APPENDIX E.9.2

2024 Lake Sedimentation Monitoring Program Report

Mary River Project -
Lake Sedimentation
Monitoring 2023/2024

Prepared for:
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Mary River Project –
Lake Sedimentation Monitoring 2023/2024

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ACRONYMS AND ABBREVIATIONS

ABS – Acrylonitrile-Butadiene-Styrene

AEMP – Aquatic Effects Monitoring Plan

ALS – ALS Environmental

ANOVA – Analysis-of-Variance

BAFFINLAND – Baffinland Iron Mines Corporation

BD – Bulk Density

BIC – Benthic Invertebrate Community

CES – Critical Effect Size

CREMP – Core Receiving Environment Monitoring Program

CV-AAS – Cold Vapour Atomic Absorption Spectrometer

FEIS – Final Environmental Impact Statement

FFG – Functional Feeding Groups

GPS – Global Positioning System

HPG – Habitat Preference Group

HSD – Honestly Significant Difference

ICP-MS – Inductively Coupled Plasma Mass Spectrometer

LPL – Lowest Practical Level

NIRB – Nunavut Impact Review Board

NW – Northwest

PSD – Particle Size Distribution

PVC – Polyvinylchloride

QA/QC – Quality Assurance/Quality Control

SE – Southeast

SOP – Standard Operating Procedure

SQG – Sediment Quality Guideline

SRC – Saskatchewan Research Council

TARP – Trigger, Action, Response Plan

TOC – Total Organic Carbon

TSS – Total Suspended Solids

WQG – Water Quality Guideline

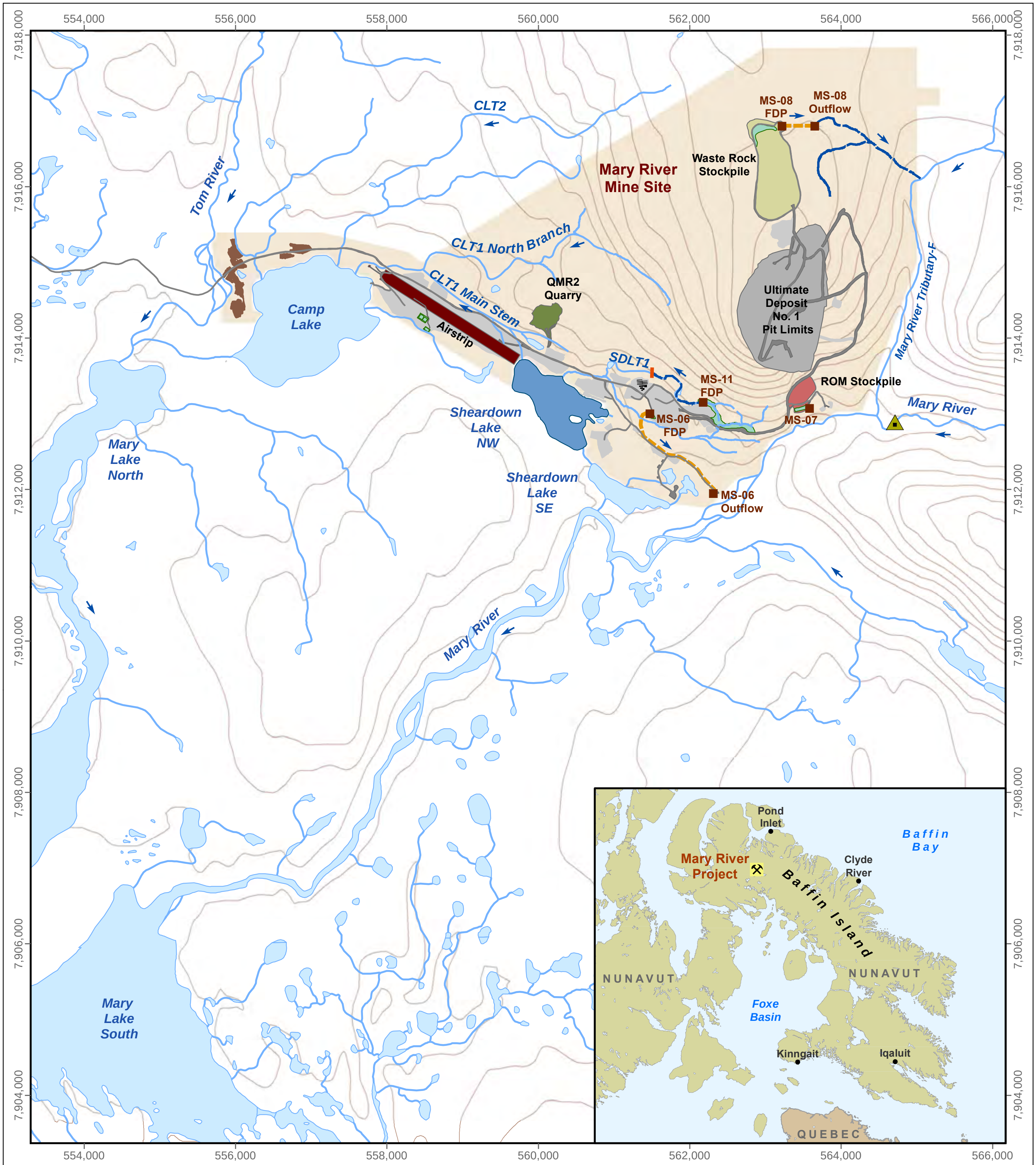
1 INTRODUCTION

The Mary River Project (herein referred to as "the Project"), owned and operated by Baffinland Iron Mines Corporation (Baffinland), is a high-grade iron ore mining operation located in the Qikiqtani Region of northern Baffin Island, Nunavut (Figure 1.1). Commercial open pit mining, including pit bench development, ore haulage, and ore stockpiling, as well as the crushing and screening of high grade iron ore, commenced at the Project site in 2015. Fugitive dust deposition and surface runoff/erosion from Project activities and increased biological productivity (e.g., increased biological production due to treated sewage discharge) have the potential to result in increased sedimentation in nearby waterbodies. In aquatic environments, these deposits may lead to physical habitat alteration (e.g., changes in substrate composition or embeddedness) and/or chemical alteration (e.g., changes in metal, nutrient, and/or organic matter concentrations) that, in turn, could alter biotic assemblages and lead to adverse ecological effects (e.g., physical smothering and reduced survival of organisms residing on/in existing substrate and effects to growth and reproduction of fish, respectively).

Lake Sedimentation Monitoring was included as a special investigation component of the Project's Aquatic Effects Monitoring Plan (AEMP; Baffinland 2015, NSC 2014a) to better understand rates of sediment deposition associated with the Project and the potential implications of this sediment deposition on aquatic biota. The primary concern regarding Project-associated lake sedimentation is the potential for physical effects on arctic charr (*Salvelinus alpinus*) populations resulting from:

- Changes to benthic invertebrate community structure and/or density resulting from habitat alteration that, in turn, may alter food availability (quantity and/or quality) for arctic charr;
- Loss of spawning habitat for artic charr resulting from the accumulation of fine materials on and/or surrounding spawning substrates; and,
- Accumulation of fine material on and/or surrounding the spawning substrates used by arctic charr, which could limit the amount of oxygen available in spawning beds during the overwinter incubation period, thereby resulting in reduced egg hatching success and/or reduced larval survival following hatch (Berry et al. 2003).

The Lake Sedimentation Monitoring study is a year-round sampling program that was designed to measure the sedimentation rate (i.e., total dry weight of sediment deposited per day) at Sheardown Lake Northwest (NW; DL0-01) separately over ice cover and open water periods (Baffinland 2015, NSC 2014a,b, NSC 2015, Minnow 2016, 2017, 2018, 2019, 2020, 2021, 2022a, 2023, 2024a). Relative to other waterbodies near the Project, Sheardown Lake NW is expected



LEGEND

- Airstrip
- Mine Site Complex
- Pond
- ROM Stockpile
- Road
- Open Pit
- Waste Rock Facility
- Infrastructure
- Borrow Pit
- Quarry
- Project Development Area
- Sheardown Lake NW
- Final Discharge Point (FDP)
- Mary River Cascade Barrier
- Fish Barrier
- Overland Surface Water Flow
- HDPE Pipe
- Contour (20m)

Note: CLT - Camp Lake Tributary
SDLT - Sheardown Lake Tributary

Sheardown Lake NW at Baffinland Iron Mines Corporation, Mary River Mine Site

0 1.25 2.5 5 km

N E S W

Map Projection: UTM Zone 17 W NAD 1983
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Figure 1.1

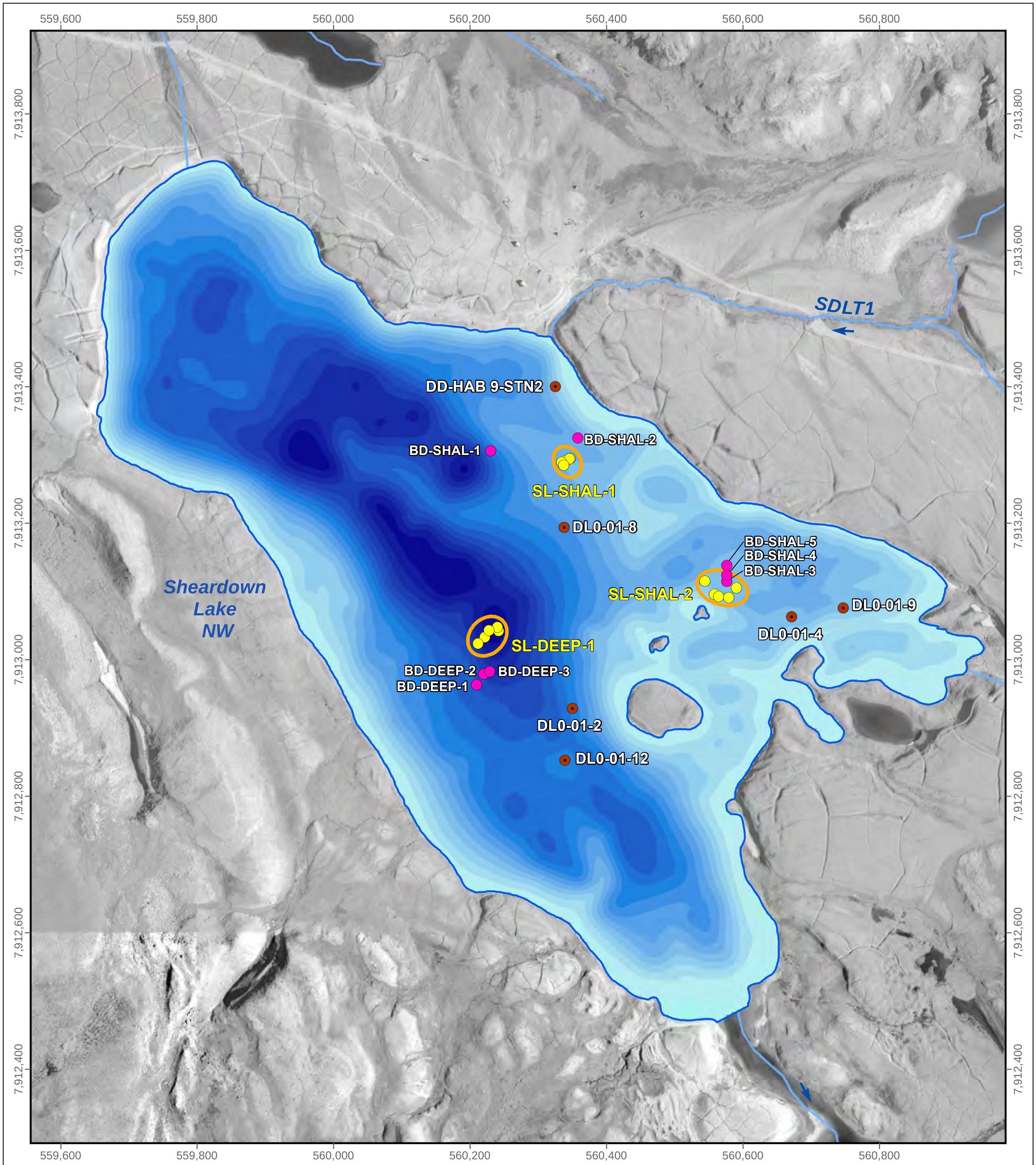
Document Path: C:\Users\MLaPalme\Trinity Consultants, Inc\Baffinland Iron Mines - 247202.0075 - 2024 AEMP\D - GIS\Sedimentation Report\24-75 Figure 1.1 Mary River Mine Site Location.mxd to receive the highest particulate inputs (through dust deposits and site runoff) and was therefore selected for lake sedimentation monitoring (Figure 1.1; NSC 2014b). Sedimentation monitoring was initiated at Sheardown Lake NW in 2013; data collected from fall 2013 to fall 2014 represent one full ice cover period (September/October to June/July) and one full open water period (June/July to September/October). These data were collected to form the baseline for the annual evaluation of potential effects from Project activities to lake sedimentation (Minnow 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024a). This report presents the results of the 2023 to 2024 Lake Sedimentation Monitoring study, including the evaluation of potential Project-related influences on sedimentation at Sheardown Lake NW in the tenth year following the commencement of commercial mine operation in 2015.

2 METHODS

2.1 Overview

Sedimentation studies at Sheardown Lake NW have been used to estimate sedimentation rate and sediment accumulation thickness estimates during ice cover and open water periods (Baffinland 2015, NSC 2014a,b, NSC 2015, Minnow 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024a). Monitoring of sedimentation rate ($mg/cm^2/day$) has been conducted using consistent monitoring locations, sampling equipment, and approach since 2013 (Figure 2.1; Minnow 2024a). Beginning in 2017/2018, the study design was modified to include methods for the direct collection of bulk density (BD) information from deposited sediment as the basis for improving sediment accumulation thickness estimates (Minnow 2019, 2020, 2021, 2022, 2023, 2024a). During review of the Lake Sedimentation Monitoring report in 2022, the Nunavut Impact Review Board (NIRB) requested an investigation of dustfall on lake sedimentation in Sheardown Lake NW. Subsequently, the potential influence of aerial dustfall on sedimentation rate and sediment accumulation thickness estimates was integrated into the 2022/2023 Sheardown Lake NW sedimentation study (Minnow 2024a). In the Final Environmental Impact Statement (FEIS) for the Project (Volume 7; Baffinland 2012), it was predicted that Sheardown Lake NW would receive 2.1×10^9 g of dust annually from direct aerial dustfall and surface runoff during mining operations.

During their review of the Lake Sedimentation Monitoring report in 2023, the NIRB requested investigations into: 1) the influence of dustfall chemistry on sediment trap chemistry; and 2) the potential influence of sedimentation rates and sediment accumulation thickness estimates on the benthic invertebrate community (BIC) in the silt-loam substrate of Sheardown Lake NW over the mine operation period (2015 to 2023). To address the first request, dustfall data collected during the 2022/2023 and 2023/2024 Mary River Terrestrial Environment Annual Monitoring Project were compared to sediment trap data (Minnow 2024a, EDI 2022). The second request was addressed using data for BIC samples collected annually in August as part of the Mary River Project Core Receiving Environmental Monitoring Program (CREMP; Baffinland 2015). An additional BIC monitoring station (DL0-01-8) was incorporated into the 2024 CREMP field study at Sheardown Lake NW (Figure 2.1), to facilitate collection of BIC data from the silt-loam substrate in a depositional area with expected high sedimentation rates (SL-SHAL-1; see also Section 2.2). Using the data collected for the CREMP, correlation analyses were completed between BIC endpoints (e.g., density, richness, Simpson's Evenness, dominant taxonomic groups, and functional feeding groups [FFGs]) and sedimentation rate and accumulation thickness data (see Sections 2.3.5 and 2.4.1 for further details).



LEGEND

- Benthic Invertebrate Community Monitoring Station
- Bulk Density Replicate Station
- Sedimentation Rate Replicate Station
- Sedimentation Rate and Accumulation Thickness Monitoring Area

Bathymetry (m)

0- 2	6 - 8	14 - 16	22 - 24
2 - 4	8 - 10	16 - 18	24 - 26
4 - 6	10 - 12	18 - 20	26 - 28
	12 - 14	20 - 22	28 - 30

Note: SDLT - Sheardown Lake Tributary

Sheardown Lake NW Lake Sedimentation Rate and Benthic Invertebrate Community Monitoring Stations, 2023 to 2024

0 125 250 500 Meters

N E S W

Map Projection: UTM Zone 17N NAD 1983
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Figure 2.1

Document Path: C:\Users\MLaPalme\Trinity Consultants, Inc\Baffinland Iron Mines - 247202.0075 - 2024 AEMP\D - GIS\Sedimentation Report\24-75 Figure 2.1 Sheardown Lake NW Lake Sedimentation Monitoring Locations.mxd

The following sub-sections describe the current methodology for selecting monitoring areas, collection of field data, laboratory analyses, and data analyses (i.e., to evaluate sedimentation rate, sediment accumulation thickness estimates, sediment chemistry, and BIC endpoints).

2.2 Monitoring Areas

In 2023/2024, sedimentation was monitored at the same three annual monitoring areas established at Sheardown Lake NW during the initial 2013/2014 baseline study (Figure 2.1, Table 2.1). The initial selection of monitoring areas in 2013 accounted for dominant benthic habitat types present in the lake as well as habitats considered important for supporting the resident arctic charr population. These considerations resulted in the establishment of Shallow Depositional, Shallow Hard-bottom, and Deep Profundal areas for Sheardown Lake NW sedimentation monitoring based on the following rationale:

1. Shallow Depositional Area (SL-SHAL-1): Silt-loam represents the dominant substrate type in Sheardown Lake NW. Therefore, increased sedimentation in habitats with this substrate type has the greatest potential to affect overall benthic invertebrate density (i.e., productivity) and/or community composition within the lake. In turn, sedimentation-related changes to productivity and/or BIC composition (i.e., food resources) can affect the arctic charr population of Sheardown Lake. For these reasons, and to represent a potentially high sediment deposition habitat, SL-SHAL-1 (referred to as SHAL-1 in the text hereafter) was established within silt substrate in the lake's littoral zone[1]. Additionally, because SHAL-1 is located near the outlet from SDLT1 (Figure 1.1), information acquired from this area also evaluates the extent to which sediment releases from key tributaries affect sedimentation at Sheardown Lake NW. Higher sedimentation rates observed in SHAL-1 in previous monitoring years, relative to the other sedimentation rate monitoring areas, have been attributed to inputs from key tributaries into Sheardown Lake NW however, this did not occur in 2023/2024 data (Minnow 2017).
2. Shallow Hard-bottom Area (SL-SHAL-2): Increased sedimentation at hard-bottom areas could reduce the amount of habitat available to arctic charr for spawning and/or reduce arctic charr egg hatch/reproductive success. Therefore, SL-SHAL-2 (referred to as SHAL-2 hereafter) was established on coarse substrate (i.e., gravel and cobble) in the lake's littoral zone, within an area considered to provide suitable spawning and egg incubation habitat for arctic charr.

[1] In the AEMP, littoral zones in lakes are defined as water depths between 2 to 12 m (Baffinland 2015).

Table 2.1: Sedimentation Rate and Dry Bulk Density Trap Replicate Station Coordinates, Habitat Information, and Deployment and Retrieval Information, Sheardown Lake NW Sedimentation Monitoring Study, 2023/2024

Area	Station	Original Set Location (UTM; Zone 17W)		Substrate	Ice Cover Period (2023 to 2024)			Open Water Period (2024)		
		Easting	Northing		Date Deployed	Date Retrieved	Set Duration (days)	Date Deployed	Date Retrieved	Set Duration (days)
Shallow 1 (SL-SHAL-1)	SL-SHAL-1A	560340	7913292	silt	19-Sep-23	16-Jul-24	301	16-Jul-24	5-Oct-24	81
	SL-SHAL-1B	560347	7913295	silt	19-Sep-23	12-Jul-24	297	12-Jul-24	5-Oct-24	85
	SL-SHAL-1C	560346	7913294	silt	19-Sep-23	17-Jul-24	302	18-Jul-24	5-Oct-24	79
	SL-SHAL-1D	560334	7913289	silt	-	-	-	24-Jul-24	5-Oct-24	73
	SL-SHAL-1E	560337	7913285	silt	19-Sep-23	16-Jul-24	301	16-Jul-24	5-Oct-24	81
Shallow 2 (SL-SHAL-2)	SL-SHAL-2A	560558	7913096	cobble	19-Sep-23	16-Jul-24	301	16-Jul-24	7-Oct-24	83
	SL-SHAL-2B	560564	7913093	cobble	19-Sep-23	16-Jul-24	301	16-Jul-24	5-Oct-24	81
	SL-SHAL-2C	560579	7913091	cobble	19-Sep-23	-	-	24-Jul-24	5-Oct-24	73
	SL-SHAL-2D	560544	7913116	cobble	19-Sep-23	13-Jul-24	298	13-Jul-24	5-Oct-24	84
	SL-SHAL-2E	560590	7913106	cobble	19-Sep-23	-	-	24-Jul-24	5-Oct-24	73
Deep 1 (SL-DEEP-1)	SL-DEEP-1A	560242	7913042	silt	19-Sep-23	10-Jul-24	295	10-Jul-24	7-Oct-24	89
	SL-DEEP-1B	560240	7913048	silt	19-Sep-23	-	-	24-Jul-24	7-Oct-24	75
	SL-DEEP-1C	560222	7913033	silt	18-Sep-23	10-Jul-24	296	10-Jul-24	-	-
	SL-DEEP-1D	560211	7913024	silt	19-Sep-23	12-Jul-24	297	12-Jul-24	7-Oct-24	87
	SL-DEEP-1E	560228	7913043	silt	19-Sep-23	19-Jul-24	305	19-Jul-24	7-Oct-24	80
Bulk Density	BD-SHAL-1	560583	7913137	silt	19-Sep-23	16-Jul-24	301	19-Jul-24	5-Oct-24	78
	BD-SHAL-2	560570	7913136	silt	19-Sep-23	13-Jul-24	298	13-Jul-24	5-Oct-24	84
	BD-SHAL-3	560350	7913321	silt	-	-	-	24-Jul-24	5-Oct-24	73
	BD-SHAL-4	560352	7913306	silt	19-Sep-23	12-Jul-24	297	12-Jul-24	5-Oct-24	85
	BD-SHAL-5	560568	7913153	silt	19-Sep-23	17-Jul-24	302	17-Jul-24	5-Oct-24	80
	BD-DEEP-1	560210	7912963	silt	19-Sep-23	17-Jul-24	302	17-Jul-24	7-Oct-24	82
	BD-DEEP-2	560220	7912979	silt	19-Sep-23	12-Jul-24	297	12-Jul-24	7-Oct-24	87
	BD-DEEP-3	560229	7912983	silt	18-Sep-23	-	-	-	-	-

Notes: "-" = sediment trap not recovered or deployed.

3. Deep Profundal Area (SL-DEEP-1): The profundal area[2] is the ultimate depositional area within lakes and the highest sediment deposition rate is expected to occur at the deepest point within the main basin of a lake. Monitoring area SL-DEEP-1 (referred to as DEEP-1 hereafter) was established on silt substrate within the profundal zone of the main lake basin (approximately 25 metres [m] deep) to provide an estimate of maximum sedimentation for Sheardown Lake NW.

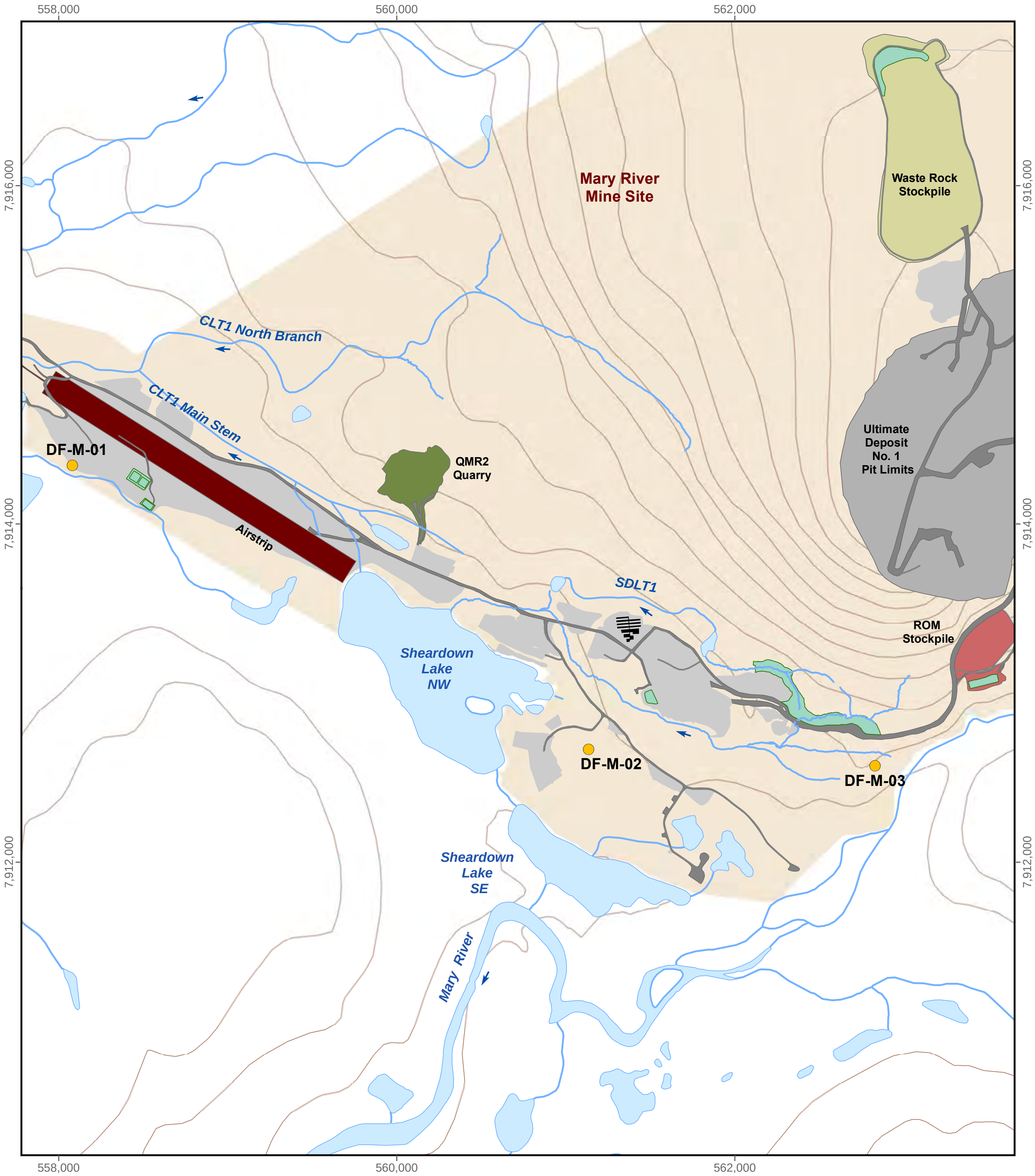
Baffinland has conducted passive dustfall monitoring at the Project site since 2013 as part of the Terrestrial Environment Mitigation and Monitoring program (EDI 2022). Three passive dustfall monitoring stations (Stations DF-M-01, DF-M-02, and DF-M-03) located near Sheardown Lake NW and within the prevailing wind direction were selected to support the assessment of potential influence from aerial dustfall deposition on sedimentation rates and sediment chemistry in Sheardown Lake NW (Figure 2.2). Additionally, to support the investigation of the relationship between high sedimentation rates/accumulation thickness and BIC in Sheardown Lake NW, six of the ten BIC monitoring stations from the CREMP (Stations DL0-01-2, DL0-01-4, DL0-01-8, DL0-01-9, DL0-01-12, and DD-HAB 9-STN2) were paired with the three established sedimentation monitoring areas in Sheardown Lake NW (SHAL-1, SHAL-2, and DEEP-1; Table 2.2, Figure 2.1).

2.3 Field and Laboratory Methods

2.3.1 Sedimentation Rate

Sediment traps were used to monitor sedimentation rates at Sheardown Lake NW during the 2023/2024 ice cover and 2024 open water periods. Sediment traps were constructed using the same materials and dimensions as those deployed annually since the initial study in 2013. Specifically, each sediment trap was constructed of three 50-centimetre (cm) long, 5 cm internal diameter polyvinylchloride (PVC) pipes (i.e., 58.9 cm^2 surface area) sealed at the bottom and clamped together to create a single trap unit. The sediment traps were designed to provide an aspect ratio of approximately 10:1, which meets the ≥ 5:1 aspect ratio generally recommended for cylindrical sediment traps to effectively monitor sediment deposition (Mudroch and MacKnight 1994). Each sediment trap unit was secured to a float-anchor system designed to maintain the trap in an upright position on the lake bottom for the duration of each deployment period. Under this system, the mouth of the sediment trap unit was situated approximately 1.5 m above the substrate.

[2] In the AEMP, profundal zones in lakes are defined as water depths greater than 12 m (Baffinland 2015).



LEGEND

- Dustfall Monitoring Location
- Airstrip
- Mine Site Complex
- Pond
- ROM Stockpile
- Road
- Open Pit
- Waste Rock Facility
- Borrow Pit
- Quarry
- Infrastructure
- Project Development Area
- Contour (20m)

Note: SDLT - Sheardown Lake Tributary
CLT - Camp Lake Tributary

Sheardown Lake NW Dustfall Monitoring Locations, 2023 to 2024

0 0.5 1 2 km

N W E S

Map Projection: UTM Zone 17 W NAD 1983
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Figure 2.2

Document Path: C:\Users\MLaPalme\Trinity Consultants, Inc\Baffinland Iron Mines - 247202.0075 - 2024 AEMP\D - GIS\Sedimentation Report\24-75 Figure 2.2 Sheardown Lake NW Lake Dust Fall Monitoring Locations, 2023-2024.mxd

Table 2.2: Benthic Invertebrate Community Monitoring Station Identifiers and Coordinates Used for the Mary River Project CREMP, 2024

Waterbody	Station Code	UTM Zone 17N, NAD83		Sampling Habitat
		Easting	Northing	
Sheardown Lake Northwest (NW; DL0-01)	DD-HAB 9-STN2	560325	7913400	littoral
	DL0-01-2	560350	7912929	profundal
	DL0-01-4	560696	7913049	littoral
	DL0-01-8	560338	7913194	littoral
	DL0-01-9	560747	7913076	littoral
	DL0-01-12	560339	7912853	profundal

Sedimentation was assessed separately for ice cover and open water periods at Sheardown Lake NW. The seasonal timing of ice breakup and freeze-up at Sheardown Lake NW generally corresponds to mid-July and mid-September, respectively. For the 2023/2024 ice cover period, five sediment traps were deployed, over two days, at each of the three Sheardown Lake NW study areas (September 18th to 19th, 2023; Table 2.1).[3] Sediment traps deployed over the ice cover period were individually fitted with a marker buoy and lowered to the bottom of the lake such that the marker buoy was submerged approximately two to three metres below the water surface (i.e., to avoid entrapment of the buoy by ice during winter). Sediment traps for the 2023/2024 ice cover period were retrieved from July 10th to July 19th, 2024 (295- to 305-day deployment duration; Table 2.1). Marker buoys were submerged and therefore required the use of a grappling tool to secure the marker buoy and retrieve the sediment trap at the time of collection. Three of the 14 sediment traps deployed in September 2023 (Stations SHAL-2C, SHAL-2E, and DEEP-1B) were not located in July 2024, presumably due to the entrapment of the marker buoy by ice and subsequent relocation of the trap. Sediment traps for the open water period were deployed from July 10th to 24th, 2024 and were retrieved from October 5th to 7th, 2024 (73- to 87- day deployment duration; Table 2.1).[4] For the open water period, 15 traps were lowered to the lake bottom on individual lines fitted with a surface marker buoy so that they could be seen from the lake surface. Global Positioning System (GPS) coordinates were recorded for all sediment traps at the time of deployment.

To retrieve each sediment trap, the entire unit was pulled to the surface very slowly to prevent sediment re-suspension in, and/or sediment loss from, each sediment trap. All contents of the trap, including all water and deposited sediment, were transferred into a 20 litre (L) plastic container pre-labelled with station identification and collection date information. Ambient water was used to rinse all sediment from each sediment trap, applied as a pressurized spray, as appropriate. Upon complete removal of all material within the sediment trap, each sediment trap was redeployed at its approximate retrieval location. Following collection of all sediment from individual traps, the sample containers were sealed and stored upright in a dark location until submission to the analytical laboratory. The lake sediment samples were shipped to ALS Environmental (ALS; Waterloo, ON) for analysis of the sediment total dry weight.

At the laboratory, the sedimentation samples were filtered through a pre-weighed 0.70 µm glass fiber filter. The filter apparatus and container were rinsed three times to ensure complete removal

[3] One sediment trap, SHAL-1D, was not deployed in September 2023 (Table 2.1). All sediment rate monitoring traps that were not deployed or retrieved during the 2023/2024 ice cover period were deployed for the 2024 open water period (i.e., a total of 15 of 15 sediment rate monitoring traps were deployed during the 2023/2024 open water period).

[4] One sediment trap (Station DEEP-1C) was not retrieved in October 2024, presumably due to the entrapment of the marker buoy by ice and subsequent relocation of the trap.

of all sediment. The filter and residual sample material were dried at 105°C for two hours, allowed to cool for one hour, and then weighed to the nearest milligram using an electronic balance with a draft shield.

2.3.2 Sediment Accumulation Thickness Estimates, Bulk Density, and Particle Size Distribution

Sediment BD information, which was collected to support sediment accumulation thickness estimates for separate ice cover and open water periods, was collected for the 2023/2024 ice cover period and 2024 open water period. The original sediment trap configuration (2013 to 2017) did not produce sufficient sample volume for BD analysis; therefore, sediment traps used for BD were subsequently modified to have larger dimensions than those used for the collection of sedimentation rate data (Section 2.3.1). The BD sediment traps were constructed of a single 75 cm long, 15.2 cm internal diameter acrylonitrile-butadiene-styrene (ABS) pipe (182 cm^2 surface area) that was capped at the bottom end.[5] Each BD sediment trap was secured to a float-anchor system designed to maintain the trap in an upright position on the lake bottom for the duration of the deployment period. The mouth of the BD sediment trap was designed to sit approximately 1.5 m above the substrate, to match the sedimentation rate traps.

The BD sediment traps for the 2023/2024 ice cover period were deployed on September 18th and 19th, 2023 and retrieved between July 12th and 17th 2024 (297- to 302-day deployment duration; Table 2.1).[6] Similar to the sediment traps deployed for sedimentation rate determination, BD sediment traps deployed over the ice cover period were individually fitted with a marker buoy that was submerged approximately 2 to 3 m below the water surface to avoid entrapment of the buoy by ice during winter. This configuration required the use of a grappling tool for trap retrieval. One of the eight BD sediment traps deployed (station BD-DEEP-3) was not recovered at the end of the ice cover period.

The BD sediment traps for the open water period were deployed between July 12th and 24th and retrieved between October 5th and 7th, 2024 (73- to 87day deployment duration; Table 2.1). The BD sediment traps were lowered to the lake floor on individual lines fitted with a surface marker buoy so that they could be seen from the lake surface. Additionally, GPS coordinates were taken at each BD sediment trap location during deployment. At the end of the open water

[5] The resulting BD sediment traps had an aspect ratio of 5:1, meeting the recommended aspect ratio for cylindrical sediment traps to effectively monitor sediment deposition (Mudroch and MacKnight 1994).

[6] One of the eight bulk density sediment traps (station BD-SHAL-3) was not deployed in September 2023 because the top buoy could not be located.

period, one BD sediment trap (BD-SHAL-3) was not retrieved because the top buoy could not be located. All other BD sediment traps deployed in July 2024 were retrieved.

The retrieval process involved pulling each BD sediment trap to the surface very slowly to prevent sediment re-suspension and/or sediment loss. The entire contents of the trap, including all water and deposited sediment, were transferred into a 4 L plastic container pre-labelled with the replicate station identification code. Residual material in each BD sediment trap was removed using a plastic spatula and/or a pressurized stream of water and then discarded. The BD samples were transported to an on-site laboratory and left undisturbed for approximately 48 hours to allow the sediment to settle. After 48 hours, the overlying water was siphoned and/or pipetted out and the sediment was then transferred into a 50 mL glass collection jar.

To provide sufficient sample volume for BD analysis, BD samples collected from each monitoring area during the 2023/2024 ice cover period were combined to create three composite samples (i.e., BD-SHAL-A, BD-SHAL-B, and BD-DEEP). Each composite sample represented five replicate BD stations at the shallow littoral areas and two replicate BD stations at the profundal area. The BD traps labelled BD-SHAL-1 and BD-SHAL-2 (composited to create sample BD-SHAL-A) correspond to the SHAL-1 sediment monitoring area, and bulk density stations BD-SHAL-3, BD-SHAL-4, and BD-SHAL-5 (composited to create sample BD-SHAL-B) correspond to the SHAL-2 sediment monitoring area (Figure 2.1). The BD traps labelled BD-DEEP-1, BD-DEEP-2, and BD-DEEP-3 (composited to create sample BD-DEEP) correspond to the profundal DEEP-1 sediment monitoring area (Figure 2.1). Sufficient sample volume for BD analysis was acquired from all replicate BD sediment traps deployed at the littoral and deep areas during the 2024 open water periods (Appendix Table B.1).

Following the collection of all sediment, sample containers were sealed and stored cool in an upright position until submission to the Saskatchewan Research Council (SRC; Saskatoon, SK). At SRC, the analysis of BD was conducted using the pycnometer method[7].

After BD analysis, an aliquot of sediment was collected from each BD sample and submitted for particle size distribution (PSD) analysis. The sediment was analyzed by SRC (Saskatoon, SK) using a Microtrac Series 5000 (laser diffraction instrument) before and after ashing the sample at 550°C. The particle range analyzed was between 0.01 µm to 4000 µm. Glass beads were analyzed for quality assurance/quality control (QA/QC).

[7] The pycnometer method uses volume displacement to determine bulk density (see Appendix D for a summary of the laboratory method used).

2.3.3 Sediment Trap Chemistry

Sediment trap material collected during the 2023/2024 ice cover and 2024 open water periods was submitted to ALS (Winnipeg, MB) for analysis by gravimetry. Sediment material was collected on filters (Whatman Glass fiber 934-AH filters) and dried at 105°C. After filtration and drying, the filters were sent to ALS in Waterloo, ON and sediment (approximately one gram) was scraped off the filter for digestion and analysis of total metal concentrations. Blank filters were digested as method blanks. Sediment material that was less than 2 mm in size was digested using a mixture of nitric and hydrochloric acids.[8] All metals were analyzed using an inductively coupled plasma mass spectrometer (ICP-MS), except mercury, which was analyzed using cold vapour atomic absorption spectroscopy (CV-AAS).

2.3.4 Dustfall Collection

The Terrestrial Environment Annual Monitoring Project monitors passive dustfall at 53 stations in and around the Project (EDI 2022). Three passive dustfall monitoring stations (Stations DF-M-01, DF-M-02, and DF-M-03; Figure 2.2) located near Sheardown Lake NW and within the prevailing wind direction were incorporated into the lake sediment monitoring program to support interpretation of lake sedimentation data and sediment trap chemistry. A comparison of data from these dustfall monitoring stations and sediment trap data from Sheardown Lake NW offers insight into whether higher dust deposition rates during the ice cover[9] and/or open water periods influence seasonal sedimentation rates, accumulation thicknesses, and potentially sediment trap chemistry[10]. Based on the proximity of the three dustfall monitoring stations to Sheardown Lake NW, it was expected that historical and current data from these monitoring stations would be sufficient for a preliminary comparison between the two datasets (Figures 2.1 and 2.2).

Dustfall material was collected monthly, suspended in a liquid (isopropyl alcohol or algaecide), and then submitted to ALS (Waterloo, ON) for digestion. Dustfall material was digested at the analytical laboratory using a mixture of nitric and hydrochloric acids and then analyzed for total suspended particulates, metals by ICP-MS, and total mercury by CV-AAS (EDI 2022, Hawthorne 2024).

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[8] The digestion procedure used for sediment chemistry was selected to be similar to the digestion procedure used for the dustfall chemical analysis.

[9] Although ice coverage limits the direct input of dust, material entrapped in and/or deposited on lakes, ice may enter the lake during spring melt.

[10] Sediment trap chemistry was not monitored in the previous years of the lake sediment monitoring program. Available sediment trap chemistry data corresponds to the 2023/2024 ice cover and 2024 open water periods.

2.3.5 Benthic Invertebrate Community

Benthic invertebrate community samples are collected annually in August at 10 established stations in Sheardown Lake NW as part of the CREMP; data from six of these monitoring stations (located proximal to the sediment trap monitoring areas) were used for this study and are presented herein (see Section 2.2; Baffinland 2015). One of these six stations (DL0-01-8) was incorporated into the CREMP for the first time in 2024 (Table 2.2), to support collection of BIC data from an area expected to have high sedimentation rates.

Benthic invertebrate community sampling was conducted using a petite Ponar grab sampler (15.24 x 15.24 cm; 0.023 m^2 sampling area) and targeted areas of the lake with predominantly soft silt-sand, silt, and/or clay substrates.[11] A single composite sample, consisting of five grabs (i.e., 0.115 m^2 sampling area), was collected at each station, ensuring that each grab was acceptable (i.e., captured enough surface material to fill to the edges of the Ponar). Any incomplete grabs were discarded. For each acceptable grab, the petite Ponar was thoroughly rinsed, and the material was then field-sieved through 500-µm mesh. After sieving all five grabs, the retained material was carefully transferred into a plastic sampling jar, which was labelled externally and internally with the station identifier, while working over a catch-tote.

Following collection, the BIC samples were preserved in 10% buffered formalin in ambient water. Supporting information, including substrate descriptions, presence of aquatic vegetation/algae, sampling depths, *in situ* water quality at both the surface and bottom of the water column, and GPS coordinates, was recorded on field sheets.

The BIC samples were submitted to Zeas Inc. (Nobleton, ON), where they were processed using standard sorting, identification, and counting methods (Environment Canada 2014). Upon arrival at the laboratory, a biological stain was added to each sample to enhance sorting accuracy. The samples were first washed free of formalin in a 500-µm sieve and then a technician examined the remaining sample material under a stereomicroscope at a magnification of at least 10 times. Benthic invertebrates were carefully removed from the sample debris and placed into vials containing 70% ethanol. Organisms were sorted by major taxonomic groups (typically at the order or family level). A senior taxonomist later identified and enumerated the organisms to the lowest practical level (LPL) of taxonomy (usually genus or species) using up-to-date taxonomic keys. QA/QC control procedures employed during laboratory processing included assessments of

[11] Successful recovery of a complete Petite Ponar grab sample (i.e., such that surface material is collected and the sampler is full to each edge) is influenced by substrate particle sizes. Specifically, coarser substrates (e.g., pebbles and cobbles) often prevent the sampler from closing, resulting in loss of material or incomplete/unsuccessful grabs. Therefore, softer/finer substrates like sand, silt, and clay are targeted, despite being smaller relative to the substrate particle sizes at the sediment trap set locations (refer to Section 2.2).

organism recovery and sub-sampling checks on up to 10% of the total samples collected for the 2024 CREMP report (Minnow 2025).

2.4 Data Analysis

2.4.1 Sedimentation Rate and Sediment Accumulation Thickness Estimates

Sedimentation (deposition) rate was calculated for each replicate sediment trap using the equation (Kemp et al. 1974):

$$\textit{Sedimentation rate (mg/cm}^2\textit{/day)} = \frac{\textit{dry weight (mg)}}{\textit{total area (cm}^2\textit{)}} \div \textit{deployment time period (day)}$$

The sedimentation rate information was evaluated statistically as follows: 1) spatial comparisons among the three areas for separate ice cover and open water periods; 2) comparisons between the ice cover and open water periods at each area; 3) temporal comparisons at each area among years of mine operation and baseline separately for ice cover and open water periods; 4) temporal trend analysis of sedimentation rate at each monitoring area among years of mine operation and baseline; 5) trend analysis between sedimentation rate and aerial dustfall deposition during the ice cover and open water periods; and 6) graphical comparison between aerial dustfall chemistry and sediment trap chemistry.

For the statistical analysis, raw data were assessed for normality and homogeneity of variance and log-transformed as necessary to meet test assumptions before conducting t-tests, Analysis-of-Variance (ANOVA), and *post hoc* tests. In instances where normality could not be achieved through data transformation, non-parametric Mann-Whitney Utest statistics were used for pair-wise comparisons, and Kruskal-Wallis H-tests were used for multiple group (i.e., area or year) comparisons using rank transformed data. When variance was unequal between groups based on Levene's Test for Equality of Variance, Welch's t-test was used for comparisons. For the multiple area or year comparisons, Tukey's Honestly Significant Difference (HSD) *post hoc* tests were conducted for pair-wise comparisons. Temporal trends in sedimentation rate for the open water and ice cover periods were evaluated using non-parametric Spearman's ρ rank correlation and p-values less than 0.05 were considered statistically significant. All statistical comparisons were conducted using R programming (R Foundation for Statistical Computing, Vienna, Austria).

Estimation of the uncompacted thickness (mm)[12] of sediment (referred herein as sediment accumulation thickness estimates) was calculated separately for each of the ice cover and open water periods using the equation (Kemp et al. 1974):

$$\textit{Sediment accumulation thickness (mm/deployment period)} = \frac{\textit{sedimentation rate (mg/mm}^2\textit{/day)}}{\textit{bulk density (mg/mm}^3\textit{)}} \textit{ x deployment time period (day)}$$

Sedimentation BD results were used to calculate sediment accumulation thickness estimates at shallow (littoral) and deep (profundal) areas of Sheardown Lake NW for each of the 2023/2024 ice cover and 2024 open water periods. The sediment thickness information was evaluated statistically between littoral and profundal habitats separately for the ice cover and open water periods, and between the ice cover and open water periods separately for each habitat type, using the same statistical methods described above that were used for comparing sedimentation rates.

Baffinland has proposed sediment accumulation thickness estimate thresholds to guide management response decisions as part of a Trigger, Action, Response Plan (TARP) for the Mary River Project AEMP (Minnow 2021, Baffinland 2022). The proposed thresholds include:

- a Low Action response threshold of 0.15 mm of sediment deposition based on the upper range of the natural sedimentation rate of 50 mg/cm^2/year converted to a sediment accumulation thickness estimate using the BD of deposited sediment at Sheardown Lake NW;
- a Moderate Action response threshold of 0.54 mm of sediment deposition based on the sediment accumulation thickness estimate predicted in the FEIS for the Project; and
- a High Action response threshold of 1 mm sediment deposition based on the threshold presented in the FEIS for the Project (Baffinland 2012).

The High Action response threshold was adopted from, and supported by, Morgan et al. (1983), Fudge and Bodaly (1984), and Berry et al. (2011) as the sediment accumulation thickness estimates over the egg incubation period at which adverse effects on fish egg survival may occur. On Baffin Island, arctic charr spawning occurs in autumn (September and October) and, although egg hatch occurs in early April, larval emergence generally does not occur until ice breakup in mid-July (Scott and Crossman 1998). Because this egg incubation and larval swim-up period mirrors the ice cover period used in this study, sediment accumulation thickness estimates for the ice cover period were used to evaluate the potential effects of depositing sediment on arctic charr

[12] Uncompacted thickness (i.e., sediment accumulation thickness estimates) represents the thickness of sediment accumulated during the ice cover (September/October to July) or open water (July to September/October) periods (i.e., the deployment period). For this study, sediment accumulation thickness estimates are calculated on a period basis (i.e., ice cover or open water) unless otherwise noted.

egg survival at Sheardown Lake NW. Sediment accumulation thickness for the 2023/2024 ice cover period was compared to the Low, Moderate, and High Action response thresholds proposed by Baffinland (2022) and Minnow (2021) to identify the potential effects to arctic charr egg incubation and to guide management decisions in accordance with the TARP framework.

2.4.2 Aerial Dustfall Deposition and Chemistry

Dustfall data were compared to sedimentation rates and sediment accumulation thickness estimates by grouping corresponding dustfall data collected every month to the respective ice cover and open water periods. These data were then compared to the sedimentation rate and accumulation thickness estimates for the ice cover and open water periods. Spearman's ρ was used to assess correlations between dustfall data and sedimentation rate data from 2013 to 2024 and were considered statistically significant if the correlation had a p-value less than 0.05. For comparisons between sediment trap and dustfall chemistry, parameters were selected for graphical representation if they have applicable AEMP sediment quality benchmarks (i.e., arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, phosphorus, and zinc) or if there was an indication of mine-related effects based on water quality (molybdenum and uranium) in Sheardown Lake NW during the 2022/2023 monitoring program (Minnow 2024b).

2.4.3 Benthic Invertebrate Community

Statistical analyses of BIC data were conducted for the mine operation period (i.e., 2015 to 2024). The BIC endpoints assessed included:

- mean invertebrate densities (i.e., the average number of organisms per m^2);
- mean taxonomic richness (number of taxa identified to the LPL of taxonomy);
- Simpson's Evenness Index; and
- relative abundance of dominant/indicator taxa and functional feeding groups (FFG).

Simpson's Evenness was calculated using the Krebs method (Smith and Wilson 1996). Relative abundances of dominant/indicator taxa and FFG were calculated as the raw abundance (i.e., total number of organisms counted) of each respective group relative to the total number of organisms in the parent BIC sample. Dominant/indicator taxonomic groups were defined as those groups representing, on average, greater than 5% of the raw total organism count for a study area or any groups considered to be important indicators of environmental stress. The FFG were assigned based on Pennak (1989), Mandaville (2002), and/or Merritt et al. (2008) descriptions/designations for each taxon.

The BIC endpoints calculated for littoral areas (i.e., DL0-01-2, DL0-01-4, DL0-01-9, and DL0-01-12) as part of this study may differ slightly from those calculated in the CREMP; BIC endpoints from the CREMP were used for profundal areas (Minnow 2025). Differences between endpoints calculated here for littoral areas and in the CREMP are attributed to how the decision key in the standard operating procedure (SOP) for benthic invertebrate data management is applied to different datasets (i.e., the dataset for littoral areas of Sheardown Lake NW and the larger dataset for the CREMP). The decision key, which was developed to standardize resolution of taxonomic ambiguity, reduce subjectivity, and improve efficiency, uses criteria based on organism abundance and richness to guide decisions. For example, child taxa (e.g., multiple genera) do not get "rolled up" to the parent taxonomic level (e.g., family) in the final dataset due to high richness and relative abundance. The criteria used in the decision key may change as new data are added. To facilitate comparability over time, the decision key was applied to all years of data.

Potential relationships between BIC endpoints and sedimentation rates and accumulation thickness estimates were examined by correlation analysis. Benthic invertebrate community endpoints were paired with sedimentation rate and accumulation thickness estimate data based on habitat type (i.e., profundal [deep] or littoral [shallow]) and proximity (i.e., BIC stations were paired with the closest sedimentation monitoring area). Specifically, the following pairings were used in the correlation analysis: DL0-01-4 and DL0-01-9 paired with SHAL-2 and DL0-01-2 and DL0-01-12 paired with DEEP-1. For each set of paired data, Spearman's Rank correlations were conducted between the BIC endpoints and sediment endpoints. All comparisons were also plotted to support visualization of the data. Significance was assessed at alpha of $p < 0.1$.

Correlation analysis could not be completed for BIC stations DD-HAB 9-STN2 and DL0-01-8 and their corresponding sediment monitoring area (SHAL-1) because DD-HAB 9-STN2 and DL0-01-8 had only a single year of data each (2016 and 2024, respectively; Figure 2.1). Instead, the BIC data from DD-HAB 9-STN2 and DL0-01-8 were added to the data plots, along with sedimentation data from SHAL-1 (the closest sedimentation monitoring area), to support visual examination of the data.

3 RESULTS

3.1 Sedimentation Rate

3.1.1 Spatial Comparisons for the 2023 to 2024 Ice Cover and Open Water Periods

The amount of sediment collected (i.e., based on dry weight) during the 2023/2024 ice cover period was less than that collected during the 2024 open water period (Appendix Table B.2). During the 2023/2024 ice cover period, all lake sedimentation monitoring areas had comparable sedimentation rates (Appendix Tables A.1 and A.2). The mean sedimentation rates at each of the littoral areas (SHAL-1 and SHAL-2) did not differ significantly from the mean sedimentation rate at the profundal area (DEEP-1) during the 2023/2024 ice cover period (Appendix Tables A.1 to A.3). During the ice cover period, sedimentation rates at areas SHAL-1 and SHAL-2 were not statistically different, suggesting that sedimentation was uniform between the silt-loam habitat located close to the SDLT1 outlet (SHAL-1) and habitat characterized by hard substrate potentially used for arctic charr spawning (SHAL-2; Appendix Table A.3).

During the 2024 open water period, mean sedimentation rates in the profundal area (i.e., main basin area DEEP-1) were significantly higher relative to the littoral monitoring areas (i.e., SHAL-1 and SHAL-2; Figure 3.1; Appendix Tables A.2 to A.4). These results are considered normal or typical for lakes (Wetzel 2001). No significant differences in mean sedimentation rates were identified for SHAL-1 and SHAL-2 during the open water period which did not support inputs from key tributaries into Sheardown Lake NW impacting shallow immediately adjacent (SHAL-1) or potential egg-rearing areas (SHAL-2) (Appendix Tables A.2 to A.4).

Mean annual sedimentation rates at Sheardown Lake NW in 2023/2024 were 46 mg/cm^2/year and 45 mg/cm^2/year for the littoral areas SHAL-1 and SHAL-2, respectively (Appendix Table A.2). The profundal area (DEEP-1) had the highest mean annual sedimentation rate of approximately 57 mg/cm^2/year (Appendix Table A.2). These annual sedimentation rates are within the range of those observed at other Canadian Arctic lakes (e.g., 7 to 50 mg/cm^2/year; Lockhart et al. 1998) and much lower than at proglacial lakes in southeast Greenland (e.g., mean of 790 mg/cm^2/year; Hasholt et al. 2000). Therefore, observed annual sedimentation rates at Sheardown Lake NW over the study period were within a range that is typical for lakes in the Canadian Arctic that have not been significantly impacted by mining or industrial activities.

3.1.2 Temporal Comparisons for the 2023 to 2024 Ice Cover and Open Water Periods

Average sedimentation rates at the littoral monitoring areas (SHAL-1 and SHAL-2) in Sheardown Lake NW were significantly higher during the ice cover period in 2023/2024 relative to baseline (i.e., 2013/2014), whereas average sedimentation rates in the profundal monitoring area

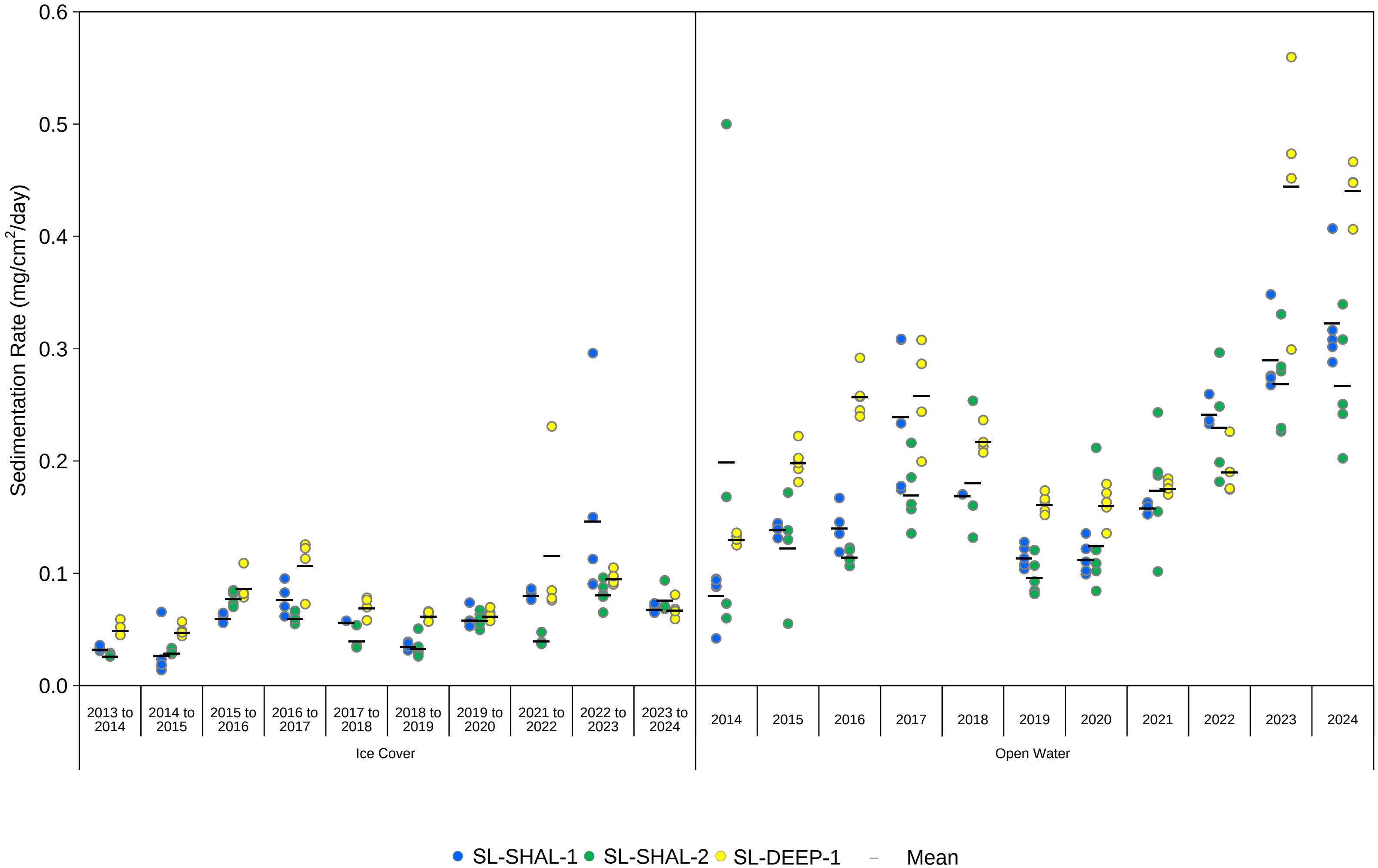

Figure 3.1: Sedimentation Rates During Ice Cover and Open Water Periods at Sheardown Lake NW over Mine Baseline (2013 to 2014) and Operational Phases (2015 to 2024), Sheardown Lake NW Sedimentation Monitoring Study

Note: Black lines indicate the mean sedimentation rate of a station for a given year/season.

(DEEP-1) were not (Appendix Table A.5). Sedimentation rates for the littoral area SHAL-1 were also significantly higher during the 2023/2024 ice cover period than two of the eight[13] (i.e., 2014/2015 and 2018/2019) previous ice cover periods since mine operation (Appendix Table A.5). Strong (SHAL-1, Spearman's ρ of 0.68 and $p<0.05$) and moderate (SHAL-2 and DEEP-1, Spearman's ρ of 0.42 to 0.53, $p<0.05$) significant correlations between sedimentation rates during the ice cover period and year suggested there may be an overall increase in sedimentation rate since the onset of mining (Figure 3.1, Appendix Figure A.1). The observed increase in lake sedimentation rates corresponded to sediment accumulation thickness estimates during in the 2023/2024 ice cover period that were below the Low Action TARP threshold of 0.15 mm (discussed in further detail in Section 3.2).

For the open water period, average sedimentation rates at all littoral (SHAL-1 and SHAL-2) and profundal (DEEP-1) areas were significantly higher in 2024 relative to baseline (2014; Appendix Table A.6). However, sedimentation rates for the littoral areas SHAL-1 and SHAL-2 in 2024 were statistically similar to sedimentation rates observed in the open water periods of 2017, 2018, and 2021 to 2023 (Appendix Table A.6). Similarly, sedimentation rates at the profundal area DEEP-1 during the 2024 open water period were similar to sedimentation rates observed in 2015 to 2018, 2022, and 2023 (Appendix Table A.6). At the littoral monitoring areas, strong (SHAL-1, Spearman's ρ of 0.65, and $p<0.05$) and moderate (SHAL-2, Spearman's ρ of 0.55, and $p<0.05$) significant correlations during the open water period between sedimentation rates and year suggested an overall increase in sedimentation rate since the onset of mining (Appendix Figure A.1). At the profundal area (DEEP-1) and during the open water period, there is a weak, significant correlation (Spearman's ρ of 0.36, and $p<0.05$) between sedimentation rate and year, indicating a minor increase in sedimentation rates since the onset of mining (Appendix Figure A.1). The observed increase in lake sedimentation rates corresponded to sediment accumulation thickness estimates during in the 2024 open water period that were below the Low Action TARP threshold of 0.15 mm (discussed in further detail in Section 3.2).

Within Sheardown Lake NW, mean sedimentation rates were three- to six- times higher during the open water period, relative to the ice cover period, for all sampling areas (Appendix Table A.7). Higher sedimentation rates during the open water period versus ice cover periods during baseline were also observed in Sheardown Lake NW. Sheardown Lake NW tributaries freeze to the bottom in the winter and therefore limit sediment material entering Sheardown Lake NW from tributary sources (e.g., sediments sourced from erosion). The deposition of more allochthonous sediment from surface runoff and/or the increased deposition of autochthonous organic material

[13] Includes only data with available sedimentation rate results (e.g., 2020 to 2021 results are not discussed).

due to higher within-lake productivity may have contributed to the higher sedimentation rates observed during the open water period.

3.2 Sediment Accumulation Thickness Estimates

3.2.1 Spatial Comparisons for the 2023 to 2024 Ice Cover and Open Water Periods

During the 2023/2024 ice cover period and 2024 open water period, BD ranged from 2.63 to 3.36 g/cm^3 (Appendix Table B.1). The BD was consistent with BD collected in sediment trap material from 2018 to 2023, suggesting that the sediment source has remained consistent since 2018 (Appendix Table B.1). During the 2023/2024 ice cover period, the PSD of sediment at the BD littoral area BD-SHAL-A (i.e., sedimentation rate monitoring area SHAL-1) and BD profundal area, BD-DEEP, were dominated by silt and/or clay sized grains (Appendix Table B.3). The BD littoral station BD-SHAL-B (corresponding to sedimentation rate monitoring area SHAL-2), which is expected to represent favourable habitat for arctic charr egg incubation, had a higher proportion of coarser sediment (relative to BD-SHAL-A) and was composed primarily of silt and/or clay with smaller amounts of fine sand (Appendix Table B.3). During the 2024 open water period, PSD was heterogenous among replicate BD traps corresponding to littoral monitoring areas SHAL-1 (i.e., BD-SHAL-1 and BD-SHAL-2) and SHAL-2 (i.e., BD-SHAL-3, BD-SHAL-4, and BD-SHAL-5; Figure 2.1 and Appendix Table B.4). Generally, during the 2024 open water period, the littoral stations consisted of silt and/or clay (69 to 100%) and smaller amounts of fine sand (0 to 31%; Appendix Table B.4). The 2024 open water period PSD corresponding to SHAL-1 was consistent with the 2023/2024 ice cover period (Appendix Table B.3). Conversely, PSD for monitoring area SHAL-2 was inconsistent between ice cover and open water periods, which suggested heterogeneity of sediments between seasons for SHAL-2 (Appendix Table B.4). Particle size distribution results for the BD profundal Stations BD-DEEP-1 and BD-DEEP-2 were consistent between the 2023/2024 ice cover and 2024 open water periods (Appendix Tables B.3 and B.4).

During the 2023/2024 ice cover period, mean sediment accumulation thickness estimates did not differ among sediment monitoring areas SHAL-1, SHAL-2, or DEEP-1 (Appendix Figure A.3, Appendix Table A.8 and A.9). In contrast, sediment accumulation thickness estimates were significantly different among all three Sheardown Lake NW study areas during the 2024 open water period (Appendix Tables A.8 and A.9). Sedimentation rate monitoring area DEEP-1 had a significantly higher mean sediment accumulation thickness estimate than the littoral areas (SHAL-1 and SHAL-2; Appendix Tables A.8 and A.9). Additionally, SHAL-1 had a significantly higher mean sediment accumulation thickness estimate than SHAL-2, which is the area considered favourable for arctic charr spawning (Appendix Tables A.8 and A.9). Although sedimentation rates were similar at the littoral stations (SHAL-1 and SHAL-2), sediment accumulation thickness estimates differed between the two stations during the 2024 open water period. The higher sediment accumulation thickness estimates at SHAL-1 relative to SHAL-2 are likely due to the differences in BD of the sediment trap material (Appendix Table B.1). Sediment trap material in the SHAL-1 monitoring area had a BD of 2.83 g/cm^3 and material in SHAL-2 sediment traps had a mean BD of 3.25 g/cm^3. Overall, results for the open water period reflected the expected depositional characteristics within the lake, where the maximum depositional areas would be (i.e., DEEP-1 [profundal deep area]).

Sediment accumulation thickness estimates at areas SHAL-1 and DEEP-1, but not at SHAL-2, were significantly higher during the open water period of 2024 relative to the ice cover period of 2023/2024 (Appendix Figure A.3, Appendix Tables A.8 and A.10). Among the three monitoring areas, an average of 55% of the total annual (from September 2023 to October 2024) sediment accumulated occurred during the open water period (Appendix Table A.8).

The mean annual sediment accumulation thickness estimate (September 2023 to October 2024) at all monitoring areas (0.17 ± 0.03 mm/year; Figure 3.2; Appendix Table A.8) at Sheardown Lake NW was lower compared to other Arctic lakes in western Greenland (mean of 0.54 mm/year; Sobek et al. 2014, Brothers et al. 2008). The sediment accumulation thickness estimates in Sheardown Lake NW at all monitoring areas were comparable to an Alaskan Arctic lake (0.16 mm/y) of similar depth and lakes that are deeper than 10 m (range from 0.3 to 1.5 mm/year) north of the 65° latitude[14] (O'Brien et al. 1997, Sobek et al. 2014, Brothers et al. 2008). The mean annual sediment accumulation thickness estimate (0.20 ± 0.01 mm/year) for the profundal DEEP-1 area was similar to annual accumulation thicknesses observed at profundal depths in Alaskan Arctic lakes (0.16 ± 0.08 mm/year; Cornwell 1985, O'Brien et al. 1997).

Project-related sedimentation accumulation thickness estimates less than 1 mm/y were predicted in the FEIS to have negligible effects on the direct mortality of arctic charr and arctic charr eggs (Fudge and Bodaly 1984, Baffinland 2012). The sediment accumulation thickness estimates corresponding to the 2023/2024 arctic charr egg incubation period were well below 1 mm/y at Sheardown Lake NW (approximately five to seven times less; Appendix Table A.10) at all monitoring stations; the absence of direct mortality of arctic charr was in compliance with predictions made in the Baffinland FEIS (Baffinland 2012). The TARP Low Action response threshold of 0.15 mm corresponds to the ice cover period and egg incubation/larval pre-emergence period for arctic charr (Scott and Crossman 1998, Baffinland 2024). The mean sediment accumulation thickness estimated for the 2023/2024 ice cover period at all areas (SHAL-1, SHAL-2, and DEEP-1) were two times below the TARP Low Action response threshold

[14] The sediment monitoring areas at Sheardown Lake NW have a latitude of 71.31°N.

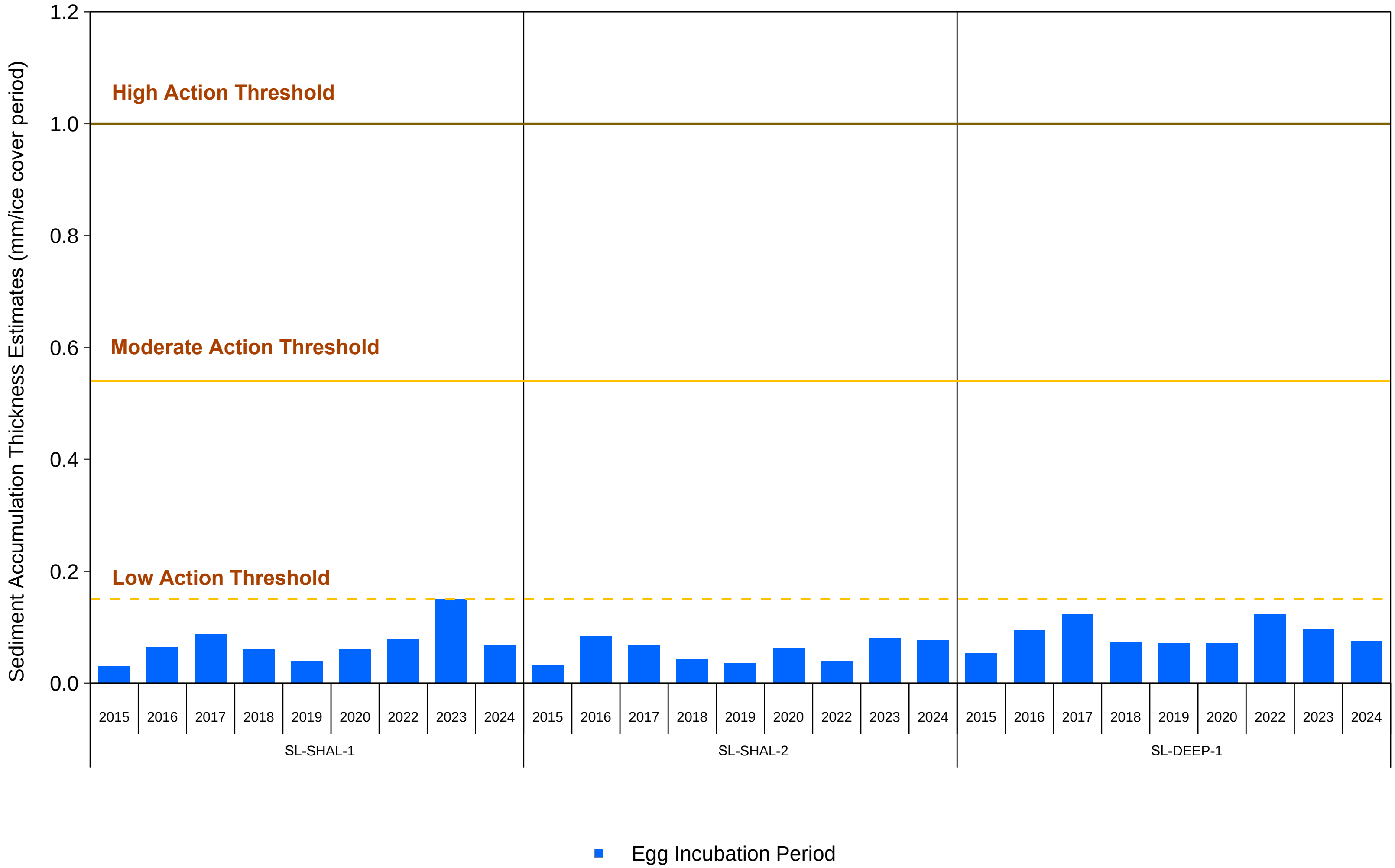

Figure 3.2: Mean Sediment Accumulation Thickness Estimates (mm) for Arctic Charr Egg Incubation Period (Ice Cover), Sheardown Lake NW, 2015 to 2024

Note: Dashed orange line represents the sediment Low Action Threshold of 0.15 mm, the solid orange line represents the Moderate Action Threshold of 0.54 mm, and the solid brown line indicates the High Action Threshold of 1.0 mm. Action Thresholds are based on the egg incubation period (dark blue) only. The egg incubation period corresponds to the ice cover period (September 2023 to July 2024). Sediment accumulation data was not collected during the ice cover period of 2021.

(Figure 3.2), indicating no mine-related risk of smothering or reducing in larval success of arctic charr.

3.2.2 Temporal Comparisons for the 2023 to 2024 Ice Cover and Open Water Periods

Ice cover and open water sediment accumulation thickness estimates from 2023/2024 were compared to previous seasons starting with the 2014/2015 ice cover and 2015 open water periods. During the 2023/2024 ice cover period, average sediment accumulation thickness estimates for SHAL-1 and DEEP-1 were statistically comparable to 2014/2015 (Appendix Table A.11). In contrast, the average sediment accumulation thickness estimate for SHAL-2 was significantly higher in 2023/2024 relative to the 2014/2015 ice cover season (Appendix Table A.11). Comparisons among the 2023/2024 ice cover period and other recent ice covered monitoring periods (i.e., 2019 to 2023) indicated that average sediment accumulation thickness estimates for SHAL-1 and DEEP-1 in 2023/2024 were comparable to, or significantly lower than, 2019/2020 through 2022/2023 (for the periods with available data; Appendix Table A.11). The average sediment accumulation thickness estimate for the littoral SHAL-2 area during the ice cover period of 2023/2024 was significantly higher relative to 2019/2020 through 2021/2022, but comparable to 2022/2023 (for the periods with available data; Appendix Table A.11). During the 2013 to 2024 ice cover periods, the littoral area SHAL-1 had a moderate positive (Spearman's ρ of 0.50, $p<0.05$) correlation between sediment accumulation thickness estimates and year, indicating there may be an increase in sediment accumulation thickness estimates since the onset of mining (Appendix Figures A.2 and A.3). However, there were no significant correlations between sediment accumulation thickness estimates and year at the littoral SHAL-2 area (area favourable for arctic charr egg incubation) or DEEP-1 (most depositional zone in the lake) during the ice cover periods (Appendix Figure A.2).

Average sediment accumulation thickness estimates for each of the littoral and profundal areas (i.e., SHAL-1, SHAL-2, and DEEP-1) in Sheardown Lake NW were significantly higher during the 2024 open water period relative to the first year of mine operations (2015; Appendix Table A.12). Additionally, average sediment accumulation thickness estimates for littoral areas SHAL-1 and SHAL-2 were significantly higher in 2024 open water period relative to 2016, 2017, 2019, and 2020 (SHAL-1) and 2016 to 2021 (SHAL-2; Appendix Table A.12). During the 2024 open water period, the profundal monitoring area (DEEP-1) had a higher average sediment accumulation thickness estimates than 2017 and 2019 to 2022 (Appendix Table A.12). During the open water period, there was an increase in sediment accumulation thickness estimates with time at Sheardown Lake NW at all monitoring areas (SHAL-1, SHAL-2, and DEEP-1) indicated by the significant, strong (SHAL-1 and SHAL-2, Spearman's ρ of 0.72 to 0.76, $p<0.05$) to moderate (DEEP-1, Spearman's ρ of 0.64 to 0.59, $p<0.05$) positive Spearman's correlations

(Appendix Figure A.2). These results suggest that there was an increase in sediment accumulation thickness estimates at Sheardown Lake NW with year since mine operation.

Overall, the sediment accumulation thickness estimates suggest an increase in sedimentation thickness over time at all monitoring areas during the open water period but not the ice cover period (except for SHAL-1). However, the sediment accumulation thickness estimates are within the range of Arctic lakes and below the 0.54 mm/y sediment accumulation thickness estimates predicted in the FEIS.[15] This indicates that although sediment accumulation thickness estimates are increasing in Sheardown Lake NW during the open water period, these changes, as defined by thresholds, do not have a direct adverse effect on arctic charr and the survival of arctic charr eggs (Baffinland 2012).

3.3 Aerial Dustfall and Sediment

3.3.1 Comparisons to Aerial Dustfall Deposition

Sedimentation rate and accumulation thickness data for all the Sheardown Lake NW study areas from 2013 to 2024 were evaluated relative to dustfall deposition rates from proximal dustfall monitoring stations (DF-M-01, DF-M-02, and DF-M-03) to explore potential causal relationships (Appendix Figures A.4 and A.5). For the ice cover and open water periods, there were no statistically significant correlations ($p>0.05$) between sedimentation rates or sediment accumulation thickness estimates and cumulative total dustfall rates for any of the Sheardown Lake NW sediment trap monitoring areas (Appendix Table A.13, Appendix Figures A.4 and A.5). Further, sediment accumulation thickness estimates in Sheardown Lake NW were below 0.54 mm/y. These results indicated that aerial dustfall and/or surface runoff of aerial dustfall into the lake had no demonstrable influence on accumulated sediment on the lake bottom. In addition to dustfall, sedimentation rates in Sheardown Lake NW have other input sources that may introduce suspended sediment, and the deposition of organic material, which varies seasonally, generated within the lake (e.g., plankton).

3.3.2 Sediment Trap Chemistry

For the 2023/2024 ice cover period, metal concentrations in sediment trap material from SHAL-1, SHAL-2, and DEEP-1 were generally low relative to applicable AEMP benchmarks[16] and federal/provincial sediment quality guidelines (SQG), except for iron and zinc which were also higher than baseline in Sheardown Lake NW (Appendix Figure A.6, Appendix Tables B.5 and B.9;

[15] The sediment accumulation thickness estimate of 0.54 mm/y from the FEIS is derived from the worst-case scenario that all sedimentation within Sheardown Lake NW is sourced from direct deposition of dust and surface runoff of airborne dust.

[16] The selection criteria for AEMP benchmarks are outlined in Baffinland (2012).

Minnow 2025). Additionally, the mean concentrations of arsenic at SHAL-2 were above the AEMP benchmark and mean concentrations of manganese at DEEP-1 were above the AEMP benchmark, SQG, and higher than baseline (Appendix Tables B.5 and B.9).

During the 2024 open water period, and at all sediment trap monitoring areas, the mean concentrations of iron and zinc[17] were above AEMP benchmarks and baseline (Appendix Tables B.6 and B.9, Appendix Figure A.7). The mean nickel concentration was also above AEMP benchmarks and SQG at the profundal sediment monitoring station, DEEP-1, and the SQG at the littoral station, SHAL-1 (Appendix Tables B.6 and B.9). Mean concentrations of manganese were above applicable SQG and baseline but not the AEMP benchmarks at all sediment trap monitoring areas during the 2024 open water period (Appendix Tables B.6 and B.9).

3.3.3 Metal Concentrations in Sediment Trap Material Compared to Surface Sediments

Metal concentrations that were measured in sediment trap material that were above AEMP benchmarks and/or applicable SQGs during the 2023/2024 ice cover period and 2024 open water period (i.e., iron, manganese, zinc, arsenic, and nickel) were examined relative to the surface sediment chemistry results reported in the 2024 CREMP (referred to as surface sediment). Sediment trap material represents freshly deposited material during mine operations, while surface sediments (i.e., the upper 2 cm) from the CREMP represent sediment quality integrated over time.

Mean iron concentrations in the sediment trap material of littoral (SHAL-1 and SHAL-2) and profundal (DEEP-1) monitoring areas in Sheardown Lake NW were more than three times higher than Reference Lake 3 and/or baseline surface sediment concentrations. Results of the 2024 CREMP indicated iron concentrations in littoral and profundal surface sediments of Sheardown Lake NW and Reference Lake 3 were elevated relative to AEMP benchmarks and the applicable SQG (Minnow 2025). In the 2023 CREMP, a special investigation of iron in Sheardown Lake NW surface sediments indicated a potential mine-related influence (Minnow 2024b).

The mean concentration of manganese was above SQGs in the sediment trap material of the profundal area, DEEP-1, during the ice cover period and all sediment trap monitoring areas (SHAL-1, SHAL-2, and DEEP-1) during the 2024 open water period (Appendix Tables B.5 and B.6, Appendix Figures A.6 and A.7). Results of the 2024 CREMP also indicated that mean concentrations of manganese in surface sediment were above applicable SQGs, but not AEMP

[17] The mean concentration of zinc exceeded the AEMP benchmarks for sediment trap monitoring area SHAL-1. The recovery of zinc (129%) in laboratory QC samples (SHAL-1D and SHAL-1E) was above the acceptable range (80 to 120%) and duplicate samples (SHAL-1E) had a relative percent difference of 35% (acceptable range of 30%).

benchmarks, in the littoral and profundal areas of Sheardown Lake NW. However, concentrations of manganese in surface sediments of Reference Lake and during baseline were also above the applicable SQG (Minnow 2025). These results indicate that manganese is naturally elevated in profundal sediments and is likely of geogenic origin in the study area (Minnow 2025).

In Sheardown Lake NW, sediment trap material had mean concentrations of zinc that were above AEMP benchmarks and/or SQGs (Appendix Figures A.5 and A.6, Appendix Tables B.5 and B.6), but in the 2024 CREMP, surface sediments from Sheardown Lake NW had mean concentrations of zinc that were below AEMP benchmarks, SQGs, concentrations in Reference Lake 3, and baseline concentrations, indicating no mine-related influence (Minnow 2025).

At the littoral sediment trap monitoring station, SHAL-2, during the 2023/2024 ice cover period, the mean arsenic concentration (6.5 mg/kg) was above the AEMP benchmark (6.2 mg/kg) but was similar to Reference Lake 3 (5.02 ± 1.55 mg/kg; Minnow 2025). In the 2024 CREMP, two littoral surface sediment samples in Sheardown Lake NW had concentrations above the SQG for arsenic, but the mean concentration of arsenic in surface sediments was below the SQG and/or AEMP benchmarks, Reference Lake 3, and baseline (Minnow 2025). Although, the mean arsenic concentration in sediment traps at SHAL-2 was above the AEMP benchmark, results of the 2024 CREMP indicate there was not a mine-related influence for arsenic in the surface sediments of Sheardown Lake NW (Minnow 2024b, 2025).

The mean concentration of nickel in sediment trap material exceeded AEMP benchmarks and/or applicable SQGs in SHAL-1 and DEEP-1 during the 2024 open water period, the results of temporal trend analysis of nickel in the 2023 CREMP did not indicate a mine-related influence of nickel in surface sediments (Minnow 2024b). In the 2024 CREMP, the mean nickel concentration in surface sediments in Sheardown Lake NW did not exceed SQG or AEMP benchmarks but three surface sediment stations exceeded the AEMP benchmark for nickel and four exceeded the applicable SQG (Minnow 2025). These results suggested that nickel concentrations in surface sediment may be elevated spatially within the lake's surface sediments, but the mean does not exceed applicable guidelines (Minnow 2025).

The observed concentrations of metals that were above guidelines (AEMP benchmarks or SQGs; e.g., iron, nickel, manganese, and zinc) in sediment trap material (Section 3.3.2) may be influenced by organic matter within the traps and may not reflect sediment material on the lake bottom which will have accumulated over several years (top 2 cm).[18] The inclusion of total organic

[18] Surface sediments in Sheardown Lake NW (e.g., the top 2 cm) are expected to have accumulated over multiple years, which is in contrast to sediment trap material, therefore caution should be taken when comparing surface sediment quality to sediment trap material quality. Metal concentrations of bioactive metals in sediment trap materials may be higher than could be expected in surface sediment because of the presence of transient organic carbon (not yet degraded), compared to surface sediment, which over years of accumulation will start to undergo early diagenesis.

carbon with metal chemistry for sediment trap material is recommended for the 2024/2025 Lake Sedimentation Monitoring Program, where sample volumes are sufficient.

In Sheardown Lake NW, water chemistry data reviewed in the 2024 CREMP did not show elevated concentrations of total or dissolved iron, manganese, zinc, nickel, or arsenic in any season compared to Reference Lake 3 and baseline concentrations. Additionally, none of these parameters exceeded AEMP water quality benchmarks or water quality guidelines (WQGs; Minnow 2025). The 2024 CREMP assessment found no adverse effects on BIC, arctic charr populations, or the health of juvenile and adult arctic charr, indicating that the elevated metal concentrations observed in sediment do not appear to have negatively influenced or are associated with water chemistry or biota in Sheardown Lake NW (Minnow 2025).

3.3.4 Sediment Trap Chemistry Comparisons to Aerial Dustfall Chemistry

Direct comparisons of sediment chemistry and dustfall chemistry require that further monitoring be completed, because only one year of data were available for sediment trap chemistry. During the 2023/2024 ice cover period, metal concentrations were generally similar between the three terrestrial dustfall monitoring stations but the mean concentrations varied between stations (DF-M-01, DF-M-02, and DF-M-03; Appendix Figure A.8). Visual examination of dustfall chemistry data and sediment trap chemistry data suggested that metals that were typically elevated in dustfall (except for cadmium and phosphorus)[19] were present within the sediment trap material (Appendix Figures A.6 to A.9, Appendix Tables B.5 to B.7). For example, arsenic, iron, nickel, and zinc may be elevated in ice cover and open water dustfall and may be a potential source of these parameters in the sediment either by direct deposition, spring melt, or surface runoff of aerial dustfall. However, due to the lack of temporal data and other skewing inputs, definitive conclusions cannot be drawn.

3.4 Benthic Invertebrate Community Relationships with Sedimentation Rate and Thickness and the Potential Effects to Arctic Charr

3.4.1 Littoral Zone

No significant relationships were found between benthic invertebrate density, richness, or Simpson's Evenness and sedimentation (rate or accumulation thickness estimates) in the littoral areas of Sheardown Lake NW in the open water season over the mine operational period (2015 to 2024; Table 3.1, Appendix Table C.1, Appendix Figures C.1 to C.4). However, the relative proportion of *Chironomidae* at the littoral BIC stations (DL0-01-4 and DL0-01-9) was significantly and strongly negatively correlated with both sedimentation rate and accumulation

[19] Cadmium and phosphorus concentrations in dustfall material were generally below the LRLs during the 2023/2024 ice cover and 2024 open water periods.

Table 3.1: Spearman's Rank Correlations between Sedimentation Rate and Sediment Accumulation Thickness Estimates and Benthic Invertebrate Community Endpoints in Littoral Areas of Sheardown Lake Northwest during the Open Water Season, Baffinland Iron Mines, 2015 to 2024

Comparison	Benthic Invertebrate Community Endpoint	Sedimentation Rate ($mg/cm^2/day$)		Sediment Accumulation Thickness (mm/deployment period)	
		P-value	Rho	P-value	Rho
DL0-01-4/ SL-SHAL-2	Density (org/m^2)	0.213	-0.467	0.148	-0.533
	Richness (#Taxa)	0.949	-0.0252	0.415	-0.311
	Simpson's E (Krebs)	0.521	0.250	1.000	0
	% Nemata	0.398	0.322	0.806	0.0957
	% Ostracoda	0.312	0.383	0.133	0.550
	% Chironomidae	0.037	-0.717	0.017	-0.783
	% Metal Sensitive Chironomidae	0.776	-0.117	0.581	-0.217
	% Collector Gatherers	0.744	0.133	0.493	0.267
	% Filterers	0.810	-0.100	0.552	-0.233
DL0-01-9/ SL-SHAL-2	Density (org/m^2)	0.514	0.236	0.682	0.152
	Richness (#Taxa)	0.867	0.0610	0.802	-0.0915
	Simpson's E (Krebs)	0.759	0.115	0.759	-0.115
	% Nemata	0.243	0.407	0.763	0.109
	% Ostracoda	0.123	0.527	0.049	0.648
	% Chironomidae	0.024	-0.721	0.007	-0.818
	% Metal Sensitive Chironomidae	0.865	0.0667	0.733	-0.127
	% Collector Gatherers	0.838	-0.0788	0.759	0.115
	% Filterers	0.865	0.0667	0.733	-0.127

P-value < 0.1.

abs(Rho) > 0.6.

Notes: Benthic invertebrate community endpoints were calculated only for data used in the correlation and may vary slightly from those reported in the CREMP (Minnow 2025).

thickness estimates[20] (Table 3.1, Appendix Table C.1, Appendix Figures C.1 to C.4). Based on visual examination, the newly collected BIC data at Station DL0-01-8, when combined with the nearest sedimentation station (SHAL-1), suggested a higher relative abundance of *Chironomidae* at higher sedimentation rates and accumulation thickness estimates than would be expected based on the same data types for DL0-01-04, DL0-01-09, and SHAL-2 (Appendix Figures C.1 to C.4). However, since there was only a single data point collected in 2024 for station DL0-01-8, rather than multiple years of data, definitive conclusions could not be made. On this basis, BIC data should continue to be collected at DL0-01-8 to better characterize the relationship between sedimentation and the predominance of chironomids in the BIC. Additionally, a significant and strong positive correlation between the relative abundance of *Ostracoda* and sediment accumulation thickness estimates was identified for the paired DL0-01-9 (BIC) and SHAL-2 (sediment trap) stations during the open water season and over the mine operational period from 2015 to 2024 (Table 3.1, Appendix Table C.1, Appendix Figure C.4). Visual examination of the BIC data from DL0-01-8, when paired with SHAL-1, suggested a lower relative abundance of *Ostracoda* than expected based on the same endpoint data collected from DL0-01-09 and SHAL-2 (Appendix Figures C.1 to C.4). However, once again, due to the lack of temporal data, definitive conclusions cannot be drawn for DL0-01-8/SHAL-1, and further data collection is recommended.

Regionally, within Arctic lakes, arctic charr are generalist predators that employ a versatile feeding strategy, enabling them to capitalize on temporal fluctuations in prey availability and access to resources from various habitat types and trophic levels (Eloranta et al. 2010, Wight et al. 2023). Juvenile arctic charr heavily rely on littoral benthic energy sources, in particular, chironomids (emergent invertebrates), which make up 65% to 75% of their diet (Eloranta et al. 2010, Wight et al. 2023). This is due, in part, to juvenile arctic charr having smaller gape sizes relative to adults, which limits prey selection (i.e., the size of prey they are able to consume; Minnow 2022b), as well as their tendency to seek refuge in littoral zones to avoid predation (Eloranta et al., 2010). In Sheardown Lake NW, the majority of identified benthic invertebrates belong to the chironomid family (i.e., midges). This supports the notion that chironomids are likely key prey items for juvenile arctic charr in this lake, and that shifts in BIC composition could affect juvenile growth, reproduction, and overall survival (Burke et al. 2023, Eloranta et al.

[20] The amount of organic carbon may influence this relationship, as total organic carbon (TOC) serves as a critical food source for chironomids (Merritt et al. 2008). The 2024 CREMP indicated no significant difference in TOC content between sediments from Sheardown Lake NW and Reference Lake 3 littoral areas. This suggests that mining activities are not introducing additional organic content to Sheardown Lake NW. However, the TOC data from the CREMP likely represented material that had more time to break down and had become mineralized, compared to the fresher material in the sediment trap samples. Although TOC analyses were not conducted on the sediment trap samples, it is recommended that this analysis be included in future sampling to better understand the potential relationship between TOC and relative abundance of chironomids.

2010, Wight et al. 2023). However, sedimentation rates and accumulation thicknesses were below Low Action TARP thresholds and FEIS predictions in 2024, and do not appear to be affecting total benthic invertebrate densities in Sheardown Lake NW.

In Arctic freshwater ecosystems, higher sedimentation rates can support *Ostracoda* populations by creating favourable conditions for Ostracoda species such as *Candoninae*, *Potamocypris*, *Limnocythere*, and *Eucypris* (Moquin et al. 2014). Although not a preferred "emergent invertebrate" prey item, arctic charr may consume *Ostracoda* due to their "generalist" feeding strategy, particularly during certain seasons or in specific habitats (e.g., the littoral zone; Eloranta et al. 2010; Sinnatamby et al. 2012). The increased proportion of these protein and energy rich invertebrates (Wilkinson et al. 2007) may help support all life stages of arctic charr in Sheardown Lake NW, potentially offsetting the lower availability of chironomids that may be observed at higher sedimentation rates.

The results from the 2024 CREMP indicated that juvenile and adult arctic charr densities in Sheardown Lake NW have remained consistent over the years of mine operations (Minnow 2025). Additionally, fish health endpoints, including body size (length and weight) and condition, showed that arctic charr in Sheardown Lake NW have remained healthy throughout the mine's operational period (Minnow 2025). The findings of the CREMP suggest that Sheardown Lake NW remains a productive environment and indicate that no adverse effects from sedimentation on arctic charr food supply, growth, reproduction, or survival have occurred over the mine's operational period (2015 to 2024).

3.4.2 Profundal Zone

Few BIC endpoints associated with the profundal zone stations (i.e., DL0-01-2 and DL0-01-12) were significantly and strongly correlated with sedimentation rates and sediment accumulation thickness estimates (Table 3.2). Specifically, results of the correlation analysis for DL0-01-2 (BIC) and DEEP-1 (sediment trap) stations indicated that, during the open water season and over the mine operational period (2015 to 2024), benthic invertebrate densities were significantly and strongly negatively correlated with sedimentation rate, whereas Simpson's Evenness exhibited a strong positive correlation with sedimentation rate (Table 3.2, Appendix Table C.1, Appendix Figure C.5). Additionally, the relative abundance of *Chironomidae* was significantly and negatively correlated with sediment accumulation thickness estimates at the DL0-01-2/DEEP-1

Table 3.2: Spearman's Rank Correlations between Sedimentation Rate and Sediment Accumulation Thickness Estimates and Benthic Invertebrate Community Endpoints in Profundal Areas of Sheardown Lake Northwest during the Open Water Season, Baffinland Iron Mines, 2015 to 2024

Comparison	Benthic Invertebrate Community Endpoint	Sedimentation Rate (mg/cm²/day)		Sediment Accumulation Thickness (mm/deployment period)	
		P-value	Rho	P-value	Rho
DL0-01-2/ SL-DEEP-1	Density (org/m²)	0.050	-0.683	0.437	-0.300
	Richness (#Taxa)	0.742	-0.128	0.381	0.333
	Simpson's E (Krebs)	0.006	0.850	0.194	0.483
	% Nemata	0.665	0.168	0.940	0.0297
	% Ostracoda	0.359	0.350	0.410	0.317
	% Chironomidae	0.437	-0.300	0.086	-0.617
	% Metal Sensitive Chironomidae	0.410	0.317	0.776	0.117
	% Collector Gatherers	0.025	-0.750	0.336	-0.367
	% Filterers	-	-	-	-
DL0-01-12/ SL-DEEP-1	Density (org/m²)	0.493	-0.267	0.581	0.217
	Richness (#Taxa)	0.806	0.0962	0.272	-0.411
	Simpson's E (Krebs)	0.121	0.567	0.776	0.117
	% Nemata	0.859	-0.0696	0.183	-0.487
	% Ostracoda	0.912	-0.0500	0.194	-0.483
	% Chironomidae	0.148	-0.533	0.493	-0.267
	% Metal Sensitive Chironomidae	0.359	0.350	0.843	-0.0833
	% Collector Gatherers	0.050	-0.683	0.463	-0.283
	% Filterers	0.815	0.0913	0.086	-0.602

[grey] P-value < 0.1.

[blue] abs(Rho) > 0.6.

Notes: "-" indicates no available data. Benthic invertebrate community endpoints were calculated only for data used in the correlation and may vary slightly from those reported in the CREMP (Minnow 2025).

pairing over the mine's operational period[21] (Table 3.2; Appendix Table C.1, Appendix Figures C.5 to C.8). Lastly, at both profundal BIC sampling stations, the relative proportions of the collector-gatherer[22] FFG were significantly and strongly negatively correlated with the sedimentation rate, whereas the relative proportions of the filterer[23] FFG showed a similar (i.e., strong, negative) significant correlation with sediment accumulation thickness estimates (Table 3.2, Appendix Table C.1, Appendix Figures C.5 to C.8). These results suggested that as sedimentation rate/accumulation estimates increase, the relative abundance of these FFGs (i.e., filterers and collector-gatherers) decreases.

Increased sedimentation in Arctic ecosystems can reduce benthic invertebrate density by smothering habitats, lowering oxygen levels, and burying food sources (Donohue and Molinos 2009). It can also influence Simpson's Evenness by favouring tolerant species and/or disadvantaging others, leading to differences in species diversity and potentially creating an imbalanced community (McKenzie et al. 2023). However, during the open water season, dissolved oxygen concentrations in Sheardown Lake NW were found to be well above the WQG of 9.5 mg/L near the bottom at profundal stations in 2024, as noted in the CREMP (Minnow 2025), suggesting sedimentation is not adversely affecting oxygen levels in benthic habitats. Moreover, although differences in Simpson's Evenness and diversity have been observed over the years of mine operation (2015 to 2024) in the profundal habitats of Sheardown Lake NW, these differences were generally not ecologically meaningful, as indicated by values remaining within the critical effect size (CES) of ±2 reference area standard deviations for the BIC metrics; suggesting that the observed changes were not sufficient to adversely effect the overall functioning or balance of the ecosystem (Minnow 2025).

Although littoral habitats are heavily relied upon by arctic charr in Arctic lacustrine ecosystems, the pelagic and/or profundal environment is also important. Ontogenetic dietary shifts, driven by

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[21] In the 2024 CREMP, the amount of TOC in sediments was significantly lower at Sheardown Lake NW profundal areas compared to similar areas in Reference Lake 3, suggesting greater deposition of inorganic content in Sheardown Lake NW. Since chironomids rely on organic matter for nourishment, the lower TOC and higher inorganic deposition in Sheardown Lake NW may contribute to the observed lower relative proportion of chironomids. However, the TOC data from the CREMP likely represent materials that have had more time to break down/more mineralized material compared to the fresher sediment trap samples. Although TOC analyses were not conducted on the sediment trap samples, it is recommended that this analysis be included in future sampling to better understand the relationship between TOC and proportions of chironomids in the BIC samples.

[22] Collector-gatherer FFGs, as outlined by Merritt et al. 2008, are organisms that feed on detritus, fine particulate organic matter, or small organic particles from the substrate or water column in aquatic environments. They primarily consume decomposing plant material, microorganisms, and suspended particles. In freshwater ecosystems, collector-gatherers play a key role in recycling organic material and supporting nutrient cycling and can be found in both benthic and water column habitats.

[23] Filterer FFGs, as outlined by Merritt et al. 2008, are organisms that capture small particles, such as plankton and detritus, from the water using specialized filtering structures. They play a crucial role in aquatic ecosystems by removing suspended particles, thereby influencing water clarity and nutrient cycling.

temporal prey availability across different habitats within the lake, suggest that arctic charr will feed on prey items in the profundal zone at various points during the open water season (Eloranta et al. 2010, Wight et al. 2023). Larger individuals (i.e., sub-adults and adults) in particular, are likely to prey on smaller or mid-sized conspecifics, as well as emergent benthic invertebrates (i.e., chironomids) in the water column and on the water surface (Eloranta et al. 2010, Wight et al. 2023). A decrease in the relative abundance of chironomids and FFGs (which can serve as alternative food sources when preferred prey items are scarce), can have negative outcomes on the growth, reproduction, and overall survival of arctic charr through bottom-up trophic cascades and/or resource depletion in other habitats relied upon by different age classes throughout the season (Eloranta et al. 2010, Wight et al. 2023). However, annual monitoring of juvenile, sub-adult, and adult arctic charr as part of the CREMP suggests that no adverse effects on fish health have been observed over the years of mine operation, supporting the conclusion that documented sedimentation rates has not caused significant harm to arctic charr populations in Sheardown Lake NW (Minnow 2025).

In Arctic ecosystems, increased sedimentation can disrupt feeding and survival of collector-gatherers and filterers, given both these FFGs are sensitive to high sedimentation rates. For example, smothering of habitats and lowered oxygen levels have been shown to have implications for collector-gatherer populations (Donohue and Molinos, 2009). For filterers, increased sedimentation can clog filtering mechanisms and reduce water clarity, limiting their ability to capture plankton and other food particles. Although Secchi depth readings, which are used as a proxy for water clarity, showed higher suspended particulate levels in Sheardown Lake NW in 2024 when compared to Reference Lake 3 (Minnow 2025), it is considered unlikely that sedimentation and water clarity have adversely affected BIC. This is because the 2024 CREMP results suggested that observed differences in FFGs have not been ecologically meaningful, generally remaining with the CES, over the years of mine operation (Minnow 2025). Additionally, water quality results from the CREMP indicated low total suspended solids (TSS) throughout Sheardown Lake NW and high dissolved oxygen levels (above the WQG of 9.5 mg/L) at the bottom of the lake in profundal habitats (Minnow 2025).

Overall, sedimentation rates and accumulation thickness estimates appear to influence the BIC in Sheardown Lake NW's profundal habitat to some extent, with arctic charr likely relying on these food sources (i.e., chironomids and FFGs) during later life stages and at various points throughout the open water season. Although no adverse effects on arctic charr health have been observed in annual monitoring, the observed relationships between BIC and sedimentation (rate and accumulation estimates[24]) suggested that continued monitoring of potential sedimentation effects to both BIC and arctic charr is crucial. Ongoing monitoring will help clarify patterns in potential influences and community shifts over time and enable early detection of any potential effects to arctic charr.

It is important to emphasize that the correlations presented herein are based on a limited subset of BIC data collected from Sheardown Lake NW, which represents only a small portion of the lake. Although sedimentation appears to influence BIC in the areas examined in this report, arctic charr are not sedentary and can access preferred food sources in other parts of the lake, including Sheardown Lake southeast (SE), which is connected to Sheardown Lake NW. Additionally, a more comprehensive annual analysis of the entire lake's BIC community and arctic charr populations/health is conducted through the CREMP, which to date has shown no consistent, adverse mine-related effects. However, ongoing monitoring of the relationship between BIC, sedimentation rates, and accumulation thickness estimates will be essential for providing valuable insights, ensuring timely detection of potential effects, and supporting mitigation measures if any issues arise.

[24] This relationship may depend on the balance between inorganic and organic content. However, TOC data were not available as part of the 2023/2024 sediment trap dataset. The inclusion of TOC in the suite of sediment quality analytes is recommended for future analysis.

4 CONCLUSIONS

Lake Sedimentation Monitoring has been included as a special investigation component of the Mary River Project AEMP since 2013. The objective of this monitoring program is to track sedimentation and evaluate the potential for adverse influences on resident arctic charr populations due to sedimentation at a representative lake (Sheardown Lake NW) within the immediate area of mine influence. The principal conclusions of the 2023/2024 Lake Sedimentation Monitoring study were:

- Sedimentation rates at Sheardown Lake NW during the open water period and at the habitat likely to be used for arctic charr spawning (i.e., area SHAL-2) were significantly different (higher) in 2024 compared to baseline.
- Annual sediment accumulation thickness estimated for Sheardown Lake NW for the 2023 to 2024 combined ice cover and open water periods was within the range of annual estimates for Arctic lakes of comparable size and/or depth. The mean sediment accumulation thickness estimated for the 2023 to 2024 arctic charr egg incubation/larval pre-emergence period at Sheardown Lake NW (0.067 mm/ice cover period, 0.077 mm/ice cover period, and 0.075 mm/ice cover period at SHAL-1, SHAL-2, and DEEP-1, respectively) was below the draft AEMP Rev. 2 TARP Low Action threshold of 0.15 mm/ice cover period and approximately 14 to 20% of the threshold level of 1 mm/y of sediment accumulation thickness purported to affect egg incubation success. Overall, these results suggested no anticipated mine-related effects on arctic charr reproductive success at Sheardown Lake NW as the result of sedimentation rates/accumulation thickness over the 2023 to 2024 egg incubation/larval pre-emergence period.
- Comparisons between cumulative dustfall deposition rates (i.e., amount of dustfall deposited during the ice cover or open water period) and sedimentation rates and sediment accumulation thickness estimates indicated no positive temporal correlations between dustfall and sediment endpoints, indicating that dustfall is not likely the main source of sediment into Sheardown Lake NW.
- Sediment trap material had elevated mean concentrations of arsenic, iron (all monitoring areas), manganese, nickel, and zinc during the 2023/2024 ice cover and 2024 open water periods. Although metal concentrations were elevated relative to AEMP benchmarks, SQGs (for manganese only), and baseline, the 2024 CREMP assessment found no indication of effects from elevated (relative to AEMP benchmarks and SQG)

metal concentrations in sediment on water chemistry or biota in Sheardown Lake NW.

- Visual comparison between dustfall and sediment chemistry data indicated that dustfall may be a potential source of metals in newly accumulated sediment in Sheardown Lake NW, but further monitoring and data analysis are required to determine any causal relationships and trends.
- During the investigation of BIC sedimentation relationships, significant, negative, and positive correlations between relative abundances of chironomids and ostracods in the littoral zone, respectively, as well as relative abundances of chironomids, BIC density, BIC evenness, and FFGs in the profundal zone and sedimentation rates were observed. However, the more comprehensive biological monitoring program conducted in Sheardown Lake NW through the CREMP indicated no significant adverse effects on BIC key indicators or fish populations during the mine operational period. While findings from the annual CREMP report suggest that the relationships reported herein are likely not adversely affecting the biota in the lake, ongoing monitoring will be essential to understand changes over time and facilitate early detection of any potential effects to arctic charr.

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APPENDIX A
SUPPORTING SEDIMENTATION DATA

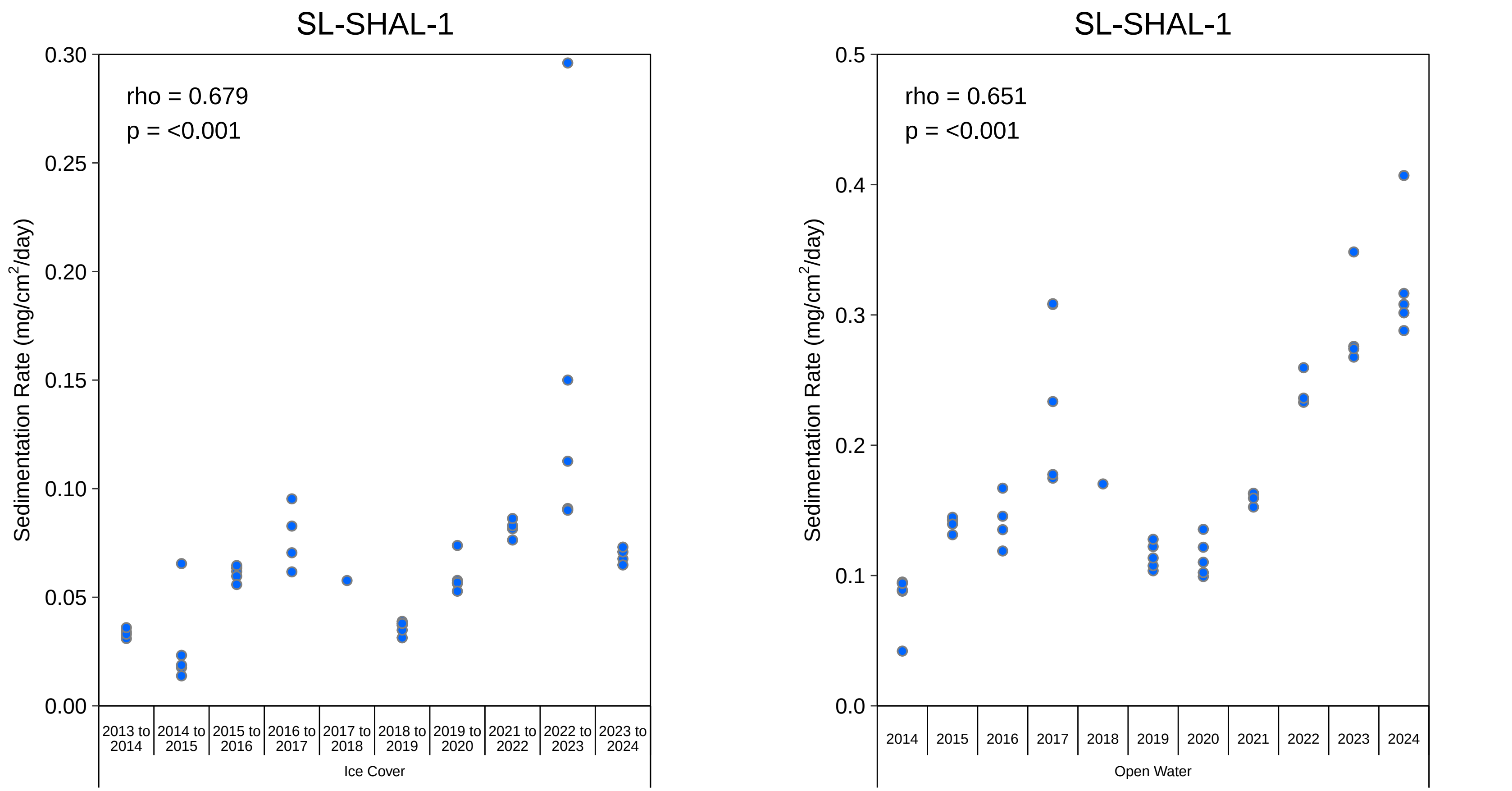
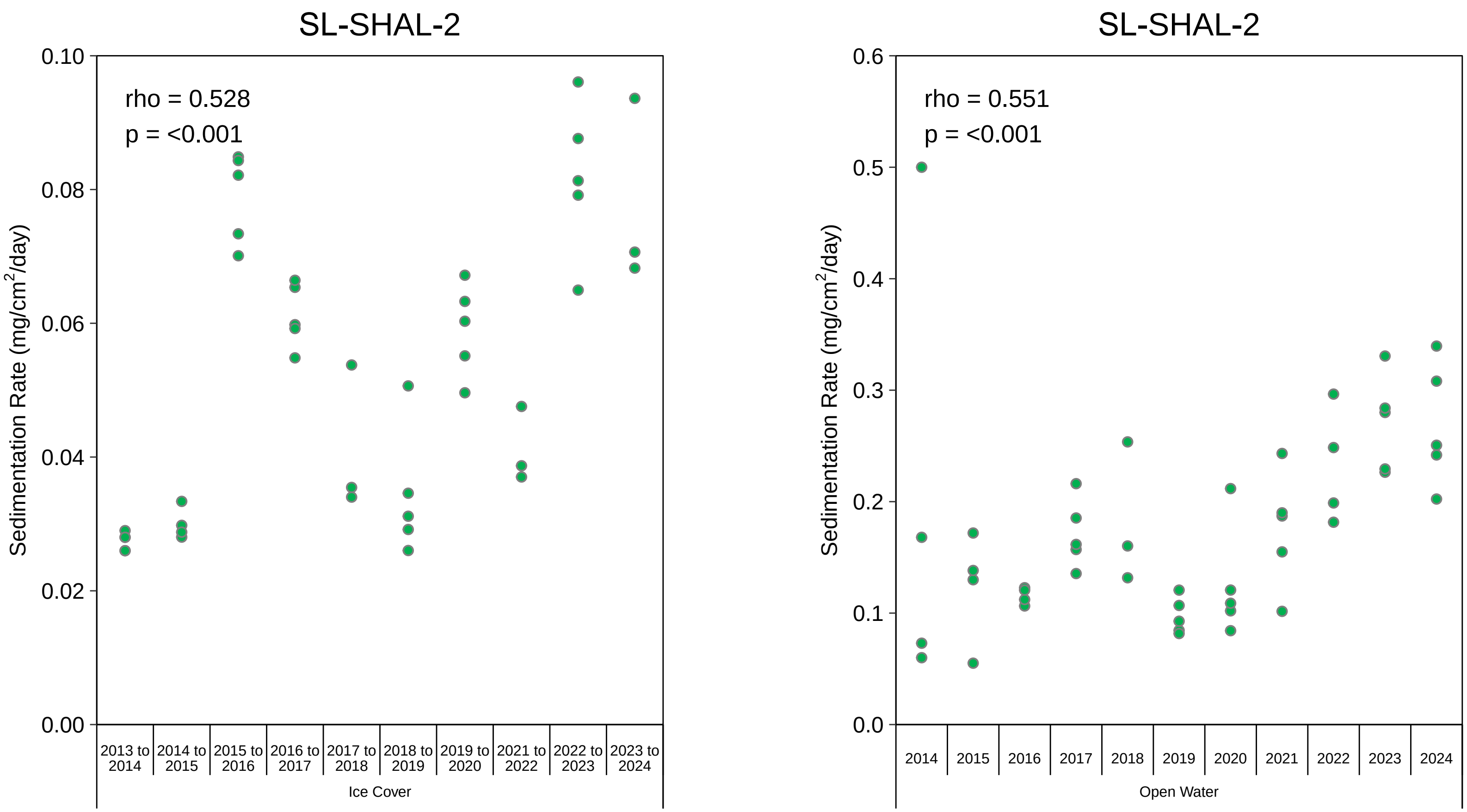


Figure A.1: Sedimentation Rates (mg/cm^2/day) from 2014 to 2024 During Periods of Ice Cover and Open Water at Sheardown Lake NW, Sheardown Lake NW Sedimentation Monitoring Study

Notes: P−values and rho values are calculated using a Spearman's correlation. SL-SHAL−1 and SL-DEEP−1 correlations were run without the anomalously high values during the ice cover period in 2022/2023 and 2021/2022, respectively, and did not change the outcome of the correlation.



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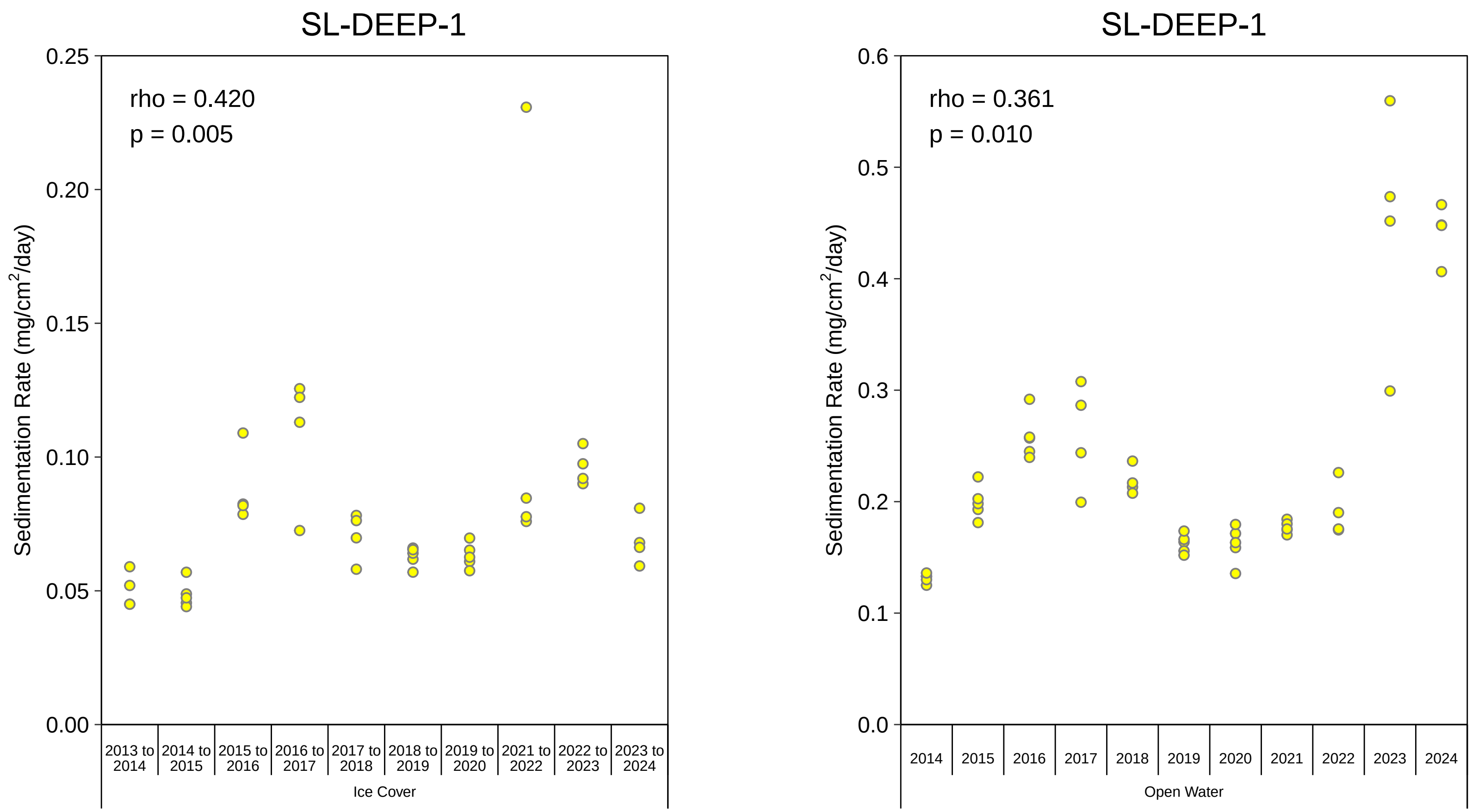

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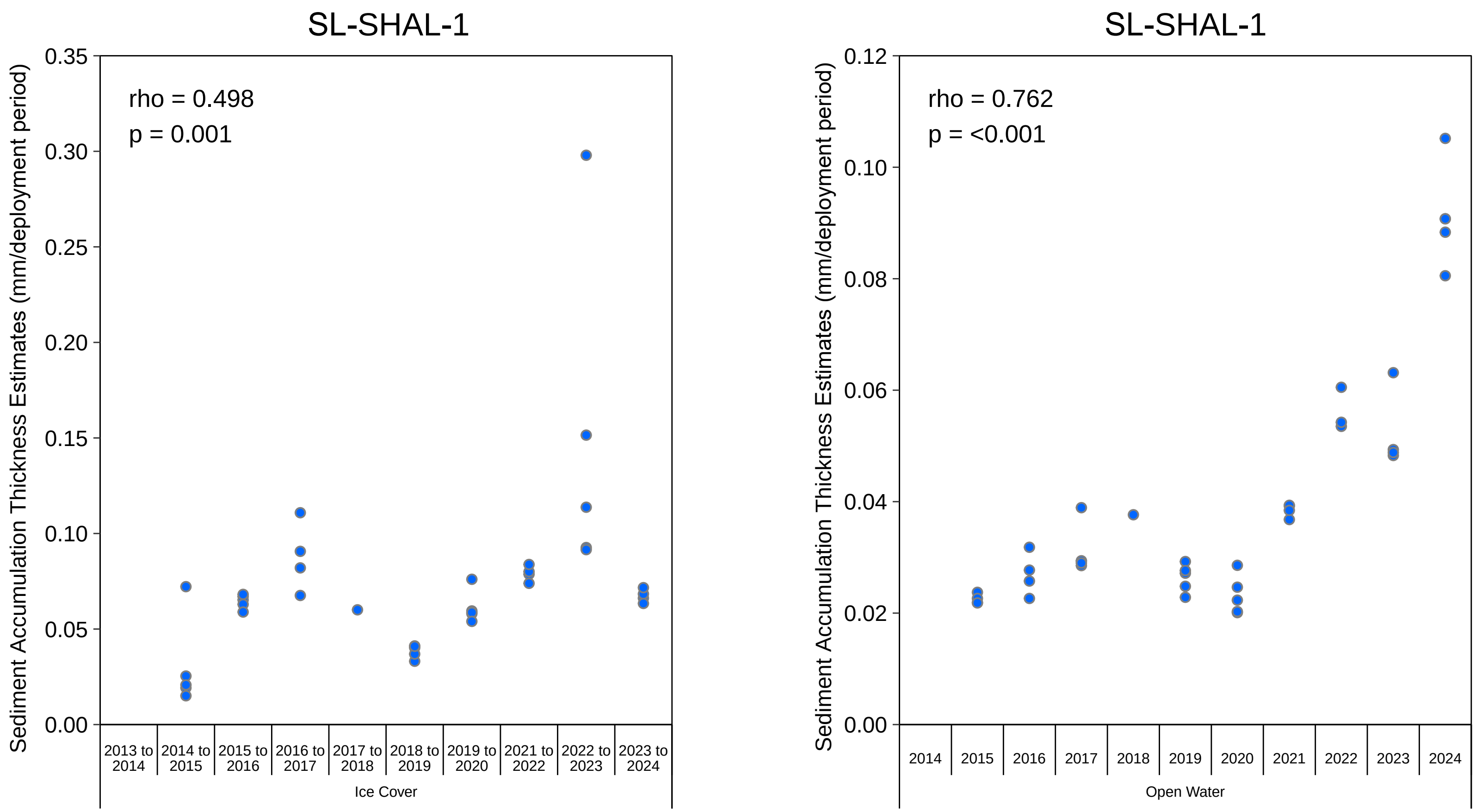
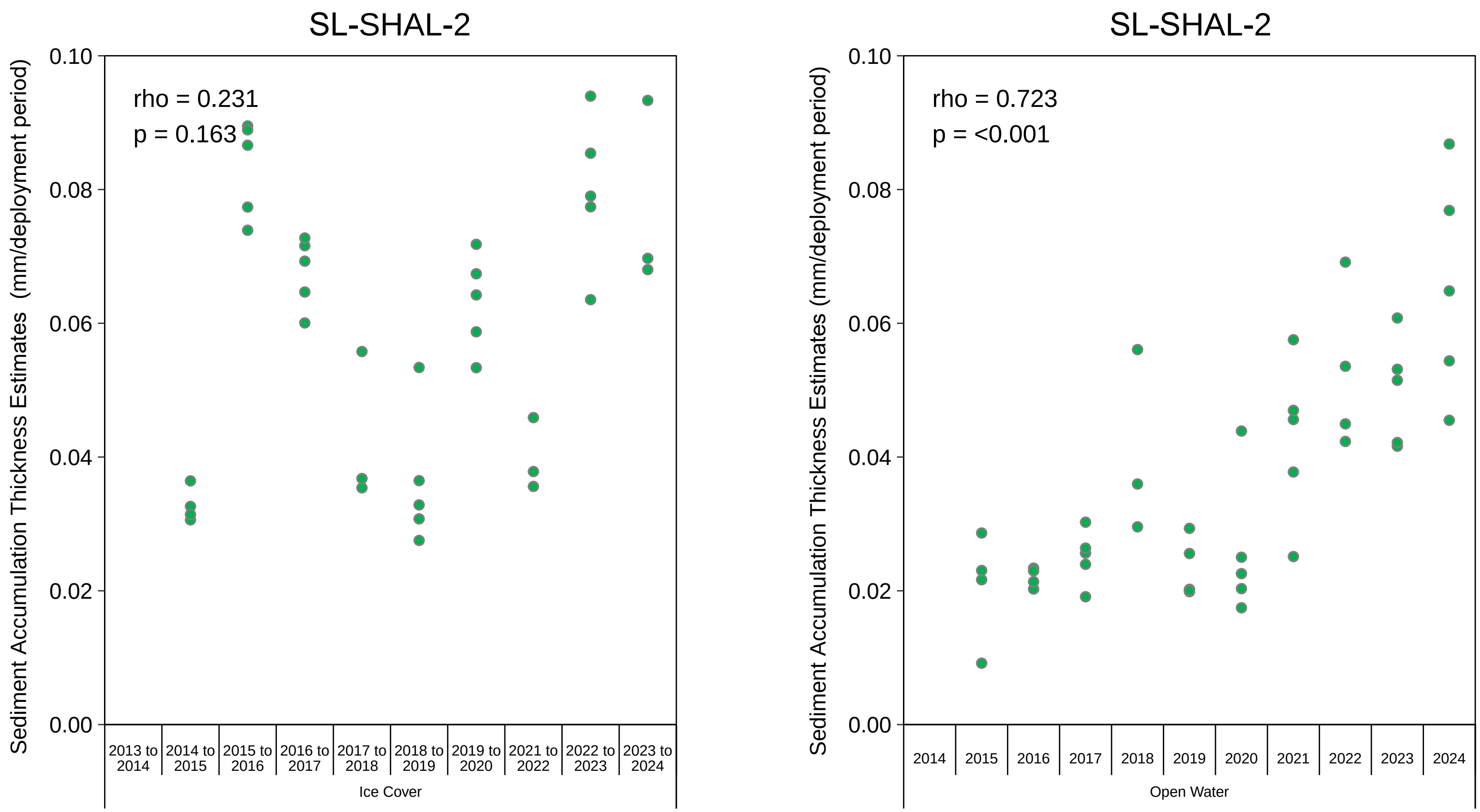


Figure A.2: Sedimentation Accumulation Thickness Estimates (mm) from 2014 to 2024 During Periods of Ice Cover and Open Water at Sheardown Lake NW, Sheardown Lake NW Sedimentation Monitoring Study

Notes: P−values and rho values are calculated using a Spearman's correlation. SL-SHAL−1 and SL-DEEP−1 correlations were run without the anomalously high values during the ice cover period in 2022/2023 and 2021/2022, respectively, and did not change the outcome of the correlation.



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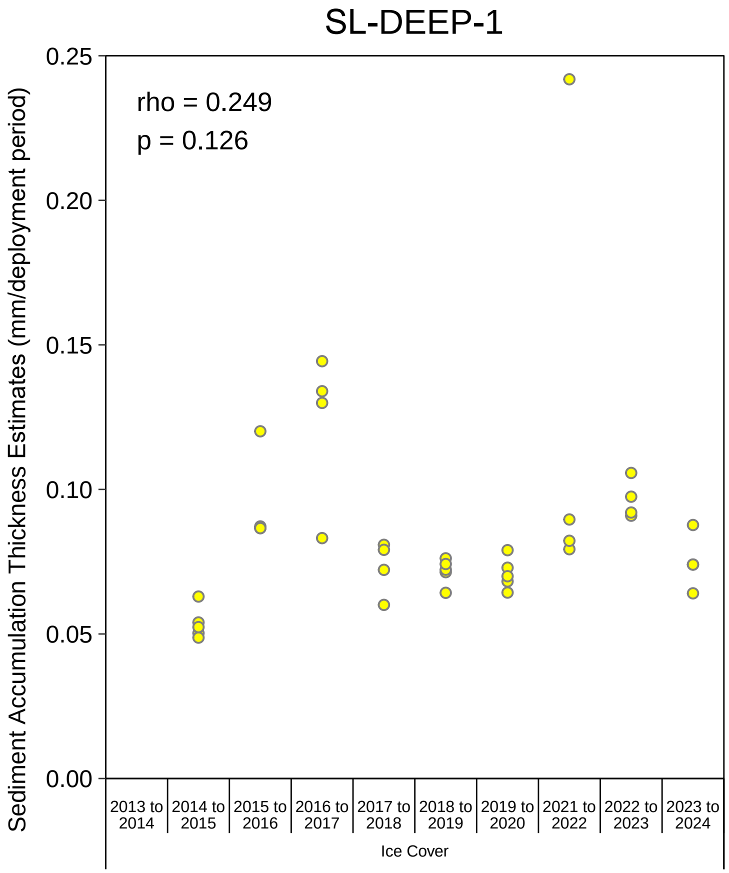
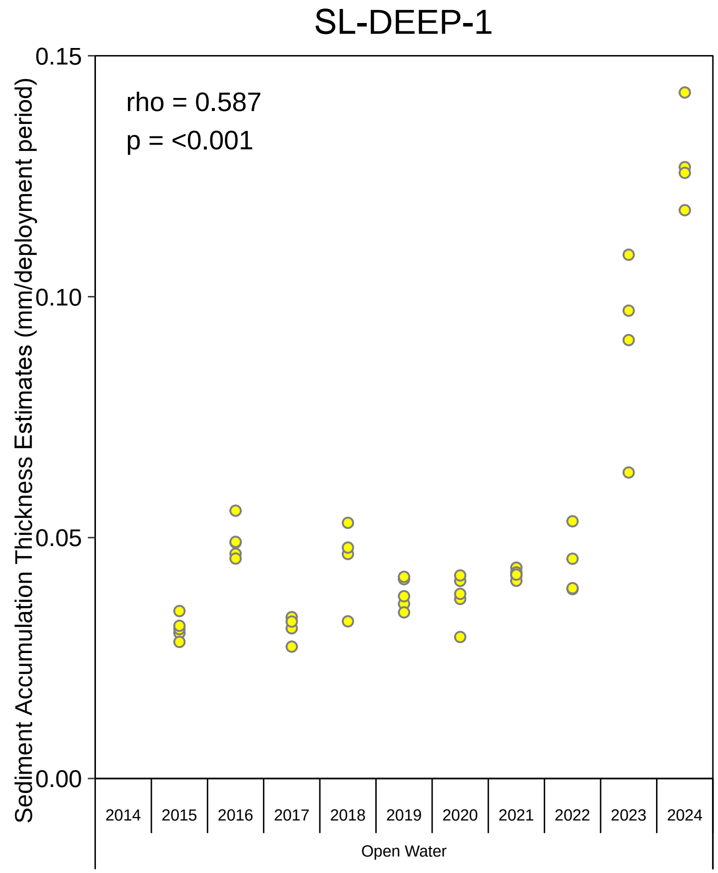
Notes: P−values and rho values are calculated using a Spearman's correlation. SL-SHAL−1 and SL-DEEP−1 correlations were run without the anomalously high values during the ice cover period in 2022/2023 and 2021/2022, respectively, and did not change the outcome of the correlation.





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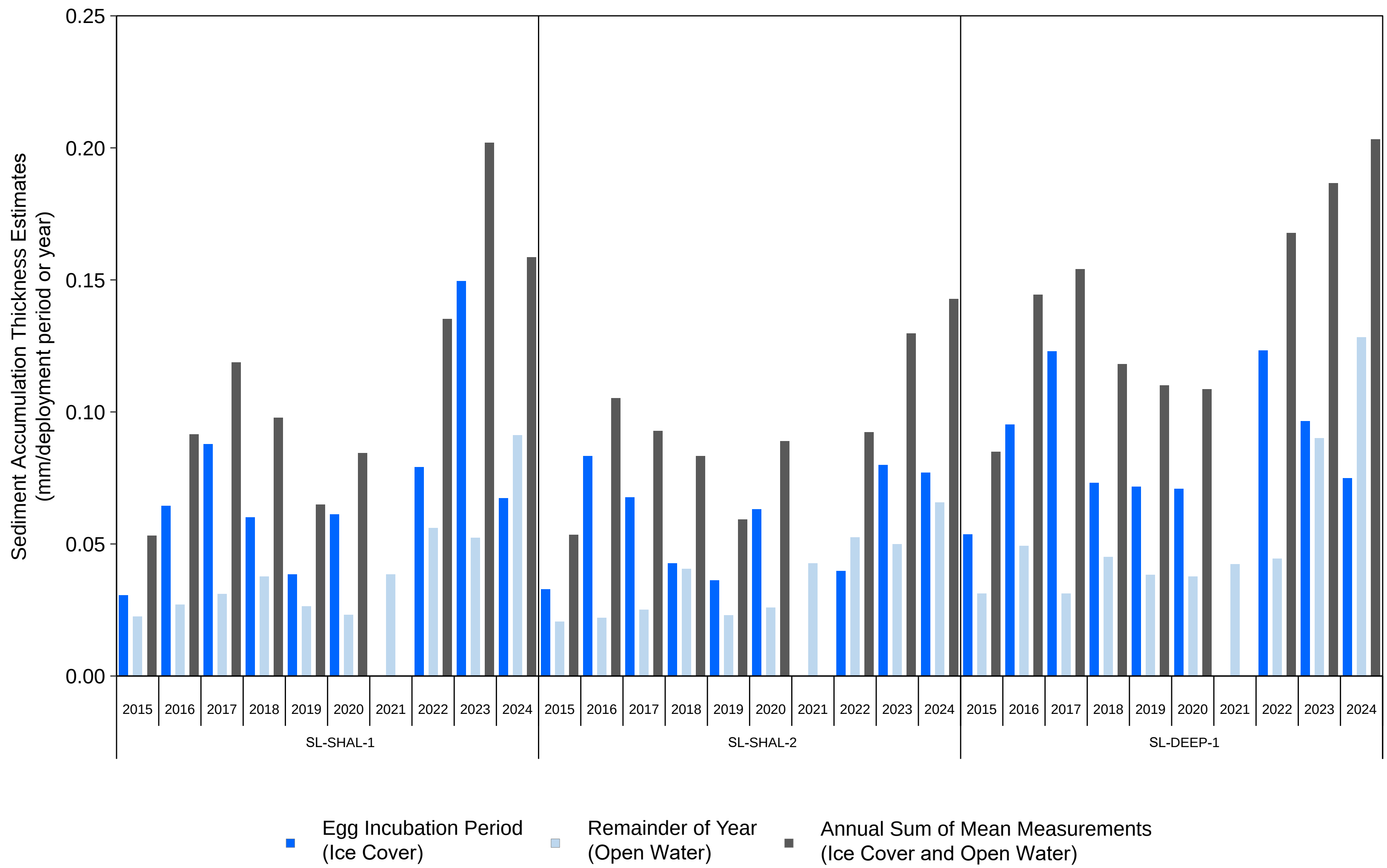


Figure A.3: Mean Sediment Accumulation Thickness Estimates (mm/Deployment Period or Year) for Arctic Charr Egg Incubation Period (Ice Cover) and the Remainder of the Year (Open Water), Sheardown Lake NW, 2015 to 2024

Notes: The egg incubation period corresponds to the ice cover period (September to July). The TARP action thresholds apply only to the egg incubation period (i.e., the ice cover period). Sediment accumulation thickness data was not collected during the ice cover period of 2021.

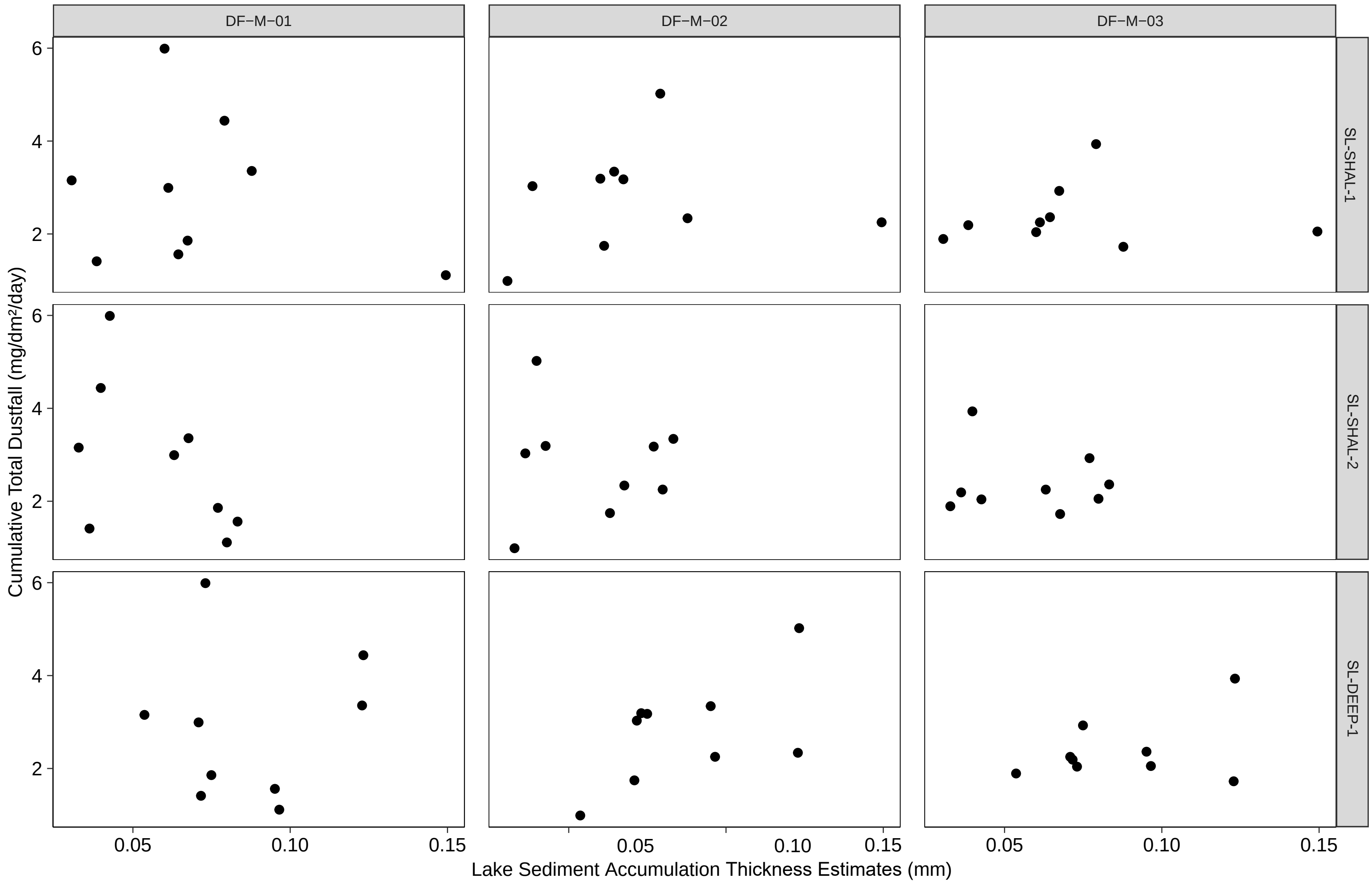
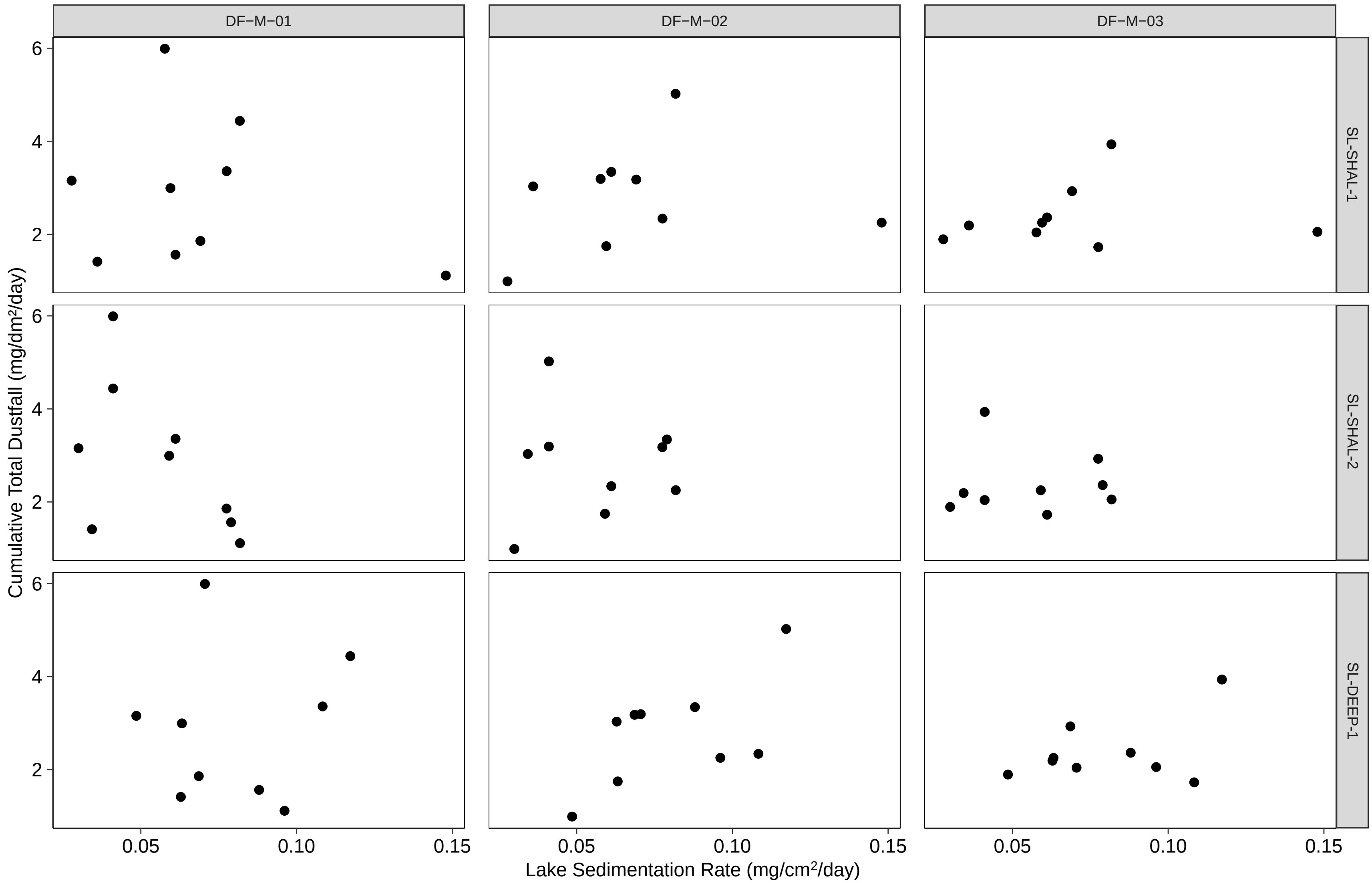


Figure A.4: Comparison of Total Dustfall (mg/dm²/day) to Sedimentation Rate and Sediment Accumulation Thickness Estimates at Sheardown Lake NW, Ice Cover Period, 2014 to 2024

Note: Dustfall data less than the lower reporting limit were replaced with the lower reporting limit for calculation of cumulative dustfall for a given period.



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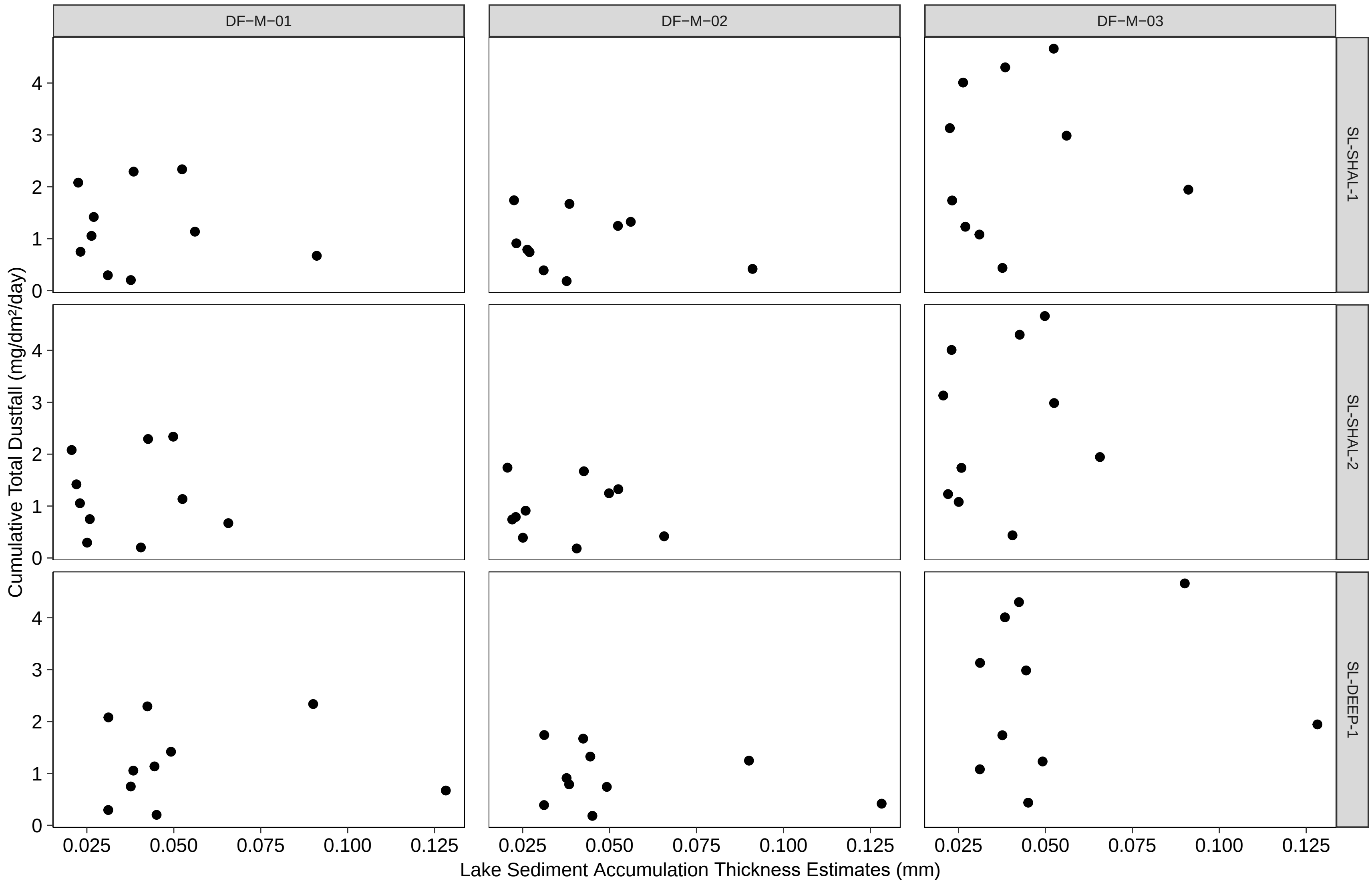
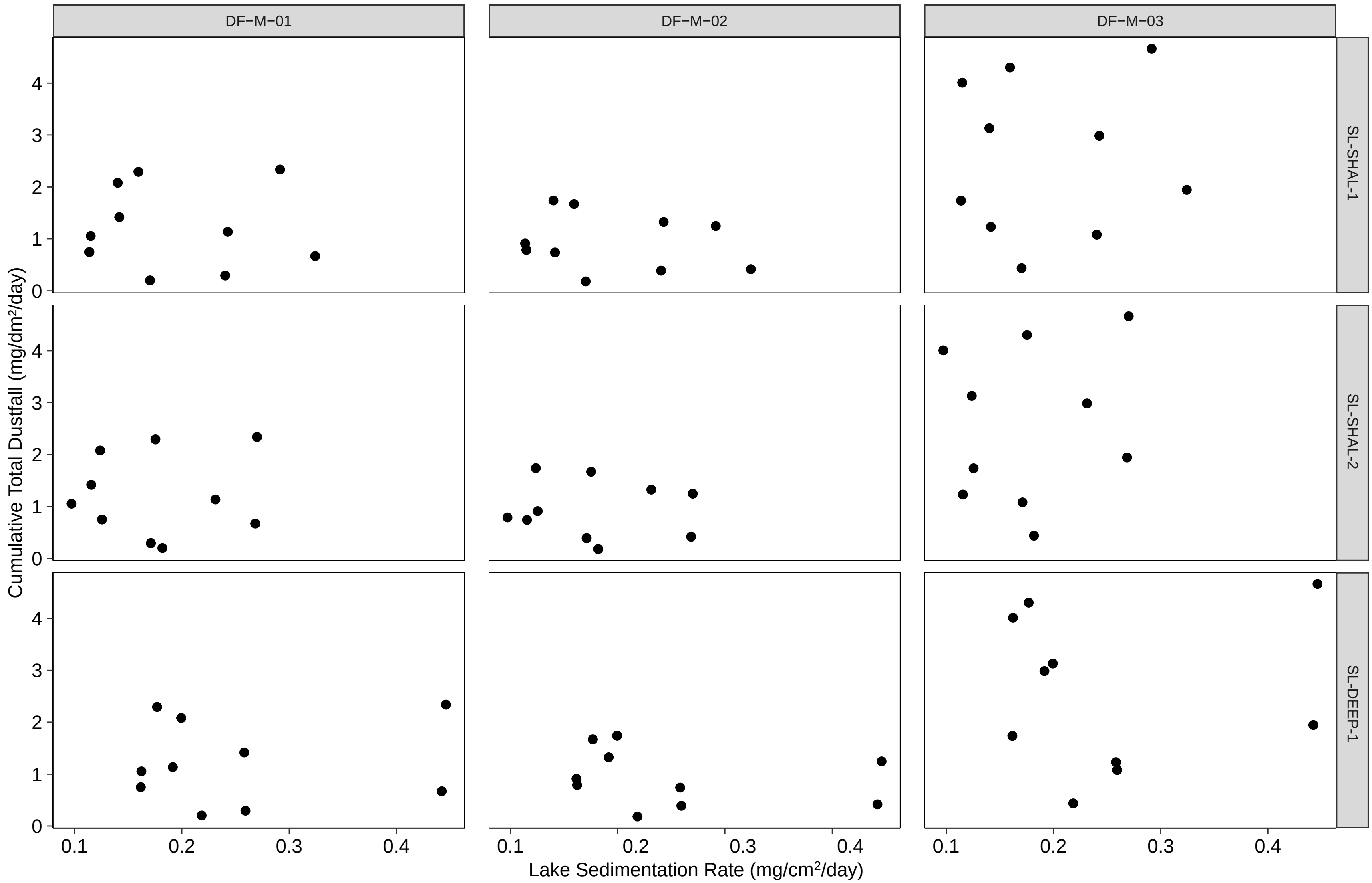


Figure A.5: Comparison of Total Dustfall (mg/dm²/day) to Sedimentation Rate and Sediment Accumulation Thickness Estimates at Sheardown Lake NW, Open Water Period, 2014 to 2024

Note: Dustfall data less than the lower reporting limit were replaced with the lower reporting limit for calculation of cumulative dustfall for a given period.



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Note: Dustfall data less than the lower reporting limit were replaced with the lower reporting limit for calculation of cumulative dustfall for a given period.

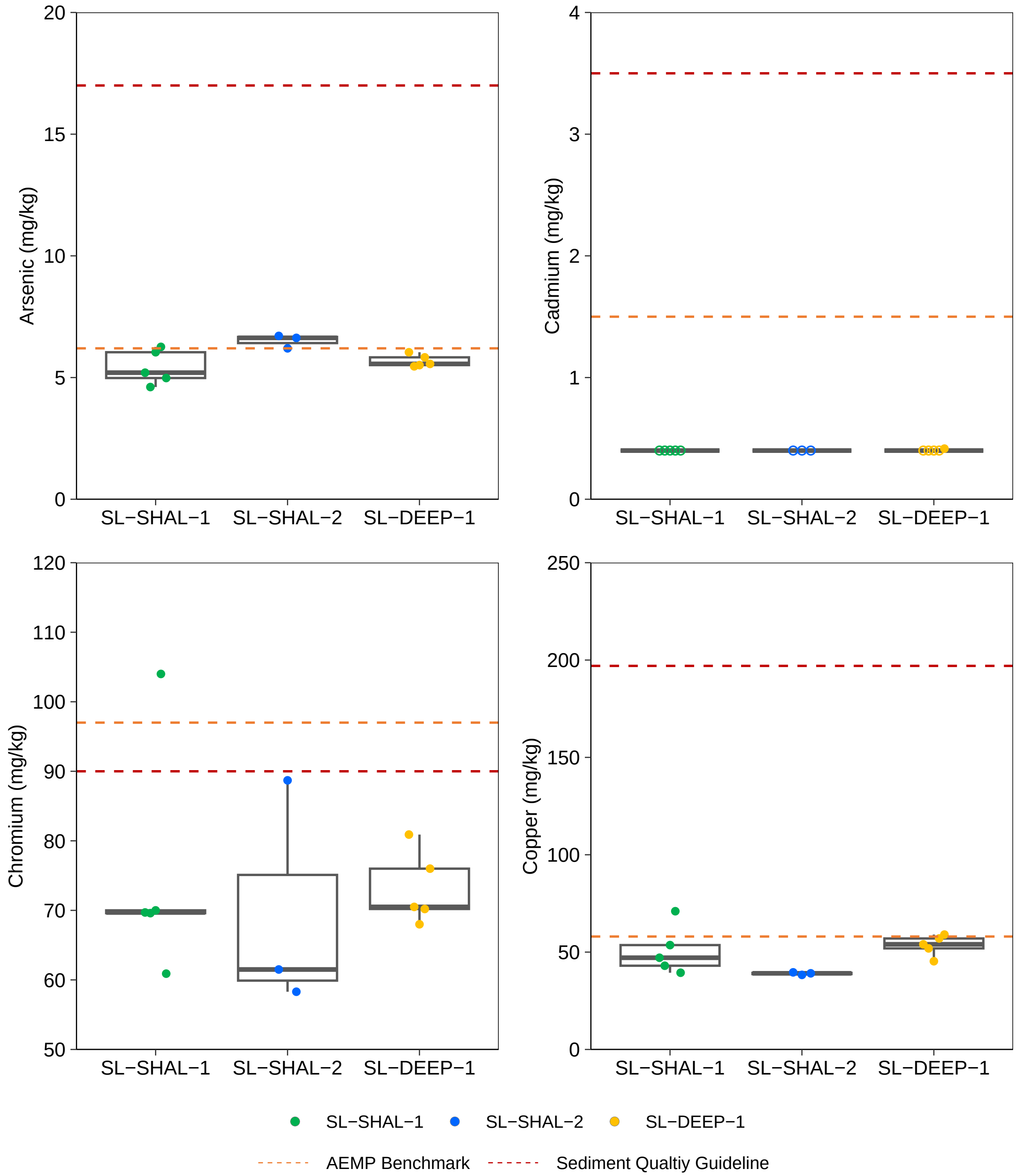
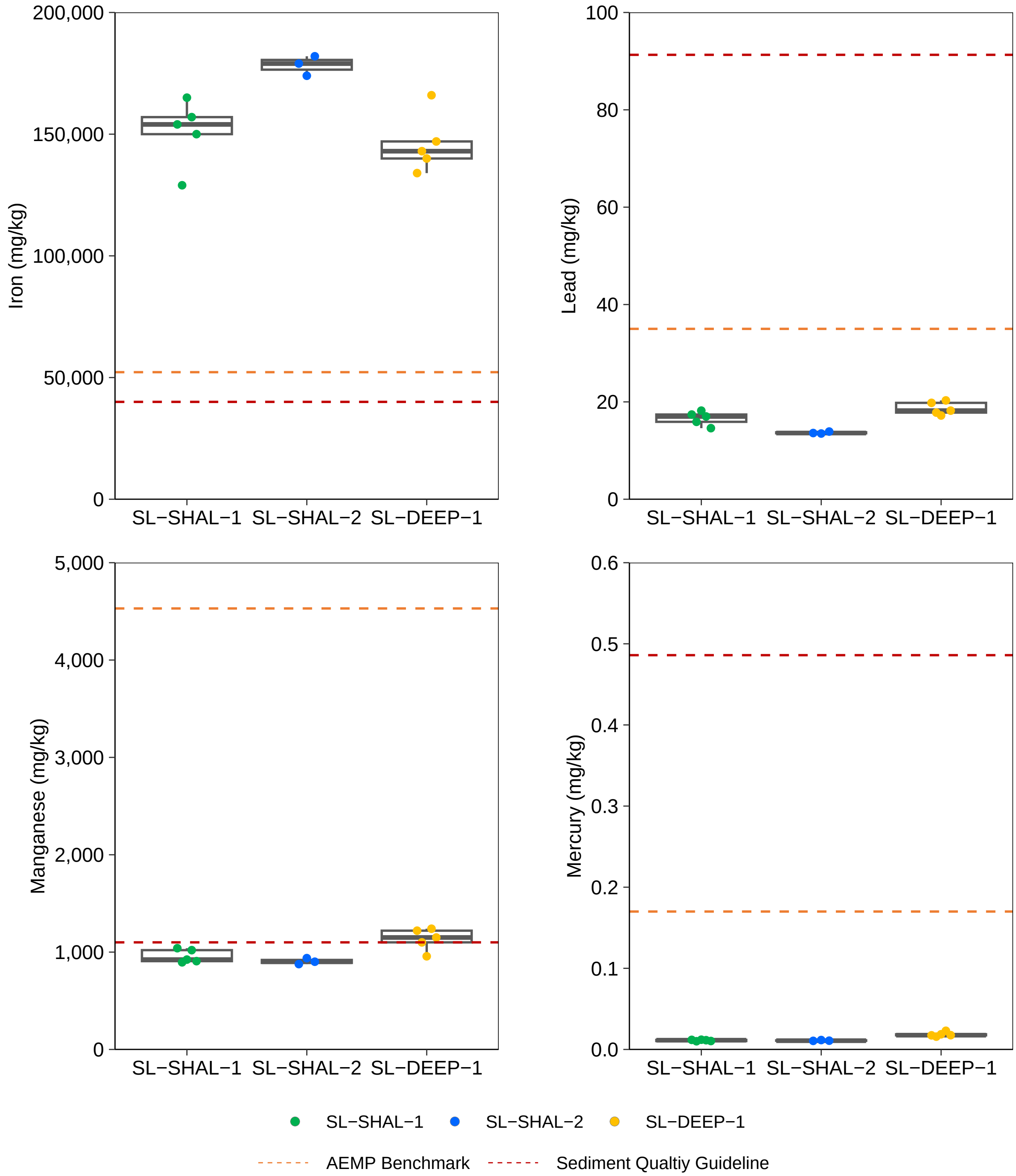


Figure A.6: Sediment Metal Concentrations During the Ice Cover Period, 2023 − 2024.

Notes: Values below the laboratory reporting limit (LRL) have been substituted at the LRL. Boxplots consist of all data for a given area throughout the period. Sediment Quality Guidelines represent CCME Probable Effect Level (PEL) guidelines (CCME 2020) with some exceptions. The iron SQG is based on Ontario Provincial Sediment Quality Guideline for the severe effect level (OMOE 1993). The manganese and nickel SQG are based on the BC Working Sediment Quality Guideline for the PEL (BCMWLRS 2024). Hollow circles in the plot represent the measurement was at the LRL.



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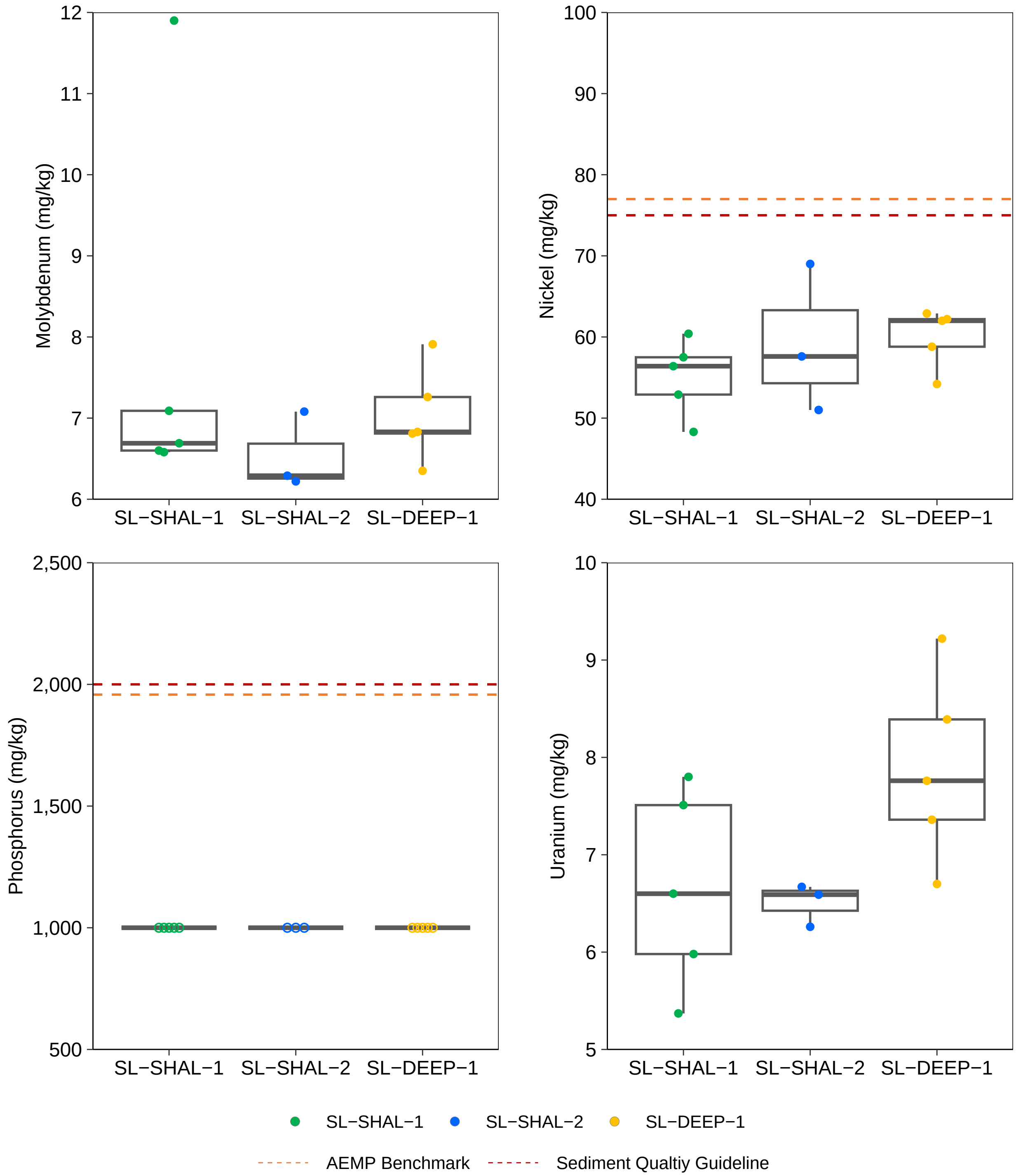

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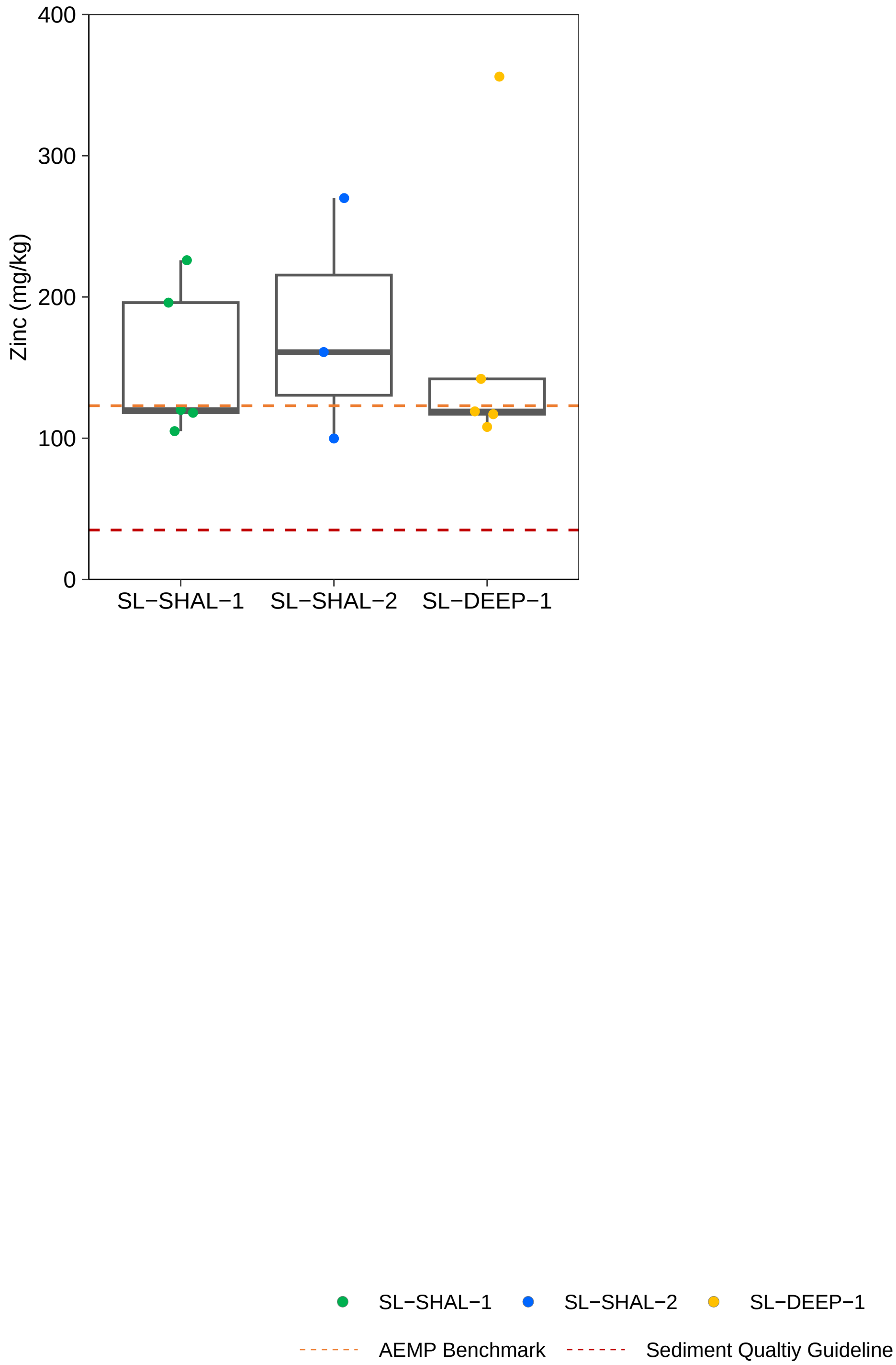

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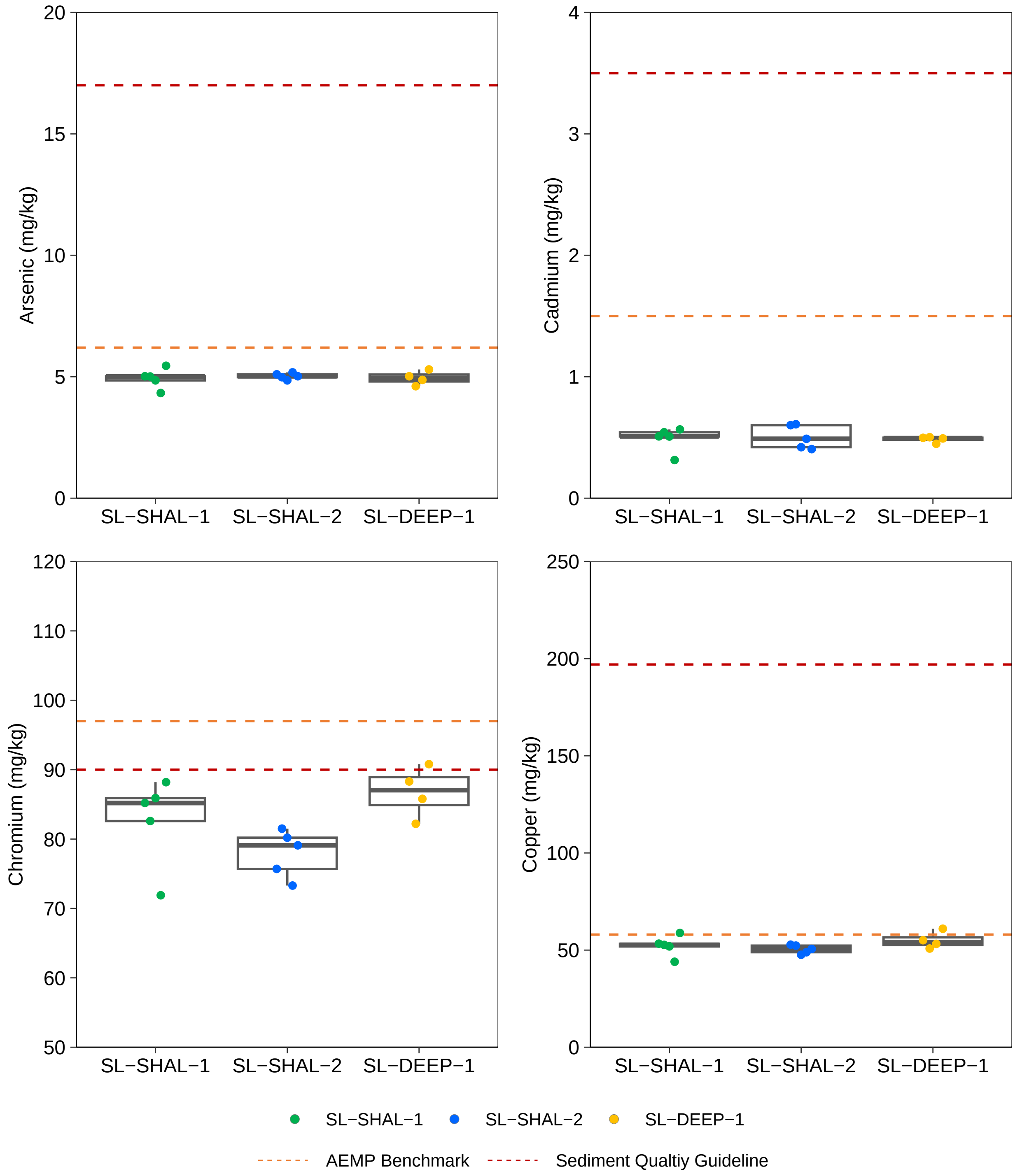
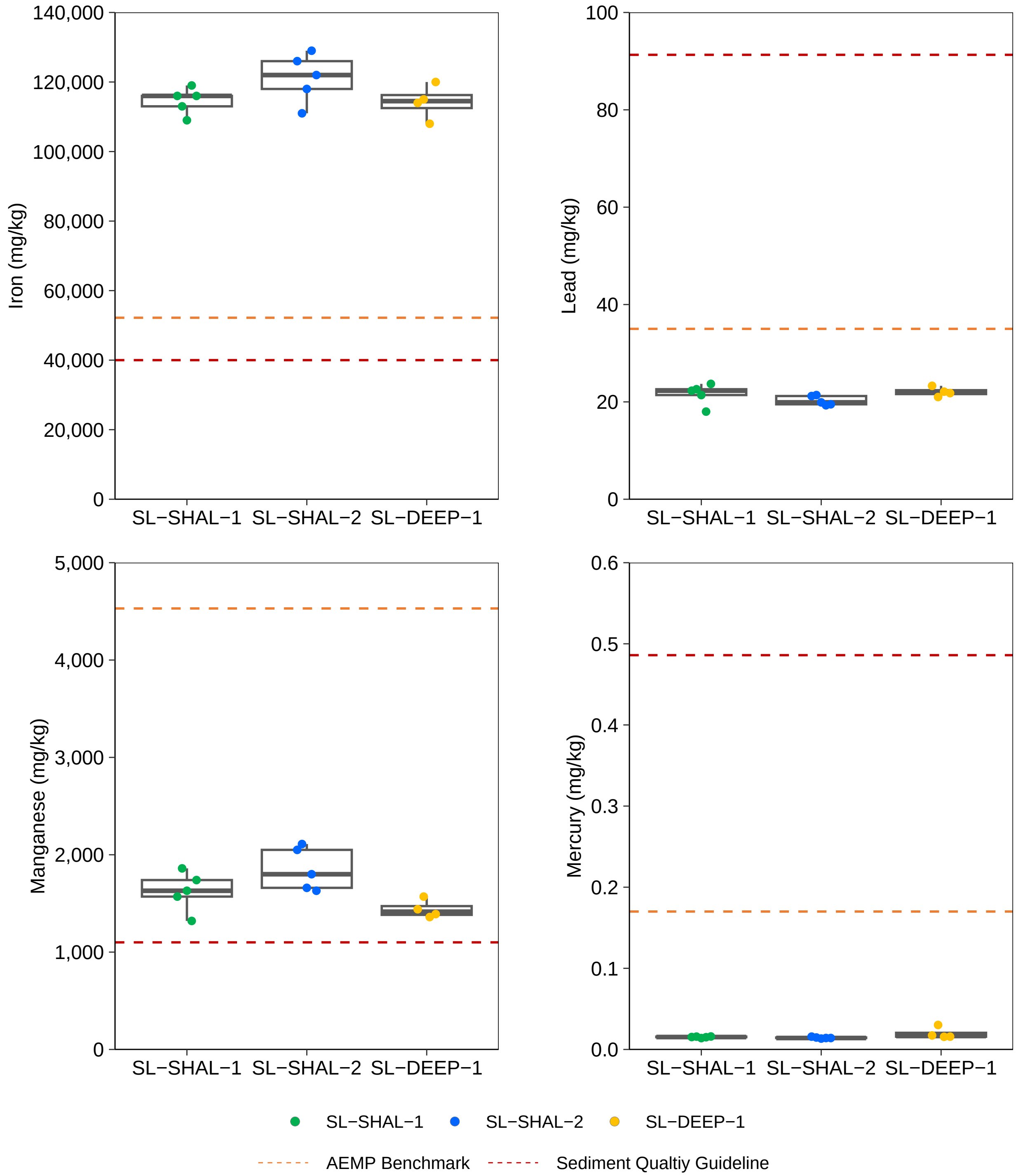


Figure A.7: Sediment Metal Concentrations During the Open Water Period, 2024.

Notes: Values below the laboratory reporting limit (LRL) have been substituted at the LRL. Boxplots consist of all data for a given area throughout the period. Sediment Quality Guidelines represent CCME Probable Effect Level (PEL) guidelines (CCME 2020) with some exceptions. The iron SQG is based on Ontario Provincial Sediment Quality Guideline for the severe effect level (OMOE 1993). The manganese and nickel SQG are based on the BC Working Sediment Quality Guideline for the PEL (BCMWLRS 2024). Hollow circles in the plot represent the measurement was at the LRL.



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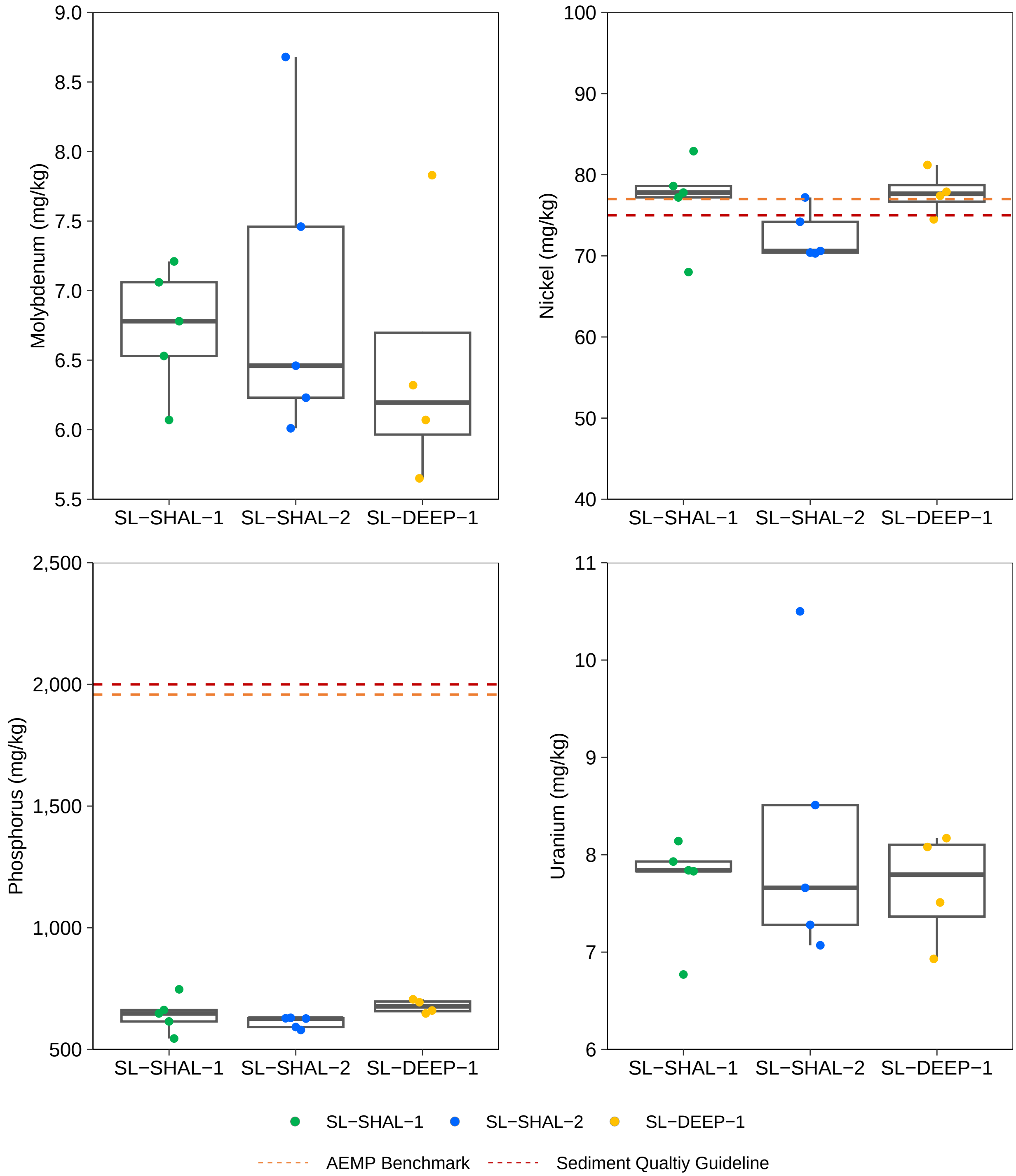

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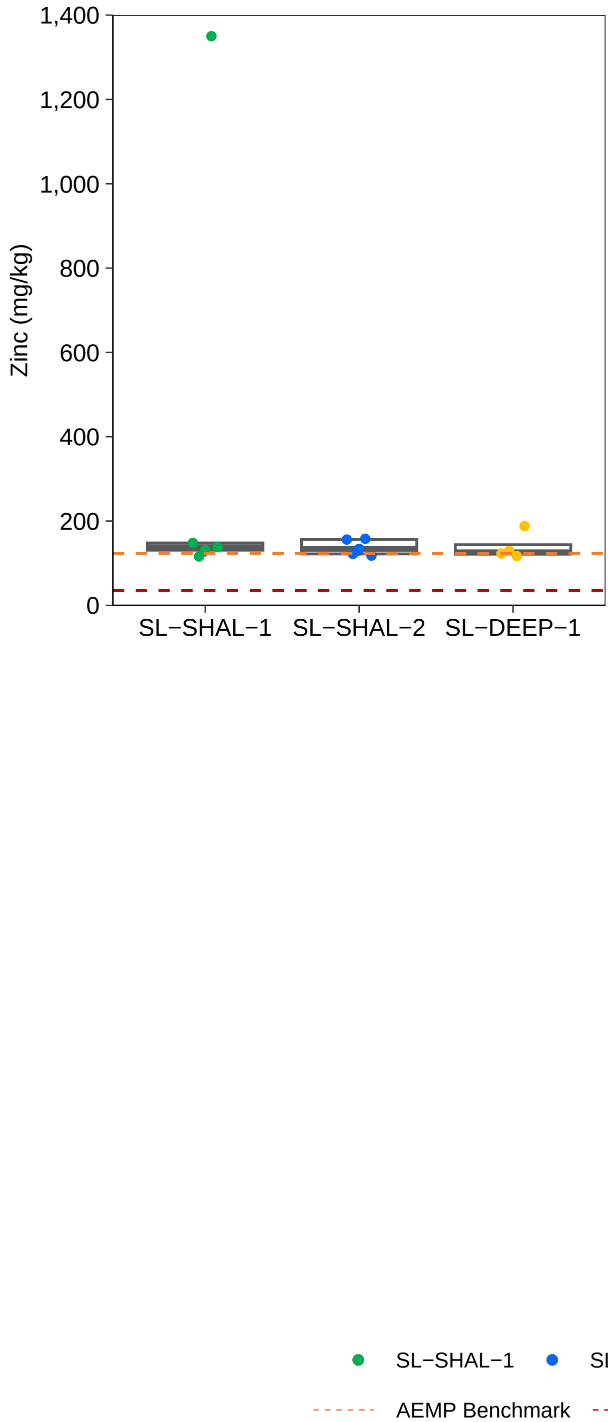

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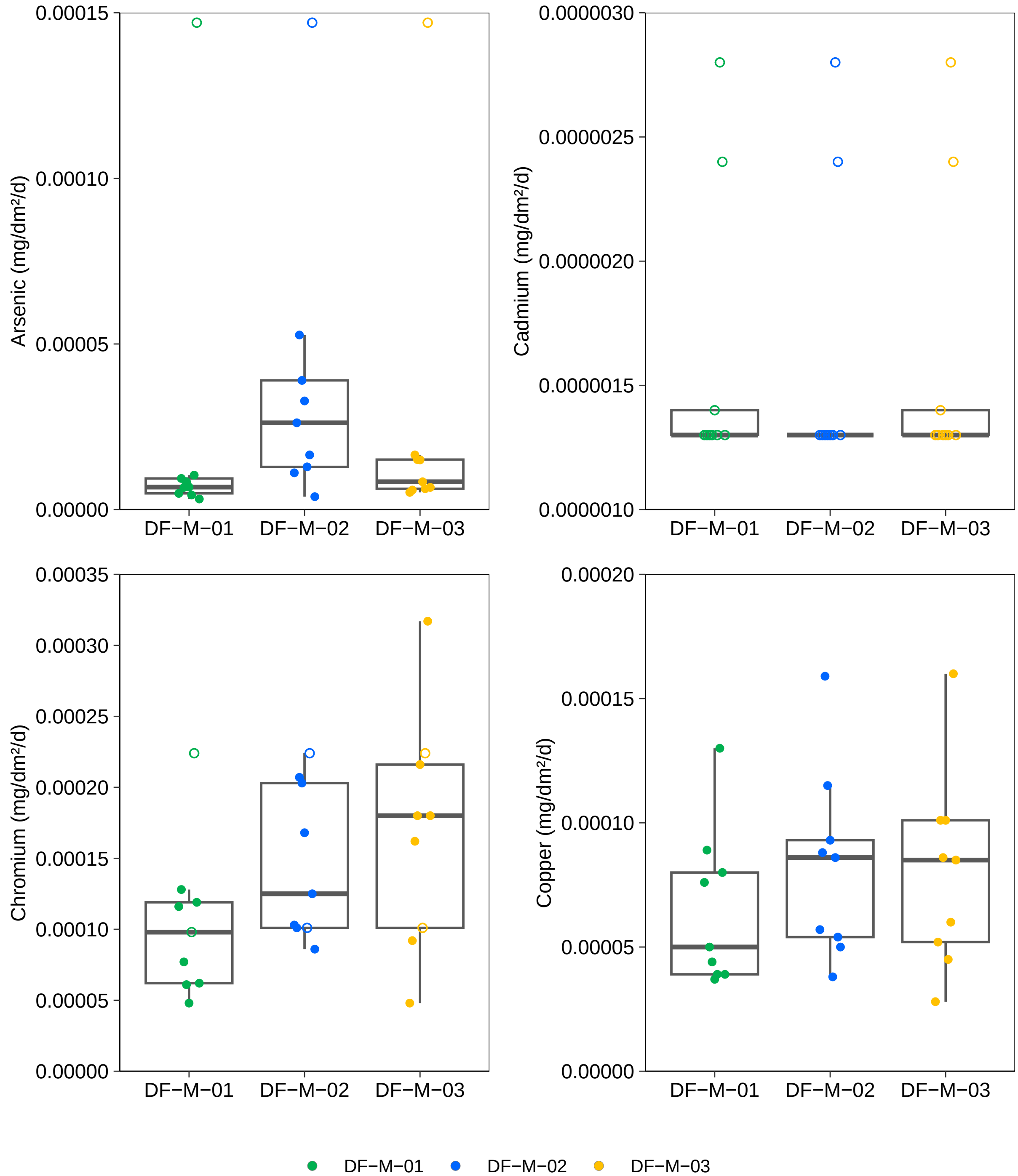
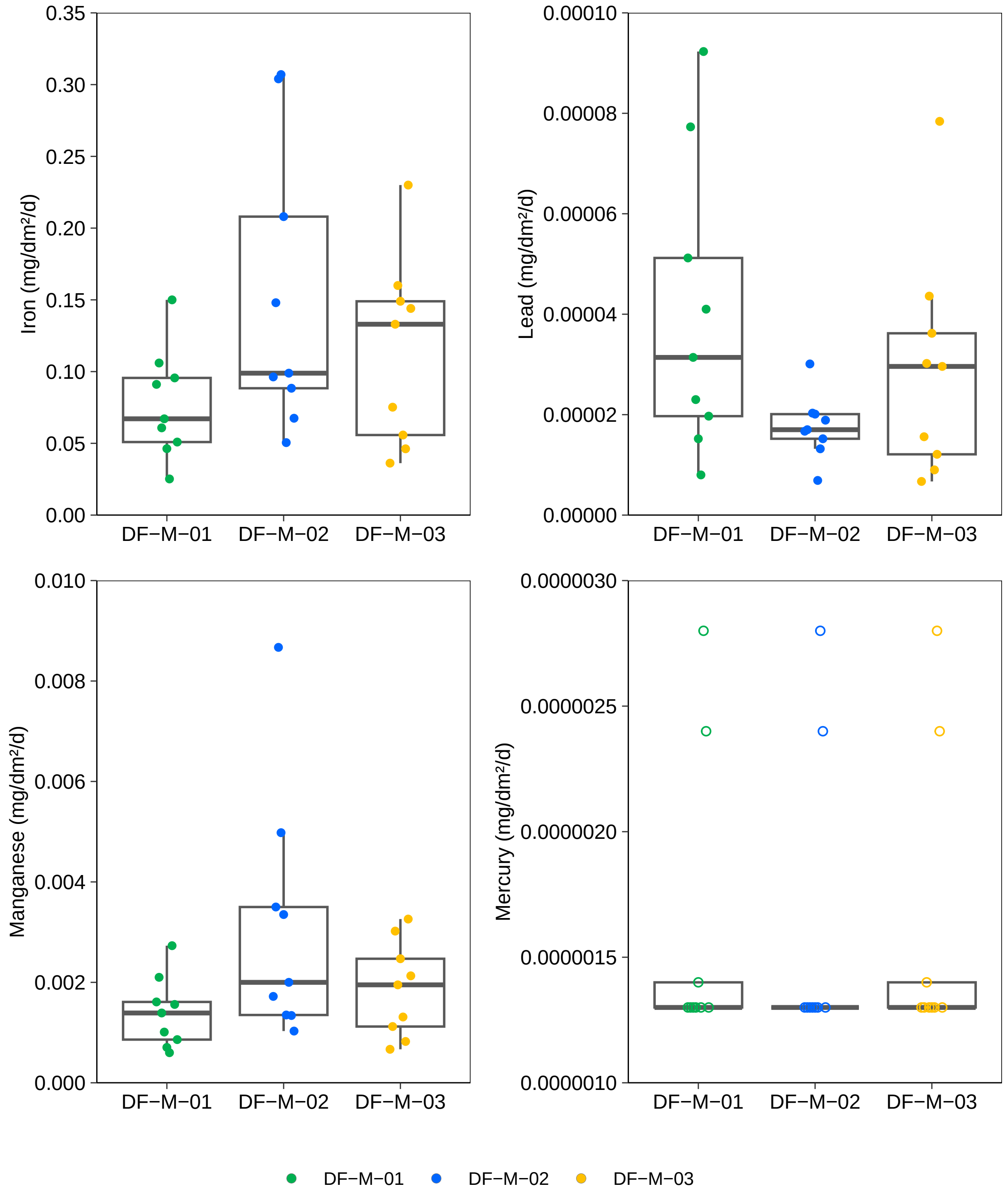


Figure A.8: Dustfall Metal Concentrations During the Ice Cover Period, 2023 − 2024.

Notes: Values below the laboratory reporting limit (LRL) have been substituted at the LRL and are represented by hollow circles. Boxplots consist of all data for a given area throughout the period.



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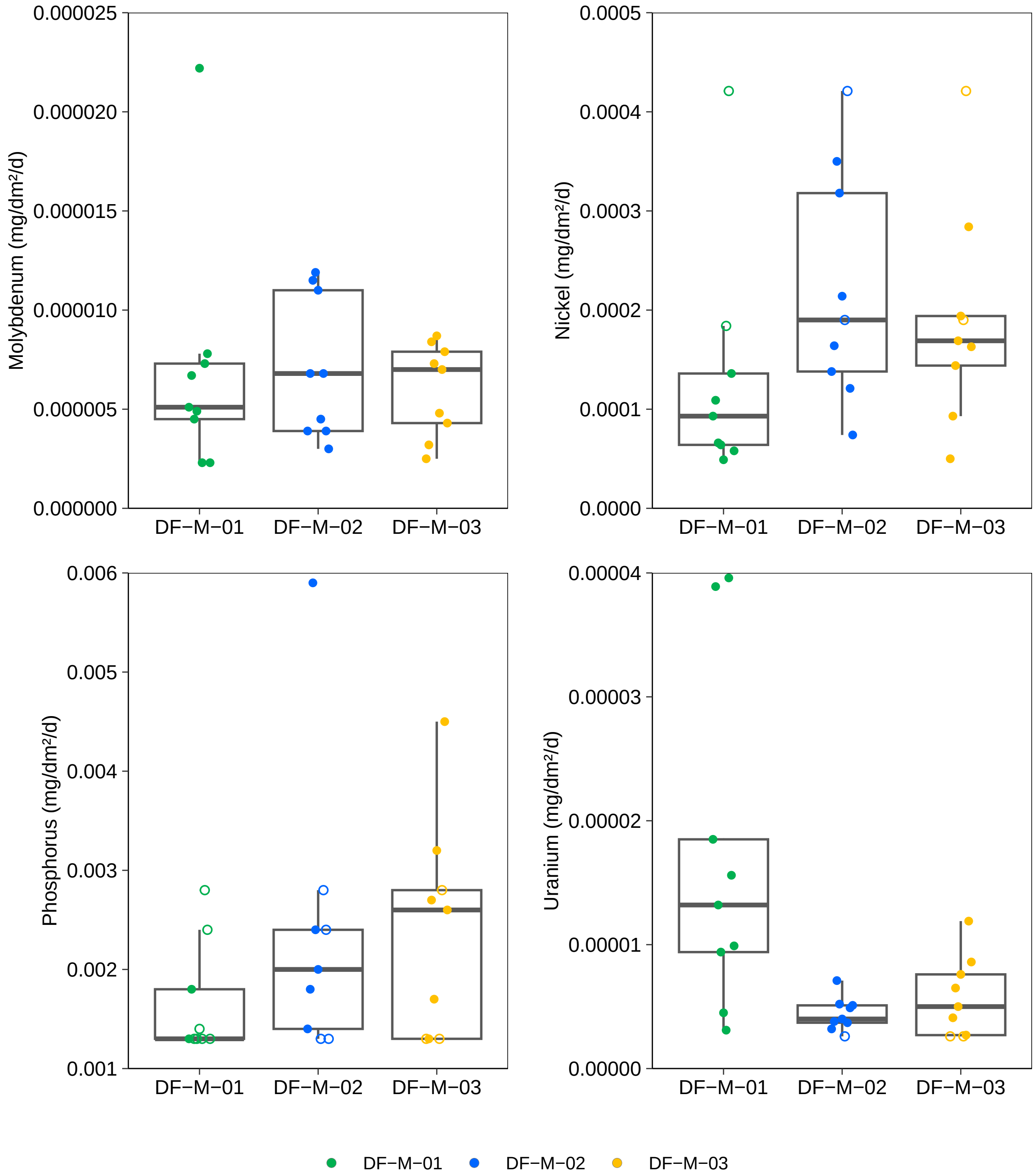

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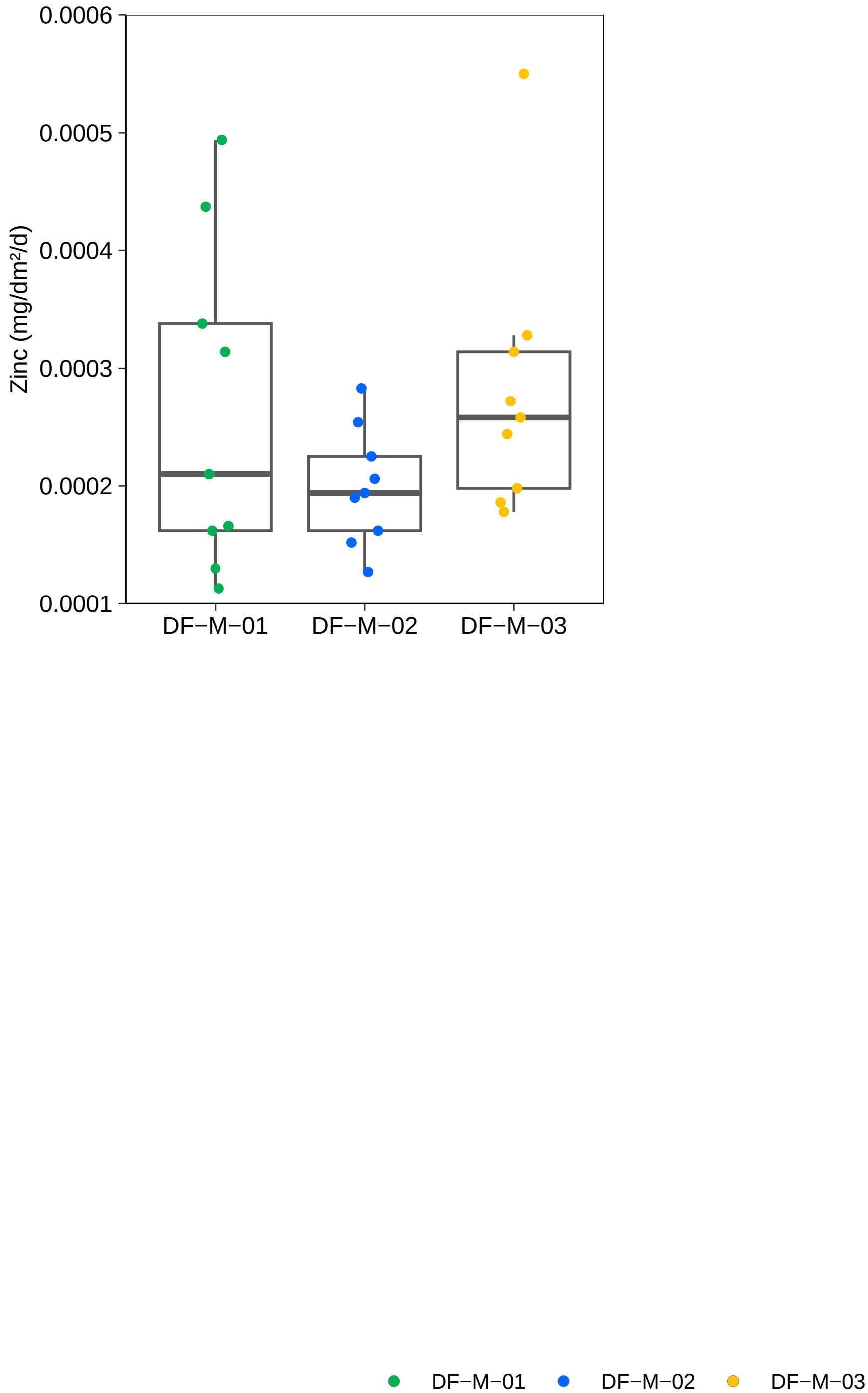

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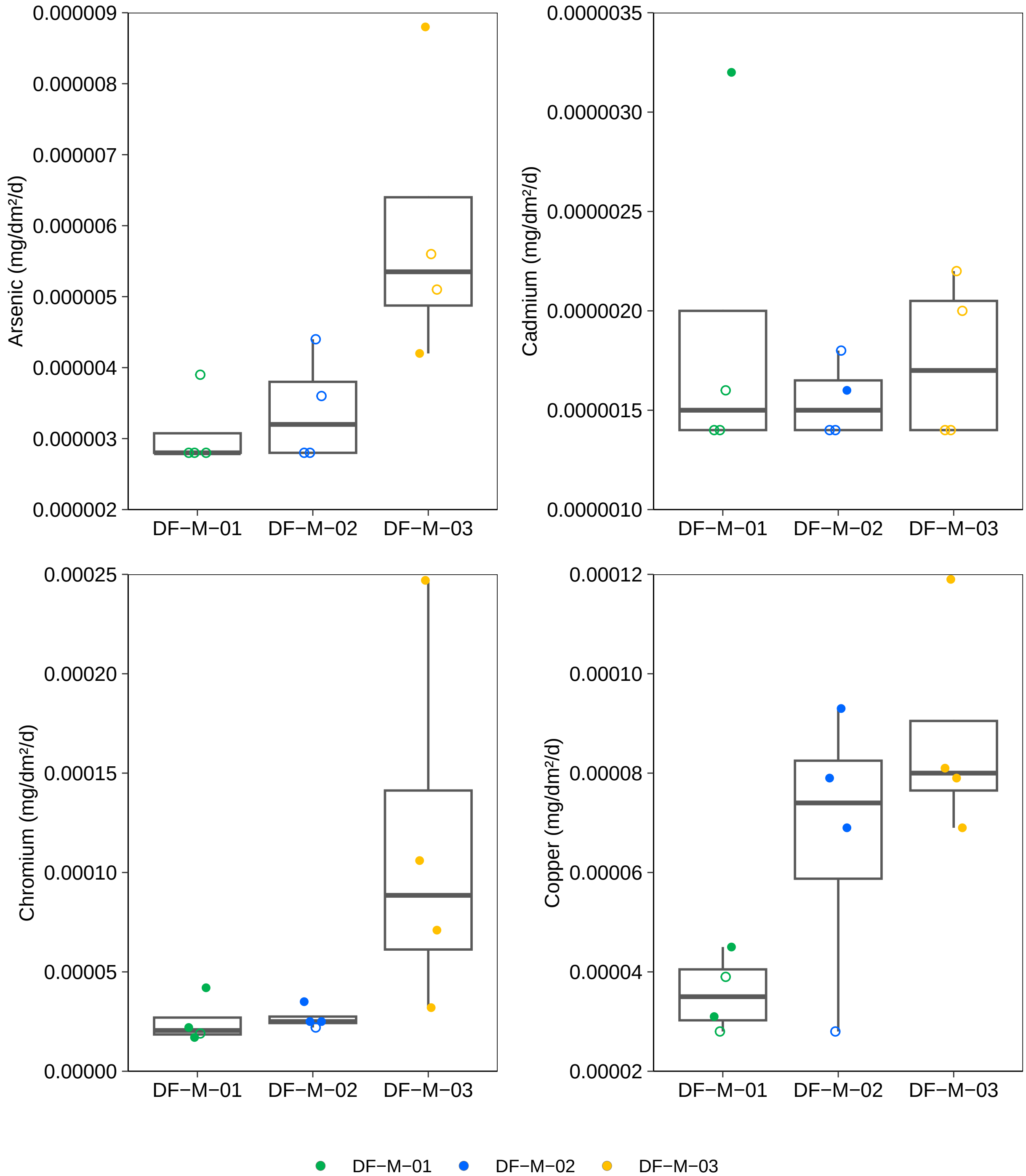


Figure A.9: Dustfall Metal Concentrations During the Open Water Period, 2024.

Notes: Values below the laboratory reporting limit (LRL) have been substituted at the LRL and are represented by hollow circles. Boxplots consist of all data for a given area throughout the period.

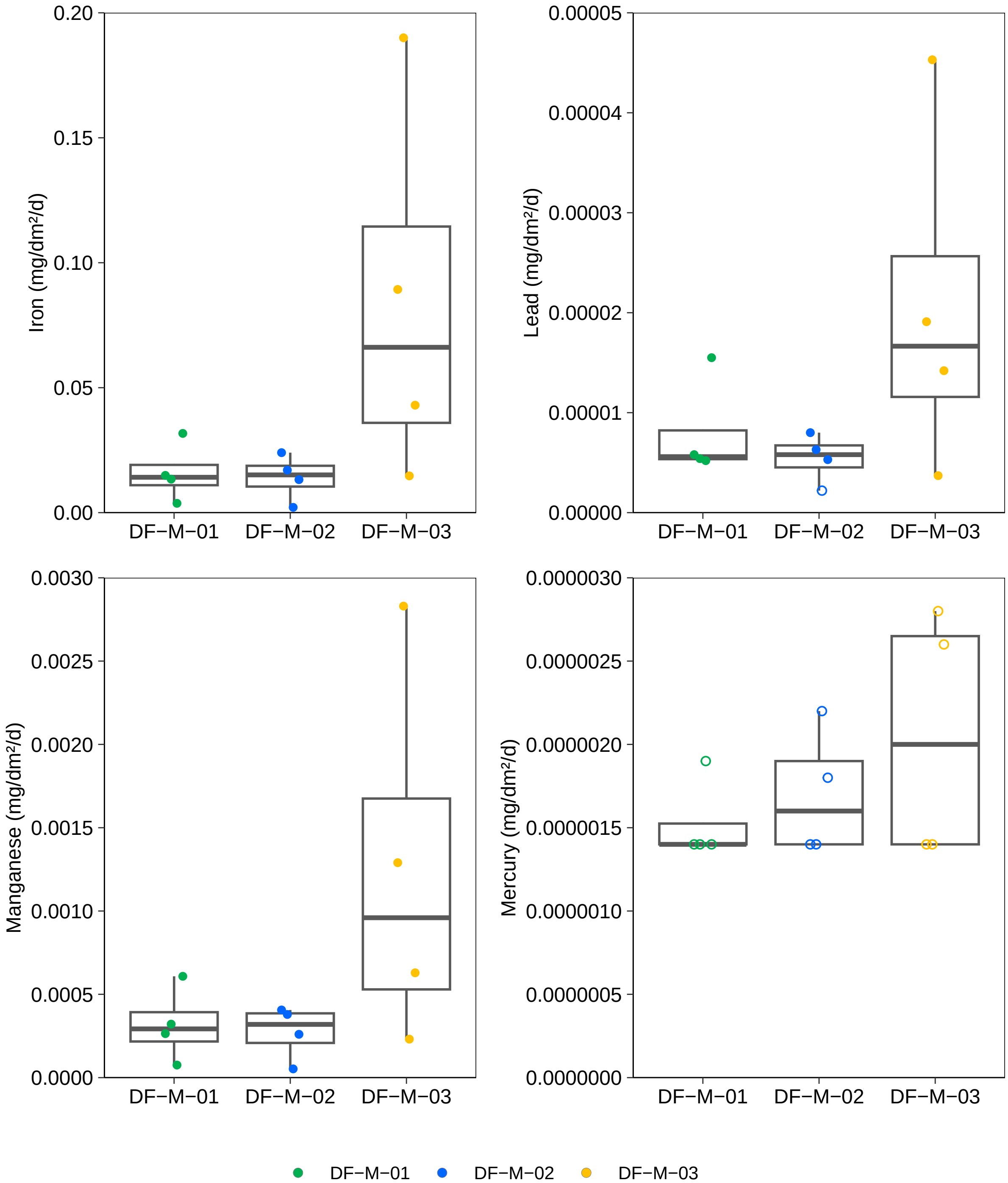


Figure A.9: Dustfall Metal Concentrations During the Open Water Period, 2024.

Notes: Values below the laboratory reporting limit (LRL) have been substituted at the LRL and are represented by hollow circles. Boxplots consist of all data for a given area throughout the period.

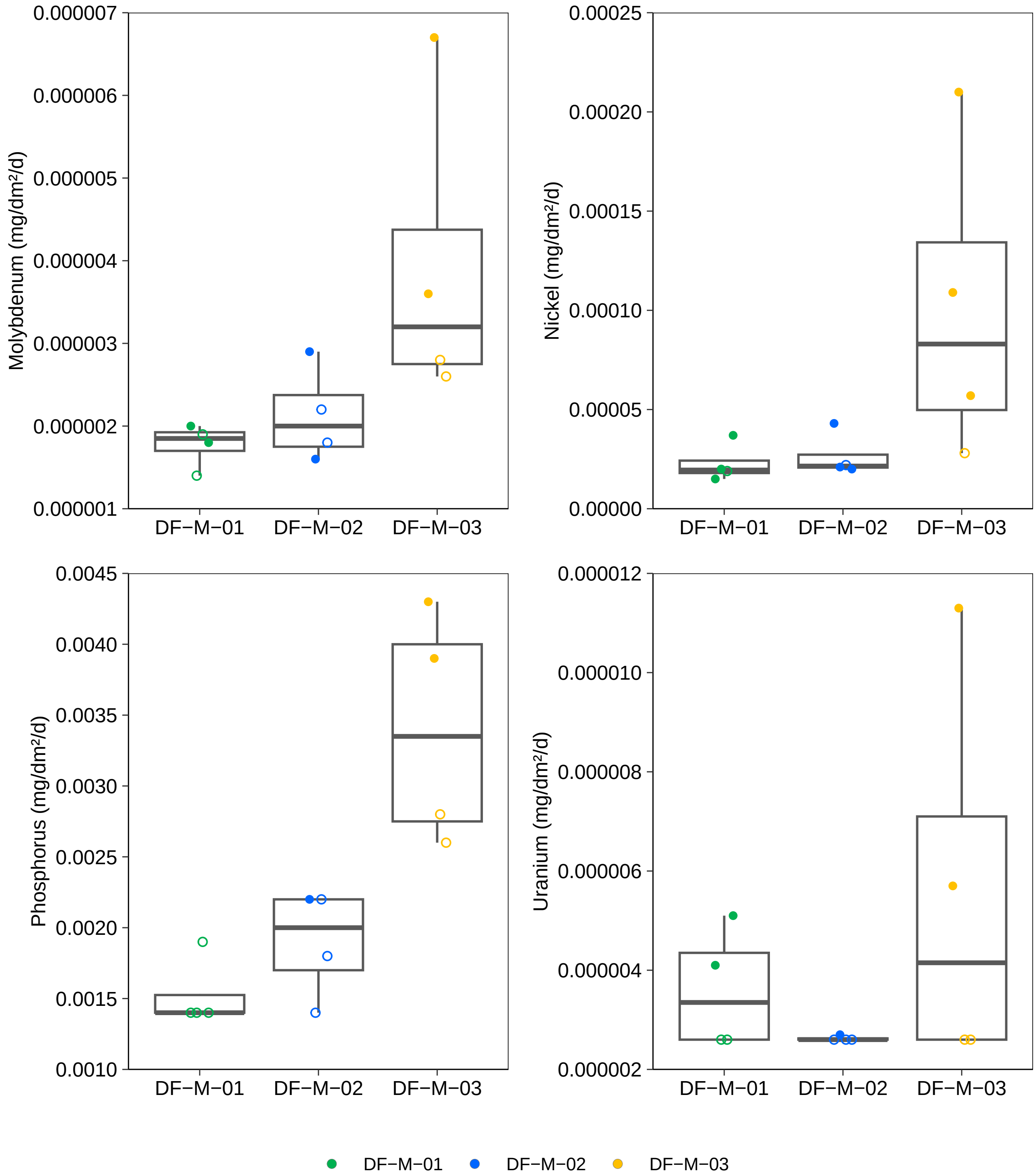
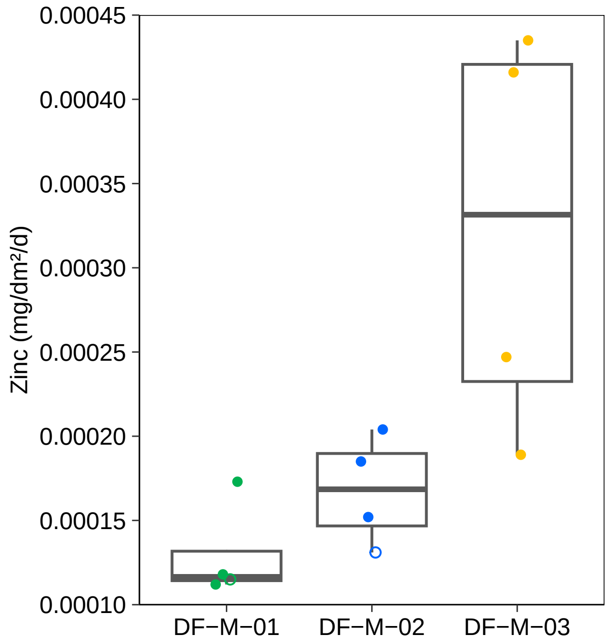


Figure A.9: Dustfall Metal Concentrations During the Open Water Period, 2024.

Notes: Values below the laboratory reporting limit (LRL) have been substituted at the LRL and are represented by hollow circles. Boxplots consist of all data for a given area throughout the period.



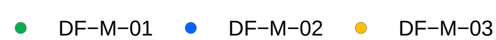


Figure A.9: Dustfall Metal Concentrations During the Open Water Period, 2024.

Notes: Values below the laboratory reporting limit (LRL) have been substituted at the LRL and are represented by hollow circles. Boxplots consist of all data for a given area throughout the period.

Table A.1: Sedimentation Rate and Sediment Accumulation Thickness Estimate Data for the 2023 to 2024 Ice Cover Period at Sheardown Lake NW

Station	Station Replicate	Original Set Location		Date		Set Duration	Total Dry Weight	Sedimentation Rate ($mg/cm^2/day$)	Sedimentation Rate (mg/cm^2/ice cover period)	Sediment Accumulation Thickness Estimate[b] (mm)
		Easting	Northing	Deployed	Retrieved	(days)	(g)			
Shallow 1 (SL-SHAL-1)	SL-SHAL-1A	560340	7913292	19-Sep-23	16-Jul-24	301	1.20	0.0677	20.4	0.0661
	SL-SHAL-1B	560347	7913295	19-Sep-23	12-Jul-24	297	1.24	0.0709	21.1	0.0684
	SL-SHAL-1B-HIS[a]	-	-	-	16-Jul-24	-	4.61	-	-	-
	SL-SHAL-1C	560346	7913294	19-Sep-23	17-Jul-24	302	1.30	0.0731	22.1	0.0717
	SL-SHAL-1D	560334	7913289	-	-	-	-	-	-	-
	SL-SHAL-1E	560337	7913285	19-Sep-23	16-Jul-24	301	1.15	0.0649	19.5	0.0634
	Average					**300**	**1.22**	**0.0691**	**20.76**	**0.0674**
	Standard Deviation					**2.22**	**0.0634**	**0.00360**	**1.08**	**0.00350**
Shallow 2 (SL-SHAL-2)	SL-SHAL-2A	560558	7913096	19-Sep-23	16-Jul-24	301	1.66	0.0936	28.2	0.0933
	SL-SHAL-2B	560564	7913093	19-Sep-23	16-Jul-24	301	1.21	0.0683	20.5	0.0680
	SL-SHAL-2C	560579	7913091	19-Sep-23	-	-	-	-	-	-
	SL-SHAL-2D	560544	7913116	19-Sep-23	13-Jul-24	298	1.24	0.0706	21.1	0.0697
	SL-SHAL-2E	560590	7913106	19-Sep-23	-	-	-	-	-	-
	Average					**300**	**1.37**	**0.0775**	**23.3**	**0.0770**
	Standard Deviation					**1.73**	**0.252**	**0.0140**	**4.27**	**0.0141**
Deep 1 (SL-DEEP-1)	SL-DEEP-1A	560242	7913042	19-Sep-23	10-Jul-24	295	1.03	0.0593	17.5	0.0641
	SL-DEEP-1B	560240	7913048	19-Sep-23	-	-	-	-	-	-
	SL-DEEP-1C	560222	7913033	18-Sep-23	10-Jul-24	296	1.41	0.0809	23.9	0.0877
	SL-DEEP-1D	560211	7913024	19-Sep-23	12-Jul-24	297	1.19	0.0680	20.2	0.0740
	SL-DEEP-1D-HIS[a]	-	-	-	17-Jul-24	-	10.5	-	-	-
	SL-DEEP-1E	560228	7913043	19-Sep-23	19-Jul-24	305	1.19	0.0662	20.2	0.0740
	Average					**298**	**1.21**	**0.0686**	**20.5**	**0.0749**
	Standard Deviation					**4.57**	**0.156**	**0.00901**	**2.65**	**0.00971**

Notes: Surface area of the sediment trap is 58.9 cm^2. The hyphen "-" indicates a sediment trap that was not deployed or recovered.

[a] Data excluded from this analysis because of extended deployment time (multiple ice-covered/open-water seasons). The exact deployment period and location for the historical traps is unknown, but the traps may have been deployed in the Fall of 2022.

[b] Sediment accumulation thickness estimates are for the entire ice cover period and calculated using the composite bulk density of an area (Table B.1).

Table A.2: Sedimentation Rate Summary Statistics for Sheardown Lake NW Sediment Trap Monitoring Areas, 2023/2024 Lake Sedimentation Monitoring Study

Deployment Period	Units	Area	Sample Size	Mean	Standard Deviation	Standard Error	Minimum	Median	Maximum
Ice Cover 2023 to 2024	$mg/cm^2/day$	SL-SHAL-1	4	0.0691	0.00360	0.00156	0.0649	0.0693	0.0731
	$mg/cm^2/day$	SL-SHAL-2	3	0.0775	0.0140	0.00661	0.0683	0.0706	0.0936
	$mg/cm^2/day$	SL-DEEP-1	4	0.0686	0.00901	0.00390	0.0593	0.0671	0.0809
Open Water 2024	$mg/cm^2/day$	SL-SHAL-1	5	0.324	0.0474	0.0190	0.288	0.308	0.407
	$mg/cm^2/day$	SL-SHAL-2	5	0.269	0.0548	0.0219	0.202	0.251	0.340
	$mg/cm^2/day$	SL-DEEP-1	4	0.442	0.0254	0.0110	0.406	0.448	0.466
Annual[a] September 2023 to October 2024	$mg/cm^2/y$	SL-SHAL-1	9	46.5	3.24	1.08	29.7	45.2	46.7
	$mg/cm^2/y$	SL-SHAL-2	8	44.6	4.78	1.69	14.8	42.1	56.4
	$mg/cm^2/y$	SL-DEEP-1	8	57.0	8.98	3.17	23.9	53.7	60.8
	$mg/cm^2/y$	**Average (All Areas)**	**3**	**49.4**	**6.69**	**3.86**	**44.6**	**45.2**	**60.8**

Note: Sample size corresponds to the number of stations (sediment trap replicates).
[a] Annual sedimentation rates are the sum of the rates over the ice cover and open water periods.

Table A.3: Spatial Statistical Comparison of Sedimentation Rate ($mg/cm^2/day$) among Sheardown Lake NW Sediment Trap Monitoring Areas for the 2023/2024 Ice Cover and 2024 Open Water Periods, Lake Sedimentation Monitoring Study

Deployment Period	Overall 3-group Comparison			Pair-wise comparisons			
	Statistical Test[a]	Transformation	P-value	(i) Area	(j) Area	p-value	MOD[b]
Ice Cover 2023 to 2024	ANOVA	none	0.42	SL-SHAL-1	SL-SHAL-2	0.489	ns
				SL-SHAL-1	SL-DEEP-1	0.996	ns
				SL-SHAL-2	SL-DEEP-1	0.450	ns
Open Water 2024	ANOVA	none	0.001	SL-SHAL-1	SL-SHAL-2	0.177	ns
				SL-SHAL-1	SL-DEEP-1	0.007	36
				SL-SHAL-2	SL-DEEP-1	<0.001	65

P-value < 0.05 and positive MOD.

P-value < 0.05 and negative MOD.

Shading indicates significant difference between study areas based on p-value less than 0.05.

Note: "ns" indicates p-value was not significant.

[a] Statistical tests include Analysis of Variance (ANOVA) followed by post hoc Tukey's HSD tests or Kruskal-Wallis (K-W) multiple group test followed by Mann-Whitney (M-W) pairwise tests. Raw data were assessed for normality and homogeneity of variance and log-transformed as necessary to meet test assumptions before conducting Analysis of-Variance (ANOVA) and post hoc tests. In instances where normality could not be achieved through data transformation, non-parametric Mann-Whitney U test statistics were used for pair-wise comparisons, and Kruskal-Wallis H-tests were used for multiple group comparisons using rank transformed data.

[b] MOD = Magnitude of Difference, calculated as $((Area_j - Area_i)/Area_i)*100$.

Table A.4: **Sedimentation Rate and Sediment Accumulation Thickness Estimate Data for the 2024 Open Water Period at Sheardown Lake NW**

Station	Station Replicate	Original Set Location		Date		Set Duration (Days)	Total Dry Weight (g)	Sedimentation Rate ($mg/cm^2/day$)	Sedimentation Rate (mg/cm^2/open water period)	Sediment Accumulation Thickness Estimate[a] (mm)
		Longitude	Latitude	Deployed	Retrieved					
Shallow 1 (SL-SHAL-1)	SL-SHAL-1A	560340	7913292	16-Jul-24	5-Oct-24	81	1.47	0.308	25.0	0.0883
	SL-SHAL-1B	560347	7913295	12-Jul-24	5-Oct-24	85	1.51	0.302	25.6	0.0907
	SL-SHAL-1C	560346	7913294	18-Jul-24	5-Oct-24	79	1.34	0.288	22.8	0.0805
	SL-SHAL-1D	560334	7913289	24-Jul-24	5-Oct-24	73	1.75	0.407	29.7	0.105
	SL-SHAL-1E	560337	7913285	16-Jul-24	5-Oct-24	81	1.51	0.317	25.6	0.0907
					Average	**80**	**1.52**	**0.324**	**25.7**	**0.0911**
					Standard Deviation	**4.38**	**0.148**	**0.0474**	**2.52**	**0.00891**
Shallow 2 (SL-SHAL-2)	SL-SHAL-2A	560558	7913096	16-Jul-24	7-Oct-24	83	1.66	0.340	28.2	0.0868
	SL-SHAL-2B	560564	7913093	16-Jul-24	5-Oct-24	81	1.47	0.308	25.0	0.0769
	SL-SHAL-2C	560579	7913091	24-Jul-24	5-Oct-24	73	1.04	0.242	17.7	0.0544
	SL-SHAL-2D	560544	7913116	13-Jul-24	5-Oct-24	84	1.24	0.251	21.1	0.0648
	SL-SHAL-2E	560590	7913106	24-Jul-24	5-Oct-24	73	0.870	0.202	14.8	0.0455
					Average	**79**	**1.26**	**0.269**	**21.3**	**0.0657**
					Standard Deviation	**5.40**	**0.318**	**0.0548**	**5.40**	**0.0166**
Deep 1 (SL-DEEP-1)	SL-DEEP-1A	560242	7913042	10-Jul-24	7-Oct-24	89	2.13	0.406	36.2	0.127
	SL-DEEP-1B	560240	7913048	24-Jul-24	7-Oct-24	75	1.98	0.448	33.6	0.118
	SL-DEEP-1C	560222	7913033	10-Jul-24	-	-	-	-	-	-
	SL-DEEP-1D	560211	7913024	12-Jul-24	7-Oct-24	87	2.39	0.466	40.6	0.142
	SL-DEEP-1E	560228	7913043	19-Jul-24	7-Oct-24	80	2.11	0.448	35.8	0.126
					Average	**83**	**2.15**	**0.442**	**36.5**	**0.128**
					Standard Deviation	**7.09**	**0.0814**	**0.0254**	**2.92**	**0.0102**

Notes: Surface area of the sediment trap is 58.9 cm^2. The hyphen "-" indicates a sediment trap that was not deployed or recovered.

[a] Sediment accumulation thickness estimates are for the entire open water period and calculated using the mean bulk density for an area (Table B.1).

Table A.5: **Temporal Statistical Comparison of Sedimentation Rates ($mg/cm^2/day$) Between Mine Baseline (2013 to 2014) and Operational (2015 to 2024) Phases at Sheardown Lake NW Sediment Trap Areas (SHAL-1, SHAL-2, DEEP-1) During Ice Cover Periods, Lake Sedimentation Monitoring Study, 2013 to 2024**

Area	Overall 10-group Comparison			Pair-wise, *post hoc* comparisons				
	Statistical Test[a]	Transformation	P-value	Deployment Period	Sedimentation Rate[b]	Comparison Among Years: Temporal Difference[c]	Comparison to Baseline: P-value for Baseline vs Deployment Period	Comparison to Baseline: MOD[d] for Baseline vs Deployment Period
SL-SHAL-1	K-W	rank	0.001	2013 to 2014	0.034	C	na	na
				2014 to 2015	0.019	C	0.97	ns
				2015 to 2016	0.062	BC	0.11	ns
				2016 to 2017	0.077	AB	0.0080	129
				2017 to 2018	0.058	ABC	0.44	ns
				2018 to 2019	0.037	C	0.74	ns
				2019 to 2020	0.057	BC	0.15	ns
				2020 to 2021	-	-	-	-
				2021 to 2022	0.082	AB	0.0020	145
				2022 to 2023	0.11	A	<0.001	236
				2023 to 2024	0.069	AB	0.020	107
SL-SHAL-2	ANOVA	none	0.001	2013 to 2014	0.027	D	na	na
				2014 to 2015	0.030	D	1.0	ns
				2015 to 2016	0.079	A	<0.001	188
				2016 to 2017	0.061	B	<0.001	123
				2017 to 2018	0.041	CD	0.38	ns
				2018 to 2019	0.034	D	0.93	ns
				2019 to 2020	0.059	BC	<0.001	116
				2020 to 2021	-	-	-	-
				2021 to 2022	0.041	CD	0.38	ns
				2022 to 2023	0.082	A	<0.001	199
				2023 to 2024	0.078	AB	<0.001	183
SL-DEEP-1	K-W	rank	0.001	2013 to 2014	0.049	BC	na	na
				2014 to 2015	0.047	C	0.89	ns
				2015 to 2016	0.082	A	0.0020	69
				2016 to 2017	0.12	A	<0.001	143
				2017 to 2018	0.073	AB	0.059	ns
				2018 to 2019	0.064	BC	0.24	ns
				2019 to 2020	0.063	BC	0.23	ns
				2020 to 2021	-	-	-	-
				2021 to 2022	0.081	A	0.0030	67
				2022 to 2023	0.095	A	<0.001	95
				2023 to 2024	0.067	AB	0.076	ns

P-value < 0.05 and positive MOD.
P-value < 0.05 and negative MOD.
Shaded values indicate significant difference between years based on test p-value less than 0.05.

Note "-" indicates no data for the given period; "na" indicates not applicable; "ns" indicates p-value was not significant.

[a] Statistical tests include analysis of variance (ANOVA; followed by Tukey's Honestly Significant Difference post-hoc tests) and Kruskal Wallis H-test (K-W; followed by Mann-Whitney U-test pair-wise comparisons). Raw data were assessed for normality and homogeneity of variance and log-transformed as necessary to meet test assumptions before conducting Analysis of-Variance (ANOVA) and post hoc tests. In instances where normality could not be achieved through data transformation, non-parametric Mann-Whitney U test statistics were used for pair-wise comparisons, and Kruskal-Wallis H-tests were used for multiple group comparisons using rank transformed data.

[b] Sedimentation Rate provided represents the median (K-W test) or mean (ANOVA) of all stations for a given site.

[c] Deployment periods denoted by the same letter do not differ significantly based on tests conducted for each individual station.

[d] MOD = Magnitude of Difference, calculated as (($Year_i$ - Baseline Year)/Baseline Year)*100.

Table A.6: Temporal Statistical Comparison of Sedimentation Rates (mg/cm²/day) Between Mine Baseline (2014) and Operational (2015 to 2024) Phases at Sheardown Lake NW Sediment Trap Areas (SHAL-1, SHAL-2, DEEP-1) During Open Water Periods, Lake Sedimentation Monitoring Study, 2014 to 2024

Area	Overall 11-group Comparison			Pair-wise, *post-hoc* comparisons				
						Comparison Among Years	Comparison to Baseline	
	Statistical Test[a]	Transformation	P-value	Deployment Period	Sedimentation Rate[b]	Temporal Difference[c]	P-value for 2014 vs Deployment Period	MOD[d] for 2014 vs Deployment Period
SL-SHAL-1	K-W	rank	0.001	2014	0.089	D	na	na
				2015	0.14	BCD	0.051	ns
				2016	0.14	BCD	0.059	ns
				2017	0.23	AB	<0.001	162
				2018	0.17	ABCD	0.077	ns
				2019	0.11	CD	0.32	ns
				2020	0.11	CD	0.36	ns
				2021	0.16	ABC	0.012	81
				2022	0.24	AB	0.0020	165
				2023	0.28	A	<0.001	209
				2024	0.31	A	<0.001	246
SL-SHAL-2	K-W	rank	0.001	2014	0.12	BCD	na	na
				2015	0.13	BCD	0.75	ns
				2016	0.12	CD	0.54	ns
				2017	0.16	ABD	0.50	ns
				2018	0.16	ABCD	0.45	ns
				2019	0.093	C	0.23	ns
				2020	0.11	CD	0.62	ns
				2021	0.19	ABCD	0.53	ns
				2022	0.24	AB	0.002	165
				2023	0.28	A	<0.001	209
				2024	0.25	A	0.027	108
SL-DEEP-1	K-W	rank	0.001	2014	0.13	F	na	na
				2015	0.20	BCDE	0.011	49
				2016	0.26	ABD	<0.001	93
				2017	0.27	ABCD	<0.001	99
				2018	0.22	ABCD	0.0040	62
				2019	0.16	EF	0.42	ns
				2020	0.16	EF	0.36	ns
				2021	0.18	CEF	0.095	ns
				2022	0.24	AB	0.0020	165
				2023	0.28	A	<0.001	209
				2024	0.45	AB	<0.001	237

P-value < 0.05 and positive MOD.

P-value < 0.05 and negative MOD.

Shaded values indicate significant difference between years based on test p-value less than 0.05.

Note "-" indicates no data for the given period; "na" indicates not applicable; "ns" indicates p-value was not significant.

[a] Statistical tests include analysis of variance (ANOVA; followed by Tukey's Honestly Significant Difference post-hoc tests) and Kruskal Wallis H-test (K-W; followed by Mann-Whitney U-test pair-wise comparisons). Raw data were assessed for normality and homogeneity of variance and log-transformed as necessary to meet test assumptions before conducting Analysis of-Variance (ANOVA) and post hoc tests. In instances where normality could not be achieved through data transformation, non-parametric Mann-Whitney U test statistics were used for pair-wise comparisons, and Kruskal-Wallis H-tests were used for multiple group comparisons using rank transformed data.

[b] Sedimentation Rate provided represents the median (K-W test) or mean (ANOVA) of all stations for a given site.

[c] Deployment periods denoted by the same letter do not differ significantly based on tests conducted for each individual station.

[d]MOD = Magnitude of Difference, calculated as ((Year$_j$ - Baseline Year)/Baseline Year)*100.

Table A.7: Statistical Comparison of Sedimentation Rate ($mg/cm^2/day$) Among Seasons (Ice Cover and Open Water) at Sheardown Lake NW Sediment Trap Monitoring Areas, 2023 to 2024

Area	Overall 2-group Comparison			
	Statistical Test[a]	Transformation	P-value	MOD[b]
SL-SHAL-1	t-test (equal)	log10	0.001	366
SL-SHAL-2	t-test (equal)	none	0.001	246
SL-DEEP-1	t-test (equal)	none	0.001	545

P-value < 0.05 and positive MOD (Open-Water > Ice-Cover).
P-value < 0.05 and negative MOD (Ice-Cover > Open-Water).
Shading indicates significant difference between study areas based on p-value less than 0.05.
Note: "ns" indicates p-value was not significant.
[a] Statistical tests include paired t-test (for unequal or equal variance) and Mann-Whitney (M-W) pair-wise tests.
[b] MOD = Magnitude of Difference, calculated as ((Open Water - Ice Cover)/Ice Cover)*100.

Table A.8: Sediment Accumulation Thickness Estimates (mm) Summary Statistics for Sheardown Lake NW, Lake Sedimentation Monitoring Study, 2023 to 2024

Deployment Period	Area	Sample Size	Mean	Standard Deviation	Standard Error	Minimum	Median	Maximum
Ice Cover 2023 to 2024	SL-SHAL-1	4	0.0674	0.00350	0.00175	0.0634	0.0673	0.0717
	SL-SHAL-2	3	0.0770	0.0141	0.00817	0.0680	0.0697	0.0933
	SL-DEEP-1	4	0.0749	0.00971	0.00485	0.0641	0.0740	0.0877
Open Water 2024	SL-SHAL-1	5	0.0911	0.00891	0.00398	0.0805	0.0907	0.105
	SL-SHAL-2	5	0.0657	0.0166	0.00744	0.0455	0.0648	0.0868
	SL-DEEP-1	4	0.128	0.0102	0.00512	0.118	0.126	0.142
Annual September 2023 to October 2024	SL-SHAL-1	9	0.159	0.0142	0.00472	0.144	0.158	0.177
	SL-SHAL-2	8	0.143	0.0158	0.00559	0.114	0.135	0.180
	SL-DEEP-1	8	0.203	0.0299	0.0106	0.182	0.200	0.230
	All Areas	**3**	**0.168**	**0.0312**	**0.0180**	**0.114**	**0.158**	**0.230**

Note: Sample size corresponds to the number of stations (sediment trap replicates). Average sediment accumulation thickness estimates during the ice cover and open water periods were calculated from the mean of ice cover and open water sediment accumulation thickness estimates for each sediment monitoring area.

Table A.9: Spatial Statistical Comparison of Sediment Accumulation Thickness Estimates (mm) Among Sheardown Lake NW Sediment Trap Monitoring Areas for the Ice Cover and Open Water Periods, Lake Sedimentation Monitoring Study, 2023 to 2024

Deployment Period	Overall 3-group Comparison			Pair-wise comparisons			
	Statistical Test[a]	Transformation	P-value	(i) Area	(j) Area	P-value	MOD[b]
Ice Cover 2023 to 2024	ANOVA	none	0.394	SL-SHAL-1	SL-SHAL-2	0.42	ns
				SL-SHAL-1	SL-DEEP-1	0.53	ns
				SL-SHAL-2	SL-DEEP-1	0.96	ns
Open Water 2024	ANOVA	none	0.001	SL-SHAL-1	SL-SHAL-2	0.021	-28
				SL-SHAL-1	SL-DEEP-1	0.0030	41
				SL-SHAL-2	SL-DEEP-1	<0.001	95

P-value < 0.05 and positive MOD.

P-value < 0.05 and negative MOD.

Shading indicates significant difference between study areas based on p-value less than 0.05.

Note: "ns" indicates p-value was not significant.

[a] Statistical tests include Analysis of Variance (ANOVA) followed by *post hoc* Tukey's HSD tests or Kruskal-Wallis (K-W) multiple group test followed by Mann-Whitney (M-W) pair-wise tests. Raw data were assessed for normality and homogeneity of variance and log-transformed as necessary to meet test assumptions before conducting Analysis of-Variance (ANOVA) and *post hoc* tests. In instances where normality could not be achieved through data transformation, non-parametric Mann-Whitney U test statistics were used for pair-wise comparisons, and Kruskal-Wallis H-tests were used for multiple group comparisons using rank transformed data.

[b] MOD = Magnitude of Difference, calculated as $((Area_j - Area_i)/ Area)*100$.

Table A.10: Statistical Comparison of Sediment Accumulation Thickness Estimates (mm) Among Seasons at Sheardown Lake NW Sediment Trap Monitoring Areas, for the 2023/2024 Ice Cover Season and the 2024 Open Water Season, Lake Sedimentation Monitoring Study

Area	Overall 2-Group Comparison			
	Statistical Test[a]	Transformation	P-value	MOD[b]
SL-SHAL-1	t-test (equal)	none	0.002	35
SL-SHAL-2	t-test (equal)	none	0.365	ns
SL-DEEP-1	t-test (equal)	none	0.001	71

P-value < 0.05 and positive MOD. (green)
P-value < 0.05 and negative MOD. (blue)
Shading indicates significant difference between seasons based on p-value less than 0.05. (grey)

Note: "ns" indicates p-value was not significant.

[a] Statistical tests include paired t-test (for equal or unequal variance) and Mann-Whitney (M-W) pair-wise tests.

[b] MOD = Magnitude of Difference, calculated as ((Open Water - Ice Cover)/Ice Cover)*100.

Table A.11: Statistical Comparison of Sediment Accumulation Thickness Estimates (mm) Among Years (2014 to 2024) at Sheardown Lake NW Sediment Trap Monitoring Areas (SHAL-1, SHAL-2, DEEP-1) During Ice Cover Periods, 2023/2024 Lake Sedimentation Monitoring Study

Area	Overall 10-group Comparison			Pair-wise, *post hoc* comparisons				
	Statistical Test[a]	Transformation	P-value	Deployment Period	Average Sediment Accumulation Thickness Estimates (mm)[b]	Comparison Among Years: Temporal Difference[c]	Comparison to 2014/2015: P-value of 2014 to 2015 vs Deployment Year	Comparison to 2014/2015: MOD[d] of 2014 to 2015 vs Deployment Year
SL-SHAL-1	K-W	rank	0.001	2014 to 2015	0.021	D	na	na
				2015 to 2016	0.065	BCD	0.124	ns
				2016 to 2017	0.086	AB	0.003	316
				2017 to 2018	0.060	ABCD	0.511	ns
				2018 to 2019	0.040	D	1.000	ns
				2019 to 2020	0.059	CD	0.267	ns
				2020 to 2021	-	-	-	-
				2021 to 2022	0.079	ABC	0.004	283
				2022 to 2023	0.114	A	<0.001	449
				2023 to 2024	0.067	BCD	0.065	ns
SL-SHAL-2	ANOVA	none	0.001	2014 to 2015	0.033	D	na	na
				2015 to 2016	0.083	A	<0.001	154
				2016 to 2017	0.068	AB	<0.001	107
				2017 to 2018	0.043	CD	0.850	ns
				2018 to 2019	0.036	D	1.000	ns
				2019 to 2020	0.063	BC	<0.001	93
				2020 to 2021	-	-	-	-
				2021 to 2022	0.040	D	0.976	ns
				2022 to 2023	0.080	AB	<0.001	144
				2023 to 2024	0.077	AB	<0.001	135
SL-DEEP-1	K-W	rank	0.001	2014 to 2015	0.052	D	na	na
				2015 to 2016	0.087	ABC	<0.001	66
				2016 to 2017	0.132	A	<0.001	152
				2017 to 2018	0.076	CD	0.108	ns
				2018 to 2019	0.072	CD	0.127	ns
				2019 to 2020	0.070	D	0.174	ns
				2020 to 2021	-	-	-	-
				2021 to 2022	0.086	ABC	<0.001	64
				2022 to 2023	0.095	AB	<0.001	81
				2023 to 2024	0.074	BCD	0.066	ns

P-value < 0.05 and positive MOD.

P-value < 0.05 and negative MOD.

Shaded values indicate significant difference between years based on test p-value less than 0.05.

Note "-" indicates no data for the given period. "na" indicates not applicable. "ns" indicates p-value was not significant.

[a] Statistical tests include analysis of variance (ANOVA; followed by Tukey's Honestly Significant Difference *post hoc* tests) and Kruskal Wallis H-test (K-W; followed by Mann-Whitney U-test pair-wise comparisons). Raw data were assessed for normality and homogeneity of variance and log-transformed as necessary to meet test assumptions before conducting Analysis of-Variance (ANOVA) and *post hoc* tests. In instances where normality could not be achieved through data transformation, non-parametric Mann-Whitney U test statistics were used for pair-wise comparisons, and Kruskal-Wallis H-tests were used for multiple group comparisons using rank transformed data.

[b] Sediment accumulation thickness provided represents the median (K-W test) or mean (ANOVA) of all stations for a given site.

[c] Deployment periods denoted by the same letter do not differ significantly based on tests conducted for each individual station.

[d] MOD = Magnitude of Difference, calculated as $((Year_j - Year_{2014\ to\ 2015})/Year_{2014\ to\ 2015})*100$.

Table A.12: Statistical Comparison of Sediment Thickness Estimates (mm) at Sheardown Lake NW Sediment Trap Monitoring Areas (SHAL-1, SHAL-2, DEEP-1) During Open Water Periods, Lake Sedimentation Monitoring Study, 2015 to 2024

Area	Overall 10-group Comparison			Pair-wise, *post hoc* comparisons				
	Statistical Test[a]	Transformation	P-value	Deployment Period	Sediment Accumulation Thickness Estimates (mm)[b]	Comparison Among Years: Temporal Difference[c]	Comparison to 2014/2015: P-value of 2015 vs Deployment Year	Comparison to 2014/2015: MOD of 2015 vs Deployment Year[d]
SL-SHAL-1	K-W	rank	0.001	2015	0.022	D	na	na
				2016	0.027	CD	0.32	ns
				2017	0.029	BCD	0.063	ns
				2018	0.038	ABCD	0.16	ns
				2019	0.027	CD	0.35	ns
				2020	0.022	D	0.86	ns
				2021	0.039	ABC	0.015	74
				2022	0.054	AB	0.0020	144
				2023	0.049	AB	0.0020	120
				2024	0.091	A	<0.001	308
SL-SHAL-2	ANOVA	none	0.001	2015	0.021	C	na	na
				2016	0.022	C	1.00	ns
				2017	0.025	C	1.00	ns
				2018	0.041	BC	0.26	ns
				2019	0.023	C	1.0	ns
				2020	0.026	C	1.00	ns
				2021	0.043	BC	0.067	ns
				2022	0.053	AB	0.0030	155
				2023	0.050	AB	0.0040	142
				2024	0.066	A	<0.001	218
SL-DEEP-1	K-W	rank	0.001	2015	0.031	D	na	na
				2016	0.049	AB	0.0010	58
				2017	0.032	D	0.98	ns
				2018	0.047	ABC	0.020	52
				2019	0.038	CD	0.21	ns
				2020	0.038	CD	0.27	ns
				2021	0.042	BC	0.028	36
				2022	0.043	BC	0.033	37
				2023	0.094	AB	<0.001	203
				2024	0.126	A	<0.001	307

P-value < 0.05 and positive MOD.
P-value < 0.05 and negative MOD.
Shaded values indicate significant difference between years based on test p-value less than 0.05.

Note "-" indicates no data for the given period. "na" indicates not applicable. "ns" indicates p-value was not significant.

[a] Statistical tests include analysis of variance (ANOVA; followed by Tukey's Honestly Significant Difference post-hoc tests) and Kruskal Wallis H-test (K-W; followed by Mann-Whitney U-test pair-wise comparisons). Raw data were assessed for normality and homogeneity of variance and log-transformed as necessary to meet test assumptions before conducting Analysis of-Variance (ANOVA) and post hoc tests. In instances where normality could not be achieved through data transformation, non-parametric Mann-Whitney U test statistics were used for pair-wise comparisons, and Kruskal-Wallis H-tests were used for multiple group comparisons using rank transformed data.

[b] Sediment thickness provided represents the median (K-W test) or mean (ANOVA) of all stations for a given site for the open water period (July to September).

[c] Deployment periods denoted by the same letter do not differ significantly based on tests conducted for each individual station.

[d] MOD = Magnitude of Difference, calculated as ((Year$_j$ - Baseline Year)/Baseline Year)*100.

Table A.13: **Spearman Correlations Between Sediment Accumulation Thickness Estimates and Sedimentation Rate at Stations in Sheardown Lake NW and Total Cumulative Dustfall on Baffinland Iron Mine Property Calculated by Season, 2013 to 2024**

Season	Lake Station	Dustfall Station	Sediment Accumulation Thickness Estimate vs Total Cumulative Dustfall		Sedimentation Rate vs Total Cumulative Dustfall	
			p-value	Spearman's ρ	p-value	Spearman's ρ
Ice Cover	SL-SHAL-1	DF-M-01	0.744	-0.133	0.776	-0.117
		DF-M-02	0.581	0.217	0.437	0.300
		DF-M-03	0.678	0.167	0.437	0.300
	SL-SHAL-2	DF-M-01	0.270	-0.417	0.213	-0.467
		DF-M-02	0.581	0.217	0.678	0.167
		DF-M-03	0.581	0.217	0.493	0.267
	SL-DEEP-1	DF-M-01	0.810	0.100	0.552	0.233
		DF-M-02	0.108	0.583	0.133	0.550
		DF-M-03	0.521	0.250	0.644	0.183
Open Water	SL-SHAL-1	DF-M-01	1.00	-0.00606	0.919	-0.0424
		DF-M-02	0.682	-0.152	0.537	-0.224
		DF-M-03	0.707	0.139	0.919	0.0424
	SL-SHAL-2	DF-M-01	0.892	-0.0545	0.946	0.0303
		DF-M-02	0.892	-0.0545	0.919	-0.0424
		DF-M-03	0.608	0.188	0.682	0.152
	SL-DEEP-1	DF-M-01	0.707	0.139	1.00	0.00606
		DF-M-02	0.560	-0.212	0.296	-0.370
		DF-M-03	0.759	0.115	0.785	-0.103

Indicates a significant correlation (p-value < 0.05).

Indicates a moderate positive correlation (0.600 > ρ > 0.400).

Indicates a strong positive correlation (ρ > 0.600).

Note: "ρ" = Spearman's Rho. Cumulative dustfall was calculated for a given station in a given season as the quotient of the total dustfall and the total deployment days.

APPENDIX B
SUPPORTING RAW SEDIMENT AND DUSTFALL DATA

Table B.1: **Bulk Density (BD) of Sediment Trap Samples Collected at Sheardown Lake NW, 2018 to 2024**

Deployment Period	Sample Identification	Collection Date	Bulk Density (g/cm^3)
Open Water 2018	SDNW DBD	21-Sep-18	2.94
Ice Cover 2018 to 2019	BD-SHAL-A	12-Aug-19	2.76
	BD-SHAL-B	12-Aug-19	2.76
	BD-DEEP	12-Aug-19	2.88
Open Water 2019	BD-SHAL	Oct-2019	2.53
	BD-DEEP	Oct-2019	2.59
Ice Cover 2019 to 2020	BD-SHAL-A	18-Jul-20	3.03
	BD-SHAL-B	18-Jul-20	2.91
	BD-DEEP	14-Jul-20	2.75
Open Water 2020	BD-SHAL-A	4-Sep-20	2.37
	BD-SHAL-B	5-Sep-20	2.46
	BD-DEEP	5-Sep-20	2.22
Open Water 2021	BD-SHAL-A	12-Sep-21	2.82
	BD-SHAL-B	13-Sep-21	2.79
	BD-DEEP	11-Sep-21	2.82
Ice Cover 2021 to 2022	BD-SHAL	12-Jul-22	3.14
	BD-DEEP	13-Jul-22	2.91
Open Water 2022	BD-SHAL	17-Sep-22	2.83
	BD-DEEP	17-Sep-22	2.71
Ice Cover 2022 to 2023	BD-SHAL-1	24-Jul-23	2.82
	BD-SHAL-2	22-Jul-23	3.30
	BD-SHAL-4	22-Jul-23	2.98
	BD-SHAL-5	22-Jul-23	3.37
	BD-SHAL-A	Jul-2023	3.15
	BD-SHAL-B	Jul-2023	3.12
	BD-SHAL-B-R	Jul-2023	3.16
	BD-DEEP-1	22-Jul-23	2.84
	BD-DEEP-2	22-Jul-23	2.95
	BD-DEEP-3	24-Jul-23	3.52
	BD-DEEP	Jul-2023	3.00
Open Water 2023	BD-SHAL-1	10-Sep-23	2.96
	BD-SHAL-2	19-Sep-23	3.43
	BD-SHAL-5	18-Sep-23	3.10
	BD-SHAL-A	Sep-2023	3.11
	BD-DEEP-1	18-Sep-13	2.76
	BD-DEEP-3	18-Sep-23	2.80
	BD-DEEP	Sep-2023	2.90
Ice Cover 2023 to 2024	BD-DEEP	12-Jul-24	2.73
	BD-SHAL-A	13-Jul-24	3.08
	BD-SHAL-B	12-Jul-24	3.02
Open Water 2024	BD-SHAL-1	5-Oct-24	2.83
	BD-SHAL-2	5-Oct-24	2.82
	BD-SHAL-3	5-Oct-24	3.36
	BD-SHAL-4	5-Oct-24	3.20
	BD-SHAL-5	5-Oct-24	3.18
	BD-DEEP-1	7-Oct-24	3.07
	BD-DEEP-2	7-Oct-24	2.63

Notes: "R" indicates replicate samples. When the day of sampling is unknown only the month and year are shown.

Table B.2: Dry Weight of Sediment Trap Samples Collected at Sheardown Lake, NW, 2023 to 2024

Deployment	Sample Identification	Collection Date	Dry Weight (g)
Ice Cover 2023 to 2024	SL-DEEP-1A	10-Jul-24	1.03
	SL-DEEP-1B	-	-
	SL-DEEP-1C	10-Jul-24	1.41
	SL-DEEP-1D	12-Jul-24	1.19
	SL-DEEP-1E	19-Jul-24	1.19
	SL-SHAL-1A	16-Jul-24	1.20
	SL-SHAL-1B	12-Jul-24	1.24
	SL-SHAL-1C	17-Jul-24	1.30
	SL-SHAL-1D	-	-
	SL-SHAL-1E	16-Jul-24	1.15
	SL-SHAL-2A	16-Jul-24	1.66
	SL-SHAL-2B	16-Jul-24	1.21
	SL-SHAL-2C	-	-
	SL-SHAL-2D	13-Jul-24	1.24
	SL-SHAL-2E	-	-
Open Water 2024	SL-DEEP-1A	7-Oct-24	2.13
	SL-DEEP-1B	7-Oct-24	1.98
	SL-DEEP-1C	-	-
	SL-DEEP-1D	7-Oct-24	2.39
	SL-DEEP-1E	7-Oct-24	2.11
	SL-SHAL-1A	5-Oct-24	1.47
	SL-SHAL-1B	5-Oct-24	1.51
	SL-SHAL-1C	5-Oct-24	1.34
	SL-SHAL-1D	5-Oct-24	1.75
	SL-SHAL-1E	5-Oct-24	1.51
	SL-SHAL-2A	7-Oct-24	1.66
	SL-SHAL-2B	5-Oct-24	1.47
	SL-SHAL-2C	5-Oct-24	1.04
	SL-SHAL-2D	5-Oct-24	1.24
	SL-SHAL-2E	5-Oct-24	0.870

Note: The "dash" indicates that a trap was not collected or deployed and dry weight was not determined.

Table B.3: Particle Size Distribution of Sediment Trap Material Before and After Ashing During the 2023/2024 Ice Cover Period, Sheardown Lake NW, Lake Sedimentation Monitoring Study

Sample		Particle Size Distribution (%)[a]			
		Coarse Sand	Medium Sand	Fine Sand	Silt and/or Clay
		5 to 2 mm	2 to 0.5 mm	0.5 to 0.075 mm	<0.075 mm
BD-SHAL-A	Before Ashing	-	-	0.0	100
	After Ashing	-	-	0.0	100
BD-SHAL-B	Before Ashing	-	0.0	22	78
	After Ashing	-	0.0	16	84
BD-DEEP	Before Ashing	-	0.0	6.0	94
	After Ashing	-	0.0	38	62

Note: "-" indicates that no size fraction in the given range was reported.

[a]ASTM D2487-17E01 Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System). 2020. American Society for Testing and Standards (ASTM) International. West Conshohocken, PA, USA.

Table B.4: Particle Size Distribution Before and After Ashing in Sediment Trap Material During the 2024 Open Water Period, Sheardown Lake NW, Lake Sedimentation Monitoring Study

Sample		Particle Size Distribution (%)[a]			
		Coarse Sand	Medium Sand	Fine Sand	Silt and/or Clay
		5 to 2 mm	2 to 0.5 mm	0.5 to 0.075 mm	<0.075 mm
BD-SHAL-1	Before Ashing	-	0	31	69
	After Ashing	-	0	25	75
BD-SHAL-2	Before Ashing	-	-	0.0	100
	After Ashing	-	-	1.0	99
BD-SHAL-3	Before Ashing	-	1.0	42	57
	After Ashing	-	0.0	53	47
BD-SHAL-4	Before Ashing	-	-	0.0	100
	After Ashing	-	-	0.0	100
BD-SHAL-5	Before Ashing	-	-	2.0	98
	After Ashing	-	-	1.0	99
BD-DEEP-1	Before Ashing	-	-	1.0	99
	After Ashing	-	-	0.0	100
BD-DEEP-2	Before Ashing	-	-	2.0	98
	After Ashing	-	-	0.0	100

Note: "-" indicates that no size fraction in the given range was reported.

[a]ASTM D2487-17E01 Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System). 2020. American Society for Testing and Standards (ASTM) International. West Conshohocken, PA, USA.

Table B.5: Sediment Trap Chemistry Results for the 2023/2024 Ice Cover Period

Parameter	Sample ID	Canadian or Provincial SQG Criteria[a]	AEMP Benchmark[b]	Mean			SL-SHAL-1A	SL-SHAL-1B	SL-SHAL-1B-HISTORIC	SL-SHAL-1C	SL-SHAL-1E
	Units			SL-SHAL-1	SL-SHAL-2	SL-DEEP-1	16-Jul-24	12-Jul-24	16-Jul-24	17-Jul-24	16-Jul-24
Aluminum	mg/kg	-	-	25,950	22,700	28,675	26,700	25,400	27,700	27,200	24,500
Antimony	mg/kg	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Arsenic	mg/kg	17	6.2	5.3	6.5	5.6	5.2	4.6	6.0	6.3	5.0
Barium	mg/kg	-	-	151	127	164	163	145	159	153	142
Beryllium	mg/kg	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Bismuth	mg/kg	-	-	4.0	4.0	4.0	<4.0	<4.0	<4.0	<4.0	<4.0
Boron	mg/kg	-	-	186	201	293	131	160	<100	199	253
Cadmium	mg/kg	3.5	1.5	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Calcium	mg/kg	-	-	4,898	4,433	5,543	4,650	4,720	3,620	4,960	5,260
Chromium	mg/kg	90	97	76	70	74	70	70	70	**104**	61
Cobalt	mg/kg	-	-	22	23	24	24	21	25	23	21
Copper	mg/kg	197	58	50	39	53	47	43	54	71	39
Iron	mg/kg	40,000$^{\alpha}$	52,200	**147,500**	**178,333**	**141,000**	**154,000**	**129,000**	**165,000**	**157,000**	**150,000**
Lead	mg/kg	91	35	16	14	18	17	16	18	17	15
Lithium	mg/kg	-	-	<40	<40	<40	<40	<40	<40	<40	<40
Magnesium	mg/kg	-	-	21,800	18,533	23,175	22,700	21,400	22,400	22,700	20,400
Manganese	mg/kg	1,100$^{\alpha,\beta}$	4,530	966	905	**1,107**	1,040	895	923	1,020	907
Mercury	mg/kg	0.49	0.17	0.011	0.011	0.017	0.012	0.010	0.012	0.011	0.010
Molybdenum	mg/kg	-	-	7.9	6.5	7.0	6.6	6.6	7.1	12	6.7
Nickel	mg/kg	75$^{\alpha,\beta}$	77	55	59	60	56	53	58	60	48
Phosphorus	mg/kg	2,000$^{\alpha}$	1,958	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
Potassium	mg/kg	-	-	6,023	4,883	6,138	6,270	5,980	6,010	6,200	5,640
Selenium	mg/kg	-	-	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
Silver	mg/kg	-	-	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Sodium	mg/kg	-	-	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
Strontium	mg/kg	-	-	13	12	16	11	12	<10	13	14
Sulphur	mg/kg	-	-	<20,000	<20,000	<20,000	<20,000	<20,000	<20,000	<20,000	<20,000
Thallium	mg/kg	-	-	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tin	mg/kg	-	-	<40	<40	<40	<40	<40	<40	<40	<40
Titanium	mg/kg	-	-	1,255	1,044	1,245	1,310	1,210	1,170	1,300	1,200
Tungsten	mg/kg	-	-	<10	<10	<10	<10	<10	<10	<10	<10
Uranium	mg/kg	-	-	6.4	6.5	7.6	6.6	5.4	7.5	7.8	6.0
Vanadium	mg/kg	-	-	46	39	49	49	44	46	48	44
Zinc	mg/kg	315	135	161	177	181	196	105	120	226	118
Zirconium	mg/kg	-	-	<20	<20	<20	<20	<20	<20	<20	<20

Indicates parameter concentration above AEMP Benchmark.

BOLD Indicates parameter concentration above the Sediment Quality Guideline (SQG).

Notes: Sample ID's with historic in the label are historical sediment monitoring traps that were deployed prior to 2023 and retrieved during the spring retrieval period. Values at or below the laboratory reporting limit (LRL) are replaced with the LRL for calculations. The dates reported in the table are the retrieval dates of the sediment trap. AEMP = aquatic effects monitoring program.

[a] Canadian SQG for the protection of aquatic life probable effect level (PEL; CCME 2024) except α = Ontario Provincial Sediment Quality Guideline (PSQG) severe effect level (SEL; OMOE 1993) and β = British Columbia Working SQG PEL (BCMOE 2024).

[b] AEMP Sediment Quality Benchmarks developed by Intrinsik (2013) are specific to Sheardown Lake NW using sediment quality guidelines, background sediment quality data, and method detection limits.

Table B.5: Sediment Trap Chemistry Results for the 2023/2024 Ice Cover Period

Parameter	Sample ID	SL-SHAL-2A	SL-SHAL-2B	SL-SHAL-2D	SL-DEEP-1A	SL-DEEP-1C	SL-DEEP-1D	SL-DEEP-1D-HISTORIC	SL-DEEP-1E
	Units	16-Jul-24	16-Jul-24	13-Jul-24	10-Jul-24	10-Jul-24	12-Jul-24	17-Jul-24	19-Jul-24
Aluminum	mg/kg	21,700	23,000	23,400	30,800	28,800	26,900	26,600	28,200
Antimony	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Arsenic	mg/kg	6.7	6.2	6.6	6.0	5.5	5.5	5.8	5.6
Barium	mg/kg	123	129	129	178	162	152	145	165
Beryllium	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Bismuth	mg/kg	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
Boron	mg/kg	130	312	162	411	303	304	<100	154
Cadmium	mg/kg	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	0.42
Calcium	mg/kg	3,540	5,620	4,140	6,500	5,850	5,510	3,400	4,310
Chromium	mg/kg	62	89	58	81	71	68	70	76
Cobalt	mg/kg	23	23	23	25	23	23	25	25
Copper	mg/kg	40	38	39	54	52	45	57	59
Iron	mg/kg	**179,000**	**174,000**	**182,000**	**134,000**	**143,000**	**140,000**	**166,000**	**147,000**
Lead	mg/kg	14	14	14	20	18	17	20	18
Lithium	mg/kg	<40	<40	<40	<40	<40	<40	<40	<40
Magnesium	mg/kg	17,600	18,800	19,200	24,800	23,500	21,800	20,500	22,600
Manganese	mg/kg	877	938	901	**1,220**	1,100	957	**1,240**	**1,150**
Mercury	mg/kg	0.011	0.012	0.011	0.017	0.016	0.019	0.023	0.018
Molybdenum	mg/kg	6.3	6.2	7.1	6.8	6.8	6.4	7.3	7.9
Nickel	mg/kg	58	69	51	63	59	54	62	62
Phosphorus	mg/kg	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
Potassium	mg/kg	4,670	4,920	5,060	6,460	6,000	5,660	5,820	6,430
Selenium	mg/kg	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
Silver	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Sodium	mg/kg	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
Strontium	mg/kg	<10	15	11	20	17	18	<10	12
Sulphur	mg/kg	<20,000	<20,000	<20,000	<20,000	<20,000	<20,000	<20,000	<20,000
Thallium	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tin	mg/kg	<40	<40	<40	<40	<40	<40	<40	<40
Titanium	mg/kg	993	1,060	1,080	1,310	1,250	1,180	1,140	1,240
Tungsten	mg/kg	<10	<10	<10	<10	<10	<10	<10	<10
Uranium	mg/kg	6.7	6.3	6.6	7.8	7.4	6.7	9.2	8.4
Vanadium	mg/kg	37	39	40	52	49	46	47	48
Zinc	mg/kg	161	100	270	119	142	108	117	**356**
Zirconium	mg/kg	<20	<20	<20	<20	<20	<20	<20	<20

Indicates parameter concentration above AEMP Benchmark.

BOLD Indicates parameter concentration above the Sediment Quality Guideline (SQG).

Notes: Sample ID's with historic in the label are historical sediment monitoring traps that were deployed prior to 2023 and retrieved during the spring retrieval period. Values at or below the laboratory reporting limit (LRL) are replaced with the LRL for calculations. The dates reported in the table are the retrieval dates of the sediment trap. AEMP = aquatic effects monitoring

[a] Canadian SQG for the protection of aquatic life probable effect level (PEL; CCME 2024) except α = Ontario Provincial Sediment Quality Guideline (PSQG) severe effect level (SEL; OMOE 1993) and β = British Columbia Working SQG PEL (BCMOE 2024).

[b] AEMP Sediment Quality Benchmarks developed by Intrinsik (2013) are specific to Sheardown Lake NW using sediment quality guidelines, background sediment quality data, and method detection limits.

Table B.6: Sediment Trap Chemistry Results for the 2024 Open Water Period

Parameter	Sample ID	Canadian or Provincial SQG Criteria[a]	AEMP Benchmark[b]	Mean			SL-SHAL-1A	SL-SHAL-1B	SL-SHAL-1C	SL-SHAL-1D	SL-SHAL-1E
	Units			SL-SHAL-1	SL-SHAL-2	SL-DEEP-1	05-Oct-24	05-Oct-24	05-Oct-24	05-Oct-24	05-Oct-24
Aluminum	mg/kg	-	-	31,720	29,860	32,050	32,400	31,700	32,500	26,200	35,800
Antimony	mg/kg	-	-	0.30	0.27	0.45	0.25	0.19	0.19	0.58	0.30
Arsenic	mg/kg	17	6.2	4.9	5.0	5.0	5.0	5.0	4.9	4.3	5.5
Barium	mg/kg	-	-	178	170	183	186	179	187	154	183
Beryllium	mg/kg	-	-	1.3	1.2	1.3	1.3	1.3	1.3	1.0	1.4
Bismuth	mg/kg	-	-	0.69	0.66	0.69	0.71	0.70	0.68	0.56	0.78
Boron	mg/kg	-	-	189	173	126	133	132	222	160	297
Cadmium	mg/kg	3.5	1.5	0.49	0.50	0.48	0.51	0.54	0.51	0.31	0.57
Calcium	mg/kg	-	-	10,280	7,562	9,770	10,200	9,860	11,100	8,840	11,400
Chromium	mg/kg	90	97	83	78	87	85	83	86	72	88
Cobalt	mg/kg	-	-	24	23	24	25	25	24	20	26
Copper	mg/kg	197	58	52	50	55	53	53	52	44	59
Iron	mg/kg	40,000[α]	52,200	**114,600**	**121,200**	**114,250**	**116,000**	**113,000**	**109,000**	**119,000**	**116,000**
Lead	mg/kg	91	35	22	20	22	22	23	21	18	24
Lithium	mg/kg	-	-	38	37	40	39	37	41	32	41
Magnesium	mg/kg	-	-	29,200	25,560	29,300	29,800	28,900	30,200	25,400	31,700
Manganese	mg/kg	1,100[α,β]	4,530	**1,624**	**1,850**	**1,440**	**1,570**	**1,860**	**1,630**	**1,320**	**1,740**
Mercury	mg/kg	0.49	0.17	0.015	0.014	0.020	0.015	0.016	0.014	0.015	0.016
Molybdenum	mg/kg	-	-	6.7	7.0	6.5	7.1	6.5	6.1	7.2	6.8
Nickel	mg/kg	75[α,β]	77	**77**	73	**78**	**79**	**77**	**78**	68	**83**
Phosphorus	mg/kg	2,000[α]	1,958	643	611	677	648	662	615	545	747
Potassium	mg/kg	-	-	7,864	7,452	7,873	8,200	7,910	7,870	6,780	8,560
Selenium	mg/kg	-	-	0.57	0.64	0.53	0.59	0.61	0.52	0.46	0.66
Silver	mg/kg	-	-	0.20	0.18	0.22	0.21	0.21	0.19	0.18	0.22
Sodium	mg/kg	-	-	285	276	288	296	285	294	230	318
Strontium	mg/kg	-	-	17	15	15	16	16	19	15	22
Sulphur	mg/kg	-	-	1,100	1,020	1,000	<1000	<1000	<1000	<1000	<1500
Thallium	mg/kg	-	-	0.43	0.40	0.44	0.46	0.45	0.44	0.35	0.47
Tin	mg/kg	-	-	2.9	3.3	2.1	<2.0	<2.0	3.7	3.6	<3.0
Titanium	mg/kg	-	-	1,428	1,294	1,425	1,480	1,430	1,450	1,200	1,580
Tungsten	mg/kg	-	-	1.1	1.1	0.92	1.1	1.1	1.4	0.93	1.2
Uranium	mg/kg	-	-	7.7	8.2	7.7	7.9	8.1	6.8	7.8	7.8
Vanadium	mg/kg	-	-	56	51	58	58	57	57	47	61
Zinc	mg/kg	315	135	**377**	138	139	148	116	131	**1,350**	138
Zirconium	mg/kg	-	-	12	12	13	12	12	13	9.9	14

Indicates parameter concentration above AEMP Benchmark.

BOLD Indicates parameter concentration above the Sediment Quality Guideline (SQG).

Notes: Recovery of zinc (129%) in quality control samples (SHAL-1D and SHAL-1E) was above the acceptable range (80 to 120%). Duplicate samples (SL-SHAL-E) had a relative percent difference of 35% (acceptable range of 30%). The dates reported in the table are the retrieval dates of the sediment trap. AEMP = aquatic effects monitoring program.

[a] Canadian SQG for the protection of aquatic life probable effect level (PEL; CCME 2024) except α = Ontario Provincial Sediment Quality Guideline (PSQG) severe effect level (SEL; OMOE 1993) and β = British Columbia Working SQG PEL (BCMOE 2024).

[b] AEMP Sediment Quality Benchmarks developed by Intrinsik (2013) are specific to Sheardown Lake NW using sediment quality guidelines, background sediment quality data, and method detection limits.

Table B.6: Sediment Trap Chemistry Results for the 2024 Open Water Period

Parameter	Sample ID	SL-SHAL-2A	SL-SHAL-2B	SL-SHAL-2C	SL-SHAL-2D	SL-SHAL-2E	SL-DEEP-1A	SL-DEEP-1B	SL-DEEP-1D	SL-DEEP-1E
	Units	07-Oct-24	05-Oct-24	05-Oct-24	05-Oct-24	05-Oct-24	07-Oct-24	07-Oct-24	07-Oct-24	07-Oct-24
Aluminum	mg/kg	29,600	31,200	30,100	29,300	29,100	34,000	30,300	32,100	31,800
Antimony	mg/kg	0.22	0.34	0.31	0.24	0.22	0.17	0.35	0.46	0.80
Arsenic	mg/kg	5.1	5.0	4.9	5.2	5.0	5.0	4.6	4.9	5.3
Barium	mg/kg	177	182	166	163	162	191	180	183	176
Beryllium	mg/kg	1.3	1.3	1.2	1.2	1.1	1.4	1.2	1.3	1.3
Bismuth	mg/kg	0.71	0.68	0.67	0.64	0.62	0.73	0.64	0.68	0.71
Boron	mg/kg	94	166	222	152	231	140	89	143	132
Cadmium	mg/kg	0.60	0.61	0.42	0.49	0.40	0.50	0.50	0.45	0.49
Calcium	mg/kg	6,240	7,500	8,490	7,310	8,270	9,330	10,000	9,750	10,000
Chromium	mg/kg	76	82	80	73	79	88	82	86	**91**
Cobalt	mg/kg	24	24	22	23	23	25	23	25	24
Copper	mg/kg	53	52	48	49	51	55	51	53	61
Iron	mg/kg	**126,000**	**111,000**	**118,000**	**129,000**	**122,000**	**114,000**	**115,000**	**108,000**	**120,000**
Lead	mg/kg	21	21	20	19	20	23	21	22	22
Lithium	mg/kg	38	39	38	36	32	42	37	42	39
Magnesium	mg/kg	24,900	26,100	26,200	24,900	25,700	30,500	28,500	29,000	29,200
Manganese	mg/kg	**2,050**	**2,110**	**1,660**	**1,800**	**1,630**	**1,440**	**1,570**	**1,360**	**1,390**
Mercury	mg/kg	0.016	0.015	0.013	0.014	0.014	0.017	0.030	0.016	0.016
Molybdenum	mg/kg	8.7	6.0	6.5	7.5	6.2	6.3	5.7	6.1	7.8
Nickel	mg/kg	74	**77**	70	70	71	**81**	75	**77**	**78**
Phosphorus	mg/kg	628	630	592	580	627	706	694	648	660
Potassium	mg/kg	7,280	7,990	7,680	7,220	7,090	8,270	7,550	7,900	7,770
Selenium	mg/kg	0.70	0.65	0.56	0.74	0.57	0.54	0.50	0.51	0.58
Silver	mg/kg	0.19	0.18	0.19	0.17	0.18	0.21	0.20	0.20	0.25
Sodium	mg/kg	273	287	282	276	262	308	259	302	281
Strontium	mg/kg	13	15	17	15	17	16	14	15	16
Sulphur	mg/kg	<1000	<1000	<1000	<1000	<1100	<1000	<1000	<1000	<1000
Thallium	mg/kg	0.42	0.42	0.41	0.38	0.38	0.47	0.42	0.44	0.45
Tin	mg/kg	<2.0	2.1	2.9	4.7	4.8	<2.0	2.0	<2.0	2.4
Titanium	mg/kg	1,250	1,350	1,340	1,240	1,290	1,510	1,350	1,450	1,390
Tungsten	mg/kg	1.1	0.97	1.1	1.0	1.1	0.98	0.81	0.93	0.94
Uranium	mg/kg	11	7.7	7.3	8.5	7.1	8.1	6.9	7.5	8.2
Vanadium	mg/kg	51	54	52	50	50	61	56	58	57
Zinc	mg/kg	156	122	134	158	118	123	129	117	188
Zirconium	mg/kg	12	12	12	12	11	13	13	12	12

Indicates parameter concentration above AEMP Benchmark.

BOLD Indicates parameter concentration above the Sediment Quality Guideline (SQG).

Notes: Recovery of zinc (129%) in quality control samples (SHAL-1D and SHAL-1E) was above the acceptable range (80 to 120%). Duplicate samples (SL-SHAL-E) had a relative percent difference of 35% (acceptable range of 30%). The dates reported in the table are the retrieval dates of the sediment trap. AEMP = aquatic effects monitoring program.

[a] Canadian SQG for the protection of aquatic life probable effect level (PEL; CCME 2024) except α = Ontario Provincial Sediment Quality Guideline (PSQG) severe effect level (SEL; OMOE 1993) and β = British Columbia Working SQG PEL (BCMOE 2024).

[b] AEMP Sediment Quality Benchmarks developed by Intrinsik (2013) are specific to Sheardown Lake NW using sediment quality guidelines, background sediment quality data, and method detection limits.

Table B.7: **Dustfall Chemistry Results for Selected Parameters at Dustfall Monitorings Stations Located Nearby Sheardown Lake NW**

Season	Station ID	Date Sampled	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Phosphorus	Uranium	Zinc
			$mg/dm^2/d$	$mg/dm^2/d$	$mg/dm^2/d$	$mg/dm^2/d$	$mg/dm^2/d$	$mg/dm^2/d$	$mg/dm^2/d$	$mg/dm^2/d$	$mg/dm^2/d$	$mg/dm^2/d$	$mg/dm^2/d$	$mg/dm^2/d$	$mg/dm^2/d$
2023 to 2024 Ice Cover	DF-M-01	Oct-2023	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
		18-Nov-23	0.0000049	< 0.0000013	0.00012	0.000076	0.091	0.000051	0.0016	< 0.0000013	0.0000051	0.000093	0.0013	0.000019	0.00034
		24-Dec-23	0.0000094	< 0.0000013	0.00013	0.000089	0.11	0.000077	0.0021	< 0.0000013	0.0000067	0.00011	0.0018	0.000039	0.00044
		23-Jan-24	0.0000067	<0.0000013	0.000077	0.000050	0.061	0.000031	0.0014	<0.0000013	0.0000045	0.000066	<0.0013	0.000013	0.00021
		22-Feb-24	0.0000084	<0.0000013	0.000061	0.000044	0.067	0.000023	0.0010	<0.0000013	0.0000049	0.000064	<0.0013	0.0000094	0.00016
		22-Mar-24	0.0000068	<0.0000014	0.000048	0.000037	0.046	0.000015	0.00071	<0.0000014	0.000022	0.000049	<0.0014	0.0000045	0.00013
		23-Apr-24	0.0000044	<0.0000013	<0.000098	0.000039	0.025	0.000008	0.00060	<0.0000013	0.0000023	<0.000184	<0.0013	0.0000031	0.00011
		07-May-24	0.000010	<0.0000028	<0.000224	0.00013	0.15	0.000092	0.0027	<0.0000028	0.0000073	<0.000421	<0.0028	0.000040	0.00049
		23-May-24	<0.000147	<0.0000024	0.00012	0.000080	0.096	0.000041	0.0016	<0.0000024	0.0000078	0.00014	<0.0024	0.000016	0.00031
		26-Jun-24	0.0000032	<0.0000013	0.000062	0.000039	0.051	0.000020	0.00086	<0.0000013	0.0000023	0.000058	<0.0013	0.0000099	0.00017
	DF-M-02	Oct-2023	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
		19-Nov-23	0.000011	< 0.0000013	0.00010	0.000057	0.096	0.000017	0.0017	< 0.0000013	0.0000039	0.00014	0.0014	0.0000032	0.00015
		23-Dec-23	0.000026	< 0.0000013	0.00010	0.000088	0.15	0.000017	0.0035	< 0.0000013	0.0000068	0.00016	0.0018	0.0000038	0.00019
		23-Jan-24	0.000053	<0.0000013	0.00021	0.00016	0.30	0.000030	0.0087	<0.0000013	0.000012	0.00035	0.0059	0.0000071	0.00025
		22-Feb-24	0.000039	<0.0000013	0.00020	0.00012	0.31	0.000020	0.0050	<0.0000013	0.000012	0.00032	0.0024	0.0000052	0.00028
		23-Mar-24	0.000033	<0.0000013	0.00017	0.000093	0.21	0.000020	0.0034	<0.0000013	0.000011	0.00021	0.0020	0.000004	0.00019
		23-Apr-24	0.000013	<0.0000013	<0.000101	0.000038	0.051	0.0000069	0.0014	<0.0000013	0.0000045	<0.000190	<0.0013	<0.0000026	0.00013
		07-May-24	0.000017	<0.0000028	<0.000224	0.000086	0.099	0.000013	0.0020	<0.0000028	0.0000068	<0.000421	<0.0028	0.0000037	0.00023
		23-May-24	<0.000147	<0.0000024	0.00013	0.000054	0.088	0.000015	0.0013	<0.0000024	0.0000039	0.00012	<0.0024	0.0000049	0.00021
		26-Jun-24	0.0000039	<0.0000013	0.000086	0.000050	0.068	0.000019	0.0010	<0.0000013	0.000003	0.000074	<0.0013	0.0000051	0.00016
	DF-M-03	Oct-2023	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
		24-Nov-23	0.0000052	< 0.0000013	0.000048	0.000028	0.036	0.0000067	0.00067	< 0.0000013	0.0000025	0.000050	< 0.0013	< 0.0000026	0.00019
		27-Dec-23	0.0000059	< 0.0000013	0.000092	0.000052	0.075	0.000016	0.0011	< 0.0000013	0.0000032	0.000093	0.0013	0.0000041	0.00018
		23-Jan-24	0.000017	<0.0000014	0.00016	0.00010	0.13	0.000030	0.0030	<0.0000014	0.0000084	0.00014	0.0027	0.0000065	0.00024
		22-Feb-24	0.000015	<0.0000013	0.00018	0.000086	0.16	0.000044	0.0020	<0.0000013	0.0000073	0.00017	0.0017	0.000005	0.00027
		23-Mar-24	0.000015	<0.0000013	0.00022	0.00010	0.15	0.000036	0.0025	<0.0000013	0.0000087	0.00019	0.0032	0.0000076	0.00031
		23-Apr-24	0.0000084	<0.0000013	<0.000101	0.000045	0.056	0.000009	0.0013	<0.0000013	0.0000048	<0.000190	<0.0013	<0.0000026	0.00020
		07-May-24	0.0000063	<0.0000028	<0.000224	0.000060	0.046	0.000012	0.00082	<0.0000028	0.000007	<0.000421	<0.0028	0.0000027	0.00026
		23-May-24	<0.000147	<0.0000024	0.00032	0.00016	0.23	0.000078	0.0033	<0.0000024	0.0000079	0.00028	0.0045	0.000012	0.00055
		26-Jun-24	0.0000067	<0.0000013	0.00018	0.000085	0.14	0.000030	0.0021	<0.0000013	0.0000043	0.00016	0.0026	0.0000086	0.00033
2024 Open Water	DF-M-01	24-Jul-24	<0.0000028	<0.0000014	0.000022	0.000031	0.015	0.0000058	0.00026	<0.0000014	0.0000020	0.000015	<0.0014	0.0000041	0.00011
		21-Aug-24	<0.0000028	<0.0000014	0.000017	<0.000028	0.013	0.0000054	0.00032	<0.0000014	<0.0000014	0.000020	<0.0014	<0.0000026	0.00012
		20-Sep-24	<0.0000039	<0.0000016	<0.000019	<0.000039	0.0037	0.0000052	0.000076	<0.0000019	<0.0000019	<0.000019	<0.0019	<0.0000026	<0.000115
		20-Oct-24	<0.0000028	0.0000032	0.000042	0.000045	0.032	0.000016	0.00061	<0.0000014	0.0000018	0.000037	<0.0014	0.0000051	0.00017
	DF-M-02	24-Jul-24	<0.0000028	<0.0000014	0.000035	0.000079	0.024	0.000008	0.00041	<0.0000014	0.0000029	0.000043	0.0022	<0.0000026	0.00019
		21-Aug-24	<0.0000028	<0.0000014	0.000025	<0.000028	0.017	0.0000063	0.00038	<0.0000014	0.0000016	0.000021	<0.0014	0.0000027	0.00015
		20-Sep-24	<0.0000044	<0.0000018	<0.000022	0.000093	0.0021	<0.0000022	0.000052	<0.0000022	<0.0000022	<0.000022	<0.0022	<0.0000026	<0.000131
		20-Oct-24	<0.0000036	0.0000016	0.000025	0.000069	0.013	0.0000053	0.00026	<0.0000018	<0.0000018	0.000020	<0.0018	<0.0000026	0.00020
	DF-M-03	24-Jul-24	0.0000042	<0.0000014	0.00011	0.000081	0.089	0.000019	0.0013	<0.0000014	0.0000036	0.00011	0.0043	0.0000057	0.00025
		21-Aug-24	0.0000088	<0.0000014	0.00025	0.00012	0.19	0.000045	0.0028	<0.0000014	0.0000067	0.00021	0.0039	0.000011	0.00042
		20-Sep-24	<0.0000056	<0.0000022	0.000032	0.000079	0.015	0.0000037	0.00023	<0.0000028	<0.0000028	<0.000028	<0.0028	<0.0000026	0.00019
		20-Oct-24	<0.0000051	<0.0000020	0.000071	0.000069	0.043	0.000014	0.00063	<0.0000026	<0.0000026	0.000057	<0.0026	<0.0000026	0.00044

Note: "n.a" = data not available. Metal depositional rates presented are the total metal concentrations.

Table B.8: Dustfall Deposition Rates for Dustfall Monitoring Stations Nearby Sheardown Lake NW

Season	Station ID	Period	Sample Date	Unit	Sampling Days	Insoluble Dustfall		
						Fixed	Volatile	Total
Ice Cover	DF-M-01	2013 to 2014	14-Dec-13	mg/dm²/day	39	<0.10	<0.10	<0.10
	DF-M-01		13-Jan-14	mg/dm²/day	30	0.28	<0.10	0.28
	DF-M-01		26-Feb-14	mg/dm²/day	44	0.39	<0.10	0.39
	DF-M-01		17-Mar-14	mg/dm²/day	19	<0.16	<0.16	0.20
	DF-M-01		14-Apr-14	mg/dm²/day	28	4.9	0.57	5.5
	DF-M-01		19-May-14	mg/dm²/day	35	0.80	<0.10	0.79
	DF-M-01		29-Jun-14	mg/dm²/day	41	1.0	<0.10	1.0
	DF-M-01	2014 to 2015	12-Sep-14	mg/dm²/day	33	0.45	<0.10	0.45
	DF-M-01		7-Dec-14	mg/dm²/day	86	1.1	<0.10	1.2
	DF-M-01		4-Jan-15	mg/dm²/day	30	0.37	<0.11	0.37
	DF-M-01		7-Feb-15	mg/dm²/day	35	2.9	<0.10	2.9
	DF-M-01		8-Mar-15	mg/dm²/day	28	0.72	<0.11	0.66
	DF-M-01		7-Apr-15	mg/dm²/day	30	11	<0.10	10
	DF-M-01		9-May-15	mg/dm²/day	32	14	0.29	14
	DF-M-01		8-Jun-15	mg/dm²/day	30	1.7	<0.10	1.7
	DF-M-01		10-Jul-15	mg/dm²/day	32	0.41	<0.10	0.41
	DF-M-01	2015 to 2016	8-Oct-15	mg/dm²/day	32	0.48	<0.10	0.50
	DF-M-01		17-Nov-15	mg/dm²/day	40	0.16	<0.10	0.16
	DF-M-01		21-Dec-15	mg/dm²/day	34	0.17	<0.10	0.18
	DF-M-01		18-Jan-16	mg/dm²/day	28	0.36	<0.10	0.38
	DF-M-01		16-Feb-16	mg/dm²/day	29	0.31	<0.10	0.31
	DF-M-01		14-Mar-16	mg/dm²/day	27	1.2	<0.10	1.3
	DF-M-01		11-Apr-16	mg/dm²/day	28	1.0	<0.10	1.1
	DF-M-01		9-May-16	mg/dm²/day	28	6.1	0.71	6.8
	DF-M-01		11-Jun-16	mg/dm²/day	33	2.4	<0.10	2.5
	DF-M-01		12-Jul-16	mg/dm²/day	31	3.1	<0.10	3.1
	DF-M-01	2016 to 2017	17-Oct-16	mg/dm²/day	24	4.5	<1.0	4.7
	DF-M-01		19-Nov-16	mg/dm²/day	33	2.6	0.18	2.8
	DF-M-01		19-Dec-16	mg/dm²/day	30	0.53	<0.10	0.53
	DF-M-01		19-Jan-17	mg/dm²/day	31	5.5	0.48	6.0
	DF-M-01		19-Feb-17	mg/dm²/day	31	<0.10	<0.10	<0.10
	DF-M-01		22-Mar-17	mg/dm²/day	31	0.84	<0.10	0.89
	DF-M-01		23-Apr-17	mg/dm²/day	32	1.5	<0.10	1.5
	DF-M-01		21-May-17	mg/dm²/day	28	9.6	0.3	9.9
	DF-M-01		19-Jun-17	mg/dm²/day	29	2.4	<0.10	2.5
	DF-M-01		21-Jul-17	mg/dm²/day	32	5.3	0.17	5.5
	DF-M-01	2017 to 2018	15-Oct-17	mg/dm²/day	25	2.7	0.18	2.8
	DF-M-01		14-Nov-17	mg/dm²/day	30	0.75	0.12	0.87
	DF-M-01		10-Dec-17	mg/dm²/day	26	40	1.2	42
	DF-M-01		9-Jan-18	mg/dm²/day	30	0.42	<0.10	0.44
	DF-M-01		13-Feb-18	mg/dm²/day	35	2.7	0.14	2.8
	DF-M-01		17-Mar-18	mg/dm²/day	32	2.1	<0.10	2.1
	DF-M-01		20-Apr-18	mg/dm²/day	34	4.4	0.12	4.5
	DF-M-01		13-May-18	mg/dm²/day	23	4.7	0.79	5.5
	DF-M-01		15-Jun-18	mg/dm²/day	33	3.9	<0.10	4.0
	DF-M-01		17-Jul-18	mg/dm²/day	32	0.84	<0.10	0.87
	DF-M-01	2018 to 2019	10-Oct-18	mg/dm²/day	27	2.7	0.14	2.9
	DF-M-01		10-Nov-18	mg/dm²/day	32	0.49	<0.10	0.49
	DF-M-01		9-Dec-18	mg/dm²/day	29	0.45	<0.10	0.45
	DF-M-01		7-Jan-19	mg/dm²/day	29	1.5	<0.10	1.5
	DF-M-01		4-Feb-19	mg/dm²/day	28	0.87	<0.10	0.91

Table B.8: Dustfall Deposition Rates for Dustfall Monitoring Stations Nearby Sheardown Lake NW

Season	Station ID	Period	Sample Date	Unit	Sampling Days	Insoluble Dustfall		
						Fixed	Volatile	Total
Ice Cover	DF-M-01	2018 to 2019	4-Mar-19	mg/dm²/day	28	0.24	<0.10	0.25
	DF-M-01		2-Apr-19	mg/dm²/day	29	3.1	0.21	3.3
	DF-M-01		2-May-19	mg/dm²/day	30	3.0	0.11	3.1
	DF-M-01		29-May-19	mg/dm²/day	27	1.8	<0.10	1.9
	DF-M-01		25-Jun-19	mg/dm²/day	27	0.18	<0.10	0.19
	DF-M-01		24-Jul-19	mg/dm²/day	29	0.50	<0.10	0.55
	DF-M-01	2019 to 2020	16-Oct-19	mg/dm²/day	28	0.70	<0.10	0.72
	DF-M-01		13-Nov-19	mg/dm²/day	28	0.28	<0.10	0.30
	DF-M-01		12-Dec-19	mg/dm²/day	29	1.7	<0.10	1.7
	DF-M-01		8-Jan-20	mg/dm²/day	27	2.2	<0.10	2.2
	DF-M-01		5-Feb-20	mg/dm²/day	28	0.31	<0.10	0.33
	DF-M-01		4-Mar-20	mg/dm²/day	28	0.39	<0.10	0.41
	DF-M-01		1-Apr-20	mg/dm²/day	28	6.4	0.21	6.6
	DF-M-01		1-May-20	mg/dm²/day	30	1.8	<0.10	1.9
	DF-M-01		29-May-20	mg/dm²/day	28	17	0.49	17
	DF-M-01		29-Jun-20	mg/dm²/day	31	1.2	<0.10	1.2
	DF-M-01		27-Jul-20	mg/dm²/day	28	0.79	<0.10	0.84
	DF-M-01	2020 to 2021	21-Oct-20	mg/dm²/day	30	5.7	0.15	5.9
	DF-M-01		19-Nov-20	mg/dm²/day	29	0.28	<0.10	0.30
	DF-M-01		20-Dec-20	mg/dm²/day	31	1.5	<0.10	1.5
	DF-M-01		18-Jan-21	mg/dm²/day	29	10.0	0.45	10
	DF-M-01		17-Feb-21	mg/dm²/day	30	0.87	<0.10	0.93
	DF-M-01		20-Mar-21	mg/dm²/day	31	2.6	<0.10	2.6
	DF-M-01		25-Apr-21	mg/dm²/day	36	2.9	0.11	3.0
	DF-M-01		20-May-21	mg/dm²/day	28	9.9	0.36	10
	DF-M-01		20-Jun-21	mg/dm²/day	31	3.2	<0.10	3.3
	DF-M-01		22-Jul-21	mg/dm²/day	32	0.46	<0.10	0.46
	DF-M-01	2021 to 2022	21-Oct-21	mg/dm²/day	29	1.0	<0.10	1.1
	DF-M-01		18-Nov-21	mg/dm²/day	28	0.85	<0.10	0.88
	DF-M-01		17-Dec-21	mg/dm²/day	29	7.8	0.2	8.0
	DF-M-01		15-Jan-22	mg/dm²/day	29	4.9	0.16	5.0
	DF-M-01		17-Feb-22	mg/dm²/day	33	5.6	<0.10	5.6
	DF-M-01		19-Mar-22	mg/dm²/day	30	0.89	<0.10	0.91
	DF-M-01		18-Apr-22	mg/dm²/day	30	3.6	0.14	3.8
	DF-M-01		17-May-22	mg/dm²/day	29	13	0.37	13
	DF-M-01		17-Jun-22	mg/dm²/day	31	3.2	<0.10	3.3
	DF-M-01		16-Jul-22	mg/dm²/day	29	2.4	<0.10	2.5
	DF-M-01	2022 to 2023	11-Oct-22	mg/dm²/day	29	1.2	<0.10	1.2
	DF-M-01		18-Nov-22	mg/dm²/day	38	0.56	<0.10	0.57
	DF-M-01		16-Dec-22	mg/dm²/day	28	2.3	<0.10	2.3
	DF-M-01		16-Jan-23	mg/dm²/day	31	0.48	< 0.10	0.5
	DF-M-01		16-Feb-23	mg/dm²/day	31	0.49	< 0.10	0.49
	DF-M-01		11-Mar-23	mg/dm²/day	23	0.51	< 0.10	0.52
	DF-M-01		9-Apr-23	mg/dm²/day	83	0.79	< 0.10	0.81
	DF-M-01		8-May-23	mg/dm²/day	81	1.8	< 0.10	1.8
	DF-M-01		3-Jun-23	mg/dm²/day	26	1.8	< 0.10	1.8
	DF-M-01		1-Jul-23	mg/dm²/day	28	1.4	< 0.10	1.4
	DF-M-01	2023 to 2024	Oct-23	mg/dm²/day	n.a	n.a	n.a	n.a
	DF-M-01		18-Nov-23	mg/dm²/day	n.a	2.6	< 0.1	2.7
	DF-M-01		24-Dec-23	mg/dm²/day	36	2.1	< 0.1	2.2
	DF-M-01		23-Jan-24	mg/dm²/day	30	1.8	<0.10	1.9

Table B.8: Dustfall Deposition Rates for Dustfall Monitoring Stations Nearby Sheardown Lake NW

Season	Station ID	Period	Sample Date	Unit	Sampling Days	Insoluble Dustfall		
						Fixed	Volatile	Total
Ice Cover	DF-M-01	2023 to 2024	22-Feb-24	mg/dm²/day	30	1.8	0.16	1.9
	DF-M-01		22-Mar-24	mg/dm²/day	29	1.4	<0.10	1.5
	DF-M-01		23-Apr-24	mg/dm²/day	32	0.95	<0.10	0.99
	DF-M-01		7-May-24	mg/dm²/day	14	6.3	0.12	6.4
	DF-M-01		23-May-24	mg/dm²/day	16	2.9	<0.10	3.0
	DF-M-01		26-Jun-24	mg/dm²/day	34	1.3	<0.10	1.4
	DF-M-01		24-Jul-24	mg/dm²/day	28	0.47	<0.10	0.49
	DF-M-02	2013 to 2014	14-Dec-13	mg/dm²/day	39	<0.10	<0.10	<0.10
	DF-M-02		13-Jan-14	mg/dm²/day	30	0.12	<0.10	0.12
	DF-M-02		26-Feb-14	mg/dm²/day	44	0.13	<0.10	0.13
	DF-M-02		17-Mar-14	mg/dm²/day	19	1.1	<0.16	1.1
	DF-M-02		14-Apr-14	mg/dm²/day	28	1.0	<0.11	1.0
	DF-M-02		19-May-14	mg/dm²/day	35	1.0	<0.10	1.0
	DF-M-02		29-Jun-14	mg/dm²/day	41	0.23	<0.10	0.27
	DF-M-02	2014 to 2015	12-Sep-14	mg/dm²/day	33	0.21	<0.10	0.21
	DF-M-02		7-Dec-14	mg/dm²/day	86	0.66	<0.10	0.68
	DF-M-02		4-Jan-15	mg/dm²/day	30	0.65	<0.11	0.65
	DF-M-02		7-Feb-15	mg/dm²/day	35	0.84	<0.10	0.86
	DF-M-02		8-Mar-15	mg/dm²/day	27	1.1	<0.11	1.1
	DF-M-02		6-Apr-15	mg/dm²/day	30	0.90	<0.10	0.88
	DF-M-02		9-May-15	mg/dm²/day	33	3.0	<0.10	3.0
	DF-M-02		8-Jun-15	mg/dm²/day	30	1.4	<0.10	1.3
	DF-M-02		10-Jul-15	mg/dm²/day	32	0.66	<0.10	0.66
	DF-M-02	2015 to 2016	8-Oct-15	mg/dm²/day	33	0.29	<0.10	0.28
	DF-M-02		17-Nov-15	mg/dm²/day	40	0.46	<0.10	0.46
	DF-M-02		21-Dec-15	mg/dm²/day	34	0.89	<0.10	0.91
	DF-M-02		18-Jan-16	mg/dm²/day	28	2.6	<0.10	2.6
	DF-M-02		16-Feb-16	mg/dm²/day	29	2.1	<0.10	2.2
	DF-M-02		14-Mar-16	mg/dm²/day	27	6.5	<0.10	6.6
	DF-M-02		11-Apr-16	mg/dm²/day	28	3.3	<0.10	3.3
	DF-M-02		9-May-16	mg/dm²/day	28	13	0.93	14
	DF-M-02		11-Jun-16	mg/dm²/day	33	4.3	0.12	4.5
	DF-M-02		12-Jul-16	mg/dm²/day	31	1.3	<0.10	1.3
	DF-M-02	2016 to 2017	17-Oct-16	mg/dm²/day	24	<1.0	<1.0	<1.0
	DF-M-02		19-Nov-16	mg/dm²/day	33	5.9	<1.0	6.6
	DF-M-02		19-Dec-16	mg/dm²/day	30	0.90	<0.10	0.91
	DF-M-02		16-Jan-17	mg/dm²/day	28	3.1	0.16	3.3
	DF-M-02		17-Feb-17	mg/dm²/day	32	0.25	<0.10	0.26
	DF-M-02		22-Mar-17	mg/dm²/day	33	2.2	0.13	2.3
	DF-M-02		23-Apr-17	mg/dm²/day	32	1.1	<0.10	1.1
	DF-M-02		21-May-17	mg/dm²/day	28	4.0	0.14	4.2
	DF-M-02		19-Jun-17	mg/dm²/day	29	0.84	<0.10	0.88
	DF-M-02		22-Jul-17	mg/dm²/day	33	2.5	<0.10	2.5
	DF-M-02	2017 to 2018	15-Oct-17	mg/dm²/day	25	1.6	<0.10	1.7
	DF-M-02		14-Nov-17	mg/dm²/day	30	1.5	<0.10	1.6
	DF-M-02		10-Dec-17	mg/dm²/day	26	10	0.19	11
	DF-M-02		9-Jan-18	mg/dm²/day	30	1.8	<0.10	1.8
	DF-M-02		13-Feb-18	mg/dm²/day	35	4.6	0.17	4.7
	DF-M-02		17-Mar-18	mg/dm²/day	32	1.5	<0.10	1.5
	DF-M-02		20-Apr-18	mg/dm²/day	34	4.9	<0.10	5.0
	DF-M-02		13-May-18	mg/dm²/day	23	3.1	0.11	3.2

Table B.8: **Dustfall Deposition Rates for Dustfall Monitoring Stations Nearby Sheardown Lake NW**

Season	Station ID	Period	Sample Date	Unit	Sampling Days	Insoluble Dustfall		
						Fixed	Volatile	Total
Ice Cover	DF-M-02	2017 to 2018	15-Jun-18	mg/dm²/day	33	2.4	<0.10	2.4
	DF-M-02		17-Jul-18	mg/dm²/day	32	<0.10	<0.10	0.11
	DF-M-02	2018 to 2019	10-Oct-18	mg/dm²/day	27	4.4	<0.10	4.4
	DF-M-02		10-Nov-18	mg/dm²/day	31	2.7	<0.10	2.7
	DF-M-02		9-Dec-18	mg/dm²/day	29	1.8	<0.10	1.8
	DF-M-02		7-Jan-19	mg/dm²/day	29	3.5	0.19	3.7
	DF-M-02		4-Feb-19	mg/dm²/day	28	2.4	<0.10	2.5
	DF-M-02		4-Mar-19	mg/dm²/day	28	2.1	<0.10	2.1
	DF-M-02		2-Apr-19	mg/dm²/day	29	9.6	0.36	9.9
	DF-M-02		29-May-19	mg/dm²/day	27	1.7	<0.10	1.7
	DF-M-02		25-Jun-19	mg/dm²/day	28	0.23	<0.10	0.23
	DF-M-02		24-Jul-19	mg/dm²/day	28	1.0	<0.10	1.1
	DF-M-02	2019 to 2020	16-Oct-19	mg/dm²/day	28	0.50	<0.10	0.52
	DF-M-02		13-Nov-19	mg/dm²/day	28	0.20	<0.10	0.21
	DF-M-02		12-Dec-19	mg/dm²/day	29	2.8	<0.10	2.8
	DF-M-02		8-Jan-20	mg/dm²/day	27	0.71	<0.10	0.73
	DF-M-02		5-Feb-20	mg/dm²/day	28	1.3	<0.10	1.3
	DF-M-02		4-Mar-20	mg/dm²/day	28	1.9	<0.10	1.9
	DF-M-02		1-Apr-20	mg/dm²/day	28	5.1	0.32	5.5
	DF-M-02		1-May-20	mg/dm²/day	30	1.9	<0.10	2.0
	DF-M-02		29-May-20	mg/dm²/day	28	2.8	0.1	2.9
	DF-M-02		29-Jun-20	mg/dm²/day	31	0.43	<0.10	0.44
	DF-M-02		27-Jul-20	mg/dm²/day	28	0.92	<0.10	0.97
	DF-M-02	2020 to 2021	20-Dec-20	mg/dm²/day	31	1.2	<0.10	1.3
	DF-M-02		21-Oct-20	mg/dm²/day	30	4.8	0.1	4.9
	DF-M-02		19-Nov-20	mg/dm²/day	29	0.69	<0.10	0.73
	DF-M-02		18-Jan-21	mg/dm²/day	29	8.0	0.69	8.7
	DF-M-02		17-Feb-21	mg/dm²/day	30	1.3	<0.10	1.3
	DF-M-02		20-Mar-21	mg/dm²/day	31	1.6	<0.10	1.7
	DF-M-02		22-Apr-21	mg/dm²/day	33	1.8	<0.10	1.8
	DF-M-02		20-May-21	mg/dm²/day	28	1.2	<0.10	1.2
	DF-M-02		20-Jun-21	mg/dm²/day	31	1.4	<0.10	1.4
	DF-M-02		22-Jul-21	mg/dm²/day	32	0.27	<0.10	0.27
	DF-M-02	2021 to 2022	21-Oct-21	mg/dm²/day	29	0.85	<0.10	0.88
	DF-M-02		18-Nov-21	mg/dm²/day	28	1.0	<0.10	1.1
	DF-M-02		17-Dec-21	mg/dm²/day	29	5.9	0.15	6.1
	DF-M-02		15-Jan-22	mg/dm²/day	29	1.9	<0.10	2.0
	DF-M-02		17-Feb-22	mg/dm²/day	33	18	0.25	19
	DF-M-02		20-Mar-22	mg/dm²/day	31	3.3	<0.10	3.4
	DF-M-02		18-Apr-22	mg/dm²/day	29	5.8	0.11	5.9
	DF-M-02		18-May-22	mg/dm²/day	30	4.5	<0.10	4.5
	DF-M-02		17-Jun-22	mg/dm²/day	31	1.5	<0.10	1.5
	DF-M-02		16-Jul-22	mg/dm²/day	29	4.5	0.14	4.7
	DF-M-02	2022 to 2023	11-Oct-22	mg/dm²/day	29	0.97	<0.10	0.99
	DF-M-02		18-Nov-22	mg/dm²/day	30	5.1	<0.10	5.2
	DF-M-02		18-Dec-22	mg/dm²/day	38	0.59	<0.10	0.60
	DF-M-02		16-Jan-23	mg/dm²/day	29	2.4	< 0.10	2.4
	DF-M-02		16-Feb-23	mg/dm²/day	31	3.7	< 0.10	3.7
	DF-M-02		11-Mar-23	mg/dm²/day	23	2.5	< 0.10	2.5
	DF-M-02		10-Apr-23	mg/dm²/day	53	2.6	< 0.10	2.6
	DF-M-02		8-May-23	mg/dm²/day	81	2.6	< 0.10	2.6

Table B.8: **Dustfall Deposition Rates for Dustfall Monitoring Stations Nearby Sheardown Lake NW**

Season	Station ID	Period	Sample Date	Unit	Sampling Days	Insoluble Dustfall		
						Fixed	Volatile	Total
Ice Cover	DF-M-02	2022 to 2023	3-Jun-23	mg/dm²/day	26	1.1	< 0.10	1.1
	DF-M-02		1-Jul-23	mg/dm²/day	28	0.88	< 0.10	0.9
	DF-M-02	2023 to 2024	Oct-23	mg/dm²/day	n.a	n.a	n.a	n.a
	DF-M-02		19-Nov-23	mg/dm²/day	n.a	2.2	< 0.1	2.3
	DF-M-02		24-Dec-23	mg/dm²/day	35	3.7	< 0.1	3.8
	DF-M-02		23-Jan-24	mg/dm²/day	30	3.8	0.16	4.0
	DF-M-02		22-Feb-24	mg/dm²/day	30	5.3	0.1	5.5
	DF-M-02		23-Mar-24	mg/dm²/day	30	6.0	0.21	6.2
	DF-M-02		23-Apr-24	mg/dm²/day	31	1.6	<0.10	1.6
	DF-M-02		7-May-24	mg/dm²/day	14	3.0	<0.10	3.1
	DF-M-02		23-May-24	mg/dm²/day	16	1.8	<0.10	1.9
	DF-M-02		26-Jun-24	mg/dm²/day	34	1.3	<0.10	1.3
	DF-M-02		24-Jul-2024	mg/dm²/day	28	0.56	<0.10	0.6
	DF-M-03	2013 to 2014	14-Dec-13	mg/dm²/day	39	0.35	<0.10	0.35
	DF-M-03		13-Jan-14	mg/dm²/day	30	0.30	<0.10	0.30
	DF-M-03		26-Feb-14	mg/dm²/day	44	<0.10	<0.10	<0.10
	DF-M-03		17-Mar-14	mg/dm²/day	19	<0.16	<0.16	<0.16
	DF-M-03		14-Apr-14	mg/dm²/day	28	0.16	<0.11	0.16
	DF-M-03		19-May-14	mg/dm²/day	35	0.69	<0.10	0.66
	DF-M-03		29-Jun-14	mg/dm²/day	41	0.29	<0.10	0.31
	DF-M-03	2014 to 2015	12-Sep-14	mg/dm²/day	33	0.45	<0.10	0.45
	DF-M-03		7-Dec-14	mg/dm²/day	86	3.0	<0.10	3.0
	DF-M-03		4-Jan-15	mg/dm²/day	30	0.90	<0.11	0.98
	DF-M-03		7-Feb-15	mg/dm²/day	38	0.51	<0.10	0.54
	DF-M-03		7-Mar-15	mg/dm²/day	24	0.79	<0.13	0.69
	DF-M-03		6-Apr-15	mg/dm²/day	30	1.9	<0.10	1.8
	DF-M-03		9-May-15	mg/dm²/day	33	3.3	<0.10	3.3
	DF-M-03		8-Jun-15	mg/dm²/day	30	2.5	<0.10	2.6
	DF-M-03		10-Jul-15	mg/dm²/day	32	1.7	<0.10	1.7
	DF-M-03	2015 to 2016	8-Oct-15	mg/dm²/day	32	0.50	<0.10	0.50
	DF-M-03		17-Nov-15	mg/dm²/day	40	0.75	<0.10	0.75
	DF-M-03		21-Dec-15	mg/dm²/day	34	0.45	<0.10	0.48
	DF-M-03		18-Jan-16	mg/dm²/day	28	0.99	<0.10	1.1
	DF-M-03		16-Feb-16	mg/dm²/day	29	1.1	<0.10	1.1
	DF-M-03		14-Mar-16	mg/dm²/day	27	1.6	<0.10	1.7
	DF-M-03		11-Apr-16	mg/dm²/day	28	7.6	0.28	7.9
	DF-M-03		9-May-16	mg/dm²/day	28	3.4	0.11	3.5
	DF-M-03		11-Jun-16	mg/dm²/day	33	2.5	<0.10	2.6
	DF-M-03		12-Jul-16	mg/dm²/day	31	4.9	0.15	5.0
	DF-M-03	2016 to 2017	17-Oct-16	mg/dm²/day	23	<1.0	<1.0	<1.0
	DF-M-03		19-Nov-16	mg/dm²/day	33	1.2	<0.10	1.2
	DF-M-03		19-Dec-16	mg/dm²/day	29	0.51	<0.10	0.54
	DF-M-03		16-Jan-17	mg/dm²/day	28	0.87	<0.10	0.89
	DF-M-03		17-Feb-17	mg/dm²/day	32	0.19	<0.10	0.19
	DF-M-03		22-Mar-17	mg/dm²/day	33	1.4	<0.10	1.5
	DF-M-03		23-Apr-17	mg/dm²/day	32	0.96	<0.10	1.0
	DF-M-03		21-May-17	mg/dm²/day	28	3.8	<0.10	3.9
	DF-M-03		19-Jun-17	mg/dm²/day	29	1.7	<0.10	1.7
	DF-M-03		22-Jul-17	mg/dm²/day	33	4.9	0.12	5.0
	DF-M-03	2017 to 2018	15-Oct-17	mg/dm²/day	25	2.6	<0.10	2.7
	DF-M-03		14-Nov-17	mg/dm²/day	30	0.76	<0.10	0.81

Table B.8: Dustfall Deposition Rates for Dustfall Monitoring Stations Nearby Sheardown Lake NW

Season	Station ID	Period	Sample Date	Unit	Sampling Days	Insoluble Dustfall		
						Fixed	Volatile	Total
Ice Cover	DF-M-03	2017 to 2018	10-Dec-17	mg/dm²/day	26	2.8	<0.10	2.9
	DF-M-03		9-Jan-18	mg/dm²/day	30	1.3	<0.10	1.3
	DF-M-03		13-Feb-18	mg/dm²/day	35	1.7	0.32	2.1
	DF-M-03		17-Mar-18	mg/dm²/day	32	0.92	<0.10	0.93
	DF-M-03		20-Apr-18	mg/dm²/day	34	2.4	<0.10	2.3
	DF-M-03		13-May-18	mg/dm²/day	23	1.4	<0.10	1.4
	DF-M-03		15-Jun-18	mg/dm²/day	33	4.3	<0.10	4.3
	DF-M-03		17-Jul-18	mg/dm²/day	29	1.5	<0.10	1.6
	DF-M-03	2018 to 2019	10-Oct-18	mg/dm²/day	27	3.5	<0.10	3.5
	DF-M-03		11-Nov-18	mg/dm²/day	32	1.1	<0.10	1.1
	DF-M-03		10-Dec-18	mg/dm²/day	29	0.48	<0.10	0.47
	DF-M-03		7-Jan-19	mg/dm²/day	28	1.1	<0.10	1.1
	DF-M-03		4-Feb-19	mg/dm²/day	29	1.6	<0.10	1.7
	DF-M-03		7-Mar-19	mg/dm²/day	30	2.4	<0.10	2.5
	DF-M-03		2-Apr-19	mg/dm²/day	26	6.9	0.46	7.4
	DF-M-03		2-May-19	mg/dm²/day	30	2.4	<0.10	2.5
	DF-M-03		29-May-19	mg/dm²/day	27	1.4	<0.10	1.4
	DF-M-03		26-Jun-19	mg/dm²/day	28	0.74	<0.10	0.76
	DF-M-03		24-Jul-19	mg/dm²/day	28	2.2	<0.10	2.3
	DF-M-03	2019 to 2020	16-Oct-19	mg/dm²/day	28	1.4	<0.10	1.5
	DF-M-03		13-Nov-19	mg/dm²/day	28	0.52	<0.10	0.54
	DF-M-03		12-Dec-19	mg/dm²/day	29	1.9	<0.10	2.0
	DF-M-03		8-Jan-20	mg/dm²/day	28	0.31	<0.10	0.33
	DF-M-03		5-Feb-20	mg/dm²/day	27	0.45	<0.10	0.46
	DF-M-03		4-Mar-20	mg/dm²/day	28	1.4	<0.10	1.4
	DF-M-03		1-Apr-20	mg/dm²/day	28	2.2	0.14	2.3
	DF-M-03		1-May-20	mg/dm²/day	30	3.9	0.1	4.0
	DF-M-03		29-May-20	mg/dm²/day	28	6.8	0.17	7.0
	DF-M-03		29-Jun-20	mg/dm²/day	31	1.9	<0.10	1.9
	DF-M-03		27-Jul-20	mg/dm²/day	28	3.1	<0.10	3.2
	DF-M-03	2020 to 2021	20-Dec-20	mg/dm²/day	31	0.48	<0.10	0.49
	DF-M-03		21-Oct-20	mg/dm²/day	30	5.8	0.12	6.0
	DF-M-03		19-Nov-20	mg/dm²/day	29	0.37	<0.10	0.38
	DF-M-03		18-Jan-21	mg/dm²/day	29	0.79	<0.10	0.83
	DF-M-03		17-Feb-21	mg/dm²/day	30	0.84	<0.10	0.89
	DF-M-03		20-Mar-21	mg/dm²/day	31	1.5	<0.10	1.5
	DF-M-03		25-Apr-21	mg/dm²/day	36	0.74	<0.10	0.78
	DF-M-03		21-May-21	mg/dm²/day	26	0.75	<0.10	0.78
	DF-M-03		21-Jun-21	mg/dm²/day	31	4.3	<0.10	4.4
	DF-M-03		22-Jul-21	mg/dm²/day	31	1.3	<0.10	1.4
	DF-M-03	2021-2022	21-Oct-21	mg/dm²/day	29	0.53	<0.10	0.56
	DF-M-03		18-Nov-21	mg/dm²/day	28	1.5	<0.10	1.6
	DF-M-03		17-Dec-21	mg/dm²/day	29	1.9	<0.10	2.0
	DF-M-03		15-Jan-22	mg/dm²/day	29	4.7	0.12	4.8
	DF-M-03		18-Feb-22	mg/dm²/day	34	6.9	0.21	7.1
	DF-M-03		19-Mar-22	mg/dm²/day	29	2.9	<0.10	3.0
	DF-M-03		18-Apr-22	mg/dm²/day	30	1.6	<0.10	1.7
	DF-M-03		18-May-22	mg/dm²/day	30	7.3	0.23	7.6
	DF-M-03		17-Jun-22	mg/dm²/day	30	4.2	0.11	4.4
	DF-M-03		16-Jul-22	mg/dm²/day	29	5.8	0.17	6.0
	DF-M-03	2022-2023	11-Oct-22	mg/dm²/day	29	0.56	<0.10	0.59

Table B.8: **Dustfall Deposition Rates for Dustfall Monitoring Stations Nearby Sheardown Lake NW**

Season	Station ID	Period	Sample Date	Unit	Sampling Days	Insoluble Dustfall		
						Fixed	Volatile	Total
Ice Cover	DF-M-03	2022 to 2023	18-Nov-22	mg/dm²/day	38	0.48	<0.10	0.49
	DF-M-03		20-Dec-22	mg/dm²/day	32	0.51	<0.10	0.52
	DF-M-03		16-Jan-23	mg/dm²/day	28	1.0	< 0.10	1.1
	DF-M-03		16-Feb-23	mg/dm²/day	31	0.92	< 0.10	0.95
	DF-M-03		11-Mar-23	mg/dm²/day	23	1.1	< 0.10	1.2
	DF-M-03		10-Apr-23	mg/dm²/day	111	6.0	0.1	6.1
	DF-M-03		9-May-23	mg/dm²/day	82	3.9	0.11	4.0
	DF-M-03		3-Jun-23	mg/dm²/day	25	2.9	0.11	3.0
	DF-M-03		1-Jul-23	mg/dm²/day	28	3.2	< 0.10	3.2
	DF-M-03	2023 to 2024	Oct-23	mg/dm²/day	n.a	n.a	n.a	n.a
	DF-M-03		24-Nov-23	mg/dm²/day	n.a	1.0	< 0.1	1.1
	DF-M-03		27-Dec-23	mg/dm²/day	33	1.8	< 0.1	1.9
	DF-M-03		23-Jan-24	mg/dm²/day	27	3.2	<0.10	3.3
	DF-M-03		22-Feb-24	mg/dm²/day	30	2.9	<0.10	3.0
	DF-M-03		23-Mar-24	mg/dm²/day	30	4.5	0.29	4.8
	DF-M-03		23-Apr-24	mg/dm²/day	31	1.5	<0.10	1.6
	DF-M-03		7-May-24	mg/dm²/day	14	1.2	<0.10	1.2
	DF-M-03		23-May-24	mg/dm²/day	16	5.6	0.13	5.7
	DF-M-03		26-Jun-24	mg/dm²/day	34	3.3	<0.10	3.4
	DF-M-03		24-Jul-24	mg/dm²/day	28	1.9	<0.10	1.9
Open Water	DF-M-01	2013	17-Aug-13	mg/dm²/day	28	<0.11	<0.11	<0.11
	DF-M-01		18-Sep-13	mg/dm²/day	33	0.10	<0.10	0.10
	DF-M-01	2014	10-Aug-14	mg/dm²/day	42	0.29	<0.10	0.35
	DF-M-01	2015	8-Aug-15	mg/dm²/day	29	1.4	<0.10	1.4
	DF-M-01		6-Sep-15	mg/dm²/day	29	2.6	0.14	2.7
	DF-M-01	2016	15-Aug-16	mg/dm²/day	34	1.9	<0.10	2.0
	DF-M-01		23-Sep-16	mg/dm²/day	39	0.90	<0.10	0.92
	DF-M-01	2017	19-Aug-17	mg/dm²/day	29	0.36	<0.10	0.40
	DF-M-01		20-Sep-17	mg/dm²/day	32	0.18	<0.10	0.20
	DF-M-01	2018	14-Aug-18	mg/dm²/day	28	0.12	<0.10	0.13
	DF-M-01		13-Sep-18	mg/dm²/day	30	0.26	<0.10	0.27
	DF-M-01	2019	20-Aug-19	mg/dm²/day	27	1.2	<0.10	1.2
	DF-M-01		18-Sep-19	mg/dm²/day	29	0.88	<0.10	0.90
	DF-M-01	2020	23-Aug-20	mg/dm²/day	27	0.91	<0.10	0.94
	DF-M-01		21-Sep-20	mg/dm²/day	29	0.56	<0.10	0.57
	DF-M-01	2021	21-Aug-21	mg/dm²/day	30	1.2	<0.10	1.2
	DF-M-01		22-Sep-21	mg/dm²/day	31	3.2	0.12	3.3
	DF-M-01	2022	14-Aug-22	mg/dm²/day	30	1.6	0.14	1.7
	DF-M-01		12-Sep-22	mg/dm²/day	29	0.48	<0.10	0.51
	DF-M-01	2023	29-Jul-23	mg/dm²/day	28	2.4	< 0.10	2.4
	DF-M-01		28-Aug-23	mg/dm²/day	30	0.4	< 0.10	0.41
	DF-M-01		25-Sep-23	mg/dm²/day	28	4.1	0.18	4.3
	DF-M-01	2024	21-Aug-2024	mg/dm²/day	28	0.46	<0.10	0.49
	DF-M-01		20-Sep-2024	mg/dm²/day	30	<0.34	<0.10	<0.34
	DF-M-01		20-Oct-2024	mg/dm²/day	30	1.1	<0.10	1.2
	DF-M-02	2013	17-Aug-13	mg/dm²/day	28	<0.11	<0.11	<0.11
	DF-M-02		18-Sep-13	mg/dm²/day	33	<0.10	<0.10	<0.10
	DF-M-02	2014	10-Aug-14	mg/dm²/day	42	0.16	<0.10	0.19
	DF-M-02	2015	8-Aug-15	mg/dm²/day	29	0.91	<0.10	0.94
	DF-M-02		6-Sep-15	mg/dm²/day	29	2.5	<0.10	2.5
	DF-M-02	2016	15-Aug-16	mg/dm²/day	34	0.53	<0.10	0.57

Table B.8: **Dustfall Deposition Rates for Dustfall Monitoring Stations Nearby Sheardown Lake NW**

Season	Station ID	Period	Sample Date	Unit	Sampling Days	Insoluble Dustfall		
						Fixed	Volatile	Total
Open Water	DF-M-02	2016	23-Sep-16	mg/dm²/day	39	0.85	<0.10	0.89
	DF-M-02	2017	19-Aug-17	mg/dm²/day	30	0.20	<0.10	0.22
	DF-M-02		20-Sep-17	mg/dm²/day	30	0.55	<0.10	0.56
	DF-M-02	2018	14-Aug-18	mg/dm²/day	28	<0.10	<0.10	<0.10
	DF-M-02		11-Sep-18	mg/dm²/day	30	0.25	<0.10	0.26
	DF-M-02	2019	20-Aug-19	mg/dm²/day	27	0.93	<0.10	0.97
	DF-M-02		18-Sep-19	mg/dm²/day	29	0.60	<0.10	0.62
	DF-M-02	2020	23-Aug-20	mg/dm²/day	27	1.1	<0.10	1.2
	DF-M-02		21-Sep-20	mg/dm²/day	29	0.65	<0.10	0.66
	DF-M-02	2021	21-Aug-21	mg/dm²/day	30	0.36	<0.10	0.38
	DF-M-02		22-Sep-21	mg/dm²/day	31	2.8	0.11	2.9
	DF-M-02	2022	14-Aug-22	mg/dm²/day	29	1.5	<0.10	1.6
	DF-M-02		12-Sep-22	mg/dm²/day	29	1.0	<0.10	1.0
	DF-M-02	2023	29-Jul-23	mg/dm²/day	28	2.0	< 0.10	2.1
	DF-M-02		28-Aug-23	mg/dm²/day	30	0.24	< 0.10	0.26
	DF-M-02		25-Sep-23	mg/dm²/day	28	1.4	< 0.10	1.5
	DF-M-02	2024	21-Aug-2024	mg/dm²/day	28	0.5	<0.10	0.52
	DF-M-02		20-Sep-2024	mg/dm²/day	30	<0.40	<0.10	<0.40
	DF-M-02		20-Oct-2024	mg/dm²/day	30	0.32	<0.10	0.34
	DF-M-03	2013	17-Aug-13	mg/dm²/day	28	<0.11	<0.11	<0.11
	DF-M-03		18-Sep-13	mg/dm²/day	33	0.52	<0.10	0.52
	DF-M-03	2014	10-Aug-14	mg/dm²/day	42	0.13	<0.10	0.15
	DF-M-03	2015	8-Aug-15	mg/dm²/day	29	0.76	<0.10	0.85
	DF-M-03		6-Sep-15	mg/dm²/day	29	5.3	0.16	5.4
	DF-M-03	2016	15-Aug-16	mg/dm²/day	34	1.1	<0.10	1.1
	DF-M-03		24-Sep-16	mg/dm²/day	40	1.3	<0.10	1.4
	DF-M-03	2017	19-Aug-17	mg/dm²/day	30	0.9	<0.10	0.95
	DF-M-03		20-Sep-17	mg/dm²/day	30	1.1	<0.10	1.2
	DF-M-03	2018	16-Aug-18	mg/dm²/day	30	0.33	<0.10	0.34
	DF-M-03		13-Sep-18	mg/dm²/day	28	0.52	<0.10	0.54
	DF-M-03	2019	20-Aug-19	mg/dm²/day	29	3.2	0.11	3.3
	DF-M-03		18-Sep-19	mg/dm²/day	27	4.6	0.15	4.8
	DF-M-03	2020	23-Aug-20	mg/dm²/day	27	2.1	<0.10	2.1
	DF-M-03		21-Sep-20	mg/dm²/day	29	1.3	<0.10	1.4
	DF-M-03	2021	21-Aug-21	mg/dm²/day	30	0.48	<0.10	0.5
	DF-M-03		22-Sep-21	mg/dm²/day	31	7.8	0.19	8.0
	DF-M-03	2022	14-Aug-22	mg/dm²/day	30	4.3	0.14	4.4
	DF-M-03		12-Sep-22	mg/dm²/day	29	1.5	<0.10	1.5
	DF-M-03	2023	29-Jul-23	mg/dm²/day	28	3.5	< 0.10	3.6
	DF-M-03		28-Aug-23	mg/dm²/day	30	0.16	< 0.10	0.17
	DF-M-03		25-Sep-23	mg/dm²/day	28	10	0.39	11
	DF-M-03	2024	21-Aug-24	mg/dm²/day	28	4.3	0.1	4.4
	DF-M-03		20-Sep-24	mg/dm²/day	30	<0.50	<0.10	<0.50
	DF-M-03		20-Oct-24	mg/dm²/day	30	1.0	<0.10	1.1

Table B.9: Sediment Metal Concentrations in Sheardown Lake Northwest During the Baseline (2005 to 2013) Period

Parameter	Baseline Period Sediment Chemistry in Sheardown Lake NW	
	Littoral Stations (n = 3)	Profundal Stations (n = 4)
	mg/kg	mg/kg
Aluminum	11,792	17,745
Antimony	1.0	1
Arsenic	3.0	3.2
Barium	78	93
Beryllium	1.0	1.0
Bismuth	-	-
Boron [a]	3.0	3.0
Cadmium	0.5	0.5
Calcium	2,697	3,558
Chromium	53	81
Cobalt	10	15
Copper	33	48
Iron	28,120	40,382
Lead	13	20
Lithium	-	-
Magnesium	7,448	11,498
Manganese	756	2,164
Mercury	0.1	0.1
Molybdenum	3.4	3.5
Nickel	49	69
Phosphorus	863	1,400
Potassium	2,681	4,612
Selenium	1.0	1.0
Silver	0.3	0.3
Sodium	249	342
Strontium	7.2	11.4
Sulphur	-	-
Thallium	1.0	1.0
Tin	-	-
Titanium	-	-
Tungsten	-	-
Uranium	-	-
Vanadium	37	58
Zinc	51	76
Zirconium	-	-

Note: '-' indicates baseline data not available.

[a] Boron concentrations in sediment from 2015 to 2022 were considerably higher (i.e., 10- to 70-times) than those reported during both the baseline and 2014 studies at all mine-exposed lakes. The lack of any distinct gradient in the magnitude of the elevation in boron concentrations among stations within each lake and among study lakes suggested that the stark contrast in boron concentrations between recent data and data collected prior to 2015 was likely due to laboratory based analytical differences.

APPENDIX C
SUPPORTING BENTHIC INVERTEBRATE COMMUNITY DATA

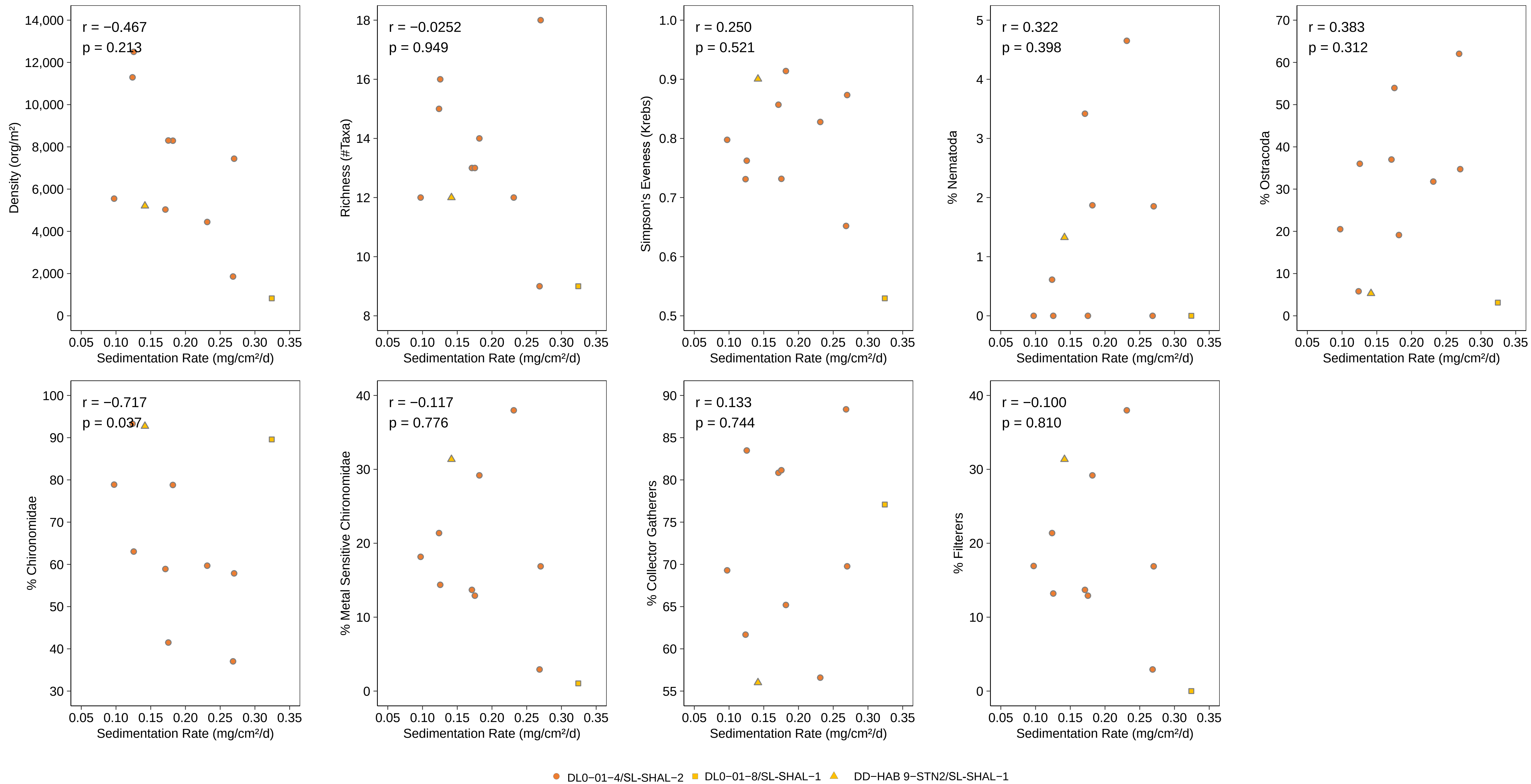


Figure C.1: Spearman's Rank Correlations Between Benthic Invertebrate Community Endpoints and Sedimentation Rate at Sheardown Lake Northwest Stations DL0−01−4 and SL-SHAL-2 during the Open Water Season over the Mine Operation Period, Baffinland Iron Mine, 2015 to 2024

Notes: Benthic Invertebrate Community Endpoints were calculated only for data used in the correlation and may vary slightly from those reported in the CREMP. SL-SHAL−1 stations were not included in the correlation analysis, but are included in the plots for reference.

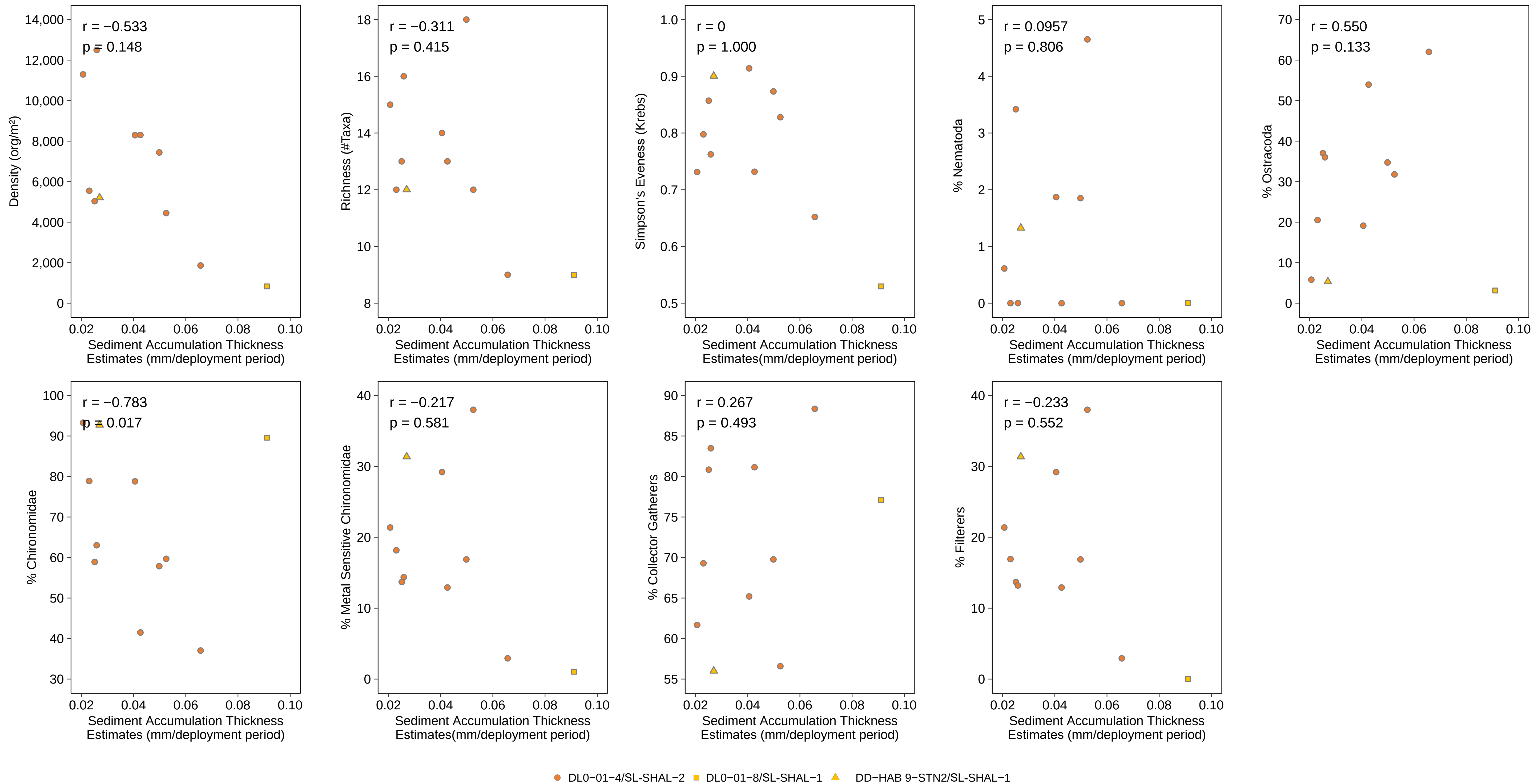


Figure C.2: Spearman's Rank Correlations Between Benthic Invertebrate Community Endpoints and Sediment Accumulation Thickness Estimates at Sheardown Lake Northwest Stations DL0−01−4 and SL-SHAL-2 during the Open Water Season over the Mine Operation Period, Baffinland Iron Mine, 2015 to 2024

Notes: Benthic Invertebrate Community Endpoints were calculated only for data used in the correlation and may vary slightly from those reported in the CREMP. SL-SHAL−1 stations were not included in the correlation analysis, but are included in the plots for reference.

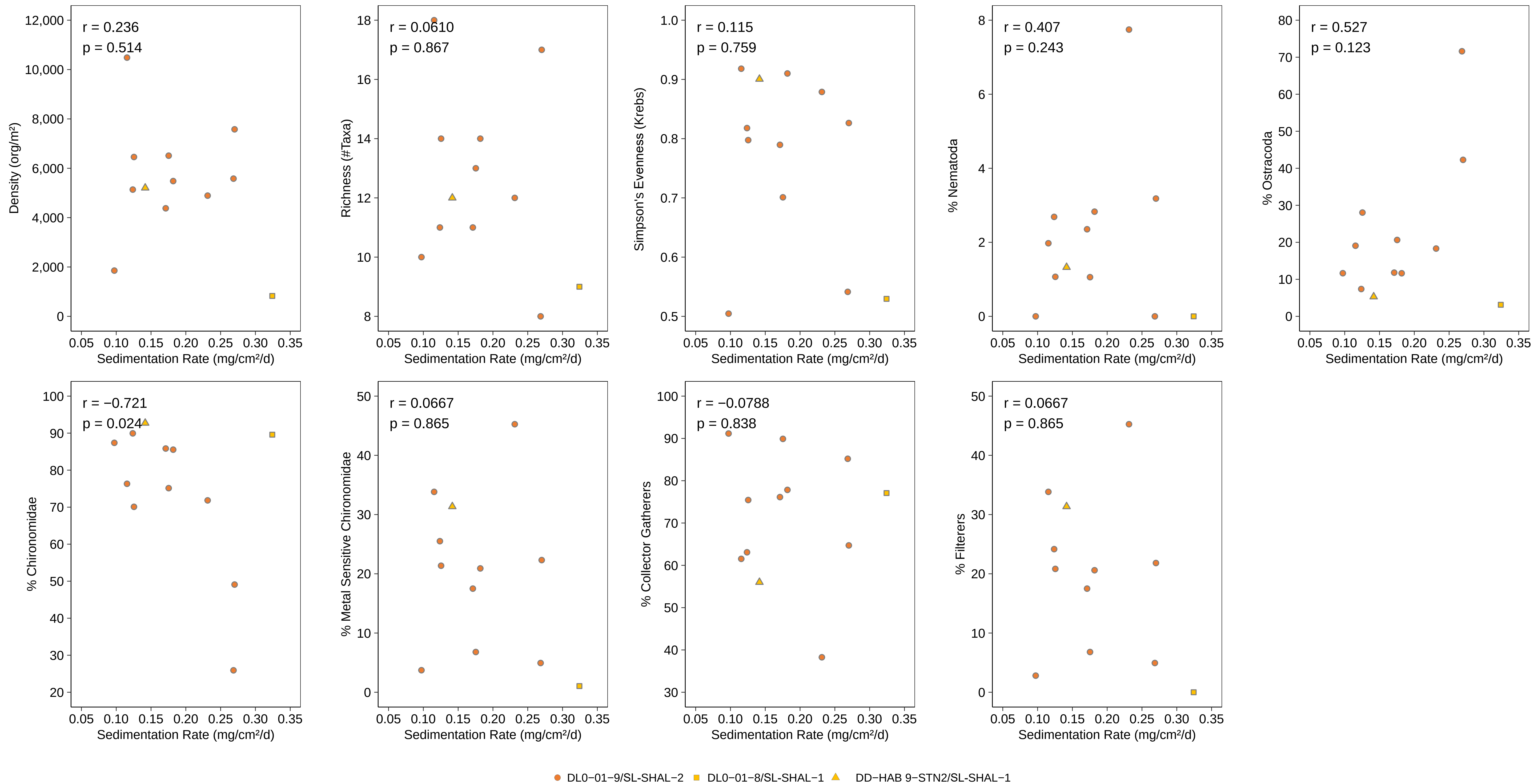


Figure C.3: Spearman's Rank Correlations Between Benthic Invertebrate Community Endpoints and Sedimentation Rate at Sheardown Lake Northwest Stations DL0−01−9 and SL-SHAL-2 during the Open Water Season over the Mine Operation Period, Baffinland Iron Mine, 2015 to 2024

Notes: Benthic Invertebrate Community Endpoints were calculated only for data used in the correlation and may vary slightly from those reported in the CREMP. SL-SHAL−1 stations were not included in the correlation analysis, but are included in the plots for reference.

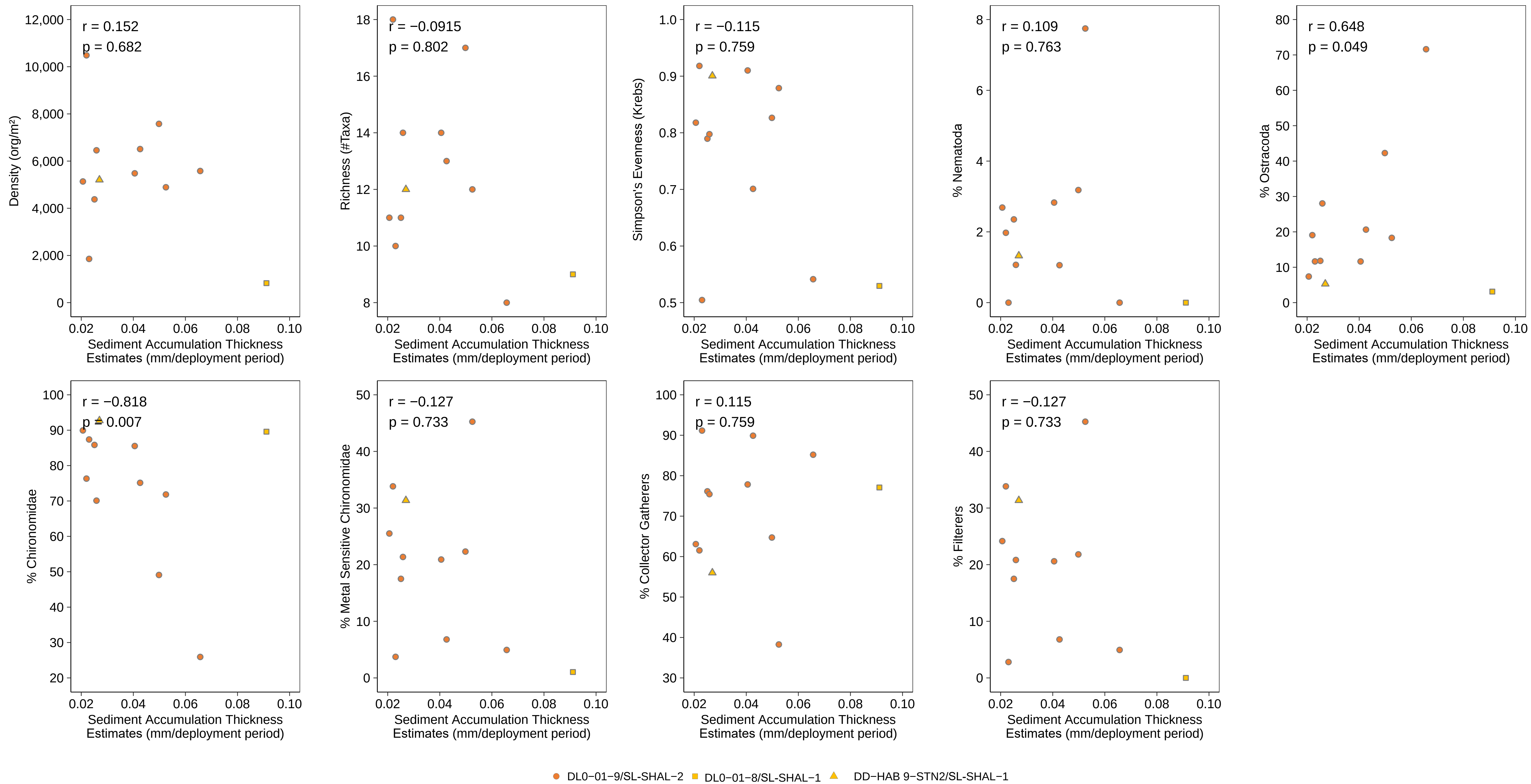


Figure C.4: Spearman's Rank Correlations Between Benthic Invertebrate Community Endpoints and Sediment Accumulation Thickness Estimates at Sheardown Lake Northwest Stations DL0−01−9 and SL-SHAL-2 during the Open Water Season over the Mine Operation Period, Baffinland Iron Mine, 2015 to 2024

Notes: Benthic Invertebrate Community Endpoints were calculated only for data used in the correlation and may vary slightly from those reported in the CREMP. SL-SHAL−1 stations were not included in the correlation analysis, but are included in the plots for reference.

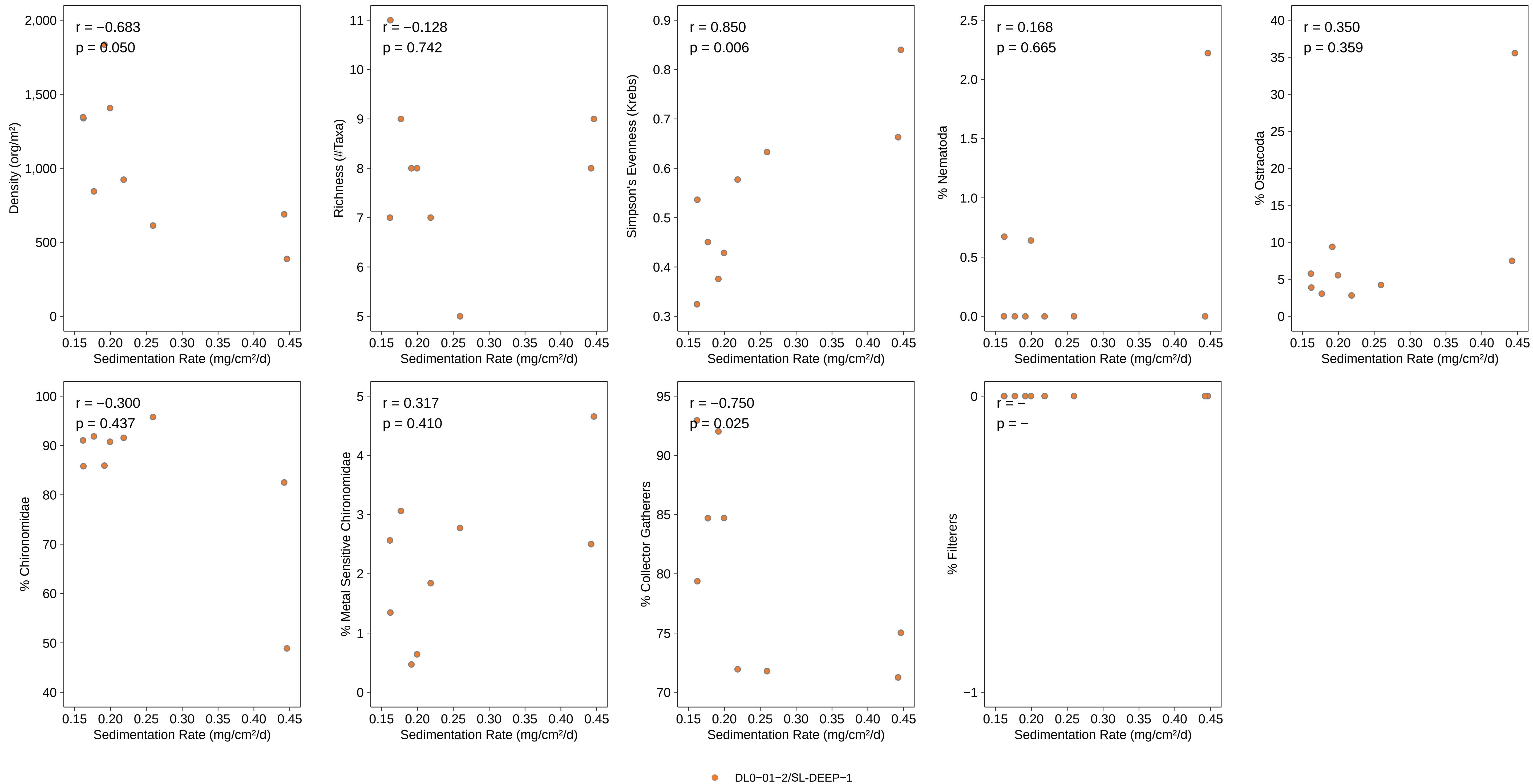


Figure C.5: Spearman's Rank Correlations Between Benthic Invertebrate Community Endpoints and Sedimentation Rate at Sheardown Lake Northwest Stations DL0−01−2 and SL-DEEP-1 during the Open Water Season over the Mine Operation Period, Baffinland Iron Mine, 2015 to 2024

Notes: A '−' indicates no variation in the BIC endpoint.

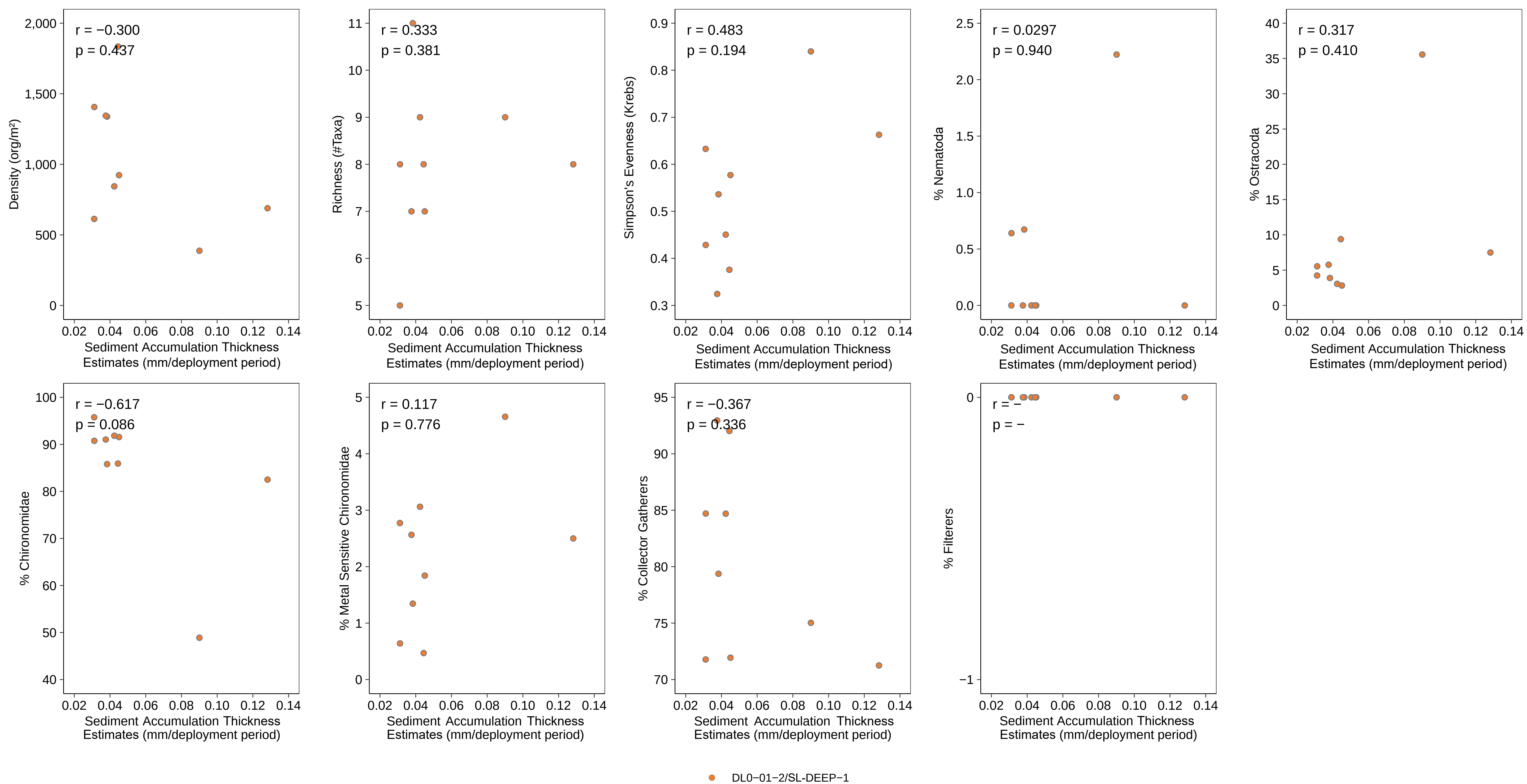


Figure C.6: Spearman's Rank Correlations Between Benthic Invertebrate Community Endpoints and Sediment Accumulation Thickness Estimates at Sheardown Lake Northwest Stations DL0−01−2 and SL-DEEP-1 during the Open Water Season over the Mine Operation Period, Baffinland Iron Mine, 2015 to 2024

Notes: A '−' indicates no variation in the BIC endpoint.

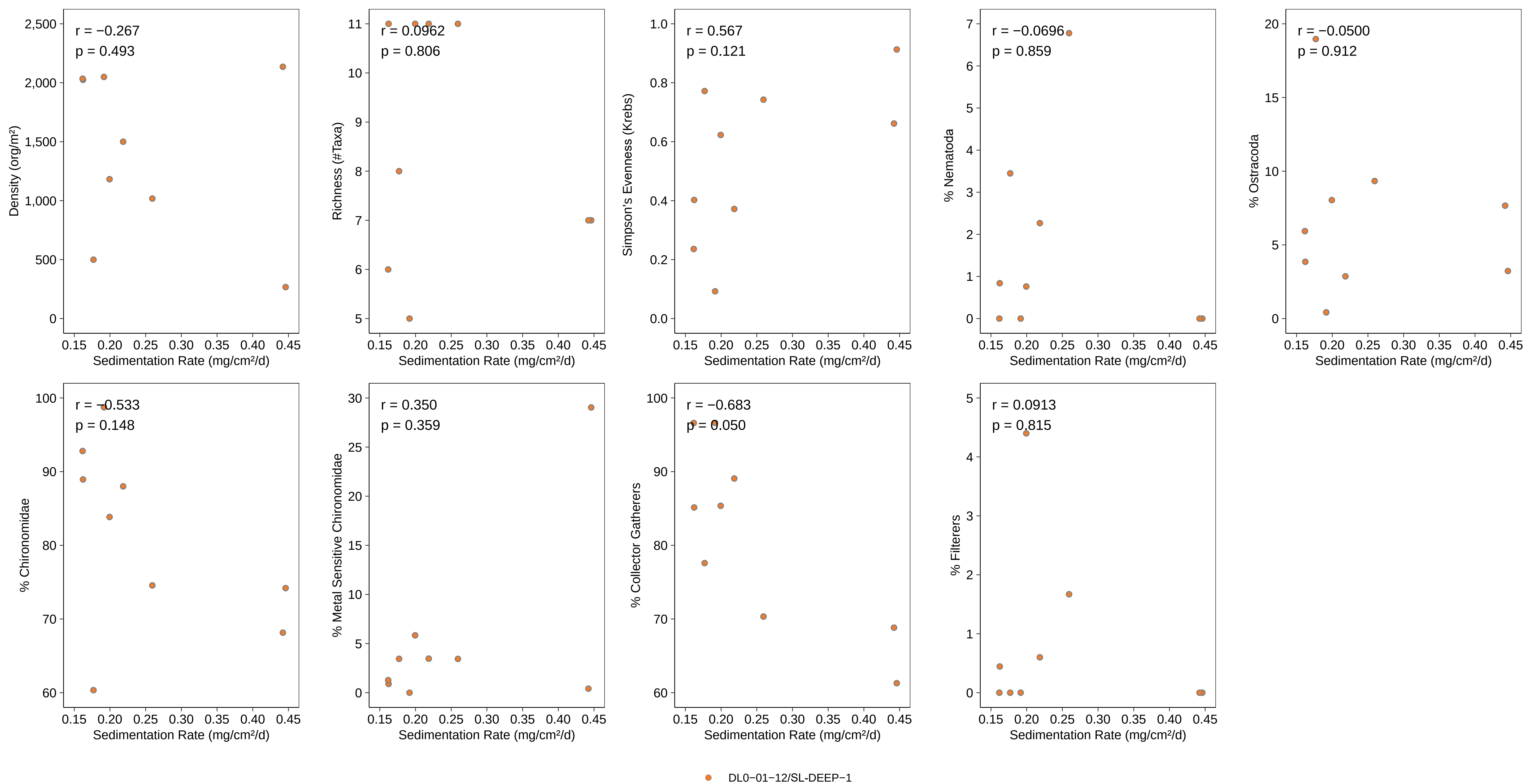


Figure C.7: Spearman's Rank Correlations Between Benthic Invertebrate Community Endpoints and Sedimentation Rate at Sheardown Lake Northwest Stations DL0−01−12 and SL-DEEP-1 during the Open Water Season over the Mine Operation Period, Baffinland Iron Mine, 2015 to 2024

Notes: A '−' indicates no variation in the BIC endpoint.

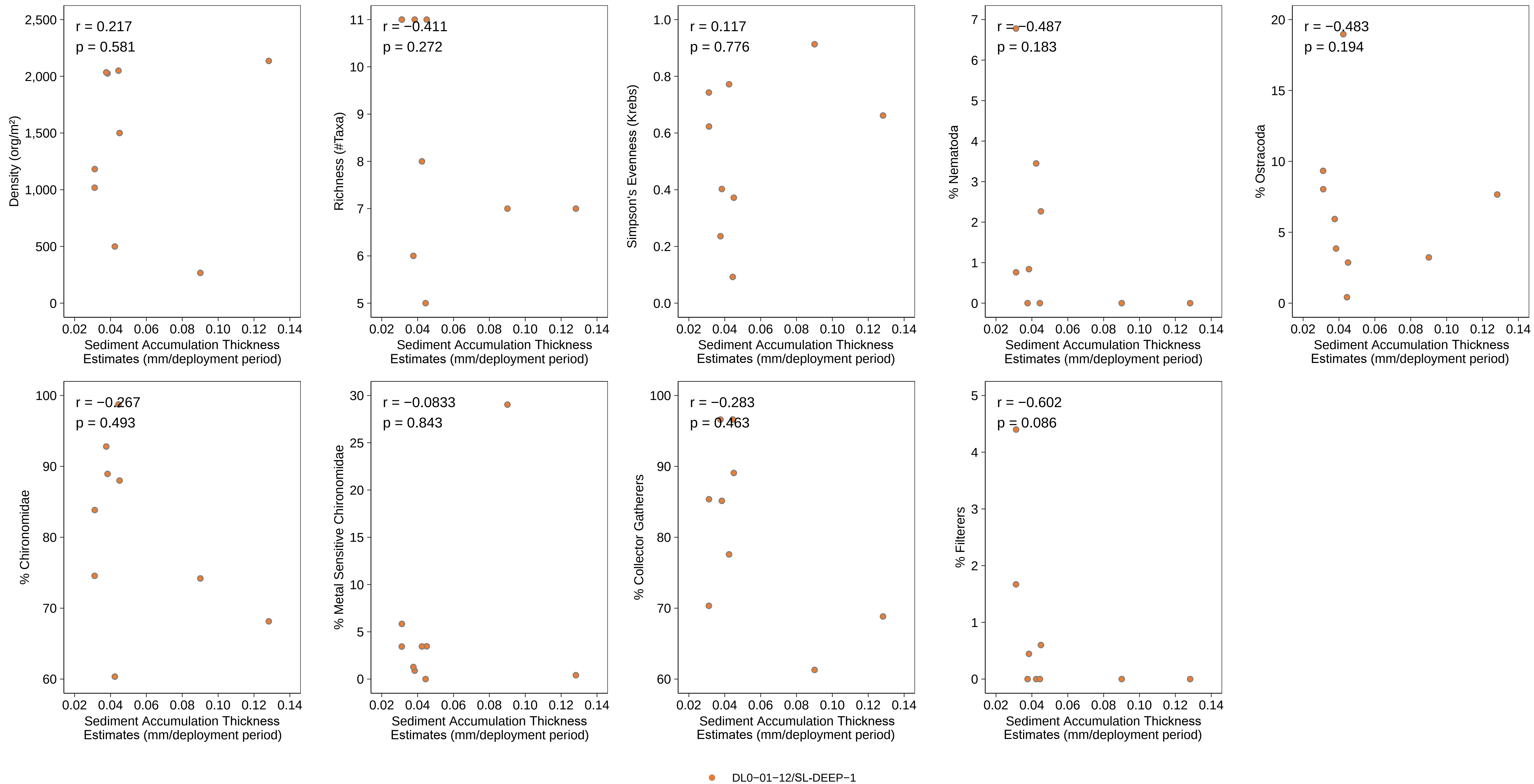


Figure C.8: Spearman's Rank Correlations Between Benthic Invertebrate Community Endpoints and Sediment Accumulation Thickness Estimates at Sheardown Lake Northwest Stations DL0−01−12 and SL-DEEP-1 during the Open Water Season over the Mine Operation Period, Baffinland Iron Mine, 2015 to 2024

Notes: A '−' indicates no variation in the BIC endpoint.

Table C.1: Benthic Invertebrate Community Endpoints from Sheardown Lake Northwest used in Sedimentation Rate and Sediment Accumulation Thickness Estimates Correlation over Mine Operation Period, Baffinland Iron Mine, 2015 to 2024

Habitat	Station	Year	Density (org/m²)	Richness (#Taxa)	Simpson's Evenness (Krebs)	% Nematoda	% Ostracoda	% Chironomidae	% Metal Sensitive Chironomidae	% Collector Gatherers	% Filterers
Littoral	DL0-01-4/ SL-SHAL2	2015	11,292	15.0	0.731	0.611	5.80	93.3	21.4	61.7	21.4
		2017	5,032	13.0	0.857	3.42	37.0	58.9	13.7	80.8	13.7
		2018	8,292	14.0	0.914	1.87	19.1	78.8	29.2	65.2	29.2
		2019	5,549	12.0	0.798	0	20.5	78.9	18.2	69.3	16.9
		2020	12,500	16.0	0.762	0	36.0	63.0	14.4	83.5	13.2
		2021	8,301	13.0	0.732	0	53.9	41.5	12.9	81.1	12.9
		2022	4,443	12.0	0.828	4.65	31.8	59.7	38.0	56.6	38.0
		2023	7,440	18.0	0.873	1.85	34.7	57.9	16.9	69.8	16.9
		2024	1,860	9.00	0.652	0	62.0	37.0	2.92	88.3	2.92
	DL0-01-9/ SL-SHAL2	2015	5,136	11.0	0.818	2.69	7.38	89.9	25.5	63.1	24.2
		2016	10,484	18.0	0.918	1.97	19.1	76.3	33.8	61.5	33.8
		2017	4,378	11.0	0.790	2.35	11.8	85.8	17.5	76.1	17.5
		2018	5,481	14.0	0.910	2.83	11.6	85.5	20.9	77.8	20.6
		2019	1,854	10.0	0.505	0	11.6	87.4	3.72	91.2	2.80
		2020	6,457	14.0	0.798	1.07	28.0	70.1	21.4	75.4	20.8
		2021	6,510	13.0	0.701	1.06	20.6	75.1	6.79	89.9	6.79
		2022	4,891	12.0	0.879	7.75	18.3	71.8	45.2	38.3	45.2
		2023	7,578	17.0	0.826	3.18	42.3	49.1	22.3	64.7	21.8
		2024	5,580	8.00	0.541	0	71.6	25.9	4.94	85.2	4.94
	DL0-01-8/ SL-SHAL1	2024	827	9.00	0.530	0	3.12	89.6	1.04	77.1	0
	DD-HAB 9-STN2/ SL-SHAL1	2016	5,205	12.0	0.901	1.33	5.30	92.7	31.4	56.0	31.4
Profundal	DL0-01-2/ SL-DEEP-1	2015	1,406	8.00	0.429	0.640	5.55	90.8	0.640	84.7	0
		2017	613	5.00	0.633	0	4.24	95.8	2.77	71.8	0
		2018	923	7.00	0.577	0	2.82	91.5	1.84	71.9	0
		2019	1,338	11.0	0.536	0.673	3.89	85.8	1.35	79.4	0
		2020	1,345	7.00	0.324	0	5.77	91.0	2.56	93.0	0
		2021	844	9.00	0.451	0	3.06	91.8	3.06	84.7	0
		2022	1,834	8.00	0.376	0	9.39	85.9	0.469	92.0	0
		2023	388	9.00	0.840	2.22	35.6	48.9	4.66	75.0	0
		2024	689	8.00	0.663	0	7.50	82.5	2.50	71.2	0
	DL0-01-12/ SL-DEEP-1	2015	1,182	11.0	0.623	0.761	8.04	83.8	5.84	85.4	4.40
		2017	1,018	11.0	0.743	6.78	9.33	74.6	3.44	70.3	1.67
		2018	1,500	11.0	0.372	2.27	2.87	88.0	3.47	89.1	0.600
		2019	2,025	11.0	0.402	0.840	3.85	88.9	0.889	85.1	0.444
		2020	2,034	6.00	0.236	0	5.93	92.8	1.28	96.6	0
		2021	499	8.00	0.772	3.45	19.0	60.3	3.45	77.6	0
		2022	2,049	5.00	0.0924	0	0.420	98.7	0	96.6	0
		2023	267	7.00	0.913	0	3.23	74.2	29.0	61.3	0
		2024	2,136	7.00	0.662	0	7.66	68.2	0.411	68.8	0

APPENDIX D
SUPPORTING BULK DENSITY METHODS

Method: Density 1

Method Reference: Density of Solid Materials by Pyknometer

Method Summary:

Sample Preparation: Samples were crushed and/or ground prior to analysis.

Sample analysis: All flasks were cleaned, dried, and pre-weighed. Each flask was filled to volume with deionized water and placed under vacuum then weighed. An aliquot of sample was weighed and then transferred to one of the pre-weighed volumetric flasks. The flask was then topped up with DI water and placed under vacuum until all the air was evacuated. The flasks were then filled to volume and reweighed. All weights were entered into the database and the rock density calculated. The temperature of the water was recorded at the time of all measurements and included in the calculations.

Detection Limit: The detection limit is 0.01 g/cc.

Quality Control: One of every 40 samples is analyzed in duplicate. All Quality Control results must be within specified limits otherwise corrective action is taken.

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