers were identified from the fitted model as standardized residuals greater than 3, and flagged to caution interpretation of results but not removed from the analysis.



Outliers on untransformed scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Doris	2019	Under-ice	Deep	0.114	0.025	6.28
Doris	2019	Under-ice	Surface	0.103	0.025	5.50

Outliers on natural log scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Doris	2019	Under-ice	Deep	0.114	-4.856	3.296
Doris	2019	Under-ice	Surface	0.103	-4.915	3.243

The natural log transformed model better meets the residual assumptions. Analysis proceeds with natural log transformed data.

Doris Lake

The trend for Doris Lake was compared to a slope of zero. If there was a significant trend, then the trend for Doris Lake was compared to the trend in Reference Lake B. This contrast does not test for differences in intercepts between lakes.

Doris Under-Ice

Analysis	Chi.sq	df	p	Significance
Compare to slope zero	1.363	3	0.71410	not sig.

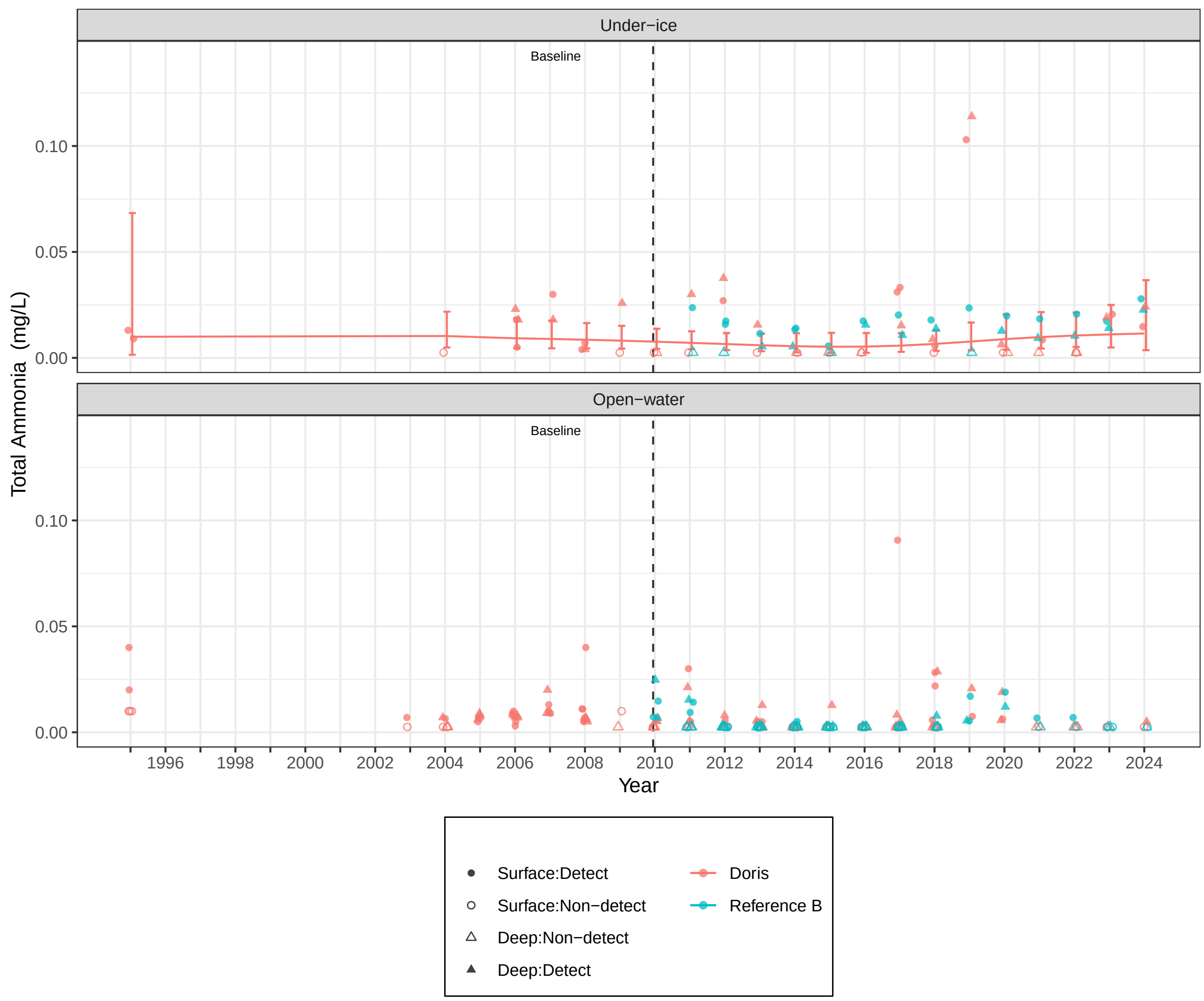
Doris Lake did not exhibit significant deviation from a slope of zero and thus comparison to the trend in Reference Lake B was not completed.

Doris Open-Water

All data from Doris Lake open-water removed from the analysis. No analysis performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols are values presented at half the detection limit. Solid lines represent the fitted curves. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations.



Patch Lake

Before-after analyses were first performed to compare the change in the before and after period for the exposure site. If a change was detected, then before-after-control-impact linear modelling was applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Patch Under-Ice Before-After Analysis

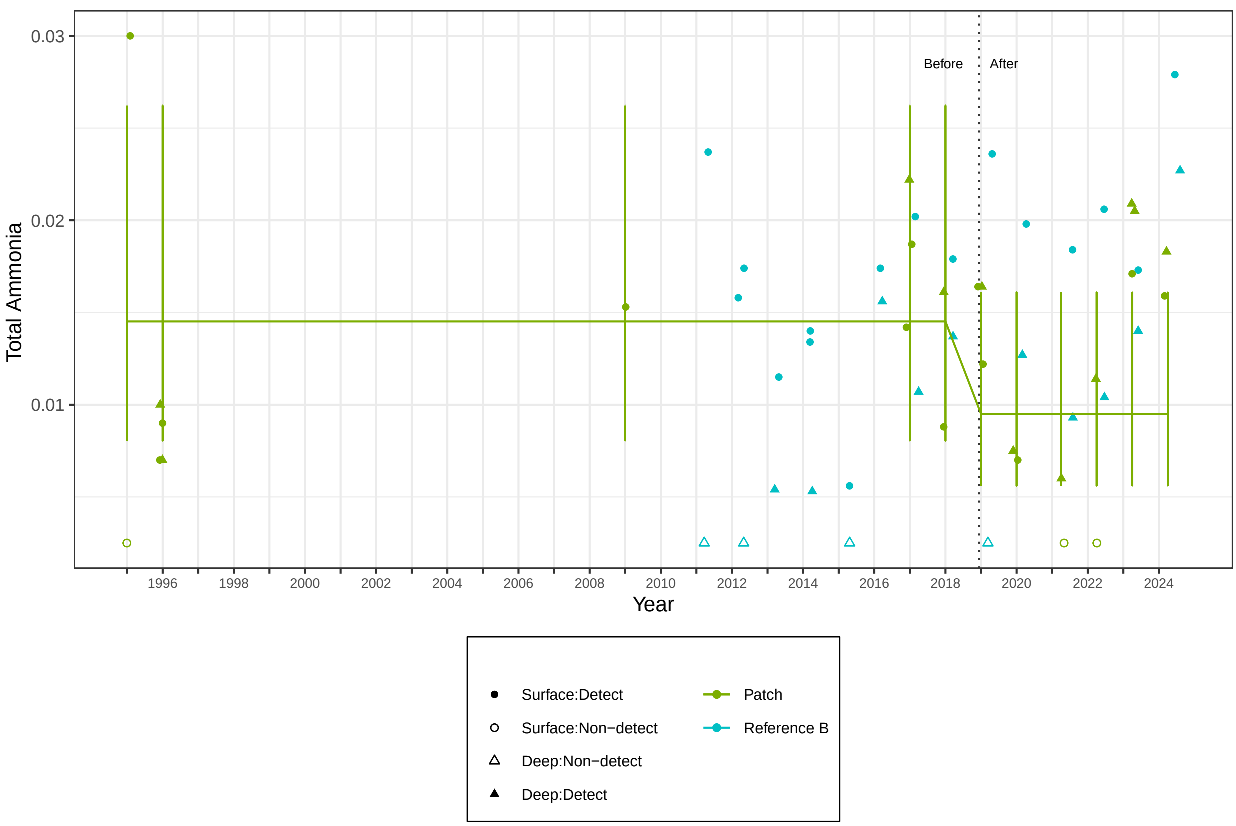
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	-0.4237	0.3505	9.469	-1.209	0.256	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Patch Open-Water Before-After Analysis Analysis was not performed.

Windy Lake

Before-after analyses were first performed to compare the change in the before and after period in the exposure lake. If a change was detected then before-after-control-impact linear modeling would be applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Windy Under-Ice Before-After Analysis

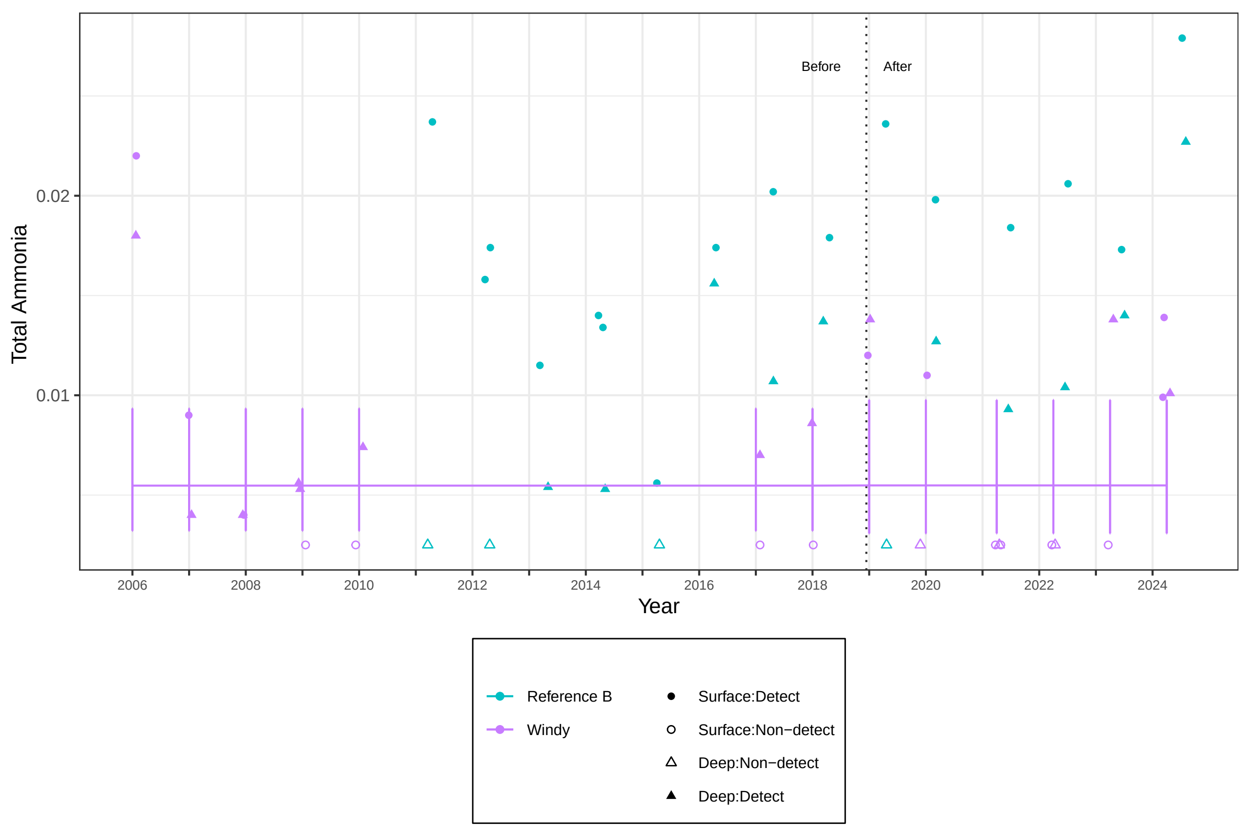
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0.0018	0.3572	11	0.0049	0.9962	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



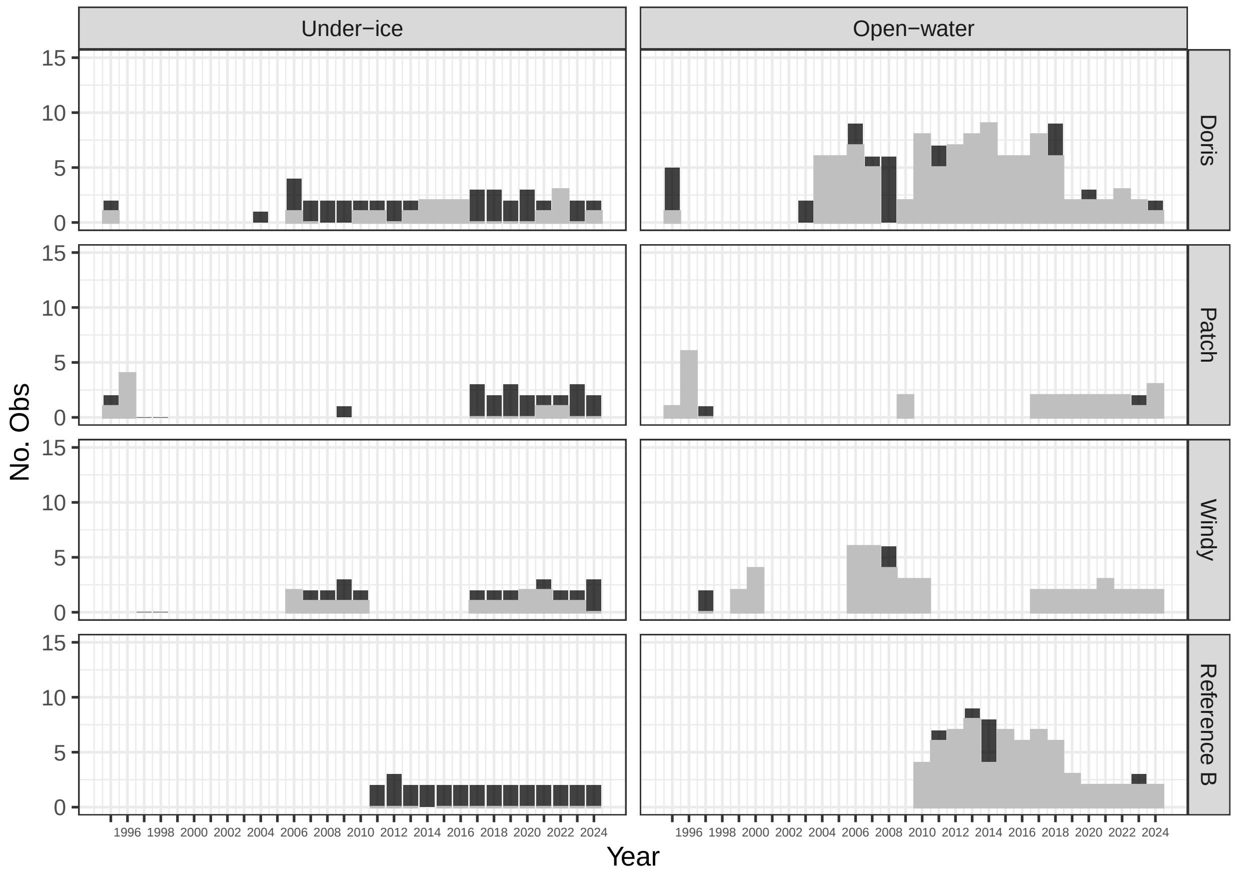
Windy Open-water Before-After Analysis

Analysis was not performed.

C.3.1.7 Nitrate

Censored Values and Sample Sizes

The following plots indicate the number of observations for each year from each lake that were less than the detection limit (light gray) or greater than the detection limit (dark gray). Observations below the analytical detection limit were considered censored.



Analysis was not performed if greater than 50% of observations from a site-season grouping were censored or if 100% of observations from the current assessment year (i.e., 2024) were censored.

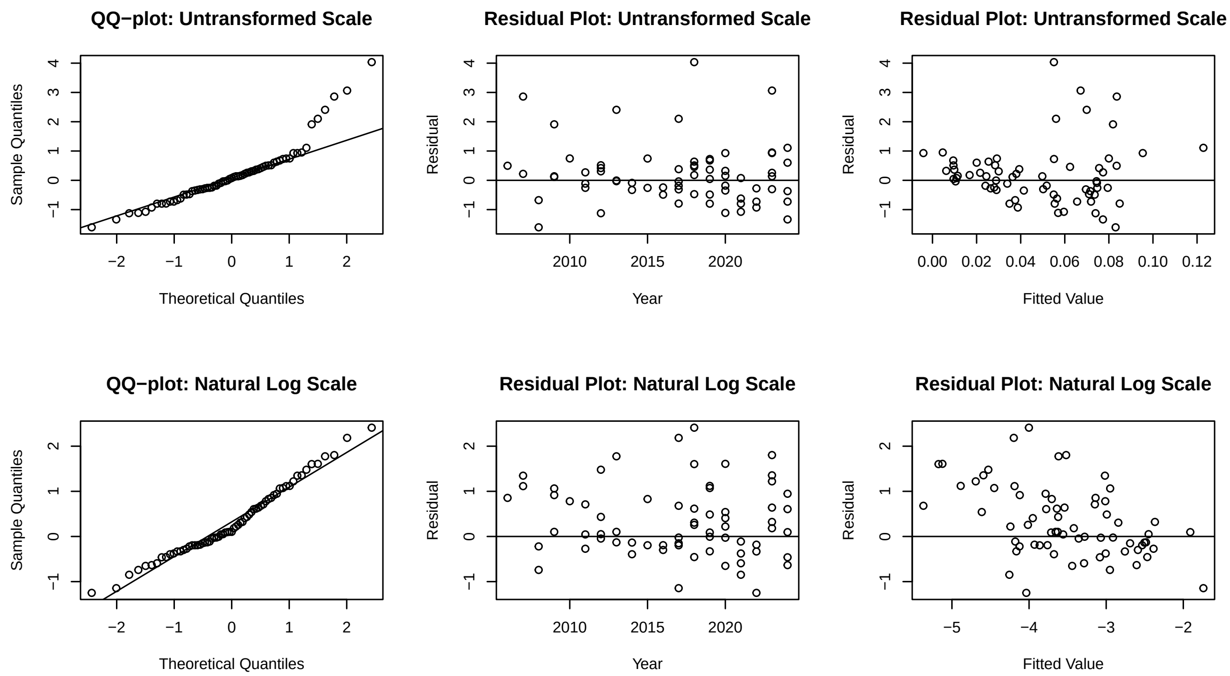
The sample sizes per lake and season are summarized in the table below.

Lake	Season	# Obs (total)	# < DL (total)	% < DL (total)	% < DL (2024)
Doris	Under-ice	47	17	36	50
Doris	Open-water	124	106	85	50
Patch	Under-ice	26	7	27	0
Patch	Open-water	27	25	93	100
Reference B	Under-ice	29	0	0	0
Reference B	Open-water	75	68	91	100
Windy	Under-ice	29	15	52	0
Windy	Open-water	49	45	92	100

More than 50% of data was under detection limit in Doris North Open-water, Patch Open-water, Reference B Open-water, Windy Under-ice, and Windy Open-water. Data from those site-season groupings will be removed from the analysis. Doris North Under-ice and Patch Under-ice exhibited more than 10% of data under detection limit. The analysis proceeds with tobit regression for Doris Lake.

Initial Model Fit

A model was fit both on the untransformed and natural log scale to assess the need for transformations. Outliers were identified from the fitted model as standardized residuals greater than 3, and flagged to caution interpretation of results but not removed from the analysis.



Outliers on untransformed scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Doris	2018	Under-ice	Deep	0.201	0.055	4.035
Doris	2023	Under-ice	Deep	0.178	0.067	3.064

Outliers on natural log scale:

None

The natural log-transformed data better meets the residual assumptions. Analysis proceeds with natural log-transformed data.

Doris Lake

The trend for Doris Lake was compared to a slope of zero. If there was a significant trend, then the trend for Doris Lake was compared to the trend in Reference Lake B. This contrast does not test for differences in intercepts between lakes.

Doris Under-Ice

Analysis	Chi.sq	df	p	Significance
Compare to slope zero	2.502	3	0.47500	not sig.

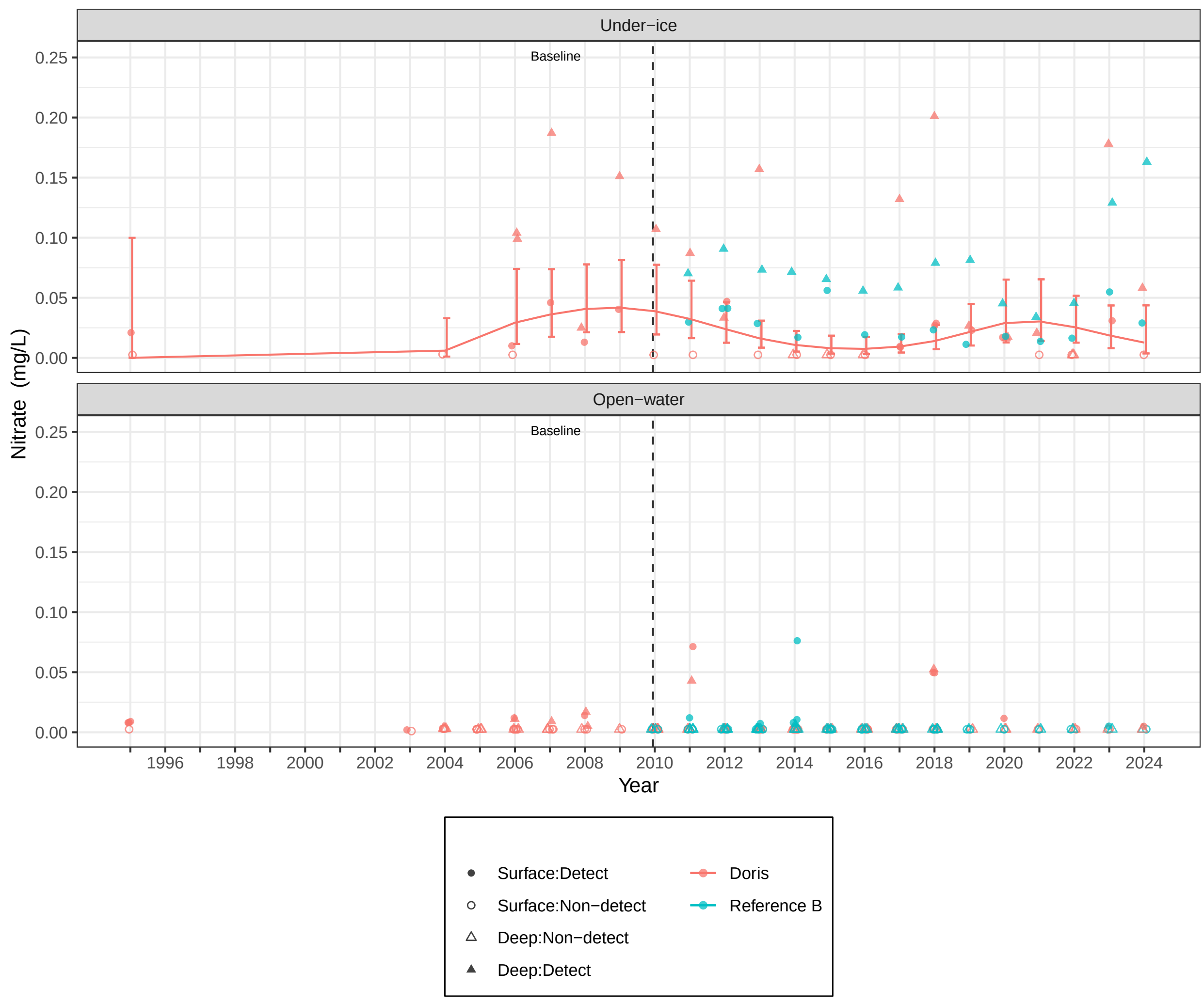
Doris Lake did not exhibit significant deviation from a slope of zero and thus comparison to the trend in Reference Lake B was not completed.

Doris Open-Water

All data from Doris Lake open-water removed from the analysis. No analysis performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols are values presented at half the detection limit. Solid lines represent the fitted curves. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations.



Patch Lake

Before-after analyses were first performed to compare the change in the before and after period for the exposure site. If a change was detected, then before-after-control-impact linear modelling was applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Patch Under-Ice Before-After Analysis

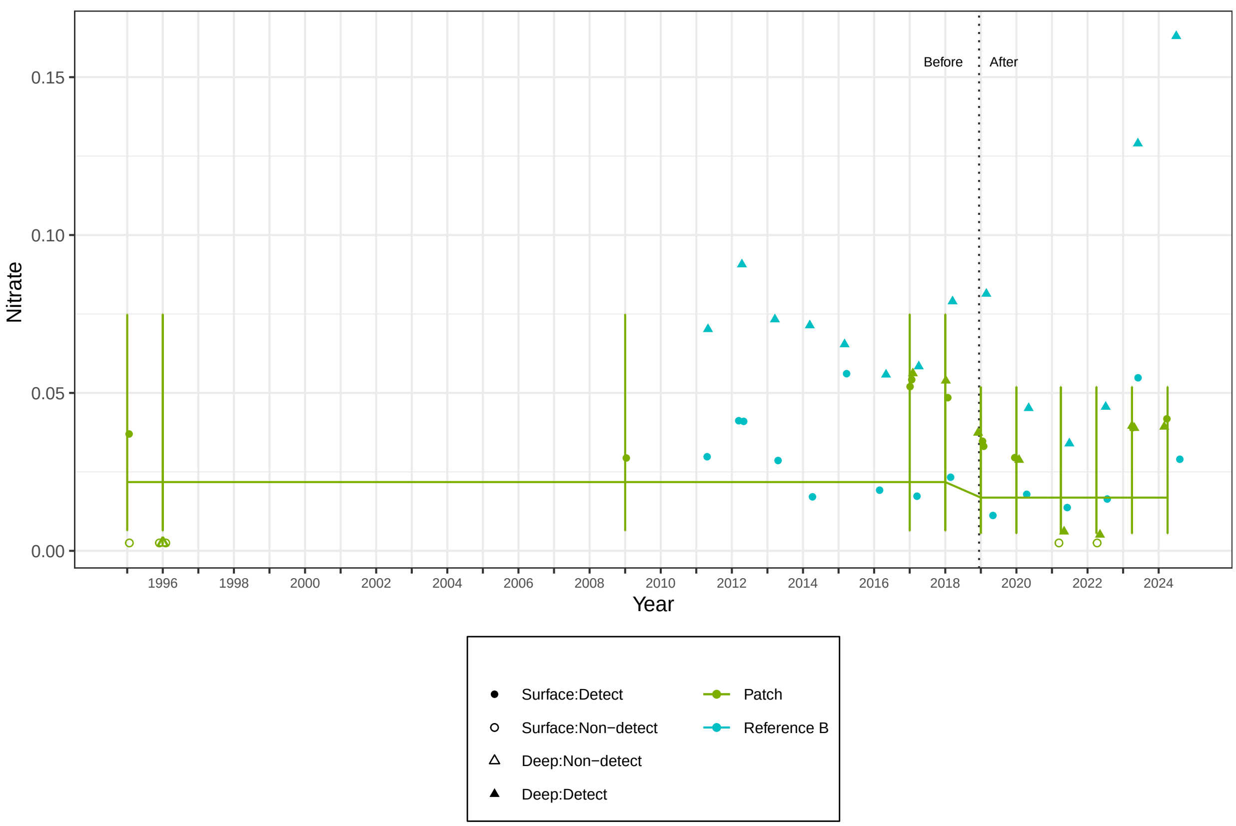
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	-0.256	0.7394	9.09	-0.3462	0.7371	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Patch Open-Water Before-After Analysis Analysis was not performed.

Windy Lake

Before-after analyses were first performed to compare the change in the before and after period in the exposure lake. If a change was detected then before-after-control-impact linear modeling would be applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

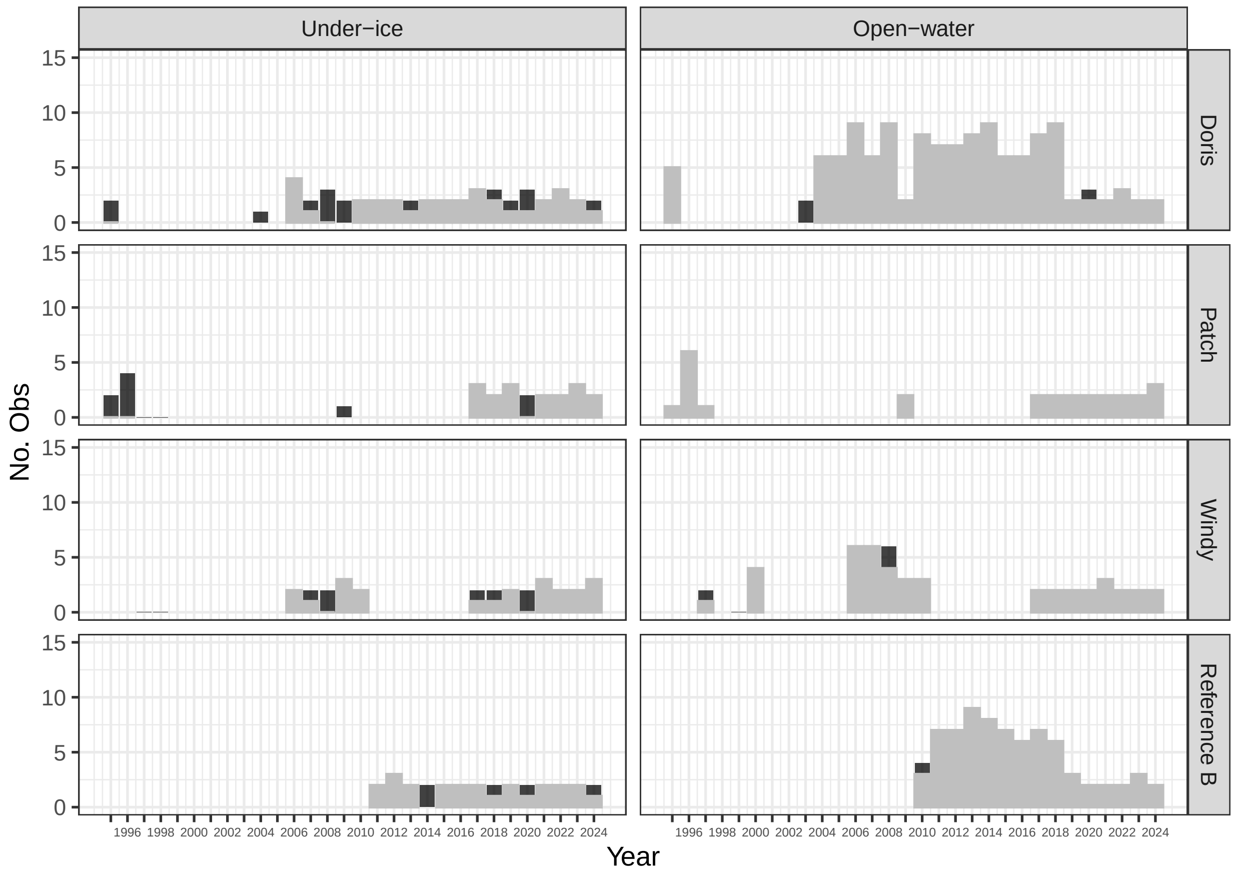
Windy Under-Ice Before-After Analysis Analysis was not performed.

Windy Open-water Before-After Analysis Analysis was not performed.

C.3.1.8 Nitrite

Censored Values and Sample Sizes

The following plots indicate the number of observations for each year from each lake that were less than the detection limit (light gray) or greater than the detection limit (dark gray). Observations below the analytical detection limit were considered censored.



Analysis was not performed if greater than 50% of observations from a site-season grouping were censored or if 100% of observations from the current assessment year (i.e., 2024) were censored.

The sample sizes per lake and season are summarized in the table below.

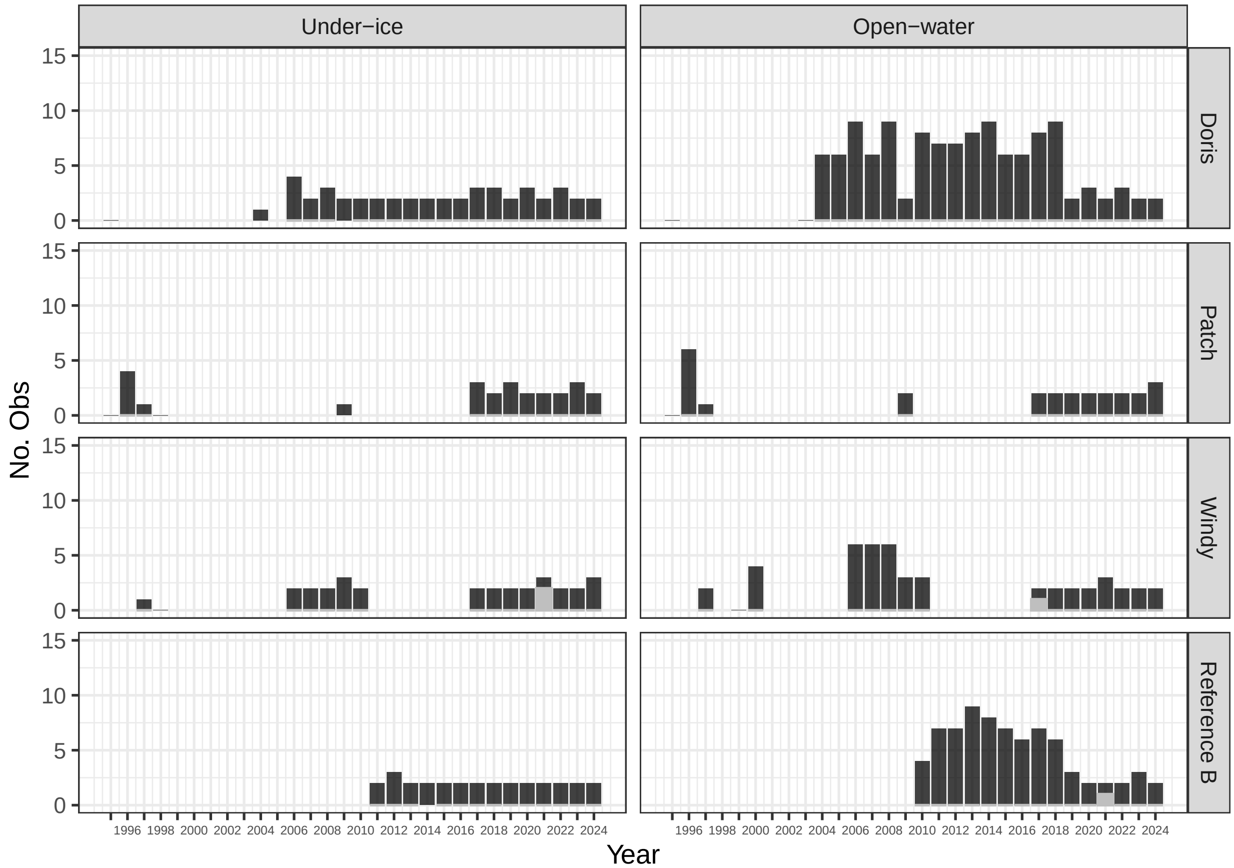
Lake	Season	# Obs (total)	# < DL (total)	% < DL (total)	% < DL (2024)
Doris	Under-ice	48	35	73	50
Doris	Open-water	127	126	99	100
Patch	Under-ice	26	18	69	100
Patch	Open-water	27	27	100	100
Reference B	Under-ice	29	26	90	50
Reference B	Open-water	75	74	99	100
Windy	Under-ice	29	22	76	100
Windy	Open-water	47	44	94	100

All data from Doris North, Patch and Windy were censored. All data removed from the analysis and no statistical analyses were performed.

C.3.1.9 Total Phosphorus

Censored Values and Sample Sizes

The following plots indicate the number of observations for each year from each lake that were less than the detection limit (light gray) or greater than the detection limit (dark gray). Observations below the analytical detection limit were considered censored.



Analysis was not performed if greater than 50% of observations from a site-season grouping were censored or if 100% of observations from the current assessment year (i.e., 2024) were censored.

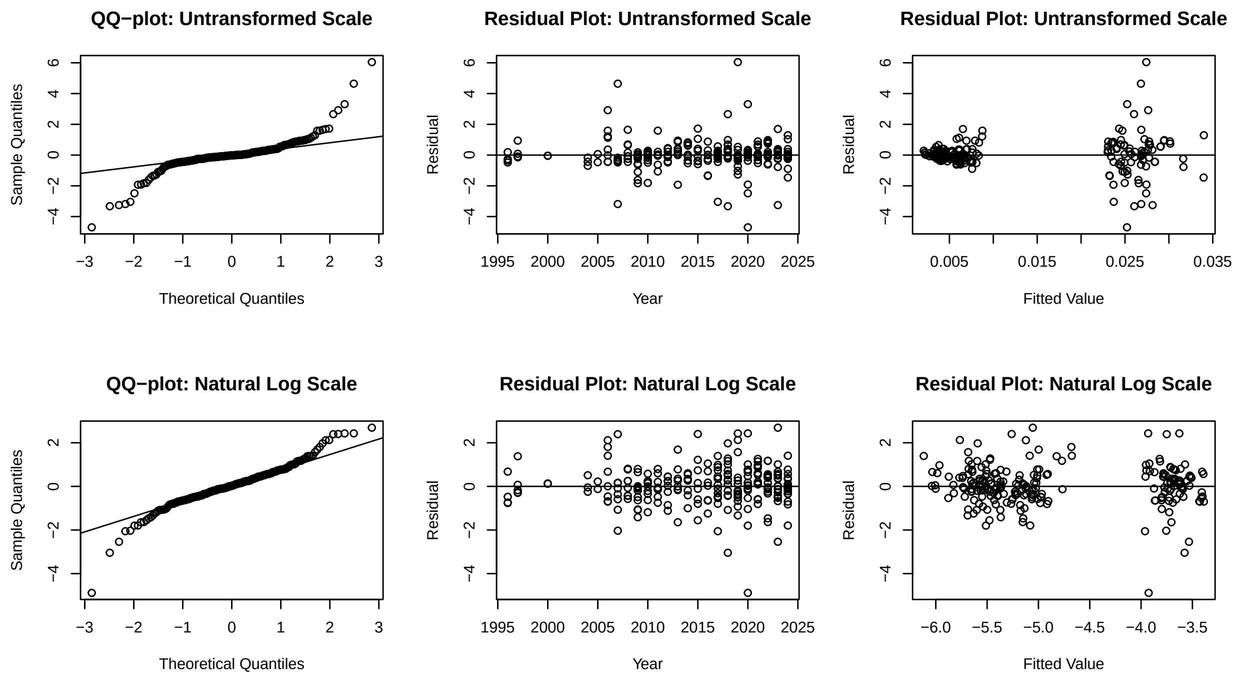
The sample sizes per lake and season are summarized in the table below.

Lake	Season	# Obs (total)	# < DL (total)	% < DL (total)	% < DL (2024)
Doris	Under-ice	46	0	0	0
Doris	Open-water	120	0	0	0
Patch	Under-ice	25	0	0	0
Patch	Open-water	26	0	0	0
Reference B	Under-ice	29	0	0	0
Reference B	Open-water	75	1	1	0
Windy	Under-ice	30	2	7	0
Windy	Open-water	47	1	2	0

None of the sites exhibited greater than 50% of data less than the detection limit. The analysis proceeds with linear mixed model regression.

Initial Model Fit

A model was fit both on the untransformed and natural log scale to assess the need for transformations. Outliers were identified from the fitted model as standardized residuals greater than 3, and flagged to caution interpretation of results but not removed from the analysis.



Outliers on untransformed scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Doris	2007	Under-ice	Deep	0.01300	0.027	-3.185
Doris	2007	Under-ice	Surface	0.04700	0.027	4.642
Doris	2017	Under-ice	Deep	0.01050	0.024	-3.041
Doris	2018	Under-ice	Deep	0.01160	0.026	-3.326
Doris	2019	Under-ice	Deep	0.05370	0.027	6.043
Doris	2020	Open-water	Deep	0.03965	0.025	3.311
Doris	2020	Open-water	Surface	0.00480	0.025	-4.698
Doris	2023	Under-ice	Deep	0.01400	0.028	-3.253

Outliers on natural log scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Doris	2018	Under-ice	Deep	0.0116	-3.576	-3.044
Doris	2020	Open-water	Surface	0.0048	-3.926	-4.884

The natural log-transformed data better meets the residual assumptions. Analysis proceeds with natural log-transformed data. However, there was an outlier retained in the analysis. Results should be interpreted with caution and along with graphical results.

Doris Lake

The trend for Doris Lake was compared to a slope of zero. If there was a significant trend, then the trend for Doris Lake was compared to the trend in Reference Lake B. This contrast does not test for differences in intercepts between lakes.

Doris Under-Ice

Analysis	Chi.sq	df	p	Significance
Compare to slope zero	1.737	4	0.78390	not sig.

Doris Lake did not exhibit significant deviation from a slope of zero and thus comparison to the trend in Reference Lake B was not completed.

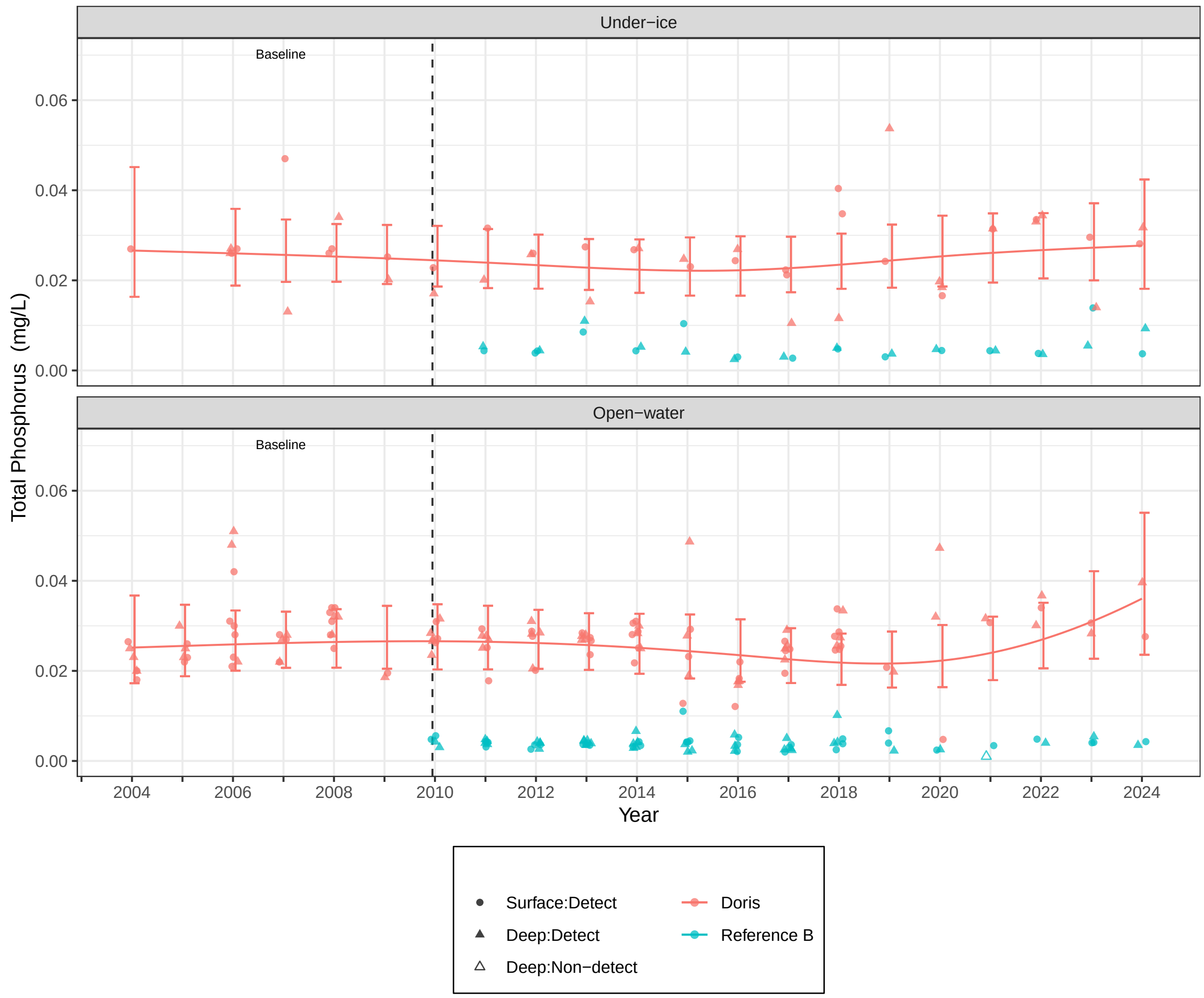
Doris Open-Water

Analysis	Chi.sq	df	p	Significance
Compare to slope zero	4.976	4	0.28970	not sig.

Doris Lake did not exhibit significant deviation from a slope of zero and thus comparison to the trend in Reference Lake B was not completed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols are values presented at half the detection limit. Solid lines represent the fitted curves. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations.



Patch Lake

Before-after analyses were first performed to compare the change in the before and after period for the exposure site. If a change was detected, then before-after-control-impact linear modelling was applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Patch Under-Ice Before-After Analysis

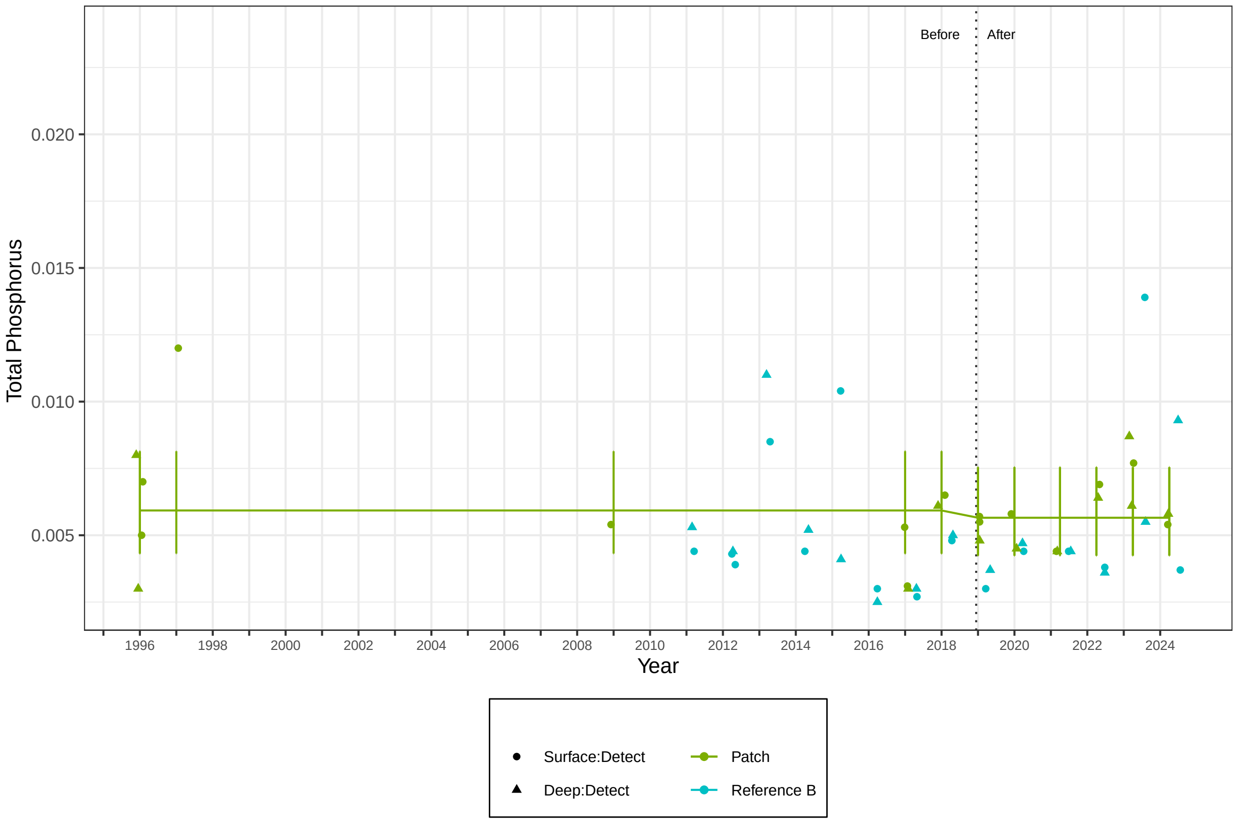
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	-0.0469	0.1899	8.814	-0.2471	0.8105	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Patch Open-Water Before-After Analysis

Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0.2866	0.1257	9.033	2.28	0.0484	sig.

Conclusion:

The change from before to after was significantly different.

BACI Analysis with Comparable Years

Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	p
class	1.6607	1.6607	1	21	14.8470	<0.001
period	0.0130	0.0130	1	6	0.1160	0.745
Depth.Zone	0.0107	0.0107	1	21	0.0954	0.76
class:period	0.2709	0.2709	1	21	2.4216	0.135

Estimated marginal means for site class by period:

Class	Period	LSmean	SE	DF	LowerCL	UpperCL
Monitored	after	-4.979	0.1218	12.04	-5.245	-4.714
Reference	after	-5.718	0.1218	12.04	-5.983	-5.453
Monitored	before	-5.261	0.2109	12.04	-5.720	-4.801
Reference	before	-5.574	0.2109	12.04	-6.034	-5.115

- Results are given on the natural log scale.

Summary of BACI contrasts for relative difference between changes from the before to after in Patch North and Reference Lake B, with 95% confidence intervals:

Patch North vs:	Estimate	Lower C.I.	Upper C.I.	Significance
Reference Sites	0.4249	-0.1429	0.9928	not sig.

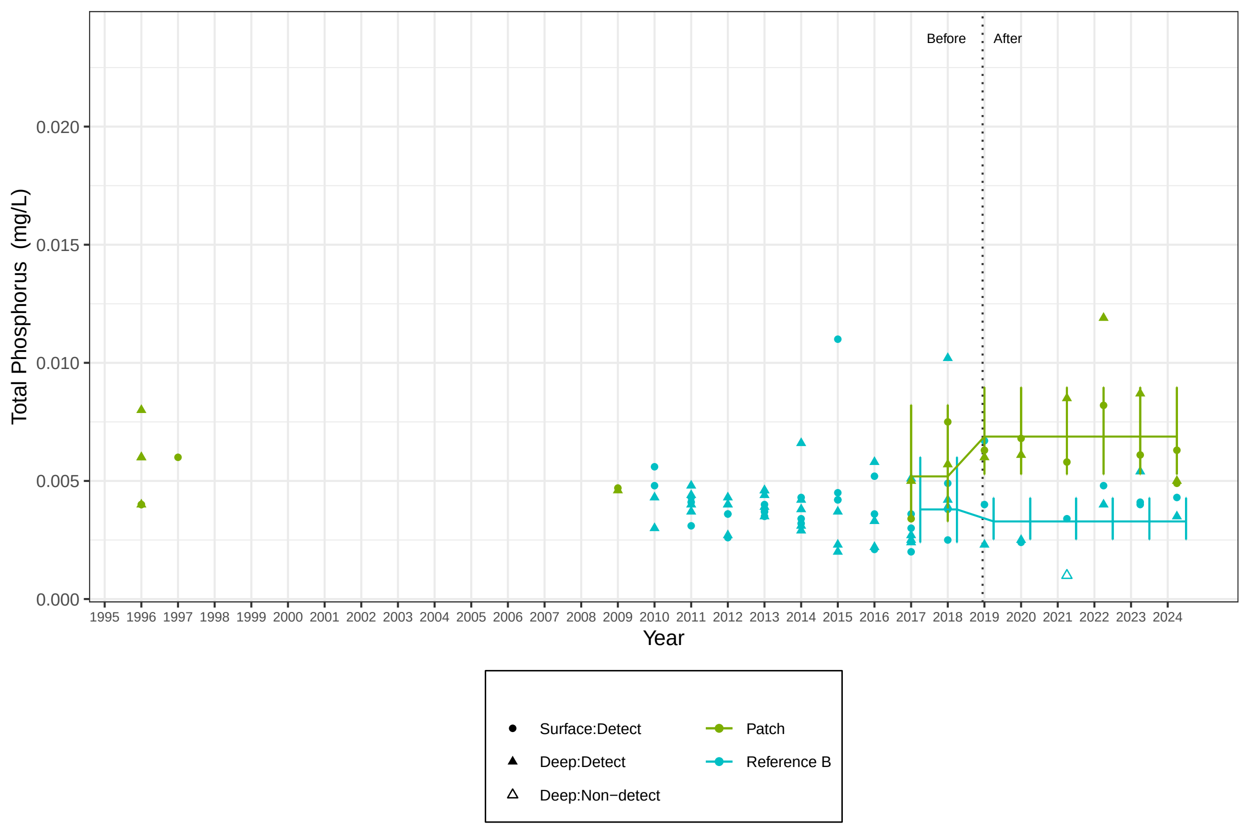
A BACI contrast is identified as *significant* if the confidence interval does not include 0.

Conclusion:

The change in Total Phosphorus concentrations at the Patch North site from before to after was not significantly (p = 0.135) different from the change at Reference Lake B, according to the test on the BACI term (*class:period*).

Observed Data and Fitted Values with Comparable Years

Depth was accounted for in the model but not evaluated since its effect is not of primary interest. Below are plots of the observed and fitted data. The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for monitored and reference sites.



Windy Lake

Before-after analyses were first performed to compare the change in the before and after period in the exposure lake. If a change was detected then before-after-control-impact linear modeling would be applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Windy Under-Ice Before-After Analysis

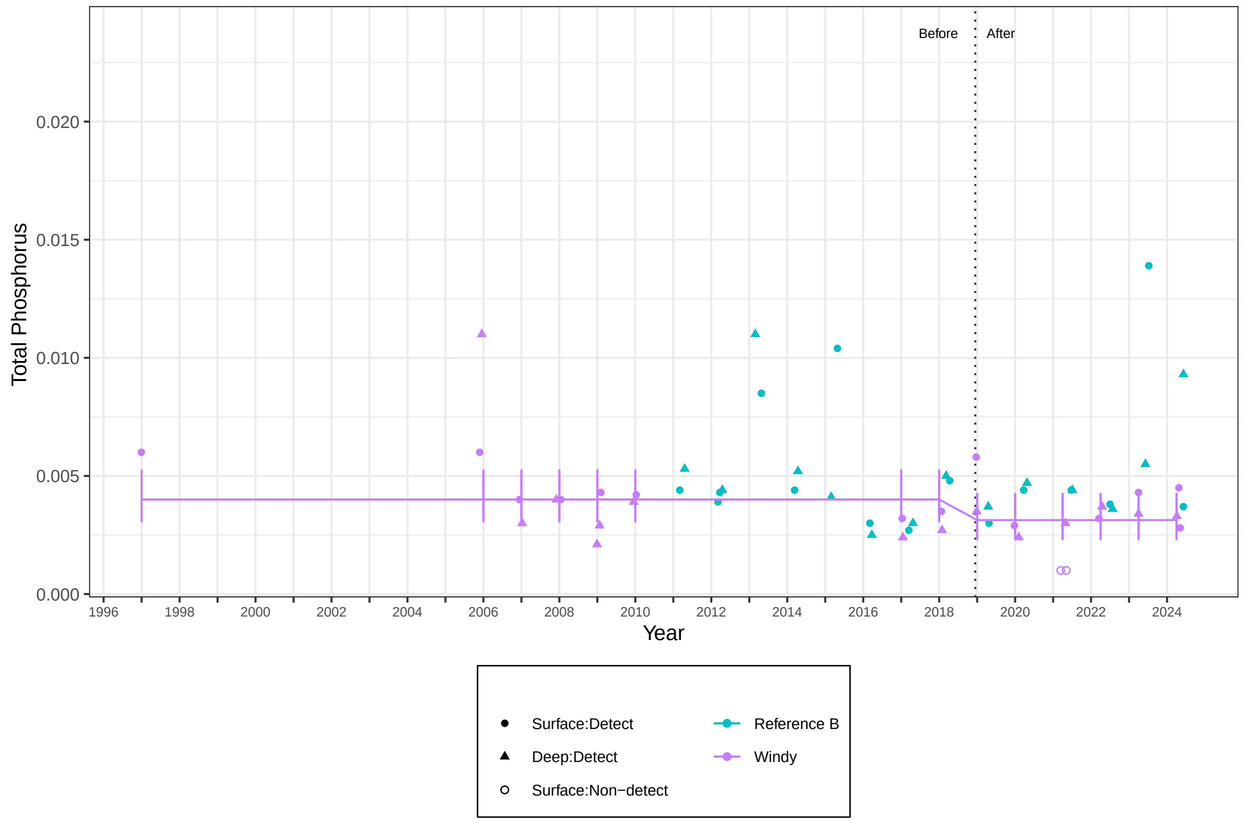
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	-0.2465	0.1888	11.84	-1.306	0.2165	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Windy Open-water Before-After Analysis

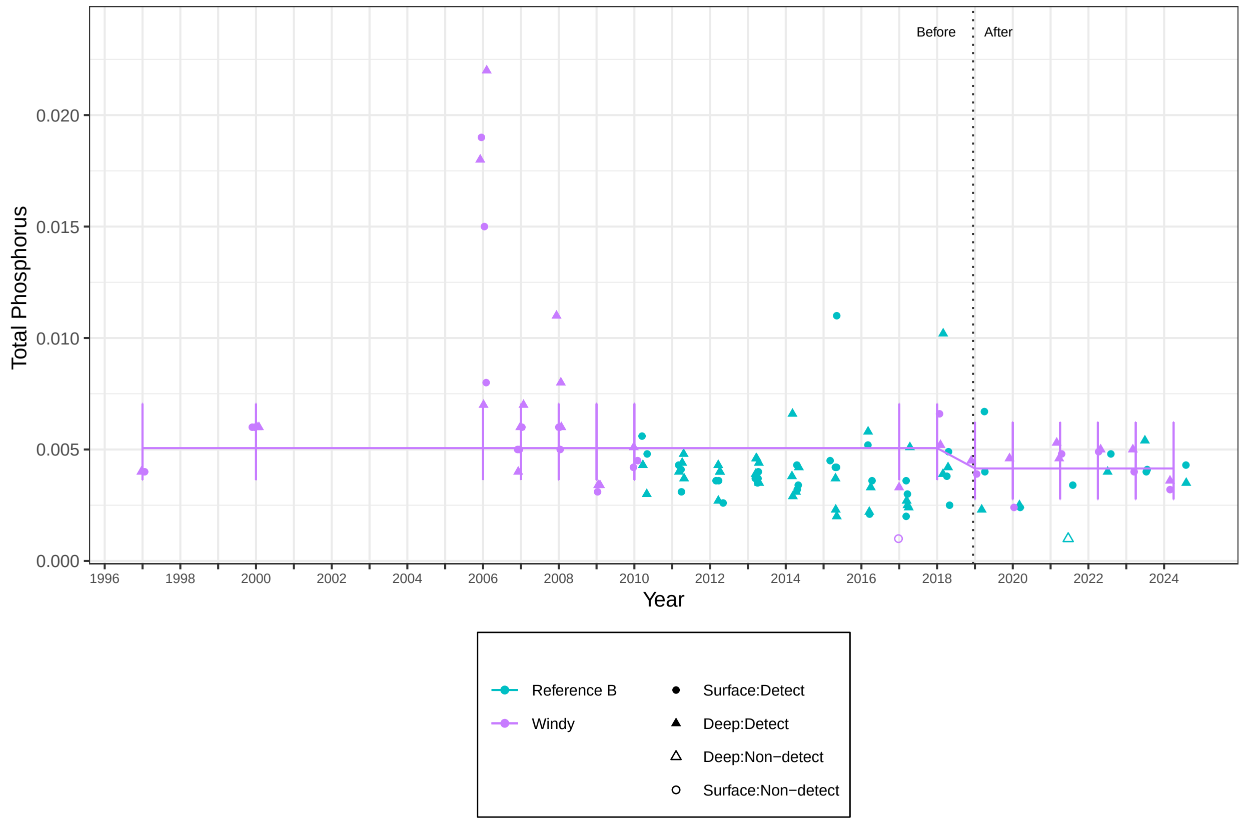
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	-0.1992	0.243	13	-0.8196	0.4272	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

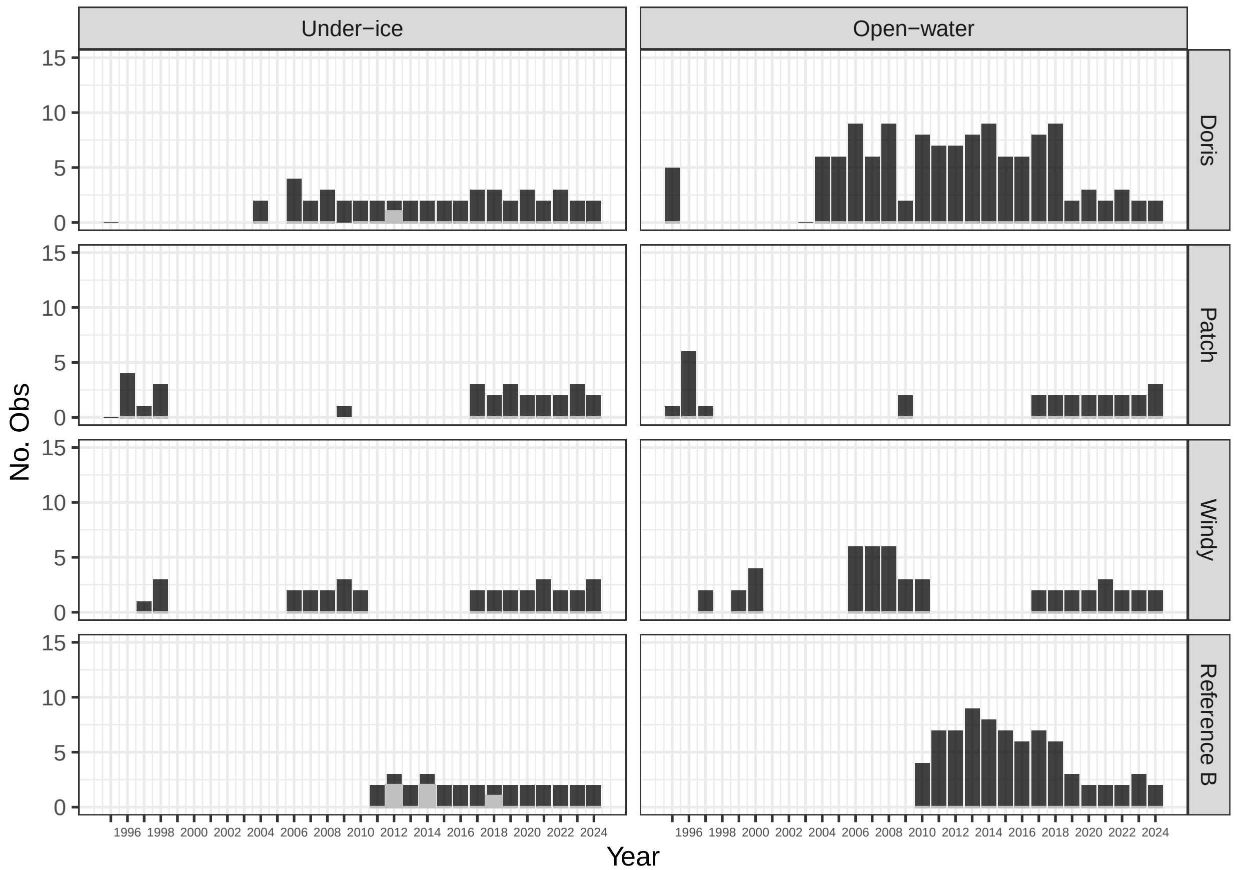
The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.


Before
After
Total Phosphorus
0.000
0.005
0.010
0.015
0.020
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
Year
Reference B
Windy
Surface:Detect
Deep:Detect
Deep:Non−detect
Surface:Non−detect

C.3.1.10 Total Aluminum

Censored Values and Sample Sizes

The following plots indicate the number of observations for each year from each lake that were less than the detection limit (light gray) or greater than the detection limit (dark gray). Observations below the analytical detection limit were considered censored.



Analysis was not performed if greater than 50% of observations from a site-season grouping were censored or if 100% of observations from the current assessment year (i.e., 2024) were censored.

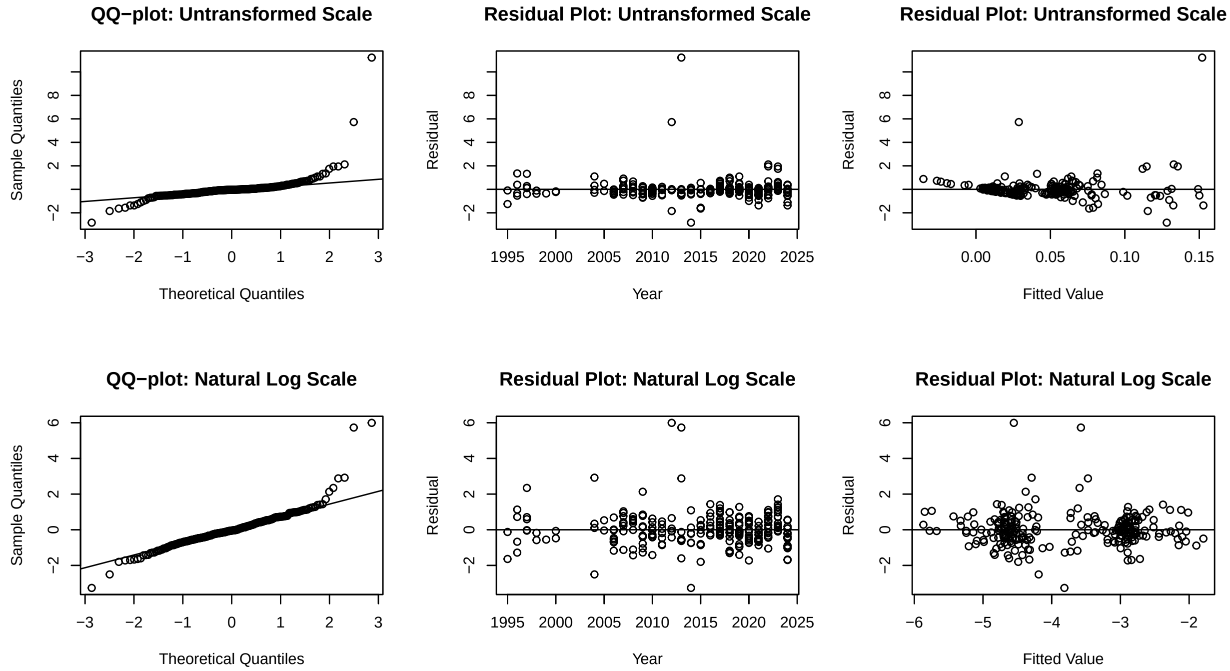
The sample sizes per lake and season are summarized in the table below.

Lake	Season	# Obs (total)	# < DL (total)	% < DL (total)	% < DL (2024)
Doris	Under-ice	47	1	2	0
Doris	Open-water	125	0	0	0
Patch	Under-ice	28	0	0	0
Patch	Open-water	27	0	0	0
Reference B	Under-ice	30	5	17	0
Reference B	Open-water	75	0	0	0
Windy	Under-ice	33	0	0	0
Windy	Open-water	49	0	0	0

None of the sites exhibited greater than 50% of data less than the detection limit. The analysis proceeds with linear mixed model regression.

Initial Model Fit

A model was fit both on the untransformed and natural log scale to assess the need for transformations. Outliers were identified from the fitted model as standardized residuals greater than 3, and flagged to caution interpretation of results but not removed from the analysis.



Outliers on untransformed scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Doris	2012	Under-ice	Surface	0.280	0.029	5.727
Reference B	2013	Under-ice	Surface	0.644	0.152	11.218

Outliers on natural log scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Doris	2012	Under-ice	Surface	0.2800	-4.551	5.995
Reference B	2013	Under-ice	Surface	0.6440	-3.575	5.732
Reference B	2014	Under-ice	Deep	0.0037	-3.815	-3.262

The natural log-transformed data better meets the residual assumptions. Analysis proceeds with natural log-transformed data. There were outliers retained in the analysis. Results should be interpreted with caution and along with graphical results.

Doris Lake

The trend for Doris Lake was compared to a slope of zero. If there was a significant trend, then the trend for Doris Lake was compared to the trend in Reference Lake B. This contrast does not test for differences in intercepts between lakes.

Doris Under-Ice

Analysis	Chi.sq	df	p	Significance
Compare to slope zero	4.417	3	0.21980	not sig.

Doris Lake did not exhibit significant deviation from a slope of zero and thus comparison to the trend in Reference Lake B was not completed.

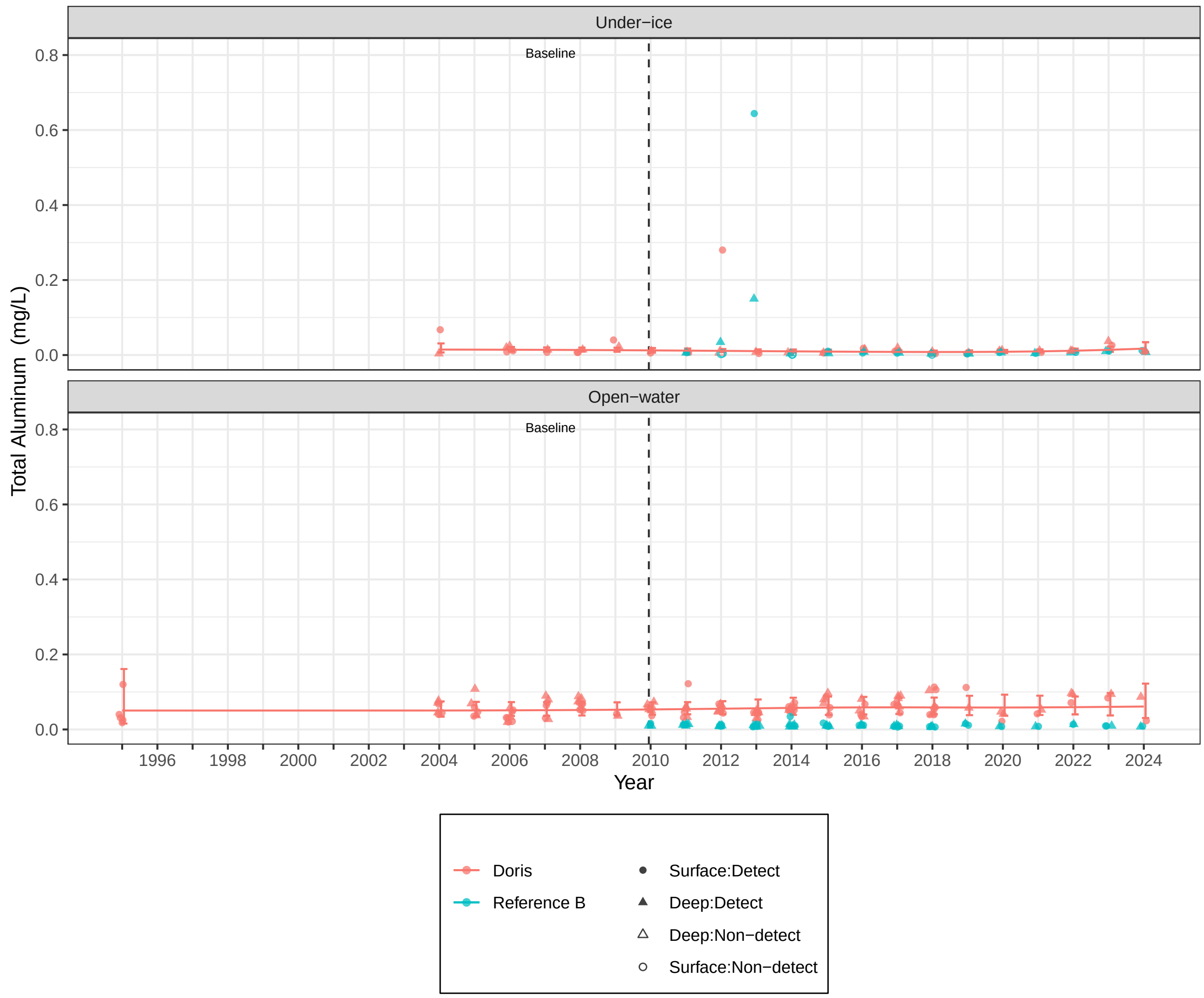
Doris Open-Water

Analysis	Chi.sq	df	p	Significance
Compare to slope zero	0.384	3	0.94350	not sig.

Doris Lake did not exhibit significant deviation from a slope of zero and thus comparison to the trend in Reference Lake B was not completed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols are values presented at half the detection limit. Solid lines represent the fitted curves. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations.



Patch Lake

Before-after analyses were first performed to compare the change in the before and after period for the exposure site. If a change was detected, then before-after-control-impact linear modelling was applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Patch Under-Ice Before-After Analysis

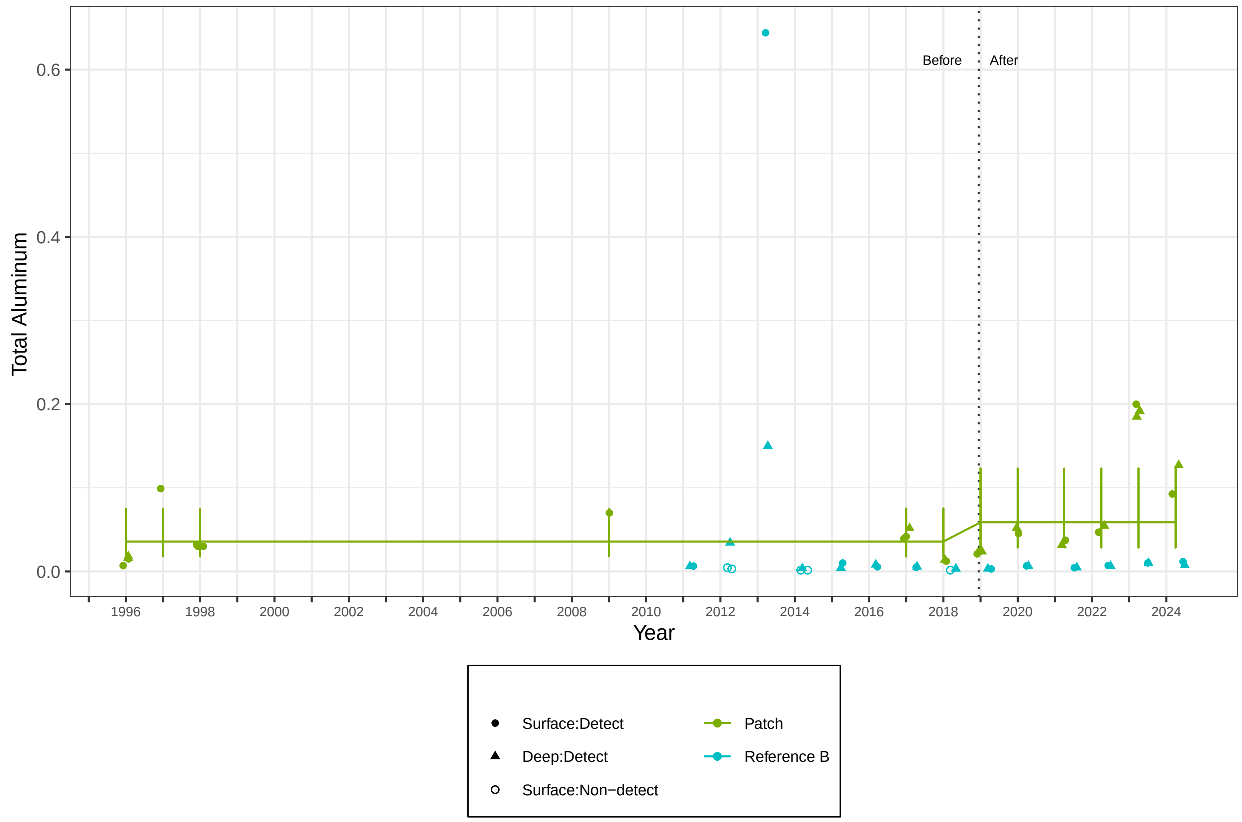
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0.497	0.4742	10.01	1.048	0.3193	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Patch Open-Water Before-After Analysis

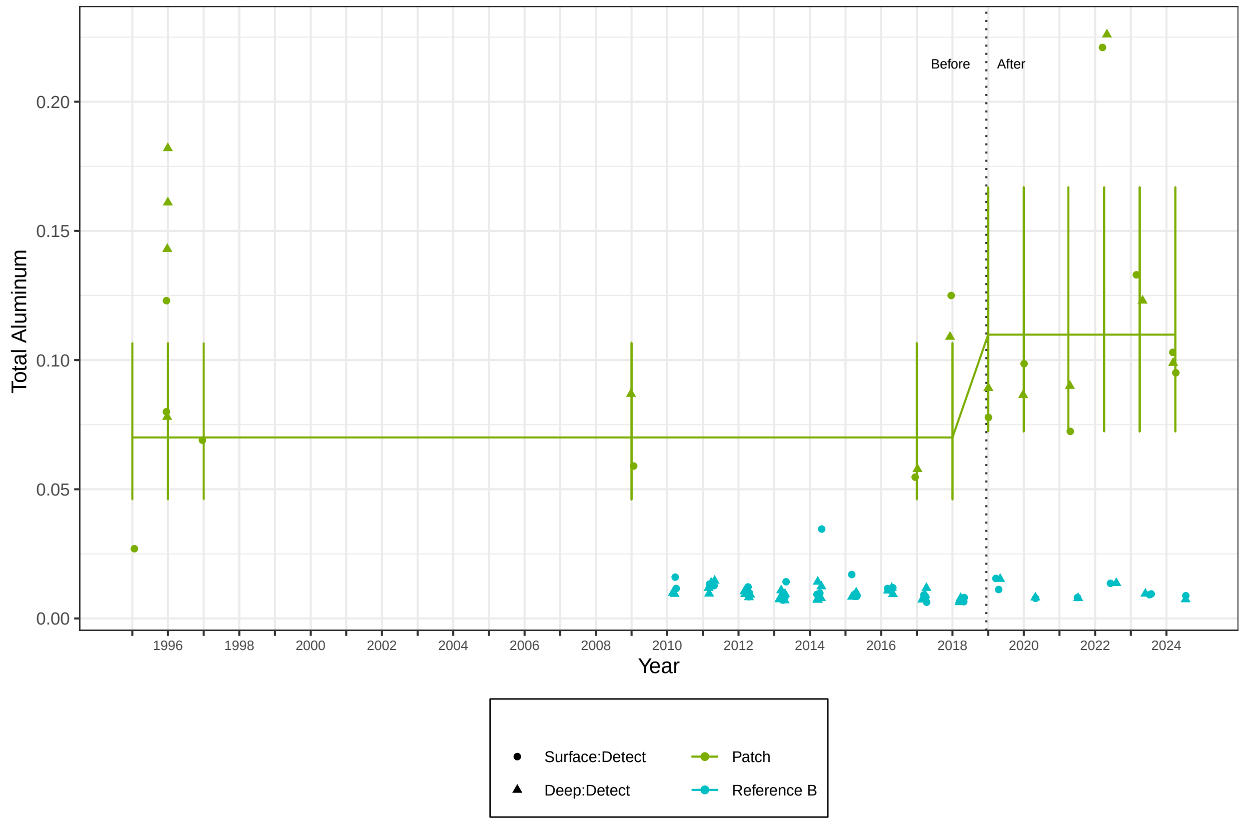
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0.4498	0.2666	9.833	1.687	0.1231	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Windy Lake

Before-after analyses were first performed to compare the change in the before and after period in the exposure lake. If a change was detected then before-after-control-impact linear modeling would be applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Windy Under-Ice Before-After Analysis

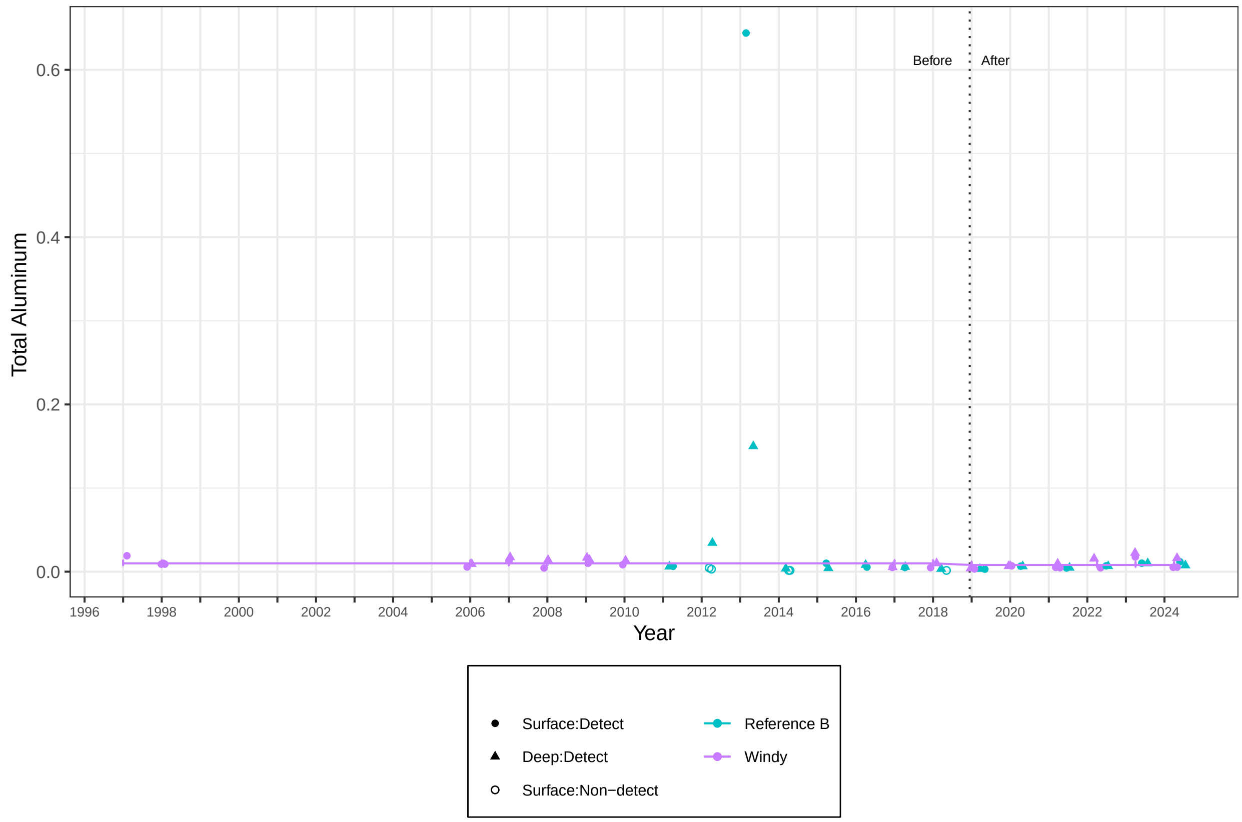
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	-0.2227	0.261	12.41	-0.8536	0.4095	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Windy Open-water Before-After Analysis

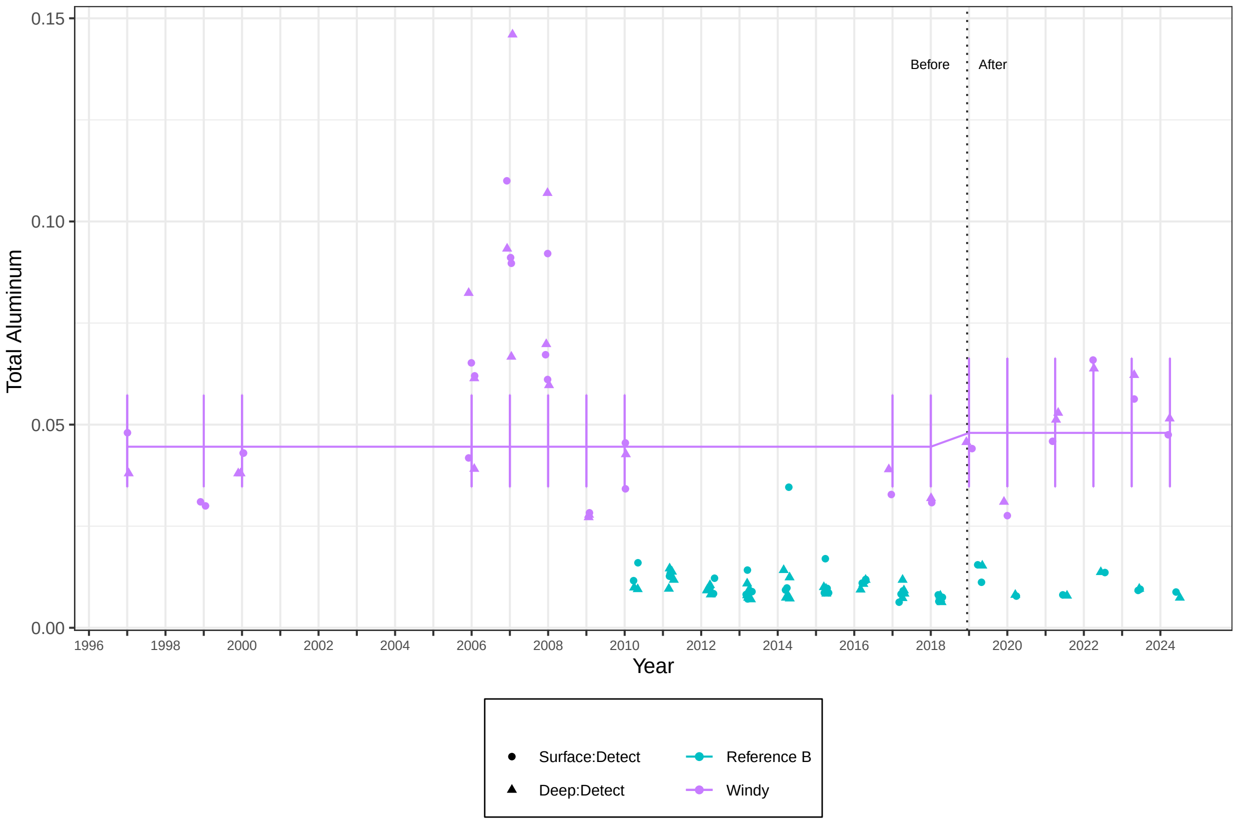
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0.0736	0.1917	13.98	0.3842	0.7066	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

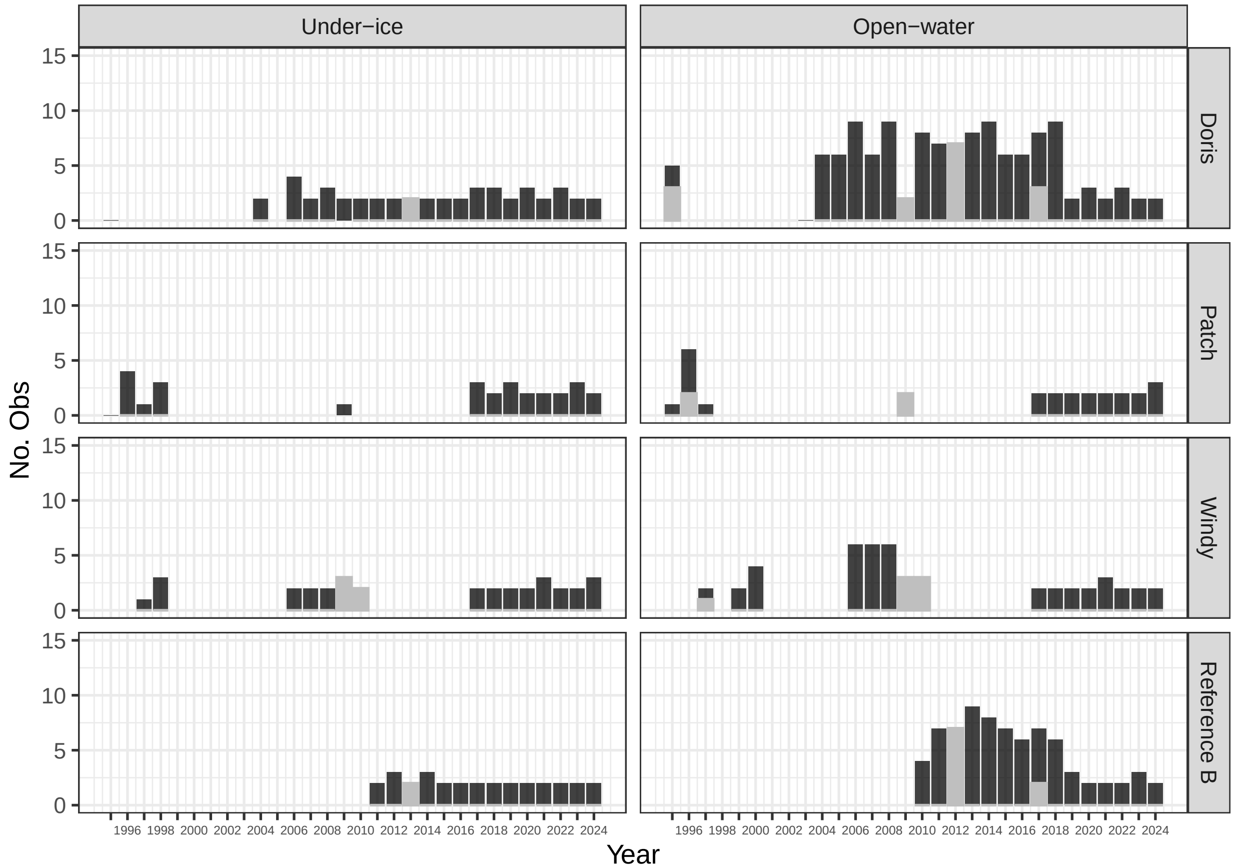
The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.


Total Aluminum
0.15
0.10
0.05
0.00
Before
After
Year
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
Surface:Detect
Deep:Detect
Reference B
Windy

C.3.1.11 Total Arsenic

Censored Values and Sample Sizes

The following plots indicate the number of observations for each year from each lake that were less than the detection limit (light gray) or greater than the detection limit (dark gray). Observations below the analytical detection limit were considered censored.



Analysis was not performed if greater than 50% of observations from a site-season grouping were censored or if 100% of observations from the current assessment year (i.e., 2024) were censored.

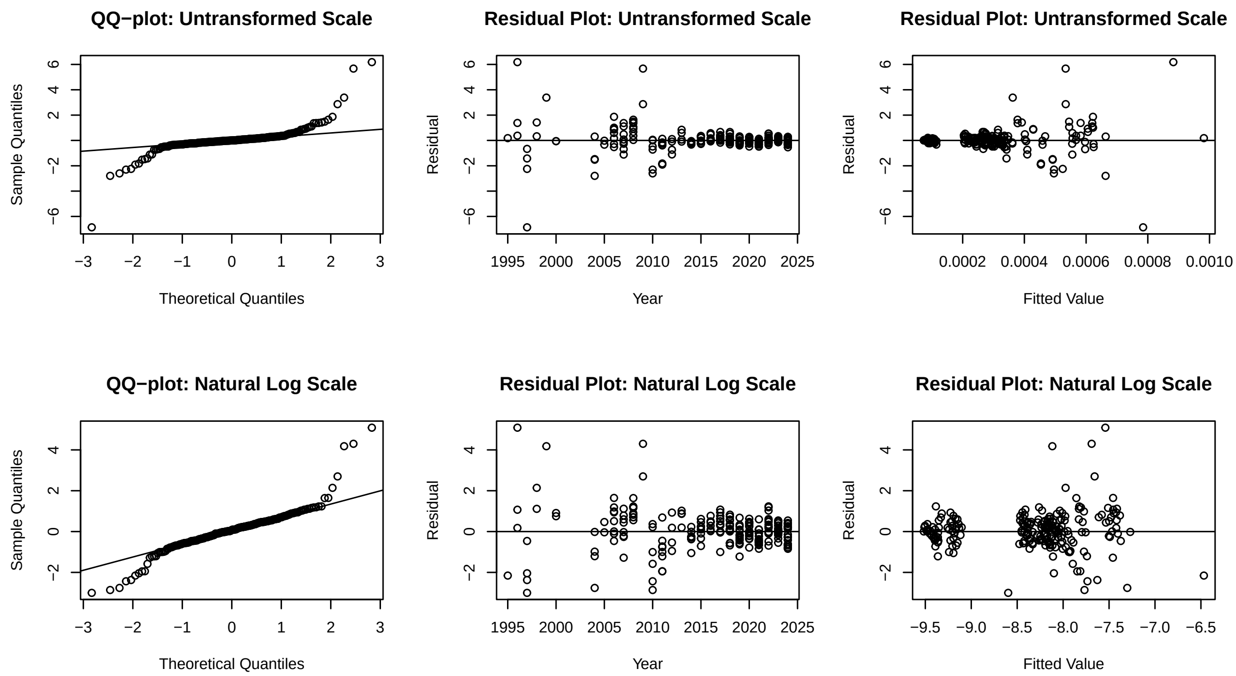
The sample sizes per lake and season are summarized in the table below.

Lake	Season	# Obs (total)	# < DL (total)	% < DL (total)	% < DL (2024)
Doris	Under-ice	47	2	4	0
Doris	Open-water	125	15	12	0
Patch	Under-ice	28	1	4	0
Patch	Open-water	27	4	15	0
Reference B	Under-ice	30	2	7	0
Reference B	Open-water	75	9	12	0
Windy	Under-ice	33	5	15	0
Windy	Open-water	49	7	14	0

None of the sites exhibited greater than 50% of data less than the detection limit. The analysis proceeds with linear mixed model regression. Doris North Open-water, Patch Open-water, Reference B Open-water, Windy Under-ice, and Windy Open-water exhibited more than 10% of data under detection limit. The analysis proceeds with tobit regression for Doris Lake.

Initial Model Fit

A model was fit both on the untransformed and natural log scale to assess the need for transformations. Outliers were identified from the fitted model as standardized residuals greater than 3, and flagged to caution interpretation of results but not removed from the analysis.



Outliers on untransformed scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Doris	2009	Under-ice	Deep	0.0011	0.001	5.671
Patch	1996	Open-water	Surface	0.0015	0.001	6.181
Patch	1997	Open-water	Surface	0.0001	0.001	-6.858
Windy	1999	Open-water	Surface	0.0007	0.000	3.382

Outliers on natural log scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Doris	2009	Under-ice	Deep	0.0011	-7.690	4.299
Patch	1996	Open-water	Surface	0.0015	-7.540	5.088
Patch	1997	Open-water	Surface	0.0001	-8.598	-3.003
Windy	1999	Open-water	Surface	0.0007	-8.117	4.180

The natural log transformed model better meets the residual assumptions. Analysis proceeds with natural log transformed data.

Doris Lake

The trend for Doris Lake was compared to a slope of zero. If there was a significant trend, then the trend for Doris Lake was compared to the trend in Reference Lake B. This contrast does not test for differences in intercepts between lakes.

Doris Under-Ice

Analysis	Chi.sq	df	p	Significance
Compare to slope zero	97.61	3	<0.00001	sig.
Compare to Reference B	14.17	3	0.00270	sig.

Doris Lake exhibited significant deviation from a slope of zero. Doris Lake exhibited significant deviation from the trend of Reference Lake B.

Doris Open-Water

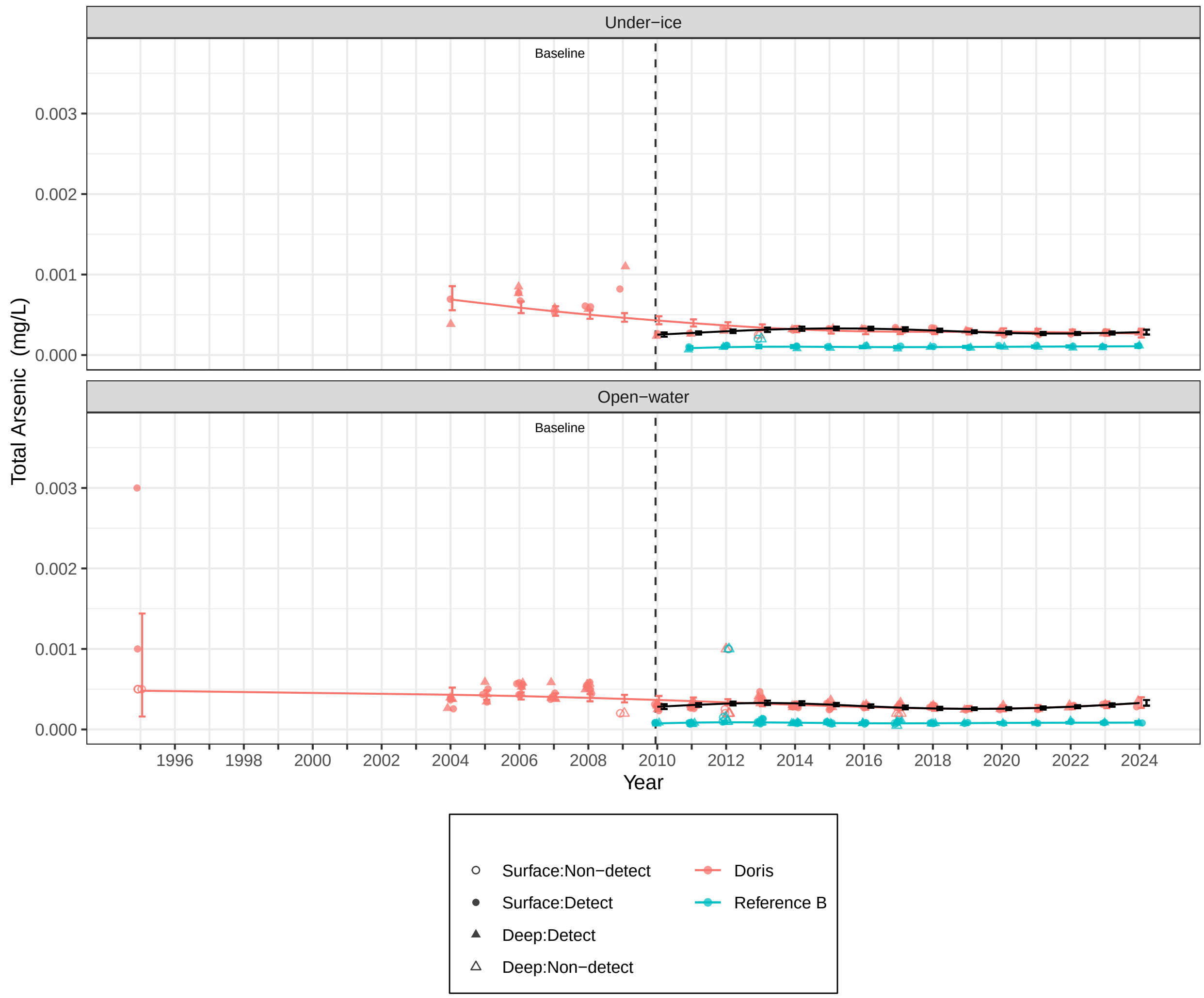
Analysis	Chi.sq	df	p	Significance
Compare to slope zero	36.353	3	<0.00001	sig.
Compare to Reference B	6.776	3	0.07940	not sig.

Doris Lake exhibited significant deviation from a slope of zero. Doris Lake did not exhibit significant deviation from the trend of Reference Lake B.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols are values presented at half the detection limit. Solid lines represent the fitted curves. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations.

As Doris Lake exhibited significant deviation from a slope of zero in at least one season, the black lines and error bars represent the model built with Doris Lake data from comparable sampling years with Reference Lake B only.



Patch Lake

Before-after analyses were first performed to compare the change in the before and after period for the exposure site. If a change was detected, then before-after-control-impact linear modelling was applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Patch Under-Ice Before-After Analysis

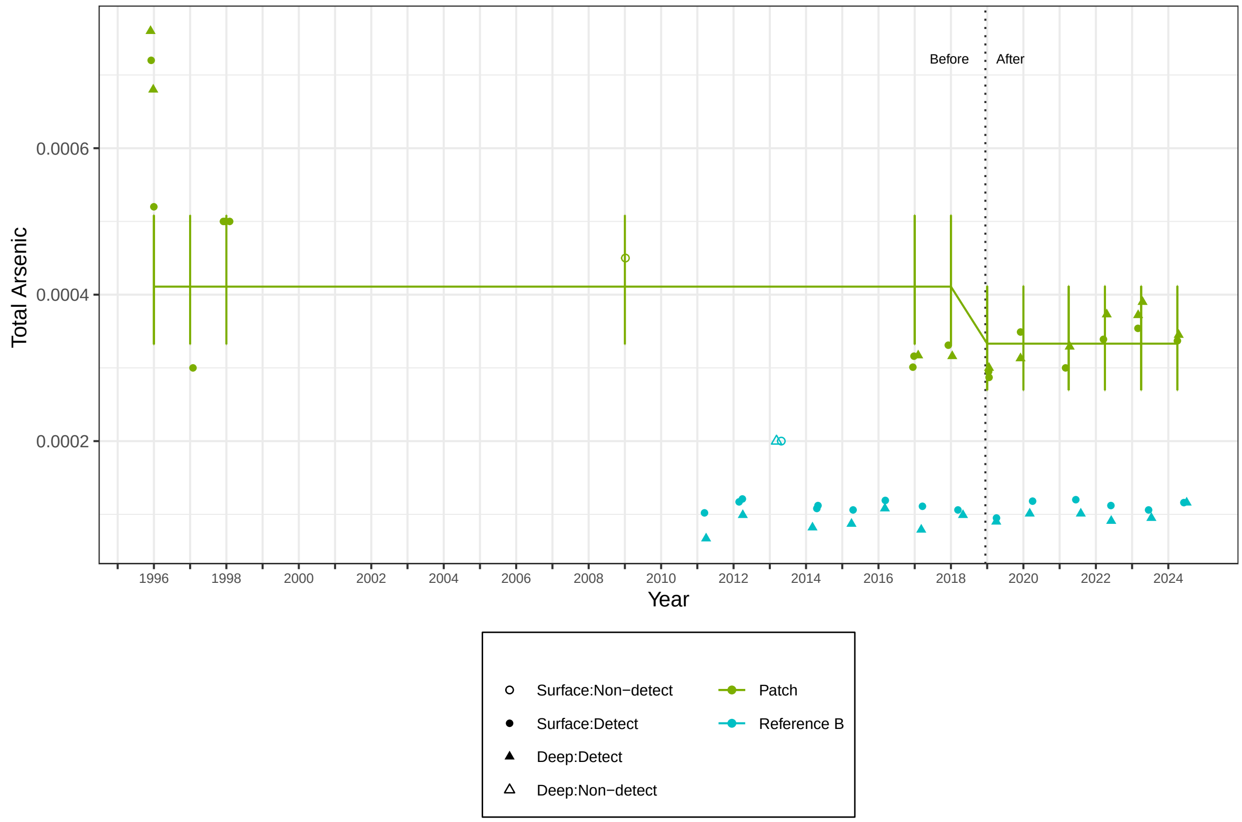
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	-0.2101	0.1351	10.04	-1.556	0.1507	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Patch Open-Water Before-After Analysis

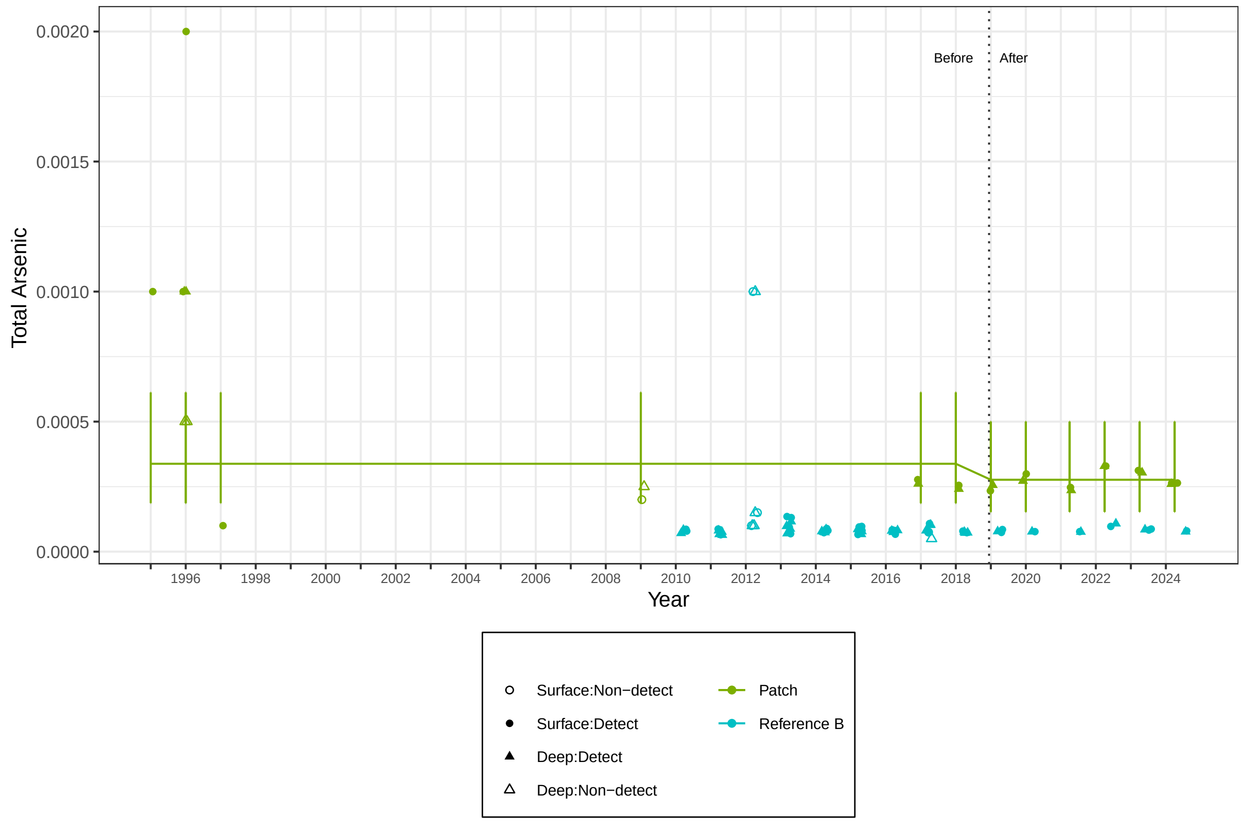
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	-0.2006	0.3767	9.724	-0.5326	0.6063	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Windy Lake

Before-after analyses were first performed to compare the change in the before and after period in the exposure lake. If a change was detected then before-after-control-impact linear modeling would be applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Windy Under-Ice Before-After Analysis

Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	-0.5053	0.2238	12.93	-2.257	0.0419	sig.

Conclusion:

The change from before to after was significantly different.

BACI Analysis with Comparable Years

Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	p
class	3.9163	3.9163	1	21	605.0475	<0.001
period	0.0010	0.0010	1	6	0.1502	0.712
Depth.Zone	0.1415	0.1415	1	21	21.8616	<0.001
class:period	0.0130	0.0130	1	21	2.0130	0.171

Estimated marginal means for site class by period:

Class	Period	LSmean	SE	DF	LowerCL	UpperCL
Monitored	after	-8.405	0.0292	12.12	-8.468	-8.341
Reference	after	-9.166	0.0292	12.12	-9.229	-9.102
Monitored	before	-8.377	0.0505	12.12	-8.486	-8.267
Reference	before	-9.231	0.0505	12.12	-9.341	-9.121

- Results are given on the natural log scale.

Summary of BACI contrasts for relative difference between changes from the before to after in Windy Deep and Reference Lake B, with 95% confidence intervals:

Windy Deep vs:	Estimate	Lower C.I.	Upper C.I.	Significance
Reference Sites	-0.0932	-0.2298	0.0434	not sig.

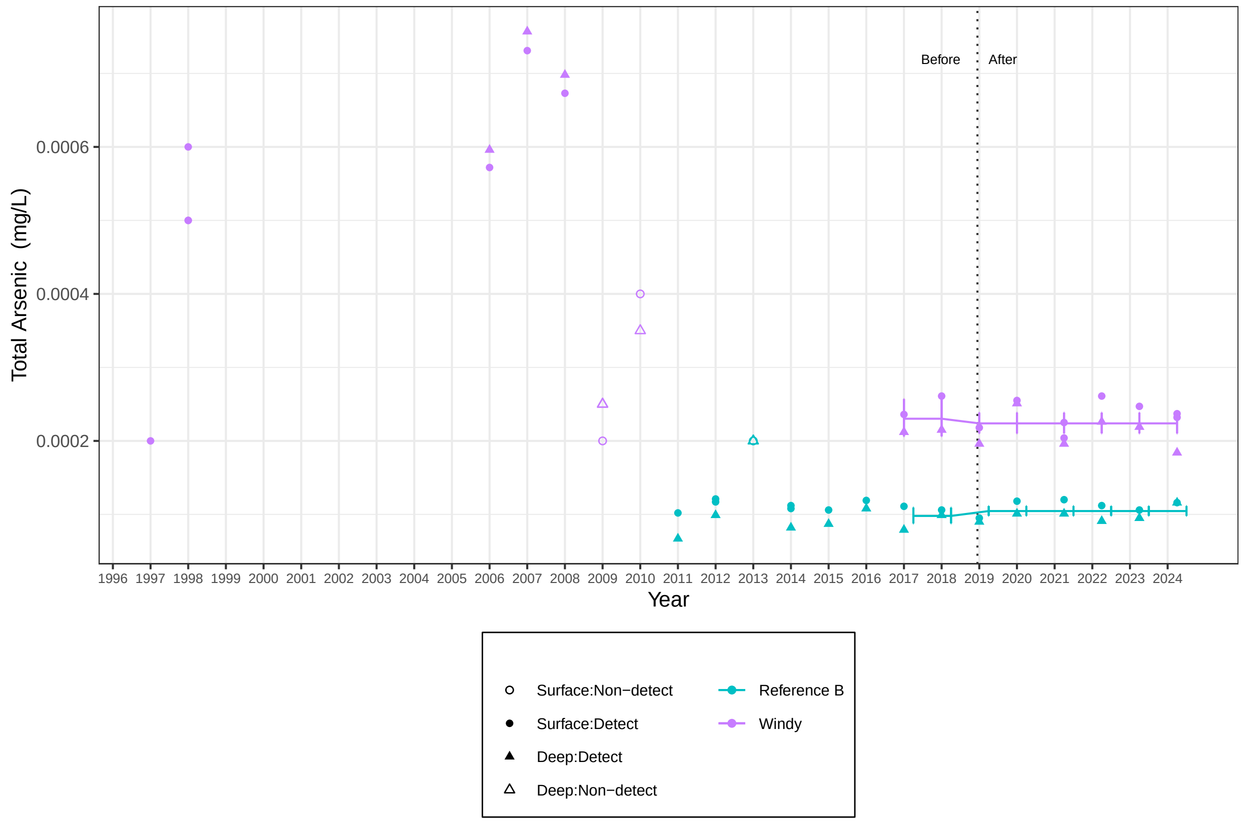
A BACI contrast is identified as *significant* if the confidence interval does not include 0.

Conclusion:

The change in Total Arsenic concentrations at the Windy Deep site from before to after was not significantly (p = 0.171) different from the change at Reference Lake B, according to the test on the BACI term (*class:period*).

Observed Data and Fitted Values with Comparable Years

Depth was accounted for in the model but not evaluated since its effect is not of primary interest. Below are plots of the observed and fitted data. The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for monitored and reference sites.



Windy Open-water Before-After Analysis

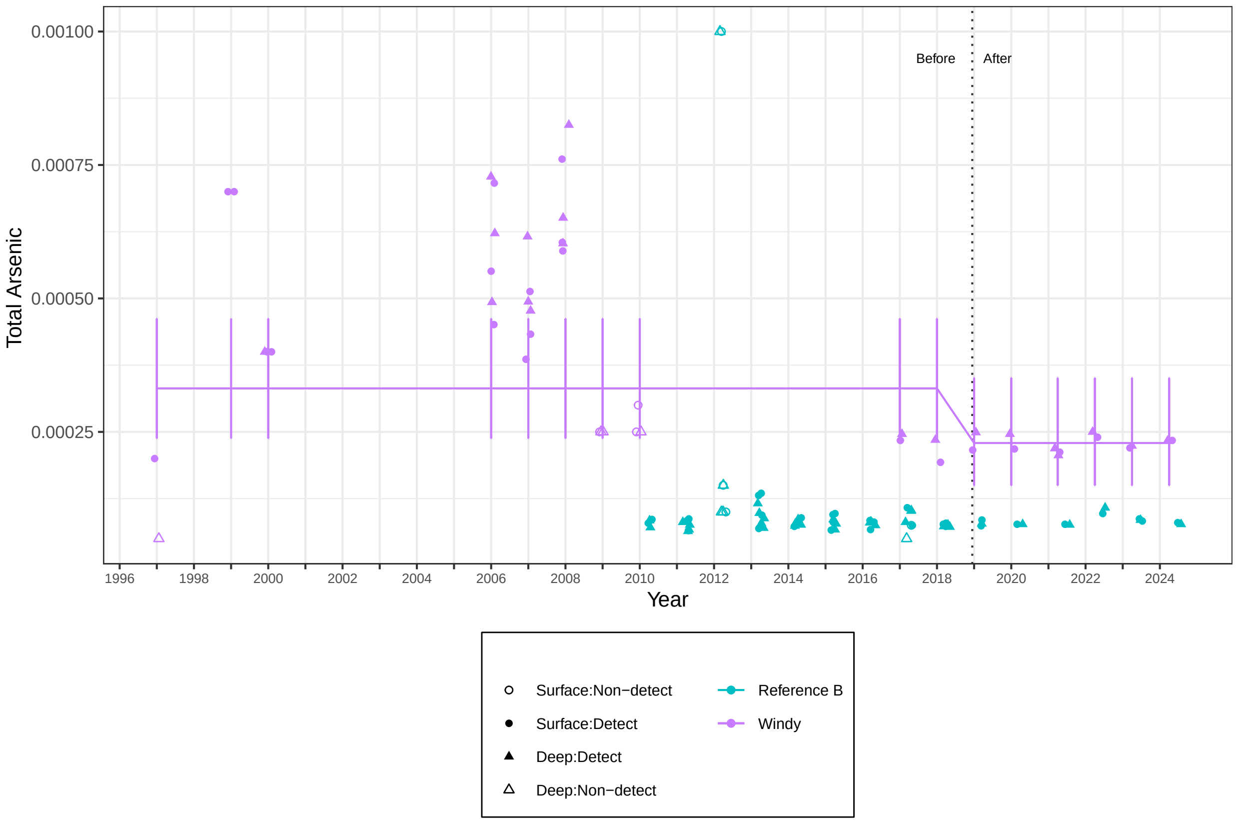
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	-0.3693	0.2522	13.63	-1.464	0.1658	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

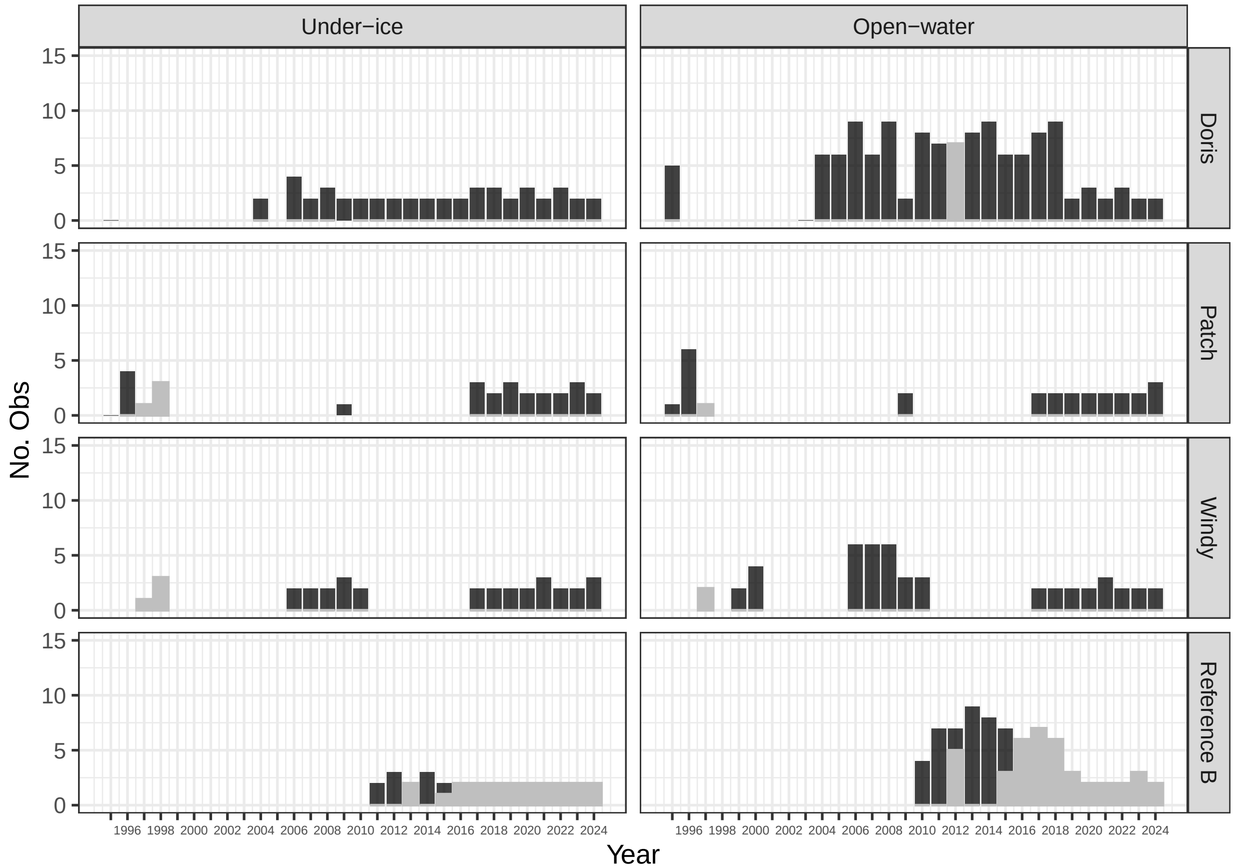
The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.


0.00100
0.00075
0.00050
0.00025
Total Arsenic
Before
After
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
Year
Surface:Non−detect
Surface:Detect
Deep:Detect
Deep:Non−detect
Reference B
Windy

C.3.1.12 Total Boron

Censored Values and Sample Sizes

The following plots indicate the number of observations for each year from each lake that were less than the detection limit (light gray) or greater than the detection limit (dark gray). Observations below the analytical detection limit were considered censored.



Analysis was not performed if greater than 50% of observations from a site-season grouping were censored or if 100% of observations from the current assessment year (i.e., 2024) were censored.

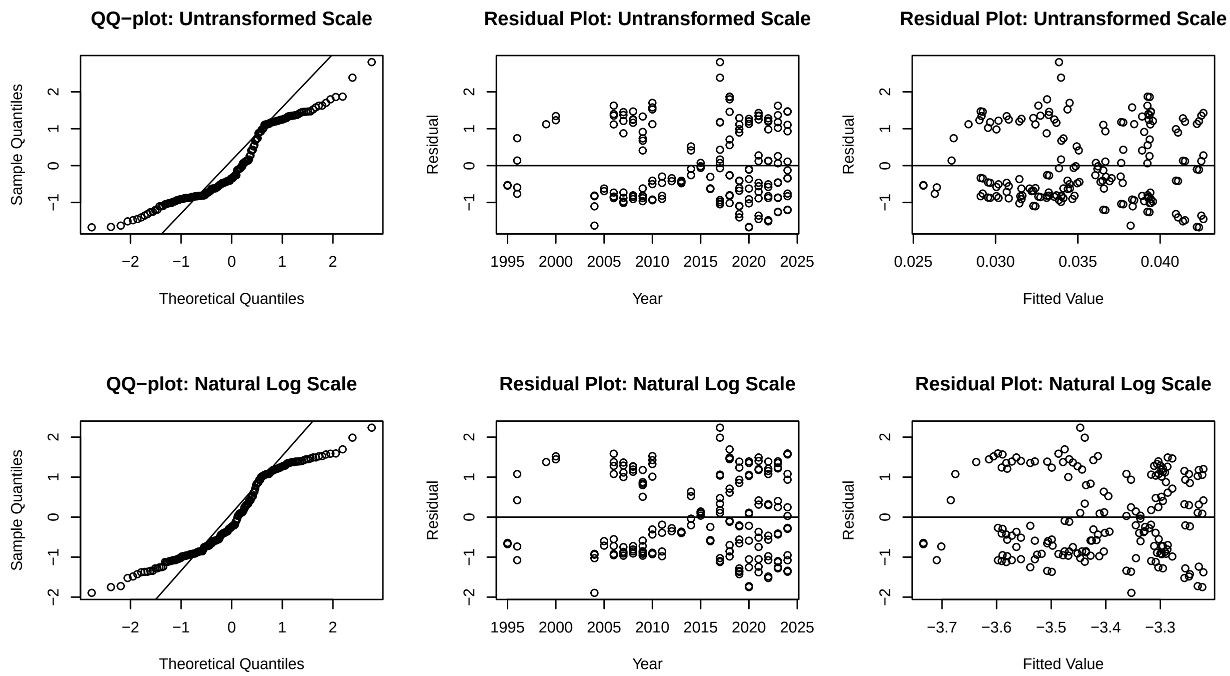
The sample sizes per lake and season are summarized in the table below.

Lake	Season	# Obs (total)	# < DL (total)	% < DL (total)	% < DL (2024)
Doris	Under-ice	47	0	0	0
Doris	Open-water	125	7	6	0
Patch	Under-ice	28	4	14	0
Patch	Open-water	27	1	4	0
Reference B	Under-ice	30	21	70	100
Reference B	Open-water	75	41	55	100
Windy	Under-ice	33	4	12	0
Windy	Open-water	49	2	4	0

More than 50% of data was under detection limit in Reference B Under-ice and Reference B Open-water. Data from those site-season groupings will be removed from the analysis.

Initial Model Fit

A model was fit both on the untransformed and natural log scale to assess the need for transformations. Outliers were identified from the fitted model as standardized residuals greater than 3, and flagged to caution interpretation of results but not removed from the analysis.



Outliers on untransformed scale:

None

Outliers on natural log scale:

None

The untransformed and natural log-transformed model fit the data equally well. Analysis proceeds with untransformed data.

Doris Lake

The trend for Doris Lake was compared to a slope of zero. If there was a significant trend, then the trend for Doris Lake was compared to the trend in Reference Lake B. This contrast does not test for differences in intercepts between lakes.

Doris Under-Ice

Analysis	Chi.sq	df	p	Significance
Compare to slope zero	44.92	3	<0.00001	sig.

Doris Lake exhibited significant deviation from a slope of zero. Comparison to the trend in Reference Lake B was not completed due to Reference Lake B being excluded from analysis.

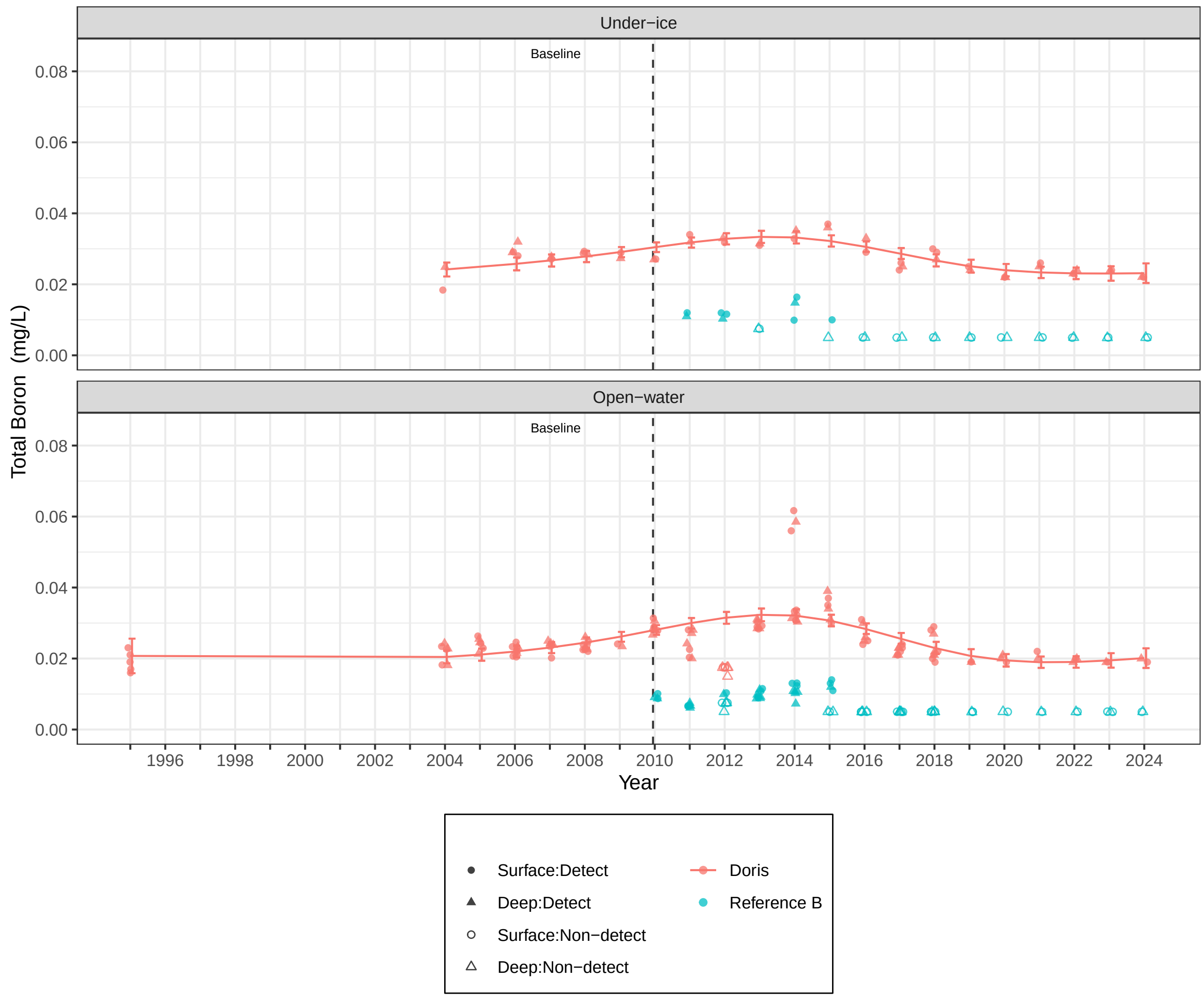
Doris Open-Water

Analysis	Chi.sq	df	p	Significance
Compare to slope zero	43.51	3	<0.00001	sig.

Doris Lake exhibited significant deviation from a slope of zero. Comparison to the trend in Reference Lake B was not completed due to Reference Lake B being excluded from analysis.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols are values presented at half the detection limit. Solid lines represent the fitted curves. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations.



Patch Lake

Before-after analyses were first performed to compare the change in the before and after period for the exposure site. If a change was detected, then before-after-control-impact linear modelling was applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Patch Under-Ice Before-After Analysis

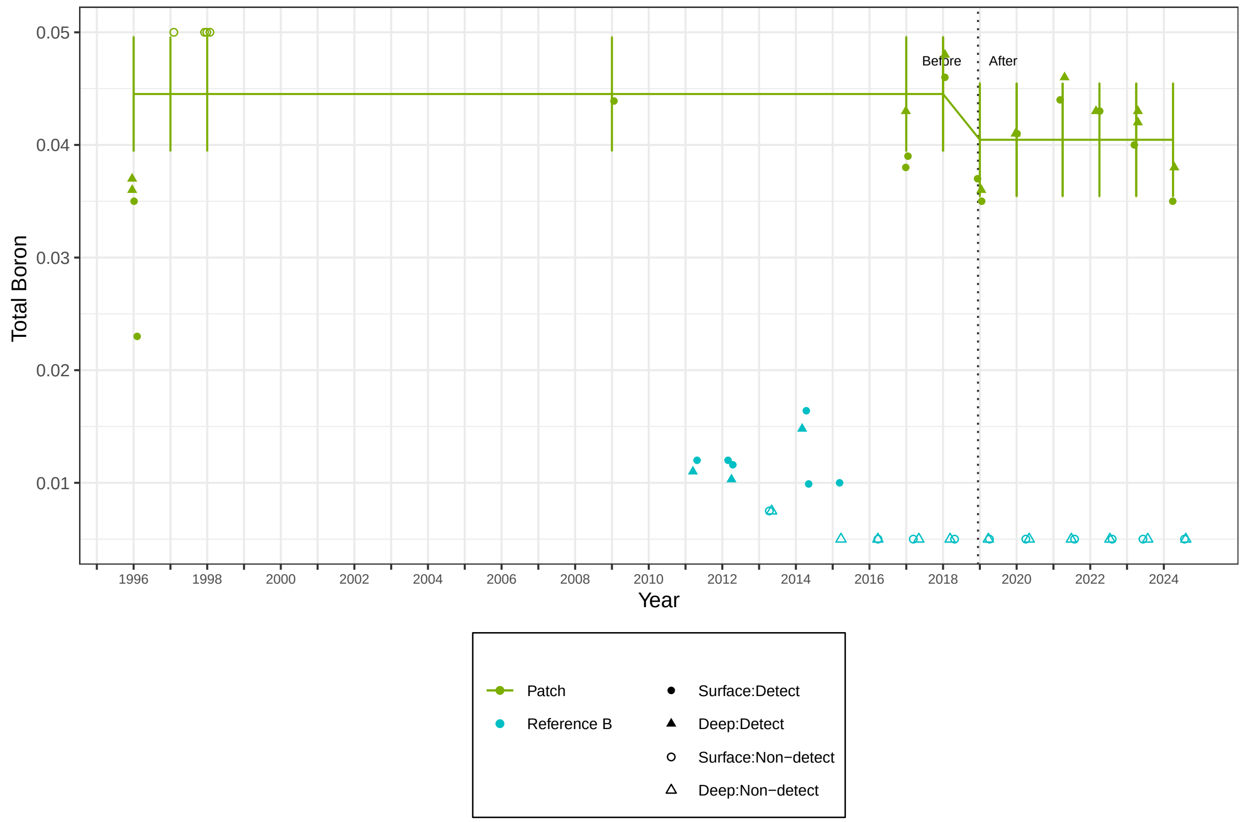
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	-0.0041	0.0032	9.989	-1.262	0.2355	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Patch Open-Water Before-After Analysis

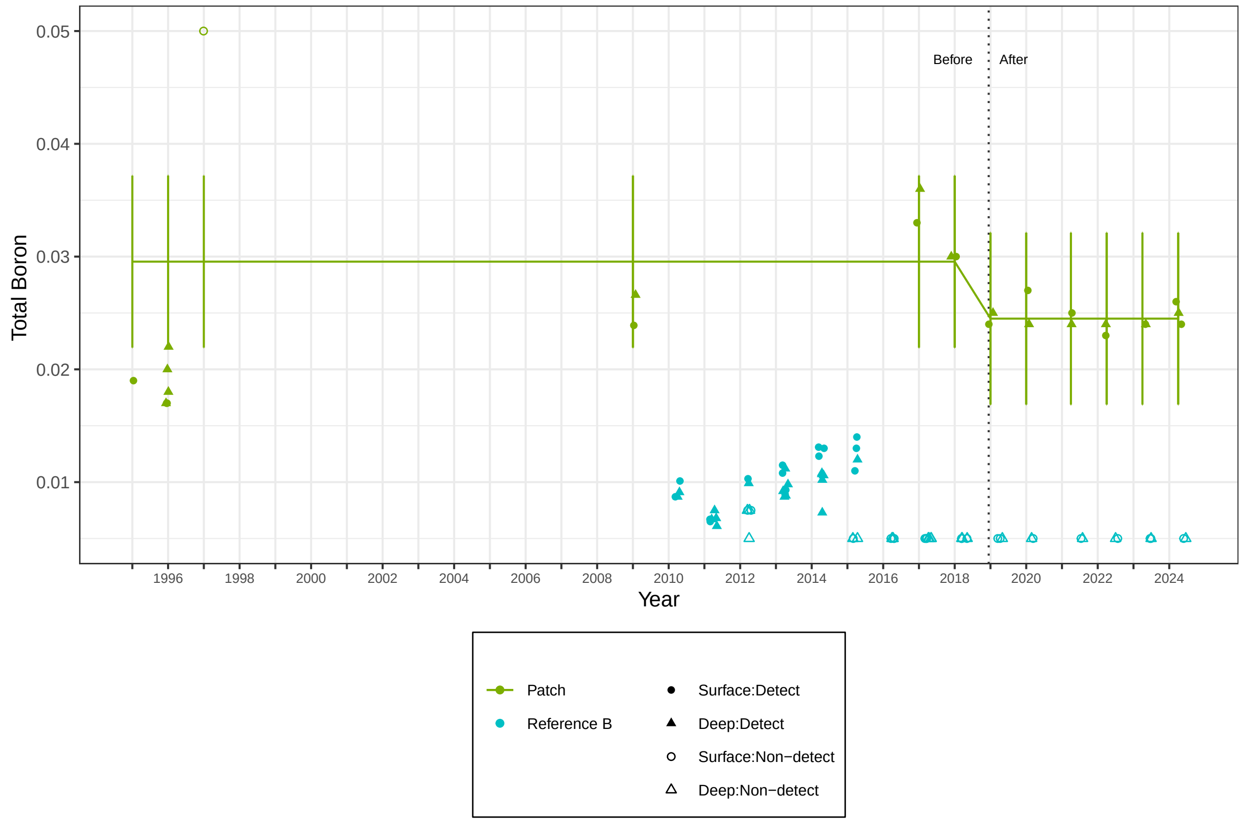
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	-0.0051	0.0048	9.864	-1.045	0.3211	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Windy Lake

Before-after analyses were first performed to compare the change in the before and after period in the exposure lake. If a change was detected then before-after-control-impact linear modeling would be applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Windy Under-Ice Before-After Analysis

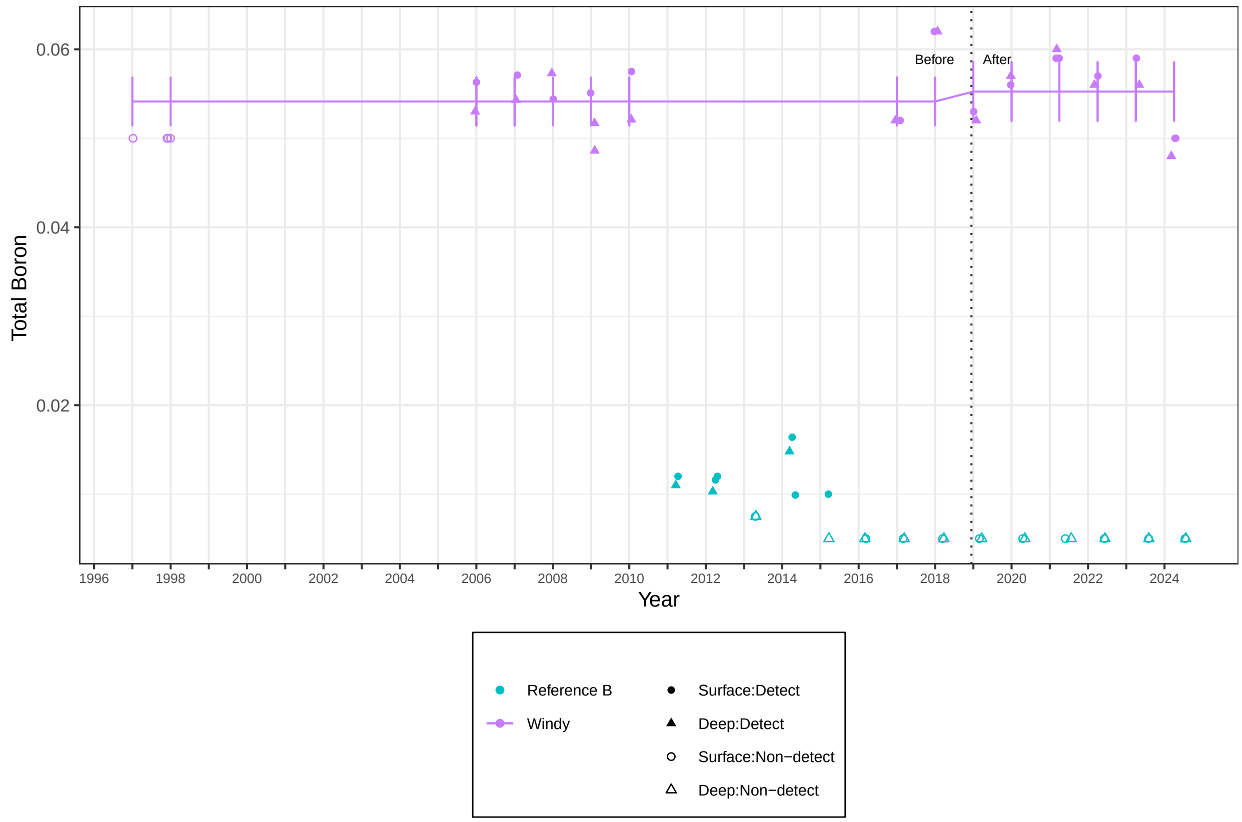
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0.0011	0.002	12.63	0.5527	0.5901	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Windy Open-water Before-After Analysis

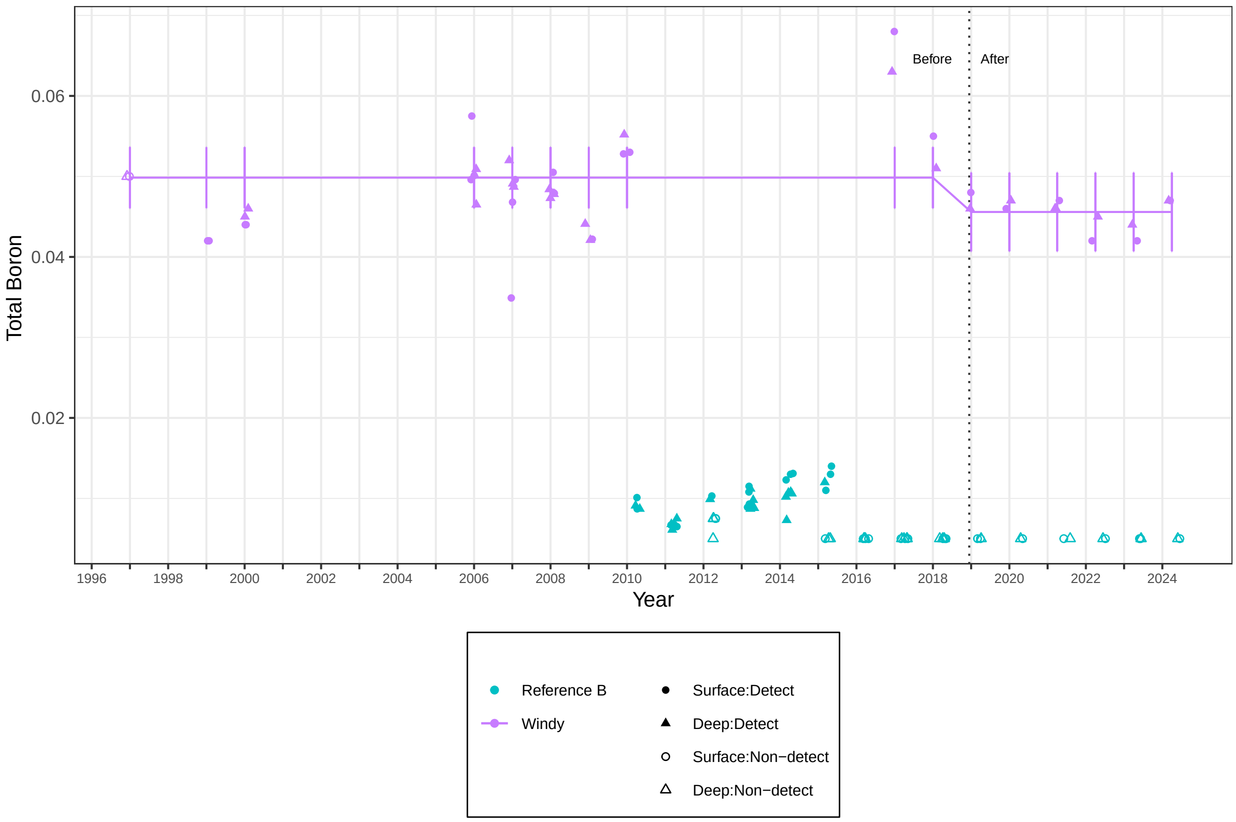
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	-0.0043	0.0029	13.83	-1.48	0.1613	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

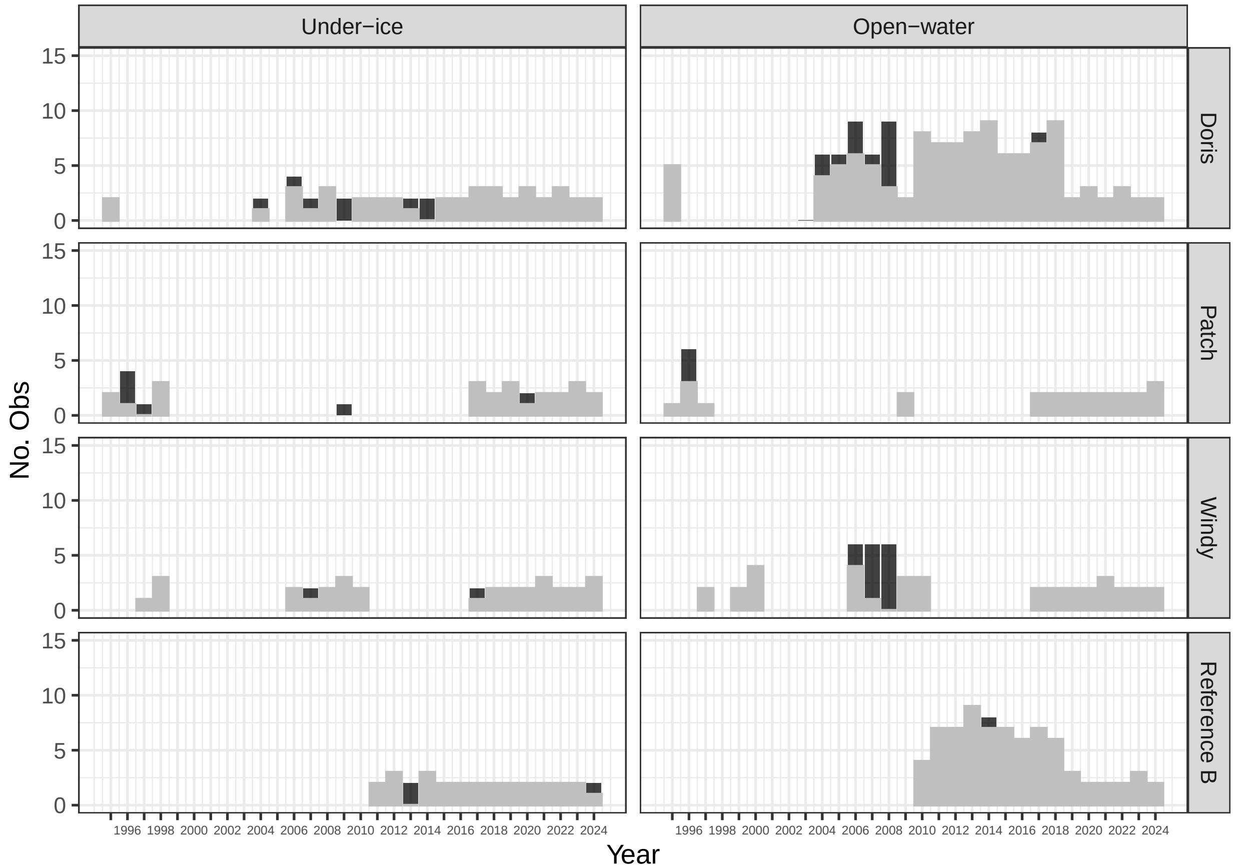
The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.


Total Boron
0.06
0.04
0.02
Before
After
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
Year
Reference B
Windy
Surface:Detect
Deep:Detect
Surface:Non−detect
Deep:Non−detect

C.3.1.13 Total Cadmium

Censored Values and Sample Sizes

The following plots indicate the number of observations for each year from each lake that were less than the detection limit (light gray) or greater than the detection limit (dark gray). Observations below the analytical detection limit were considered censored.



Analysis was not performed if greater than 50% of observations from a site-season grouping were censored or if 100% of observations from the current assessment year (i.e., 2024) were censored.

The sample sizes per lake and season are summarized in the table below.

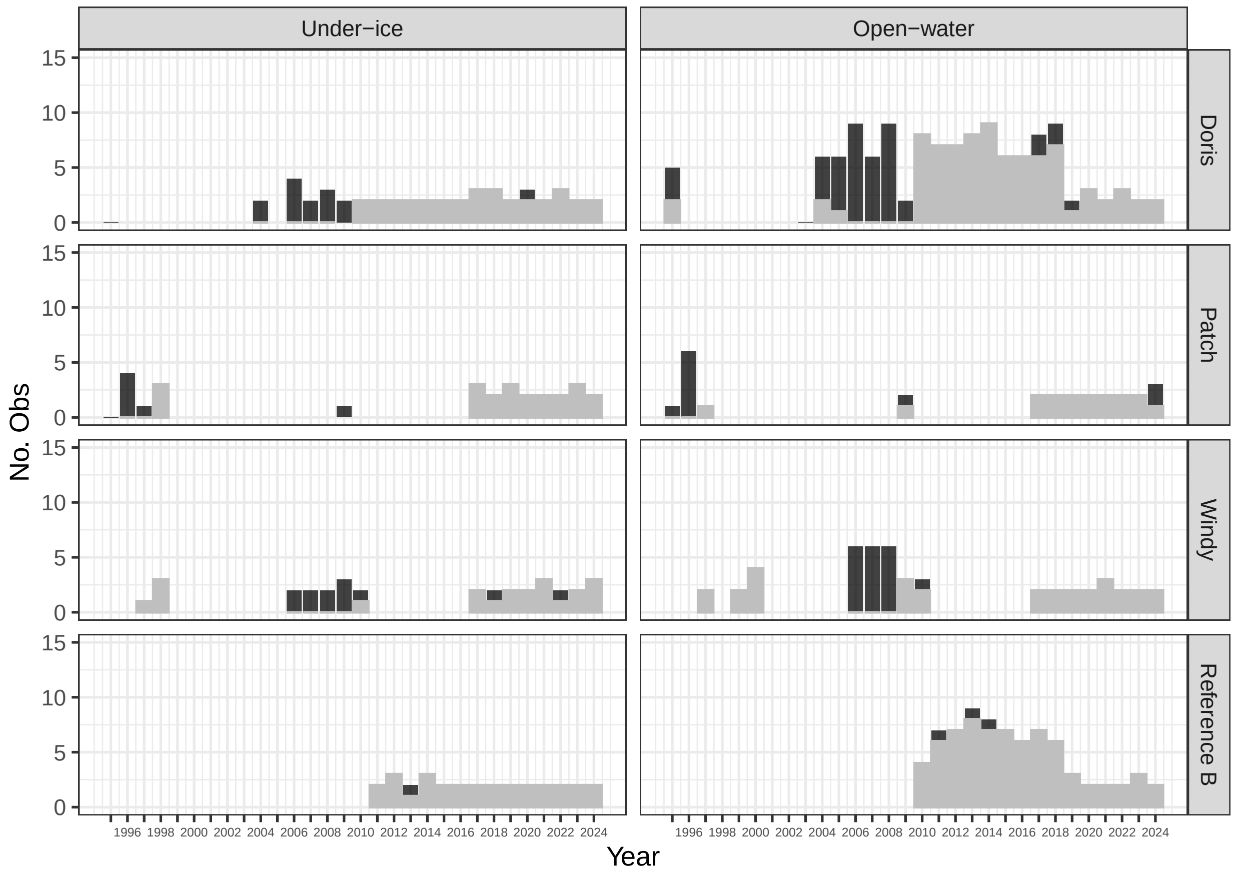
Lake	Season	# Obs (total)	# < DL (total)	% < DL (total)	% < DL (2024)
Doris	Under-ice	49	43	88	100
Doris	Open-water	125	111	89	100
Patch	Under-ice	30	25	83	100
Patch	Open-water	27	24	89	100
Reference B	Under-ice	30	27	90	50
Reference B	Open-water	75	74	99	100
Windy	Under-ice	33	31	94	100
Windy	Open-water	49	36	73	100

All data from Doris North, Patch and Windy were censored. All data removed from the analysis and no statistical analyses were performed.

C.3.1.14 Total Chromium

Censored Values and Sample Sizes

The following plots indicate the number of observations for each year from each lake that were less than the detection limit (light gray) or greater than the detection limit (dark gray). Observations below the analytical detection limit were considered censored.



Analysis was not performed if greater than 50% of observations from a site-season grouping were censored or if 100% of observations from the current assessment year (i.e., 2024) were censored.

The sample sizes per lake and season are summarized in the table below.

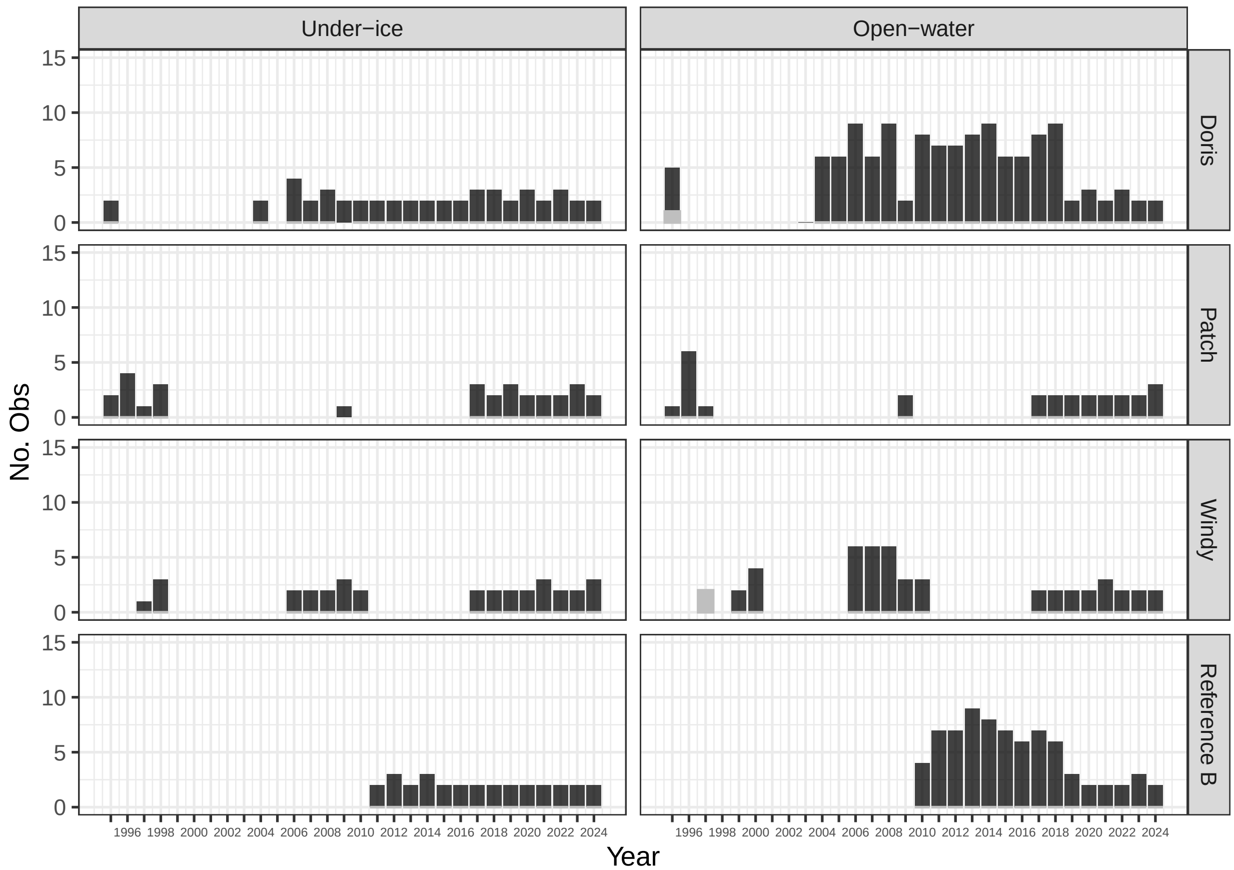
Lake	Season	# Obs (total)	# < DL (total)	% < DL (total)	% < DL (2024)
Doris	Under-ice	47	33	70	100
Doris	Open-water	125	82	66	100
Patch	Under-ice	28	22	79	100
Patch	Open-water	27	17	63	33
Reference B	Under-ice	30	29	97	100
Reference B	Open-water	75	72	96	100
Windy	Under-ice	33	21	64	100
Windy	Open-water	49	30	61	100

All data from Doris North, Patch and Windy were censored. All data removed from the analysis and no statistical analyses were performed.

C.3.1.15 Total Copper

Censored Values and Sample Sizes

The following plots indicate the number of observations for each year from each lake that were less than the detection limit (light gray) or greater than the detection limit (dark gray). Observations below the analytical detection limit were considered censored.



Analysis was not performed if greater than 50% of observations from a site-season grouping were censored or if 100% of observations from the current assessment year (i.e., 2024) were censored.

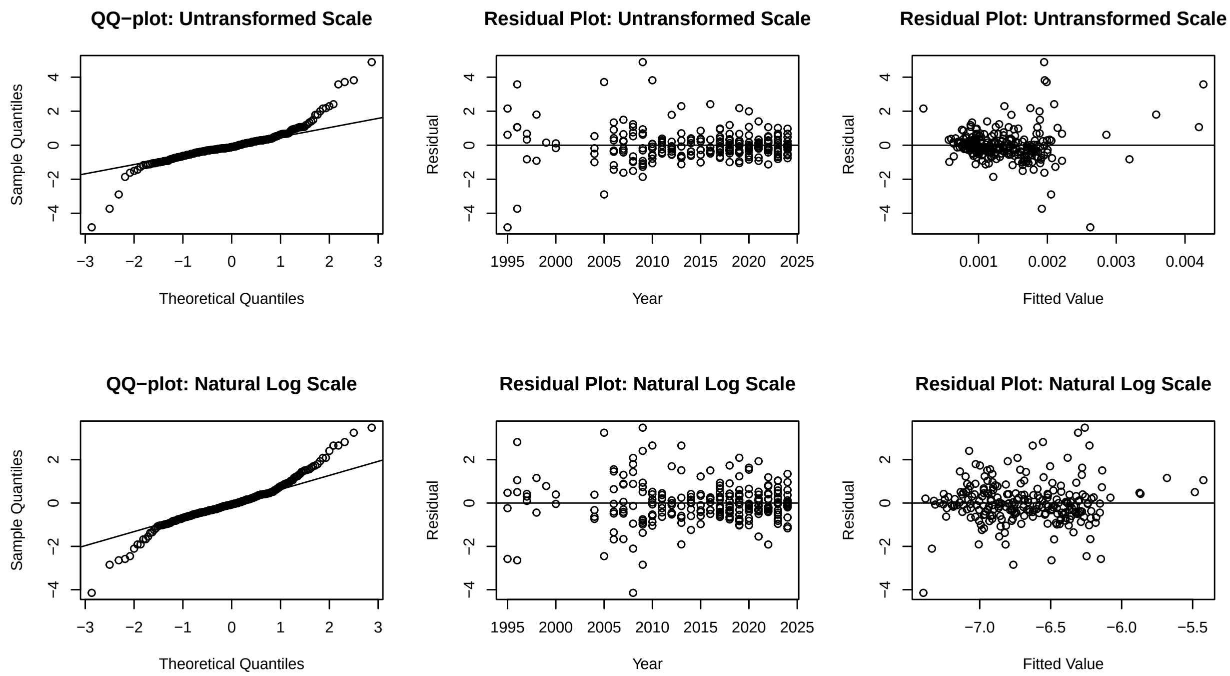
The sample sizes per lake and season are summarized in the table below.

Lake	Season	# Obs (total)	# < DL (total)	% < DL (total)	% < DL (2024)
Doris	Under-ice	49	0	0	0
Doris	Open-water	125	1	1	0
Patch	Under-ice	30	0	0	0
Patch	Open-water	27	0	0	0
Reference B	Under-ice	30	0	0	0
Reference B	Open-water	75	0	0	0
Windy	Under-ice	33	0	0	0
Windy	Open-water	49	2	4	0

None of the sites exhibited greater than 50% of data less than the detection limit. The analysis proceeds with linear mixed model regression.

Initial Model Fit

A model was fit both on the untransformed and natural log scale to assess the need for transformations. Outliers were identified from the fitted model as standardized residuals greater than 3, and flagged to caution interpretation of results but not removed from the analysis.



Outliers on untransformed scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Doris	2005	Open-water	Deep	0.002853	0.002	3.712
Doris	2009	Under-ice	Surface	0.003090	0.002	4.884
Doris	2010	Under-ice	Surface	0.002850	0.002	3.818
Patch	1995	Under-ice	Surface	0.001500	0.003	-4.824
Patch	1996	Under-ice	Surface	0.005100	0.004	3.577
Patch	1996	Open-water	Surface	0.001050	0.002	-3.733

Outliers on natural log scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Doris	2005	Open-water	Deep	0.002853	-6.307	3.244
Doris	2009	Under-ice	Surface	0.003090	-6.260	3.476
Windy	2008	Under-ice	Deep	0.000346	-7.397	-4.146

The natural log-transformed data better meets the residual assumptions. Analysis proceeds with natural log-transformed data. However, there were outliers retained in the analysis. Results should be interpreted with caution and along with graphical results.

Doris Lake

The trend for Doris Lake was compared to a slope of zero. If there was a significant trend, then the trend for Doris Lake was compared to the trend in Reference Lake B. This contrast does not test for differences in intercepts between lakes.

Doris Under-Ice

Analysis	Chi.sq	df	p	Significance
Compare to slope zero	8.821	4	0.06570	not sig.

Doris Lake did not exhibit significant deviation from a slope of zero and thus comparison to the trend in Reference Lake B was not completed.

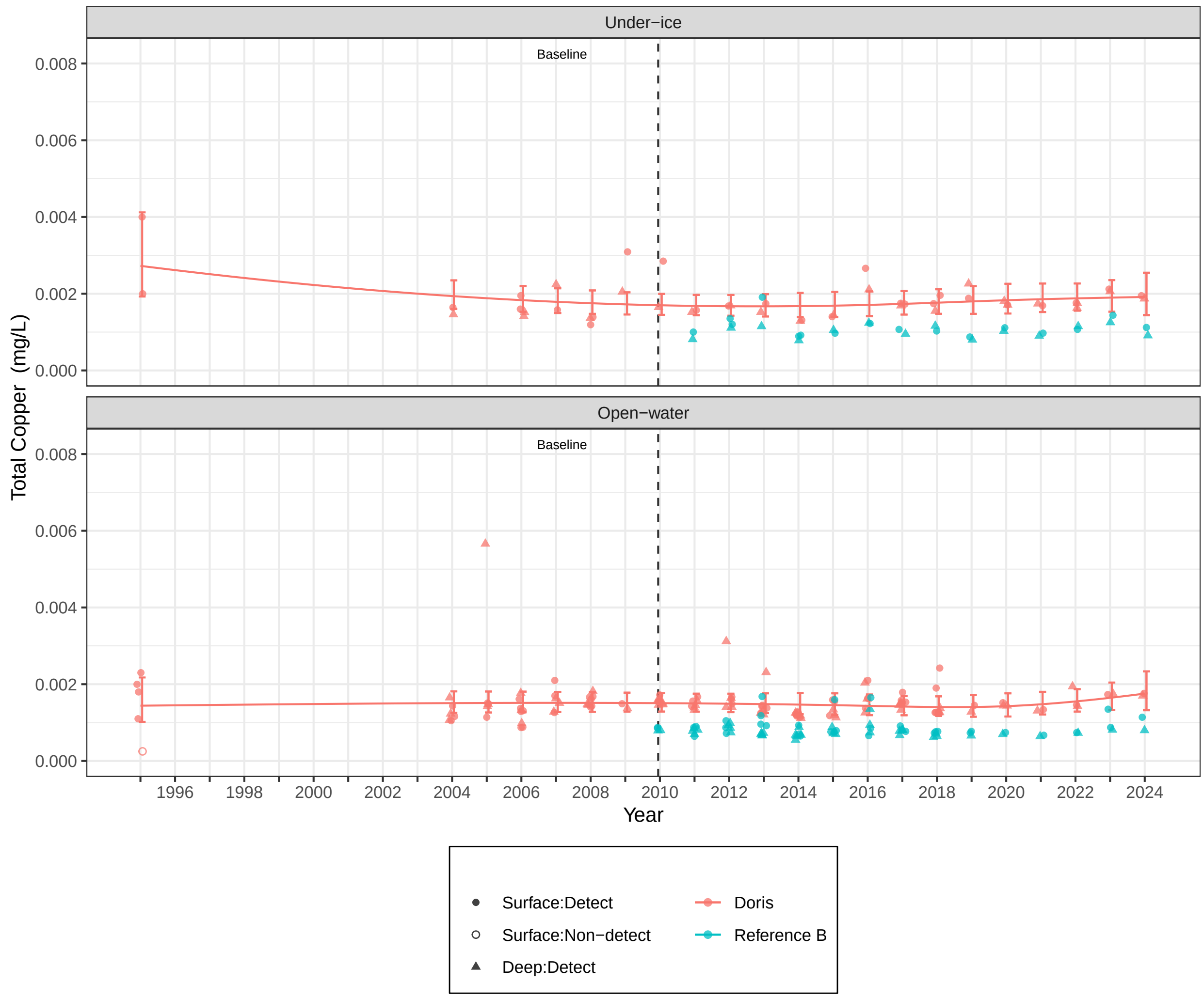
Doris Open-Water

Analysis	Chi.sq	df	p	Significance
Compare to slope zero	2.714	4	0.60670	not sig.

Doris Lake did not exhibit significant deviation from a slope of zero and thus comparison to the trend in Reference Lake B was not completed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols are values presented at half the detection limit. Solid lines represent the fitted curves. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations.



Patch Lake

Before-after analyses were first performed to compare the change in the before and after period for the exposure site. If a change was detected, then before-after-control-impact linear modelling was applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Patch Under-Ice Before-After Analysis

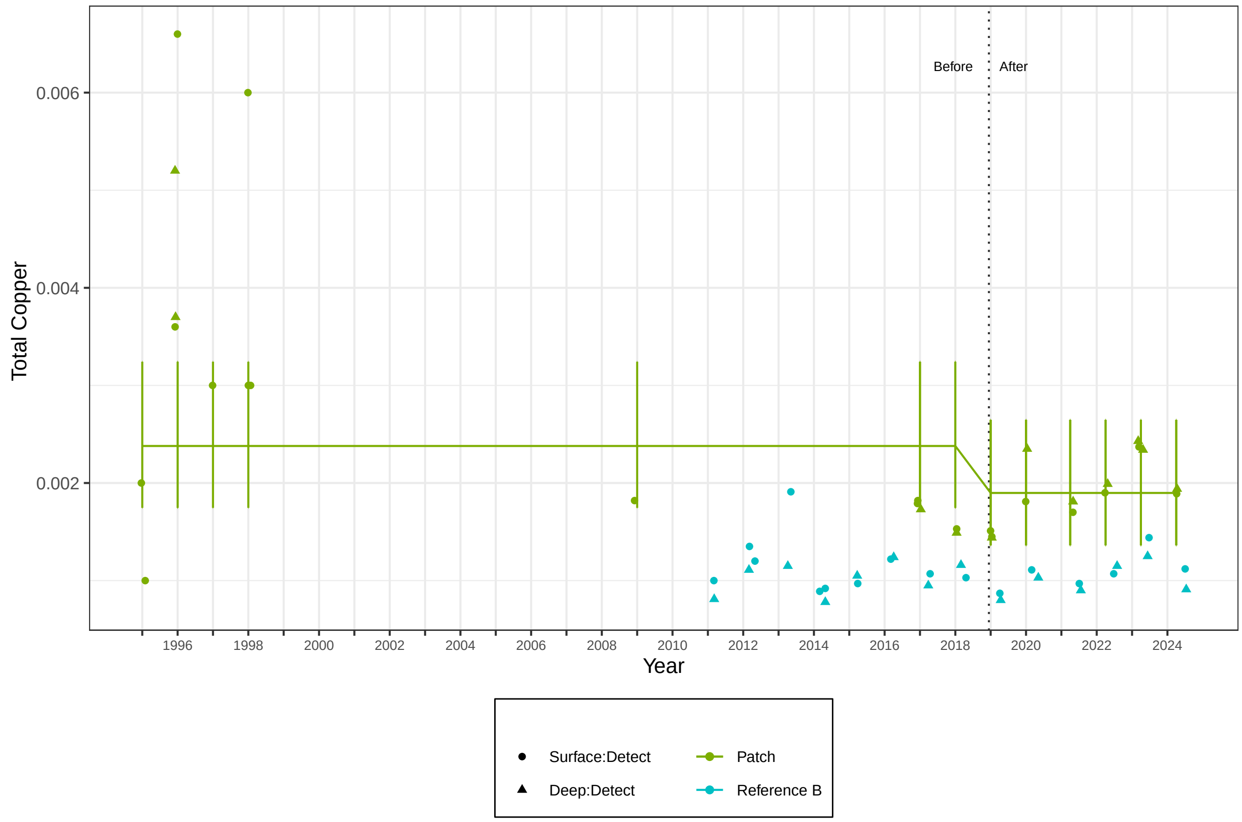
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	-0.226	0.2066	10.99	-1.094	0.2974	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Patch Open-Water Before-After Analysis

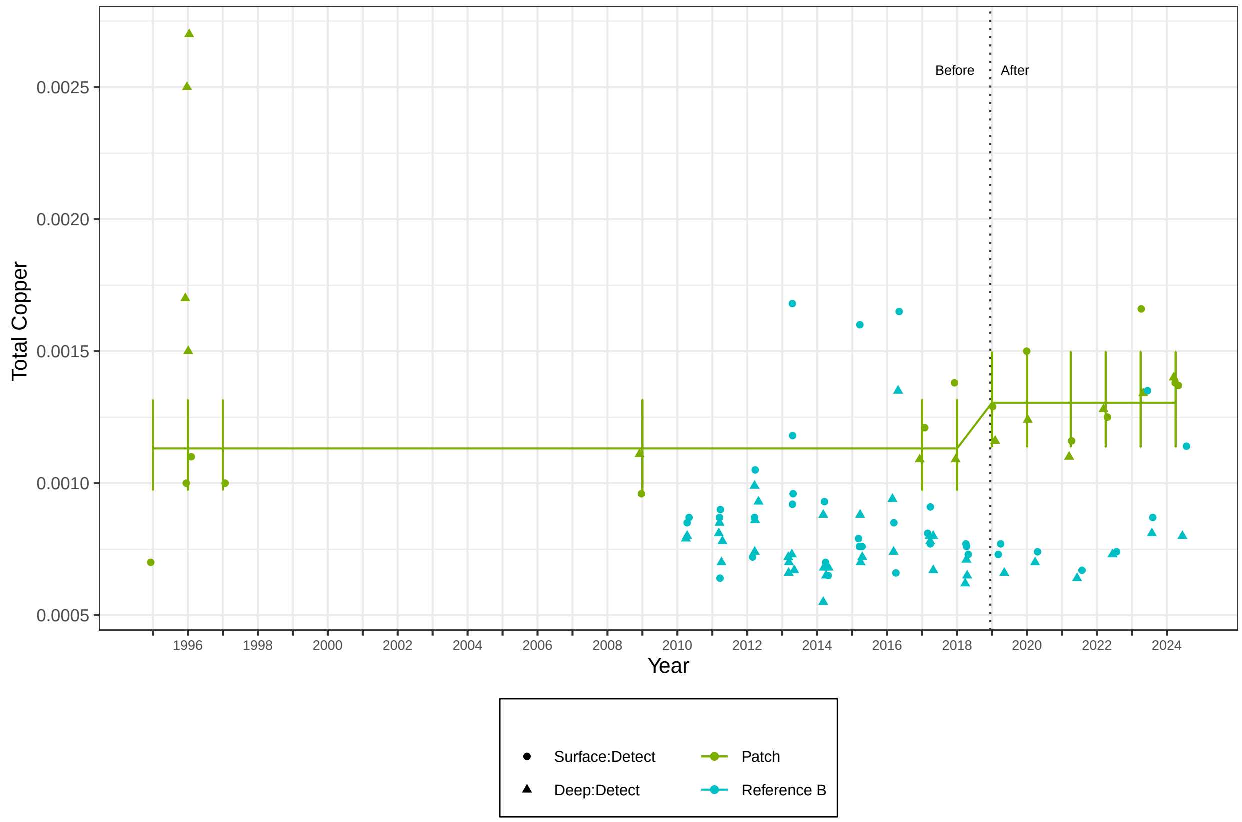
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0.1424	0.0905	19	1.574	0.132	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Windy Lake

Before-after analyses were first performed to compare the change in the before and after period in the exposure lake. If a change was detected then before-after-control-impact linear modeling would be applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Windy Under-Ice Before-After Analysis

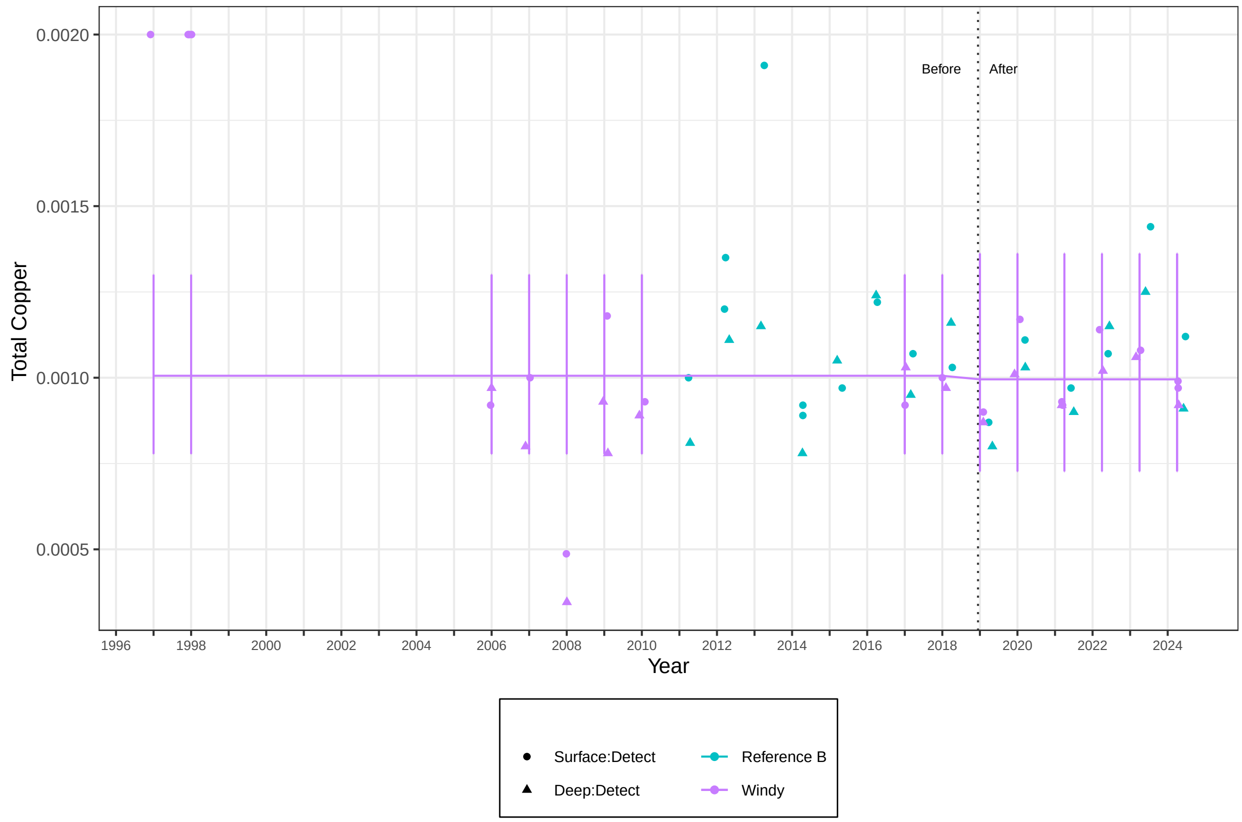
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	-0.0105	0.1876	12.57	-0.0558	0.9564	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Windy Open-water Before-After Analysis

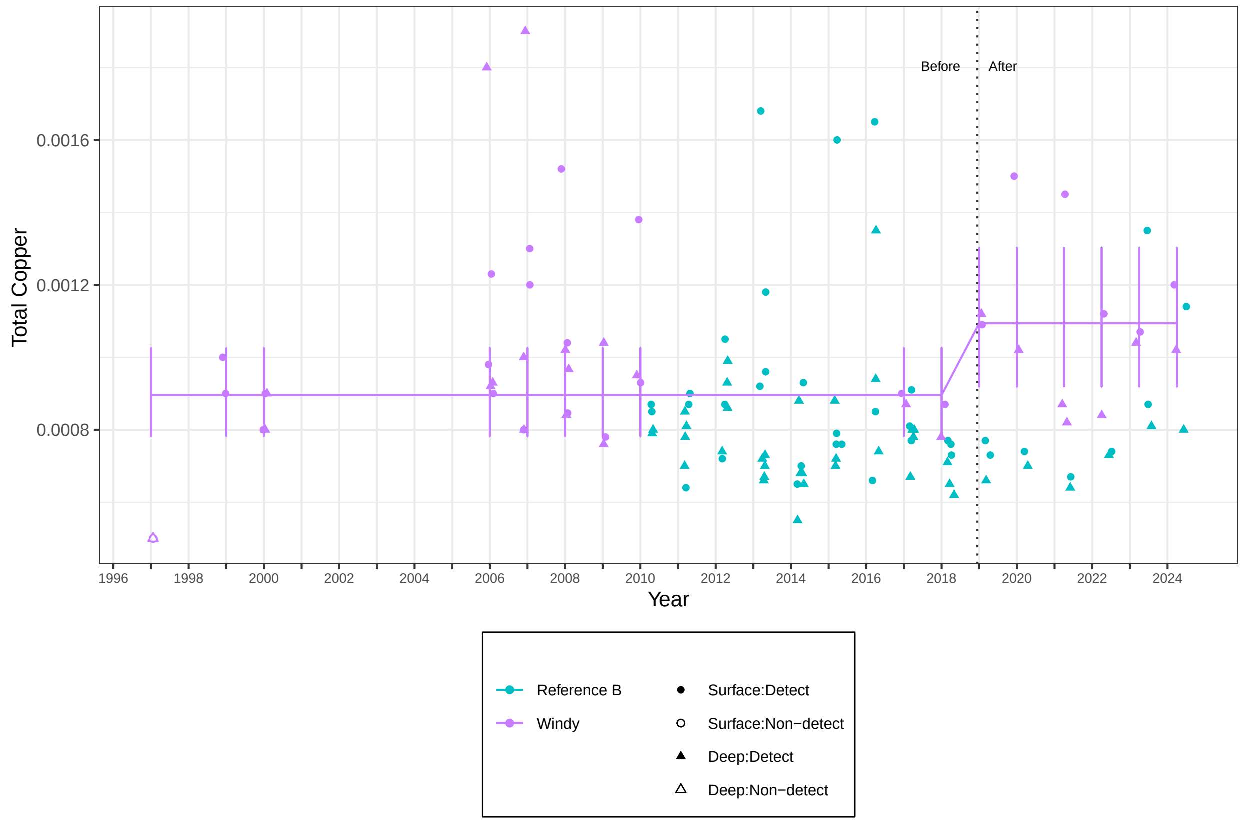
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0.1999	0.1035	14.14	1.931	0.0738	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

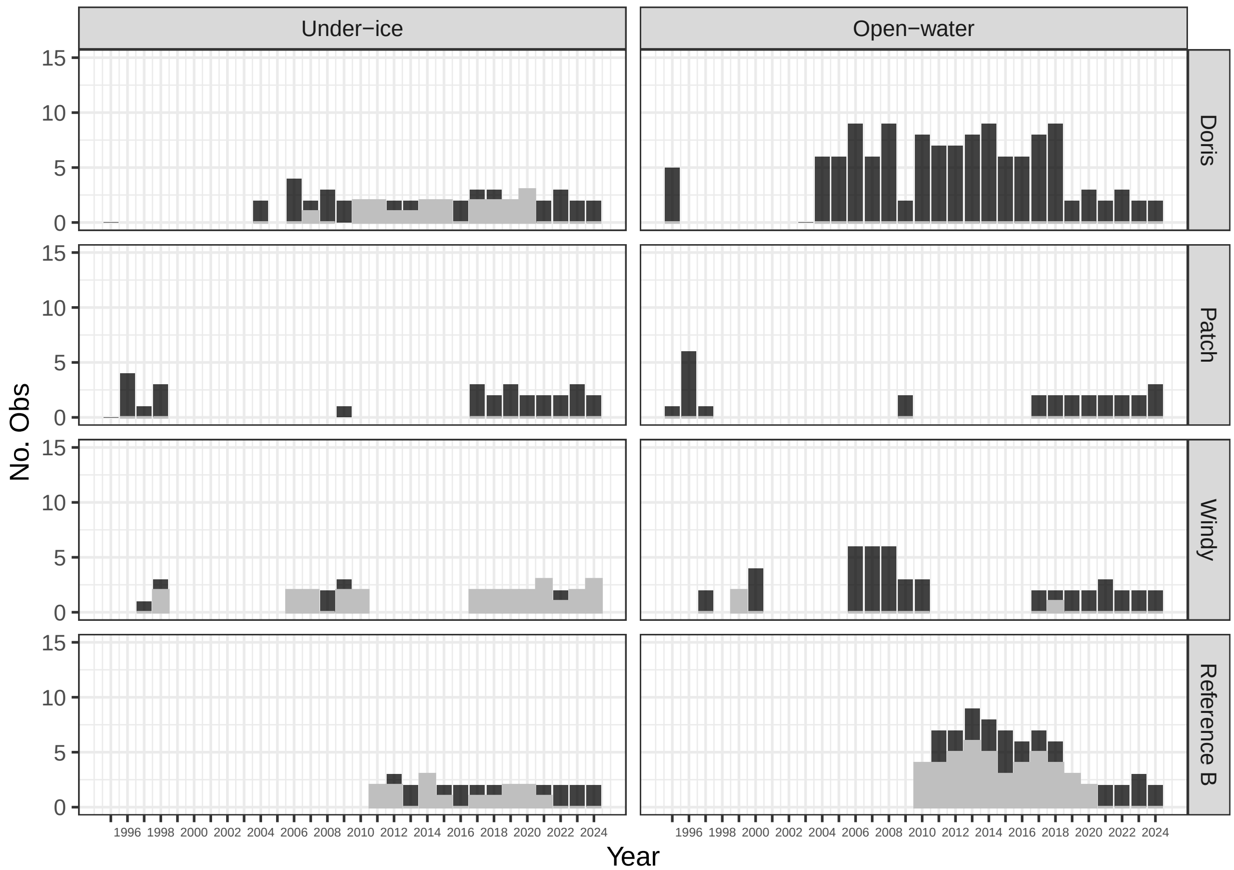
The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.


Before
After
0.0016
0.0012
0.0008
Total Copper
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
Year
Reference B
Windy
Surface:Detect
Surface:Non−detect
Deep:Detect
Deep:Non−detect

C.3.1.16 Total Iron

Censored Values and Sample Sizes

The following plots indicate the number of observations for each year from each lake that were less than the detection limit (light gray) or greater than the detection limit (dark gray). Observations below the analytical detection limit were considered censored.



Analysis was not performed if greater than 50% of observations from a site-season grouping were censored or if 100% of observations from the current assessment year (i.e., 2024) were censored.

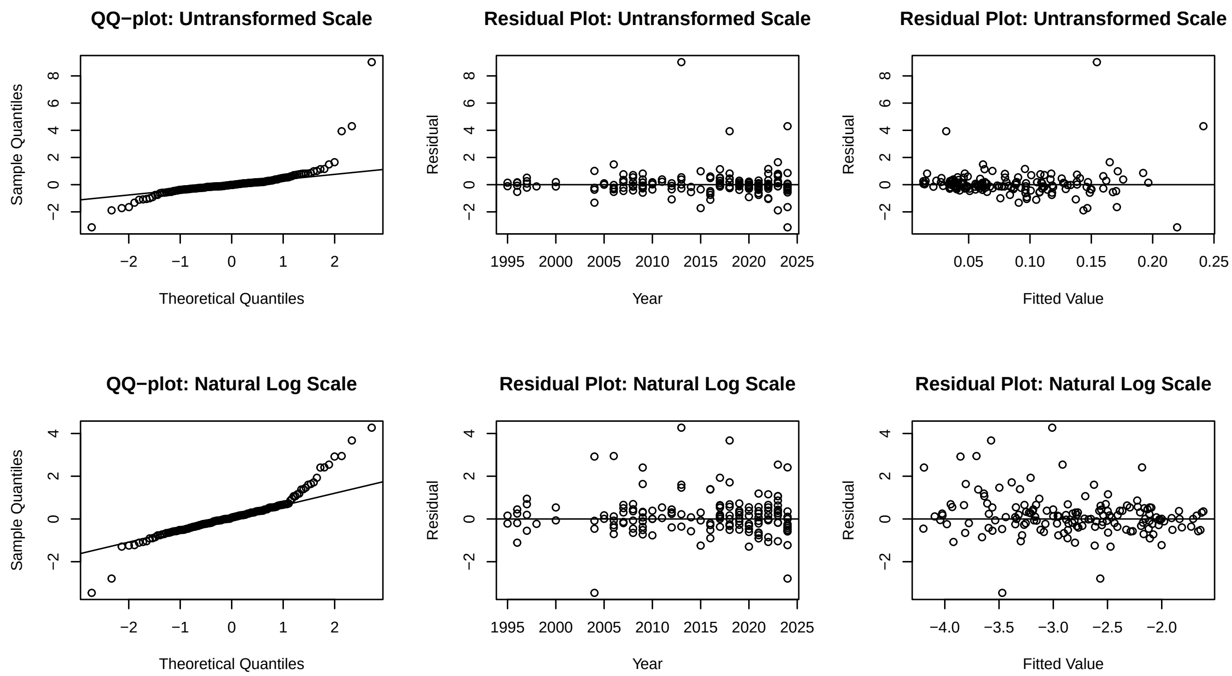
The sample sizes per lake and season are summarized in the table below.

Lake	Season	# Obs (total)	# < DL (total)	% < DL (total)	% < DL (2024)
Doris	Under-ice	47	20	43	0
Doris	Open-water	125	0	0	0
Patch	Under-ice	28	0	0	0
Patch	Open-water	27	0	0	0
Reference B	Under-ice	30	15	50	0
Reference B	Open-water	75	45	60	0
Windy	Under-ice	33	27	82	100
Windy	Open-water	49	3	6	0

More than 50% of data was under detection limit in Reference B Open-water and Windy Under-ice. Data from those site-season groupings will be removed from the analysis. Doris North Under-ice and Reference B Under-ice exhibited more than 10% of data under detection limit. The analysis proceeds with tobit regression for Doris Lake.

Initial Model Fit

A model was fit both on the untransformed and natural log scale to assess the need for transformations. Outliers were identified from the fitted model as standardized residuals greater than 3, and flagged to caution interpretation of results but not removed from the analysis.



Outliers on untransformed scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Reference B	2013	Under-ice	Surface	0.749	0.155	9.013
Reference B	2018	Under-ice	Deep	0.291	0.032	3.931
Reference B	2024	Under-ice	Deep	0.525	0.241	4.301
Reference B	2024	Under-ice	Surface	0.013	0.220	-3.137

Outliers on natural log scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Doris	2004	Under-ice	Deep	0.00344	-3.470	-3.457
Reference B	2013	Under-ice	Surface	0.74900	-3.010	4.271
Reference B	2018	Under-ice	Deep	0.29100	-3.573	3.672

The natural log-transformed data better meets the residual assumptions. Analysis proceeds with natural log-transformed data. However, there were outliers retained in the analysis. Results should be interpreted with caution and along with graphical results.

Doris Lake

The trend for Doris Lake was compared to a slope of zero. If there was a significant trend, then the trend for Doris Lake was compared to the trend in Reference Lake B. This contrast does not test for differences in intercepts between lakes.

Doris Under-Ice

Analysis	Chi.sq	df	p	Significance
Compare to slope zero	0.566	3	0.90410	not sig.

Doris Lake did not exhibit significant deviation from a slope of zero and thus comparison to the trend in Reference Lake B was not completed.

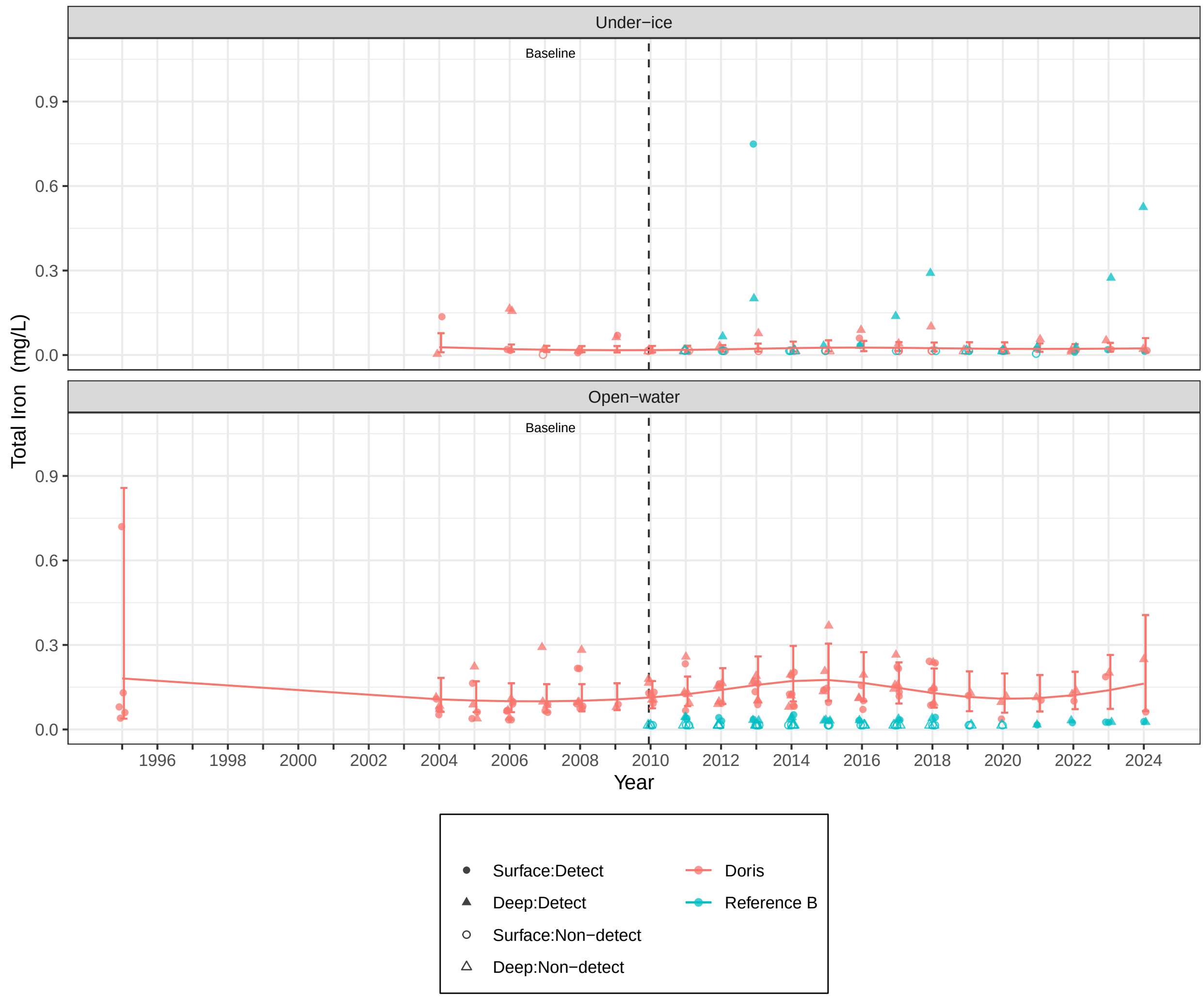
Doris Open-Water

Analysis	Chi.sq	df	p	Significance
Compare to slope zero	0.806	3	0.84800	not sig.

Doris Lake did not exhibit significant deviation from a slope of zero and thus comparison to the trend in Reference Lake B was not completed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols are values presented at half the detection limit. Solid lines represent the fitted curves. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations.



Patch Lake

Before-after analyses were first performed to compare the change in the before and after period for the exposure site. If a change was detected, then before-after-control-impact linear modelling was applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Patch Under-Ice Before-After Analysis

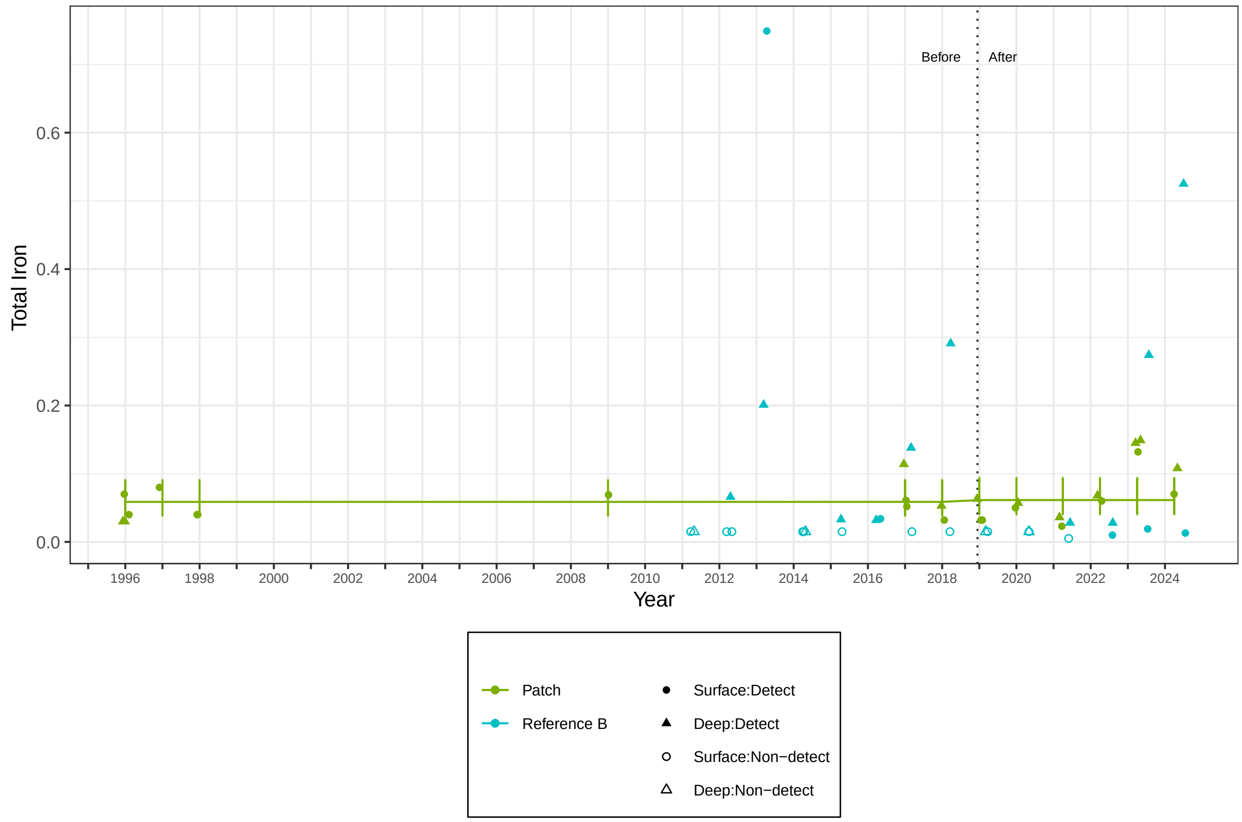
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0.0444	0.2769	10.47	0.1604	0.8756	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Patch Open-Water Before-After Analysis

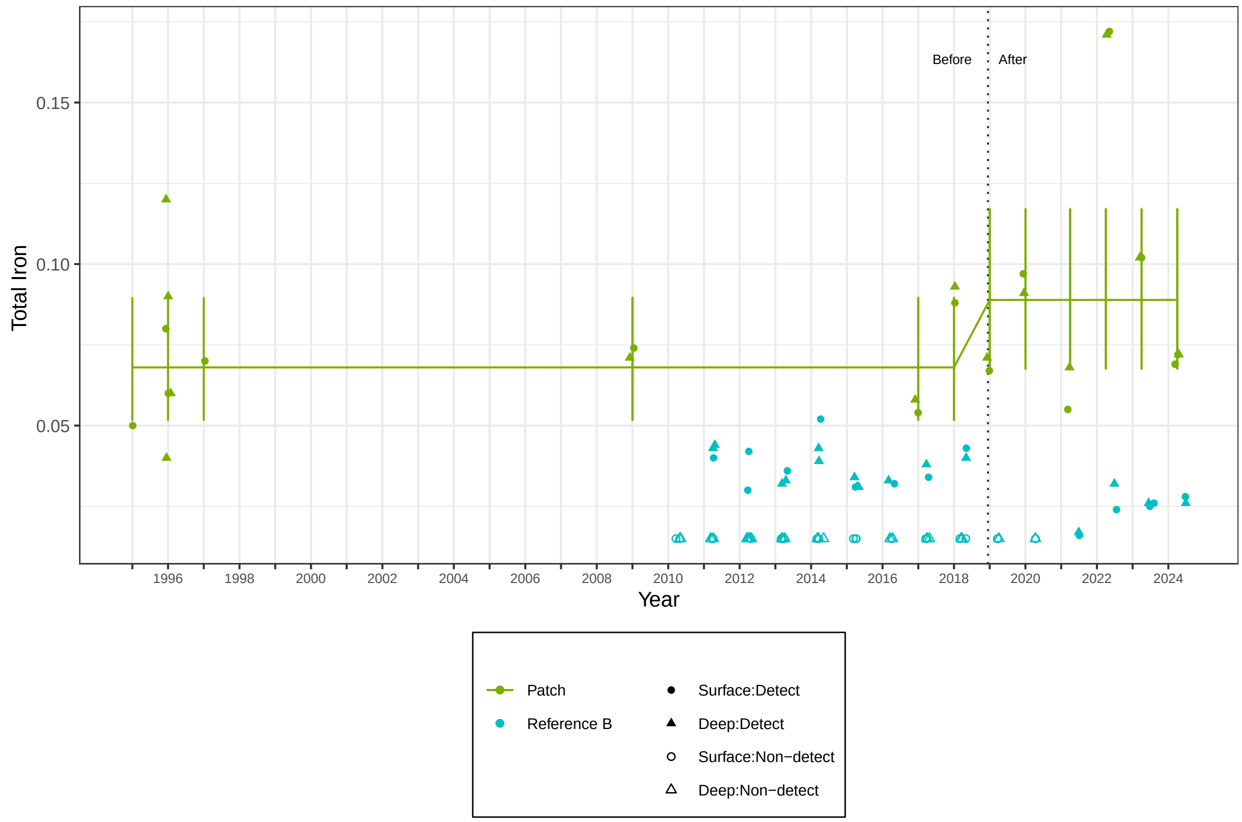
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0.2678	0.1756	10.03	1.526	0.158	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Windy Lake

Before-after analyses were first performed to compare the change in the before and after period in the exposure lake. If a change was detected then before-after-control-impact linear modeling would be applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Windy Under-Ice Before-After Analysis Analysis was not performed.

Windy Open-water Before-After Analysis

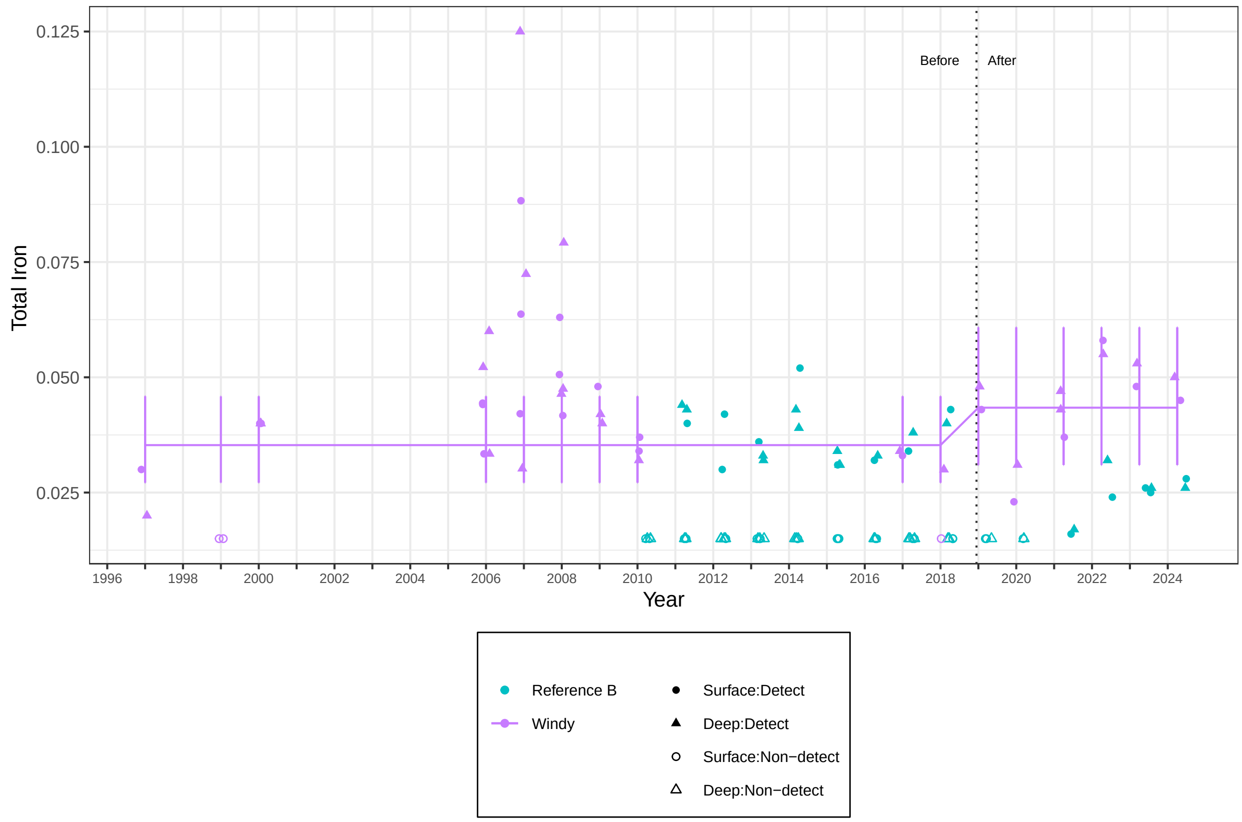
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0.2071	0.1992	13.35	1.04	0.3169	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

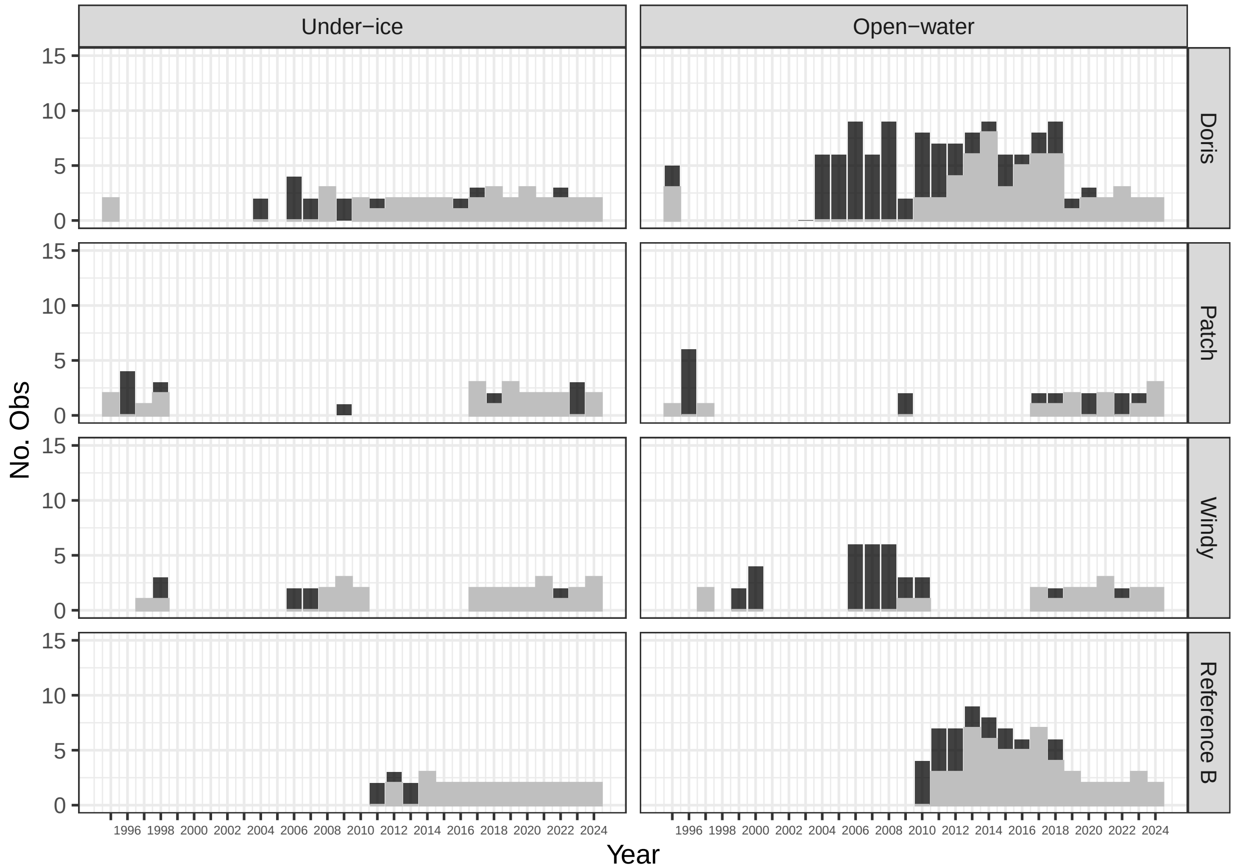
The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.


0.125
0.100
0.075
0.050
0.025
Total Iron
Before
After
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
Year
Reference B
Windy
Surface:Detect
Deep:Detect
Surface:Non−detect
Deep:Non−detect

C.3.1.17 Total Lead

Censored Values and Sample Sizes

The following plots indicate the number of observations for each year from each lake that were less than the detection limit (light gray) or greater than the detection limit (dark gray). Observations below the analytical detection limit were considered censored.



Analysis was not performed if greater than 50% of observations from a site-season grouping were censored or if 100% of observations from the current assessment year (i.e., 2024) were censored.

The sample sizes per lake and season are summarized in the table below.

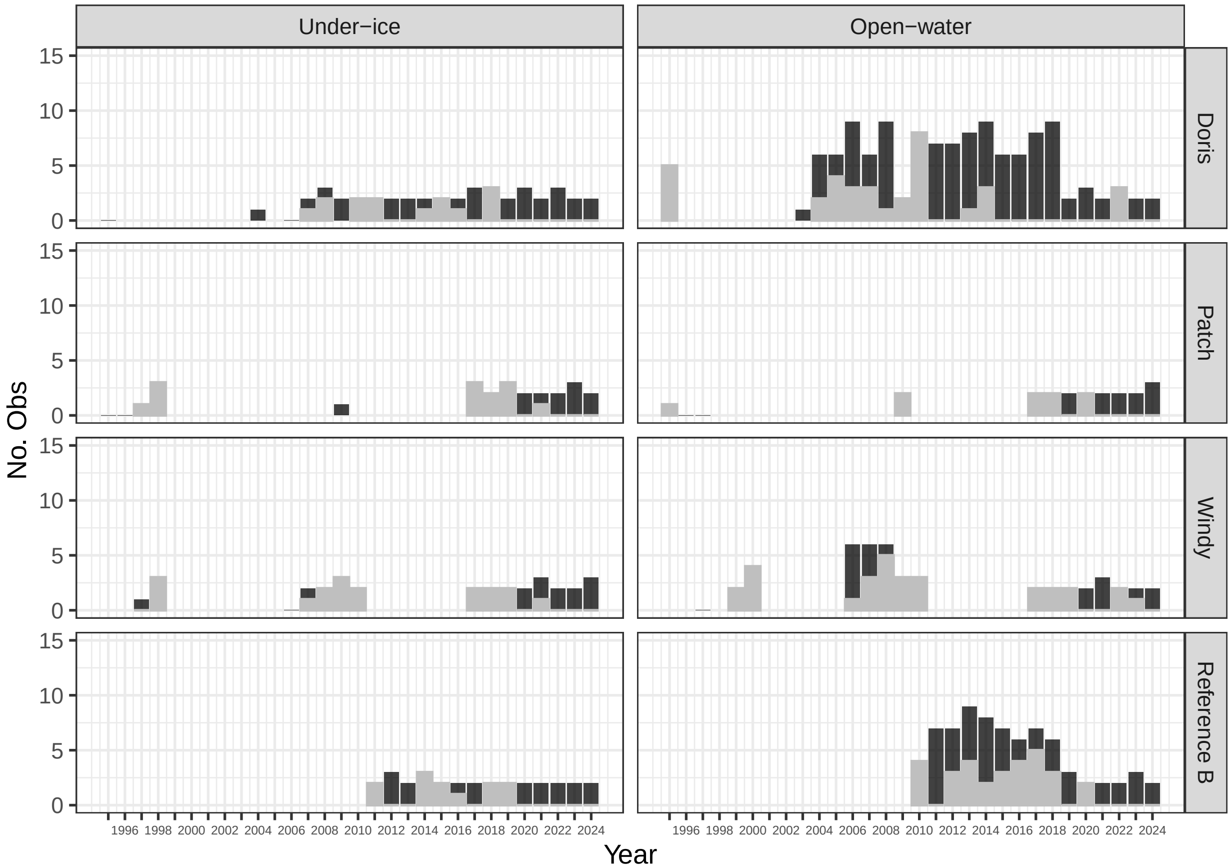
Lake	Season	# Obs (total)	# < DL (total)	% < DL (total)	% < DL (2024)
Doris	Under-ice	49	36	73	100
Doris	Open-water	125	57	46	100
Patch	Under-ice	30	20	67	100
Patch	Open-water	27	12	44	100
Reference B	Under-ice	30	25	83	100
Reference B	Open-water	75	54	72	100
Windy	Under-ice	33	26	79	100
Windy	Open-water	49	19	39	100

All data from Doris North, Patch and Windy were censored. All data removed from the analysis and no statistical analyses were performed.

C.3.1.18 Total Mercury

Censored Values and Sample Sizes

The following plots indicate the number of observations for each year from each lake that were less than the detection limit (light gray) or greater than the detection limit (dark gray). Observations below the analytical detection limit were considered censored.



Analysis was not performed if greater than 50% of observations from a site-season grouping were censored or if 100% of observations from the current assessment year (i.e., 2024) were censored.

The sample sizes per lake and season are summarized in the table below.

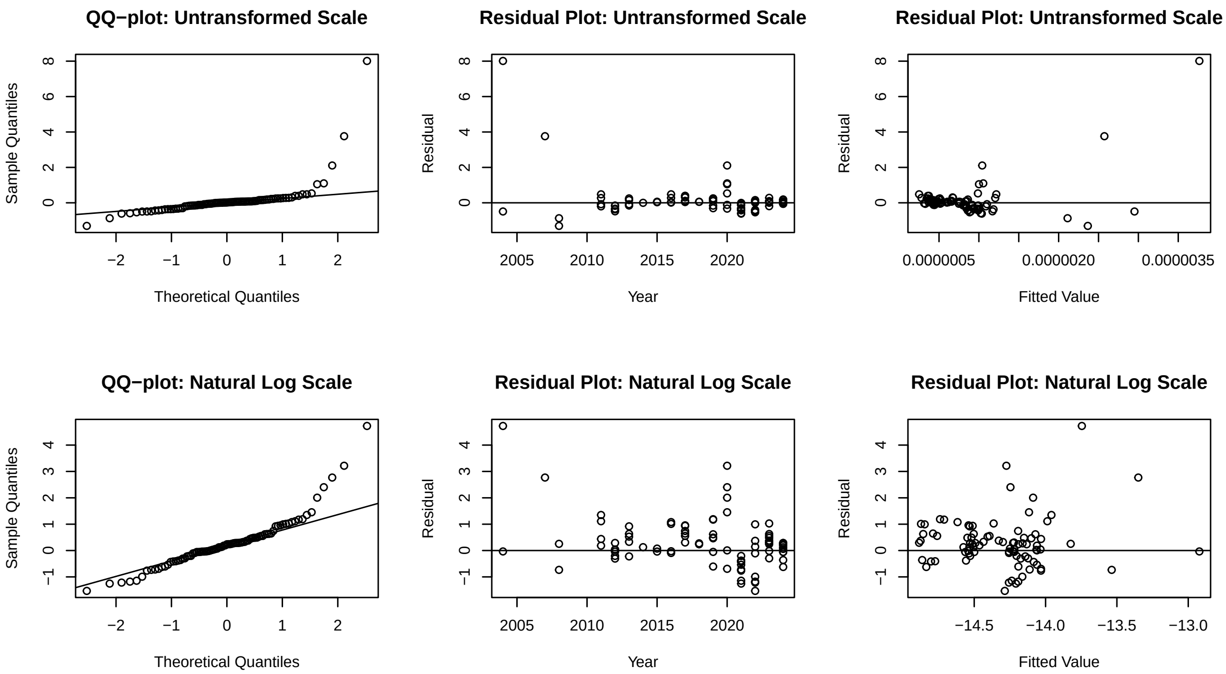
Lake	Season	# Obs (total)	# < DL (total)	% < DL (total)	% < DL (2024)
Doris	Under-ice	42	16	38	0
Doris	Open-water	126	36	29	0
Patch	Under-ice	24	14	58	0
Patch	Open-water	20	9	45	0
Reference B	Under-ice	30	12	40	0
Reference B	Open-water	75	30	40	0
Windy	Under-ice	31	18	58	0
Windy	Open-water	47	30	64	0

More than 50% of data was under detection limit in Patch Under-ice, Windy Under-ice, and Windy Open-water. Data from those site-season groupings will be removed from the analysis. Doris North Under-ice, Doris North Open-water, Patch Open-water, Reference B Under-ice, and Reference B

Open-water exhibited more than 10% of data under detection limit. The analysis proceeds with tobit regression for Doris Lake.

Initial Model Fit

A model was fit both on the untransformed and natural log scale to assess the need for transformations. Outliers were identified from the fitted model as standardized residuals greater than 3, and flagged to caution interpretation of results but not removed from the analysis.



Outliers on untransformed scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Doris	2004	Open-water	Deep	0.00001277	0	8.011
Doris	2007	Under-ice	Surface	6.800e-06	0	3.761

Outliers on natural log scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Doris	2004	Open-water	Deep	0.00001277	-13.75	4.726
Reference B	2020	Under-ice	Deep	3.410e-06	-14.28	3.216

The natural log transformed model better meets the residual assumptions. Analysis proceeds with natural log transformed data.

Doris Lake

The trend for Doris Lake was compared to a slope of zero. If there was a significant trend, then the trend for Doris Lake was compared to the trend in Reference Lake B. This contrast does not test for differences in intercepts between lakes.

Doris Under-Ice

Analysis	Chi.sq	df	p	Significance
Compare to slope zero	13.102	3	0.00440	sig.
Compare to Reference B	0.237	3	0.97150	not sig.

Doris Lake exhibited significant deviation from a slope of zero. Doris Lake did not exhibit significant deviation from the trend of Reference Lake B.

Doris Open-Water

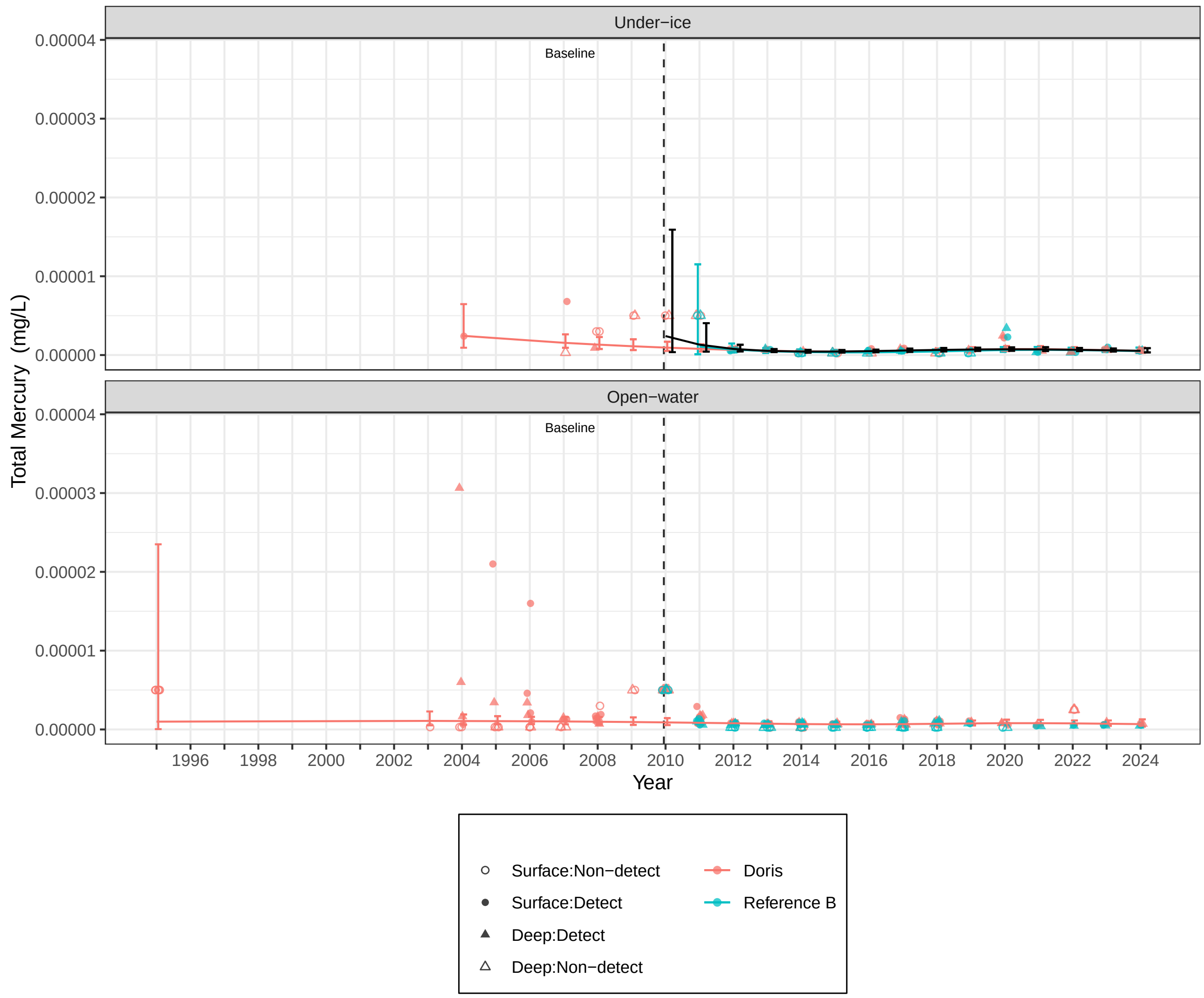
Analysis	Chi.sq	df	p	Significance
Compare to slope zero	1.877	3	0.59840	not sig.

Doris Lake did not exhibit significant deviation from a slope of zero and thus comparison to the trend in Reference Lake B was not completed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols are values presented at half the detection limit. Solid lines represent the fitted curves. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations.

As Doris Lake exhibited significant deviation from a slope of zero in at least one season, the black lines and error bars represent the model built with Doris Lake data from comparable sampling years with Reference Lake B only.



Patch Lake

Before-after analyses were first performed to compare the change in the before and after period for the exposure site. If a change was detected, then before-after-control-impact linear modelling was applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Patch Under-Ice Before-After Analysis Analysis was not performed.

Patch Open-Water Before-After Analysis

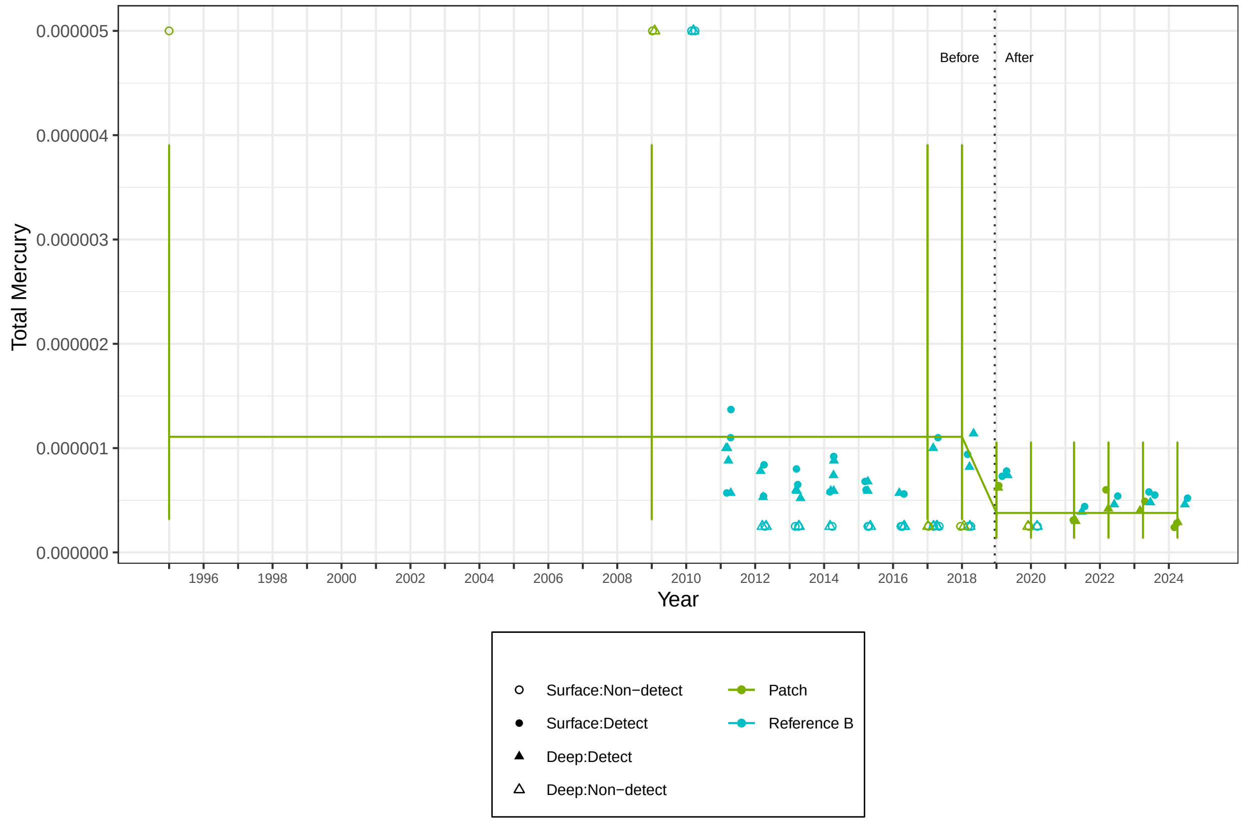
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	-1.075	0.7058	7.995	-1.523	0.1663	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Windy Lake

Before-after analyses were first performed to compare the change in the before and after period in the exposure lake. If a change was detected then before-after-control-impact linear modeling would be applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

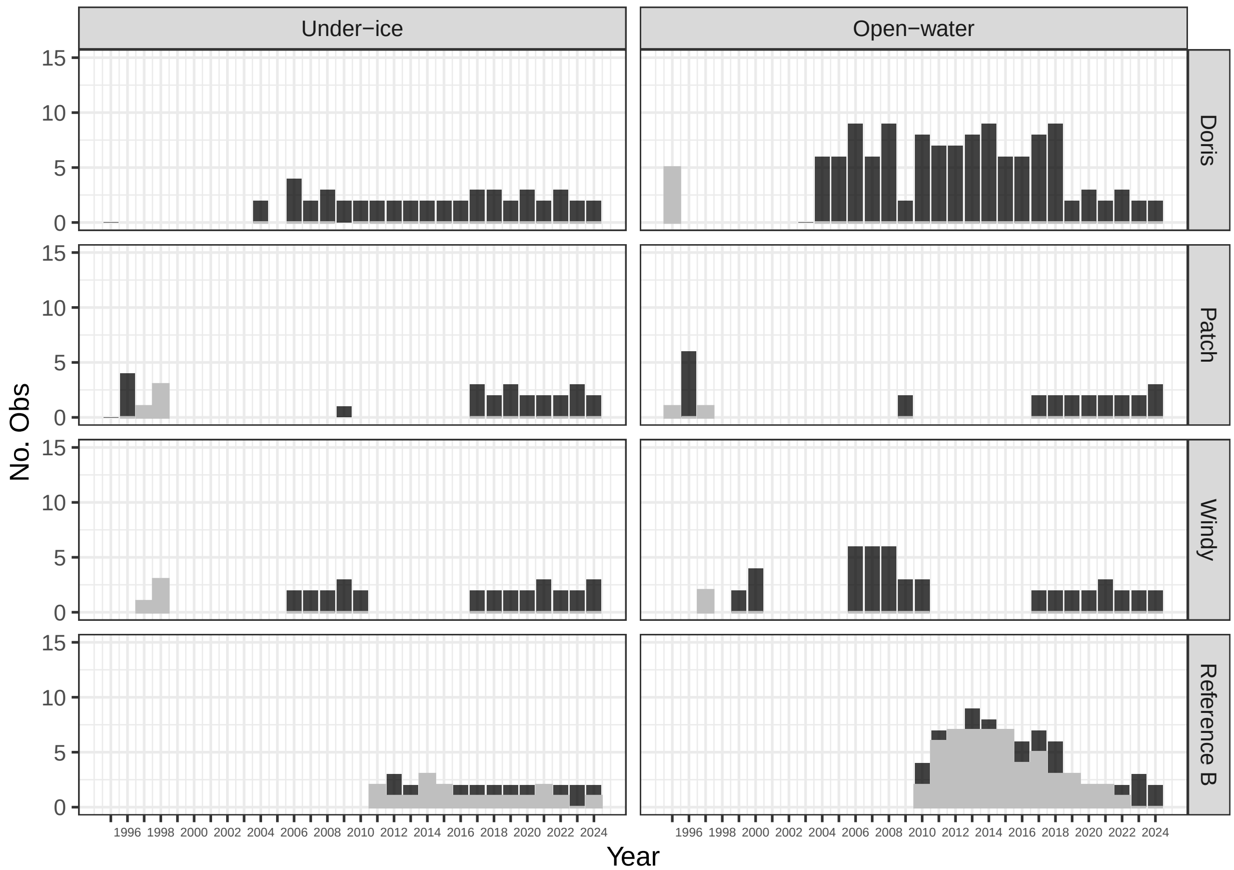
Windy Under-Ice Before-After Analysis Analysis was not performed.

Windy Open-water Before-After Analysis Analysis was not performed.

C.3.1.19 Total Molybdenum

Censored Values and Sample Sizes

The following plots indicate the number of observations for each year from each lake that were less than the detection limit (light gray) or greater than the detection limit (dark gray). Observations below the analytical detection limit were considered censored.



Analysis was not performed if greater than 50% of observations from a site-season grouping were censored or if 100% of observations from the current assessment year (i.e., 2024) were censored.

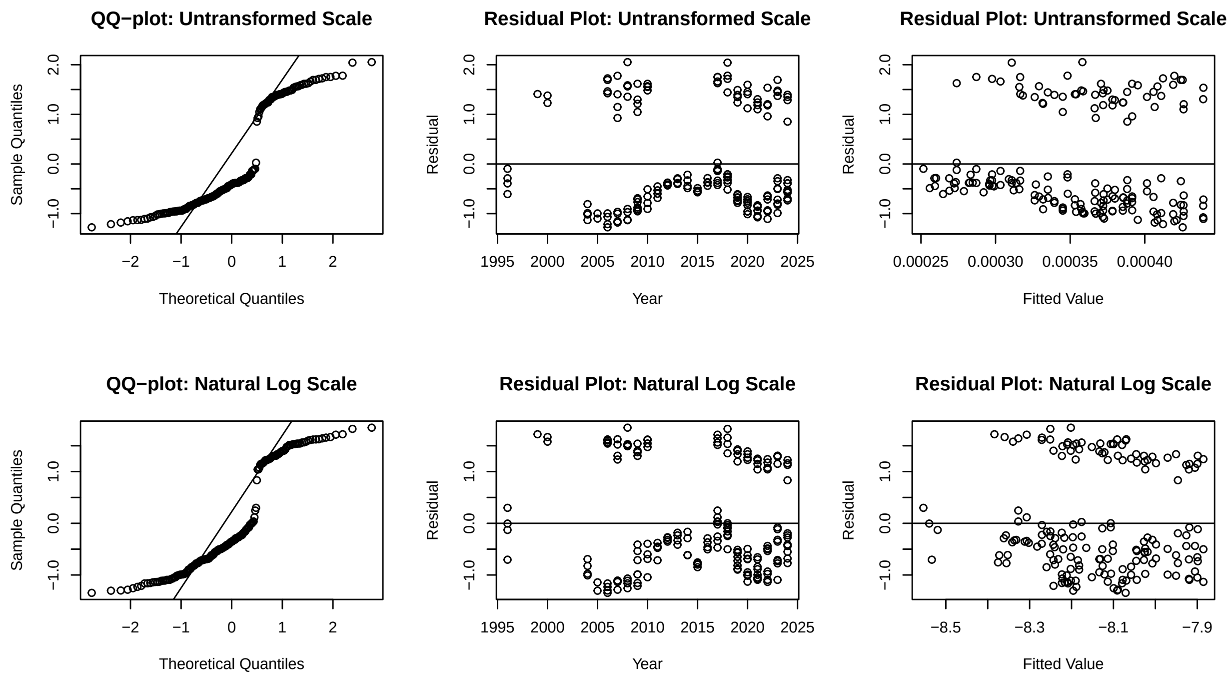
The sample sizes per lake and season are summarized in the table below.

Lake	Season	# Obs (total)	# < DL (total)	% < DL (total)	% < DL (2024)
Doris	Under-ice	47	0	0	0
Doris	Open-water	125	5	4	0
Patch	Under-ice	28	4	14	0
Patch	Open-water	27	2	7	0
Reference B	Under-ice	30	18	60	50
Reference B	Open-water	75	56	75	0
Windy	Under-ice	33	4	12	0
Windy	Open-water	49	2	4	0

More than 50% of data was under detection limit in Reference B Under-ice and Reference B Open-water. Data from those site-season groupings will be removed from the analysis.

Initial Model Fit

A model was fit both on the untransformed and natural log scale to assess the need for transformations. Outliers were identified from the fitted model as standardized residuals greater than 3, and flagged to caution interpretation of results but not removed from the analysis.



Outliers on untransformed scale:

None

Outliers on natural log scale:

None

The untransformed and natural log-transformed model fit the data equally well. Analysis proceeds with untransformed data.

Doris Lake

The trend for Doris Lake was compared to a slope of zero. If there was a significant trend, then the trend for Doris Lake was compared to the trend in Reference Lake B. This contrast does not test for differences in intercepts between lakes.

Doris Under-Ice

Analysis	Chi.sq	df	p	Significance
Compare to slope zero	27.8	3	<0.00001	sig.

Doris Lake exhibited significant deviation from a slope of zero. Comparison to the trend in Reference Lake B was not completed due to Reference Lake B being excluded from analysis.

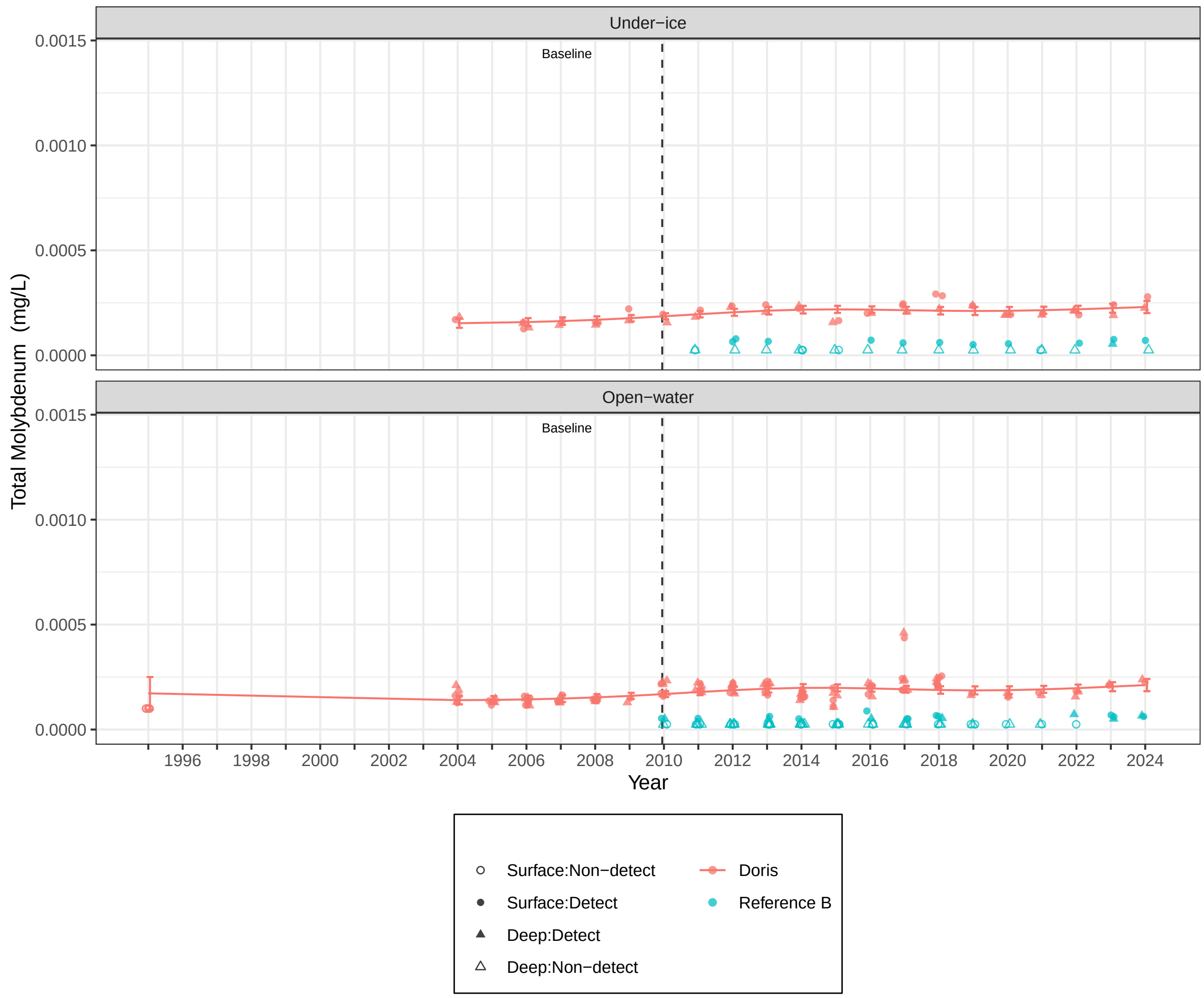
Doris Open-Water

Analysis	Chi.sq	df	p	Significance
Compare to slope zero	23.38	3	<0.00001	sig.

Doris Lake exhibited significant deviation from a slope of zero. Comparison to the trend in Reference Lake B was not completed due to Reference Lake B being excluded from analysis.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols are values presented at half the detection limit. Solid lines represent the fitted curves. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations.



Patch Lake

Before-after analyses were first performed to compare the change in the before and after period for the exposure site. If a change was detected, then before-after-control-impact linear modelling was applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Patch Under-Ice Before-After Analysis

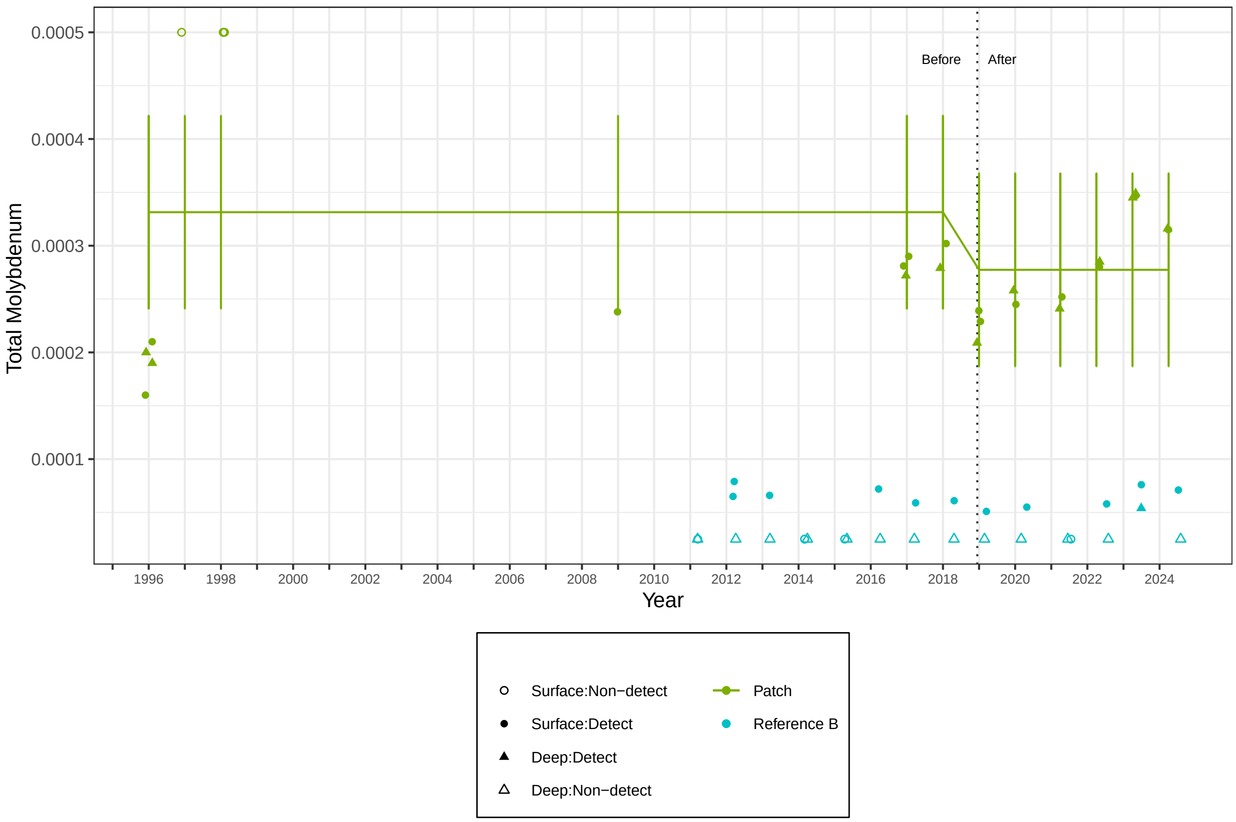
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	-0.0001	0.0001	37.71	-0.9374	0.3545	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Patch Open-Water Before-After Analysis

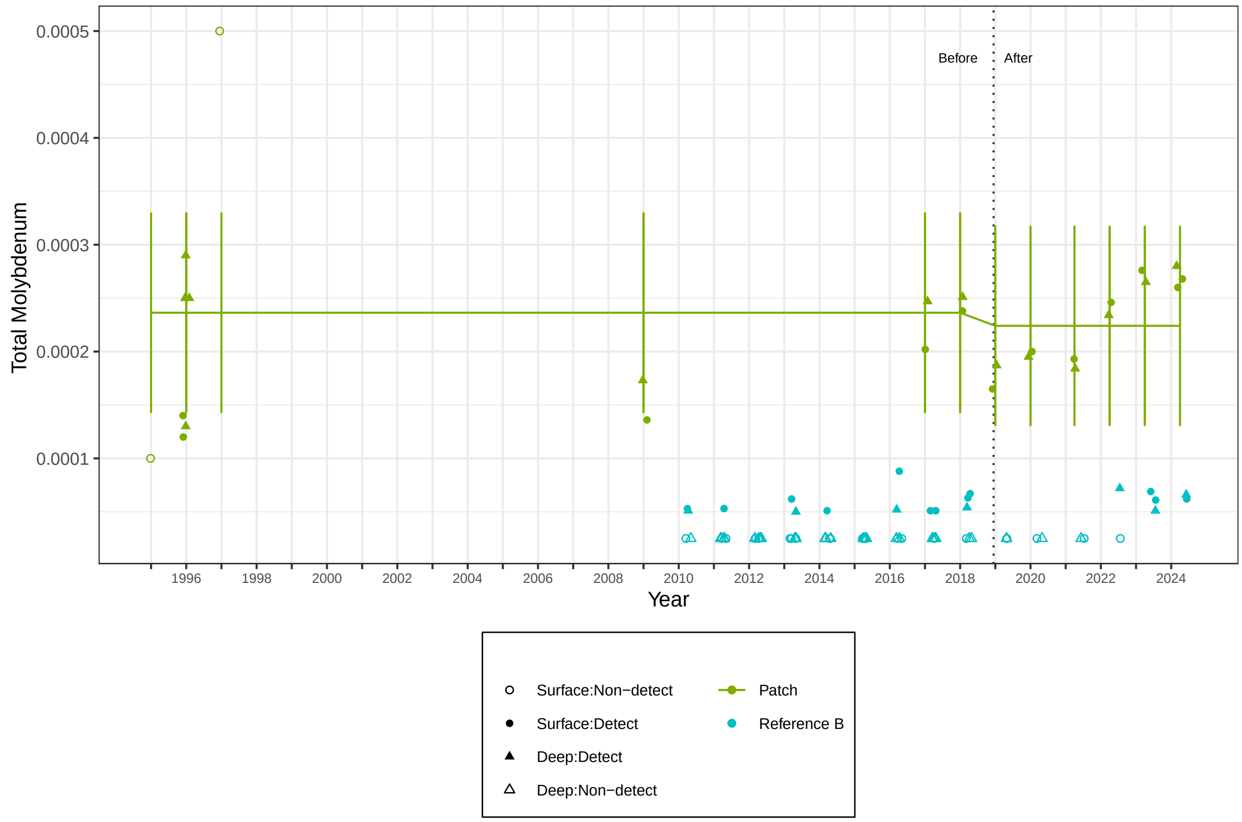
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0	0.0001	9.616	-0.2066	0.8406	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Windy Lake

Before-after analyses were first performed to compare the change in the before and after period in the exposure lake. If a change was detected then before-after-control-impact linear modeling would be applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Windy Under-Ice Before-After Analysis

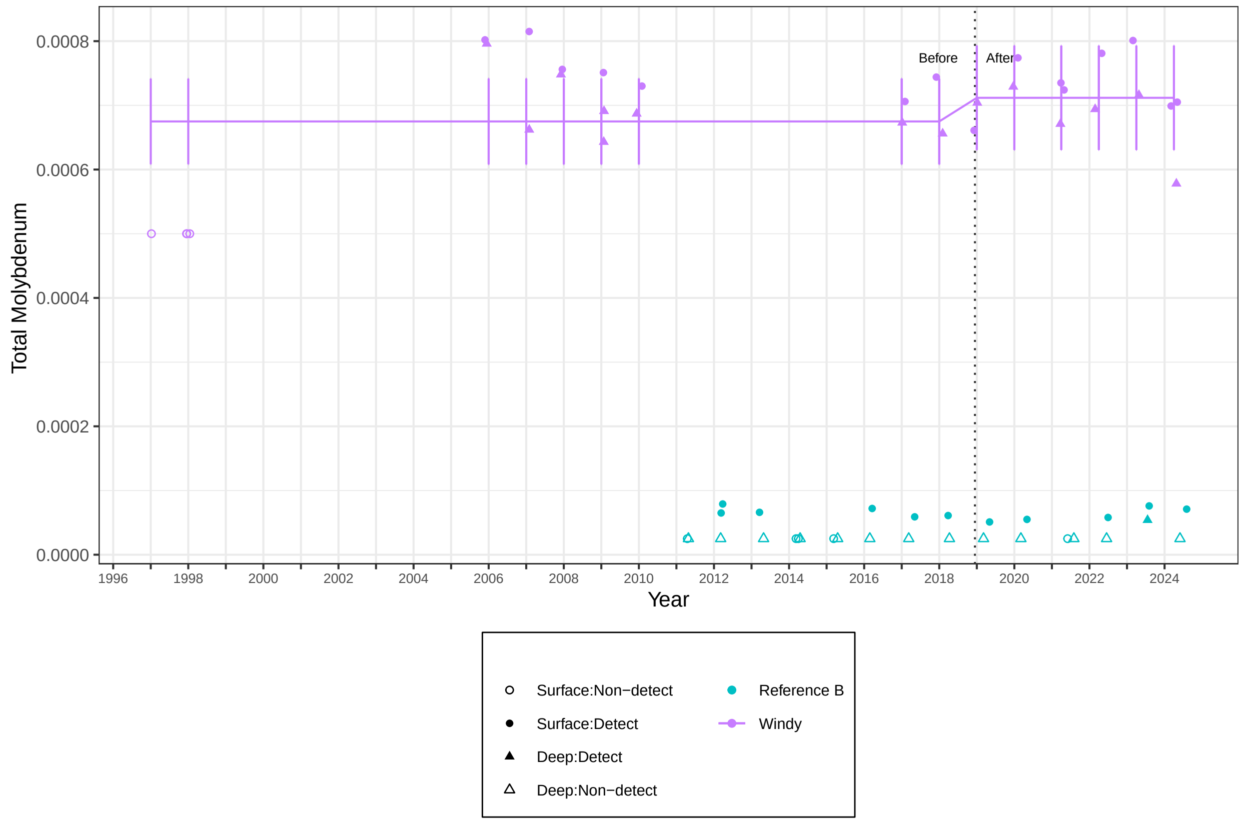
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0	0	11.49	0.7574	0.4641	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Windy Open-water Before-After Analysis

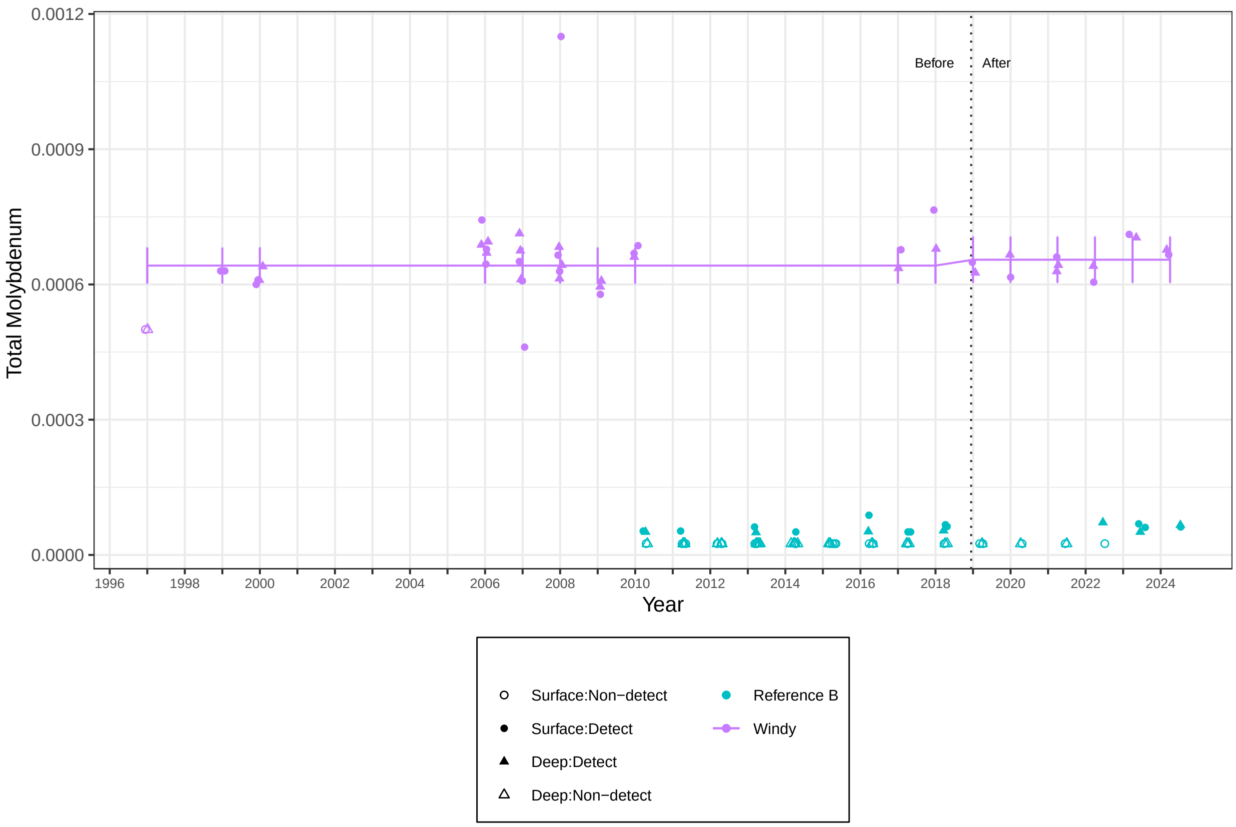
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0	0	14.12	0.4336	0.6711	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

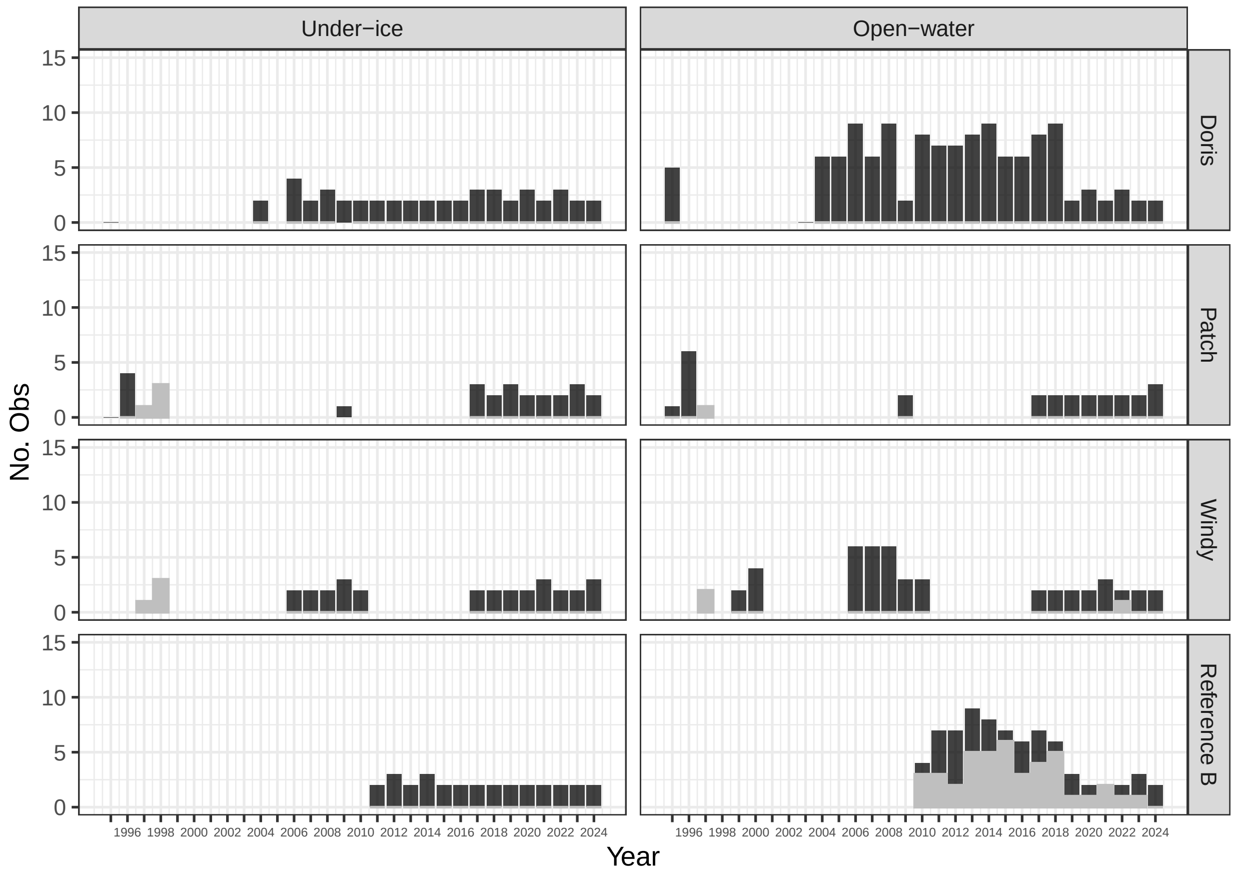
The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.


0.0012
0.0009
0.0006
0.0003
0.0000
Total Molybdenum
Before
After
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
Year
Surface:Non−detect
Surface:Detect
Deep:Detect
Deep:Non−detect
Reference B
Windy

C.3.1.20 Total Nickel

Censored Values and Sample Sizes

The following plots indicate the number of observations for each year from each lake that were less than the detection limit (light gray) or greater than the detection limit (dark gray). Observations below the analytical detection limit were considered censored.



Analysis was not performed if greater than 50% of observations from a site-season grouping were censored or if 100% of observations from the current assessment year (i.e., 2024) were censored.

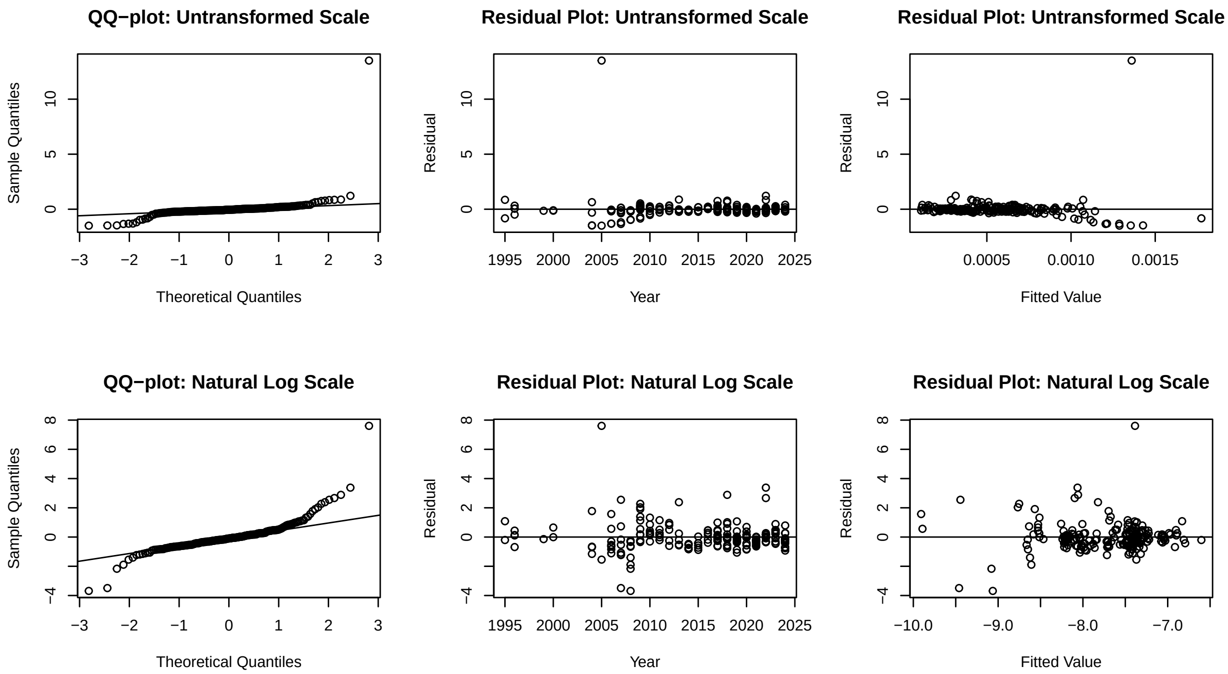
The sample sizes per lake and season are summarized in the table below.

Lake	Season	# Obs (total)	# < DL (total)	% < DL (total)	% < DL (2024)
Doris	Under-ice	47	0	0	0
Doris	Open-water	125	0	0	0
Patch	Under-ice	28	4	14	0
Patch	Open-water	27	1	4	0
Reference B	Under-ice	30	0	0	0
Reference B	Open-water	75	42	56	0
Windy	Under-ice	33	4	12	0
Windy	Open-water	49	3	6	0

More than 50% of data was under detection limit in Reference B Open-water. Data from those site-season groupings will be removed from the analysis.

Initial Model Fit

A model was fit both on the untransformed and natural log scale to assess the need for transformations. Outliers were identified from the fitted model as standardized residuals greater than 3, and flagged to caution interpretation of results but not removed from the analysis.



Outliers on untransformed scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Doris	2005	Open-water	Deep	0.009736	0.001	13.5

Outliers on natural log scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Doris	2005	Open-water	Deep	0.0097363	-7.386	7.606
Windy	2007	Under-ice	Deep	0.0000220	-9.461	-3.491
Windy	2008	Under-ice	Surface	0.0000305	-9.063	-3.687
Windy	2022	Under-ice	Surface	0.0010700	-8.063	3.379

There were outliers retained in the analysis. Results should be interpreted with caution and along with graphical results. The natural log data better meets the residual assumptions. Analysis proceeds with natural log data.

Doris Lake

The trend for Doris Lake was compared to a slope of zero. If there was a significant trend, then the trend for Doris Lake was compared to the trend in Reference Lake B. This contrast does not test for differences in intercepts between lakes.

Doris Under-Ice

Analysis	Chi.sq	df	p	Significance
Compare to slope zero	7.879	3	0.04860	sig.
Compare to Reference B	9.083	3	0.02820	sig.

Doris Lake exhibited significant deviation from a slope of zero. Doris Lake exhibited significant deviation from the trend of Reference Lake B.

Doris Open-Water

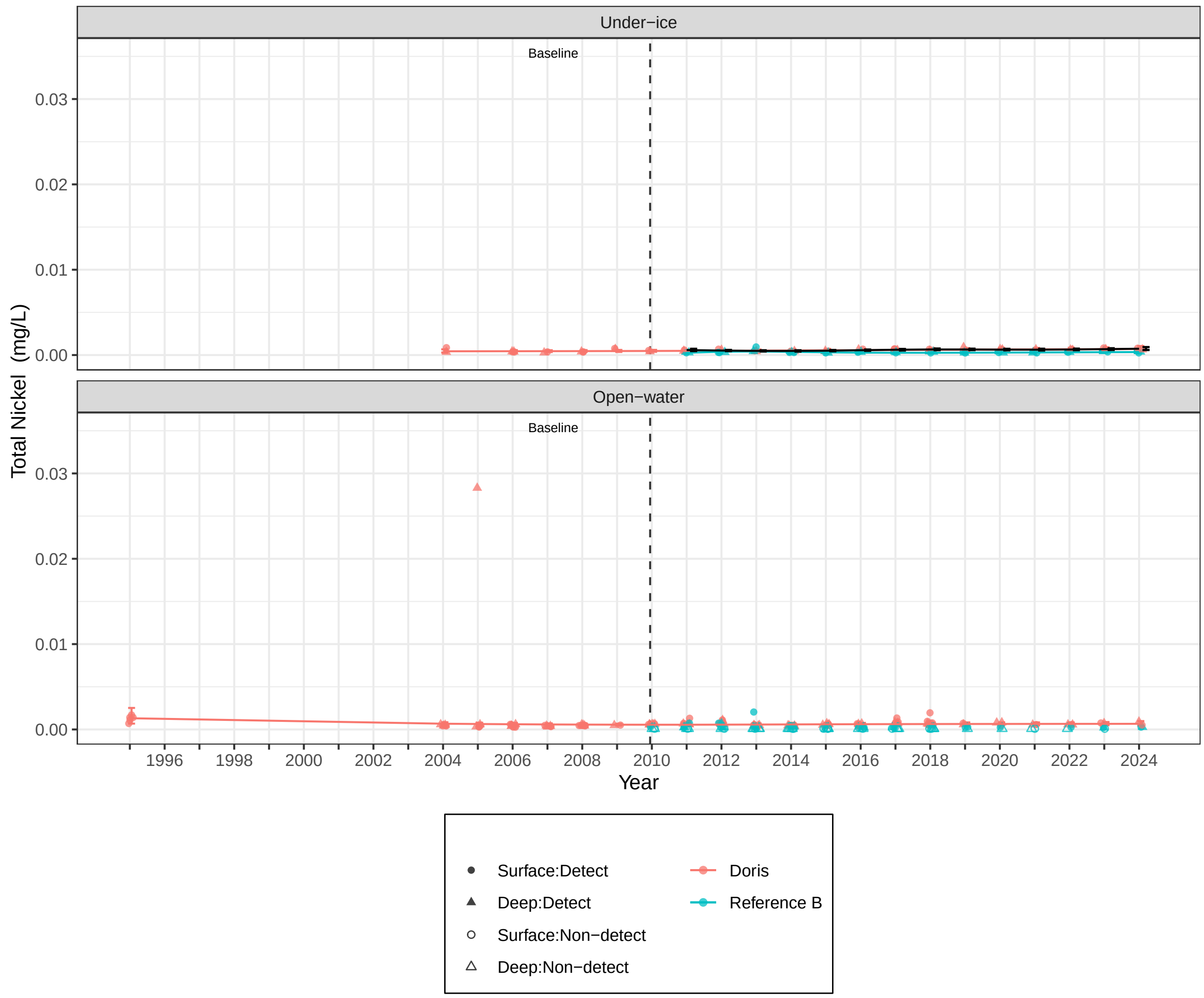
Analysis	Chi.sq	df	p	Significance
Compare to slope zero	6.175	3	0.10340	not sig.

Doris Lake did not exhibit significant deviation from a slope of zero and thus comparison to the trend in Reference Lake B was not completed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols are values presented at half the detection limit. Solid lines represent the fitted curves. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations.

As Doris Lake exhibited significant deviation from a slope of zero in at least one season, the black lines and error bars represent the model built with Doris Lake data from comparable sampling years with Reference Lake B only.



Patch Lake

Before-after analyses were first performed to compare the change in the before and after period for the exposure site. If a change was detected, then before-after-control-impact linear modelling was applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Patch Under-Ice Before-After Analysis

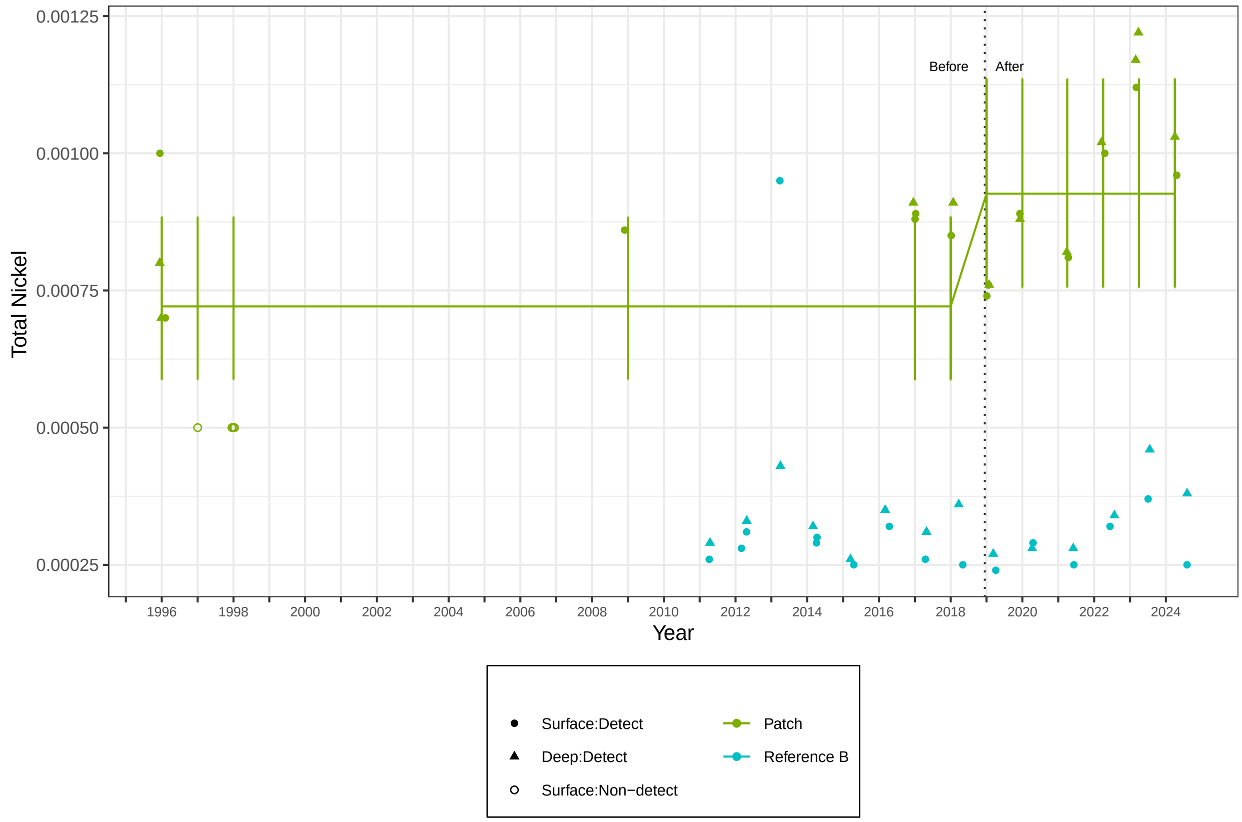
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0.2509	0.1297	9.893	1.934	0.0822	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Patch Open-Water Before-After Analysis

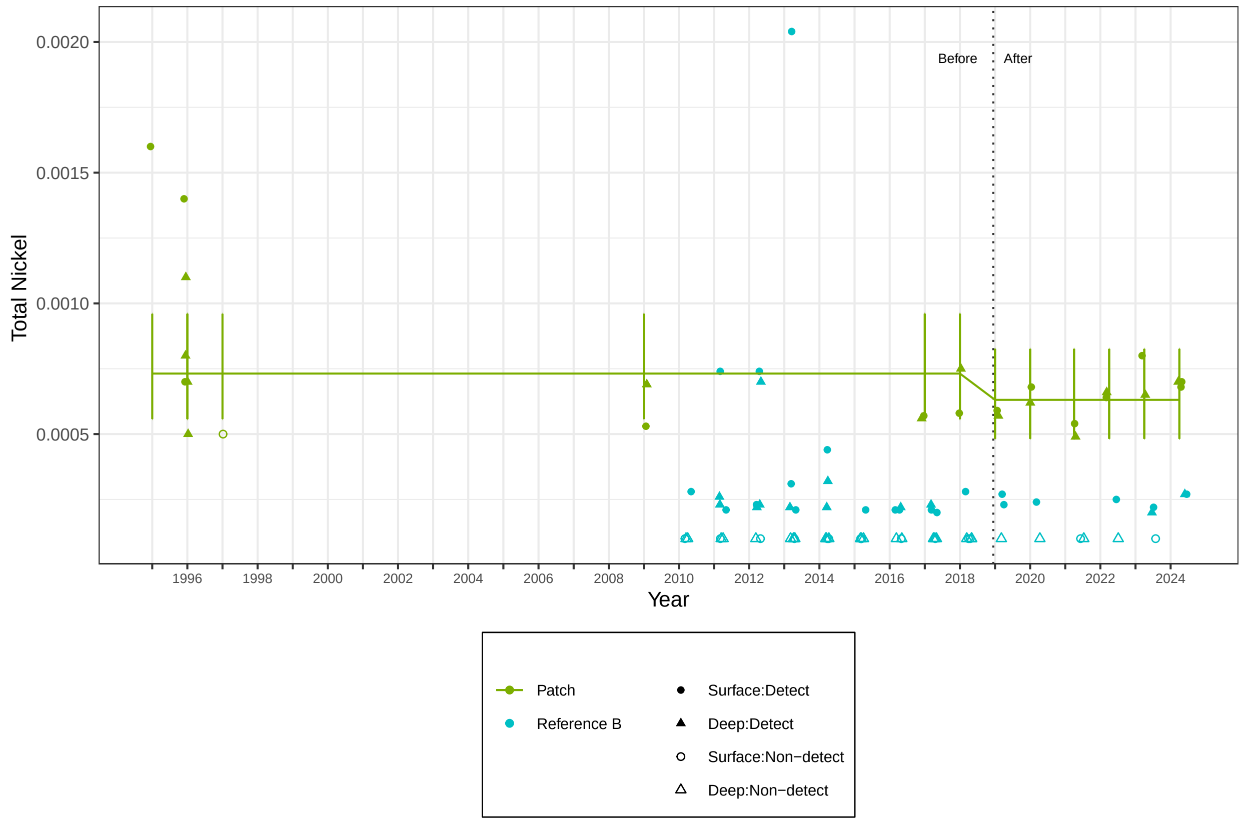
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	-0.148	0.1718	8.85	-0.8615	0.4117	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Windy Lake

Before-after analyses were first performed to compare the change in the before and after period in the exposure lake. If a change was detected then before-after-control-impact linear modeling would be applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Windy Under-Ice Before-After Analysis

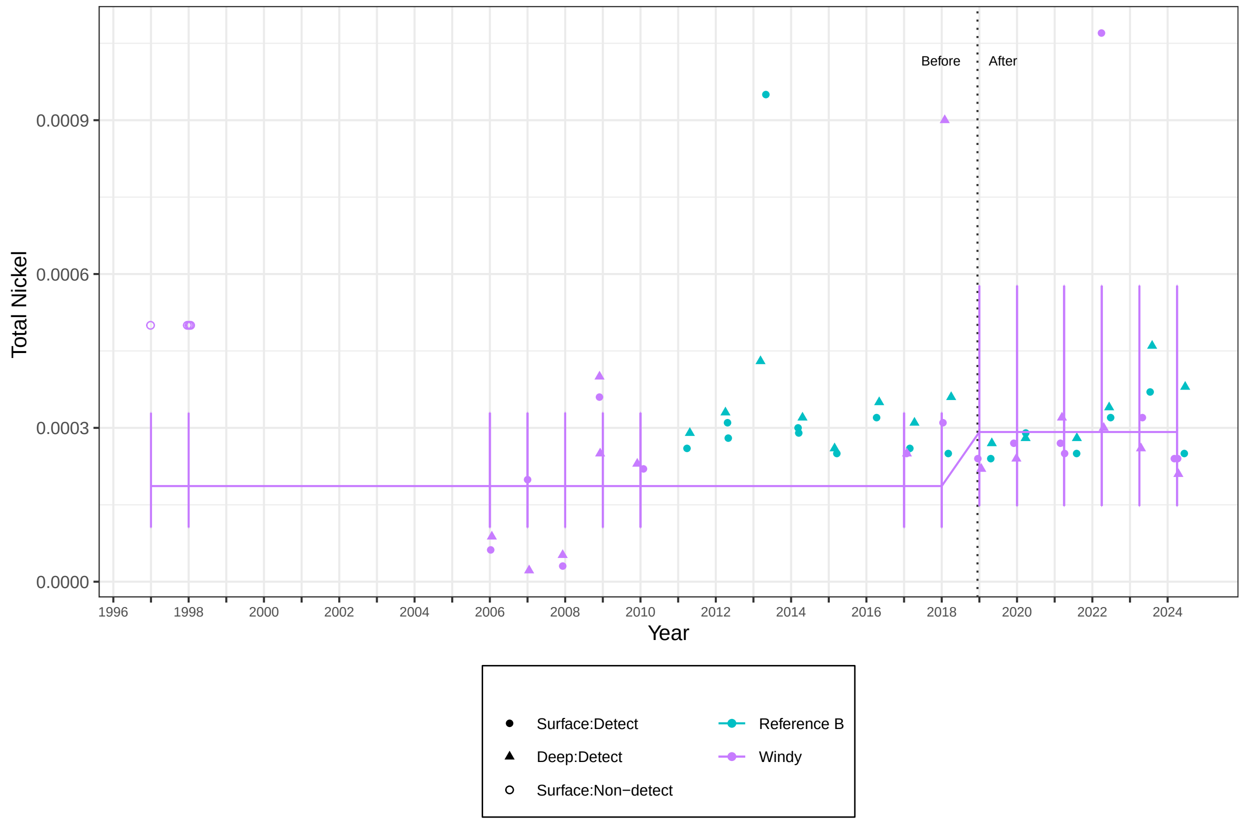
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0.448	0.4095	12.52	1.094	0.2945	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Windy Open-water Before-After Analysis

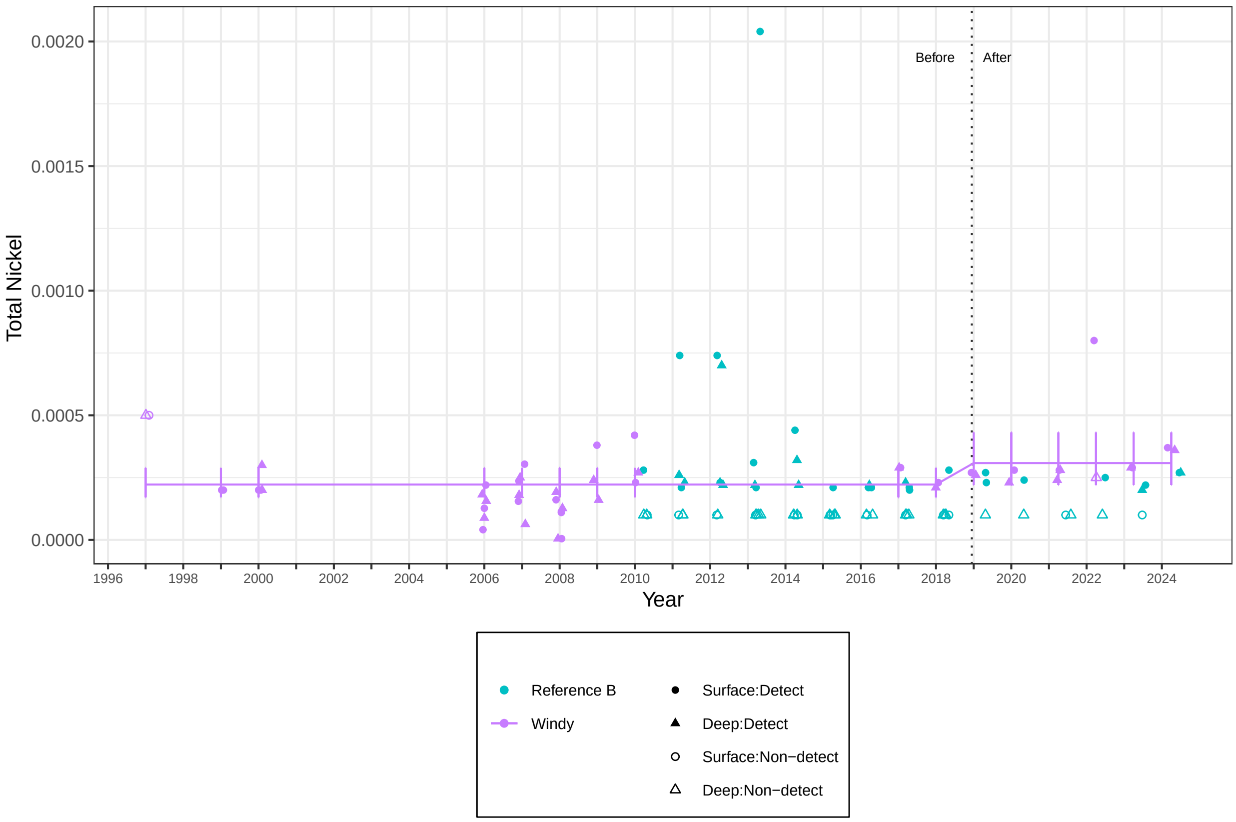
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0.3274	0.1986	14.08	1.648	0.1215	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

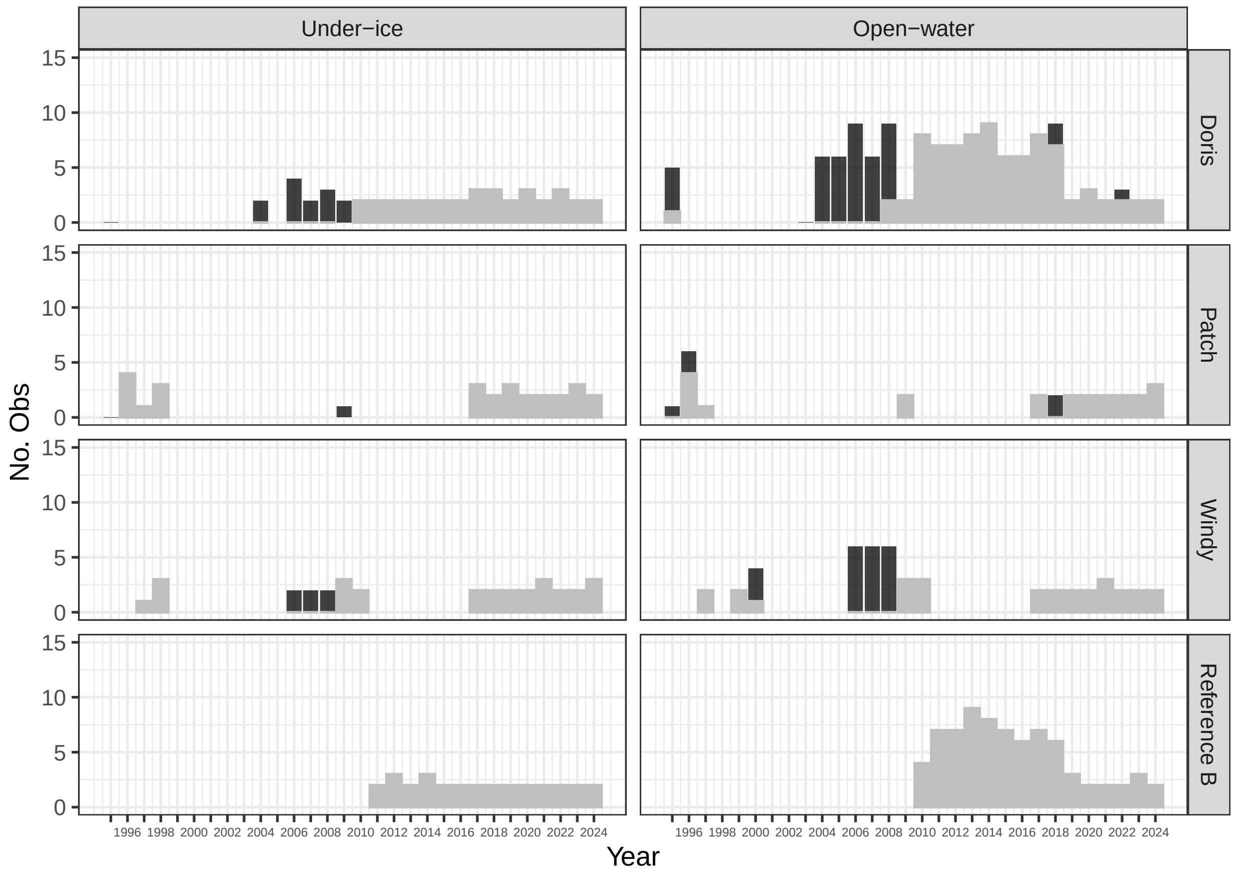
The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.


Total Nickel
0.0020
0.0015
0.0010
0.0005
0.0000
Before
After
Year
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
Reference B
Windy
Surface:Detect
Deep:Detect
Surface:Non−detect
Deep:Non−detect

C.3.1.21 Total Selenium

Censored Values and Sample Sizes

The following plots indicate the number of observations for each year from each lake that were less than the detection limit (light gray) or greater than the detection limit (dark gray). Observations below the analytical detection limit were considered censored.



Analysis was not performed if greater than 50% of observations from a site-season grouping were censored or if 100% of observations from the current assessment year (i.e., 2024) were censored.

The sample sizes per lake and season are summarized in the table below.

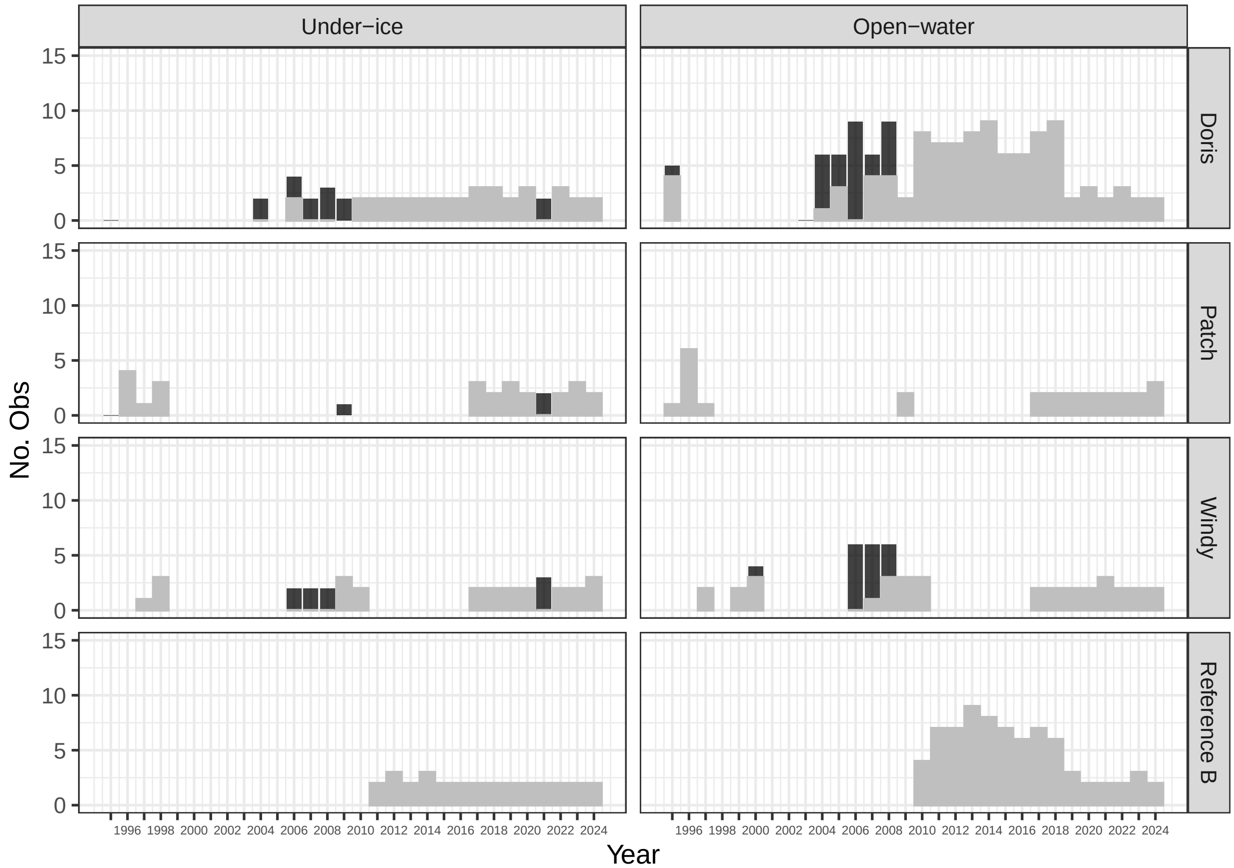
Lake	Season	# Obs (total)	# < DL (total)	% < DL (total)	% < DL (2024)
Doris	Under-ice	47	34	72	100
Doris	Open-water	125	84	67	100
Patch	Under-ice	28	28	100	100
Patch	Open-water	27	22	81	100
Reference B	Under-ice	30	30	100	100
Reference B	Open-water	75	75	100	100
Windy	Under-ice	33	27	82	100
Windy	Open-water	49	28	57	100

All data from Doris North, Patch and Windy were censored. All data removed from the analysis and no statistical analyses were performed.

C.3.1.22 Total Silver

Censored Values and Sample Sizes

The following plots indicate the number of observations for each year from each lake that were less than the detection limit (light gray) or greater than the detection limit (dark gray). Observations below the analytical detection limit were considered censored.



Analysis was not performed if greater than 50% of observations from a site-season grouping were censored or if 100% of observations from the current assessment year (i.e., 2024) were censored.

The sample sizes per lake and season are summarized in the table below.

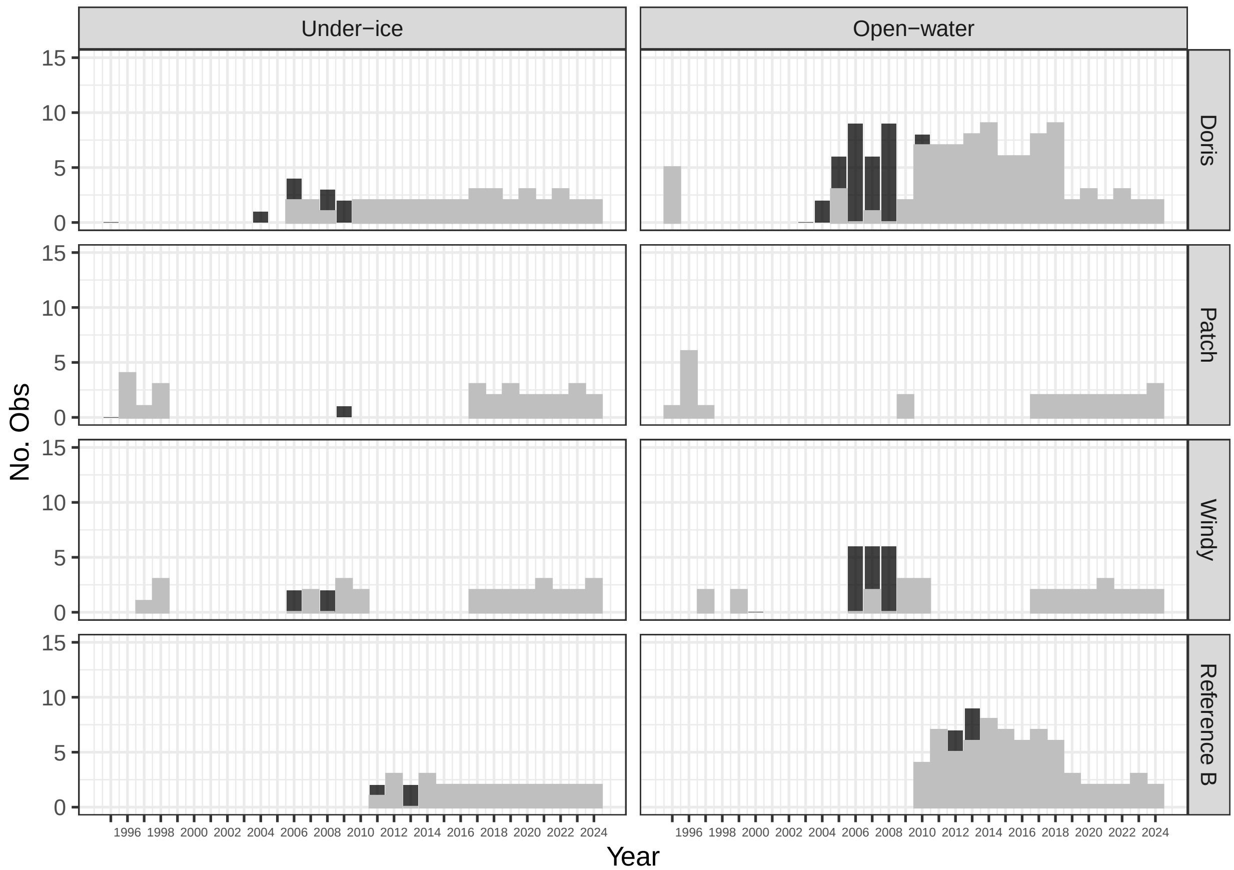
Lake	Season	# Obs (total)	# < DL (total)	% < DL (total)	% < DL (2024)
Doris	Under-ice	47	36	77	100
Doris	Open-water	125	100	80	100
Patch	Under-ice	28	26	93	100
Patch	Open-water	27	27	100	100
Reference B	Under-ice	30	30	100	100
Reference B	Open-water	75	75	100	100
Windy	Under-ice	33	24	73	100
Windy	Open-water	49	34	69	100

All data from Doris North, Patch and Windy were censored. All data removed from the analysis and no statistical analyses were performed.

C.3.1.23 Total Thallium

Censored Values and Sample Sizes

The following plots indicate the number of observations for each year from each lake that were less than the detection limit (light gray) or greater than the detection limit (dark gray). Observations below the analytical detection limit were considered censored.



Analysis was not performed if greater than 50% of observations from a site-season grouping were censored or if 100% of observations from the current assessment year (i.e., 2024) were censored.

The sample sizes per lake and season are summarized in the table below.

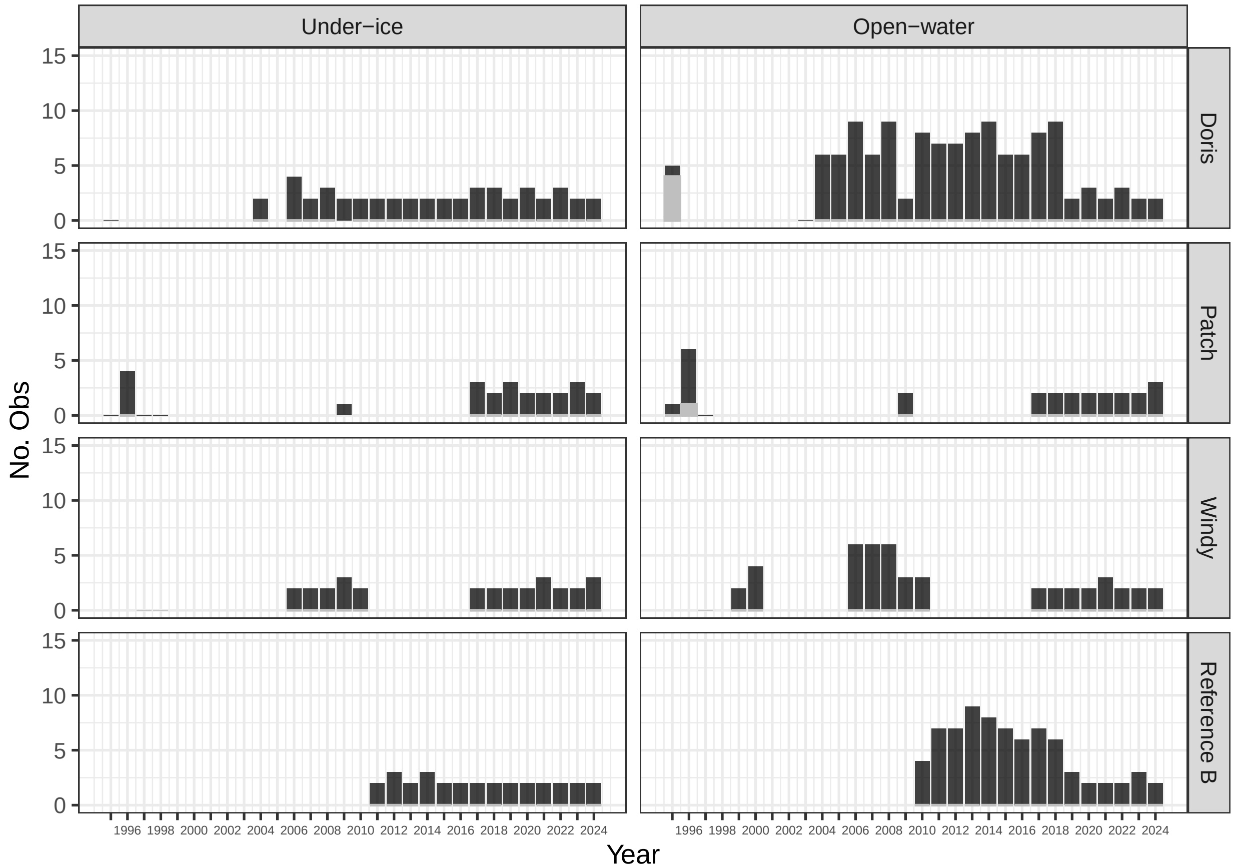
Lake	Season	# Obs (total)	# < DL (total)	% < DL (total)	% < DL (2024)
Doris	Under-ice	46	42	91	100
Doris	Open-water	121	94	78	100
Patch	Under-ice	28	28	100	100
Patch	Open-water	27	27	100	100
Reference B	Under-ice	30	27	90	100
Reference B	Open-water	75	70	93	100
Windy	Under-ice	33	29	88	100
Windy	Open-water	45	29	64	100

All data from Doris North, Patch and Windy were censored. All data removed from the analysis and no statistical analyses were performed.

C.3.1.24 Total Uranium

Censored Values and Sample Sizes

The following plots indicate the number of observations for each year from each lake that were less than the detection limit (light gray) or greater than the detection limit (dark gray). Observations below the analytical detection limit were considered censored.



Analysis was not performed if greater than 50% of observations from a site-season grouping were censored or if 100% of observations from the current assessment year (i.e., 2024) were censored.

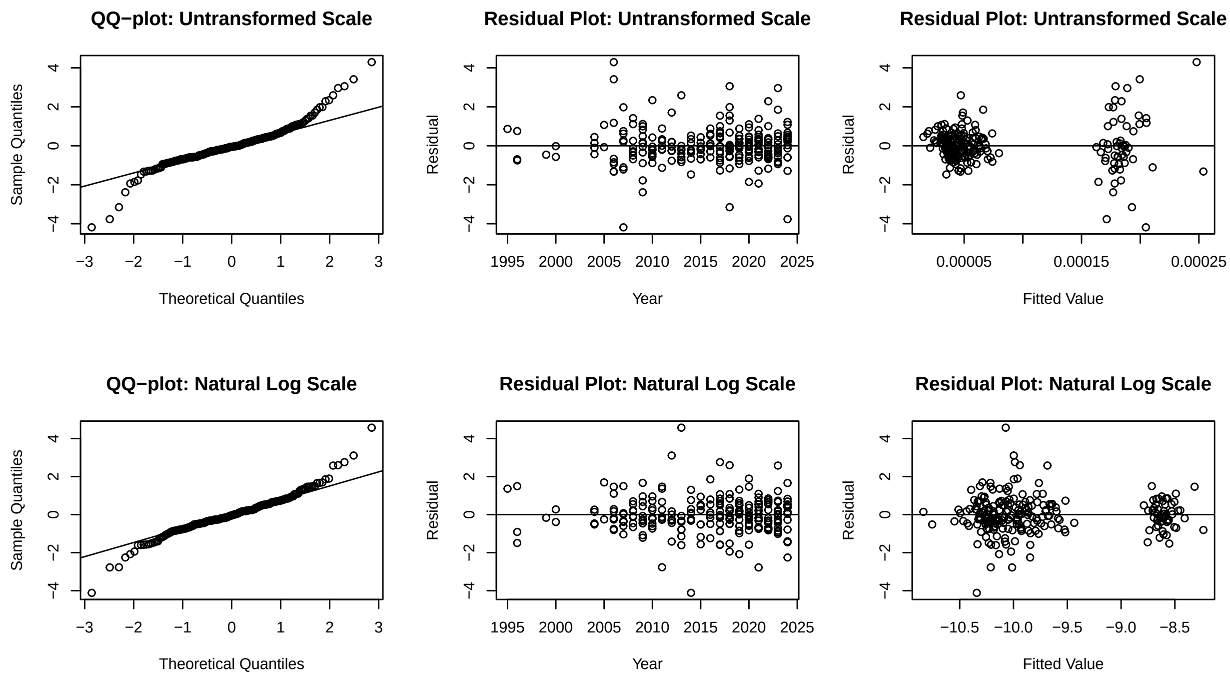
The sample sizes per lake and season are summarized in the table below.

Lake	Season	# Obs (total)	# < DL (total)	% < DL (total)	% < DL (2024)
Doris	Under-ice	47	0	0	0
Doris	Open-water	125	4	3	0
Patch	Under-ice	24	0	0	0
Patch	Open-water	26	1	4	0
Reference B	Under-ice	30	0	0	0
Reference B	Open-water	75	0	0	0
Windy	Under-ice	29	0	0	0
Windy	Open-water	47	0	0	0

None of the sites exhibited greater than 50% of data less than the detection limit. The analysis proceeds with linear mixed model regression.

Initial Model Fit

A model was fit both on the untransformed and natural log scale to assess the need for transformations. Outliers were identified from the fitted model as standardized residuals greater than 3, and flagged to caution interpretation of results but not removed from the analysis.



Outliers on untransformed scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Windy	2006	Under-ice	Deep	0.0002930	0	4.293
Windy	2006	Open-water	Deep	0.0002353	0	3.414
Windy	2007	Under-ice	Deep	0.0001610	0	-4.185
Windy	2018	Under-ice	Deep	0.0001600	0	-3.151
Windy	2018	Open-water	Surface	0.0002110	0	3.057
Windy	2024	Under-ice	Deep	0.0001320	0	-3.766

Outliers on natural log scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Reference B	2012	Under-ice	Surface	0.00006685	-9.997	3.108
Reference B	2013	Under-ice	Surface	0.00007430	-10.073	4.572
Reference B	2014	Under-ice	Deep	0.00001940	-10.342	-4.115

The natural log-transformed data better meets the residual assumptions. Analysis proceeds with natural log-transformed data. However, there were outliers retained in the analysis. Results should be interpreted with caution and along with graphical results.

Doris Lake

The trend for Doris Lake was compared to a slope of zero. If there was a significant trend, then the trend for Doris Lake was compared to the trend in Reference Lake B. This contrast does not test for differences in intercepts between lakes.

Doris Under-Ice

Analysis	Chi.sq	df	p	Significance
Compare to slope zero	33.238	4	<0.00001	sig.
Compare to Reference B	5.174	4	0.26990	not sig.

Doris Lake exhibited significant deviation from a slope of zero. Doris Lake did not exhibit significant deviation from the trend of Reference Lake B.

Doris Open-Water

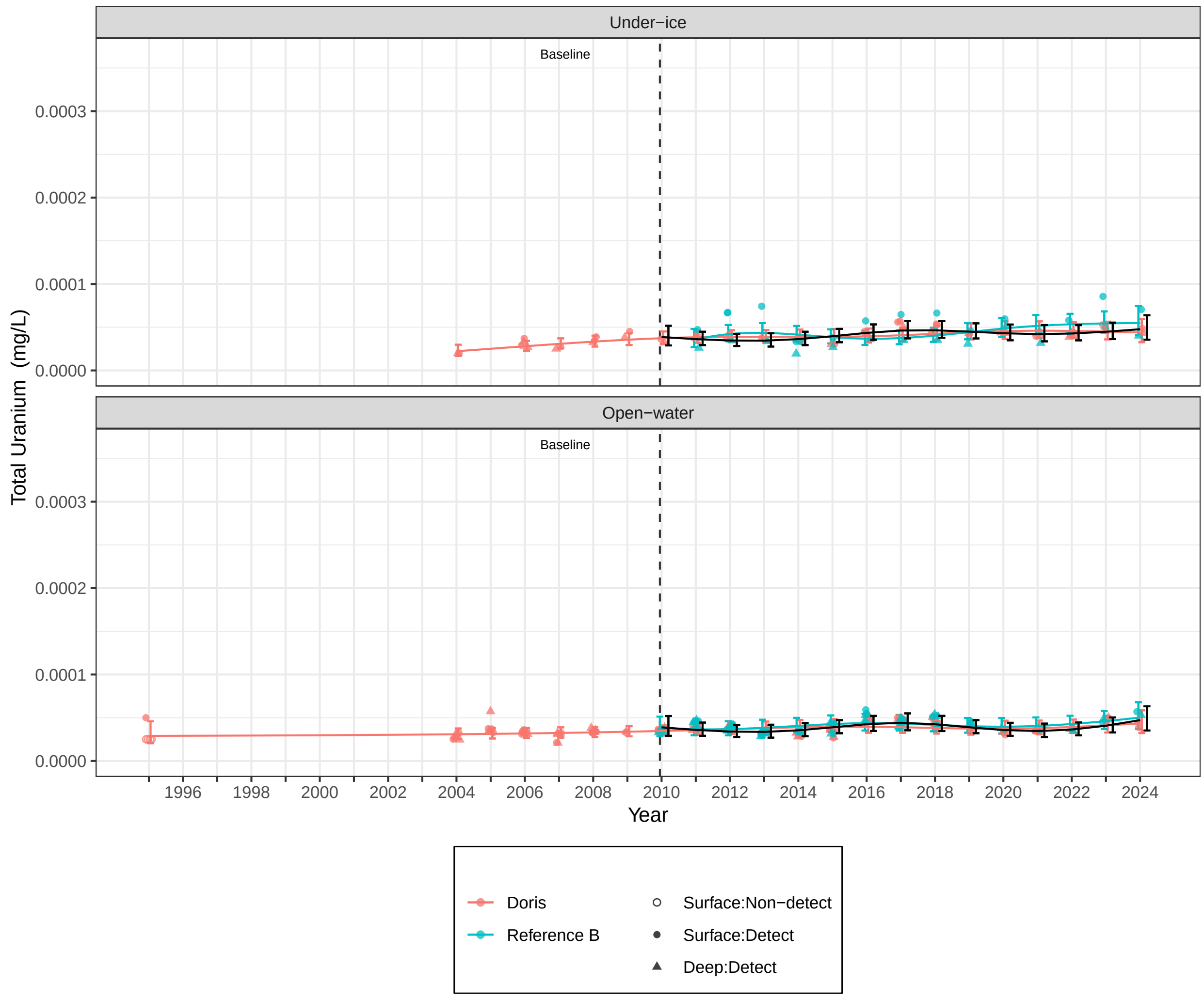
Analysis	Chi.sq	df	p	Significance
Compare to slope zero	9.903	4	0.04210	sig.
Compare to Reference B	0.755	4	0.94440	not sig.

Doris Lake exhibited significant deviation from a slope of zero. Doris Lake did not exhibit significant deviation from the trend of Reference Lake B.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols are values presented at half the detection limit. Solid lines represent the fitted curves. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations.

As Doris Lake exhibited significant deviation from a slope of zero in at least one season, the black lines and error bars represent the model built with Doris Lake data from comparable sampling years with Reference Lake B only.



Patch Lake

Before-after analyses were first performed to compare the change in the before and after period for the exposure site. If a change was detected, then before-after-control-impact linear modelling was applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Patch Under-Ice Before-After Analysis

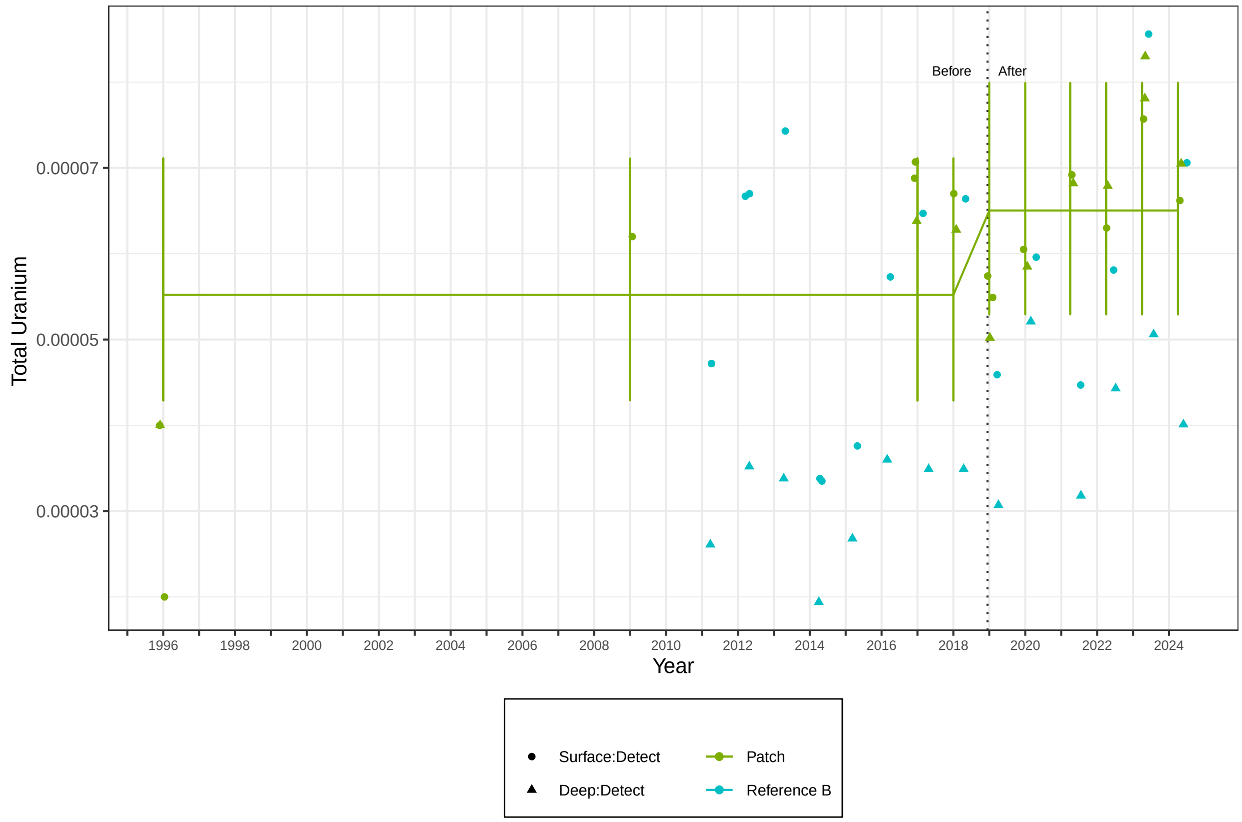
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0.1639	0.1421	8.132	1.153	0.2817	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Patch Open-Water Before-After Analysis

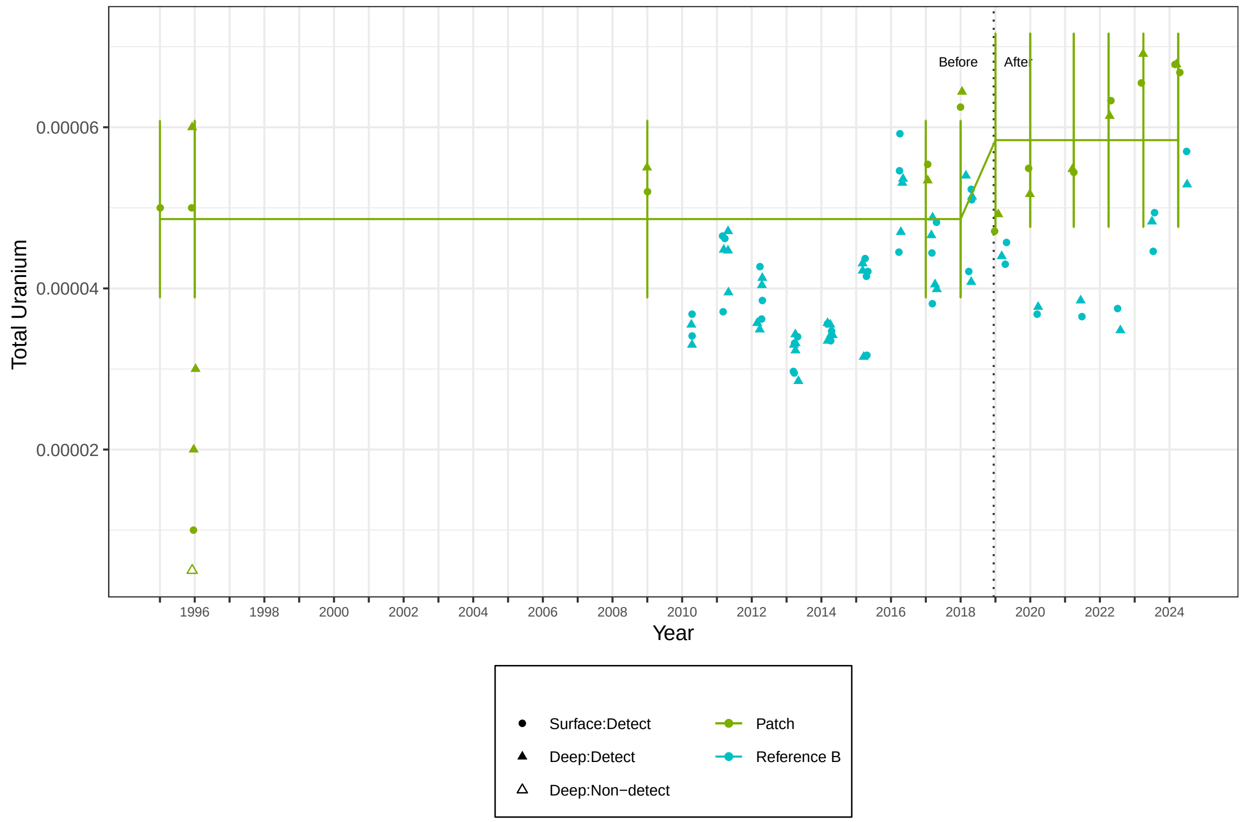
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0.1836	0.1345	9.019	1.365	0.2054	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Windy Lake

Before-after analyses were first performed to compare the change in the before and after period in the exposure lake. If a change was detected then before-after-control-impact linear modeling would be applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Windy Under-Ice Before-After Analysis

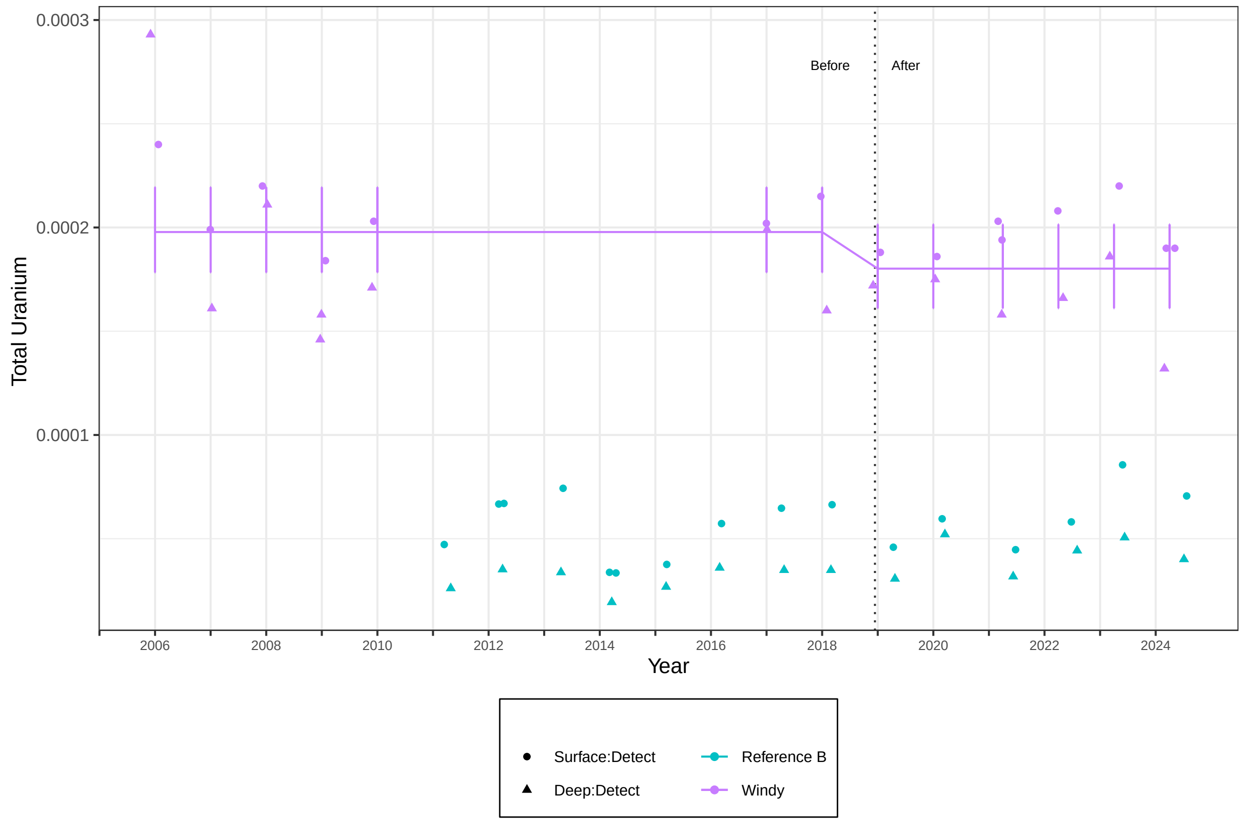
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	-0.0934	0.0693	11	-1.348	0.2047	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Windy Open-water Before-After Analysis

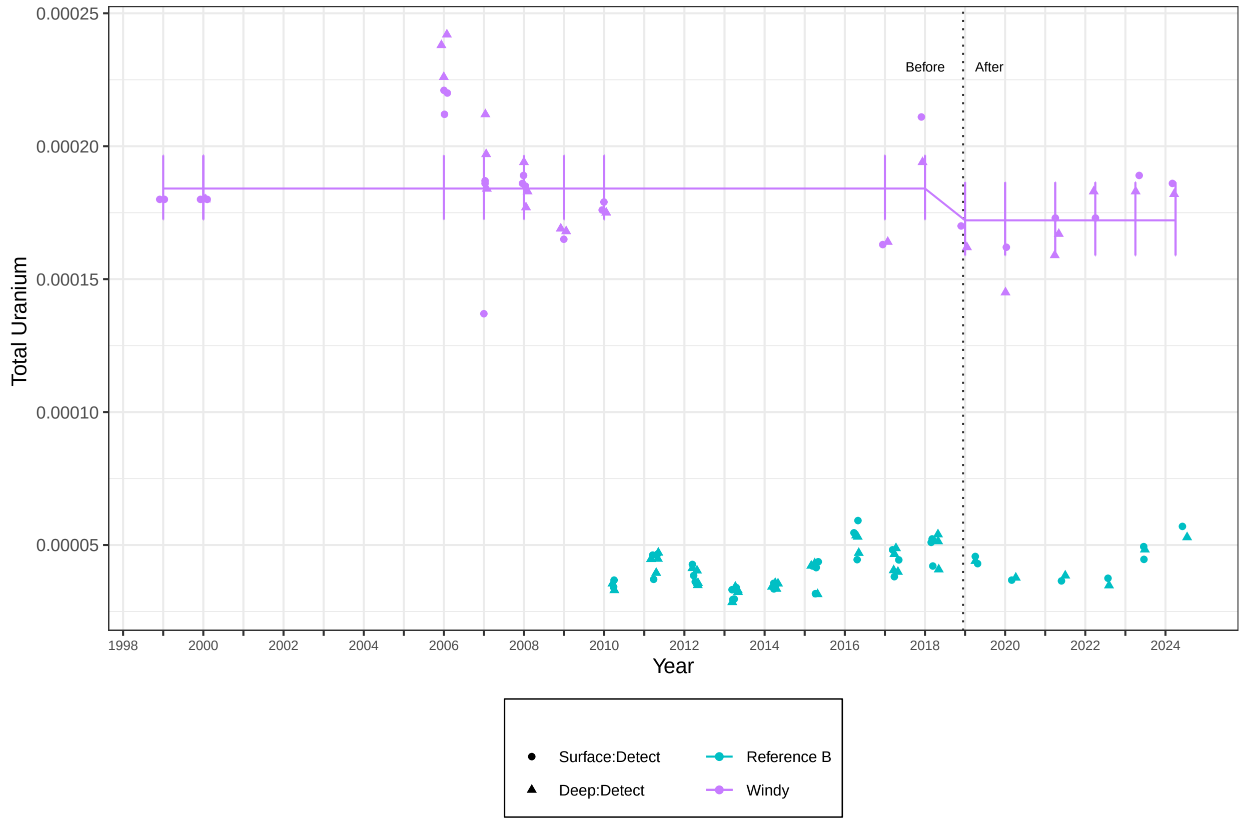
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	-0.0672	0.0478	13.1	-1.406	0.183	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

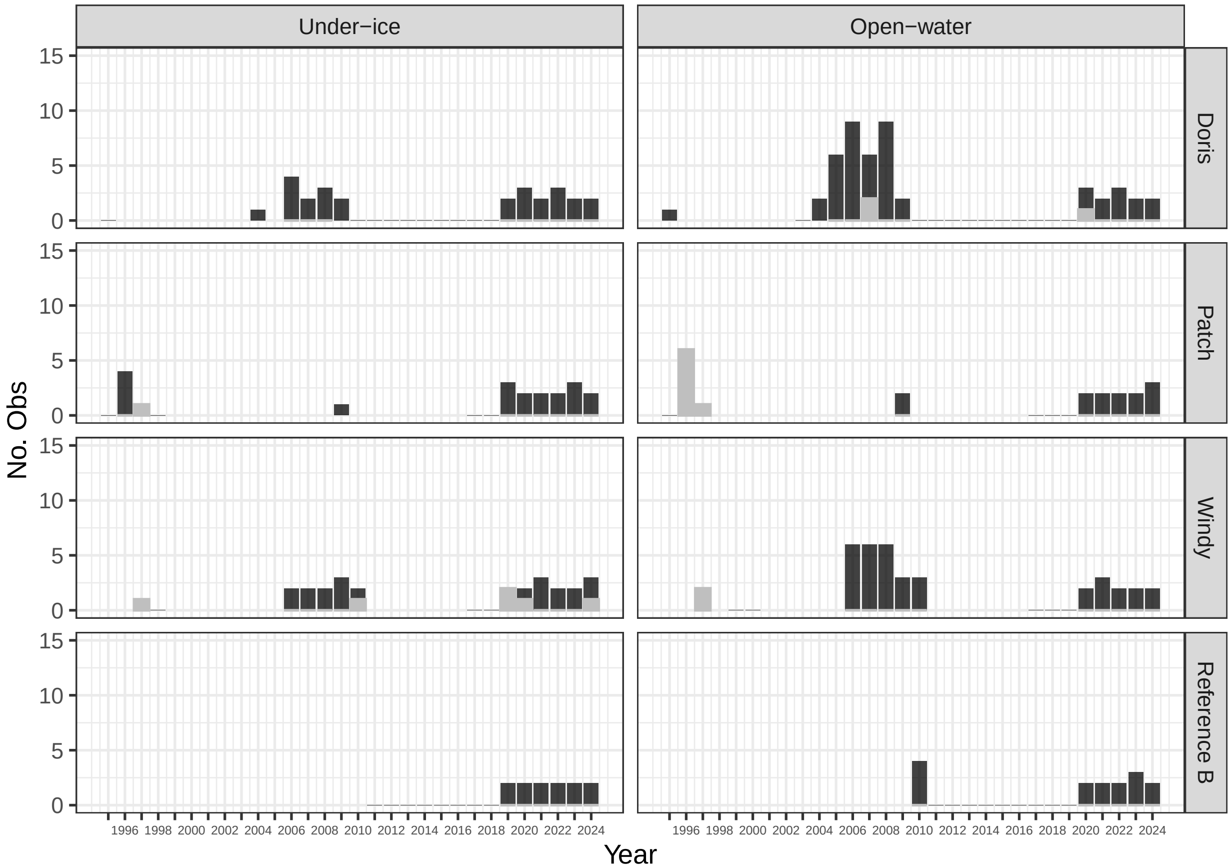
The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.


Total Uranium
Year
Before
After
0.00025
0.00020
0.00015
0.00010
0.00005
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
Surface:Detect
Deep:Detect
Reference B
Windy

C.3.1.25 Dissolved Manganese

Censored Values and Sample Sizes

The following plots indicate the number of observations for each year from each lake that were less than the detection limit (light gray) or greater than the detection limit (dark gray). Observations below the analytical detection limit were considered censored.



Analysis was not performed if greater than 50% of observations from a site-season grouping were censored or if 100% of observations from the current assessment year (i.e., 2024) were censored.

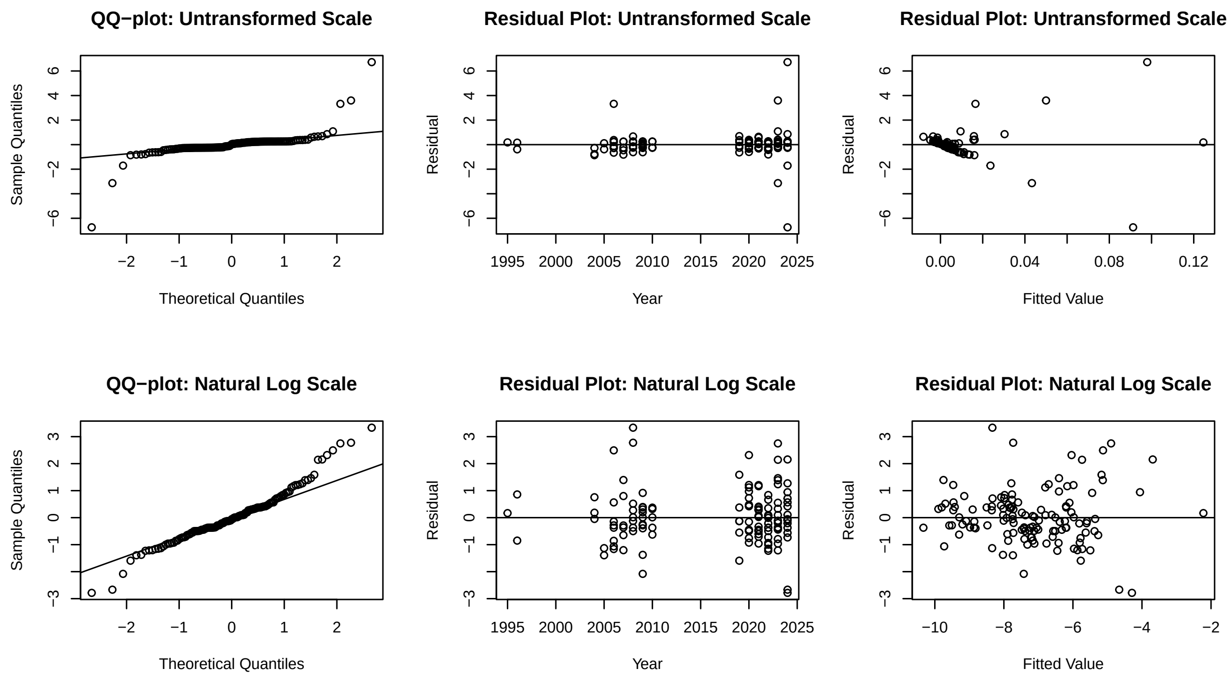
The sample sizes per lake and season are summarized in the table below.

Lake	Season	# Obs (total)	# < DL (total)	% < DL (total)	% < DL (2024)
Doris	Under-ice	26	0	0	0
Doris	Open-water	47	3	6	0
Patch	Under-ice	20	1	5	0
Patch	Open-water	20	7	35	0
Reference B	Under-ice	12	0	0	0
Reference B	Open-water	15	0	0	0
Windy	Under-ice	26	6	23	33
Windy	Open-water	37	2	5	0

None of the sites exhibited greater than 50% of data less than the detection limit. The analysis proceeds with linear mixed model regression.

Initial Model Fit

A model was fit both on the untransformed and natural log scale to assess the need for transformations. Outliers were identified from the fitted model as standardized residuals greater than 3, and flagged to caution interpretation of results but not removed from the analysis.



Outliers on untransformed scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Doris	2006	Under-ice	Deep	0.06110	0.017	3.324
Reference B	2023	Under-ice	Deep	0.09820	0.050	3.597
Reference B	2023	Under-ice	Surface	0.00132	0.043	-3.135
Reference B	2024	Under-ice	Deep	0.18800	0.098	6.722
Reference B	2024	Under-ice	Surface	0.00101	0.091	-6.738

Outliers on natural log scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Doris	2008	Open-water	Surface	0.005445	-8.332	3.333

The natural log-transformed data better meets the residual assumptions. Analysis proceeds with natural log-transformed data. However, there was an outlier retained in the analysis. Results should be interpreted with caution and along with graphical results.

Doris Lake

The trend for Doris Lake was compared to a slope of zero. If there was a significant trend, then the trend for Doris Lake was compared to the trend in Reference Lake B. This contrast does not test for differences in intercepts between lakes.

Doris Under-Ice

Analysis	Chi.sq	df	p	Significance
Compare to slope zero	4.196	3	0.24110	not sig.

Doris Lake did not exhibit significant deviation from a slope of zero and thus comparison to the trend in Reference Lake B was not completed.

Doris Open-Water

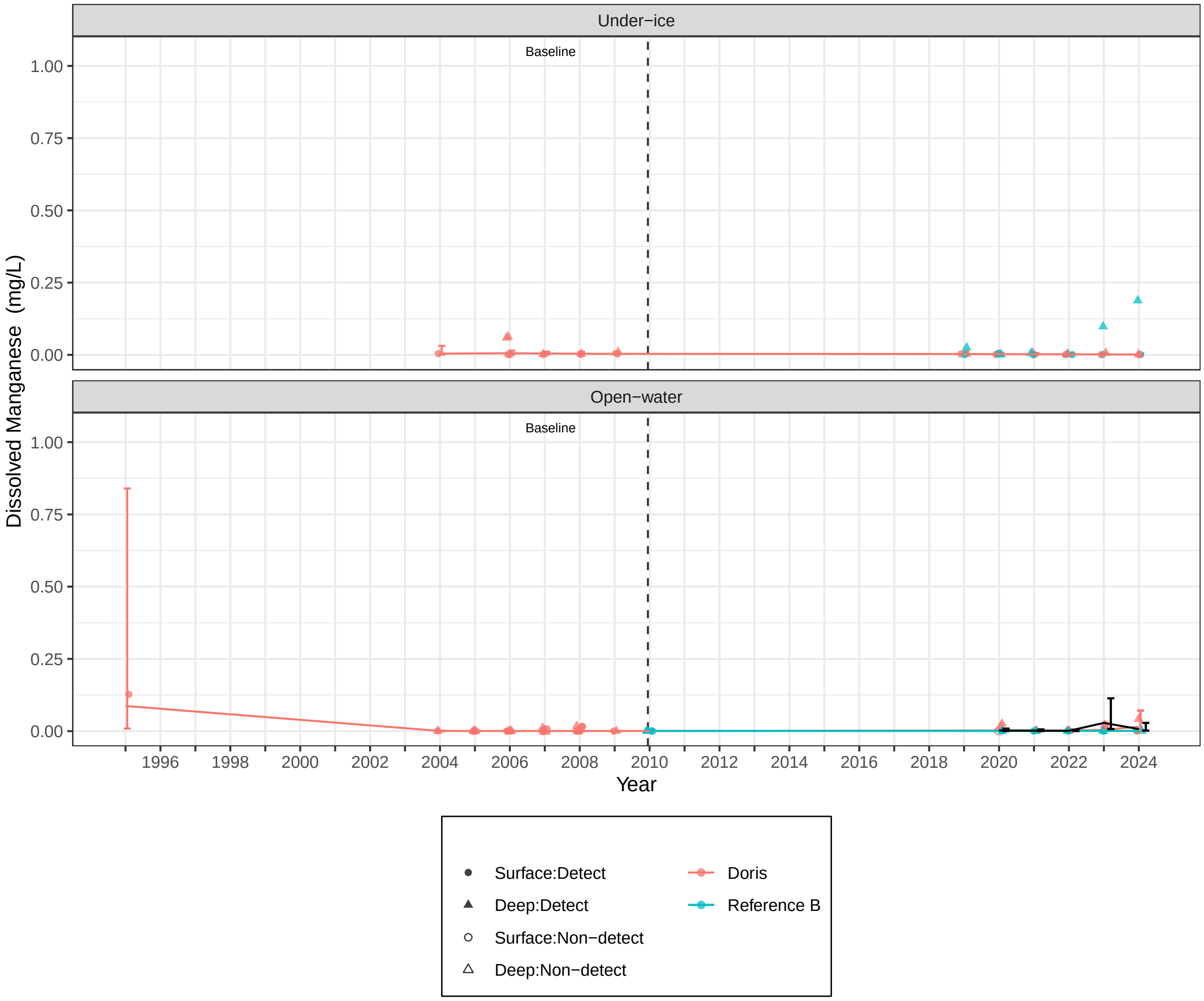
Analysis	Chi.sq	df	p	Significance
Compare to slope zero	35.445	3	<0.00001	sig.
Compare to Reference B	2.969	3	0.39650	not sig.

Doris Lake exhibited significant deviation from a slope of zero. Doris Lake did not exhibit significant deviation from the trend of Reference Lake B.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols are values presented at half the detection limit. Solid lines represent the fitted curves. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations.

As Doris Lake exhibited significant deviation from a slope of zero in at least one season, the black lines and error bars represent the model built with Doris Lake data from comparable sampling years with Reference Lake B only.



Patch Lake

Before-after analyses were first performed to compare the change in the before and after period for the exposure site. If a change was detected, then before-after-control-impact linear modelling was applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Patch Under-Ice Before-After Analysis

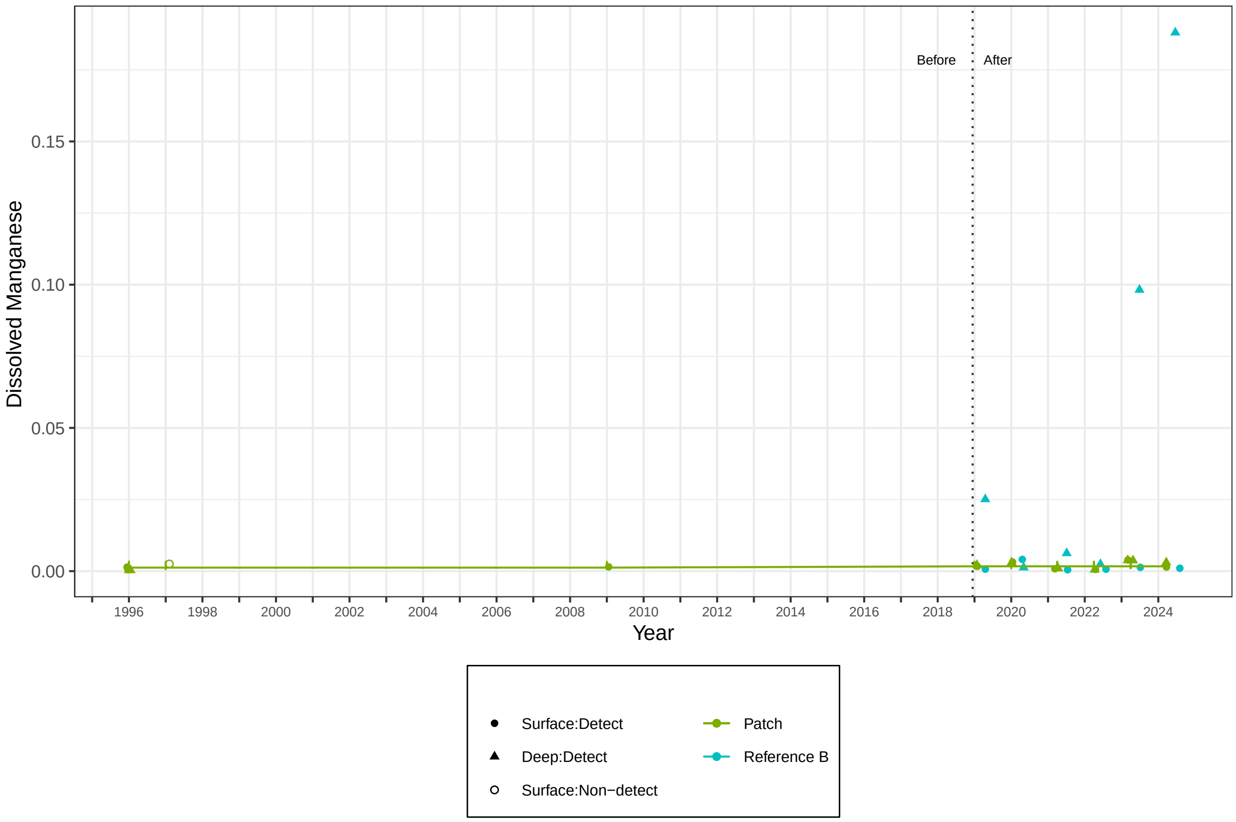
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0.3163	0.5401	7.658	0.5856	0.575	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Patch Open-Water Before-After Analysis

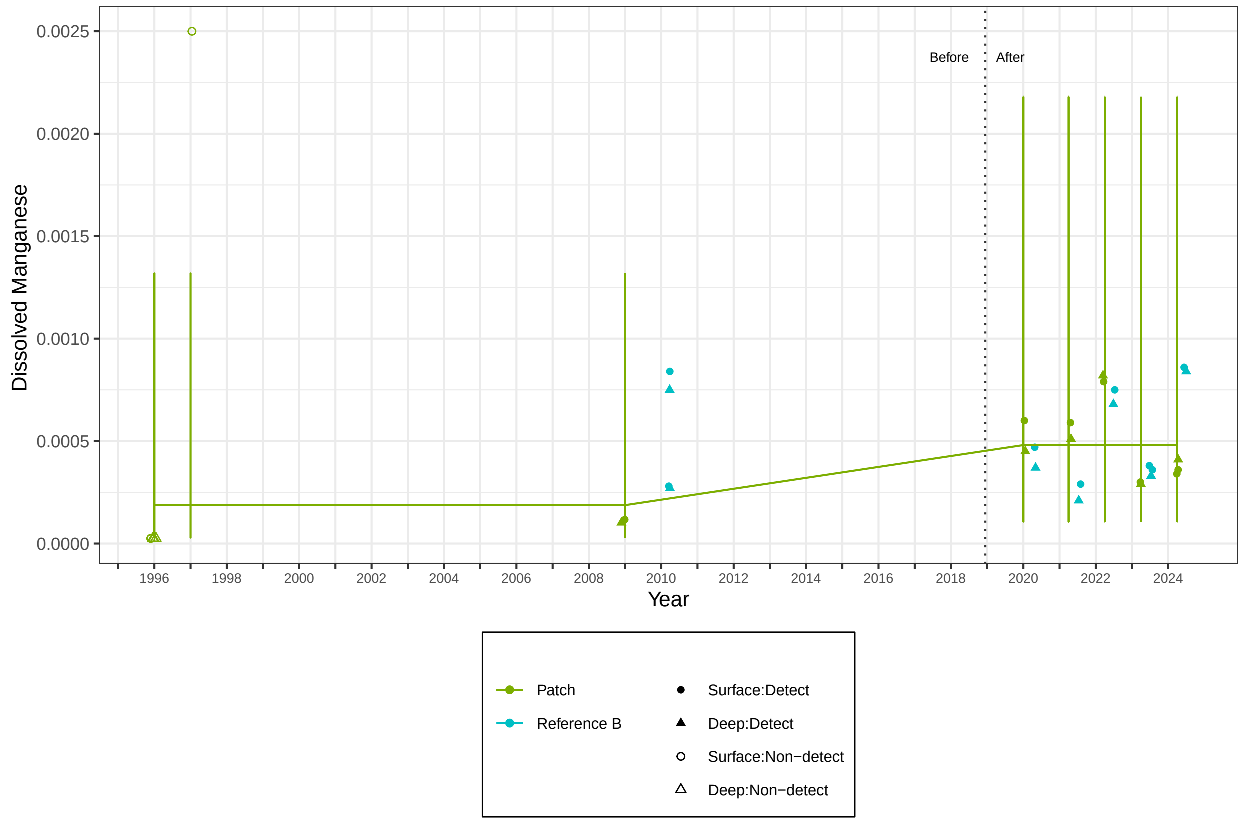
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0.9419	1.01	5.986	0.933	0.3869	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Windy Lake

Before-after analyses were first performed to compare the change in the before and after period in the exposure lake. If a change was detected then before-after-control-impact linear modeling would be applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Windy Under-Ice Before-After Analysis

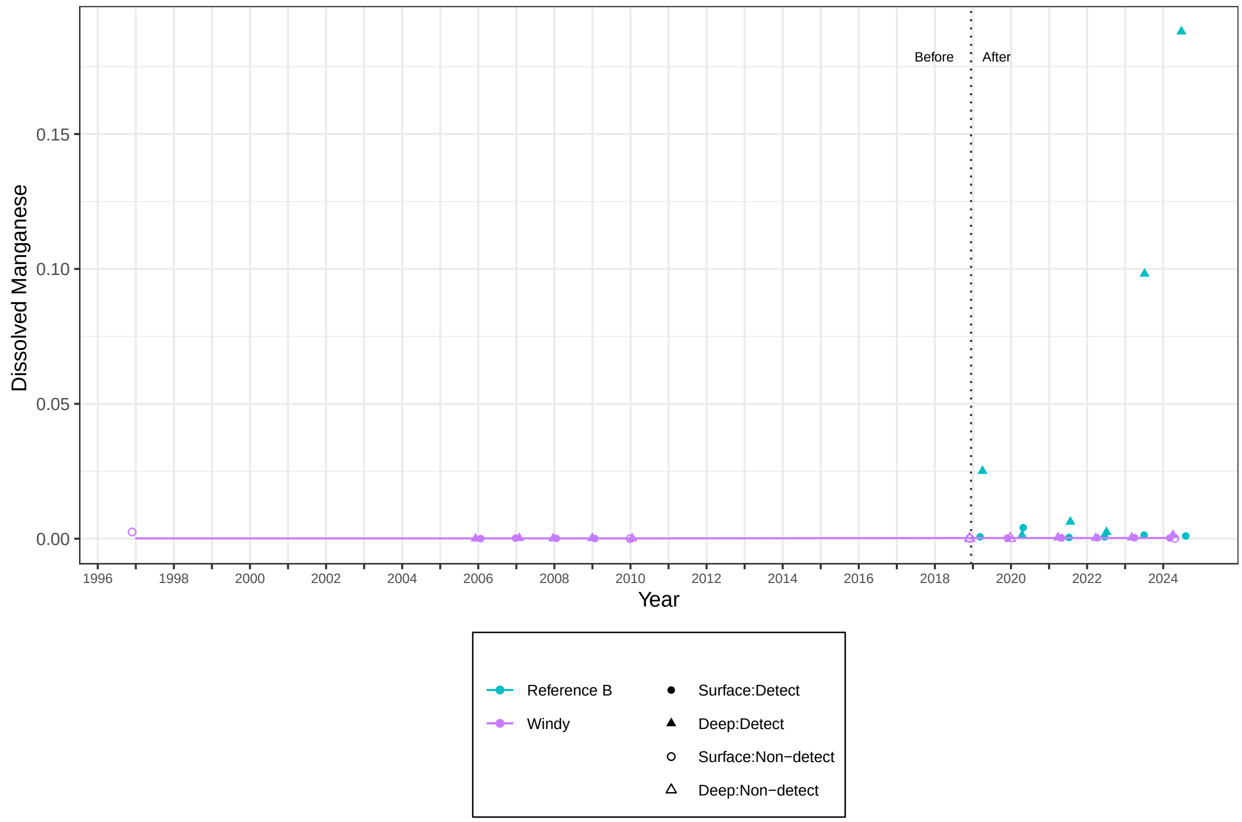
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	0.7118	0.6903	8.694	1.031	0.3303	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.



Windy Open-water Before-After Analysis

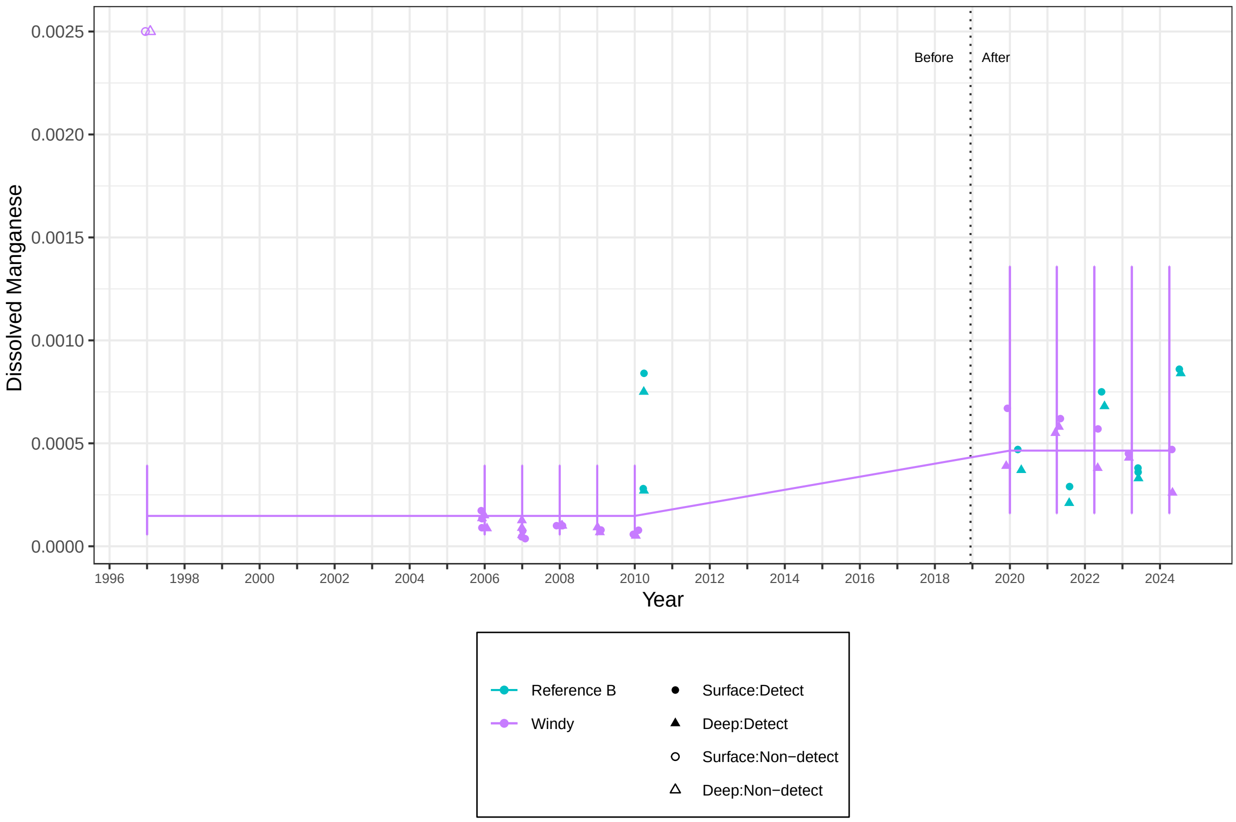
Coefficient	Estimate	Std. Error	df	t value	p	Significance
periodafter	1.147	0.6428	9	1.785	0.108	not sig.

Conclusion:

The change from before to after was not significantly different.
BACI analysis not performed.

Observed Data and Fitted Values

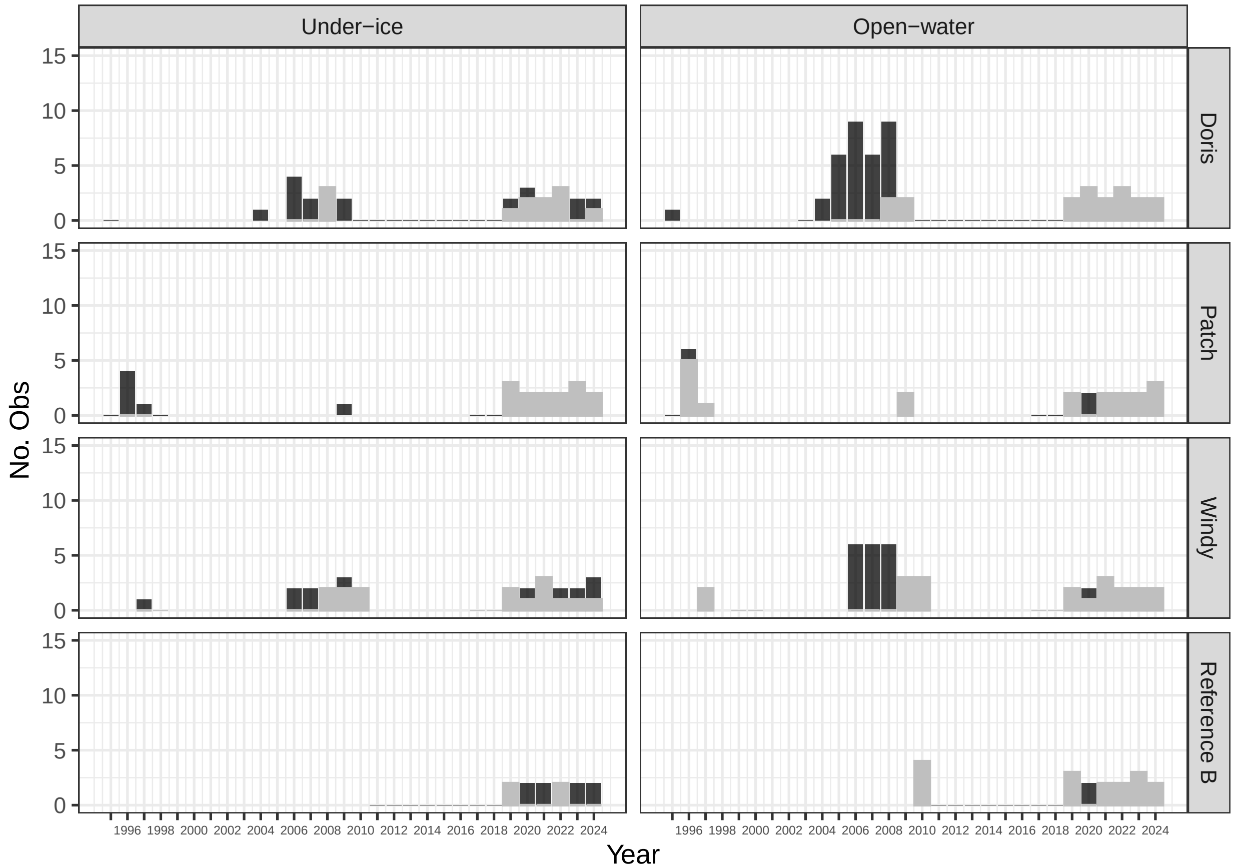
The symbols represent the observed data values and hollow symbols at half the detection limit. Solid lines represent the fitted means. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations in the before and after periods for the exposure site.


Dissolved Manganese
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
Before
After
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
Year
Reference B
Windy
Surface:Detect
Deep:Detect
Surface:Non−detect
Deep:Non−detect

C.3.1.26 Dissolved Zinc

Censored Values and Sample Sizes

The following plots indicate the number of observations for each year from each lake that were less than the detection limit (light gray) or greater than the detection limit (dark gray). Observations below the analytical detection limit were considered censored.



Analysis was not performed if greater than 50% of observations from a site-season grouping were censored or if 100% of observations from the current assessment year (i.e., 2024) were censored.

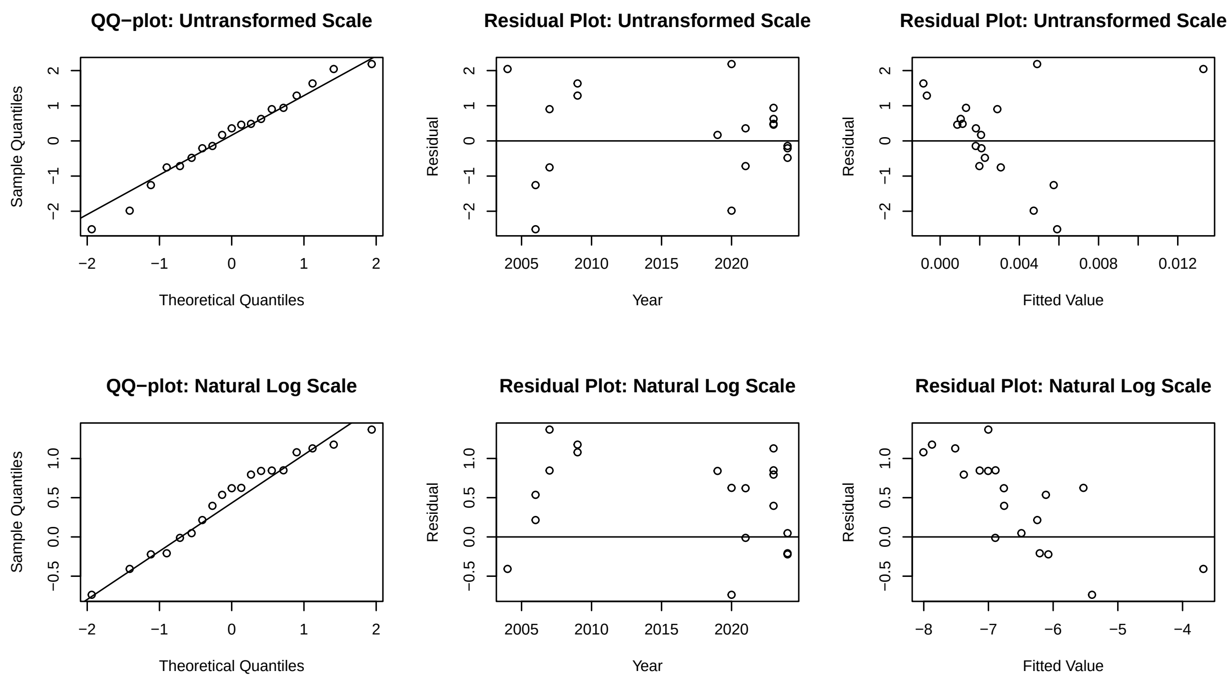
The sample sizes per lake and season are summarized in the table below.

Lake	Season	# Obs (total)	# < DL (total)	% < DL (total)	% < DL (2024)
Doris	Under-ice	26	12	46	50
Doris	Open-water	49	19	39	100
Patch	Under-ice	20	14	70	100
Patch	Open-water	22	19	86	100
Reference B	Under-ice	12	4	33	0
Reference B	Open-water	18	16	89	100
Windy	Under-ice	26	15	58	33
Windy	Open-water	39	20	51	100

More than 50% of data was under detection limit in Doris North Open-water, Patch Under-ice, Patch Open-water, Reference B Open-water, Windy Under-ice, and Windy Open-water. Data from those site-season groupings will be removed from the analysis. Doris North Under-ice, Doris North Open-water, and Reference B Under-ice exhibited more than 10% of data under detection limit. The analysis proceeds with tobit regression for Doris Lake.

Initial Model Fit

A model was fit both on the untransformed and natural log scale to assess the need for transformations. Outliers were identified from the fitted model as standardized residuals greater than 3, and flagged to caution interpretation of results but not removed from the analysis.



Outliers on untransformed scale:

None

Outliers on natural log scale:

None

The untransformed and natural log-transformed model fit the data equally well. Analysis proceeds with untransformed data.

Doris Lake

The trend for Doris Lake was compared to a slope of zero. If there was a significant trend, then the trend for Doris Lake was compared to the trend in Reference Lake B. This contrast does not test for differences in intercepts between lakes.

Doris Under-Ice

Analysis	Chi.sq	df	p	Significance
Compare to slope zero	31.561	3	<0.00001	sig.
Compare to Reference B	4.673	3	0.19740	not sig.

Doris Lake exhibited significant deviation from a slope of zero. Doris Lake did not exhibit significant deviation from the trend of Reference Lake B.

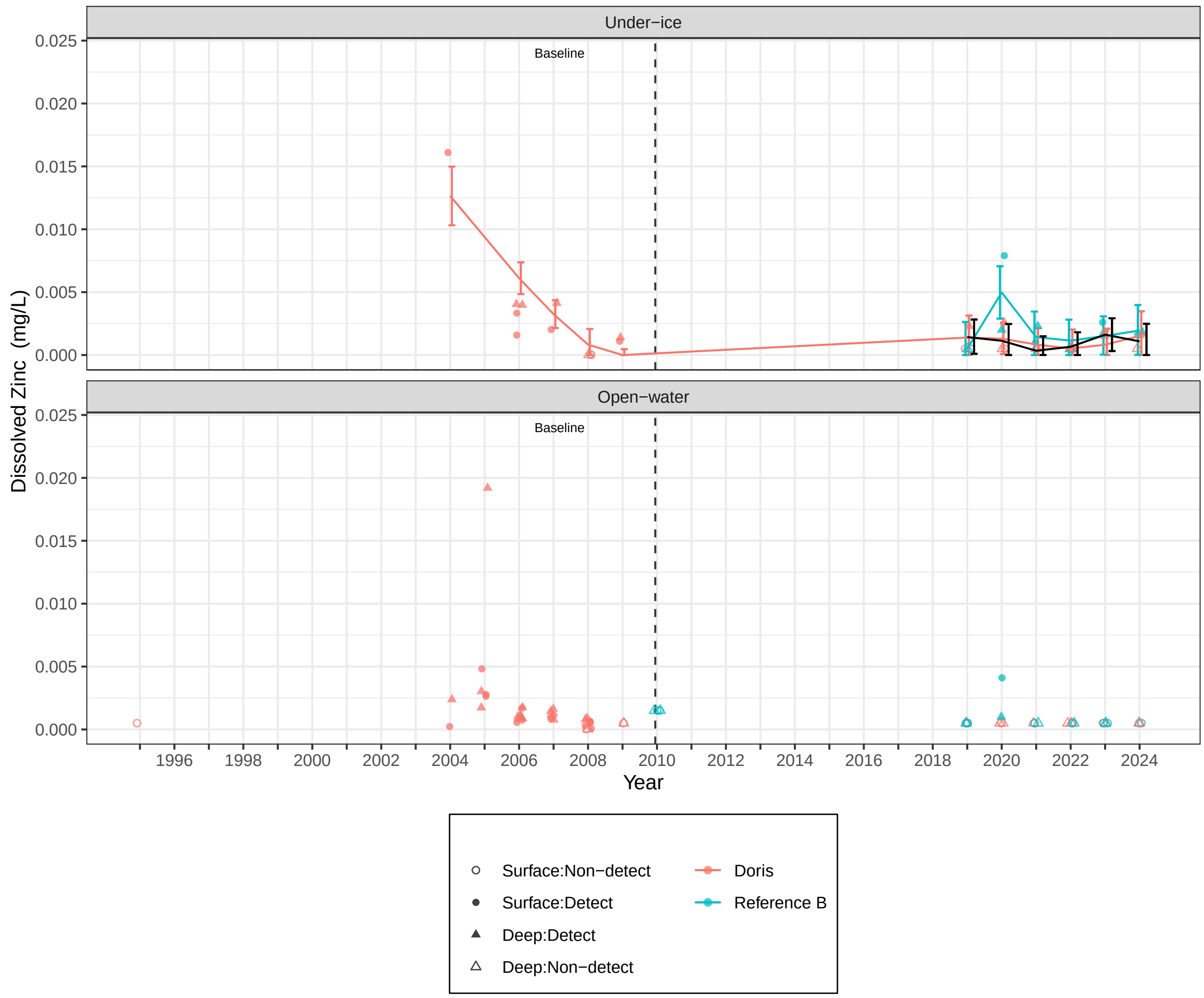
Doris Open-Water

All data from Doris Lake open-water removed from the analysis. No analysis performed.

Observed Data and Fitted Values

The symbols represent the observed data values and hollow symbols are values presented at half the detection limit. Solid lines represent the fitted curves. Error bars indicate the upper and lower 95% confidence intervals of the modelled concentrations.

As Doris Lake exhibited significant deviation from a slope of zero in at least one season, the black lines and error bars represent the model built with Doris Lake data from comparable sampling years with Reference Lake B only.



Patch Lake

Before-after analyses were first performed to compare the change in the before and after period for the exposure site. If a change was detected, then before-after-control-impact linear modelling was applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Patch Under-Ice Before-After Analysis Analysis was not performed.

Patch Open-Water Before-After Analysis Analysis was not performed.

Windy Lake

Before-after analyses were first performed to compare the change in the before and after period in the exposure lake. If a change was detected then before-after-control-impact linear modeling would be applied to compare the change in before and after periods relative to Reference Lake B. Models were fit separately for each season.

Windy Under-Ice Before-After Analysis Analysis was not performed.

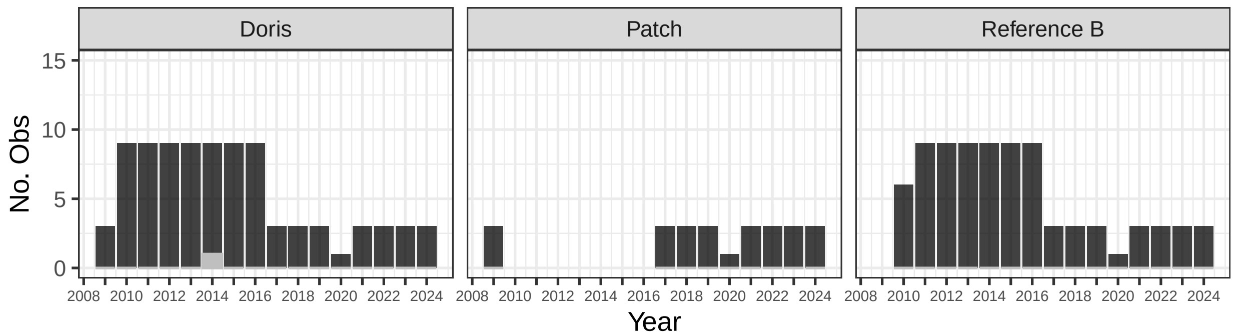
Windy Open-water Before-After Analysis Analysis was not performed.

C.3.2 Phytoplankton

C.3.2.1 Phytoplankton Biomass

Censored Values and Sample Sizes

The following plots indicate the number of measurements taken in each year from each lake that were less than the detection limit (light gray) or greater than the detection limit (dark gray). Observations at or below the analytical detection limit were considered censored.



Analysis was not performed if greater than 50% of observations from a site-season grouping were censored or if 100% of observations from the current assessment year (i.e., 2023) were censored.

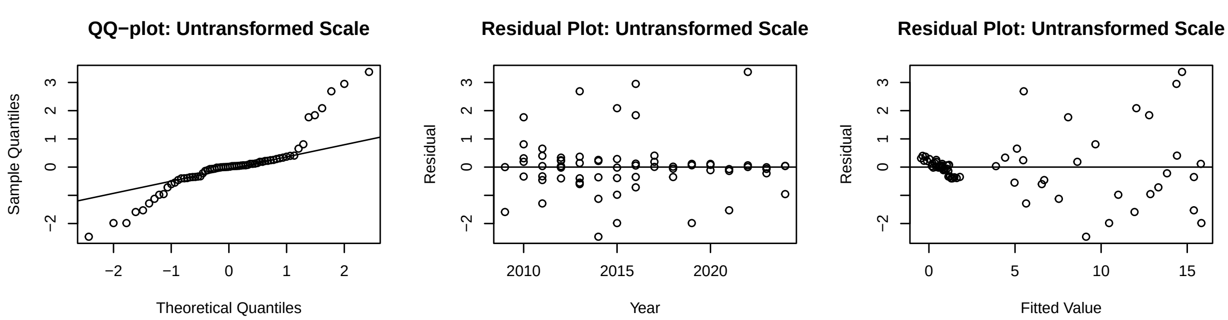
The sample sizes and median values per lake are summarized in the table below.

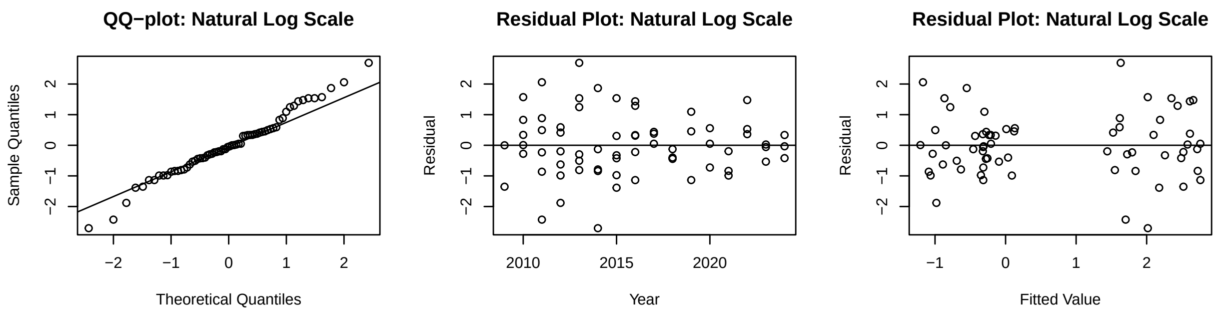
Lake	Season	# Obs (total)	# < DL (total)	% < DL (total)	% < DL (2023)
Doris	Open-water	88	1	0.01	0
Patch	Open-water	25	0	0.00	0
Reference B	Open-water	82	0	0.00	0

None of the lakes exhibited greater than 10% of data less than the detection limit. The analysis proceeds with linear mixed model regression.

Initial Model Fit

A model was fit both on the untransformed and natural log scale to assess the need for transformations. Outliers were identified from the model fit as standardized residuals greater than 3, and flagged to caution interpretation of results but not removed from the analysis.





Outliers on untransformed scale:

Lake	Year	Season	Depth.Zone	Impute	Fitted	Std. Residual
Doris	2022	Open-water	Deep	22.81111	14.69981	3.372891

Outliers on natural log scale:

None

The natural log data better meets the residual assumptions. Analysis proceeds with natural log data.

Doris Lake

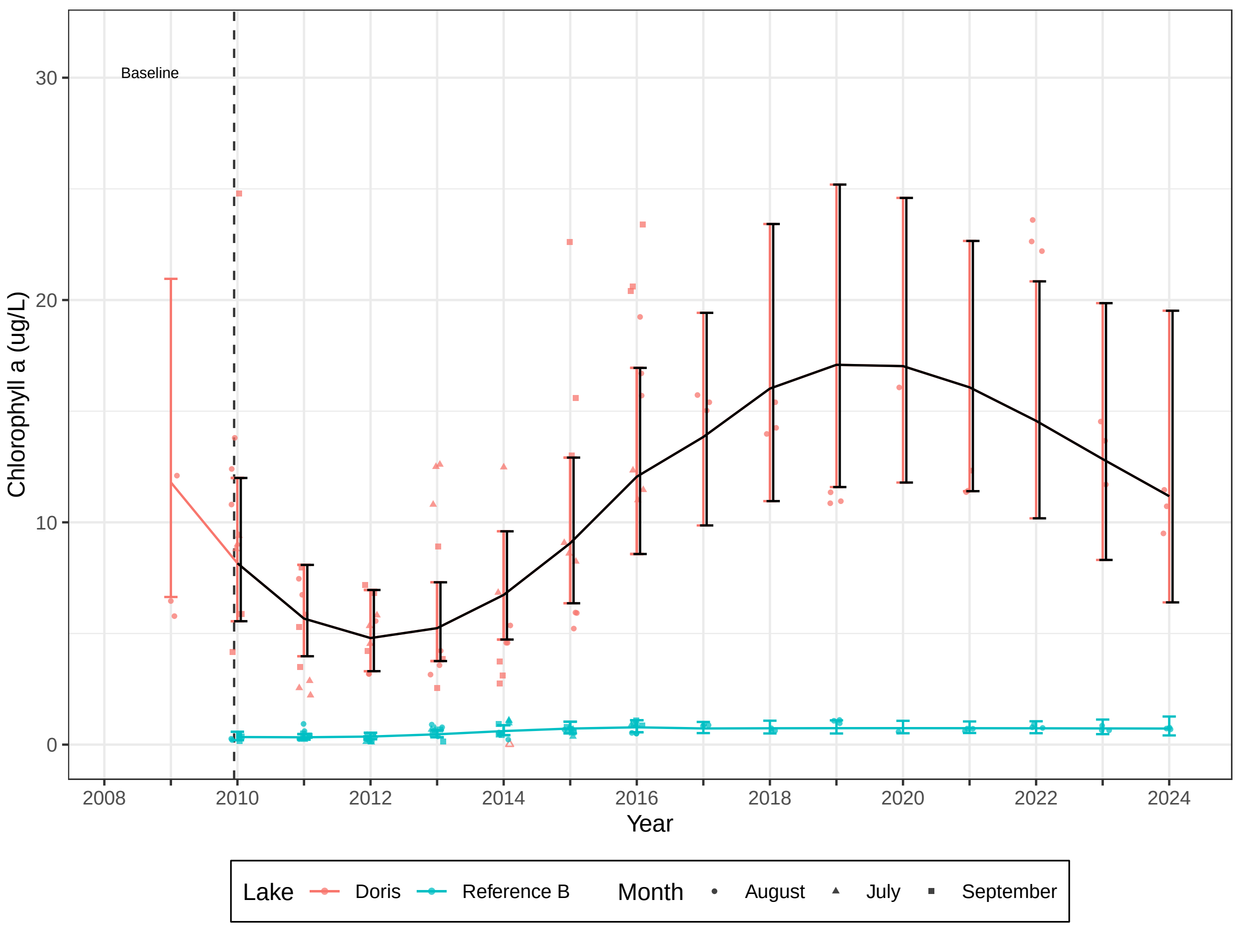
The trend of Doris Lake was compared to a slope of 0. If there is a significant trend, then the trend of Doris Lake is compared to the trend in Reference Lake B. This contrast does not test for differences in intercepts between lakes.

Analysis	Chi.sq	df	p	Significance
Compare to slope 0	47.854	4	<0.00001	sig.
Compare to Reference B	12.094	4	0.01670	sig.

Doris Lake exhibited significant deviation from a slope of zero. Doris Lake exhibited significant deviation from the trend of Reference Lake B

Observed Data and Fitted Values

Symbols represent the observed data values. Observations under detection limit are shown by hollow symbols and plotted at half the detection limit. Solid lines represent the fitted curves and the error bars indicate the upper and lower 95% confidence intervals.



Patch Lake

Before-after analyses were first performed to compare the change in concentrations in the before and after period in the monitoried site. If a change has been detected then before-after-control-impact linear modeling was applied to compare the change in concentrations before and after baseline years between Reference B and Patch lakes.

Before-vs-After Analysis

Coefficient	Estimate	Std. Error	t value	p	Significance
periodafter	0.0082	0.2514	0.0326	0.9749	not sig.

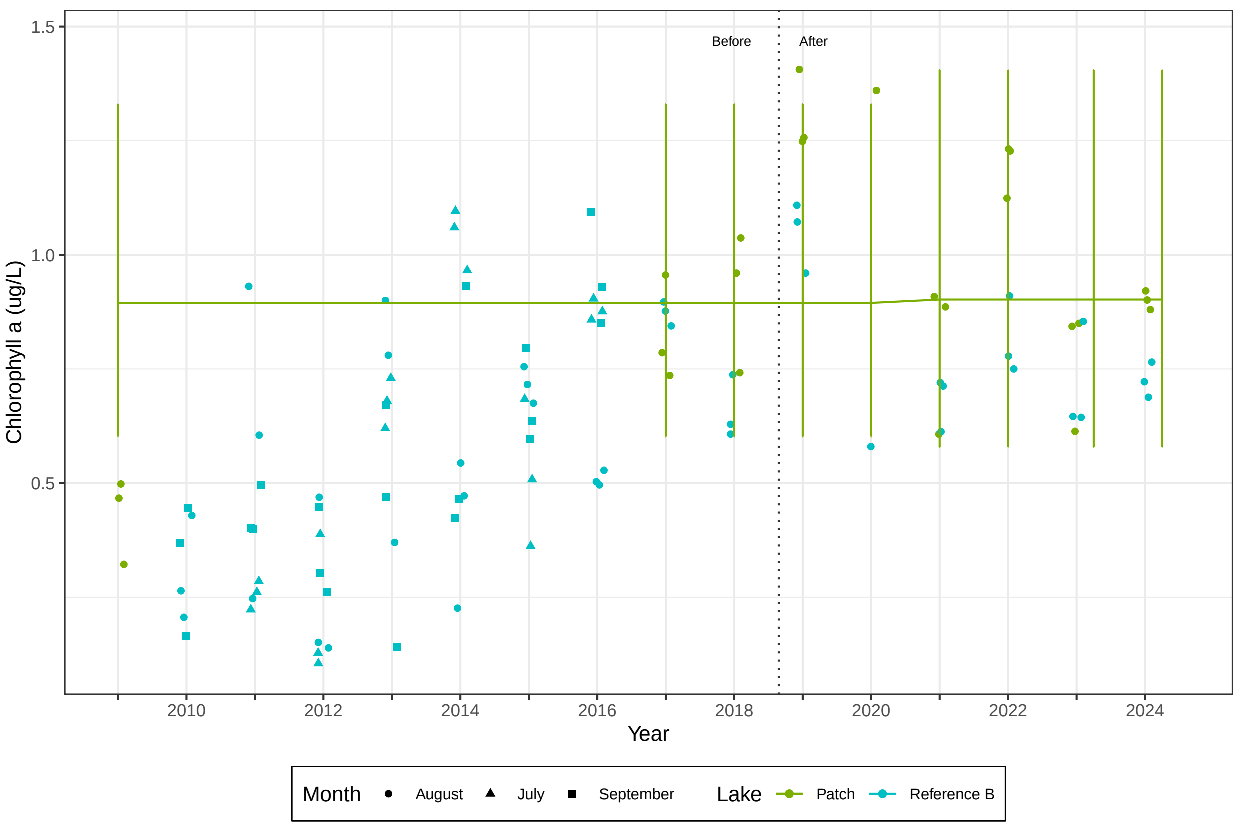
Conclusion:

The change at Patch North Lake from before to after was not significantly different.

BACI analysis not performed.

Observed data and fitted values

Below are plots of the observed and fitted data. The symbols represent the observed data values. Solid lines represent the fitted means and error bars indicate the upper and lower 95% confidence intervals.



C.4 REFERENCES

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Tobin. 1958. "Estimation of Relationships for Limited Dependent Variables." *Econometrica* 26 (1): 24 – 36.

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